

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

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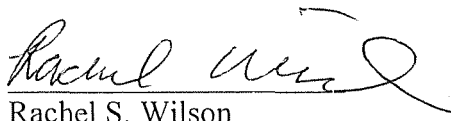
In the Matter of:

Application of Kentucky Power Company for Approval of)
its Environmental Compliance Plan, Approval of its Amended) CASE NO. 2011-00401
Environmental Cost Recovery Surcharge Tariffs, and for the)
Grant of Certificates of Public Convenience and Necessity)
for the Construction and Acquisition of Related Facilities)

AFFIDAVIT OF RACHEL S. WILSON FOR DIRECT TESTIMONY
(PUBLIC VERSION)

Commonwealth of)
Massachusetts)
)

Rachel S. Wilson, being first duly sworn, states the following: The prepared Direct Testimony (Public Version) and associated exhibits filed on Monday, March 12, 2012 constitute the direct testimony of Affiant in the above-styled cases. Affiant states that she would give the answers set forth in the Direct Testimony, Public Version, if asked the questions propounded therein. Affiant further states that, to the best of her knowledge, her statements made are true and correct.


Rachel S. Wilson

SUBSCRIBED AND SWORN to before me this 8 day of March 2012.


Notary Public



JANICE CONYERS
Notary Public
Commonwealth of Massachusetts
My Commission Expires
July 27, 2018

My Commission Expires:

Commonwealth of Kentucky

Before the Public Service Commission

In the Matter of:

APPLICATION OF KENTUCKY POWER)
COMPANY FOR APPROVAL OF ITS 2011)
ENVIRONMENTAL COMPLIANCE PLAN,)
FOR APPROVAL OF ITS AMENDED)
ENVIRONMENTAL COST RECOVERY)
SURCHARGE TARIFF, AND FOR THE)
GRANTING OF A CERTIFICATE OF)
PUBLIC CONVIENENCE AND NECESSITY)
FOR THE CONSTRUCTION AND)
ACQUISITION OF RELATED FACILITIES.)

Case No. 2011-00401

**Direct Testimony of
Rachel S. Wilson**

**On Behalf of
Sierra Club**

March 12, 2011

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1 **1. INTRODUCTION AND QUALIFICATIONS**

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

3 **A** My name is Rachel Wilson and I am an Associate with Synapse Energy
4 Economics, Inc. (Synapse). My business address is 485 Massachusetts Avenue,
5 Suite 2, Cambridge, Massachusetts 02139.

6 **Q Please describe Synapse Energy Economics.**

7 **A** Synapse Energy Economics is a research and consulting firm specializing in
8 energy and environmental issues, including electric generation, transmission and
9 distribution system reliability, ratemaking and rate design, electric industry
10 restructuring and market power, electricity market prices, stranded costs,
11 efficiency, renewable energy, environmental quality, and nuclear power.

12 Synapse's clients include state consumer advocates, public utilities commission
13 staff, attorneys general, environmental organizations, federal government and
14 utilities.

15 **Q Please summarize your work experience and educational background.**

16 **A** At Synapse, I conduct research and write testimony and publications that focus on
17 a variety of issues relating to electric utilities, including: federal and state clean air
18 policies; emissions from electricity generation; environmental compliance
19 technologies, strategies, and costs; integrated resource planning; valuation of
20 environmental externalities from power plants; and the nexus between water and
21 energy.

22 I also perform modeling analyses of electric power systems. I am proficient in the
23 use of optimization and electricity dispatch models to conduct analyses of utility
24 service territories and regional energy markets. I have experience with
25 STRATEGIST, PROMOD, PROSYM/Market Analytics, and PLEXOS. I have
26 participated in a series of trainings for the STRATEGIST model, both in-house
27 and at the Atlanta headquarters of Ventyx, an ABB Company.

