

Balancing Adequacy, Reliability, and Market Rules

Tom Kaslow

Director, Market Design & Regulatory Affairs – NE

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Overview

- Reliability & Adequacy - Basics
- Reliability & Adequacy – Rest of the Story
- Market Rule Change Process
- ISO New England's Chosen Path
- Conclusion



Reliability & Adequacy – The Basics

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The Basics

- While RTO tariffs parse reliability into a discrete set of obligations, standards and objectives, the desired end product is the same as it always was:
- Maintain uninterrupted electric supply to consumers,
- Avoid damage to transmission equipment, and
- Avoid harm to neighboring regions
- **Reliability** is assuring RTO can convert capacity into sufficient energy or operating reserves when needed to maintain uninterrupted electric supply to consumers
- **Adequacy** is the most forward looking RTO planning to assure that the set of resources *could* support firm electric supply needs (under various assumptions)



Adequacy Requirements

- Capacity (adequacy) requirements are based on a probabilistic evaluation of the quantity of aggregate resources needed to supply peak demand, assuming:
 - Historic resource mix
 - Historic forced outage and maintenance outage rates
 - Forecasted peak load distributions
 - Perfect hindsight unit commitment & dispatch
- Adequacy requirements are met with sufficient installed capacity commitments
- Audit demonstrations that stated capability can be achieved
- Obligation to offer available capacity into the spot energy market (and dispatch)
- Various consequences for unavailability or non-performance
- Adequacy that does not assure reliability is meaningless



Reliability & Adequacy – The Rest of the Story

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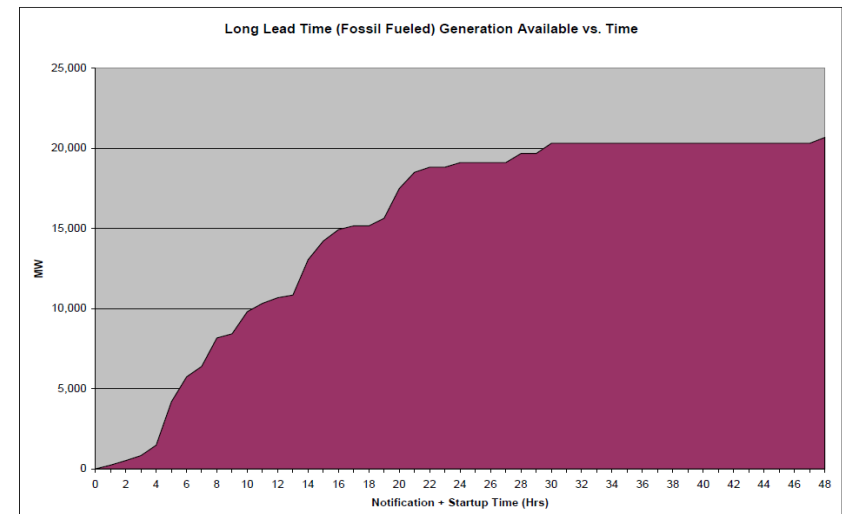
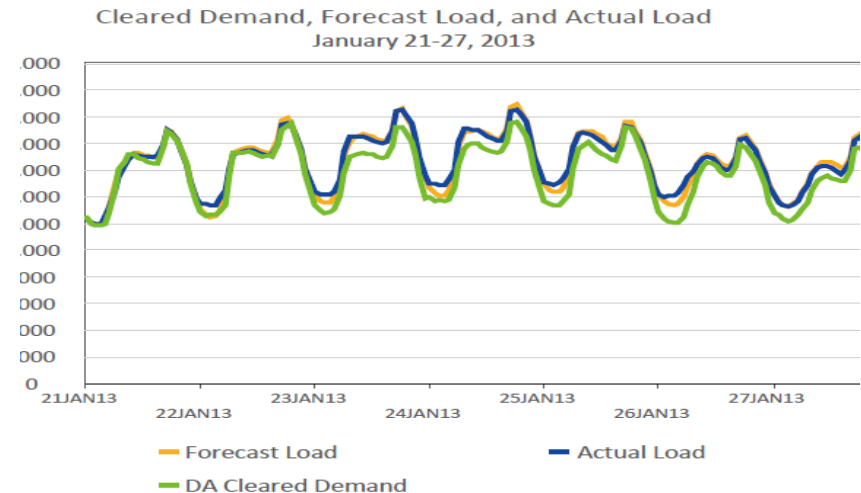


Simply holding steel in the ground up to the adequacy requirement may not be “adequate”

- Perfect hindsight dispatch is not possible – so mix matters
- Not all resources can provide the same flexibility
- Not all present the same energy economics (low forced outage rate on resources rarely asked to run may contribute less)
- Forced outage rate may not tell the whole story
- Adequacy not worth much if RTO cannot convert capacity into sufficient energy and operating reserves to maintain reliability

I'm available but you should have called me earlier...

