Solar + Storage Feasibility Report

Coquille Indian Housing Authority

Warehouse Building

801 Miluk Dr., Coos Bay, Oregon 97420

Conserve **Sol Coast Consulting & Design, LLC** *Create*

243 S 2nd Street, Coos Bay, OR 97420 #541.266.0877 CCB#164208

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Executive Summary:

This Solar + Storage Feasibility Report for the Warehouse Building at Kilkich Reservation was commissioned on behalf the Coquille Indian Housing Authority, "CIHA" to better understand opportunities for CIHA facilities located on Kilkich Reservation to contribute to the following Coquille Indian Tribe objectives of:

• Establish Energy Resilience: Reduce disruptions, damage, and recovery time

• Strengthen Economic Resilience: Minimize volatility in energy and fuel operating costs

• Achieve Energy Sovereignty: Self-sufficiency and control of our energy future

Access to usage data from the utility was authorized by CIHA and provides the basis for sizing solar production and energy storage in accordance with defined Energy Resilience steps for incremental development:

The utility data provided was used to define and evaluate the following:

- Annual net zero solar production targets,
- Daily, weekly and seasonal peak energy demand thresholds for peak shaving,
- Energy storage requirements for time of use tariff participation,
- Battery storage requirements to support continuous operations during short and long duration utility outages.

Recommendations and proposals for each CIHA facility at Kilkich are designed to leverage readily or potentially available funding for solar plus storage that contributes toward long term planning for net zero energy generation and a campus wide VPP and Microgrid at Kilkich Reservation.

Project sizes for solar generation and battery storage are identified with planning budgets and operational values calculated. A recently installed & commissioned (June 2024) solar + storage project at the Warehouse, that includes a 66.6kWdc and 57.6kWh BESS, was examined for existing energy use of the facilities at the CIHA Warehouse, and new Time of Use and demand charge tariffs through Pacific Power were considered.

Our immediate recommendation is to reprogram the existing inverters for greater operational flexibility and to double the existing battery storage capacity for a total of 115.2kWh. The additional storage capacity would reduce strain on the Kilkich energy grid during daily and seasonal peaks, potentially resulting in fewer and less extensive utility outages and power quality fluctuations. Reprogramming the inverters will allow for Time of Use tariff savings, and demand shaving.

As an enhanced disaster preparedness measure, additional PV generation and even greater storage can be accommodated by the transformer and service meter at this location. The building is above the Tsunami Zone and could be an important building to have a greater power capacity when isolated from the grid. The 5 attached, but separately metered, storage bays contain facilities housing emergency and disaster readiness supplies, archeology storage facilities. These facilities are being considered for their own solar + storage systems and underline the importance of this facility for disaster resilience.

Figure 1 Site Plans for existing Solar + Storage system installed in 2024

Study Narrative

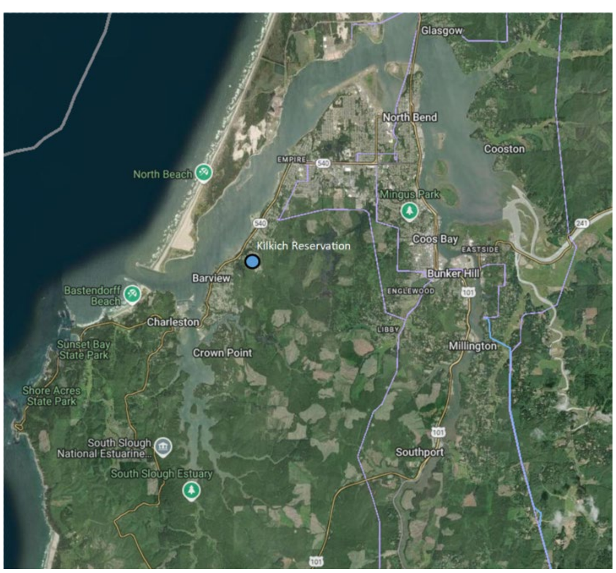
The Coquille Indian Tribe (CIT) flourished in Oregon's southwestern corner for thousands of years, cherishing the bountiful forests, rivers and beaches of a homeland encompassing more than 750,000 acres. But the 19th century's onslaught of European diseases, gold mining and westward expansionism nearly erased the Coquille people. Treaties ceded their homeland to the U.S.

government, in exchange for promises that would go unfulfilled. As a result, the ancestral culture nearly went extinct. In 1954, Congress declared the Coquille Tribe “terminated.” , but they have endured. Restored to federal recognition in 1989, they are rebuilding their nation.

Today CIT numbers almost 1,200 members and has regained more than 10,000 acres of ancestral homeland. CIT provides education assistance, health care, elder services and (where needed) housing assistance to their people, while contributing substantially to the surrounding community’s economy. Their various enterprises employ about 600 people, and their community fund is the region’s leading local source of charitable grants.

Kilkich currently relies on a mix of clean and dirty energy and fuels imported through catastrophe-prone routes and controlled by others. By thoughtfully applying clean energy technology and financial tools to the renewable resources available, CIT plans to sustainably provide for their own energy needs while reducing the burden on the environment and building Tribal wealth. Plan actions that support each of the three goals are organized into phases that cumulatively build upon previous phases of investigation, planning and development.   Development of solar and energy storage at Kilkich facilities has been identified as a critical first step and central action for phase one efforts that can ultimately be built upon toward establishment of a Kilkich campus wide micro-grid and virtual power plant.

Currently, electricity is transmitted to Kilkich from PacifiCorp’s resource portfolio, across the state and coastal range, to Trust lands where it is then distributed by a feeder serving Kilkich and communities beyond. The distribution system at Kilkich is a closed loop but interconnected to the larger distribution system in a way that does not safely allow for micro-gridding at this time.



Figures 2 - 4 PacifiCorp transmission to Coos Bay and distribution to Kilkich.

Non-residential facilities located at Kilkich are operated either by CIT or Coquille Indian Housing Authority (CIHA) with total annual electricity use averaging just over 1 GWh/year based on the most recent three years of usage. A preliminary review of the existing network by PacifiCorp staff suggests that a new master meter could be installed at the entry point on Cape Arago Highway, should suitable conditions be agreed upon between the Tribe and PacifiCorp. Such an agreement and metering upgrade could accommodate a Kilkich-wide microgrid and virtual power plant configurations. CIT plans to engage Energy Trust of Oregon for microgrid design assistance.

After entering into the Solar + Storage Feasibility Study agreements, Sol Coast conducted site walk-throughs and received additional input from staff to determine solar availability, identification and documentation of electrical service and distribution equipment to determine potential interconnections and size of project, and identification of physical or operational constraints that may affect project feasibility.

The following sections provide facility specific evaluations of:

1. Energy Usage: Utility service, annual & interval energy usage, and peak demand spikes.
2. Solar Resource Assessment: Roof and Ground Mount viability, Total Solar Resource Fraction, Net Zero solar energy requirements
3. Battery Storage: Scenario Analysis for Time of Use (TOU), 8 hour and long duration battery backup of Critical Loads & Whole Building
4. Financial Study: Costs, Incentives, Economic Analysis, and Resource Scenarios for Proposed Designs
5. Next Steps: Recommendations and Considerations for Development

1. **Energy Usage**:

The CIHA Warehouse serves as a small shop for woodworking, fixing equipment, and storage of equipment & vehicles. There are also parking areas for utility vehicles, trailers, and containers, and storage of maintenance materials such as gravel, bark chips, and sand in the lot on the south side of the building.

208V 3ph electricity is delivered to the building through a 300 kVA transformer. Electricity is distributed through the 800A service entrance at 120/208V 3ph 4W. At the service entrance there is the net meter for the Warehouse, and 5ea non-net metered meters for smaller associated storage bays. The main net meter feeds an 800A Main Service Panel (MSP) in the large main shop area of the building. The MSP is connected to two 225A sub-panels which are the AC combiners for net metered grid connection to 2ea Sol-Ark 15K inverters per each sub-panel to the MSP. An additional 2ea 225A sub-panels are also each connected to and fed by 2ea - Sol-Ark 15K inverters to power each a separate load panels. Each set of Sol-Ark 15K inverters has an attached 28.8kWh BESS to power each separate load sub panel in a grid down scenario. The MSP runs larger mechanical loads and is not directly connected to the battery solar + storage system. The system was installed by a solar professional other than Sol Coast, so it was not confirmed how the system was specifically programmed, and if the BESS would send power to loads in the MSP as well as the load sub-panels in a grid down scenario.

