# SELECTION AND TECHNICAL CRITERIA FOR PHOTOVOLTAIC INSTALLATIONS

## *Eastern Caribbean Solar Challenge*

The Eastern Caribbean SOLAR CHALLENGE *race to the sun!*

Caribbean NDC Finance Initiative
Collective Leadership for Accelerated NDC Implementation

***Prepared with the kind support of GIZ***

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# INTRODUCTION

The following criteria were developed for the Eastern Caribbean Solar Challenge and initiative of the Caribbean NDC Finance Initiative (NDCFI). While they are mainly intended to guide public-sector agencies, they are also helpful for private-sector interests and homeowners who are looking to install photovoltaic systems.

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The NDCFI was established in 2017 by the OECS and the Government of Saint Lucia. It is a regional cross-sector and multi-partite stakeholder consultation and engagement process to support ambitions for climate leadership in the Caribbean and a regional platform for learning and support on project preparation and access to finance to accelerate NDC implementation and complementary action.

The NDCFI aims to advance and accelerate NDC implementation and Caribbean climate action and has initiated a non-traditional engagement that includes governments, development partners, and the private sector.

Through the Eastern Caribbean Solar Challenge, the NDCFI aims to contribute to the region's efforts to promote awareness and increase the adoption of photovoltaic energy.

For more information on the NDCFI, visit: [ndcfi.oecs.org](ndcfi.oecs.org)

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# 1. CLIMATE CHANGE IMPACT RESILIENCE

Climate change impact resilience is a key requirement for any RE plants.

- Risks exist in hurricane situations where it is possible to lose parts or the entire PV plant due to insufficient compliance with technical specifications.
- Robust arrays for PV panels are essential. Also important is the mechanical protection of cables against flying objects or collapsing structures during hurricane conditions.
- Especially important is the specification for PV panels and their arrays to resist hurricane conditions of up to cat. 5. **Minimum requirement: Hurricane resistance to Category 5**
- Climate resilience does not only refer to the PV plant and its components but also to the selection of location; preparation of the selected location; and other protective measures such as the housing inverter and transformers to protect them from storms and floods.

Additional Guidance:

- https://rmi.org/insight/solar-under-storm/
- https://rmi.org/solar-under-storm-part-ii-designing-hurricane-resilient-pv-systems/

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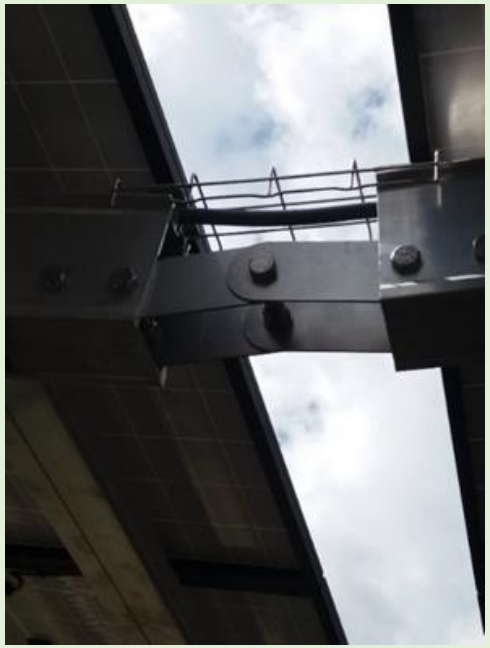
# 1. CLIMATE CHANGE IMPACT RESILIENCE



Protection of cables against flying objects or collapsing structures (Carport at Union, Saint Lucia

Wall building housing inverters, transformers, control panels etc., (PV plant at Argyle, SVG

PV Plant (Carport, Union, Saint Lucia)

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# 2. COMPLIANCE WITH INTERNATIONAL NORMS AND STANDARDS

- **Compliance with international norms and standards** is an important pre-condition for repetition, up-scaling and establishment of ‘best practice standards’ in PV technology.
- The specification of international norms and standards is important to ensure high-quality components (preferably TIER 1 specifications), plant operation, performance, and sustainability.

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# 3. VISIBILITY AND PUBLIC RELEVANCE

- Selected projects should fulfil multiple functions, e.g.
  - **schools** (reduction of public funds for electricity, educational aspect for students and shelter function for the public)
  - **community centres** (reduction of operational cost, high visibility for public and shelter function)
  - **hospitals** (only for non-critical functions, reduction of operational cost, high visibility for public)

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# 3. VISIBILITY AND PUBLIC RELEVANCE

- Existing buildings with high visibility and public relevance should be selected as flagship/ lighthouse projects.
- If possible, selected buildings should be used by, and accessible to, the wider public to increase awareness for the merits of the PV technology.
- Existing buildings like schools are often listed and accessible as public shelters in emergency situations.
- Decentralized generation of PV electricity can help to reduce electricity bills, increase grid independence in emergency situations and increase overall climate change resilience (e.g., for communication, cooling of essential medicine, powering and re-charging of critical infrastructure such as pumps, emergency radios, phones, water supply treatment, etc.).
- In many OECS Member States, schools and other public structures are undergoing rehabilitation and improvement.

