



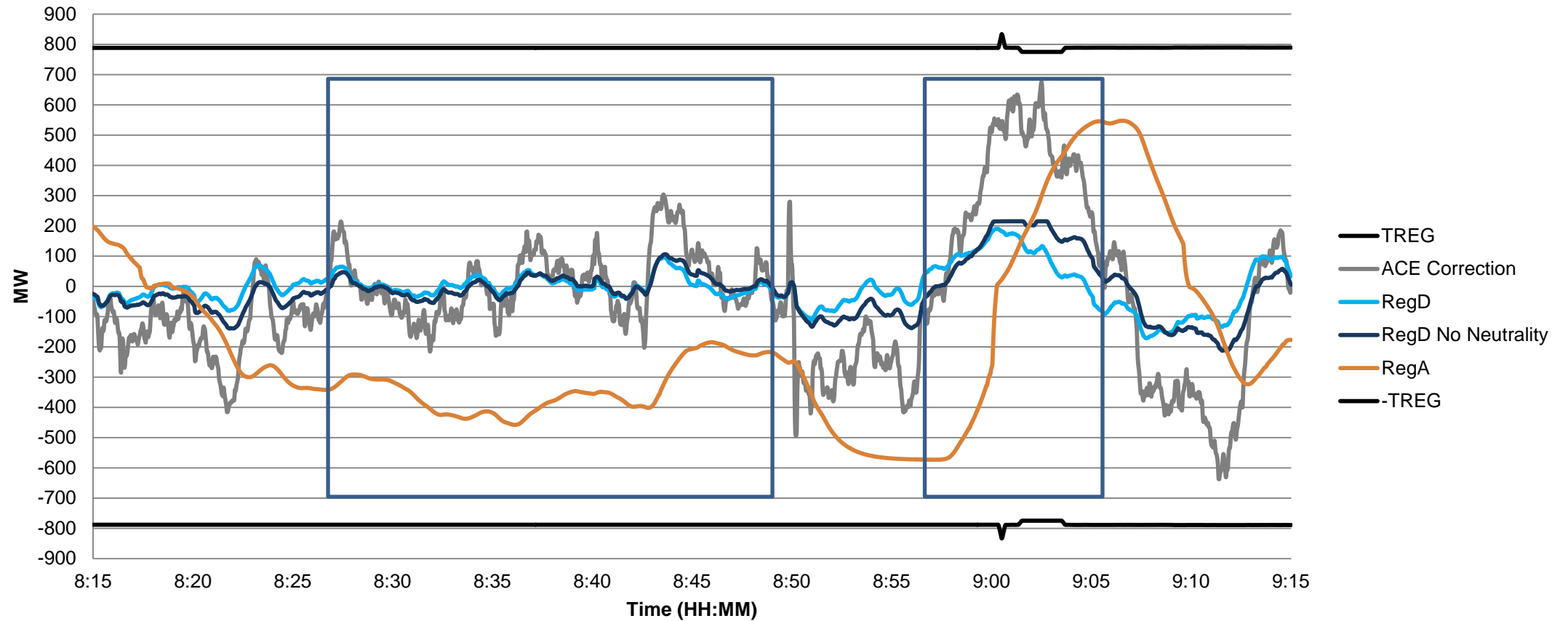
PJM Regulation Study Update

December 10, 2015

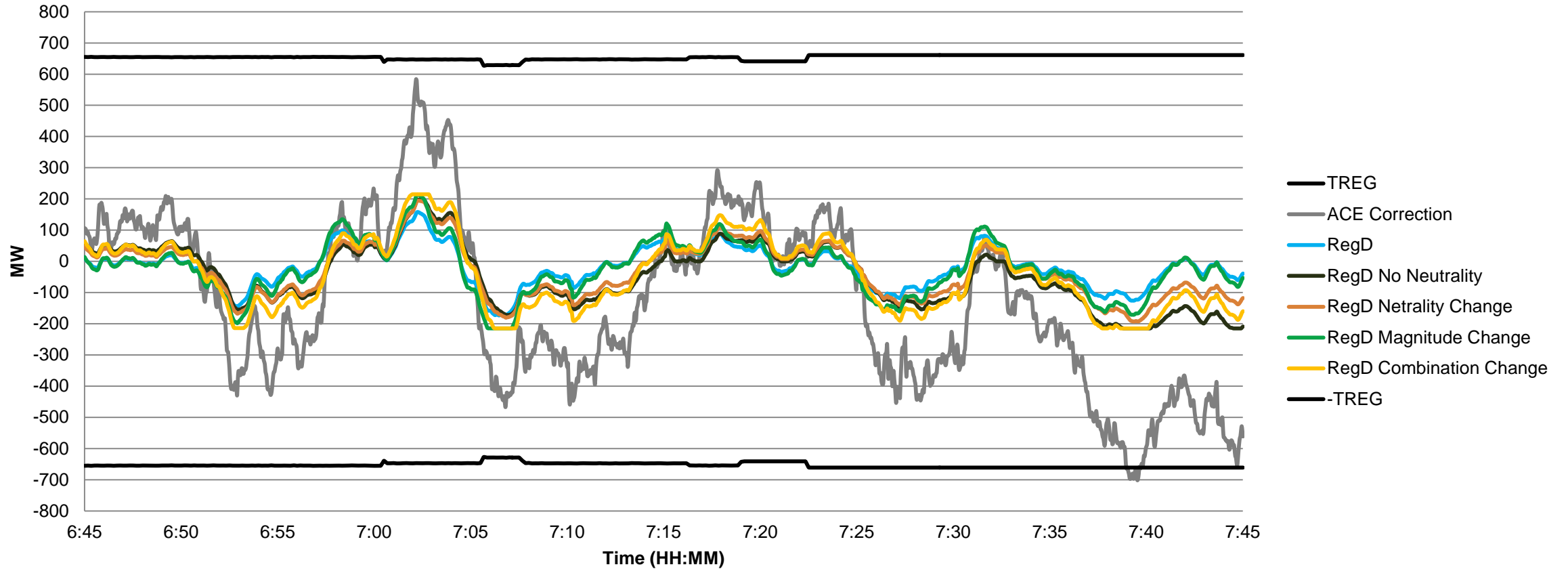
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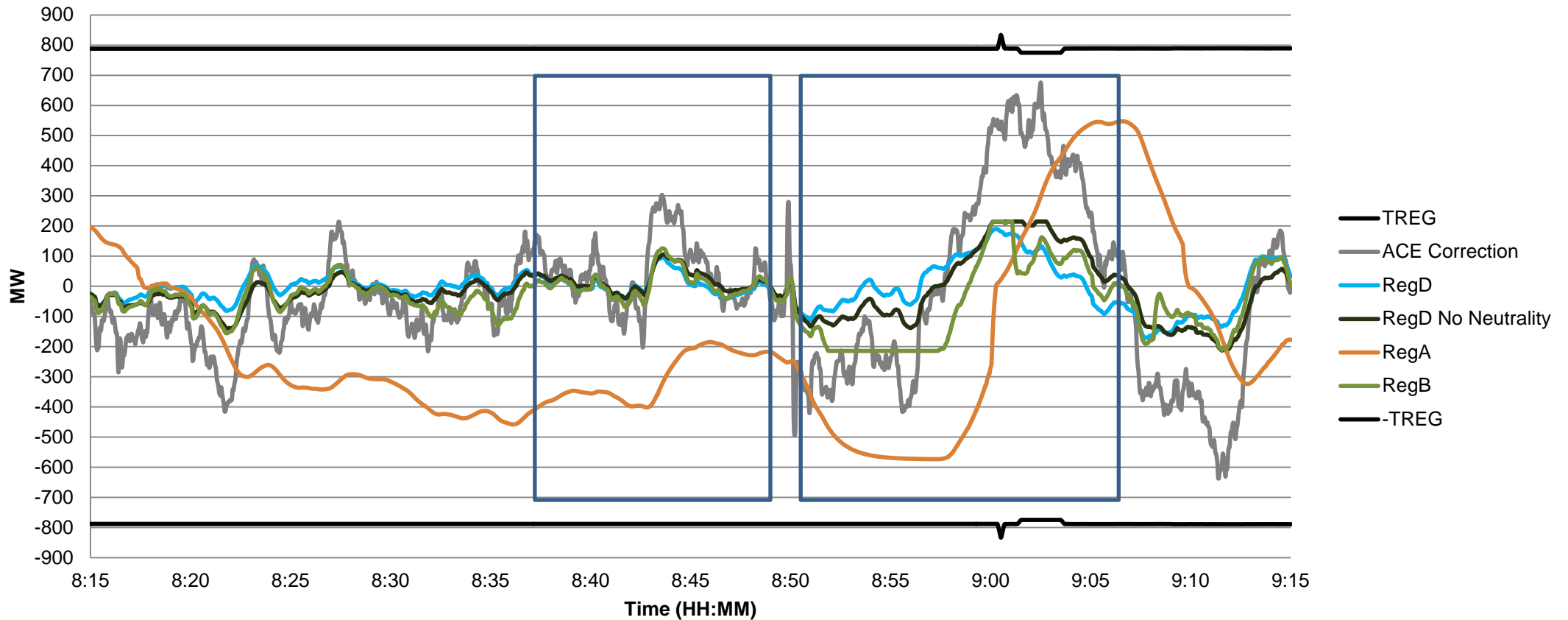
- Investigated Signal Tuning Options
 - These results do not represent a solution
 - Only regulation signal creation, there is no modeled dynamic response in following graphs
- Added Test Regulation Signals to Automatic Generation Control (AGC) Test Environment
 - RegD signal with adjusted variables
 - No Neutrality
 - Changes to Neutrality (Extending Time)
 - Changes to Signal Magnitude
 - Added RegB signal for observation



- RegD and RegD No Neutrality are very close when ACE is neutral
- RegD and RegD No Neutrality start to separate as a large ACE deviation takes place



- Test control logic for various parameters
- Adjust duration of signal (neutrality) using a control parameter
- Adjust magnitude of signal using a control parameter



- RegB signal is created using the RegA signal and a filtered version of ACE Correction ($\text{RegB} = \text{Filtered ACE Correction} - \text{RegA}$)
- When ACE is neutral RegB is close to RegD with no neutrality
- When there is a large ACE deviation the different control logic becomes apparent (RegB is dependent on RegA)

- Added new signals for future testing purposes
 - RegB
 - RegD No Neutrality
- Added Adjustable parameters to test their impact on signals
 - Adjust Neutrality
 - Adjust Signal Magnitude
- Next Steps
 - Allows simulations over long time periods to determine desired signals
 - These signals will be coded into the PJM Regulation Study Package in order to observe a simulated response using regulation unit models