Technology Diffusion

Presented to the UNGA Workshop on Technology Needs of Developing Countries and options to address them

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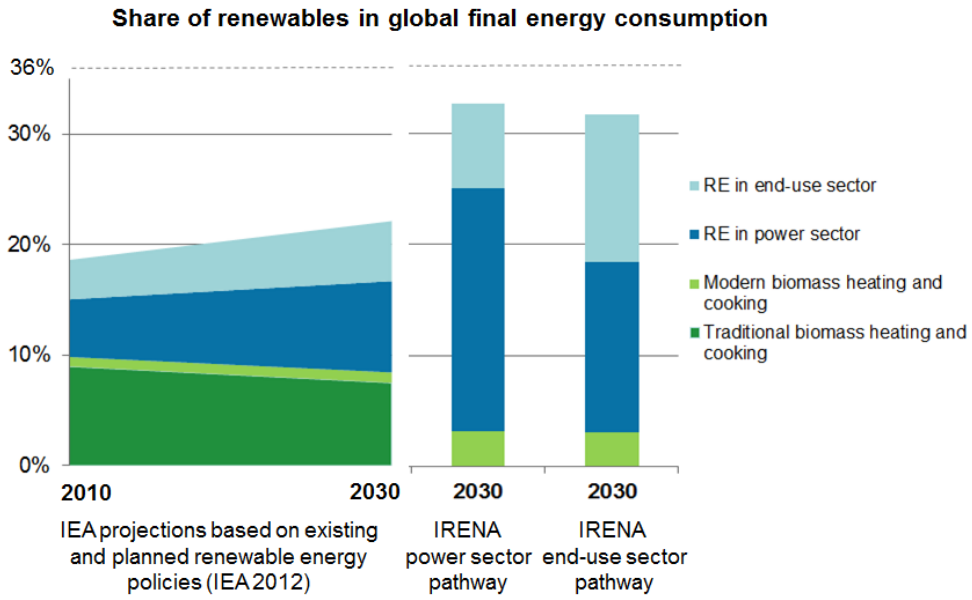
International Renewable Energy Agency

Context

- Climate, energy and development nexus
- Business-as-usual is no longer an option
- Meeting energy access, energy security and climate protection goals
- The case for clean energy transformation has been made – the question is how and at what pace?
- Accelerating technology diffusion is a key requirement
- RE technologies have shown remarkable progress in last five years and can and will play a leading role in this transformation
- Providing energy at affordable prices

REMAP 2030



Source: IRENA REMAP 2030 working paper

- **RENEWABLE ENERGY HUB** for UN Secretary-General's **Sustainable Energy for All** (SE4ALL) initiative
- Increasing renewables to **30% of global energy mix by 2030** is achievable
- At current rates, RE would be 21%, leaving **9% gap**

