City Council Staff Report

Subject:	**Consideration of RESOLUTION 28-2017 ADOPTING NET-ZERO ENERGY PERFORMANCE REQUIREMENTS**
Author:	**Celia Peterson**
Department:	**Sustainability**
Date:	**October 12, 2017**
Type of Item:	**Administrative**

Summary Recommendation

Staff recommends City Council adopt this policy to specify a requirement for all new municipal buildings and facilities to be net-zero energy.

Executive Summary

- Park City's buildings and facilities account for thirty-nine percent (39%; 2016) of all carbon emissions that come from municipal activities. These emissions come from electricity usage (i.e. Scope 2 indirect emissions) and natural gas that is burned on site for heating (i.e. Scope 1 direct emissions).
- In general, a net-zero energy building or facility is one that balances the annual energy use with renewable energy, thereby reducing the use of non-renewable energy in the building sector.
- This standard for new buildings and facilities built using municipal funds outlines the process to achieve net-zero energy building performance and third party verification options.

Background

- On May 24, 2007 City Council passed and adopted Resolution No. 12-07 Green High Performance Building Requirements.
- On September 24, 2015 City Council elevated Energy to a Critical Priority and set a goal of net zero carbon emissions for municipal operations by 2022 and citywide by 2032.
- On September 22, 2016 City Council passed Resolution 23-2016 to set 100% renewable electricity goals by 2022 for municipal operations and 2032 community-wide. On July 13, 2017 this approach to net-zero energy buildings was discussed (see page 20)

How this could further the goals expressed in the General Plan

This proposal aligns with three goals expressed in the General Plan:

5A Encourage development practices that decrease per capita carbon output, decrease vehicle miles traveled, increase carbon sequestration, protect significant existing vegetation and contribute to the community emission reduction goal.

5B Encourage efficient infrastructure to include water conservation, energy conservation, renewable resource technology, decreased waste production, green public transit, and increased road and pathway connectivity.

5C Park City Municipal Corporation will be a strong partner in efforts to reduce community GHG emissions, leading by example and providing policy guidance while promoting personal accountability and community responsibility.

Abbreviations and Definitions

Applicable building projects

Any new construction or major renovation of a City-owned building or facility that uses over 1 MMBtus energy (approximately 293 kWh) per year upon completion of construction. For example, this would cover most existing City owned buildings and facilities. Excluded would be e.g. the restrooms on Main Street, and a few irrigation structures.

Major renovation Work that demolishes space down to the shell structure and rebuilds it with new walls, ceilings, floors and systems, when such work affects more than twenty-five percent (25%) of the building's square footage.

MT CO2e Metric tons carbon dioxide equivalent. This is the standard unit for measuring carbon emissions.

Net-zero carbon emissions

Carbon neutrality, or having a net-zero carbon footprint, refers to achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered or offset.

Emissions are classified into three categories:

Scope 1 refers to on-site natural gas and other fossil fuel combustion, e.g. fleet and transit fuel.

Scope 2 refers to indirect emissions that come from purchased electricity production.

Scope 3 refers to emissions that come from other business activities, e.g. employee commute.

Net-zero energy building (DOE definition)

An energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy.

Net-zero energy building or facility for Park City

One that balances the on-site annual energy use with renewable energy generated on-site, or as close to the consumption site as possible, i.e. campus renewable installations are encouraged to

capture efficiencies. Net-zero energy buildings and facilities include all designed constructions that use City funds and use in excess of 1 MMBtu (approximately 293 kWh) annually, including parks, outdoor facilities, etc.

Renewable electricity

Energy sources for renewable energy include solar, wind, micro hydro and biomass byproduct.

The Problem

- Park City's municipal buildings and facilities, account for thirty-nine percent (39%; 2016) of all carbon emissions that come from municipal activities. These emissions come from electricity usage (i.e. Scope 2 indirect emissions) and natural gas that is burned on-site (i.e. Scope 1 direct emissions).
- This policy is to ensure that public monies spent are towards buildings and facilities that address Park City's Energy critical priority, and that the City's buildings and facilities are aligned around a common approach to net-zero energy.

Options for City Council to Consider

1. **Recommended Option:** Net-zero energy buildings and facilities with on-site renewables to balance energy usage.

   Pros

   a. This approach ensures that buildings are net-zero energy according to all definition standards.
   b. This will significantly reduce carbon emissions from Park City's municipal buildings and facilities.
   c. This approach will significantly reduce annual operational energy costs of the building or facility.
   d. This approach will be another act of leadership on climate change taken by Park City Municipal.

   Cons

   a. Buildings and facilities designed and built to net-zero energy performance can incur capital costs around five to twelve percent higher than new buildings or facilities that are value engineered.

2. **Null Alternative:** Value engineering with some added energy efficiency features and on-site renewables on a case-by-case basis.

   Pros-

   a. This alternative will not require additional capital funds compared to past procedure.

   Cons-

   b. This will significantly deter Park City Municipal from reaching its net-zero carbon goal.

3. **Other Alternatives?** Net-zero energy buildings and facilities with off-site renewables to balance energy usage.

