

VILLAGE OF MCFARLAND **Sustainability & Natural Resources** *NOTICE OF PUBLIC MEETING*
Committee

Monday, April 14, 2025

6:00 PM

McFarland Municipal Center
5915 Milwaukee St, McFarland
Community Room

AGENDA

The public may attend in-person or remotely through the Zoom webinar or telephone options listed below. *Please Note: Virtual attendance is offered as a convenience, but technical difficulties beyond the Village's control may prevent or limit its availability at any meeting. The public is encouraged to attend the meeting in person to assure full access to the proceedings.*

PLEASE CLICK THE LINK BELOW TO JOIN THE ZOOM WEBINAR:

<https://us02web.zoom.us/j/86843249644>

Or by Telephone: +1 (312) 626-6799

Webinar ID: 868 4324 9644

Press *9 to raise/lower hand. Press *6 to mute/unmute.

1. CALL TO ORDER, ROLL CALL.

2. PUBLIC APPEARANCES.

- a. This is an opportunity for members of the public to address the Sustainability and Natural Resources Committee for items that are not on the agenda. Please remember this is a hybrid meeting conducted in person and through the Zoom online meeting platform. Meeting attendees wishing to address the Committee about items not on the agenda may do so at this time. Zoom attendees should type their name and address in the Question and Answer feature within the Zoom online meeting platform at this time. Members of the public who are present in person and wish to address the Committee should fill out a public comment form and turn into the meeting chairperson. When you are called upon to speak, state your name, address, and provide your comments to the Committee for their consideration. Please adhere to the 3-minute time limit. Additionally, you may send your public comments to sustainability@mcfarland.wi.us to be included as part of the meeting.

Members of the public may also speak during their selected agenda item as they designate on the public comment form or in the Question and Answer feature on Zoom.

3. APPROVAL OF MINUTES.

- a. Motion to approve the minutes of the March 10, 2025, Sustainability & Natural Resources Committee meeting.

4. BUSINESS.

- a. Update on 2025 Arbor Day celebration
- b. Discussion and recommendation to the Village Board regarding a proposal from HGA to complete a Net Zero Energy Measurement and Verification Energy Audit for the Public Safety Center.
- c. Discussion and recommendation to the Village Board regarding the Village's existing Office of Energy Innovation Grant Agreement for the Public Safety Center.

5. SCHEDULE NEXT MEETING DATE.

- a. Monday, May 12, 2025, at 6:00 p.m.

6. ADJOURNMENT.

Any person who has a qualifying disability as defined by the Americans with Disabilities Act that requires the meeting or materials at the meeting to be in an accessible location or format should contact the McFarland Municipal Center at (608)838-3153, 5915 Milwaukee Street, McFarland, Wisconsin, or village.clerk@mcfarland.wi.us by 2:00 p.m. at least 5 business days prior to the meeting so that any necessary arrangements can be made to accommodate each request. If the meeting or request is less than 5 business days from the meeting, requests for accommodations may still be made and reasonable efforts will be made to accommodate each request.

Minutes
Sustainability & Natural Resources Committee Meeting
March 10, 2025

Committee Members Present: Miguel Pena, Alisa Leamy, Lori Whitman, Nina Schultz, Michael Allen

Committee Members Absent: None

Staff Present: Andrew Bremer, Community and Economic Development Director; Lee Igl, Public Works Director; Sayer Larson, Parks Superintendent; Kong Thao, Associate Planner; Phil McDade, Utility Clerk.

1. CALL TO ORDER

Committee Chairman Miguel Pena called the joint meeting to order at 6 p.m.

2. PUBLIC APPEARANCES.

No public appearances.

3. APPROVAL OF MINUTES

a. Motion to approve the minutes of the December 9, 2024, Sustainability & Natural Resources Committee meeting.

Motion by Schultz, second by Allen, to approve the minutes of the December 9, 2024, Sustainability & Natural Resources Committee meeting. Motion carried 5-0.

b. Motion to approve the minutes of the February 11, 2025, joint meeting of the Sustainability & Natural Resources Committee and Village Board.

Motion by Schultz, seconded by Allen, to approve the minutes of the February 11, 2025, joint meeting of the Sustainability & Natural Resources Committee and Village Board, with a friendly amendment by Allen to correct the spelling of trustee Pena's first name. Motion carried 5-0.

4. BUSINESS

a. Presentation of forestry operations for 2024 and outlook for 2025.

Larson highlighted the village's forestry operations for 2024, including: 82 trees planted throughout the village; an estimated 600 trees trimmed; and donations of wood to the McFarland School District from trees cut down during the Exchange Street renovation projects. The village plans to continue tree planting and trimming efforts in 2025 and will contract for work to trim large cottonwood trees in McDaniel Park.

b. Discussion on the Commissioning Report of the Village's Public Safety Center presented by HGA.

Alexander Harris of HGA presented information on energy savings and efficiency at the Public Safety Center, which opened in August 2023. The building was designed to lower energy costs through solar panels, geo-thermal heating and air conditioning systems, and other energy-saving technologies. The building's energy usage compares favorably with other buildings in the Madison area constructed with energy efficiency targets.

c. Discussion and action to submit the Village of McFarland's 2024 Green Tier Annual Report to the Wisconsin Department of Natural Resources.

Thao reviewed the village's work in joining the Green Tier Legacy Communities network. This would be the fourth Green Tier Annual Report the village will file with the Department of Natural Resources, which organized the network. The network focuses on encouraging communities to work on energy conservation, water quality and conservation, solid waste reduction, and community wellness activities. Leamy motioned, Schultz seconded, to approve submittal of the Village of McFarland's 2024 Green Tier Annual Report to the Wisconsin Department of Public Resources. Motion carried 5-0.

5. SCHEDULE NEXT MEETING DATE.

- a. Monday, April 14, 2025 at 6:00 p.m.

6. ADJOURNMENT.

Leamy motioned to adjourn; Whitman seconded. Motion carried by unanimous consent. Meeting adjourned at 7 p.m.


VILLAGE OF
McFarland
SUMMARY SHEET

MEETING DATE: Monday, April 14, 2025

SECTION: Business

DEPARTMENT: Public Works

CONTACT: Sayer Larson, Parks Superintendent

AGENDA ITEM: Update on 2025 Arbor Day celebration

PREVIOUS ACTION:

None.

ISSUE SUMMARY:

The Village of McFarland will be hosting an Arbor Day event in 2025. The event will take place at the Lewis Park shelter on Friday, April 25th from 5:30 - 7:30pm. The event will include a short presentation on proper tree planting techniques followed by a bare root tree planting demonstration. There will be craft tables, bucket truck and equipment demonstrations, and tree giveaways.

FINANCIAL/BUDGET IMPACT:

None.

VILLAGE PLAN REFERENCE:

None.

ORDINANCE REFERENCE:

None.

BOARD, COMMISSION OR COMMITTEE RECOMMENDATION:

No action is required on this item.

ATTACHMENTS:

None


VILLAGE OF
McFarland
SUMMARY SHEET

MEETING DATE: Monday, April 14, 2025

SECTION: Business

DEPARTMENT: Community Development

CONTACT: Andrew Bremer, Comm & Eco Dev Director, Kong Thao, Associate Planner

AGENDA ITEM: Discussion and recommendation to the Village Board regarding a proposal from HGA to complete a Net Zero Energy Measurement and Verification Energy Audit for the Public Safety Center.

