



PROJECT DETAILS

**PRIME CONTRACTOR/
PROJECT MANAGER:**
United Mechanical (UM)

INDUSTRY
Residential

CATEGORY
Private Residence in
Cayo Costa, Florida

GROSS SQUARE FOOTAGE
3,147 square feet

COMPLETED
May 2021



SCAN TO VIEW ONLINE

BACKGROUND

Cayo Costa, Florida is an idyllic island off the Gulf of Mexico, but the region's climate can strain a property's electrical system.

By partnering with United Mechanical (UM) – a Fidelity Building Services Group (Fidelity BSG) company – one property owner was able to meet his goals of off-grid reliability that would improve the home's energy costs and indoor air quality (IAQ), as well as making living in paradise a sustainable reality.

OBJECTIVES

Nearly every two to three months, the oversized generator that powered the property consumed up to \$9,000 in propane. To conserve fuel costs, the air conditioning system ran only when the site was occupied; however, due to the area's humid nature, this created challenging home environment issues and a desire for an overall more efficient design.

In 2020, UM was commissioned by the property owners to provide a 100% off-grid solution that would conserve propane for potable water heating and cooling. UM was also delegated with developing a sustainable way to maintain proper IAQ.

EQUIPMENT

- (5) OutBack Flex Power Inverters
- (30) 3.8K/48V Lithium Batteries
- (5) OutBack Battery Rack Systems
- (80) 400W Jinko Bifacial Solar Panels
- (1) 38kW KOHLER® Generator
- (1) 200 Amp Automatic Transfer Switch
- (1) Solar Array Stand

CHALLENGES

While UM had the experts and resources to meet the client's objectives, the logistics involving accessibility, weather, and vegetation created some challenges.

ACCESSIBILITY

Cayo Costa is a Florida barrier island accessible only by boat, so UM incorporated additional planning for all site work, including significant coordination with the owner's personnel for deliveries and worker transport. UM conducted all prefabrication at their shop to limit location challenges and the frequency of boat trips to the island.

WEATHER

Cayo Costa has a humid/subtropical climate, and the saltwater environment is particularly harsh on mechanical and electrical components. Prior to installation, all materials were vetted for corrosion resistance and reliability, resulting in an all-aluminum support structure. The design was challenging given the wind load and required height of the solar panels. And because Cayo Costa is in a hurricane-prone region, UM had to implement design considerations for both high winds and storm surges.

VEGETATION

Vegetation was also a challenge, as UM was not permitted to remove old-growth trees. This meant that the design of the solar field evolved to protect the island's plant life.



SOLUTIONS

After initial load calculations, UM walked the client through how they wanted to use their property, an important tactic to setting up the owner's expectations and helping them understand the various design tradeoffs.

Once goals and objectives were clearly defined, UM utilized the resources of their in-house engineering, prefabrication, and electrical teams. The prefabrication department designed the structural fabrication for the aluminum stands that would hold the solar panels, while the electrical team performed the electrical installation. These installations consisted of making electrical connections for the solar off-grid system, including tying in existing electrical panels and mounting/wiring in the solar array.

The UM electrical team also fitted the site with a new KOHLER® generator and designed the full solar system to include an automatic transfer switch (ATS) to generator backup, with the intent for the solar/battery system to carry the electrical demand as much as possible.

With so many intricate pieces to this puzzle, UM mobilized a team of experts to meet the client's objectives and served as the lead to coordinate all engineering design and permitting drawing review, as this was a unique project for the island's local Authority Having Jurisdiction (AHJ).

Additional solutions UM implemented to meet the project's objectives included:

- Biphase solar panels to maximize efficiency
- Banks of batteries to decrease generator run time and increase reliability
- High-efficiency air conditioning equipment and dehumidifiers to provide optimal IAQ at the lowest possible energy use
- Custom control systems to maximize system efficiency and provide off-site visibility to the owner

RESULTS

UM met 100% of the client's goals, delivering a fully functioning, off-grid residence that maintains proper IAQ and is more efficient and cost-effective than a traditional home connected to a utility grid. Additionally, UM completed the project on time and within budget.