

Project outline to make Memory Lane Heritage the first museum in Nova Scotia to be 100% solar-powered

1. Background

In 2018, Memory Lane Heritage Village, in response to requests from both visitors and local tourism industry service-providers, increased the hours it was open to the public by 72%. This increase was achieved by opening on June 1st instead of June 15th, closing on September 30th instead of September 15th, and opening each day at 9:30 AM instead of 11:00 AM. In addition, a number of special events (Forest Festival, Walk Through Bethlehem and Tree Lighting) were held between the end of September and the end of December, as well as rehearsals and performances associated with the use of the Clam Factory by Eastern Shore Players during the same time period.

As expected, these changes resulted in an increase in visitation (from 11,535 in 2017 to 13,014 in 2018), but less expected was the significant increase in electricity consumption, approximately 9,120kWh on the Cookhouse meter alone, for the April to December period. Given that the Lake Charlotte Area Heritage Society (LCAHS), as well as the local tourism industry operators, would like the Village to continue to be open in future years for the same number of hours as in 2018, an increase in electricity consumption will be unavoidable unless the measures proposed below are undertaken to reduce the predicted power consumption.

In 2018, the Lake Charlotte Area Heritage Society also embarked on a project to make Memory Lane Heritage Village the first museum in Nova Scotia, and possibly in Canada, to be 100% solar-powered. To achieve this goal, a photovoltaic (PV) panel system was planned for the roof of the Artifact Storage Facility, a modern storage building, just outside the Village itself, but still on land owned by the Lake Charlotte Area Heritage Society. The annual output of this solar panel installation was expected to produce about 35,000kWh per year, close to the predicted annual baseline electrical consumption¹ at that time. However, as indicated in the power consumption chart below, this season-extension will result in predicted power consumption for 2019 of 46,420kWh, about 11,000kWh above the solar system's production capacity.

This project seeks to first reduce the Village's annual electrical power consumption and to then install a solar-panel electrical generation system that will match this reduced consumption. These actions will make Memory Lane Heritage Village 100% solar powered on an annual basis, simultaneously reducing the greenhouse gas emissions associated with the operation of the Village and the Eastern Shore Archives, while also dramatically reducing the annual cost of electricity to less than \$1,000.²

¹ The term 'baseline electrical power' is used to indicate the annual operational electrical power consumption excluding power consumption for special capital projects involving major renovation or construction work, such as the upgrading of the Store washrooms in 2016/2017 and the Cookhouse washrooms in 2017/2018, both of which were carried out during the late Fall and late Spring when the Village was closed and the weather was cold.

² The \$698.40 annual cost of the four meters that service Memory Lane are fixed costs levied by Nova Scotia Power that are still required with the solar panel system

MEMORY LANE HERITAGE VILLAGE ELECTRICAL POWER CONSUMPTION - 2017 & 2018 ACTUAL WITH 2019 PROJECTED*															
2-Month Period	ARTIFACT STORAGE			ARCHIVES			WORK SHOP			COOKHOUSE			TOTAL		
	2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019
Dec.15-Feb.15	322	493	400	1840	2027	2000	170	8	10	5400	1740	2000	7732	4268	4410
Feb.15-Apr.15	635	843	700	1692	1574	1650	1	8	10	6540	3600	3800	8868	6025	6160
Apr.15-Jun.15	301	151	250	1070	955	1000	165	116	150	4860	6960	6500	6396	8182	7900
Jun.15-Aug.15	263	308	300	859	872	900	436	410	400	6540	7200	7000	8908	8790	8600
Aug.15-Oct.15	237	139	200	754	889	850	403	390	400	5940	6,300	6500	7334	7718	7950
Oct.15-Dec.15	1426	882	600	950	1246	1200	77	96	100	4800	10800	9500	7253	13024	11400
	3184	2816	2450	7165	7563	7600	1252	1028	1070	34080	36600	35300	46491	48007	46420

* The predicted 2019 electrical power consumption assumes that no consumption-reduction actions have been implemented

2. Overall Project Goals

- a) To reduce the annual baseline electrical power consumption of Memory Lane Heritage Village as much as possible, thus minimizing the Village's annual greenhouse gas emissions.
- b) Once electrical power consumption has been reduced as much as possible, to then install a photovoltaic solar array on the roof of the Artifact Storage Facility (ASF) that matches the reduced electrical power consumption, so that Memory Lane can legitimately establish that it is 100% solar-powered on an annual basis.
- c) To achieve the 100% solar-powered goal at the lowest possible capital and annual operational cost.

3. Actions to reduce electrical power consumption as much as possible

- a) Change all lighting in the Village to LED lights as outlined in the accompanying lighting replacement plan. This action is predicted to reduce the annual electrical power consumption by 8,007kWh per year.
- b) Remove all baseboard heaters and window-mounted air conditioner in the Hosking Store offices and replace with a 12,000BTU air-sourced heat pump. This action is predicted to reduce the annual electrical power consumption by 5,000kWh per year.