4.2 kWp PV Plant at Secondary School (Campus B, Vieux Fort, Saint Lucia)

Old PV plant at a school (Primary school at Bouton, Saint Lucia)

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# 4. COMMERCIAL OPERATION

- PV plants should be operated and based on viable and beneficial business model and not as demonstration project.
- PV technology is mature, used world-wide including in the Caribbean and does not need to be demonstrated. It is, however, essential for the owner of a PV plant as well as for the public to demonstrate its economic value in helping to reduce electricity bills and increasing public awareness, beside other benefits.

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# 5. OWNERSHIP AND RESPONSIBILITY

- Assignment and follow-up is an especially important consideration for continuous operation and sustainability of a PV plant.
- Transferring ownership of a PV plant and assigning responsibility for operation, maintenance, data collection and reporting is a key precondition for sustainable operation of a PV plant and its suitability as a flagship/lighthouse project. The lack of clear responsibility for a PV plant is often the reason for the break-down of PV plants creating much damage of the image of PV technology in the public eye.

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# 6. MAINTENANCE CONTRACT

- A maintenance contract is an important instrument  to ensure plant availability, data collection and continuous training of operators.
- Although often regarded as maintenance-free, a PV plant and its components require regular service and preventive maintenance.
- If well designed and installed with high quality components, it may happen that the PV supplier/installer will not to have visit the plant again. However, the contractually agreed warrantee period does usually not include any site visits for preventive maintenance and service.
- In some cases, a PV plant can therefore be operated at lower efficiency/performance or be shut down completely for lack of maintenance and service. A service and maintenance contract for a PV plant is, however, essential for its continuous operation at nominal performance.
- Experience with PV installations has shown that privately-owned PV plants operated by households, companies or other entities have a higher sustainability and performance record than public PV plants without clearly assigned responsibilities and consequent follow up.
- The cost expenditure for such a contract with annually two visits and respective reports is often not higher than the investment cost of one (1) kW and therefore, well-spent money.

# 7. DATA COLLECTION AND ANALYSIS

**Data collection and data analysis** is important for follow tracking benefits and operational experience (‘travelling on the learning curve’).

There are many PV plants installed in the Caribbean, the majority of which are operational, but operational data are often not systematically collected, recorded and analyzed.

Without proper recording and analysis of operational data, design errors, technical problems and the need of spare parts may not be recognized early enough and that may lead to unnecessary down-time and loss of economic benefits.

Lack of systematic data collection is also often the reason that electricity savings and other economic and environmental benefits are not properly recorded and accounted for.

A good example of using data to raise public awareness, while simultaneously documenting achievements, is the procurement, installation and public exposure of a panel that shows the real-time values for electricity production, avoided GHG emissions and achieved economic benefits.

PV Plant at Argyle, Saint Vincent and the Grenadines

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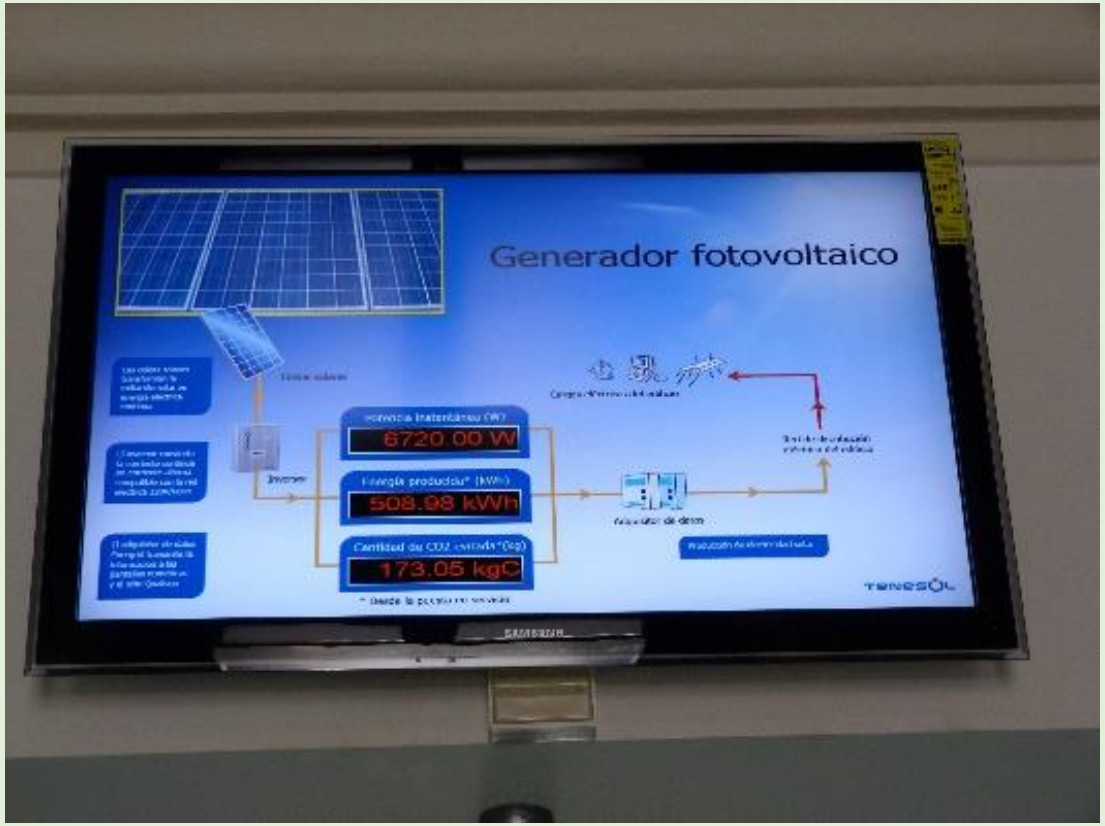
# 7. DATA COLLECTION AND ANALYSIS





