Renewable Energy Sources and Energy Efficiency and their Role in SEE Energy Security

Conference on *"Energy Security as a Security Challenge in Southeast Europe?"*
The Aspen Institute, 15 -18 October 2013
Alt Madlitz, Germany

A Presentation by Costis Stambolis,
Executive Director
Institute of Energy for S.E. Europe (IENE), Athens

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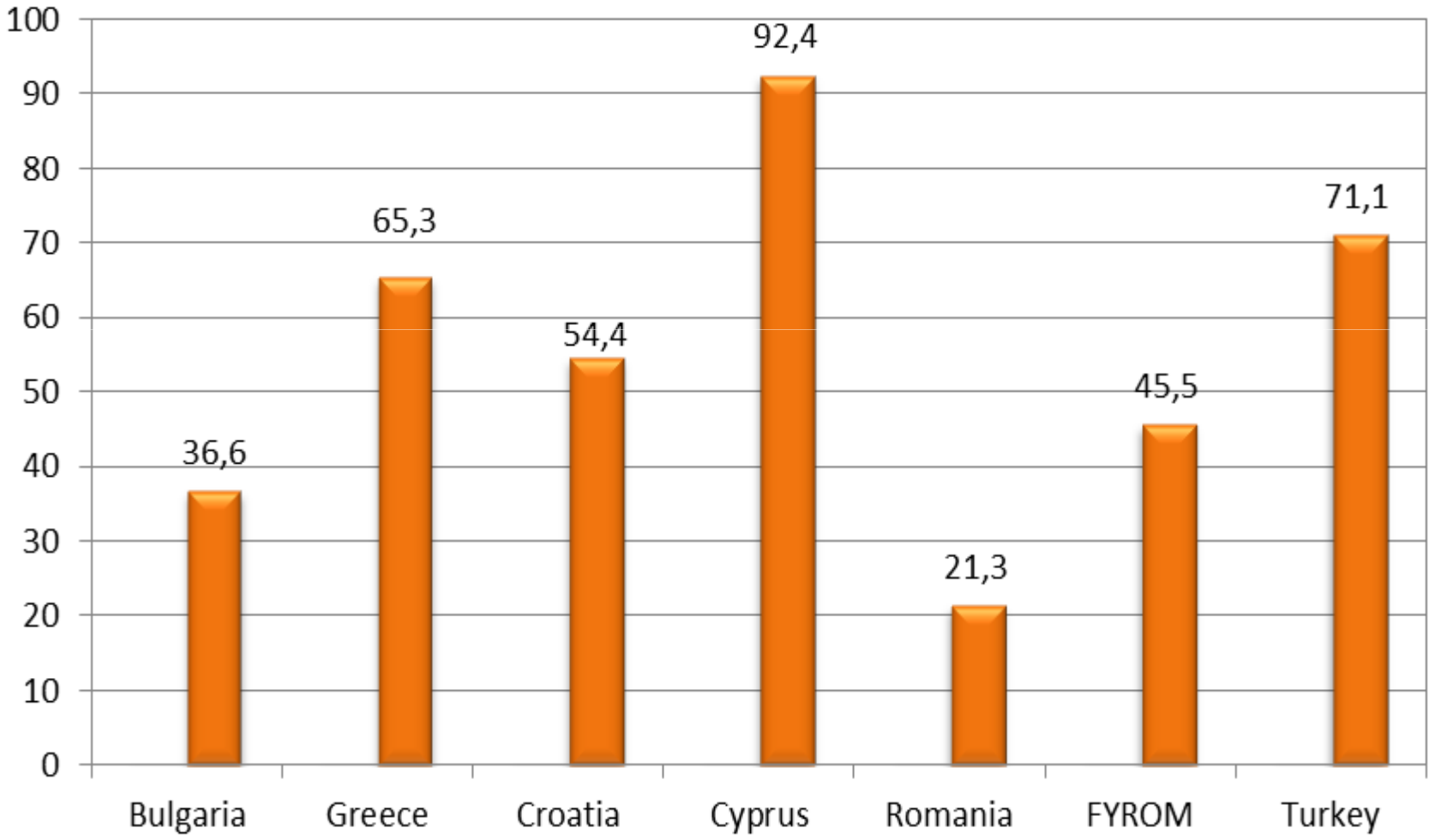
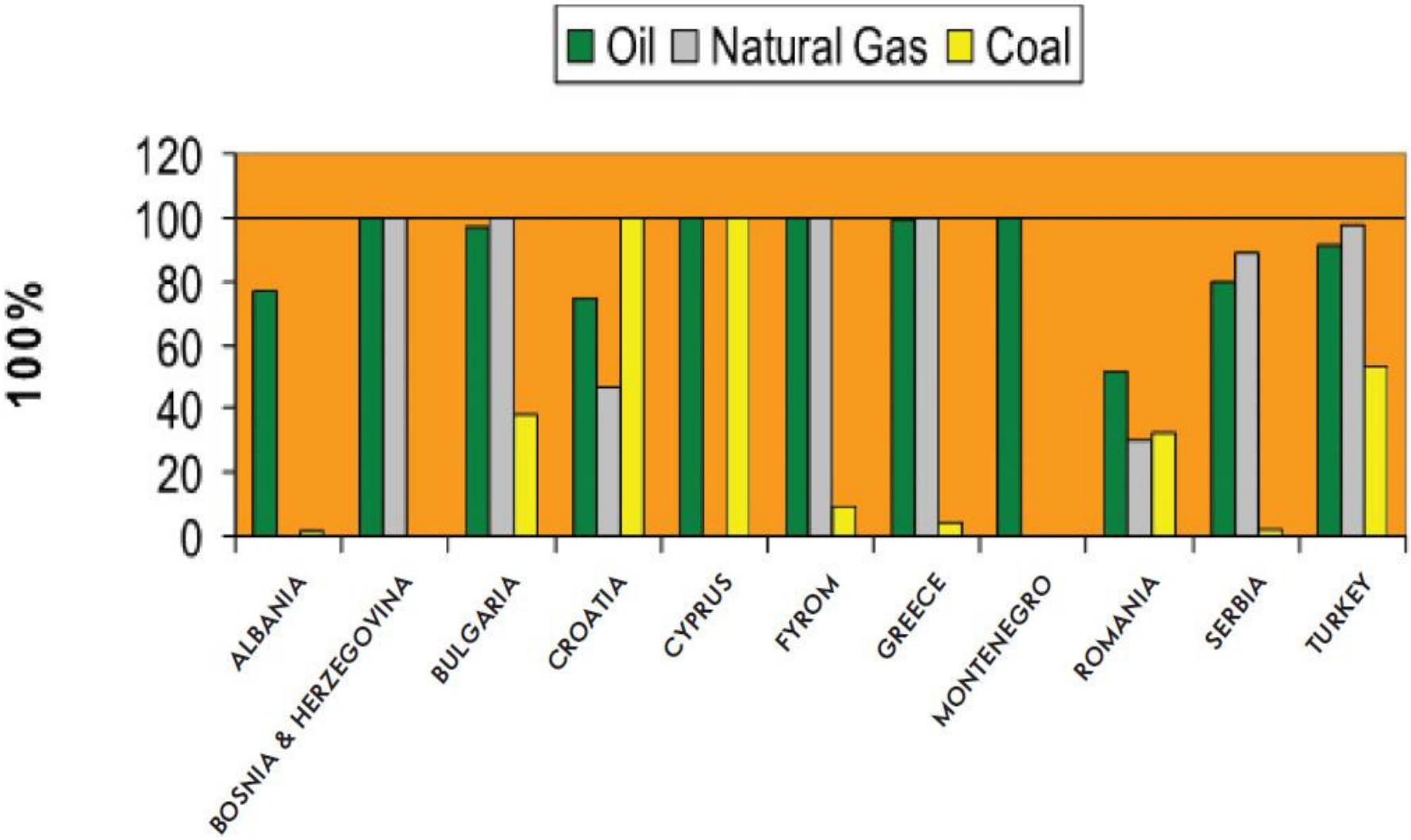
SEE Energy Dependency

