Market Analysis Forecasting & Structuring

International Gas Summit
Nice, 28-29 November 2016

Recent developments and features in the European power generation mix: a new role for gas?

Elisa Scarpa

Head of Market Analysis, Forecasting & Structuring

Edison S.p.A.

November 2016

Agenda

Recent developments and features in the European power generation mix: a new role for gas?

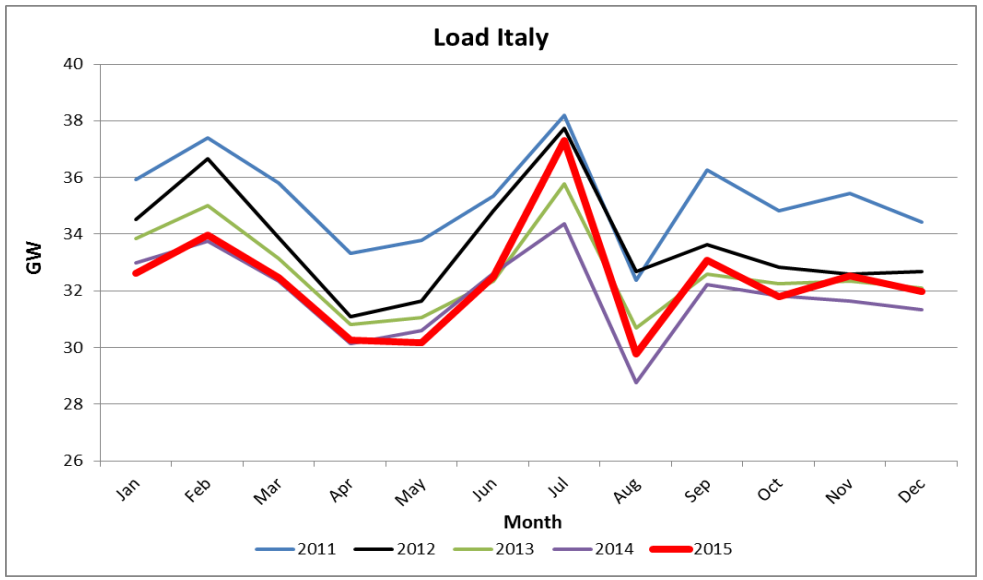
- Load and generation mix in European power markets
- Generation mix 2009 vs 2015
- Power demand is shrinking …
- Renewables penetration 2009 vs 2015
- Evolution of installed capacity in Italy, Greece and Germany
- Effect of RES generation on prices
- Coal/natural gas fuel switching: A new role for gas?
- Desperately seeking … flexibility
- Conclusions

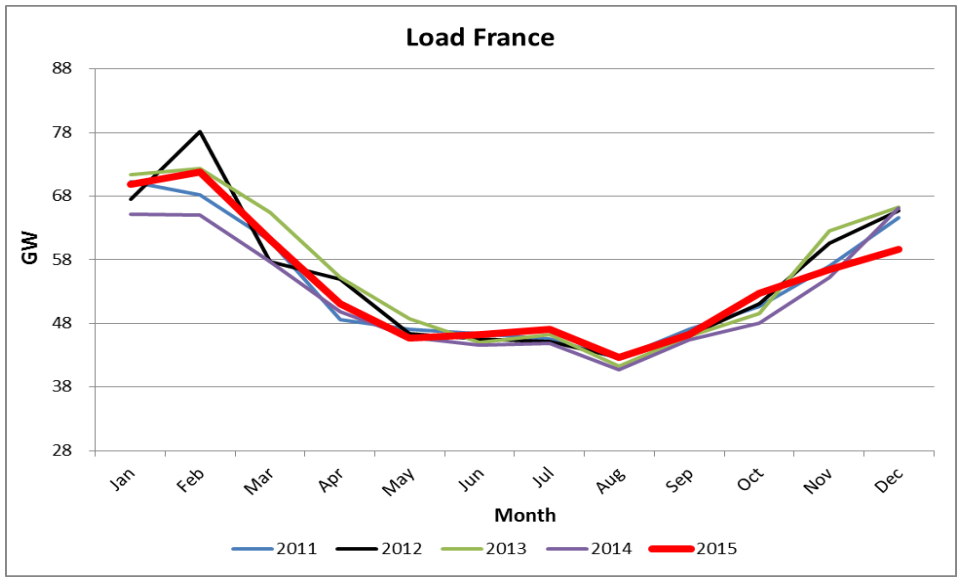
Load and generation mix in European power markets

