Resource Adequacy Reconsidered: Mandates and Markets

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Background

- The Electric Markets Research Foundation (EMRF) formed in 2012 as a result of concerns about the operation of electric markets given today's challenges.
- Funding external studies by experts.
- Non-profit 501(c)(3) Corporation.
- Independent Board of Directors.

Initial Studies

- First study, conducted by Navigant Consulting, looked at how we got to the current bifurcated market structure.
- Second study designed to look at how electric markets were working to ensure that adequate capacity is built to meet consumer needs.
- Christensen Associates Energy Consulting retained to perform this study.

What is Resource Adequacy?

Security, Adequacy, & Reliability

- Physics requires:
  - supply match demand in real time; and
  - voltages stay within tight limits.
- Reliability problems occur when system operators lack the resources, information, or judgment to maintain power balance and voltages.
  - Deviations can erode grid reliability and in extreme cases cause blackouts.

Security and Adequacy Depend Upon Reserves

- Security depends upon operating reserves.
  - *Operating reserves* are the amount by which available resources exceed load, where availability depends upon resources' capacities and responsiveness.
- Adequacy depends upon planning reserves.
  - *Planning reserves* are the amount by which resources' total capacity exceeds annual peak loads.
- Operating reserves and planning reserves are indicators of system reliability in short- and long-term timeframes, respectively.

The Two Market Models

The Resource Adequacy Approaches of the Two Market Models

- Traditionally regulated model
  - State regulatory agencies set prices based upon utilities' average costs of service.
  - Investments are based upon integrated resource plans.
- Restructured market model
  - Competitive bidding sets wholesale market prices of energy, operating reserves, and capacity based upon supply and demand.
  - Investment responds to market prices.

Traditionally Regulated Model

- Vertically integrated utilities manage security and adequacy through self-supply and bilateral contracts.
- Capacity markets are bilateral and non-centralized.
- Utilities participate in reserve-sharing arrangements allowing them to rely on each other's capacity, thereby reducing overall reserve requirements.
- States have integrated resource planning (IRP) processes that determine resource requirements and identify resources that meet those requirements at lowest cost.

Restructured Market Model

- Regional Transmission Organizations direct resource commitment and dispatch and administer centralized energy and capacity markets.
  - Originally, markets were energy only – theory was that when there were shortages, prices would rise to attract new capacity.
  - Price caps put in place.
  - Missing money problem discovered – plants operating limited hours a year could not recover enough revenue.
  - Some RTOs have thus developed capacity markets.

Capacity Cost Recovery Under the Two Market Models

- Traditional regulatory model:
  - Investors receive return of capital based on annualized costs of actual capital investments, including an allowed rate of return.
- Restructured market model:
  - Investors receive whatever return is achievable through market prices for energy (and capacity in some RTOs).
  - Capacity prices are determined through a variety of regulatory/administrative rules, including:
    - Minimum Offer Price Rules; and
    - penalties for load-serving entities (LSEs) that fail to procure sufficient capacity.

Problems with the Restructured Market Model

Market Model – In Theory (1)

- Investment responds to price expectations.
  - Investors develop resources when they expect to profit from sales at projected market prices, hedged by bilateral and derivatives contracts.
  - Capital and operating costs recovered solely through revenues from the sale of these services.
  - Locational prices induce generators to locate where generation services are most valuable.
- Long-term markets develop to facilitate hedging against price uncertainty.

Market Model – In Theory (2)

- When demand threatens to exceed available capacity:
  - high energy and ancillary services prices encourage immediate load reductions; and
  - customers do not receive service in excess of the resources to which they have purchased rights.
- There is no “capacity” product.
- Market rules are stable.

