A Strategic Energy Plan for

City and County of Denver Municipal Facilities 100% Renewable Electricity Goal

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Final Plan

ENERGY OFFICE

DENVER GENERAL SERVICES

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Executive Summary

This Strategic Energy Plan was developed by the City and County of Denver and Xcel Energy, through the Partners in Energy community energy planning offering. The plan focuses on Denver's goal to achieve 100% renewable electricity for municipal buildings by 2025.

City and County of Denver facilities use 368 GWh of electricity annually out of 6,852 GWh of electricity used community-wide (Xcel Energy, 2018). City and County of Denver's electricity use can be broken down into four categories: municipal buildings (31%), Denver International Airport operations (45%), streetlights (18%), and other (6%). This Strategic Energy Plan focuses on achieving 100% renewable electricity for the municipal building category. However, the plan is replicable and could be expanded in future phases to include the airport, zoo, and other enterprise-funded facilities.

The 256 buildings included in this plan use 112 GWh of electricity per year, representing $9.5 million in electricity costs across more than 10 million sq ft of building space. Achieving the 100% renewable electricity goal for these buildings would reduce the City and County of Denver's annual carbon footprint by 62,000 $MTCO_2e$, approximately equivalent to the carbon emitted from 13,400 passenger vehicles per year.

The City and County of Denver regularly participates in demand-side management (DSM) programs offered by Xcel Energy. From 2015-2017, approximately 9.8 GWh of electricity were saved annually through these programs. In addition, beginning in 2019, the City and County of Denver entered into agreements with Xcel Energy through the Renewable*Connect® program for approximately 11.1 GWh of renewable energy, representing 10% of 2018 electricity use. The City and County of Denver also participates in Xcel Energy's Solar*Rewards® program (1.5 GWh generated from rooftop installations) and Solar*Rewards Community® program (8.7 GWh generated through subscriptions to three community solar gardens). The City and County of Denver retain the renewable energy credits through the Renewable*Connect program but not the Solar*Rewards programs.

Building from this strong foundation of energy management, the plan contains eight strategies to achieve 100% renewable electricity. The strategies are organized into three focus areas to reduce energy use in existing buildings, mitigate load growth from new buildings, and supply electricity through renewable sources (**Figure 1**).

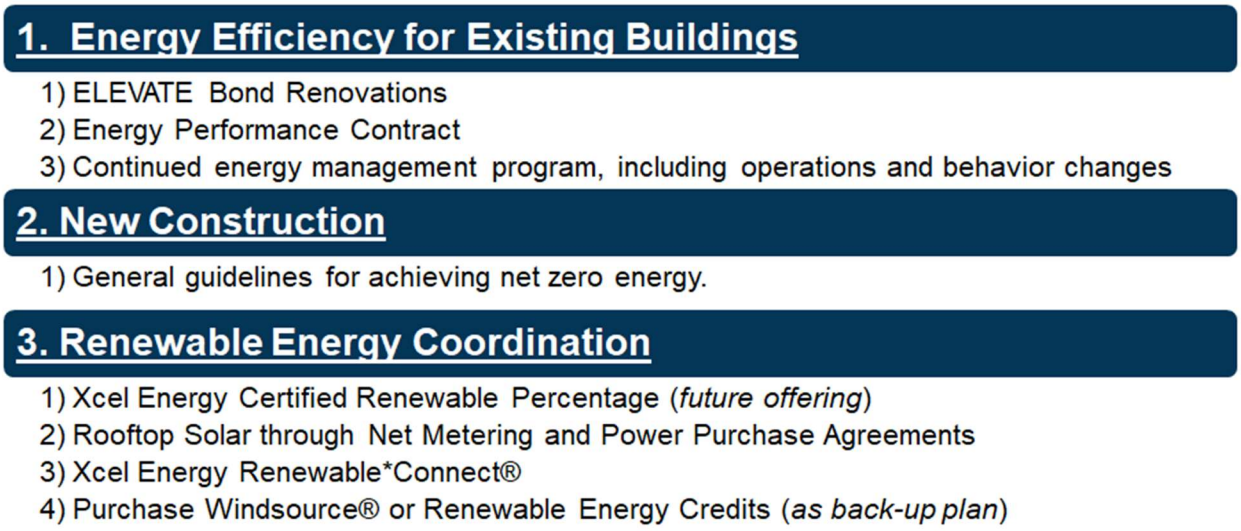

Figure 1. Focus Areas and Strategies to Achieve 100% Renewable Electricity

Each strategy was analyzed to determine its range of potential contribution to the 100% renewable electricity goal. The combined maximum potential of the strategies exceeds 100% of baseline energy use, providing flexibility in the pathway for achieving the 100% renewable electricity goal as planning assumptions are confirmed and implementation results inform the plan from year to year. Initial working targets were established for each strategy, with energy contributions shown in the waterfall diagram in **Figure 2**.

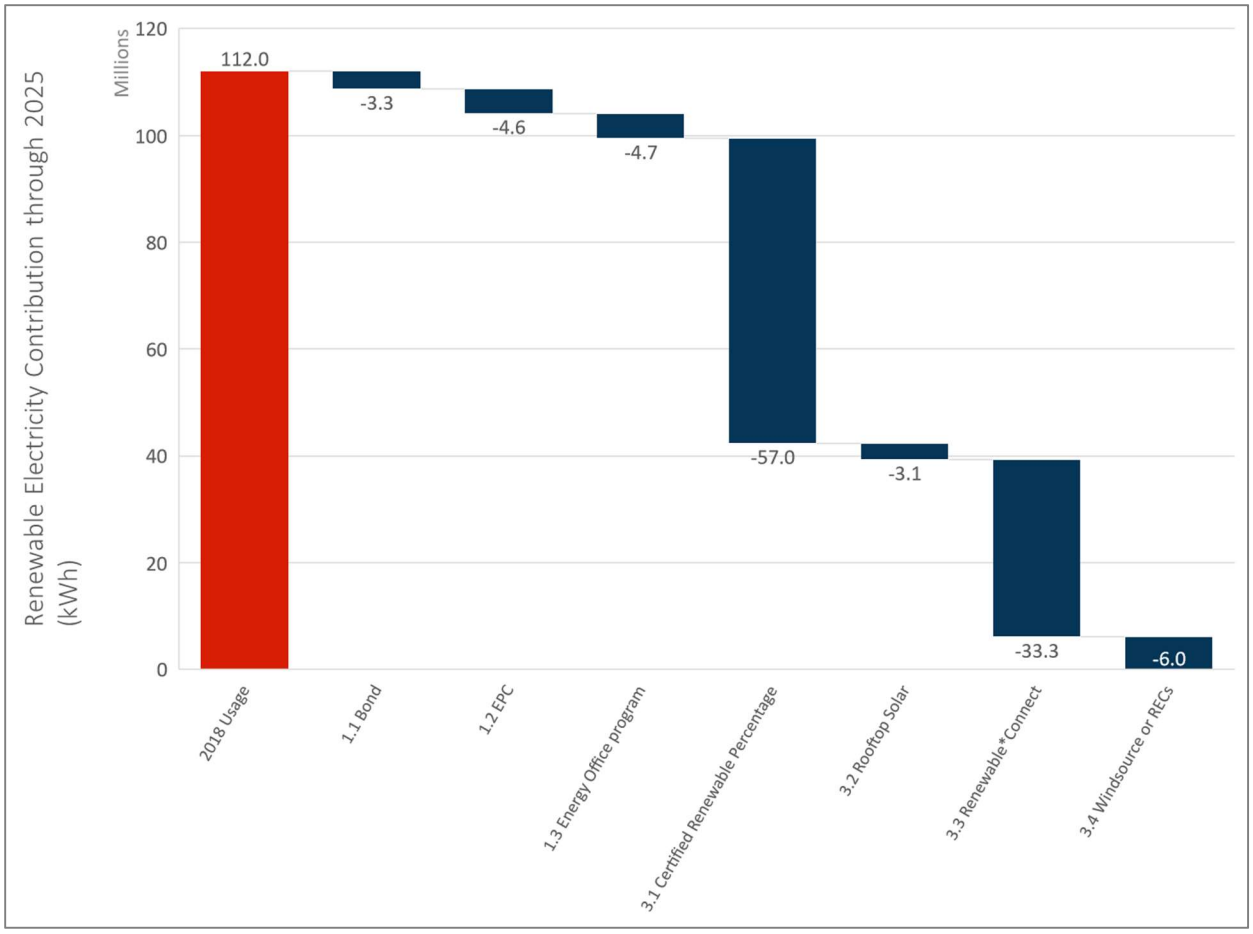

Figure 2. Energy Modeling Results (Initial Planning Targets)

Energy efficiency strategies are expected to deliver 12.6 GWh of electricity savings (11% of baseline electricity use) and will result in over $1 million per year of electricity savings. To achieve these savings, $26 million in investment is required, $1.4 million of which would come from Xcel Energy DSM incentives. Approximately 40% of the $26 million would come from capital budgets through the Elevate Denver bond initiative, Parks 2A funding, and other capital planning efforts. The remainder would be accessed through an energy performance contract requiring $570,000 up-front for technical energy audits and $14.4 million to implement energy efficiency measures. Natural gas, steam, and chilled water savings are also expected to occur from implementing the efficiency strategies identified in this plan. However, these savings were not quantified or included in the total estimated cost savings. Renewable strategies through Xcel Energy are expected to be cost-neutral over the long term. The plan includes details on annual estimates by strategy for capital costs, operations and maintenance (O&M) costs, and cost savings. Overall financial performance for achieving 100% renewable electricity is commensurate with annual budget levels.

While energy and cost modeling show that achieving the 100% renewable electricity goal by 2025 is feasible and cost-effective, successfully executing this plan will require:

- Aligning departments across the City and County of Denver to achieve this fast-paced and ambitious goal;

- Fostering a culture of energy awareness among employees to motivate participation;
- Approving the necessary funding and actively managing projects, especially energy efficiency capital improvement projects;
- Partnering with Xcel Energy on energy efficiency and renewable supply strategies; and
- Securing regulatory approvals for future renewable options.

To support these implementation requirements, the plan contains action plans for each focus area around roles, responsibilities, scope, timeline, resources, outreach channels, and metrics.

Like City and County of Denver, Xcel Energy is committed to successful plan implementation. Potential collaboration areas through the Partners in Energy offering are listed in **Table 1**.

Table 1. Partners in Energy Implementation Roles

Xcel Energy Partners in Energy	City and County of Denver
• Project management support and team facilitation – monthly meetings • Bi-annual accounting of progress toward goal • Annual update to strategies analysis to inform updates to the plan • Peer community resources through Partners in Energy exchange events and web portal • Marketing and communications collateral and case studies to communicate progress and celebrate successes along the way • Assistance accessing DSM incentives and enrolling in existing renewable energy offerings • Sharing product development updates and implications for Denver's plan • Technical assistance and staff trainings on energy efficiency and renewable energy topics • Educational signage and other staff communications to support energy efficiency opportunities and awareness around renewable energy - where renewables come from, etc.	• Program management – monthly meetings to review progress of implementation action plans and coordinate action items • Annual budgeting to support plan activities and capital projects • Public Utilities Commission advocacy for Xcel Energy's Certified Renewable Portfolio and Renewable*Connect® offerings using identified needs for Denver facilities. Xcel Energy will lead the regulatory filings and coordinate with the City and County of Denver on supporting activities. • Commitment to keeping the implementation action plans on track • Identify energy efficiency champions to align staff, ensure regular communication, and encourage accountability across departments • Partner with additional stakeholders as needed to support plan implementation

Introduction

In 2018, the City and County of Denver put forth a climate action plan to help "guide our City to a climate safe future in a way that works well for all the businesses and residents of Denver (Denver Public Health & Environment, 2018)". The 80x50 Climate Action Plan lays out a broad framework of strategies to reduce Denver's greenhouse gas emissions while improving air and water quality, increasing resiliency, and preserving a high quality of life. As a leading city for climate action, Denver has made a commitment to acquire clean energy and reduce carbon emissions.

