OPUC Flexibility Planning Guidelines

Pacific Northwest Demand Response Project
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OPUC’s New IRP Guidelines*

• Integrated Resource Plans to include:
  – Forecasts of flexibility needs and flexible capability in all time intervals, 20 year horizon
  – Evaluate all flexible resources to fill any needs on a consistent and comparable basis

• Response to planning challenges/opportunities
  – Increasing net load variability
  – Emergence of new tools, including demand management, to absorb that variability, maintain reliability
  – Need a planning approach that differentiates between capacity and flexibility; value of different resources/strategies across multiple time dimensions

* OPUC Order 12 013 issued January 19, 2012 in Docket UM 1461 (Electric vehicle investigation)
Net Load Variability

- Frequency, amplitude and duration of VER variability precludes single or easy solution
  - Continuous short-term production variability puts premium on speed/accuracy of response
  - Fast, large magnitude ramps may not align with load ramps
  - Extended periods of low/no VER production
- Demand for flexibility dramatically increased at higher penetration levels of VERs
- SCCTs (& low gas prices) the default solution, but there is a growing list of alternatives
- Reforms and new technologies suggest a more operational view of planning, including comprehensive multi-faceted VER integration strategy
One 3,000 MW wind ramp in 7 days
5,000 + MW of hydro system flexibility, thermal reasonably stable
Similar load 5-7,000 MW
Three days of significant wind production
Hydro output higher with less flexibility; thermal at lower output and absorbing variability
Flexibility Sources

• Diversity (access) strategies – geographic/technology diversity, BA consolidation/cooperation, markets
• Generation – fast responding hydro, CTs, reciprocating engines
  – CT/recips “wear & tear”, response range a fraction of nameplate, potentially degraded fuel/emissions performance
• Storage – response range 2X nameplate
  – Short, limited capacity (batteries, flywheels) fast, accurate
  – “Bulk”, longer duration (pumped hydro, CAES)
  – Thermal storage (molten salt, ice, hot water)
• Demand management – smart grid controllable “withdrawal” and “recharge”
What is the piece of the flexibility question that we have not talked about?

And don’t forget your valentine!!
Flexibility Sources

Institutional Reforms

• Break with traditional hour-based operating regimes
  – Sub-hourly generation and transmission scheduling intervals closer to the operating period
• Refine ancillary services definitions; align value recognition and compensation with performance
• Reform planning & resource acquisition processes
  – Identify operating/flexibility needs, alternative solutions
  – Full operations benefit/value comparisons, technology neutrality
  – Inclusive RFP bidding rules/evaluation; example, shorter/smaller A/S performance minimums
• Balancing area cooperation to broaden flexibility choices
  – Rate accommodation (avoid TX rate pancaking)
  – Adequacy of transmission
  – Markets (i.e., EIM) and liquidity
Flexibility Sources

Storage 1

- Regulatory and business model issues remain
  - Definition/regulatory authority - generation asset or transmission asset? Or neither?
  - Utility ownership (ratebase), independent 3rd party ownership with PPAs or tolling agreements

- Storage is not just a VER integration tool, can unlock value of existing assets (G or T, or D) regardless of VERs
  - Short to long continuum of technologies

- Flywheels (<15 min) and batteries (up to hours)
  - Faster/more accurate response to frequency excursions - full up/down capacity available in less than a second (2X nameplate) versus CT’s fractional operating range
  - Advances, scale and full recognition of benefits to system making costs increasingly competitive with CTs
  - Modularity of batteries & flywheels/siting simplicity advantage
  - Commercial projects around the world
Flexibility Sources

Storage 2

• Compressed air energy storage (CAES)( up to 24 hours)
  – 2\textsuperscript{nd} generation technology near commercial maturity
  – High quality (faster than CT) reserves, low fuel burn “bulk” storage, fast recharge
  – Unique siting/geology requirements (salt dome, aquifer, depleted gas fields, deep water, abandoned mines)*
  – Pilots under way in California and New York, other proposals

• Pumped hydro (hours)
  – Mature technology “bulk” storage
  – Dynamic controls for generation and recharge improve value
  – Difficult siting possibly eased with closed systems
  – Many proposals, no new construction....yet

*Above ground pipe storage vessel designs generally limited to several hours
Flexibility Sources
Demand Response/Demand Management

• DR & time-based rates and VERs developing on own tracks; little regard for complimentary operations
• Potential of the demand resource and related technologies has been demonstrated
• Communication & control technologies within reach
• Financial incentives to induce participation
  – TOU rates
  – Rebates on interrupted service
  – Market solutions, allow/encourage aggregators