



MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

# Renewable Energy Programs of Greece

**Dr. Panagiotis K. Chaviaropoulos**

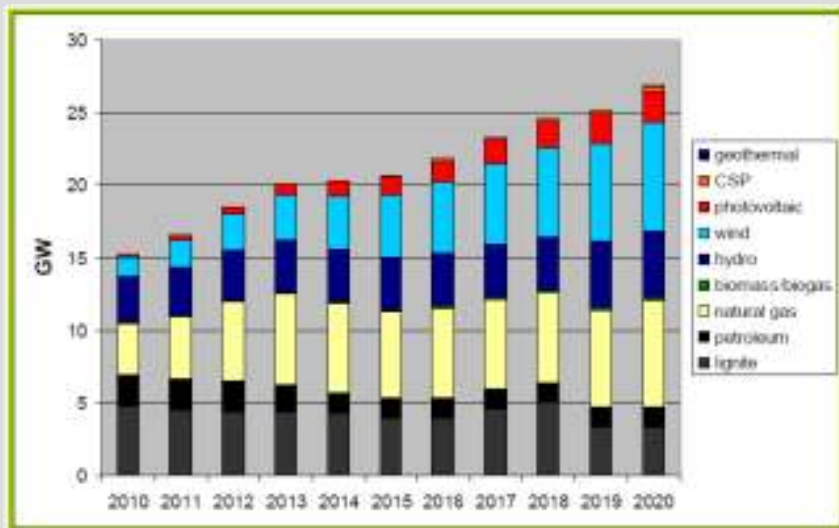
*Head of RES Office*

*Ministry of Environment, Energy and Climate Change*



MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## National Action Plan for RES (2010-2020)



***Estimated installed capacity of the different technologies for electricity production***

Greece presented early last summer 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.



MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## 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
<b>Total</b>	<b>22252</b>
<i>from which RES</i>	<b>16455</b>

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

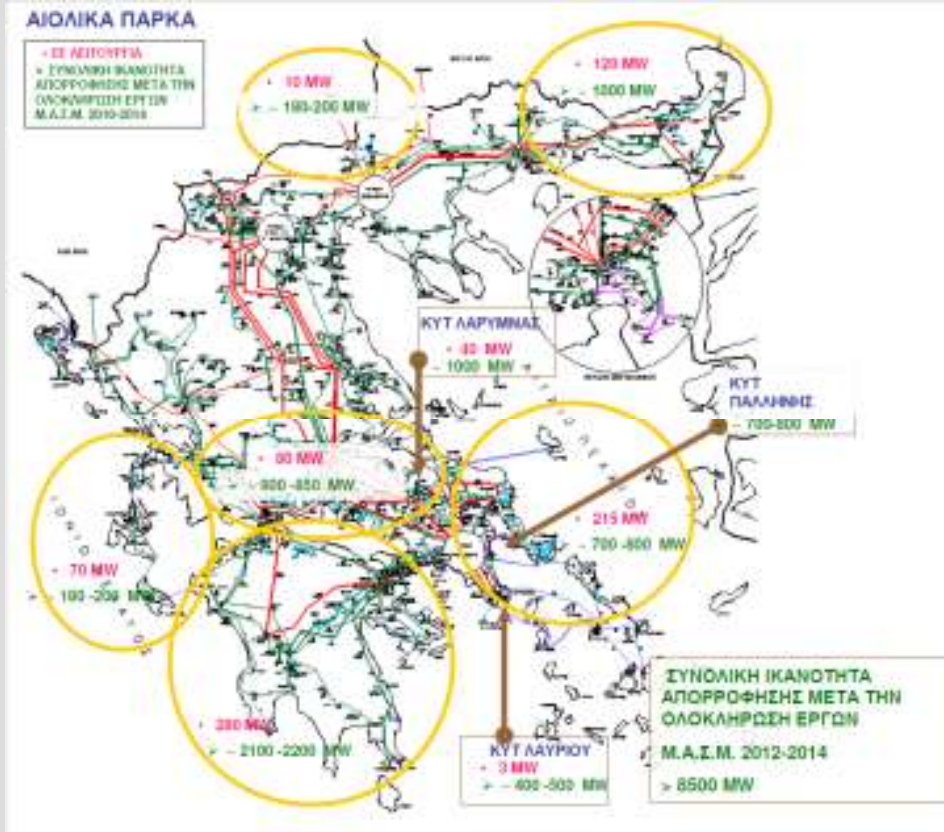
Details of the total budget needed for 2010-2020 are shown on the table

