



3D ENERGY
LIMITED



Energy Management Plan

Taber and District Housing Foundation

Project no.: C18-2353B

Client Draft Issued: November 16, 2018

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Energy Auditor and Modeller

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1) Project Background

3D Energy has completed an ASHRAE level 2 energy audit for Taber and District Housing Foundation in accordance with the Detailed Energy Assessment Requirements (DEAR) of the Non-profit Energy Efficiency Transition (NEET) program. The Clearview Lodge, located in Taber, Alberta, is a single storey structure constructed circa 1962. A site visit was made on September 5, 2018 where essential data and observations were collected about how the Clearview Lodge uses, creates and wastes energy. This information is used to generate several possible energy conservation measures (ECMs) that if implemented, would improve the operating and environmental performance of the building.

This Energy Management Plan (EMP) utilizes information provided in the energy audit report (attached), which details the calculations, rationale and exact methodology used to develop each ECM. The EMP summarizes the details of the energy audit report into an easy to understand action plan that will improve the energy performance of the Clearview Lodge.

2) About 3D Energy

3D Energy is an energy-centric engineering and project development company located in Sherwood Park, AB and is part of the Vital Group of Companies, which also includes Vital Engineering, an electrical and mechanical engineering firm, and Generate Energy, a PV solar installation and lighting retrofit contractor. The specific experience and expertise of these affiliated companies allows 3D Energy to diagnose, develop and deliver customized energy solutions to meet the unique energy needs of our clients. Our goal is to make a difference in our communities through inspiring action on energy.

3) Internal Taber and District Housing Foundation Objectives

Tim Janzen of Taber and District Housing Foundation completed an EMP Input Form and identified Taber and District Housing Foundation's priorities, financial constraints, capacity, and resources available for building energy upgrades. 3D Energy has integrated the information collected in the EMP Input Form with technical building data collected during the site visit, to create a plan that will improve building energy performance and align with Taber and District Housing Foundation's objectives. The results of the EMP input form are summarized below:

- **Facility Objectives:** The main objectives are to reduce energy use and costs, replace end of life equipment and modernization of the buildings.
- **Financial Resources:** The main funding sources are Alberta Seniors and Housing and the Government of Alberta with a small reserve fund available internally. No annual dollar value was specified.
- **Staff Resources:** There are three full time staff on the maintenance team. The CAO is responsible for funding applications.

4) Technical Details

The following section summarizes and lists each of the ECMs that are proposed for the Clearview Lodge, as identified in the energy audit report. The ECMs are listed in order of least cost as determined by the 3D Energy team. Estimated grant funding amounts, where available, are identified for each ECM. The grant funding estimates provided in this report and in the accompanying audit report are **not guaranteed** by 3D Energy and are only meant to provide a path towards potential funding opportunities. Subsequent sections of this report, list options for ECM implementation and recommend a practical plan to achieve optimal building and environmental performance while taking into consideration the financial parameters and tools available to Taber and District Housing Foundation.