Our Energy Vision

> ***Our vision is to make Denver a leader in clean and local energy that comes from the sun, wind, or other innovative renewable technologies.***
>
> ***-80x50 Climate Action Plan (Denver Public Health & Environment, 2018)***

Improving energy efficiency, switching natural gas usage to electricity, and increasing renewable electricity production are three important strategies called for in the 80x50 Climate Action Plan that will not only reduce greenhouse gas emissions but also transform Denver's buildings into high-performing spaces for the City's residents and businesses (Denver Public Health & Environment, 2018). The City and County of Denver seeks to apply these strategies to municipal facilities to lead the way and set an example for the broader community to take action (City and County of Denver, 2019).

Our Energy Goals and Timelines

The goals in the 80x50 Climate Action Plan complement previous efforts to improve the sustainability of municipal operations through energy efficiency, green building practices, fuel switching, fleet electrification, increased renewable production, and benchmarking. As **Figure 3** shows, progress has been made toward some but not all goals, depending upon when the goals were established and the implementation timelines. City and County of Denver staff are tasked with developing implementation plans to synthesize activities across departments and to achieve the goals within the allotted timeframes.

Municipal Facilities Goal			Facilities Affected	Baseline (Year)	Goal to Meet from Baseline by Year						Current Progress
					2020	2025	2030	2035	2040	2050	
2020 Sustainability Government Operations Goals	Energy and Fuel Reduction		General Services, Parks & Rec, Arts & Venues, Botanic Gardens, DEN, Fleet	2012	20%						3.8% (2017)
	Renewables		All	2012	Double						16.17% (2017)
80x50 Climate Goal	Buildings and Electricity Supply Goals	100% Renewable Electricity in Municipal Facilities	TBD – Strategic Plan in development			100%					
		Reduce Commercial Building Energy Use	All Commercial Buildings	2016	10%		30%			50%	
		New Buildings Will Be Net-Zero	New Construction	N/A				100%			
		Fuel Usage in Commercial and Residential Properties Will Switch from Natural Gas/Propane to Low-Carbon Fuel and/or Electric Heat	All	N/A					50%		
200 Electric Vehicles in Fleet by 2020			Buildings Hosting City Fleet Vehicles	N/A	200 vehicles						40 vehicles (2018)
Better Buildings Challenge (BBC)			149 buildings (2017)	2011	20%						10%(2017)
Energy Star Certification			Offices, Courthouses, Non-Refrigerated Warehouses	N/A							11 buildings (2018)

Figure 3. Goals Influencing City and County of Denver Municipal Operations (City and County of Denver, 2019)

This Strategic Energy Plan focuses on the City's goal to achieve 100% renewable electricity for municipal buildings by 2025 - five years ahead of the community goal to achieve 100% renewable electricity by 2030 (Denver Public Health & Environment, 2018). This Strategic Energy Plan was developed early in 2019 to support budget requests for plan implementation starting in 2020.

> ***Denver will lead by example to achieve 100 percent renewable electricity for municipal buildings by 2025.***
>
> ***-80x50 Climate Action Plan (Denver Public Health & Environment, 2018)***

The Role of Electrification

This Strategic Energy Plan focuses on efficiency measures and renewable energy pathways for the current electricity footprint of the City and County of Denver's municipal buildings. During plan implementation, opportunities for fuel switching from natural gas to electricity should be considered in conjunction with energy efficiency opportunities to leverage new construction and planned capital improvements. Once current electricity usage has been covered by renewable energy sources by 2025, Denver can intensify focus on electrification, whereby half of natural gas usage is converted to electricity usage to meet the 2040 fuel switching goal. As natural gas usage is converted to electricity usage, Denver should also procure additional renewable energy through existing or new sources to stay in compliance with the 100% renewable electricity goal.

The Role of Innovation

Innovation is an important factor to the City and County of Denver, as evidenced by the recent launch of Denver Smart City to build on the successes of the Panasonic Site project in partnership with Xcel Energy, as well as being selected as a finalist in the Department of Energy's Smart Cities Challenge (City and County of Denver, 2019; U.S. Department of Transportation, 2019).

For the purposes of this Strategic Energy Plan, which seeks to lay out an actionable plan for achieving 100% renewable electricity by 2025, the City and County of Denver is focusing on large-scale and proven renewable energy solutions. This approach is not intended to preclude the use of small-scale projects that demonstrate innovation, which could include micro-hydropower installations, anaerobic digestion at the zoo, or other demonstration projects.

Our Partnership with Xcel Energy

Xcel Energy is the sole electric utility serving the City and County of Denver. In 2019, Xcel Energy announced a commitment to achieving 100% carbon-free electricity by 2050 (Xcel Energy, 2019). As Xcel Energy moves toward this commitment to increase renewable and carbon-free fuel sources, the utility will also help the City and County of Denver achieve our renewable energy goals. In partnership toward these goals, the City and County of Denver is currently collaborating with Xcel Energy through two community-scale offerings.

Partners in Energy

This Strategic Energy Plan was developed by the City and County of Denver and Xcel Energy, through the Partners in Energy community energy planning offering (Xcel Energy, 2019). The City and County of Denver and Xcel Energy entered into a memorandum of understanding defining expectations for each partner and the resources brought by each party. Xcel Energy provided resources to help the City and County of Denver develop this strategic plan through a four-month planning process. Through participation in this offering, the City and County of Denver received analysis of baseline energy data and plan strategies, facilitation of two stakeholder workshops to support the planning process, and delivery of the Strategic Energy Plan.

After this Strategic Energy Plan is completed, the City and County of Denver will enter into a second memorandum of understanding with Xcel Energy, under which Xcel Energy will provide resources to support plan implementation.

Energy Future Collaborations

The City and County of Denver has also entered into a memorandum of understanding with Xcel Energy under Energy Future Collaborations, a new structure in Colorado serving communities that have established ambitious energy-related goals. This memorandum of understanding stresses the importance of innovation and collaboration between the two parties in support of their respective goals. Xcel Energy's service area manager is responsible for managing the collaboration in each participating community.

Where We Are Now

Baseline Assessment

City and County of Denver facilities use 368 GWh of electricity annually out of 6,852 GWh of electricity used community-wide (Xcel Energy, 2018). City and County of Denver's electricity use can be broken down into four categories: municipal buildings (31%), Denver International Airport operations (45%), streetlights (18%), and other (6%). This Strategic Energy Plan focuses on the municipal building category.

The City and County of Denver tracks building and energy data using the EnergyCAP energy management and utility bill accounting software program. Historical data were analyzed for the period 2014-2018. Data for the most recent year (2018) were used to establish the baseline against which future implementation efforts will be assessed (**Table 2**). In addition to total values, baseline characteristics were broken into two groups, General Services and Independents, based on who pays the utility bills (which will influence how implementation actions are budgeted moving forward). The Independents group includes Arts and Venues, Botanical Gardens, Golf, Human Resources, and Wastewater Management. The General Services group includes the remaining buildings including Parks and Recreation, Libraries, Police, Fire, and Sherriff. **Appendix B** contains a detailed list of municipal buildings and their group designation.

Table 2. Denver Municipal Facilities Building Portfolio and Energy Footprint (2018 Data)[1]

	Total Portfolio	General Services Group	Independents Group
Number of Buildings	256	207	49
Building Square Footage	More than 10.7 million square feet	More than 6.7 million square feet	Almost 4.0 million square feet
Annual Electricity Charges	$9.5 Million	$5.8 Million	$3.7 Million
Annual Electricity Usage	112 GWh	67 GWh	45 GWh

	Total Portfolio	General Services Group	Independents Group
Percent of Total Municipal Use	**31%**	**19%**	**12%**
Annual Renewable Generation[2]	**1.5 GWh**	**1 GWh**	**0.5 GWh**

[1] Data shown do not include the airport, zoo, or streetlights.

*[2] In 2018, renewable energy was produced only through rooftop solar systems. Beginning in 2019, Renewable*Connect® and Solar*Rewards Community® subscriptions will also come into play.*

Progress to Date

The General Services Energy Office has been operating a high-performing energy management program for several years, focusing on improving energy efficiency and increasing renewable energy production:

- Energy Efficiency Initiatives
  - In 2015-2016, the General Services Energy Office entered into an energy performance contract to finance energy efficiency measures in 14 buildings totaling more than 273,000 sq ft. The energy efficiency measures achieved 11% energy savings based on annual energy use in the included buildings.
  - The City and County of Denver regularly participates in demand-side management (DSM) programs offered by Xcel Energy that include rebates and other financial incentives for energy efficiency measures. From 2015-2017, approximately 9.8 GWh of electricity were saved annually through these programs. Lighting projects (converting to light-emitting diode (LED) bulbs) accounted for 63% of the energy savings. Motor and drive efficiency projects accounted for 13% of the energy savings.
  - New roofing standards have been adopted that require light-colored roofing materials as well as extra insulation that improve building heating and cooling demands.
  - Facilities staff have been considering energy efficiency during equipment selection, especially where Leadership in Energy and Environmental Design (LEED) certification is sought for a building. Variable frequency drives (VFDs) and pool covers that minimize heat loss are being used routinely.
  - Denver has established standards for thermostat settings. Thermostats are locked down to avoid tampering.
- Renewable Energy Initiatives
  - The City and County of Denver has participated in Xcel Energy's Solar*Rewards® program, which incentivizes rooftop solar systems. The City has 1,508 kW of installed rooftop solar on 20 buildings (City and County of Denver, 2019). The rooftop solar systems generated 1.5 GWh of electricity in 2018. Third-parties own most of the systems (1347.5

kW) though the City and County of Denver owns 160.5 kW of rooftop solar. In all cases, the City and County of Denver does not own the renewable energy credits (RECs) for the renewable energy. Rather, Xcel Energy retains the RECs in exchange for the incentive payment. While the City cannot count the generation from these solar facilities towards their renewable electricity goals, the projects generate cost savings that can be used to offset the cost of participating in other renewable energy programs that allow the City to retain the RECs but may (or may not) come at a price premium.

- In 2018, the City and County of Denver went through a Request for Proposal process to purchase electricity from Community Solar Garden developers who participate in Xcel Energy's Solar*Rewards Community program (City and County of Denver, 2019). The City and County of Denver signed contracts for 4,180 kW of capacity and is in negotiations for another 850 kW of capacity. The subscriptions to the three community solar gardens, both signed and pending, are estimated to generate 8.7 GWh annually beginning in 2019. The City and County of Denver does not own the RECs for this renewable energy. Rather, Xcel Energy retains the RECs in exchange for incentive payments. As with Solar*Rewards®, the projects generate cost savings that can be used to offset the cost of participating in other renewable energy programs that allow the City to retain the RECs but may (or may not) come at a price premium.
- In 2018, the City and County of Denver signed a 10-year subscription agreement with Xcel Energy for 4,822 kW of capacity through the Renewable*Connect® program which will offset the electricity use of four buildings plus the electricity use for all meters on commercial rate schedules (City and County of Denver, 2019). Xcel Energy retires these RECs on behalf of the City and County of Denver such that this renewable energy counts toward the City's goals. The City's current subscription to Renewable*Connect® is expected to produce approximately 11.1 GWh annually beginning in 2019.

In summary, starting in 2019, the City and County of Denver has entered into agreements for approximately 21.3 GWh of renewable energy (19% of baseline annual use). However, the City can count only 11.1 GWh (10% of baseline annual use) towards renewable energy goals based on REC ownership and retirement. Where Xcel Energy retains the RECs under the Solar*Rewards® and Solar*Rewards Community® programs, the RECs are retired by Xcel Energy for compliance with Colorado's Renewable Energy Standard (Colorado Energy Office, 2019). **Appendix B** contains a detailed list of municipal buildings and current renewable energy initiatives.

How We'll Achieve Our Goal

The Road to 100% Renewable Electricity

Figure 4 presents a general roadmap to achieving 100% renewable electricity for municipal facilities. Progress toward the goal will be assessed annually across the portfolio of buildings. This approach means that balancing energy use and renewable supplies in real-time is not a requirement and that this Strategic Energy Plan can include portfolio-wide as well as building-specific strategies.

