CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

ENERGY RESEARCH AND DEVELOPMENT DIVISION

FINAL PROJECT REPORT

Imperial Western Products Microgrid Project

November 2025 | CEC-500-2025-048

PREPARED BY:

Joseph Boyd
Imperial Western Products
Primary Authors

Claire Sweeney
Project Manager
California Energy Commission

Agreement Number: FPI-19-033

Alex Horangic
Branch Manager
SUSTAINABILITY AND RESILIENCE BRANCH

Jonah Steinbuck, Ph.D.
Director
ENERGY RESEARCH AND DEVELOPMENT DIVISION

Drew Bohan
Executive Director

ACKNOWLEDGEMENTS

Imperial Western Products would like to thank the California Energy Commission for the opportunity. We would also like to thank the City of Coachella, Imperial Irrigation District, California Department of Food and Agriculture, and Gridscape for their support in the project.

PREFACE

The California Energy Commission's (CEC) Energy Research and Development Division supports energy research and development programs to spur innovation in energy efficiency, renewable energy and advanced clean generation, energy-related environmental protection, energy transmission and distribution and transportation.

The Food Production Investment Program, established in 2018, encourages California food producers to reduce greenhouse gas (GHG) emissions. Funding comes from the California Climate Investments program, a statewide initiative that uses cap-and-trade dollars to help reduce GHG emissions, strengthen the economy, and improve public health and the environment.

The food processing industry is one of the largest energy users in California. It is also a large producer of GHG emissions.

The Food Production Investment Program will help producers replace high-energy-consuming equipment and systems with market-ready and advanced technologies and equipment. The program will also accelerate the adoption of state-of-the-art energy technologies that can substantially reduce energy use and costs and associated GHG emissions.

IWP Microgrid Project Final Report is the final report for the IWP Microgrid Project (FPI-19-033) conducted by Imperial Western Products, Inc. The information from this project contributes to the Energy Research and Development Division's FPIP Program.

For more information about the Energy Research and Development Division, please visit the CEC's research website (www.energy.ca.gov/research/) or contact the CEC at ERDD@energy.ca.gov.

ABSTRACT

Imperial Western Products (IWP) implemented the IWP Microgrid Project (FPI-19-033) at its Coachella rendering facility to reduce reliance on grid electricity, lower greenhouse gas emissions, and increase operational resilience. The project deployed a microgrid system consisting of 2,068 photovoltaic solar modules, a 1,300-kilowatt-hour battery energy storage system, and Gridscape's advanced microgrid controller. Post-installation measurement and verification confirmed annual reductions of about 908,000 kilowatt-hours of grid electricity and 217 metric tons of carbon dioxide equivalent. The system ensures uninterrupted operations during power outages, preventing spoilage of perishable feedstocks and avoiding additional landfill emissions. Beyond direct environmental benefits, the project strengthens IWP's role as an employer in a disadvantaged community and demonstrates the technical feasibility of industrial microgrids. By sharing lessons learned with policymakers, trade associations, and local schools, IWP is helping advance adoption of microgrid technology across California to improve efficiency, resilience, and sustainability.

Keywords: Microgrid, Solar, Battery Storage, Food Production Investment Program, Food Processing

Please use the following citation for this report:

Boyd, Joseph, 2025. *Imperial Western Products, Inc. IWP Microgrid Project Final Report.* California Energy Commission. Publication Number: CEC-500-2025-048.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Executive Summary

Introduction

Imperial Western Products' (IWP) primary business since 1966 — rendering and processing residual and waste foods into animal feed — is a critical process that California relies on to reduce organic waste and minimize greenhouse gas (GHG) emissions associated with food waste degradation in landfills. Imperial Western Products sources its feedstocks from local cotton gins, food and pet food manufacturers, and used cooking oil producers, supporting the local economy and providing in-state opportunities for salvaged food recovery and recycling. Imperial Western Products also converts a portion of collected used cooking oil to biodiesel, supporting additional GHG emissions reductions by producing approximately 12 million gallons of biodiesel each year.

Programs like the California Energy Commission's (CEC) Food Production Investment Program are essential for food producers seeking to reduce costs and contribute to climate solutions by adopting innovative projects that save energy and shrink their carbon footprints in California.

Project Purpose

The purpose of this project was to install a photovoltaic solar microgrid with storage capabilities to reduce energy consumption and ensure constant power at IWP's Coachella, California, organic food recycling facility. The facility relies on electrically powered processing equipment to convert food waste and agricultural byproducts into animal feed. The Coachella Valley experiences high winds that cause power outages at least once every year. Combined with the increasing prevalence of utilities cutting off power to reduce fire risk, IWP was concerned about facing future prolonged outages. If this were to occur, a significant portion of IWP's feedstock could spoil, leading to landfill disposal and negating potential GHG reductions. The microgrid system prevents this outcome by enabling continued processing without interruption.

The project planned to reduce 344 metric tons of carbon dioxide equivalent ($MTCO_2e$) of GHG emissions and to reduce grid electrical consumption by 1,510,000 kilowatt-hours (kWh) annually (about 35 percent of facility usage).

The project's methods and lessons learned will interest a broad spectrum of professions in the food production and processing industry: facility and sustainable managers; production designers and engineers; building energy analysts; local, regional, state, and federal energy policy analysts, policymakers and regulatory experts; and energy-efficiency consultants.

The project aimed to:

- Reduce GHG emissions, improving air quality in surrounding low-income and disadvantaged communities.
- Eliminate process downtimes due to power outages.

- Quantify energy savings, reduced downtime, and other benefits attained by the project, in comparison to the baseline.
- Demonstrate the technical and economic feasibility of a solar microgrid installation in a challenging industrial setting such as the IWP Coachella facility.
- Share knowledge about the project with other market segments in California that can use the technologies demonstrated.

In addition to the CEC, support for the project was provided by: city of Coachella, Imperial Irrigation District, California Department of Food and Agriculture, and California State Assembly Member Eduardo Garcia.

Project Approach

Successfully implementing a project of this scale required a team with expertise, experience, and innovative problem-solving skills. The core IWP project team members and their respective roles were:

- Joseph (Joe) Boyd, director of engineering, acting as project manager.
- Amanda Johnson, assistant controller, acting as administrator.
- Jason Cabanyog, vice president of operations, acting as outreach manager.
- Allen Burkett, controller, acting as accounting officer.
- David (Dave) Isen, risk manager, acting as legal counsel.

The renewable energy-consulting firm EcoEngineers conducted third-party measurement and verification (M&V) and related activities for this project. Equipment was procured from California-based vendors, including Gridscape Solutions for the battery energy storage system and microgrid controller, and Green Realties for solar panels, inverters, and transformers.

The city of Coachella issued the building permit on September 21, 2021. Construction and installation work began in October 2021 and was completed in February 2023. First, Green Realties erected the carport structures needed to support the solar panels. Next, IWP and Green Realties performed the trench work needed to install the conduit and cables, which connect the solar arrays to the distribution and service panels. Green Realties and Gridscape performed the installation of the solar panels, battery storage system, and other electrical gear to complete the microgrid system. Coachella's local electric utility, Imperial Irrigation District, issued the final interconnection authorization for the microgrid on June 6, 2023.

