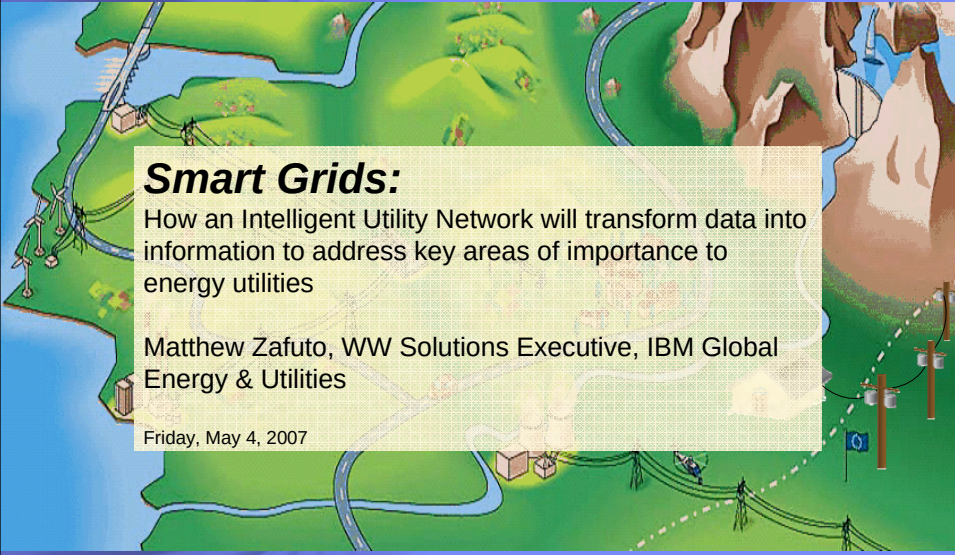


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Smart Grids:

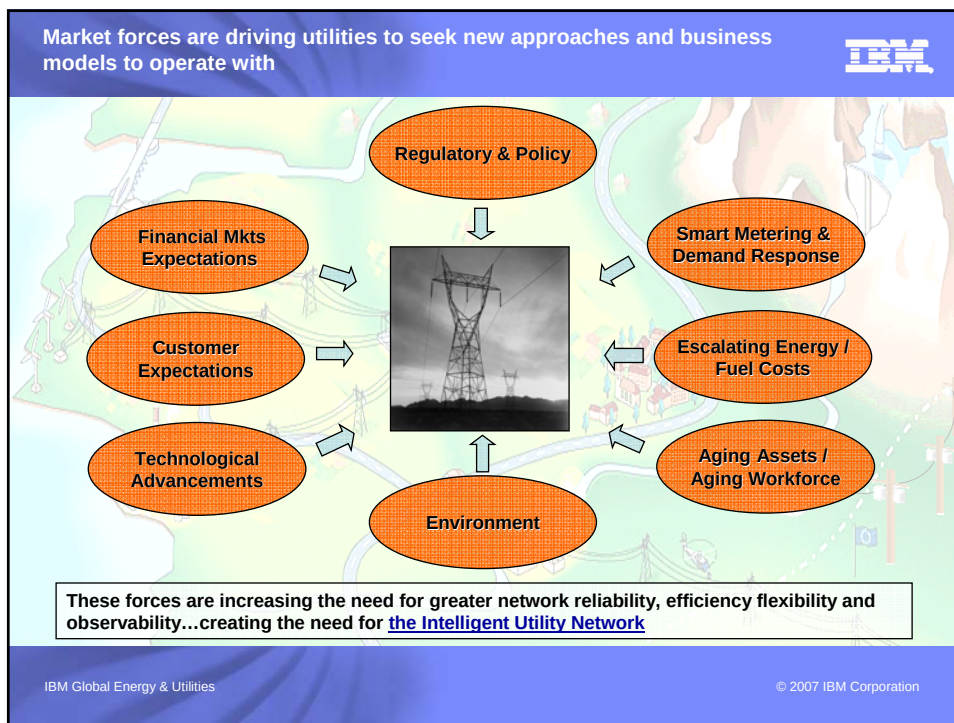
How an Intelligent Utility Network will transform data into information to address key areas of importance to energy utilities

Matthew Zafuto, WW Solutions Executive, IBM Global Energy & Utilities

Friday, May 4, 2007

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These market drivers introduce three main categories of risk to utilities:
operational, financial and technological risk



- **Operational Risk**

- **Aging Assets** – August 14, 2006, a blackout in Tokyo leaves at 800,000 households without electricity for at least two hours.
- **Environmental Stewardship** – February 1, 2006 report, Office of Gas and Electricity Markets – Concerns about reducing greenhouse gas emissions, maintaining security of supply and tackling fuel poverty are at the top of the political agenda.

