Boulder Energy Future Options Study Issue Paper #2
A comparison of options shows that a local electric utility is significantly more likely to provide lower emissions and better financial value for Boulder customers.

Executive Summary: This study compares two options for Boulder’s energy future: staying with the current utility, Public Service of Colorado (PSCo) “status quo”, or opting for a Boulder municipal utility. The results of the study show, with very high confidence (approximately 90%), that the municipal option is significantly more likely to provide lower emissions and better financial value for Boulder customers. Key findings are:

- The municipal utility option allows large reductions in fossil fuel use.
- The use of coal is eliminated (for the local utility variations considered).
- One variation limits Natural Gas use over 20 years studied to the same amount as the status quo.
- Emissions driving climate change are 2 to 3 times lower for a local municipal option that limits emissions over 20 years to 5.6-8.4 Mt (million tonnes) versus PSCo’s 18.5 Mt for the status quo option.
- Of the options considered, only a local utility keeps Boulder’s 20-year emissions for electricity below a total emissions budget of 12.3 Mt¹ (for all Boulder’s emissions).
- Renewable energy increases from 54.9% to 72.3% for a local utility versus 28.3% to 32.4% for PSCo.
- Fossil fuel energy decreases from 43.5% to 27.7% for a local utility versus 71.7% to 67.6% for PSCo.
- A local utility option has a high probability of lower cost and risk compared to the status quo.

The City’s “No Coal” option was chosen for comparison as the local utility option, because this analysis found it to be the least expensive; and more importantly, this option provides the lowest overall emissions. Analysis using 10K-50K randomized Monte Carlo trials shows a low emission utility generally costs less to nearly the same for customers. Storage was not modeled and remains an opportunity for even lower emissions.

This study reports findings of an independent financial model created to compare Boulder’s “No Coal” municipal utility option to PSCo’s status quo. The most critical modeling assumptions appear on page 10. This independent model shows that the City modeling was transparent and conservative. It supports the results of the City modeling that Boulder can have significantly lower CO₂ emissions at a lower average cost to consumers for electricity. Using lower cost gas power contracts for firm backup power, a utility can not only meet or beat the status quo on price, it provides significant reduction in CO₂ emissions. This analysis includes estimates for PSCo’s projected new renewable energy additions² of 450 MW of wind and 170 MW of solar.

The city analysis optimized for low cost using cheaper natural gas backup power contracts with independent power producers. These cheaper contracts have higher CO₂ emissions and use more natural gas per kilowatt-hour (kWh). Higher cost contracts efficiently use less gas and lower emissions further. This study builds on city results by considering cost and emission contract alternatives for three variations of the “No Coal” option.

Cumulative CO₂ emissions over 20 years (Table 1) were calculated for each option examined to provide context for comparison. Boulder’s total CO₂ emissions for electricity for each option were compared to a scaled limit based on a fair and equitable share of CO₂ emissions for Boulder’s portion of a global population³. This limit is discussed further in Issue #2. It attempts to give some accounting for carbon in the discussion, since this analysis includes no cost for carbon. The proposal of this limit should be considered an invitation to the community and experts to weigh in on better methods to evaluate impacts, costs of externalities, risk of carbon taxes, and carbon limits for Boulder over time. These may be reported in future papers.

<table>
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<tr>
<th></th>
<th>PSCo Baseline</th>
<th>&quot;No Coal&quot; Local Utility</th>
<th>&quot;No Coal&quot; Most Efficient Gas Local Utility</th>
<th>&quot;No Coal&quot;, Better Gas &amp; Solar Local Utility</th>
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Table 1 - Comparison of Boulder’s 20-year, cumulative CO₂ emissions for its electric utility options and global share that all Boulder emissions must stay below as a fair limit of the remaining carbon budget that keeps global temperature increase below 2°C if each person on earth has an equal share using the 900 GtCO₂-eq² emission remaining for a 2°C increase. (See Issue #2 on page 4 for details and for footnote #6.)

