# Operating Reserves Rules

RMWG

February 7 , 2006

Market Monitoring Unit

# Topics

- Daily details on economic and non-economic generation
  - Day with lowest operating reserve credits
  - Day with highest operating reserve credits
  - Summer 2005  5 coincident peak days

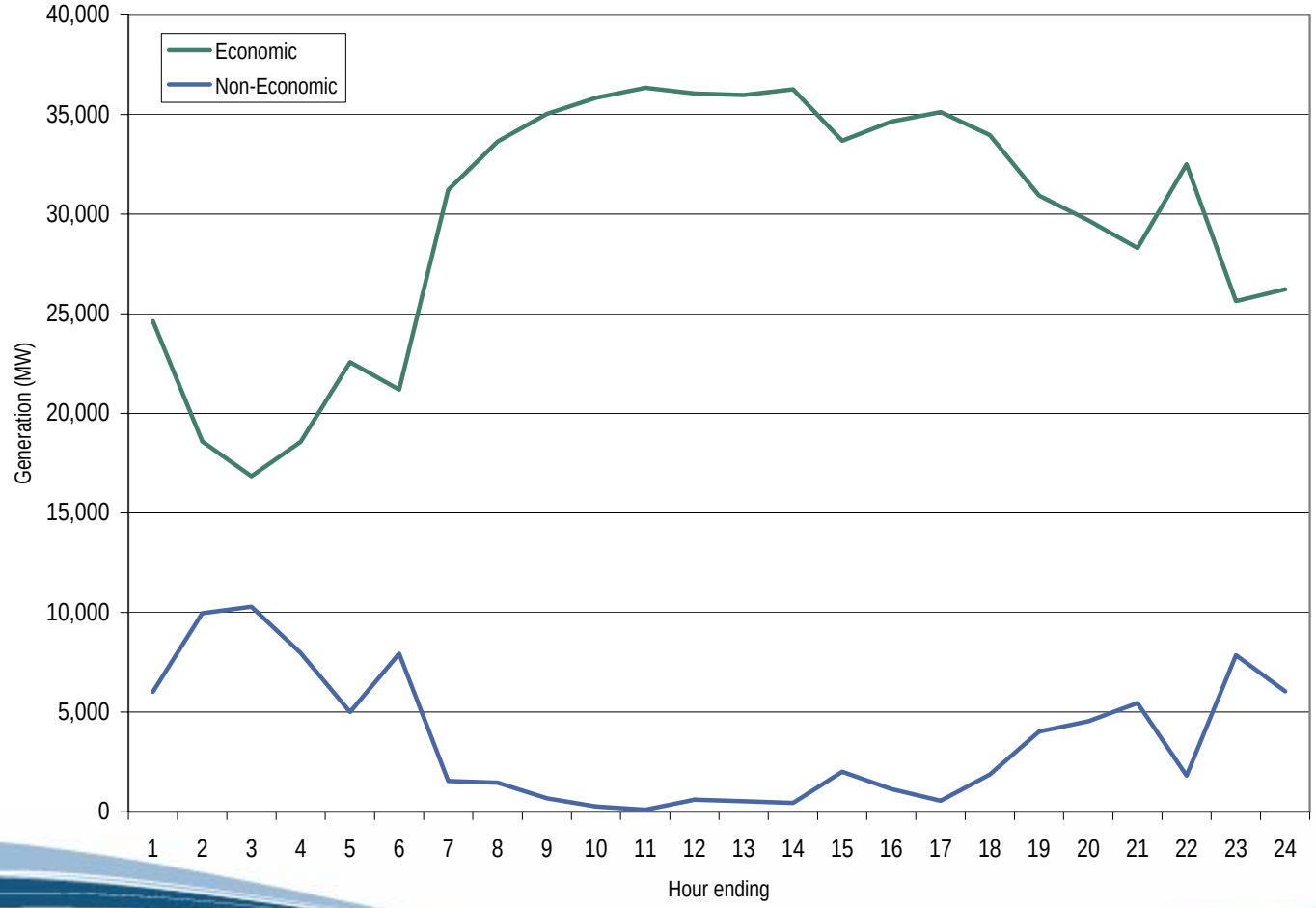
- Operating parameters and operating reserves charges

