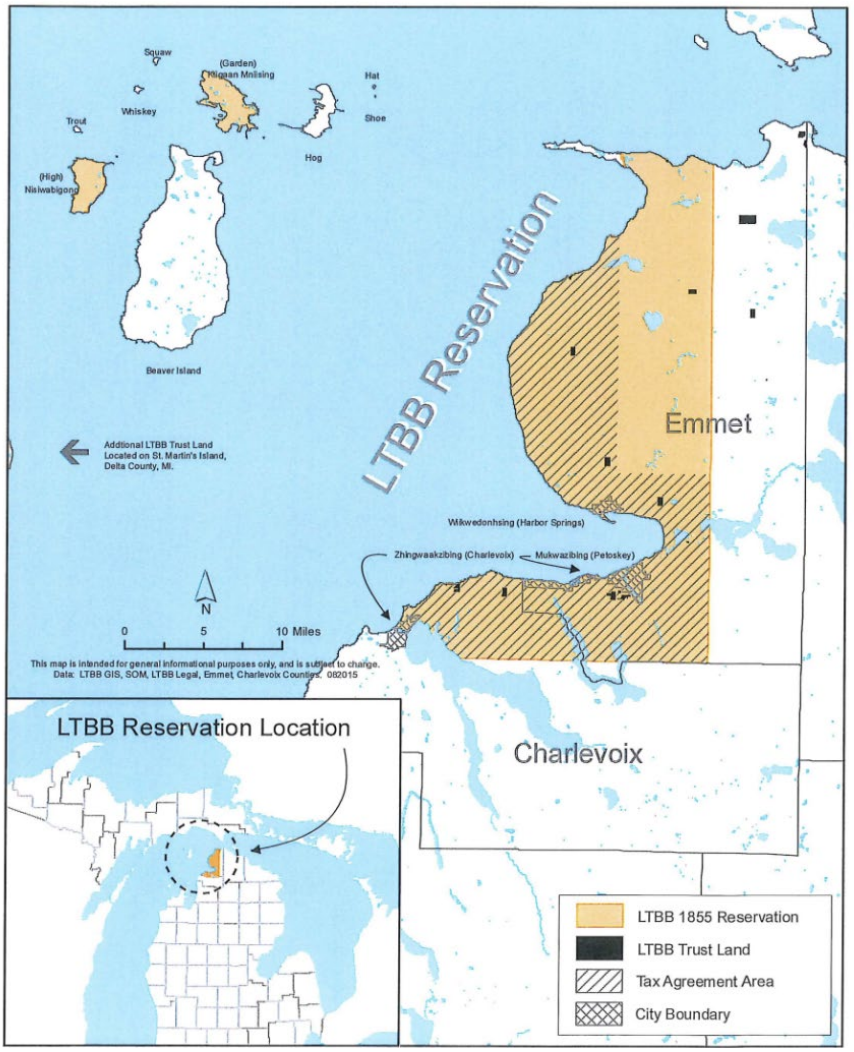
Priority Climate Action Plan (PCAP)



Little Traverse Bay Band of Odawa Indians

Prepared for the State and Local Climate and Energy Program
U.S. Environmental Protection Agency

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Prepared by

catalyst partners

and

LITTLE TRAVERSE BAY BANDS OF ODAWA
WAGANAKISING ODAWA

502 2nd Street NW, Suite 200
Grand Rapids, MI

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P 616 454 1111 502 Second Street NW Suite 200 **catalyst-partners.com**
F 616 454 1110 Grand Rapids, MI 49504

P 616 454 1111 502 Second Street NW Suite 200 **catalyst-partners.com**
F 616 454 1110 Grand Rapids, MI 49504

1 Executive Summary

Catalyst Partners and the Little Traverse Bay Band of Odawa Indians (LTBB) have partnered to create a report that meshes goals of LTBB's Climate Emergency Action Plan Resolution with an implementable plan for the EPA's Climate Pollution Reduction Grant. For the Little Traverse Bay Band of Odawa Indians (LTBB), costs are not the most important aspect of their carbon emissions: sustainable practices for the planet are. This is why LTBB has been striving toward more sustainable practices as a Tribe since 2005 and has goals to achieve zero net carbon in the near future. After taking the steps to understand where the emissions of the LTBB are coming from, Catalyst Partners was able to define opportunities to reduce those emissions. In addition to meeting LTBB's carbon goals, reducing emissions can save both energy and operational costs.

Catalyst Partners and LTBB prepared a priority plan for reducing Scope 1 and 2 Greenhouse Gas (GHG) Emissions from the LTBB operations. Some examples of the opportunities for these reductions are the transition of fossil fuel heating sources to electric, energy efficiency projects, and the expansion of renewable energy generation.

As part of the inventory, Catalyst Partners evaluated the sources of the Greenhouse Gasses emitted by LTBB's operations. This included both Scope 1 and 2 Greenhouse Gases (GHG). Scope 1 includes direct GHG emissions from sources that are owned or controlled by the reporting entity, such as emissions from combustion of fossil fuels on-site. Scope 2 includes indirect GHG emissions associated with the consumption of purchased or acquired energy, such as electricity or heat. In collaboration with the Tribal representatives, Catalyst Partners discussed the existing sources of the Scope 1 and 2 GHGs within facility operations and the plans for continued improvement and maintenance. Areas to prioritize were identified based on the readiness of project sites, volume of emissions for each source, and the feasibility of the proposed reduction opportunities.

These considerations led Catalyst Partners to provide three packages that are ready for immediate implementation. Package 1 and 2 are the recommended initial projects. In package 1, the recommendation is to expand the existing solar installation at the hatchery to offset the remaining yearly electricity consumption. Packages 2 for the Natural Resources building recommends a similar approach, where the existing solar array is expanded to offset the remaining yearly energy use. These two measures will allow both sites to claim net zero electricity consumption and reduce carbon emissions by 85.1 Tons per year.

Further considerations for this recommendation revolve around motivating a community to rise to the occasion and drive toward the Tribe's goals of carbon neutrality. By completing these two projects that are very visible within the tribe and demonstrate leadership to the community, they can act as a model for future projects and building improvements.

2 Introduction

Catalyst Partners is pleased to have the opportunity to partner with Little Traverse Bay Bands of Odawa Indians (LTBB) for assistance with the implementation of their EPA Climate Pollution Reduction Grant.

The LTBB was federally reaffirmed with the signing of Public Law 103-324 on Sept. 21, 1994. Located in the northwestern part of the Lower Peninsula of Michigan, the reservation area encompasses approximately 336 square miles of land. The LTBB has over 4,000 members, is led by three branches of government, and currently employs over 550 full and part-time employees.

Catalyst Partners is a sustainability and building performance consulting firm based in Grand Rapids, Michigan. Catalyst Partners has been in business since 2002 and has assembled a group of industry professionals who share a passion for creating a positive environmental impact.

LTBB and Catalyst Partners share similar ideals and missions. Both entities believe that education, justice, communication, and planning will bring a future that respects and values the places we inhabit and people we aspire to be. An understanding of culture is fundamental to sustainability work, and the hope is that the activities associated with this EPA Climate Pollution Reduction Grant will be the catalyst for continued efforts within the Tribe into the future.

Using the recommendations provided in this PCAP report, LTBB has an outline of the next steps to take to complete the goals set in their Climate Emergency Action Plan Resolution to become carbon neutral.

2.1 CPRG Overview

The Climate Pollution Reduction Grant (CPRG) program through the United States Environmental Protection Agency (EPA) provides grants to local tribes in order to set and meet ambitious targets for decreasing greenhouse gas emissions and other types of air pollution. Grant money recently became available through the Inflation Reduction Act. Since the Little Traverse Bay Band of Odawa Indians (LTBB) already had significant sustainability goals, they decided to pursue funding to meet these goals through the CPRG program to speed up the ability to implement carbon emission reduction measures.

2.2 PCAP Overview and Definitions

The PCAP will include discussion of the LTBB's Greenhouse Gas Inventory, emission projections, reduction targets, and some possible reduction measures. There will be a benefits analysis for each measure as well as an analysis of benefits for Low Income / Disadvantaged Communities and the authority to implement each measure. Intersection with other funding availability, workforce planning analysis, and next steps will also be discussed.

For the sake of this report, Greenhouse Gas (GHG) emissions are defined as gases discharged on LTBB property and from the operations of LTBB which trap heat in the atmosphere. This can include emissions from natural gas burned on site, electricity usage, operation of LTBB vehicles, fertilizer usage, waste and wastewater treatment, and commutes of LTBB employees. Below is a list of common terms used throughout this report and their definitions:

1. Base Year:
    - The reference year against which future emissions reductions or changes are measured. It serves as a benchmark for assessing progress in emission reduction efforts.
2. Carbon Dioxide Equivalent (CO_2e):
    - A standardized unit to express the total global warming potential of all GHGs, by converting them into the equivalent amount of CO_2 that would have the same warming effect over a specified time period.
3. Carbon Footprint:
    - The total amount of GHGs, usually measured in CO_2e, emitted directly or indirectly by an individual, organization, event, or product throughout its lifecycle.
4. Carbon Neutrality:
    - Achieving a balance between the amount of GHGs emitted and the amount removed from the atmosphere, resulting in a net-zero carbon footprint.
5. Carbon Offset:
    - A reduction, removal, or avoidance of GHG emissions to compensate for emissions occurring elsewhere, often achieved through projects like reforestation or renewable energy initiatives.
6. Carbon Sequestration:
    - The process of capturing and storing carbon dioxide from the atmosphere, often in forests, soils, or geological formations.
7. Embodied Carbon
    - The greenhouse gas emissions arising from the manufacturing, transportation, installation, maintenance, and disposal of building materials.
8. Global Warming Potential (GWP):
    - A measure of how much heat a GHG traps in the atmosphere over a specific time period, relative to carbon dioxide. GWP is used to compare the warming potential of different gases.

9. Greenhouse Gases (GHGs):
    - Gases in Earth's atmosphere that trap heat. Common GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), fluorinated gases, and others.
10. Operational Carbon
    - The emissions associated with energy used to operate the building or in the operation of infrastructure, including heating, hot water, cooling, ventilation, lighting systems, equipment, and elevators.
11. Scope 1 Emissions:
    - Direct GHG emissions from sources that are owned or controlled by the reporting entity, such as emissions from combustion of fossil fuels on-site.
12. Scope 2 Emissions:
    - Indirect GHG emissions associated with the consumption of purchased or acquired energy, such as electricity or heat.
13. Scope 3 Emissions:
    - Indirect GHG emissions from sources not owned or controlled by the reporting entity but related to its activities, such as emissions from supply chains, employee commuting, or business travel.

