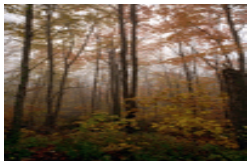
IRENA
International Renewable Energy Agency

Islands: Lighthouses for the energy transition

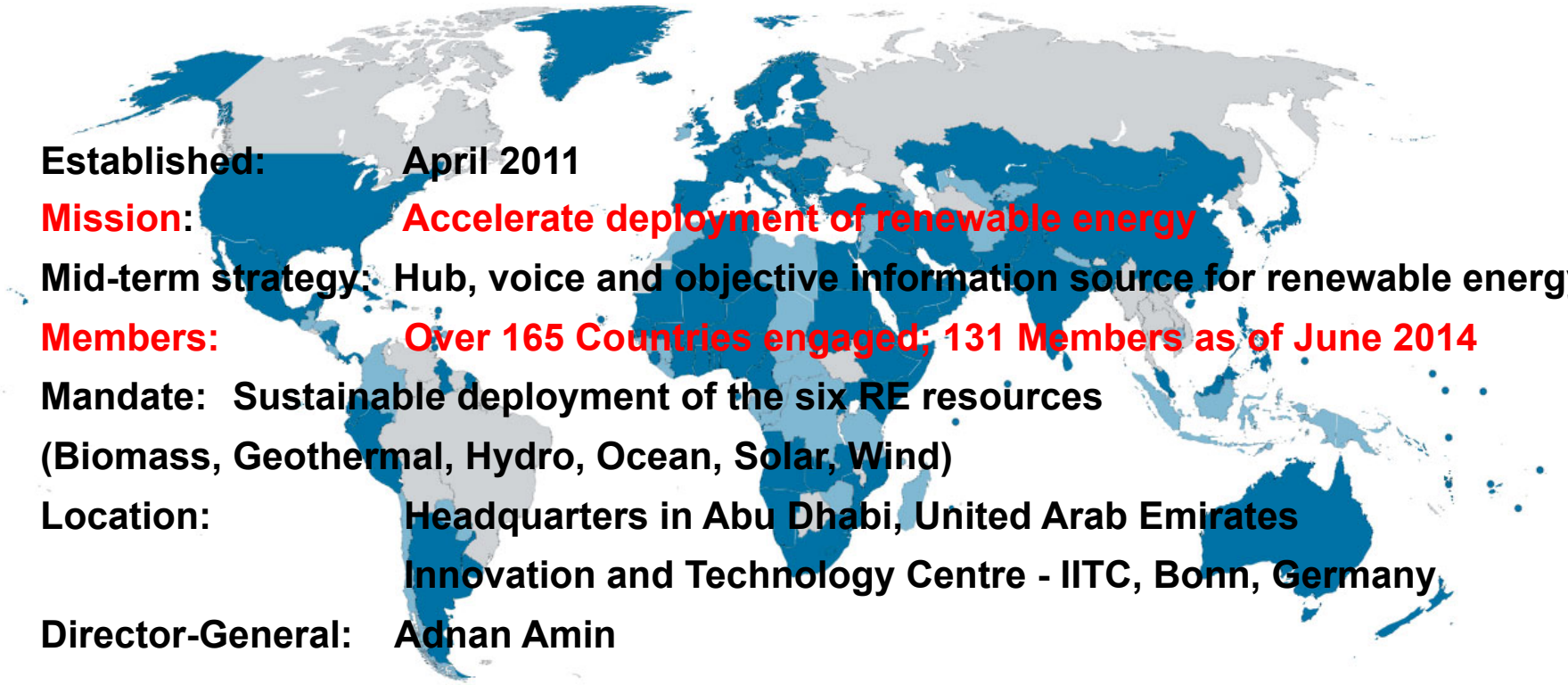
Emanuele Taibi

El Hierro, 26 June 2014




International Renewable Energy Agency (IRENA)



Established: April 2011

Mission: Accelerate deployment of renewable energy

Mid-term strategy: Hub, voice and objective information source for renewable energy

