



COMITÉCORFO

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

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# Background

PV modules installed in the North of Chile today **comply with the IEC 61215 and IEC 61730 standards.**

Business actors are understanding that these standards guarantee the life time of the PV systems to last for twenty or more years.

**Previous standards did not carry out tests to guarantee the modules' life time**, not least under the high UV radiation levels, corrosion levels and temperatures cycles day/night of the Atacama Desert.

**A shorter life time would lead to lower interest for privately financing PV developments.**

This could lead to **delaying the achievement of the 2050 Energy Policy goal** which aims at covering the 70% of the country's energy needs via renewable energy sources.

First studied **climate change impacts** in the chilean energy are: **increasing high radiation levels, extreme events of high temperatures and droughts<sup>1</sup>.**

*1: Source: Anteproyecto de Plan de Adaptación al Cambio Climático en el Sector Energía de Chile, Ministerio de Energía Nov 2017.*

# Strategy

## 1. Metrology

National Metrology Laboratory of Photometry and Radiometry is in progress

## 2. Standards

Developing a serial version of IEC 61215 and others IEC standards is crucial to particularize 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 real field operation conditions.

IEC TC82 Solar photovoltaic energy systems (Chile mirror) has started.

## 3. Conformity assessment schemes

Regulations and Certification of modules and systems in/for desert conditions are pending.



### Photos

- El Romero Solar 246 MWp, 495 GWh annual production, ACCIONA
- TARP-04 (Transport Antarctic Research Platform), located at Chajnantor close to ALMA Observatory, 4,500 m above sea level, 40 kms east of San Pedro de Atacama, Universidad de Santiago, Chile.



# Results and Impact

The current **IEC standards** have been conducive to the take-off of solar **PV in Chile**, which has reached a 5% share of generation in the national energy mix, and an estimated reduction of 2.2 million tonnes of CO<sub>2</sub>e in 2017.

It is deemed necessary to advance the development and/or extension of the current **IEC standards**.

Including the **IEC-RE Conformity Assessment Schemes** within the sector.

Transfer behavioural knowledge or certifications of PV systems under **Atacama Desert conditions to other desert zones worldwide**. This is an extremely relevant issue to address, as arid and desert zones in the world are increasing. What is, as of now, a **complex environment for human living conditions** to be met, could in fact be facilitated by **adopting zero-emissions PV technologies**.

#### Photos

- Plataforma Solar del Desierto de Atacama (PSDA) Universidad de Antofagasta testing cells for Desert conditions.
- Atacama Module System Technology Consortium (ATAMOSTEC) Launch Antofagasta Jan 2018



