

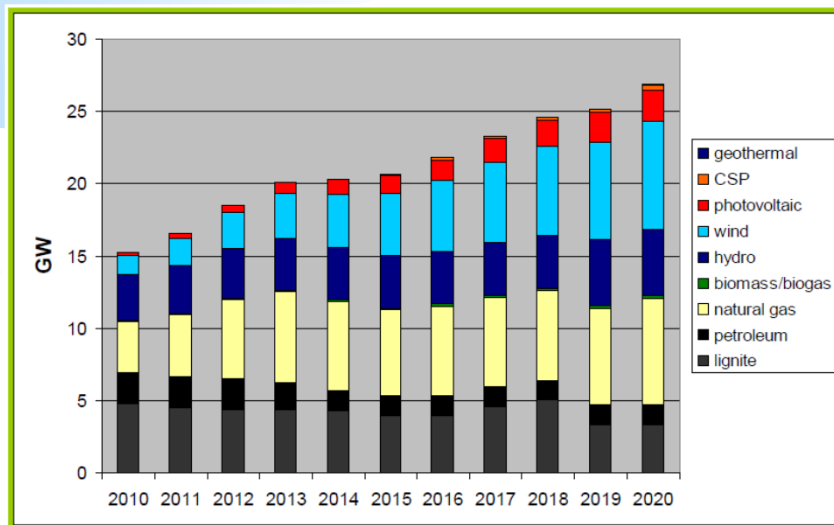
Αξιοποιώντας τις ευκαιρίες των ΑΠΕ: Η περίπτωση της Ελλάδας

RES opportunities explored: The Greek Case

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National Action Plan for RES (2010-2020)



Estimated installed capacity of the different technologies for electricity production

In 2010 Greece presented its National Action Plan for Renewable Energy Sources (time frame 2010-2020)

It is an ambitious plan aiming to reform the country's energy sector so that 20% of the primary energy use is coming from RES by 2020 (penetration level: 40% electricity, 20% heat and 10% transport)

In the electricity sector, major RES players are going to be Wind and PV (7.5 and 2.2 GW target values for 2020) and, evidently the existing large hydro.

This does not exclude additional contributions from other RES e.g. biomass, geothermal energy and concentrated solar power.

Investments needed (2010-2020)

Mil. euro (2005)	Total 2010-2020
Lignite	2100
Natural gas	3311
Oil	249
Large hydro	650
Small hydro	137
Pump storage	1672
PV	5508
Solar thermal	1120
Wind	6710
Geothermal	264
Biomass/biogas	530
Total	22252
<i>from which RES</i>	16455

The overall investments needed in the energy sector are estimated to 22.2 billion euro for the 2010-2020 timeframe

From these 16.5 will go to new RES capacity, nearly 7 billion to wind, 5.5 billion to PV, 1.6 billion to pump storage for supporting the variable RES production, 1.1 billion to solar heating and cooling, 0.5 billion to biomass and biogas projects

On fossil fuels, Greece will spent 2.1 billion euro for new «clean coal» (lignite in our case) power plants while 3.3 billion will be invested in natural gas facilities

Details of the total budget needed for 2010-2020 are shown on the table

An additional budget of 5 billion euro will be needed for grid reinforcement and interconnections