1 Prior to joining Synapse in 2008, I worked for the Analysis Group, Inc., an
2 economic and business consulting firm, where I focused on issues relating to
3 energy and the electric industry. I was also a Research Assistant at the Yale
4 Center for Environmental Law and Policy and was responsible for collecting and
5 processing data on corporate and environmental strategy, as well as
6 environmental performance data on a country-by-country basis.

7 I hold a Master of Environmental Management from Yale University and a
8 Bachelor of Arts in Environment, Economics, and Politics from Claremont
9 McKenna College in Claremont, California.

10 A copy of my current resume is attached as Exhibit RSW-1.

11 **Q On whose behalf are you testifying in this case?**

12 **A** I am testifying on behalf of Sierra Club

13 **Q Have you testified previously before the Kentucky Public Service**
14 **Commission?**

15 **A** Yes. On September 16, 2011, I filed direct testimony in the joint application of
16 Kentucky Utilities/Louisville Gas & Electric for Certificate of Public
17 Convenience and Necessity (CPCN) in similar dockets (2011-00161 and 2011-
18 00162).

19 **Q What is the purpose of your testimony?**

20 **A** My testimony describes and evaluates the STRATEGIST modeling performed by
21 Kentucky Power Company (KPCo) and American Electric Power (AEP) (the
22 “Company,” collectively) in this docket. I also describe my own STRATEGIST
23 modeling efforts using the Company input data and present the results of that
24 analysis.

1 **Q What data sources did you rely upon in your review of the Company's**
2 **STRATEGIST analysis and in preparation of your own analysis?**

3 **A** In my review of the Company's STRATEGIST analysis, I relied upon the
4 Application for CPCN with accompanying witness testimony and appendices, the
5 STRATEGIST input and output files provided by the Company, and select
6 spreadsheet work papers provided by the Company in response to discovery
7 requests by Sierra Club, KIUC, and Commission Staff. My analysis also depends
8 heavily on a telephone conversation I had with Mr. Mark A. Becker from AEP on
9 February 24, 2012. During this conversation, Mr. Becker provided me with
10 specific changes to the STRATEGIST input files that were required to run the
11 model and produce the results that KPCo submitted in this docket.

12 **2. SUMMARY AND CONCLUSIONS**

13 **Q In your opinion, does the STRATEGIST modeling performed by the**
14 **Company in this docket support the decision to retrofit Big Sandy Unit 2**
15 **with a DFGD in 2016?**

16 **A** No, it does not. The Company's modeling contains several errors that bias the
17 results in favor of the retrofit and continued operation of Big Sandy Unit 2.

18 **3. DESCRIPTION OF AEP/KPCo STRATEGIST MODELING**

19 **Q Please provide a general description of the capabilities of the STRATEGIST**
20 **model.**

21 **A** STRATEGIST is capable of selecting the least-cost mix of capacity and energy to
22 meet a utility's projected peak demand and annual energy over a long-term
23 planning horizon. It determines this least-cost mix from the range of supply- and
24 demand-side resources the user specifies as being available during the planning
25 horizon.

26 **Q Please provide a general description of the Company's use of the**
27 **STRATEGIST model in this proceeding.**

28 **A** Rather than input various resource options and allow STRATEGIST to select the
29 optimal mix and timing, the Company "locked-in" specific resource options in

1 specific years. In the period between 2011 and 2024, KPCo did not allow
2 STRATEGIST to “build” additional capacity and instead forced it to meet any
3 demand shortfall with market purchases.

4 The Company therefore only evaluates resource plans within STRATEGIST that
5 have been preselected prior to beginning the modeling process. In describing the
6 Company’s STRATEGIST modeling in direct testimony, witness Weaver states
7 that “the objective of this exercise was to identify the **relative least-cost**
8 **alternative** among those identified in Table 1” (the five resource options
9 described below.) A more appropriate way to state this is that the objective of the
10 Company’s STRATEGIST exercise was to identify the relative least-cost
11 alternative **among those identified in Table 1** (emphasis added). The number of
12 resource portfolios evaluated by STRATEGIST was so tightly constrained that it
13 is possible, and even likely, that a lower cost resource portfolio exists that would
14 have been identified by the model had it been allowed to perform long-term
15 resource optimization.