¹ This limit is only an estimated Boulder share of the global maximum CO₂ emissions that likely keeps global temperature increases below 2°C. EOF invites the community and experts to join a discussion to determine an emission limit for comparing electric utility options. See Issue #2.

² New wind and solar nameplate generation capacities come from Section 5. Acquisition of Generation Resources from 2013 All-Source Solicitation, [https://www.dora.state.co.us/ps/leti/ERI_Show_Filing?fileId_33812828_2013_ASGS_ASO_8SO](https://www.dora.state.co.us/ps/leti/ERI_Show_Filing?fileId_33812828_2013_ASGS_ASO_8SO).

³ The Boulder population used was 97,385 and 7,125,000,000 used as the global population.
Introduction: For the Boulder utility option, three variations were considered with varying levels of natural-gas efficiency and increases in solar. The first is simply the lowest cost, but less efficient. The other two variations use higher priced, but lower emission gas contracts, to provide significant opportunities to reduce both CO₂ emissions and limit the total amount of natural gas used. One uses the same amount of gas over 20 years as the status quo and the other only about 35% more, while no variations use coal. The latter simply pays more for higher efficiency power contracts. The former variation phases in gas efficiency over time and grows the energy provided by solar from 5% (50MW) in 2017 to 21% (250MW) in 2037. The solar and gas efficiency ramps provide an opportunity to use no more total natural gas than PSCo would use on Boulder’s behalf for electricity over the 20 years modeled, and reduces CO₂ emissions further. The cost is less under most of the conditions analyzed. This can be considered an opportunity for improvement to be implemented in the base plan for a local municipal “No Coal” utility as conditions warrant that add no cost or additional cost acceptable to the community or possibly customers participating in voluntary programs.

A model’s range of assumptions can significantly affect its outputs. A more detailed summary of the most critical assumptions is included later. Most significantly, the total stranded cost and system acquisition costs were capped at the City of Boulder Charter limit of $214M adjusted for inflation. Additionally, an alternative method for determining PSCo’s future rates based on historical data, PSCo 10K filings, and the 2015-2017 PSCo rate case’s customer impact study was included in the model and compared to the required revenue for PSCo included in the City’s analysis. The results of the lower of the two were used to determine average base rates for energy for PSCo and (a required average rate) for the local utility “No Coal” option and variations.

Total costs for Boulder customers include taxes and fees unique to Boulder and are not the same as rates. The average Boulder rate does not include taxes and fees and is an average of PSCo rates by customer class weighted by their energy consumption. PSCo’s average rate in Boulder tends to be lower, because it has a higher portion of commercial and industrial consumption than other communities. It is important to understand whether rates or average costs are being compared, since customers are more interested in what they would actually pay on their bill and rates do not make that clear. The City’s analysis calculated a cost that included both Payment in Lieu of Taxes (PILOT, the equivalent of the Franchise Fee) and the Climate Action Plan (CAP) tax. While these are included in PSCo billing, these are not included in PSCo rates. So, these either must be removed from a local utility cost to get an equivalent “rate” required, or the PSCo rate should have these costs added to get an average total cost to customers for the status quo. Both rates and average total cost to customers were calculated and considered for both options. PSCo rates are shown in Figure 1 along with the average required rates for the lowest cost Boulder utility under the same median assumptions used for a deterministic calculation for both. For comparison, Figure 6 on page 5 shows the median average total cost for 10,000 trials, using excess reserves when available to stabilize the cost to customers.

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4 Averages for rate classes calculated from example billing for averages for each class based on PSCo’s Settlement Agreement Corrected Attachment B Proceeding No. 14AL-0660E/14A-0680E filing https://www.dora.state.co.us/pls/efi/efi_p2_v2_demo_show_document?p_dms_document_id=459076

