City of Boulder, Colorado

Independent Expert Findings Review & Verification of Modeling of New Electric Utility

PROVIDED BY:

PowerServices, Inc.

Power Services
Engineering & Management Services®

1616 East Millbrook Road, Suite 210
Raleigh, North Carolina 27609
Phone: (919) 256-5900

CITY OF BOULDER, COLORADO

REPORT OF

INDEPENDENT EXPERT FINDINGS
REVIEW & VERIFICATION OF MODELING
OF NEW ELECTRIC UTILITY

TABLE OF CONTENTS

Section		Page No.
1.	Introduction	1
2.	Executive Summary	4
3.	Component Assessment	5
4.	Results	12
5.	Conclusion	14
6.	Signature and Seal Page	15

Appendices

Appendix 1	Municipalization Exploration Modeling	16
Appendix 2	April 16, 2013 Financial Model Results	17
Appendix 3	Biographic Summaries for Key Team Members	18
Appendix 4	Representative List of Utility Clients	19

CITY OF BOULDER, COLORADO

REPORT OF

INDEPENDENT EXPERT FINDINGS
REVIEW & VERIFICATION OF MODELING
OF NEW ELECTRIC UTILITY

1. Introduction

The City of Boulder, Colorado engaged the services of PowerServices, Inc. ("PowerServices") on May 20, 2013 as a Third Party Independent Consultant to review and verify the City's modeling of a new electric utility as part of an acquisition feasibility determination in a manner consistent with the April 17, 2013 Request for Proposals (the "RFP"). The Independent Expert was retained to perform the work described in the RFP. PowerServices, Inc. began its work immediately, which included data requests, establishment of conferences with the Energy Future team and outside consultants, and review of the City's work product, all as further described in this report.

The primary participants in the PowerServices, Inc. team included: Gregory L. Booth, PE with over 45 years of experience in the electric utility industry with over 300 utility clients served and numerous successful acquisitions on behalf of several utility clients; R. L. Willoughby with over 40 years in the electric utility industry many years of which include serving as staff engineer, director of utilities, and city manager of electric municipal systems, and the rest of which serving as a consult to utilities; and Linda Kushner with over 25 years of utility experience, including managing the renewable portfolio of Duke Energy. Appendix 3 contains a brief biographical summary of the team members' experience.

PowerServices presented the results of its findings at a July 23, 2013 council meeting, and responded to questions from the council. Additionally, PowerServices responded to follow-up written questions. PowerServices also attended the August 6, 2013 council meeting and was available for questions at that meeting.

A. Project Scope and Authorization

The assignment, as defined in the contract pursuant to Section 178 (a) of the Boulder Home Rule Charter, was to verify for the City Council whether its Preliminary Council Determination made in Ordinance No. 7898, based on the Base Materials, demonstrated that:

- The utility could acquire the electric distribution system in Boulder and charge rates that do not exceed those charged by Xcel Energy at the time of acquisition;
- The rates charged by the utility will produce revenues sufficient to pay the operating expenses and debt payments, plus an amount equal to twenty-five percent (25%) of the debt payments;
- The utility will have reliability comparable to Xcel Energy; and
- The utility will have a plan for reducing greenhouse gas emissions and other pollutants, and a plan for increasing the use of renewable energy.

The scope of the project, contract deliverables, and project completion dates were defined in the *"Consulting Services Agreement-Third Party Expert Review"* as executed between the City of Boulder and PowerServices.

B. Objective

To meet the assignment requirements, PowerServices has provided an independent review of Boulder's Municipalization Model supporting the creation of a new electric utility. The objective of this review was to evaluate the model and associated materials for completeness, determine the reasonableness of modeling assumptions, and determine if key findings and conclusions demonstrate conditions prerequisite in Section 178(a) of the Boulder Home Rule Charter.

C. Review Process

PowerServices evaluated the Base Materials provided to Boulder Council on February 26th and April 16th. The Base Materials, in general, consisted of study session documents with detailed descriptions of the modeling process, assumptions, inputs, key findings and modeling results. The Municipalization Exploration Modeling (Municipalization Model) diagram shown in *Appendix 1* provides a roadmap of the various components that were subject to evaluation. It should be noted that PowerServices accepted Boulder's assumptions for Acquisition and Stranded Costs as provided, including the multiple scenarios for these costs.

Throughout the course of the evaluation, Boulder's Project Manager facilitated numerous conference calls and information exchanges with Boulder's Energy Future team in response to multiple data requests. The Boulder Staff fielded in-depth questions and provided supporting data for assumptions and inputs. The Boulder consultants were made available for in depth discussions and questions regarding their assumptions and proposed process and costs, which included the Homer Model representatives. PowerServices validated assumptions against industry practices, industry reports, and publically available filings including, but not limited to:

- National Renewable Energy Laboratory ("NREL")
- Department of Energy ("DOE")
- Lawrence Berkley National Laboratory ("LBNL")
- U.S. Energy Information Administration ("EIA")
- International Energy Association ("IEA") Wind
- Public Service of Colorado ("PSCo") FERC Form 1
- Xcel Electric Resource Plan ("ERP")
- Xcel/PSCo Quality of Service Plan ("QSP")
- Xcel wind and solar integration studies
- Xcel Open Access Transmission Tariff ("OATT")

This evaluation was not intended to re-create the Municipalization Model or perform parallel testing. However, it was significantly more than a simple audit process. Thorough analysis of each model component was performed to confirm reasonableness of assumptions and identify gaps. Model inputs were numerous and complex, eventually providing a set of probabilistic outcomes as shown in the Results section of this report.

Additionally, PowerServices compared the model and its assumptions and components to completed successful acquisitions for an additional reasonableness test. Furthermore, we compared the model components and electric municipal operating costs to comparably sized municipal electric systems' cost of service and/or financial forecast models for reasonableness of costs.

The evaluation was performed with an understanding that modeling is an iterative process and updated over time. PowerServices reviewed a static model based on Boulder's work performed through April, 16, 2013. Recommendations resulting from the evaluation are presented within this report, and have been discussed with Boulder Staff. These modeling refinements, which are recommended to enhance overall risk evaluation, may have been implemented since the time of PowerServices' evaluation or of this report. This report cannot, and will not, predict future outcomes based on potential implementation of the recommendations.

2. Executive Summary

The City of Boulder's technical and financial feasibility of forming a municipal electric utility is explored through a complex model that includes acquiring, operating and maintaining a local distribution system. The model analyzes multiple power supply configurations and cost forecasts that are eventually narrowed to a set of probabilistic outcomes. The results of the model indicate a high probability of several successful municipalization options that meet provisions of Boulder's Home Rule Charter regarding debt service, reliability, retail rates, and GHG/renewable energy.

Serving as a Third Party Independent evaluator, PowerServices reviewed the model to determine reasonableness and completeness of inputs and assumptions and specifically determine if Charter metrics can be achieved. Many resources were used to analyze and test model inputs including reports, industry metrics, generally accepted industry practices, and comparisons to other munipalization efforts. PowerServices conclusion is that the Charter provisions can be met, and likely exceeded in some cases.