Membership

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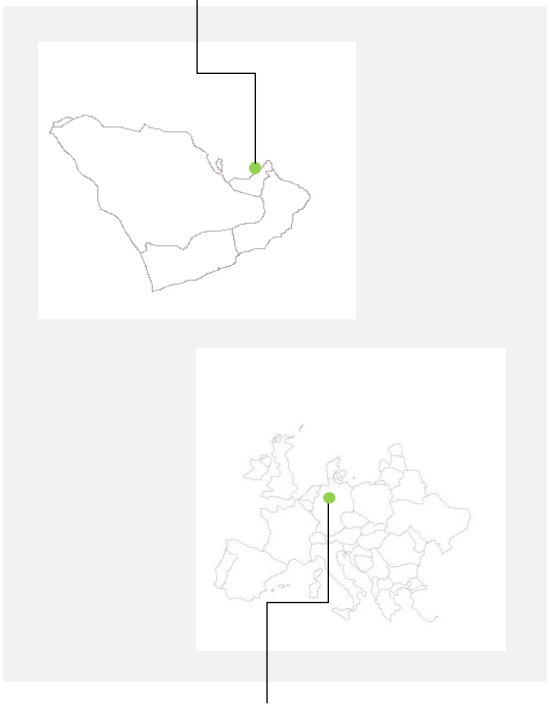
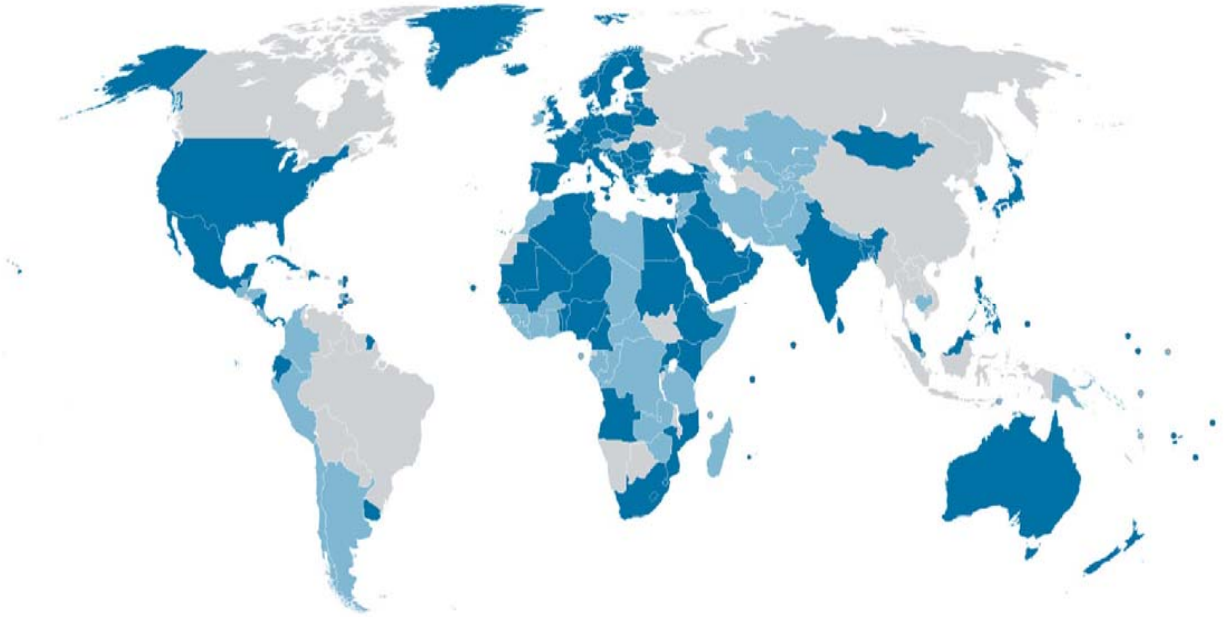
- Established in 2011
- Approaching universal participation

Headquarters in Abu Dhabi,
United Arab Emirates





109 Member States + European Union

51 Signatories/applicants

as of March 2013

IRENA Innovation and Technology Centre (IITC), Bonn, Germany

Status of Permanent Observer to the United Nations in New York

Mission, Vision and Mandate

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About IRENA

Mission: Promote the widespread and sustainable use of renewable energy worldwide

How: Serve as **hub**, **resource** and unified **voice** for renewable energy

Scope: All renewable energy sources

Bioenergy | Geothermal Energy | Hydropower | Ocean Energy | Solar Energy | Wind Energy

Hub, Resource and Voice

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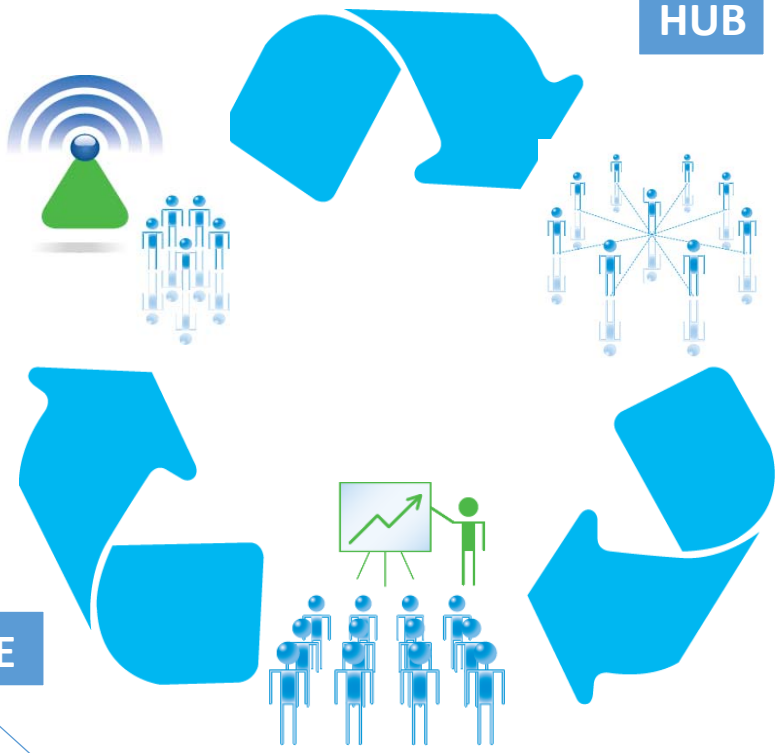
VOICE

