# Boulder Energy Future QUALITATIVE ANALYSIS Part One: Benefits and Concerns of Each Path

| Objective | The Status Quo: Xcel Energy | A Local Electric Utility: Boulder Light & Power | Partnership |
|---|---|---|---|
| **GENERAL (RELATED TO ALL GOALS)** | | | |
| **Applies to All Goals and Objectives** | SUPPORTS THE GOALS:<br>• Xcel Energy has an established organizational and management structure.<br>• The large scale of Xcel's assets, financial resources and service area provides opportunities to manage multiple objectives based on economies of scale.<br>• Xcel is a financially strong and highly profitable company. It has consistently increased earnings per share for nine consecutive years and anticipates earnings of $1.85 – $1.95 billion in 2013.<br>• The Colorado Public Utilities Commission (PUC) provides oversight of Xcel's rates and services based on the desires of the State of Colorado which in many cases are aligned with the Boulder community.<br>• The Electricity Section of the PUC serves the public interest by balancing the needs of customers and utility service providers. Their mission is to achieve a regulatory environment that provides safe, reliable, and quality services to electric utility customers on just and reasonable terms.<br><br>CONCERNS:<br>• Xcel Energy is a large utility provider, with a diverse customer base (8 states and 4 subsidiaries) and local opinion does not significantly influence the management and delivery of its services. Whatever is done for one community must be done for all other communities that are served. Desires of local customers and businesses may not be supported by other Colorado area customers, limiting opportunities for managing the desires and specific objectives of our community.<br>• As a for-profit corporation, Xcel must meet shareholders desire to maximize profit. To protect customers, the Colorado PUC has been granted oversight of the charges and rates levied by Xcel; however, the PUC process requires substantial time and ability to navigate the complex regulatory structure. Local voters have little input on the make-up of the Commissioners of the Colorado PUC, who are appointed by the governor for 4-year terms and approved by the state Senate. | SUPPORTS THE GOALS:<br>• A Local Electric Utility would have fewer "sunk" costs (i.e. investments in pre-existing systems), allowing for greater choice in purchase of generation, billing systems, etc.<br>• Municipal utilities have lower costs of capital. A local utility would have access to less expensive financing, through tax-exempt bonds, than is available to Xcel, and would not need to provide a return on investment to shareholders.<br>• As a not-for-profit entity, a municipal utility would have the ability to re-invest any excess revenues locally; this could include, for example, reducing rates, increasing programs and services or increasing reliability.<br>• Boulder voters approved an amendment to the City Charter that allows the city to form a municipal electric utility only if it can meet strict financial requirements that deliver our community clean, reliable, low-cost, local energy. The city has since performed an analysis (modeling described in more detail in each section below) that demonstrates that it would be feasible under certain conditions to create a local electric utility that meet the conditions prescribed in the City Charter.<br>• The American Public Power Association (APPA) is an important support organization for the nation's more than 2,000 community-owned electric utilities. Collectively, these utilities serve more than 47 million customers in the U.S. APPA was created to advance the public policy interests of its members and their consumers, and provide member services to ensure adequate, reliable electricity at a reasonable price with the proper protection of the environment.<br>• A Boulder Light & Power Utility would have more flexibility to balance innovation risk with efficiency gains and ensure that the results of innovative investment are shared with local customers.<br>• Local customers have more direct access to decision-makers—local elected and appointed officials-- who have the ability to make decisions based on local priorities.<br><br>CONCERNS:<br>• The city has worked hard to accurately model the financial impacts associated with creating a local electric utility; however, an inability to test assumptions based on data provided by Xcel means there could be some variations in actual outcomes.<br>• New organizational and management structure would need to be established (though existing City management and administrative systems would be leveraged and applied to the local electric utility).<br>• This would be the largest debt issue the city has ever made. It will require a significant undertaking to establish a new utility. The financing terms, which are currently unknown, would be set by bond rating agencies.<br>• Members of the business community who do not live in the city are not eligible to vote or run for local office. Business customers are likely to account for 80 percent of the utility's billing and revenue and some are concerned that local politics may influence the local electric utility in a manner that is counter to their interests. | **Information not available at time of this writing.**<br><br>**See section VI of July 23 study session memo.** |
| **ENVIRONMENTAL STEWARDSHIP & CLEAN ENERGY Goal: Significantly reduce carbon emissions and pollutants** | | | |
| **1. Consider and Mitigate Full range of Environmental Impacts:**<br><br>**Decarbonize the Energy Supply**<br>• Consider all environmental and health costs of the associated | SUPPORTS THE GOAL:<br>• Xcel's current portfolio in Colorado consists of approximately 58% coal, 23% natural gas, 16% wind (including renewable energy credits). The remaining resources come from a combination of solar, hydroelectric and biomass. Xcel has proposed to acquire approximately 550 MW of wind capacity as part of its 2011 Electric Resource Plan.<br>• Under the Clean Air, Clean Jobs Act (CACJA), Xcel was required to develop a plan that retires or converts 900 MW of coal generation. This includes retirement of Arapahoe 3 & 4, Cameo 1 & 2 and Valmont 5. Pollution controls will be added to other units. Xcel has reduced $NO_x$, $SO_x$, mercury, and particulate emissions each year since 2005. Under the CACJA, Xcel was also required to develop a plan that would reduce $NO_x$ emissions by 70% by 2017, pursuant to Colorado's obligations under the Clean Air Act. | SUPPORTS THE GOAL:<br>• The city's modeling indicates that a local electric utility could meet a significant portion of Boulder's energy needs with renewable energy sources and dramatically reduce the community's coal dependency while maintaining the same (or better) costs and reliability as Xcel.<br>• Even with slight fluctuations in carbon intensity over time, the modeling shows that the local utility would have much lower carbon intensity of its fuel supply than Xcel.<br>• To achieve the levels of greenhouse gas emission and carbon reductions needed to meet the city's Climate Commitment, a utility will need to provide both aggressive demand-side management (DSM) programs and a provide significantly less carbon- intensive energy supply than we have currently. A local utility could cut local emissions more quickly than an Investor-owned utility by prioritizing demand-side efforts paired with a cleaner energy portfolio as shown in the city's modeling. | **Information not available at time of this writing.** |

| Boulder Energy Future QUALITATIVE ANALYSIS Part One: Benefits and Concerns of Each Path | | | |
|---|---|---|---|
| **Objective** | **The Status Quo: Xcel Energy** | **A Local Electric Utility: Boulder Light & Power** | **Partnership** |
| fuel mix.<br>• Maximize utilization of the least carbon-intensive fuel sources.<br>• Support local testing of new, innovative "carbon-free" and pollution-reducing technologies.<br>• Provide the ability to accurately predict and set specific future targets for emission reductions based on demand-side efforts and fuel sources along with the flexibility to continually decarbonize Boulder's fuel mix over time.<br><br>**Reduce Pollutants**<br>• Reduce other pollutants such as mercury, particulates and various nitrous and sulfurous emissions.<br>• Consider the full range of environmental and health risks and costs associated with the fuel mix.<br><br>**Reduce Dependency on Fossil Fuels** | • Xcel indicates that it has achieved a 20% reduction in carbon dioxide emissions (relative to a 2005 baseline) and is on track to achieve a 30% carbon emission reduction by 2020.<br>• Xcel serves customers in eight states and if it chooses to make positive changes in its fuel supply or program offerings, it would impact a larger number of customers and have a greater environmental impact than would a local utility.<br>• Xcel has been recognized as a leader among regulated investor-owned utilities in investing in wind energy.<br><br>CONCERNS:<br>• Current efforts to increase renewables are hampered by Xcel's continued investments in coal. While Xcel emphasizes its leadership in wind energy, it still invests heavily in coal. So much so, that Boulder customers use one of the most carbon-intensive energy supplies in the nation. Real change would mean decommissioning more coal plants than the company has planned, and an end to building new ones or refurbishing or repowering existing ones.<br>• Currently, Colorado has 13 coal plants which emit 47,200,000 tons of C02 emissions per year, ranking Colorado 23rd among power-related carbon emissions for all US states. Of these 13 coal plants, Xcel Energy operates 7. By 2020, Colorado greenhouse gas emissions are project to reach 71% above 1990 levels.<br>• Xcel has substantial investments in base load coal generation units that make high renewable energy percentages impractical.<br>• Due to Xcel's reliance on coal, its CO2 emission factor of 1.93 lb/kWh is relatively high compared to the U.S. average of1.34 lb/kWh. In fact, Colorado has the highest carbon intensity among the 4 states in Xcel's service territory and EPA's eGRID carbon intensity places the Rocky Mountain region ("RMPA") at the highest in the nation.<br>• While Xcel plans to decommission the Valmont coal plant by 2017, the Hayden and Pawnee coal plants are being considered for pollution controls which would keep the coal plants on-line until 2036 and 2041 respectively and would cost close to $380 million.<br>• Xcel produces "Toxic Release Inventory" reports for the EPA, showing that pounds of toxic substances, such as barium and mercury, increased in 2010 as compared to 2009 (the last reported years).<br>• Currently, energy users pay market prices that reflect the direct costs of production, transportation and storage of the energy they use. However, energy prices typically do not account for environmental costs (e.g. human health and welfare impacts caused by air and water pollution, solid waste, climate change, loss of biodiversity and ecological changes from shifts in land use and nutrient cycles) and therefore do not reflect the full cost of energy production and consumption.<br>• Xcel has indicated that compliance with the CACJA will result in over $1 billion in costs and roughly a 2%-3% rate increase per year over 10 years.<br>• In its 2011 Electric Resource Plan, the PUC approved Xcel testing a $20/ton carbon tax in 2017 for sensitivity, but has not required that Xcel propose alternative resource options based on that possibility.<br>• While Xcel suggests it is on track to achieve a 30% $CO_2$ reduction by 2020, Xcel's $CO_2$ emissions have not significantly decreased since 2009.<br>• Under current regulations there is not a cost for carbon emissions factored into energy generation, providing no incentive for Xcel to move away from carbon based fuels. | • In order to meet the city's Climate Commitment, a municipal utility could make choices to move away from carbon based energy supply, limiting the exposure to any potential future carbon tax regulations.<br>• The modeling assumes an increased level of funding in comparison with Xcel for DSM and solar incentives and rebates.<br>• The city has significant experience in developing and managing innovative energy efficiency and DSM programs targeted to the needs of the Boulder community, such as EnergySmart. In May, 2012 the Rocky Mountain Institute (RMI) performed an independent analysis of all Boulder DSM programs funded through the Climate Action Plan Tax and found that Boulder "has attained impressive energy savings and emission reductions, and is well positioned to achieve future emissions reduction targets. RMI also found that the city "has generated significant carbon savings at reasonable cost."<br>• A local utility can continue to tailor its programs to address local issues and needs. As an example, Boulder is currently partnering with Pecan Street Research Institute to collect real-time energy usage data from homes and businesses in Boulder to test and validate which new efficiency programs and technologies work and which do not. This consumer focused research will allow the city to enhance its demand-side efforts to be most effective.<br>• A local utility would have control over capital investment priorities, such as undergrounding electric lines, replacing aging equipment, micro-gridding, or investing in other innovative practices and technologies, as described in the Part 2 Qualitative Analysis.<br>• By focusing on clean energy generation sources, a local utility's portfolio will result in reduced pollutants such as nitrogen oxides, sulfur oxides, mercury and particulates. Additionally, the utility's portfolio can prioritize water consumption in fuel extraction and generation.<br><br>CONCERNS:<br>• The City's resource mix will require some fossil fuel use over the short-term. This could result in additional costs should a carbon fee be enacted. However, given that the city's portfolio (as modeled) relies less on coal based generation than Xcel, it is anticipated the local utility would be impacted less than Xcel. Modeling showed that the Charter metrics could be met under a range of future carbon costs, or even without a carbon tax.<br>• There may be future limitations or constraints on existing transmission. These constraints could potentially increase the cost of transmitting clean energy sources such as wind, or may constrain the sites that are suitable for generation resources.<br>• Charter requirements state the utility will strive to maintain rate parity with the investor owned utility (IOU). There are a number of lifecycle costs that will be considered by the local utility that are not accounted for by Xcel. These include costs associated with everything from water use, how warmer climate trends will impact agriculture, to the damage rising sea water will cause, to the cost of installing charging stations for electric cars. If these externalities are incorporated into the local utility rates, it may be harder to maintain rate parity.<br>• Wholesale Power purchase structures and pricing are critical to a local utility's success. Care must be taken to align PPA terms and conditions to Boulder's local demand-side efforts and local generation such that they do not conflict or add cost. | |
| **2. Energy Investments Built on Grid Modernization and Innovation** | SUPPORTS THE GOAL:<br>• In 2008, Xcel announced that Boulder would become the nation's first "fully integrated" SmartGridCity, putting it ahead of the curve on grid modernization. (see Section 1 of Part 2 Analysis)<br>• Xcel participates in the Electric Power Research Institute Green Circuits project to quantify and reduce distribution circuit losses. (see Section 1 of Part 2 Analysis) | SUPPORTS THE GOAL:<br>• The local utility will have fewer regulatory restrictions than Xcel in creating leading-edge programs in reliability, energy efficiency, renewable energy, related economic development and customer service (see Section 2 of Part 2 Analysis).<br>• Locally controlled public utilities have the freedom to design programs and services that directly match the | N/A |

