How and When Reliability Issues are Addressed
What's an RTEP?!?

FERC/RTO Training Session

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PART A – ***Current System Planning Processes Within an RTO***

I. Introduction to Planning Processes and Requirements

II. How to Read an RTEP – Common Sections of Annual Planning Reports

III. Notable Studies Under Consideration in Regional Markets

Part B – *Best Practices for Improving System Planning and Reliability Issues*

I. More Accurate Assessments of Regional Load Forecasts

II. Timely Planning for At-Risk Unit Retirements

III. Comparable Treatment of Non-Transmission Alternatives

FERC Requirement of Regional Planning
Attachment K

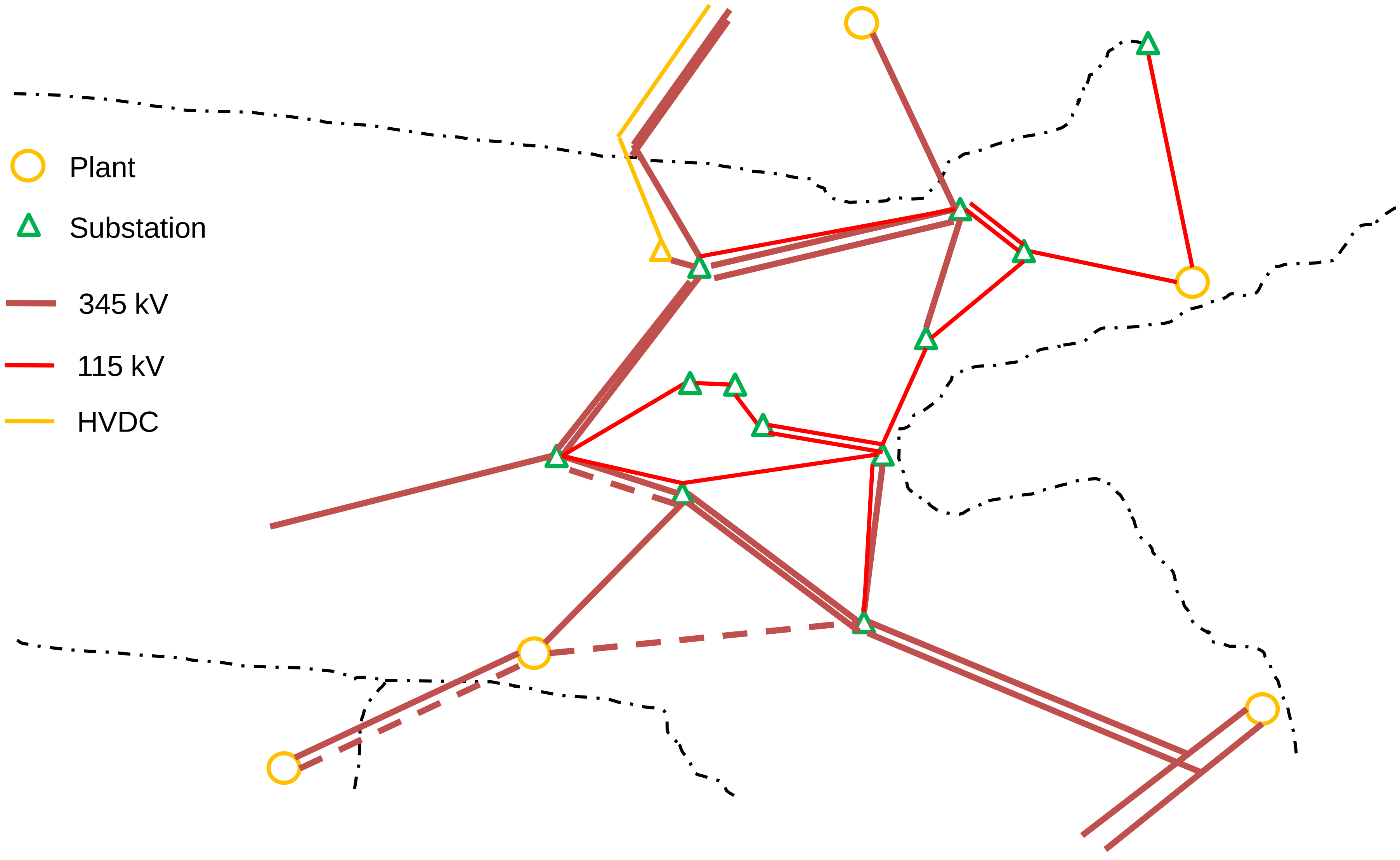
In FERC Order 890, issued February 16, 2007, the Commission required each Transmission Provider to establish a coordinated, open and transparent planning process to ensure that the regional transmission system is planned to meet system needs on a comparable and nondiscriminatory basis.

The Order also required each Transmission Provider's planning process to satisfy the following nine principles: (i) coordination; (ii) openness; (iii) transparency; (iv) information exchange; (v) comparability; (vi) dispute resolution; (vii) regional participation; (viii) economic planning studies; and (ix) cost allocation for new projects.

<u>Bottom Line</u>: RTOs *have to* engage in planning. Our role is to make sure that clean energy resources/policies get a fair shake in the process.

Who Cares?

A Very Simple Transmission Map



Major Components of an RSP or RTEP

Most Regional System Plans include:

- Forecasts of future peak loads (the demand for electricity) for shorter- and longer-term planning horizons.
- Information about the amounts, locations, and characteristics of market resources that can meet system needs to satisfy demand.
  - Market Resources include traditional generation, renewable resources, demand-side resources (EE and DR), behind-the-meter and distributed generation resources,
- Descriptions of transmission projects for the region that could meet identified needs, project status and cost estimates.
- Results of Economic studies, Production Cost studies and Power Flow studies to determine the grid's ability to tolerate various resource options and demand needs.
- Analyses of Future Scenarios, selected and developed by stakeholders, to help the region prepare for a series of uncertain futures.

Approaches to Planning

MISO Board-Approved Guiding Principles for System Planning:

- **Guiding Principle 1**: Make the benefits of a competitive energy market available to all customers by providing access to the lowest possible delivered electric energy costs.
- **Guiding Principle 2**: Provide a transmission infrastructure that safeguards local and regional reliability and supports interconnection-wide reliability.
- **Guiding Principle 3**: Support state and federal renewable energy objectives by planning for access to all such resources such as wind, biomass, and demand-side management.
- **Guiding Principle 4**: Provide an appropriate cost allocation mechanism.
- **Guiding Principle 5**: Develop a transmission system scenario model and make the model available to state and federal energy policy makers to provide context and inform the choices they face.

