Tower Xchange

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TowerXchange Meetup Africa 2016 Post Event Report

Key market insights, working group reports and attendee profiles from 4th Annual Meetup

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Managing Director
Intrepid Advisory Partners

Zhiyong Zhang
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Miteno

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Chairman
Bharti Infratel

Nat-sy Missamou
Directeur Programme Partage d'Infrastructure AMEA, Orange

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Managing Director, Global, Head of Telecoms & Media
Standard Bank

Terry Rhodes
CEO
Eaton Towers

Marc Ganzi
President, Digital Bridge & Mexico Tower Partners

Arun Kapur
Co-Founder
Irrawaddy Green Towers

James Maclaurin
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edotco

Areef Kassam
Director of Infrastructure
GSMA Mobile for Development

Ayman Al Adl
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Standard Chartered Bank

Dagan Kasavana
CEO
Phoenix Tower International

Chuck Green
Executive Chairman
Helios Towers Africa

Suresh Sidhu
CEO
edotco

Malcolm Collins
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CTIL

Ted Zhong
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Q Towers International

Hal Hess
EVP, International Operations and President, EMEA and Latin America
American Tower

Nobel Tanihaha
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Umang Das
Chief Mentor
Viom Networks

Gilles Kuntz
CEO
TowerCo of Madagascar

Maria Scotti
CEO
Torrecom

David Meganck
Founder and COO
Acsys

Tilak Raj Dua
Director General
TAIPA

Dimitris Lioulias
GM of Strategy
Saudi Telecom Company

Kurt Bagwell
President International
SBA Communications

Jim Eisenstein
Chairman & CEO
Grupo TorreSur

Bimal Dayal
CEO
Indus Towers

Inder Bajaj
Advisor, Helios Investment Partners & former CEO
HTN Towers

Riana Donaldson
Manager: International Network Operations Support
Vodacom

Tunde Titilayo
Vice Chairman
SWAP International

Jack Dessay
Managing Director
Macquarie Capital

Jeffrey Eldredge
Partner
Vinson & Elkins

Enda Hardiman
Managing Partner
Hardiman Telecommunications Ltd.

Adeel Bajwa
Senior GM of Legal Affairs and Contracts
Warid Telecom

Scott Coates
CEO
Wireless Infrastructure Group

Carlo Ramella
COO, EI Towers
and Chairman, Towertel

About TowerXchange

Founded in 2012, TowerXchange is your independent community for operators, towercos, investors and suppliers interested in EMEA, CALA and Asian towers. We're a community of practitioners formed to promote and accelerate infrastructure sharing. TowerXchange don't build, operate or invest in towers; we're a neutral community host and commentator on telecoms infrastructure.

The TowerXchange Journal is free to qualifying recipients. We also provide webinars and regular meetups. TowerXchange monetises this community through hosting annual Meetups and the sale of advertising, without compromising editorial integrity.

TowerXchange was founded by Kieron Osmotherly, a TMT community host and events organiser with 18 years' experience, and is governed with the support and advice of the TowerXchange "Inner Circle" – an informal network of advisors ■

Foreword

2016 was one again a sell-out

TowerXchange would once again like to thank everyone who made the African and Middle Eastern Meetup a great success; from our 69 panellists and roundtable hosts, to over 300 of you who raised your comments and questions in over 40 roundtable discussion groups. A big thank you to our 49 sponsors and exhibitors, over 70% of which have reconfirmed already to join us for 2017. Plus thanks to the TowerXchange inner circle of advisors and all our contributors to 2016's research and analysis of the African and Middle Eastern tower industry.

Reflecting on 2016's discussions and looking forward to the year ahead we are delighted to share this year's event report with you with a selection of insights from the numerous panels, roundtable discussions and working groups.

In summary of discussions on site, a few key trends and take homes really stood out, providing insights into how the market will continue to evolve throughout 2017 and beyond:

1. Deeper infrastructure sharing is in the centre of MNO crosshairs

Already high on the agenda in 2016, but for 2017 discussions will intensify. Active sharing is becoming commonplace for in-building solutions and discussions are starting to gather momentum regarding active sharing on macro sites. Drawing up agreements and obtaining mutual trust between involved parties is going to be challenging but with lessons to draw from other markets, MEA's MNOs will continue to drive towards active sharing where many of the largest cost savings can be achieved. In 2017 we look forward to hearing the results of pilot projects, hearing how discussions are progressing between the region's operators and understanding how towerco contracts stipulating active sharing start to shape up.

2. Replacement of diesel gensets with hybrid options is a priority

Despite a whole range of sophisticated technologies and processes, talks at the 2016 roundtables show that the issue of diesel theft isn't going away. Throw in unpredictable oil prices and MNO carbon reduction commitments and the case to minimise fuel usage strengthens further. Some recent high profile works, such as IHS' replacement of almost 15,000 gensets with new hybrid solutions (expected to lead to savings of 500 litres per tower per month) are likely to spur investment by other tower owners who have been assessing options for a while. TowerXchange forecast some major RFPs for hybrid systems to come to light in 2017.

3. Future proofing and diversification of the towerco business model

The towerco business model in its traditional sense is coming under threat and must evolve. A number of factors are at play in this dynamic; a realisation by MNOs that they can replicate towerco practices; the emergence of ESCOs who can take the towerco's position as an energy expert; and a transition to 4G and ultimately 5G meaning that small cells, DAS and

fibre will become as, if not more important than macro structures.

Yet with extensive new build still required in sub-Saharan Africa, requirements from MNOs to monetise their infrastructure to free up capex for network rollout and spectrum auctions and towercos already owning a significant amount of infrastructure, there is still an important future for the towerco business model. In 2017 new discussion groups will focus around how the towerco business model needs to evolve, drawing examples from more mature international markets and providing learnings for MEA's towercos.

4. Monetisation of decommissioning programmes

This year's MENA panel highlighted the amount of decommissioning required across the region; an area in which towercos are poised to play an important role. There exists significant revenue potential in decommissioning programmes and savvy towercos realise this, and it's not just in MENA where decommissioning is happening, major programmes are also underway in sub-Saharan Africa. In 2017 we look forward to taking a deeper dive into the field of decommissioning, looking at how to release optimum value from such programmes in the region.

5. Margins continue to be squeezed

It's an inevitable trend that shows no sign of abating and a major pressure point for the entire value chain. The 2016 working groups came up with some key recommendations to be put into practice in 2017 (the report from which will be available shortly) and through facilitating dialogue between the entire ecosystem, TowerXchange are hopeful new synergies can be achieved, reducing cost without compromising quality.

6. New towercos continue to emerge and grow

In 2016 we were excited to see new towercos in attendance, and we look forward to hearing about their growth as their first tower acquisitions close and first build to suit contracts come to fruition. Emerging in markets yet untouched by other towercos and developing innovative business models, these new towercos plan to exploit underexplored niches. Many come with experienced management teams and ambitious plans; one such company forecasts growing their portfolio by over 1000 sites in the next 18 months, and another is aiming for a lofty 35,000 in the next five years.... Watch this space!

For more detailed insights into discussions at this year's Meetup, read our "Meetup Insights" section of the report and also make sure you sign up to the TowerXchange online portal to access the latest research and interviews coming out of the Meetup. Plus if you would like to be considered for an interview in the TowerXchange journal, or have a suggestion of information you would like to see covered, please don't hesitate to get in touch.

I hope to see you at the 2017 TowerXchange Meetup Africa & Middle East. The dates are already set and the venue is booked, with a much larger space meaning that we can fit in an increased number of more intimate roundtables for next year's event. Mark 3-4 October 2017 in your calendar and join us in Johannesburg for the fifth annual Meetup!

I look forward to seeing you there!

Warm regards

Laura Graves, Head of EMEA, TowerXchange

Laura Graves
Managing Director, EMEA
TowerXchange

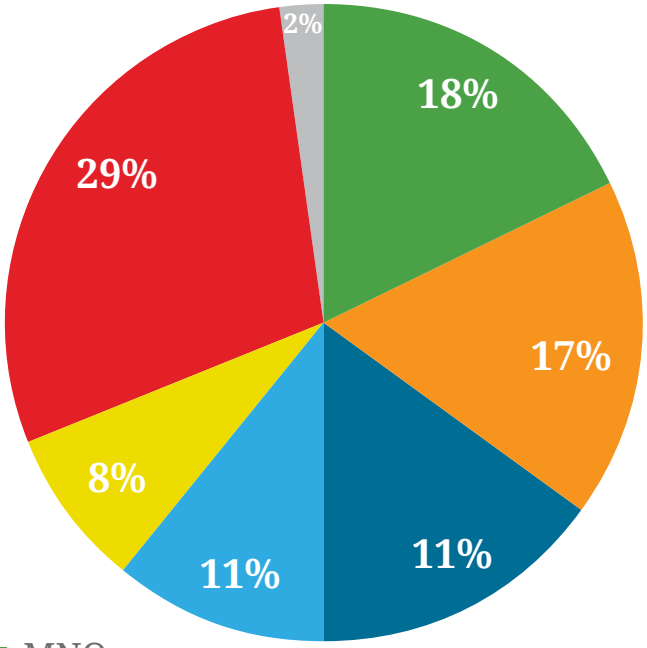
TowerXchange Meetup Africa and Middle East at a Glance

- **4** years of welcoming the who's who in MEA towers
- **300** delegates
- **69** panelists and roundtable hosts
- **40+** interactive roundtable discussion groups
- **4** invite-only onsite technology working groups
- **49** exhibitors showcasing the latest technology innovations
- **14** event sponsors
- **140** networking dinner guests

Attending tower owners and operators include:

airtel, ANTOSC, ATLAS TOWER, CELLO, CONNECT AFRICA, EatonTowers, ECONET WIRELESS, etisalat, expresso, FANASIA, helios towers, HOiMEA, HotSpot, MILLICOM, MTN, orange, PowerCom (PTY) LTD, SBA, Safaricom, SENTECH, smile, STC, SWAP, telenor, telkomkenya, Telkom, tigo, TOM, TOWERSHARE, vodacom, vodafone

Industry breakdown of TowerXchange Meetup Africa 2016 attendees

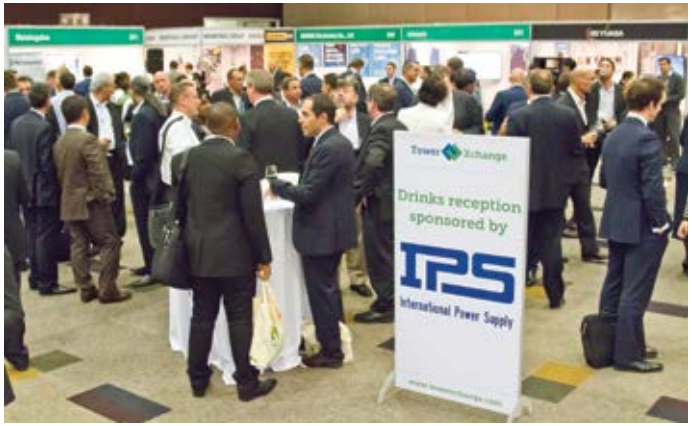


- MNOs
- Towercos
- Managed service providers & tower builders
- Analysts, investors, advisors and strategic consultants
- Platforms for site monitoring, intelligence and control
- Energy equipment and ESCOs
- Other

Source: TowerXchange

Meetup Africa & Middle East 2016 feedback

> Thank you for a greatly organised conference. It's difficult to create a conference with a good balance of representatives from all relevant stakeholders and you guys did that brilliantly ***- General Manager, Strategy, Saudi Telecom Company***



> Attending Towerxchange in Africa gives me the perfect opportunity and environment to meet all the people I need to network with. It is highly cost effective considering how many existing relationships can be revisited and the new ones that are discovered
> ***- CTO, GSM Systems***

Meetup Africa & Middle East 2016 feedback

"A great and rare moment in industry life where an active actor can return home with the feeling of having achieved half year's work in terms of learning, benchmarking and assessing new solutions and suppliers. The event brings together the industry to aid the sector in reaching a high level of operational excellence and efficiency ***- Director, M&A Capital & Executive Board Member, Al Karama Towers***"

"The meet up provided an excellent knowledge sharing opportunity and learning experience. Having MNOs and towercos present in a single platform helps to establish an understanding of mutual challenges and how to collectively address these challenges to develop a win-win situation for the entire industry ***- Manager Network Sharing, Telenor Pakistan***"

TowerXchange Meetup Africa & Middle East attendee list

Towercos and MNOs

Airtel Nigeria, VP, Network Infrastructure
Al Karama Towers, Executive Board Member
ANTOSC SA, Executive Director
ANTOSC SA, O&M Manager
Atlas Tower, CEO
Atlas Tower, CFO
Atlas Tower, GM Northern Region
Atlas Tower, Legal Advisor
Atlas Tower, Managing Director
Blue Sky Towers, Director
Cell C, Executive: Technical Facilities
Cell C, Services Manager
Connect Africa, Managing Director
Eaton Towers Kenya, Deputy Managing Director
Econet Group, Group Head Network Operations
Econet Group, Head - Network Construction
Econet Power, Chief Operating Officer
Econet Power, Corporate Transition Manager
Econet Telecom Lesotho, Chief Engineer
Econet Wireless Zimbabwe, Director
Econet Wireless Zimbabwe, Financial Consultant
EcoTowers Zimbabwe, CEO
Etisalat, Director, M&A
Etisalat, Senior Legal Counsel M&A
Fanasia, CEO
Fanasia, COO
Fanasia, Project Manager
Fanasia, Project Manager
Fanasia, R&D
Helios Towers Africa, Executive Chairman
Helios Towers Africa, Group Director of Sales & Marketing
Helios Towers Africa, Technical Director
Helios Towers Ghana, CEO
Hotspot Network Ltd, CEO
Hotspot Network Ltd, COO
Indus Towers, Vice President (National Head - Site Acquisition)
Indus Towers, Vice President
Indus Towers, Circle CEO
Millicom, Business Development Manager
MTN, National Site Acquisition Manager
MTN, Senior Manager, Access Implementation
MTN, GM Passive Infrastructure
MTN Cameroon, CTO
MTN Ghana, General Manager, Capital Projects
MTN Ghana, General Manager, Network Operations
MTN Group, GM Finance
MTN Group, Management Accountant
Orange, Sharing New Business Program Director
PowerCom, CEO
Pula Towers, Director
Quippo International, President of International Business
Safaricom, Senior Manager, Wholesale Services
Safaricom Kenya, Tower Sales Manager
Saudi Telecom Company, Advisor
Saudi Telecom Company, General Manager, Strategy
Sentech, Head: Implementation
Sentech, Head: Product Management
Smile, CTO
SWAP Technology & Telecoms, Country Manager Ghana & Cote d'Ivoire
Telenor Pakistan, Manager, Network Sharing
Telkom, Executive, Masts & Towers
Telkom, Network Procurement
Telkom Kenya, Manager, Operations & Maintenance/ NOC
Tigo Tanzania, Contracts Manager
Tigo Tanzania, Head of Procurement & Supply Chain
Towerco of Madagascar, CEO
Towershare, CEO
Towershare, Director Sales
Towershare, General Counsel
Towershare, Manager Corporate Finance
Towershare, COO
Vodacom, Executive Head, Field Force Management & Network Property
Vodacom, Manager: Strategic Technologies - Property
Vodacom, National Network Property
Vodacom, Program Manager
Vodacom, NGA Property Manager
Vodacom, Property Manager
Vodafone, Head of Supply Chain Management Sales, SCM Sales & Enterprise
Vodafone Procurement Company, Director Global SCM Sales & Marketing
Vodafone Procurement Company, Principal Category Manager, Networks SCM Technology
Vodafone Procurement Company, Senior Category Manager, Network Site Infrastructure
Vodacom, Senior Specialist

Managed service providers and tower builders

Alkan CIT, Business Development Manager
Alkan CIT, CEO
Broadband Communication Network, General Manager, Managed Services
Broadband Communication Network, Managing Director & CEO
Camusat, Vice-President Africa & Indian Ocean
Com-struct, Director
Com-struct, Director
Eki.Struct, CEO
Eki.Struct, Sales & Business Develoment Manager
Ericsson, Head of Managed Services
Ericsson, Director & Senior Advisor

TowerXchange Meetup Africa & Middle East attendee list

Ganges Internationale, Director
Ganges Internationale, GM-Exports
Gibotel Company, Director of Finance
GSM Systems, CTO
HOI-MEA, Business Development Manager
Huawei, Head of Wireless Site Marketing
Huawei, CTO, Wireless South Africa region
Huawei, Director of Wireless Site Marketing Operation
ieng Group, CEO
ieng Group, COO
ieng Group, Group Business Development Head
ieng Group, Sales Supervisor
INNOVATIONTELCO, CEO
JRDC, Partner
JRDC, Partner
LCC Algeria, Managing Director
Leadcom, Head of Operations Africa
Leadcom, Business Development
Likusasa, Director
Mahindra & Mahindra, President & Chief Executive
Mahindra & Mahindra, SVP Power
Masaba Services, Business Development Manager
MER Group, Senior Representative
MER Group, VP, Sales Africa-Asia
Metalogalva, Senior Representative
METKA, Project Director
METKA, Project Manager
NETIS, CEO
NETIS, Group CEO
NETIS BENIN, CEO
NEWL, COO
NEWL, Head of Business
NEWL, Country Manager - Malawi
ORION, Commercial Director
Sagemcom, Business Development Director
Sagemcom, Sales Director
Salasar Techno Eng, President
Seccional Poles, CEO
Sincro Sitewatch, Managing Director
Tantri Trailers Pvt Ltd, Managing Director
Tech Mahindra, Head of Sales and Business Development Subsaharan Africa
Tricom, Head of Sales
Towertech Africa, CCO
Towertech Africa, COO

Analysts, investors, advisors and strategic consultants

Analysys Mason, Principal
Analysys Mason, Senior Partner
Astem Group, CEO
Aurecon, Technical Director
Citi, Director, Global Communications Group
Citi, Head of Telecoms, MEA
Delmec, Chief Technical Officer
Delmec, Technical Officer
Deloitte, Director, Financial Advisory
FTTH Council, CEO
Gemcorp Capital, Principal
IFC, Chief Investment Officer
IHS Markit, Africa Research Director
ING Bank, Managing Director
Lerumo, CEO
M&A Capital, Associate Director
Macquarie, Managing Director, TMET
Norton Rose Fulbright, Partner
OPIC, Managing Director - Africa
Postscriptum Ventures, Chairman
UBS, Head of Equity Research, South Africa
Vine Advisory Partners, CEO
Vinson & Elkins, Senior Representative
Vinson & Elkins, Senior Representative
Willkie Farr & Gallagher, Partner

Platforms for site monitoring, intelligence and control

Abloy, Managing Director
Abloy, PEU Manager, South Africa
Acsys Technologies Ltd, CEO and Founder
Acsys Technologies Ltd, Sales Director, Africa
AIO Systems, CEO
AIO Systems, VP Marketing
Codefish, CEO/ Software Architect
Codefish, Application Developer
Galooli Telecom, CEO
Infozech, CEO
Invendis Technologies, CTO
Invendis Technologies, COO
Jabil Inala, Managing Director
Jabil Inala, Operations Director
nexsysone, CEO
Qowisio, Business Development Manager AME
Tarantula, CEO
Telemisis, Commercial Director

Energy equipment and ESCOs

3tech, Regional Manager, EMEA
4energy, COO
4energy, GM Egypt
Aquion Energy, Vice President, Product Management
Ascot Industrial, CEO
AuBren Limited, Managing Director /Owner
Ausonia, CEO
Ausonia, Export Manager
Beijing Dynamic Power, Communication Business

TowerXchange Meetup Africa & Middle East attendee list

Division Chief Director
Beijing Dynamic Power, Overseas Business Division Deputy Director- Sales
Bladon Jets, Managing Director
Bladon Jets, Vice President, Market Development
Cambridge Clean Energy (CCE), Founder & CEO
Caterpillar, Sales Manager
Cummins, Low KVA Segment Leader - Africa
Cummins, Business Director - VSPP Segments and Independent Business - Africa
Delta Electronics, Regional Head, Southern Africa - MEA
Delta Electronics, Head of Telecom Power Solutions EMEA
Eltek, Key Account Manager
Eltek, Managing Director
Emerson Network Power, Global Hybrid Solutions, Marketing/Business Development
Emerson Network Power, Sales Director: Key Accounts
Enatel Energy, Regional Sales Manager – Africa
Energic Plus, Team Leader, Technical Sales
Energy Vision, Business Development & Sales Director
Energy Vision, CEO
EnerSys, Business Director MEA
EnerSys, Sales Manager - SSA
Ergos Energy, Managing Partner
Fiamm, Key Account, Telecom
FG Wilson, Key Accounts Manager
Flexenclosure, CEO
Flexenclosure, Vice President
Fluidic Energy, Chief Marketing Officer
Generator Logic, Technical Director
GNB® Industrial Power, Director Product Application
GNB® Industrial Power, Network Power Sales Manager Africa
GreenPole, General Manager
GS Yuasa, Regional Manager, EMEA
GS Yuasa, Manager
Heliocentris, Senior Representative
HIMOINSA, Network Development, Sales & Marketing
HIMOINSA, Director of Sales and Marketing
Huawei, Director
Huawei, General Manager
Huawei, Marketing Manager
Huawei, Marketing Manager
Huawei, Marketing Manager
Intelligent Energy, Sales, Marketing & Business Development Director
Intelligent Energy, Special Advisor
IPI Group Holding, CEO
IPI Group Holding, GM – Power Division
IPS, Business Development
IPS, CEO
IPS, Managing Partner
IPS, Member of Board of Directors
IPS, VP Business Development
IPT PowerTech, GM – Telecom Services Division
IPT PowerTech, VP & COO
Jubali Bros, Assistant General Manager
Jubali Bros, Business Development Manager
LEOCH Battery EMEA SA, Vice President Global Telecom
Mantrac Group, Power Systems Segment Manager
Mantrac Group, Power Systems Segment Manager
NEC Africa, VP Sales Africa
NorthStar, President Reserve Power Division
NorthStar, Sales Director Africa – Reserve Power Division
Omega Power Systems, Head of Business Development
Pentair, Regional Sales Manager EMEA
Perkins Engines Ltd., EAME & CIS Regional Director
PRAMAC, Group Sales Director
PRAMAC, Product Manager
Redflow, VP Business Development
Saft, France & MEA Telecom BDM
Saft, Telecom Director
SEDEMAC, Head – International Business
SEDEMAC, Chief Operating Officer
TOTAL, Director of Commercial Development, MEA
Transtech Africa Global, Head of Power Solutions
Transtech Africa Global, Director
Unatrac, Senior Representative
Unatrac, Senior Representative
Voltalia, Managing Director - Off-grid Renewable Energy
Voltalia, Key Account Director
Wind-IT, CTO
Wind-IT, General Manager

Other

Africa Finance Corporation, Snr. Vice President, Heavy Industries & Telecoms
Dantherm Cooling, Area Sales Manager
India Africa Trade & Investment, Chairman & Founder
Kathrein, Solutions Building Digitalisation - Sales Management
Kathrein, Head of Solutions - Region Africa
Lagos State Infrastructure Maintenance & Regulatory Agency, General Manager
Nanhua Electronics, Vice Director, Africa Sales
National Communications Authority Ghana, Deputy Director
SOLiD UK, Director

TowerXchange

Industry Awards 2016

Winners

For over four years TowerXchange have been tracking and covering excellence in telecom towers – from landmark tower transactions and the formation and growth of new tower companies to improving the uptime on sites through the adoption of improved processes and technologies.

To recognise such achievements, we were pleased to announce our inaugural industry awards, presented at this year's TowerXchange Meetup Africa & Middle East. Over 50 nominations were received for the eight categories set in this year's awards with a special lifetime achievement award also being presented.

MNO passive infrastructure team of the year

Shah Faisal Safdar Khattak, Manager, Network Sharing, Telenor Pakistan

Winner: Telenor Pakistan

Judges comments: Telenor Pakistan have pioneered RANsharing and promoted passive site sharing, saving US$1.6mn, and fibre sharing, saving US$5mn per year while maintaining 99% network availability

Highly commended: Indosat Ooredoo
Highly commended: Vodacom South Africa in conjunction with Vodafone Procurement Company

Tower transaction of the year

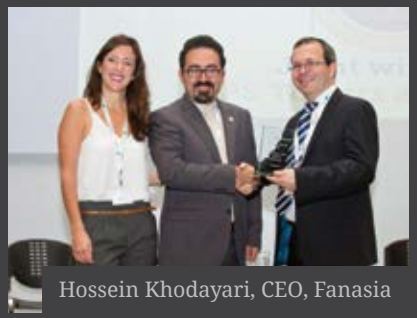
Gulfraz Quyyum, Head of Telecoms, MEA, Citi

Winner: IHS Towers – MTN Nigeria, advised by Citi

Judges comments: IHS leveraged an innovative deal structure to close the largest, most impactful tower transaction in the history of African towers

Highly commended: IHS Towers – HTN Towers
Highly commended: IHS Towers – Hotspot Network Ltd
Highly commended: Helios Towers Africa – Airtel (DRC)
Highly commended: OPIC investment into Apollo Towers Myanmar

Most innovative towerco of the year



Hossein Khodayari, CEO, Fanasia

Joint winner: Fanasia

Judges comments: Fanasia have developed a landmark decommissioning and revenue sharing business model in Iran

Joint winner: FPS Towers

Judges comments: FPS Towers have pioneered the professionalisation of alternative site typologies in France

Highly commended: IHS Towers
Highly commended: Towershare

BTS towerco of the year

Nathan Foster, Managing Director, Atlas Tower

Winner: Atlas Tower

Judges comments: Atlas Tower have achieved an impressive organic growth rate unsurpassed anywhere in sub-Saharan Africa

Operational efficiency solution of the year (non-energy)

William John Turner, Manager, Strategic Technologies, Vodacom

Winner: Vodacom Drone Site Survey Project

Judges comments: A commendable focus on HSE led Vodacom to research develop and rollout pioneering drone site surveys, eliminating the need for physical site climbing and accelerating site surveys

Highly commended:Towershare's Asset Management Platform
Highly commended: Helios Tower Tanzania's Operational Excellence programme
Highly commended: Netis Ghana
Highly commended: Infozech's Remote Operating Centre
Highly commended: Siterra, an Accruent Product
Highly commended: Sagemcom
Highly commended: Acsys
Highly commended:: Tarantula

Green initiative of the year

Huawei's energy team

Rocco Incardona, Area Manager, Ascot Industrial

Joint winner: Huawei's combined solar energy, high efficiency converter and unique cooling system

Judges comments: Huawei have designed an holistic approach to energy efficiency combining modular renewables, a 98% efficient rectifier and enhance cooling systems

Joint winner: Ascot and IHS Towers' replacement of 2400 diesel generators with solar-hybrid systems

Judges comments: Ascot have replaced diesel generators running 23/7 at 2400 IHS sites with solar hybrid units yielding a 76% reduction in carbon emissions

Joint winner: Bharti Infratel's Zero Emission Network

Judges comments: Bharti Infratel have run a landmark energy efficiency initiative greening 38% of their portfolio of 33,750 sites

Highly commended: IPS's EXERON system to reduce diesel usage
Highly commended: Apollo Solar, Camusat and Orange's 100% solar solution
Highly commended: Towerco of Madagascar and WIND-IT combine solar PV and wind
Highly commended: Emerson Network Power's solar hybrid solution in East Africa

Excellence in procurement

Edward van Kuijk, Director Global SCM Sales & Marketing, Vodafone Procurement Company

Winner: Vodafone Procurement Company

SCM Sales & Marketing, Vodafone Procurement Company

Judges comments: Vodafone Procurement Company unlocks the expertise and experience of Vodafone's collective supply chain management wisdom with an holistic set of services tailored to meet the needs of towercos

Site upgrade project of the year

Winner: Indosat Ooredoo Jaguar Project in Java

Judges comments: Upgrading 3000 sites, Indosat Ooredoo's Jaguar Project (Radio Access Modernisation) undertook extensive tower strengthening and ground rectification in record time

Lifetime achievement award

Chuck Green, Executive Chairman, Helios Towers Africa

Chuck Green, Executive Chairman, Helios Towers Africa

TowerXchange's comments: The lifetime achievement award was presented to someone without whom there would be no African tower industry - and no TowerXchange! Chuck has been a visionary and spokesperson for the tower industry since it's inception, and we are proud to recognise his unique contribution.

Our congratulations to all of the winners and shortlisted entries in the inaugural TowerXchange Industry Awards. The calibre of the entrants speaks volumes as to all the hard work that operators, towercos and the supply chain are doing to improve the management of passive infrastructure in an industry whose margins are being increasingly squeezed. We would like to thank all of our entrants and judges for the contributions to the awards!

Tower Xchange

2016 Meetup Insights

Following a state of the market address from TowerXchange, the 2016 Meetup featured 11 interactive panel debates, 38 focussed roundtable discussions and four working groups. Plus with a drinks reception hosted by Diamond sponsors International Power Supply, a networking dinner welcoming 140 people and countless interactions between the event's 300 delegates, the 2016 Meetup provided a packed couple of days of insights into the African and Middle Eastern tower industry.

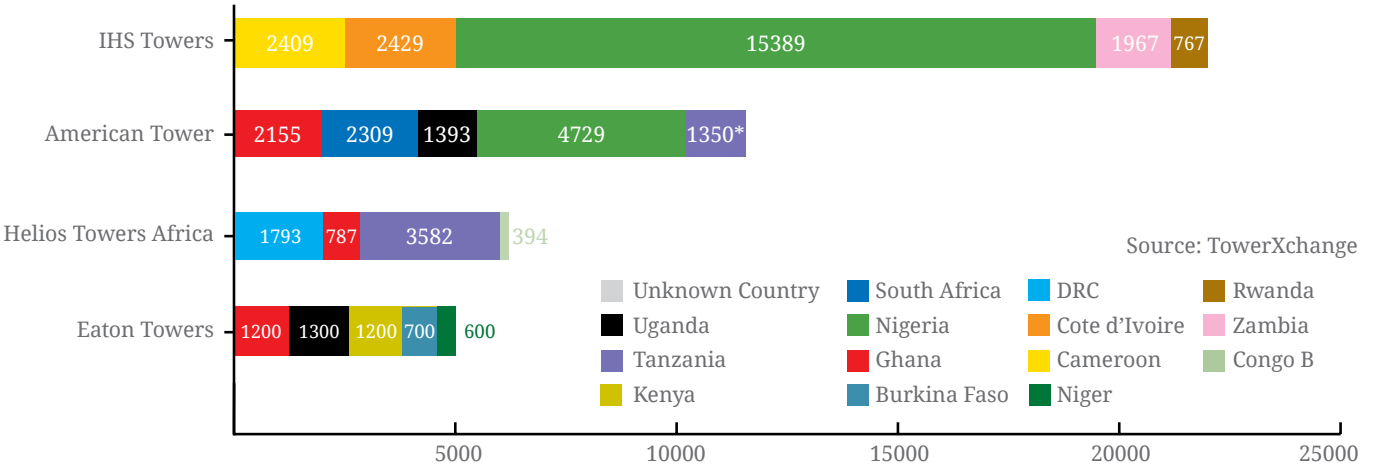
Read coverage of and key take home messages on:

Plus four working group reports:

www.towerxchange.com

TowerXchange's analysis of the independent tower market in Africa and the Middle East

Figure 1: Estimated number of towers owned or managed by towercos in MEA



Source: TowerXchange

Source: TowerXchange

TowerXchange held their fourth Annual Meetup Africa and Middle East this last quarter, welcoming over 300 leaders from the region's tower industry to once again delve into the industry's latest deals, trends and issues.

Achievement of new operational efficiencies, deeper infrastructure sharing and alternatives to and diversification of the towerco business model were top of discussions at this year's Meetup. As margins continue to be squeezed across the value chain amidst decreasing ARPU, new solutions, improved processes and alternative business models are required in order to ensure that site uptime continues to improve.

As the largest Meetup to date, one market segment with much higher representation in 2016 than previous years were the region's MNOs. Whilst a handful of tower sales are still expected (with processes underway in Kuwait, potential divestments rumoured from Telkom Kenya and Airtel Madagascar and an appetite amongst tier two MNOs to monetise their assets to fund network expansion), optimising towerco relations and alternatives to sale and leaseback transactions took centre stage at the event.

Out in full force at the Meetup were the South African players, MTN, Vodacom, Telkom and Cell C. Following American Tower's acquisition of Eaton Towers and Cell C's decision to rebuild their tower portfolio after a sale of its 1350 sites to American Tower in 2010, the shape of the tower industry in the country is changing. Realising the value in their infrastructure through the success of the towerco business model, South Africa's MNOs are proactively pursuing co-locations on a commercial basis, generating additional revenue streams and functioning as as de facto towercos. Whilst introducing a level of competition to South Africa's independent towercos, the level of new build projected will require the involvement of new MNO and towerco owned towers in order to meet demand.

Operator-led towercos aren't just emerging in South Africa but also across the rest of Africa. In Kenya, Telkom Kenya are following Safaricom's lead in pursuing co-locations and in Zimbabwe, Econet have created EcoTowers as the Zimbabwean government pushes forward legislation to mandate infrastructure sharing in the country. The jury is still out as to the efficacy of operator-led towercos, with towercos continuing to opine that independence is key to agreeing and enforcing SLAs whilst some MNOs see value in retaining site infrastructure, especially as the rollout of 4G and eventually 5G necessitates increased site density.

In Saudi Arabia, plans are moving forward with the joint venture between Saudi Telecom Company and Mobily, both of which had initiated and then shelved plans to divest their towers in the first half of 2016. Having established an initial three month agreement for the joint venture, this has now been extended as the operators continue to explore strategies to bring efficiencies to their combined network of over 25,000 towers. Significant parallel infrastructure exists in the country, and as such, decommissioning is expected to be a significant component of the joint venture and whilst additional efficiencies could be brought through active infrastructure sharing, this is not currently on the table.

Whilst active infrastructure sharing has yet to become commonplace across the MEA region, there is growing appetite amongst MNOs to explore such arrangements which many believe are where the greatest cost savings can be achieved. In North Africa, Orange, Tunisie Telecom and Ooredoo are exploring active sharing in Tunisia, with Ooredoo also exploring an active sharing agreement with Djezzy in Algeria; whilst in East Africa Vodacom, Tigo and Airtel have signed the region's first RANsharing agreement in order to bring coverage to rural areas more cost effectively. Whilst towercos have historically opposed RANsharing, seeing it as a threat to their business model, there is growing acceptance that it will be inevitable and several are opening up discussions with active sharing becoming an increasingly significant part of MLA negotiations.

Whilst implementing active sharing across macro sites remains particularly challenging, especially in instances where MNOs have divested their tower portfolios, sharing of DAS networks is more straightforward. Shared DAS networks are gaining an increasing amount of traction, with MNOs in both Kenya and South Africa operating shared networks for in-building solutions and observers feeling shared DAS will become increasingly common in the short term.

Another area gaining increasing traction in sub-Saharan Africa in particular is the ESCO business model with TowerXchange being made aware of MNOs in the process of appointing ESCOs in Gabon, Madagascar, Niger, Guinea and Chad. Whilst under consideration by some companies, the ESCO model is often less palatable to independent towercos who view energy provision as an important part of their value proposition and an area where they are able to make significant margins. Whilst TowerXchange forecast MNO ESCO agreements to continue to increase, the rise of towerco-ESCO arrangements is likely to be less forthcoming.

Significant money is however being invested by towercos in upgrading their energy infrastructure. With diesel theft being one of the biggest sources of headache for towercos and MNOs, reducing dependency on the fuel is seen as a key way to curtail pilferage as well as opex costs. In Nigeria, IHS have invested around US$1bn in replacing ageing generators with solar-hybrid solutions, a move which is expected to lead to a saving of 500 litres of diesel per tower per month. Whilst solar remains the renewable solution of choice for sub-Saharan Africa's telecom sites, wind and fuel cell pilots are also underway by towercos in the region.

As well as upgrading the infrastructure on existing sites, significant new build is still required in sub-Saharan Africa as LTE rollout necessitates increased site density and MNOs look to expand their geographic footprint. In Nigeria, MTN have announced the addition of 3,904 new sites by the end of 2017 as well as the addition of 3G and 4G equipment to 7,345 existing sites and Nigeria's other operators are expected to follow suit; in Angola the two resident MNOs need to add a further 3,000 new sites in order to improve coverage in the country and in Tanzania, the site count has almost doubled in the past five years with significant new build still expected.

In the Middle East, however, new site build is much more limited with decommissioning more likely to be a key focus for MNOs going forward. In Bahrain, there are approximately 1500 sites in a market that requires just 600; in Kuwait, tower sales from Zain and potentially the Kingdom's other MNOs are expected to lead to a significant decommissioning program by the acquiring party; and in Iran significant decommissioning is being undertaken by local towerco Fanasia with their latest project rationalising the number of sites in Iran's second largest city, Mashhad, from over 1,000 to 350. Whilst transactions have been stop start in the MENA region, observers feel that it is only a matter of time before the first deal will lead to a snowball effect. A towerco entering the market must however

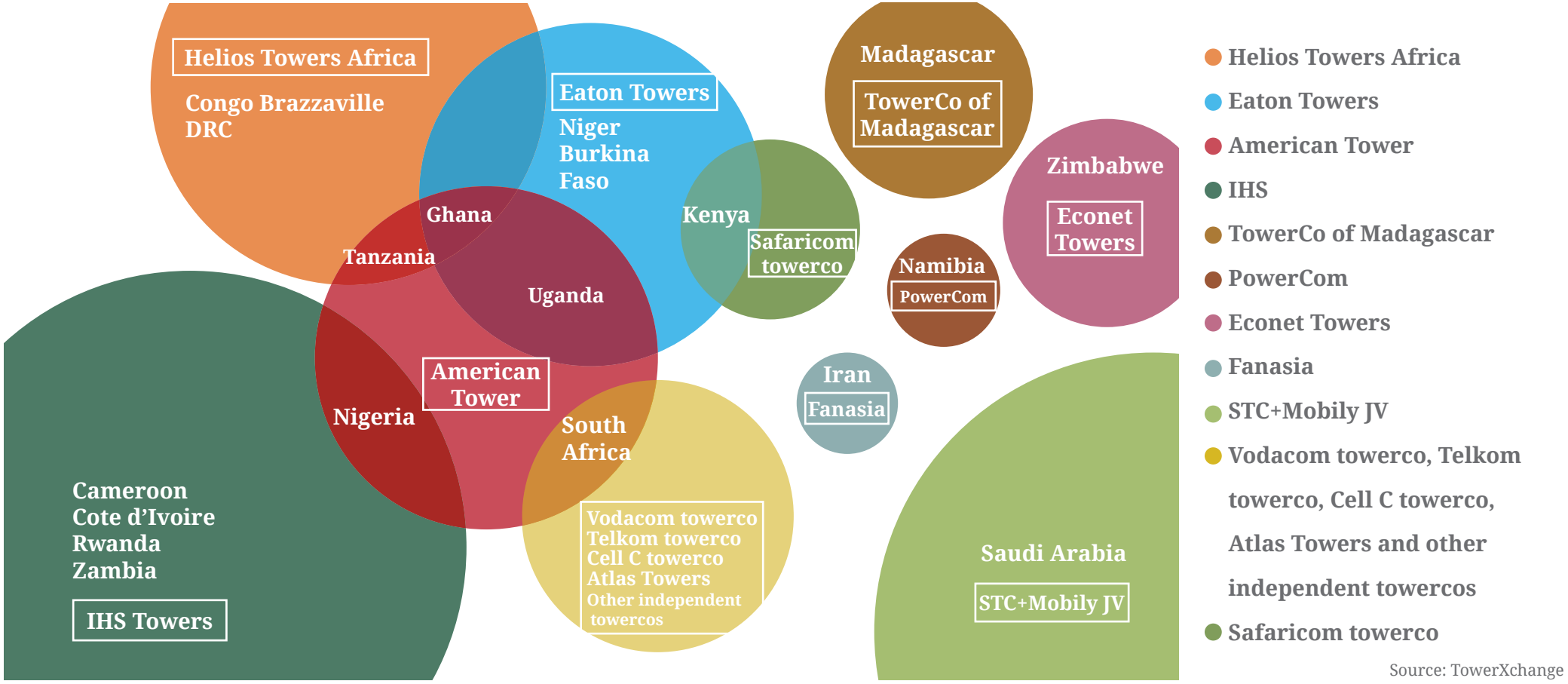
Figure 2: MEA's biggest tower transactions to date

Source: TowerXchange

Year	Country	Seller	Buyer	Tower count	Deal value US$	Cost per tower US$	Deal structure
2016	Senegal*	Expresso Telecom	Al Karama Towers	450			SLB
2016	South Africa	Eaton	American Tower	300			Portfolio acquisition
2016	DRC	Airtel	HTA	950			SLB
2016	Nigeria*	Hotspot	IHS	160			Portfolio acquisition
2016	Tanzania*	Airtel	American Tower	1,350	$179,000,000	$123,593	SLB
2016	Nigeria	HTN Towers	IHS	1,211**			Company acquisition
2015	Nigeria	Etisalat	IHS	555			SLB
2015	Egypt***	MobiNil	Eaton	2,000	$131,150,000	$65,575	SLB
2014	Rwanda & Zambia	Airtel	IHS	1,113	$181,000,000	$162,624	SLB
2014	Nigeria	Airtel	American Tower	4,800	$1,050,000,000	$218,750	SLB
2014	Ghana, Burkina Faso, Kenya, Uganda & Niger****	Airtel	Eaton	2,500			SLB
2014	Nigeria	MTN	IHS	9,151	$882,000,000	$196,700	Joint venture (IHS 49%, MTN 51%)
2014	Nigeria	Etisalat	IHS	2,136	$485,000,000	$227,060	SLB
2014	Congo B	Airtel	Helios	394			SLB
2014	Rwanda & Zambia	MTN	IHS	1,269			SLB
2013	Tanzania	Vodacom	Helios	1,149	$75,000,000	$87,616	SLB with direct investment in HTT+
2013	Kenya***	Telkom Kenya	Eaton	1,000			MLL (Contract since cancelled)
2013	Cameroon & Cote d'Ivoire	Orange	IHS	2,000			MLL
2012	Cote d'Ivoire	MTN	IHS	931	$141,000,000	$151,450	SLB
2012	Cameroon	MTN	IHS	827	$143,000,000	$172,914	SLB
2012	Uganda	Warid	Eaton	400			SLB
2012	Uganda	Orange	Eaton	300			SLB
2011	Uganda	MTN	American Tower	1,000	$89,000,000	$174,510	Joint venture (AMT 51%, MTN 49%)
2010	Tanzania	Millicom/Tigo	Helios	1,020	$80,000,000	$130,719	Joint venture (HTA 60%, Millicom 40%)++
2010	DRC	Millicom/Tigo	Helios	729	$45,000,000	$102,881	Joint venture (HTA 60%, Millicom 40%)++
2010	Ghana	MTN	American Tower	1,876	$21,850,000	$228,375	Joint venture (AMT 51%, MTN 49%)
2010	South Africa	Cell C	American Tower	1,400+++	$200,000,000	$142,857	SLB with right to acquire 1800 more
2010	Nigeria	Starcomms	SWAP	407	$81,000,000	$199,017	SLB
2010	Ghana	Vodafone	Eaton	750			MLL
2010	Nigeria	Visafone	IHS	800	$67,000,000	$83,750	SLB
2010	Nigeria	Multilinks	HTN	400			MLL
2010	Ghana	Millicom/Tigo	Helios	750	$54,000,000	$120,000	Joint venture (HTA 60%, Millicom 40%)++
			Totals / average	**43,227**	**$4,141,650,000**	**$185,948**	

*Deal announced, not yet closed **Plus HTN's managed service agreement governing 702 SWAP towers transferred to IHS ***Transaction subsequently cancelled **** Niger announced, not closed
+ Vodacom sold 100% of equity in towers but subscribed to acquire 24.5% interest in HTT ++Millicom restructured their equity into Helios' operations into a 24% stake at group level, which Millicom is now looking to monetise +++ Cell C included 1,400 existing towers plus the option to acquire up to 1,800 more to be constructed. Cost of 1400 towers only included here

Figure 3: African towerco footprints



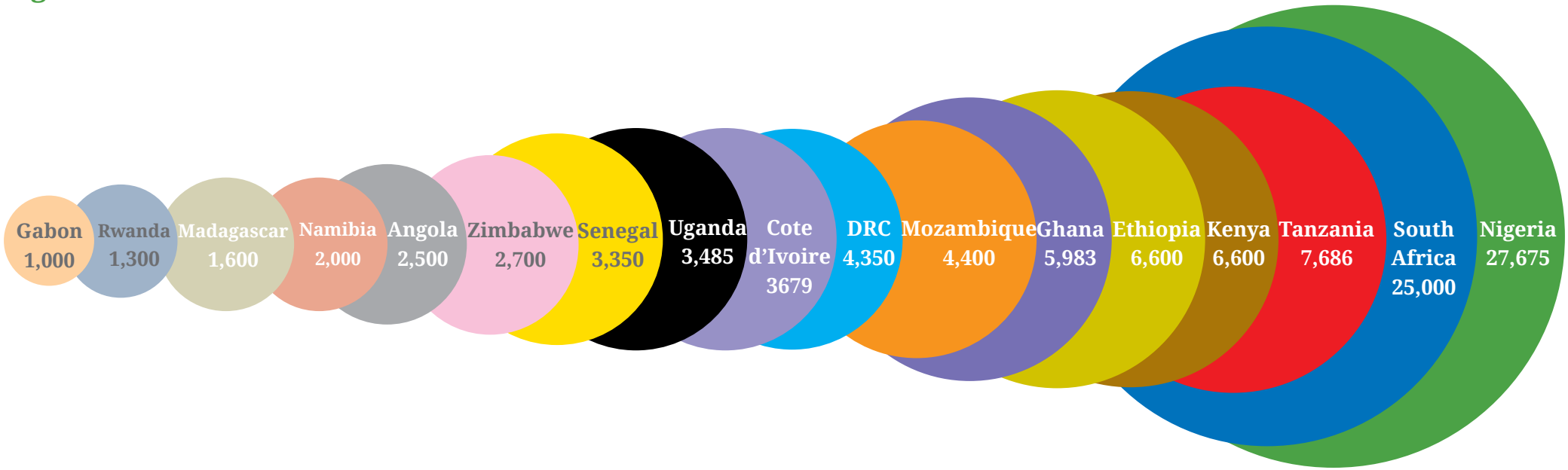
Source: TowerXchange

gear their business model to make money out of decommissioning programmes as well as co-locations, with any build to suit contracts likely to be very limited.

In light of alternatives to the towerco business model, as well as the towerco consolidation that we have started to see in 2016 with IHS's acquisition of HTN Towers in Nigeria and American Tower's acquisition of Eaton Towers' South African business, questions at the Meetup focussed on what is in store for not only Sub-Saharan Africa's big four towercos but also the region's smaller players.

With the big four towercos present in the majority of markets in which they want to enter, focus has very much shifted to organic growth, opex reduction and operational excellence. Their business models surrounding portfolio acquisitions were built around securing co-locations on sites and they must now be delivering on these to ensure growth expectations are met. Whilst there are potential transactions the towercos would likely bid on (MTN's South African towers being one notable example), the towercos have walked away from transactions in other markets where they are not yet present. Given the scale of the big four towercos, there are portfolios which they now view as too small or not additive to their business and so have shied away from.

Figure 4: Estimated tower counts for selected countries in SSA



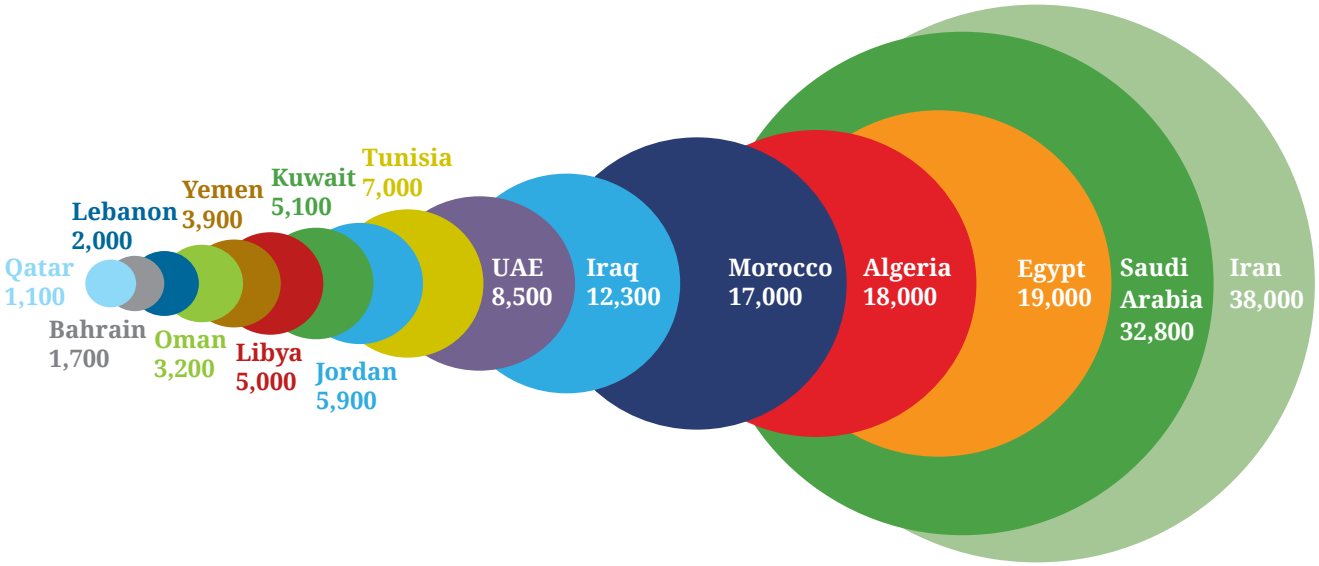
Source: TowerXchange

The lack of interest in such portfolios has created a niche for a new breed of towerco; one looking to enter virgin territories through the acquisition of smaller or tier two MNO tower portfolios. One such company is Al Karama Towers, the newly formed towerco which has reached agreement to acquire Expresso's 450 sites in Senegal. With an appetite for other tier two MNO portfolios in markets not yet touched by the big four, Al Karama Towers plans to lay the foundations for the independent towerco business model in such geographies. Should the business model work, the company and/or its local opcos would make very attractive acquisition targets should the big four look to enter at a later date. Another new entrant with multi-country aspirations is Pan African Tower Company whose ambitious West African centric plan to scale to 35,000 towers in five years involves "non-traditional" sale and leaseback deals and and build to suit programmes. Other local players are also emerging with October seeing Botswana's Pula Towers being licenced as the first independent towerco country and Antosc on track to become Angola's first independent towerco.

As to the future of the big four towercos, three of these are owned by private investors who will likely be looking for an exit in the next 18-24 months. Whilst Helios or Eaton could make attractive acquisition targets for American Tower or IHS (or an international player looking to enter the region), IHS' issuance of an US$800mn bond on the Irish Stock Exchange has only further fueled speculation that the company is gearing up for an IPO. Whilst the towerco IPO market may currently be sub-optimal, with Telefónica pulling their listing of Telxius and Turkcell pulling their listing of Global Tower, focus of the privately owned towercos must soon shift to gearing up for some kind of liquidity event. Moody's rating of IHS' opco in Nigeria gives some indication as to how the financial markets perceive emerging market towerco risk, from which the towercos can draw conclusions on how their valuations can be improved.

In addition to how to strengthen towerco valuations, one big question mark on the horizon is how the towerco business model needs to evolve as the telecoms market matures. Sub-Saharan

Figure 5: Estimated number of towers in MENA



Source: Delta Partners data, TowerXchange presentation

Africa's towercos need only look to the more developed markets such as the US to see how their contemporaries are changing. The evolution to 4G and ultimately 5G involves greater site density, small cells, DAS networks and the fibre backhaul to support this. Already some towercos are starting to explore shared DAS solutions in sub-Saharan Africa and the more advanced are grappling with the question of whether they should get into fibre. IHS have been the first of sub-Saharan Africa's towercos to enter the fibre space, acquiring one of Nigeria's five infraco licences, but with the fibre business more about selling capacity than space, and the multiples of fibre companies not matching up to those of towercos, others are still uncertain how and if they will follow suit.

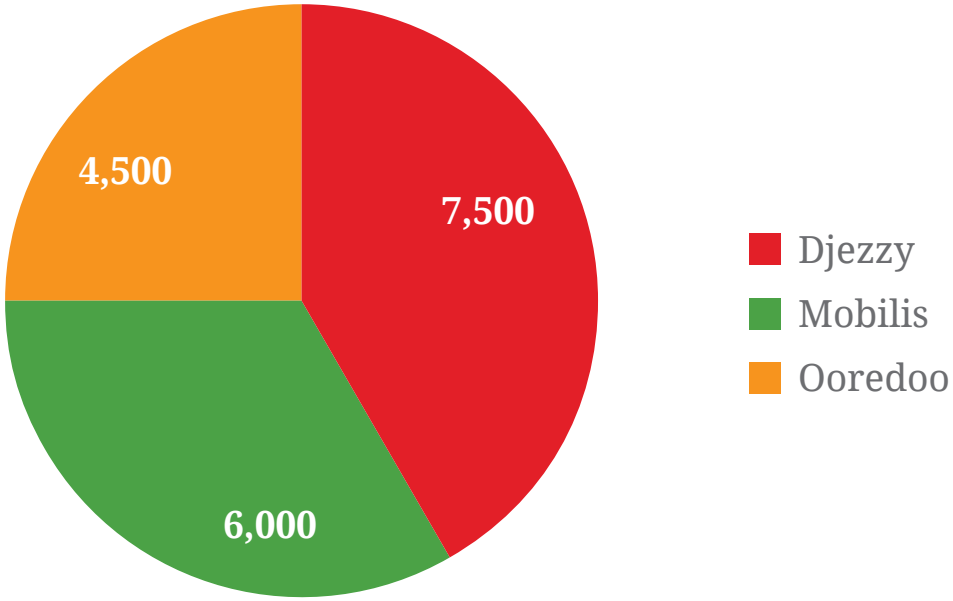
As 2016 draws to a close, TowerXchange look ahead to 2017 and what we expect to be the major news on the horizon. With Zain reportedly in exclusive negotiations on the sale of their Kuwaiti towers (reportedly with Towershare), and CEO Scott Gegenheimer informing local press that they have narrowed down the number of bidders for their Saudi towers to just two, TowerXchange forecast 2017 will see the first Middle Eastern transaction announced in the first half of the year. With an emergence of buyers for MNO tower portfolios that would likely be overlooked by the big four towercos, TowerXchange expect a number of such MNOs to start discussions on potential divestments, particularly as the Al Karama Towers - Expresso deal closes in Senegal. Rumours are abound that Helios Towers Africa are looking to exit the Ghanaian market, with their business unit reportedly up for sale (with both American Tower and Eaton expected to have submitted bids) and so further consolidation and reshuffling between the big four looks set to be on the horizon. TowerXchange also expect a number of new local towercos to continue come to light in new territories, with business models built around built-to suit but with ambitions for inorganic growth. With a number of ESCO projects in the pipeline, these will become operational in 2017 and if results are positive we expect a number of other ESCO projects to come to light within the year; and TowerXchange forecast further announcements around pilot projects for active infrastructure sharing with this becoming a key focus for the region's MNOs.

Country Overviews

Algeria

2015 saw extensive investment in 3G network rollout across the country and with 4G licenses awarded to each of the country's three MNOs in early 2016, rollout plans are well underway. Djezzy, in which VimpelCom have a 49% stake and the Algerian government a 51% stake, have appointed an executive to evaluate the sale of their 6,500 towers (in conjunction with processes in Pakistan and Bangladesh). The 51/49 rule, limiting foreign investors to a minority stake in investments in the country, coupled with the announcement of a RANsharing agreement between Djezzy and Ooredoo presents challenges

Figure 6: Ownership of Algeria's ~18,000 towers



Source: TowerXchange

to an international towerco considering entering the market.

Angola

Angola has two MNOs, Unitel and Movicel with Unitel having around about two thirds of the market share in terms of subscribers and Movicel the other third. Unitel has the larger portfolio of towers, possessing 1,700 sites and Movicel is a relatively young network with just 800 sites. In order to reach the level of coverage they are targeting, Unitel needs to add a further 1,000 sites and Movicel a further 2,000. There is a high degree of competition between the two operators and as such, they have been reluctant to share infrastructure in the past, however, in 2016 a new law came into force, prohibiting the construction of new sites in close proximity to existing ones, thus necessitating infrastructure sharing in the country. Antosc are Angola's first independent towerco, currently in negotiations with the country's MNOs to expand their networks.

Burkina Faso

Orange have completed the acquisition of Airtel's local opco which had previously agreed the sale of their ~500 tower strong portfolio to Eaton Towers in the country. Airtel was the number two operator in the country with a market share of around 25%. Etisalat's Onatel was the leading operator in the market with Telecel the third operator. 3G was launched in the country in 2013 but mobile broadband penetration sits at just 7% in a country of some 18.4mn.

Chad

Whilst Orange's takeover of Airtel's opcos in Burkina Faso and Sierra Leone was completed in the last quarter, their proposed takeover of Airtel Chad collapsed at the start of this year. Prior to discussions surrounding Orange's takeover of their opco, Airtel had agreed the sale of their towers to Helios Towers Africa but the deal was subsequently cancelled as the regulatory regime was not conducive to the effective operation of independent towercos.

Orange have now entered discussions with Millicom regarding a takeover of Tigo in Chad (along with subsidiaries in Senegal and Ghana). Millicom is Chad's largest operator with 53% of the market share, followed by Airtel with 46% and State owned Sotel with less than 1%. With just 7.1mn subscribers and an estimated 2,000 towers, Chad represents a small market but one where dynamics may be set to change.

Millicom have entered into an agreement with an ESCO to supply power to their sites in the country although details are yet to be publically released.

Congo Brazzaville

Helios Towers Africa is the sole towerco in Congo Brazzaville, having closed a deal to acquire Airtel's 394 towers, representing around 44% of the country's towers. Negotiations to sell Airtel's Congolese opco to Orange recently lapsed, but MNO consolidation is not a new phenomenon in Congo, Airtel having acquired Warid's operation in the country in 2014 vaulting them over MTN to become market leaders. BinTel's Azur are ranked a distant third.

Cote d'Ivoire

While SWAP operates a handful of towers in the country, IHS holds a dominant position in the Cote d'Ivoire tower market having acquired a total of ~2,000 towers from market leaders MTN (under SLB) and Orange (MLL) in 2014. IHS owns more than two thirds of the towers in the country and provides a full tower+power service. According to Orange, fuel represented 36% and the grid 64% of the total energy cost in Cote d'Ivoire in 2015.

The government has signed an MOU to start the process for the long awaited merger or fixed-line CI Telecom and Orange's mobile unit in the country. Orange will hold a 69% stake in the new entity (versus the 85% and 51% stakes it has in the current mobile and fixed line businesses respectively). Number three MNO Moov was part of a package of assets transferred from Etisalat to Maroc Telecom.

After having had their mobile license revoked in April 2016 (along with MNO Comium) over poor quality of service and unpaid taxes, LPTIC-backed GreenN have been re-awarded their license by Cote d'Ivoire's regulator (ARTCI) taking the number of MNOs in the country back up to four.

There are 24.5mn* mobile subscribers in Cote d'Ivoire and mobile broadband penetration sits at 36%*.

DRC

The sale of Airtel's 950 towers to Helios Towers Africa has closed, further strengthening Helios' position in the market. The transaction, signed and closed in three months will lead to the decommissioning of 150 duplicated sites, adding to Helios's programme to reduce the level of parallel infrastructure in the country (removing almost 10% of the country's installed base). A 12 month capex programme has already start to carry out the necessary site maintenance and upgrade work.

Helios is the sole towerco and has been delivering reliable service and strong tenancy ratio growth in the DRC since entering the market on the back of a US$45mn deal to acquire 729 towers from Millicom Tigo back in 2010 (Millicom originally retained 40% equity in Helios Towers DRC which they then restructured into a 24% stake at group level - which Millicom is now seeking to monetise). Helios has also built over 100 new towers in the country.

Helios Towers DRC provides full service tower+power. Grid power is reasonably reliable in Kinshasa, but less reliable in Lubumbashi and Goma. Almost all sites outside these three cities are off-grid and the delivered cost of diesel can be 2.5x more expensive in rural areas.

Infratel claims to have built over 800 rural sites for Vodacom DRC.

With around 4,350 towers serving 48.75mn connections, DRC has one of the highest number of SIMs per tower in the world at 11,207, illustrating the DRC's huge growth potential.

Following Orange's recent acquisition of Tigo there are four leading MNOs in the market; Airtel, Orange, Vodacom and aggressive cut-price operator Africell, who claimed to have 7mn subscribers in DRC by the end of 2014. Africell leveraged co-locations on over 200 Helios Towers DRC sites to accelerate time to market, and the operator is launching 3G. Smile plans to launch LTE in DRC in 2016. Raga Sat has launched broadband services leveraging O3b's "fibre from the sky" MEO satellite service.

SIM penetration is just 55% and although 3G was launched in 2012, mobile broadband penetration remained at 7% in the DRC in Q4 2015*

Egypt

In April last year, Eaton announced a US$131mn acquisition of 2,000 MobiNil towers - an estimated third of the total owned by the opco (which was rebranded to Orange following a 99% buyout by the company). The deal however was recently cancelled with the Orange board failing to extend the long stop date for completion of the deal and with Orange also still missing some approvals from the regulator. It may still be likely that the towers may return to the table, although changes in management at both the local opco and head office level for Orange is likely to slow things down. In a statement to TowerXchange, Eaton Towers' CEO, Terry Rhodes stated that the company remained committed to the Egyptian market "Eaton Towers still regards Egypt as a market ready for independent tower companies. The imminent roll out of 4G, together with the economic and political changes which have made US dollars very scarce mean the operators will be under financial and

operational pressure to expand their networks. It would be enormously beneficial for this expansion to share infrastructure."

In August, the board of fixed-line incumbent, Telecom Egypt gave its final approval for plans to buy a 4G license and as such, the fixed line player becomes Egypt's newest mobile network operator.

The Egyptian regulator, NTRA, had offered licenses to the three resident MNOs, Orange, Etisalat and Vodafone, but each expressed concerns regarding the amount of spectrum being made available in the auctions, as well as the regulator's stipulation that a portion of the 4G license fees be paid in US dollars.

After having initially rejected the offer from the NTRA, the country's three MNOs have since reached an agreement with the regulator with both Orange and Etisalat acquiring 10MHz of frequencies and Vodafone acquiring 5MHz of frequencies. The three MNOs now join fixed-line incumbent Telecom Egypt as 4G spectrum holders in the country.

The NTRA is reportedly in talks with international operators regarding the 4G licenses, with Kuwaiti-based Zain having reportedly expressed an interest in the license.

With SIM penetration of 101%* and mobile broadband penetration of 42%*, plus an established culture of infrastructure sharing in the country, the potential for towerco profitability is good in Egypt. While 3G coverage is currently fairly extensive Egypt still has more SIMs per tower than any other country in MENA (4,690 versus the regional average of around 2,500), illustrating potential for new tower builds.

Grid connections for Egyptian tower sites are slow and expensive, so DGs are widely used – the business case for renewables may be boosted if fuel subsidies, which currently mean diesel is around a fifth the cost of other African markets, are reduced.

Local tower manufacturer / service provider HOI-MEA operates a network of around 60 towers in Egypt, with a vision to scale to 300 by 2018. HOI-MEA's tenancy ratio is already approaching 1.5.

Gabon

Airtel's efforts to monetise their towers in Gabon never made much headway, so all the country's towers remain MNO captive for the time being.

Airtel is deploying LTE, but mobile broadband penetration was still negligible in Gabon at the end of 2014. Whilst the electricity grid in the main cities is okay, the grid is much less extensive in more rural areas leading to 30-35% of the country's ~1,000 sites being off-grid. Energy Vision have signed the first real ESCO contract in Africa with one of Gabon's MNOs, offering power on a fixed monthly price with no upfront capex. The project encompasses a full solar hybrid system with CDC batteries and will cover 150 off-grid sites, with a view to extend this to sites on unreliable grid.

The regulator has approved the merger between market leader Gabon Telecom (owned by Maroc Telecom) and number three operator Moov (owned by Maroc Telecom's parent company, Etisalat). The merger will give the new entity 55% of the market share. Azur (BinTel) is the country's fourth MNO. Oil and Gas wealth partly accounts for Gabon's regional high GNI/capita of US$10,000 which has resulted in the country's 162%* SIM penetration rate.

Ghana

Eaton are adding Airtel's Ghanaian towers to the 750 Vodafone towers they are managing with license to lease. There are three major towercos active in Ghana, which have been snapping up tenancies for over three years. Back in 2010, Helios Towers Africa set up a joint venture towerco with Millicom Tigo as minority partners, to which 750 towers were transferred. Shortly afterward Eaton Towers closed their deal with Vodafone Ghana, then American Tower set up another joint venture with MTN to which 1,876 towers were transferred. ATC Ghana now markets 2,146 Ghanaian towers, representing around a third of the country's tower stock.

All of Ghana's towercos now provide a full service tower+power. With strict permitting and environmental policies in Ghana, it's tough to get new towers built and towercos expect less than 100 new structures to go up in 2016. However, this amplifies appetites for co-location: tenancy ratios in Ghana are already around two.

With much competition between towercos in the

market, Helios's Ghana unit and its 787 towers are reportedly up for sale with first bids now in for the business unit. American Tower and Eaton Towers are both believed to have bid for the portfolio which could sell for up to US$150mn, based on recent transaction values. The sale would enable Helios Towers Africa to focus on their three other markets where they are currently the sole towerco present (until American Tower close the acquisition of Airtel's 1350 sites in Tanzania).

American Tower is partnering with Energize the Chain to provide vaccine refrigeration at a further 50 cell sites, in addition to the 35 at which these life-saving systems have been installed.

MTN leads a crowded market for operators, followed by Vodafone, Tigo, Airtel and Glo, with the regulator considering revoking Expresso's operating license. MTN Group is planning selling a 35% stake in its unit in Ghana in a bid to meet the terms and conditions for the award of its 15-year 4G licence last year, that 35% of the business is divested to Ghanaian investors.

