Breaking Out New Moves: How Resource Flexibility Benefits Utility Operations
Flexibility Supply Curve

Breaking Out New Moves: How Resource Flexibility Benefits Utility Operations
Flexibility from Utility-Scale Resources

“Breaking Out the New Moves: How Resource Flexibility Benefits Utility Operations”

NARUC Annual Meeting
November 14, 2018

Commissioner Liane Randolph
California Public Utilities Commission
RESOURCE ADEQUACY

- Multi-Year requirements

- Single Buyer for local capacity
INTEGRATED RESOURCES
PLANNING

• Planning towards decarbonization

• Meeting reliability with high penetration of renewables

• Considering not just GHG but air pollutants as well
Total planned baseline and new energy purchases, TWh, by resource type
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Michael Goggin
www.gridstrategiesllc.com
Renewables are now dispatchable

At 2:45 a.m., RT operator initiates curtailment to 300 MW due to high ACE.

At 4 a.m., RT operator initiates AGC regulation. Note that the ACE stays within ±50.

Source: IEEE magazine chart, data from Xcel Colorado power system
Renewables will increasingly provide flexibility

Source: E3 study of TECO system for First Solar
Market reforms for a more flexible, cleaner power system

**ENERGY MARKET REFORMS**
- Ensure energy market prices reflect the value of reliability.
- Bring self-scheduled resources into markets.
- Multi-Day Unit Forecasts
- Price the inflexibility costs of conventional generators.
- Ensure accurate, detailed generator bid parameters.
- Reduce operational over-commitment of conventional units.
- Create operating reserve zones.
- Incent improvements in renewable energy forecasting
- Probabilistic Unit Commitment.
- Improve gas-electric coordination.
- Respect bilateral contracts.
- Allow flexible resources to bid flexibly without being inappropriately constrained by market power mitigation rules.
- Allow real-time prices and demand response aggregation for electricity customers and allow demand resources to set prices.
  - Streamline ISO seams.
  - Use advanced grid technologies and operating practices to improve utilization of existing transmission.

**RELIABILITY SERVICES REFORMS**
- Reactive power compensation.
- Remove barriers to renewable energy providing operating reserves like frequency regulation.
- Primary frequency response markets.
- Allow renewables to provide and set price for all reliability services.
- Create additional flexibility products.
- Make contingency reserves available to accommodate abrupt drops in renewable output.

**CAPACITY MARKET REFORMS**
- Respect state resource choices.
- Allow MOPR to be avoided through bilateral contracts.
- Ensure capacity markets reflect renewable resources’ true capacity value.
- Relax the requirement for capacity to perform year-round, and create seasonal rather than annual capacity products.
- Allow storage participation in capacity markets.
- Ensure conventional generators are not awarded excess credit relative to renewable resources.
- Efforts to add a fuel security component to the capacity market should be abandoned unless demonstrated to improve reliability or efficiency.
- Reform the capacity performance penalty structure to be symmetric.
- Allow generators to retain their Capacity Interconnection Rights (CIRs) if capacity values change.
- Allow hybrid projects for purposes of meeting market rules.

Source: Grid Strategies paper for Wind Solar Alliance
Available at [https://gridstrategiesllc.com/](https://gridstrategiesllc.com/)
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Breaking Out the New Moves:
How Resource Flexibility Benefits Utility Operations Panel

Grid Interactive Efficient Buildings

David Nemtzow
Director, Building Technologies Office
November 14, 2018

https://www.energy.gov/eere/buildings/geb
Energy use in the U.S. building sector

Energy Use

- Transportation 27 Quads (72% Electric)
- Industrial 31 Quads (31% Electric)
- Commercial 18 Quads (80% Electric)
- Residential 21 Quads (0.4% Electric)

Building Electricity Use

- Cooling: 40%
- Heating: 13%
- Water Heating: 4%
- Lighting: 10%
- Refrigerators: 10%
- Cooking: 5%
- Electronics: 11%
- Other Residential Appliances: 10%
- Other: 5%

Buildings Energy Use: 40% of U.S. total
Buildings Electricity Consumption: 75% of U.S. total
Buildings Peak Electricity Demand: ~80% of regional total
U.S. Building Energy Bill: $380 billion per year

Source: EIA 2017 Annual Energy Outlook
“When” matters for some regions/loads more than others

Hourly Residential Cooling Cost Totals by Climate Zone in 2018 (May-Sep)

11X peak/off-peak ratio
Interoperable, integrated systems.
- Continuously optimized operation for maximum comfort and efficiency.
- Grid-responsive (e.g., demand response).

Applicable to Other Technologies, e.g.:

- Sensor/Occupant Inputs
- Control Signal
- Utility Communication
Impact on a Building’s Energy Use

Solar PV

Energy Efficiency, Demand Response, then Solar PV

Images and data courtesy of PG&E
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TWO MOST SIGNIFICANT TRENDS IN US ENERGY MARKETS

1. Adoption of large, central renewable generation by utilities and policy-makers
2. Adoption of distributed energy resources by customers

QUESTION | *Do these trends complement or frustrate one another?*

CONCLUSION | *Distributed Resources increasingly seen as a complement to large, scale renewables, because they deliver unique benefits to customers AND flexibility to the grid.*
“NOT YOUR GRANDMA’S DER”

- Leveraging new technologies and low cost communications, DER can now provide flexibility
- Solar PV with Smart Inverters
- Storage
- Demand Response
- Electric Vehicles

WHAT IS FLEXIBILITY?

The flexibility the grid requires can be described as:

- **Ramp** - the ability to respond rapidly and over sustained periods to changes in load or generation.
- **Overgeneration** - the grid needs to be able to absorb or shift excess generation.
- **Frequency** - the grid needs to keep generation and load in balance at all times.
- **Voltage** - maintain voltage within acceptable limits. While the other flexibility needs are required at a larger system level, voltage is a local requirement and must be managed at a circuit level.
DER FLEXIBILITY

• New market products for DER
  • CAISO DERP
  • FERC NOPR

• Aggregation allows for participation models

• Modeling shows DER flexibility as key to unlocking higher RE penetrations (MN)
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Session C3

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