Delaware

Energy Efficiency Advisory Council

The Future of Energy Efficiency, Demand Response, and the Connected Grid

Optimal ENERGY

Topics for today

- Where is the grid headed, and how is that relevant to Energy Efficiency (EE)?
- What are the areas of intersection between demand reduction and EE?
- What is the value of EE as a demand resource?

Changing Energy Landscape

Then

- Increasing demand
- Slow technology change
- Customers indifferent to usage patterns
- One-way supply
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Now

- Flat or declining demand
- Rapid technology change
- Ubiquity of variable pricing
- On-site generation
- Climate change a critical concern

Components of the Near-Future Grid

- Energy Efficiency
- Demand Response
- Renewable Energy
- Electric Vehicles
- Behind-the-Meter & Utility-Scale Storage
- Other Non-Wires Alternatives

Demand Resources

- Keep the grid stable and efficient
- Defer upgrades to generation, transmission and distribution systems
- Deliver customer economic benefits
- Ask consumers to play an important role in grid operation
- Lower the cost of electricity in wholesale markets, and in turn, lead to lower retail rates

Demand Resources Reduce Consumer Demand for Electricity

- Passive Demand Management (Energy Efficiency)
  - Saves electricity across many hours
  - Not dispatchable
  - Examples: energy-efficient appliances and lighting, advanced cooling and heating technologies, etc.
- Active Demand Management (Demand Response)
  - Targets reductions to times of high system load and/or cost
  - Dispatched by the regional system operator or the utility
  - Examples: turning off equipment, delaying high-intensity tasks (e.g., cleaning cycles), raising/lowering set-points for cooling/heating, substituting electricity from on-site generator or storage device for grid power
- Rate Design

Enabling Demand Response…

- Sensors
- Data analytics
- Advanced metering infrastructure
- Connected and “smart” devices and appliances
- Home automation and business management systems

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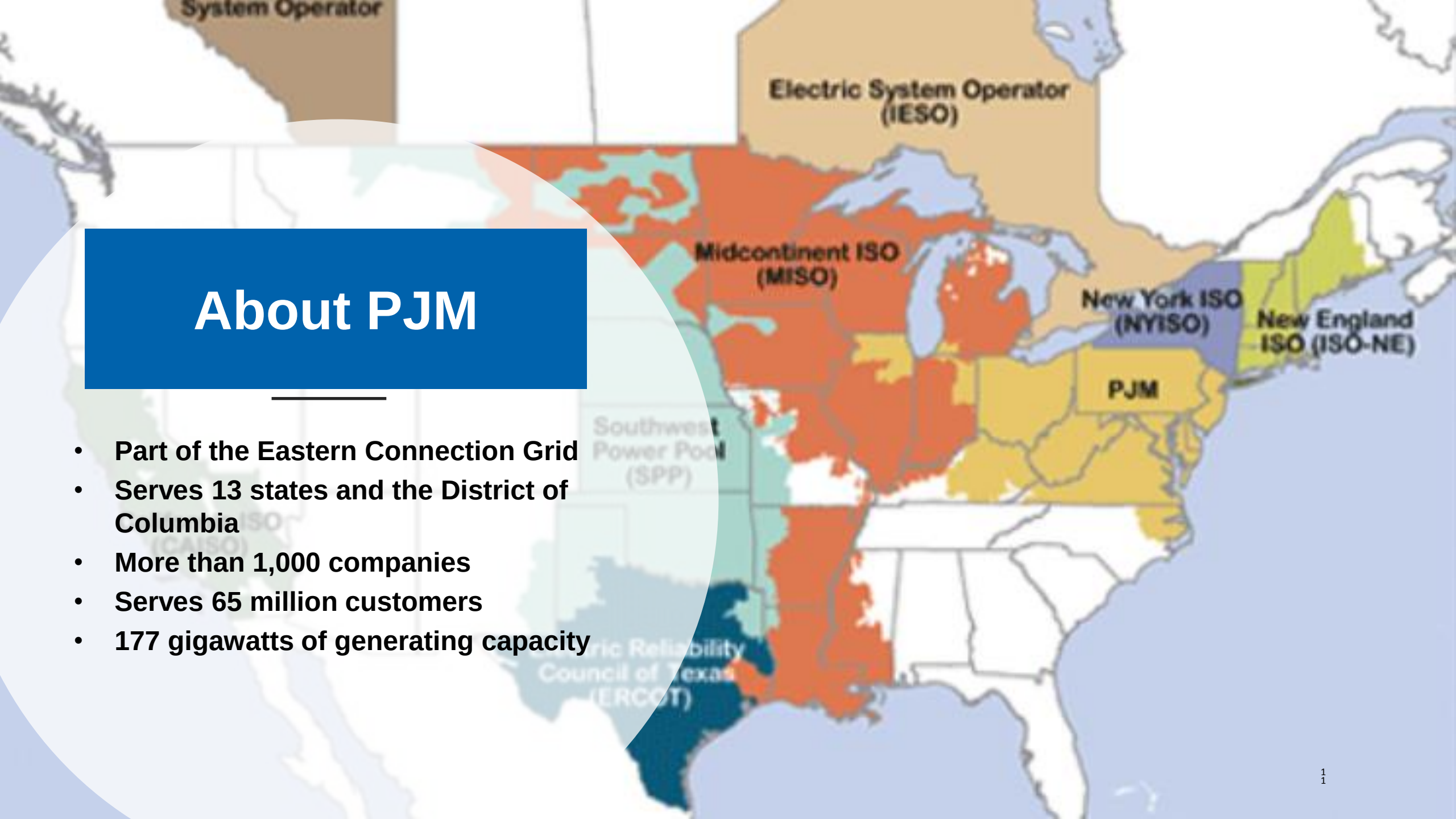
…Enables Energy Efficiency!

Integrating Demand Response and EE

- Example: advanced LED lighting
  - Energy efficient
  - Automatic daylight dimming
  - Direct load control
  - Using these types of tools, lighting load could be automatically dimmed by 10% to reduce loads when needed. This amount of dimming is barely perceptible to the human eye, but its impact would be substantial.
- Example: advanced thermostats
  - Energy efficient (via traditional setbacks)
  - Supports rate design adaptation
  - Active demand response
    - NV Energy pilot had >60 automated DR “events” with little “override”

About PJM

- Part of the Eastern Connection Grid
- Serves 13 states and the District of Columbia
- More than 1,000 companies
- Serves 65 million customers
- 177 gigawatts of generating capacity



PJM Reliability Pricing Model (RPM)

- Forward auction for capacity
- Requires strong M&V
- Price is locational and uncertain, and only paid for 4 years
- There may be penalties for failure to “perform.”

Getting a resource into the market

- Submit Measurement &Verification Plan prior to auction
- Register in the electronic Reliability Pricing Model (eRPM) system
- Establish credit with PJM Credit Department
- Participate and clear in the Base Residual Auction (BRA)
- Submit post-installation Measurement & Verification Report prior to delivery year
- Allow for post-installation audit

Potential revenue from DSM resources

- Recent clearing price for EMAAC = $165.73/Megawatts-day.
- Each MW earns approximately $60,500 per year.
  - For an EE resource, four-year Net Present Value (NPV) > $200,000.
- As an example, if DNREC's EEIF program saved approximately 1.5 Megawatts, RPM revenues of approximately $300,000, compared to $1.6 million in costs.