

Developing Quality Infrastructure for Off-grid Systems



IRENA

International Renewable Energy Agency

IOREC 2016
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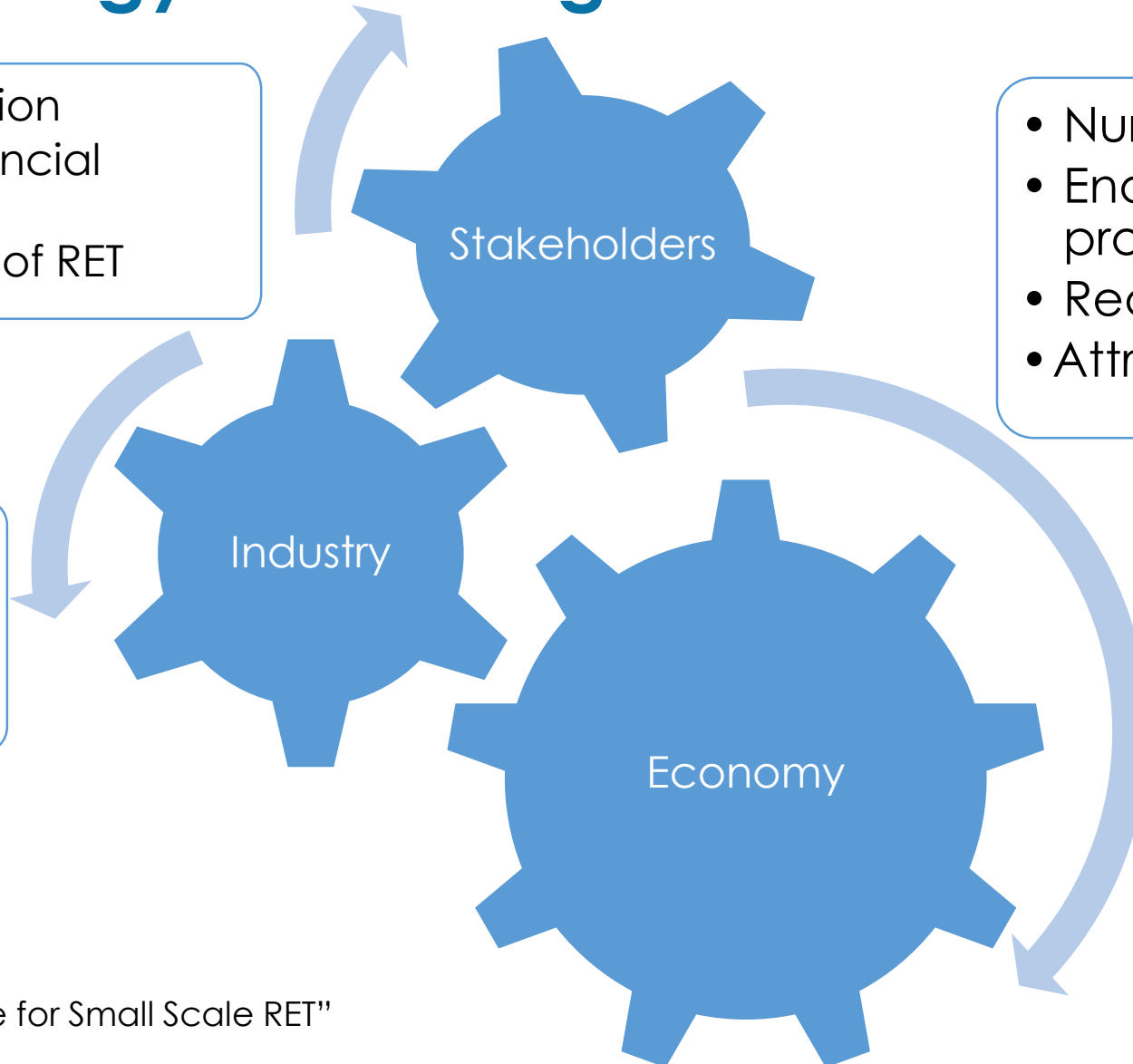
Why standards for RET?

Relevance of Standardisation for Renewable Energy Technologies

- Consumer protection
- Build trust with financial services
- Enable promotion of RET

- Nurture emerging markets
- Enable technology promotion
- Reduce trade barriers
- Attract new businesses

- Improve product design
- Improve manufacturing



Market Support – Access to sources for financing



“A principle of project finance is that debt should not bear the risk of the technology.”

In order to minimize the first technology-related risk, modules have to be certified in accordance with international standards. Unfortunately, it is common knowledge that a successful certification is not enough for predicting the expected lifetime of a module: a failure in a certification process only suggests that a long life is unlikely. Certification is therefore a necessity but not sufficient.