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



MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

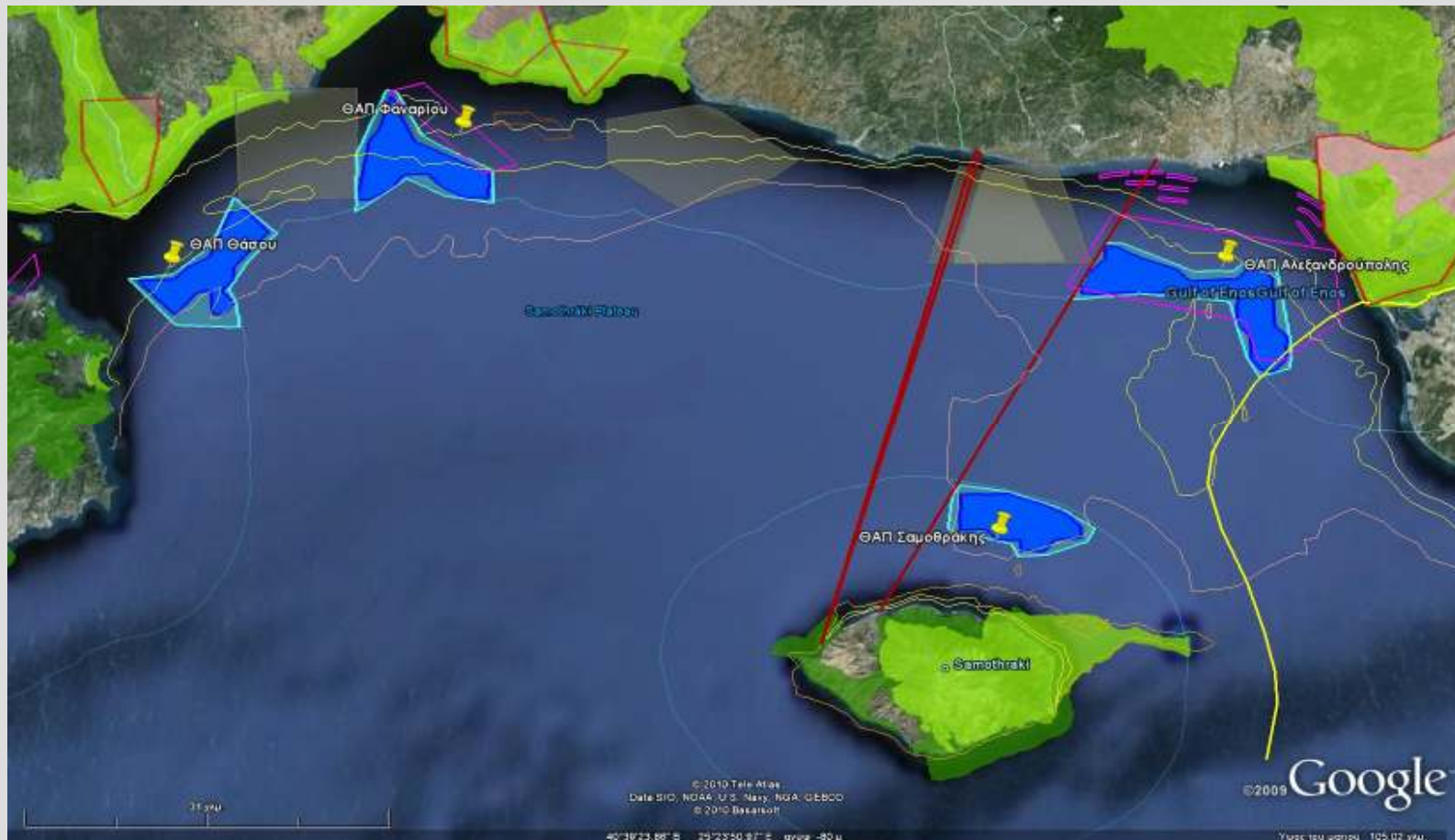
Accompanied by a huge (5+ billion euro) grid reinforcement and interconnection program (islands)





MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## Exploiting new RES-Electricity options, like offshore wind





