

BEAT THE PEAK

Pilot Project Report

Northern Energy Innovation



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Acronyms

- NEI** – Northern energy Innovation
- YukonU** – Yukon University
- YEC** – Yukon Energy Corporation
- YCS** – Yukon Conservation Society
- YG** – Yukon Government
- DSM** – Demand-side management
- BTP** – Beat the Peak
- PNS** – Peak notification system

Abstract

Beat The Peak is a pilot project in which Yukoners were asked to conserve electricity usage on winter days when electricity consumption is highest. During the winter of 2022, we encouraged Yukoners to sign-up for a Peak Notification System through a marketing campaign. These alerts would encourage the participant to conserve energy use.

Only two peak events were targeted out of three planned originally; it was difficult to conclude whether the campaign was successful. The success of the campaign was linked to two key factors: outreach/engagement and reduction in energy consumption beyond statistical error. Although a scarcity of forecasted load data made it difficult to determine the effectiveness of the campaign in reducing the winter peak this year, the pilot project was successful in gaining a large number of participants and attention from the public. We will build upon this success and apply data gathered from YEC to better assess the campaign's effectiveness in 2022-23.

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Introduction

Yukon’s electric power network is an isolated system and must generate enough electric power in the territory to meet the demand of all Yukoners. At specific times throughout the day (generally 6-9 AM and 5-7 PM) the demand for electric power is at its highest, colloquially referred to as a peak. On the coldest days of winter, the energy demand is greater due to many homes using electric baseboard heaters. Figure 1 illustrates peak demand on the Yukon grid on a cold winter day [1]. Circled in red are the morning and evening peak load events when the demand of electric power is maximum.

By encouraging the public to reduce their energy consumption at peak times, it may be possible to reduce the amount of diesel (red and purple peaks in the below figure)

burned each winter. If our results indicate that these peaks can be significantly reduced, Beat the Peak could be a low-cost, low-tech solution to help meet Yukon's electric power needs and decrease investment in new thermal generation.

