

**BEFORE THE
CORPORATION COMMISSION OF OKLAHOMA**

APPLICATION OF PUBLIC SERVICE COMPANY OF)
OKLAHOMA FOR COMMISSION AUTHORIZATION OF)
A PLAN AND COST RECOVERY OF ACTIONS OF PSO)
TO BE IN COMPLIANCE WITH CERTAIN)
ENVIRONMENTAL RULES PROMULGATED BY THE)
UNITED STATES ENVIRONMENTAL PROTECTION)
AGENCY; SUCH ACTIVITIES TO INCLUDE, BUT NOT)
BE LIMITED TO, CAPITAL EXPENDITURES FOR)
EQUIPMENT AND FACILITIES; CONSTRUCTION OR)
PURCHASE OF AN ELECTRIC GENERATING FACILITY)
OR ENTER INTO A LONG-TERM PURCHASE POWER)
CONTRACT (AND POSSIBLE EARNING ON THE)
CONTRACT); CHANGE IN DEPRECIATION RATES)
AND/OR ESTABLISHMENT AND RECOVERY OF A)
REGULATORY ASSET; AND FOR SUCH OTHER RELIEF)
AS THE COMMISSION DEEMS PSO IS ENTITLED.)

Cause No. PUD 201200054

**RESPONSIVE TESTIMONY OF
JONATHAN WALLACH
ON BEHALF OF
THE SIERRA CLUB**

Resource Insight, Inc.

JANUARY 8, 2013

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1 **I. Introduction**

2 **Q: Please state your name, occupation, and business address.**

3 A: My name is Jonathan F. Wallach. I am Vice President of Resource Insight,
4 Inc., 5 Water Street, Arlington, Massachusetts.

5 **Q: Please summarize your professional experience.**

6 A: I have worked as a consultant to the electric-power industry since 1981.
7 From 1981 to 1986, I was a research associate at Energy Systems Research
8 Group. In 1987 and 1988, I was an independent consultant. From 1989 to
9 1990, I was a senior analyst at Komanoff Energy Associates. I have been in
10 my current position at Resource Insight since September of 1990.

11 Over the past thirty years, I have advised clients on a wide range of
12 economic, planning, and policy issues including: electric-utility restructuring;
13 wholesale-power market design and operations; transmission pricing and
14 policy; market valuation of generating assets and purchase contracts; power-
15 procurement strategies; risk assessment and management; integrated resource
16 planning; cost allocation and rate design; and energy-efficiency program
17 planning and design.

18 My resume is attached as Exhibit JFW-1.

19 **Q: Have you testified previously in utility regulatory proceedings?**

20 A: Yes. I have sponsored expert testimony in more than 55 federal, provincial,
21 or state proceedings in the U.S. and Canada. I include a detailed list of my
22 previous testimony in Exhibit JFW-1.

23 **Q: Please summarize your experience with regard to resource planning and**
24 **risk management.**

1 A: During my thirty years working as an economic consultant, I have evaluated
2 and formulated numerous utility resource plans in jurisdictions throughout
3 the U.S. and Canada. I have also conducted economic evaluations and risk
4 assessments of responsive bids in competitive solicitations of wholesale
5 supply for retail default service in a number of deregulated jurisdictions.
6 Finally, I have advised clients and sponsored expert testimony with the
7 regard to risk profiles of resource portfolios and authored a major study of
8 long-term costs and risks of resource portfolios for residential default-service
9 load.

10 **Q: On whose behalf are you testifying?**

11 A: I am testifying on behalf of the Sierra Club.

12 **Q: What is the purpose of your testimony?**

13 A: On September 26, 2012, Public Service Company of Oklahoma (PSO or “the
14 Company”) filed direct testimony in support of its request for approval to
15 recover costs associated with a plan (“Compliance Plan”) for bringing
16 Northeastern Units 3 and 4 into compliance with the Regional Haze Rule
17 (RHR) and the Mercury and Air Toxics Standard (MATS). The Company
18 formulated the Compliance Plan in accordance with the terms and conditions
19 of a settlement agreement between PSO, the U.S. Environmental Protection
20 Agency (EPA), the Secretary of the Environment for the State of Oklahoma,
21 the Oklahoma Department of Environmental Quality, and the Sierra Club
22 (“Settlement Agreement”).

23 This responsive testimony addresses the Company’s assessment of the
24 costs and risks associated with the proposed Compliance Plan and various
25 alternative plans for complying with the RHR and MATS. The Company’s
26 economic evaluation of various compliance options is described in the direct

1 testimony of Company witness Scott C. Weaver. The Company's risk
2 assessment of these options is described in the direct testimony by Company
3 witnesses Steven L. Fate and Howard L. Ground.

4 **Q: Please summarize your findings and conclusions.**

5 A: The Company's filing provides compelling evidence that the proposed
6 Compliance Plan is the lowest-cost and least-risky of the Company's options
7 for meeting deadlines in the next three to four years to comply with
8 significant environmental regulations. According to the Company's economic
9 analysis, the long-term cost for the proposed Compliance Plan – which
10 entails environmental upgrades to Northeastern Unit 3 and retirement of
11 Northeastern Unit 4 – is about \$203 million less than the cost of an
12 alternative plan that assumes more-extensive environmental upgrades and
13 continued operation of both Northeastern units to 2031.¹ Moreover, the
14 Company's risk assessment clearly shows that, of the potential compliance
15 options, the proposed Compliance Plan provides the strongest hedge against
16 potential new regulations over the next two decades.

17 In fact, PSO has understated the cost and risk-mitigation advantages of
18 its proposed Compliance Plan. The Company's economic analysis relies on a
19 natural-gas price forecast that reasonably reflected market conditions when
20 the forecast was completed. However, this forecast has become increasingly

¹ The Company conducted its economic analysis three times. The first analysis was conducted in late 2011, in support of ongoing settlement negotiations. The Company then undertook a follow-up analysis in August of 2012, based on the term sheet for the Settlement Agreement. Finally, PSO submitted an updated version of the August, 2012 analysis in a supplemental response to Oklahoma Industrial Energy Consumers' (OIEC) Data Request (DR) 3-2. All discussion herein of the Company's economic analysis refers to this updated version reported in the supplemental response to OIEC DR 3-2.

1 outdated as prices have plummeted to the point that even the Company's
2 lower-band price forecast exceeds current trading prices for futures contracts
3 over the next eleven years. Relying on the Company's lower-band
4 commodity forecast would widen the cost difference between the proposed
5 Compliance Plan and the alternative of retrofit and continued operation to
6 about \$294 million. Using current futures prices would widen this gap even
7 further to about \$332 million.

8 The Company may have further understated the cost and risk-mitigation
9 advantages of the proposed Compliance Plan, because the economic analysis
10 did not consider additional cost-effective energy efficiency or wind power as
11 options for meeting future resource needs and instead satisfied needs solely
12 with new gas capacity after retirement of Northeastern Unit 3 in 2026. There
13 are large, untapped reserves of both energy-efficiency savings and wind
14 generation in Oklahoma, and the Company plans to rely more heavily on
15 both of these resources in the future. Substituting cost-effective energy
16 efficiency and wind for the expected gas additions after 2026 would likely
17 yield a lower-cost, more-flexible, and less-risky Compliance Plan.

18 Finally, the Company's economic analysis apparently understates the
19 benefits of the proposed Compliance Plan relative to sensitivity cases that
20 assume that Northeastern Units 3 and 4 would continue to operate after
21 environmental upgrades until 2041, or ten years longer than in the base case.
22 As the Company acknowledges, these sensitivity cases do not account for the
23 potentially substantial costs to comply with a host of impending
24 environmental regulations. The proposed Compliance Plan mitigates the risk
25 that the Company will need to incur such costs in the future, and provides
26 PSO flexibility to respond to future environmental regulations. Because these
27 sensitivity cases omit potentially substantial costs of additional

1 environmental upgrades, the Commission should give little weight to their
2 results.

3 Given the evidence regarding the advantages of the proposed
4 Compliance Plan relative to potential alternatives, the Company's proposal to
5 upgrade Northeastern Unit 3 and to retire Unit 4 in 2016 appears to be the
6 most-reasonable approach for complying with the RHR and MATS and for
7 mitigating the risk of future environmental requirements.

8 **II. Proposed Compliance Plan**

9 **Q: Which environmental rules are addressed by the proposed Compliance**
10 **Plan?**

11 A: The Company proposes the Compliance Plan in order to comply with:

- 12 • The EPA final rule entitled, "Approval and Promulgation of
13 Implementation Plans; Oklahoma; Federal Implementation Plan for
14 Interstate Transport of Pollution Affecting Visibility and Best Available
15 Retrofit Technology Determinations," 76 Fed. Reg. 81, 728 (Dec. 28,
16 2011) ("RHR FIP").
- 17 • The Mercury and Air Toxics Standard (40 C.F.R. §63.9984), which
18 became effective on April 16, 2012.

19 **Q: Are these rules final and currently in effect as they apply to PSO?**

20 A: Yes.

21 **Q: Please summarize the requirements for these two rules.**

22 A: The RHR FIP sets a limit of 0.06 lb/MMBtu on SO₂ emissions from
23 Northeastern Units 3 and 4. According to the RHR FIP, PSO could meet this
24 limit by installing Dry Flue Gas Desulfurization equipment (DFGD) or by

1 fuel switching. The Company must reduce SO₂ emissions as required by the
2 RHR FIP by January 27, 2017.

3 The Mercury and Air Toxics Standard regulates the emissions of
4 hazardous air pollutants, which the Clean Air Act defines as particularly toxic
5 pollutants that cause cancer, birth defects, and other serious health problems.
6 As noted by Mr. Ground, MATS sets specific emission limits for mercury and
7 other pollutants emitted by Northeastern Units 3 and 4. The Company must
8 meet these limits by April 16, 2016, including a one-year extension.²

9 **Q: Please describe the Compliance Plan proposed by PSO.**

10 A: In accordance with the terms of the Settlement Agreement, the proposed
11 Compliance Plan provides for PSO to:

- 12 • Install Separated Over-Fire Air on Northeastern Units 3 and 4 by the
13 end of 2013.
- 14 • Attain a 30-day average SO₂ emission rate of 0.65 lb/MMBtu starting in
15 2014 by burning ultra-low-sulfur coal at both Units 3 and 4.
- 16 • Attain a 12-month average SO₂ emission rate of 0.60 lb/MMBtu starting
17 in 2015 by burning ultra-low-sulfur coal at both Units 3 and 4.
- 18 • Install Dry Sorbent Injection (DSI), Activated Carbon Injection (ACI),
19 and a fabric filter baghouse (FF) on Unit 3 by April 16, 2016.
- 20 • Retire Unit 4 on April 16, 2016 and replace it with a long-term purchase
21 power agreement (PPA).
- 22 • Limit the annual capacity factor for Unit 3 to 70% starting in 2021, 60%
23 starting in 2023, and 50% starting in 2025.

² *Direct Testimony of Howard L. Ground on behalf of Public Service Company of Oklahoma*, Cause No. PUD 201200054, September 26, 2012, p. 16.

1 • Retire Unit 3 by the end of 2026.³

2 **Q: Will the retirement of Northeastern Unit 4 in 2016 give rise to the need**
3 **for new replacement capacity?**

4 A: Yes. However, PSO does not expect to need to replace all 470 MW of the
5 unit's capacity, because of excess capacity on the PSO system. Instead, the
6 Company expects that retirement of Unit 4 will result in a capacity deficiency
7 that ranges from 200 MW to 250 MW between 2016 and 2021.⁴ As part of
8 the proposed Compliance Plan, the Company proposes to fill this resource
9 need with a 15-year contract with Calpine Oneta Power, LLC for the
10 purchase of 260 MW of capacity and dispatchable energy from the Oneta
11 combined-cycle (CC) natural-gas power plant.

12 **Q: Does the proposed Compliance Plan address future resource**
13 **requirements after retirement of Northeastern Unit 3 in 2026?**

14 A: No. However, as discussed below, the Company's simulation modeling of the
15 Compliance Plan adds new gas-fired generating capacity following
16 retirement of Unit 3 in 2026.

17 **Q: Why does PSO support the proposed Compliance Plan?**

18 A: According to Mr. Fate, the Company's support is based on a number of
19 considerations. First, PSO found that the expected cost of the proposed
20 Compliance Plan was reasonable relative to alternative approaches for
21 bringing Northeastern Units 3 and 4 into compliance with the RHR and

³ In addition, the Settlement Agreement requires that the Company undertake an economic analysis in 2021 to determine whether Unit 3 can be replaced at lower or equal cost with natural-gas or renewable resources. If so, then PSO will retire Unit 3 by the end of 2025.

⁴ *Direct Testimony of Scott C. Weaver on behalf of Public Service Company of Oklahoma*, Cause No. PUD 201200054, September 26, 2012, Table 3, p. 23.

1 MATS. Second, the Compliance Plan brings certainty to the Company's
2 compliance- and resource-planning process. The Settlement Agreement and
3 associated Compliance Plan eliminates the Company's litigation risk with
4 regard to RHR and MATS compliance requirements and mitigates
5 implementation risk with regard to the Company's ability to install required
6 controls in time to meet compliance deadlines. Finally, the Compliance Plan
7 provides PSO with crucial flexibility to respond to new environmental
8 restrictions that may be imposed in the future.

9 **Q: Would there be other benefits to the public from the proposed**
10 **Compliance Plan?**

11 A: Yes. The phase-out of the Northeastern units by 2026 will reduce and
12 eventually fully eliminate the plant's emissions of such pollutants as sulfur
13 dioxide, fine particulate matter, mercury, nitrogen oxides, and carbon
14 dioxide, all of which are harmful to human health.⁵

15 In addition, water intake by the Northeastern plant would be
16 substantially less under the proposed Compliance Plan than if PSO were to
17 retrofit Units 3 and 4 with DFGD, thereby reducing the potential for water
18 conflicts during severe droughts.⁶ The Company estimates that the increase

⁵ See RHR FIP, 76 Fed. Reg. at 81,752; *National Ambient Air Quality Standards for Sulfur Oxides (Sulfur Dioxide) – Final Decision*, 75 Fed. Reg. 35520, 35525-27 (June 22, 2010); *Clean Air Fine Particle Implementation Rule; Final Rule*, 72 Fed. Reg. 20586-01, 20586-87 (Apr. 25, 2007); 42 U.S.C. § 7412(b)(1),(2) (Clean Air Act provision covering hazardous air pollutants, including mercury compounds); *Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act; Final Rule*, 74 Fed. Reg. 66496, 66496 (Dec. 15, 2009); *Primary National Ambient Air Quality Standards for Nitrogen Dioxide; Final Rule*, 75 Fed. Reg. 6474, 6479-82 (Feb. 9, 2010).

⁶ Oklahoma is experiencing a drought of historic proportions. See, e.g., Bryan Painter, *Oklahoma's exceptional drought area more than doubles in week, report shows*, THE Responsive Testimony of Jonathan Wallach • Cause No. PUD 201200054 • January 8, 2013 Page 8

1 in water consumption at the Northeastern plant from retrofit of DFGD at both
2 units would be 65 times greater than with retrofit of ACI and DSI at Unit 3
3 pursuant to the proposed Compliance Plan.⁷ Under continued drought, the
4 Company’s daily need for water resulting from DFGD retrofits could
5 increase the potential for conflict with other needs in the Tulsa area.⁸ The
6 Northeastern Units currently intake water from the City of Tulsa, and the
7 surrounding area includes a variety of farms and ranches.⁹

8 **Q: Is the Company’s proposal to retire Northeastern Unit 4 before it**
9 **reaches the end of its useful life an exceptional response to impending**
10 **environmental requirements?**

11 A: No. To the contrary, numerous owners of coal plants around the U.S. –
12 whether regulated utilities or unregulated generators – have responded to new
13 environmental restrictions imposed by the RHR and MATs, and to the threat
14 of additional restrictions from future requirements, by announcing the early
15 retirement of coal generation. I provide a list of announcements to-date
16 compiled by the Sierra Club in Exhibit JFW-2. Faced with the prospect of
17 substantial expenditures to comply with current regulations and the risk of

OKLAHOMAN, Aug. 17, 2012, at <http://newsok.com/oklahomas-exceptional-drought-area-more-than-doubles-in-week-report-shows/article/3701474>. The drought and continuing dry conditions will put pressure on power plant operations. See Juliet Eilperin, *Climate change challenges power plant operations*, Washington Post, Sept. 9, 2012 (noting that, already, “[r]ising temperatures have started to affect U.S. coal plants”), at http://www.washingtonpost.com/national/health-science/climate-change-challenges-power-plant-operations/2012/09/09/42b26b8e-f6a5-11e1-8b93-c4f4ab1c8d13_story.html.