- Advocacy and information dissemination
- Global, universal, unbiased
- Outreach and awareness raising

HUB

- Costing Alliance
- Global Atlas
- GREIN
- Regional approaches
- REPAN
- African clean energy corridor



RESOURCE

- Renewables Readiness Assessment + follow-up
- Capacity building
- IRELP

RRA

Renewables Readiness Assessment

- Country-led, collaborative process
- Identifies **effective policies** for renewable energy deployment
- Crafts **investor-friendly regulations**
- Brings together stakeholders
- Shapes **national action plans**
- Provides framework for future IRENA **engagement and advice**

- RRA process prompted Senegal to adopt new, renewable-friendly energy legislation

11 countries have done RRAs (Jan 2013)

Outcome of RRAs

- Senegal :
- Adoption of two pending decrees; decree No. 2011-2013 providing conditions of power purchase and remuneration for electricity generated by renewable energy plants and the conditions of their connection to the grid; Decree No. 2011-2014 provides the conditions of power purchase of surplus renewable energy-based electricity from self-producers
- Support from the European Union in drafting Feed-in-Tariffs and Model Power Purchase Agreement for Renewable Energy.
- Support from World Bank in developing a strategy and action plan on RE deployment

A "*Pincer*" Approach

- A *pincer* approach is combining *supply push* with *demand pull*
  - *The current national and international efforts are largely directed towards "supply push" i.e. FIT, tax exemptions, tax rebates and subsidies etc. These are necessary but not sufficient conditions for technology diffusion on the scale required*
  - *What is also critical is "effective demand pull" which means looking at the softer side of technology development and diffusion*

Delivery Mechanisms

Local presence of technology manufacturers or dealers; financial delivery mechanisms such as banks; assistance for technology deployment, operations and maintenance; technology procurement

Technology "Push"

Government Targets, Policies, Legislations, Incentives- Tax breaks, subsidies, feed-in tariffs, de-risking financing portfolios

Technology "Pull"

Consumer pull due to technology affordability, reliability, easy applicability, maintainability and operability

Major Challenges in Technology Diffusion (Push and Pull)

- Lack of awareness about the technology
- Lack of a national delivery system for the technology
- Technical risks
- Installation risks (lack of trained staff)
- **Affordability (critical) and affordable access**