- For various reasons, not all reliability needs are anticipated well in advance
- Under-cleared day ahead demand
- Missed forecasts
- Contingencies
- Shorter start & higher ramping resources can permit short notice energy conversion
- Longer start resources may not meet all RTO energy conversion needs
- Availability without accessibility will not keep the lights on

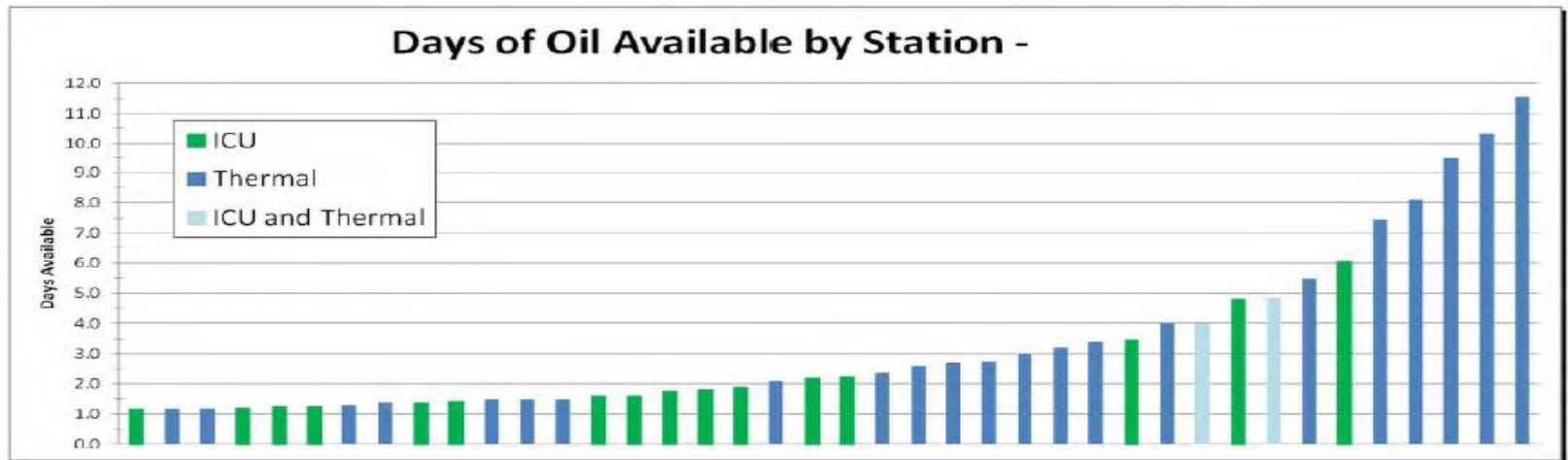


Let's hope it all works out...

- “Availability” in adequacy evaluations is typically based on the historical absence of a planned or forced outage
- Outages that would have resulted if dispatch had occurred are not known
- Latent failures
- Equipment
- Fuel
- Reported outage history may not be the whole story – particularly for rarely run resources



