



Comprehensive Analysis Report:

Ciudad Deportiva del Tenerife Solar-Plus-Storage Project

Executive Summary

The Ciudad Deportiva del Tenerife solar-plus-storage project represents a successful implementation of commercial-scale renewable energy integration in sports facilities. Located on the island of Tenerife, Spain, this project has demonstrated exceptional performance over its first year of operation (September 10, 2023 - September 10, 2024), exceeding initial energy production estimates while providing significant economic benefits through electricity cost savings.



The system configuration consisting of three SAJ CHS2 50kW/100kWh hybrid solar-storage cabinets has proven technically reliable and economically viable, with a simple payback period of under 5 years even without additional government subsidies. Performance data indicates potential for further optimization through increased storage capacity, which would better utilize the available solar generation currently constrained by zero-export requirements

1 Project Background and System Configuration

1.1 Project Overview

The Ciudad Deportiva del Tenerife project is a sports club located on the island of Tenerife, Spain,



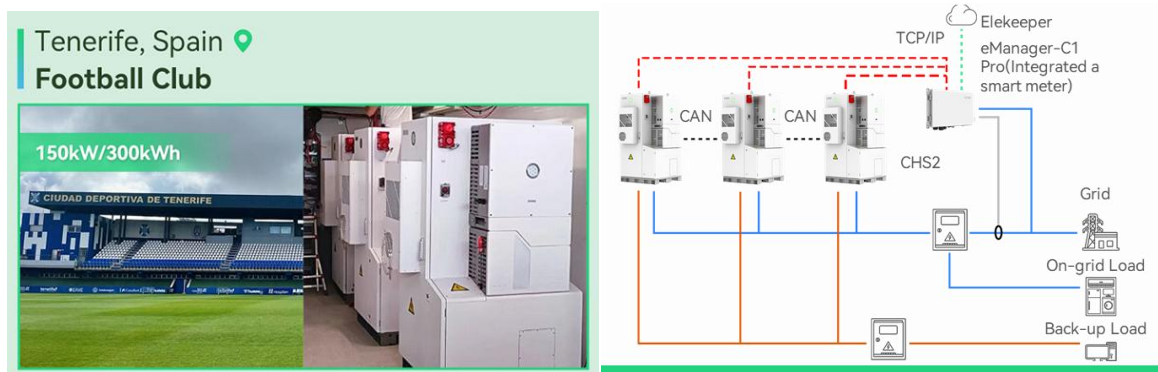
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providing extensive athletic facilities for local residents. The facility's energy load primarily serves HVAC and lighting systems, with power demand fluctuating between 30kW and 150kW depending on facility usage patterns. Maximum electricity consumption occurs during evening hours (18:00-22:00) when sporting activities peak and lighting demands increase substantially. This load profile creates an ideal scenario for solar-storage integration, as solar generation occurs during daylight hours while energy consumption peaks in the evening when solar radiation is unavailable.

1.2 Technical Configuration

The project utilizes three SAJ CHS2 50kW/100kWh hybrid solar-storage integrated cabinets,



providing a total storage capacity of 300kWh with a power output rating of 150kW. The photovoltaic system has a installed capacity of 251kWp, designed to maximize renewable energy generation within the constraints of the available space. The system was commissioned on September 10, 2023, and has completed one full year of operation without significant technical issues. SAJ provided comprehensive equipment commissioning services and operational guidance to ensure proper system functioning and maintenance procedures.

The system operates under specific constraints due to Spanish grid regulations, particularly zero-export requirements that prevent excess solar energy from being fed back into the grid. This limitation necessitates careful energy management to ensure that solar generation does not exceed onsite consumption, with excess energy being directed to storage rather than exported to the grid.

