

Leading the Energy Resiliency Imperative: Bayamón's Replicable Blueprint for Smart Local Energy in Puerto Rico

Building a Resilient Energy Investment Pipeline in Bayamón, Puerto Rico

AT A GLANCE

Investment Priorities

Municipal Solar + Storage Microgrid (Resilience Hub), Residential Solar + Storage Program for Priority Communities (Low- and Moderate-Income Households)

Pipeline Value

\$53.9M (Onofre Carballeira Microgrid, preliminary engineering estimate); \$3.5M–\$111.6M (Residential Solar + Storage Program, scaled by deployment scenario from 135 to 4,300 households)

Key Partners

EarthSpark International (lead); Municipality of Bayamón; Puerto Rico Green Energy Trust (PRGET)

Community Impacts

Priority communities served: 4,564 households and approximately 11,000 residents in Bayamón's rural service area; median per capita income \$17,337; 28% of residents below the poverty line; 100% of pipeline projects located in priority community census tracts; projected \$38.9M in reduced electricity expenditures over 20 years (a net present value of savings of approximately \$21.8M at a 6% discount rate) under municipal ownership scenario for microgrid alone

Strategic Role

Market Enabler / Project Originator / Project Developer / Pioneer for Scale

The Path Forward

Onofre Carballeira Microgrid: \$2M in grant or equity financing to advance regulatory discovery and permitting progression for proof-of-concept piloting phase for the. Residential Solar + Storage Program: \$3.5M–\$111.6M of concessional financing, grants, and CGC credit enhancements needed to close the gap between municipal capital capacity and full project deployment; third-party ownership structures under active evaluation to mobilize private financing at scale for the residential program

THE BIG PICTURE

Puerto Rico offers a compelling opportunity for clean energy investment, with abundant solar resources, an experienced local workforce, strong customer demand, and favorable policies for distributed energy. With electricity costs exceeding \$0.27 per kilowatt-hour and customers experiencing approximately 11 times as many power interruptions as those in the 50 states, affordable solar and storage can deliver meaningful benefits to households, businesses, and essential community facilities.

In Bayamón, one of Puerto Rico's largest municipalities with approximately 185,000 residents, the Municipality has developed a vision for using clean local energy to manage electricity costs and maintain essential services during broader grid outages. The Municipal Investment Fund (MIF) supports Bayamón in bringing that vision to implementation by helping address its primary barrier: access to financing.

The Challenge: Puerto Rico has made substantial progress in restructuring its public debt, but access to capital markets remains constrained for public-sector borrowers, including most municipalities. Advancing locally developed solar-plus-storage projects requires financing that aligns with municipal resources, affordability goals, and investor requirements.

The Solution: To advance Bayamón's vision, the coalition is developing financing pathways that match the Municipality's energy priorities with public, philanthropic, and private capital. Financial models compare municipal and third-party ownership options, combining potential grants, concessional financing, and credit enhancements with revenue streams from Net Energy Metering (NEM), the Customer Battery Energy Sharing (CBES) program, and Solar Renewable Energy Credits (SRECs). This analysis helps identify the financing needed to make projects affordable for participants and attractive to investors. EarthSpark brings direct experience deploying community-scale microgrids in underserved island contexts. The Puerto Rico Green Energy Trust (PRGET), Puerto Rico's independent nonprofit green bank, brings local knowledge, financial expertise, and relationships with capital providers. Working alongside the Municipality, these partners are helping Bayamón move its plans toward implementation and developing financing approaches that other municipalities can adapt to their own priorities. The potential for replication and scale is significant, and other municipalities across Puerto Rico have already indicated their interest in learning from Bayamón's experience. This project is regarded as an important pilot, "de-risking by doing", to clarify the processes and clear the path for island-wide replication and scale-up.



"In the Municipality of Bayamón, we recognize the importance of electricity as an essential part of the well-being, health, and development of our community, as well as the vulnerability it represents due to its instability. This reality leads us to explore and adopt new projects like this one, which contribute to improving the quality of life of our citizens and, at the same time, minimize dependence on fossil fuels and reduce environmental pollution."

- Ramón Luis Rivera, Mayor of the Municipality of Bayamón

BUILDING THE FINANCIAL AND MARKET INFRASTRUCTURE FOR ISLAND SOLAR DEPLOYMENT

MIF funding enabled the coalition to build on Bayamón's planning and Puerto Rico's growing distributed clean energy market. Each activity below supports project implementation by clarifying risk, expanding project development capacity, and designing financing options for residential and municipal solar in priority communities.

