

Following Dispatch Metrics Education

MIC

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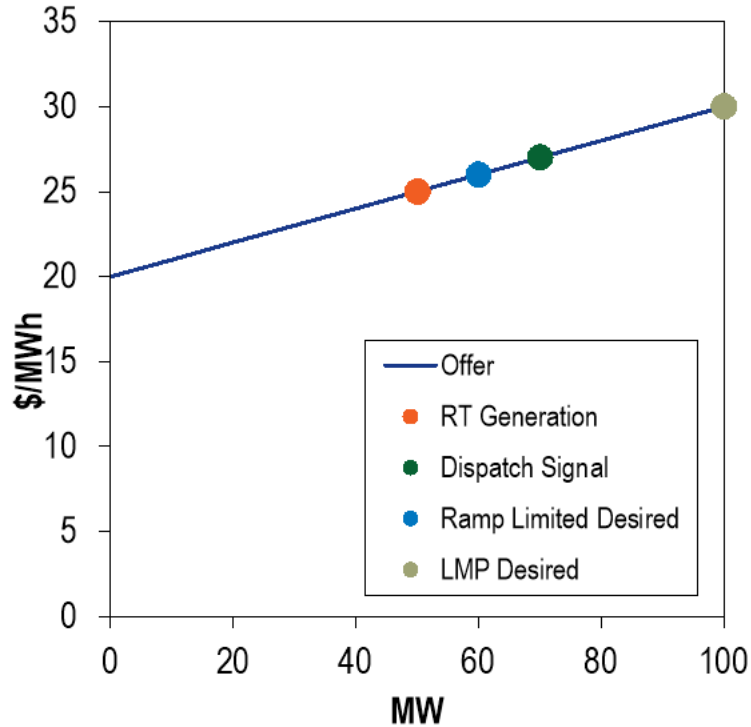
Monitoring Analytics

Status Quo

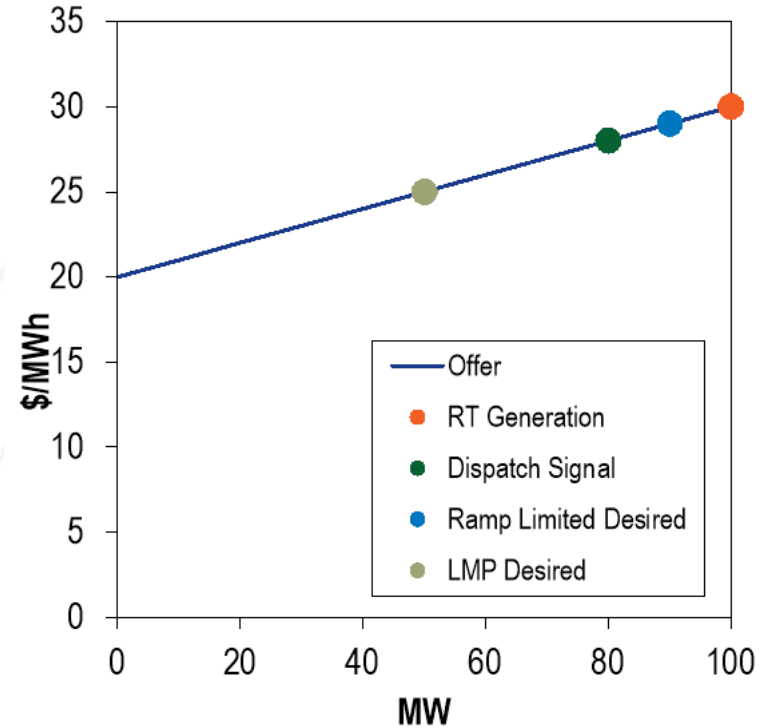
- **Currently PJM calculates how well a unit follows dispatch using three metrics: Dispatch Signal, Ramp Limited Desired and LMP Desired.**
- **The Dispatch Signal, also known as Basepoint, is the MW value calculated by RT SCED and sent to generators.**
- **The Ramp Limited Desired is the MW value that the unit should have achieved between Dispatch Signals.**
- **The LMP Desired is the MW level on the incremental offer curve where the Dispatch Run LMP intersects the offer curve.**