For M&V, EcoEngineers collected energy usage three months before and twelve months after equipment upgrade installations. To determine the energy savings, per the International Performance Measurement and Verification Protocol, the project team compared measured energy use before and after implementing the energy conservation measures.

$$\textit{Energy Savings} = \textit{Pre Installation Energy Use} - \textit{Post Installation Energy Use} \pm \textit{Adjustments}$$

EcoEngineers used production data to make adjustments to account for changes in the production of various animal feed products. Including production data allowed EcoEngineers to normalize the usage between the pre-installation and post-installation M&V periods. The

project team made adjustments to normalize production variations and measure efficiency both before and after equipment installation. The team also used the Gridscape EnergyScope cloud-based platform to record data on solar production, grid consumption, and plant load consumption (in conjunction with electricity bills).

Project Results

While the original goal of reducing 344 $MTCO_2e$ annually was not fully achieved, the project still delivered a significant annual reduction of 217 $MTCO_2e$ (22 percent), calculated using the average California electricity emissions factor. By displacing grid electricity with clean, zero-emission solar electricity, the project advanced the broader objective of establishing a cleaner, more efficient production process while enhancing resilience against grid power outages. The project achieved:

- Reduced grid electricity usage and associated GHG emissions by approximately 22 percent.
- Reduced GHG emissions associated with grid electricity by 217 $MTCO_2e$ annually.
- Eliminated process downtime due to grid outages and prevented GHG emissions from disposal of spoiled products in landfills.
- Reduced utility costs by approximately $200,000 per year, allowing IWP to be more resilient and supportive of securing quality jobs for members of the surrounding low-income and disadvantaged communities.
- Supported the economic competitiveness of California's food processing by demonstrating the benefits of an industrial microgrid installation.

The project used California-based suppliers and contractors to support local jobs while increasing the economic competitiveness of IWP as a business in a low-income, disadvantaged community.

Technology/Knowledge Transfer/Market Adoption (Advancing the Research to Market)

Imperial Western Products shared knowledge gained from this project with the surrounding communities. This included hosting a special press conference, organizing field trips for local schools, and communicating benefits to the local community through the Coachella Valley Chamber of Commerce. Imperial Western Products hosted a ribbon-cutting event with representatives from the CEC, Imperial Irrigation District, and California Department of Food and Agriculture in March 2023 to showcase the project; IWP also included the microgrid project in a presentation given to members of the California Feed and Grain Association in October 2022.

Knowledge shared about the project includes the benefits of microgrid technology including cost benefits to the upgrader (reduced utility costs and increased resilience), environmental benefits (reduced pollution), and benefits to employees and the local community (improved job resiliency and increased opportunities).

The project's methods and lessons learned will be of interest to a broad spectrum of professionals in the food production and processing industry including facility and sustainability managers, production designers and engineers, building energy analysts, local, regional, state, and federal energy policy analysts, policymakers, and regulatory experts, as well as energy-efficiency consultants.

CHAPTER 1:
Introduction/Project Purpose

Facility Overview

Imperial Western Products (IWP), founded in 1966, offers alternative solutions for leftover food by upcycling food destined for landfills into nutrient-rich animal feed. Imperial Western Products started by processing cottonseed from local gins at its original plant located in Coachella, California. As IWP grew, it started implementing other feed operations and functions. As a result, IWP now specializes in producing animal feed from various sources like cottonseed, leftover bakery byproducts, dried poultry litter, expired pet food, and other commodities. Imperial Western Products is also home to one of the largest biodiesel manufacturing plants on the West Coast.

Today, IWP operates nine locations across the Southwest, many located in low-income and/or disadvantaged communities. In addition, IWP has a variety of brands within its affiliation, including:

- Bakery solutions that specialize in processing bakery waste.
- Organic solutions that specialize in processing organic material like fruits and vegetables.
- Products that specialize in creating industrial soaps, lubricants, and sanitizers from organic materials.
- Biotane fuels that specialize in creating biodiesel.
- Biotane pumping that collects yellow grease from local restaurants for IWP's animal feed and biodiesel productions.
- All Pro hydrojetting and pumping that specialize in hydrojetting and grease-trap cleaning services.

Imperial Western Products' remaining divisions include product destruction, agricultural feed commodity services, cottonseed treatment, and salvaged and distressed pet food processing.

Imperial Western Products models its current processes on the Environmental Protection Agency (U.S. EPA) Food Recovery Hierarchy, diverting over 500,000 tons of food waste from landfills annually across California and keeping nearly 400,000 tons of organic material from entering landfills each year. This equates to 3.5 percent of California's Assembly Bill (AB) 32[1] goal (2020 diversion goal of 11.5 million tons), AB 1826[2] goals, and Senate Bill (SB) 1383[3] goals. This landfill diversion prevents 672,840 metric tons of carbon dioxide equivalent

[1] AB 32, Nunez. Air pollution: greenhouse gases: California Global Warming Solutions Act of 2006

[2] AB 1826, Chesbro. Solid waste: organic waste

[3] SB 1383, Lara. Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste: landfills

($MTCO_2e$) per year of landfill emissions based on the CalRecycle Organics Program Calculator Tool.

The IWP Microgrid Project was installed at the Coachella, California, headquarters, IWP's largest location (aerial view shown in Figure 1). This site is in an AB 1550[4]-defined low-income community. The project will provide the following direct, meaningful, and assured benefits to priority populations by meeting the following benefit criteria.

Benefit 1: Reduces greenhouse gas (GHG) emissions through reduction of grid electricity consumption via energy efficiency improvements.

Benefit 2: Includes policies that are consistent with federal and state law and result in at least 25 percent of project work hours being performed by residents of a disadvantaged or low-income community, or by residents of low-income households.

Benefit 3: Includes recruitment, agreements, policies, or other approaches that are consistent with federal and state law and result in at least 10 percent of project work hours performed by residents of a disadvantaged or low-income community or by residents of low-income households, who are also participating in job training programs that lead to industry-recognized credentials or certifications.

Figure 1: IWP Coachella Facility

Source: Google Earth

This facility processes salvaged and distressed pet food, cottonseed, bakery waste, product destruction, and used cooking oil (UCO) to produce animal feed for use at many dairies across California. It is also home to IWP's biodiesel plant, which produces approximately twelve million gallons of biodiesel per year and provides byproducts used for animal feed. The Coachella facility operates 24 hours a day, 7 days a week, and 365 days a year. This facility produces approximately 23,000 tons of dry animal feed, 82 million pounds of UCO, and 4,500 tons of biodiesel by-products per year.