2 Performance Analysis

2.1 Photovoltaic Generation Performance



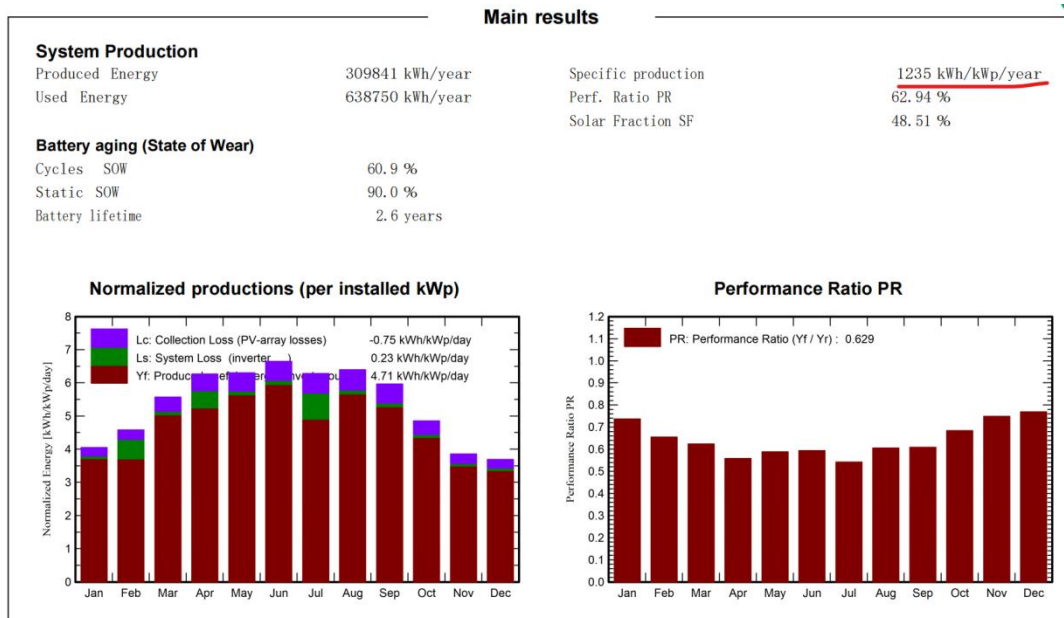
The photovoltaic system has demonstrated exceptional performance during its first year of operation:

Total Generation: 334 MWh cumulative production since commissioning

Average Generation Hours: 1,330 hours annually

Performance Ratio: Actual generation exceeded PVsyst simulations by approximately 7.7% (1,330 actual vs. 1,235 simulated kWh/kW/year)

The superior performance compared to simulation results can be attributed to several factors, including better-than-expected solar radiation patterns on the island, efficient system design, and potentially lower-than-predicted system losses. The zero-export limitation has been managed through coordinated operation with the storage system, though as discussed later, this constraint has also resulted in some curtailment of potentially available solar energy.



2.2 Energy Storage System Performance

The storage system has operated with remarkable efficiency and reliability:

Cycling Pattern: Average of 1 complete cycle per day

Depth of Discharge: Consistently achieving the designed 90% DoD

Total Energy Discharged: 89.71 MWh during the first year

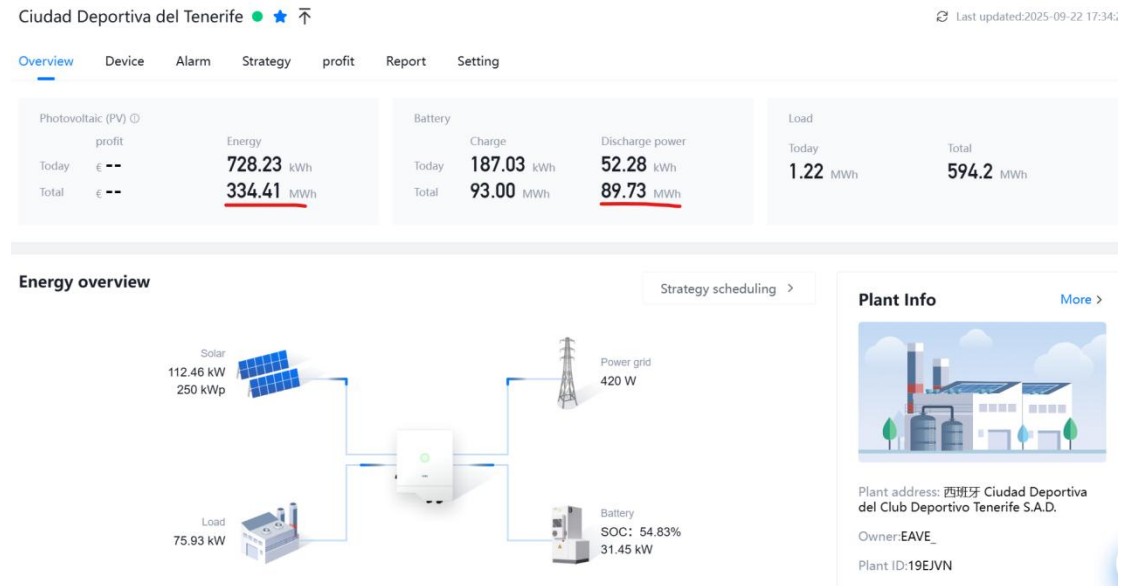
Equivalent Full Cycles: 332 complete cycles (89.71 MWh ÷ 0.3 MWh = 299 cycles; adjusted for 90% DoD = 332 cycles)