Source: Holz, F. “The myth of PV module manufacturers’ bankability in project financing”
Deutsche Bank AG

Policy Incentives linked to Quality Requirements



DSIRE™
Database of State Incentives for Renewables & Efficiency

U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy

IREC
INTERSTATE RENEWABLE ENERGY COUNCIL

NORTH CAROLINA Solar Center


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DSIRE SOLAR
solar policy information 

Resources

- RPS Data
- Summary Maps
- Summary Tables
- Library
- What's New?
- Search



PUERTO RICO
Incentives/Policies for Renewable Energy

 [Printable Version](#)

Puerto Rico - Solar and Wind Contractor Certification

 Me gusta     1

Last DSIRE Review: 12/19/2012

Program Overview:

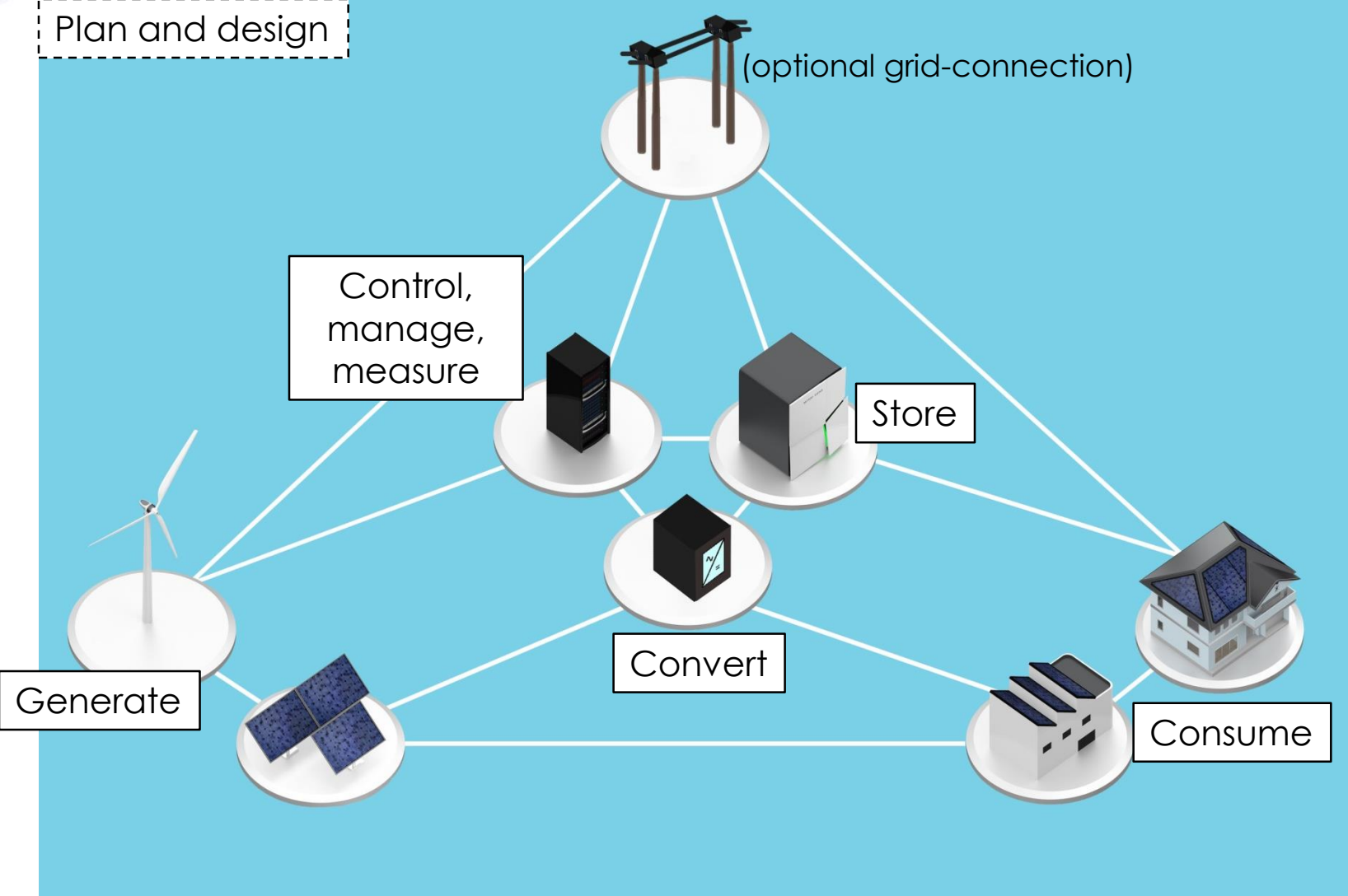
State:	Puerto Rico
Incentive Type:	Solar/Wind Contractor Licensing
Eligible Renewable/Other Technologies:	Photovoltaics, Wind
Applicable Sectors:	Commercial, Installer/Contractor
Web Site:	http://www.aaepr.net/
Authority 1:	C3268 (2008) Act No. 248
Date Enacted:	08/10/2008
Date Effective:	08/10/2008
Authority 2:	Reclamento 7796 (Certification of Renewable Energy Systems - In Spanish)
Date Enacted:	01/19/2010