The devaluation of the Ghanaian Cedi, compounded by deregulation of fuel prices, led to spiralling opex costs and crippling fuel shortages in 2015. Every industry was affected, and towercos struggled to achieve SLAs, while EBITDA margins suffered. However, Ghana's towercos have developed dynamic processes able to get ahead of fuel shortages.

SIM penetration rose from 113% to 121%* and mobile broadband penetration from 24% to 30%* in Ghana between Q4 2014 and Q4 2015.

Iran

With 38,000 towers, three nationwide operators MCI, MTN-Irancell and Rightel and little infrastructure sharing to date, Iranian towerco Fanasia is working in partnership with municipalities to reduce the level of parallel infrastructure in the country. The towerco has completed one project in trade free zone, Kish Island reducing 110 towers to 27, has a second project underway in Mashhad, Iran's second largest city (with the goal of reducing 1,000 towers to 350) and is in discussions with several other municipalities.

Kenya

Eaton Towers are integrating 1,200 towers recently acquired from Airtel Kenya into their portfolio. Eaton is the sole independent towerco in Kenya and has long coveted the market, having secured an MLL deal with Orange that was soon cancelled after a change in strategic direction by the operator, which culminated in the announcement of the sale of Orange's 70% stake in Telkom Kenya to Helios Investment Partners (which was completed this last quarter).

Eaton's number one issue: how to engage with Safaricom as a tenant and as a de facto competitor - Safaricom's Wholesale team leases 800 of their 4,000 towers to other MNOs at attractive rates Telkom Kenya is also pursuing a similar strategy on its towers and is the process of adding a further 500 sites to its portfolio although rumours are circulating that a tower sale is in the pipeline.

Safaricom has a dominant position in Kenya with a 65.2% subscriber market share. Airtel has 16.6%, Orange (Telkom Kenya) 13.2% and new entrant Equitel has 5.1%, according to CAK statistics for Q2 2016.

Kenya has ~6,600 towers, grossly insufficient for a country of 46mn people and with a land area of 570,000 sq km. SIM penetration is just 80%* with plenty of room for mobile broadband growth, at 18%* penetration at Q4 2015. Safaricom launched LTE at the end of 2014.

Kuwait

Market leaders Zain are in the process of divesting 1,600 towers in the country with Towershare reportedly in exclusive negotiations with the operator. A high degree of parallel infrastructure exists in the country, with infrastructure sharing to date having been limited between Zain and the country's other two MNOs Ooredoo and STC. The entrance of a towerco through the acquisition of Zain's towers and potentially those of other MNOs is expected to lead to significant decommissioning in the country.

Madagascar

TELMA, Orange and Airtel operate in the Madagascan market with ISP Gulfsat Madagascar (operating as Blueline) having become the country's newest MNO. In spite of tough economic conditions, the government has a key focus on improving

connectivity in the country, with SIM penetration standing at just 31%* and mobile broadband penetration 19%* at the end of 2015.

TELMA is in the process of rolling out 4G and optical fibre in the country, with Orange expected to follow suit by the end of 2016.

Towerco of Madagascar (TOM), initially spun out of TELMA but now an independent towerco in it's own right, operates a portfolio of 900 sites in the country (approximately 55% of the total towers in the country), having added several hundred towers in 2015-16 through both the deployment of new sites for operators and through the acquisition of the towers as part of the liquidation process of failed MNO, Madamobile. In 2017, TOM plan to add another 150 sites, taking their total to over 1000 sites in the country.

With Airtel having divested their towers in the vast majority of markets in which it operates, there have been unconfirmed rumours that the MNO is in discussion with a number of parties regarding a potential tower sale. Airtel have also reportedly agreed a contract with QTE for the company to provide power under the ESCO model.

The operational challenge of operating a distributed tower network, particularly during the rainy season is not for the feint hearted, and with significant energy challenges in the country, TOM has been extensively evaluating a number of different energy options including a pilot of a wind project in the country.

Malawi

Eaton's deal to acquire Airtel's towers in Malawi was cancelled in late 2015, and at present it doesn't look like the towers will be brought back to market. Mobile services are among the most expensive in Africa in Malawi, contributing to SIM penetration of just 38%*, and mobile broadband penetration of 15%*. The end of 2015 saw a third MNO, Lacell, being awarded a license in the country which is hoped to increase competition, lowering prices and increase service quality.

Mozambique

The entrance of a third MNO Movitel back in 2012 caused a radical shakeup of the telecoms sector with the operator rapidly deploying their network and securing 49% of the mobile subscriber market share by the end of 2015.

The country has an estimated 3,000 foundation-based towers, supplemented by an additional 1,800 guyed masts (primarily owned by Movitel). Fibre rollout to the tower has been relatively extensive, resulting in microwave backhaul dishes being removed from sites, thus freeing them up for further active equipment.

Infrastructure sharing in the country has been limited, with a just an estimated 50 towers being shared between mCel and Vodacom. The government passed a first reading of a bill mandating infrastructure sharing in November 2015, however talks appear of have stalled. The government has however been putting pressure on operators to share infrastructure in rural areas to meet the country's universal service access goals, a country where 68% of the population lives in rural areas.

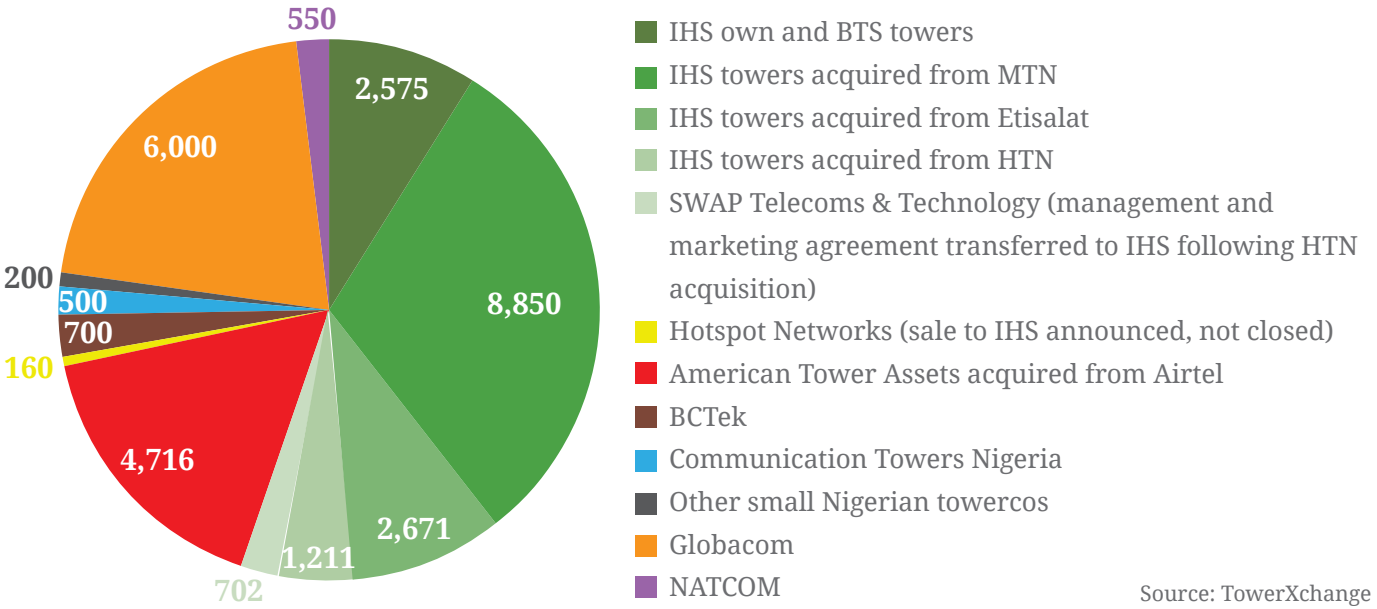
State-owned mCel has long standing debts and has appointed Barclays to oversee the sale of its ~1,000 towers in order to reduce leverage. In July of this year, it was announced that mCel would be merged with fixed line incumbent TDM to create a single more sustainable entity. In addition to their own towers, mCel use TDM's network and it is not yet clear how the sale of mCel's towers will be affected by the merger.

There has also been speculation of a potential tower sale at Movitel although a formal process has not been announced. Rumour has it that the entrance of Movitel into the market was part of a government plan to expand network infrastructure and then sell the assets. If this were the case, the decision to sell may be more likely to come from FRELIMO than Viettel.

As to who the likely bidders would be in a Mozambique tower sale from either mCel or Movitel, it is not yet clear - the talks don't appear to have attracted the interest of the continent's leading towercos.

In late 2013, a domestic company, TowerCo Mozambique, tried and failed to set up towerco operations in the country. It is thought that the company was unable to reach an agreement on lease rates with mCel and Vodacom and as

Figure seven: Estimated tower ownership in Nigeria



Source: TowerXchange

such, talks were disbanded. We have yet to hear rumours of any other domestic players forming in Mozambique.

There are 19.2mn* mobile connections in Mozambique with SIM penetration sitting at 68% and mobile broadband penetration at 34%*.

Namibia

The Namibian mobile market has been dominated by two government owned MNOs: MTC and Telecom Namibia, although the entrance of privately held Paratus following an overhaul of the country's telecoms regulation has introduced a new level of competition.

PowerCom, owned by MNO Telecom Namibia, is Namibia's first dedicated infrastructure player. Managing a portfolio of 300 towers, the company has ambitions to integrate further assets into its portfolio and in the long term plans to bring solar to its sites to make use of the country's abundant sunshine. The company has tenancies from all three operators in the market as well as a number of non-traditional tenants.

The Communications Regulatory Authority of Namibia has proposed a new regulation pertaining to mandatory infrastructure sharing where operators will no longer be allowed to set up new infrastructure where there are existing sites. An announcement from the regulator is expected imminently regarding the legislation. The government have also introduced a network facility license category to regulate a designated infrastructure provider in the country.

Whilst the country's electricity grid is extensive, the power crisis hitting Southern Africa has had a knock on effect on Namibia and as such, the operators are exploring alternative energy strategies as a means as protecting against risk to the site uptime.

Namibia has 2.8mn* mobile subscriptions and SIM penetration rate of 114%*

Niger

Eaton Towers have recently closed the acquisition of Airtel's sites in the country, with the towerco now set to face a challenging energy logistics scenario, low population density, and sub US$5 ARPU. Airtel has recently secured a 3G license in Niger where it competes with Orange, SahelCom and Moov (recently sold by Etisalat to Maroc Telecom). SahelCom is set to merged with national state owned fixed line incumbent Sonitel in a bid to combat competition from the other operators in the market.

SIM penetration is just 34%* in Niger, and mobile broadband penetration 2%*.

Maroc Telecom saw impressive growth in their subscriber base, with wireless numbers increasing by 68% to 1.1mn.

Nigeria

Nigeria is a benchmark tower market for many

reasons. It's the largest mobile market in SSA, with 154.3mn* connections among a population of 184.6mn*. It's the oldest growth independent towerco market in Africa; towercos have been building towers in Nigeria since 2006. Almost half of SSA's towerco-owned towers are in Nigeria, and over US$2.5bn has been spent by towercos to acquire 79% of Nigeria's towers. Towercos have proved their ability to deliver 99.9% uptime in challenging grid conditions in Nigeria. Nigeria is not just a benchmark for African towers, it's proof of the efficacy of the independent towerco model in any emerging market.

American Tower entered the Nigerian market in 2014 following an acquisition of Airtel's 4,700 towers, whilst IHS acquired the portfolios of Etisalat and MTN in the same year.

Competition for BTS opportunities is increasing among Nigeria's towercos. Most commentators agree Nigeria needs to double the country's current stock of towers and despite market leader MTN's financial challenges as a result of the NCC's fine, MTN have announced they are to more than double 2015's capex spend this year, citing figures of ZAR11.1bn. Such spend covers an extensive network rollout which includes the addition of 3G and 4G infrastructure to 7,345 existing towers as well as the addition of 3,904 new sites by the end of 2017. As part of this, IHS (with whom MTN have a joint venture governing 9,038 sites in the country) are known to have been awarded a build-to-suit program involving the addition of 1,650 new towers as well as the addition of approximately 2,000 tenancies to existing sites.

In order to fund the build to suit program and refinance the debt taken on following the acquisition of HTN Towers earlier this year, IHS' Nigerian subsidiary has issued a US$800mn high yield corporate bond which was listed on the Irish Stock Exchange with a high level of appetite from investors.

Nigerian cell site energy efficiency programmes are also becoming a benchmark for the rest of Africa, with battery hybrids widely deployed and solar being added, particularly in the north of the country. IHS' "Big Five" project in the country is one major initiative designed to replace power generation systems on 15,000 sites with cleaner, more efficient solutions. IHS have selected five companies to each upgrade a portfolio of 2,500-3,000 sites, thus enabling the towerco to benchmark different technologies and identify the most efficient and effective energy solution for its largest market.

Rwanda

IHS has acquired both Airtel's and MTN's Rwandan towers, building an additional 34 towers in 2014 and an estimated 50 towers in 2015. TowerXchange estimate there are around 1,300 towers in Rwanda, of which IHS own 767.

Rwanda is home to three tier one MNOs, so has no shortage of credit worthy tenants. MTN leads the market, followed by Tigo and Airtel. Korea Telecom secured a joint venture with the Rwandan Ministry of Youth and ICT to build a nationwide LTE network. IHS have announced that they are assessing solar farm opportunities in Rwanda that could potentially supply power to the national grid in the first 'energy swap' model to be used in Africa.

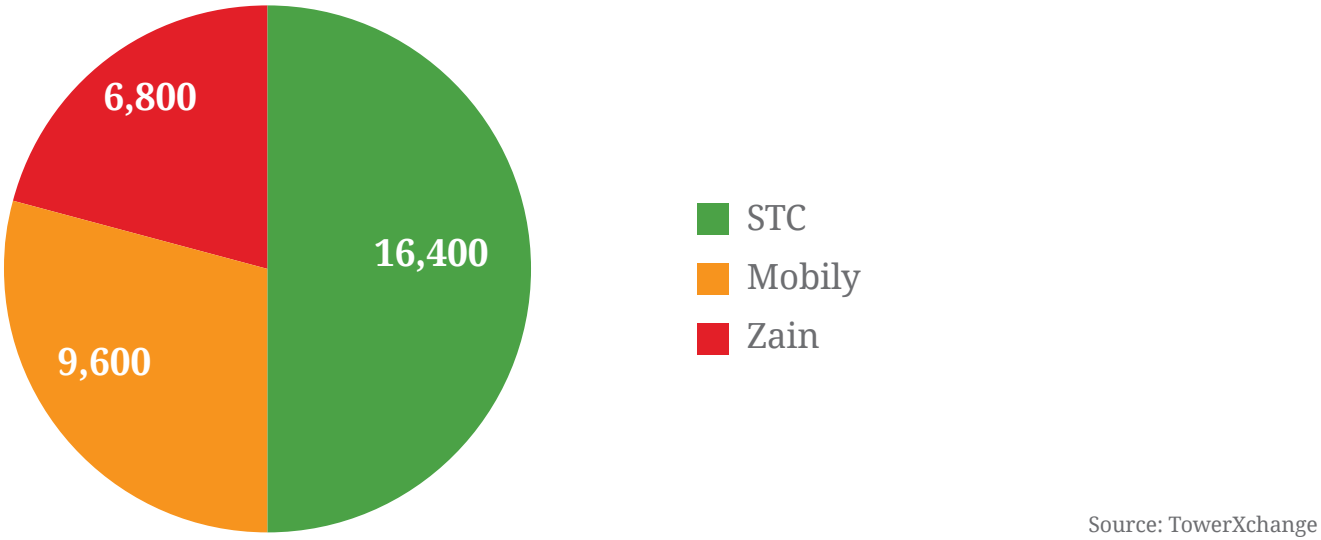
SIM penetration in Rwanda rose from 61% to 75%* with mobile broadband rising from 28% to 35%* between Q4 2014 and Q4 2015.

Saudi Arabia

Number one and number two operators in the market, Saudi Telecom Company and Mobily had been looking at a sale of their sites earlier in the year, but have instead announced a pilot study into the formation of a joint venture to manage the two MNO's towers. The pilot, originally scheduled for a three month period has recently been extended with suggestions that the MNOs plan to bring in outside equity investment into the venture in the future. Saudi Telecom Company have a portfolio of 16,400 sites in the country, whilst Mobily have 9,600; it is not yet however clear how many towers will be involved in the joint venture.

Meanwhile, number three operator Zain are progressing ahead with the sale of their 7,776 towers with CEO Scott Gegenheimer telling Arabianbusiness.com that it had narrowed down offers to two prospective bidders and expected the transaction to close in the first half of 2017. It had been reported that Zain may look to sell their towers to the STC-Mobily joint venture and similarly, Towershare had also been rumoured to be one of the front runners in the transaction.

Figure eight: Estimated tower ownership in Saudi Arabia



Source: TowerXchange

A number of international parties and local investors had expressed an interest in both the Zain and Mobily processes, the latter of which reached advanced stages before being cancelled.

In addition to the interest from international towercos in the Saudi market, TowerXchange has been made aware of a handful of Saudi tower builders who are starting to retain portfolios of sites with a view to securing co-locations. In the major metropoles of Riyadh and Jeddah there has been some infrastructure sharing to meet growing data usage, however infrastructure sharing beyond this been limited, with estimates suggesting that fewer than 2% of sites have multiple tenants.

Senegal

Expresso Telecom has agreed the sale of their 450 towers to newly formed towerco, Al Karama Towers. The sale and leaseback transaction also includes first right of refusal on new build for Expresso, with the operator planning to add an additional 200-250 sites in the next twelve months as part of the regulatory mandate for MNOs to increase coverage to underserved areas of the country.

There is a high level of parallel infrastructure in Senegal as infrastructure sharing in the country has been limited, things have however started to change. Tigo and Expresso currently share 45 sites in the country and there is strong expectation that this will increase with the formation of the new towerco.

Sonatel (in which Orange has a controlling stake) had reportedly looked into a sale of its 2,100 towers previously but talks failed. Tigo possess a tower portfolio of 800 sites, which represents an interesting acquisition target for Senegal's first towerco to bolster their portfolio.

Sonatel is the only operator to possess a 4G license in the country but Tigo and Expresso have expressed a strong interest in securing licenses, with the sale of Expresso's towers designed to raise capital for such a license.

The government is set to award further universal service licenses, following in the footsteps of Hayo which provides coverage in the Matam region, and is on the cusp of awarding two or three ISP licenses. These licensed players represent additional prospective tenants for a towerco in the market.

There have been reports that a joint venture between South Korea's SK Telecom and Middle Eastern firm CKG Group has applied for a fourth MNO license in the country, in a bid to access Senegal's nascent LTE market.

There are 14.6mn* mobile subscriptions in Senegal and a SIM penetration rate of 96%*. Mobile broadband penetration has increased 64% YoY to 14%*.

South Africa

Towercos have struggled to get a foothold in the South African market since Cell C sold their portfolio to American Tower back in 2010 and the MNO has recently announced that they plan to build approximately 600-800 towers each year for the

next four to five years, in order to develop their own portfolio once again with a view to commercialising its sites.

Telkom, who's towers had previously been the subject of speculation, have similarly developed a passive infrastructure team to actively pursue co-locations on their sites and Vodacom's passive infrastructure co-location strategy is well established, with the operator having recently developed a platform on which other frequency holders can view available space on Vodacom sites.

After a turbulent year for MTN following their record fine from the Nigerian Communications Commission (reduced from $5.2bn to $1.7bn), the South African company have appointed a new senior management team with a new CEO and new head and deputy head of M&A appointed. The operator are yet to give any clues as to whether a sale of their 9,000 tower strong South African portfolio could be back on the cards to offset the fine but with their CEO hailing from Vodafone (who have traditionally chosen to retain their passive infrastructure) we don't expect any quick decisions, with the listing of MTN Nigeria on the stock exchange being the first step to raise the necessary $1.7bn. MTN have invested over R16bn (US$1.1bn) in their South African network since January 2014, including the addition of 1,300 new sites, as well as adding 400 3G sites and 4 000 LTE sites to existing infrastructure. According to acting CTO, Babak Fouladi, the operator plans to add a further 1,450 sites in 2017.

The biggest news in the South African tower market this year is American Tower's acquisition of Eaton Towers' portfolio of 300 towers. "Eaton Towers' strategy in South Africa was to establish a build-to-suit presence and then scale up by buying a substantial portfolio of towers from one of the operators," said Eaton Towers CEO Terry Rhodes in an exclusive TowerXchange interview. "However, the operators in South Africa have not given this opportunity, and they still own over 90% of the total towers. We have outperformed American Tower in South Africa over the last few years but our operation is about 1% of the total South African market, so when American Tower approached us it made sense to sell," added Eaton's Rhodes. American Tower's acquisition is thought to have been more about Eaton's pipeline of 1,000 new sites than their existing ones.

South Africa's smaller towercos have benefited from the acquisition, consolidating their number one and number two competitors in the market. With lower overheads, they have outperformed American Tower in the build-to suit market in South Africa and what's more, with a moratorium on the use of American Tower's sites by Vodacom (due to their high lease rates), have also received healthy co-locations.

MNOs in the market have come out with bullish forecasts for new infrastructure with even the hard hit MTN increasing their infrastructure spend 50% on previously forecasted numbers. With such a level of new build required, both towercos and MNOs will need to play an important role in reaching these numbers.

Sierra Leone

Orange has completed the takeover of Airtel's opco in Sierra Leone in partnership with its Senegal based subsidiary, Sontel. Significant investment is underway in the 3G infrastructure in the country, providing an attractive growth opportunity.

With four MNOs, the country has a 4.5mn* mobile subscribers and a SIM penetration rate of 76%*. Mobile broadband penetration sits at 23%, up 36% YoY.*
The market represents an attractive growth opportunity with significant investments in rolling out 3G infrastructure in the country.

Tanzania

Helios Towers Tanzania (HTT) owns around 3,582 of Tanzania's ~9,200 towers, acquired in a US$75mn deal with Vodacom in 2013 and a US$80mn deal with Millicom-Tigo in 2010 for 1,149 and 1,020 towers respectively. The company has built a further 1,413 sites in the country. Millicom recently restructured their equity stakes in HTA's local towercos to acquire a 24% stake in HTA's parent company. Millicom are now looking to exit that investment. In order to fund further infrastructure expansion in the country, Helios Towers Tanzania has just secured a US$95mn loan facility with Standard Bank.

American Tower are in the process of entering the Tanzanian market following the announcement that agreement had been reached to acquire Airtel's 1,350 sites. The closure of that deal has been held up by a ruling in June 2016 in which Tanzania's

National Assembly ordered all telecom companies in country to float a 25% stake on the Dar es Salaam Stock Exchange (DSE).

Vodacom and Tigo are supplementing their network in anticipation of aggressive competition from new market entrants Viettel, which launched on October 2015 under the Halotel brand. Viettel has 3,000 new towers in the air or under construction, and has begun co-locating, having leveraged 1,000 HTT sites. Expect Halotel's site count to approach 8,000 by this time next year, including colocations. Zantel (acquired by Millicom from Etisalat), Smart, Smile and TTCL complete the MNO landscape in Tanzania, which lends itself to co-location as each of Tanzania's four main MNOs is dominant in a different region of the country, providing a strong incentive for co-location to accelerate nationwide coverage. The sheer scale of Tanzania amplifies maintenance costs, which can be as high as US$7,000 per annum – ten times the cost in the US.

In terms of power, over 70% of Tanzania's sites are on grid and Helios Towers have introduced a limited gainsharing programme to incentivise tenants to migrate to low power, outdoor solutions in a bid to curb opex.

In July 2016, it was announced that each of the three main MNOs have entered into a RANsharing agreement to improve coverage in rural areas.

TTCL have announced they plan to add an additional 50 LTE sites in Dar Es Salaam (taking their total LTE site count in the city to 75) due to increased demand - after this they will extend coverage to other major cities in the country. There are 40.4mn* mobile connections in Tanzania as of December 2015, up 26% on 2014 figures. Mobile broadband penetration sits at 30%*.

Uganda

Eaton Towers has added Airtel's Ugandan towers to the 700 towers they acquired from Orange and Warid back in 2012. Airtel since acquired Warid, while Orange sold out to Africell. Uganda remains ripe for further in-market consolidation, with seven licensed MNOs. American Tower is also active in Uganda, where they have a joint venture with MTN and currently market 1,393 towers. TowerXchange estimate there are a little over 4,000 tenancies on 3,485 towers in Uganda, suggesting an average tenancy ratio just under 1.2. Expect this number to rise driven by the enthusiasm of new entrant MNO Africell, which operates an asset-light model and prefers to co-locate rather than build thus accelerating time to market.

Organised crime compounds the effect of administrative fuel theft in Uganda, making site hardening a priority for towercos.

SIM penetration is just 72%* in Uganda, with multi-SIMing meaning actual penetration is under 50%*. Mobile broadband penetration is low with only 13% of the population having a smartphone.

Zambia

IHS have acquired the towers of market leaders Airtel Zambia to supplement their 2014 acquisition of MTN's Zambian 719 towers, which supplemented by new build gives them 1,967 towers in this this ~2,300 tower market. Capital constrained Zamtel is the third of three MNOs, although the government is a fourth player in Zambia's tower market through the first of 400 towers to be built by Huawei, funded by the Universal Service Fund.

The government issued an ultimatum to the country's three operators, MTN, Airtel and Zamtel, in October 2015 to improve their service or face the introduction of a new operator in the market.

Whilst speculation had been circulated that Vodafone had been awarded a fourth operator license by the Zambia Information and Communications Technology Authority, the regulator issued an announcement stressing that this was not the case with Vodafone being limited to internet services.

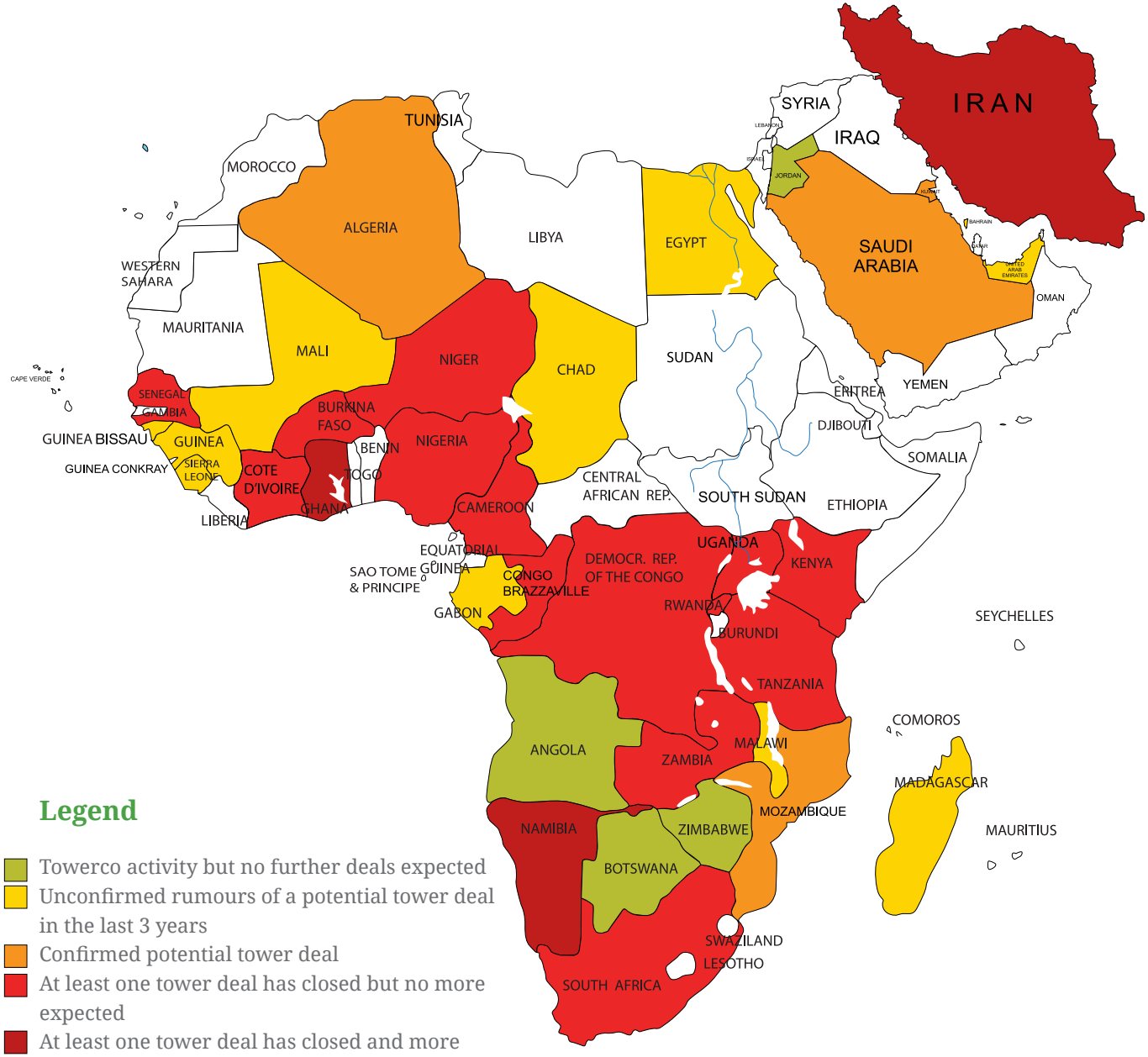
The devlauation of the Zambian Kwacha, down over 40% versus the USD in the last year, has hit all stakeholders in Zambian telecoms hard.

SIM penetration is 72%* in Zambia, and mobile broadband penetration 16%*. ARPU is low: in the US$2-3 range.

Zimbabwe

There are an estimated 2,700 towers in Zimbabwe, of which market leader Econet owns around 1,385. The government of Zimbabwe has gazetted new regulations which give the country's regulator the Postal and Telecommunications Authority

TowerXchange MEA tower transaction heat map



Legend

- Towerco activity but no further deals expected
- Unconfirmed rumours of a potential tower deal in the last 3 years
- Confirmed potential tower deal
- At least one tower deal has closed but no more expected
- At least one tower deal has closed and more expected

Source: TowerXchange

of Zimbabwe (POTRAZ) the power to compel the country's three MNOs to share their infrastructure. Econet Wireless who have invested over US$1.2mn on network rollouts in the past five years and who own over half of the country's towers, have been against the move, arguing that it unfairly benefits state-backed competitors NetOne and Telecel. The government argues that reducing capex spend through the sharing of existing infrastructure will ultimately lead to reduced costs for the consumer. In anticipation of such regulation, Econet Wireless has created a dedicated infrastructure unit, EcoTowers whilst fixed line incumbent, TelOne has pooled its network equipment with other fixed line players with a view to extending infrastructure to MNOs in the market.

Econet has also carved out ESCO Econet Power, who report that grid conditions have improved in Zimbabwe, with downtime reduced to an average of ten to closer than three hours per day. That hasn't stopped Econet from seeking to instill hybrid and renewable power on 650, rising to as many as 1,000, of their cell sites.

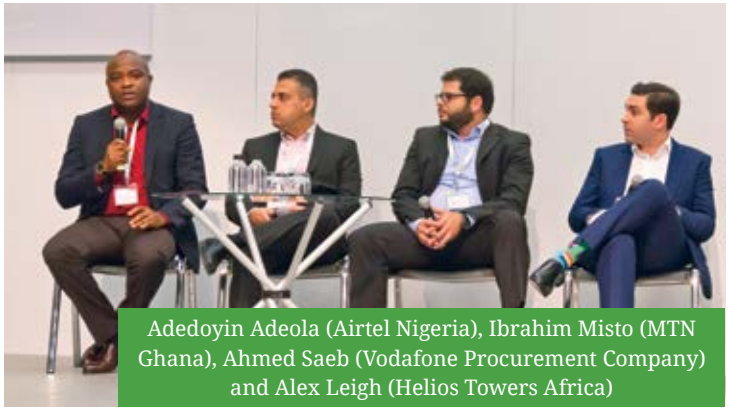
Investment in any segment of the Zimbabwean economy may be on pause given the cash crisis caused by the reintroduction of a domestic currency, after Zimbabwe had halted hyper-inflation by using the US-dollar since 2009.

Zimbabwe has 12.8mn connections and 81% SIM penetration, with mobile broadband standing at 26%*

(*Source: GSMA Intelligence, Q4, 2015)

The top 20 tips for achieving operational excellence

Vodafone, Airtel, MTN and Helios Towers Africa share their combined experience



Adedoyin Adeola (Airtel Nigeria), Ibrahim Misto (MTN Ghana), Ahmed Saeb (Vodafone Procurement Company) and Alex Leigh (Helios Towers Africa)

As sophistication in the management of MEA's towers continues to grow, the opening panel at the 2016 TowerXchange Meetup Africa and Middle East focussed on the subject of operational excellence in passive infrastructure management, and what this really means - whether managing your own sites, those of a third party or overseeing a towerco relationship. TowerXchange were delighted to welcome Helios Towers Africa, Airtel Nigeria, MTN Ghana and Vodafone Procurement Company to the panel.

Keywords: Access Control, Active Equipment, Africa, Africa & ME, Airtel, Batteries, Best of TowerXchange, Capex, Change Management, Construction, Energy Efficiency, Fuel Security, Helios Towers Africa, Infrastructure Sharing, KPIs, Logistics, Managed Services, Masts & Towers, MNOs, Monitoring & Management, MTN, Multi-Country Partner, NOC, O&M, Off-Grid, Passive Equipment, Procurement, QoS, Risk, RMS, ROI, Site Level Profitability, Site Management System, Site Visits, Skilled Workforces, SLA, Towercos, Uptime, Vodafone, Vodafone Procurement Company, Warehousing

Read this article to learn:

- Areas where the region's tower owners and operators see the biggest inefficiencies in managing passive infrastructure
- Strategies for improved collaboration with the entire tower industry supply chain
- The delicate balance between deploying new capex and improving existing equipment and processes
- How to obtain a deeper understanding of operations and how to use this insight
- Success stories from four of the most important players in the African tower industry

With towerco focus having shifted from acquisition to the integration and optimisation of acquired portfolios, and management of passive infrastructure amongst operators who retain towers increasingly becoming a specialist discipline, the opening panel of the 4th Annual TowerXchange Meetup Africa & Middle East focussed on the topic of "operational excellence", welcoming expertise from three of the continent's biggest mobile network operators, MTN, Airtel and Vodafone and Africa's third largest towerco, Helios Towers Africa.

As the first of MTN's opcos to have outsourced their sites to a towerco, MTN Ghana were represented in the discussions by Ibrahim Misto, heading up the opco's Operations and Maintenance department which interacts with three of the big four towercos in sub-Saharan Africa. From Nigeria, TowerXchange were pleased to welcome Airtel's Head of Network Infrastructure, Adedoyin Adeola, who, as a master black belt in six sigma also brings extensive experience working for Vodacom, Globacom, Ericsson and Alcatel Lucent (now Nokia) and has ultimate responsibility for Airtel Nigeria's outsourced network.

With a total of 6,556 sites split across four countries and a recent business restructuring to focus on operational excellence, Helios Towers Africa were represented on the panel by Alex Leigh, who heads up the company's commercial and business development function.

Plus from Vodafone, an operator whose strategy is based on retaining control of their passive

infrastructure, TowerXchange welcomed Ahmed Saeb who oversees the company's assessment and selection of civil works and O&M providers on a global level.

Leading the discussion was Delmec Engineering's CTO, Spencer Crawford-White.

Over the course of an hour, each of the participants shared some of the challenges they faced in the management of their networks and offered exclusive insights into new processes and methodologies four of the most important companies in the region's telecoms have adopted in a drive towards operational excellence. In this article, TowerXchange summarise the top 20 pieces of advice the panellists shared with this year's audience.

1. Treat your suppliers and service providers as strategic partners

A buzzword throughout the duration of the conference, the importance of partnerships cannot be underestimated. Short term contracts, excessive penalties and finger-pointing are a surefire way to bring inefficiencies into the ecosystem. With reduced revenues for MNOs globally, pressure on opex and the supply chain is set to continue but simply squeezing already thin margins will only lead to a compromisation of quality of service.

Responsible for the procurement of O&M services for the Vodafone group globally, Ahmed Saeb spoke of the importance of giving suppliers long-term business and allocating larger geographic regions whilst supporting them in their growth into new business areas. With longer term contracts, service providers can invest in their business, training staff, adopting improved processes and can find new synergies.

Fostering a positive working environment whereby contractors receive the guidance to improve performance is also key. Penalising a supplier because a mistake is made on one site, or only valuing them by the success of their last site build is not conducive to the achievement of operational excellence. It isn't just about giving suppliers and contractors business; MNOs and towercos need to train their partners how to work with new products, enter new sectors and cross borders into new geographies. Only with this true support and partnership can the supply chain reach new efficiencies which can then translate into savings for those at the top of the value chain. ,

It is also important for towercos and MNOs to not abuse the word "partnership". Every CEO or Head of Procurement likes to use the word "partnership", a phrase which can often be used to simply negotiate a discount. A true partnership however embeds the suppliers within an organisation, giving them clear direction and accountability; MNOs and towercos must play their part in making the relationship work.

2. Develop an effective corporate and operational governance strategy - and implement it!

At Airtel Nigeria, Adedoyin Adeola referenced that the majority of his time was spent on governance; setting weekly, monthly and quarterly meetings to scrutinise service providers and their subcontractors and suppliers. This management occurs at both the local level and at the group level, and with a background in managed services, Adedoyin explained the importance of structuring your team to mirror that of your partner, providing multiple levels of interaction between the two companies.

Tracking performance, questioning results and figures and drilling down into granular detail is essential to ensuring that work is being carried out in the optimum manner.

3. Share your own KPIs with those of your suppliers and work towards a common goal

Too often the success of an operator - supplier relationship is measured solely by the supplier's performance against a set of SLAs. Establishing a common set of goals that the entire ecosystem is working towards, however, instills a sense of ownership at all levels of the value chain and keeps all parties focussed on the bigger task at hand.

In the telecoms sector, the ultimate goal is improved quality of service to the subscriber, MTN Ghana have adopted an approach whereby they share customer net promoter scores and regulator rankings with each of their key service providers, further engendering the partnership spirit and allowing operators and the supply chain to work together to understand the impact and consequence of their actions.

4. Leverage the value of local knowledge and suppliers...

Local expertise and knowledge is a huge asset in managing a cell sites. As voiced by Adedoyin Adeola from Airtel Nigeria, when American Tower entered the Nigerian market following the acquisition of Airtel's towers, whilst they had extensive experience of managing a global network of towers, they did not have the experience of managing towers in Nigeria, but were keen to learn from their new partners. You can't enter a market and assume what has worked in one country will work in another. Similarly differences don't just occur country to country, between the north and south of Lagos challenges vary greatly and it is important to be cognisant of these differences in order to optimise your operations.

A local supply base is also critical from a logistics standpoint. A large part of time spent by maintenance contractors is due to extensive travel to site; having partners based in close proximity to the cell sites can bring huge time savings as well as local knowledge. Vodafone have invested heavily in building out a list of preferred suppliers country to country, a feature which brings real value to their operations.

5. ...but also bring global expertise and support geographic expansion

Whilst the importance of local knowledge cannot be underestimated, there are certain best practices (albeit with local tweaks required) that translate globally. Combining this international experience gleaned from operating large tower portfolios in multiple countries with your local knowledge on the ground can bring significant improvements to your processes.

There are also significant efficiencies to be gained by encouraging your suppliers and service providers to expand to neighbouring regions and countries. Vodafone's Ahmed Saeb referenced how he would love to make his suppliers larger and have them work across borders, but it can often be difficult to convince them to go from one area to another. Committing to long term contracts and supporting the companies through their expansion is key to making progress on this front.

6. Engage and empower local communities

In addition to sourcing local suppliers, it is also critically important to engage with local communities, both in accelerating new site build and also in the protection of existing assets.

Theft remains one of the biggest challenges for African tower owners and operators, with the cost of theft not just being in equipment replacement but also in system downtime and SLA penalties, especially in the case of energy equipment and fuel theft.

Employing villagers as security, engaging with local chiefs and giving a sense of ownership to the community has delivered sound results for Airtel in Nigeria, where pilferage levels are some of the highest on the continent. Whilst there is no one stop solution for tackling the crime issue, having the local community on side is one of the most critical components in ensuring the security of your equipment and sites.

7. Knowledge and skills transfer to develop local skill sets

Maintaining expat salaries represents a major cost to operators, towercos and major contractors, whilst highly skilled workers are often in short supply in many sub-Saharan regions. MTN Ghana have embarked on extensive road shows and training with local workers who have access to their sites, delivering training which has yielded strong results.

8. Foster collaboration within your supply chain

Partnerships shouldn't just exist between an MNO and the supply chain, or a towerco and the supply chain; it is important to integrate your suppliers with each other. The relationship between DG, rectifier and battery bank is one critical dependence. Another example: diesel generator manufacturers should be extensively involved in training your maintenance partners how to operate and maintain the equipment, ensuring that it is managed in accordance with the manufacturer's guidelines.

Enabling the ecosystem to understand who else is involved in managing the tower portfolio will improve visibility and cross-pollination of ideas whilst avoiding a culture of finger-pointing when things go wrong. At MTN Ghana, Ibrahim Misto has

adopted a strategy to bring maintenance partners for both active and passive infrastructure into one monthly meeting. If a site goes down, the two partners are challenged in unison on why this has happened and can develop a strategy to minimise the risk of this occurring again.

9. Ensure continuous improvement and seek new solutions

Operational excellence is a moving target, with expectations of towercos, operators and ultimately mobile customers continuing to rise as efficiencies improve. Helios Towers' Alex Leigh noted that when towercos first took over the management of passive infrastructure there was significant improvement on how towers performed, just from the sheer focus that towercos were able to give to passive infrastructure. Initially, towercos just took the process and systems that MNOs had put in place and simply executed them better.

As the well known moniker goes however, repeating the same action and expecting different results is the definition of insanity. Without implementing significant changes and improvements, the performance of sites can only plateau, and the rising expectations of operators after initial experiences would fail to be met.

Ensuring that you remain at the top of your game and continuously improve is essential in the drive to operational excellence, especially as technology and the shape of operator networks continues to evolve.

10. Dig deep into the root causes of issues

Solving a given problem requires you to understand the true root cause of the issue in order to develop the most suitable fix, and minimise risk of repeat occurrences. For example, combatting fuel theft isn't simply about increasing your security and surveillance; you need to understand why and where the theft is happening.

In order to combat issues operators and towercos face, Helios Towers Africa's new management team has applied six sigma methodology to their operations, interrogating why events are occurring and drilling down into the root cause. In the case of fuel theft, Alex Leigh referenced an instance where a security guard was stealing fuel. Drilling down into the issue further revealed that the maintenance partner wasn't paying the security guard. Fixing the issue wasn't simply a case of replacing the security guard, it required a solution to track and monitor whether the maintenance partner was making payments correctly.

MNOs, towercos and their partners need to continuously ask "why" and then take their learnings and constantly reapply them in order to improve processes.

11. Minimise the number of site visits

It was observed by panellists that a large proportion of theft occurs when contractors and service providers are present on site. As such, it can be derived that by reducing the number of site visits you start to reduce the occurrence of theft.

This requires coordination of your service providers and suppliers, synchronising their maintenance schedules and deliveries in order to reduce the amount of visits to your sites.

12. Avoid the "rush to capex" and consider the cost of change

The rush to deploying capex is a common mistake, agreed the panellists, no matter how good the solution is. If it goes into the field without the skills or systems to correctly install, integrate, commission and maintain it, the solution is doomed to fail. Capex decisions need to be carefully evaluated and considered, with assessment of existing infrastructure being an important first step.

One must also not underestimate the cost of change. Whilst a solution may promise improved efficiencies, requirements to train contractors in using the solution, or the extensive and complex integration into existing systems, may quickly erode some of the financial and operational benefits that you had been expecting.

13. Rationalise your site equipment

It is not uncommon, observed Helios' Alex Leigh, that when you inherit a portfolio of sites there can be five different types of generators and five different types of controllers across the fleet of assets, creating 25 different potential combinations

which maintenance contractors need to familiarise themselves with.

By rationalising the amount of different equipment on site, it simplifies the work of the contractors, allowing them to become familiar with the equipment and as such, experts in ensuring that it runs and is used optimally.

14. Be smarter in the way you assign your contractors

Helios Towers Africa observed that it is also not uncommon when taking over maintenance contracts following a tower transaction that you have two different maintenance partners overseeing sites next to each other. Rationalising these contracts to give each contractor clusters of towers in close proximity to each other will reduce the amount of time each partner spends on the road and will ultimately improve the efficiencies of your operations. It is a straightforward solution but one that is often overlooked in light of companies not having a granular view of who is doing what on their sites.

15. Balance high and low tech solutions for optimal effect

Whilst sophisticated solutions on the market can offer significant benefits to your operations, it is also important to not overlook low tech options. Advanced locking and surveillance systems and unique anti-theft battery designs can go a long way to decreasing theft of batteries, however MTN Ghana referenced one of the most effective systems they put in place were simple metal bars to restrict access to their batteries.

16. Avoid "data paralysis" and the quest for perfect data

All decisions need to be based on facts and data; you need to know what information you require and you have to be scientific. Whilst data can never be overvalued, sometime the quest for perfect data means you become paralysed by reams of analysis instead of drawing conclusions from more simple data sets. There are a lot of clever people who can do a lot of clever analyses, but ultimately you need to be able to extract as much value as you can from data without overloading the system.

Integrating new RMS systems can sometimes reduce efficiency as it often adds a layer of operational complexity as you have to retrofit it within existing operations. Understanding what you really need to be measuring and simplifying your monitoring can achieve real benefits.

17. Appreciate the value of operational insight afforded by your P&L

It isn't just remote monitoring and site management systems that can reveal information into the efficiency of your operations; your P&L can reveal interesting insights into what is and isn't working on cell sites. For example, it may be that you notice fuel usage is a lot lower on some of your sites but on closer inspection this may correlate with some of your worst performing sites, thus indicating a problem with the generator which needs to be inspected.

Combining data from non traditional monitoring sources can give you a much more sound picture of your network operations and identify problems that other systems have missed.

18. Aim for a reduced dependency on diesel

Whilst optimising energy efficiency was the subject of a separate debate at this year's Meetup, all panellists were in agreement that reducing dependency on diesel would have a positive impact on operational efficiency.

With fluctuating prices, localised shortages, substantial delivery challenges and its attractiveness to thieves, the dependence of cell sites on diesel is the source of a whole array of issues for tower owners and operators. Whilst the grid situation in sub-Saharan Africa not expected to improve dramatically in the short term, the switch to hybrid systems and alternative energy generation sources by tower owners is starting to reduce their dependency on diesel and all its challenges that it brings.

19. Integrate active and passive management

Diversification of the towerco business model was a much talked about area at this year's Meetup, however the growing interest in integrating the

management of passive and active equipment was also echoed by the opening session's panellists. In order to bring bigger synergies to the sector, Airtel's Adedoyin Adeola felt that towercos needed to move out of the mindset that active and passive should be segregated, and forecasted that we would be seeing towercos entering the active space in the next five years.

In line with this, Vodafone's Ahmed Saeb commented that the MNO has worked on a project where the same supplier carried out the passive and active maintenance thus reducing the number of site visits required and also creating efficiencies in the supply chain.

20. Understand your finite resource and better use it

The list of steps that can be made to improve operating efficiencies is endless but ultimately the people managing the process have a finite capacity to execute such steps. Prioritisation of tasks and streamlining of processes and implementation of supporting technologies to reduce workloads is critical to ensuring that focus remains on the steps which will make the most difference to your operations.

Prioritisation of tasks is also essential when making process improvements, it is impossible to change everything at once and expect it to run smoothly, you need to start with the extremes and work your way in, gradually tackling the more subtle inefficiencies in the process ■

Deepening the level of infrastructure sharing at Orange, Telenor, Safaricom and Cell C

How four key MNOs are working to reduce their network costs

Brian Burns (Analysys Mason) with Muhalia Allan (Safaricom), Dana van den Berg (Cell C) and Nat-sy Missamou (Orange)

The telecoms sector has come a long way since network infrastructure was seen as a source of competitive advantage by mobile network operators. With infrastructure sharing recognised as a critical strategy to reduce network costs amidst declining revenues, TowerXchange invited four MNOs to share their strategies, experiences and concerns regarding the sharing of passive and active infrastructure.

Keywords: 3G, Active Equipment, Active Infrasharing, Africa, Africa & ME, Analysys Mason, Build-to-Suit, Business Case, Business Model, Capex, Cell C, Co-locations, Construction, Core Network, Backhaul & FTTT, DAS, Decommissioning, Energy, Energy Efficiency, ESCOs, First Mover Advantage, IBS, Infrastructure Sharing, Managed with License to Lease, Masts & Towers, Middle East, MNOs, Network Rollout, Opex Sharing, Orange, Passive Equipment, Regulation, Risk, Roaming, Safaricom, Sale & Leaseback, Small Cells, Telenor, Towercos

Read this article to learn:

- Orange, Telenor, Safaricom and Cell C's history of working with towercos
- How operators perceive the benefits and risks of outsourcing their tower networks
- MNO experiences of active sharing and how they foresee the market evolving
- Key hurdles to overcome in establishing active sharing agreements
- How MNOs are sharing energy resources and fibre to further tackle network costs

Tower divestments, towerco relations and co-locations

Across Africa and the Middle East there have been 31 tower transactions of scale, with highly variable strategies between operators in the region. At the one end of the spectrum, Airtel has closed tower transactions in 10 of the 14 markets in which it operates (and has agreed the sale of its Tanzanian portfolio to American Tower); whilst at the other end of the spectrum, Vodafone has preferred to keep its towers in-house, having only entered into tower agreements in Tanzania and Ghana (and in both instances retaining ownership of or equity in the towers).

Joining the panel at this year's Meetup were operators with a diverse set of strategies with regards to outsourcing their towers. Vodafone-owned Safaricom with its portfolio of over 4,000 towers, dominates the Kenyan market. Not only does the operator have no current plans to sell their towers, but Safaricom has also formed their own internal towerco business (headed up by Muhalia Allan, this year's panellist) and actively pursues co-locations as a revenue generating strategy. When Safaricom began to look at site sharing, this was originally on a non-commercial basis, typically through bilateral swaps, but the operator subsequently moved to setting commercial rates on their sites, and has more recently entered a full service model, providing power as well as space to their tenants.

Whilst Safaricom has opted to retain their sites, Muhalia Allan explained that they still saw towercos

as playing an important complementary role in the market. In Kenya, Eaton Towers possess a portfolio of 1,200 sites following the acquisition of Airtel's sites and the execution of build to suit programmes for operators in the market. Safaricom balance the use of their own infrastructure with co-locating on Eaton's sites and also giving build to suit programmes to the towerco. In many instances, towercos are able to deploy sites more cost effectively and can similarly obtain attractive sites which the operator has failed to secure. As such, it makes sense for Safaricom to build the use of towercos into their business plan.

Joining the panel was Shah Faisal Safdar Khattak who oversees network sharing initiatives for Telenor Pakistan. Telenor also has retained its sites in each of the 13 markets in which it operates, although the operator possesses a significant stake in the VimpelCom group which has publically announced its intention to divest towers in a bid to raise capital, with processes underway in Russia and Pakistan and tower divestments being assessed in Bangladesh, Algeria and the CIS. Having entered the Pakistani market back in 2004, Telenor had proposed a joint rollout model with other operators in order to minimise capex spend, however negotiations around the strategy failed to reach an agreement between all parties. The company, however, favours a co-location model, preferring to use existing sites rather than rollout their own network in a bid to keep their capital expenditure low.

Speaking on the Pakistani market, Telenor's Shah Faisal explained that there was still significant potential for mature towercos to penetrate the country, not only in regards to new build (Telenor themselves have just signed a BTS agreement with a towerco in the country). In total, there are almost 35,000 towers in Pakistan, owned by each of the five MNOs; whilst there is still significant requirement to improve population coverage in the country (a 15-20% coverage expansion is required), a network of 18,000 - 20,000 sites would be the optimal size for the market, thus demonstrating the amount of decommissioning as well as new build required. Towercos are ideally positioned to play a role in this whilst also supporting improved power supply in a country with severe energy challenges.

Cell C's strategy is one very much making the tower industry headlines at present and TowerXchange were delighted to welcome the MNO's head of Technical Facilities, Dana van den Berg to the panel. Having been the sole operator in South Africa to have sold their sites to an independent towerco, (agreeing the sale and leaseback of 1,400 sites to American Tower back in 2010), the company has since taken a u-turn and is currently rebuilding their own tower portfolio.

"Whilst management of passive infrastructure isn't an operator's core business, it is core to our business" explained Cell C's Dana van den Berg in response to whether a towerco is better positioned to manage sites. "Having an outsourced network has created significant challenges in controlling our opex costs, and exposes our long term business plan to risks. Voice revenues are declining and although data usage is increasing, so are costs for supplying that data. As an operator you need to be wary about the profitability of your sites and be able to control your opex"

"In South Africa, the electricity grid is robust, with the majority of sites on grid, and as such, the value that a towerco can bring in terms of power provision, reducing costs and improving uptime is limited. What's more, the lack of our own infrastructure limits our ability to negotiate with other MNOs when it comes to site sharing and furthermore, we need to be mindful that as we move to 4.5G and 5G we will need a lot more infrastructure and owning your own is more strategic. Taking all these factors into consideration, we believe that it makes sense for us to own our own network"

Orange have had a more diverse strategy with regards to outsourcing their towers, with the differing perspectives of their 21 MEA opcos informing their strategy as much as the company's corporate strategy, explained Nat-sy Missamou, Orange's Sharing New Business Program Director. Orange has entered into MLL agreements with IHS in Cameroon and Cote d'Ivoire, sold their Ugandan sites to Eaton (prior to the opco being sold to Africell) and have inherited towerco relationships following their acquisitions of Airtel's Burkina Faso and Millicom's DRC opcos (who had previously sold their sites to the Eaton Towers and Helios Towers Africa respectively). In Egypt, Orange recently acquired MobiNil who had agreed the sale of 2000 site to Eaton, however the transaction has since been cancelled.

"There is no one single strategy across our opcos"

explained Nat-sy Missamou “One must consider the situation in the local market; does the opco need to alleviate debt? Are they looking to reduce opex? Do they need to improve availability? It really depends on the local issues, the relationship with other MNOs in the market and also the attitudes of the regulator. Whilst the head office has a good general view, the opco is on the front line, decisions must be made coordinating input from the two in order to reach the right solution. Whilst we retain a large proportion of our sites, towercos play an important role in our strategy. With towercos investing significant capex in upgrading infrastructure, we have seen good results in the improvement of network availability through working with towercos and in places where we need to grow quickly, we have had a lot of success through build to suit programmes such as with Helios Towers Africa in the DRC or ToM in Madagascar”.

One audience member raised the question as to whether the operators anticipated a role for towercos in managing active infrastructure in order to further develop synergies between passive and active equipment maintenance. Orange mentioned they have had some approaches by towercos to offer active platforms, for example, in rural areas whereby they could offer open RAN to all operators in a bid to more cost effectively tackle coverage requirements. Telenor referenced that it would be attractive to them to be able to offer the entire site management to a single party and as such would welcome the entrance of towercos into the active equipment sphere.

Active infrastructure sharing

Active infrastructure sharing, the panellists felt, was the area where the highest cost savings could be made, with one panel member offering the opinion that it represented an alternative to the towerco value proposition. Spectrum is a finite resource and is extremely expensive, the ability to share spectrum could significantly improve costs.

There are already several permutations of RANsharing, with the potential for still more to evolve in the future. The foremost of these are:

- MORAN (Multi Operator RAN where antennae, transmission, power, passive equipment and all hardware are shared but operators use their own spectrum)
- MOCN (Multi Operator Core Network, in which spectrum, as well as all of the above, is shared)
- GWCN (Gateway Core Network, where both RAN and core network are shared)

Whilst all agreed active sharing is something that should be aimed for, the panelists observed

Figure one: The pros and cons of working with towercos

	Pros	Cons
1	Releases capital for opcos with financial challenges	Lacking your own infrastructure means you can’t doesn’t allow you to negotiate with other MNOs regarding site swaps
2	Towercos have the ability to invest significant capex which leads to an improvement in network availability	Escalating lease rates means that it can be hard to control your opex
3	Towercos are able to rollout sites more cost effectively than operators	Challenges can be presented when wanting to enter active sharing
4	Towercos can access sites that MNOs may struggle to get hold of	Requirements to use more sites as we move to 4G and 5G will further present opex challenges
5	Towercos bring expertise in power management	When power isn’t a consideration, there is less of a value add in terms of what towercos can offer

that there are several hurdles and barriers to the establishment of RANsharing agreements, namely

1. Regulatory frameworks not yet in place in several markets

2. A lack of alignment of operator objectives

3. Significant upfront capital costs required

4. Reluctance of towercos to enter negotiations when you have sites owned/ managed by them

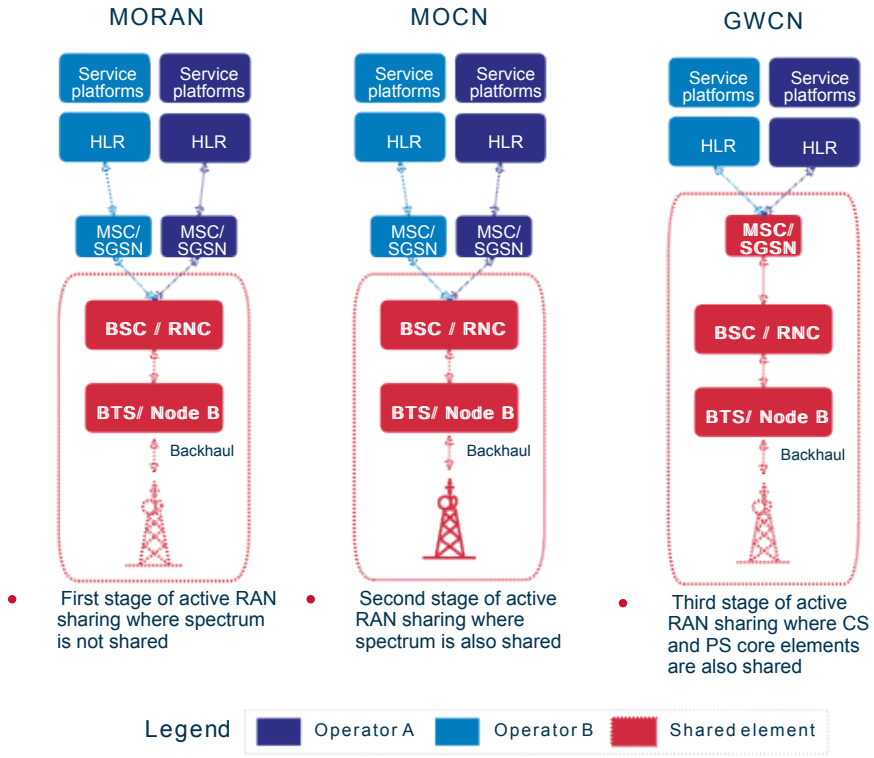
5. Imbalance of spectrum (in the case of MOCN)

In Pakistan, Shah Faisal explained, the regulatory environment had initially not be supportive of active network sharing, with reluctance having been, in part, due to the large reserves of spectrum still available. Recent amendments to policy however have enabled both MORAN and MOCN and since then, four of Pakistan's MNOs have entered into discussions.

Entering into active infrastructure sharing is not without upfront costs however, but the business model is driven by opex reduction which typically will be seen in a 8-10 year period.

Whilst Safaricom's Muhalia Allan agreed that RANsharing was where the real opportunity existed to reduce network costs, there were instances he felt where it didn't make sense, such as when looking for a first mover advantage when launching 4G. One area in particularly he felt however where RANsharing could deliver the most value was in regards to in-building solutions. Access to buildings and landlord

Figure two: RANsharing models as identified by Analysys Mason



negotiations present a real challenge in the deployment of DAS networks along with high costs and disputes over who should be managing what. Safaricom have been deploying open access DAS networks in malls and shopping centres to more effectively bring indoor coverage. Whilst Safaricom are conducting multiple active sharing studies, they see it as an easier step to implement sharing of DAS than of macro sites, a sentiment echoed by the other panellists.

At Cell C, RANsharing is currently prohibited by their existing agreements with towercos however Dana van den Berg thought that it was important to keep lines of discussion open between all parties. Currently all of the operator's IBS are shareable, and in South Africa there are roaming agreements in place between the two smaller and two larger operators. Beyond that it remains to be seen how the market will dictate the evolution of active sharing, although increasing cost pressures and requirements to drive down capex are likely to necessitate a move towards deeper infrastructure sharing.

Orange's Nat-sy Missamou further emphasised the

sentiment that active sharing was the ideal business strategy with it unlocking the highest number of benefits to operators. There needs to be, however, a long process of negotiation between all parties in order to foster trust and open communication. In terms of Orange's experience, the MNO has entered into RANsharing with Vodafone in Spain and has also entered into agreements with MNOs in other European markets, and anticipate RANsharing coming to Africa in the near future. In Tunisia, Orange are taking part in a pilot to test active sharing alongside Tunisie Telecom and Ooredoo and they are also in discussions regarding RANsharing in Jordan.

The operators felt that a dialogue with towercos was essential to further active sharing. Whilst most towercos have been opposed to active sharing due to its threat to tenancy ratios and BTS contracts, some have started to embrace the strategy as inevitable and opened discussions with operators on the subject. Telenor offered the opinion that creative solutions should be sought after; whilst revenues from tenancies will decline, alternative strategies such as revenue sharing models could help protect the towerco business model. Telenor explained that they were open to discussing different commercial models; it is not in the best interest of MNOs to put towercos under significant stress, but it is important that the two sides work together to develop a win-win for both parties.

Innovations in energy models

Whilst discussion regarding energy models was covered in more depth later in the Meetup programme, panelists noted that the ESCO model, in particular, had been gaining increasing traction in the region's tower industry, with Millicom undertaking a project in Chad, Energy Vision in discussions with an operator in Gabon and Airtel having agreed an ESCO project in Madagascar. At the 2015 TowerXchange Meetup we were discussing tens of towers being powered under the opex model, this year we're discussing hundreds.

Nat-sy Missamou felt that the ESCO value proposition was particularly promising in sub-Saharan Africa and forecasted that we would see further adoption of the business model, with all operators agreeing they were open for discussions on the topic. Operationally, power remains the biggest challenge and the advent of specialist energy companies with sufficient expertise and robust enough balance sheets provides an attractive alternative to tackling the issue.

Now offering power as a service to their tenants, Safaricom have further extended the role that they are playing in the power space, whilst in Jordan, Orange have explored an alternative energy model to lower their electricity costs, constructing a solar farm that feeds power into the national grid in a bid to counteract the high energy costs in the country. As the biggest contributor to opex in much of sub-Saharan Africa, new energy models as well as more efficient equipment is critical in tackling the profitability of sites.

Shared fibre and shared backhaul

Continuing on the theme of deeper infrastructure sharing, discussion moved onto shared fibre and the role for independent third parties. In Pakistan, an additional 15-20,000km of fibre needs to be deployed in the next 3-4 years, far outstripping the capacity of existing fibrecos and operators in the market. With high deployment costs and security as well as environmental restrictions constraining the process, significant rollout challenges exist. Telenor themselves have piloted fibre sharing in the country, investing in joint rollout with other operators, dividing up geographical areas in order to improve cost efficiencies and accelerate time to market. Such a strategy is estimated to save operators around US$200mn. Similarly in Kenya, Safaricom referenced they too were looking to open up their infrastructure sharing to the next level and that this may well encompass shared fibre.

Conclusions

Summarising discussions, Analysys Mason's Brian Burns (the panel's moderator) concluded that whilst the common ground was that there was a priority to optimise cost base, there was no one strategy which fits all markets and purposes. Active sharing is a big goal but can be difficult to achieve; it is easier at the DAS and small cell level but more difficult on macro networks and more challenging still following a tower divestment. The ESCO model and shared fibre represent two other key opportunities to control network costs and will start to gain further momentum in the African market. Ultimately however, the future lies in cooperation, between towercos and MNOs and between the operators themselves ■

Figure three: Infrastructure sharing strategies of Orange, Telenor, Safaricom and Cell C

Source: TowerXchange

MNO	Geo footprint	History of working with towercos?	Active infrastructure sharing?	Energy models?
orange	21 countries in Africa & ME (plus 8 European countries)	■ MLL with IHS in Cameroon & Cote d'Ivoire ■ Sale of 2000 towers to Eaton towers in Egypt cancelled ■ Inherited towerco relationships in DRC and Burkina Faso following acquisition of Millicom and Airtel opcos ■ Sold 300 towers to Eaton in Uganda prior to opco sale to Africell ■ Works with towercos for BTS	■ Exploring RANsharing in Tunisia and Jordan ■ RANsharing with Vodafone in Spain ■ Further RANsharing experience in Europe	■ Solar farm feeding into the grid in Jordan ■ Interested in ESCO model
Safaricom	Kenya	■ Has own internal towerco business unit actively pursuing co-locations ■ Leverages Eaton Towers' sites ■ Works with towercos for BTS	■ Open access DAS for inbuilding solutions ■ Further active sharing studies underway	■ Providing power as a service to tenants ■ Yet to adopt ESCO model
CELL C	South Africa	■ Sold 1400 sites to ATC in 2010 ■ Uses towerco sites for co-locations ■ Rebuilding own tower portfolio	■ Current towerco agreements preclude active sharing on macro sites ■ IBS all shareable ■ Roaming agreements with other MNOs	■ Most sites on grid ■ Open to discussing ESCO model
telenor	13 markets covering Nordic countries, CEE and Asia	■ BTS programme agreed with towerco ■ Preference for co-locations over new site build creates opportunities for towercos	■ Successful active sharing in Sweden, Denmark and Hungary ■ Trialled RANsharing in Pakistan ■ Shared fibre rollout with other MNOs	■ Significant energy upgrades completed ■ Yet to explore ESCO models

Energy priorities for sub-Saharan African MNOs and towercos

Insights from Vodafone, Helios Towers Africa and Towerco of Madagascar

Alex Leigh (Helios Tower Africa), Solange Karwera (Vodafone) and Gilles Kuntz (Towerco of Madagascar)

The second afternoon of the TowerXchange Meetup Africa & Middle East turned its attention to key considerations and solutions when managing cell site power. From tackling the low hanging fruit on existing infrastructure, to the widescale deployment of new technologies and the potential and limitations of the ESCO model.