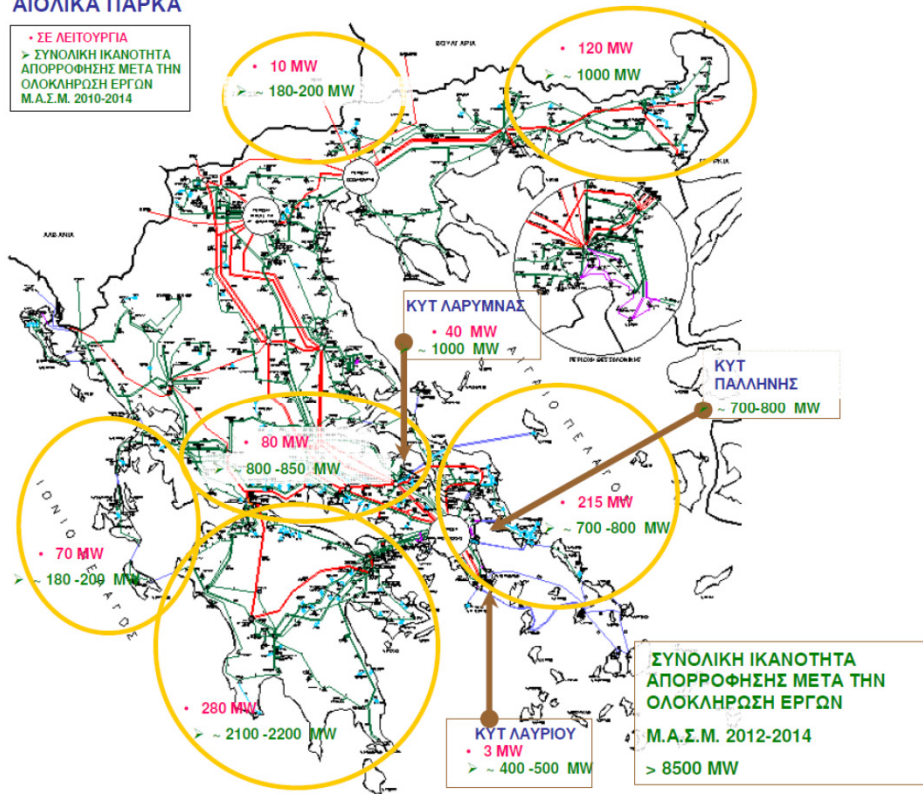


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Accompanied by a huge (5+ billion euro) grid reinforcement and interconnection program (islands)

