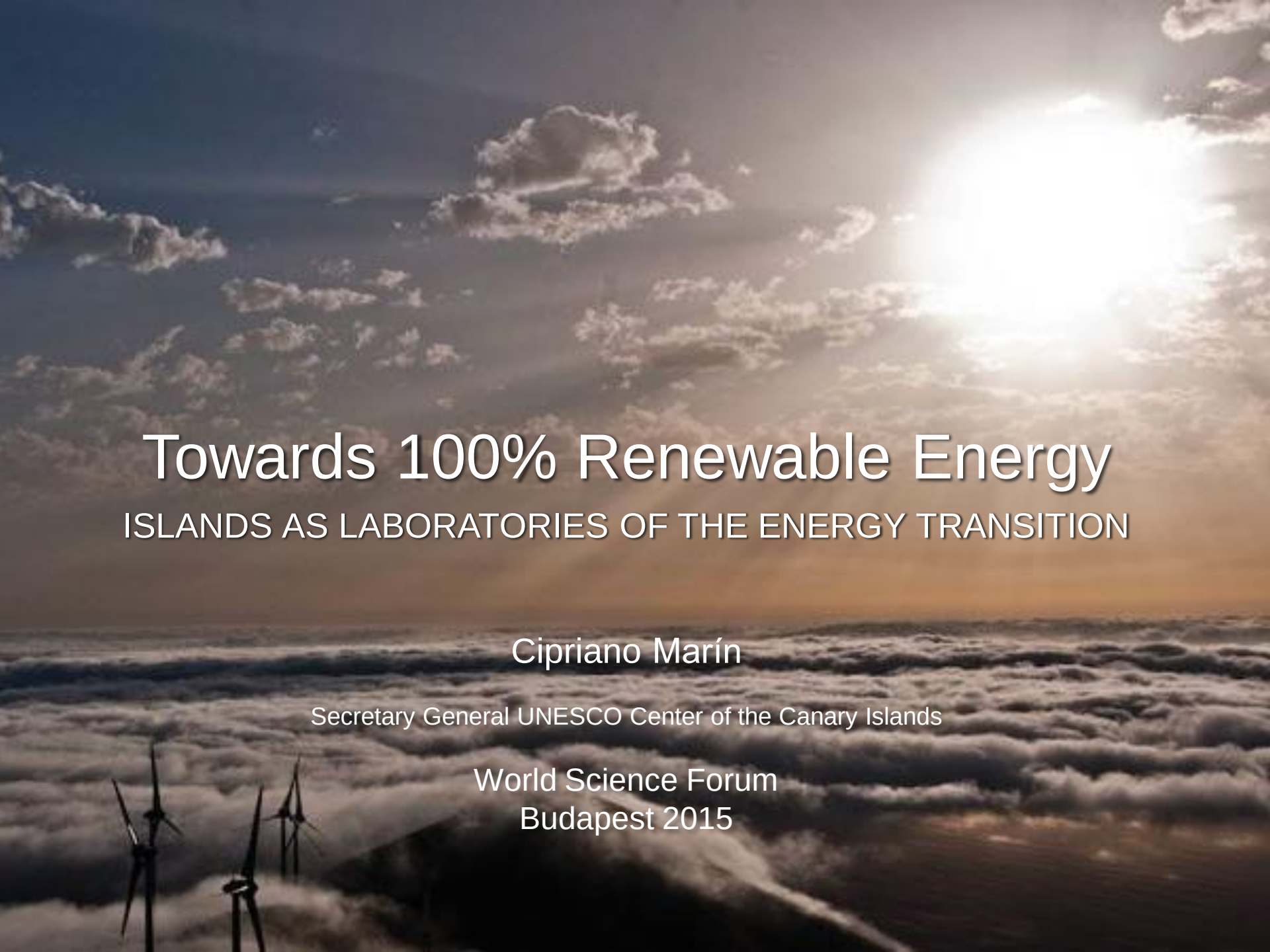


Towards 100% Renewable Energy

ISLANDS AS LABORATORIES OF THE ENERGY TRANSITION

Cipriano Marín

Secretary General UNESCO Center of the Canary Islands

World Science Forum
Budapest 2015

A Decade of Renewable Energy Growth Surpassing Expectations

Global installed capacity and production from all renewable technologies have **increased substantially**