The Charter requirement for debt service was met and exceeded in all scenarios since the Financial Model was designed to solve for a higher debt service coverage ratio (DSCR) of 1.65 versus the Charter metric of 1.25. PowerServices observed that a lower DSCR will decrease revenue requirements and accommodate lower rates. Alternately, rates may be held at a higher level to allow additional GHG reductions or increased renewables.

There are two components of reliability; wholesale reliability driven by the power supply portfolio and transmission system availability, and retail reliability driven by distribution system design and operation and maintenance commitment. Reliability metrics are expected to be met for the wholesale portion of power delivery, and for retail delivery. Although wholesale power supply portfolio specific resource locations will not be resolved until power supply requests for proposals are received, a defined portfolio is determined and subsequent transmission studies are complete, all evidence would indicate the existing transmission reliability would be comparable. The retail reliability is a function of an adequate operation and maintenance and capital upgrade budget and thorough engineering plans for separation and capacity reserves, all of which are included within the model.

A plan for GHG reductions and increased renewables is met or exceeded for options with a high probability of success. This is driven by the model's inherent functionality that constrains portfolio options to favor resources that meet clean energy goals. The model allows for aggressive GHG reductions and renewables, however, some options are prohibitive due to higher costs and the inability to meet Charter financial metrics.

Lastly, retail rates at the time of acquisition will not exceed those charged by Xcel, which is an outcome observed by modeling DSCR at the required Charter level of 1.25. The opportunity for rates to be on par or below Xcel for the first year is bolstered by Boulder's ability to defer debt payments for 18 months or adjust capital expenditures that reduce revenue requirements.

PowerServices also recommended completing a model assessment without carbon costs since the influence of carbon legislation on retail rates is unpredictable. The inclusion of predicted carbon costs in a model is certainly an appropriate scenario and does not represent an error in the modeling process. Our recommendation for a model scenario without carbon cost is intended to provide an additional level of risk assessment and further enhance assurance of the model success and predictability. This recommendation in no way diminishes the evaluations meeting the Charter metrics.

3. Component Assessment

The individual component evaluation was guided by the Municipalization Exploration Modeling diagram. Specifically, the process, inputs, and outputs related to the Load Model, Resource Model, and Financial Model were analyzed.

A. Load Model

PowerServices reviewed the load model, associated inputs, and resulting load profile.

Inputs

Boulder's Hourly Energy Data
Estimated Meters by Service Level

Output

20-year forecast of Energy and Demand Needs (Hourly Load Profile)

The hourly energy data input is reasonably based on Xcel's electricity sales for the Boulder area. However, the service area that defines boundaries for the load and number of meters served is not finalized for the future municipality. There are opportunities for Boulder to include or exclude an extended area outside of the City limits as well as transmission customers. Although the final service area is not defined, the model appropriately incorporates functionality to consider alternative load scenarios that will ultimately be determined through a separation strategy.

B. Load Profile

The projected load conservatively increases over time to reflect a nominal load growth. Loads are adjusted for transmission and distribution losses along with impacts of demand side management and energy efficiency ("DSM/EE") programs. The overall load factor was initially considered high relative to comparable municipalities. This is attributable to Boulder's high ratio of commercial and industrial customer (high load factor customer) energy use compared to residential use. It follows that a shift in consumption patterns of a single industrial customer can impact overall load factor and, ultimately, wholesale power costs and retail rates across classes. PowerServices recommends model refinement to incorporate varying factors that causeload loss and changes in load factor..

C. Resource Model (HOMER)

PowerServices reviewed the HOMER model, inputs, and output to evaluate generation costs, wholesale reliability, carbon tax, and overall purchase power costs and assumptions. Our team's work included conferences with HOMER representatives in order to assure the process inputs and outputs followed generally accepted utility market power purchase predictive modeling.

Inputs

5 Energy Portfolio Options
Components of Power Purchase Agreement
Cost of Resources

Output

20-year Resource Portfolios (optimized by cost, fuel mix, carbon emissions)

The HOMER model is not a robust utility program, but provides a reasonable method to derive risk-adjusted wholesale power portfolio options. Critical inputs to the model include resource pricing, resource availability, transmission costs, carbon costs and reserve margins. These components reflect the cost of power when generated (busbar pricing), the cost to reliably deliver power to the municipality (transmission and ancillary services), and requirements necessary to meet reliability standards (reserves). The portfolio is optimized by constraining resources in order to meet pre-determined goals, such as no-coal or low GHG options. When combined with varying load forecasts, HOMER produces over 150 portfolio options that can be incorporated into a 20-year financial model.

PowerServices notes that long term forecasts are typically imperfect and that HOMER does not predict future wholesale power costs. The model reasonably estimates potential portfolio options and costs, but also contains variables that change for both a Boulder municipality and Xcel, such as the price of wind, natural gas or carbon costs. With the exception of carbon costs discussed below, this provides a reasonable quantitative risk assessment of wholesale power costs.

For HOMER component evaluation, PowerServices focused on key inputs, including generation resource types, pricing forecasts, capacity factors (availability), transmission and firming considerations, and carbon costs.

i. Resource Types, Pricing and Availability:
Overall, HOMER incorporates regional generation resources that could supply wholesale power to a municipality. Sensitivities of generator busbar pricing are reflected through low, median, and high price forecasts. The inputs for power derived from natural gas reasonably benchmark publically available Xcel data. Portfolio options include power requirements above anticipated load, or reserve capacity, in amounts that are aligned with industry practice. Renewable energy availability and pricing are generally conservative with the following observations:

- Wind
  The model uses estimated wind prices based on data that includes projects beyond the immediate Mountain Region which is not necessarily reflective of potential wind pricing in Colorado. The model also assumes a wind capacity factor (annual availability) that appears high when compared to actual data for Colorado and the Mountain Region. PowerServices recommends reviewing current regional operating data and recent reports to refine wind pricing and capacity factor. To maintain the model's conservative focus, the median wind price should reflect expiration of the production tax credit (PTC). Lastly, PowerServices did identify softness in current wind markets which may, if sustained, provide pricing consistent with the low to median ranges currently predicted by model.

- Solar
  The pricing and capacity factors used in the model for distributed solar are reasonable when compared to industry data. PowerServices notes that proposed projects are limited to 100kW which prevents the potential to optimize utility scale solar. Solar PV prices continue to decline and utility scale projects incorporate economies of scale that can reduce the cost below distributed PV. PowerServices recommends consideration of large scale solar which may be transmitted from various regions of Colorado similar to wind.

ii. Transmission and Firming

HOMER incorporates various direct and indirect transmission related cost components. The major direct cost is for transmission and ancillary service charges under an Open Access Transmission Tariff (OATT) administered by the area Balancing Authority (Public Service of Colorado). These services are required to reliably transmit energy from generation sources to Boulder's future delivery points. However, reliable and cost effective transmission is not solely a function of OATT payments. Efficient portfolio management and adequacy of firming resources is required to minimize balancing authority charges. This is particularly important since many of Boulder's power portfolio options include over 50% of wind-derived energy. Wind is intermittent and more difficult to integrate and predict than traditional generation resources.