I'm available today...but I can only help out for a day or two



■ Fuel access becoming a bigger issue – weak performance signals

■ Natural gas

■ Transportation priority, volume, timing

■ Oil/Coal

■ Inventory & replenishment

■ The market will get exactly what it signals – important to get it right



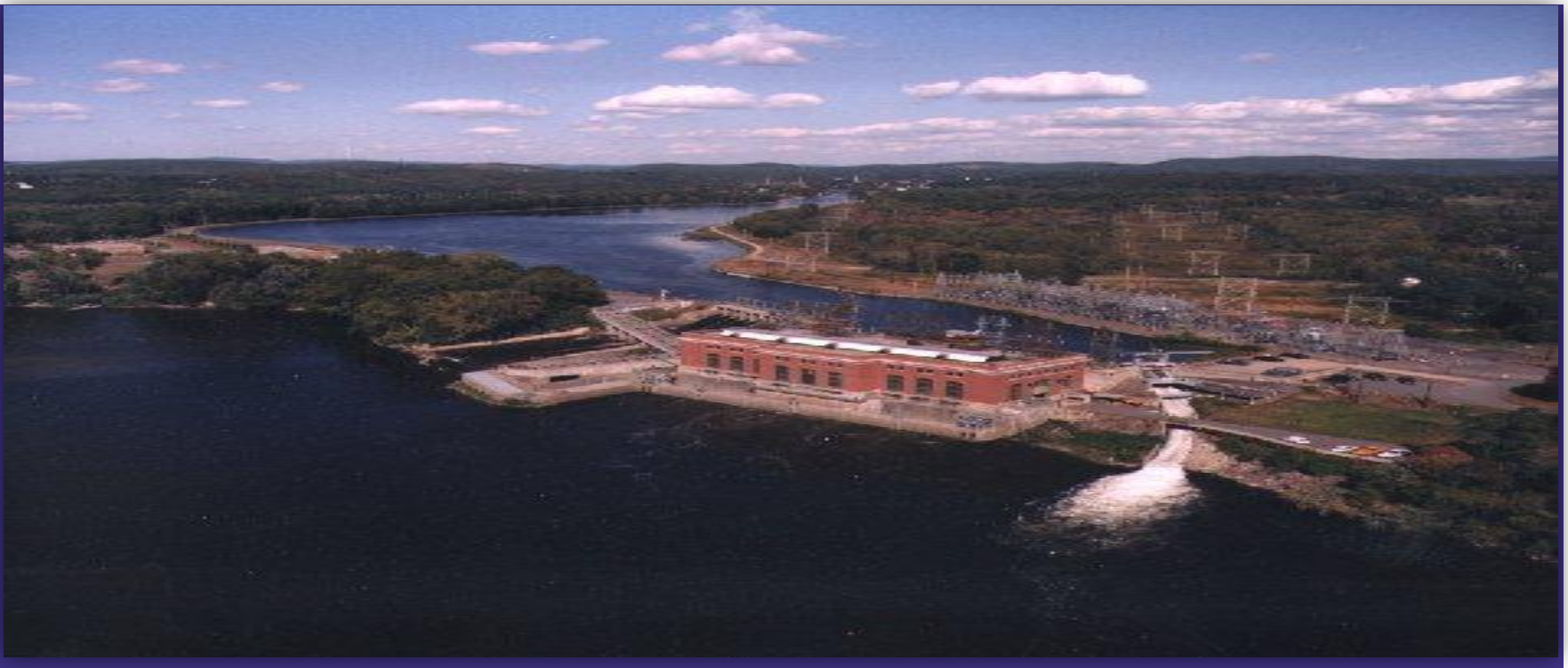
Adequacy assumptions must be fulfilled somewhere

- Two high level choices:
 - Hold a class of commercial entities responsible to assure ability to convert capacity into sufficient energy and operating reserve
 - Develop more complex adequacy/market requirements
- Account for latent failures
 - Improve forced outage measurement (presumably higher capacity reqt)
- Accounting for inflexibility
 - Break the requirement into tranches
 - Require balanced day ahead schedules (& maximum 12-hour start), else require load server to present adequate flexible reserve
 - Improve real-time energy price formation
- And, hope you have covered everything sufficiently!



Energy & ancillary service markets have their shortfalls too

- Market monitoring & energy sellers both face challenges
- Energy market prices often do not reflect the most expensive energy dispatched
- Under-cleared demand suppresses day ahead energy prices
- Causes of real time energy/reserve market price suppression
 - RTO over-forecast
 - “Lumpy” resources
 - Economy imports
 - Bid caps/administrative pricing capping
 - Reserves only valued when run out of them
- Making capacity market compensation even more important



The Market Rule Change Process

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It's more complicated now

- When a single utility developed an integrated plan with assured recovery through regulated rates, pointed-fingers had one target
- Current situation is more complicated:
 - RTOs are generally held to reliability standards, but they do not own or control the assets
 - Disaggregated wholesale supply services have blurred the connection between serving load and the full responsibility to make that happen
 - Reliability concerns ultimately result in finger pointing to the merchant generator owners (and RTO) even if the reliability service isn't *procured*
 - Short term cost avoidance incentives invite opposition to good/needed market changes
 - While getting it right at the outset is the most efficient, workarounds are often easier to achieve

The RTO perspective

Steady State	Risk of Losing Resources	Crisis
Reliability Competitive Markets Cost of Reliability	Reliability Competitive Markets Cost of Reliability	Reliability Competitive Markets Cost of Reliability

