

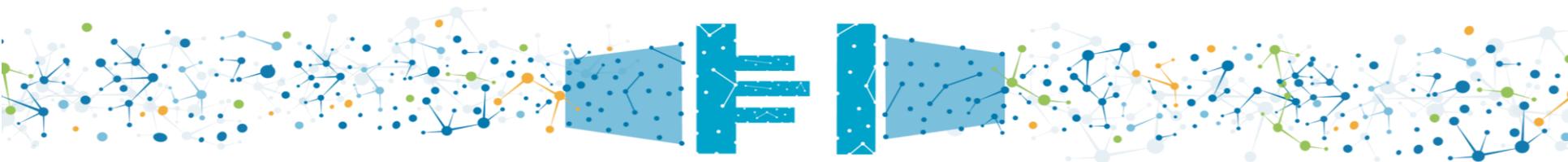


4TH INTERNATIONAL OFF-GRID RENEWABLE ENERGY CONFERENCE & EXHIBITION

Developing quality infrastructure for renewable mini-grids



International Renewable Energy Agency



Forthcoming IRENA report on QI for Mini-grids

in collaboration with IEC and ARE



Report: Quality Infrastructure for mini grids

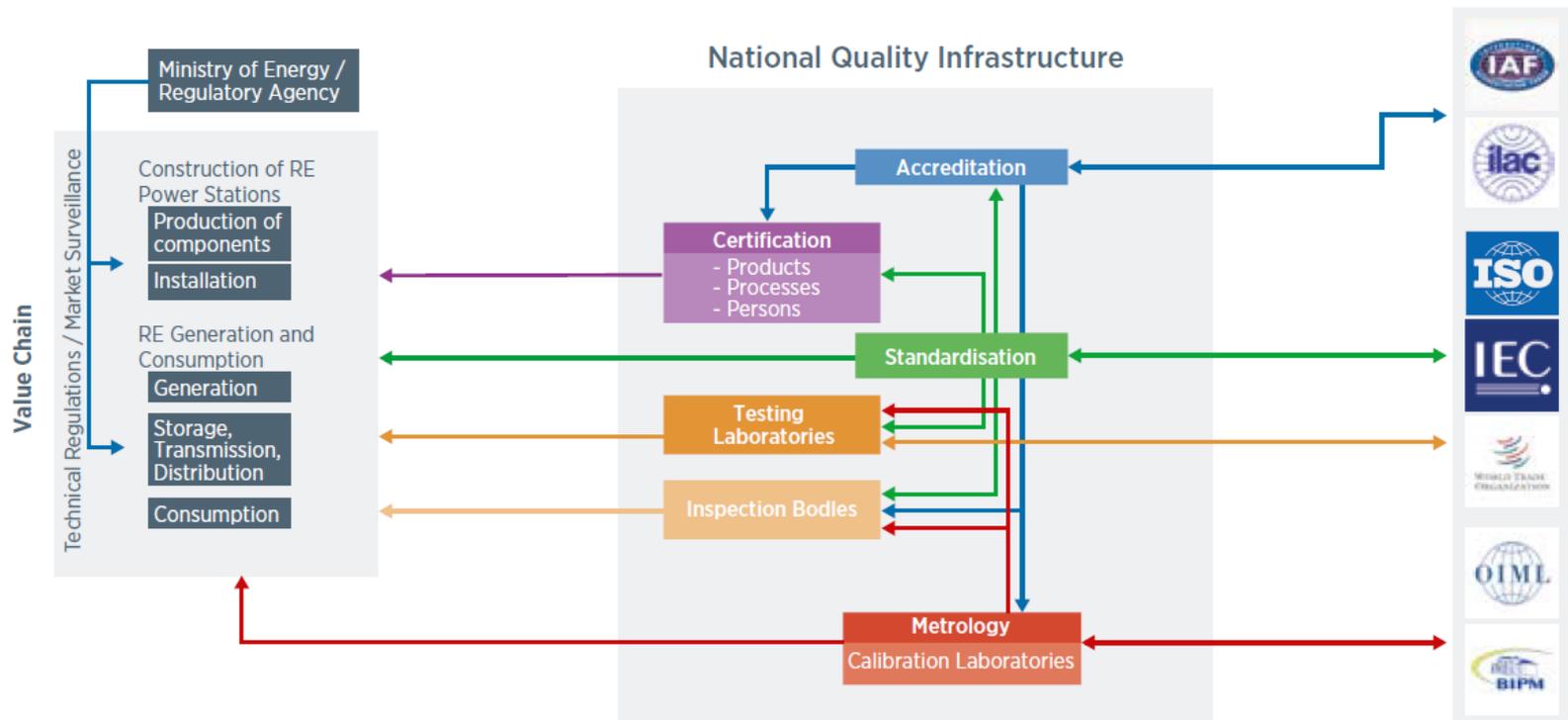
1. Brief on the market status and costs
2. Quality gaps in mini-grids functionalities
3. Costs and benefits of QI deployment
4. Needed QI in the future
5. Strategies to develop QI
6. QI in policy frameworks