Section I. Load Forecasting Methodologies

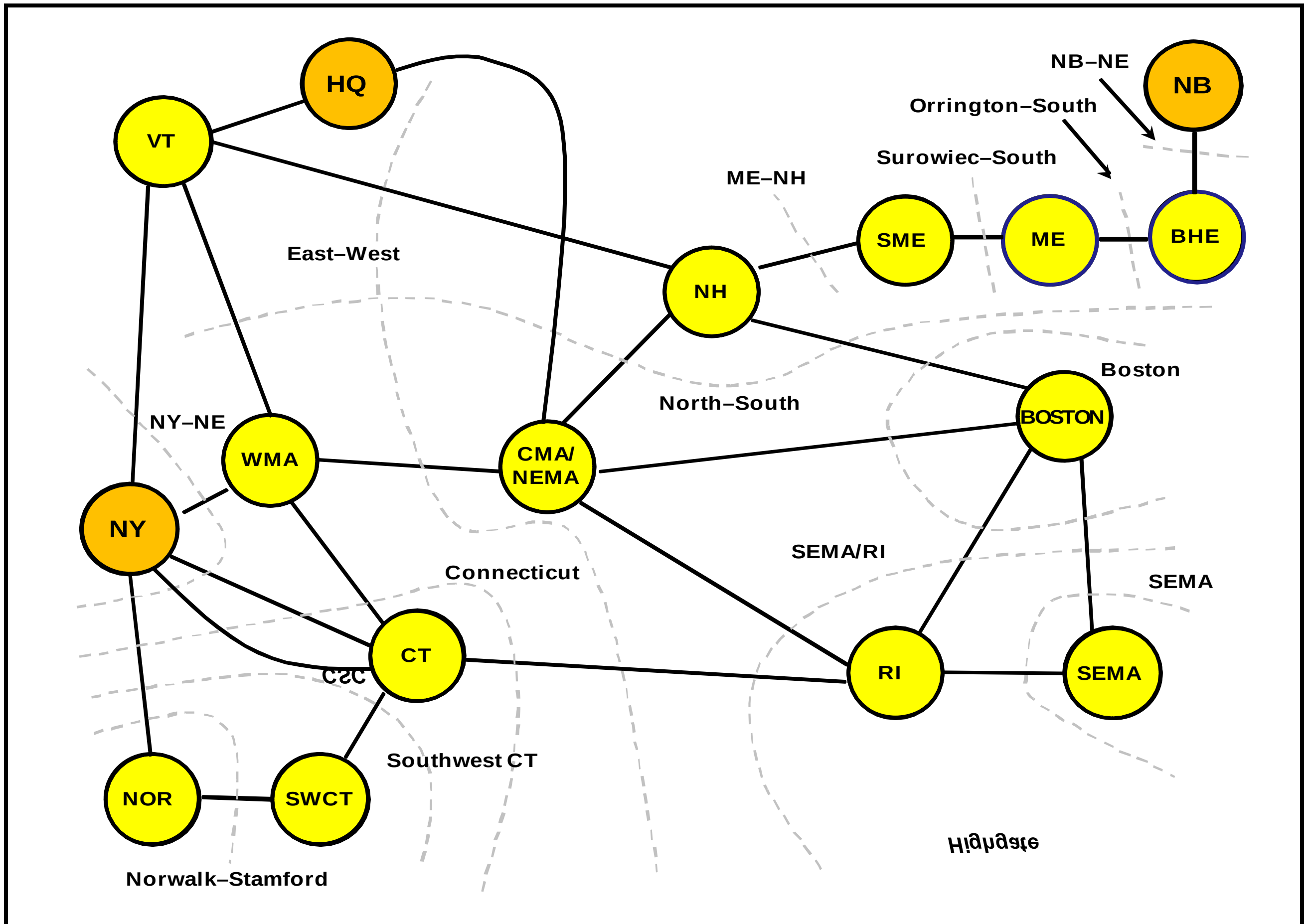
- Describes the economic and demographic factors that drive forecasts and explains the forecast methodology
- Summer and Winter Peaks and Net Energy for Load
- 50/50 “Reference” Case Peak Loads v 90/10 “Extreme” Case Peak Loads
- Assumptions about Demand-Side Resources and their Impacts on Future Demand Forecasts
- Region-wide and localized load forecasts

Section II. Resource Adequacy and Capacity

- Installed Capacity Requirement – the amount of capacity a region's power system needs to meet its resource adequacy and reliability requirements.
- Forward Capacity Markets: Passive and Active Demand Resources
- Loss of Load Expectation Analysis
- Generating Units in the Generator Interconnection Queue
- Ensuring Deliverability

Section II. Resource Adequacy and Capacity, p. 2

Transmission Interfaces and RSP Areas.



Section III. Transmission Upgrades

- Transmission Planning
  - Regular Needs Assessments
  - Load Growth Forecasts
  - Aging Infrastructure Assessments
  - Solutions Studies to Compare Resource Options

- Project Lists and Project Costs

<u>The MISO Example</u>

After system requirements have been determined, stakeholders begin a process to identify and select system solutions. Projects are proposed and categorized into Appendices A, B and C depending upon their value and feasibility. When first submitted, projects are listed in Appendix C. They are moved to Appendix B after MISO has documented their need and effectiveness, and to Appendix A after gaining approval by MISO's Board of Directors

Section III. Transmission Upgrades, p. 2

Appendix A Projects are:

- Recommended by MISO staff and approved by MISO's Board of Directors
- Required to meet reliability, economic or public policy requirements
- Eligible for regional cost-sharing after review process completed by MISO staff and stakeholders

Appendix B Projects are:

- Still in the planning process or the review and recommendation process
- Analyzed to ensure that they address a transmission need
- Ineligible for regional cost sharing because review is not completed

Appendix C Projects are:

- Long-term conceptual projects still in the early stages of the planning process
- Un-reviewed for need or effectiveness and ineligible for cost sharing
- Not included in power flow reliability analyses due to their uncertainty

Section IV. Fuel Diversity

- Importance of Fuel Diversity/Risks

- Resource Options: Traditional Generation, Natural Gas-based, Oil-based, Nuclear, Hydroelectric, Wind and other Renewable Resources
  - Renewable Resource integration increases fuel diversity
  - Retirements can threaten fuel diversity (if you turn off coal, what do you turn on?)

- Implications
  - Economic: Economic conditions and global events can create price shocks to specific fuel sources and require other fuel sources to fill gaps;
  - Reliability: Hurricane Katrina, Fukushima
  - RTO must be assured that it can operate in each hour of the year

Section V. Environmental Regulations

- EPA Rule Impacts
- Power Plant Emissions
- State-based Energy Efficiency Mandates
- Renewable Portfolio Standards

Section V. Environmental Regulations, p. 2

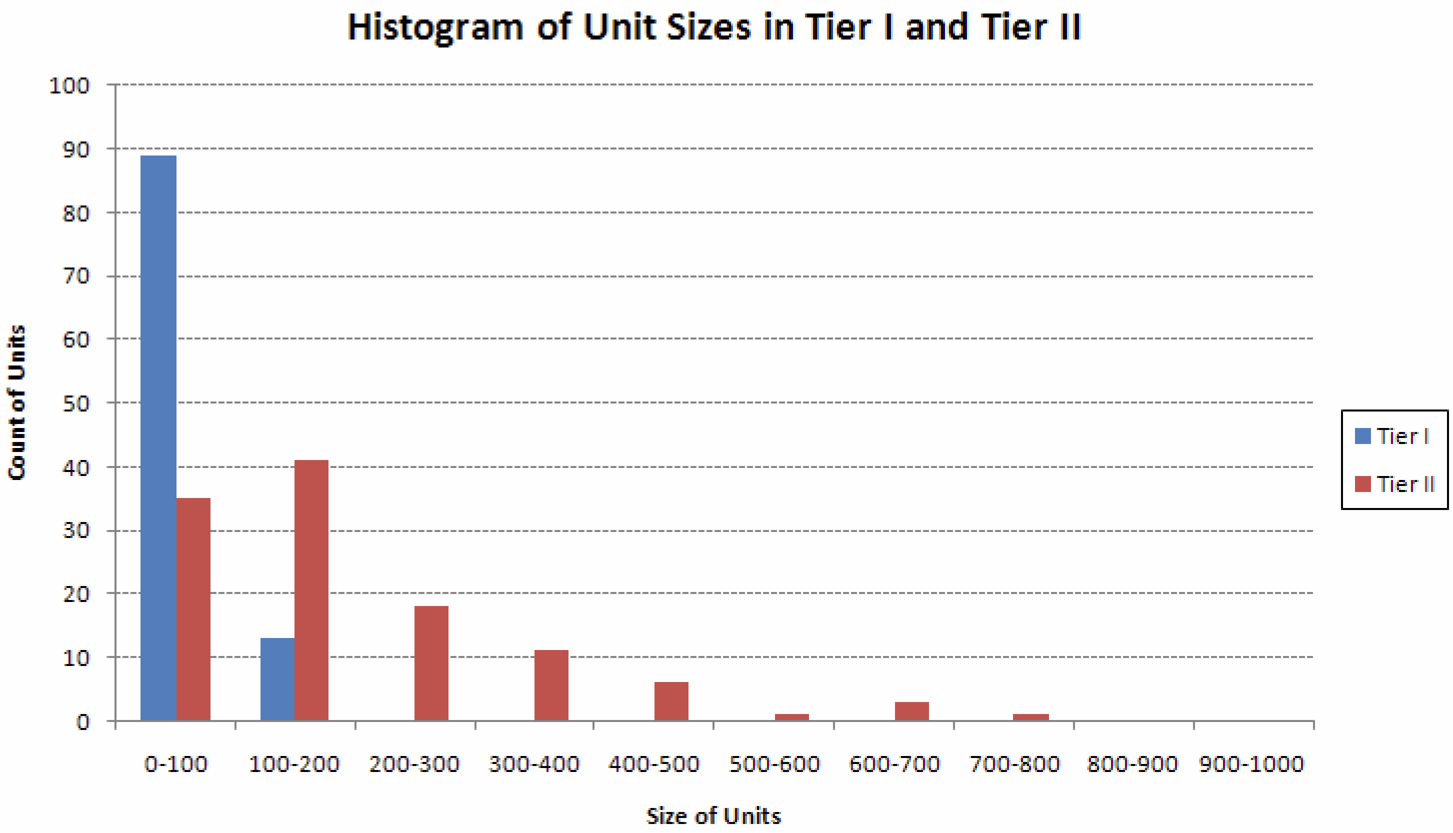
Improved RSPs and RTEPs have Responded to Environmental Advocacy as annual system plans have begun to include Sections on:

- The potential for on- and off-shore wind and other renewable resource integration;
- Assessments/Integration of demand-side resources including demand response, energy efficiency and distributed generation;
- Impacts from State and Federal Environmental Regulatory Policies and Mandates;
- Integration of New Technologies, including Smart Grid, Storage, Plug-In Hybrid Electric Vehicles and other Advanced Grid Technologies;
- Carbon and Environmental Pollutant Emissions Data
- Assessments of Impacts of Proposed EPA Emission Rules on Unit Retirements

The Goal remains to convince planning authorities to analyze these data inputs, and plan the system in a manner that accounts for the impacts of clean energy resources and policies.

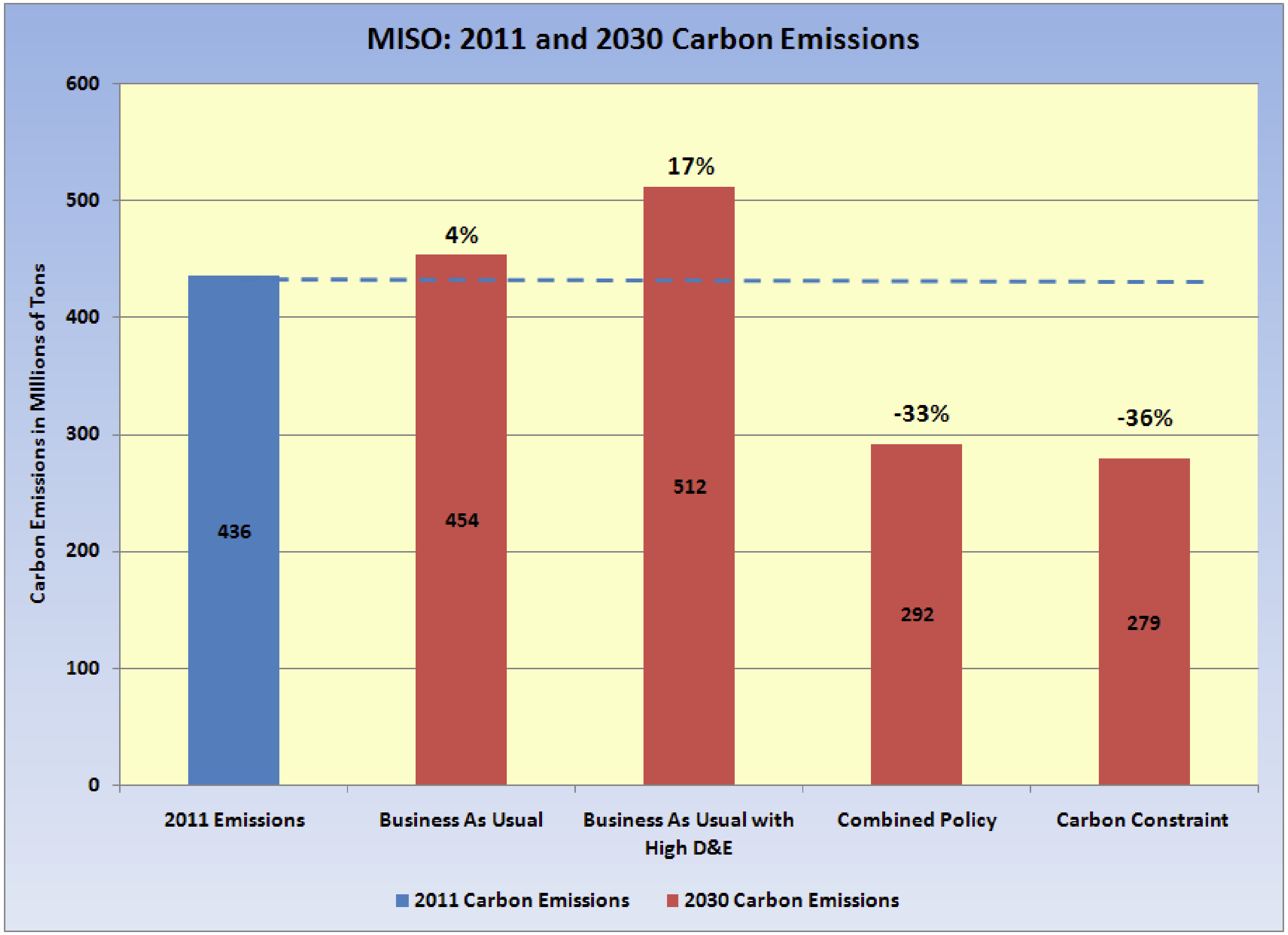
Section V. Environmental Regulations, p. 3

Data from MISO EPA Regulation Impact Analysis



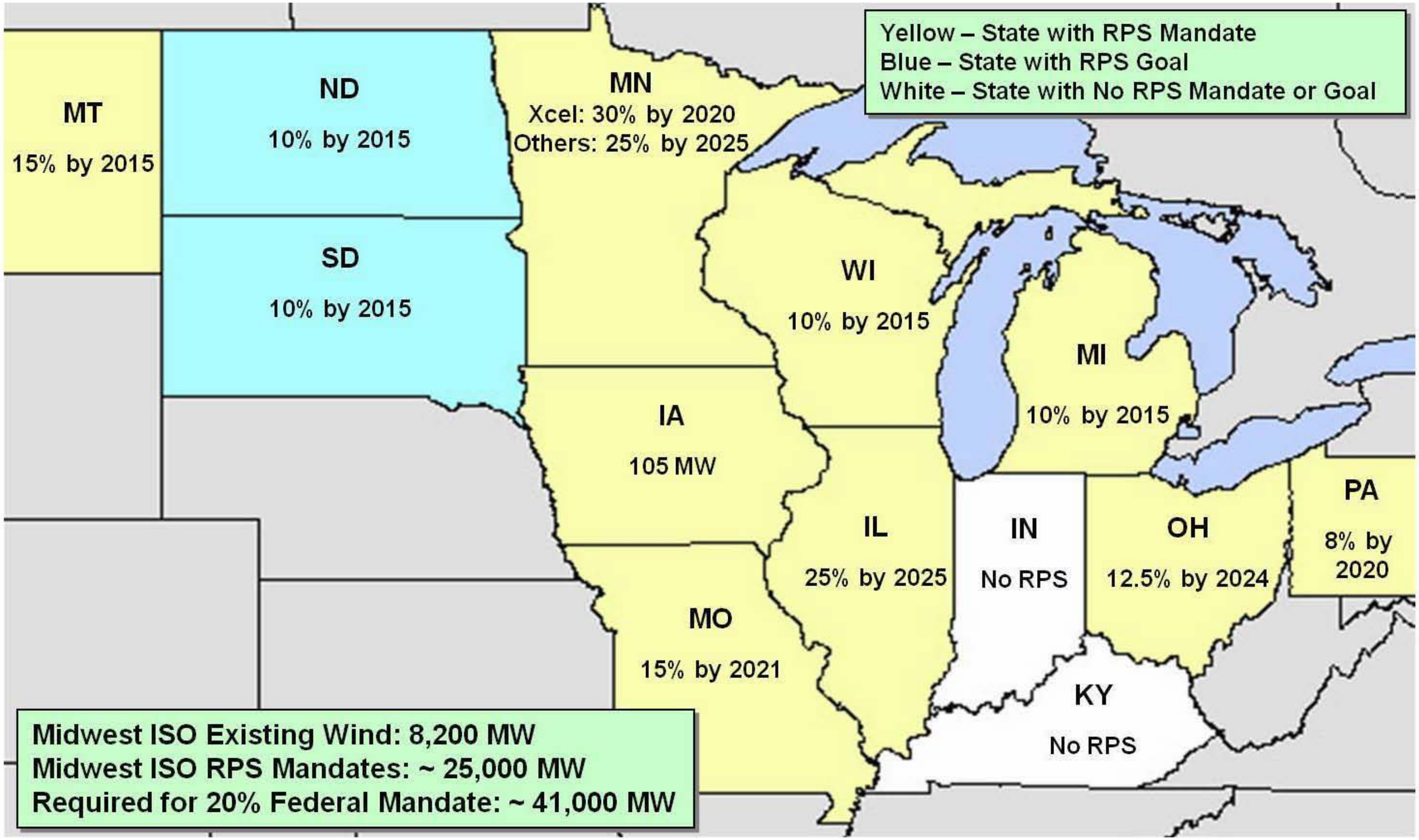
Section V. Environmental Regulations, p. 4

