

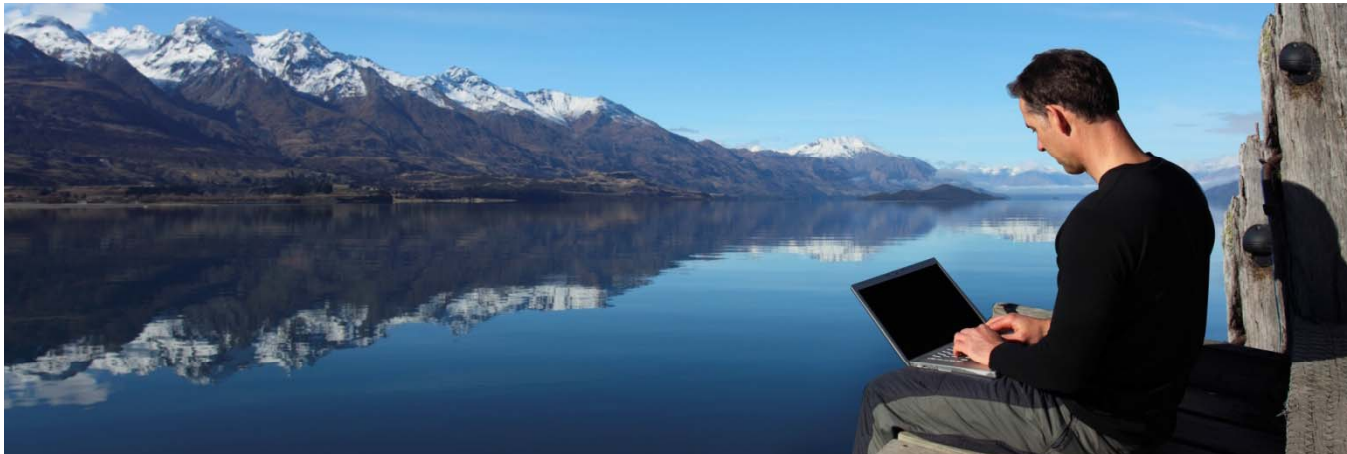
Wireless LTE Deployment

Changing Cell Site Energy and Infrastructure Design



Introduction

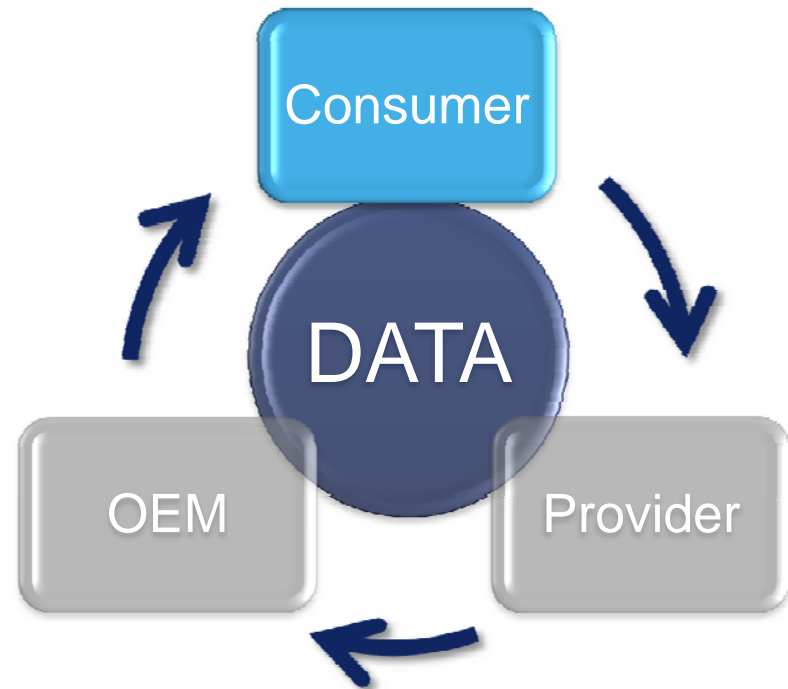
- New business society relies solely on mobile connectivity
- Mobile smart devices employ greater data intensive applications
 - Places greater demand on the wireless infrastructure
- Explosive amounts of data back through the wireless infrastructure in the last (5) years
- Data has surpassed voice as the primary wireless transmission
- The infrastructure has been forced to evolve



