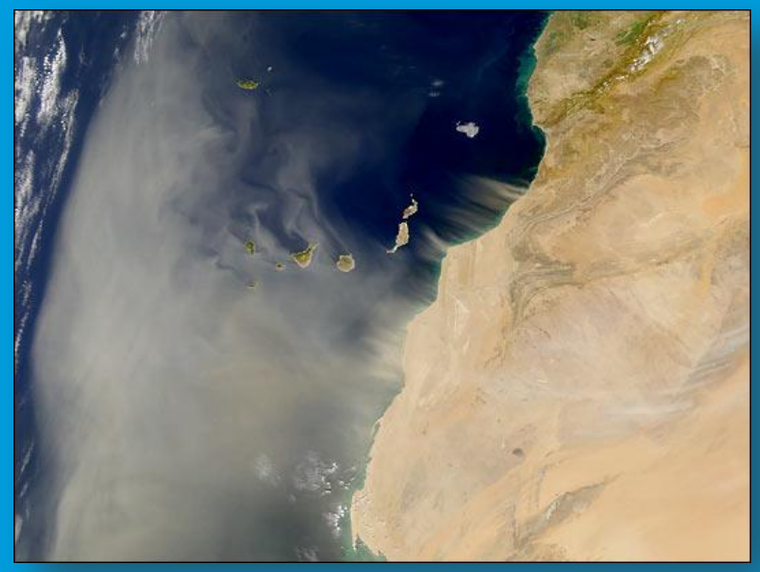
sdewes | 11th CONFERENCE ON SUSTAINABLE DEVELOPMENT OF ENERGY, WATER AND ENVIRONMENT SYSTEMS

Lisbon, 6 September 2916

Islands as references of Circular Economy Models: Potentials and Challenges

Gonzalo Piernavieja Izquierdo
CTO – R&D&I Director
Canary Islands Institute of Technology - ITC



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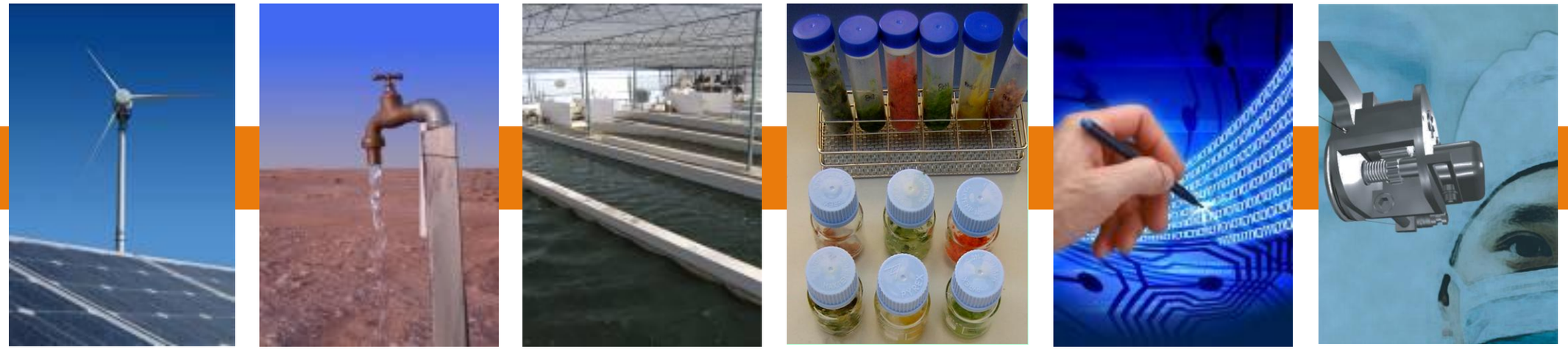
ITC is a technology center specialized in

- Renewable Energies and Energy Efficiency
- Sustainable Water Technologies
- Algae Biotechnology
- Enviromental Analysis (pollution prevention)
- Computing & ICTs
- Biomedical Engineering (customized implants)



- International Cooperation (above sectors; focus: West Africa)
- Innovation & Entrepreneurship

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ITC: POZO IZQUIERDO facilities

Gran Canaria

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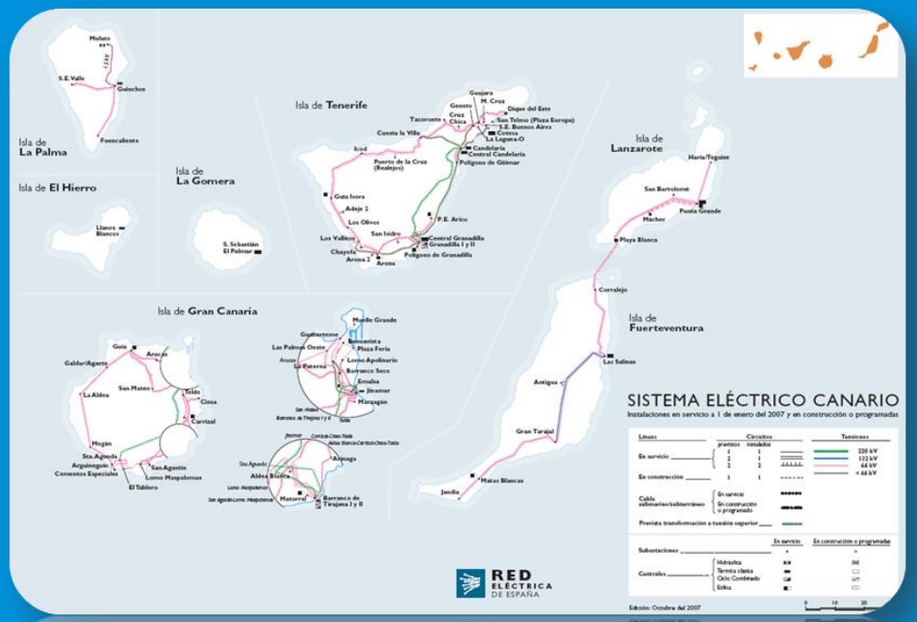
The Canary Islands (Spain)

Energy and Water Framework

- 2,1 mill. inhabitants, 13 mill. tourists/year (fast economic growth)
- Energy dependence on external resources
- Electricity generation from fossil fuels (oil); low heat demand
- Isolated (insular) electrical systems
- Lack of water resources (extremely low rainfall)
- Insular dimension: strategic need to maximise the use of endogenous resources (energy+water for self-sufficiency)
- -> Importance of water-energy binomial (desalination)



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Additional Challenges (apply to many islands worldwide)

- Biodiversity preservation (fragile land&sea ecosystems)
- Climate change
- Population density/growth
- Waste (removal, recycling, small scale biomass exploitation, etc.)
- Food Autarky
- Sustainable tourism
- Sustainable transport (land&sea)
- Difficulties for creation of new and sustainable economic sectors (potential: blue economy)
- Difficulties for the massive deployment of Renewable Energies (weak/isolated grids, lack of space for energy infrastructure placement, etc.)
- **Etc.**

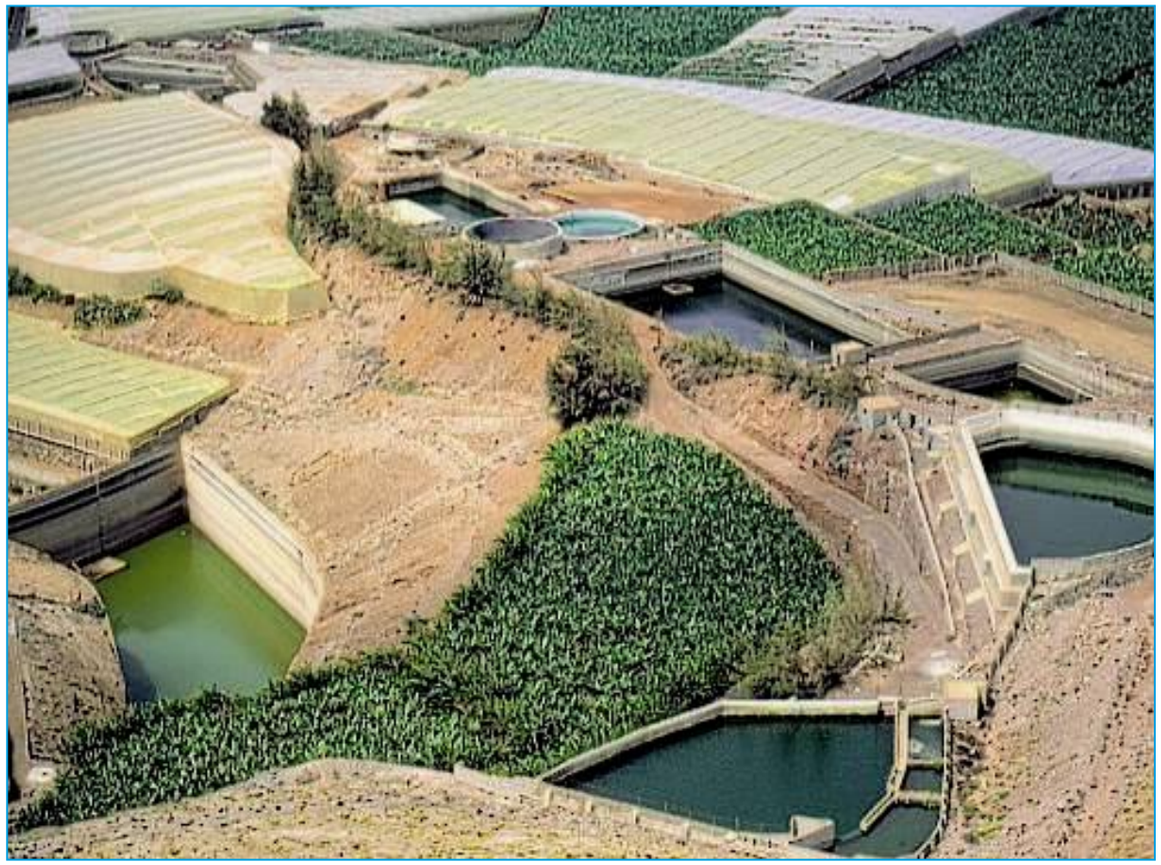
Continental areas vs. Islands

BaU solutions vs. Sustainable/Smart/Circular solutions

The Canary Islands Water Resources

- Historically, the Canary Islands have suffered water scarcity associated to: low rainfall, high permeability of soils, over-exploitation of aquifer resources

- Conventional solutions applied:
  - Groundwater catchment by horizontal water tunnels (“galerías”) and vertical wells
  - Rainwater catchment and storage
  - Construction and waterproofing of reservoirs
  - Efficient use of water



Canary Islands (non conventional) water resources (1)

Desalinated freshwater – European reference

- The first European seawater desalination plant was installed in Lanzarote island (1964)
- Currently, freshwater total demand is 200 hm^3/year (more than 650,000 m^3/day installed, approx. 2% world capacity)
- All desalination technologies installed (VC, MED, MSF, OI, EDR, SOLAR STILLS…..)

PRODUCTION CAPACITIES

Seawater	430,000 m³/d	167 plants
Brackish water	150,000 m³/d	146 plants
Reclaimed wastewater	66,000 m³/d	12 plants

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Canary Islands (non conventional) water resources (2)

Reclaimed wastewater

- **Goal: to balance the hydric deficit of the islands and to promote a sustainable management of natural resources**
- **20 years experience in wastewater treatment and reuse**
- **Recent normative and management challenges**

DEMAND

Irrigation	**10.40 hm³/y**	**41 %**
Golf Public gardens	**15.19 hm³/y**	**59 %**

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15 years experience in non-conventional low energy consumption waste water treatment systems (< 2.000 inh.equiv.)

Gran Canaria

Temisas, Agüimes

Campus de Tafira

la de la Naturaleza

La Laurisilva

Santa Lucía

Lomo Fregenal, Arenales

Presa de Las Niñas

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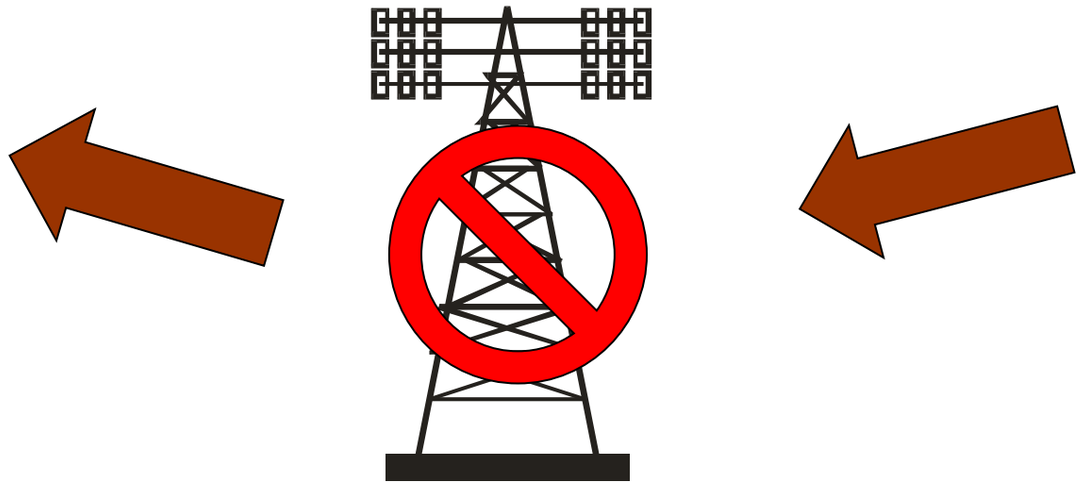
Canary Islands (non conventional) water resources (3)

Desalination has narrowed the gap between water demand and production for more than 20 years, thanks to a cheap energy supply.



But the age of “easy & cheap oil” is coming to an end and the link water–energy is critical.

A promising option is desalination powered by renewable energies (RE), which are abundant, clean and endless resources.

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The Canary Islands

Energy Framework

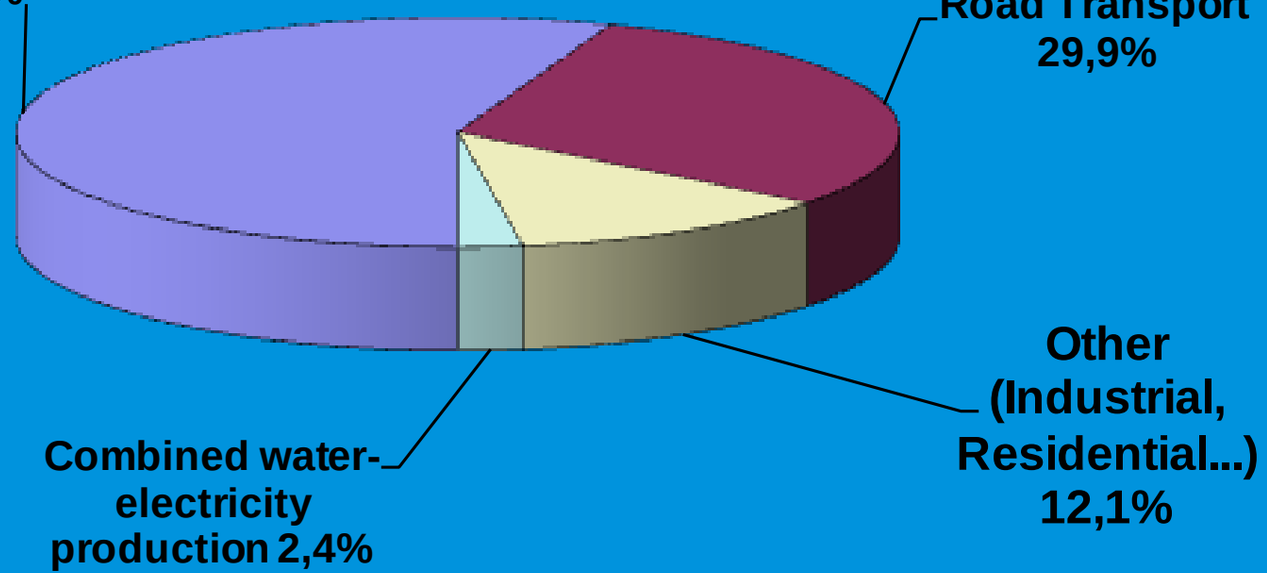
- 3 GW installed power, approx. 9000 GWh total el. consumption
- 15% of electricity consumed in water cycle
- Abundant Renewable Energy Resources:

  wind: ~ 4000 h.eq./y; sun: ~ 2000 kWh/m^2/y

  GOAL: 25% penetration in 2018

Structure of internal fossil fuels market

Seawater desalination plants



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ISLANDS

VISION

ISLANDS are NATURAL LABORATORIES for developing, testing and demonstrating new technologies which will be implemented in continental regions (Europe and ROW), in insular regions worldwide, as well as in developing countries

ISLANDS are the IDEAL PLATFORMS to showcase and transfer adapted technologies to regions of developing and emerging countries worldwide (and particularly of European neighbour regions)

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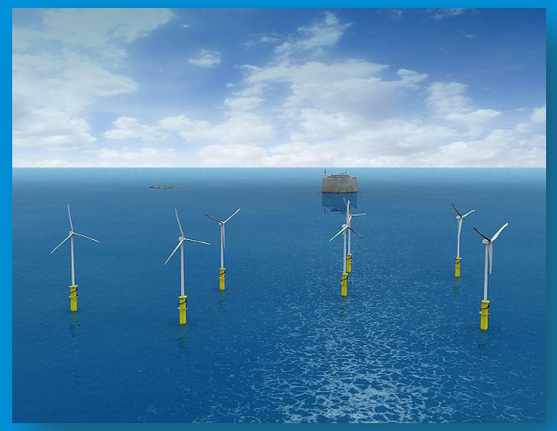
The Canary Islands: Ideal Test Beds

Islands: Natural Laboratories

Every island configurates one or several real laboratories for testing and demonstrating new technologies, especially emerging ones.