ECM 2: DHW TANK BLANKET			Estimated Cost: \$100
Description: Water tank insulation blankets are an inexpensive and effective way to increase the insulation value of the hot water tank and reduce standby losses. Hot water tanks are only operating at capacity when hot water is needed, the remaining time the tank is maintaining a set-point temperature, which usually ranges from 55-60°C. Added insulation will decrease the amount of energy needed to heat and maintain the tank, by limiting heat loss to the surrounding room.			
Details and reasoning: → Current: DHW is heated using a storage type hot water tank with no extra insulation. → Proposed Retrofit: Fit Existing DHW tank with an insulated thermal blanket which can be purchased at any local hardware store and be installed by maintenance staff. → Reasoning: An increase in insulation around the water heater will decrease the standby losses of the water tank and reduce its energy consumption			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
10.0 years	\$10.00 / year	1.00 GJ	0.05 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 9: DHW PIPE INSULATION			<i>Estimated Cost: \$250</i>
Description: Most mechanical rooms are found to be at higher temperatures than the rest of the building due to piping heat loss and equipment generating excess heat. Heat loss in piping can be drastically reduced when properly fitted with pipe insulation.			
Details and reasoning: → Current: Piping in the mechanical room is uninsulated and is leaking heat into the mechanical room. → Proposed Retrofit: Insulate all pipe in the mechanical room with insulation. → Reasoning: Implementing this ECM will reduce heat loss in piping, thus reducing natural gas costs.			
Estimated Savings			
<i>Simple Payback:</i>	<i>Annual Cost Savings:</i>	<i>Annual Energy Savings:</i>	<i>Annual GHG Reduction:</i>
N/A	\$0.00 / year	0.00 GJ	0.00 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 5: HIGH EFFICIENCY AIR FILTERS			<i>Estimated Cost: \$390</i>
Description: Any filter will cause some airflow restriction, which results in air pressure drop as the air passes across it. This pressure drop causes the blower to require more energy to move the air. Different types of filters will have a different amount of airflow restriction and pressure drop, depending on the design. Pleated filters offer a low pressure drop, as well as being able to filter many particles (available with MERV ratings of 5 to 14). MERV ratings classify a filter with respect to the smallest particle size it can filter, with higher ratings able to filter smaller particles.			
Details and reasoning: → Current: Polyester panel filters. → Proposed Retrofit: Replace with low pressure drop high-capacity pleated panel filters. → Reasoning: These filters can reduce energy consumption due to airflow restriction by up to 25% and last up to 12 months.			
Estimated Savings			
<i>Simple Payback:</i>	<i>Annual Cost Savings:</i>	<i>Annual Energy Savings:</i>	<i>Annual GHG Reduction:</i>
9.8 years	\$40.00 / year	1.80 GJ	0.32 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 4: HIGH EFFICIENCY NOTCHED FAN BELTS			<i>Estimated Cost: \$490</i>
Description: Notched V-belts have higher efficiencies, and generally last longer than regular V-shaped belts. These belts do not require modification to the pulleys and can directly replace existing belts. Notched V-Belts can be purchased for roughly \$8/ft. These belts can be installed by building maintenance personnel and do not require any modification to existing pulleys.			
Details and reasoning: → Current: Motor drive belts are not notched, thus resulting in low efficiencies. → Proposed Retrofit: Replaced with notched V-belt. → Reasoning: This will increase motor efficiency and reduce motor electrical consumption.			
Estimated Savings			
<i>Simple Payback:</i>	<i>Annual Cost Savings:</i>	<i>Annual Energy Savings:</i>	<i>Annual GHG Reduction:</i>
2.5 years	\$200.00 / year	9.72 GJ	1.73 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 6: DHW PIPE HEAT TRAP			<i>Estimated Cost: \$680</i>
Description: Heat traps are a piping configuration installed directly before the cold-water inlet, and directly after the hot water outlet of the DHW tank (within 2.4 meters of the tank). A heat trap piping arrangement keeps the hot water from traveling throughout the piping system, which minimizes tank losses. Heat traps installed on the inlet, and outlet water lines of the current DHW tank would prevent unwanted flow of heat out of the DHW tank through pipes, thus reducing overall heat loss.			
Details and reasoning: → Current: The current DHW Tank's inlet and outlet piping are straight, which allows some heat loss. → Proposed Retrofit: Install heat traps on inlet and outlet pipes to prevent heat loss. → Reasoning: This is an easy implementation and low-cost ECM.			
Estimated Savings			
<i>Simple Payback:</i>	<i>Annual Cost Savings:</i>	<i>Annual Energy Savings:</i>	<i>Annual GHG Reduction:</i>
34.0 years	\$20.00 / year	3.00 GJ	0.15 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 1: LOW FLOW WATER FIXTURES			Estimated Cost: \$1,110
Description: One of the simplest methods of lowering water, hot-water, and energy consumption in a building is by wasting less water through low-flow water fixtures. Depending on the building size and type, water heating can account for between 15-20% of a utility bill. To conserve hot water, low-flow fixtures, such as faucets and showerheads can be installed, and to conserve cold water, install low flow toilets and urinals.			
Details and reasoning: → Current: Water fixtures are set at a flow rate that is too high. → Proposed Retrofit: Install low flow alternatives to reduce water consumption. → Reasoning: Implementing this retrofit would not reduce the performance of the fixtures and would lower energy and water usage.			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
0.3 years	\$3,820.00 / year	213.00 GJ	10.65 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 8: DOOR SEALS & SWEEPS			Estimated Cost: \$1,710
Description: Over time the weather stripping will wear down and gaps will become visible around the perimeter of exterior doors. Poor door seals increase the infiltration/exfiltration rate of the building causing loss of heated and conditioned air and longer run times on HVAC equipment.			
Details and reasoning: → Current: Door seals and bottom door sweeps of exterior doors are in poor condition. → Proposed Retrofit: Replace damaged and worn door seals and door sweeps. → Reasoning: This ECM would reduce natural gas costs and improve occupant thermal comfort.			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
14.3 years	\$120.00 / year	15.36 GJ	0.81 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 7: PROGRAMMABLE THERMOSTATS			Estimated Cost: \$5,000
Description: Programmable thermostats are an easy, and effective way to reduce overall building energy consumption. Programmable thermostats allow occupancy schedules to be programmed in for heating and cooling; this way, the heating/cooling system is only operating when the building is occupied, thus less energy is wasted by heating/cooling the building unnecessarily.			
Details and reasoning: → Current: Non-programmable electronic thermostats. → Proposed Retrofit: Replace with programmable thermostats and introduce setback temperature. → Reasoning: Keeping the building at the same temperature is an unnecessary use of energy during unoccupied times, this ECM will lead to immediate energy savings.			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
3.9 years	\$1,280.00 / year	156.64 GJ	8.94 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 13: CONDENSING DHW-2			Estimated Cost: \$8,790
Description: The current water heater can be directly switched out for a condensing power vented water heater. Condensing water heater capture heat which would otherwise be used to carry exhaust gasses up the flue stack. When this heat is recaptured from the flue gas, water will condense out of it, and must be pumped/drained to the nearest drain due to the acidic characteristics of the condensate. Subsequently, the flue gas must be power vented by a fan, as it is no longer hot enough to rise on its own.			
Details and reasoning: → Current: Existing storage type DHW tank is 72% efficient and due for replacement in 2023. → Proposed Retrofit: Install a high efficiency condensing DHW storage water heater that is 93% efficient with a rated lifetime of 18 years. → Reasoning: The proposed heater will heat and store water more efficiently, resulting in reduced energy consumption. This ECM should be considered when the current tank has reached the end of its life.			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
11.1 years	\$790.00 / year	105.00 GJ	5.25 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 12: CONDENSING DHW-1			Estimated Cost: \$14,490
Description: The current water heater can be directly switched out for a condensing power vented water heater. Condensing water heater capture heat which would otherwise be used to carry exhaust gasses up the flue stack. When this heat is recaptured from the flue gas, water will condense out of it, and must be pumped/drained to the nearest drain due to the acidic characteristics of the condensate. Subsequently, the flue gas must be power vented by a fan, as it is no longer hot enough to rise on its own.			
Details and reasoning: → Current: Existing storage type DHW tank is 78% efficient and due for replacement in 2033. → Proposed Retrofit: Install a high efficiency condensing DHW storage water heater that is 93% efficient with a rated lifetime of 18 years. → Reasoning: The proposed heater will heat and store water more efficiently, resulting in reduced energy consumption. This ECM should be considered when the current tank has reached the end of its life.			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
12.9 years	\$1,120.00 / year	149.00 GJ	7.45 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 15: SOLAR HOT WATER			Estimated Cost: \$19,810
Description: Solar thermal systems circulate antifreeze from the solar collectors to a storage tank, where the heated fluid passes through a heat exchanger to heat DHW; the stored DHW can then be distributed through the building. Solar thermal applications provide the most benefit when pre-heating domestic water via a heat exchanger in a preheat tank before it enters the primary water heating tank, or for other low-temperature applications, including pools or carwashes. The primary water heating tank also serves to ensure there is always hot water ready for use, even when solar energy is not available.			
Details and reasoning: → Current: DHW is heated using conventional natural gas fired hot water storage tanks. → Proposed Retrofit: Install a solar thermal (hot water) system on the building. This would include the solar thermal collectors on the roof, a solar hot water pre-heat tank and piping/pumps between the collectors and the tank. → Reasoning: Solar thermal harnesses the renewable energy of the sun to pre-heat water which reduces natural gas costs associated with water heating.			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
99.1 years	\$200.00 / year	27.28 GJ	1.27 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 10: ROOF UPGRADE			Estimated Cost: \$33,750
Description: When upgrading the energy performance of a building in cold climates, it is often appropriate, to begin with improving the building envelope. Roof quality when referring to building envelope is measured in R-value which indicates the capacity of an insulating material to resist heat flow (higher is better). Improving a buildings roofing quality will enable: reduced annual energy costs, reduce heating and cooling loads, draft-free environment, reduce condensation and moisture, enhance building durability, and improve air quality.			
Details and reasoning: → Current: Attic insulation is insufficient and is allowing heat to escape. → Proposed Insulation: Spray-applied loose-fill fiberglass insulation that sits overtop of existing ceilings within attic spaces. Loose-fill fiberglass insulation has a thermal resistance of R-2.9/inch and an installed cost of \$0.50/board-foot. → Reasoning: Improving thermal performance of the attic space will reduce heat loss through the roof and lead to cost savings.			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
59.2 years	\$570.00 / year	76.00 GJ	3.80 tCO ₂ e
Available Grant Funding: There is currently no specific incentive that focuses on this ECM.			