| Boulder Energy Future QUALITATIVE ANALYSIS Part One: Benefits and Concerns of Each Path | | | |
|---|---|---|---|
| **Objective** | **The Status Quo: Xcel Energy** | **A Local Electric Utility: Boulder Light & Power** | **Partnership** |
| • Promote current and future energy investments built on the Smart Grid infrastructure in order to provide options to customers that further reduce emissions.<br>• Encourage new and innovative ways to maximize investment in local distributed generation and considers new opportunities for energy storage, on-site generation and electric vehicle integration. | • Xcel is implementing a decentralized "grid modernization" plan that includes testing distribution voltage optimization. (see Section 1 of Part 2 Analysis)<br>• Xcel supported Colorado HB 12-1258, a bipartisan bill authorizing the sale of electricity for electric vehicle charging without requiring approval from the PUC. (see Section 1 of Part 2 Analysis)<br>• Xcel is piloting a small "Community Energy Planning" program to offer Colorado local government's strategic support in developing demand-side management programs. (see Section 2 of Part 2 Analysis)<br><br>CONCERNS:<br>• While Xcel's SmartGridCity™ Project was effective in providing benefits to the utility itself, components related to customer benefits and new technologies (e.g. vehicle-to-grid, large-scale distributed generation) have not been fully implemented.<br>• Even when authorized by customers, Xcel has not consistently provided meaningful access to energy usage data. Local governments, including the City, Boulder County and Denver, have had to file multiple pleadings with the PUC in attempts to get Xcel to provide them with meaningful and consistent access to the energy usage data that participants in the EnergySmart and Denver Energy Challenge programs have authorized them to receive. This data is needed to fulfill DOE grant requirements related to program verification. | needs of the geographic and demographic area served.<br>• The business model of a municipal utility would focus on meeting Boulder's Energy Future goals, which include having a cleaner energy supply; the ability to develop innovative energy efficiency and demand-side management programs that enhance customers' control; a structure that supports economic vitality through low costs and high reliability, and the creation of a high-tech test bed; and the opportunity to work with energy consumers to meet their diverse needs.<br>• A local utility would have consistent access to usage data that would enhance demand-side programs and services by providing real-time data on the effectiveness of existing efforts. The local utility would work with customers to balance data privacy with effective services, tailored programs and innovation. This is particularly important to commercial and industrial sector customers.<br><br>CONCERNS:<br>• The nature of innovation is that some programs will not be cost-effective. | |
| **ENERGY LOCALIZATION/ LOCAL ECONOMIC VITALITY Goal: Provide energy customers with a greater say about their energy supply and promote local economic vitality** | | | |
| **3. Provide Customers with a Strong Voice in Utility Decisions** | SUPPORTS THE GOAL:<br>• Xcel offers a number of renewable energy programs or energy saving offers. Customers can choose to pay extra for programs such as Windsource, Energy Audits or the Saver's Switch® program.<br>• Xcel is a regulated monopoly requiring oversight of rates and resources by the Public Utilities Commission. Parties are able to intervene in PUC proceedings related to rates, customer services, resources and programs.<br>• The Office of Consumer Counsel represents the interests of residential, small business and agricultural customers before the PUC.<br><br>CONCERNS:<br>• Certain customer choice programs such as Community Choice aggregation are not legal in Colorado.<br>• Xcel is required to obtain approvals or authority from the PUC before implementing new programs or offerings, but it frequently is not required to invite stakeholders to participate in program design.<br>• While parties such as the PUC and large electricity users are able to intervene in proceedings at the PUC, individual customers must prove that they have interests different from the Office of Consumer Council before they are allowed to participate. | SUPPORTS THE GOAL:<br>• A local utility would not be regulated at the state level in the same way as investor-owned utilities, but would be subject to local oversight and local elected officials who can more directly ensure the utility is held to a high standard of service.<br>• A local utility has the freedom to design programs and services that directly match the geographical and demographical needs of the area served.<br>• The Charter requires the implementation of a local electric utility governing board which would have the ability to engage residents and business in decisions related to different resource mixes, crafting more innovative and locally-centered services, and providing new infrastructure opportunities in response to community priorities.<br>• Under Colorado law, a municipal utility is governed locally and is independent from many of the state regulatory constraints that bind investor owned utilities like Xcel. Municipal utilities are typically held to a higher standard by the community and local oversight board.<br>• A local utility could offer innovative rate structures tied to customer interests. These could be time of use rates, tiered rate structures or on-bill financing for energy efficiency and renewable (see Qualitative Analysis Part 2).<br><br>CONCERNS:<br>• The design and representation on the local governing board may be difficult in terms of designing to meet all local interests. | **Information not available at time of this writing.**<br><br>**See section VI of July 23 study session memo.** |
| **4. Innovative Ownership and Financing/ Local Investment**<br><br>• Create new opportunities for local ownership in distributed energy generation through innovative program designs.<br>• Create new | SUPPORTS THE GOAL:<br>• Xcel's Solar*Rewards incentive program has contributed to the installation of approximately 160 MW of solar in its Colorado service territory as of 2012. Xcel administers the Renewable Energy Standard Adjustment fund, which comes from ratepayers in Colorado. This fund has allowed Boulder residents and businesses to install close to 13 MW in Boulder.<br>• Xcel offers a "Renewable Energy Trust" grant program for nonprofits seeking to install PV systems; this can be paired with Solar*Rewards incentives.<br>• Xcel supported the Solar Gardens legislation which allows virtual net metering for solar benefits to customers that cannot have solar at their own premise.<br><br>CONCERNS:<br>• Xcel was criticized by the Colorado PUC for failing to lay out a strategic vision for implementing the | SUPPORTS THE GOAL:<br>• Local investment in efficiency and on-site generation is a cornerstone of the local utility business model. The City's most recent modeling assumed funding for local rebates and incentives in excess of Xcel's current funding levels.<br>• Local utility customers could take advantage of the city's access to low interest financing for energy efficiency upgrades or distributed generation.<br>• A local utility could design a comprehensive business model around the ongoing customer programs offered by EnergySmart by offering on-bill financing for energy efficiency and distributed generation. (see Qualitative Analysis Part 2).<br><br>CONCERNS:<br>• The up-front costs of improving energy efficiency and increasing renewable energy generation can be a barrier | N/A |