- **P3 structure analysis and standardized project templates:** EarthSpark and PRGET conducted a rigorous comparison of municipal ownership and third-party ownership models for both the Onofre Carballeira Microgrid and the Residential Solar and Storage Program, producing detailed capital cost estimates, 20-year financial models, and structured P3 frameworks (see Attachment A Table 1 and Table 2). For the microgrid, the analysis showed a net present value of savings of approximately \$21.8M over 20 years under municipal ownership, validating the project's long-term financial case. For the residential program, the analysis mapped three deployment scales with associated capital requirements and tested the subsidy levels needed to make third-party lease and PPA structures affordable for low- and moderate-income households.
 - **Impact:** Investors and municipal leadership have a financial decision framework that builds on the Municipality's concept — the ownership structures, cost ranges, and tradeoffs are already modeled.
- **Revenue stream identification and VPP integration strategy:** Solar United Neighbors was engaged to map the full set of economic benefits available to LIDAC solar-plus-storage in Puerto Rico's current regulatory environment. The analysis identified three layerable revenue streams: NEM bill credits for exported solar generation under Act 10-2024 (stable through 2030 to 2031), CBES payments of approximately \$1.00 per kWh for battery energy dispatched to the grid during peak events, and SREC revenue projected at approximately \$7.45M over nine years for a 29 MW portfolio of approximately 5,600 homes.
 - **Impact:** This revenue mapping directly improves bankability by demonstrating to private lenders and equity investors that project returns are not solely dependent on avoided electricity costs — a useful basis for evaluating investment performance across utility rate scenarios.
- **Stakeholder mapping and coalition governance structure:** The coalition conducted a structured stakeholder mapping exercise to identify the institutions, capital sources, and community partners required to advance each project type, and established working groups with standardized documentation to reduce soft costs and clarify risk allocation. Outreach engaged Calibrant Energy and AZ Engineering for technical and interconnection input, financial-sector partners including Monllor Capital Partners and Power Financial to evaluate PPP viability in Puerto Rico's energy market, and community-based organizations including Cooperativa Hidroeléctrica de la Montaña and Solar United Neighbors to ground project design in local knowledge.
 - **Impact:** The governance structure is already in place — when capital is ready to deploy, the coalition does not need to rebuild the stakeholder alignment from scratch.

- **Community engagement strategy for LIDAC enrollment:** The coalition developed a community-centered outreach strategy for the residential program built around partnerships with municipal leadership, faith communities, nonprofit organizations, and trusted community leaders. Engagement uses listening sessions, bilingual education campaigns, and flexible enrollment design to prioritize seniors, medically vulnerable residents, and households with the highest energy burden.
 - **Impact:** The enrollment infrastructure is designed to reduce customer acquisition costs and support affordable deployment at scale.
- **Workforce development integration:** Four training partners were identified and engaged for solar installation and operations pipelines: GRID Alternatives Puerto Rico, Fundación Borincana (Solar IT Program), Solar Energy International's Certified PV Professional (CPVP) pathway via the Engineers and Surveyors Association of Puerto Rico (CIAPR), and Aprende Energía Renovable. The coalition structured the procurement process for the engineering, procurement, and construction (EPC) contractor to award additional points to firms committing to local hiring targets. Bayamón could partner with Conexión Laboral Bayamón–Comerio (Centro de Gestión Única / American Job Center) for employer recruiting and placement support.
 - **Impact:** Workforce integration ensures that capital invested in Bayamón's energy infrastructure generates jobs accessible to priority community residents — not just electricity.



ADVANCING TWO COMPLEMENTARY PROJECT TYPES ACROSS THE SAME COMMUNITY

The coalition screens all potential projects against a structured set of criteria covering technical feasibility, community benefit, NCIF eligibility, and financial viability. Building on Bayamón's concept and priorities, the coalition is advancing two primary project types for investments.

- **Onofre Carballeira Solar and Storage Microgrid (municipal anchor):** The Municipality of Bayamón's multi-use sports complex is the site of the coalition's flagship project — a 6.6 MW DC (5 MW AC) solar-plus-storage system distributed across 13 locations at the complex. A preliminary engineering design commissioned by the Municipality produced a detailed capital cost estimate of \$53.9M, covering \$34.1M in equipment (solar PV generation, battery energy storage, and microgrid controls), \$11.2M in construction, \$2.8M in design and environmental assessment, \$1.8M in interconnection infrastructure, and approximately \$2.6M in permitting, inspection, and commissioning. The hybrid microgrid will sustain critical loads during outages through islanding capability, enabling the complex to serve as an emergency shelter during hurricanes and grid disruptions while supporting grid stability through peak shaving and frequency regulation. Optional electric vehicle (EV) charging infrastructure may be added to improve project economics and community benefit. Financial modeling under the municipal ownership scenario projects approximately \$38.9M in reduced electricity expenditures over 20 years, equivalent to a net present value of savings of approximately \$21.8M at a 6% discount rate.
- **Residential Solar and Storage Program (household-scale resilience):** The program offers standardized rooftop solar PV systems paired with 13.5 kWh battery energy storage to low- and moderate-income single-family households in Bayamón's rural service area, where per capita income is \$17,337 and 28% of residents live below the poverty line. The coalition designed the program to scale in stages: a targeted pilot serving approximately 135 households in six priority rural sectors (~\$3.5M capital required), a rural deployment serving approximately 500 households (~\$13.0M), and a municipality-wide program serving approximately 4,300 low- and moderate-income households (~\$111.6M). Under a third-party ownership model, municipal subsidies of approximately \$7,000 to \$10,000 per household reduce monthly lease payments from an unsubsidized range of \$136 to \$204 per month down to \$94 to \$157 per month, and reduce PPA electricity prices from \$0.26 per kWh without subsidy to \$0.18 to \$0.20 per kWh — competitive with projected future utility rates.