PREVIOUS ACTION:

March 10, 2025, Sustainability Committee Meeting

ISSUE SUMMARY:

As part of their design service agreement with the Village, HGA has been assisting the Village with post-construction commissioning of the Public Safety Center. These efforts include making sure that building equipment and controls are functioning properly. These efforts also include reviewing the amount of nonrenewable and renewable energy used at the PSC to determine how well the building is performing compared to pre-construction design modeling. HGA has studied a full year's of energy data from 2024. At the March 10, 2025, Sustainability & Natural Resources Committee meeting, HGA provided a presentation on the benefits the building has provided in terms of renewable energy use and how initial energy use and on-site generation have compared to pre-construction design modeling. Refer to the [meeting packet](#) and [meeting video](#) for more information. HGA takeaways from their presentation included:

- Building energy performance far exceeds a code baseline building - using 86% less energy.
- Actual solar generation for year 2024 was inline with pre-construction modeling and generated the equivalent of the annual electric usage of 67 homes.
- To achieve net zero energy certification, additional energy savings are required as the actual base load energy use in 2024 was higher than pre-construction modeling.
- Building energy optimization is a normal part of the Measurement & Verification process for a new building.

In order to further reduce the baseload to certify the building as net zero HGA recommended completing a measurement and verification energy audit. Refer to the scope of services in the packet. Based on the analysis completed to date, HGA believes the higher baseload energy use vs. pre-construction modeling may be from IT loads, but will also investigate opportunities for other load reductions, including geo-thermal pump optimization.

FINANCIAL/BUDGET IMPACT:



The estimated fee for this work is \$15,000; however, there would be no out-of-pocket expense to the Village as the costs associated with the work will be covered as part of the IRS 179D assignment to HGA. On [March 26, 2024](#) the Village Board approved an allocation of energy tax deductions to HGA. Under this IRS program, eligible renewable energy design consultants are able to claim a tax deduction for renewable energy projects for municipal projects if the municipality enters into a 179D agreement with the consultant. Government entities are not eligible to directly receive the tax deduction. In return for the Village agreeing to allow HGA to obtain the IRS 179D tax deduction, HGA agreed to provide the Village with up to \$32,033 of in-kind services to be used for future renewable energy planning, audit, and design work.

VILLAGE PLAN REFERENCE:

2021 Sustainability Plan. Includes the goal of achieving 50% of total municipal energy consumed per year generated from renewables by 2030 and 100% by 2040.

ORDINANCE REFERENCE:

BOARD, COMMISSION OR COMMITTEE RECOMMENDATION:

Recommended motion:

Motion, second, to recommend to the Village Board approval of a proposal from HGA to complete a Net Zero Energy Measurement and Verification Energy Audit for the Public Safety Center.

ATTACHMENTS:

1. VoM_PSB_MV_energy_audit



REQUEST FOR SERVICES

NET ZERO ENERGY MEASUREMENT AND VERIFICATION
ENERGY AUDIT

FOR THE
PUBLIC SAFETY BUILDING

MCFARLAND, WISCONSIN

MARCH 19TH, 2025

Contact:
Alex Harris
HGA
Phone: 608-554-5329
E-mail: aharris@hga.com

HGA Commission Number 4715-006-00

WORK SCOPE

HGA will provide the following services at Public Safety Building:

1. Complete energy audit to investigate contributions to baseload energy usage
 - a. Review building loads and determine significant loads contributing to baseload power use
 - i. IT Loads
 - ii. HVAC Loads
 - iii. Plug Loads
 - iv. Other misc loads
 - b. Coordinate audit efforts with the Village's IT consultant and electrical contractor as needed to inform the audit
 - c. Leverage existing metering data to identify opportunities for energy reduction
2. Develop strategies and recommendations to reduce baseload energy use based on audit finding
 - a. Potential strategies may include
 - i. Geo pumping power reduction opportunities
 - ii. Are IT loads higher than predicted?
 - iii. Scheduling or part load energy reduction
 - iv. IT strategies
3. Document findings and magnitude of savings via presentation or report
4. Review findings with owner and determine next steps
5. Implement selected recommendations and evaluate impacts to the net zero energy goal
6. Re-evaluate building energy usage as it relates to the net zero energy goal 3, 6 and 12 months after the measure implementation.

Total Fee: The costs associated with this work will be covered as part of the 179D assignment to HGA. HGA will log hours on a time and materials basis but this time will not be billed to the Village. It is estimated the scope of this work will be no more than \$15,000. If the total time and materials is greater than this amount, HGA will review with the village for approval.

This request for services will fall under the 179D credit for the PSC project and allocation for services between the Village of McFarland and HGA (commission # 4715-006-00, dated 3/6/2024). An invoice will be generated monthly and send to the Village of McFarland representative showing the hourly time spend on the project by HGA employee, services provided and credit remaining.

Assumptions:

- Fee associated with IT consultant time and electrical contractor (or others) to be paid for by the Village of McFarland

AGREEMENT FOR PROFESSIONAL SERVICES

The scope of services (the “Services”) to be provided by HGA under this Agreement is described in the above Request for Services. The total cost for these services will be provided without charge to the Village as part of the 179D PSB credit that was assigned to HGA.

179D Credit Value (3-6-2024)	\$32,033.00
Credit Used to Date (2-21-2025)	\$7,146.44
Planned Credit Used for These Services (T&M)	\$15,000.00
Remaining at Completion or Services	\$9,886.56

There will be no reimbursable expenses. This request for services falls under the previous agreement for the 179d Credit for the PSB project signed and agreed upon 3/6/2024.

HGA

7475 Hubbard Ave, Suite 201 • Middleton, WI 53562 • Ph: 608.554.5333 • Fax: 608.836.4477 • www.hga.com


McFarland
SUMMARY SHEET

MEETING DATE: Monday, April 14, 2025

SECTION: Business

DEPARTMENT: Administration

CONTACT: Andrew Bremer, Comm & Eco Dev Director

AGENDA ITEM: Discussion and recommendation to the Village Board regarding the Village's existing Office of Energy Innovation Grant Agreement for the Public Safety Center.

PREVIOUS ACTION:

January 9, 2023 - S&NR recommended approval to the Village Board for the submittal of two OEI Energy Innovation Grant Program Applications

April 19, 2023 - Staff presented to the Committee, award of grant application by the PSC for Battery Storage and Microgrid technology at the Public Safety Center.

May 8, 2023 - S&NR recommended approval to the Village Board for HGA's proposal design, bid and construction administration services for installation of battery and microgrid at the Public Safety Center.

May 9, 2023 - Village Board approval of HGA contract.

September, 2023 - Grant contract signed with OEI.

February 22, 2024 - S&NR and Village Board project update meeting.

March 11, 2024 - S&NR unanimously recommended approval of the bid documents.

March 26, 2024 - Village Board approval to bid project.

May 1, 2024 - Bid opening

May 28, 2024 - Village Board rejects bids.

July 8, 2024 - S&NR unanimously recommends submitting the proposed grant amendments with a preferred alternative to reallocate the funding to the Community Center.

July 23, 2024 - Village Board approves submitting the proposed grant amendments with a preferred alternative to reallocate the funding to the Community Center.

ISSUE SUMMARY:

Project Update

Last Fall, staff submitted two grant amendment requests per the S&NR Committee recommendation and Village Board action. One option was to reduce the project scope to a grid-connected battery-only installation at the Public Safety Center. The second option was to transfer the grant funding to the Municipal Center for geothermal energy improvements as part of future building renovations into a Community Center. The S&NR and Village's Board's preference was the second option, although both options were submitted to OEI per committee and board direction.