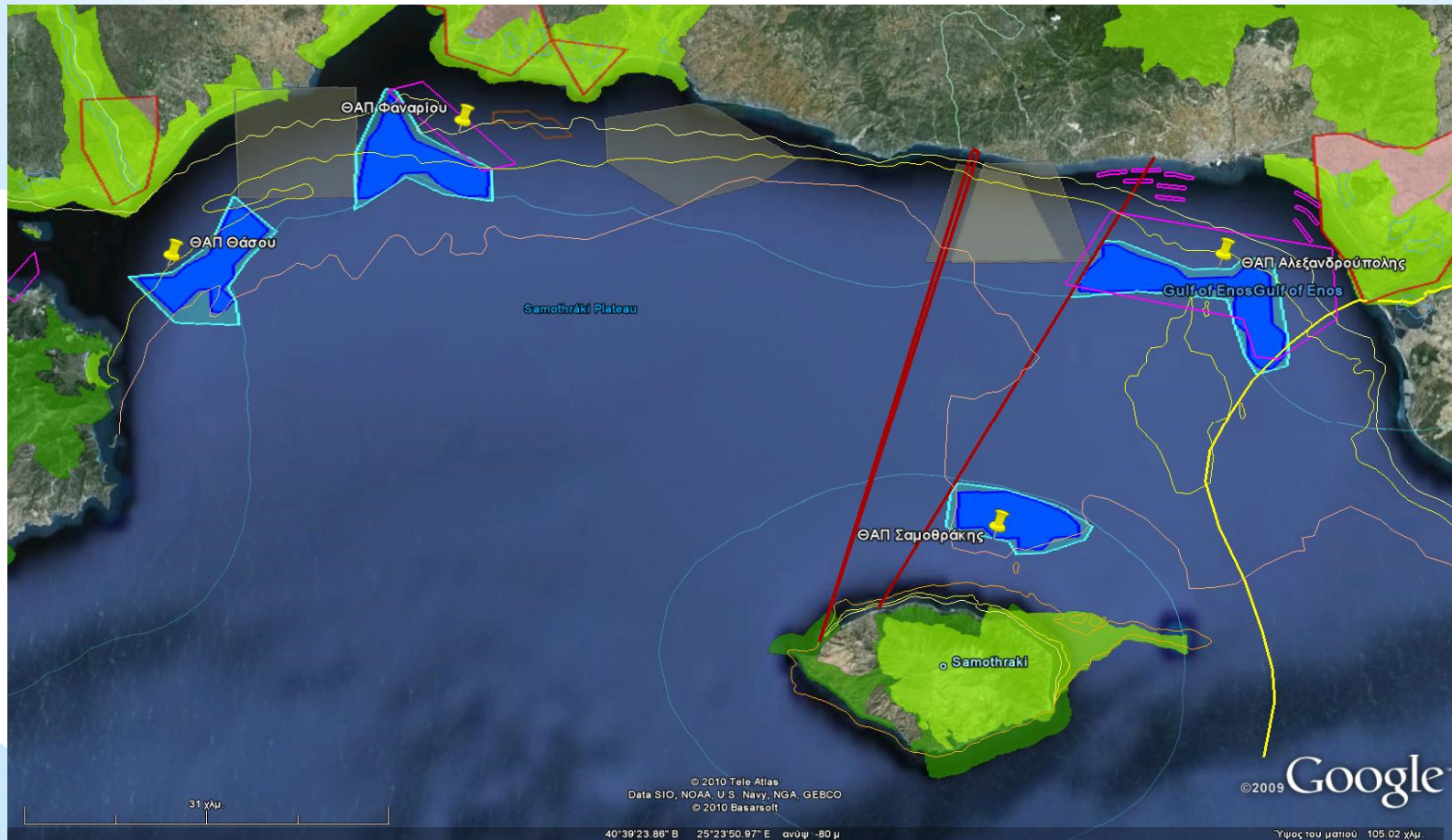
ΑΙΟΛΙΚΑ ΠΑΡΚΑ

• ΣΕ ΛΕΙΤΟΥΡΓΙΑ
> ΣΥΝΟΛΙΚΗ ΙΚΑΝΟΤΗΤΑ ΑΠΟΡΡΟΦΗΣΗΣ ΜΕΤΑ ΤΗΝ ΟΛΟΚΛΗΡΩΣΗ ΕΡΓΩΝ
Μ.Α.Σ.Μ. 2010-2014





Exploiting new RES-Electricity options, like offshore wind





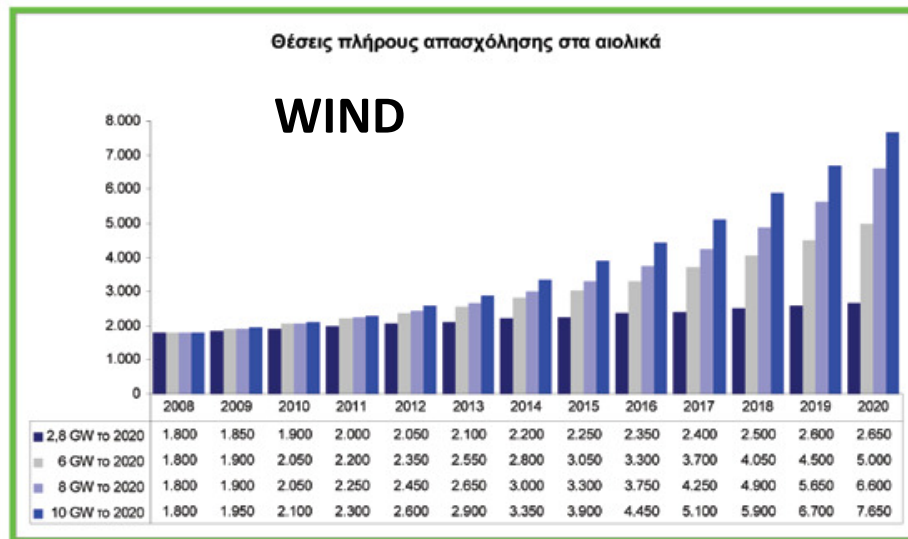
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The desired renewable mix (2014/2020) Ministerial Decree, October 2010

Technology	Actual	Targets		Actual
	End 2009	2014	2020	Sep 2013
Hydro	3201	3700	4650	3236
<i>Small (0-15MW)</i>	<i>183</i>	<i>300</i>	<i>350</i>	<i>218</i>
<i>Large (>15MW)</i>	<i>3018</i>	<i>3400</i>	<i>4300</i>	<i>3018</i>
Photovoltaics	53	1500	2200	2160
<i>Roofs (10 kW)</i>	<i>0</i>	<i>excl</i>	<i>excl</i>	<i>367</i>
<i>Farmers</i>	<i>0</i>	<i>500</i>	<i>750</i>	<i>2160</i>
<i>Rest</i>	<i>53</i>	<i>1000</i>	<i>1450</i>	
CSP	0	120	250	0
Wind (including offshore)	1167	4000	7500	1809
Biomass	43	200	350	46



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Employment

Greenpeace (2009)

PV (Helapco 2013)

