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QUALITY ASSURANCE AND STANDARDISATION STRENGTHEN RENEWABLE ENERGY MARKETS

Harmonised technical requirements based on international standards have been shown to significantly stimulate the trading of renewable energy technologies in globalised markets

Standardisation and quality assurance have proven indispensable for the rapid uptake of renewable energy technologies (RET). Quality assurance frameworks comprise requirements to ensure products and services perform as expected, along with instruments to verify that such requirements are fulfilled. This builds the credibility necessary for the creation of healthy, efficient and rapidly growing technology markets and ensure that expectations can be met from investors and end-users on technology performance, durability and safety.

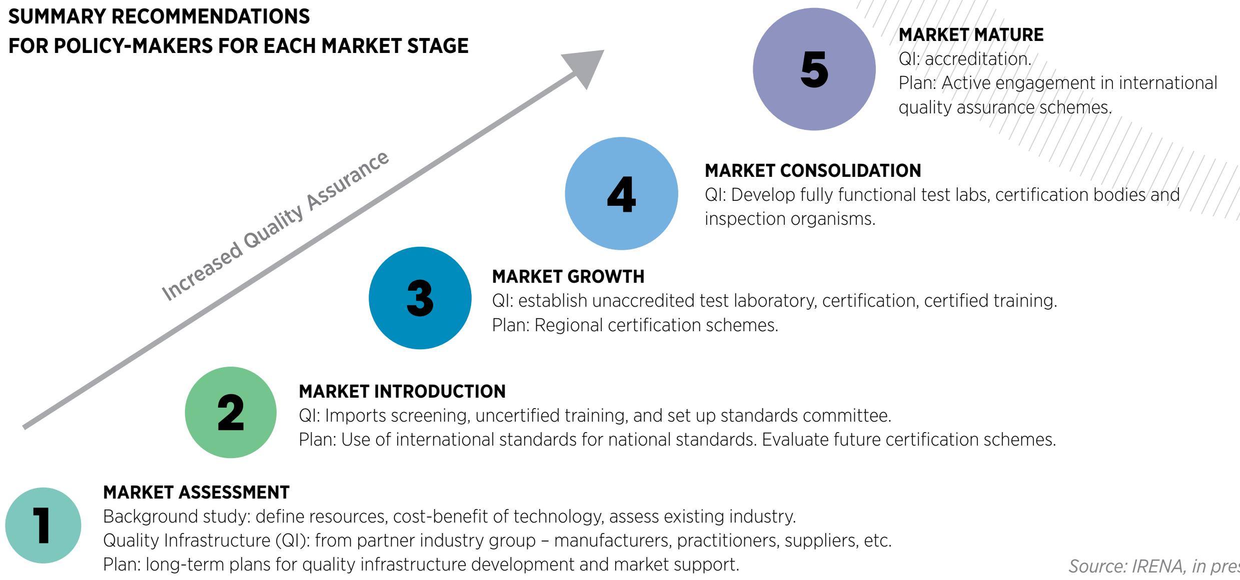
Through increased market recognition, standards and testing methods spur technology improvements. In the US state of Florida, a compulsory testing standard for solar water systems drove a 36% improvement in their efficiency within a five-year period. Assured quality is also a powerful tool to mitigate technical risk and provides a secure environment for large investments. Commercial banks often require the use of equipment certified to international standards to grant loans.

Standards and quality assurance are indispensable for the rapid uptake of renewables

Policy support schemes that integrate standards and quality-assurance instruments result in higher quality products and services. Incentive policies can increase RET effectiveness through the inclusion of mechanisms to ensure that systems deliver as planned. At present, 14 States in the US request contractor licensing and four request equipment certification for either solar or wind energy technologies. For solar photovoltaic and thermal technologies, the State of Arizona, for example, requires residents to use certified equipment quality for a personal income tax credit.

