Synapse
Energy Economics, Inc.

Integrated Resource Planning
and the potential for energy efficiency and renewables

Coal Finance 2013

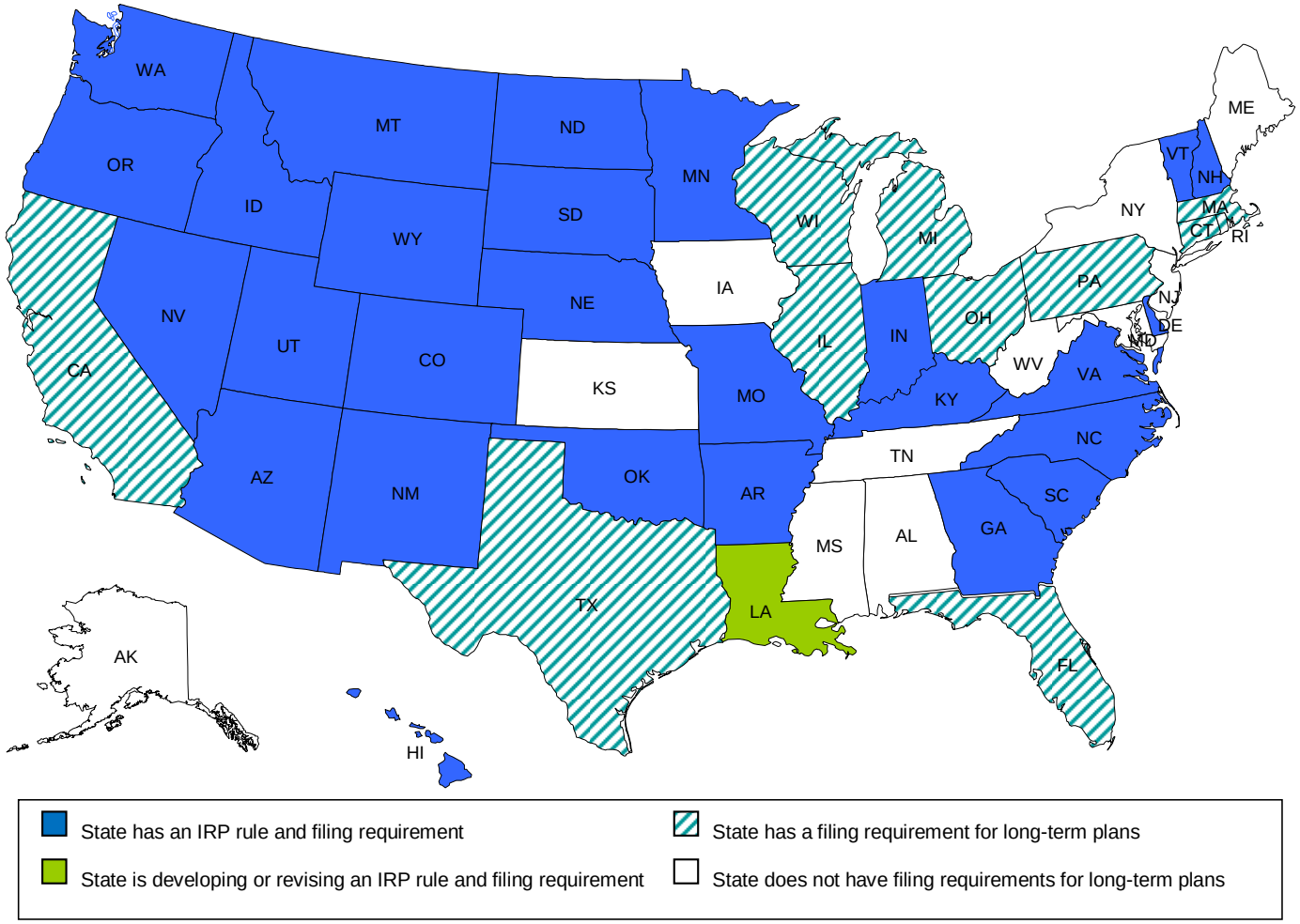
March 19, 2013 – New York City

Bruce Biewald – CEO, Synapse Energy Economics

A good electric system IRP should include:

- Load forecast
- Reserves and reliability
- **Demand Side Management**
- Supply options
- **Avoided costs**
- Fuel prices
- **Environmental costs and constraints**
- **Existing resources**
- Fresh information
- Integrated analysis
- Time frame
- Uncertainty
- Metrics
- Valuing and selecting plans
- **Cost recovery issues**
- Action plan
- **Documentation**