Market Model – In Practice (1)

- Public policy will not allow the price mechanism to work under shortage conditions.
  - Market participants do not want the extreme and unpredictable price volatility of unfettered electricity markets.
  - Price caps are used to limit upside volatility, which reduces incentives to invest in or postpone retirement of resources.
- Public policy distorts the price mechanism under all conditions.
  - Policy favoring particular resources – RPS and PTC – subsidize those resources while implicitly taxing other resources.
  - Minimum offer price rule unevenly applied

Market Model – In Practice (2)

- Institutional limitations inhibit the price mechanism.
  - Limited demand-side participation restricts the extent to which prices reflect consumer value.
  - There has been little development in practice of long-term markets for energy and ancillary services.
- Is there a fatal flaw?
  - Different customers have different willingness to pay for different levels of bulk system reliability, but only one level of reliability can be maintained.
  - Society values reliability higher than individual customers.
  - Thus, reliability must be maintained at levels that exceed many customers' willingness to pay for reliability.

Market Model – In Practice (3)

- The price mechanism does not suffice to get the “right” level or typr of resources. Consequently:
  - RTO rules often specify the quantities and locations of resources that must be procured.
  - RTOs regularly make large out-of-market payments to resources to ensure reliable operations.
  - Fuel diversity is important, but largely ignored.
  - Fuel security (particularly natural gas) is important, but largely ignored.

Market Model – In Practice (4)

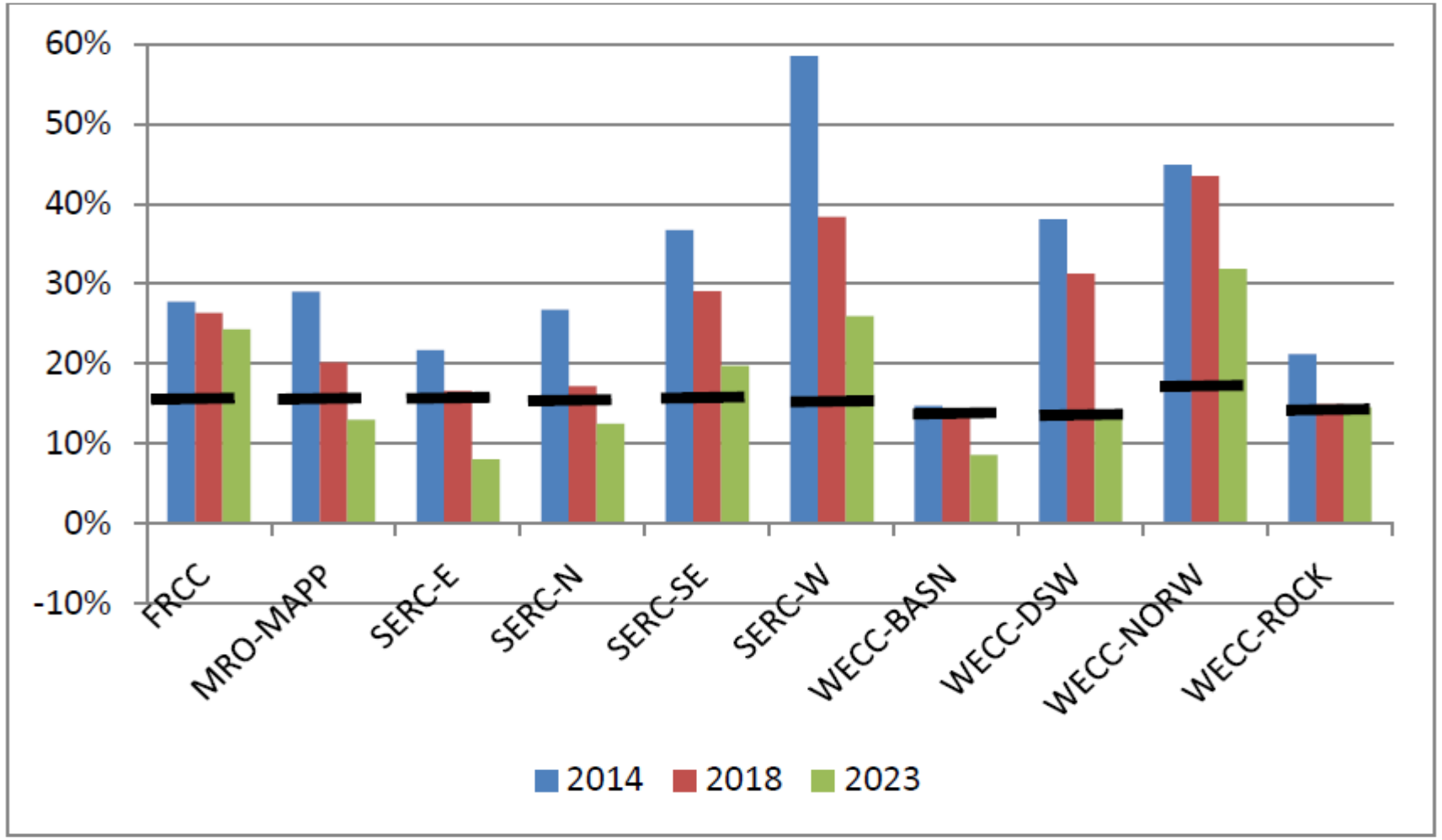
- Market rules continually change, creating uncertain investment environment.
- Demand-side resources make up large portion of reserves – should that be a concern?
- Incentives for investment for steel in the ground is not there:

Net Revenue for Combustion Turbine Gas Plant ($/MW-month)

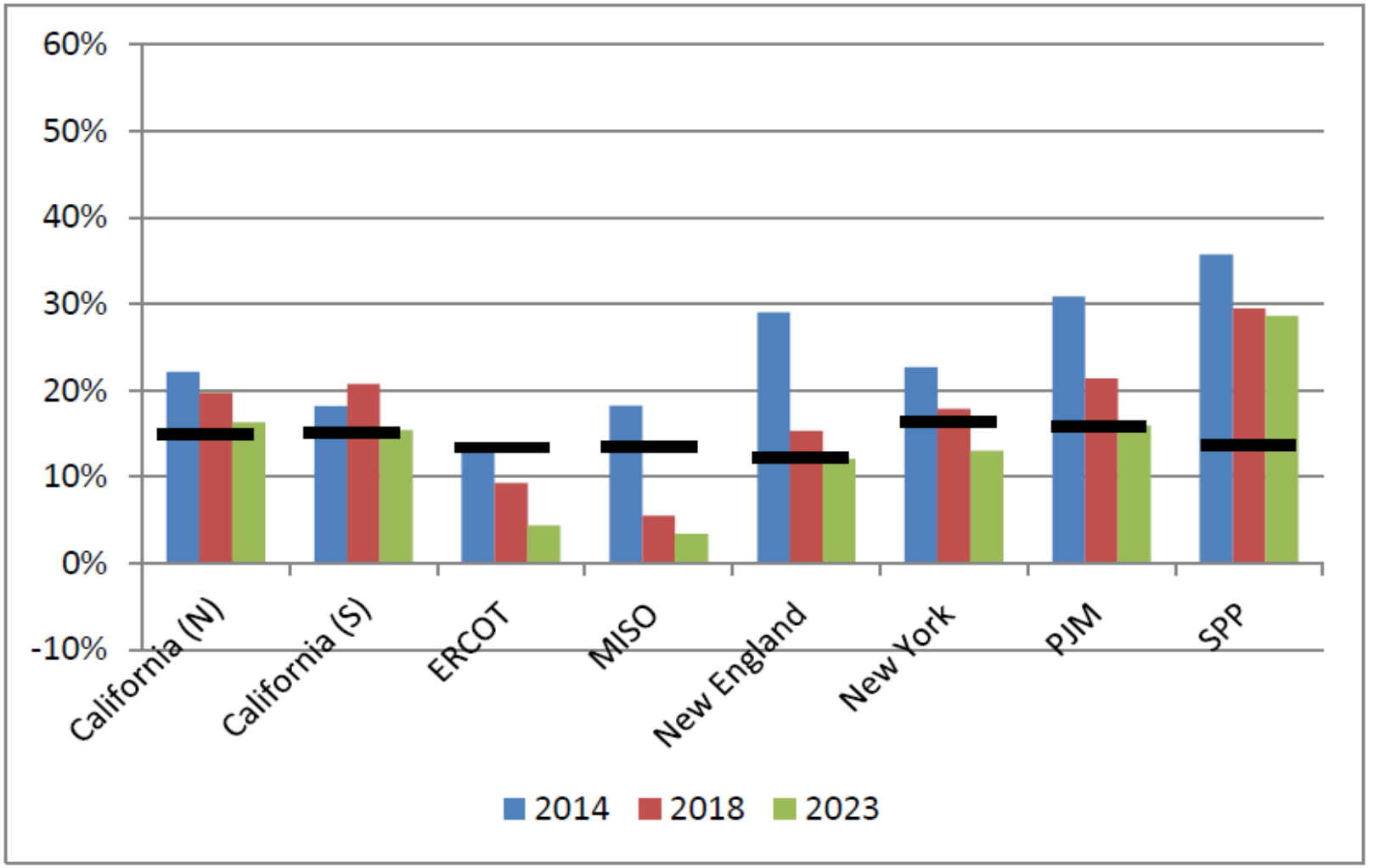
Year	CAISO	ERCOT	ISO NE	MISO	NYISO	PJM	Levelized Cost
2005					1,917	833	6,000
2006					3,167	1,250	6,667
2007	4,333	3,333			4,167	4,083	7,583
2008	5,083	7,583			5,667	4,250	10,333
2009	4,917	3,667			5,250	4,833	10,750
2010	4,417	3,750	2,500	2,250	3,833	7,667	10,917
2011	3,750	9,167	2,333	2,250	3,333	7,167	9,250
2012	4,083	2,083	2,000	2,333	1,750	4,500	9,417