⁷ See Response to Sierra Club DR 5-9 and Attachments 1 and 2.

⁸ See, e.g., Kate Galbraith, *Amid Texas Drought, High-Stakes Battle Over Water*, The New York Times (June 18, 2011), available at <http://www.nytimes.com/2011/06/19/us/19ttwater.html>.

⁹ See Responses to Sierra Club DR 2-11 and Sierra Club DR 5-8.

1 even greater expenditures to comply with future requirements, these owners
2 have apparently concluded that the prudent course of action is to retire these
3 coal plants.

4 **III. Economic Analysis of Compliance Options**

5 **Q: Please describe the Company's economic analysis of compliance options.**

6 **A:** Using the Strategist software model, PSO estimated system production costs
7 and incremental-capital revenue requirements for four compliance cases:

- 8 1. Proposed Compliance Plan ("EPA Settlement Option").
- 9 2. Install DFGD and ACI on both Northeastern Units 3 and 4. Continue
10 operating both units and retire at the end of 2031 ("Option #1").
- 11 3. Retire Unit 4 in 2016 and replace with a 30-year PPA. Install DFGD and
12 ACI on Unit 3 and continue operating to the end of 2031 ("Option #2").
- 13 4. Retire both Units 3 and 4 in 2016 and replace with a combination of a
14 long-term PPA and new gas build ("Option #4").

15 For options #1 and #2, PSO assumes that the Northeastern units would
16 have fifteen years of useful life remaining after upgrades with environmental
17 controls. The Company also evaluated sensitivities on these two compliance
18 cases that assumed 25 years of remaining life and thus did not retire
19 controlled units during the planning horizon for economic modeling ("Option
20 #1A" and "Option #2A").

21 Based on the Company's forecasts for customer demand, capital costs
22 for new generation resources, fuel prices, plant operating characteristics and
23 retirement schedules, and other model inputs, the Strategist model schedules
24 the addition of new capacity to meet resource needs and then simulates the
25 dispatch of both existing and new generation resources. Based on the

1 capacity-expansion schedule and annual dispatch, Strategist estimates annual
2 system expenditures for:

- 3 • Fuel plus variable O&M.
- 4 • Emissions allowances.
- 5 • Fixed O&M.
- 6 • Market energy purchases or sales.
- 7 • Amortized recovery of capital investments in environmental retrofits.
- 8 • Amortized recovery of capital investments in new generation capacity.
- 9 • PPA capacity and energy costs.

10 For each compliance case, PSO forecast annual system costs over a
11 thirty-year analysis period from 2011 to 2040, and then calculated the
12 cumulative present worth (CPW) for each compliance case by discounting
13 the thirty-year stream of costs to 2011 at the Company's weighted average
14 cost of capital.

15 **Q: What did the Company estimate for the CPW for each compliance case?**

16 A: As indicated in Table 1, the EPA Settlement Option has the lowest CPW of
17 the four compliance cases evaluated by PSO. In particular, the CPW for
18 Option #1 exceeds that for the EPA Settlement Option by about \$203 million.
19

1 **Table 1: Cumulative Present Worth of Four Compliance Cases¹⁰**

Compliance Case	Cumulative Present Worth (\$M)	Difference from EPA Settlement Option (\$M)
EPA Settlement Option	14,589	----
Option #1	14,791	203
Option #2	14,705	116
Option #4	14,759	170

2

3 **Q: How does the CPW for the EPA Settlement Option compare to those for**
 4 **the 25-year sensitivity cases?**

5 A: As indicated in Table 2, assuming 25 years of remaining life on the
 6 Northeastern units substantially reduces the CPW for the compliance
 7 scenarios that install DFGD and ACI on one or both of the Northeastern
 8 units. In this case, the CPW for the EPA Settlement Option exceeds that for
 9 Option #1A by about \$278 million and exceeds that for Option #2A by about
 10 \$117 million.

11 **Table 2: Cumulative Present Worth of Sensitivity Cases¹¹**

Compliance Case	Cumulative Present Worth (\$M)	Difference from EPA Settlement Option (\$M)
EPA Settlement Option	14,589	----
Option #1A	14,311	(278)
Option #2A	14,472	(117)

12

¹⁰ CPW data extracted from the Excel spreadsheet (SUBSTITUTE) Ex SCW-8 WP (FOLLOW UP (Aug '12) NE 3&4_CPW Econ Analysis Summ).xls, provided in the supplemental response to OIEC DR 3-2.

¹¹ CPW data extracted from the Excel spreadsheet (SUBSTITUTE) Ex SCW-8 WP (FOLLOW UP (Aug '12) NE 3&4_CPW Econ Analysis Summ).xls, provided in the supplemental response to OIEC DR 3-2.

1 **Q: Why does the CPW decrease with the assumed ten-year extension of**
2 **remaining life?**

3 A: The decrease is due to the fact that a ten-year extension eliminates the need
4 for new gas capacity to replace the Northeastern units.¹² For example,
5 according to Exhibit SCW-8A (substitute), the Strategist run for Option #1
6 adds 932 MW of new gas CC capacity in 2031 to fill the resource need
7 created by the retirement of Northeastern Units 3 and 4 in that year.¹³ In
8 contrast, no replacement capacity is required in the Strategist run for Option
9 #1A, since the Northeastern units are assumed to operate through the 30-year
10 planning horizon.¹⁴

11 Based on model results provided in the supplemental response to OIEC
12 3-2, I estimate that about \$338 million, or about 70%, of the \$481 million
13 CPW decrease from Option #1 to Option #1A is due to the additional capital
14 and fixed O&M cost for the new gas CC in the Option #1 case. Another \$129

¹² In contrast, the associated increase in the amortization period for capital investments in DFGD and ACI should not materially affect the CPW. Whether amortized over 15 or 25 years, the annual streams of depreciation and return on unamortized balances should present value to the same amount when discounted at the weighted average cost of capital.

¹³ See the Excel spreadsheet (SUBSTITUTE) Ex SCW-8A DETAIL WP (FOLLOW-UP_NE 3&4_CPW Summ_BASE Pricing).xls, provided in the supplemental response to OIEC DR 3-2.

¹⁴ More precisely, the Strategist runs for Option #1 and Option #1A add the same amount of new combustion-turbine capacity throughout the thirty-year analysis period in order to meet minimum reserve requirements. In addition, the run for Option #1 adds 932 MW of new CC capacity as a result of the retirement of the Northeastern units in 2031.

1 million, or 27%, of the CPW decrease is due to the additional cost of fuel
2 burned at the new gas CC in the Option #1 case.¹⁵

3 As discussed below, there would likely be less of a difference in CPW
4 between the Option #1 and Option #1A cases if PSO relied on cost-effective
5 energy efficiency and wind resources rather than new gas-fired generation to
6 meet future resource needs after the retirement of Northeastern Unit 3 in
7 2031. These resources are abundant and as yet largely untapped in
8 Oklahoma.

9 **Q: What do you conclude from the results of the Company's economic**
10 **analysis?**

11 A: The Company's economic analysis provides conclusive evidence that the
12 proposed Compliance Plan would likely be the lowest-cost of the feasible
13 options for bringing Northeastern Units 3 and 4 into compliance with the
14 RHR and MATS. In fact, as discussed below, the Company's economic
15 analysis may understate the cost advantage of the EPA Settlement Option
16 case in three respects. First, the Company's analysis may overstate likely fuel
17 prices, and thus fuel costs for the gas resources that provide replacement
18 generation once the Northeastern units are retired. Second, the EPA
19 Settlement Option case may overstate the cost to meet future resource needs
20 after the retirement of Northeastern Unit 3 in 2026, because it does not allow
21 for the replacement of Unit 3 with cost-effective energy efficiency or wind
22 resources. Third, the Company's analysis likely understates the costs for
23 Options #1A and #2A cases, since these sensitivity cases do not account for

¹⁵ These calculations are based on data from the Excel spreadsheet (SUBSTITUTE) Ex SCW-8 WP (FOLLOW UP (Aug '12) NE 3&4_CPW Econ Analysis Summ).xls, provided in the supplemental response to OIEC DR 3-2.

1 the potentially substantial costs to comply with a number of impending
2 environmental regulations.

3 **IV. Natural Gas Price Forecast**

4 **Q: What is the basis for the Company's long-range forecast of natural gas**
5 **prices?**

6 A: For the purposes of its economic analysis, PSO relied on a forecast of
7 commodity prices (for all fossil fuels, CO₂, and Southwest Power Pool [SPP]
8 electric market prices) developed internally in September of 2011. According
9 to Mr. Weaver, the Company's natural gas price forecast incorporates the
10 Company's estimates of price impacts from increased gas demand as
11 environmental restrictions force substitution of gas for coal generation.

12 **Q: How does the Company's internal forecast compare with market**
13 **expectations regarding natural gas price trends?**

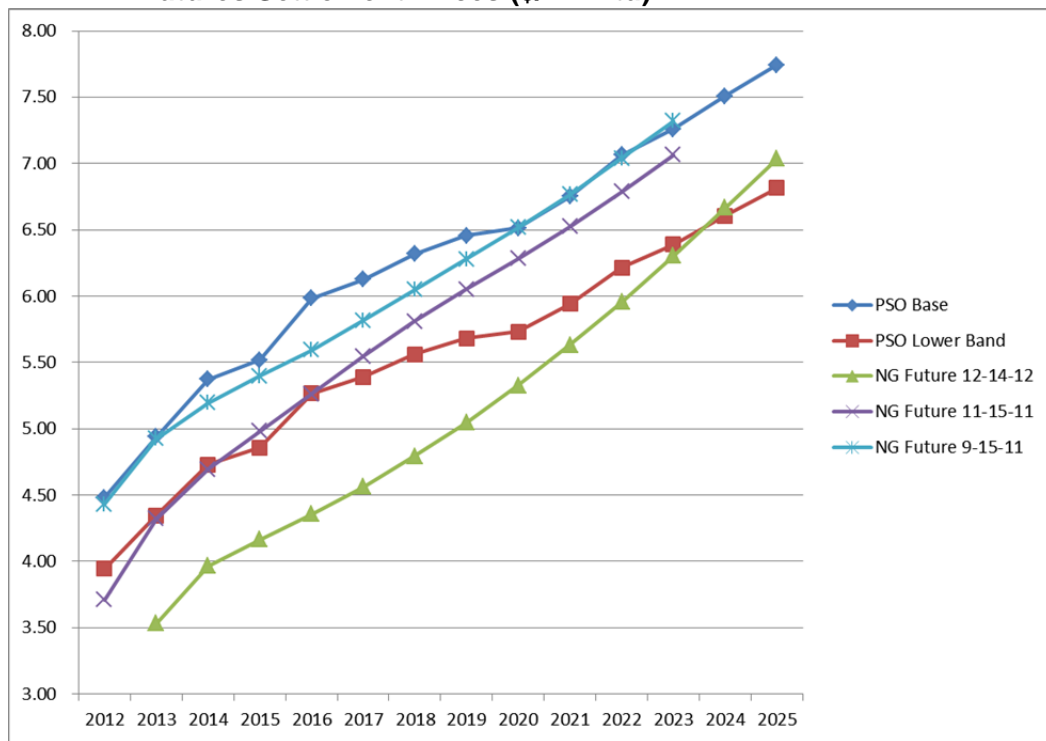
14 A: The Company's forecast appears to be fairly consistent with market
15 expectations prevailing at the time that the forecast was developed in
16 September of 2011. Figure 1 compares the Company's base and lower-band
17 price forecasts for natural gas at the Henry Hub against settlement prices for
18 natural gas futures contracts on various trading days.¹⁶ As Figure 1

¹⁶ For each trading day, I derive the annual settlement price as the average of settlement prices for monthly futures contracts for that year. For example, for the December 14, 2012 trading day, the 2013 futures price is calculated by taking the average of that day's settlement prices for the twelve monthly futures contracts for 2013.

1 illustrates, the Company's base forecast closely tracked market expectations
2 that prevailed in mid-September of 2011.¹⁷

3 However, as also indicated in Figure 1, market prices have fallen
4 sharply since PSO developed its internal price forecast in September of 2011.
5 In fact, from mid-September of 2011 to mid-December of 2012, trading
6 prices for natural gas futures contracts have fallen by an average of about
7 20%. As a result, current market expectations are that Henry Hub prices for
8 the years 2013 to 2023 will be about 11% lower on average than projected in
9 the Company's lower-band forecast.

10 **Figure 1: Comparison of PSO Henry Hub Price Forecast and Natural Gas**
11 **Futures Settlement Prices (\$/MMBtu)**



12

¹⁷ On average from 2012 to 2023, annual prices forecast by the Company exceed market prices for contracts traded on September 15, 2011 by only 2%.

1 **Q: How would a reduction in forecasted gas prices affect the Company's**
2 **economic modeling of the EPA Settlement Option case?**

3 A: Relying on a forecast that is consistent with current expectations would lower
4 the CPW for the EPA Settlement Option case and increase this case's cost
5 advantage over the Option 1 case.

6 A reduction in natural gas prices would reduce the cost of the EPA
7 Settlement Option case relative to the Option 1 case in four respects. First,
8 the cost of gas-fired generation to replace output from Northeastern Unit 4
9 after retirement in 2016 – whether from existing generation or from the
10 Calpine PPA – would be reduced with lower forecasted gas prices. Likewise,
11 the cost of generation from new gas capacity after Northeastern Unit 3 is
12 retired in 2026 (if that is the replacement resource) would be reduced with
13 lower gas prices. Third, a reduction in gas prices would likely result in lower
14 electric market prices, to the extent that gas generation is the marginal
15 resource in SPP and thus sets market-clearing prices. Such reductions in
16 market prices would, in turn, lower the cost of energy market purchases
17 relied on to replace Unit 4 output after 2016. Finally, lower gas prices
18 (relative to coal prices) might reduce the economic dispatch of both
19 Northeastern units, and thus effectively reduce the amount (and therefore
20 cost) of additional gas generation or market purchases required to replace
21 their output after retirement.

22 The results from the Company's modeling of the compliance cases with
23 the lower-band commodity forecast indicate the combined impact of these
24 four effects. As indicated in Table 3, substituting the lower-band for the base
25 commodity forecast reduces the CPW for the EPA Settlement Option case by
26 about \$930 million, but reduces the CPW for the Option 1 case by about

1 \$839 million.¹⁸ As a result, the cost advantage of the EPA Settlement Option
2 case relative to the Option #1 case increases from \$203 million to \$294
3 million, or by about 45%.