- Almost all countries in SE Europe rely highly on oil and gas imports, with most of them being above 90% dependent
- As oil and gas prices move at historically high levels, this dependence becomes more acute and has dire financial consequences
- The need to increase indigenous energy production, including RES, becomes all apparent together with the need to diversify energy resources by broadening the energy mix
- High levels of local energy production together with a balanced energy mix is key to a successful energy security strategy

SEE Energy Dependency, 2011 (%)



SEE Energy Dependency, 2008 (%)



Oil and Gas Production and Consumption in SE Europe (2011 oil statistics, 2010 gas statistics)

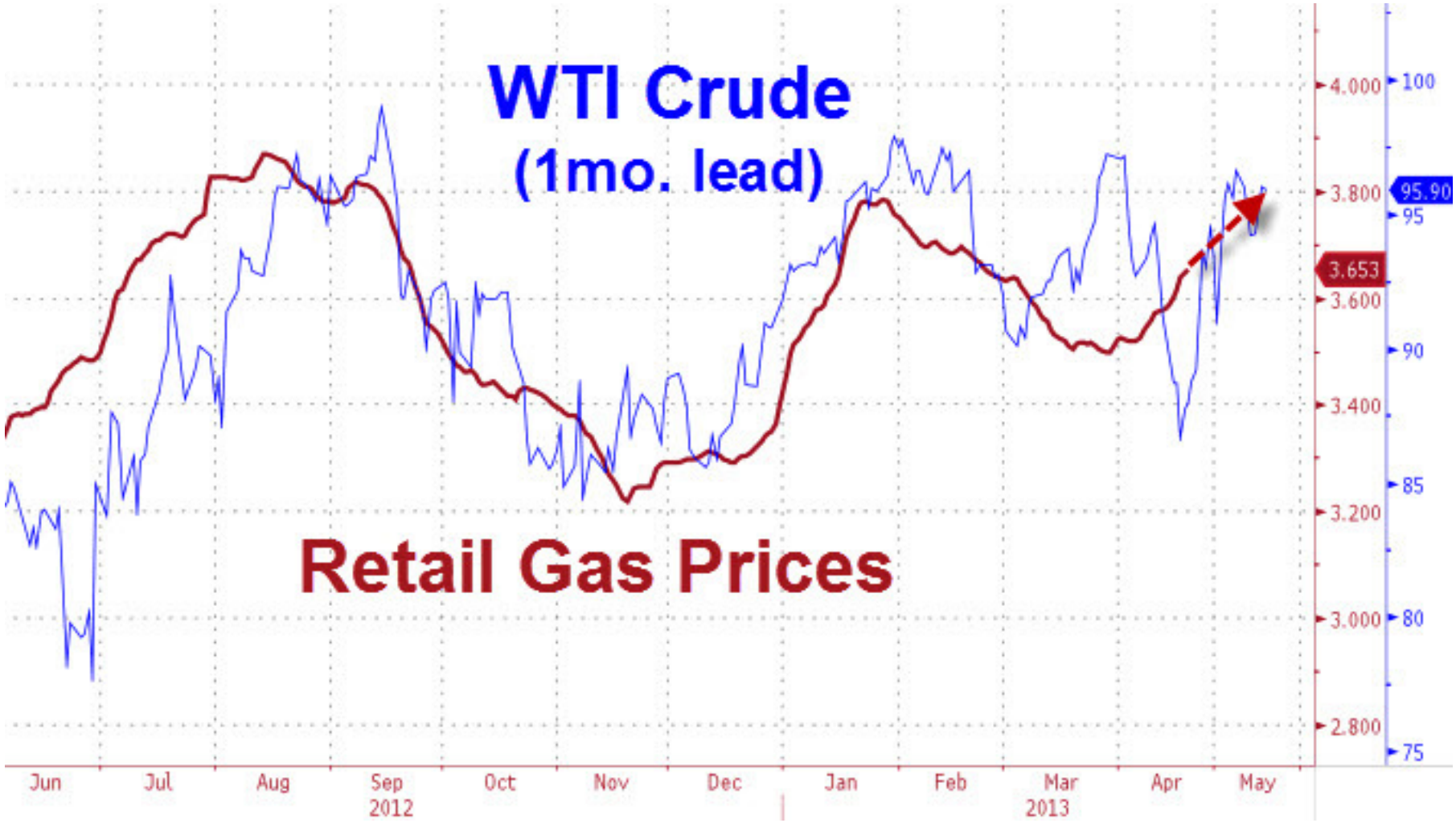
COUNTRY	OIL PRODUCTION (bbl/day)	OIL CONSUMPTION (bbl/day)	GAS PRODUCTION (bcf/year)	GAS CONSUMPTION (bcf/year)	OIL REFINING CAPACITY (bbl/day) [2009]
ALBANIA	15,500	44,000	2	1	26,000
BOSNIA & HERZEGOVINA	0	35,000	0	7	0
BULGARIA	1,000	134,000	0	77	115,000
CROATIA	13,500	113,000	67	100	250,000
CYPRUS	0	65,000	0	0	0
EGYPT	564,500	697,000	2,369	1,630	726,000
F.Y.R.O.M.	0	19,000	0	3	50,000
GREECE	1,800	336,800	0	135	423,000
ITALY	99,200	1,455,500	293	2,930	2,337,000
ISRAEL	100	237,000	114	129	220,000
LEBANON	0	88,000	0	0	0
MONTENEGRO	0	4,000	0	0	0
ROMANIA	86,900	217,000	374	455	517,000
SERBIA & KOSOVO	2,200	81,000	15	80	215,000
SYRIA	300,200	258,000	356	340	240,000
TURKEY	45,700	679,900	24	1,346	714,000
TOTAL	**1,130,600**	**4,464,200**	**3,614**	**7,233**	**5,833,000**

