COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

AN APPLICATION OF EAST KENTUCKY POWER COOPERATIVE, INC. FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR ALTERATION OF CERTAIN EQUIPMENT AT THE COOPER STATION AND APPROVAL OF A COMPLIANCE PLAN AMENDMENT FOR ENVIRONMENTAL SURCHARGE COST RECOVERY	)))))))))	**CASE NO. 2013-00259**

Supplemental Direct Testimony of

Tyler Comings

Public, Redacted Version

On Behalf of

Sonia McElroy and Sierra Club

December 27, 2013

Table of Contents

List of Figures and Tables

1. INTRODUCTION AND PURPOSE OF TESTIMONY

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

A My name is Tyler Comings. I am an Associate with Synapse Energy Economics, Inc. (Synapse), which is located at 485 Massachusetts Avenue, Suite 2, in Cambridge, Massachusetts.

Q Are you the same Tyler Comings who submitted direct testimony in this case on November 27, 2013?

A Yes, I am.

Q What is the purpose of your testimony?

A This testimony provides an update to the analysis presented in my direct testimony, based on new information provided by East Kentucky Power Cooperative, Inc. (EKPC or Company) in response to the Commission's December 10th order granting Sierra Club's Motion to Compel.

My testimony focuses on compliance costs of future environmental regulations (including carbon regulation) and the costs of operating Cooper Unit 1. I have updated the valuation analysis in my direct testimony to include scenarios of environmental compliance costs, including the mid-case Synapse 2013 Carbon Dioxide Price Forecast.[1]

Q Did you perform additional analysis based on the new information provided by the Company?

A Yes. I performed an adjusted annual valuation of the Cooper Unit 1 project to include the costs of carbon regulation. I also present a summary of valuations based on scenarios of environmental compliance costs for other pending regulations.

[1] Exhibit TFC-10.

Q What are the results of your updated analysis?

A My updated results are shown in Confidential Figure 1. Under the scenarios described below, the 25-year Net Present Value (NPV) of the Cooper unit 1 project is:

1) [redacted] based on EKPC's assumptions;

2) [redacted] based on an adjusted energy price forecast as presented in my direct testimony;[2]

3) [redacted] based on an adjusted energy price forecast and "lenient" compliance costs for coal combustion residual, cooling, and NOx controls;

4) [redacted] based on an adjusted energy price forecast, "lenient" environmental rules, and the Synapse mid-case carbon prices; and

5) [redacted] based on an adjusted energy price forecast, "strict" environmental rules and the Synapse mid-case carbon prices.

Confidential Figure 1: Select 25-Year NPV with Scenarios of Environmental Compliance Costs

[2] Comings Direct, p. 8 and 21.

Q What are your findings based on this updated analysis?

A The wide range of estimates above shows the significant risk of the Cooper Unit 1 project. Even with lenient compliance costs and no carbon costs, the project would be only marginally economic [redacted] NPV over the 25-year period) with adjusted market prices. If EKPC must comply with coal ash, cooling, NOx regulations and moderate carbon costs, the project would be uneconomic (with adjusted energy prices). In other words, my analysis indicates that the proposed retrofit project is economic only if one makes extremely optimistic assumptions about energy prices and environmental compliance costs.

Given the likelihood that energy prices will not increase as much as EKPC is assuming, and the likelihood that the plant will face carbon costs and other environmental regulations over the 25-year planned life of the project, EKPC is assuming very large financial risks with the proposed project.

2. EKPC'S OWN ESTIMATES OF ENVIRONMENTAL COMPLIANCE COSTS WERE NOT CONSIDERED IN ITS FILING

Q Has EKPC provided new information on environmental compliance costs?

A Yes. In Sierra Club's initial information requests 59-61, Intervenors asked EKPC for any study of the cost to comply with the proposed coal combustion residual (CCR) rule, cooling water intake rule (316b), and effluent limitation guidelines (ELG). At the time, EKPC claimed that it had not prepared or caused to be prepared any such studies.