The Public Service Commission met on February 27, 2025 to review the Village's amendment requests. The PSC voted to approve removing the microgrid controls and pursue an energy



storage system (battery) at the PSC. The PSC did not approve transferring the funding to a Municipal Center project. In addition, OEI Staff indicated that the removal of the microgrid controls necessitates an adjustment of the grant award from \$350,000 to \$250,000, which is the maximum grant request for an energy storage system project without microgrid controls. The Village is expected to provide at least the same grant to local match ratio as the original application (i.e. 58% OEI, 42% VOM); therefore, the minimum required Village match is reduced from \$255,000 to ~\$182,143.

The Village has until April 28 to reply to OEI to indicate whether the Village desires to either:

1. Accept the PSC decision and amend the existing grant agreement for an energy storage system-only project. This will require Village staff to submit a relined version of its original application and current budget necessary to draft a grant agreement amendment. Once the amended agreement is finalized, the Village will work with HGA to rebid the project as a battery only installation. Much of the original design work by HGA would be reusable since the location and design of the battery is not substantially changing from the original micro-grid and battery project bid last year. The Village would also request an additional extension to the grant agreement, which currently expires June 30, in order to complete the project in the next 12 months. There is some concern that pricing for the battery could still come in over the revised project budget, particularly given the current turbulence in global markets. If the bids received are still over the revised project budget the Village still has the option to reject the bids and cancel the grant agreement.
 - Benefits of Battery Storage. Included in the packet is the Net Zero Feasibility Study completed by HGA in 2021 as part of the design for the Public Safety Center. Refer to pages 12-14.
2. Cancel the grant agreement. This will require Village staff to submit a letter to withdraw/cancel the grant.

Under both options, the Village can submit a request for partial reimbursement of the HGA design fees to date totaling \$57,475 based on the grant to local match ratio. OEI will then determine eligibility consistent with the objectives of the original or amended grant agreement.

Project Background Information Presented at the July 16, 2024 S&NR and July 23, 2024 Village Board meetings

On May 1, 2024, Village staff, along with our energy design consultant HGA, opened the bids for the proposed project to add batteries and microgrid controls at the Public Safety Center. One bid was from Universal Power Systems for the amount of \$1,748,500, with an Alternate #1 price of \$998,500. The second bid was from EnTech/Faith Solutions in the amount of \$1,659,084, with no Alternative #1 bid price received. Both base bid prices, and the UPS Alternative #1 price, were well in exceedance of the total project budget of \$605,000, which includes a \$350,000 grant from the WI Office of Energy Innovation (OEI). Staff recommended the Village Board reject both bids, which it did at its May 28th meeting.



Moving forward, Village and HGA staff are working with staff from OEI to determine available options to move a project of some sort forward. Staff has already obtained approval for a grant extension from OEI through December 31, 2024. The three options staff have discussed with OEI are:

1. Cancel the project. The Village could cancel the grant funding. OEI may cover some of the HGA design fees based on the work completed at the same 58% / 42% grant match provided the Village demonstrates that we met some of our grant objectives. HGA design services to date are approximately \$60K of the \$82K contract; therefore it is possible that OEI will cover 58% of the costs incurred to date.
2. PSC Grid Connected Battery System. Under this option, the Village would request an amendment to the existing grant agreement to modify the project scope to remove the micro grid and rebid the project as a grid connected battery system only. This was essentially what the Village requested bidders present as the Alternative #1 bid. Only one contractor provided a bid for this option, and it was still significantly above the project budget of \$605,000. It is possible that removing the micro-grid from the scope will open the possibility for more qualified vendors to bid on the project. If the bids come back above the project budget, the Village still has the option to reject the bids and cancel the project. However, there is still some cost and effort in rebidding the project.
3. Transfer Grant to the Community Center Project. Under this option, the Village would request an amendment to the existing grant agreement to transfer unused grant funds to be used as part of the installation of a geothermal system for the planned renovations of the Municipal Center into a Community Center. Early this year, the Village submitted a separate grant agreement to OEI for this project. The Village requested \$332,500 with a local share of \$332,500 (50/50 match). The Village's application was competitive but did not make the cut line for funding. OEI funded 11 of the 27 projects submitted in the Activity 1 Renewable Energy and Energy Storage category. The Village's application ranked 19 on the list. Transferring the grant funding to the Community Center likely offers the Village the best bang for its buck. However, that is a bigger request of OEI than option 2 and may require a higher level of approval authority within the PSC.

OEI staff have indicated that the Village can submit a request for both option #2 and #3, and indicate which is our preference. Staff preference is option #3. While there is merit in adding a grid connected battery to the PSC to meet our renewable energy and sustainability goals, there is more value in using the funding to offset the costs of adding a geothermal system to the Community Center if choosing between one or the other. Whether the Village requests OEI consider both options #2 and #3 is certainly open for discussion.

FINANCIAL/BUDGET IMPACT:

The total project cost is estimated to be \$605,000. In March of 2023, the Village was awarded a \$350,000 grant from the Office of Energy Innovation for the installation of a micro grid and battery storage system at the new Public Safety Center as a Level 1 Microgrid Community Resilience Center. The Village's \$250,000 match is included in the 2024 budget. The project costs roughly break down as follows:



- \$82,000 HGA design and commissioning services
- \$475,000 Equipment and Installation Labor
- \$43,000 Contingency
- \$5,000 in-kind Village labor for grant administration

HGA has indicated that they believe they can complete the amended project scope within the existing project budget between HGA and the Village. The revised grant funding would be \$250,000 and the Village will be required to provide at least the same original match percentage (42%), or ~\$182,143, but can contribute additional matching funds up to the original 2024 Village project budget.

VILLAGE PLAN REFERENCE:

2023/2024 Strategic Implementation Plan. Goal B, Action Step VI, Install battery storage at Public Safety Center through OEI grant award for excess power created in solar array.

2021 Sustainability Plan. Includes the goal of achieving 50% of total municipal energy consumed per year generated from renewables by 2030 and 100% by 2040.

ORDINANCE REFERENCE:

BOARD, COMMISSION OR COMMITTEE RECOMMENDATION:

Recommended motion:

Motion, and second, to recommend to the Village Board amending the existing Office of Energy Innovation Grant Agreement for the Public Safety Center to an energy storage system-only project.

ATTACHMENTS:


1. NZE Feasibility Study McFarland PSB_1_8_2021



HGA

NET ZERO ENERGY FEASIBILITY STUDY
VILLAGE OF MCFARLAND
NEW PUBLIC SAFETY BUILDING

January 8, 2021



INTRODUCTION

This study explores the options for achieving net zero energy for the new Public Safety Building project for the Village of McFarland. This building is going to include a fire station, police station and courthouse with an area of 55,325 ft².

The U.S. Department of Energy defines net zero energy as the following: “An energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy”.

$$\frac{\textit{Building Energy Consumed}}{\textit{year}} = \frac{\textit{Renewable Energy Produced}}{\textit{year}}$$

Building Energy Consumed = energy used as recorded by the electric and natural gas meters that are connected to the grid through the local utility (Alliant Energy). This energy is used to heat, cool, light and power the building loads.

Renewable Energy Produced = energy produced onsite (at the building) or offsite from renewable resources (Solar Photovoltaic for example). Over the course of a year, this renewable energy must offset the energy consumption of the building to reach the net zero energy goal.

In this study we explore each piece of the net zero equation for the new Public Safety Building and provide budget level costs to carry for the project.