4 **Table 3: Impact of Lower-Band Gas Prices on Cumulative Present Worth (\$M)¹⁹**

Compliance Case	Base Case Gas Price Forecast	Lower-Band Gas Price Forecast	Difference
EPA Settlement Option	14,589	13,658	930
Option #1	14,791	13,952	839
Difference	203	294	(91)

5 **Q: What would be the cost impact if the gas price forecast were based on**
6 **current market prices rather than on the Company's lower-band**
7 **expectations?**

8 A: Basing the gas price forecast on current market prices would further increase
9 the cost advantage of the EPA Settlement Option case over the Option #1
10 case. However, I would have to rerun the Company's Strategist modeling of
11 compliance options to fully capture the effect on plant dispatch, market
12 purchases and sales, and new-resource additions from using a gas price
13 forecast that is based on current market prices. Instead, I estimate the impact
14 on system costs based on a simplified analysis that assumes no changes to
15 plant dispatch, market prices or transaction quantities, or the timing or type
16 of capacity additions. As such, this analysis captures only the direct reduction

¹⁸ The lower-band forecast incorporates lower prices for natural gas, coal, and energy market purchases or sales, and higher prices for CO₂ allowances. As such, use of the lower-band forecast for natural gas reduces the CPW for the EPA Settlement Option case as described above, while use of the lower-band forecast for coal reduces the CPW for the Option #1 case.

¹⁹ CPW data extracted from the Excel spreadsheet (SUBSTITUTE) Ex SCW-8 WP (FOLLOW UP (Aug '12) NE 3&4_CPW Econ Analysis Summ).xls, provided in the supplemental response to OIEC DR 3-2.

1 in gas fuel costs from a reduction in gas prices, but not the indirect impacts
2 from changes in plant dispatch or additions.

3 Based on the price trends indicated in Figure 1, I assume for the
4 purposes of this analysis a market-price forecast with prices through 2025
5 that are set at the settlement prices for natural gas futures contracts for the
6 December 14, 2012 trading day. For all years thereafter, I assume the same
7 prices for the market-price forecast as in the lower-band forecast. For the
8 EPA Settlement Option and Option #1 cases (with lower-band price forecast),
9 I then calculate for each year starting in 2016 the reduction in annual gas
10 costs resulting from substitution of market prices for lower-band prices.²⁰ I
11 derive this annual reduction as the product of: (1) the annual amount of gas
12 consumption; and (2) the annual price difference between market-price
13 forecast prices and lower-band forecast prices.

14 Table 4 summarizes the CPW impact of substituting current market
15 prices for lower-band forecast prices. As indicated in Table 4, replacing
16 lower-band prices with current market prices reduces the CPW by about \$257
17 million for the EPA Settlement Option case and by about \$219 million for the
18 Option #1 case. Thus, replacing lower-band prices with current market prices
19 increases the cost advantage of the EPA Settlement Option case over the
20 Option #1 case from \$294 million to \$332 million.
21

²⁰ I start this calculation in 2016 based on an assumption that annual gas consumption will not differ between the two cases until Northeastern Unit 4 is retired in 2016. In reality, the Strategist model simulates slightly different amounts of gas burn between the two cases prior to 2016 due to the stochastic nature of the model's simulation of plant availability and dispatch.

1

Table 4: Impact of Market Gas Prices on Cumulative Present Worth (\$M)

Compliance Case	Lower-Band Gas Price Forecast	Current Market Price Forecast	Difference
EPA Settlement Option	13,658	13,402	257
Option #1	13,952	13,734	219
Difference	294	332	(38)

2 **V. Clean Replacement Resources**

3 **Q: In the Strategist runs for the EPA Settlement Option and Option #1**
4 **cases, what type of new capacity is added to the PSO system when**
5 **Northeastern Unit 3 retires?**

6 A: As discussed above, in either case, the Strategist model adds 932 MW of new
7 gas CC capacity when Northeastern Unit 3 retires.²¹ In contrast, no new CC
8 capacity is added in the run for the Option #1A case, since Unit 3 is assumed
9 to remain in operation throughout the analysis period.

10 **Q: Would it be reasonable to expect that PSO might actually replace**
11 **Northeastern Unit 3 with resources other than gas-fired generation?**

12 A: Yes. It seems likely that there will be lower-cost alternatives – in particular,
13 energy efficiency and wind resources – available to the Company by the time
14 Unit 3 retires. In fact, according to Mr. Fate, PSO is planning to develop and
15 deploy such resources over that same time frame:

²¹ Specifically, Strategist adds four 233 MW CC plants over the six-year period from 2026 through 2031 in the EPA Settlement Option case, but adds all four units in 2031 in the Option #1 case.

1 Over the next 15 years PSO expects to transition its generating fleet to
2 rely more heavily on natural-gas fired generation, wind resources, and
3 energy efficiency to meet customers' demand, while also having the
4 flexibility to consider the benefits of any other supply- or demand-side
5 options that may develop over this period of time.²²

6 With sufficient commitment, the Company may be able to acquire more
7 than enough cost-effective energy efficiency and wind resources to replace
8 the output from Northeastern Unit 3 when it retires.²³

9 **Q: For the purposes of its economic analysis, what amount of energy**
10 **savings does the Company assume are generated from utility energy-**
11 **efficiency programs?**

12 A: According to Exhibit SCW-2 to Mr. Weaver's direct testimony, the Company
13 expects that its programs will yield cumulative savings of about 610 GWh by
14 2021, representing an increase of 470 GWh of savings over the nine-year
15 period from 2013 to 2021. On average, then, the Company anticipates
16 acquiring about 52 GWh of new savings per year over the next nine years, or
17 about 0.3% of total PSO sales.

18 **Q: How does this compare to the total potential for cost-effective energy**
19 **savings in the Company's service territory?**

20 A: According to a study by the Company of the market potential for cost-
21 effective energy-efficiency savings, cumulative savings of more than 1,600
22 GWh are economically achievable over ten years with a comprehensive
23 portfolio of utility programs that overcome market barriers to customer

²² *Direct Testimony of Steven L. Fate on behalf of Public Service Company of Oklahoma*, Cause No. PUD 2012000054, September 26, 2012, p. 16.

²³ Depending on the generation profile of system resources, Northeastern Unit 3 might be replaced by some combination of energy efficiency, wind generation, and energy market purchases.

1 participation with strong customer incentives and other design measures.²⁴
2 Thus, according to the Company's potential study, a comprehensive effort at
3 maximizing cost-effective savings could generate on average about 160 GWh
4 of incremental savings per year, equivalent to about 0.8% of PSO retail sales.

5 In fact, the Company's potential study indicates that even greater
6 savings may be economically achievable in the Company's service territory.

7 The potential study notes that:

8 ... among utilities recognized for their "best practices" programs (e.g.,
9 Pacific Gas & Electric, Xcel-Northern States Power, Southern California
10 Edison, Wisconsin Power & Light), annual incremental efficiency is
11 typically in the range of less than 1.4%. These results should be used
12 with some care absent comparison of utility service area and avoided
13 cost differences, but they are nevertheless suggestive.²⁵

14 A more-recent study by the Green Energy Economics Group of energy-
15 efficiency potential in Oklahoma likewise finds that the best-performing
16 utility or statewide efforts have achieved and are planning to continue to
17 achieve savings rates of between 1%-2% of load.²⁶ According to this study,
18 savings equivalent to 2% of load could be achieved at a cost of about
19 5¢/kWh.

20 Were PSO to ramp up its annual rate of energy-efficiency savings to
21 1.5% of retail sales by 2015, I estimate that the Company could achieve
22 cumulative savings of about 2,590 GWh by 2021, or about 1,990 GWh more

²⁴ *Energy Efficiency Potential Study*, Figure 8, p. 16. Provided as Attachment 1 to the Company's response to Sierra Club Data Request 3-3.

²⁵ *Id.*, p. 22.

²⁶ This study was filed as Exhibit JJP-2 to *Direct Testimony of John Plunkett on behalf of the Sierra Club*, Oklahoma Corporation Commission, Cause No. PUD 201100087, November 9, 2011.

1 savings than the Company is planning to achieve in that year. Assuming a
2 T&D loss factor of 7%, this additional savings would be equivalent to about
3 2,130 GWh of generation. By way of comparison, a 460 MW CC plant (i.e.,
4 equivalent capacity to Northeastern Unit 3) operating at a 60% capacity
5 factor would generate about 2,420 GWh of energy per year. Thus, the
6 Company could replace the bulk of the output from new gas CC by ramping
7 up its acquisition of energy-efficiency savings to 1.5% of load.

8 **Q: What is the potential for new wind development in Oklahoma and**
9 **adjacent areas?**

10 A: Oklahoma and other parts of the Southwest Power Pool have enormous
11 potential for wind-farm development. As of June of 2012, there were
12 approximately 6,200 MW of wind capacity in service, representing a more
13 than 50% increase in installed capacity from the previous year. In addition, as
14 of June of 2012, there were 63 wind projects totaling about 12,200 MW that
15 had active or suspended Generation Interconnection Agreements, but were
16 not yet in service. Another 54 wind projects totaling approximately 9,300
17 MW were in Southwest Power Pool's interconnection queue.²⁷

18 In addition, a study for SPP found that "there are no significant
19 technical barriers to integrating wind generation to a 20% penetration level
20 into the SPP system, provided that sufficient transmission is built."²⁸ A 20%
21 penetration level would be equivalent to 46,700 GWh from about 13,700
22 MW of wind farms. This study also reviewed the effects of increasing wind

²⁷ All statistics from *Third Status Report of Southwest Power Pool, Inc., In Response to Order on Interconnection Queue Reform*, FERC Docket No. ER09-1254-000, July 31, 2012.

²⁸ Charles River Associates, *SPP WITF Wind Integration Study Final Report*, CRA Project No. D14422, 2010, p. 1-5.

1 generation to a 40% penetration level (about 25,000 MW of wind capacity,
2 producing 86,000 GWh) and identified no specific problems, although the
3 analysis was more limited than for the 20% case.

4 **Q: How much might this new wind development cost?**

5 A: According to the U.S. Department of Energy, contracts for wind power
6 signed in 2011 for projects in the “wind belt,” which includes Oklahoma,
7 Missouri, Texas and Kansas, averaged \$32/MWh, with some projects as low
8 as \$28/MWh.²⁹ Even without the Production Tax Credit (PTC), these projects
9 would cost less than \$60/MWh. Turbine costs continue to fall, according to
10 Bloomberg New Energy Finance, “because of excess capacity and new low-
11 cost competitors.”³⁰

12 Moreover, Oklahoma Gas and Electric Company currently assumes for
13 its integrated resource planning that purchases from third-party wind
14 developers will be priced at \$30/MWh with the PTC or \$50/MWh without
15 the PTC.³¹

16 **Q: Would acquisition of energy efficiency and wind resources in lieu of new
17 gas-fired capacity provide benefits other than lower costs?**

18 A: Yes. In particular, the addition of energy efficiency and wind resources would
19 enhance fuel diversity and would serve to mitigate fuel-price risk. In
20 addition, with their relatively short lead times and small unit sizes, reliance
21 on energy efficiency and wind resources would allow PSO to more closely

²⁹ U.S. Department of Energy, *2011 Wind Technologies Market Report*, August, 2012, p. 52.

³⁰ Ethan Zindler, “Overcapacity and New Players Keep Wind Turbine Prices in the Doldrums”, Bloomberg New Energy Finance, March 6, 2012.

³¹ Oklahoma Gas and Electric Company, *Integrated Resource Plan*, Draft, October, 2012, p. 35.

1 match the timing and magnitude of resource acquisition to expected need and
2 would greatly enhance the Company's flexibility to respond to unexpected
3 changes in resource requirements. Finally, reliance on energy efficiency or
4 wind resources rather than fossil-fueled generation would mitigate the
5 Company's exposure to the risk of future environmental restrictions.

6 A recent report by Ceres (excerpts of which are attached as Exhibit
7 JFW-3) highlights the risk-mitigation advantages of energy efficiency and
8 wind power. The report ranks a number of generation resources (including
9 gas CC generation) according to their composite risk scores and finds that
10 energy efficiency and wind are the least-risky by a wide margin of the ranked
11 options.³²

12 **VI. Future Compliance Costs**

13 **Q: Are Northeastern Units 3 and 4 likely to be subject in the future to**
14 **environmental requirements beyond the RHR and MATS?**

15 A: Yes. There are a number of impending new regulations or revisions to
16 existing requirements which might require additional capital investments or
17 an increase in operating costs at the Northeastern units. According to Mr.
18 Ground, these new rules or revisions include:

- 19 • Cross State Air Pollution Rule (CSAPR).
- 20 • Coal Combustion Residuals (CCR) regulations.
- 21 • Clean Water Act Section 316(b) rule.

³² Ceres, *Practicing Risk-Aware Electricity Regulation*, April, 2012, Figures 14-17, p. 35-37. The full report is available online at <http://www.ceres.org/resources/reports/practicing-risk-aware-electricity-regulation>.

- 1 • Greenhouse gas New Source Performance Standards (NSPS) for
- 2 existing units.
- 3 • New one-hour SO₂ and NO₂ Primary National Ambient Air Quality
- 4 Standards (NAAQS).
- 5 • Revised NAAQS for particulate matter and ozone.
- 6 • Revised State Implementation Plan for the second planning period
- 7 under the RHR.

8 Mr. Ground and Mr. Fate discuss these rules and their requirements in
9 more detail.

10 **Q: Did PSO include expected compliance costs for these impending**
11 **requirements in its economic analysis of compliance options?**

12 A: For the most part, no. The Company explicitly included costs to comply with
13 the CCR rule, based on an assumption that coal combustion byproducts
14 would be regulated as non-hazardous waste.³³ In addition, according to Mr.
15 Weaver, PSO assumed a tax on CO₂ emissions starting in 2022.³⁴

16 However, PSO did not explicitly assume any costs to comply with any
17 other impending environmental requirements in its economic modeling of
18 compliance cases.³⁵ For example, as noted above, the Company assumed that
19 coal combustion byproducts would be regulated as non-hazardous waste,
20 even though the EPA has not yet determined whether it will classify coal

³³ See the Company's response to the Attorney General's DR 3-12.

³⁴ Although PSO did not include any direct compliance costs, the Company stated its belief in response to Sierra Club DR 2-12 that greenhouse gas NSPS regulation for existing plants "is likely in the future."

³⁵ The Company currently expects that both Northeastern units will be exempt from requirements promulgated under Section 316(b) of the Clean Water Act.

1 combustion waste as hazardous or non-hazardous. The EPA has estimated
2 that the overall compliance costs to dispose of coal combustion waste under
3 hazardous waste provisions would be about 2.5 times higher than for disposal
4 as non-hazardous waste, suggesting that disposal costs would also be
5 significantly higher for each individual plant.³⁶

6 In addition, the Company acknowledges that further emissions
7 reductions may be required in response to the revised PM and Ozone
8 NAAQS, and that PSO did not include the costs associated with such
9 requirements in its economic modeling.³⁷ In a recent filing before the Texas
10 Public Utility Commission, Southwestern Electric Power Company (also a
11 subsidiary of AEP) acknowledges that the EPA is considering revising the 8-
12 hour ozone NAAQS from 75 ppb down to 60 - 70 ppb, and that the EPA
13 expects to finalize the new standard by December of 2014.³⁸ The EPA
14 predicts that Tulsa, the closest major metropolitan area to the Northeastern

³⁶ According to the EPA, “the Regulatory Impact Analysis (RIA) estimates the average annual regulatory cost, for the next 50 years, to be \$1,474 million a year under the Subtitle C option and \$587 million a year under the Subtitle D option. These estimates include the costs of industry compliance and state and federal government oversight and enforcement costs. On a 50-year present value basis at a 7% discount rate, these average annual costs total to \$20.3 billion (Subtitle C) and \$8.1 billion (Subtitle D), respectively.” EPA, *Frequent Questions: Coal Combustion Residues (CCR) - Proposed Rule*, at <http://www.epa.gov/osw/nonhaz/industrial/special/fossil/ccr-rule/ccrfaq.htm#20>. See also Response to Sierra Club DR 2-9 (acknowledging higher costs under hazardous waste scenario).

³⁷ Response to Sierra Club DR 5-2.