MISO Carbon Emissions in 2011 and 2030



Section V. Environmental Regulations, p. 5

State RPS Requirements Considered in MISO RGOS Analysis



Section VI. New Technologies

- Smart Grid
- Active Demand Resources
- Variable Output Generation
- Storage

Each region is *exploring* these resources, but only as pilot programs, until more hard data becomes available.

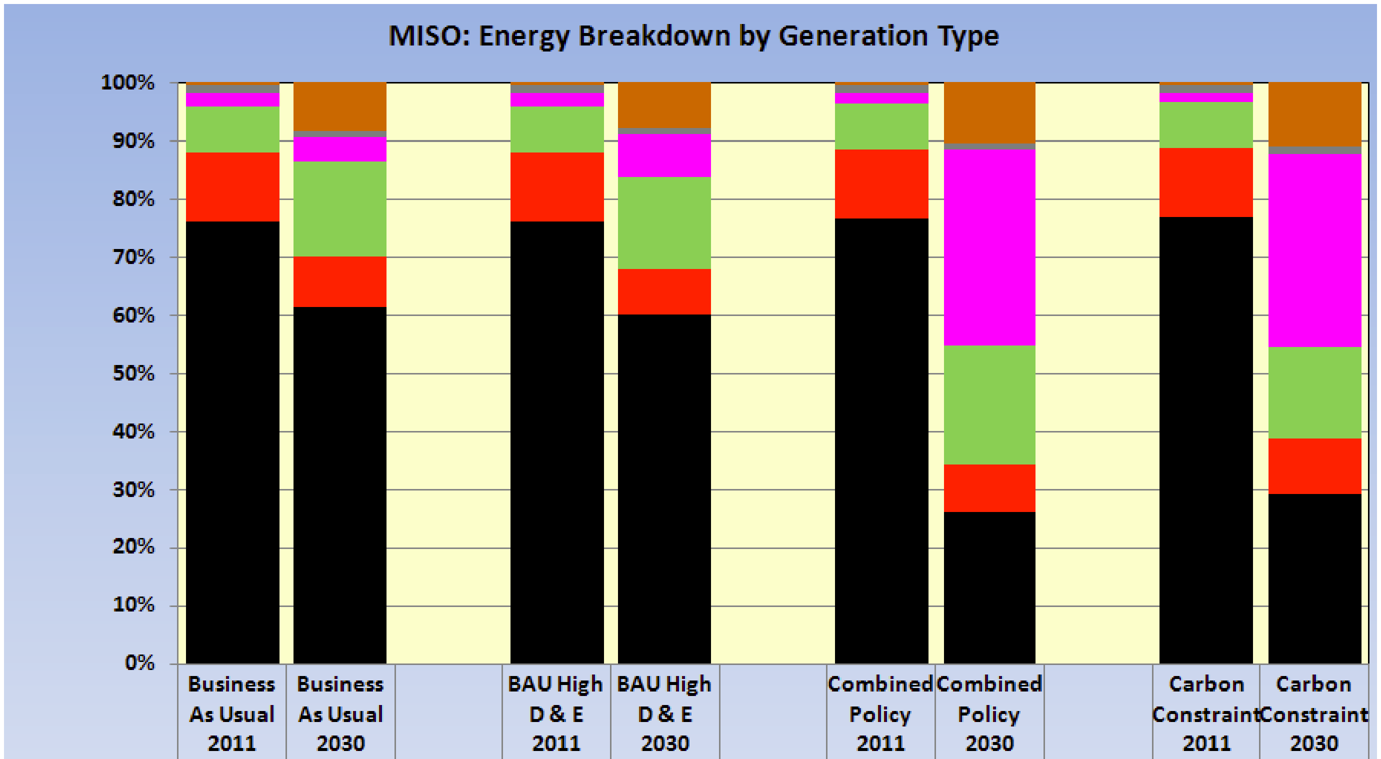
Quote from MTEP 2010: In MTEP11, Midwest ISO plans to more fully explore the potential benefits of a variety of energy storage technologies. Midwest ISO also plans to consider energy storage as a resource option in planning models and future-based scenarios. *If enough interest is expressed*, an entirely new scenario may be developed and evaluated in the MTEP11 planning cycle.

Section VII. Economic, Power Flow and Production Cost Studies

- Development of Resource/Future Scenarios

- Modeling and Assumptions
  - Fuel resource prices
  - Emissions rates
  - Demand side resource costs
  - Resource availability
  - Forecast projections

