

Tracking Ramp Limited Desired

MIC

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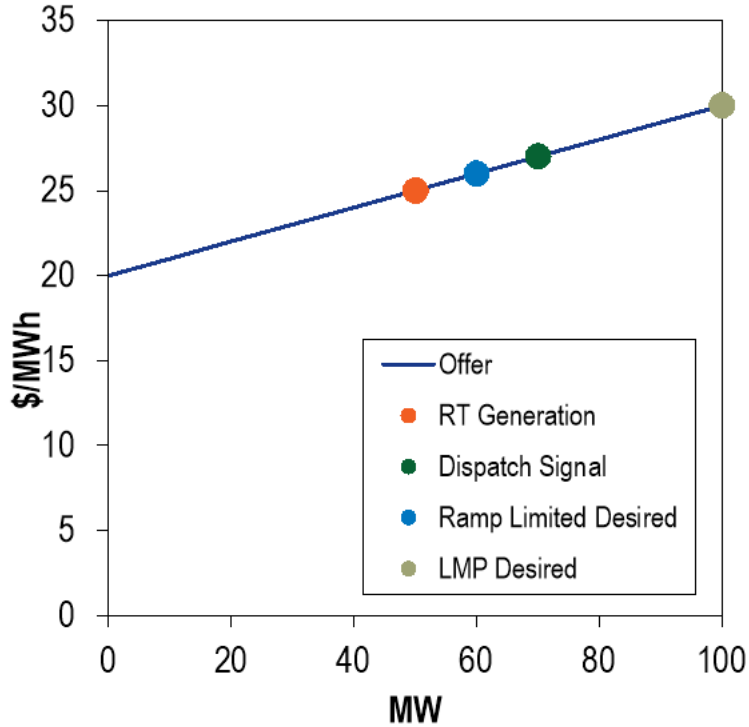
Monitoring Analytics

Status Quo

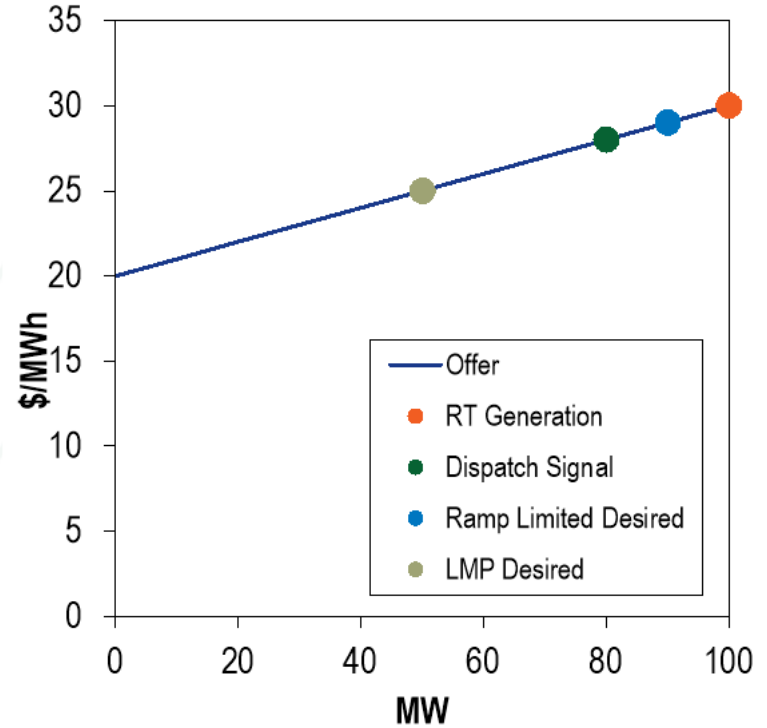
- **Currently PJM calculates how well a unit follows dispatch using three metrics: Dispatch Signal, Ramp Limited Desired and LMP Desired.**
- **The Dispatch Signal, also known as Basepoint, is the MW value calculated by RT SCED and sent to generators.**
- **The Ramp Limited Desired is the MW value that 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, as 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 dispatch 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.**

Tracking Ramp Limited Desired

- **PJM and the IMM jointly propose implementing a new metric: Tracking Ramp Limit Desired (TRLD) MW**
- **The TRLD MW proposed solution would replace all desired MW values in the calculation of operating reserve credits**
 - **Simplifies the calculation**
 - **More accurately measures how closely a resource is following dispatch over a period of time than the status quo**
 - **Acknowledges ramping limitations better than the LMP Desired MW value that is currently used when resources are significantly deviating**