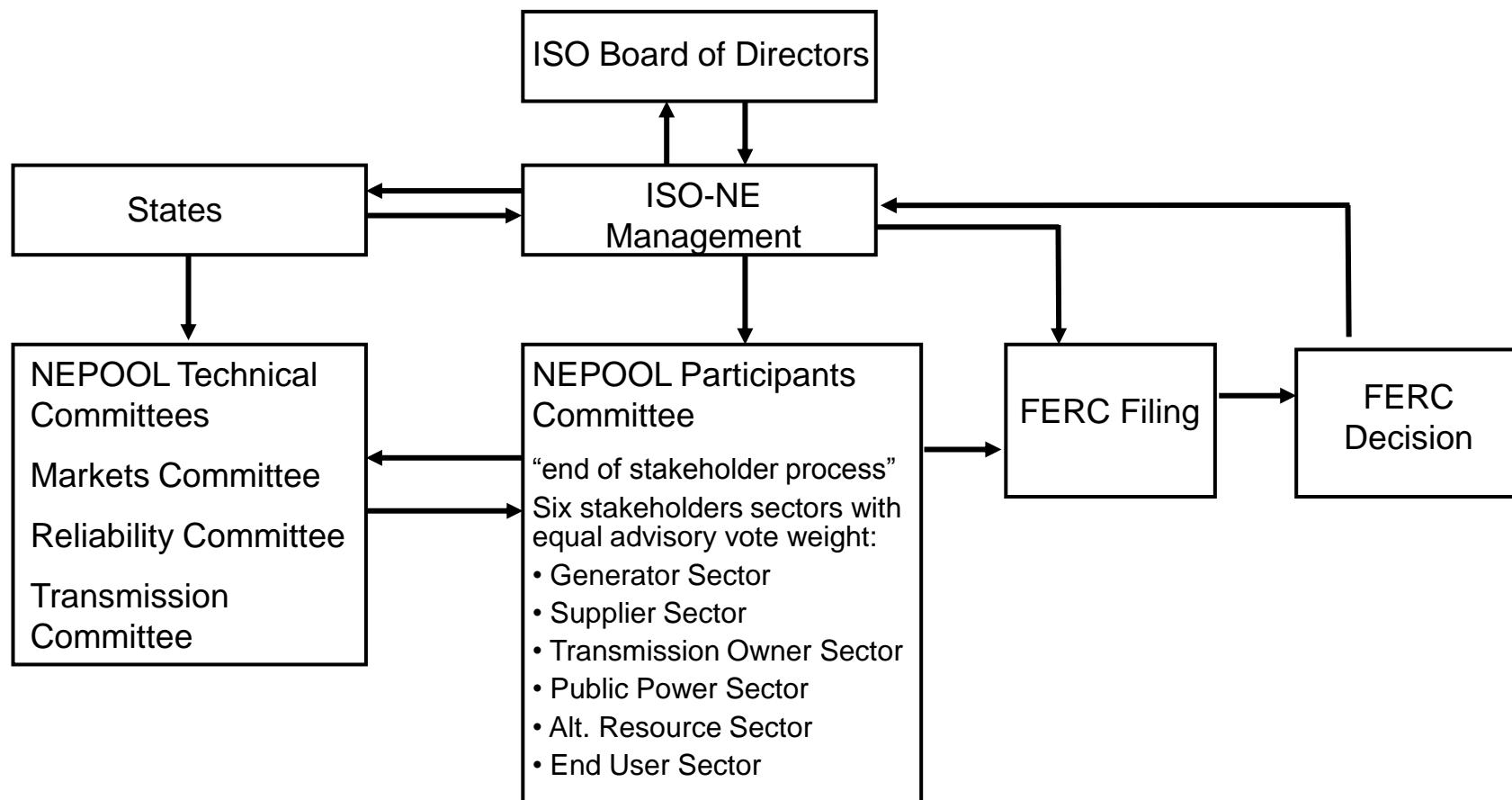
Sellers' perspective

Steady State	Reliability Crisis	Can't Survive
Competitive Revenue Reliability Cost of Reliability	Reliability Competitive Revenue Competitive Markets Cost of Reliability	Revenue! Reliability Cost of Reliability

Buyers'/consumers' perspective

Steady State	Reliability Crisis	Increasing Prices
Cost Reliability Competitive Markets	Reliability Cost Competitive Markets	Cost Reliability Competitive Markets

Change process is neither short nor simple





ISO New England's Chosen Path

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ISO-NE's Pay-For-Performance

- Spread the reliability obligation (pro-rata) over all capacity sellers
- Performance is supplying adequate energy and operating reserve
- Performance obligation enforced where energy and operating reserve needs not met
- Under-performers charged \$2,000/MWh+
- Over-performers paid \$2,000/MWh+
- Directs outcome (reliability) but leaves the solution to the market
- That's in June 2018, what about the interim?
- Interpret obligations – be careful what you ask for
- Out-of-market workarounds



Conclusions

- Absent a commercial entity having the responsibility to support firm load needs, RTOs must disaggregate that support into defined market services
- Where the defined market services prove inadequate in definition, scope or performance incentives, out-of-market actions will result
 - Convenience tariff interpretations
 - Bypassing markets with administrative remedy
 - RMR agreements
- Temporary out-of-market actions undermine the market function that does exist and create new problems or worsen old problems
- No competitive substitute for getting the scope, definition and incentives for aggregate market purchases right