5 Since rates are not yet set for a local utility, a “required rate” is defined as total cost minus PILOT and CAP and averaged over energy sales.
Issue #1: The local utility option allows for large reductions in fossil fuel use. Coal use is eliminated by the local utility options considered. Natural gas use can be limited to the same amount used by the PSCo status quo over the 20-year period studied. This analysis examines some of the benefits and costs of various local electric utility options. A key benefit is decreased use of fossil fuels and lower emissions that meet community goals for addressing climate change. The modeling showed that the baseline, lowest cost system in this analysis was actually the “No Coal” option. This differed from the City’s findings for their “Least Cost” option. This difference was due to differences in modeling that will be discussed later in this paper, but this is an important advantage, because the “No Coal” option has the lowest overall CO₂ emissions. The results in this report reflect an analysis of the status quo with PSCo versus the city’s “No Coal” option and variations on its energy mix that use more efficient gas contracts and increased solar to reduce fossil fuel use and CO₂ emissions. Figure 2 shows projected fossil fuel use over time for PSCo, “No Coal” and variations of increased gas generation efficiency alone and a combined ramp of efficiency and solar.

![Graph showing PSCo vs Muni Options Fossil Fuel Use](image)

Figure 2 – PSCo’s planned fossil fuel use scaled to Boulder’s share (total in black) versus the “No Coal” local utility option and two variations (“No Coal” in red, a variation that uses more expensive but more efficient gas contracts over all 20 years in blue, and a variation in green that phases in gas efficiency while growing solar from 50MW to 250MW to provide 5% of Boulder’s 2017 energy then increases to 21% in 2037. This assumes community participation and net metering policies continue).

PSCo’s fossil fuel use (by BTU content) drops over time, but the electric energy produced is nearly flat as a percentage of PSCo’s energy mix, as more efficient gas generation replaces coal generation. All the variations of the “No Coal” option considered immediately cut total fossil fuel use by more than half, but increase the amount of natural gas used initially vs PSCo (though coal is eliminated). The variation shown in green (Figure 2) increases solar over time allowing the distribution system to be adjusted gradually, and cuts gas use incrementally with more efficient generation reducing it over time to its lowest level (46% of PSCo’s in 2037) as PSCo’s natural gas component increases over time to replace coal as PSCo’s predominant energy source. The result is the same total amount of natural gas is used over 20 years as compared to PSCo. This does cost more than the basic “No Coal” option, though still generally less than the projected PSCo rates with CAP tax and franchise fees added, as shown in Figure 3, and assumes that current net metering policies continue and that the city’s budget assumption for incentives is adequate (a portion of $3M per year from the its financial assumptions). The local utility analysis includes no carbon tax, but if a carbon tax is levied or PSCo begins charging fees for solar connections or paying less per kWh for solar, the local utility’s average customer cost would be even more competitive. The local utility would also add value by fully retiring solar REC’s.
Issue #2: Emissions driving climate change are significantly lower with a local option that limits CO\textsubscript{2} emissions over 20 years to 5.6-8.4 Mt (million tonnes) versus PSCo’s 18.5 Mt for the status quo. The accumulations listed are calculated directly from Boulder options’ annual CO\textsubscript{2} emissions in Figure 4 using assumptions reported by the City of Boulder and PSCo. One approach for an emission budget for Boulder options is to consider a 900 GtCO\textsubscript{2}-eq limit\textsuperscript{6} based on recent IPCC reporting with the intent to limit average global increase in temperature to 2°C. This can be used to find a per capita share for the global population\textsuperscript{7} and then apply it to Boulder’s population. The result is Boulder’s equal share for CO\textsubscript{2} emissions is around 12.3 Mt for all emissions, not just electricity. The status quo’s predicted emission for Boulder’s electric generation, over 20 years, is 18.5 Mt, exceeding the 12.3 Mt limit by 50% just by itself. The 12.3 Mt level should not be considered final. It is a starting point for finding a limit for comparison only. The community and experts are invited to help find better ways to calculate the Boulder community’s emissions budget.

\textsuperscript{6} The 900 GtCO\textsubscript{2}-eq limit is determined using Tables SPM.1, 6.3 in IPCC 2014 AR5 WG3 reports (http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full.pdf, pg. 22 and http://report.mitigation2014.org/report/ipcc_wg3_ar5_chapters6.pdf, pg. 431), a level likely to keep global average CO\textsubscript{2}-eq concentrations below 450 PPM. 450 PPM is the level most likely to prevent more than a 2°C rise in average global temperature, (see SPM.1 and reports in the Climate Change 2014 Synthesis Report, the first link above, for a discussion on climate risks).

