



# **DIGITAL I&C & Grid Operations**

July 18<sup>th</sup> 2007

Tom Bowe

PJM Interconnection

[bowet@pjm.com](mailto:bowet@pjm.com)





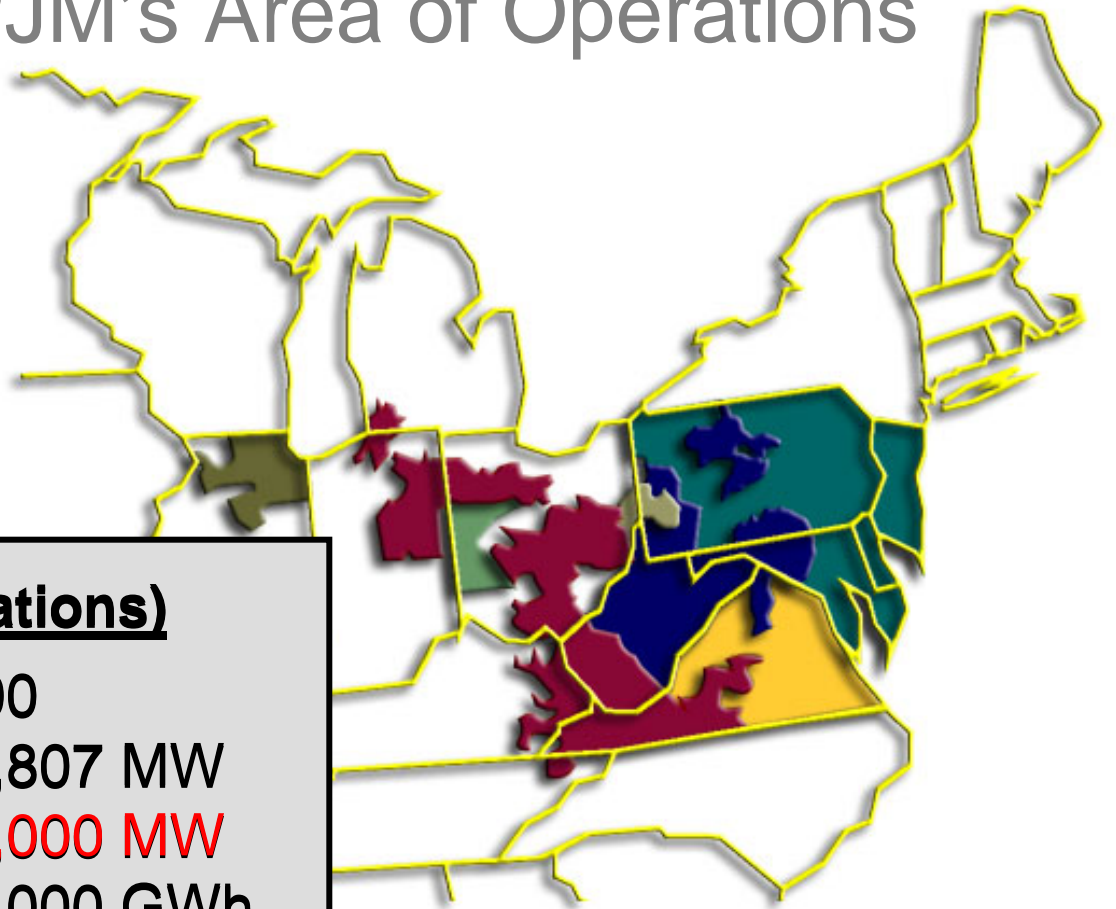
# PJM's MISSION

- Maintain the safety, adequacy, reliability and security of the bulk power system
- Create and operate a robust, competitive, and non-discriminatory electric power market
- Ensure that no Member or group of Members has undue influence