Market Evolution – Consumer

Consumer Drivers

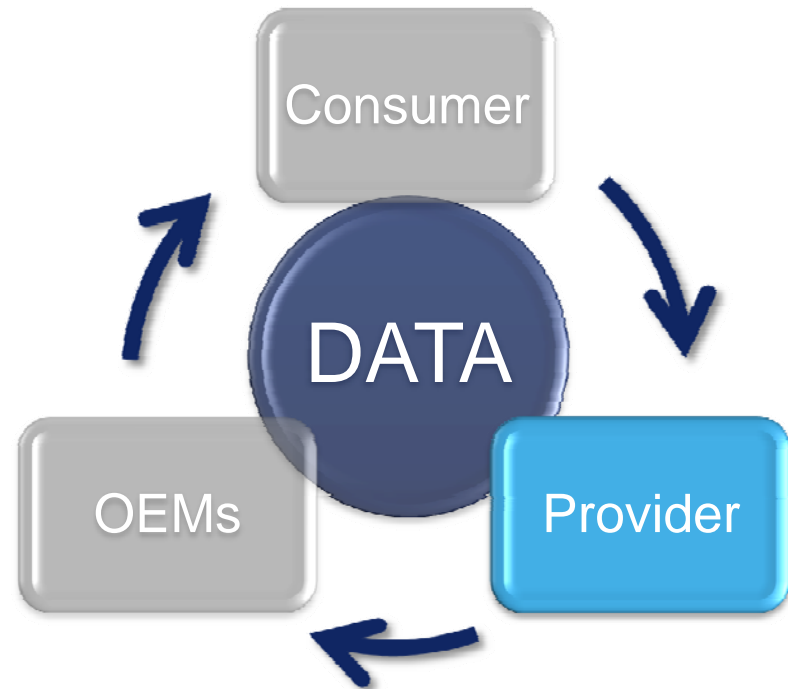
- Greater mobile flexibility through voice, text, email and video
- Drive toward greater mobile data exchange
- Create mobile applications: “The Killer App”
- Increased mobile use in static environments
- Smarter phone equals smarter people?



Market Evolution – Provider

Service Provider Drivers

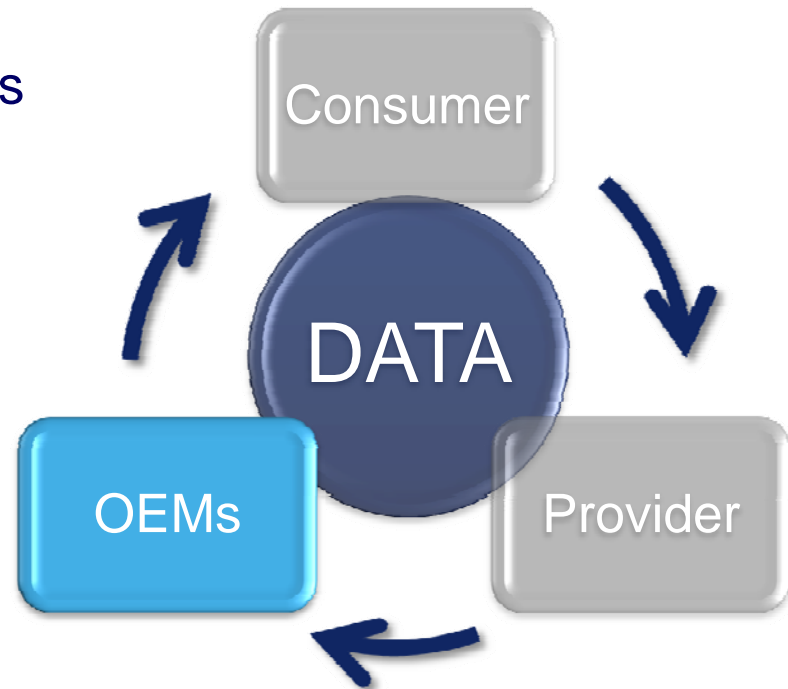
- Provide a greater consumer experience
- Generate increased revenue with higher margins
- Marginalize voice
 - Low margin voice
 - High margin data
- Provide faster data speeds for mobile applications
- Lower infrastructure and operational costs