Biggest islands: 900.000 inhabitants; Smallest Islands <10.000 inhabitants

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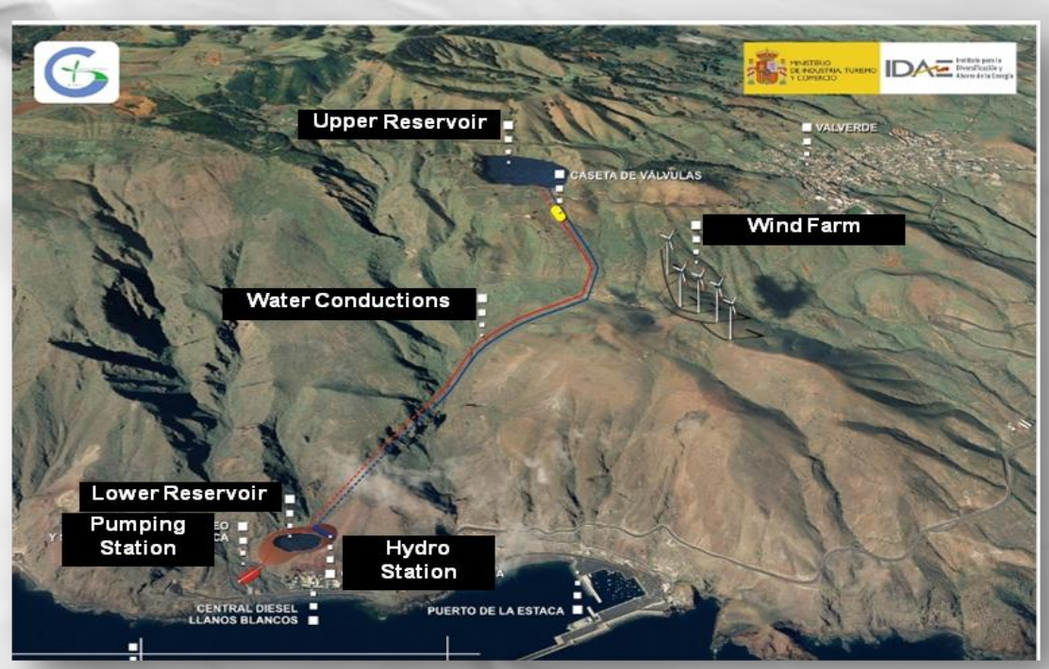
SUSTAINABILITY

Islands: Natural Laboratories

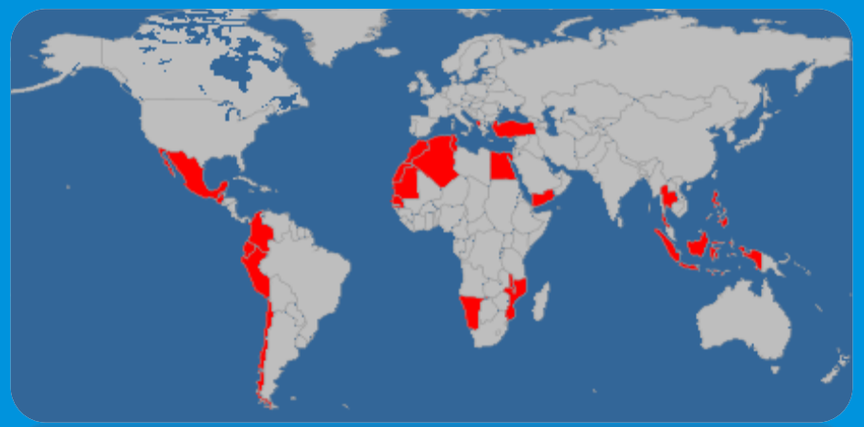
The Canary Islands are fully committed to the development and implementation of innovative energy, water and environmental protection technologies and policies, providing sound proof of concepts for the whole Europe and RoW



Strategic Areas

SCIENCE & TECHNOLOGY FOR INTERNATIONAL COOPERATION

The Canary Islands have been carrying out succesful international cooperation projects (especially with West Africa and South America) for many years, developing and transferring adapted technology, for example in the energy, water, agriculture, fishing and public health sectors



RENEWABLE ENERGIES AND WATER TECHNOLOGIES

The Canary Islands Government is deploying technology parks specialized in adapting technologies for the developing world.

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Capacities and outstanding projects (2) - WATER

Case 1. Off- grid wind farm coupled to 3 desalination systems (1998-2002)

- SDAWES project (Seawater Desalination with Autonomous Wind Energy System), connection of 3 different desalination systems to an off-grid wind farm.

2x230 kW off-grid wind farm.

EDR plant (from 3 to 7.9 m^3/h).

8 RO desalination plants (1 m^3/h each).

Synchronous machine (100 kW) & flywheel.

VVC plant (2 m^3/h).

Capacities and outstanding projects (3) - WATER

Case 2. Seawater - PV desalination unit (since 1999)

- Autonomous PV-RO system, designed to satisfy small water demands (up to 1,000 inhabitants) isolated from the electric grid. DESSOL® is an ITC patent.

RO unit - <3.5 kWh/m³.

PV field

Battery back-up system

Also tested a battery-less PV-RO system

Average operation 8 h/d (summer); 6 h/d (winter).

PROYECTO COFINANCIADO POR LA UNIÓN EUROPEA
FEDER
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Capacities and oustanding projects (4) - WATER

Case 3. Wind energy for high capacity desalination plant

- Grid-Wind-RO system, private initiatives

On-grid wind farm

Irrigation

SWRO plant with energy recovery - <3.0 kWh/m^3

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CANARY ISLANDS INSTITUTE OF TECHNOLOGY (ITC)

We have accumulated 20 years of experience in the development of solutions for the ENERGY and WATER supply to peri-urban/rural/remote areas

We have carried out consulting and electrification/water desalination projects using RENEWABLE ENERGIES, as well as training and awareness activities in:

- **Mauritania (since 1996)**
- **Morocco (since 1998)**
- **Tunisia**
- **Cape Verde**
- **Senegal**
- **ECOWAS**

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Technology transfer examples (I)

ITC Experience

- **Electrification of isolated communities with wind/solar energy**

- **Development and installation of small autonomous desalination plants, powered by renewable energies**

COOPERACIÓN CANARIA

MINISTERIO DE ASUNTOS EXTERIORES

AGENCIA ESPAÑOLA DE COOPERACIÓN INTERNACIONAL

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Technology transfer examples (II)

ITC Experience

- 4 seawater desalination plants, National Park Banc d'Arguin, Mauritania

- 4 brackish water desalination plants, powered by solar energy, Morocco

- Brackish water desalination plant powered by solar energy, Tunisia

- Consultancy in rural "microgeneration" (RES hybrid systems and micro/minigrids) (Cape Verde and ECOWAS)

MINISTERIO DE ASUNTOS EXTERIORES

AGENCIA ESPAÑOLA DE COOPERACIÓN INTERNACIONAL

MEDA Water

COOPERACIÓN CANARIA

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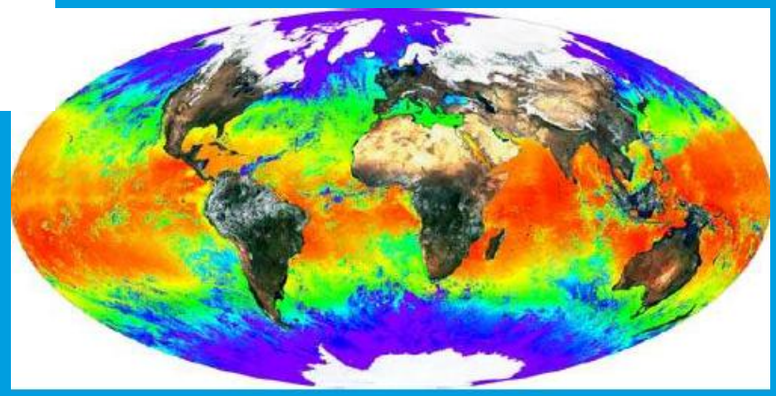

Climate Change Study: Regional Approach

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CLIMATIQUE

Observatorio Cambio Climático
Canarias - Souss Massa Drâa

http://climatique.itccanarias.org

Programa Cooperación Transfronteriza
España-Fronteras Exteriores

canarias OBJETIVO de PROGRESO

Unión Europea

Fondo Europeo de Desarrollo Regional

Socios en la Región de Souss Massa Drâa:

Royaume du Maroc
Région Souss Massa Drâa

Royaume du Maroc
Ministère de l'Energie, des Mines, de l'Eau et de l'Environnement
Département de l'Environnement

Socios beneficiarios:

itc Instituto Tecnológico de Canarias

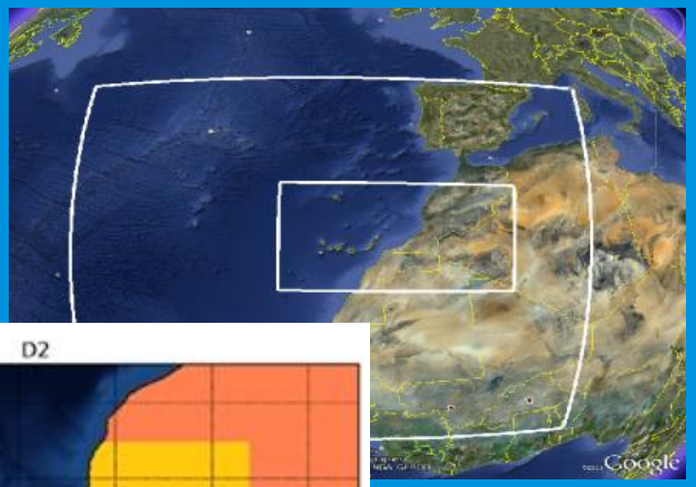
Gobierno de Canarias

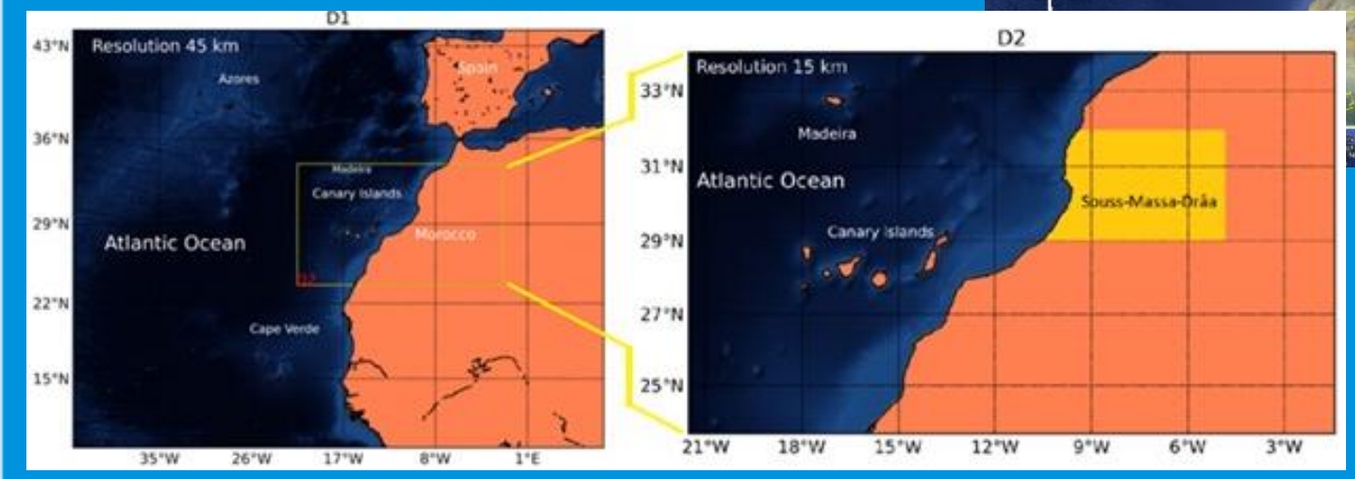
ULL Universidad de La Laguna

The CLIMATIQUE project

- 2 years project lead by ITC, carried out by Canary Islands' and Moroccan Institutions (Sous Massa Draa Region)

- "New" approaches:
  - Projections below the meso-scale ("regional" level)
  - Monitoring of bird migration patterns (deviations) as potential Climate Change indicator





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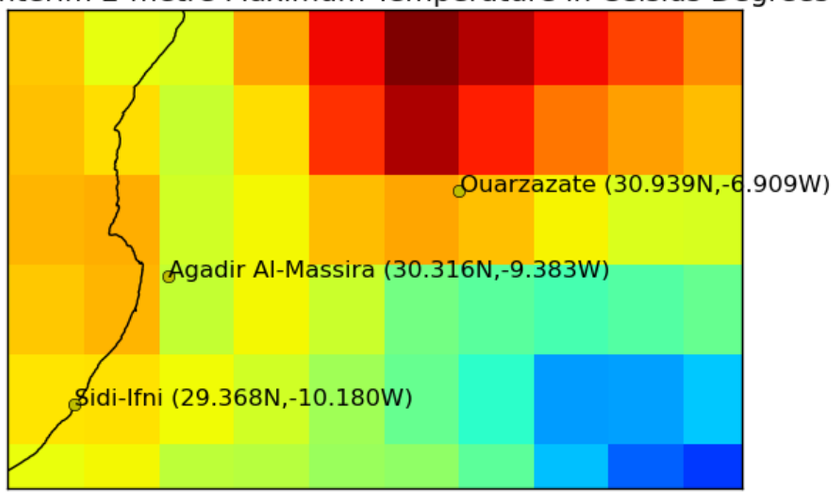
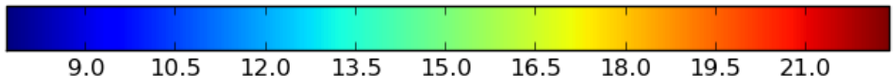
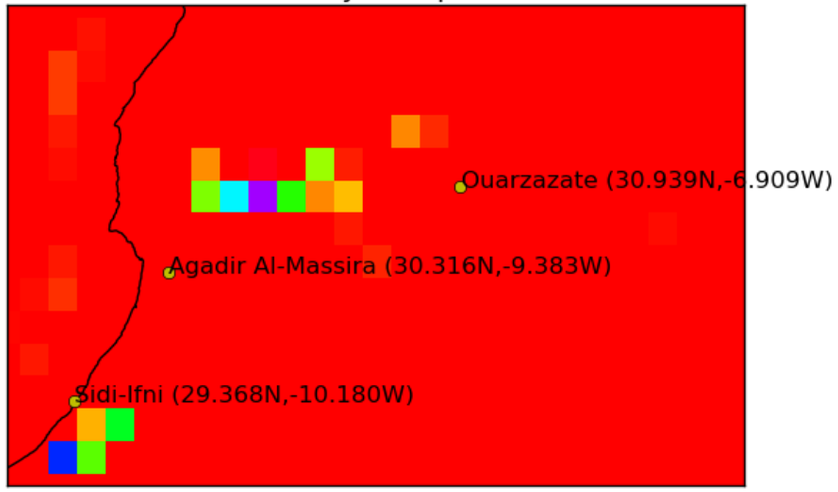
Regionalization improvements

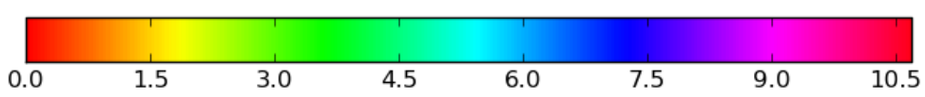
ERA-Interim 2-metre Maximum Temperature in Celsius Degrees