Significant **cost reductions** for most technologies

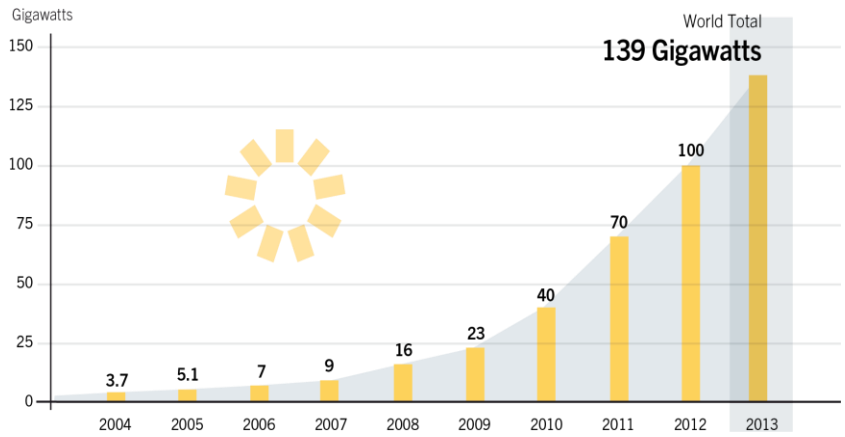
Supporting policies spread throughout the world.

		START 2004[1]	END 2012	END 2013
INVESTMENT				
New investment (annual) in renewable power and fuels[2]	billion USD	39.5	249.5	**214.4** (249.4)
POWER				
Renewable power capacity (total, not including hydro)	GW	85	480	**560**
Renewable power capacity (total, including hydro)	GW	800	1,440	**1,560**
Hydropower capacity (total)[3]	GW	715	960	**1,000**
Bio-power capacity	GW	<36	83	**88**
Bio-power generation	TWh	227	350	**405**
Geothermal power capacity	GW	8.9	11.5	**12**
Solar PV capacity (total)	GW	2.6	100	**138**
Concentrating solar thermal power (total)	GW	0.4	2.5	**3.4**
Wind power capacity (total)	GW	48	283	**318**
HEAT				
Solar hot water capacity (total)[4]	GW_{th}	98	282	**326**
TRANSPORT				
Ethanol production (annual)	billion litres	28.5	82.6	**87.2**
Biodiesel production (annual)	billion litres	2.4	23.6	**26.3**

Data source: REN21 Renewables 2014 Global Status Report

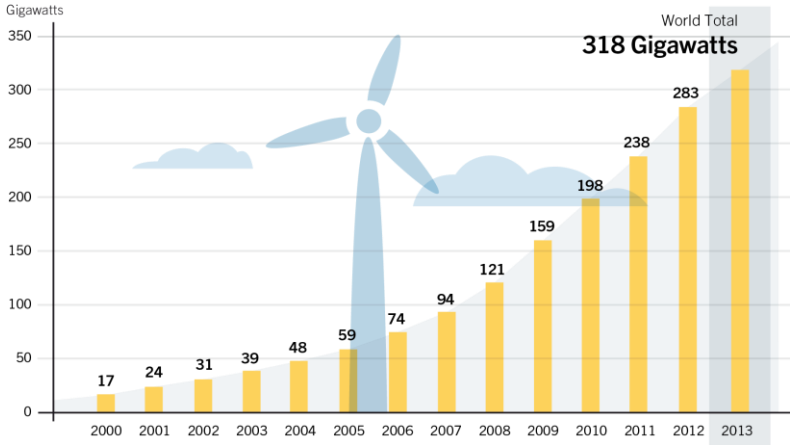
A Decade of Renewable Energy Growth Surpassing Expectations

