

Capacity Discussion



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Energy, Capacity and Reserves

ENERGY is the ability to do work

Common definition of Electrical Capacity is “the maximum output an electricity generator can physically produce, measured in megawatts (MW). ... **Energy** is the amount of electricity a generator produces over a specific period of time. Many generators do not operate at their full **capacity** all the time.”
ISO- New England

CAPACITY is the ability to reliably deliver an exact amount of energy, at an exact point in time.

Reserves, to ensure reliability, BA’s hold capacity available on reserve to account for expected and unexpected changes in generation and demand

Resource Characteristics

Dispatchable

- Hydro Resources
 - Fast start and ramping
 - May be fuel limited
- Coal Resources
 - Long start-up times and slow ramping
 - Typically not fuel limited
- Natural Gas Resources
 - Reasonable start-up times and ramp rates
 - Typically not fuel limited

Non-Dispatchable

- Solar
 - Unable to start-up on demand
- Wind
 - Unable to start-up on demand
- Run-of-River Hydro
 - Minimal dispatchability

System Operational Needs

- NERC & WECC Reliability Standards require Balancing Authorities (BAs) to hold Capacity available on Reserve to cover:
 - Contingency Reserve (BAL-002-3, BAL-002-WECC-2a)
 - Recover from unexpected loss of generation
 - Interconnection Frequency Control (BAL-001-2)
 - Sufficient Regulating Capacity to maintain ACE to support system frequency
 - Responds to changes in Variable Energy Resources
 - Frequency Response (BAL-003-1.1)
 - To arrest frequency deviations upon loss of large generator
- Adequate capacity and ramping capability to pass Western EIM sufficiency tests.
- Sufficient capacity and reserves to insulate customers from price volatility
 - i.e., hedging future time horizons

Firm vs. Flexible Capacity

Firm Capacity: There exists a high degree of confidence that when capacity is called upon, energy will be available

- Self Provided: Expectation that energy will be available upon demand
- Procured: Seller will provide energy upon demand
 - Backed up by a guarantee to keep non-defaulting party financially whole

Flexible Capacity

The ability to ramp up or down as needed.

In operations, total system capacity must be both firm and flexible. Resources that are not both must be offset by another resource which is.

Resource Types and Capacity Levels and Values

- Hydro resources utilizing storage reservoirs have significant benefits
 - Fast starting and ramping
 - Flexibility in dispatching when most economic and managing reservoirs
- Thermal resources:
 - Subject to de-rates, capacity equals nameplate
 - Relatively slow start and ramp limited
- Variable Energy Resources
 - Wind/Solar
 - Dependent on the weather.
 - Can dispatch “down”, but not “up” reliably

July 2017 Load and Wind