# Definitions of Economic and Non-Economic Generation

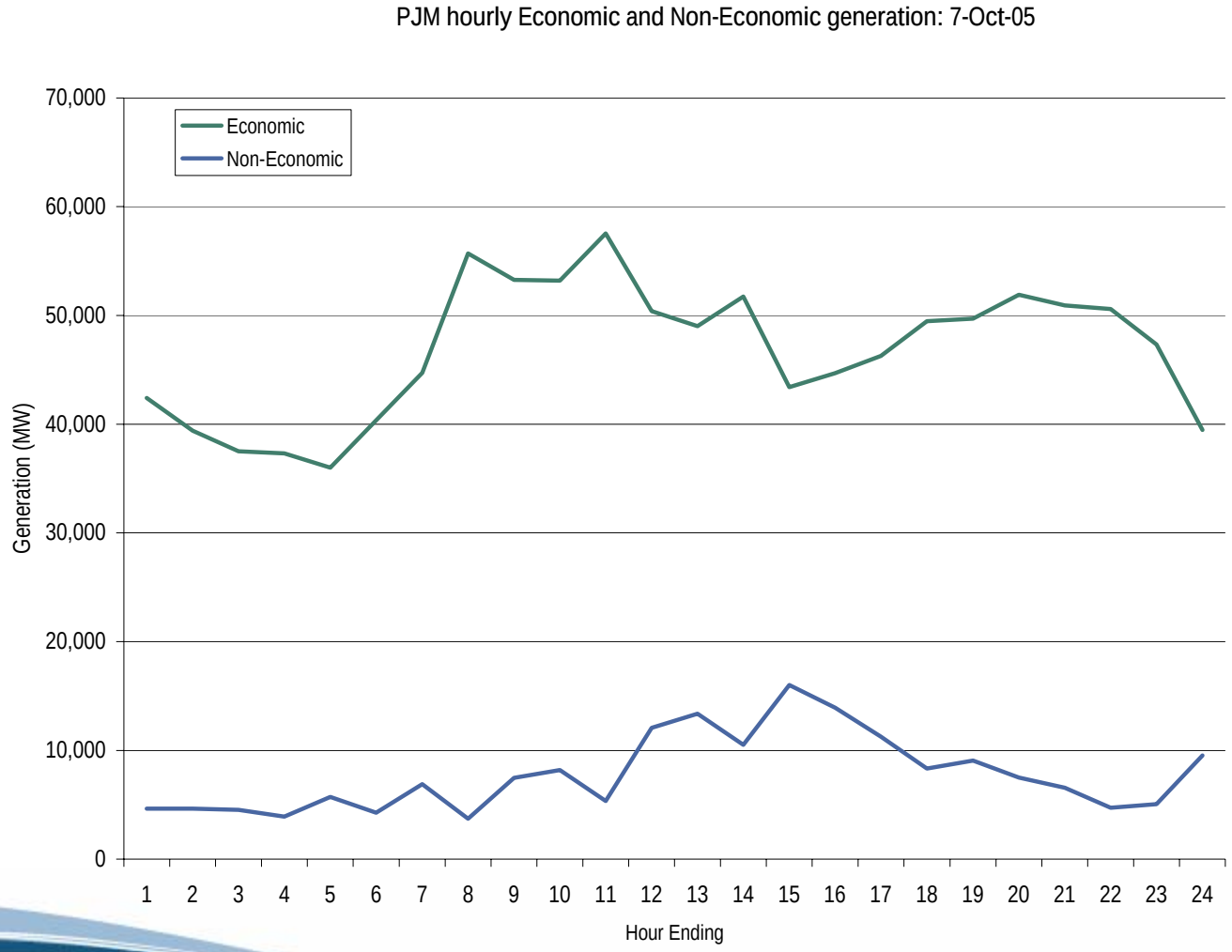
- Economic Generation: Offer<= LMP
- Non-Economic Generation: Offer >LMP
- Self-Scheduled units not included