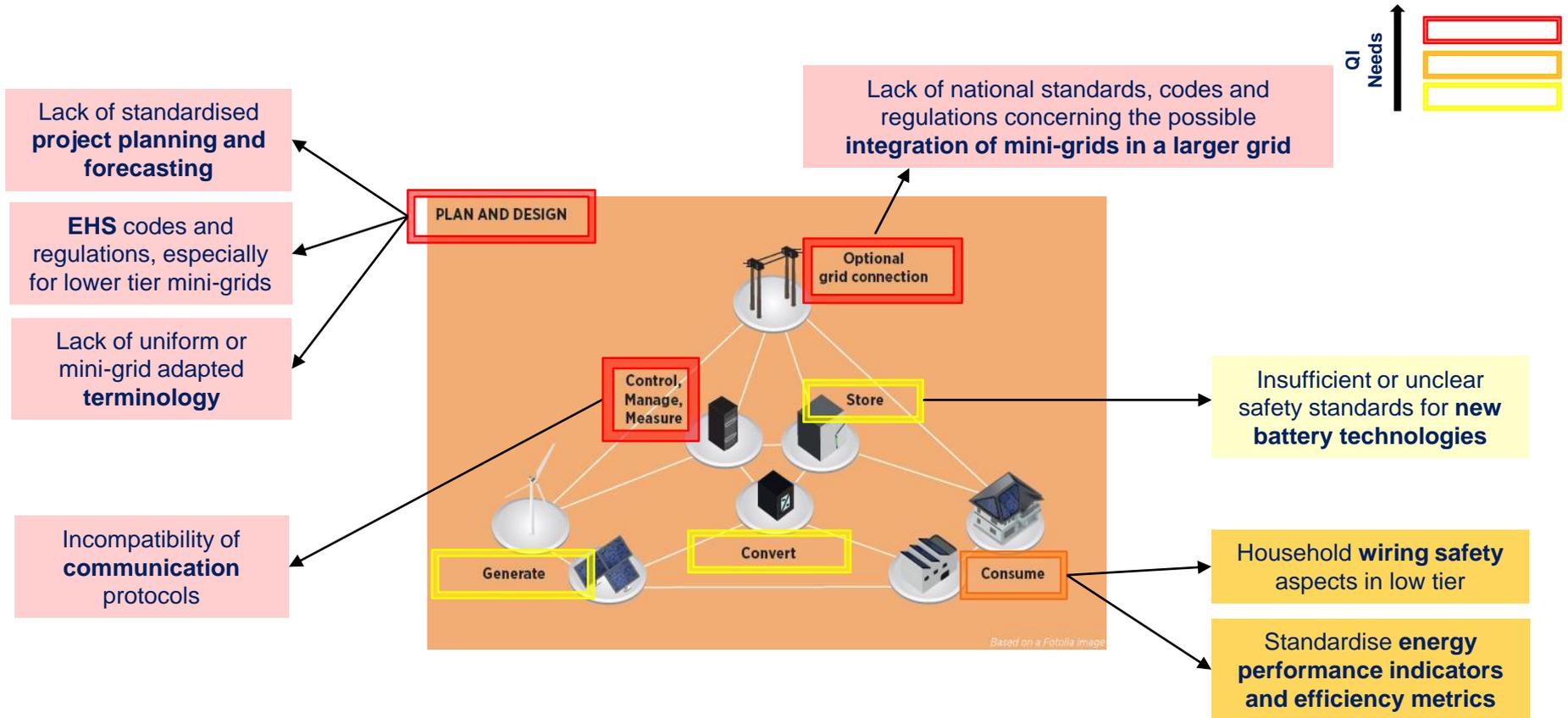
Quality Infrastructure to mitigate technical risk



Which **instruments** do we have to mitigate technical risk, attract investment and public acceptance, and meet expectations by all stakeholders in a USD trillion market?