Solar PV Total Global Capacity, 2004–2013



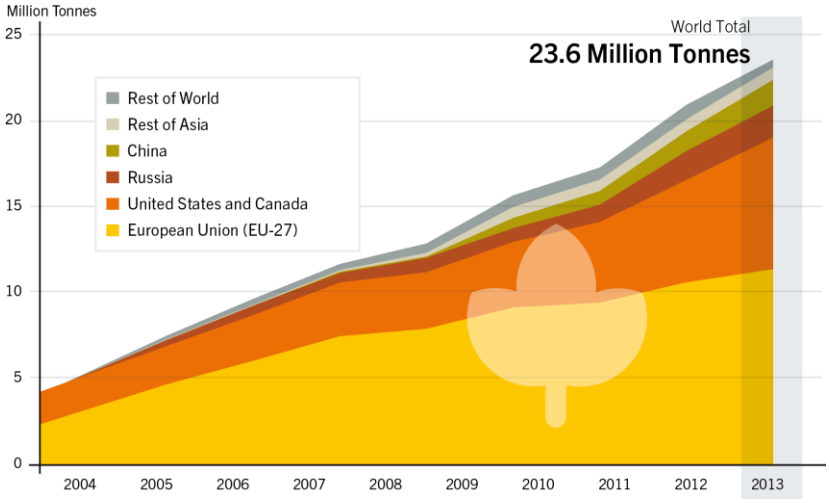
Data source: REN21 Renewables 2014 Global Status Report

Wind Power Total World Capacity, 2000–2013



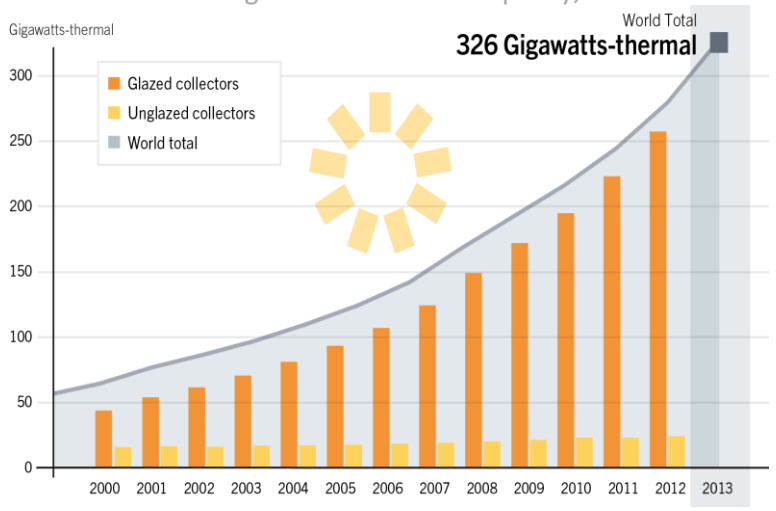
Data source: REN21 Renewables 2014 Global Status Report