Presence or absence of state IRP rules and procurement plan filing requirements



Source: Peterson & Wilson 2011

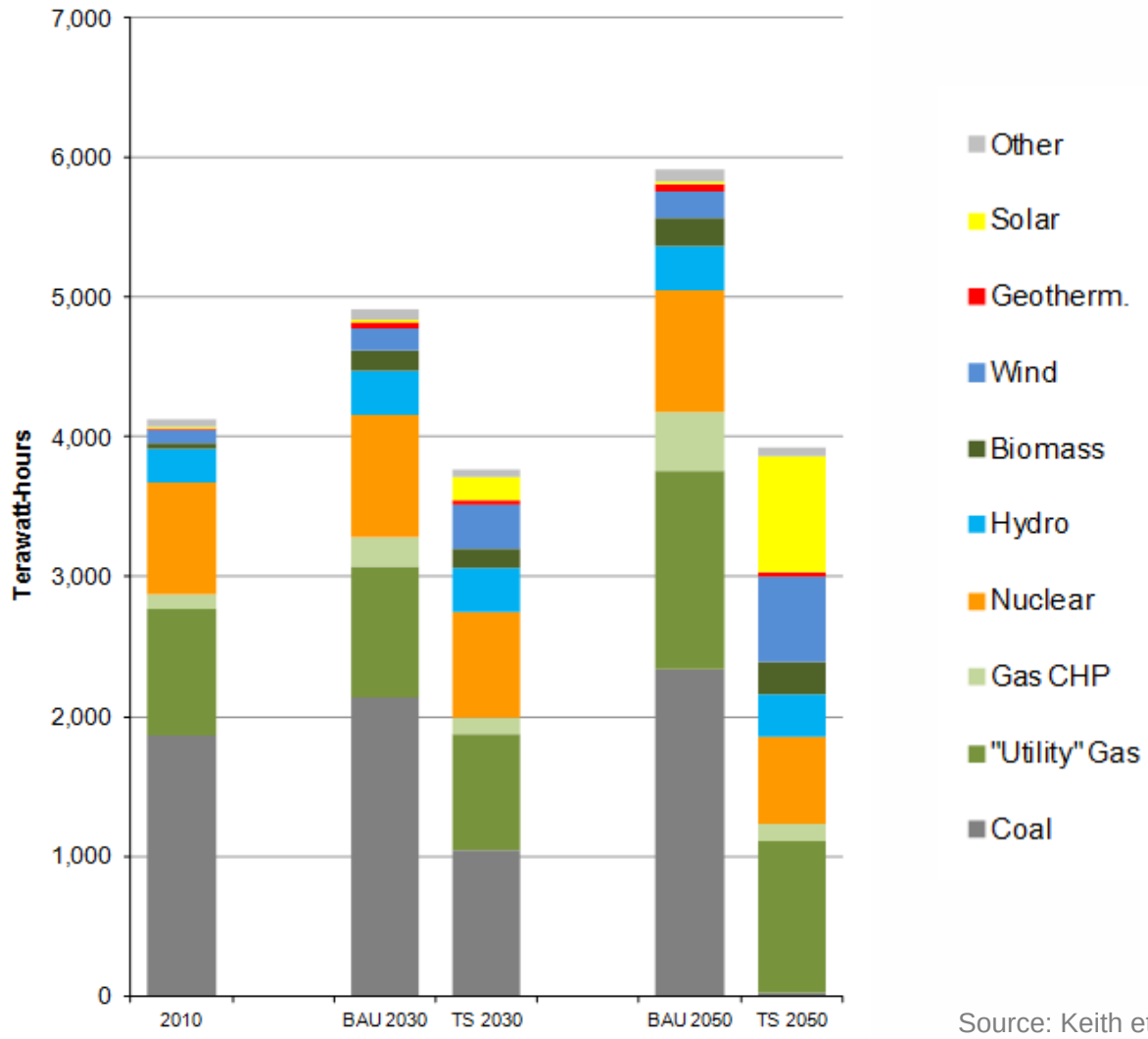
Electric industry structure

Generation	Transmission	Distribution	Retail Electric Service
Merchant	ISO/RTO		Competitive
Public Power		Local Distribution Companies	Default Service
Investor-Owned Utility	Utilities are Planning Authorities and Grid Operators		Cost-Based Utility Supply

Demand side management

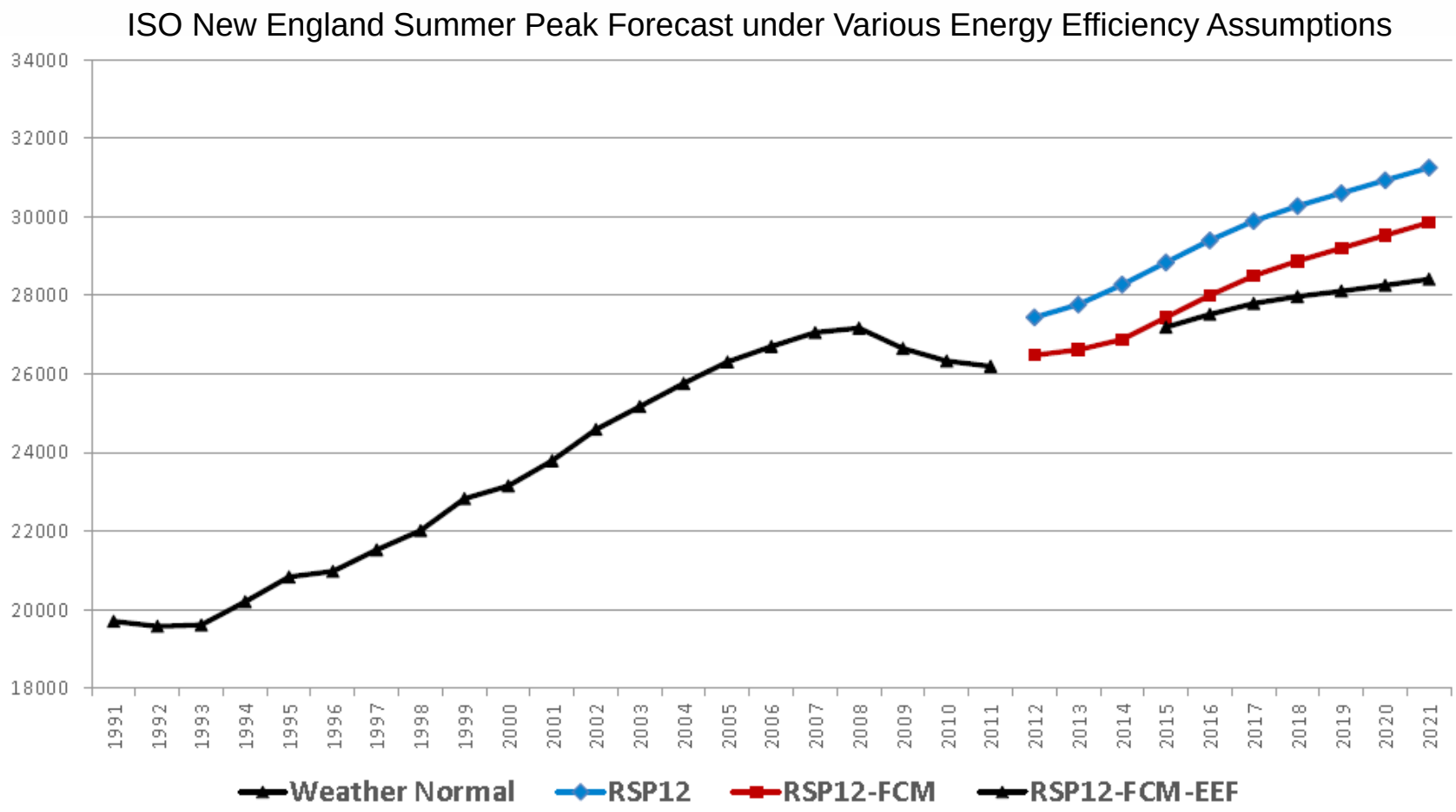
Utility planning should consider various levels of DSM savings ranging from low to something beyond “all cost effective” DSM in order to provide confidence that “all cost effective DSM” has been included.