- **Financial Risk**

- "The cost of electricity is going up...fuel costs, infrastructure updates, environmental compliance and improved reliability all insure that...we must find ways to show the ratepayer and government that our service is improving." **CEO, Southern Company**
- "We must provide stable, reliable and economic energy for industry to continue to expand but we must not do so at the cost of our environment." **Minister of Energy, China**
- "We need a better view on how we make our investments in the network and how the rate payer and shareholder are benefiting. I do not have that kind of visibility today." **CEO, National Grid**

- **Technological Risk**

- EU Directive 2006/32 requires member states to insure that consumers have "individual meters that accurately reflect the final customer's actual energy consumption and that provide information on actual time of use"
- Section 1225 of the Energy Policy Act of 2005 (Electric Transmission and Distribution Programs) directs the secretary of energy to establish a research, development, demonstration, and commercialization program that includes planning, design, and operation software.

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Utilities must also manage these risks in the face of a balanced energy challenge

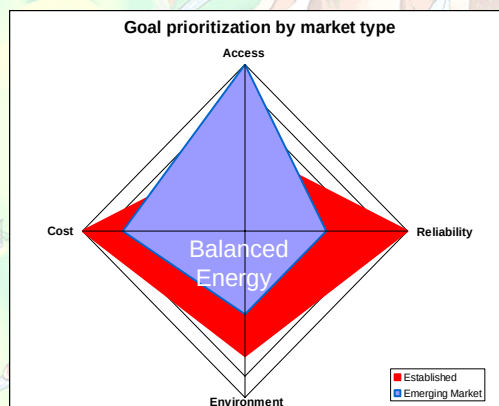


- **Fundamental goals of electric industry worldwide**

- Access to electricity for all
- Environmental stewardship
- Reliability and Quality of Service
- Cost effectiveness and efficiency

- **Priorities differ between established/domestic/ first world markets and the Emerging Markets**

- **Impacts of addressing challenges are often polar opposites of each other**



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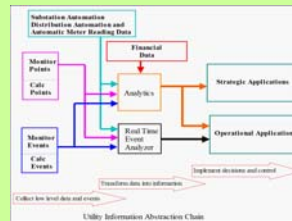
Intelligent Utility Network (IUN) POV



*The convergence of environmental pressures, financial expectation, energy costs, regulatory transparency, aging infrastructure, limited price electricity and improved risk management requires a new level of enterprise information and integration to allow for informed decision making.... The **Intelligent Utility Network** provides processes, technology and partners to deliver informed decision making.*

The Intelligent Utility Network

- It is an IP-enabled continuous sensing network which connects all parts of the utility... equipment, control systems, applications, employees
- Enables automatic data collection and storage from across the utility based on a Common Information Model and Services Oriented Arch
- Upon which analytics, simulation and modeling can be performed to support the optimization of the management of assets and operations to deliver efficient system reliability and performance
- To meet regulatory, financial, customer and compliance expectations



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Reliability in the Distribution System can be increased by...