Sierra Club's supplemental information requests 31-33 asked whether EKPC had reviewed any documents relating to the potential costs for Cooper Unit 1 to comply with the CCR, 316(b), and ELG rules. EKPC claimed that it had reviewed such documents, but refused to provide them to Intervenors.

After the Commission granted Sierra Club's motion to compel EKPC to respond to supplemental requests 31-33, EKPC provided new information on the costs for Cooper Unit 1 to comply with pending environmental rules.

Q Did EKPC provide all of the information that was requested regarding compliance with these regulations?

A No. After the Commission granted Sierra Club's motion to compel, EKPC produced comments it submitted to EPA on the CCR, 316(b), and ELG rules. These comments included estimates of the compliance costs Cooper Station would face. However, EKPC has not provided engineering studies it commissioned for estimating the costs at Cooper to comply with these proposed regulations.[3]

Q Have the cost impacts discussed by the Company been incorporated into their valuation of the Cooper Unit 1 project?

A No. As stated in my direct testimony, the Company did not incorporate the costs of any future environmental regulations except for the Mercury and Air Toxics Standard (MATS) and the regional haze rule. In responding to previous data requests, the Company claimed that since other environmental rules have not yet been finalized, identifying regulatory compliance options would be speculative.[4] However, given the most recent discovery responses from EKPC, it is apparent that when EKPC sought to dissuade EPA from adopting regulations, EKPC was able to estimate the compliance costs it told the Intervenors could not be estimated. Unfortunately, EKPC did not incorporate its own cost estimates into its analysis of the Cooper unit 1 project.

Q Have the Intervenors' estimates of Cooper Unit 1 compliance costs for coal combustion residuals (CCR) changed given the new information from the Company?

A Yes. In my direct testimony, I offered an estimate of future costs of CCR associated with Cooper Unit 1 of $41 million for strict compliance and no costs for lenient compliance.[5] Based on the Company's comments made to EPA on the CCR rule, they estimate subtitle C compliance ("strict") costs of $151.5 million or

[3] Additional Responses Pursuant to the Commission's December 10, 2013 Order 31a-b, 32a-b, and 33a-b
[4] See EKPC Responses to Intervenors' Supplemental Requests 31a, 32a & d, 33a & d, 35c, 36a & b, and 38b.
[5] Comings Direct, p. 37, lines 9-12.

subtitle D or D prime compliance ("lenient") costs of $31.5 million for Cooper Units 1 and 2.[6]

The Company has not provided a breakdown of compliance costs by unit. In estimating Cooper 1's share of environmental compliance costs, I assumed that these costs would be avoidable if Cooper 1 were to retire. In the absence of estimates from EKPC of compliance costs at Cooper Unit 1, I applied Cooper 1's share of the total plant's capacity (34%) to the compliance costs for Cooper Station. This results in lenient compliance costs at Cooper Unit 1 of $10.7 million and strict costs of $51.5 million—both approximately $10 million higher than the estimates provided in my direct testimony.

Q Have the Intervenors' estimates of Cooper Unit 1 compliance costs for the 316(b) cooling water intake rule changed given the new information from the Company?

A Yes. In my direct testimony, I offered an estimate of future costs of 316(b) cooling for Cooper Unit 1 of $16 million for strict compliance and no costs for lenient compliance.[7] Based on EKPC's comments made to EPA, EKPC estimates the costs of a new cooling tower ("strict") of $44.8 million or impingement screens ("lenient") of $2.3 million for Cooper Units 1 and 2.[8] As mentioned above, EKPC has estimated compliance costs for the entire Cooper Station rather than Cooper Unit 1, so I applied Cooper 1's share of the total plant's capacity (34%) to the estimated compliance costs for Cooper Station. This results in lenient costs of $0.8 million and strict costs of $15.2 million—both very close to the estimates provided in my direct testimony.