Resource mix for BAU and clean electricity scenarios



Source: Keith et al., 2011

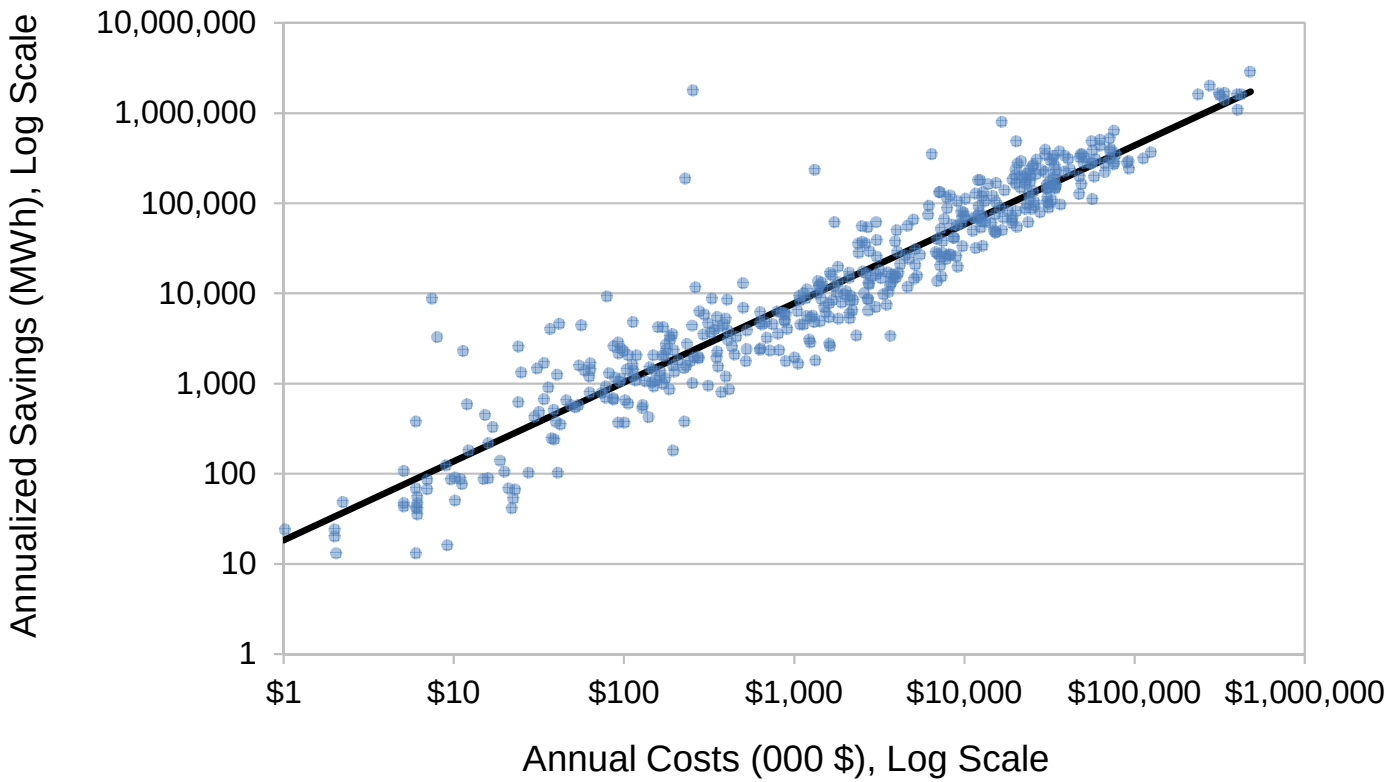
Energy efficiency forecasts



Source: Peterson et al., 2012

EE cost vs. savings

Program years with savings as a percent of sales greater than 0.5% (n=468)



Best Estimate Regression: $y = 18.274x^{0.875}$, $r^2 = 0.889$

Source: Synapse Analysis of EIA 861 Dataset, 2007-2011

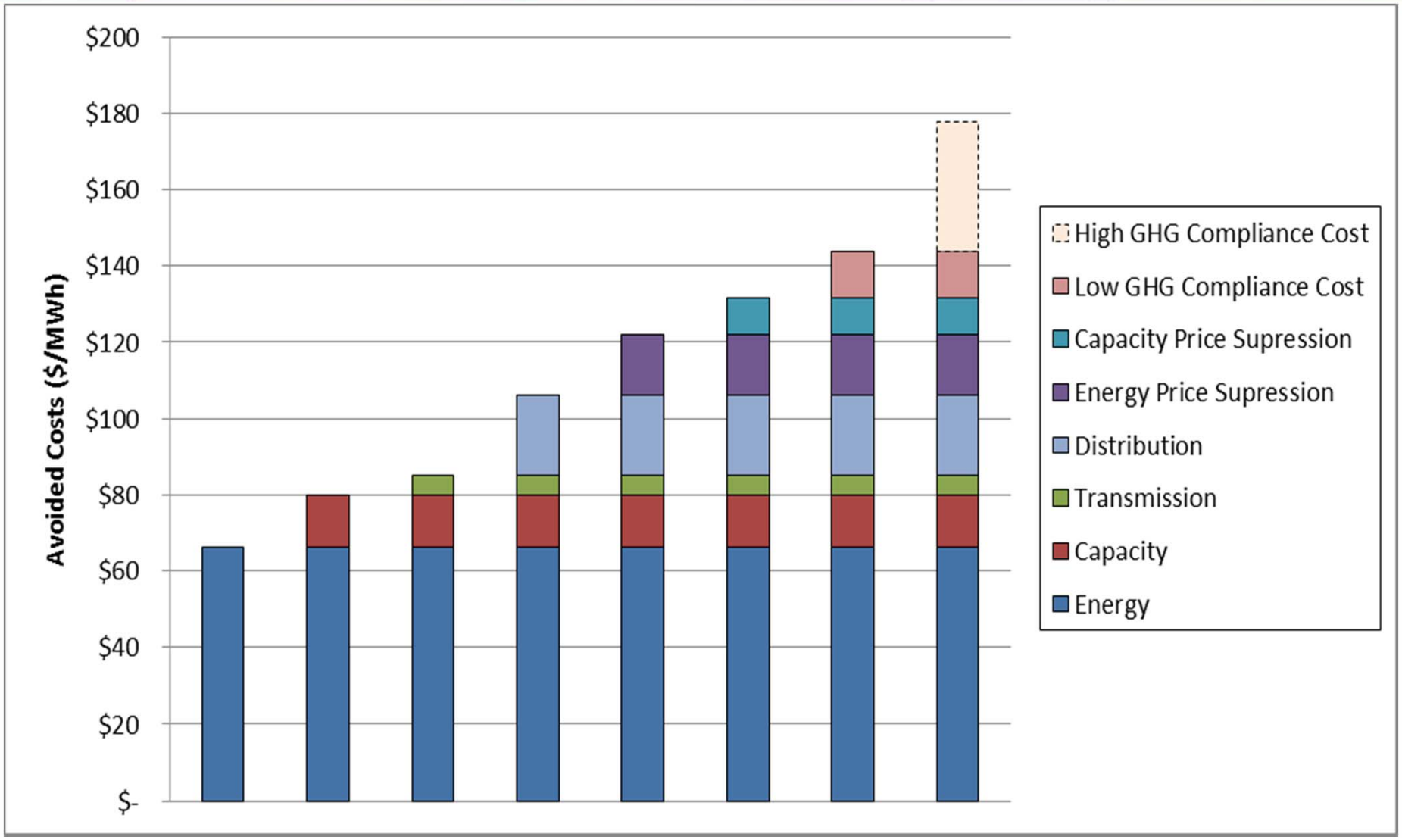
EE Cost vs. Savings

- Slope indicates cost per kWh of first year savings at 16.2c/kWh
- Assuming 12 year measure life and 4.5 percent real discount rate, this amounts to a levelized unit cost to the utility of 1.7 c/kWh by EE programs