For renewable energy technologies, as analysed in detail for solar thermal and wind power technologies, the design of appropriate quality-assurance frameworks is highly dependent on country context and the status of the market for a specific RET. Implementing mechanisms for a technology in countries with established markets, a developed infrastructure for

Incremental approach for developing national quality infrastructure for RET



Source: IRENA, in press

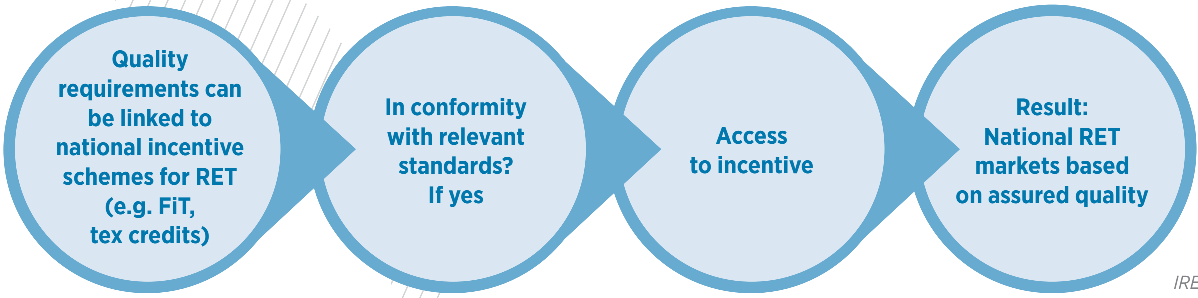
testing and certifying products and services, is not the same for a country where the technology is just being introduced and the infrastructure is not in place. Quality infrastructure can, however, be developed incrementally, hand-in-hand with RET market development.

Significant gaps, however, remain in implementing quality-assurance and standardisation in the renewable energy sector. Applicable international standards may be hard to find, adopting them may present a challenge, or the necessary institutional infrastructure may be costly to put in place. In order to bridge these gaps, IRENA has developed a first-of-its-kind online platform for access to international standards for renewable energy.

INSPIRE – Internationals Standards and Patents in Renewable Energy — is a one-stop shop website where users can search some 400 RET standards across the globe, to obtain abstracts, links to development organisations, and real-time reports. The platform also provides access to related material from IRENA and partner organisations, learning material on how to use standards within policy frameworks, and information on who is engaged in developing international RET standards. Maps show which countries are most active in RET standardisation processes, helping to create networks between standards developers and users.

IRENA continues expanding its work in the area of standardisation and quality assurance. Examples include an in-depth analysis on how to operationalise quality-assurance frameworks for solar photovoltaic technologies, as well as supporting national regulatory bodies for power with standards for integrating variable renewables into electricity grids.

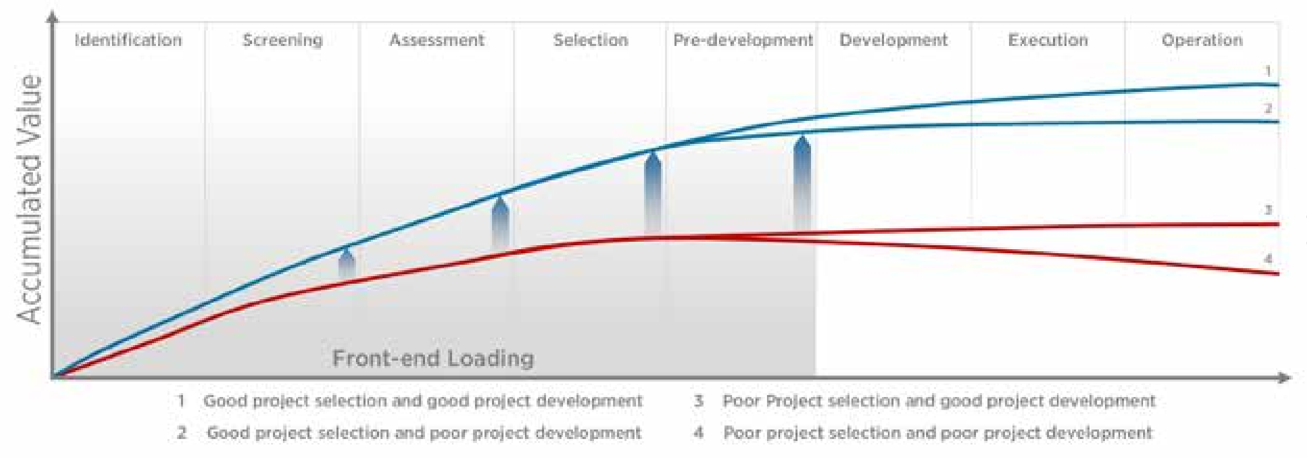
Using quality assurance schemes in support on incentive policies for RET