2.3 Scope of the PCAP

The Little Traverse Bay Band of Odawa Indians (LTBB) owns properties throughout the northwestern lower peninsula of Michigan and in the upper peninsula of Michigan. The properties are in various regions throughout Emmet, Delta, and Charlevoix Counties in addition to the townships of Hayes, Resort, Bear Creek, Little Traverse, West Traverse, Friendship, Readmond, Center, McKinley, Carp Lake, Nahma, and Wawatam. The emissions scope of this PCAP includes the carbon emissions from electricity used, natural gas burned on site, and vehicle emissions from tribal vehicles as well as commutes from the employees of the LTBB. It also includes the carbon emissions from some waste and wastewater treatment data that was collected, refrigeration, emissions from fertilizers used during farming activities, and carbon offsets from solar panels and urban forestry. The properties were divided into categories based on use case: residential, commercial, casino, administration, and other areas.

2.4 Approach to Developing the PCAP

The original carbon reduction goals of the Little Traverse Bay Band of Odawa Indians (LTBB) were established in their 2006 Mno-Gwaashkweziwin, or “Good Energy”, report. This plan established some “first steps toward developing renewable energy and

energy efficiency on tribal lands" and created the framework for the Tribal Strategic Energy Plan and Energy Code. Since then, several structures have been built on tribal lands with sustainable building goals in mind, such as some of the LEED requirements put into place at the Odawa Casino. There have also been retrofits of existing buildings on tribal lands to implement energy efficiency measures, including recommendations from the 2013 NRD Energy Audit Report and the 2016 Energy Audit Reports of the Government Center, Health Park, and Judicial Building. Some solar projects have been constructed on tribal properties as well.

LTBB sought engagement from Catalyst Partners to support the efforts established in their PCAP report, to help with establishing a carbon emissions baseline, and to suggest measures that could be put into place to reduce carbon emissions. The primary LTBB staff involved with data gathering were Caroline Moellering (Environmental Manager), Lauren Davenport (Environmental Specialist), and Doug Craven (Natural Resources Director). Catalyst Partners included all factors of carbon emissions that the LTBB had data for in the PCAP.

The collected data for this report was received through several different methodologies. Electricity and natural gas use on site were collected through analysis of utility bills and tribal records. Gas, diesel, and recreation fuel for on-site vehicles were tracked through gas station receipts. Emissions from employee commutes were calculated through an online survey of tribal employees. Refrigerant data was collected by analyzing building plans for various sites and reviewing the manuals for equipment requiring refrigerants to determine usage amounts. Urban forestry offsets were calculated by looking at each tribal property via satellite map and measuring how much of the property had tree coverage. Information about waste and wastewater processing was reported by the LTBB facilities department. All of this data was then processed through CarbonHUB software to create a baseline for tribal carbon emissions. This baseline was used as a starting point to suggest carbon reduction measures and estimate the impact of implementing the suggested measures over time.

At the request of the LTBB, one of the carbon mitigation measures that was considered for implementation was additional solar panels. In order to install these at a site connected to the grid, utility permission is needed and the LTBB will need to go through the standard interconnection process to obtain approval to operate these systems. If the property where the solar will be located is not self-governed, the LTBB will also need to obtain permission from the local municipality and receive inspection approval of the system.

Other carbon reduction measures were selected by first evaluating their Return on Investment (ROI) from an energy savings perspective, and second from a load and carbon emissions reduction perspective. If measures provided load reductions that translated to avoided costs for renewable energy installations, they were prioritized for implementation. Catalyst's general methodology for recommendations was to primarily reduce loads, electrify energy sources, then offset consumption where possible with site renewable energy generation.

3 Tribal / Territorial Organization and Considerations

The Little Traverse Bay Band of Odawa Indians (LTBB) has the following existing climate action / emissions reduction plans:

1. Kyoto Protocol Resolution (2005)
2. Renewable Energy Strategic Plan (2005)
3. Mno-Gwaashkweziwin "Good Energy" (2006)
4. Environmentally Preferable Purchasing Program (2011)
5. Housing Development Wind Turbine (2012)
6. Natural Resources Building ASHRAE Level II Energy Assessment (2013)
7. Government Center ASHRAE Level II Energy Audit (2016)
8. Judicial Building ASHRAE Level II Energy Audit (2016)
9. Health Park ASHRAE Level II Energy Assessment (2016)
10. Fish Hatchery Solar Array (2016)

The LTBB's Kyoto Protocol Resolution and Renewable Energy Strategic Plan were first presented in 2005. The Kyoto Protocol Resolution was adopted on May 15, 2005, and set a goal to convert 25% of LTBB's energy supply to renewable energy by 2020. In the same year, the Renewable Energy Strategic Plan was created. The first goal of the plan was to have the Department of Energy within LTBB establish a Tribal Energy Code to provide the parameters for the development of an energy unit or office within government operations for future management of Tribal Energy Resources. After this, the group implemented the Strategic Energy Plan, which involved development of renewable energy and energy self-sufficiency on Tribal lands. The initial meeting regarding this plan established roles of project manager and working group members and created a monthly work group to meet energy plan goals. It also outlined newsletters and meetings to keep the Tribe informed on progress and encourage participation and new ideas.

Mno-Gwaashkweziwin was an initial evaluation of LTBB's energy use and renewable energy potential. It discussed ongoing and future energy projects for the Tribe and began the framework for a Tribal Strategic Energy Plan and Energy Code. The main goals of this plan for the 1855 Reservation and outlying Tribal properties were as follows:

1. Develop wind energy resources
2. Develop bio-energy resources
3. Develop solar energy resources
4. Implement combined heat and power technology
5. Establish Utility (Tribal or Inter Tribal)
6. Identify, promote, and implement energy efficient services
7. Establish Tribal Energy Code
8. Promote and implement renewable energy fuels for transportation purposes

Many of these goals have already been accomplished to an extent. The LTBB currently has a 2.4-kW wind turbine at the Murray Road Housing (installed in 2012), a 15-kW solar

array at the Natural Resources Building, and a 20-kW solar array at the Hatchery. LTBB has also experimented in bio-diesel production and has the equipment to make it, however production is not currently active. Several of the buildings with larger energy use profiles have been evaluated for energy efficiency measures, and many of the suggested measures have already been implemented. In 2015, the Casino won 2nd place in the US Green Building Council Battle of the Buildings for Michigan in the entertainment division by reducing their energy consumption by 5% in the previous year.

The Environmentally Preferable Purchasing Program was created in 2011 and focused on opportunities for more sustainable purchasing decisions for office supplies, facilities supplies, and equipment. The biggest opportunity highlighted was to purchase paper with at least 30% recycled content as a standard. Other EPP purchase standards were also included.

Finally, ASHRAE Level II Audits were performed between 2013 and 2016 on the Natural Resources Department, Government Center, Health Park, and Judicial Buildings owned by LTBB. These audits analyzed each building's energy use and then outlined many energy and cost saving measures that could be implemented in each building, most of which were implemented following the reports. The recommended measures included interior lighting upgrades, HVAC upgrades, building envelope updates, water efficiency upgrades, and several other miscellaneous improvements.

This PCAP builds on existing plans by identifying additional areas where building improvements could be made, such as installing heat pumps or LED lighting upgrades, along with a focus on carbon emissions rather than purely energy use. This strategy can help LTBB to identify potential areas of environmental improvements. It also establishes additional opportunities for renewable energy resources that the LTBB may not have explored or implemented yet.

4 PCAP Elements

4.1 Greenhouse Gas (GHG) Inventory

The scope of the Greenhouse Gas Inventory of this PCAP includes emissions from scope 1 and 2 as well as some scope 3 emissions. It also includes urban forestry as a carbon sink.

The scope 1 emissions that were accounted for were natural gas use on site at the Biindigen Gas Station, refrigerants used on site at the Administration Building and the Community Center, and emissions from all LTBB vehicles. Natural gas information was collected through bills from the local utility. Refrigerant information was collected using plans for the buildings listed. Vehicle emissions were documented through receipts from gas, diesel, and REC fuel purchases collected by LTBB.

The scope 2 emissions originated from purchased energy from the local utility companies, which included Great Lakes Energy and the City of Petoskey. Usage

information came from bills that LTBB had tracked via a spreadsheet, and carbon emissions from this usage were calculated separately between the two utility companies. The fuel mixes of both utility companies were researched and the most recent data available was used to determine the typical g CO_2 eq emitted per kWh generated by the utility.

The scope 3 emissions that were documented included emissions from fertilizer at LTBB's farms, employee commutes, waste tracked from the administration building, and wastewater treated from the casino. The fertilizer, waste, and wastewater data were provided from LTBB's records. Employees of LTBB were surveyed about their typical commutes and data was compiled so that typical gas, diesel, and electricity (from EVs) use could be calculated over the course of a year and emissions data calculations could then be extrapolated.

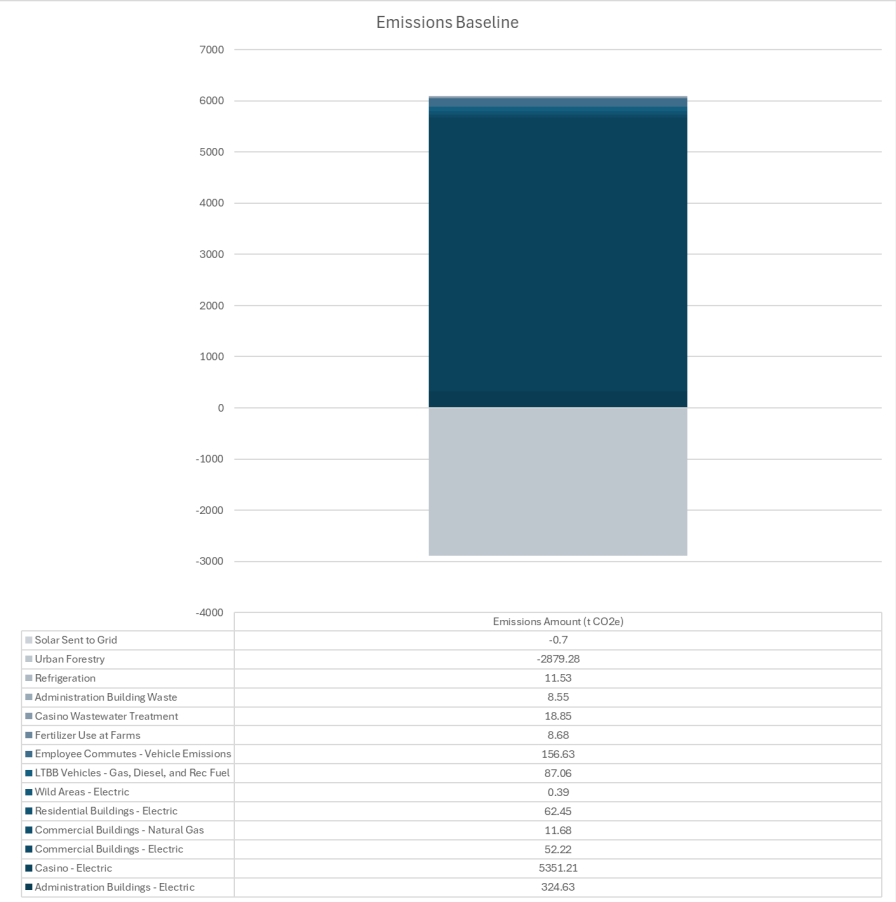
Urban forestry was a large carbon sink for LTBB because they own many undeveloped and forested properties for conservation purposes. An atlas of all LTBB owned properties with properties lines and parcel size was provided. Using satellite imagery, the percentage of each parcel that was forested could be calculated. This percentage was put into the Urban Forestry calculator of ICF Incorporated's Tribal GHG Inventory Tool to result in a total carbon offset amount.