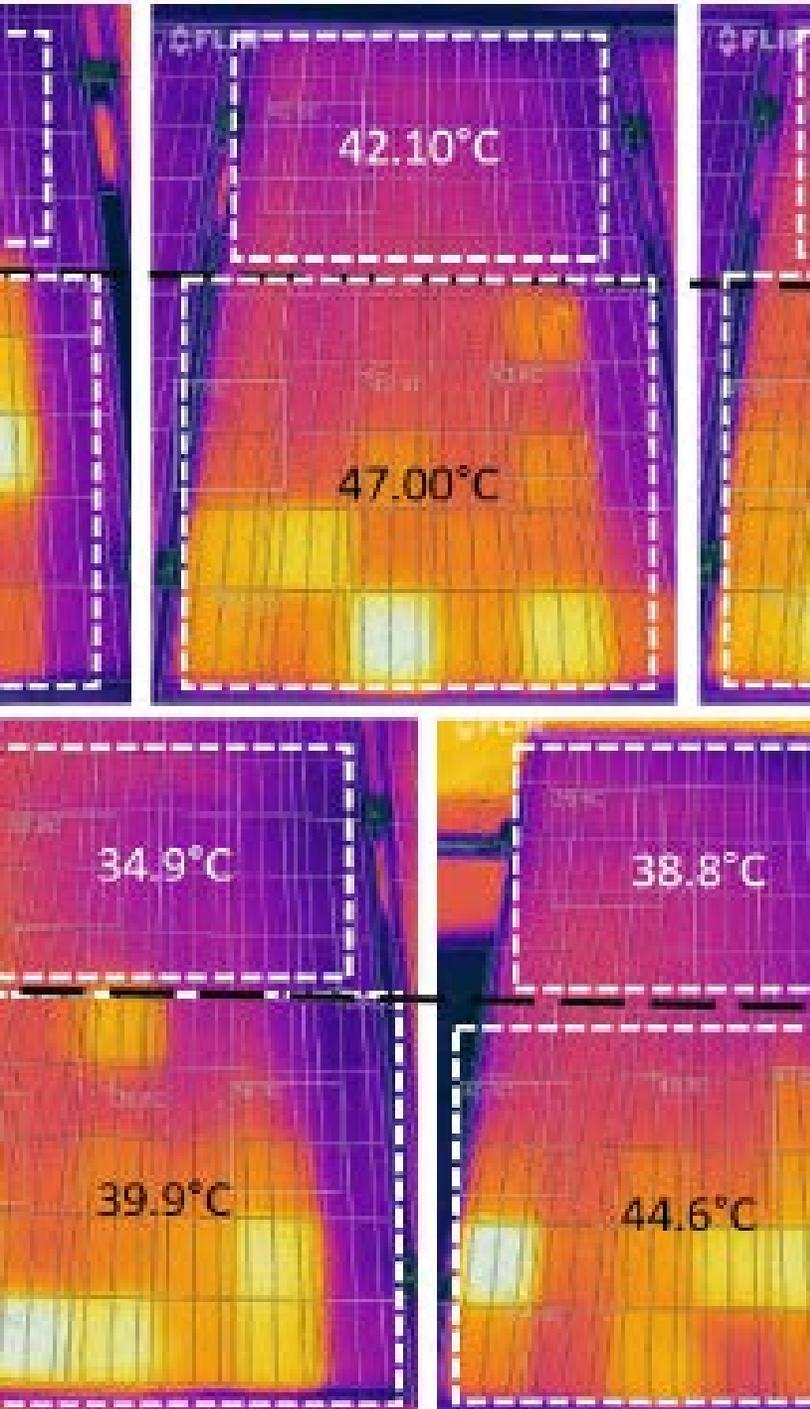
# Challenges and Lessons Learned

**Project developers chase after market opportunities**, seeking options from suppliers with lower investment costs **assuming that the certifications they exhibit are enough**

Some large companies buy the services of those who offer extended certifications to achieve better quality, yet this is not necessarily an option available to all market agents

**The lack of awareness of the impact of radiation conditions in the long-term performance and durability** of solar modules and systems

It is deemed **necessary to design and implement standards that protect the markets of low-performance and low-reliability products**, especially when it comes to distributed generation



Five from the six modules with uncertain thermal pattern (pattern is 2 or 7).  
Modules installed in 2015. The average temperature of the lower and the upper half is shown. Ignacia Devoto Universidad de Chile 2018.

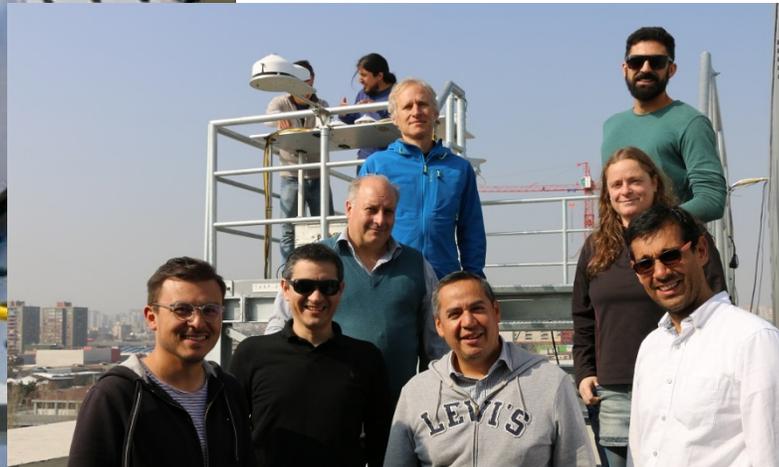


# Potential for Replication

**Chile could be a leading example** for other countries in the region as well as those countries outside the region featuring specific climatic conditions suitable for renewables systems.

**The conditions of the Atacama Desert would equally serve as a benchmark for desert areas around the world..**

**The solar energy resource in the Atacama Desert is estimated in 1,800 GW** a potential for supplying 30% of the energy demand in South America and more, a great opportunity for reduction of CO2 emissions and get grid stability at regional level.



Photos from Intercomparability Campaign with following Regional Labs participation: Energía Solar Uruguay (LES), Ensayos Eléctricos (LABE) de la Universidad Nacional de Colombia, Sistema Fotovoltaicos (LSF) de la Universidad de Sao Paulo – Brasil, de Radiometría y Fotometría Básica (LRFB) del Instituto Nacional de Tecnología Industrial de Argentina and Laboratorio de Óptica del Centro Nacional de Metrología (CENAM) de México), Dirección Meteorológica de Chile and el Centro Mundial de Radiación (Suiza) en Laboratorio de Radiometría y Fotometría (LRF) Universidad de Santiago, Chile and other places in Chile. Sept 2018



# Summary

To strengthen the quality infrastructure for PV systems in desert conditions within the three pillars:

## 1. Metrology

Installing the capabilities of metrology in PV systems

Having the laboratory infrastructure with a custody entity of photometry and radiometry parameters.

## 2. Standards

- Adopting and adapting standards

- Increasing awareness of the importance of a strengthened quality infrastructure for the solar industry

- Improving knowledge of the procedures and generating indications and recommendations to the international technical committee of desert conditions

## 3. Conformity assessment schemes

To strength with the Chilean solar industry the photovoltaics systems and it's durability in desert conditions

.....Approaches:

0. **Understanding Atacama Desert solar resource**, solar spectral measurement campaign

1. Installing national laboratory featuring capabilities and equipments to watch over key parameters for the solar industry (**Photometry and Radiometry Metrology Lab**) ---- Universidad de Santiago

2. Benchmark study of failures in PV power plants, and Establishing the Open Innovation Challenges for PV industry local suppliers, ----- launched by **Solar Committee CORFO**.

3. **Next ...**Aiming to include Conformity Assessment Schemes into the national solar industry,