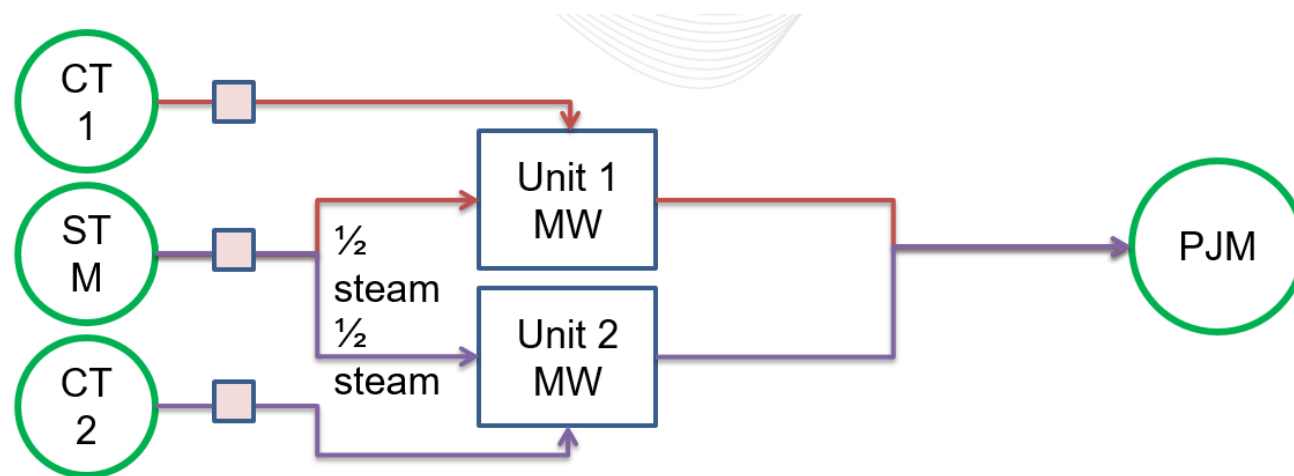


Pseudo Modeled Combined Cycle Unit's Minimum Run Time Parameter Limit Issue

Tom Hauske
Market Implementation Committee
January 12, 2022

- Market Sellers can model a combined cycle unit as multiple pseudo units composed of a single Combustion Turbine (CT) and a portion of the Steam Turbine (ST)



- A pseudo unit enters the same generating unit information as a non-pseudo modeled generating unit into Markets Gateway
 - Schedules
 - Cost, Price, Price-based PLS
 - Energy offer into the Day Ahead & Real Time
 - Start-Up, No-Load, and Incremental Energy
 - Operating Parameters
 - Eco Min, Eco Max, Start-up times, **Minimum Run Time**, etc.
 - Ancillary Service Offers
 - Synchronized Reserve & Regulation

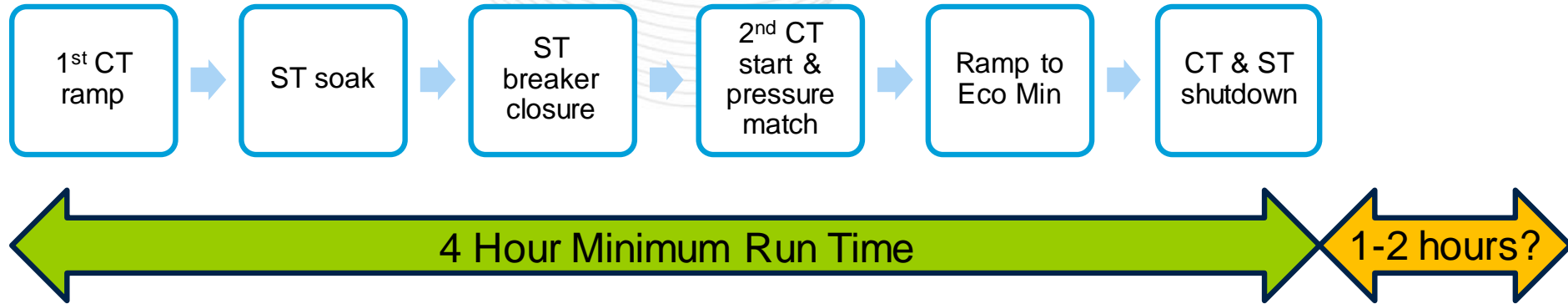
- The Unit Specific Parameter proxy limit for a combined cycle unit's Minimum Run Time is 4 hours*. It is based on a 2x1 combined cycle and includes:
 - Ramping the first CT to Eco Min
 - Warming and starting the steam turbine from cold conditions
 - Starting the second CT and pressure matching its heat recovery steam generator (HRSG)
 - Ramping the unit to Eco Min
 - Shutting down the CT and the steam turbine