## New supportive Legislative Framework

To achieve these ambitious goals and facilitate the implementation of our RES Roadmap we need a sound legislative framework which we established in early June 2010 with the new RES law 3851 :

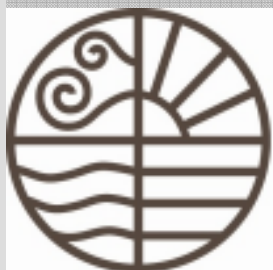
- The law aims to accelerate the permitting procedure of the larger projects as much as possible,
- Simplifies considerably the licensing of smaller projects,
- Offers new attractive feed-in-tariffs for all RES technologies,
- Introduces new clauses for offshore wind,
- Deals with the NIMBY phenomenon at several levels and
- Establishes an Autonomous RES Office to act as an One-Stop-Shop for RES-Electricity



MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## With attractive feed-in-tariffs

Type of RES plants	Feed In Tariff (€/MWh)	
	In the mainland	Non-interconnected islands
1. On shore Wind Farms > 50 kW	87,85	99,45
2. Wind Farms ≤ 50 kW	250	
3. PV < 10kWpeak in houses or industrial areas	550	
4. Small Hydro Electric plants < 15 MW	87,85	
5. CSP	264,85	
6. CSP which secures at least 2 hours of electricity supply	284,85	
7. Low Temperature Geothermal (low – high)	99,45 – 150	
8. Biomass plants	99,44 – 220	
9. Co generation and high level heat performance	87,85	99,45
10. Other	87,85	99,45



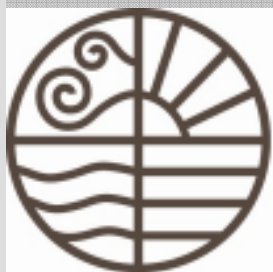
MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## FITs for PV

Year – Month	Mainland		Non-interconnected islands
	A	B	C
	>100kW	<=100kW	
<b>2009 February</b>	<b>400,00</b>	<b>450</b>	<b>450</b>
<b>2009 August</b>	<b>400,00</b>	<b>450</b>	<b>450</b>
<b>2010 February</b>	<b>400,00</b>	<b>450</b>	<b>450</b>
<b>2010 August</b>	<b>392,04</b>	<b>441,05</b>	<b>441,05</b>
<b>2011 February</b>	<b>372,83</b>	<b>419,43</b>	<b>419,43</b>
<b>2011 August</b>	<b>351,01</b>	<b>394,89</b>	<b>394,89</b>
<b>2012 February</b>	<b>333,81</b>	<b>375,54</b>	<b>375,54</b>
<b>2012 August</b>	<b>314,27</b>	<b>353,55</b>	<b>353,55</b>
<b>2013 February</b>	<b>298,87</b>	<b>336,23</b>	<b>336,23</b>
<b>2013 August</b>	<b>281,38</b>	<b>316,55</b>	<b>316,55</b>
<b>2014 February</b>	<b>268,94</b>	<b>302,56</b>	<b>302,56</b>
<b>2014 August</b>	<b>260,97</b>	<b>293,59</b>	<b>293,59</b>
<b>For every year v from 2015 onwards</b>	<b><math>1,3 \times \mu\text{OT}\Sigma_{v-1}</math></b>	<b><math>1,4 \times \mu\text{OT}\Sigma_{v-1}</math></b>	<b><math>1,4 \times \mu\text{OT}\Sigma_{v-1}</math></b>