ECM 3: LED LIGHTING UPGRADE			Net Cost: \$104,446
Estimated Cost Before Rebate \$106,130		Less BES Rebate of: \$1,684	
Description: LED lighting has reduced wattages compared to traditional lighting fixtures and will result in lower electricity consumption and electrical demand. Fluorescent lighting has a rated life of approximately 20,000 hours, while incandescent lighting has a rated life of approximately 1,500 hours. LED equivalent fixtures can range from 25,000 hrs for screw-in lamps to over 100,000 hours fluorescent fixture equivalents. LED fixtures will also generate maintenance savings due to their long lifetime, resulting in less frequent lamp burnouts, and less waste.			
Details and reasoning: → Current: A variety of non-LED lighting is used to illuminate the space. → Proposed Retrofit: Replace all non-LED lighting with LED equivalent bulbs and/or fixtures. → Reasoning: LED retrofitting is quickly becoming the norm among energy-efficient buildings and are eligible for BNI funding.			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
13.5 years	\$7,740.00 / year	115.28 GJ	42.47 tCO ₂ e
Available Grant Funding: Energy Efficiency Alberta's Business Energy Savings Program is estimated to provide funding towards this ECM. More information about how BES funds this ECM and how to apply for funding can be found at: • https://www.efficiencyalberta.ca/business-non-profit-and-institutional/ • Section 5 of this report titled "Possible Funding Sources" outlines the steps required to properly apply for BES funding.			

ECM 11: CONDENSING BOILER		Net Cost: \$156,920	
Estimated Cost Before Rebate \$0	Less BES Rebate of: \$12,000		
Description: Older conventional steam boilers typically operate in the range of 70% annual fuel utilization efficiency (AFUE). Annual Fuel Use Efficiency (AFUE) is a common measure of thermal efficiency that is used to compare boilers (a higher AFUE means that the boiler is more efficient). High efficiency near-condensing equivalent boilers can operate as high as 85-90% AUFE, which reduces the amount of fuel required to produce the same amount of heat in the building.			
Details and reasoning: → Current: Conventional boiler that is reaching end of life and is performing inefficiently. → Proposed Retrofit: Replace new high efficiency condensing boiler. → Reasoning: This ECM will improve the efficiency with which the building is heated and should be considered when the current boiler reaches its end of life.			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
56.0 years	\$2,800.00 / year	374.00 GJ	18.70 tCO2e
Available Grant Funding: Energy Efficiency Alberta’s Business Energy Savings Program is estimated to provide funding towards this ECM. More information about how BES funds this ECM and how to apply for funding can be found at: • https://www.efficiencyalberta.ca/business-non-profit-and-institutional/ • Section 5 of this report titled “Possible Funding Sources” outlines the steps required to properly apply for BES funding.			

ECM 14: SOLAR PV		Net Cost: \$157,502	
Estimated Cost Before Rebate \$242,310	Less RCSP Rebate of: \$84,809		
Description: Installation of a roof-mounted solar PV array to generate electricity for the building behind-the-meter. Under the Micro-generation regulation, electricity generated by the system will be used to satisfy the building electrical demand first, and any excess electricity will be exported to the grid and credit will be earned on the monthly electricity bill for this exported electricity.			
Details and reasoning: → Our sister company Generate Energy has completed a preliminary grid-tied PV solar design for this building although, there are several local solar PV installation companies that focus on this type of work. The system will generate 114,200 kWh per year. → Proposed Retrofit: 98.90 kW Solar PV array consisting of 271 Canadian Solar Modules. → Reasoning: This PV solar system will generate enough electricity to offset a portion of the electricity (retail) charges (and the variable components of other charges for electricity consumed on-site) on the electricity bill (over the period of a full year). This will reduce the building’s carbon footprint and serve as protection against future increases in the cost of electricity.			
Estimated Savings			
Simple Payback:	Annual Cost Savings:	Annual Energy Savings:	Annual GHG Reduction:
18.7 years	\$8,410.00 / year	411.12 GJ	73.09 tCO2e
Available Grant Funding: Energy Efficiency Alberta’s Residential and Commercial Solar Program (RCSP) is estimated to provide funding towards this ECM. More information about how the RCSP funds this ECM and how to apply for funding can be found at: • https://www.efficiencyalberta.ca/solar/ • Section 5 of this report titled “Possible Funding Sources” outlines the steps required to properly apply for RCSP funding.			