Source: IRENA, in press

For more information, please visit: www.irena.org/inspire and www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=44&CatID=112&SubcatID=298&RefID=298&SubID=596&MenuType=Q

The influence of front-end loading on the overall value of a project



Project Planning Helps to Secure Finance

Despite rising installed capacity worldwide, the deployment of renewable energy is still hindered because many projects fail to secure financing. Project developers often struggle to create an attractive project proposal that convinces banks of the profitability of their project. Reasons for this include a lack of reliable data for investment analysis and inadequate project development skills, which together translate into weak project proposals.

These hurdles reflect technological immaturity and a shortage of public information, making some renewable energy technologies unfamiliar to financiers. This brings us to a paradox: while funding is required to properly develop a project, the project must be at least partially developed to convince a bank and allow for financing. A great number of projects, therefore, stall or fail at the early stages of development. According to a study conducted by the California Energy Commission, failure rates for renewable energy projects in the United State and some countries in Europe can be as high as 78%.[1] When it comes to venture capital funds it is not unusual to see deal closure-ratios on proposals as low as 5%.[2]

Adequate project development and planning are critical, particularly given the complexity of bringing together all the aspects required to ensure long-term financial and technical success. A useful concept to ensure robust and bankable project proposals is *front-end loading*. This means concentrating planning and design efforts in the early stages of project development, when many crucial factors have not yet been decided upon, investments have not been made, and several options are still being considered allowing for changes to be made swiftly and at virtually no additional cost.

Paying enough attention to details in the early stages of the development process also ensures a good project selection. If a good selection is complemented by good project execution, the increase in the value and the quality of a project will be substantial. With poor project selection, good execution will do little to increase its value.

IRENA has created an online tool to address such issues. The Project Navigator provides developers with the means to create a comprehensive and bankable project proposal guiding them through each step of the project development process and ultimately helping to secure funding.

The knowledge, tools, case studies and best practices in the application can help developers make the right decisions. Through a range of guidelines, the Navigator provides information on both general and technology-specific levels, incorporating a financial perspective. In addition, the Financial Navigator component allows developers to identify suitable funding options from a database.

To find out more about the IRENA Project Navigator, visit: www.irena.org/navigator

[1] *http://news.heartland.org/newspaper-article/2006/04/01/study-finds-high-failure-rate-renewable-energy-projects*
[2] *https://www.kfw-entwicklungsbank.de/Download-Center/PDF-Dokumente-Diskussionsbeiträge/38_AMD_E.pdf*

Saving Power for Rainy Days

While rapid cost reductions for solar photovoltaics (PV) and wind power are driving a transition across the globe, one fundamental question remains for a renewable energy future: "What about when the sun doesn't shine or the wind doesn't blow?"

Electricity storage is often described as being able to solve the problem of variable power generation associated with solar PV and wind power. This view is exaggerated. There are other cost-effective measures available to integrate variable renewable energy into existing power systems. For example, a combination of different renewable energy resources, like hydropower, biomass, geothermal or ocean power, can reduce the effects of variability substantially. A pro-active and diligent planning process, grid codes and investments in transmission and distribution networks also support the transition towards renewables-based power systems. These increasingly practical storage systems signal an important breakthrough as renewables become a mainstream part of the power mix.