Daily energy and demand records received for the Maintenance Building for 2022-2024, and 15 min interval usage for one year (2024) provide insight into daily energy and demand patterns and form the basis for evaluating existing system sizing for net zero generation and exploration of various battery storage system use cases. In the years prior (2021-2023) to the installation of the solar + storage system, the facility used 68.3MWh/year on average. The system was installed and commissioned in June 2024. Data up to Oct 2025 was received at the finalizing of this report and was factored into usage calculations and system production performance.

Fig 1.a below charts energy usage for the CIHA Warehouse meter per daily basis for the 2024 calendar year, based on the 15 min interval usage data provided by Pacific Power. Daily energy usage mainly peaks during the late fall, winter, and early spring months (Nov-Mar). The middle of the graph illustrates usage during late spring through early fall (Apr-Oct). Regular dips seen in the chart, in particular during fall through spring are on weekends when the facility is closed and not fully in operation. The large low dip in the summer is mostly due to the start up & commissioning of the solar system, lowering the power usage to off hours, with the BESS used solely for backup scenarios.

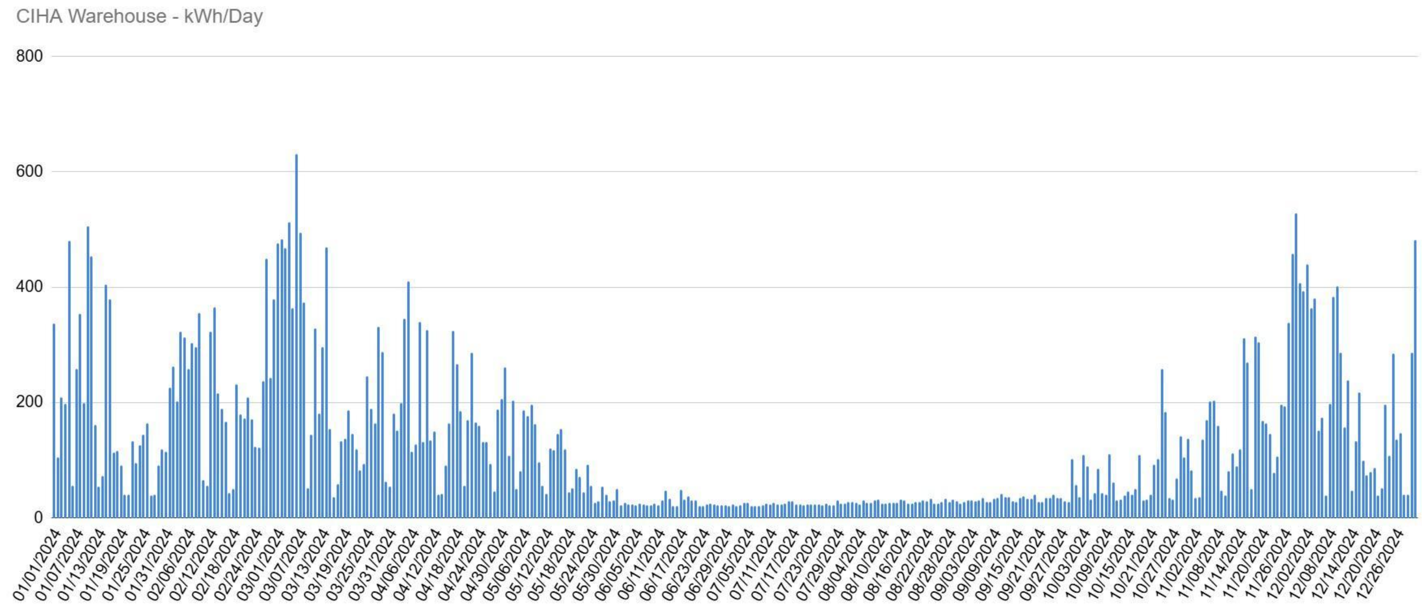


Fig 1.a - Warehouse Building daily use, 2024

During the three years spanning 2021-2023, the facility used an average of 68.3MWh/yr. Though the solar PV system had only been commissioned into service mid-year, the facility saw a reduction in overall energy usage dropping significantly to 45MWh/yr in 2024. From May 2024 (system commission) to May 2025, the warehouse used 40,100kWh, and generated 61,547kWh. From Oct 2024 through Oct 2025, it used 42,400kWh and generated 56,572kWh. The existing system is a net generator with extra generation applied to other, aggregated, CIHA utility meters at Kilkich.

During business hours In the winter months energy usage averages between 60-70kWh per day, with spikes near 80kWh. Summer days average nearly 30-35kWh/day with some occasional spikes near 45kWh. There is a minimum daily usage of about 30-40kWh/day throughout the year. After the solar array was commissioned into service, there was a consistent 20-25kWh daily usage during the following summer months. Spikes in usage increased starting in October increasing with the colder winter months.

Energy demand, which is the immediate use of power in kW, elevates during the winter months, particularly starting sometime around 4am, continuing until 11a. This morning demand spike usually around 20-40kW can spike as high as 80+kW and was frequently noticed early in the morning of March 5-7, 2024. These spikes in demand are most often associated with the start of morning operations as large mechanical equipment are turned on at the same time. Standard operating procedures can be put in place to stagger the start up in equipment, lowering the immediate demand and saving on demand charges. Soft starts can be added to equipment such as HVAC units to lower the startup amperage, lowering the morning demand spike. It is recommended that the facilities management look into start up requirements for all high amperage equipment and look for avenues to reduce the morning spikes in demand.

Demand drops starting after 11am to an operational average of 20kW until 5pm, after which demand drops significantly, to 8kW on average during non-operational hours. This demand pattern informs sizing of BESS to provide continuous power to support operations during periods of utility service disruption. Fig 1.b charts the monthly peak demand, which sets the amount charged for demand by the utility. Peak demands of 75kW+ with high peaks of up to 85kW occur in the heating months of Nov-May. The peaks drop significantly to as low as 7kW but averaging around 15kW in the summer months of June-October. This demand pattern informs sizing of battery energy storage systems (BESS) designed to supply energy to loads during peak demand periods to shave demand peaks to below utility thresholds. This demand shaving is perhaps the most valuable battery management scenario which benefits the local energy distribution system by reducing peaks in grid demand and, hence, the potential for rolling brown and blackouts during peak hours for the Tribal residents of the Kilkich Reservation.

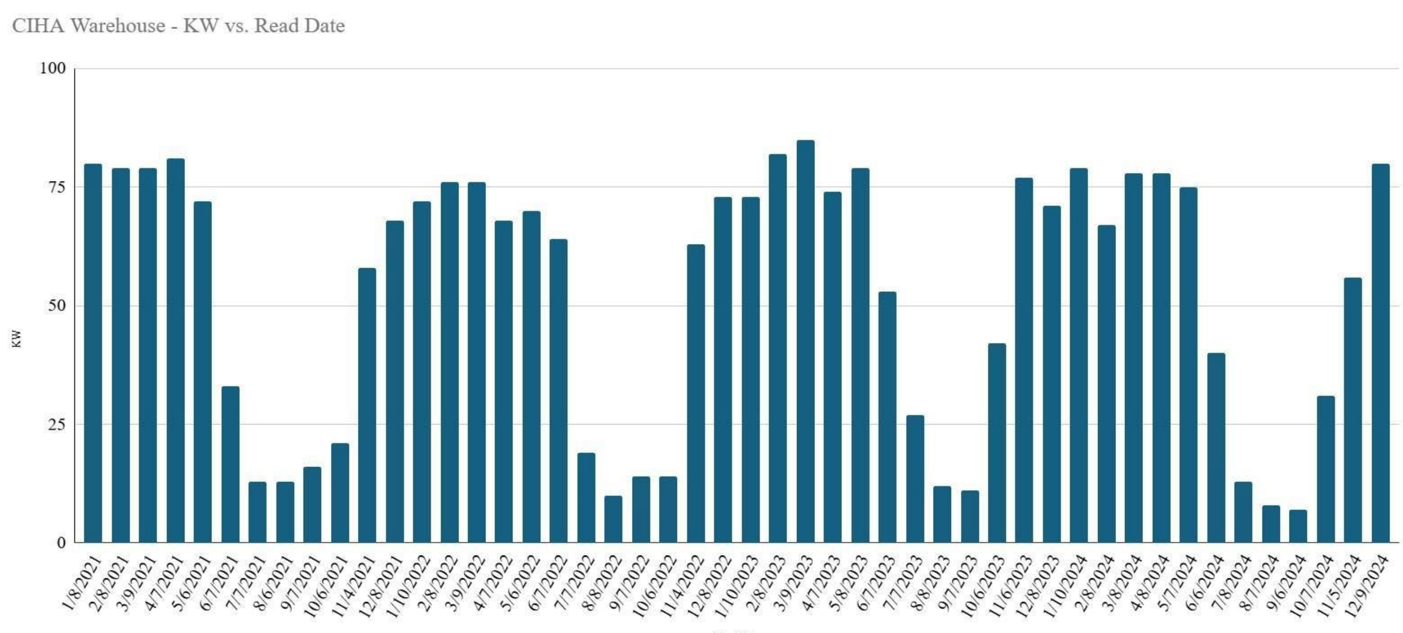


Fig 1.b - Daily peak kW demand by month over 4 years

2. Solar Resource Assessment:

The Warehouse Building is a newer building with good insulation, however, also with large bay doors for vehicles to drive inside. PV arrays totaling 66kWdc were installed on the south facing roof and connected to 4ea Sol-Ark 15K inverters. Drawings for the installation were provided by the Coquille Indian Tribe and utilized in this report (fig 2.a). No load analysis was performed for the roof structure to determine whether it could support the weight of the arrays. It is assumed the installing company performed structural engineering and passed local structural inspection.