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The consistent daily cycling pattern indicates that the system is effectively performing its intended function of shifting solar energy from daytime generation to evening consumption. The achievement of near-full-depth discharge on a daily basis demonstrates proper system sizing for the application and effective energy management strategies.



3 Economic Evaluation

3.1 BESS Cost Savings Analysis

The primary economic benefit of the storage system comes from electricity cost savings through arbitrage - storing solar energy during daytime hours when electricity values are lower (or effectively zero cost for onsite solar) and discharging during high-value evening hours:

Energy Discharged: 89.71 MWh annually

Average Electricity Rate: €0.17/kWh (based on local tariff structures)

Annual Savings: €15,250 (89,710 kWh × €0.17/kWh)

These savings represent direct reduction in electricity purchases from the grid during peak rate periods. Additional savings may be realized through demand charge reduction, though specific data on demand charges was not provided in the project information.

3.2 Investment Return Analysis

Based on the demonstrated first-year performance:



Annual Savings: €15,250

Simple Payback Period: less than 5 years based on storage system cost only

Based on the revised storage system cost assumption of €250/kWh, the economic evaluation for the Ciudad Deportiva del Tenerife project demonstrates a significantly improved return on investment. With a total storage capacity of 300 kWh, the revised initial investment for the storage system alone is €75,000 (300 kWh × €250/kWh). Annual savings from energy arbitrage remain €15,250, as derived from the discharged energy of 89.71 MWh and an average electricity rate of €0.17/kWh. The simple payback period is now approximately 4.92 years (€75,000 / €15,250), aligning with the project's initial report of under 5 years without subsidies.

4.1 System Reliability

The project has demonstrated exceptional reliability during its first year of operation:

Uptime : All three CHS2 units have maintained continuous operation without failures

Maintenance Requirements: Less than 8 hours annually for routine maintenance

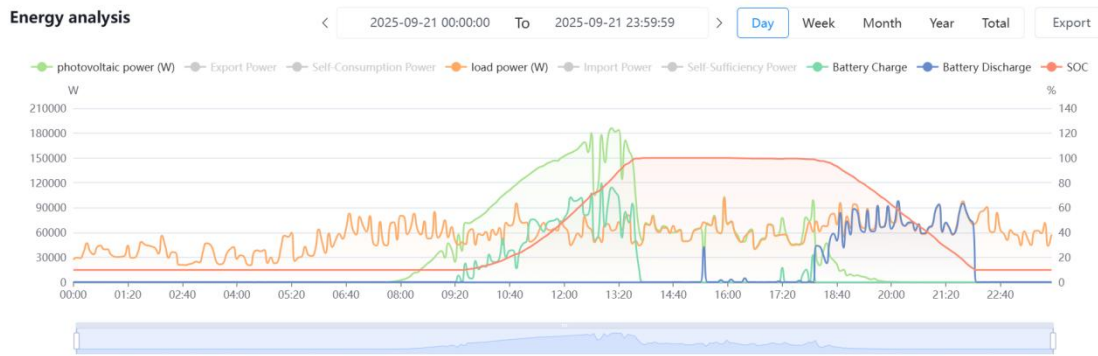
Component Replacement: No replacement of major components required