# Day with Lowest Operating Reserve Credits in 2005: Economic and Non-Economic Generation

PJM hourly Economic and Non-Economic generation: 29-Apr-05



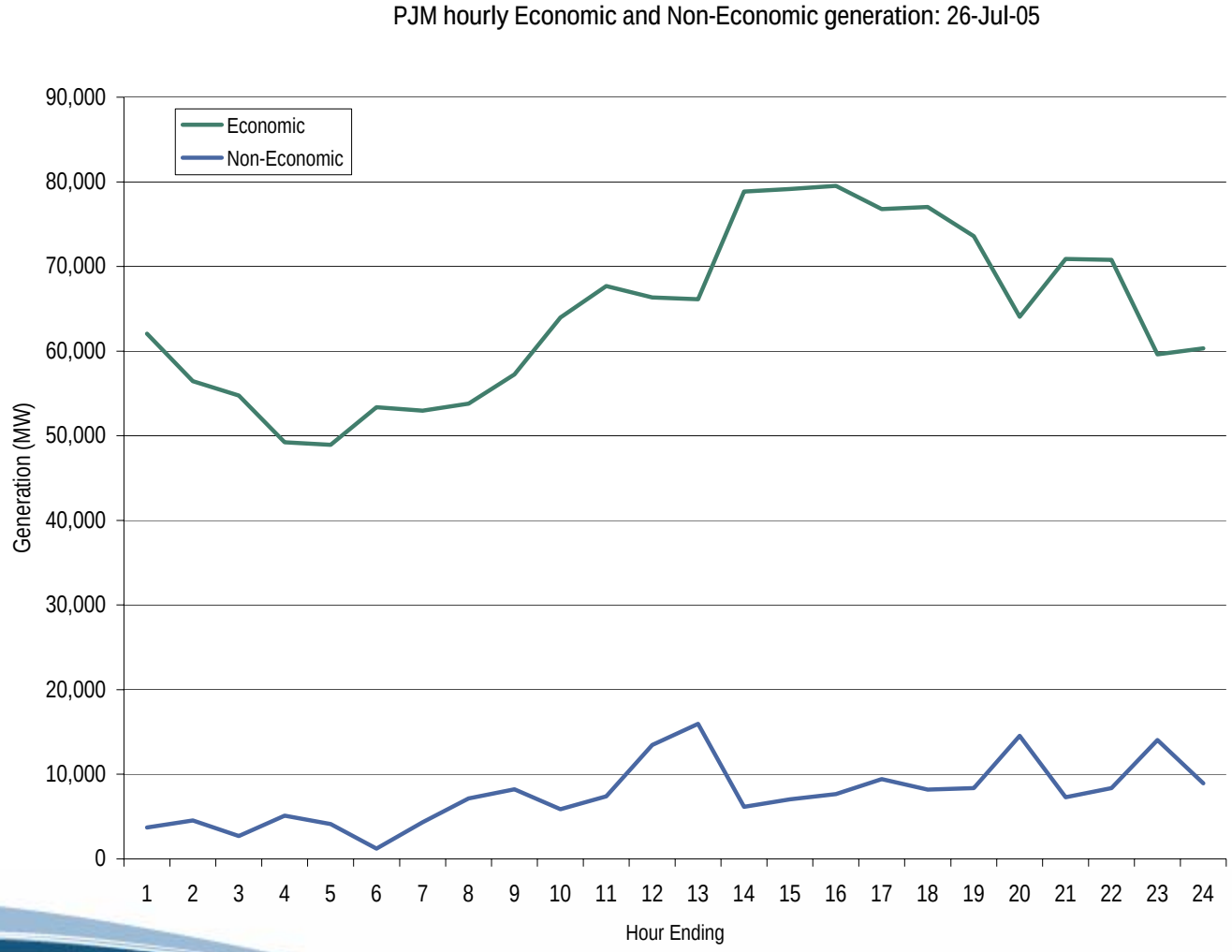
# Day with Highest Operating Reserve Credits in 2005: Economic and Non-Economic Generation