5) Possible Funding Sources

Business Energy Savings Program (BES)

Energy Efficiency Alberta's Business Energy Savings program offers incentives that encourage organizations to choose high-efficiency products for their buildings. Rebates are available for interior and exterior lighting, heating, ventilation and air conditioning equipment, and water heaters. Total incentives are limited to \$25,000 per building per year.

The following steps should be taken to apply for BES funding:

1. Review the list of eligible funding measures on the Energy Efficiency Alberta BES website:
 - ➡ <https://www.efficiencyalberta.ca/business-non-profit-and-institutional/>
2. Create an online account by filling in the necessary personal and organization information or sign in to the online account if one has already been created.
3. Submit an online pre-approval application which confirms eligibility and is required.
4. Install the eligible equipment using an in-house specialist or contractor if required.
5. Following installation, the applicant must submit the final invoice and proof of payment. The final invoice and proof of payment documentation must be submitted within 90 days of the reservation date on the pre-approval reservation letter.
 - ➡ An itemized invoice or invoices must be submitted post-installation detailing the new equipment purchased and installed.
6. Upon approval of the incentive claim, a rebate cheque will be sent within four weeks, in the eligible amount, to assist with offsetting the cost of equipment.

A more comprehensive list of the terms and conditions of the BES program can be found on the Energy Efficiency Alberta BES website.

Residential & Commercial Solar Program (RCSP)

Energy Efficiency Alberta's RCSP offers a rebate to non-profits that install grid-tied solar photovoltaic (PV) systems in compliance with the micro-generation regulation. This program offers a rebate of \$1.00/watt (dc), up to a maximum of \$1,000,000 or 35% of system costs, whichever is less.

The following steps should be taken to invest in solar PV and apply for the RCSP grant:

1. Research the basics of solar PV technology by visiting the following websites:
 - ➡ Estimate the energy production potential of your building- <http://pvwatts.nrel.gov/>
 - ➡ Learn about how Alberta's micro-grid regulation applies to your building <http://www.auc.ab.ca/involving-albertans/micro-generation/Pages/default.aspx>
2. Contact several of the solar contractors listed on the website of the Solar Energy Society of Alberta or CanSIA. To assist with this process, visit - <https://solaralberta.ca/how-choose-solar-provider>
3. Provide chosen solar contractor with one-year of utility bills. The contractor will then develop a preliminary quote for your building.
4. Apply for RCSP grant and required permits:

- Create an online account by filling in the necessary personal and organization information or sign in to online account if one has already been created. This process yields conditional approval, which guarantees distribution of funds upon project completion.
 - Apply for generation project notice to Wire Service Provider (may be done by a contractor)
 - Apply for building, development and electrical permit (may be done by a contractor)
5. Solar PV system is installed by a chosen electrical contractor.
 6. Electrical inspection is done by the municipality and the contractor connects the system to the grid.
 7. Upon project completion, the contractor provides confirmation of the installation and triggers payment of the rebate. The entire application process can be completed online.

Custom Energy Solutions (CES)

Custom Energy Solutions helps industrial, institutional and commercial facilities improve productivity, save energy and save money by upgrading inefficient equipment and making other energy improvements. Facilities with over 10,000 tonnes of annual GHG emissions are eligible for incentives up to \$1 million per year and parent facilities implementing Custom Energy Solutions projects in multiple facilities are eligible for incentives up to \$2 million per year. Facilities with less than 10,000 tonnes are eligible for incentives up to \$250,000 per year for individual facilities and \$500,000 per year for parent facilities. Facilities defined as Large Final Emitters or customers or facilities that have opted into the Carbon Competitiveness Incentive Regulation are not eligible. More information can be found at: <https://www.encyalberta.ca/customsolutions/>

Other Funding Sources

The Alberta Government's Community Facility Enhancement Program (CFEP) provides a lump sum grant to repair, renovate or upgrade the facilities of Non-Profit organizations. Up to 50% of project costs are eligible to be covered by this program. Funding amounts can be up to \$1 million in some cases. It is recommended to explore the eligibility of this grant in supporting the implementation of the recommended measures, as the grant may have the potential to cover a significant portion of the costs associated with this project.

- <https://www.culturetourism.alberta.ca/community/community-grants/community-facility-enhancement-program/>

Summary of ECM Paybacks with Applicable Grants

The following table summarizes all ECMs proposed in the audit report. The lowest cost ECMs are listed first:

ECM #	ECM Description	Capital Cost (\$)	Funding Available (\$)	Net Cost (\$)	Annual Cost Savings (\$)	Payback (Years)
2	DHW Tank Blanket	100	-	100	10	10.0
9	DHW Pipe Insulation	250	-	250	-	N/A
5	High Efficiency Air Filters	390	-	390	40	9.8
4	High Efficiency Notched Fan Belts	490	-	490	200	2.5
6	DHW Pipe Heat Trap	680	-	680	20	34.0
1	Low Flow Water Fixtures	1,110	-	1,110	3,820	0.3
8	Door Seals & Sweeps	1,710	-	1,710	120	14.3
7	Programmable Thermostats	5,000	-	5,000	1,280	3.9
13	Condensing DHW-2	8,790	-	8,790	790	11.1
12	Condensing DHW-1	14,490	-	14,490	1,120	12.9
15	Solar Hot Water	19,810	-	19,810	200	99.1
10	Roof Upgrade	33,750	-	33,750	570	59.2
3	LED Lighting Upgrade	106,130	1,684	104,446	7,740	13.5
11	Condensing Boiler	168,920	12,000	156,920	2,800	56.0
14	Solar PV	242,310	84,809	157,502	8,410	18.7