³⁸ *Southwestern Electric Power Company’s Response to Commission Staff’s First Set of Requests for Information, Question Nos. Staff 1-1 Through Staff 1-9*, Texas Public Utility Commission Project No. 40882 (filed Dec. 14, 2012).

1 plant, will be out of attainment in 2020 if the ozone standard is revised to 65
2 ppb or lower.³⁹

3 According to Mr. Fate:

4 PSO recognizes that the Northeastern Power Station might have an
5 impact in the Tulsa metropolitan area and its ability to stay in attainment
6 with the National Ambient Air Quality Standards (“NAAQS”) for ozone
7 and PM2.5 and avoid costly counter-measures. Thus, installing emission
8 controls at or obtaining replacement power for Northeastern is important
9 to Tulsa and the Tulsa economy.⁴⁰

10 However, the Company did not include the costs of these potential
11 “costly counter-measures” for either ozone or PM2.5 in its economic
12 modeling of the scenarios in which Northeastern continues to operate.

13 **Q: Are there other potential regulations that Mr. Ground did not discuss?**

14 A: Yes. There are at least two additional potential regulations that Mr. Ground
15 did not reference. First, the EPA is in the process of reevaluating the effluent
16 limitation guidelines developed for the steam electric generation industry and
17 in particular for coal-fired power plants, because:

³⁹ See EPA, *Counties Projected to Violate Primary 8-hour Ground-Level Ozone Standard in 2020* (attached as Exhibit JFW-4), at <http://www.epa.gov/glo/pdfs/CountyOzoneLevels2020primary.pdf>, and *Maps of Counties with Monitors Ozone Standards*, at <http://www.epa.gov/glo/pdfs/20100104maps.pdf>. Tulsa is already struggling to meet the existing ozone standards, with related health advisories. For example, see *Tulsa area's air quality 'horrific'*, Tulsa World (Aug. 12, 2012) (reporting 22 violations of federal ozone standards in 2012 as of August), http://www.tulsaworld.com/news/article.aspx?subjectid=11&articleid=20120810_16_A10_TheLon654452, *Oklahoma's ozone levels spike as heat wave continues*, The Oklahoman (Aug. 5, 2011) <http://newsok.com/oklahomas-ozone-levels-spike-as-heat-wave-continues/article/3597772>, *Specialists advise residents to stay indoors, escape high ozone levels*, The Oklahoma Daily (July 2, 2011) <http://oudaily.com/news/2012/jul/02/ozone-days/>, *Ozone Alert in Tulsa*, Fox News 23 (July 12, 2012), <http://www.fox23.com/news/local/story/Ozone-Alert-in-Tulsa/wLIRSZWdb0aiFZUIgM-yIQ.csp>.

⁴⁰ Direct Testimony of Steven L. Fate, p. 16.

1 Over the past 20 years, growing use of flue-gas desulfurization systems
2 has increased the amount of toxic metals discharged from power plants,
3 and installation of scrubbers is expected to increase over the next 15
4 years.⁴¹

5 In a filing with the Texas Public Utility Commission, Southwestern
6 Electric Power Company states that:

7 It is expected that this proposal will include proposed [limitations] for
8 the following wastewater categories - fly ash sluice wastewater, bottom
9 ash sluice wastewater, blow down from wet FGD systems and coal
10 combustion residual leachate. . . Depending on the constituents in the
11 covered waste stream, treatment options, if necessary, would include co-
12 precipitation, adsorption, neutralization and bioreactor systems.⁴²

13 While the proposed rule has been delayed to April 2013, the EPA is
14 bound by consent decree to issue final wastewater effluent limitations for
15 coal-fired power plants by May 22, 2014.⁴³

16 Second, as acknowledged by PSO, the EPA will continue with its
17 ongoing reviews of the ozone, PM2.5, and other NAAQS. These reviews
18 might result in stricter NAAQS. Because the “good neighbor” requirements
19 of the Clean Air Act are triggered by NAAQS, identification of new
20 nonattainment areas, or areas struggling with attainment, could also result in

⁴¹ *Defenders of Wildlife v. Jackson*, D.D.C., No. 1:10-cv-01915, *stipulated extension* 12/10/12 (Attached as Exhibit JFW-5). See also *Cleansing the Air at the Expense of Waterways*, The New York Times (Oct. 12, 2009), at <http://www.nytimes.com/2009/10/13/us/13water.html> (describing how scrubber retrofits on coal-fired power plants have led to increased water pollution).

⁴² *Southwestern Electric Power Company's Response to Commission Staff's First Set of Requests for Information, Question Nos. Staff 1-1 through Staff 1-9*, Texas Public Utility Commission Project No. 40882 (filed Dec. 14, 2012), p. 6.

⁴³ See Exhibit JFW-5.

1 a requirement for further reductions in Oklahoma to address pollution
2 transported to other states.⁴⁴

3 **Q: How does the Company's assumption that there are no costs associated**
4 **with complying with these impending requirements affect its economic**
5 **analysis?**

6 A: As a result of this assumption, the Company's economic analysis likely
7 understates the cost advantage of the EPA Settlement Option, particularly in
8 relation to Options #1A and #2A. As noted by Mr. Fate, it may not be
9 economic to incur the additional costs at the Northeastern Units 3 and 4
10 required to comply with future environmental restrictions. If so, continued
11 operation beyond fifteen years, as assumed in Options #1A and #2A, would
12 not be feasible. The Commission should therefore give little weight to these
13 unrealistic sensitivity analyses.

14 **VII. Conclusion**

15 **Q: What do you conclude from your review of the Company's filing?**

16 A: The results of the Company's economic analysis show that the proposed
17 Compliance Plan is likely to be the lowest-cost of feasible options for
18 complying with the RHR and MATS. Furthermore, the Company's risk
19 assessment clearly shows that, of the feasible compliance options, the
20 proposed Compliance Plan provides the strongest hedge against potential
21 environmental restrictions over the next two decades. Given the evidence
22 regarding the advantages relative to feasible alternatives, the Company's

⁴⁴ 42 U.S.C. §7410(a)(2)(D)(i)(I) (states must prohibit emissions contributing significantly to another state's failure to attain the NAAQS).

1 proposal to upgrade Northeastern Unit 3 and to retire Unit 4 in 2016 is a
2 reasonable approach for complying with the RHR and MATS and for
3 mitigating the risk of future environmental requirements.

4 The Company may be able to further reduce the costs and risks
5 associated with its Compliance Plan in the future by increasing its efforts to
6 acquire cost-effective energy efficiency and wind resources. With additional
7 investment in these clean resources, the Company may be able to forego the
8 expected acquisition of more-costly gas-fired generation when Northeastern
9 Unit 3 retires in 2026. If so, the resulting Compliance Plan would be even
10 less expensive, better hedged against fuel-price risk, more flexible in its
11 ability to respond to unexpected changes in customer demand, and less
12 exposed to future environmental requirements than is currently expected by
13 PSO.

14 **Q: Does this conclude your responsive testimony?**

15 **A: Yes.**

Qualifications of
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SUMMARY OF PROFESSIONAL EXPERIENCE

- 1990–Present* **Vice President, Resource Insight, Inc.** Provides research, technical assistance, and expert testimony on electric- and gas-utility planning, economics, regulation, and restructuring. Designs and assesses resource-planning strategies for regulated and competitive markets, including estimation of market prices and utility-plant stranded investment; negotiates restructuring strategies and implementation plans; assists in procurement of retail power supply.
- 1989–90* **Senior Analyst, Komanoff Energy Associates.** Conducted comprehensive cost-benefit assessments of electric-utility power-supply and demand-side conservation resources, economic and financial analyses of independent power facilities, and analyses of utility-system excess capacity and reliability. Provided expert testimony on statistical analysis of U.S. nuclear plant operating costs and performance. Co-wrote *The Power Analyst*, software developed under contract to the New York Energy Research and Development Authority for screening the economic and financial performance of non-utility power projects.
- 1987–88* **Independent Consultant.** Provided consulting services for Komanoff Energy Associates (New York, New York), Schlissel Engineering Associates (Belmont, Massachusetts), and Energy Systems Research Group (Boston, Massachusetts).
- 1981–86* **Research Associate, Energy Systems Research Group.** Performed analyses of electric utility power supply planning scenarios. Involved in analysis and design of electric and water utility conservation programs. Developed statistical analysis of U.S. nuclear plant operating costs and performance.

EDUCATION

BA, Political Science with honors and Phi Beta Kappa, University of California, Berkeley, 1980.

Massachusetts Institute of Technology, Cambridge, Massachusetts. Physics and Political Science, 1976–1979.

PUBLICATIONS

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- 1994 **NY PSC** on behalf of the Pace Energy Project, Natural Resources Defense Council, and Citizen's Advisory Panel. Case No. 93-E-1123. Joint testimony with John Plunkett critiques proposed modifications to Long Island Lighting Company's DSM programs from the perspective of least-cost-planning principles.
- 1994 **Vt. PSB** on behalf of the Vermont Department of Public Service. Docket No. 5270-CV-1 and 5270-CV-3. Testimony and rebuttal testimony discusses rate and bill effects from DSM spending and sponsors load shapes for measure- and program-screening analyses.
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- 1998 **Massachusetts Department of Telecommunications and Energy** Docket No. 97-111, Commonwealth Energy proposed restructuring; Cape Cod Light Compact. Joint testimony with Paul Chernick, January, 1998.
- Critique of proposed restructuring plan filed to satisfy requirements of the electric-utility restructuring act of 1997. Failure of the plan to foster competition and promote the public interest.
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- Support of proposed comprehensive restructuring settlement agreement
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- Support of proposed comprehensive restructuring settlement agreement
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- Reasonableness of proposed revisions to standard-offer-supply energy costs. Implications of revisions for other elements of proposed settlement.
- 2000 **U.S. FERC** Docket No. RT01-02-000, Order No. 2000 compliance filing, Joint Consumer Advocates intervenors. Affidavit, November 2000.
- Evaluation of innovative rate proposal by PJM transmission owners.
- 2001 **Maryland PSC** Case No. 8852, Charges for electricity-supplier services for Potomac Electric Power Company, Maryland Office of People’s Counsel. March 2001.
- Reasonableness of proposed fees for electricity-supplier services.
- Maryland PSC** Case No. 8890, Merger of Potomac Electric Power Company and Delmarva Power and Light Company, Maryland Office of People’s Counsel. September 2001; surrebuttal, October 2001. In support of settlement: Supplemental, December 2001; rejoinder, January 2002.
- Costs and benefits to ratepayers. Assessment of public interest.
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Benefits of proposed settlement to ratepayers. Standard-offer service. Procurement of supply.

2003 **Maryland PSC** Case No. 8980, adequacy of capacity in restructured electricity markets; Maryland Office of People's Counsel. Direct, December 2003; Reply December 2003.

Purpose of capacity-adequacy requirements. PJM capacity rules and practices. Implications of various restructuring proposals for system reliability.

2004 **Maryland PSC** Case No. 8995, Potomac Electric Power Company recovery of generation-related uncollectibles; Maryland Office of People's Counsel. Direct, March 2004; Supplemental March 2004, Surrebuttal April 2004.

Calculation and allocation of costs. Effect on administrative charge pursuant to settlement.

Maryland PSC Case No. 8994, Delmarva Power & Light recovery of generation-related uncollectibles; Maryland Office of People's Counsel. Direct, March 2004; Supplemental April 2004.

Calculation and allocation of costs. Effect on administrative charge pursuant to settlement.

Maryland PSC Case No. 8985, Southern Maryland Electric Coop standard-offer service; Maryland Office of People's Counsel. Direct, July 2004.

Reasonableness and risks of resource-procurement plan.

2005 **FERC** Docket No. ER05-428-000, revisions to ICAP demand curves; City of New York. Statement, March 2005.

Net-revenue offset to cost of new capacity. Winter-summer adjustment factor. Market power and in-City ICAP price trends.

FERC Docket No. PL05-7-000, capacity markets in PJM; Maryland Office of People's Counsel. Statement, June 2005.

Inefficiencies and risks associated with use of administratively determined demand curve. Incompatibility of four-year procurement plan with Maryland standard-offer service.

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Inefficiencies and risks associated with use of administratively determined demand curve. Effect of proposed reliability-pricing model on capacity costs.

2006 **Maryland PSC** Case No. 9052, Baltimore Gas & Electric rates and market-transition plan; Maryland Office of People's Counsel, February 2006.

Transition to market-based residential rates. Price volatility, bill complexity, and cost-deferral mechanisms.

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Assessment of proposals to modify default service for commercial and industrial customers.

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Assessment of effects and risks of proposed merger on ratepayers.

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Transition to market-based rates. Securitization of power costs. Rate of return on deferred assets.

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Procurement of standard-offer power. Structure and format of bidding. Risk and cost recovery.

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Distorting effects of proposed reliability-pricing model on clearing prices. Economically efficient alternative treatment.

Maryland PSC Case No. 9063, optimal structure of electric industry; Maryland Office of People's Counsel, Direct Testimony, October 2006; Rebuttal November 2006; surrebuttal November 2006.

Procurement of standard-offer power. Risk and gas-price volatility, and their effect on prices and market performance. Alternative procurement strategies.

Maryland PSC Case No. 9073, stranded costs from electric-industry restructuring; Maryland Office of People's Counsel, Direct Testimony, December 2006.

Review of estimates of stranded costs for Baltimore Gas & Electric.

2007 **Maryland PSC** Case No. 9091, rate-stabilization and market-transition plan for the Potomac Edison Company; Maryland Office of People's Counsel, Direct Testimony, March 2007.

Rate-stabilization plan.

Maryland PSC Case No. 9092, rates and rate mechanisms for the Potomac Electric Power Company; Maryland Office of People's Counsel, Direct Testimony, March 2007.

Cost allocation and rate design. Revenue decoupling mechanism.

Maryland PSC Case No. 9093, rates and rate mechanisms for Delmarva Power & Light; Maryland Office of People's Counsel, Direct Testimony, March 2007.

Cost allocation and rate design. Revenue decoupling mechanism.

Maryland PSC Case No. 9099, rate-stabilization plan for Baltimore Gas & Electric; Maryland Office of People's Counsel, Direct, March 2007; Surrebuttal April 2007.

Review of standard-offer-service-procurement plan. Rate stabilization plan.

Connecticut DPUC Docket No. 07-04-24, review of capacity contracts under Energy Independence Act; Connecticut Office of Consumer Counsel, Joint Direct Testimony June 2007.

Assessment of proposed capacity contracts.

Maryland PSC Case No. 9117, residential and small-commercial standard-offer service; Maryland Office of People's Counsel. Direct and Reply, September 2007; Supplemental Reply, November 2007; Additional Reply, December 2007; presentation, December 2008.

Benefits of long-term planning and procurement. Proposed aggregation of customers.

Maryland PSC Case No. 9117, Phase II, residential and small-commercial standard-offer service; Maryland Office of People's Counsel. Direct, October 2007.

Energy efficiency as part of standard-offer-service planning and procurement. Procurement of generation or long-term contracts to meet reliability needs.

2008 **Connecticut DPUC 08-01-01**, peaking generation projects; Connecticut Office of Consumer Counsel. Direct (with Paul Chernick), April 2008.

Assessment of proposed peaking projects. Valuation of peaking capacity. Modeling of energy margin, forward reserves, other project benefits.

Ontario EB-2007-0707, Ontario Power Authority integrated system plan; Green Energy Coalition, Penimba Institute, and Ontario Sustainable Energy Association. Evidence (with Paul Chernick and Richard Mazzini), August 2008.

Critique of integrated system plan. Resource cost and characteristics; finance cost. Development of least-cost green-energy portfolio.

2009 **Maryland PSC** Case No. 9192, Delmarva Power & Lights rates; Maryland Office of People's Counsel. Direct, August 2009; Rebuttal, Surrebuttal, September 2009.

Cost allocation and rate design.