[6] Additional Responses Pursuant to the Commission's December 10, 2013 Order 32d - EKPC CCR Comments to EPA 11192010, Table 1.
[7] Comings Direct, p. 40, lines 4-7.
[8] Additional Responses Pursuant to the Commission's December 10, 2013 Order 31, Letter from Jerry Purvis to EPA, Aug. 15, 2011. p5-6.

Q Have the Intervenors' estimates of Cooper Unit 1 compliance costs for Effluent Limitation Guidelines (ELG) changed given the new information from the Company?

A Yes. In my direct testimony, I offered a modest estimate of future costs of ELG for Cooper Unit 1 of $9 million for strict compliance and $2 million for lenient compliance.[9] However, based on the most recent discovery responses from EKPC, I am assuming that Cooper Unit 1 handles all its ash dry and would generate no scrubber waste waters. Therefore, I assume that Cooper Unit 1 will incur minimal costs to comply with the ELG rule.

Q Have the Intervenors' estimates of the costs to comply with the Cross State Air Pollution Rule (CSAPR) and National Ambient Air Quality Standards (NAAQS) changed given the new information from the Company?

A No. The Company has not provided any additional information on compliance with these regulations. Therefore, the estimates of additional controls needed to control NOx remain the same. I estimated that a lenient rule would require a Selective Non-Catalytic Reduction (SNCR) costing $6 million at Cooper Unit 1 or a strict rule would require an Selective Catalytic Reduction (SCR) costing $27 million.[10]

Q How do these costs change the economic picture for Cooper 1?

A Under lenient to strict environmental regulations, my updated range of estimates for the Company's capital compliance obligations are now from $19 to $100 million or more at Cooper 1.[11] The present value of these compliance costs was calculated assuming that capital investments would be made in 2020; this resulted

[9] Comings Direct, p. 38, lines 14-17.
[10] Comings Direct, p. 35, lines 17-20.
[11] Lenient: $7.3 million (SNCR) + $10.7 million (CCR) + $0.8 (cooling) = **$18.8 million**. I assume the Company's cost estimates are in $2020 with adjusted SNCR estimates from $2012 to $2020 using a 2.5% inflation rate.
Strict: $33 million (SCR) + $51.5 million (CCR) + $15.2 million (cooling) = **$100 million.** I assume the Company's cost estimates are in $2020 with adjusted SCR estimates from $2012 to $2020 using a 2.5% inflation rate

in a present value of $14.9 million for lenient compliance and $79.2 million for strict compliance.[12]

My updated economic evaluation (see Figure 1 on page 2) includes the present value of lenient and strict costs. I estimate that the Cooper Unit 1 project is marginally economic with adjusted energy prices and lenient compliance costs. If carbon costs and/or strict compliance costs are included, the project is rendered uneconomic (with adjusted market prices).

3. AN UPDATED VALUATION WITH ENVIRONMENTAL COMPLIANCE COSTS SHOWS THAT COOPER UNIT 1 WOULD BE UNECONOMIC

Q Did you perform an adjusted valuation that included a carbon price assumption?

A Yes. The Company provided information on the projected generation and costs of Cooper Unit 1 that allowed me to estimate costs to comply with carbon pollution standards, if the proposed project proceeds. I have utilized the Synapse 2013 mid-case carbon price forecast (starting in 2020) to develop carbon cost impacts on Cooper Unit 1 and on the adjusted market energy price forecast.

Q What is the adjusted 25-year NPV for the proposed project?

A In my direct testimony, I adjusted the energy market price to be consistent with the Company's natural gas price forecast. This change resulted in a 25-year market valuation of [redacted] compared to the Company's original [redacted] estimate (both are shown in Confidential Figure 2).