Keywords: Africa, Africa & ME, Batteries, Capex, Community Power, Energy, Energy Efficiency, Energy Storage, Fixed Price, Fuel Cell, Helios Towers Africa, Hybrid Power, Infrastructure Sharing, O&M. Opex Reduction, Renewables, Risk, ROI, SLA, Solar, Towerco of Madagascar, Unreliable Grid, Uptime, Vodafone, Vodafone Procurement Company, Wind

Read this article to learn:

- What is the low hanging fruit in improving cell site energy efficiency
- How the true ROI of energy equipment needs to be validated
- To what extent renewables are competitive in powering base stations
- Limitations to the ESCO business model and how these can be addressed

Understanding your energy consumption profile

For any operator or towerco, the first step in any energy initiative is developing a thorough understanding of your energy consumption profile. It is impossible to manage what you can't measure and so you first must understand what power is being consumed on your sites. Even in Europe where almost 100% of sites are on-grid, you need to understand what you are using in order to be able to reconcile your utility bill. Only once you have these metrics in place can you then look to negotiate with your suppliers.

Across the sub-Saharan African region, the energy profile of an MNO or towerco's sites varies drastically, from the robust grid in South Africa to more challenging markets such as the DRC. Any decisions that are made on tackling energy generation and efficiency need to be backed by figures in order to inform your choices and monitor their impact.

Tackling the low hanging fruit

Huge savings can be made by first making sure that the equipment you have on site is being properly used and maintained. Fixing a faulty air conditioner or ensuring that a diesel generator is operating in the correct phase will often have a bigger impact and a much better ROI than deploying the latest piece of technology.

Spending the time and money to ensure that your

contractors know how to work with the equipment and are able to service it properly will yield huge savings and is an absolutely critical step. Avoid rushing to deploy capex and first focus on optimising the existing equipment that you have on site.

Replacing suboptimal configurations with tried and tested solutions

When inheriting a tower portfolio from an operator, towercos often find that the energy equipment is sub-optimally configured. Whilst it may not make sense to reconfigure the sites as soon as you take over the assets, the emergence of key events such as the addition of a new tenant may present an opportune time to undertake such works. Often a towerco may have a portfolio strategy that is yielding strong results across their other assets, such as the deployment of deep cycle batteries, and this will therefore be the first port of call in upgrading energy infrastructure.

From capex evaluation to assessment of TCO

Whilst the upfront cost of new technologies is important to take into consideration, the panel underscored the importance of evaluating the TCO of new systems. Simplifying site design is key, not only can a overly sophisticated system be challenging to configure but a lack of standardisation between sites can make maintenance inefficient. Designing a simplified and low maintenance system that requires fewer site visits can have a significant impact on TCO. What's more putting in place robust preventative maintenance schedules will reduce the amount of reactive site visits and help to control costs further, whilst standardisation between sites helps achieve efficiencies with your contractors.

Comparing performance in the lab, in pilot studies and in widescale deployment

The panel were all in agreement that there was a huge array of fantastic technologies in the market, each with the promise to contribute to impressive savings. Whilst in the lab environment these solutions reliably perform to expectations, and in pilot studies they often perform highly, deployment on a wider scale and a longer term basis can often yield drastically different results.

Firstly, a lab is a controlled environment, immune from the variables that can be found in a network setting. Whilst pilot studies expose technologies to a network setting, the focus that pilot studies receive from vendors as well as tower owners, coupled with their limited scale and study length provides different conditions to a full-scale deployment. In order to assess the true ROI of a system and thus assess its suitability for widescale deployment, extensive testing in the field is required, a key area of focus for the Vodafone Procurement team. The ROI that is promoted by vendors may not always be the same in the field and it is important to understand this difference in order to inform your decision making for major procurement activities.

The success of the technology in the field is also influenced by the expertise of your staff and contractors in installing and maintaining the equipment according to manufacturer's guidelines. The equipment needs to have the correct maintenance and management to ensure that it reaches it full potential, and without this in place it is doomed to failure. There is no point investing large sums of capital in new technologies if you then fail to install, configure and maintain them correctly, offered Helios' Alex Leigh.

The panel explained that tower owners were increasingly wanting to see vendors incentivised to ensure the success of their products in the long run, and observed that an increasing number are offering full service warranties. Whilst a full service warranty will increase opex, it is important to make sure that a technology is correctly managed to ensure it is delivering on its advertised ROI.

Scalability is another key component that needs to be carefully assessed prior to making purchasing decisions. Whilst a piece of equipment may function optimally in a single tenant scenario, many fail to meet up to expectations when the load on a given site is increased through the addition of new tenants. With the towerco business model based on multiple tenancies, it is of fundamental importance to make sure that technologies adjust well to increases in load.

The role for renewables

The panel were questioned on their appetite for

and experience with renewables. Helios observed that when you look at solar you can see very good solution that works well in low consumption single tenant scenarios. There are still some question marks however on how well solar works when you start adding more tenants.

Vodafone commented that they had deployed lots of renewable solutions at big data centres and switching centres, but when it comes to base stations, the ROI is harder to achieve and so this hasn't been deployed at such scale yet. As the price of solar continues to come down however, the business case will start to stack up.

Towerco of Madagascar have trialled a wind project, offering an interesting alternative to solar, solar being by far the leading renewable technology being considered by cell site operators. Vodafone commented that they had been conducting some assessments into fuel cells in niche markets and continue to assess a whole array of different technologies. At the moment the ROI of most renewable options means that deployment can't be justified, that being said, it is important to continue trialling and testing technologies to ensure that all alternatives are being considered in the future.

Adoption of the ESCO model

The ESCO model has continued to gain traction in sub-Saharan Africa with companies including both Millicom and Airtel in the process of adopting the model. A strong degree of uncertainty about the viability of the model does however still exist, particularly amongst towercos in the market.

Speaking on the matter the panel questioned the ability of ESCOs to deliver a better job than the towercos have. With towercos having learned operational lessons over the past 7-10 years, power has become a core competency. Excellence in improving site uptime through improved power management is one of the towerco's core USPs when speaking to MNOs, towercos themselves have specialised in power provision, they don't need an ESCO to bring specialist expertise to tower operations. The panel commented how towercos often make a significant part of their margins on power and taking power out of the equation would sacrifice some of this benefit.

Whilst the ESCO model has been more widely adopted in India, it was commented that the there is a much more established network of skilled engineers in the country than in sub-Saharan Africa, which lowered the level of risk. Vodafone have signed ESCO contracts in India (and also parts of Europe) but that doesn't necessarily mean that the model makes sense in Africa.

Another challenge for ESCOs is that they are generally smaller unproven entities and as such, their cost of capital is higher and more volatile than that accessible by towercos and MNOs. New financing solutions will be required to make the ESCOs more competitive.

The differing structure of contracts in place between MNOs and towercos also affects the appetite for a towerco to adopt the ESCO model and is something that needs to be carefully considered when considering an agreement.

Several comparisons were drawn between ESCOs and towercos in their early days; ESCOs need to convince tower owners they have the expertise to do what tower owners have been doing for years; ESCOs are faced with the same challenges that towercos face, whereby clients want fixed costs but also upsides to savings; and ESCOs may need to buy existing power assets in place on sites and look to carve out teams, similar to the strategy deployed by towercos.

The panel also observed the towerco business model works with multiple tenants and so it is rational for ESCOs to look for further synergies through shared infrastructure. Efficiencies all come into play with sharing and the business case is tough if you're just providing for one client. The ability for ESCOs to extend power to factories, industrial power users and the local community all present new revenue streams. Whilst CSR is a component in extending power to off-grid communities, it also delivers real benefits to the MNOs and thus ultimately the supply chain. Providing power to a community along with connectivity increases their purchasing power which in turn strengthens operator revenues.

Whilst the ESCO model is coming to the region, panellists felt that rollout would be slow as various parties test the waters and the business model becomes defined. When connected to the grid, MNOs pay the utility by power consumed with different tariffs available; such thinking should be applied to ESCO discussions ■

Financing options and exit strategies for MEA's towercos

How bonds, IPOs, increasing investor confidence and diversification of the towerco business model are affecting the landscape

Rob Dixon (Vinson & Elkins), David Murphy (Standard Chartered), Suresh Samuel (OPIC) and Eric Crabtree (IFC)

Vinson and Elkins hosted a discussion with Standard Chartered, the IFC and OPIC at 2016's TowerXchange Meetup in Johannesburg, examining how the finance and investment landscape is changing in the African and Middle Eastern tower industry. Discussion topics included IHS's bond, the role of local banks, potential exit strategies for SSA's privately owned towercos and IPOs that we could see on the horizon; what are the key trends that we need to observe?

Keywords: Acquisition, Africa, Africa & ME, Bankability, Capex, Cashflow Finance, Country Risk, Debt Finance, EBITDA, ESCOs, Exit Strategy, Global Tower, IFC, IHS, Investment, Investors, Middle East, Private Equity, ROI, Standard Chartered, Telxius, Towercos, Valuation, Vinson & Elkins

Read this article to learn:

- Details of the IHS bond and the implications that it has on the tower industry
- Why recent IPOs have failed and what we can expect for towerco IPOs in the future
- Exit strategies and refinancing options for the region's towercos
- Challenges in obtaining finance for Middle Eastern towercos
- Appetites for investment in small cells and DAS

The IHS bond

With news of the IHS bond fresh off the press at the time of this year's Meetup, the subject was the opening discussion point on this year's finance panel. The US$800mn high yield corporate bond was listed on the Irish Stock Exchange and is the largest of its kind listed out of Africa (excluding South Africa). The bond has a 2021 maturity and offers a 9.5% coupon. The funds will be used to refinance the debt of IHS Towers NG (formerly known as HTN Towers, which IHS acquired earlier this year) as well as refinance some of the IHS Nigeria's opco level debt and fund the build of 1,650 new towers as part of MTN Nigeria's rollout plans.

In discussion of the bond (Ba3 / B+ / B+ (Moody's / S&P / Fitch)), Standard Chartered's David Murphy explained that uptake of the bond had been very positive, a sentiment which was echoed by the other panellists. In addition to the positive rating of IHS as the parent company (B1; Moody's), the fact that the bond was backed by DFI funding and also had an extensive pre-marketing campaign helped contribute to the high level of uptake. The IFC's Eric Crabtree also added that the size of the bond was ideal which helped contribute to its liquidity.

The bond also managed to attract a number of new investors who had not previously looked at the towerco space, a development which will have a positive impact for the future of the tower industry on a global level.

IPOs on the horizon in the tower industry?

It had been suggested in the industry that the settlement of an bond may be a precursor to an IPO by sub-Saharan Africa's largest towerco. Many in the market have expressed their viewpoint that IHS's size may preclude an acquisition by a strategic investor and as such, an IPO may be the optimal exit strategy for IHS's private investors.

On the subject of IPOs, the panel observed that the state of the public markets and the stage of development of Africa's towercos may not be ideal for a listing. A couple of weeks prior to the Meetup, Telefónica was forced to scrap the listing of its infrastructure unit, Telxius, after insufficient investor demand; and more recently, leading Turkish operator Turkcell postponed the IPO of their carved out towerco, Global Tower, citing uncertainties surrounding the US election and cyber attacks.

In the case of Telxius, while some felt the structure of the MSA made Telxius less attractive to investors, others felt the inclusion of the company's subsea cabling in the unit was the primary factor resulting in a lack of uptake from the public markets. Whilst the IPOs of companies such as Cellnex and Inwit had familiarised investors with the tower asset class, panellists commented that investors were potentially unable to reconcile the value of their cable business.

Commenting in a separate panel, Helios Towers Africa's Chuck Green observed that the sub-Saharan African tower industry effectively had three phases. The first phase was the land grab, whereby towercos look to bolster their portfolios through major acquisitions of MNO tower portfolios. The second phase involves the integration of the aforementioned tower portfolios and driving towards operational excellence in order to demonstrate the company's expertise in the market. The third phase is the preparation of a company for a liquidity event, be that a sale to a strategic or a listing on the stock exchange. The finance session panellists agreed that potentially the privately owned towercos were not yet in the ideal position for such an event and that current focus remained on the second phase.

Closer inspection of Moody's rating of IHS Netherlands Holdco (awarded B1) alongside their rating of the bond (Ba3 negative) reveals the financial markets' perception of risk in the sub-Saharan tower industry and makes for interesting reading for those working towards an eventual IPO - see "How Moody's rated IHS" in issue 18 of the TowerXchange Journal.

Stable revenues from tenants with parent company ratings of Baa3 negative and higher, IHS' proven strong operating experience, coupled with a long serving experienced management team and a good liquidity profile supported by the ability to draw upon an intercompany shareholder loan, all contribute to the company' credit strengths. Sovereign risk, a volatile currency, fluctuations in diesel prices, exposure to integration risk from the acquisition of HTN Towers, escalations in ground lease payments with just 15% of sites on owned land, the limited scale of the company's revenue and a high debt/ EBITDA ratio all contributed to challenges on the company and bond's rating. The steps that IHS are making however to mitigate some of these risks, have had a positive impact on ratings.

Whilst the Telxius and Global Tower IPOs have been postponed, there are further IPOs on the horizon globally with edotco, China Tower Company and potentially Indus Towers all preparing for a listing. As the markets become more accustomed to the tower industry, this will help pave the way for a future IPO by a MEA towerco.

Alternative exit strategies for SSA's privately owned towercos

With private equity at work in sub-Saharan Africa's three largest privately owned towercos, it is likely that investors will be looking at an exit within the next 18-24 months and as such we will see a churning of capital, observed the panel.

In the Latin American tower industry there are regional strategic investors such as SBA and American Tower who have a history of acquiring smaller towercos. Whilst 2016 saw American Tower acquire Eaton Towers' South African unit (as well as IHS acquire HTN Towers in Nigeria) we are yet to see a wave of towerco acquisitions across the continent. Should a new strategic investor enter the region (for example through the acquisition of MTN's South African towers should they come to market), this may change dynamics.

Funding expansion capital and examining refinancing options

The region's towercos are still capital hungry, not for

the repayment of dividends to their shareholders, but rather to enable them to keep investing in their networks. On the question of whether it was now easier for new towercos to raise capital than it was in the early days of the African tower industry, panellists felt that the familiarity of the towerco business model today significantly helped. Plus as towercos mature and develop stronger operational excellence practices, further confidence in instilled in potential investors.

With the provision of energy as a service a critical component in sub-Saharan Africa, there are still barriers to entry for a new towerco which are higher than for their counterparts in Latin America. The evolution of the ESCO model, panellists felt, may however help to address some of these concerns, with a dedicated and experienced party taking control of the most challenging element of tower operations.

In relation to refinancing, the panel observed that towercos mature quickly which enables them to access cheaper capital. As such, they expected to see a number of towerco refinancings on the horizon.

The increasing role of local banks

On the question of the role of local banks, OPIC explained that it was in their remit to support local banks who may not have the experience in providing finance to the sector. DFIs coming into play with guarantee tools that help to absorb some of the risk also assist in supporting the influx of local debt into the tower industry. Panellists felt that it was important that local banks become more involved in providing local currency to towercos and as the market developed, expected to see more of this.

Financing in the Middle East

With a higher prevalence of towercos in sub-Saharan Africa, much of the focus of discussions remained on the region, however attention did also turn to the Middle East where a new breed of towerco is starting to emerge. Given the current liquidity issues that Middle Eastern banks are facing, panellists observed that the cost of financing had started to rise in the Middle East and as such, the economics of future transactions in the region would be affected by this.

Rooftops, DAS and small cells

The panel rounded up discussions moving away from macro sites and focussing on HetNet solutions. With many of these sites, the panel observed, the capex to deploy such systems is lower and therefore companies are able to speculate on build-to suit programmes.

The panel commented that the area of small cells and DAS had been overlooked by many of the region's towercos and this created a niche for new players. If they could develop the technical expertise and come up with an innovative business model, there could be some attractive investment opportunities ahead ■

M&A, towerco consolidation and maturation in sub-Saharan Africa

How the region's tower industry is set to evolve

2016 saw the start of in-market towerco consolidation as well as the opening up of tier two MNO tower transactions; with MNO consolidation on the horizon, towerco shareholders looking to exit their investments and the rollout of 4G starting, Helios Towers Africa, Eaton Towers, Al Karama Towers and Citi explain how they expect the sub-Saharan African tower industry to evolve.

Keywords: Acquisition, Al Karama Towers, American Tower, Africa, Africa & ME, C-Level Perspectives, Carve Out, Citi, Core Network, Backhaul & FTTT, Deal Structure, Eaton Towers, Exit Strategy, Helios Towers Africa, HTN Towers, IHS, Infrastructure Sharing, Investors, IPO, M&A Capital, Masts & Towers, Middle East, MNOs, Operational Excellence, Operator-Led JV, Sale & Leaseback, Towercos

Read this article to learn:

- Expectations for future tower divestments across Sub-Saharan Africa
- How tier two MNO tower portfolios are most likely to be acquired
- Driving factors behind 2016's towerco consolidation and alternative exit strategies
- Increasingly important points of negotiation in tower transactions
- Towerco expectations for diversification of their business models

MNO consolidation and tower transactions

Since 2010, sub-Saharan Africa has seen MNOs divest almost 40,000 towers to independent towercos in a total of 28 transactions, in some instances retaining equity and in others electing to sell completely. Whilst the gold rush is over, the towercos still expect a handful of transactions to still filter through. Airtel have sold the majority of their sites but still retain towers in a handful of countries, portfolios which participants thought could well come to market; MTN has monetised towers in a number of countries and now their fine has been resolved in Nigeria, the operator may once again start looking at their tower strategy; and Millicom is known to want to sell out of their African operations.

In terms of M&A activity between MNOs, the panellists forecasted that consolidation would be on the horizon; in many markets there are far too many licenses and far too many MNOs. Whilst MNO consolidation can often be seen as a bad thing for towercos due to reduced tenancies, the panel commented how the stability brought by such activity could have a positive impact. Towerco business models are built on their validity of their contracts with MNOs and a healthier operator landscape brings reduced risk to a towerco balance sheet.

In discussion on MNO consolidation, panellists cautioned against operators taking steps with their towers which may jeopardise their desired M&A

strategy. In the UK, a key factor in the blocking of Hutchison's takeover of O2 was the involvement of the MNOs in different joint venture infracos in the market. If an operator is looking to consolidate, they need to be mindful of the effect that tower strategy may have on this.

The evolution of transaction structures

Whilst the structure of an MLA and the set of terms and conditions are well defined, transactions are generally bespoke to the MNOs in line with their strategic objectives; Airtel's tower sales have been more about raising capital whilst MTN have been more focussed on valuation creation and the more efficient deployment of capital.

In terms of how transactions have evolved, Citi who have advised Tigo and MTN on their sale and leasebacks, have seen a maturation in the deals, with learnings from previous transactions reapplied.

One significant difference between transactions in the early days and the current day is that many deals originally had power as a pass-through. This has since transitioned to power as a service becoming the norm, with towercos also exhibiting a preference for this as the ability to improve energy opex is one of the areas where the towerco can make its most significant margins.

Another evolution has been around the issue of active sharing. In their first transaction in Ghana, Chuck Green voiced how active sharing had been addressed by a simple clause in the contract. Today, active sharing is a key point for negotiation in agreeing the deal terms.

Tier two MNO portfolios

With Africa's big four towercos having primarily focussed on the tower portfolios of the continent's tier one operators, discussion turned to the appetite for the infrastructure assets of the regions tier two MNOs.

With higher counterparty risk, tier 2 MNO portfolios are typically less attractive to the larger towercos. Eaton voiced their opinion that if you are already present in a market and you already understand the operating conditions, there may be some potential synergies afforded by acquiring such portfolios and in those instances a transaction may make sense. In instances where a towerco does not however have a presence on the ground, the value proposition is greatly reduced. The panel brought attention to the proposed sale of mCel's ~1,000 sites in Mozambique for which the operator had approached Barclays to run a tower sale. Commenting on the sale process Eaton explained that when they had looked at the government owned operator in a country facing a lot of economic challenges, they decided that their time would be best spent elsewhere.

Helios' Chuck Green echoed this sentiment adding that there are a variety of reasons that towercos have looked at markets and passed on them, making the decision to focus their efforts elsewhere. Given the scale of the big four towercos, there are portfolios which they now view as too small or not additive to their business and so have shied away from. This does however, he added, open up opportunities for other towercos. Whilst there are risks and potentially limited growth prospects, as long as these are accounted for in the business model and pricing then there does exist an opportunity for a certain type of company.

One such company is Al Karama Towers; the newly formed towerco is in the process of acquiring Expresso Telecom's 450 sites in Senegal. In addition to Expresso's Senegalese towers, Al Karama also has an appetite for further tier two MNO portfolios in markets which are yet to be touched by the larger towercos.

Smaller MNOs on the continent are keen to compete with the larger operators and require significant amounts of capital to fund the rollout of 3G and 4G in order to keep up with their competitors. Such players have been looking for capital to help fund this expansion and one strategy to access this capital is through the sale of their towers.

Al Karama's focus is on this niche, an area in which the major towercos in the continent are not keen to play. By entering these virgin territories with MNOs who have previously been overlooked but who have a strong motivation to sell, Al Karama Towers

is carving out a very interesting niche for itself. By doing the groundwork in greenfield markets, should the larger towercos look to enter a later date as a response to MNO consolidation or larger tower portfolios coming to market, then Al Karama Towers would make a very attractive acquisition target.

Towerco consolidation

2016 saw the first in-market towerco consolidation, firstly with IHS's acquisition of HTN Towers in Nigeria and subsequently with American Tower's acquisition of Eaton Towers' South African business unit.

Speaking on the ATC-Eaton transaction, Terry Rhodes explained how they had looked at HTN Towers' situation as a model of what could happen to a towerco in a market where a much larger player is present. Whilst HTN Towers had been in the market for a long time, the level of competition from IHS and American Tower gave HTN Towers little room for manoeuvre. Eaton could see the same thing playing out in South Africa and were keen to take the offer on the table rather than take the risk of a similar fate. The transaction also raised funds for Eaton to be able to reinvest in other areas of its business, further strengthening its position in other markets.

Towerco exit strategies

With private equity at work in three of the big four towercos, liquidity events are to be expected within the next 18-24 months as firms look to exit their investments. The aforementioned towerco consolidation represents one such exit strategy, a strategy that is a win-win scenario for both parties involved; whilst one towerco achieves an exit, the other increases its chances of a successful exit.

An alternative strategy would be an IPO. On the subject of IPOs, Chuck Green mentioned that it was important to consider the three phases of a towerco in the region. The first phase was the landgrab, whereby towercos focus on external growth through the acquisition of tower portfolios. This is the phase that towercos were in for the past five to six years. The second phase requires the focus to shift internally, focussing on organic growth and the drive towards operational excellence. The towerco business model is built upon selling co-locations and towercos need to now deliver these co-locations and furthermore, achieve operational efficiencies which will improve their profit margins. This second phase is where towerco attention is currently focussed.

With this inward looking perspective towercos can start to see where their weaknesses are and then work on these weaknesses in order to improve their IPO story. At present, Chuck felt, none of the towercos had an optimal IPO story and so this needed to become the next area of focus for companies.

Diversification of the towerco business model

Discussion on the panel turned towards the diversification of the towerco business model and how this was likely to evolve in sub-Saharan Africa. With such common principles between the towerco business model worldwide (albeit with sub-Saharan Africa and some other regions having a higher degree of operational complexity), the panel thought it important to look to more developed markets, such as the US, and how towercos have evolved their business model in such countries.

Panellists commented that the diversification of the towerco business model was inevitable; with the rollout of 4G and eventually 5G, small cells, in-building solutions and DAS networks are all going to play an important role in eliminating the bandwidth bottleneck. Owning the backbone is strategic as the network moves towards this shape. In the US, Crown Castle has a big fibre network, the primary reason for this not necessarily for being in the fibre business per se, but rather as a key element in supporting smalls cell and DAS deployment. IHS have entered the fibre space in Nigeria and panellists thought that as markets mature across sub-Saharan Africa, you will see more towercos looking to play a role in fibre, both owning the fibre themselves and working with parties such as Liquid and Google.

One thing the panel cautioned that towercos must be careful of in this space is how the pricing model works. Traditional fibre models do not make financial sense in the context of the towerco business model and so new pricing structures

need to be developed. Another area of caution was in relation to the failed IPO of Telxius. It is widely believed that a key reason for the failed listing was the inclusion of the cable business; fibre cannot be rated at the same multiples as towercos and so a towerco getting into fibre needs to consider the balance of their business and pricing in line with this.

Operator-led towercos and joint ventures

The subject of operator-led towercos was high on the agenda at the 2016 Meetup with an increasing number of MNOs understanding the value in their assets and actively pursuing co-locations. In discussion of the topic, the panel commented how Airtel had created a towerco (Africa Towers) originally but then changed their strategy completely and sold their towers. In the case of Airtel, they had found that other MNOs were not so keen to lease towers from a company who had a competitor as their sole shareholder and thus they decided to monetise their towers sooner rather than later.

That level of distrust and unwillingness to share rollout plans with competitors, the panel thought, was a key barrier to the rise of the MNO-led towerco. Similarly, the panel questioned the ability of the two different companies to operate in a true operator-towerco nature, commenting that it was less likely that the towerco would act with the same discipline when negotiating a sale and leaseback contract.

Helios' Chuck Green added that in every market, he has seen independence as crucial in optimising the value of a towerco business. Whilst there are examples of operator led towercos such as Indus Towers, questions have been raised about successful entities such as Indus Towers have truly been.

The panel raised the idea that often the creation of an operator-led towerco was the first step towards a tower monetisation. Getting the assets in order and demonstrating their value will help to achieve a better release of capital as and when you look to sell but setting a clear path to independence in the carve out of a towerco business is key. Citi cautioned that if the terms of the original sale and leaseback agreement were skewed towards the MNO during the carve out, it will be more difficult to sell or list the towerco down the road.

With the Middle Eastern market also in the spotlight at this year's event and Saudi Arabia seeing the formation of a joint venture infraco between Saudi Telecom Company and Mobily, the panel were asked how they viewed opportunities for such entities. Whilst all agreed that efficiencies could be achieved, challenges around alignment of business objectives and a willingness to discuss strategies openly would continue to create challenges. Citi observed that they had a 100% success rate in Africa in arranging a dozen sale and leasebacks, whereas when it came to bringing MNOs together, that success rate dropped to one in six ■

Drivers and inhibitors of infrastructure sharing and tower sales in MENA

How and why the market is starting to evolve

To date, 99% of MENA's towers sit in the hands of the region's MNOs. Orange's cancelled transaction in Egypt, coupled with the cancellation of Mobily and Saudi Telecom Company processes in Saudi Arabia may suggest that figure is set to remain, however a wave of activity has started and those closest to the market think it is only a matter of time before things start to change. Saudi Telecom Company are in the process of starting a tower joint venture with Mobily; Fanasia have pioneered a new towerco business model in Iran; and Towershare are reportedly the frontrunners in Kuwait's first tower transaction. TowerXchange were delighted to welcome all three companies to an open panel debate at this year's Meetup Africa & Middle East with each of these companies also joining interactive roundtable discussions with a cross section of the MENA telecom industry's most important stakeholders.

Keywords: Acquisition, Active Infrasharing, ARPU, Bahrain, Build to Suit, Capex, Country Risk, Decommissioning, Densification, Egypt, Etisalat, Fanasia, Infrastructure Sharing, Iran, Kuwait, Leasing & Permitting, Maroc Telecom, Middle East, Mobily, MNOs, MTN, North Africa, Oman, Ooredoo, Operator-Led JV, Orange, QoS, Regulation, Saudi Arabia, Saudi Telecom Company, Towercos, Towershare, Uptime, Zain

Read this article to learn:

- Motivations of the region's MNOs to enter into infrastructure sharing agreements
- Why MENA's tower transactions have faltered in the past and what this means for future deals
- How regulation and the role of government in the telecoms sector influences market dynamics
- Where the biggest opportunities lie for independent towercos
- Leasing and permitting challenges faced in the market
- The role active infrastructure is expected to play

The telecoms landscape

When discussing MENA, whilst one has to be cognisant of the fact there are large differences between the countries, common threads tie the region together. A strong Arabic influence, a central involvement of government in the business sector, similar climates and environmental conditions and a prevalence of key telecom players across multiple markets (figure one). What's more, the region as a whole has yet to see the evolution in tower ownership witnessed across the globe, with over 99% of MENA's sites remaining in the hands of the mobile network operators.

The period in which MNOs entered a given market, their market share, how they have funded their operations, as well as whether they are an independent company or part of a broader group, are all factors which influence a company's strategy and decision making processes.

In comparison to other regions, ARPUs in the Middle East have been relatively well preserved, with the region having some of the highest data usage and with voice still generating strong revenues. MNOs such as Etisalat and Saudi Telecom Company have particularly healthy balance sheets. Roundtable participants questioned whether the focus of such MNOs was geared more towards improving top line revenues in place of reducing costs, with some observers commenting focus was much more on the former.

Other MNOs in the market are much more capital

Figure one: The presence of major operators in MENA

Source: TowerXchange

	Etisalat	MTN	Ooredoo	Orange	STC	Zain
Algeria						
Bahrain						
Egypt						
Iran						
Iraq						
Israel						
Jordan						
Kuwait						
Lebanon						
Libya						
Morocco						
Oman						
Palestine						
Qatar						
Saudi Arabia						
Sudan						
South Sudan						
Syria						
Tunisia						
UAE						
Yemen						

constrained, with highly leveraged balance sheets and a need to rollout 4G in a bid to keep up with their competitors, such players are keenly focused on accessing new sources of capital.

Quality of service requirements remain a key focus for all MNOs in the market. With there often being little difference in market share between MNOs in some countries, maintaining that competitive edge through quality of service, OTT offerings or innovative packages are key focal points for companies.

It has been observed that MNOs in the region tend to be very much led by the CTO and only in recent years have the CFO and commercial teams become more involved in influencing the strategic direction of an operator, balancing the technical influence.

Government influence and regulation

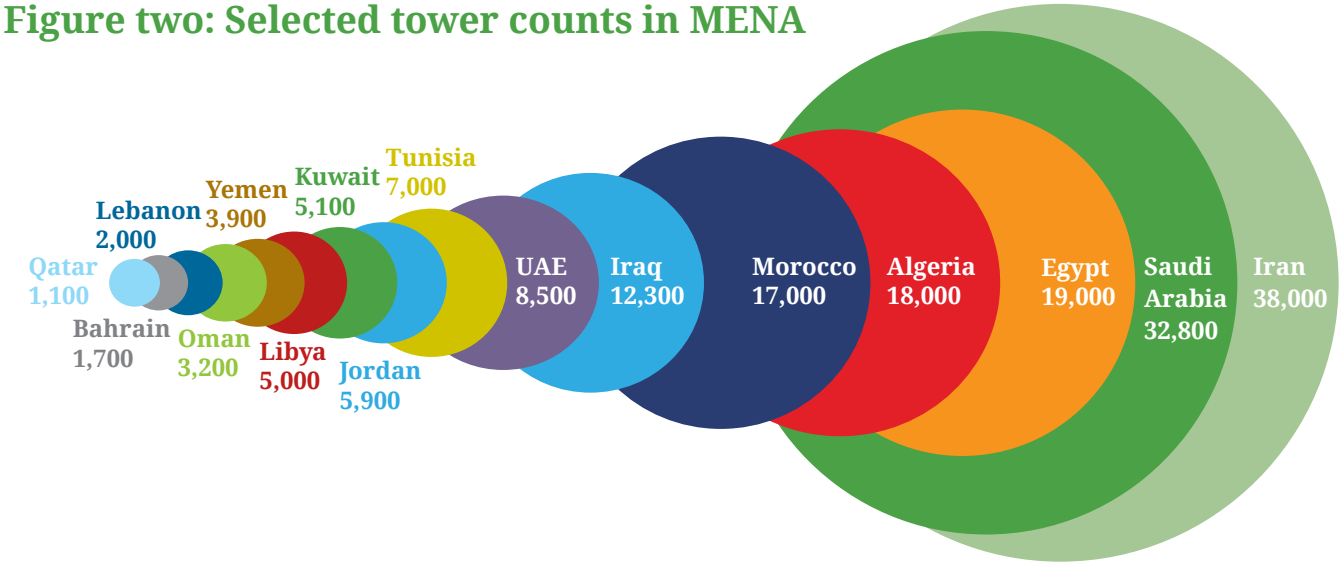
The government also has a very strong strong influence on MNOs in the region; several operators originated as government-owned entities with a number still having the government as a significant stakeholder; others that developed more independently often built infrastructure under a build-operate-transfer structure and thus in these instances the government would eventually become a key stakeholder in infrastructure. Some observers felt that regardless of ownership, MNOs often operated very much like nationalised organisations, although this opinion was up for debate. Participants questioned how a government-centric MNO behaved relative to those that were more independent; one

MNO from the region commented how they had a culture of being very risk averse, adding that they were very good "second adopters", looking at what innovative strategies have worked for others and copying them effectively.

The involvement of the government in the telecoms landscape also meant that MNOs are generally subject to high degrees of regulation and taxation and this presented some concerns to those looking to enter the Middle Eastern market. Uncertainty over how regulation may evolve and expectations that they may wish to get their cut of revenues in the sector still remained one of the biggest concerns.

Whilst there has to be moderation in the way that the government is involved in the telecoms sector in order to not be counterproductive to investment, there are areas in which observers see governments making positive steps to support the telecoms sector. There are several initiatives to improve coverage to rural areas across the region; in Oman, the government is pushing infrastructure sharing, in Bahrain the government has issued an RFP to look at how to rationalise 1,500 towers in a country that only needs in the region of 400 and in Iran municipalities have mandated infrastructure sharing, which has led to significant decommissioning.

Figure two: Selected tower counts in MENA



Source: Delta Partners data, TowerXchange presentation

Land ownership, leasing and permitting

Ground lease rates in the Middle East are generally high, more akin to lease rates in Europe than the African continent. A significant portion of the land is government owned and the land that is privately owned is often held in big blocks by real estate companies which gives MNOs and towercos less negotiating power. With regards to permitting, participants noted that slow approval times and requirements from municipalities are often a major hurdle to pass.

Infrastructure sharing and motivations to divest towers

Whilst a handful of transactions have been started in the past, none have seen it through to fruition. In 2015, Orange Egypt (then MobiNil) agreed the sale of 2,000 sites, approximately one third of their portfolio, to Eaton Towers, only for the transaction to be called off earlier this year. Both Saudi Telecom Company and Mobily started tower processes in Saudi Arabia in 2016, only for those too to be cancelled. With no established towercos of a similar scale to sub-Saharan Africa's 'big four' active in MENA, the Saudi MNOs voiced concerns over a new entrant's ability to maintain and execute tasks to their high standard. CTOs require reassurance that the acquiring party not only has the international expertise but also a network of local subcontractors and suppliers, a prerequisite which they felt was not present amongst potential candidates.

Whilst STC and Mobily had hesitations regarding the sale of their towers, Zain is in the process of selling its portfolio of 6,800 sites in Saudi and 1,600 sites in Kuwait. The MNO has reportedly narrowed down the offers in Saudi to two bidders and in Kuwait they are reportedly in exclusive negotiations with a towerco, who many believe to be Towershare. Participants at the Middle East roundtable felt that

once the first transaction had been completed there would be a domino effect and we would start to see the market opening up to further transactions. Based on previous experience however, participants felt that processes were likely to still be long and drawn out plus with restrictions on ownership in certain countries, deal structures may be complicated.

Questions were raised as to how towercos could validate the commitment of MNOs to a tower sale process and how one can identify who the serious parties are. It was commented that numerous parties had spent a lot of money on the STC and Mobily processes, only for them to be cancelled. In response to the question, those who were participating in the transactions commented that you could obtain a sense of how serious a process was by the attitudes of the MNO when you enter the formal process. They also commented that if the MNO had appointed an advisor to carry out due diligence or if they have a financial advisor in place for the process, the board must have approved at least US$4mn to get to that point, another indication of their commitment to a transaction.

Having observed the evolution of the independent towerco markets in other regions, some participants highlighted the concerns associated with disparate lease rates across the country. Whilst some MNOs may prefer to agree on a higher lease rate in exchange for a higher upfront release of capital, this can lead to difficulties down the line as MNOs benchmark their opex against that of their competitors. Stakeholders need to work together closely to ensure that the market evolves sustainably.

In terms of the business case for a towerco looking to enter the market, the mature nature of most countries' telecom industries means that opportunities in new build will be limited. One area however where towercos can add significant value and generate revenue is in decommissioning. WIth a high degree of parallel infrastructure in the region, extensive decommissioning programmes are required and re-using those towers to meet government targets for improved high speed broadband coverage to rural areas presents lucrative opportunities.

Speaking on the Kuwaiti market where Towershare are believed to be in exclusive negotiations with at least one of the MNOs, the towerco voiced how decommissioning would be very much top of the agenda for a towerco looking to enter the market. In Iran, local towerco Fanasia's business model is also very much focussed around decommissioning, with their latest project aiming to reduce a network of 1,000 sites in Iran's second most populous city to just 350. The formation of STC and Mobily's joint venture is expected to also lead to a decommissioning of a significant number of the two operators' combined portfolio of over 25,000 sites, with STC stating that a lot of investment could have been saved had the two entered into the agreement earlier.

Active infrastructure sharing

On the subject of active infrastructure sharing in the region panellists felt that it would be inevitable and that policy may also play a role in driving this. Active infrastructure sharing makes a lot of sense from a cost perspective for companies that would need to buy a lot of new equipment, for example the region's WiMAX players, but participants felt that it was challenging to set up.

In the case of STC and Mobily's joint venture, they have opted to stick to passive infrastructure sharing. With the operators being at different stages in their lifecycle as well as having different amounts of spectrum, the decision was made to not introduce extra levels of complexity and rather omit active sharing from their plans for now.

With regards to negotiating active sharing agreements where towercos are involved, there are additional levels of complexity. Towershare commented how they were open to discussions with MNOs but that meaningful contracts are very challenging to draw up when there are so many unknowns. Ultimately there had to be some agreement to agree on active sharing details at a later stage.

Participants commented that there were different permutations of active sharing and that in building solutions would likely come first to MENA. Speaking on this, Fanasia commented how they were working on active sharing agreements in shopping malls and airports in Iran and forecasted further work to be done in the field ■

Improving urban and rural coverage in East Africa

Indoor and outdoor DAS, policy changes and innovative business models

East Africa roundtable host Jim Burns, Eaton Towers

East Africa is a dichotomy; in urban areas, increasing population density, construction and data usage is presenting MNOs and towercos with one set of challenges, whilst meeting coverage requirements for a large underserved population in remote, rural areas presents totally different issues. At the East Africa roundtable at the 2016 TowerXchange Meetup, participants focussed on how the East African stakeholders must collaborate to address challenges at both ends of the spectrum.

Keywords: 3G, 4G, Active Infrasharing, Africa, Anchor Tenant, ARPU, Burundi, Business Model, DAS, East Africa, Ethiopia, Infrastructure Sharing, Kenya, KPIs, Leasing & Permitting, MNOs, Network Rollout, Opex Reduction, Opex Sharing, Passive Equipment, QoS, Regulation, Rooftop, Rwanda, Tanzania, Towercos, Uganda, Urban vs Rural

Read this article to learn:

- The shape of the MNO and towerco landscape in East Africa
- How increased data usage is shaping network infrastructure requirements in urban areas
- Challenges presented to MNOs and towercos by increased rates of urbanisation
- Models for deployment of in-building solutions
- Strategies to tackle coverage obligations for remote areas

The East African mobile market and tower industry

When comparing East Africa's mobile markets some stark contrasts can be observed. In Tanzania and Uganda you have markets ripe for consolidation with eight MNOs active in each, whilst in Ethiopia there is a monopoly with Ethio Telecom being the sole operator present; SIM penetration ranges from around 40% in countries such as Burundi and Ethiopia and rises to 78% in Kenya; whilst Ethiopia boasts the highest broadband mobile penetration at 58% versus just 4% in Burundi [1].

Africa's big four towercos have each established a footprint in the region; Eaton acquiring portfolios from Orange, Warid and Airtel in Uganda and from the latter in Kenya; Helios Towers Africa securing the Millicom and Vodacom portfolios in Tanzania and American Tower set to enter as a competitor in the country once their transaction with Airtel closes; IHS have a footprint in Rwanda having acquired the MTN and Airtel portfolios in the country.

The region has also seen the rise of the operator-led towerco with Kenya's Safaricom actively pursuing co-locations on around 20% of their 4,000 sites in the country and Telkom Kenya looking to pursue a similar strategy. With regards to future divestments by MNOs, rumours have been circulating that Telkom Kenya will look to monetise their tower portfolio, with the operator having entered into and then cancelled an MLL agreement with Eaton Towers in 2013.

Figure 1: Mobile market and telecom tower comparison across East Africa

	Connections [1]	Population [1]	Number of MNOs	% mobile broadband [1]	Independent towercos present
Kenya	36.3mn	46.7mn	3	19%	Eaton
Tanzania	38.6mn	54.3mn	8	30%	Helios & ATC
Uganda	23.5mn	39.7mn	8	18%	Eaton
Ethiopia	42.1mn	100.6mn	1	58%	None
Rwanda	8.8mn	11.7mn	4	35%	IHS
Burundi	4.8mn	11.4mn	4	4%	None

[1] Source: GSMA Intelligence

Data growth and usage

In reference to the Kenyan market, one participant present referenced how the data market isn't as regulated as it should be with the KPIs being set by the regulator tending to focus on quality in voice services and the number of dropped calls, rather than throughput and speed. There is however ongoing consultation with the Kenyan Ministry of Communications in order to set KPIs around quality of service on data.

With the demand for data in the region growing, a question was raised as to how this is affecting the shape of infrastructure in the market and what impact this is having on the towercos present. One towerco referenced that as fibre was being brought to the tower to support data growth it was resulting in the removal of microwave antennae which could have a negative consequence on towerco revenues. Towercos in the region need to work out how to build revenue streams around fibre; there are providers who are charging for bringing fibre to the site and as such making money from a towerco's facilities, towercos need to look at this business model carefully.

In-building solutions

Following on from discussions around increased data usage, a further question was raised on how extensively in-building solutions are being brought to East Africa. One participant referenced how they had five buildings covered by DAS in Uganda whereas in Kenya, the number of buildings covered was in the hundreds, thus demonstrating the difference in maturity of the two countries. In Kenya, one participant estimated that there are around 500 prospective buildings they felt should be target for IBS.

A DAS supplier at the table also felt that Uganda was still quite far behind Kenya in the deployment of IBS but saw IBS coming in a big way in the region. Rwanda, they felt was showing some of the strongest promise, with Ethiopia also being a region showing significant promise. Uganda and Tanzania, they felt, lagged behind these two countries.

As to the business models for IBS deployment, the same supplier felt that MNOs were keen to hand the responsibility to towercos to execute. One of the towercos at the table explained, however, that IBS are more expensive to install than a ground based tower and as such, the rates that a towerco needs to charge are higher which can make it a hard business case for the MNO to justify.

Another towerco at the table referenced how they had completed two in-building projects in Africa but didn't anticipate that it would become a major revenue stream for them. Their motivation for doing the projects was more to continue good relationships with the operators rather than seeing it as a strong commercial opportunity.

With regards to MNO motivations to install IBS, one participant referenced that it was less about securing new revenue streams and more about addressing quality issues but that it was harder to

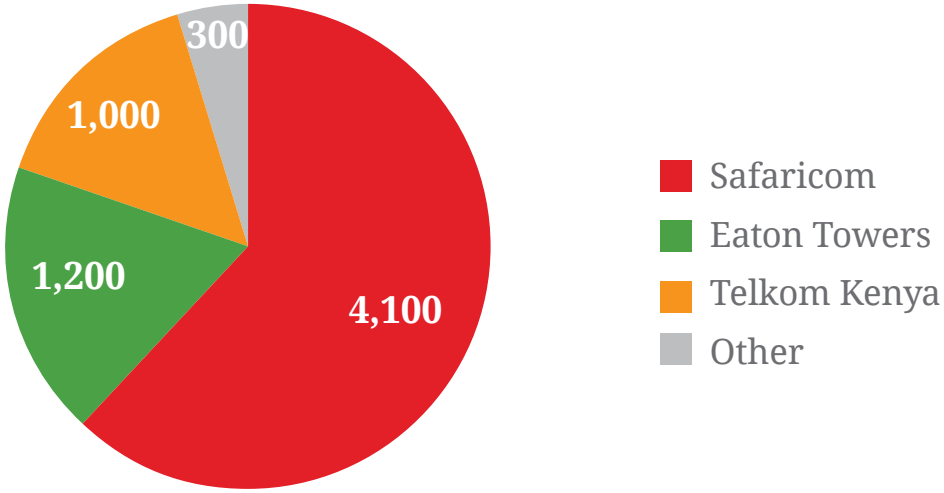
justify capex spend for quality of service. Another participant offered the perspective that many hotels are currently installing their own WiFi and through this mobile subscribers are using WhatsApp and Skype. The resulting effect of this action is that operators are losing revenue and that deploying IBS may help protect some of this revenue.

As to how involved a towerco should get in designing and specifying an in-building solution, one towerco with experience outside of the African market explained how they preferred to give technical design responsibility to the anchor tenant. As a towerco, focus has always been on the passive equipment and with the active equipment changing so quickly, they felt specification and management of this is better managed by the MNOs.

Changes to the outdoor urban landscape

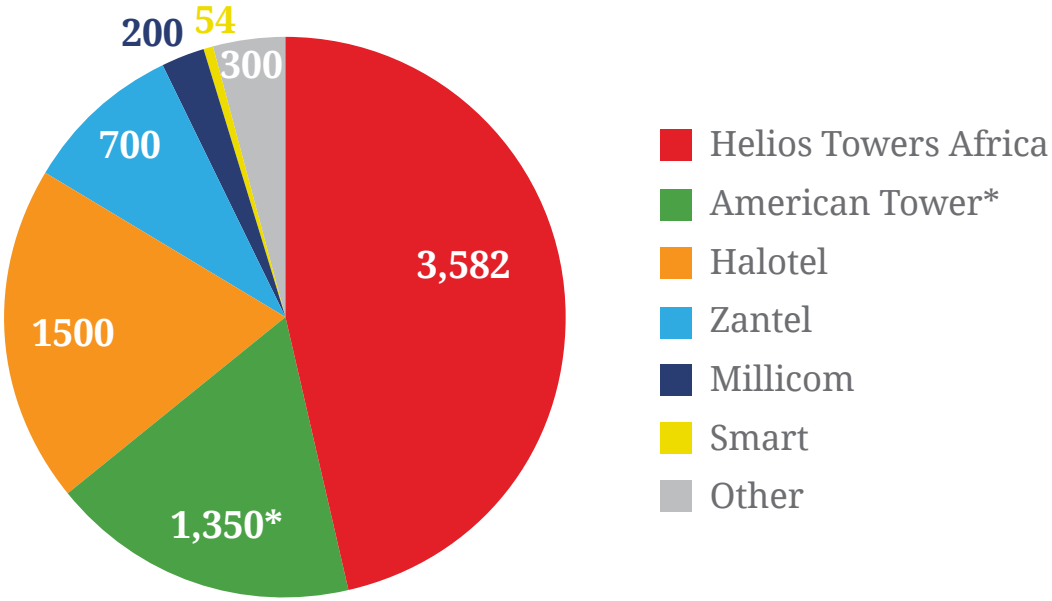
Participants observed that communities are becoming increasingly opposed to the proliferation of towers in urban areas, even the proliferation of rooftop sites. As such, new solutions will need to be found. Urbanisation is also leading to the growth of high-rise buildings in East African cities which is causing challenges for signal propagation from existing towers. This trend is causing issues for MNOs and towercos alike; MNOs lose the ability to be able to transmit a signal from a given site and when the site is owned by a towerco, they end up entering into a dispute with the MNO who no longer wants to pay for rental on that site. With the towerco having invested significant capex in the site, they are

Figure two: Ownership of Kenya's 6,600 towers



Source: TowerXchange

Figure three: Ownership of Tanzania's 7,686 towers



*Pending closure of the Airtel transaction

Source: TowerXchange

understandably not willing to lose their revenue and as such an agreement needs to be reached.

Participants felt that this was an area where ultimately there needed to be improved communication between the building owner and the operator. It is in the best interest for both parties that building tenants have access to a robust signal and so counterproductive to exclude the interests of the other party. Participants also felt this is an area where regulators should be getting more involved. In major cities in Nigeria, one of the regulatory agencies has proposed that any new building over a certain height needs to have a solution built into it and is in the process of trying to put this into law. Such a solution could be transferred across to East African markets.

Another challenge presented to towercos and MNOs is the creation of large and highly secured residential estates. Such dwellings have proven hard to penetrate with 3G which has led to complaints amongst residents. However due to their highly secure nature, gaining access to these estates to work on a solution is tough. One potential solution to explore for such settings is outdoor DAS; with the sites needing power, attaching such antennae to streetlights could present a very interesting strategy in order to improve coverage. When it comes to targeting these areas however, no one size fits all and so a whole host of different solutions will need to be assessed.

Improving rural coverage

Whilst much of the discussion focussed around challenges in urban and densely populated areas, talks also turned to rural coverage and obligations placed upon the MNOs to address the poor connectivity for the high proportion of the population living in remote areas.

In Kenya, players including towercos, ISPs and MNOs are required to pay a percentage of their revenues into a universal service fund. At present however, only the GSM operators are able to access the fund. Other parties are currently working with the regulator to change legislation so that anyone who pays into the fund is able to access it in order to make coverage expansion in underserved areas commercially viable.

One of the concerns around such a proposal is that although a towerco may access the fund to build a site, this does not guarantee that an MNO would automatically use that site. MNOs at the table felt that towercos would need to work at creating a model which would give the regulator and MNOs that assurance.

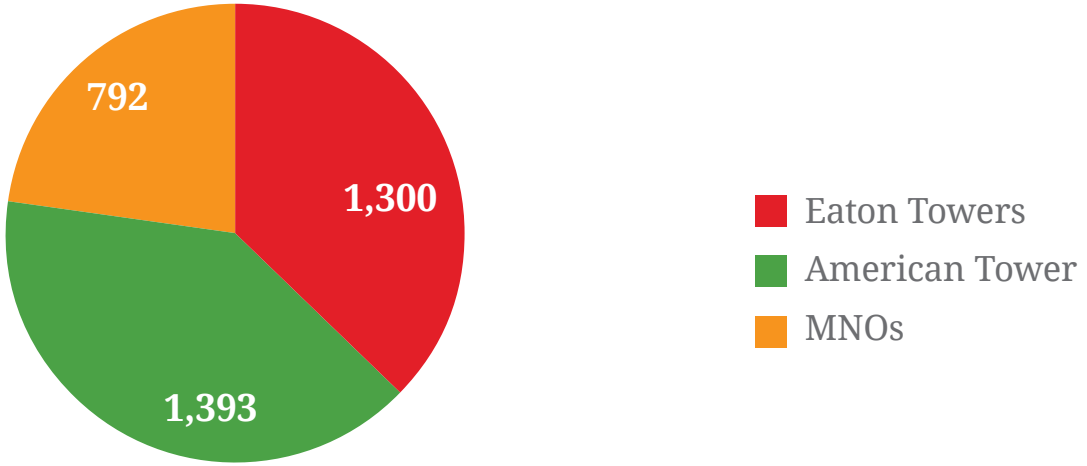
With the towerco business model being based on the addition of multiple tenants, developing a solution that is commercially viable in an underserved area with no grid connection that would most likely only have a single tenant presents a particular challenge.

In addition to that, in some remote areas, such as the East of Kenya, there are increased security risks which further complicate rollout. Developing a solution to this requires collaboration between the full value chain in order to bring a cost effective alternative to the market.

One participant at the table had been working on rural coverage in Zambia, developing a low tower, low power solution. The model had initially proposed a revenue sharing agreement with MNOs but with such low ARPU in the region, this had never got off the ground. The company has since looked at developing a WiFi solution in conjunction with an ISP and a more lenient licensing structure, whereby the WiFi is funded by media owners who use the platform for advertising.

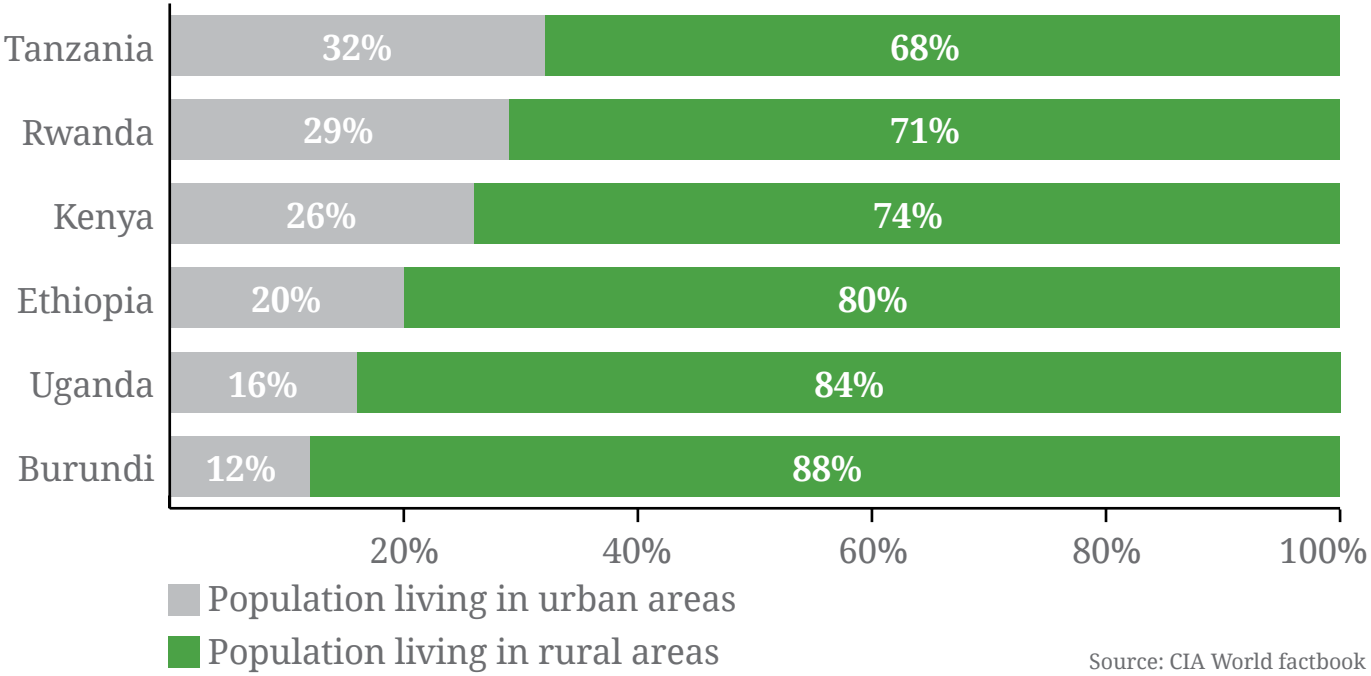
One MNO at the table shared their experience in extending free coverage to individuals through agreements with bus and taxi owners. The owners of the buses bear the cost of the service and use it as a loyalty scheme or attraction for their customers. Such innovative models are important in finding ways to deliver coverage more cost effectively ■

Figure four: Ownership of Uganda's 3,485 towers



Source: TowerXchange

Figure five: Percentage of the population living in urban and rural areas in select East African countries



Source: CIA World factbook

A shake-up of South Africa's telecoms infrastructure

How MNOs, towercos, government and 5G evolution are shaping the future

The shape of South Africa's telecoms network infrastructure has undergone significant changes in the past twelve months, with further shake-ups on the horizon. From operator-led towercos and Cell C's plans to rebuild their tower portfolio, to American Tower's acquisition of Eaton Towers and the Government's proposal to create a Wholesale Open Access Network. Such developments made for interesting debate at TowerXchange's 2016 South Africa roundtable as participants voiced their concerns, ambitions and forecasts for the year ahead.

Keywords: 3G, 4G, Acquisition, Active Infrasharing, Africa, Africa & ME, American Tower, Anchor Tenant, Atlas Tower, Blue Sky Networks, Capacity Enhancements, Capex, Cell C, Co-locations, Coast to Coast, Comco, Construction, DAS, Densification, Eagle Towers, Eaton Towers, Infrastructure Sharing, Lease Rates, Leasing & Permitting, LTE, Market Overview, Masts & Towers, MNOs, MTN, Network Rollout, Opex Reduction, Pro High Site Communications, QoS, Regulation, RF Design, Sale & Leaseback, South Africa, Southern Africa, Telkom, Towercos, Vodacom

Read this article to learn:

- Mobile market shares and tower ownership in the South African market
- The role South Africa's MNOs see for towercos and how they would like business models and pricing to evolve
- New build requirements and challenges faced by towercos and MNOs
- The impact of the American Tower - Eaton Towers transaction and speculation surrounding an MTN tower sale
- Proposed mechanisms and models for 5G deployment and indoor coverage expansion
- How the National Integrated ICT Policy White Paper could affect the South African market

The current shape of the South African mobile market and tower industry

South Africa has four MNOs, with Vodacom and MTN leading the market with 38% and 36% of mobile subscribers respectively, Cell C possessing 23% market share and Telkom accounting for just 3%. There are also a number of MVNOs which hold less than 1% of the subscriber base (figure 1).

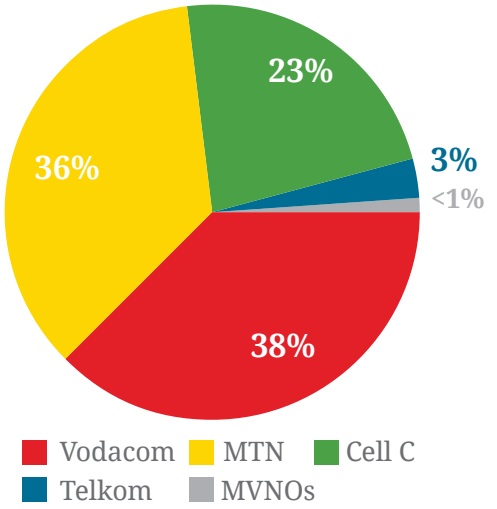
The country has an installed base of just under 30,000 towers with each of the MNOs, bar Cell C, retaining their tower portfolios. Whilst Cell C had sold their portfolio of 1,400 sites to American Tower back in 2010, the operator is now in the process of rebuilding their own network (more of which later).

Having entered the market following the acquisition of the Cell C towers, American Tower are the largest towerco in the South African market with a portfolio of 2,309 sites after their recent acquisition of Eaton Towers' 300 South African sites absorbed their largest competitor. In addition to American Tower there is a long tail of other independent towercos in the country, with fast-growing Atlas Tower and their 171 sites heading the group. In addition to the MNOs and towercos there are approximately 7,500 sites managed by broadcast, web and other industries (figure two).

The rise of the operator-led towerco

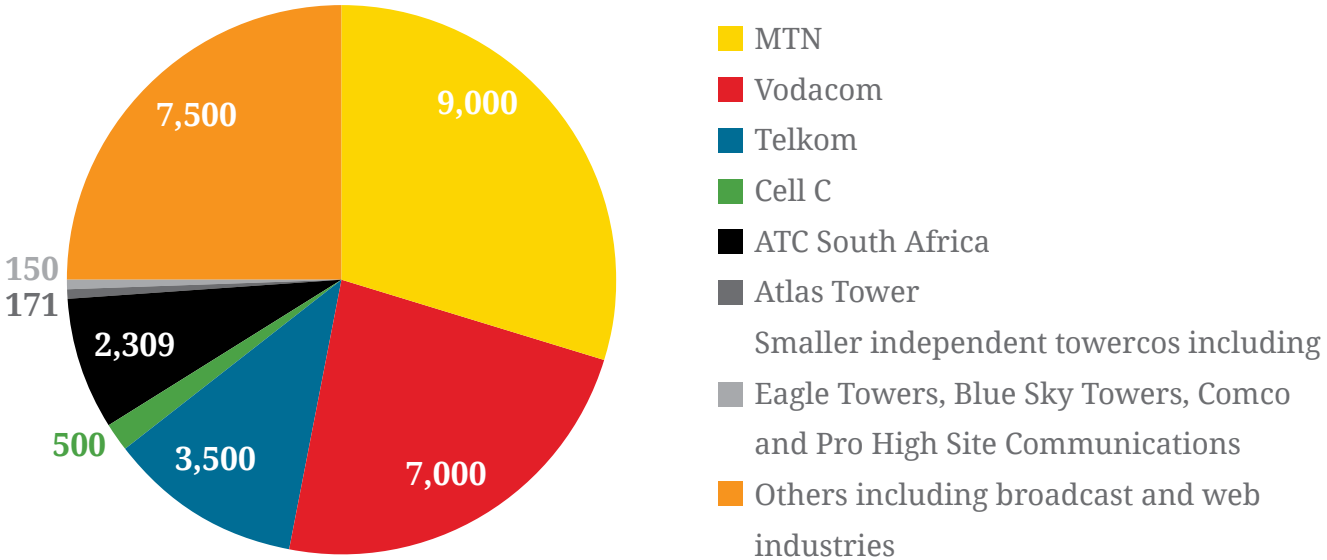
Much discussion on the South African table this year centred around the role for towercos in the

Figure 1: MNO market share of South Africa's 85.1mn subscribers (FY2015)



Source: Business Tech Insider

Figure two: Ownership of South Africa's ~29,500 towers



Source: TowerXchange

South African market, particularly in light of the fact that each of the South African MNOs are now actively pursuing co-locations on a commercial basis between themselves; effectively functioning as operator-led towercos.

The success of the towerco business model, referenced one of the MNO representatives present, has demonstrated to operators that there are decent revenues to be made in the space and as such, leasing up their towers is becoming an increasingly important strategy. What's more, South Africa's robust and extensive electricity grid means that the energy challenge and costs faced by MNOs across much of sub-Saharan Africa are of less concern to South African operators and as such, much of the value that a towerco can add is removed.

The balance of towercos and operator-led new build of macro sites

Whilst the capability of MNOs to build, manage and lease up their own tower portfolios is increasing, participants at the table raised the fact that operators had undergone a massive rationalisation of staff in recent years, through which much of their expertise in rolling out new sites had been lost. It was also observed that historically MNOs had been given large reserves of capital with which to acquire new sites but that the funds had often not been well used, often sitting untouched. As a specialist skill set in high demand, some participants felt that it would take operators a while to build up highly effective teams in order to manage rollout more effectively. Acquiring sites in key locations represents a major challenge for operators and towercos alike. It was suggested that American Tower's recent acquisition of Eaton Towers was as much about the latter's portfolio of 1,000 sites under development as it was motivated by the acquisition of their existing portfolio of 300 sites, and that generally towercos had been more successful in acquiring highly desirable sites than had the MNOs. Operators at the table agreed that this was one of the key strengths of towercos in the country.

Whilst towercos argued their ability to rollout sites minimised capex spend for MNOs, one of the operators explained that their own ability to access cheap capital, combined with the high towerco lease prices in South Africa, meant that in current market conditions it sometimes made more financial

sense for MNOs to build their own sites. They did however explain that there are certain times of year when they are more capex constrained and in these instances it would then make sense to work with towercos more closely to manage network expansion.

Reflecting on whether new site build was best managed by towercos or operators however, MNOs agreed that the level of demand for new sites over the next two years would mean that both would have an important role to play. The volume of new site build required far outstrips the capacity of MNOs to deliver such numbers alone and as such, towercos will be key partners in the process.

Whilst towercos are a useful partner, one area where network planners would like to see an improvement was on the visibility of sites that towercos were able to offer. It would be highly valuable for network planners to be able to automatically view the stage of development or construction of each of the towerco sites, enabling them to weigh up their options more efficiently when designing the timely rollout of their networks.

Ground leases aggregators and property concerns

Escalating ground lease rates are causing significant challenges, as the price of real estate continues to rise exponentially in South Africa. One participant referenced how it was hard for the sector to keep pace with the amount of money that is filtering into real estate in the country and expected the problem to become more acute.

When questioned on their appetite to own versus lease land, it was referenced that towercos will aim to buy the land when they can or aim for long term (~40 year) leases. One of the challenges in purchasing land, referenced one of the MNOs present, is that you only want a small area, however the effort that goes into portioning off a section of land often doesn't make the exercise worth it. One of the smaller independent towercos referenced that this is where their strength really comes in. As a smaller, more nimble company, they can look at alternative use of the land that is not being used by the tower - for example, a small factory could be built on the land, thus finding further ways to monetise their investment. A towerco's ability to do this is one of its key strengths above an MNO; flexibility is their niche.

Participants at the table reported seeing an increasing number of approaches from ground lease aggregators in the market, whose involvement will further intensify property management challenges that MNOs and towercos are facing.

Speculation surrounding an MTN tower sale

It would not be a South African roundtable discussion without questions surrounding the likelihood of an MTN tower sale being raised. With the company's primary focus being on opex reduction at present, a tower sale was not something that participants expected to happen imminently, although of course there were plenty of interested parties present.

There had been rumours circulating in the public domain that IHS had been in discussion with MTN regarding a tower sale, with the towerco having acquired the operator's sites in Cameroon and Cote d'Ivoire and the two parties having entered into a joint venture in Nigeria. It was referenced however that the South African market was very different to these countries and as such there would be different motivations and considerations when looking at a deal.

Should MTN's towers come to the table, however, it was observed that a deal would be complicated by the fact that around 1,500-1,800 sites are shared with other MNOs, with some of them having been paired off with other operator sites. Uncoupling these sites and starting to invoice each other for space used would present an added level of complexity to the execution of such a tower transaction.