Wisconsin PSC Docket No. 6630-CE-302, Glacier Hills Wind Park certificate; Citizens Utility Board of Wisconsin. Direct and Surrebuttal, October 2009.

Reasonableness of proposed wind facility.

PUC of Ohio Case No 09-906-EL-SSO, standard-service-offer bidding for three Ohio electric companies; Office of the Ohio Consumers' Counsel. Direct, December 2009.

Design of auctions for SSO power supply. Implications of migration of First-Energy from MISO to PJM.

2010 **PUC of Ohio** Case No 10-388-EL-SSO, standard-service offer for three Ohio electric companies; Office of the Ohio Consumers' Counsel. Direct, July 2010.

Design of auctions for SSO power supply.

Maryland PSC Case No. 9232, Potomac Electric Power Co. administrative charge for standard-offer service; Maryland Office of People's Counsel. Reply, Rebuttal, August 2010.

Proposed rates for components of the Administrative Charge for residential standard-offer service.

Maryland PSC Case No. 9226, Delmarva Power & Light administrative charge for standard-offer service; Maryland Office of People's Counsel. Reply, Rebuttal, August 2010.

Proposed rates for components of the Administrative Charge for residential standard-offer service.

Maryland PSC Case No. 9221, Baltimore Gas & Electric cost recovery; Maryland Office of People's Counsel. Reply, August 2010; Rebuttal, September 2010; Surrebuttal, November 2010

Proposed rates for components of the Administrative Charge for residential standard-offer service.

Wisconsin PSC Docket No. 3270-UR-117, Madison Gas & Electric gas and electric rates; Citizens Utility Board of Wisconsin. Direct, Rebuttal, Surrebuttal, September 2010.

Standby rate design. Treatment of uneconomic dispatch costs.

Nova Scotia UARB Case No. NSUARB P-887(2), fuel-adjustment mechanism; Nova Scotia Consumer Advocate. Direct, September 2010.

Effectiveness of fuel-adjustment incentive mechanism.

Manitoba PUB, Manitoba Hydro rates; Resource Conservation Manitoba and Time to Respect Earth's Ecosystems. Direct, December 2010.

Assessment of drought-related financial risk.

2011 **Mass. DPU 10-170**, NStar–Northeast Utilities merger; Cape Light Compact. Direct, May 2011.

Merger and competitive markets. Competitively neutral recovery of utility investments in new generation.

Mass. DPU 11-5, -6, -7, NStar wind contracts; Cape Light Compact. Direct, May 2011.

Assessment of utility proposal for recovery of contract costs.

Wisc. PSC Docket No. 4220-UR-117, electric and gas rates of Northern States Power: Citizens Utility Board of Wisconsin. Direct, Rebuttals (2) October 2011; Surrebuttal, Oral Sur-Surrebutal November 2011;

Cost allocation and rate design. Allocation of DOE settlement payment.

Wisc. PSC Docket No. 6680-FR-104, fuel-cost-related rate adjustments for Wisconsin Power and Light Company: Citizens Utility Board of Wisconsin. Direct, October 2011; Rebutal, Surrebuttal, November 2011

Costs to comply with Cross State Air Pollution Rule.

2012 **Maryland PSC** Case No. 9149, Maryland IOUs' development of RFPs for new generation; Maryland Office of People's Counsel. March 2012.

Failure of demand-response provider to perform per contract. Estimation of cost to ratepayers.

PUCO Cases Nos. 11-346-EL-SSO, 11-348-EL-SSO, 11-349-EL-AAM, 11-350-EL-AAM, transition to competitive markets for Columbus Southern Power Company and Ohio Power Company; Ohio Consumers' Counsel. May 2012

Structure of auctions, credits, and capacity pricing as part of transition to competitive electricity markets.

Wisconsin PSC Docket No. 3270-UR-118, Madison Gas & Electric rates, Wisconsin Citizens Utility Board. Direct, August 2012; Rebuttal, September 2012.

Cost allocation and rate design (electric).

Wisconsin PSC Docket No. 05-UR-106, We Energies rates, Wisconsin Citizens
Utility Board. Direct, Rebuttal, September 2012.

Cost allocation and rate design (electric).

State	Plant Name	Boiler	Year Operational	Nameplate (MW)	2010 Capacity Factor	Planned Retirement Date	Announcement Source
AL	Widows Creek	5	1954	141	11%	7/31/2015	EPA TVA Settlement
AL	Widows Creek	6	1954	141	9%	7/31/2015	EPA TVA Settlement
AL	Widows Creek	3	1952	141	0%	7/31/2014	EPA TVA Settlement
AL	Widows Creek	4	1953	141	10%	7/31/2014	EPA TVA Settlement
AL	Widows Creek	1	1952	141	5%	7/31/2013	EPA TVA Settlement
AL	Widows Creek	2	1952	141	1%	7/31/2013	EPA TVA Settlement
AL	E C Gaston	1	1960	272	29%	4/1/2015	Platts Electric Power Daily
AL	E C Gaston	2	1960	272	38%	4/1/2015	Platts Electric Power Daily
AL	E C Gaston	3	1961	272	54%	4/1/2015	Platts Electric Power Daily
AL	E C Gaston	ST4	1962	245	50%	4/1/2015	Platts Electric Power Daily
AL	Gadsden	1	1949	69	22%	12/31/2014	The Gadsden Times
AL	Gadsden	2	1949	69	16%	12/31/2014	The Gadsden Times
CO	Arapahoe	4	1955	112	44%	12/31/2014	PUC Docket - Reduction Emission Plan
CO	Arapahoe	3	1951	46	45%	12/31/2013	PUC Docket - Reduction Emission Plan
CO	Cherokee	3	1962	171	52%	12/31/2011	PUC Docket - Reduction Emission Plan
CO	Cherokee	4	1968	381	51%	12/31/2017	PUC Docket - Reduction Emission Plan
CO	Valmont	5	1964	192	65%	12/31/2017	PUC Docket - Reduction Emission Plan
CO	W N Clark	1	1955	19	61%	12/31/2013	PUC Compliance with "Clean Air-Clean Jobs" Bill
CO	W N Clark	2	1959	25	72%	12/31/2013	PUC Compliance with "Clean Air-Clean Jobs" Bill
CT	AES Thames	GEN1	1989	214	74%	4/30/2013	Canadian Business
DE	Indian River Generating Station	1	1957	82	26%	5/1/2011	WGMD News Radio
DE	Indian River Generating Station	3	1970	177	36%	12/31/2013	WGMD News Radio
DE	NRG Energy Center Dover	COG1	1985	18	44%	5/30/2012	DNREC Public Affairs Office
FL	Central Power & Lime	GEN1	1988	125	55%	12/31/2012	Application for minor source air construction permit
GA	Harlee Branch	1	1965	299	30%	12/31/2013	Georgia Power News Release
GA	Harlee Branch	2	1967	359	27%	10/1/2013	Georgia Power News Release
GA	Mitchell	3	1964	163	7%	12/31/2012	Georgia PSC
IA	Dubuque	3	1959	29	23%	1/1/2015	IP&L Docket 08-673
IA	Dubuque	4	1952	38	29%	1/1/2015	IP&L Docket 08-673
IA	Pella	6	1972	27	14%	12/31/2012	Missouri River Energy Press Release
IA	Pella	5	1964	12	13%	12/31/2012	Missouri River Energy Press Release
IA	Sutherland	1	1955	38	47%	1/1/2015	IP&L Docket 08-673
IL	University of Illinois Abbott Power Plt	T10	2004	13	0%	12/31/2017	IL Climate Action Plan
IL	University of Illinois Abbott Power Plt	T11	2004	13	0%	12/31/2017	IL Climate Action Plan
IL	University of Illinois Abbott Power Plt	T12	2004	7	47%	12/31/2017	IL Climate Action Plan
IL	University of Illinois Abbott Power Plt	T6	1959	8	33%	12/31/2017	IL Climate Action Plan
IL	University of Illinois Abbott Power Plt	T7	1962	8	15%	12/31/2017	IL Climate Action Plan
IN	CC Perry K	4	1925	15	2%	12/31/2014	Indianapolis Business Journal
IN	CC Perry K	6	1938	5	10%	12/31/2014	Indianapolis Business Journal
IN	CC Perry K	7	2009	2	24%	12/31/2014	Indianapolis Business Journal
IN	CC Perry K	8	2009	2	0%	12/31/2014	Indianapolis Business Journal
IN	Tanners Creek	1	1951	153	25%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
IN	Tanners Creek	2	1952	153	21%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
IN	Tanners Creek	3	1954	215	25%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
IN	Whitewater Valley	2	1973	61	25%	2/28/2013	Louisville Platts
IN	Whitewater Valley	1	1955	33	27%	2/28/2013	Louisville Platts

IN	Frank E Ratts	1	1970	117	75%	12/31/2015	Power Engineering
IN	Frank E Ratts	2	1970	117	63%	12/31/2015	Power Engineering
KY	Big Sandy	1	1963	281	36%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
KY	Cane Run	4	1962	163	65%	5/31/2015	LG&E Press Release
KY	Cane Run	5	1966	209	61%	5/31/2015	LG&E Press Release
KY	Cane Run	6	1969	272	51%	5/31/2015	LG&E Press Release
KY	Green River	3	1954	75	53%	12/31/2015	LG&E Press Release
KY	Green River	4	1959	114	55%	12/31/2015	LG&E Press Release
KY	Shawnee	10	1956	175	12%	12/31/2015	EPA TVA Settlement
KY	Tyrone	3	1953	75	21%	12/31/2015	LG&E Press Release
KY	Robert A Reid	1	1966	96	1%	1/1/2014	CPCN application in KY PSC case no. 2012-00063
LA	Big Cajun 2	2	1982	626	70%	4/15/2015	Consent Decree
MA	Salem Harbor	1	1952	82	42%	6/1/2014	PR Newswire
MA	Salem Harbor	2	1952	82	37%	6/1/2014	PR Newswire
MA	Salem Harbor	3	1958	166	47%	6/1/2014	PR Newswire
MI	B C Cobb	4	1956	156	78%	1/1/2015	Gongwer News Michigan
MI	B C Cobb	5	1957	156	64%	1/1/2015	Gongwer News Michigan
MI	Harbor Beach	1	1968	121	16%	12/31/2015	PSCR Plan
MI	J C Weadock	7	1955	156	67%	1/1/2015	Gongwer News Michigan
MI	J C Weadock	8	1958	156	60%	1/1/2015	Gongwer News Michigan
MI	J R Whiting	1	1952	106	61%	1/1/2015	Gongwer News Michigan
MI	J R Whiting	2	1952	106	66%	1/1/2015	Gongwer News Michigan
MI	J R Whiting	3	1953	133	68%	1/1/2015	Gongwer News Michigan
MN	Silver Lake	1	1948	8	-2%	12/31/2015	RPU Utility Board Decision
MN	Silver Lake	2	1953	12	-1%	12/31/2015	RPU Utility Board Decision
MN	Silver Lake	3	1962	25	7%	12/31/2015	RPU Utility Board Decision
MN	Silver Lake	4	1969	54	2%	12/31/2015	RPU Utility Board Decision
MO	Asbury	2	1986	19	0%	1/31/2014	Missouri PSC Docket
NC	Buck	5	1953	125	49%	1/1/2015	Duke Energy Carolinas IRP
NC	Buck	6	1953	125	46%	1/1/2015	Duke Energy Carolinas IRP
NC	L V Sutton	1	1954	113	41%	12/31/2014	Progress Energy Retirement Plan
NC	L V Sutton	2	1955	113	44%	12/31/2014	Progress Energy Retirement Plan
NC	L V Sutton	3	1972	447	45%	12/31/2014	Progress Energy Retirement Plan
NC	Riverbend	4	1952	100	27%	1/1/2020	Duke Energy Carolinas IRP
NC	Riverbend	5	1952	100	26%	1/1/2020	Duke Energy Carolinas IRP
NC	Riverbend	6	1954	133	35%	1/1/2020	Duke Energy Carolinas IRP
NC	Riverbend	7	1954	133	35%	1/1/2020	Duke Energy Carolinas IRP
NC	Univ of NC Chapel Hill Cogen Facility	TG3	1991	28	27%	12/31/2020	UNC News
NC	Lumberton	GEN1	1985	35	0%	4/1/2009	SELCO existing and proposed biomass facilities
NJ	B L England	1	1962	136	9%	10/31/2013	Press of Atlantic City
NJ	B L England	2	1964	163	33%	5/31/2016	Reuters
NM	Four Corners	1	1963	190	81%	12/31/2012	Arizona Public Service Company News Release
NM	Four Corners	2	1963	190	73%	12/31/2012	Arizona Public Service Company News Release
NM	Four Corners	3	1964	253	75%	12/31/2012	Arizona Public Service Company News Release
NY	Cornell University Central Heat	TG2	1988	5	0%	6/1/2011	Ithaca Journal
NY	Cornell University Central Heat	TG1	1988	1	0%	6/1/2011	Ithaca Journal
NY	Black River Generation	GEN1	1989	56	17%	3/31/2013	Black River company fuel swtich announcement
NY	Danskammer Generating Station	3	1959	147	52%	12/31/2102	Dynegy retirement announcement
NY	Danskammer Generating Station	4	1967	239	49%	12/31/2102	Dynegy retirement announcement
OH	Ashtabula	5	1958	256	39%	9/1/2012	First Energy

OH	Avon Lake	7	1949	86	4%	4/30/2015	GenOn Planned Retirement Announcement
OH	Avon Lake	12	1970	680	47%	4/30/2015	GenOn Planned Retirement Announcement
OH	Conesville	3	1962	162	39%	12/31/2012	American Electric Power EPA Regulations Compliance Plan
OH	Eastlake	1	1953	123	71%	9/1/2012	First Energy
OH	Eastlake	2	1953	123	52%	9/1/2012	First Energy
OH	Eastlake	3	1954	123	47%	9/1/2012	First Energy
OH	Lake Shore	18	1962	256	34%	9/1/2012	First Energy
OH	Lausche Heating Plant	OUG1	1994	1	0%	12/31/2015	Sierra Club - OU Press Release
OH	Miami Fort	6	1960	163	69%	1/1/2015	Cincinnati.com
OH	Muskingum River	1	1953	220	38%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
OH	Muskingum River	2	1954	220	34%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
OH	Muskingum River	3	1957	238	44%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
OH	Muskingum River	4	1958	238	50%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
OH	Niles	1	1954	133	18%	6/30/2012	GenOn Planned Retirement Announcement
OH	Niles	2	1954	133	19%	6/30/2012	GenOn Planned Retirement Announcement
OH	Picway	5	1955	106	7%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
OH	Shelby Municipal Light Plant	1	1968	13	26%	3/31/2011	WMFD TV
OH	Shelby Municipal Light Plant	2	1973	13	34%	3/31/2011	WMFD TV
OH	Shelby Municipal Light Plant	3	1948	5	0%	3/31/2011	WMFD TV
OH	Shelby Municipal Light Plant	4	1954	7	3%	3/31/2011	WMFD TV
OH	Walter C Beckjord	1	1952	115	-1%	1/1/2015	Wall Street Journal
OH	Walter C Beckjord	2	1953	113	0%	1/1/2015	Wall Street Journal
OH	Walter C Beckjord	3	1954	125	-1%	1/1/2015	Wall Street Journal
OH	Walter C Beckjord	4	1958	163	39%	1/1/2015	Wall Street Journal
OH	Walter C Beckjord	5	1962	245	56%	1/1/2015	Wall Street Journal
OH	Walter C Beckjord	6	1969	461	51%	1/1/2015	Wall Street Journal
OH	O H Hutchings	1	1948	69	0.05%	6/1/2015	PJM Reliability Study
OH	O H Hutchings	2	1949	69	0.22%	6/1/2015	PJM Reliability Study
OH	O H Hutchings	4	1951	69	4%	6/1/2013	PJM Reliability Study
OH	O H Hutchings	5	1952	69	9%	12/31/2015	Air Pollution Permit
OH	O H Hutchings	6	1953	69	8%	12/31/2015	Air Pollution Permit
OR	Boardman	1	1980	601	78%	12/31/2019	PUC Docket
PA	Elrama Power Plant	1	1952	100	3%	6/30/2012	GenOn Planned Retirement Announcement
PA	Elrama Power Plant	2	1953	100	11%	6/30/2012	GenOn Planned Retirement Announcement
PA	Elrama Power Plant	3	1954	125	7%	6/30/2012	GenOn Planned Retirement Announcement
PA	Elrama Power Plant	4	1960	185	20%	6/30/2012	GenOn Planned Retirement Announcement
PA	New Castle Plant	3	1952	98	23%	4/30/2015	GenOn Planned Retirement Announcement
PA	New Castle Plant	4	1958	114	24%	4/30/2015	GenOn Planned Retirement Announcement
PA	New Castle Plant	5	1964	136	25%	4/30/2015	GenOn Planned Retirement Announcement
PA	Portland	1	1958	172	46%	1/31/2015	GenOn Planned Retirement Announcement
PA	Portland	2	1962	255	45%	1/31/2015	GenOn Planned Retirement Announcement
PA	Shawville	1	1954	125	46%	4/30/2015	GenOn Planned Retirement Announcement
PA	Shawville	2	1954	125	44%	4/30/2015	GenOn Planned Retirement Announcement
PA	Shawville	3	1959	188	46%	4/30/2015	GenOn Planned Retirement Announcement
PA	Shawville	4	1960	188	51%	4/30/2015	GenOn Planned Retirement Announcement
PA	Sunbury Generation LP	1	1949	89	56%	12/31/2014	Centre Daily News
PA	Sunbury Generation LP	2	1949	89	51%	12/31/2014	Centre Daily News
PA	Sunbury Generation LP	3	1951	104	36%	12/31/2014	Centre Daily News
PA	Sunbury Generation LP	4	1953	156	40%	12/31/2014	Centre Daily News
PA	Titus	1	1951	75	38%	4/30/2015	GenOn Planned Retirement Announcement