To adjust for wind intermittency, the HOMER model appropriately includes natural gas units that "firm" or operate when wind power is unavailable. Modeling may be further refined to include proxies for indirect costs associated with wind integration such as balancing (reconciling between forecasted and actual generation), system costs (responses to intra-hour changes), system operations (less than optimal operation of the electric system resulting from intermittent generation), and gas turbine cycling costs for firming. These charges may be assessed through the Balancing Authority/OATT and will be influenced by Boulder's portfolio management decisions. PowerServices recommends effective and efficient portfolio management operations to minimize costs, particularly when optimizing a high penetration of variable generation to serve a load that is increasingly influenced by DSM, EE, or local renewable (intermittent) generation.

Additionally, while difficult to forecast, Boulder may expect transmission costs to deliver power over constrained areas of the grid (transmission congestion). Ultimate congestion issues and overall transmission system costs caused by generation resources serving Boulder load will not be identified until the resource portfolio is determined, transmission service requests are studied, and final study results are delivered by the regional transmission owner and operator. To maintain the expected level of transmission costs and reliability presented in the model, Boulder will have the option to pay for system impacts within budget tolerances, or choose alternative resources with less transmission delivery risk. The purchase power agreement request for proposal process typically allows these issues to be balanced and the final determination to be achieved.

iii. Carbon Costs

The Municipalization model captures the potential for carbon legislation by assigning carbon costs to both the Boulder municipality and the Xcel baseline. This methodology attempts to quantify carbon risk by applying costs to "both sides of the equation" through a post-dispatch cost to the HOMER and Xcel baseline resource mixes. The desire to define carbon risk ultimately adds an additional level of modeling uncertainty, since both Boulder and Xcel portfolios will react differently to carbon costs. In particular, it is difficult at best to predict the impact to Xcel. PowerServices recommends that the model include a scenario that removes carbon costs to decrease uncertainties and provide a higher level of confidence in the findings.

iv. Portfolio Costs

The model forecasts portfolio costs under numerous scenarios, including those that are financially improbable in meeting Charter metrics. For the highest likelihood

portfolios, generally containing a combination of market/utility purchases, natural gas, hydro, and wind, Boulder's forecast for overall power purchase costs is reasonable for the amount of load served. Portfolio cost as a percentage of total cost ranges from 65%-70%. This is comparable to industry data and is slightly higher than Xcel's power supply estimate of 62% to 64%. PowerServices emphasizes the importance of power supply which is the largest and most uncertain annual cost component that impacts the Charter financial metrics. The model produces a portfolio goal which will not be achieved until power purchase agreements (PPA) are executed and transmission is secured.

D. Financial Model

PowerServices reviewed the financial model, associated inputs, and outputs to evaluate separation & reintegration, O&M, retail reliability, Xcel retail rates, revenues and costs, and overall options and risks.

Inputs

Stranded & Acquisition Costs (assumptions accepted)
Capital Costs
Bond Financing Assumptions
Xcel Data: Cost, Rates, Resources
Transmission Costs
Operations and Maintenance Costs

Outputs

Total Costs to Operate Utility for 20 years
Average Cost per kWh
CO2 Intensity
Energy Mix

The financial model is a complex and comprehensive analysis tool that combines multiple inputs and assumptions over a 20-year period. Model results show financial metrics such as revenues, costs, and cash flow under varying scenarios. It also calculates debt service coverage ratio (DSCR) and compares projected municipality rates to an Xcel baseline. Thus, the model is the primary tool to evaluate electric municipality viability, and most importantly, determine if key financial Charter metrics can be met.

It is equally important to note that the financial model is designed to solve for DSCR and prioritizes a higher measure of 1.65 versus a 1.25 Charter requirement. To determine if Charter metrics are achievable, PowerServices reviewed the model with a 1.25 DSCR.

i. Separation and Reintegration

The separation and reintegration plan is comprised of engineering, planning, construction, operation, and maintenance activities necessary to electrically separate future Boulder infrastructure from Xcel. To evaluate the plan, data was obtained and conference calls were held with the engineering consultants and the Energy Future team to address questions and concerns. Overall, PowerServices determined that the separation and reintegration plan is soundly routed in engineering planning principles.

The plan divides the substation and major feeder capacity such that Boulder will have reserve capacity for the substations and feeders for the portion of the system which they plan on acquiring. The Boulder engineers have developed a plan which allows Excel to retain capacity and major feeders for the service for the remainder of the

load, which is currently being served by facilities inside the City that will be acquired by Boulder.

A robust single contingency design has been developed, which means that Boulder can lose major feeders during outage conditions and transfer loads. Additionally, the plan allows for sufficient substation capacity, so that a major power transformer failure does not result in an extended outage. The system is designed and configured such that load can be transferred between substation power transformers to assure a strong retail reliability. Additionally, the configuration of the substation and distribution system allows for load transfers in the event of segments of the Xcel transmission system failing. Although transmission system outages and structure failures are rare, it is still prudent to have a configuration which allows most, if not all, of the capacity to be transferred to other substations in the event of transmission line section failures. The separation reintegration plan provides for such reasonable contingency.

The separation and reintegration plan is a primary component of the retail reliability. The engineering plan has aligned the substation and feeder capacity in a comparable manner to the system before acquisition. The single contingency plan provides for system reliability in the event of a component failure. The configuration and evaluation of the system from a short range and long-range planning perspective has been structured under the acquisition to provide for reliability, capacity and backstand capabilities comparable to, or even more robust than, the existing Xcel system. This includes a conversion of portions of the overhead distribution system to underground with loop feed capabilities. This configuration combined with the operation and maintenance dollars, including system upgrades and undergrounding, will continue to enhance reliability beyond the existing Xcel system configuration. Xcel's future plans for system upgrades, capacity additions and undergrounding inside the Boulder city limits is unknown. The City's electric system proposed configuration and upgrade plans outlined in the model will clearly meet, while potentially exceeding, reliability of the existing Xcel system configuration based on normal Xcel maintenance activity associated with maintaining the integrity of the existing facilities and adding capacity as load continues to grow. The allocation of capital for additional undergrounding is a major contributor to this enhanced configuration and associated retail reliability strengthening.

Lastly, PowerServices recognizes that Boulder may include service to transmission level customers. If electing to acquire transmission infrastructure, the model should be revised to include a budget and engineering plan for separation and reintegration of the transmission infrastructure along with O&M to maintain lines in accordance with NERC standards.

ii. O&M and Retail Reliability

As part of PowerServices' evaluation of the operation and maintenance expense component of the model, electric municipal local distribution cost (or "LDC", which are all cost in excess of purchase power cost) was evaluated for the operation of an electric municipal system. PowerServices used several sources for comparison including:

1. American Public Power Association statistics.
2. North Carolina Electric Municipal system statistics.
3. PowerServices' own comparably sized electric municipal clients with RP3 reliability ratings.

