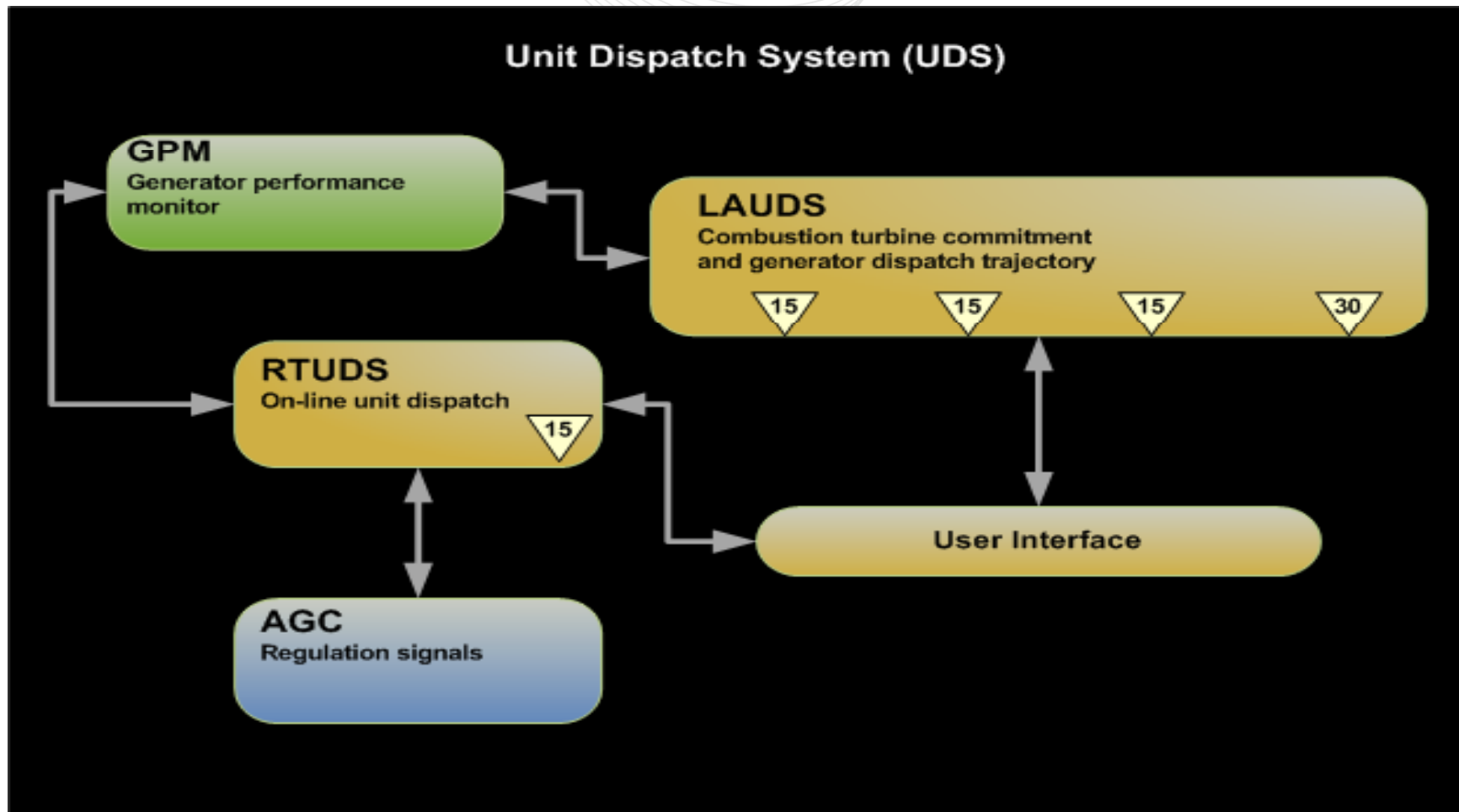




Generation Control Application (GCA) and Shortage Pricing

Operating Committee
March 16, 2010

- PJM's approach will :
 - Reduce dispatch volatility
 - Increase efficiency of reserve deployment
 - Account for regulation, synchronized reserve and primary reserve deployment directly in real-time dispatch
 - Reduce price volatility as reserve shortage approaches
 - Increase transparency of price formation as reserve shortage is encountered
 - Reduce uplift payments
 - Address concerns expressed regarding potential for 'transient' reserve shortage events



