

# ERPIV: DASR Market Changes

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| #  | Design Components <sup>1</sup>                   | PJM Solution   |
|--|--|--|
| <b>Incorporating More Operator Actions in Energy/Reserve Pricing (Long Term)</b> |  |  |
| 1  | Trigger  | Hot Weather Alert, Cold Weather Alert, Max Emerg Gen Alert, Weather / Environmental Emergency, Sabotage / Terrorism Emergency<br>AND/OR<br>We've scheduled at least an additional .5% of forecasted peak load outside of the DA/RAC run based on the eco mins of the scheduled units |
| <b>DASR Market Changes</b>   |  |  |
| 2  | Clear based on Emerg Max or Eco Max of resources | currently uses Emergency Max, change market to clear using Eco Max   |
| 3  | Eligible capability from offline units           | $\min[\text{EcoMax}, \text{EcoMin} + ((30 - (\text{Startup} + \text{NotificationTime})) * \text{DA Default RampRate})]$  |
| 4  | Locations  | RTO only, leave flexibility in manual / tariff language to implement a reserve sub-zone if needed  |
| 5  | Increase DASR Req by:                            | sum of (eco min + DA Default RR*30) of units scheduled outside DA market and RAC run capped at eco max   |
| 6  | On/Off Peak Differentiation                      | No - same all 24 hours   |

- DA cleared demand ~ 85-90% of RT load on most days
  - On a peak load day this can be > 15,000 MW
- On most days this is not a problem
  - At lower loads, PJM can cover the difference in load with resources that can be committed intraday (i.e. CTs)
    - Roughly 25,000-35,000 MW in this bucket
- When a significant amount of these resources are scheduled in the DAM to meet cleared DA demand it becomes problematic

## Conditions:

- RT Load Forecast: 155,000 MW
- RT Primary Reserve Requirement: 2,000 MW
  - **Total RT Needed Resources: 157,000 MW**
    - Assumes no load forecast error or unit failures
- DA Cleared Demand: 135,000 MW
- DASR Requirement: 9,700 MW
  - **Total DA Scheduled Resources: 144,700 MW**

*RT Resources Needed – DA Resources Scheduled = 12,300 MW*

*Intraday Resource = resource that can be brought online during the operating day (i.e., CTs, diesels, CCs, etc.)*

Total DA Scheduled Resources: 144,700 MW  
Total RT Needed Resources: 157,000 MW

- If PJM schedules a significant amount of “intraday” resources in the DA market (DAM) to meet the DA cleared demand + DASR, such that the remaining amount of intraday resources is less than the difference between RT and DA resource needs (12,300 MW)...
  - Absent the commitment of long lead time steam resources that will run during the operating day, we will be short on resources to meet real time operating requirements (assuming forecasts were good)

- Scheduling resources outside the DAM needs to be done to ensure reliability but is only done when needed
- Under current rules it can have adverse market impacts
  - Diverges DA and RT pricing because resources operating and thus setting price are different
  - If not committed in DA, in RT they will displace resources scheduled in the DAM creating CT LOC

*How do we avoid these impacts?*

- DASR Requirement:
  - Increased on “peak” days based on the historic difference between DA cleared demand and actual load in the past 7 days
  - Need to determine whether or not this should be done all 24 hours
- Resource Commitment:
  - Commit resources scheduled for the next operating day in the DAM based on the schedule dictated by PJM operations
    - Daily checkpoint at 10am to decide which long lead time units are still needed



## Conditions:

- DA Cleared Demand: 145,000 MW
- **DASR Requirement: 9,700 MW + 10,000 MW = 19,700 MW**
  - Total DA Scheduled Resources: 164,700 MW
- RT Load Forecast: 155,000 MW
- RT Primary Reserve Requirement: 2,000 MW
  - Total RT Needed Resources: 157,000 MW
    - Assumes no load forecast error or unit failures