4. The cost associated with previous successful acquisitions comparing the initial model to the actual cost following acquisition.
5. The operation and maintenance cost associated with contracting these services to a private firm.

In reviewing each cost component, our evaluation found that all of the anticipated costs have been accounted for, and at levels equal to or above reasonable projections. The O&M model is conservative and did not, for instance, take into account the most likely scenario of operating synergies between other existing city utilities. There are additional savings that would likely be achieved by operating both electric and water utilities, such as billing and accounting services along with others including customer service aspects. The O&M component of the model also includes a substantial budget for capital upgrades on the electric system and expansion of underground. There is flexibility to defer these costs in order to achieve improved retail rate competitiveness without compromising system reliability.

Boulder has adequately addressed the operation and maintenance budget, ratio of capital upgrade cost, and staffing and equipment levels as compared to industry standards for municipalities of similarly sized public power systems. Our evaluation included comparison to Public Power utilities of similar size in terms of load and geographic size. Comparisons were made to analyze total dollars and cost per customer and cost per kilowatt-hour sold (LDC only). Public Power systems with an RP3 reliability rating served as the comparison group to assure the highest ranking of reliability of was considered. It is our opinion that the projected reliability metrics have every likelihood of exceeding comparable IEEE Std. 1366, Quartile 2 and achieving the public power reliability rating of RP3.

The budget levels and components prepare a Boulder municipality to achieve retail reliability on par or better than comparably sized municipalities. PowerServices notes that municipalities are generally focused on immediate and local needs of customers, which is an advantage over larger utilities that must spread resources over larger geographic regions. Our experience across the country has shown that comparably sized electric municipal systems to what Boulder proposes achieve and sustain higher reliability, including storm restoration reliability, than the surrounding larger investor owned utilities.

iii. Xcel Retail Rates

The Xcel baseline is derived by using publically available filings to determine Xcel's revenue requirement for the Boulder service territory. Dividing the revenue requirements by Boulder's load yields an average rate (cents/kWh), which is then compared to Boulder's average forecasted rates. This methodology yields several uncertainties, since Xcel data is not available for the Boulder region. Additionally, it is difficult to predict how an Xcel baseline will change in accordance with external factors, such as portfolio changes in response to underlying fuel prices.

As an alternative, PowerServices analyzed historical filings related to actual energy sales and revenues for the incumbent utility serving Boulder, Public Service of Colorado (PSCo). Although PSCo serves areas beyond Boulder, their rates provide an adequate proxy of the rates paid by Boulder residents. The analysis concludes that Xcel baseline retail rates within the financial model are reasonable when compared to a forecast of PSCo rates that increase at historical averages. PowerServices recognizes that historical rates are not indicative of future rates, and that utility rate increases are not linear or predictable. However, this analysis is limited to rate

evaluation at the time of acquisition in accordance with the Charter. As such, PowerServices finds the Xcel baseline retail rate assumptions for 2017 to be reasonable, and may be further adjusted by removing carbon costs which impact both Boulder and the Xcel baseline (as described in Section 3.C.iii).

iv. Revenues and costs

Within the financial model, revenue requirements are driven by costs to operate the utility, including wholesale power purchases, and the amount to service debt. The costs allocated to operate the utility relative to total costs are reasonable when compared to municipalities of similar size (as discussed in O&M and Reliability).

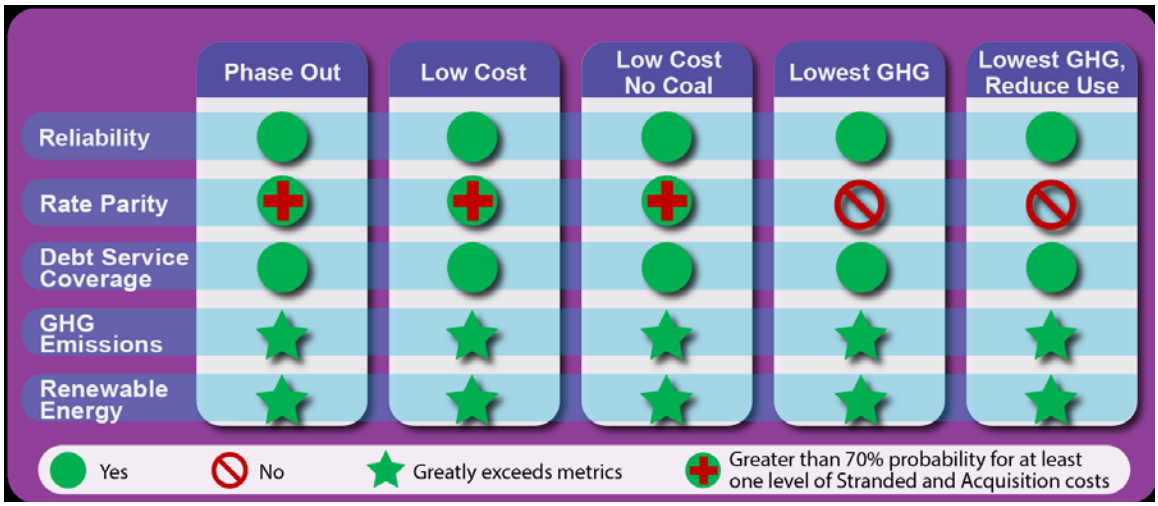
The model allows for a sufficient amount of revenue in all scenarios by raising retail rates to meet DSCR and clean energy goals. It is impractical to assume that rate adjustments are limitless and acceptable in response to the high operating costs resulting from aggressive renewable and GHG initiatives. However, the long term model view does not imply that the highest revenue requirement options are a consideration; rather it validates the options that are most likely or achievable over the long term. PowerServices agrees with the model methodology and believes it prudent to consider long term impacts of portfolio options.

v. Options and Risks

The financial model considers ample scenarios and uncertainties by accommodating combinations of inputs for sensitivity analysis. The Base Material considered over 700 model runs per each municipalization option. A probabilistic model (Decision Analysis Model or DPL) is used to collect the outputs and process them into weighted averages, risk profiles, and sensitivities. Based on PowerServices evaluation of the collective components and processes, the model exceeds expected functionality regarding options and risks.

4. Results

The municipalization model results in a set of financial data and probabilistic outcomes for each Charter metric under the pre-defined portfolio options. There are a considerable number of municipalization options produced by the model, and some fail to meet Charter objectives. For the purposes of this report, PowerServices references the financial model results from the Energy Future team's April 16th recommendations (*Appendix 2*) with the probabilistic outcomes summarized below:



The results of the model demonstrate that several options, particularly a low cost and low cost/no coal portfolio, have a high probability of meeting Charter metrics. PowerServices agrees with the results due to the high level of confidence in model processes and assumptions as indicated throughout this report. Key observations are as follows:

- Favorable reliability results are expected and in line with PowerServices' assessment that the model includes an adequate O&M budget coupled with a robust separation and integration design.