As to how such a transaction would impact on smaller towercos in the market, representatives from such companies felt that there would be a positive impact. When a major transaction occurs, one participant observed, a vacuum is created in the country whereby the other MNOs come rushing to the smaller towercos.

The American Tower - Eaton Towers transaction

One of the biggest talking points in the South African tower industry in the past year was American Tower's acquisition of Eaton Towers, which had been met by opposition from the MNOs in the

market. With American Tower possessing just over 2,000 of almost 30,000 sites in the country however, South Africa's competition commission ruled that there was no case to answer and as such the merger was cleared.

Participants observed that it was no secret that American Tower's lease rates were considerably higher than those of other towercos in the market (with one party suggesting rates were almost double), as function at least in part of the high leaseback rate agreed with Cell C, a deal which was structured to maximise cash released at the time of sale. One MNO suggested they had a moratorium on the use of American Tower sites, at least until their lease rates came into line. A merger between the American Tower and Eaton Towers has caused concern from MNOs using Eaton's sites, however measures have been put in place to protect existing contracts.

On the subject of the transaction, the smaller towercos present felt that American Tower's acquisition of Eaton has had a positive effect on their business. Should the Eaton portfolio have been acquired by a new entrant to the market it would have caused concern, but the consolidation of the number one and number two towerco has driven further business towards the smaller independent players.

Evolving pricing mechanisms and business models

One operator at the table said that they had been undertaking benchmarking of towerco pricing, finding considerable variation in the structure of towerco pricing models. At one end of the spectrum, American Tower's pricing is pretty much all inclusive, whilst at the other end of the spectrum some towercos charge extras for absolutely everything.

MNOs questioned towerco appetites to offer discounts to anchor tenants as additional tenants are added to sites. One towerco referenced this was a model that worked well in other markets and is something that they were open to discussing.

One participant at the table questioned towerco appetite to get into fibre as a means of offering additional services in the market. Whilst some towercos are starting to assess this, one company referenced that the adding fibre to the towerco business model hasn't always been effective in the US, as the anchor tenant usually wants to control the fibre and make money from it. What's more, with so many fibre players in the South African market already participants questioned whether there was a role for a towerco to play.

One area where participants did see towercos expanding successfully into was small cells and indoor DAS. Whilst in the instance of the Mall of Africa the role for an independent infraco was bypassed with the four MNOs collaborating on an extensive DAS installation, instances where not all MNOs are keen to invest make sense for an infraco to get involved. The proposal by one towerco that MNOs could opt for coverage in just select areas and pay for the service they use was met with approval from MNOs present.

The move to 5G and the role of disruptive technologies

Participants at the table forecasted that 5G would explode in the US and Europe in 2019 and 2020, with this filtering through to South Africa around 2022/23. Most at the table felt, however that there was still some way to go in understanding how the deployment of 5G should be executed, with one person commenting that RF planners and real estate teams often have very different ideas.

All were in agreement that macro sites wouldn't go away, rather you will see 4G and 5G equipment hung on towers in place of the 2G and 3G that is there today. When it came to deploying small cells, it was commented that you wouldn't always need permits, all you might require was a fibre connection with one participant commenting that simply installing a network of routers in residential properties would create a small cell network, whilst others talked about the Bluetooth experiment that had been conducted in Boston to create a communications network.

On the subject of whether investing in street furniture constituted a sensible decision for towercos, some felt that it constituted a very high capex investment for very little return whilst others observed that this had been big in Europe since the 1990s.

Creating new synergies

With increasingly thin margins across the industry, discussion moved to the synergies that can be created by a single party managing maintenance of both active and passive equipment, with operators referencing that this would be a desirable outcome. What's more, reducing the number of people with access to a site also reduces risk.

One participant at the table suggested they felt there needed to be closer interaction between MNOs. Rather than each operating, rolling out and building their own network of sites and creating parallel infrastructure, there should be improved communication so that the rollout costs can be shared. If the government 2030 targets are to be met, the participant continued, it makes sense for MNOs to consolidate budgets. With MNOs typically reluctant to discuss their network planning with their competitors, one participant questioned how such a model could be executed, whilst others raised concern over when this would constitute anti-competitive practice. A potential solution, one person suggested, would be the creation of a neutral independent party to oversee the process.

The government's draft ICT white paper and the spectrum auction

Discussions around pooled resources led to another big topic of the day, the South African Department of Telecommunications and Postal Services' National Integrated ICT Policy White Paper.

The paper calls for radical changes in the telecommunications market, including the creation of a Wireless Open Access Network (OAN). All unassigned high-demand spectrum (essentially LTE spectrum) would be set aside for the OAN and what's more, the paper also puts in place the suggestion that the government can take back spectrum previously assigned to the MNOs. The white paper proposes that competition will only happen at the service level and that the OAN will be managed by a consortium which will operate with 'competitive neutrality'.

The white paper has been met by opposition particularly amongst the larger operators who see their network as a competitive differentiator, and who have concerns about spectrum not being allocated in proportion to the number of subscribers each operator has, a move they feel which will compromise their quality of service. The announcement of the white paper on spectrum caused MNO share prices to fall, a downward trend which has persisted.

The white paper has also held up the recent spectrum auction in South Africa, with the Independent Communications Authority of South Africa (ICASA) having made the decision to proceed with the auction, only for this to be blocked by the High Court following a challenge from the Department of Telecommunications and Postal Services ■

Tower Xchange

Civil works and O&M working group report

On 19 October, TowerXchange hosted the first working group for Civil Works & O&M in the African and Middle Eastern tower industry. The aim of the group was to identify some of the key challenges in the rollout, operations and maintenance of cell sites in the region and provide recommendations to MNOs, towercos and managed service providers on how to better work together amidst increasingly challenging economic conditions.

Working group members

- Geert van Eijk, CEO, Helios Towers Ghana
- Hassan Nayef Dakhlallah, Advisor, Network Sector, Saudi Telecom Company
- Stefan van Heerden, Construction Manager, Atlas Tower
- Martin Black, Head of Procurement & Supply Chain, Tigo Tanzania
- Ahmed Saeb, Principal Category Manager, Networks SCM Technology, Vodafone Procurement Company
- Yatendra Chadha, Vice President (National Head - Site Acquisition), Indus Towers
- Salah Medawar, Chief Operations Officer, ieng Group
- Arie Ben-Dayin, VP sales, AEMEA, Mer Group
- Jean Farhat, Group CEO, NETIS
- Anita Pauperio Paulino, Business Unit Manager, Telecom, Metalogalva

Civil works and O&M Working group recommendations

Training and contractor management

RECOMMENDATION 1: Implement a continuous retraining programme with contractors

RECOMMENDATION 2: Integrate contractors with equipment manufacturers to ensure installation and maintenance is done to guidelines

RECOMMENDATION 3: Create an interface between basic skilled workers and higher skilled workers on rotation

RECOMMENDATION 4: Ensure remuneration is in-line with standard levels and progression is achievable

RECOMMENDATION 5: Rationalise and simplify site equipment

Strategies to combat theft

RECOMMENDATION 1: Deploy multi-faceted solutions

RECOMMENDATION 2: Prosecute where possible and hold thieves accountable

RECOMMENDATION 3: Examine strategies to share poor contractor experiences

RECOMMENDATION 4: Engage local communities

Specify sites correctly and look towards the shape of future networks

RECOMMENDATION 1: Employ more attention to detail in checking the specification of sites to avoid unexpected costs

RECOMMENDATION 2: Better understand the pros and cons of camouflaged towers

RECOMMENDATION 3: Ensure new sites are future proofed for the advent of 4G

Smarter use of time on site

RECOMMENDATION 1: Implement better planning to coordinate site visits from all parties

RECOMMENDATION 2: Employ the use of remote solution experts

RECOMMENDATION 3: Do not allow preventative maintenance schedules to slip

RECOMMENDATION 4: Minimise man hours through new technologies (e.g. drones)

RECOMMENDATION 5: Carry out a full refuelling in place of multiple trips

Focus on relationships with communities and landlords

RECOMMENDATION 1: Educate local communities on the central role of towers in providing critical communication services

RECOMMENDATION 2: Develop expertise with landlords and legal teams advising them on lease negotiations

RECOMMENDATION 3: Prioritise community relation skill sets in your supply chain

Innovation and partnerships across the supply chain

RECOMMENDATION 1: Diversify into new geographies and service lines

RECOMMENDATION 2: Negotiate longer term contracts and think strategically rather than tactically

RECOMMENDATION 3: Provide expertise and guidance to MNOs and towercos and fundamentally shape their O&M strategies

Executive summary

Across Africa and the Middle East, pressures on mobile revenues are felt throughout the value chain. Whilst MNO expectations and requirements on quality and timelines continue to rise, a focus on reducing costs is creating challenges for towercos, tower builders and managed service companies who need to meet such targets whilst being simultaneously faced with escalating costs of raw materials. Identifying where inefficiencies are brought into civil works and O&M is critical to improving quality of service whilst protecting the increasingly thin margins of all stakeholders in the value chain.

To tackle the topic, TowerXchange brought together MNOs Vodafone, Saudi Telecom Company and Tigo, towercos Helios Towers Africa, Atlas Tower and Indus Towers, leading managed service providers ieng Group, Mer Group and NETIS and tower builders Metalogalva. After first mapping out the problem areas, the group focussed on steps put in place and innovative strategies being considered to address such challenges and drive forward quality and cost efficiency in the tower industry in MEA and beyond.

Better training, management and retention of contractors

Personnel management remains one of the biggest challenges in overseeing new site rollout and maintenance of existing sites. Whilst there is a noticeable skills gap, even relative to other developing regions such as the Indian market, the moniker that it's "good enough for Africa'" is not acceptable.

There are two challenges that need to be addressed; on the one hand, contractors may not be adequately trained, whilst on the other hand it may be more a case of negligence or non-compliance whereby they are not carrying out tasks in the manner explained or potentially not carrying them out at all.

To tackle the first issue, more robust training programmes need to be put in place. This is not just a once off experience; training needs to be repeated and updated to ensure that skills are up to scratch. Stakeholders also need to work to ensure better interaction between the supply chain; equipment manufacturers should be liaising directly with contractors and subcontractors, equipping them with the knowledge and expertise to install and maintain equipment in accordance with manufacturer guidelines. There needs to be a rotation of experts to support the lower level skill sets, and a rationalisation of equipment to simplify operations is key.

On the second issue, operational governance strategies need to be implemented effectively and monitoring systems put in place to verify and validate that the work is being done in a correct and timely manner.

Work smarter on site visits

The time spent travelling to and between sites is often significantly greater than the amount of time spent on site by a contractor, an issue only compounded by the poor road infrastructure in much of Africa. Reducing the number of visits to site

is fundamental to controlling costs and timelines in site maintenance.

One solution to inefficient site visits proposed was the use of remote solution experts. Whilst there is nearly always a need for there to be a pair of boots on the ground during maintenance, the opportunity for an expert to log in remotely enables them to service a larger number of sites in a shorter period of time. In the meantime, the manual worker on site can carry out key preventative maintenance tasks whilst the more sophisticated works are carried out by the expert.

Another technological advance discussed which could help reduce man hours was the use of drones. Examples are now coming to light of MNOs using drones to carry out thermal imaging and structural assessment, which not only reduces man hours but also helps to remove risks associated with climbing towers for inspections. When there has been a severe storm, it is possible to deploy a drone to inspect a site for damage, rather than mobilising a team on the ground. Going forward there exists the potential for drones to carry out some of the maintenance as their usage by the industry becomes more widespread.

It is also important to reduce the amount of reactive maintenance carried out. Whilst the call outs themselves result in costs adding up, the unplanned nature of such visits means that contractors often turn up on site with the wrong spare parts, thus delaying the repair works. Implementing a robust preventative maintenance strategy is central to alleviating the issue. Whilst working group members agreed that that this was fundamental, most felt that their preventative maintenance often fell by the wayside with reactive jobs taking precedence and that renewed focus needed to be placed upon preventative maintenance being done.

One working group member explained how they had introduce a “one site visit per month” strategy, whereby various teams are deployed to a site to carry all preventative maintenance in conjunction with a complete filling of the fuel tank. Carrying out preventative maintenance ahead of schedule and reducing the number of access requests to site has had a significant impact on site level profitability.

Combat theft and safety concerns through a variety of solutions

Theft is undoubtedly one of the biggest challenges faced by tower owners. With the vast majority of pilferage events occurring during site visits, minimising the number of times various parties can access sites will help to alleviate some of the problem. Security measures also need to be put in place, be it smart locking systems, response teams, alarm activated tear gas or CCTV systems.

Holding culprits accountable is also key. Some stakeholders referenced the success of publicising photos of thieves, whilst others advised they had adopted a strategy of involving the police and prosecuting where possible in order to send out a clear message to other would be thieves.

Panellists also questioned how, within legal and ethical frameworks, it could be possible to share a list of companies or individuals who had been caught pilfering. Whilst word of mouth provided one such means, the group were hesitant to propose a formalised process as legal implications would need to be carefully considered.

Focus on relationships with communities and landlords

Increasing resistance from local communities and municipalities is creating challenges in the rollout of new sites. Community engagement programmes whereby stakeholders help the community view towers as part of essential infrastructure are critical to expediting rollout programmes and the full supply chain must work together to strengthen the value proposition, from access to power to job creation.

Further challenges are arising as a result of the increasing commercial awareness of landlords of the value of their ground or buildings. This challenge is further compounded by the rise of a new breed of law firm, educating landlords on the rates which they could be charging. With continuing downward pricing pressure on the supply chain, those managing new site build need to become increasingly adept at dealing with such situations.

With local community support also important in helping to curtail theft, the importance of human skills and cultural understanding is an essential item in the tool set of firms carrying out civil works and O&M.

Specify sites correctly and look towards the shape of future networks

The misspecification of sites by MNO, towerco or tower builder is a major source of headaches. If a line item is missed out and a charge applied later it creates significant challenges for the signed off budgets of the procurement teams. An increased amount of diligence is required to ensure that sites are specified correctly from the off.

Amongst increasing resistance from communities, camouflaged towers are growing in popularity although concerns still exist around their competitiveness. Many still felt that they were harder and more expensive to build and maintain and so tower designers still had a way to go in promoting their value.

How towers need to be designed for the advent of 4G and an increased role for small cells still need to be ironed out. It was observed that many older sites were not designed with multiple tenancies in mind and so it is important to ensure that today's new sites are future proofed. Tower manufacturers need to work closely with the MNOs and towercos to ensure that these needs are met.

Innovation and partnerships to address pressures on margins

Perhaps the most contentious subject in the working group focussed on the way in which stakeholders needed to adjust in order to account for declining revenues in the mobile market. Maintenance contractors voiced concerns that quality was meant to increase whilst expenditure decreased, towercos expressed how they had fixed costs agreed with MNOs and so could not pass on escalations, and MNOs explained they continued to be faced with decreasing ARPU. With the downward trend on revenues not showing any sign of letting up, and the cost in raw materials continuing to rise, concern was expressed around how already thin margins may be further eroded.

Stakeholders underscored the importance of partnerships in helping to protect margins whilst ensuring quality was not compromised. Giving companies longer term contracts and procuring services strategically rather than tactically is an essential step; with longer term contracts companies can invest in their people, processes and technologies which enable them to reach new efficiencies. Larger scale contracts will also enable stakeholders to reach economies of scale, further bringing savings to the value chain.

Diversifying both geographically and into the offering of new service lines was another piece of advice given by the group. MNOs and towercos had an appetite to work with parties who had broader competencies and footprints which would help to bring new efficiencies to the supply chain.

MNOs and towercos also voiced the opinion that service providers needed to be forthcoming with recommendations of what is and and isn't working in an O&M protocol laid out by a towerco or MNO. MNOs and towercos are looking for guidance and expertise from service companies, and looking for areas in which they are innovating to reduce their own costs in house - many of which strategies were shared by the group during discussions ■

The next working group on civil works and O&M for the African and Middle Eastern tower industry is scheduled to take place on **3 October 2017 in Johannesburg**. If you would like to be considered for participation, please contact Laura Graves, Managing Director of EMEA, TowerXchange on **lgraves@towerxchange.com**

Supporting insights from leading managed service providers and tower suppliers to and towers builders in Africa and the Middle East

ieng Group

i engineering Group provides end-to-end engineering infrastructure solutions to the telecommunications and power industries across Africa, the Middle East and Southeast Asia.

We were established in 2007 and are now operational in nineteen countries: Afghanistan, Algeria, Burkina Faso, Cameroon, Congo, DR Congo, Ethiopia, Ghana, Iran, KSA, Lebanon, Myanmar, Niger, Nigeria, Rwanda, South Sudan, Tanzania, Uganda and Zambia.

We procure, build, commission, optimize and maintain telecom infrastructure on one hand; and provide fiber optic services on the other. We manage today over 4,500 sites for Africa's largest MNOs and all 4 towercos.

www.ieng-group.com

Metalogalva

Metalogalva is a Portuguese steel manufacturing company with more than 43 years of activity in fields of Energy, Communication, Transport, Lighting, Renewables and Steel protection (hot dip galvanizing and painting). Has three industrial units (total area of 44000m² and a total gross area of 160000m²), with a galvanizing capacity (per year) of 100000 tons.

Metalogalva exports 70% of its own manufacturing for more than 40 different countries. Has invested (6.6M€) on new equipment to face the requirements/delivery times of the international markets.

Metalogalva promote the excellence of its services, investing in the researching, development and innovation of its products.

www.metalogalva.pt

NETIS

NETIS is a Service and Infrastructure provider for the Telecom Industry in Africa, founded in 2009.

NETIS operates permanently in 7 countries namely, Côte d'Ivoire, Ghana, Burkina Faso, Benin, Kenya, Uganda and Tanzania. 4,555 sites are under NETIS Passive and Active maintenance management, in 5 countries for the top 4 TowerCos. Hundreds of sites and Power solutions have been built and deployed all over the African networks and NETIS has built strong partnerships with vendors whom are specialized in Power solutions, RMS, RDUs, COWs, etc.

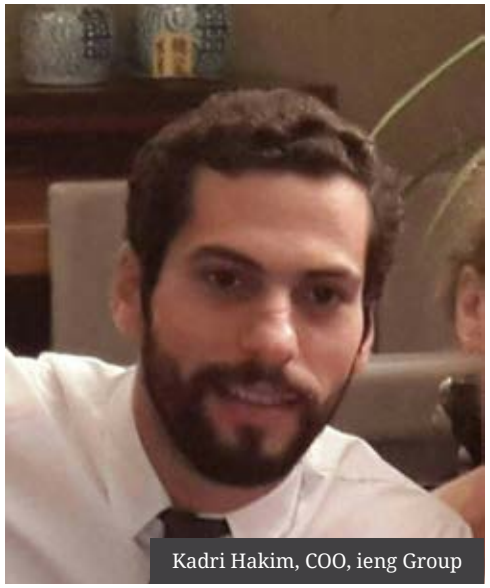
NETIS Fiber Optic division delivers full turnkey projects from marketing survey to low-level design, network construction, equipment installation and maintenance.

At NETIS we strongly believe in partnership, the best way leading to success!

www.netisgroup.net

Surveying, building and strengthening towers for the era of infrastructure sharing

ieng Group is a proven partner to towercos in eleven African countries and in Myanmar



Kadri Hakim, COO, ieng Group

Multi-country turnkey infrastructure solution provider ieng Group has seen their business transform from an initial focus on site build and upgrade, to focusing on longer term O&M contracts. ieng Group increasingly see Africa's 'Big Four' towercos as their primary clients for managed services, tower surveys and strengthening, and for build-to-suit programmes. ieng Group has also recently opened an office in Myanmar.

Keywords: Who's Who, Managed Services, O&M, Construction, Installation, Batteries, Capacity Enhancements, Build-to-Suit, SLA, Hybrid Power, Greenfield, DG Runtime, Site Surveys, Skilled Workforces, Multi-Country Partner, Infrastructure Sharing, Asia, Myanmar, Africa, Algeria, Burkina Faso, Cameroon, Congo Brazzaville, DRC, Ethiopia, Ghana, Rwanda, Uganda, Zambia, Eki-Struct, ieng Group

Read this article to learn:

- i eng Group's capabilities, footprint and credentials as one of Africa and Myanmar's leading TI firms
- The impact of tower transactions on the managed services ecosystem
- Balancing the business between recurring, stable O&M contracts and higher margin, less predictable EPC contracts
- Contrasting the approaches to energy efficiency programmes of towercos in Myanmar and Africa

TowerXchange: Please introduce ieng Group – what role do you play in the telecoms infrastructure ecosystem?

Kadri Hakim, COO, ieng Group: ieng Group is one of Africa's leading turnkey infrastructure solution providers. We are established in twelve countries: Algeria, Burkina Faso, Cameroon, Congo B, DRC, Ethiopia, Ghana, Rwanda, Uganda and Zambia. Our newest and soon to be biggest operation is Myanmar. Our headquarters are in Lebanon. We're a cash flow funded, Lebanese-Canadian company, co-founded by myself and CFO Rami Shibley.

TowerXchange: What are ieng Group's capabilities, and can you tell us who some of your key clients are?

Kadri Hakim, COO, ieng Group: We plan, procure, build, optimise and maintain telecom infrastructure. We also provide tower manufacturing through our partner Eki-Struct.

Most of our business now comes from the Big Four African towercos, although we also work with MTN, Airtel, Orascom and Ooredoo.

TowerXchange: Did you win your managed services contracts after the towercos acquired the towers, or was the relationship with ieng Group transferred from MNO to towerco with the tower transaction?

Kadri Hakim, COO, ieng Group: We were already providing managed services to the MNOs – after

the acquisitions our contracts eventually became with the towercos.

Towers are the core business of the towercos – they know exactly what they want, and they know exactly what it costs. They want the same services we are currently providing to MNOs, but with a higher service quality – reflected in the SLAs.

TowerXchange: When towercos enter a new market, how do managed services providers like ieng Group position yourselves to secure new contracts?

Kadri Hakim, COO, ieng Group: We find out about the tower transactions after the deals close, not before. We use the experiences and credentials we have from our existing relationships with the towerco to enter new markets.

TowerXchange: Do you forsee there still being a role for the tier one OEMs, Ericsson, Huawei, Nokia and ZTE, in managed services for passive infrastructure in Africa?

Kadri Hakim, COO, ieng Group: When they were maintaining both the active and passive infrastructure for the MNOs, it made sense. But towercos don't own active equipment, so they have no need to use a vendor like that for managed services. We believe the towercos will work more and more directly with companies like us to manage their passive infrastructure, leaving MNOs still working with vendors for the management of active infrastructure.

TowerXchange: What is the balance of your business between EPC contracts and O&M?

Kadri Hakim, COO, ieng Group: When we started the company in 2007, all our business was EPC – site build and refurbishment. When the EPC business started slowing down from 2009-10, we went into O&M. We now have more than 3,000 sites under management.

O&M provides good recurring, stable business; we know the work is coming. We try to stabilise our operations on O&M revenue, such that any EPC revenue is the cherry on the cake.

ieng Group provides managed services for both passive and active infrastructure.

TowerXchange: What are the implications for your business of the current wave of tower transactions in Africa, with towercos acquiring 17,877 new towers in the last quarter alone?

Kadri Hakim, COO, ieng Group: We believe all the managed service providers will see a surge in their businesses. Towers are the core business of the towercos, they are well financed and will invest in new site builds, refurbishment programmes, strengthening for co-locations and energy efficiency programmes.

With the recent wave of tower transactions, towerco's short term focus is to understand and stabilise the networks they just acquired, and to understand the quality of sites – based on which they will determine which towers they have to refurbish or upgrade. Then they will tackle co-location sales and building new sites for their anchor tenants – the framework agreements often include a build to suit programme.

"O&M provides good recurring, stable business; we know the work is coming. We try to stabilise our operations on O&M revenue, such that any EPC business is the cherry on the cake. ieng Group provides managed services for both passive and active infrastructure"

TowerXchange: What do you anticipate being the impact of the increasingly important role of towercos on the build to suit market?

Kadri Hakim, COO, ieng Group: Whenever we've been asked to execute build-to-suit programmes for

The ieng Group team in Myanmar

the towercos, they've built towers with capacity for at least three tenants.

We're not seeing a lot of single tenant towers being installed any more – EPC contracts from MNOs have decreased significantly.

TowerXchange: What factors influence the cost of upgrading a single tenant tower and power solution to be suitable for multiple tenants?

Kadri Hakim, COO, ieng Group: The power system has to be upgraded or replaced to suit the new power requirements. The tower part is more complicated and depends on the load of the existing tower structure. We have been providing tower strengthening services to a lot of towercos. We do a structural analysis of tower to see if it is suitable to take another operator. If it isn't suitable, we provide and implement a strengthening solution. Occasionally we find there is no solution and the tower has to be replaced – or we might find that the cost of strengthening is so great that it's preferable to build a new tower.

TowerXchange: How do the priorities of the Myanmar towercos differ from those in Africa?

Kadri Hakim, COO, ieng Group: The towercos in Myanmar are undertaking a massive build to suit program rather than acquiring existing networks which involves refurbishment, upgrades and tower strengthening services. Myanmar is witnessing for the first time a substantial telecom site deployment, so the priorities and challenges are very different. Because it's new network being deployed, all the towercos have the possibility to utilise the most recent technologies in telecom passive infrastructure, for example they are putting in place the most recent hybrid power systems; energy efficiency programmes and security locking systems.

TowerXchange: Finally, please sum up how you would differentiate ieng Group from other turnkey infrastructure firms in SSA and Myanmar.

Kadri Hakim, COO, ieng Group:
ieng Group has an edge thanks to our well-structured, flexible management system which allows us to adapt to the local culture with our global experience. We understand what's required locally to adapt our structure and be the most efficient turnkey infrastructure firm in each country. We are also fortunate to have a young, experienced, motivated, smart management team that excels in their work.

ieng Group is happy to follow its clients into new countries – we typically start two new operations every year. This includes following the Big Four towercos as they enter new markets in Africa. We know how they work, and they know what to expect from us ■

Introducing tower designers and manufacturers Metalogalva

Metalogalva has manufactured over 200 towers for Unitel and Vodacom Mozambique in the last year

Bruno Mota, Metalogalva

TowerXchange asked Bruno Mota, Manager of Metalogalva's Telecoms Business Unit, to explain the quality differentiators and economics of telecom tower design and manufacture, and to describe and how they adapt to meet the changing needs of customers as their structural requirements change from capacity for single to multiple tenants.

Keywords: Who's Who, Steelwork, Tower Design, Tower Manufacture, Installation, Capacity Enhancements, Loading, Retrofitting, Procurement, Masts & Towers, Asset Lifecycle, Infrastructure Sharing, Europe, Africa, Vodacom Mozambique, Unitel, Metalogalva

Read this article to learn:

- The importance of sourcing high quality steel from a reputable company
- How the lifetime, and guarantee, of a tower is extended
- Designing towers to be easily upgraded for multiple tenants
- Metalogalva's experience supplying towers for Unitel in Angola and Vodacom Mozambique

TowerXchange: Where does Metalogalva fit in the telecom tower ecosystem?

Bruno Mota, Business Unit Manager - Telecom, Railways & Special Projects, Metalogalva: We design, manufacture and galvanise towers, for telecoms, transmission line poles, substations, lighting poles, road structures, catenaries and solar structures. For the telecom industry, we manufacture monopoles, lattice and tubular towers from existing designs - Metalogalva's standard - or we develop a new design in order to meet customers' specific requirements.

We have our own factories, which we adjust according to the requirements of the work, with capacity to galvanise up to 140,000 tonnes per year. We have specialist equipment including welding robots, plasma and laser cutting machines and CNC machines for cutting, drilling and punching profiles and L shaped section. We also have in-house an automatic powder coating line (with capacity of 1400m²/day) and we have as well a liquid painting unit, so we are able to do the DUPLEX system with good quality at fair prices. Right now we are doing some interesting projects with camouflaged towers (Pine|Palm towers) for a partner with lots of experience in this niche market.

To get an idea of our capacity in telecoms, we recently produced 114 towers in under one month for Vodacom Mozambique.

TowerXchnage: What is Metalogalva's experience in Africa?

Bruno Mota, Business Unit Manager - Telecom, Railways & Special Projects, Metalogalva: In the last year we have manufactured over 200 telecom towers which are now installed in Unitel's network in Angola and in the network of Vodacom Mozambique. We're looking to expand to send our towers to countries like Nigeria, Uganda and Tanzania.

In these cases we didn't sell directly to the operators, but were introduced by our partners locally. We've also sold towers into Algeria, Morocco, Cape Verde and São Tomé and Príncipe markets indirectly. We're interested in building relationships with other tower installation companies in Africa, in order to spread our product to other emergent markets.

Metalogalva also have several important clients in Europe, for example we supply towers to E-Plus and Vodafone in Germany, and two years ago we won a big project for TGV in France called GSMR Synerail to supply GSM towers.

> We source our steel mainly from ArcelorMittal, the world's leading steel producer - we don't use second rate steel. It's important to confirm that your tower manufacturer uses raw material from a reputable company

TowerXchange: How should buyers distinguish between the quality of products offered by different tower manufacturers?

Bruno Mota, Business Unit Manager - Telecom, Railways & Special Projects, Metalogalva: We source our steel mainly from ArcelorMittal, the world's leading steel producer - we don't use second rate steel. It's important to confirm that your tower manufacturer uses raw material from a reputable company, and we use 3.1 certified raw material whether we're shipping to Germany or Angola. All the procedures we use are certified like for example welding (DIN 18800) or galvanisation (DASt22). We are as well certified by ISO9001, ISO14001, OHSAS18001, CE mark and EN1090 (EXC3).

There are different standards and specifications in different markets. Our solutions meet the customers requirements and they are adapted to the location

where they will be placed. We have a technical department with eight Structural Engineers able to design structures according to any norm required: Eurocode or TIA for example.

The lifetime of a tower has a lot to do with the thickness of the paint and the zinc galvanisation, so we can offer towers with a 10, 15 or even 25+ year guarantee depending on the client's requirements and its own respective budget. We use the 1461 Euronorm standard for galvanisation.
Our competitiveness comes from optimised and custom solutions, introducing technology on the production process such us robots, lasers, powder coating, and also Kaizen concepts.

TowerXchange: What is the tradeoff between tailor made solutions to meet the specific requirements of each cell site versus installing standard, and therefore lower cost, towers?

Bruno Mota, Business Unit Manager - Telecom, Railways & Special Projects, Metalogalva: If we have an order for 200 different towers then that requires lots of unique designs to be verified, lots of different drawings to be prepared - a lot of work is needed before manufacture. In addition the performance of our production line will be reduced, making our solution less competitive. So instead the optimum solution might be to create four variants on a standard tower, enabling us to produce four batches of fifty towers for example, so we can offer a more competitive manufacturing price, and facilitate easier mounting/logistics of the structures on the field.

> We have a multidisciplinary team of engineers who can quickly verify if it is possible to apply more load

There are fixed costs that are the same whether we're producing one tower, 50 or 200. We're very competitive at a larger quantity as we can use serial production techniques.

TowerXchange: Tell us about the implications for the design and reinforcement of towers as clients add additional tenants.

Bruno Mota, Business Unit Manager - Telecom, Railways & Special Projects, Metalogalva: There are now a number of companies offering solutions to reinforce towers to achieve more capacity.

If one of our customers wants a tower with 6sqm on top, we may evaluate their requirements and find they can be met by a standard tower, or we may need to design a new structure. Then if the customer wants to add additional antennae, requiring additional capacity, then we have a multidisciplinary team of engineers who can quickly verify if it is possible to apply more load. If there is no additional capacity, the customer may need to reinforce or replace the tower.

We can also offer towers designed to be easily upgraded after installation. For example, we recently applied for a tender in France for two variants of 30m tower designs, evolutive and non-evolutive. The evolutive designs have 4sqm of capacity at the top, but it is possible to add an extra section to add a further 3sqm of capacity to enable sharing the tower with more operators, so we design the structure for 7sqm capacity.

TowerXchange: Finally, please sum up how you would differentiate Metalogalva from other tower manufacturers.

Bruno Mota, Business Unit Manager - Telecom, Railways & Special Projects, Metalogalva: In 2013 we invested €6.6m in new equipment, enabling us to produce towers more efficiently.

Moreover, we have been serving the market for 42 years, which means we have a lot of 'know how' in what we do.

We think it's very important to achieve our lead time commitments, whilst maintaining quality.

And we think it's important to give constant support to our customers, to act quickly to meet their needs, which means Metalogalva has many happy customers! ■

How to develop and retain a highly skilled workforce

Combining a strong skills base with excellence in standardisation, customisation and community relations

Sean Alborough, CEO, NETIS

Keywords: Africa, Bénin, Burkina Faso, Capacity Enhancements, Change Management, Co-locations, Côte d'Ivoire, East Africa, Energy, Ghana, Kenya, KPIs, Managed Services, Monitoring & Management, Multi-Country Partner, NETIS, O&M, Operational Excellence, Opex Reduction, QoS, Site Level Profitability, Site Surveys, Skilled Workforces, SLA, Tanzania, Uganda, West Africa, Who's Who

Read this article to learn:

- The varying appetites of different towercos and MNOs to upgrade sites to different levels
- How to balance standardisation and customisation in site works
- Strategies for training and retaining a skilled workforce
- How to effectively engage local communities surrounding cell sites
- What differentiates NETIS from its competitors

TowerXchange: Please can you introduce NETIS, their size, geographic footprint and track record in the telecoms sector.

Sean Alborough, CEO, NETIS: NETIS is a service and infrastructure provider for the telecom industry in Africa which was founded in 2009. With its headquarters in Abidjan, NETIS operates permanently in 7 countries namely; Ghana, Côte d'Ivoire, Burkina Faso, Bénin, Kenya, Uganda and Tanzania. NETIS has 4,555 sites under passive and active maintenance management in five countries for the main African towercos, these being for IHS, Eaton Towers, Helios Towers and American Tower. Our branch in Côte d'Ivoire also has a tower manufacturing facility from which we are able to supply our customers with all their monopole and other tower items.

Hundreds of sites and power solutions have been built and deployed all over the African networks and NETIS has built strong partnerships with vendors specialised in power solutions, RMS, RDUs, COWs and other areas.

TowerXchange: In our previous interview with NETIS we spoke about investment unlocked in site upgrades following transactions between MNOs and towers. With much of the emergency upgrade work being done on sites that have been acquired a few years ago, what trends do you see in order to enhance the performance of integrated sites?

Sean Alborough, CEO, NETIS: The situation and the strategies vary from one towerco to the other. Some are very keen to upgrade sites to state of the art level whilst others prefer to refurbish to a minimum

acceptable level in order to just meet a functional level.

We have seen the same trend within the same tower companies, depending on the available budgets and the financial situations. Generally speaking, there is no doubt that after handover to the towercos the general condition of the sites have remarkably improved in terms of performance. This is thanks to upgrades relating to power solutions (including hybrid systems and genset upgrades and replacement), tower refurbishment and other factors.

TowerXchange: In some countries in sub-Saharan Africa, we have seen operators starting to function more like towercos, actively pursuing co-locations. Have NETIS observed any changing trends in how well maintained and highly specified operator owned sites are?

Sean Alborough, CEO, NETIS: From what we could observe, when an operator enters into a co-location program, the commercial aspects are predominant. We do not really see a will to improve the site efficiency.

TowerXchange: To what extent can structural works be standardised across a portfolio of sites in order to control costs and increase the efficiency of works? How do NETIS balance the need to tailor works for specific locations versus standardising works to improve efficiency?

Sean Alborough, CEO, NETIS: We believe that each site must be treated as an individual site. In large deployment projects, there is usually a great temptation to standardise the designs and the works in order to minimise the costs. This often leads to mistakes which not only do not minimise costs but actually increase them beyond the set budgets. Therefore it is necessary to have a hybrid approach with standard designs being tailored to individual sites. It might appear contradictory at first sight but it is not. To implement this model, we look for and deploy well trained and competent staff in the field. Staff trained to respect and strictly implement the standards but also capable of analysing every single site and deciding if it requires a particular action and/or set up. In doing so, we aim to avoid mistakes and multiple site visits thus controlling costs. In addition, supervision remains a key factor.

TowerXchange: Finding, training and retaining a skilled workforce has been cited as one of the biggest challenges in carrying out civil work and O&M in Sub-Saharan Africa, how does NETIS address this challenge?

Sean Alborough, CEO, NETIS: Situations vary from one country to another. Some countries have more advanced education systems than others, thus internal training is not so strongly required. In these countries it is easier to find skilled personnel available and as such, these regions are less problematic. In some countries it is indeed very difficult to find experienced technicians and consequently the operation cost is higher because of the need of ongoing internal training to build in-house competence. At the same time it is necessary to have higher salaries in order to retain the staff and prevent poaching from the competition or any other industry. In parallel and in order to minimise the cost inflation it is important to have strong human resource management to create the sense of belonging and ownership towards the company. This is a long and ongoing process.

TowerXchange: Management of community relations is critical in ensuring that sites are built in a timely manner and are able to be well maintained - what experiences can NETIS share with us on this front?

Sean Alborough, CEO, NETIS: One of the major challenges in the industry is managing the noise pollution, especially with sites that are in small rural villages where the grid is not reliable. NETIS has to work closely with the community to not only ensure that the site is accepted but that the site is well maintained and that generator runtime is at a minimum. Secondly, a cell site has become an “ATM” to criminals as diesel fuel and batteries are easily accessible making them prone to theft. Engaging with the local community in terms of having a caretaker guard responsible for the site has reduced some of the theft. NETIS plans to set up community security forums to eradicate theft on a bigger scale.

TowerXchange: What is NETIS’ niche over some of the larger players offering managed services in the market and what differentiates it from its competitors?

Sean Alborough, CEO, NETIS: NETIS has achieved a first in Ghana where a towerco has placed all its sites under the maintenance of a single partner, that partner being NETIS. This was due to the following strategies which placed NETIS above its competitors in the region:

■ **Structure:** Operational support structures were developed which enabled the operation and maintenance staff to concentrate on their core business.

■ **Ownership:** Instilled a sense of ownership in all NETIS O&M staff by means of improving working conditions, valuing our staff and creation of a NETIS brand in all that we do. This means the teams do more than just maintenance and it has created healthy competition between the teams.

■ **Operational support:** NETIS' strategy in terms of support has been a priority and forward support to operations was created by developing regional offices with Logistics Officers, Administrators, SHERQ Officers and warehouses in each region. This gives the field teams the time to concentrate on their core business (operations) whilst the support from the back office is maintained 24/7 (which is controlled by the head office)

■ **Process driven:** Processes were developed for all activities in O&M and implemented with the key of improving and maintaining operational support at all times.

■ **Real-time reporting:** All activity is reported in real time, utilising software developed and media platforms available.

■ **Training and development:** The NETIS HR department developed programs to ensure the NETIS staff are well equipped for the task and we have a working succession program.

■ **Quality:** QA officers are deployed in each region to ensure the highest quality of work is maintained during PM and CM.

■ **Teamwork:** From management to field engineers, all NETIS staff are fully involved with the company's daily activities; SLA performance and continuous improvement in the workplace is visible ■

Tower Xchange

Platforms for site intelligence, management and optimisation working group report

On 19 October, TowerXchange hosted the first working group on platforms for site intelligence, management and optimisation. With robust data being absolutely critical to decision making in site operations and management, the working group was designed to address some of the limitations that users are finding with current technology platforms, share success stories in the implementation of different systems and examine requirements on how technologies need to evolve.

Working group members

- Geert van Eijk, CEO, Helios Towers Ghana
- Nat-sy Missamou, Sharing New Business Program Director, Orange
- Hossein Khodayari, CEO, Fanasia
- Alisa Amupolo, CEO, Powercom
- Stefan van Heerden, Construction Manager, Atlas Tower
- Ahmed Saeb, Principal Category Manager, Networks SCM Technology, Vodafone Procurement Company
- Ankur Lal, CEO, Infozech
- Ohad Polinovsky, Telecom Director, Galooli
- Asher Avissar, CEO, AIO Systems
- Kishore K Das, CTO, Invendis
- Tshepo Motaung, Business Development, SADC Region, Abloy

www.towerxchange.com

Platforms for site intelligence, management and optimisation

Working group recommendations

RECOMMENDATION 1: Avoid having too many probes and sensors, simplify this to the most critical metrics

RECOMMENDATION 2: Ensure multiple layers of redundancy in transmission of your data

RECOMMENDATION 3: Examine your budget and determine what are your priorities to integrate

RECOMMENDATION 4: Use intelligent filtering and data infill to account for erroneous and missing data

RECOMMENDATION 5: Consider the pros and cons of embedded and third party RMS carefully

RECOMMENDATION 6: Establish a long term partnership between vendor and customer to ensure the system works as well in the field as the lab

RECOMMENDATION 7: Appreciate the value that time and the collection of longer term data brings to the ROI of your system

The top 5 limitations that need to be addressed:

1. Reliability: Even the most robust site management systems do not match the level of uptime that cell sites must be hitting. When towercos are pressured to hit 99%+ uptime but the monitoring systems can only promise 90%, the discrepancy can be problematic

2. Integrability: Vendors are so focussed on their own offerings that they neglect to look at how they integrate into other vendors' systems; better interaction between suppliers is required to deliver the true end-to-end experience that buyers are looking for

3. Flexibility and scalability: Equipment on cell sites is subject to constant change, be it the addition of further tenants or the replacement of a diesel generator. Site management and monitoring systems need to be able to quickly and seamlessly adapt to such changes, a quality which some systems lack

4. Unmanageable data: With so many parameters now able to be measured, the sheer volume of data and number of alerts can make obtaining meaningful findings challenging. Simplification of systems and better definition of which parameters need to be measured is a key step moving forward

5. Lack of predictability: Whilst notifying the responsible party of a fault is beneficial, much more value can be obtained from flagging issues before a fault occurs. A much greater degree of predictability is required from systems currently on the market, with suppliers working hand in hand with tower owners and managers to identify warning signs that precede a fault

Key questions buyers need answering in the decision making process

- Why do I need an independent RMS system, why can't I just use OEM embedded solutions as these are now commonplace? What are the real advantages of third party systems?
- How many metrics should I try and integrate into one system? What just adds extra levels of complexity and what is fundamentally important?
- Is a single platform the ideal or does it make me more vulnerable if the system goes down?
- What is the reliability of systems and what layers of redundancy and backup are built into it?
- How are the prices of systems forecasted to change?
- What after sales support can I typically expect?
- How critical are missed data points and how useful are systems that work to fill in the blanks?
- How can you help me better predict faults before they occur?
- How future proofed are systems to the way in which networks and antennae are evolving?

Executive summary

An increasing number of site management, remote monitoring and access control systems are becoming available, each of which promise to give tower owners and operators better visibility and control of their site operations, driving improved efficiencies and cost savings. Whilst large sums are being spent on R&D by vendors, many users find that platforms do not stack up to expectations and have reported disappointing results. When working properly however, platforms have the ability to bring high levels of intelligence to sites, better predicting faults before they occur, tracking inefficiencies in operations and informing decision making processes. TowerXchange invited some of the most promising vendors to join both experienced users and first time buyers gearing up for major purchasing decisions in examining how the full potential of such platforms can be reached.

Discussion in the group kicked off with a brainstorming of key requirements from site management, monitoring and access control systems - highlighting the features and benefits that are the most valued by users

1. Integrated task force management, access control and job ticketing to support SLA enforcement

2. Track when and how preventative maintenance has been done - and alert the user when it is not

3. Sense and alert when the system has been tampered with

4. The ability to analyse information region by region

5. Ease of sharing information with tenants and other parties

6. The ability to inform prior to an incident occurring

7. Easy integration into OEM embedded monitoring systems

8. Segregation of information tenant by tenant to support separate invoicing

9. Simple for subcontractors and staff to use

10. High uptime and quick repair time when it does go down

One of the biggest requirements that is often listed of a site management system is its ability to offer a fully integrated, truly end-to-end solution. Whilst in theory this sounds like the ideal solution to be aiming towards, in reality the measurement of a large number of parameters comes at price - not only in a financial sense but also in the added complexity that it brings.

Whilst full integration is often an aspiration of those setting out to buy a site management system for the first time, some of the more seasoned site management system users advised against overcomplicating your system by introducing too many sensors and probes. There can be a temptation when starting out to try and integrate everything into one system but some users have found this impractical, preferring instead to distill the system down to the core essentials.

For smaller companies, this is even more important. With more limited budgets available, the high cost

of very sophisticated, fully integrated systems is prohibitive, forcing the company to consider which elements are a top priority to integrate.

In terms of deciding what systems are important to invest in, participants questioned their peers over what value they thought third party remote monitoring systems brought to operations. With much equipment, particularly when it comes to energy components having its own embedded monitoring devices, the question was raised as to whether additional systems were surplus to requirements.

Having third party monitoring systems does add an extra level of redundancy which protects against system failure, but often there are discrepancies between the two readings, further complicating interpretation of increasingly large data sets. With each system producing data in its own proprietary protocol, ensuring that each system is functioning correctly becomes a bigger challenge when multiple systems are deployed and can add extra workload.

Vendors in the room explained some of the work they had been doing to eliminate erroneous results (read some of our interviews later in the report) and underscored the importance of ensuring the intelligence is built upon only sound rules. As well as incorrect data points participants discussed how to handle missing data points and algorithms that have been developed to better "fill in" gaps, particularly important when the output relates to invoicing.

The robustness of systems and the uptime that they can provide was one major talking point during discussions. Perhaps one of the biggest criticisms of monitoring systems was the level of downtime; towercos in the room explained how their SLAs with MNOs stipulate they must have 95-99% uptime on sites, yet no platforms in the market can provide close to this, although some vendors mentioned they had newer higher performance systems starting to approach this.

Often the reason behind failure can be beyond the control of the vendor, with the missing data a result of a communication error through the operator's network. In order to protect against this it is important to have multiple layers of redundancy in the communication; be it multiple SIMs, OSS feeds or other mechanisms. Being able to fix the system quickly should it go down is of the utmost importance, a metric which can be affected by the level of after sales support offered by a given vendor. Similar to the point raised in many of the discussions at the event, seeing a vendor-user relationship as a long term partnership and rather than a standalone deal is key to the success of implementing site management systems effectively.

Alongside improved reliability of the system, perhaps the biggest development that users would like to see with platforms is their ability to become more predictive, notifying tower owners and operators of a potential fault before it occurs. In many instances, the vendors explained that the capability was there and that the longer that a given system is installed, the more effectively they can track trends which proceed a fault.

Similarly the longer systems are used the more information can be gleaned from site equipment and how efficiently it is operating. Whilst vendors are unable to share learnings between their clients on what sort of performance they should be expecting and what they can do to improve it, they will be able to comment that they believe something is operating sub-optimally and can be improved upon.

Speaking of trials, one user explained their process of whittling down a range of systems to a choice of one, advocating homogenisation of platforms for ease of operation. One challenge faced by vendors is that product trials are often over very short periods of time, meaning that users are unable to see the benefit of a system in that period, longer term trials they felt would be more indicative of a system's performance.

Discussions in the group showed that whilst awareness of system capabilities varies between different MNOs, towercos and O&M firms, the technical capabilities on their wish lists are very much ready, at least in the lab. Putting these into the field in a network setting, with large amounts of variables and unknowns however is where the challenges can arise and where vendors need to work closely with their clients to ensure that robust, reliable and insightful results are being obtained and used ■

For additional discussion and answers on how the limitations with remote monitoring, site management and access control systems need to be, and are being, addressed, you can read further insights with five of the leading system providers in the following section.

Supporting insights from leading access control, remote monitoring and site management system providers in Africa and the Middle East

ABLOY

Abloy Oy is one of the leading manufacturers of locks, locking systems and architectural hardware and the world's leading developer of products in the field of electromechanical locking technology.

Experienced Partner
Abloy Oy has a proven history of telecommunication business for decades. Along with the new technology Abloy has introduced new methods and systems to create value and fast pay-back time to customers.

Abloy operates in all continents and several telecom customers have chosen ABLOY solutions to be leaders in fast developing telecommunication world.

www.abloy.com

Acsys

Acsys is the global leader in cell site access control solutions. Our patented, military-grade technology is utilised by leading tower companies, telecom operators, and vendors throughout the globe to better manage their O&M and eliminate unauthorised access.

Acsys designs simple, yet powerful solutions, with a focus on power-independent locking systems and workforce management software and applications. These technologies are combined to reduce theft, better manage vendors, create fairer and stronger SLAs, and simplify operational workflows. Our solutions equate to increased uptime.

European-rooted with the benefits of China-based production and a highly-specialised and diverse team from around the world, Acsys pushes the boundaries of how technology can be embraced within complex industrial environments for better security and staff management. With a customer-centric, customised approach Acsys follows the belief to think 'outside the box' to deliver easy-to-deploy, highly durable and cost effective solutions for the most challenging scenarios.

www.acsys.com

AIO Systems

AIO Systems is a next generation solution provider of management systems for remote unmanned sites. AIO's management platform and enhanced Premium EyeSite controller are incorporated with site hardware and telemetry systems enabling companies to control, secure, predict, track and remediate their remote site operations in a timely and pro-efficient manner.

We specializes in advanced 24/7 Security solutions and Hybrid/Energy Resource Management. Furthermore, we address multi-tenant infrastructure complexities, reduce OPEX, increase profitability, assure access to BI services, and deliver effective Asset/ Inventory control.

AIO's numerous business models propose alternative operational structures that guarantee ROI. When combined with our added value Services, such as Site Installation Simulations, System Integrations, Technicians mobile application, companies can rest assured AIO will address all their RMS needs from A-Z.

www.aiosystems.com

Galooli Telecom

Galooli Telecom provides innovative Bottom Line Solutions™ (BLS) – the market leading practical business intelligence solution. Galooli's uniqueness is to convert big data into reliable and useful tools to achieve real OPEX savings. From full-site remote monitoring and management to workforce and fleet management, our customizable solutions cover all operational aspects for Towercos and operators.

Instead of the reaction to past events and alerts available on any standard monitoring systems, Galooli promotes the use of prevention.

Galooli is actively operating in over 30 territories with in-country services and support as an integral part of the offering.

www.galooli.com

Infozech

Infozech is a leading provider of technology-led and data analytical solutions to Telecom – Infrastructure providers, Operators and Communication service providers. Infozech has been delivering cost optimization and revenue management solutions for past 17 years to 80 customers across 25 countries. Infozech's innovative offering iTower (Infozech Tower Product Suite) provides an end to end solution for managing and reducing operational costs through tracking real time tower operations, meaningful analytics and helping take smarter decisions. iTower won the prestigious Aegis Graham Bell Award 2015 for being most Innovative solution for telecom tower infrastructure. iTower enables tower companies to drive 99% uptime with minimum operational cost.

www.infozech.com

A flexible solution for access control in the Middle East and Africa

Abloy's PROTEC2 CLIQ system combines the benefits of electromechanical and mechanical solutions

Abloys high security mechanical locks and keys are widely used to secure cell sites across the MEA region. There is a smooth product progression path, without wasting the original investment, to Abloy's electromechanical PROTEC2 CLIQ solution. This is supplemented by CLIQ CONNECT, which manages full access rights and provides an audit trail.

Keywords: Abloy, Access Control, Africa, Africa & ME, Monitoring & Management, Site Surveys, Urban vs Rural, Who's Who

Read this article to learn:

- Abloy's history and footprint in Africa and the Middle East
- How security requirements vary across the region and between customers
- Urban compared to rural sites and their specific risks
- The award-winning Abloy CLIQ Connect and other top range products

TowerXchange: Please tell us about Abloy's activities in Africa and the Middle East. Which countries are you active in?

David Knight, Area Director, Africa, Abloy: Abloy provides high security locking systems to the telecoms market in Africa. We provide solutions that can combine electromechanical systems and mechanical systems. This means most clients start with the Abloy high security mechanical locks and keys. The keys cannot be duplicated and can be set onto a master keying system. This system is extremely effective in sites which are shared. A case in point is in South Africa where most sites are shared between five telecom companies. Everyone's key can open the main gate and then only opens their own equipment (BTS or BBS). This method gives the client a cost advantage as when upgrading to an electromechanical system their previous investments would not be wasted, and can be used in the electromechanical system. Abloy is active in most countries in the Middle East and in the majority of Sub-Saharan countries, namely, SADC countries, East Africa (Kenya, Tanzania, Uganda and Ethiopia) and West Africa (Nigeria, Ghana, Democratic Republic of Congo and Congo).

TowerXchange: Who are your main clients? And how does the demand change between operators and towercos?

David Knight, Area Director, Africa, Abloy: Our clients are mobile network operators and the tower companies. There is a huge demand from

the operators who require site efficiency and long term solutions. There is a growing trend where there is a need for an integrated solution within the sites. Over the last couple of years, with the towercos purchasing, and taking over operators' towers, the demand has certainly moved towards the towercos. The "big 4" towerco companies, IHS, Eaton Towers, ATC and Helios are certainly the main players, however, the operators still have a clear presence in the Sub-Saharan region.

TowerXchange: How does the demand for security solutions differ between different countries across the MEA region?

David Knight, Area Director, Africa, Abloy: In certain countries there is a high demand for security. There are two types of scenarios; first, there is a need for controlling access into our clients' infrastructure, such as the base station sites. Our solution gives the client the ability to determine who actually has entered a site. The second scenario deals with re-enforcing security. In most cases this means the Abloy solution must provide stronger locks which cannot be easily cut. We have also cooperated with cabinet manufacturers to create integrated cabinet locking solutions.

TowerXchange: How do you find security issues vary between rural and urban areas?

David Knight, Area Director, Africa, Abloy: The security issues between the rural and urban sites differ greatly. We have realised that there is a higher theft in rural areas than urban areas. Rural area sites are generator driven, as opposed to direct electricity in the urban areas, therefore a continuous supply of diesel is required. The theft of diesel is a major headache for the towercos and operators. Due to the fact that the rural sites are generally outside of a populated area, anything of value is vulnerable to theft. In these areas, where thieves have more time on their hands, the demand for re-enforcing security is more prominent than controlling access.

TowerXchange: How does your product differ from others in the market?

David Knight, Area Director, Africa, Abloy: We are an established global company with 110 year track record in protecting critical infrastructure. Our PROTEC2 CLIQ is a proven solution with over 1000 customers worldwide, 500,000 cylinders and 500,000 keys already delivered and in use.

We are also the only company who has introduced a product progression plan. This means clients can install a mechanical solution with the intention of upgrading these products to electromechanical products.

PROTEC2 CLIQ is the only product in the market where one solution combines the benefits of electromechanical and mechanical solutions. The **CLIQ CONNECT** feature provides access rights and logs audit trail in any situation, whether you are working at an online or offline location. Not only is it a highly advanced electronic key controlling system, but as an extra level of security, we have the **ABLOY PROTEC2** mechanical platform backup. So, if ever your electronic system is compromised your assets remain secure with the mechanical platform backup.

"We are also the only company who has introduced a product progression plan. This means clients can install a mechanical solution with the intention of upgrading these products to electromechanical products"

We are also able to provide a complete solution from padlocks and cylinders to door closers and electric locks to secure and protect our clients' facilities, infrastructure and assets ■

Visit Abloy at booth 222 at the TowerXchange Meetup Africa & Middle East, October 19 & 20, Sandton Convention Centre.
www.towerxchange.com/meetup/meetup-africa/

Enhanced security and operational efficiencies through improved access control

An interview with leading access control provider - Acsys

Poor access control can not only lead to security concerns but it can also have a significant impact on a company's operational efficiency and bottom line. In this interview, we speak to leading access control system provider, Acsys, to understand how the telecom tower industry has been affected by poorly managed access control and discuss the advantages that mechatronic locks can bring to the sector.

Keywords: Access Control, Acsys, Africa, Health & Safety, Job Ticketing, KPIs, Logistics, Masts & Towers, MLA, MNOs, Monitoring & Management, NOC, O&M, Operational Excellence, RMS, Site Level Profitability, Site Surveys, Site Visits, SLA, Towercos

Read this article to learn:

- Limitations with mechanical locks
- Challenges in controlling access to NOCs
- The importance of access control in enforcing SLAs
- How mechatronic locks can contribute to increased efficiency
- Safety and security benefits afforded by mechatronic locks

TowerXchange: Please can you describe some of the limitations of mechanical locks and keys?

Olivier Meganck, VP Sales, Africa, Acsys: There are several limitations in the use of mechanical locks and keys; keys can be copied, lost and forgotten or unreturned and the cost of replacing the lock is often higher than the lock itself. In managing keys, operators need to employ numerous amounts of workers who require training and the wrong keys can be given to the vendor. With traditional mechanical lock and key there is no way to prevent collusion, and users can forget to close sites (intentionally or not).

Regular audits need to be undertaken to ascertain the amount of keys in use and the keys' location and the management of keys and locks requires dedicated space and security. Managing keys on weekends or during an emergency is a problem as staff will not be present, it is critical to be able to respond quickly to downed sites but if access is prevented in the absence of keys then the only way is to cut the locks which will require a lock replacement and sites can stay unsecured for quite some time

When keys are copied it is difficult to detect when a theft or loss occurs and with picking and bumping there is no proof of break and entry and as such there are high insurance premiums. The result of these inefficiencies is that some vendors eventually make their own copies of the keys to gain access.

TowerXchange: In relation to controlling access and NOCs, what are some of the operational challenges faced?

Olivier Meganck, VP Sales, Africa, Acsys: The NOC deals with a complex set of equipment that is scattered around a region and is impossible to control efficiently with mechanical locks. The NOC also deals with a large amount of vendors, who are responsible for site maintenance. It is hard for the NOC to respond efficiently to emergencies as they don't know where the vendors are located and false alarms can cause disorder.

Access to the NOC is impossible to control. Vendors are requested to do maintenance and only do it when they are able to do it, not necessarily when the NOC has requested that they do it. When sites are down it can be difficult to find the vendor, the NOC then needs to call other support to get someone to the site

The NOC is looking for a solution whereby tickets are issued and acted upon as quickly as possible in a first phase. In a second phase the NOC needs to know when the vendor has arrived, what he has done, whether the problem is fixed and when he has left the site. NOC operations need to rely solely on the vendors assertions

TowerXchange: What challenges can poor access control systems have on SLA implementation and adherence?

Olivier Meganck, VP Sales, Africa, Acsys: MNOs and towercos will have SLAs in place with their vendors to regulate site maintenance. These SLAs have escalation clauses that dictate when a vendor should arrive on location. It is hard for the NOC to see when vendors are going to the sites and if they completed the job correctly making SLAs redundant.

The lack of data prevents an operator from setting operational KPIs to benchmark the performance of the various vendors between each other. The fact that there is no or little data from the performance on the SLA also means that the NOC and operator need to rely on the vendor to obtain performance information which creates a conflict of interest. SLAs fees are being paid when the services that need to be provided aren't being carried out. Vendors invoke the problems of collecting and returning keys as a valid reason for non-compliance with SLAs.

TowerXchange: What are the advantages of implementing mechatronic locks for remote site management?

Olivier Meganck, VP Sales, Africa, Acsys: Mechatronic locking systems cannot be picked/bumped, hacked, copied or corrupted in any way. Telecom customised software enables the NOC to manually or automatically control where users can go, for how long wirelessly and in real-time with minimal cost.

Mechatronic solutions allow the NOC to control precisely what assets can be opened and when. All keys and locks memorise the last thousand actions giving an incorruptible record of the user's actions, providing the NOC and operator with valuable operational data.

The mechatronic locks combine four important solutions into one system; a wireless and real-time access control system, a high security lock and key solution, a time and attendance solution and a key management solution

TowerXchange: What are some of the basic practical advantages of mechatronic locks?

Olivier Meganck, VP Sales, Africa, Acsys: The solution is a standard padlock and Euro-Din cylinder configuration meaning that no modifications are required to install them. The padlocks and cylinders can be fitted on all equipment and no maintenance is required. The stainless steel plating prevents corrosion on the padlock body and cylinder and what's more anyone can use the solution.

The operational advantages of using mechatronic locks are instantly visible after deployment and lasting over time, uptime is increased and the solution prevents keys being copied, stolen, lost or unreturned, locks being picked, issues around collecting and returning keys, the requirements for lock and key audits and unauthorised access.

TowerXchange; How do mechatronic locks contribute to increased efficiency?

Olivier Meganck, VP Sales, Africa, Acsys: Users can service more sites in one day and a user's position and length on site is controlled and monitored. The NOC can have a real-time view of site status looking at the number of sites, which sites have guards and are they present or not, which site is in need of maintenance and for what reason and which and how many vendors are on the site.

By implementing mobile apps, the NOC is now able to receive real-time site information and user

performance, such as when did the user receive the task, accept the task, arrive on and leave the site. This system can also monitor what the user did on the site (watermark GPS pictures) and can also receive information on whether the user closed the locks after leaving the site.

This data has significant value to determine SLA adherence because the tower owner can now see exactly what is happening on their site. Being able to understand who is going where and for how long means that the owner can make smarter business decisions. Data collected by mechatronic locks gives concrete undisputable data on whether the vendor has been meeting the SLAs. Furthermore upon additional analysis of the data, site operators can create and negotiate more suitable SLAs using the information collected.

TowerXchange: How do mechatronic locks increase site and user security and reduce theft?

Olivier Meganck, VP Sales, Africa, Acsys: With regards to safety and security, as the NOC knows who is on the site and for what reason, in the case a vendor does not request a locking code (because of a fall or injury) the NOC is able to act on that.

In relation to thefts, most thefts are caused by people who had a mechanical key at one stage and copied it. The mechatronic keys can have an embedded feature that monitors where the key is being used, if the user tries to fraudulently use the key three times, the key will automatically block themselves thereby forcing the user to go back to the NOC or programmer to update his key.

TowerXchange: What information can be collected to monitor behavioural patterns and how does this translate into more cost effective operations?

Olivier Meganck, VP Sales, Africa, Acsys: The NOC will be able to download the access logs stored on the key through programmers and study what sites or assets were accessed and when, how long the vendor spent on each site, whether the user tried to access sites or assets without authorisation and on which day, time or location.

By collecting data on user performance the NOC and operator are now able to obtain site maintenance benchmarks which in turn allow them to set KPIs for certain tasks.

In addition, mechatronic locks allow for increased flexibility. When a technician is unavailable, another can be called as a substitute with no wasted time or resources. A temporary access can be instantly granted 'on the fly' for a site normally outside of this technician's work zone.

By collecting data on behavioural patterns, the financial department is also able to control how much time was spent on site by users, thereby gaining a better control over payment of billable hours to vendors.

TowerXchange: How will the data that mechatronic locks provide influence the way in which the telecoms sector works?

Olivier Meganck, VP Sales, Africa, Acsys: Using the data that mechatronic locking systems provide effectively will lead to more efficient access policies, enhanced SLA agreements and increased productivity. The data collected does not only benefit the site owner, but is also valuable for tenants and vendors. The data helps build relationships between the ecosystem by aiding their understanding and giving evidence of site activities. The more a database is built and the further it is integrated the more valuable it becomes to its users ■

How AIO Systems' operations in Nigeria address unique market needs

All-in-one solution addresses key challenges such as unreliable grid, fuel and equipment theft

Asher Avissar, CEO, AIO Systems

Operating cell sites in Nigeria is notoriously challenging. The challenges of an unreliable grid, compounded by a rampant diesel mafia, put real pressure on opex and on margins. But AIO Systems has delivered opex savings of 40% across 7,000 Nigerian cell sites, offering return on investment in their RMS and Hybrid solution in less than a year and a half. TowerXchange spoke to CEO Asher Avissar to learn more about AIO's Nigerian success story.

Keywords: Africa, AIO Systems, DG Runtime, Energy, Energy Efficiency, Fuel Security, Hybrid Power, Job Ticketing, KPIs, Lithium, Monitoring & Management, Nigeria, NOC, Opex Reduction, RMS, Site Management System, Site Visits, Skilled Workforces, Unreliable Grid, Who's Who

Read this article to learn:

- Resourcing AIO's operations in Nigeria, including a dedicated NOC and local project management, deployment and installation staff
- How AIO Systems maximises use of grid power
- Monitoring regular site maintenance stops to reduce equipment write-offs by 14% across 400 sites
- How AIO monitors, manages and reduces diesel and equipment theft
- How AIO's "know your opex" policy enabled 40% opex savings across 7,000 sites; amounting to over $1mn per annum

TowerXchange: Please re-introduce AIO Systems for readers who are unfamiliar with your company.

Asher Avissar, CEO, AIO Systems: AIO Systems develops, produces and markets advanced solutions for the management of remote networks tailored specifically for tower management. AIO Systems is renowned for our cutting edge technologies that are based on robust turnkey platforms for hardware, software and management services, and which are customised to suit the individual needs of our clients.

Under our "All-In-One" umbrella we tackle towerco operations from A-Z. For example, just for energy we supply equipment for providing electrical power to the sites, advanced site hardware controller systems, and site detector equipment that is backed up by our CMS management system aimed at significantly reducing energy costs. The list simply goes on and on.

TowerXchange: What is the scale of your activities in Nigeria - what project management and support resources do you have deployed locally?

Asher Avissar, CEO, AIO Systems: AIO's largest subsidiary is based in Nigeria, which has consistently and diligently served our clients for the past four years. The success of this team is testimonial to the scale of our operations that includes thousands of sites, featuring some of the most prominent towercos in Nigeria.

AIO Systems' Nigerian NOC

Our team of experts handpicked for their local knowledge and skills, include a sales and marketing unit, specialised project managers, deployment and installation staff, a NOC dedicated only to provide services to our clients in Nigeria, and a financial and logistics department.

Customers/Suppliers via our portals have privileged access to our BI engine, which allows them to focus in on specific network information (HR performance, site components, equipment, impact of environment, price fluctuations, et cetera) from a global scale to a single site. AIO's BI engine empowers them to take remediate steps which includes financial analyses enabling them to optimise their network operations even further.

TowerXchange: What operational challenges and KPIs come to the fore in the Nigerian market?

Asher Avissar, CEO, AIO Systems: It is our experience that Nigerian towerco operations redefine the term KPI. Characteristics such as the poor maintenance of electrical networks, leading to the instability of these networks, and subsequent high costs of fuel due to the use of generators, are not necessary unique only to Nigeria. What makes Nigeria stand out from the rest of Africa is the dynamics of the market.