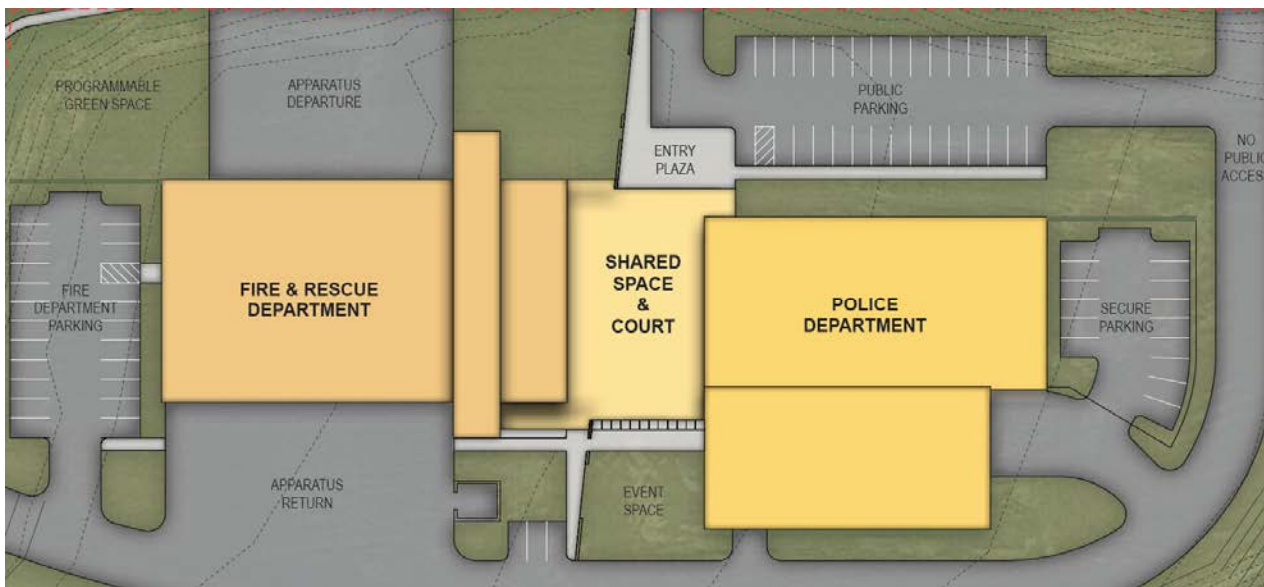


Figure 1- Current project site plan

Building Energy Consumed

The first step in determining the net zero energy feasibility is to predict the energy use of the proposed building. There are various ways of doing this, including benchmarking, baseline comparisons, and energy modeling. HGA has used a combination of these techniques to predict the energy use of McFarland's new Public Safety Building (PSB), helping the team set an energy utilization intensity goal for the project. Energy use intensity (EUI) is the metric used for describing the building energy use per area. The following energy star article has more background information on this energy metric:

<https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/understand-metrics/what-energy>

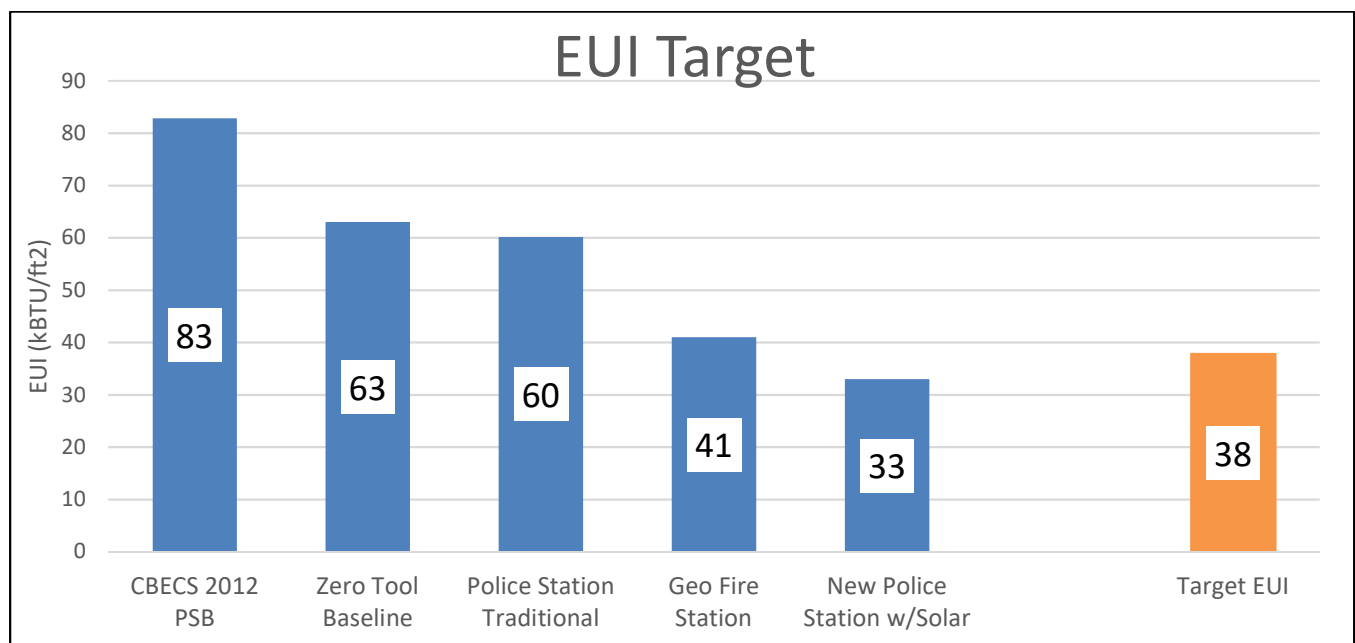


Figure 2: Target energy use intensity (site energy) comparisons and the proposed PSB project

Based on existing police/fire/public safety building performance, as well as other net zero energy building usage, we have set the project target EUI at 38 kBTU/SF/Yr site energy. This target will be updated throughout the design process, but it will give us an idea of what the net zero equation looks like for budgeting purposes. The current design, with the help of HGA design consulting and commissioning, is well positioned to achieve the 38 EUI goal at this time.

The goal of setting the energy use target as low as possible is to be able to offset 100% of that energy usage with energy generation.

Renewable Energy Produced

Making the building net zero energy involves offsetting building energy used with energy produced through onsite renewable generation. The most cost effective method for producing renewable energy onsite is solar photovoltaic (PV) systems. Rooftop mounted, ground mounted, wall mounted and carport solar PV are strategies that we will look at for the new Public Safety Building project.

Rooftop Mounted Solar Photovoltaic Systems

HGA reviewed the roof plan and design documents to see what size of solar PV system was feasible at the new Public Safety Building. Based on the 25% design documents, the roof can support a maximum of 350 kW DC of solar PV.

