

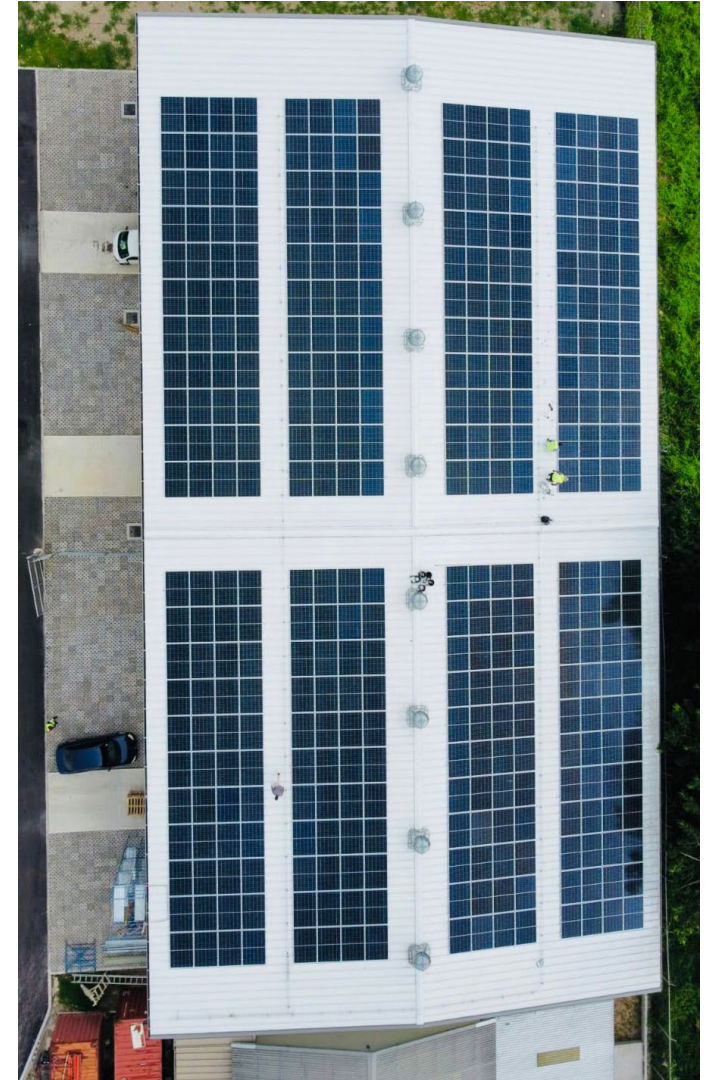
Strengthening Energy Sector Resilience in Jamaica (SESR-Jamaica) Programme

Solar PV Standards in Jamaica: Research Findings and Opportunities for Private Sector Engagement

November 21, 2023

Agenda

- Introduction of SESR-Jamaica Programme and Standards Analysis
- Current Jamaican Context – Solar PV Standards
- International Standards Organizations and Best Practices
- Private Sector Survey Results
- Suggested Standards and Enforcement Mechanisms
- Overview of BSJ Standards Development Process
- Facilitated Discussion / Q&A
- Next Steps / Closing Remarks



INTRODUCTION OF SESR-JAMAICA PROGRAMME AND STANDARDS ANALYSIS

Tiffany Arnold and Will Sloan, Cadmus

Scope of Solar PV System Standards Analysis

The Ministry of Science, Energy, Telecommunications, and Transport (MSETT) as a member of the Bureau of Standards Jamaica (BSJ) Electrical Products and Practices (EPP) Committee, requested technical assistance from Cadmus to assess and provide recommendations to inform the adoption of additional solar PV system standards in Jamaica.

Cadmus reviewed international best practices and conducted a survey of Jamaican PV industry representatives to develop recommendations for PV system (safety, performance) standards, compliance, and enforcement mechanisms.

This analysis was conducted under, and supports objectives of, Strengthening Energy Sector Resilience in Jamaica (SESR-Jamaica), a programme of USAID/Jamaica and the Jamaica Energy Resilience Alliance (JERA). Cadmus is the lead member of JERA. www.cadmusgroup.com/jamaicaenergy.

Strengthening Energy Sector Resilience in Jamaica Programme

SESR-Jamaica is a 3-year programme of the **U.S. Agency for International Development (USAID) Jamaica** and the **Jamaica Energy Resilience Alliance (JERA)**.