Wood Pellet Global Production, by Country or Region, 2004–2013



Data source: REN21 Renewables 2014 Global Status Report

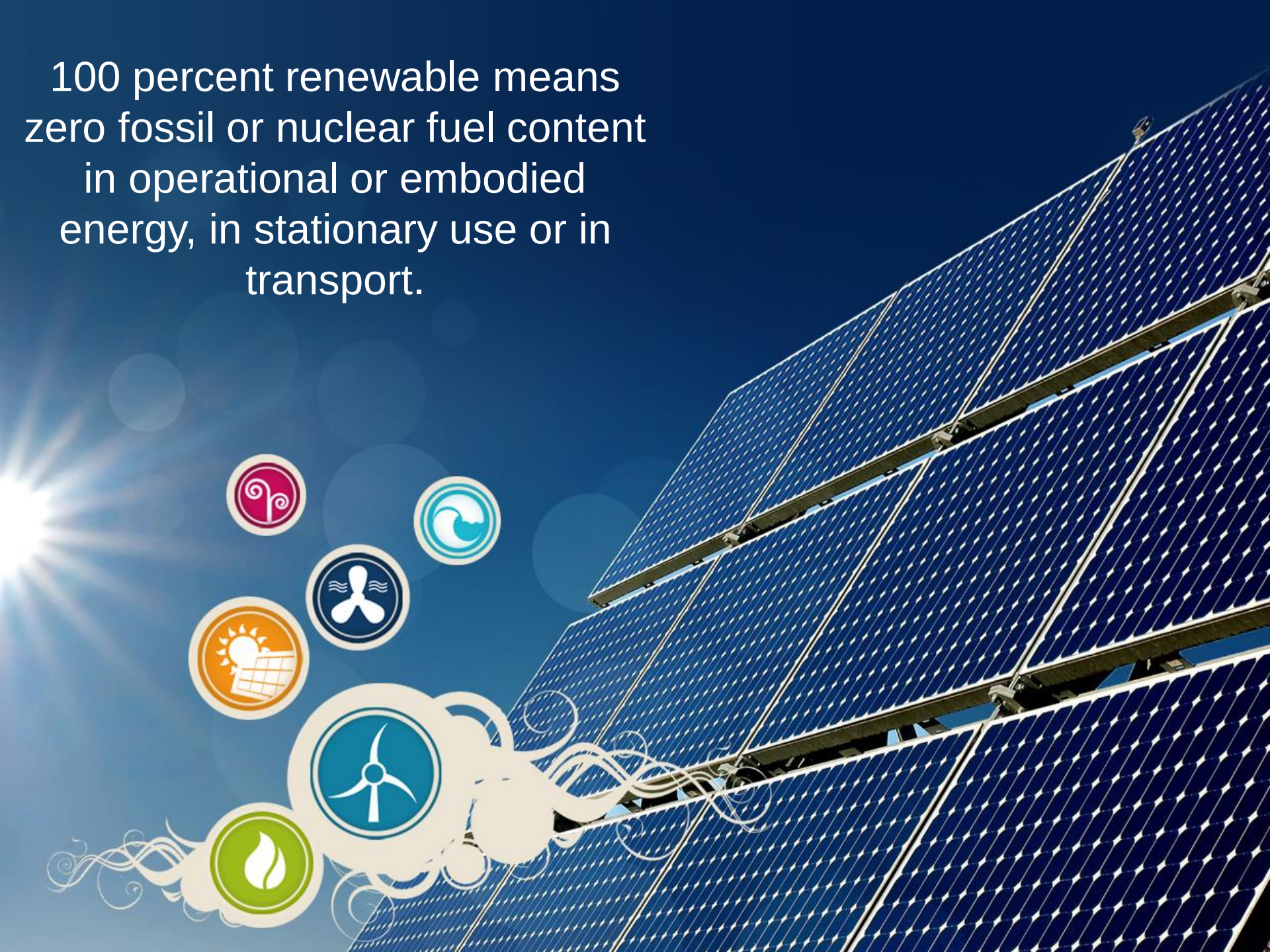
Solar Water Heating Collectors Global Capacity, 2000–2013



Data are for solar water collectors only (not including air collectors)

Data source: REN21 Renewables 2014 Global Status Report

100 percent renewable means zero fossil or nuclear fuel content in operational or embodied energy, in stationary use or in transport.