- Today there are 4 primary tools that are used to maintain both energy and reserve needs in real-time
 - SPREGO – Performs hour-ahead commitment and pricing for regulation and synchronized reserves
 - Look-ahead UDS (LAUDS) – Performs energy unit commitment and dispatch trajectory over a multi-interval look-ahead.
 - Respects A/S commitments by dispatching energy around them.
 - Real Time UDS (RTUDS) – Performs the incremental dispatch of energy using online dispatchable generators.
 - Respects A/S commitments by dispatching energy around them.
 - Generator Performance Monitor (GPM) – Estimates expected generator ramping performance based on recent history.
 - Exponential learning curve.

Generation Control Application (GCA)

AGM
realistic generator
response profiles

ACM
intelligent
constraint control

SCED-2
demand trajectory, generator loading strategy, CT commitment

SCED-3
final dispatch contour, pricing

Current Operating Plan (COP)
generator dispatch range & sequence solution

AGC
regulation signals



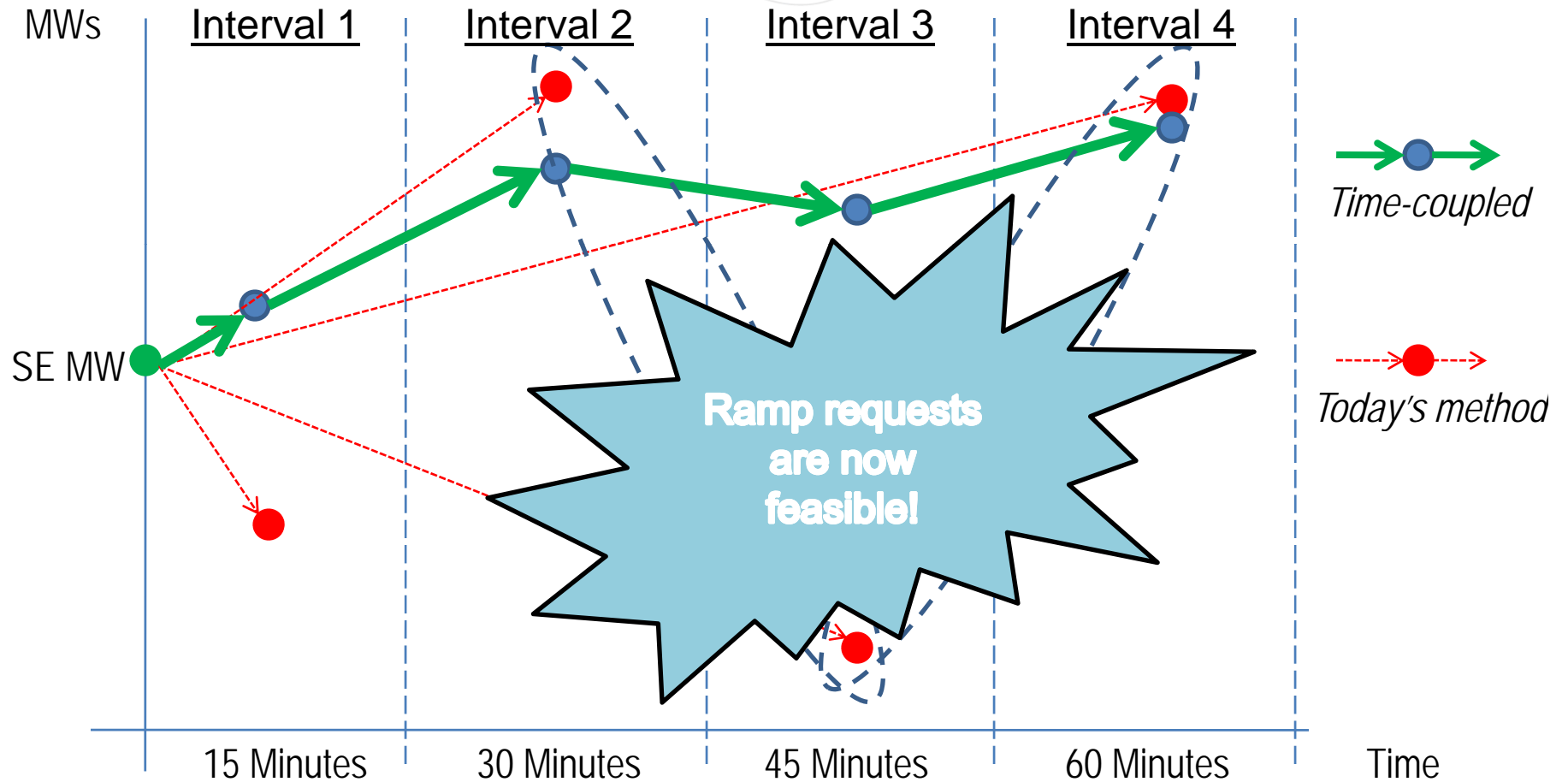
Generation Control Application (GCA)