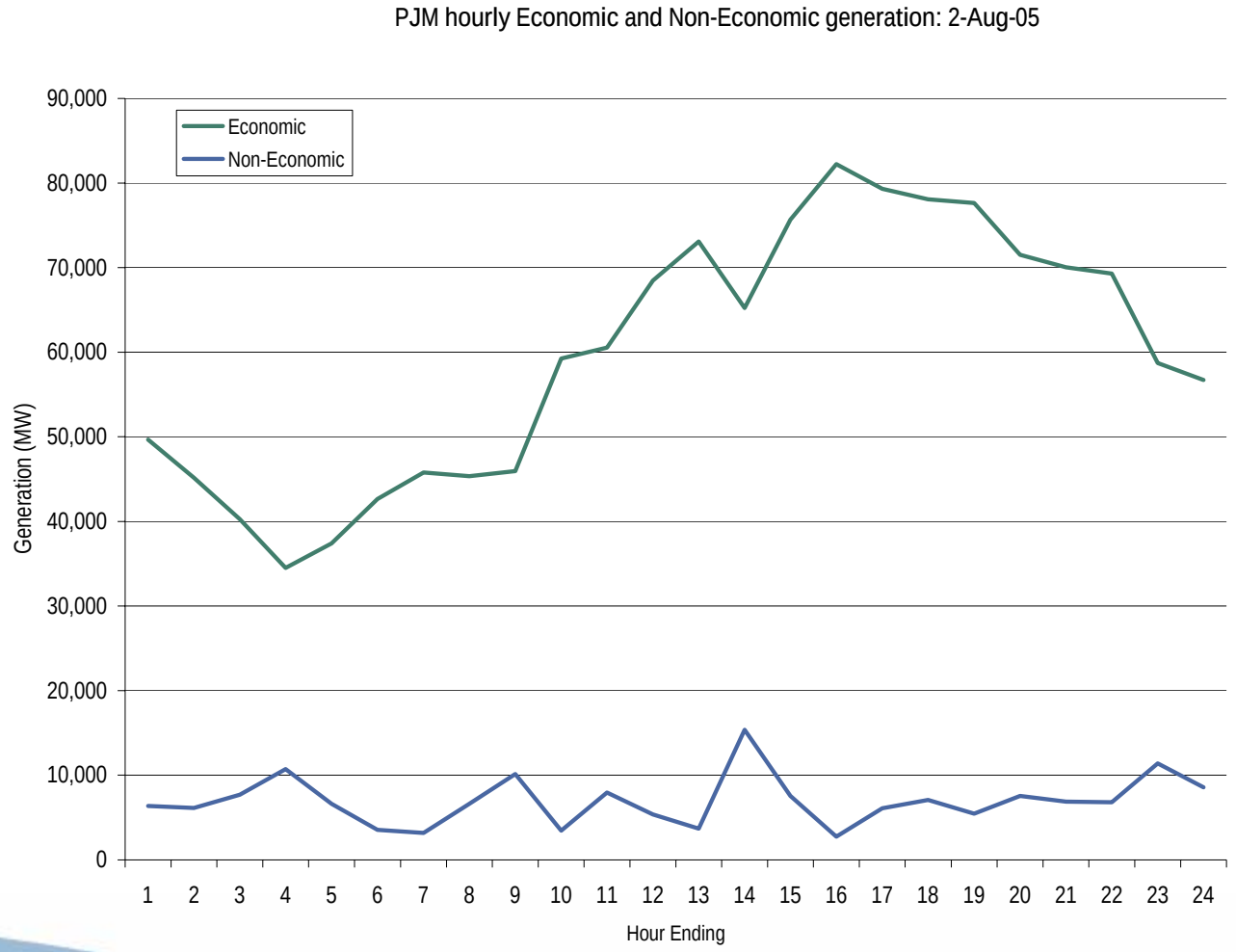
# Summer 2005 Coincident Peaks (5 CP)

| Day | Date | Hour |
|---|---|---|
| Tuesday | 7/26/2005 | 16:00 |
| Tuesday | 8/2/2005 | 17:00 |
| Wednesday | 8/3/2005 | 17:00 |
| Thursday | 8/4/2005 | 17:00 |
| Friday | 8/12/2005 | 17:00 |

