ISO new england

Operational Complexities and Strategic Solutions

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SR. MANAGER, CONTROL ROOM OPERATIONS

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As Senior Manager of Control Room Operations at ISO New England, Jonathan Gravelin leads strategic oversight of real-time grid operations and wholesale electricity markets across the region. He ensures the reliable dispatch of energy resources while aligning operational decisions with market rules and regulatory compliance. His role involves coordinating cross-functional teams, managing system contingencies, and driving continuous improvement in control room performance. With over two decades of experience, Jon plays a pivotal role in maintaining grid stability and market integrity in one of the nation's most complex power systems.

ISO New England Inc. (2004–Present)

- **Senior Manager, Control Room Operations** – Oversee real-time dispatch and ensure grid reliability across New England.
- **Manager & Lead Supervisor Roles** – Directed operational teams, enforced market rules, and led compliance initiatives.
- **System Operator Roles** – Managed grid operations, responded to system contingencies, and coordinated with stakeholders.

Education & Credentials

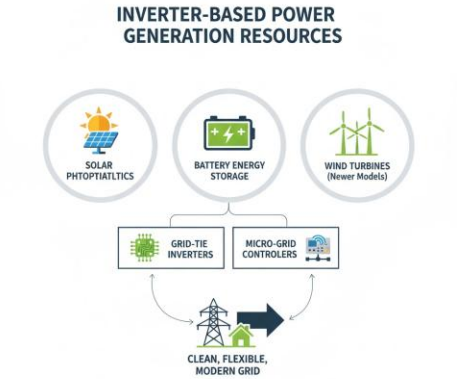
- **M.S. Power System Management** – Worcester Polytechnic Institute
- **B.S. Marine Engineering** – Massachusetts Maritime Academy
- **NERC Reliability Coordinator Certification**

The Control Room Crucible: Variables vs. Physics in Grid Operations

Navigating Complexity and Building a Strategy for Success

The Control Room Crucible: Variables vs. Physics in Grid Operations

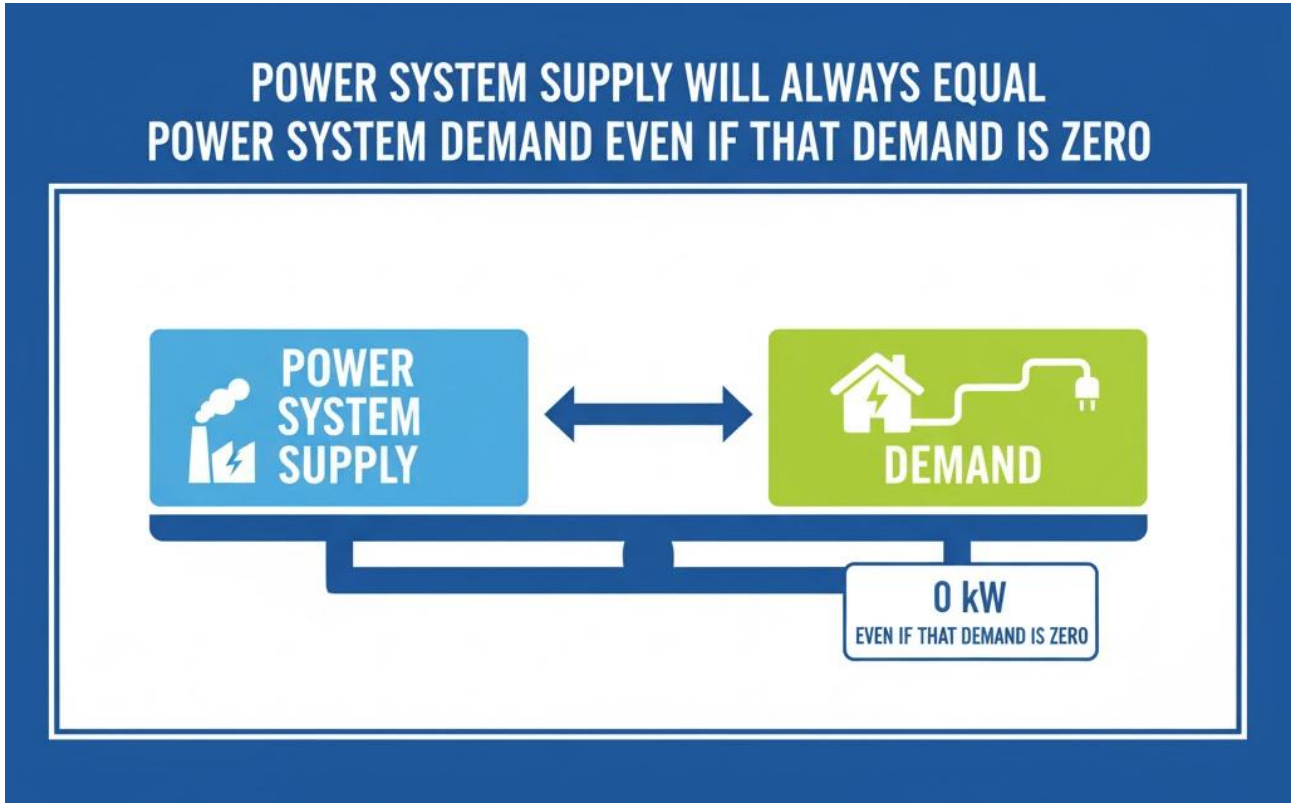
- The Old Grid
  - Finite and Predictable
    - Large Centralized Generating Stations
    - Changing Weather



