# Energy Storage Resources in RPM

## December 4, 2013

# Goals

- Be as comparable as possible with existing rules for other resource types.
- To allow for new technologies, rules should not be technology specific.
- Avoid administratively setting values.



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# Proposal

**Use existing rules for generation with as little modification as possible:**

- ICAP is power capacity; UCAP ultimately determined by forced outage rates.
- Storage Units must offer into the DA energy market.
- Units that run out of energy take a forced outage.
- EFORd and EFORp calculated as for generation.
- One hour test required during both winter and summer seasons unless capacity can be demonstrated from operational data.

# Day Ahead Must Offer

- Storage units are required to have cost-based energy offer in the day ahead market.
- Costs shall account for energy purchases, storage efficiency, and opportunity cost of not participating in regulation market.
  - Many storage devices are primarily regulation machines
  - Optimal solution is probably to relax DA requirement and let balancing co-optimization sort it out, but this is not consistent with the requirements for other resources.
- To the extent possible, DA commitments should recognize unit parameters to avoid unnecessary balancing; hours not scheduled due to parameters still count as forced outages.



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# Forced Outages and EFOR rates

- Storage units will take a forced outage whenever unable to deliver energy.
- Units that are able to deliver less than their ICAP commitment for an hour take a partial outage. (e.g., 4MW ICAP unit with 3MWh charge is on a 25% outage)
- Consistent with M18, forced outages contribute to EFORp during “outage hours when needed” (M18, p113)
- For EFOR purposes, storage units will be considered in service when they are providing regulation or available but not dispatched.



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# Example

1MW ICAP battery with 3MWh charge and $50/MWh cost-based offer. Unit charges at 500kw whenever RT LMP is less than $40.00. (Parameters chosen for simplicity, not as an example of an actual battery)

| | HE7 | HE8 | HE9 | HE10 | HE11 | HE12 |
|---|---|---|---|---|---|---|
| DA LMP | $56.26 | $56.77 | $53.62 | $49.13 | $41.16 | $37.84 |
| RT LMP | $35.33 | $38.29 | $44.97 | $97.67 | $36.18 | $37.76 |
| Committed | DA | DA | DA | RT | no | no |
| Charge at start of hour | 3 MWh | 2 MWh | 1 MWh | 0 MWh | 0 MWh | 500 kWH |
| Forced out? | No | No | No | Yes | Yes | Partial |
| Needed? | Yes | Yes | Yes | Yes | No | No |

# Immature Units

- Before a unit has established EFOR rates, it shall use class averages.
- Before PJM has established class average EFOR rates, PJM shall estimate capacity value based on the increase in load carrying capacity by deploying the unit's ICAP on half of its capable hours at the peak of each day.
  - E.g.: 12MWh, 2MW battery starts with a UCAP equal to the benefit of adding 2MW during the peak 3 hours (half of 12MWH/2MW) of each day.
  - Justification is that batteries that provide frequency regulation will on average be 50% charged.



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# Settlements

Storage units would be subject to:

- Peak-Hour Period Availability Charge
- Capacity Resource Deficiency Charge
- Generation Resource Rating Test Failure Charge
- Peak Season Maintenance Compliance Penalty Charge
- Emergency Procedures Charges



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# Thank You

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