The results of the GHG Inventory are provided in Table 1.

Carbon Source	Emissions Amount (t CO_2e)
Administration Buildings – Electric	325.31
Casino - Electric	2,946.15
Commercial Buildings - Electric	52.22
Commercial Buildings – Natural Gas	11.68
Residential Buildings - Electric	62.46
Wild Areas - Electric	0.39
LTBB Vehicles – Gas, Diesel, and Rec Fuel	87.06
Employee Commutes – Vehicle Emissions	156.63
Fertilizer Use at Farms	8.68
Casino Wastewater Treatment	18.85
Administration Building Waste	8.55
Refrigeration	11.53
Urban Forestry	-2879.28
Solar Sent to Grid	-0.70

Table 1: 2022 LTBB Emissions Sources

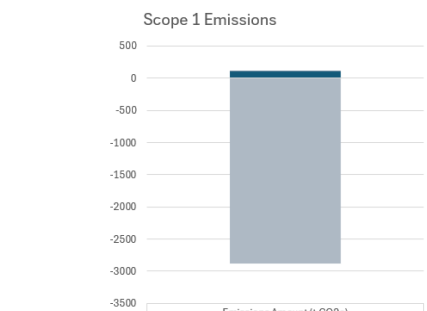
Figure 1 (below) illustrates the data that has been collected to date and breaks it down into carbon sources (positive) and carbon sinks (negative).



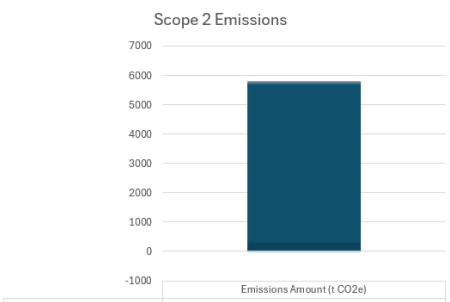
	Emissions Amount (t CO2e)
Solar Sent to Grid	-0.7
Urban Forestry	-2879.28
Refrigeration	11.53
Administration Building Waste	8.55
Casino Wastewater Treatment	18.85
Fertilizer Use at Farms	8.68
Employee Commutes - Vehicle Emissions	156.63
LTBB Vehicles - Gas, Diesel, and Rec Fuel	87.06
Wild Areas - Electric	0.39
Residential Buildings - Electric	62.45
Commercial Buildings - Natural Gas	11.68
Commercial Buildings - Electric	52.22
Casino - Electric	5351.21
Administration Buildings - Electric	324.63

Figure 1: Emissions Baseline

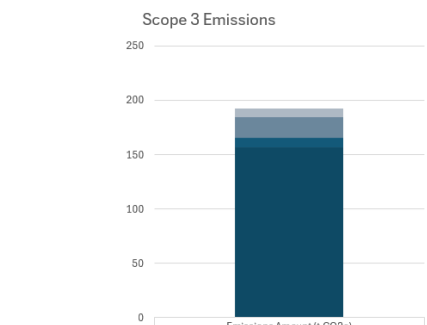
Figure 2 (below) shows the 2022 allocation for each emission source and the scope that it falls within. It is expected that Scope 1 emissions will expand significantly as further data for on-site stationary combustion is added.



	Emissions Amount (t CO2e)
Urban Forestry	-2879.28
Refrigeration	11.53
LTBB Vehicles - Gas, Diesel, and Rec Fuel	87.06
Commercial Buildings - Natural Gas	11.68



	Emissions Amount (t CO2e)
Solar Sent to Grid	-0.7
Wild Areas - Electric	0.39
Residential Buildings - Electric	62.45
Commercial Buildings - Electric	52.22
Casino - Electric	5351.21
Administration Buildings - Electric	324.63



	Emissions Amount (t CO2e)
Administration Building Waste	8.55
Casino Wastewater Treatment	18.85
Fertilizer Use at Farms	8.68
Employee Commutes - Vehicle Emissions	156.63

Figure 2: 2022 Emission Sources by Scope

Figure 3 (below) shows the breakdown of greenhouse gas emissions from gases other than CO2 that were able to be calculated. Most of the reported data converted other gases to CO2 equivalents (CO2e) and so all emissions will be referred to in those terms throughout the report except for below, as that unit is includes all other emission types and keeps data consistent throughout the report. Much of the data that was used in this report had already been converted into CO2e before it was collected for the report (for example, utility emissions), so this is not a full representation of all non-CO2 emissions -- only what data was available (refrigerants for some properties and mobile combustion data).

Greenhouse Gas	Emissions (t CO2e)
HCFC-22	11.51
HFC-134a	0.02
CH4	0.27
N2O	0.67

Table 2: Non-CO2 Greenhouse Gas Summary

4.2 GHG Emissions Projections

GHG emissions for the Tribe were detailed in section 4.1 above for both 2022 and 2023. Based on the trends from year to year, emissions are expected to grow at a rate of 4% per year, excluding any new construction projects. Any new project added to the Tribe's portfolio will inherently add to the total emissions, and there are strategies that can be implemented to optimize new construction projects and lessen their impact. Section 5.4 describes new construction guidelines that will allow projects to both reduce embodied carbon and optimize operational emissions.

A major consideration for projecting future carbon emissions in Michigan is the sources of electricity production for the state's grid. Currently about 20% of the grid in Great Lakes Energy territory is supplied by energy that is generated by coal power plants, which have significantly more carbon emissions per unit of energy than other sources. This is even higher in Consumer's Energy (34%) and the City of Petoskey (48%) fuel mixes, which several LTBB buildings use as electrical suppliers. While this currently creates a disadvantage to electric building systems, the State of Michigan's utility providers have plans to shut down most of the coal energy generation capacity by 2026. Due to these changes to the carbon intensity of the grid serving the state, and subsequently LTBB, there is expected to be a rather significant change in carbon intensity within the next few years.

Most of the properties owned by LTBB have electric service from Great Lakes Energy. Several properties have electric service with the City of Petoskey: Victory Square Health Park, Odawa Hotel, the 911 Building, the Youth Services Building, and the Food Distribution Warehouse. Two properties have Consumers Energy electric service: Biindigen Gas Station and the Environmental Services Building / Rentals. These three utilities have slightly different fuel mixes as shown in figures 3.1 – 3.3 below.

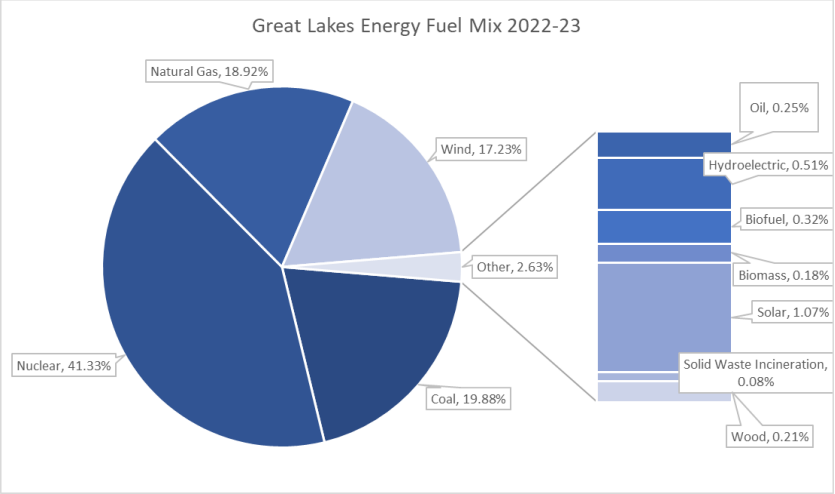


Figure 3.1: The fuel mix for Great Lakes Energy Utility Company in Fiscal Year 2022-2023

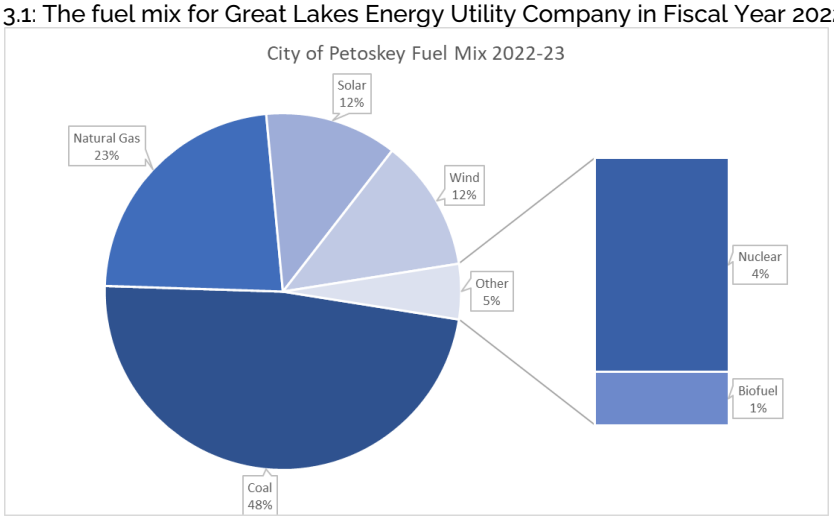


Figure 3.2: The fuel mix for the City of Petoskey Utility Company in Fiscal Year 2022-2023

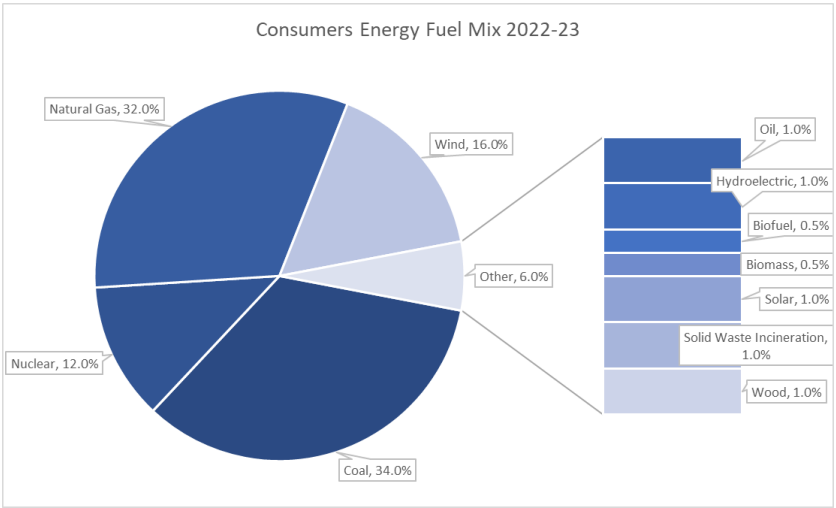


Figure 3.3: The fuel mix for Consumers Energy Utility Company in Fiscal Year 2022-2023

Figures 4.1 – 4.3 below show the carbon emissions sources for each utility's electric grid as of 2022. This illustrates the significant impact the coal plants have on the State of Michigan's current emissions. With 60-80% of emissions at each utility tied to electric production coming from coal power plants, shutting the coal plants down in the future will have major impacts on the grid's overall emissions factors.