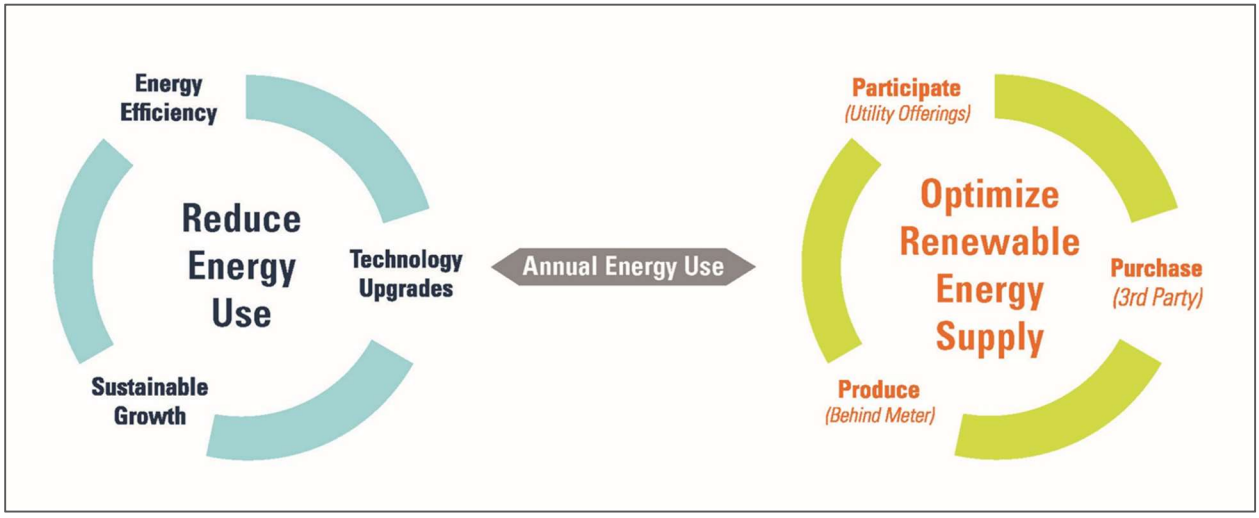

Figure 4. Roadmap for Achieving 100% Renewable Electricity

The City and County of Denver seeks first to reduce the energy footprint associated with municipal buildings before sourcing the electricity from renewable energy projects. This approach will save Denver money over time, is supportive of the City's related efficiency goals (**Figure 3**), will serve to minimize the renewable energy needed to achieve 100% renewable electricity, and will offer co-benefits such as reducing loads on the electricity grid.

In addition to achieving energy efficiency in existing buildings, the City and County of Denver strives to promote sustainable growth and green building practices for new buildings and major renovations. Implementing energy efficiency and renewable energy solutions into new building practices will help prevent municipal energy use from increasing, even as the City and County of Denver is expected to experience high population growth.

Renewable energy can be sourced in one of three ways: by producing renewable energy on-site, by participating in utility-scale renewable projects, or by purchasing renewable energy from a third-party project. The 80x50 Climate Action Plan lays out a preference for local clean energy projects that feature solar, wind, or other innovative renewable technologies (Denver Public Health & Environment, 2018). Based on this guidance as well as stakeholder input during the planning process, the following guidelines were used to prioritize renewable energy strategies. The City and County of Denver should:

- Leverage both on-site and subscription renewable programs offered by Xcel Energy.

- Implement renewable energy solutions where the City can retain and retire the RECs to take credit for the renewable energy toward the City's goals.
- Favor solutions that support additionality (adding new renewable energy to the grid) and give preference to local renewable energy projects in Colorado.
- Focus more on utility-scale renewable energy solutions, with less emphasis on rooftop solar and technology innovations due to the relatively short timeline to achieve the City's 100% renewable electricity goal.
- Focus on third-party ownership, as the City is less interested in owning and operating generating assets.
- Look to promote public awareness and other co-benefits (e.g., resiliency) where rooftop solar is installed.

Focus Areas and Strategies

Building from the roadmap, the City and County of Denver will implement eight strategies to achieve 100% renewable electricity in municipal facilities by 2025 (**Figure 5**).

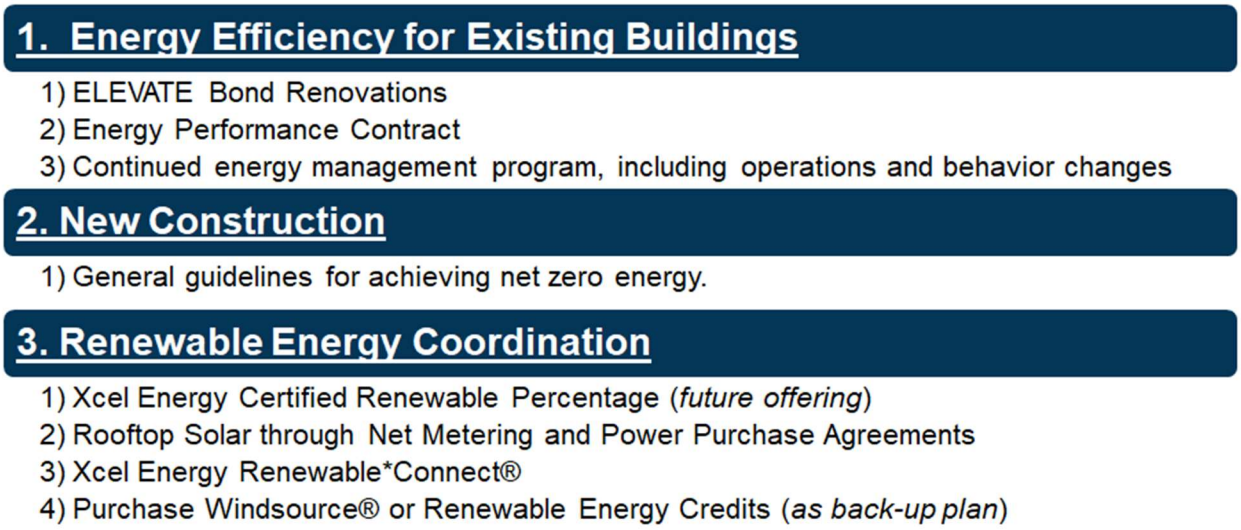

Figure 5. Focus Areas and Strategies to Achieve 100% Renewable Electricity

Each strategy was evaluated for building recommendations, the potential to save energy (for the energy efficiency strategies), the potential to produce energy (for the renewable energy strategies) and the expected costs to the City and County of Denver. Energy and cost estimates were developed for a range of possible outcomes (minimum reasonable potential, working target for planning purposes, and maximum reasonable potential) to reflect uncertainties in the planning assumptions, prioritization and sequencing of the strategies, and how aggressively individual strategies can be pursued. The following sections describe the results for each focus area and strategy. **Appendix B** contains a list of municipal buildings along with recommendations for implementing the energy efficiency and renewable energy strategies. **Appendix C** contains financial details including annual capital costs, annual O&M costs, and annual cost savings.

Focus Area 1 Energy Efficiency in Existing Buildings

The City and County of Denver will achieve energy efficiency in existing buildings through three financing mechanisms, with each mechanism representing one implementation strategy:

- Renovations through the Elevate Denver bond program (City and County of Denver, 2017)
- A new energy performance contract for implementing energy efficiency measures in large buildings
- Continuation of the General Services Energy Office's energy management program

Common Energy Efficiency Opportunities

Across the municipal building portfolio, several common energy efficiency opportunities exist that should be considered under each financing mechanism:

- Opportunities exist to install LED bulbs, for example where exterior lighting is still using metal halide technology and where linear fluorescent bulbs are still being used.
- Most recreation centers have indoor pool areas that would benefit from HVAC system upgrades, building recommissioning, and/or building envelope improvements. Swimming pool circulation pumps are good candidates for motor and drive efficiency projects.
- Many buildings have old HVAC systems that could be replaced or recommissioned.
- Many restroom buildings were designed as two-season facilities but are kept heated and open year-round. These buildings are candidates for winter shutdown procedures or efficiency improvements through building upgrades. Future facilities should be designed for year-round operation.
- Maintenance buildings have not historically been a priority for efficiency investments, as they are not typically high energy users. However, because the buildings tend to be older, efficiency opportunities exist.
- The City and County of Denver has done a number of recommissioning studies through Xcel Energy DSM programs that led to low-cost opportunities being identified. Recommissioning opportunities should continue to be emphasized along with incentives from Xcel Energy's DSM programs.
- Many buildings would benefit from space planning and utilization studies. There are several buildings that operate fully at night or on weekends when a small number of employees are in the building.
- Although the focus of this Strategic Energy Plan is electricity efficiency, the City and County of Denver will also seek to achieve efficient use of natural gas, steam, and chilled water through these pathways. Most of Denver's natural gas usage is associated with water heaters, furnaces, and boilers, so renovation plans should include selection of energy-efficient equipment at a minimum as well as consideration of equipment alternatives that run on electricity where equipment upgrades, or replacements, are recommended.
- As many buildings as possible should be audited, including an assessment of the age and condition of building roofs. Many energy efficiency recommendations from the audits could be addressed by facilities and maintenance staff. Buildings should be prioritized to start with buildings that have a high energy-use intensity (EUI) or a low ENERGY STAR score.
- Prioritize deep-energy retrofits through the bond projects or the energy performance contract to maximize energy savings through these financing mechanisms.

Appendix B contains specific energy efficiency recommendations by building.

Energy and Cost Modeling

The Elevate Denver Bond program includes over $133 million for renovation of 27 municipal buildings, 11 of which are libraries (City and County of Denver, 2017). Energy efficiency measures are expected to be able to achieve energy savings of up to 15% of annual electricity use through capital improvements (City and County of Denver, 2019b). For the 27 existing buildings included in the bond program, energy efficiency measures are expected to be implemented for more than 1.6 million sq ft for a maximum potential energy savings of 3.3 GWh annually. To achieve these energy savings, $10.5 million of the project costs will need to be invested in energy efficiency measures.

The City and County of Denver originally identified 13 buildings that could achieve energy savings through an energy performance contract (EPC). Because performance contracts become increasingly advantageous for large projects, additional buildings are recommended for inclusion where the building size is large (greater than 10,000 sq ft), the annual energy use intensity (kBtu/sq ft) is high, and the building is not included in the bond program. Energy efficiency measures are expected to be able to achieve annual energy savings of up to 15% of annual electricity use through capital improvements (City and County of Denver, 2019b; DellaCava, 2019). Additional recommissioning, operations and maintenance, energy management, and on-site renewable energy generation opportunities should also be identified and considered. Fifty-one (51) buildings are recommended for inclusion in the performance contract, resulting in energy efficiency measures for 2.3 million sq ft. These buildings are expected to achieve a maximum potential energy savings of 4.6 GWh annually. The performance contract will require an upfront investment of up to $570,000 by the City and County of Denver to pay for an investment-grade audit. If the project is viable (as it is expected to be), the total project cost is expected to be approximately $14.4 million. For initial planning purposes, the City and County of Denver will work with an energy services company (ESCO) to conduct the audits and phase the project into three self-financed performance contracts with terms of 10-15 years.

The General Services Energy Office will continue the existing energy management program, focusing on the remaining buildings that are not included in the bond program or the performance contract. Energy efficiency measures are expected to achieve energy savings of approximately 8% of annual electricity use through operations and maintenance, energy management, and behavior improvements. Energy efficiency measures in these remaining buildings are expected to be implemented for more than 6.8 million sq ft for a maximum potential energy savings of 4.7 GWh annually. To achieve these energy savings, the General Services Energy Office will need to invest only $540,000 but will need to work with facilities and maintenance staff across a large portion of the building portfolio to implement operations and maintenance, energy management, and behavior changes. The General Services Energy Office is interested to set up a revolving fund for this purpose. A revolving fund remains available to finance operations without fiscal year limitations, because the City and County of Denver would replenish the fund by repaying money used from the account.

Table 3 presents a summary of the energy and cost modeling results for each energy efficiency strategy. More detailed year-by-year financial estimates can be found in **Appendix C**, including yearly capital costs, O&M costs, and cost savings from reduced energy use. The 12.6 GWh of electricity savings from energy efficiency noted in **Table 3** represents 11% of baseline electricity use and will result in over $1 million per

year of electricity savings. The project costs shown would be reduced by an estimated $1.4 million in utility incentives from Xcel Energy. Natural gas, steam, and chilled water savings are also expected to occur from implementing the efficiency strategies identified in this plan. However, these savings were not quantified or included in the total estimated cost savings.