- The model evaluates rate parity by comparing the NPV of average rates for a Boulder municipality as compared to an Xcel baseline over a 20-year period. This exceeds the Charter requirement for rate evaluation at the time of acquisition, or Year 1. The probabilistic results which indicate that some, but not all, options meet rate parity over a 20-year period are actually for a more aggressive target.

- DSCR is expected to be met and exceeded for all options since the model prioritizes solving for a more stringent DSCR of 1.65 rather than a Charter requirement of 1.25.

- The ability to meet Charter financial metrics of debt coverage and rate parity are further bolstered by incorporating debt deferral for the first 18 months, which is a common practice for municipalities. This effectively lowers revenue requirements and provides for lower retail rates during the same time period. Deferrals allow the city to generate necessary cash flow for successful operation and maintenance of the system while keeping reasonable retail rates.

- In all cases, the model naturally favors renewables and lower GHG resources that provide many opportunities for short and long term plans. Thus, positive results are expected for this municipalization goal in all cases.

In order to address exact Charter requirements related to DSCR and rate parity, PowerServices executed the Financial model to solve for a 1.25 DSCR. Viewing the results for the first year revealed that Boulder's projected retail rates were lower than an Xcel baseline under all portfolio options at the maximum level of stranded and acquisition costs. The model was further adjusted to raise generation resource costs to the maximum level, at which point the phase out and low cost portfolios continued to meet rate parity goals in the first year. PowerServices observes that applying a 1.25 DSCR, which is less stringent than the model goal of 1.65, lowers revenue requirements and provides more financial flexibility. Achieving a 1.25 DSCR allows for lower retail rates over a longer period of time, or alternately, Boulder may fund additional GHG reduction initiatives and increase renewables.

5. Conclusion

After a thorough evaluation of key inputs and assumptions, PowerServices' finds the Municipalization Model to be a comprehensive and reasonable methodology to support the creation of a new electric utility. No major deficiencies were identified, although minor refinements and enhancements as discussed throughout this report are recommended to improve risk evaluation. Overall, the model process and ability to incorporate varying degrees of optionality and risk exceeds municipalization models previously reviewed by PowerServices, including the last four successful acquisitions of which PowerServices has direct knowledge.

After completing an independent evaluation with the results contained in this report, PowerServices concludes that the Base Materials and City Demonstration Models confirm that Section 178(a) of Boulder Home Rule Charter metrics can be met. Specifically:

- The utility could acquire the electric distribution system in Boulder and charge rates that do not exceed those charged by Xcel Energy at the time of acquisition;
- The rates charged by the utility will produce revenues sufficient to pay the operating expenses and debt payments, plus an amount equal to twenty-five percent (25%) of the debt payments;
- The utility will have reliability comparable to Xcel Energy; and
- The utility will have a plan for reducing greenhouse gas emissions and other pollutants, and a plan for increasing the use of renewable energy.

PowerServices recommends the following model updates and refinements to improve risk evaluation:

- Exclude carbon cost
- Test sensitivity to changes in load and load factor
- Refresh generation pricing
- Include proxies for renewable integration/transmission congestion costs
- Consider financial and reliability impacts of transmission ownership
- Consider additional costs arising from litigation associated with separation

Lastly, PowerServices emphasizes that the model solves for retail rates that meet debt service requirements under varying PPA structures, but that PPA costs comprise 65-70% of the annual budget and ultimately drive DSCR and competitive retail rates. Favorable wholesale power supply cost is critical to successfully achieving Charter financial metrics.

6. Signature and Seal Page

The foregoing report expresses my findings and opinions. I have reviewed the data provided for this project, and present herein the statement of my findings upon examination and analyses of the data and my engineering findings. I understand that data provided may be updated or modified, and I reserve the right to change or supplement the opinions and conclusions contained herein, as appropriate.

August 15, 2013

Gregory L. Booth, PE

Date

I hereby certify this document was prepared by me or under my direct supervision. I also certify I am a duly registered professional engineer under the laws of the State of Colorado, Registration No. 43948.