Its goal is to strengthen the ability of Jamaica's energy sector to withstand or rebound quickly from a natural or **battery technologies (PV+)**. human-made shock by **supporting the adoption of resilient solar PV and**

In collaboration with industry partners like JMEA, JHTA, and PSOJ, SESR-Jamaica is helping Jamaican businesses access solar power through:

- Free consultations from third-party solar and storage experts,
- Access to well-qualified solar installers, and
- Help identifying the best available financing options for a PV or PV+ installation.

Energy Resilience in Jamaica

Strengthening Energy Sector Resilience in Jamaica Overview

Overview

What is PV and PV+?

I Want to Go Solar!

I am a Solar Professional

Informational Resources

Workshops and Events

Contact Us

JERA Customers-Only Resources

USAID FROM THE AMERICAN PEOPLE

Jamaica Energy Resilience Alliance

About

"Strengthening Energy Sector Resilience in Jamaica" is a three-year partnership between the United States Agency for International Development (USAID) and the Jamaica Energy Resilience Alliance (JERA). Led by Cadmus and with USAID support, JERA offers specialized support to Jamaican businesses seeking to reduce power costs, increase reliability of supply, and green their operations. JERA will help you:

1. Understand how solar photovoltaic (PV) systems, including with battery storage (PV+), can benefit your business;
2. Navigate the regulatory and installation processes; and
3. Access financing from PV/PV+ developer partners with up to USD 50 million of available capital for investment-quality projects.

JERA is...

an alliance of Jamaican and international private sector and non-profit organizations committed to support, promote and encourage the uptake of renewable energy for a more resilient and sustainable Jamaica.

JERA consists of:

CADMUS
(lead)



Key Activities Under SESR-Jamaica

- Demand Aggregation / Market Development (flagship)

PV
Standards
Work



- Resources and recommendations to reduce legal, regulatory, and administrative solar PV “soft costs”
- Solar PV+ ~500 kW/1200 kWh pilot project at LASCO
- PV/PV+ Workforce development

What are PV+ Soft Costs?

"Soft costs": non-equipment costs of PV & PV+ systems passed onto customer

Soft costs include, but are not limited to:

- Customer acquisition costs (e.g., installer advertising & marketing)
- Installation and maintenance costs
- Workforce development costs (recruitment and training of personnel)
- Legal and regulatory costs, including fees and time spent navigating regulatory processes for system approval
- Financing costs, including interest payments

In the US, the Department of Energy has estimated that soft costs can account for as much as 64% of the total cost of a PV system.

PV Standards to Reduce Soft Costs

US National Renewable Energy Laboratory:

“Most consumers may invest based on price alone” and “suboptimal PV system performance and safety incidents have downstream impacts on customer adoption and the solar industry because of unmet expectations and negative publicity” ...
“Low-quality systems can reduce developer, investor, and consumer confidence in solar products”.

PV standards may reduce soft costs including:



Financing (insurance and interest payments on loans)



Customer acquisition/
Sales & Marketing



Operations & Maintenance

PV Standards to Reduce Soft Costs

Standards adoption can contribute to increases in other cost categories, such as:

- **PV equipment costs** (manufacturer cost of certification)
- **Regulatory soft costs** (compliance and enforcement)
- **Supply chain soft costs** (installation delays and logistics costs)

However, literature on PV standards suggests the benefits of standards outweighs their costs, in terms of the financial returns for PV investors, improved system performance, and overall market expansion.⁽¹⁾

(1) IRENA, Boosting Solar PV Markets: The Role of Quality Infrastructure https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Sep/IRENA_Solar_PV_Markets_Report_2017.pdf?rev=7a016d7457464c6ea478daf8a9a9d863

CURRENT JAMAICAN CONTEXT: SOLAR PV STANDARDS

Jason Robinson, JREA

Current Jamaican Context – Current Solar PV Standards

Bureau of Standards Jamaica (BSJ) is a statutory body established by the Standards Act of 1969 with the mandate to promote and encourage standardization in relation to commodities, processes and practices, including setting quality assurance and safety standards for economic industries in Jamaica.

BSJ has adopted two standards relevant to solar PV:

- **Underwriters Laboratories (UL) Standard 1741** for inverter safety under BSJ Standard JS 330 2016.⁽¹⁾ This standard applies to JPS Standard Offer Contracts for distributed energy resources connecting to the electricity grid for net-billing, auxiliary, and power wheeling connections. BSJ also provides a list of approved inverters, per the Net Billing program (2016).
- **International Electrotechnical Commission (IEC) 60904 standards** to measure PV modules against manufacturer specifications if requested.