The issue of storage is also not new in the power sector. Conventional power plants rely on coal piles or tanks of natural gas, diesel or LPG to provide the necessary storage to match supply and demand, and nuclear power stations have often been matched with pumped-storage hydropower stations that use the excess electricity to pump water into reservoirs, and reverse this process when the electricity is needed again. Today, 99% of the global electricity storage capacity in place, is in the form of pumped-storage hydropower.

So why is electricity storage of interest to renewable power developers? Advanced electricity storage technologies, especially lithium-ion batteries, have fallen in price due to the resurgence of electric vehicles and fierce competition in the electronics industry. This has led to improved performance and cost characteristics for other electricity storage technologies, like advanced lead-acid, nickel-cadmium, redox flow, molten salt, and metal-air batteries as well as flywheels and supercapacitors.

Consequently, renewables combined with electricity storage have challenged diesel generators as the most cost-effective power supply option including islands.

Advanced electricity storage technologies can be located at any point in the grid infrastructure. This means that renewable power generation can be combined with local storage, as is the case with the six million solar home systems already deployed around the world in remote areas without grid connection. In the next five to ten years, the declining cost of rooftop solar PV, combined with storage, can create a situation where consumers can start producing and consuming their own electricity more cheaply than buying electricity from the grid. Although this will not diminish the importance of grid infrastructure, it has called into question the existing models for utilities to recover their costs of maintaining and managing the grid.

Electricity storage technologies can do more than store electricity. They can help in the management of grids by regulating frequency and voltage, by providing reserve capacity in case demand suddenly peaks, or by deferring the need for grid investments.

Policy makers and regulators need to be aware of the potential disruptive effects of electricity storage on grid management — including its effect on the business models of utilities and grid operators. Utilities and grid operators can use demonstration projects to gain more experience with the impact of storage for managing renewables-based grids. Research institutes can create analytical tools to support decision-making. Industry will have to work on performance standards that reduce risks from a social, economic, and environmental perspective. In this respect, a new technology roadmap from IRENA provides guidance for international cooperation among these different stakeholders to ensure that electricity storage strengthens the deployment of renewables.

Please see IRENA's report:
Renewables and Electricity Storage

New Energy Solutions on the Block

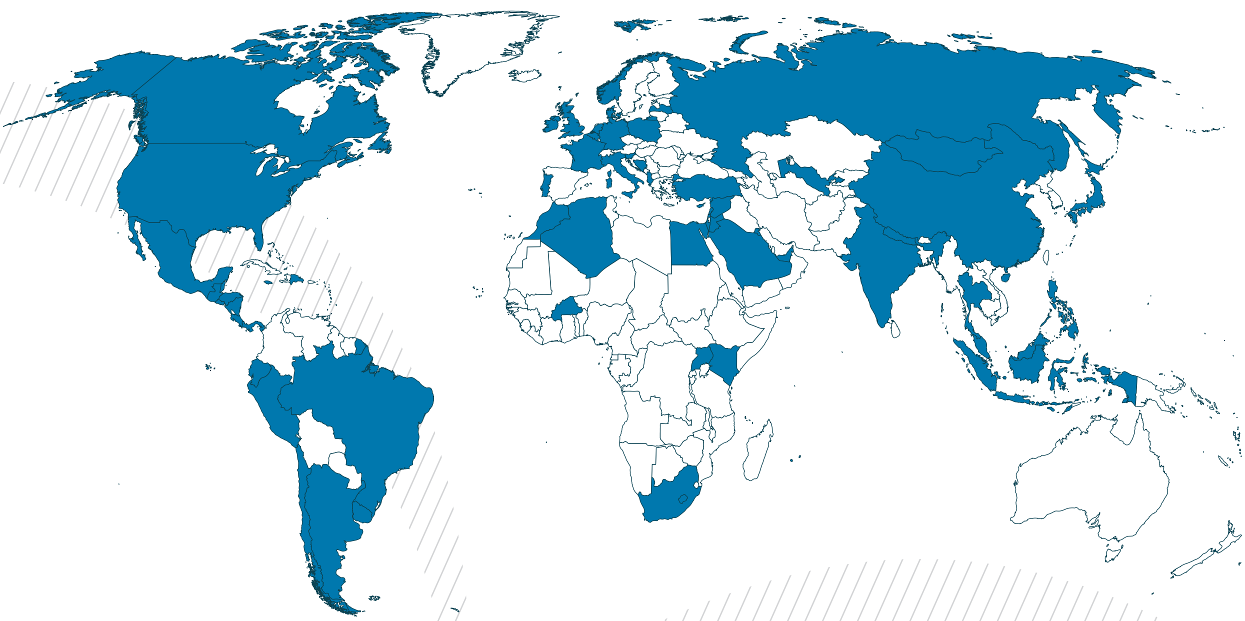
As countries worldwide seek sustainable and affordable energy solutions, a traditional procurement process has become the instrument of choice to reach a competitive price for renewable energy electricity. Recently, the considerable decline in the cost of renewable energy technologies has made it challenging to set appropriate levels of public support for their deployment, while maintaining a stable and attractive environment for investment. This is partly why the auction has come to the fore as an effective way to promote renewable energy deployment.

