

## Case Study – Isla Grande's Energy Transition with Hybrid Energy Solutions



*The Isla Grande Hybrid Power Plant built in the picturesque island scenery*

### Executive Summary

Isla Grande in Colombia, a vibrant Caribbean island home to approximately 1000 Afro-Colombian descendants, has long sought a reliable and sustainable energy solution. This case study highlights the successful implementation of a cutting-edge hybrid solar-diesel power plant on Isla Grande, significantly improving the quality of life for its residents and fostering sustainable development. ATESS, a leading provider of advanced energy storage solutions, played a crucial role in this transformative project, deploying its PCS250 battery inverters, and battery storage system to enable an efficient and robust AC-coupled off-grid system. This innovative solution, seamlessly integrating with existing grid-tied inverters and diesel generators, ensures 24-hour electricity service for the first time, reduces reliance on fossil fuels, and lays the groundwork for future grid integration.

## Background: Isla Grande – A Community Rooted in Biocultural Heritage

For over 300 years, the community of Isla Grande has cultivated a profound relationship with its unique environment, encompassing coral reefs, mangrove seascapes, inland lagoons, and dry forests. This deep connection, embodied in their collective biocultural heritage, underscores the importance of a sustainable future for the island. Historically, access to reliable electricity has been a significant challenge, impacting residential life, tourism, and community services.

Recognizing this critical need, the Institute for Planning and Promotion of Energy Solutions (IPSE) initiated a visionary project, with construction commencing in November 2023. This ambitious undertaking, with a budget of \$16.359 billion, aimed to build a hybrid solar-diesel generation plant to power 373 homes on Isla Grande, benefiting over 1,200 people, including residential areas, hotels, eco-hotels, an educational institution, a health center, and churches. The project also emphasized community participation, with the Isla Grande community actively pursuing "Energy Community" status to democratize energy access.

## The Energy Challenge & ATESS's Solution

The core challenge was to provide consistent, 24-hour power to Isla Grande in an off-grid environment, while maximizing the use of renewable energy and minimizing diesel consumption. The existing infrastructure included grid-tied inverters, and there was a need to integrate these with a robust energy storage system and existing diesel generators.

ATESS delivered a sophisticated AC-coupled Battery Energy Storage System (BESS) solution designed for optimal performance in an off-grid setting:

**750 kW battery inverter system consisting of 3 units 250kW PCS250:** These high-performance bidirectional inverters are the heart of the system, enabling efficient conversion between AC and DC power, charging and discharging the batteries, and managing the overall power flow. Their programmable working modes ensure flexible operation adapted to the island's dynamic energy demands.

**ATESS Bypass1000 1000kVA Bypass Cabinet (1 unit):** This crucial component provides seamless transfer between different power sources (solar, battery, diesel, and future grid connection) and offers robust protection for the system. Its significant capacity ensures the smooth operation of the entire hybrid plant.



**A 1.4 MWh battery system consisting of 7 units of battery rack BR200R :** These battery racks house the energy storage capacity, working in conjunction with the PCS250 inverters to store excess solar energy and provide power during periods of low solar irradiance or high demand.



*ATESS PCS + Bypass AC-Coupled BESS Solution*

### **Working Principle:**

#### **ATESS PCS + Bypass AC-Coupled BESS Solution**

The ATESS system operates as an intelligent off-grid solution with AC coupling:

**Seamless Integration:** The ATESS PCS250 inverters are AC-coupled with the existing grid-tied inverters. This design allows the inverters to continue generating power from solar PV, even in the absence of a grid connection.

**Smart Energy Management (EMS):** An advanced Energy Management System (EMS) controller precisely manages the power output of the grid-tied inverters. This ensures that solar energy is prioritized and fully utilized to power the island's loads and charge the ATESS battery system.

