

## **Explanation of City of Boulder’s modeling process and sample cash flow spreadsheet released Jan. 5, 2015**

### **1. CONTEXT**

#### **Why did the city develop a model?**

The original model was developed as a tool to inform City Council about whether a city-owned utility could meet specific requirements that were approved by voters in 2011 and placed into the City’s Charter. Those Charter requirements are conditions that must be met in order to form a city-owned utility that serves the Boulder community. The requirements are:

- 1) Rates do not exceed rates charged by Xcel Energy (Xcel) at time of acquisition;
- 2) Rates produce revenues sufficient to pay for the new utility’s operating expenses and debt payments plus an amount equal to 25% of debt payments;
- 3) Reliability comparable to Xcel; and,
- 4) There must be plans to reduce greenhouse gas (GHG) emissions and increase renewable energy compared to Xcel.

City staff, working with a group of community members representing residents and businesses, converted these requirements into metrics, which provided a way to measure whether the utility could meet the standards set by voters. The metrics were presented to City Council and approved in November 2012.

An additional Charter requirement was passed subsequently that limits the amount the city can spend to acquire Xcel Energy’s assets, and any lump-sum payment of stranded costs, to \$214 million.

#### **What makes the modeling credible?**

After the metrics were approved by council, staff conducted a public process to evaluate the assumptions that went into the consultant-built model. The underlying data that fed the model was based on research from national laboratories, benchmarking with other utilities, publicly available data from Xcel, and other sources. The scenarios that were modeled, and the assumptions that were used, were vetted through an extensive public working group process that involved over 70 members of the community and lasted more than six months. The working groups were open to anyone who had an interest in participating in the process. City staff was very fortunate to have had a broad representation of skills and backgrounds in these groups. There was a mix of skeptics and supporters, business people, scientists, utility experts, entrepreneurs and others. They offered invaluable expertise.

Working group members identified a series of power supply scenarios that expert consultants modeled—such as looking for the cheapest resources or significantly increasing investment in local rooftop solar. They also provided feedback on different types of costs that had a large impact on whether the local electric utility could meet the requirements in the City Charter. For example, the working groups encouraged the city to incorporate modeling runs that assumed

that federal tax credits for wind power aren't reinstated, making wind power more expensive. This information was presented in memos to City Council in February, April, and July 2013.<sup>1</sup>

In both February and April, council directed staff to do further work on the model by testing additional assumptions and risk. There were conditions under which a city-owned utility would not meet the metrics. Those were presented to council as well as the options that did meet the metrics.

Lastly, another requirement approved in 2011 in the City Charter was for an independent 3<sup>rd</sup> party to review the results of the city's analysis for reasonableness. PowerServices, Inc., performed that review and presented its assessment to council in August 2013 ([https://www-static.bouldercolorado.gov/docs/PowerServices\\_Review\\_Verification\\_Findings\\_Report\\_8-15-13-1-201308201555.pdf](https://www-static.bouldercolorado.gov/docs/PowerServices_Review_Verification_Findings_Report_8-15-13-1-201308201555.pdf)). It found the outcomes were reasonable and concluded that the Charter metrics could be met by a city-owned utility. In fact, the PowerServices reviewers commented that this was one of the most robust analyses they have ever seen for this type of transaction.

### **So what are “high-impact” costs, and how can the city evaluate future risk?**

The city's modeling process was designed to show whether, given what was known about the future at the time, the city could form a local electric utility in compliance with the conditions written into the City Charter. To measure this, the city's modeling integrated a form of “decision analysis” to show risk—the likelihood of a negative outcome. This process was integrated into the modeling with the assistance of a trained decision analyst with over 20 years of experience working with investor-owned and public power utilities. Certain inputs, like wind power prices, have a large impact on the results. Because the city doesn't know exactly what wind power prices will be in the next several years, the modeling used publicly available datasets (in this case, from Lawrence Berkeley National Laboratory) to create a large range of possible future prices, which were weighted by whether they were more or less likely to occur. The probabilistic modeling ran those alternative price trajectories and calculated weighted average results based on all of the outputs. A single, deterministic run of the modeling process does not reflect the same consideration of future risk. More about decision analysis can be found on the city's Energy Future website (<https://www-static.bouldercolorado.gov/docs/WhatisDecisionAnalysis-1-201305151611.pdf>).