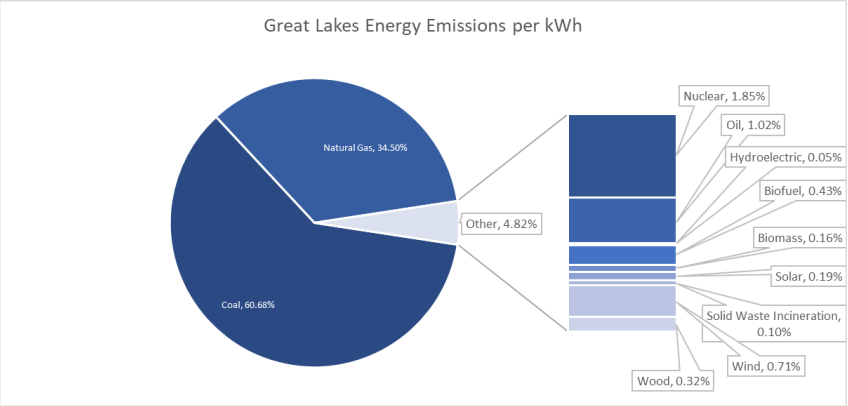


Figure 4.1: Emissions sources per kWh for Great Lakes Energy Utility in 2022-2023

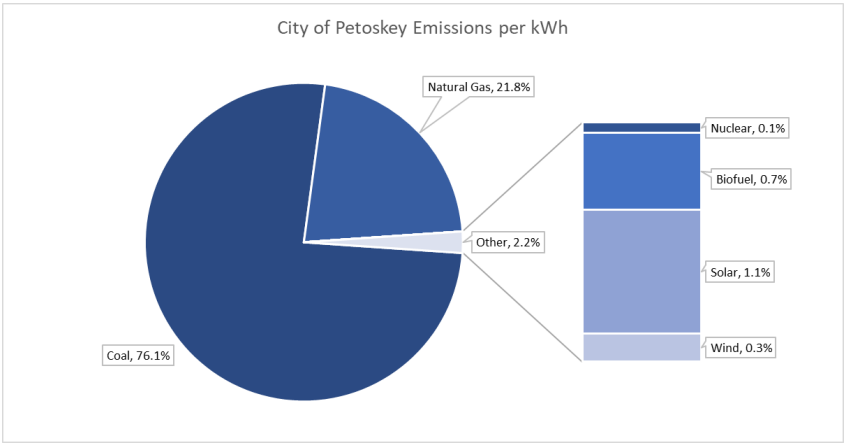


Figure 4.2: Emissions sources per kWh for the City of Petoskey Utility in 2022-2023

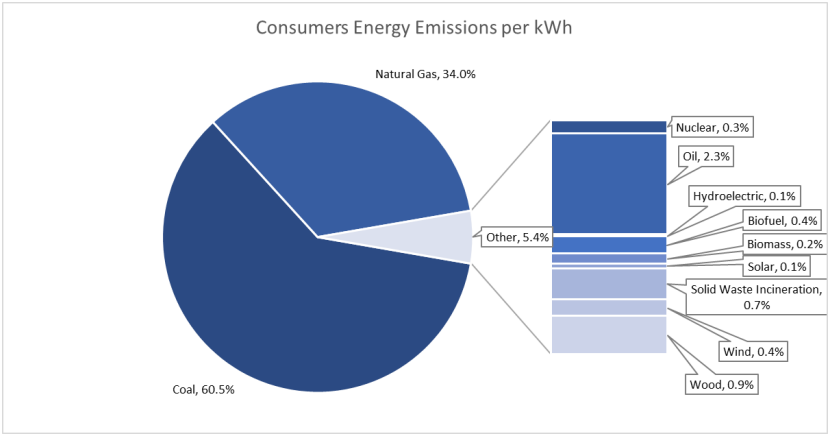


Figure 4.3: Emissions sources per kWh for Consumers Energy Utility in 2022-2023

Taking these factors into consideration, some high-level projections for LTBB have been developed. Shown in Figure 5, these are based on a target of carbon neutrality by 2050. The blue line shows the current trend based on today's emissions factors and apparent growth trajectory, including current carbon sequestration resources. The orange line indicates what this same projection would look like based on the current plan for Michigan's electric grids, which includes shuttering the coal power plants and reaching zero carbon by 2040. The gray line shows our current targets for LTBB, which includes a trend of electrifying energy consumption at a rate of 1% per year until 2030, 2% from 2030-2040, then 2.5% until 2050. This could be achieved by bringing online new construction projects that are all electric (like Mtigwaakiis), electrifying the current building through end-of-life system replacement projects, and producing more electricity on site with solar installations. As the Comprehensive Climate Action Plan is implemented, this will develop further, and any projections can be aligned with recommended improvement measures.

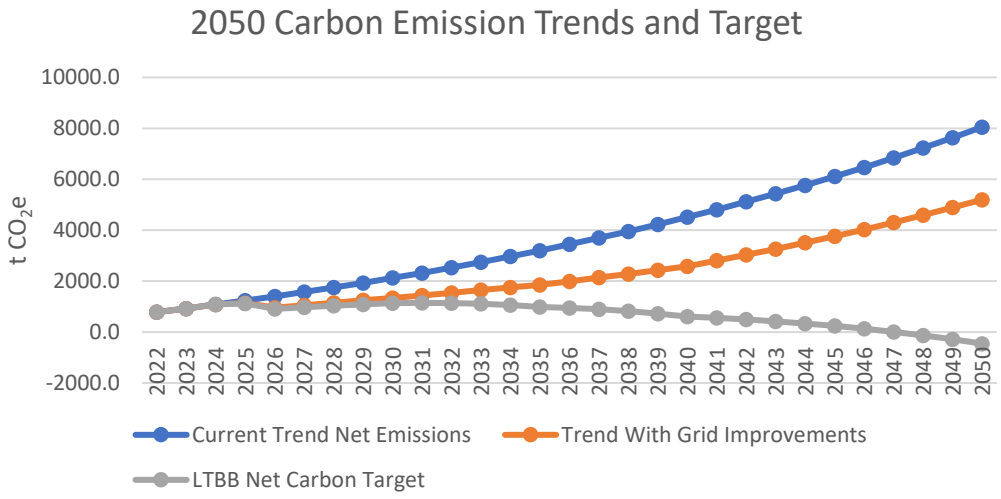


Figure 5: 2050 Emissions Target

The tribal resolution also provided guidance to achieve carbon neutrality by 2031, which is more aggressive than the previously presented target. To show how the LTBB's goal aligns with the EPA's goal, the 2031 target was overlayed onto the 2035 projection. Figure 6 shows what this target means for reduction measures and how aggressive the Tribe would have to be to meet those goals. These projections include a trend of electrifying energy consumption at a rate of 6% per year until 2031, then switching to a more relaxed rate of 0.5% going forward. As the trend becomes more defined beyond 2040, further adjustments to manage emissions and implement electrification measures may need to be made.

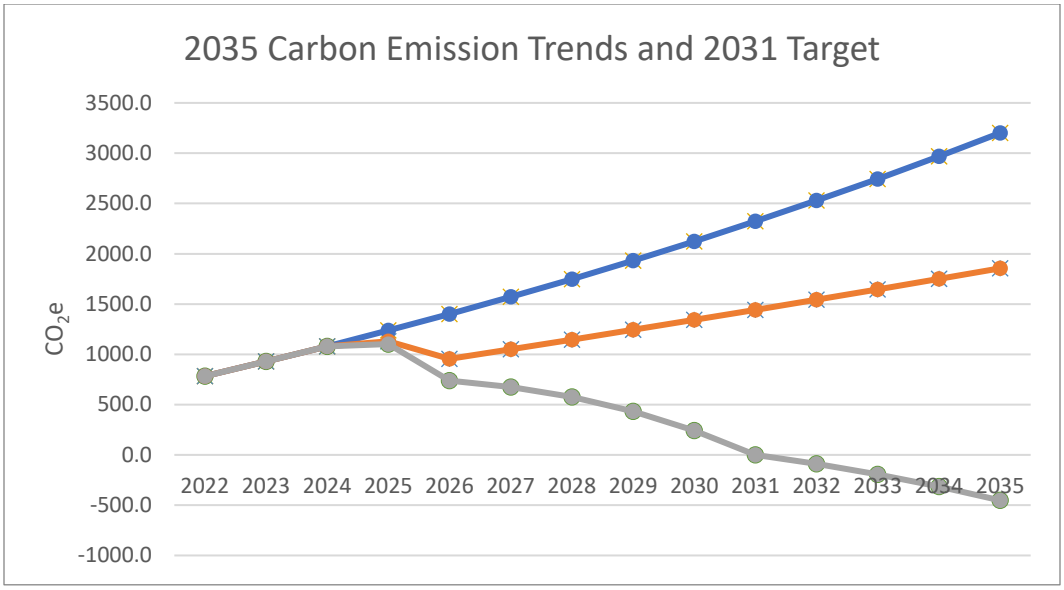


Figure 6: 2035 Emissions Trends and 2031 Target

4.3 GHG Reduction Targets

In support of the Tribe's long-term goal of reaching carbon neutrality, the Priority Climate Action Plan outlines a pathway to reducing emissions that are seen as higher priority or easier to implement. GHG reduction measures are detailed in section 4.4. When implemented as described below, the Tribe will be able to realize an 8% reduction in total GHG emissions for LTBB with improvements at Mtigwaakiis for Package 1. Similarly, the Hatchery can provide a 7.8% reduction to the Tribe's GHG emissions with Package 2, and Natural Resources can provide a 3% reduction with Package 3. Additional opportunities are detailed throughout section 4.4, yet is is noted these suggestions require additional investigation, significant groundwork, and commitments from the Tribe and other entities. For these reasons, these additional opportunities are provided in this report, but not included in the recommended packages. These will be pursued further for the Comprehensive Climate Action Plan, and feedback will be helpful on these opportunities.