COLORADO LICENSED
GREGORY L. BOOTH
43948
PROFESSIONAL ENGINEER

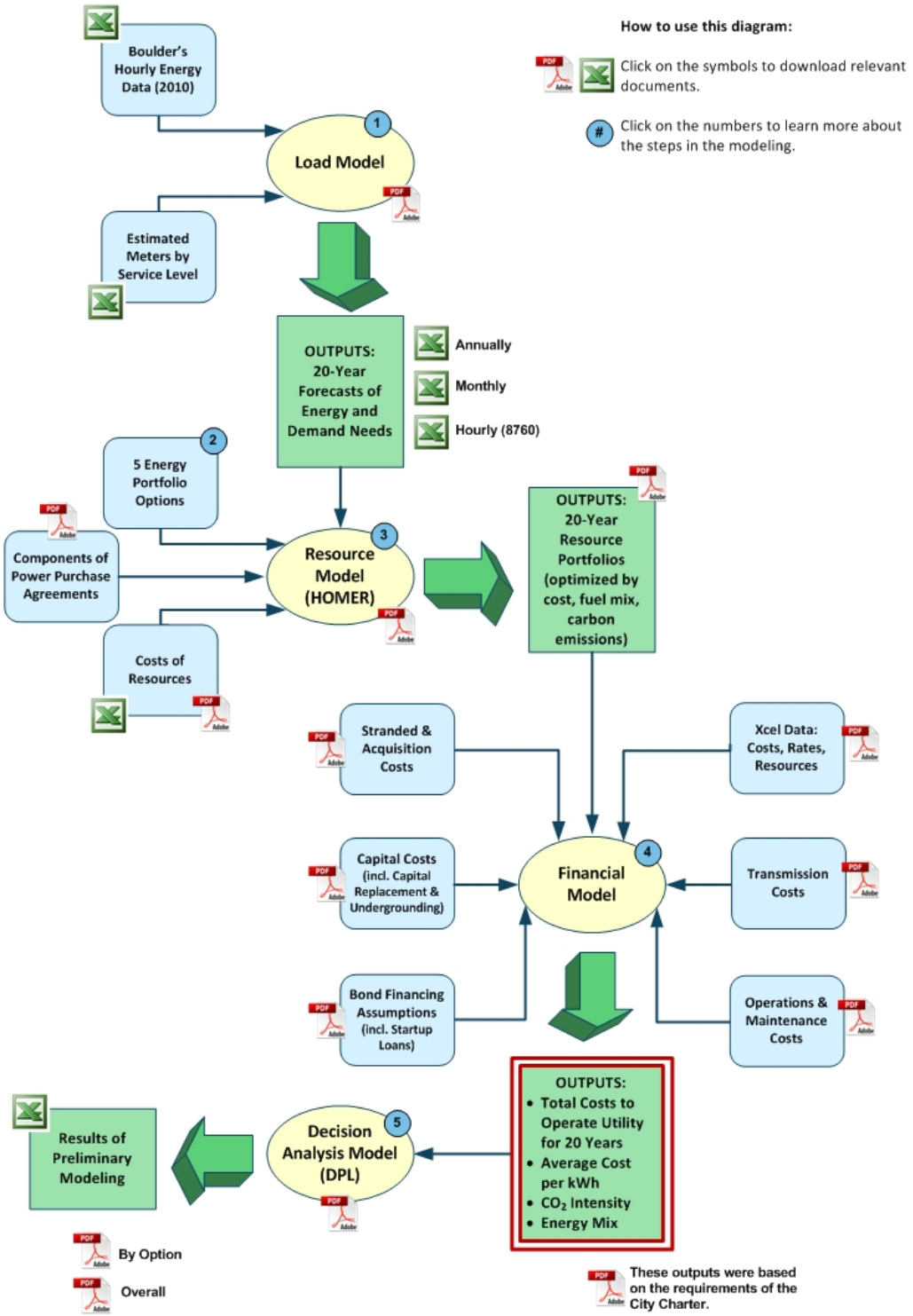
8/15/13

August 15, 2013

Gregory L. Booth, PE

Appendix 1

Municipalization Exploration Modeling



Appendix 2

April 16, 2013 Financial Model Results

Expected Value Results of Preliminary Modeling
Presented in Feb. 26, 2012 Memo to City Council
Compiled by City of Boulder Staff (version 4-16-13)

HOW TO USE THIS INFORMATION

These results represent expected values: the averaged results of 729 model runs, each of which have been weighted by the underlying likelihood of key uncertainties. Additional information is available in Attachment H of the Feb. 26, 2013 Memo to City Council. Results were generated by DPL software and are shown for an Xcel Baseline option and 5 municipalization options. Because the Phase Out option is designed to reduce legal risk, results are only presented for the lowest modeled stranded and acquisition costs.

LOWEST MODELED STRANDED AND ACQUISITION COSTS ($150 million)

Metric	Units	Xcel Baseline	Phase Out	Low Cost	Low Cost, No Coal	Lowest GHGs	Lowest GHGs, Reduce Use
Revenue Requirements (2017-2037)	millions (net present value)	$2,819	$2,620	$2,398	$2,586	$2,973	$2,849
Revenue Requirements compared to Xcel Baseline (2017-2037)	millions (net present value)	n/a	$199	$421	$233	-$155	-$30
Average Rates (across sectors, 2017-2037)	cents per kWh	16.34	15.19	13.90	14.99	17.24	17.43
Carbon Intensity in 2017	kg CO_2e per MWh	719.13	684.23	331.61	224.66	154.78	165.40
Carbon Intensity in 2037	kg CO_2e per MWh	481.28	209.07	212.64	209.07	146.90	149.79
Total GHG Emissions in 2017	mtCO_2e	1,136,443	1,081,296	524,035	355,025	244,600	259,653
Total GHG Emissions in 2037	mtCO_2e	846,919	367,905	374,186	367,905	258,498	238,228
Renewable Energy in Resource Mix in 2017	%	23.10%	24.50%	57.50%	50.40%	65.80%	63.50%
Renewable Energy in Resource Mix in 2037	%	24.40%	54.10%	60.50%	54.10%	67.70%	67.00%

MIDDLE MODELED STRANDED AND ACQUISITION COSTS ($277.5 million)

Metric	Units	Xcel Baseline	Phase Out	Low Cost	Low Cost, No Coal	Lowest GHGs	Lowest GHGs, Reduce Use
Revenue Requirements (2017-2037)	millions (net present value)	$2,819	N/A	$2,597	$2,785	$3,172	$3,048
Revenue Requirements compared to Xcel Baseline (2017-2037)	millions (net present value)	n/a	N/A	$222	$34	-$354	-$229
Average Rates (across sectors, 2017-2037)*	cents per kWh	16.34	N/A	15.06	16.15	18.39	18.64
Carbon Intensity in 2017	kg CO_2e per MWh	719.13	N/A	331.61	224.66	154.78	165.40
Carbon Intensity in 2037	kg CO_2e per MWh	481.28	N/A	212.64	209.07	146.90	149.79
Total GHG Emissions in 2017	mtCO_2e	1,136,443	N/A	524,035	355,025	244,600	259,653
Total GHG Emissions in 2037	mtCO_2e	846,919	N/A	374,186	367,905	258,498	238,228
Renewable Energy in Resource Mix in 2017	%	23.10%	N/A	57.50%	50.40%	65.80%	63.50%
Renewable Energy in Resource Mix in 2037	%	24.40%	N/A	60.50%	54.10%	67.70%	67.00%

HIGHEST MODELED STRANDED AND ACQUISITION COSTS ($405 million)

Metric	Units	Xcel Baseline	Phase Out	Low Cost	Low Cost, No Coal	Lowest GHGs	Lowest GHGs, Reduce Use
Revenue Requirements (2017-2037)	millions (net present value)	$2,819	N/A	$2,796	$2,984	$3,371	$3,247
Revenue Requirements compared to Xcel Baseline (2017-2037)	millions (net present value)	n/a	N/A	$23	-$165	-$553	-$428
Average Rates (across sectors, 2017-2037)*	cents per kWh	16.34	N/A	16.21	17.30	19.55	19.86
Carbon Intensity in 2017	kg CO_2e per MWh	719.13	N/A	331.61	224.66	154.78	165.40
Carbon Intensity in 2037	kg CO_2e per MWh	481.28	N/A	212.64	209.07	146.90	149.79
Total GHG Emissions in 2017	mtCO_2e	1,136,443	N/A	524,035	355,025	244,600	259,653
Total GHG Emissions in 2037	mtCO_2e	846,919	N/A	374,186	367,905	258,498	238,228
Renewable Energy in Resource Mix in 2017	%	23.10%	N/A	57.50%	50.40%	65.80%	63.50%
Renewable Energy in Resource Mix in 2037	%	24.40%	N/A	60.50%	54.10%	67.70%	67.00%

* Measured in cost (revenue requirements) per kWh

Appendix 3

Biographic Summaries for Key Team Members

PROJECT TEAM OVERSIGHT: GREGORY L. BOOTH, PE, PLS - PRESIDENT; PHONE (919) 256-5901
1616 E. MILLBROOK ROAD, SUITE 210, RALEIGH, NC 27609; E-MAIL GBOOTH@POWERSERVICES.COM

The team is headed by Gregory Booth, President, a registered professional engineer licensed in 22 states. Mr. Booth's experience includes engineering, financial, and management services, and experience assisting local, state, and federal government units, municipal electric systems, rural electric and telephone cooperatives; investor-owned utilities, industrial customers and privately owned businesses. Mr. Booth has served over 300 utility clients in 40 states throughout his career, including cost-of-service and rate studies, and filings before state commissions for regulated clients and for many electric municipalities. Mr. Booth has been accepted as an expert before the Federal Energy Regulatory Commission and seven state commissions on rate and regulatory matters. He has been accepted as an expert in both state and federal courts (12) on utility and engineering matters. Investigation and testimony experience includes areas of wholesale and retail rates, territorial disputes, electric service reliability and right-of-way issues. Mr. Booth has managed hundreds of projects each year during his career, including engineering design of upward of $100 million in construction and a staff of over 75. His management skills and client satisfaction have been proven, and the references provided, along with hundreds of others, can serve as support. Mr. Booth has overseen the development of three cost-of-service studies for municipal systems and has provided services for several utility system acquisitions since January 2008.

