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Economics for Wholesale Electricity Markets

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Services of Different Plants

Module 2

Objectives

- Consider the different 'services' created by a plant
- What characteristics of a plant have value?
 - Flexibility and ancillary services
- How is that value compensated?

New plants have different flexibility

- **Ramp rate:** How quickly the plant can increase or decrease power output
- **Ramp time:** The amount of time it takes from the moment a generator is turned on to the moment it can start providing energy to the grid at its lower operating limit
- **Capacity:** The maximum output of a plant
- **Lower Operating Limit:** The minimum amount of power a plant can generate once it is turned on
- **Minimum Run Time:** The shortest amount of time a plant can operate once it is turned on
- **No-Load Cost:** The cost of turning the plant on, but keeping it "spinning," ready to increase power output
- **Start-up and Shut-down Costs:** the costs of turning the plant on and off

Why is generator flexibility important

- Uncertainty in supply and demand
- Proper compensation to encourage investment
- Increased availability of wind and solar
- Immediate response and incremental supply adjustment
- Unresponsive demand in the short run
 - Can demand response act as flexible supply?
- These things made worse by transmission constraints

Ancillary Services

- Voltage/frequency regulation
 - Primary, secondary and tertiary
- Spinning and non-spinning reserves
 - Quick response supply
- Reactive power
- Black start capability

- Which plants provide these?
- How will batteries, wind and solar fit in?

Things that are valuable need compensation

- In thinking about capital investments, think about whether these generation attributes have value
- And whether generators have incentive to provide them