

Executive Summary

The National Western Center (NWC) is a 250-acre, long-term redevelopment and expansion of the National Western Stock Show site by the City and County of Denver (City), Western Stock Show Association (WSSA) and Colorado State University (CSU), Denver Museum of Nature and Science and History Colorado (NWC Partners). It is one of the largest urban infill projects in the country. The NWC will physically transform north Denver and create tremendous regional economic benefits as it seeks to create *“the global destination for agricultural heritage and innovation.”*

The NWC Master Plan identified nine guiding principles for the NWC, including “Embrace an Ethic of Regeneration” and “Engage the River and Nature.” Captured in the Master Plan’s Regeneration and Sustainability Framework, the NWC Partners have expressed a desire to create a zero energy district (ZED) and carbon neutral future at the NWC. The City, in its role as manager of the NWC Capital Build Program,¹ has a singular opportunity to lay a strong foundation during the Capital Build for sustained success of the NWC’s energy future. Long term operations, maintenance and programming of the campus will be the responsibility of the NWC Authority (Authority), which will be established in early 2018. Once established, many critical decisions about campus-wide energy systems will rest with the Authority.

To help frame and pursue these aspirations, CCD engaged with Xcel Energy through its Partners in Energy offering. Partners in Energy is a six-month facilitated planning process culminating in the creation of an Energy Action Plan Technical Advisory Report (Report), followed by ongoing implementation support. For NWC, the facilitated planning process included an energy model used to help gain data-driven insights to the interactions between energy, cost and greenhouse gas (GHG) emissions for the redevelopment and to assist stakeholders in recommending performance targets to achieve NWC goals. The energy model was built on results of past and concurrent studies, using historical energy consumption data from the site along with Capital Build Program assumptions such as future buildings, construction year, phase and square footage, to create an energy forecast by year and phase through build-out.

Concurrently with this effort the NWC Capital Build Program management team developed a Capital Build Performance Management Framework with specific goals in the areas of energy, water, the natural environment, and waste. The Capital Build Performance Management Framework necessarily takes into consideration Capital Build scope and budget constraints. This EAP Report is organized to align with and inform that Framework and also extend beyond the many constraints of the Capital Build to identify future opportunities for implementing campus-wide energy goals. As such, the targets and strategies in this Report – such as those related to achieving a zero energy district and carbon neutrality – extend beyond the Capital Build Performance Management Framework to include targets and strategies that could be achievable if additional partners and resources are identified.

Through Partners in Energy, Xcel Energy and the NWC Partners relied on local energy advisors such as the National Renewable Energy Lab (NREL) and CSU to guide this approach. Offering many creative ideas and strategies, NWC Partners and energy advisors consistently challenged the City, Xcel Energy and the NWC Capital Build program to:

¹ Throughout this EAP Report, Capital Build Program refers to Phases 1 and 2 of the redevelopment, which includes all land acquisition, site remediation and horizontal development across 250-acres and 1,500,000 sf of new facilities.

- Maximize what can be delivered through the Capital Build program
- Maximize what can be *enabled* through the Capital Build program and achieved through partnerships with the NWC Authority and/or private sector partners

Summary of Key Findings

The table below summarizes the projected energy, carbon, and economic differences after completion of Phase 1 and 2 Capital Build between three scenarios analyzed:

- **Scenario 1: LEED Gold v4** - Focuses solely on energy efficiency and the amount of annual energy use reduced from adopting LEED Gold energy use targets in addition to energy code standards.
- **Scenario 2: Zero Energy District but Not Carbon Neutral** - Achieves zero energy performance with the tradeoff of selling the renewable energy credits (RECs) associated with the two variations of solar arrays to lower the cost of zero energy improvements.
- **Scenario 3: Zero Energy District and Carbon Neutral** - Like Scenario 2, this scenario also achieves zero energy performance but it looks at the implications of retaining all RECs.

Table 1: Summary of Scenarios Analyzed after completion of capital build program (Phases 1 and 2)

Summary of Results after Phase 1 & 2			
	LEED Gold v4	Zero Energy District but Not Carbon Neutral	Zero Energy District and Carbon Neutral
Percent towards Carbon Neutral	26%	55%	92%
Percent towards Zero Energy	27%	93%	93%
Estimated Incremental Cost*	\$2,800,000	\$9,200,000	\$9,200,000
Estimated Annual Cost Savings	\$140,000	\$533,000	\$533,000
Incentives	\$920,000	\$4,650,000	\$4,000,000

**The cost assumptions and scenarios developed in this report are preliminary and meant mainly to inform performance management targets*

Based on energy modeling, scenario analysis and stakeholder input, key findings in this Report include:

1. Because NWC facilities will be built using improved building and energy codes and will achieve a minimum of LEED Gold certification (modeled as 27% reduction over code), the NWC campus (which is four times larger than the current Stock Show Complex) will only double electric use and require a 35% increase in natural gas use compared to current energy use.
2. Building to even more aggressive energy efficiency (Best-in-Class) standards could result in less than a 10% increase in energy use compared with the Stock Show Complex’s current energy use today (despite the new NWC campus being four times larger).
3. Since LEED is a points-based rating system with options for achieving certification at the individual building level and on a campus level, it is recommended that the NWC develop a program-level LEED strategy coordinating energy, water, and waste targets within the Capital Build performance management framework.