Towards decentralized energy vision

NEW MODEL

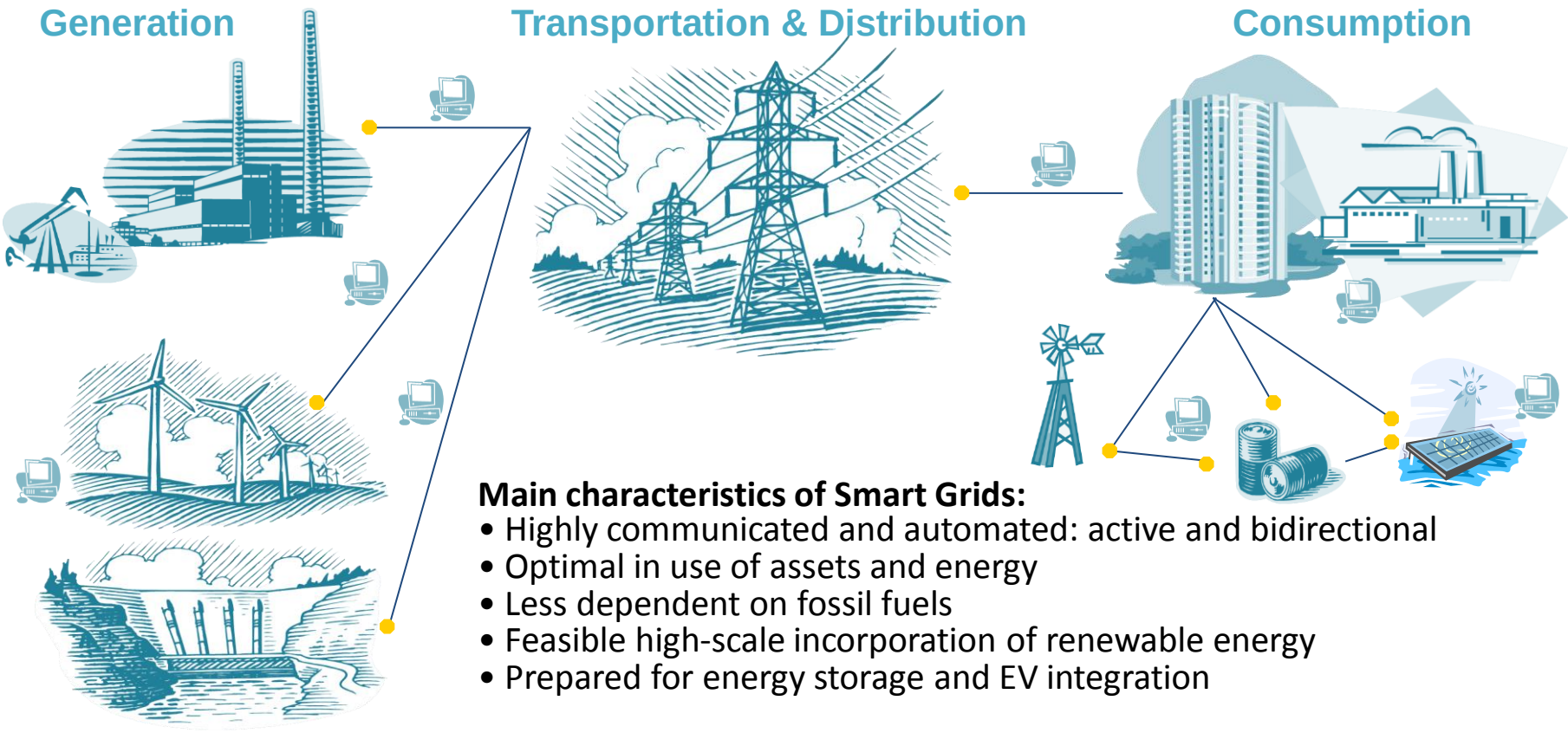
New storage solutions for variable RE sources

Self-consumption, distributed generation

Smart grid

The new electricity model: Smart Grids

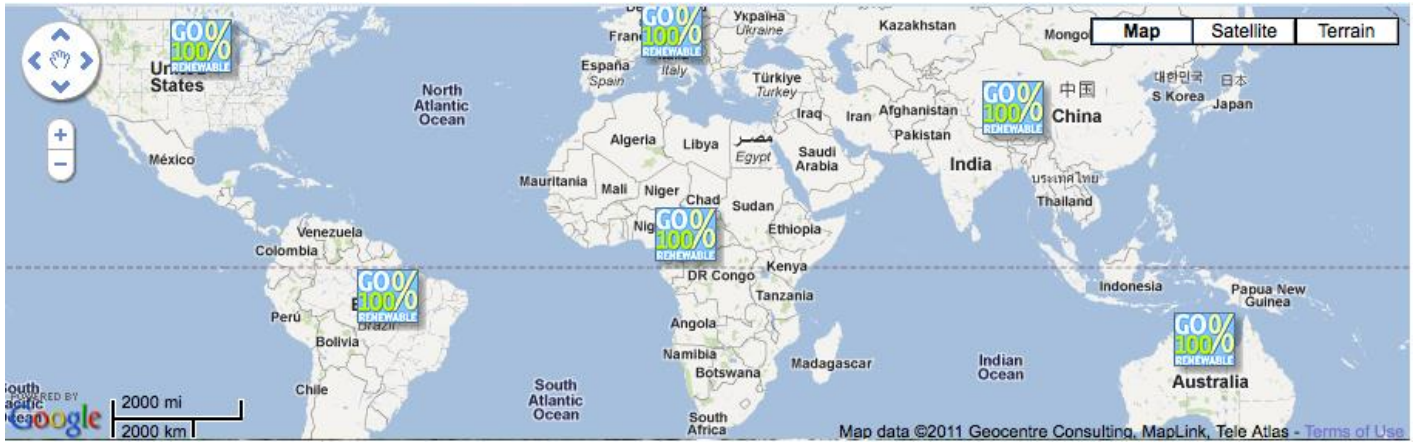
The Smart electricity model is strongly multidirectional