6) Implementation Strategy

The ECMs described above would reduce energy consumption and/or costs if implemented individually or in some collective iteration. This EMP aims to take the goals and characteristics of Taber and District Housing Foundation that were identified on the EMP input form into consideration when determining which ECMs should be implemented. The following highlights the rationale 3D Energy has used to determine whether an ECM should be considered for implementation:

- **ECM 1, 2, 4, 5, 7 and 8** are low cost and quick payback ECMs that are recommended for immediate implementation in both options.
- **ECM 3** is a high cost and quick payback ECM that is recommended in option B below.
- **ECM 12 and 13** are high cost ECMs that are recommended in year 5 of option A and immediately in option B.
- **ECM 6, 9, 10, 11 and 15** are long payback ECMs that don't fit within the financial constraints listed on the EMP input form and thus are not recommended in any of the options below.
- **ECM 14** is a renewable energy measure that has a long payback period and a high upfront capital cost, thus it has only been included in option B below.

Immediate implementation of the recommended ECMs gives Taber and District Housing Foundation the best opportunity to maximize energy reduction and to take full advantage of all incentive programs that are currently available. Based on the organizational objectives, financial resources and staff resources available, as identified in the EMP Input Form, 3D Energy has identified the following options for implementation:

Option A - Staged Budget Approach

On the EMP input form, an annual budget was not identified. Thus, \$5,000 was chosen as a placeholder for this option. This option is based on the idea that ECMs that fit into the priorities stated on the EMP input form will be implemented as quickly as possible while remaining within the budget. The following outlines which ECMs are recommended for immediate implementation and when to implement subsequent ECMs to achieve a more energy efficient building.

➤ **Step 1 (Immediate): Implementation of Low-Cost ECMs (ECM 1/2/4/5/8)**

The first step immediately implements the lowest cost and fastest payback ECMs so that energy cost savings can begin accruing as quickly as possible. The total cost of this step is estimated to be \$3,800 and is estimated to yield \$4,190 in annual energy cost savings.

➤ **Step 2 (Year 1): Implementation of ECM 7**

In Year 1, the budget will have accumulated enough to fund the implementation of ECM 7. It is estimated that the \$5,000 initial capital cost will yield annual cost savings of \$1,280.

➤ **Step 3 (Year 5): Implementation of ECM 12/13**

By year 5, the budget will have accumulated enough to fund the implementation of ECM 12 and 13. It is estimated that the \$23,280 initial capital cost will yield annual cost savings of \$1,910.

Figure 1: Gantt chart depicting the timeline for Option A

	Year											
Activity:	0	1	2	3	4	5	6	7	8	9	10	
Review Audit Report and EMP												
Debrief Meeting with 3D Energy												
Decision to Move Forward												
Implement ECM 1/2/4/5/8 Immediately												
Accumulate ECM 1/2/4/5/8 Savings												
Implement ECM 7 in Year 1												
Accumulate ECM 1/2/4/5/8/7 Savings												
Implement ECM 12/13 in Year 5												
Accumulate ECM 1/2/4/5/8/7/12/13 Savings												

Option B – Third Party Financing Approach

This approach implements ECMs 1/2/3/4/5/7/8/12/13/14 immediately, through the involvement of a third-party financier that specializes in financing energy efficiency projects and strategies, and the cost of upgrades is paid off over a 15-year period by utilizing the energy cost savings that result from the implemented ECMs. The advantages to Taber and District Housing Foundation in utilizing this approach are:

- ✓ Immediate implementation of all recommended ECMs
- ✓ Ability to take advantage of all incentives/grants that are currently available
- ✓ Immediate savings in operating budget that can be reallocated to other organizational priorities
- ✓ Greater financial savings should energy prices increase
- ✓ Increased overall reduction in carbon emissions from energy used in the building

By implementing solar PV immediately, Taber and District Housing Foundation can access the RCSP grant that is available and ensures that this grant is utilized to its full potential. Furthermore, Taber and District Housing Foundation would substantially reduce its GHG emissions through the implementation of these ECMs and protect itself from future increases in the cost of electricity.

This third-party financing option allows Taber and District Housing Foundation to implement the ECMs immediately so that operational savings from reduced energy use can be realized from the beginning.

7) Financial Analysis

Below is an economic justification for the implementation of the options presented. This pro-forma financial analysis highlights the capital required to implement each option and the resulting future cash savings compared to the current (status quo) scenario.

The following energy prices are based on rates that reflect costs currently experienced by Taber and District Housing Foundation. All rates assumed to experience compounding annual growth at 1% per year:

- ➡ Current delivered price of electricity of \$0.074 / kWh
- ➡ Current price of \$0.063 / kWh for electricity only
- ➡ Current natural gas rate of \$7.48 / GJ
- ➡ Current electrical demand cost of \$0.60 / kW