Each of these packages includes solar installations which produce more energy in the summer than in the winter. Due to this, some energy in the summer will go back to the grid, while in the winter the sites will need to draw from the grid. These recommendations will allow LTBB to produce an equal amount of kWh on an annual basis compared to what is consumed. Note that an equal state does not imply energy bills will be reduced by the same amount. Table 2 below shows the rates offered by Great Lakes Energy for energy produced on a site vs. energy consumed on the sites.

Electrical Rates (GLE)	
Buy All / Sell All Buyback Rate per kWh	$ 0.10
Net Metering Buyback Rate per kWh	$ 0.056
Energy Purchase Rate per kWh	$ 0.17

Table 3: Electric Rates

Currently, there are a few options when it comes to how solar projects are structured, and these should each be considered for each site to best meet the Tribe's goals. LTBB has shown interest in expanding their solar energy portfolio. Several locations were analyzed, and a few sites were determined to have the greatest solar potential. Most of the properties owned by the LTBB are in the Great Lakes Energy (GLE) utility's territory, so their solar programs were primarily examined. GLE has two programs: 1. Net Metering, in which the system size is limited to one that will produce as much energy as the site pulls from the utility over the course of a year and 2. Buy All / Sell All, in which an existing GLE customer can install a system up to 100 kW and sell all of the energy directly back to the grid. This latter program is limited to 100 kW per customer (over all properties), so that is the largest array any given customer can have unless their site justifies a larger system through the Net Metering program. Both programs pay the system owner a wholesale rate for their electricity.

In terms of properties, the prime candidates for GLE's Buy All / Sell All program are Mtigwaakiis and Ziibimijwang. Mtigwaakiis has a section of the property already slated for future solar development that is well sized to accommodate 100 kW worth of ground arrays, including array size limits and setbacks between arrays. Ziibimijwang has clear and unshaded space for agriculture. Areas not currently being used as farmland are ideal for solar given the size and exposure. Ziibimijwang has more than enough space to max out the Buy All / Sell All program limits.

If GLE's Net Metering program is considered, the best properties for this would be the Odawa Casino, the Mackinaw Casino, and the Odawa Hotel (with the City of Petoskey utility – but still could do net metering through them for up to 30 kW). These properties would likely qualify for more solar energy on site through Net Metering than the Buy All / Sell All program. This assessment is based on their large electricity usage. There is also ample space on each site for either a roof or ground mounted system (or both). The structural capacity of each building's roof would need to be evaluated to ensure they have been designed to support the additional weight for the system to be installed. If the goal is to maximize solar production, these sites are the best option to investigate further.

All suggested measures will be detailed in the following sections of the report. In summary, the suggested measures are as shown below:

GHGRM Package Summary								
Package	Production (kWh)	Energy Savings (kWh)	Cost Savings (per year)	% Energy Savings	Available Incentives	ECM Cost	CO2e Savings (tons / year)	Payback (years)
GHGRM 1: Hatchery Solar	207,797	-	$25,850	100.0%	$169,935	$566,450	61.5	15.3
GHGRM 2: Natural Resources Solar	79,787	-	$9,926	99.9%	$67,350	$224,500	23.6	15.8
Mtigwaakiis GHGRM 3: Solar	149,540	-	$21,557	69.34%	$127,987	$426,622	44.2	13.9
GHGRM 3: Option 1 - Batteries for Building A	-	-	-	-	$6,240 for lead-acid / $15,300 for Li-ion	$20,800 for lead-acid / $51,000 for Li-ion	-	-
GHGRM 3: Option 2 - Batteries for Building B	-	-	-	-	$5,460 for lead-acid / $11,700 for Li-ion	$18,200 for lead-acid / $39,000 for Li-ion	-	-
GHGRM 3: Option 3 - Batteries for the Well House	-	-	-	-	$780 for lead-acid / $4,500 for Li-ion	$2,600 for lead-acid / $15,000 for Li-ion	-	-
GHGRM 4: Solar Farm	125,990	-	$12,599	-	$105,000	$350,000	37.28	19.45
GHGRM 6: Mtigwaakiis Heat Pump	-	32,650	$5,551	15.1%	$3,000	$16,000	9.7	2.3
GHGRM 7: Mtigwaakiis Lighting	-	30,922	$5,257	14.3%	$-	$5,920	9.1	1.1

Table 4: Summary of all GHGRM Packages

Package 1 – Hatchery

The Hatchery currently has a solar array; therefore, it appears to be a good candidate for additional capacity. Once additional information is received for the Hatchery, Catalyst Partners can provide an analysis of additional measures, including increasing the solar array capacity.

	GHGRM Package #1 Hatchery							
	Production (kWh)	Energy Savings (kWh)	Cost Savings (per year)	% Energy Savings	Available incentives	ECM Cost	CO2e Savings (tons / year)	Payback (years)
GHGRM 1: Solar	207,797	-	$ 25,850	100.0%	$ 169,935	$ 566,450	61.5	15.3

Table 5: GHGRM Package #1: Hatchery

Package 2 - Natural Resources

Natural Resources currently has a solar array; therefore, it would appear to be a good candidate for additional capacity. Once additional information is received for the Natural Resources building, we can provide an analysis of additional measures, including increasing the solar array capacity.

	GHGRM Package #2: Natural Resources							
	Production (kWh)	Energy Savings (kWh)	Cost Savings (per year)	% Energy Savings	Available incentives	ECM Cost	CO2e Savings (tons / year)	Payback (years)
GHGRM 2: Solar	79,787	-	$ 9,926	99.9%	$ 67,350	$ 224,500	23.6	15.8

Table 6: GHGRM Package #2: Natural Resources

Package 3 – Mtigwaakiis

Mtigwaakiis was chosen as the first package given the site has great opportunities for GHG reduction measures and can serve as an example for future developments for LTBB. The existing buildings are solar ready and all electric, which makes them great candidates for further energy conservation measures (ECMs) in reducing energy load and installing solar production. The last two years of energy use on site are detailed below.

	Mtigwaakiis Baseline Energy Use	
Meter on Site	2022 Usage (kWh)	2023 Usage (kWh)
Apartment Building A	100731	103457
Apartment Building B	99955	88019
Outdoor Lights	7640	6561
Well House	13255	11728

Table 7: Baseline Data for Energy Use at Mtigwaakiis Site

The Greenhouse Gas Reduction Measures (GHGRM) package in the table below outlines a path for reducing 98% of the utility related GHG emissions on site and provides an ROI of 9.8 years. It should be noted that the measures in GHGRM 7 and 8 reduce energy use on site and therefore allow for the solar array to be downsized by 28%, resulting in an avoided cost of $170,000 for the array. Battery options were also examined at the request of LTBB.

	GHGRM Package #3: Mtigwaakiis							
	Production (kWh)	Energy Savings (kWh)	Cost Savings (per year)	% Energy Savings	Available incentives	ECM Cost	CO2e Savings (tons / year)	Payback (years)
GHGRM 3: Solar	149,540	-	$ 21,557	69.34%	$ 127,987	$ 426,622	44.2	13.9
Option 1: Batteries for Building A	-	-	-	-	$6,240 for lead-acid / $15,300 for Li-ion	$20,800 for lead-acid / $51,000 for Li-ion	-	-
Option 2: Batteries for Building B	-	-	-	-	$5,460 for lead-acid / $11,700 for Li-ion	$18,200 for lead-acid / $39,000 for Li-ion	-	-
Option 3: Batteries for the Well House	-	-	-	-	$780 for lead-acid / $4,500 for Li-ion	$2,600 for lead-acid / $15,000 for Li-ion	-	-
GHGRM 6: Heat Pump	-	32,650	$ 5,551	15.1%	$ 3,000	$ 16,000	9.7	2.3
GHGRM 7: Lighting	-	30,922	$ 5,257	14.3%	$ -	$ 5,920	9.1	1.1
Total	149,540	63,572	$ 32,365	98.8%	$ 130,987	$ 448,542	63.1	9.8

Table 8: GHGRM Package #3: Mtigwaakiis

4.4 GHG Reduction Measures

As part of the process of deciding on recommendations for Greenhouse Gas (GHG) reduction measures, the plans for the Government Complex Administration and Archives building, Mtigwaakiis Townhouse, and Community Center at Wa Wah No De Kahs were provided. The GHG Reduction Measures proposed have been separated into three categories: recommendations specific to buildings for which we have plans; general recommendations for the buildings for which plans were not provided; and proposed solar energy development.

4.4.1 GHGRM 1: Hatchery Solar Expansion

The existing solar installation at Hatchery does not offset the site's total yearly energy consumption in its current form. In order to increase production to meet the consumption recorded in 2023, an additional 161.7 kW of solar would need to be added. This measure explores the payback associated with installing a system of that size utilizing the net metering program with Great Lakes Energy. Before this project is implemented, Catalyst Partners recommend that an energy audit be completed for the site to determine if operations can be optimized to help reduce the total capacity of solar needed to offset on site consumption.

Installing solar comes with a 30% tax credit available through the Inflation Reduction Act (IRA), which will be available as a direct payment for non-taxable entities like LTBB. This credit can apply to both solar and battery systems as needed. We have included this credit in the incentives category and highly recommend taking advantage of these programs while they are available, which is currently slated to remain in place in its current form until 2032.

As this is the first priority project, it should be scheduled before other recommendations listed below in the report. It will likely take a few months to complete the construction project with steps as follows:

1. Gather quotes from potential solar installers and decide which quote to approve.
2. Wait for solar installers to obtain permits and interconnection approval (typically up to 2 months).
3. Begin installation process (up to a month)
4. Gain inspection approval (typically a few days to a month depending on availability of local inspector)
5. Wait for utility approval to turn on system (typically around 3 weeks after inspection.