Consumer first

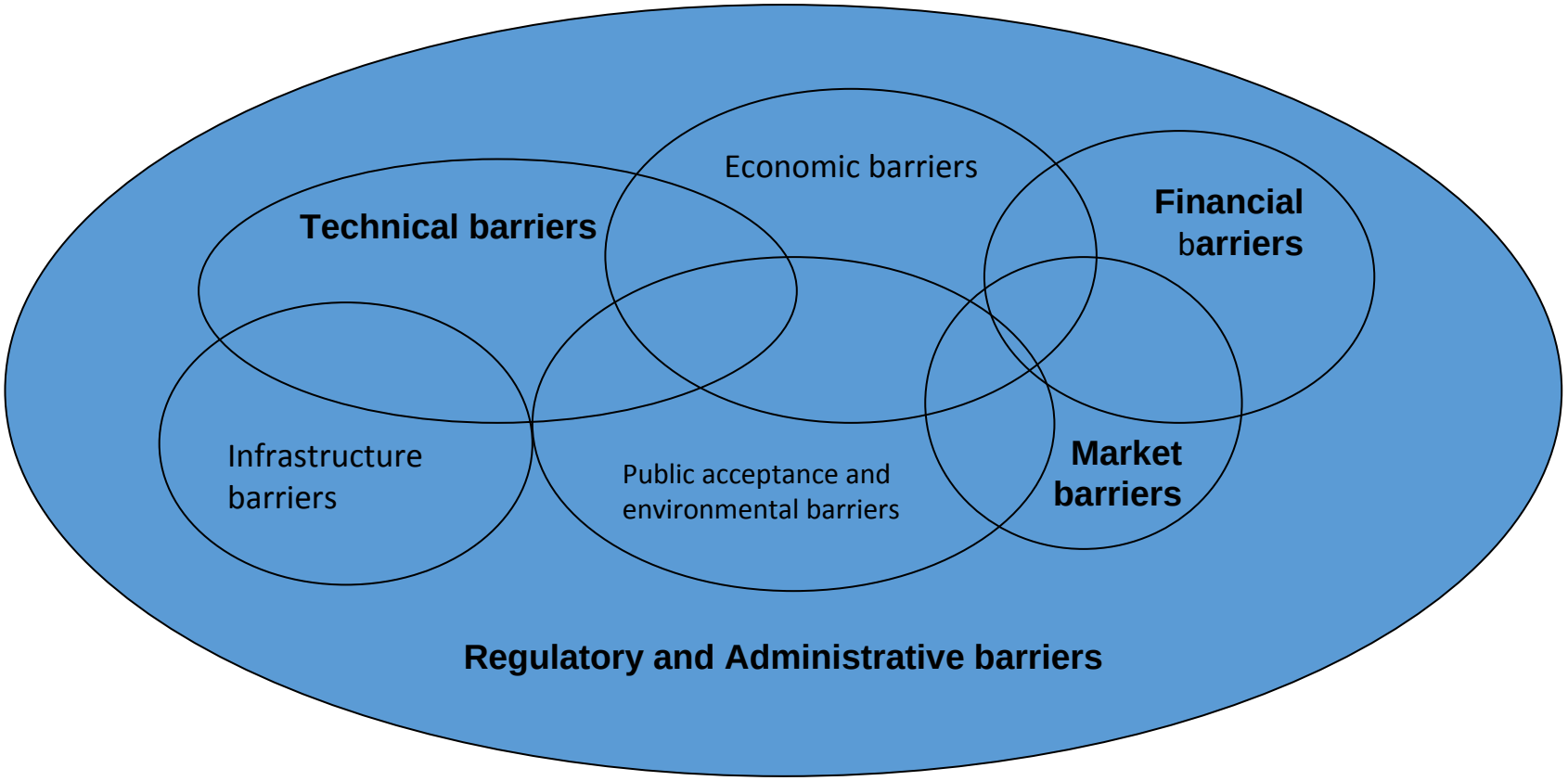
- For a successful technology diffusion the focus has to be on the final consumer and given his specific situation and affordability criteria all policy steps and all actions must be subservient to that
- Governments need to play an enabling role through appropriate policies, legislations, access to finance, level playing field
- Developing a national market for better and cheaper technologies – Example Africa lighting project

Overarching RE diffusion pathway

•Three main phases for RE deployment :

- ❑ Initial phase – Where a rational (or driver) for adopting RETs is initiated and pilot projects are developed (with relatively high costs)
- ❑ Transition phase – Where lessons learned from pilots inform policy making that will provide sound support structures and mechanisms to develop a market and manage its growth
- ❑ Consolidation/Adaptation phase – Where market grows towards maximum allowable level

Barriers to RE diffusion*



*Adapted from IEA,2011-Deploying Renewables

The Renewable Technology "Push"

1. Support Systems are crucial for market introduction and continuous diffusion of renewable energy technologies.
2. Support systems target
    1. The Economic barrier or "expensiveness"
    2. The Financing barrier, obtaining finance loans/interest of equity investors
3. Support systems utilize many different instruments and are often dynamic
4. Predominant loopholes in support systems introduced by governments
    1. Extent of Financial Support offered- which is dependent on location characteristics-price grantees, investment subsidies, tax reduction, quality, availability and distribution of renewable energy resource.
    2. The Issue of Risk: resource quality, availability and cost risks, technology risks, construction risks, planning approval risks, environmental impact risks, interest rate risks, currency exchange risks, operation risks, institutional risks, political risks, other regulatory risks.

