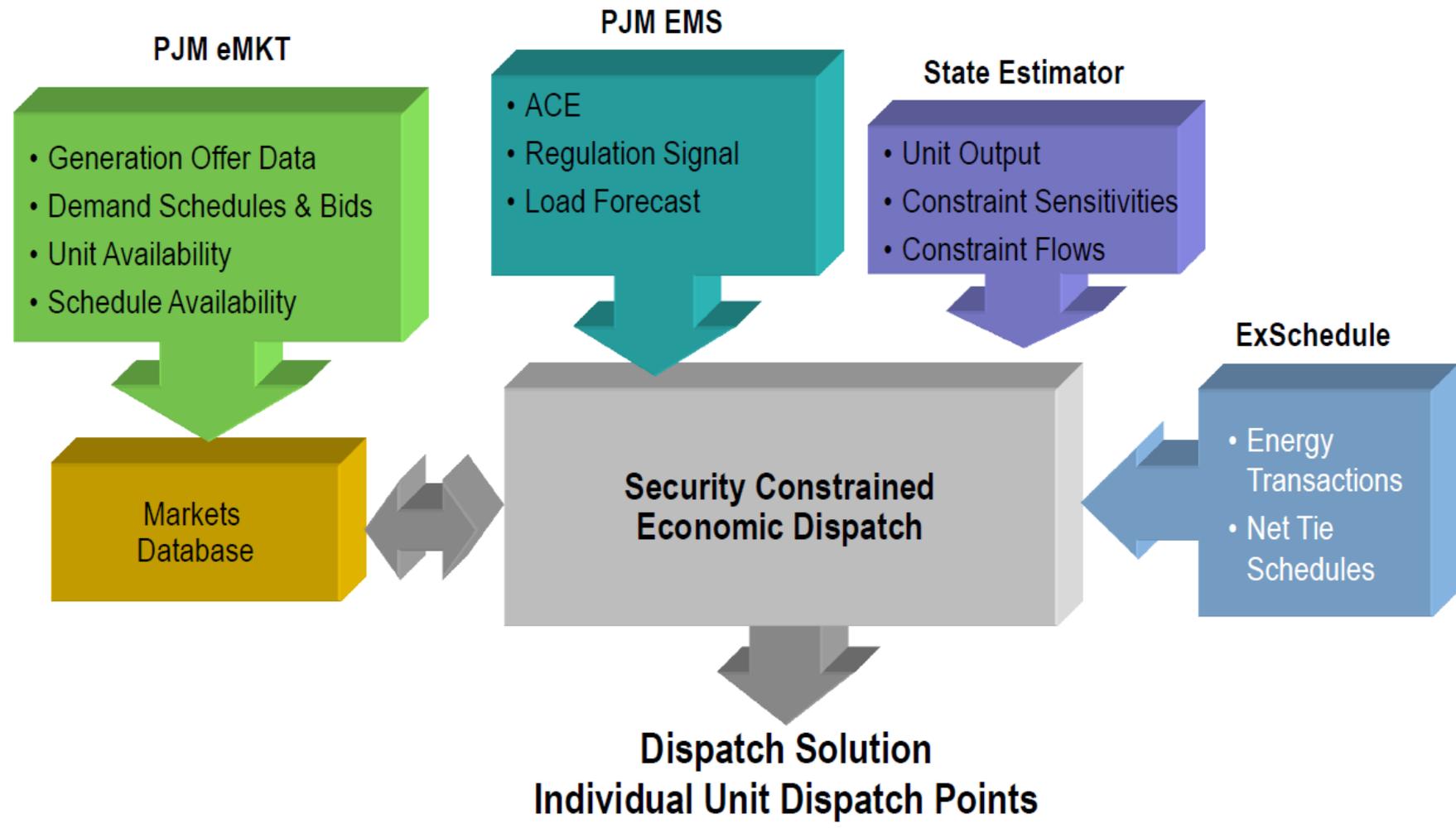


# Five Minute Dispatch and Pricing

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DA  
(24 hours  
prior)

RAC  
(~8 hours)

IT SCED  
(2 hours ahead)

ASO  
(1 hour ahead)

RT SCED  
(10 minutes  
ahead)

- RT SCED auto execution every 3 minutes for 10 minute look ahead interval, dispatch has the ability to kick off a case manually or ad-hoc
- Performance depends on variables. (Number of constraints active, units online)
- ~70 Seconds to solve a case (each RT case is 3 separate cases)
- ~20 seconds to render on the UEV display
- ~1.5- 2 minutes – Solved and render
- ~2.5 seconds to approve



# Inputs into RTSCED Engine and Frequency

Inputs Used	Description	Frequency
Bid Data	Latest Participant Bid data (eco-limits, hour offer curves)	1 Minute
EMS Data	Latest State Estimator run, Constraint specific Distribution Factors and Loss Penalty Factor	2 Minutes
Load Forecast	RT SCED uses Neural Net Load Forecast (VSTLF). It is a rolling 6 hours into the future and is updated every 5 minutes	5 Minutes
Reg/Spin	Current Regulation/Spin assignments	Available Each case execution
Interchange	Energy Schedules	5 Minutes
Load Bias	Bias utilization is based on actual load, actual interchange, and the actual performance/availability of generation resources	Ad hoc
Operator specific Inputs	Hydro Schedules, Constraint Control %,Marginal Value Limit Overrides	Ad hoc

Emergency Type	Impact
Spinning	Spinning as Condensers units are converted to energy automatically
Emergency DR	Emergency DR becomes Dispatchable
Max Emergency Online	RT SCED dispatch units up to their Emergency Max MW
Emergency Purchase	RT SCED recognizes the fixed emergency purchase quantity and allows it to set price
Voltage Reduction	Forces Shortage Pricing in specific area or region
Manual Load Dump	Forces Shortage Pricing in specific area or region

- Typically a Case is approved on average every 5 minutes
- Generally, Dispatchers verify if the outputs make sense (experience)
  - Anomalous high values or low values are typically red flags.
  - Review generation totals and binding constraints to determine appropriate generation is moving correctly
- Any data alarms identified
- Review any pricing that seems anomalous given system conditions
  - Pricing maybe the result of poor input data

- ICCP, Internet SCADA, Dispatch Lambda in MG are PJM's methodology for communication
- Generators receive PJM signals instantaneously, as fast as our telecom structure and protocol enables communication.
- The dispatch signal is based on look ahead value of 10 minutes into the future and the bid in parameters (including ramp rate)
  - Use of the Carrot in the “Carrot vs. Stick Analogy”; constantly leading generation