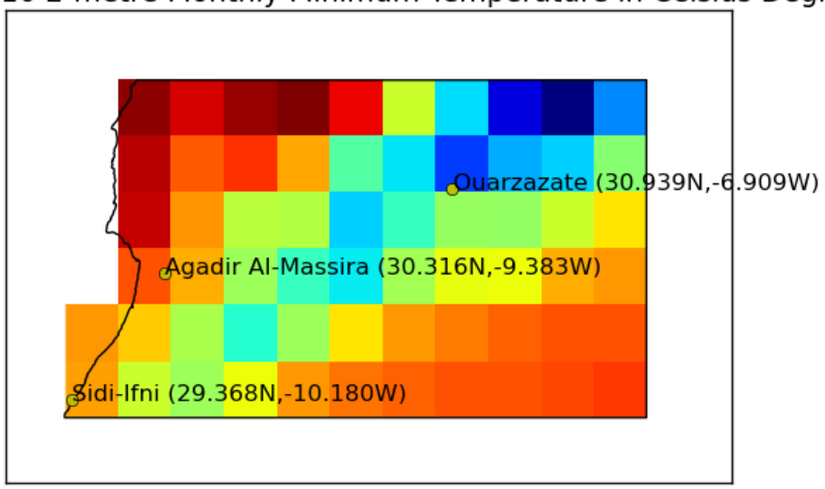


TRMM 3B42 Daily Precipitation in mm

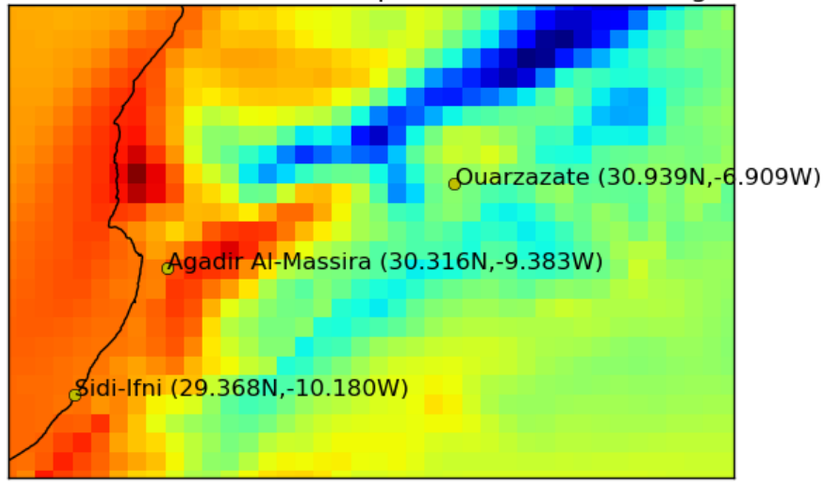


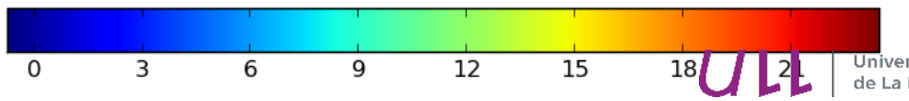


CRU-TS 3.10 2-metre Monthly Minimum Temperature in Celsius Degrees



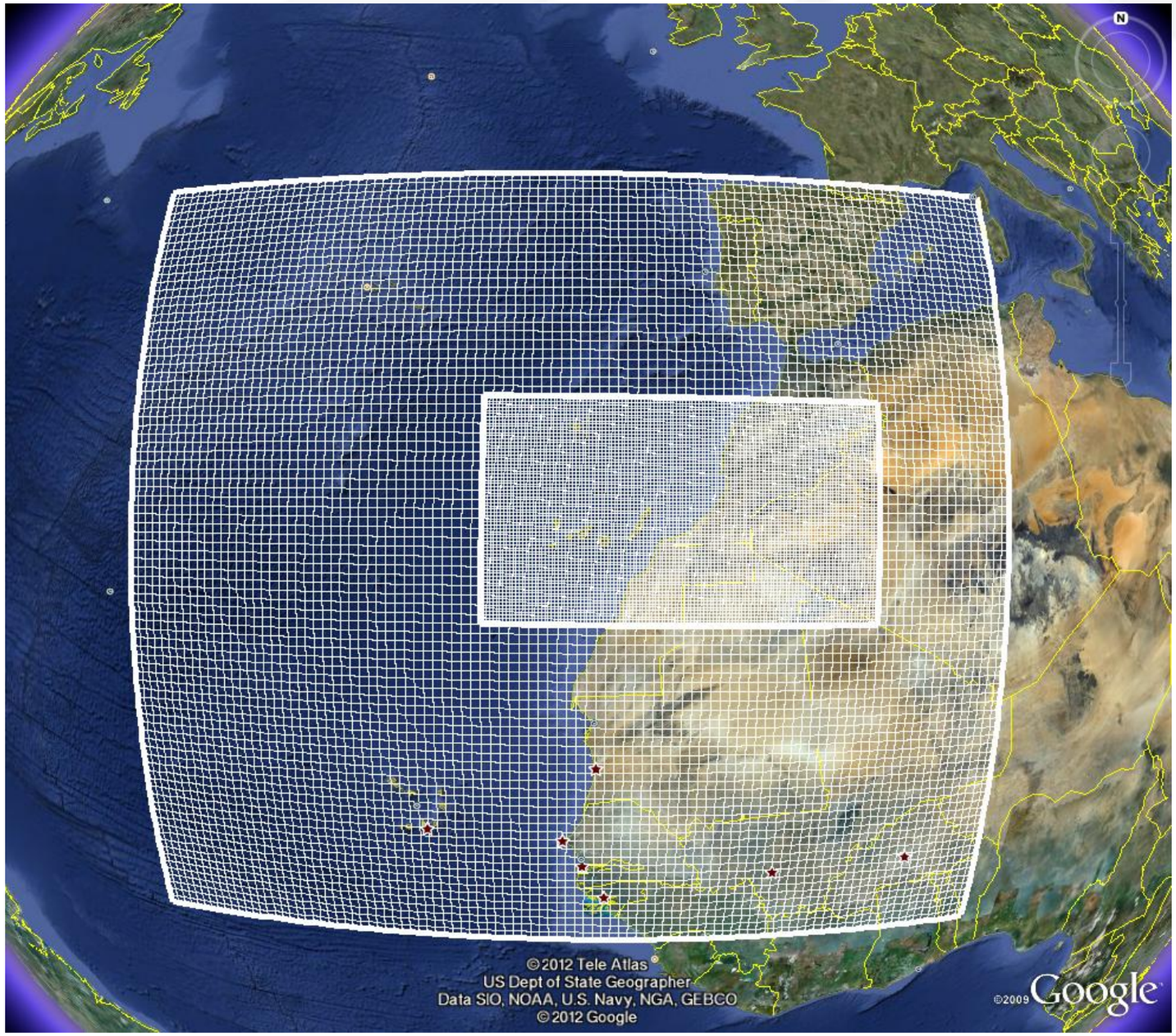
WRF 2-metre Maximum Temperature in Celsius Degrees



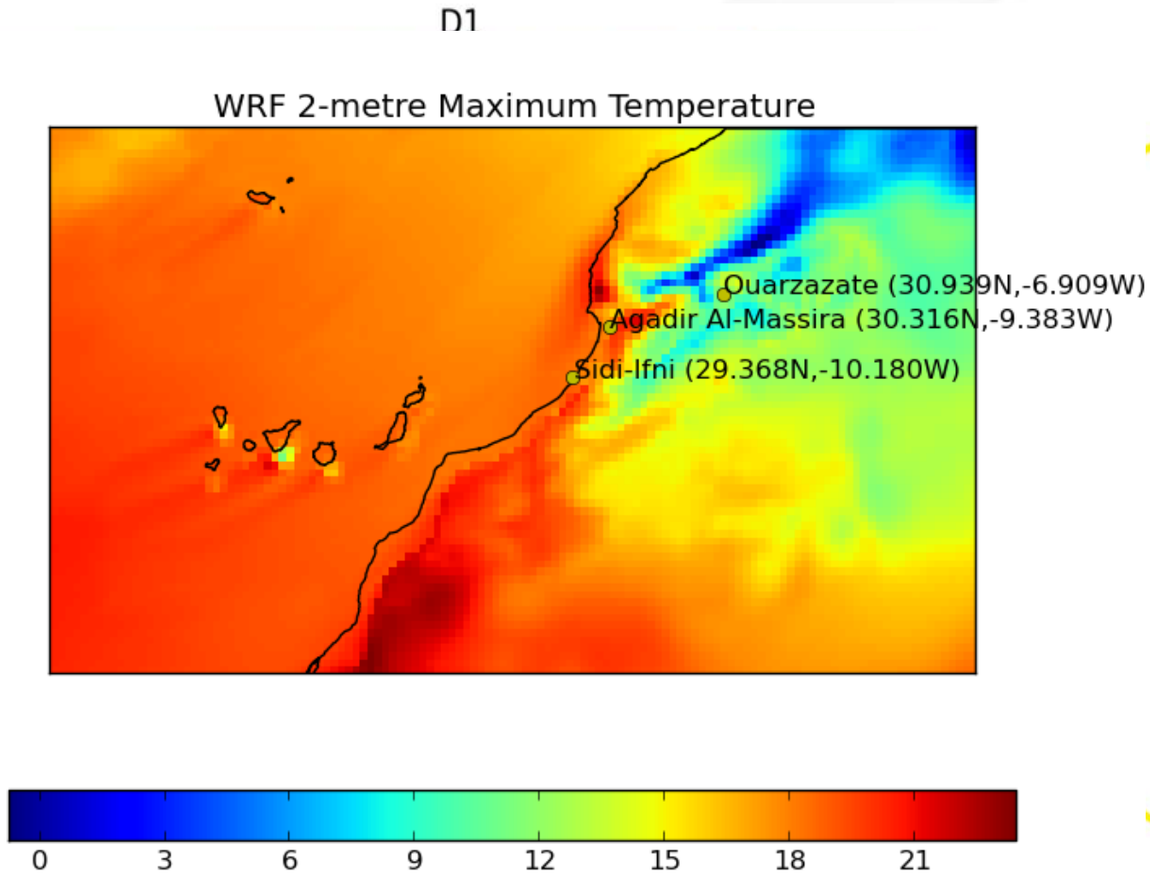


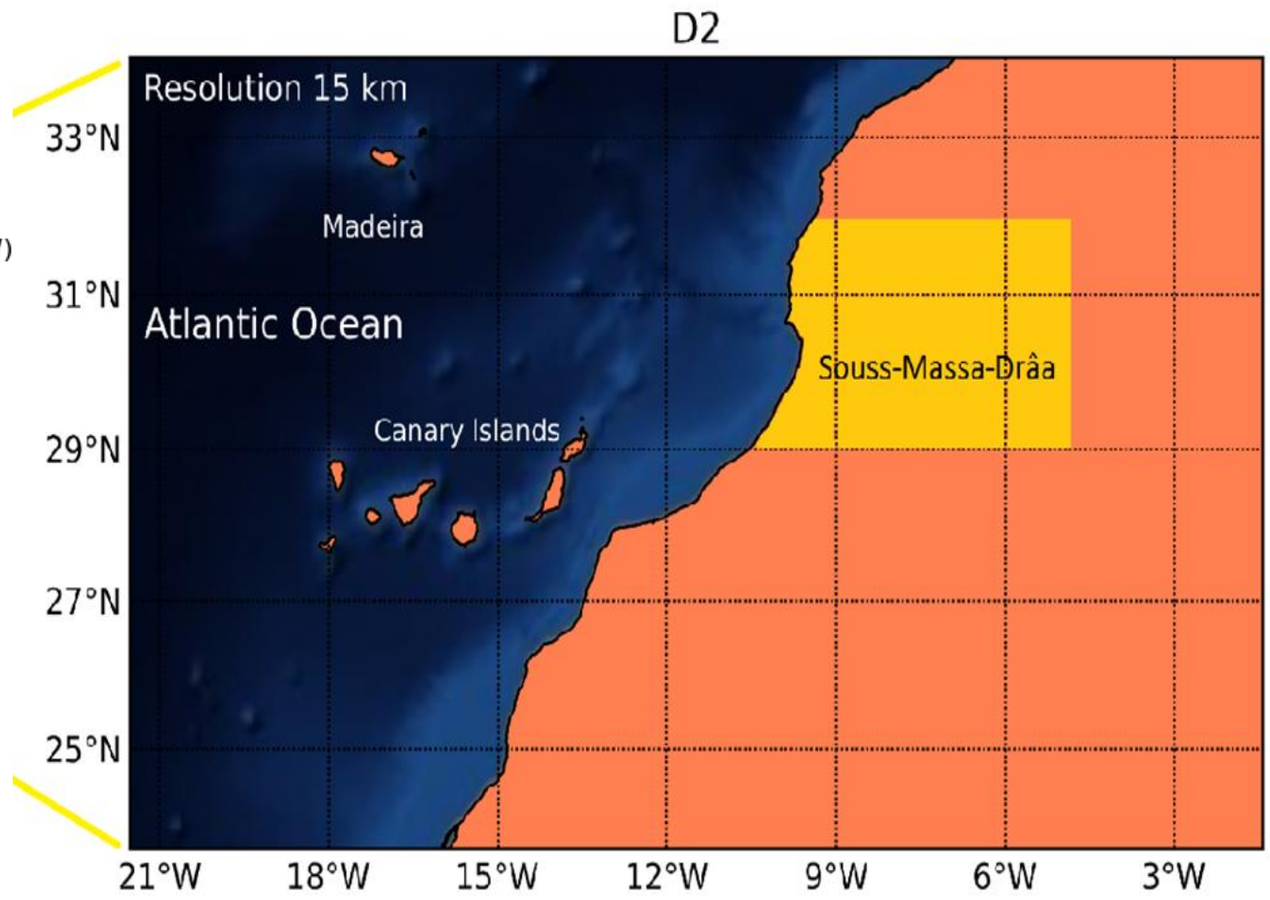
PROGRAMA Cooperación Transfronteriza España-Fronteras Exteriores
CLIMATIQUE Observatorio Cambio Climático Canarias - Souss Massa Drâa
canarias OBJETIVO de PROGRESO Unión Europea Fondo Europeo de Desarrollo Regional
ULL Universidad de La Laguna GOTA

Domains definition

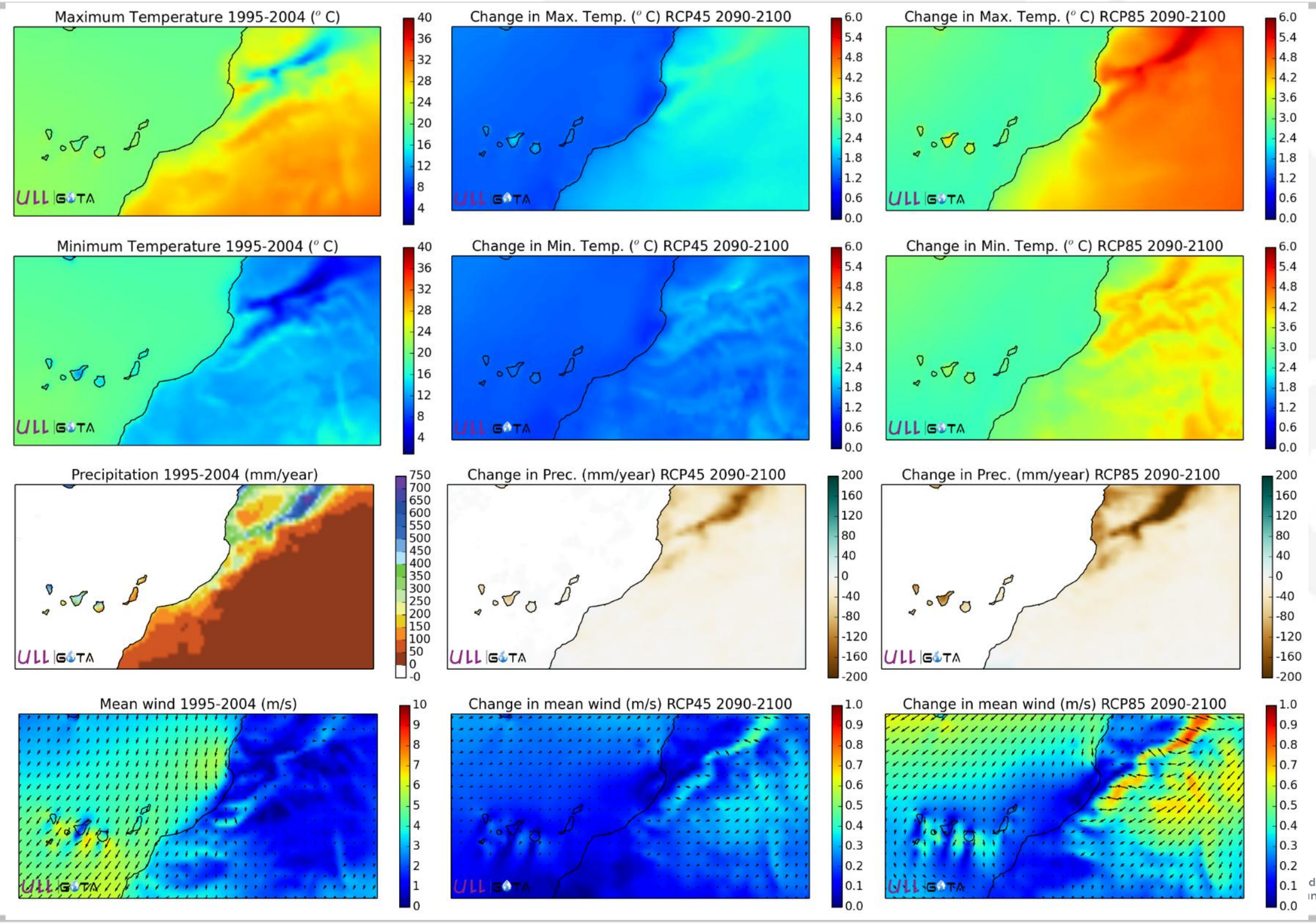


WRF model configuration

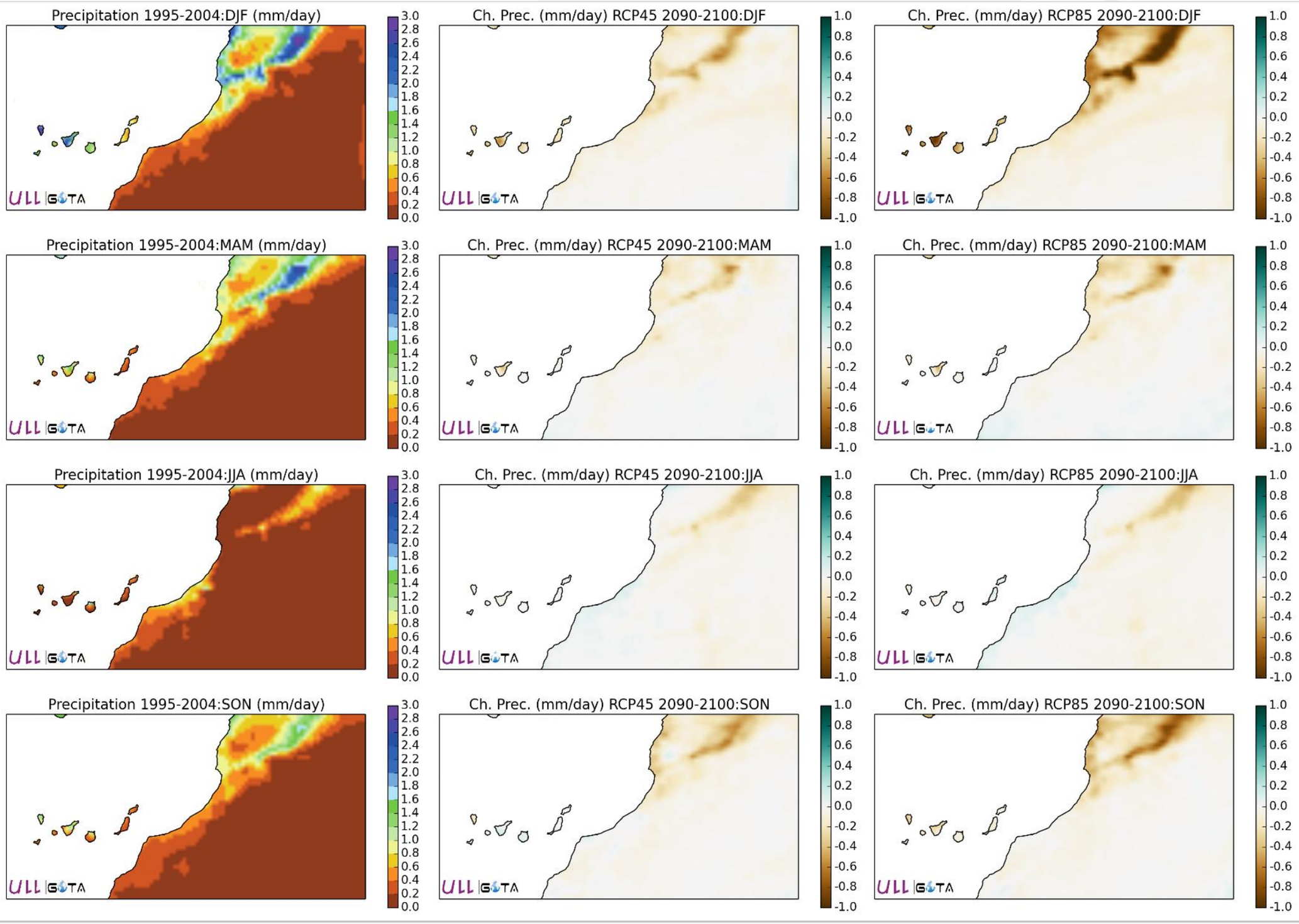




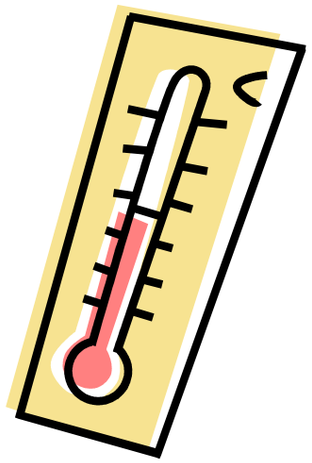
Projections: annual mean changes, 2090-2100



Projections: seasonal changes, Precip., 2090-2100



Conclusions



- Maximum and minimum temperatures increase:
  - Up to 2.5ºC (2045-55) and up to 6 ºC (2090-2100)
  - The changes will be more important at elevated zones
  - During summer, the changes will be more significant

- Precipitations decrease:
  - Most import changes will occur at high altitude areas
  - During winter, the changes will be more significant
  - The largest changes appear for the period 2090-2100 and the RCP8.5 scenario

- Winds:
  - No significant changes during 2045-55 were appreciated
  - For 2090-2100 decade and for the scenario RCP8.5, important changes are observed at high altitude areas with an increase in the East component
  - At the south part of the domain, an increase in the NE component is observed

A new project (H2020): Moving Towards Adaptive Governance in Complexity: Informing Nexus Security" (MAGIC)

Call H2020-WATER-2015; Topic: "Integrated approaches to food security, low-carbon energy, sustainable water management and climate change mitigation"

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THE ISSUES OF THE CALL

- **Increased understanding** of how water management, food and biodiversity policies are linked together and to climate and sustainability goals.

