# INTERNATIONAL RENEWABLE ENERGY AGENCY


Accelerating the Growth of Renewable Energy

**APEC EGNRET 44**
**Laoag, the Philippines, 13 - 14 April 2015**

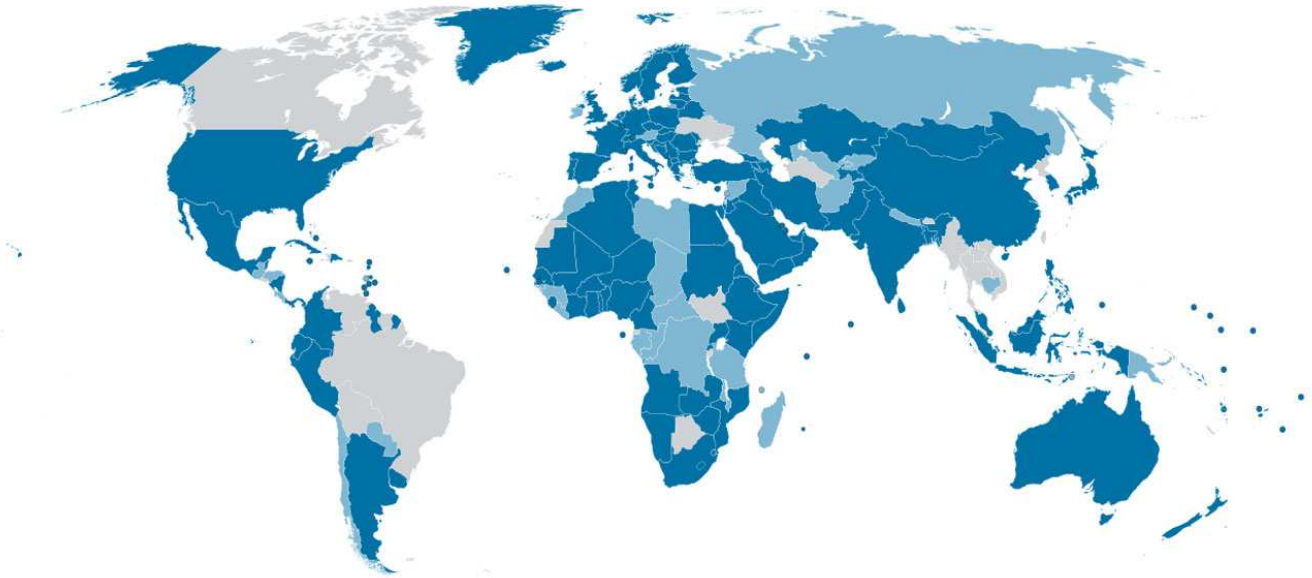
1. Introduction of IRENA
2. Transitioning towards Renewable Power Generation
3. REmap 2030
4. Capacity Building
5. Renewable Readiness Assessment
6. The Role of IRENA

# 1

# Introduction of IRENA

# The International Renewable Energy Agency

*The Voice, Advisory Resource and Knowledge Hub for 171 Governments*



Renewable energy can:

- Meet our goals for ***secure***, ***reliable*** and ***sustainable*** energy
- Provide ***electricity access*** to 1.3 billion people
- Promote ***economic development***
- At an ***affordable cost***

# Structure and Membership

Headquarters:

**Abu Dhabi,**

**United Arab Emirates**

**Three Programmes:**

- **Innovation and Technology Centre (IITC) in Bonn, Germany**
- **Knowledge, Finance and Policy Centre in Abu Dhabi**
- **Country Support and Parnterships in Abu Dhabi**

***Foundation***

**26 January 2009 in Bonn**
**International Agency since April 2011**
**The only international RE agency worldwide**

***Scope***

**Hub, voice and source of objective information for renewable energy**

***Mandate***

**Sustainable deployment of the six forms of renewable energy resources**
**(Biomass, Geothermal, Hydro, Ocean, Solar, Wind)**

# Thematic Areas of the Work Programme

- Planning for the global energy transition
- Gateway to knowledge on renewable energy
- Enabling RE investment and growth
- Renewable energy access for sustainable livelihoods
- Islands: lighthouses for renewable energy deployment
- Regional action agenda

# IRENA Publications

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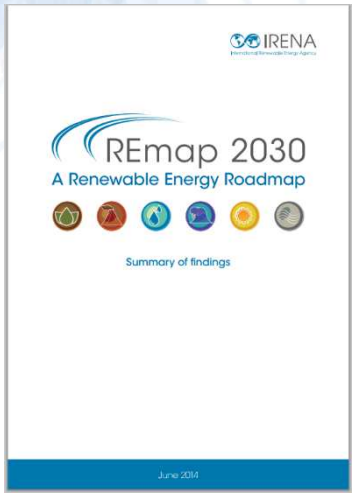