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<sup>1</sup> February 26, 2013 study session memo:

<https://documents.bouldercolorado.gov/WebLink8/0/doc/121319/Page1.aspx>

April 16, 2013 study session memo: [https://www-](https://www-static.bouldercolorado.gov/docs/EF_April16_CCmemo_wattach%2810%29-1-201306201131.pdf)

[static.bouldercolorado.gov/docs/EF\\_April16\\_CCmemo\\_wattach%2810%29-1-201306201131.pdf](https://www-static.bouldercolorado.gov/docs/EF_April16_CCmemo_wattach%2810%29-1-201306201131.pdf)

July 23, 2013 study session memo:

<https://documents.bouldercolorado.gov/WebLink8/0/doc/121330/Electronic.aspx>

**Does Xcel do this type of modeling? Is its model public?**

Xcel conducts sophisticated resource modeling to evaluate its need for new energy resources and the operational and financial impact of adding resources to its system. Xcel also does financial modeling to determine when it needs to increase rates and by how much. The software and algorithms for modeling Xcel's future need for energy resources are not public; however, the inputs and outcomes (when not considered confidential) are usually released through different Colorado Public Utilities Commission (PUC) proceedings.

One of the financial models provided to the PUC is a cost of service study that supports Xcel's proposed revenue requirement. The revenue requirement (the basis from which rates are derived) is a presentation of costs the utility needs to recover any shortfall that existing rates would generate. In Xcel's last two rate increase requests, the investor-owned utility proposed rates that incorporated projections of future costs, much like the city's modeling process for determining whether the Charter metrics could be met. As part of the regulatory process, Xcel must present this to the PUC. However, some of the information—such as proprietary price forecasts and customer load data—is confidential and not shared with the public.

Xcel, as a large utility, has many different types of models it uses to manage its business; however, customers, including the City of Boulder, are not privy to these. Xcel is not required to disclose its software to the public or to intervenors in different proceedings.

**But the city is a public entity. So what's the harm in releasing its model?**

The model is made up of various pieces of proprietary software, which the city paid for and had designed specifically by expert consultants to test the City Charter metrics. This software is not subject to the Colorado Open Records Act, as confirmed by a district court judge on Jan. 6, 2015 ([https://www-static.bouldercolorado.gov/docs/Order\\_Re\\_Show\\_Cause\\_Hearing-1-201501071834.pdf](https://www-static.bouldercolorado.gov/docs/Order_Re_Show_Cause_Hearing-1-201501071834.pdf)). However, the inputs and assumptions of the model for the various options for a utility—which included multiple levels of stranded and acquisition costs, as well as varying levels of clean energy mixes—were made public beginning in February 2012. They have been on the city's website since they were created, along with updates made in the April and July presentations to council.

The city is concerned that releasing the specific algorithms and formulas these software programs utilized would give Xcel Energy, the opposing party in several pending lawsuits, an unfair advantage in negotiations and litigation.

Even with this information being released, anyone with experience in developing a cash flow model could potentially recreate or develop a model to test the reasonableness of the staff work. In fact, that is what the 3<sup>rd</sup> party evaluator did. Rather than using the city software, PowerServices ran the assumptions through its own model to validate whether the outcomes of

the city modeling were reasonable. As mentioned above, PowerServices independently verified that the outcomes were reasonable and concluded that the Charter metrics could be met by a city-owned utility.

**Does the city plan to update the model at some point?**

The model for testing the Charter metrics will not be updated. That model was developed for a specific purpose, which has been completed. However, as the city moves forward in the development of the electric utility and actual costs, such as the acquisition price, power supply, and operations and maintenance of the system, become known, city staff will develop pro forma financial projections. These projections will be public and provided to rating agencies and investors to show the cost of owning and operating a city-owned electric utility. If the proposed rates at the time a utility is formed are not adequate to cover the city's costs, the city would not be able to move forward with the utility.