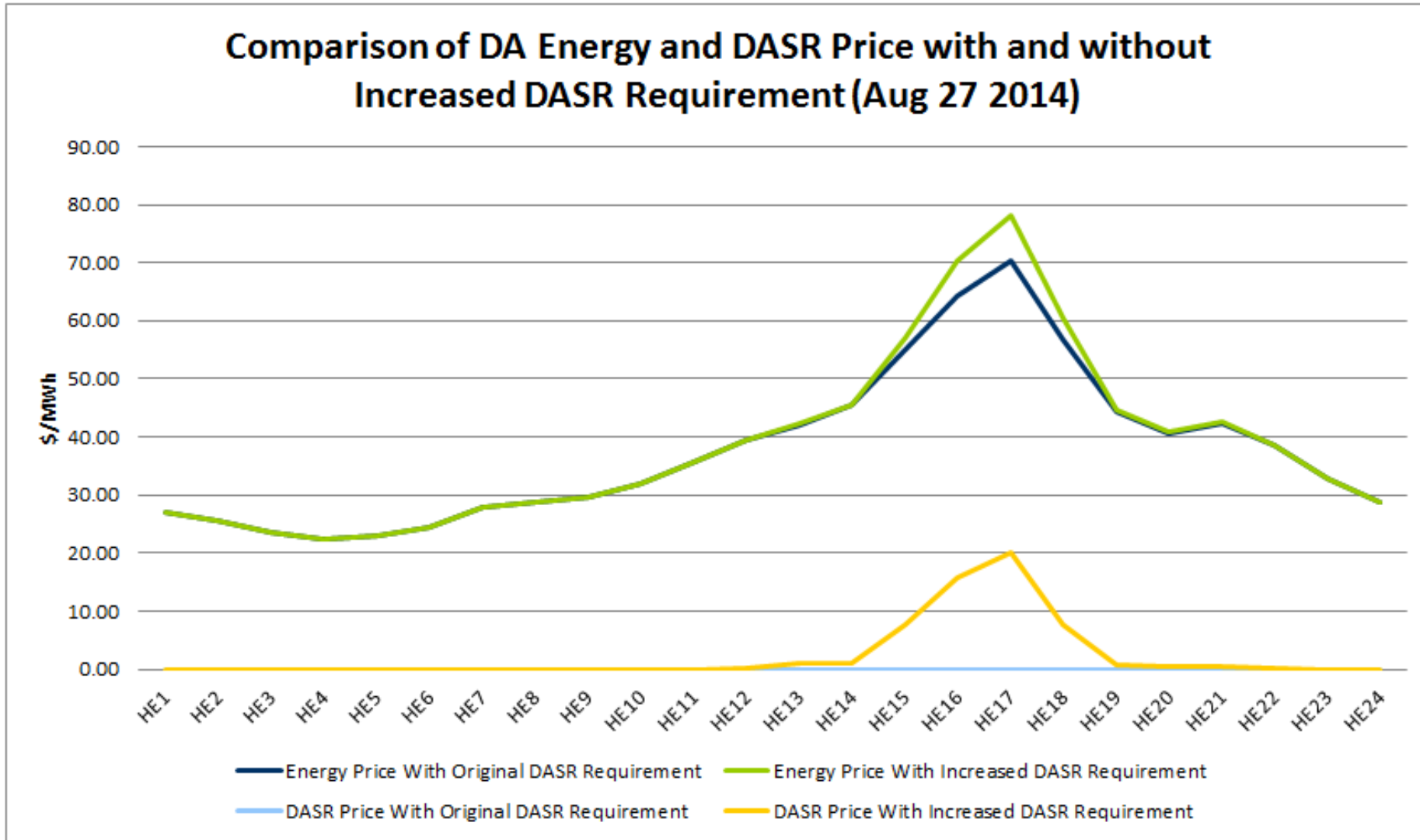


## Methodology for Day-Ahead Case Rerun with Increased DASR Requirement for August 27, 2014

- Increased DASR Requirement from 7,617.3 MW to 12,677.95 MW
- No Extra Unit Commitment changes were needed
- No Steam units were committed outside of DA Market

- Original DASR Requirement on August 27<sup>th</sup> = 7617.3 MW
- Additional DASR requirement will be based on exponential weighting of the difference between DA Load forecast and net Cleared DA Load for the hour when RT peak load observed for previous seven days.

|        | DA load Forecast | Net DA Load | Diff   | Weighting | Additional DASR requirement |
|--------|------------------|-------------|--------|-----------|-----------------------------|
| 26-Aug | 131160           | 123819.4    | 7340.6 | 0.3       | 2202.18                     |
| 25-Aug | 127506           | 122440      | 5066   | 0.25      | 1266.5                      |
| 24-Aug | 108207           | 105468.6    | 2738.4 | 0.2       | 547.68                      |
| 23-Aug | 106678           | 103670.5    | 3007.5 | 0.1       | 300.75                      |
| 22-Aug | 126642           | 120865      | 5777   | 0.075     | 433.275                     |
| 21-Aug | 126910           | 122405.8    | 4504.2 | 0.05      | 225.21                      |
| 20-Aug | 126063           | 122660.7    | 3402.3 | 0.025     | 85.0575                     |
|        |                  |             |        |           | 5060.6525                   |