Also shown in Confidential Figure 2, when carbon costs are included, the project's annual value has decreased further and is never positive. The valuation of the project has fallen to [redacted]—a decrease in [redacted] from the

[12] These were calculated using the discounting methodology employed by Brattle Group in their valuation of each proposal. The calculations are found on the "Env Reg Cost Impacts" tab in "PSC 5 - CONFIDENTIAL_Proposal Evaluation_Energy Production - Synapse alt Supp".

Company's estimate or [redacted] from the estimate provided in my direct testimony.[13]

Q What is the adjusted 10-year NPV for the proposed project?

A The 10-year valuation presented in my direct testimony was $[redacted] compared to the Company's [redacted] estimate. With a carbon price assumption, the 10-year value is estimated to be [redacted] As shown in Confidential Figure 2, the project is always "in the red" when a carbon price is included.

Confidential Figure 2: Adjusted Cumulative NPV for Cooper Unit 1 Project[14]

[13] The impact of the carbon price shows up slightly in the figure in 2019 even though the carbon prices start in 2020. This is because each year shown on the figure actually represents April 1st of the given year to April 1st of the next year, since the Cooper 1 project was modeled to start in April 1, 2016.

[14] "Company's 25-year NPV" is produced annually by changing the "Lifetime of New Facility" field in PSC 5 - CONFIDENTIAL_Proposal Evaluation_Energy Production.xls; "Adjusted 25-year NPV" is calculated in the same way in PSC 5 - CONFIDENTIAL_Proposal Evaluation_Energy Production - Synapse alt supp.xls

Q Do the annual valuations presented in Confidential Figure 2 incorporate other lenient or strict environmental compliance costs that have been updated?

A No. Figure 3, Below shows the 25-year NPV of the Cooper Unit 1 project under the following scenarios--some of which include lenient or strict environmental compliance costs:

1) [redacted] based on EKPC's assumptions;

2) [redacted] based on an adjusted energy price forecast as presented in my direct testimony;[15]

3) [redacted] based on an adjusted energy price forecast and "lenient" compliance costs for coal combustion residual, cooling, and NOx controls;

4) [redacted] based on an adjusted energy price forecast, "lenient" environmental rules, and the Synapse mid-case carbon prices; and

5) [redacted] based on an adjusted energy price forecast, "strict" environmental rules and the Synapse mid-case carbon prices.

Confidential Figure 3: Select 25-Year NPV with Scenarios of Environmental Compliance Costs[16]

[15] Comings Direct, p. 8 and 21.

[16] These calculations are found in PSC 5 - CONFIDENTIAL_Proposal Evaluation_Energy Production - Synapse alt supp.xls

Confidential Figure 4 shows the 10-year NPV of the Cooper Unit 1 project under the same scenarios:

6) [redacted] based on EKPC's assumptions;

7) [redacted] based on an adjusted energy price forecast as presented in my direct testimony;[17]

8) [redacted] based on an adjusted energy price forecast and "lenient" compliance costs for coal combustion residual, cooling, and NOx controls;

9) [redacted] based on an adjusted energy price forecast, "lenient" environmental rules, and the Synapse mid-case carbon prices; and

10) [redacted] based on an adjusted energy price forecast, "strict" environmental rules and the Synapse mid-case carbon prices.

Confidential Figure 4: Select 10-Year NPV with Scenarios of Environmental Compliance Costs[18]

[17] Comings Direct, p. 8 and 21.

[18] These calculations are found in PSC 5 - CONFIDENTIAL_Proposal Evaluation_Energy Production - Synapse alt supp.xls

Q What do these scenarios indicate about the risk of the proposed retrofit project?

A The figures above show the NPV for the proposed retrofit with different combinations of adjusted energy prices and future environmental costs. Over the first ten years of project operation, only one of the four revised scenarios has a positive NPV. Over the 25-year life of the project, two scenarios have small positive NPVs--so small that the project is close to break-even; the other two scenarios have large negative NPVs indicating the project would be uneconomic by a wide margin.