Status Quo

Unit Ramping Up



Unit Ramping Down



Status Quo Issues

- **These three metrics are calculated individually for each interval. These metrics are useful to determine how well a unit followed in each interval, but they are not useful to measure how well a unit followed consecutive instructions.**
- **The Dispatch Signal and the Ramp Limited Desired are based on the SE MW. When a unit does not follow dispatch, the Dispatch Signal and the Ramp Limited Desired do not reflect where the unit should have been.**
- **The LMP Desired is not ramp limited. For units with slow ramp rates, this value does not measure how well the unit could have moved in response to consecutive signals if the unit had followed its ramp rate.**

Following Dispatch

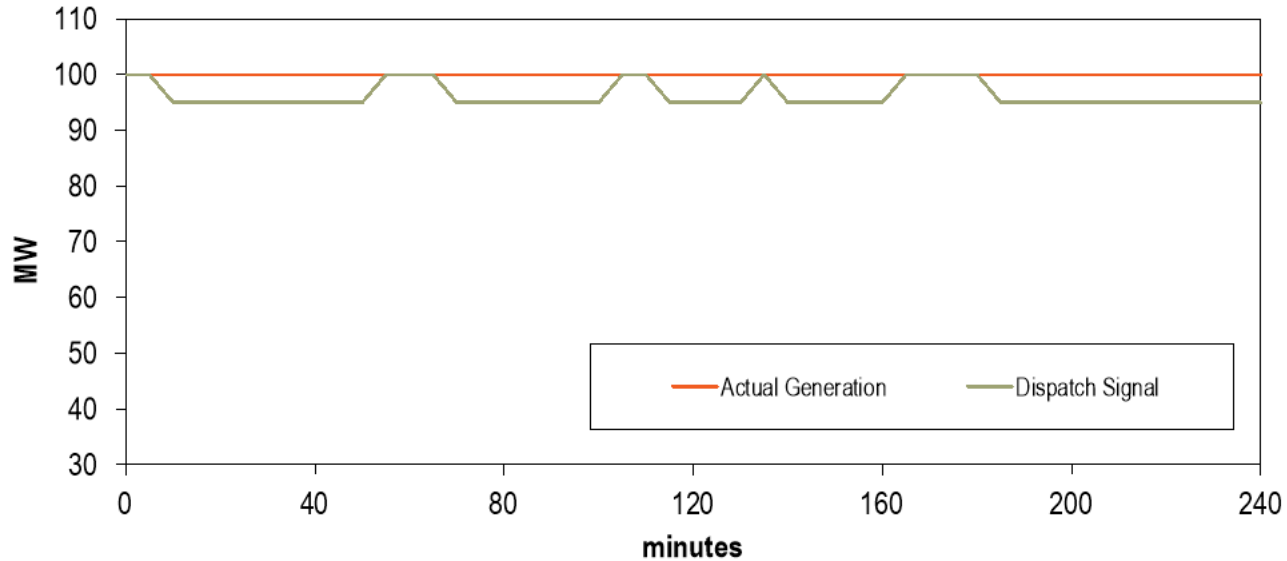
- **Following dispatch can be measured at each individual interval, like it is currently done but it can also be measured during an entire commitment.**
- **When measured at each individual interval, we can measure how well units follow as close to RT as possible (necessary for power balance).**
- **Following dispatch can be measured over a period of time incorporating consecutive instructions.**
- **When measured over a period of time, we can measure what units should have achieved if they had followed each dispatch signal, based on their ramp rates.**

Example

- **Eco Min: 50 MW**
- **Eco Max: 100 MW**
- **Ramp Rate: 1 MW/minute**
- **Unit Offer**
 - **Incremental: \$50/MWh**
 - **No Load: \$1,000/hour**
 - **Start: \$5,000/start**
- **Ramp Limited Desired MW is used as the Operating Reserve Desired MW for simplicity.**