Project Overview

The project deployed a state-of-the-art microgrid at the animal feed production facility in Coachella. The project reduced GHG emissions from the facility, realized energy cost savings, reduced unplanned downtime due to grid outages, and today serves as a model for other

[4] AB 1550, Gomez. Greenhouse gases: investment plan: disadvantaged communities.

similar facilities across the state seeking to improve energy efficiency and reduce scheduled and unplanned facility downtime.

Before the installation of the microgrid, IWP relied entirely on grid electricity to power its animal feed processing equipment such as mills, grinders, conveyors, and pumps. Imperial Western Products evaluated solar and other electric generation projects at the Coachella facility at various times over the last decade; however, financial incentives were not adequate to justify the investment. With the California Energy Commission (CEC) Food Production Investment Program (FPIP) grant, the project finally became economically viable.

Goals and Objectives

The project goals were to:

- Reduce grid electricity usage by approximately 35 percent and protect against power outages.
- Support the economic competitiveness of California's food processing by demonstrating the benefits of a microgrid at a food production facility.

The project objectives were to:

- Install a state-of-the-art microgrid at the Coachella facility to generate and store zero-emission electricity to reduce GHG emissions.
- Quantify energy efficiency improvements, reduced downtimes, and other benefits attained by the project, in comparison with the baseline.

Share knowledge about the project with other market segments in California that can use the demonstrated technologies.

Project Support

Support for the project included the city of Coachella, California Department of Food and Agriculture (CDFA), CalRecycle, Gridscape Solutions, and Imperial Irrigation District (IID). Through their support, IWP achieved project goals and helped California meet its aggressive climate goals. The city of Coachella, where IWP has called home since 1966, and IID helped IWP meet regulatory compliance with the project. The CDFA and CalRecycle supported IWP's mission of repurposing food waste into animal feed.

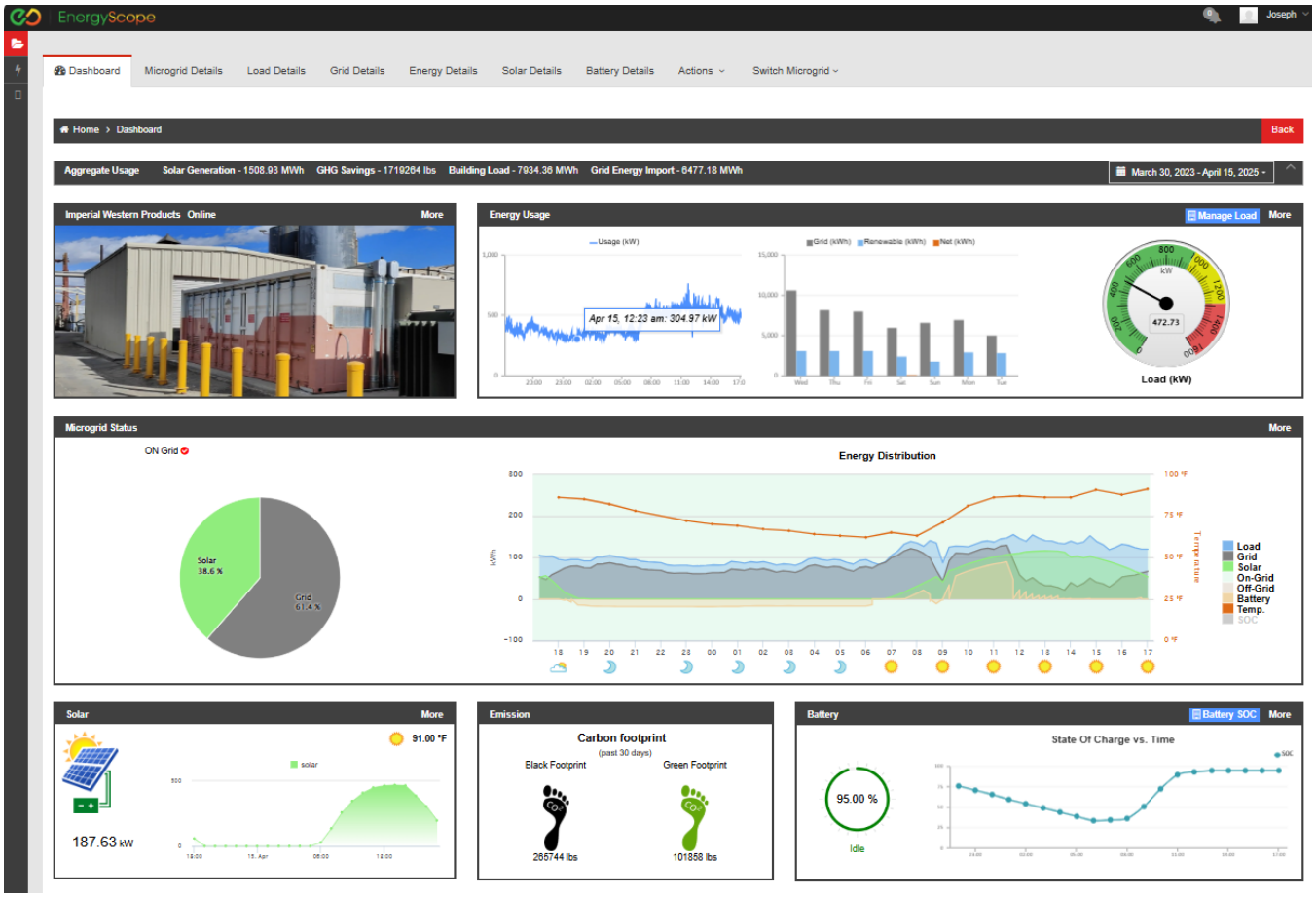
Estimated Energy Savings and Other Co-Benefits

Besides reducing GHG emissions, the microgrid was expected to save IWP roughly 1,510,000 kilowatt hours (kWh) of grid electricity annually. This corresponds to savings of roughly $225,000 per year on electricity purchased from the utility. The financial benefit from this project allows IWP to become more resilient and supportive of securing quality jobs for members of the surrounding low-income and disadvantaged communities. The solar carport structures also provide shade for IWP's employees, creating a more comfortable and safe working environment.

Technology Benefits

This project has realized many technological benefits. Imperial Western Products upgraded the ageing service panels and breakers supplying electricity to the facility, which improved reliability and reduced the frequency of outages due to breaker trips. The battery storage system allows the facility to continue operating during grid outages. Gridscape's EnergyScope technology enables IWP to monitor the performance of not only the solar and battery systems but also grid consumption and load demand, in real time. This new data help IWP identify further efficiency improvements to production processes. Figure 2 is a screenshot of the EnergyScope web portal dashboard page.

Figure 2: EnergyScope Web Interface



Source: Gridscape EnergyScope

Team and Key Stakeholders

The Imperial Western Products team has extensive experience in engineering, design, procurement, installation, commissioning, and operation of over a dozen upgrade projects supporting process improvements, green energy, process recycling, product manufacturing upgrades, and expansions across four manufacturing and production locations.

