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Transmission Alternatives: Distributed Resources

Tom Dagenais and Erik Winsand
Economic Planning
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Overview

1. What are distributed resources?
2. Why model distributed resources in PROMOD?
3. Developing assumptions for distributed resources
4. ATC technique for modeling distributed resources

Part 1

1. **What are distributed resources?**
2. Why model distributed resources in PROMOD?
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What are Distributed Resources?

Distributed Resources (DR) refers to a variety of possible load modifications:

- Behind-the-meter and distributed generation
  - Gas or diesel microturbines, consumer owned backup generation, etc.
- Utility demand response programs
  - Direct load control, interruptible load programs, or price-response rate design
- Consumer Driven Demand Side Management
  - Energy conservation programs, distributed renewable generation, etc.

Part 2

1. What are distributed resources?
2. **Why model distributed resources in PROMOD?**
3. Developing assumptions for distributed resources
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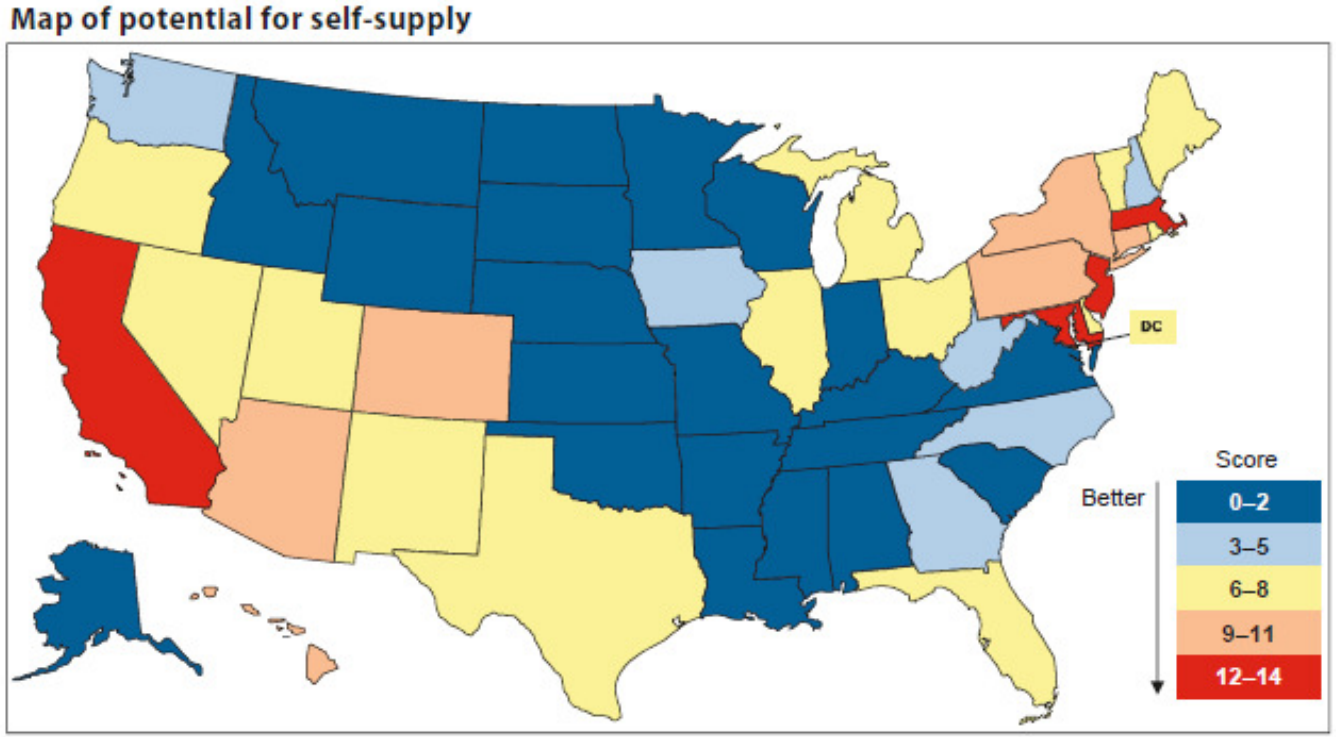
So, why model Distributed Resources?