Table 3. Summary of Energy and Cost Modeling – Energy Efficiency for Existing Buildings

	Initial Planning Targets			Potential Range
Strategy	Recommended Buildings	Electricity Savings (GWh)	Costs ($)	Electricity Savings (GWh)
1.1 Elevate Denver bond renovations	27	3.3	$10,500,000	0.0-3.3
1.2 Energy performance contract	51	4.6	$570,000 (audit) $14,400,000 (EPC)	0.8-4.6
1.3 Continued energy management program	178	4.7	$540,000	1.3-4.7
TOTALS	**256**	**12.6**	**$26,010,000**	**2.1-12.6**

Takeaways for Existing Buildings

There is a limit to the electricity savings potential that can be achieved through traditional energy efficiency measures. To get as close as possible to the 80x50 Climate Action Plan energy efficiency goals, the initial planning targets for efficiency strategies are set to the maximum reasonable potential.

Focus Area 2 New Construction

The City and County of Denver will strive to achieve energy efficiency and renewable energy production in new municipal buildings to mitigate electricity load growth above the 2018 electricity baseline. New construction offers both the opportunity to bring design innovations to life as well as the challenge of meeting new and more stringent requirements. Three policy and regulatory drivers are currently in place to promote energy efficiency and renewable energy in new buildings:

- 80x50 Climate Action Plan (Denver Public Health & Environment, 2018)
    - Continue to increase building code to net zero energy for new buildings and be significantly more stringent for existing buildings by 2035.
- Executive Order 123 (Hancock, 2013)
    - All new City buildings (new construction and major renovations) >5,000 sq ft must achieve LEED Gold certification (and achieve LEED Platinum certification where economically feasible).
    - Building projects <5,000 sq ft must meet the intent of LEED-BD+C (Building Design and Construction) Gold certification, with a goal of achieving LEED-NC (New Construction) Gold and must follow the requirements of the Greenprint Denver Construction Project Guidance documents.
    - All General Fund agencies must implement LEED EB: O+M best practices.

- Green Buildings Ordinance (City and County of Denver, 2018)
    - Applies to new buildings, roof permits for existing buildings, and additions >25,000 sq ft.
    - Multiple compliance pathways via cool roofs, green spaces, on-site solar, off-site renewable energy purchases, energy efficiency, and building certifications.

Guidance for Achieving Net Zero Energy

To achieve net zero energy in new buildings, the City and County of Denver will apply new construction best practices, monitor progress, and use effective project management as follows:

- Apply new construction best practices to help determine the optimal mix of energy efficiency measures and renewable energy sources
    - Customizing for Denver's climate zone
    - Optimizing the building envelope
    - Maximizing daylighting with attention to good insulation and glare control
    - Minimizing cooling and heating loads, using outdoor air for temperate shoulder seasons
    - Utilizing efficient lighting and HVAC systems
    - Incorporating renewables to offset remaining load
    - Incorporating lessons learned from similar building types to address occupant productivity and health
    - Gather best practices into building design and construction guidance documents that can be used for all new construction
- Monitor progress toward policy goals and ensure adequate budget in capital planning to achieve policy goals
- Project management
    - Review similar projects with exemplary results. Integrate lessons learned into project design goals, procurement strategy, and project risk register
    - Clearly define energy performance goals in procuring design services, being as specific as possible about energy use intensity and targets for on-site renewable energy supply versus utility subscription-based offerings or third-party RECs
    - Select team members experienced with designing and building net zero energy buildings; check references and confirm results
    - Use an integrated design approach including design charrettes for cross-collaboration among design disciplines and gathering input from building owner and occupant groups
    - Require an energy model not just for LEED documentation but to inform the design process and check whether energy targets will be met by the design as it progresses from concept to design and construction.

Energy and Cost Modeling

Based on information available through the Elevate Denver Bond Program, up to four new buildings could be added to the municipal building portfolio over the next 10 years for a total project cost of $147 million (**Table 4**).

Table 4. New Buildings Planned through the Elevate Denver Bond Program (City and County of Denver, 2017)

Building	Square Footage	Estimated Completion Date	Estimated Project Cost
Denver Botanic Gardens – Center for Science, Art and Education	50,000	2020	$18,000,000
Denver Health and Hospital Authority (DHHA) Ambulatory Care Center	293,000	2020	$75,000,000
Fire Station at 72nd & Tower Road	Not available	Not available	$16,170,000
Westwood Recreation Center	Not available	Not available	$ 37,500,000
TOTALS	**343,000**	**--**	**$146,670,000**

The new buildings will increase the square footage of the municipal building portfolio. For the purposes of this Strategic Energy Plan, it was assumed that the new buildings will be highly energy efficient and therefore will not substantially add to the municipal energy footprint.

Takeaways for New Construction

Despite the working assumptions, early indications for the Denver Botanic Gardens Center for Science, Art and Education and the DHHA Ambulatory Care Center are that these buildings will likely not achieve net zero energy because their specialized uses will result in high energy use intensity values. Their impact on total municipal electricity use should be minor (<5%) and will not change the strategies presented in this plan.

Focus Area 3 Renewable Energy Coordination

The City and County of Denver will pursue renewable energy through four strategies that allow the City to retain REC ownership:

- Participate in Xcel Energy's Certified Renewable Percentage program, a future offering designed to clarify customer accounting toward their own renewable goals of renewable energy in Xcel Energy's source fuel mix.
- Install rooftop solar using Xcel Energy's Net Metering program through Power Purchase Agreements so that third parties will own and operate the systems, relieving operations and maintenance burden on City staff.
- Maximize subscriptions to Xcel Energy's Renewable*Connect® program, which provides customers access to utility-scale renewable projects in Colorado.
- Purchase renewable energy through Xcel Energy's Windsource® program or through the REC markets.

Common Renewable Energy Opportunities

Across the municipal building portfolio, several renewable energy opportunities exist, mostly relevant to rooftop solar:

- As the facilities and maintenance staff replace roofs, the installation of rooftop solar systems should be considered as one compliance pathway under Denver's Green Buildings Ordinance (City and County of Denver, 2018).
- Buildings that are three stories high or shorter are better candidates for rooftop solar as they do not require cranes for installation.
- Many recreation centers have good roofs for rooftop solar systems.
- Critical facilities are good candidates for solar-plus-storage installations to increase the resiliency of the facilities and to provide emergency shelters for the community.

Appendix B contains renewable energy recommendations by building.

Energy and Cost Modeling

Xcel Energy intends to file the Certified Renewable Percentage program no earlier than Q3 2019 with the Public Utilities Commission (Xcel Energy, 2018). If approved in 2020, this program will clarify customer accounting toward their own renewable goals of renewable energy in Xcel Energy's source fuel mix. Xcel Energy is required by Colorado's current Renewable Energy Standard to achieve 30% renewable energy in their source fuel mix by 2020 (Colorado Energy Office, 2019). However, this percentage is likely to increase substantially by 2025 as a result of two factors: (1) Colorado Governor Polis has expressed an intention to pass legislation to increase Colorado's Renewable Energy Standard to 100% by 2040 (Colorado Politics, 2019); and (2) Xcel Energy has made a public commitment to 100% carbon-free electricity by 2050 (Xcel Energy, 2019). Due to these initiatives, the electricity that City and County of Denver buildings use from the grid could be as high as 58% carbon-free by 2025 (based on a linear forecast) which would contribute significantly to Denver's renewable electricity goals. The Strategic Energy Plan assumes that this program will be approved by the PUC, that the program will benefit all buildings served by Xcel Energy, and that any program costs will be incorporated into customer rates.

The University of Colorado at Denver conducted a rooftop solar study for the City and County of Denver in 2018 (Li, Losowski, Raines, & Ridener, 2018). The study made preliminary recommendations of 50 rooftops for on-site solar, with the potential to generate 31 GWh annually based on a modeled unit generation value (kWh/solar panel). Rooftop solar installations have several benefits including: (1) they reduce energy sourced from the grid and therefore reduce utility bills; (2) they are supportive of building certification and other sustainability directives; (3) if used in conjunction with investment in controls, switches, and energy storage, they foster resiliency for emergency management purposes; and (4) they are visible to the public and raise energy awareness. However, the procurement, design, and installation processes, in addition to the ongoing operations and maintenance burden, are barriers. This Strategic Energy Plan assumes that up to 2 MW of rooftop solar capable of producing 3.1 GWh annually will be installed before 2025. The rooftop systems will be financed through Power Purchase Agreements with the objective to retain the renewable energy credits but avoid ownership to reduce the operations and maintenance burden. **Appendix B** identifies the top five and the top 50 buildings that should be further evaluated for rooftop solar. The implications for roof leak repairs and roof warranties should be considered as part of the evaluation.

Xcel Energy launched the Renewable*Connect® program in 2018. The program was an immediate success, with the 50 MW solar project fully subscribed within a matter of days. Xcel Energy intends to expand this program moving forward, though the timing, capacity, and structure of future projects remains uncertain. Because of the ease of subscription, the favorable financial terms, and the fact that customers can claim the RECs, the City and County of Denver intends to maximize participation in this program. This Strategic Energy Plan assumes that the City and County of Denver will be able by 2025 to subscribe to twice as much capacity as the first offering and that the subscription will be cost-neutral or show a net-savings under the terms of a 10-year subscription agreement, similar to current terms. The final renewable strategy calls for the City and County of Denver to purchase Windsource® subscriptions or RECs as needed to achieve the goal of 100% renewable electricity. Both solutions can be purchased for a premium payment of $0.015/kWh. Windsource® is a subscription program from Xcel Energy that provides access to renewable energy from wind farms in Colorado and allows customers to claim RECs from their subscription. Windsource® payments are part of the monthly energy billing process. Xcel Energy has indicated that the Windsource® program may be re-priced or integrated with the Renewable*Connect® program, but for now the program is available to customers. RECs can be purchased through voluntary renewable energy markets through a separate contract. The City and County of Denver will choose the appropriate option based on price, among other factors. This strategy is easy to implement but requires ongoing annual payments until the 100% renewable electricity goal is achieved through other strategies. This strategy will be enacted in 2025 as needed to achieve 100% renewable electricity while minimizing costs to the City and County of Denver.

Table 5 presents a summary of the energy and cost modeling results for each renewable energy strategy. **Appendix C** includes additional financial details, including yearly generation estimates and O&M costs.

Table 5. Summary of Energy and Cost Modeling – Renewable Energy Coordination

Strategy	Initial Planning Targets Recommended Buildings	Initial Planning Targets Electricity Generation (GWh)	Costs ($)	Potential Range Electricity Generation (GWh)
3.1 Xcel Energy Certified Renewable Percentage	256	57.0	Via rates	31.0-64.3
3.2 Rooftop Solar through Net Metering and PPAs	5	3.1	Cost-neutral	0.0-31.1
3.3 Xcel Energy Renewable*Connect®	213	33.3	Net savings to cost-neutral	11.1-69.9
3.4 Purchase Windsource® or RECs	39	6.0	$90,000 annually	0.0-69.9
TOTALS	**256**[1]	**99.4**	**Varies**	**42.1-235.2**

[1] *Buildings will be covered by more than one renewable energy offering.*

Takeaways for Renewable Energy Coordination

Although the exact timing and availability of renewable energy offerings through Xcel Energy are uncertain, these four renewable energy strategies combined provide more than enough opportunity for the City and County of Denver to achieve 100% renewable electricity in municipal buildings by 2025.

Energy and Cost Summary

Taken together, the eight strategies support the City and County of Denver in achieving 100% renewable electricity in municipal buildings by 2025, with flexibility to update the pathway for achieving the goal as working assumptions are confirmed or refined during plan implementation. Achieving the 100% renewable electricity goal for municipal buildings would reduce the City and County of Denver's annual carbon footprint by 62,000 $MTCO_2e$, approximately equivalent to the carbon emitted from 13,400 passenger vehicles per year.