USA

- 14 states: Contractor Licensing Requirements for Renewable Energy
- 4 States: Equipment Certification Requirements for Renewable Energy

Source: <http://www.dsireusa.org/>

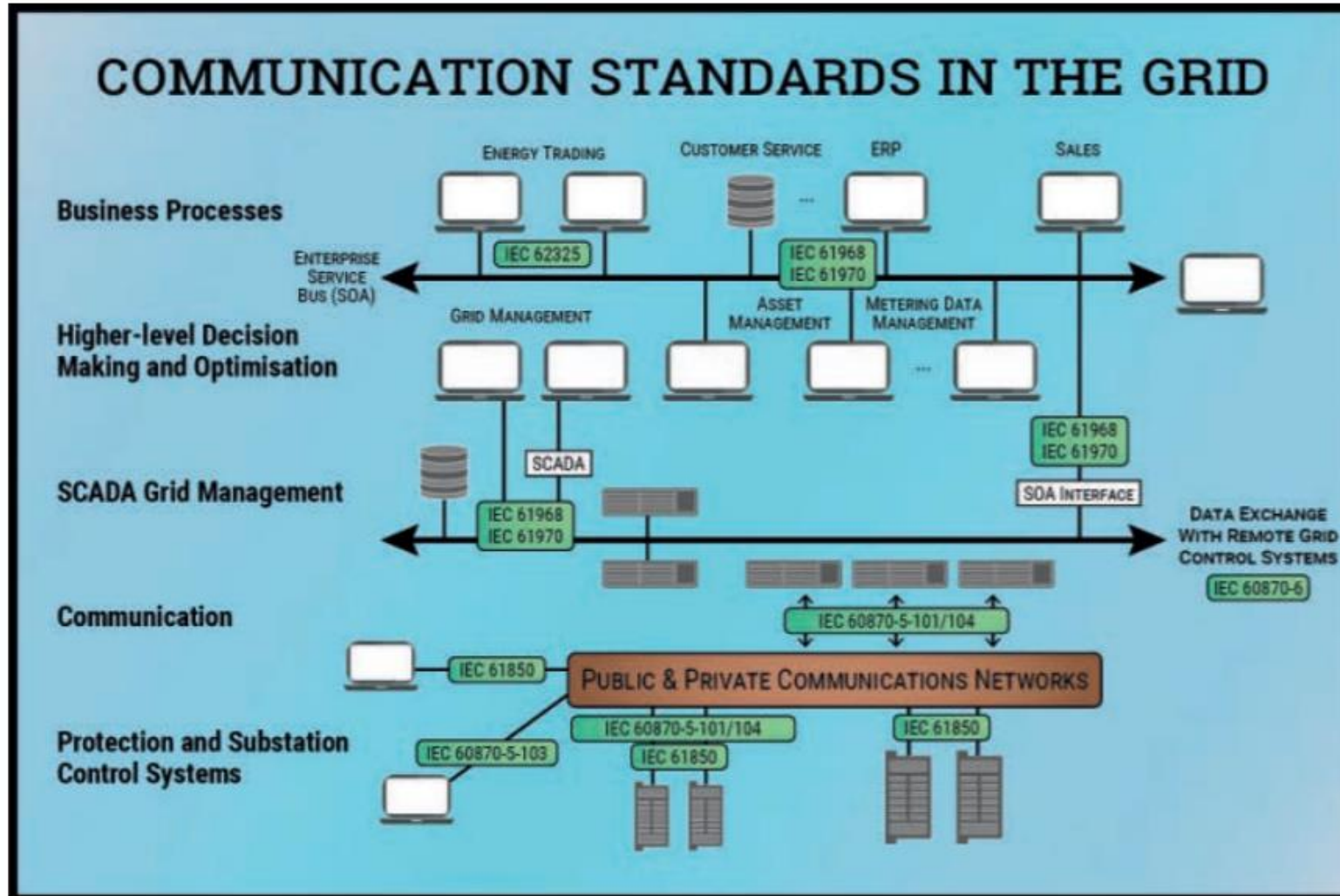
Functionalities



Mini-grids categorisation

	Stand-alone			Grids		
	DC		AC	AC/DC		AC
System	Solar lighting kits	DC Solar home systems	AC Solar home systems; single-facility AC systems	Nano-grid Pico-grid	Micro-grid, Mini-grid	Full-grid
Application	Lighting	Lighting and appliances	Lighting and appliances	Lighting, appliances, emergency power	all uses	all uses
User	Residential;Community	Residential;Community	Community;Commercial	Community;Commercial	Community;Commercial;Industry	
Key component	Generation, storage, lighting, cell charger	Generation, storage, DC special appliances	Generation, storage, lighting, regular AC appliances. Building wiring incl. but no distribution system	Generation + single-phase distribution	Generation + three-phase distribution + controller	Generation + three-phase distribution + transmission

Communication standards within electricity supply



Source: Adapted from Appelrath et al., 2012



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Developing Quality Infrastructure for RET