The project team was led by:

- Joe Boyd: IWP's Director of Engineering, has been with IWP for 22 years, and has intimate knowledge of all IWP's processes. Joe's role on the project was project manager and engineer (technical expert).
- Amanda Johnson: IWP's Assistant Controller, has been with IWP for five years and served as the primary contact for this grant. Amanda's role on the project was administrator.
- Trent Trawick: One of IWP's two owners, has consistently and successfully managed project schedules and budget targets for facility improvement projects. Trent's role on the project was project manager.
- Dave Isen: IWP's Risk Manager, has been with IWP for 10 years, and is an in-house expert in contracts and legal compliance. Dave's role on the project was legal counsel.
- Jason Cabanyog: Vice president of operations, acted as outreach manager. Jason coordinated outreach to the local community.

Gridscape was the subcontractor for microgrid commissioning and completion. Gridscape has developed several other microgrid projects for clients throughout California and beyond. Gridscape contracted with Green Realities for the installation work. IWP contracts with Gridscape for ongoing maintenance and technical support of the microgrid system to ensure it continues to operate at peak performance.

The Gridscape project team included:

- Gaurav Kumar: Senior project manager for Gridscape, oversaw the day-to-day development of the project.
- Vipul Gore: Chief Executive Officer for Gridscape, provided project oversight.
- Bhavesh Gore: Chief Financial Officer for Gridscape.
- Dhruvin Patel: Senior Microgrid Engineer and technical expert.

The project's subcontractor for third-party measurement and verification (M&V) was EcoEngineers, a renewable energy consulting firm. The EcoEngineers M&V team included:

- Andrew Clapp: Regulatory Consultant, who served as the M&V Project Manager.
- James Ramm - Director of Engineering, who served as the Supervising Engineer.

The M&V's team role in the project was to develop a pre-installation M&V Protocol; perform twelve months of pre-installation measurements and calculations based on the pre-installation M&V protocol; develop a post-installation M&V protocol; perform 12 months of post-installation measurements based on the M&V protocol for post-installation; assist with analysis of post-installation electrical usage and GHG emissions; prepare the M&V Findings Report that included the M&V protocol, pre- and post-installation measurements, analysis, and results performed in this task; and provide all key assumptions used to estimate projected benefits.

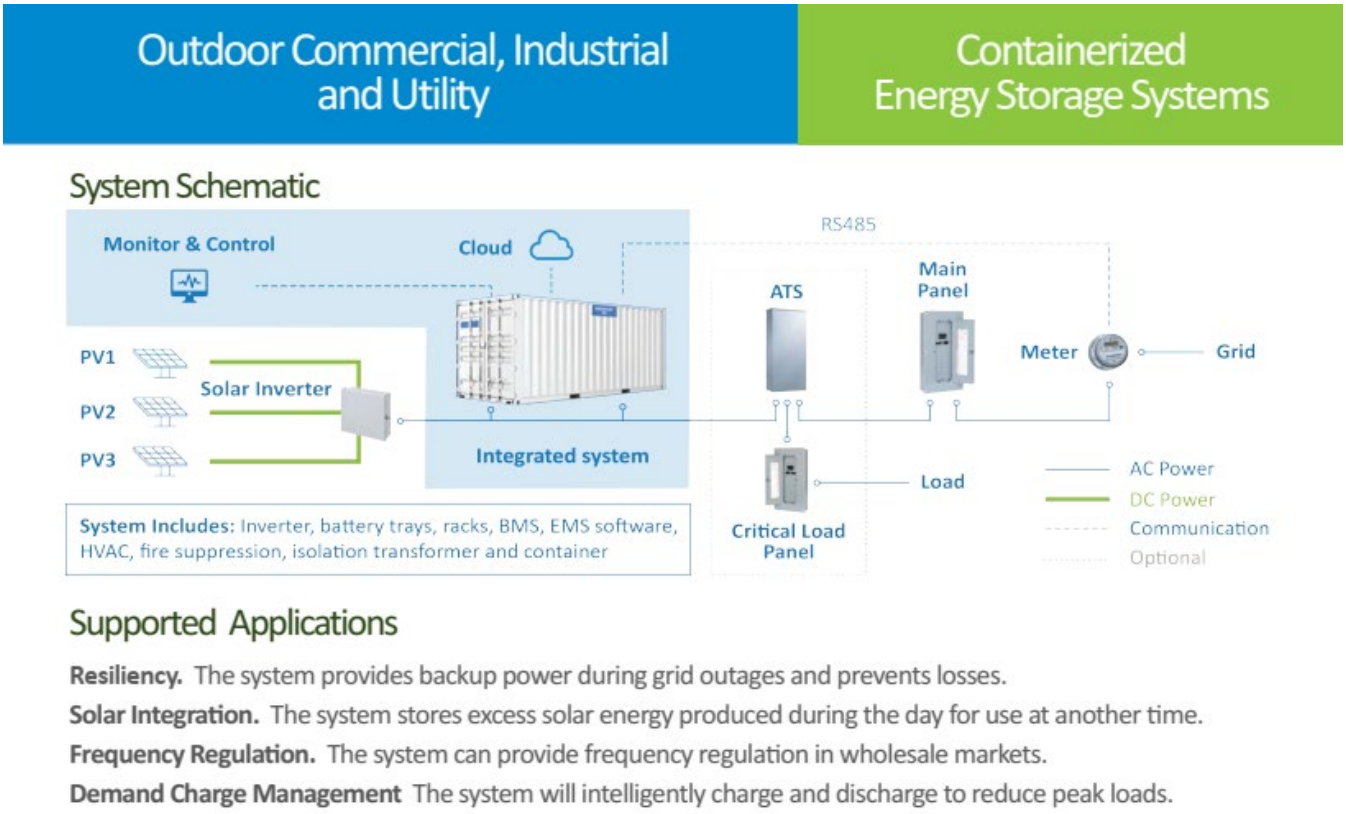
CHAPTER 2:
Project Approach

Project Description

The project installed a solar microgrid at the Coachella facility. The main components of the microgrid that were installed were:

- Trina Duomax solar panels, qty: 2068, rated 847.9 Kilowatt Direct Current
- Five carport structures to support solar panels
- Gridscape battery energy storage system (BESS), rated 1300 kWh
- Figure 3 illustrates the function of the microgrid system.

Figure 3: Illustration of System Function



Source: Gridscape Solutions

In addition to the solar panels and BESS, the system includes new electrical service panels, transformers, solar inverters, and five carport structures to support the solar panels. Since the IWP facility is large and operations are spread out, the project required transformers to minimize voltage loss in the lines connecting the solar arrays on the west side of the facility to the main service panel.

Projected Benefits

The project initially estimated an annual grid electricity savings of 1,510,000 kWh. This amount of grid electricity is estimated to account for GHG emissions of 344 $MTCO_2e$ using the California Climate Investments Quantification Methodology Emission Factor Database average electricity emission factor (EF) of 0.2278 $MTCO_2e$/megawatt hours (MWh). The Coachella facility is in a region of California with an electricity EF of 0.4608 $MTCO_2e$/MWh according to the California Air Resources Board GREET 3.0 model. The GREET 3.0 model is used to quantify the carbon intensity of transportation fuels such as gas, diesel, natural gas, and electricity.