However, to date BSJ's involvement in the industry has primarily focused on reviewing and validating inverter spec sheets for inverters that are not already on their approved list, according to engagement with BSJ conducted by Cadmus staff in 2022.

(1) [BSJ JS 330 2016](#)



<https://www.bsj.org.jm/about/about-bsj>

Current Jamaican Context – Opportunity for Additional PV+ Standards Adoption

Cadmus conducted a review of PV+ standards adoption in other jurisdictions and identified opportunities for adoption of additional PV+ standards in Jamaica.

Currently, Jamaica does not have standards like equipment safety and performance nor associated enforcement mechanisms that are common industry practices.



OVERVIEW OF INTERNATIONAL PV+ STANDARDS AND BEST PRACTICES

Andrew Whiteman, Cadmus

International Standards Organisations Develop PV System Standards

1. Regionally-focused standards organisations:

- Underwriters' Laboratories (UL) is a North-American focused standard.
- Conformité Européene (CE) is a Europe-focused standard; products sold in Europe are required to test for CE.
- Germany also has its own set of standards, developed by TUV Rheinland.

2. International standards organisations: The International Electrotechnical Commission (IEC) and the Institute of Electrical and Electronics Engineers (IEEE) are two main international organisations that develop PV system standards.

A review of best practices from other countries provides examples for consideration

Countries analyzed: USA (three jurisdictions - California, Florida, Puerto Rico), Barbados, Ghana, Kenya

Standards currently in effect in surveyed countries (not all categories apply to each country)

Solar PV modules (safety and performance)

Inverters (safety and performance)

Batteries (safety and performance)

Other Component Parts (racking, surge protectors)

Electrical System Design Requirements

Performance Tests (against manufacturer specifications)

Hurricane and Climate Standards – Salt-mist corrosion

Other factors

Government-managed equipment lists

Enforcement

System size limits

What is the scope of each standard?

Equipment (modules, inverters, batteries, other component parts)

- Safety
- Performance

Electrical System Design Requirements

- Requirements for electrical wiring specific to solar

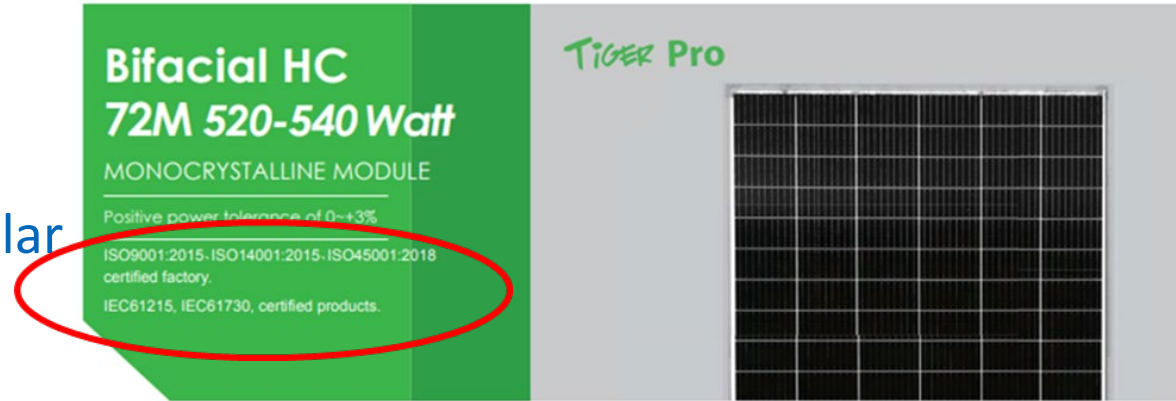
Performance Tests

- Testing against manufacturer specifications

Hurricane and Climate Standards

- Salt-mist corrosion standard / structural design, installation requirements

*Note: Refer to manufacturer's technical specifications for information on standards.



Other factors

Enforcement

- Review of PV system component parts at time of system commissioning.

Equipment lists

- Government-manage equipment lists with standardized products; installers/manufacturers can request products to be added.

System size limits

- Applicability of standards to all system sizes.