$\mu\text{OT}\Sigma_{v-1}$  : Marginal Energy Price during previous year v-1

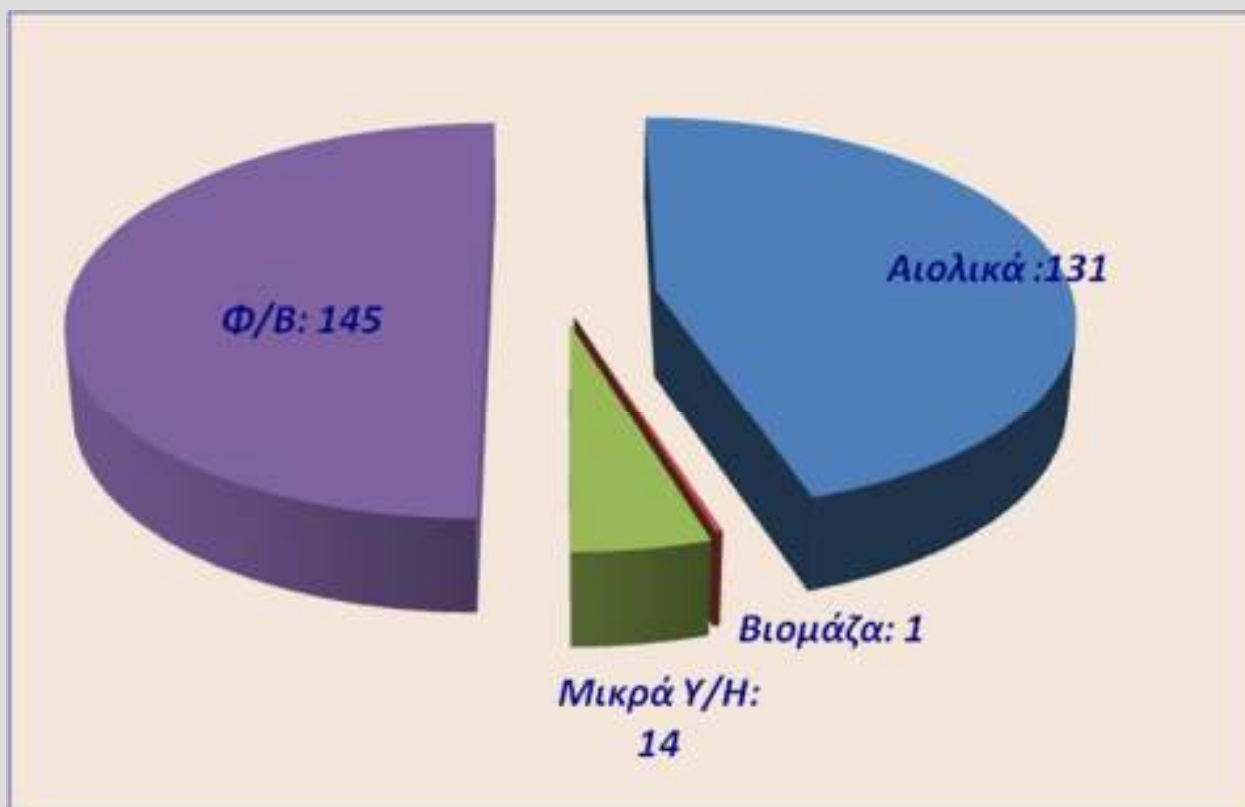




MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## 2010 Developments

---



**290 MW, RES Power Added within 2010  
(Wind 131, PV 145, Small Hydro 14)**



## 2011 Developments

### STATUS OF RES Investments in Greece (June 2011)

TECHNOLOGY	POWER	Application for Production Licence		Production Licence		Connection Offer		Installation Permit		With PPA		In Operation	
		end 2010	June 2011	end 2010	June 2011	end 2010	June 2011	end 2010	June 2011	end 2010	June 2011	end 2010	June 2011
Wind	MW	61791,0	65395,1	14373,4	18432,4	3601,5	3320,2	1249,2	1460,6	360,3	272,5	1297,7	1431,0
Biomass	MW	1461,9	1517,6	243,4	361,9	42,3	51,0	21,2	24,4	0,8	5,5	44,0	43,5
Geothermal	MW	340,5	340,5	8,0	8,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Small Hydro	MW	2220,9	2255,7	886,3	931,4	189,3	161,5	79,2	66,5	28,0	22,5	196,3	205,6
Solar PV	MW	4255,0	5387,3	1564,6	1947,0	524,9	2557,2	320,2	348,5	497,4	1048,0	198,3	341,1
CSP	MW	963,2	1013,8	0,0	320,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Hybrid	MW	1742,8	1828,7	262,8	382,3	0,0	0,0	0,1	0,1	0,0	0,0	0,0	0,0
<b>Total MW</b>		<b>72775,3</b>	<b>77738,7</b>	<b>17338,5</b>	<b>22383,4</b>	<b>4358,0</b>	<b>6089,9</b>	<b>1669,9</b>	<b>1900,1</b>	<b>886,5</b>	<b>1348,5</b>	<b>1736,3</b>	<b>2022,2</b>