To date, more than 60 countries — see figure of *Countries holding auctions for renewable energy by 2015* — and predominantly in the developing world, including Brazil, China, Morocco, Peru and South Africa, have turned to renewable energy auctions, mainly to attract competition and drive down the resulting electricity costs.

What Are Renewable Energy Auctions?

Renewable energy auctions are competitive bidding procurement processes for electricity, either specifically from renewables or where renewable energy technologies are eligible. Typically, a government issues a call for tenders to install a certain capacity of renewable energy-based electricity. Project developers submit their bids. The government then evaluates the offers, and this results in a power purchase agreement with the successful bidder.

Countries holding auctions for renewable energy by 2015 (in blue)



Source: Based on data from the Global Status Report, REN 21, 2015

In fact, the growth of countries adopting auctions has outpaced that of other instruments, such as the feed-in tariff (FiT) and the quantity-based Renewable Purchase Obligation (RPO) since 2010, as they incorporate both tariffs and quantity considerations —see figure on the growth of renewable energy policies.

Indeed, renewable energy policies have encouraged investments and helped stimulate the sector's development. More recently, the use of auctions has scaled up renewables in a cost-efficient and transparent manner, while also achieving socio-economic objectives. Some of the short-comings associated with auctions include high transaction costs, delays and unrealistically low bidding. Solid auction design considers each country's circumstances to minimise these risks.