\textsuperscript{7} The Boulder population used was 97,385 and 7,125,000,000 used as the global population.
The renewable energy content for the various options that help limit these emissions are shown in Figure 5 for the Boulder utility options (with and without the 2017-2037, 50 MW to 250 MW Solar energy ramp) and for PSCo’s status quo.

**Figure 5 - The Renewable Energy content as a percentage of the energy mix for the local utility option variations (baseline “No Coal” option, in red, and with a 50 MW to 250 MW ramp added, in green) versus PSCo’s Renewable Energy content (in black).**

Issue #3: A local utility option has a high probability of lower cost and risk compared to the status quo. While the advantages of lower emissions are compelling by themselves, the costs and economic risks of the various options must also be considered, especially with the goal of becoming a model that others will follow. 10,000 randomized trial cases were run for each local utility variation and the PSCo option to put a bound on the expected risk relative to the status quo under the same randomized conditions. Figure 6 shows median average total per kWh cost to customers for the status quo and local utility “No Coal” options.

**Figure 6 - The baseline “No Coal” option’s median average total cost per kWh to Boulder customers, shown in blue (includes PILOT and CAP expenses, but sales taxes are excluded), is compared to the projected PSCo average Boulder customer cost, shown in red (includes CAP tax and Franchise Fee for total average billed per kWh, but sales taxes are excluded). This result is from 10,000 randomized-assumption trial cases. The median average total cost with 50 MW to 250 MW ramp is shown in green.**
Risk is often assessed by many as “How bad can my bill get?” While this may seem to ignore environmental and climate risks, cost to customers is very important, because it drives participation rates and low emission paths must have participation to be effective. While many in Boulder may make the judgment that paying significantly more for cleaner power is worthwhile, many other communities will not. To meet the City’s goal of being a replicable model, cost and the risk must be considered and must be kept competitive. In Figure 7, a randomized analysis with 10,000 trials shows that the range of total customer cost per kWh for the local utility “No Coal” option (lines in blue) is not only competitive with the PSCo status quo (in red) in the highest cost trials (solid lines), but had a better opportunity for lower cost in the lowest cost trials (dashed lines).

When the risk of higher emissions to the environment and climate is to be considered, it may justify a higher cost risk. Figure 8 shows that a much lower emission, local-utility variation of the “No Coal” option does have some higher cost risk in later years at the high end of the cost range, but opportunity remains at the low end.
The results in Figure 8 do not include the effects of carbon taxes, which were not included, and assumes that net metering policies continue to reimburse customers at the full retail cost of energy with no additional fees. It is also assumed that Renewable Energy Credits (REC's) are retired, and not sold to reduce rates further nor used to fund subsidies or projects. The analysis summarized in Figure 8 includes over $1M more per year in the O&M budget for the local utility to cover additional cost in enhancing and maintaining the distribution system to incorporate increasingly higher levels of solar from 50 MW to 250 MW of local solar over time.

Another way to assess risk and opportunity to the Boulder community and its businesses is to consider the Net Present Value (NPV) of the difference between the costs of energy consumed in Boulder over 20 years from a municipal utility versus the status quo, PSCo operating in Boulder. Figure 9 shows a histogram of the NPV for 10,000 randomized sets of assumption combinations for the “No Coal” local utility option (the range of these assumptions are described later). For this option and range of assumptions, all trials show a positive NPV that represents a good value for the Boulder community (NPV > $50,000,000) over 20 years in all trials.

Figure 9 - Histogram of NPV for average total cost to Boulder customers for the “No Coal” option versus PSCo’s status quo.

Figure 10 shows the same data for the solar and natural-gas generation efficiency ramp variation for the local utility. While there is some financial risk, it occurs in only about 11.9% of trials as measured by negative NPV.