Members: Over 165 Countries engaged; 131 Members as of June 2014

Mandate: Sustainable deployment of the six RE resources

(Biomass, Geothermal, Hydro, Ocean, Solar, Wind)

Location: Headquarters in Abu Dhabi, United Arab Emirates

Innovation and Technology Centre - IITC, Bonn, Germany

Director-General: Adnan Amin

Outline

1. Islands: lighthouses for the energy transition
2. RE for island tourism
3. RE roadmaps for islands
4. Grid-stability for islands
5. Global Renewable Energy Island Network (GREIN)
6. Relevant IRENA publications

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ISLANDS: LIGHTHOUSES FOR THE ENERGY TRANSITION

2. IRENA Lighthouses initiative

Key pillars:

1. Institutional framework
2. Knowledge base
3. RE transition planning
4. Financing
5. RE deployment and operation
6. Human capacity building
7. Regional and international cooperation

1. IRENA Renewables and Islands Global Summit

- Held in Malta on 6-7 September 2012
- Convened island leaders from all regions
- Discussed policies, investments and best practices
- Malta communiqué on accelerating renewable energy uptake for islands
- Leaders called on IRENA to establish a Global Renewable Energy Islands Network (GREIN)

100% solar country: Tokelau

Generation technologies

- Solar PV
- (bio-)Diesel backup

Storage technologies

- OPzS Lead-acid batt.

Hi-Tech RE island: Pellworm (DE)

Generation technologies

- Solar PV
- Wind
- Biogas

Storage technologies

- Lithium-Ion
- Redox Flow
- Household storage

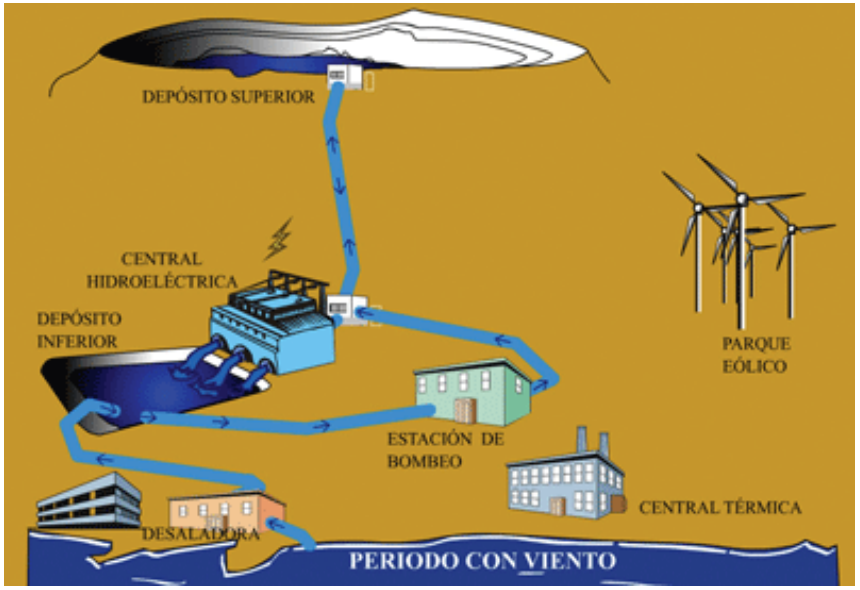
100% wind island: El Hierro (ES)

Generation technology

- Wind

Storage technology

- Pumped hydro



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RENEWABLE ENERGY FOR ISLAND TOURISM

2. Objectives of IRENA study on RE for island tourism

The study aims to assess the **business case for** the deployment of Renewable Energy Technologies (**RETs**) **in island tourism** facilities.

The technologies analysed include:

- Solar Water Heaters (SWH)
- Solar Air Conditioning (SAC)
- Sea Water Air Conditioning (SWAC)
- Solar Photovoltaic (PV)

2. Structure of the study

1. Review energy trends in the island tourism sector.
2. Assess RE technologies, considering required investments, avoided costs and added benefits.
3. Identify barriers to RET deployment.
4. Select key policies and best practices.
5. Engage stakeholders, determining what works (when, where and why).
6. Analyze relevant case studies of RET adoption in island hotels.

