Challenge:
How to Improve Electric Grids

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Current Electric Grid:

Electric Power Transmission:
- Bulk transfer of electrical energy

Color Key:
Black: Generation
Blue: Transmission
Green: Distribution

Generating Station
Generating Step Up Transformer
Transmission Customer 138kV or 230kV
Transmission lines 765, 500, 345, 230, and 138 kV
Substation Step Down Transformer
Transmission Customer 138kV or 230kV
Subtransmission Customer 26kV and 69kV
Primary Customer 13kV and 4kV
Secondary Customer 120V and 240V
Current Problems:

1. Excessive Power Demands
2. Black Outs
3. Inefficient Transmission (Electricity lost through Resistance)
Solution:

Smart Grid Technology
What is a Smart Grid?

- Delivers electricity to consumers using two-way digital technology to control appliances at consumer’s homes to save energy, reduce cost and increase reliability and transparency.
ISO-New England

- Ensure the constant availability of electricity by:
  1. Providing
  2. Overseeing
  3. Managing
Smart Grid Technology

Supply:
- Microgrids
- Distribution Generation
- Electric Energy Storage

Demand:
- Advanced Metering
- Home-Area Networks
- Smart Appliances
Smart Grid

Power Generation

Transmission System

Transmission Lines (765, 500, 345, 230, 138 kV)

Transmission Customer (138 kV to 230 kV)

Transmission Substation (Step-Down Transformer)

SCADA System

Distribution System

Customer (26 kV to 69 kV)

Customer (4 kV to 13 kV)

Customer (120V to 240V)

Distribution Automation

End User Customers

Utility Control Center

Internet

2-way communication network
Smart Grid

Transmission – The Flow of Electricity

Resistance – (cost) Lost Electricity during Transmission
Smart Grid

- Real-time transmission information
- The Extended Model - Control
- Downed lines: Locating and Rerouting
Questions?