PA	Titus	2	1951	75	36%	4/30/2015	GenOn Planned Retirement Announcement
PA	Titus	3	1953	75	39%	4/30/2015	GenOn Planned Retirement Announcement
SC	W S Lee	1	1951	90	30%	10/1/2014	Duke Energy Carolinas IRP
SC	W S Lee	2	1951	90	31%	10/1/2014	Duke Energy Carolinas IRP
SC	W S Lee	3	1958	175	38%	10/1/2014	Duke Energy Carolinas IRP
SC	Canadys Steam	1	1962	136	26%	12/31/2012	SCE&G announces planned retirement per the IRP
SC	Canadys Steam	2	1964	136	34%	12/31/2015	SCE&G announces planned retirement per the IRP
SC	Canadys Steam	3	1967	218	33%	12/31/2015	SCE&G announces planned retirement per the IRP
SC	Urquhart	3	1955	100	46%	12/31/2012	SCE&G announces planned retirement per the IRP
SC	McMeekin	1	1958	147	60%	12/31/2015	SCE&G announces planned retirement per the IRP
SC	McMeekin	2	1958	147	52%	12/31/2015	SCE&G announces planned retirement per the IRP
SC	Dolphus M Grainger	1	1966	82	26%	12/31/2015	Santee Cooper Retirement Announcement
SC	Dolphus M Grainger	2	1966	82	31%	12/31/2015	Santee Cooper Retirement Announcement
SC	Jefferies	3	1970	173	26%	12/31/2015	Santee Cooper Retirement Announcement
SC	Jefferies	4	1970	173	17%	12/31/2015	Santee Cooper Retirement Announcement
SD	Ben French	ST1	1961	25	60%	8/30/2012	Black Hills Company Announcement
TN	John Sevier	1	1955	200	49%	12/31/2012	EPA TVA Settlement
TN	John Sevier	2	1955	200	64%	12/31/2012	EPA TVA Settlement
TN	John Sevier	3	1956	200	55%	12/31/2012	EPA TVA Settlement
TN	John Sevier	4	1957	200	51%	12/31/2012	EPA TVA Settlement
TN	Johnsonville	1	1951	125	52%	12/31/2015	EPA TVA Settlement
TN	Johnsonville	2	1951	125	55%	12/31/2015	EPA TVA Settlement
TN	Johnsonville	3	1952	125	53%	12/31/2015	EPA TVA Settlement
TN	Johnsonville	4	1952	125	48%	12/31/2015	EPA TVA Settlement
TN	Johnsonville	5	1952	147	41%	12/31/2015	EPA TVA Settlement
TN	Johnsonville	6	1953	147	45%	12/31/2015	EPA TVA Settlement
TN	Johnsonville	7	1958	173	54%	12/31/2017	EPA TVA Settlement
TN	Johnsonville	8	1959	173	43%	12/31/2017	EPA TVA Settlement
TN	Johnsonville	9	1959	173	54%	12/31/2017	EPA TVA Settlement
TN	Johnsonville	10	1959	173	42%	12/31/2017	EPA TVA Settlement
TX	J T Deely	1	1977	486	59%	12/31/2017	CPS CEO Announcement
TX	J T Deely	2	1978	446	78%	12/31/2017	CPS CEO Announcement
TX	Welsh	2	1980	558	75%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
UT	Kennecott Utah Power Plant	3	1946	25	60%	12/31/2013	Rio Tinto News Release
UT	Kennecott Utah Power Plant	2	1943	25	60%	12/31/2013	Rio Tinto News Release
UT	Kennecott Utah Power Plant	1	1943	50	46%	12/31/2013	Rio Tinto News Release
UT	Carbon	1	1954	75	80%	4/30/2015	Filing of Revised Tariff Schedules
UT	Carbon	2	1957	114	77%	4/30/2015	Filing of Revised Tariff Schedules
VA	Altavista	1	1992	71	26%	12/31/2012	Dominion Resources News Release
VA	Bremo Bluff	3	1950	69	38%	12/31/2014	Dominion Resources IRP
VA	Bremo Bluff	4	1958	185	46%	12/31/2015	Dominion Resources IRP
VA	Chesapeake	3	1959	185	54%	12/31/2015	DailyPress
VA	Chesapeake	ST1	1953	113	62%	12/31/2015	DailyPress
VA	Chesapeake	ST2	1954	113	64%	12/31/2015	DailyPress
VA	Chesapeake	ST4	1962	239	59%	12/31/2015	DailyPress
VA	Clinch River	2	1958	238	24%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
VA	Clinch River	1	1958	238	36%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
VA	Clinch River	3	1961	238	12%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
VA	Glen Lyn	5	1944	100	2%	12/31/2014	American Electric Power EPA Regulations Compliance Plan
VA	Glen Lyn	6	1957	238	10%	12/31/2014	American Electric Power EPA Regulations Compliance Plan



PRACTICING RISK-AWARE ELECTRICITY REGULATION: What Every State Regulator Needs to Know

How State Regulatory Policies
Can Recognize and Address
the Risk in Electric Utility
Resource Selection

A Ceres Report

April 2012

Authored by

Ron Binz

and

Richard Sedano

Denise Furey

Dan Mullen

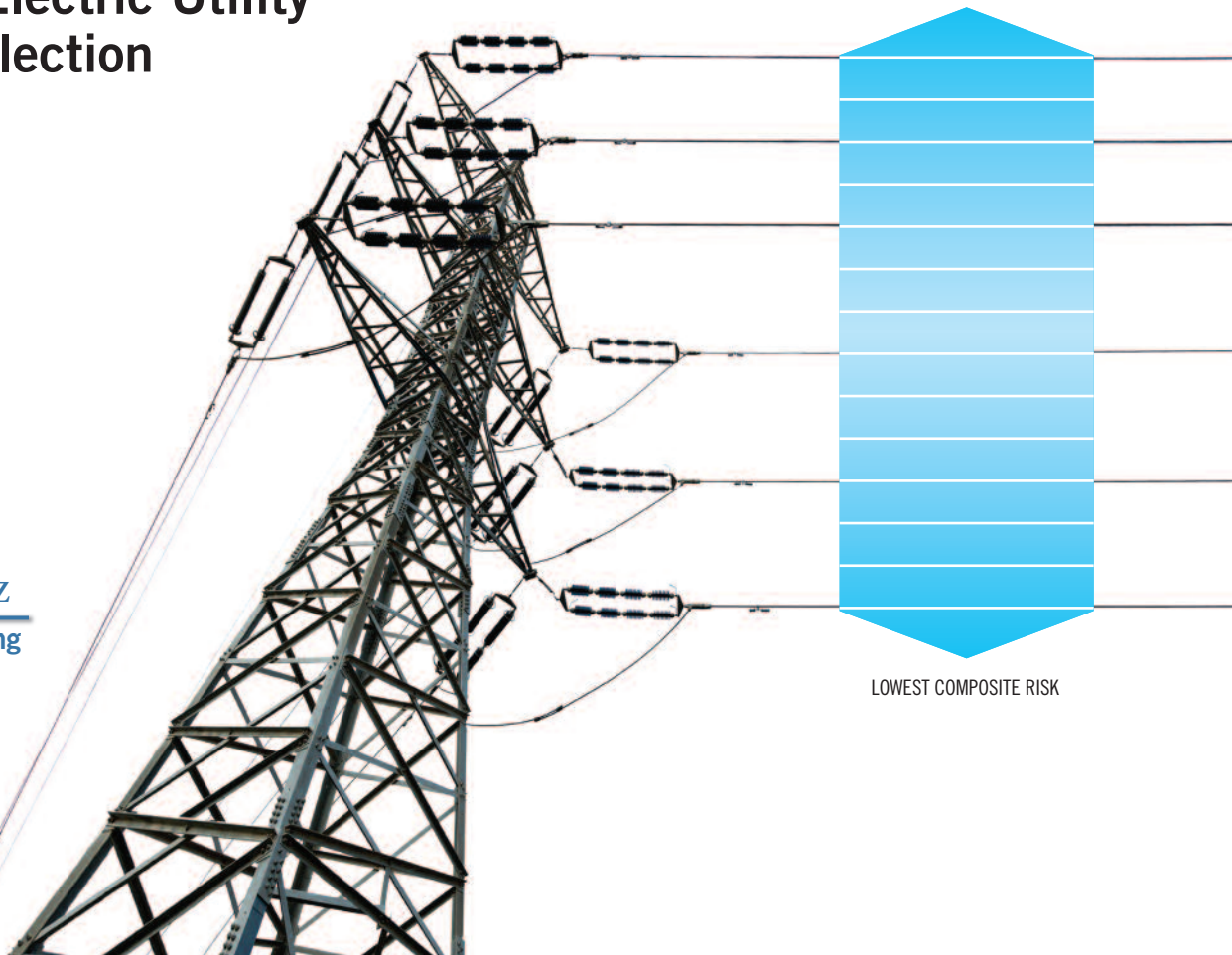
Ronald J. Binz

Public Policy Consulting



HIGHEST COMPOSITE RISK

LOWEST COMPOSITE RISK



Ceres is an advocate for sustainability leadership. It leads a national coalition of investors, environmental groups and other public interest organizations working with companies to address sustainability challenges. Ceres also directs the Investor Network on Climate Risk (INCR), a network of 100 institutional investors with collective assets totaling about \$10 trillion.

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ABOUT THIS REPORT

AUDIENCE

This report is primarily addressed to **state regulatory utility commissioners**, who will preside over some of the most important investments in the history of the U.S. electric power sector during perhaps its most challenging and tumultuous period. This report seeks to provide regulators with a thorough discussion of risk, and to suggest an approach—“risk-aware regulation”—whereby regulators can explicitly and proactively seek to identify, understand and minimize the risks associated with electric utility resource investment. It is hoped that this approach will result in the efficient deployment of capital, the continued financial health of utilities, and the confidence and satisfaction of the customers on whose behalf utilities invest.

Additionally, this report seeks to present a unique discussion of risk and a perspective on appropriate regulatory approaches for addressing it that will interest numerous **secondary audiences**, including **utility managements, financial analysts, investors, electricity consumers, advocates, state legislatures and energy offices, and other stakeholders** with a particular interest in ensuring that electric system resource investments—which could soon reach unprecedented levels—are made thoughtfully, transparently and in full consideration of all associated risks.

SCOPE

While we believe that the approach described herein is applicable to a broad range of decisions facing state regulators, the report focuses primarily on resource investment decisions by investor-owned electric utilities (IOUs), which constitute roughly 70 percent of the U.S. electric power industry. The findings and recommendations may be of particular interest to regulators in states facing substantial coal generating capacity retirements and evaluating a spectrum of resource investment options.

AUTHORS

Ron Binz, the lead author of this report, is a 30-year veteran of utility and energy policy and principal with Public Policy Consulting. Most recently, he served for four years as the Chairman of the Colorado Public Utilities Commission where he implemented the many policy changes championed by the Governor and the Legislature to bring forward Colorado’s “New Energy Economy.” He is the author of several reports and articles on renewable energy and climate policy has testified as an expert witness in fifteen states.

Richard Sedano is a principal with the Regulatory Assistance Project (RAP), a global, non-profit team of experts focused on the long-term economic and environmental sustainability of the power and natural gas sectors, providing technical and policy assistance to policymakers and regulators on a broad range of energy and environmental issues. RAP is widely viewed as a source of innovative and creative thinking that yields practical solutions. RAP members meet directly with government officials, regulators and their staffs; lead technical workshops and training sessions; conduct in-house research and produce a growing volume of publications designed to better align energy regulation with economic and environmental goals.

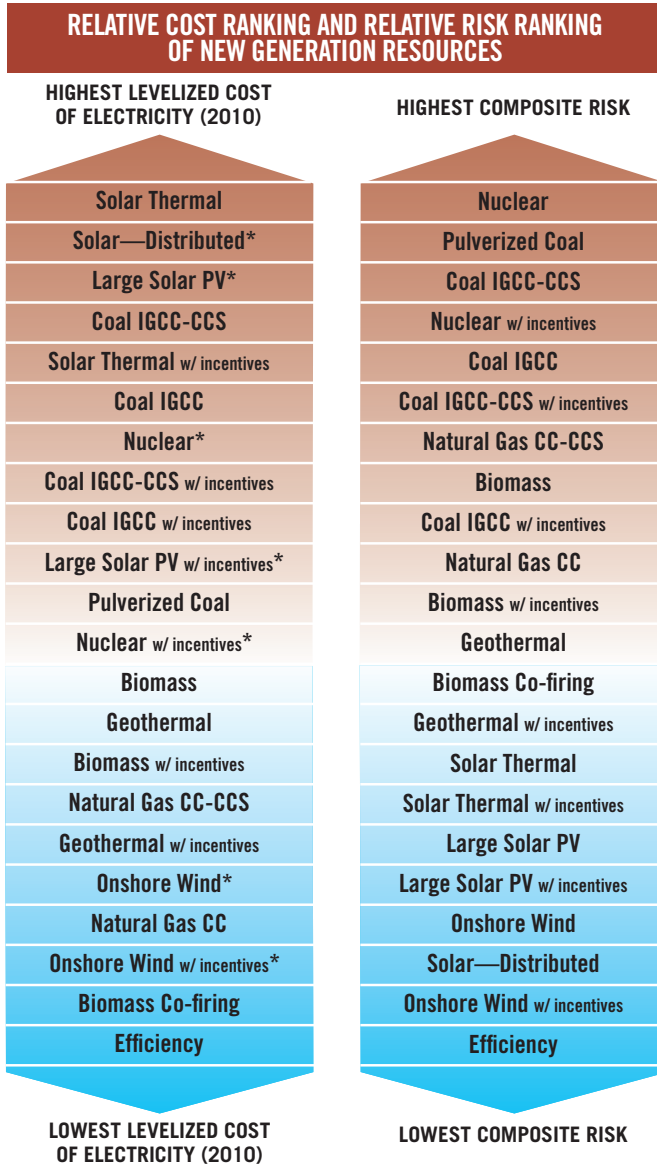
Denise Furey has over 25 years of experience with financial institutions, structuring and analyzing transactions for energy and utility companies. In 2011 she founded Regent Square Advisors, a consulting firm specializing in financial and regulatory concerns faced by the sector. She worked with Citigroup covering power and oil & gas companies, and worked with Fitch Rating, Enron Corporation and MBIA Insurance Corporation. Ms. Furey also served with the Securities and Exchange Commission participating in the regulation of investment companies.