2. The island energy context

- Tourist arrivals in small islands have increased by over 30% in the last decade.
- Over the last decade, energy prices have increased dramatically
- Energy consumption in island hotels is represented primarily by air conditioning, lighting and refrigeration.

Average commercial electricity tariffs in 2012

Islands

- US$ 0.33/kWh in Caribbean islands
- US$ 0.43/kWh in Hawaii
- US$ 0.33/kWh in Mauritius
- US$ 0.39 - 0.44/kWh in Pacific islands

Others

- US$ 0.26/kWh in EU member states
- US$ 0.09/kWh in China and Canada

2. RETs – Solar Water Heater

Case Study: Turtle Beach Resort, Barbados

- Hotel size: 167 suites
- RET: SWH system with total capacity of 7,800 gallons (40 gallons of water per room plus 1,120 gallons for ancillary services)
- Capital cost: US$ 200,000.
- Payback time: 8 years between 1997 and 2013 (less than 2 years at present electricity price)
- Savings: US$ 1,484,811 between 1997 and 2013.

2. RETs – Solar Air Conditioning

Case Study: Rethymno Village Hotel, Crete

- Hotel size: 110 rooms
- RET: SAC system with total capacity of 105 kW, powered by 450m^2 of rooftop mounted solar thermal collectors,
- Capital cost: US$ 146,000
- Payback time: 5 years
- Electricity savings for cooling: 70,000 kWh/year
- Diesel oil savings for heating: 20,000 liters per year

2. RETs – Sea Water Air Conditioning

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Case Study: InterContinental Bora Bora Resort & Thalasso Spa, Bora Bora

- Hotel size: 83 large villas
- RET: SWAC system with 2,000 m long pipeline
- Capital cost: US$ 7.9 million
- Payback time: 8 years (5 years considering incentives)
- Savings from avoided electricity consumption : US$ 720,000/year

2. RETs – Solar PV

Case Study: Turtle Island Resort, Fiji

- Hotel size: 14 cottages
- RET: Off-grid solar PV system with 240 kW of capacity and battery storage
- Capital cost: US$ 1.5 million
- Payback time: 6 years
- Savings from avoided diesel cost: US$ 250,000/year

2. IRENA event on RE for island tourism applications

- Held in Cyprus on 29-30 May 2014
- Convened tourism and energy experts from all regions
- Discussed the business case and best practices
- High-level support

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RENEWABLE ENERGY ROADMAPS FOR ISLANDS

3. Island roadmaps

- Pacific Lighthouses: renewable energy roadmapping for islands
- Nauru completed, with GIZ and SPC
- Cyprus ongoing - completion end of September
- Maldives ongoing - completion Q3 2014
- Kiribati in the pipeline
- Blueprint by end of 2014, based on the first three cases

Steps.	Activity	Description
1	*goal/target definition*	A goal may be defined either politically, or through stakeholder consultations and/ or based on a thorough scenario analysis on what can be achieved.
2	*Pathway/milestone definition*	A pathway refers to a series of intermediate steps from today (status quo) to the final goal. Based on stakeholder consultations and/or using formal modeling tools, one or more pathways may be defined.
3	*Definition of actions by stakeholders*	Assessment of what need to be done by whom by when to implement the pathway(s) leading to the goal.