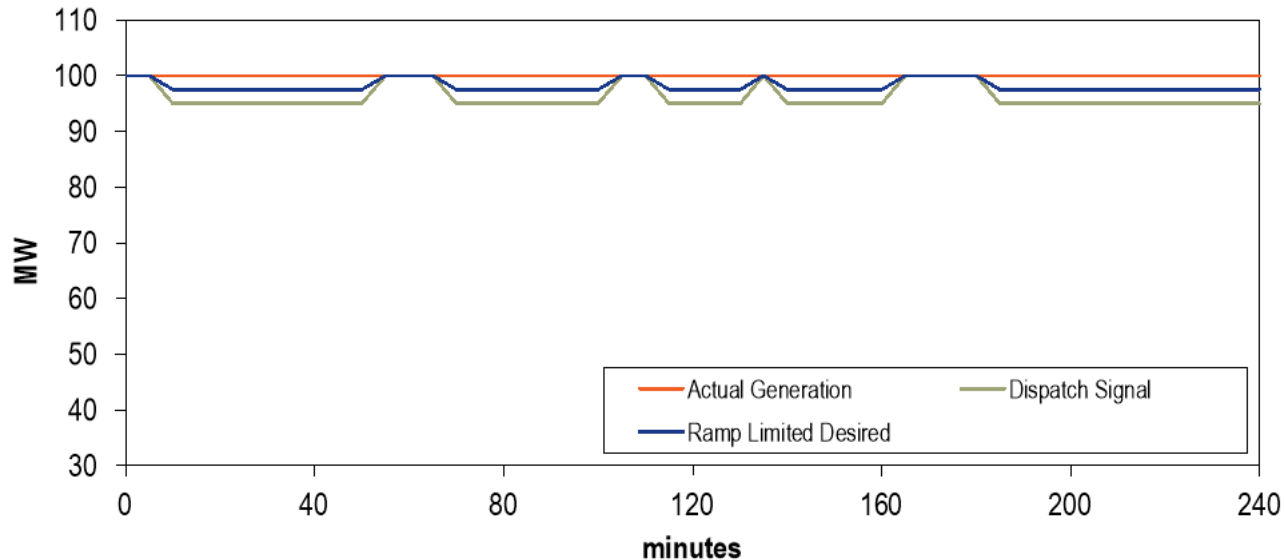
Example

- **Unit is dispatched down several times. Unit does not follow.**



Example

- **The Ramp Limited Desired MW (RLD) is not far from actual. Based on the RLD, the unit appears to follow because is always within the allowable thresholds.**