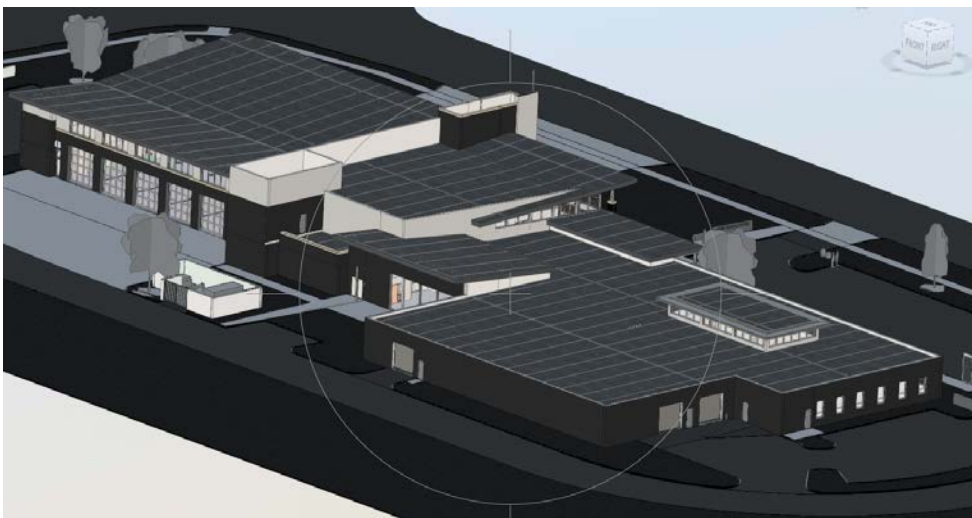


Figure 3- Current roof plan view

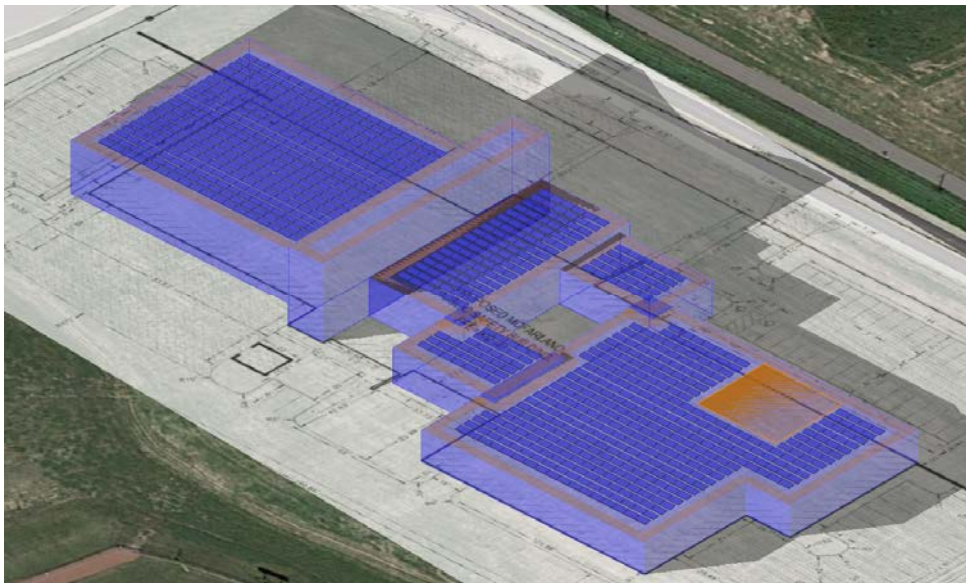


Figure 4- Helioscope solar PV modeling helps estimate the size and production of a proposed system, model shown here for the new PSB

Based on the roof arrangement and elevations, we estimate that a roof mounted 350 kW solar system would produce around 450,000 kWh/yr on an average solar year. This would offset about 28 kBTU/SF/yr of energy usage from the building.

Table 1- Design assumptions made for the solar PV system proposed for the new PSB project

PV System Parameter	Modeled Assumption
Array Tilt Angle	10°
Array Orientation	175°
Panel Wattage	385 W (72M)
Roof Setback	6 ft
Cost	\$1.8/W
PV Inverters	100 kW, 480V



Figure 5- Example solar PV installation at Oregon Forest Edge Elementary School - a similar PV system is proposed for the new PSB project



Figure 6- Closer image of solar PV panel and racking arrangement - similar design assumptions have been made for the new PSB project

Additional Renewable Energy Needed

Since the largest rooftop solar PV system that can fit in the current roof design is predicted to offset only 28 kBTU/SF/yr, we have a gap in the net zero equation of 10 kBTU/SF/yr.

$$\frac{\text{Building Energy Consumed}}{\text{year}} = \frac{\text{Rooftop Solar PV Energy}}{\text{year}} + \frac{\text{Additional Energy Needed}}{\text{year}}$$
$$\frac{38 \text{ kBTU}}{\text{ft}^2} = \frac{28 \text{ kBTU}}{\text{ft}^2} + \frac{10 \text{ kBTU}}{\text{ft}^2}$$

To reach our net zero energy goal we predict needing additional renewable energy to offset this 10 kBTU/SF of building usage. This additional energy could come from a variety of sources described below.

Ground Mount Solar PV Systems

In addition to roof mounted solar PV systems, ground mount solar PV systems have come down in price in recent years. Because these panels do not have to comply with the rooftop code requirements, costs should be only slightly higher than the rooftop PV systems.



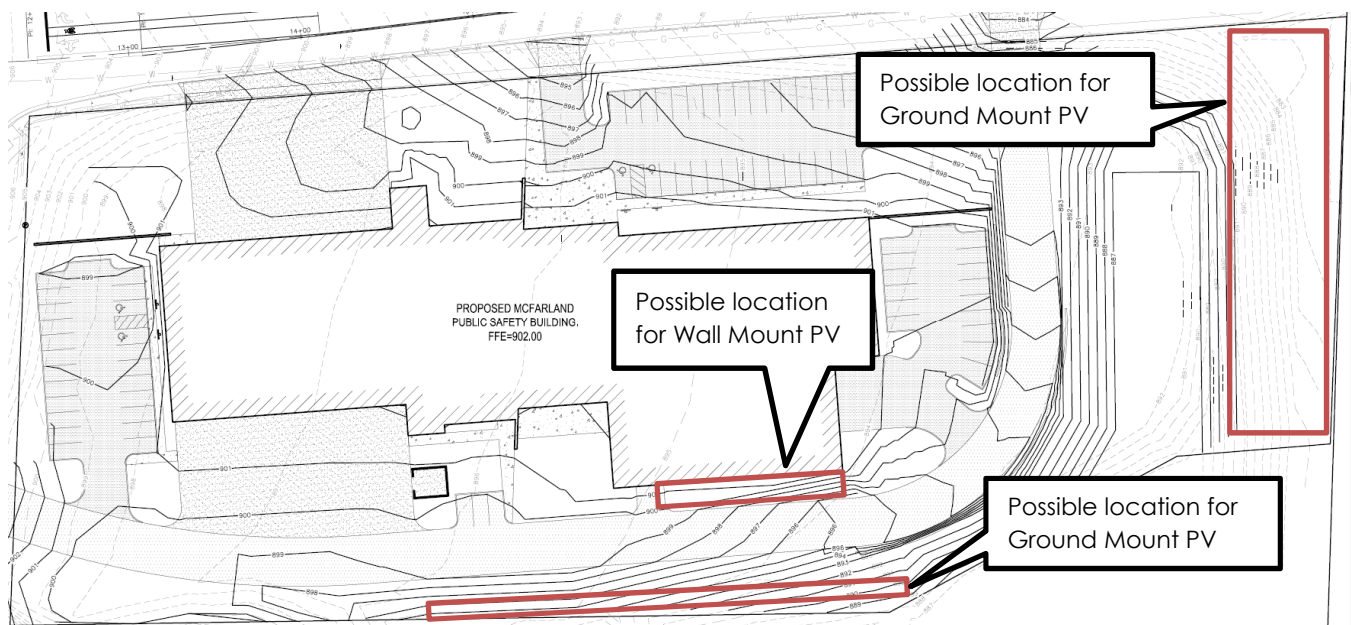
Figure 7- Example of ground mounted solar PV system

There are several areas on the site that could support a ground mounted system to supply the additional needed



Figure 8- Example of south-facing exterior wall mounted panels

Another alternative is to mount panels to south facing walls - the south side of the police garage would be a good place to explore.