Utilizing Helioscope solar resource software, Sol Coast projects that the existing solar arrays totaling 66.6kWdc could produce 80MWh annually. (fig 2.b & c) This is 25% over the projected annual Net Zero goals for the building as it is now used. Energy produced in excess of meter loads is net metered in aggregate with two additional meters managed by CIHA to accommodate billing credits against those meters.

Fig 2.a - Canopy Solar Site Plan

Solar Resource (Avg Annual Usage= 63,700kWh)	Array kWdc	Avg TSFR	Footprint (square feet)	Winter Prod (kWh/day)	Summer Prod (kWh/day)	Annual Prod (kWh/year)	% of Net Zero (%)
Roof Top Arrays (15deg tilt / 218deg Azimuth)	66.6	92.8	3500	117	419	80,000	125.59%

Fig. 2.b - Array Production

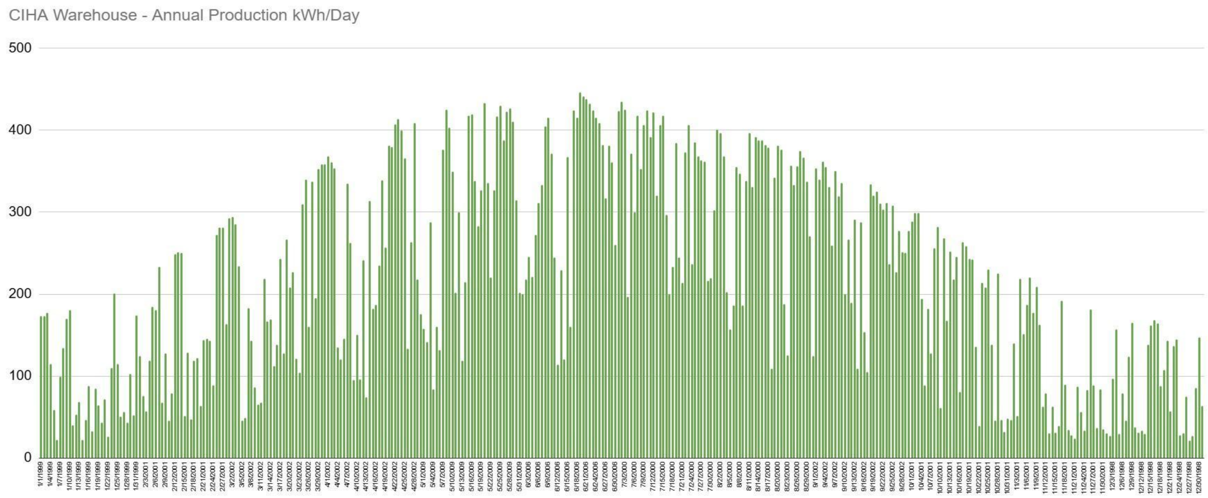


Fig 2.c - Annual kWh/day solar electricity production profile per Helioscope analysis

Though additional PV generation is not needed to balance any facility net metering goals, the building location is out of the Tsunami Zone and contains critical resources key for community disaster recovery. Additional solar generation can be accommodated by the service meter and transformer, which could increase the energy security of the building during extended utility outages. Cantilevered solar canopies with an array capacity of 35kWdc each could be constructed on the southern face of the building with the additional benefit of providing cover over the utility bay doors. (Fig 2-d) These canopies could be either fixed tilt or single axis tilting. A matching additional 115.2kWh battery storage is also suggested to connect with the additional solar, connecting to loads in the 800A MSP. This system would mirror the existing 4ea Sol-Ark 15K inverters and battery storage. Doubling the energy generating and storage potential for the building. Costs for this addition are included in financials.


Fig 2.d - Concept for additional PV arrays. 35kWdc each

3.**<u>Battery Storage Usage</u>**:

Battery Storage was investigated from multiple usage scenarios including Resilience, Peak Demand Shaving, Time of Use and Demand Response. Resilience and Demand Response have immediate value for CIHA. Peak Demand and Time of Use do not contribute to immediate monetary benefits however both could have future benefits and be considered for potential future utility cost savings and for compatibility within a future Tribal utility or Virtual Power Plant configuration. However, both peak shaving and time of use programming would contribute to local distribution system grid resilience by reducing the frequency and duration of daily and seasonal rolling brown and blackouts anticipated during the winter and high temperature summer seasons for the region.

Resilience backup provides security and resilience against utility outages and service irregularities (service blips, and brownouts). Scenarios include battery backup of Critical Loads for individual load panels, and for whole building backup. There is no onsite generator at the facility to provide backup for facility loads. The lack of generators can be alleviated with a battery energy storage system to provide backup power during grid down scenarios. A small mobile fuel generator could be used to charge batteries at multiple facilities during outages when no solar gain is present. This strategy allows the generator to operate at maximum efficiency for shorter periods and to minimize the expense of multiple, additional permanent generators.

The installed battery system consists of two separate battery banks of 28.8kWh, totaling 57.6kWh together. Each system is connected to a sub-panel in the facility, providing back up power to each. The Main Service Panel, consisting mostly of the facility's heating and venting mechanicals, is not directly connected to the battery storage system. The Sol-Ark inverters are programmed to "Grid Sell" only, utilizing the batteries solely as a backup system for grid down scenarios. While each load sub-panel will be powered separately by each associated BESS, it was not determined if the inverters were programmed to send power from the batteries to the MSP, as well, during grid down scenarios or only for Grid Sell when grid connection is available. The Sol-Ark inverters can be programmed to use battery storage for Time of Use and Demand Peak Shaving, using batteries for additional future utility cost savings and contributing to local grid energy security by potentially alleviating or reducing the frequency of local brown or black outs during peak energy usage periods. It is recommended that the Tribe look into current settings and determine the best settings for future usage.

The average daily peak demand at the Plank House is 53kW, with an annual average demand of 2.5kW. The minimum demand is 1kW at all hours of the day whenever the facility is not in use. The averages, max, and min can be used when calculating storage hrs for backup loads.

Peak Demand Shaving uses BESS to maintain demand peaks below utility thresholds as described in the Energy Usage section. In April of 2025, Pacific Power announced their Time of Use program, which offers ratepayers the option to receive a discounted tariff for energy usage during non-peak periods in exchange for an elevated tariff rate for any energy consumed between 5p-9p. This option can be leveraged through using BESS to power loads during Time of Use periods which reduces grid impacts and can result in utility savings. These use cases are of value to the resilience of the local distribution system which also supplies power to Tribal member residents and present the potential for future financial benefits to CIHA toward electricity costs.

<u>Whole Building Back Up battery usage</u>:

Based on a max, peak usage, load of 85kW (Mar 2024), a min battery capacity of 340kWh would be required to back up a continuous 85kW load for 4 hrs. A battery capacity of 85kWh would be required to back up 1hr of the same 85kW max peak load. If Monthly demand peaks are averaged, the monthly peak average is 53kW. Backing up this load for 4 hrs would require a min battery capacity of 212kWh. 8hrs of load requires 424kWh. The current battery capacity 57.6kWh is well under the required amount to power such peak loads for any significant amount of time. If the batteries are not backing up loads in the MSP, the BESS won't cover these peak loads effectively.

The annual average daily demand is 2.5kW. A min battery capacity of 10kWh would be required to back up a load of 2.5kW for 4 hrs. 20kWh of battery capacity for 8 hrs. To cover the average continuous load during daily operations (8kW) at the Maintenance Building for 4hrs requires a battery with a min capacity of 32kWh and adds up to 64kWh for 8 hrs and 96kWh for 12 hrs of coverage. The battery system in place can handle these loads for an estimated 7.2hrs. The BESS may be adequate for short duration; however, the Tribe may want to consider adding capacity if there is a desire to cover larger mechanical equipment loads in the MSP. This facility is importantly above the Tsunami Zone. In terms of emergency preparedness, and community resilience, this building's solar + storage capacity could be overbuilt for immediate use, with the capacity to increase localized demand when needed.