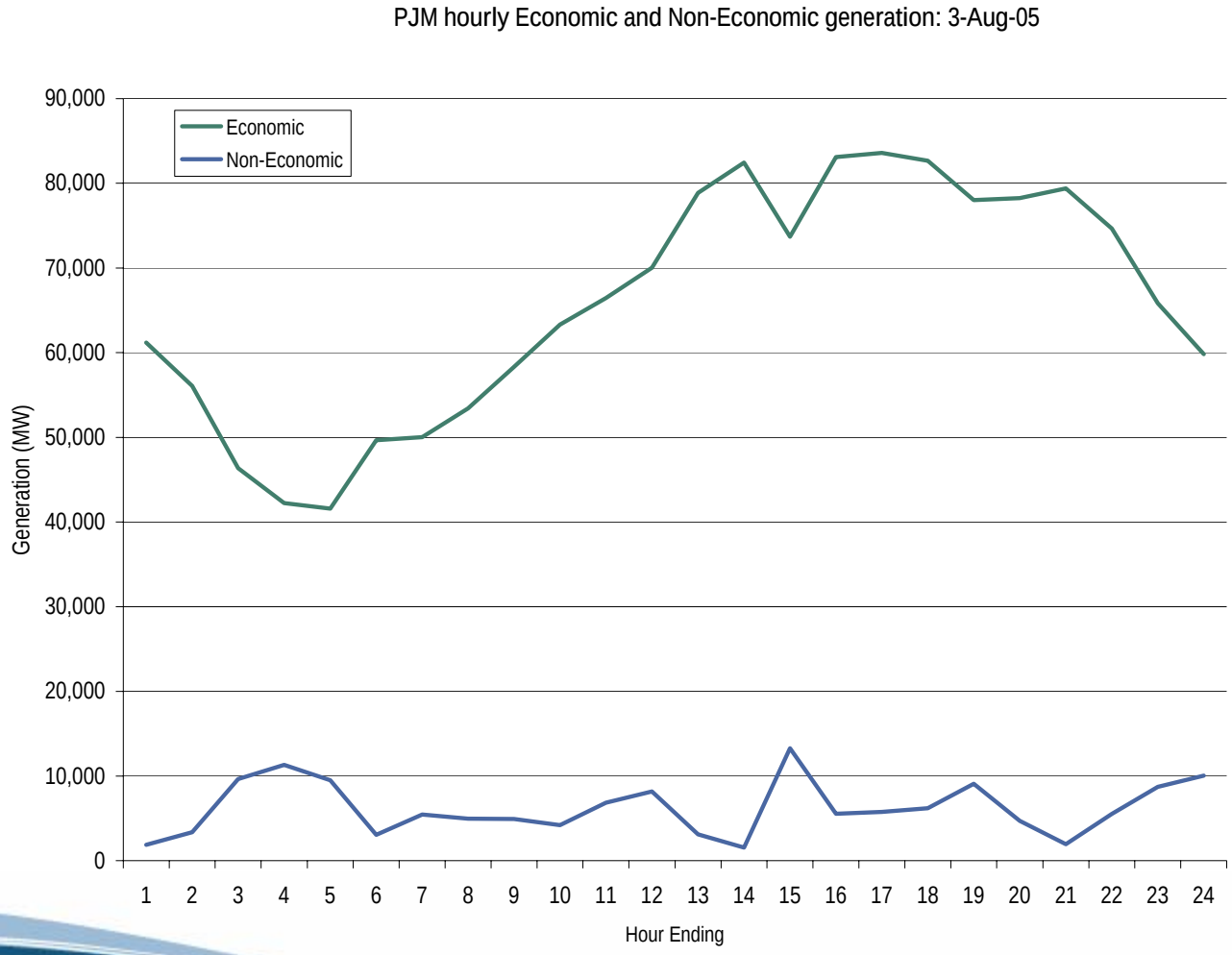
# First Day of 5 CP in 2005: Economic and Non-Economic Generation