- The New Grid
  - Rapid Progress and New Challenges
    - New Technologies
    - New Players
    - Engineering Challenges
    - Many Additional Weather Variables
      - Wind (Speed/Direction)
      - Irradiance

The Stakes – The New Reality

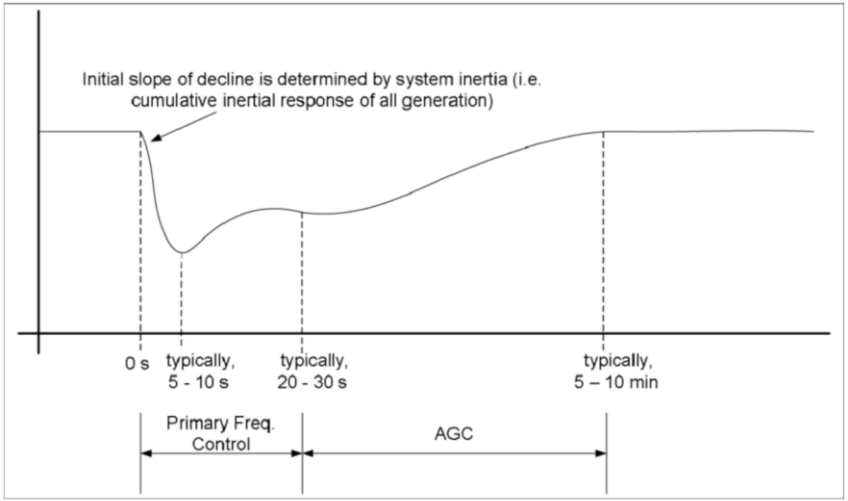
- The Shifting Grid: Zero Tolerance for Error
  - **Central Hub:** Real-time balance of Generation, Transmission, and Load.
  - **The New Normal:** The system is now defined by rapid change and high stress.
  - **The Core Problem:** Grid transformation is outpacing the physical and operational limits.


POWER SYSTEM SUPPLY WILL ALWAYS EQUAL
POWER SYSTEM DEMAND EVEN IF THAT DEMAND IS ZERO
POWER SYSTEM SUPPLY
DEMAND
0 kW
EVEN IF THAT DEMAND IS ZERO

Complexity Driver 1: The Policy Accelerator

- Green Energy Mandates: The Decisive Force
  - **Aggressive Deadlines:** Regulatory incentives encourage rapid deployment of Variable Renewable Energy (VRE).
  - **Decentralization:** Power shifts from central plants to a highly distributed, two-way flow system.
  - **The Challenge:** Speed of Policy > Speed of Physical Grid Change.

Complexity Driver 2: The Physics Crisis



Typical power system frequency response to a sudden loss of generation (©IEEE2013, from reference [3]).

- System Stability: The Loss of Inertia
  - **Inertia Reduction:** Retiring synchronous generators removes the "stability mass" of the system.
  - **VRE Volatility:** Solar and wind add constant, weather-dependent operational uncertainty.
  - **Impact:** Grid disturbances are **faster, more severe,** and require immediate, millisecond-level response.

Complexity Driver 3: The Infrastructure Bottleneck

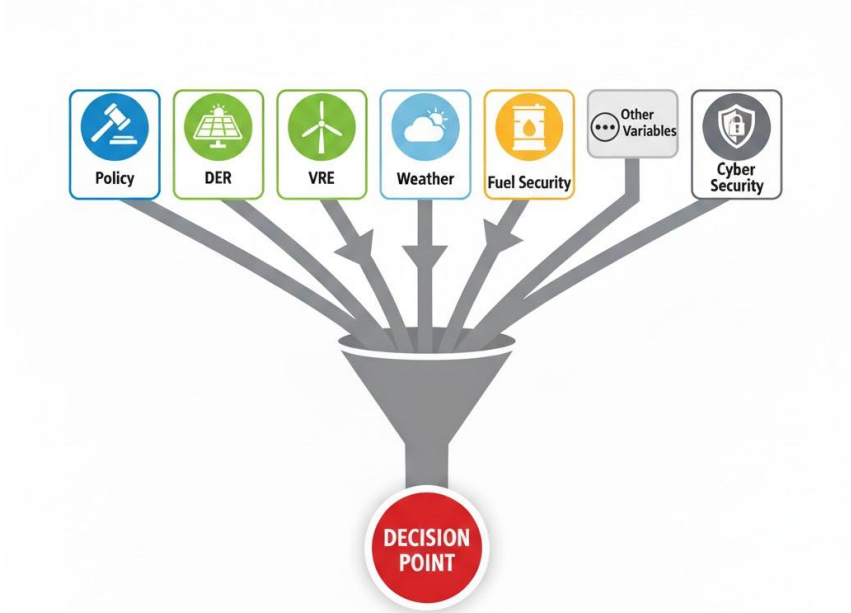
- Locational Challenges
  - **Siting Mismatch:** New VRE is built in remote, resource-rich areas (e.g., wind/solar corridors), or interconnected on the distribution systems
  - **Planning Delays:** Transmission planning and siting processes cannot keep pace.
  - **Technical Delays:** EMS and dispatch software challenged to handle the limited visibility and number of new, smaller distributed generation installations.
  - **Result:** Chronic **Transmission Congestion** and the costly **Curtailment** of clean energy. Heavy burden on IT staffs to develop and maintain system models.