### Details for Solar PV

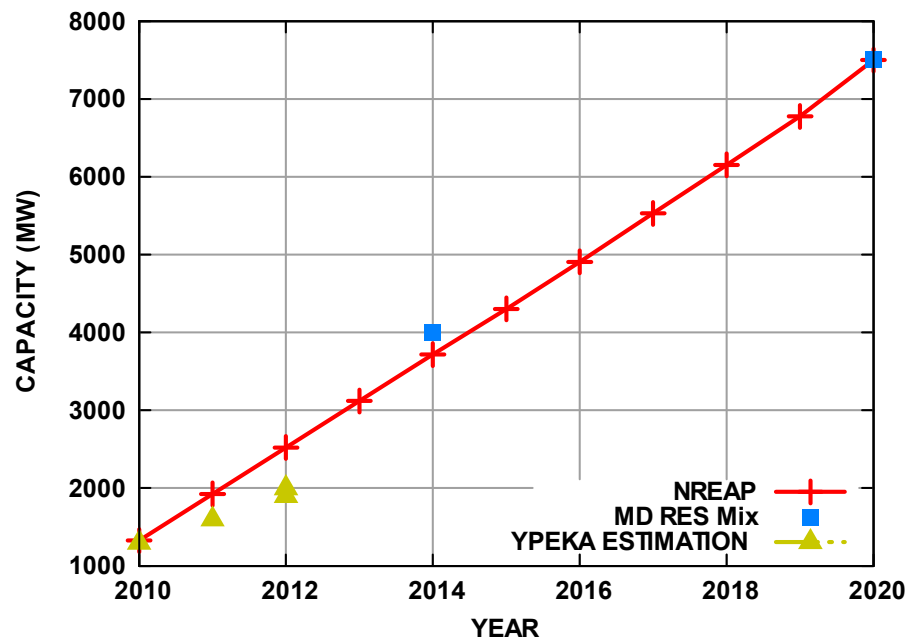
PV Type / Size	Number/Power	Applications to DSO		Connection Offer		With PPA		In Operation		
		end 2010	June 2011	end 2010	June 2011	end 2010	June 2011	end 2010	June 2011	
<i>Roofs (&lt;10 kW)</i>	Number	3752	4732		2911	7998			585	3351
	Power (MW)	34,2	27,8		24,9	69,7			5,2	28,1
<i>Farmers ≤100kW</i>	Number	6197	2086		373	4476				
	Power (MW)	611,9	201,2		36,4	440,2				
<i>Rest</i>	Number	20429	14125		4587	8529	2672	7315	2041	3653
	Power (MW)	4536,1	3172,9		463,6	2047,3	497,4	1048,0	193,1	313,1
<b>Total Number</b>		<b>30378</b>	<b>20943</b>		<b>7871</b>	<b>21003</b>	<b>2672</b>	<b>7315</b>	<b>2626</b>	<b>7004</b>
<b>Total Power (MW)</b>		<b>5182,2</b>	<b>3401,9</b>		<b>524,9</b>	<b>2557,2</b>	<b>497,4</b>	<b>1048,0</b>	<b>198,3</b>	<b>341,1</b>