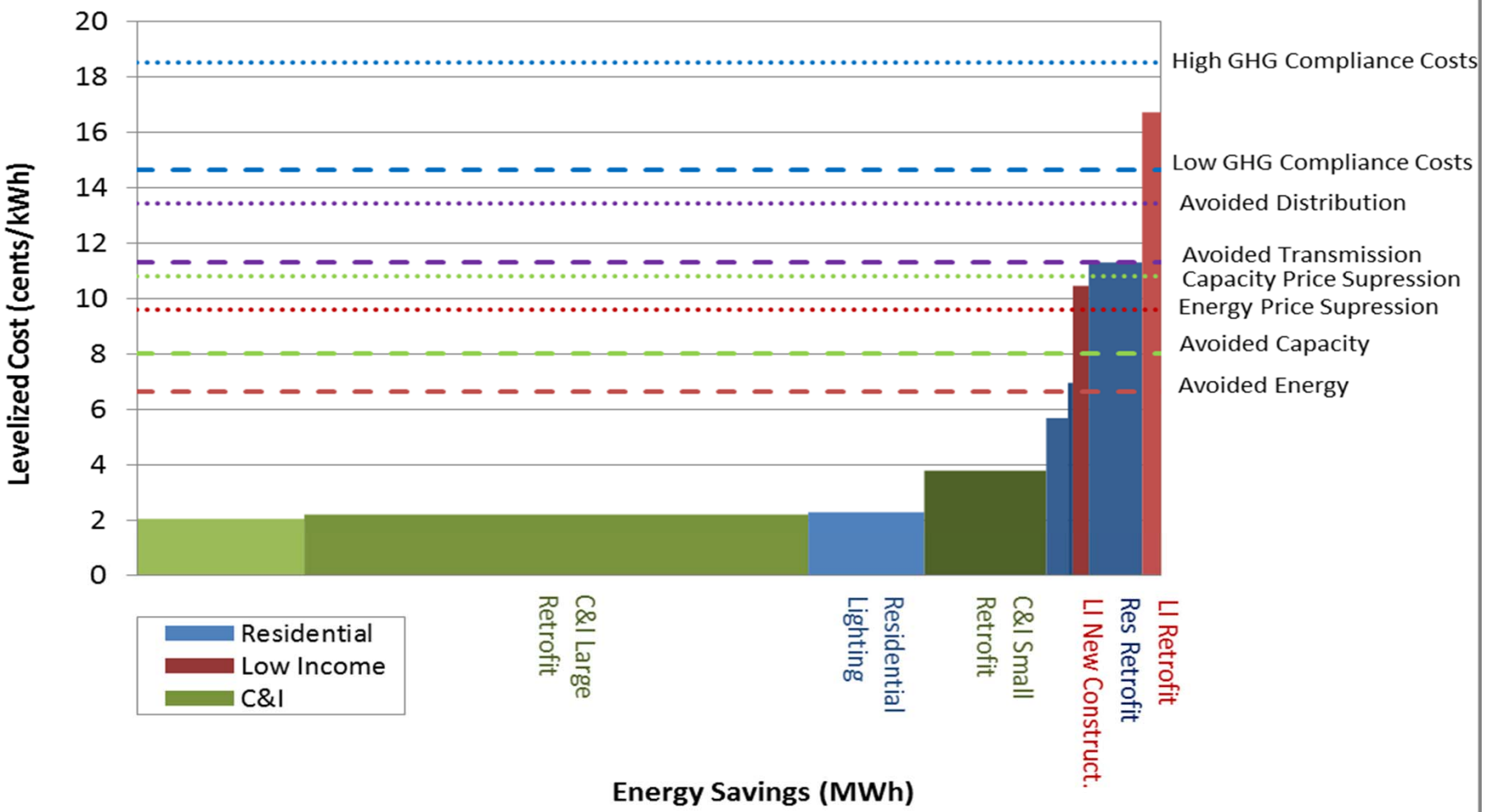
Avoided costs

A proper calculation of avoided costs (for purposes of screening DSM options) that generally should include demand and energy.

Example of avoided costs, by component



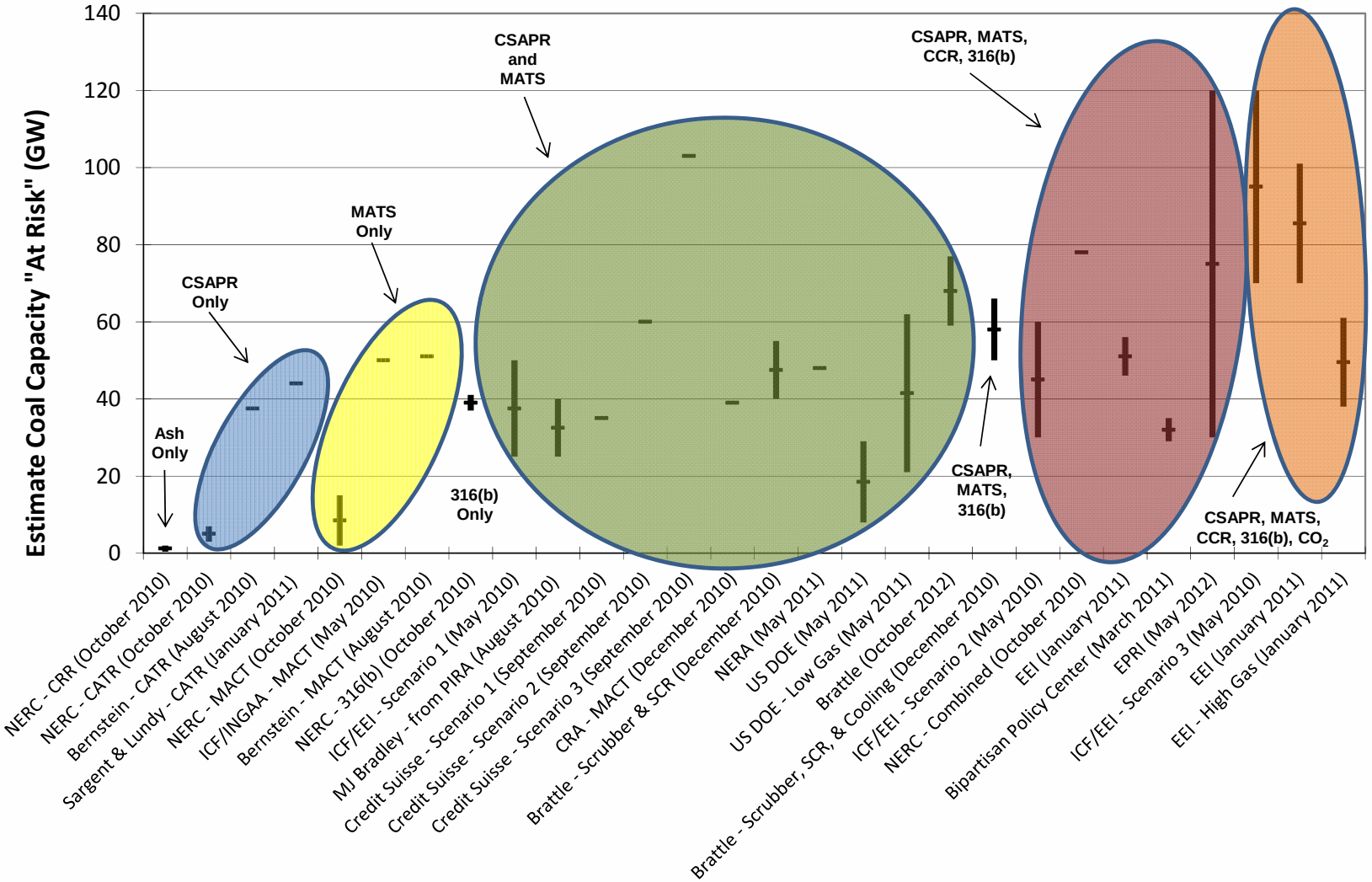
Avoided costs relative to the levelized cost of saved energy (cents/kWh)