Some of the best use cases for the whole building back up are Peak Demand Shaving and Time of Use coverage, both could present a future financial benefit to CIHA. Perhaps the most valuable battery management scenario is for peak shaving which benefits the local energy distribution system by reducing peaks and, hence, the potential for rolling brown and blackouts during peak hours for the Tribal residents of the Kilkich Reservation. Another good use for whole building backup, however, occurs during short, but increasingly frequent brief outages, power fluctuations, and brownouts, which contribute to sensitive electrical equipment failures and require manual resets of automated systems. The current inverter settings only allow the battery system to provide the latter, which is understandable, as Time of Use and Peak Shaving are only recently coming into play as newer programs with Pacific Power.

Critical Load Back Up battery usage:

Using the battery storage to backup only designated critical loads in a specified critical loads panel, extends the amount of hrs a specifically sized battery can provide power to cover those critical loads, as one is minimizing the amount of load the batteries need to support. Dedicated critical loads panels can allow for a smaller specific number of critical loads to be powered by the Solar + Storage system for a longer period of time. The two load sub-panels in the facility, currently connected and backed up by the battery storage, can function as critical load panels. They have easily accessible breakers to disconnect feed to loads and shed demand. By shedding unnecessary loads, and controlling demand, CIHA staff could extend BESS supported backup time during prolonged outages. To better understand the actual loading and real time demand scenarios at each of the distribution panels, data from each of the Sol-Ark inverters can be examined, and Current Transformers (CTs) could be installed on various panel feeder lines, left in place to measure and gather interval data on the circuits over time.

Back Up Recommendation**:**

Sol Coast recommends full backup of each of the two 225A load sub-panels currently connected to each 28.8kWh battery storage unit. This amount of storage could accommodate close to 8hrs of non-peak operational power usage. While this seems adequate, CIHA will want to explore increasing battery storage size to support the building for grid outages of longer duration and to accommodate Time of Use and peak shaving to strengthen local grid reliability, especially since no other backup generation is currently available for the facility. Sol Coast would recommend doubling the current capacity to a total of 115.2kWh and looking to re-program inverters for Peak Load Shaving.

Demand (kW)	Use Case for Storage	1 hour (kWh)	4 hour (kWh)	8 hour (kWh)	12 hour (kWh)
2.5	Annual Ave	2.5	10	20	30
8	Occupied Ave	8	32	64	96
2	UnOccupied Av	2	8	16	24
53	Daily Peak Ave	53	212	424	636
1	Minimum	1	4	8	12
85	Yearly Peak	85	340	680	1020

Table 3.a - Energy storage requirements for various use cases

Equipment Summary:

Sol-Ark 15K inverters coupled with a compatible LFP battery for the battery backup system were identified in drawings provided by the Coquille Indian Tribe as part of the installation by GSC Construction. An electrical 3 line drawing from the construction set is provided below. The equipment data sheet is included in the Appendix.

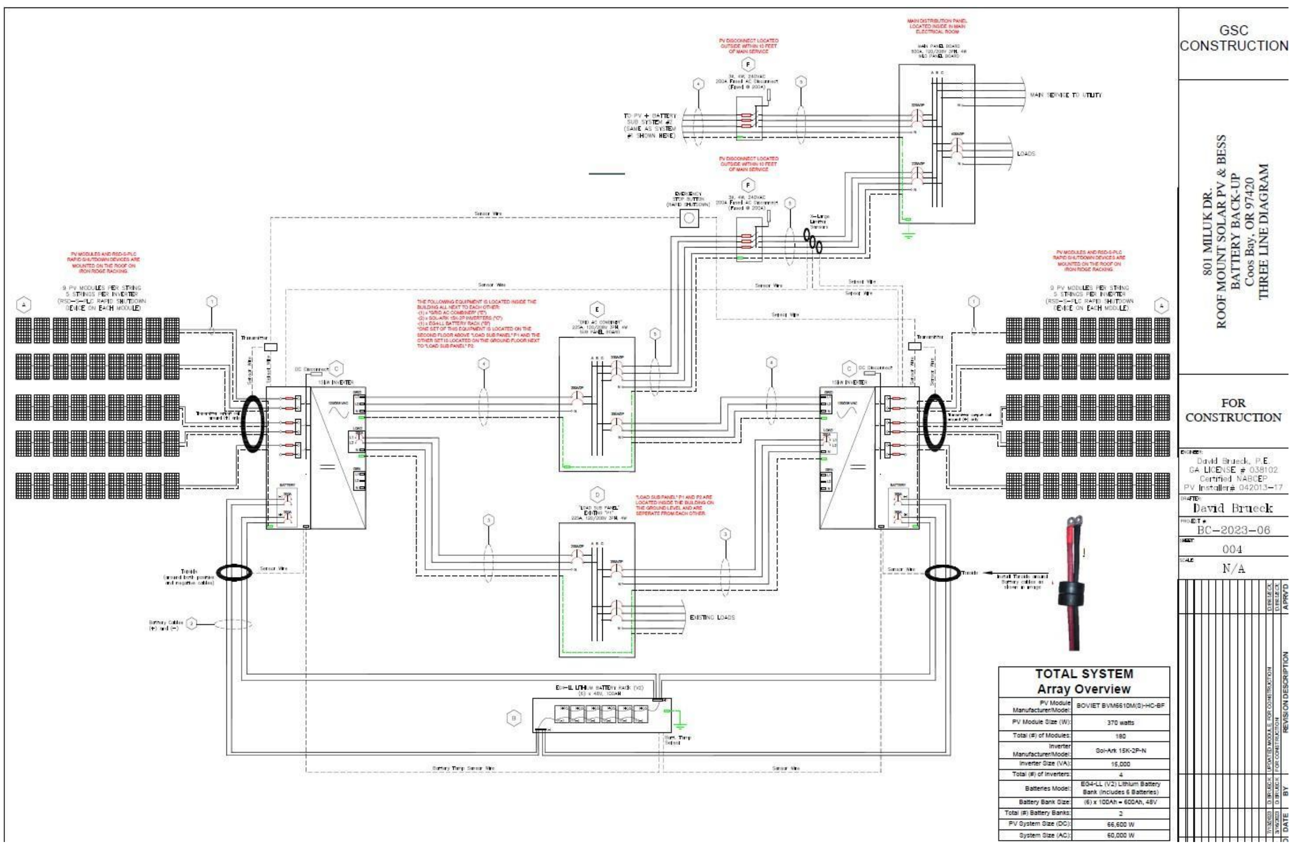


Fig 3.a - Electrical SLD

4.Financial Study:

The pricing for system equipment includes PV modules, canopy structure and related module racking, solar energy inverters, battery storage banks, balance of system components including required disconnects, shutdown devices, distribution block, and load panels. Labor and installation costs were estimated based on system size, design of array and structure, and installation site complexities. Also included in the project cost estimates are fees and labor for permitting, engineering, and project management. Additional costs for trenching to identified canopy locations are not included.

Planning budgets are provided below (table 4a) for full system development and for incremental projects broken down by canopy location and battery bank sizing. Included are system budgets for the addition of battery only for peak demand shaving, and for additional solar + storage for community resilience.