Source: U.S. Energy Information Administration

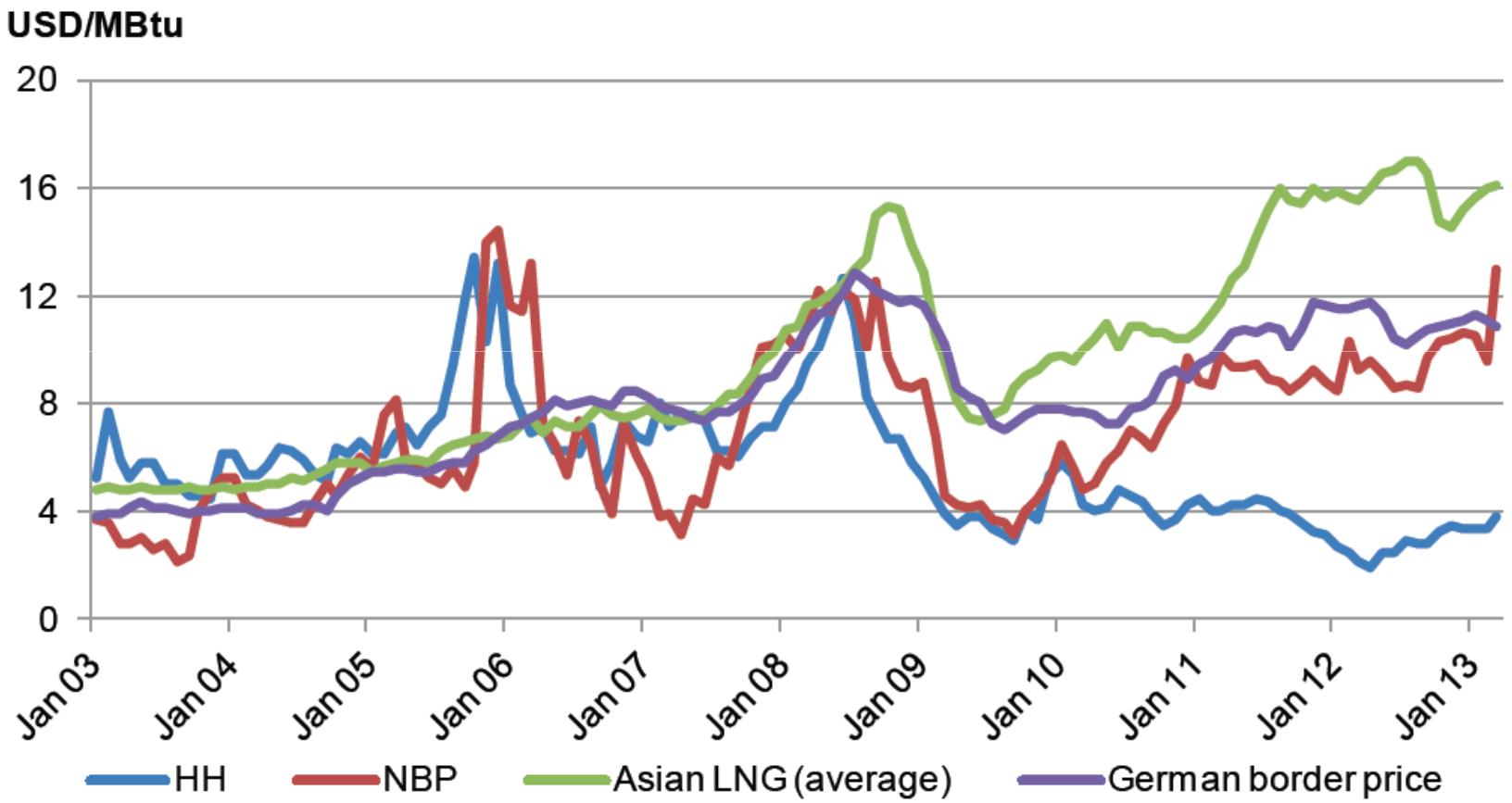
Brent Crude Oil Spot Prices (2010 – 2011 – 2012)

Brent Crude Oil Prices
(May 2012 – September 2013)

Global Gas and Oil Prices (2013)