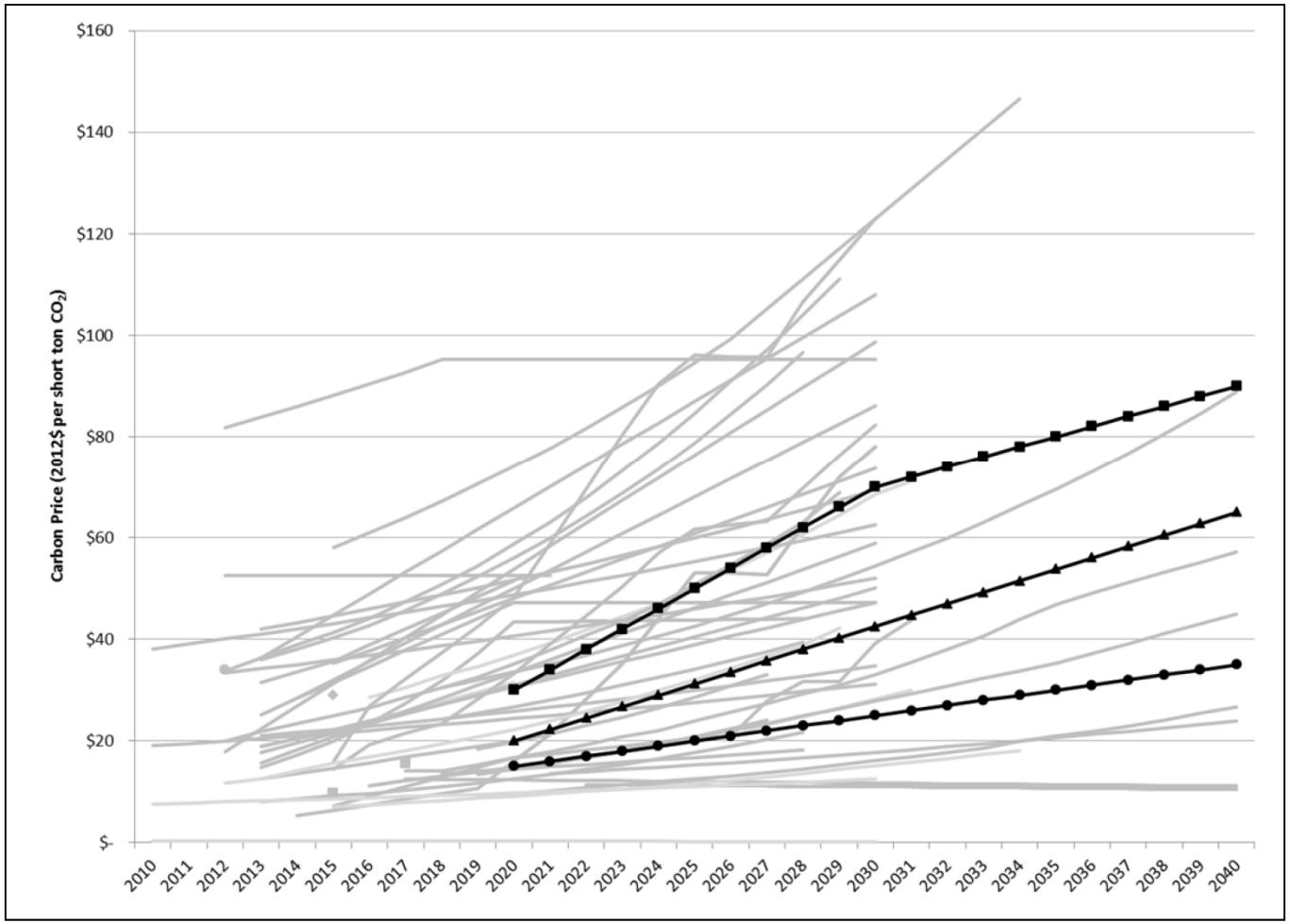
Environmental costs and constraints

Projection of environmental compliance costs, including recognition of all reasonably expected future regulations.

Studies of coal capacity at risk



CO_2 price forecast



Source: Wilson et al., 2012

Existing resources

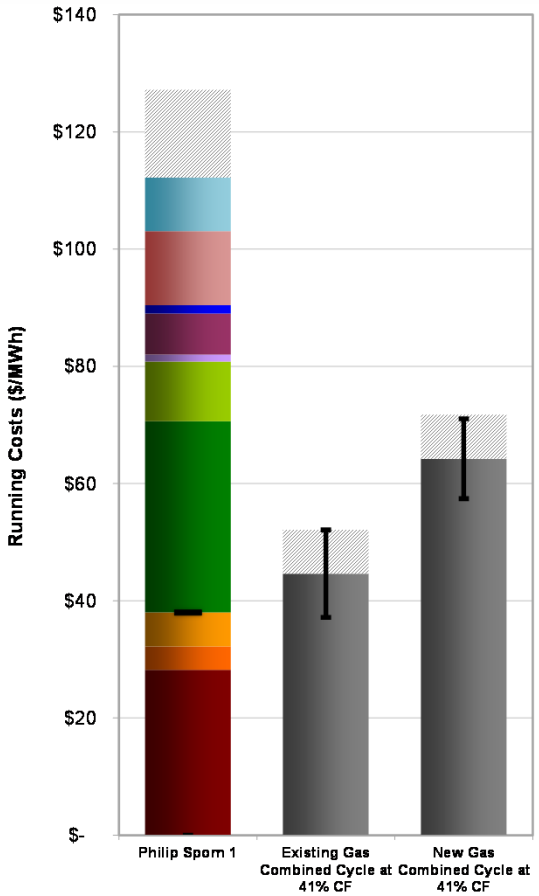
Modifications to existing resources (including retirement) should be considered.

