IBM founded the Global Intelligent Utility Network Coalition to accelerate the adoption of Smart Grids globally

Together, the current Global IUN Coalition member base serves over 55 million electric and natural gas consumers.

At the most recent IUN Coalition meeting in June in Copenhagen, the agenda included in-depth project updates from members and the results of two Coalition initiatives:
- Embedded Generation Taskforce, which is analyzing the technical, process and revenue impacts and opportunities of distributed/embedded generation on the LV energy grid
- Changing Revenue Models, including how will utilities derive profitable revenue in the future, what are operating structure impacts and the regulatory implications
DER Drivers, Wants and Needs

Regulators
• Increasing the percentage of power derived from sustainable and environmentally friendly energy sources
• Reducing the need for transmission network expansion by reducing the role of bulk generation.
• Reducing energy costs
• Improving the efficiency of the system by reducing losses
• Improving power quality and reliability by increasing source diversity.

Customers
• Reducing energy costs.
• Minimizing the negative impact DER integration on daily activities
• Increasing the percentage of power derived from sustainable and environmentally friendly energy sources
• Improving power quality and reliability.

Distributed Energy Resource Operators
• Maximize return on asset/investment
• Increasing the amount of energy that can be injected by DER sources
• Reducing the cost of connection
• Reducing the time to connect
Distribution System Operator Issues

- Protection
- Voltage management
- Equipment Limits
- Optimization of network power flows.

Fit and Forget Model and Limitations

Wind farm #1 requires 50 MVA - available in the network

Wind farm #2 requires 10 MVA - has to pay for another 40 MVA

Wind farm #1 increases capacity to 80 MVA at no cost
Active Distribution Network

Active networks are distribution networks with the possibility of controlling a combination of Distributed Energy Resources (generators, loads, and storage). The DSO has the possibility to manage electricity flows using a flexible network topology. DERs take some degree of responsibility for system support, which will depend on a suitable regulatory environment and connection agreements.

Active Distribution Network Features

- Reactive power management
- Active power management
- Coordinated voltage control
- Fault level control (network topology management)
- Adaptive Protection
Active Distribution Network Strengths and Weaknesses

Strengths:
- Alternative to network reinforcement
- Increased operational reliability, including power delivery
- Electrical loss reduction

Weaknesses:
- Regulatory issues
- Compatibility with existing distribution system infrastructure
- Present lack of experience

Modes of System Operation

**Deductive:** medium term prediction in advance of actual operation. Next day generation, load forecasting, tolerate more latency

**Inductive:** Near real time. Predictive component, but limited optimization or analysis. Simpler models, more constrained remedies, voltage regulation, selection of protection group settings. Curtailing load or generation. Low latency

**Reflexive:** Real time. Protection tasks in one form or another, whether fundamentally triggered by voltage, current or frequency. No latency.

**Analytic:** Post operation analysis. Network upgrades, tuning generation and load forecasts immune to the typical latencies