SENIOR PROJECT MANAGER: R.L. WILLOUGHBY, MBA - VICE PRESIDENT; PHONE (919) 256-5902
1616 E. MILLBROOK ROAD, SUITE 210, RALEIGH, NC 27609; E-MAIL RLW@POWERSERVICES.COM

Mr Willoughby has over 45 years experience with operations, maintenance, and management of utility systems. He has worked with all aspects of utility operations and management, including 8 years as an electric utility director, and 7 years as a city manager. From January 2000 through December 2005, he served on the Board of Directors for two nationally recognized Joint Municipal Power Agencies, and one Joint Municipal Assistance Agency as the Chairman and Vice-Chairman during this time. Mr. Willoughby has completed many cost-of-service studies for municipal systems and assisted Mr. Booth in providing services for several utility system acquisitions since January 2008.

PROJECT MANAGER: LINDA J. KUSHNER, MBA - SPECIAL PROJ. MGR.; PHONE (919) 256-5900
1616 E. MILLBROOK ROAD, SUITE 210, RALEIGH, NC 27609; E-MAIL LKUSHNER@POWERSERVICES.COM

Ms. Kushner has twenty five years of experience in the electric power industry holding various positions in business development, account management and engineering. She has broad experience in renewable and alternative generation, energy efficiency, energy management, utility operations, and wholesale energy markets. Her focus area includes energy portfolio compliance and related regulatory policies.

Appendix 4

Representative List of Utility Clients

Following is a list of clients our key team members have worked with in the past.

MUNICIPAL CLIENTS
ALACHUA, CITY OF
APEX, TOWN OF
AYDEN, TOWN OF
BEDFORD, CITY OF
BELHAVEN, TOWN OF
BENNETTSVILLE, CITY OF
BENSON, TOWN OF
BLACK CREEK, TOWN OF
BLOUNTSTOWN, CITY OF
BUSHNELL, CITY OF
CHATTAHOOCHEE, CITY OF
CLAYTON, TOWN OF
CLEWISTON, CITY OF
COCONUT CREEK, CITY OF
DALTON UTILITIES
DANVERS, TOWN OF
DANVILLE, CITY OF
DOVER, CITY OF
DREXEL, TOWN OF
EASTON UTILITIES COMMISSION
EDEN, CITY OF
EDENTON, TOWN OF
ELIZABETH CITY, CITY OF
ENFIELD, TOWN OF
FARMVILLE, TOWN OF
FREEMONT, TOWN OF
FORT LAUDERDALE, CITY OF
FORT MEADE, CITY OF
GILLETTE, CITY OF
GREEN COVE SPRINGS, CITY OF
GREENVILLE UTILITIES
GREER, SC COMMISSION OF PUBLIC WORKS
GROTON UTILITIES
HARNETT COUNTY WW
HAVANA, TOWN OF
HERTFORD, TOWN OF

MUNICIPAL CLIENTS *(Continued)*
HIGH POINT, CITY OF
HOBGOOD, TOWN OF
JACKSONVILLE BEACH, CITY OF
JUPITER INLET COLONY, CITY OF
KINSTON, CITY OF
LAGRANGE, TOWN OF
LAURINBURG, CITY OF
LEE COUNTY
LEWES, DE BOARD OF PUBLIC WORKS
LEXINGTON UTILITIES
LOUISBURG, TOWN OF
LUCAMA, TOWN OF
LUMBERTON, CITY OF
MANASSAS, CITY OF
MARTINSVILLE, CITY OF
MADISON, BOROUGH OF
MEBANE, CITY OF
MILFORD, CITY OF
MONROE, CITY OF
MORGANTON, CITY OF
NEW BERN, CITY OF
NEWBERRY, CITY OF
NORTH MIAMI, CITY OF
PALM BEACH, TOWN OF
PANAMA CITY BEACH
PERKASIE, BOROUGH OF
PINEVILLE, TOWN OF
POMPANO BEACH, CITY OF
PWC FAYETTEVILLE
QUINCY, CITY OF
RED SPRINGS, TOWN OF
ROBERSONVILLE, TOWN OF
ROCKY MOUNT, CITY OF
ROXBORO, CITY OF
SALEM, CITY OF
SCOTLAND NECK, TOWN OF
SEAFORD, CITY OF
SELMA, TOWN OF
SENECA, CITY OF
SHARPSBURG, TOWN OF
SMITHFIELD, TOWN OF
SOUTH DAYTONA, CITY OF

MUNICIPAL CLIENTS *(Continued)*
SOUTHPORT, CITY OF
STANTONSBURG, TOWN OF
TARBORO, TOWN OF
VERO BEACH, CITY OF
WAKE FOREST, TOWN OF
WALSTONBURG, TOWN OF
WASHINGTON, CITY OF
WAYNESVILLE, TOWN OF
WILMINGTON, CITY OF
WILSON, CITY OF
WINDSOR, TOWN OF
WINTER PARK, CITY OF
WINTERVILLE, TOWN OF
COOPERATIVE CLIENTS
A&N ELECTRIC COOPERATIVE
ADAMS RURAL ELECTRIC COOPERATIVE
ALBEMARLE ELECTRIC MEMBERSHIP CORPORATION
ALLEGHENY ELECTRIC COOPERATIVE
BARC ELECTRIC COOPERATIVE
BLUE RIDGE ELECTRIC COOPERATIVE
BLUE RIDGE ELECTRIC MEMBERSHIP CORPORATION
BLUE RIDGE MOUNTAIN ELECTRIC MEMBERSHIP CORPORATION
BRUNSWICK ELECTRIC MEMBERSHIP CORPORATION
C & T ENTERPRISES
CAPE HATTERAS ELECTRIC COOPERATIVE
CARROLL ELECTRIC COOPERATIVE
CARTERET-CRAVEN ELECTRIC COOPERATIVE
CENTRAL ELECTRIC COOPERATIVE, INC.
CENTRAL ELECTRIC MEMBERSHIP CORPORATION
CENTRAL GEORGIA ELECTRIC MEMBERSHIP CORPORATION
CENTRAL VIRGINIA ELECTRIC COOPERATIVE
CHOPTANK ELECTRIC COOPERATIVE
CITIZENS ELECTRIC
CLAVERACK RURAL ELECTRIC COOPERATIVE
COBB ELECTRIC MEMBERSHIP CORPORATION
COMMUNITY ELECTRIC COOPERATIVE
CRAIG-BOTETOURT ELECTRIC COOPERATIVE
DELAWARE COUNTY ELECTRIC COOPERATIVE
DELAWARE ELECTRIC COOPERATIVE
EDGECOMBE MARTIN COUNTY ELECTRIC MEMBERSHIP CORPORATION
ENERGYUNITED
FOUR COUNTY ELECTRIC MEMBERSHIP CORPORATION