Potential Implications for Jamaica's Energy Sector

The costs and benefits of adopting standards will be unique to each market based on:

- Existing availability of certified PV equipment
- Price sensitivity of the PV market
- Existing governance structure to enforce standards, among others

To gain a more robust understanding of potential implications to the energy sector in Jamaica, it is therefore critical to understand the perceived costs and benefits of standards adoption among industry stakeholders.

As such, Cadmus ran a survey of Jamaica solar PV market participants to inform its recommendations.

PRIVATE SECTOR SURVEY RESULTS

Mark Dennis, Cadmus

Jamaican Industry Survey Overview

To gather these industry perspectives, Cadmus designed an online survey that ran from August 5 to August 31, 2023.

The survey was distributed through JREA and the target audience was solar installers and other market participants.

SESR-Jamaica received 12 responses from individuals at 11 different Solar PV industry organisations or companies.

- Respondents worked for solar and renewable energy companies whose focus included installation, training, distribution, wholesaling, maintenance, and engineering. The survey contained questions on product availability, market implications, and enforcement.

Survey Results: Most products for PV systems in Jamaica are compliant with standards

Overall, products listed in the survey tend to be compliant with some form of product standard.

However, responses show that the products listed in the survey may not be completely representative of the market.

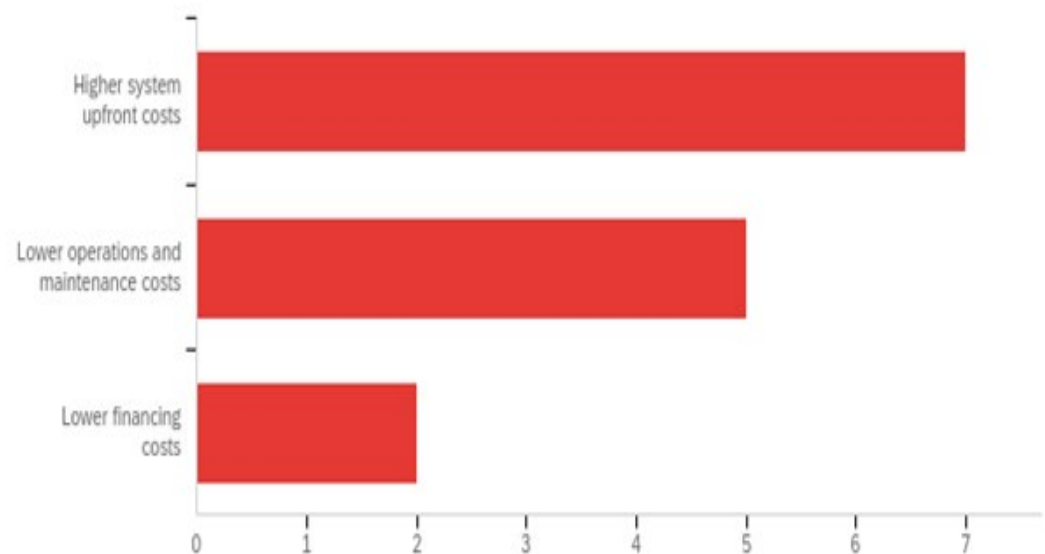
Additionally, respondents indicated that there might be supply chain disruptions for some companies if standards are adopted.



Survey Results: Expected higher upfront costs but lower operations, maintenance, and financing cost with standards adoption

Impact on soft costs:

- The majority of respondents (7) say that standards would result in higher system upfront costs for customers. However, five (5) respondents also say it would reduce operations and maintenance costs, and two (2) say it would lower financing costs.



Survey Results: Respondents overwhelmingly support additional PV system standards and enforcement

When asked which PV standards they would support, virtually all respondents said they would support equipment safety performance standards.

With regards to the system capacities that should be subject to standards, respondents said that all system capacities should be subject to standards.

To understand how to effectively structure enforcement of solar standards, respondents were asked, “In your opinion, which agencies in Jamaica should lead enforcement of Solar PV standards?” Four respondents said Bureau of Standards Jamaica (BSJ), three said the Government Electrical Regulator (GER), and two said the Ministry of Science, Energy, Telecommunications and Transport (MSETT). When asked at what stage of the Solar PV process standards should be enforced, six respondents said standards should be enforced at the system commissioning stage, and two said at the imports stage.