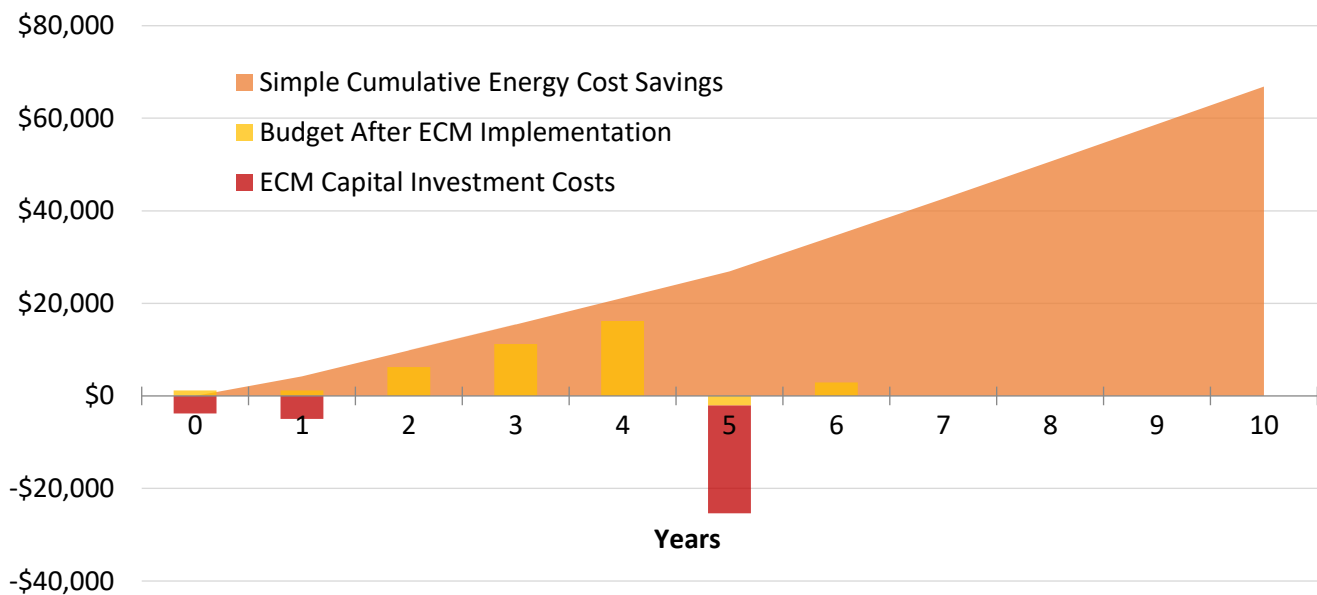
Additionally, the following assumption is made by 3D Energy with respect to completing a financial analysis on the LED lighting retrofit:

- ➡ The audit report calculates the value of an LED lighting retrofit as the amount saved by reducing electricity consumption, net of increases to incremental heating costs that result from the replacement of incandescent bulbs (which give off radiant heat). However, an LED retrofit can result in additional cost savings (not considered in the audit report) that result from the longer lifetime of LED bulbs which leads to less frequent bulb and fixture replacement. 3D Energy has calculated that the current non-LED lighting in/on the building costs \$12,370 per year on average to replace. This cost is saved if an LED lighting retrofit is completed since LEDs require very infrequent replacement.

Analysis: Option A – Staged Budget Approach

This option outlines a package of ECMs that achieves the objectives that were identified on the EMP input form while remaining within the identified budget. As stated above, the first step will be to implement ECM 1/2/4/5/8, for a cost of \$3,800. Next, ECM 7 will be implemented with the accumulated budget in year 1 for a total cost of \$5,000. Next, ECM 12/13 will be implemented with the accumulated budget in year 5 for a total cost of \$23,280. Figure 2 displays the annual capital investment required, remaining annual budget and the resultant cumulative energy cost savings that are anticipated over the 10 years.

Figure 2: Option A Capital Costs, Remaining Annual Budget and Cumulative 10 Year Projected Cash Flows

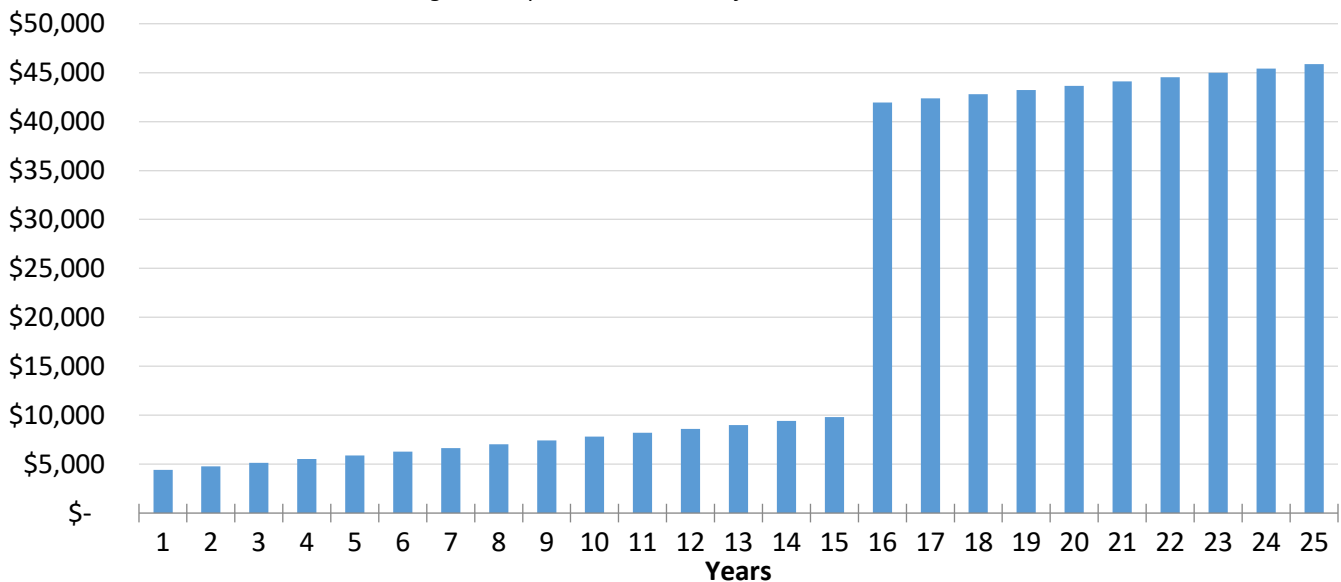


- Over a 25-year period, this option is expected to generate \$167,306 of cash flows.
- The Net Present Value (NPV) of this option over a 25-year time horizon is \$79,229 discounted at 5%.
- The IRR over a 25-year time span is 56.96%.