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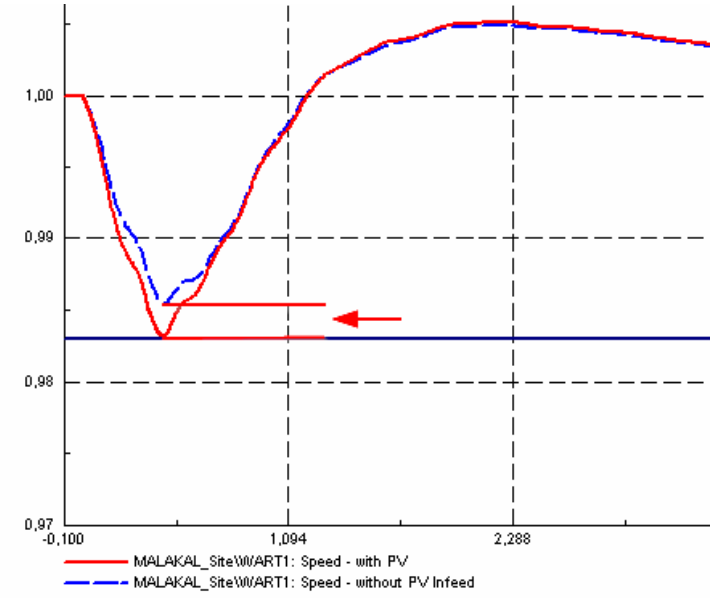
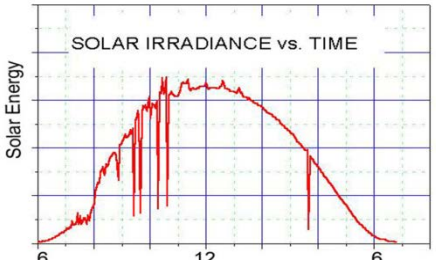
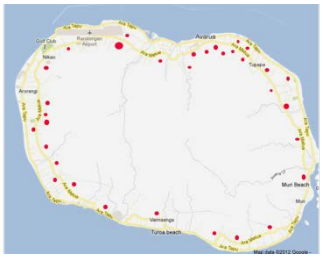
GRID STABILITY STRATEGIES AND MODELLING

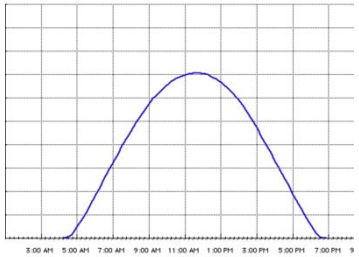


4. Grid stability for islands

- Aims of IRENA grid stability study:
  - Large shares of PV proposed for islands
  - Utilities need to understand consequences for grid stability and grid operation, and learn how to manage them







- Activities 2013:
  - Power factory training with PPA
  - Palau grid stability case study

- Activities 2014
  - 2 studies in cooperation with Pacific Power Association
  - 2 outside the Pacific region (1 in Maldives)
  - Ongoing development of a methodology for grid stability assessment