Tracking Ramp Limited Desired

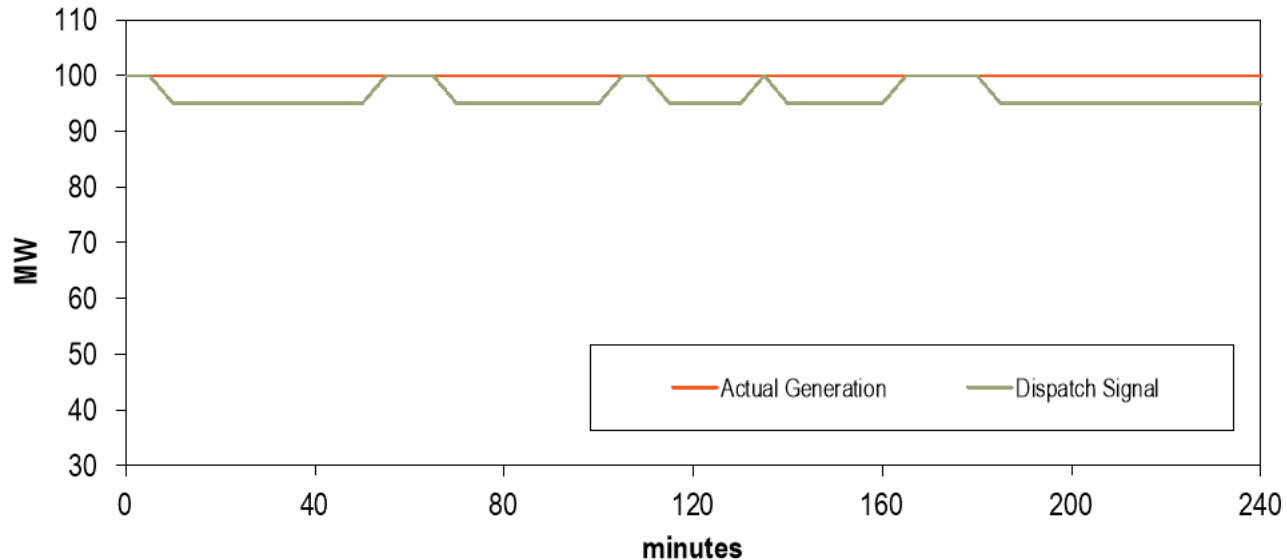
- **The Tracking Ramp Limited Desired MW is:**
 - $D_t = D_{t-1} +/- Ramp_t$
- **Where:**
 - **D = Tracking Ramp Limited Desired MW**
 - **t = Calculation interval. When t-1 = 0, D = Actual Output.**
 - ***Ramp* = Increase/decrease in output based on market conditions. The ramp will be calculated using the dispatch LMPs solved in every RTSCED case and the ramp rates submitted by the units.**

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**
- **In the example, Ramp Limited Desired MW is used as the Operating Reserve Desired MW for simplicity.**