International Standards for Small Wind Turbines & Solar Water Heaters

IEC Standard	Standard Title	Status
IEC 61400-2	Wind turbine – Part 2: Small wind turbines for turbines less than 200 m ²	3 rd Revision 2013 2 nd Revision 2006 1 st Revision 1995
IEC 61400-11	Wind turbine generator systems – Part 11: Acoustics noise measurement techniques	2006
IEC 61400-12-1	Wind turbines – Part 12-1: Power performance measurements of electricity producing wind turbines	2006
IEC 61400-14	Wind turbines – Part 14: Declaration of apparent sound power level and tonality values	2005
IEC 61400-22	Wind turbines – Part 22: Conformity testing and certification	2010

Identification of the Standard	Title of the Standard Solar Thermal Products and Components	Status/Comments
Solar Thermal Collectors		
ISO 9806: 2013	Solar energy - Solar thermal collectors - Test methods	Recently revised and published. Considers performance and durability
Solar Thermal Systems		
ISO 9459-3: 2005	Solar heating - domestic water heating systems - Part 3: Outdoor test methods for system performance characterization and yearly performance prediction of solar-only systems	Only performance. Daily time steps. Does not treat auxiliary interactions
ISO 9459-4: 2013	Solar heating - domestic water heating systems - Part 4: System performance by means of component tests and computer simulation	Only performance. Simplifications discussed in Annex C
ISO 9459-5: 2007	Solar heating - Domestic water heating systems - Part 5: System performance characterization by means of whole-system tests and computer simulation	Only performance. Dynamic System Test Method

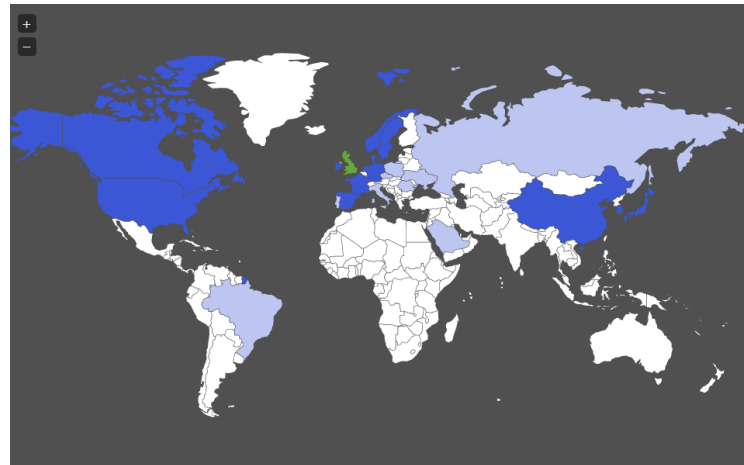
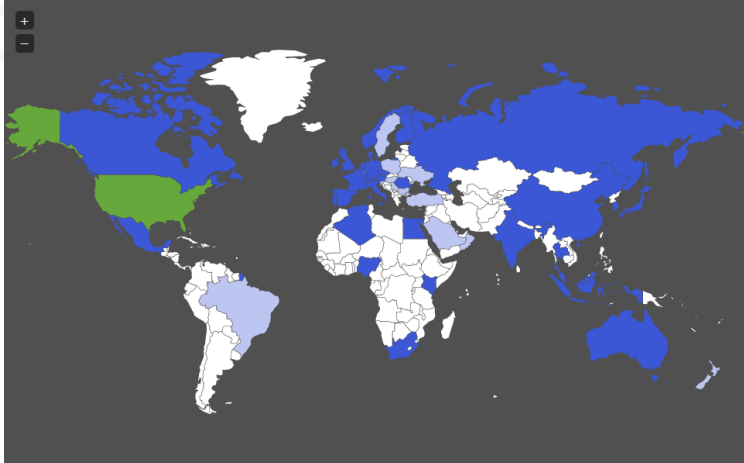
PV Standards

Country	PV Module	Inverter	Design and Installation	Commissioning	Performance and Operations	Grid Code Related	Off Grid Specific	Utility Scale Specific
International / IEC	IEC 61730, and IEC 61215 or IEC 61646 as applicable	IEC 62109-1/2 IEC 62093 (Qualification)	IEC 62548 ² (Primary) and IEC 60364 series	IEC 62446	IEC 61724 Future IEC 62446-2 (2017)	Country specific, but grid function testing per IEC 62116, IEC 62910	IEC 62257 Series for off grid and rural electrification	Future IEC 62738 (2016)
USA	UL 1703 UL 61215 / IEC 61646	UL 1741, UL 62109	National Electrical Code (NEC) Article 690	Not specified, multiple industry group recommended practices	ASTM E2848, multiple industry recommended practices	IEEE 1547 and regional/state requirements	N/A	Future NEC Article 691 (2017)
Australia	Same as IEC	AS/NZS 4777, AS/NZS 3100	AS/NZS 5033	Same as IEC	Same as IEC	AS/NZS 4777	AS 4509	
China ³	National standards & IEC		GB 50797-2012	Same as IEC	Same as IEC			