Annual Maintenance Cost: Below €250

The minimal maintenance requirements align with expectations for modern solar-storage systems, which are designed for operational simplicity and reliability. The low maintenance time (under 8 hours annually) demonstrates the effectiveness of SAJ's design and the adequacy of the provided operational guidance

4.2 Monitoring and Control

The system is monitored through SAJ's Elekpper platform, which provides continuous performance data and system status information. This remote monitoring capability has likely contributed to the high reliability figure by enabling proactive identification of potential issues before they result in downtime. The platform provides the data necessary for the performance analysis presented in this report.



5 Optimization Recommendations

5.1 Storage Capacity Analysis

Current performance data indicates that the storage system is undersized for optimal operation:

Existing Capacity: 300 kWh

Recommended Capacity: 500-600 kWh based on analysis of constrained solar generation

The larger storage capacity would enable capture and utilization of more solar energy that is currently constrained by zero-export requirements. Based on the superior PV performance (1,330 vs. 1,235 kWh/kW/year), approximately 7.7% more solar energy is available than initially projected, but this excess energy cannot be fully utilized due to storage limitations.

5.2 Economic Impact of Increased Capacity

A storage system expansion to 500-600 kWh would potentially increase energy discharge proportionally:

Potential Additional Discharge: 50-100% increase (approximately 45-90 MWh annually)

Additional Annual Savings: €7,650-€15,300 (at €0.17/kWh)

Incremental Investment: Approximately €120,000-€210,000 for 200-300 kWh additional capacity

The economic case for expansion depends heavily on the actual cost of additional storage capacity and potential changes to electricity rate structures over time. Given the trend of declining storage costs, a phased expansion approach might be warranted.

5.3 System Operation Optimization



Further optimization could be achieved through:

Enhanced Energy Management Strategies: More sophisticated algorithms could potentially extract additional value from the existing system through predictive scheduling based on weather forecasts and usage patterns.

Demand Response Participation: The system could potentially participate in grid services programs if available in the Spanish market, creating additional revenue streams.

BACK UP: when grid loss, SAJ CHS2 can provide back up function for the loads;

Ciudad Deportiva del Tenerife ● ★ ↕

Overview Device Alarm Strategy profit Report Setting

Manual close Type Device SN/Related device Search Reset Fold ^ Download records Refre

Alarm name Alarm time < 2024-12-02 2024-12-23 >

● Urgent(0) ● Important(0) ● General(3)

Status	Alarm name	Related device SN	Type	Device SN	Alarm occurrence time	Alarm update time	Alarm C	Operation
●	Grid Lost	CSV6503J2419E00089	Inverter	CSV6503J2419E00089	10/12/2024 13:25:34	16/12/2024 13:34:04	6DAY 8	△
●	Grid Lost	CSV6503J2419E00095	Inverter	CSV6503J2419E00095	10/12/2024 13:25:34	16/12/2024 13:34:09	6DAY 8	△
●	Grid Lost	CSV6503J2419E00098	Inverter	CSV6503J2419E00098	10/12/2024 13:25:33	16/12/2024 13:34:13	6DAY 8	△

6 Conclusion and Implications

The Ciudad Deportiva del Tenerife project demonstrates the technical and economic viability of solar-storage systems for commercial and sports facilities in Spain. The successful first year of operation has proven the reliability of SAJ's CHS2 systems and the effectiveness of their integrated approach. The project's performance exceeded energy generation expectations while providing substantial electricity cost savings.

The identified undersizing of storage capacity presents an opportunity for enhanced performance and economic returns. Future projects with similar profiles should consider larger storage capacities relative to PV size, particularly in jurisdictions with zero-export restrictions. The demonstrated low maintenance requirements and high reliability should give confidence to other facilities considering similar investments.



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As storage costs continue to decline and energy management sophistication improves, the economic case for such projects will strengthen further. The Tenerife project serves as an valuable reference case for the sports and commercial facility sector in Southern Europe.