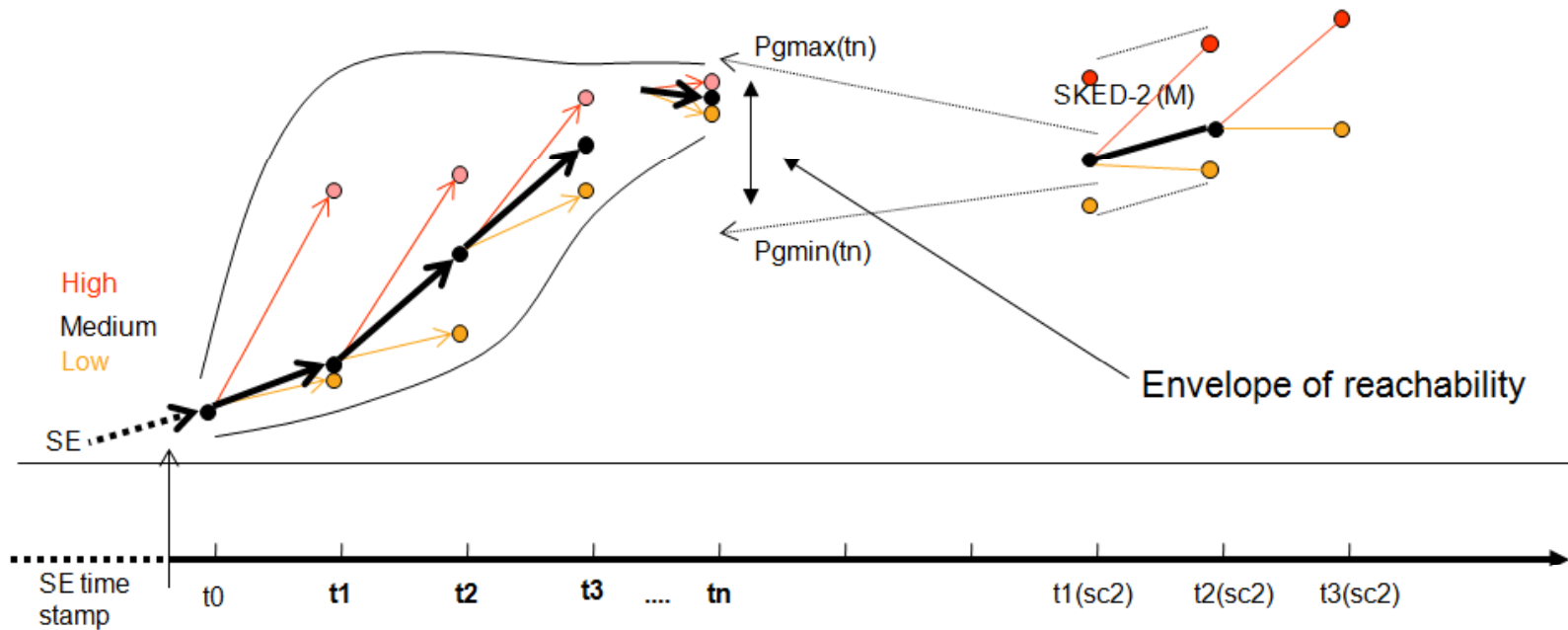
- **ASO** = Ancillary Services Optimizer (SPREGO replacement)
- **AGM** = Adaptive Generator Model
- **SCED 2 or IT SCED** = Intermediate Security Constrained Economic Dispatch
- **SCED 3 or RT SCED** = Real-Time Security Constrained Economic Dispatch
- **AGC** = Automatic Generator Control
 - This exists today and is not directly part of the GCA suite.