The Operational Crisis: Data and Decision-Making

- Navigating the Information Fog
  - **Information Overload:** Data velocity from thousands of new sources overwhelms operators.
    - *Crisis Point:* Differentiating critical alarms from system noise under stress.
  - **Human Factors:** High cognitive load combined with loss of experienced staff and low-inertia training needs.
  - **Cybersecurity:** Digital interconnectivity dramatically increases vulnerability to malicious attacks.

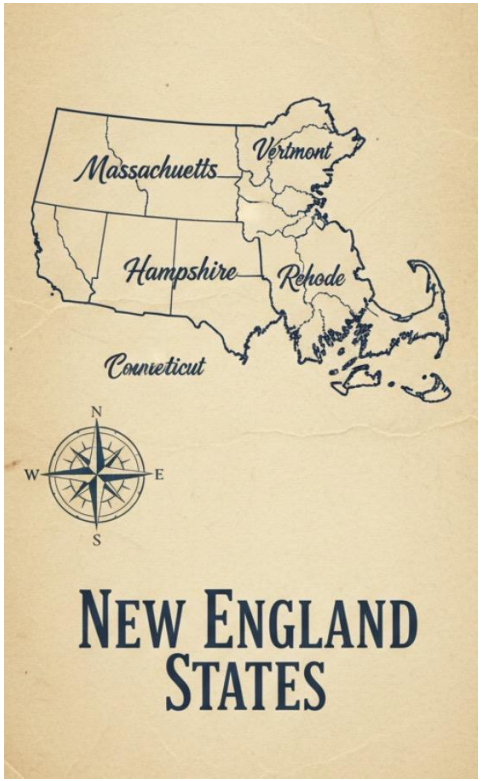
The Operational Climax: The Tight Window

- Zero Margin: Operating at the Edge of the Envelope
  - **Automation Risk:** Dependence on tools introduces **"Out-of-the-Loop"** syndrome.
  - **Tool Coherence:** Need for flawless integration between complex analytical software.
  - **Conclusion:** The Control Room is managing **low-probability, high-impact events** with zero margin for error.



Strategy for Success: Pillars 1 & 2 - Technical Fixes

- Strategy for Success: Smart Tools and Resilient Infrastructure
  - **Pillar 1: Advanced Tools:** Deploy AI/ML for **predictive situational awareness** and smarter alarms.



Strategy for Success: Pillars 1 & 2 - Technical Fixes

- Strategy for Success: Smart Tools and Resilient Infrastructure
  - **Pillar 2: Resilient Design:** Enhance physical flexibility through **Grid-Enhancing Technologies (GETs)**.
    - *Examples:* Battery Storage, Dynamic Line Ratings (DLRs), Advanced Power Flow Control (APFC).

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Strategy for Success: Pillar 3 – Who Fixes It?

- Strategy for Success: Talent Development
  - **Pillar 3: Attract and Invest in the Future of the Industry:** Attract diversely skilled and educated personnel to support and drive the innovation necessary to adapt to the rapidly changing industry.

Strategy for Success: Pillar 4 - Policy

- Strategy for Success: Policy Alignment
  - **Pillar 4: Policy Coordination:** Align state energy goals with regional transmission planning.

Strategy for Success: The Success

- **Goals:**
  - Ensure infrastructure and operational tool upgrades are planned and built at the **same pace** as new generation is integrated.
  - Develop smarter tools that enhance the capabilities of our System Operators and provide them an advantage in managing stressful situations.
  - Build a more capable workforce, empowered and educated to adapt and manage the grid of the future.

Questions

About the Presenter

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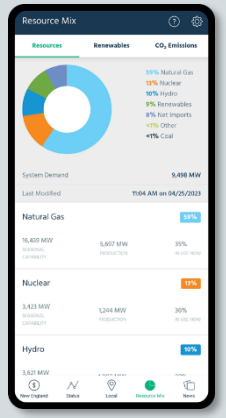

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