The development of rates would happen prior to financing the utility but after actual costs and community-specific data are available. The Charter metrics still have to be met at that time, so the city would be comparing those rates to Xcel's. This information will be shared with the public.

**Have any of the inputs and assumptions changed since July 2013, such that it would change the conclusion that the Charter metrics can be met?**

The assumptions have changed some, but because the city used a range of values for high-impact variables in the model (see discussion below related to probabilistic modeling), those that have fluctuated are not likely to change the conclusions that can be drawn from the model. In fact, with wind and solar power prices continuing to drop and gas prices lower than they have been in years, a local electric utility could compare even more favorably to Xcel. Staff monitors the model assumptions on a regular basis and feels confident in the results presented to council in July 2013, which informed council's decision to authorize staff to move forward with the acquisition of the electric assets needed to serve Boulder.

**Are there still any off-ramps? When will those be considered?**

There are still circumstances that could result in the city not forming an electric utility. Some of these include court findings that could put the cost of acquiring Xcel's assets at more than \$214 million or a determination after further analysis that the sum of the costs to operate a utility would result in rates and bills higher than Xcel's at the time of utility formation. These limitations provide valuable checks and balances against any effort to proceed with municipalization without proper regard for the financial implications.

**2. THE SAMPLE CASH FLOW SPREADSHEET**

**So, what is this spreadsheet the city released on Jan. 5, 2015, and why was it created?**

This spreadsheet ([https://www-static.bouldercolorado.gov/docs/spreadsheet\\_released\\_010515-1-201501051805.xlsx](https://www-static.bouldercolorado.gov/docs/spreadsheet_released_010515-1-201501051805.xlsx)) was created last year when city staff was working to help the community understand the modeling process. The document was an attempt to take data from one of over 700 model runs the city conducted and show a single type of output that could be produced. The point of creating such a document was to illustrate, at a very high level, the type of inputs used in the modeling.

Staff chose not to load this spreadsheet on the city website for fear that it might actually cause more confusion. This one document does not represent the full analysis the city conducted—in other words, it will not, by itself, “match” the results the city produced, which were calculated from many runs of the model. This is because the results produced in the cash flow spreadsheet are “deterministic,” or based on a fixed set of inputs that will produce a fixed set of outputs. The modeling process, in contrast, was “probabilistic,” which means the outputs vary based on the likelihood of a particular input occurring. This deeper-level approach was valuable in helping City Council assess potential risk, especially since a number of costs (i.e., market costs of power and interest rates on bonds) were not fully known at the time.

**Many have said it is important to know what assumptions and inputs were used in the modeling. What are those and can the public see them?**

The city agrees. It is important that the public is able to evaluate whether the inputs and assumptions to the model are reasonable. This is precisely the discussion that was conducted with public working groups through 2012 and 2013. These assumptions are and have been publicly available through the documentation provided to council, specifically the Feb. 26, 2013 study session memo (<https://documents.bouldercolorado.gov/WebLink8/0/doc/121319/Page1.aspx>) and on a visual graphic on the city’s Energy Future website (<https://prezi.com/ecxftirjhbc/>).

**What are the assumptions behind this cash flow spreadsheet?**

The spreadsheet released Jan 5, 2015, which never made it past draft stage, shows one output obtained from a partial run of the modeling process. In general, the assumptions underpinning this spreadsheet are those presented on the visual graphic available on the city’s Energy Future website, with updated power supply costs for July 2013. Specifically, it shows what the costs and revenue would be related to the first 20 years of the city operating a local electric utility ONLY under the following assumptions:

1. The total of stranded and acquisition costs was set at \$150 million.
2. The fuel supply modeled was called the “low cost” option. This was one of several fuel supply scenarios modeled through the HOMER portion of the model as part of the city’s complete analysis. This option was based on at least 30% of the Boulder

community's electricity supply coming from wind power on the first day of operation. The mix would also include some solar and hydroelectric power.