Market Evolution – OEMs

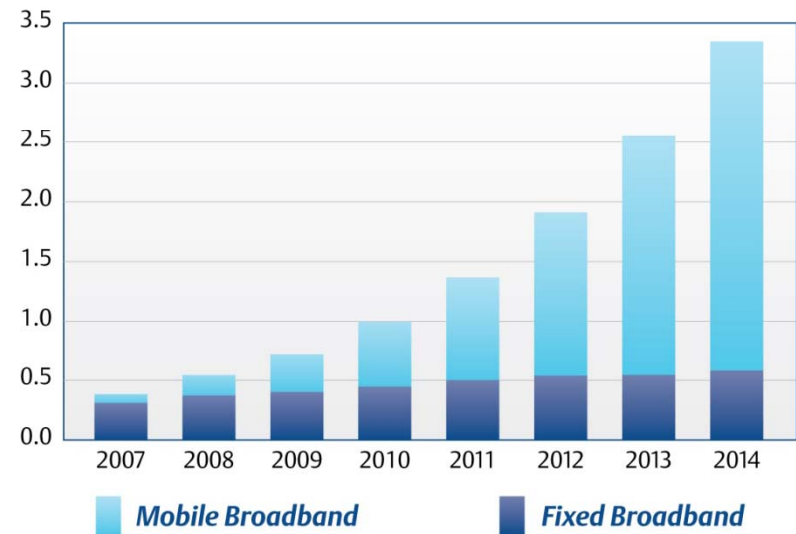
OEM Radio Drivers

- Provide high speed radio systems
- New products mean higher margins
- System backward compatibility
- Lower power consumption
- Multiple radio generations supported by a single platform
- Ethernet and microwave compatible



Drive for Mobile Data

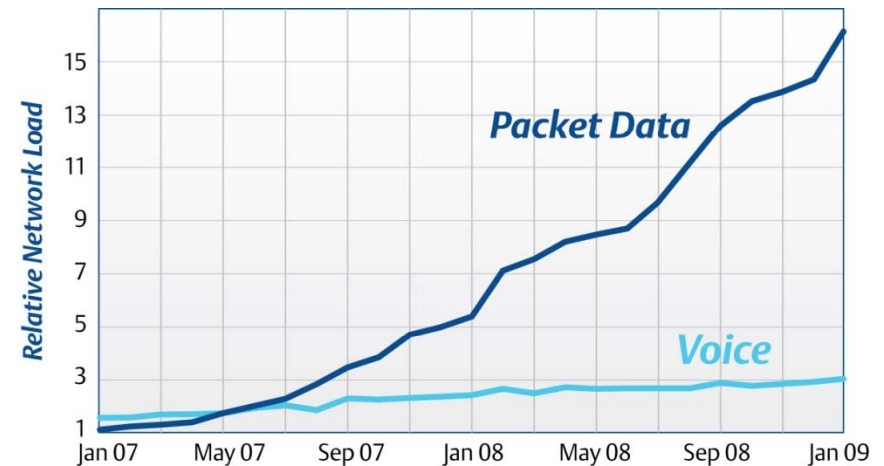
- LTE forecasted to reach 32.6 million subscribers by 2013 globally
- Service providers are being driven by (2) distinct trends
 - Smart mobile devices
 - Data centric applications
- Broadband subscribers to reach 3.4 billion by 2014
- 80% of the users will be mobile based
- Fixed broadband growth remains near static increases



Ericsson White Paper, "LTE – An Introduction". June 2009.