Figure 6 presents a summary of the range of energy savings and generation potential across the energy efficiency and renewable energy strategies. The maximum potential of these strategies sum to greater than the baseline annual energy use, providing the City and County of Denver flexibility to adjust course as needed during plan implementation.

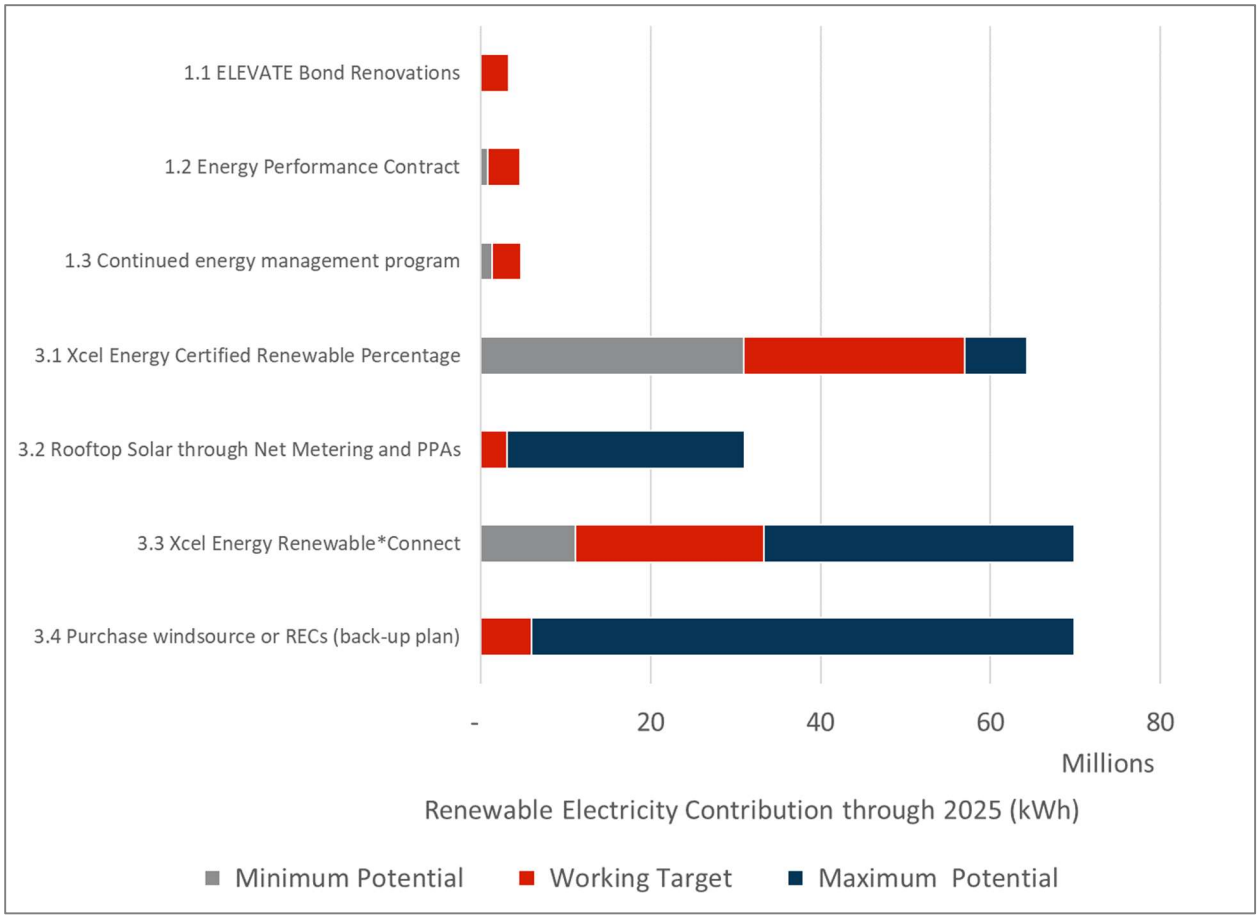

Figure 6. Energy Modeling Results (Range of Potential Values)

Figure 7 presents a waterfall chart showing how the initial planning targets for each strategy fully offset the 2018 baseline energy use, achieving the goal of 100% renewable electricity.

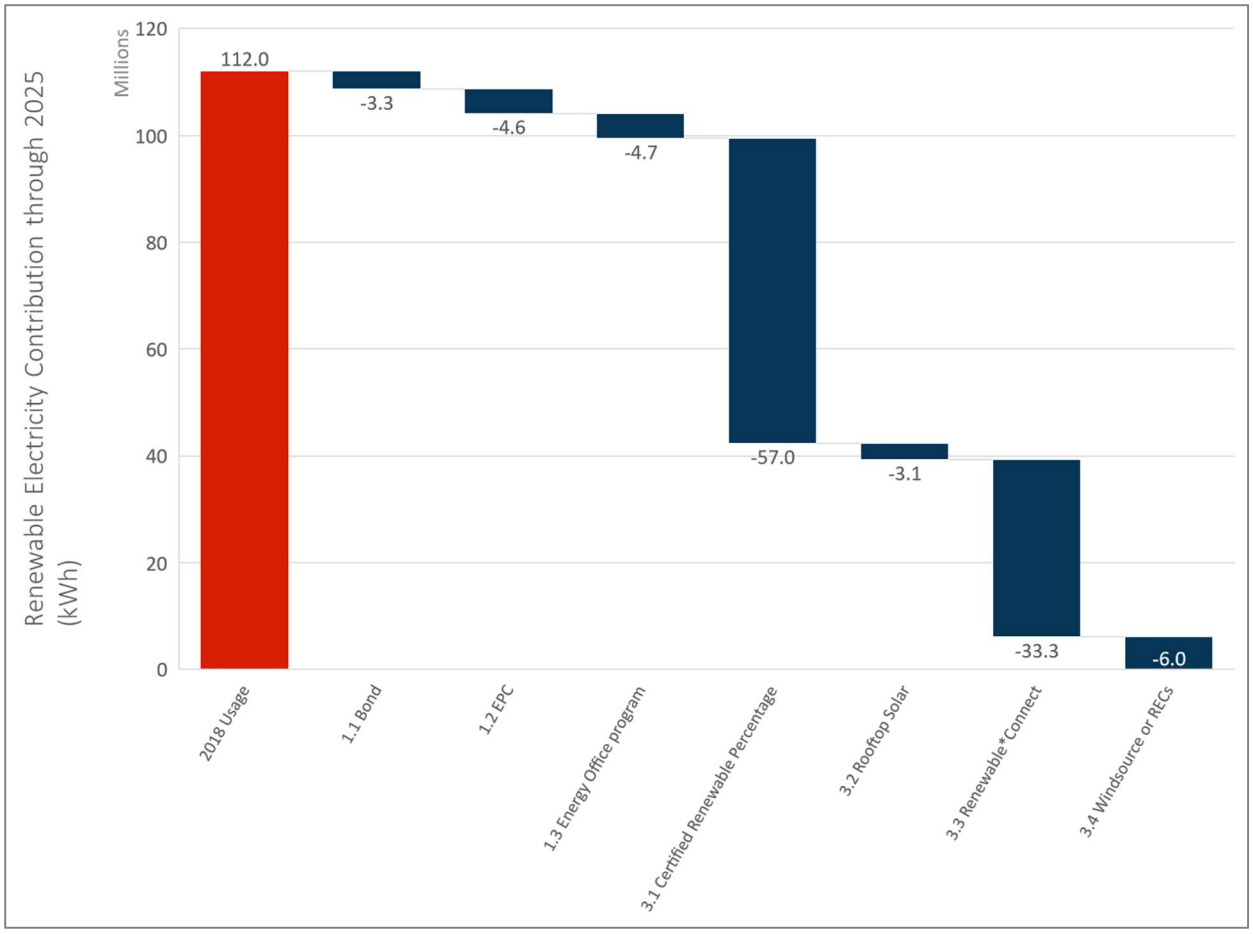

Figure 7. Energy Modeling Results (Initial Planning Targets)

Table 6 presents a summary of the implementation costs across the energy efficiency and renewable energy strategies. **Appendix C** includes additional financial details including yearly capital costs, O&M costs, and cost savings from reduced energy use.

Table 6. Cost Modeling Results (Initial Planning Targets)

Strategy	Costs to Achieve Targets ($)	Funding Notes
1.1 ELEVATE Bond Renovations	$10.5 million	Financing secured through bond. Need a portion of building project costs toward energy efficiency measures.
1.2 Energy Performance Contract (EPC)	Audit - $570,000 Project cost - $14.4 million	Technical energy audit will be paid for separately from EPC.
1.3 Continued energy management program	$540,000	Financed through a revolving loan program.
3.1 Xcel Energy Certified Renewable Percentage	Via rates	Costs captured through rate changes for all customers
3.2 Rooftop Solar through Net Metering and PPAs	Cost-neutral	Assumes 1,960 kW additional installed for 5 roofs
3.3 Xcel Energy Renewable*Connect	Net savings to Cost-neutral	Assume sign 10-year subscription agreement
3.4 Purchase Windsource® or RECs	$90,000 annually	$0.015/kWh premium

How We'll Stay on Course

Achieving 100% renewable electricity is feasible by 2025 but will require:

- Aligning departments across the City and County of Denver to achieve this fast-paced and ambitious goal;
- Fostering a culture of energy awareness among employees to motivate participation;
- Approving the necessary funding and actively managing projects, especially energy efficiency capital improvement projects;
- Partnering with Xcel Energy on energy efficiency and renewable supply strategies; and
- Securing regulatory approvals for future renewable options.

Partners in Energy Implementation Support

To support these implementation requirements, Xcel Energy's Partners in Energy offering is structured to provide ongoing implementation support. Based on experience supporting other communities through implementation, **Table 7** provides a list of potential activities that could be included in the implementation memorandum of understanding to help the City and County of Denver stay on course toward 100% renewable electricity.

Table 7. Partners in Energy Implementation Roles

Xcel Energy Partners in Energy	City and County of Denver
• Project management support and team facilitation – monthly meetings • Bi-annual accounting of progress toward goal • Annual update to strategies analysis to inform updates to the plan • Peer community resources through Partners in Energy exchange events and web portal • Marketing and communications collateral and case studies to communicate progress and celebrate successes along the way • Assistance accessing DSM incentives and enrolling in existing renewable energy offerings • Sharing product development updates and implications for Denver's plan • Technical assistance and staff trainings on energy efficiency and renewable energy topics • Educational signage and other staff communications to support energy efficiency opportunities and awareness around renewable energy - where renewables come from, etc.	• Program management – monthly meetings to review progress of implementation action plans and coordinate action items • Annual budgeting to support plan activities and capital projects • Public Utilities Commission advocacy for Xcel Energy's Certified Renewable Portfolio and Renewable*Connect® offerings using identified needs for Denver facilities. Xcel Energy will lead the regulatory filings and coordinate with the City and County of Denver on supporting activities. • Commitment to keeping the implementation action plans on track • Identify energy efficiency champions to align staff, ensure regular communication, and encourage accountability across departments • Partner with additional stakeholders as needed to support plan implementation

Implementation Action Plans

Each of the focus areas in this plan require funding, staffing, tracking, and other implementation logistics to successfully execute the eight strategies for achieving 100% renewable electricity. **Table 8, Table 9, and Table 10** provide implementation action plans for the energy efficiency, new construction, and renewable energy focus areas, respectively.