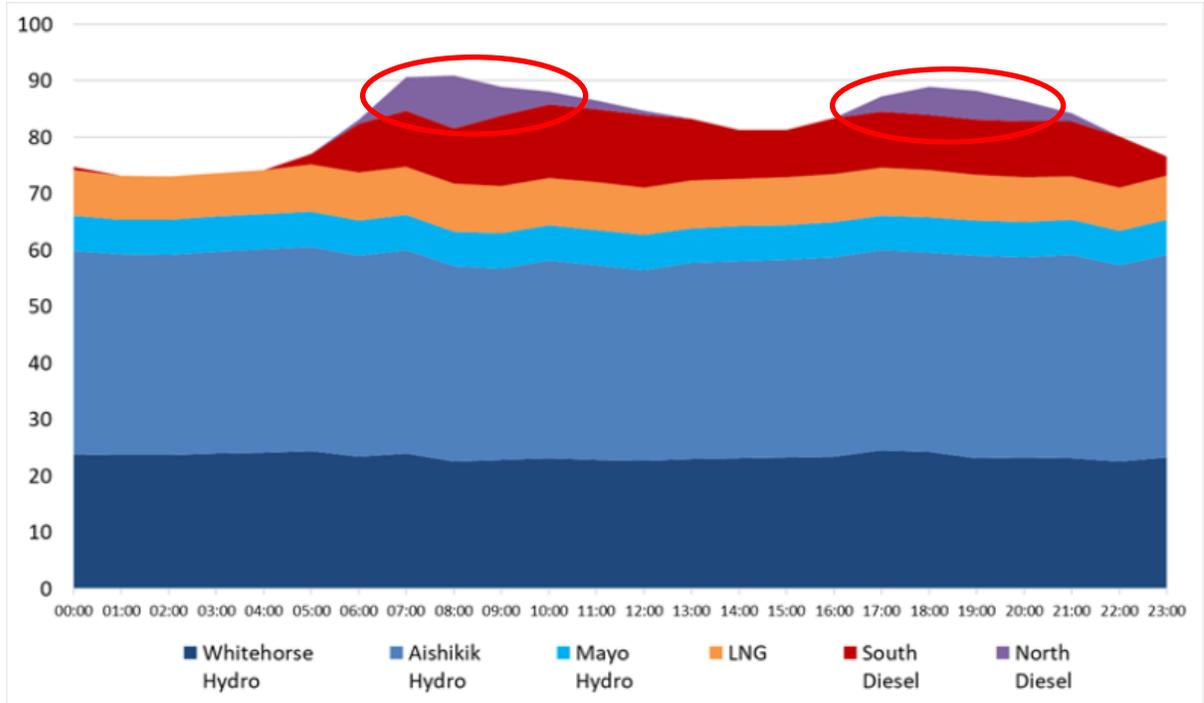


Figure 1: Yukon system load over time on a cold (-35°C) February 5, 2018. Morning and evening peaks are circled in red.

Methods

Our research team at Yukon University developed a framework to encourage Whitehorse residents to participate in a 'Beat the Peak' campaign in collaboration with YEC. This campaign was developed by conducting an extensive review of other low-tech, social DSM programs across North America.

We identified 30–59-year-old homeowners as the most appropriate audience to address, given their strong influence over major household energy usage [2]. The largest residential energy uses are for space heating, hot water usage and large appliances like clothes dryers and dishwashers[3].

We established two methods for encouraging people to reduce their peak power consumption: social media messages and a Peak Notification System. Our social media messages were timed around peak events and educated the public on the

winter peak and how to reduce it. These messages also promoted our Peak Notification System through our BTPYukon.ca webpage. Some additional messaging was also distributed via radio interviews, newsletters, newspapers, and radio ads. The Peak Notification System (PNS) alerted participants via SMS and email when a peak was to be expected and informed them of actions that they can take to reduce the peak. Our team employed these methods for two peak events over the winter, although we initially planned to target three events.

After the winter, our team planned to quantitatively assess the effectiveness of the program, using YEC's usage and forecast data to determine whether the campaign had any significant effect upon winter peaks. Unfortunately, this data was not readily accessible, and we had to apply alternative methods to gauge the campaign's effectiveness. Feedback, from participants who registered for the PNS was gathered to refine the approach of the program for future winters.

Did we 'beat the peak'?

Unfortunately, limited access to total load generation and forecast data makes it difficult to draw a strong conclusion about whether Yukoners were able to beat the peak this year. Figure 2 indicates some reduction in energy consumption during the targeted peak time (5:00-7:00 PM), relative to two other days with similar temperature profiles. However, detailed load and load forecast data, ideally for several winters, is necessary to definitively ascertain the effectiveness of our program.

Nonetheless, a cursory look at electricity consumption on days when we deployed our PNS and other peak days does reveal some interesting information. A load comparison for a targeted peak day (Monday, 2022-01-31) when peak alert messages were sent to participants and two 'control' peak days (Wednesday, 2022-02-02 and Thursday, 2022-02-03) when no peak alerts were sent is shown in Figure 2. Although people were asked to conserve electric energy usage between 5:00 PM to 7:00 PM, data is represented from 3:00 PM – 8:00 PM to illustrate any shift in load before and after the peak time.

The non-targeted days were picked to compare with targeted peak days based on similar temperatures as shown in Figure 2. The closer the temperature data of days under comparison, the higher the chances of having similar energy consumption over constant time intervals.