Figure 10 - Histogram of NPV for average total cost to Boulder customers for the ramped solar/gas eff. versus PSCo’s status quo.
Notes on the modeling: The model that was used to determine the data in this report was created to provide an independent analysis of the results of the City of Boulder’s 2013 modeling8. The city’s assumptions, process flow, and results were posted at that time on the city website, making these all available to the public. Although critics have claimed this was not “transparent” enough, in fact the data and assumptions made available by the city were successfully used to create the model used in this analysis.

The Xcel (PSCo) model was more difficult because complete cost assumptions were not all available. The Electric Resource Plan (ERP) that PSCo filed in 2011 did not have a detailed cost information breakdown included and some of the information, while not proprietary, was not easily available publicly. Other cost assumption detail simply does not appear to be available in the detail required for a 20-year projection. Fortunately, various interveners involved in the PUC process were able to help locate adequate PSCo data in most cases for calculating generation and transmission costs for the same set of assumptions used for the local utility calculations. Information was available for rate projections to be used to calculate total revenue from Boulder collected by PSCo. This was used to calculate aggregated costs when detail was unavailable.

The city website’s 2013 summary8 had projections of annual revenue requirements for PSCo that include profit over 20 years. It was decided to verify and, if needed, update these 2013 requirements using an alternate method to calculate PSCo’s projected revenue for Boulder through 2037 using average rates from PSCo’s 2015-2017 rate case (specifically, the rate case filing’s customer impact study9) and growth rates from other historical sources. Total PSCo revenue for Boulder in 2017 was calculated from rates that are a weighted average for each class and their energy use. Later years were projected forward based on historical growth for each class. The revenue assumption was then adjusted lower from the City’s 2013 assumption for required revenue if the rate revenue calculated was less, giving PSCo the benefit of any doubt. Generation and transmission costs for PSCo in Boulder were calculated for median assumptions and subtracted from the total Boulder revenue (from above) to determine the median total of the remaining operating expenses (including profits and debt) attributable to Boulder. This was then held constant in the model except to adjust for assumptions of gains or losses of customers.

For verification, the total revenue requirement assumption for 2017 was checked to verify that the model calculated an average Boulder rate of 9.8 cents/kWh correctly for PSCo by the model under median assumptions. The calculated PSCo total revenue and the average rate calculated from it then adjusts to changes in assumptions affecting generation and transmission. This allows total revenue and rates to be calculated for PSCo and other options under the same assumptions and captures the sensitivity of changes in cost assumptions.

Once rates are calculated by the model for the status quo and the amount of energy used by each customer class is determined, the CAP taxes and Franchise Fee are added to the rates to get the total cost per kWh to the customer under the status quo. Both average rates with no extras and average total costs, including taxes and fees, are calculated for the status quo, using the same set of assumptions as used for the local utility options. This is allows for fair comparisons of the status quo to the local option using either rate or total customer cost calculations. It is important to ensure that a comparison of options and the status quo uses the same type of cost for both, either a rate without taxes and fees, or a total cost to customers with taxes and fees included. Using the same type of cost avoids a mistake that has been made in comparing a PSCo rate that excludes taxes and fees at one inflation rate to an average cost for a local utility option that includes the CAP tax and PILOT, the equivalent of the Franchise Fee, at a different inflation rate. This has caused errors of 15% in the first year alone (and more in later years) in some comparisons presented to the public by critics.

A note of caution on comparing rates and average total costs as defined in this paper. A rate is just revenue required to operate the utility in one year divided by the number of kWh sold in that year. It does not include applicable fees and taxes customers pay. An average cost is what customers pay for a kWh sold before sales taxes are added (but does include franchise fees, occupation taxes or CAP taxes). Since the model allows reserves exceeding required minimums to offset costs in some years, average cost may be lower than a rate.