An additional 126 kW DC of ground/wall mounted panels would be needed to offset all of the energy usage at the net zero building. This amount of ground mounted solar would require roughly 10,000 – 15,000 SF of land area, depending on racking and mounting arrangements. The cost of this additional solar PV system has been included in the budget numbers for achieving the net zero energy goal.



Figure 9- A more decorative example of ground mounted solar

Third Party Ownership

Another way to install additional onsite renewable energy is to have a Third-party solar developer install the system. In this method a solar developer would finance the installation of the solar PV system and either lease the solar system for use over a period of time, or use a power purchase agreement (PPA) where McFarland would buy the energy produced from the solar developer.

This model is legal to use in some areas depending on the financial arrangements. There may be additional requirements and legal road-blocks that McFarland would need to work through if third-party financing was pursued, but it is possible in Wisconsin.

Renewable Energy Credits

Renewable energy certificates (also known as renewable energy credits, or RECs) represent the energy generated by renewable energy sources from a 3rd party, such as solar or wind power facilities. Buying RECs is not equivalent to buying electricity. Instead, RECs represent the clean energy attributes of renewable electricity.

RECs in Wisconsin have more recently been offered for between \$5.00-\$10.00/MW-hour. Typically, these RECs are unbundled, meaning that the new Public Safety Building would claim the attributes of the REC without using the direct electricity produced by the actual solar panels at a given location.

The Village of McFarland may choose to make up the difference in energy usage and energy produced with RECs or another method described later in the report (such as carport solar PV).

However, buying RECs does not meet the definition of a net zero building by the U.S. Department of Energy. In that case all renewable energy used to offset usage must be produced on-site.

Incentive Programs

Focus on Energy New Construction Program

The new Public Safety Building would likely qualify for the Focus on Energy New Construction program. This program incentivizes the owner and design team for choosing energy efficiency measures to be part of the new building design. For a building the size of the new PSB, the incentive will range from \$15,000 to \$30,000 depending on strategies selected.

Focus on Energy Renewable Energy Program

The solar PV system would likely qualify for the Focus on Energy Renewable Energy program. A PV system of 476 kW (350 kW rooftop mounted, 126 kW ground mounted) would qualify for the 300kW to 500kW tier of incentives, valued at \$48,000 in 2021 rates. This incentive must be applied for in advance, during the year of project completion. There is a reservation code and incentive budget.

Energy Innovation Grant Program

The Public Service Commission Office of Energy Innovation has a grant program to support geothermal, solar PV and battery storage technologies. The Energy Innovation Grant Program (EIGP) covers a wide variety of energy related projects that reduce energy consumption and support renewable energy and energy storage, energy efficiency and demand response, electric and renewable natural gas (RNG) vehicles and infrastructure, or comprehensive energy planning. HGA feels McFarland is well placed to take advantage of this program with an application for either the geothermal costs, solar PV costs, or battery (Tier 2) costs depending on program advantage. Since only one project can be submitted on in this round of the program, HGA can work with Village to determine the best fit. Estimated incentives range from \$200,000 to \$500,000 based on what is included in the application.

Design Team Assistance

Based on the design team's and HGA's past project experience with net zero energy building projects, a few key additional services are needed to ensure a successful implementation of these strategies and goals.

Net Zero Energy Consulting Services

This would include design team guidance on achieving net zero energy goals. Tools and strategies used would include energy modeling, optimization of MEP systems, envelope analysis, and incentive program support. This would ensure that the design seamlessly incorporates the NZE technologies, takes full advantage of all grant program opportunities and is able to achieve the EUI/NZE goals.

Solar PV Design Services

The solar PV system needed to make the building NZE would be designed and integrated into the electrical systems of the building. This includes working with the electrical, structural, and mechanical engineers to coordinate the solar PV system into the documents and specifications. A performance specification is created for the solar PV contractor to bid on and support is given to the construction team as they work through the solar PV installation.

Commissioning

Commissioning of the building is a critical step in ensuring the net zero energy goals are carried through design, construction and operational phases. With the additional systems needed for the net zero energy goals, commissioning ensures that the construction team is supported in installing and controlling the systems that both use energy and produce energy onsite.

Measurement and verification of the net zero energy goals is also a key element of the commissioning after construction. The commissioning group tracks the building energy performance against goals and projections as well as trouble shooting system performance during the warranty phase.



Tier 1 Net Zero Energy Budget

We have termed 'tier 1' net zero energy as those systems and requirements needed in the project to make the building net zero energy as defined in the introduction. The list of items in this table represent the most cost effective way to accomplish that goal.

Table 2- Budget costs for accomplishing net zero energy goals

Budget Item	Budget
Solar PV System (Rooftop)	\$630,000
Solar PV System (Ground Mount)	\$260,000
Electrical System Upgrades	\$50,000
Battery Ready Design*	-
Solar Design and Energy Modeling	\$60,000
Commissioning	\$70,000
Total First Cost	\$1,070,000
Possible Incentives	
Focus on Energy New Construction	\$22,000
Focus on Energy Solar PV	\$48,000
PSC Energy Innovation Office Grant**	\$300,000
Total Incentives	\$370,000
Net First Cost	\$750,000

*Including provisions for a battery in the future (battery ready) would be included in the solar and electrical design, accounted for in the table.

**only one energy innovation grant can be submitted, the value here is subject to which technology is submitted for and the program structure.

Estimated Payback of Net Zero Energy Tier 1

Table 3- Budget costs for accomplishing net zero energy goals

Estimated Utility Costs	\$/yr
PSB traditional utilities	\$74,000/yr
PSB with Solar PV and NZE	\$31,000/yr
Savings	\$43,000/yr
Simple Payback	16.3 years

The simple payback is useful to compare against the useful life of the NZE equipment and systems. In this case the useful life of most NZE equipment (solar, geothermal, etc.) is estimated at 20 years. Over these 20 years two options are presented:

1. Pay \$70,000 each year to the utility = \$1,400,000 total
2. Pay \$27,000 each year to the utility with a net \$750,000 upfront cost = \$1,290,000 total

This scenario is simplified (no inflation of energy rates, equipment maintenance, etc.), but it demonstrates that the NZE design has reached cost effectiveness compared to traditional utility rates.

Tier 2 Net Zero Energy Ideas

There are several other technologies available on today's market that help to accomplish the net zero energy goals. These technologies can help make net zero energy buildings payback more quickly or provide additional onsite renewable energy generation and building resilience. We will explore these technologies as optional or additional items for the new public safety building.

Battery Storage

Lithium ion battery storage systems are becoming more popular as prices drop, due in part to improved manufacturing and increased competition. There are numerous ways a battery storage system can be used at a facility; to increase electric reliability, generate utility grid revenue, store excess renewable energy, and lower utility demand charges.

Store Excess Solar Energy

During a sunny day, the battery system can be used to store excess solar energy production that would normally be sold back to the utility at a reduced rate. This stored energy could be used later during night or peak utility cost times.