<http://inspire.irena.org/Pages/standards/search.aspx>

International engagement in standardization process

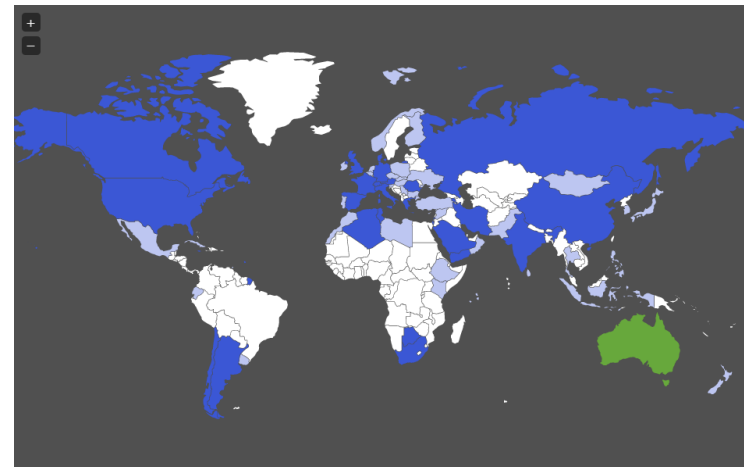
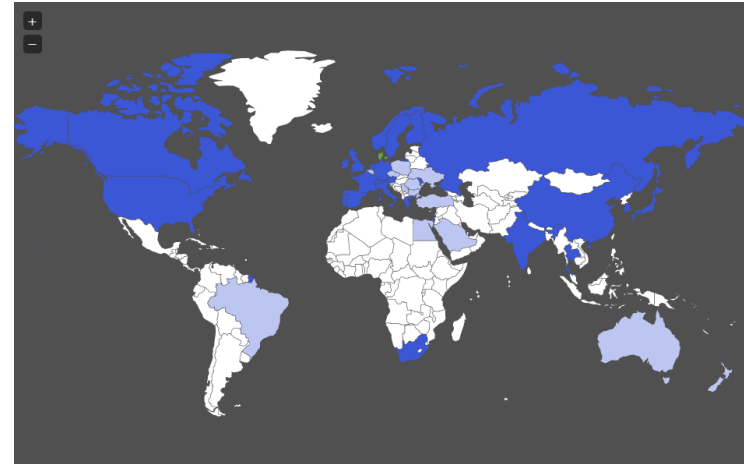
IEC TC 82 - PV