Dan Mullen, Senior Manager for Ceres’ Electric Power Programs, works to identify and advance solutions that will transform the U.S. electric utility industry in line with the urgent goal of sustainably meeting society’s 21st century energy needs. In addition to developing Ceres’ intellectual capital and external partnerships, he has engaged with major U.S. electric utilities on issues related to climate change, clean energy and stakeholder engagement, with a particular focus on energy efficiency. A Stanford University graduate, Dan has also raised more than \$5 million to support Ceres’ climate change initiatives and organizational development.

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Figure 14

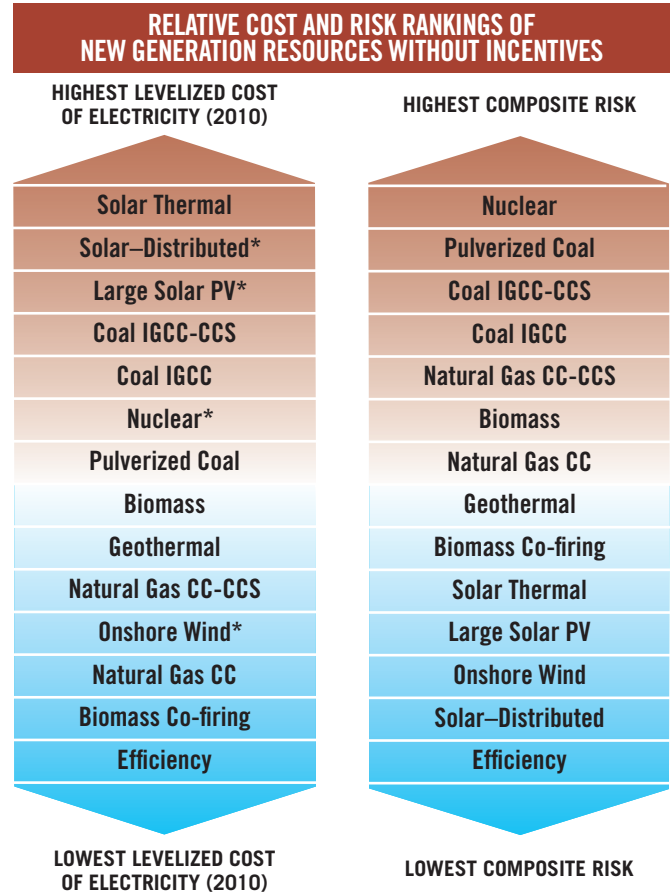


* Cost ranking based on 2010 data. Does not reflect recent cost increases for nuclear or cost decreases for solar PV and wind.



The risk ranking shows a clear difference between renewable resources and non-renewable resources. Nuclear generation moves from the middle of the cost ranking to the top of the risk ranking. Notably, energy efficiency ranks lowest in both cost and risk.

Figure 15



* Cost ranking based on 2010 data. Does not reflect recent cost increases for nuclear or cost decreases for solar PV and wind.

To derive a ranking of these resources with respect to risk, we assigned numeric values to the estimated degrees of risk (None=0, Very High=4) and totaled the rating for each resource. The scores were then renormalized so that the score of the highest-risk resource is 100 and the others are adjusted accordingly. The composite relative risk ranking that emerges is shown in **Figure 14**, which, for ease of comparison, we present alongside the relative cost ranking from Figure 11.

The risk ranking differs from the cost ranking in several important ways. First, the risk ranking shows a clear difference between renewable resources and non-renewable resources. Second, nuclear generation moves from the middle of the cost ranking to the top of the risk ranking. Notably, energy efficiency ranks lowest in both cost and risk.

To illustrate how resources stack up against each other in more general terms, and for simplicity of viewing, **Figure 15** presents those same rankings without information about incentives.

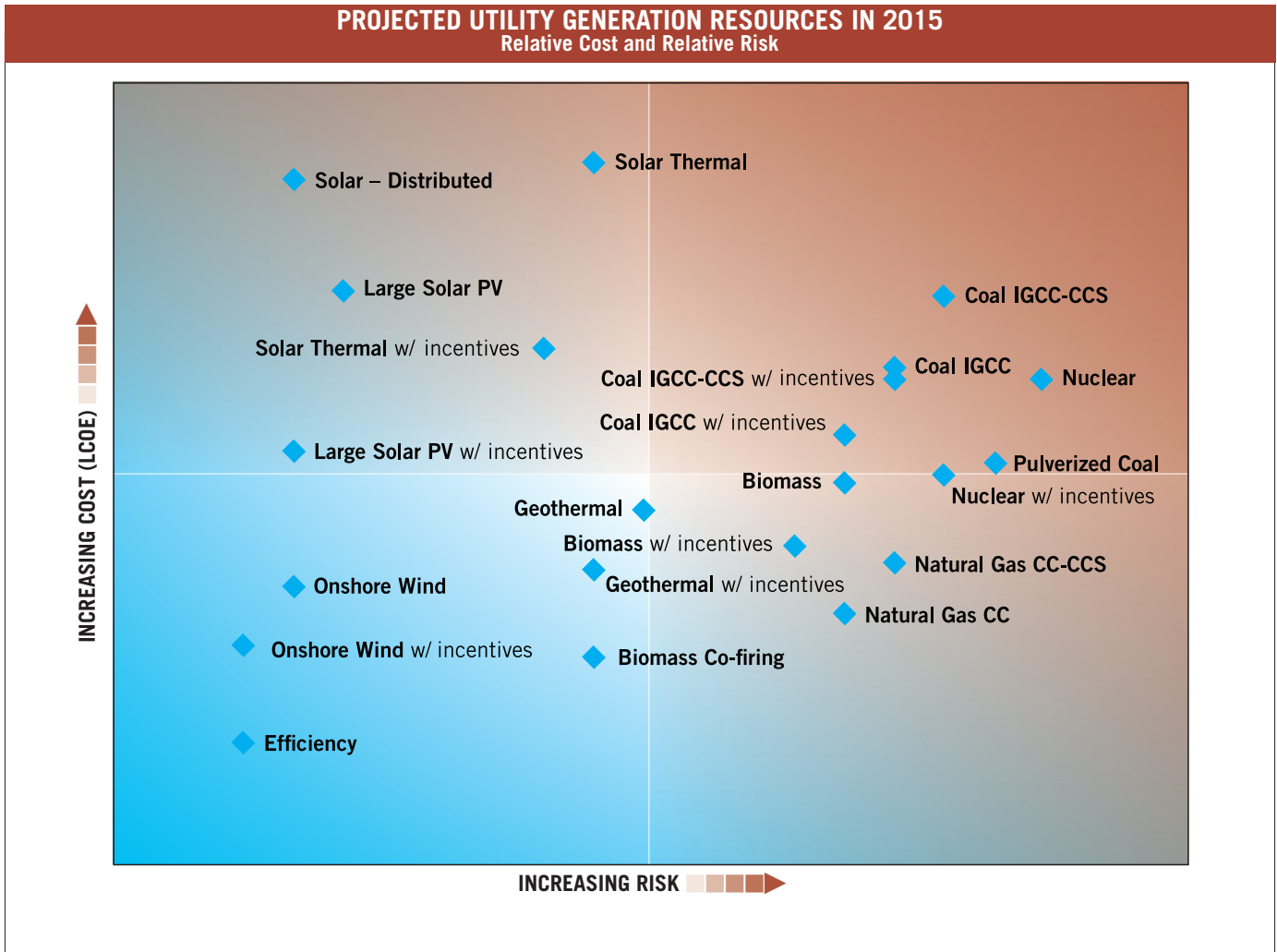
Figure 16

To test the robustness of the composite risk ranking, we also examined two rankings where the scores were weighted. In one case, the environmental factors were given double weight; in the other, the cost factors were given double weight. As before, the scores were renormalized so that the highest-scoring resource is set to 100. The results of the unweighted ranking, together with the two weighted rankings, are shown in **Figure 16**. By inspection, one can see that the rank order changes very little across the three methods, so that the risk ranking in Figure 14 appears to be relatively robust. Once again, we emphasize that these figures are intended to show the relative risk among the resources, not to be absolute measures of risk.⁶⁶

SUMMARY OF RISK SCORES FOR NEW GENERATION RESOURCES			
Resource	Composite Score	Environmental Weighted Score	Cost Weighted Score
Biomass	79	79	72
Biomass w/ incentives	74	76	66
Biomass Co-firing	53	57	44
Coal IGCC	84	83	79
Coal IGCC w/ incentives	79	79	72
Coal IGCC-CCS	89	84	87
Coal IGCC-CCS w/ incentives	84	81	80
Efficiency	16	14	16
Geothermal	58	59	52
Geothermal w/ incentives	53	55	46
Large Solar PV	26	22	28
Large Solar PV w/ incentives	21	19	21
Natural Gas CC	79	76	75
Natural Gas CC-CCS	84	79	82
Nuclear	100	91	100
Nuclear w/ incentives	89	83	89
Onshore Wind	21	19	21
Onshore Wind w/ incentives	16	16	15
Pulverized Coal	95	100	82
Solar - Distributed	21	19	21
Solar Thermal	53	52	49
Solar Thermal w/ incentives	47	48	43

⁶⁶ Dr. Mark Cooper, a longtime utility sector analyst and supporter of consumer interests, recently arrived at similar conclusions about composite risk; see Cooper, *Least-Cost Planning For 21st Century Electricity Supply* (So. Royalton, VT: Vermont Law School, 2011), <http://www.vermontlaw.edu/Documents/21st%20Century%20Least%20Cost%20Planning.pdf>. Cooper's analysis incorporated not only variations in "risk" and "uncertainty," but also the degrees of "ignorance" and "ambiguity" associated with various resources and the universe of possible future energy scenarios.

Figure 17



Finally, we can combine the information in the cost ranking and the risk ranking into a single chart. **Figure 17** shows how resources compare with each other in the two dimensions of cost and risk. The position of a resource along the horizontal axis denotes the relative risk of each resource, while the position on the vertical axis shows the relative cost of the resource.

Counties Projected to Violate Primary 8-hour Ground-Level Ozone Standard in 2020

(Model projections for 2020)
 (Only includes counties with monitors)

	Not projected to violate proposed range
	Projected to violate 0.060 parts per million
	Projected to violate 0.065 parts per million
	Projected to violate 0.070 parts per million

State	County
Alabama	Baldwin
Alabama	Clay
Alabama	Elmore
Alabama	Etowah
Alabama	Jefferson
Alabama	Lawrence
Alabama	Madison
Alabama	Mobile
Alabama	Montgomery
Alabama	Morgan
Alabama	Shelby
Alabama	Sumter
Alabama	Tuscaloosa
Arizona	Cochise
Arizona	Coconino
Arizona	Maricopa
Arizona	Navajo
Arizona	Pima
Arizona	Pinal
Arizona	Yavapai
Arkansas	Crittenden
Arkansas	Montgomery
Arkansas	Newton
Arkansas	Pulaski
California	Alameda
California	Amador
California	Butte
California	Calaveras
California	Colusa
California	Contra Costa
California	El Dorado
California	Fresno
California	Glenn
California	Imperial
California	Inyo

California	Kern
California	Kings
California	Lake
California	Los Angeles
California	Madera
California	Marin
California	Mariposa
California	Mendocino
California	Merced
California	Monterey
California	Napa
California	Nevada
California	Orange
California	Placer
California	Riverside
California	Sacramento
California	San Benito
California	San Bernardino
California	San Diego
California	San Francisco
California	San Joaquin
California	San Luis Obispo
California	San Mateo
California	Santa Barbara
California	Santa Clara
California	Santa Cruz
California	Shasta
California	Solano
California	Sonoma
California	Stanislaus
California	Sutter
California	Tehama
California	Tulare
California	Tuolumne
California	Ventura
California	Yolo
Colorado	Adams
Colorado	Arapahoe
Colorado	Boulder
Colorado	Denver
Colorado	Douglas
Colorado	El Paso
Colorado	Jefferson
Colorado	La Plata
Colorado	Larimer
Colorado	Montezuma
Colorado	Weld
Connecticut	Fairfield
Connecticut	Hartford
Connecticut	Litchfield
Connecticut	Middlesex
Connecticut	New Haven

Connecticut	New London
Connecticut	Tolland
D.C.	Washington
Delaware	Kent
Delaware	New Castle
Delaware	Sussex
Florida	Alachua
Florida	Baker
Florida	Bay
Florida	Brevard
Florida	Broward
Florida	Collier
Florida	Columbia
Florida	Duval
Florida	Escambia
Florida	Highlands
Florida	Hillsborough
Florida	Holmes
Florida	Lake
Florida	Lee
Florida	Leon
Florida	Manatee
Florida	Marion
Florida	Miami-Dade
Florida	Orange
Florida	Osceola
Florida	Palm Beach
Florida	Pasco
Florida	Pinellas
Florida	Polk
Florida	Santa Rosa
Florida	Sarasota
Florida	Seminole
Florida	St Lucie
Florida	Volusia
Florida	Wakulla
Georgia	Bibb
Georgia	Chatham
Georgia	Cherokee
Georgia	Clarke
Georgia	Cobb
Georgia	Coweta
Georgia	Dawson
Georgia	De Kalb
Georgia	Douglas
Georgia	Fayette
Georgia	Fulton
Georgia	Glynn
Georgia	Gwinnett
Georgia	Henry
Georgia	Murray
Georgia	Muscogee

Georgia	Paulding
Georgia	Richmond
Georgia	Rockdale
Georgia	Sumter
Idaho	Ada
Idaho	Butte
Idaho	Canyon
Idaho	Elmore
Illinois	Adams
Illinois	Champaign
Illinois	Clark
Illinois	Cook
Illinois	Du Page
Illinois	Effingham
Illinois	Hamilton
Illinois	Jersey
Illinois	Kane
Illinois	Lake
Illinois	Macon
Illinois	Macoupin
Illinois	Madison
Illinois	McHenry
Illinois	McLean
Illinois	Peoria
Illinois	Randolph
Illinois	Rock Island
Illinois	Sangamon
Illinois	St Clair
Illinois	Will
Illinois	Winnebago
Indiana	Allen
Indiana	Boone
Indiana	Carroll
Indiana	Clark
Indiana	Delaware
Indiana	Elkhart
Indiana	Floyd
Indiana	Gibson
Indiana	Greene
Indiana	Hamilton
Indiana	Hancock
Indiana	Hendricks
Indiana	Huntington
Indiana	Jackson
Indiana	Johnson
Indiana	La Porte
Indiana	Lake
Indiana	Madison
Indiana	Marion
Indiana	Morgan
Indiana	Porter
Indiana	Posey