**RTO = Regional Transmission Operator**



# PJM's Area of Operations

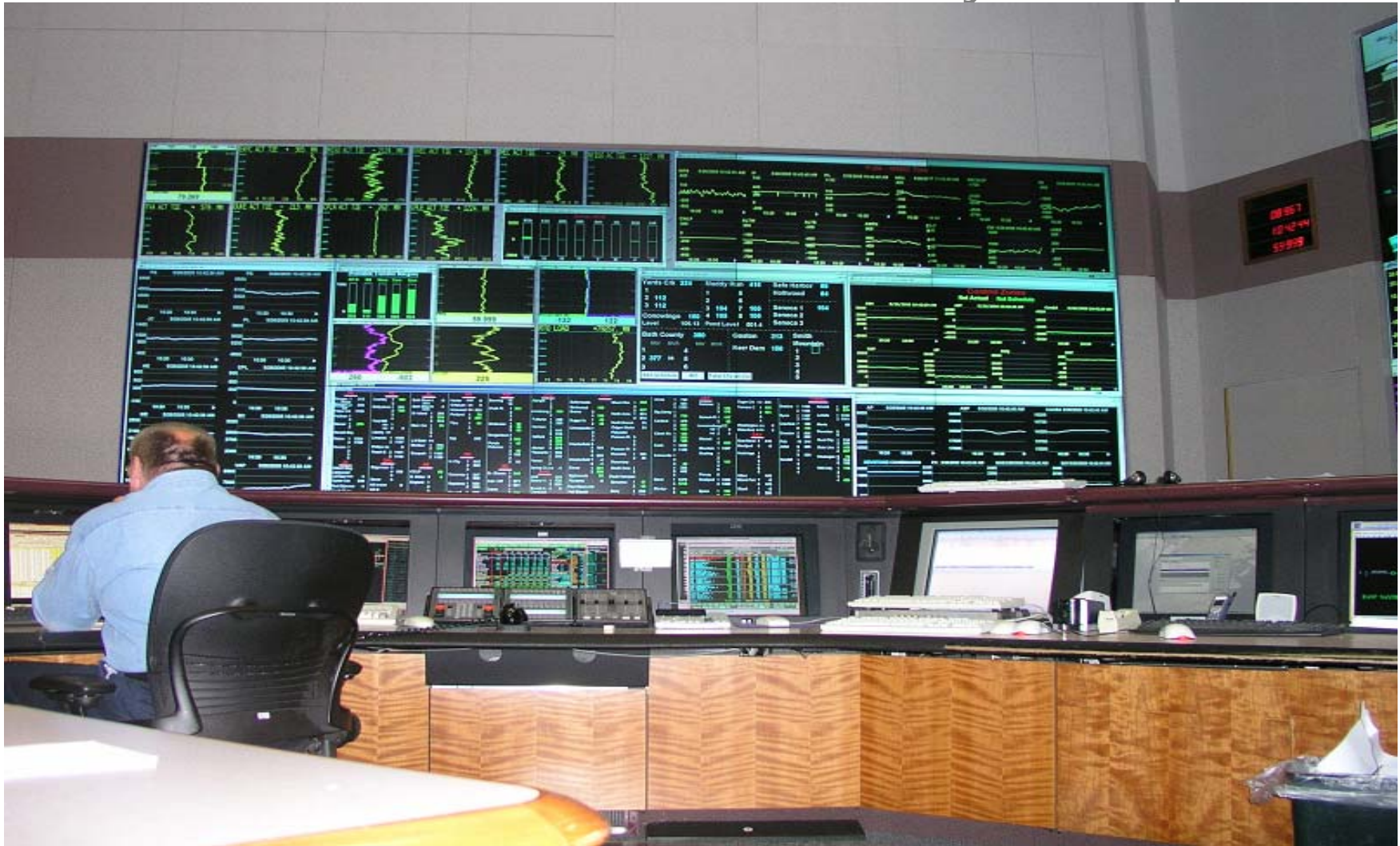


## PJM RTO (Post-integrations)

Generating Units	1,400
Generation Capacity	170,807 MW
Peak Load	<b>144,000 MW</b>
Annual Energy	648,000 GWh
Transmission Miles	55,000
Area (Square Miles)	186,000
Customers	21 Million
Population Served	<b>50+ Million</b>
States (+ D.C.)	13 states + D.C.