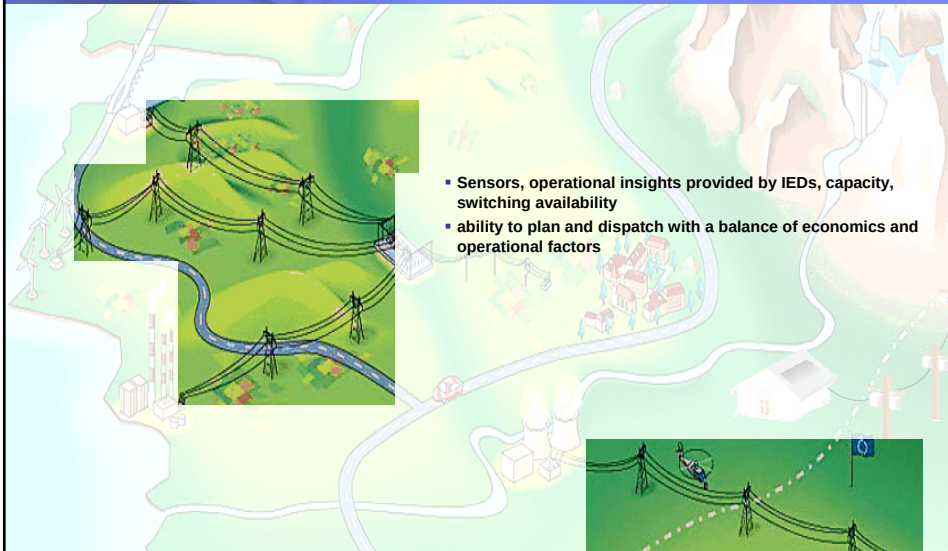
- Installation of Intelligent devices, sensors & meters to eliminate system "blind spots", which results in:
 - Faster detection and localization of outages
 - Better load balancing & maintaining stability
 - Locating power quality, reliability & fault issues before they impact customers
 - Automatic be detection of problem areas, automating corrective action
- Equipment Condition Monitoring, allowing:
 - Optimization of Capital and O&M spending to maximize system performance
 - Real time knowledge of asset health
 - Increased asset life through better management & maintenance
 - Remote management of Sensors/IEDs
- Staging and dispatching mobile workers efficiently in order to respond more rapidly



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Reliability in the Transmission system can be increased by...



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Reliability in the Generation system can be increased by...



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Efficiency in the Distribution System can be increased by...



- **Two-way communication between utilities and customers, allowing:**
 - Customers to intelligently manage and plan consumption and cost
 - Real time pricing to make most efficient use of existing generation capacity
 - Peak shaving/demand management to reduce necessary generation and T&D asset requirements
- **More efficient use of mobile workforce, including:**
 - More accurate mobile crew dispatch (right crew, right place, right time)
 - Better information and software application access in field
 - Optimal use of centralized knowledge/expertise for field troubleshooting
 - More remote monitoring and configuration of equipment
- **Better customer management, including:**
 - Remote connect/disconnect of service
 - More accurate tariff and billing information



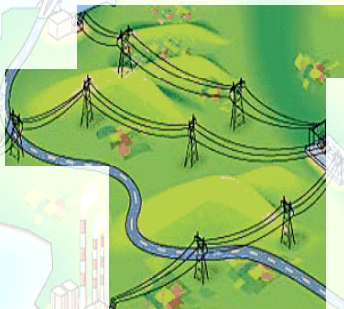
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Efficiency in the Transmission grid can be increased by...



- **Better use of existing transmission capacity, through:**
 - Enhanced asset utilization monitoring, allowing operation closer to dynamic limits
 - Load balancing and management
 - Real time asset life information, providing basis for over/under loading of assets during transients
- **Capital asset investment optimization, due to:**
 - Better knowledge of true asset remaining life
 - More accurate system loading profiles, indicating key areas in need of investment



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Efficiency in the Generation system can be increased by...