- c) Replace the existing 50-gallon propane hot water heater and 40-gallon electric hot water heater in the Cookhouse with a single on-demand³ propane hot water heater. This action is predicted to reduce the annual electrical power consumption by 1,260kWh per year.
- d) Refurbish the back doors of the Store to reduce drafts and purchase 2 portable gas catalytic heaters. This will help alleviate the need for intermittent electric heaters for staff on the ground floor of the Hosking Store during colder weather.

4. Actions to install a ‘consumption-matching’ PV solar array on the roof of the Artifact Storage Facility (ASF)

The predicted 2019 electrical power consumption for Memory Lane Heritage Village is 46,420kWh. The predicted savings as a result of replacing all existing lighting with LEDs, replacing the office baseboard heaters with a heat pump, and replacing the propane and electric hot water heaters in the Cookhouse with a single propane heater, is 14,267kWh. Thus the predicted annual power consumption after these power reduction actions have been completed is **32,153kWh** (46,420 – 14,267).

The proposed solar installation of the southwest-facing roof of the ASF is comprised of sixty-six LG400 panels that will generate 26.4watts DC or **31,680kWh** (at 1200kWh per watt of DC installation). This installation will cover the entire southwest roof of the ASF. Given the margin of error involved with these estimates, it is prudent to proceed initially with the minimum possible size of installation and then review actual power generation and consumption after a year or so of ‘real time’ generation and add some additional solar panels in the future if required.

Within the next year or two, it is likely that the maintenance shed portion of the ASF will need to be expanded to accommodate equipment associated with the expanding special events. The most cost effective addition will be to add a section onto the end of the maintenance shed that will also create a roof area that will extend the existing southwest-facing ASF roof so that it could accommodate an additional six LG400 panels. The addition of these six panels would increase the electrical power generation by 2,880kWh per year for a total of **34,560kWh** (31,680 + 2,880), some 2,500kWh more than the 32,153kWh predicted need after consumptions reductions have been completed.

Should this addition turn out to be insufficient, the entire southeast-facing side of the ASF is still available for panel installation, although the power production of the panels on this side of the ASF roof will be less productive due to their less favourable orientation.

³ Currently, in Nova Scotia, propane hot water heating produces less GHG’s than a similarly sized electric hot water heater. In addition, an on-demand propane system, as opposed to a storage tank system, avoids storing heated water for later use because the propane is used only when hot water is needed, hence on-demand

5. Actions to reduce the capital and operational costs of the planned power reduction and power generation

- a) Purchase the new LED lights and heat pump via the Efficiency Nova Scotia rebate program. Note that switching to LED lights not only reduces the consumption of electrical power but also reduces the labour cost associated with changing light bulbs.
- b) Proposition the Nova Scotia Power Corporation (NSPC) to install the most advanced 'smart meters' possible to determine as accurately as possible the specifics of electrical consumption of all electrical equipment within the Village and then review ways in which electrical power consumption can be reduced further.
- c) Write to Nova Scotia Power requesting a reduction in the combined annual cost (\$698.40) for the four separate meter bases required to operate the Village.
- d) Seek funding assistance from public and private sector agencies.

6. Budget (Note all prices include HST at 7.5%)

a) Change all existing lighting to LED lighting as per detailed budget (fixtures, lights and electrician)	\$ 3,915.00
b) Remove office baseboard heaters and replace with heat pump.	\$ 4,686.00
c) Replace immersion and propane water heater with on-demand propane unit	\$ 4,352.00
d) Install 26.4kW DC Photovoltaic system on roof of ASF together via net-metering agreements with NSPC	\$65,661.00
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Total project cost	\$78,614.00

7. Secured Funding as of April 3rd 2019

• Nova Scotia Communities, Culture and Heritage, Strategic Funding Initiative	\$50,000.00
• Efficiency Nova Scotia	\$ 680.00
• Lake Charlotte Area Heritage Society fundraising to date	\$ 2,905.00
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Total funds raised to date	\$53,585.00

Funds yet to be raised (including Efficiency NS Rebate) \$25,415.00

8. Fundraising Campaign

There are three ways to contribute:

- a) Crowd Funding Campaign through CrowdRise.com. This campaign is targeting former student staff, members and volunteers, as well as the general public and visitors to the Heritage Village. Donations can be made at www.crowdrise.com/solarpoweredmuseum.
- b) 'Pay for a Panel Campaign' allows donors to purchase a single solar panel for \$500. The solar panel system has sixty-six panels. Each panel sponsor will have their name/logo and any accompanying message (limit of 25 words) recorded on a donor panel and placed on the "Founder Wall" inside the Hosking Store. Charitable tax receipts can be issued for individuals who sponsor a panel.
- c) Foundation Campaign is still underway, seeking support from charitable foundations with like-minded missions. All foundation donations will be recognized on the "Founder's Wall".

9. Grand Opening

The fundraising campaign will be ongoing until June 1st, at which time any short-fall in the campaign will have to be financed through the Solar City program. The goal of the Heritage Society is to fully fundraise the cost of the project. The efficiency measures and the solar panels will be installed during the month of June and unveiling will take place on July 1st (Memory Lane's 19th birthday) with a celebration and dedication of the donor panels.