Over the first ten years of the project, the NPV would be positive only under the most optimistic of scenarios for the retrofit project. Even over the full 25-year useful life of the project, the revised scenarios range from essentially break-even to significantly uneconomic.

Q Do your adjusted valuations take into account the operating costs of the associated environmental controls?

A No. My lenient and strict compliance cost estimates include only capital costs. It is possible that EKPC would incur additional O&M costs associated with new environmental controls.

Q Did you receive new information on the generation and operating costs of operating Cooper unit 1?

A Yes. EKPC provided the historical and projected costs of Cooper Station (units 1 and 2 combined) in their responses to the Commission's December 10, 2013 order.[19] EKPC also provided the historical and projected generation of Cooper Unit 1.[20]

Q Are projections of Cooper unit 1's generation consistent throughout EKPC's filing?

A No. As mentioned in my direct testimony, EKPC provided capacity factors for Cooper Unit 1 but the implied generation from this data did not match the

[19] Additional Responses Pursuant to the Commission's December 10, 2013 Order 5a-g and 6a-g.
[20] Additional Responses Pursuant to the Commission's December 10, 2013 Order 12c.

difference in generation between the Cooper 1 retrofit case and the base case in the valuation analysis (shown in Confidential Figure 5).[21] The latest generation data provided by EKPC does not match either of those cases (also shown in Confidential Figure 5). So there are now three possible projections for the generation of Cooper Unit 1, according to EKPC. For purposes of my estimates, I am using the most recent data provided since I cannot determine which projection is correct.

Confidential Figure 5: EKPC's Generation Assumptions for Cooper Unit 1 [22]

Q How did you distinguish dispatch costs for Cooper unit 1 alone?

A EKPC provided only cost data for Cooper Station as a whole. I have taken the projected costs for Cooper Station and allocated them to each unit based on the projected generation of each unit.[23] The resulting unit-specific dispatch costs are based on the implied variable O&M and fuel costs for each unit. The addition of a carbon price to these dispatch costs is explained below.

[21] Also see Comings Direct, p.22.
[22] This data is presented in the "Summary" tab of CONFIDENTIAL Synapse Cooper Generation Analysis-Supp.xls
[23] This calculation is shown in the "O&M costs" tab of CONFIDENTIAL Synapse Cooper Generation Analysis-Supp.xls

Q How did you incorporate carbon costs into the valuation analysis?

A The Synapse 2013 Carbon Dioxide Price forecast was included as additional operating costs for Cooper Unit 1 based on the emissions rate of the unit (lbs. of CO2 per MMBtu of coal burned), the heat rate of the unit (MMBtu of coal burned per MWh of energy generated), and the Synapse carbon price per year (dollars per ton of CO2 emitted).[24]

This same logic is applied to the energy market as a whole, although the marginal emission rate for the market is comprised of a mix of fuels (mainly coal and natural gas) so the incremental impact of a carbon price is smaller than for Cooper Unit 1 per unit of energy produced. This methodology potentially overstates the impact on energy prices since I am assuming that the mix of coal and natural gas on the margin is fixed in the future, whereas it is likely to shift more towards less carbon-intensive natural gas.

As shown in Confidential Figure 6, the addition of a carbon price causes a sharp increase in energy prices in 2020, when the carbon regulation is assumed to take effect. In contrast, EKPC's original energy price forecast showed [redacted], but this could not have been due to a carbon price assumption since the long-term forecast was called "[redacted]"

Q How does a carbon price change the economics of Cooper unit 1 relative to the energy market?

Confidential Figure 6 below plots the dispatch costs of Cooper Unit 1 with and without a carbon price against various energy price forecasts: EKPC's forecast; my adjusted forecast without a carbon price; and my adjusted forecast with a carbon price. This figure shows that Cooper Unit 1 would be slightly more expensive than the all-hours market price without a carbon price and much more expensive than the all-hours market price with a carbon price. Therefore, buying off of the market would be advantageous to operating Cooper Unit 1 for more years—with or without a carbon price assumption.