Evolution of Wireless Backhaul

- Initial providers were driven by providing voice
- As network speed evolved, data became the primary vehicle
- Developing countries pushed mobile over fixed
- As data use grew, current networks became overburdened
- LTE (Long Term Evolution) was born (evolved)
- Greater data brings greater demands on wireless backhaul
- T1 growth is replaced with Ethernet, an efficient, high bandwidth, cost effective solution
- Greater use of point to point microwave systems



Ericsson White Paper, "LTE – An Introduction". June 2009.

Industry Expectations

- Data will become the dominant mobile transmission vehicle
- Voice will be secondary, transmitted as VOIP data transaction
- Providers that securely manage data in their networks will be financially successful long term
- Voice only providers will force lower rates, lower cost infrastructures
- Networks may become shared, with data transactions managed by one or two dominate providers
- Infrastructure will become a commodity with a large focus on the backhaul transmission components



4th Generation of Wireless

- 3G speeds: Download 3.5 MB in 28 seconds
- 4G speeds: Download 3.5 MB in 5 seconds
- Wi-Max Networks
 - An extension of Wi-Fi hot spots
 - Focused more on new deployments
 - Geared toward data only (Laptop)
 - Clear Wire/Sprint
- Long Term Evolution (LTE)
 - Based on the existing GPRS wireless standard
 - Focused more on existing network infrastructure
 - AT&T and Verizon have embraced LTE as their next generation of wireless platform



Road to Long Term Evolution

- LTE = Long Term Evolution
- LTE has forced providers to rethink their current deployment plans
 - More data = more backhaul
 - Higher speed to the end user
 - Less sites, less power (700 MHz)
 - Current versus future network infrastructure requirements



LTE promises greater long term savings through smaller sites with less power consumption

LTE Effects on the Wireless Infrastructure

	700 MHz Propagation	1900 MHz Propagation	2400 MHz Propagation
Total Network Cost @ \$150k/cell	\$150,000	\$600,000	\$1,500,000
Network Cost Per Customer	\$180	\$725	\$1,820
# Mos. to Network Cost Breakdown	9 Months	36 Months	91 Months