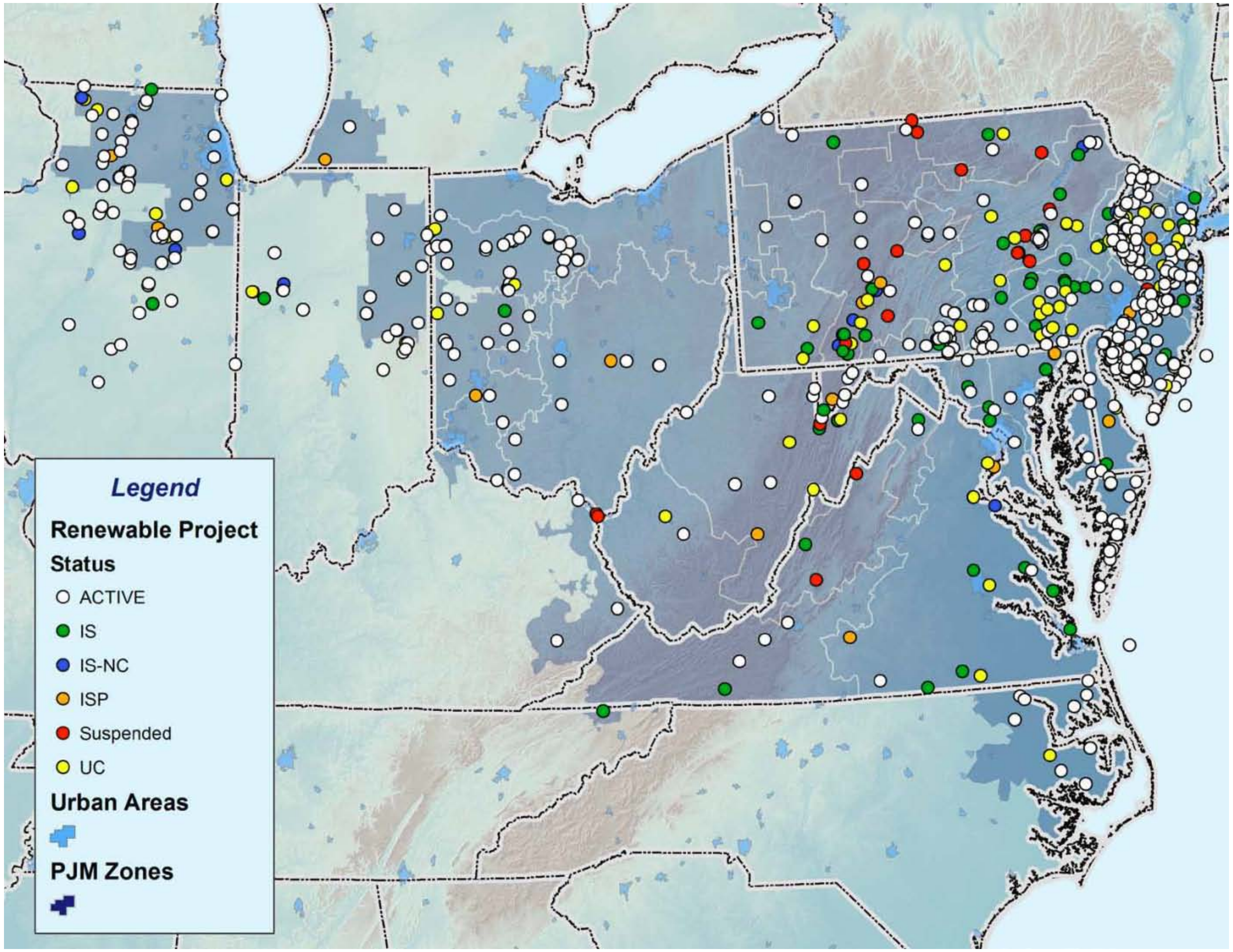
Section VII. Economic, Power Flow and Production Cost Studies, p. 2



	Business As Usual 2011	Business As Usual 2030		BAU High D & E 2011	BAU High D & E 2030		Combined Policy 2011	Combined Policy 2030		Carbon Constraint 2011	Carbon Constraint 2030
DSM	0%	8%		0%	8%		1%	10%		1%	11%
Other	1%	1%		1%	1%		1%	1%		1%	1%
Gas	2%	4%		2%	7%		2%	34%		2%	33%
Renewable	8%	16%		8%	16%		8%	20%		8%	16%
Nuclear	12%	9%		12%	8%		12%	8%		12%	9%
Coal	76%	61%		76%	60%		77%	26%		77%	29%

Section VII. Economic, Power Flow and Production Cost Studies, p. 3

PJM Sensitivity Study Renewable Energy Projects



Section VIII. Economic, Power Flow and Production Cost Studies, p. 4

PJM estimates of State Programs through 2025:

Year	Demand Resources	EE
2010	3001	471
2011	3241	1,216
2012	4012	2,030
2013	4829	3,167
2014	5,757	4,127
2015	6,943	5131
2016	7,624	5,688
2017	8,300	6,238
2018	8,976	6,792
2019	9,511	7,516
2020	10,285	8,489
2021	10,295	9,042
2022	10,304	9,579
2023	10,312	9,986
2024	10,324	10,399
2025	10,811	11,241

Section IX. Inter-Regional/Interconnection-Wide Planning

- IPSAC Process
- EIPC/WECC Processes
- PJM/MISO Joint Operating Agreement
- MISO/SPP Joint Future Scenario Development
- FERC Rule on Planning & Cost Allocation

Notable Studies

- PJM Off-Shore Wind Conceptual Study
- MISO RGOS Candidate Multi-Value Projects
- PJM and MISO EPA Regulation Impact Analysis
- ISO New England Energy Efficiency Load Forecast Process
- MISO Global Energy Partners Assessment of DR and EE

Finally, single-state ISOs planning processes, as in New York ISO and California ISO are often driven by state goals:

- *New York's 15% by 2015 Energy Efficiency Mandate; and*

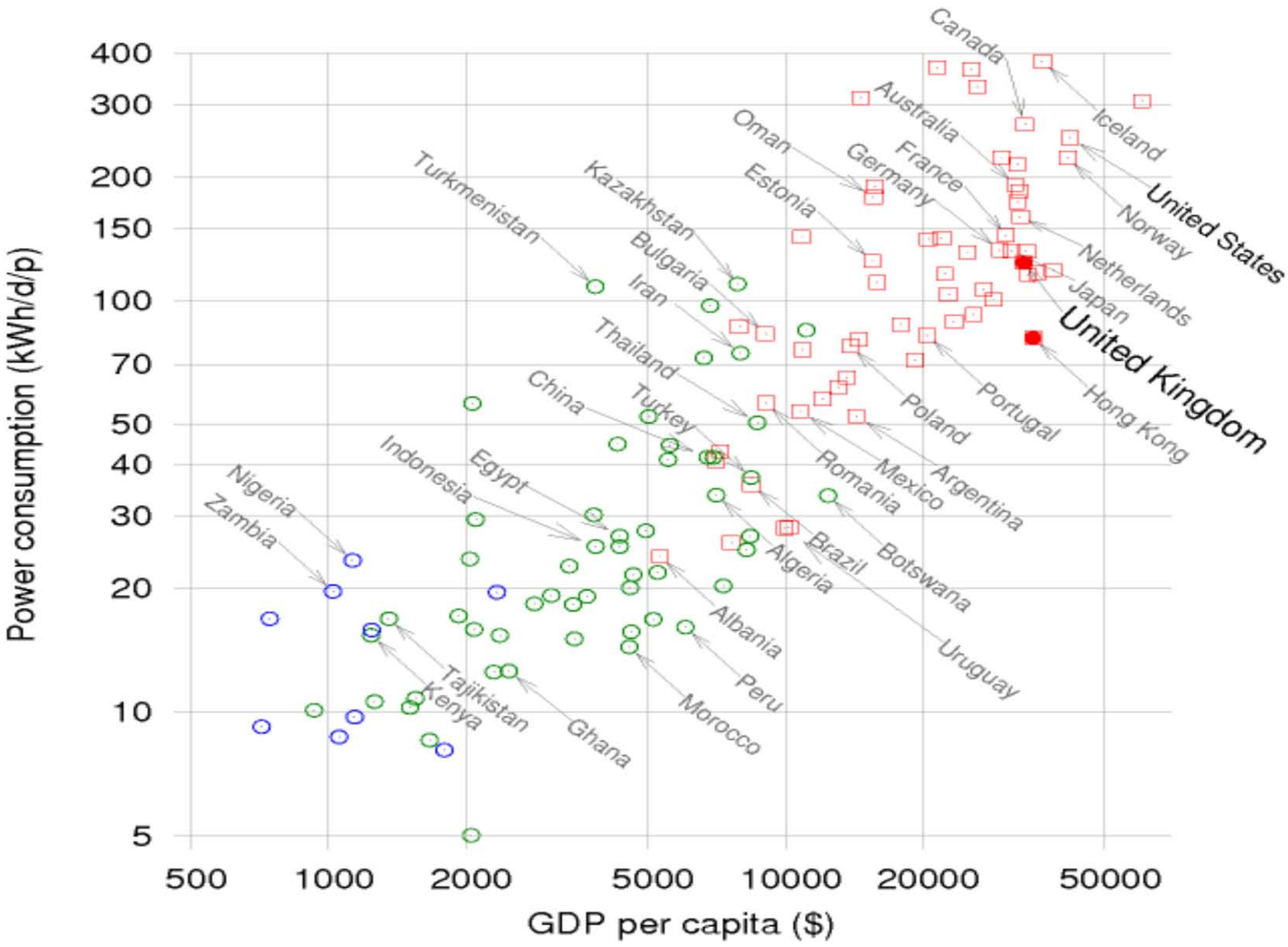
- *California's 33% Renewable Portfolio Standard*