1. System planning benefits
   - Robust “Strategic Flexibility” methodology
   - More reliable PROMOD solutions
2. Stakeholder and Customer interests
   - Future potential Demand Side Management
   - State Utility Commissions requirements

DR or “self supply” potential



- WI relatively low on potential for self-supply
- Other states may soon ask for better accounting of DR in planning assumptions

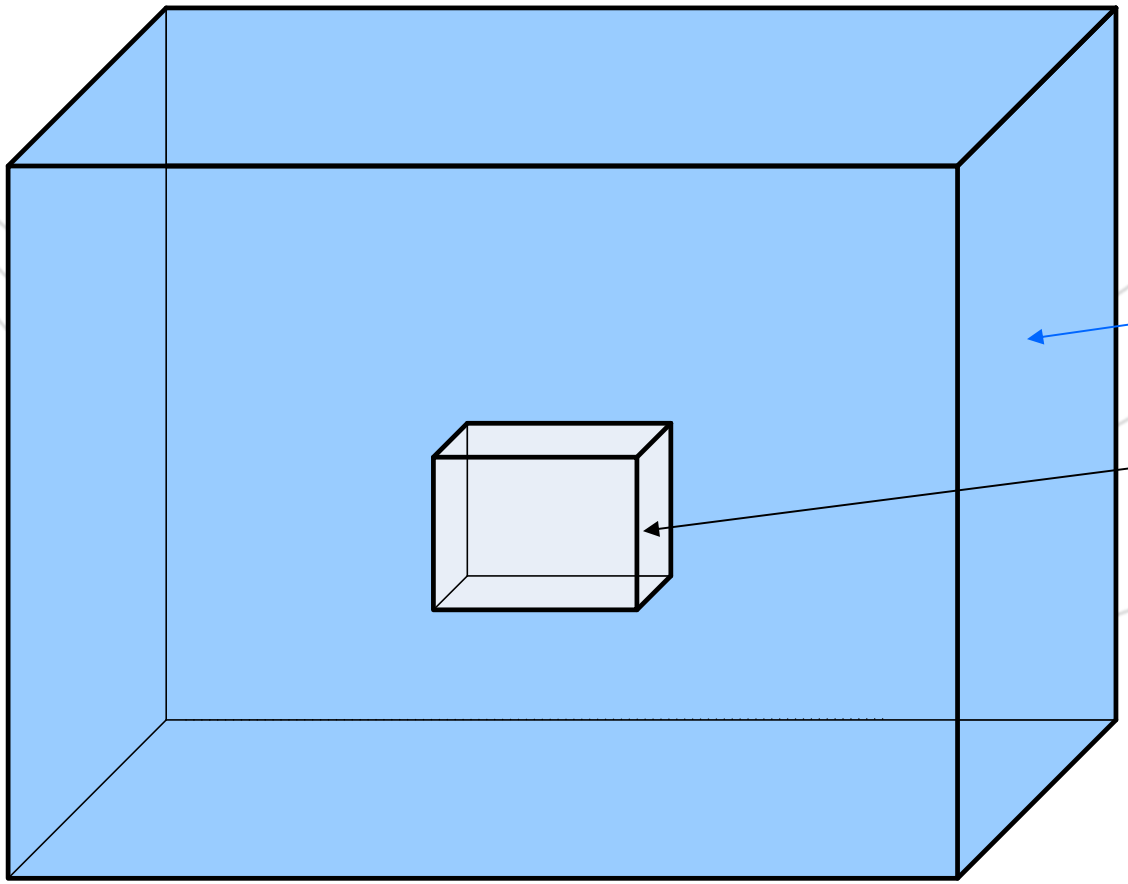
Robust System Planning

1. Robust system planning captures a wide range of plausible outcomes for a variety of variables to show value for a transmission project