SUGGESTED STANDARDS, COMPLIANCE, AND ENFORCEMENT MECHANISMS

Andrew Whiteman, Cadmus

Suggestions for PV system standards and enforcement

Solar PV modules

- Cadmus suggests that BSJ adopt **IEC 61215** (performance) and **IEC 61730** (safety) standards for PV modules. As described above, these standards are widely adopted internationally and virtually all products listed in the survey are certified against them.

Battery storage

- Cadmus suggests that BSJ adopt **UL 1973** as its battery storage safety standard. Virtually all products listed in the survey are certified against this standard, which California also adopts.

Guidelines for solar PV installation and structural design for countries in hurricane zones

- Incorporate guidelines for solar PV installation and structural designs in the National Building Code from Rocky Mountain Institute's (RMI) Solar Under Storm publication provides recommended measures for structural design, installation, and procurement. Furthermore, adopting additional codes would require coordination with relevant permitting authorities for enforcement.

Suggestions for further consultation

Hurricane / climate standards

- Barbados has adopted IEC 61701 – salt corrosion, but the survey shows that many PV modules in Jamaica are not certified against this standard. Cadmus suggests that BSJ consult with Jamaican industry and the Barbados National Standards Institution to better assess adoption of this standard.

PV electrical system design

- Cadmus suggests that BSJ consult with OUR, Governmental Electrical Regulator (GER), and industry stakeholders to consider adopting provisions of the US National Electrical Code or IEC 62548, specific to solar PV wiring.

Standards NOT suggested for adoption at this time

Inverter performance

- Given that there is no standard for inverter performance, Cadmus does not suggest that BSJ adopt its own inverter performance testing protocol.

Other component parts (racking, surge protectors, etc.)

- Cadmus suggests that BSJ should not adopt additional standards for surge protectors, mounting devices, clamps, and ground lugs.

Additional PV module and performance testing

- Cadmus suggests that the BSJ rely on manufacturers certifications instead of adopting additional testing protocols.

Suggestions for system size limits, equipment lists, and enforcement

Enforcement

- Supported by survey responses, Cadmus asserts that system commissioning is the appropriate stage for enforcement. The BSJ would be positioned to establish a process for standards enforcement, potentially involving the GER, the government entity responsible for regulation of electrical installation and inspections, or the Local Building Authority permit as applicable.

PV System Size

- Survey respondents support standards for all system sizes and most countries do not include size limits. As such, Cadmus suggests that standards apply to all PV system sizes.

Equipment List

- Cadmus suggests that BSJ develop a publicly available equipment list covering the above-mentioned components for both stand-alone and grid-connected systems. This would be a resource for solar installers and financial institutions.

Key Takeaways

- Survey results and industry literature suggest that **equipment standards can reduce PV system soft costs.**
- International examples and survey results validate recommendations for **additional PV system standards and enforcement processes.**
- **BSJ's standards development process provides opportunities for stakeholders to advocate for standards based on these suggestions.**