- **Reduction of the uncertainties** about the opportunities and limitations of low-carbon options, such as bioenergy technologies and resource efficiency measures, in view of relevant near-term policy initiatives.

- **Contribution to future assessments**, including those of the IPCC, with multidisciplinary and integrated tools.

THE STRUCTURE OF THE SYSTEMS

NEXUS SECURITY

External Constraints (Availability)

Internal Constraints (Use)

Climate

A

Resources

Energy

Water

Agriculture

B

Supply

Energy

Water

Food

D

Requirements (Water, Food Energy)

Technological Innovation (E)

Member States Productive Structure

F

State Members Governance

G

EU Governance

H

J

I

Third Countries

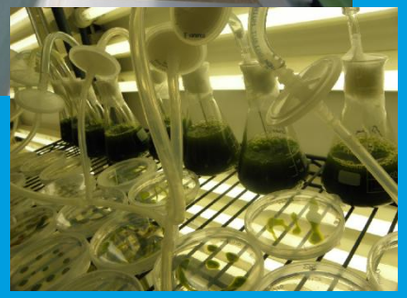
International Regulations and markets

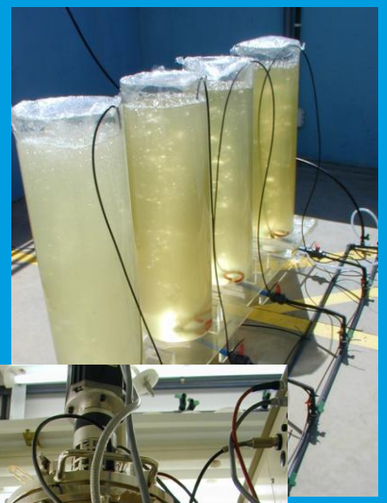
Global

Local

Global

- CA
- Twente
- Wageningen, UAB
- ITC
- JHI
- UiB
- FII





BLUE Growth / BLUE Economy

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DE CANARIAS

Gobierno
de Canarias

Implementation of RIS3 Priorities in Blue Growth

Las Palmas de Gran Canaria (Canary Islands)

STORY TELLING

Canary Islands

BLUE GROWTH IN REGIONAL RIS 3

8-9 October 2015

Europe in my region|city
September|October|November 2015

Gobierno de Canarias
un solo pueblo

Organised by:

Gobierno de Canarias
Agencia Canaria de Investigación, Innovación y Sociedad de la Información

S3 SMART SPECIALISATION PLATFORM

Comisión Europea

Local partners:

Cluster Marítimo de Canarias

PLOCAN consorcio

UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA

ULL Universidad de La Laguna

CETECIMA CENTRO TECNOLOGICO CIENCIAS MARINAS

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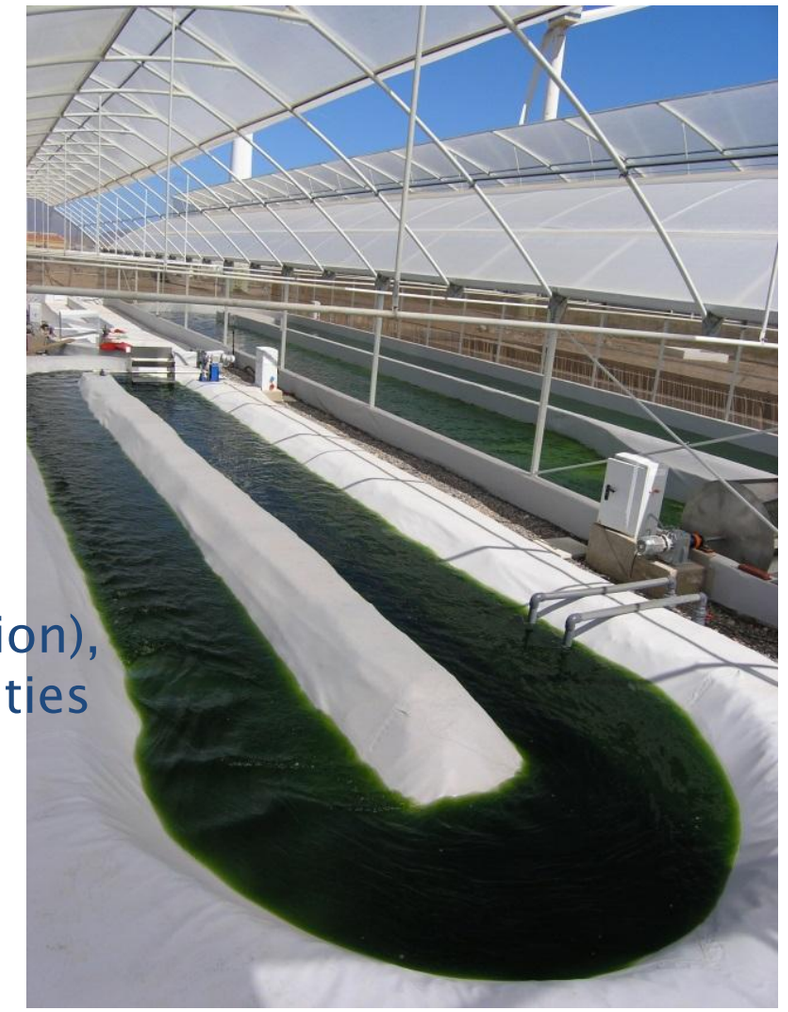
Pilot projects (1)

- **Blue Economy / Algae Technology / Business Incubation:**



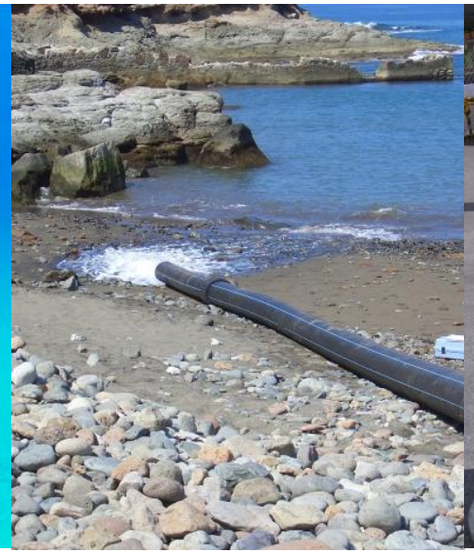
Algalimento S.L. (microalgae production), incubated at ITC Pozo Izquierdo facilities

Support to Biotech start-ups

Europe in my region|city
September|October|November 2015

Pilot projects (2)

- **Coastal Water Quality / Protection of Marine Biodiversity:**

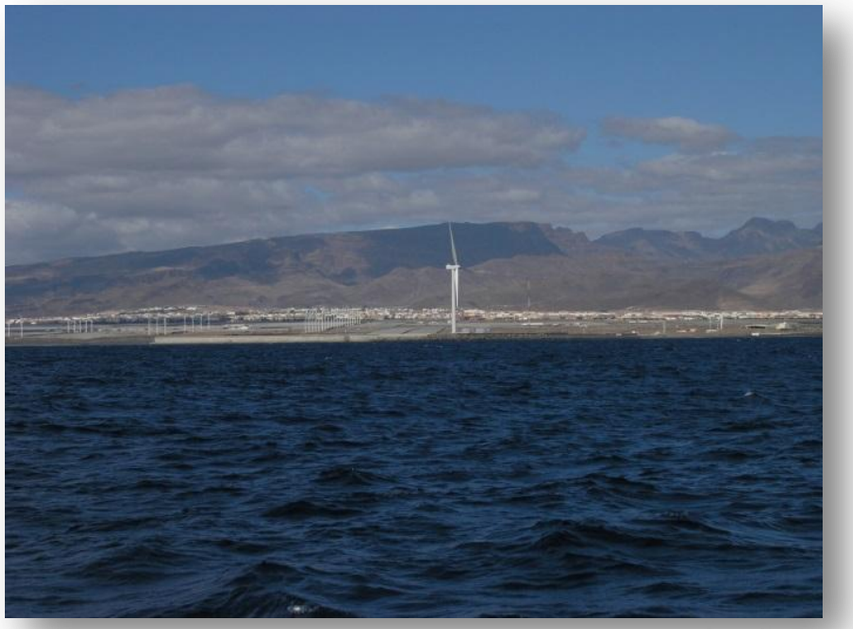


Monitoring of discharges / Risk prevention

Venturi (desalination plants´) Brine Diffuser
(International Patent)

- **Marine Renewable Energies:**

Arinaga (Gran Canaria)
Multimegawatt Wind Test Platform):
First spanish off-shore wind turbine
tested/certified 2014/2015



Europe in my region|city
September|October|November 2015

Gobierno de Canarias
Agencia Canaria de Investigación, Innovación y Sociedad de la Información

SMART SPECIALI PLATFOR

European Commission

GOAL: 100 % Renewable Energy Supply

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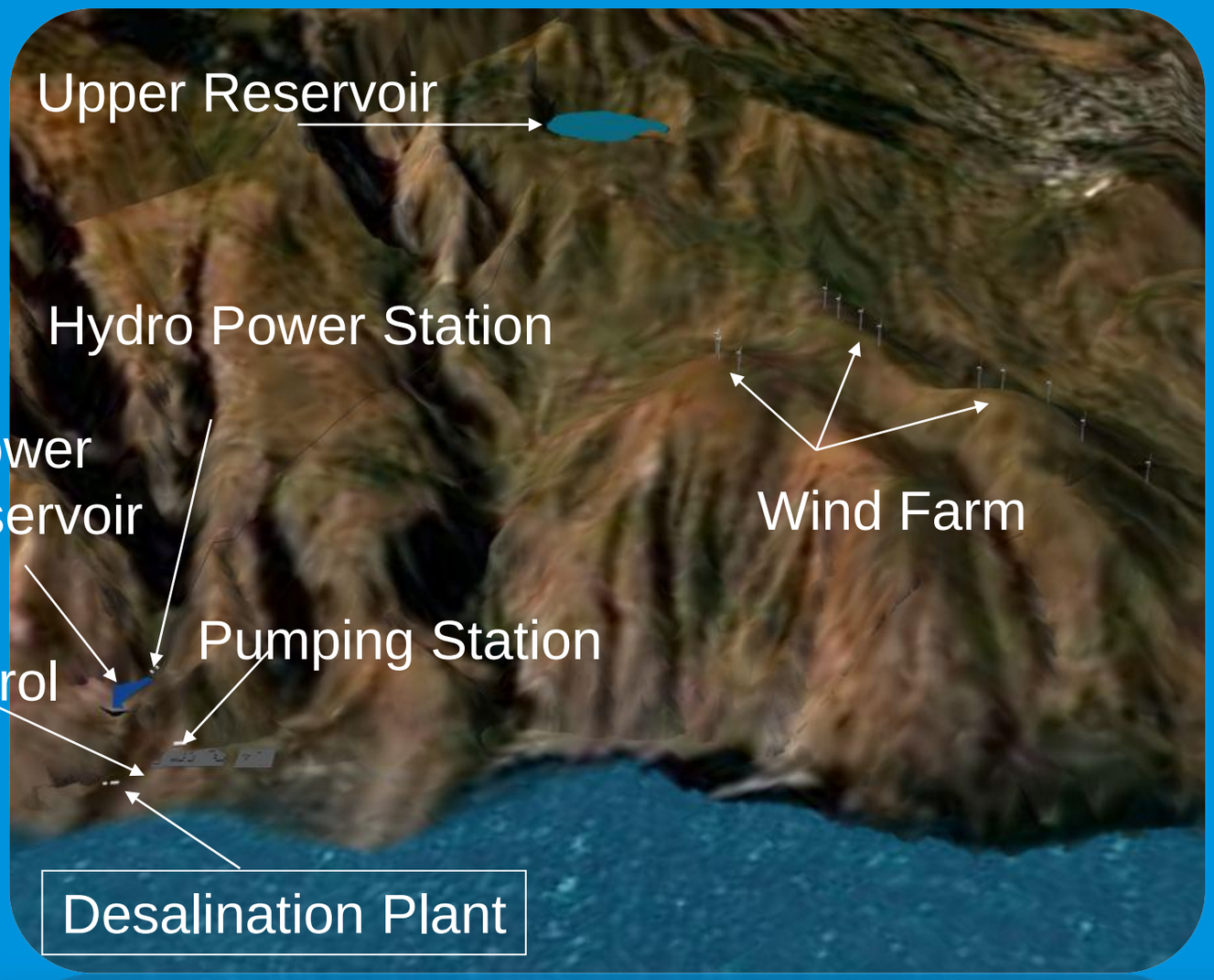
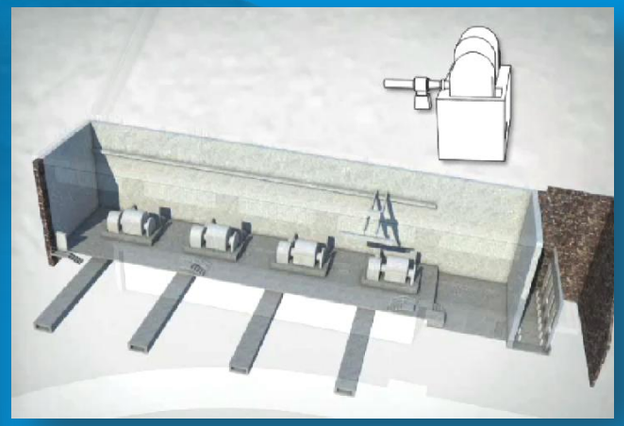
DE CANARIAS

Gobierno
de Canarias

Technical Solutions (I) HV/MV: Pumped Hydro (where possible)





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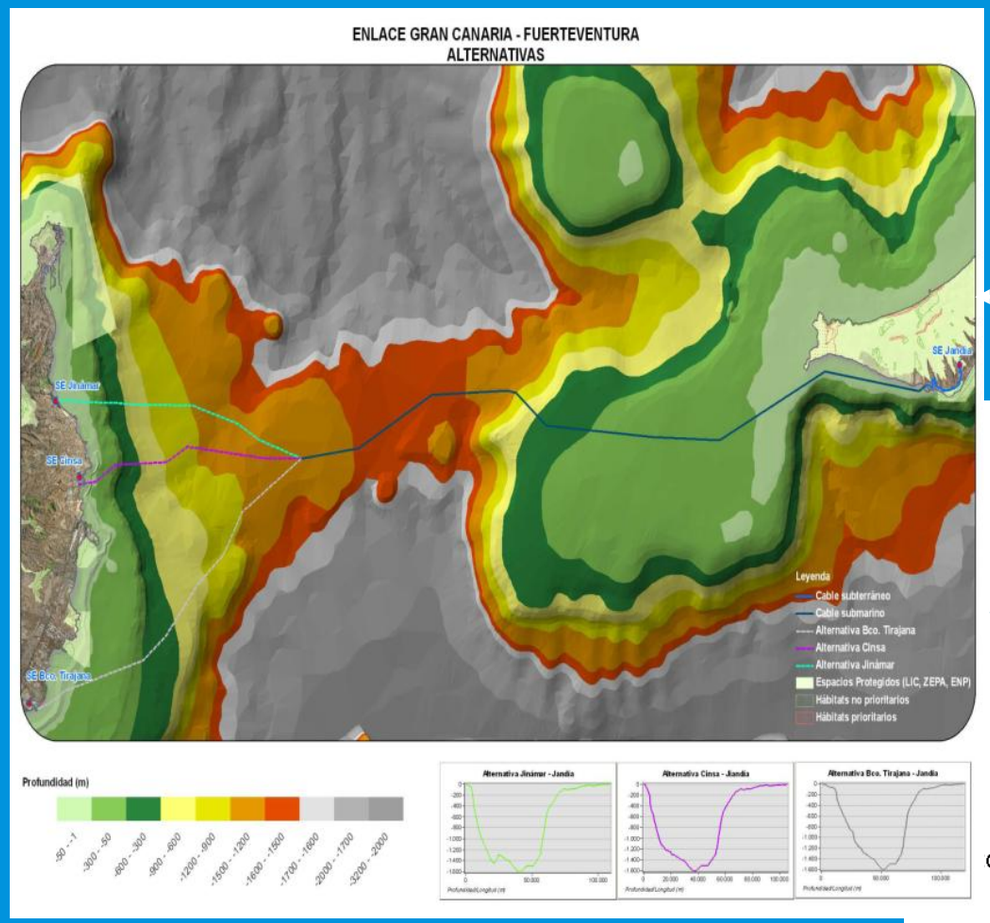
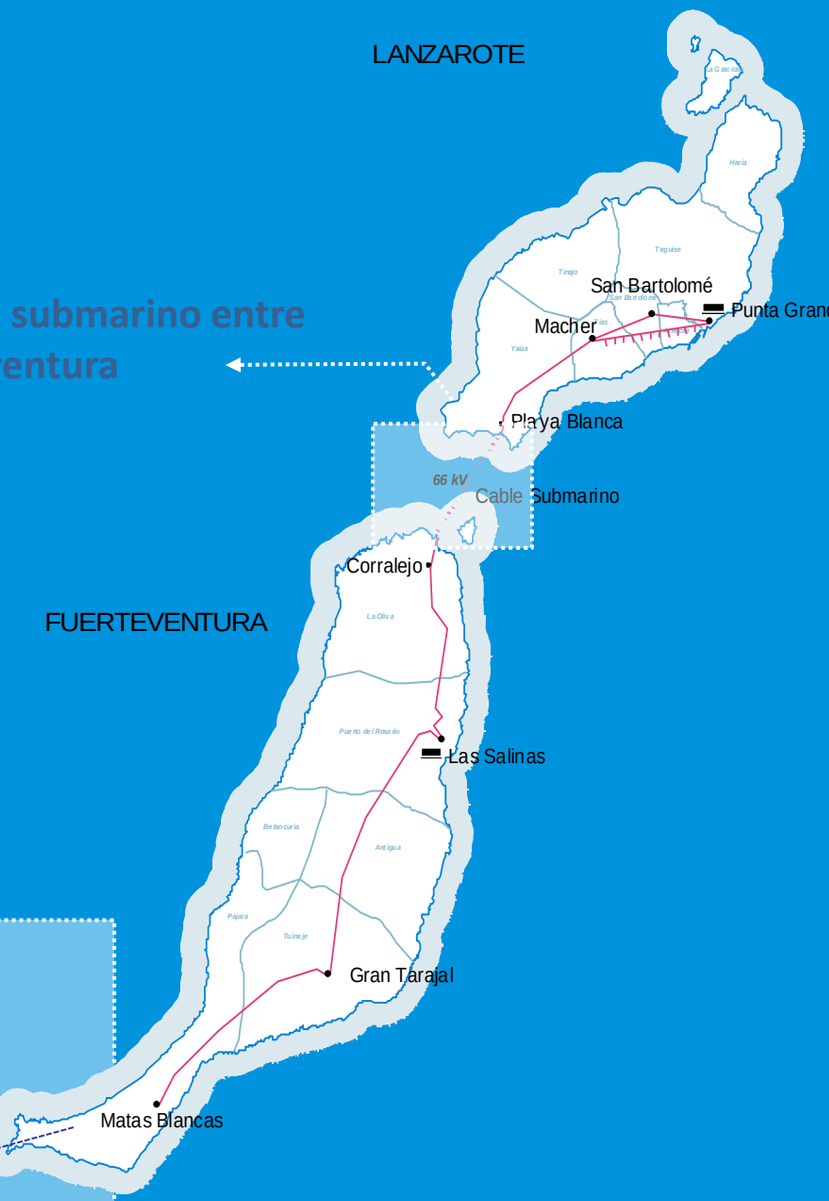
Technical Solutions (II)