1.5 bEuro investments in 2013

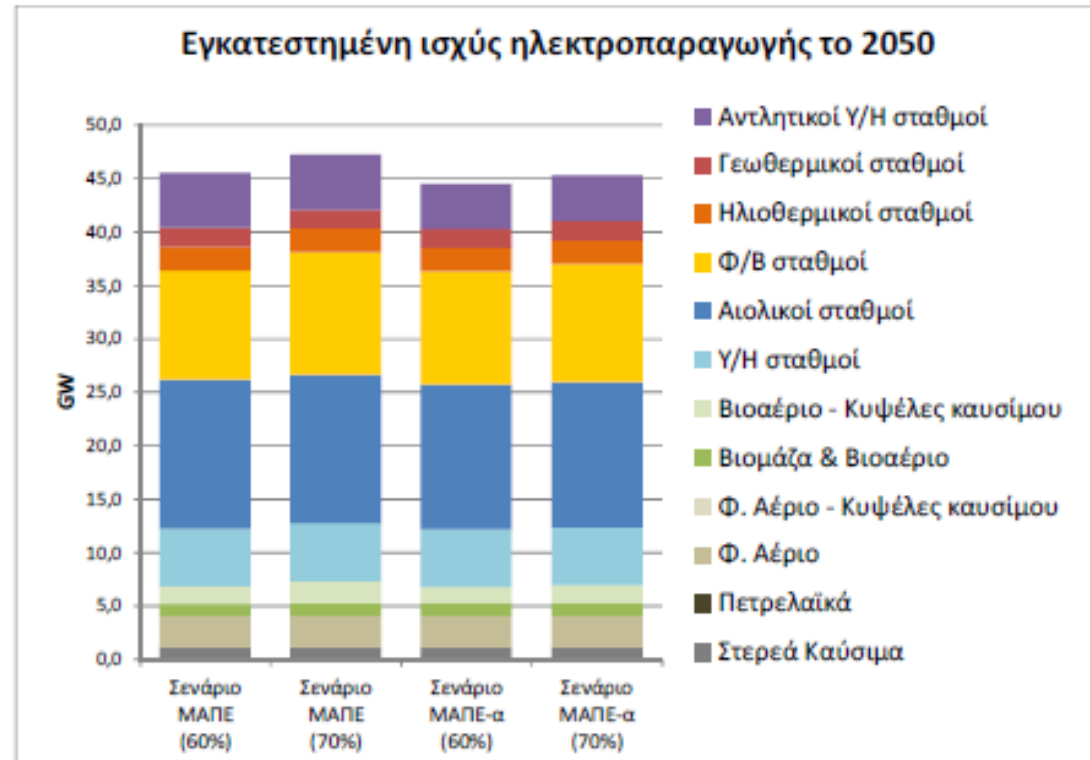
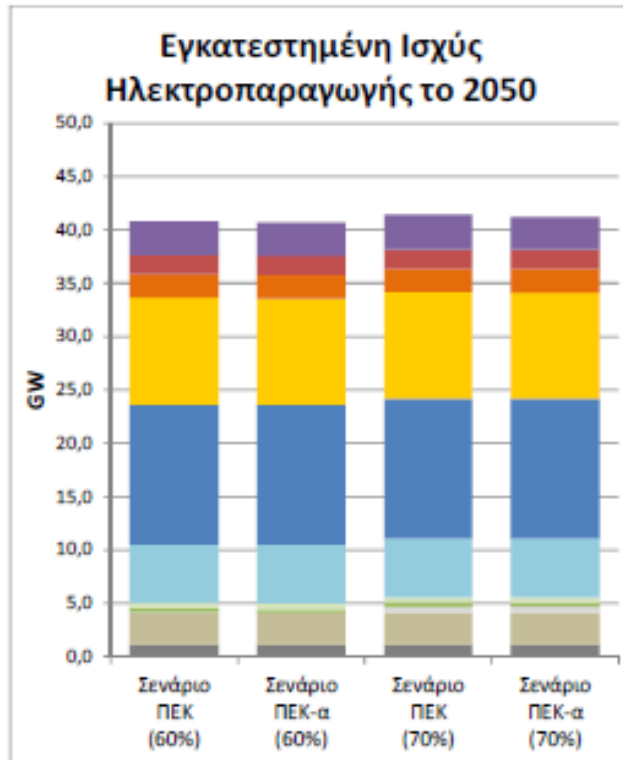
4.5 bEuro investments the last 5 years