Existing electrical generating capacity by fuel type

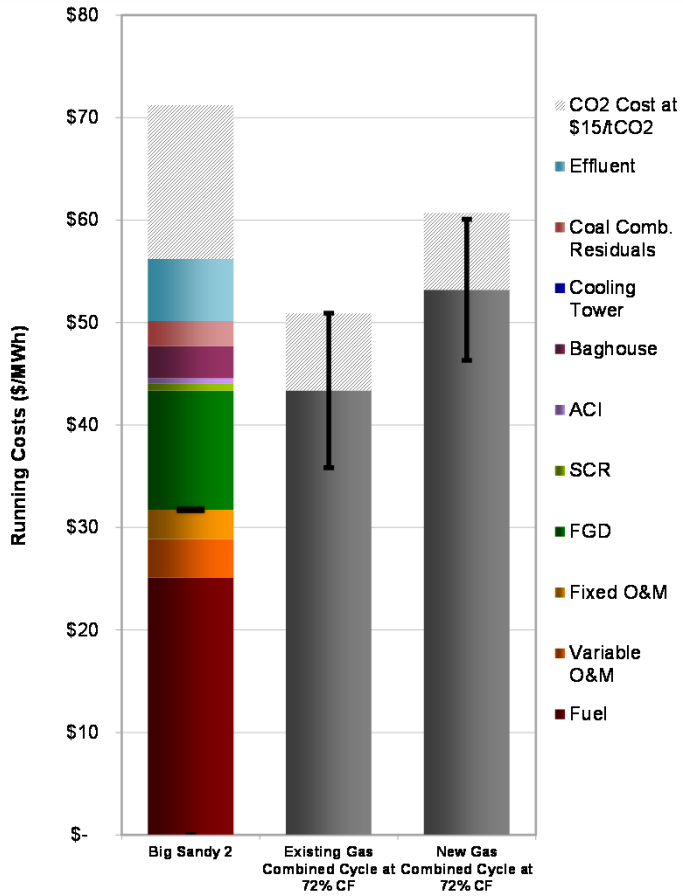
Source: EIA Form 860 2009

Coal unit forward-going costs: two examples

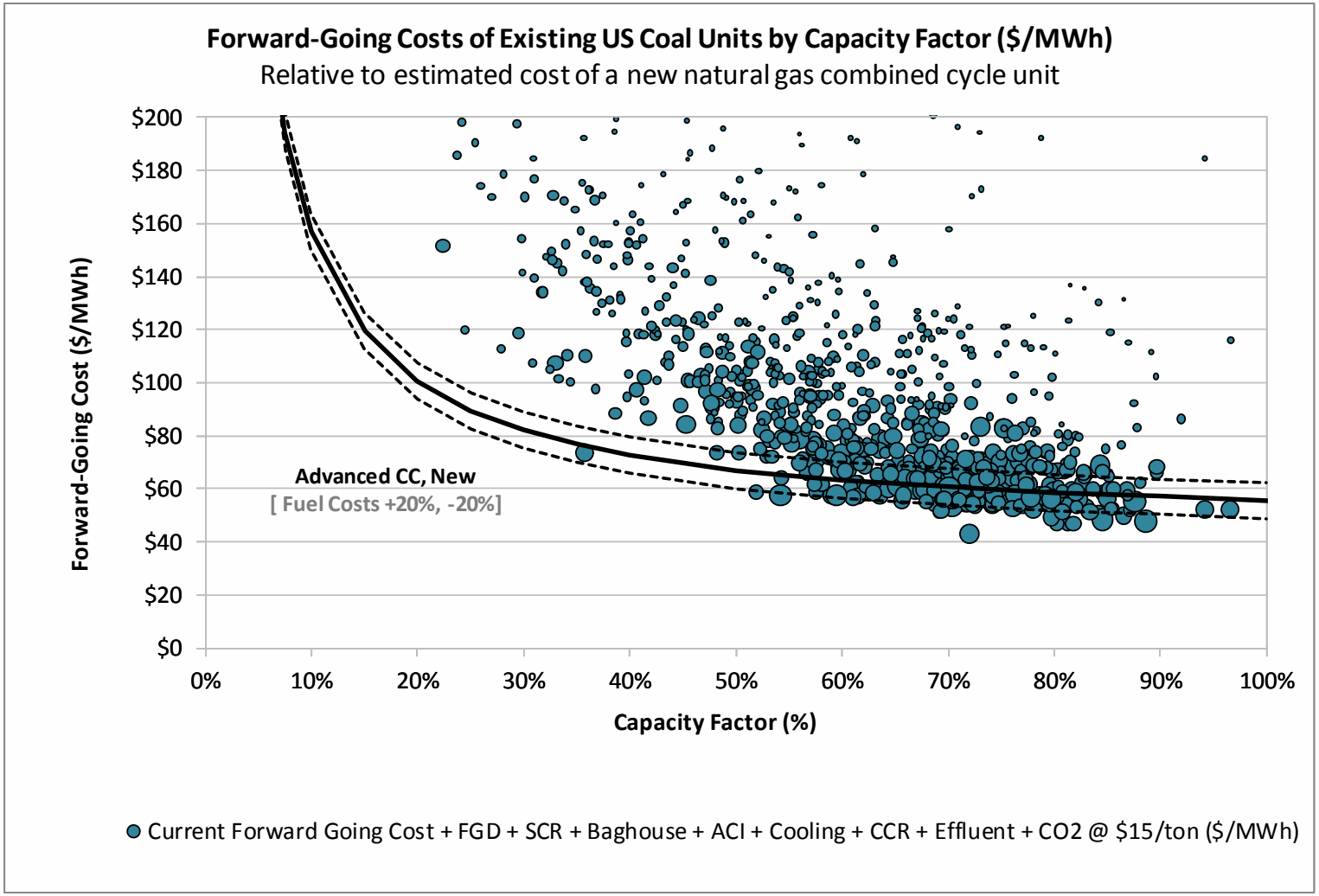
Philip Sporn 1 (AEP, WV)
152 MW



Big Sandy 2 (AEP, WV)
816MW

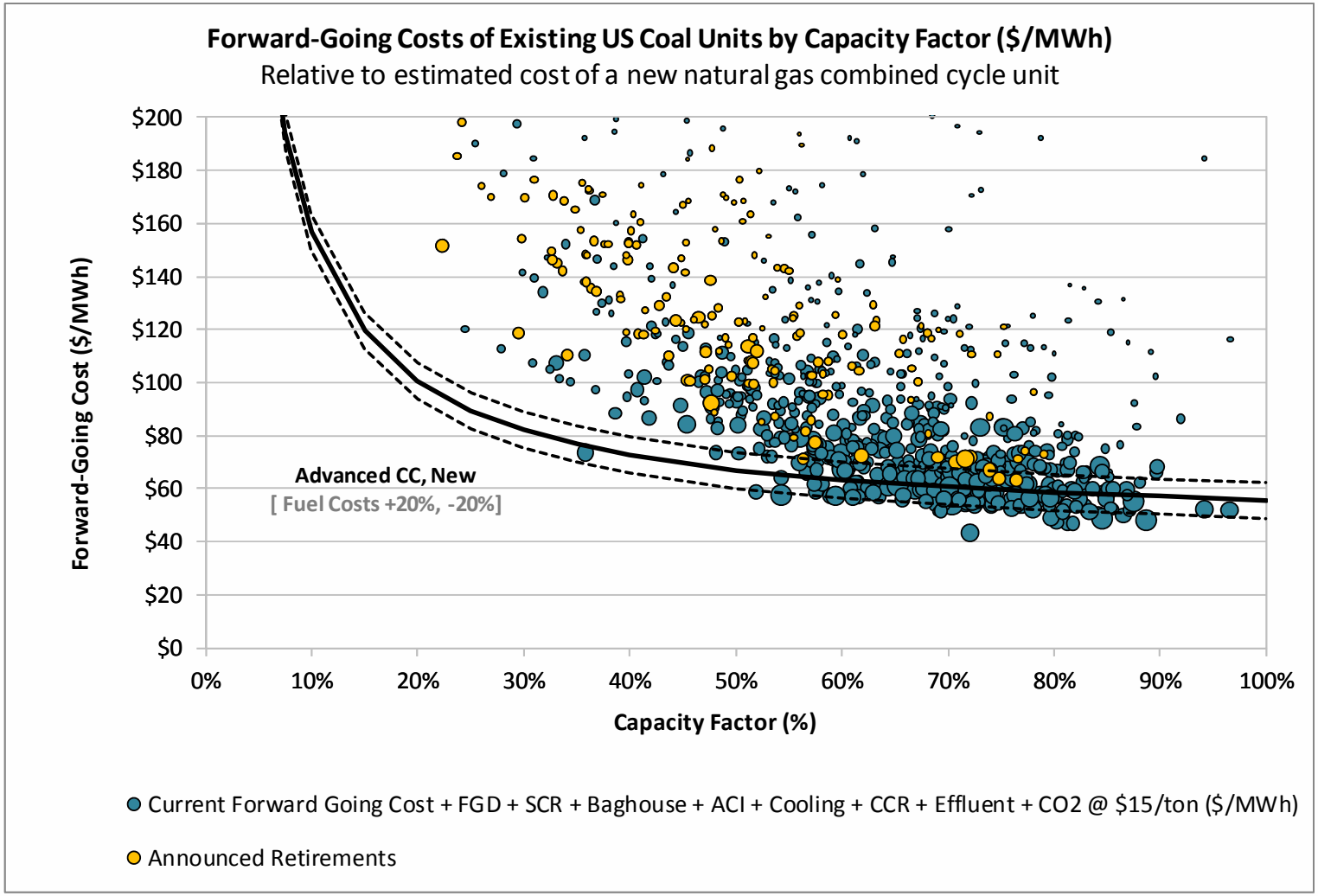


Existing US coal fleet forward-going costs



Note: Area of circles indicates MW capacity of units

Announced retirements of US coal fleet



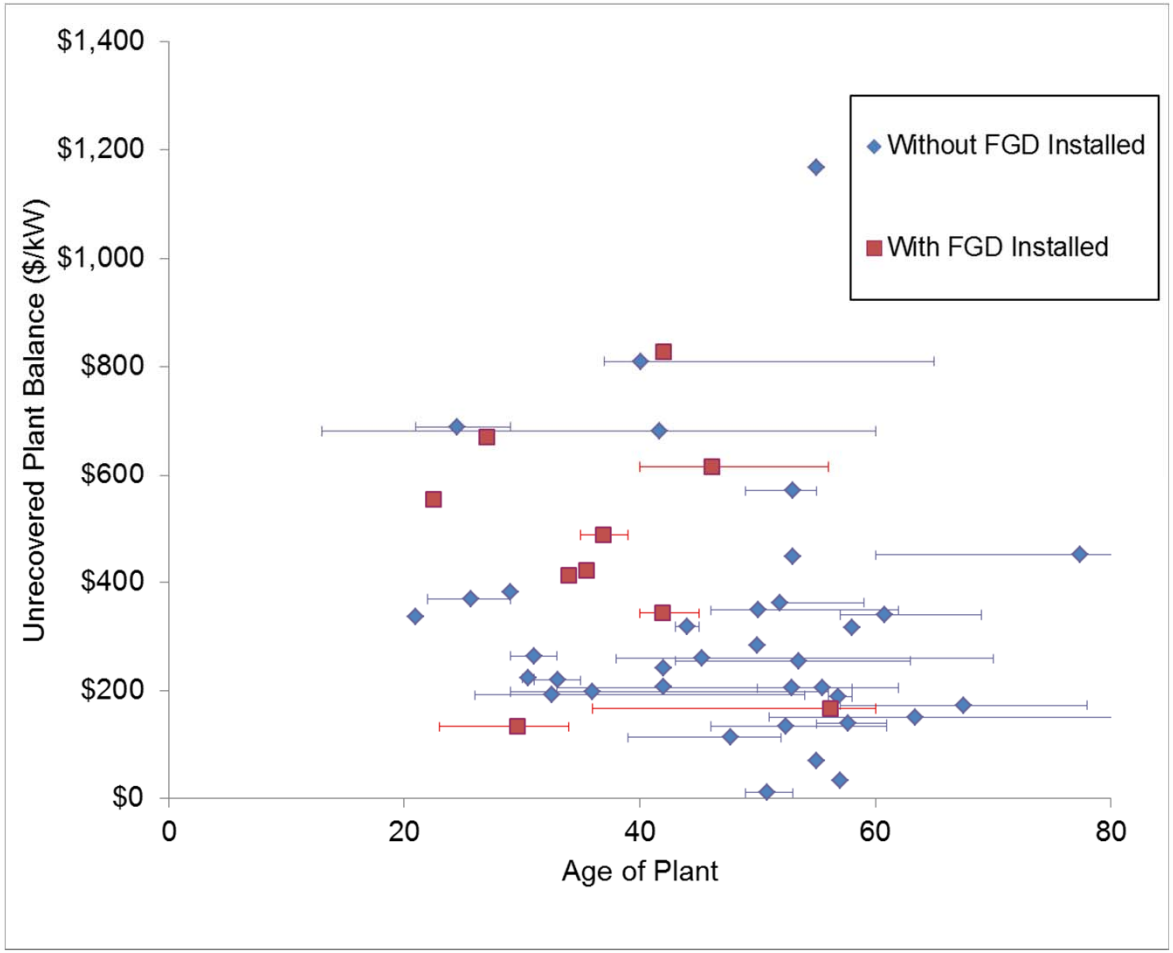
Note: Area of circles indicates MW capacity of units

Cost recovery issues

Cost recovery is important, but may be handled separately from IRP.

Regulatory treatment of sunk costs matters.

Old coal plants have significant investment in rate base



- Data collected from 41 coal plants owned by eight utilities.
- Average plant age weighted by capacity: ~45 years
- Average plant capacity: ~636 MW
- Average unrecovered plant balance: ~$347/kW
- Average unrecovered balance as a percentage of Total Cost: ~50%

Prudence disallowance of emissions retrofit investment in Oregon

As pointed out by the parties, Pacific Power's cost-effective analyses were flawed in a number of ways:

- Assumption of Immediate Shutdown
- Lack of meaningful sensitivity and scenario analyses
- Failure to incorporate potential costs of known, emerging regulations
- Failure to update analyses
- The inherent limitations of a PVRR(d) analysis

Section c.

"Based on our findings that Pacific Power failed to reasonably examine alternative courses of action and perform adequate analysis to support its investments, we conclude that a partial disallowance is warranted. Pacific Power's imprudent and inadequate analysis and decision-making put ratepayers at risk. The full costs of the investments resulting from that imprudence should not be recoverable in rates."