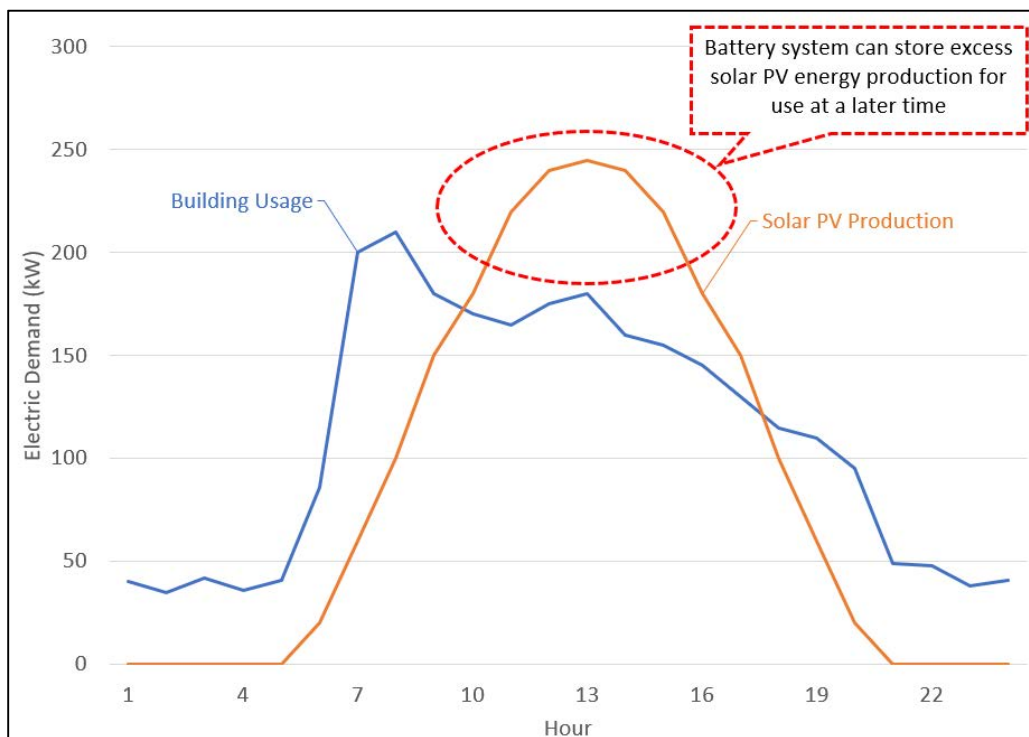


Figure 10- Example building usage and solar production graph during a typical sunny day

Peak Shaving

During a cloudy day the battery system can be used to shave a utility peak that would increase demand costs. The battery can use stored solar energy or off peak energy to be used when electric utility costs are at their highest, and manage the demand charges that a facility will incur.

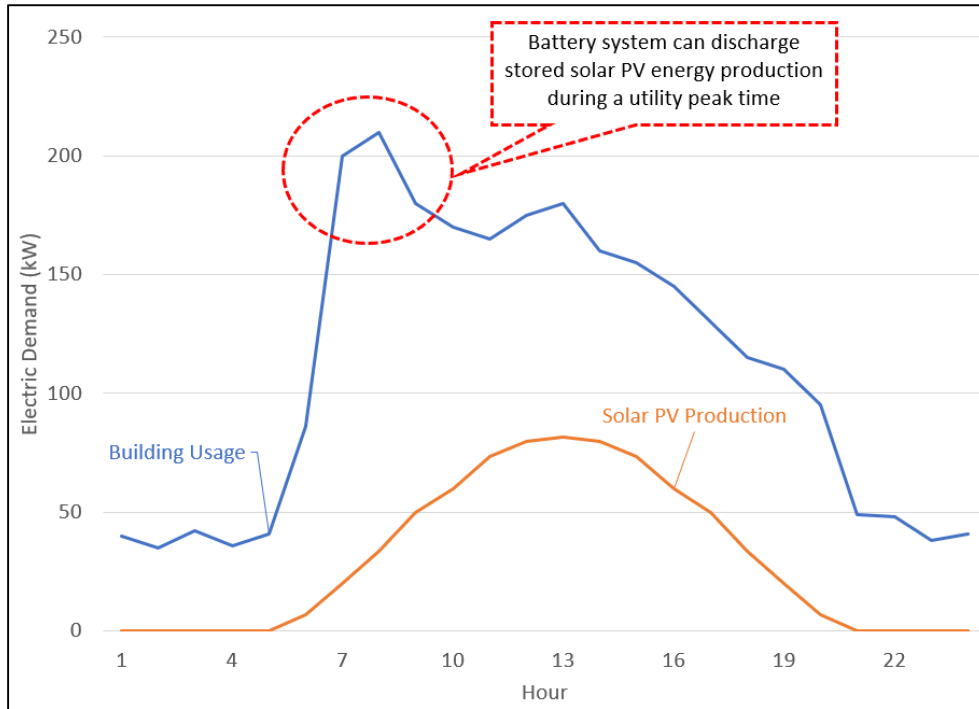


Figure 11 – Example building usage and solar production graph during a typical cloudy day

Battery Power Backup

Batteries can increase electric resiliency by providing back-up electric power during loss of building utility connection. These battery systems can be used in tandem with a conventional dual fuel gas generator, or as a standalone means of providing emergency power in an electric utility outage.

Depending on the emergency backup requirements of the new PSB and the electrical design of the system, a battery storage system could be incorporated to provide back-up power or the ability to generate solar energy during utility outages. If a battery system is selected to be implemented as part of this project, further investigation and coordination is needed with the electrical design team on whether this can be done.



Figure 12- Example of a building battery storage system

Battery Ready Design

If a battery is not chosen to be part of the project, the project can still be ready for a battery installation in the future with a few simple provisions. These include:

- Picking an outdoor location for the future battery and concrete pad
- Running cable conduit to locations during construction for the future battery
- Including a spot for the battery system to land on the Solar PV electrical subpanel
- Configuring the 1-line electrical design for the batteries future use

These provisions would add minimal extra cost in the current design package (similar provisions to getting the design ready for solar PV) but may save considerable of money in the future if a battery is later integrated into the building electrical systems.

Carport Solar PV System

A covered parking structure can be used to house additional solar panels needed to meet the net zero energy goals of the project (in place of the additional ground mount solar PV system previously discussed).

Arrays installed over parking lots are often referred to as carport solar. Experience with carport solar in Wisconsin has shown that building users typically prefer parking under these arrays due to the shading they offer. Consideration must be taken to handle snow melt and to allow plowing around carport solar arrays. There are several successful examples of where these systems have been done successfully in Wisconsin.

Because of the structure, design and labor needed to construct covered parking solar PV, these systems are more expensive than a rooftop or ground mounted solar system. The additional benefit of covered parking spots onsite is worth the premium price for some project teams.

Solar PV System	Typical Costs
Flat Roof Mounted	\$1.8/W
Ground Mount	\$2.0/W
Carport Mounted	\$4.0/W



Figure 13- Example solar carport in Wisconsin



Figure 14-Example structure detail and lighting concept, similar layout to what is being proposed

Tier 2 Net Zero Energy Budget

We have termed 'Tier 2' net zero energy strategies as those that can provide additional onsite renewable energy generation benefits. The list of items in this table represent the budget costs associated with these strategies.

Table 4- Budget costs for Tier 2 equipment

Budget Item	Budget
Solar Carport PV System*	\$240,000
Battery Storage System	\$450,000
Solar and Battery Design	\$30,000
Total First Cost	\$720,000
Possible Incentives**	\$500,000
Net First Cost	\$220,000

*The cost for the solar carport PV system here is the difference between this option and the ground mount system shown in the Tier 1 budget (total cost for the option is \$480,000).