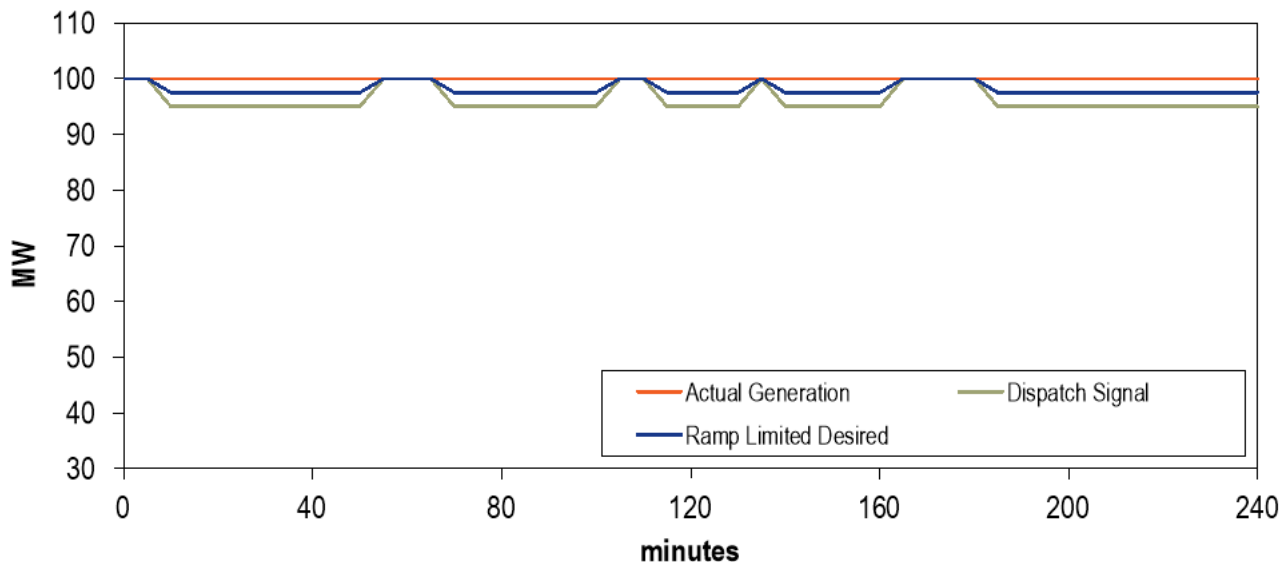
Example

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



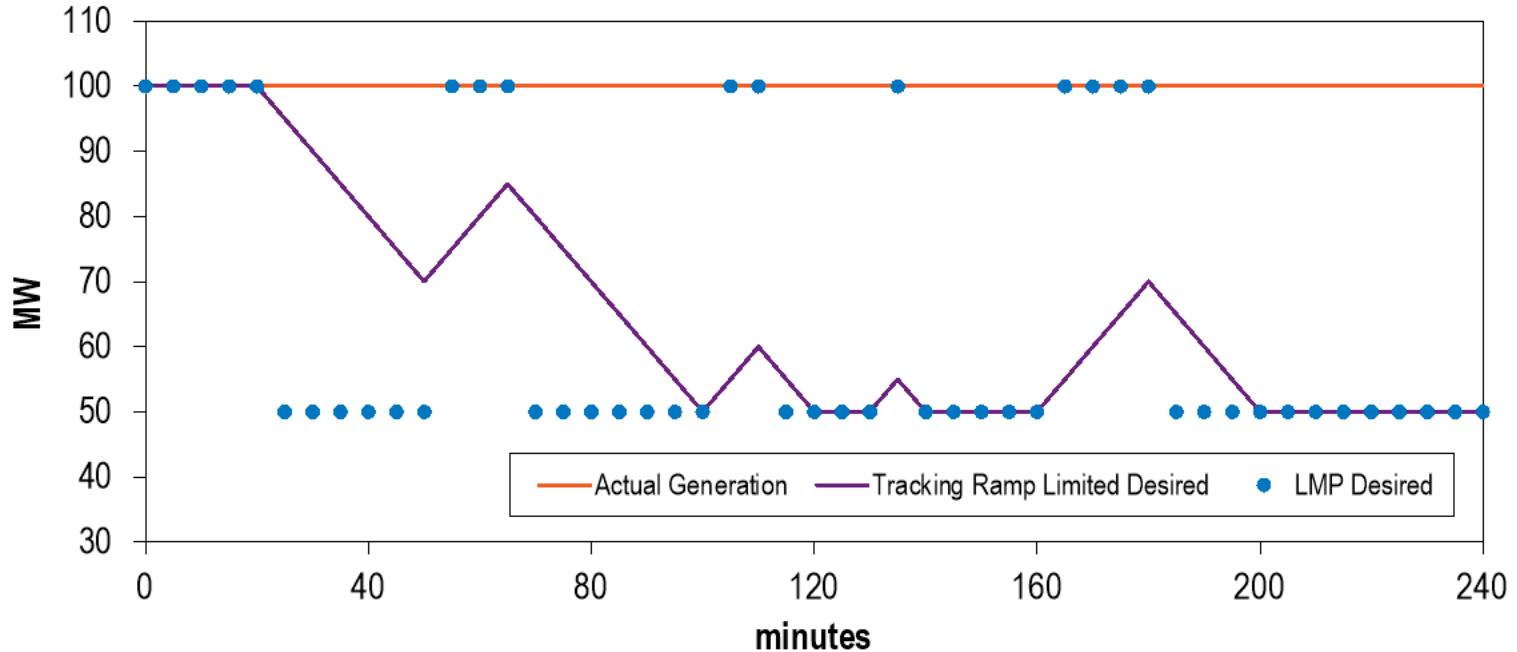
Example

- **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.**



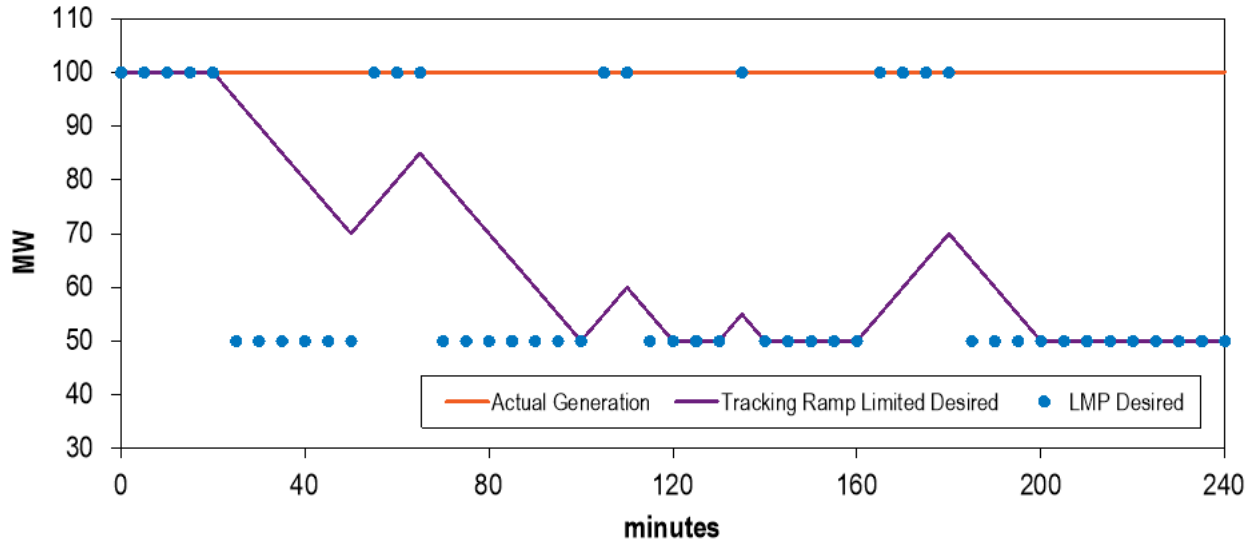
Example

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