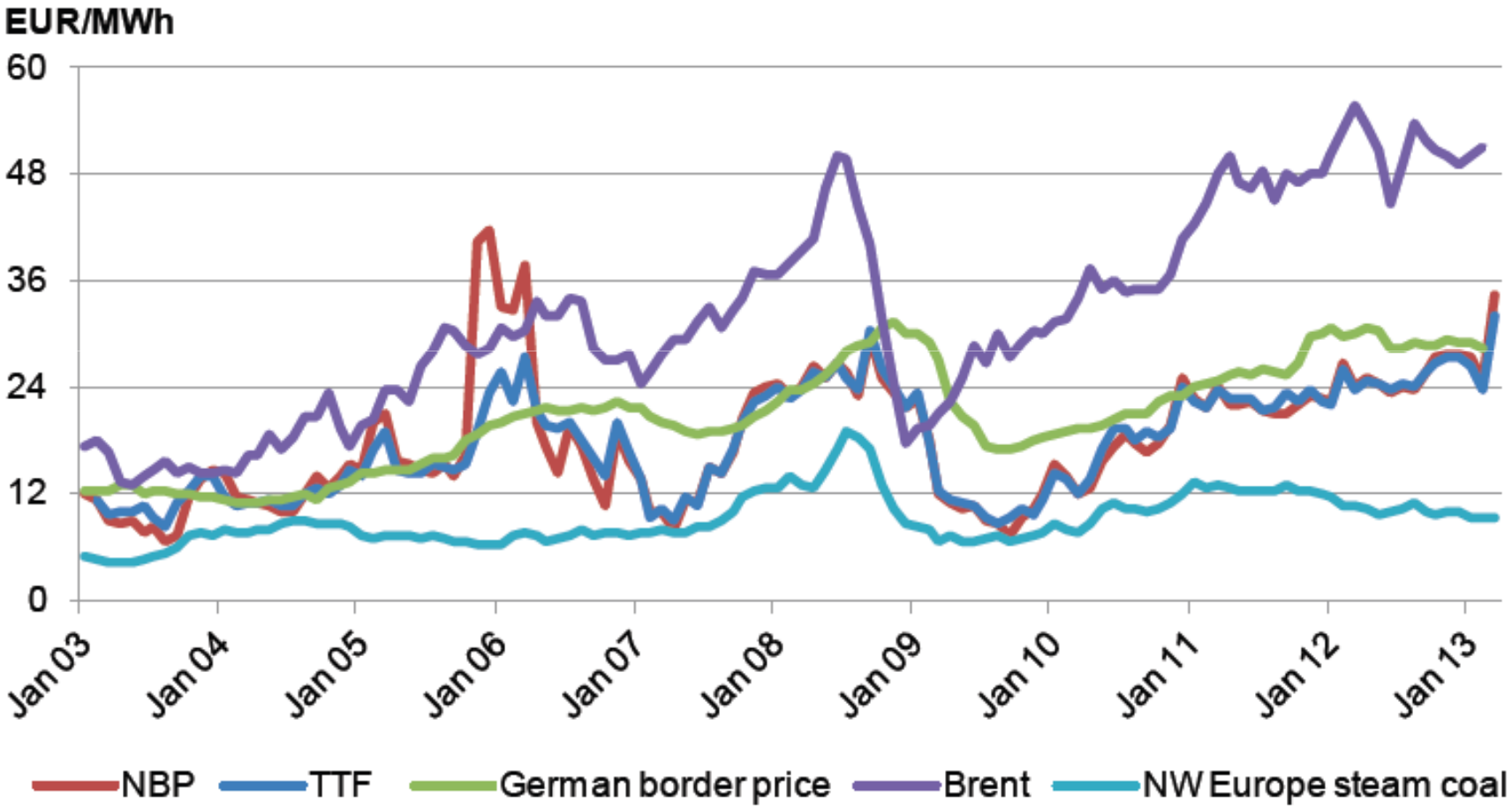


Gas Price Developments in the Three Main Regional Markets, Jan 2003 – Jan 2013



Source, IEA ,
Medium-Term Gas Market Report 2013

European Energy Price Developments, Jan 2003 – Jan 2013



Source, IEA ,
Medium-Term Gas Market Report 2013

Risks to Energy Security

The IEA defines energy supply to be “secure” if it is adequate, affordable and reliable. The European Commission defines energy security in its Green Paper (EC, 2000) as the “uninterrupted physical availability of energy products on the market, at a price which is affordable for all consumers (private and industrial)

Energy Security risks can be categorized as:

a) Energy market instabilities caused by unforeseen changes in geopolitical or other external factors, or compounded by fossil fuel

b) Technical failures such as power “outages” (blackouts and brownouts) caused by grid or generation plant malfunction

c) Physical security threats such as terrorists, sabotage, theft or piracy, as well as natural disaster (earthquakes, hurricanes, volcanic eruptions, the effects of climate change etc.)

Policy Responses to Energy Security Risks

- In order to prevent significant impacts from energy insecurity, governments need to diversify their energy sources
- Renewables in one of several options for such a diversification
- Energy efficiency improvements through demand side management and technological innovation can cost-effectively mitigate the large-scale impact of energy supply disruption in the electricity and heat sectors, and to a limited degree in the transport sector too
- Demand side management and energy efficiency measures can reduce fuels for the production of electricity, heat and transport fuels

Energy Mix of Selected Countries in SE Europe (2011) (%)

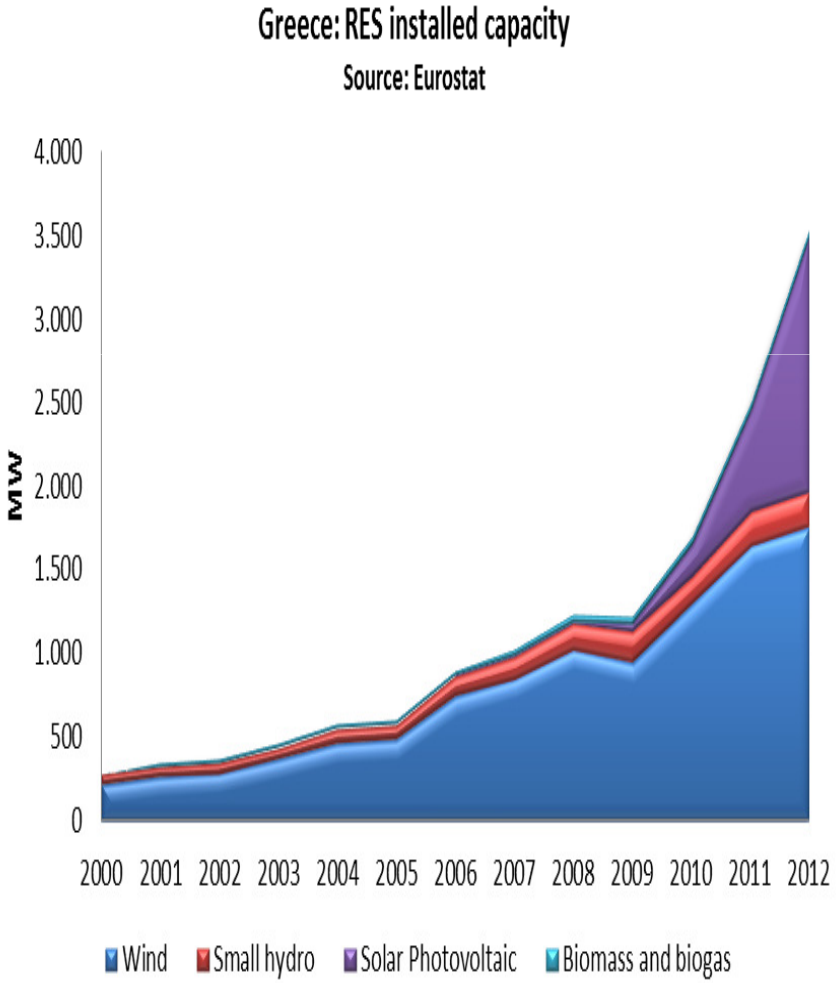
	Solid Fuels	Oil Products	N. Gas	Nuclear	Electricity	RES
Bulgaria	35.5	34.0	21.0	5.5	-	3.5
Croatia	5.0	69.0	10.0	-	-	16.0
Greece	28.0	49.0	14.0	-	1.0	8.0
Romania	19.5	25.8	30.1	8.4	-	16.3
Turkey	29.0	31.0	31.0	-	5.0	6.0