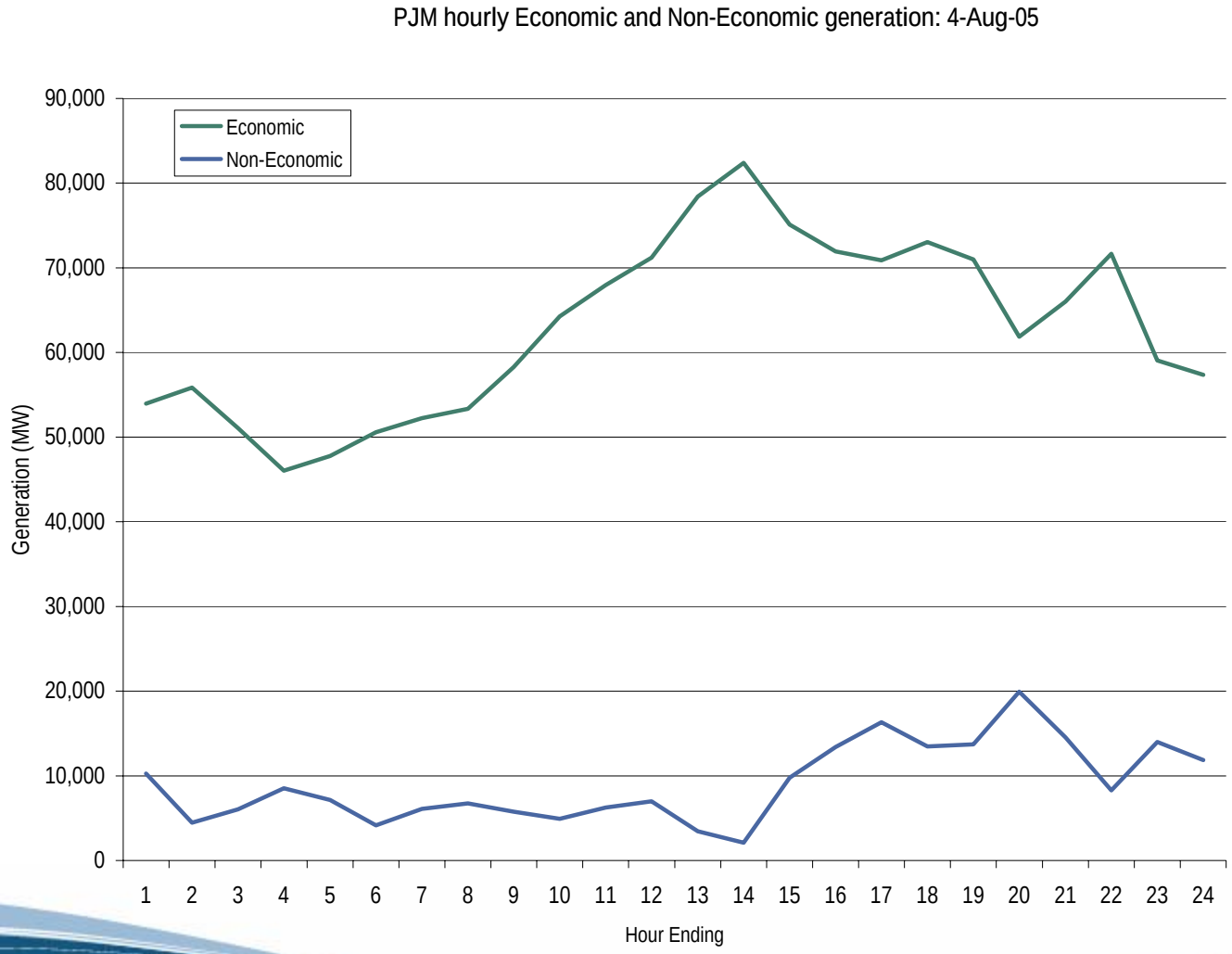
# Second Day of 5 CP in 2005: Economic and Non-Economic Generation