20.000 direct and 30.000 indirect employment

38.000 households and 13.500 SMSs beneficiaries



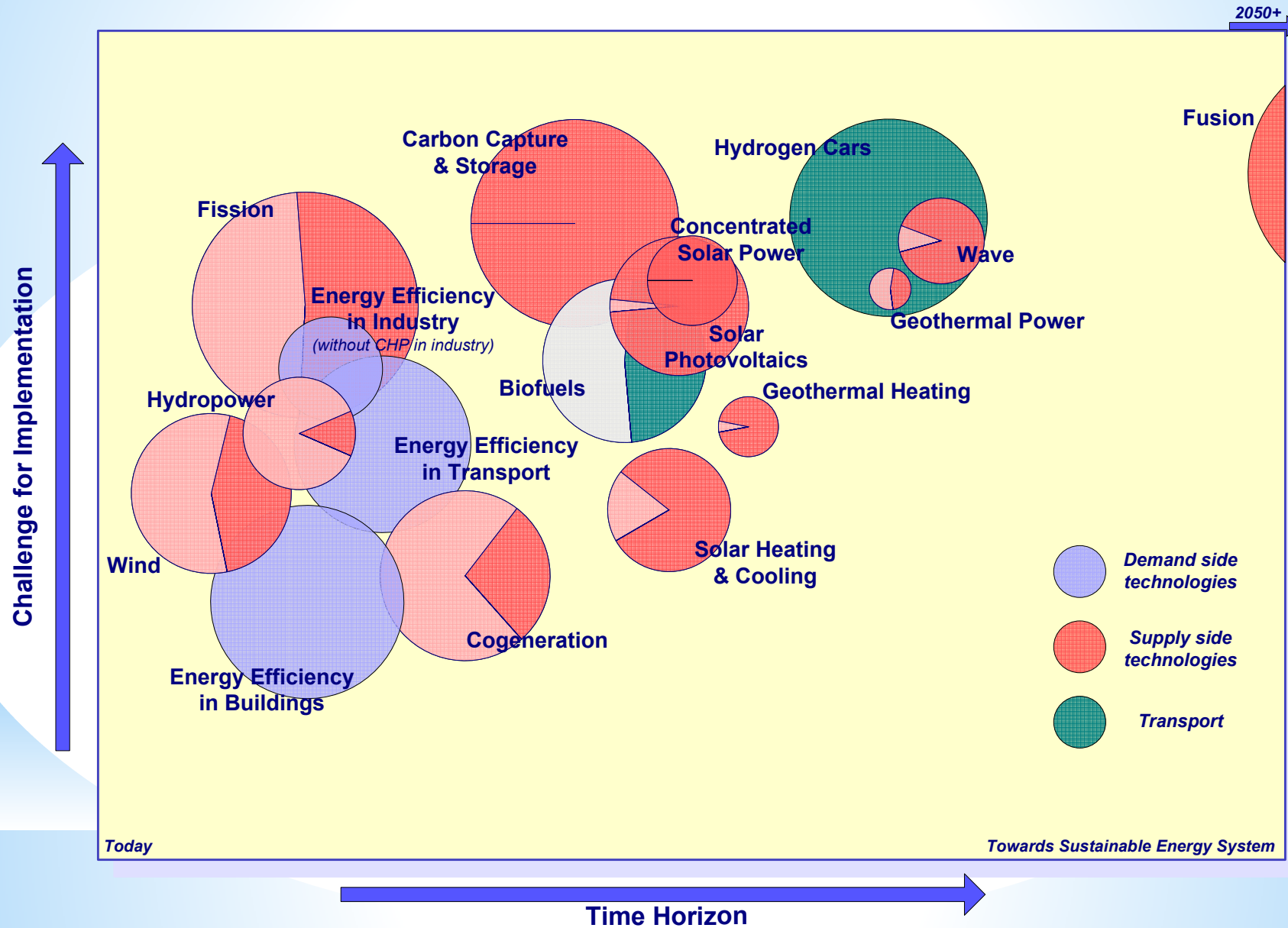
The 2050 low GHE vision, scenarios and roadmaps for Greece