Indiana	Shelby
Indiana	St Joseph
Indiana	Vanderburgh
Indiana	Vigo
Indiana	Warrick
Iowa	Bremer
Iowa	Clinton
Iowa	Harrison
Iowa	Linn
Iowa	Montgomery
Iowa	Palo Alto
Iowa	Polk
Iowa	Scott
Iowa	Story
Iowa	Van Buren
Iowa	Warren
Kansas	Linn
Kansas	Sedgwick
Kansas	Sumner
Kansas	Trego
Kansas	Wyandotte
Kentucky	Bell
Kentucky	Boone
Kentucky	Boyd
Kentucky	Bullitt
Kentucky	Campbell
Kentucky	Carter
Kentucky	Christian
Kentucky	Daviess
Kentucky	Edmonson
Kentucky	Fayette
Kentucky	Graves
Kentucky	Greenup
Kentucky	Hancock
Kentucky	Hardin
Kentucky	Henderson
Kentucky	Jefferson
Kentucky	Jessamine
Kentucky	Kenton
Kentucky	Livingston
Kentucky	McCracken
Kentucky	McLean
Kentucky	Oldham
Kentucky	Perry
Kentucky	Pike
Kentucky	Pulaski
Kentucky	Scott
Kentucky	Simpson
Kentucky	Trigg
Kentucky	Warren
Louisiana	Ascension
Louisiana	Beauregard

Louisiana	Bossier
Louisiana	Caddo
Louisiana	Calcasieu
Louisiana	East Baton Rouge
Louisiana	Grant
Louisiana	Iberville
Louisiana	Jefferson
Louisiana	Lafayette
Louisiana	Lafourche
Louisiana	Livingston
Louisiana	Orleans
Louisiana	Ouachita
Louisiana	Pointe Coupee
Louisiana	St Bernard
Louisiana	St Charles
Louisiana	St James
Louisiana	St John The Baptis
Louisiana	St Mary
Louisiana	West Baton Rouge
Maine	Cumberland
Maine	Hancock
Maine	Kennebec
Maine	Knox
Maine	Oxford
Maine	Penobscot
Maine	Sagadahoc
Maine	York
Maryland	Anne Arundel
Maryland	Baltimore
Maryland	Carroll
Maryland	Cecil
Maryland	Charles
Maryland	Frederick
Maryland	Harford
Maryland	Kent
Maryland	Montgomery
Maryland	Prince Georges
Maryland	Washington
Massachusetts	Barnstable
Massachusetts	Berkshire
Massachusetts	Bristol
Massachusetts	Essex
Massachusetts	Hampden
Massachusetts	Hampshire
Massachusetts	Middlesex
Massachusetts	Norfolk
Massachusetts	Suffolk
Massachusetts	Worcester
Michigan	Allegan
Michigan	Benzie
Michigan	Berrien
Michigan	Cass

Michigan	Clinton
Michigan	Genesee
Michigan	Huron
Michigan	Ingham
Michigan	Kalamazoo
Michigan	Kent
Michigan	Lenawee
Michigan	Macomb
Michigan	Mason
Michigan	Missaukee
Michigan	Muskegon
Michigan	Oakland
Michigan	Ottawa
Michigan	Schoolcraft
Michigan	St Clair
Michigan	Washtenaw
Michigan	Wayne
Minnesota	St Louis
Mississippi	Adams
Mississippi	Bolivar
Mississippi	De Soto
Mississippi	Hancock
Mississippi	Harrison
Mississippi	Hinds
Mississippi	Jackson
Mississippi	Lauderdale
Mississippi	Lee
Mississippi	Madison
Mississippi	Warren
Missouri	Cass
Missouri	Cedar
Missouri	Clay
Missouri	Greene
Missouri	Jefferson
Missouri	Monroe
Missouri	Platte
Missouri	St Charles
Missouri	St Louis
Missouri	St Louis City
Missouri	Ste Genevieve
Montana	Flathead
Nebraska	Douglas
Nebraska	Lancaster
Nevada	Carson City
Nevada	Clark
Nevada	Douglas
Nevada	Washoe
Nevada	White Pine
New Hampshire	Belknap
New Hampshire	Carroll
New Hampshire	Cheshire
New Hampshire	Grafton

New Hampshire	Hillsborough
New Hampshire	Merrimack
New Hampshire	Rockingham
New Hampshire	Strafford
New Hampshire	Sullivan
New Jersey	Atlantic
New Jersey	Bergen
New Jersey	Camden
New Jersey	Cumberland
New Jersey	Essex
New Jersey	Gloucester
New Jersey	Hudson
New Jersey	Hunterdon
New Jersey	Mercer
New Jersey	Middlesex
New Jersey	Monmouth
New Jersey	Morris
New Jersey	Ocean
New Jersey	Passaic
New Mexico	Bernalillo
New Mexico	Dona Ana
New Mexico	Eddy
New Mexico	San Juan
New Mexico	Sandoval
New Mexico	Valencia
New York	Albany
New York	Bronx
New York	Chautauqua
New York	Chemung
New York	Dutchess
New York	Erie
New York	Essex
New York	Hamilton
New York	Herkimer
New York	Jefferson
New York	Madison
New York	Monroe
New York	Niagara
New York	Oneida
New York	Onondaga
New York	Orange
New York	Oswego
New York	Putnam
New York	Queens
New York	Rensselaer
New York	Richmond
New York	Saratoga
New York	Schenectady
New York	Suffolk
New York	Ulster
New York	Wayne
New York	Westchester

North Carolina	Alexander
North Carolina	Avery
North Carolina	Buncombe
North Carolina	Caldwell
North Carolina	Caswell
North Carolina	Chatham
North Carolina	Cumberland
North Carolina	Davie
North Carolina	Duplin
North Carolina	Durham
North Carolina	Edgecombe
North Carolina	Forsyth
North Carolina	Franklin
North Carolina	Granville
North Carolina	Guilford
North Carolina	Haywood
North Carolina	Jackson
North Carolina	Johnston
North Carolina	Lenoir
North Carolina	Lincoln
North Carolina	Martin
North Carolina	Mecklenburg
North Carolina	New Hanover
North Carolina	Northampton
North Carolina	Person
North Carolina	Pitt
North Carolina	Randolph
North Carolina	Rockingham
North Carolina	Rowan
North Carolina	Swain
North Carolina	Union
North Carolina	Wake
North Carolina	Yancey
North Dakota	Billings
North Dakota	Cass
North Dakota	Dunn
North Dakota	McKenzie
North Dakota	Mercer
North Dakota	Oliver
Ohio	Allen
Ohio	Ashtabula
Ohio	Butler
Ohio	Clark
Ohio	Clermont
Ohio	Clinton
Ohio	Cuyahoga
Ohio	Delaware
Ohio	Franklin
Ohio	Geauga
Ohio	Greene
Ohio	Hamilton
Ohio	Jefferson

Ohio	Knox
Ohio	Lake
Ohio	Lawrence
Ohio	Licking
Ohio	Lorain
Ohio	Lucas
Ohio	Madison
Ohio	Mahoning
Ohio	Medina
Ohio	Miami
Ohio	Montgomery
Ohio	Portage
Ohio	Preble
Ohio	Stark
Ohio	Summit
Ohio	Trumbull
Ohio	Warren
Ohio	Washington
Ohio	Wood
Oklahoma	Canadian
Oklahoma	Cleveland
Oklahoma	Comanche
Oklahoma	Dewey
Oklahoma	Kay
Oklahoma	Mc Clain
Oklahoma	Oklahoma
Oklahoma	Ottawa
Oklahoma	Pittsburg
Oklahoma	Tulsa
Oregon	Clackamas
Oregon	Columbia
Oregon	Jackson
Oregon	Lane
Oregon	Marion
Pennsylvania	Adams
Pennsylvania	Allegheny
Pennsylvania	Armstrong
Pennsylvania	Beaver
Pennsylvania	Berks
Pennsylvania	Blair
Pennsylvania	Bucks
Pennsylvania	Cambria
Pennsylvania	Centre
Pennsylvania	Chester
Pennsylvania	Clearfield
Pennsylvania	Dauphin
Pennsylvania	Delaware
Pennsylvania	Erie
Pennsylvania	Franklin
Pennsylvania	Greene
Pennsylvania	Lackawanna
Pennsylvania	Lancaster

Pennsylvania	Lawrence
Pennsylvania	Lehigh
Pennsylvania	Luzerne
Pennsylvania	Lycoming
Pennsylvania	Mercer
Pennsylvania	Montgomery
Pennsylvania	Northampton
Pennsylvania	Perry
Pennsylvania	Philadelphia
Pennsylvania	Tioga
Pennsylvania	Washington
Pennsylvania	Westmoreland
Pennsylvania	York
Rhode Island	Kent
Rhode Island	Providence
Rhode Island	Washington
South Carolina	Abbeville
South Carolina	Aiken
South Carolina	Anderson
South Carolina	Barnwell
South Carolina	Berkeley
South Carolina	Charleston
South Carolina	Cherokee
South Carolina	Chester
South Carolina	Chesterfield
South Carolina	Colleton
South Carolina	Darlington
South Carolina	Edgefield
South Carolina	Oconee
South Carolina	Pickens
South Carolina	Richland
South Carolina	Spartanburg
South Carolina	Union
South Carolina	Williamsburg
South Carolina	York
South Dakota	Pennington
Tennessee	Anderson
Tennessee	Blount
Tennessee	Davidson
Tennessee	Hamilton
Tennessee	Haywood
Tennessee	Jefferson
Tennessee	Knox
Tennessee	Lawrence
Tennessee	Meigs
Tennessee	Putnam
Tennessee	Rutherford
Tennessee	Sevier
Tennessee	Shelby
Tennessee	Sullivan
Tennessee	Sumner
Tennessee	Williamson

Tennessee	Wilson
Texas	Bexar
Texas	Brazoria
Texas	Brewster
Texas	Cameron
Texas	Collin
Texas	Dallas
Texas	Denton
Texas	El Paso
Texas	Ellis
Texas	Galveston
Texas	Gregg
Texas	Harris
Texas	Harrison
Texas	Hidalgo
Texas	Hood
Texas	Jefferson
Texas	Johnson
Texas	Kaufman
Texas	Montgomery
Texas	Nueces
Texas	Orange
Texas	Parker
Texas	Rockwall
Texas	Smith
Texas	Tarrant
Texas	Travis
Texas	Victoria
Texas	Webb
Utah	Box Elder
Utah	Cache
Utah	Davis
Utah	Salt Lake
Utah	San Juan
Utah	Utah
Utah	Weber
Vermont	Bennington
Vermont	Chittenden
Virginia	Alexandria City
Virginia	Arlington
Virginia	Caroline
Virginia	Charles City
Virginia	Chesterfield
Virginia	Fairfax
Virginia	Fauquier
Virginia	Frederick
Virginia	Hampton City
Virginia	Hanover
Virginia	Henrico
Virginia	Loudoun
Virginia	Madison
Virginia	Page

Virginia	Prince William
Virginia	Roanoke
Virginia	Rockbridge
Virginia	Stafford
Virginia	Suffolk City
Virginia	Wythe
Washington	Clallam
Washington	Clark
Washington	King
Washington	Mason
Washington	Pierce
Washington	Skagit
Washington	Spokane
Washington	Thurston
Washington	Whatcom
West Virginia	Berkeley
West Virginia	Cabell
West Virginia	Greenbrier
West Virginia	Hancock
West Virginia	Kanawha
West Virginia	Monongalia
West Virginia	Ohio
West Virginia	Wood
Wisconsin	Brown
Wisconsin	Columbia
Wisconsin	Dane
Wisconsin	Dodge
Wisconsin	Door
Wisconsin	Florence
Wisconsin	Fond Du Lac
Wisconsin	Green
Wisconsin	Jefferson
Wisconsin	Kenosha
Wisconsin	Kewaunee
Wisconsin	Manitowoc
Wisconsin	Marathon
Wisconsin	Milwaukee
Wisconsin	Oneida
Wisconsin	Outagamie
Wisconsin	Ozaukee
Wisconsin	Racine
Wisconsin	Rock
Wisconsin	Sauk
Wisconsin	Sheboygan
Wisconsin	St Croix
Wisconsin	Vernon
Wisconsin	Vilas
Wisconsin	Walworth
Wisconsin	Washington
Wisconsin	Waukesha
Wisconsin	Winnebago
Wyoming	Campbell

Wyoming	Teton
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**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA**

_____)	
DEFENDERS OF WILDLIFE and)	
SIERRA CLUB)	
)	
Plaintiffs,)	
)	
v.)	Case No. 10-cv-1915 (RWR)
)	
LISA P. JACKSON,)	
Administrator, United States)	
Environmental Protection Agency,)	
)	
Defendant.)	
_____)	

DECEMBER 10, 2012 STIPULATED EXTENSION

Whereas, on March 18, 2012, the Court entered a Consent Decree in this matter;

Whereas, Paragraph 3 of the original Consent Decree provides that by July 23, 2012, Defendant Lisa P. Jackson, Administrator of the United States Environmental Protection Agency (“EPA”), shall sign a notice of proposed rulemaking pertaining to revisions to the effluent limitations guidelines referred to in the Consent Decree as the “Steam Electric Effluent Guidelines”;

Whereas, Paragraph 4 of the original Consent Decree provides that by January 31, 2014, the EPA Administrator shall sign a decision taking final action following notice and comment rulemaking pertaining to revisions to the Steam Electric Effluent Guidelines;

Whereas, Paragraph 5 of the Consent Decree provides that dates set forth in the Consent Decree may be extended by written agreement of the parties and notice to the Court;

Whereas, on April 2, 2012, the parties filed a Corrected Stipulated Extension extending the deadline in Paragraph 3 of the Consent Decree until November 20, 2012, and the deadline in Paragraph 4 of the Consent Decree until April 28, 2014;

Whereas, on September 20, 2012, the parties filed a Stipulated Extension extending the deadline in Paragraph 3 of the Consent Decree until December 14, 2012, and the deadline in Paragraph 4 of the Consent Decree until May 22, 2014;

Whereas, EPA does not plan to seek further extensions of the proposed rule deadline in Paragraph 3 beyond April 19, 2013;

Whereas, at the request of Plaintiffs, EPA will file reports with the Court on the status of the rulemaking every 30 days from the filing of this Stipulated Extension until EPA completes its obligations as set forth in Paragraph 3 of the Consent Decree;

Whereas, at the request of Plaintiffs, EPA will file reports with the Court on the status of the rulemaking every 90 days from the EPA's completion of its obligations as set forth in Paragraph 3 of the Consent Decree until EPA completes its obligations as set forth in Paragraph 4 of the Consent Decree;

Whereas, over the past 20 years, growing use of flue-gas desulfurization systems has increased the amount of toxic metals discharged from power plants, and installation of scrubbers is expected to increase over the next 15 years;

Whereas, in the absence of nationally applicable effluent limitations guidelines and standards for steam electric facilities, permitting authorities are required under section 402(a)(1) of the Clean Water Act, 33 U.S.C. § 1342(a)(1), to develop technology-based effluent limitations and standards on a best professional judgment basis, and development of these best professional

judgment limitations and standards takes more time and resources than implementation of a nationally applicable rule;

Now, therefore, the parties agree and stipulate as follows:

The December 14, 2012 deadline in Paragraph 3 shall be extended until April 19, 2013.

No other provisions of the Consent Decree are affected by this Stipulation.

SO AGREED:

FOR DEFENDANT:

IGNACIA S. MORENO
Assistant Attorney General
Environment and Natural
Resources Division

Dated: 12/10/2012

/s/ Madeline Fleisher
MADELINE P. FLEISHER
Environmental Defense Section
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044
(202) 514-0242

Of counsel:
JESSICA HALL
U.S. Environmental Protection Agency
Office of General Counsel
1200 Pennsylvania Ave., N.W.
Washington, D.C. 20460

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FOR PLAINTIFFS:

Dated: 12/10/2012

/s/ Jennifer S. Peterson
JENNIFER S. PETERSON
Managing Attorney
Environmental Integrity Project
One Thomas Circle, NW, Ste. 900

Washington, DC 20005
(202) 263-4449
jpeterson@environmentalintegrity.org

CERTIFICATE OF SERVICE

I hereby certify that on December 10, 2012, I electronically filed the foregoing Stipulation with the Clerk of the Circuit Court using the CM/ECF system, which sent notification of such filing to all counsel of record.

/s/ Madeline Fleisher
MADELINE FLEISHER, Attorney