Wind Power in Brazil

Brazil went from 29 MW in 2005 to 1 509 MW in 2011 of installed Wind Capacity and have a pipeline of 7000 MW of Wind by 2016

- The country unbundled its electricity sector with the privatization of generation, transmission and distribution
- Provision for diversifying the electricity generation mix by establishing PROINFA (Programme of Incentives for Alternative Electricity Sources) to provide an installed capacity of 3 300 MW of wind, biomass and small hydropower
- In the First phase (2002-2009) a total capacity of 1 429 MW was assigned for wind under a FiTs scheme and guaranteed grid access for all electricity produced over a period of 20 years
- In the Second phase (2009-2012) a reverse price auction was introduced to efficiently and cost-effectively increasing energy security (the Auction commercialized 1.8 GW of new projects)

Wind Power in India

India installed Wind capacity in 2011 is estimated at 16 000 MW from 1 167 MW in 2000

- Main driver for the country was energy self-sufficiency due to the oil crisis and price volatility
- Technology demonstration and R&D with the setting up of a Department in charge of wind resource assessment and initiation of wind farm pilots
- Policy framework with major fiscal incentives (including accelerated depreciation, tax exemption on income from sale of power from wind, Mandatory purchase of electricity by the states' Electricity Boards, Etc.)
- Economic liberalization and institutionalization through the creation of a ministry dedicated to non-conventional energy sources
- Passing of the Electricity act introducing define tariffs for wind energy
- Introduction of Generation-Based incentives (GBI) for gird connected wind power projects

Key Success Factors

- Political commitment from government (Policy portfolio for RE, targets,)
- Effective rule of law and transparency
- Effective administrative and permitting process
- A Clear and effective pricing structure and a functioning finance sector
- Monitor deployment trends to adjust and adapt support mechanisms

Concluding remarks

- A systems thinking
- No one-size-fits all approach – country circumstances, capability dependent
- Approaches need to adjust to learning curve of technology
- Technology Pull and Push are both important
- Affordability and access is key - Lower transaction costs, lower system costs, lower installation costs (few systems to choose from)
- North-South and South-South cooperation

Recent Publications

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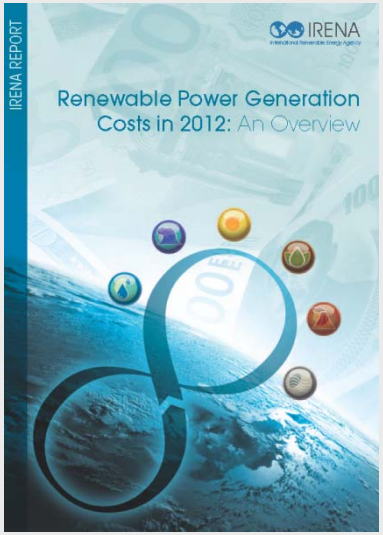