History of renewable power auctions

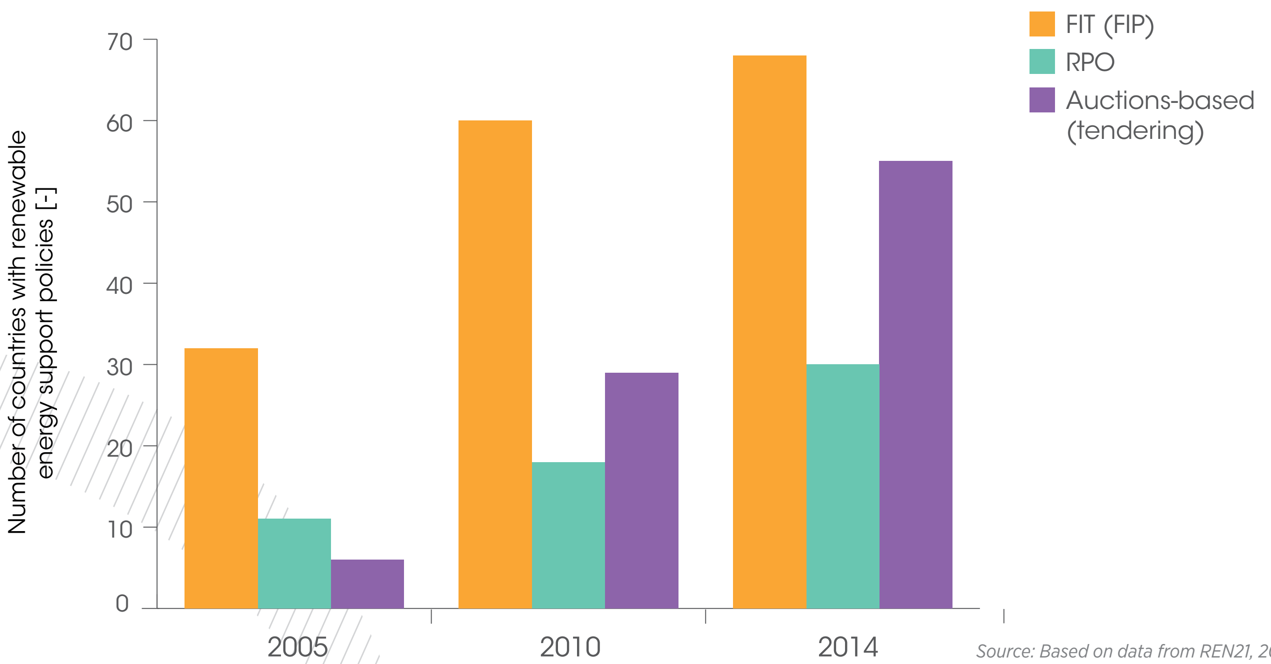
In line with the vertical unbundling that arose in the late 1980s, governments and state utilities set out to procure new electricity capacity from independent power producers. The first auctions for long-term electricity contracts happened in the 1990s. The UK Non Fossil Fuel Obligation, until 1998, sought bids to produce a specific amount of electricity from chosen technologies at a certain price.

More recently, with a second wave of power sector reforms, Brazil, Canada, Chile, China and Ireland were among the first countries to adopt auctions, in some cases facilitating the transition from monopolistic to liberalised markets. This has helped ensure an adequate volume of new power generation in a number of countries with rapidly increasing electricity consumption.

Stability and price discovery

The increasing interest in auctions is driven by their key strengths, including their ability to achieve deployment in a well-planned, cost-efficient and transparent manner. Because of this, auctions, with their ability for real price-discovery, have emerged as a key policy instrument for many countries to promote the energy transition.

The growth of renewable energy policies



Source: Based on data from REN21, 2014

For more on the strengths, weaknesses and main design elements of this important policy instrument, see: Renewable Energy Auctions: A Guide to Design (IRENA, 2015).
An earlier report, Renewable Energy Auctions in Developing Countries (IRENA, 2013) noted the effectiveness of auctions in selected markets.

Deploying Renewables Sustains Job Growth

Jobs in the renewable energy sector continue to grow apace with the global scale-up. More than 7.7 million people are now employed through renewable energy worldwide, up 18% from the number reported last year and up 35% over the last two years, according to IRENA's *Renewable Energy and Jobs – Annual Review 2015*, released in May. The report also provides a first-ever global figure for the number of jobs supported by large hydropower, with a conservative estimate of an additional 1.5 million direct jobs worldwide.

Doubling the share of renewables in the global mix by 2030, jobs could easily exceed 16 million worldwide

As in previous years, renewable energy employment is shaped by regional shifts, industry realignments, growing competition and advances in technologies and manufacturing processes. Jobs in the renewable energy sector are increasingly being created in Asia, with five of the ten countries with the most renewable energy jobs located there. As a result, even with continued employment growth, the European Union and the United States now represent only a quarter of global renewable energy jobs, compared to 31% in 2012.