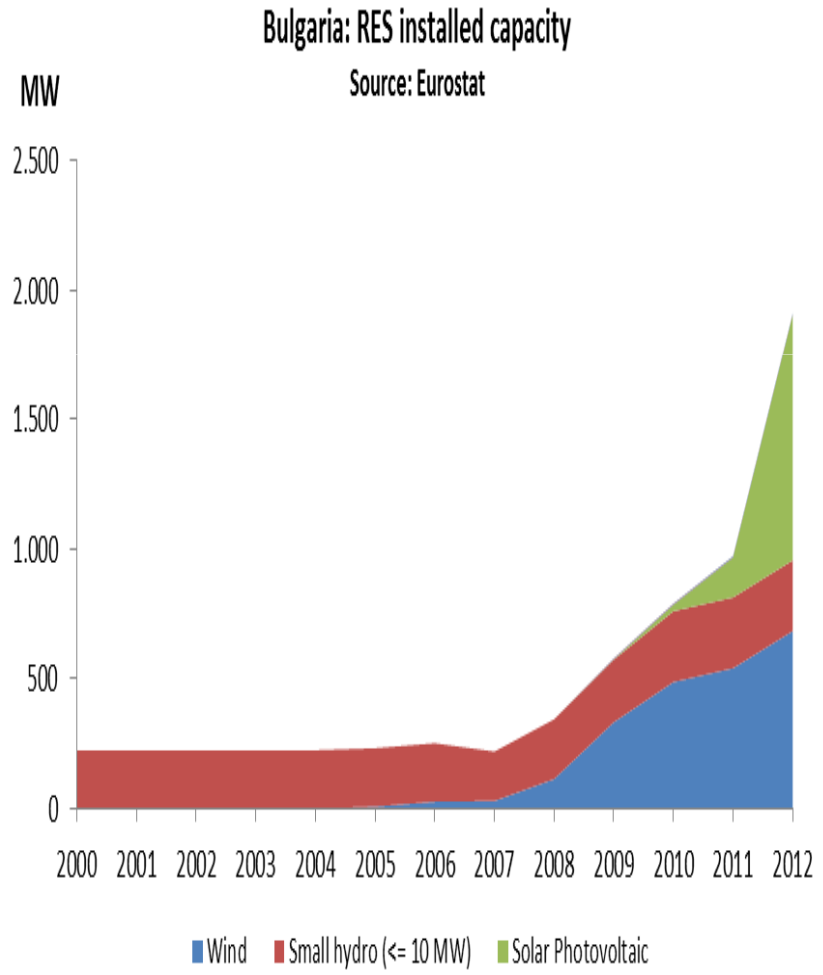
Installed Electricity Capacity in SE Europe and the Share of RES in Power Generation (2012)

	Hydro[1] (MW)	Wind (MW)	PV (MW)	Total RES (MW)	Total Electricity (MW)	RES (total %)
Albania	1.466	0	0	1.466	1.496	96%
Bosnia & Herzegovina	2.058	0	0	2.058	3.803	53%
Bulgaria	2183	682	980	3.874	13.759	29%
Croatia	2.112	180	2.9	2.295	4.268	54%
FYROM	580	0	1	581	1.600	36%
Greece	3.060 + 218	1750	2.600	7.673[2]	17.700	44%
Montenegro	660	0	0	660	870	73%
Romania	6.400	2.095	94	8.640[3]	17.360	50%
Serbia	2.831	0[4]	2	2.833	8.360	34%
Turkey	14.000	2312	2	16.500[5]	60.121	28%

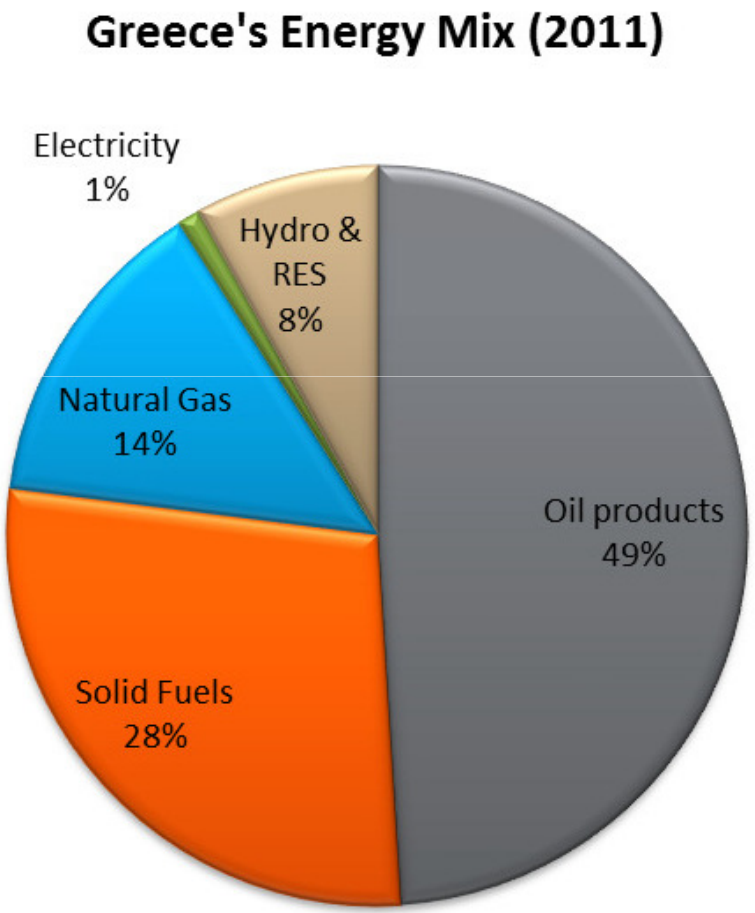
[1] Including both large and small hydro
[2] Including some 50 MW of biomass installation
[3] Including some 40 MW of biomass installation
[4] A wind farm of 120 MW is under construction since September 2013
[5] Including 180 MW of geothermal power plants