IEC TC 114 - Marine

Number of regions with important potential for RET are underrepresented

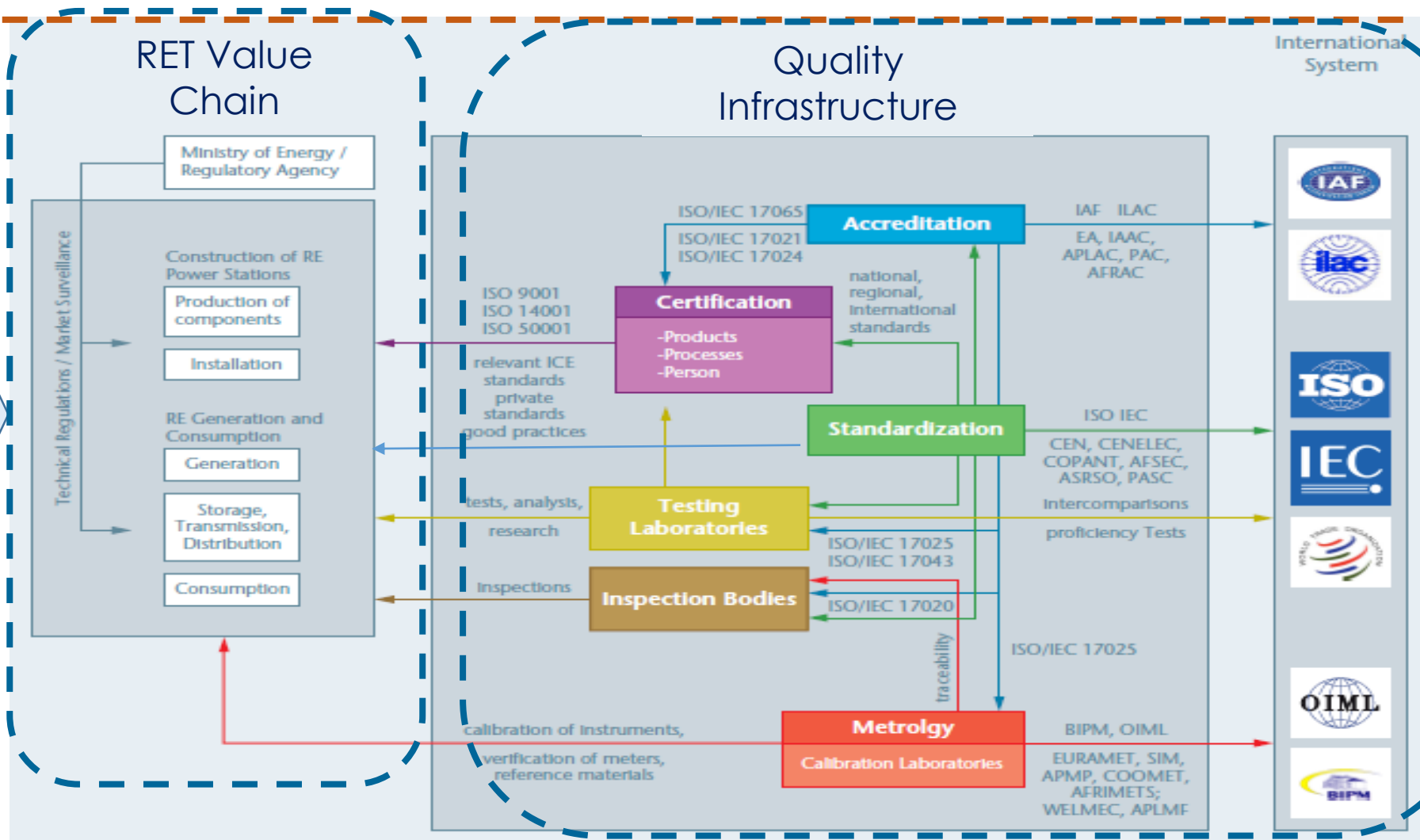
IEC TC 88 - Wind



ISO TC 180 - Solar Thermal

Implementation requires a Quality Infrastructure

R&D,
IPR,
FiT,
Tax credits,
Soft loans,
Carbon
Markets...



Holistic View - Quality Covers the Whole System, not Hardware only

Implementation of Quality Schemes covers not only equipment but whole systems including Design, Installation, O&M services

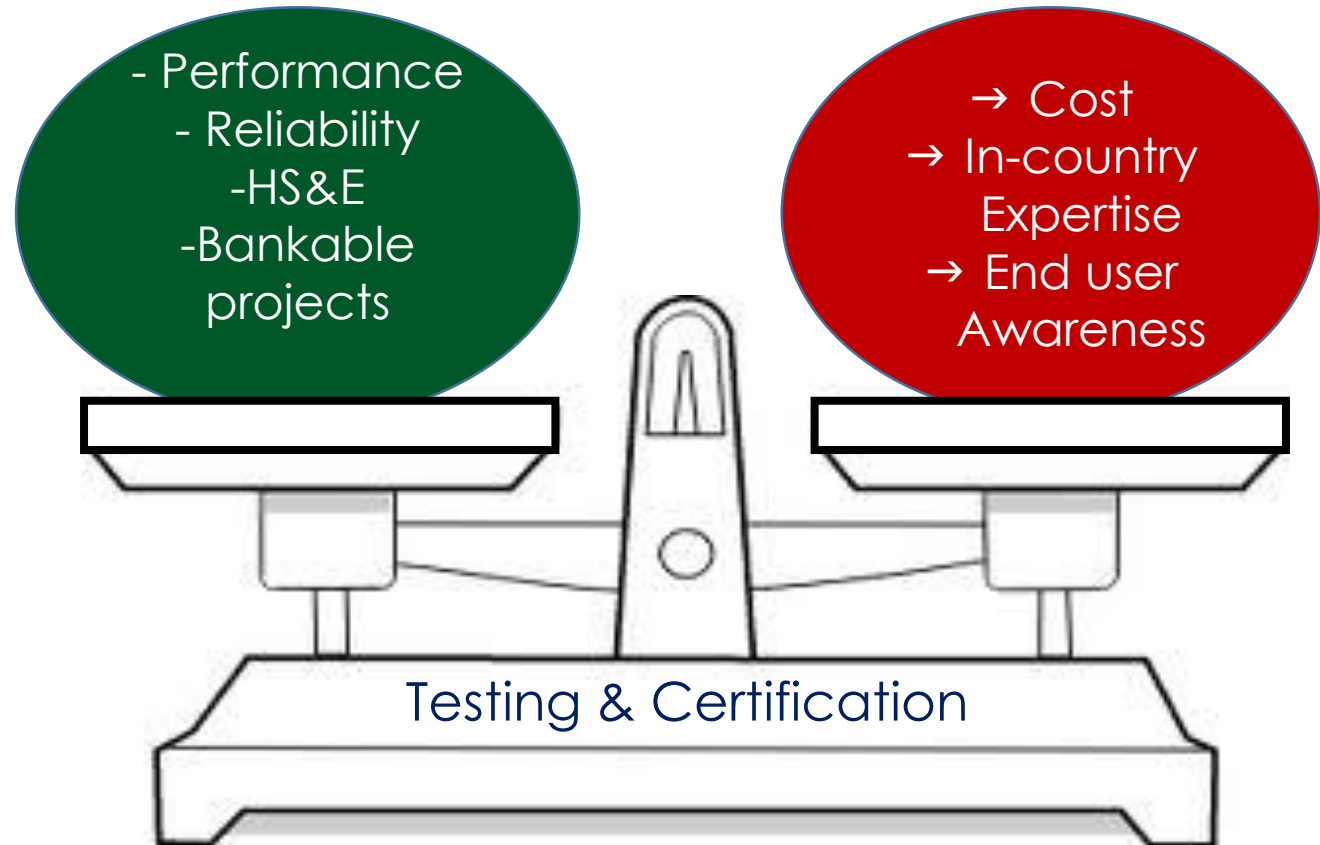
TÜV Rheinland analyzed the faults in 125 large-scale solar: *“Every other fault that we detect is due to incorrect installation. Poor or even dangerous cable routing, incorrect foundation or installation of the support frame, faults in the connections or grounding and so on. One in five systems exhibits (mainly safety-relevant) faults that are so severe that immediate action is required. And a further 10% of systems have a large number of defects,”*