Are Markets Securing Sufficient Capacity?

Forecast Summer Reserve Margins Traditional Regions

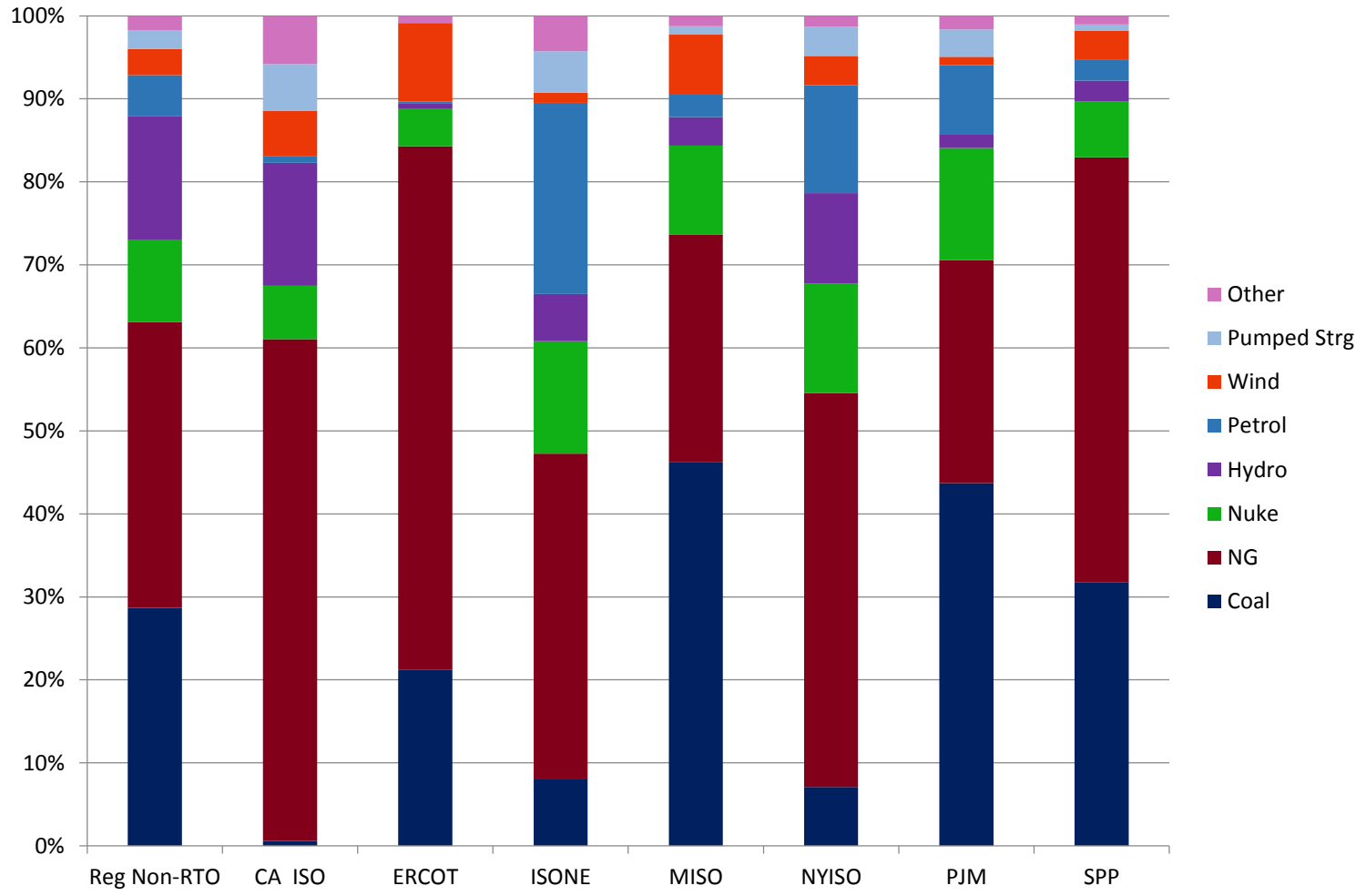