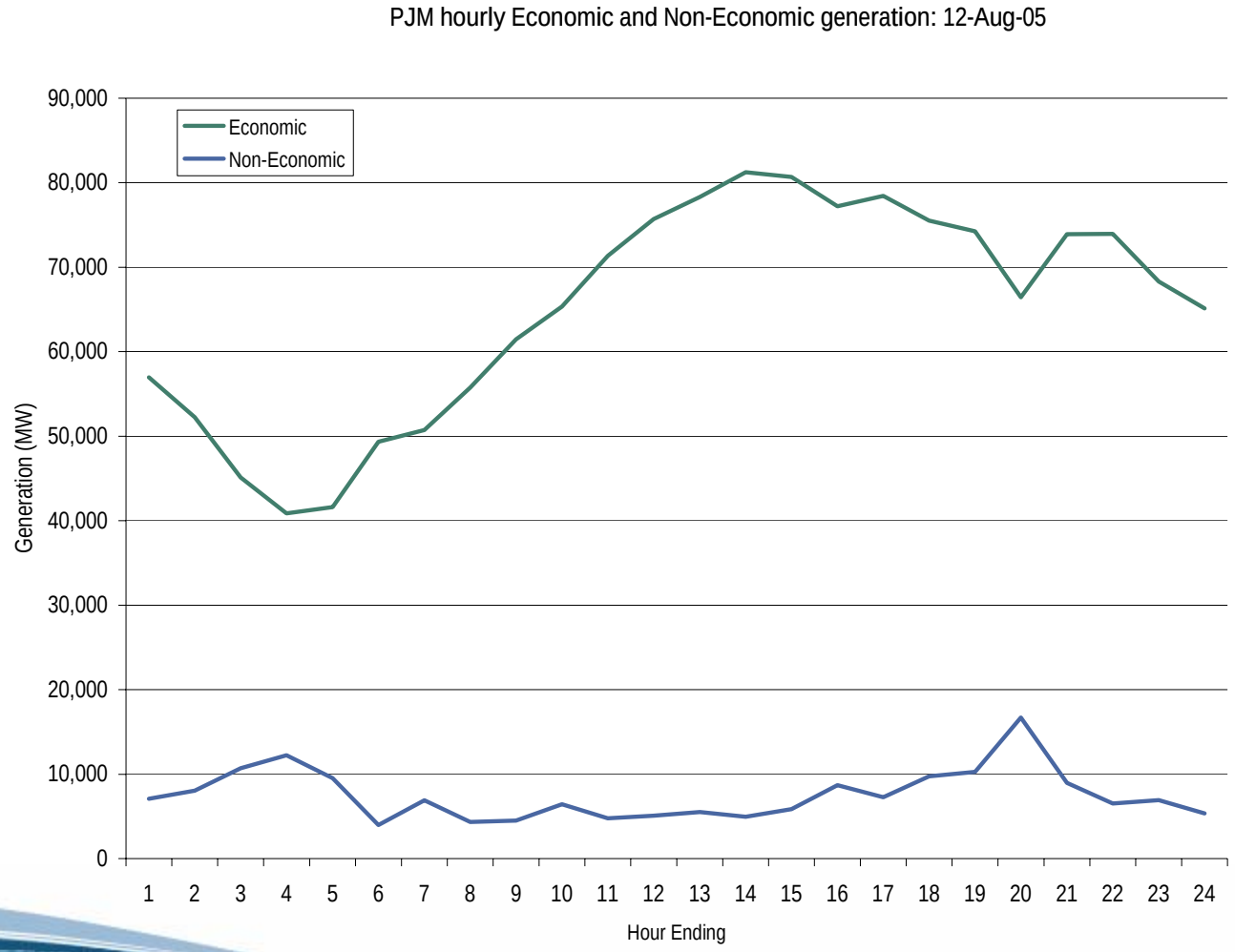
# Third Day of 5 CP in 2005: Economic and Non-Economic Generation



# Fourth Day of 5 CP in 2005: Economic and Non-Economic Generation



# Fifth Day of 5 CP in 2005: Economic and Non-Economic Generation



# Market Power Issues: Operating Reserves Goals

- Goal is competitive outcome
- Ensure that units are paid operating reserves only if they provide flexibility
  - Require flexible operating parameters
  - Require operating parameters consistent with unit capabilities

- Market power may be exercised via
  - Inflexible operating parameters compared to unit capabilities
    - Long minimum run times
    - Small number of starts per day/week
    - Long minimum down times
    - Set economic minimum equal to economic maximum

- Operating parameters proposal:
  - Limit operating reserve payments consistent with operating parameters based on the market data for actual PJM market offers by unit class, where relevant.
  - Limit operating reserve payments consistent with operating parameters based on physical parameters for specific units, where relevant.
  - Limit operating reserve payments consistent with economic minimum and economic maximum points set consistent with unit capabilities

•Minimum Down Time — The minimum number of hours between starts, calculated as the difference between when the unit shuts-down and the next time the unit is put online, as measured by telemetry available to PJM.

•Minimum Run Time — The minimum number of hours a unit must run, from the time the unit is put online to the time the unit is shut down (as measured by PJM's state estimator).

•Maximum Daily Starts — The maximum number of times that a unit can be started in a day under normal operating conditions.

•Maximum Weekly Starts — The maximum number of times that a unit can be started in a week under normal operating conditions.

# Definitions of Operating Parameters

•Cold Start Lead Time — The time interval, measured in hours, from the time of PJM notification to the actual unit start sequence to the unit breaker closing for a generating unit in its cold temperature state.

•Hot Start Lead Time — The time interval, measured in hours, from the time of PJM notification to the actual unit start sequence to the unit breaker closing for a generating unit in its hot temperature state.