From this point, the solar system should be able to be tracked through the monitoring system installed with the solar. Solar energy production can be tracked over time to ensure that the solar system is performing as expected, and offsets can be subtracted from LTBB's carbon footprint. The projections for carbon savings for this measure are 615 tons of CO2e by 2035 and 1,537.5 tons of CO2e by 2050.

Authority to implement a solar project would need to be obtained from the local utility company (Great Lakes Energy) and through permitting from the local jurisdiction, if applicable.

	GHGRM Package #1 Hatchery							
	Production (kWh)	Energy Savings (kWh)	Cost Savings (per year)	% Energy Savings	Available incentives	ECM Cost	CO2e Savings (tons / year)	Payback (years)
GHGRM 1: Solar	207,797	-	$ 25,850	100.0%	$ 169,935	$ 566,450	61.5	15.3

Table 9: GHGRM Package #1: Hatchery

4.4.2 GHGRM 2: Natural Resources Solar Expansion

This property already has an existing solar array. There appears to be space near the existing array for more solar to be installed if desired (and allowed by the utility based on output restrictions).

The existing solar installation at the Natural Resources site does not fully offset the site's total yearly energy consumption in its current form. In order to increase production to meet the consumption recorded in 2023, an additional 64 kW of solar would need to be added. This measure explores the payback associated with installing a system of that size utilizing the net metering program with Great Lakes Energy. Before this project is implemented, Catalyst Partners recommends an energy audit is completed for the site to determine if operations can be optimized to help reduce the total capacity of solar needed to offset on site consumption.

This is the second priority project, so it should be scheduled prior to other recommendations listed below in the report, but after the Hatchery solar expansion. It will likely take a few months to complete the construction project with steps as follows:

1. Gather quotes from potential solar installers and decide which quote to approve.
2. Wait for solar installers to obtain permits and interconnection approval (typically up to 2 months).
3. Begin installation process (up to a month)
4. Gain inspection approval (typically a few days to a month depending on availability of local inspector)
5. Wait for utility approval to turn on system (typically around 3 weeks after inspection.

From this point, the solar system should be able to be tracked through the monitoring system installed with the solar. Solar energy production can be tracked over time to ensure that the solar system is performing as expected and offsets can be subtracted from LTBB's carbon footprint. The projections for carbon savings for this measure are 236 tons of CO_2e by 2035 and 590 tons of CO_2e by 2050.

Authority to implement a solar project would need to be obtained from the local utility company (Great Lakes Energy) and through permitting from the local jurisdiction, if applicable.

	GHGRM Package #2: Natural Resources							
	Production (kWh)	Energy Savings (kWh)	Cost Savings (per year)	% Energy Savings	Available incentives	ECM Cost	CO2e Savings (tons / year)	Payback (years)
GHGRM 2: Solar	79,787	-	$ 9,926	99.9%	$ 67,350	$ 224,500	23.6	15.8

Table 10: GHGRM Package #2: Natural Resources

4.4.3 GHGRM 3: Mtigwaakiis Solar

The Mtigwaakiis townhouses are a great candidate for a solar installation because the buildings already utilize fully electric heating and cooling systems and are constructed as solar ready buildings. The site is configured for future development phases, and two new buildings are currently under construction. Due to the intended expansion at the site, this site is a good candidate to act as an example for future construction projects.

When reviewing the site, four electric meters that provide energy for Building A, Building B, site lighting, and the pump house were discovered. Due to the limitations for solar array size imposed by Great Lakes Energy, Catalyst Partners is proposing installing four (4) arrays in total. Buildings A and B will each require about 52 kW of solar arrays to offset the remaining energy consumption after accounting for GHGRM's 7 and 8 detailed below. The pump house will require a 9.3 kW array, and the site lighting meter will need 5.2 kW. This measure combines these four arrays into a single project that provides 69% of the current energy consumption over a year, and offsets over 80% of utility costs.

Image 1: A depiction of what the solar system at the Mtigwaakiis site could look like to offset current energy consumption after energy efficiency measures are installed (about 119 kW of solar).

LTBB expressed interest in potential battery backup for power outages as well. They stated that the typical power outage at the Mtigwaakiis location is about 3-4 hours long. Opportunities for both lead-acid and lithium-ion batteries were considered as they have different pros and cons. Lead-acid batteries are cheaper and less intensive to install. However, lithium-ion batteries typically include monitoring software and app-based energy controls, which are nice perks despite the extra cost. Adding battery backup for Building A, Building B, and the Well House were then considered in order to cover these outages. To cover an average power outage, Building A will need about 47 kWh, Building B will need about 40 kWh, and the Well House will need about 5 kWh. Based on these estimates, Building A would require either 16 typical lead-acid or 4 typical lithium-ion batteries. Building B would require either 14 typical lead-acid or 3 typical lithium-ion batteries. The well house would need either 2 typical lead-acid batteries or 1 typical lithium-ion battery. As these batteries would just be used to cover power outages, they would not be offsetting any other energy per-se as there is not currently a generator on site that they would be replacing. The batteries would just be an extra perk and therefore payback period was not a consideration for these options.

	GHGRM 3: Mtigwaakiis Solar							
	Production (kWh)	Energy Savings (kWh)	Cost Savings (per year)	% Energy Savings	Available incentives	ECM Cost	CO2e Savings (tons / year)	Payback (years)
GHGRM 3: Solar	149,540	-	$ 21,557	69.34%	$ 127,987	$ 426,622	44.2	13.9
Option 1: Batteries for Building A	-	-	-	-	$6,240 for lead-acid / $15,300 for Li-ion	$20,800 for lead-acid / $51,000 for Li-ion	-	-
Option 2: Batteries for Building B	-	-	-	-	$5,460 for lead-acid / $11,700 for Li-ion	$18,200 for lead-acid / $39,000 for Li-ion	-	-
Option 3: Batteries for the Well House	-	-	-	-	$780 for lead-acid / $4,500 for Li-ion	$2,600 for lead-acid / $15,000 for Li-ion	-	-

Table 11: GHGRM 3 - Install solar for the townhomes, site, and pump house

This is the third priority solar project, so it should be scheduled after the previous solar recommendations listed in the report. It should also be installed after the energy efficiency measures for Mtigwaakiis are completed, which are listed below in the report. The solar installation process will likely take a few months to complete, with steps as follows:

1. Gather quotes from potential solar installers and decide which quote to approve.
2. Wait for solar installers to obtain permits and interconnection approval (typically up to 2 months).
3. Begin installation process (up to a month)
4. Gain inspection approval (typically a few days to a month depending on availability of local inspector)
5. Wait for utility approval to turn on system (typically around 3 weeks after inspection.

From this point, the solar system should be able to be tracked through the monitoring system installed with the solar. Solar energy production can be tracked over time to ensure that the solar system is performing as expected and offsets can be subtracted from LTBB's carbon footprint. The projections for carbon savings for this measure are 442 tons of CO2e by 2035 and 1,105 tons of CO2e by 2050.

Authority to implement a solar project would need to be obtained from the local utility company (Great Lakes Energy here) and through permitting from the local jurisdiction if applicable.

4.4.4 GHGRM 4: Solar Farm

In Great Lakes Energy (GLE) territory, there is a program called Buy All / Sell All, which allows a solar farm to be created without the need to prove that the property uses the total amount of energy that the site will generate. The system size limit for this program is 100 kW per "member" (different name on a bill) and can be spread across multiple properties. The property must also have existing electric service to qualify for this program. Electricity produced by the solar array(s) will all be directly bought from the utility at $0.10/kWh and none of it will go to the property. In the region of LTBB properties, an array of 100 kW will produce about 130,000 kWh per year and offset about 68.4 MT CO2e per year.

The prime candidates for a potential solar farm (likely using the Buy all / Sell all program through GLE) are the wastewater treatment plant, Mtigwaakiis, and Ziibimijwang.

Mtigwaakiis currently includes several multi-family buildings. It has allocated sections of the property for future developments such as agriculture, a playground, a burial area, and an area for solar. The area marked for solar is about 233' x 243' with 10' spacing between arrays to prevent shading. Within this footprint, about thirty 20 kW ground arrays could fit. Assuming the array uses 360 W panels, the output would be approximately 600 kW of solar. This total exceeds what is allowed by GLE's Buy All / Sell All program, so the whole agreement could be maximized in this area.

Ziibimijwang includes previously cleared spaces for agricultural activities, so trees may not need to be cleared in this area. The farm also appears to already have electric service (this requires confirmation), which would make connecting to the utility grid easier. Since most of this area is used for agriculture, available areas for solar would have to be determined. However, Ziibimijwang has ample space for solar in comparison to the other sites, so it could more than address LTBB's carbon offset needs.

If a 100 kW solar array was installed in Great Lakes Energy Territory, it would produce around 125,990 kWh per year (depending on location), resulting in a carbon emissions reduction of 37.28 tons of CO2e per year.

This is the fourth and lowest priority solar project, so it should be scheduled after all of the other solar recommendations listed in the report. The solar installation process will likely take a few months to complete, with steps as follows:

1. Gather quotes from potential solar installers and decide which quote to approve.
2. Wait for solar installers to obtain permits and interconnection approval (typically up to 2 months).
3. Begin installation process (up to a month)
4. Gain inspection approval (typically a few days to a month depending on availability of local inspector)
5. Wait for utility approval to turn on system (typically around 3 weeks after inspection.

From this point, the solar system should be able to be tracked through the monitoring system installed with the solar. Solar energy production can be tracked over time to ensure that the solar system is performing as expected and offsets can be subtracted from LTBB's carbon footprint. The projections for carbon savings for this measure are 372.8 tons of CO2e by 2035 and 932 tons of CO2e by 2050.

Authority to implement a solar farm would need to be obtained from the local utility company (Great Lakes Energy at most properties) and through permitting from the local jurisdiction if applicable.

	GHGRM 4: Solar Farm							
	Production (kWh)	Energy Savings (kWh)	Buyback Rate (per year)	% Energy Savings	Available incentives	ECM Cost	CO2e Savings (tons / year)	Payback (years)
GHGRM 4: Solar Farm	125,990	-	$ 12,599	-	$ 105,000	$ 350,000	37.28	19.45

Table 12: GHGRM 4 – Solar Farm with Great Lakes Energy

4.4.5 GHGRM 5: Admin Building Improvements

To reduce the need for a larger solar system, it is also important to increase energy efficiency at sites before solar is installed. At the Government Complex Administration and Archives building, the first recommendation would be moving to a trim and respond demand-based reset method for the hot water system based on a valve position from 180°F to 120°F. When the system is at the minimum temperature, pump speed should be modulated between the system minimum and maximum speed following trim and respond logic based on valve positions. When loads increase and the system is at the differential pressure setpoint, system temperature setpoints shall reset based on system valve positions. When the time comes for the heating boilers to be replaced, we recommend considering supplementing heating with solar thermal evacuated tubes to reduce loads on carbon intensive sources.