Main characteristics of Smart Grids:

- Highly communicated and automated: active and bidirectional
- Optimal in use of assets and energy
- Less dependent on fossil fuels
- Feasible high-scale incorporation of renewable energy
- Prepared for energy storage and EV integration

Go 100% Renewable Map



8 Countries, 46+ Cities, 52 Regions, representing **more than 45.3 million people** in the next few years.

and counting…

100% RE INITIATIVES

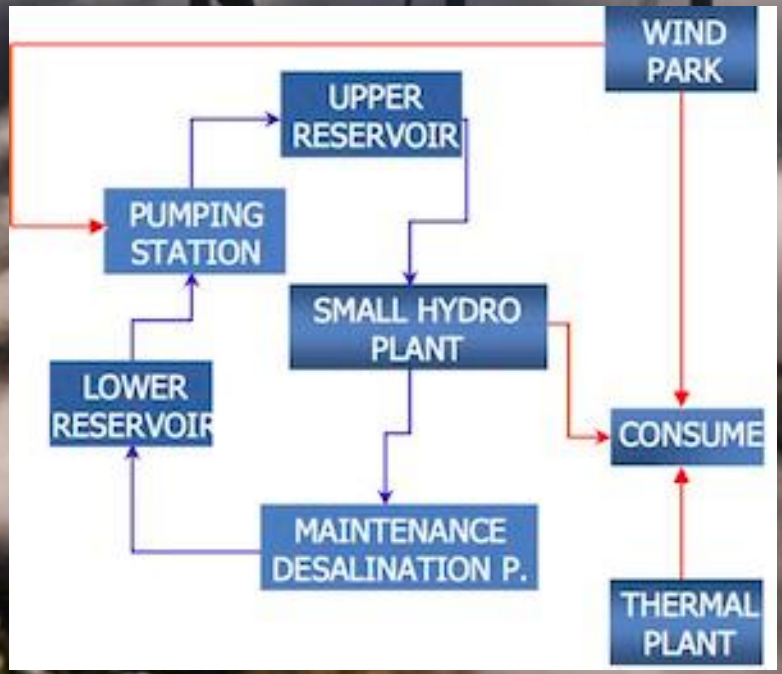
RENFORUS GIS VIEWER

WWW.RENFORUS.NET


ISLANDS
LABORATORIES
FOR TESTING THE