| Boulder Energy Future QUALITATIVE ANALYSIS Part One: Benefits and Concerns of Each Path | | | |
|---|---|---|---|
| **Objective** | **The Status Quo: Xcel Energy** | **A Local Electric Utility: Boulder Light & Power** | **Partnership** |
| financing vehicles. | "test bed" concept of SmartGridCity in Boulder.<br>• Xcel's decision to reduce Solar*Rewards incentives was criticized by the Colorado Solar Energy Industries Association as eliminating 600 jobs in early 2011. Boulder-based Namaste Solar laid off 12 out of 77 employees.<br>• Most innovative options would have to be behind the meter. Currently, programs cannot combine customers to be served from one meter, which does not allow for technologies such as microgrids, islanding, peer-to-peer sharing of energy etc. | for many homeowners, building owners, and businesses. | |
| **5. Economic Vitality**<br>• Support Local Business Innovation<br>• Encourage Economic Competitiveness | SUPPORTS THE GOAL:<br>• Xcel contracts with the National Center for Atmospheric Research (NCAR) in Boulder to make its 15-minute wind forecasts more granular.<br>• Xcel is a founding member of the Solar Technology Acceleration Center (SolarTAC), which tests solar technologies and storage in Aurora, CO. Proprietary research and commercialization are managed by MRIGlobal.<br>• In 2012, Xcel contributed >$100,000 to Boulder-area nonprofits through its Foundation Grants.<br>• Xcel has contributed >$180,000 to Boulder-area nonprofits for the installation of solar PV from 2003-2012.<br>• Xcel has indicated that it employs approximately 200 employees in the Boulder Region. | SUPPORTS THE GOAL:<br>• The city's economic vitality programs and strategies promote innovation, competitiveness, and entrepreneurship. A local utility would be closely aligned with these current program goals.<br>• A local utility can partner with local companies to implement innovative energy generation, storage, conservation and pollution-reduction technologies.<br>• Boulder is the home to a number of innovative clean energy companies that could test and model their technologies locally.<br>• A local utility can partner with local organizations such as the Chamber of Commerce, Boulder Economic Council and Boulder Greentech to maximize investment in local businesses; reduce financial out-flows to purchase fuel and technology from external sources; and allow local businesses to become part of the local energy supply infrastructure.<br>• A local utility will stimulate Boulder's economic competitiveness by prioritizing stable and predictable energy rates and making Boulder an attractive location for clean energy businesses and start-ups.<br>• A local utility is expected to capitalize on the proximity of Boulder's university and Federal research laboratories and other private sector and institutional partners; and provide incentives and benefits for clean energy clusters and innovative energy start-up companies.<br>• A municipal utility would create over 100 municipal jobs and the city provides competitive compensation including a pension plan. Many more additional jobs would be created and sustained through the local energy industry technology companies supporting the local generation goals. (see Section 7 of Part 2 of the Qualitative Analysis). Typically city employees are active in the community in social and non-profit organizations, contributing time and resources to Boulder based organizations.<br>• Money spent on bills and services, along with salaries and other overhead, would stay in the community. | |
| **FISCAL RESPONSIBILITY GOAL: Operate the utility in a fiscally responsible manner, mindful that every expenditure will be reflected in customers' rates and will affect household budgets and business profitability** | | | |
| **6. Fiscal Responsibility**<br>• Position Boulder residents and businesses to receive predictable energy prices.<br>• Provide a structure and process for continuous rate management to meet the changing needs of the community. | SUPPORTS THE GOAL:<br>• According to state law, charges by a public utility must be "just and reasonable." C.R.S. 40-3-101.<br>• The PUC has four key responsibilities: providing "safe, reliable power, at reasonable rates, while affording the utility the opportunity to earn a fair rate of return" (12M-041E & NARUC report).<br>• As of 2012, Xcel's average rates in Colorado have been below, but are approaching, the national average.<br>• Xcel's Colorado subsidiary has some A-rated debt.<br>• In 2012, Xcel spent between 50-60% of its demand-side management costs on direct rebates and incentives to participants (p.16).<br>• Xcel provides customer impact studies as part of certain rate filings, like Electric Commodity Adjustment (ECA) rider changes, which are filed quarterly with the PUC.<br><br>CONCERNS:<br>• Xcel CEO Benjamin Fowke received $11 million in compensation in 2012. He was the sixth highest paid utility CEO in 2012. Review by PUC staff determined that Xcel attempted to pass onto ratepayers the costs of private jet commuting for two executives; the PUC disallowed this.<br>• In 2012, the Colorado Association of Municipal Utilities found that bills for customers of municipal utilities and rural electric associations were lower on average by customer class compared to rates | SUPPORTS THE GOAL:<br>• The city has a proven track record of fiscal responsibility with its water utilities, including a AAA bond rating.<br>• The city can issue tax-exempt debt after the initial acquisition of the system for on-going upgrades and improvements, which provides access to less expensive financing than is available to Xcel. Council would provide vision, approve rates and capital expenses, while the electric utility board would guide strategies, risk policies, handles management decisions and advises council. The specific governance structure is still to be determined, but its structure will provide checks and balances for fiscal responsibility through a relationship between the advisory board and council.<br>• A municipal utility would be freer to invest in innovative technologies such as distributed generation because it does not need to provide a return on investment to shareholders. Rather, decisions could be made that are both fiscally responsible and meet community goals. Any net income is returned to the local utility for ongoing local investments.<br><br>CONCERNS:<br>• As a new utility, the bond rating is uncertain, initially estimated to be A-.<br>• There are factors that will be determined through legal processes that add risk to the financial analyses. The city's modeling used various levels of acquisition and stranded costs to test the level of costs where the city | **Information not available at time of this writing.**<br><br>**See section VI in July 23 study session memo.** |

| Boulder Energy Future QUALITATIVE ANALYSIS Part One: Benefits and Concerns of Each Path | | | |
|---|---|---|---|
| **Objective** | **The Status Quo: Xcel Energy** | **A Local Electric Utility: Boulder Light & Power** | **Partnership** |
| | charged by Colorado's investor-owned utilities (Xcel and Black Hills). *The New York Times* used EIA data to show that government-run utilities generally charge lower rates than privately owned utilities.<br>• In its most recent rate case, Xcel was authorized a return on equity of 10% and a debt-to-equity ratio of 56%/44%, yielding a weighted rate of return of 8.06% (paragraph 52) for 2012-2014. Utilities and their shareholders earn this return to finance their rate base (capital investments). This guaranteed return can lead to overinvestment in infrastructure ("the Averch-Johnson effect").<br>• After advising that it would not seek recovery from ratepayers for SmartGrid City, Xcel attempted to recover approximately $44.5 million from Colorado ratepayers without the pre-approval of the PUC. After challenges from several interveners, the PUC ultimately approved $27.9 million, or just slightly more than 60% of the funds expended.<br>• The current regulated monopoly context does not offer a free market to ratepayers. The regulated business model is guided by return on investment with guaranteed profits to shareholders.<br>• Ratepayer electrical payments are going out of the state and region in the form of monopoly profits and taxes. | could either meet or not meet the charter rate parity requirement. However, the actual acquisition and stranded costs are unknown.<br>• The city will incur legal costs associated with the determination of the actual acquisition and stranded costs (the city budget includes $1.9 million annually for five years to cover these costs). | |
| **7. Transparency in Rate Design**<br>• Allow for full transparency in all charges included in energy rates.<br>• Provide the ability to fully evaluate fuel cost price risks. | SUPPORTS THE GOAL:<br>• Xcel is required to file changes in rates with the PUC in the form of advice letters and tariff sheets that generally can be found online.<br><br>CONCERNS:<br>• According to Xcel's 2012 year-end earnings report, Colorado remains the largest contributor to its per-share earnings, despite having less than half the customers of its Minnesota subsidiary.<br>• Xcel's bills have been criticized as not understandable. Xcel's FAQ "Understand Bills" directs customers to the most current Colorado tariff filing, a 300-page document including around 30 different rates, but not how they are calculated.<br>• Xcel bills customers using an "Electric Commodity Adjustment" rider that is "automatic" and "passed along to customers on a dollar-per-dollar basis."<br>• Xcel is allowed to keep a "negative balance" in its Renewable Energy Standard Adjustment (RESA) account, meaning that it earns interest when it has paid more in incentives for renewable resources than it has taken in from the 2% charge on customers' bills.<br>• Although Xcel files all changes to rates with the PUC in the form of advice letters, they do not consistently provide the "baseline" number from which the increase or decrease is being made.<br>• Xcel is a vertically integrated utility, owning transmission, distribution, generation and retail meters. This makes it very difficult to understand how each component impacts rates and audit them independently.<br>• In regulated electricity markets, fuel price risk often ends up being borne primarily by the rate payers rather than by the utility companies. Fuel price increases are passed through the electric commodities adjustment (ECA), an automatic utility bill rider. | SUPPORTS THE GOAL:<br>• The city is committed to transparency in operations and city decisions related to rates, as demonstrated by the current water utility and council decision-making processes.<br>• Decisions on rates will be made in forums that are accessible to customers – public utility advisory board meetings and city council meetings held in Boulder, not in Denver or Minneapolis.<br>• Rate designs with specific price signals may be offered without PUC approval<br><br>CONCERNS:<br>• Electric rate design is complicated and considerable effort will need to be placed on communication and explanation of rates and energy literacy in general. | N/A |
| **8. Protection from Future Pollution Costs** (Minimize the risk to ratepayers from future carbon costs and legislation along with other environmental regulations such as mercury and particulate controls): **See Objectives in #12** | | | |
| **RATEPAYER EQUITY GOAL: Create a fair and equitable distribution among all users of the costs of the safe and efficient delivery of electric power to customers** | | | |
| **9. Equitable Rates**<br>• Promote ratepayer equity in all aspects of the operations.<br>• Design rates to create a fair and | SUPPORTS THE GOAL:<br>• Xcel provides exemptions from tiered summer rates for customers with certain medical conditions.<br>• Xcel partners with state agencies to provide low-income energy assistance and weatherization programs. In 2012, they contributed over $12 million to those programs around the state.<br><br>CONCERNS/ RISKS:<br>• Based on the share of revenues generated from each rate class as a proportion of the total | SUPPORTS THE GOAL:<br>• The specific ratemaking methodology has not yet been determined for a municipal utility; however, the model results indicate that a municipal utility could have rates equal to or lower than Xcel (by comparing the overall cost of service, or revenue requirements, of a municipal utility to those of Xcel's). Therefore, the opportunity exists to develop rates that are comparable to Xcel on day 1, with potential savings over 20-years.<br>• Inherent in the structure of a municipal utility, which is governed locally, is the assumption that rate structures can be adjusted in response to local community needs and at a faster pace than rate cases regulated through | N/A |