Cell Site Coverage Per Thousand Square Miles



700 MHz Coverage



1900 MHz Coverage



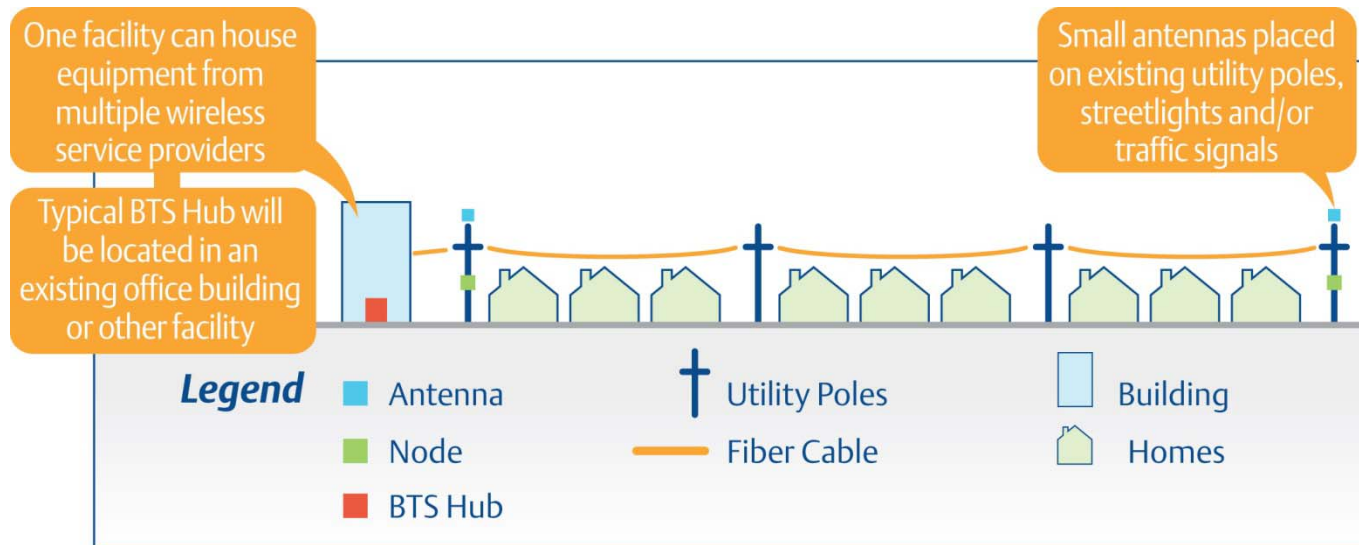
2400 MHz Coverage

Source: Aloha Partners

- Transmission frequency has a direct impact on the size of the network
- Lower frequencies mean larger antennas on an overstressed tower infrastructure
- 700 MHz provides greater penetration for in building use

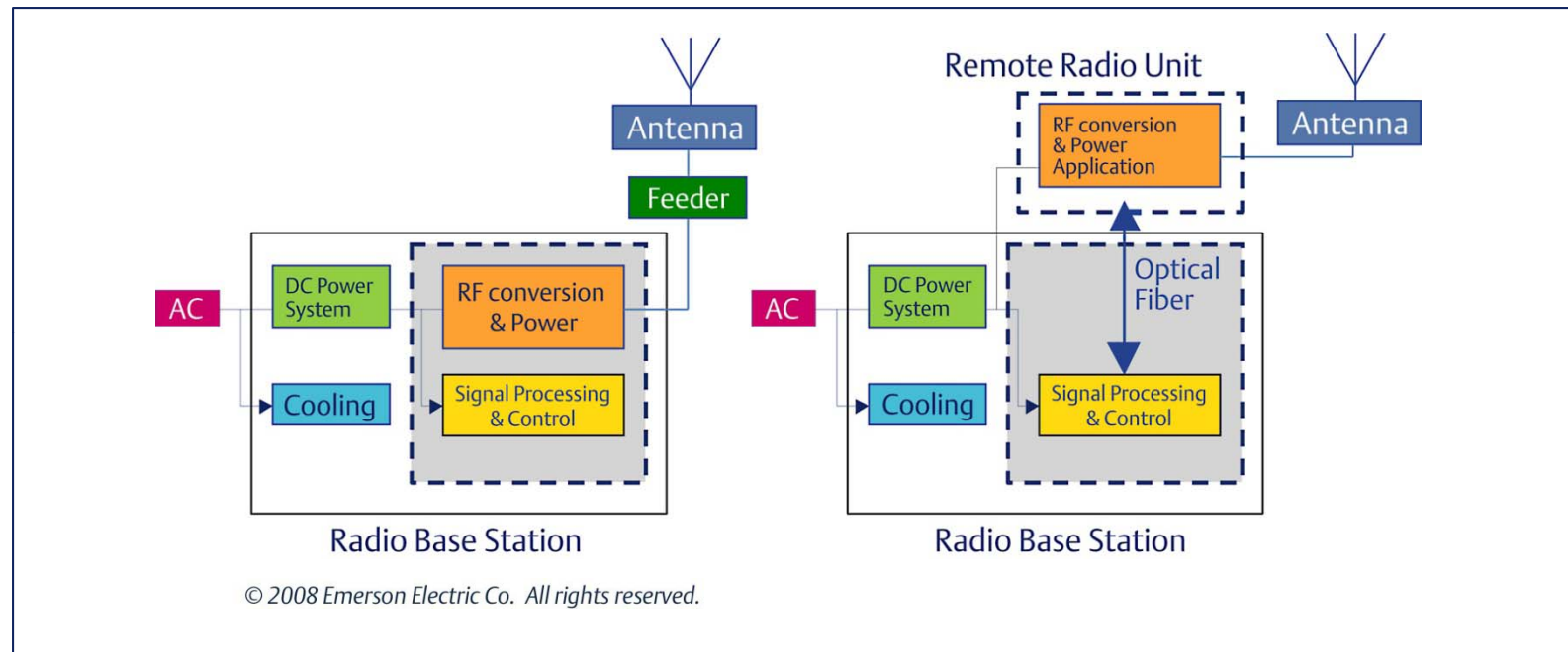
LTE Effects on the Wireless Infrastructure