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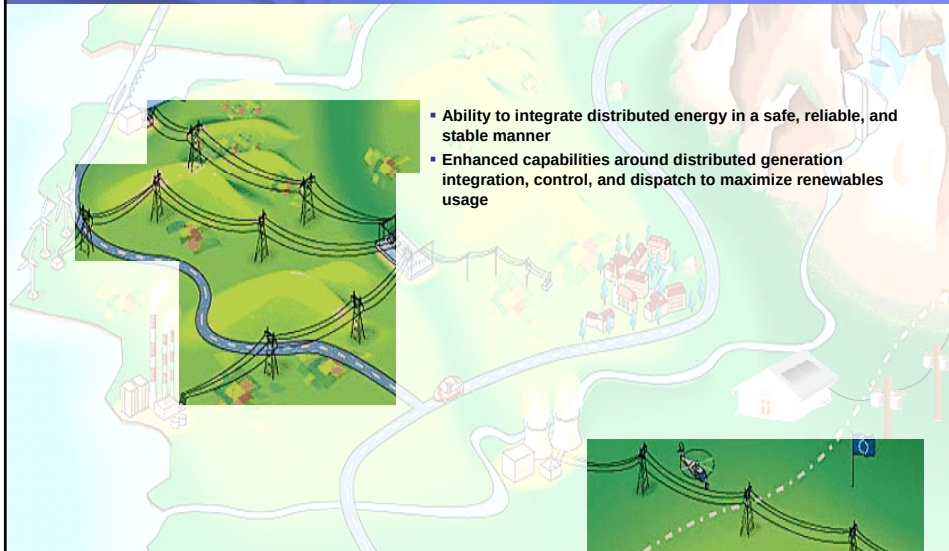
Environmental Stewardship in the Distribution System can be increased by...



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Environmental Stewardship in the Transmission system can be increased by...

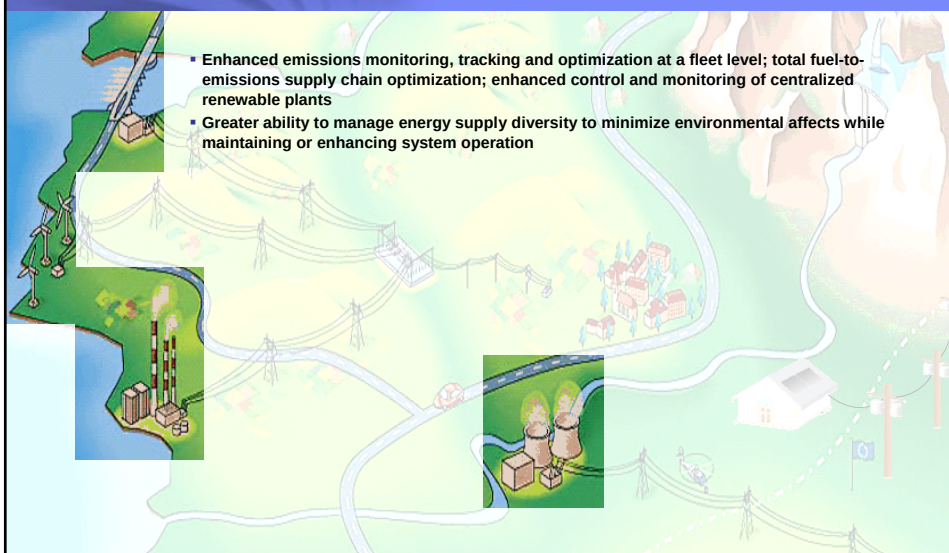


- Ability to integrate distributed energy in a safe, reliable, and stable manner
- Enhanced capabilities around distributed generation integration, control, and dispatch to maximize renewables usage

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Environmental Stewardship in the Generation system can be increased by...



- Enhanced emissions monitoring, tracking and optimization at a fleet level; total fuel-to-emissions supply chain optimization; enhanced control and monitoring of centralized renewable plants
- Greater ability to manage energy supply diversity to minimize environmental affects while maintaining or enhancing system operation

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Increased reliability will benefit...

Ratepayers – Will receive a greater quality of service, experiencing fewer outages with less duration

Utilities – Will be better able to comply with increasingly stringent reliability requirements

Regulators – Smarter investments in advanced technology will bring greater value to their constituents

Increased efficiency will benefit...

Ratepayers – Will pay lower rates for electricity, experience fewer capacity-related outages

Utilities – Will receive a greater return on investment associated with their assets, workforce, use of information; the ability to conserve cash while optimizing cap ex and op ex will also be a key benefit

Regulators – Investing in advanced communications and technology will provide a balance of efficiency increases for the utilities and rate pressure relief for the ratepayers

Increased environmental stewardship will benefit...

Ratepayers – Will maintain/achieve quality of life while simultaneously helping the environment

Utilities – Will be able to meet increasingly stringent RPS requirements; increase energy security/diversity; reduce price volatility, enhance cash flow

Regulators – Will provide mitigation of environmental effects on state and globally, while maintaining customer service/satisfaction

Thank You!