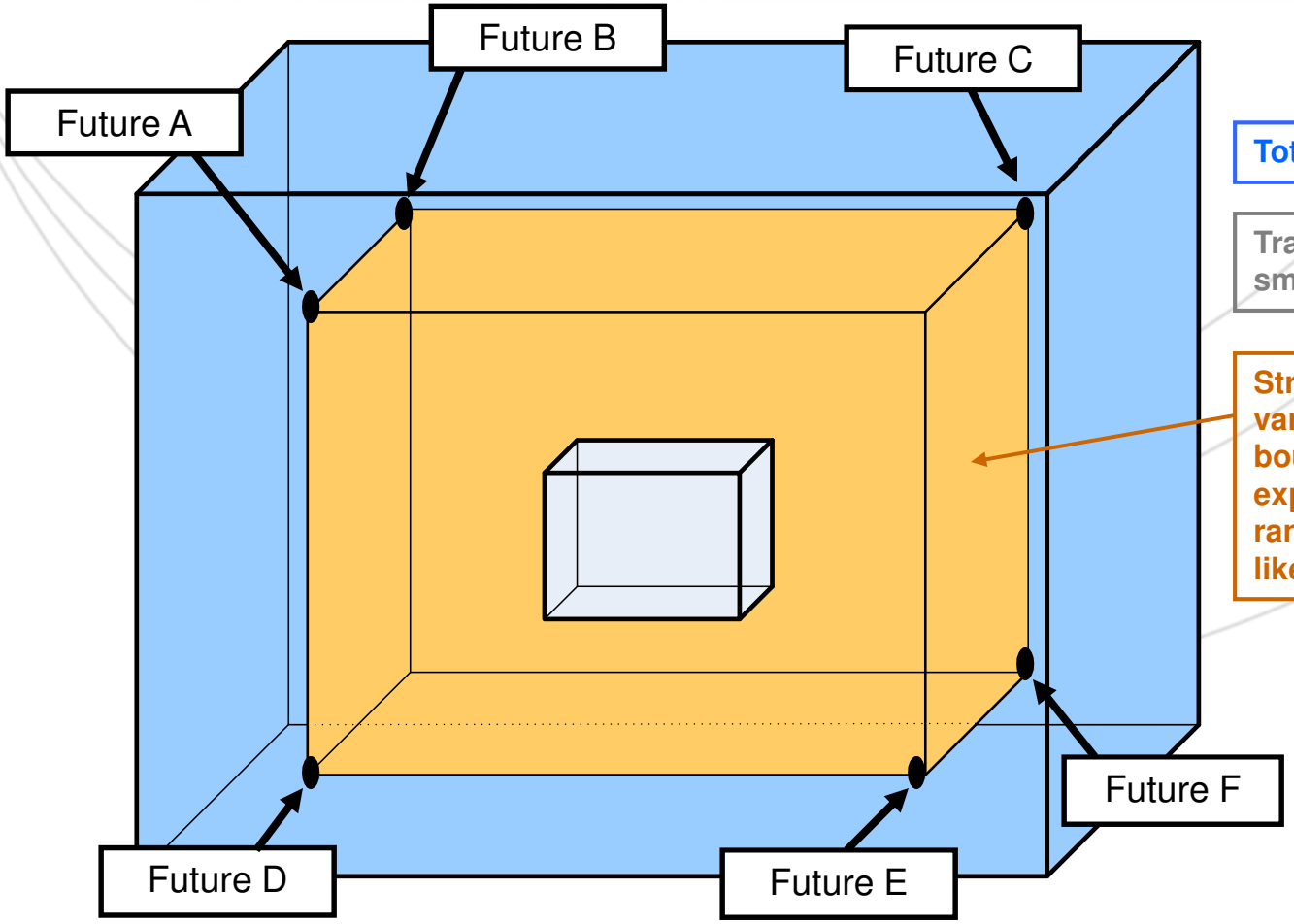
2. Practiced by MISO, and known as “Strategic Flexibility”
   - Future is uncertain - can’t be reliably predicted
   - Multiple plausible futures developed
   - Futures bound the range of possible outcomes

3. ATC has embraced Strategic Flexibility and feels that DR is an important component.

Traditional System Planning



Strategic Flexibility



Total range of possible futures

Traditional planning considers a small range of possible futures.

Strategic Flexibility develops various futures that provide bounds on a plausible but expanded range of futures. This range will capture most of the likely possible futures.

Part 3

1. What are distributed resources?
2. Why model distributed resources in PROMOD?
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Developing Assumptions for DR

Created preliminary assumptions and polled stakeholders (2008-09)

1. DR is composed of a variety of load modifiers
   - Must be well distributed throughout system
   - Must be quick-response
   - Should be reasonably sized - can't completely cancel out load
   - Shouldn't add to overall emissions
2. DR consists of differing levels of price sensitivity
   - Should be used by the system when conditions warrant
   - Only a small portion of DR is a permanent load reduction

Distributed Renewable Generation (DRG) and Energy Efficiency (EE)

- DR should imitate action of future DRG
- DR should also capture future EE
  - Note that EE assumptions are already included in utility load forecasts, but unforeseen additional EE could occur
- Once installed, DRG / EE are assumed to constantly modify load
  - "Always on" in PROMOD model
- DRG and EE is a small amount of overall DR capabilities
  - Small amount of capacity at a subset of DR locations