Gaps in QI for mini grids



A major gap is **QI for the overall mini grid system**. Currently QI is isolated, and oriented to each technology type or specific functionality!

Quality Infrastructure Gaps for LVDC mini-grids



Adjustment of AC standards (plugs, sockets, grounding, overvoltage/current, fault detection)

Standardisation of DC voltages, installation guidelines and certifications. This will reduce uncertainty and barriers for contractors.



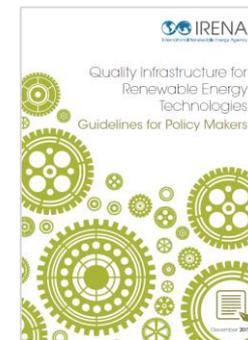
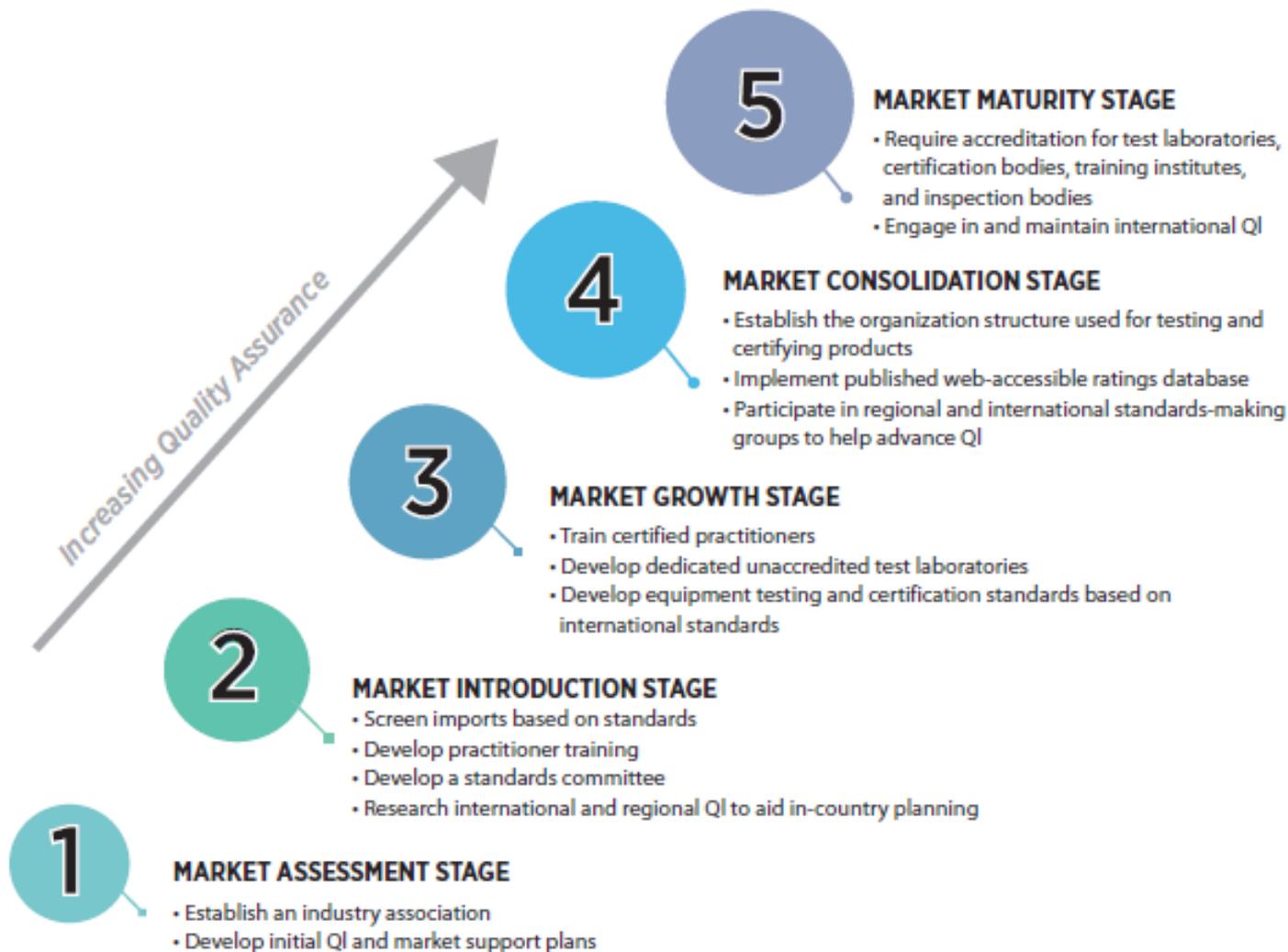
Development of new standards and testing specifically targeting **safety, protection and power quality** to mitigate any negative perception.