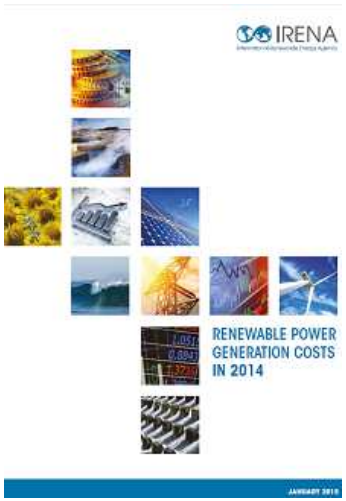


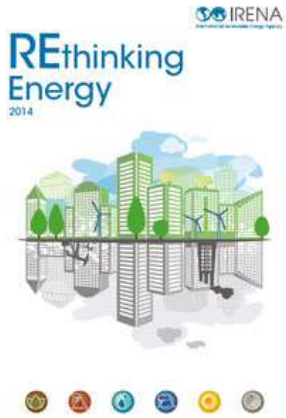


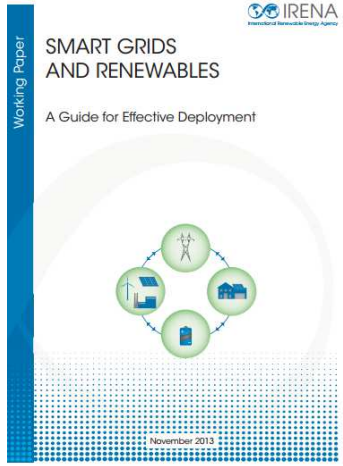


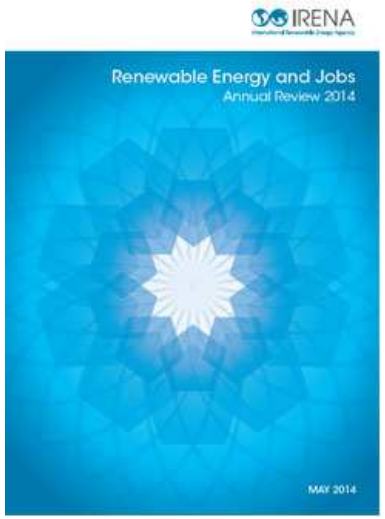



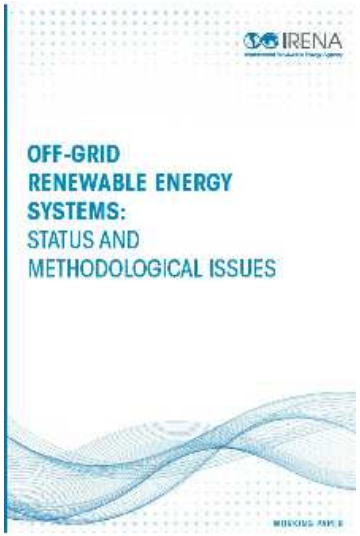


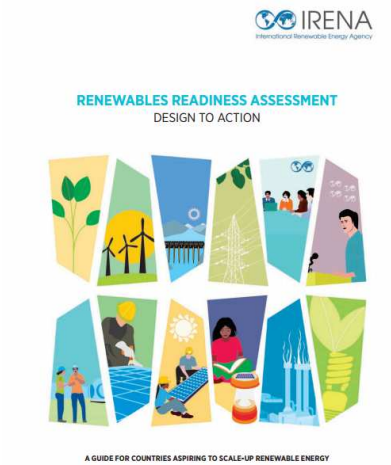

# 2 Transitioning towards Renewable Power Generation

# Renewables Dominate New Capacity Additions

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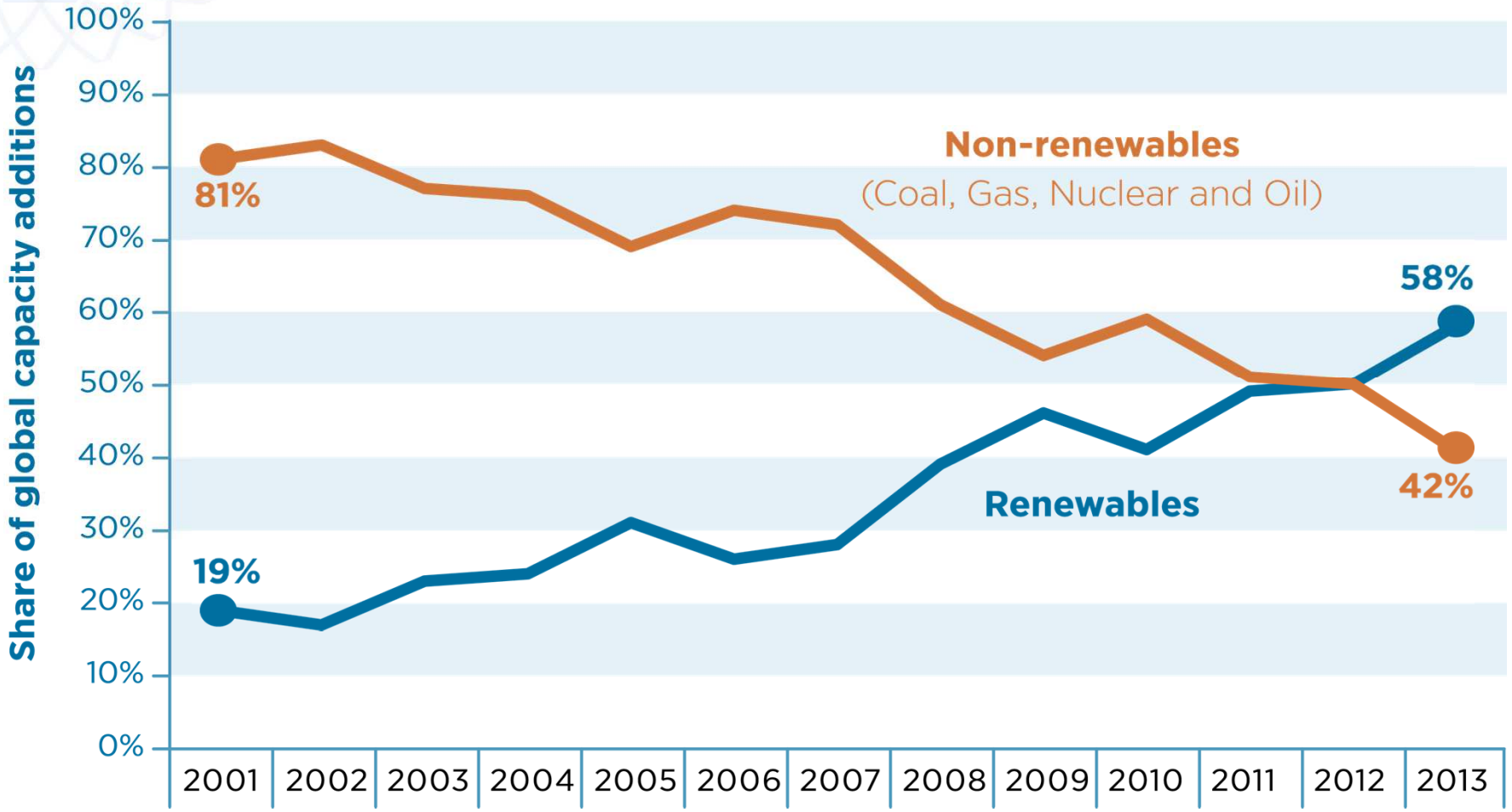
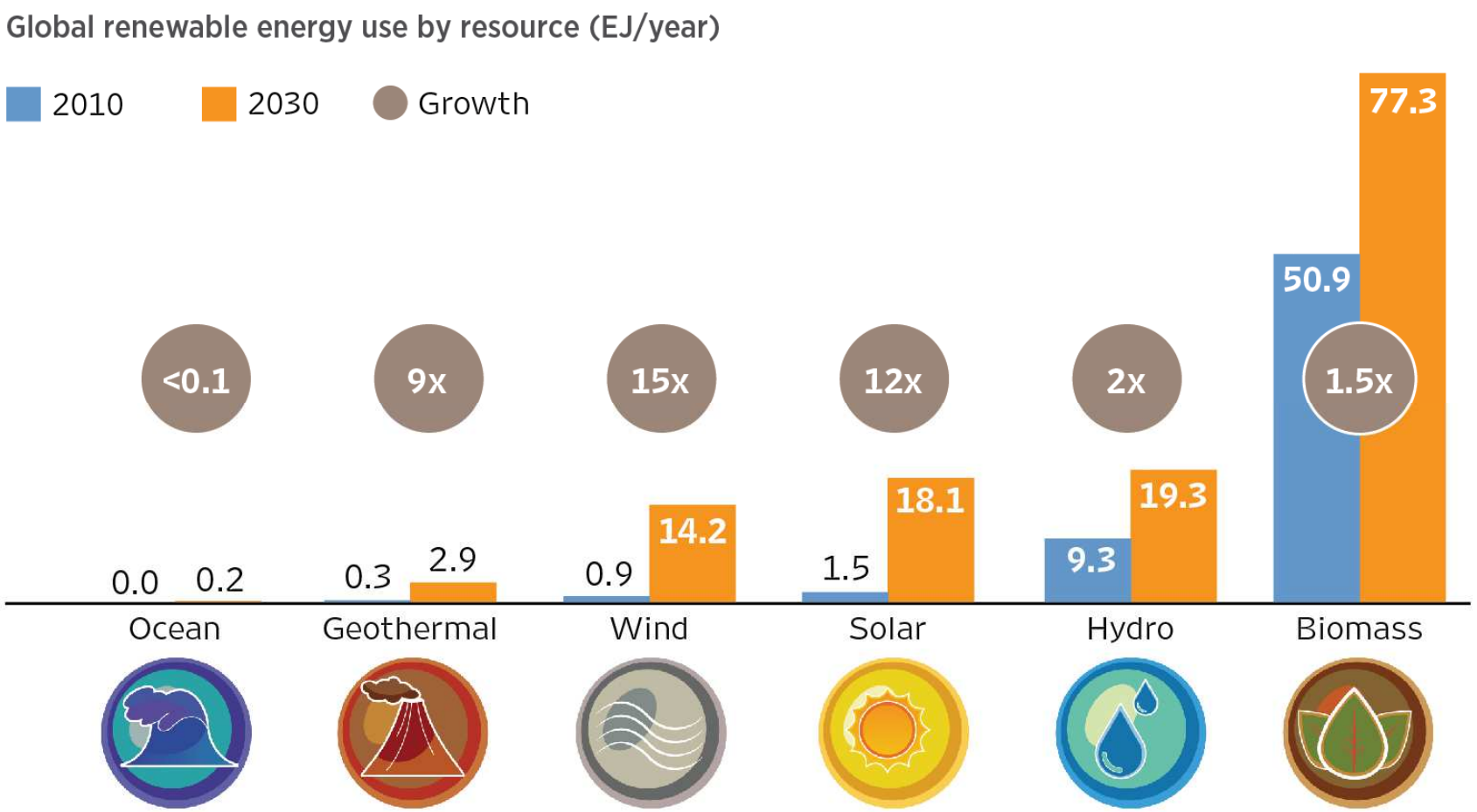
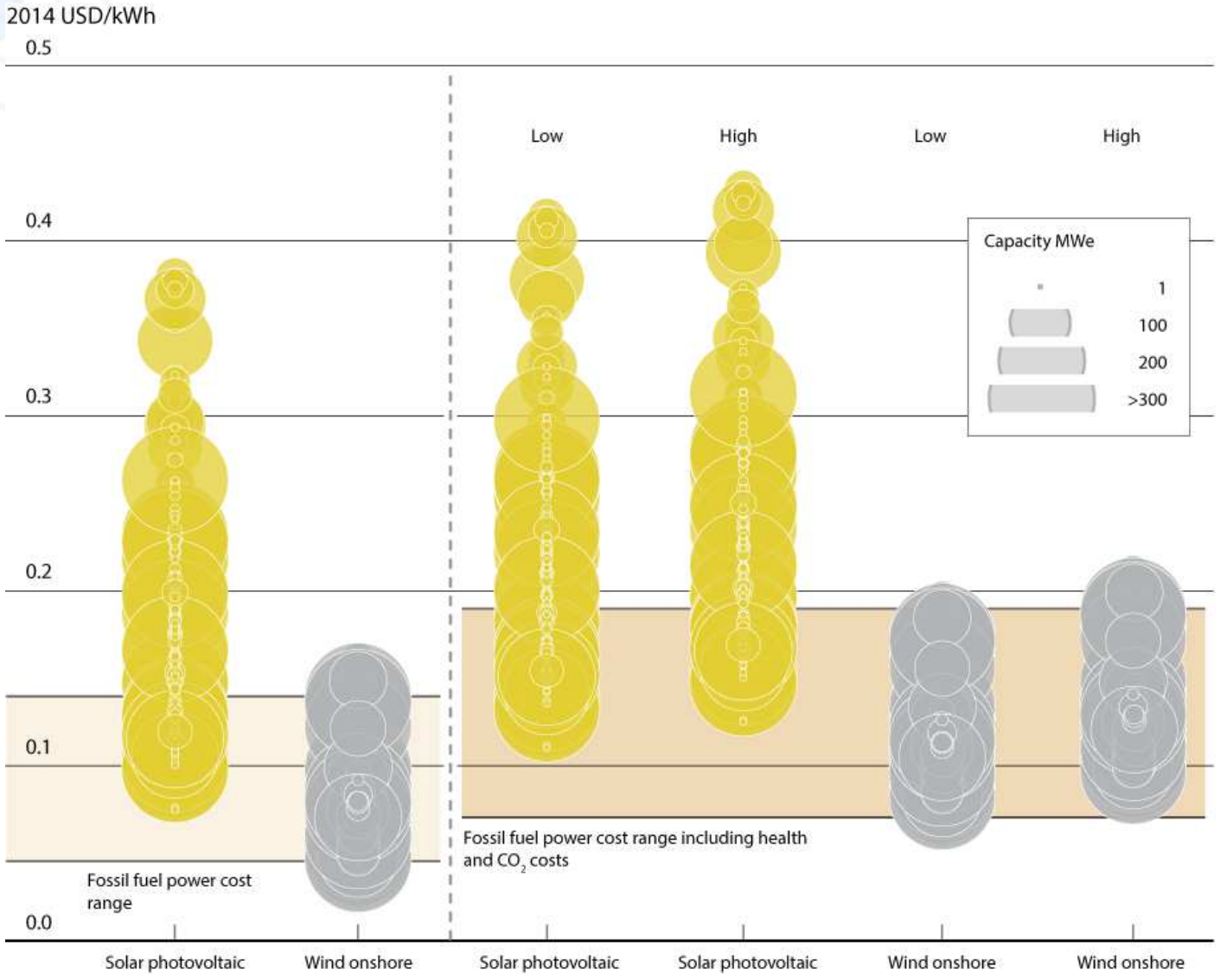