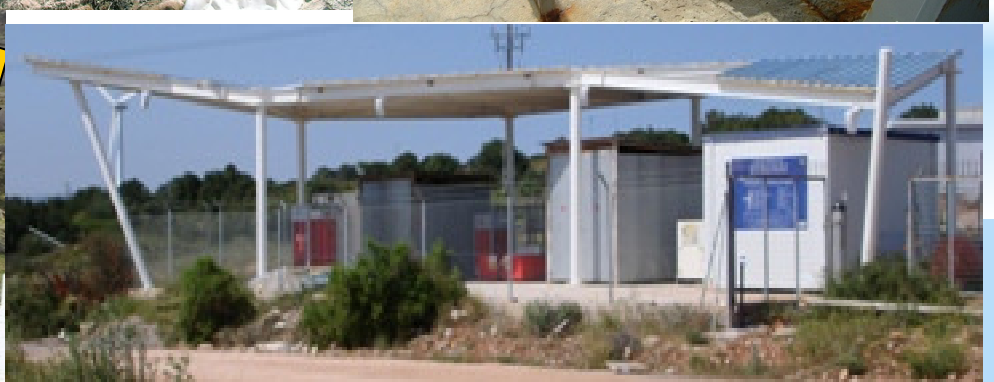


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Technology Roadmap, SET-Plan



Selected RTDI Projects of CRES

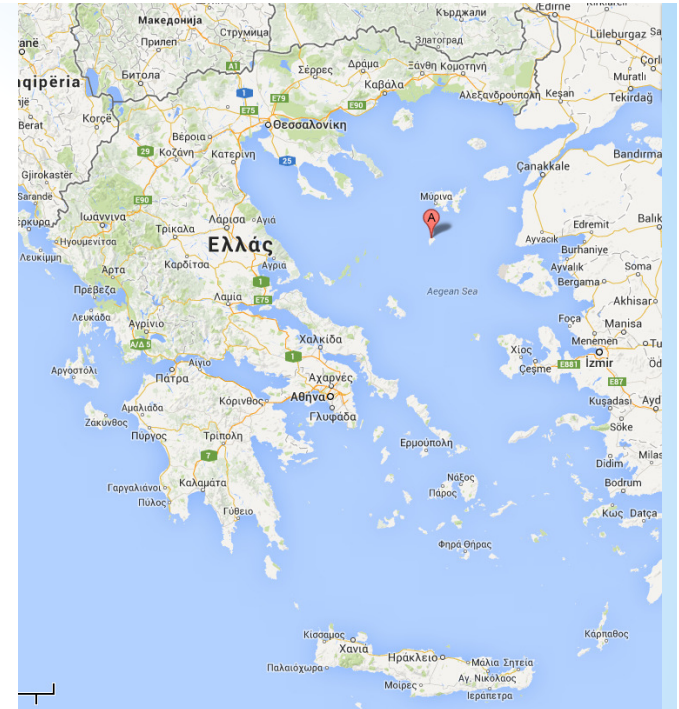


Green Island Ai Stratis

“Green Island – Ai Stratis” is an R&D Project, where mature technologies of Renewable Energy Sources (RES) in combination with energy storage technologies will be implemented in a non-interconnected power systems.

The following interventions are foreseen in the island:

- 1) Power Generation from RES (RES penetration > 85%)**
- 2) Introduction of Electric and H2 vehicles in the Transport Sector**
- 3) Hydrogen-based Autonomous Stationary Applications**
- 4) Covering heating and cooling loads in buildings using renewable energy technologies (geothermal and solar thermal systems) and**
- 5) Energy saving in buildings having as a main objective the reduction on fossil fuels dependence and the introduction of environmentally friendly technologies.**



Energy Awareness Park of CRES



Summary

- **Greece is rich in RES, in particular Wind and Solar (but also hydro, geothermal and biomass)**
- **RES exploitation addresses positively all major energy policy drivers (European and national), security of supply, competitiveness and combating climate change**
- **During the last couple of years of economic crisis in Greece RES deployment was one of the very few sectors where investments were made and employment was created**
- **There have been side effects, though, due to the difficulties in controlling the penetration rate of PVs in the electrical system. This was not only a Greek problem and it should not be used as a show stopper for future RES deployment**
- **In the fore coming years we should keep supporting RES for all the benefits they provide but putting more effort in getting costs down in the benefit of the energy consumers**
- **To do this both the financing costs and technology costs should be reduced**
- **Greece has not exploited yet all the opportunities associated to RES deployment, especially those related to technology development, innovation and smart specialization**
- **There exist in the country strong RTDI groups with excellence in RES technologies (among them CRES) which are ready to deliver along these lines, as they already did in the past**