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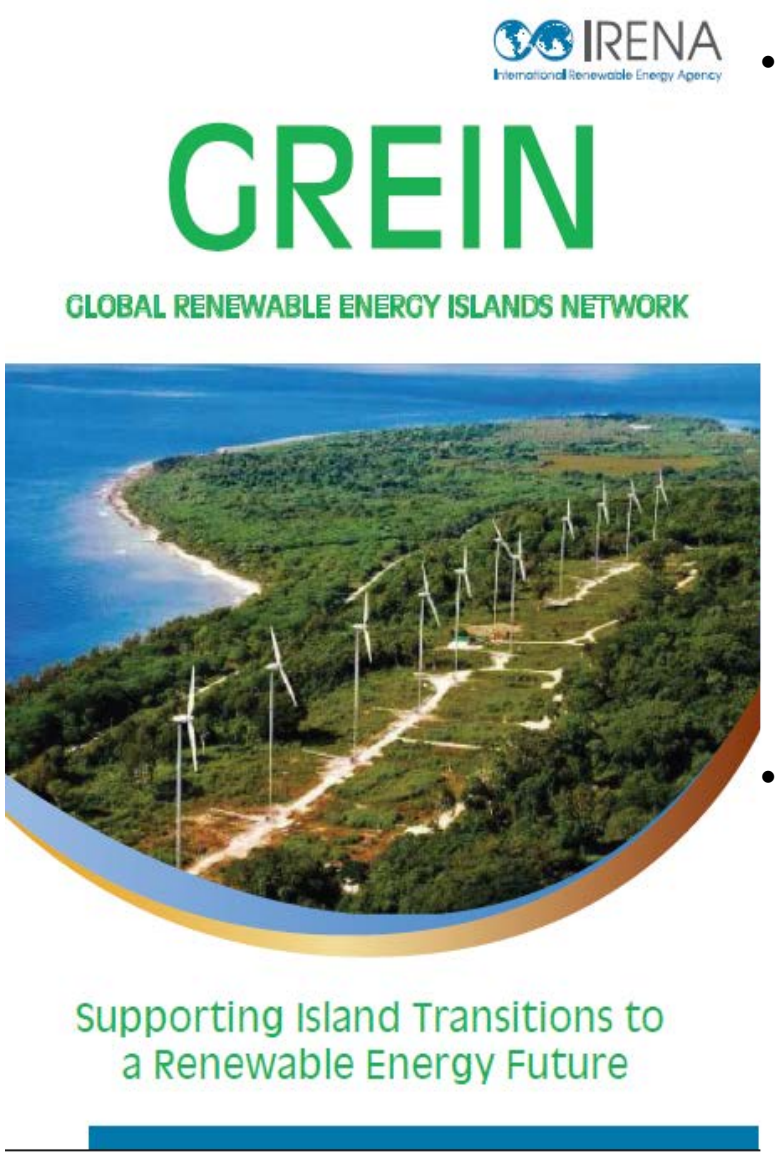
GLOBAL RENEWABLE ENERGY ISLAND NETWORK (GREIN)

5. Global Renewable Energy Islands Network (GREIN)



- Active clusters:
  - RE Technology Deployment Roadmaps for Islands
  - RE Power Grid Integration on Islands
  - RE for Island Tourism Applications
  - RE Resource Assessment for islands
- Next clusters to be activated:
  - Waste-to-energy for islands
  - RE for water desalination

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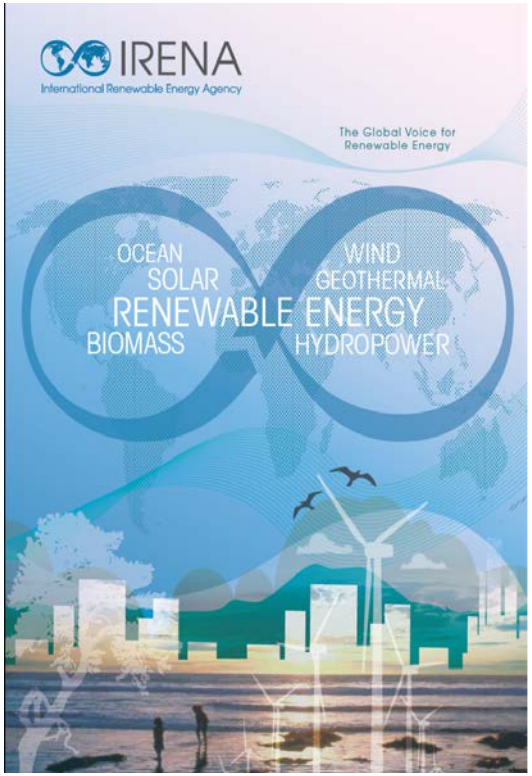
RELEVANT IRENA PUBLICATIONS

6. IRENA publications most relevant to islands

- Smart Grids and Renewables: A Guide for Effective Deployment
- Renewable Energy Technology briefs (over 10 published and 20 forthcoming)
- Electricity Storage and Renewables for Island Power
- Hybrid Power Systems for islands
- Renewable Power Generation Cost overview
- Battery Storage for renewables: Technology and Market Outlook (forthcoming)
- Smart Grids and Renewables: A Cost-Benefit Analysis Guide for Developing Countries (forthcoming)
- Quality infrastructure for small wind generators and solar water heaters (forthcoming)
- Energy storage roadmap (forthcoming)

Renewables are increasingly competitive, but more needs to be done to fulfill their potential…



IRENA is part of the solution

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