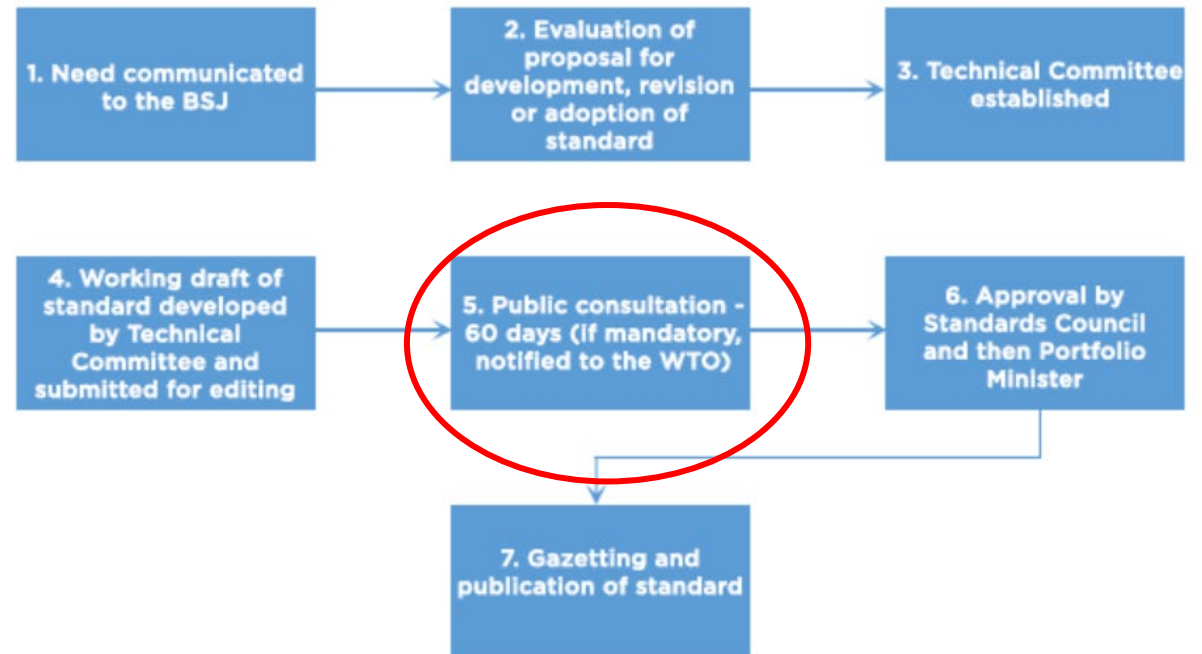
OVERVIEW OF BSJ STANDARDS DEVELOPMENT PROCESS

Mark Dennis, Cadmus

BSJ standards development process provides opportunities for further stakeholder engagement

BSJ's standards development process includes a public consultation period.

Interested parties can also request to join the EPP committee.



Source: BSJ website

Suggested areas of focus during public consultation period

- Impact on long-term operations & maintenance, customer acquisition, and financing costs.
- Product availability in the marketplace / supply chain considerations.
- Suggested enforcement mechanisms and entities.
- Equipment list online interface.

FACILITATED DISCUSSION / Q&A

Tiffany Arnold, Cadmus

NEXT STEPS / CLOSING REMARKS

Tiffany Arnold, Cadmus

Resources

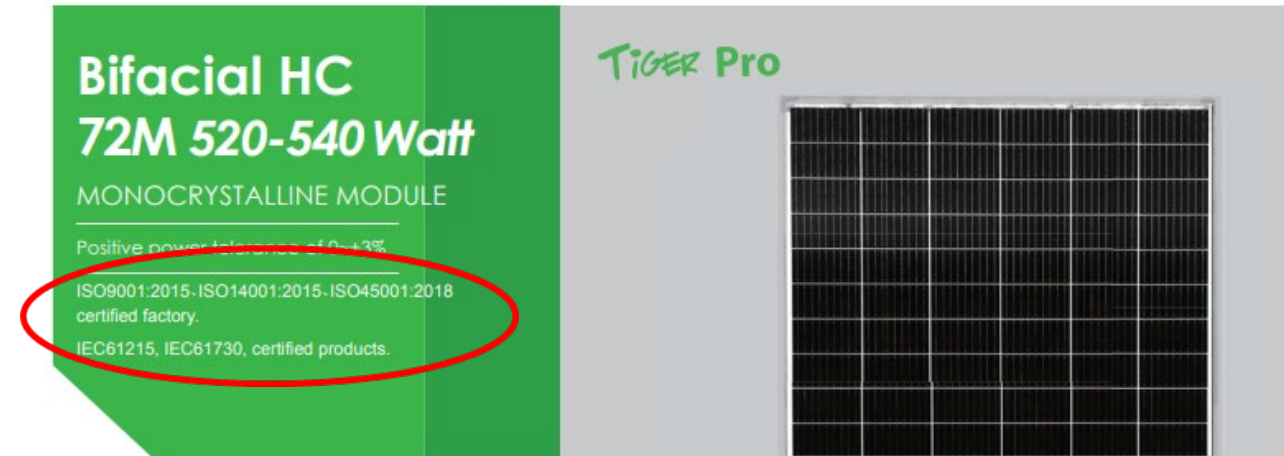
BSJ list of approved inverters: [Website](#)

MSETT net billing and process flow: [Website](#)

GER Portal for electrical inspections: [Website](#)

Refer to PV product technical specification sheets for review of certification.

Literature on soft costs: [US Department of Energy](#), [NREL](#)



Next Steps

BSJ is reviewing the research paper. Cadmus will share feedback from this webinar with MSETT/BSJ as well.

Cadmus will share this presentation with attendees after today's webinar.

For additional questions about engaging with BSJ's EPP committee and any updates on the BSJ standards development process, please visit [BSJ's website](#) or contact jamaicaenergy@cadmusgroup.com.