Source: Public Utility Commission of Oregon, December 2012

Regulatory treatment of retired power plant(s)

Ohio

- Docket 10-1454-EL-RDR
- Order: January 12, 2012
- Ohio Power sought approval for a rider to recover unamortized plant balance of $58.7 million for Sporn Unit 5 (450 MW, 1960)
- Commission dismissed the case citing closure not subject to approval and no statutory basis for recovery of closure costs

Alabama

- Docket U-5033
- Order: September 7, 2011
- Alabama Power sought authorization to establish regulatory asset treatment and amortization schedule for generating units to be retired early as a result of EPA regulations
- Commission approved request

Documentation

A proper IRP report will include discussion of the inputs and results, and appendices with full technical details. Only items that are truly sensitive business information should be treated as confidential, because such treatment can hinder important stakeholder input processes.

Good documentation is important

Response to data request in an ongoing IRP docket, asking for planning model information:

"The content of internal business strategy discussions constitutes confidential business information. In addition, because of ongoing litigation challenges, [the Company] presently conducts internal strategy meetings with an attorney present for the purpose of giving legal counsel and in anticipation of litigation. As a result of this litigious climate, no minutes are taken and any analyses are performed in real time. A spreadsheet tool is used to summarize data, but that tool is a proprietary, business confidential tool which has data contained therein which is also proprietary."

A good electric system IRP should include: (part 1 of 5)

- **Load forecast**. A reasonable, up-to-date, and fully documented forecast of system peak and energy requirements.
- **Reserves and reliability**. Reserve requirements to provide capacity adequacy based on rigorous analysis of system characteristics and proper treatment of intermittent resources.
- **Demand Side Management**. Consideration of various levels of DSM savings ranging from low to something beyond “all cost effective” DSM in order to provide confidence that “all cost effective DSM” has been included.
- **Supply options**. Consideration of a full range of supply alternatives, with reasonable assumptions for their costs, performance, and availability.

A good electric system IRP should include: (part 2 of 5)

- **Avoided costs**. A proper calculation of avoided costs (for purposes of screening DSM options) that generally should include demand and energy.
- **Fuel prices**. Reasonable, recent, and consistent projections of fuel prices.
- **Environmental costs and constraints**. Projection of environmental compliance costs, including recognition of all reasonably expected future regulations.
- **Existing resources**. Modifications to existing resources (including retirement) should be included in the consideration.

A good electric system IRP should include: (part 3 of 5)

- **Fresh information**. All of the assumptions and calculations mentioned above should be reasonably up-to-date. Construction cost estimates, for example, can be notoriously out of date within a few months, and reliance upon such estimates would be imprudent.
- **Integrated analysis**. There are various reasonable ways to model plans, generally requiring the use of optimization or simulation models. It is important that the integrated modeling does not inadvertently exclude combinations of options that deserve consideration.
- **Time frame**. A reasonable IRP will focus on decisions that must be made in the next few years (e.g., ramping up a DSM program, beginning construction of a new power plant) but the study period for the analysis should be sufficiently long to incorporating much of the operating lives of the new resource options, typically at least 20 years, and even then "end effects" should be considered.

A good electric system IRP should include: (part 4 of 5)

- **Uncertainty**. At a minimum, important and uncertain input assumptions should be tested with high and low cases to assess the sensitivity of results to changes in the input values. In many cases more sophisticated techniques, combining uncertainties and/or involving probabilistic techniques are warranted.
- **Metrics**. Generally the "present value of revenue requirements" is the primary metric to be minimized in an IRP process. Other important metrics can include minimizing risks, environmental costs, rate or bill increases, and so on.
- **Valuing and selecting plans**. There are often multiple stages of running scenarios and screening in developing an IRP, and there are various reasonable ways to approach this. What is essential is that the process be done in a manner that applies the metrics in a reasonably transparent and logical manner, without inappropriately screening out resource options or plans that deserve consideration in the next stage.

A good electric system IRP should include: (part 5 of 5)

- **Cost recovery issues**. Cost recovery is important, but may be handled separately from IRP.
- **Action plan**. A good IRP will generally include a specific discussion of the implications of the analysis for what needs to be done in the near-term, and specific plans for getting those near-term items done.
- **Documentation**. A proper IRP report will include discussion of the inputs and results, and appendices with full technical details. Only items that are truly sensitive business information should be treated as confidential, because such treatment can hinder important stakeholder input process.

References

- Biewald, B., and S. Bernow. *Electric Utility System Reliability Analysis: Determining the Need for Generating Capacity.* Boston: Energy Systems Research Group, 1988.
- Black & Veatch, 2010, *Alaska Railbelt Regional Integrated Resource Plan (RIRP) Study*, Final Report, prepared for the Alaska Energy Authority, February 2010.
- Chernick, P., R. Hornby, J. Wallach, and D. White. *Risk Analysis of Procurement Strategies for Residential Standard Offer Service*. Resource Insight, Inc. and Synapse Energy Economics, Inc. Prepared for the Maryland Office of People's Counsel. March 2008.
- Hirst, E. *A Good Integrated Resource Plan: Guidelines for Electric Utilities and Regulators*. Oak Ridge National Laboratory. December 1992.
- Hornby, R., D. Hurley, and P. Knight. *A Review of Demand Response Potential in the United States.* Synapse Energy Economics, Inc. Prepared for the U.S. Environmental Protection Agency. 2011.
- Keith, G., B. Biewald, E. Hausman, K. Takahashi, T. Vitolo, T. Comings, and P. Knight. Toward a Sustainable Future for the U.S. Power Sector: Beyond Business as Usual 2011. Prepared for the Civil Society Institute. November 2011.

References (continued)

- Peterson, P., and R. Wilson. *A Brief Survey of State Integrated Resource Planning Rules and Requirements*. Synapse Energy Economics, Inc. Prepared for the American Clean Skies Foundation. April 2011.
- Peterson, P., D. Hurley, S. Jackson, and M. Schultz. *The Road to Better System Planning: ISO-New England's Revised Energy Efficiency Forecast.* Synapse Energy Economics, Inc. Prepared for Connecticut Office of Consumer Counsel. April 2012.
- Public Utility Commission of Oregon. Order No. 12 493. In the Matter of PACIFICORP, dba PACIFIC POWER Request for a General Rate Revision. December 2012.
- Vermont Department of Public Service. Vermont Comprehensive Energy Plan 2011: Facts, Analysis and Recommendations, Volume 2. Public Review Draft. 2011.
- White, D., D. Hurley, and J. Fisher. *Economic Analysis of Schiller Station Coal Units*. Synapse Energy Economics, Inc. Prepared for Conservation Law Foundation, July 2011.
- Wilson, R., P. Luckow, B. Biewald, F. Ackerman, and E. Hausman. *2012 Carbon Dioxide Price Forecast.* Synapse Energy Economics, Inc. October 2012.

Synapse reports are available at www.synapse-energy.com.