Cooperation between the various stakeholders to obtain a comprehensive and universally applicable QI





Stepwise approach based on market context





Puerto Rico Regulation on Microgrids.

After hurricane Maria in 2017, Puerto Rico looked to implement more resilient energy systems in their communities.

The 2018 regulation defines ‘renewable microgrids’ as those that can generate 75 % of their energy from renewables. It identifies the applicable codes and standards.

Below, the Commission establishes the list of Codes and Standards with which all microgrids must comply. It remains the responsibility of each microgrid owner and operator to ensure that its microgrid system is in compliance with any and all Codes and Standards that may be applicable to it.

1. Latest National Electrical Code;
2. Latest National Electrical Safety Code;
3. IEEE Standard 1547-2014;
4. IEEE P2030.2, P2030.7;
5. IEC 61850-7-420; Power Utility Automation
6. IEC/TS 62898-1 and 62898-2; Guidelines for microgrid projects planning and specification

- Other examples: USA, Tanzania

Explore INSPIRE and get engaged in the work of patents and standards



Free online platform International Standards and Patents in Renewable Energies(INSPIRE)

More than 400 international standards available for all types of RE



Access INSPIRE at: <http://inspire.irena.org>

Find here a [video](#) on how to use INSPIRE

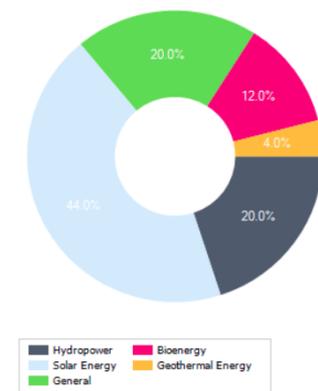
Filters

Search in title and abstract

Technology group

Aspects covered

Technology Group



We found 25 entries:

1

IEC 60041 ed3.0 : Field acceptance tests to determine the hydraulic performance of hydraulic turbines, storage pumps and pump-turbines

Abstract:
Specifies methods for any size and type of impulse or reaction turbine, storage pump or pump turbine. Determines whether the contract guarantees have been fulfilled and deals with the rules... [Read More](#)

Normative references:
You can find the normative references on the standardization body's web site. Use the link below.

Body: IEC | Ref.-No: IEC 60041 ed3.0
Technology: Hydro | Publication: 11/30/1991 | Aspect: Testing, Sampling and Analysis | Status: Active | More: [IEC Website](#)

IEC 60609-1 ed1.0 : Hydraulic turbines, storage pumps and pump-turbines - Cavitation pitting evaluation - Part 1: Evaluation in reaction turbines, storage pumps and pump-turbines

Abstract:
Provides a basis for the formulation of guarantees applied to cavitation pitting for reaction hydraulic turbines, storage pumps and pump-turbines. It addresses the measurement and... [Read More](#)

Normative references:
IEC 60193, Hydraulic turbines, storage pumps and pump-turbines – Model acceptance tests IEC TR 61366-1, Hydraulic turbines, storage pumps and pump-turbines – Tendering documents... [Read More](#)

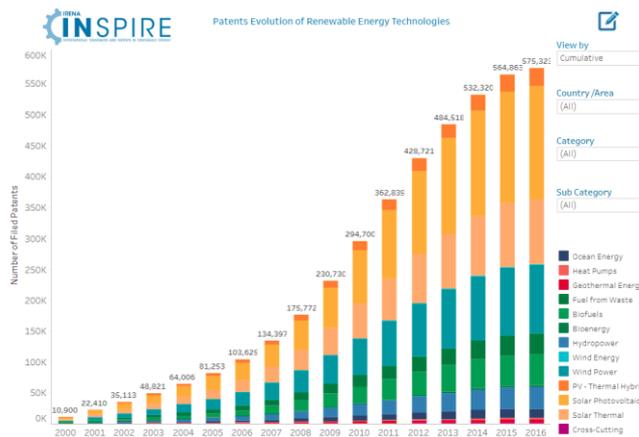
Body: IEC | Ref.-No: IEC 60609-1 ed1.0
Technology: Hydro | Publication: 11/24/2004 | Aspect: Installation | Status: Active | More: [IEC Website](#)

IEC 60805 ed1.0 : Guide for commissioning, operation and maintenance of storage pumps and of pump-turbines operating as pumps

Abstract:
Applies to storage pumps and reversible pump-turbines of all types, especially to large units coupled to electrical motor-generators.