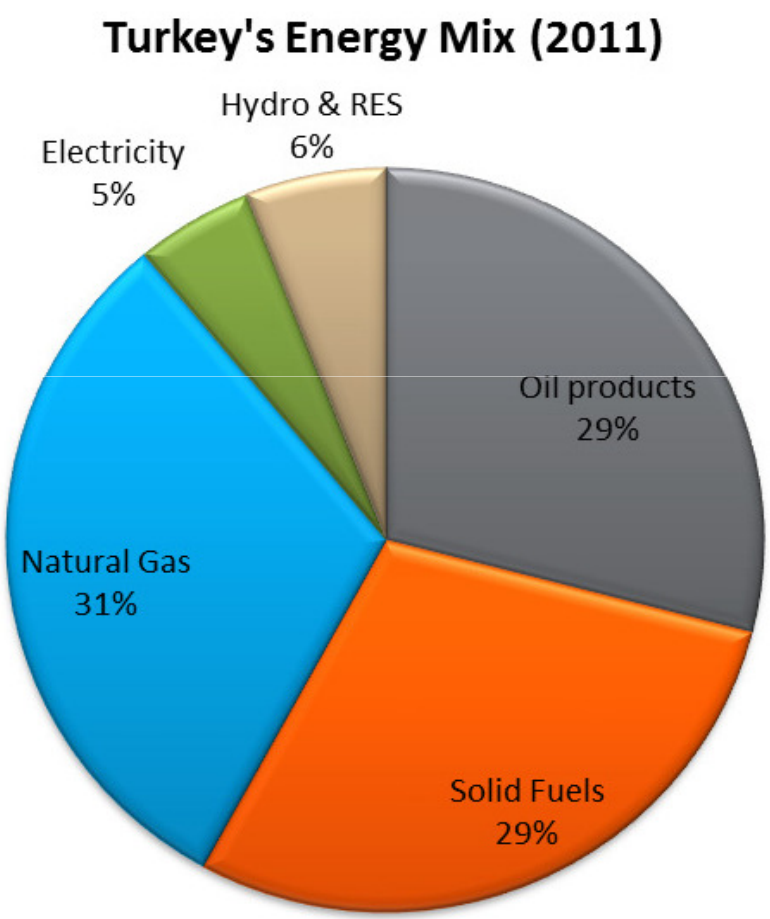
RES Installed Capacity (Greece and Bulgaria)