Table 8. Implementation Actions for Energy Efficiency in Existing Buildings

Focus Area 1: Energy Efficiency in Existing Buildings
Description
Achieve cost-effective and measurable reduction in energy use and demand through a combination of capital upgrades financed through the Elevate Denver bond and a 3rd party performance contract; low-cost operational improvements and building tune-ups; and creating a culture of efficiency that motivates building occupants to save energy.
Responsible Parties & Roles
• General Services Energy Office: overall leadership and technical expertise to implement this focus area; provide recognition and support to facility managers and staff for work that contributes to the goal • Facilities Managers: champion the building-level strategies in **Appendix B** and help inform project priorities based on individual building-level needs and seasonal O&M best practices

Focus Area 1: Energy Efficiency in Existing Buildings

- Public Works: work with General Services Energy Office on project management and implementation of capital projects
- Budget Management Office, capital planning and bond team: work with General Services Energy Office on funding approvals for the EPC, accessing capital through the bond for energy improvements, and annual budget and 6-year capital improvement planning (CIP) to ensure energy efficiency is adequately resourced.
- Public Health and Environment: work with General Services Energy Office to help close the loop between policy goals and implementation progress
- Mayor's Office and Sustainability Office: continue top-down leadership support of the plan and assist with public outreach and communications on progress to the goal
- Space Planning: add energy use implications to decision-making for allocating people to spaces across the building portfolio
- Real Estate: consider building energy performance and costs when procuring new real estate
- Human Resources: work with General Services Energy Office on employee awareness, training, and incentives
- Procurement: work with General Services Energy Office on procuring EPC implementer and ensuring energy efficiency is included in equipment purchases

Scope / Timeline

Short-term (by end of 2019)

- Confirm EPC approach and begin procurement process
- Meet with Bond project managers to integrate energy performance goals into project scope
- Work with Budget Management Office to include funding needs from this plan in annual budget process, including continuing to build a revolving fund for capital improvements
- Coordinate DSM incentives with Xcel Energy – including status of past Recommissioning Studies

Mid-term (2020-2021)

- Complete EPC Technical Energy Assessment and Phase 1 construction projects
- Complete relevant bond renovations
- Work with HR and Communications departments on incentivizing energy savings behaviors
- Document progress to inform annual update to plan and renewable supply requirements

Long-term (2022-2025 and beyond)

- Complete EPC remaining construction phases
- Complete remaining bond renovations
- Continue annual budgeting and revolving loan fund projects

Resources

- Ensure annual budget needs for energy projects
- General Service Energy Office and facilities managers staffing and training
- Xcel Energy DSM incentives
- Partners in Energy resources and examples from peer communities
- Colorado Energy Office EPC support

Focus Area 1: Energy Efficiency in Existing Buildings

Outreach Channels

- Project managers, EPC contractor, bond contractors – communication on contract performance goals and how they tie into 100% renewable electricity goal
- Facility managers – ambassadors for energy efficiency
- City communications channels and departmental level communications channels

Measurement

- Annual energy use (kWh)
- Building-level EUI
- Energy savings (kWh) – City and County of Denver will have access to energy savings from three sources:
    - The EnergyCAP software program can be used to weather-normalize energy use against a baseline year, which allows for the estimation of energy savings for the aggregated building portfolio.
    - The ENERGY STAR Portfolio Manager tool weather-normalizes energy use data and compares building performance to national median values by building category, which allows for the estimation of energy savings by building.
    - Energy performance contracts include monitoring and verification of energy savings as part of the repayment program.

Table 9. Implementation Actions for New Construction

Focus Area 2: New Construction

Description

Provide 100% renewable electricity guidance and performance assurance support to project managers for new construction and major renovations within the Elevate Denver Bond Program.

Responsible Parties & Roles

- General Services Energy Office: overall leadership and technical expertise to implement this focus area
- Public Health and Environment: work with General Services Energy Office to create performance assurance framework for achieving policy goals at building level for new construction
- Project managers assigned to new construction projects: ensure net zero energy is scoped into project – coordinate with General Services Energy Office and Public Health and Environment on performance assurance

Scope / Timeline

- Develop simple performance assurance checklist for 100% renewable electricity in new construction, based on information in this plan (April 2019)
- Develop new construction guidelines to better support net zero energy outcomes
- Distribute to project managers for new construction and major renovations (May 2019)
- Conduct quarterly performance assurance review meetings through design and construction period

Resources

Focus Area 2: New Construction
Ensure adequate budget in performance assurance checklist and monitor financial health through project risk register
Outreach Channels
Procurement; project managers and design teams, general contractors
Measurement
Energy modeling results and energy performance assurance checklists

Table 10. Implementation Actions for Renewable Energy Coordination

Focus Area 3: Renewable Energy Coordination
Description
Ensure every facility is supplied with 100% renewable electricity from rooftop solar, Xcel Energy renewable offerings, or third-party projects.
Responsible Parties & Roles
• General Services Energy Office: overall leadership and technical expertise to implement this focus area • Public Health and Environment: work with General Services Energy Office to confirm renewable energy supply strategy for each building and lead policy/advocacy work for CRP and Renewable*Connect programs. • Mayor's Office and Sustainability Office: provide leadership support for advocacy work with the PUC • Xcel Energy: provide product updates and enrollment support in renewable energy offerings
Scope / Timeline
Short-term (by end of 2019) • Confirm PPA approach for rooftop solar or determine fit with EPC • Provide advocacy support for Xcel Energy CRP and Renewable*Connect filings • Celebrate buildings already achieving 100% renewable electricity Mid-term (2020-2021) • Update renewable energy needs based on energy efficiency progress and confirm building-level renewable energy strategy • Complete first two rooftop solar projects Long-term (2022-2025 and beyond) • Complete remaining rooftop solar projects • Enroll in new renewable energy offerings from Xcel Energy, as available and feasible • Determine remaining requirements for 100% renewable energy, if any, and close gap through Windsource® or REC purchases
Resources
• Procurement process for rooftop solar projects

Focus Area 3: Renewable Energy Coordination

- Xcel Energy renewable energy offerings
- Colorado Solar and Storage Association (COSSA)

Outreach Channels

- Partners in Energy – public-facing case studies showcasing building achieving 100% renewable electricity and annual progress report for achieving 100% renewable electricity goal in municipal buildings
- Facility managers – ambassadors for renewable energy
- City communications channels and departmental level communications channels

Measurement

- Building portfolio - % renewable electricity

Organizational Alignment and Creating a Culture of Energy Awareness

This plan covers 256 buildings serving thousands of employees and the public. While Denver's General Services Energy Office provides expertise and staffing to keep the plan on course, they can't do it all alone. A top-down vision to achieve 100% renewable electricity requires alignment across all departments as well as fostering a culture of energy awareness among employees and the public.

The hardest energy efficiency measures to implement and maintain over time are energy awareness and energy-efficient behaviors by employees and the public. **Table 11** contains a list of best practices, where Denver stands on each, and future opportunities while implementing this plan.

Table 11. Best Practices for Fostering a Culture of Energy Awareness

Best Practice	Where Denver Stands and Future Opportunities
Gain Leadership Buy-In	• The energy goals set forth in this plan have been endorsed at the highest levels of Denver's municipal government, including by the Mayor. • As Denver moves from planning to implementation, the financial and human resources also need to be committed for successful plan implementation.
Form Connections to Other Leadership Initiatives	• 100% renewable electricity connects to related goals in the City's 80x50 Climate Action Plan
Form a Dedicated Energy Team	• General Services Energy Office has been implementing a successful energy management program for years. Staff are committed to implementing this plan and achieving Denver's renewable electricity goals. • Xcel Energy is committed to working with the City through Partners in Energy to help keep the plan's implementation on course.

Best Practice	Where Denver Stands and Future Opportunities
Prioritize All-Staff Engagement	• Use all-staff communication channels to launch plan implementation and provide updates on goals and successes. • Seek volunteers from across the organization to participate on plan implementation, especially around energy awareness and behavior changes. • Include content around energy awareness into new employee onboarding. • Consider a training program to raise awareness of energy use, energy efficiency opportunities, and renewable energy basics. • Consider tying performance assessments, salary actions and bonuses to goal achievement
Develop a Culture of Energy Awareness	• Make it fun! Can Denver use energy campaigns or challenges to engage employees and reduce personal heating equipment (e.g., space heaters) and unnecessary desktop electricity use (e.g., desk lights, computers)? • Can Denver establish a grant fund that any staff member can apply to with creative ideas for saving energy? • Staff who engage with energy awareness should be recognized for their efforts and successes. • Successful projects (e.g., buildings fully covered by renewable energy) should be showcased or recognized in some way, such as educational signage.
Use a Program Vision to Communicate and Inspire	• Be proud! Denver should let employees and the public know about the good work being done.

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Appendix A: Acronyms and Glossary of Terms

Term	Definition
Community solar garden	A medium-sized solar array (e.g. 500 kW) that can provide electricity for a small group of homes or businesses. Members of the community can subscribe to community solar to offset a portion of or all their electricity bill.
CIP	Capital improvement plan
COSSA	Colorado Solar and Storage Association
CRP	Certified Renewable Percentage
DHHA	Denver Health and Hospital Authority
DSM	Demand-side management. Actions that a utility undertakes to reduce the overall demand for electricity within its system. This may include incentivizing energy efficiency and shifting industrial loads outside of peak times. DSM increases the reliability of the grid during periods when generation requirements are at their highest and decreases the need for the utility to invest in additional generation while still allowing the community to grow.
ESCO	Energy services company
EPC	Energy performance contract
EUI	Energy use intensity
HR	Human Resources
HVAC	Heating, ventilation, and air conditioning
kW	Kilowatt
LEED	Leadership in Energy and Environmental Design
LEED-BD+C	Building Design and Construction
LEED EB	Existing Buildings
LEED-NC	New Construction
LED	Light-emitting diode

Term	Definition
MW	Megawatt
Net Metering	The practice of generating electricity at a location and sending any surplus electricity out to the electrical grid or drawing from the electrical grid, if needed. This allows homes and businesses to balance the electricity that is generated at their location with purchases from the grid when they are not generating electricity.
O&M	Operations and maintenance
PPA	Power purchase agreement. A financial agreement where the seller builds or installs the renewable energy generation project and the buyer pays for the energy that is generated on a per unit basis with the cost of the seller's investment factored in.
PUC	Public Utilities Commission
REC	Renewable energy credits (or certificates). Non-tangible property rights of electricity generated by renewable sources – the clean energy attributes, where 1 megawatt-hour of electricity is equal to 1 REC. REC owners may claim the environmental and other non-power benefits of renewable energy production.
Rooftop solar	Individual renewable energy installations that allow a home or building to generate renewable energy to serve their location.
Utility-scale renewables	Very large renewable electricity installations (e.g. greater than 1 MW) that are implemented by the utility and fed directly into the utility's electric grid.
VFD	Variable frequency drives

Appendix B: Building Recommendations

Appendix Key

1.1 ELEVATE Bond Renovations

- Includes buildings that have been identified for renovation as part of the ELEVATE Bond. These buildings are highlighted in navy blue.
- It is assumed that the capital funds that will be required to complete energy efficiency upgrades will be part of the bond budget.

1.2 Energy Performance Contract

- "Previous" refers to buildings that were part of the first energy performance contract
- "CCD Selection" refers to buildings that were identified by the city for a potential EPC. These selections were based on EUI as well as divvying between building groups.
- "PiE Selection" refers to buildings that have been identified for potential inclusion in a future energy performance contract. The selection process focused on large buildings with EUIs that were above the median EUI of the group.
- It is assumed that capital funds will be required to complete the energy efficiency upgrades that are included in this strategy.

1.3 Continued energy management program

- Buildings are included in this strategy if they are not assigned to the first two strategies.
- It is assumed that energy efficiency upgrades that are part of this strategy would be completed under the existing operational budget for each building.

3.1 Xcel Energy Certified Renewable Percentage: a future offering designed to allow customers to take credit for the renewable energy in Xcel Energy's source fuel mix

- This strategy applies to all buildings and does not require buildings to opt-in.

3.2 Rooftop Solar through Net Metering and Power Purchase Agreements (PPAs)

- Buildings that already have an on-site renewable energy installation or subscription are highlighted using grey boxes.
- The top 50 buildings identified for rooftop installations by the CU Feasibility Study (based on highest kWh generation per unit panel) are highlighted with blue boxes.
- Partners in Energy reduced the list of recommended buildings for rooftop solar to the Top 5 buildings based on the following criteria:
  - High generation potential (based on total kWh)
  - Building is not located downtown (working assumption that rooftop solar is precluded in down, pending new information from Xcel Energy)
  - The building is less than 3 stories tall.

- The building provides good co-benefits including educational awareness, emergency preparedness, and/or is visible to the community.

3.3 Xcel Energy Renewable*Connect®: an offering that provides access to utility-scale renewable projects through a subscription agreement.