Measurement and Verification Plan

The final M&V plan quantified the electricity savings provided by the microgrid by comparing the baseline of four years prior to the installation to the twelve-month post-installation. Per the International Performance Measurement and Verification Protocol (IPMVP), energy savings are determined by comparing measured energy use before and after implementation of an energy conservation measure. In general:

Energy Savings = Pre-Installation Energy Use – Post-Installation Energy Use ± Adjustments

Adjustments were used to normalize operating conditions and measure efficiency both before and after installation of the energy conservation measure. Since IWP is a food manufacturing facility, energy consumption is very dependent on the volume of food and feed products produced. EcoEngineers' methodology accounts for and normalizes energy consumption based on production variations. Final M&V showed a significant reduction in GHG emissions, although not as high as initially predicted.

Project Implementation

The project was implemented in phases, with the first phase consisting of design and permit applications. The design work was performed by Gridscape and the permitting was handled by IWP. The second phase consisted of site preparation and equipment procurement. There were some COVID-19-related delays with procurement, which delayed the project. Next came the installation and commissioning of equipment, which proceeded smoothly overall.

Site Preparation and Equipment Procurement

Site preparation consisted of several subcontractor visits to evaluate the site and prepare preliminary plans, starting in July 2020. Existing roof structures were evaluated to ensure structural integrity for the panel installation. Underground utility surveys were conducted to ensure safe excavation. Locations for the BESS system and new electrical gear were selected, and new concrete foundations were installed to support the battery container. Trenching work was completed to run the communication and transmission lines, which connect the arrays on the west end of the property to the main service panel.

Equipment procurement was handled by Gridscape, including solar panels, BESS, and electrical gear. Procurement was challenging due to material shortages resulting from the COVID-19 pandemic. Solar panels were ordered and arrived first, while the longest lead time item was

the step-down transformer located near the BESS. Equipment was stored at the IWP site until ready for installation. Once engineering plans and the bill of materials for the project were set, official submissions to the electric utility and city of Coachella were made for interconnection and construction permits, respectively.

Equipment Installation and Commissioning

Concrete pads for the transformers, switchgear, and the BESS were installed by March 2022. The rooftop and carport solar panel installations were completed in June 2022. The new microgrid switchgear and transformer were installed in December 2022. Imperial Western Products received a "permission to operate" letter from IID in June 2023, at which time the system commenced operation. The system achieved full solar production in October 2023 after correction of a solar step-down transformer issue. Figure 4 shows the new solar carports installed in the employee parking area. Figure 5 shows the installed BESS and the new solar step-down transformer.

Figure 4: Solar Panel Carport in Employee Parking Area

Source: Imperial Western Products

Figure 5: BESS Battery Container and Transformer

Source: Imperial Western Products

Project Changes and Challenges

The project faced numerous challenges. COVID-19 created a severe shortage of electrical equipment such as switchgears and transformers, resulting in major delays in procurement. Near the end of the installation, the team encountered an issue with the transformer purchased for the project; the transformer did not meet exact original specifications. The engineer of record determined that the transformer could still work but would need to be modified for safety by adding a Schwitzer Engineering Laboratories 751 Feeder Protection relay. The relay was ordered, but had a long lead time, which caused a delay in the system reaching full output, which in turn delayed the start of post-installation M&V.

Permitting with the city of Coachella went smoothly overall. The interconnection with IID was challenging because it was one of the first solar microgrid projects IID had approved. As such, it took longer than expected for the IID staff to review the plans and provide input. IID required some upgrades at the upstream substation, as well as the installation of an

isolation/disconnect device located outside the facility perimeter, which IID had sole access to. However, the interconnection did not significantly delay the commissioning of the microgrid.

An ongoing challenge was high winds at the project location. There was an incident in March 2024 where some panels and an inverter required replacement on the highest carport array after a very strong windstorm damaged approximately a dozen panels. This resulted in the carport array being offline for approximately two weeks.

Another issue was keeping the panels clean with high winds, a dusty environment, and very low rainfall. Strong winds blow sand and dust from the piles of stored animal feed into the air, which settled on the panels and reduced output. This effect was more pronounced in the panels installed on the rooftop in the northwest corner of the property due to its proximity to the food recycling operation. To combat this issue, IWP regularly washes the panels and installed automatic sprayers to rinse down the panels. However, this is an ongoing challenge requiring continued work.

CHAPTER 3:
Project Results

Project results reflect pre- and post-installation M&V data collection.

Pre-Installation M&V Findings

Imperial Western Products provided grid electricity consumption and production data based on the criteria defined in the M&V protocol for each month of the pre-installation M&V period. Production quantities were provided for glycerin, free fatty acid, used cooking oil (UCO) and yellow grease, cottonseed, bakery, and protein feed. Table 1 summarizes the measured electricity consumption and production data along with the calculated consumption ratio for the plant for the four-year pre-installation period.

Table 1: Pre-Installation Energy Consumption and Production

Year	Electricity Consumption (kWh)	Production (lbs)	Consumption to Production Ratio (kWh/lbs)
2018	4,010,000	167,591,873	0.0239
2019	4,264,500	195,473,693	0.0218
2020	4,060,900	197,056,877	0.0206
2021	4,281,800	176,609,264	0.0242
Average	**4,154,300**	**184,182,927**	**0.0226**

Source: EcoEngineers

Greenhouse Gas Emissions Reduction Estimates

As part of IWP's application for the FPIP grant, IWP estimated GHG emissions reductions associated with the planned microgrid project. This estimate was based on modeling conducted by Gridscape using the Helioscope software platform. The projected annual energy savings, based on these data, were 1,510,000 kWh. Converting these energy savings into GHG emissions reductions provided 344 $MTCO_2e$/year. Over the 20-year project life, total projected savings were estimated at 6,883 $MTCO_2e$. The formula for calculating the GHG emissions reductions follows.

GHG Emissions Reduction = Annual Energy Savings* EFElect

Where EFElect = California Climate Investments Quantification Methodology Emission Factor Database average electricity EF of 0.2278 $MTCO_2e$/MWh.

Post-Installation M&V Findings

Imperial Western Products provided grid electricity consumption and production data based on the criteria defined in the M&V protocol for each month of the post-installation period

(November 2023 to October 2024). Table 2 summarizes the measured electricity consumption and production data along with the calculated consumption ratio for the 12-month post-installation period.

Table 2: Post-Installation Energy Measurements

Quarter	Grid Electricity Consumption (kWh)	Production (lbs)	Consumption to Production Ratio (kWh/lbs)
Q4 2023	906,123	55,065,267	0.0165
Q1 2024	849,000	28,707,320	0.0296
Q2 2024	741,000	25,991,128	0.0285
Q3 2024	749,500	24,694,395	0.0304
12 Month Totals	**3,245,623**	**134,458,110**	**0.0241**

Source: EcoEngineers

Table 3 summarizes the measured amount of renewable electricity produced by the microgrid system from November 2023 to October 2024.