Forecast Summer Reserve Margins
RTO Regions

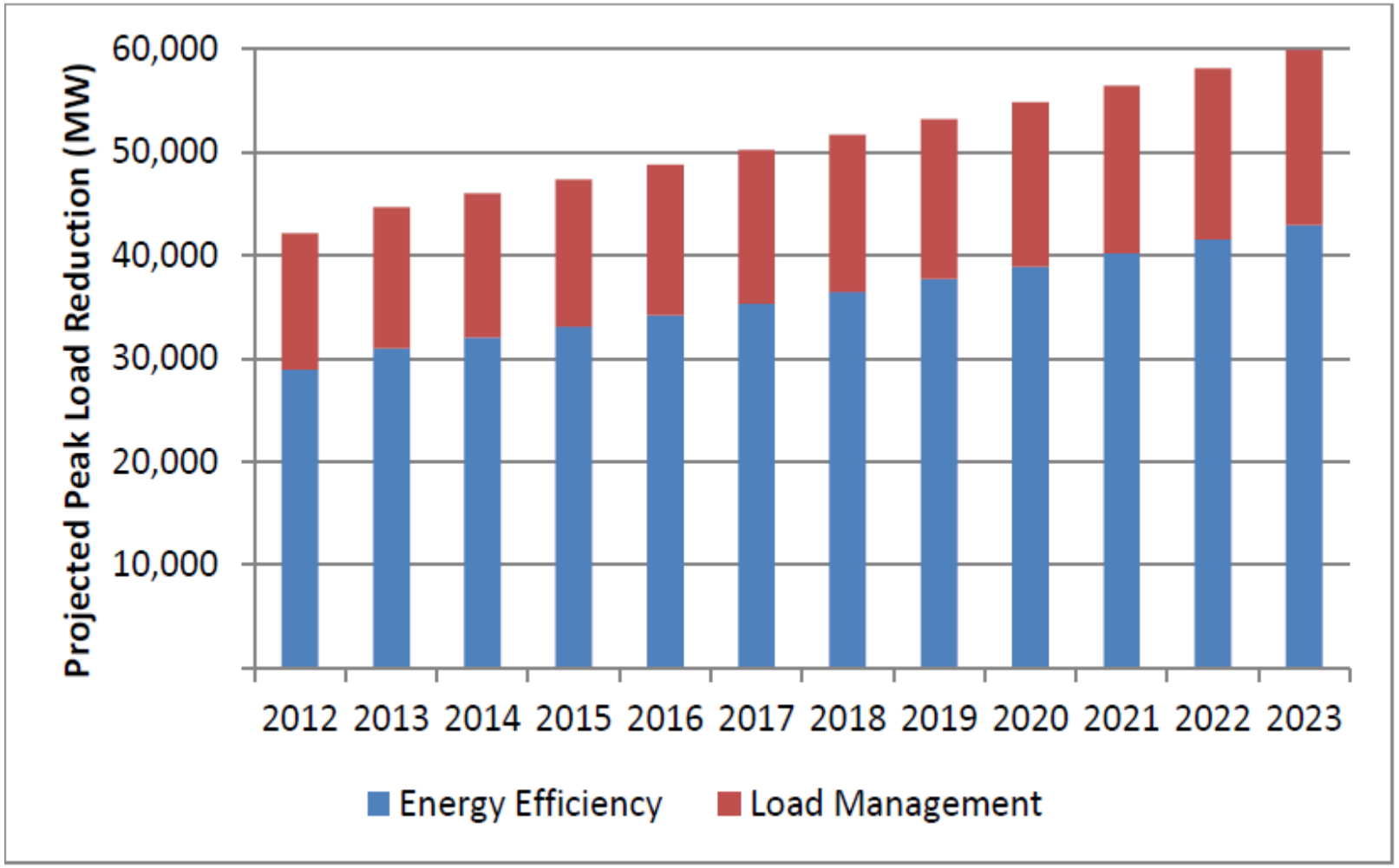


Is it the Right Type?