- HV/MV:
  - Subsea electrical interconnections



Refuerzo del enlace submarino entre Lanzarote y Fuerteventura



Enlace submarino Gran Canaria y Fuerteventura :

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Technical Solutions (III)

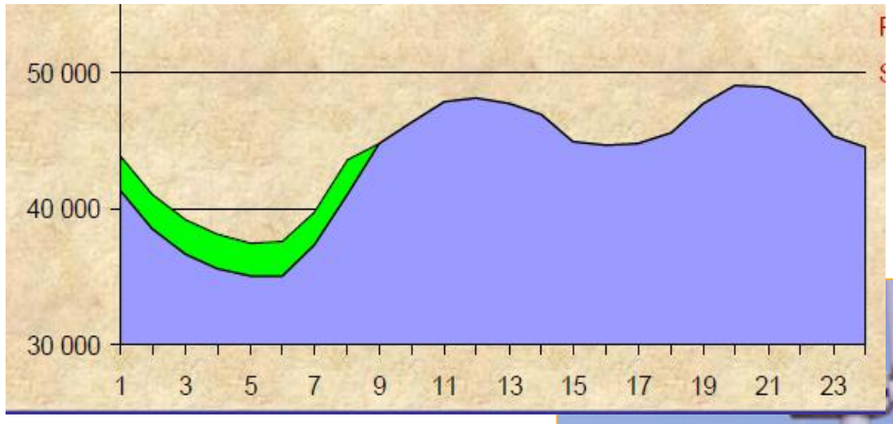
- MV/LV:
  - Distributed Generation, esp.:
  - Mini- & Microgrids with high renewable energy penetration, incl. energy storage, management of critical loads (e.g. seawater desalination) and electrical mobility

DEMAND MANAGEMENT: water desalination

15% of energy production goes to water desalination and water distribution.

Use of desalinated water

Residential & touristic	**374,000 m³/day**	**153 plants**
Agriculture	**146,000 m³/day**	**100 plants**



Energy consumption for water desalination:

1Kgr fuel/ m³ of desalinated water.

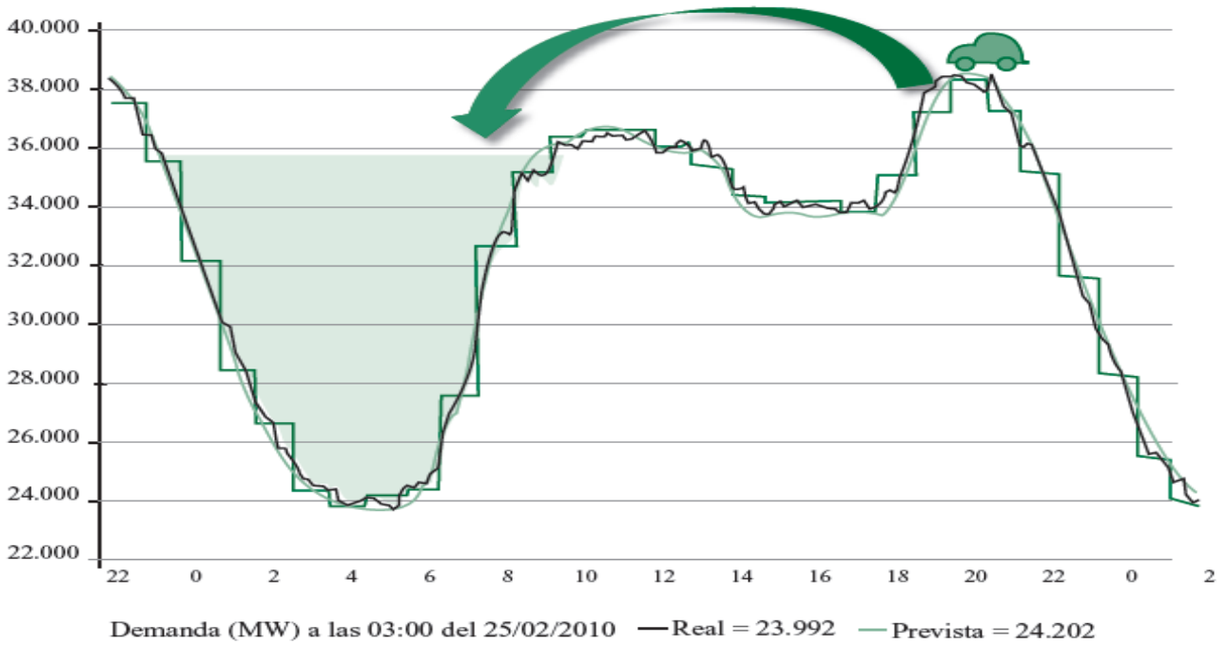
- For 522.000 m³/day

- Import 150.000 Ton fuel /year.

DEMAND MANAGEMENT: Electric cars

30% of oil consumed in the internal market goes to the road transport sector.

Peak shaving: More than 1 million vehicles could charge at valley hours of the electric demand curve



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Maximizing PV/RES Penetration in islands

- Governance

- Operation

SiNGULAR
Smart and Sustainable Insular Electricity Grids Under Large-Scale Renewable Integration

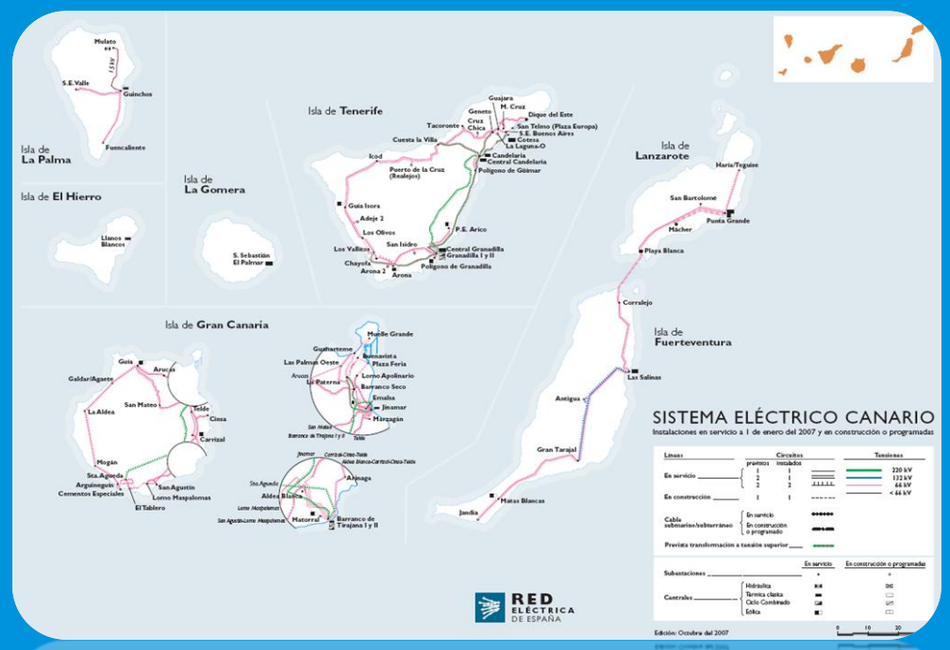
Enhancing Effective Implementation of Sustainable Energy Action Plans in European islands through Reinforcement of Smart Multilevel Governance

www.sustainableislands.eu

www.smilegov.eu

SEVENTH FRAMEWORK PROGRAMME

- Distributed Generation (Microgrids)
  - La Graciosa
  - TILOS
  - West Africa



INSTITUTO TECNOLÓGICO DE CANARIAS

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SiNGULAR Project (FP7)

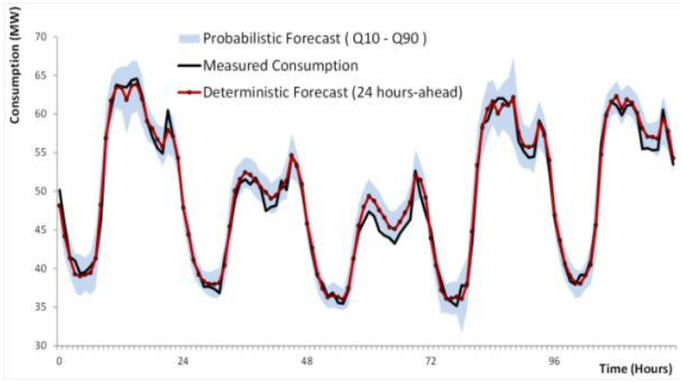
R&D: effects of large-scale integration of renewable energy sources (RES) and demand side management (DSM) on the planning and operation of insular (non-interconnected) grids.

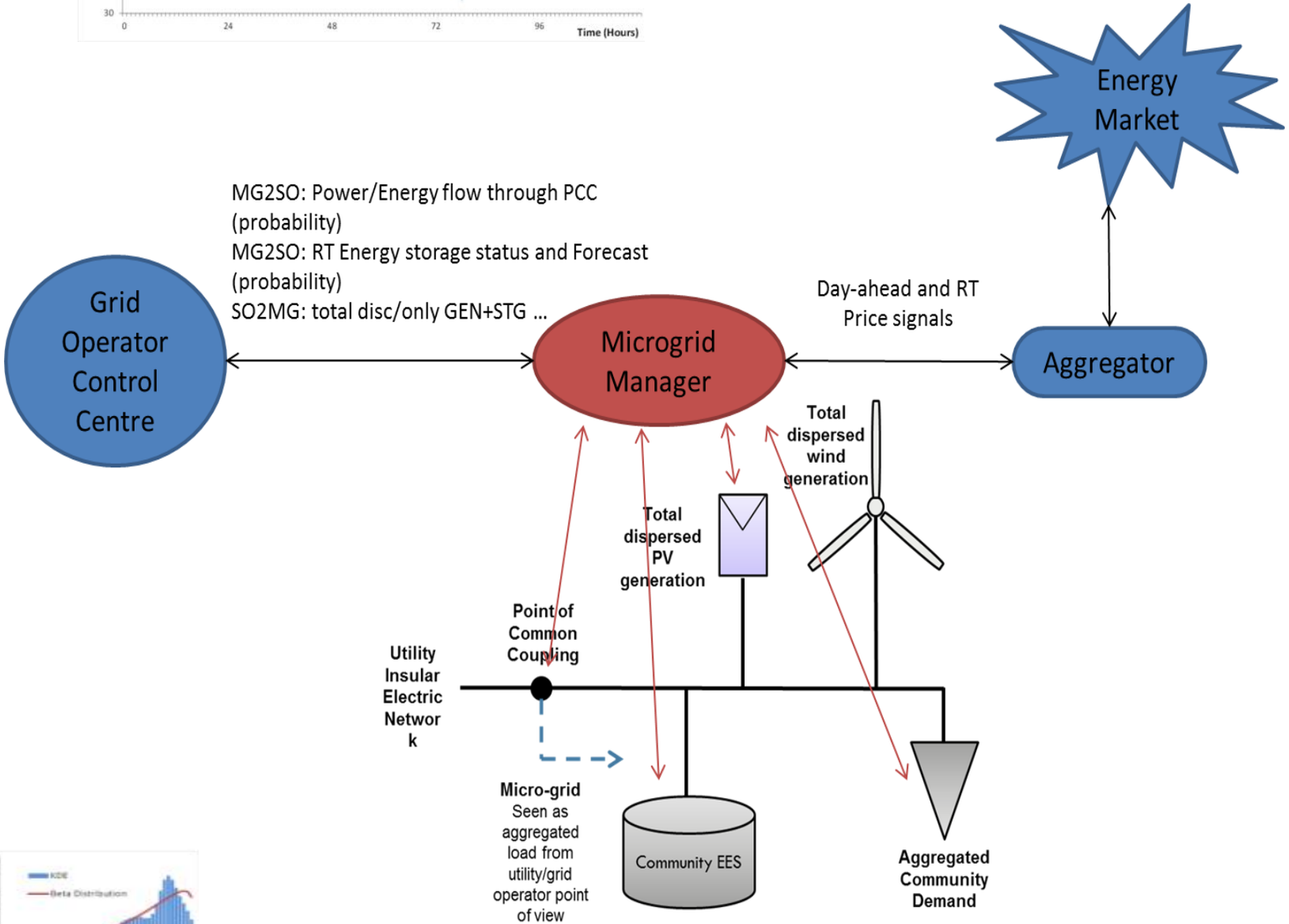
Emerging issues: grid-connected RES, large scale distributed generation (DG), informed or active consumers with real-time pricing, energy efficiency, demand response, energy storage, forecasting: Towards a Smart and Sustainable Grid!

Financed by EC FP7: 5,5 M€ (Dec. 2012- Dec. 2015)

Pilot sites for testing and validation:

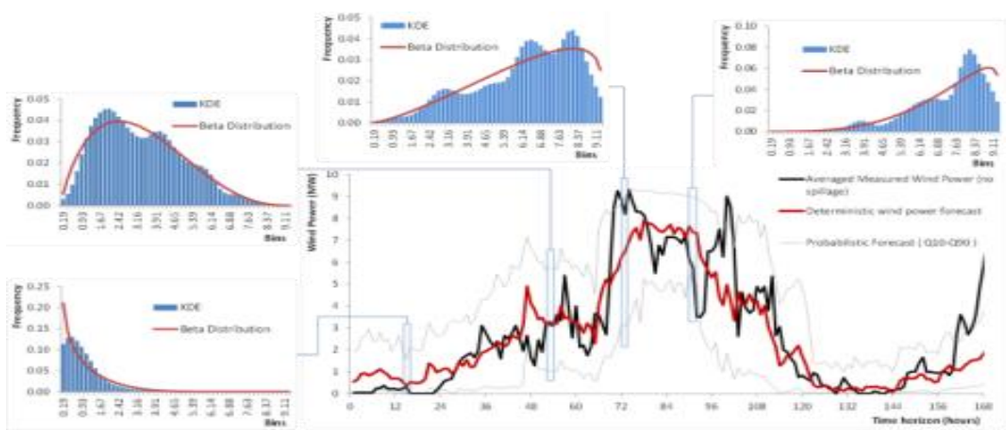
- S. Miguel Island, Azores – Portugal
- **La Graciosa, Canary Islands – Spain**
- **El Hierro, Canary Islands - Spain**
- Island of Pantelleria – Italy
- Crete Island – Greece
- Great Island of Brailla – Romania





Objectives:

- Reduce CoE
- Communicate to the Operator the status of the EES and forecast of the energy flow
- Receive emergency orders from the Grid Operator
- Ensure that the energy flow at the PCC is within the forecasted limits



TILOS Project (H2020)

INDUSTRIAL PARTNERS

EUNICE Laboratories SA (EL)

FIAMM Energy Storage Solutions SRL (IT)

Open Energi (UK)

SMA Solar Technology AG (DE)

Younicos AG (DE)

ISLAND GRID OPERATORS

Hellenic Electricity Distribution Network Operator S.A. (EL)

Schleswig-Holstein Netz AG (DE)

RESEARCH / ACADEMIC PARTNERS

Commissariat à l' Energie Atomique et aux Energies Alternatives (FR)

Instituto Tecnológico de Canarias S.A. (ES)

Kungliga Technica Hogskolan (SE)

Rheinisch-Westfaelische Technische Hochschule Aachen (DE)