Pros-

a. This makes it easier to balance the energy usage with renewables sited in alternate locations which may be better suited for wind or solar production.

Cons-

a. This does not meet the standard definition of net-zero energy buildings, and such buildings or facilities would not pass third party verification.

Analysis

Park City, Utah is nestled in the Wasatch Range and is dependent on world class snow and moderate temperatures to sustain our resort economy and high quality of life. Climate change is deeply affecting the community through changes in weather patterns including droughts, volatile snow events, and warmer temperatures. The community has expressed deep concerns for the environment we live in.

In order to preserve its beautiful natural setting, clean air, expansive open spaces and snow covered mountains, Park City has set North America's most ambitious climate goals. On March 24, 2016 Park City Council passed resolution No. 04-16 to achieve Net-zero carbon by 2022 for the municipal government and by 2032 for the broader community. On September 22, 2016 the resolution was amended to include the clause that the electricity portion of this goal be achieved using only renewable electricity.

Park City Municipal's buildings and facilities, not including water distribution and treatment facilities, account 6524 MT CO2e. This is approximately eighty-five percent of the yearly carbon sequestered by the City's open spaces and land easements.

It can often be the case that net-zero energy buildings are more expensive during the design and build phase, on average between five and twelve percent more expensive than standard buildings[1]. However, the results of several case studies show that fees incurred for Energy Modeler/Engineer (EME), ranging between $34,000 and $74,000 are recouped by the initial cost savings alone, which range between $267,000 and $1,695,000. Annual energy cost savings of up to $70,600 are realized by projects that utilize the process of employing an Energy Modeler/Engineer, Building Envelope Commissioning Agent, and Mechanical Engineer/Commissioning Agent as detailed in this resolution[2].

Department Review

Public Utilities, Building

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[1] Net Zero and Living Building Challenge Financial Study: A Cost Comparison Report for Buildings in the District of Columbia, 2013.

[2] An Analytical Evaluation of the Lifecycle Cost Effectiveness of Implementing Section 5.5 of the DFCM 2014 High Performance Building Standard, see attached document.

Attachment

A RESOLUTION ADOPTING NET-ZERO ENERGY PERFORMANCE REQUIREMENTS

RESOLUTION 28-2017

A RESOLUTION ADOPTING NET-ZERO ENERGY PERFORMANCE REQUIREMENTS FOR ALL NEW OR RENOVATED BUILDINGS AND FACILITIES CONSTRUCTED USING FUNDS ALLOCATED BY PARK CITY, UTAH TO PROMOTE ENERGY EFFICIENCY, REDUCTION OF CARBON EMISSIONS, AND SUSTAINABLE DESIGN

WHEREAS, the City has adopted ambitious climate and energy targets to be net-zero carbon and running on 100% renewable electricity by 2022 for municipal operations and by 2032 community wide; and

WHEREAS, buildings and facilities currently account for approximately thirty-nine percent of carbon emissions from municipal operations; and

WHEREAS, the City desires to promote sound environmental practices in new construction and renovation of facilities that are funded by the City; and

WHEREAS, buildings and facilities designed and verified to be net-zero energy with the collaboration of appropriate commissioning agent(s) and energy modeler does not increase the costs of the building when taken over the lifetime of the project. Efficiency measures and on-site renewables incorporated during the design phase of the facility does not significantly increase the cost of the facility; and

WHEREAS, buildings designed for sustainability promote a healthy environment, provide long-term cost benefits through the efficient use of energy, optimize building performance, and create healthier workplaces for employees and visitors; and

WHEREAS, a strategic approach to sustainable buildings and energy management can produce twice the savings for the bottom line and the environment as typical approaches; and

WHEREAS, the International Livings Futures Institute's Energy Petal certification, a score of zero from the Zero Energy Performance Index, and Passive House certification verify a building's actual performance on an annual basis.

NOW THEREFORE, be it resolved by the City Council of Park City as follows:

SECTION 1. REQUIRE MUNICIPAL BUILDINGS AND FACILITIES TO BE VERIFIED AS NET-ZERO ENERGY.

It is the intent of the City Council of Park City that all new buildings and major renovations be designed and perform to a standard of net-zero energy on an on-site basis. That is, all new and renovated buildings and facilities must produce the same amount or more renewable energy as the facility uses on an annual basis.

According to the U.S. Department of Energy (DOE), in general, a net-zero energy building is one that balances the annual energy use with renewable energy, thereby reducing the use of non-renewable energy in the building sector. For the purposes of

this policy, the net-zero definition shall apply to any building or facility designed and constructed using Park City Municipal Corporation capital funds and refers to on-site energy usage and production.

Net-zero energy buildings use all cost-effective measures to reduce energy usage through energy efficiency and include renewable energy systems that produce enough energy to meet remaining energy needs. There are a number of long-term advantages of moving toward net-zero energy buildings, including lower operating and maintenance costs, lower environmental impacts, improved comfort levels, better resiliency to power outages and natural disasters, and improved energy security.