•Warm Start Lead Time — The time interval, measured in hours, from the time of PJM notification to the actual unit start sequence to the unit breaker closing for a generating unit in its warm temperature state.

eMKT User Guide - http://www.pjm.com/etools/downloads/emkt/ts-userguide.pdf

# Proposed Parameters

- Proposed parameter levels based on actual unit characteristics in PJM

# PJM Unit Parameter Matrix Summary

**All Figures in Hours**

**Lead Time = Start Time Plus Notification Time**

### Small Frame CT and Aero CT Units - Up to 29 MW ICAP

| Parameter | Minimum Down Time | Minimum Run Time | Maximum Daily Starts | Maximum Weekly Starts | Hot Start Lead Time | Warm Start Lead Time | Cold Start Lead Time |
|---|---|---|---|---|---|---|---|
| Recommended Parameter Range | 2.0 or Less | 2.0 or Less | 3 or More | 21 or More | .75 or less | .75 or less | .75 or less |

### Medium Frame CT and Aero CT Units - 30 MW to 65 MW ICAP

| Parameter | Minimum Down Time | Minimum Run Time | Maximum Daily Starts | Maximum Weekly Starts | Hot Start Lead Time | Warm Start Lead Time | Cold Start Lead Time |
|---|---|---|---|---|---|---|---|
| Recommended Parameter Range | 2.0 or Less | 3.0 or Less | 4 or More | 23 or More | .75 or less | .75 or less | .75 or less |

### Medium-Large Frame CT Units - 65 MW to 125 MW ICAP

| Parameter | Minimum Down Time | Minimum Run Time | Maximum Daily Starts | Maximum Weekly Starts | Hot Start Lead Time | Warm Start Lead Time | Cold Start Lead Time |
|---|---|---|---|---|---|---|---|
| Recommended Parameter Range | 3.0 or Less | 5.0 or Less | 2 or More | 14 or More | 1.5 or Less | 1.5 or Less | 1.5 or Less |

### Large Frame CT Units - 135 MW to 180 MW ICAP

| Parameter | Minimum Down Time | Minimum Run Time | Maximum Daily Starts | Maximum Weekly Starts | Hot Start Lead Time | Warm Start Lead Time | Cold Start Lead Time |
|---|---|---|---|---|---|---|---|
| Recommended Parameter Range | 4.0 or Less | 5.0 or Less | 3 or More | 16 or More | 1.5 or Less | 1.5 or Less | 1.5 or Less |

### Combined Cycle Units

| Parameter | Minimum Down Time | Minimum Run Time | Maximum Daily Starts | Maximum Weekly Starts | Hot Start Lead Time | Warm Start Lead Time | Cold Start Lead Time |
|---|---|---|---|---|---|---|---|
| Recommended Parameter Range | 4.0 or Less | 6.0 or Less | 2 or More | 11 or More | 4.0 or Less | 5.5 or Less | 6.5 or Less |

### Petroleum and Natural Gas Steam Units

| Parameter | Minimum Down Time | Minimum Run Time | Maximum Daily Starts | Maximum Weekly Starts | Hot Start Lead Time | Warm Start Lead Time | Cold Start Lead Time |
|---|---|---|---|---|---|---|---|
| Recommended Parameter Range | 5.0 or Less | 6.0 or Less | 2 or More | 8 or More | 5.5 or Less | 7.5 or Less | 11.5 or Less |

### Sub-Critical Coal Units

| Parameter | Minimum Down Time | Minimum Run Time | Maximum Daily Starts | Maximum Weekly Starts | Hot Start Lead Time | Warm Start Lead Time | Cold Start Lead Time |
|---|---|---|---|---|---|---|---|
| Recommended Parameter Range | 9.0 or Less | 15.0 or Less | 1 or More | 5 or More | 8.5 or Less | 12.5 or Less | 15.5 or Less |

### Super-Critical Coal Units

| Parameter | Minimum Down Time | Minimum Run Time | Maximum Daily Starts | Maximum Weekly Starts | Hot Start Lead Time | Warm Start Lead Time | Cold Start Lead Time |
|---|---|---|---|---|---|---|---|
| Recommended Parameter Range | 84.0 | 24.0 or Less | 1 or More | 2 or More | 14.0 or Less | 18.0 or Less | 22.0 or Less |