

Creating additional Intra-day Real-time RAC commitments

Gabel Associates on behalf of Red Oak Power, LLC; Rockland Capital and J-Power

Electric Gas Coordination Senior Task Force

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Electric-Gas Coordination

Ignoring the fundamental difference in timing between the Electric Day and Gas Day creates commitment issues

Electric Gas Coordination Senior Task Force

- The Electric Gas Coordination Senior Task Force Issue Charge acknowledges the timing difference and requested the following areas of focus:
 1. Account for natural gas transportation, gas procurement, and oil reserves in its economic dispatch signal and reserve calculations, as necessary.
 2. Enhance the dispatch rules and energy offers for dual fuel generation resources with alternative fuel (e.g. oil, LNG) back-up under extreme weather events and constrained pipelines, as necessary.
 3. Develop PJM market rules that can address challenges of procuring gas over non-peak hours, weekends and holidays, as necessary.
 4. Enhance emergency procedures and increase coordination between PJM and natural gas pipelines, as necessary.
 5. Develop any additional PJM market rules to address the natural gas and electric coordination, as necessary.
- Current PJM forecasting and commitment practices (DAM, RAC) only focus on next –day delivery with disregard to gas-day nomination cycle timeframes.
- Two fundamental changes are required to reduce this difference and commit resources adequately:
 1. Require all resources to maintain notification times and minimum run times that reflect any pipeline restrictions and require PJM to use those most current notification times and minimum run times.
 2. Implement new intra-day RT RAC runs automate the incorporation of these parameters and align with gas flow deadlines.

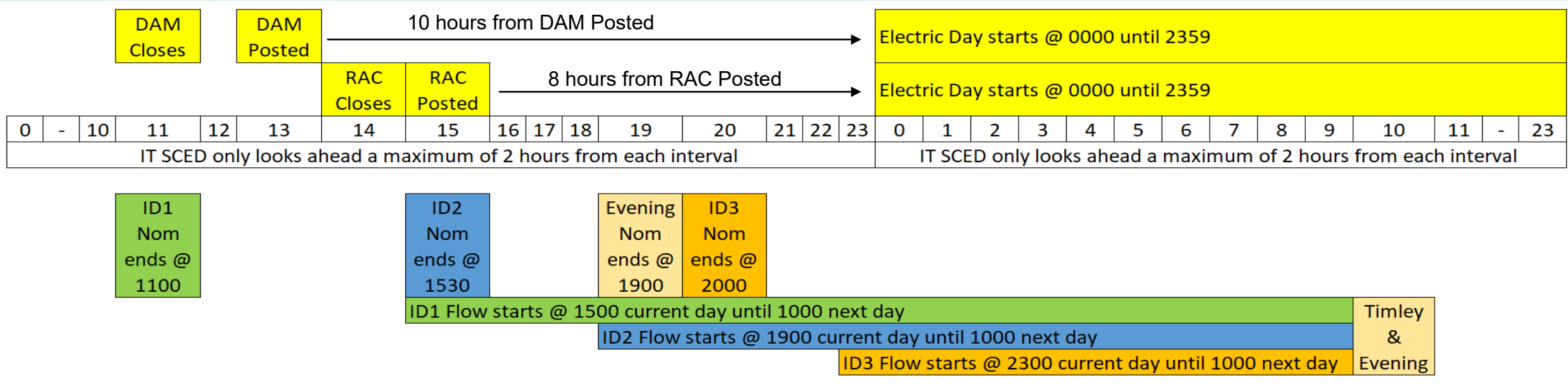


Inherent gap between Electric Day and Gas Day commitment and nomination timeframes

Lack of established intra-day SCED runs aligning with gas day timelines is fundamental root cause

Commitment Timing

- PJM's current commitment process is at least 10 hours (posting of DAM awards to next day) **or 2 hours (IT SCED) ahead of resources starting with nothing in-between and no alignment with the Gas Day.**
 - If PJM determines at 1600 a natural gas resource is needed at 1900, PJM missed the ID2 Nom (ends at 1530). The next gas flow does not start until 2300, at best, or 1000 the following day.
 - If PJM determines at 2100 a natural gas resource is needed at 0100 next day, PJM missed the ID3 Nom (ends at 2000). The next gas flow does not start until 1000 the following day. At this time, no other natural gas resources could obtain gas flow until 1000.
- There is no established process to commit resources intra-day more than 2 hours ahead of time. The RAC process allows for additional commitments but for the next delivery day. Use this similar concept intra-day for specific timeframes that align with the gas day nomination deadlines.



Ignoring the gas day nomination deadlines and the associated resource notification timeframes creates resource commitment issues and reliability concerns.