CIHA Warehouse Solar & Storage	Array Size	Units	PV	Inverter AC size	Units	Inverter	Battery	Racking &	BOS	Permitting	Design & Engineerin	Project Manage	Installation	Total
Peak Demand PV	0	kWdc	$ -	0	kWac	$ -		$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Peak Demand BESS	57.6	kWh					$ 40,320		$ 2,016	$ 2,500	$ 10,000	$ 3,444	$ 11,480	**$ 69,760**
Com Resilience PV	70	kWdc	$ 35,000	15	kWac	$ 7,500		$ 168,000	$ 1,750	$ 5,000	$ 20,000	$ 30,100	$ 301,000	**$ 568,365**
Com Resilience BESS	57.6	kWh					$ 40,320		$ 2,016	$ 5,000	$ 20,000	$ 1,148	$ 11,480	**$ 79,964**

Table 4a Project development planning budgets

Existing federal, state, public purpose and utility incentives that could affect the financial feasibility of installing solar projects at Kilkich are those with upfront capital development payments (table 4b):

- Energy Trust of Oregon solar and storage incentives are available to support proposed systems but require reservation of the active published incentive rate by an Energy Trust Solar Trade Ally. Incentive rates are published at [Solar: Making Solar Equitable - Energy Trust of Oregon] and subject to reduction at any time.
- Environmental Protection Agency (EPA) Grid Resilience Grant – CIT has secured $500,000 of grant funding for energy storage through EPA's Grid Resilience Grant fund. The energy storage components presented are eligible for funding through this program.
- WattSmart Program In March of 2025, PacifiCorp was approved to operationalize their Wattsmart Battery Program, a demand response program specific for battery energy storage systems in Oregon. The new program will offer upfront incentives for customers enrolling in the program, which grants the utility permission to use customer-installed battery systems to balance energy flows during certain conditions for a four-year period. Additional bill credits are applied to the customer annually based on utility usage and battery size. The program cap of $18,000 may be increased based on PacifiCorp project specific authorization.
- Oregon Community Renewable Energy Program (C REP) - Fifth funding round anticipated Q2 2026

Source	Description	Fund	Per	Max	Availability
ETO	Commercial PV	$0.10	watt	$10,000	Current
	Battery Storage thru 12/31/2025	$400	kWh	$12,000	Current
	Battery Storage starting 1/1/2026	$300	kWh	$9,000	1/1/2026
ODOE	Community Renewable Energy Program, resilience project planning			$100,000	Competitive Award
	Community Renewable Energy Program, resilience development			$1,000,000	Competitive Award
Pacific Power	Wattsmart Battery Storage, commercial with PV	$600	kW	$18,000	Current
	Time of Use Pricing: Non-Peak Hour credit SCH 23	$0.02532	kWh		Current
	Time of Use Pricing: Non-Peak Hour credit SCH 29	$0.0169	kWh		Current

Table 4b Summary of funding sources and status as of November 2025

Other funding streams historically available but currently dependent on proactive policy actions include:

- Federal Emergency Management Agency grants
- Oregon Solar and Storage rebates

Savings:

Presently, CIHA receives federal entitlement reimbursements for electricity expenses. Accordingly, the financial benefits of energy offsets, Time of Use rate benefits and Peak Shaving will not be captured. However, the potential fiscal impacts of the various solar and BESS configurations under alternate federal reimbursement or tribally owned utility scenarios are estimated based on current energy tariffs and participation in the Time of Use program. The following table (4c) summarizes project costs and the potential for application of currently available incentives and secured grants:

CIHA Warehouse Solar & Storage Options	Total	Grid Resilience	Block Grant	Energy Trust of	Wattsmart*	OTHER	Balance
Peak Demand PV	$ -						
Peak Demand BESS	$ 69,760	$ 69,760					$ -
Com Resilience PV	$ 568,365						$ 568,365
Com Resilience BESS	$ 79,964	$ 69,760					$ 10,204

Table 4c Summary of system sizes and available funding

A simple return on investment for each system based on system net costs after current Energy Trust of Oregon and PacifiCorp WattSmart incentive rates was calculated (table 4d):

CIHA Warehouse Solar & Storage Options	Production (MWH/Yr)	Peak Storage (Hr)	Production Value***	Annual O&M****	ROI Cash (Years)
Peak Demand Solar	**80**		$ 9,866	$ 1,400	0
Peak Demand BESS		16	$ 2,026	$ 288	0
Com Resilience PV	**90**		$ 11,015	$ 1,400	48
Com Resilience BESS		8	$ 2,266	$ 288	5
Existing tarrif/kWh SCH 23	$0.14	/kWh	1st MWH/mo		
Existing tarrif/kWh SCH 23	$0.12	/kWh	After 1st MWh		
Time of use credit/kWh SCH 23	$0.03	/kWh			
***	Based on offset of retail purchases and enrollment in Time of Use credits				
****	National Renewable Energy Laboratory (NREL) Home Page | NREL				

Table 4d Simple ROI on a net cash basis

To inform the evaluation of the impacts of various funding strategies and the resulting return on investment, the energy less maintenance value of the system was calculated for the first 20 years for the Warehouse Solar + Storage system (table 4e):

Year of Operation	1	2	3	4	5	6	7	8	9	10
Cumulative Value	$ 8,466	$ 8,720	$ 8,982	$ 9,251	$ 9,529	$ 9,814	$ 10,109	$ 10,412	$ 10,724	$ 11,046
Year of Operation	11	12	13	14	15	16	17	18	19	20
Cumulative Value	$ 11,378	$ 11,719	$ 12,070	$ 12,433	$ 12,806	$ 13,190	$ 13,585	$ 13,993	$ 14,413	$ 14,845

Table 4e 20 year net system value evaluation

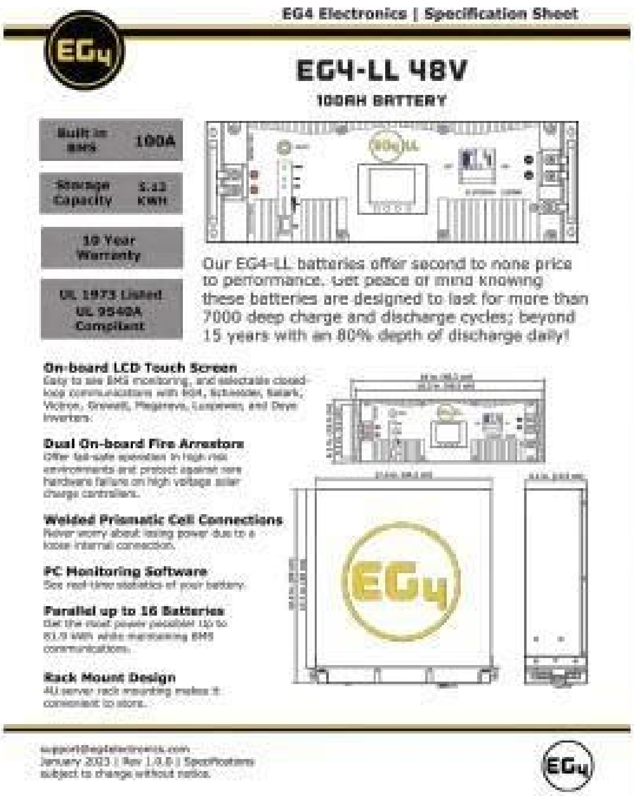
While not captured in this analysis, the most impactful savings to CIHA and CIT of the proposed system is to the metered facility and the electricity network serving Kilkich Reservation by reducing the frequency and duration of brown or black out events and the resulting loss of life or livelihood endured during those events.

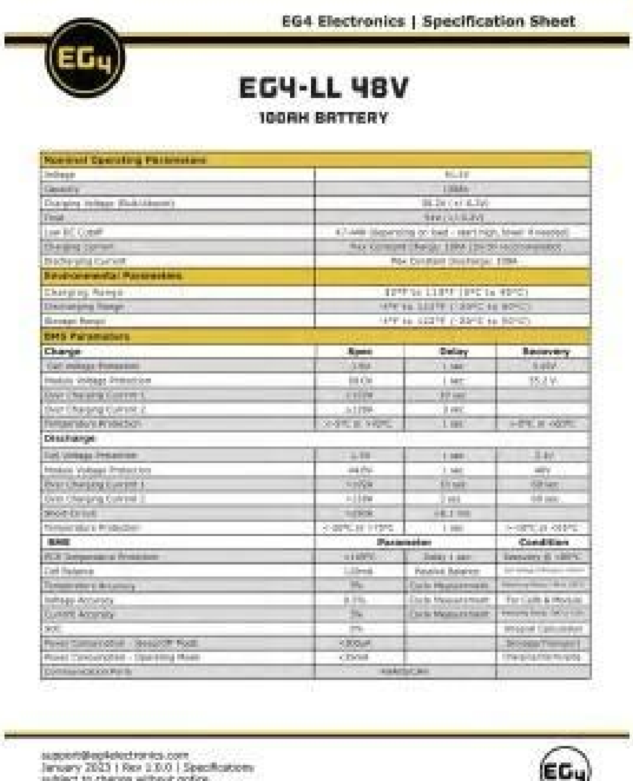
5.<u>Next Steps</u>:

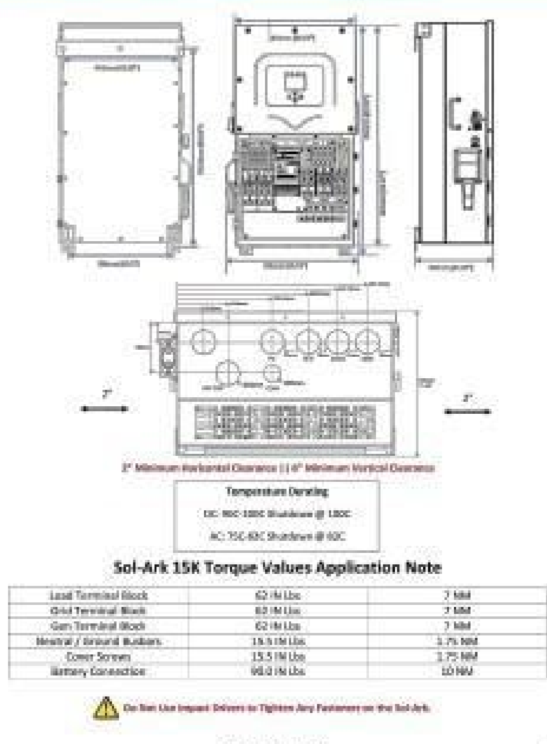
The next steps for pursuing the first phase of development are as follows:

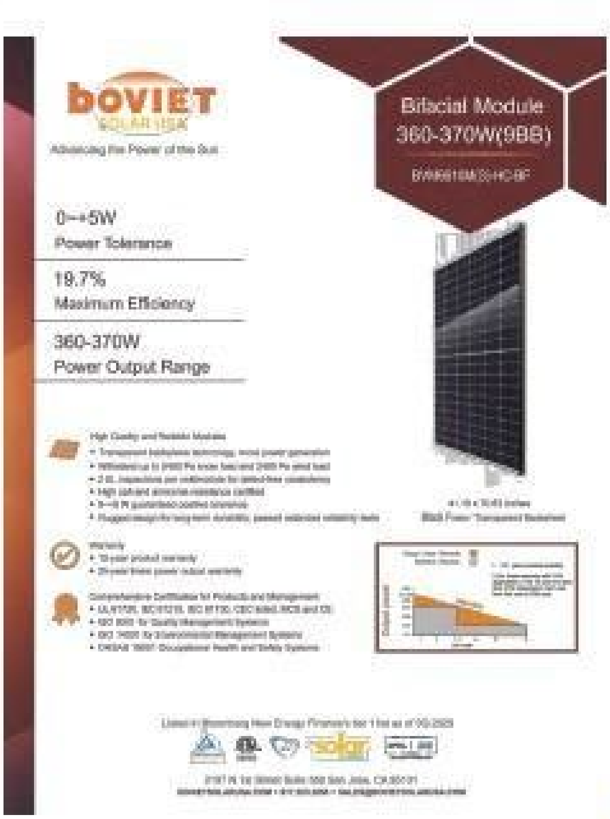
- Finalize locations for inverters, disconnects and batteries
- Formalize interconnection request for largest potentially funded system from Pacific Power
- Reserve Energy Trust of Oregon solar and battery storage installation incentives
- Prepare grant applications for balance of funding required
- Prepare design build scope of work pending funding award
- Contract for design and construction services
- Initiate permitting processes for structures and electrical contracting

Equipment Specifications:








BOVIET SOLAR USA

Bifacial Module
360-370W(9BB)

0~+5W
Power Tolerance

19.7%
Maximum Efficiency

360-370W
Power Output Range

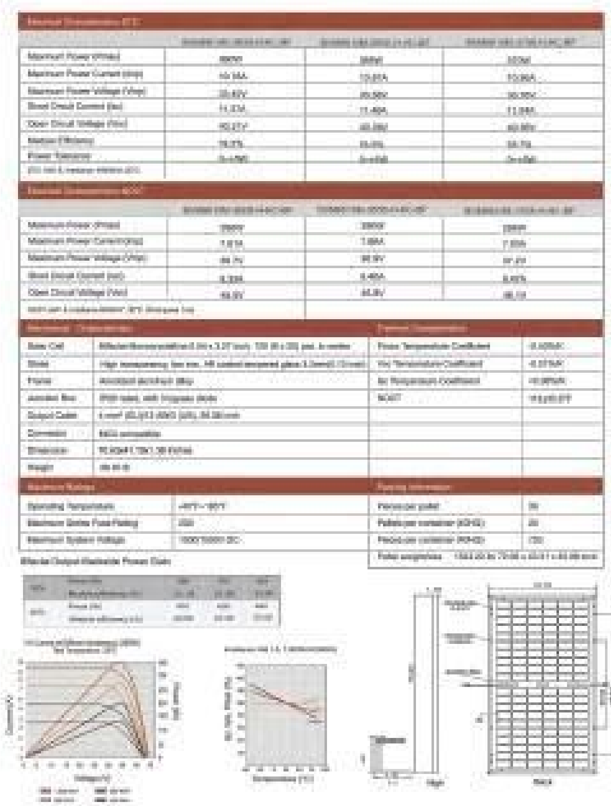

IRONRIDGE

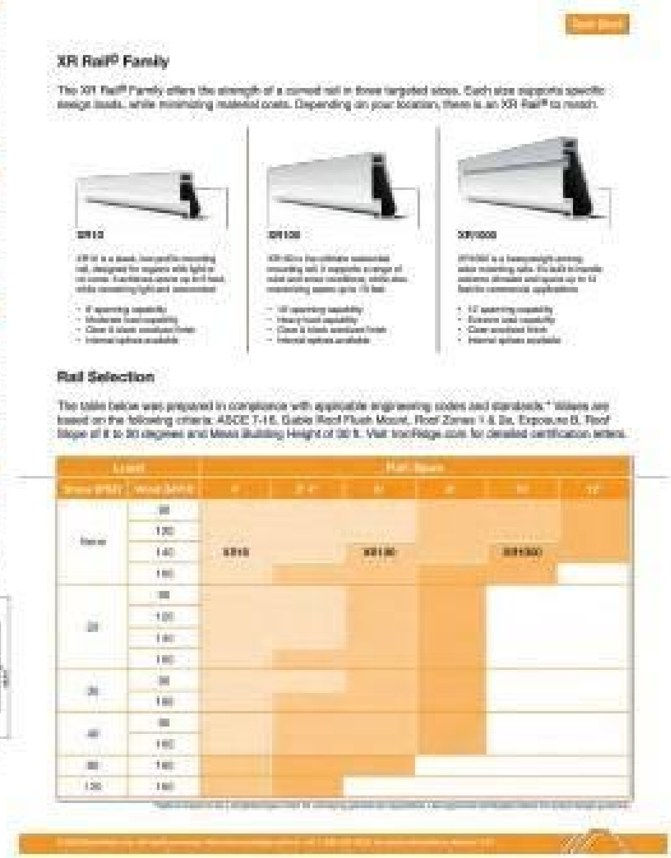
XR Rail® Family

Solar Is Not Always Sunny

Compatible with Flat & Pitched Roofs

Corrosion-Resistant Materials




XR Rail® Family

XR10

XR100

XR1000

Rail Selection

Design 2 CIHA Warehouse 801 Miluk Dr, Coos Bay, OR 97420, USA

Project Details

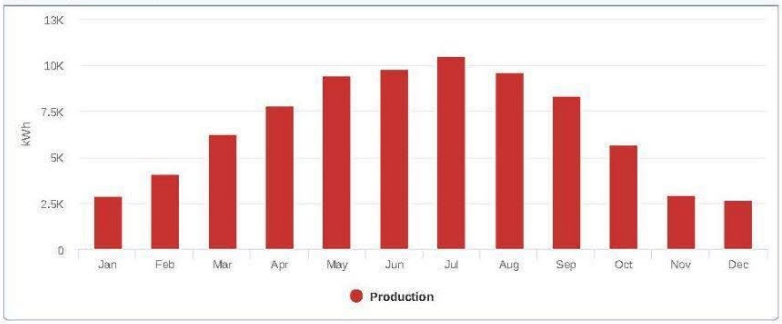
Address	801 Miluk Dr, Coos Bay, OR 97420, USA
Owner	Rick Zitzmann
Last Modified	Rick Zitzmann 5 minutes ago
Location	(43.35746559999999, -124.2935022) (GMT -8)

System Metrics

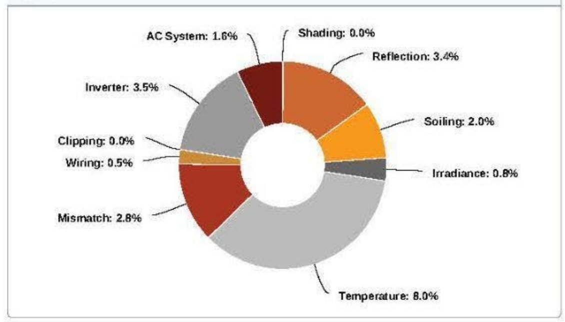
Design	Design 2
Module DC Nameplate	66.6 kW
Inverter AC Nameplate	60.0 kW Load Ratio: 1.11
Annual Production	80.0 MWh
Performance Ratio	79.2%
kWh/kWp	1,201.1
Weather Dataset	TMY, 10km Grid (43.35,-124.25), NREL (prospector)
Simulator Version	6ab36465a1-86f33c1457-24fd304c90-46776630f3