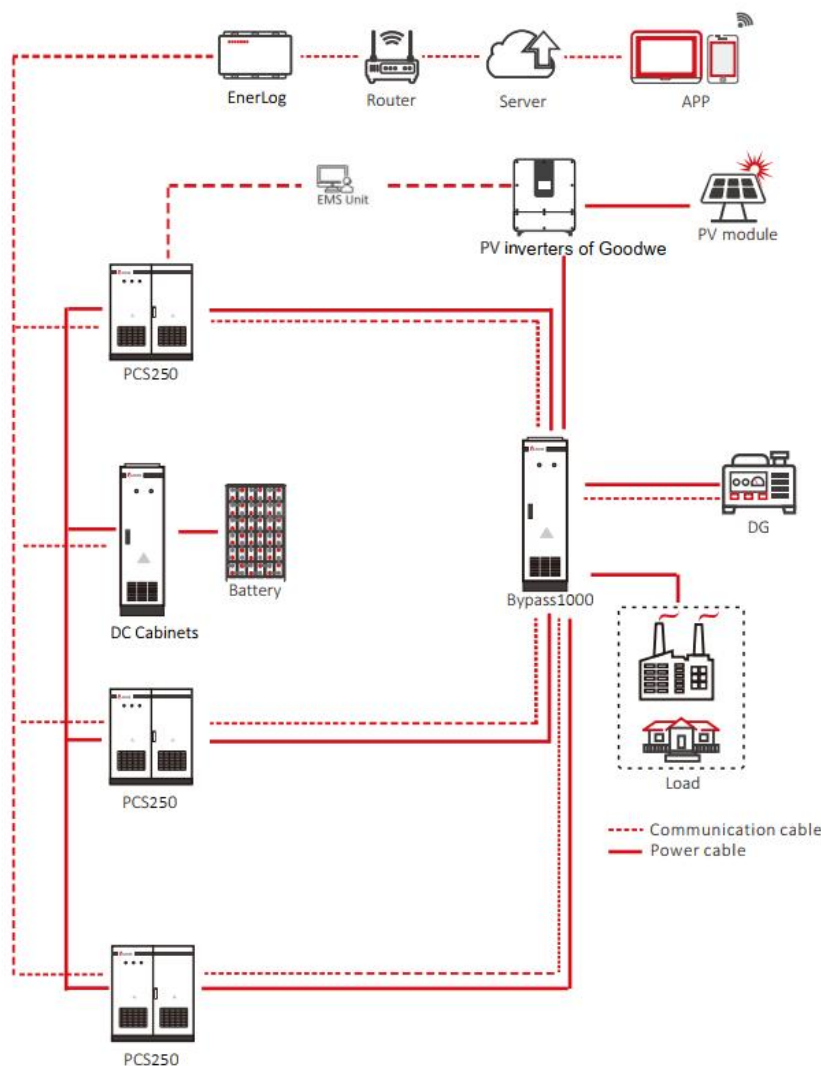




**Reduced Diesel Dependency:** By intelligently integrating solar PV and battery storage, the system significantly reduces the operational hours and fuel consumption of the diesel generators, leading to lower operating costs and a smaller carbon footprint.

**Off-Grid Resilience:** The ATESS PCS inverters, in combination with the Bypass cabinet, create a stable microgrid, ensuring continuous power supply even without a central grid connection.

**Future-Proof Design:** The Bypass1000 is equipped with a grid interface, enabling a seamless transition to a true hybrid energy system if grid access becomes available in the future, without requiring additional configurations. This foresight protects the investment and offers maximum flexibility.



System Diagram



## Impact and Benefits

The implementation of the ATESS-powered hybrid energy system on Isla Grande, operational since April 2025, has delivered significant benefits:

**24-Hour Electricity:** For the first time, over 1,200 residents across 373 properties, including homes, hotels, and essential community facilities, now enjoy uninterrupted electricity service.

**Enhanced Quality of Life:** Reliable power improves daily life, supports economic activities like tourism and cold chain management, and enhances access to education and healthcare.

**Sustainable Energy Transition:** The project champions the use of non-conventional renewable energy sources, aligning with Colombia's "Just Energy Transition" goals and reducing reliance on fossil fuels.

