The Next-Generation Utility: Trends, Drivers and toward a Definition
We all know the warning signs and predictions

- **Expected Increases in:**
  - **Environmental Concerns** (carbon, Climate Change, CO2 emissions)
  - **Distributed and Renewable Energy sources**
  - Energy demand
  - Energy quality/reliability concerns (Digital Economy)
  - Energy prices (sharp spike?)
  - Consumer Advocacy – rates, reliability, accountability, billing transparency/reliability, ease of dealing with utility
  - Regulatory Scrutiny – Fed (new Energy Act), State PUCs, Security and Reliability Oversight (FERC/NERC Standards)
Environment has vaulted to the top of social concern

Mckinsey *Global Survey of Executives, 2007* (36% C-level)
% of respondents choosing issue as one of top 3

8 of 10 IOU CEO’s named Climate Change as top issue in recent “Energy Central.com” round-table discussion.
The shape of grids to come?

Conventional electrical grid
Centralised power stations generate electricity and distribute it to homes, factories and offices.

Energy internet
Many small generating facilities, including those based on alternative energy sources such as wind and solar power, are orchestrated using real-time monitoring and control systems.

Offices or hospitals generate their own power and sell the excess back to the grid. Hydrogen-powered cars can act as generators when not in use. Energy-storage technologies smooth out fluctuations in supply from wind and solar power.

Distributing power generation in this way reduces transmission losses, operating costs and the environmental impact of overhead power lines.

Sources: The Economist; ABB
The “Big-Bad Utility” is expected to step up

- As usual, nobody will give credit for doing it right, but there will be hell to pay for doing it wrong
- And nobody wants to pay more for their reliable, secure, cleaner energy

➤ So let’s get beyond the platitudes!!
Intelligent, Next-Gen Utility is enabled by end-to-end, overlapping networks tied to “smart” devices/sensors.
New Intelligent Grid

Generation Fleet

Transmission Substation

Transmission System

Distribution Substation

Distribution System

ISO/RTO

Embedded Line/Premise Sensors

Electric/Gas/Water Meters

Energy Bus

Pervasive/Wireless Bus

Embedded Asset Sensors

“On-Demand” Response

Industrial Customer

Residential Customer

Mobile Field Force

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New, integrated applications

- AMR/AMI
  - Interval Meter Reads
  - Load Profiles
  - Demand Usage
  - Power Quality

- Conservation
  - Curtailment Status
  - Chiller Flow Data
  - Critical Peak Pricing

- Customer Care
  - Outage Status
  - Off-Cycle Reads
  - Theft Detection

- Distribution / Substation Automation
  - Outage Status
  - Circuit Status
  - Substation Power Quality

- Security And Valued Added Services
  - Video Surveillance
  - And Valued Added Services

More Data

Enhancements /Additions

- Outage Detection
  - From Manual Reads to AMR
  - Energy Mgmt Services

- Demand Response
  - Load Shedding
  - Load as a Resource
  - TOU Rates

- Outage Notification
  - Billing Consolidation
  - Trouble Account Management
  - Customer Loyalty Programs

- Asset Management
  - Mobile Mapping
  - Reliability Enhancement / Outage Recovery
  - Distribution Planning
  - Automated Controls

- Asset Protection
  - Homeland Security
  - Internet and VOIP

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A plethora of thorny tech issues

- BPL versus RF?
- Meter capabilities?
- IP/digital or not?
- HAN or not?
- Demand Response/Management applications and tools?
- Data Integration?
  - Meter Data Management (MDM)
  - Data Analytics
  - Middleware/Network Architecture/SOA

Choices, Choices, Choices!!!

- Tech platform(s) must mesh, scale and allow flexibility going forward
AMI Tech Choices

An avalanche of Data, from millions of endpoints, will be coming down the pipe
Combined with advanced Analytics, and new human interface techniques/machines to mine and present the data for use.
Wireless Tech Choices

WAN
- VSAT
- 802.20 (proposed)
- 400Mhz, 800Mhz, 900Mhz, 2.5G, 3G

MAN
- Wi-Fi Mesh
- WiMAX (802.16), MeshNetworks

LAN
- ZigBee
- Wi-Fi

PAN
- HomeRF
- Bluetooth
- UWB (802.15)
Wireless network solutions will likely combine private/public systems.
NGU Benefits Customers

Examples:
- Faster restoration times
- Receive usage information to better understand and manage their bills and energy use
- Reduced inconvenience in meter reads
- Improvements in timeliness and accuracy of billing
- Remote service turn-on and shut-off
- Customer can call Utility Customer Service for real-time meter read or via data on in-home display/portal
- Customer can manage DSM appliances via portal
- Ability to participate in other tariff options
Examples:
- Reduced operating costs (less truck rolls)
- Improved outage management
- Reduced number of delayed and estimated bills
- Reduced energy theft
- Lower procurement costs
- Improves Distribution Load Management and Planning
- Greater Historical Load and Usage Data
- Better Asset Management and Maintenance
- Time-Of-Use Pricing, pre-paid, and flat bill programs
- Reduces need for additional generation and transmission capacity
- Supports any PUC’s price-responsive tariff requirements
- Supports environmental PR
NGU benefits Government

• Environmental benefits
• Public interest
• Public safety
• Better services
• Efficiency and savings
• National security
• Quality infrastructure for businesses
• Better management of resources
• Prevention of widespread outages, failures, and disasters
AMI Benefits – is the glass half-full, or half-empty?

Current business cases overlook many possible benefits of AMI.

Source: Smart Energy Alliance
NGU Obstacles (among others)

- **Regulatory Negotiations**
  - especially on rate recovery
  - especially in rising energy cost environment

- **Investor Communications about decreased ROI and risks (IOUs)**

- **Understanding/merging business requirements and needed applications with technology**
  - Communications between personnel, especially between techs and business guys

- **Understanding consumer wants/needs/behaviors**

- **Fear of stranding technology investment by making poor choices**

- **Lack of adequate Standards (AMI, MDM, HAN etc.)**
Some near-term, out-on-a-limb predictions

- Commercial Carriers (Sprint/Nextel?) will get more play if willing to hold to SLAs, and expand coverage to remote areas (First Energy example)
- Current sanguine AMI implementation predictions may stall in regulatory “battle” over cost recovery
- Emergence of end-to-end solution providers?
- Standards will develop around MDM and SOA (Multi-speak?)
- Continued increase in Util differentiation by type:
  - Coops implement AMR/AMI at twice the rate; IOUs more interest/investment in peak-load applications

... and Some not-so-out-on-a-limb:
- Ubiquitous IP/digitalized/MPLS networks are safest bets for interoperability and scale-ability
- Continued pace of substation-upgrades for some time
- Data needs will grow over voice, mobility over fixed
- Wide use of multi-network handsets for mobile workforce
- Critical on-going need for Communications Master Planning skills/tools
- Increased focus/skill on regulatory relations (lobbying?) and PR