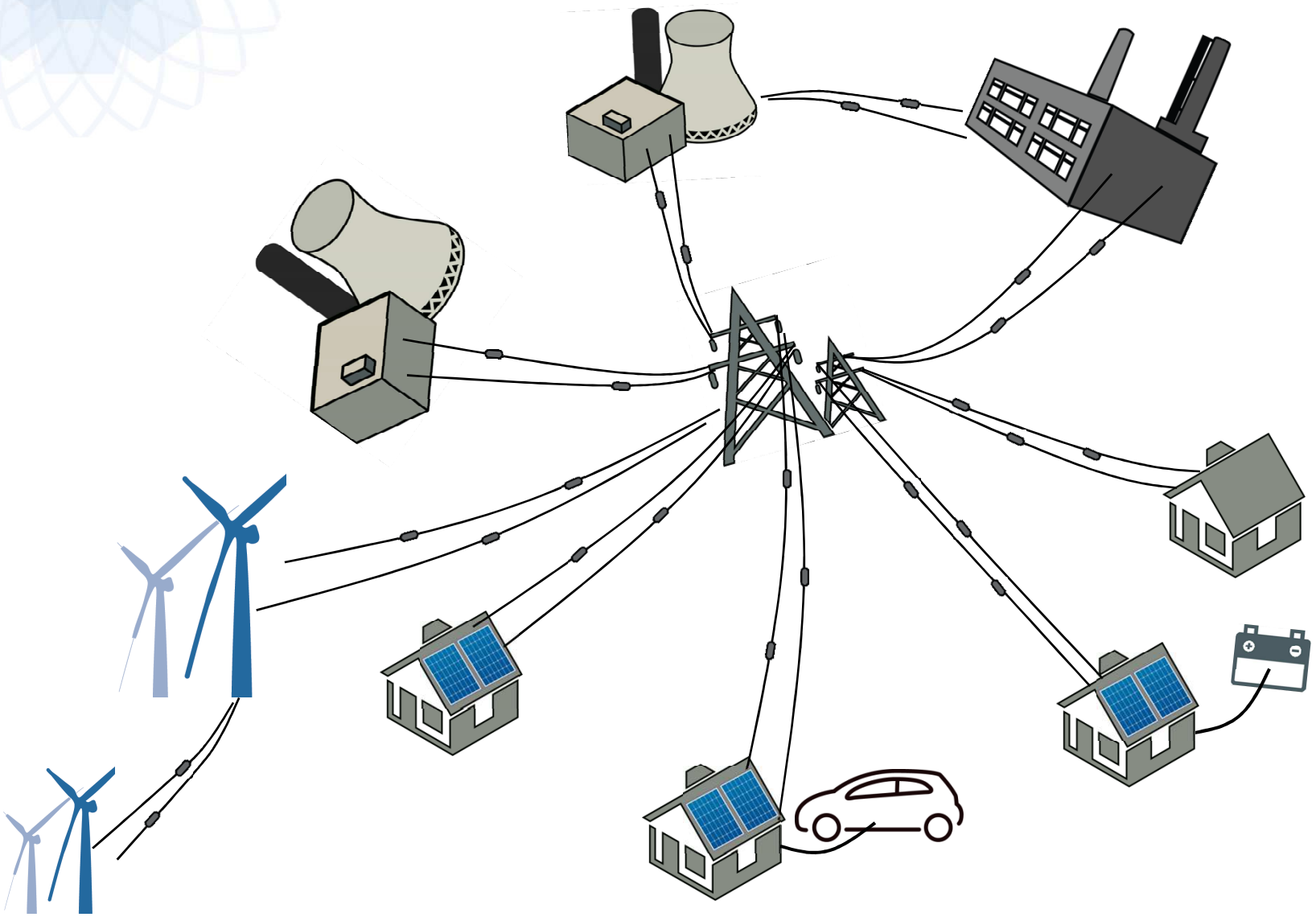
# Scaling-up all renewable energy sources