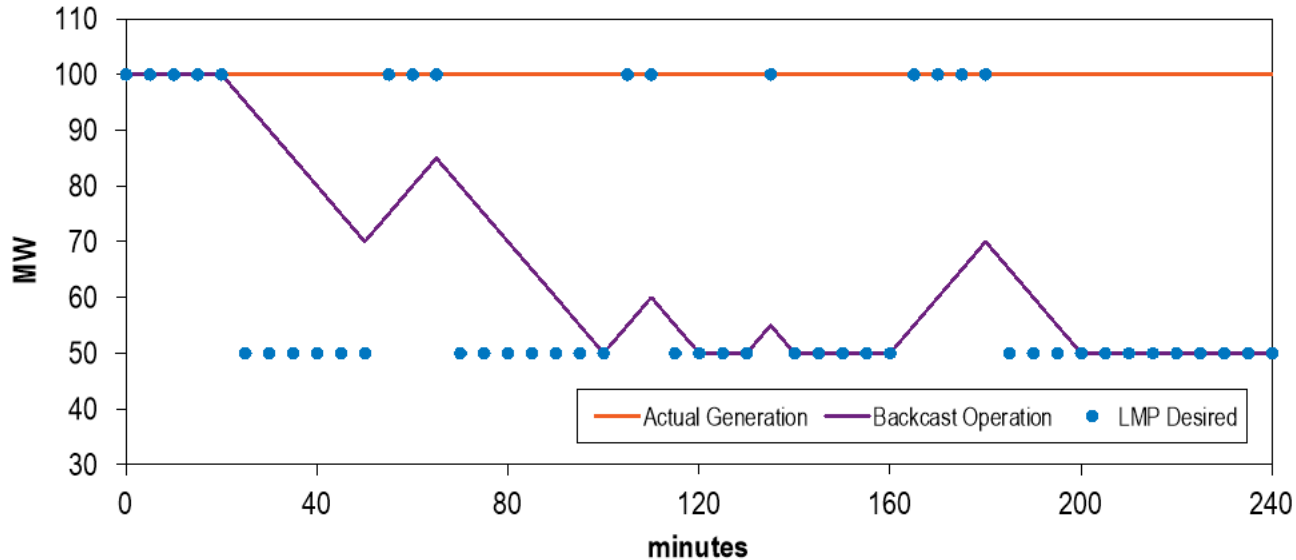


Financial Outcome – Status Quo

- **Energy produced: 408 MWh**
- **Cost: \$29,000**
- **Energy Revenues: \$17,591**
- **Uplift payment: \$11,409**
- **Deviations: 0 MWh**
- **The fact that the unit did not follow dispatch is not reflected in the BOR paid to the unit and it is not reflected in the BOR deviation charges.**

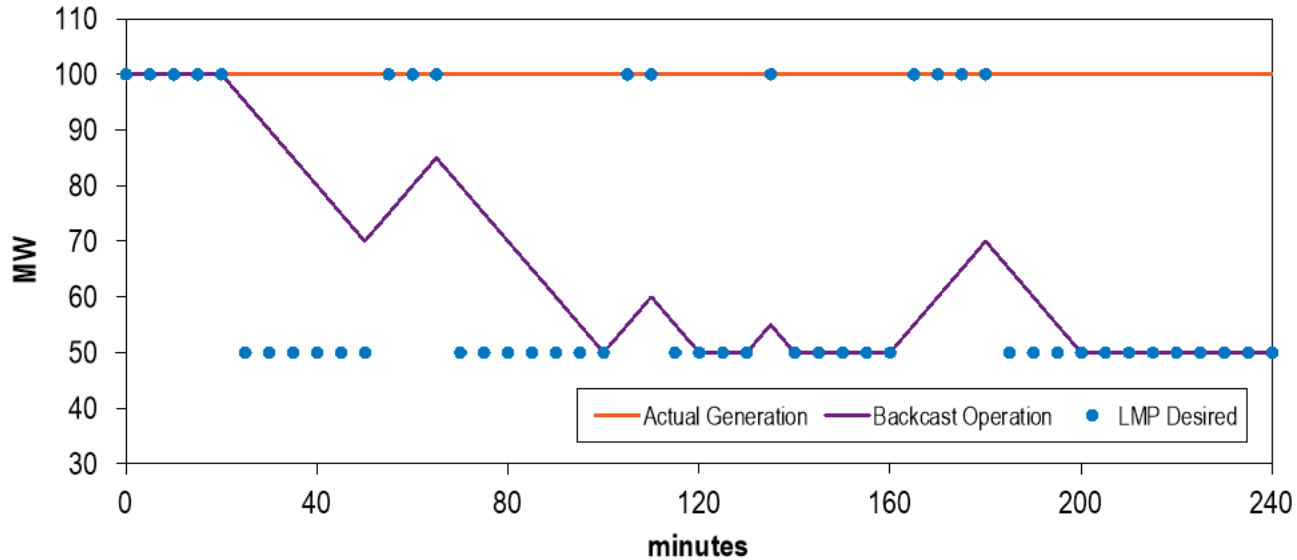
Backcast Operation

- What if the unit operated as requested?
- We can calculate the output the unit should have achieved if it followed the dispatch instructions.



