Case study n°1

Chile and its Efforts Towards High Quality in Photovoltaic (PV) Systems for Desert Conditions: Innovation, Awareness, and Implementation Approach

Country: Chile

Level: National

SDG Addressed: SDG 13 – Climate Action

Summary

Chile implemented two standards – IEC 61215-1:2016 "Terrestrial Photovoltaic (PV) Modules: Design Qualification and Type Approval" and IEC 61730-1:2016 "Photovoltaic (PV) Module Safety Qualification" – when installing solar plants in the Alcatama Desert, located the northern region of the country. This case study aims demonstrate how the correct implementation of these standards leads to a longer lifetime of the PV modules, while contributing to the achievement of SDG 13.2 "Integrate Climate Change Measures into National Policies, Strategies and Planning,". The subsequent share of renewable energy in Chile's national energy mix, would reduce the country's carbon emissions.

The main objective is to strengthen the quality infrastructure for PV systems in desert conditions within three main pillars; namely, metrology, standards and conformity assessment schemes. The first approach consisted of installing a national laboratory featuring capabilities and equipment to monitor key parameters concerning the solar industry. The second step featured a benchmark study on failures in PV plants has been carried out and an Open Innovation Challenge has been launched by the Chilean Solar Committee, with a view to tackling the most pressing issues affecting companies operating in the solar business. The third phase, currently in progress, aims at integrating conformity assessment schemes into the national PV industry.

Background

According to the technical specifications delivered by the manufacturers and developers, the PV modules installed in the North of Chile today comply with the IEC 61215 and IEC 61730 standards. In the national market, it is understood that these standards ensure the operation of the photovoltaic modules for twenty or more years. However, the aforementioned standards do not carry out tests to guarantee the modules' lifetime, not least under the high radiation levels and temperatures characterising the Atacama Desert, where they have been installed.

A shorter lifetime would lead to lower interest for financing PV developments. This could stile the growing market for solar power generation, and delay the achievement of the 2050 Energy Policy goal, which aims to cover the 70 per cent of the country's energy needs via renewable energy sources. This is indeed considered one of the axis for integrating climate change measures into Chilean national energy policies, strategies and planning (SDG 13.2).

Strategy

Developing an extended version of IEC 61215 is crucial to adapt the tests to different climate-related conditions, and to provide a model that allows to simulate the loss of power and the correlation factors between the accelerated laboratory tests and the actual operation conditions. Likewise, in the test protocols, it seems pivotal to take into account the high levels of UV radiation under real operating conditions in the Atacama Desert area.

Results and Impact

The current IEC standards have been conducive to the greater adoption of solar PV in Chile. This has reached a 5% share of generation in the national energy mix and contributed to an estimated reduction of 2.2 million tonnes of CO2e in 2017.

It is necessary to advance the development and extension of the current IEC standards, with the aim of ultimately relying on standards, which could guarantee long-term operation and accurately estimate the life time of photovoltaic systems, in different climatic and radiation conditions.

Specific challenges for areas with high solar generation potential, such as the Atacama Desert, present technological questions that need to be taken into account as part of the development of new IEC standards and/or when updating existing ones, so as to avoid the maximum emissions of tCO2e.

The rise in arid and desert zones, highlights the need for greater sharing of behaviour knowledge and certification of PV systems – under Atacama Desert conditions – to other desert zones. The adoption of zero-emissions PV technologies could mitigate many of the more challenging aspects of life in such desert conditions.

Challenges and Lessons Learned

When satisfied that the demonstrated supplier certifications are sufficient, project developers will seek the option with the lowest invest cost. Whilst some larger companies may purchase the services of supplier who provide extended certifications to achieve greater quality, this is not necessarily an option available to all market actors.

Challenges arose from the lack of awareness of the impact of radiation conditions in the long-term performance and durability of solar modules and systems.

Potential for Replication

As a continental leader in the development of solar PV, Chile's experience can inspire others to develop renewable systems. Further, the standards for photovoltaic systems, which guarantee performance and reliability under specific climatic conditions (e.g. Atacama Desert), would equally serve as a benchmark for replication.

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