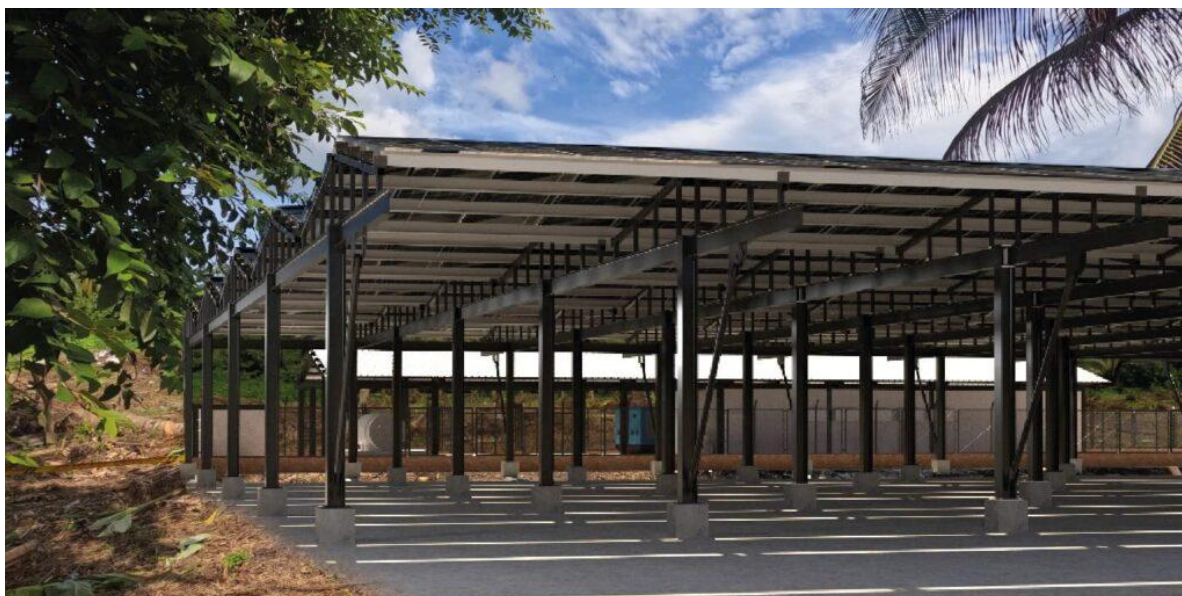
**Economic Development:** Consistent power strengthens the island's productive vocations and fosters tourism, contributing to local economic growth.

**Community Empowerment:** The project's emphasis on prior consultation and the community's pursuit of "Energy Community" status highlight a collaborative and inclusive approach to energy development.

**Reliability and Redundancy:** The AC-coupled design, coupled with the bypass system and diesel generator integration, ensures a highly reliable power supply with built-in redundancy.

The Isla Grande project aligns with Colombia's national strategy to democratize energy access through Energy Communities, as highlighted by Minister Andrés Camacho in November 2023. By providing a sustainable, community-driven energy solution, ATESS contributes to IPSE's mission to strengthen productive processes and meet territorial energy needs. The project's success underscores ATESS's commitment to supporting global energy transitions with innovative, reliable, and scalable solution.





*The hybrid solar-diesel plant in Isla Grande, Bolívar (Image source: canal1.com.co)*

## Conclusion

The Isla Grande Hybrid Power Plant stands as a testament to the power of innovative energy solutions in transforming communities. ATESS is proud to have contributed its robust and intelligent energy storage technologies to this landmark project. By enabling the seamless integration of solar PV, battery storage, and traditional power sources, ATESS has helped to deliver a sustainable, reliable, and future-proof energy infrastructure for the residents of Isla Grande, empowering them with 24-hour access to electricity and fostering a brighter, more sustainable future for this unique Caribbean island.

This project not only showcases ATESS's technical expertise in complex off-grid and hybrid applications but also reinforces our commitment to supporting global energy transitions and delivering impactful solutions that improve lives.

## Reference link:

<https://canal1.com.co/noticias/empresas/construccion-central-hibrida-solar-diesel-isla-grande/>

[https://ipse.gov.co/blog/2023/11/24/inicia-la-construccion-de-la-central-hibrida-que-energizara-a-373-hogares-en-isla-grande/#:~:text=Inicia%20la%20construcci%C3%B3n%20de%20la%20Central%20H%C3%ADbrida,proyecto%20tiene%20un%20presupuesto%20de%20\\$16.359%20millones.](https://ipse.gov.co/blog/2023/11/24/inicia-la-construccion-de-la-central-hibrida-que-energizara-a-373-hogares-en-isla-grande/#:~:text=Inicia%20la%20construcci%C3%B3n%20de%20la%20Central%20H%C3%ADbrida,proyecto%20tiene%20un%20presupuesto%20de%20$16.359%20millones.)