COOPERATIVE CLIENTS *(Continued)*
FOX ISLANDS ELECTRIC COOPERATIVE
FRENCH BROAD ELECTRIC MEMBERSHIP CORPORATION
GUERNSEY-MUSKINGUM ELECTRIC COOPERATIVE
HABERSHAM ELECTRIC MEMBERSHIP CORPORATION
HALIFAX ELECTRIC MEMBERSHIP CORPORATION
HANCOCK-WOOD ELECTRIC COOPERATIVE
HARKERS ISLAND ELECTRIC MEMBERSHIP CORPORATION
HART ELECTRIC MEMBERSHIP CORPORATION
HAYWOOD ELECTRIC MEMBERSHIP CORPORATION
JEFFERSON ENERGY COOPERATIVE
JOE WHEELER ELECTRIC MEMBERSHIP CORPORATION
JONES-ONSLOW ELECTRIC MEMBERSHIP CORPORATION
LEE COUNTY ELECTRIC COOPERATIVE
LEWIS COUNTY RURAL ELECTRIC COOPERATIVE
LUMBEE RIVER MEC
LYNCHES RIVER ELECTRIC COOPERATIVE
MECKLENBURG ELECTRIC COOPERATIVE
MITCHELL ELECTRIC MEMBERSHIP CORPORATION
NCEMC
NEW ENTERPRISE RURAL ELECTRIC COOPERATIVE
NEW HAMPSHIRE ELECTRIC COOPERATIVE
NORTHERN VIRGINIA ELECTRIC COOPERATIVE
NORTHWESTERN RURAL ELECTRIC COOPERATIVE ASSOCIATION, INC.
OHIO RURAL ELECTRIC COOPERATIVE, INC.
OLD DOMINION ELECTRIC COOPERATIVE
OTSEGO ELECTRIC COOPERATIVE
NORTHERN VIRGINIA ELECTRIC COOPERATIVE
PEE DEE ELECTRIC COOPERATIVE
PEE DEE ELECTRIC MEMBERSHIP CORPORATION
PIEDMONT ELECTRIC MEMBERSHIP CORPORATION
PITT & GREENE ELECTRIC MEMBERSHIP CORPORATION
PRINCE GEORGE ELECTRIC COOPERATIVE
RANDOLPH ELECTRIC MEMBERSHIP CORPORATION
RAPPAHANNOCK ELECTRIC COOPERATIVE
REA ENERGY COOPERATIVE
ROANOKE ELECTRIC COOPERATIVE
ROANOKE ELECTRIC MEMBERSHIP CORPORATION
RUTHERFORD ELECTRIC MEMBERSHIP CORPORATION
SANDHILLS UTILITIES, LLC
SHENANDOAH VALLEY ELECTRIC COOPERATIVE
SNAPPING SHOALS ELECTRIC MEMBERSHIP CORPORATION
SOMERSET RURAL ELECTRIC COOPERATIVE

COOPERATIVE CLIENTS *(Continued)*
SOUTH RIVER ELECTRIC MEMBERSHIP CORPORATION
SOUTHERN MARYLAND ELEC COOPERATIVE
SOUTHSIDE ELECTRIC COOPERATIVE
STEUBEN RURAL ELECTRIC COOPERATIVE
SULLIVAN COUNTY RURAL ELECTRIC COOPERATIVE
SULPHUR SPRINGS VALLEY ELECTRIC MEMBERSHIP CORPORATION
SUMTER ELECTRIC COOPERATIVE
SURRY-YADKIN ELECTRIC MEMBERSHIP CORPORATION
SUSSEX RURAL ELECTRIC COOPERATIVE
TALQUIN ELECTRIC COOPERATIVE
TIDELAND ELECTRIC MEMBERSHIP CORPORATION
TRI-COUNTY ELECTRIC MEMBERSHIP CORPORATION
TRI-COUNTY RURAL ELECTRIC CORPORATION
UNION ELECTRIC MEMBERSHIP CORPORATION
UNITED ELECTRIC COOPERATIVE
VALLEY RURAL ELECTRIC COOPERATIVE
WAKE ELECTRIC MEMBERSHIP CORPORATION
WARREN ELECTRIC MEMBERSHIP CORPORATION
WASHINGTON ELECTRIC COOPERATIVE
INVESTOR-OWNED UTILITY CLIENTS
ALLEGHENY ENERGY
AMERICAN ELECTRIC POWER
ALABAMA POWER COMPANY
DOMINION POWER
DUKE ENERGY PROGRESS
DUKE ENERGY RENEWABLES
GAMESA ENERGY
GEORGIA POWER
JEFFERSON ENERGY COOP
KEYS ENERGY SERVICES
LOOKOUT WINDPOWER, LLC
MISSISSIPPI DEVELOPMENT AUTHORITY
MISSISSIPPI POWER
NATIONAL GRID
PENNSYLVANIA POWER & LIGHT
PEPCO
PROGRESS ENERGY
PUBLIC SERVICE ELECTRIC & GAS
SANTEE COOPER
SOUTHERN COMPANY
STRATA SOLAR, LLC
WELLSBORO ELECTRIC COMPANY

POWER AGENCIES; COOPERATIVE ASSOCIATIONS; REGULATORY AGENCIES; GOVERNMENTAL AGENCIES
DELAWARE STATE FAIR
CAMP LEJEUNE
EAST CAROLINA UNIVERSITY
ELECTRICITIES OF NORTH CAROLINA
FMEA
FMPA
FORT PIERCE UTILITIES
NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION
NORTH CAROLINA ASSOCIATION OF ELECTRIC COOPERATIVES
NORTH CAROLINA ELECTRIC MEMBERSHIP CORPORATION
NORTH CAROLINA EASTERN MUNICIPAL POWER AGENCY
NORTH CAROLINA LEAGUE OF MUNICIPALITIES
NORTH CAROLINA MUNICIPAL POWER AGENCY 1
NORTH CAROLINA RURAL TELECOMMUNICATIONS COOPERATIVE
NORTH CAROLINA STATE UNIVERSITY
NORTH GEORGIA ELECTRIC MEMBERSHIP CORPORATION
NORTHERN NECK ELECTRIC COOPERATIVE
MASSACHUSETTS ATTORNEY GENERAL ADVOCATE
NORTH CAROLINA AT&T STATE UNIVERSITY
PENNSYLVANIA RURAL ELECTRIC ASSOCIATION
RHODE ISLAND DIVISION OF PUBLIC UTILITIES AND CARRIERS
SOUTH CAROLINA ASSOCIATION OF MUNICIPAL POWER SYSTEMS
TVPPA
UNC-ASHEVILLE
UNC-CHAPEL HILL
UNC-CHARLOTTE
UNC-GREENSBORO
VA, MD & DE ASSOCIATION OF ELECTRIC COOPERATIVES
WESTERN CAROLINA UNIVERSITY