16 **Q How could the Company have done that analysis differently?**

17 **A** Simply put, STRATEGIST should have been used to select the optimal resource
18 plan from a variety of options, including construction of coal and natural-gas fired
19 generation, a purchase-power agreement (PPA) for energy and capacity, and
20 energy efficiency, demand response and renewable generating resources.

21 There are other ways in which the Big Sandy 2 retrofit, specifically, could have
22 been modeled. STRATEGIST will not retire a unit on its own, but the model can
23 determine whether the most economic option is to retrofit, repower, or replace a
24 unit. The Company should have allowed the model to select the optimal resource
25 portfolio.

1 **4. VERIFICATION OF COMPANY MODELING**

2 **Q Did you request and receive the STRATEGIST files the Company used to**
3 **produce the results it presented in this docket?**

4 **A** I did request and receive the files, however, nine of the 25 files received returned
5 the error message that “No feasible combination of resources could be found in
6 2015,” and the model optimization stopped. Several weeks after I received the
7 files, I was informed that certain changes were required to make the
8 STRATEGIST files we received match the files that the Company used to
9 produce its analysis. Mr. Mark A. Becker described the necessary changes to me
10 during a phone conversation on February 24, 2012.

11 **Q Please describe the changes that were necessary to execute STRATEGIST**
12 **model runs.**

13 **A** The Company provided us with 25 .FSV STRATEGIST input files, representing
14 five alternative resource portfolios under five future scenarios. The alternative
15 resource portfolios and future scenarios are described by Mr. Hornby in his
16 testimony.

17 Of the 25 STRATEGIST files that I was provided, Mr. Becker indicated that I had
18 to make changes to 16 of the files in order to reproduce the Company’s analysis.
19 For Options 1, 2, and 3 under all five of the Company’s scenarios, as well as
20 Option 4b under the No Carbon scenario, I was asked to adjust the “Minimum
21 Reserve Margin (%)” for KPCo from 8.04% to -100% during the time periods of
22 2014-2025 and 2037-2040. This variable represents the minimum reserve margin
23 that must be maintained in each year of the planning period. Per my discussion
24 with Mr. Becker, the effect of this change is to constrain the model such that it
25 does not add additional capacity resources beyond what the Company has
26 “locked-in” in any given year. The STRATEGIST model can therefore only add
27 capacity in years where the minimum reserve margin is set to 8.04%, which is
28 between 2025 and 2037.

1 **Q Were any other changes required in order to execute STRATEGIST model**
2 **runs?**

3 **A** Yes, there were two other changes. Under Option 1 in the Low Band scenario, we
4 were asked to change the “Operating Life” of the Big Sandy Unit 2 dry flue gas
5 desulfurization (DFGD) retrofit from 15 years to 30 years. In the original .FSV
6 file we received from the Company, the 15 year operating life of the DFGD was
7 causing Big Sandy Unit 2 to retire at the end of 2031. Changing the operating life
8 to 30 years allows the unit to run through the end of the planning period.

9 Secondly, under Option 2 in the Low Band Scenario, the STRATEGIST model
10 had been set to add a new 602 MW natural gas-fired combined-cycle unit in 2032.
11 We were asked to remove this addition, and the model no longer added this 602
12 MW combined-cycle unit.

13 **Q Please list the Strategist runs that you reproduced once the Company**
14 **identified the changes required to the input files it provided.**

15 **A** After the Company identified the required changes, I reproduced the nine runs
16 that had previously terminated in 2015 due to an infeasible combination of
17 resources. I re-ran an additional seven runs that had given incorrect results in
18 absence of the required changes. The remaining nine runs appeared to have run
19 correctly using the STRATEGIST files initially provided by the Company in
20 response to the Sierra Club’s first discovery request.

