



Greywale
Management

Complementary Meeting Notes

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The following are **raw** notes from the Sustainability Track (#5). They are an aggregate of numerous panels and discussions. No attempt has been made to interpret these raw notes.

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1. Architecture Considerations
 - a. Energy cost verse transport cost?
 - b. Moving bits to energy is more efficient than moving energy to bits.
 - c. Large centralized data centers or distributed edge caches?
2. Drivers
 - a. Sustainability goals
 - b. Traffic Growth
 - c. Cost of electricity expected to double in 10 years
 - d. Technical limitations
3. China Mobile
 - a. 700 mill subs, 14% of OPEX is energy, 14.9B Kwh, Base stations 64%, Equipment rooms 25%. 830K 2G base stations, 1.1 million total, 250k 3G
4. Energy strategy hierarchy
 - a. Base: Power modeling and assessment - need accurate modeling
 - b. Equipment: Advanced components and designs
 - c. Site: Resources Sleeping
 - d. Network – network wide coordination
5. Trend to do more 'stuff' in software.
6. Multipath TCP
 - a. WiFi and 3G at the same time.
7. Need to develop a life cycle assessment of energy usage
8. GreenTouch.org
 - a. Targets
 - i. 1000% energy reduction in wireless
 - ii. 500% reduction
 1. Small cells in urban environments
 2. Access (FTTH. Bit interleaved PON)
 - iii. 100% in core optical network
 - b. EARTH
 - i. Reduced energy in LTE 60-70%...target was 50%
 - ii. Options: Antenna muting, Large scale antenna systems
 - iii. More antennas with better energy efficiency
 - iv. MIMO (multipoint to multipoint)
9. Tier One U.S.A. Carrier
 - a. Spends \$1 Billion on energy each year. Impacts share holder value.
 - b. Business Case and ROI mandatory
 - i. Goal to reduce OPEX
 - ii. Spending \$100 M on green project this year. (Not off-grid)
 - c. Key issues are the Cost, Availability and Reliability of **energy**

- d. Next step is how to drive technology innovation and vendors need to show telco's how to phase-in new solutions.
- e. Carrier does not do PPA (Power Purchase Agreements). Wants to own assets. Tax incentives help a lot.
- f. Traditional ROI is 12-24 months
 - i. Questions whether that is reasonable for "green" projects. 5 years?
- g. Test new technologies in 5 CO's (3 – Brooklyn, 2- Bronx)
 - i. Figure if they can "crack the code" in Brooklyn rest of country will be easy.
 - ii. Municipal regulations, requirements, statues, et al.
 - iii. Challenges; Demographics, variances, etc.
- h. Next focus is remote cell towers
 - i. Outside powering OK
- i. All next generation access equipment must reduce power by 25%
- j. Have Carbon Intensity Metric. (CIM)
 - i. Terabytes/energy to run network
 - ii. Goal: increase data by 50% and reduce CIM by 50%
- k. Have 38,000 vehicles
 - i. 2800 alternative fuels
 - ii. Looking at route optimization
- l. Issue with M2M is not the size of the data but the # of transactions.
 - i. Overhead per transaction
- m. Smart home integration on roadmap. Not sure when?
 - i. In-home device powering issues.
 - 1. Will consumers have to replace AA batteries?
 - ii. 2 Million homes have smart meters
 - 1. VZ partnering with utilities
- n. India has a lot of diesel powered rural base stations.
- o. Energy resiliency is key driver. Not green.
- p. VZ HQ uses ice (Frozen water). Create ice at night.



ABOUT THE AUTHOR

Greg Whelan, Principal, Greywale Management has over 20 years of international high technology marketing experience. He has worked in technical marketing roles for large technology firms including Cisco Systems (San Jose, CA) where he lead award winning global marketing campaigns in telecommunications and internet markets and Analog Devices (Norwood, MA) where he created and lead their entrance into the broadband telecommunication market. He's also spearheaded marketing for a number of early stage venture-backed start-ups in the Boston area, three of which were acquired by larger tech companies.

He's a pioneer in the broadband telecommunications area and drove the first international DSL standards and was a co-founder, and Vice President of the International Broadband Forum. He has over two-dozen published papers and articles and has spoken at numerous conferences and forums in the US and in Europe. Today, he focuses on service provider energy strategy technologies, issues and trends. He advises both corporations and entrepreneurial start-ups in strategic marketing, messaging, value chain participation and marketing material development.

He has a BS Electrical Engineering from Cornell University and a High Technology MBA, with honors from Northeastern University. He has also studied Digital Video Networking at the MIT MediaLab.

Hassan Hamdoun is a senior analyst at Greywale Management. He received his Ph.D. in Wireless Communications from Swansea University, United Kingdom. He received his M.Sc. (ENG) in Electronics Engineering (distinction) from the University of Sheffield, UK, and the B.Sc. (Hons) in Electrical Engineering from the University of Khartoum, Sudan. He worked in setting up the first Sudanese Electronic Payment Network (SUDAPAN) with the Electronic Banking Services (EBS) and the central Bank of Sudan. He then joined the Sudanese mobile telephone company (Zain-Sudan) as a radio engineer and a regional team leader for EDGE and 3G integration and implementation projects.

Currently Dr Hamdoun is involved in projects and research in the area of ICT for sustainability, energy efficient network design and holistic approaches to addressing energy costs, OPEX and CAPEX in communications systems and networks from both technical and business perspectives. A Current project is researching sustainable solar powered broadband access with African universities and institutions.