Part B - Best Practices for System Planning

Three Topics

- Current planning deficiencies
- Improvements to planning analyses
- Developing system solutions

Part B - Best Practices for System Planning

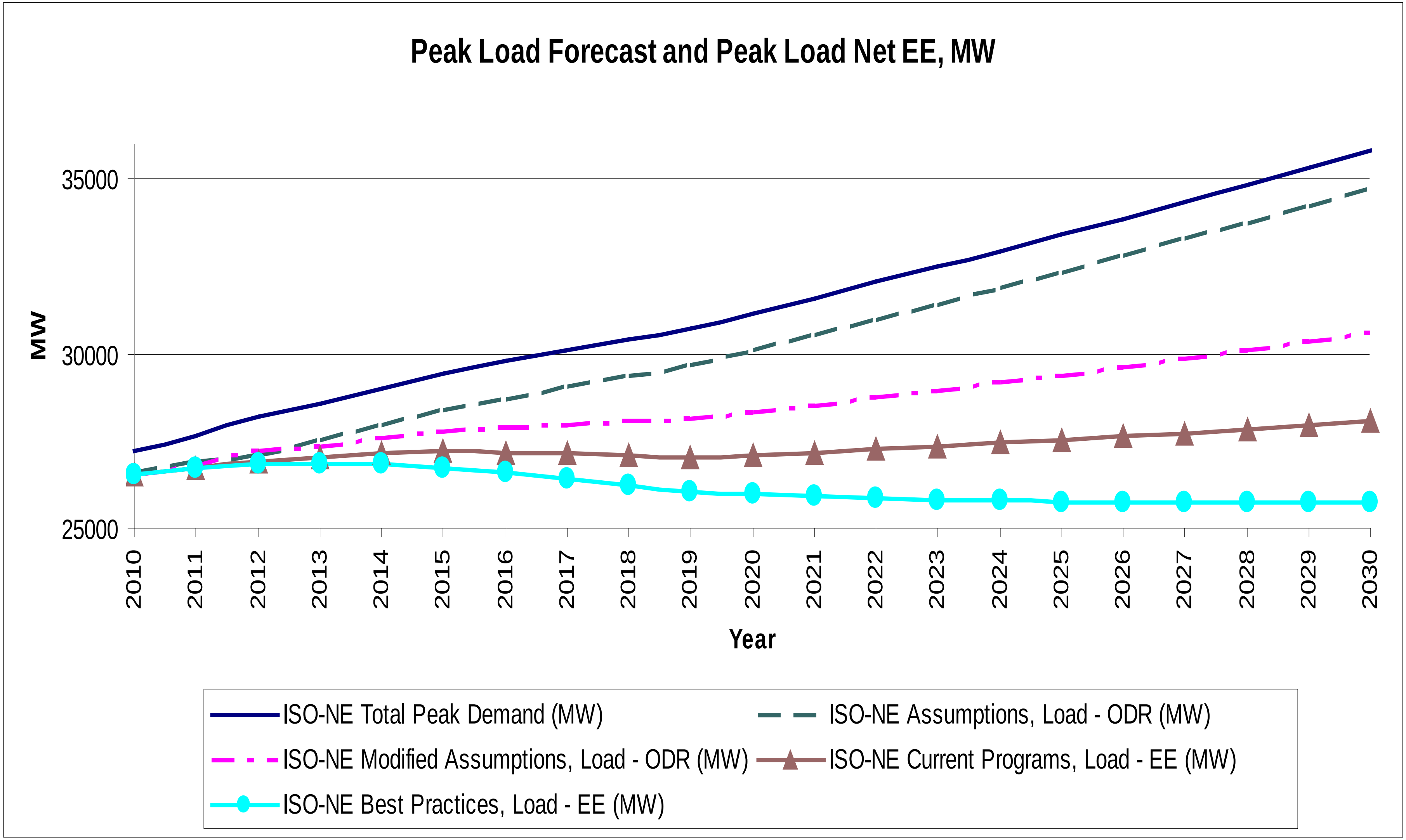


Part B - Best Practices for System Planning

Current deficiencies

- Forecasting
  - Estimating future peak loads and annual energy consumption
  - Estimating quantity and timing of new resources
    - EE
    - DR
    - DG
    - RPS
    - FiT
    - Traditional generation
    - Other?
- At-risk resources
  - Address retirements after resource owner has made that choice; provides insufficient time to analyze issues, develop options, and implement best solutions
- Upgrade solutions
  - System stressing assumptions
  - Address all reliability violations with transmission system upgrades; larger wires are better (if everything is a nail, use a big hammer)