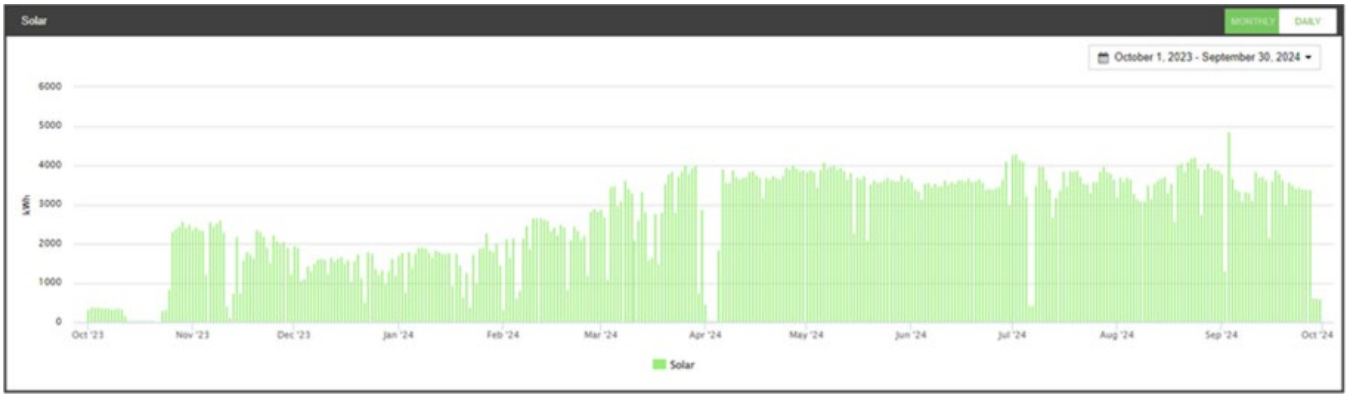
Table 3: Microgrid Solar Generation

Quarter	Renewable Electricity Produced (kWh)
Q4 2023	121,193
Q1 2024	203,260
Q2 2024	315,148
Q3 2024	314,298
12 Month Totals	**953,888**

Source: EcoEngineers

A screenshot of daily solar photovoltaic generation trends covering the post-installation period from November 2023 to October 2024 was obtained from the Gridscape EnergyScope™ web portal, seen in Figure 6.

Figure 6: EnergyScope Daily Solar Generation Trend



Source: Gridscape Solutions

Table 4 summarizes the charging and discharging battery activity of the microgrid system from November 2023 to October 2024.

Table 4: Microgrid Battery Activity

Quarter	Charging (kWh)	Discharging (kWh	Total Cycles
Q4 2023	45,952	42,148	1,811
Q1 2024	56,611	52,416	3,482
Q2 2024	62,621	57,865	2,372
Q3 2024	35,362	32,874	1,807
Totals	**200,546**	**185,303**	**9,472**

Source: EcoEngineers

Energy Savings Analysis

To calculate annual grid electricity savings, the following equation was used:

Annual Energy Savings = Pre-Installation Electricity – Post-Installation Electricity

(± Adjustments)

Where: Pre- and post-installation energy represent the measured grid electricity consumed, based on facility utility bills.

Adjustments are used to normalize the operating conditions and measured efficiency (specifically, production output and temperature) of the post-installation phase. EcoEngineers determined that no adjustments to normalize operating conditions were required as the energy conservation measure installed had no impact on food processing production efficiencies or overall plant electricity demand.

Table 5 compares the pre-install grid electricity usage to the post-install usage.

Table 5: Measured Consumption Pre- and Post-Installation

Pre-Install Grid Electricity Usage (kWh)*	4,154,300
Post-Install Grid Electricity Usage (kWh)	3,245,623
Difference	908,677

*Based on 4-year average
Source: EcoEngineers

Project proposal annual savings estimate versus actual annual savings are shown in Table 6.

Table 6: Projected vs Actual Energy Savings

Projected Annual Energy Savings (kWh)	1,510,000
Actual Annual Energy Savings (kWh)	908,677

Source: EcoEngineers

Project Goals Achieved

The final analysis for GHG emissions reductions is displayed below. Table 7 provides projected and actual GHG emissions reductions. The total GHG emissions from the IWP facility were reduced by 22 percent when compared with the initial estimate of 35 percent. The actual GHG reduction was measured at 217 $MTCO_2e$/year, compared with the initial estimate of 344 $MTCO_2e$/year. Over the 20-year project life the actual GHG reductions are measured at 8,792 $MTCO_2e$/year as compared with the projected GHG reductions of 13,920 $MTCO_2e$/year.

Table 7: Final GHG Reductions Analysis

Time Period	Projected GHG Reductions ($MTCO_2e$/year)	Actual GHG Reductions ($MTCO_2e$/year)	Difference ($MTCO_2e$/year)
Annual	344	217	-127
Project Life (20 years)	6,883	4,346	-2,537

Source: EcoEngineers

CHAPTER 4: Technology/Knowledge/Market Transfer Activities

Knowledge Share

Imperial Western Products shared the knowledge gained from this project with surrounding communities. This included a special press conference, ribbon-cutting ceremony (see Figure 7), hosting field trips for local schools, presenting at trade association events, and communicating benefits at both city and state levels. Examples of this outreach include a presentation on the benefits of the microgrid to the California Feed and Grain annual meeting and several field trips with Desert Mirage High School students enrolled in its "Green Academy" program (see Figure 8). Imperial Western Products is currently considering a similar project at its facility in Selma, California.

Figure 7: Microgrid Ribbon Cutting Event

Source: Imperial Western Products

Knowledge shared about the project included the benefits of a microgrid to food producers, including reduced utility costs and increased energy resilience. The latter is of particular

importance to producers of perishable food products, for which power outages are particularly costly. The cost savings, in turn, put California-based businesses in a better position to compete globally and keep good-paying jobs in local communities. With the increasing frequency of power outages caused by wildfires, extreme winds, and other climate change-fueled extreme weather events, the benefits provided by microgrid systems will become increasingly important in the future.

Outreach to Disadvantaged Communities

Imperial Western Products' Coachella facility is located within a low-income, disadvantaged community. During the project and in daily operations, IWP employs members of these communities and offers competitive salaries and opportunities to develop vital workforce skills. During the project, IWP worked with team members from these communities to help prioritize their needs. IWP also hosted informational field trips for schools from disadvantaged communities to educate students on clean energy and its benefits to their community.

Figure 8: Field Trip with Local High School

Source: Imperial Western Products

CHAPTER 5:
Conclusions and Recommendations

With support from the CEC and the FPIP, IWP successfully installed a state-of-the-art microgrid system at its Coachella, California, facility. These upgrades reduced the facility's reliance on grid electricity, lowering associated GHG emissions. The system also increased resilience by ensuring continued operations during grid outages. The microgrid performed as expected during outages, preventing processing downtimes and avoiding feedstock spoilage.