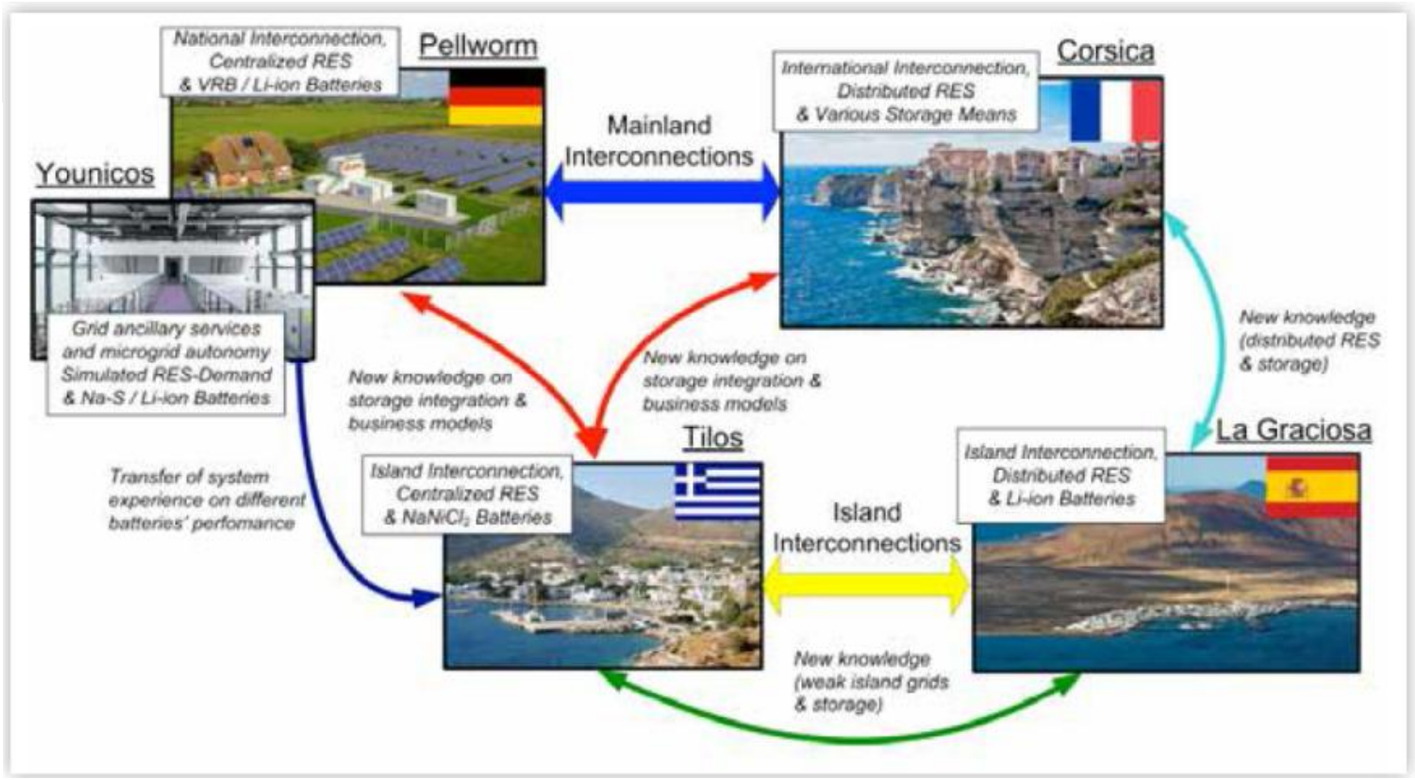
Technological Educational Institute of Piraeus (EL)

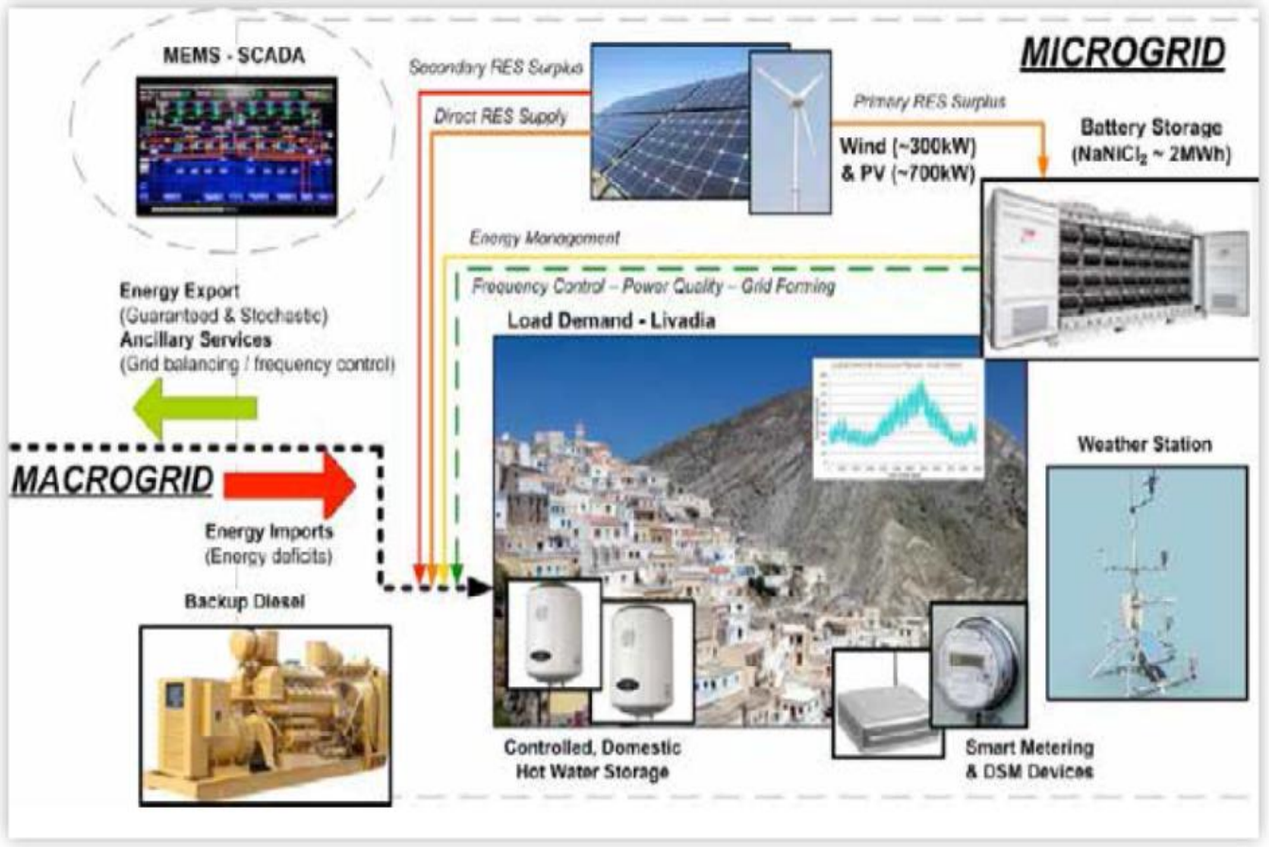
Universite de Corse (FR)

University of East Anglia - Business School (UK)

NGOs

WWF World Wide Fund for Nature - Greece (EL)





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Existing Expertise/Capacities (Energy & Water)

- Energetic optimization of the Water Cycle
- Water desalination and treatment/reuse technologies, powered by Renewable Energies (+ experience in Africa)
- Water quality (focus: coastal waters)
- Design of innovative & sustainable energy generation systems (microgrids, hybrid systems, etc.)
- Dynamic grid stability studies (using advanced software)
- Reversible pumped hydro power systems and design of energy storage solutions
- Integration of Renewable Energies in electricy grids; design of power electronics devices
- Energy Planning strategies (focus: insular systems & remote areas)
- Test of RES system components (both electrical (focus: PV) and thermal (solar heaters); modeling of thermal loads in buildings using advanced software; bioclimatic design of buildings

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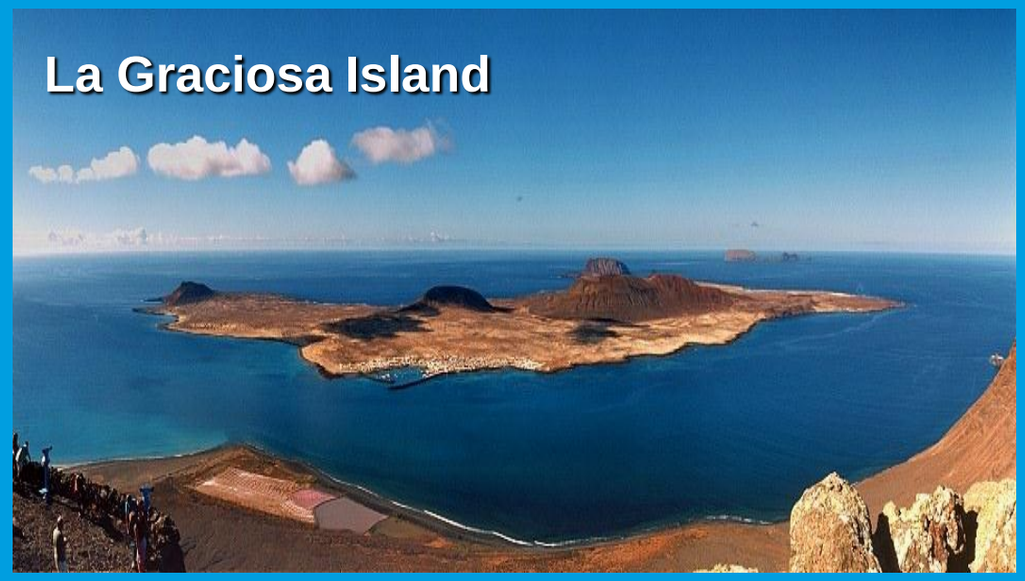
The paradigms of our vision: La Graciosa & El Hierro



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Gobierno de Canarias

La Graciosa 100% RES

On-going

La Graciosa:
650 inhabitants
0.7 MW peak
2 GWh/y demand

Smart Microgrid with high RES penetration, energy storage (incl. desalination) and electric vehicles fleet

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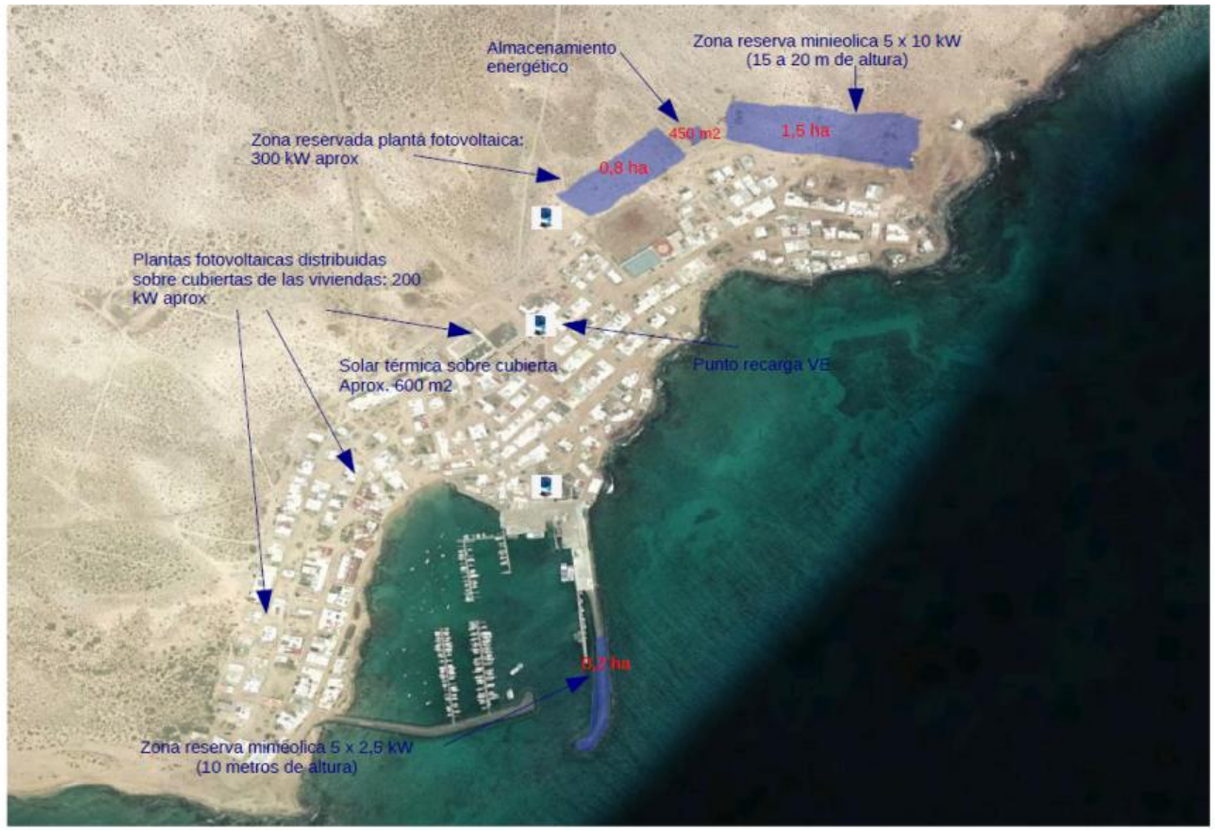
- Electric power supply through a submarine cable
  - Cable capacity = 1.030 kW
  - Max electric demand = 668 kW
  - Electric consumption 1,6 GWh/year
  - Diesel genset for emergencies
- Water supply through a submarine water pipe
- High wind and solar resources
  - Solar radiation = 4,9 kWh/m^2-d
  - Wind speed = 5,7 m/s

La Graciosa	
Permanent residents	658
Residents coming on weekends	200
Residents coming in summer	600
Touristic beds	400
Houses	
Electric consumption	1,6 GWh/y
Energy for Water consumption	175.200 kWh/y

- La Graciosa: The perfect object to illustrate one of the pillars of the new energy paradigm: distributed generation / RES micro-mini grids

Microgrid in La Graciosa Island

- Technical works on-going (coordination between ENDESA and ITC with the Insular Authority)



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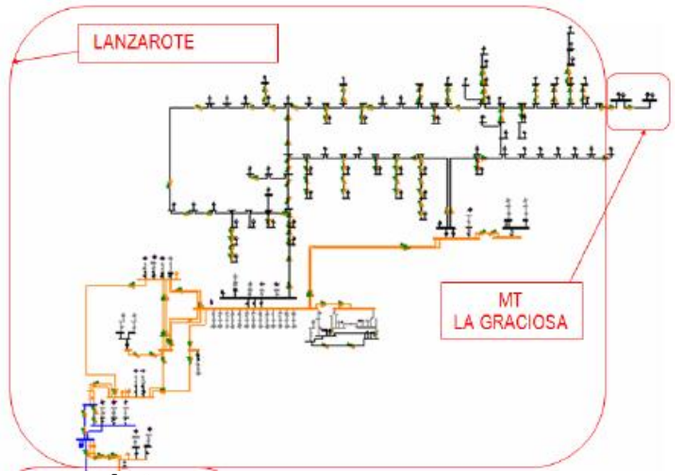
Microgrid in La Graciosa Island



- Insular authority is investing in:
  - Installation of PV systems
  - Installation of charging station for electric vehicles
- Technological Industrial partners (ENDESA, ENEL, ITC) are working together to raise funds for:
  - Installation of batteries
  - Finalisation of technical studies to maximize RES penetration

SMART METERS (already installed) + electric vehicles (planning phase)