Analysis: Option B – Third Party Financing Approach

This option recommends that ECM 1/2/3/4/5/7/8/12/13/14 are implemented immediately with the full capital costs of \$294,028 financed over a fifteen (15) year period by a third-party lending source. The following financing estimates are based on assumptions used by 3D Energy in consultation with our project financing partners. It is assumed that the interest rate for this loan would be 7% (actual rate still to be determined) and that monthly payments of \$2,643 (\$31,714/year) would be required. This would result in an initial cash flow benefit of \$4,422 to Taber and District Housing Foundation which increases year over year because of an assumed 1% annual escalation in energy cost savings (See Figure 3 for projected annual cash flow). This third-party financing option provides more long-term savings since it takes full advantage of current rebate programs and implements all ECMs immediately.

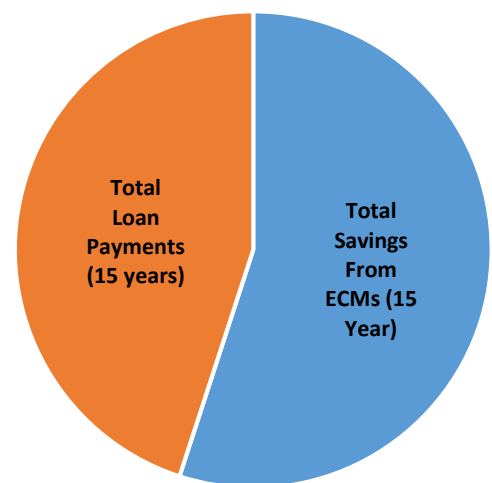
Figure 3: Option B 25 Year Projected Cash Flows



- ➡ Over a 25-year period, this option is expected to generate \$544,872 of cash flows.
- ➡ The Net Present Value (NPV) of this option over 25 years is \$232,090 discounted at 5%.

Figure 4 depicts that over the 15-year term of the loan, the amount of energy cost savings exceeds the amount that is required to cover the loan payments, therefore yielding a net profit over the term of the loan.

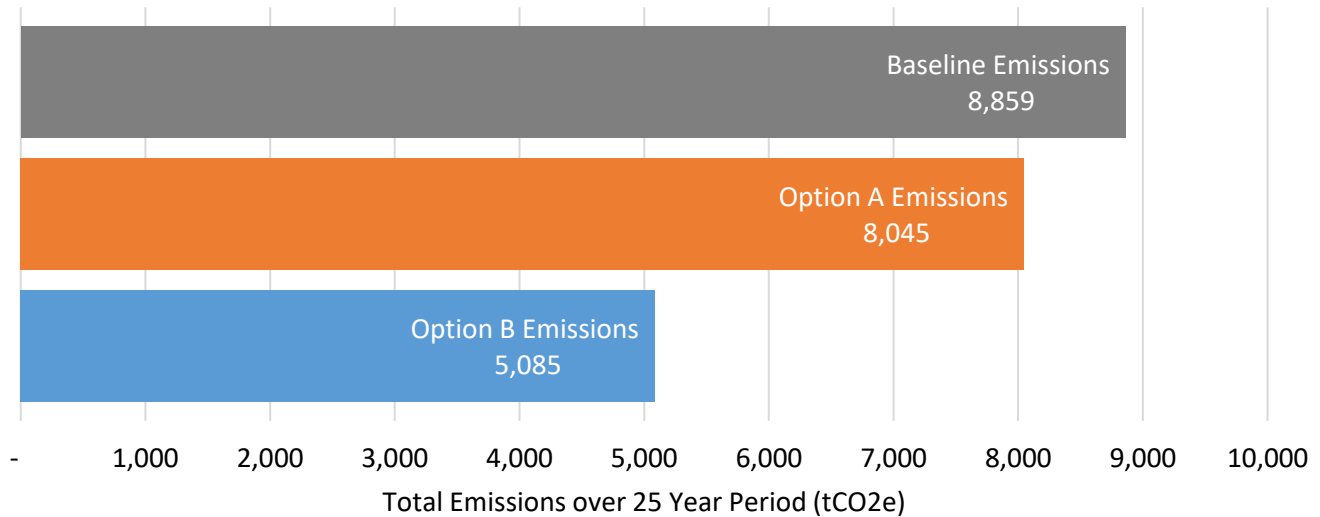
Figure 4: Cost Savings from ECM Implementation vs Total Loan Payment Amount over 15-year Term of Loan