**Total global RE use in REmap 2030: 132 EJ/yr**

# High levels of variable renewables are competitive





# 3 REmap 2030

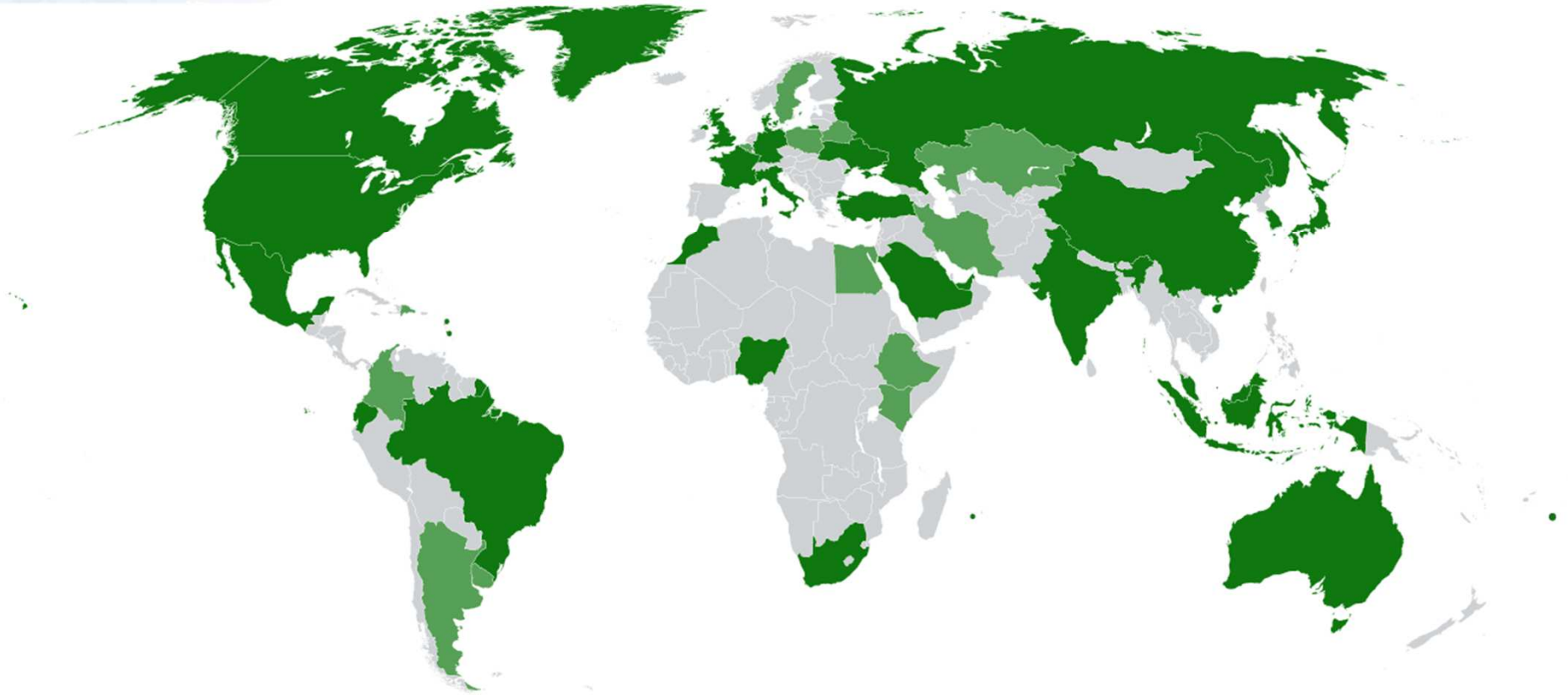
# REmap 2030 - A roadmap for doubling the RE share

- Originates from the United Nations global Sustainable Energy for All (SE4ALL) initiative
- Three objectives, all to be achieved by 2030:
  - Universal energy access (rural electrification, modern forms of renewables)
  - Doubling the rate of energy intensity improvements
  - **Doubling the share of renewables in the global energy mix (compared to 2010 level)**
- Each objective has its own hub; IRENA is the thematic hub for renewables
- 2014-2024: UN decade of Sustainable Energy for All

# REmap 2030 - A roadmap for doubling the RE share

- REmap explores the **potential**, **cost** and **benefits** of doubling the renewables share in the global energy mix
- **Technology options**
  - No target setting; options characterised by their cost and potentials
  - Technology options can be combined into scenarios and translated into policy action
- Focuses on power, district heat and end-use sectors
- Coverage: **40 countries;** 80% of the global energy use
- Developed together with & validated by country experts

# REmap countries



**Dark green**: Completed country analysis in June 2014 (26 countries)
**Light green**: Ongoing country analysis end of 2015 (14 countries)

# Breakdown of Global Renewable Energy Use in 2010

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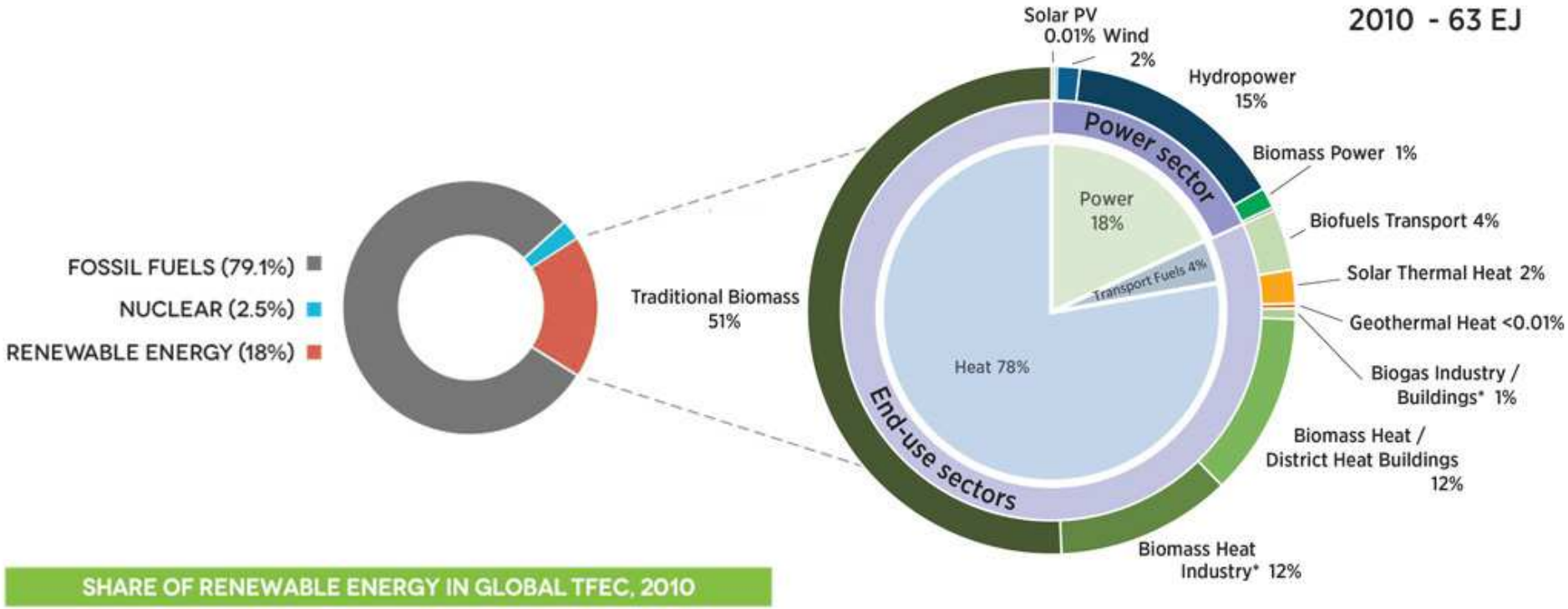
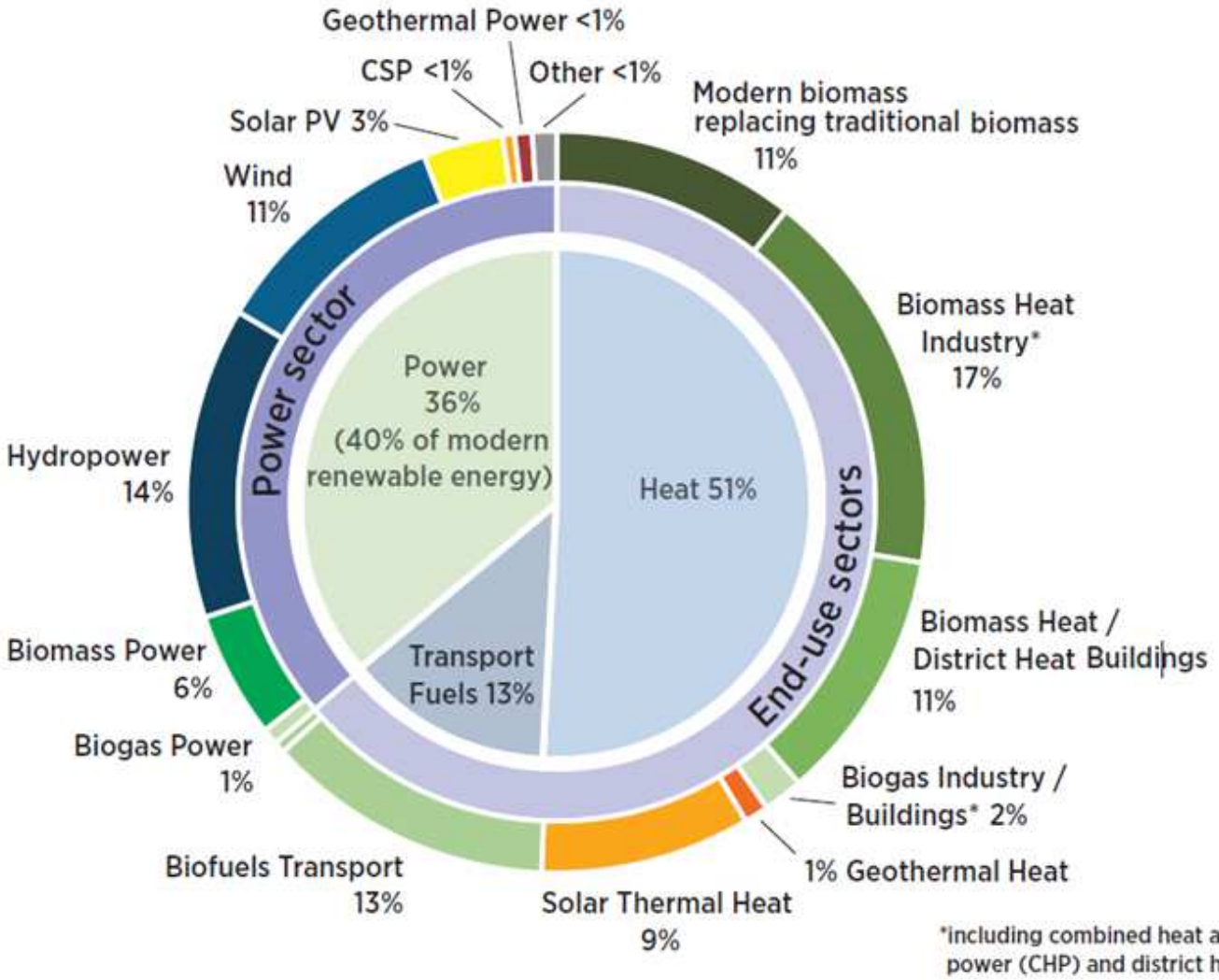
**Globally 18% RE in Total Final Energy Consumption (TFEC)**
**Half is traditional biomass, 8.4% modern renewables**