**At least 500 MW, new RES Power will be added in 2011  
(Wind 300, PV 200)**

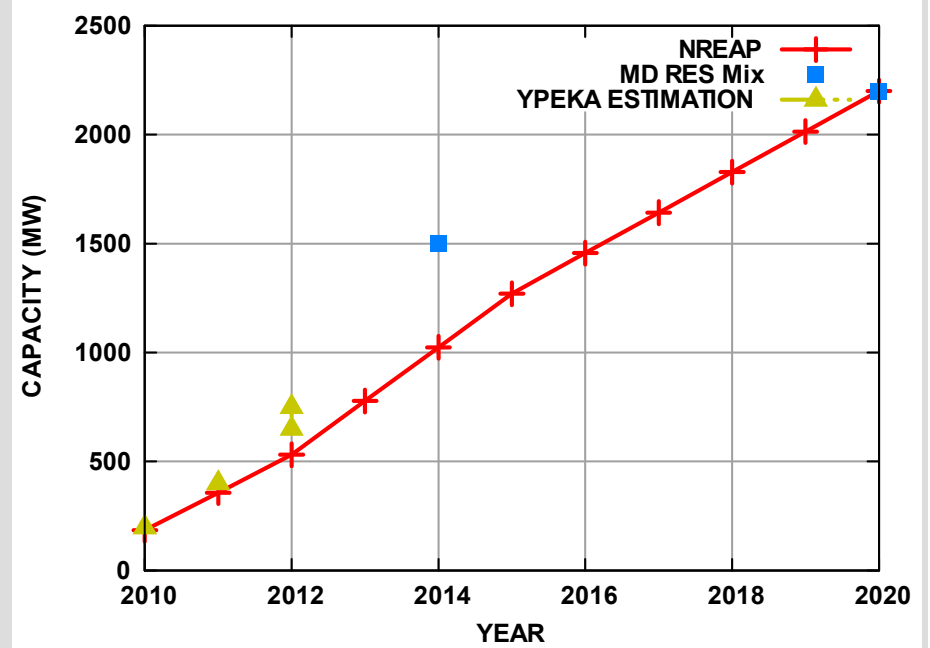


MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## Projections 2010-2020



Wind Energy



PV



MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## Focusing on CSP

- There are seventy one (71) solar-thermal power plants with energy production license from RAE (October 2011)
- The total capacity for all above power plants is 379,7 MW



MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## North and Central Greece



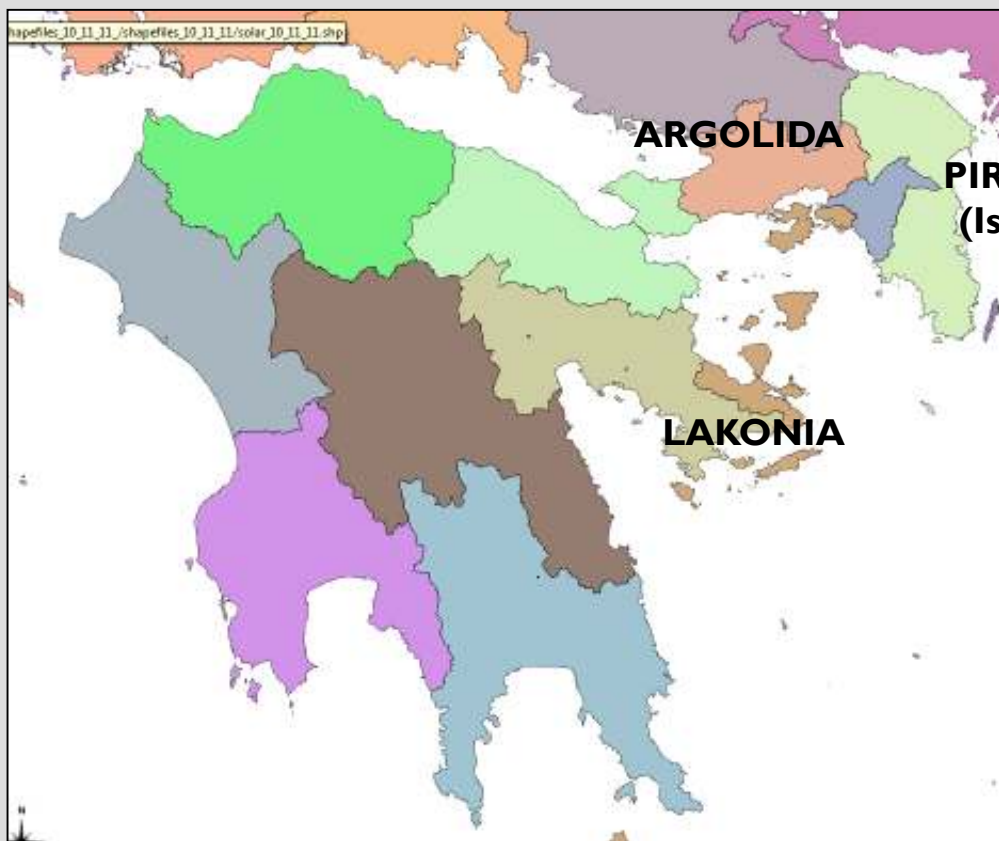
EVROS

Regional Unity	No of Power Plants	Total Capacity [MW]	Average Capacity [MW]
IMATHIA	3	9,60	3,20
KASTORIA	5	10,30	2,06
KOZANI	2	5,60	2,80
KILKIS	4	14,00	3,50
FLORINA	28	52,30	≈1,85
EVROS	1	2,00	2,00
KARDITSA	9	17,30	≈1,90
LARISSA	5	8,80	1,76



MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## South Greece (Peloponnesus)

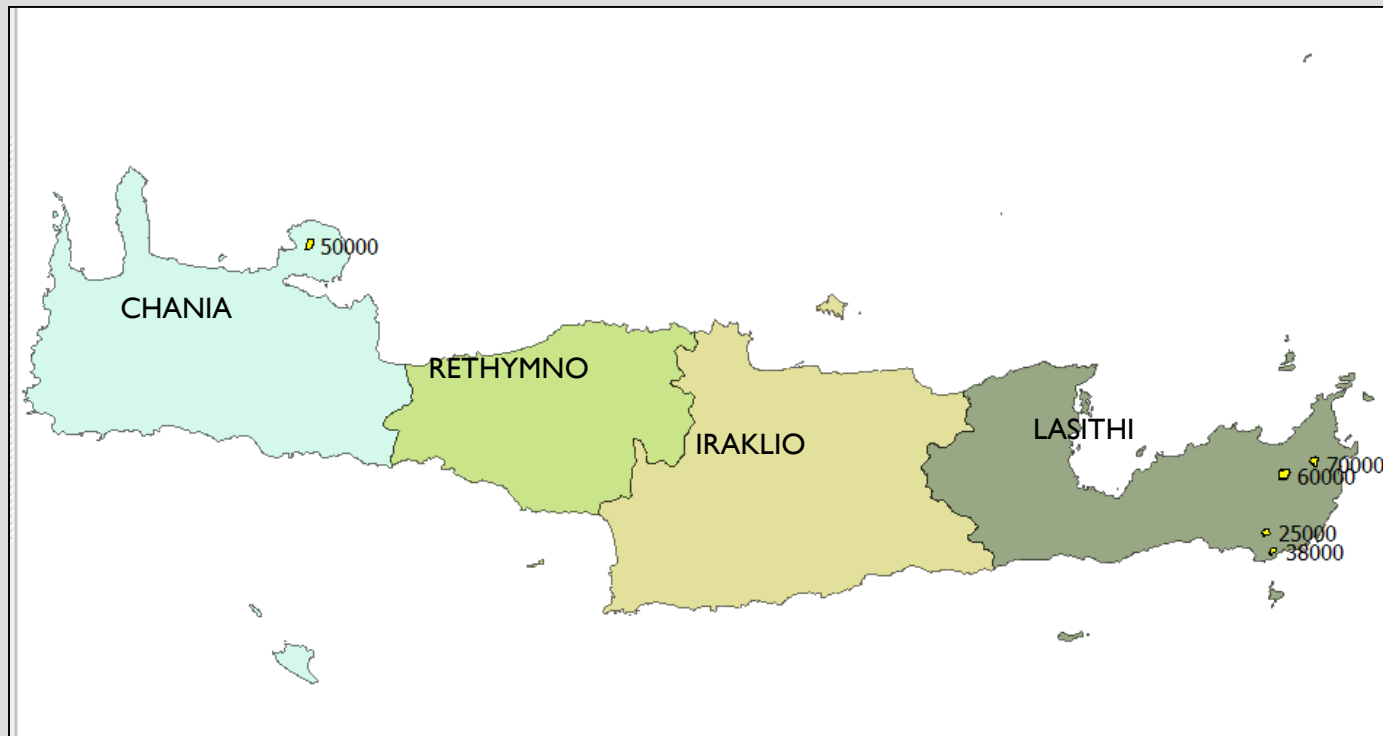


Regional Unity	No of Power Plants	Total Capacity [MW]	Average Capacity [MW]
<b>ARGOLIDA</b>	5	9,50	1,00
<b>Piraeus (Islands)</b>	3	6,00	2,00
<b>LAKONIA</b>	1	1,30	1,30



MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

## Crete Island



There are five thermal-solar power plants with energy production license from RAE, with total capacity 243 MW.

In Lasithi Region: 4 power plants, Total capacity 193 MW

In Chania Region: 1 power plant, Total capacity 50 MW



MINISTRY OF  
ENVIRONMENT  
ENERGY &  
CLIMATE  
CHANGE

**Thank you for your attention**