| Boulder Energy Future QUALITATIVE ANALYSIS Part One: Benefits and Concerns of Each Path | | | |
|---|---|---|---|
| **Objective** | **The Status Quo: Xcel Energy** | **A Local Electric Utility: Boulder Light & Power** | **Partnership** |
| equitable distribution among all users of the costs, replacement, maintenance, expansion, operations of facilities, energy, and energy conservation programs.<br>• Consider the effects of programs, policies, and rates in the development of programs for low-income customers. | revenues, city analysis determined there may be cross-subsidization between rate classes<br>• Xcel has established a program to trade Renewable Energy Credits (RECs), largely to California; it initially proposed that it retain 30-40% of the profits with 60-70% going to customers—as compensation for engaging in high-risk trading—but the PUC adopted a closer to 80/20 customer/Xcel split, with the customers' share of the profits going to pay down the negative RESA balance. In 2010, the amount of the profit was over $30 million.<br>• Xcel has forecasted its estimated capital expenditure programs for the years 2013 through 2017. Over the next five years Xcel Energy is expecting to spend close to $3.5 billion on electric generation, transmission and distribution. This includes $793 million for projects associated with Colorado "Clean Air-Clean Jobs" Act.<br>• Coal costs at Xcel's newest and largest Colorado coal plant, Comanche 3, are currently increasing by more than 10 percent per year.<br>• Xcel CEO Ben Fowke announced in Minnesota that declines in energy sales and aging infrastructure will lead to increasing rates.<br>• Coal prices have increased significantly over the past 10 years, which suggests that Boulder customers are vulnerable to future price increases given Xcel's strong investments in coal. | the PUC. The city is in a better position to respond to its customers' unique needs and continues to explore governance models that will give customers a strong voice in decisions.<br><br>CONCERNS:<br>• The utility will need to develop innovative rate structures that balance the goal of reducing consumption and energy costs with generating sufficient revenue for operations and services provided.<br>• Rate design methodology and cost allocation structures are unique to individual utilities. Derivation of specific rates for Xcel is complex and all the data needed to complete this analysis is not available to the city. Additionally, rate increases and cost adjustments for Xcel versus a municipal utility would happen on different timing schedules. These factors could pose challenges in making equal comparisons over the short and long term. | |
| **10. Access to Programs and Services for All Customers**<br><br>Provide programs and incentives for all populations to participate in efficiency programs and distributed generation through efforts such as Community Solar Gardens, on-bill financing and choice of rate structure. | SUPPORTS THE GOAL:<br>• In 2011, Boulder residents and businesses purchased over 38,000 MWh from the Windsource program, or 18% of the more than 212,000 MWh Xcel sold to Colorado customers that year. At $2.16 per 100 kWh, that comes to an $821,000 investment in wind renewable energy credits (RECs).<br>• Xcel provides solar rebates to customers (More than 2,600 took advantage of solar rewards and will receive over time, $75.8 million in rebates for their roof-top solar installations)<br>• Se of online billing increased by 45% in 2011 saving time, money and paper.<br>• In 2012, 6 MW of community solar gardens (Community Solar*Rewards) were locked in almost immediately, allowing renewable access to renters and other customers who are unable to self-install solar PV.<br><br>CONCERNS:<br>• Customer financing is often a barrier to implementing energy efficiency or renewable energy programs. Xcel does not offer on-bill financing, a mechanism where the utility finances the improvement and the energy savings on the utility bill are used to repay the loan (see Qualitative Analysis Part 2 for more details). Financing provides greater access to programs and services.<br>• Ratepayers have limited, if any, say in what programs are offered, incentive levels for specific programs and services, and resulting rate impacts or designs.<br>• Many innovative programs and services require access to the distribution system. As owner of the system, Xcel does not provide this access to others. This limits the ability of local communities to retrofit and/or upgrade the system to access certain programs and services. An example is allowing customers with multiple locations (like the University of Colorado) to produce energy on one site and net their use and generation through a contract.<br>• A regulated utility must provide more generalized services that are designed from a top down view of its entire service area. Typically, what the investor-owned utility offers to one set of customers it must offer to all, making customization difficult.<br>• On-line bills are difficult to access. Many features in the on-line billing service are not fully functional such as downloading trends in energy usage. | SUPPORTS THE GOAL:<br>• The financial model assumes sufficient funding to replace Xcel's existing level of rebate and incentive programs. Further innovations could be considered for priority compared to other objectives of the local utility<br>• Local control over programs, rates, incentives and services would allow a municipal utility to be responsive to the goals and needs of the community.<br>• Local ownership of the distribution system allows a local utility to test new smart grid technology, microgrids, increased distributed generation, and demand response (See Qualitative Analysis Part 2 for details).<br><br>CONCERNS:<br>• Transferring Xcel's smart grid and solar/DSM rebate programs over to a municipal run utility has not been determined. There are concerns about the technology associated with smart grid, such as the smart meters being outdated and ineffective. And, although the city is committed to ensuring that individuals and businesses who are investing in solar will not be harmed if they later become customers of a Boulder utility, specific solar contract information between customers and Xcel has not been made available for the city to analyze. | N/A |
| **11. Minimize rate increases by managing the full range of costs and environmental impacts: See objectives in # 12.** | | | |

## Boulder Energy Future QUALITATIVE ANALYSIS Part One: Benefits and Concerns of Each Path

| Objective | The Status Quo: Xcel Energy | A Local Electric Utility: Boulder Light & Power | Partnership |
|---|---|---|---|
| **12. Increase Awareness and Understanding of Energy Related Issues**<br>• Improve community input and energy literacy.<br>• Provide assistance to understand energy conservation and efficiency measures and their impact on economic concerns.<br>• Support neighborhood energy planning, and an overall understanding of energy efficiency, renewable generation and workforce development. | SUPPORTS THE GOAL:<br>• Xcel's performance, related to customer satisfaction and outages, has improved significantly since 2006 when it was ranked last nationally among large utilities in a J.D. Power & Associates survey.<br>• Xcel posts a Corporate Social Responsibility annual report for stakeholders and ratepayers to understand economic, environmental, and social performance.<br>• Xcel offers educational resources, including lesson plans for the classroom, interactive energy games, renewable energy definitions, an explanation of their electric and gas operations as well as guided tours.<br>• Xcel has an A+ rating with the Better Business Bureau and 60 complaints filed within 3 years.<br>• Xcel has an ongoing pilot in which Denver-area customers receive Opower bills, which provide greater context on how their energy consumption compares to that of their neighbors.<br><br>CONCERNS:<br>• Xcel's bills and regulatory filings are not designed to be transparent to non-expert customers.<br>• Explaining how renewable energy investments interface with long-term investments in carbon based fuels can be complex and sometimes misleading as to the overall net impact. | SUPPORTS THE GOAL:<br>• The model includes proportionate funding for customer accounts and services staff to meet Xcel's current levels of DSM rebates with the addition of the Climate Action Plan tax to fund additional programs and services. All funding for education and awareness of programs and services would be tailored specifically to the Boulder community.<br>• Because the local electric utility would not be constrained to Xcel's existing billing software, it would have the ability to provide customers with billing information in transparent and meaningful ways, based on emerging best practices. The city already does this with its water utilities.<br>• The city has a strong history of educating residents, providing community outreach, and leveraging resources city-wide to create effective engagement with the community.<br>• A local utility would incorporate the city's Climate Commitment strategies that continue to reduce local emissions. An independent assessment of the City's demand side management (DSM) programs that have been funded through the City's Climate Action Plan Tax found that "Boulder has attained impressive energy savings and emission reductions, and is well positioned to achieve future emissions reduction targets." Further, RMI found that Boulder has "generated significant carbon savings at reasonable cost." (See report prepared by Rocky Mountain Institute for more details).<br>• Among other innovative DSM programs, Boulder is currently partnering with Pecan Street Research Institute to collect real-time energy usage data from homes and businesses in Boulder to test and validate what new efficiency programs and technology works and what doesn't. This consumer focused research will allow the city to enhance its demand-side efforts to be most effective.<br><br>CONCERNS:<br>• Understanding energy usage, efficiency program impacts, and personal choices around energy can be complex and difficult to communicate.<br>• It can be difficult to measure the impact of marketing and outreach on program participation. There is a need for constantly evolving approaches and techniques to customer engagement. | N/A |
| **RELIABLE ENERGY GOAL: Ensure a stable, safe and reliable energy supply** | | | |
| **13. Ensure Reliable Electric Power**<br>• Use industry standard criteria to track, predict and model system reliability.<br>• Ensure strict compliance with the North American Electric Reliability Corporation (NERC), the federal agency charged with enforcing reliability standards for utilities. | SUPPORTS THE GOAL:<br>• Current reliability performance is in the top half of United States power providers based on standard industry criteria.<br>  ○ System Average Interruption Duration Index (SAIDI): 85<br>  ✓ Reliability Warning Threshold (RWT) – 101.3<br>  ✓ 5-year average (2008-2012) – 88.64<br>  ○ System Average Interruption Frequency Index (SAIFI): 0.85<br>  ✓ 5-year average (2008-2012) – 0.89<br>• No deficiencies are known to exist in Xcel's compliance with the North American Electric Reliability Corporation (NERC) regulations. Xcel is an established NERC Transmission Service Provider and is subject to NERC and Western Electricity Coordinating Council (WECC) standards and enforcement. It adheres to NERC & WECC reliability criteria, as well as internal company criteria for planning studies.<br>• Xcel Energy has deployed an Outage Management System (OMS) and a Reliability Management Program (RMP) for the Boulder area that is required by the Colorado PUC and internal company criteria.<br><br>CONCERNS:<br>• Smartgrid was never fully deployed which limited the opportunities for outage management.<br>• Current reliability performance is not as good as Colorado Front Range municipal power providers such as Ft. Collins and Longmont. See Attachment F in the Feb. 26, 2013 City Council Study Session memo.<br>• The transmission system is constrained which limits Boulder's access to wind generation in | SUPPORTS THE GOAL:<br>• City Council established and voters approved reliability metrics that meet or exceed current Xcel reliability performance, including system average interruption duration & frequency indices (SAIDI and SAIFI) and compliance with the North American Electric Reliability Corporation (NERC) regulations.<br>  ○ System Average Interruption Duration Index (SAIDI): 85, see Attachment F in the Feb. 26, 2013 City Council Study Session memo.<br>  ○ System Average Interruption Frequency Index (SAIFI): 0.85, see Attachment F in the Feb. 26, 2013 City Council Study Session memo.<br>• Costs have been incorporated in the financial model to ensure that reliability metrics are met. This includes cost for 1) separating from the Xcel system, 2) start-up of the utility, 3) capital replacement, 4) energy resources, and 5) the human, organizational and financial resources that would be needed for ongoing administration, operation, maintenance, monitoring, control, dispatch, project management, customer service and response.<br>• Compliance with the American Public Power Association (APPA) Reliable Public Power Provider (RP3) program is anticipated and incorporated in the modeling assumptions. Program elements affecting reliability include 1) reliability indices collection, 2) reliability indices use, 3) mutual aid and NIMS, 4) disaster plan, and 5) standards, security and compliance.<br>• An outage management system (OMS) and Reliability Management Program will be established and executed.<br>• Financial modeling incorporates millions of dollars of funding to secure improved reliability through the undergrounding of distribution circuits and replacement of aging equipment and infrastructure.<br>• The city would become a NERC Load Serving Entity and a Distribution Service Provider subject to NERC and WECC (Western Electricity Coordinating Council) standards and enforcement. | **Information not available at time of this writing.**<br><br>**See section VI in July 23 study session memo.** |