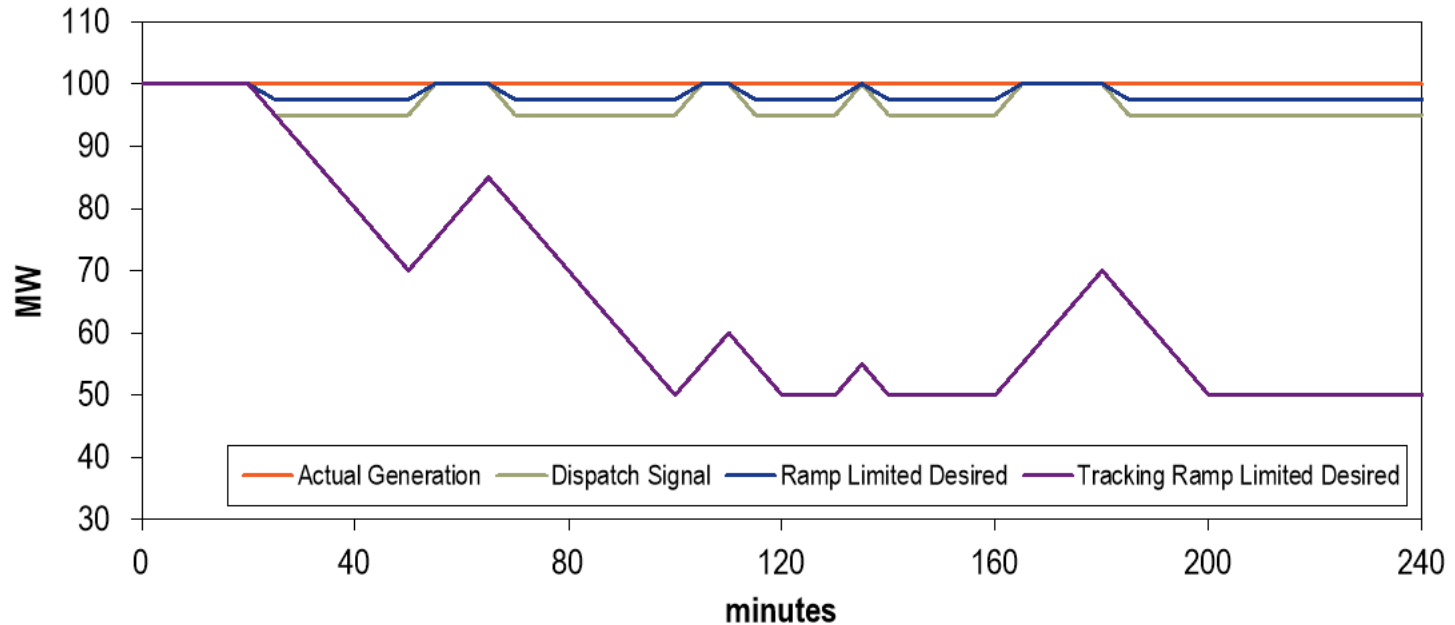
Example

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



Example

- The difference between tracking ramp limited desired and the Dispatch Signal or the Ramp Limited Desired is that it accounts for the previous instructions over multiple intervals.



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