Project Location

Energy Consumption



System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m²)	Annual Global Horizontal Irradiance	1,393.8	-
	POA Irradiance	1,516.0	8.8%
	Shaded Irradiance	1,515.9	-0.0%
	Irradiance After Reflection	1,464.0	-3.4%
	Irradiance After Soiling	1,434.7	-2.0%
	Total Collector Irradiance	**1,434.7**	**0.0%**
Energy (kWh)	Nameplate	95,558.0	-
	Output at Irradiance Levels	94,779.8	-0.8%
	Output at Cell Temperature Derate	87,181.1	-8.0%
	Output After Mismatch	84,707.3	-2.8%
	Optimal DC Output	84,277.3	-0.5%
	Constrained DC Output	84,276.5	-0.0%
	Inverter Output	81,326.8	-3.5%
	Energy to Grid	**79,996.6**	**-1.6%**
Temperature Metrics			
	Avg. Operating Ambient Temp		12.8°C
	Avg. Operating Cell Temp		28.4°C
Simulation Metrics			
	Operating Hours		4,645
	Solved Hours		4,645
	Pending Hours		-
	Error Hours		-

Condition Set

Description	Condition Set 1
Weather Dataset	TMY, 10km Grid (43.35,-124.25), NREL(prospector) (download)
Solar Angle Location	Meteo Lat/Lng
Transposition Model	Perez Model
Temperature Model	Sandia Model
Irradiation Variance	5.0%
Cell Temperature Spread	4.0°C
Module Binning Range	-2.5% to 2.5%
AC System Derate	0.50%

Temperature Model Parameters

Rack Type	a	b	Temperature Delta
Fixed Tilt	-3.56	-0.08	3.0°C
Flush Mount	-2.81	-0.05	0.0°C
East-West	-3.56	-0.08	3.0°C
Carport	-3.56	-0.08	3.0°C

Soiling (%)

J	F	M	A	M	J	J	A	S	O	N	D
2	2	2	2	2	2	2	2	2	2	2	2

Component Characterizations

Type	Component	Characterization
Module	BVM6610M-370S-H-HC-BF (1500V) (Boviet)	Spec Sheet Characterization, PAN
Inverter	Sol-Ark-15K-2P (Sol-Ark)	Spec Sheet

Design BOM

Component	Type	Quantity
10 AWG (Copper)	AC Home Runs	4
500 MCM (Copper)	AC Home Runs	1
4 input AC Panels	AC Panels	1
Sol-Ark-15K-2P	Inverters	4
BVM6610M-370S-H-HC-BF (1500V)	Modules	180
10 AWG (Copper)	Strings	20

Monthly Shading

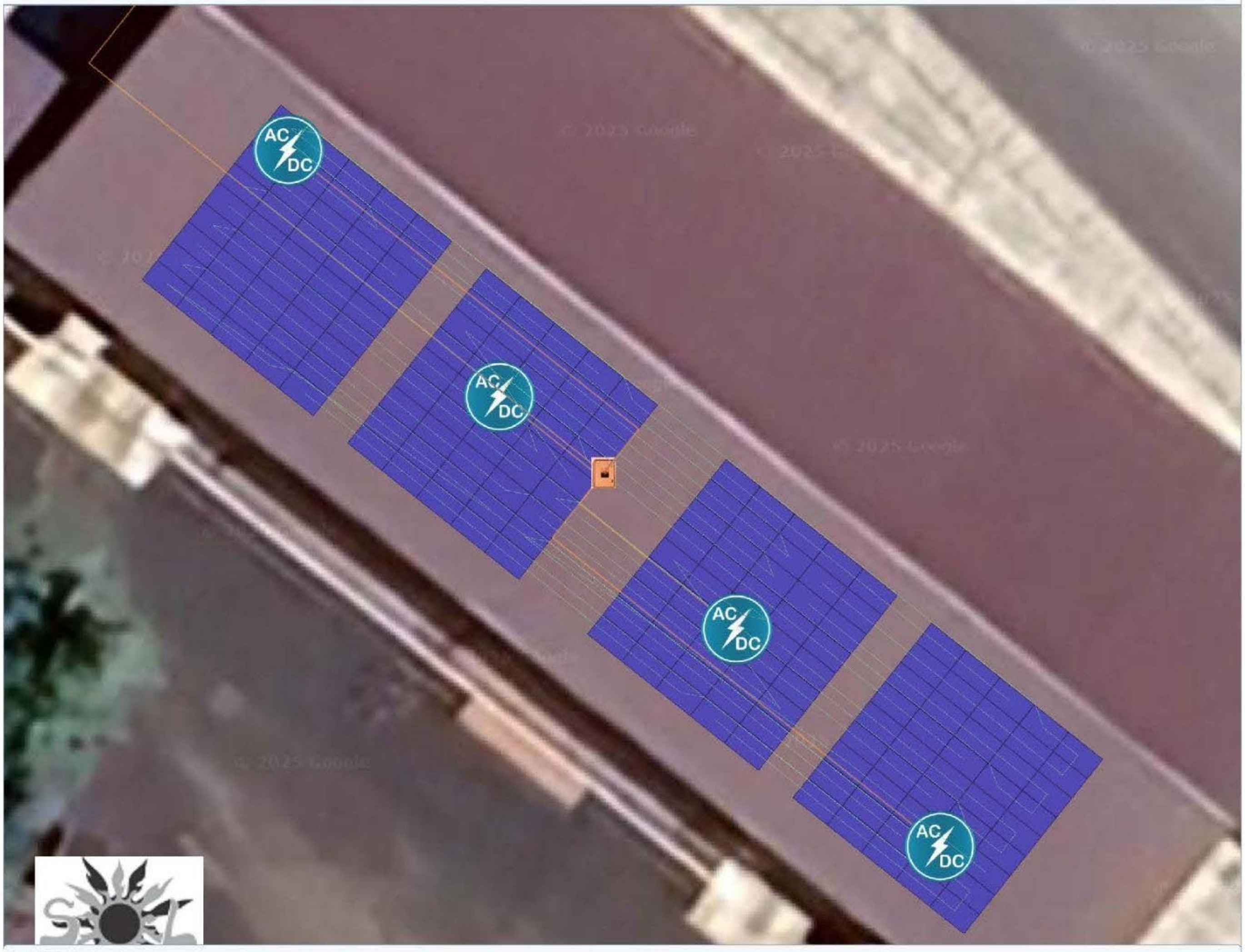
Month	GHI (kWh/m²)	POA (kWh/m²)	Shaded (kWh/m²)	Nameplate (kWh)	Grid (kWh)
January	41.5	51.4	51.4	3,171.2	2,851.3
February	63.1	74.4	74.4	4,647.6	4,096.3
March	102.4	114.7	114.7	7,206.9	6,260.6
April	137.0	145.5	145.5	9,192.6	7,795.7
May	176.7	180.8	180.8	11,442.3	9,459.4
June	183.3	187.6	187.6	11,877.8	9,771.1
July	197.0	204.2	204.2	12,952.6	10,513.2
August	176.3	187.2	187.2	11,869.9	9,632.6
September	144.7	161.5	161.5	10,207.6	8,338.8
October	90.3	107.0	107.0	6,702.1	5,682.0
November	44.1	53.6	53.6	3,327.3	2,921.9
December	37.5	48.1	48.1	2,959.9	2,673.7