- Buildings that already participate in Renewable*Connect have highlighted grey boxes.
- All other buildings are highlighted in blue. This is because CCD does not retain the Renewable Energy Credits for its current rooftop solar installations and community solar garden subscriptions and cannot take credit for this renewable energy towards meeting goals. These recommendations will be refined based on (1) whether a meter can be covered by more than one renewable offering, (2) CCD prefers to leave a gap towards the goal or purchase RECs to cover the energy, and (3) based on the estimated Renewable*Connect capacity that will be offered by Xcel Energy prior to 2025.

3.4 Purchase Windsource® or Renewable Energy Credits

- Buildings are highlighted in blue if they do not currently participate in Renewable*Connect. This is because CCD does not retain the Renewable Energy Credits for its current rooftop solar installations and community solar garden subscriptions and cannot take credit for this renewable energy towards meeting goals. These recommendations will be refined based on (1) whether a meter can be covered by more than one renewable offering, (2) CCD prefers to leave a gap towards the goal or purchase RECs to cover the energy, and (3) based on the estimated Renewable*Connect capacity that will be offered by Xcel Energy prior to 2025.
- Any building that is not able to be covered under Renewable*Connect and does not already have a 100% renewable electric supply will be considered for Windsource®.

Arts and Venues

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable* Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Boettcher Concert Hall	10003		PiE Selection							
Buell Theatre	10005									
Coliseum and Horse Barn	10001							Renewable*Connect – C rate		
Colorado Convention Center	11001						Rooftop Solar PPA			
DPAC Pkg Garage (Managed by A&V, Pd by GS)	10012							Renewable*Connect – C rate		
Ellie Caulkins Opera Hse - Newton Aud	10006		PiE Selection							
Galleria (Managed by A&V, Pd by A&V)	10004AV									
McNichols Bldg	4018									
Red Rocks - Box Office / Will Call	10010									
Red Rocks - Combined Stage Power	10009									
Red Rocks - Depot	10013									
Red Rocks - Trading Post	10011									
Red Rocks - Visitor's Center	10008									

Botanic Gardens

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Bot Gdns at Chatfield - Greenhouses	23012						Oak Leaf through DBG - C Rate			
Bot Gdns at Chatfield - Maintenance Shop	23010						Oak Leaf through DBG - C Rate			
Bot Gdns Chatfield HildebrandRanchHse - Child Play	23011							Renewable*Connect - C rate		
Bot Gdns Chatfld Visitor Ctr - Restrm - School Hse	23007							Renewable*Connect - C rate		
Bot Gdns Chatfld-RentalBarn-Nature Ctr-GrnFarm Hse	23008							Renewable*Connect - C rate		
Bot GdnsChatfield-HIldebrandOutBldgs-Well-CSA Barn	23014						Oak Leaf through DBG - R Rate			
Botanic Gardens at York - EL - Alpine House	23019						Oak Leaf through DBG - SG Rate			
Botanic Gardens at York - EL - Garage - Visitor's Ctr - Children's Garden	23021						Oak Leaf through DBG - SG Rate			
Botanic Gardens at York - EL - Greenhouse - Hive - Science Pyramid	23022						Oak Leaf through DBG - SG Rate			
Botanic Gardens at York - EL - Plant Society Bldg	23023							Renewable*Connect - C rate		
Botanic Gardens at York - EL - Primary Electric Mtr - Boettcher	23024		PiE Selection				Oak Leaf through DBG - SG Rate			
Botanic Gardens at York - York - WaringHouse	23004						Oak Leaf through DBG - SG Rate			
Botanic Gardens at York - York- Morrison Center	23003									

Central Platte Campus

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
CPC - Fleet Maint - Bldg 5 - SOLAR	7019		PiE Selection				AES - Rooftop PPA			
CPC - Fuel/Wash - Bldg 1	7020		PiE Selection							
CPC - Gary Price Ops - Bldg 2	7021		PiE Selection							
CPC - Heated Vehicle Garage - Bldg 3	7018									
CPC - Salt Dome - Bldg 6	7022									

Fire Department

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Fire Station #1 - Headqtrs	3001		Previous							
Fire Station #2	3002		PiE Selection				Microgrid			
Fire Station #3	3003							Renewable*Connect - C rate		
Fire Station #4	3004									
Fire Station #6	3006									
Fire Station #7	3007									
Fire Station #8	3008		Previous							
Fire Station #9	3009		Previous							
Fire Station #10	3010		PiE Selection							
Fire Station #11	3011									
Fire Station #12	3012									
Fire Station #13	3013									
Fire Station #14	3014							Renewable*Connect - C rate		
Fire Station #15	3015									
Fire Station #16	3016									
Fire Station #17	3017									
Fire Station #18	3036									
Fire Station #19	3019							Renewable*Connect - C rate (one meter only)		
Fire Station #20	3020									
Fire Station #21	3021		CCD Selection							
Fire Station #22	3022		PiE Selection							
Fire Station #23	3023									
Fire Station #24	3024		PiE Selection							
Fire Station #25	3025							Renewable*Connect - C rate		
Fire Station #26	3026		CCD Selection							
Fire Station #27	3027									
Fire Station #28	3028									
Fire Station #29	3029									
Fire Station #30	3030		PiE Selection							

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Fire Line Shop	3035									

Golf

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Aqua Golf	22008									
Evergreen Golf – Clubhouse	22013									
Evergreen Golf – Maintenance Shop	22014									
Evergreen Golf – Residence	22016									
Harvard Gulch Golf Course	22007									
Kennedy Golf – Cart Barn/Fuel	22034									
Kennedy Golf – Pro Shop - Cafe - Smaller Mtr	22017									
Kennedy Golf Clubhouse – Tavern Restaurant	22018									
Kennedy Golf Maintenance Bldg	22020									
Overland Golf - Maintenance Complex	22023									
Overland Golf - Clubhouse	22022									
Wellshire Golf – Cart Barn	22024									
Wellshire Golf – Equipment Storage	22025									
Wellshire Golf – Starter House - Exterior Lights	22043									
Wellshire Golf – West Maintenance Shop Bldg	22048									
Wellshire Golf – DrivingRange	22044									
Willis Case Golf – Equipment Storage - 271	22026									
Willis Case Golf – Maintenance Shop	22027									
Willis Case Golf – New Club House - 272	22009									

Human Services

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Castro Bldg - Human Services -Team B	4016						Owns 30kW Rooftop Solar			
Castro Parking Garage - Hum Svcs - Team B	4009									
Eastside - Human Services - Team C	4035									
Family Crisis Center - Team B	4010									

Libraries

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Athmar Park Library	14001									
Barnum Library	14002		Previous							
Bear Valley Library	14003		Previous				Microgrid			
Blair Caldwell African-American Library	14004									
Broadway Library	14005									
Byers Library	14006							Renewable*Connect - C rate		
Central Library	14007									
Cherry Creek Library	14008						Microgrid			
Decker Library	14009							Renewable*Connect - C rate		
Eugene Field Library	14010		Previous							
Ford Warren Library	14011		CCD Selection							
Green Valley Ranch Library	14023		PiE Selection							
Hadley Library	14012									
Hampden Library	14013		PiE Selection							
Montbello Library	14014		PiE Selection							
Park Hill Library	14015									
Pauline Robinson Library	14016									
Rodolfo "Corky" Gonzales Library	14025		PiE Selection					Renewable*Connect - SG rate		
Sam Gary Library (Stapleton)	14024									
Schlessman Family Library	14017		Previous				Microgrid			
Smiley Library	14018							Renewable*Connect - C rate		
University Hills Library	14019									
Valdez Perry Library	14020									
Virginia Village Library	14021		CCD Selection							
Woodbury Library	14022		PiE Selection							

Parks & Rec

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Barnum Park - Restroom	26119									
Berkeley Lake Park - Restroom	26060									
Bible House - City Park	26020									
Bible Park - Restroom	26091									
Buffalo Bill Museum - Mtn Pk	27004									
Central Park - Restroom	26144									
Chaffee Park - Restroom	26145									
Cheesman Park - Storage	26057									
Cheesman Pk - Pavilion	26070									
Chief Hosa Lodge - Current	26164									
City Park - Greenhouse	26003									
City Park - Pavilion	25041									
City Park - Restroom	26078									
Civic Center Park - Greek Theater	26152									
Commons Park - Restroom	26146									
Cook Park - Restroom	26046									
CSU Denver Ext-Harvard Gulch Pk	4001									
Four Mile Historic Park - 785 S Flamingo House	26036									
Four Mile Historic Park - Four Mile House	26066									
Four Mile Historic Park - Museum	26085									
Four Mile Historic Park - Restroom	26101									
Garfield Lake Park - Pool House	25046									
Garland Park - Restroom	26024									
Great Lawn Park - Restroom	26147									

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Green Valley Ranch East Park - Poolhouse	26143									
Green Valley Ranch Rec Ctr	25026		PiE Selection		Higher than expected EUI. 11-12 years old. HVAC issues. A good recommissioning opportunity. Planning to add a pool.		Top 5			
Greenway Park - Restroom	26107									
HarvardGulchRec/ DPDWhse	25017		PiE Selection							
Jefferson Park - Restrooms	26026									
Johnson Habitat Park - Special Use Bldg	26018									
McWilliams Park - Restroom	26040									
Montclair Park - Mulkery (Special Rentals)	26111									
Mt. Parks HQ Carpenter Shop	27008									
Mt. Parks HQ/Civilian Conservation Corps Campus	27012									
Observatory Park - Restroom	26041									
Parkfield Lake Park - Storage	26138				Electricity use can be attributed to the ball field complex.					
Parks Maint - Barnum Park	26001									
Parks Maint - Bear Creek Park	26008							Renewable*Connect - C rate		
Parks Maint - Berkeley Park	26051									
Parks Maint - Central Park	26081									
Parks Maint - City Park	26002				Has 200 hp motors for the fountain operation.					

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Parks Maint - Citywide Ops - South Jason	26031						Sunshare			
Parks Maint - Congress Park	26004							Renewable*Connect - C rate		
Parks Maint - Crestmoor	26005							Renewable*Connect - C rate		
Parks Maint - Huron - SOLAR	26006						AES - Rooftop PPA	Renewable*Connect - C rate		
Parks Maint - Lowry	26009									
Parks Maint - North Jason - SOLAR	26007						AES - Rooftop PPA			
Parks Maint - Northeast	26010		PiE Selection					Renewable*Connect - C rate		
Parks Maint - Rocky Mountain Lake Park	27002							Renewable*Connect - C rate		
Parks Maint - Rosedale Park	26011							Renewable*Connect - C rate		
Parks Maint - Ruby Hill Park	26012							Renewable*Connect - C rate		
Parks Maint - Sloan's Lake - SUNSHARE	26013						Sunshare			
Parks Maint - Washington Park	26014							Renewable*Connect - C rate		
Parks Maint - Yale	26015							Renewable*Connect - C rate		
Pferdstellar Park - Restroom	26148									
Robinson Park - Restroom	26075									
Rosamond Park - Restroom	26149									
Ruby Hill Park - Restroom	26084									
Sloan's Lake Park - Boat House	26139									
Sloan's Lake Park - Restroom	26150									
Sunken Gardens Park - Storage	26086									
Thomas Memorial Park - Restroom	26108									
Washington Park - Eugene Field House	26016									
Washington Park - Restroom	26151									

Recreation Centers

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Ashland Indoor Pool	25025		Previous							
Ashland Rec Ctr	25019		Previous							
Athmar Rec Ctr	25002		PiE Selection		Building envelope concerns. Decided to switch from 1.3 to 1.2. Natatorium being repaired.					
Aztlan Rec Ctr	25021		PiE Selection							
Barnum Rec Ctr	25018						CCD Selection	Renewable*Connect - C rate		Getting new roof. Would be good candidate for rooftop solar.
Carla Madison Rec Ctr	25113				New building (1-year-old); Used heavily; LEED certified; Issues with training equipment. Recommissioning should be considered. A lot of visitors, large space, and long hours contribute to the high energy use. RTUs and pool equipment should be efficient.		CCD Selection			Good opportunity for rooftop solar. Might be 4 stories tall. Is there an option for plug-in-play systems so that roof leaks can be addressed? Constantly have roof issues. Reinstalling solar is a high cost.
College View Rec Ctr	25014		PiE Selection		One of the emergency shelters. Electric service has to accommodate generator.					
Community Rec Ctr	26035									
Cook Park Rec Ctr - OutdoorPool	25027				No indoor pool. One of the emergency shelters. Service has to accommodate generator.					A generator can be used to power the building.
Eisenhower Rec Ctr - Restroom	25007									