- DAS (Distributed Antenna System)
- Moving data closer to the subscriber
- Reduces AC load, DC power and OSP infrastructure
- Works well for new site deployments



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LTE Effects on the Wireless Infrastructure



- Existing infrastructure will migrate to remote radios
- Reduces AC load, DC power and OSP infrastructure
- Reduces overall long term operation costs
- Works well for existing sites (overlay)

The Energy Factor

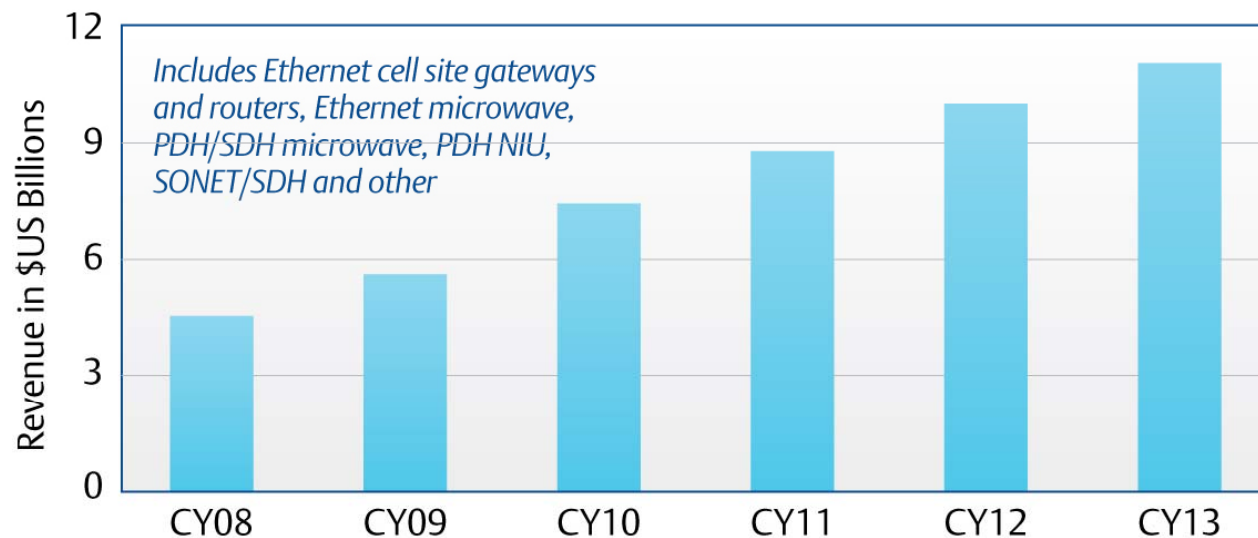
- Move toward reduced power consumption at the wireless site
 - LTE Radio System draw 10% less power due to system architecture change
 - General infrastructure changes have moved some configurations to 50% less power over past 3rd generation system
- Many sites contain “extra” DC power, infrastructure space from past deployments
- Most initial deployments are based on 48VDC requiring DC-DC site conversion
- Less power consumption translates to less cooling requirements overall
- Every infrastructure will pose it's own set of issues and opportunities