21 **5. CONCERNS WITH THE COMPANY’S STRATEGIST MODELING**

22 **Q Did you identify any problems with the Company’s STRATEGIST runs**
23 **when you reproduced those runs?**

24 **A** Yes, I did. The first problem I noticed is the way in which capital costs for the Big
25 Sandy Unit 2 DFGD is represented in STRATEGIST compared to the way it is
26 represented in the direct testimony of and discovery responses from Company
27 Witness Scott C. Weaver. Capital costs are represented in the Proview module of
28 STRATEGIST at a “Base Cost without AFUDC [allowance for funds used during

1 construction]” value of \$696/kW (real 2011\$)¹ for the DFGD retrofit. Table 2 of
2 Witness Weaver’s testimony indicates that the total cost of the DFGD retrofit is
3 \$948/kW (real 2011\$). In the Company’s response to Sierra Club Supplemental
4 Data Request Item No. 4, it is stated that “The capital costs in Table 2 in Mr.
5 Weaver’s testimony were used as the basis for the capital costs of the four
6 alternative options defined in the PROVIEW module of Strategist.”

7 This appears to be untrue, however, as the capital costs included in the
8 STRATEGIST model for the Big Sandy DFGD are much lower than the capital
9 costs shown by the Company witness Scott C. Weaver. The manner in which
10 these capital costs flow through the Company’s analysis is discussed by my
11 colleague, Dr. Jeremy Fisher.

12 The second problem I noticed was a spike in fixed O&M costs in STRATEGIST
13 in 2040, which was due to the manner in which the Company represented end
14 effects for that particular input variable.

15 In the Company STRATEGIST runs, several of the thermal units in the AEP
16 system, including Big Sandy 2, experience a spike in fixed O&M costs in 2040,
17 the end of the planning period. During my conversation with Mr. Becker, he
18 stated that this spike represents the addition of the present value (in 2040) of on-
19 going capital costs that continue on until the unit is ultimately retired. In essence,
20 this calculation is accounting for an “end effects” period for one particular cost –
21 fixed O&M – for specific units.

22 The end effects calculation in STRATEGIST is used to analyze differences
23 between alternatives after the planning period – in this case after 2040. This is
24 important because different resource options have different operating lives and
25 characteristics, and the end effects calculation measures those differences in
26 operating costs between resources after the planning period.

¹ Values are input into STRATEGIST in base year dollars – in this case 2011\$. STRATEGIST then converts costs to nominal dollars based on the unit’s in-service date.

1 KPCo did not utilize the end effects calculation capability of STRATEGIST,
 2 stating in Response to Sierra Club Data Request 39 that the planning period of
 3 2011 to 2040 is sufficiently long to cover the life of the FGD retrofits and the
 4 majority of the life of gas replacement alternatives. In addition, KPCo expects that
 5 relative cost impacts after 2040 would be very small due to the discounting of
 6 costs.

7 KPCo’s inclusion of on-going capital for certain units – using an end effects
 8 calculation for specific variables but not others – is flawed, and does not represent
 9 the true operating costs of a unit, especially a coal-fired unit like Big Sandy 2.
 10 Costs of CO₂ emissions are one variable where exclusion from an end effects
 11 calculation is particularly important. Allowance prices for emissions of CO₂
 12 would have a significant effect on the operating cost of a coal-fired unit over time,
 13 particularly if those emissions costs are escalating, as might reasonably be
 14 expected as emission caps grow more stringent. Exclusion of specific variables
 15 from an end effects calculation thus biases the modeling results in favor of coal-
 16 fired generating resources.

17 **Q Are there any other costs that are not represented in the model runs?**

18 **A** Yes. Company witness Scott Weaver states in his direct testimony that it is
 19 reasonable to assume that KPCO would curtail the operation of both Big Sandy
 20 Units 1 and 2 under Cross State Air Pollution Rule (CSAPR) Phase 1 (2012-
 21 2013), and further curtail operation to meet CSAPR Phase 2 requirements (from
 22 2014 until the Big Sandy 2 retrofit date). STRATEGIST modeling does not curtail
 23 operation of the Big Sandy units to comply with CSAPR. Table 1 shows the
 24 projected emissions of the Big Sandy units compared to the CSAPR allocation.