[24]This calculation is shown in the "Synapse CO2 price impact" tab in CONFIDENTIAL Synapse Price Analysis-Supp.xls

Confidential Figure 6: Cooper 1 Dispatch Costs Compared to Energy Price Forecasts with and without Carbon Costs

Q How does the adjusted energy price with carbon change the energy margin recovered by the Project?

A As described in my direct testimony, the valuation of the project is significantly dependent on the energy margin (i.e. the revenue from energy sold minus the costs to produce the energy). Since a carbon price would be more costly for Cooper Unit 1 than for the market as a whole (per unit of energy produced) the energy margin for Cooper Unit 1 would decrease with a carbon price.

Confidential Figure 7 shows that after the carbon price assumption is implemented in 2020, Cooper Unit 1 would no longer have a positive energy margin. The average annual energy margin with the adjusted energy price forecast with a carbon price is [redacted] compared to $[redacted] using the Company's forecast and [redacted] with the adjusted energy price without a carbon price (presented in my direct testimony).

Confidential Figure 7: Adjusted Energy Margin Estimate for Cooper Unit 1 Project [25]

Q Do your adjusted valuations take into account changes in dispatch of Cooper Unit 1 in response to market price changes?

A No, these valuations are still incomplete regarding changes in dispatch of Cooper Unit 1. However, with new information on the costs of operating Cooper Unit 1, my updated analysis shows that Cooper Unit 1 would not be competitive with the all-hours energy market—with or without a carbon price assumption.

4. FINDINGS

Q What are your findings based on the new information provided by the Company?

A The justification for the investment in Cooper Unit 1 is still inadequate in light of this new information for the following reasons:

[25] "Company's Energy Margin estimate" from PSC 5 - CONFIDENTIAL_Proposal Evaluation_Energy Production.xls; "Adjusted Energy Margin estimate" is calculated in PSC 5 - CONFIDENTIAL_Proposal Evaluation_Energy Production - Synapse alt Supp.xls

1) The Company's analysis does not account for future environmental regulations and associated compliance costs. In this filing, EKPC has continued to ignore the risks of impending environmental regulations and their potential costs to Cooper Unit 1. Based on EKPC's recent comments on EPA's proposed rules, I now estimate that the associated capital costs could range from $19 million under lenient regulations to $100 million for strict regulations. Other options available to EKPC would not carry these risks such as the wind PPA mentioned in my direct testimony or additional demand-side management discussed by Witness Jeffrey Loiter.

2) The updated market valuation including environmental compliance costs shows that Cooper Unit 1 would be uneconomic under certain scenarios. Compliance with coal ash, cooling, NOx regulations, and a moderate carbon cost would render the plant uneconomic with adjusted energy prices. My alternative estimates of the value of the project over a 25-year period with adjusted energy prices and environmental regulation compliance (including carbon regulation) are [redacted] with lenient regulations and [redacted] with strict regulations.

Q Have your conclusions changed?

A No. For the reasons listed above (and those presented in my direct testimony), I still recommend that the Company's application for CPCN for Cooper Unit 1 be denied in this case.

Q Does this conclude your testimony?

A Yes, it does.

CERTIFICATE OF SERVICE

I certify that I have filed with the Commission and served via U.S. first class mail the foregoing Supplemental Direct Testimony of Tyler Comings on Behalf of Sonia McElroy and Sierra Club (Public Version) on December 27th, 2013 to the following:

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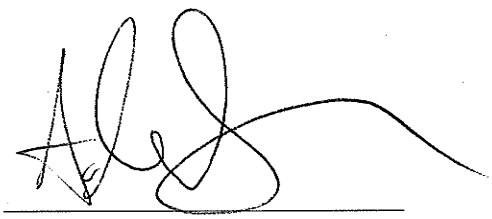

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