3. A moderate carbon price came into existence at the state and/or federal level—this could be a tax or another policy that generates costs associated with carbon, such as implementation of the Clean Power Plan. Other model runs did not include a price for carbon.
4. All sensitive variables (such as interest rates, wind and natural gas prices) were set at their median values.
5. The Boulder community is continuing to consume electricity at a slightly increasing rate.
6. Inflation is at 2.5%.

In other words, this is a single scenario, and not necessarily the one the city would consider the most "likely."

### **What does this particular spreadsheet suggest about the costs the city would incur?**

This spreadsheet produces the expected revenues the city utility would need to collect based on the expenses it would need to cover. That total revenue was divided by an annual forecast for how much electricity the Boulder community is expected to consume to get an "average cost per kilowatt-hour." The spreadsheet shows that the total costs, and the number of kilowatt-hours the community is expected to consume, will increase over time. The spreadsheet also shows that power supply costs are a considerable factor in overall costs. Neither of these conclusions is surprising.

First, costs in initial years would increase once the city utility begins to make debt payments; this process is called capitalizing interest, and it was discussed by council and in the media in the council memos produced in 2013. Many utilities have rate stabilization policies, by which they increase rates at a small but fixed level annually to keep up with inflation and costs. Second, the increasing cost of supplying power shows that even on a high level, energy efficiency and conservation will continue to make both environmental and economic sense for a city-operated electric utility.

While this spreadsheet was a draft, it does provide an opportunity to make recommendations about how to stabilize rates, shift reserves, allocate internal funding, or increase or defer investments to provide financial stability for the utility over many years. This is not unlike the process any utility would go through to evaluate future operations and determine strategies for managing costs under various conditions. It was never intended to be used as an operational cash flow plan or document. This is not a pro forma budget to be issued in a bond offering.

**How does this spreadsheet translate to potential rates? Does the fact that costs will increase when debt payments begin mean that rates will increase by the same proportion?**

The spreadsheet looks at overall costs and revenue of a utility under the scenario described above. The cost per kilowatt hour figure gives a rough idea of the money the city would need to recover to operate and manage the electric system, and supply power, effectively. It is a metric that can be used to compare the city with other utilities. It is not, however, accurate to assume that the kilowatt per hour cost will be the same as the rates a city – or any other utility – will charge. Electric rates are not created based on taking total costs and dividing by total electricity sold. Xcel Energy does not allocate rates in this simplistic way, and neither would a city utility. The city has not undergone a ratemaking process yet.

### **What will the rate-setting process involve and when will it occur?**

There are a variety of factors that go into rate setting. For example, in the first couple of years, when the per-kilowatt-hour costs of a city-owned utility are expected to be lower than Xcel's, it is possible the city would continue to charge about the same rates that customers would be paying if they were still customers of Xcel Energy. This would generate additional revenue that could be banked and put in a reserve fund for the purposes of preserving rates and mitigating increases in the future.

Looking at fluctuations in long-term costs and developing strategies to mitigate potential rate increases is something that utilities across the country do on a regular basis. In fact, Xcel Energy is projecting significant increases to its costs – and is currently seeking increases to the rates it charges customers – over the same 20-year time period the city examined. It is important to consider the city's potential rates and Xcel's relative to each other. The city has never said rates would not go up over 20 years. What has been said is that the city will strive to keep rates comparable or less than what neighboring utilities would charge over the same 20 years. All analysis conducted by the city to date shows that this goal can be achieved.

A full ratemaking process involves determining what types of costs have to be covered to operate the system effectively, and then allocating those costs among the customers who generate them. This requires a significant amount of data, such as load and energy consumption for the Boulder community, which the city so far has been unable to obtain from Xcel. Some of the high-level discussions on electric ratemaking will begin in 2015. Unlike the process that occurs with our current provider, the city plans to establish working groups and develop a public engagement strategy around the setting of rates, giving potential customers an increased understanding of the factors that must be considered and opportunities to provide feedback.