Forecasting example #1

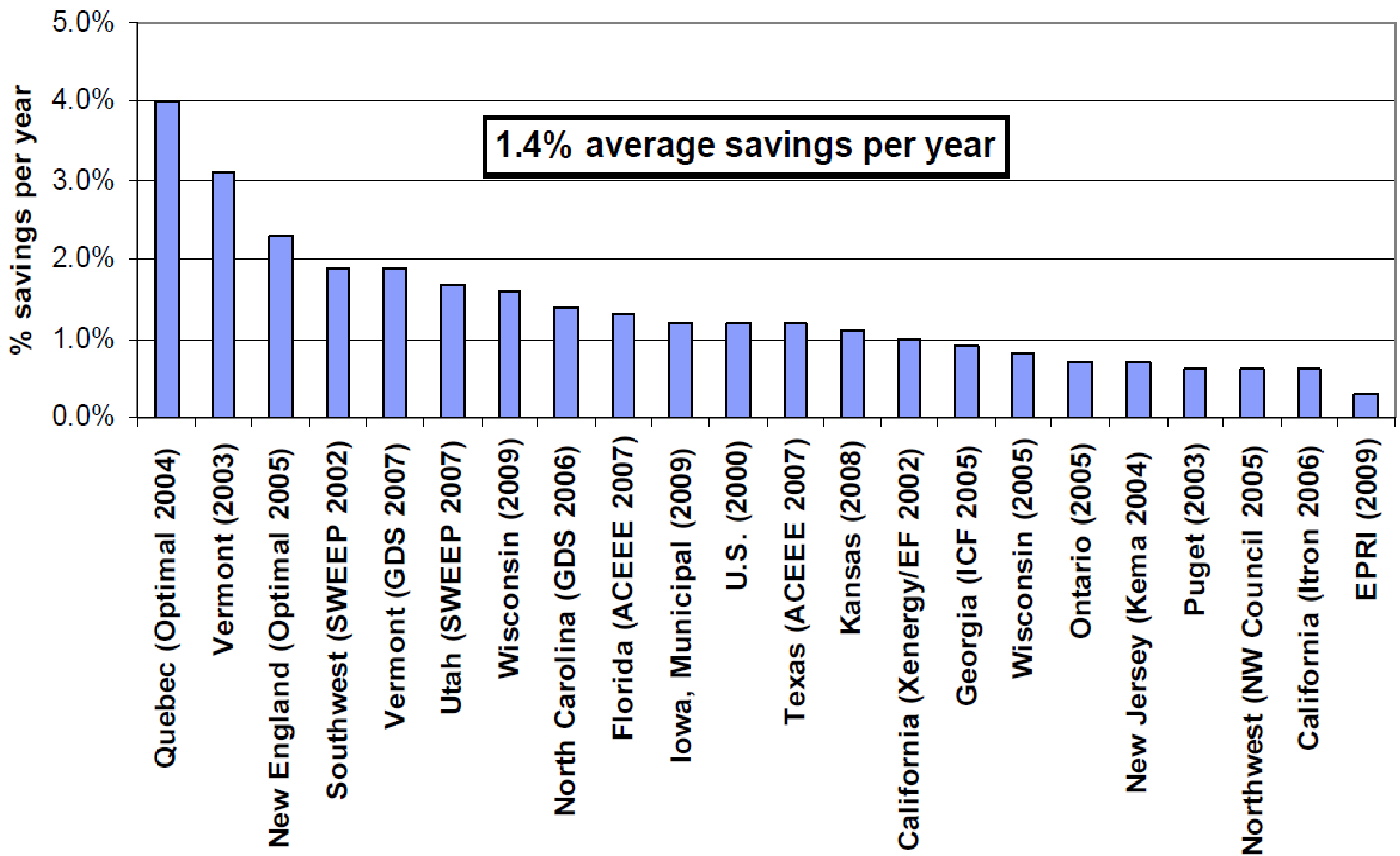


Forecasting example #1

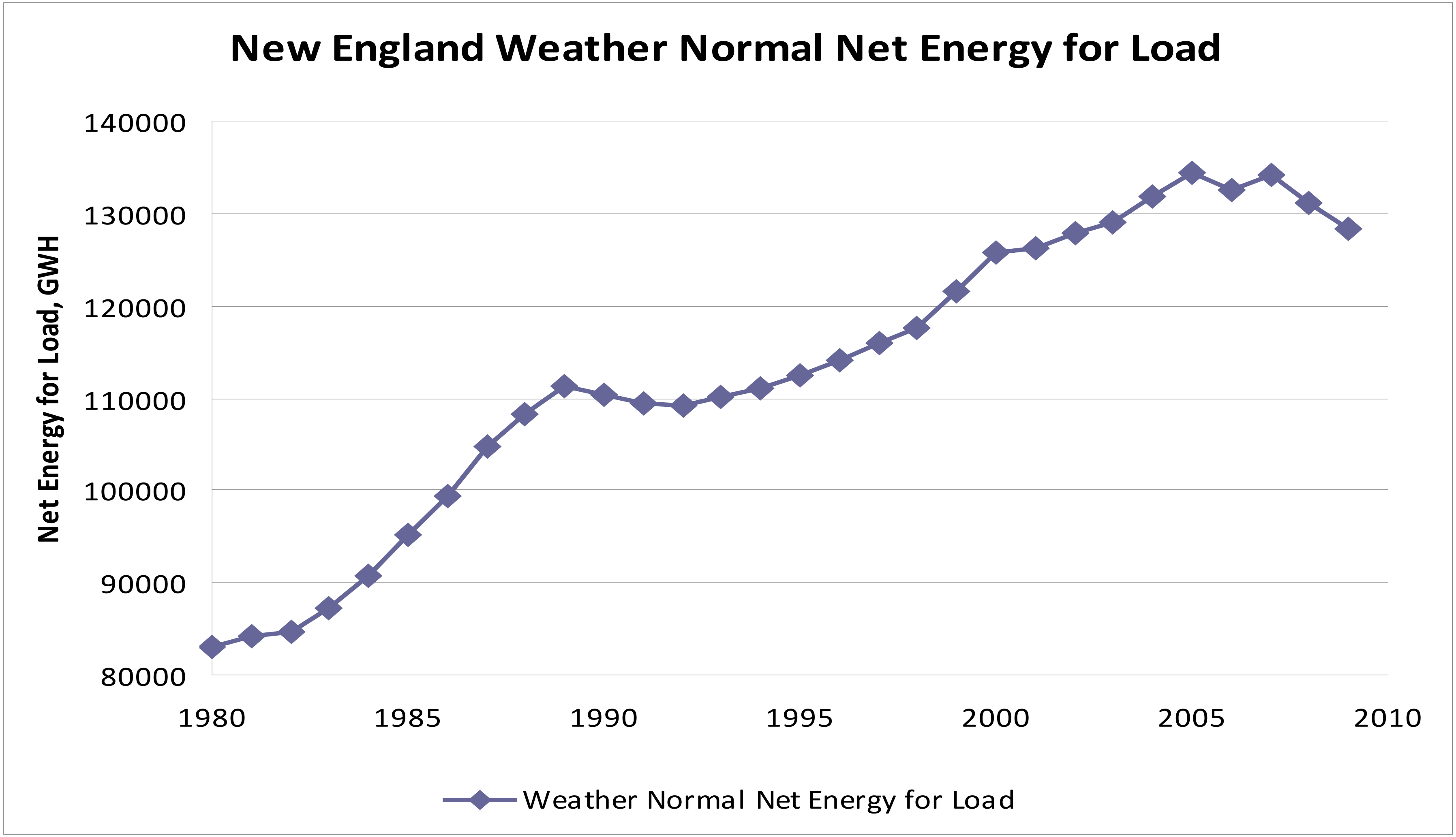
Five Cases

- Base forecast with no EE reductions
- ISO-NE: FCA EE values and zero for future
- Modified ISO: FCA EE average (~1%)
- Current Programs: 1.4% penetration
- Best Practices: 2.0% penetration