El Hierro: first 100% RES Island

278 km^2

10.500 inhabitants

7 MW peak

40 GWh/y demand (Diesel)

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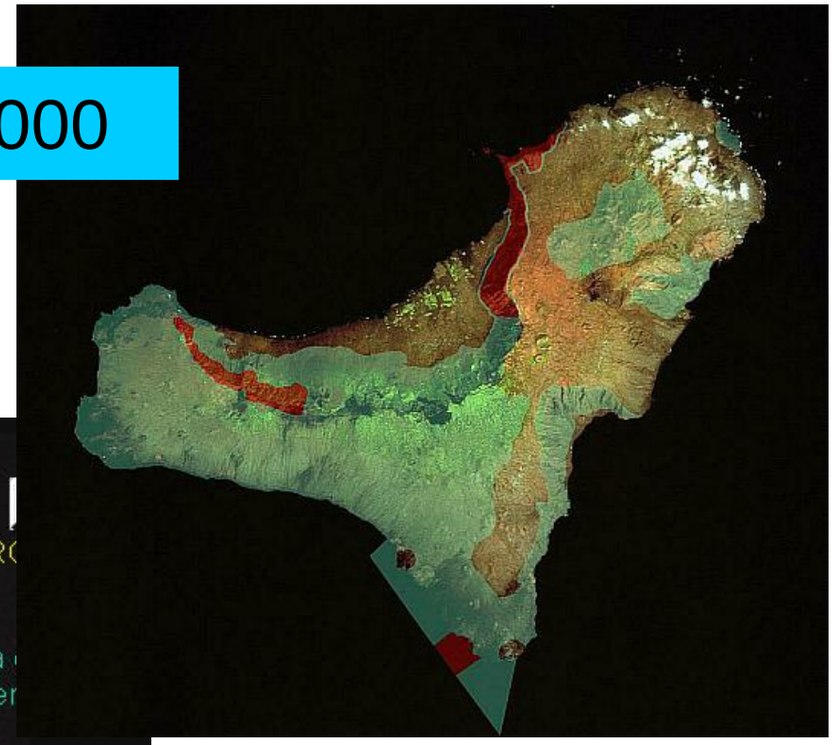
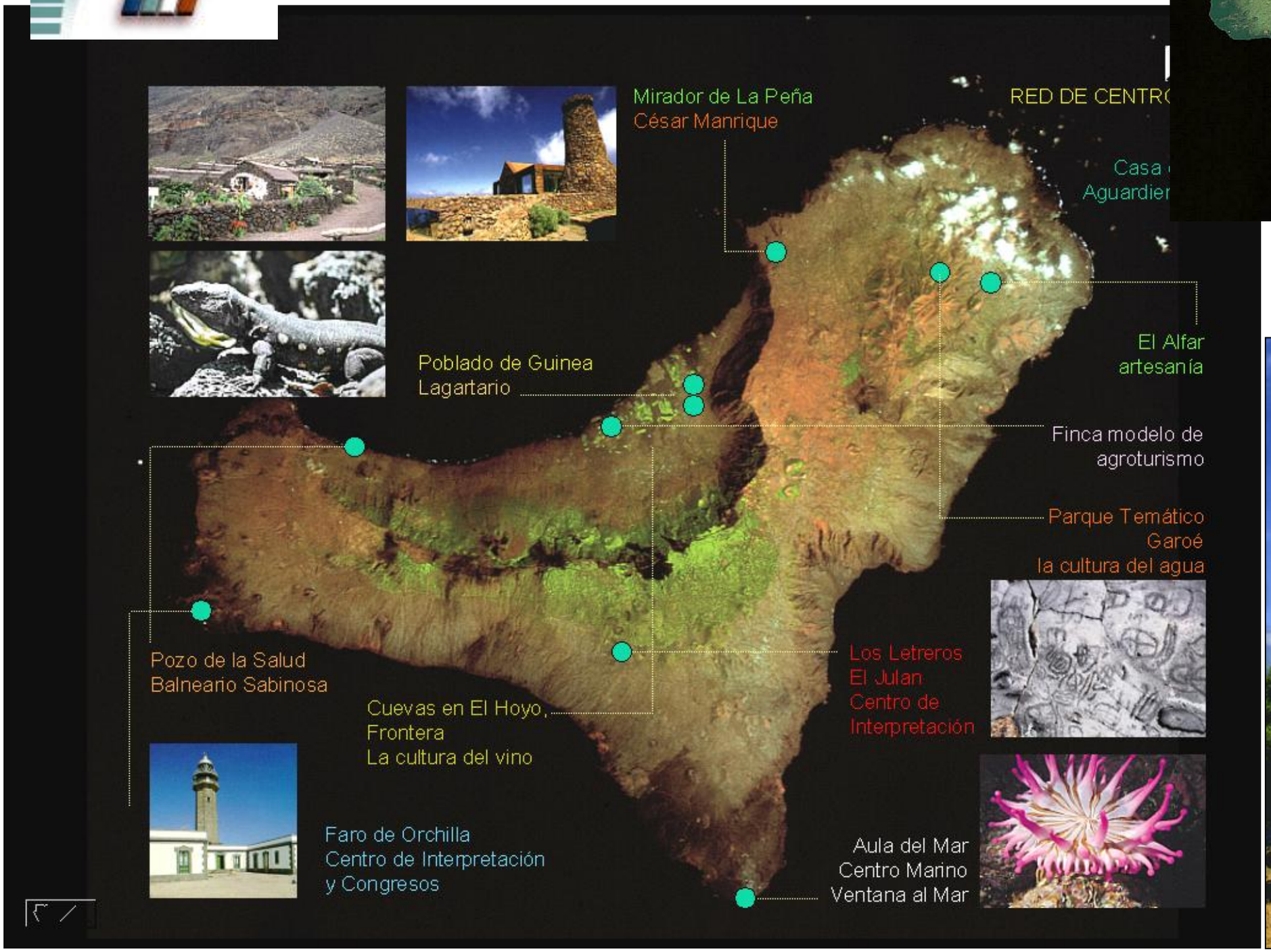
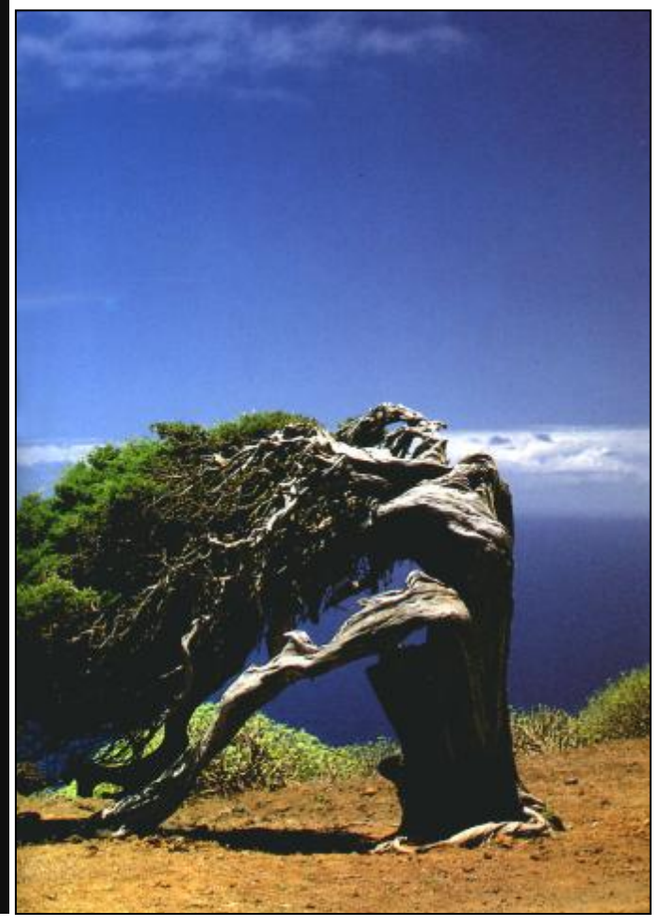
EL HIERRO
Sustainible Development Plan (1997)
Biosphere Reserve Declaration (2000)

BIOSPHERE RESERVE – UNESCO - JANUARY 2.000

Sustainable Development Program
SDP







Sustainable Development Program

Start 1995

Updated 2006

Arquitecture
Tourism
Agriculture
Employment
Fisheries
Energy
Water
Culture
Transportation
Comercialization
Wastes
Livestock
Industry
Etc.

Sustainable Development Program

6 CRITERIA

1.- People as the Main Target

2.- Clean Production and Technologies

3.- Systems Design

4.- Creating Cycles

5.- Economical System / Local Economy

6.- Social Development and Citizens Participation

¿What have we done untill now towards sustainability?

Organic Agriculture
Waste Recycling
Marine Reserve
El Hierro, UNESCO Biosphere Reserve
Primary Sector Products Processing
Sustainable Water Management
Sustainable Tourism
Renewable Energies

"El Hierro, Comunidad Sostenible"

100% renewable energy supply

- Design and construction of a Wind-Pumped Hydro Power Station
- Installation of solar collectors & PV systems
- Evaluation of biomass exploitation possibilities
- Transport. Sustainable Mobility
- Environmental Education

Wind-Hydro Power Station

Gorona del Viento
El Hierro S.A.

Gorona del Viento
El Hierro S.A.

CABILDO EL HIERRO

unelco endesa

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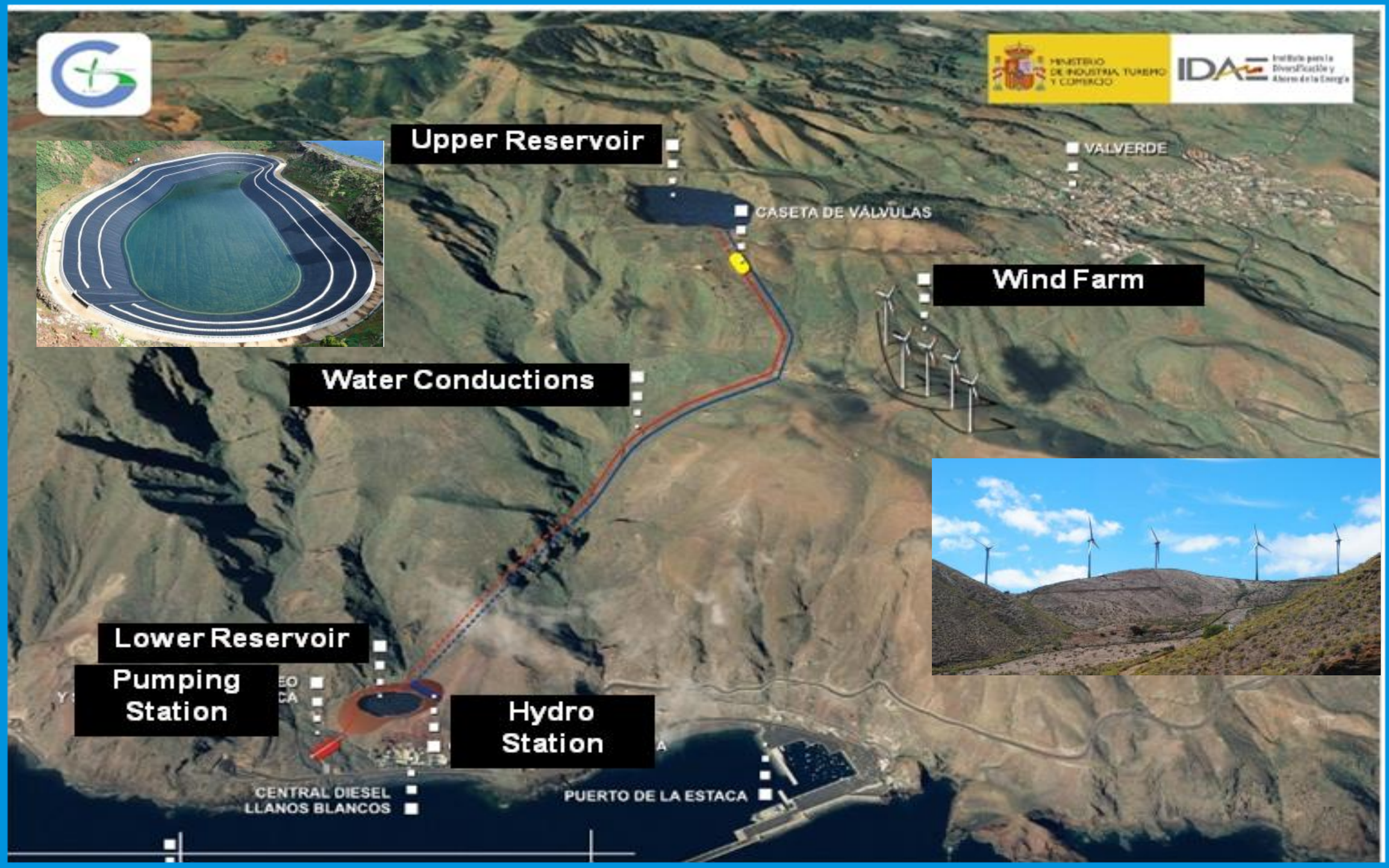
Gobierno de Canarias

MINISTERIO DE INDUSTRIA, TURISMO Y COMERCIO

IDAE Instituto para la Diversificación y Ahorro de la Energía

El Hierro: 100% RES Island

In operation since 2014



Wind – Pumped Hydro Power Station

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Gobierno de Canarias


DEPÓSITO SUPERIOR
VALVERDE
CASETA DE VÁLVULAS
PARQUE EÓLICO
TUBERÍAS FORZADAS
DEPÓSITO INFERIOR
CENTRAL DE BOMBEO
Y SUBESTACIÓN HIDROEÓLICA
CENTRAL HIDROELECTRICA
CENTRAL DIESEL
LLANOS BLANCOS
PUERTO DE LA ESTACA

Wind-Hydro Power Station

Wind Farm	**11,5 MW**
Hydroelectric Substation	**11,3 MW**
Pumping Station	**6 MW**
Upper Reservoir	**400.000 m^3**
Lower Reservoir	**150.000 m^3**

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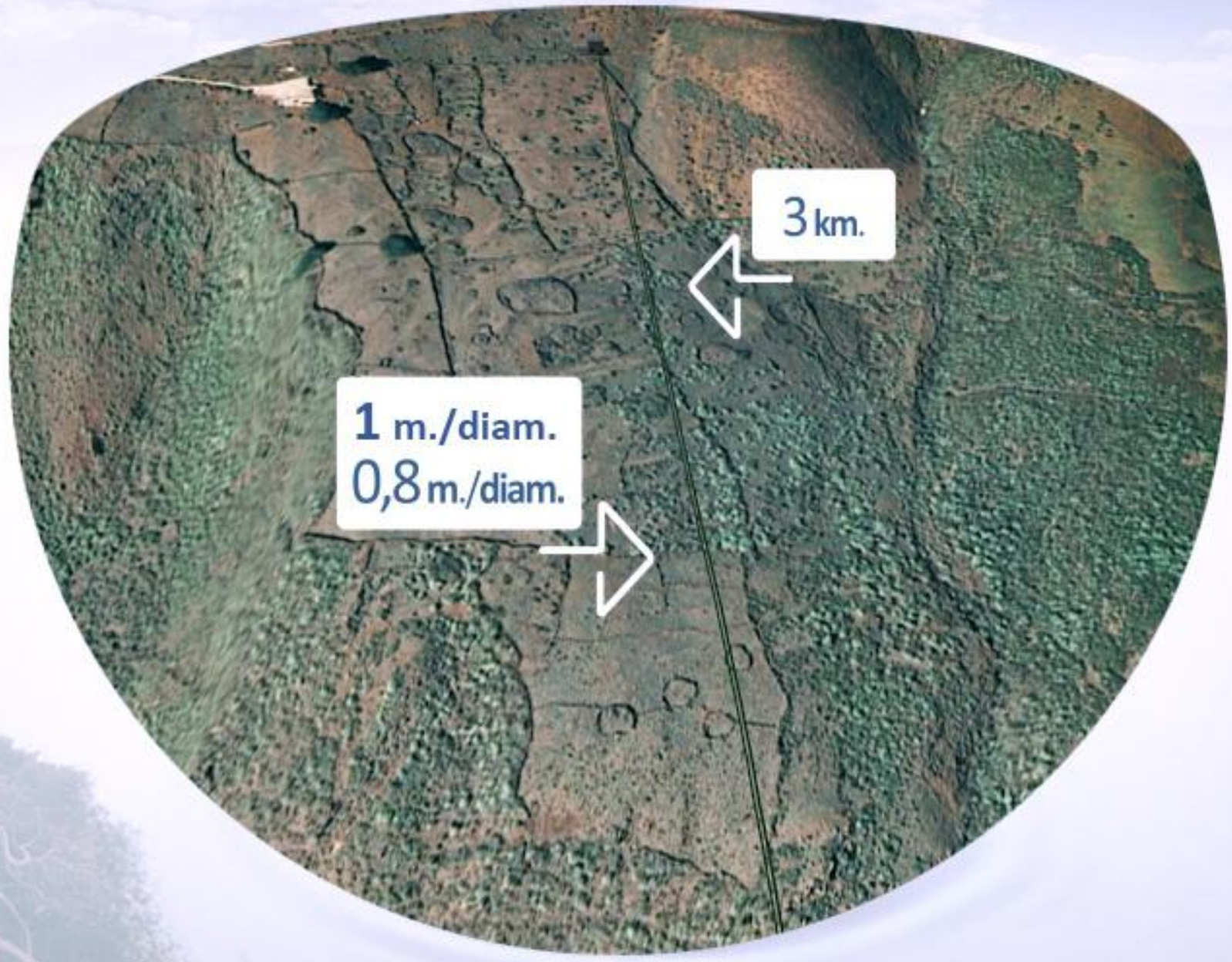
Upper Reservoir


acciona
Leciñena

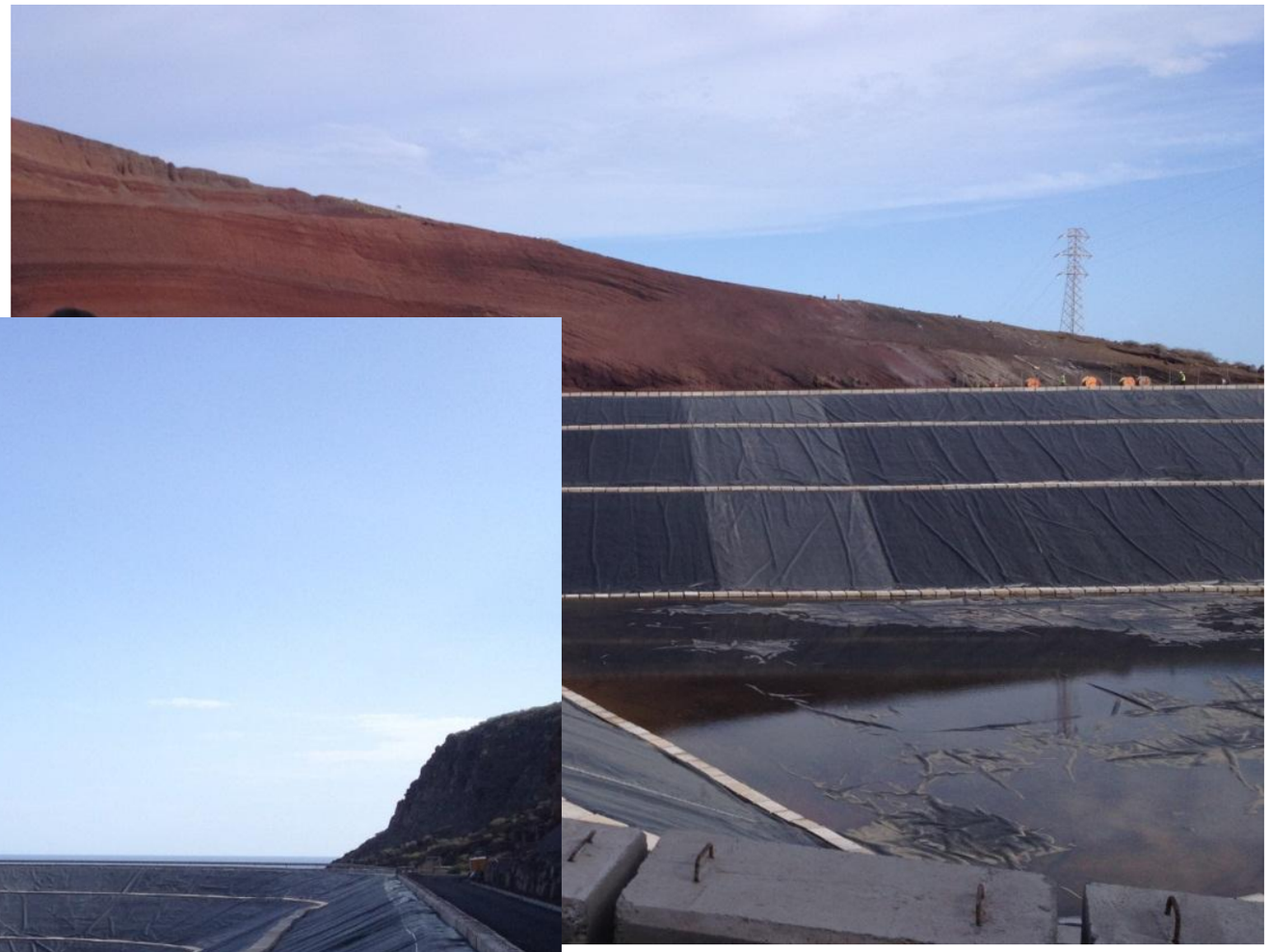
Gorona del Viento
El Hierro S.A.

