Project Charter

SollNova Lda.

Implementation of Solar Panel Systems on the Lisbon-Cascais Train Stations

VERSION: 1.0 REVISION DATE: 29.11.2023

Approver Name	Title	Signature	Date
Pedro Manuel	Project Manager		29.11.2023
Pedro Moreira	Customer		30/11/2023
Marinho Gama	Sponsor		29.11.2023

Project Name: Implementation of Solar Panel Systems on the Lisbon-Cascais Train Stations	**Business area:** Renewable energy infrastructure
Customer: Pedro Moreira, President of Comboios de Portugal	**Budget:** 3.000.000 €
Project Manager: Pedro Manuel	**Start date:** 01.03.2024
Sponsor: Marinho Gama, CEO of SollNova Lda.	**Finished date:** 30.09.2025

1 – Project goal

This project aims to provide reliable, renewable and sustainable energy to the Lisbon-Cascais train stations, through the implementation of solar panels. This initiative not only ensures robust access to energy, but also demonstrates a tangible commitment to environmental sustainability, aligning with the United Nations Sustainable Development Goal number 7, which emphasizes access to affordable, reliable, sustainable and modern energy for all. Furthermore, in the long term, the adoption of this technology will result in a significant reduction in costs associated with energy, promoting more efficient financial management for Comboios de Portugal.

Emphasizing:

a) **Financial:** Long-term cost reduction compared to conventional forms of energy supply;
b) **Ecological:** Reduction in emission levels of polluting gasses and noise pollution;
c) **Operational:** Clean and renewable energy supply system that reduces dependency on the grid and other sources.

Completion Criterion:

The project is completed when the final project documentation is delivered on October 2, 2024, two days after the date of signature of the final acceptance notice of the work by the client.

2 – Business justification

2.1 – Problem / Business need

The current dependence of Lisbon-Cascais train stations on conventional energy sources presents a double challenge.

- Firstly, it exposes stations to the volatility of energy prices in the market, as constant variations in fossil fuel prices are observed driven by global conflicts such as wars - resulting in financial uncertainties in the operational budget.

- Second, dependence on non-renewable energy sources contributes to the carbon footprint of stations, undermining environmental sustainability efforts.

This project aims to eliminate these issues by introducing solar panel systems to harness clean and renewable energy, reducing operational costs and environmental impact, as well as making stations less vulnerable to fluctuations in the energy market. Further, it positions SollNova and Comboios de Portugal as leaders in the adoption of innovative and environmentally friendly solutions in the transport sector.

2.2 – Strategic context

Within the strategic context, the project aligns perfectly with the general objectives of SollNova and Comboios de Portugal. Comboios de Portugal, as an important player in the transport sector, is strategically positioned to establish new standards of environmental awareness within the industry. And no one is better than Sollnova Lda to implement such solutions, a visionary engineering company, a pioneer in sustainable energy solutions.

In a global context in which sustainability becomes increasingly imperative, Europe and particularly Portugal emerge as protagonists committed to innovation and environmental responsibility. This project for the implementation of solar

panel systems at Lisbon-Cascais train stations not only responds to the pressing need to reduce the local carbon footprint and expand the form of energy generation, but also aligns with the determination observed worldwide to implement eco-efficient solutions.

In the Portuguese business scenario, there is a growing demand for sustainable practices, driven by environmental awareness and recognition of long-term economic benefits.

In this context, our client, Comboios de Portugal, not only seeks to improve its image, but is genuinely committed to promoting an exemplary environmental, social and governance (ESG). In doing so, it not only ensures a greener future for generations to come, but also cements a position as a catalyzing force in positive transformation.

2.3 – Expected benefits

On business positioning: CP can position itself as an environmentally responsible company, contributing to sustainability and reducing the carbon footprint associated with public transportation. By integrating solar panels, CP showcases a commitment to innovative solutions and technology.

On market share: The implementation of solar panels can serve as a unique selling proposition, attracting environmentally conscious commuters and potentially expanding the customer base. With an environmentally friendly initiative, CP may gain more support from local communities, enhancing its standing in the market.

On annual revenue: Excess energy generated by solar panels could potentially be fed back into the grid, creating an additional revenue stream.

On operational cost reduction: Solar panels can offset a significant portion of the energy consumption of the train stations, leading to reduced operational costs over time. Solar panels generally require less maintenance compared to traditional power sources, contributing to operational cost savings.

In other costs: Depending on the region, there may be tax incentives or subsidies for companies adopting renewable energy solutions, further reducing the financial burden. With a sustainable initiative in place, CP may negotiate lower insurance premiums, as the company demonstrates a commitment to risk mitigation and environmental responsibility.

On ROI: While the initial investment in solar panels may be significant, the long-term return on investment is likely to be positive due to reduced energy costs and potential revenue streams.

Intangible benefits: CP can enhance its brand reputation by aligning with sustainability goals, creating a positive image among customers, stakeholders, and the public.

Other benefits: Solar panels contribute to energy independence, reducing reliance on external power sources and providing a more stable energy supply. CP can engage with local communities through awareness campaigns and educational initiatives, fostering a sense of partnership and support.