Wireless Backhaul Infrastructure Drivers

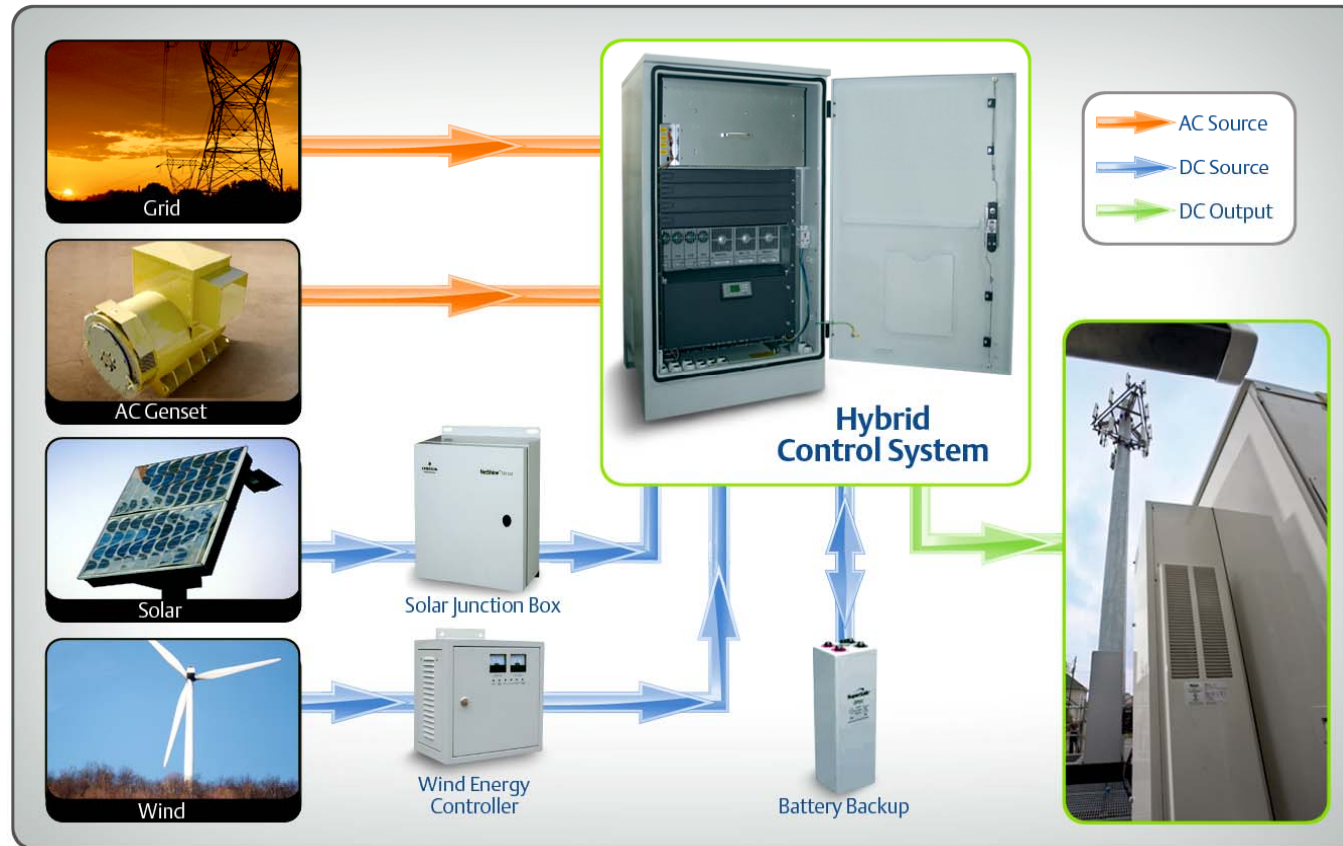
- Fiber quickly replacing copper to meet the bandwidth requirements of LTE
- Point to point microwave backhauled to fiber as a cost saving
- Ethernet over T1 driving savings, greater data flow and greater reliability

Mobile market is booming, driving the mobile backhaul market up year-over-year



© Infonetics Research, *Mobile Backhaul Equipment and Services*
Biannual Worldwide and Regional Market Size and Forecasts May 2009

The Renewable Energy Approach



- Decreased energy consumption allows for greater use of renewable and hybrid energy sources
- Future US Government energy policy will focus on bridging new alternatives to the existing energy infrastructure

Conclusions

- Mobile broadband will continue to grow rapidly
- Wireless LTE will provide the transmission means
- Mobile wireless will begin to focus on the static home user
- Increasing focus on OSP, DC power and utility use
- Site components will become a “throw away” commodity
- Vendors who provide solutions geared toward back haul transmission will be successful



Questions?

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