Demand Response

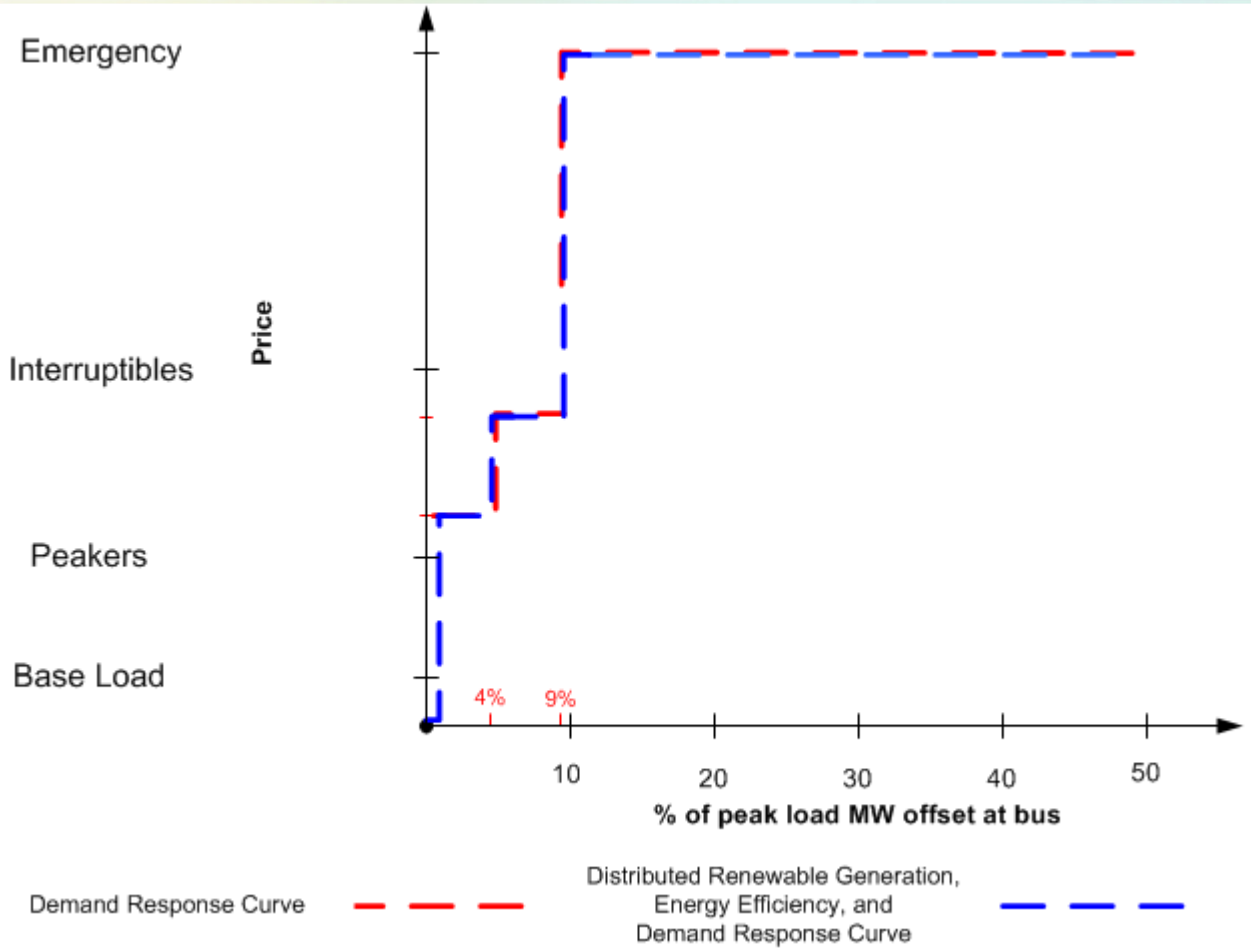
- Large portion of DR falls under “Demand Response”
- Demand Response assumptions
  - EEI 2009 Special Report “FERC on SmartGrid” scenarios
    - » Business-As-Usual: 4% reduction in peak demand
    - » Expanded Business-As-Usual: 9% reduction in peak demand
  - Model as increasing cost curve to simulate customer resistance

Capacity Segment Assumptions

Assume four capacity segments for DR

1. Small % of constant load offset for DRG / Efficiency
2. Up to 4% of peak load level for demand response
3. Up to 9% of peak load level for expanded demand response
4. Up to 50% of peak load level for “emergency” response