FUTURE OF 100%
RENEWABLE
ENERGIES

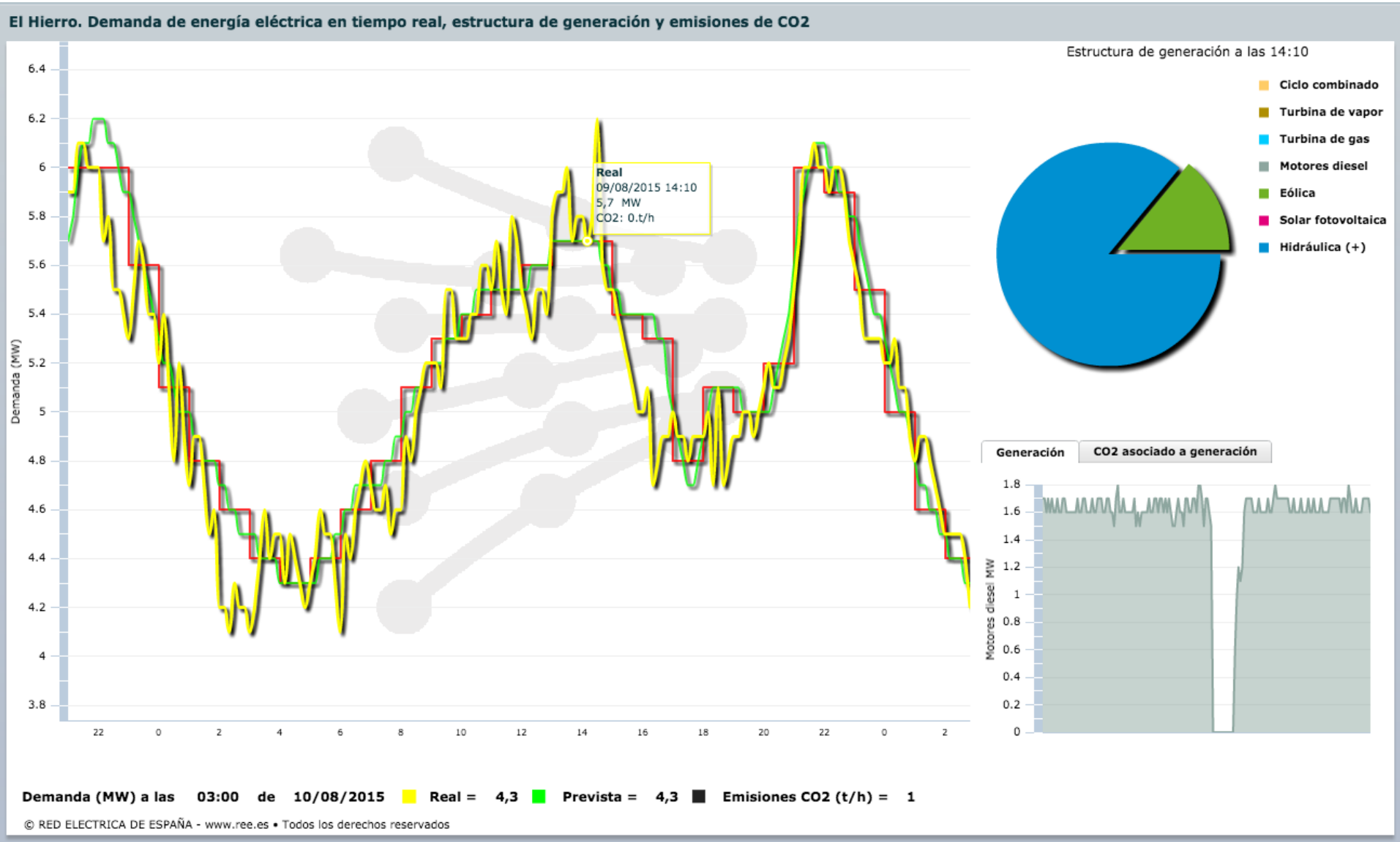
EL HIERRO ISLAND

The wind-hydro pumped storage power plant



August 9, 2015

EL HIERRO BECOME 100% RENEWABLE



SMART REGION PELLWORM

Germany's green energy island

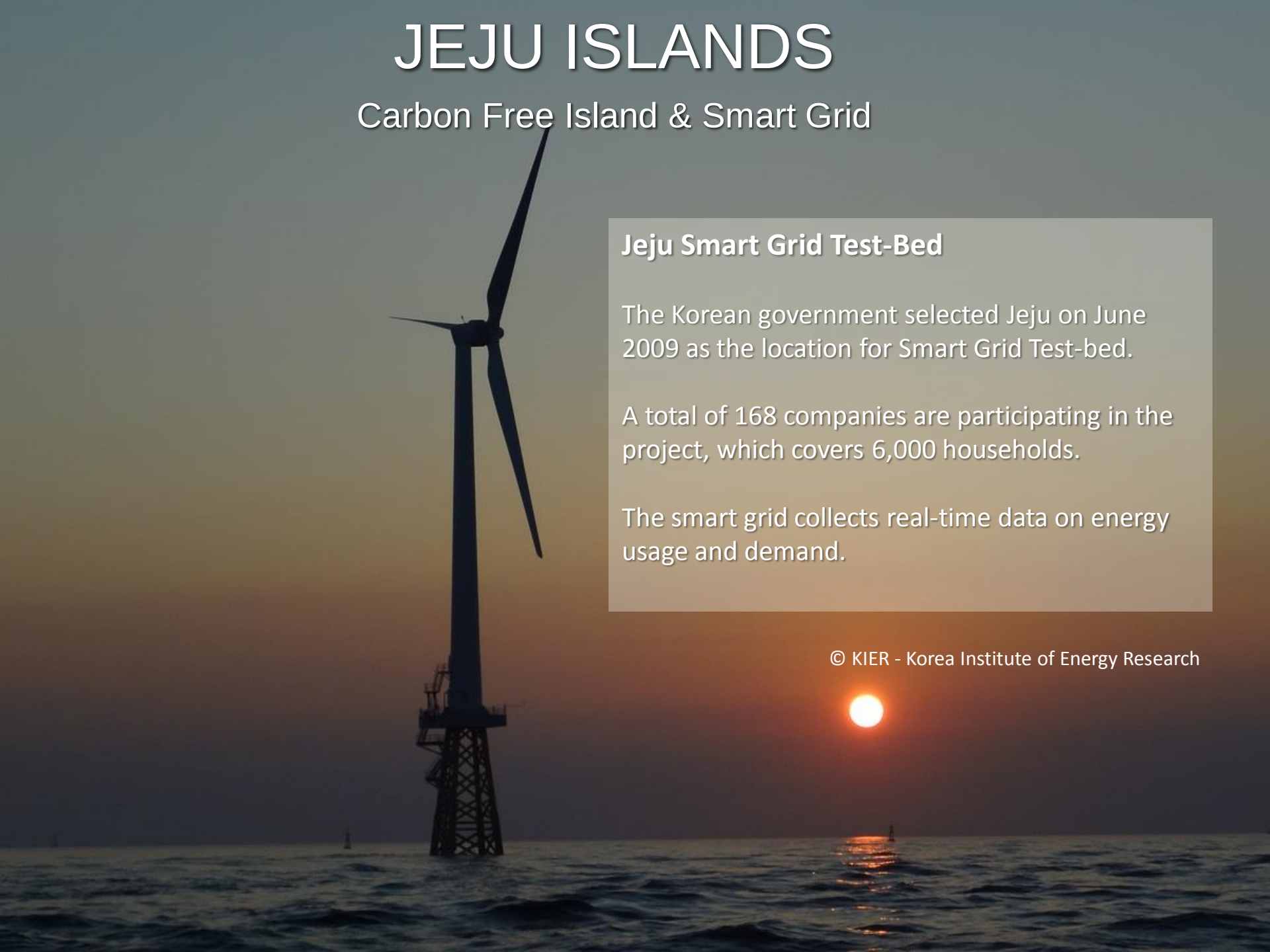
Pioneering energy storage system
redox-flow (200 kW, 1.600 kWh)
lithium ion (1 MW, 560 kWh)

Electric storage heaters in homes for demand response residential batteries for balancing distributed photovoltaic systems.

Other key components of the island's innovative power system include automated distribution substations, smart meters and grid communication infrastructure.

JEJU ISLANDS

Carbon Free Island & Smart Grid



Jeju Smart Grid Test-Bed

The Korean government selected Jeju on June 2009 as the location for Smart Grid Test-bed.

A total of 168 companies are participating in the project, which covers 6,000 households.

The smart grid collects real-time data on energy usage and demand.

United Nations
Educational, Scientific and
Cultural Organization

renforus

Renewable Energy Futures for UNESCO Sites

TOWARDS A RENEWABLE ENERGY FUTURE