Conductions



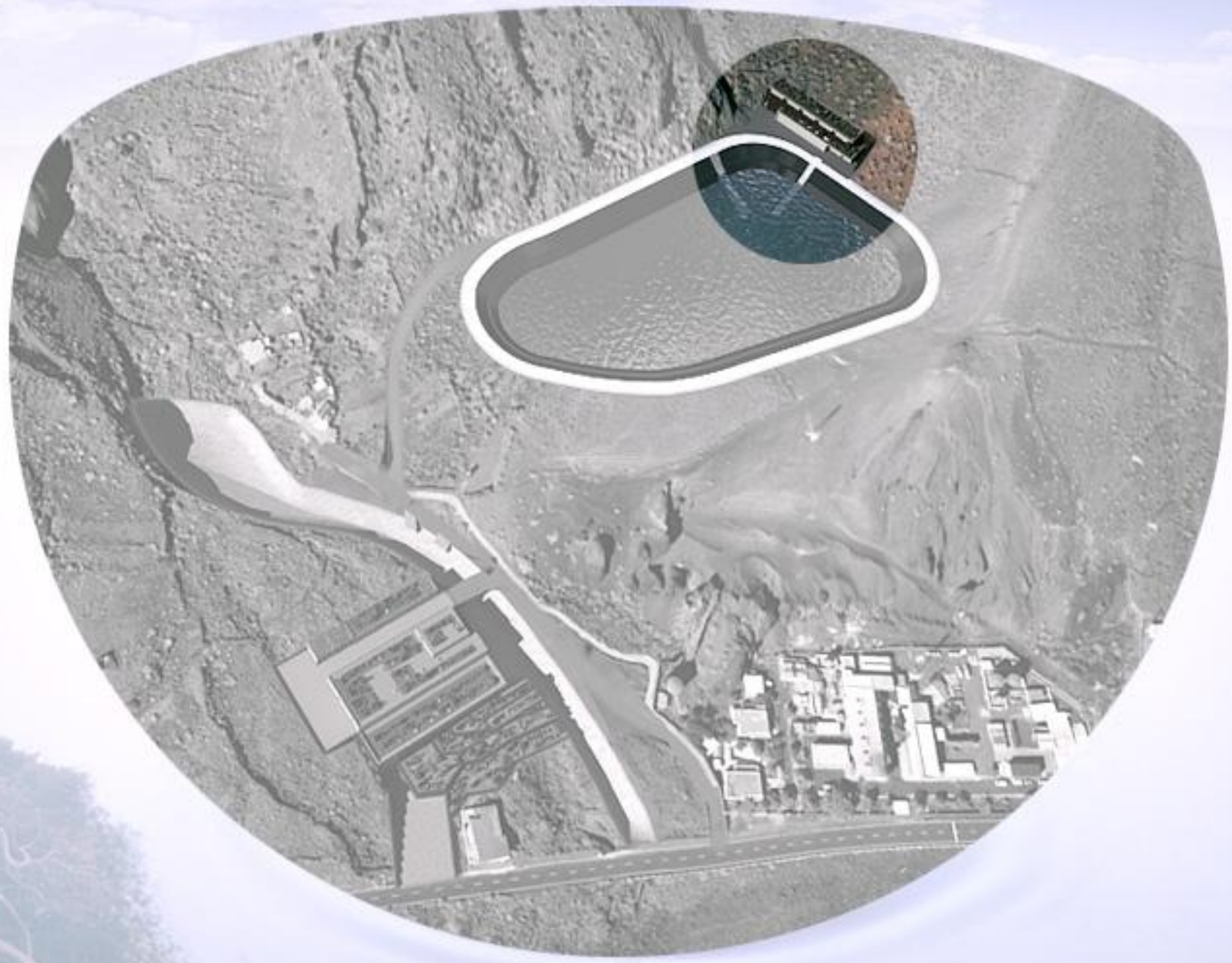
Lower Reservoir

Gorona del Viento
El Hierro S.A.



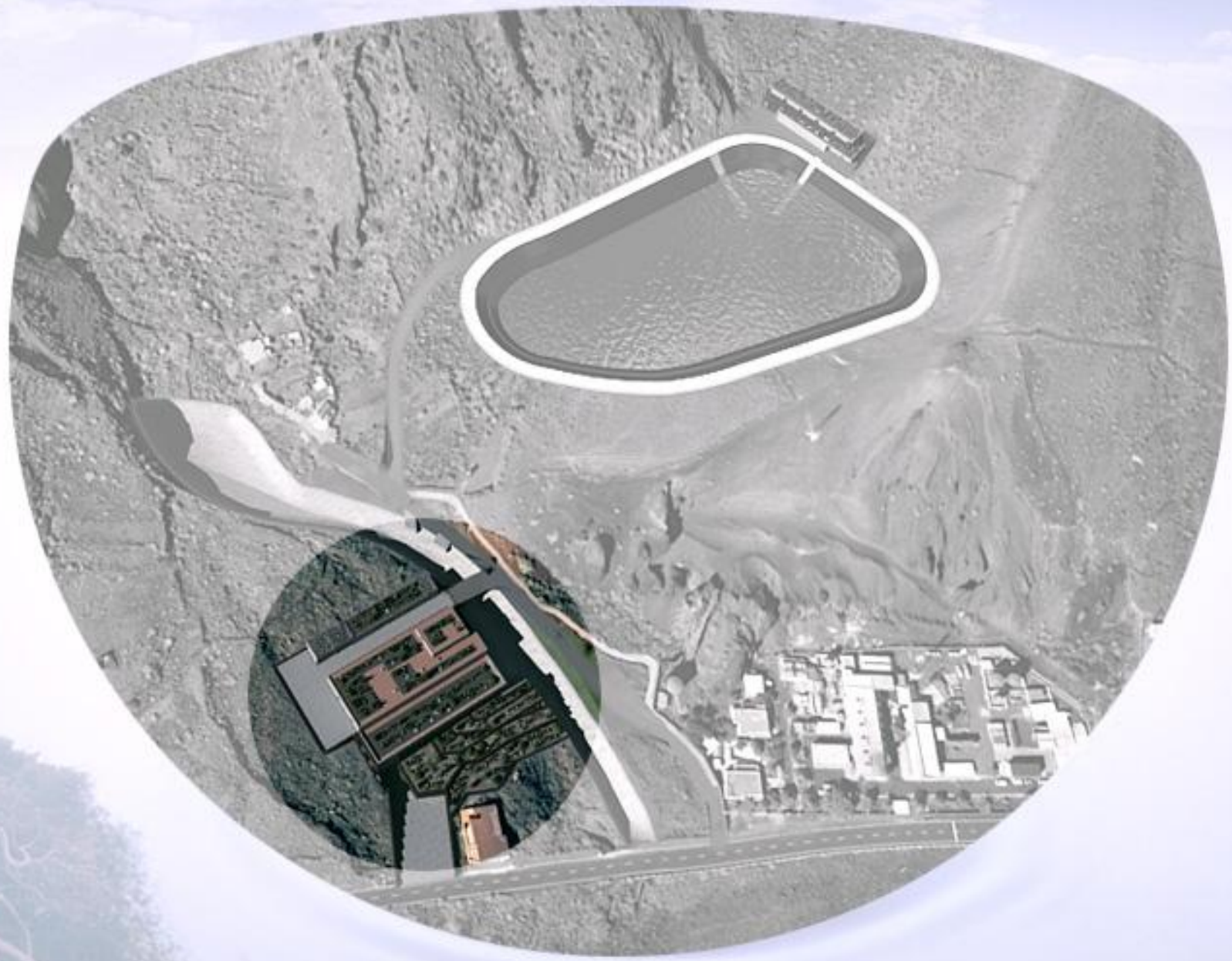
Gorona del Viento
El Hierro S.A.

Hydro-Station




Grupos Turbogeneradores

Pumping-Station



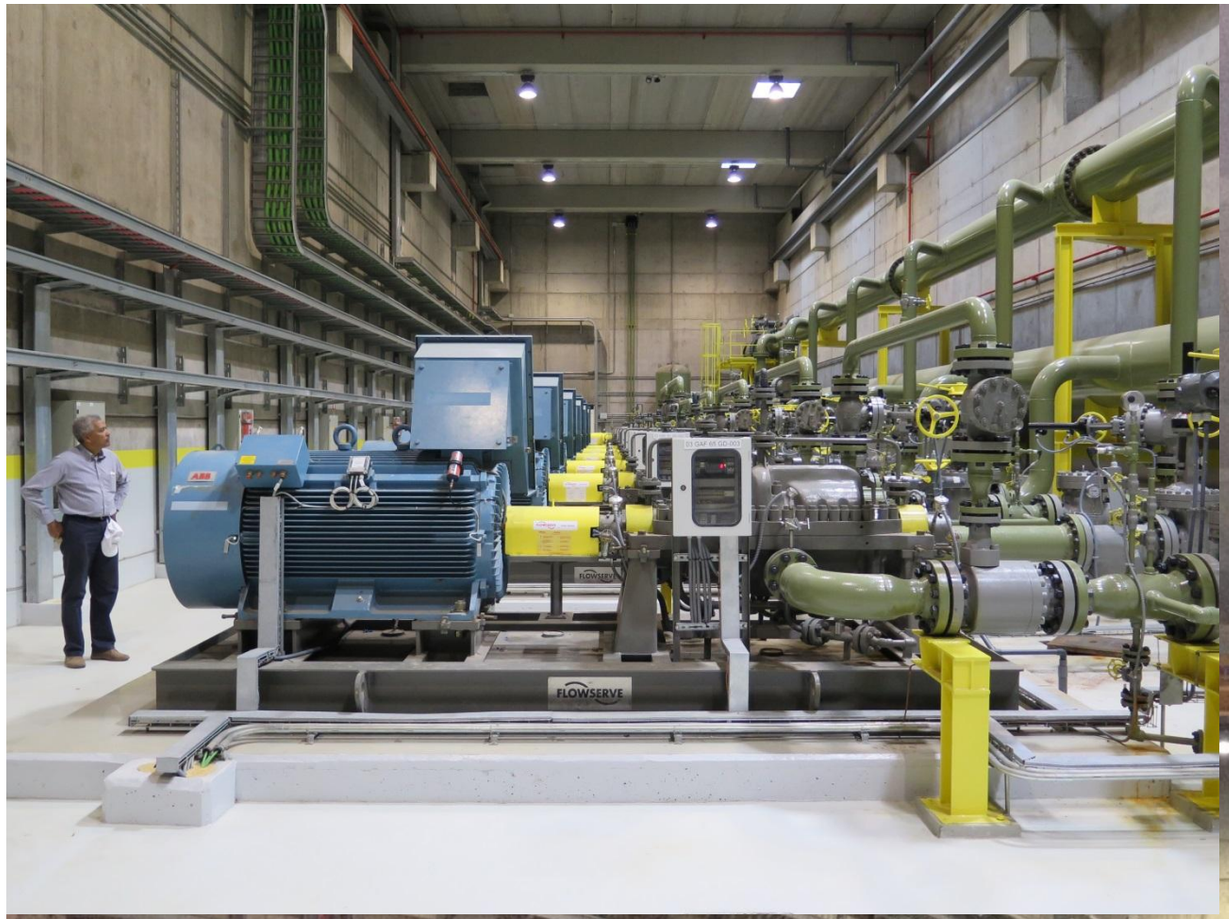

Edificio Central:
Subestación
Hidroeólica y
Sala de Bombas
Gorona del Viento El Hierro, S.A.


FASSI


acciona


ABB
FLOWSERVE

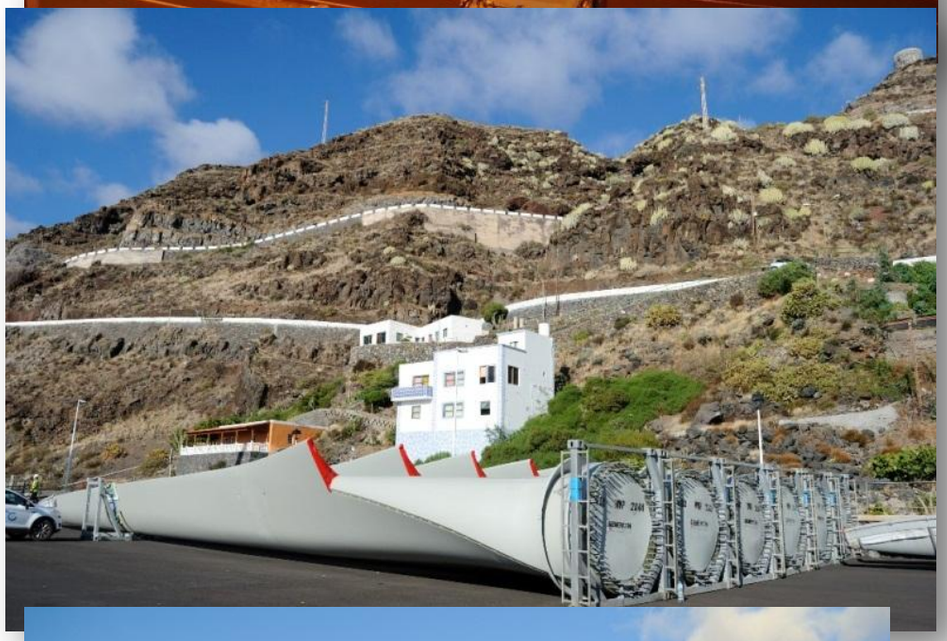
FLOWSERVE
FLOWSERVE
ABB


FLOWSERVE

Wind Farm

Gorona del Viento
El Hierro S.A.


B B C




678 WP 2039
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ENERGIA
SP
8501CSG


TIMIJIRAQUE
Parador
Las Playas
MAN


INAUGURACIÓN
Central Hidroeólica
de El Hierro
INAUGURATION
Wind-Pumped-Hydro
Power Station
of El Hierro
27JUN
2014
Gorona del Viento
El Hierro, S.A.
endesa
itc

Five E-70

energy-self-sufficient El Hierro

ENERCON WIND TURBINES WORK IN COMBINATION WITH A PUMPED STORAGE SYSTEM. THE PROJECT MAKES POWER GENERATION ON EL HIERRO COMPLETELY INDEPENDENT OF FOSSIL FUELS.

El Hierro has set itself ambitious goals for power production. The smallest of the Canary Islands soon wants to meet its electricity demand using one hundred percent renewable energies. The electrical energy will be produced directly on the island to make El

from the Spanish Government and the European Union. The project was realised on the west coast near the island's main settlement of Valverde. ENERCON supplied the wind energy converters and the wind farm control unit (FCU). Five E-70/2.3 MW wind turbines

Upper reservoir of El Hierro's hybrid power plant. In the background to the right the wind farm.

GRAN CANARIA
El Cabildo recrea en 3D el yacimiento de Risco Caído, en Artenara

ARQUEOLOGÍA. SANTUARIO. El yacimiento de Risco Caído tiene ya una reproducción virtual en 3D, en 700 millones de puntos, recreación de una definición tan alta que permitiría realizar una copia exacta. Es lo que el Cabildo quiere hacer, una réplica de la cueva número 6, la más espectacular.

Inauguración de Gorona del Viento. La Isla del Meridiano comienza a producir energía 100% renovable

» El arranque del parque eólico marca el punto de partida para el autoabastecimiento energético y de agua

EL HIERRO ENCIENDE LA LUZ LIMPIA

El arranque ayer de la Central Hidroeólica de El Hierro convierte a la Isla y a Canarias en referente mundial en energías renovables. Su inauguración, en medio del debate de las prospecciones petrolíferas que el Estado ha autorizado frente a Lanzarote y Fuerteventura, se aprovechó para pedir una Canarias «verde y azul, no negra».

R. R. / VALVERDE (EL HIERRO)

Siete minutos tardaron ayer en echar a andar los cinco aerogeneradores del parque eólico de la Central Hidroeólica de El Hierro. A las 10.40 de la mañana se iniciaba el proceso con la calibración de las aspas según la dirección y velocidad del viento

con energía 100% limpia y para demostrar que «las energías renovables y la demanda son gestionables», dijo Alpidio Armas no sin recordar que la Isla tiene ahí «la llave del modelo de transición energética» que «dará a otros territorios del mundo».

Paulino Rivero, por su parte, no desaprovechó la ocasión para incidir en que «Canarias quiere un futuro verde y azul, pero nunca negro», en clara alusión al petróleo que el Gobierno de la Nación ha autorizado a buscar frente a Lanzarote y Fuerteventura. «Los combustibles fósiles son el pasado», dijo al tiempo que recordó que «frente a los que algutilan el mar a quienes no quieren a Canarias, estamos nosotros

Estación de aerogeneradores de Gorona del Viento, en la isla de El Hierro (Canarias). / ORIANA MARTIN (AFP)

El Hierro prescinde del petróleo

Una nueva central hidroeólica suministrará toda la energía que necesitan sus 10.000 habitantes ● Se espera que todos los coches sean eléctricos en 2020

fuente de energía intermitente en

ENERGÍAS RENOVABLES **PUESTA EN MARCHA DE LA CENTRAL HIDROEÓLICA HERREÑA**

Gorona del Viento ahorra a la atmósfera 18.700 toneladas anuales de CO2

La central hidroeólica pone sobre el Hierro el foco mundial en energías limpias ● Paulino Rivero y Hernández Bento ajustan cuentas por el crudo

con energías renovables en Canarias es mucho más barata que la convencional, léase quemar hidrocarburos en centrales térmicas.

Traducido a consumo de gasoil, el ahorro es de 6.000 toneladas al año. Y llevado a moneda corriente, el abastamiento será de 81,45 millones de euros en los próximos veinte años. Dicha cantidad paga la obra, por lo que ni el Estado, ni los socios de Gorona –Cabildo herreño (60%), Endesa (30%) y Gobier-

Inauguración de Gorona del Viento. El evento reunió en El Hierro a más de 200 personas » Media docena de invitados portaba pegatinas en contra del petróleo » Una cápsula del tiempo recordará el arranque de la central

ACTO SENCILLO QUE PASARÁ A LA HISTORIA

1 Dos escenarios para más de 200 invitados

El acto de inauguración de la Central Hidroeólica de El Hierro tuvo lugar en dos escenarios: el parque eólico y el mirador de La Peña, diseñado por César Manrique. Se habilitaron varias guaguas para trasladar a los más de 200 invitados al evento.

2 El himno del Cabildo, de Benito Cabrera, amenizó

Tanto en el parque eólico, situado en las proximidades de Valverde, como en el mirador de la Peña, el evento estuvo amenizado por el himno del Cabildo de El Hierro, compuesto por el timplis-

Instituto Tecnológico de Canarias

Thank you very much!

Gonzalo Piernavieja

gpiernavieja@itccanarias.org

sdewes | 11th CONFERENCE ON SUSTAINABLE DEVELOPMENT OF ENERGY, WATER AND ENVIRONMENT SYSTEMS

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