Source: IRENA (2014); SE4ALL Global Tracking Framework (2013)

# Global RE Use in 2030 including REmap Options

**Remap 2030 – 132 EJ (final energy) 60% is biomass**




*including combined heat and power (CHP) and district heat

# Mapping Out the Renewable Energy Transition

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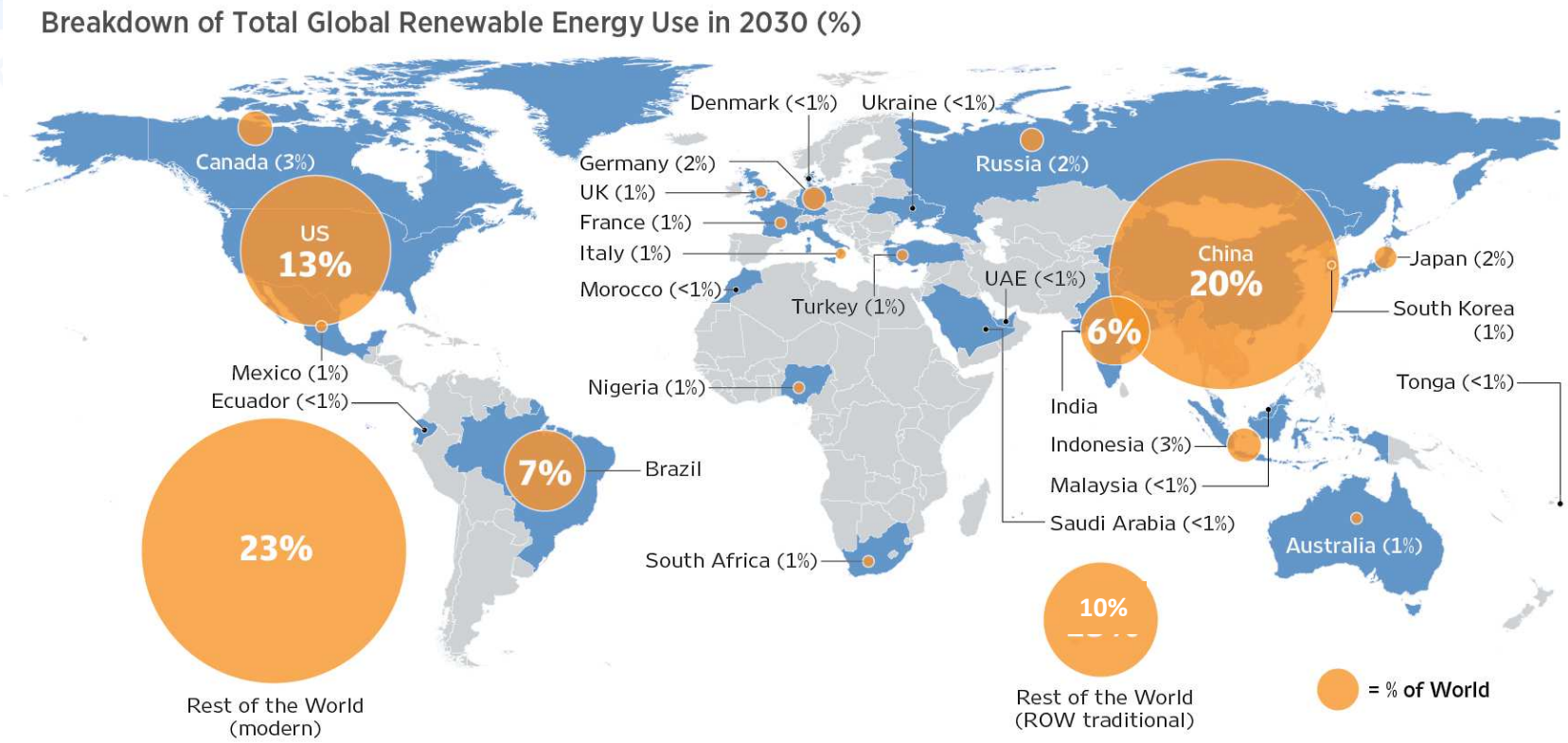


## 26 countries – 75% of global energy consumption

China is the largest single market for global renewable energy use

# REmap 2030 key findings

- **Doubling the RE share from 18% in 2010 to 36% in 2030 is technically achievable with existing technologies**
  - Higher shares in power generation
  - More attention needed for heating and transportation fuels
- **Doubling is affordable when externalities are accounted for**
  - However these are not reflected in todays prices and markets are distorted because of energy subsidies
  - Macro-economic benefits include more jobs; economic activity; health benefits; a cleaner environment; a higher level of energy security
- **Biomass is key resource**
- **Potential exists in all countries, and differentiated action**

# Benefits for Health, Environment and the Economy

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**$200bn**

Global health-related costs can be reduced up to $200 billion annually

**900,000 jobs**

Doubling the global share of renewable energy would create a net gain of 900,000 jobs in the energy sector in 2030

**15%**

Demand for oil and natural gas can be reduced by around 15%, creating more energy security for fossil-fuel importing countries

**26%**

Demand for coal can decline by 26% resulting in reduced carbon emissions and cleaner air