Normative references:
You can find the normative references on the standardization body's web site. Use the link below.

RE: Technology Patents Evolution | RE: Technology Profiles | RE: Enablers Patents Evolution | Global Overview | RE: Patents by Country





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Information on standards development and project application

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Get in contact with developers and find reports on the topics

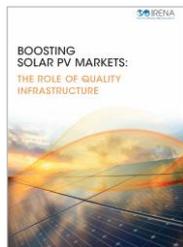
 [Read More](#)

News and Events

Extending the Frontier of PV Reliability IRENA at the World Future Energy

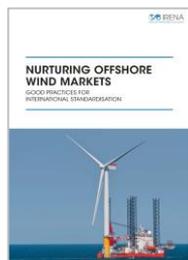
Quality Infrastructure: Develop, Control, Cost and Benefit

Guidelines for countries to develop and implement QI for RET



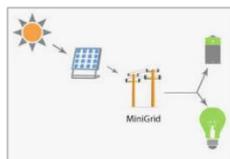
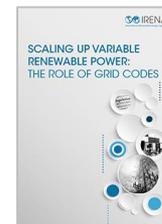
In-depth analysis for PV systems, shows the impact of the whole quality infrastructure (QI) in PV markets

QI for solar thermal and small wind, as well as a general guideline on QI for policy-makers



Standards for Offshore Wind

Grid codes requirements for variable renewable energy



Forthcoming: QI for Mini-grids

Download all the publications at www.irena.org/publications

IRENA undertakes **regional analysis and workshops** for regulators and policy-makers in countries. As an example, the recent Forum done for the Latin American region on solar PV. Or in Asia with the Asian Development Bank and IEC

Forward Looking



- ❖ QI for mini grids technologies is still in an **early stage**, QI for the overall mini grid system is missing
- ❖ **When drafting regulations referring to QI**, rely on pioneer cases and stakeholders to assess the need and application of a regulatory framework
- ❖ **Facilitate the path to a national quality infrastructure** by issuing guidelines, incentives and studies, possibly with international help
- ❖ When promoting a **market innovation** to establish an industry-leading position, make sure to include QI.
- ❖ Pro-actively develop regulations by **stimulating and supporting innovative projects and monitoring quality issues**
- ❖ **Represent national interests** in international technical standardisation committees and possibly establish mirroring national committees to be in line with international standardisation efforts



Back up



USA National Electrical Code: new article about DC mini grids.

California and Hawaii: new installations require inverters to provide grid support or smart inverter functions. (UL Test Standards)



Tanzania Energy and Water Utilities Regulatory Authority: Latest mini grid regulatory framework allows:

- Mini-grids at multiple locations can acquire a **single license** (> 1 MW) **or registration** for mini-grids using the same technology (<1 MW);
- Allow grid-connected mini-grids to **operate in islanded** mode when power to a previously isolated mini-supply is not available from the main grid;
- **Clarity and credibility on the compensation calculation** for distribution assets when the main grid connects grid.



Event



Hurricane Sandy blackout led to costs of up to **\$65 billion**, up to 60% of backup diesel generators failed for critical facilities



Poor power quality is estimated to cost Canadian businesses about **\$1.2 billion annually** in lost production



Half-day power outage at Hartsfield-Jackson Atlanta International Airport, costs between **\$25 million to \$50 million**

With QI mechanisms...

Renewable mini grids with **islanded capability and properly tested** can decrease these costs.

Enhanced **testing and monitoring** can help to solve this issues.

A more **distributed architecture** of its power supply reliability would have avoided at least a portion of these costs.

Cost standardisation committee
USD 138 K

Cost Testing Lab
USD \$2-30 M



QI for Mini grids

- Starting point IRENA Innovation Outlook: Mini grids
- Consider
 - Mini grids functionalities
 - QI elements
 - Type of Systems

QI for Mini grids of the Future

- Cost/Benefit → Quantitative indicators (e.g: savings in costs, infrastructure investment vrs revenues,...)
- On-the-ground case studies

Strategies and integration in policy frameworks

- Include the QI component in policies
- Step wise methodology
- Clear messages for different context of markets
- Policies, regulations and codes referring to QI components



- Text
- Text



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31 October - 1 November 2018 | Singapore

Organised by