**Does the city feel like the assumptions made for this particular scenario were reasonable to use as a potential example? Don't they assume some of the best possible outcomes for the city?**



Recall that this spreadsheet was created to illustrate the process of the modeling, not as a tool to draw conclusions about the feasibility of creating and running an electric utility. That said, this particular scenario assumes an acquisition and stranded cost figure that is on the lower end; however, the city feels this is not an unreasonable assumption for two primary reasons:

1. Stranded costs can be mitigated or eliminated if the city continues to purchase some or all of its supply from Xcel for a finite period of time. This was confirmed by a declaratory order issued by the Federal Regulatory Commission last fall (<https://documents.bouldercolorado.gov/WebLink8/0/foi/127247/Row1.aspx>).
2. The city's appraiser has valued the actual assets the city is seeking to acquire at an amount closer to \$120 million – significantly less than the \$150 million cap in this model run.

In addition, while this particular run included a carbon price, based on community feedback at the time of analysis, the city also ran scenarios that did not include a carbon price. As mentioned above, this scenario included the median value for sensitive variables that have an impact on the model (interest rates, fuel prices, etc.). A “median” value means that in looking to the future, 50 percent of possible price trajectories are expected to be above it and 50 percent are expected to be below it.

The city, as part of its overall modeling process, looked at a variety of scenarios that would be negative, either in terms of costs being too high or renewables being less than what Xcel Energy has promised over the next 20 years. One of the fuel supply scenarios run – the one that would have cut carbon emissions most aggressively – was dismissed outright by city staff as a viable option because it would cause significant financial stress. A good example of the conclusions reached based on each of these scenarios can be found in the July 23, 2013 City Council memo (<https://documents.bouldercolorado.gov/WebLink8/0/doc/121330/Electronic.aspx>). In general, the modeling process helped narrow the focus to more gradual and middle-of-the-road approaches to reducing greenhouse gas emissions and increasing renewables than originally sought by some members of the community, in recognition that maintaining reliability and rates are also important values.

### **Did the city run other deterministic cash-flow scenarios and if so, where are those spreadsheets?**

While the city ran 729 scenarios for the purpose of evaluating whether the Charter metrics could be met, the modeling process preserved only high-level outputs reflective of the Charter metrics, rather than individual cash flows – and city staff did not create any other documents as a result of this process. This one spreadsheet was created by printing a document from a partial run of the modeling process, after a few but not all of the software programs had been run. The staff's report and recommendation to council was based on the outputs produced at the



conclusion of the complete analysis and provides a more meaningful understanding of what likely scenarios are and what their impacts could be. The most recent report that summarizes the results of the modeling process can be found in the July 23, 2013 City Council memo (<https://documents.bouldercolorado.gov/WebLink8/0/doc/121330/Electronic.aspx>).

### **Why did the city release this sample spreadsheet now – and not earlier?**

The city chose to release this document on Monday, Jan. 5, 2015, in hopes that it would address the underlying questions that a community member, Patrick Murphy, was asking in a complaint he filed in Boulder County District Court. The version that was released was in fact still a draft at the time of its release and the city believed it was work product under the statutory definition included in the Colorado Open Records Act.

As explained previously, the effort to finalize this spreadsheet was abandoned when it became clear that it might be confusing since it represents just one of the 700-plus scenarios that were run. No staff member considered this document to be a finished product.

### **Questions from Patrick Murphy:**

#### **What exactly is the energy mix and the cost per unit of each of the energy classes for each of the years that were used to construct the values that are in the line "Sale of Power" revenues?**

City staff has interpreted Mr. Murphy's question to assume that the energy mix is the percent makeup of the different resources to provide electric power, such as solar, wind, gas, etc. The energy mix and costs were calculated through the resource model, HOMER software by HOMER Energy. The HOMER Energy model optimized energy resource mixes to meet forecasted electricity demands based on criteria such as price of the resource and its carbon emissions. The spreadsheet released by the city on Jan. 5, 2015, assumed 42 percent renewables on the first date of operation. Other energy mix-related assumptions that went into this particular spreadsheet included:

- At least 30% wind energy;
- An allocation of \$3.5 million per year dedicated to solar resources; and,
- Could include purchases from the energy market, with Xcel's resource mix.

The city believes Mr. Murphy is referring to the price of each type of resource, wind, solar, gas, etc. when he asks for the cost per unit of each of the energy classes. The cost per unit of each of the energy resources was the median value for each of the fuel types modeled.