| Boulder Energy Future QUALITATIVE ANALYSIS Part One: Benefits and Concerns of Each Path | | | |
|---|---|---|---|
| **Objective** | **The Status Quo: Xcel Energy** | **A Local Electric Utility: Boulder Light & Power** | **Partnership** |
| | Wyoming and certain areas of Colorado.<br>• In the event of a transmission grid failure, there is not adequate local generation to meet the city's electrical load demands. Examples of transmission grid failure include the Northeast United States in August 2003 and the Southwest United States in September 2011. | CONCERNS:<br>• The transmission system is constrained which limits Boulder's access to wind generation in Wyoming and certain areas of Colorado.<br>• In the event of a transmission grid failure, there is currently not adequate local generation to meet the city's electrical load demands. Examples of transmission grid failure include the Northeast United States in August 2003 and the Southwest United States in September 2011. | |
| **14. Provide Experienced and Professional Utility Management**, including:<br>• Ongoing investment in maintenance and system improvement<br>• A strong customer-service ethic in responding to emergencies<br>• Daily maintenance and long-term grid investment. | SUPPORTS THE GOAL:<br>• Xcel has deployed a Quality of Service (QOS) plan and is required to monitor and report parameters according to Colorado PUC regulations including:<br>1. Customer Complaints (see concerns/risks noted in 2012 report listed below)<br>2. Telephone Response (no concerns/risks noted in 2012 report)<br>3. Reliability Warning Threshold (RWT) (no concerns/risks noted in 2012 report)<br>4. Electric Continuity Threshold (ECT) (see concerns/risks noted in 2012 report listed below)<br>5. Electric Restoration Threshold (ERT) (no concerns/risks noted in 2012 report (See report)<br><br>CONCERNS:<br>• Grid intelligence, particularly on the customer side, was never fully deployed as anticipated as part of Smartgrid, which limited the opportunities for customer service and information.<br>• Customer complaints for 2012 were 0.31% compared with a 2007-2012 benchmark of 0.08%<br>• The Electric Continuity Threshold (ECT) was violated 1,042 times in the Boulder Region during 2012, requiring Xcel Energy to provide bill credits of over $52,000.<br>• Xcel is not attending to code violations including minimum clearance of over head power lines above public streets.<br>• There is evidence Xcel Energy is deferring electrical distribution system maintenance and capital replacement based on the age and condition of these assets (Attachment F-1 starting on p 95 of the February 26 Boulder City Council packet discusses existing system maintenance).<br>• Uncertainty associated with new technologies, cost recovery and risk aversion on the part of Xcel may discourage innovative grid investment.<br>• Xcel's legacy data communications and information management systems may complicate the implementation of grid investments. | SUPPORTS THE GOAL:<br>• Costs have been incorporated in the financial model sufficient to insure experienced and professional utility management.<br>• Compliance with the APPA Reliable Public Power Provider (RP3) program is anticipated and incorporated in the modeling assumptions. Program elements affecting this objective include safety, work force development and system improvement.<br>• A quality of service (QOS) plan will be established and executed.<br>• Existing City management and administrative systems including Supervisory Control and Data Acquisition, Geographic Information System, human resources, finance, information technology, utility billing, record management, asset management, constituent relationship management and emergency management will be leveraged and applied to the local electric utility.<br>• Financial modeling incorporates millions of dollars of funding for long-term grid investment through the undergrounding of distribution circuits and replacement of aging equipment and infrastructure according to best asset management and replacement practices.<br>• A smaller local utility can be more agile and nimble than a large entity, and can capitalize on local expertise and synergies with other public utilities (locally and nation-wide).<br>• "Rate Payers" would become clients / utility owners.<br>• According to the Charter requirements, businesses would have a strong representation in the Utility Board.<br>• An aggressive capital replacement program totaling over $81 million over 20 years for distribution system components has been included in the city's modeling of a local electric utility to overcome the perceived deficits in age and condition of existing assets.<br><br>CONCERNS:<br>• The current model relies heavily on three resources: gas, PV Solar and wind. In the long run, it will be desirable to have a geographically diverse resource portfolio. | N/A |
| **15. Effective System Redundancy & Load Management**<br>• Create redundant generation resources to ensure a stable energy supply.<br>• Create generation resources that provide high-quality electrical supply.<br>• Manage the peak load to minimize necessary investment in new generation resources. | SUPPORTS THE GOAL:<br>• Xcel Energy is required to file resource plans with the Colorado PUC and provide reliability for its generation system by maintaining an adequate supply of electric generation according to Western Electricity Council (WECC) and the Rocky Mountain Reserve Group (RMRG) requirements.<br>• The large scale of Xcel's generation resources and service area provides significant opportunities to manage this objective.<br>• Xcel Energy is subject to Senate Bill 100 which requires Utilities to continually evaluate and, if necessary, improve electric transmission facilities to meet the state's existing and future energy needs. It essentially seeks to expand Colorado's electric transmission system and promote the use of renewable resources. Xcel Energy is required to provide open access transmission service on a comparable and nondiscriminatory basis to the transmission service they provide themselves at rates approved by the FERC.<br><br>CONCERNS:<br>• Grid intelligence, particularly on the customer side, was never fully deployed which limited the opportunities for peak load demand response and demand side management.<br>• Traditional volumetric charges for electricity gives Xcel the incentive to increase sales and | SUPPORTS THE GOAL:<br>• Costs have been incorporated in the financial model for purchase of energy resources to meet this objective. This includes the cost of firmed power purchase agreements that would secure access to high quality and redundant generation and transmission facilities and a reserve margin of 15% to compensate for uncertainty surrounding future load forecast changes and resource contingencies such as generation or transmission-forced outages.<br>• A municipal utility would not have pre-existing investments in generating resources, which would allow it to use generation resources based on the most current technology, pricing and other factors required to meet this objective.<br>• A local utility can build in protection from fuel supply disruptions by developing a diverse portfolio of multiple short- and long-term power purchase agreements coupled with local generation resources. As one fuel source becomes cost-prohibitive due to availability or transmission availability, the utility could more quickly shift to another available resource.<br><br>CONCERNS:<br>• Colorado's transmission system is not sufficiently built out to serve areas that can produce large blocks of renewable power. Unless adequate transmission is available, new utility scale renewable energy projects are | N/A |

| Boulder Energy Future QUALITATIVE ANALYSIS Part One: Benefits and Concerns of Each Path | | | |
|---|---|---|---|
| **Objective** | **The Status Quo: Xcel Energy** | **A Local Electric Utility: Boulder Light & Power** | **Partnership** |
| | discourage energy conservation and distributed generation because they reduce sales. | less likely. These constraints may impact the associated costs and/or the location of available generation resources. There are efforts underway to expand Colorado's transmission capacity. In 2007, Senate Bill 100 established requirements for utilities to continually evaluate and, if necessary, improve electric transmission facilities to meet the state's existing and future energy needs. It essentially seeks to expand Colorado's electric transmission system and promote the use of renewable resources. See http://www.sb100transmission.com/ | |
| **16. Limit Fuel Supply Risks and Disruptions**<br>• Reduce reliance on fossil fuel sources that may be subject to supply shortages and price volatility – and in the case of renewable—intermittency.<br>• Take into account potential fuel supply risks and disruptions and provides suitable mechanisms to manage such risks. | SUPPORTS THE GOAL:<br>• Xcel has indicated that 24% of its portfolio will come from renewable energy by 2020, which diversifies the company's portfolio. As its generation resources become more diverse, the company is better prepared to manage risks associated with one particular fuel source.<br>• The company incorporates a Price Volatility Mitigation Adder ("PVM Adder") in evaluating bids submitted in the 2011 Electric Resource Plan to account for the volatile nature of natural gas prices as compared to the fixed pricing typically associated with other resource options such as wind or solar.<br><br>CONCERNS:<br>• Xcel has not projected more renewables in its portfolio beyond the minimum required by law. (Colorado's renewable energy standard is 30% by 2020; however, the company is allowed to take advantage of an "in-state multiplier," –i.e., for every kilowatt-hour of electricity provided by an in-state renewable resource, it counts as one and one quarter toward the renewable mandate—Xcel is allowed to provide the lower amount of 24% by 2020).<br>• Xcel does not currently plan to retire any Colorado coal plants (after the 2017 Clean Air Clean Jobs retirement/conversion of Cherokee and Valmont) until the 2030s and the largest coal plants won't be retired until 2041 (Pawnee in Brush) and 2069 (Comanche 3 in Pueblo). Xcel is currently spending over $300 million on old coal plants so that they can stay on line for another 2-3 decades. This is on top of the over $1 billion spent on the new Comanche 3 coal plant project in Pueblo (to serve the Boulder-Denver area) with the intention of operating it until 2069.<br>• Xcel's significant investments in coal-based generation resources constrains opportunities for it to invest in other cleaner generation resources.<br>• When over-generation prompts curtailment, Xcel is automatically compensated by rate-payers. There is no motivation to seek cost-saving solutions. | SUPPORTS THE GOAL:<br>• Costs have been incorporated in the financial model for development of energy resources to meet this objective. Modeling has shown that more than 50% of the power can be generated by renewable resources and meet all of the other Charter metrics under certain levels of stranded and acquisition costs.<br>• Limited existing generating resources and associated "sunk" costs from pre-existing investments allows a municipal utility to develop a portfolio based on the most current technology and cost-effective pricing.<br>• The modeling assumed that the local utility would use multiple strategic power purchase agreements coupled with local generation. This diversification of the fuel mix will help manage potential risk associated with specific fuel resources.<br><br>CONCERNS:<br>• Limitations of transmission capacity at the time of energy procurement and the costs of using the existing transmission system may constrain the location of specific generation resources. | N/A |

EXPLANATORY NOTES: Text in blue indicates link in online version. Guiding principles from the City Charter are referenced by Article XIII. The Energy Future Goals are referenced by goal number and objective.

# Boulder Energy Future Qualitative Analysis Part Two: Electric Utilities and Progressive Practices

This paper and appendix present an overview of progressive technologies and practices that align with Boulder's Energy Future goals. This second component of the Qualitative Analysis provides a menu of techniques that could be employed by either Xcel Energy, a local electric utility or through a partnership to advance the city's goal of providing the "electric utility of the future."

The technologies and practices are listed in the following categories:

1. Grid Modernization
2. Demand-Side Strategies
3. Customer Choice
4. Rate/ Financing Structure
5. Local Generation
6. Utility Business Model

These categories are defined below, followed by some sample technologies and practices—what they are, how and where they've been used, known results, and links to more information. The attached matrix includes a longer list of technologies and practices in each category, indicating which of Boulder's Energy Future goals each could address, where it has been implemented; and the extent to which it is technically and legally possible under either the Status Quo with Xcel Energy or a Municipal Utility.