The ten countries with the largest renewable energy employment figures are China, Brazil, the US, India, Germany, Indonesia, Japan, France, Bangladesh and Colombia. While the bulk of employment is found in a relatively small number of countries, more and more countries are creating jobs through renewable energy deployment. Plummeting prices for renewable energy technologies are also triggering capacity additions and driving job growth in installation, operation and maintenance.

Solar photovoltaic (PV) is the largest renewable energy employer with 2.5 million jobs worldwide, up from 2.3 million at last count. According to IRENA's Renewable Power Generation Costs in 2014, solar PV module prices have dropped more than 75% since 2009, while residential solar PV systems are 65% cheaper than in 2008. In an auction this year, Dubai obtained the lowest-ever contract price of electricity from a solar park, without financial support, at less than USD 0.06 per kilowatt-hour (/kWh).

Wind is another example where falling costs are creating new jobs. Employment in wind energy passed the 1 million jobs mark, up from 834,000. Onshore wind is now one of the most cost-competitive sources of electricity available, with some projects now delivering electricity for as little as USD 0.04/kWh, again without financial support.

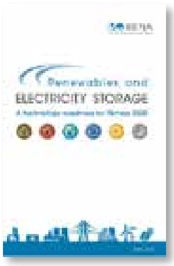
In a world recovering from an economic crisis and stressed by high unemployment rates, this job creation potential is an important consideration for policy makers. Forward-looking approaches are needed to train and educate people to fill these new job vacancies, and policies must be adopted to maximise renewable energy job creation. This entails developing a supportive policy mix that governs deployment, trade, investment, research, education and regional development.

For example, the Indian government has adopted an ambitious vision for renewable energy development over the next few years. If the right policy mix is enacted and the government reaches its goal of installing 100 gigawatt (GW) of solar PV and 60 GW of wind, it will generate more than 1 million much-needed jobs by 2022. In the US, declining technology costs and enabling policies have already resulted in increases to solar and wind power employment of 22% and 43% respectively, over the past year.

Growth in renewable energy jobs looks set to continue. If the share of renewables in the global mix were doubled by 2030, jobs in the sector could easily exceed 16 million worldwide.

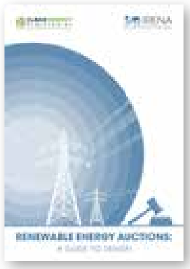
For more information see IRENA's Renewable Energy and Jobs – Annual Review 2015

Recent Publications



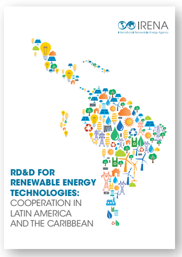
Renewables and Electricity Storage

Electricity storage is a key option available to manage variability and ensure reliable, round-the-clock supply. This technology roadmap indicates priorities and points out specific actions where governments, industry and other stakeholders can work together to advance storage systems, as part of the infrastructure for a sustainable energy future, with renewable sources and technologies dominating the power sector.



Renewable Energy Auctions: A Guide to Design

This guide examines auctions for contracts to develop power-generation capacity. These have emerged as an essential policy instrument for many countries to promote the transition to renewable energy sources and technologies. This six-volume guide from IRENA notes more than 60 countries using renewable energy auctions by 2015, mainly in order to attract competition and drive down costs.



RD&D for Renewable Energy Technologies: Cooperation in Latin America and the Caribbean

This report shows that the main gaps in cooperative Research, Development & Deployment (RD&D) for renewable energy technologies relate to human and financial capacities, knowledge development and diffusion, the promotion of entrepreneurial activities, and market formation for new technologies. It finds wide opportunities to coordinate innovation activities and efforts in Latin America & the Caribbean.

Fiji, Vanuatu and Republic of Marshall Islands: Renewables Readiness Assessment

These island territories are reviewing their energy policies and looking at the long-term challenges associated with the generation, distribution and use of electricity. The Renewables Readiness Assessment (RRA) reports of these three islands aim to highlight the significant renewable geothermal, wind and solar energy resources available to bring higher quality energy services to populations across each country.

www.irena.org/publications

About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international cooperation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity.

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