Reflecting Proper Resource Parameters during Ratable Take

Pipelines may impose restrictions that do not allow resources to meet approved parameters and Temporary Exceptions should be used

Utilize Current Temporary Exception Process

- Current Temporary Exception process allows for a resource to request different operating parameters than those already approved.
- Pipelines may place restrictions, therefore, causing natural gas fueled resources to follow specific operating levels (min. run time and notification time) due to ratable take requirements. These new data points should be followed by resources and used by PJM.
- Support 9/8/2023 Monitoring Analytic memo regarding use of Temporary Operating Parameters Limits for Winter 2023.
- However, it is unclear exactly how PJM uses these specific parameters in its commitment process and without established intra-day commitment timeframes aligning with the gas day nomination deadlines, the commitment discount will remain.
- Continue discussions on process efficiency and schedule update automation.

Hour Begin	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Hour End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Notification Time	15	14	13	12	11	10	9	8	7	6	9	8	7	6	9	8	7	6	5	20	19	18	17	16
Min Run Time	19										15			11			19							
Earliest on	1500										1900			2300			1500							
Run Until	Next Day 0959																			Day + 2 0959				



Real-time RAC Commitment

Add Intra-day commitment review for specific intra-day timeframes that account for notification and fuel procurement timeframes

Real-time RAC Commitment

- RT RAC runs are additional commitment periods for specific timeframes that align with the gas day nomination deadlines (following slide has details)
- RT RAC run foundation thinking:
 - Uses current resource's parameters, especially, Notification Time and Minimum Run Time
 - Expected that PJM will be able to complete each run within 1 hour from start - like running additional RAC runs
 - Each run has a specific timeframe that aligns with gas day nominations and time required to obtain gas to nominate flows
 - Resource parameters, like notification time and min run time, are locked down during each run – like DAM and RAC
 - Each run will adjust for load forecasting error and future weather conditions
 - Example: If original forecast was X and now saying it will be Y – adjust for the difference
 - Resources can update offer with each run – like DAM and RAC and in accordance with Fuel Cost Policy
 - Resource commitment MW levels are those that PJM expects resource to produce, instead of having resource a minimum
 - Committing in 1x1 mode to 'just have the resource online' vs. needing in 2x1 mode has the same limitations of not being able to procure fuel
- Phased-In Implementation
 - Start with Winter 2023 and Cold Weather Alert as the trigger to run the extra commitment timeframes
 - Conduct a stakeholder-PJM review in March 2024 to determine if any additional timing or commitment changes required
 - Not intended as stakeholder process but allow collaboration to ensure process is working as expected
 - If any changes required, apply to Hot Weather Alerts in Summer 2024
 - Conduct one more stakeholder-PJM review in September 2024 for final adjustments and implementation



RT RAC Daily Processing and Timing

Strategically placed RT RAC runs allows ample time prior to gas day deadlines while commitment resources intra-day

Processing and Timing

- Create four additional intra-day commitment periods (RT RAC).
 - RT RAC 1, 2 and 3: aligns with Intra-Day Gas Day Nominations that flow until 0959 next day
 - FW RAC: aligns with Evening Gas Day Nomination that start flow next 1000
- All resource commitments from each RT RAC are included in the next run (DAM, RAC) to avoid over commitment.
- Any resource fuel type may be committed.
- Treated as real-time physical commitments.
 - Seen as a dispatch from PJM – if PJM cancels commitment, then resource made whole for the entire commitment time
 - If unit trips, then a forced outage taken and no RT revenues or make whole obtained
 - Any associated uplift is assigned to deviations for both load that comes in higher in RT and generation that comes in lower in RT
- Example – RT RAC 1 (use next slide for visual):
 - Resource parameters are locked down at 0900
 - PJM starts the RT RAC 1 run at 0900, which will use current parameters and forecast will be updated
 - PJM will post or communicate resource commitments around 1000
 - If natural gas fueled resource, allows 60 minutes to procure fuel prior to gas day ID1 nomination deadline at 1100
 - RT RAC 1 commitment results will be incorporated into the DAM
 - Resources commitment in RT RAC 1 are expected to start no sooner than 1500 current day, following parameters



Stakeholder Matrix Inputs

Application of the additional RT RAC runs addresses the Issue Charge

Stakeholder Matrix

- Application of the additional RT RAC runs addresses most of the topic areas in situational awareness, financial and markets and operations
- Additional RT RAC runs acknowledges proper parameters, including offers, along with pipelines and operational restrictions

Topic	Design Component	Red Oak/Rockland/J-Power
Situational Awareness	Fuel inventory and alternate fuel capability	Status Quo Plus RT RAC
Situational Awareness	Pipeline, gas supply, dual fuel arrangements	Status Quo Plus RT RAC
Situational Awareness	Visibility of all fuel limitations	Status Quo Plus RT RAC
Financial	Cost adders	Status Quo
Financial	Recovery of cost of fuel disposal as a result of a canceled dispatch	Dominion Energy
Markets & Operations	Natural gas volume commitment	Dominion Energy Plus RT RAC
Markets & Operations	Dispatch instructions	RT RAC
Markets & Operations	Day ahead award model	
Markets & Operations	Training	Status Quo plus make training material public
Markets & Operations	N-1 reliability and emergency spin reserves	Address with Reserve PS/IC
Markets & Operations	Communication protocols for advance notice of fuel limitations.	Status Quo Plus RT RAC
Markets & Operations	CT firm commitment in day-ahead	