# Comprehensive REmap country reports

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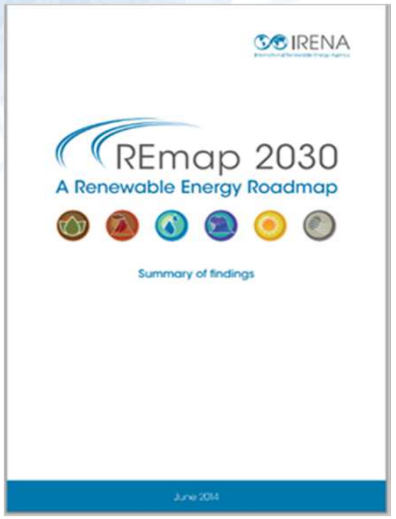
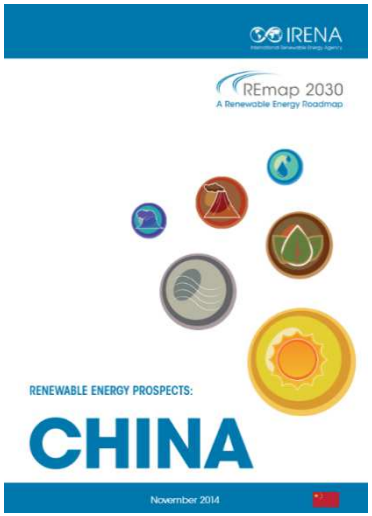



June 2014

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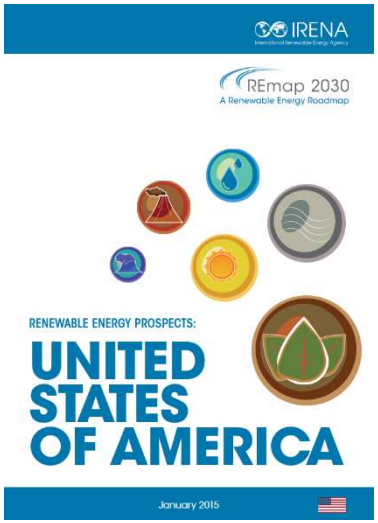


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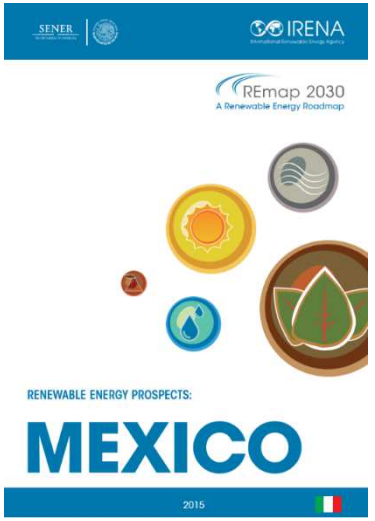



May 2015

- Purpose: Translate analysis into actionable options
  - Areas for joint action to accelerate RE deployment
- China, Mexico, UAE, United States, Ukraine **completed**
- India, Poland, South Africa reports **in preparation**
- Discussion on-going with other countries

# 4 Capacity Building

# Technical Capacities for RE

- **RE on Power Grids *(implementing)*:**
  - Certify installers to properly install PV
  - Train island utilities and regulators to understand grid stability analyses and potential for reliable RE integration
  - Train island utilities to operate grids with higher RE shares.
- **RE in Buildings *(envisioned)*:**
  - Certify installers to properly install PV and SWH
  - Train auditors to conduct EERE audits
- **RE Systems *(envisioned)*:**
  - Training in proper installation, operation and maintenance of renewable desalination and waste-to-energy systems.

# Entrepreneurial Capacities

- **RE in Electricity Markets:**
  - Training on how to follow wind measurement guidelines in developing bankable wind power projects (proposed)
  - Training to set up and operate PV businesses (ProSPER: Promoting a Sustainable Market for Photovoltaic Systems in the ECOWAS [Economic Community of West African States] Region) – focus on enterprise development and linkages with financial institutions.
- **RE in Buildings:**
  - Training to set up and operate ESCOs (proposed)

# Policy and Regulatory Capacities

- **RE in Electricity Markets (activities envisioned):**
  - Train policy-makers on how to ***set targets*** and meet them
  - Train regulators on setting rates for the power ***utility***.
    - Appropriate Rate of Return (ROR)
  - Train regulators on market opening to ***IPPs***
    - Design of Power Purchase Agreements
  - Train regulators on market opening to ***prosumers***
    - Net billing to share rents between prosumers and utility

# Possible Areas for IRENA-APEC Cooperation on Capacity Building

- **Training for PV Installers:**
  - IRENA training seminars in cooperation with SPREP (Secretariat of the Pacific Regional Environment Program)
  - APEC EGNRET [NRE142-6] APEC Building Mounted PV Best Practices and Latest Development Comparative Study (Proposed)
- **Business Models for PV Entrepreneurs:**
  - IRENA work on business models for mini-grids, in cooperation with Mini Grids High Impact Opportunity (HIO) of UN Sustainable Energy for All (SE4All) initiative.
  - APEC EGNRET [NRE142-2]: Innovative business models for scale-up application of solar photovoltaic technology in APEC (Proposed)

# 5 Renewable Readiness Assessment

# RRA Approach

"*Problems cannot be solved by the same level of thinking that created them*."

---*Albert Einstein*

## RRA Approach

- Taking a holistic and system approach
- But, focusing on key issues
- Formulating actionable activities/programs with multi-stakeholder participations

# Recommendations:

**Conduct Institutional capacity Analysis**

1. A thorough map-out of *who is doing what* against *who is supposed to do*
2. Emerging issues are calling for additional skills and manpower: *are we there?*
3. Multi-stakeholders are offering multiple perspectives as well as various demands
4. What institutional capacity should be in place from a national and long-term perspective?

# Recommendations:

**Effective use of GIZ PV Guidebook for the Philippines**

1. The guiding should be viewed as a dynamic process as the administrative procedures are evolving
2. Effective dissemination and communication may be helpful for investors/developers to better use the resources provided in the Guidebook
3. Feedbacks are always welcome and timely addressed

# Recommendations:

## Conduct country study on rural minigrids

**Contexts** of the study

a. *Energy supply by renewable resources providing more than just sources of energy*

b. *Improved electrification rate is not enough*

# Recommendations:

## Conduct country study on rural minigrids

**Objective**:

to facilitate the Philippines to create enabling environment for renewable energy-based mini-grid deployment to shift the paradigm for universal energy access as well as for enhanced energy security

**Scope:**

covering the issues from estimation of physical potentials, policy and regulatory framework, technological options/guidelines, business models, to evaluation of long-term social and economic benefits that such systems can generate for the society as a whole

**Focus:**

islands and remote/unelectrified regions where RE-powered mini-grids can be economic viable and also used for promoting rural development