Assuming Mr. Murphy means the "Sale of Power" to be the total cost of providing electric service from a city owned utility, the costs used to construct the "Sale of Power" line in this

spreadsheet were based on the costs to operate the utility, purchase power and cover debt payments. The assumptions behind all these costs were included in Attachment D of the Feb. 26, 2013, City Council memo (<https://documents.bouldercolorado.gov/WebLink8/0/doc/121319/Page1.aspx>), with commodity costs (such as natural gas and wind) updated in a August 2013 “Purchasing Power” handout (<https://www-static.bouldercolorado.gov/docs/Assumptions Resources FINAL-1-201308201409.pdf>).

One can translate assumptions that were produced in Attachment D directly into outputs on the cash flow spreadsheet. For example, Attachment D shows four rows of costs associated with “Billing,” i.e., the cost to charge customers for the electricity they purchase and collect their payments. The sum of the “Billing” costs is \$1.5 million annually. Attachment D also states that inflation is 2.5% and that 2011 dollars are used. Applying 2.5% inflation to \$1.5 million creates the \$1.76 million in the “Billing” line of the cash flow spreadsheet for year 2017. There are numerous such examples where assumptions the city has released publicly can be tied directly to conclusions the city has drawn.

#### **What were the values used to calculate the average cost for each of the years in the spreadsheet?**

The cost per kWh is calculated by dividing the total operating revenues by the kWh consumed. The total operating revenues are equal to the costs of running the utility. This is similar to what most cost-based utilities do to determine the revenues needed to support utility operations. What is different about the average cost calculation is that it is not a rate; rather, it is a proxy for what an average overall cost would be.

The average cost in the spreadsheet, represented as cents/kWh, was calculated by dividing the total revenues in dollars by the expected sales of energy in kilowatt hours (kWh). By taking the sale of power and dividing it by the average cost, one can arrive at the expected energy sales of the utility for each year.

#### **Where on the spreadsheet are energy efficiency rebates and solar incentives included?**

The energy efficiency rebates are a component of customer accounts in the operation expenses section of the spreadsheet. A breakdown of the costs included in the customer accounts item is detailed in Attachment D of the February 26, 2013 City Council memo (<https://documents.bouldercolorado.gov/WebLink8/0/doc/121319/Page1.aspx>). The energy efficiency rebates are listed in the line of Attachment D called “Customer Service and Accounts – Energy Rebates.” This line shows about \$2.23 million in energy efficiency rebates annually. The February model was updated in Attachment B of the July 23, 2013 city council memo (<https://www-static.bouldercolorado.gov/docs/Energy Future SS Memo 07232013-1->

[201307241011.pdf](#)), which shows that these assumptions changed to a \$3 million annual investment for energy efficiency rebates.

The solar incentives are included in the Power Generation and Purchases lines of the model, which represent the resource costs. More information on the most recent resource cost assumptions, including an example using the \$3.5 million investment in solar in the “Low Cost” option can be found in the August 2013 “Purchasing Power” handout ([https://www-static.bouldercolorado.gov/docs/Assumptions\\_Resources\\_FINAL-1-201308201409.pdf](https://www-static.bouldercolorado.gov/docs/Assumptions_Resources_FINAL-1-201308201409.pdf)).

**The spreadsheet included only one option that assumed \$0 stranded costs. Will the city make cash flow spreadsheets for the low, medium and high alternatives for stranded costs available?**

The city’s overall analysis included scenarios at different stranded costs levels. The city’s report to council included conclusions based on two other levels of stranded costs. This information, however, was reported in terms of the impact on the charter metrics, not on any kind of cash flow analysis.

Based on a recent decision by the Federal Energy Regulatory Commission (FERC), the city maintains the position that stranded costs can be mitigated through purchasing power from Xcel Energy for a period of time if needed (<https://documents.bouldercolorado.gov/WebLink8/0/fol/127247/Row1.aspx>). As a result, stranded costs can be managed to a level that supports achieving the financial targets and poses less of a risk than previously thought.