I will give one good example. We found that the power from the utility (when available) is still cheaper than the costs of generators and diesel. Towercos don't usually take into account unforeseen generator maintenance costs and their product life due its high usage. AIO Systems have found a way to make full use of power from the utility. Electrical networks for sites in Nigeria are based on three phase networks. Almost 36% of grid failures fail when one of the phases in the network falls. As a consequence the site's power will automatically switch to generator power. AIO's solutions are based on two or single phases. Therefore the site is able to remain on grid power should one of the phases fall, and our systems will also bypass the automatic switch to generator power.

Another good example is what to expect during a "regular maintenance stop". To effectively manage our sub-contractors and what they are doing during their site visits, AIO Systems has developed our Mobile inSite application for technicians. Our NOC team could ensure that they are actually in the site's vicinity when logging in at the site, how they respond to alarms/tickets, and of

course what maintenance procedures are being carried out during their stop with actual pictures of equipment. Just with this simple measure, equipment write-off for our client towerco was reduced by 14% for 400 sites alone.

TowerXchange: The Nigerian tower market is unfortunately notorious for high levels of diesel and equipment theft from cell sites - how have you been able to combat this problem?

Asher Avissar, CEO, AIO Systems: As with any challenge, we design, redesign and implement our solutions to resolve the issue. As I mentioned these challenges are dynamic that needs a dynamic solution.

Yes, diesel theft is not any different. Now instead of just monitoring the situation, AIO Systems can manage the challenge in full. Immediately when inconsistencies are detected, we can remotely switch the generator on/off, set off a full security procedure including locking the site's access and of course monitor and record everything on camera. Our solutions also control the diesel's flow, quality, close/seal off the tank and of course filter out any water in the diesel that may have been "accidently" added to the diesel. AIO's saver-logic algorithm enables towercos to manage everything from the cost of diesel, refueling to minimising its use with our hybrid solution. Measurements are based on duplicated measurements and verification systems, making it almost impossible to tamper with any measurements/data.

Illustration of DG runtime savings

Equipment theft can be just as damaging for the site's operations, and yes this has also evolved in recent years. We've found that adding measures such as detecting and videoing the "displacement" of equipment is not enough. Yes you need to know that it is being moved, but you also need to track it while it is being moved. Our RFID tracking and identification solutions for assets is an effective measure to track and map in real-time when, where and what is being moved.

AIO's solutions are backed by a comprehensive alarm and ticketing system. We pre-programme thresholds for inconsistencies, which sets off the aforementioned security procedures. Not to mention the fact that one of AIO Nigeria's partners is KingsGuard, is one of the biggest local security companies. Kingsguard offer physical security services fully backing network site security day and night.

TowerXchange: For similar reasons, one would imagine tamper proofing of RMS is critical in Nigeria - how has this been achieved?

Asher Avissar, CEO, AIO Systems: Yes, unfortunately many of the culprits are well-familiar and have wide technical experience. The destruction of

controllers, cutting wires and vandalism have forced AIO to implement drastic measures such as our SMART-Tampering components. We adapt a military-standard policy for our hardware. Components placed in a durable, tamper proof housing that is equipped with a micro-switch that sets off alarms once it is being tampered with. Wiring is replaced by wireless communication.

It is also necessary to secure data with backup software which incorporates control systems that pre-emptively manage user levels and will automatically detect inconsistent data entries. AIO protects the aforementioned wireless communication with effective firewalls, SSL protocols and data verification systems.

TowerXchange: I recall learning that MTN was the second largest power generator in Nigeria! That was of course before they sold their towers. How have you been able to improve energy efficiency at Nigerian cell sites?

Asher Avissar, CEO, AIO Systems: Yes, of course energy efficiency is top priority for any towerco. That is why RMS vendors fashion their sales packages around this issue. Nigeria is notorious for their unstable grid, accounting for the wide use of diesel generators. There is no Time of Use billing system in place, and as mentioned previously it is important for towercos to make optimal use of the grid as the most cost-effective energy source. Unfortunately, power has to run 24/7 for companies like MTN to guarantee their service.

Our "Know your opex" policy, coupled with our Hybrid solutions, have been very effective to tackle this problem in Nigeria. AIO's Hybrid solution addresses the grid instability in three ways. The Hybrid solution automatically switches the power to the cheapest power source available. When the grid becomes unavailable, power is switched to the lithium battery bank. Should the battery bank become unavailable, power is switched to next available source generator/grid. We've found that the grid is usually available during the late hours of the night until early morning, at which stage we use the grid to recharge the battery bank, of course at the cheapest rate.

Delivering this opex knowledge to the right people within the towerco has proven to be very effective. On average we were able to reduce these expenditures by 40% for 7,000 sites. Savings that amounted to over a million dollars per annum.

TowerXchange: Can you give us a sense of some of the operating performance parameters of a Nigerian cell site before and after the installation of your solutions?

Asher Avissar, CEO, AIO Systems: AIO Systems has conservatively calculated that by adapting our solutions, a typical cell site in Nigeria can make a return on investment within 17.6 months of operation. Our Hybrid solution alone contributes to 65% of these savings, with fuel at 15%.

In addition to the direct savings , AIO systems introduces a set of "soft savings", which indirectly add to the cost benefit of the system, and reduce even further the period for return on investment.

- BI machine learning wisdom increases the monetary worth of the network
- Prolonged life-span of equipment
- Prevent unnecessary run-time of equipment and reduced rate of failure
- Efficient use of equipment when put in operation
- Reduced site visits for real maintenance
- Reduced site visits for false alarms
- Reduced down-time
- Preventive maintenance
- Cost control

TowerXchange: Please sum up your experiences in Nigeria and how they prove AIO's credentials to monitor and optimise performance of other large tower portfolios in emerging markets.

Asher Avissar, CEO, AIO Systems: The large scale and continuity of AIO's operations within Nigeria is testimonial in itself. Our ability to adapt our solutions and succeed in one of Africa's toughest and ever-changing emerging markets, has made us the number one choice time and time again. Our credentials not only lie in our cutting-edge technology and ability for our clients to make substantial profits, but also in the excellence and consistency of AIO System's local support. It is this dedication and commitment that I am very proud of. AIO Systems Nigeria is indeed one of our shining examples of how large towercos are able to optimise their performance on another level ■

Fuel monitoring and preventative maintenance reduces fuel consumption by up to 40%

Galooli's integrated site management system brings financial savings to tower owners

Ohad Polinovsky, Director, Galooli Telecom

Used by personnel from technicians to CEOs, Galooli's RMS system and its intelligent data analysis platform offers MNOs and towercos a fully comprehensive system to manage fleet, workforce and operating efficiencies. Enabling fuel reductions of up to 40% and equipping tower owners with the tools to take a preventative rather than reactive approach to site management, Galooli works hard to deliver financial results to its clients.

Keywords: Change Management, Data Room, Dimensioning, Energy, Energy Efficiency, Fuel Security, Galooli, Galooli Telecom, Job Ticketing, KPIs, Monitoring & Management, NOC, O&M, Off-Grid, QoS, RMS, Site Level Profitability, Site Management System, Skilled Workforces, Who's Who

Read this article to learn:

- How Galooli's system offers a truly end-to-end experience for all levels of the business
- Strategies and success rates in tackling fuel theft
- Moving from reactive to preventative maintenance through the use of Galooli's system
- How data is being used to inform business decisions

TowerXchange: Please can you provide an introduction to Galooli and their solutions for the telecom sector.

Ohad Polinovsky, Director, Galooli Telecom:
Galooli Telecom provides innovative Bottom Line Solutions™ (BLS) – the market leading practical business intelligence solution. Galooli's unique strength is its ability to convert big data into reliable and useful tools to achieve real opex savings. From full-site remote monitoring and management to workforce and fleet management, our customisable solutions cover all operational aspects for towercos and operators. Instead of reacting to events that have already happened and alerts available on any standard monitoring systems, Galooli promotes the use of prevention. Galooli is actively operating in over thirty territories with in-country services and support as an integral part of the offering.

TowerXchange: Galooli have been specialising in fuel monitoring for a number of years, how have you seen strategies used by thieves change and how does Galooli's platform meet these challenges?

Ohad Polinovsky, Director, Galooli Telecom:
The main change we saw over the years is that fuel theft carried out by "insiders" is almost not happening anymore. The thieves understand that the organisation can easily cross reference the information from our system and understand who was part of a fuel scheme. Moreover, the MNOs and towercos are no longer responsible for the fuel in the tank, using our system they can pay only for the

fuel that was actually consumed since our system can separate between normal consumption and fuel drops even when the generator is running.

Galooli's reliable fuel monitoring platform enables the MNOs and towercos to agree on common consumption scales and transfer the responsibility for the fuel in the tank to the fueling contractors. Nevertheless, as fuel is the main expense and main concern, there will be always new challenges to cope with, so we keep developing new technologies to overcome them.

TowerXchange: What kind of reduction in fuel theft have your customers seen? How does this compare to other monitoring system providers?

Ohad Polinovsky, Director, Galooli Telecom: From information gathered for several years we saw that a 30-40% in fuel reduction can be achieved by using our solution in a very short time. Additional reductions are also observed as time goes by as well, but this is not as dramatic as the initial impact. I cannot tell you about our competitors' performance but what I can is that Galooli is constantly looking for ways to reduce MNO and towerco opex by providing bottom-line solutions. This means analysing tools that help in taking operational decisions that also contribute to a reduction in fuel consumption, for example by optimising hybrid cycling time or air cooling system operation.

TowerXchange: There have been criticisms from some towercos and MNOs that current site management systems on the market still exhibit a number of limitations. What do you see as the limitations of site management platforms and how has Galooli's platform evolved in recent years?

Ohad Polinovsky, Director, Galooli Telecom: One of the limitations is that MNOs and towercos need to work with several different systems. Galooli develops its solutions to provide a complete offering that anyone in the organisation has use of, from the filing technician with our workforce management mobile app up to the CEO with our analysis and dashboard tools.

Having all of the information from the technicians and site equipment on the same database enables us to present it on one platform. On top of that, Galooli enables integration of any equipment on site that has a communication port, in order to use all the information we can get from the site and provide our clients with a one stop for all the data they need.

Another limitation MNOs and towercos experience is interpreting the collected data. Besides building dashboards for analysis, Galooli develops prediction and prevention solutions to enable bigger savings.

TowerXchange: How is Galooli assisting its customers to react in a preventative rather than reactive manner?

Ohad Polinovsky, Director, Galooli Telecom: Galooli takes data collected from sites and provides effective dashboards and reports which help the operation managers make decisions. The NOC alerts dashboard is one of the examples of this; we try to make sure alerts pop up before a malfunction or bad event happen. We don't only invest a lot in the technology to be able to do this, but we also invest heavily in creating reliable and professional teams on the ground; workforce quality is critical to the success of the operation.

> From information gathered for several years we saw that a 30-40% in fuel reduction can be achieved by using our solution in a very short time

TowerXchange: Finally, with so many site intelligence system providers to chose from, what differentiates Galooli from its competitors?

Ohad Polinovsky, Director, Galooli Telecom: Galooli provides bottom line solutions, meaning effective information that leads to real opex savings. We are committed to financial results more than just to data. Galooli has vast experience, its solution is flexible and customisable to meet the client's needs and the company has outstanding after sales support to ensure the client gets the most out of the system ■

Intelligent preparation and use of data for more proactive network management

Infozech's iTower suite tackles the huge volume of variable data being generated by diverse RMS systems

Ankur Lal, Founder & CEO, Infozech

The multiplicity of RMS systems, coupled with communication errors, presents a major challenge to MNOs and towercos looking to obtain a "single source of truth" regarding their operations. TowerXchange speak to Infozech Founder and CEO, Ankur Lal to discuss how the company is working with customers to better handle raw data and analyse it in a structured way to equips MNO and towercos with the tools to take action on their sites.

Keywords: Africa, Capex, Data Room, Energy, Energy Efficiency, Fuel Security, Infozech, Job Ticketing, Monitoring & Management, NOC, O&M, Operational Excellence, QoS, RMS, Site Level Profitability, SLA, Uptime, Who's Who

Read this article to learn:

- Challenges that towercos and MNOs face in obtaining a "single source of truth" from their RMS systems
- How Infozech are working with customers to improve the handling of raw data including the use of "smoothing" and "fill-in" algorithms and data verification against the norm
- Key metrics Infozech recommend capturing to improve energy efficiency and cost savings
- How Infozech's iTower platform assists operators and towercos in capturing and analysing data in a structured way

TowerXchange: An increasing number of RMS platforms, either as standalone systems or built into different equipment on cells sites gives towercos and operators a wealth of data with which to monitor operations. Can you explain some of the challenges that are presented to tower owners and operators by this?

Ankur Lal, Founder & CEO, Infozech: RMS systems are increasingly being deployed by towercos and MNOs with a view to increase site visibility. This need is especially large with new sites (where RMS comes built in) or retrofitting existing sites. In the retrofit scenario, one emphasis is on gaining better visibility of source of power and visibility of fuel consumption.

Towercos believe that once they have the necessary RMS deployed, they will get authentic information and achieve a single source of truth. On the ground there are multiple systems, some standalone and others which are integrated. Due to multiplicity of systems and on the ground realities, often the sought-after "single source of truth" through RMS deployments is not achieved.

Each RMS system produces data in its proprietary protocol. There are multiple challenges being faced by the towercos with an increasing number of RMS platforms and collection of data from RMS.

The communication between site and server consists of four steps:

1. RMS controller capture and relay: RMS controller captures information at site and relays it.

2. SIM/ and mobile modem transfers information from site

3. Mobile network establishes connectivity between site and server,

4. Server: Set up to receive information from RMS controller and auto correct any transmission errors

In the event that any of the above four steps fail to work, or do not work in tandem, the desired outcome of receiving data on server is not achieved. Whilst this seems simple and should always work, in reality, due to multiple choices for each of the above, getting all of them to work reliably needs focus and review.

TowerXchange: Please can you explain a case where customers had experienced challenges in this area?

Ankur Lal, Founder & CEO, Infozech: Our customer experienced a case where the RMS was configured to relay energy data every ten minutes, meaning six times an hour or 144 times a day, as such, the expected number of data packets for energy data was 144 per day. When we looked at this analysis across sites we found a large number of sites doing this, however for over 30% of the sites, the number of data packets received was under 135 (i.e. they were not 95% compliant). When we delved further we realised that this was happening due to one of the aforementioned reasons, ensuring you are getting all the data is absolutely critical.

While looking at this we also saw sites which were sending 155 packets or more a day – We found that some of the data is erroneous and did not provide a consistent trend, rather it led to confusion of the receiving system. We explained this phenomenon as noise which was due to unpredictable events at site or in transmission of data and as such it resulted in us building sophisticated proprietary solutions to parse the data in such a way that noise reduction happens.

TowerXchange: Can you share the work that Infozech is doing to better prepare the raw data that is being received by towercos and MNOs on their sites? What further steps are required by different stakeholders to assist in this?

Ankur Lal, Founder & CEO, Infozech: The raw data packets being received by the server may contain alarm information, data value or both. Some of the functionality which helps us in better handling of raw data are:

1. Handling alarm fluctuations: Alarms are configured for key events such as door open, low fuel, low voltage, fire et cetera. Some of them need immediate action while others are not so critical. At times, the information received may not be fully accurate, for instance an alarm fluctuation due to a malfunctioning of a sensor or controller can result in the central server starting to receive a flood of these alarm packets. If an alert is passed on every time such event occurs, the end user mailbox is flooded with messages and it becomes difficult for the user to handle. The Infozech itower (Tower Product suite) comes built in with “intelligent filtering” to assess if this event is due to malfunctioning at site, and sends only the relevant notifications to the user.

2. Fuel sensor calibration: Each site has different types of fuel tanks (of all sizes and shapes) and there are multiple types of fuel sensors which can be fitted. While some newer ones like Capacitive maybe more reliable, others are less so. RMS vendors need to calibrate the sensor with the tank and the equipment to ensure the readings are accurate. In the event that a sensor or tank is changed, recalibration is required.

Besides recalibration we noticed that even the best of sensors have fluctuations due to external temperature and other factors. At times, this fluctuation is so significant that it may cause the receiving system to misinterpret the information; in case of fuel, such as a normal fluctuation may be misinterpreted as theft or vice versa. Infozech has developed a proprietary “Smoothing Algorithm” which helps normalise the data and show the correct trends without fluctuations.

3. Missing data – correction: At times the data may be missing in a data stream. Infozech has a mechanism to identify and highlight any missing data parameters in the raw packet. Infozech has

built proprietary algorithms to "fill-in" for missing data depending on the type of data missing and the number of instances in which it is missing. This helps autocorrect a data stream.
4. Business rule: When raw data is received, it needs to be verified against permissible ranges and likely values. Infozech's system validates every raw data packet and each value in the data packet against its defined type and permissible value and filters out any garbage value from the system. It is possible to configure multiple types of business rules to identify data and depict business scenarios.

Based on these findings, towercos and the RMS vendors should acknowledge and rectify these data discrepancies highlighted by the system in a time bound activity; any loss of data packet due to rejection of garbage values will lead to loss of information and indirectly hamper other day to day processes linked with those data values.

TowerXchange: In the instance where there are multiple images of the same data from the different systems, or where there is a gap in data, what are Infozech's recommendations on how to best manage this?

Ankur Lal, Founder & CEO, Infozech: The ultimate objective is to treat RMS data as a single source. However, the challenges enumerated above while collecting and validating data leads to compromisation of the objective. This happens because towercos are collecting data from multiple sources.

Infozech recommends the use of a standard platform which can reconcile data from any sources based on:

- Type of data (instantaneous value or cumulative value)
- Business rules applied on the data

Infozech's platform has been precisely designed to achieve this objective for towercos. Infozech provides a platform where it reconciles data from any source or platform. The system automatically eliminates repetitive inflow of the same data, selecting the best value and capturing it. Users can then have an option to approve the best value based on their business requirement for future use.

TowerXchange: With the number of parameters that can be measured on a cell site being seemingly endless, what metrics do Infozech think are particularly important for tower owners to measure that may not be widely monitored currently?

Ankur Lal, Founder & CEO, Infozech: Key things which can be implemented as energy/cost saving measures include:

1. Where there is high genset run hours, battery backup hours should be monitored

2. Where there is high grid availability, generators can be removed by enhancing the battery bank

3. Second (spare) gensets can be removed from sites with lesser load by managing one genset with proper battery cyclic operation

4. Periodic analysis of runtime distribution across the grid, battery and genset based on load and battery capacity which can then lead to up gradation if required.
5. Maintenance results of battery (e.g. discharge test) periodically can suggest enhancement or replacement of battery bank.

6. CPH establishment based on site category based on load, temperature, colocation and other known/ unknown factors. This can be then improved based on a feedback from the system correcting variances between actual and theoretical values.

Infozech's i-Analytics solution helps customers carry out such analysis easily and repeatedly thus helping them take much more informed and optimal decisions.

TowerXchange: Preparing the data into a manageable format is the first step but turning data into intelligence that can be used by the client is key. Where are we today in being able to consolidate and analyse all the different inputs into real intelligence? How do Infozech see this being built upon in the short, medium and long term?

Ankur Lal, Founder & CEO, Infozech: "Improving Profitability through 'Discipline of Action" (TowerXchange Issue 17, August 2016), focuses

on how to assist customers take action. Taking action is often associated with higher risk or effort. Infozech's iTower platform assists operators capture and analyse information is a structured way.
Once actions are taken, they are fed back in the system for further assessment of the quality of action. This helps assess action effectiveness.
The analysis provides trends which can indicate short, medium and long term actions. One area which Infozech has started engaging in, is the optimal mix of capex – opex. Often a large number of capex measures, such as long lasting batteries, need effective systems which can monitor and measure energy spend and battery life over multiple years to determine:

1. Whether the initiative itself was right (i.e. switching to long lasting batteries), or was it fraught with failures, site downtime issues or difficulty in maintenance.

2. In case the initiative was a success which battery provider gave the best service – in which case was the yield the most – this may not have been in the lowest cost one. In absence of such analysis companies lean towards the lowest cost alternative which at times could even be the highest cost one.

TowerXchange: Can you share some examples where Infozech has worked with a client to get more out of the data that they are generating? What improved efficiencies, cost savings or timelines has this afforded the client?

Ankur Lal, Founder & CEO, Infozech: Infozech has been working with one of our clients to help them to get more value from the data which they receive from RMS systems for cross functional consumption.

One of the challenge faced by the client was the ability to obtain accurate and complete data for energy billing from the RMS system. Major challenges included:

1. Missing /Garbage data packets

2. Incomplete data packets

Incomplete data packets: The Infozech System derives the possible value based on trends in the historic data. There are sites where the data is not available for the complete month, for instance, energy billing cannot be done for site where data is only available for 25 days. In such scenarios of incomplete data, Infozech help in determining those values based on Infozech's proprietary algorithm "Fill in".

After applying the above functionality, the customer is now able to bill the sites accurately based on the RMS data.

We have also been providing solutions where data has been missing for 15 days or there is no data for the month. These functionalities can be reapplied to fuel sensor data, genset run hours and other data sets ■

Tower Xchange

Energy storage working group report

Lively debate characterised the inaugural energy storage working group at the TowerXchange Meetup Africa 2016, where dozens of experienced buyers and sellers of batteries exchanged insights into how to extend lifecycles in challenging operating conditions in Africa and the Middle East.

Working group members, buyers:
Econet Power, Helios Towers Africa, Vodafone, Leadcom, TowerTech

Working group members, suppliers:
4energy, Aquion Energy, Energic Plus, EnerSys, Fluidic Energy, GNB (Exide), GS Yuasa, NorthStar, Redflow, Saft

Energy storage Working group key learnings

Key learnings

LEARNING 1: There are a lot more lead acid batteries deployed at SSA cell sites than alternate chemistries – lead acid probably still has over 85% market share

LEARNING 2: Buyers felt that vendors of alternate energy storage chemistry solutions needed to do a better job presenting a "full business case, with complete costs and ROI"

LEARNING 3: At a "legacy" African cell site, a lead acid battery might last 18 months. With modernisation and process optimisation, that can increase to 24-30 months, although some MNOs are still seeking five year lifecycles

LEARNING 4: Cell site owners need to optimise the relationship between the rectifier and the batteries in order to maximise equipment lifecycles

LEARNING 5: The process of battery hybridisation of MNO's African cell sites is nowhere near complete – there is a substantial addressable market, and a substantial replacement system market

LEARNING 6: Towercos' upgrade of energy equipment acquired at the towers formerly owned by MNOs doesn't happen overnight – sites acquired several years ago are not all up to spec, while other sites have only recently been transferred

LEARNING 7: Towercos own >40% of Africa's cell sites, and provide a full DC power service at the majority of those sites – meaning towercos now buy the batteries for almost half Africa's cell sites, including the majority of sites occupied by Airtel, MTN and Millicom

LEARNING 8: The typical power load on a cell site in Africa is around 2-3kW per tenant, rising as high as 8-10kW for indoor and hub sites. The load on single tenant, low cost rural sites can be as low as 300W-1.5kW

LEARNING 9: The unpredictability yet severity of grid outages in SSA demand significant autonomy, which in turn means battery banks will be 'lazy' for long periods

LEARNING 10: Cell site autonomy requirements vary widely across the continent; the lowest we heard was for 4 hours, the highest for 10-20 hours.

LEARNING 11: There may be a case for mixed battery banks including lead-acid and lithium ion batteries to cater to a greater variety of operating conditions, although one buyer suggested <10% of their sites might suit such a configuration

LEARNING 12: Battery theft varies across Africa: we heard a range between "negligible" and "higher than 5%"

LEARNING 13: Integrating monitoring systems into "intelligent batteries" is a promising development, but MNOs and towercos often struggle to translate the volume of data into actionable intelligence

LEARNING 14: Standard battery warrantees are meaningless in challenging grid conditions; a few alternate chemistry energy storage vendors are offering warrantees based on a guaranteed kWh output

Executive summary

Sub-Saharan Africa may represent the world's toughest operating conditions for energy storage at cell sites. Poor grid reliability means it can be impossible to maintain disciplined charge/discharge regimes. High operating temperatures, combined with a legacy of indoor site configurations, often require that premium high temperature batteries be installed. Premium batteries, particularly those with domestic or light industrial re-use scenarios, become targets for theft. And maintenance regimes and maintenance skillsets aren't always optimum. This all combines to mean that the lifecycle of a backup battery bank at an African cell site can be as short as 18 months.

TowerXchange's inaugural energy storage working group convened in Johannesburg in October 2016 to highlight these operating challenges and to challenge buyers and sellers of batteries to work in closer partnership to devise products and processes to enhance battery performance at African cell sites.

Let's start our report with snapshots of three of the key battery buyers present at the working group.

Helios Towers Africa

Helios Towers Africa has widely deployed charge discharge (CDC) battery hybridisation, mainly using lead-acid batteries, across their 6,556 site network.

Helios Towers Africa's portfolio spans four countries and a range of vintages, from older portfolios in Ghana (750 sites), and Tanzania (3,500) to newer acquisitions including 400 sites in Congo Brazzaville and the Airtel DRC sites, bringing their count in the country to around 1,600.

Helios Towers Ghana is shifting from AC only to a full DC power service, starting with around 300-400 Millicom sites, which are being converted from indoor to outdoor sites at the same time.

Grid availability in Ghana has returned closer to norms prior to the devaluation of the local currency, the Cedi, which saw availability slide from and average of 22 hours to 14 hours back in January 2015. Grid conditions in Tanzania are also relatively reliable, at just under 20 hours of good grid per day, while in the DRC availability drops to 14-15 hours, although grid reliability falls dramatically (before it disappears altogether) outside Kinshasa, Lubumbashi and Goma. Helios Towers Africa has around 640 off-grid sites in the DRC, where the company are deploying their first 50 site solar trial, and 180 off-grid sites in Congo Brazzaville. A further 800 Tanzanian sites are off grid.

Vodafone

Vodafone were represented by the Network Site Infrastructure team at Vodafone Procurement Company, which is responsible for procurement across over 50,000 Vodafone, Vodacom and Safaricom sites in Africa.

Vodafone are committed to 'going green' and reducing carbon emissions, evaluating solutions on a Total Cost of Ownership (TCO) basis, incorporating up front capex, transportation, maintenance et cetera.

Vodafone typically has two to four hours of battery backup power at sites in good grid markets such as those in Northern Europe. Greater autonomy is required in SSA, where high temperature lead-acid batteries are most commonly used, although Vodafone are looking at future energy storage chemistries.

Econet Power

COO Neil Taylor represented in-house ESCO Econet Power, recently carved out from Econet Zimbabwe. While parallel carve-out Econet Towers manages only the towers, Econet Power manages the energy systems at 1,380 sites.

While Zimbabwe's grid is characterised as "bad everywhere", downtime had reduced from an average of around ten to just 2-4 hours per day at the time of the Meetup, although the impact of the subsequent currency crisis remains unclear. Just 3.5% of Econet's sites were completely off grid, and over 90% of those sites had solar installed. Around a quarter of their total site network was hybridised, primarily with lead-acid batteries.

What is the typical power load on a site?

Of course it depends on the configuration of the site. An indoor site could have a load as high as 8-10kW, a hub site even higher, but most sites have a power load around 2-3kW per tenant. Energy efficiency initiatives can bring that down to 1.5-2kW.

Single tenant, rural sites might typically be in the 1-1.5kW range, although we've seen as low as 300W.

Outage durations and implications for Service Level Agreements (SLAs)

There is huge variation in outage from country to country and from month to month. "We might have a Nation wide outage for six to eight hours, then have no outages for months," said Econet Power, commenting on Zimbabwe. While seldom as severe, Tanzania was similarly unpredictable, at least outside of Dar es Salaam.

Rather than try to quantify outages, it is perhaps more pertinent to focus on SLAs and their implications for required cell site autonomy: one MNO typically required 10-20 hours autonomy in their RFPs, while a towerco sought four hours at urban sites and six hours at rural sites.

"A battery hybrid site might need eight hours autonomy and discharge to around 50% during a typical outage," offered one participant as an example.

If you're sizing your battery bank for 10, 12 or even 20 hours of autonomy, meaning it's 'lazy' most of the time, does that mean there might be a business case for a mix of lead-acid and lithium-ion batteries in the bank? Helios Towers Africa suggested there might be around 200 of their sites in Tanzania where such an approach could prove viable.

How to extend battery lifecycles?

How long are batteries lasting? "At one of our low cost 500W rural sites, operating in 20-35°C, we'll schedule the swap of the batteries after three years," said a representative of TowerTech, a managed service provider with experience of building off-grid sites.

Vodafone typical sought five year lifecycles from their battery banks, while Helios Towers Africa reported that a battery might typically last two and a half years at an air cooled outdoor site operating up to 35°C, although batteries would be replaced sooner if autonomy dropped below a certain threshold, or if low voltage alarms were being triggered early.

"Previously rectifiers were killing batteries in as little as 18 months; energy efficiency isn't just about batteries," said one buyer. "In my experience, it is often the rectifier that causes under or over charging, so it's about how the DG, rectifier and battery work together."

How bad is the problem of battery theft?

Battery theft is an acute problem in some markets, it can be almost non-existent in others. "We have had no battery thefts since I started with the company," suggested one participant.

"We have 3-4% battery theft per year," said another.

"It's higher than 5% in South Africa," offered a third

participant, suggesting that TCO increased as much as 20% over a five year period due to theft.

It was generally agreed that battery theft was being reduced, and that the problem was not as acute as perceived, although it was acknowledged that the resultant downtime could be disproportionately harmful to reputations.

Helios Towers Africa reported having significant success reducing battery theft originating within the supply chain. Their holistic approach involves splitting O&M contracts between suppliers to create competitive benchmarks, eradicating "bad apples", investing in access control solutions, process optimisation and training, and simply making sure security guards are fairly paid to reduce temptation to steal. "It's all about creating accountability. While these steps will initially increase opex, it drops in the long term," concluded Helios.

What buyers want from their battery suppliers

There is an inherent contradiction in two key forces; buyers have strict guidelines for recycling and re-use of equipment, yet they increasingly want to see re-use scenarios reduced and scrap value minimised to disincentivise battery theft.

Integrating GPS has had minimal effect; one buyer said it "over-complicates matters", while another pointed out that law enforcement authorities seldom have the capacity to track stolen batteries in an effort to apprehend thieves.

Intelligent batteries which can monitor and protect themselves, and other equipment, may be an important development, but beware creating data overload as MNOs and towercos can struggle to integrate, analyse and respond to thousands of data points from thousands of sites.

> "What matters more than the warrantee is the level and quality of training your product teams provide my service teams, and ultimately our charging behaviour"

Alternate chemistries

"Lithium ion and flow batteries won't replace lead acid over night," commented one buyer, asking that vendors focus on best fit use cases initially to enable limited trials (vendors suggested 100 site trials would be better than 10 sites!) The buyer continued: "we need to see a full business case, with complete costs and ROI."

Vodafone Procurement Company highlighted their process; an initial business case from which TCO can be derived. Next follows an in-house or third party trial. Asked target return on investment, Vodafone simply said "ASAP", and depended on the size of the investment, although they admitted more than four years would be too long. "There is no magic number for battery ROI," they concluded.

Fixing battery warrantees

Buyers complained that standard lead acid battery warrantees were meaningless in emerging market operating conditions . "There has to be some limitation with lead acid battery warrantees," responded one vendor. "Cycles kill lead acid more than temperature."

A flow battery vendor countered "we'll offer a guaranteed energy throughput, localised warrantees based on operating temperatures up to 60°C, regardless of depth of discharge."

A lithium ion battery vendor offered similar terms: a guaranteed kWh output with a maximum operating temperature as high as 60°C.

The lead acid battery vendor countered "alternate chemistry batteries have to be as easy to deploy as lead acid before these factors come into play."

"What's needed is a warrantee with a margin for error," suggested another vendor.

"What matters more than the warrantee is the level and quality of training your product teams provide my service teams, and ultimately our charging behaviour," concluded a buyer ■

Supporting insights from leading energy storage equipment providers to towercos and MNOs in AME

Aquion Energy

Aquion Energy is the manufacturer of proprietary Aqueous Hybrid Ion (AHI™) batteries and battery systems for long-duration stationary energy storage applications. Aquion's Aspen line of batteries are optimized for daily deep cycling for residential solar, green architecture, off-grid and microgrid, energy management, and grid-scale applications. Aquion's high-performance, safe, sustainable and cost-effective batteries deliver reliability and value for customers. The company's battery systems provide flexible, modular energy storage that enables broad adoption of renewable energy technologies such as wind and solar, reduced reliance on fossil fuels, and optimization of existing grid-tied generation assets. For more information, visit our website.

www.aquionenergy.com

EnerSys

EnerSys® is the global leader in stored energy solutions for industrial applications. We complement our extensive line of motive power, reserve power and specialty products with a full range of integrated services and systems. With sales and service locations throughout the world. Headquartered in the United States, with regional headquarters in Europe and Asia, EnerSys employs over nine thousand people and operates 32 manufacturing and assembly facilities world-wide. This vast infrastructure and over 100 years of battery experience positions EnerSys at the forefront of both manufacturing capabilities and new product development.

www.enersys.com/GlobalLanding.aspx

GS Yuasa

GS Yuasa is a Japanese company formed in 2004 by the merger of two large 100 year old battery manufacturers, Japan Storage Battery and Yuasa. At US$3.5B in sales, GS Yuasa is one of the worlds largest battery manufacturers.

GS Yuasa manufactures a full line of technologies including lithium, lead acid, nickel metal hydride, and nickel cadmium for the automotive, industrial, and specialty battery markets. Especially for Telecom market, we have developed a 48V lithium ion battery module that has outstanding cyclic life and charge acceptance that can reduce the runtime of generators and the total cost of ownership of telecom base stations.

With 37 affiliates in 17 countries, GS Yuasa has a worldwide presence operating under the GS Yuasa, GS, and Yuasa brands.

www.gs-yuasa.com/jp/index.asp

NorthStar

NorthStar is an industry leader in designing and manufacturing high performance lead-acid batteries and high efficiency site solutions. The company has state-of-the-art facilities in the USA, and their products are used in more than 120 countries worldwide. NorthStar premium thin plate AGM batteries deliver long life at elevated temperatures, with faster recharge and superior PSOC cyclic performance. NSB Blue+ Batteries can reduce diesel generator run time by 85% in offgrid telecom applications. SiteStar Cabinets can maintain batteries at optimal operating temperatures, using less power than a household lightbulb. If you need the best, you need NorthStar.

www.northstarbattery.com

Redflow

Redflow Limited is an energy storage specialist that has developed the world's smallest flow batteries.

Redflow's unique flow batteries are designed for stationary energy storage applications ranging from its ZCell home battery to its ZBM battery range for commercial, telecommunications and grid-scale deployment. Redflow is a publicly-listed company (ASX: RFX) that operates R&D facilities in Australia, as well as offices in the US and Europe. Produced in North America by Flex, one of the world's largest supply chain solution companies, Redflow's high energy density batteries are sold, installed and maintained by a global network of system integrators. Redflow batteries connect directly to the telco bus, experience no damage from regular power outages, are 100% depth of discharge and their full capacity is usable over lifetime.

www.redflow.com

Saft

Saft is the leader in high technology batteries, and has developed specifically for Telecom backup need a lithium module of 48V: Evolion.

Evolion is the perfect choice for off grid sites: combined with a Diesel Genset, it will bring high cycling capability, to save fuel consumption and drastically reduce running time of the genset.

Evolion has a compact format, that will help to be integrated in very limited space, and is maintenance free, reducing the OPEX of the hybrid off grid or on grid site.

www.saftbatteries.com

Environmentally friendly battery achieves lower TCO than lead-acid batteries

Aquion Energy's Aqueous Hybrid Ion solution

Matt Maroon, Vice President, Product Management, Aquion Energy

Aquion Energy's Aqueous Hybrid Ion chemistry offers an environmentally-friendly solution which is particularly important for developing countries with no robust recycling programmes in place. The battery's resistance to high temperatures and ability to withstand deep cycling, partial state of discharge conditions make it ideally suited to off-grid applications, and with a TCO lower than lead acid batteries offers a financially compelling alternative. TowerXchange speak to Aquion Energy to learn more about their innovative solution.

Keywords: Aquion, Aquion Energy, Batteries, Energy, Energy Efficiency, Energy Storage, Microgeneration, Off-Grid, On-Grid, Opex Reduction, Renewables, Solar, Unreliable Grid, Who's Who

Read this article to learn:

- The appetite amongst tower owners for environmentally friendly batteries and their importance in developing countries
- The resistance of Aquion's battery to partial state of discharge conditions, deep cycling, variable power supply and high ambient temperatures
- The extent to which Aquion Energy's batteries have been deployed globally
- How TCO compares to lead acid batteries

TowerXchange: Please can you introduce Aquion Energy and where they sit in the telecoms supply chain.

Matt Maroon, Vice President, Product Management, Aquion Energy: Aquion Energy manufactures maintenance-free, daily deep-cycling batteries that provide energy storage for off-grid and weak-grid telecom towers. Our batteries store power generated from solar and enable towers to run from solar during nighttime hours or during periods of cloud cover. This enables telecom towers to provide reliable service and reduce their use of diesel considerably.

TowerXchange: Can you explain the benefits of Aquion Energy's aqueous hybrid ion chemistry batteries? What has been the reaction of industry to their environmentally-friendly design? Do you see this as becoming increasingly important?

Matt Maroon, Vice President, Product Management, Aquion Energy: Aquion's batteries are made using our unique environmentally-friendly Aqueous Hybrid Ion (AHI) chemistry. They contain no heavy metals or toxic chemicals, and are non-flammable and non-explosive. We have found that safety and sustainability resonates with our customers and sets us apart from traditional battery chemistries. The environmentally benign content of our batteries is especially important in developing nations that do not have robust recycling programs in place. If our batteries are landfilled or recycled by hand, this poses no danger to people and the environment.

TowerXchange: What is the sweet spot for the battery in terms of grid availability?

Matt Maroon, Vice President, Product Management, Aquion Energy: The sweet spot for Aquion batteries are sites that are off-grid and require long duration storage of anywhere from four hours to multiple days. The AHI chemistry in the battery is not negatively affected standing partially charged when the solar PV generation varies. This is a problem for lead acid batteries. Also high ambient temperature doesn't affect the life of the Aquion batteries.

TowerXchange: How proven is the solution in the field? Who are your key clients and what results have been achieved relative to other batteries?

Matt Maroon, Vice President, Product Management, Aquion Energy: Aquion has been shipping commercially for over two years and we have shipped over 30 MWhs of batteries to over 200 locations worldwide. We have a demonstration telecom site in Chile with Wireless Energy, three telecom installations in China - two that are grid-tied and one off-grid, and an off-grid telecom installation scheduled for South Africa in Q4 of this year. We also have numerous off-grid microgrid systems in the field that operate the same way a telecom system operates. Our batteries are paired with a solar array which carries the load during the day and charges the batteries. The batteries are discharged to feed the overnight energy loads and during periods of cloud cover. The systems include a diesel generator for emergency backup. For more examples of our projects in the field, including an off-grid microgrid project for ecotourism lodges in Kenya, an off-grid farm in Hawaii, visit our blog at blog.aquionenergy.com.

> "The environmentally benign content of our batteries is especially important in developing nations that do not have robust recycling programs in place. If our batteries are landfilled or recycled by hand, this poses no danger to people and the environment"

TowerXchange: What kind of maintenance do the batteries require and what is their lifespan?

Matt Maroon, Vice President, Product Management, Aquion Energy: Our batteries are sealed and maintenance-free. We expect 8+ years of life in the field when they are daily cycling with deep discharge. Aquion batteries are high temperature tolerant, and can operate from -5°C to 40°C with no HVAC required. On the high end that's 40°C averaged over 24 hours. The batteries are robust and abuse tolerant; they can sit at partial states of charge without degradation, they do not require a trickle charge, and they are designed to daily deep cycling which makes them an ideal match for long-duration solar self-consumption applications. They are long-lasting, 2-3 times that of lead acid, and therefore require fewer replacements.

TowerXchange: What warranty and sales support do you offer?

Matt Maroon, Vice President, Product Management, Aquion Energy: We offer a standard 8 year warranty. We have a sales team that covers the global market, as well as partners that distribute, design, and install systems worldwide.

TowerXchange: How does the TCO of an energy system incorporating your solution compare to systems incorporating other batteries?

Matt Maroon, Vice President, Product Management, Aquion Energy: Given that our batteries can cycle to 100% depth of discharge, are temperature tolerant, and last 2-3 times as long as lead acid, we have found that Aquion-based hybrid storage systems deliver a lower TCO over lead acid. Our batteries operate with most solar charge controllers on the market so they can be installed at existing sites to replace lead acid batteries ■

Uncontrolled cyclic use of batteries and deep discharge recovery

EnerSys bring their Genesis EP battery to the poor/unstable grid telecoms sector

Anssi Laitinen, Marketing Director, Reserve Power EMEA, EnerSys

In poor or unstable grid scenarios, batteries installed on cell sites are regularly subjected to uncontrolled partial state of charge (PSOC) conditions and medium to high cyclic use. This, coupled with the often high ambient temperatures at such sites, puts significant stress on the energy storage system in place. Enersys' deep discharge capable batteries have had significant success in other applications and the company is now introducing their PSOC capable Genesis EP battery to the telecom market. TowerXchange speak to Enersys, one of the global leaders of energy storage solutions to learn more.

Keywords: Batteries, Capex, Energy, Energy Efficiency, Energy Storage, Enersys, Monitoring & Management, Outdoor Equipment, ROI, Unreliable Grid, Who's Who

Read this article to learn:

- Enersys' history and experience in the telecom sector
- How Enersys' Genesis EP battery is ideally suited for unstable grid conditions
- Key factors to consider in TCO calculations and battery selection
- Theft protection systems inbuilt into Enersys' cabinets
- How remote monitoring and control systems enable better battery management

TowerXchange: Please can you provide an introduction to EnerSys® for those who are not familiar with the company?

Anssi Laitinen, Marketing Director, Reserve Power EMEA, EnerSys: EnerSys is the global leader in stored energy solutions for industrial applications. We manufacture and distribute reserve power and motive power batteries, battery chargers, power equipment, battery accessories and outdoor equipment enclosure solutions to customers worldwide.

Motive power batteries and chargers are utilised in electric forklift trucks and other commercial electric powered vehicles. Reserve power batteries are used in the telecommunication and utility industries, uninterruptible power supplies, and numerous applications requiring stored energy solutions including medical, aerospace and defence systems. Outdoor equipment enclosure products are utilised in the telecommunication, cable, utility, transportation industries and by government and defence customers. EnerSys also provides aftermarket and customer support services to customers from over 100 countries through our sales and manufacturing locations around the world.

We have extensive long term experience in power management in Middle East and African telecom backup power applications. EnerSys has also introduced many innovative solutions, such as SBS® EON Technology® batteries that provide up to four times more cycles than the standard Absorbent Glass Matt (AGM) batteries in hybrid applications.

“We have recently introduced a PSOC capable Genesis EP® battery which is based on thin plate pure lead technology and has enhanced the ability to recover from deep discharge. This helps in case the battery has entered to this state of discharge, which is quite common in these grid type conditions”

TowerXchange: Why is it imperative for tower companies and operators to consider the location of the towers when deciding on their choice of batteries? How does grid availability and reliability affect battery choice?

Anssi Laitinen, Marketing Director, Reserve Power EMEA, EnerSys: In general, the grid connectivity or lack of it can be divided to three main areas: in the stable grid environment there is only minimal cyclic use for batteries and a relative stable ambient temperature. The stable grid does not necessarily demand a battery compatible with harsh conditions.

The unreliable grid may need a battery capable of withstanding partial state of charge and to handle more repeating cycles.

In the off-grid scenario we typically find a diesel generator and battery as a ‘hybrid’ solution. The hybrid solution can also incorporate renewable energy sources such as a wind turbine or photovoltaic array. Warm ambient temperature and regular cyclic use in the off-grid scenario place again different demands for the battery. Understandably it is challenging to choose the right battery, and in addition one needs to also consider related equipment such as outdoor enclosures. A one fit for all approach does not work in these scenarios.

TowerXchange: Considering that poor-grid is still quite common in most parts of Africa what new solutions are available for sites situated on poor-grid? How extensively have these been deployed?

Anssi Laitinen, Marketing Director, Reserve Power EMEA, EnerSys: When there is a poor or unstable grid this often means that there is a condition that we call uncontrolled cyclic use of batteries. Very often there is also a warm ambient climate. The battery solutions available should match to the uncontrolled partial state of charge (PSOC) conditions and the medium to high cyclic use of the battery. We have recently introduced a PSOC capable Genesis EP® battery which is based on thin plate pure lead technology and has enhanced the ability to recover from deep discharge. This helps in case the battery has entered to this state of discharge, which is quite common in these grid type conditions. EnerSys has earlier introduced these type of deep discharge capable batteries in other applications such as renewables and home energy storage, and now we are introducing this to the telecom environment.

TowerXchange: In terms of reducing the total cost of ownership of power management there are multiple choices available for equipment such as cabinets, cooling and rectifiers. How does the choice of each affect costs and what recommendations does EnerSys have?

Anssi Laitinen, Marketing Director, Reserve Power EMEA, EnerSys: This is a question that may need a webinar or a lecture to answer in detail, but I will try to provide a short answer here.

In general, the Capex (Capital Expenditure) costs for batteries consist of the battery costs, transportation, installation and overheads. The Opex (Operating Expenditure) costs then cover energy consumption and maintenance of the backup power solution. We have TCO (Total Cost of Ownership) calculators in place for discussion with our customers to assist them with their choices.

However, in the hybrid scenario, the generator maintenance costs and the fuel savings and site visit costs are important considerations. The battery needs to recharge quickly and withstand the high cyclic use. The EnerSys hybrid calculator provides guidance for even the most complex total cost of ownership questions.

The cabinet TCO calculations are covering the capital and operating expenditures but are also based on the following criteria: need for equipment protection in general, free cooling, air conditioning and need for anti-theft features. The outside temperature places demands for the cabinet and cooling method choices. In comparison with batteries, one deployment strategy rarely fits. You will need to consider the need for cooling batteries and other equipment such as rectifiers and power equipment. Some batteries can withstand higher temperatures so you may not want to have the most expensive cooling method, however, in the hybrid scenario the cycles may kill the battery before the temperature element starts to affect the battery life.

TowerXchange: Battery theft is a major issue at the moment. Are there new ways to combat this?

Anssi Laitinen, Marketing Director, Reserve Power EMEA, EnerSys: There are two ways to look at battery theft from the site operations perspective. If the strategy is to retrofit existing sites with battery protection, then we have battery protection alternatives. If however you want to start a green field operation and need both new battery cabinets and batteries, our outdoor enclosures can provide anti-theft features today.

There are more than half a dozen different protection features available in our cabinets. Thus if you are considering a new site with new cabinet options then you should look at the anti-theft features available both in the cabinet and in the batteries.

TowerXchange: Should tower companies look at remote monitoring of batteries and what benefits this will bring?

Anssi Laitinen, Marketing Director, Reserve Power EMEA, EnerSys: Most definitely they should. With remote monitoring, one reduces the need for site visits. Many industries are already using remote monitoring of their equipment. The benefits are key here with the protection of assets. This can be 24/7 and this can be crucial for instance in the hybrid-off grid scenario as in these sites the backup power solutions provide for the real operation of the site, hence the need for better monitoring. There are additional benefits available if one wants to consider even more advanced solutions: remote management. Instead of sending someone on site, the voltage of a battery can now be corrected remotely, saving an unnecessary site visit ■

EnerSys will be exhibiting at the 2017 TowerXchange Meetup Africa & Middle East, taking place on 3-4 October at the Sandton Convention Centre. **www.towerxchange.com/meetup/meetup-africa/**

Lithium ion batteries could eliminate the need for diesel generators

Perspectives on a new generation of energy storage solutions

Soichi Hanano, General Manager, Industrial Battery, GS Yuasa

GS Yuasa is a leading manufacturer and distributor of energy storage solutions which has been serving various industries for decades prior to its final merger back in 2004. The company has been supplying mobile network operators with its solutions and is now actively doing business with independent towercos and ESCOs.

In this exclusive interview, GS Yuasa's General Manager, Mr Soichi Hanano, shares his views and insights on the dynamics of the energy business and how the company can support green targets as well as cost reduction initiatives.

Keywords: GS Yuasa, Southeast Asia, Japan, Southern Asia, East Asia, China, India, Bangladesh, Pakistan, Australia, Thailand, Hong Kong, Asia Pacific, Interview, Batteries, Opex Reduction, Energy Storage, Lithium, Off-Grid, Unreliable Grid, ESCOs

Read this article to learn:

- GS Yuasa's footprint, client base and evolution
- Why lithium ion batteries are the right choice for off-grid sites
- How the right battery can support green initiatives
- The evolution of the industry business model and the arrival of towercos and ESCOs

TowerXchange: Tell us about GS Yuasa.

Soichi Hanano, General Manager, Industrial Battery Department, Marketing Division, International Business Unit, GS Yuasa: GS Yuasa is a Japanese company formed in 2004 by the merger of two large, 100-year old battery manufacturers; Japan Storage Battery Co., Ltd., known as GS, and Yuasa Corporation. At US$3.5 billion in sales, GS Yuasa is currently one of the world's largest battery manufacturers.

GS Yuasa manufactures a full line of technologies including lithium ion, lead acid, nickel metal hydride, and nickel cadmium for the automotive, industrial, telecommunications and specialty battery markets. With thirty-six affiliates in sixteen countries, GS Yuasa has a worldwide presence operating under the GS Yuasa, GS, and Yuasa brands.

TowerXchange: Who are your key clients and which products are they showing their interests the most?

Soichi Hanano, General Manager, Industrial Battery Department, Marketing Division, International Business Unit, GS Yuasa: Our key clients in the telecommunications sector are mobile network operators who own telecom towers to whom we have been supplying batteries for many years. However towercos and ESCOs, who have started managing passive equipment including batteries, are becoming a very relevant part of our business. We are aware that the independent towerco model

is widely accepted in developing countries, where the need for cell site densification and extension is urgent and capex intensive.

In terms of customers' requirements, we experience a variety of scenarios. Although our principle service is to supply batteries for site backup, the choice of product depends on a combination of factors, including peripheral devices, renewable generation, remote monitoring, electricity condition and grid stability.

GS Yuasa is a well established battery manufacturer with exceptional experience of supporting new applications. It is our strength to have a wide line-up of products such as long life VRLA, advanced VRLA with superior cyclic life performance and lithium ion batteries. Our new lithium ion products have cutting edge performance, which allows us to offer new approaches to energy storage that were not previously feasible.

The lithium ion battery has especially superior characteristics for cyclic life performance, quick charging and deep discharging and is attracting a huge amount of interest from MNOs as well as towercos, who use lithium ion batteries as a core power component for the telecom base stations in areas with poor electricity networks.

TowerXchange: What is the percentage of your business coming from MNOs versus towercos? And how big of a change the entrance of towercos represented for your business?

One of GS Yuasa solutions

Soichi Hanano, General Manager, Industrial Battery Department, Marketing Division, International Business Unit, GS Yuasa: I'd say to date 60% of our business comes from MNOs and 40% from towercos. However, the percentage of business coming from towercos has been increasing and we presume the trend will continue in the future, as the business model for managing telecom towers continues to change.

Today towercos are focusing intensely on reducing opex as this is the primary way for them to increase profitability. GS Yuasa has had to provide much support to towercos in their pursuit of efficient operation as we have considerable project management experience in terms of recognising and analysing telecom base station load patterns by data logging and proposing the most suitable power system, depending on the site condition. We then follow up with a field trial and, eventually, with the commercial implementation. Our approach is particularly useful for MNOs and towercos who have experienced site instability due to poor power quality.

GS Yuasa is working not only as a battery manufacturer and supplier but also proposing green power solutions that can contribute to reducing opex as well as CO2 in the long term.

TowerXchange: How does GS Yuasa address the environmental issues in markets where green initiatives are flourishing?

Soichi Hanano, General Manager, Industrial Battery

> The lifecycle of lithium-ion batteries is five to ten times greater than currently utilised lead acid technology and their performance is not degraded, even if they never experience a full charge

Department, Marketing Division, International Business Unit, GS Yuasa: Our batteries are usually deployed as components of larger systems. Their use in the power delivery system of a telecom base station is a typical example. We believe that the environmental impact of our products should be evaluated as part of the whole assessment of a particular application, rather than a narrow definition of battery production and disposal impacts.

In off-grid and unreliable grid scenarios, the choice of battery can strongly influence the selection of the primary energy source. Our lithium ion technology is allowing our clients to avoid utilising any fossil fuel based solution thanks to its high charge acceptance and long cycle life at elevated temperatures. In some sites we are able to avoid the deployment of diesel generators altogether by harnessing intermittent grid supplies or renewable power sourcess more effectively.

Having an overall cost benefit, in addition to environmental advantages, generally helps promoting green initiatives. Luckily this isn't hard when diesel generators are involved!

Local operating conditions can have an enormous impact in the choice of the appropriate green storage solution. The lead acid battery is often perceived as an environmental hazard because of its heavy metal content. In reality, lead is exceptionally recyclable, therefore we can easily demonstrate its advantages as long as a safe recycling infrastructure is locally accessible. Our company is unique in our range of traditional and new battery technologies, which allows us to provide an unbiased view of the most appropriate green solution to a particular application.

TowerXchange: What performance and RoI can be achieved with lithium-ion batteries at unreliable or off-grid sites? How do life-cycles compare with lead acid batteries?

Soichi Hanano, General Manager, Industrial Battery Department, Marketing Division, International Business Unit, GS Yuasa: Utilising lithium-ion batteries in unreliable or off-grid sites can deliver great opex savings and overall financial benefits. In fact, full charge can be obtained in less than two hours, which means that even in the case of frequent power outages, the need for diesel fuel purchases and delivery costs can be greatly reduced or eliminated altogether. For some sites we have shown that DG capex can also be avoided which allows companies to achieve the payback point within one or two years.

The lifecycle of lithium-ion batteries is five to ten times greater than currently utilised lead acid technology and their performance is not degraded, even if they never experience a full charge. These characteristics greatly improve the flexibility of operation and reduce maintenance requirements of our products. Soon after the payback period, our clients start realising the advantageous opex savings which last for many years until replacements are required.

Finally, the electronic state of health monitoring system is an integral component of our products. It allows remote monitoring to be applied throughout the life of a telecom base station to provide long term operating efficiencies. In particular it means that there is no need for local input from skilled technicians to maintain the operation of the battery. The optimum performance and replacement strategy can be applied to every site across a whole network ■

NorthStar: more than just a battery company

Market leaders in premium lead acid batteries committed to understanding and resolving their customers' energy storage problems

Thierry Tardivent, Head of MEA and APAC, NorthStar Battery

NorthStar is more than just a battery company. They've made a commitment to really supporting their customers. A commitment to help customers select the right batteries. A commitment to identify and resolve power system problems, even if they aren't caused by batteries. And a commitment to manufacture, and dispose of, lead-acid batteries in an environmentally aware manner. Of course, NorthStar also manufactures premium lead acid batteries which they say represent the best compromise between capex and opex, which is why they are one of the market leaders in energy storage for emerging market cell sites.

Keywords: Who's Who, How to Guide, Meetup Preview, Energy, Installation, Opex Reduction, Batteries, Fuel Security, Air Conditioning, Off-Grid, Unreliable Grid, ROI, Hybrid Power, DG Runtime, Dimensioning, Procurement, Warehousing, Shelters, Rectifiers, Africa, Asia, Pakistan, NorthStar Battery

Read this article to learn:

- Why premium lead-acid batteries remain the best compromise between capex and opex
- How to choose the right battery for the grid profile and application
- How to overcome common problems in the installation and setting of batteries
- How to cool batteries with just 40W, even at 30-40°C ambient
- How to protect batteries from theft and vandalism

TowerXchange: Please introduce NorthStar to our readers - what role do you play in the telecoms infrastructure ecosystem?

Thierry Tardivent, Head of MEA and APAC, NorthStar Battery: Since 2000 NorthStar's telecom batteries and site solutions have been delivered in more than 150 countries. NorthStar helps its customers globally to extend battery life and save energy by providing High Performance AGM Batteries specially designed for different grids and telecom applications – I believe today NorthStar Batteries makes the best AGM batteries in the industry.

But NorthStar Battery is more than just a battery company. We also have a unique expertise in power systems for emerging markets which is key to optimise battery life and energy saving.

TowerXchange: We usually ask how many cell sites in Africa, LatAm and Asia the interviewee's solutions are installed - I guess that may be difficult to specify given the scale of NorthStar's business! However, can you give us a sense of the size of your telecoms business in those three regions.

Thierry Tardivent, Head of MEA and APAC, NorthStar Battery: Tens of thousands sites in MEA are equipped with NorthStar products. In Pakistan alone, Northstar has equipped over 5,000 sites with a pure fuel saving application delivering outstanding results. Many thousands of hybrid sites in Africa have been equipped with NorthStar

technology since 2000.

TowerXchange: Why are lead acid batteries standing up to the challenge of alternate energy storage chemistries in a telecom context?

Thierry Tardivent, Head of MEA and APAC, NorthStar Battery: Frank Fleming, our renowned CTO, has a strong belief that lead acid can remain the technology of choice for telecom energy storage for the next 50 years, as long as we push the limits of the design.

We also want to push back against the bad environmental image of lead acid batteries, which is why we invested massively in environmental controls when we built our new factory. Many of our key customers select NorthStar as their preferred / strategic supplier partly because of our strong environmental control. Corporate Social Responsibility policies make environmental control a key target for companies like Ericsson, with whom we've been a key strategic partner since 2002. We're also strategic suppliers to NSN, Huawei and ZTE.

TowerXchange: How much tailoring to the specific requirements of individual sites can really be achieved through the selection of batteries?

Thierry Tardivent, Head of MEA and APAC, NorthStar Battery: One battery cannot fit all applications. You need different chemistry depending on the grid profile and energy situation. There's a huge difference between the battery you should deploy on a stable grid in USA, compared with the unpredictability of the grid in Pakistan, and pure off grid applications in Myanmar for example.

NorthStar differentiates ourselves by offering different chemistry depending on the application and grid profile. Whereas with other vendors the battery is a standard, commoditized component, forcing site designers to solve their problems through the modification of other power systems, NorthStar have been able to customise the design of our batteries for different grid availability and telecom applications.

For example, one of the most unstable grids we have experienced was in Bangladesh. No matter what power system we used, there were so many repeated power outages that it seemed we were never able to fully recharge our batteries. That presents a problem for traditional lead acid energy storage technology, but we were able to modify our electro chemistry to be fully partial state of charge (PSOC) compatible.

TowerXchange: Why is the replacement cycle so much shorter for batteries on developing market cell sites, and what can be done to deliver reliable, sustainable power?

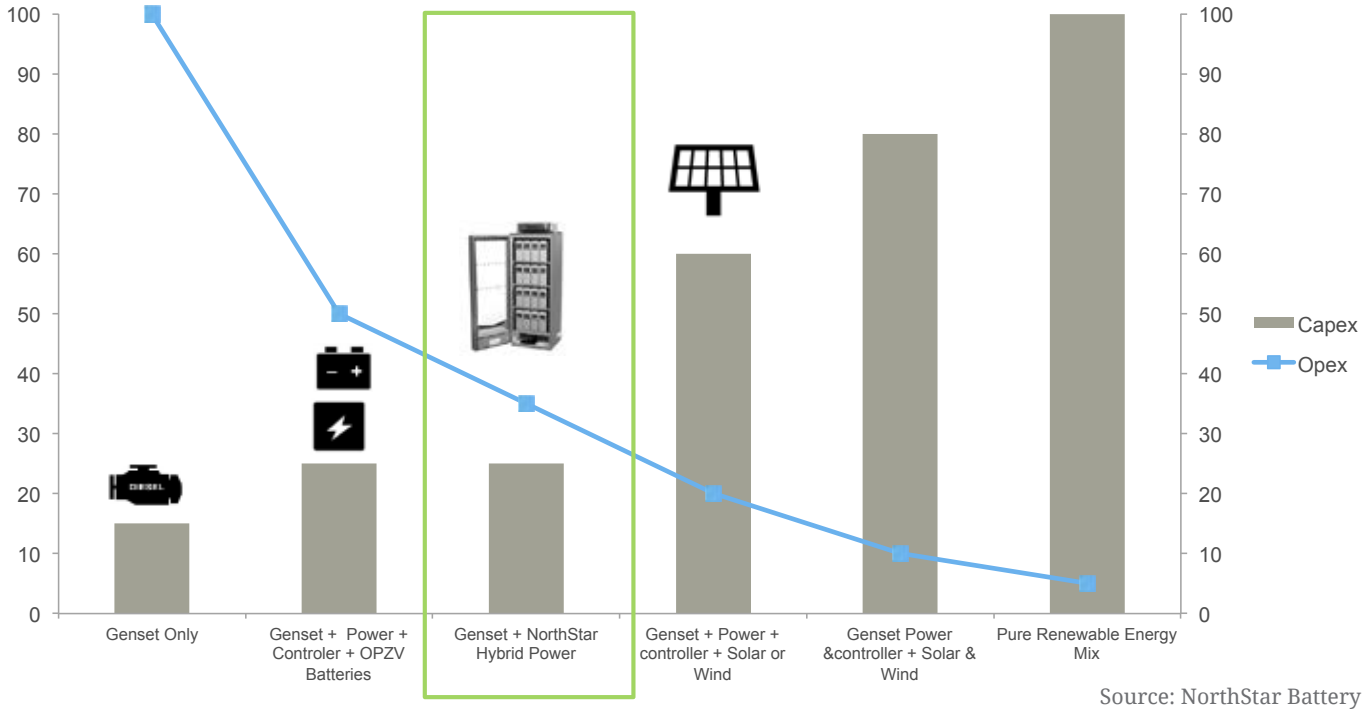
Thierry Tardivent, Head of MEA and APAC, NorthStar Battery: We think there is too little understanding of why batteries are failing. While the right choice of battery is crucial, it's as much about the electrochemistry as it is the choice of supplier – so simply switching to a different supplier won't fix the problem. Energy storage solutions need to be redesigned to provide reliable, sustainable power to cell sites in emerging markets, providing faster recharge, high cyclic, high temperature, high efficiency operation.

You need to deploy the right power system, on the right settings and ensure it's installed properly. This is why we are lauching the NorthStar Academy – to help to extend battery life by two to three times and save energy.

While some battery vendors may prefer their batteries die sooner to accelerate replacement cycles and sales volumes, NorthStar want to make sure our batteries last a long time and deliver the opex savings targeted. Our success comes from our people in the field, people with a background from the power industry, who can address power system problems holistically and who can help our customers fix those problems. If it's not a battery problem, we don't just say "talk to the power system vendor", we help the customer to change controller settings, cabling et cetera – training their people to avoid repeating mistakes.

TowerXchange: I understand NorthStar initially, and to a certain extent still do, sell a significant proportion of batteries via OEMs – how does the entry of the independent towercos affect the criteria against which energy storage solutions are acquired?

Thierry Tardivent, Head of MEA and APAC,



Source: NorthStar Battery

NorthStar Battery: We have always had a strong strategic relationship with OEMs and we will always will. But we also realised we need to accelerate the battery technology and solutions awareness at the end customer level such as with towercos as they are more and more driving the battery selection process.

Our technology has been approved already by two major emerging market towercos this year. We still see a few examples where energy storage solution selection is driven by short term capex savings, resulting in a temporary improvement in the P&L. However, making the wrong decisions in the selection of energy storage is does not yield performance improvements that are sustainable in the medium and long term, particularly at unstable and off grid sites.

There are only three or four factories worldwide that can manufacture premium AGM batteries. But the good thing about premium AGM is that they have a two year shelf life thus we can then easily maintain inventories in hubs all around the world and provide a short lead time to our customers; we adapt to the logistical challenges to ensure our products are available as close as possible to market.

TowerXchange: What is the performance, and cost, difference when using premium lead acid batteries versus lower cost alternatives at cell sites in harsh conditions?

Thierry Tardivent, Head of MEA and APAC, NorthStar Battery: A premium AGM (thin plate technology) would normally cost 30% more than a Standard AGM battery with three to four times greater storage life and up to five times longer operating life in real harsh conditions (typically 2.5 X the life).

A lot of our customers are migrating from dual DG to DG plus battery hybrids to cut DG runtime by 50% or more. If you want to optimise energy efficiency programmes, you have to think about total efficiency; about DG efficiency, the efficiency of rectifiers, and the efficiency of batteries. A standard battery can suffer two to three times more loss than a premium battery, which can make a huge difference for some applications. A premium, fast charge battery can take a lot of energy to recharge the battery in short time, which enables the customer to run the DG faster and more efficiently, for a shorter time.

For example, when we rolled out NorthStar Blue Technology in Pakistan, we found that most of the operators were buying low cost batteries because of their focus on capex. When they saw that at off grid sites we were cutting DG runtime by up to 85%, we helped them realise that it doesn't even matter if you replace in your batteries every two to three years if you payback the investment in three to four months.

NorthStar Blue Technology is ideal for unstable and off grid sites; it's a fast charge, high efficiency battery with Partial State of Charge (PSOC) compatibility. If used in a hybrid genset combination, it offers the best capex and opex compromise. Other technology such as sodium and lithium batteries are two to three times the price and are not so easy to implement in large scale projects.

TowerXchange: Why are telecom batteries failing so early? And what are the key steps towercos and MNOs can take to extend battery life?