* <https://www.pjm.com/-/media/committees-groups/committees/elc/postings/20150612-june-2015-capacity-performance-parameter-limitations-informational-posting.ashx>

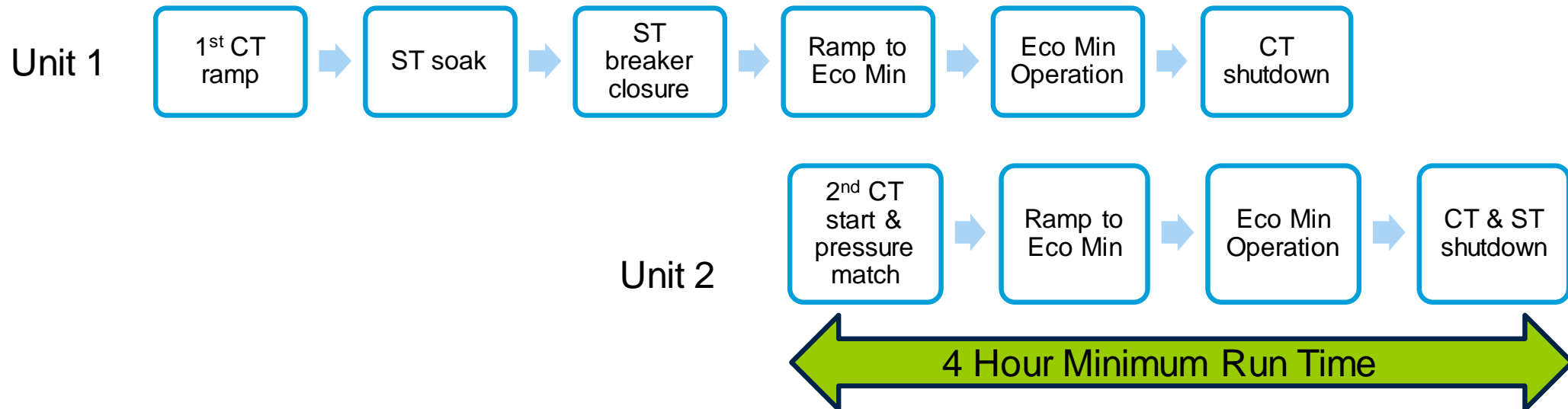
- The Unit Specific Parameter Minimum Run Time proxy limit for both units of a 2x1 pseudo modeled combined cycle is also, like a non-pseudo modeled CC, equal to 4 hours.
- However, the first pseudo unit started only includes
 - Ramping the first CT to Eco Min
 - Warming and starting the steam turbine from cold conditions
 - Shutting down the CT and the steam turbine
- And the second pseudo unit started only includes
 - Ramping the second CT and pressure matching its HRSG
 - Shutting down the CT

Comparison of 2x1 CC with pseudo modeled 2x1 CC when dispatched on a Parameter Limited Schedule

2x1 Non-Pseudo Modeled CC



2x1 Pseudo Modeled CC



- If the Market Units of a pseudo modeled combined cycle unit are dispatched at different times on parameter limit schedules, the potential exists for one or more of the pseudo modeled units to operate for some period beyond the Minimum Run Time Parameter limit for an identical non-pseudo modeled combined cycle unit.

- MIC Solution Option & First Read – 1/12/2022
- MIC Endorsement – 2/9/2022
- MRC First Read – 2/24/2022
- MRC Endorsement -3/23/2022

- Key Dates for the annual Unit Specific Parameter Adjustment process:
 - Market Sellers must submit a request by 2/28/2022
 - PJM must provide a determination on the request by 4/15/2022
 - PJM will provide any guidance developed under this initiative to any pseudo modeled combined cycle which requests an adjustment this review period or existing pseudo modeled combined cycle with an approved unit specific minimum run time parameter.

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