



CLIMATE ACTION CHAMPIONS
AN EFFORT UNDER THE PRESIDENT'S CLIMATE ACTION PLAN

DOE FACT SHEET: Net Zero Retrofit Analysis

Overview

Sault Ste Marie Tribe of Chippewa Indians (SSM) was recognized as a Climate Action Champion (CAC) by The White House and the Department of Energy (DOE) in December 2014. In 2015, DOE released a Notice of Technical Assistance (NOTA) to provide CACs with additional opportunities for financial and technical assistance to support and advance their greenhouse gas emissions reduction and climate resilience objectives. SSM was an awardee of this Technical Assistance project from DOE's Office of Energy Efficiency and Renewable Energy's Commercial Building Partnerships (CBP) Program.

In spring 2015, Lawrence Berkeley National Laboratory (LBNL) and Steven Winter Associates (SWA) conducted an energy audit of the Chi Mukwa Community Rec Center in Sault Ste Marie, Michigan. The objective was to identify energy savings opportunities for one of the Tribe's primary buildings. The approach involved a review of the utility bills, design documents and equipment literature, conversations with the Tribe and Chi Mukwa staff, and a detailed audit of the building itself.

What is the Chi Mukwa Community Rec Center?

The Chi Mukwa (Big Bear) Community Recreation Center was built in 1995 and has significantly higher operating costs than many of the 38 facilities owned by the Tribe. The 150,000 square foot building has two floors and includes: a retail area, basketball and volleyball courts, aerobic and weight rooms, two ice rinks, locker rooms, offices, and other ancillary spaces. Centrally located, the building is at the core of many community activities and plays a key role in supporting and enhancing the community. With an interest in improving overall energy-efficiency and exploring future opportunities for renewable energy, the team agreed that a more detailed energy audit of the Rec Center was the best approach.

Study Objectives

- ▶ Characterize the energy performance of the Chi Mukwa Community Rec Center,
- ▶ Identify approaches to improve overall energy-efficiency and exploring future opportunities for renewable energy,
- ▶ Conduct a more detailed energy audit to identify no- and low-cost strategies, and document investment needs that could contribute to operational savings,



The Chi Mukwa Community Rec Center for the Sault Sainte Marie Tribe of the Chippewa Indians (SSM)

Energy Audit Results	
Current Use	In 2014 the 150,000 sf facility consumed ~2,000,000 kWh of electricity and 120,000 ccf of natural gas. The combined energy cost was ~\$248,000.
Energy Savings	The set of recommended measures (not including envelope upgrades and boiler replacement) provide ~ 193,000 kWh of electricity and ~25,400 CCF of natural gas savings per year depending on the dynamics between the measures.
Utility Savings	The set of recommended measures provides ~\$32,700 in annual utility savings with a 3 year payback for implementation. Additional measures could enhance current estimated savings.
Overall Performance	The recommended set of measures could result in ~10% electricity and ~21% natural gas savings.

Study Design: The Existing Facility

The energy audit approach for the project included use of available metering and performance data, an evaluation of physical characteristic information and input on the operations and maintenance of the facility. As is common with other projects of this type there are typically gaps in the information available. There was no sub-metering in the building to allow a breakdown of the loads and the information on systems tied to Building Management System (BMS) was not sufficient to help quantify specific loads. Several major loads, including the ice rink and domestic hot water equipment, are not connected to the BMS.

The team developed an analysis approach with the available information to characterize the energy consumption breakdown of the facility use types, so that the savings and energy cost savings for energy conservation measures could be quantified.

Results

The energy audit combined with the technical review of the available information resulted in an evaluation of nine energy conservation measures.

Six of the measures represent the core set of recommendations, which had simple paybacks (years) ranging from 0.2 to 6.7 years. The set included:

- Sidewalk Snow Melt Controls
- Radiant Barrier on Ice Rink Ceilings
- Control of Heating Beneath Ice Rinks
- Control of Infrared Heaters in Ice Rinks
- Use of Chiller Waste Heat
- Control of Vending and Game Machines

For the facility, 50% of electricity is used by the ice rink chillers. Many of the energy conservation measures (ECMs) are related to this major load.

The remaining three measures either contained a need for additional evaluation to convey an estimated cost of the measure or resulted in a simple payback of greater than 10 years.

Building Envelope: Upgrades to the building envelope to reduce infiltration and improve waterproofing could substantially improve energy savings in a number of areas. An estimated annual energy savings was identified, but establishing an estimated cost for the improvements was beyond

the scope of the energy audit.

Boiler Replacement: the current boilers (2) are ~20 years old and nearing the end of their recommended life. Savings were identified for replacement with high performance boilers.

Solar Energy: The project location, combined with the low cost of electricity, made the payback period for solar energy (PV) higher than the acceptable range unless significant incentives are available.

Conclusions

Although not included in the recommended ECM set based on the need for a more in-depth and holistic investigation to estimate overall cost, the most critical need at the Chi Mukwa Center is improvement of the building envelope. In addition to very poor insulation, the building has experienced leaks during rain events since construction was completed in 1995. There are significant energy saving opportunities available from improving the envelope, which would lead to additional savings for the ECM recommended set. However, the most important envelope benefits may be improved health, durability, and functionality.

The ECM recommended set focused on different facets of the largest energy consumer in the facility, the two ice rinks. The amount of cooling called from the chiller can be reduced by installing a radiant barrier on the ceiling, controlling the infrared heaters for the seating areas, and optimizing use of heat beneath the rinks. Another significant opportunity for savings is the utilization of waste heat from the chiller, which could completely offset the full boiler consumption for the year.

The recommended set of ECMs could result in a savings of ~\$33,000 with a three year payback, and more in-depth investigation of the building envelope and boiler replacement could lead to additional energy cost savings and increased comfort and usability for the Chi Mukwa Recreation Center.

Learn More

Climate Action Champions Initiative:
<http://energy.gov/epa/climate-action-champions>

Sault Ste. Marie Tribe of Chippewa Indians Tribe:
<http://www.saulttribe.com/>