3 – Goals and products

3.1 – Intermediate goals

List relevant intermediate goals:

- Site assessment & energy needs analysis (of each train station)
- Design proposal (for PV system)
- Regulatory compliance
- Financial planning
- Vendor selection (for equipment)
- Logistics & procurement
- Installation & testing (of PV systems)
- Grid connection
- Monitoring & maintenance plan (of PV systems)
- Training (for station staff)
- Community & stakeholder engagement
- Final tests & commissioning (of PV systems)

3.2 – Products and deliverables

Intermediate:

- Site assessment report (for each train station)
- Energy consumption analysis (for each train station)
- Regulatory compliance documentation
- Cost-benefit analysis report
- PV system technology recommendations
- Vendor selection & contracts
- Detailed system designs (PV)
- Seasonal irradiance study
- Grid connection approvals
- Community engagement documentation
- Installation completion reports
- Monitoring & maintenance plan (PV)
- Training materials & sessions

Final:

- Functional PV systems
- Performance evaluation reports (of PV systems)
- Maintenance & monitoring records (of PV systems)
- Community awareness initiative
- Sustainability impact assessment
- Final project documentation

3.3 – Product and Project requirements and specifications

The PV panels will be installed on the waiting covers and/or roofs of each station of the Lisbon-Cascais train line. Throughout all the 17 stops there is plenty of sun exposure, which will contribute to the project's success. Nonetheless the site assessment and the energy consumption reports will help define the area, the angle and placement of the PV panels.

Technology recommendations for the solar panel systems will be based on an in-depth analysis of available options, considering efficiency, durability, and suitability for the local climate. Keeping in mind factors that could affect its performance such as bad weather and salty water (since some stations are pretty close to the ocean.

During the day, all the energy produced will directly be used in the station, using the grid whenever it's not enough electricity and charging the batteries when there's a surplus of energy, also feeding/selling into the power grid when batteries are fully charged. During the night, the possible remaining energy of the batteries is used. It is expected to be operational during the whole year, although the irradiance study will determine the viability of this decision.

Detailed system designs will provide precise engineering blueprints, considering aesthetics and integration with existing structures. Grid connection approvals will involve coordination with local utility providers to ensure seamless integration with the existing power grid. One of the restrictions of the implementation is not to affect the trains and stations' normal functioning.

To oversee and regulate energy consumption and storage, smart meters equipped with internet connectivity will be integrated, necessitating human intervention solely in instances where operational deviations occur. This way, the systems will run almost automatically, with the possibility of monitoring them from far away.

In the initial part, to complete the installation a lot of personnel will be involved, including project and electrical engineers and technicians. While performing, only one technician will be hired to daily monitor if everything is running the way it's supposed to and to intervene if some anomaly happens.

To have communitary support and build the image of the client as a clean energy advocate, marketing communication can be made depending on the goals and decisions of future meetings. In any case, an opening ceremony will be held, probably in one of the end stations (Cais do Sodré or Cascais), with quick lectures on how solar panel technology works and covering what´s the project about.

The success of the Lisbon-Cascais train stations solar panel installation project will be measured by efficient power generation, adherence to budgetary constraints, positive community impact, and long-term sustainability. Regular assessments and performance evaluations will guide ongoing improvements and ensure the project's enduring success.

4 – Critical Success Factors

1. Safety and Compliance:

Priority is given to ensuring the safety of workers and passengers, as well as compliance with regulations. This is fundamental to the success of the project and the reputation of the company.

2. Budget Management:

Regularly monitoring expenditures and staying within the allocated budget is crucial for financial control. This includes identifying areas where cost-saving measures can be implemented without compromising the project's overall success.

3. Cost-Efficient Solutions:

Prioritizing cost-effective equipment and solutions is important for managing the project within budget constraints. However, cost-efficiency should not compromise the quality and long-term performance of the solar panel systems.

4. Efficiency in Implementation:

Streamlining the installation processes is crucial to meet timelines and ensure that the project is completed within a reasonable timeframe. Efficiency helps control costs and minimizes disruptions.

5. Resource Allocation:

Ensuring the availability of skilled labor and necessary resources during critical phases helps prevent delays and keeps the project on track. Adequate resource allocation supports both efficiency and quality.

6. Feasibility and Adaptability:

Assessing and prioritizing stations based on their suitability for solar installations is essential to maximize the effectiveness of the project. Adapting to the specific conditions of each station ensures better energy generation outcomes.

7. Functionality and Quality:

Ensuring that the solar panel systems meet the intended energy generation targets and adhere to quality standards is crucial for the long-term success and sustainability of the project.

8. Sequential Planning:

Planning tasks and phases effectively is essential to optimize workflow and minimize project duration. However, this factor is ranked lower than efficiency, as an overly rigid sequential plan may hinder adaptability to unforeseen challenges.

9. Innovation and Future-Readiness:

While considering scalability and potential future enhancements is important, it is placed lower in priority as the immediate success of the project relies more heavily on factors such as safety, efficiency, and cost-effectiveness.

10. Flexibility and Contingency:

Allowing some flexibility in scheduling to accommodate unexpected challenges or changes in the project timeline is important but is placed lower in priority than other factors as it should be balanced with efficiency and adherence to timelines.

5 – Assumptions and constraints

Assumptions:

- SollNova is a portuguese company based in Lisbon and has a large importance on the portuguese market.
- Various studies previous to this project show that Portugal is compromised on helping to fix environmental issues, and also that there are several other projects that are being developed regarding this issue, so it is a good opportunity for SollNova to grow.
- 100% of the available budget was gathered through financing and support from the government.

Constraints:

- **Internal Conditions:**
  - Potential lack of qualified labor
  - Possible exceedance of the time schedule
  - Possible exceedance of the planned budget

- **External Conditions:**
  - Weather constraints
  - Delays of supplies
  - Dimension of the available space for the PVs could be smaller than the demand
  - Location restraints
  - Delays in approvals by entities such as Lisbon City Hall and DGEG
  - Financing requested could not be granted

6 – Total budget

Manpower:
Materials:
Suppliers and service providers:
Financial costs:
Administration:
Other costs:

TOTAL: 3.000.000 €

7 – List of appendixes

List of documents needed for complementing the project description:

[No appendixes required in the course assignment]