Thierry Tardivent, Head of MEA and APAC, NorthStar Battery: We need to increase customer awareness of the root cause of batteries problems. What NorthStar have done, and what all the battery manufacturers should have done, is make an assessment on over 60 countries where our batteries had been installed, to find out what were the key challenges were with using batteries, and to and try to find a solution for each:

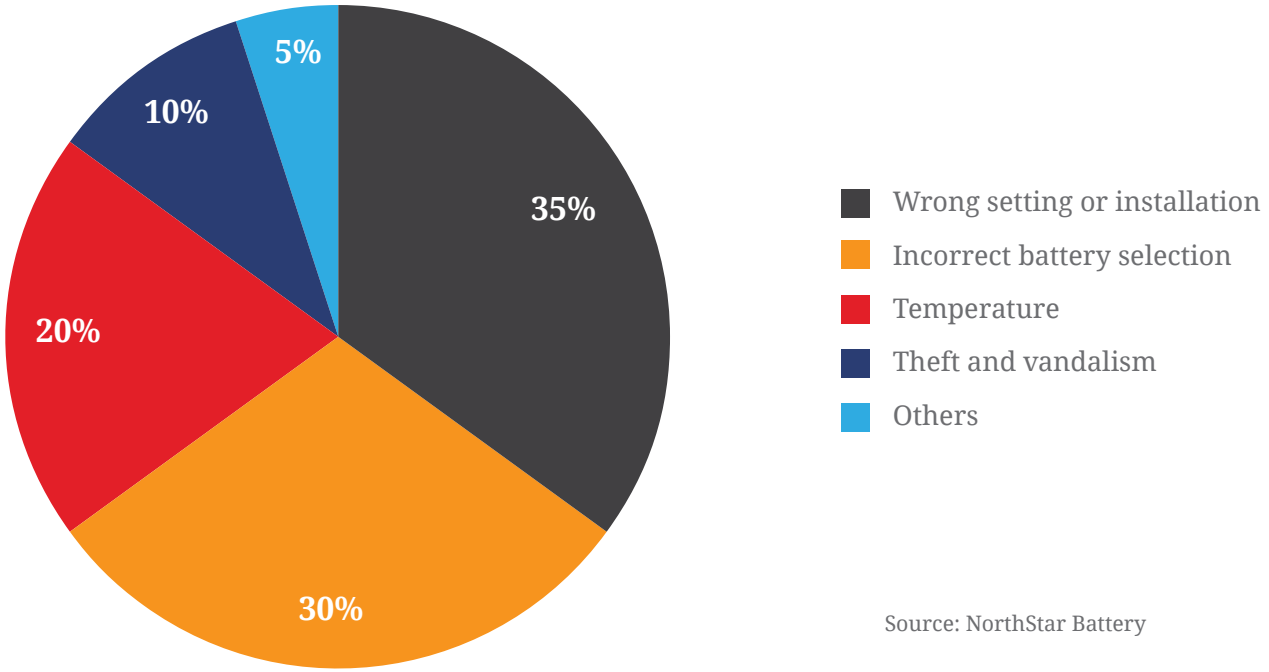
1 Make sure to select the right battery based on grid and application including sizing/dimensioning; in too many cases there is not enough power to recharge the batteries. Our recommendation is that customers need to use different chemistries for different locations.

2 Solve installation and setting issues: everything from cabling the battery properly to controller settings (charging voltage, boost timing et cetera); low voltage disconnect; temperature sensor configuration and cooling systems. Too many site installers don't even know how many rectifiers they need to recharge the batteries – spending an extra US$200 on a rectifier can save a US$5,000 battery bank.

3 Temperature: a 10°C change in temperature can reduce battery performance by as much as 30-50%. But air conditioning just to cool energy storage elements costs a lot of money. A few years ago we partnered with one of the most famous fridge manufacturers to leverage proven consumer product technology into the telecom fields. We took the high efficiency, high reliability DC compressor cooling technology, added a unique cabinet structure and made the world's most efficient telecom battery cooler called SiteStar. We can now cool batteries with just 40W even at 30-40°C ambient. Over 30,000 sites have been equipped with our SiteStar technology to date with very positive feedback from the field.

4 Protect batteries from theft and vandalism: One approach we're trying is to protect batteries in a safe-like structure. We've co-operated with a safe manufacturer to come up with a cabinet which used to be a safe box; made of robust, very thick metal. Another area we're starting to explore is advanced locking systems.

Why are telecom batteries failing so early?



Source: NorthStar Battery

In some countries theft is related to the parallel market; at one point batteries were even being resold to the operators from which they were stolen! This was resolved with a relatively easy to fix – an engraving that cannot be removed. In other cases the parallel market is home usage, but I feel that's minimal.

No single approach to combating theft can be successful everywhere as there are different causes of theft, from theft by large organisation's to pilferage within the fuel supply chain. Ultimately combating theft requires working with the operators and towercos to develop an understanding of the nature of their theft problem and what budget they can afford to resolve it. Theft is a problem, and we want to address it.

NorthStar can help MNOs and towercos overcome all four of these challenges. I'm particularly concerned when people talk about minimising the competence required of people in the field. While the solution needs to be as simple as possible to be installed and operated, the competence of the average field engineer is not necessarily the same in Southern Asia and Africa as it might be in Europe. We see a lot of mistakes in installation, and we're happy to the deliver first training at the NorthStar Academy on the basic principles – we can put all the installers in one room, identify common problems and misconceptions, and make corrective actions.

TowerXchange: How do NorthStar ensure you remain sensitive to environmental considerations from manufacture to disposal?

Thierry Tardivent, Head of MEA and APAC, NorthStar Battery: NorthStar has invested heavily in building the most environmentally advanced battery plant in the world. But our environmental policies actually start from the design of the product; making sure the battery is designed to last longer and also not to deteriorate beyond the end of its life. We are also developing an advanced solution to operate batteries with the minimum energy consumption – our SiteStar battery cooler designed in Sweden is still the most energy efficient Battery cooler in the industry.

TowerXchange: Finally, please sum up how you would differentiate NorthStar's batteries from other energy storage solutions for remote cell sites.

Thierry Tardivent, Head of MEA and APAC, NorthStar Battery: Most battery companies are focusing only on selling their own components. But NorthStar are more than just a battery company. We take a different approach – we really want to help our customers (as well as help ourselves). How we support our customers is a tangible, core value for NorthStar Batteries. In the past few years we've assessed the typical problems faced by our customers, and come up with solutions for what can we do to extend battery life and save energy.

We seek to understand our customers' problems. We'll audit your site for you and we won't leave without giving you an analysis of the problem and corrective actions. You won't get an "it's not a battery problem – talk to power system vendor" attitude with NorthStar – we have a strong competence on the whole power solution, not just the batteries.

We've changed the focus of our business to help our customers understand how to select the right batteries. One best electro-chemistry and battery technology isn't right for all grid profiles and applications. For example, low technology batteries could be good enough for some developed market applications. But battery performance is more problematic in developing markets, so we've developed energy storage solutions for unreliable and off grid applications which we think represent the best compromise between capex and opex.

Lastly we are developing solutions which have a very quick payback. Payback after five to ten years won't work in telecom industry – everything needs to pay for itself in less than two years. NorthStar are focused on developing the best opex solutions, with affordable capex and quick payback – making our energy storage solutions a 'no brainer'! ■

NorthStar Battery will be exhibiting at the 2017 TowerXchange Meetup Africa & Middle East, taking place on 3-4 October at the Sandton Convention Centre.

For more information, visit: www.towerxchange.com/meetups/meetup-africa

Redflow's innovative application of flow battery technology for telecoms infrastructure shows great potential

Zinc-bromide flow batteries are making waves

Simon Hackett, Chairman, Redflow

TowerXchange caught up with Simon Hackett, Chairman of Redflow Limited and a champion of a innovative new commercial application of zinc-bromide flow batteries. Redflow's ZBM battery is a good fit for emerging market telecoms. The ZBM supports a ten+ year lifespan of daily cycles that is insensitive to depth-of-discharge. It can be fully charged and totally discharged every cycle without damage. Accordingly - and unlike other battery types - 100% of the battery capacity can be utilised to supply energy to a telecommunications load without needing to 'oversize' the battery capacity (as is required with other battery chemistries). Zinc - bromide batteries have generally been considered too large and high capacity for deployment on telecoms sites to date, but Redflow are in the process of changing this.

Keywords: Africa, Air Conditioning, Asia, Australia, Batteries, Blue Sky Energy, Central America, DG Runtime, Emerson, Energy Storage, ESCOs, Hybrid Power, Jaladri, Off-Grid, Opex Reduction, Redflow, RoI, Schneider Electric, Unreliable Grid, Who's Who, Zinc-bromide

Read this article to learn:

- The background of zinc-bromide flow batteries and Redflow's new design
- Redflow's global footprint and partner ecosystem
- The performance of flow batteries in remote sites with unstable grids and high temperatures
- Other potential future applications of flow batteries

TowerXchange: Please give us an introduction to your company.

Simon Hackett, Chairman, Redflow: Our Head office and research and development centre is in Brisbane, Australia. Our global presence also incorporates offices in the USA and Europe. Our batteries are manufactured by Flextronics in North America to be sold to the world market. This network provides us with the capacity to sell, integrate and maintain our products internationally. Our batteries are already installed in a range of industries, including telecommunications, agriculture and power distribution, in Australia, Central America, Asia and Africa.

TowerXchange: Tell us about your solution and where it fits in the telecom tower ecosystem.

Simon Hackett, Chairman, Redflow: Redflow has spent the last decade designing and perfecting the world's smallest flow battery. Most people in the telecoms industry are familiar with the other batteries more commonly associated with tower sites such as lead acid or lithium-ion. Redflow's ZBM is the first flow battery product that is the right physical size and capacity to serve the needs of the tower ecosystem. The ZBM module has an 8kWh or 10kWh storage capacity, supplying 48 Volts DC at 60-70A typical (120A Max) per module. Multiple modules can be clustered to develop any required energy storage size. This means the ZBM is the first flow battery that can scale up to a 600

kwh shipping-container form-factor module (60 ZBM's), and that can scale down to 10-20kWh (1-2 ZBM's) for telecoms towers, small commercial and residential applications.

TowerXchange: Please tell us about your partners and global footprint.

Simon Hackett, Chairman, Redflow: We work with energy integration providers such as Emerson, Blue Sky Energy and Jaladri (amongst others). We currently have ongoing trials on tower sites in several markets including Australia, Central America, Asia and Africa, giving us an opportunity to build on our operational experience globally. These trials are progressing well and now we're sitting on the cusp of some large scale deployments.

TowerXchange: Batteries are typically deployed in remote sites in developing markets. What are the specific benefits of flow batteries in these environments?

Simon Hackett, Chairman, Redflow: Flow batteries are particularly suited to use in remote areas where the grid is unreliable. They will perform well over a very long lifetime in harsh conditions and will and suffer no damage if completely depleted. By contrast, lead acid batteries can be damaged or suffer reduced operating life if they are allowed to become fully depleted or if they are disconnected for a long period.

Zinc-bromide flow batteries are able to work in a wide range of ambient temperatures, from five degrees Celsius ambient up to forty five degrees, which is a major benefit in more hostile climates. The battery will self-protect outside of these temperature limits to avoid damage.

The ZBM is well suited to hybrid solar solutions and it is also a good fit for generator run-time-reduction applications.

A unique capability of the ZBM is an ability to be completely shut down (and taken offline) at any state of charge (including fully charged), for an arbitrary period without loss of internally stored energy. The battery can be brought back online later with the application of a very small external power source for less than 30 seconds. This provides an outcome much like a diesel generator, but with indefinite standby time, no physical maintenance requirement, and no issues with the long term storage of diesel fuel.

TowerXchange: What kind of life span do flow batteries have?

Simon Hackett, Chairman, Redflow: Redflow ZBM batteries have a warranted ten year life span based on daily full cycles (and insensitive to cycle depth variation). A 10 kWh ZBM battery can store and recover up to 36,000 kWh over this period. Lithium-ion battery lifespan (by comparison) is a complex function of charge cycle depth and charge cycle energy intensity, with significant 'reserved capacity' being needed to avoid the potential for battery pack damage. The lifetime of the ZBM is independent of cycle depth and cycle intensity and are not damaged by full-charge or full-discharge events, even if they occur every single day.

TowerXchange: Are there any other key differentiators between flow batteries and other types of batteries used on tower sites?

Simon Hackett, Chairman, Redflow: Flow batteries are real workhorses; the are hardy and will run consistently, require less maintenance, with the on-board control system providing proactive battery management and protection. They're safer too as the electrolyte is actually a fire retardant. The majority of the battery (even the electrode stack) is made of fully recyclable plastic.

TowerXchange: Do you envision any other applications for these batteries in the future?

Simon Hackett, Chairman, Redflow: Currently our primary telecoms/ICT focus is telecom tower sites as our battery is an ideal energy storage solution for that market. They can also be deployed in data centre applications, as well as other non-telco power support roles (such as water pumping stations in weak-grid or no-grid environments). We have seen increasing interest in deployment of these batteries in residential environments, and we expect to have a residential reference energy system design available to system integrators in the first quarter of 2016 ■

Li-ion technology takes telecom backup power to the next level

New generation Li-ion batteries minimise installation size and weight while optimising backup performance and TCO

Joel Brunarie, Telecom Business Development Manager, Saft

Effective, reliable backup power is essential for the telecommunications industry to maintain continuity of service as networks need to evolve to meet the demands of the 'always on' world that now includes cloud computing and high bandwidth data streaming, et cetera. Saft has used its extensive experience in the global telecoms industry to develop a broad portfolio of advanced, specialised battery solutions suitable for wireless or wireline installations, indoor or outdoor, on-grid or standalone, in very hot or cold climates, urban settings or remote hard-to-access locations.

Keywords: Who's Who, Energy, Batteries, QoS, On-grid, Off-grid, Unreliable grid, Hybrid power, DG runtime, RMS, Africa, Saft

Read this article to learn:

- The critical issues you need to consider in order to select the right battery to meet the specific requirements of a cell site
- TCO of Li-ion versus LA batteries
- The advantages of Li-ion batteries in terms of energy density, and the implications for the installation footprint at a cell site
- Meeting differing backup power requirements at on-grid, unreliable grid and off-grid BTS and at larger CO, DPCO and MSC sites

TowerXchange: Please introduce Saft - where do you fit in the telecoms infrastructure ecosystem?

When network stability is low, customers need a solution with good cycling capabilities and good chargeability. When network stability is high, they need solutions with float charging capability and a long service life. Saft offers backup solutions for periods from 30 seconds to over one day.

TowerXchange: What is your installed base and experience in emerging markets, particularly Africa?

Joel Brunarie, Telecom Business Development Manager, Saft: Saft has extensive experiences and references in various African countries such as Algeria, Nigeria, Cóte d'Ivoire, Senegal and Gabon.

In Nigeria, Saft's specialised Sunica.plus nickel-based batteries provide the energy storage at the heart of Eltek Valere's innovative hybrid telecom power systems, combining batteries with diesel generators, that have been rolled out to 80 mobile telecom sites across the country. These co-location sites are provided for Nigeria's wireless operators on a fully managed leased basis, and QoS (Quality of Service) is absolutely vital in this competitive market.

TowerXchange: Batteries have an unfair reputation as a commoditised piece of equipment, the selection of which rarely attracts the attention of C-level decision makers - why should CTOs, CFOs and CEOs take an interest in

which batteries are used at their cell sites?

Joel Brunarie, Telecom Business Development Manager, Saft: Mobile network operators place a major emphasis on ensuring consistent quality of subscriber service. The design and management of backup power systems to maintain continuity of power, in the event of an interruption to the main site power supply, is therefore a vital issue. When the main power supply fails, the backup battery must be able to perform. My view is therefore that battery selection is a critical element in the success of the entire installation.
So while it can be tempting to regard the battery as a simple commodity item, to be purchased at the lowest initial cost, I urge the C-suite to look at the bigger picture. A cheap battery can in fact prove very expensive if it fails to function when required, causing loss of subscriber revenues. In contrast, an initially more expensive specialised telecoms battery that delivers in terms of reliability, performance and life will provide a superior return on investment (RoI) as well as peace of mind.

TowerXchange: What are the critical considerations in selecting battery backup power solutions?

Joel Brunarie, Telecom Business Development Manager, Saft: There are a number of critical considerations that determine the correct choice of battery for a telecoms installation:

- The duration of backup time required, i.e. the capacity needed to support the duty profile, which largely determines the battery sizing.
- The specific application, will the battery be subjected to frequent daily cycling with deep discharges or will it mainly be on floating duty?
- The environmental temperature, as extremely cold conditions can adversely affect performance, while elevated temperatures reduce the expected life. In some cases, batteries might need to be housed in a specially heated or cooled enclosure.
- The energy density (in terms of both volume and weight), can the battery provide the required performance from the limited installation footprint available at telecom sites?
- Maintenance requirements - how often will the battery need servicing or replacement? At remote locations, the cost of frequent service visits can exceed the battery purchase cost.

TowerXchange: How does the TCO of Saft's solutions compare to alternatives?

Joel Brunarie, Telecom Business Development Manager, Saft: Currently, the majority of telecom backup power systems are supported by lead-acid (LA) batteries. While these batteries have operated successfully in the field for many decades, they have some drawbacks, including concerns regarding reduced life expectancy at higher temperatures, shorter cycling life, the necessity to over-size the capacity, low reliability, high weight and low energy density.

In recent years, lithium-ion (Li-ion) battery technology has demonstrated its exceptional capability to deliver high performance, reliability and long life in a range of demanding backup applications. Saft has now created a second generation of Li-ion batteries, known as Evolion® that capitalises on this experience by offering tailor made outside plant hardened modules to meet the specific demands of the telecom industry, where they offer possibilities to create compact, safe and reliable backup power systems.

Thanks to its zero maintenance, sealed for life design, and long calendar and cycle life, Evolion® offers an optimised TCO (Total Cost of Ownership). So while a lead-acid battery might last only up to five years, Evolion® is designed to have the same life expectancy as the telecom equipment it serves. This means a long float life of 20 years at +20°C and more than 10 years at +40°C and a high cycle life of 4,300 cycles at 80% DOD (depth of discharge) and 8,200 cycles at 50% DOD. Furthermore, unlike lead-acid batteries that are prone to 'sudden-death' failures, the life and performance of a Li-ion battery is always predictable.

TowerXchange: What are the operational advantages of Saft Li-ion batteries?

Joel Brunarie, Telecom Business Development Manager, Saft: The operational advantages of the Evolion® modules include:

- High energy density (in terms of both volume and weight), delivering high performance from the limited installation footprint available at telecom sites
- High performance in cycling and floating

applications

- Safe, reliable operation at extreme temperatures (-40°C to +75°C) that eliminates the need for on site heating or air conditioning
- Easy battery management, since the state of charge (SOC) of a Li-ion battery is directly related to its cell voltage. This also offers the potential for intelligent remote supervision

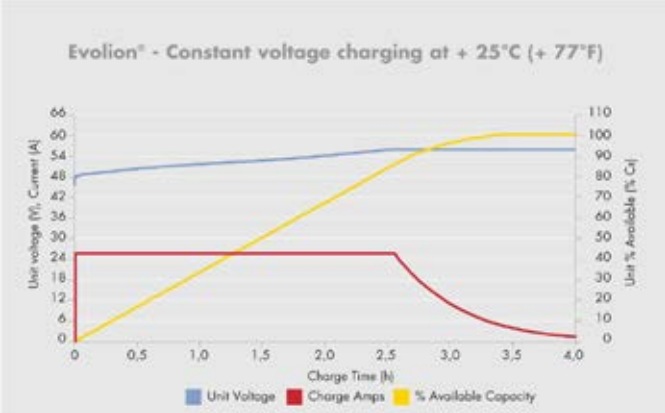
The main advantage of Li-ion technology for telecom networks is that it enables more energy per weight and volume to be stored. For example, a typical VRLA (valve regulated lead-acid) telecom battery will store 80-95 Wh/l and 35 Wh/kg. In comparison, the Evolion® module stores over 170 Wh/l and 139 Wh/kg, making it effectively two times smaller and four times lighter.

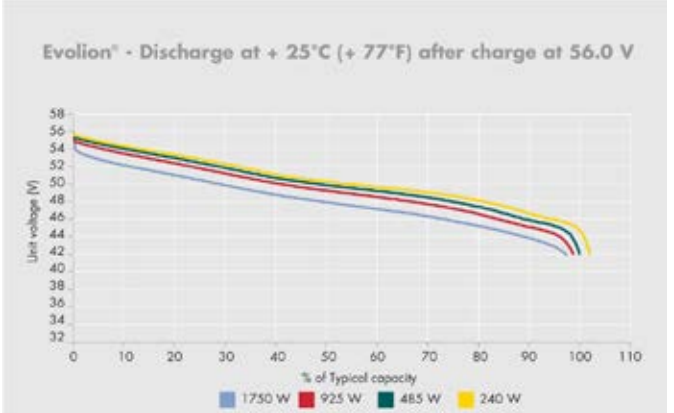
TowerXchange: What are the typical applications in which your batteries are used?

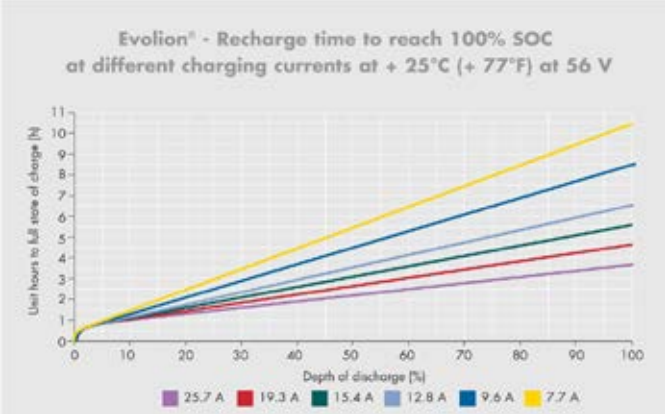
Joel Brunarie, Telecom Business Development Manager, Saft: Currently, Evolion® has four main applications:

Outdoor in wire-line/wireless applications with a high quality grid - including outdoor cabinet applications such as BTS (Base Transceiver Stations), BSC (Base Station Controllers), MSC (Mobile Switching Centres) and access node terminals for FTTx.

At these sites, the battery has to support around 10 to 30 power outages per year ranging from a few seconds to hundreds of minutes. Since it is in an uncontrolled environment, the battery has to survive temperature ranges from -20°C to +55°C and large variations in relative humidity - Evolion® can work across this temperature range without affecting performance and life.







These sites can be remote and hard to access. In this case, reducing expenses associated with transportation, installation and maintenance is a key objective when considering new solutions. Evolion® is 'maintenance free', with state of health and state of charge information available through remote monitoring.

On average, the power required in such applications is in a range of 800 W up to a few kW and the runtimes range from 2 to 8 hours.

CO, MSC and DPCO applications - covering all types of indoor sites with high power requirements (from above 10 kW to several hundreds of kW) that are connected to electrical grids with good or poor quality, and including Central Offices (CO), the more recent architecture of Distributed Power

Central Offices (DPCO), where the power is locally distributed and decentralised and MSC (Mobile Switching Centers). The battery is installed inside under a controlled environment, where the average temperature is typically between +15°C to +25°C.

The Li-ion module is an interesting alternative when compared with the conventional VRLA battery primarily because its low weight and low volume can minimise floor loading and the need for building structural enhancements.

Outdoor and inside wireless applications with no reliable electrical grid - typical of countries where the grid is unreliable. In contrast to the two previous applications, the battery can be discharged several times a day and with a variable depth of discharge.

Again, the battery is usually installed in an uncontrolled environment and must survive a temperature range of -20°C to +55°C and large variations in relative humidity. The average power required is between 1 to 4 kW and runtimes range from 4 to 12 hours.

And again the site is often remote and hard to access. In this case, reducing expenses associated with transportation, installation and maintenance is necessary. The Evolion® module offers high cycling capability at different depths of discharge and in particular at high temperature.

Standalone, off-grid hybrid applications - As fuel costs continue to rise, operators are now seeking more cost-effective ways of powering their sites.

A particularly attractive solution is to use a hybrid system that integrates a variable speed diesel DC generator (genset) with a deep cycling Li-ion module. This offers an extremely energy efficient alternative to using an AC generator operating 24/7, since the generator simultaneously charges the battery and powers the site load.

When the battery is fully charged the generator shuts down and the battery takes over as the primary source of power. The genset runtime is reduced to typically 4 hours per day, with major savings in fuel consumption - usually up to 74 percent compared with a standard genset. It also reduces CO2 emissions while increasing refuelling and service intervals.

A complete hybrid system of this type can be packaged in a compact and light 'energy container' to offer a turnkey solution that is quick and easy to install in remote locations. The addition of PV (photovoltaic) panels and/or wind turbines could allow further reductions in operating costs (OPEX) while also increasing environmental benefits.

For hybrid sites, Evolion® offers high cycling capability and long life at deep discharge; fast recharging; resistance to high temperatures; high charge efficiency and ultimately low OPEX.

TowerXchange: Finally, please sum up how you differentiate Saft from your competitors?

Joel Brunarie, Telecom Business Development Manager, Saft: The important difference with Saft is that we don't focus on simply selling batteries. We aim to design, develop, manufacture and supply cost-effective energy storage solutions that will ensure high performance and reliability throughout the life of the telecom installation. We are able to do this through our vast experience in the industrial standby power business combined with a wide choice of battery chemistries - including nickel-based and Li-ion technologies - provided within dedicated telecom battery designs and supported by the strength of our global organisation.

All this means that we are able to offer a comprehensive approach that takes telecom customers from a blank sheet of paper through creating the ideal specification for their application, designing and manufacturing the battery system, on site installation and commissioning and then ensuring the system always functions at peak performance by providing through-life service support ■

Tower Xchange

Distributed generation working group report

TowerXchange hosted our inaugural working groups at our recent TowerXchange Meetup Africa. These unique discussions help vendors understand the real operating conditions for leading buyers at MNOs, towercos and their subcontractors, identifying specific requirements and revealing much about procurement criteria. In our distributed generation working group, we focused on diesel, hybrid and renewable generation, drawing upon the experiences of two towercos, two MNOs, an ESCO and three of Africa's leading managed service providers.

Working group members, buyers:
Airtel Nigeria, ANTOSC, Econet Power, Helios Towers Africa, Vodafone

Working group members, managed service providers:
Camusat, Likusasa, Mer Group

Working group members, suppliers:
Ascot, Ausonia, Beijing Dynamic Power, Bladon Jets, Delta, Eltek, Emerson, Enatel, Flexenclosure, Generator Logic, Heliocentris, HIMOINSA, Huawei, IPS, IPT Powertech, Mantrac, Pramac, Sedemac, Total

Distributed generation Working group recommendations

Key recommendations

RECOMMENDATION 1: Convert indoor sites to outdoor where possible. The energy load of an indoor site can be 3-4x that of an outdoor site.

RECOMMENDATION 2: Vendors should respond more specifically to RFPs instead of pitching off the shelf solutions which buyers complain often don't meet their needs.

RECOMMENDATION 3: Buyers should consolidate suppliers and standardise equipment to the narrowest range possible to enable their installation and maintenance teams to develop expertise in the chosen systems.

RECOMMENDATION 4: Security guards and other local stakeholders must be fairly compensated to avoid conflicts of interest.

RECOMMENDATION 5: You cannot optimise energy opex by looking at distributed generation in isolation: the best results are achieved when the genset, rectifier and battery work optimally together.

RECOMMENDATION 6: Towercos must treat suppliers as genuine partners, sharing training, sharing performance analyses and working together to ensure continuous improvement.

Key learnings

LEARNING 1: Lead acid is still widely used as the default energy storage chemistry, although lithium-ion is being explored by several buyers.

LEARNING 2: It is critical that vendors understand who is responsible for distributed generation equipment in different scenarios; whether the MNO or towerco, and whether the towerco manages just AC or a full DC power service.

LEARNING 3: All the buyers in the working group selected suppliers on the basis of total cost of ownership (TCO), so a low upfront capex solution might prove unattractive if maintenance was expensive and/or if the lifecycle of the equipment fell short of expectations.

LEARNING 4: Early experiences with 'all in one' pre-integrated powercubes have been mixed, with many let down by poor quality connections between components. Power cubes designed and integrated by a single supplier had been found to be more reliable to date.

LEARNING 5: You cannot just replace diesel without risk of violent repercussions from the 'Diesel Mafia'.

LEARNING 6: "Technology is not the biggest issue – people are." Skills are scarce when it comes to the installation and maintenance of complex distributed generation systems; make them as simple as possible, and training is key.

LEARNING 7: The cost of ground rent can destroy the business case for substantial PV arrays.

LEARNING 8: African towercos have largely built through the acquisition of legacy cell sites, and many of these older sites have indoor configurations that are tough to hybridise. Many towercos will sweat their acquired energy assets until the end of their natural lifecycle before replacing – vendors may have to be patient for towercos to invest in hybrid and renewable energy.

LEARNING 9: Appetite for super-silent gensets ranged from less than 1% of the network to as much as 10%.

LEARNING 10: RMS is only an effective tool to combat fuel pilferage within the supply chain if employees can effectively be held accountable.

Executive summary

Econet Power

Econet Power is a new ESCO-type carve out from Econet's home market of Zimbabwe. Sister company Econet Towers is a 'steel and grass' towerco, managing only the land and the towers, while Econet Power manages the energy systems at 1,380 sites, of which 48 are off grid. Of these 44 have been converted to solar power.

Econet Power are seeking to utilise renewables on as many as 650 sites, rising to 1,000 sites. Their RFP was drawing to a close during the Meetup, to be followed by a proof of concept phase with a view to deployment in February 2017.

Around 80% of Econet sites have outdoor equipment, typically with a 2-3kWh load. The remaining 20% of indoor sites have much higher loads, typically in the 8-10kWh range.

Grid conditions in Zimbabwe have improved dramatically, from typically ten hours of downtime per day to an average closer to three, as a function of a recent power purchase agreement, although whether this is sustainable remains to be seen. Protecting sites against a potential reversion to previous grid reliability, Econet typically sends out RFPs seeking 10-20 hours of autonomy, although they noted that many of their RFP requirements were not being met.

Energy storage consists exclusively of lead acid batteries to date, although Econet Power are looking at lithium-ion.

Helios Towers Africa

Helios Towers Africa has around 3,500 sites in Tanzania, 1,600 in the DRC, 400 in Congo Brazzaville, and 750 in Ghana. Of these a little over 800 in Tanzania are off grid, plus around 640 in the DRC and 180 in Congo Brazzaville. No figure was disclosed for off grid sites in Ghana.

Helios Towers Africa find grid conditions in Tanzania currently to be relatively reliable, with an average of perhaps 18 to 19 hours of good grid per day. That drops to 14-15 hours in the DRC, where the company are deploying their first 50 site solar trial.

It should be noted that Helios Towers Africa had provided an AC power service only in Ghana, but that is now being evolved to full DC power services.

Helios Towers Africa are currently deploying improvement capex to integrate recent acquisitions from Airtel in the DRC and in Congo Brazzaville.

Two philosophies drive Helios Towers Africa's procurement strategy: lean six sigma and an imperative to treat suppliers as genuine partners.

Helios Towers Africa recently concluded partner selection, with at least two approved suppliers in each supplier category. The move to standardise equipment was motivated by the wide variety

of systems deployed at sites, which was adding complexity and cost to O&M.

Airtel Nigeria

Airtel has around 6,000 cell sites in the ~25,000 site Nigerian market, although 4,719 sites have been sold to American Tower (Airtel retains "a few" sites as well as 16 data centres).

Only 20% of Airtel's sites are on grid, and many of those on grid sites have useable power for only half the day, qualifying them as unreliable grid sites.

It is not unusual to see DGs running in tandem 24/7 in Nigeria, where 2,500L of diesel can be burned per site per month, costing around US$3,000. The opex challenges this creates are compounded by theft and escalating lease costs as landlords raise prices.

Airtel Nigeria are committed to 'going green', seeking the most beneficial solutions from a TCO (total cost of ownership) point of view.

Vodafone

Vodafone were represented by the Network Site Infrastructure team at Vodafone Procurement Company, which is responsible for procurement across over 50,000 Vodafone, Vodacom and Safaricom sites in Africa.

Like Airtel, Vodafone are committed to 'going green' and reducing carbon emissions, evaluating solutions on a TCO basis, incorporating up front capex, transportation, maintenance et cetera. Asked if there was a magic number in terms of return on investment, Vodafone's representative said there was no fixed number, but that a sub-three year ROI was often required.

> "Technology is not the issue when it comes to solar power – people are. A DG might last eight years in Africa and a solar system 15 years, but if people issues mean you cannot get the full value out of the system, whether it be due to vandalism and sabotage, or simply because you cannot hire field maintenance engineers who understand the system, then the value proposition breaks down"

30% of sites was the current suggested addressable market for hybrid and renewable energy innovations.

ANTOSC

ANTOSC is a new towerco being created in response to the infrastructure sharing mandate in Angola. The company hopes to have 90 sites by the end of 2016.

There are around 2,000 towers in Angola, with perhaps a further 2,000 needed, particularly if a third MNO were licensed. Around 30% of sites are on grid, although grid quality was described as 'unreliable', with 70% off grid, mostly powers by diesel gensets.

ANTOSC were seeking plug and play, efficient, integrated solutions upgradeable for two to three tenants. Load averaged 2.5kWh, rising to 5kWh at peak, per tenant.

Managed service providers

Several multi-country managed service providers also participated in the working group, including:

- Camusat, which operates around 5,000 sites across 20 countries, offering a full suite of installation, operations and maintenance services, with an optional full service opex model.
- Likusasa, another turnkey installation and upgrade firm which installs around 100-150 power systems per year across multiple African markets.
- A third turnkey infrastructure provider, Mer Group, called attention to their involvement in designing and installing innovative remote sites to reduce reliance on diesel, with complete hybrid energy systems for sites as small as 300-500W.

Hybrid and renewable power

All participants spoke of their companies' commitments to reduce carbon emissions and reduce energy opex.

One participant highlighted that running DGs 24/7 in dense urban areas like Lagos could be seen as a health and safety risk, which had prompted the local government to review energy permitting. Another participant admitted their company was burning 800,000L of diesel per month – seeking to reduce that figure by 50% would also remove a significant proportion of exposure to risk of fuel theft. However, the risks of repercussions from the so-called 'diesel mafia' could extend beyond vandalism.

Tighter governance of security, starting with making sure security guards are fairly paid and local community stakeholders engaged, were cited as mitigation steps. Effective remote monitoring of fuel, it was noted, demanded alignment of interests: with much fuel theft originating within the supply chain, there remained a high risk of sabotage of telemetry systems if the contractors and their employees could not be effectively held accountable.

"Technology is not the issue when it comes to solar power – people are," said one buyer. "A DG might last eight years in Africa and a solar system 15 years, but if people issues mean you cannot get the full value out of the system, whether it be due to vandalism and sabotage, or simply because you cannot hire field maintenance engineers who understand the system, then the value proposition breaks down. That's why we feel it's essential to educate and train our people, so we can get the best out of our equipment."

The economics of utilising solar at single tenant sites were felt to be challenging due to the substantial ground rent costs of the space for PV arrays, suggested one participant, while another suggested they had demand for solar across sites with loads from 500W to 8kWh.

One reason why hybridisation is proceeding slower than many vendors might have hoped is that the sites towercos are acquiring in Africa have a lot of shelters; legacy configurations that are tough to hybridise. It is often more economical to sweat acquired power assets to the natural end of their life cycle, than to hybridise immediately (although TowerXchange have heard unconfirmed reports that IHS, among others, tend to hybridise sooner after new sites are acquired).

Experiences deploying early power cubes were mixed, with some buyers complaining that these 'all in one' pre-integrated, containerised solutions were difficult to install, often let down by poor quality connections. "We've had to dismantle some power cubes," complained one buyer. Better results had been achieved with power cubes designed and integrated by single suppliers. The weight and logistical challenges of transporting power cubes was cited as another differentiator, while another buyer called attention to customs and regulatory conditions which may make it more favourable for imported items such as power systems to be packaged.

"We tend to use DG as backup power at cell sites and data centres in Spain and Italy, but we've deployed some power cubes in Albania and Romania," said one participant. "We're responding to carbon emission reduction commitments in the UK, but the targets are not always as clear in Africa."

Diesel gensets

"We don't buy off the shelf gensets," said one buyer. "It's never about one solution: it's about how the DG, rectifier and battery work together."

"We were replacing an average of 1.5 contactors every day," said another buyer. "As a result we now use DC control changeover switches."

Sound levels were another topic of discussion. It seems there is little consistency in the regulations governing sound levels, to the extent that some regulations specify a decibel limit, but lack detail on how far away from the site that measurement should be taken! Regulation often differentiates between daytime and night time noise limits: for example in one market the limit was 70dB limit during daytime, 55dB at night, prompting the local tower owner to adjust their specs to a 69dB daytime limit regardless of load. One supplier called attention to the capability of some controllers in hybrid systems to automate the imposition of a curfew, reducing night time noise levels. Ultimately the tower owners in the working group felt they rarely needed to invest in super-silent DGs: one stakeholder suggested as much as 10% of the gensets in their network for super-silent, another two suggested the figure was less than 1% in their networks ■

Supporting insights from leading providers of distributed generation equipment to towercos and MNOs in AME

Ascot Industrial

HYBRID GENERATORS DESIGNED FOR TELECOM or TOWER OPERATORS that want to enter into a multi-tenancy agreement – CAPEX & OPEX PACKAGE from 5 to 40 KVA load. More than 30 years of experience in the power sector and 34000 installations in the Telecom Market, make Ascot Industrial leader in Africa, Middle East and Asia for tailor made solution to meet customer needs. A real modular, flexible, scalable and plug & play solution is designed by engineers to guarantee cost-effectiveness too.

Portfolio of products

- High Efficiency Diesel AC Generators from 5 to KVA
- Variable Speed and Scalable DC Generators from 5 to 60 KW
- Full Hybrid Solution (DGS+BATTERY+ PV PLUG & PLAY)

www.ascotinternational.com/hybrid-generators/

Ausonia

AUSONIA is leader in customized power solutions, specifically designed to meet MNOs and TowerCos power requirements and performance needs.
Among its products portfolio - entirely made in Italy - AUSONIA offers High Efficiency DC Gensets and Hybrid Power Systems fully integrated with Solar & Wind, for off-grid and poor-grid indoor/outdoor sites.

Extended maintenance intervals, very low fuel consumption levels and a complete web-based Remote Monitoring System allow Ausonia Customers to significant cut their OPEX and reduce their TCO.

The use of Ausonia Power Systems in OPEX model is certified by 13 years of operation in Europe and already replicated in Africa and LATAM.

www.ausonia.net

Beijing Dynamic Power Co., Ltd. (DPC)

Beijing Dynamic Power Co., Ltd. (DPC) is a leading manufacturer of Telecom Power Supply in Beijing China. Established in 1995 who are the China first IPO (Initial Public Offerings) company in power supply industry in Shanghai Stock Exchange in 2004.

Over 2,400,000 Rectifier modules operating on Carrier Networks globally and 30% market share in China owned by Carriers/China Tower(Ranking No.1 in China Tower). More than 20 years of experience in diversity power solutions for tower company.

Over 3000 employees with the main production base of 330, 000m2, with production capacity of 80,000 pcs rectifiers and 15,000 sets systems per month. DPC's stable high efficient and cost effective Power Supply create maximum value for carriers and tower company.

www.dpc.com.cn

Bladon Jets

Bladon Jet's breakthrough technologies enable the production of micro gas turbine engines which are more efficient, less polluting and lower cost than traditional reciprocating power units. Introducing the world's first 12kW microturbine genset designed specifically for the telecom tower power market delivering reduced fuel and maintenance costs, durability, and ultra-quiet operation for use in urban environments. Bladon's revolutionary microturbine, heat exchanger and air bearing technologies harness the power of a miniature jet engine to provide a compact and ultra-reliable alternative to the traditional diesel generator. Use Bladon's Micro Turbine Genset as a primary power source, hybrid mode with batteries or renewable energy sources, or as backup power to the grid.

www.bladonjets.com

Eltek

Eltek are committed to meeting the power needs of our customers. For more than four decades Eltek has provided power solutions for telecommunication networks globally. Our systems cover the entire range of power requirements; from small to very large, meeting all the power needs of the telecom industry, in both fixed and mobile networks. Our broad range of rectifiers and converters comply with all international standards and requirements. Eltek's high efficiency solutions and new, innovative designs help the industry achieve the objectives of combating climate change whilst remaining competitive, by reducing energy spend and environmental impact.

Eltek have offices in more than 40 countries and business in more than 100. Our presence and expertise is close to each individual market we serve. This enables us to truly understand the needs of each market and provide solutions and services specifically adapted to local requirements.

Telecom Hybrid Solutions

Eltek's hybrid solutions are based on the HE technology for optimal utilization of all energy resources. By combining solar or wind energy input with smart generator control and optimally dimensioned batteries, the scene is set for dramatic OPEX reductions and a positive environmental impact.

www.eltek.com/

Emerson Network Power

Emerson Network Power, a business of Emerson, maximizes reliability, deployment speed and operational efficiency for communications networks and data centers. A trusted industry leader in smart infrastructure technologies, Emerson Network Power provides innovative, rapidly deployable solutions that deliver efficiency and uncompromised reliability regardless of network demands. Emerson Network Power offers expertise in AC & DC Power, renewable energy, precision cooling systems, infrastructure management, integrated racks and enclosures, power switching and controls. Our solutions are supported globally by local Emerson Network Power service technicians. Learn more about Emerson Network Power products and services at:

www.emersonnetworkpower.eu

Enatel Energy

Enatel Energy delivers an expansive portfolio of configurable systems designed to meet every telecommunication network power requirement. Solutions offer flexibility and scalability, by way of hot pluggable combinations of modular Rectifiers, Inverters, Converters, Solar/Wind Chargers and encompass advanced energy management. Enatel's SYNERGi hybrid solutions include unique patented generator control capabilities allowing dynamic optimisation to accommodate off-grid site variables so ensure the highest levels of network

www.enatelenergy.com

Flexenclosure

Flexenclosure is a designer and manufacturer of intelligent power management systems and prefabricated data centre buildings for the ICT industry. The company provides systems that are fully integrated, modular, factory tested for reliability, adaptable to local conditions and quick to install. eSite is a hybrid power system for off-grid and bad-grid cell sites that delivers 24/7 network uptime and diesel-related cost savings of up to 90%. eSite is an integrated single cabinet system for maximum reliability and speed of installation. eManager, an all-in-one toolbox for site power infrastructure management including remote monitoring, power optimisation, KPI reporting and site logistics, is an integral part of eSite.

www.flexenclosure.com

FG Wilson

For 50 years, FG Wilson has been a leading manufacturer of diesel and gas generator sets from 6.8 to 2,500 kVA and beyond. Since 1990 alone, we have installed 600,000 generator sets, supported by over 300 distributors, offering world-class levels of service from product selection to installation and lifetime support. With products specifically designed to meet the needs of the telecoms sector and backed by out expert local dealer support, FG Wilson is the brand providers all over the world have been turning to for trusted and reliable remote power supply, even in the most remote and harsh environments.

www.fgwilson.com

Generator Logic

Generator Logic is an innovative manufacturer of custom-built generators that provide power solutions to a wide variety of industries worldwide. For the past decade, Generator Logic has concentrated its efforts in providing power solutions which are specific to the client's industry and are built taking into consideration the often harsh environments in which the industries operate in Africa. Recent innovations include our Hybrid generator incorporating the AC generator, rectifier system and battery bank in a single theft resistant "cube" ; with an optional add-on of Solar banks. **www.genlogic.co.za**
Offices in South Africa, Tanzania and Mauritius.

HIMOINSA

HIMOINSA is a global corporation that designs, manufactures and distributes power generation equipment worldwide. It has extensive **experience in the telecommunications market**, having supplied equipment with power outputs ranging from 8 to 45KVA in the international market to well-known companies in the sector.

Our telecom range gensets can work remotely, providing efficient and reliable power and incorporate functionalities such as: GPS system, making it possible to locate the machine at any time, fuel level alarm, remote management and remote control for gathering and recording data in real time. HIMOINSA has develops a variable speed hybrid generator sets that reduces fuel consumption by 40% and extend maintenance periods up to 1000 hours.

www.himoinsa.com

IPS

IPS – International Power Supply is 26 years experienced high-tech company specialized in the R&D and manufacturing of power electronics and energy conversion technologies.
IPS offers high-tech products and integrated solutions for the area of Renewable Energy and Off-Grid Electricity (mini-grids, off-grid power systems, OPEX and fuel safe optimization), Telecommunications, Utilities, Defense. IPS global headquarters is located in Sofia, Bulgaria where it began in 1989. Company subsidiaries are located in US, Australia, Indonesia, Nigeria, UAE. IPS's products are operated currently in 51 countries and used by clients such as NATO, large telecom groups, mini grid operators, utilities, the armed forces of various countries, international system integrators and many others.

IPS has developed an optimal system for both grid connected and off-grid use in the form of our EXERON range. The EXERON technology can offer power independence for areas with limited or no grid power and can provide cost savings for grid connected objects through on-demand use for any kind of power equipment. The Exeron features stringent modular design, easy-to-maintain hot plug technology, advanced battery management as well as the increased availability thanks to excellent system redundancy.

In Germany, 2014, EXERON won the Intersolar ees Award (ees: electrical energy storage).

www.exeron-power.com www.ips-group.net.

IPT PowerTech

IPT PowerTech Group delivers specialized solutions to the power, industrial and telecom sectors in Africa, Middle East and Asia. Combining power expertise with telecom infrastructure specialization, we are market leaders in providing energy solutions, telecom services, and managed maintenance services, and we are the most qualified to provide both models of Guaranteed Savings and ESCO. Our self-manufactured enclosures allow us to create customized energy efficient/hybrid and renewable energy solutions, and to implement new concepts in site renovation.

With offices in 11 countries, our solutions are delivered to more than 80 operators, tower companies and vendors in more than 50 countries.

www.iptpowertech.com

PRAMAC

PRAMAC is an Italy-based company engaged in the manufacturing of power generators and material handling equipment. The Company divides its activities into two main business sectors:
POWER - In the field of power generation PRAMAC offers solutions for every kind of power demand: from the portable to the industrial power supply both for stand-by and prime power applications.
MHE- The Company develops, manufacture and sells a complete range of handling equipment aiming at satisfying customers' requests and needs.

PRAMAC has four production plants in Italy, Spain, China and Brazil. It operates worldwide through a global distribution network of subsidiaries.

www.pramac.com

SEDEMAC

SEDEMAC Mechatronics is a product innovation company which manufactures wide range of control products like a range of AMF genset controllers, electronic governors and variable speed controls for diesel gensets / engines.

SEDEMAC was founded by four technocrats who came together as part of a research group at India's premium engineering institute.What started as a small lab-based enterprise has now grown into India's fastest growing powertrain controls company.

Today, SEDEMAC is India's No. 1 in genset controls market and is the preferred choice amongst all the major OEMs in India and supplies/licenses unique control products to the leading manufacturers such as Bajaj, TVS, Hero MotoCorp, Mahindra, Kirloskar, Cummins, Ashok Leyland, TATA Motors etc.

TOTAL

Total is the world's fourth-ranked oil and gas company and a global leader in solar energy through our affiliate SunPower. With operations in more than 130 countries, we have 100,000 employees who are committed to better energy.

Supplying affordable energy to a growing population, addressing climate change and meeting new customer expectations are the three main challenges Total must meet as an energy major.

www.total.com

Makasa Sun Nigeria and Ascot Industrial bring cleaner, more efficient power to IHS's Nigerian portfolio

Justus Ukwade, Chairman, Makasa Sun Nigeria Ltd

IHS' "big five" project in Nigeria has been designed to replace power generation systems on 15,000 sites with cleaner, more efficient solutions. TowerXchange speak to Makasa Sun Nigeria, one of the five companies selected to upgrade a portfolio of 2,500-3,000 sites as part of the project and learn about their choice of Ascot Industrial's hybrid system for such an important initiative.

Keywords: Africa, Ascot, Ascot Industrial, Batteries, Big Five, DG runtime, Energy, Energy Efficiency, Energy Storage, Fuel Security, IHS, Makasa Sun Nigeria, Monitoring & Management, Nigeria, O&M, Off-Grid, Renewables, Solar, Unreliable Grid, Uptime, Who's Who

Read this article to learn:

- The scope of IHS' "big five" project in Nigeria and the role that Makasa Sun Nigeria and Ascot are playing
- Details of the Ascot system being installed and how it matches IHS's specifications
- Why Makasa Sun Nigeria chose Ascot for the project
- The stage of the project rollout and how timelines have compared to those laid out in initial plans
- The lifespan and maintenance schedule for Ascot systems

TowerXchange: Makasa Sun Nigeria is one of the five companies selected to be involved in IHS' "big five" project in Nigeria. Please can you share details of the project and its goals?

Justus Ukwade, Chairman, Makasa Sun Nigeria: Makasa Sun is a full service telecoms company and are one of the companies that have been selected by IHS to be involved in their "Big Five" project focussed on delivering cleaner and more efficient energy to their sites in Nigeria. Each of the five selected companies is working on a portfolio of 2,500 to 3,000 sites (and so we are talking about 15,000 sites in total), and is tasked with bringing a tailored power solution to each of the individual sites. The initiative is designed to enable IHS to benchmark different technologies and generation systems and find the most efficient solution to powering their towers in the country.

TowerXchange: What can you tell us about the power systems that Makasa Sun is installing as part of the project?

Justus Ukwade, Chairman, Makasa Sun Nigeria: On each of the IHS sites, the old existing equipment consisted of various AC diesel generators, sourced from different suppliers. As part of the project, each of these old generators is being swapped out and replaced by a DC diesel generator hybrid system from Ascot. The Ascot DC diesel generators are cleaner, less noisy, more compact and more efficient and combine solar and battery storage.

TowerXchange: What made you decide to select

Ascot's system and why did you decide to work with them on this project?

Justus Ukwade, Chairman, Makasa Sun Nigeria: We decided to work with Ascot because it met most of our criteria for the IHS project. IHS wanted a system that was environmentally friendly in terms of noise and pollution. On top of this, they wanted a solution that was efficient in terms of fuel consumption and managed space. Some of their sites are old sites that have a lot of space constraints; with Ascot HPU, you get everything you need in one compact unit. These were very important factors in Makasa choosing Ascot. We also took into account the fact that Ascot provides a ten year guarantee on the lifespan of its units which is a real added bonus.

TowerXchange: In terms of selecting the technology for this project, did IHS give you total responsibility or did IHS give each of the "big 5" partners responsibility for their particular sites?

Justus Ukwade, Chairman, Makasa Sun Nigeria: IHS gave that decision to the big five because they were searching for the best solution and in their view if five different people go and look for five different solutions, you will have more confidence that the optimum solution has been assessed. IHS laid out their specifications and we had the responsibility to select the equipment within that framework; that is how Ascot came into the picture.

TowerXchange: What stage is the project at and how streamlined has the rollout been?
Justus Ukwade, Chairman, Makasa Sun Nigeria: The project is well into its final stages and we have done well over three quarters of our required installations. There have been a small number of challenges that we have faced along the way, such as dealing with community relations and handling difficult environmental factors but that has been on less than 5% of our sites. Bar this small number of exceptions, delivery and installation have been carried out pretty much to the timelines that we laid out, allowing us to reach our objectives and obtain IHS' approval of our choice. We have ultimately been very happy with the progress we have made.

TowerXchange: Are the sites that you have been working on located in a particular region of the country or are they dispersed more widely? What is grid availability for the sites you have been working on?

Justus Ukwade, Chairman, Makasa Sun Nigeria: The projects are widely dispersed across most regions of the country and so as you can imagine it has been challenging logistically.

Grid penetration and availability is poor, with a maximum of five per cent of the sites being connected to the grid. As such, generators are required to run 24 hours a day. A durable system which could cope with this high level of usage was central to IHS' requirements.

The Ascot system is a solar hybrid system, whereby diesel generators will run for a certain period with solar taking over for longer periods, with a battery bank wrapped into it. The whole system is perfectly blended together by Ascot, and this mix was particularly important when picking a manufacturer or OEM.

TowerXchange: In terms of the monitoring of the systems, is this something that you or Ascot will be involved in, or has this now been handed over to IHS?

Justus Ukwade, Chairman, Makasa Sun Nigeria: It is ultimately IHS' responsibility to monitor the sites, but we are also taking that on because the Ascot systems have their own in-built monitoring system which works in real time. This is an added feature which gives you more visibility and accuracy; it was part of the reason why the Ascot system was perfect for us, enabling us to monitor performance prior to IHS putting on their own monitoring equipment.

TowerXchange: What kind of maintenance is required on the system and what is the expected lifespan of the system?

Justus Ukwade, Chairman, Makasa Sun Nigeria: With the Ascot systems you have 1,001 hours before you need to service them, this averages out to two services a year which is a very good feature. In regards to the lifespan, the efficiency of the system means that the generators do not need to run as long as anticipated (typically six hours a day when properly installed) and as such you get a longer lifespan.

TowerXchange: Are there any in-built measures in the systems that prevent theft and vandalisation?

Justus Ukwade, Chairman, Makasa Sun Nigeria: Theft is a major challenge in the African market, and preventing it is a joint effort between all parties. In regards to the Ascot system, it is compact which makes it hard to steal diesel and what's more, the batteries are in compartments that can be locked to prohibit theft. These characteristics help to contribute towards reducing theft, however there are always challenges in relation to access control that need to be met by a broader solution.

TowerXchange: What's next for Makasa and Ascot?

Justus Ukwade, Chairman, Makasa Sun Nigeria: In terms of such projects in Nigeria, IHS is by far the largest tower owner and there is no other company planning on rolling such an initiative on such a scale right now. Whilst that limits the potential for Makasa Sun and Ascot to carry out another similar project together, I have no doubt that there will be plenty of opportunities for Ascot to put systems on more sites in Nigeria and also other countries. The whole purpose of IHS' big five project was to draw comparisons between different energy generation systems and we are confident that the Ascot system will perform well ■

Ascot will be exhibiting at the 2017 TowerXchange Meetup Africa & Middle East, taking place on 3-4 October at the Sandton Convention Centre. **www.towerxchange.com/meetup/meetup-africa/**

Ausonia: the Italian (r)evolution of energy solutions

Ausonia explain their switch from capex-only to offering a full opex solution to the market

Massimo Ombra, CEO, Ausonia

As towercos consolidate their portfolios and search for proven power solutions which fit with their need to reduce opex, Ausonia talk us through their long history in the market and how they developed both capex and full opex offering to enable them to deliver power solutions worldwide. Drawing on over 80 years of R&D experience, Ausonia's hybrid solutions are proving successful for both towercos and MNOs.

Keywords: Ausonia, South America, Central America, Batteries, Energy, Energy Efficiency, Energy Storage, ESCOs, Fuel Security, Hybrid Power, Installation, O&M, Opex Reduction, Site Visits, Unreliable Grid, Who's Who

Read this article to learn:

- How Ausonia has grown in the tower industry
- The driving factors fueling their growth in telecom towers
- The importance of flexibility when developing solutions for clients
- How high efficiency solutions can reduce opex costs and O&M demands

TowerXchange: Please introduce Ausonia – where do you fit in the telecoms infrastructure ecosystem? How did you get started in this business?

Massimo Ombra, CEO, Ausonia: Ausonia has a very long history, we were the first company to produce diesel generators in Italy, starting our activities in 1932 thanks to the efforts of my grandfather. We are still a family company today and following the management of my grandfather and my father, I have now the role to lead and manage the company, keeping client satisfaction as our main priority.

Since the outset, we have continuously invested into R&D activities and we expanded our product portfolio to meet all the specific needs of our customers, who come from many different industries and countries, and who always need tailored products. Thanks to this, over the years we provided power solutions to critical sectors such as telecoms, oil & gas, defence, healthcare and many others. Specifically for the telecoms market, we provide different kinds of gensets for powering Base Transceiver Stations, BSC/MSC, data centres – all kinds of cell sites, as well as mobile power units for energy recovery and no-break power systems for TOC sites. More recently, we added into our portfolio High Efficiency Power Units dedicated to remote areas and off grid, BTS power supply applications. With such wide flexibility, we can definitively say that Ausonia is not only a product manufacturer, but it's also a solution maker.

TowerXchange: How has Ausonia grown in the tower market and what has fuelled that growth?

Massimo Ombra, CEO, Ausonia: Ausonia entered the tower market through the supply of power units to MNOs and towercos on a pure capex model basis. After many years of experience in this industry with this business model approach, in 2003 we got the opportunity to enter into a big challenge which definitively changed our way of approaching the telecoms market. That was when we were awarded a contract by Vodafone Italy for the supply of energy to their off-grid BTS sites in Italy through a full opex business model. This was something new to us, but we structured ourselves in order to give Vodafone the utmost power availability on site and achieve their complete satisfaction for the energy services we had to provide.

We then created our energy service company (MediPower, ndr) and developed a genset model specifically designed around the needs of this activity and able to optimise our operational costs. Since then, we have continuously expanded this business by signing power lease agreements also with TIM, Wind (Vimpelcom) and H3G. Furthermore, in 2010, we have also developed a family of high efficiency diesel gensets solutions dedicated to off grid and bad grid cell sites, in order to further reduce our opex and share this advantage with the telecom operators, enjoying of a continuous growth which has been possible thanks to the high quality standards of our products and the excellent service levels offered to the Italian operators. Today we can say we power almost 85%

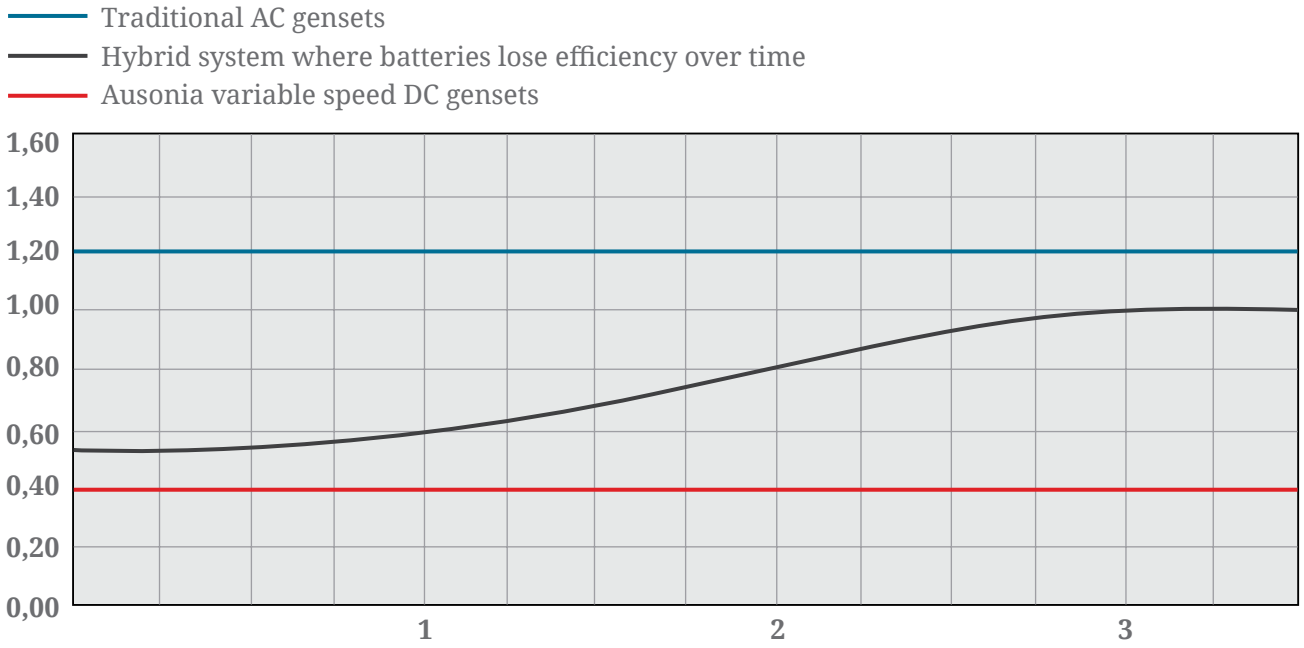
of the off grid, base transceiver station BTS sites in Italy. We realised that the solid experience we gained directly from the field could allow us to start offering and replicating the full opex business model also in foreign countries.

TowerXchange: How have you found customer response to Ausonia's solutions in the African market?

Massimo Ombra, CEO, Ausonia: Honestly, very positive and with excellent forecasts for the future. Being very flexible in our offer, going from a pure capex offer to the full opex business model, we can now satisfy different kind of demand for power.

After the testing we directly performed on the sites we service in Italy, today we have a proven technology which has been installed in several

Fuel consumption trends over three years (l/kWh)



countries with different temperature, humidity and altitude scenarios, guaranteeing extreme reliability and power continuity.

Remember that we are not only a producer of these power solutions, but also first users in performing the Energy as a Service model, so we are perfectly aware of the importance of the reliability of a product, as well as its capability of maintaining unaltered performance over its lifetime. Our customers know this and in recent years they asked us to provide them with our High Efficiency DC gensets, which are based on variable speed DC generator technology we developed internally in Ausonia for the telecom industry. With our units on their sites, our customers realised that this technology can guarantee them huge opex reductions, both in terms of fuel cost savings and number of maintenance and/or refueling trips to site.

They clearly understood our technology went beyond the typical concept of "hybrid solutions", in which a genset needs to cycle with batteries in order to achieve the desired opex reduction. In fact, we are able to achieve even more savings than the typical hybrid power units available in the market by directly operating our variable speed DC generator, which automatically adjusts the engine speed according to the load existing on site and following the most efficient point of its power curve. All this is done without the necessity to add deep cycle batteries for CDC operation, and this makes our customers more than happy, especially when they think about their sites located in harsh climatic conditions, where they can eliminate the costs of the batteries and of the ACU needed for the battery cabinet, further reducing both the power and fuel consumption on site.

TowerXchange: In a sector where opex is kept to a minimum, can you talk us through the numbers which make your solution stack up? How does capex and opex compare?

Massimo Ombra, CEO, Ausonia: There are multiple advantages to our high efficiency solutions for powering cell sites. Thanks to the significant reduction in fuel consumption and different capacities of our integrated fuel tank, we can extend the refueling interval of our power units up to three to four months. On top of this, our high efficiency solutions can be configured to have a preventive maintenance interval of up to 2,000 hours, which is more than 80 days and requires only four or five trips to a site per year to perform maintenance activities.

Additionally the systems can be controlled and managed remotely through a web-based dedicated system which can be integrated to the Network Operation Centre (NOC) to track alarms, ticketing and escalation. Moreover, thanks to the scalability of our modular solution, we can deliver systems to power multi-tenant sites, in which each operator can be billed singularly for

its energy consumption. Considering all this, if our customers compare our DC gensets solutions with the traditional solutions installed around the globe, they realise that the payback period is often less than one year and the product lifetime goes over five years, making it therefore an excellent investment even in preparing short term business plans.

TowerXchange: Do you always work directly with the operator or towerco or do you also work closely with managed service providers in the market as well?

Massimo Ombra, CEO, Ausonia: All these scenarios are possible in this market. We have supplied directly to operators when they owned the passive infrastructure assets, but we have sold our units also to towercos when the sites were on lease. In some other cases, we offered our solutions to local managed service providers who wanted to add a 'plus feature' into their current offers for services. So, I have to say we are totally open to work in all possible directions with any reliable partner, given for us it is mandatory to keep our clients happy - what's best for them is also the best for us! ■

China's leading telecom power supply company looks globally

Beijing Dynamic Power Company's extensive and high efficiency product offering

Thomas Liu, Deputy Director, Sales, Beijing Dynamic Power Co.

Arguably the largest name in energy equipment provision to the telecom industry in China, with such accolades as being the number one supplier to China Tower Company, Beijing Dynamic Power (DPC) boasts a diverse product offering with strong R&D, high efficiency and customer service at the heart of its offerings. TowerXchange speak to the company to discover more about its high efficiency solutions and their suitability to the global telecom industry.

Keywords: Beijing Dynamic Power, Capex, China Tower Company, DPC, Energy, Energy Efficiency, Infrastructure Sharing, Microgeneration, O&M, Off-Grid, On-Grid, Opex Reduction, Rectifiers, RMS, Unreliable Grid, Who's Who

Read this article to learn:

- DPC's scale and depth of experience in the supply of power equipment to the telecom industry
- The company's wide product offering applicable to the sector
- How a focus on R&D is driving higher efficiency and cost-competitive solutions
- Features of DPC's products which are ideally suited to multi-tenant applications
- DPC's RMS platform, its compact design and ease of operation

TowerXchange: Please can you introduce Beijing Dynamic Power to those unfamiliar with the company. Where does the company fit in the telecoms infrastructure ecosystem?

Thomas Liu, Deputy Director, Sales, Beijing Dynamic Power Co.: Beijing Dynamic Power Co., Ltd. (DPC for short) is a leading manufacturer of telecom power supply equipment in Beijing China. The company was established in 1995, the first public company in the power supply industry in China, and underwent an IPO in 2004 (Shanghai Stock Exchange Code: 600405), the open market value is over US$800mn. The group has five wholly-owned companies with a total of over 3000 employees including 400 R&D engineers in three R&D centres. Our main production base is 330,000m^2, with production capacity of 80,000 pcs rectifiers and 15,000 sets systems per month. DPC has nearly 30% market share in China and are the number one supplier to China Tower Company (CTC). DPC have been committed to supplying power solutions for the telecoms sector and a wide range of rectifiers for telecom integrated system suppliers in the telecoms infrastructure ecosystem for the past 21 years.

TowerXchange: How extensive is the company's experience? How many systems are deployed in the field? What is the company's geographic footprint and who are some of your key clients?

Thomas Liu, Deputy Director, Sales, Beijing Dynamic Power Co.: DPC has been the leading mainstream power supplier in the Chinese telecommunications

industry for years. DPC has created hundreds of different power products and supplied a huge number of solutions to worldwide customers, covering the entire range of power requirements; very large power systems, medium power indoor systems, compact rack-mounted systems, wall-mounted type, remote DC powering solutions, modular outdoor systems, mini outdoor power cells, hybrid power system et cetera.

Over 500,000 systems within 2,400,000 rectifier modules are operating on MNO and towerco networks globally. Our products are highly regarded by our esteemed telecom customers globally such as China Tower, China Mobile, China Unicom, China Telecom, Telecom Italia, MTS, STC, Ethio Telecom, Tanzania Telecom, LG U+, Sri Lanka Telecom, Lao Telecom, Nepal Telecom and Yemen Telecom amongst others.

TowerXchange: How is Beijing Dynamic Power able to help towercos and operators tackle escalating energy costs at cell sites across Africa? What kind of efficiency improvements can be obtained?