25 **Table 1. Comparison of CSAPR SO₂ Allocation at Big Sandy vs. STRATEGIST Emissions Projections.**

| Plant Name | SO2 Allocation 2012 (tons) | SO2 Allocation 2014 (tons) | STRATEGIST Projected SO ₂ Emissions (tons) | | | | | |
|-------------|----------------------------|----------------------------|---|--------|--------|--------|--------|-------|
| | | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Big Sandy 1 | 3,399 | 1,462 | 7,356 | 8,341 | 8,593 | 7,731 | 0 | 0 |
| Big Sandy 2 | 11,926 | 5,131 | 34,606 | 41,295 | 35,138 | 41,993 | 39,402 | 1,158 |

1

2 Depending on the number of SO₂ allowances available for purchase, the Big
3 Sandy units may require significant curtailment to meet emission caps. Unit
4 curtailment, or unit cycling, is likely to increase the wear and tear on the unit,
5 driving up maintenance costs and possibly requiring replacements of various
6 components. Some of these components may need to be replaced subsequent to
7 the DFGD retrofit at Big Sandy Unit 2, leading to on-going capital costs that are
8 higher than those projected in STRATEGIST. Certain of these costs are likely to
9 be incurred in all scenarios under all options, but certain on-going capital cost
10 replacements may be able to be avoided under a scenario that retires both Big
11 Sandy Units 1 and 2.

12 KPCo may also be able to sell excess SO₂ allowances in scenarios where Big
13 Sandy is retired. This sale of allowances was not analyzed by the Company.

14 **Q Are there any other variables that are not properly represented in**
15 **STRATEGIST?**

16 **A Yes.** The Mercury and Air Toxics Standards (MATS) for power plants in the
17 United States were finalized by the U.S. Environmental Protection Agency in
18 December 2011. The MATS rule sets a limit on emissions of mercury by fossil-
19 fueled generators of 0.0012 lb/MBtu. The Company has stated that KPCo will be
20 in compliance with this rule without the installation of additional pollution control
21 equipment; however, this is not reflected in the STRATEGIST model. Emissions
22 output for the KPCo system from the STRATEGIST run in which Big Sandy is
23 retrofit in the base future shows emissions of mercury at 0.006 lb/MBtu or higher
24 for all of the years in the planning period. Emissions rates are being modeled
25 improperly, or additional pollution control equipment may in fact be needed at
26 Big Sandy Unit 2 in order to bring the unit into compliance with MATS standards
27 for mercury.

1 **6. DESCRIPTION OF SYNAPSE ENERGY ECONOMICS STRATEGIST MODELING**

2 **Q Did you perform any of your own STRATEGIST modeling for this docket?**

3 **A**Yes. Based upon input from Dr. Fisher, after correcting for the errors in the
4 original STRATEGIST files we received from the Company, I created an
5 additional scenario that utilizes the Low CO₂ price forecast from the Synapse
6 Energy Economics *2011 Carbon Dioxide Price Forecast*. The Synapse Low
7 forecast begins at a price of \$15/ton in 2020 and rises to a price of \$45/ton in
8 2040 (real 2010\$). (In real 2010\$, the Company's Base CO₂ forecast begins at
9 \$11.92/ton in 2022 and declines to \$11.21/ton in 2040.) Using this Synapse Low
10 CO₂ scenario, I then executed model runs for each of the five resource portfolios
11 presented by the Company. The results of this modeling analysis are presented in
12 the direct testimony of Dr. Fisher.

13 **7. CONCLUSIONS AND RECOMMENDATIONS**

14 **Q Please summarize the conclusions and recommendations that you have**
15 **developed from your review of the Company's STRATEGIST modeling.**

16 **A**Based on my review, I conclude that the Company's STRATEGIST modeling
17 does not demonstrate that the retrofit of Big Sandy Unit 2 with a DFGD is
18 reasonable and cost-effective. The Company determined the resource portfolios to
19 analyze rather than allowing Strategist to choose the optimal resource portfolio.
20 KPCo only used STRATEGIST to determine the total resource cost (NPV) of
21 each of the options under each of the scenarios.