**This incentive is the OEIGP 2020 maximum incentive based on the incurred cost of both the battery and solar PV systems. Only one incentive may be applied for in the 2020 program, see tier 1 strategies for other OEIGP 2020 options. Future battery systems may be able to take advantage of the OEIGP in future years.



HGA

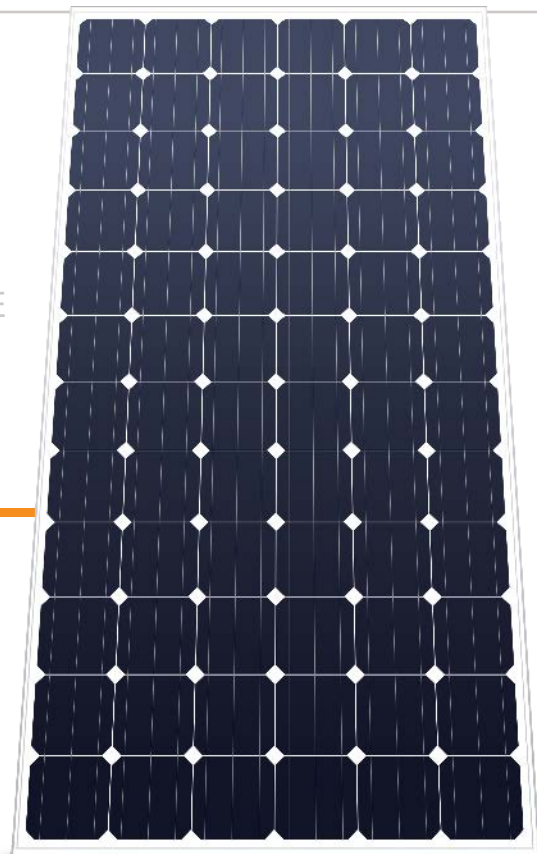
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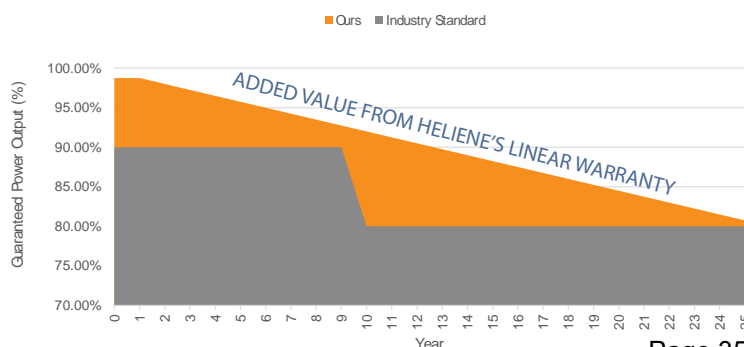
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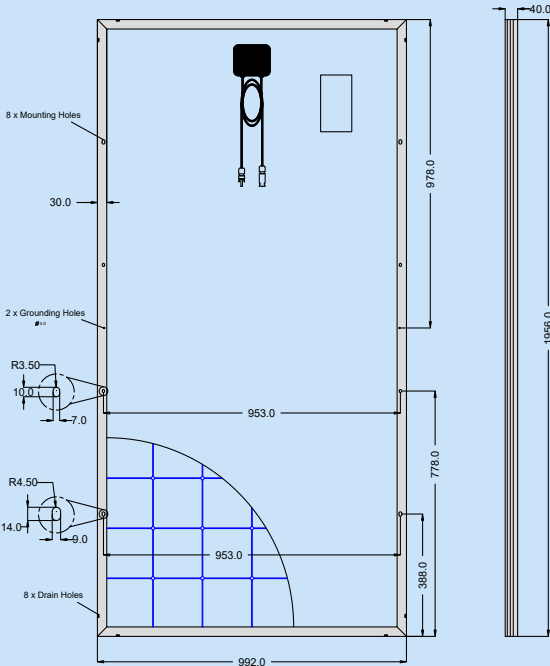
H-BLACK INTEGRATION AVAILABLE (ALL-BLACK MODULE)

LINEAR PERFORMANCE GUARANTEE

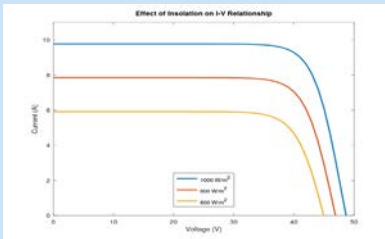
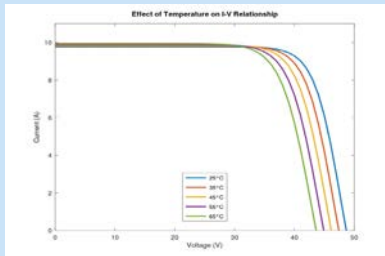
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DIMENSIONS FOR HELIENE 72M SERIES MODULES



I-V CURVE FOR HELIENE 72M SERIES



CERTIFICATIONS



ELECTRICAL DATA (STC)

Peak Rated Power	P_{mpp} (W)	385	380	375	370	365
Maximum Power Voltage	V_{mpp} (V)	41.76	41.20	40.67	40.23	39.90
Maximum Power Current	I_{mpp} (A)	9.24	9.23	9.22	9.21	9.20
Open Circuit Voltage	V_{oc} (V)	49.70	49.55	48.96	48.66	48.50
Short Circuit Current	I_{sc} (A)	10.06	9.98	9.90	9.77	9.75
Module Efficiency *	Eff (%)	20.01	19.65	19.34	19.09	18.82
Maximum Series Fuse Rating	MF (A)	20	20	20	20	20
Power Output Tolerance		[- 0, + 4.99] Wp				

STC - Standard Test Conditions: Irradiation 1000 W/m² - Air mass AM 1.5 - Cell temperature 25 °C

* Calculated using maximum power based on full positive output tolerance [-0, +4.99] Wp

MECHANICAL DATA

Dimensions (L x W x D)	1956 x 992 x 40 mm (77 x 39 x 1.6 inch)
Weight	22 kg (48.5 lbs)
Output Cables	1.2 m (47.2 inch) symmetrical cables with MC4 type connectors
Junction Box	IP-67 rated with 3 bypass diodes
Frame	Double webbed 15 micron anodized aluminum alloy
Front Glass	Low-iron content, high-transmission PV solar glass
Solar Cells	72 Monocrystalline cells (156.75 x 156.75 mm)

CERTIFICATIONS

UL Certification	ULC/ORD-C1703-1, UL1703 UL61215 & UL61730
IEC Certification	Optional

Heliene modules are certified under the California Energy Commission (CEC) Listing Report

TEMPERATURE RATINGS

Nominal Operating Cell Temperature (NOCT)	+45°C (±2°C)
Temperature Coefficient of P_{max}	-0.39%/°C
Temperature Coefficient of V_{oc}	-0.31%/°C
Temperature Coefficient of I_{sc}	0.06%/°C

PACKAGING CONFIGURATION

Modules per box:	26 pieces
Modules per 53' trailer:	780 pieces

MAXIMUM RATINGS

Operational Temperature	-40°C - +85°C
Max System Voltage	1000V (*1500V) *Optional

WARRANTY

10 Year Manufacturer's Workmanship Warranty
25 Year Linear Power Guarantee
(Refer to product warranty page for details)