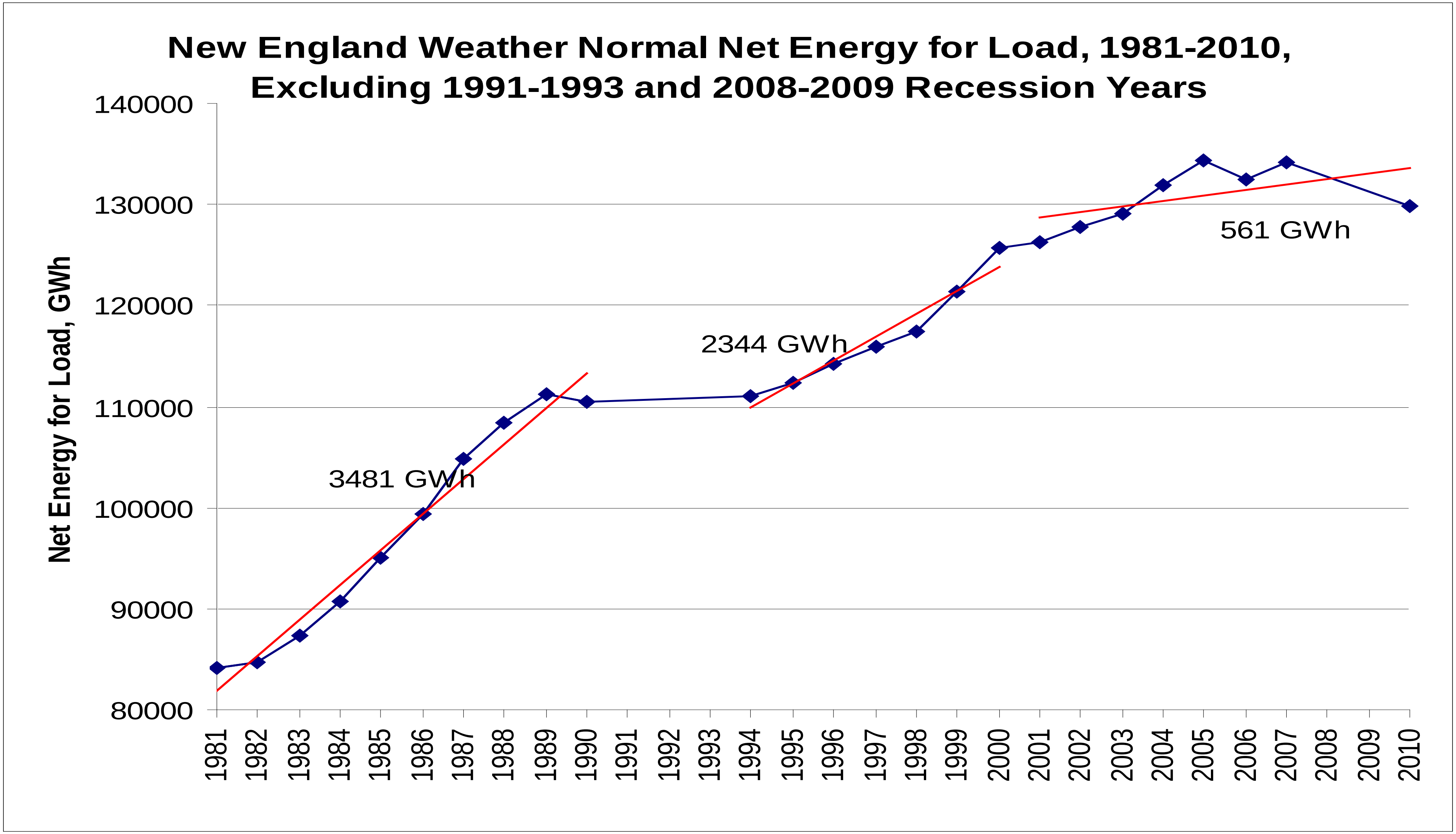
Forecasting example #1



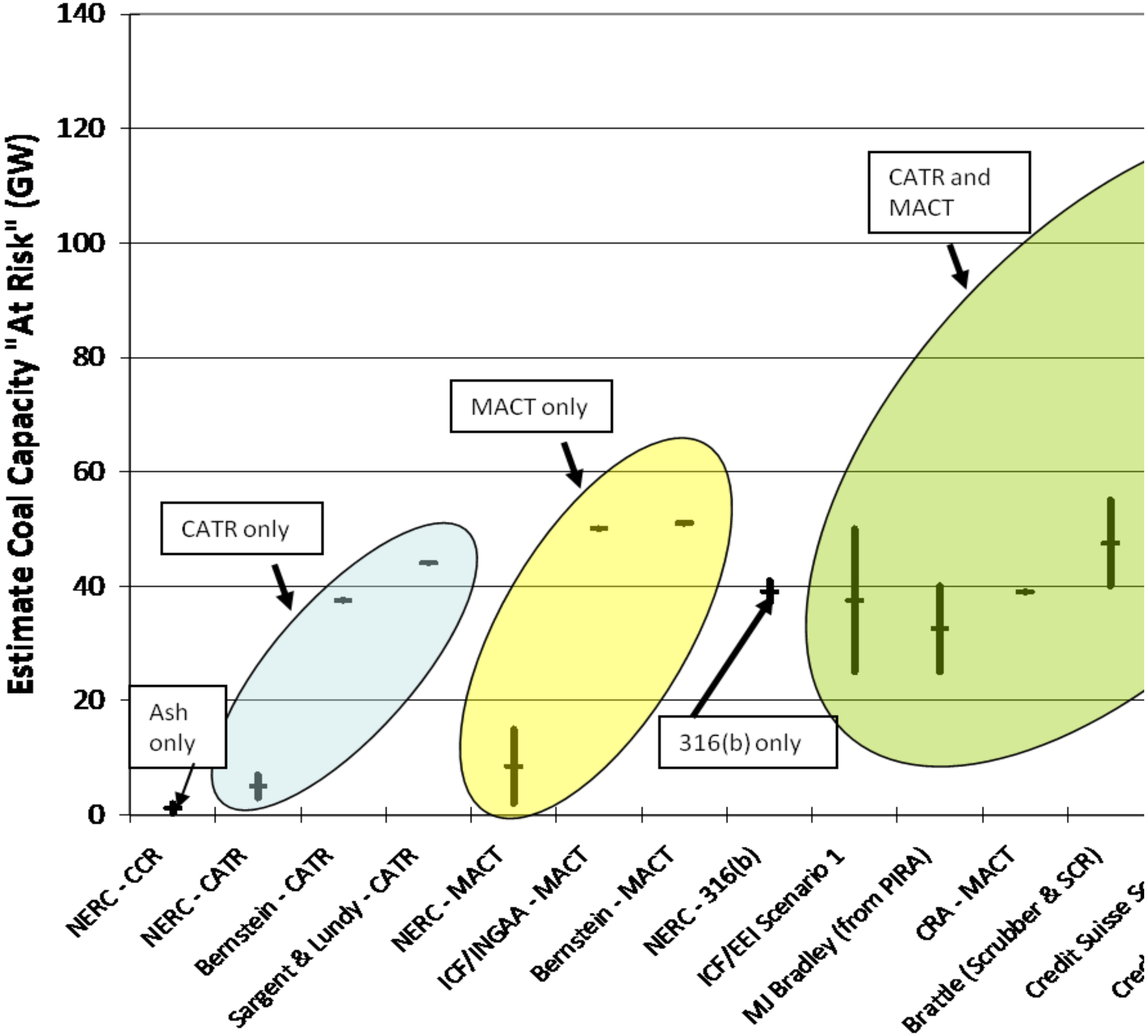
Forecasting example #2



Forecasting example #3



At-Risk Resources example #1



At-Risk Resources example #2

MW of summer coal capacity without necessary SO2 and NOx controls

	PJM RTO	MAAC	Rest of PJM
Total Coal	22,849	6,326	16,523
Coal > 40 years	17,724	5,652	12,072
Coal < 400 MW	15,237	5,338	9,899
Coal > 40 years, < 400 MW	14,680	5,094	9,586

Source: PJM EIA-411 Submittal as of January 1, 2009 and
United States Environmental Protection Agency Database of Unit Characteristics
MW of Summer Net Dependable Capacity

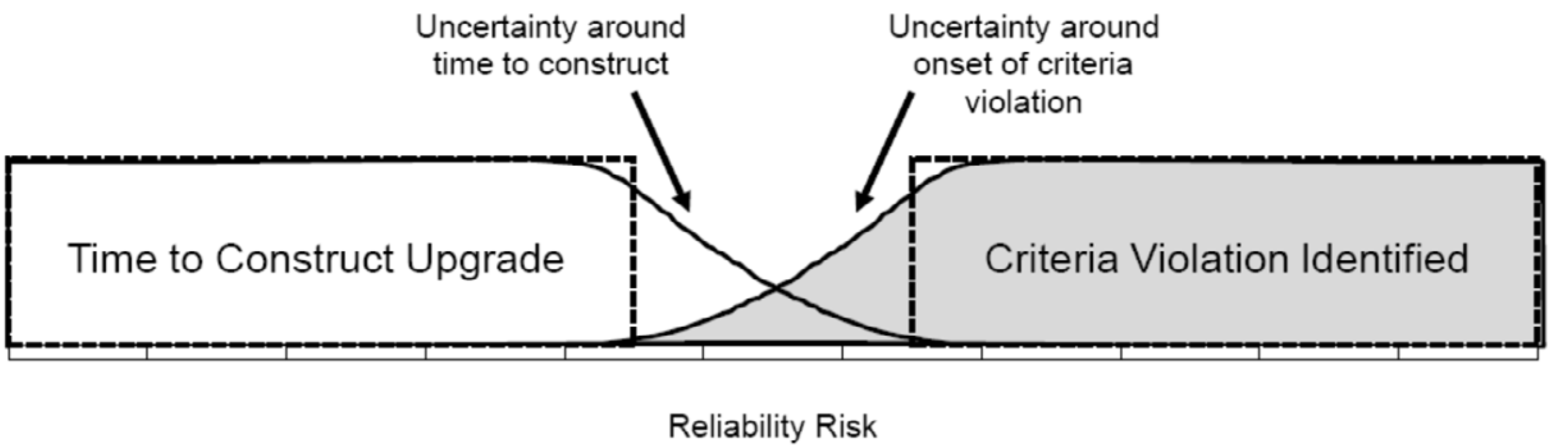
At-Risk Resources example #3

PJM estimates of at-risk coal generation for the PJM footprint

Environmental Controls	MW of summer coal capacity, Coal > 40 years, < 400 MW
Without necessary SO_2 controls	16,830
Without necessary SO_2 and NO_x controls	14,680
Without necessary mercury controls	14,806
Using once through cooling	17,157

Upgrade Criteria

Uncertainty and bright line violation



Upgrade Analysis Process

- NY ISO Planning process
  - Risk of violation identified
  - Proposal from transmission provider
    - All resources alone or in combinations
  - RFP for solutions
    - All resources alone or in combinations
  - NY DPS review of application for solution
    - May issue its own RFP
  - Lowest cost solution for the upgrade
  - Cost allocation as per transmission upgrade
  - Cost recovery from transmission tariffs
- ISO-NE non-transmission alternatives (NTA) analyses
  - Demand response
  - Generation
- Northwest Power Conservation Council
  - Pioneer and leader in “non-wires” options