22 The capital cost input value for the DFGD retrofit at Big Sandy Unit 2 appears to
23 be too low, biasing the analysis in favor of the retrofit scenario. Uneven
24 application of end effects calculations also biases the analysis in favor of
25 continued operation of coal-fired generating units, as do ongoing capital costs that
26 do not appear to be considered in the Company's modeling analysis. Correction of
27 these errors would increase the total costs of the Option 1 portfolio, causing the
28 portfolios that contain natural gas replacement capacity and/or capacity purchases
29 to look more favorable by comparison.

1 My recommendation is that the Commission disregards the Company's
2 STRAGEGIST analysis in its determination of whether or not to grant CPCN, as
3 the analysis contains several errors that bias the results in favor of continued
4 operation of Big Sandy Unit 2.

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. Associate, 2010 – present, Research Associate, 2008 – 2010.

Performs consulting, conducts research, and assists in writing testimony and reports on a wide range of issues relating to electric utilities, including federal and state clean air policies; emissions from electricity generation; environmental compliance technologies, strategies, and costs; integrated resource planning; valuation of environmental externalities from power plants; and the nexus between water and energy. Uses optimization and electricity dispatch models, including Strategist, PROMOD, and PROSYM/Market Analytics, to conduct analyses of utility service territories and regional energy markets.

Analysis Group, Inc., Boston, MA. Associate, Energy Practice, 2007 - 2008.

Supported an expert witness asked to opine on various topics in the electric industry as they applied to merchant generators and provided incentives for their behavior in the late 1990s and early 2000s. Analyzed data related to coal production on Indian land and contractual royalties paid to the tribe over a 25 year period to determine if discrepancies exist between these values for the purposes of potential litigation. Examined Canadian policies relating to carbon dioxide, and assisted with research on linkage of international tradable permit systems. Managed analysts' work processes and evaluated work products.

Senior Analyst Intern, Energy Practice, 2006 - 2007.

Supported an expert witness in litigation involving whether a defendant power company could financially absorb a greater investment in pollution control under its debt structure while still offering competitive rates. Analyzed impacts of federal and state clean air laws on energy generators and providers and built a quantitative model showing the costs of these clean air policies to the defendant over a 30 year period. Built a financial model calculating impacts of various pollution control investment requirements. Researched the economics of art; assisted in damage calculations in arbitration between an artist and his publisher.

Yale Center for Environmental Law and Policy, New Haven, CT. Research Assistant, 2005 – 2007.

Gathered and managed data for the Environmental Performance Index, presented at the 2006 World Economic Forum. Interpreted statistical output, wrote critical analyses of results, and edited report drafts. Part of the team that produced *Green to Gold*, an award-winning book on

corporate environmental management and strategy. Managed data, conducted research, and implemented marketing strategy.

CERES, Boston, MA. Student Consultant, Spring 2006.

As part of a four-person team, made strategic recommendations on all aspects of messaging and engagement to encourage corporate directors to act on the issue of climate change. First strategic recommendation was sustainable governance forums, which were profiled in New York Times article “Global Warming Subject for Directors at Big Companies” on September 21, 2006.

Marsh Risk and Insurance Services, Inc., Los Angeles, CA. Risk Analyst, Casualty Department, 2003 – 2005.

Evaluated Fortune 500 clients’ risk management programs/requirements and formulated strategic plans and recommendations for customized risk solutions. Supported the placement of \$2 million in insurance premiums in the first year and \$3 million in the second year. Utilized quantitative models to create loss forecasts, cash flow analyses and benchmarking reports. Completed a year-long Graduate Training Program in risk management; ranked #1 in the western region of the US and shared #1 national ranking in a class of 200 young professionals.