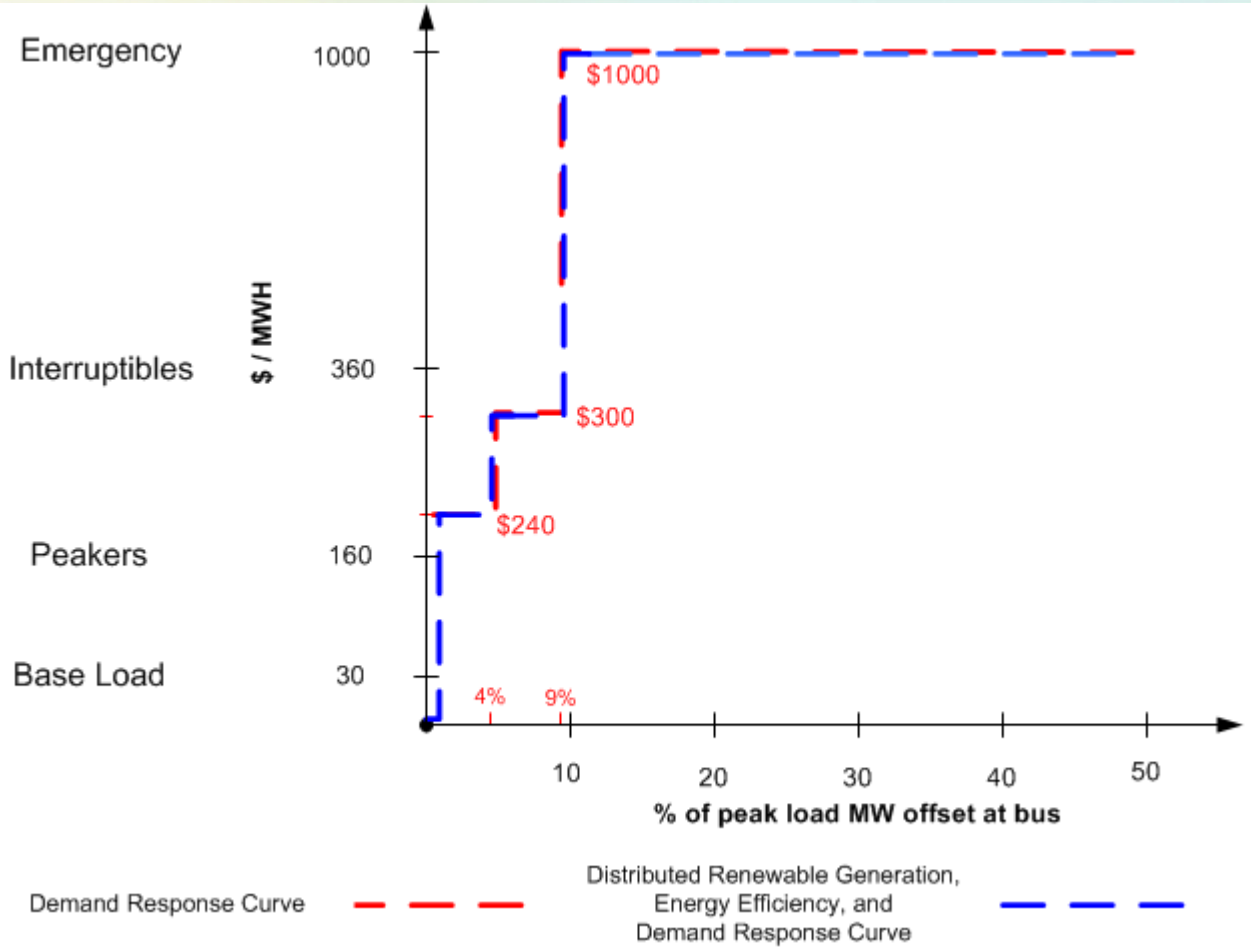
Capacity Curve Assumption for DR



Price Points for DR Capacity Segments

- DRG / Energy Efficiency
  - Small load reduction: **$0**
    - » Dispatch of this small segment is “always on”
- Demand response
  - 4% reduction of load: **$240**
    - » Price choice based on customer response during industry pilot programs
  - 9% reduction of load: **$300**
    - » Price set at midpoint between peaker costs and emergency dispatch costs
  - 50% reduction of load: **$1000**
    - » Eliminates PROMOD “buying through” constraints and highlights concerns
- Prices are updated to remain between peaker and emergency

Generator Price Curve - Distributed Resources



Part 4

1. What are distributed resources?
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4. **Technique for modeling distributed resources**

Modeling Distributed Resources

- DR modeled as generating units at load busses
  - First modeled in ATC's 2008 PROMOD models
  - Revised and enhanced several times since
  - Modeled as fast-start combustion turbines
  - Emissions set to zero
  - Placed at every ATC load with peak > 5 MW
  - Capacity set to 50% of peak load level at bus

Open Discussion and Feedback