The measurements for Park City's net-zero buildings are through annual energy consumption minus annual on-site energy production. Related to the energy usage, the carbon emissions will also be tracked. An additional metric to determine the energy efficiency of buildings is Energy Use Intensity (EUI). Buildings should achieve an EUI of 25 or below. Emissions from construction activities are excluded.

A building that achieves the net-zero energy definition should first and foremost reduce the energy needs through all cost-effective and demand-avoidance strategies. That is, all buildings and facilities using Park City Municipal Corporation funds must be built as energy-efficient as possible. To offset the remaining energy needs of the building, use on-site installed renewable energy (preferred). If on-site renewable energy production is not possible to meet the entire energy budget of the building or facility, a plan for offsetting any remaining emissions within City boundaries must be submitted for approval by City Council.

Section 2. REQUIRE FACILITIES BE DEISGNED, COMMISSIONED, AND VERIFIED TO BE NET-ZERO ENERGY.

To ensure these project outcomes, additional specialists are required and contracted directly by the Architect/Design Team for all building projects with expected energy consumption over 1 MMBtus annually. The following personnel must work together to provide the Energy Use Intensity (EUI), annual fuel usage (in MMBtus), and annual electricity usage (kWh). In addition, expected return on investment (ROI) of installed energy efficient technologies and renewable energy installations should be submitted.

1. Energy Modeler Engineer (EME) – Works with the Architect to optimize/validate the design and confirm that energy modeling carries through as changes to the design are made; compares life cycle cost analysis (LCCA) of various equipment and design options to assist in informing value engineering and budget considerations. A specialist dedicated to energy management and energy modeling, the EME ensures that the systems designed by the Architect actually comply with the energy performance desired.
2. Building Envelope Commissioning Agent (BECxA) – The building envelope is the critical container of the energy efficiency features and largely determines operation costs and occupant comfort. The BECxA works with Architect,

EME, and Contractors to ensure that the building envelope is properly designed to achieve energy goals and that it is actually constructed as designed. Building components included in the building envelope commission include below-grade construction and foundation, exterior enclosure construction above grade, walls, claddings, fenestration, sheathing, framing, insulation, air and vapor barriers, drainage control layers, roofing, roofing insulation, skylights, hatches and any roof openings/penetrations…all of the components that impact long-term performance of the enclosure.

3. Mechanical Engineer/Commissioning Agent (CxA) – Working with the Architect, EME and Contractors, the CxA ensures that the building systems (cooling, heating, steam, air handling, plumbing, emergency power and sprinkler systems, renewable energy systems, electrical, and building automation systems) have been designed and installed to function properly together, are tested and balanced, and commissioned. Follow-up verification is conducted at 3, 6, 9 and 12 months to ensure that the building systems are performing as intended.

The Owner, design team, EME, BECxA and CxA review each design phase (concept, schematic, design development, construction documents) submittal for compliance to the selected net-zero certification. All are involved throughout the construction process and work with contractors to remedy sub-optimal performance before building completion and any deficiencies discovered after occupancy.

All new projects that are built using municipal funding must call for net-zero energy buildings and facilities, with a focus on achieving net-zero performance. Prior to the end of the Schematic Design (SD) phase, the architect and energy modeler must evaluate the feasibility of pursuing one of three net-zero building certifications:

1) The Living Building Challenge's Energy Petal Certification; or
2) The zEPI (Zero Energy Performance Index) score of 0; or
3) Passive House Certification, with on-site renewable systems to achieve net-zero energy performance.

In addition, all new projects that are built using municipal funding must segregate the major loads of the building (i.e. sub metering) into e.g. lighting, HVAC, plug loads.

SECTION 3. APPLY THIS RESOLUTION TO THE FOLLOWING PROJECTS.

Park City will apply this policy to the following construction projects design when the contract is first solicited after the date of this Resolution, except as exempted or waived under this Resolution: All new construction to construct buildings or facilities owned and controlled by the City, or using any City funds for construction, including all affordable housing projects developed by the City, and all major renovations of buildings owned and controlled by the City when the remaining has a useful life in excess of fifteen

years. The term “major renovation” means a construction project affecting more than 25% of the building’s square footage.

SECTION 4. EXEMPT PROJECTS FROM THIS POLICY WITH CITY COUNCIL APPROVAL.

Park City will not apply this resolution to the following, and City departments are required to document the reason for the exemption:

- Buildings or facilities where on-site renewable energy production is physically impossible, cost-prohibitive, or unsafe. Note: determination of cost-prohibitive will be determined by City Council on a project-by-project basis.
- Projects where the useful life of an improvement does not justify whatever additional expense would be incurred to increase the efficiency.
- Projects where the use of net-zero will create an impediment to construction due to conflicts of laws, building code requirements, federal or state grant funding requirements, or other similar requirements.
- Process equipment for water treatment and distribution, e.g. pumps, treatment and filtration equipment, underground vaults, metering equipment.

SECTION 5. EFECTIVE DATE. This resolution shall become effective upon adoption.

PARK CITY MUNICIPAL CORPORATION

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Mayor Jack Thomas

Attest:

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Michelle Kellogg, City Recorder

Approved as to form:

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Mark D. Harrington, City Attorney