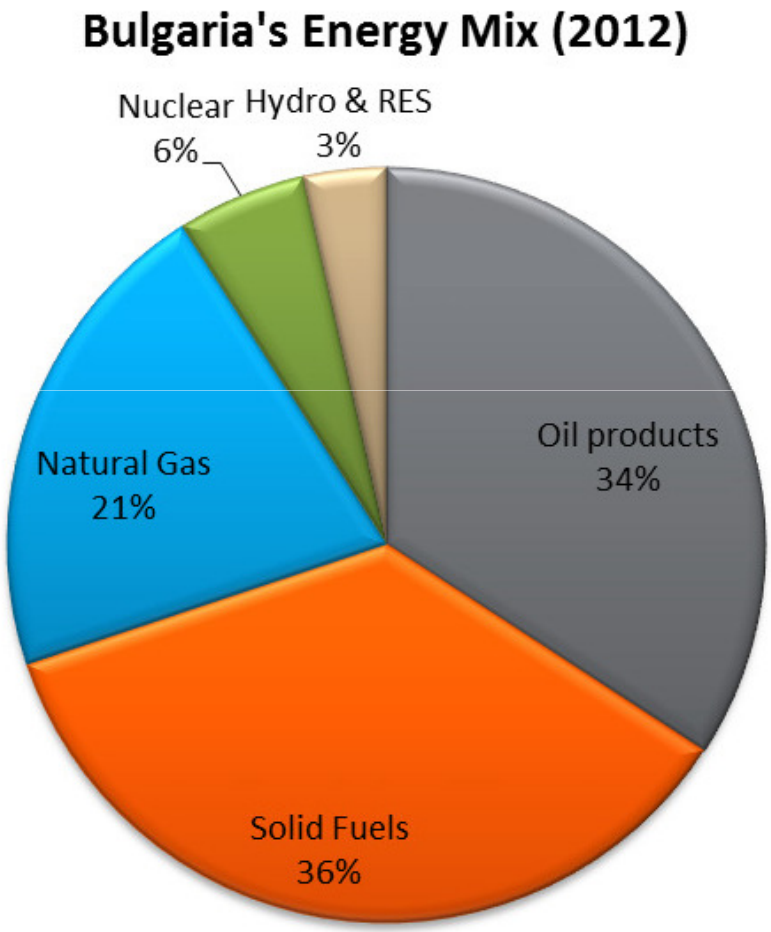


Energy Mix
Greece - Turkey

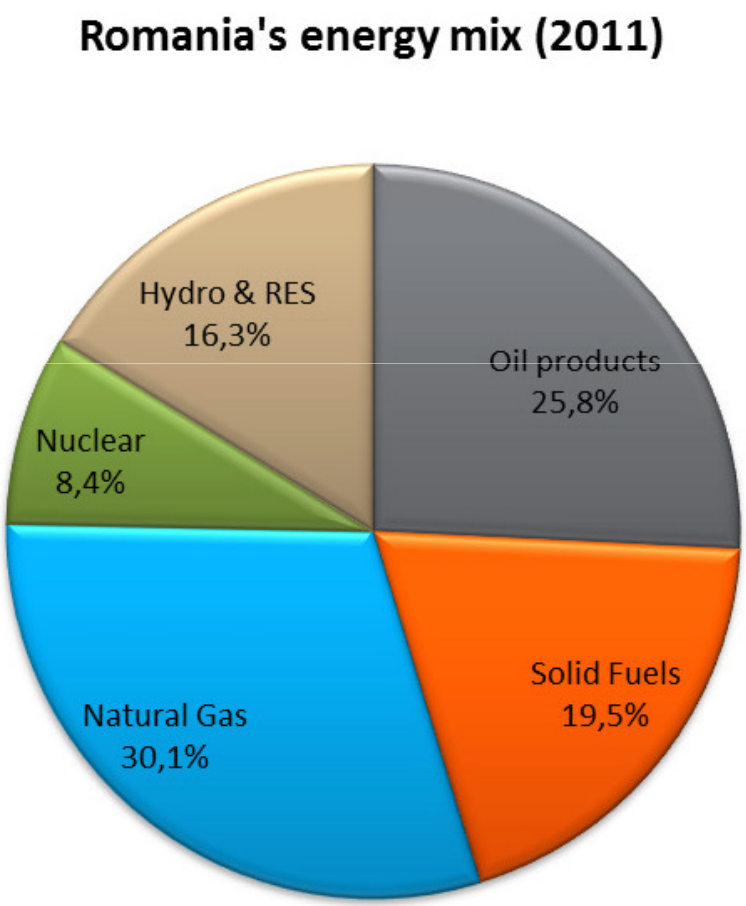


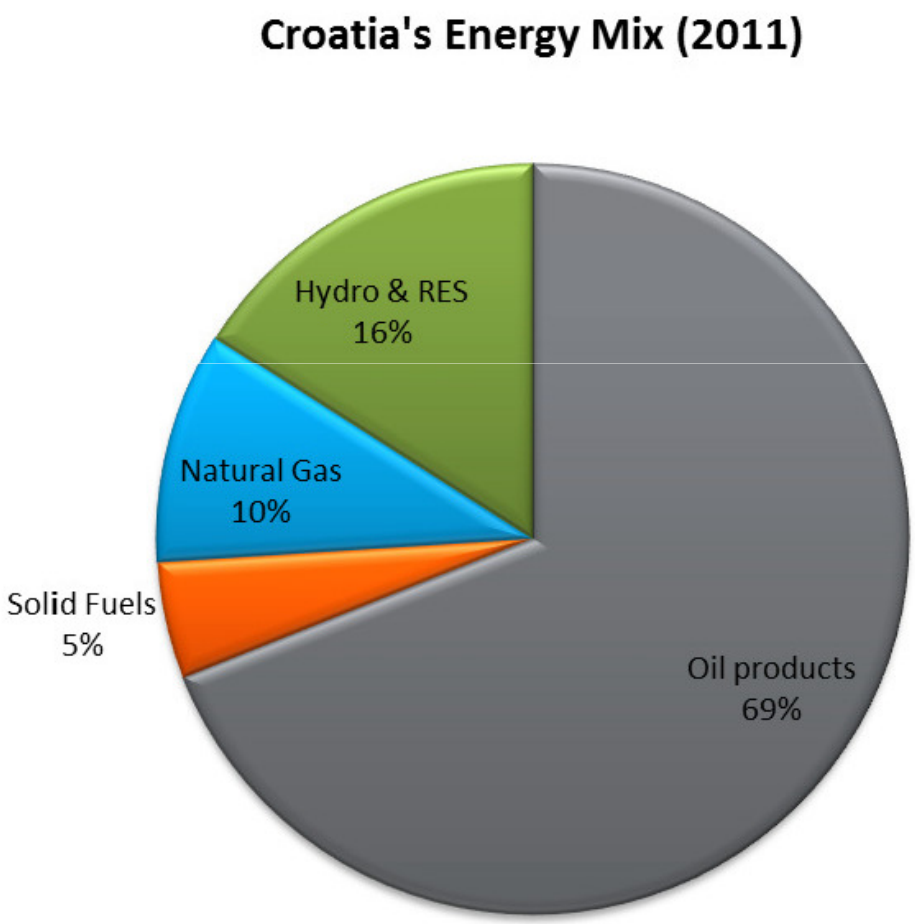


Energy Mix
Bulgaria



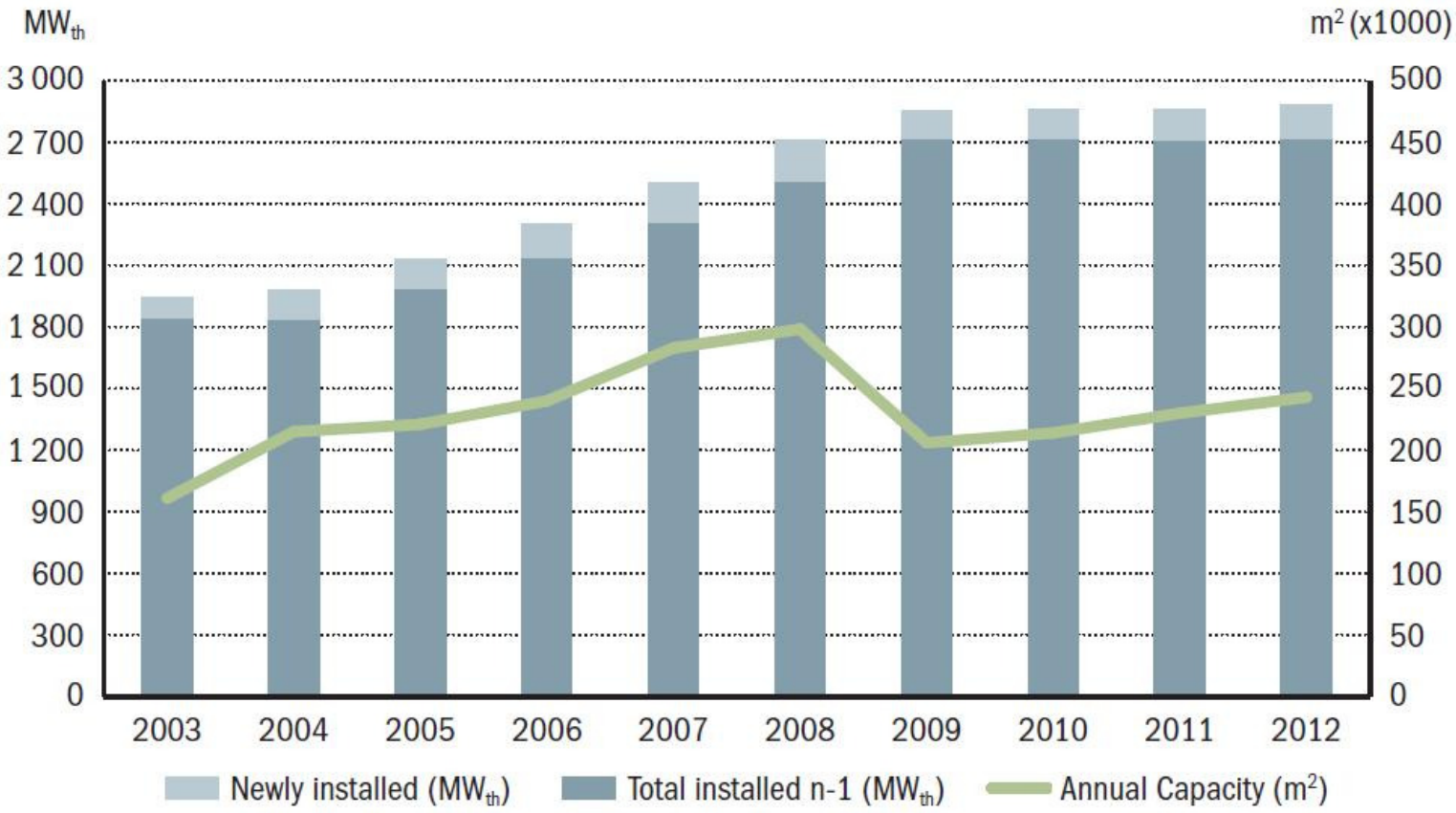
Energy Mix
Romania - Croatia





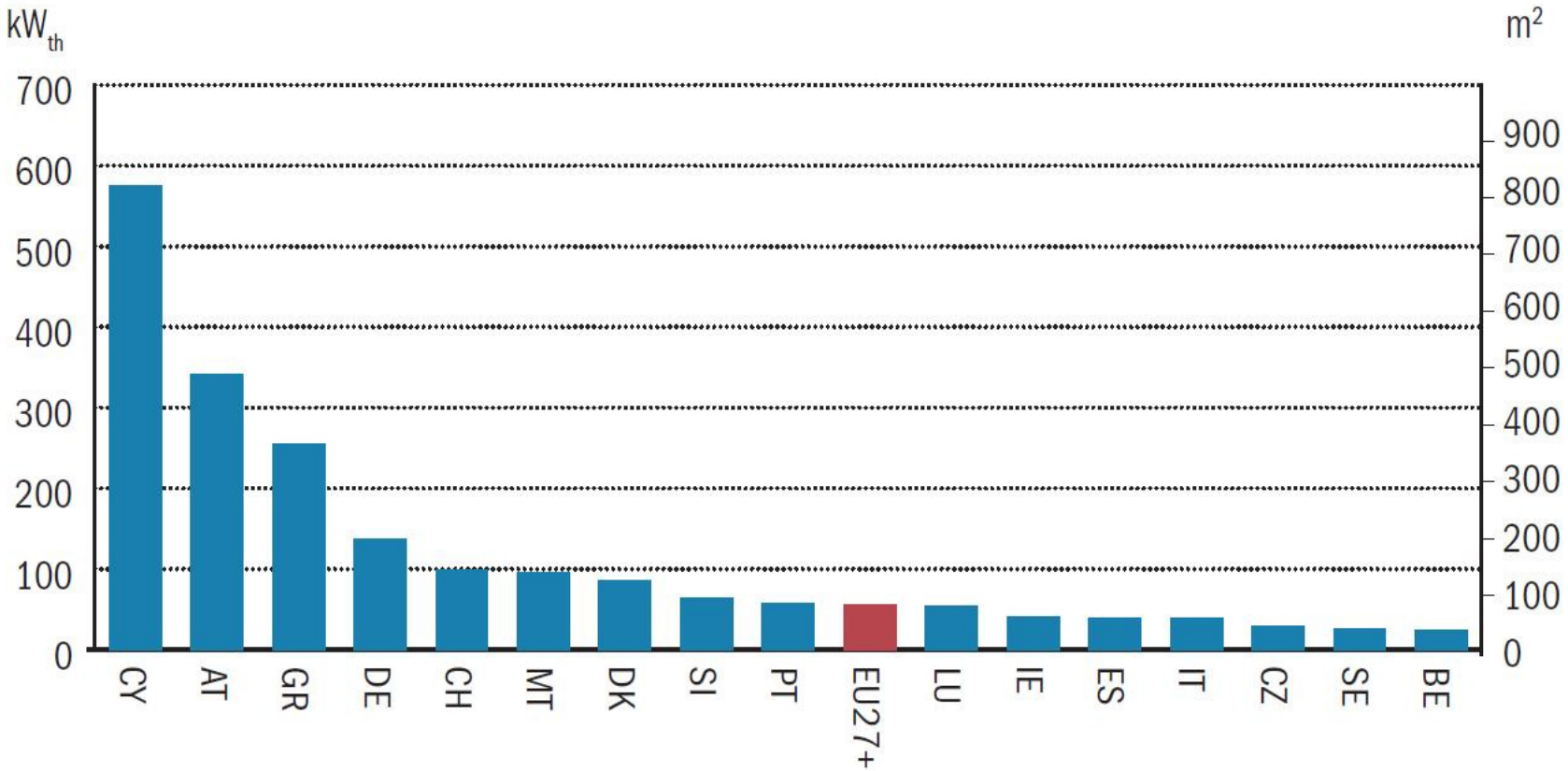
Solar Thermal Market in EU27 and Switzerland
Total and Newly Installed Capacity (glazed collectors)

Solar Thermal Market in Greece
Total and Newly Installed Capacity (glazed collectors)



Solar Thermal Market in Croatia
Total and Newly Installed Capacity

Solar Thermal Capacity in Operation (per 1000 Capita)



Energy Security Implications of Renewable Energy Technologies

- Renewable energy sources (RES) are typically indigenous resources and can reduce dependence on energy imports
- RES are widely (though unevenly) distributed and their use for electricity generation can minimize both transmission losses and costs when they are located close to the demand load of end-users: so called " distributed" generation
- Relatively high capital costs per unit of capacity installed remain for many RETs – in spite of significant cost reductions as a result of learning experience – this is offset to some extent by a zero fuel cost over the life of the system

RES and Energy Security

The extent to which RES can contribute in bolstering energy security depends on four key factors:

1. The installed electricity capacity of RES and its relation to the overall power generation capacity of the country concerned

2. The grid development and its operational level which allows for maximum utilisation of the electricity produced

3. The availability of energy storage mechanisms (both dispersed and pumped storage)

4. The actual contribution of RES in each country's energy balance

Conclusions

i. Large scale introduction of RES can contribute towards improving SEE's energy security

ii. The degree to which RES can bolster energy security depends greatly on the type of RES used, its connectivity to the national grid and its storage capability

iii. Energy security role of RES can be strength thermal through dispersed and pumped storage schemes so as to overcome the drawback from the intermittent nature of renewable energy sources

iv. Energy efficiency applications can also help lessen a country's dependence on fossil fuels and/or imported fuels

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Thank you for your attention

cstambolis@iene.gr