EDUCATION

Yale School of Forestry & Environmental Studies, Master of Environmental Management, New Haven, Connecticut, 2007.

Concentration in Law, Economics, and Policy with a focus on energy issues and markets.

Claremont McKenna College, Bachelor of Arts in Environment, Economics, Politics (EEP) Claremont, California, 2003.

cum laude and EEP departmental honors.

School for International Training Quito, Ecuador. Spring 2002.

Semester abroad studying Comparative Ecology. Microfinance Intern – Viviendas del Hogar de Cristo in Guayaquil, Ecuador.

SKILLS AND ACCOMPLISHMENTS

Microsoft Office Suite, Lexis-Nexis, Platts Energy Database, Strategist, PROMOD, and PROSYM/Market Analytics, some SAS and STATA.

Competent in oral and written Spanish.

Hold the Associate in Risk Management (ARM) professional designation.

PUBLICATIONS AND PRESENTATIONS

Johnston, L., and R. Wilson. *Global Best Practices: Strategies for Decarbonizing Electric Power Supply*. Prepared for Regulatory Assistance Project (RAP). December 14, 2011.

Hornby, R., P. Chernick, C. Swanson, D. White, J. Gifford, M. Chang, N. Hughes, M.

Wittenstein, R. Wilson, and B. Biewald. *Avoided Energy Supply Costs in New England: 2011*

Report. Prepared for the Avoided-Energy-Supply-Component (AESC) Study Group. July 21, 2011.

Wilson, R. and Paul Peterson. *A Brief Survey of State Integrated Resource Planning Rules and Requirements.* Prepared for the American Clean Skies Foundation. April 28, 2011.

Johnston, L., E. Hausman., B. Biewald, R. Wilson, and D. White. *2011 Carbon Dioxide Price Forecast.* February 11, 2011.

Fisher, J., R. Wilson, N. Hughes, M. Wittenstein, and B. Biewald. *Benefits of Beyond BAU: Human, Social, and Environmental Damages Avoided Through the Retirement of the US Coal Fleet.* Prepared for the Civil Society Institute. January 25, 2011.

Peterson, P., V. Sabodash, R. Wilson, and D. Hurley. *Public Policy Impacts on Transmission Planning.* Prepared for Earthjustice, December 21, 2010.

Fisher, J., S. Levy, Y. Nishioka, P. Kirshen, R. Wilson, M. Chang, J. Kallay, and C. James. *Co-Benefits of Energy Efficiency and Renewable Energy in Utah.* Prepared for the State Energy Office of Utah, March 2010.

Wilson, R. "The Energy-Water Nexus: Interactions, Challenges, and Policy Solutions." Presented at the National Drinking Water Symposium 2009, October 2009.

Fisher, J., C. James, L. Johnston, D. Schlissel, R. Wilson, *Energy Future: A Green Alternative for Michigan.* Prepared for Natural Resources Defense Council and Energy Foundation, August 2009.

Schlissel, D., R. Wilson, L. Johnston, D. White, *An Assessment of Santee Cooper's 2008 Resource Planning.* April 2009.

Schlissel, D., A. Smith, R. Wilson, *Coal-Fired Power Plant Construction Costs.* July 2008.

TESTIMONY

Kentucky Public Services Commission. Direct testimony before the Commission on behalf of Sierra Club and Natural Resources Defense Council. Testimony included discussion of STRATEGIST modeling relating to the applications of Kentucky Utilities Company and Louisville Gas and Electric Company for Certificates of Public Convenience and Necessity. September 16, 2011.

Minnesota Public Utilities Commission. Rebuttal testimony before the Commission on behalf of Izaak Walton League of America, Fresh Energy, Sierra Club, and Minnesota Center for Environmental Advocacy. Testimony described STRATEGIST modeling performed in the docket considering Otter Tail Power's application for an Advanced Determination of Prudence for BART retrofits at its Big Stone plant. September 7, 2011.

Resume dated January 2012.