Imperial Western Products encourages other food manufacturing plants in California to consider microgrid technology. Clean electricity sources such as solar can significantly reduce long-term operating costs while lowering GHG footprints. Incorporating battery storage and a microgrid controller further strengthens resilience, minimizing reliance on highly polluting diesel backup generators and protecting against costly downtimes. To ensure optimal performance, regular maintenance and system cleaning should also be prioritized.

CHAPTER 6:
Benefits to California

While IWP's goal of reducing 344 $MTCO_2e$ annually was not met, IWP was able to reduce over 200 $MTCO_2e$ each year. These reductions will help mitigate climate change for Californians and low-income and disadvantaged communities served by IWP. Efficiency gains also helped free up funds spent on utility bills and excessive repair and maintenance costs, securing jobs for Californians from low-income and disadvantaged communities. Together, these benefits help create more equitable communities for areas served by IWP.

California residents benefited from the IWP microgrid project as it reduced GHG emissions by over 200 $MTCO_2e$ per year. The economic benefits reaped by IWP will help further its mission to keep organic waste streams out of landfills and upcycle them to animal feed. In turn, the landfill diversion magnifies GHG reductions benefits while helping IWP expand its business.

Finally, IWP shared the knowledge gained from this project with other California companies so that they, too, can evaluate if this technology could similarly benefit them. This project also benefited the local community by protecting good paying jobs in and around the city of Coachella, a low-income community.

GLOSSARY AND LIST OF ACRONYMS

Term	Definition
BESS	Battery Energy Storage System
CDFA	California Department of Food and Agriculture
CEC	California Energy Commission
EF	Emissions Factor
FPIP	Food Production Investment Program
GHG	Greenhouse Gas Emissions
IID	Imperial Irrigation District
IWP	Imperial Western Products
kWh	Kilowatt-hour
M&V	Measurement and Verification
$MTCO_2e$	Metric tons of carbon dioxide equivalent
MWh	Megawatt-hour. 1 MWh = 1000 kWh
UCO	Used Cooking Oil

References

California Air Resources Board. 2019. Benefits Calculator Tool for the Food Production Investment Program. https://ww2.arb.ca.gov/resources/documents/cci-quantification-benefits-and-reporting-materials. California Air Resources Board.

California Air Resources Board. 2020. Organics Programs Quantification Methodology. https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/calrecycle_organics_finalqm_6-15-20.pdf. California Air Resources Board.

CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

ENERGY RESEARCH AND DEVELOPMENT DIVISION

APPENDIX A: Third Party Measurement and Verification Protocol

August 2025 | CEC-500-XXXX-XXX

APPENDIX A:
Measurement and Verification Plan

TABLE OF CONTENTS

EXECUTIVE SUMMARY

EcoEngineers is submitting this Third-Party Measurement & Verification Protocol as part of Imperial Western Products' micro-grid project funded under the California Energy Commission's Food Production Investment Program. As part of the grant solicitation, grant awardees are required to measure energy savings and greenhouse gas emissions reductions post-installation of energy conservation measures to verify estimates included in the grant application.

Imperial Western Products intends to install an 842-kW solar photovoltaic (PV) array (nameplate capacity of final installation is subject to change) and Gridscape EnergyScope™ Microgrid System at their food processing plant located in Coachella, California to reduce grid electricity consumption and thereby, reduce greenhouse gas emissions. Measurement of both baseline and post-installation consumption will entail monitoring the electricity usage and PV generation. Energy consumption data and PV generation and micro-grid system data will be obtained and reviewed monthly by qualified EcoEngineers' staff to track progress against project goals.

There is a required minimum 3-month pre-installation measurement phase, followed by 12-months of measurement post-installation. Measurement and Verification Findings Reports will be completed at the conclusion of each phase. EcoEngineers will also complete quarterly progress reports.

1.0 M&V PROJECT OVERVIEW

1.1 Project Overview

In response to California's high food production costs and out-of-state and international competition, the California Energy Commission (CEC) instituted the Food Production Investment Program (FPIP) in 2018 to support updating and improving food production facilities with energy efficient technologies that will reduce operating costs and greenhouse gas (GHG) emissions. The aims of the program are "to accelerate the adoption of energy efficiency and renewable energy technologies at California food processing plants, demonstrate their reliability and effectiveness, help California food processors work towards a low carbon future and benefit priority populations".

Imperial Western Products (IWP) operates four food processing plants in California. IWP applied for and was awarded funding under the FPIP for a Tier II project for a PV array and micro-grid system at its Coachella processing plant. The focus of Tier II is to fund and demonstrate emerging technologies that are not widely used in California but have been proven elsewhere to reduce GHG emissions. As part of the application process, the GHG emissions reductions must be calculated by measuring the grid power used prior to and following the microgrid installation, and the PV array energy production that reduces the amount of grid power needed.

Post grant award, projects are required to monitor and verify post-retrofit energy performance to verify GHG emissions and energy reductions attained by the micro-grid PV system and storage equipment system.

The objective of this third-party measurement & verification (M&V) project will be to determine the GHG emissions reductions realized at the IWP Coachella facility by the installation of a PV array and smart-grid energy storage.

1.2 Description of the Micro-Grid

IWP's project will deploy new Gridscape EnergyScope™ micro-grid equipment at IWP's Coachella food processing plant. The micro-grid system will include a solar photovoltaic (PV) energy plant, a battery storage unit and a microgrid controller system. For details of the planned micro-grid installation at the facility see the Project Narrative and HelioScope Simulation included in Appendix A and Appendix B, respectively. Total energy savings and GHG emissions reductions estimated to result from the project are as follows:

- 1.510 GWh/year of renewable energy production (35% of the current consumption)
- 344 $MTCO_2e$/year of GHG reductions

Additional equipment specification sheets are included in Appendix C, including details on the battery storage system, inverters, and PV modules.

1.3 EcoEngineers' Qualifications and Independence

EcoEngineers is a renewable energy consulting firm with over 10 years of experience providing independent auditing, compliance, and verification services across the renewable energy sector. All verification services are overseen by a Professional Engineer (PE) and Certified Public Accountant (CPA). All EcoEngineers verifiers, contractors, and subcontractors are required to have a minimum of a bachelor's degree in science, engineering, finance, or policy field. EcoEngineers' verifiers, contractors, and subcontractors are independent of IWP. See Appendix D for M&V project team member qualifications.

1.4 Record Retention

EcoEngineers will retain all records pertaining to the M&V for a period of five years from the date of creation and shall deliver such records to the CEC upon request.

2.0 M&V METHODOLOGY

2.1 M&V Method

Per the International Performance Measurement and Verification Protocol (IPMVP), energy savings are determined by comparing measured energy use before and after implementation of an energy conservation measure. In general:

> Energy Savings = Pre-Installation Energy Use – Post-Installation Energy Use ± Adjustments

Adjustments are used to normalize the operating conditions and measured efficiency before and after the energy conservation measure installation.