Thomas Liu, Deputy Director, Sales, Beijing Dynamic Power Co.: Based on the idea of environmental protection and energy savings, DPC developed a series of high efficiency rectifiers with typical technology such as Intelligent Directional Dormancy, by which the power system will automatically choose the normal-working high efficiency modules in the case of mix-use module conditions, which will ensure the system is always working at the highest efficiency point, aiming to reduce energy loss.

Customers use our high efficiency products to cut capex and reduce energy consumption. The extremely high deployment level of our products globally over a number of years is testament to the high reliability of our products and demonstrates their performance in the field.

Our high efficiency rectifier modules rating range from 48VDC 1kW, 2kW, 3kW to 6kW with a high efficiency performance approaching 97%. Meanwhile along with DPC's continuous investment in and development of cutting edge, energy efficiency technology with fully independent IP rights, we will soon release higher efficiency products (approaching 98% efficiency) to help our customers reduce the capex and opex of their networks.

TowerXchange: How scalable is your solution for the addition of further tenants at sites?

Thomas Liu, Deputy Director, Sales, Beijing Dynamic Power Co.: DPC's power solution is specialised in catering for multi-tenant use. Every tenant's power consumption is metered by an individual energy meter which is individually monitored and managed by the system controller without tenants interfering with each other. DPC's multi-tenant management and LVD individual solution can record the different power consumption and key data of each tenant, helping the towercos effectively manage tower sharing.

TowerXchange: With many sites in remote locations, how does DPC's solution allow for effective monitoring and what kind of maintenance is required?

Thomas Liu, Deputy Director, Sales, Beijing Dynamic Power Co.: DPC's remote integrated intelligent monitoring system (RMS) can effectively monitor and manage power systems located in remote sites globally through an online user-friendly management interface, typically based on Ethernet communication by wireless channel. An all-in-one compact design with multi-ports and a highly-integrated 19" rack-mounted type core monitoring unit enables low cost maintenance with easy operation.

TowerXchange: Finally, please can you sum up how you differentiate Beijing Dynamic Power from your competitors?

Thomas Liu, Deputy Director, Sales, Beijing Dynamic Power Co.: DPC is committed to the continuous design and manufacture of innovative and competitive products with robust reliability, customer-oriented flexibility and highly competitive prices to bring benefits to our customers and partners. We listen to our customers needs and ensure that we understand them, making sure that we are around for support from the very beginning ■

Jet powered microturbine gensets offer a more efficient alternative to traditional DGs

Cost effective innovative solution has upto 8,000 hour service intervals, is cleaner, greener, quieter, and can use existing diesel supply chain; breaks even compared with DGs after approximately 15 months

Stuart Kelly, Bladon Jets

It's not often TowerXchange comes across a genuinely innovative alternative to a traditional diesel genset that provides primary or backup power to many emerging market cell towers, but when we heard about Bladon Jet's micro turbine gensets (MTG), we had to find out more! While the MTG is cleaner and quieter than a traditional DG, with almost no maintenance requirements, what makes the MTG particularly interesting to towercos is the fact that they are more efficient and are cleaner and quieter than a similar powered DG. Delivering cleaner and more efficient energy are key business requirements we continuously see from mobile operators and towercos.

Keywords: Africa, Asia, Bladon Jets, Capex, DG Runtime, Energy, Fuel Cell, Hybrid Power, Off-Grid, Opex Reduction, RMS, ROI, Rooftop, Shelters, Site Visits, Skilled Workforces, Solar, Spare Parts, Unreliable Grid, Uptime, Who's Who

Read this article to learn:

- How Bladon Jets harnessed the power of choice at 40,000ft for static power solutions
- The size and weight advantages of MTGs over traditional DGs
- A low maintenance solution: no oil, no water, only one big moving part
- The importance of an energy efficient solution that compliments your existing supply chain – MTGs can run on almost any liquid or gas fuel
- Months to breakeven/crossover in different scenarios, compared with traditional DGs

TowerXchange: Where do Bladon Jets fit in the telecoms infrastructure ecosystem?

Stuart Kelly, VP Market Development, Bladon Jets: We have invested considerably in R&D over the last 5 years and perfected the design and manufacture of low cost jet powered microturbine gensets (MTGs). Our MTGs are positioned to replace diesel generators as the primary or backup power solution at cell sites, thanks to our superior performance and reliability. Bladon's MTGs are ultra quiet, clean and green, small and light, which is critical at shared cell sites.

Jet engines aren't new. This is a 70 year old technology, and is the power of choice at 40,000ft. Our secret sauce is not so much a new technology as a manufacturing methodology that enables us to produce microturbines economically in volume. One of our most important manufacturing techniques is a process to cut turbine blades from a single piece of material. Our units are about 30% smaller than a diesel generator, yet they generate the same power. We've been able to manufacture to a price point such that our MTGs are commercially viable compared to reciprocating diesel gensets.

TowerXchange: How did your micro jet engines evolve as a solution for cell sites?

Stuart Kelly, VP Market Development, Bladon Jets: TATA became excited about our micro turbines and invested via Jaguar Land Rover in 2010. The first incarnation was actually in the Jaguar CX75 concept supercar, but the ancillary application of

the technology was for static power solutions for telecoms.

We are finalising our market entry strategy to sell 12kW MTGs into telecoms. For us the towercos, managed service providers and MNOs themselves are all prospective clients.

TowerXchange: Which telecom markets are you targeting and why?

Stuart Kelly, VP Market Development, Bladon Jets: Given the Tata connection, an early market will be India. The continent of Africa is also a key market for Bladon's products. We have conducted field trials in Africa over the last few months and learned valuable feedback from our partners there. Some of our field trial units have been running nonstop for 1000+ hours without ANY filter changes or servicing. That's a really compelling proposition to towercos that are crippled with genset maintenance costs.

We have attended TowerXchange Meetups around the world to share Bladon's vision with MNOs and towercos. With so many assets changing ownership in Africa, there is a new focus and financial drive to leverage tower assets harder. When towers are bought, or being prepared for sale, audits often reveal the assets aren't operating as efficiently as the owner might have thought. But the new owners don't want to create too much turbulence in the supply chain, so it's important that our solution complements the existing energy supply chain in developing markets.

Clean, green and ultra low maintenance makes the MTG most attractive for telecom sites

TowerXchange: Tell us about your solution's maintenance requirements.

Stuart Kelly, VP Market Development, Bladon Jets: Microturbine engines are a low or no maintenance solution. Unlike a diesel reciprocating engine, there is no oil and no liquid coolant in our solution. We have just one moving part, the turbine itself, which runs on air bearings with no liquid lubrication. Maintenance is a key issue at remote sites that might be many hours drive on a lousy road – the cost to get there can kill the TCO – so a technology with the potential to dramatically reduce site visits can be very compelling. There is a very low skill requirement to maintain our MTGs – in the highly unlikely event of a turbine failure, our strategy is remove and replace, not rebuild onsite. For lesser maintenance issues, such as filter changes, the O&M subcontractor can readily maintain a stock of fuel and air filters.

As well as reducing fuel and maintenance costs, thieves are less inclined to steal our MTGs as there are few if any parts they can recycle.

Aspiring ESCOs that are currently in the business of maintaining traditional diesel gensets have an opportunity to profit handsomely by deploying a more reliable solution like ours – their goal of selling at a price per kWh rate becomes more compelling. Our MTG unit has robust telemetry built in, so you need fewer field engineers as many settings can be changed remotely. From the NOC you can see if units are operating outside of their tolerances, enabling preventive maintenance rather than waiting for it to break. Also, and not insignificant for the tower operator, is the use of telemetry to know where the unit is as well as having the inbuilt electronics to stop the unit operating if moved without permission – the same technology as a tracker system on a car.

TowerXchange: Okay, so what are the advantages of micro jet engines over other alternate energy solutions such as fuel cells or solar?

Stuart Kelly, VP Market Development, Bladon Jets: There is no reliable or sustainable supply chain to support hydrogen or methane fuel in Africa yet. As a technology that is hostile to the current supply chain, the practical challenges of keeping fuel cells running are prohibitive to embracing that particular alternative energy solution in more than perhaps 20% of the estate. Let's be honest, green power is not widely used on cell sites. In India for example, eco-friendly cell sites account for less than 1% of the estate, but tower owners still want to migrate away from the reciprocating diesel genset because of the substantial energy and maintenance opex it incurs. We don't see our solution as an alternative to a 200sqm PV array; our solution is so much more compact that the use cases differ significantly. Solar isn't the optimum alternate energy solution for all cell sites; even in Africa, sites don't get good quality sunshine all the time, especially in high rise areas with shadows. You can install solar panels on an urban rooftop, and find that six months later the neighboring building has had five floors added! Our solution doesn't succumb to such vagaries. Solar has to be a part of the future, but in the context of telecom towers it's not a killer app, it's a point solution. Our MTGs can be used to smooth power from solar as well as replacing a chugging tractor engine based generator. When renewables work the MTG can become a part core part backup, there are no startup issues even if it's left idle for some considerable time between use. The fuel will contaminate before the genset has a problem!

> We don't see our solution as an alternative to a 200sqm PV array; our solution is so much more compact that the use cases differ significantly

But the important thing is that this is an evolution not a revolution – the MTG can be adapted to any local fuel supply resource. Bladon gensets, in keeping with all turbine based solutions, run on a wide range of fuels, including green alternatives such as natural gas and biofuels as well as diesel and kerosene. Bladon MTGs will also tolerate a blend of fuels like diesel mixed with kerosene thus making the mix useless for thieves planning on using it for other diesel engines.

TowerXchange: How does the capital outlay for your MTGs compare to traditional DGs, and when does the Total Cost of Ownership (TCO) crossover?

Stuart Kelly, VP Market Development, Bladon Jets: The capital outlay for an MTG is currently slightly higher than a quality diesel genset solution, but the price difference is a double not triple digit percentage. Running for 12 hours a day in SSA in 30° heat then within 15-19 months the TCO will crossover having recovered the difference in capital outlay through fuel and maintenance cost savings.

TowerXchange: How near are your MTGs for telecom to being a market-ready solution?

Stuart Kelly, VP Market Development, Bladon Jets: We go into production later this year. The first run of MTGs have already been ordered, and we've signed distribution agreements already with partners in Africa and India. We'll be manufacturing in the UK, and in Asia soon too, and from the US in due course.

TowerXchange: What is the sweet spot in terms of the load your solutions can support?

Stuart Kelly, VP Market Development, Bladon Jets: Our Bladon MTG12 MTG delivers up to 12kW, with output options 230V AC or 120V AC. We also have a 48V DC output variant that telecom clients tend to like. Most telecom sites need somewhere between 3kW and 6kW for constant power, maybe 9kW if there is a hybrid arrangement requiring battery bank charging. Since the MTG runs at variable speed to match the load our efficiencies are much better at partial loads compared to traditional DGs

TowerXchange: How do you ensure modularity as power requirements increase with the addition of multiple tenants?

Stuart Kelly, VP Market Development, Bladon Jets: Given that operators are trying to drive power consumption down, a new BTS might need 1kW when the last model needed 2kW. At the moment the applications we see don't consume more the 3kW in total, so it should be possible to add a second tenant without upgrading the MTG. Because our unit doesn't de-rate over time, its ability to deliver continuous power is stronger. The MTG is a more reliable means of delivery of consistent power than a conventional DG for a multi-tenant site. If additional tenants are added beyond what one MTG can provide, the answer is to add a second unit in a daisy chain. And if the power requirement reduces again, our units are relatively easy to relocate to another tower. Another critical consideration is that the MTG can be 25% more efficient as a reciprocating engine when running at part load.

TowerXchange: How do you bring Bladon Jets to market – do you sell direct or through channel partners?

Stuart Kelly, VP Market Development, Bladon Jets: Our model is to sell through partners. Towercos and MNOs need the credibility of boots on the ground to provide after sales service, even with a low maintenance solution such as ours. We are targeting key managed service providers on the front lines of tower builds, upgrades and maintenance, with the objective of creating a pipeline for thousands of unit sales.

TowerXchange: Finally, please sum up how you would differentiate Bladon Jets from other cell site energy solution providers.

Stuart Kelly, VP Market Development, Bladon Jets: We've taken a well known form of power generation in the reciprocating engine, turned it on its head and married it with another established technology in jet engines, then developed a manufacturing process to bring to market an innovative solution with a lower TCO business case for telecom tower operators. Micro jet engines are ultra reliable, super durable, low maintenance, and generally have a TCO runway in Africa and India from 9 to 19 months. The MTG is designed to support the current supply chain, which means our solutions can be easily introduced with an expectation of a short term payback. The fact that it's an exciting jet engine is only so interesting – what matters is reducing fuel bills, and the ability to deploy it into the field easier and cheaper than a regular diesel genset ■

“We go into production later this year. The first run of MTGs have already been ordered, and we've signed distribution agreements already with partners in Africa and India”

A business model to buy and sell energy by the kWh

How an Energy Supply Company' (ESCO) can accelerate RoI in hybrid energy

Bob Hurley, Regional Director MEA, Eltek

Tower operators would like to transfer the responsibility, and risks, of energy provision to specialist ESCOs. However there is a lack of consensus on the business model, pricing and contractual terms for selling energy by the kWh. In this article we speak to Eltek's Bob Hurley to understand the issues.

Keywords: Meetup Preview, Interview, Energy, ESCOs, Opex Reduction, Hybrid power, Solar, Wind, DG Runtime, Batteries, Fuel Security, Risk, Business Model, Off-grid, Unreliable Grid, RoI, Procurement, Site Visits, Stakeholder Buy-in, Infrastructure Sharing, Africa, Eltek

Read this article to learn:

- How demand for hybrid solutions has progressed from 20-30% of RFPs and RFQs two years ago to 70% today
- Three reasons why zero capex financing models have not worked
- A comparison of the success of three ESCO business models
- How selling energy to multiple tenants accelerates RoI for ESCOs

TowerXchange: We spoke about this in our last interview, but let's start with a summary of the current state of energy provision to cell sites in Africa.

Bob Hurley, Regional Director MEA, Eltek: Today African cell sites remain predominantly dependent upon diesel generators (DG). Grid power is neither extensive nor, in many cases, reliable, leaving many towers off-grid or relying on a grid connection that may be available as little as two to three hours per day.

To compensate for the lack of reliable grid power, there has been significant investment in dual diesel generators at many cell sites, with small batteries to bridge the time between the grid becoming unavailable and the DG kicking in. Many cell sites in Africa run the DG 24/7, at considerable expense in terms of fuel costs, refuelling and maintenance visits, and maximising exposure to fuel theft risk.

Over the last 18-24 months there has been a move towards reducing opex and accelerating the installation of solutions that are not dependent on diesel. The first step tends to be the installation of CDC (charge discharge) battery solutions - essentially a larger battery to carry the load for a longer period allowing the generator to run much more efficiently at a higher load for shorter periods of time, thus reducing opex.

The next step is to install an alternative source of energy such as photovoltaic panels to capture solar energy and deliver that as a power source to the

base station. Others have looked at wind and fuel cell solutions. The shortfall of fuel cells is that it incurs similar maintenance costs to diesel power and still requires frequent site visits to keep the fuel source topped up, whereas once solar is deployed, site visits are seldom necessary, providing it's producing power. Of course you can't guarantee sun, or wind, 365 days a year.

When rolling out a new site, tower operators' preference would be to rely purely on grid power if possible. But we don't feel that grid power will be extended fast enough to be an alternative to renewable energy - grids are prohibitively costly, so those that need power beyond the grid are left to source or generate power for themselves.

Two years ago I'd estimate that 20-30% of the RFPs and RFQs we received involved some sort of secondary energy (CDC batteries or full hybrid). Now it's more like 70% of the quotations we provide - demand has more than doubled and now exceeds demand for diesel dependent solutions.

TowerXchange: What is the decision making unit at towercos and operators when it comes to investing in hybrid energy and energy as a service innovations?

Bob Hurley, Regional Director MEA, Eltek:
The operations team typically source, test and recommend hybrid energy solutions, then the finance team signs off on the capex.

Typically the COOs of MNOs are tasked with

reducing opex. They and their team are defining requirements and specs and liaising on hybrid technologies to see what opex costs can be saved and how.

The operations team will typically then ask for proof of concept, for example "we want to evaluate installing hybrid solutions at 200 sites, tell us how much we need to pay, the time to RoI, and the impact on opex." We'll often be asked to demonstrate the solution on one site over a period of 90 days, typically at our own risk.

Usually the COO takes the result of that trial to the CFO and the financial committee for the approval of capex. The CFO is usually the gatekeeper with control of purse strings and finance governs how capex is deployed, comparing opex reduction initiatives with investing in the rollout of more base stations. Capex deployment has to maintain

a fine balance between investing to generate more revenue and spending money to secure better performance.

When that coin is flipped, it had fallen in favour of revenue generation rather than opex reduction capex investments 90% of the time, but within last 6-12 months the coin has started to fall the other way. This is driven by an increasing concern about service levels and customer loyalty as poorly maintained, poorly powered base stations risk increasing churn. The movement toward towerco-provisioned solutions based on shared infrastructure is also part of this increased appetite to invest in opex reduction - many operators are considering divesting their towers, making them more cash positive, and strengthening the case for investment in hybrid energy.

TowerXchange: Let's talk about the financial models for the sale of energy to cell sites. What has been your experience of developing and offering zero capex financing models where tower operators can repay the capital costs over an extended period?

Bob Hurley, Regional Director MEA, Eltek: The operations department want the hybrid solutions that Eltek and our competitors are offering, yet the finance department has many demands on their finite capex budget. So Eltek and several of our competitors developed zero capex financing options.

We proposed to implement our opex saving solution, and to use those savings over a lease or loan period to payback equipment costs, with length of lease or loan contract to match the opex reduction, hence a zero capex model. Eltek were able to demonstrate payback between two and a half and five years depending on various parameters. Eltek then approached large financial organisations, including the World Bank, to put together financing packages based on funding up front capital investments and recouping them through repayments based on opex savings on fixed terms over a fixed period.

Under a zero capex model, opex is stablilised but not significantly reduced over first two to three years while the capital costs are being recouped, but at the end of that period all the opex saving drops to the bottom line. For example, in a 50 base station region running DG 24/7, by installing CDC batteries the tower operator could recover US $1.5m in capex over a three year period, saving US $500k per year. And after three years that US $500k saving drops straight onto the tower operator's bottom line.

However, the operators have not bought into the zero capex model, due to three stumbling blocks.

The first stumbling block involves credit provision. Africa's franchised mobile operators tend to buy in to a local operator by acquiring 10-80% of the equity. That local OpCo is often at or near their lending limits, so when our finance partner bank evaluates the customer's suitability to be part of a US $2-5m loan, the banks will often require some form of guarantee from the parental operator, which is typically much more credit worthy. However in the majority of cases this guarantee is refused by the parent operator.

The second stumbling block is that the finance department often thinks they can borrow money at a cheaper rate than the bank and equipment provider are offering. But the finance department remain unwilling to finance the capex themselves.

The third stumbling block is the difficulty competing with Chinese OEMs who bundle finance energy and network equipment and service propositions over very long terms to secure deeper client relationships. At any green field cell site, power

equipment might represent 10% of the total capex, while 70% of capex goes into active network, with the remaining 20% in static asset and construction costs. The value of a power and network equipment bundled contract might be seven to ten times the value of just the power component, so the OEM has a greater value to discuss finance packages with the operator, while they are also motivated by securing their long term business model by locking out competitive OEMs for a five year contract term.

TowerXchange: So if zero capex financing models aren't working, tell us about the kWh energy as a service model.

Bob Hurley, Regional Director MEA, Eltek: Business models to pay for energy by the kWh originated in India, South East Asia and Indonesia.

Today in Africa, the mobile network operator often retains ownership of power systems and is only selling the steelwork to towercos. As the market moves toward a model where the operators and towercos agree that it would be easier if a third party put in and owned that power solution, that drives the ESCO (Energy Service COmpany) concept.

In Indonesia and India three potential ESCO models were developed:

■ Fixed fee operating lease. Under this model, the ESCO puts the power equipment in, and sells or leases it at a fixed cost to the tower operator over a fixed period of time. While there may be minimal opex reduction, opex is stabilised and the ESCO is able to recoup their capital investment.

> "everyone is keen to put together a power purchase agreement that yields a reasonable return for the ESCO at an acceptable rate for the tower operator"

■ Energy saving agreement. Again the ESCO puts the power equipment in, and the tower operator pays a percentage of opex savings to the ESCO on a monthly basis, based on a comparison of opex before and after installation.

■ Power purchase agreement. This is the Holy Grail of ESCO business models! Under a PPA, the ESCO installs, services and owns the power equipment and sells power to tower operators at an agreed rate per kWh.

TowerXchange: How successful has each ESCO business model been?

Bob Hurley, Regional Director MEA, Eltek: The fixed fee operating lease model has been relatively successful. However, it generally involves capex and commitment over a shorter period than the other models, so long term value creation isn't optimised. Energy savings agreements have been the least successful, primarily due to the difficulty agreeing how to measure the verified energy cost saving. Cost savings have to be measured weekly or monthly, and fluctuate depending on the weather, state of batteries et cetera. So the model is complex and opex may be reduced, but it's not stabilised.

Meanwhile, everyone is keen to put together a power purchase agreement that yields a reasonable return for the ESCO at an acceptable rate for the tower operator, but to date the two parties are to be found at either end of the scale.

TowerXchange: We've spoken to passive infrastructure decision makers at operators and towercos across Africa, and there's a lot of interest in the kWh pricing model - what challenges still have to be overcome?

Bob Hurley, Regional Director MEA, Eltek: There are still significant challenges to be overcome in terms of agreeing the price per kWh and the contract duration.

Let's breakdown the costs and risks that would be transferred to an ESCO. At an off grid cell site that might be running DG 24/7, you need regular site visits to top-up the fuel tank. You're probably losing a proportion of fuel to theft. Plus the ESCO will be exposed to the risk of increasing diesel prices.

You've got to add in the cost of preventative and reactive maintenance visits. Some of these cell sites might have been running for three to five years, and equipment has a finite lifecycle - even if optimally managed, rectifiers, batteries and generators themselves will eventually need replacing.

When the ESCO looks at the risks and costs they are exposed to over an annual period, that increases their minimum price per kWh above the price point tower operators are trying to achieve through their opex reduction initiatives. To give you an example, tower operators are looking for models that enable them to pay US $1-1.50 per kWh in Africa. For ESCOs to achieve RoI within 12 months, the cost would be around three times that level.

If an ESCO were to accept a US $1 per kWh price, after a given period they would either go out of business, and the operator would lose a long term partner, or they would have to reduce their costs by cutting back on services, with less site visits, cheaper batteries et cetera. QoS would ultimately suffer, and we're back facing the same problems we are today.

The other problem is that the ESCOs want a 5-10 year contract to give them time to recoup capital outlay, to help them secure long term business, and to reduce their cost of capital. However tower operators want to renew contracts annually, which exposes the ESCO to risk of turnover, increases the cost of capital, and therefore increases the kWh price they need to charge.

Finally, the risk is heightened if the tower operator does not want to share all his data with the ESCO, which can be a sensitive matter when assessing risks such as fuel theft. There needs to be a trust model, where tower operators share data on their real opex, and ESCOs share the true costs so we have a better chance to agree a kWh rate from which both parties can benefit. This is a significant opportunity for the tower operator to partner with a vendor he knows and is comfortable with, whose equipment he already has in his network, who he knows has the financial stability to be a long term partner.

> "With multiple tenants, capex can be recouped faster, RoI accelerated and kWh prices reduced"

TowerXchange: How can we overcome these challenges and accelerate the adoption of ESCO business models in Africa?

Bob Hurley, Regional Director MEA, Eltek:
Discussions to create a scalable PPA business model have reached something of an impasse, but this is where the infrastructure sharing proposition can help. If an ESCO is selling energy to a single tenant, RoI is longer. With multiple tenants, capex can be recouped faster, RoI accelerated and kWh prices reduced. As the towerco model matures and gains wider acceptance, so the economics of the ESCO business model get closer and closer to making sense.

The other potential solution would be for ESCOs to be formed of joint ventures between different equipment and service providers already engaged in telecom towers, each sharing the risk and returns from an ESCO joint venture according to their own investment.

We're interested in exploring the other services beyond energy provision that could add value to the ESCO proposition. ESCOs will be entrenched service suppliers with expertise on the ground - they know the sites, they know the information that needs to be shared to optimise those sites, and they can add value by diversifying their services beyond energy ■

How to achieve high 9s uptime at unreliable grid and off-grid cell sites

Improving efficiency and extending the lifecycle of gensets and batteries

Damien O'Regan, Global Sales Manager, Enatel Energy

Rectifiers, converters, inverters, chargers and controllers are often critical to the efficient operation and integration of multiple energy sources at unreliable grid and off-grid cell sites. One of the pioneers in this field is New Zealand developer and manufacturer Enatel, who you'll find exhibiting at the TowerXchange Meetup Africa & Middle East this October. We caught up with Damien O'Regan to find out more about Enatel's capabilities.

Keywords: Who's Who, Energy, Opex Reduction, Batteries, Loading, QoS, Uptime, Off-grid, Unreliable Grid, RoI, ESCOs, Hybrid Power, Renewables, Solar, DG Runtime, Dimensioning, Outdoor Equipment, Rectifiers, Africa, Enatel

Read this article to learn:

- How Enatel have overcome the consolidation of backup power to deliver high 9s uptime
- How to optimise the relationship between the genset and batteries to extend lifecycles
- The importance of modularity and scalability in meeting the different and changing requirements of individual sites
- Designing systems that are pre-wired for the integration of solar

TowerXchange: Where do Enatel fit in the telecoms infrastructure supply chain?

Damien O'Regan, Global Sales Manager, Enatel Energy: We are a New Zealand-based energy equipment manufacturer. Enatel Energy designs and manufactures a range of rectifiers, converters, inverters, solar and wind chargers across multiple voltages for telecoms and industrial applications.

Enatel is made up of three divisions. Enasolar manufacture a range of grid-tied solar inverters whilst the Motive Power group supply a suite of modular, high efficiency fast chargers. These are able to automatically identify the types of battery connected over powerline and apply the necessary voltage and charge profile. A long association with leading battery manufacturers has been a crucial contributor in identifying industry challenges and driving charger innovation.

TowerXchange: What are your channels to market?

Damien O'Regan, Global Sales Manager, Enatel Energy: We are headquartered in Christchurch, New Zealand, with direct representation via an operation in Croatia who manage parts of Europe; with Enatel Shenzhen responsible for the domestic Chinese market. However our primary business model is one that identifies and supports highly capable local partners. The results and potential is evident, for example in one instance I worked with a distributer that grew from 3 to 200 staff, driven primarily by the demand for DC power systems.

Strong relationships are crucial in tailoring systems to meet specific requirements within local environments - Enatel supplies power modules and system building blocks for integration. Alternatively, turnkey indoor and outdoor solutions are available. Our designers and decision makers are only ever one call away - we maintain very high levels of engagement, support and training.

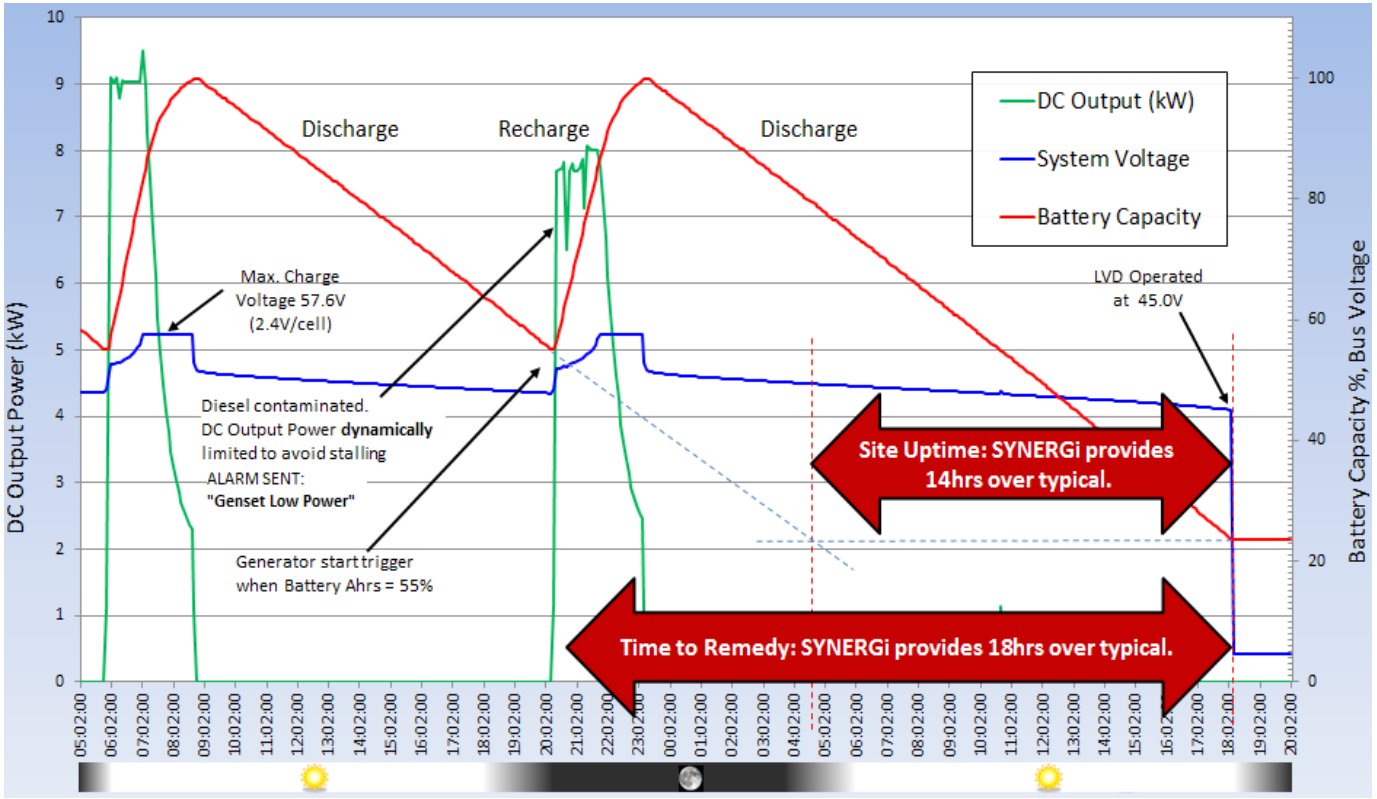
TowerXchange: What is the 'sweet spot' for Enatel's solutions - on-grid, unreliable grid, off-grid? What's the typical load?

Damien O'Regan, Global Sales Manager, Enatel Energy: Our typical applications have historically been grid connected standby power solutions where operators demand the highest levels of uptime. Demand and growth in emerging markets meant less grid dependence. Providing energy solutions for off-grid sites is a more recent challenge and one that allows us to apply innovative solutions to produce demonstrable and desired benefits

Our portfolio can support any load requirements from a 100W to 100s of kW's, but in a hybrid context we most frequently find ourselves supporting 1-3kW loads. Whilst it's possible to go outside this, careful dimensioning and evaluation of economics is necessary.

TowerXchange: Has backup power become a commoditised market?

Damien O'Regan, Global Sales Manager, Enatel Energy: Within telco networks it's a fair conclusion



based on volumes supplied, system generalisations and dollar per Watt erosions over past decades. However, sufficient and sometimes significant differentiation can still remain, particularly with the emergence of niche applications and recognition of particular capabilities. Commodification risks 'me-too' products that fail to suitably meet industry principles and foundations. Systems may aesthetically and technically appear similar, but that's largely a consequence of industry drivers. Clear distinctions normally exist at nuts, bolts and deliverables level. We've refused to compromise - the bottom line is we must be able to support and maintain high 9s availability.

Tower companies target uptimes between 2 to 4 nines (99% to 99.99%) which represent site downtimes of three days to one hour per year. For partial grid and off-grid sites, delivering higher nines goes beyond rectifier MTBF's and design architectures. It must in combination also include capabilities that address application specific issues, for example, a dependency in diesel generator uptime, information insight and self-healing elements. The towerco model is attractive because of the focus on operators, where delivering QoS means that maximising site uptime is a natural caveat.

> For CDC hybrids, fast recharge requirements can overload and stall generators. The DC power community addresses this by limiting battery recharge parameters, sequentially starting rectifiers and delaying aircon startups to avoid excessive inrush currents

Logically, commoditised system limitations can struggle to meet OPEX drivers where the challenges can be far more broad and complicated. Enatel responded to commoditisation by diversifying with an increased focus on partial grid and off-grid applications, viewing network expansion and ruralification in emerging markets as an opportunity to directly leverage our core DNA.

Blending and optimising multiple energy inputs requires the right product portfolio and expertise, but this in association with our specific development efforts has yielded unique capabilities.

TowerXchange: How do you integrate renewable energy and CDC batteries without placing excessive wear on the diesel generator?

Damien O'Regan, Global Sales Manager, Enatel Energy: The vast majority of all off-grid BTS outages relate to generator issues. Almost total site dependence can rest solely on a generator. For CDC hybrids, fast recharge requirements can overload and stall generators. The DC power community addresses this by limiting battery recharge parameters, sequentially starting rectifiers and delaying aircon startups to avoid excessive inrush currents. The relationship between the generator and cyclic batteries is critical - it necessitates tight but adaptive management. Each element is in continuous change within an environment that also never remains constant.

Increased emphasis must be placed on power conversion devices, particularly as their performance and management capabilities are instrumental in significantly extending lifetimes. Our SYNERGi solution automates and optimises energy generation. During installation, one needs to simply enter the generator nameplate kVA, push the start button to commence the commissioning charge - no further human intervention required to revisit and retune. It automatically caters for variables which may be due to tenants, altitude, wear, weather and diesel quality. It will regularly determine what parameters are required for optimum energy output and automatically adjust to maximise them.

TowerXchange: Is there still a place in the long term planning of cell site energy for diesel generators at off-grid cell sites?

Damien O'Regan, Global Sales Manager, Enatel Energy: Constant speed AC diesel generators have a bad reputation. Not totally without justification given obvious environmental and economic impacts, but it's been unfairly compounded, particularly by 24/7 operation. There are already well proven and significant improvements available. Fundamentally this is still about efficiently moving and storing energy. We know a single litre of diesel can be converted into approximately 3 kWh of energy and a review of break specific fuel consumption data is a quick way of digesting generator actualities. Our objective was to develop a solution that was generator agnostic and addresses real-world challenges.

While tower operators should always be looking to reduce their dependence on diesel, present day realities mean diesel generators will be with us for a while. With a reduction in loads and other influencing factors, alternative generation and storage mediums will increasingly come in to play.

TowerXchange: Tower operators always want to know that suppliers are proven in emerging market contexts - what is your installed base in emerging markets?

Damien O'Regan, Global Sales Manager, Enatel Energy: We have many hundreds of thousands of products installed, with the majority in emerging markets. Our power modules have very high levels of protection beyond those you'd typically find.

Enatel was established in 2002 by the same team

that founded Swichtec Power Systems, which was pioneering high frequency switch-mode power in telecoms during the mid-80's. Swichtec grew rapidly and was supplying to the major Chinese operators in 1990s. We opened a large wholly owned facility there in '96. Swichtec's products were recognised as being innovative, robust and there's good reason you still see them operating in many networks 20 years later. Swichtec became the DC business within Eaton Corporation.

The original Swichtec management team and founding head engineer Dennis Chapman, started Enatel. All remain intimately involved.

Our initial hybrid systems were limited to mining and military contexts. Recent demand has increased and as a consequence, we are engaged in discussions regarding more significant projects.

TowerXchange: Talk to us about how the challenge of hybrid dimensioning to meet the unique requirements of each site can be married up with the economic consideration where less customisation usually means less cost.

Damien O'Regan, Global Sales Manager, Enatel Energy: The application of hybrid power is complicated, primarily due to the extensive variations within a site and across multiple sites. This has limited the wide deployment of 'silver bullet' solutions.

Inherent site variability means a hybrid conversion that works at one site, won't necessarily work at all

"We see many sites dimensioned on the safe side to fit within particular capabilities. Such systems then risk being more about compromise, than optimise"

or as well on another. This can limit their successful deployment with time and cost complications. We see many sites dimensioned on the safe side to fit within particular capabilities. Such systems then risk being more about compromise, than optimise.

For us, addressing this variability was the catalyst in developing a unique dynamic solution which allows the expediting of multiple site deployments.

The integration of renewable energy generally relies on a site survey or a very clear brief. Often we're contacted by people saying we want SYNERGi. The modularity of building blocks takes much of the customisation pain off the table. However, there are some basic site information prerequisites which make dimensioning job easier.

TowerXchange: What specific parameters do you need?

Damien O'Regan, Global Sales Manager, Enatel Energy: Average site load is most critical parameter and almost always assumed to be greater than actual. We look to utilise the existing generator if possible for cost effectiveness and significant operational potential.

We also need:

- Generator - size (kVA &/or kW rating). Is it generator only? 1 or 2 generators?
- Battery preferences (if any)?
- Are there site noise curfew requirements?
- Air conditioning/cooling requirements (if any)?
- Will the site require solar or wind? Is there any likelihood of grid?
- Fuel management?
- Alarm & communication requirements? Et cetera…

TowerXchange: What's the RoI in your systems?

Damien O'Regan, Global Sales Manager, Enatel Energy: That's always an interesting question. Within a CDC environment we can deliver an eight month payback, with a better than 80% DG runtime reduction and 70% diesel savings. However, whilst these numbers are all possible and others make similar declarations, the results remain highly dependent on existing configuration. Generally you can say between 12 and 24 months payback.

We developed a tool to anticipate benefits, which

helps to reveal tangible effects in making slight configuration adjustments to meet desired balances between CAPEX and OPEX. For example, it's possible to see impacts of particular battery types, capacities and strings. What influence on lifetimes will introduction of solar have in that location? What are the fuel savings and delivery implications? It provides insight into what all the idiosyncrasies can equate to. Our primary objectives focussed on delivering a solution that produces the lowest OPEX and greatest uptime.

TowerXchange: How do you design a solution to be scalable in the event that additional sharing tenants or new technologies are added to a site, without oversizing and incurring inefficiencies?

Damien O'Regan, Global Sales Manager, Enatel Energy: One of the luxuries of our business is its inherent modularity and scalability.

The drivers and designs required to support multiple tower tenants are not totally unique. Almost two decades ago we saw similar requirements with LLU (local loop unbundling) deployments - where it was necessary to provision DC systems for the inclusions of multiple operators within enclosures and exchanges. This modular architecture has been part of telecoms power specifications since day one. The best results are most often realised by simple approaches and none are simpler. Its success is related to having the simplicity and scalability to meet periods of change and rapid growth while meeting QoS expectations.

Core to the architecture is a central 48v DC bus which allows for seamless integration of new tenants. This modularity intrinsically supports flexibility.

The DC power community continues to expand controller capabilities, where they nowadays are more representative of PLCs. They provide intelligence in managing modules and peripheral site infrastructure, such as climate control. Increasingly they are used for metering and load management. Functions such as our PowerSave, place rectifiers on standby depending on load, so regardless of variations, the system always maximises conversion efficiencies.

TowerXchange: How can you ensure your systems are ready for the integration of renewables?

Damien O'Regan, Global Sales Manager, Enatel Energy: Enatel's solar business introduced solarreadyhomes.net; where homes are pre-wired to allow for more cost effective migration to solar, at such time home owners chose to do so. This has been successful and widely adopted.

We applied that same model to telecoms, making systems that are pre-wired for solar, so when you wish to integrate solar power, it's an extremely simple process and the system will intelligently blend in this renewable energy source.

In comparison, retrofitting solar is more complicated, particularly if solar regulators are a type which cannot be intelligently controlled for optimal operation in combination with grid and generator inputs.

TowerXchange: What do you see as the most exciting developments for the future of cell site energy?

Damien O'Regan, Global Sales Manager, Enatel Energy: We naturally have huge interest in where energy storage innovation is heading. Bi-directional topologies also offer exciting possibilities. Various factors will ensure incremental efficiency gains. Our rectifier efficiency exceeds 96.5% and solar/wind chargers approach 98% - we continue to explore advancements and have demonstrated higher conversion efficiencies.

The mobile network is largely about 'the great Outdoors' and the inherent challenges this brings. Packaging variations will elevate robustness and address cooling challenges, especially in combination with hardened batteries.

Solar and wind will play increasing roles in everything we do.

Time is right for dialogue around ESCO models and we have some past experiences. The electricity price within a PPA will among many things be dependent on contract durations, risk skewing and site characteristics. Mitigating the risk is crucial. A PV spot price falling 70% over four years highlights potential exposures to volatilities.

It's important we remain cognizant of energy trends and technology advancements; otherwise there

is a danger that we simply solve the problems of yesterday and not those of tomorrow.

TowerXchange: To sum up, how do you differentiate Enatel's solutions from your competitors'?

Damien O'Regan, Global Sales Manager, Enatel Energy: We don't outsource manufacturing - design, development, and build are all done in New Zealand. This allows us to be highly agile and collaborative. Our business model is proven. We have exceptional product reliability and unique functional capabilities which are testament to Enatel's rapid ongoing growth.

We embarked on our hybrid path many years ago and during 2010 interviewed a number of key industry stakeholders, including the largest operators and towercos. This reinforced our committed and considered development efforts.

We believe SYNERGi represents a solution that is unlike any other. It departs from traditional hybrids with the inclusion of a unique and advanced generator control capability.

Loads vary due to multiple tenants and across multiple sites. The SYNERGi solution is generator agnostic and dynamically adapts to maintain maximum efficiencies ensuring extended lifetimes, maximized uptime and limits human intervention. This capability in combination with the intelligent, intuitive management of solar and wind harvesting offers a highly compelling package ■

FG Wilson's customers define the requirements for a new opex-busting DG

New telecoms product extends service intervals to 1,000 hours and can be controlled from the NOC

Michael Milligan, FG Wilson

FG Wilson is a leading global supplier of diesel generator sets with a strong heritage of quality, support and value. From 6.8 to over 2,500 kVA, today FG Wilson offers a wide range of generator sets, all built in modern facilities. This interview focuses on FG Wilson's new telecoms product, a new packaged generator product designed to meet the requirements at distributed cell sites, where the new telecoms product's 1,000 hour service intervals and integrated remote communications can significantly reduce opex.

Keywords: Caterpillar, Energy, Energy Efficiency, FG Wilson, Hybrid Power, NOC, Opex Reduction, RMS, Site Visits, Spare Parts, Who's Who

Read this article to learn:

- Defining the requirements for a new efficient DG in partnership with customers
- How FG Wilson maximise reliability
- DG-only or hybrid applications
- Post sale service and warrantee support

TowerXchange: Can you introduce your company and tell us about FG Wilson?

Michael Milligan, Account Manager, Global Accounts, FG Wilson: FG Wilson is a world leader in the generator set industry. We were founded in 1966 in Belfast which means that this year, we are celebrating 50 years in business. Our first products were mini power stations, mostly for the Middle East, and we still market large custom generator sets, but in many parts of the world we are probably better known for self-contained small power units which are relatively simple to buy and operate and require a minimum of installation work. These are supported by a global network of around 300 dealers.

FG Wilson generator sets are trusted to provide emergency power in over 190 countries around the world. They provide essential standby power to critical applications such as hospitals, airports, data centres, telecommunication networks as well as residential properties and factories.

FG Wilson generator sets are manufactured at Caterpillar facilities in the United Kingdom, United States of America, Brazil, India and China.

Since 1998 FG Wilson has been owned by Caterpillar Inc, one of the leading US corporations and a Fortune 500 company. The brand now sits within Caterpillar's Industrial Power Systems Division.

TowerXchange: Tell us about FG Wilson's new telecoms product – what makes it special?

Michael Milligan, Account Manager, Global Accounts, FG Wilson: First and foremost, this is a very customer-defined product. We spent a great deal of time simply talking with our customers and dealers and working through issues together to understand what was important. There was a real focus on product operating costs and this has led to a packaged generator product which is ideal for telecoms users, or indeed for any customer who operates at sites which are fairly remote. And the product is perfect for either hybrid or generator only applications.

To reduce operating costs, site visits for maintenance and fuel replenishment, the product offers 1,000 hours between service intervals, and comes with set-mounted fuel tanks of up to 2,000 litres. Being able to monitor the generator set from the telecom NOC maximises uptime and allows preparation for site visits minimising servicing costs and ensuring that site visits are effective.

The product options list includes a flexible range of enclosures offering three levels of sound attenuation to help ensure that it meets local noise regulations.

What makes this product special is that not only does it go further in offering much more value to customers with a specification strongly led by customers, but also we have been able to offer this for a significantly lower price.

TowerXchange: Tell us about the reliability of your solution?

“We know from past experience that rigorous upfront design, testing and validation lead to superior reliability throughout a product’s lifetime and that this can save customers a substantial amount of money over time”

Michael Milligan, Account Manager, Global Accounts, FG Wilson: We know from past experience that rigorous upfront design, testing and validation lead to superior reliability throughout a product’s lifetime and that this can save customers a substantial amount of money over time.
We are a volume manufacturer and we take reliability extremely seriously. We have made multi-million dollar investments in our industry-leading Engineering Centre of Excellence where all our new products are given intense pre-launch testing which include vibration, engine/alternator cooling, electromagnetic compatibility, noise, water ingress and rating/transient performance. Our products operate in the toughest environments and are designed to perform exactly in the way our customers expect.

Manufacturing quality is extremely important to us and our facilities operate with rigorous production quality controls, utilising the Caterpillar Production System and standard work processes. Then, once products are installed, we work together with our distributors through our Partners In Quality programme which provides on site product performance feedback back to our product engineering team.

TowerXchange: Can you outline how FG Wilson integrates with hybrid providers?

Michael Milligan, Account Manager, Global Accounts, FG Wilson: We have incorporated a great deal of product flexibility including control systems and remote communications to ensure that our generator set integrates seamlessly with any hybrid system. We are partnering with several established hybrid manufacturers to confirm compatibility and ensure efficient and fast deployment of our products on site.

TowerXchange: What warrantee and after sales support do you offer FG Wilson customers?

Michael Milligan, Account Manager, Global Accounts, FG Wilson: FG Wilson has a global

The new telecoms product with optional fuel tank

network of around 300 dealers who offer aftermarket and warranty support for the complete generator set package – a one stop shop. Dealers are fully trained on all aspects of the generator package and are supported by the FG Wilson central technical helpdesk, technical libraries, on line systems and an extensive parts distribution centre which ships three million parts a year and carries 11,500 product line parts.

Our dealers will be close at hand, fully equipped and trained, with quick access to parts in-territory to offer a fast and efficient service to solve any issues during initial visits, which minimises any product down time.

TowerXchange: Where have the generator sets been successfully installed?

Michael Milligan, Account Manager, Global Accounts, FG Wilson: FG Wilson has installed over 600,000 generator sets since 1990 and we continue to develop new products based on tried and tested key components. In every continent there is a significant population of FG Wilson generator sets working at telecom sites, and there are many reference sites listed on our website. We're now building on that population with this new customer-led product ■

Batteries for hybrid off-grid power

Five key questions you should ask

By Tomas Rahkonen, Chief Technology Officer & Vice President eCentre

In backup applications for telecom sites in developed markets with stable grids, battery operation is a well-understood topic with expected battery lifetime of more than ten years. However, for telecom sites in emerging markets with very unstable or no power grids at all, things are not quite so straightforward. Thomas Rahkonen, Flexenclosure's Chief Technology Officer and Vice President of their eCentre talks us through key criteria when selecting batteries for hybrid off-grid power applications.

Keywords: Africa, Batteries, Energy, Energy Storage, Flexenclosure, Lithium, Masts & Towers, Monitoring & Management, O&M, Off-Grid, Operational Excellence, Regulation, Renewables, RMS, ROI, Site Visits, Towercos, Unreliable Grid, Uptime

Read this article to learn:

- The pros and cons of 12V and 2V lead acid batteries and lithium ion batteries in hybrid applications
- Decision criteria in selecting a battery for a given site
- How to ensure warranties aren't invalidated and the key role played by monitoring systems
- Sizing considerations when deciding on a battery bank
- The importance of standards and the importance of traceable test records

For telecom sites in emerging markets with very unstable or no power grid at all, batteries are typically employed in a charge-discharge-charge (CDC) pattern in order to minimise the runtime of diesel gensets. It's a strategy that generally works, but with a couple of significant drawbacks.

First, such active use can often reduce the service life of batteries to just two to four years – even if special cyclic lead-acid batteries are used. And second, to keep diesel usage to a minimum during CDC operation, it's not effective to fully charge the batteries during each charging cycle, as battery power charge acceptance decreases rapidly as they fill up. The result is that gensets end up operating at low output power and therefore low diesel efficiency – thus defeating the object of using the CDC strategy in the first place.

So what's the answer? Well, let's first take a look at the two main battery technologies available today.

Lead acid batteries

Lead acid technology has been the mainstay for industrial battery applications for decades. They're available in 12V and 2V varieties, both of which have their pros and cons.

12V lead-acid batteries have relatively few mechanical constraints; are easy to charge and can be configured in parallel 12V strings in order to meet an exact Ah requirement. However, string imbalance may develop over time; they don't tolerate thermal abuse particularly well; and their

cyclic life per cell is not the highest, especially not for front access blocks.

Meanwhile their 2V cousins are extremely robust; very tolerant of electrical and mechanical abuse; are able to approach the VRLA theoretical maximum for cyclic life; and have "built-in" theft protection given that 2V power is useless for domestic applications. Further, they can be charged and discharged with exactly the same current at all times, with the result that the aging of all the cells in a bank will be uniform. But on the downside, 2V batteries require more rigid mechanical integration with the entire bank needing to be disconnected during maintenance or cell replacement. And they are also slightly heavier than their 12V rivals for any given Ah rating.

Critically though for hybrid power applications, whether 12V or 2V it's important to select batteries designed for cyclic operation. Batteries designed for good power grids (which use float operation) are typically far cheaper but will fail fast in more challenging applications.

Lithium technology

In comparison to lead acid batteries, many people assume lithium must be the best battery type simply because it's the newest technology. However, it isn't as simple as that.

Lithium batteries have a number of clear advantages. Their small size with respect to energy storage capability is one, as is their ability

to harvest and transfer energy irrespective of their charge. They can also be charged extremely fast and can accept large fluctuations in charging current.

However, the use of a battery management system is mandatory, as lithium cells always need balancing. Lithium technology is also costly – at least three times more expensive per watt hour (Wh) as compared to VRLA. And lithium batteries can only be used where the ratio between energy storage and constant power to the load is small or moderate.

Hybrid power system selection

To further complicate the matter, any battery technology will only be as good as the hybrid power system using it. How precise is the system's battery control? Has the hybrid power system vendor conducted appropriate testing and development with the battery vendor to make sure performance will be maximised?

It's important that batteries are kept within the allowed temperature range as specified in the supplier warranty. So a good hybrid system will monitor this temperature and proactively warn the operator before problems occur. And with batteries constituting a significant portion of the cost of installing and running a hybrid power system, it should also safely log all usage and charge cycle data for potential warranty claims if batteries fail prematurely.

By example, Flexenclosure's eSite hybrid power system uses a software-defined battery charging model and adaptive algorithms, which are fine-tuned with each battery supplier. In this way both the warranty period and battery performance are optimised, thus maximising battery investment regardless of which battery type or brand is selected.

So which is the "best" battery?

What soon becomes clear is that there isn't a one-size-fits-all answer to the question of which battery is best for hybrid power systems. Selection ultimately comes down to a number of different factors, including:

- Which battery type best complies with the mode of operation you need?
- Is the battery's operational temperature range adequate at your locations?
- Can you remain inside the limits of the maximum cyclic life or energy throughput for the service life you need?
- Is grid power available at each site and if so, how reliable is it?
- And how long will it take to reach any given site in the event of a grid or genset failure?

In an ideal world, you'd choose the most appropriate batteries to install at each and every individual site, rather than making a generic decision at a network level. This may not be practical from purchasing or on-going maintenance perspectives, so a trade-off will always need to be made somewhere.

Overall though, for lead acid, 2V is often the preferred choice versus 12V alternatives but with lithium technology evolving at a terrific pace in the automotive industry, it won't be long before it becomes a serious option for many hybrid power scenarios.

Five Key Battery Questions You Should Ask

1. How do I choose the right battery for different site types?

Critical data points at a site level are the duration and frequency of any power interruptions at each site each day. Also important is how long it takes for service personnel to reach the site in the event of a power failure when the site will need to run on batteries only, as this will determine required battery autonomy time.

2. Is there a solid business case for deploying lithium versus lead acid?

Lithium technology is being increasingly adopted for sites with a reliable grid and limited power interruptions, but remains technically and financially challenging in pure off-grid applications where a larger battery bank is needed for battery autonomy.

3. How strict are extended battery warranties?

Most (if not all) warranties will typically be conditional if the batteries are being used in scenarios that are more challenging than their factory tests when new. Therefore, the exact charging and cyclic operation scheme must be disclosed and agreed upon in advance if the battery manufacturer is to commit to cover long-term performance in the warranty.

4. How big should the battery bank be for a hybrid power system?

The size of the battery bank at any given site is typically driven by the size of the site load and the minimum battery autonomy time required. In pure off grid applications, an additional factor to consider is that the number of daily charging cycles must be kept below a certain value – typically four times per day – in order to prolong battery life. So the larger the battery bank, the fewer the charge cycles required.

5. What is the role of standards when selecting a battery?

International standards, IEC and others are very helpful, but only if a battery manufacturer's compliance statement is accompanied with traceable test records confirming that all the test criteria in each standard have been met. Partial compliance is misleading and prevents fair and objective comparisons between manufacturers ■

IPS unleashes the Off-Grid Beast!

EXERON runs virtually maintenance free, and can reduce opex by 96%!

Alexander Rangelov, CEO, IPS

International Power Supply (IPS) has developed a robust, military-grade off-grid power solution, which has now been refined for virtually maintenance free operation in telecom applications. IPS's modular solution is readily upgradeable for the era of infrastructure sharing, and has the advantage of all the components having been developed and sourced from the same manufacturer. TowerXchange spoke to CEO Alexander Rangelov to learn more…

Keywords: Air Conditioning, Batteries, DG Runtime, Energy, Energy Efficiency, Hybrid Power, IPS, Infrastructure Sharing, International Power Supply, Lithium, Logistics, Microgeneration, Off-Grid, On-Grid, Opex Reduction, RMS, ROI, Rectifiers, SLA, Shelters, Site Visits, Spare Parts, Who's Who

Read this article to learn:

- How IPS developed and attracted investment into EXERON – The Off-Grid Beast
- Reducing telecom opex by 96% with a 16 month ROI on a 1.5 kW load site
- How dynamic control of battery charging can extend battery life by 30%
- How IPS simplify delivery, installation and maintenance
- The importance of all the power systems, enclosures and A/C equipment coming from the same manufacturer

TowerXchange: Please introduce International Power Supply to our readers – where do you fit in the telecoms infrastructure ecosystem?

Alexander Rangelov, CEO, IPS: IPS is a 26 year experienced high tech company specialised in the R&D and manufacturing of power electronics and energy conversion technologies for the areas of telecommunications, off-grid electricity, defense and railways. We are deeply specialised in the design and development of complete telecom indoor and outdoor power solutions for both grid connected and off-grid applications. Our portfolio includes all kinds of power components and solutions needed for telecom infrastructure, all of which are developed, designed and manufactured by us in Sofia, Bulgaria (EU).

TowerrXchange: What has attracted PTIG, PostScriptum Ventures and BlackPeak Captial to invest in IPS and how are you going to deploy the capital?

Alexander Rangelov, CEO, IPS: Our investors have been attracted from our unique and innovative product: EXERON – The Off-Grid Beast. It was invented by IPS initially for military applications (powering communication infrastructure and desert camps) for providing reliable power in remote and hardly accessible areas with harsh ambient conditions. In the last seven years we developed the system to become a solution addressing the global electricity and environmental problem. The fast market penetration and international recognition we have achieved, the

IPS team's passion and our enormous R&D ability made our investors keen on supporting our global expansion. The capital is invested in R&D, business and market development, new logistic hubs and offices around the world as well as manufacturing facilities.

IPS has partners, distributors and operating systems in 51 countries. Offices, logistics hubs and service points are distributed worldwide at strategic locations.

TowerXchange: How are your solutions proven in terms of their ability to reduce opex in distributed telecom networks?

Alexander Rangelov, CEO, IPS: Regarding opex reduction, it is very important to find the optimum correlation between the opex reduction level and the return of investment (RoI) period. With one of our projects with a large telco group we achieved 96% telecom opex reduction and a 16 month return of investment period for a diesel generator powered off-grid site with 1.5 kW constant telecom load. This result is thanks to the highest integration level of the EXERON system components and the innovative process and battery management. IPS developed unique software for dynamic control of the battery charging process, leading to extending the battery life by approximately 30%.

TowerXchange: What is the "sweet spot" in terms of the kW load on the site which EXERON is able to support?

"we achieved 96% telecom opex reduction and a 16 month return of investment period for a diesel generator powered off-grid site with 1.5 kW constant telecom load"

Alexander Rangelov, CEO, IPS: We are not limited to any output power. The whole EXERON system structure is based on power modules of 2 kW or 4 kW. So the minimum power step is practically 2 kW. The unique IPS communication protocol can address up to 16,300 modules simultaneously. So, this means 16,300 modules x 2 kW or 4 kW.

A large number of modules are used in our mini grid applications, but for telecom applications typical numbers would be 2 kW, 4 kW, 6 kW, or up to 36 kW in some special cases.

TowerXchange: Tell us about IPS's Exeron system and how it meets the needs of towercos who need to increase the power capacity at cell sites as additional tenants are added?

Alexander Rangelov, CEO, IPS: The modular system structure offers great scalability and flexibility. There is only one unit (MCU – Main Control Unit) that monitors and controls all system modules (rectifiers, solar charge controllers, inverters, DC-DC converters). All of them are hot pluggable. The power capacity extension for any power system component is easily done by simply adding new plug&play power modules. The advantage of having only one MCU for the whole system, and sourcing all modules from only one manufacturer, is great efficiency, redundancy and self-control. It is the base for the intelligent mini-grid systems. It is unique because the same EXERON technology with the same control unit that is used for telco towers can be deployed as a mini-grid electricity solution for villages controlling and monitoring over 16,300 power modules corresponding to 65 MW of power. That is why we call it EXERON – The Off-Grid Beast!

EXERON – The Off-Grid Beast

TowerXchange: Tower companies' Service Level Agreements (SLAs) often demand 99.5-99.9% uptime – tell us about the reliability and autonomy of your solution.

Alexander Rangelov, CEO, IPS: IPS is developing and manufacturing all products under the NATO military standard for quality AQAP 2110, so every single component meets higher requirements than usual. As mentioned before the EXERON system has been developed initially for military applications in remote areas. A big advantage is that it can operate in very harsh ambient conditions with temperatures between -40°C and +80°C, heights above 4000m above sea level, high humidity and salinity, acid environments et cetera. These features are not always the case for civil applications but have high importance for the telco companies in some areas of Africa, Asia and South America.

TowerXchange: How do you ensure ease of delivery, installation and maintenance of your solutions at remote cell sites?

Alexander Rangelov, CEO, IPS: The ease of delivery is guaranteed with the new manufacturing facilities that we have built and the logistics hubs in Africa, Asia, Australia and America.

The ease of installation is guaranteed in a few simple steps, since everything is included and pre-installed in the system. The EXERON runs basically maintenance free, however if some of the modules need to be exchanged – it takes not more than ten seconds, because every single system module is hot pluggable (rectifiers, solar charge controllers, inverters, DC-DC converters, the MCU – Main Control Unit, surge protection devices et cetera). Another big advantage is that an outage in one of the modules or more of them cannot lead to a full system stop. Even in case of main control unit failure, the system will continue its operation unchanged.

Following the military standards for quality during the development phases and manufacturing, a high system availability and robustness is guaranteed. It is a clear advantage and of crucial importance for remote, hardly accessible and long-distance site locations, which leads directly to reduced opex costs.

TowerXchange: Should remote monitoring capabilities be built in to energy systems or should third party RMS be used to monitor performance?

Alexander Rangelov, CEO, IPS: Yes, the remote monitoring is built in to the EXERON. It offers three options for remote monitoring and signaling: there are potential free contacts for signaling (event relays), there is an SNMP monitoring, and the third one is the integrated web server in the MCU. It is accessible through HTTP. You can monitor, but also control the functions and parameters of the system. The MCU can also monitor and transfer the signals from different sensors that can be connected to the EXERON – smoke, fire, humidity, temperature, et cetera: up to 16 sensors.

TowerXchange: Do you see IPS being a pure solution provider, or do you have any appetite to explore energy services company (ESCO) business models?

Alexander Rangelov, CEO, IPS: IPS is a R&D and

> better performance, faster RoI, robustness, advanced features and functionality, a global all-in-one scalable solution, leading to outstanding opex savings

manufacturing company, so in this aspect we are a pure solution provider. In 2016 together with our investors we started offering also the ESCO business model, but mainly for residential applications.

TowerXchange: How would you differentiate IPS and EXERON from competitive modular hybrid energy solutions?

Alexander Rangelov, CEO, IPS: In just a few words: better performance, faster RoI, robustness, advanced features and functionality, a global all-in-one scalable solution, leading to outstanding opex savings.

EXERON is a multi-talented beast! It can be used for grid connected sites in the way of a customised outdoor cabinet with a purely modular rectifier. At the same time EXERON can be deployed to control and optimise hybrid diesel genset-battery sites, but also PV-diesel-battery sites. The good thing is that it can start as grid connected or hybrid configuration and then at anytime new power modules can be added – solar charge controllers and/or inverters. All within the same architecture. And under the same MCU control unit.

To mention it again, our clear advantage over other solutions is the fact that we develop and manufacture all the system modules. At the end they talk to each other in the system via a unique communication protocol, developed by IPS and delivering optimal performance and efficiency. In addition, we have the ability to scale our power modules. There are a lot good solutions and products on the market, but they have limitations.

Still in 2014 in Germany, EXERON won the world innovation ees Award for innovative off-grid power systems with energy storage. We are continuously developing the system and believe that this is the only way to break limits and create innovative functionalities and features.

IPS designs and manufactures not only the power systems, but also the proper environment - enclosures and outdoor cabinets with many options, heat exchange options, but also with our own developed air conditioning module. We have even built a redundant air conditioner for cooling and heating. It's virtually maintenance free! Sounds good?!

TowerXchange: What's next for IPS and EXERON?

Alexander Rangelov, CEO, IPS: We are ready to open a new chapter in IPS's successful history in the next couple of months, which will be a huge technological jump. In the beginning of 2017 we are planning to release a new storage technology integrated in the EXERON which will offer the long life and multicycle ability of Lithium-based batteries, but at the price levels of Lead-based batteries. Keep an eye on IPS and EXERON-The Off-Grid Beast! ■

IPS will be returning once again as Diamond Sponsors of the 2017 TowerXchange Meetup Africa & Middle East, taking place on 3-4 October at the Sandton Convention Centre. www.towerxchange.com/meetup/meetup-africa

IPT PowerTech: the evolution from product provider to one stop shop and now ESCO

Creating a single point of accountability and selling energy by the kWh demands faith in people, products and services

Khaled Habbal, VP & COO, IPT PowerTech

When and how should power system providers invest in overhead and back their products with an end to end service proposition? And when should they supplement that proposition with zero-capex, ESCO business models? This is a journey IPT PowerTech have taken over the last 20 years: their business model has evolved as fast as the business has expanded geographically.

Keywords: Afghanistan, Africa & Middle East, Algeria, Asia, Batteries, Business Model, Construction, Energy, Energy Efficiency, ESCOs, Ghana, Hybrid Power, Installation, IPT PowerTech, Iraq, Lebanon, Linfra, Managed Services, Morocco, Multi-Country Partner, Myanmar, Nigeria, O&M, Off-Grid, Operational Excellence, PCT, PowerTech, RF Design, RMS, Saudi Arabia, Shelters, Skilled Workforces, Stratum Enclosures, Syria, Unreliable Grid, Who's Who

Read this article to learn:

- Creating a single point of accountability through the combination of power products and managed services
- Meeting the challenge of energy efficiency at unreliable grid and off grid sites in Nigeria, other African countries and Myanmar
- Developing and scaling a zero-capex, ESCO proposition
- The two different energy efficiency investment strategies employed by African towercos

TowerXchange: Please introduce IPT PowerTech to our readers.

Khaled Habbal, VP & COO, IPT PowerTech: When IPT PowerTech was established in 1993 we were not a telecom service provider, but a provider of automotive and specialty batteries. As the telecom sector picked up in 1995-96, we thought we could add a lot of value so we started selling batteries to the telecom sector. We expanded into selling power systems in late 1990s, and later added site construction services, telecom services, and managed services and maintenance to create a one stop shop for telecom infrastructure equipment and services.

We made a strategic decision to become one of the few companies in the region, if not the only one, to combine product R&D and manufacturing capabilities to ensure optimum delivery. That combination of products and services together enables us to provide the maximum benefit to our customers.

Our journey has been an evolution from being a regional, Middle Eastern power systems integrator and batteries vendor, expanding into 11 countries on three continents with 2,000 employees across two main divisions. Our power division provides a wide range of power products for telecom sites; from batteries to power systems, hybrid systems, power generating sets, energy efficient solutions, and our own enclosure manufacturing and assembly. Our telecom services division provides managed services, with three main pillars:

construction – the building of telecom sites and the laying of optical fibre; maintenance and managed services; and telecom installation and network services.

While some suppliers sell energy systems with a certain promise of efficiency, it is all too easy for clients to struggle to achieve that efficiency in the field. IPT PowerTech provides a single point of accountability – we put our money where our mouth is.

TowerXchange: The perception is that telecom product development and services are very different businesses with different P&Ls – how have IPT PowerTech managed that combination from a corporate financial point of view?

Khaled Habbal, VP & COO, IPT PowerTech: One of IPT PowerTech's strengths is that we are self-funded which gives us freedom in decision making. Naturally, we take well calculated risks.

The way we run our managed services business has delivered a very consistent balance sheet. We sign long term contracts over three, five or ten years. Because of our focus on operational excellence in delivery, our financial risks are minimised. Yes there is a lot of overhead in managed services compared with pure product development, for example we have had to build a significant workforce to manage more than 4,500 sites in Africa, but we find that if we excel operationally, the business is in a good place in the medium to long term.