## Category 1: Grid Modernization

The current electric grid uses many technologies that date back to the time of Thomas Edison, requiring the electricity industry to seek new ways in which power can be generated, delivered and used in ways that minimize environmental impacts, enhance markets, improve reliability and service, reduce costs and improve efficiency.

Utilities are beginning to modernize the electric grid through the gradual development of a future electricity system that will be cost effective, seamless from generation to end-use and capable of meeting all clean energy demands and capacity requirements. Key characteristics include: (1) significant scale-up of clean energy that is sensitive to impacts on consumer costs and economic prosperity; (2) opportunities for consumer participation and choice, from electric vehicles and energy efficiency to producing and selling electricity and services; (3) holistically designed solutions, including AC-DC transmission and distribution technologies, a mix of centralized and decentralized control, energy storage and microgrids; (4) two-way flows of energy and information; and (5) reliability, security against cyber and physical threats and resiliency to disruptions and outages.

<u>Example Technology: Microgrids</u>

Microgrids are essentially miniature versions of the electric grid, or the "macrogrid, with the addition of localized generation and energy storage. A microgrid draws upon a host of on-site generation sources, otherwise known as Distributed Energy Resources (DER), and links to the grid at common points. While a microgrid can operate seamlessly with the larger grid, its most

compelling feature is the ability to separate or isolate itself-- known as “islanding”-- from the macrogrid system.

Through the use of on-site generation and integration of renewable energy resources, microgrids are an innovative and strategic approach to energy management, bolstering energy reliability, stability, and sustainability.

Sample utilities utilizing this technology:

*American Electric Power, Sacramento Municipal Utility District, San Diego Gas & Electric*
http://www.fiercesmartgrid.com/story/pike-research-sees-aep-smud-and-sdge-microgrid-trendsetters/2011-05-24
*UC San Diego*
http://www.energy.ca.gov/research/notices/2010-10-25_symposium/presentations/4%20Microgrids%20for%20Distributed%20Renewables.pdf

**Category 2: Demand-Side Strategies**

Demand-side management is used to describe the actions of a utility, beyond the customer's meter, with the objective of altering the end-use of electricity – whether it be to increase demand, decrease it, shift it between high and low peak periods, or manage it when there are intermittent load demands – in the overall interests of reducing utility costs. In other words, DSM is the implementation of those measures that help the customers to use electricity more efficiently and in doing so reduce the utility costs. DSM can be achieved through:

- improving the efficiency of various end uses through better housekeeping, correcting energy leakages, system conversion losses, etc;
- developing and promoting energy efficient technologies; and
- demand management through adopting soft options like higher prices during peak hours, concessional rates during off-peak hours, seasonal tariffs, interruptible tariffs, etc.

DSM, in a wider definition, also includes options such as renewable energy systems, combined heat and power systems, independent power purchase, etc., that utilities can use to meet customer’s demand at the lowest possible cost.

Example Practice: Sustainable Energy Utility (SEU)

Whereas a traditional utility provides access to electricity, a SEU, working in parallel with the electric utility, provides access, information, and support for efficiency and sustainability measures. The revenues of traditional utilities are typically tied to their sales of energy, and therefore have little internal incentive to promote efficiency. Giving the responsibility to promote energy efficiency to an independent, but closely related, SEU (sometimes also called Energy Efficiency Utilities) can alleviate this conflict of interest.

Sample utilities employing this practice:

The SEU in Vermont is funded by an efficiency surcharge on electric bills, and revenues from emissions allowance trading and efficiency savings sales on capacity markets.[1] In the SEU's first seven years of operation, it helped 60 percent of the state's electric customers which led to a statewide electric load growth of -1.8 percent.[2]

*Efficiency Vermont*
[1] http://www.efficiencyvermont.com/about_us/information_reports/how_we_work.aspx
[2] http://spectrum.ieee.org/green-tech/conservation/the-rise-of-the-energy-efficiency-utility
*Delaware* http://www.energizedelaware.org/
*DC* http://www.dcseu.com/
*Oregon* http://energytrust.org/
*Wisconsin* http://www.focusonenergy.com/

Example Practice: Demand Response Programs

Demand response programs encourage customers to reduce consumption during peak periods (such as the warmest part of a summer day) in favor of off-peak consumption. The net effect is not so much a reduction in total consumption (as with efficiency), but a leveling of the demand profile. This is of benefit to the utility because power plants and transmission systems must all be designed to meet peak demand. Preventing growth in the peak demand, or even reducing the magnitude of the peaks, can forestall the need to build more power plants and expand transmission systems – both of which require significant capital investment that is ultimately passed on ratepayers.

Once a smart meter is installed, demand response programs (such as time of use pricing) may be implemented on a voluntary basis – not everyone need participate. Initial reviews indicate that developing a fair time-based rate structure can be challenging, but not insurmountable.

*Demand response challenges* http://www.emeter.com/smart-grid-watch/2012/time-of-use-electricity-prices-why-do-so-few-customers-have-them/
*PG&E – time of use pricing* http://www.pge.com/mybusiness/energysavingsrebates/timevaryingpricing/timeofusepricing/
*SDG&E – peak time rebates* http://www.sdge.com/save-money/reduce-your-use/reduce-your-use-rewards
*Open Demand Response Standard* http://en.wikipedia.org/wiki/Open_Automated_Demand_Response

## Category 3: Customer Choice

Customer (or community) choice in energy is typically adopted into law and allows cities and counties to aggregate the buying power of individual customers within a defined jurisdiction in order to secure alternative energy supply contracts. Under these programs, electricity distribution providers often still operate and maintain the infrastructure to deliver the electricity and coordinate billing: these costs constitute the "distribution charge" on a customer's bill. The third-

party suppliers arrange for the supply of electricity, and it is this "commodity" or "energy" part of the bill where customers can potentially gain savings.

Today, retail customer choice in electricity is no longer an experiment. In 16 states and the District of Columbia, jurisdictions that account for over 40 percent of all electricity consumption in the continental United States, customer electricity choice is well established and widely accepted.

Example Technology: Community Choice Aggregation

Two communities that have implemented community choice aggregation are Oak Park, IL and Sonoma County, CA. They both have formed local groups that seek to fulfill their community's electric power needs by purchasing power on the open markets. Under this system, renewable sources are expected to meet between 33 and 100 percent of their energy needs while saving customers up to 25 percent on their energy bills. Programs such as these are only possible if the regulatory environment allows.

Sample Communities where CCA is allowed and practiced:

*Sonoma*
http://www.scwa.ca.gov/scp-faqs/
*Oak Park*
http://www.oak-park.us/aggregation/
*PG&E strong opposed community choice aggregation in California*
http://ballotpedia.org/wiki/index.php/California_Proposition_16,_Supermajority_Vote_Required_to_Create_a_Community_Choice_Aggregator_%28June_2010%29

## Category 4: Rate/ Financing Structure

There are a number of creative financing structures and electric rate designs that can play an important role in reducing local greenhouse gas emissions, promoting energy efficiency improvements in buildings, making the shift to renewable sources of energy more affordable, and reducing energy costs for residents and businesses. Financing vehicles such as general improvement districts, Power Purchase Agreements (PPAs), third-party models, on-bill and PACE financing, etc. create new opportunities for local ownership in distributed energy generation through innovative program designs (clean energy clusters, zero energy districts, solar gardens, etc.).

Example Practice: Innovate Rate Structures

There is great variety and room for much innovation in the way electric rates and their associated bills are structured. These are just a few of the more interesting approaches.

*Inverted Block Rate Structure*

When electricity rates are structured using an inverted block system, the more kilowatt-hours you use, the more you pay on a per kilowatt-hour basis. This is similar to the current federal income

tax structure. The benefit of this system is that it encourages conservation among those who consume the most. For those with large bills, making just moderate efficiency improvements can result in significant savings. Some care needs to be taken to ensure all customers are treated fairly across different income brackets and user types (residential, commercial, and industrial), but this can be achieved, for example, using multiple, parallel rate profiles.

Sample Communities with these practices:

*Iowa* http://www.iowapolicyproject.org/2009docs/090617-EnergyRates-xs.pdf
*Seattle – comparison*
http://www.seattle.gov/citylightreviewpanel/documents/SAIC%20SCL%20Review%20Panel%20Presentation%20October%2025%202012.pdf

*Comparative Billing*

Comparative billing allows customers to compare their energy use to other users to see where they stack up against averages in their community, region or nationwide. Such bills often include other useful or interesting statistics about how their energy use has changed over time or with respect to weather events. The data of neighbors are presented anonymously, in aggregate, to ensure privacy. With the use of smart meters, such data could be presented online on or mobile devices in nearly real time.

Being presented with energy consumption comparisons in this way helps customers better understand their energy use, and the comparative rankings can invoke a sense of competition in implementing efficiency and conservation practices.

Sample Communities utilizing this practice

*Glendale, CA*
http://www.glendalewaterandpower.com/save_money/residential/home_energy_reports.aspx
*Opower* http://opower.com/
*NYT* http://www.nytimes.com/2009/01/31/science/earth/31compete.html?_r=0

*Prepaid Bills*

With prepaid billing, customers pay for their energy use prior to using it (similar to prepaid cellphone plans). When their prepaid account balance runs low. customers are notified that they need to add more funds – which can usually be accomplished through a variety of means (online, by phone, in kiosks, etc). One of the benefits of this type of system is that it encourages customers to closely monitor their energy use and therefore promote conservation and efficiency. Watching a fixed balance run down, rather than a bill run up is often a stronger motivator – analogous to paying with cash rather than with a credit card. Some customers have found this makes budgeting easier. Special care must be given to properly protect customers with low- or fixed-incomes or who have medical conditions or children, but policies can be implemented to address these concerns.

Sample communities utilizing this approach:

*Salt River Project* http://www.srpnet.com/payment/mpower/default.aspx
*AARP* http://www.aarp.org/politics-society/advocacy/info-12-2011/prepay-for-electricity-az.html
*Media – Popularity increasing* http://www.greentechmedia.com/articles/read/Prepaid-Electricity-Plans-Gain-Momentum

## Category 5: Local Generation

The electricity grid faces significant problems resulting from fundamental design principles that limit its ability to handle the key energy challenges of the 21st century. An innovative electric system allows for the integration of generation from decentralized or 'localized" options. Such a system is controlled by intelligent power switches (IPS), and can consist of loads, energy sources and energy storage. The desired result of the proposed architecture is to produce a grid network designed for distributed renewable energy, prevalent energy storage and stable autonomous systems.