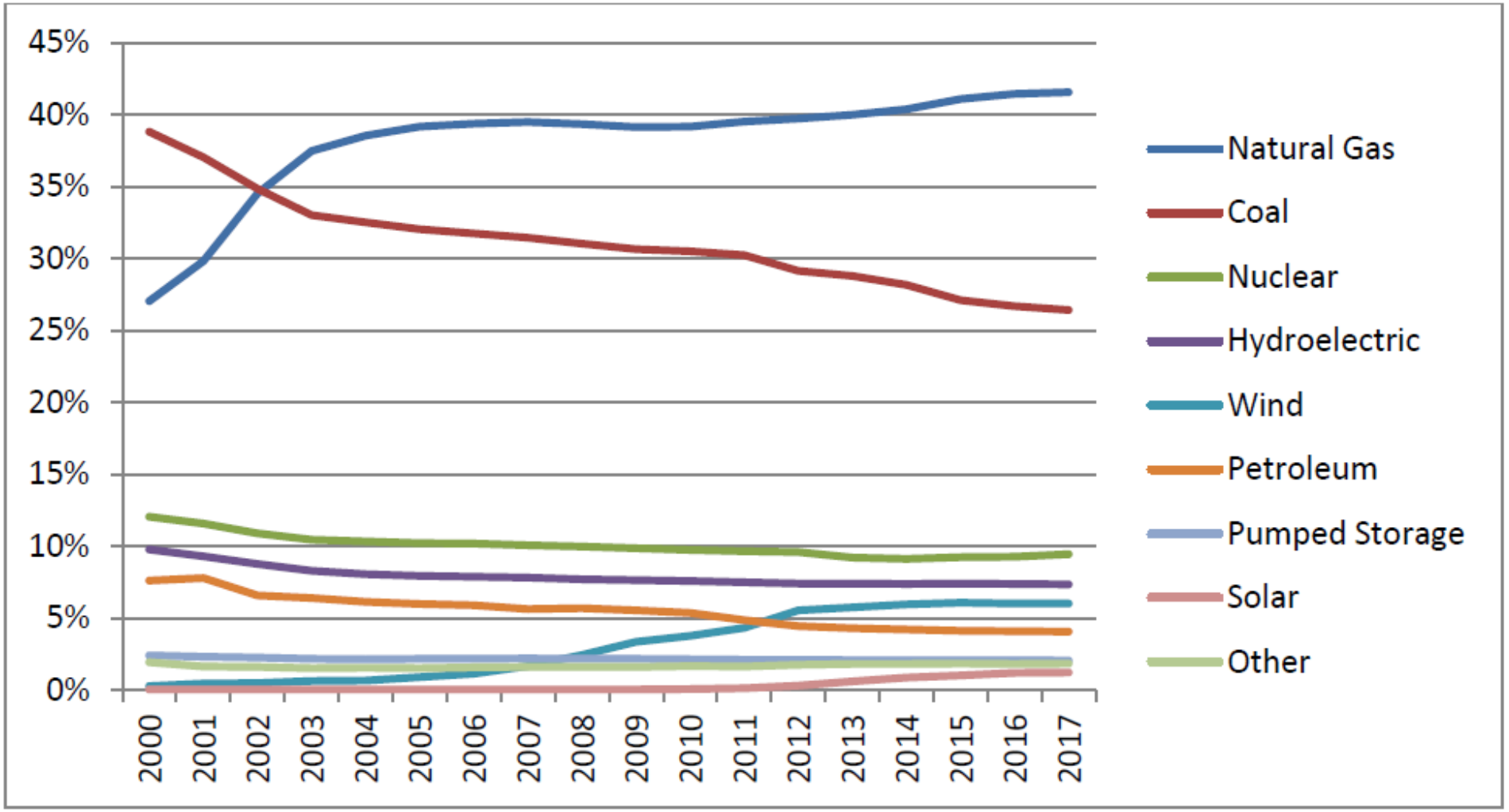
Fuel Mix, Non-RTO & RTO Regions, 2012



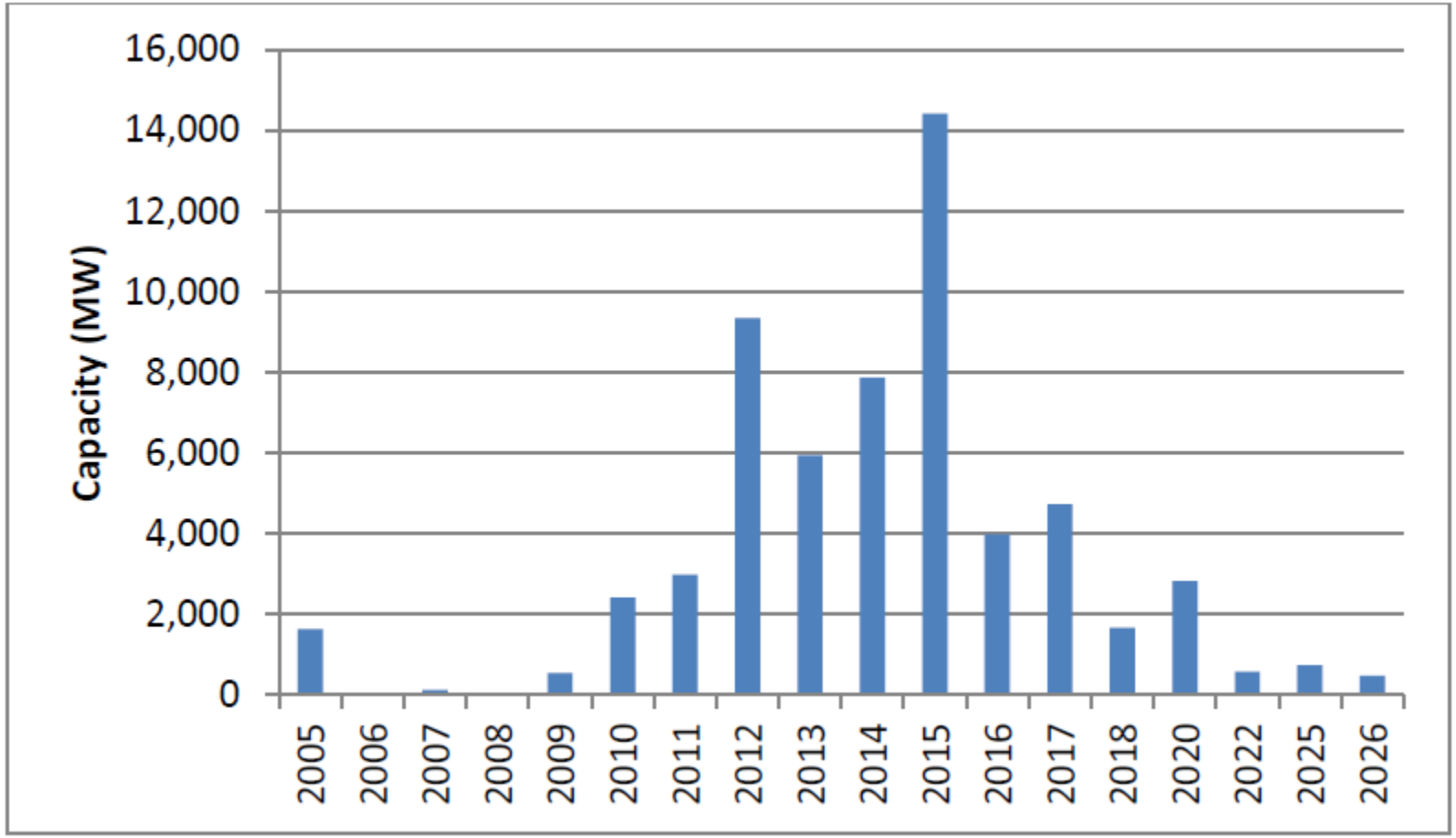
Projected DSM Load Reductions by Program Type, 2012-2023



U.S. Resource Mix, Shares of Summer Capacity, 2000-2017



Actual & Projected Coal Plant Retirements, 2005 - 2026



Study Conclusions

- RTOs' short-term centralized capacity markets do not provide incentives for long-term resource investments.
- The political process will not allow peak-period demand pricing that is consistent with a market solution.
- Mis-match between social and private value of reliability is a continuing issue and perhaps a fatal flaw.
- Markets can not ensure fuel diversity, which in turn has reliability implications.

Study Conclusions - 2

- Fuel security is a major issue. Can generation without firm fuel supply contracts be considered firm for capacity purposes?
- Additional retirement of coal plants resulting from the proposed EPA clean power plan only exacerbates the problem.
- Will we act in time?

Potential Solutions

- Obligation to maintain capacity and reserves should be reinstated and rest with Load-Serving Entity (LSE)
- Costs should be placed in rate base
- Revenues obtained in energy market in excess of costs should be credited against capacity costs in rate base
- Certain % of obligation should be long-term resources

Potential Solutions - 2

- Should be a competitive supply requirement
- Capacity markets can still provide short-term options
- Competitive retail suppliers should have obligation to pay for capacity

Finally

- EMRF study available at http://www.emrf.net/uploads/3/1/7/1/3171840/ensuring_adequate_power_supplies_for_emrf_final.pdf
- Further information: www.emrf.net