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Glenarm Rec Ctr	25022		Previous				CCD Selection			Replace existing hydronic solar with new PV solar.
Globeville Rec Ctr	25024									
Harvey Park Rec Ctr	25005									
Hiawatha Davis Rec Ctr - SOLAR	25011		PiE Selection				AES - Rooftop PPA			
Highland Senior Ctr	25020		PiE Selection		State-owned building that CCD Parks and Rec leases but CCD is able to make upgrades. Restroom being renovated.					
Johnson Rec Ctr	25006									
La Alma Rec Ctr	25001				One of the emergency shelters. Electric service has to accommodate generator.					A generator can be used to power the building.
La Familia Rec Ctr	25013		CCD Selection							
Martin Luther King Rec Ctr	25029		CCD Selection							
Montbello Rec Ctr	25010		PiE Selection		Windows drive heating load. Consider a destratification fan. Not heavily used so consider changing days/hours opened.		**Top 5**			Good rooftop solar potential
Montclair Rec Ctr	25030		CCD Selection		Envelope upgrades should be considered. Currently replacing boilers and water heaters but not electrifying					
PlattePkSenior Ctr-FlemingMansion	25015									

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Rude Rec Ctr - SOLAR	25016		PiE Selection		Metal Halide fixtures in the natatorium should be replaced with LEDs however they may have a long payback.		AES - Rooftop PPA			
Scheitler Rec Ctr - POOL	25008		Previous		New HVAC in design now. One of the emergency shelters. Service has to accommodate generator.					A generator can be used to power the building.
Southwest Denver Rec Ctr	25028		PiE Selection		Not many visitors. Might be good candidate for changing hours/days		CCD Selection			A generator can be used to power the building. Might be good candidate for rooftop solar based on roof.
St Charles Rec Ctr	25004		PiE Selection		Getting a new HVAC system with 3-phase electrical service. One of the emergency shelters. Service has to accommodate generator.					A generator can be used to power the building.
Stapleton Rec Ctr - SOLAR	25003						AES - Rooftop PPA			
Swansea Rec Ctr	25009									
Twentieth Street Rec Ctr	25012		Previous				Microgrid			
Washington Park Rec Ctr	25023		CCD Selection		Consider a more efficient PoolPak. Getting a new roof. #2 rec center in terms of usage.		CCD Selection			Will have a new roof installed soon.

Sheriff's Department

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
County Jail - Main	6001							Renewable*Connect - SG & C rate		
Impound: Auction/Sales	6005									
Impound: Hazmat Bldg	6006									
Impound: Main Office	6004									
Impound: Property-Workshop	6002		PiE Selection					Renewable*Connect - C rate		
Van Cise-Simonet Detention Ctr	6008		PiE Selection							

Team A-E

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
1245 Champa St-CCD Owned-LeasedByCOSymph	4036									
2601 W 7th Ave - Warehouse	37085									
405 S Platte River Dr	4033									
4330 E 48th Ave - Homeless Overflow -	37038									
5125 Race Ct - BSI Designs, Unit A	37051									
5125 Race Ct - Rocky Mt Colby Pipe, Unit B	37063									
5125 Race Ct - RR	37082									
Arie P. Taylor Municipal Center	4007						AES - Rooftop PPA			
Cableland Mayor's Residence	25031		PiE Selection					Renewable*Connect - C rate		
CCD Owned-CO Pharmacy	12011									
City and County Building	4019						Oak Leaf			
Communications Center - NEW	3037		PiE Selection				**Top 5**			
Communications Center - OLD	3005		Previous							
Denver Crime Lab	12021		CCD Selection				Oak Leaf			
Denver Municipal Animal Shelter	18003		CCD Selection				**Top 5**			
District 6 - Motorcycle Garage	12019									
Edna Oliver Child Dvlpmt Ctr	4032									
Elbra M Wedgeworth Municipal Bldg	4042									
Lindsey-Flanigan Courthouse	6009							Renewable*Connect - SG rate		
Lowry Child Development Ctr	37005									
Minoru Yasui Bldg	4008						Oak Leaf			
PAB-Office; PADF - Police Property	12008		PiE Selection				CCD Selection			
Park Ave-PoliceTrOps-Parks-PD Property	4026		PiE Selection				AES - Rooftop PPA			

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Permit Building	4015							Renewable*Connect - SG rate		
Police Academy	12012		PiE Selection				Top 5			
Police District #1	12013		Previous				AES - Rooftop PPA			
Police District #2	12015		CCD Selection							
Police District #3	12004		PiE Selection							
Police District #4	12005									
Police District #6	12018						Microgrid			
PoliceTransmitter-VehSvcCtr--OLD BicycleBureau-EEB	12010									
PoliceVehSvcCtr - NEW EEB	12020									
Rose Andom Center - 1330 Fox	4040		PiE Selection				CCD Selection			
Roslyn Asphalt Plant Office Bldg G	7005		PiE Selection							
Roslyn-Elec-Primary Gen	7002						AES - Rooftop PPA			
Roslyn-Mag Chloride	7011									
S. Cherry Creek Transfer Station	7009									
S. Osage Fleet Maint - Garage	7006		PiE Selection							
SurplusWhse-DMV&ElectionsStorage	29001						AES - Rooftop PPA			
Technology Services - 10 Galapago	4014						AES - Rooftop PPA			
Urban Crime Bureau	12007									
Wellington Webb Municipal Office Building	4002							Renewable*Connect - SG rate		

Temporary Buildings

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
1391 Delaware St - Retail Space	37020									
716 S Poplar Street	37025									
793 Olive St	37026									
8315 E Colfax Ave	37078									

Wastewater

Building Name	Building Code	1.1 Bond Renovation	1.2 EPC	1.3 Energy Management	Energy Efficiency Notes	3.1 CRP	3.2 Rooftop Solar	3.3 Renewable*Connect	3.4 Windsource or RECs	Renewable Electricity Notes
Wastewater Management Bldg	21002		PiE Selection				AES - Rooftop PPA			

Appendix C: Financials and Phasing

The following tables show estimated energy savings (kWh), renewable energy generation (kWh), capital costs ($), O&M costs ($), energy cost savings ($), and utility incentives ($) by year based on the working targets contained in this plan. The values are subject to change during plan implementation through the annual capital and O&M budgeting process. During implementation, the City and County of Denver will work to align budgeting with Xcel Energy's annual reporting cycle.

Annual Electricity Savings (kWh)								
Strategy	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**Cumulative Savings**
1.1 ELEVATE Bond Renovations	500,000	1,000,000	1,500,000	2,000,000	2,500,000	3,000,000	3,300,000	13,800,000
1.2 Energy Performance Contract	-	-	1,500,000	3,000,000	4,600,000	4,600,000	4,600,000	18,300,000
1.3 Continued energy management program	700,000	1,400,000	2,100,000	2,800,000	3,500,000	4,200,000	4,700,000	19,400,000
Total	**1,200,000**	**2,400,000**	**5,100,000**	**7,800,000**	**10,600,000**	**11,800,000**	**12,600,000**	**51,500,000**

Annual Electricity Generation (kWh)								
Strategy	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**Cumulative Generation**
3.1 Xcel Energy Certified Renewable Percentage	35,000,000	38,700,000	42,400,000	46,100,000	49,800,000	53,500,000	57,200,000	322,700,000
3.2 Rooftop Solar through Net Metering and PPAs	-	-	600,000	1,200,000	1,800,000	2,400,000	3,100,000	9,100,000
3.3 Xcel Energy Renewable*Connect	11,100,000	11,100,000	22,200,000	22,200,000	22,200,000	22,200,000	33,300,000	144,300,000
3.4 Purchase Windsource® or RECs (back-up plan)	-	-	-	-	-	-	6,000,000	6,000,000
Total	**46,100,000**	**49,800,000**	**65,200,000**	**69,500,000**	**73,800,000**	**78,100,000**	**99,600,000**	**482,100,000**

Capital Cost ($)								
Strategy	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**Total**
1.1 ELEVATE Bond Renovations	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$10,500,000
1.2 Energy Performance Contract	-	-	-	-	-	-	-	$0
1.3 Continued energy management program	-	-	-	-	-	-	-	$0
3.1 Xcel Energy Certified Renewable Percentage	-	-	-	-	-	-	-	$0
3.2 Rooftop Solar through Net Metering and PPAs	-	-	-	-	-	-	-	$0
3.3 Xcel Energy Renewable*Connect	-	-	-	-	-	-	-	$0
3.4 Purchase Windsource® or RECs (back-up plan)	-	-	-	-	-	-	-	$0
Total	**$1,500,000**	**$1,500,000**	**$1,500,000**	**$1,500,000**	**$1,500,000**	**$1,500,000**	**$1,500,000**	**$10,500,000**

O&M Cost ($)								
Strategy	2019	2020	2021	2022	2023	2024	2025	Total
1.1 ELEVATE Bond Renovations	-	-	-	-	-	-	-	$0
1.2 Energy Performance Contract	-	$570,000	$4,800,000	$4,800,000	$4,800,000	-	-	$14,970,000
1.3 Continued energy management program	$77,000	$77,000	$77,000	$77,000	$77,000	$77,000	$77,000	$539,000
3.1 Xcel Energy Certified Renewable Percentage	-	-	-	-	-	-	-	$0
3.2 Rooftop Solar through Net Metering and PPAs	-	-	-	-	-	-	-	$0
3.3 Xcel Energy Renewable*Connect	-	-	-	-	-	-	-	$0
3.4 Purchase Windsource® or RECs (back-up plan)	-	-	-	-	-	-	$90,000	$90,000
Total	**$77,000**	**$647,000**	**$4,877,000**	**$4,877,000**	**$4,877,000**	**$77,000**	**$167,000**	**$15,599,000**

Cost Savings								
Strategy	2019	2020	2021	2022	2023	2024	2025	Cumulative Savings
1.1 ELEVATE Bond Renovations	$43,000	$85,000	$128,000	$171,000	$210,000	$260,000	$280,000	$1,177,000
1.2 Energy Performance Contract	-	-	$130,000	$260,000	$390,000	$390,000	$390,000	$1,560,000
1.3 Continued energy management program	$60,000	$120,000	$180,000	$240,000	$300,000	$360,000	$400,000	$1,660,000
3.1 Xcel Energy Certified Renewable Percentage	-	-	-	-	-	-	-	$0
3.2 Rooftop Solar through Net Metering and PPAs	-	-	-	-	-	-	-	$0
3.3 Xcel Energy Renewable*Connect	-	-	-	-	-	-	-	$0
3.4 Purchase Windsource® or RECs (back-up plan)	-	-	-	-	-	-	-	$0
Total	**$103,000**	**$205,000**	**$438,000**	**$671,000**	**$900,000**	**$1,010,000**	**$1,070,000**	**$4,397,000**

Incentives								
Strategy	2019	2020	2021	2022	2023	2024	2025	Total
1.1 ELEVATE Bond Renovations	$55,000	$55,000	$55,000	$55,000	$55,000	$55,000	$55,000	$385,000
1.2 Energy Performance Contract	-	-	$160,000	$160,000	$160,000	-	-	$480,000
1.3 Continued energy management program	$76,000	$76,000	$76,000	$76,000	$76,000	$76,000	$76,000	$532,000
3.1 Xcel Energy Certified Renewable Percentage	-	-	-	-	-	-	-	$0
3.2 Rooftop Solar through Net Metering and PPAs	-	-	-	-	-	-	-	$0
3.3 Xcel Energy Renewable*Connect	-	-	-	-	-	-	-	$0
3.4 Purchase Windsource® or RECs (back-up plan)	-	-	-	-	-	-	-	$0
Total	**$124,000**	**$124,000**	**$294,000**	**$294,000**	**$294,000**	**$124,000**	**$124,000**	**$1,378,000**