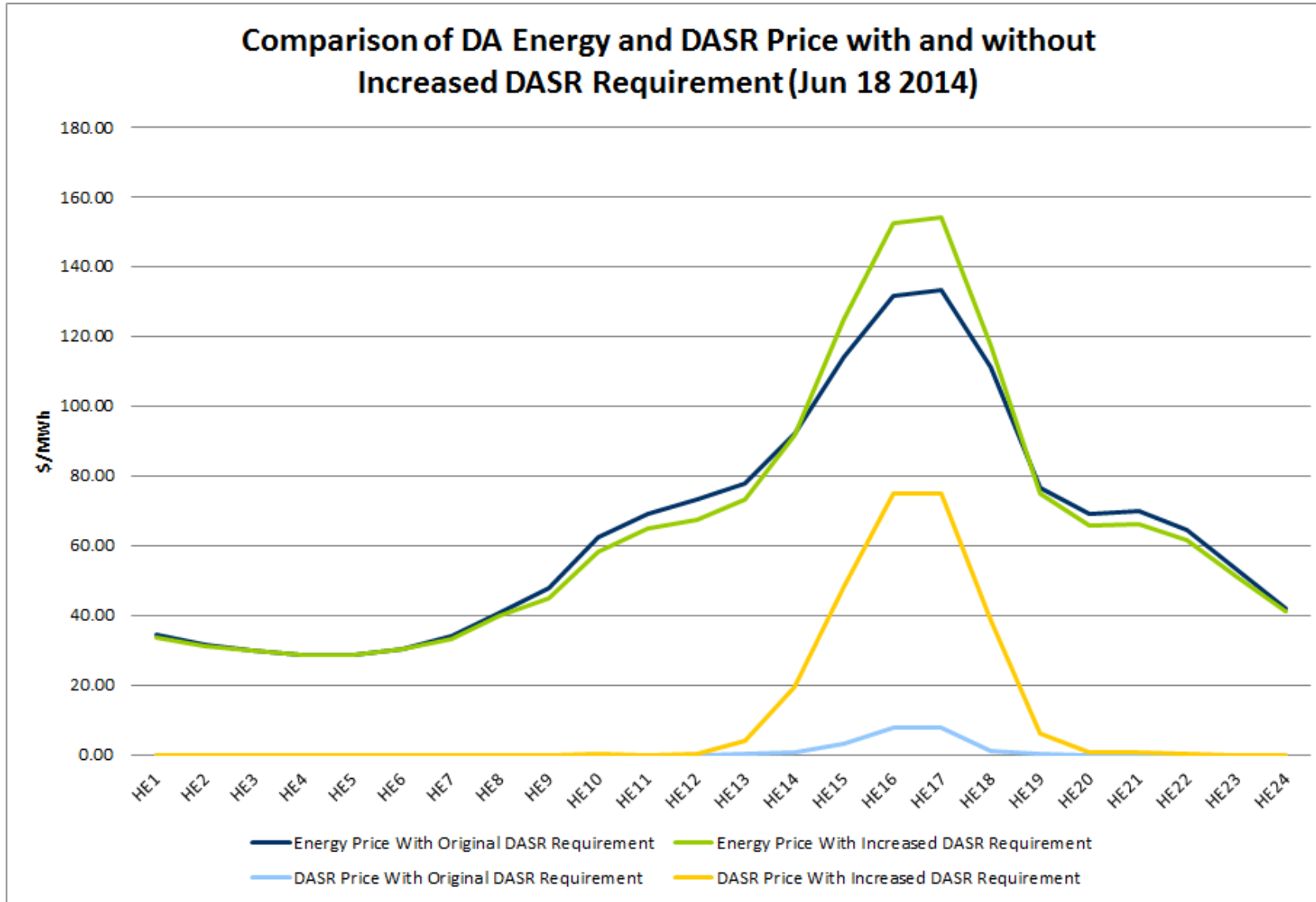


## Methodology for Day-Ahead Case Rerun with Increased DASR for June 18, 2014

- Increased DASR Requirement from 8504.8 MW to 12,123.8 MW
- Four Steam units were committed outside of DA Market
- DA Rerun with Increased DASR Requirement also included the four steam units which were committed outside of DA Market

- Original DASR Requirement on June 18<sup>th</sup> = 8,504.8 MW
- Additional DASR requirement will be based on exponential weighting of the difference between DA Load forecast and net Cleared DA Load for the hour when RT peak load observed for previous seven days.

|        | DA load Forecast | Net DA Load | Diff    | Weighting | Additional DASR requirement |
|--------|------------------|-------------|---------|-----------|-----------------------------|
| 17-Jun | 143113           | 133601.8    | 9511.2  | 0.3       | 2853.36                     |
| 16-Jun | 121914           | 118975.6    | 2938.4  | 0.25      | 734.6                       |
| 15-Jun | 96095            | 96302.6     | -207.6  | 0.2       | -41.52                      |
| 14-Jun | 90398            | 91913.2     | -1515.2 | 0.1       | -151.52                     |
| 13-Jun | 106275           | 104745.1    | 1529.9  | 0.075     | 114.7425                    |
| 12-Jun | 108091           | 106779.7    | 1311.3  | 0.05      | 65.565                      |
| 11-Jun | 111805           | 110054.2    | 1750.8  | 0.025     | 43.77                       |
|        |                  |             |         |           | 3618.9975                   |



- Increasing the DASR requirement by the expected difference in load ensures that we schedule enough capacity to meet RT Load while also scheduling enough reserves to meet the average LFE and FOR and our normal 10-minute reserve requirements
  - Currently LFE and FOR make-up the 6.27% DASR requirement
- If resources scheduled outside the DAM are not committed in the DAM clearing, there is still a mismatch between DA and RT in the resources meeting system needs and consequently those setting market clearing prices.
  - This is equivalent to not capturing operator actions in LMP – just the DA LMP.



- Should the DASR requirement be adjusted hourly?
  - Most complicated but also the most reasonable
- Inclusion of Pre-Emergency DR
  - Do they need to submit DASR offers?
  - If they are not modeled in the energy market systems how would they be compensated?
  - Could it just offset the requirement with no settlement?