Our diversified portfolio of offerings, coupled with our geographic diversity in the 11 countries where we operate, and the 40+ countries where we sell our products, stabilises our financial statements and risks of deviation. We have seen geographies, or offerings slump in years, and are picked up by other geographies and offerings, and the cycle continues. That diversification puts us in a well-balanced situation, whereby we are less affected by the geographic volatilities.

TowerXchange: What is your geographical footprint?

Khaled Habbal, VP & COO, IPT PowerTech: The headquarters of IPT PowerTech Group is in Beirut, Lebanon. We operate through five commercial brands, all fully owned: IPT PowerTech, Linfra, PCT, PowerTech, and Stratum Enclosures. We have operations in 11 countries. In the Middle East we have operational offices in the Kingdom of Saudi

Arabia (KSA), Iraq and Lebanon. We recently acquired Linfra to expand our North African footprint – we operate in Algeria and Morocco. We're in Nigeria and Ghana in West Africa, and in Afghanistan and Myanmar so far in Asia, with plans to expand further. We also have our own manufacturing facilities in Romania and Lebanon.

While we have an operational presence to deliver telecom services in each of these countries, our solutions and products have been sold to over 60 operators in more than 40 different countries.

TowerXchange: Do you have an appetite to expand into new countries should opportunities arise?

Khaled Habbal, VP & COO, IPT PowerTech: It took us less than a year in Myanmar to create a company, recruit top notch executives, secure a long term contract for provision of power products and energy services, and become fully operational. The same applied earlier in Afghanistan, and in many African countries like Nigeria.

So we are willing to invest and expand into new geographies, as long as that growth is profitable and aligned with the strategic direction of the business.

TowerXchange: Please would you contrast the typical energy equipment and service requirements in a market like Nigeria, where grid power is neither extensively available nor reliable, with a market like KSA where one would imagine cell sites have much less complex backup power and maintenance requirements?

"The existing transmission infrastructure in Nigeria and its operation is the weakest link in the power value chain. Transmission is responsible for many instances of stranded generation, thus the improvement of its operational performance and efficiency remains fundamental to the attainment of stable and reliable power to all Nigerians"

Khaled Habbal, VP & COO, IPT PowerTech: These markets present very different kinds of challenges. Nigeria is a fabulous country which has been developing steadily recently. The existing transmission infrastructure in Nigeria and its operation is the weakest link in the power value chain. Transmission is responsible for many instances of stranded generation, thus the improvement of its operational performance and efficiency remains fundamental to the attainment of stable and reliable power to all Nigerians.

This requires that we overcome a lot of challenges in harnessing energy efficient solutions that reduce diesel consumption. The impact of high energy opex is considerable, particularly in countries where ARPU is low, thus the need for energy efficient power solutions with the lowest TCO possible.

In contrast the challenges in KSA are completely different. Power is more stable, over 90% of sites are grid connected, but in KSA the challenge is the large geographical area – balancing resource allocation to achieve targeted MTTR whilst delivering a profitable service. Like in any market, SLAs and KPIs are differentiated according to the importance of each site – so it's critical to negotiate reasonable agreements that take into account logistical challenges.

TowerXchange: How would you characterise the tower and tower power market in MENA, where the towerco business model is only starting to be adopted, relative to the more mature towerco market in SSA?

Khaled Habbal, VP & COO, IPT PowerTech: The last five years have seen a revolution in SSA telecoms

> we have the faith in ourselves, in our products, in our management, and in our field workforce to sell energy by the kWh – you need to have that belief because you're taking all the risk on your back

– IHS, Helios Towers Africa, Eaton Towers and American Tower have transformed the market with a very positive impact for themselves, for their MNO counterparts and for the environment as they increasingly rollout energy efficient solutions that are more eco-friendly than the previous 24/7 operation of DGs.

Once this business model comes to MENA there will be a change in the status quo. But the energy logistics challenge does not exist in the Gulf region, even in North Africa; in Algeria and Morocco the grid is significantly better than in most countries in SSA.

TowerXchange: As emerging market telecoms evolve toward 'energy as a service' business models, do you see IPT PowerTech evolving into an ESCO and selling energy by the kWh?

Khaled Habbal, VP & COO, IPT PowerTech: This is at the heart of our strategy. IPT PowerTech has evolved from a product company, adding services, then combining products and services, and over the last years we've been talking about opex models to sell energy by the kWh. We have already started offering kWh propositions – providing energy to a certain number of sites on a kWh basis, using a zero capex, opex business model.

In fact IPT PowerTech is the first company to offer an opex business model in Nigeria five years ago. We went into Airtel after their acquisition of assets from Zain offering a kWh model, but the concept was ahead of its time – it was not as exciting as it is today.

We believe IPT PowerTech is most suited to offering opex business models given that we develop, manufacture, install and maintain our own solutions – we have the faith in ourselves, in our products, in our management, and in our field workforce to sell energy by the kWh – you need to have that belief because you're taking all the risk on your back.

TowerXchange: I understand that IPT PowerTech has worked with several of the leading tower companies in SSA, including American Tower, IHS and Helios Towers Africa – are the towercos investing substantially in energy efficiency programmes and hybrid energy yet, or does the focus of your work with them remain on maintaining legacy diesel-based power systems?

Khaled Habbal, VP & COO, IPT PowerTech: We've seen different towercos go in one of two different directions when it comes to investing in energy efficiency programmes. Some towercos invest 'full blast' in energy efficiency from early on and it takes them 12-24 months to upgrade the power systems on most of their sites. Other towercos take a more cautious approach; after they buy towers they install RMS to monitor sites for 12-18 months after which they decide where and how to invest in energy efficiency – the benefits are realised later, which might be a prudent albeit time consuming approach. Each towerco has its own strategy – there's no right or wrong.

What matters most is Total Cost of Ownership (TCO). Having acquired a new portfolio of towers, a towerco may find themselves owning a number of inefficient diesel generators with several thousand

hours of potential runtime before they need replacing. You can run those assets into the ground, or you capitalise on their immediate refurbishment and resale value and invest in a more efficient solution that delivers RoI in 12-18 months. It all depends on the way each towerco looks at TCO. It is also driven by the availability of capital to invest. Towercos are mostly generating capital to acquire new towers, they don't always have the financing needed to invest in energy efficiency across the entire portfolio until they complete a new round of funding.

TowerXchange: Finally, please sum up how you would differentiate IPT PowerTech from other turnkey infrastructure providers for telecoms?

Khaled Habbal, VP & COO, IPT PowerTech: IPT PowerTech distinguishes itself by merging the worlds of power and telecom. We have our own manufacturing facilities in Lebanon and Romania, which means we are uniquely able to combine high quality in-house products coupled with our own services proposition.

Our outstanding management team, both in our headquarters and at country level who are leading the operations, reflects the fact that our people are as valuable as our products and services.

Our company slogan, "redefining power solutions, reinventing telecom infrastructure" is illustrated in three ways:

1. We always redefine and customise power solutions to maximise quality of power delivery and economise power costs in the light of the declining ARPU.

2. We have more than 20 years of experience. With proven R&D teams and 2,000 experts in the field we are the most specialised power solution provider in this industry, operating in areas where power has always been a challenge.

3. On the other hand we reinvent telecom infrastructure by being a one stop shop for any telco, towerco or vendor in terms of infrastructure services from site acquisition, to the building of sites, managed services and maintenance, telecom installation and integration ■

PRAMAC delivers BTS power supply with less fuel consumption, lower opex and less site visits

From portable and stationary DGs to hybrid solutions

Paolo Campinoti, CEO, PRAMAC

PRAMAC is a private manufacturing company that specialises in power generation equipment and materials handling equipment. They offer a wide range of power solutions including portable generators, handling generators, as well as customised and standard stationary generators. They operate worldwide, with a presence in Italy, Spain, France, China, Brazil and many other regions.

CEO of PRAMAC Paolo Campinoti talks to TowerXchange in this article about the energy solutions PRAMAC offer their clients operating in the telecom industry.

Keywords: Who's Who, Energy, Opex Reduction, Batteries, Energy Efficiency, Hybrid Power, DG Runtime, Site Visits, Shelters, Africa, PRAMAC

Read this article to learn:

- PRAMAC's role in the telecommunications industry
- Telecom clients' power requirements
- About PRAMAC's operations in the African telecom market
- How PRAMAC is responding to the growing demand for hybrid energy solutions
- The benefits of PRAMAC's services over other power solutions in the industry

TowerXchange: Please introduce PRAMAC and your role in the telecoms infrastructure ecosystem.

Paolo Campinoti, CEO, PRAMAC: We are a solid and dynamic company dating back to 1966. We now operate worldwide through five manufacturing plants, located in Italy, France, Spain, China and Brazil. We focus ourselves on two main core activities: Material Handling Equipment and the Power Business.

As far as the power business is concerned, we design, manufacture and install a complete range of portable and stationary generators from 1 to 3360 kVA as standard production and provide also tailored solutions that can be adapted to every specific requirement.

Our Material Handling Equipment production is one of the most vibrant realities in the European panorama, with a strong historical presence in the continent and a clear market identity, based on pedestrian warehousing with a complete range of products for the light duty professional use, such as manual and electric pallet trucks, stackers.

Our high technological experience and our vertically integrated manufacturing processes ensure that all our products are designed and delivered with top quality and high performance, especially in the telecommunication sector. We are a key player in this industry thanks to the strong relations we have created with the main business operators and to our worldwide local partners.

TowerXchange: What power range do your telecom clients typically require, and do the towercos typically want a larger generator capably of supporting multiple tenants, even if they start out with a single tenant?

Paolo Campinoti, CEO, PRAMAC: Customers usually require an installation power range between 10 and 22 KVA. Most of the requests we have are about using one tenant for each generator instead of multiple tenants. This is given to the fact that the generator will suit a perfect service.

TowerXchange: Please tell us how many generators you have installed in telecom, and how many are in Africa?

Paolo Campinoti, CEO, PRAMAC: Thanks to the great work of our local partners we have installed more than 10,000 generators in Africa serving telecom needs. We have served several important telecommunications clients such as Tigo, GT, Vodafone and ZTE.

TowerXchange: Reliability, efficiency, capital cost and lifetime define the value of a generator used at an emerging market cell site – how do PRAMAC's generators score on those four measures?

Paolo Campinoti, CEO, PRAMAC: PRAMAC has more than 20 years of experience in electric generator manufacturing; for this reason we can offer a very high standard of quality and service. We are one of the few generator companies that are capable of creating customised solutions that attend to almost every customer need.

TowerXchange: Tell us about your local market partners and the after sales support you can provide in Africa.

Paolo Campinoti, CEO, PRAMAC: PRAMAC can rely on a well-structured network of local partners in different African countries, selling our products to the final customers and providing service and after sale support, under the supervision of our branches, always ready to assist them, when needed.

TowerXchange: How has PRAMAC responded to increasing demand for hybrid energy?

Paolo Campinoti, CEO, PRAMAC: In order to satisfy the increasing need of telecom operators for BTS power supply with less fuel consumption, lower operating costs, fewer maintenance trips to the field, PRAMAC has developed new solutions which allow coupling a traditional AC diesel genset with an energy storage system.

The heart of the system is the Hybrid Module which integrates latest-generation power electronics and top class battery technologies such as Lithium.

A further step to meet remote BTS power supply needs is our Hybrid Qube which is a complete electrical power supply system that can be easily configured to meet a broad range of power needs for telecom applications. It's a cubic 10' container specially designed to easily accommodate 10 -45 kVA gensets interchangeably. Its flexibility and security, along with a plug and play configuration and an easy system to start and stop the genset make this solution the ideal one for remote installed BTS.

"our Hybrid Qube… is a complete electrical power supply system that can be easily configured to meet a broad range of power needs for telecom applications"

TowerXchange: Please sum up how you differentiate PRAMAC's solutions from other diesel generators

Paolo Campinoti, CEO, PRAMAC: PRAMAC can offer to the telecom industry a wide range of solutions for every kind of power demand, from continuous operations to emergency stand-by in the two main fields such as Data Center power back up and BTS power supply. To get the highest level of reliability PRAMAC assemble top class engines and alternators on its generators and top quality material for the other components.

Our partnership with many companies working in telecom applications and the high attention paid by PRAMAC to new technologies will bring new product developments which will allow satisfy the most demanding customers ■

SEDEMAC's low-capex variable speed AC DG retrofit solution

How an innovative technology could change the energy game in India, Africa and beyond

Shashikanth Suryanarayanan, Chairman, SEDEMAC

SEDEMAC offers energy efficient and innovative controls for small engines and power-trains and is currently offering technologies to support telecom operators and towercos in reducing their level of fuel consumption. With a focus on the Indian market but an eye on international expansion, Shashikanth Suryanarayanan, Chairman of the company, discussed with us his views on how telecom and tower companies can save energy and how SEDEMAC's offerings can support them.

Keywords: Interview, SEDEMAC, India, Southern Asia, Southeast Asia, Africa, Capex, Energy Storage, Off-Grid, Unreliable Grid, ROI, Solar, DG Runtime, Energy Efficiency, Who's Who, Mahindra Powerol, Eicher Motors, Towercos

Read this article to learn:

- SEDEMAC'S footprint, activities and background
- Challenges of energy opex reduction in India and beyond
- Options available for telecom and tower companies to go green
- How can SEDEMAC's products help telecom companies and towercos reduce fuel consumption

TowerXchange: Please introduce SEDEMAC, its activities and footprint

Shashikanth Suryanarayanan, Chairman, SEDEMAC: We focus on creating mechatronic solutions for engines and power trains. The company was created by a research group I led at the Indian Institute of Technology in Bombay.

Our primary two sectors of interest are gen-sets and two-wheelers. We are very active in the two-wheelers side as India is the largest market for internal combustion engines for motorbikes and scooters in the world. This is one of our main areas of focus at SEDEMAC due to the constant growth in demand in India.

On the small gen-sets side, we have created two solutions. On one hand we focus on the retail market and on the other one, on the telecom industry. These are two very well established markets in India and we have been able to acquire key engine and gen-set manufacturers as clients.

TowerXchange: What has been your company's involvement in the energy sector for telecommunications companies so far?

Shashikanth Suryanarayanan, Chairman, SEDEMAC: Around 2009 to 2010 we started to focus on the telecom sector. In India, telecom towers currently consume an average of 4,000-6,000 litres per year of diesel. In several rural and remote locations in India access to the national grid is very poor. In these instances the back-up power solution

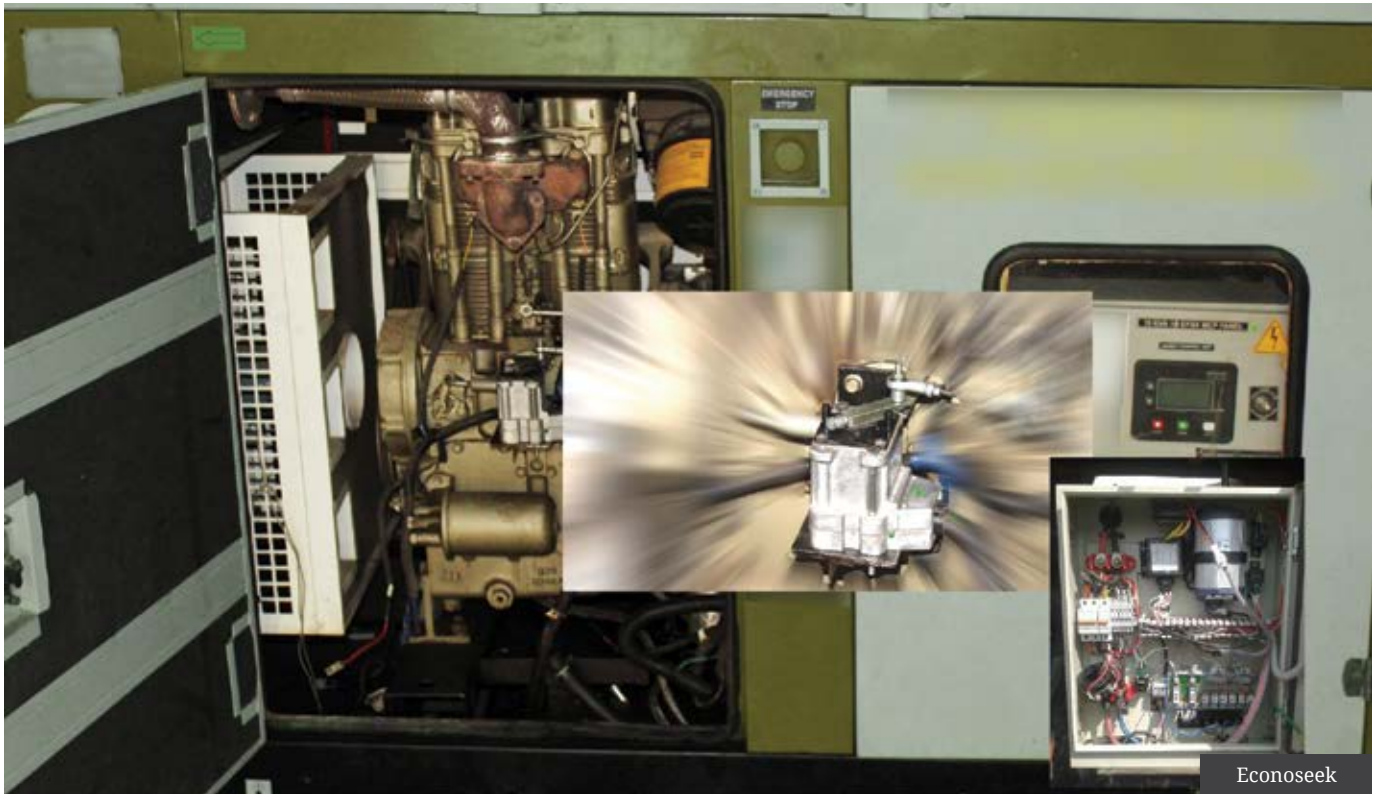
can become their main source of power. Diesel generators are key in most of these locations.

In 2011, a new technology was introduced that would allow diesel generators to run at a variable speed mode through a product popularly known as the "DC DG". This technology enabled the speed of the generator to vary depending on its load and, as a result, allow a substantial reduction in fuel consumption. SEDEMAC was the primary enabler of this variable speed technology. However, DC DGs haven't yet reached the scale expected in India, primarily because of capex challenges, and because many gen-sets are not retrofit-ready, while new DG deployments are decreasing substantially.

Our new solution, Econoseek, specifically addresses these two problems. Econoseek can be retrofitted and the capex involved is substantially less compared to traditional DC DGs. In fact, we have achieved proven savings of 15-30% in diesel consumption.

TowerXchange: Does SEDEMAC plan to develop operations in different countries?

Shashikanth Suryanarayanan, Chairman, SEDEMAC: Globally, GSMA estimates that there are one million poor grid telecom sites of which a significant proportion are in South Asia and Africa. The company is now starting to reach out to potential clients in Africa after having deployed this technology successfully in India for around a year and a half. Given that the capex problem is more defined in Africa than in India we believe that this



Econoseek

product has significant potential. The Southeast Asian market also presents some opportunities.

TowerXchange: Who are SEDEMAC's main clients?

Shashikanth Suryanarayanan, Chairman, SEDEMAC: A few thousand deployments of our variable speed control products have already been made across the Indian sub-continent. We work with some of the leading telecom companies in this sector. This has primarily been achieved through our deployment partners. We work with Mahindra Powerol and Eicher/TAFE who are active DG manufacturers for the telecom tower segment in India.

TowerXchange: How can SEDEMAC's products help telecom companies achieve green targets/ reduce energy waste and carbon emission?

Shashikanth Suryanarayanan, Chairman, SEDEMAC: For each litre of diesel you save, you avoid emitting about 2.5 Kg of carbon dioxide. In India alone, variable speed technology has the potential to save about 300-400 million litres of diesel per annum, translating to about an emission reduction of about a billion kilograms of carbon dioxide. This

> For each litre of diesel you save, you avoid emitting about 2.5 Kg of carbon dioxide. In India alone, variable speed technology has the potential to save about 300-400 million litres of diesel per annum translating to about an emission reduction of about a billion kilograms of carbon dioxide.

technology is a relatively cheap option for telecom companies looking to reduce their level of diesel consumption and power waste.

I believe that any product that offers a significant ROI is viewed positively in the telecom tower market. On the demand side it enables operators and towercos to reduce their overall energy requirements. Alternative sources of energy such as solar have significant capex requirements, while the maintenance of solar panels can also be a challenge in remote areas.

We are confident that variable speed technology could prove to be an important part of the basket of opex reduction initiatives available to the telecom industry.

TowerXchange: What are the key challenges of adopting this type of energy saving technology?

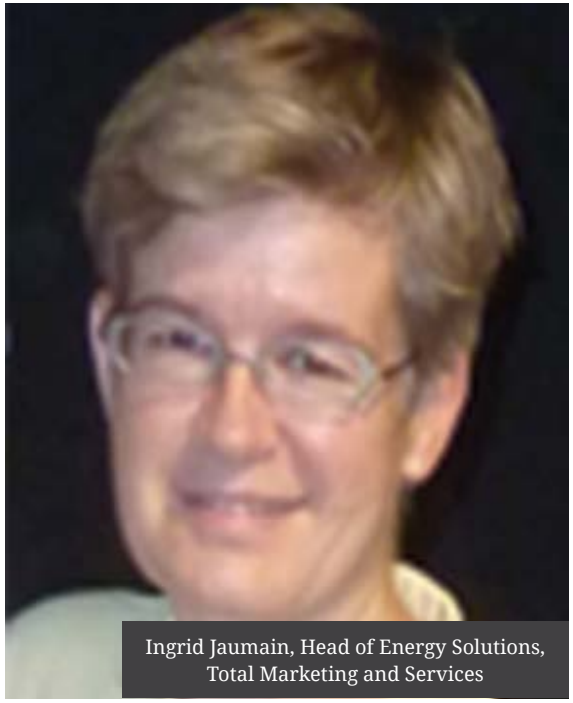
Shashikanth Suryanarayanan, Chairman, SEDEMAC: The primary challenges of alternative energy and energy efficiency products is on-site deployment. As previously mentioned, Indian and African towers that depend on diesel are often located in rural or remote areas and the deployment and maintenance is a challenge and requires highly reliable solutions.

A towerco looking at energy saving options will also have to navigate through a variety of solutions and select the best option which could differ depending on each site's characteristics. So the optimal choice of the energy saving option can be a challenge in itself.

With regards to our business in India, we are now right at the verge of mass deployment, which for me means reaching 10,000-20,000 towers per year. We aren't there yet and the decision is in the hands of towercos. However, we are optimistic as SEDEMAC has already proved itself in the Indian market and we are now ready for an exciting venture in Africa ■

Total Telecom Energy Solution

Oil & Gas major uniquely combines diesel and solar into compelling Energy Solution for emerging market cell sites



Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services

Total are uniquely positioned to provide all four of the critical components of the ESCO proposition. They have obvious capacity and accountability for diesel logistics from a footprint of 15,000 refueling sites worldwide. And they have a global field workforce and a robust balance sheet. In addition, through SunPower, one of the world's top three leaders in the solar industry, they have renewable energy solutions proven at off-grid telecom sites.

Keywords: Who's Who, Energy, O&M, Opex Reduction, Batteries, Energy Storage, Capacity Enhancements, Fuel Security, Loading, Energy Efficiency, SLA, Off-Grid, Unreliable Grid, ESCOs, Hybrid Power, Renewables, Solar, DG Runtime, Dimensioning, Skilled Workforces, Microgeneration, Community Power, RMS, Africa, Asia, Caribbean, SunPower, Total

Read this article to learn:

- Total's unique multiple energy source proposition, combining diesel, solar, and services
- Total and SunPower's track record of success at over 3,000 cell sites worldwide
- How can you judge which sites should retain DG backup, which should be hybridised and which should run solar-only?
- Modular technology and flexible business models to make hybrid energy scalable to meet the changing needs of multi-tenant sites and community power

TowerXchange: While Total needs no introduction, please could you introduce Total's Energy Solutions department and your relationship with SunPower – where do you fit in the telecoms infrastructure ecosystem?

Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services: Total is not only one of the world's leading oil and gas companies – we provide many more amazing capabilities across more than 150 countries.

In terms of where Total fits in the telecoms infrastructure ecosystem, of course we play a critical role in fuel supply, supplying tens of thousands of cell sites with diesel either directly or distributed from our 15,000 gas stations. Our assets also include SunPower, a leading solar company which has installed over 3,000 pure solar and solar hybrid telecom sites. This gives Total a unique synthesis; we can leverage a huge client portfolio and operational footprint in challenging countries across Africa, the Middle East, Asia-Pacific, the Americas and the Caribbean – countries where MNOs and towercos have to tackle the challenge of generating energy far beyond the reach of the electricity grid.

SunPower was one of only the actors worldwide able to provide robust solar power solutions; when they started in the 1980's it was a small market. SunPower develops the key components of their solution in-house, including data loggers and remote monitoring, and provides a full O&M service for several clients. Total's Marketing & Services, one

of the three branches of the Total Group, has a view to providing a complete set of multi-energy services to a customer base with diverse energy needs, from MW power plants, commercial buildings and homes to remote, distributed sites.

Total has thousands of people in the field, which is critical to field operations in telecom. Given our responsibility both for fuel supply and service, customers can trust that our fuel deliveries are up to international standards both in terms of services and product quality. As an upstream and downstream major in African countries, for example, we can't afford not to provide high quality service – we have to be reliable to keep the trust of our customers and stakeholders. Our customers are able to leverage Total's commitment to high standards, and our commitment to better energy – our value proposition is all about reducing energy risk and optimising fuel operations, batteries and renewables from grid connected to unreliable and off grid environments.

> "The unique, global footprint of Total and SunPower, spanning deep knowledge of diesel and renewables, enables us to build a sustainable relationship with our clients, helping them to save money by showing them how to hybridise a site, and showing them which sites to hybridise"

The unique, global footprint of Total and SunPower, spanning deep knowledge of diesel and renewables, enables us to build a sustainable relationship with our clients, helping them to save money by showing them how to hybridise a site, and showing them which sites to hybridise.

Total has extensive experience of operating such multi-product projects for the mining industry, which faces similar challenges of providing capitally intensive equipment with different sources of energy in remote areas. We are able to leverage multiple energy sources, from diesel and lubricants to solar.

TowerXchange: How proven are your solutions in the field?

Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services: Total and SunPower are

already managing over 3,000 cell sites, including thousands of sites for a really big MNO in Africa for whom we also do O&M and fuel supply. For some clients and some sites we supply just diesel, sometimes it's just solar.

My role is a new position within a new entity created to provide optimised energy solutions for our B2B customers. The Telecom sector is a priority for us and we aim at providing the industry with a consolidated, worldwide energy operator offer, ultimately delivered through an opex / ESCO business model based on the aforementioned value proposition of optimising the full energy path. In the most integrated models, the idea is to offer ten to fifteen year operating contracts with zero capex across Africa, the Middle East, Americas and APAC. We have all the bricks we need to put this all together.

TowerXchange: How can MNOs and towercos be certain that the optimal power source is running at any given time? How can you ensure that field technicians don't manually over-ride power source selection without good reason?

Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services: I have two answers to this question, the first of which is from a site design perspective. It is critical to carefully design the energy system to achieve the correct balance of solar, energy storage and diesel on hybrid sites. Well designed hybrid sites rarely encounter problems with the selection of the optimal power source. The second part of the solution is monitoring. Our data logger has been developed in-house, based on our extensive experience in managing the DG, solar and battery banks remotely. Data is pushed to our platform managed in France, which co-ordinates alerts and field operations.

"Most cell sites average loads of 1-3kW where hybrid solutions, with a balance of anywhere between 20-80% solar versus diesel, often deliver RoI"

The combination of robust remote monitoring with local knowledge and the right local partners are key – you've got to know how they will react in the field. That's why we also have dedicated, robust and cost-effective energy GPRS monitoring, developed based on the O&M knowledge and experience in the group. Given the challenging conditions in field operations, our principle is to keep systems and processes simple and easy to operate in the field.

TowerXchange: What is the addressable market for 100% solar and solar hybrid cell sites in terms of load and grid conditions? At what load does diesel simply make more sense?

Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services: It's difficult to give one simple answer, because it always depends on the quality of power available, drive time to the site and a number of different variables. However, we've seen some vendors install solar on big sites where the contribution will be very low. Based on the real data we've gathered from over 3,000 solar and hybrid cell sites, we seldom see return on capital invested at sites with greater than a 3kW load, particularly on sites that are a short distance from a fuel depot.

Small, remote cell sites are sometimes very difficult to supply with diesel at reasonable logistical costs. There is a business case for 100% solar (always with batteries) at small sites up to 1kW.

Most cell sites average loads of 1-3kW where hybrid solutions, with a balance of anywhere between 20-80% solar versus diesel, often deliver RoI. What gives us our credibility is Total's commitment to lower energy opex no matter what energy source is used.

TowerXchange: What is the difference between the cheapest solar panels on the market and

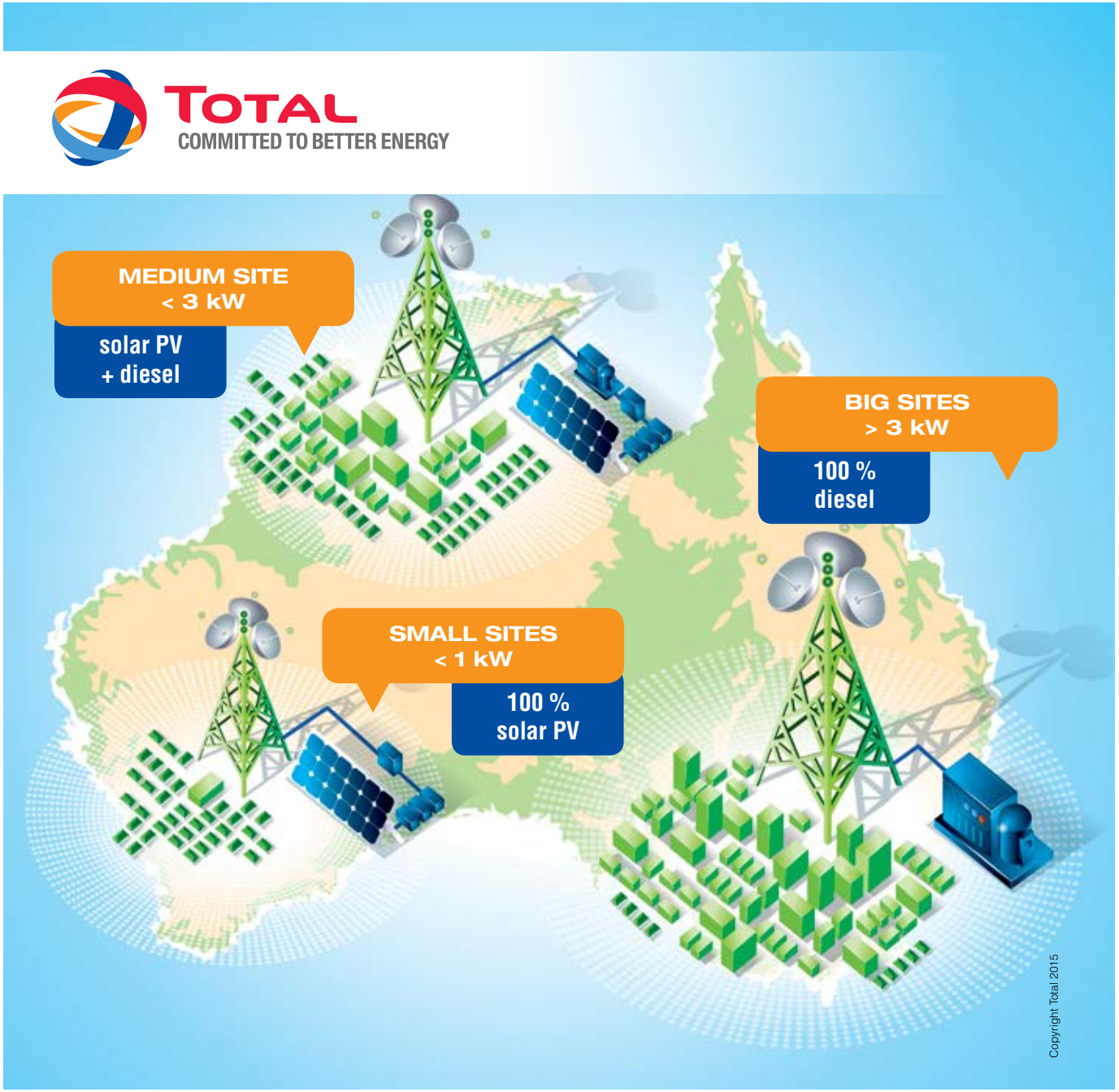
“carrier grade” solutions in terms of energy density and longevity?

Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services: Quality of product is key. The reputation of solar has been harmed by certain actors who damaged the market with unreliable solar panels and who didn’t optimise site design – they put poor quality solar products on large sites where renewables don’t make economic sense.

Total chose SunPower because of the quality of the technology. SunPower panels can provide 38% more energy from the equivalent surface areas compared to traditional solar modules. Given the space contraints on MNO and, particularly, towerco sites, this can be critical.

Total qualifies our products and equipment by simply listening to our clients’ needs, designing a relevant solution, and bringing that to market through local channels, giving the customer someone to talk to in case of problems in the field. We already tackle complex and remote sites supply as we are for instance present in this market in mining, and have the intention to increase our market footprint in the telecom segment.

Governments are rightly prioritising QoS, so the stakeholders want to fall back to the strength and credibility of a partner like Total, a global company with a strong commitment to Corporate Social Responsibility. We are strongly differentiated from smaller ESCOs offering energy services, but who don’t offer the same access to the same economies



of scale. As a worldwide big company, we are also building more complete partnerships with our clients, leveraging for instance on our existing Corporate Social Responsibilities programs, mainly dedicated to access to energy.

Solar generation and electricity provision in general is highly dependent on the levelised cost of electricity. SunPower's technology is reliable, efficient and highly differentiated, enabling us to offer hybrid and renewable energy at a very competitive cost per kWh. This gives us an advantage within the ESCO / capex free model, where finance is critical. We're able to offer reliable technology guaranteed for 25 years, with a lower degradation of product.

TowerXchange: Have you experienced any instances of solar panel theft? How can this risk be mitigated?

Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services: Like every other supplier, we have experienced some solar panel theft, in response to which we have developed a concrete based racking system that is really safe. Monitoring fuel is also key and our datalogger includes a sensor for the diesel tank.

TowerXchange: Quoting one of the towerco CEOs on TowerXchange's advisory board "The problem is that there is a finite amount of GLA (Gross Leasable Area) at a site. A solar array already needs ~35sqm to supply a single tenant, add a second tenant and the space savings are minimal – you still need ~66sqm, 97sqm for a third." How can solar power be made scalable and space-efficient so that towercos can add multiple tenants? And how can you blend in a community power proposition with its own unpredictability of peak load?

> "modular technology, flexible business models, the right energy mix and energy optimisation are all important to scalability"

Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services: I'd like to answer this question from both a technical and business model perspective.

From a technical perspective, we have developed and standardised a modular approach in addition to the SunPower technology advantage: for a 9 kWp installed capacity you need ~50 sqm versus more than 65 sqm with competitor products. For a given load you have a given combination of diesel, solar, batteries and monitoring – it's easy to add more power to create the scalability required for co-location and growing community power requirements. We'll always optimise site design and prioritise the telecom load, with backup power solutions with capacity to take on peak load – our hybrid solutions are often so optimised for solar and batteries that a little extra DG runtime whilst the site's energy load is growing toward a modular upgrade can actually increase the lifetime of the genset.

From a business model perspective, we previously ran a programme called SunCash, a pay-as-you-go system similar to using phone cards with credit used to regulate energy demand at mini-grid sites so we can anticipate the maximum load we provide per day in kWh.

While community power is critical to sustainability, the priority will be given to telecom infrastructure – that's the business imperative and SLAs need to be respected within those relationships.

In summary, modular technology, flexible business models, the right energy mix and energy optimisation are all important to scalability.

TowerXchange: What has changed which makes it time to stop talking about ESCOs and start deploying ESCOs?

Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services: From my perspective, over the last 12-24 months emerging market telecoms

have matured toward a preference to partner with specialists in dedicated fields. As towercos are present in more markets, and as stakeholders want to reconsider their capital investments and lighten their balance sheets, the time is right to start deploying ESCOs.

Now, according to what the client wants we also develop intermediary models, that's the strength of Total Marketing & Services, being the operational arm of the Group; we are flexible, we permanently listen to the market and always adapt to our client needs.

Hybrid and renewable energy technology and solutions in general are more mature. For example, now everyone has an RMS, and data management is becoming more powerful. The tricky part of the ESCO proposition had been monitoring O&M to guarantee service, but we have both the field operations and technical skills to do this.

Having a trusted ESCO partner helps prospective towercos get a contract in greenfield markets.

I took Total's proposition to the TowerXchange Meetup Asia 2014 and spoke to several stakeholders in energy services in India, for example, where the energy services market remains fragmented with no actor with both the required financial and operational capabilities to scale the model. Taking a global picture; many oil majors have largely exited from any direct presence in African marketing activities whilst operating through distributors - we've been able to purchase some of their assets.

With 30-40% of opex coming from energy, you need to trust your ESCO partner, having direct affiliates with operations in the field is a competitive advantage.

TowerXchange: Towercos, who already own one in four of the world's cell sites, are astute buyers – whilst some simply demand energy at a kWh price ESCOs find difficult to deliver, others don't want to sign long term fixed price energy services agreements, they want to share in the energy efficiencies as technology improves. How do you think the ESCO business model will evolve to attract towercos to engage?

Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services: Because of its size, Total's worldwide financial capacity and credibility, Total has some interesting assets for this market segment.

In off-grid and unreliable grid markets, our long term contracts are based on formulas that provide flexibility as even we never know what the oil price will be tomorrow. We will often put in place the capability within a contract to revisit terms every two to three years – we want to stay committed business partners – we will find a way to structure a win-win agreement using innovative legal, business model and contract engineering.

Of course any capex-free solution requires a minimum level of commitment, but I think there is a space for a kWh offer, and if clients want an optimised financial solution, combining a leasing component or similar, that is also fine with us.

Total is a big company but we're also pragmatic. We understand that ESCO agreements typically start with a pilot phase with a few sites to start with, which represents an opportunity to reassure everyone and an opportunity to demonstrate our value proposition.

TowerXchange: Finally, please sum up what differentiates Total from other companies aspiring to achieve scale in energy services for emerging market telecoms.

Ingrid Jaumain, Head of Energy Solutions, Total Marketing and Services: We have local operations – thousands of people in the field in different countries in Africa, the Middle East, APAC, the Americas and the Caribbean.

We have a track record; we're already a supplier of diesel to thousands of sites for fuel and solar equipment, which means we have knowledge and proven technology in-house which we can leverage to build a worldwide telecom energy operator proposition.

Total's unique positioning is our commitment to better energy – we are the only worldwide multi-energy provider spanning solar, diesel and lubricants, owning directly the technology and products. "Think global, act local" could be a good summary: on an everyday basis we are people "rooted in the field", putting operations at the core of all our business models and we are also committed to better energy, preparing the future! ■

Tower Xchange

5th Annual TowerXchange Meetup Africa & Middle East

3 - 4 October 2017,
Sandton Convention Centre, Johannesburg

The 2016 Meetup SOLD OUT weeks ahead of time, necessitating increased capacity to accommodate the number of requests to join. For 2017 we have taken on a bigger space and look forward to some exciting new features.

What's new?

- Higher number of concurrent roundtables creating more intimate discussion groups
- Bigger audience of engineering and maintenance contractors leading procurement decisions
- Independent towerco VIP discussion group: how does the towerco business model need to diversify and adapt?
- Future networks: prepare your business model for the advent of 4G and eventually 5G
- Extended energy and monitoring system working groups driving excellence forward
- Larger exhibition showcasing a broader spectrum of products and services

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Silver sponsors: Acsys Access Control Systems, Bladon Jets, ELTEK A Delta Group Company, Delmec

Bronze sponsors: AIO systems, Ausonia, galooli telecom, Vinson&Elkins RLLP, IPT PowerTech

2017 sponsors

After a hugely successful 2016 Meetup, TowerXchange are delighted to welcome back the following sponsors and exhibitors to the 2017 event. If you are interested in getting involved and would like to benefit from a full year of marketing activity, please contact Annabelle Mayhew, TowerXchange's Chief Commercial Officer: **amayhew@towerxchange.com**

Diamond sponsor:

IPS

IPS – International Power Supply is 26 years experienced high-tech company specialized in the R&D and manufacturing of power electronics and energy conversion technologies.

IPS offers high-tech products and integrated solutions for the area of Renewable Energy and Off-Grid Electricity (mini-grids, off-grid power systems, OPEX and fuel safe optimization), Telecommunications, Utilities, Defense. IPS global headquarters is located in Sofia, Bulgaria where it began in 1989. Company subsidiaries are located in US, Australia, Indonesia, Nigeria, UAE. IPS's products are operated currently in 51 countries and used by clients such as NATO, large telecom groups, mini grid operators, utilities, the armed forces of various countries, international system integrators and many others.

IPS has developed an optimal system for both grid connected and off-grid use in the form of our EXERON range. The EXERON technology can offer power independence for areas with limited or no grid power and can provide cost savings for grid connected objects through on-demand use for any kind of power equipment. The Exeron features stringent modular design, easy-to-maintain hot plug technology, advanced battery management as well as the increased availability thanks to excellent system redundancy.

In Germany, 2014, EXERON won the Intersolar ees Award (ees: electrical energy storage).

www.exeron-power.com **www.ips-group.net.**

2017 sponsors

Silver sponsor:

Acsys Technologies Ltd

Acsys is the global leader in cell site access control solutions. Our patented, military-grade technology is utilised by leading tower companies, telecom operators, and vendors throughout the globe to better manage their O&M and eliminate unauthorised access.

Acsys designs simple, yet powerful solutions, with a focus on power-independent locking systems and workforce management software and applications. These technologies are combined to reduce theft, better manage vendors, create fairer and stronger SLAs, and simplify operational workflows. Our solutions equate to increased uptime.

European-rooted with the benefits of China-based production and a highly-specialised and diverse team from around the world, Acsys pushes the boundaries of how technology can be embraced within complex industrial environments for better security and staff management. With a customer-centric, customised approach Acsys follows the belief to think 'outside the box' to deliver easy-to-deploy, highly durable and cost effective solutions for the most challenging scenarios.

www.acsys.com

Silver sponsor:

Bladon Jets

Bladon Jet's breakthrough technologies enable the production of micro gas turbine engines which are more efficient, less polluting and lower cost than traditional reciprocating power units. Introducing the world's first 12kW microturbine genset designed specifically for the telecom tower power market delivering reduced fuel and maintenance costs, durability, and ultra-quiet operation for use in urban environments.

Bladon's revolutionary microturbine, heat exchanger and air bearing technologies harness the power of a miniature jet engine to provide a compact and ultra-reliable alternative to the traditional diesel generator. Use Bladon's Micro Turbine Genset as a primary power source, hybrid mode with batteries or renewable energy sources, or as backup power to the grid.

www.bladonjets.com

Silver sponsor:

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Eltek are committed to meeting the power needs of our customers. For more than four decades Eltek has provided power solutions for telecommunication networks globally. Our systems cover the entire range of power requirements; from small to very large, meeting all the power needs of the telecom industry, in both fixed and mobile networks. Our broad range of rectifiers and converters comply with all international standards and requirements. Eltek's high efficiency solutions and new, innovative designs help the industry achieve the objectives of combating climate change whilst remaining competitive, by reducing energy spend and environmental impact.

Eltek have offices in more than 40 countries and business in more than 100. Our presence and expertise is close to each individual market we serve. This enables us to truly understand the needs of each market and provide solutions and services specifically adapted to local requirements.

Telecom Hybrid Solutions

Eltek's hybrid solutions are based on the HE technology for optimal utilization of all energy resources. By combining solar or wind energy input with smart generator control and optimally dimensioned batteries, the scene is set for dramatic OPEX reductions and a positive environmental impact.

www.eltek.com/

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Delmec

Delmec has been a primary component in the telecommunication industry, not only within the infrastructure area but also providing state of the art telecom solutions for Ireland, UK, Africa, Europe, America and the Middle East for over 30 years. With the company's headquarters based in Ireland, Delmec provide structural and network solutions, infrastructure

2017 sponsors

builds, steelwork, renewable energy and fibre network builds. Our expertise has led us to become a renowned provider of engineering services to the telecom and utility sectors, specialising in full turnkey solutions from design concept to live on air.

Delmec's reputation can be witnessed in over 40 countries where key services have been provided to a wide range of clients whom many have continually sought the expert knowledge of Delmec for their telecom's needs. Delmec strive to provide services ensuring the client is given the best customer service, maintaining a high efficiency and always to a quality that is highly regarded in the telecom industry with many of our clients stating that Delmec are; The best in the world at what we do

www.delmec.ie

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AIO Systems is a next generation solution provider of management systems for remote unmanned sites. AIO's management platform and enhanced Premium EyeSite controller are incorporated with site hardware and telemetry systems enabling companies to control, secure, predict, track and remediate their remote site operations in a timely and pro-efficient manner.

We specialize in advanced 24/7 Security solutions and Hybrid/Energy Resource Management. Furthermore, we address multi-tenant infrastructure complexities, reduce OPEX, increase profitability, assure access to BI services, and deliver effective Asset/Inventory control.

AIO's numerous business models propose alternative operational structures that guarantee ROI. When combined with our added value Services, such as Site Installation Simulations, System Integrations, Technicians mobile application, companies can rest assured AIO will address all their RMS needs from A-Z.

www.aiosystems.com

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AUSONIA is leader in customized power solutions, specifically designed to meet MNOs and TowerCos power requirements and performance needs.
Among its products portfolio - entirely made in Italy - AUSONIA offers High Efficiency DC Gensets and Hybrid Power Systems fully integrated with Solar & Wind, for off-grid and poor-grid indoor/outdoor sites.

Extended maintenance intervals, very low fuel consumption levels and a complete web-based Remote Monitoring System allow Ausonia Customers to significant cut their OPEX and reduce their TCO.

The use of Ausonia Power Systems in OPEX model is certified by 13 years of operation in Europe and already replicated in Africa and LATAM.

www.ausonia.net

Bronze Sponsor:

Galooli Telecom

Galooli Telecom provides innovative Bottom Line Solutions™ (BLS) – the market leading practical business intelligence solution. Galooli's uniqueness is to convert big data into reliable and useful tools to achieve real OPEX savings. From full-site remote monitoring and management to workforce and fleet management, our customizable solutions cover all operational aspects for Towercos and operators.
Instead of the reaction to past events and alerts available on any standard monitoring systems, Galooli promotes the use of prevention.

Galooli is actively operating in over 30 territories with in-country services and support as an integral part of the offering.

www.galooli.com

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IPT PowerTech

IPT PowerTech Group delivers specialized solutions to the power, industrial and telecom sectors in Africa, Middle East and Asia. Combining power expertise with telecom infrastructure specialization, we are market leaders in providing energy solutions, telecom services, and managed maintenance services, and we are the most qualified to provide both models of Guaranteed Savings and ESCO. Our self-manufactured enclosures allow us to create customized energy efficient/hybrid and renewable energy solutions, and to implement new concepts in site renovation. With offices in 11 countries, our solutions are delivered to more than 80 operators, tower companies and vendors in more than 50 countries.

www.iptpowertech.com

2017 sponsors and exhibitors

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Vinson & Elkins RLLP

Vinson & Elkins is one of the oldest and largest international law firms, with approximately 700 lawyers located in 16 offices around the world.
Our global telecommunications team has extensive experience advising on international telecoms and telecoms infrastructure transactions. We have significant industry experience, advising on telecoms transactions in numerous countries, including across Africa and the Middle East.
Our telecommunications advice includes acquisitions and disposals, debt and equity financing, infrastructure development, operational arrangements, regulatory matters and dispute resolution.

We also have significant experience in the negotiation and drafting of sale and purchase, debt and equity financing, master lease, build-to-suit, site management and service level arrangements; and have played a prominent role in complex fibre transactions.

www.velaw.com

Exhibitor:

ABLOY®

ABLOY

Abloy Oy is one of the leading manufacturers of locks, locking systems and architectural hardware and the world's leading developer of products in the field of electromechanical locking technology.

Experienced Partner

Abloy Oy has a proven history of telecommunication business for decades. Along with the new technology Abloy has introduced new methods and systems to create value and fast pay-back time to customers.

Abloy operates in all continents and several telecom customers have chosen ABLOY solutions to be leaders in fast developing telecommunication world.

www.abloy.com

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Aquion Energy

Aquion Energy is the manufacturer of proprietary Aqueous Hybrid Ion (AHI™) batteries and battery systems for long-duration stationary energy storage applications. Aquion's Aspen line of batteries are optimized for daily deep cycling for residential solar, green architecture, off-grid and microgrid, energy management, and grid-scale applications. Aquion's high-performance, safe, sustainable and cost-effective batteries deliver reliability and value for customers. The company's battery systems provide flexible, modular energy storage that enables broad adoption of renewable energy technologies such as wind and solar, reduced reliance on fossil fuels, and optimization of existing grid-tied generation assets. For more information, visit our website.

www.aquionenergy.com

Exhibitor:

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HYBRID GENERATORS DESIGNED FOR TELECOM or TOWER OPERATORS that want to enter into a multi-tenancy agreement – CAPEX & OPEX PACKAGE from 5 to 40 KVA load. More than 30 years of experience in the power sector and 34000 installations in the Telecom Market, make Ascot Industrial leader in Africa, Middle East and Asia for tailor made solution to meet customer needs. A real modular, flexible, scalable and plug & play solution is designed by engineers to guarantee cost-effectiveness too.

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www.ascotinternational.com/hybrid-generators/

Exhibitor:

DPC®

Beijing Dynamic Power Co., Ltd. (DPC)

Beijing Dynamic Power Co., Ltd. (DPC) is a leading manufacturer of Telecom Power Supply in Beijing China. Established in 1995 who are the China first IPO (Initial Public Offerings) company in power supply industry in Shanghai Stock Exchange in 2004.

Over 2,400,000 Rectifier modules operating on Carrier Networks globally and 30% market share in China owned by Carriers/China Tower(Ranking No.1 in China Tower). More than 20 years of experience in diversity power solutions for tower company.

Over 3000 employees with the main production base of 330, 000m2, with production capacity of 80,000 pcs rectifiers and 15,000 sets systems per month. DPC's stable high efficient and cost effective Power Supply create maximum value for carriers and tower company.

www.dpc.com.cn

2017 exhibitors

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Enatel Energy delivers an expansive portfolio of configurable systems designed to meet every telecommunication network power requirement. Solutions offer flexibility and scalability, by way of hot pluggable combinations of modular Rectifiers, Inverters, Converters, Solar/Wind Chargers and encompass advanced energy management. Enatel's SYNERGi hybrid solutions include unique patented generator control capabilities allowing dynamic optimisation to accommodate off-grid site variables so ensure the highest levels of network uptime, ease of deployment and OPEX savings. Renewable energy inputs can be integrated simply and blended intelligently. Enatel Energy offers renowned support, reliability, and system efficiencies. Solutions are New Zealand made to guarantee design, manufacture and process integrity.

www.enatelenergy.com

Exhibitor:

Emerson Network Power

Emerson Network Power, a business of Emerson, maximizes reliability, deployment speed and operational efficiency for communications networks and data centers. A trusted industry leader in smart infrastructure technologies, Emerson Network Power provides innovative, rapidly deployable solutions that deliver efficiency and uncompromised reliability regardless of network demands. Emerson Network Power offers expertise in AC & DC Power, renewable energy, precision cooling systems, infrastructure management, integrated racks and enclosures, power switching and controls. Our solutions are supported globally by local Emerson Network Power service technicians. Learn more about Emerson Network Power products and services at:

www.emersonnetworkpower.eu

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www.enersys.com/GlobalLanding.aspx

Exhibitor:

FG Wilson

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www.fgwilson.com

Exhibitor:

Flexenclosure

Flexenclosure is a designer and manufacturer of intelligent power management systems and prefabricated data centre buildings for the ICT industry. The company provides systems that are fully integrated, modular, factory tested for reliability, adaptable to local conditions and quick to install.
eSite is a hybrid power system for off-grid and bad-grid cell sites that delivers 24/7 network uptime and diesel-related cost savings of up to 90%. eSite is an integrated single cabinet system for maximum reliability and speed of installation. eManager, an all-in-one toolbox for site power infrastructure management including remote monitoring, power optimisation, KPI reporting and site logistics, is an integral part of eSite.

www.flexenclosure.com

Exhibitor:

Generator Logic

Generator Logic is an innovative manufacturer of custom-built generators that provide power solutions to a wide variety of industries worldwide. For the past decade, Generator Logic has concentrated its efforts in providing power solutions which are specific to the client's industry and are built taking into consideration the often harsh environments in which the industries operate in Africa. Recent innovations include our Hybrid generator incorporating the AC generator, rectifier system and battery bank in a single theft resistant "cube" ; with an optional add-on of Solar banks. **www.genlogic.co.za**
Offices in South Africa, Tanzania and Mauritius.

2017 exhibitors

Exhibitor:

GS Yuasa

GS Yuasa is a Japanese company formed in 2004 by the merger of two large 100 year old battery manufacturers, Japan Storage Battery and Yuasa. At US$3.5B in sales, GS Yuasa is one of the worlds largest battery manufacturers.

GS Yuasa manufactures a full line of technologies including lithium, lead acid, nickel metal hydride, and nickel cadmium for the automotive, industrial, and specialty battery markets. Especially for Telecom market, we have developed a 48V lithium ion battery module that has outstanding cyclic life and charge acceptance that can reduce the runtime of generators and the total cost of ownership of telecom base stations. With 37 affiliates in 17 countries, GS Yuasa has a worldwide presence operating under the GS Yuasa, GS, and Yuasa brands.

www.gs-yuasa.com/jp/index.asp

Exhibitor:

HIMOINSA

HIMOINSA is a global corporation that designs, manufactures and distributes power generation equipment worldwide. It has extensive **experience in the telecommunications market**, having supplied equipment with power outputs ranging from 8 to 45KVA in the international market to well-known companies in the sector. Our telecom range gensets can work remotely, providing efficient and reliable power and incorporate functionalities such as: GPS system, making it possible to locate the machine at any time, fuel level alarm, remote management and remote control for gathering and recording data in real time. HIMOINSA has develops a variable speed hybrid generator sets that reduces fuel consumption by 40% and extend maintenance periods up to 1000 hours.

www.himoinsa.com

Exhibitor:

ieng Group

i engineering Group provides end-to-end engineering infrastructure solutions to the telecommunications and power industries across Africa, the Middle East and Southeast Asia. We were established in 2007 and are now operational in nineteen countries: Afghanistan, Algeria, Burkina Faso, Cameroon, Congo, DR Congo, Ethiopia, Ghana, Iran, KSA, Lebanon, Myanmar, Niger, Nigeria, Rwanda, South Sudan, Tanzania, Uganda and Zambia. We procure, build, commission, optimize and maintain telecom infrastructure on one hand; and provide fiber optic services on the other. We manage today over 4,500 sites for Africa's largest MNOs and all 4 towercos.

www.ieng-group.com

Exhibitor:

Infozech

Infozech is a leading provider of technology-led and data analytical solutions to Telecom – Infrastructure providers, Operators and Communication service providers. Infozech has been delivering cost optimization and revenue management solutions for past 17 years to 80 customers across 25 countries. Infozech's innovative offering iTower (Infozech Tower Product Suite) provides an end to end solution for managing and reducing operational costs through tracking real time tower operations, meaningful analytics and helping take smarter decisions. iTower won the prestigious Aegis Graham Bell Award 2015 for being most Innovative solution for telecom tower infrastructure. iTower enables tower companies to drive 99% uptime with minimum operational cost.

www.infozech.com

Exhibitor:

Jag Rattan Daan Singh & Co

Headquartered in New Delhi, India, Jag Rattan Daan Singh & Co., (JRDC) has been a leading manufacturer of full-range of telescopic mobile towers (COW) in India for more than a decade. We design and develop COWs/RDU's that can be readily deployed both in urban and rural areas. Our product range starts from 18 meters to 45 meters COW. Through continuous innovation and absolute workmanship, the company has established itself as a recognized manufacturer and exporter of telescopic towers which includes COW and RDU in the telecommunication industry.

With a vision to deliver high-quality products using cutting-edge technology, JRDC has carved a niche for itself in developing and designing "COW' in India and abroad.

www.jrdcup.com/

Exhibitor:

Metalogalva

Metalogalva is a Portuguese steel manufacturing company with more than 43 years of activity in fields of Energy, Communication, Transport, Lighting, Renewables and Steel protection (hot dip galvanizing and painting). Has three industrial units (total area of 44000m² and a total gross area of 160000m²), with a galvanizing capacity (per year) of 100000 tons.

Metalogalva exports 70% of its own manufacturing for more than 40 different countries. Has invested (6.6M€) on new equipment to face the requirements/delivery times of the international markets.

Metalogalva promote the excellence of its services, investing in the researching, development and innovation of its products.

www.metalogalva.pt

2017 exhibitors

Exhibitor:

NANHUA Electronics Co., Ltd.

NANHUA is an independent enterprise with modern management which is located in Shanghai. We design, manufacture and sell world leading signal, lighting and control products which be applied in industrial areas since 1990, and focusing on aviation obstruction light system for telecom towers from 2007, has full experience in the complete line of cost-effective obstruction lighting and control solutions. NANHUA products have been proven to be professionally designed and highly reliable.

NANHUA will continue to maintain reliable, safety and simple R&D concepts, combine with the latest technology, commit to developing new products to help customer solve problems and enhance customer value.

www.nanhua.com

Exhibitor:

NETIS

NETIS is a Service and Infrastructure provider for the Telecom Industry in Africa, founded in 2009.
NETIS operates permanently in 7 countries namely, Côte d'Ivoire, Ghana, Burkina Faso, Benin, Kenya, Uganda and Tanzania. 4,555 sites are under NETIS Passive and Active maintenance management, in 5 countries for the top 4 TowerCos. Hundreds of sites and Power solutions have been built and deployed all over the African networks and NETIS has built strong partnerships with vendors whom are specialized in Power solutions, RMS, RDUs, COWs, etc.

NETIS Fiber Optic division delivers full turnkey projects from marketing survey to low-level design, network construction, equipment installation and maintenance. At NETIS we strongly believe in partnership, the best way leading to success!

www.netisgroup.net

Exhibitor:

NorthStar

NorthStar is an industry leader in designing and manufacturing high performance lead-acid batteries and high efficiency site solutions. The company has state-of-the-art facilities in the USA, and their products are used in more than 120 countries worldwide.

NorthStar premium thin plate AGM batteries deliver long life at elevated temperatures, with faster recharge and superior PSOC cyclic performance. NSB Blue+ Batteries can reduce diesel generator run time by 85% in offgrid telecom applications. SiteStar Cabinets can maintain batteries at optimal operating temperatures, using less power than a household lightbulb. If you need the best, you need NorthStar.

www.northstarbattery.com

Exhibitor:

PRAMAC

PRAMAC is an Italy-based company engaged in the manufacturing of power generators and material handling equipment. The Company divides its activities into two main business sectors:
POWER - In the field of power generation PRAMAC offers solutions for every kind of power demand: from the portable to the industrial power supply both for stand-by and prime power applications.

MHE- The Company develops, manufacture and sells a complete range of handling equipment aiming at satisfying customers' requests and needs.

PRAMAC has four production plants in Italy, Spain, China and Brazil. It operates worldwide through a global distribution network of subsidiaries.

www.pramac.com

Exhibitor:

Redflow

Redflow Limited is an energy storage specialist that has developed the world's smallest flow batteries. Redflow's unique flow batteries are designed for stationary energy storage applications ranging from its ZCell home battery to its ZBM battery range for commercial, telecommunications and grid-scale deployment. Redflow is a publicly-listed company (ASX: RFX) that operates R&D facilities in Australia, as well as offices in the US and Europe.Produced in North America by Flex, one of the world's largest supply chain solution companies, Redflow's high energy density batteries are sold, installed and maintained by a global network of system integrators. Redflow batteries connect directly to the telco bus, experience no damage from regular power outages, are 100% depth of discharge and their full capacity is usable over lifetime.

www.redflow.com

Exhibitor:

Saft

Saft is the leader in high technology batteries, and has developed specifically for Telecom backup need a lithium module of 48V: Evolion.

Evolion is the perfect choice for off grid sites: combined with a Diesel Genset, it will bring high cycling capability, to save fuel consumption and drastically reduce running time of the genset. Evolion has a compact format, that will help to be integrated in

2017 exhibitors

very limited space, and is maintenance free, reducing the OPEX of the hybrid off grid or on grid site.

www.saftbatteries.com

Exhibitor:

SEDEMAC

SEDEMAC

SEDEMAC Mechatronics is a product innovation company which manufactures wide range of control products like a range of AMF genset controllers, electronic governors and variable speed controls for diesel gensets / engines.

SEDEMAC was founded by four technocrats who came together as part of a research group at India's premium engineering institute.What started as a small lab-based enterprise has now grown into India's fastest growing powertrain controls company.

Today, SEDEMAC is India's No. 1 in genset controls market and is the preferred choice amongst all the major OEMs in India and supplies/licenses unique control products to the leading manufacturers such as Bajaj, TVS, Hero MotoCorp, Mahindra, Kirloskar, Cummins, Ashok Leyland, TATA Motors etc.

Exhibitor:

TOTAL COMMITTED TO BETTER ENERGY

TOTAL

Total is the world's fourth-ranked oil and gas company and a global leader in solar energy through our affiliate SunPower. With operations in more than 130 countries, we have 100,000 employees who are committed to better energy.

Supplying affordable energy to a growing population, addressing climate change and meeting new customer expectations are the three main challenges Total must meet as an energy major.

www.total.com

Meetup Africa & ME 2017

3-4 October, Sandton Convention Centre, Johannesburg

TowerXchange

By invitation only: restricted to Director, VP and C-level attendees. Maximum of 2 delegate passes per company except for MNOs, towercos and sponsors

Benefits	Delegate pass	Exhibitor	Bronze Sponsor	Silver Sponsor	Gold Sponsor	Platinum Sponsor	Diamond Sponsor
Access to TowerXchange Meetup	1 pass	1 pass	1 pass	2 passes	3 passes	4 passes	5 passes
Daytime Catering	✔	✔	✔	✔	✔	✔	✔
TowerXchange Roundtable interactions	✔	✔	✔	✔	✔	✔	✔
Video on TowerXchange TV	✘	✔	✔	✔	✔	✔	✔
10ft x 10ft Turnkey booth	✘	✔	✔	✔	✔	✔	✔
Logo on backdrop, signage, fliers & invites for TowerXchange Meetup	✘	✘	✔	✔	✔	✔	✔
Your choice of bronze sponsorship benefit	✘	✘	✔	✘	✘	✘	✘
Your choice of silver sponsorship quality benefit	✘	✘	✘	✔	✘	✘	✘
Your choice of gold sponsorship premium benefit	✘	✘	✘	✘	✔	✘	✘
Your choice of platinum business-class benefit	✘	✘	✘	✘	✘	✔	✘
Your choice of diamond first-class benefit	✘	✘	✘	✘	✘	✘	✔
Roundtable host	**Panel moderator**	**Technology Evaluation working groups**					

There is limited availability for roundtable hosts, panel moderators and inclusion on the Technology evaluation working groups please contact **amayhew@towerxchange.com** to learn more

* Discounted rate available to Towercos, Government and Regulator representatives, 100% discount for qualifying Director - C-level execs from Operators

Bronze, Silver, Gold and Platinum Sponsorship Benefit Options - Bespoke packages can be created on request

Bronze Sponsorship
Stationary sponsor (provided by client)
Gift drop (provided by client)
Drinks coaster sponsor (provided by client)
Business card wallet (provided by client)

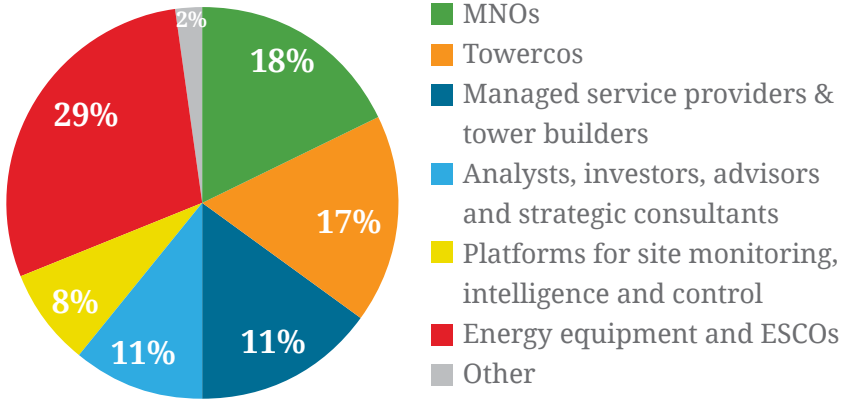
Silver Sponsorship
Totes Bags (provided by client)
Sponsorship of coffee break day two pm
Sponsorship of coffee break day two am
Sponsorship of coffee break day one am
Sponsorship of coffee break day one pm

Gold Sponsorship
Sponsorship of breakfast (Open) day one
Sponsorship of breakfast (Open) day two
USB sponsor (provided by client) - **SOLD**
Lanyards (provided by client)

Platinum Sponsor
Sponsorship of Lunch Day one
Sponsorship of Lunch Day two
Sponsorship of icebreaker drinks
Champagne Roundtable session sponsor

Diamond Sponsor
Sponsorship of Drinks Reception
Sponsorship of Networking Dinner

Industry breakdown of Meetup Africa 2016



See you at our future events!

Meetup Europe 2017

4-5 April, London

Meetup Americas 2017

7-8 June, Boca Raton

Meetup Africa & ME 2017

3-4 October, Johannesburg

Meetup Asia 2017

12-13 December, Singapore

Tower Xchange

www.towerxchange.com

Design by BLACKLIGHT Design Agency