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In reply to the request for feedback, PV Lab Australia would like to submit feedback to Question 7 in Attachment 2.

> Question 7:
> *What, if any, qualification criteria should the REZ coordinator apply to prospective REZ participants?*

Solar developers contributing power generation to the REZ should be required to implement a quality assurance program for the photovoltaic modules that they purchase.

While Quality Assurance (QA) programs, performance and safety standards are often covered within commercial contracts, regulatory bodies such as the Energy Security Board have a clear role to play to insure that these standards are aligned with the national interest. With the largest new deployment of energy infrastructure in decades it is the challenge and opportunity for regulatory bodies to guide development of reliable, long-lasting, and fit-for-purpose energy into the future. QA programs are a key component to delivering these outcomes.

As solar module inspectors, PV Lab Australia, is aware that there is a high degree of variability in the quality of photovoltaic modules within the Australian market. Poor quality modules are a liability to 1) safety, 2) technical performance, and 3) financial performance. QA programs mitigate against the problems caused by lower quality modules. In regards to the REZ, improvement of module quality through a QA program would aligned with the long term interests of consumers, and drive more efficient use of REZ infrastructure.

1. *Safety*

Safety is paramount and a critical factor in the development and maintenance of power generation. Unsafe modules can cause manual handling and electrical hazards, including the risk of fire, during installation and operation. This can be due to many factors including broken glass, broken frames, misalignment or damage to electrical circuitry. Visual inspections and electroluminescence testing done to IEC standards can identify these hazards and mitigate safety risks.

2. *Technical Performance*

In addition to safety elements, module QA programs generally test 1) if functionality has been compromised due to transport damaged 2) if modules meet promised performance, and 3) their likely performance over time.

In regards to the transport damaged, even minor defects and damage such as small cracks present pre-installation can further develop after installation and can result in significant performance loss over module life. In the last 6 months PV Lab Australia has done inspections at two large solar farms for these subtle types of transport damage, that would severely comprise panel performance in the future.

As for promised performance, the initial power performance of one module may lie within a tolerance (-0%, +5%), but statistically the average performance of a large number of the same modules should conform within a much smaller tolerance to the rated power performance. In a large solar farm deviation from promised performance of a few percent is significant, but not identifiable or easily rectified without a QA program and specific performance stipulations. Moreover, work done within our laboratory suggests that manufactures provide better performing solar modules to importers with known QA programs than to importers without these programs.

Module power performance also degrades over time, and manufactures specify annual module degradation rates. Planned periodic quality assessment of solar farms can confirm module warranty compliance and optimise whole of farm performance through the replacement or movement of underperforming modules with minimal interruption to power generation.

3. *Financial Performance*

Initially underperforming modules and/or accelerated degradation of performance will be a compounding negative financial driver. This causes solar farms to fall significantly short of financial projections. Whereas, solar farm lifespan can be economically extended with an effective quality review process.

Within the European market, laboratory testing of modules is often a requirement to obtain bank finance for MW scale projects. Thus MW scale installations with contractual performance specifications and subsequent independent testing have recourse to recover cost and ensure alignment with modelled long term reliability. In Australia, anecdotal experience suggests that banks have been reluctant to impose quality conditions on lenders, for fear of losing the financing contract to a competitor bank, this drives a ‘race to the bottom’ approach resulting in power stations being built of lower quality and performance than Australian’s would otherwise expect.

Quality Assurance Program Recommendations

It is recommended that a QA program be implemented. The program should be a documented and iterative process that begins with module acquisition or installation and has a three to seven year audit recurrence.

In its simplified form an adequate QA program should work with independent laboratories to:

- establish and document quality objectives,
- assess conformance to quality objectives, and
- action assessment results to improve safety, technical and financial performance.

The primary aim of the program from a regulatory perspective would be to ensure renewable energy equipment used in REZ projects meets the quality, reliability, performance and safety expectations where competitive market tension may lead to commercial actors compromising on these standards.

Laboratory Standards

Assessments of quality should adhere to ISO and IEC standards. ISO and IEC have developed and maintained many standards in relation to Solar Modules. PV Lab Australia works to the following standards to ensure reputable and repeatable results:

General

- AS ISO/IEC 17025 – General requirements for the competence of testing and calibration laboratories. PV Lab Australia is currently working toward this formal accreditation.

Sampling

- ISO 2859, CEI/IEC 60410 – Sampling procedures for inspection by attributes.

Testing, Inspection and Analysis

- IEC 61215 – Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval.
- IEC 60904 – Photovoltaic devices
  Inclusive of standards for measurement of current-voltage characteristics, solar simulator performance requirements and electroluminescence procedure.
- IEC 62804 - Photovoltaic (PV) modules – Test methods for the detection of potential-induced degradation.
- IEC 61724 – Photovoltaic system performance monitoring - Guidelines for measurement, data exchange and analysis.

Laboratory Capability Recommendations

It is recommended that sufficient quality assurance requires a proper PV testing laboratory has, as a minimum, the following equipment, capabilities and accreditations:

- ISO 17025 Accreditation,
- An AAA or $A^+A^+A^+$ solar simulator,
- Temperature soaking equipment,
- A WPVS calibrated reference cell, and
- Dedicated electroluminescence imagery.

Without these, facilities are inadequately prepared to test the performance of solar modules.

PV Lab Australia
PV Lab Australia is a specialized test laboratory with a focus on quality assurance and risk evaluation for PV modules and components. We are an Australian owned and operated business and have tested modules used in over 2 GW of projects across Australia.

Our independent laboratory is headquartered in Canberra, Australia and can evaluate samples ranging in size from one module through to statistical sampling of the large numbers needed for a solar farm. We support banks and investors for larger solar farms and are a competent contact for technical questions.

Thank you for taking the time to consider this submission of feedback regarding qualification criteria of prospective REZ participants.

Kind Regards,
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