Source: TÜV Rheinland “Quality Monitor – Solar 2013: Cost Pressure Increases Risks to Quality of Solar Systems”



IRENA (2013) “International Standardisation in the Field of Renewable Energy”

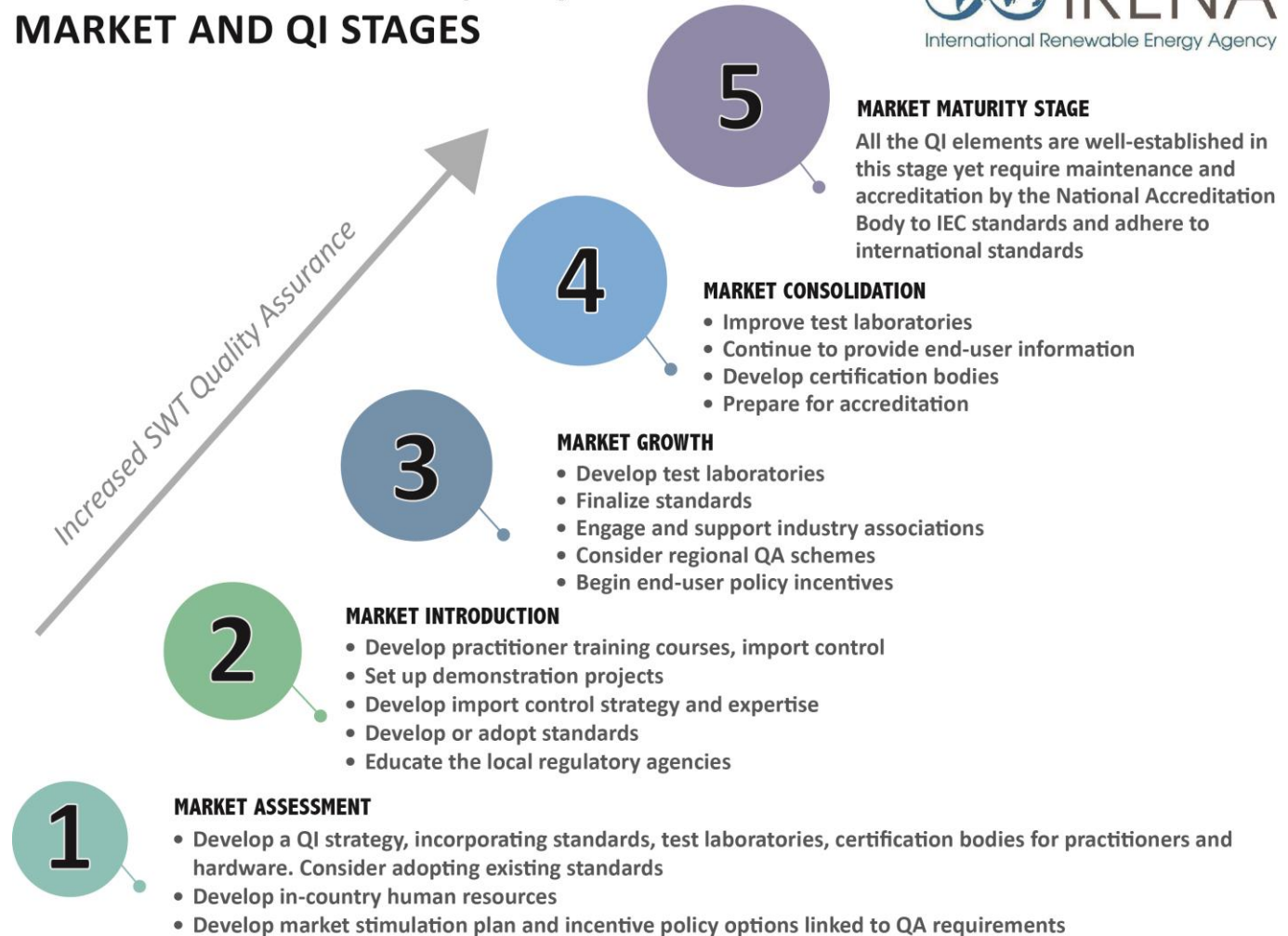
Quality infrastructure should be affordable for the local market