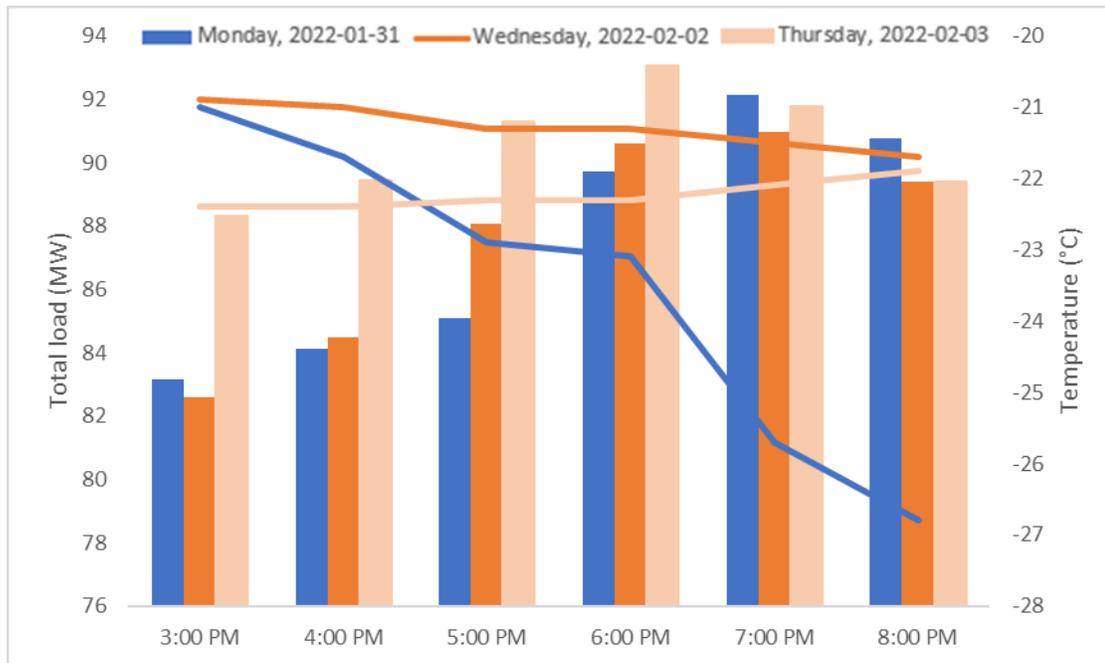


Figure 2. A comparison of a targeted peak event (Monday, Jan 31) and two other Peak events. Columns represent MW demand and lines represent Temperature.

Public engagement

Registrations for the Peak Notification System

Our registration page had a total of 351 registrations from January 2022 until March 2022. Facebook directed most of the people (425 visits) to our sign-up page, followed by direct traffic (424 visits), twitter (108 visits), the YukonU website (68 visits) and others (96 visits). Our campaign saw the greatest number of registrations for our PNS on some of the coldest days of the year, including our campaign's launch date (January 6). Response to our social media ads was greatest on these days.

Social media comments

The following comments represented common themes in our social media outreach:

- Concern over introduction of electric cars and smart heating to Yukon's distribution grid and effects upon winter peak.
- Why weren't we targeting morning peaks?
- How long should a car be plugged in to their block heater for?
- Many comments proposing a time-of-use charge

Survey response

PNS participants told us what they would like us to do in the next campaign:

- Share results immediately after a peak to promote engagement.
- Provide more hints on what the public can do to reduce their consumption.

Challenges, Lessons learned and Next steps

Challenges

- Temperature inconsistency: Mid-January and February was warmer than the previous years.

Lessons learned

- Start campaign early to catch December peaks.
- Distinguish Beat the Peak from other Demand Side Management programs, such as Yukon Energy's Peak Smart program.

Next steps

- Better access to peak forecast and usage data to conduct an extensive analysis to determine if we beat the peak.
- Incorporate results into messages after peak events.
- Organize school visits to get youth involved.
- Incorporate indigenous knowledge into campaign.
- Run a smaller, residential scale campaign for condo units in Whitehorse for which DSM initiatives have a financial incentive.

References

- [1] Yukon Energy Corporation, "Meeting Yukon's Energy Needs," 2018.
- [2] P. D. Ives and M. Consulting, "Recommendations for Alaska Energy Efficiency and Conservation Public Education and Outreach," 2011, [Online]. Available: http://www.akenergyauthority.org/Efficiency/12-2011_Recommendations-PublicEducationandOutreach.pdf.
- [3] Yukon Energy Corporation, "Yukon Five Year Demand Side Management Plan", 2013.