

Flexibility Augmentation: Consideration of Resource Flexibility in Long-Term Resource Planning

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Outline

- Augmenting flexibility in the short-term
- Key concept: reserving capacity for within-hour balancing
- Considering flexibility in long-term utility resource planning
- Resources that provide flexible capacity

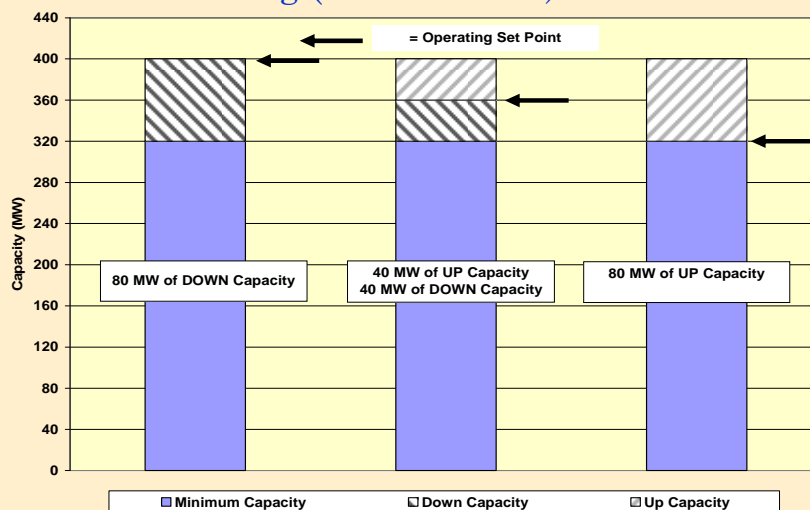
Augmenting Flexibility in the Short-term

- Significant untapped flexibility in the existing power system
 - Improve wind forecasting and scheduling
 - Change scheduling practices and procedures
 - Implement dynamic scheduling of wind generation
 - Improve automatic generation control (AGC)
 - Develop marketable ancillary services products
 - Establish wind ramping limits
 - Others...
- Short-term priority is to tap these sources of flexibility

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Illustration of Reserving Capacity for Within-Hour Balancing (400 MW CCCT)



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Considering Flexibility in Long-term Resource Planning

- How much flexible capacity will Balancing Authorities need to set aside for within-hour regulation and load following?
 - How much is attributable to load growth?
 - How much is attributable to increased wind generation?
- How much flexible capacity for within-hour regulation and load following will be available from the existing (more efficient) system?
 - Which resources are currently used for within-hour balancing?
 - Are there other existing resources that could be used?
 - How will constraints on hydro system operations impact the availability of capacity for within-hour balancing?

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Considering Flexibility in Long-term Resource Planning (Continued)

- How much flexibility will resources added to meet utility energy and peak load requirements provide?
 - Flexibility (i.e., ramping measured in MW/min.) is a resource attribute
 - Utilities should consider flexibility concurrent with their evaluation of resources alternatives in Integrated Resource Planning

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Putting the Pieces Together

- If the flexibility of the existing system is tapped in the short-run, and...
- flexibility is considered when utilities add resources to meet their load obligations in the long-run, then...
- in most cases, the regions utilities should be able to avoid adding physical capacity solely for the purpose of augmenting system flexibility

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Flexibility Resources: Ideal Characteristics

- Respond to Balancing Authority signals quickly
 - Via automatic generation control (AGC); or
 - Signals from the Balancing Authority’s energy management system
- Operate over a wide range of output levels
- Change output levels quickly
- Operate at a “near-market” heat rate
 - Reservation of capacity entails low opportunity costs

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Demand-side Flexibility Options

- Demand-side resources may be able to provide within-hour load following services
 - More frequent response than simply reducing peak demand
 - Ideally would be able to increase, as well as decrease, demand
 - Quick response to Balancing Authority signals may limit resource to specific end-uses

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Supply-side Flexibility Options

- Combined-cycle combustion turbines with duct-firing
 - Adding duct-firing to existing CCCT
- Simple-cycle combustion turbines
 - Frame units (e.g., GE 7F)
 - Aeroderivative units (e.g., LM6000)
 - Hybrid units (e.g., GE LMS100)
- Gas-fired internal combustion reciprocating engines
- Pumped storage hydro
- Other storage resources

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Conclusions

- Currently considering flexibility augmentation in development of the Council's Draft 6th Power Plan
- Draft Flexibility Augmentation Action Item for the 6th Power Plan: The Council will work with Bonneville, utilities, and regulatory boards and commissions, to develop long-term planning methodologies for power system flexibility