Proposed approach to develop quality infrastructure - Incremental approach

Quality infrastructure to be developed hand-in-hand with country context and market stage for SWH technologies

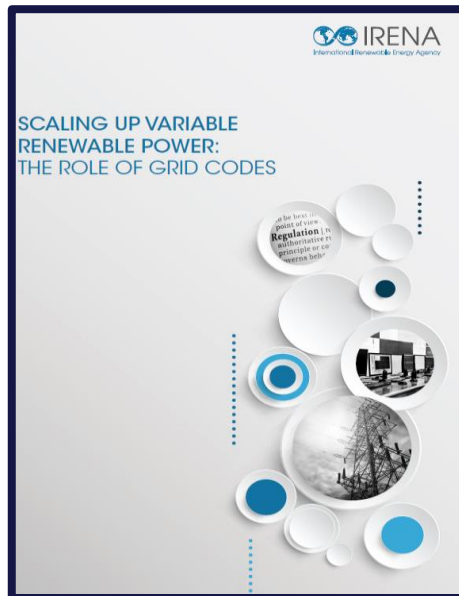
SMALL WIND TURBINE (SWT) MARKET AND QI STAGES



Supporting countries to develop and implement QI for RET



- Network of partners: IEC, PTB, WWEA, GSC, SolarUnited, SolarPower Europe
- Studies on QI for solar thermal, small wind. Forthcoming PV
- Grid integration: grid connection codes
- Workshops with policy-makers and regulators
- Expanding cooperation with IEC and IECRE



IRENA web platform for RE standards and patents: www.irena.org/inspire



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INSPIRE - is an interactive platform which facilitates the access to such information by:

- Providing one entry point for information on renewable energy technology (RET) patents and standards for the public interested in RE but non-experts in standards or patents
- Relating the information to practical applications
- Informing the users on what are and how to use patents and standards for the deployment of RET
- Facilitating a dialogue between the different stakeholders on these topics

Browse RE standards – using keywords or dropdown menus

Search Standards

Search through the catalog of important renewable energy standards

Disclaimer: The RE Standards Database has been developed and is maintained by IRENA. The main sources of data used are the ISO and IEC. While by no means exhaustive, this database aims at providing users with a thorough overview of the renewable energy standards most commonly used at an international level.

Filters

Search in title and abstract

Technology group

solar Energy

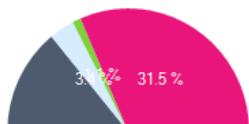
Technology sub category

PV

Aspects covered

Result charts

Bodies



We found 89 entries:

1

IEC 60891 ed2.0 : Photovoltaic devices - Procedures for temperature and irradiance corrections to measured I-V characteristics

Abstract:

IEC 60891:2009 defines procedures to be followed for temperature and irradiance corrections to the measured I-V (current-voltage) characteristics of photovoltaic devices. It also defines... [Read More](#)

Normative references:

IEC 60904-1, Photovoltaic devices – Part 1: Measurements of photovoltaic current-voltage characteristics
IEC 60904-2, Photovoltaic devices – Part 2: Requirements for reference... [Read More](#)

Body: IEC | Ref.-No: IEC 60891 ed2.0

Technology: PV | Publication: 14.12.2009 | Aspect: Testing, Sampling and Analysis | Status: final | More: [IEC Website](#)

IEC 60904-1 ed2.0 : Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics

Abstract:

Describes procedures for the measurement of current-voltage characteristics of photovoltaic devices in natural or simulated sunlight. Lays down basic requirements for the measurement... [Read More](#)

Normative references:

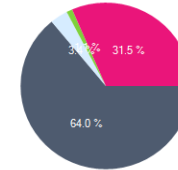
IEC 60891: Procedures for temperature and irradiance corrections to measured I-V characteristics of crystalline silicon photovoltaic (PV) devices
IEC 60904-2: Photovoltaic devices... [Read More](#)

Body: IEC | Ref.-No: IEC 60904-1 ed2.0

Technology: PV | Publication: 13.09.2006 | Aspect: Testing, Sampling and Analysis | Status: ed3.0 in progress | More: [IEC Website](#)

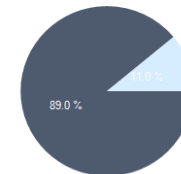
Result charts

Bodies



IEC CLC ASTM
MCS

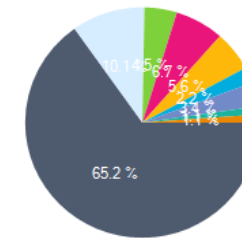
Technologies



PV Solar Thermal

E.g. Standards for PV Systems

Aspects



Testing, Sampling and Analysis
Product
Performance
Pre-Installation
General
Installation
testing, Sampling and Analysis
Cross-cutting / Performance
Certification

- List of standards
- Includes abstracts, normative references
- Organisation developing the standard and the hyperlinks

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