- The objective is to yield a time-coupled resource operating plan
 - Realistic generator characteristics and behavior
 - Intelligent transmission constraint control
 - Multi interval dispatch solution for unit commitment and dynamic contour projection for individual resource dispatch instructions
 - Jointly optimized reserve and energy solution
- Expected Benefits
 - Higher quality resource dispatch instructions
 - Increased situational awareness of operating trends
 - Reduction in operating margins

Intermediate SCED (1-2 Hour look-ahead)

- Security Constrained Economic Dispatch and Resource Commitment (MIP)
- Multi-interval, time-coupled solutions
 - Solves 4, 15-45 minute intervals over the look-ahead period
- Performs *joint optimization* of energy and reserves
- Performs incremental resource commitment for energy and reserves
- Calculates long-term dispatch trajectory
- Runs Three Pivotal Supplier Test
- **No results from the IT SCED are sent to market participants.**





- ▶ Coupling between SKED2 and SKED3 to ensure that SKED3 solution gets into the envelope of SKED2.

- Only the ASO and RT SCED will provide information to asset owners
 - ASO – Enhanced version of SPREGO. Makes hourly regulation and reserve commitments on select resources.
 - RT SCED – RT dispatch algorithm that will jointly optimize energy and reserves.
- Information from the IT SCED solutions are not directly sent to asset owners but do impact the RT SCED and ASO solutions

- Similar to SPREGO today, the ASO will publish the following to eMKT by 30-minutes prior to the operating hour
 - Regulation commitments for the next operating hour
 - Tier 2 reserve commitments on inflexible resources ONLY
 - A regional forecasted reserve position for each market
- The regional reserve position will be a result of the AS solution which will show the reserve requirements, amount assigned or self-scheduled, and the remaining available capacity
- The ASO will not calculate or post market clearing prices. They will be calculated simultaneously with energy every 5-minutes in real-time

- About every 5-minutes PJM will execute an RT SCED case that will potentially change energy basepoints and Tier 2 reserve commitments
- Currently PJM telemeters the energy basepoints from the RTUDS to asset owners
- PJM plans to replace the currently telemetered RTUDS basepoints with those coming from the new RT SCED algorithm

- Some generation owners have requested that once the shortage pricing system has been implemented that current Tier 2 commitment be telemetered in addition to the energy basepoint
- This point can be telemetered in real-time with each energy basepoint to notify the plant operators of what is expected of the plant
- This point will also be part of the RT SCED solution

Link to full presentation:

<http://www.pjm.com/~media/committees-groups/working-groups/spwg/20100122/20100122-item-01-gca-and-sp-information-session.ashx>