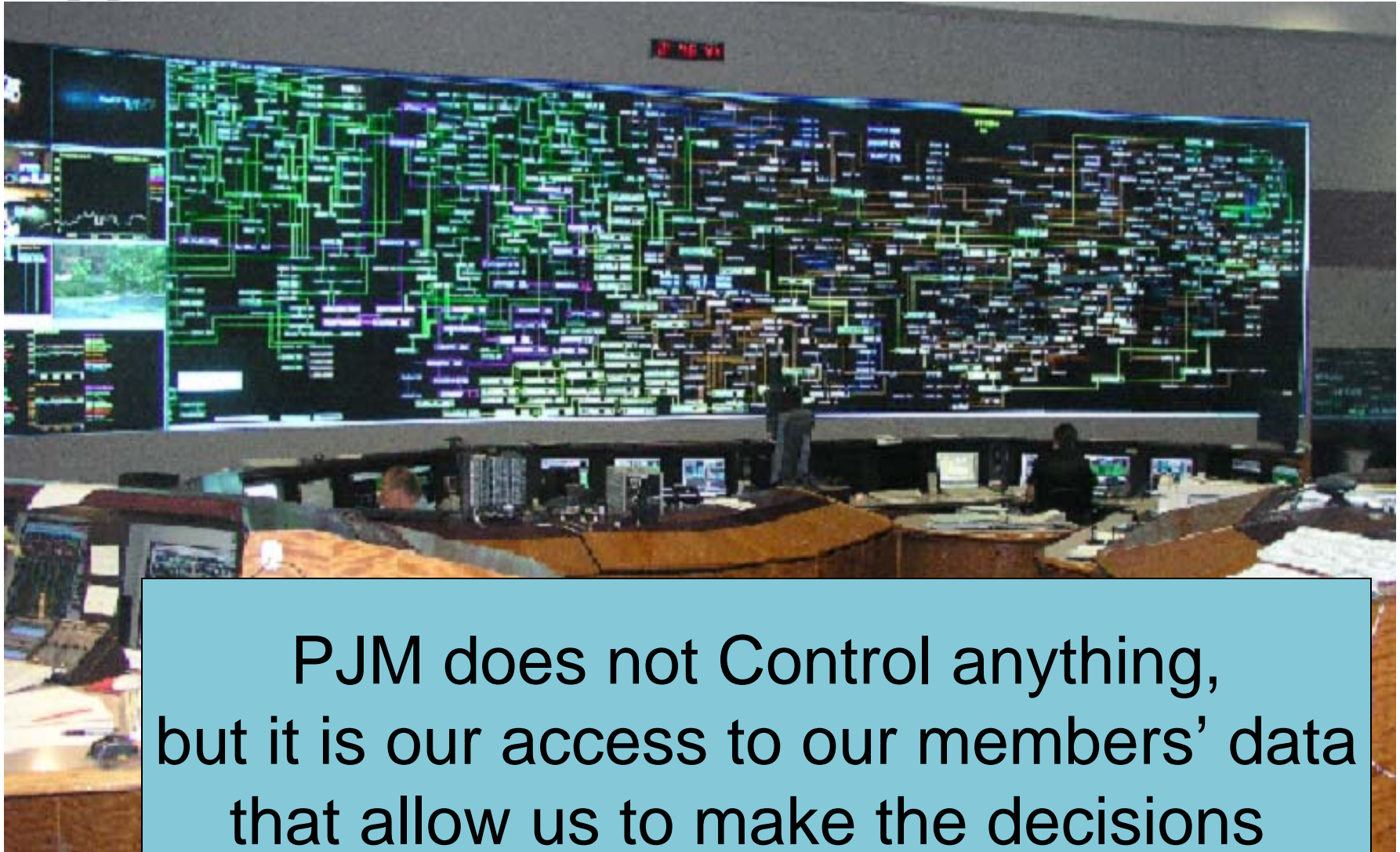


# Generation System Operator





# Transmission System Operations



PJM does not Control anything,  
but it is our access to our members' data  
that allow us to make the decisions  
that protect the grid

- We Must Maintain Situational Awareness & a Wide Area View
  - Y2K
  - September 11<sup>th</sup> 2001
  - August 14<sup>th</sup> 2003
- PJM exists on its data streams
  - Multiple and Diverse Communication Paths
- Digital I&C Provides for Greater Visibility and Flexibility
- Creative Training

- Starts with Defining – “What is Critical?”
- If everything is critical than nothing is . . .
- Must also define the “Electronic Perimeter”
  - Defense in Depth
  - Network Segmentation
- Conduct Independent Vulnerability Assessments
- NERC Critical Infrastructure Protection Standards (CIP 002-009) and/or ISO 17799



## PJM's Advanced Control Center Concepts

- Visualization with a focus on human factors and role vs. function based displays
- The evolution of intelligent event processing and intelligent agents
- Improvements in control through advanced algorithms, improved visualization, advanced look ahead, modeling of heuristics.
- Synchronized control centers for rapid recovery