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8 The City of Boulder modeling effort’s results can be found at [http://BoulderEnergyFuture.com](http://BoulderEnergyFuture.com) or the Prezi at [https://prezi.com/exsftrinpbco/view/918_11382753](https://prezi.com/exsftrinpbco/view/918_11382753)
9 Averages for rate classes calculated from example billing for averages for each class based on PSCo’s Settlement Agreement Corrected Attachment B Proceeding No. 14AL-0060E/14A-0080E filing [https://www.dora.state.co.us/pls/efi/efi_p2_v2 демо show_document?p_dms_document_id=459078](https://www.dora.state.co.us/pls/efi/efi_p2_v2 демо show_document?p_dms_document_id=459078)
An explanation would be useful for understanding variations between the model's results presented in this paper versus those posted by the city in 2013 from their analysis. When the model for this paper was first created, any deviation from the example spreadsheet released by the city in 2015 through a CORA request was examined and understood. Since that 20-year cash flow spreadsheet was only intended to be illustrative (based on statements by staff), and not a final summary of the potential utility’s 20-year cash flow, the new model was later enhanced to assess how the local utility cash flow might actually work and to reflect changes, updated information and variations from ranges for assumptions. The ranges for key parameters are described later. The model used here includes options for how the 20-year cash flows are calculated that can eliminate deferred interest and allow debt service in the first year, assumed to be 2017. An option that allows excess reserves to be applied to service debt, lowering the revenue requirement, was also used. This stabilizes and lowers the total average customer cost in more challenging years when compared to PSCo rates, but a required average “rate” for the local utility is also calculated to attempt to verify the charter requirement for 2017.

The customers outside city limits that were originally included in the city’s analysis were removed from the model’s load assumptions to reflect current understanding of the utility’s territory. The charter limit of $214M for single payment acquisition was considered a requirement for this analysis. If the total acquisition costs awarded to PSCo are higher, options to mitigate these costs would have to be studied further.

As mentioned above, comparing a rate to a total customer cost is misleading so the model calculates both. Critics seem to have overlooked that including Payments In Lieu Of Taxes (PILOT) and CAP taxes in the city’s cash flow analysis required a corresponding addition of the Franchise Fee (or equivalent Occupancy Tax) and CAP tax to PSCo’s rates to get the full (average) cost to customers in Boulder to make a fair comparison.

Another area where the city was conservative and cost savings were obtained is related to the assumption used by the city analysis (for optimization reasons) that solar energy would be purchased by the utility at a higher price and then resold back to customers at a loss, rather than simply net metering solar, effectively selling solar energy back at the same cost. The model used for this paper could include a net metering option because it does not perform optimization. Netting out the cost shows significant savings in this case. Otherwise, the utility loses because the assumed cost of solar (for a mix of rooftop and commercial) makes solar cost more than the average cost of energy (utility scale solar is cheaper, so this isn’t always true).

An area where the model used by the study was more conservative than the city model is in how it models market purchases. Since the market pricing data the city used is proprietary, this model had to assume a worst case market price for all market power purchases. This means that any scenario or option using significant market purchases for energy will have overestimated costs. That is why this analysis showed the “No Coal” option as the lowest cost option as opposed to the “Lowest Cost” option for the city analysis. Fortunately, this analysis was interested in the lower CO2 emission that the “No Coal” option provided; and the other cost advantages modeled (as described above) more than offset costs to make the “No Coal” option much more competitive.

The median, minimum and maximum plot data included in this report were generated using a Monte Carlo analysis that randomizes key assumptions over ranges for 10,000 trials. For each trial, a randomized set of assumptions is generated and then model results are created for the local utility and PSCo under the same conditions and the results compared. This allows evaluation over ranges of parameter mixes to determine sensitivity of the comparison to conditions. A summary of these assumption ranges is shown in Table 2.