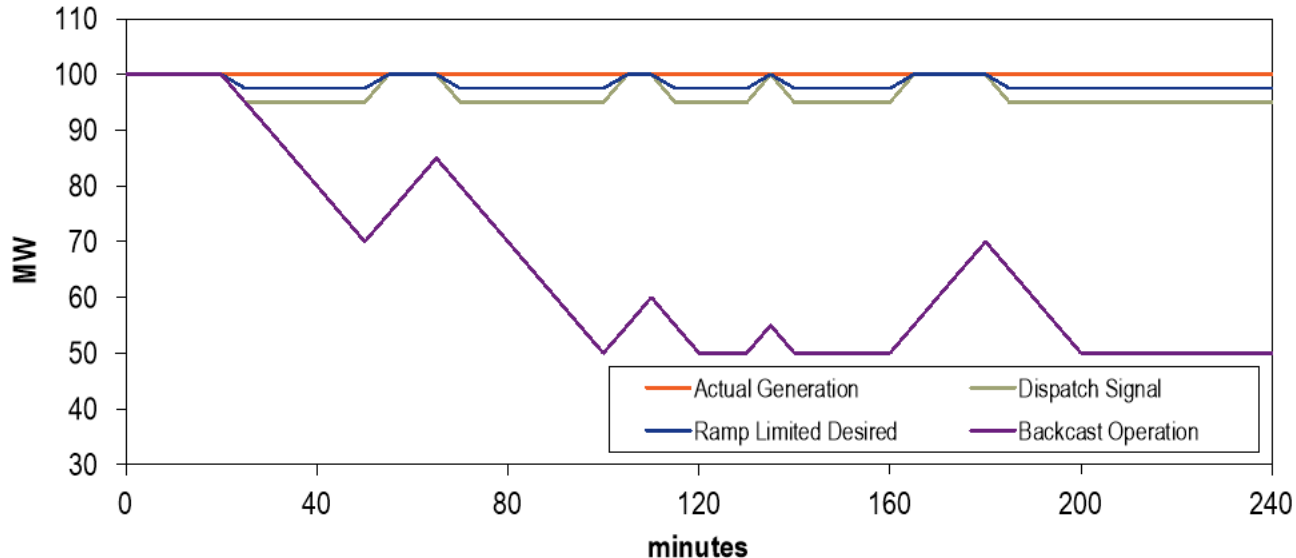
Backcast Operation

- The LMP Desired shows the desired output ignoring the ramp rate limitation.
- The backcast operation shows the desired output accounting for ramp rates (similar to the Dispatch Signal and the Ramp Limited Desired).



Backcast Operation

- The difference between the backcast operation and the Dispatch Signal or the Ramp Limited Desired is that it accounts for the previous instructions over multiple intervals.



Financial Outcome – Backcast

- **Compared to the backcast:**
 - **The unit received more uplift (\$2,409 more). Other participants cover that in the form of uplift charges.**
 - **The unit produced more energy (142 MWh more). Other resources have to be reduced to accommodate for the undesired energy.**

| ID | Component | Actual Operation | Backcast Operation | Difference |
|-----------------|------------------|------------------|--------------------|------------|
| A | Incremental Cost | \$20,000 | \$12,896 | \$7,104 |
| B | No Load Cost | \$4,000 | \$4,000 | \$0 |
| C | Start Cost | \$5,000 | \$5,000 | \$0 |
| D = (A + B + C) | Total Cost | \$29,000 | \$21,896 | \$7,104 |
| E | Energy Revenues | \$17,591 | \$12,896 | \$4,695 |
| F = D - E | Uplift | \$11,409 | \$9,000 | \$2,409 |
| | | | | 0 |
| | Generation | 408 | 266 | 142 |

Conclusion

- **Because the unit did not follow:**
 - **System production cost is increased because additional (not requested) MWh replaced cheaper MWh.**
 - **Uplift payment is increased because more noneconomic MWh had to be made whole when LMP is below offer.**
- **In this scenario, the current rules do not reduce uplift to incent the correct behavior (following dispatch).**

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