For the microgrid project, rather than an energy conservation measure, IWP is installing renewable electricity generation to replace grid electricity consumption which will result in a reduction in GHG emissions.

This M&V project will utilize IPMVP Option B: Retrofit Isolation. Option B involves full measurement of the equipment effected by the retrofit, in this scenario renewable electricity generated will be measured. Short-term or continuous metering may be used under Option B. Here, continuous metering will be employed for the duration of the post-installation periods.

Additionally, EcoEngineers will utilize IPMVP Option C: Whole Facility. With Option C, savings are determined at the whole-building level by measuring energy use at main meters pre- and post- installation.

2.2 Data Collection

The following data will be collected, as available, from the previous two years prior to the installation of the micro-grid and at least twelve months after the micro-grid has been brought fully online:

- Electrical billing data for all meters at the Coachella processing plant
- IWP will provide monthly production output metrics. This data will be utilized for adjustments necessary to match pre- and post-installation operating conditions, as applicable. Production metrics to be collected are detailed in Table A-1, below.

  Once the micro-grid has been commissioned, the following data will be monitored from the Gridscape EnergyScope™:

- Renewable energy production of the PV array, total kWh by interval (month, day, hour)
- Full log of the battery storage system behavior, by interval (month, day, hour) as available:
  - Number of duty cycles
  - Total kWh dispensed
  - Date/Time of each duty cycle

EcoEngineers will also request data, as available, pertaining to utility power outage events which occurred during the pre-installation and post-installation time periods.

Each month, IWP will collect the measurement data described above and provide EcoEngineers a complete monthly dataset by the 15th of the following of each month. EcoEngineers will analyze the data quarterly and prepare a quarterly report for submission as described in Section 2.3.

Table A-1: Equipment Divisions, Inputs and Outputs

Facility	Division	Input	Output
Coachella	B	Electricity (kWh)	Glycerin/FFA Produced (gal)
Coachella	G	Electricity (kWh)	Yellow Grease and UCO Processed (lbs)
Coachella	PC	Electricity (kWh)	Cottonseed Processed (lbs)
Coachella	R/RP	Electricity (kWh)	Animal Feed Produced (lbs)

Source: Imperial Western Products

2.3 Data Analysis and Calculations

EcoEngineers will perform the following data analysis and calculations to determine the performance and benefits of the micro-grid system.

1) Option B M&V: Retrofit Isolation

Annual energy savings will be calculated utilizing the simple equation below:
Annual Energy Savings = P_{NET}

Where:

P_{NET} is the measured renewable electricity produced by the microgrid system during the 12-month post-installation M&V.

2) Option C M&V: Whole Facility

Annual energy savings will be calculated utilizing the simple equation below:

Annual Energy Savings = Pre-Installation Electricity – Post-Installation Electricity ± Adjustments

Where:

Pre- and Post-Installation Energy are the measured grid electricity consumed based on facility utility bills.

Adjustments are used to normalize the operating conditions and measured efficiency (i.e., production output and temperature) of the post-installation phase. EcoEngineers will utilize production metrics for the facility provided by IWP for routine adjustments, as necessary. EcoEngineers will provide an amended M&V protocol including any non-routine adjustments due to unanticipated changes post-retrofit, if necessary.

GHG emissions reductions shall be determined using the statewide emission factors provided by California Air Resources Board (CARB) Emission Factor Database and Documentation and U.S. EPA Emissions & Generation Resource Integrated Database. Annual GHG emissions reductions will be calculated utilizing the general equation below:

GHG emissions reduction = Annual Energy Savings * EF_{Elect}

Where, EF_{Elect} is the emission factor for grid electricity. The average electricity EF from 5-AZNM Mix (where Coachella plant is located) is 626.72 g CO_2e/kWh

In the event of missing or lost measurement data, EcoEngineers will determine if the data are missing at random and the occurrence rate is less than 3% in which case the missing data would be deemed insignificant. If the missing data are not at random or the occurrence rate of data missing at random is more than 3%, EcoEngineers will investigate further and work with IWP and CEC to determine an appropriate solution.

2.4 Performance Verification Activities

EcoEngineers will perform verification activities to assure the veracity of data provided by IWP and confirm equipment installation and operation.

The verification activities will include a site visit to the Coachella facility during the Post-Installation phase. During the site visit, qualified EcoEngineers personnel will perform the following activities:

- Conduct a basic interview of relevant staff to determine and confirm equipment installation, maintenance, and data collection techniques
- Tour facility to confirm existence and function of equipment included in the project
- With cooperation of facility staff, obtain logged data from Gridscape EnergyScope software to monitor PV generation and Battery cycles.
- Any missing items/clarifications/findings discovered during the ongoing M&V review will be investigated during visit
- Complete a site visit report summary with photo log documenting site visit activities

EcoEngineers may determine that the above minimum verification activities are not sufficient to maintain confidence in the data provided. EcoEngineers reserves the right to increase the frequency of site visits or request additional documentation at any time to ensure confidence.

2.5 Reporting Timeline

Following the completion of baseline measurements during the Pre-Installation phase, EcoEngineers will prepare and submit a Pre-Installation M&V Findings Report including the M&V protocol, pre-installation measurements, analysis, and results. Following each 3-month period of the Post-Installation M&V, EcoEngineers will prepare and submit a progress report including a narrative on operational highlights from the reporting period and a summary of M&V findings from the reporting period. At the conclusion of the 12-month Post-Installation phase, EcoEngineers will prepare and submit a Post-Installation M&V Findings Report that includes M&V protocol, pre and post installation measurements, analysis and results. Results will at a minimum report on the reduction of grid electricity and reductions of greenhouse gas emissions which directly resulted from the micro-grid project. EcoEngineers will deliver findings reports and progress reports within the timeline in Table A-2.

Table A-2: M&V Reporting Timeline

Deliverable	Timeframe
Pre-Installation M&V Findings Report	Within 60 days of receipt of all data from Pre- Installation M&V
M&V Progress Report #1	Within 30 days of receipt of all data following 3 months of Post-Installation M&V
M&V Progress Report #2	Within 30 days of receipt of all data following 6 months of Post-Installation M&V
M&V Progress Report #3	Within 30 days of receipt of all data following 9 months of Post-Installation M&V
M&V Progress Report #4	Within 30 days of receipt of all data following 12 months of Post-Installation M&V
Post-Installation M&V Findings Report	Within 90 days of receipt of all M&V data

Source: Project_Schedule FPI-19-033 IWP

CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

ENERGY RESEARCH AND DEVELOPMENT DIVISION

APPENDIX B: Additional Photos

August 2025 | CEC-500-XXXX-XXX

APPENDIX B:
Additional Photos

Figure B-1: IWP Coachella Plant with Solar Carport

Source: IWP

Figure B-2: IWP Coachella Plant with Solar Carport

Source: IWP

Figure B-3: IWP Coachella Plant Rooftop Solar Array

Source: IWP