Project Location

Design Wiring Zone

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	4 - 12	Along Racking

Design Render

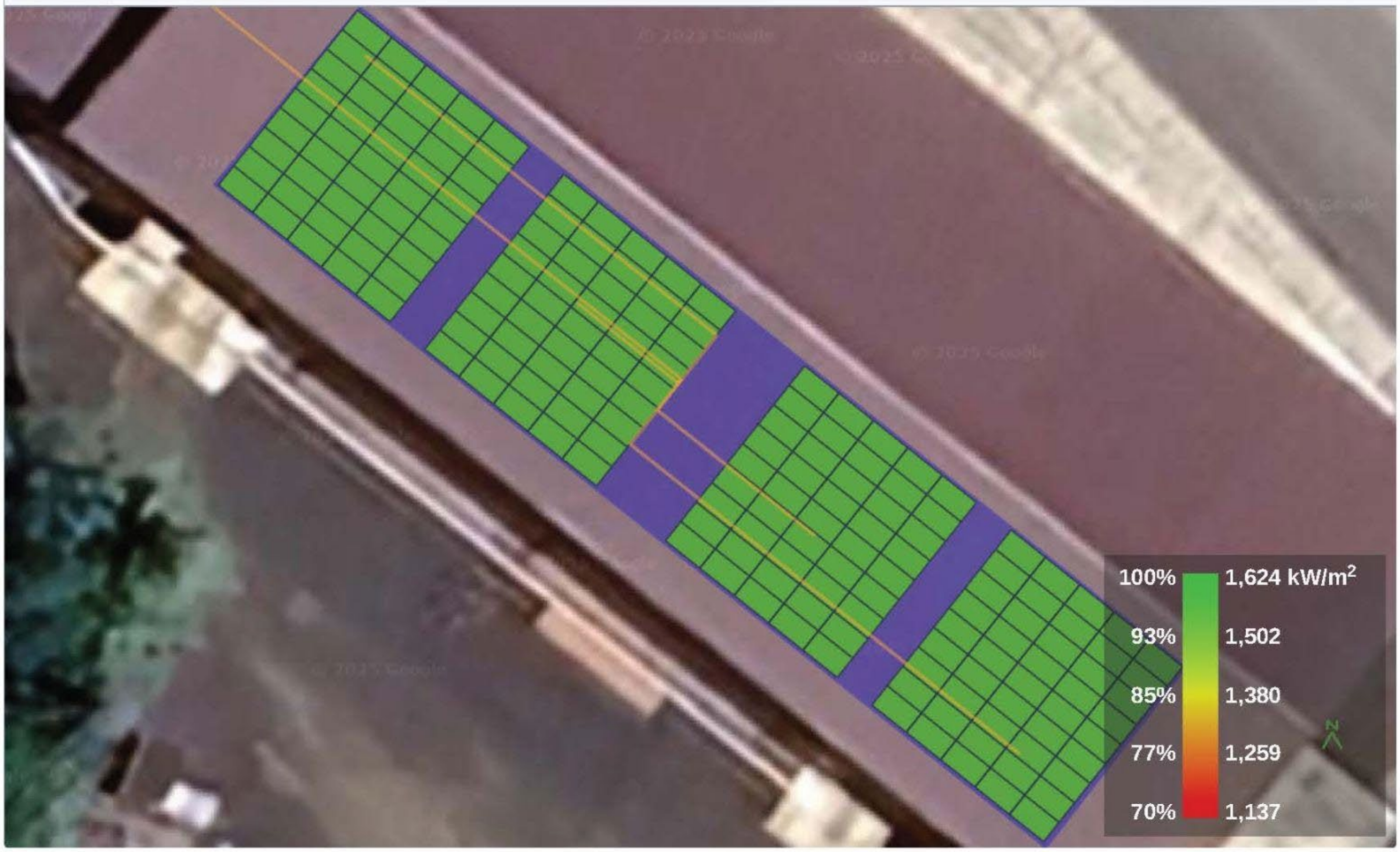


Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Flush Mount	Landscape (Horizontal)	15°	218.5°	0.0 ft	1x1	180	180	66.60 kW

Design 2 CIHA Warehouse, 801 Miluk Dr, Coos Bay, OR 97420, USA

Shading Heatmap



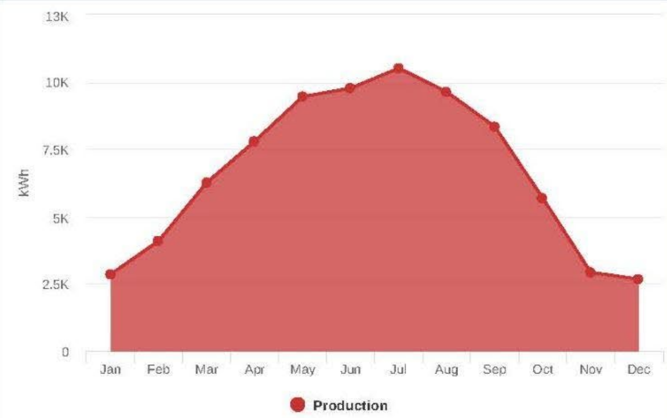
Shading by Field Segment

Description	Tilt	Azimuth	Modules	Nameplate	Shaded Irradiance	AC Energy	TOF[2]	Solar Access	Min TSRF[2]	Avg TSRF[2]
Field Segment 1	15°	218.5°	180	66.60 kWp	1,515.9 kWh/m^2	80.00 MWh[1]	93.3%	100.0%	93.3%	93.3%
Totals, weighted By kWp			**180**	**66.60 kWp**	**1,515.9 kWh/m^2**	**80.00 MWh**	**93.3%**	**100.0%**	**93.3%**	**93.3%**

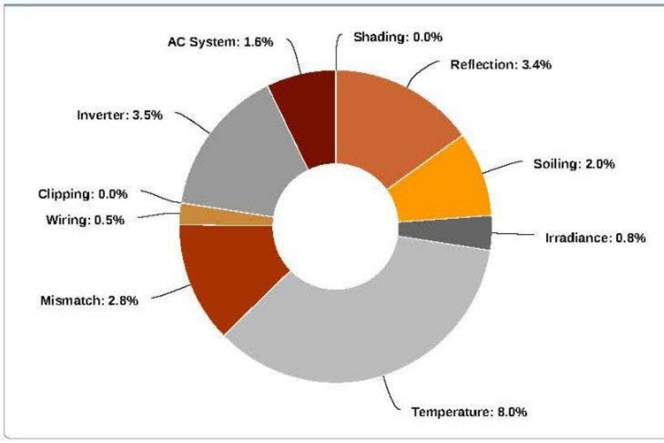
[1]approximate, varies based on inverter performance
[2]based on location Optimal POA Irradiance of 1,624.1 kWh/m^2 at 35.1° tilt and 183.9° azimuth

Design 2 CIHA Warehouse, 801 Miluk Dr, Coos Bay, OR 97420, USA

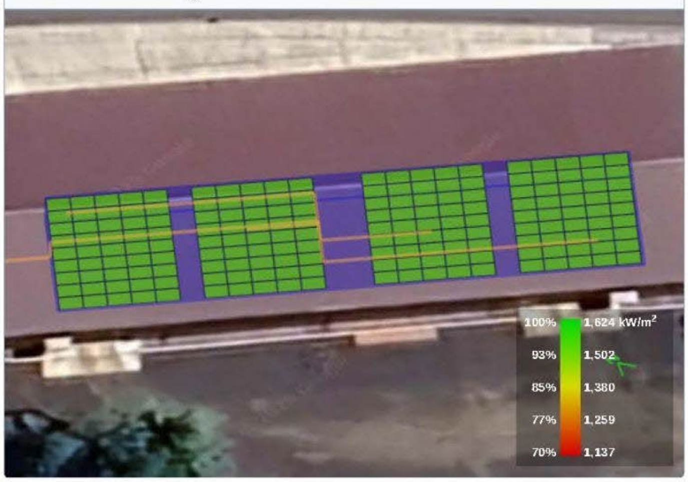
Energy Consumption



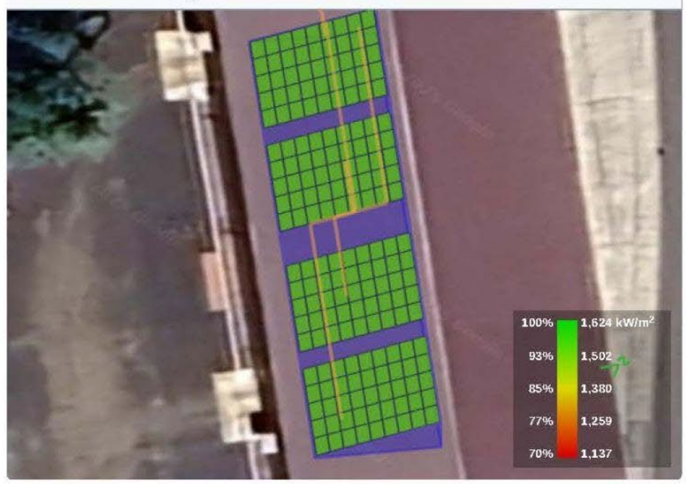
System Loss



Southwestern Angle



Southeastern Angle



Solar Access by Month

Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Segment 1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Solar Access, weighted by kWp	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
AC Power (kWh)	2,851.3	4,096.3	6,260.6	7,795.7	9,459.4	9,771.1	10,513.2	9,632.6	8,338.8	5,682.0	2,921.9	2,673.7