The second recommendation would be to switch to LED lighting throughout the building as the plans show many fluorescent and incandescent light fixtures. This has the potential to reduce lighting power consumption by 40% or more.

The third recommendation would be to install low flow domestic water fixtures wherever possible to reduce domestic water heating loads. When the water heaters reach end of life, replacements should be selected as air source heat pump style heaters to further reduce the building carbon footprint and reliance on stationary combustion heat sources.

When more energy use data is collected for this site, energy and cost savings can be calculated and then carbon emissions reductions can be determined. To be able to complete timelines and tracking metrics, more information about the site is required.

However, progress should be able to be tracked by analyzing energy reduction on utility bills received after the improvements take place. The Administration Building is on a property owned by LTBB, so the Tribe should have full authority to implement this measure, though permits may be pulled for work as needed through the local jurisdiction.

4.4.6 Mtigwaakiis Building Improvements

Mtigwaakiis is a newer building that utilizes many efficient systems and is solar ready. To minimize the number of solar panels needed, we have developed two measures that will together reduce the site energy usage by 28%, leading to reduced costs for offsetting the remaining energy consumption.

These building improvements should take place before solar is installed at Mtigwaakiis so that the solar needed to support the site can be downsized, resulting in cost savings. Progress in reducing carbon emissions can be tracked by analyzing utility bills following the implementation of each GHGRM to make sure that the expected energy use reduction takes place.

4.4.6.1 GHGRM 6: Mtigwaakiis Outdoor Air Heat Pump

The Mtigwaakiis Townhouses each utilize a 12 kW electric duct heater to temper fresh air leading to the units from the energy recovery ventilator. Catalyst Partner's recommendation is to add a heat pump and coil in line with the supply duct to act as the primary heating source. The electric resistance coil can remain as a backup heating source. This improvement allows for energy savings by shifting from a heat source with a COP of 1 to a unit that ranges from a Coefficient of Performance (COP) of 2 in the winter to 3.3 in the spring and fall. This reduction in load provides an ROI of 2.3 years which is attractive on its own, and also allows for the solar array to be downsized by roughly $85,000 due to the load reduction.

This measure also comes with a $1,500 utility incentive for each installed unit listed on the ashp.neep.org database. Catalyst Partner's calculation is based on a Bosch BOVA-60HDN1-M20G outdoor unit and an appropriately sized inline duct mounted coil, similar to what would be installed for a horizontal furnace.

Mtigwaakiis is a property owned by LTBB, so the Tribe should have full authority to implement this measure, though permits may be pulled for work as needed through the local jurisdiction. The projections for carbon savings for this measure are 97 tons of CO2e by 2035 and 242.5 tons of CO2e by 2050.

	GHGRM 6: Mtigwaakiis Heat Pump							
	Production (kWh)	Energy Savings (kWh)	Cost Savings (per year)	% Energy Savings	Available incentives	ECM Cost	CO2e Savings (tons / year)	Payback (years)
GHGRM 6: Heat Pump	-	32,650	$ 5,551	15.1%	$ 3,000	$ 16,000	9.7	2.3

Table 13: GHGRM 6 - Heat Pump

Incentives are available from the utility provider for the new heat pump

4.4.6.2 GHGRM 7: Mtigwaakiis LED Lighting

At the time of construction (2010), it was common to use compact fluorescent lighting as an energy efficient lighting solution. Since then, LED lighting has become commonplace, and prices have come down considerably. Catalyst Partner's recommendation is to switch to LED bulbs to reduce yearly consumption. This measure explores the costs and potential savings associated with replacing all bulbs with LED equivalents. This reduction in load provides an ROI of 1.1 years which is attractive on its own and also allows for the solar array to be downsized by roughly $85,000 due to the load reduction.

Mtigwaakiis is a property owned by LTBB, so the Tribe should have full authority to implement this measure, though permits may be pulled for electrical work as needed (depending on fixture type) through the local jurisdiction. The projections for carbon savings for this measure are 91 tons of CO2e by 2035 and 227.5 tons of CO2e by 2050.

	GHGRM 7: Mtigwaakiis Lighting							
	Production (kWh)	Energy Savings (kWh)	Cost Savings (per year)	% Energy Savings	Available incentives	ECM Cost	CO2e Savings (tons / year)	Payback (years)
GHGRM 7: Lighting	-	30,922	$ 5,257	14.3%	$ -	$ 5,920	9.1	1.1

Table 14: GHGRM 7 - Lighting

4.4.7 GHGRM 8: Community Center Building Improvements

For the Community Center at Wa Wah No De Kahs, the first recommendation is to replace the 200 MHB water heater with an air source heat pump water heater when the existing unit reaches end of life. In the meantime, solar thermal could be installed to reduce the load on the water heater and begin offsetting heating BTUs with a zero-carbon source. Evacuated tubes are the ideal solar thermal solution because they are able to

generate up to 120F water temperatures in the winter and are less prone to snow accumulation which limits production.

The second recommendation would be to install low flow water fixtures to save water heating and well pumping energy on site. Fixtures can commonly by retrofitted with low flow aerators which can be a cost-effective solution. This is recommended for areas outside of the kitchen. Typically, kitchen fixtures do not benefit from this retrofit because of their specific use. To complete daily activities (ex: dish washing, filling pots and filling sinks with water), a fixed amount of water is needed, and restricting flow only delays activities in the space.

The third recommendation is to install LED lighting and occupancy controls as the plans indicate that most lighting is fluorescent, incandescent, or metal halide bulbs. This has the potential to reduce lighting power consumption by over 40%.

When more energy use data is collected for this site, energy and cost savings can be calculated and then carbon emissions reductions can be determined . To finalize timelines and tracking metrics, more information about the site is required. However, progress should be able to be tracked by analyzing energy reduction on utility bills that are received after the improvements take place. As the Community Center is on a property owned by LTBB, they should have full authority to implement these measures, though permits may be pulled for work as needed through the local jurisdiction.

4.4.8 GHGRM 9: General Building Improvements

The remainder of the buildings do not currently have plans on record, so the general recommendations for those sites are to install LED lighting with occupancy controls and low flow fixtures where possible. Heat pumps could be installed at many sites when their heaters reach the end of life. Several properties likely have extensive refrigeration systems on site (such as Minogin Market, the Casino, and St. James Bay Dock's Ice House), so it would be beneficial to examine what kind of refrigerants are used there and if there is any room for improvement.

For properties with plant-based agriculture taking place (such as the Ziibimijwang Farm), more efficient irrigation techniques such as drip irrigation could be examined to determine if water use (and therefore pump energy) could be saved. Agriculture sites would also potentially benefit from composting on site if this were not already taking place. The Hatchery could be examined for energy and water conservation measures as the system on site likely has many different components that could potentially be improved.

4.4.9 GHGRM 10: Increase Canopy Coverage

Tree planting is a good carbon sink measure for several properties owned by the LTBB. There are several properties that have cleared land which may be good candidates for planting trees if there are no future development plans. The most promising of these

properties are the Mackinaw City and Odawa Casinos, which both have quite extensive clear spaces. Planting trees in these locations could significantly increase urban forestry and create large carbon sinks for the future. In addition, if local tree species are planted, these trees could create habitats for native species, which would align with LTBB's conservation goals. There should be no restrictions to implementing this plan as long as trees are planted on land owned by LTBB, as they have the authority to plant trees on their own property. This measure would slowly improve the carbon footprint of LTBB over a long time period since most local tree species take 20-30 years to reach full maturity (and tree cover). This can be tracked over time using satellite imagery and calculating the tree cover on the properties where saplings are planted each year.

4.4.10 GHGRM 11: Alternative Fuels

An analysis was performed of the emissions impact from creating and using biodiesel in tribal vehicles, and it was concluded that it does not provide a significant impact on the Tribe's total carbon footprint. Since most vehicles cannot run biodiesel directly and generally require a 10% blend with regular diesel fuel, the benefits become marginal. When compared to the effort put into the process, it does not appear beneficial to the larger goals. Catalyst Partners recommends a focus on optimizing the travel performed by tribal owned vehicles and ensuring mileage and consumption are minimized to regulate emissions. As time goes on and vehicles need to be replaced, hybrid or electric replacements would be the best way to make significant impacts on mobile emissions. With the grid working toward a goal of net zero emissions by 2040, it would be logical to align the Tribe's targets of electrifying its fleet of vehicles in line with those targets. In the future, electric vehicles will likely become more affordable, and more options will become available that meet the utility needs of the Tribe.

6.5 Benefits Analysis

Implementing GHG emissions reduction measures at LTBB's properties can have benefits for the surrounding region. First, solar energy exported to the grid reduces demand to produce energy with fossil fuels and goes directly to neighboring properties. Fossil fuel plants are often located near Low Income and Disadvantaged Communities (LIDACs), so installing solar nearby often decreases air pollution near these communities. Less pollution leads to reduced morbidity and mortality, hospital visits, and absences from school or work in the area of the fossil fuel plants. However, it is also important to be considerate with placement of large solar arrays or other renewable energy resources. Neighbors should have input on location if the arrays are visible to adjacent properties. It is best practice to consult LIDACs as they historically have not had input on energy resource locations such as coal plants, which have created pollution and health impacts in many LIDAC communities. Local solar energy jobs could be supported for a time by solar installation projects on LTBB properties, though no "new" jobs will be explicitly created by this.

Second, reducing energy and water use at the various properties reduces strain on the grid. Reducing energy use also decreases the amount of black or brown outs in the area. Decreasing water use at the sites preserves water resources for use by residents of the surrounding area. The LIDACs in this region are particularly susceptible to climate change impacts like sea level rise (as the Great Lakes would also rise), flooding, coastal erosion, drought, and extreme weather events like blizzards, tornadoes, and heat events.

LIDACs in the LTBB Area include the Petoskey Area (Tract #26047970800), the Charlevoix Area (Tract #26029001500), and the Bliss / Mackinaw City Area (Tract #26047970100). All of these tracts are low-income areas, but each of them is particularly disadvantaged by other factors as well. The Petoskey Area is close to several Superfund Sites, so pollution is a primary concern in that tract. Charlevoix Area has a lack of indoor plumbing, so water resources may be particularly valuable in that area. The Bliss / Mackinaw City Area struggles with energy cost, heart disease, transportation barriers, unemployment, and the presence of formerly used defense sites. These tracts could all benefit from the presence of more renewable energy being put on the grid as well as reducing the strain on energy and water usage in the area.