Example Technology: Solar Gardens
Solar gardens are one example of local generation that has already been implemented, to some degree, in the Boulder community and could be greatly expanded. Solar gardens, like community vegetable gardens, allow a group of users to pool their resources for construction and maintenance and then be credited the benefits in proportion to the amount they invested. This has all of the distributed-energy benefits of installing solar panels on rooftops with added advantages from economies of scale related to maintenance costs, infrastructure and siting away from trees and other buildings that could block the sun. In addition, clean-energy ownership and credits derived from solar gardens are available to renters, apartment dwellers and others who don't have access to a roof suitable for installation of a solar array.

Sample communities utilizing this technology:

*Boulder's community garden*
https://bouldercolorado.gov/pages/april-26-2013-city-celebrates-opening-of-first-community-solar-garden-since-legislative-approval-reiterates-its-commitment-to-solar-technology-and-incentives
*Bright Tucson Community Solar*
https://www.tep.com/renewable/home/bright/

Example Technology: Distributed Generation

Distributed generation allows electricity to be generated closer to the load rather than in large, centrally located power plants. While this can reduce some of the savings and efficiencies that come with economies of scale in large power plants, distributed generation has benefits of its own. For example, having multiple generation sources improves redundancy, creating possibilities for microgrid configurations. And locating those sources closer to the electric loads reduces transmission costs.
Utilities can implement distributed generation programs in various ways. Some choose to own the distributed resources while others encourage customer ownership through mechanisms like

rebates, feed-in-tariffs, and net-metering while still others adopt a hybrid approach, such as leasing solar panels to customers.

Samples of communities utilizing this practice:

*Gainesville, FL* http://grist.org/solar-power/2012-01-06-gainesville-florida-becomes-a-world-leader-in-solar/
*Concord Light – PV Rebates* http://www1.eere.energy.gov/office_eere/pdfs/aceti_concordlight.pdf
*Austin – Residential Solar Program* http://www1.eere.energy.gov/office_eere/pdfs/libby_austinenergy.pdf
*California – Self Generation Incentive Program* http://www.cpuc.ca.gov/PUC/energy/DistGen/sgip/
*SolarCity* http://www.dailyfinance.com/2013/06/05/solarcity-launches-zero-down-solar-financing-for-h/

## Category 6: An Updated Utility Business Model

Today's electric utilities face unprecedented challenges. On top of the traditional goals of safety, efficiency and reliability, the modern utility must address global environmental issues such as climate change, national security issues surrounding the dependence on foreign energy, and a growing desire by customers to have greater control over their energy use decisions to lower costs and decrease their environmental footprint.

Meeting customers' demands to turn these challenges into opportunities requires transformation of the traditional electric utility business model. Delivering safe and reliable electricity will always form the bedrock of what utilities do, but the modern utility must expand its vision and adapt to changing circumstances and adopt a new business model that doesn't rely on electricity sales to drive profits.

Example Technology: Research Partnerships

Utilities may leverage local and national research laboratories and private corporations to test innovative technologies. These research projects and pilot demonstrations often involve multiple organizations and sources of funding – including federal grants.

Sample communities:

*Pacific Northwest Smart Grid Demonstration* http://www.pnwsmartgrid.org/
*Xcel – NCAR research partnership* http://www.denverpost.com/business/ci_23194076/xcel-benefits-from-ncar-solar-wind-forecasting
*RASEI* http://rasei.colorado.edu/about-us
*S. Carolina wind project partnership* http://clemsonenergy.com/scoffshore/wind-programs/

ATTACHMENT E

**Boulder Energy Future Qualitative Analysis: Part 2**

Technologies and Practices for Achieving Boulder's Energy Future Goals

- **Promotes goal or objective**
- **Technically and legally possible under current regulatory and statutory requirements**
- **Technically and legally possible under current regulatory and statutory requirements, but requires Xcel Energy partnership**
- **May require regulatory approval in addition to Xcel Energy partnership**
- **Not technically or legally possible under current regulatory and statutory requirements**

| | Technology or Practice<br>*see References Section at bottom for notes and links to examples | Description | Energy Future Goals | | | | | | Authority | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stable, safe, reliable energy supply | Competitive rates (short / long term) | Reduce carbon emissions, improve environmental quality | Greater customer say about energy supply | Promote local economic vitality | Promote social and environmental justice | Status Quo | Local Electric Utility |
| **Section 1: Grid Modernization** | | | | | | | | | | |
| 1 | Deployment of local microgrids | *Subsections of the grid which can operate independently for periods of time* | ■ | ■ | ■ | ■ | ■ | ■ | ⚠ | ✓ |
| 2 | Prioritizing critical loads in system design | *Higher reliability for critical loads using microgrids, smart load shedding, storage, etc* | ■ | | | ■ | ■ | ■ | 🤝 | ✓ |
| 3 | Aggresive undergrounding of electric lines | *Burying electric cables to increase reliability* | ■ | | | | ■ | | 🤝 | ✓ |
| 4 | Enhanced voltage optimization | *Fine-tuning the end-of-line voltage to improve efficiency for industrial customers* | ■ | ■ | ■ | | ■ | | 🤝 | ✓ |
| 5 | Wireless internet utilizing AMI | *Using extra bandwidth or channels on smart meters to provide a public wifi network* | | | | | ■ | ■ | ⚠ | ✓ |
| **Section 2: Demand-Side Strategies** | | | | | | | | | | |
| 6 | Demand-response technologies | *Changes in customer use triggered by price or environmental triggers* | ■ | ■ | ■ | ■ | ■ | ■ | 🤝 | ✓ |
| 7 | Development of programs and services to shed load | *Dynamically removing specific loads to reduce peak demand* | ■ | ■ | ■ | | ■ | | ⚠ | ✓ |
| 8 | Energy savings performance contracts | *Contractor's pay dependent on success in saving energy* | ■ | ■ | ■ | | ■ | ■ | 🤝 | ✓ |
| 9 | Zero Energy districts | *A physical region with zero net energy consumption* | ■ | ■ | ■ | ■ | ■ | ■ | 🤝 | ✓ |
| 10 | Customer access to In-home energy use tools and dashboards | *Physical or virtual displays showing customer's real-time or aggregate energy use* | | | ■ | ■ | | | ✓ | ✓ |
| 11 | Progressive energy conservation and efficiency programs | *Programs promoting or incentivizing conservation and efficiency* | ■ | ■ | ■ | | ■ | ■ | ✓ | ✓ |
| **Section 3: Customer Choice** | | | | | | | | | | |
| 12 | Community Choice Aggregation | *Residents enter power purchase agreements directly as a group. Not currently available in CO.* | ■ | ■ | ■ | ■ | | | ✗ | ✗ |
| 13 | Customer information services and programs | *Centrally sponsored energy literacy and education programs* | | | ■ | ■ | ■ | ■ | 🤝 | ✓ |
| **Section 4: Rate/ Financing Structure** | | | | | | | | | | |
| 14 | Innovative rate structures | *Time-of-use, tiered, demand, budget billing, etc* | ■ | ■ | ■ | | ■ | ■ | ⚠ | ✓ |
| 15 | Local energy financing | *Financing for local ownership of efficiency upgrades and distributed generation* | | ■ | ■ | ■ | | ■ | ⚠ | ✓ |
| **Section 5: Local Generation** | | | | | | | | | | |
| 16 | Net metering in excess of 120% | *Customers are not limited in on-site energy production* | ■ | ■ | ■ | ■ | ■ | ■ | ⚠ | ✓ |
| 17 | Unbundled rates and service applications | *Segregation of individual electricity bill components* | | | | ■ | ■ | ■ | ⚠ | ✓ |
| 18 | Feed-In-tariffs (FIT) | *Mandated rates at which customers may sell power back to the grid* | ■ | ■ | ■ | ■ | ■ | | ⚠ | ✓ |
| 19 | Wheeling power from city-owned resources | *Access to remotely located power from remotely owned generation such as hydro* | ■ | ■ | ■ | ■ | | | ✓ | ✓ |
| 20 | Pumped storage | *Storing off peak, cheap energy in a pumped hyrdo reservoir system* | ■ | ■ | ■ | | ■ | ■ | 🤝 | ✓ |
| 21 | In–line micro hydroelectric generation | *In-line generation incorporated into existing water delivery system* | ■ | ■ | ■ | | ■ | ■ | 🤝 | ✓ |
| 22 | Utility–scale energy storage | *Large scale storage utilized to reduce peak loads* | ■ | ■ | ■ | ■ | ■ | | 🤝 | ✓ |

ATTACHMENT E

**Boulder Energy Future Qualitative Analysis: Part 2**

Technologies and Practices for Achieving Boulder's Energy Future Goals

- **Technically and legally possible under current regulatory and statutory requirements**
- **Technically and legally possible under current regulatory and statutory requirements, but requires Xcel Energy partnership**
- **May require regulatory approval in addition to Xcel Energy partnership**
- **Not technically or legally possible under current regulatory and statutory requirements**

| | Technology or Practice<br>*see References Section at bottom for notes and links to examples | Description | Energy Future Goals | | | | | | Authority | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stable, safe, reliable energy supply | Competitive rates (short / long term) | Reduce carbon emissions, improve environmental quality | Greater customer say about energy supply | Promote local economic vitality | Promote social and environmental justice | Status Quo | Local Electric Utility |
| 23 | Biogas/biomass generation facilities | *Utilizing municipal or agricultural waste to produce energy* | | | | | | | ⚠ | ✓ |
| 24 | Widespread deployment of electric vehicles and Vehicle-to-Grid technology | *Charging and discharging electric vehicles for energy storage and grid stability* | | | | | | | ⚠ | ✓ |
| 25 | Ownership options in utility-scale renewable power projects | *Fully owning or purchasing portions of large wind or solar power installations* | | | | | | | ⚠ | ✓ |
| 26 | Customized rebates and incentives based on local needs | *Incentivizing local DSM and generation options* | | | | | | | ⚠ | ✓ |
| 27 | Expand solar gardens beyond existing restrictions | *Enhanced access to solar gardens beyond existing limits* | | | | | | | ⚠ | ✓ |
| **Section 6: Utility Business Model** | | | | | | | | | | |
| 28 | Sustainability performance metrics | *Mechanism for measuring progress toward goals and standardizing verified results* | | | | | | | 🤝 | ✓ |
| 29 | Social Impact Bond / Pay for Success Bonds | *Bond for which the rate of return depends on the success of the social impact* | | | | | | | ⚠ | ✓ |
| 30 | Renewable Energy Credits (RECs) | *Buying and selling renewable credits to meet portfolio standards* | | | | | | | ✓ | ✓ |
| 31 | Advanced Integrated Resource Planning (AIRP) | *Planning for fuel and resource needs with an eye toward conservation as a resource* | | | | | | | ⚠ | ✓ |
| 32 | Utility model that prioritizes energy use reductions | *An entity charged with meeting efficiency or sustainability goals rather than making profit* | | | | | | | 🤝 | ✓ |
| 33 | Secure funding for pilot programs | *Federal funding available for some types of energy projects* | | | | | | | ✓ | ✓ |
| 34 | Comparative Bills / Peer Ranking | *Showing customers where their energy consumption ranks against their peers* | | | | | | | 🤝 | ✓ |
| 35 | Consideration of full life-cycle costs | *Adopting a long-term view of life-cycle costs and benefits* | | | | | | | ⚠ | ✓ |
| 36 | Research Partnerships | *Leveraging local and/or national research labs to explore innovative practices* | | | | | | | ✓ | ✓ |