8) Emission Reduction Analysis

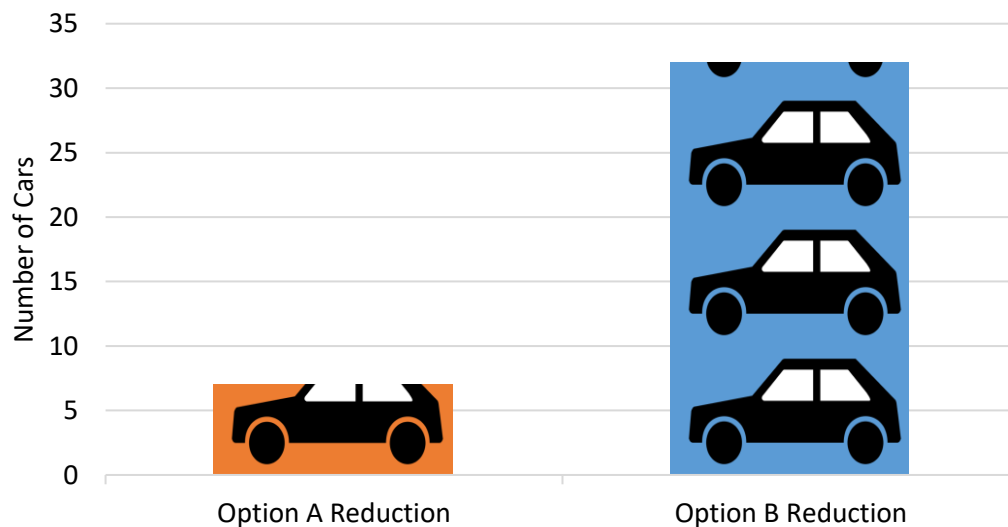
Not only do the recommended ECMs have the potential to yield ongoing yearly cost savings, but they will also reduce greenhouse gas emissions as well. If no modifications are completed to the building 8,859 tonnes of CO₂ would be released into the atmosphere over the next 25 years of operation. As can be seen in Figure 7, the options presented would reduce the emissions of the building. Since Option C includes the Solar PV ECM the emission reductions resulting from this option are highest.

Figure 5: 25 Year Total Emissions Comparing Base Case with Each Option



By implementing Option A or B, Taber and District Housing Foundation will be taking the equivalent of 7 or 32 average sized cars off the street, respectively.

Figure 6: Number of cars taken off the road over a 25-year timespan for each option



9) Additional Recommendations

In addition to the ECMs detailed above, 3D Energy has identified the following initiatives that can assist South East Edmonton Seniors Association with ongoing building energy conservation and management. These additional strategies will also contribute to the reduction of GHG emissions, increasing comfort and reducing energy costs.

Building User Awareness

One of the easiest and cheapest ways to reduce building energy consumption is for users to become more aware of how they can contribute to energy reduction. The building user can have the greatest impact on energy usage since they are the ones using the energy. Educating users can lead to the implementation of everyday actions that become habits and result in long-term savings.

Energy Star Portfolio Manager

The Energy Star Portfolio Manager is an interactive online tool that allows building operators to track and analyse energy and water use in one or more buildings. Users should begin using the tool before any Energy Conservation Measures have been implemented to establish a baseline for the building. The tool will then help the operator decide which ECMs will create the largest reduction in energy cost and greenhouse gasses. As ECMs are implemented in the future, the operator can track the results using this tool. Additionally, the Energy Star Portfolio Manager can help attain financial goals for the building, generate energy use reports, measure carbon footprint and compare the performance of the building against other buildings.

More information on the Energy Star Portfolio Manager can be found at:

- ➔ <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager>

MCCAC Building Benchmarking Tool

For operators that do not require the level of detail that the Energy Star Portfolio Manager provides, the MCCAC Building Benchmarking tool can serve as an easier to use alternative. This tool allows building operators to evaluate and compare the efficiency of their buildings. This is a no-cost tool that is specially designed to compare buildings that are located in Alberta's climate. It allows building operators to determine whether their building could perform better by implementing ECMs. Several metrics about the building are calculated like energy intensity (energy use per unit area per heating degree day), annual GHG and potential for energy savings.

More information on the MCCAC Building Benchmarking tool can be found at:

- ➔ <http://www.mccac.ca/resources/energy-benchmarking>

Continuous Energy Monitoring and Management

Ongoing and real-time monitoring of utility usage and energy consumption can be done by utilizing an online dashboard platform. A dashboard system of this nature can be customized to track the performance of specific ECMs against baseline utility consumption, which will allow South East Edmonton Seniors Association to understand, measure, and verify the results of its investment in energy conservation/efficiency. Additionally, a real-time utility monitoring dashboard gives building owners and operators access to a robust energy management tool that identifies consumption deviations as well as provides utility bill tracking and auditing. These systems can be implemented on a site-by-site basis, or across an entire organization.

More information on *Solution 105 Real Time Monitoring & Alarming* can be found at:

<http://solution105.com/services/real-time-monitoring-alarming/>

10) Resources

3D Energy	
Contact:	Sarah Busby, Office Manager
Phone:	780-416-8336
E-mail:	info@3denenergy.ca
Website:	www.3denenergy.ca
Address:	2121 Premier Way, Sherwood Park
Role:	Building energy modeling and energy auditing that capture the building envelope, electrical, and mechanical systems.

MUNICIPAL CLIMATE CHANGE ACTION CENTRE (MCCAC)	
Contact:	Calvin Lechelt
Phone:	(780) 409-7450
E-mail:	clechelt@mccac.ca
Website:	www.mccac.ca
Address:	300, 8616-51 Ave NW, Edmonton
Role:	Agency that administers the NEET incentive program.

GENERATE – SOLAR & LIGHTING TECHNOLOGY	
Contact:	Brandon Sandmaier
Phone:	780-916-3104
E-mail:	info@generateenergy.ca
Website:	www.generateenergy.ca
Address:	2121 Premier Way, Sherwood Park
Role:	Solar PV and lighting design, development and install.

SOLUTION 105	
Contact:	Cameron Mitchell, VP Data Analysis & Forecasting
Phone:	(780) 429-4774
E-mail:	mitchell@solution105.com
Website:	www.solution105.com
Address:	Suite 203, 10357 – 109 Street Edmonton, AB
Role:	Energy procurement, monitoring and utility verification company.

Aenergy Capital	
Contact:	Jim Goldmann
E-mail:	jg@aenergycapital.com

ENERGY EFFICIENCY ALBERTA	
Phone:	1-844-357-5604
E-mail:	hello@efficiencyalberta.ca
Website:	www.efficiencyalberta.ca
Role:	Agency that administers the BNI and RCSP incentive programs.