Baseline air pollution measures for Emmet County (the main county that LTBB properties are in) based on the EPA's 2020 National Emissions Inventory Data are as follows:

Air Pollutant	2020 Emissions (tons)
PM 2.5	562.24
NOx	747.69
SO2	15.81
VOCs	3,803.39
Air Toxics / Hazardous Air Pollutants	620.99

Table 15: Baseline of Air Pollutants in Emmet County across all sectors

LTBB can start from this baseline and monitor their emissions going forward to determine what their impact on the local air pollution is over time.

4.6 Review of Authority to Implement

Almost all of the GHG reduction measures that are planned are building upgrades to take place in buildings owned by the LTBB. Therefore, implementation of those measures are self-governed and must be approved by the Tribal Council. Any plumbing or electrical work should be done by a licensed tradesperson with permits as required. Tree planting on tribal properties should not be an issue because the LTBB owns the land.

In terms of solar projects, if the solar panels are connected to the grid in any way, the local utility company (Great Lakes Energy in most cases) will need to give permission to operate. To obtain permission, an interconnection application must be submitted and approved by the utility company. The utility must approve the system size and find the installation to follow acceptable standards in order to grant permission to operate the system. This will allow the system owner to receive credits for excess solar production that

is sent to the grid. If the system is fully off grid, the utility company does not need to grant permission. In most jurisdictions, permits are needed for solar installation which may include zoning/land use, electrical, building, and possibly soil erosion. These vary by jurisdiction and location. Typically, the utility company needs to see an approved electrical inspection of the system to grant final permission to operate a system.

4.7 Intersection with Other Funding Mechanisms

Property improvements, whether it is installing solar or improving water or energy consumption, are often at odds with funding available. This section explores opportunities for funding that can help offset upfront costs and improve the return-on-investment timelines.

4.7.1 Utility Incentives

Utility companies offer incentive programs to encourage customers to decrease consumption and improve their facilities. Below are some resources where further information is provided regarding current programs and opportunities.

Great Lakes Energy

Consumers Energy

DTE

4.7.2 Grant Programs

Grant programs at the state and federal level are another great way to secure funding for projects. The below list may be applicable to projects undertaken by LTBB.

1. U.S. Department of Energy (DOE) Tribal Energy Program:
    - The DOE offers various funding opportunities and technical assistance programs to support tribal energy projects, including solar installations. Visit the DOE's Tribal Energy Program website for the latest information on grants and funding opportunities.
2. Michigan Tribal Nations Housing Development Assistance Program:
    - The program builds on tribal nations' existing capacity by providing the financial, knowledge, and technical resources each needs to develop affordable housing programs and projects that respond to their unique communities.
3. U.S. Department of Agriculture (USDA) Rural Energy for America Program (REAP):

- While primarily focused on rural areas, tribes in rural locations may be eligible for USDA REAP grants, which can support solar projects. Check the USDA website for the latest program details.

4. Environmental Protection Agency (EPA) Grants:
    - Climate Pollution Reduction Grants
    - Water based funding programs
    - Additional EPA Grant Opportunities
5. Tribal Energy Development Capacity (TEDC) Program:
    - This program, administered by the U.S. Department of the Interior, supports tribes in developing their energy resources. It may include funding for solar energy projects.
    - Grant has closed for 2024; potentially an option for future projects.
6. Tribal Solar Accelerator Fund:
    - This fund, administered by GRID Alternatives, may provide resources and support for tribes looking to develop solar projects. Check with GRID Alternatives for the latest information on available assistance.

4.7.3 Federal Incentives

The United States Federal Government has a 30% tax credit on the installation of renewable energy projects such as solar, wind, geothermal, and more. With the passing of the Inflation Reduction Act (IRA), these credits have been extended to 2032. The federal government is expected to release guidance on how to capture this credit for non-taxable entities like LTBB. There is expected to be a portal provided where entities can apply for the credits and payments can be tracked. The expected outcome is an opportunity for a direct payment option to realize these benefits.

For further information refer to energy.gov.

4.8 Workforce Planning Analysis

There is a shortage of skilled tradesperson labor throughout the United States and there is no exception to this in Michigan. It may take several weeks to schedule work with electricians, plumbers, and solar installers to implement extensive upgrades to LTBB buildings. However, implementation of extensive energy efficiency, water efficiency, and solar upgrades could temporarily sustain these industries, especially the solar industry as it has seen a decline in the last year due to raising interest rates. These upgrade projects could therefore be beneficial to the local economy and create hiring opportunities for local trades businesses.

5 Next Steps

We recommend four next steps to continue improving on building energy consumption, data collection techniques, inventories of equipment, and new construction processes. Combining the longer-term efforts with the team's work on the Comprehensive Climate Action Plan will allow for faster implementation of measures, more accurate targets, and improved alignment with high level targets.

5.1 Building Audits

We strongly recommend conducting comprehensive energy audits for LTBB's portfolio of buildings to optimize energy efficiency, reduce operational costs, and contribute to emissions reduction goals. Energy audits, categorized into Level I, II, and III, provide valuable insights tailored to the complexity and scale of a building portfolio. A Level I audit involves a preliminary assessment, identifying low-cost and no-cost energy-saving opportunities. Moving to a Level II audit, a more detailed analysis is conducted, focusing on building systems and recommending improvements that offer a higher return on investment. For a more extensive understanding, a Level III audit delves into advanced diagnostics and simulations, offering a detailed analysis of potential energy conservation measures. Benefits include not only immediate energy and cost savings but also the identification of long-term strategies for building performance enhancement. Energy audits empower informed decision-making and align strategies with sustainability targets.

5.2 Carbon Source Tracking

Emissions source tracking is of paramount importance when managing long term goals for LTBB. Understanding and quantifying the sources of carbon emissions provides critical insights into the environmental impact of operations, allowing for informed decision-making and targeted mitigation strategies. By systematically tracking carbon emissions, organizations can identify key areas contributing to their carbon footprint, such as energy consumption, transportation, and waste. This knowledge enables the establishment of realistic and achievable emissions reduction goals, facilitating the development of effective sustainability initiatives. Moreover, accurate tracking supports transparency in reporting, aiding in compliance with regular benchmarking and targeted improvements. Catalyst Partners recommends implementing a procedure to allow for all carbon emission source data to be routinely collected and tracked. This will enable regular reviews of progress towards goals and heightened awareness of carbon emission reduction goals throughout the Tribe.

5.3 Energy and Water Tracking

Energy and water monitoring is intertwined with carbon accounting and environmental issues. Therefore, it would be beneficial for LTBB to track their usage of these resources to help with identifying and achieving future environmental goals. Catalyst

Partners recommends that LTBB use Energy Star's Portfolio Manager to track energy and water use for their buildings moving forward. This is a free tool that ties in with most utility providers and could help with future tracking and organization of this data.

5.4 Equipment Inventory

Performing equipment inventory is a crucial aspect of facility management as it helps in maintaining and managing assets efficiently, as well as leading to easier tracking of carbon emissions. For the purpose of carbon tracking, it is necessary to inventory all equipment that utilizes refrigerants, but it is recommended that additional equipment is tracked since it will allow for better decision making as systems come to end of life. Below is an example process that can be followed for equipment inventory:

1. Create an Inventory Team:

- Form a dedicated inventory team comprising individuals familiar with the facility, equipment, and inventory processes.
- Assign roles and responsibilities, ensuring accountability for accurate data collection.

2. Develop a Comprehensive Asset List:

- Create a master list of all equipment in the facility. Include details such as equipment name, identification number, location, manufacturer, model, serial number, purchase date, and warranty information.

3. Conduct Physical Inspections:

- Perform on-site inspections to physically verify and document the condition and location of each piece of equipment.
- Update the asset list with any changes in equipment status, such as repairs, replacements, or additions.

4. Capture Key Information:

- Record key information during inspections, including equipment specifications, maintenance history, and any relevant compliance documentation.
- Include photographs to aid in visual identification.

5. Standardize Data Formats:

- Ensure consistency in data entry by standardizing formats for information such as dates, model numbers, and specifications.
- Implement a standardized naming convention for equipment to avoid confusion.

6. Categorize Equipment:

- Group equipment into categories based on function, department, or criticality.

- Assign unique identifiers or codes to each category for easy reference.

7. Set Up a Centralized Database:

- Establish a centralized database or cloud-based system to store and manage equipment inventory data.
- Ensure that the database is accessible to authorized personnel for real-time updates.

8. Implement a Maintenance Schedule:

- Integrate a preventive maintenance schedule into the inventory management system.
- Set reminders for routine inspections, servicing, and equipment calibration.

9. Regularly Update the Inventory:

- Schedule regular updates and reviews of the equipment inventory to capture changes, additions, or disposals.
- Keep the inventory database current to reflect the most accurate information.

By following this systematic process, LTBB can establish a reliable equipment inventory system that enhances overall operational efficiency and ensures effective asset management.

5.5 New Construction Guidelines

Embodied carbon in new construction refers to the total amount of greenhouse gas emissions associated with the manufacturing, transportation, and installation of building materials and components. It represents the environmental impact of a building's construction process, measured in terms of carbon dioxide equivalents (CO_2e). This metric considers the entire life cycle of materials, from raw extraction to end-of-life disposal or recycling. Reducing embodied carbon is crucial for sustainable construction practices and aligning with climate goals, as it addresses the environmental footprint associated with the production and use of building materials in the built environment. Strategies for minimizing embodied carbon include choosing low-carbon materials, optimizing construction processes, and promoting circular economy principles.

When performing a lifecycle carbon analysis, it is essential to refer to the relevant standards based on the context and industry. Adhering to these standards ensures consistency, transparency, and reliability in the assessment process. Some of the prominent standards include:

1. ISO 14040 and ISO 14044:
    - The International Organization for Standardization (ISO) developed these standards to provide principles and guidelines for conducting life cycle

assessments (LCA). ISO 14040 outlines the framework, and ISO 14044 details the requirements and guidelines for carrying out an LCA.

2. Greenhouse Gas Protocol (GHGP) - Product Life Cycle Accounting and Reporting Standard:
    - Developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), this standard provides guidance on accounting for greenhouse gas emissions throughout the product life cycle.
3. ASTM E 3070:
    - The ASTM International standard E 3070 provides a framework for assessing and reporting the environmental and social impacts of building products throughout their life cycle.
4. Embodied Carbon in Construction Calculator (EC3) and EC3 Global:
    - These are not standards, but tools developed to measure and compare the embodied carbon of construction materials. EC3 is widely used in the construction industry and aligns with the EC3 Global (formerly called the Embodied Carbon Construction Calculator) initiative.