**REFERENCES**


| | |
|---|---|
| 1 | http://smartgrid.ieee.org/august-2012/647-smart-grid-implementation-in-sacramento<br>http://smartgrid.ieee.org/november-2012/696-epri-smart-grid-demonstrations-an-update |
| 2 | http://www.smartgridnews.com/artman/publish/Delivery_Microgrids/Microgrids-focus-on-security-creating-needs-for-UPS-storage-5795.html/#.UbCyKqA5TRG<br>http://www.energy.ca.gov/research/notices/2010-10-25_symposium/presentations/4%20Microgrids%20for%20Distributed%20Renewables.pdf |
| 3 | http://www.npr.org/2012/02/01/146158822/if-power-lines-fall-why-dont-they-go-underground |
| 4 | http://www.smartgridnews.com/artman/publish/Delivery_Grid_Optimization/Voltage-optimization-drumbeat-continues-Cooper-wins-significant-AEP-demo- |
| 5 | http://santaclarafreewifi.com/about.html |
| 6 | http://www.sdge.com/save-money/reduce-your-use/reduce-your-use-rewards |
| 7 | http://ucsdnews.ucsd.edu/newsrel/general/08-30DemandResponse.asp<br>http://en.wikipedia.org/wiki/Open_Automated_Demand_Response |
| 8 | http://en.wikipedia.org/wiki/Energy_Savings_Performance_Contract<br>http://www.ctenergyinfo.com/111003%20Final%20CT%20ESPC%20Best%20Practices-1.pdf |
| 9 | http://fortzed.com/ |
| 10 | http://www.greenbuildingadvisor.com/blogs/dept/musings/home-dashboards-help-reduce-energy-use |
| 11 | http://www.energy.ca.gov/research/notices/2010-10-25_symposium/presentations/4%20Microgrids%20for%20Distributed%20Renewables.pdf<br>https://www.gru.com/TabID/3662/Default.aspx<br>http://www.glendalewaterandpower.com/save_money/residential/sh_energy_saving_rebates.aspx<br>http://www.glendalewaterandpower.com/save_money/residential/ac_tuneup.aspx<br>http://www.glendalewaterandpower.com/save_money/large_business/incentives_program.aspx |
| 12 | http://www.scwa.ca.gov/cca/<br>http://www.oak-park.us/aggregation/<br>http://ballotpedia.org/wiki/index.php/California_Proposition_16,_Supermajority_Vote_Required_to_Create_a_Community_Choice_Aggregator_%28June_2010%29 |
| 13 | http://www.naperville.il.us/eec.aspx<br>http://www.energyedcouncil.org/ |
| 14 | http://www.iowapolicyproject.org/2009docs/090617-EnergyRates-xs.pdf<br>http://www.seattle.gov/citylightreviewpanel/documents/SAIC%20SCL%20Review%20Panel%20Presentation%20October%2025%202012.pdf<br>http://smartgrid.ieee.org/august-2012/647-smart-grid-implementation-in-sacramento<br>http://www.greentechmedia.com/articles/read/oklahoma-gas-electric-is-not-scared-of-the-home<br>http://thegazette.com/2011/11/02/battle-brewing-over-prepaid-electric-meters/<br>http://www.srpnet.com/payment/mpower/default.aspx<br>http://www.aarp.org/politics-society/advocacy/info-12-2011/prepay-for-electricity-az.html<br>http://www.greentechmedia.com/articles/read/Prepaid-Electricity-Plans-Gain-Momentum |

**Technically and legally possible under current regulatory and statutory requirements**

**Technically and legally possible under current regulatory and statutory requirements, but requires Xcel Energy partnership**

**May require regulatory approval in addition to Xcel Energy partnership**

**Not technically or legally possible under current regulatory and statutory requirements**

| Technology or Practice | Description | Energy Future Goals | | | | | | Authority | |
|---|---|---|---|---|---|---|---|---|---|
| *see References Section at bottom for notes and links to examples | | Stable, safe, reliable energy supply | Competitive rates (short / long term) | Reduce carbon emissions, improve environmental quality | Greater customer say about energy supply | Promote local economic vitality | Promote social and environmental justice | Status Quo | Local Electric Utility |
| 15 | https://www.gru.com/TabID/3660/Default.aspx<br>http://www.realenergywriters.com/ee-blog/2011/12/15/on-bill-financing-why-isn%E2%80%99t-everybody-doing-it/<br>http://aceee.org/research-report/e118<br>http://energy.ky.gov/Programs/SEE%20KY/March%202012%20Meeting/Residential/ACEEE_On-Bill%20FInancing%20Review_Dec%202011.pdf<br>http://switchboard.nrdc.org/blogs/phenderson/new_on-bill_financing_paper_ou.html<br>http://www.cityofdenton.com/departments-services/departments-a-f/denton-municipal-electric/customer-programs/p-l-u-s-one | | | | | | | | |
| 16 | http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA02R&re=1&ee=1 | | | | | | | | |
| 17 | http://blog.rmi.org/blog_06_12_2013_retail_electricity_prices_its_time_to_unbundle_the_package | | | | | | | | |
| 18 | http://grist.org/solar-power/2012-01-06-gainesville-florida-becomes-a-world-leader-in-solar/<br>http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=FL77F&re=1&ee=1 | | | | | | | | |
| 19 | [would allow the city to utilize it's owned hydro power rather than selling to Xcel at wholesale and purchasing back at retail] | | | | | | | | |
| 20 | http://www.sbireports.com/about/release.asp?id=2942 | | | | | | | | |
| 21 | http://americancityandcounty.com/water/public-water-system-hydropower-201105 | | | | | | | | |
| 22 | http://www.bloomberg.com/news/2013-05-23/pg-e-operating-second-energy-storage-system-with-ngk-batteries.html | | | | | | | | |
| 23 | http://www.ameresco.com/news/first-mover-wastewater-utilities-convert-human-biogas-natural-gas | | | | | | | | |
| 24 | http://www.glendalewaterandpower.com/utility_modernization/electric_vehicle_rebate.aspx | | | | | | | | |
| 25 | http://www.awea.org/newsroom/pressreleases/utilitiesflocktowind.cfm<br>http://www.governorswindenergycoalition.org/?p=990 | | | | | | | | |
| 26 | http://www.bloomberg.com/news/2013-03-24/nrg-skirts-utilities-taking-solar-panels-to-u-s-rooftop.html<br>http://en.wikipedia.org/wiki/SolarCity<br>http://www1.eere.energy.gov/office_eere/pdfs/aceti_concordlight.pdf<br>http://www1.eere.energy.gov/office_eere/pdfs/libby_austinenergy.pdf<br>http://www.icleiusa.org/action-center/learn-from-others/bringing-down-the-cost-of-solar-through-community-shared-solar-programs<br>http://www.cpuc.ca.gov/PUC/energy/DistGen/sgip/<br>http://www.dailyfinance.com/2013/06/05/solarcity-launches-zero-down-solar-financing-for-h/ | | | | | | | | |
| 27 | https://www.tep.com/renewable/home/bright/ | | | | | | | | |
| 28 | http://en.wikipedia.org/wiki/Global_Reporting_Initiative<br>http://www.xcelenergy.com/staticfiles/xe/Corporate/CRR2011/gri-index/about.html<br>http://www.smartgridnews.com/artman/publish/Business_Policy_Regulation/The-good-and-the-bad-about-the-Illinois-smart-grid-performance-metrics-5786.html#.UbYrZ_nVB5s | | | | | | | | |
| 29 | http://en.wikipedia.org/wiki/Social_impact_bond<br>http://www.economist.com/blogs/blighty/2013/05/prisoner-rehabilitation?fsrc=scn/tw_ec/the_peterborough_principles | | | | | | | | |
| 30 | http://biomassmagazine.com/articles/5491/renewable-energy-certificates-and-renewable-portfolio-standards | | | | | | | | |
| 31 | http://aceee.org/policy-brief/utility-initiatives-integrated-resource-planning<br>www.raponline.org/document/download/id/6368 | | | | | | | | |
| 32 | http://spectrum.ieee.org/green-tech/conservation/the-rise-of-the-energy-efficiency-utility<br>http://www.veic.org/index.aspx<br>http://greatergreaterwashington.org/post/18586/dc-sustainable-energy-utility-saves-energy-and-creates-jobs/<br>http://aceee.org/sector/state-policy/delaware<br>http://www.energizedelaware.org/<br>http://www.energizedelaware.org/<br>http://www.dcseu.com/<br>http://energytrust.org/<br>http://www.focusonenergy.com/ | | | | | | | | |
| 33 | http://www.pnwsmartgrid.org/ | | | | | | | | |
| 34 | https://social.opower.com/welcome<br>http://www.glendalewaterandpower.com/save_money/residential/home_energy_reports.aspx<br>http://www.nytimes.com/2009/01/31/science/earth/31compete.html?_r=0 | | | | | | | | |
| 35 | http://www1.eere.energy.gov/femp/pdfs/lcc_guide_05.pdf<br>http://www.synapse-energy.com/Downloads/SynapseReport.2013-06.RAP.Best-Practices-in-IRP.13-038.pdf | | | | | | | | |
| 36 | http://www.pnwsmartgrid.org/<br>http://www.denverpost.com/business/ci_23194076/xcel-benefits-from-ncar-solar-wind-forecasting<br>http://rasei.colorado.edu/about-us<br>http://clemsonenergy.com/scoffshore/wind-programs/ | | | | | | | | |