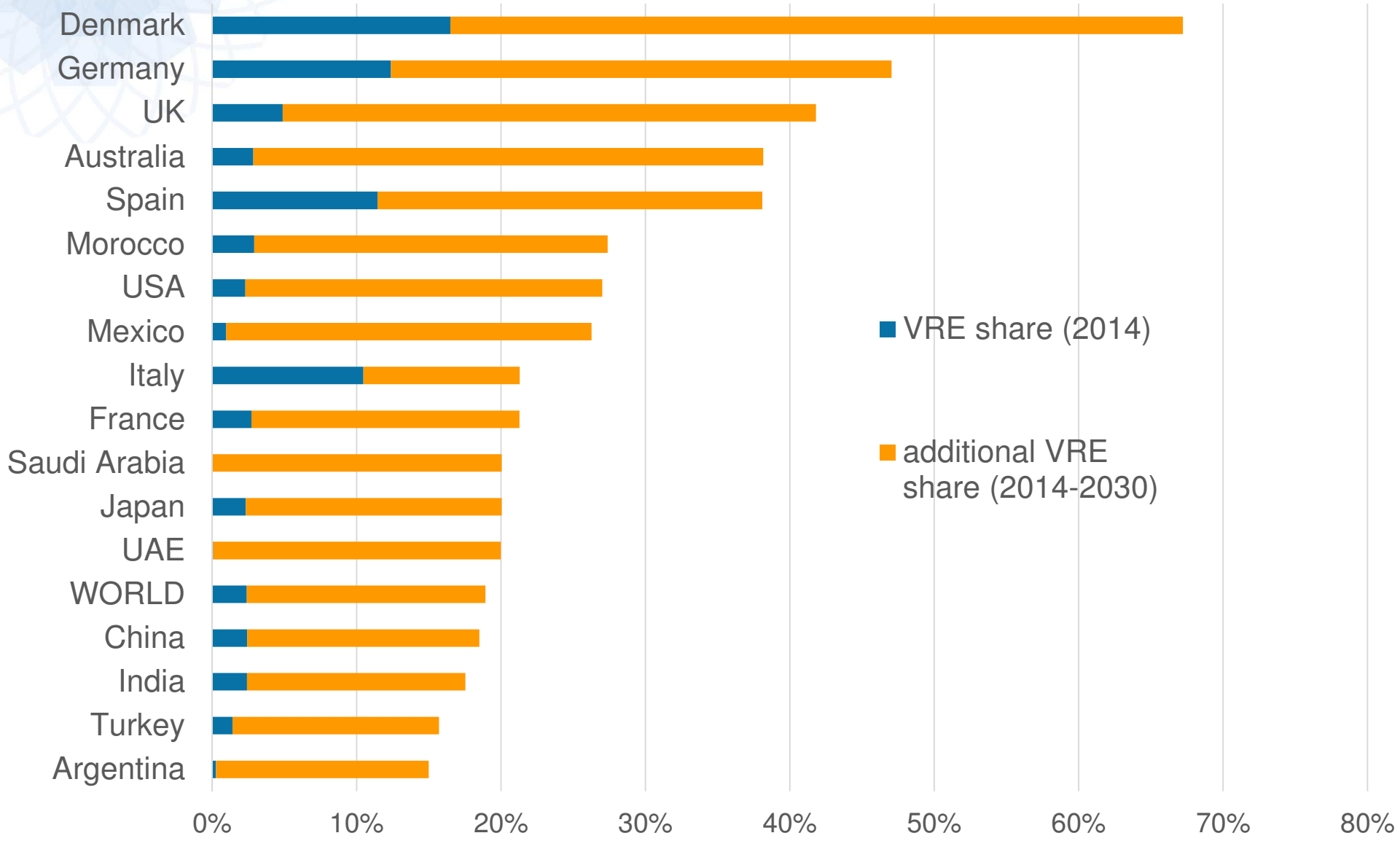
# RE Minigrids for off grid island states and remote areas in Philippines

- **Off grid power generation dominated by diesel operated minigrids**
  - NPC-SPUG under their Missionary Electrification programme serves 213 islands and isolated grids (Feb, 2012)
- **Hybridization of diesel minigrids reduces generation costs**
  - Techno-Economic studies[1] of the 3.57 MW diesel power plant at Busuanga Island show that hybridization with a 3 MW solar PV system can reduce the LCOE from 34.7 to 29.8 USDc/KWh
  - Annual diesel consumption reduces by more than 1.2 million liters
- **Study on the potential of Minigrids for remote energy access**
  - IRENA to provide technical advisory as a follow up to the RRA; study the potential of RE hybridization of existing diesel based minigrids & RE minigrids for remote areas

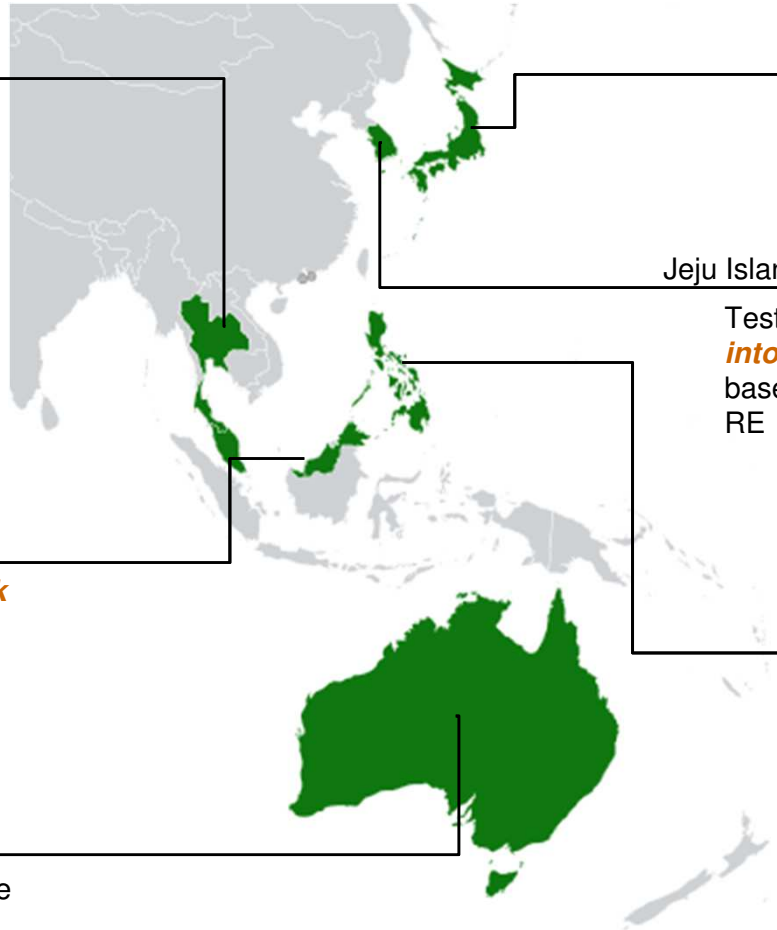
[1] RE in hybrid and isolated minigrids: Economic benefits and business cases

# 6 The Role of IRENA

# Sharing experiences



# Identify best practices



**Thailand**

The Alternative Energy Development Plan aims to increase consumption of RE by the ***deployment of DG (<10MW). Automatic Meter Reading (AMR)*** already in place.

**Hachinoe, Japan**

Project to reduce the impact of VRE by ***controlling DG output***

**Jeju Island, South Korea**

Test-bed project. ***Venture into new markets models*** based on smart grids and RE

**Malaysia**

New ***Regulatory framework*** with responsibilities for utility and RE developer

**Philippines**

***Grid codes*** in place that cover specific aspects to the grid integration of VRE

**Australia**

CSIRO convened the Future Grid Forum to assess the future high integration of RE and rise of the ***prosumers***.

# From planning to operation

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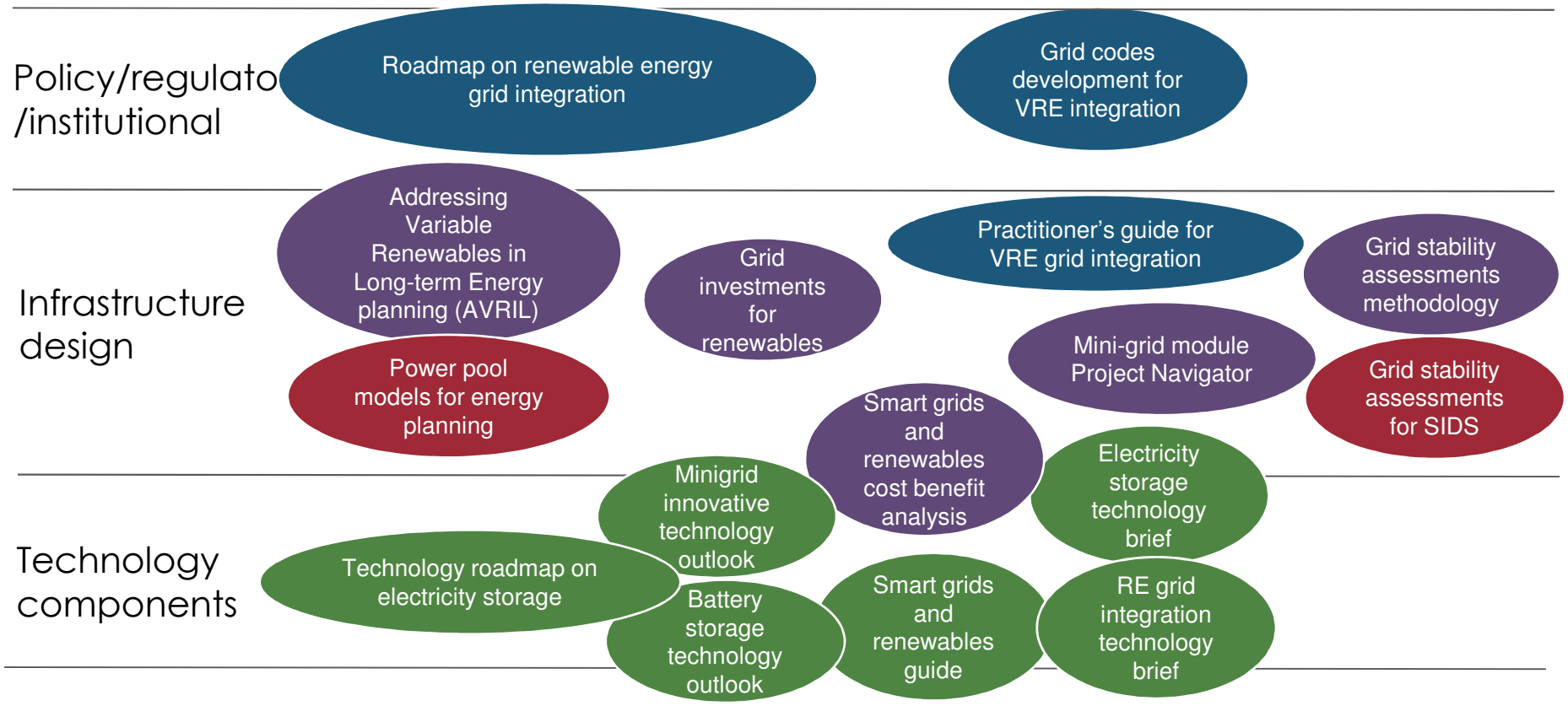
Developing a long- term strategy