Flat-screen Panel installed at the entrance hall of the 'Commission Nacional de Energia' (CNE) in Santo Domingo, Dominican Republic.

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# SUMMARY OF CRITERIA FOR SELECTION OF LIGHTHOUSE PROJECTS IN OECS MEMBER STATES

- Interested OECS Member States should select flagship/lighthouse projects applying some or all of the following design criteria:

- Climate resilience, e.g., resistant to hurricanes of category 5
- High-quality components complying with international norms and standards (see tender document in Annex)
- Service and maintenance contracts (beyond the legal warranty requirements for parts and labour)
- Monitoring and documentation of operational data (electricity generation, achieved energy savings, achieved CO2 avoidance, technical logbook, carried out service and maintenance, failures of systems, replacement of parts etc.)
- Public visibility/demonstration: in case of roof top systems: electronic display of operational time, generated kWh, avoided GHG emissions,
- Accessibility, visibility (roof top usually not visible!)
- Capacity building and training of operators
- Awareness building/education for students, visitor groups and individuals

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# SUMMARY OF CRITERIA FOR SELECTION OF LIGHTHOUSE PROJECTS IN OECS MEMBER STATES

- Demonstration of multiple use, e.g., backup power for emergency public shelters, solar pumps, rainwater harvesting and filtering, merits of energy security, power supply in emergency situations through distributed generation)
- Model for ‘behind the meter’ (to circumvent legal issues and need for Feed-in tariff)
- Transparency for repetition and upscaling: cost of investment and operation, yield, payback period, IRR and/or NPV for commercial applications
- Financing concept transparent and accessible for the public (as far as not confidential)
- Web box with internet capability, for remote control and troubleshooting as well as online information of the interested public user
- Grid connected, PPA or feed-in-tariff with utility
- Energy efficient building or Energy Efficiency Measures (EEMs) need to be implemented before any PV plants are installed
- Application of standard technical design and standardized tender documents
- PR opportunities and activities, e.g., handouts with manual how to calculate a PV plant
- Clear concept of ownership and assignment of responsibility

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# SUSTAINABILITY CRITERIA (FOR OECS)

To ensure the sustainability of a flagship/lighthouse PV projects, OECS should consider following:

- Carry out an assessment of PV history in the OECS Member state. Analyse success stories and pitfalls and distil lessons learned out of it. Consider these lessons learned in the proposed Eastern Caribbean Solar Challenge.
- Design a concept to raise public awareness among the potential users for the potential and limitations.
- Set up and implement a concept of training and capacity building for operators of PV plants under this initiative. This concept can be regionally designed.
- School programmes should be supported to educate students using the flagship/lighthouse project as showcase (e.g., in Saint Lucia, as part of the Green School NAMA).
- Monitoring System: operators should be obliged to maintain operation records/ logbooks and record not only yield and consumption (this is usually being done electronically by the inverter) but also any failure reports, down times, spare part exchanges etc.
- Raising awareness of owners for preventive maintenance issues.
- PV suppliers should also be obliged to provide with their project proposal the proof or origin of equipment, certificates, quality labels, guaranteed spare part supply etc.

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# SELECTION MATRIX OF 'FLAGSHIP VISIBILITY' OR 'LIGHTHOUSE' CHARACTER OF PV PLANT

| Public places/building (example) | Public visibility | Education oppor-tunities | Social accep-tance | Multiple uses | Public aware-ness potential | Remarks |
|---|---|---|---|---|---|---|
| School/college | medium | high | high | yes | medium | Used also as public shelter |
| Hospital, health station | medium | low | Medium | no | medium | Energy security important |
| Community centre | high | medium | High | high | high | Used also as public shelter |
| City center | high | medium | high | high | high | High visibility |
| Market place | high | high | high | medium | high | High visibility |
| National landmark | high | high | Medium | medium | medium | |
| Police station | medium | medium | low | low | medium | |
| Church | high | medium | high | medium | medium | Used also as public shelter |
| Government office building, ministry | medium | medium | medium | low | medium | |
| Cultural centre, theatre, cinema, dance hall | medium | medium | medium | medium | medium | Used also as public shelter |
| Supermarket/mall | high | high | high | Low | High | |
| Electric utility | medium | high | medium | low | medium | |

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