4. The NWC site has a unique opportunity to implement sewer heat recovery (SHR) as a potential strategy toward a zero energy district. Thermal energy from the nearby Delgany Interceptor could supply 55% of campus energy use based on current information. It would also be a highly innovative and catalyzing project supporting multiple goals across the program.
5. Achieving a zero (or positive) energy district and net carbon neutrality on the site are both technically feasible. This Report considers several potential strategies for utilizing renewable energy resources at the NWC to achieve this aspirational goal. Also, on-site energy generation would serve both resiliency purposes as well as educational purposes. Since many of these strategies would require long-term partnership agreements that extend beyond the Capital Build, the City will need to work closely with the NWC Authority on implementation.
6. Financial feasibility of creating a zero energy district and achieving carbon neutrality will likely depend on the following, at a minimum:
 - Achieving high energy efficiency (such as LEED Gold certification) through the Capital Build
 - Financial incentives from Xcel Energy
 - Identifying one or more private sector partners, such as a district energy partner
 - Tapping the ingenuity of NWC partners, such as Colorado State University's energy technology research and development capabilities
 - Coordination with and potential financial contribution from Metro Wastewater, should Sewer Heat Recovery be implemented

NWC Energy Targets

Based on these findings, two sets of energy targets have been identified - one that aligns with the Performance Management Framework, or LEED Gold v4 standard for the Capital Build Program, and a more aspirational, or preferred, set of targets that could become achievable through a partnership between the NWC Authority and a district energy partner to share both resources and risk.

LEED Gold v4 Targets:

- Buildings perform 27% below ASHRAE 90.1-2013²
- 5% of total building energy use supplied through on-site renewable energy³
- All buildings address solar ready requirements

Zero Energy District Targets:

- Campus-wide zero energy district on annual basis
- Carbon neutral campus on a net annual basis
- Zero emissions from fleet
- At least one pilot project per program phase

Due to the high visibility of the National Western Center campus and “blank slate” of campus infrastructure, the NWC Partners, Authority and Xcel Energy have an unparalleled opportunity to demonstrate global energy leadership and to educate over 2 million visitors annually about energy innovation. Being an energy

² Equivalent to a 35% reduction from ASHRAE 90.1-2010 or 14 of possible 18 LEED points under EAc2: Optimize Energy Performance.

³ Equivalent to 3 of possible 3 LEED points under EAc5: Renewable Energy Production

leader adds tremendous value to the campus – both in operational cost savings and in reputation - and will help the NWC, its partners and tenants compete in a global marketplace.

Introduction

The National Western Center (NWC) is a 250-acre, long-term redevelopment and expansion of the National Western Stock Show site. It is the largest urban infill project in the country and one of Denver’s most transformational and unique redevelopments. Current partners – including the City and County of Denver, Colorado State University, State of Colorado, Western Stock Show Association, Denver Museum of Nature and Science, History Colorado, Denver Water, National Renewable Energy Lab (NREL), and our emerging partner Metro Wastewater Reclamation District – are working together to transform the site into a year-round campus estimated to attract over two million visitors per year. A comprehensive master planning effort for the site identified nine guiding principles for the NWC, including “Embrace an Ethic of Regeneration” and “Engage the River and Nature.” NWC has translated these guiding principles into the Capital Build Performance Management Framework with specific targets in the areas of energy, water, the natural environment, and waste. Achievement of these targets will follow a stepped approach of compliance pathways based on City requirements and public commitments as top priorities. NWC Partners will also work with the NWC Authority on achieving long-term aspirational outcomes for the campus.

The NWC Master Plan identified various energy goals, which the Capital Build Team worked with NWC Partners to distill into the following eight desired outcomes:

- (1) Minimize energy demand of campus during each phase of build-out.
- (2) Maximize installed renewable energy generation
- (3) Determine and enable appropriate energy system(s) for thermal, electric and transportation energy requirements, taking a holistic and integrated view.
- (4) Serve as a platform for clean energy technology innovation.
- (5) Incorporate educational and interpretive programs that showcase clean energy innovations and practices.
- (6) Site and buildings operate to maximize energy efficiency performance with low maintenance liability.
- (7) Visitor education to increase awareness of clean energy innovations and practices.
- (8) Site and building adaptability for new systems.

Xcel Energy is the electric utility serving the NWC. In the summer of 2014, Xcel Energy launched Partners in Energy to support communities in developing and implementing energy action plans that supplement existing sustainability plans, strategies, and tools. Xcel Energy and City and County of Denver signed a Memorandum of Understanding (MOU) in March 2017 outlining the City’s participation in Partners in Energy and respective roles of the City and Xcel Energy. One of the deliverables of this agreement is this Energy Action Plan. This plan contains information and recommendations derived from a series of planning workshops, data collection and modeling efforts that included various NWC decision-makers and energy advisors, facilitated by an energy project management team committed to vetting and implementing plan strategies.

Xcel Energy will work with NWC to coordinate support for implementing the plan and will develop a MOU that outlines specific support Xcel Energy will provide to help NWC deploy its strategies and achieve its targets and goals. Partners in Energy is a two-year collaboration with Xcel Energy to develop and implement the plan.