Facilitating the implementation process

Supporting operation and management




| Guidelines | Methods | Model application | Technical information |
|---|---|---|---|

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International Renewable Energy Agency

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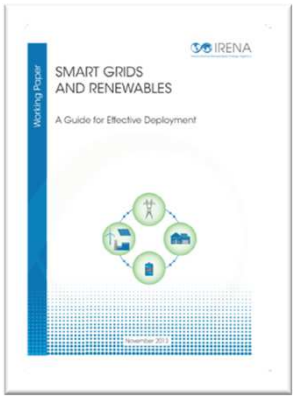
# Appendix: Smart Grids and Renewables

# Smart grids for variable renewables

**Technology options in five areas**

- Transmission
- Distribution
- Generation
- Consumer
- Storage

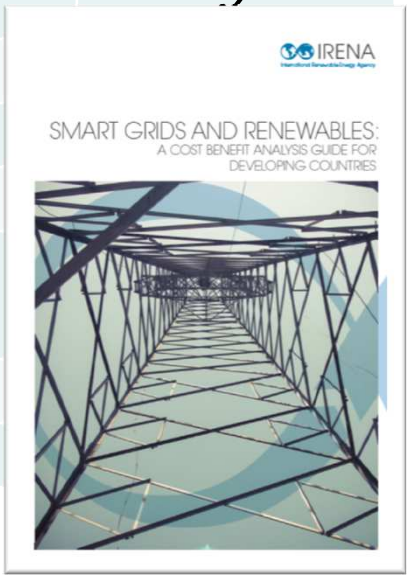



Many technology options:

Advanced metering
Better forecasting
Demand response
Distribution automation
Dynamic line ratings
Electricity storage
Flexible AC transmission
High voltage AC/DC lines
Smart inverters
Synchrophasors
Variable electricity pricing
Virtual power plants

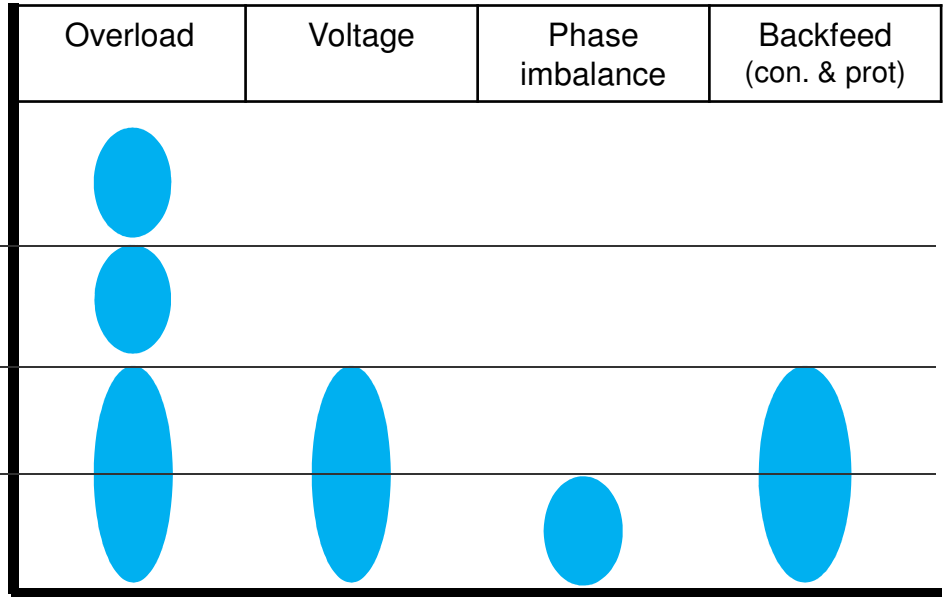
# Benefits of smart grid functions

| Functions → / Benefits ↓ | Wide-area monitoring and visualization | Flow control | Automated voltage and VAR control |
|---|---|---|---|
| Reduced ancillary service cost | ✓ | | |
| Deferred distribution investments | ✓ | ✓ | ✓ |
| Reduced equipment failures | | ✓ | ✓ |
| Reduced distribution operations cost | | ✓ | ✓ |
| Reduced electricity losses | | ✓ | ✓ |
| Reduced sustained outages | | ✓ | |
| Reduced major outages | | ✓ | |
| Reduced restoration cost | ✓ | ✓ | |
| Reduced momentary outages | ✓ | | |
| Reduced sags and swells | | | |
| Reduced wide-scale blackouts | ✓ | ✓ | |



# Grid investment needs for smart grids

| Network Categories | Wind | PV | Non-variable RE |
|---|---|---|---|
| Offshore | ✓ | | |
| Bulk Transmission | ✓ | ✓ | ✓ |
| Regional Distribution | ✓ | ✓ | |
| Local Distribution | | ✓ | |



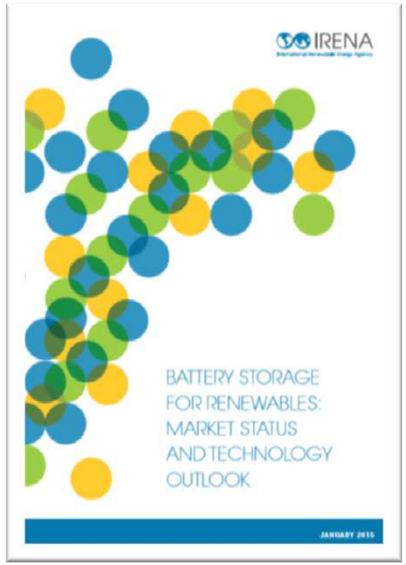


**Investment categories**

- Conventional grid reinforcement
- Smart Grid technologies
- Retrofit

# Storage for renewables

Application areas and experiences in South East Asia:

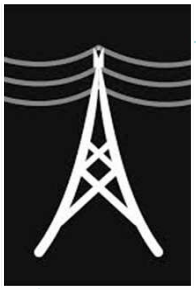



**Islands/minigrids**

Energy Storage System launched in Sumba island (Indonesia). Increasing the penetration of VRE and improving dramatically the security of supply.

**Self-consumption**

Sydney (Australia). Case studies coupling PV and storage, raising self-consumption considerably and relieving problems in the grid due to VRE



**Smoothing/supply shift**

Okinawa (Japan). Okinawa Electric Power Company and Toshiba developed and installed a 23 MW flywheel system for frequency control in the Okinawa power grid

# Cities – opportunities

- 75% of final energy consumption
- 52% population lives in cities; 60% in 2030 (ca 1.4 billion more)
- 31 megacities (>10 mln), 19 in Asia
- 21% of urban population lives in large cities (>1 mln)
  - Average growth rate of 1.5% p.a.
- 50% of urban population lives in small cities (<0.5 mln)
  - Average growth rate of 4.9% p.a.
- 50% of urban energy consumption in non-OECD countries; 65% in 2030