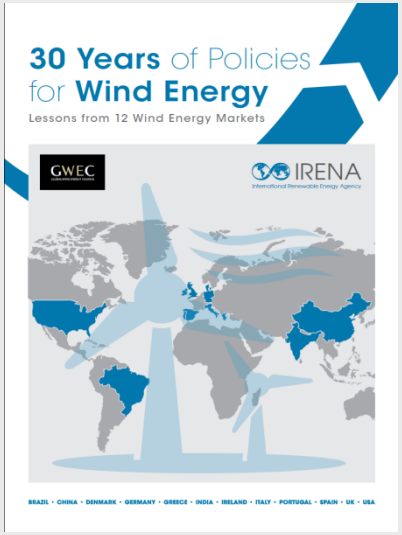

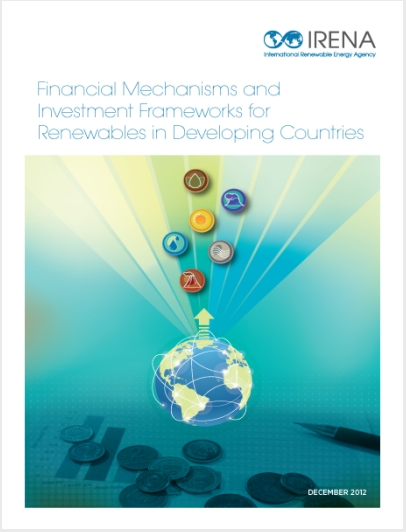

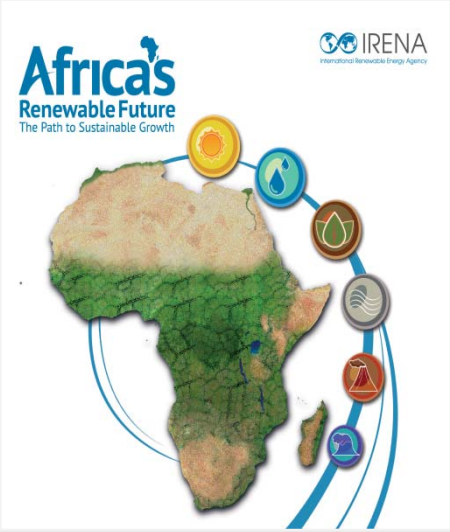

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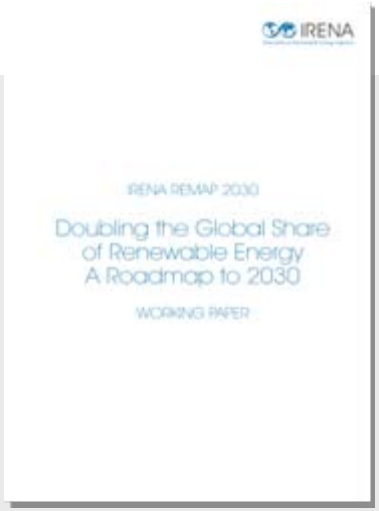

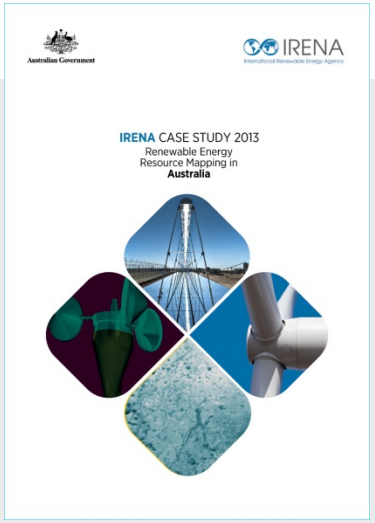

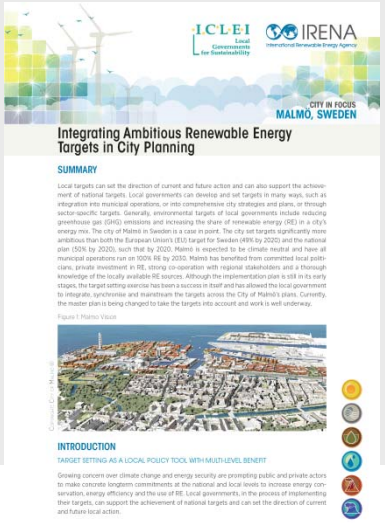

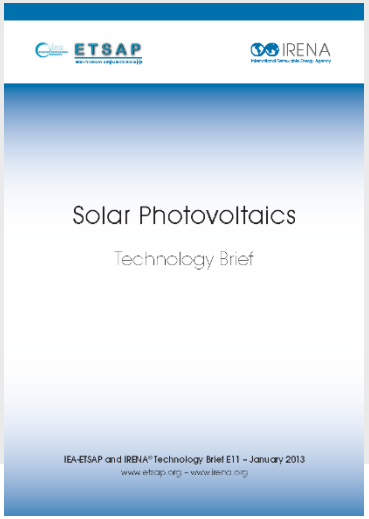

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