PROJECT SEEKING CAPITAL — ONOFRE CARBALLEIRA SOLAR AND STORAGE MICROGRID

Onofre Carballeira Multi-Use Sports Complex Microgrid — A 6.6 MW DC solar PV system with 20 MWh of battery energy storage distributed across 13 locations at Bayamón's primary municipal sports complex. The system is designed for grid-connected operation with islanding capability during outages, enabling the facility to serve as an energized emergency shelter while supporting grid stability through peak shaving and frequency regulation.

- **Capital Stack:** Total estimated project cost \$53.9M (per preliminary engineering design commissioned by the Municipality); funding sources under active development include federal and territorial grants, concessional financing from mission-aligned capital providers, CGC credit enhancements, and a third-party developer PPA structure under parallel evaluation that would shift financing and construction risk to a private developer while the Municipality pays for electricity generated under a long-term energy purchase agreement.
- **Revenue Streams:** Avoided utility electricity purchases estimated at approximately \$51.2M over 20 years; potential CBES VPP revenues from battery dispatch during grid peak events; potential SREC monetization; optional EV charging revenue if infrastructure added.
- **Investment Readiness:** Advanced Predevelopment — preliminary engineering design complete; financial modeling complete for both municipal and third-party ownership scenarios; site control held by Municipality; interconnection and regulatory pathway identified; third-party developer engagement in progress.
- **Timeline:** Target construction-ready upon capital stack formation; 20-year financial model horizon; third-party ownership scenario evaluation ongoing.



"For the Puerto Rico Green Energy Trust, collaborating with EarthSpark International and the Municipality of Bayamón as part of the Municipal Investment Fund is a chance to show how innovative financing models can accelerate clean energy adoption in communities that lack access to capital. Bayamón, like many municipalities in Puerto Rico, stands ready to partner in clean energy investments. Through strong public-private partnerships and practical financing pathways, we aim to create sustainable models in Bayamón that can be replicated across Puerto Rico to support long-term resilience and energy equity."

- Nellie Gorbea, President and CEO of the Puerto Rico Green Energy Trust

PROVEN IMPACT & NEXT STEPS

The Strategic Gap — and Why This Moment Is the Right One

Puerto Rico offers a strong foundation for clean energy investment: sustained customer demand for solar and storage, a favorable distributed energy policy framework, and an experienced network of engineers, installers, developers, and community organizations. Opportunities span homes, small businesses, critical community facilities, and larger energy infrastructure, accommodating different capital needs and investment sizes. Investments can lower energy costs, support local jobs, strengthen businesses, and protect essential services. Bayamón's projects build on these market strengths with defined sites, preliminary engineering, and financial models to support investment decisions.

With MIF support, this coalition is helping advance Bayamón's concept through a structured, financially modeled, community-grounded investment framework that turns favorable market conditions into closeable transactions. The preliminary engineering design for the Onofre Carballeira Microgrid already exists. The financial model is built. The P3 structures are analyzed. The community engagement infrastructure for the residential program is operational. The gap between where this coalition stands today and a first financial close is not technical feasibility or community support. It is the credit enhancement and concessional capital needed to bridge the difference between municipal resources, lender requirements and the scale of investment needed.

The Bayamón coalition is building more than two projects. EarthSpark, PRGET, and the Municipality designed this effort explicitly as a replicable model for Puerto Rico's 78 municipalities — most of which share priorities for reliable, affordable energy and expanded access to project financing. The tools, templates, financial models, and governance structures developed here are already being shared. The Onofre Carballeira Microgrid is the proof-of-concept that makes the next municipality's first conversation with a private lender substantially easier.

This case study was funded through the Municipal Investment Fund, a partnership between ICLEI USA and CGC to support local governments, tribes, and their partner not-for-profit organizations develop public-private partnership plans that can accelerate the deployment of capital to clean energy projects.

Bayamón