A final difference in modeling is that this model does not do optimization and relies on the optimized energy mixes from HOMER in the city’s process. This model simply calculates cost from a set energy mix and assumes it meets the energy requirement over 8,760 hours for all 20 years. The third variation of the “No Coal” option (with ramped solar and natural gas efficiency) was assessed, but would need additional study to pursue it, especially the assumption that just over $1M a year was enough to allow for the distribution system to be enhanced adequately to accommodate its solar growth from 50 MW’s in 2017 to 250 MW’s in 2037.
Assumptions for borrowing reflect a compromise for rates for alternative private loans that have been in the range of 3.5% - 5% versus traditional bond rates. The range used in the model was slightly higher than the range for alternative private loans based on the assumption that traditional bonding might be preferred, justifying a small premium, but an excessively high traditional bond rate above this would need to be analyzed further\(^\text{10}\). This analysis used a Debt Service Coverage Ratio (DSCR) of 1.625. This helps justify using a better bond rate and is the ratio expected to be used by the City of Boulder if it moves forward on municipalizing the electric utility, even though the DSCR required by the City charter is only 1.25.

Assumptions for wind and natural gas costs in 2017 are from the city median assumptions (with inflation added to get 2017 dollars). The natural gas cost used by the city was based on the 2011 PSCo ERP, as was the coal cost used for 2017 (with inflation added). No cost for carbon emissions was assumed or included in these results. Including these would only improve the competitiveness of a Boulder municipal electric utility.

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<td>Distribution System Cost for 50-250MW Solar Ramp</td>
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*Inflation is added to this real growth rate

Table 2 – Ranges for key assumptions used in this analysis.

\(^{10}\) Analysis was done using 50,000 randomized trials that showed that a bond rate of 9.6% at the maximum $214 million dollar charter limit passed by voters gives a Boulder “No Coal” electric utility an equal probability of providing Boulder customers better/worse financial value as measured by NPV (Net Present Value) versus the status quo, and significantly lower emissions risk, using all other assumptions and ranges in Table 2. Total difference in cost to customers averaged 0.046 cents per kWh cheaper for a local utility over the 50,000 trials.
Summary: In closing, the modeling results generally confirm the City of Boulder’s 2013 conclusions that a local municipal electric utility is very likely to meet charter requirements and deliver significant carbon reduction at a competitive cost to customers. This is almost certain if total acquisition costs meet the $214M charter requirement. The analysis shows that the city results were, if anything, conservative and the utility’s cost to customers is likely to be even lower than expected for the option analyzed, the “No Coal” option. A lower than expected cost opened the way to consider two variations on this option that reduce carbon emissions much further than the options the city considered. More study and verification of the result should be done to validate this result to reach a community consensus, but the current analysis shows a high likelihood that all local utility variations will not only produce significantly lower emissions, these will be at a lower total cost to Boulder customers than under PSCo.

In addition to further study and verification for the model, community involvement is desired for evaluating and setting safe limits for emissions from Boulder’s use of electricity. An attempt was made in this analysis to begin considering how to assess options in a global context, but to do that with accuracy and confidence will require additional expertise and a community discussion. Boulder is fortunate to have local expertise to advise the community on the proper limits and risks of emissions that cause climate change. However, the Boulder community’s judgment on the risks our community is willing to take, not only financially, but also with our climate, is even more important and critical for deciding the path we will take. The analysis of the CO2-eq (GHG) limit presented here is for an “equitable” share that is based on assumptions and calculations that required judgments be made that must be examined by the community. We must ask as a community what really is equitable and how much financial risk we will accept to limit the risks due to climate change and our contribution to it. If our answer is to be zero or some low percentage, the community will need to use its ingenuity to find ways to increase renewable energy beyond what is presented here, while limiting cost to what is acceptable not only for our community, but also for those we wish to have follow our community. It is hoped that this model will serve as a starting point for further modeling guided by the community’s discussion and feedback.

Analysis using a wider range of assumptions to study sensitivity and to “stress” the model have also been done but were not included in these results. Those interested, should contact us.
The model can be used to generate 20-year cash flows for the public to examine along with supporting detail and the set of assumptions used for a selected trial. The same reports can also be generated for a given set of alternative assumptions, if provided by interested members of the community. A demonstration of the model and in person review of the calculations and assumption is also available upon request.

We do not intend for this paper to be the last word. Rather, it should be used to continue a community discussion and provide analysis for those interested.

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