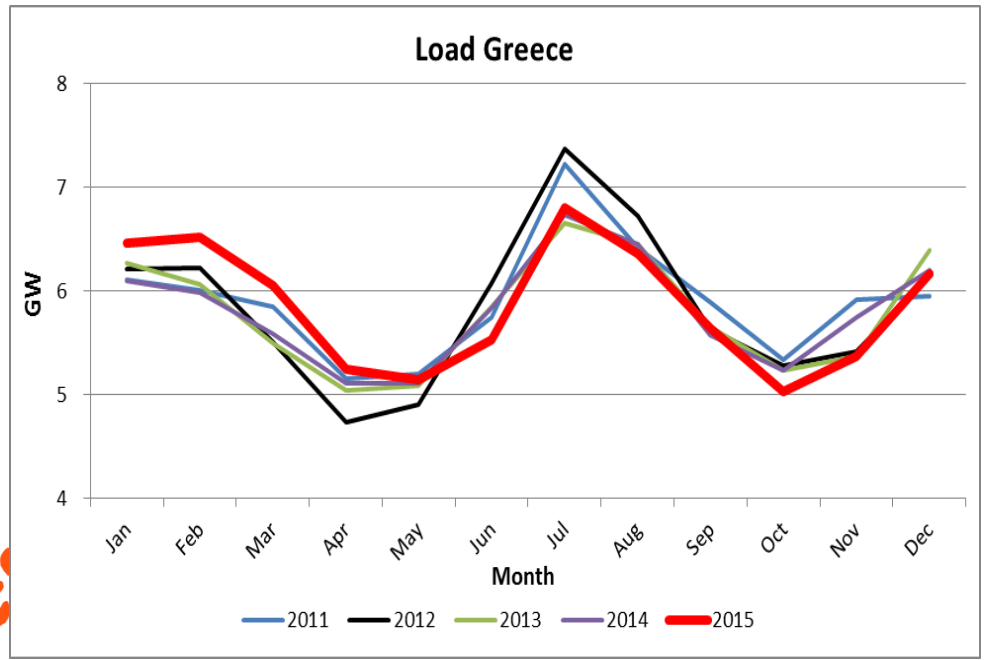
Total Generation (TWh)										
Country	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Germany	564	563	555	515	537	527	538	544	527	549
France	540	533	542	517	543	538	537	543	534	538
Italy	293	293	298	274	281	288	284	274	266	267
UK	350	352	344	322	327	312	306	300	278	266
Spain	257	266	275	262	272	261	263	253	246	247
Switzerland	59	64	64	64	64	60	66	66	67	64
Romania	57	56	60	53	56	57	54	54	61	61
Greece	50	51	51	49	49	49	50	47	41	42
Hungary	33	37	37	36	34	33	31	27	26	27

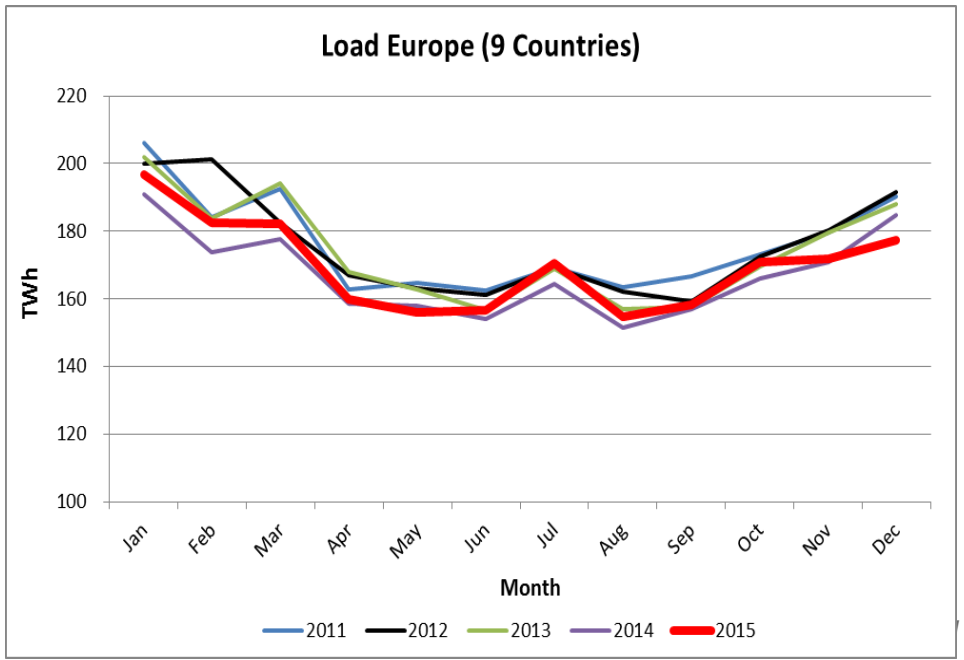
Total Consumption (TWh)										
Country	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Germany	545	543	532	501	521	521	515	510	492	501
France	478	477	494	492	513	478	490	495	465	474
Italy	338	339	337	318	325	333	327	317	308	315
UK	359	357	356	324	329	317	317	314	298	289
Spain	254	262	264	254	263	255	252	247	242	248
Switzerland	63	63	64	63	66	64	65	65	63	63
Romania	53	54	55	51	53	55	54	52	53	55
Greece	54	56	57	54	54	52	51	51	51	51
Hungary	41	41	41	42	39	40	39	39	38	41

Power demand is shrinking

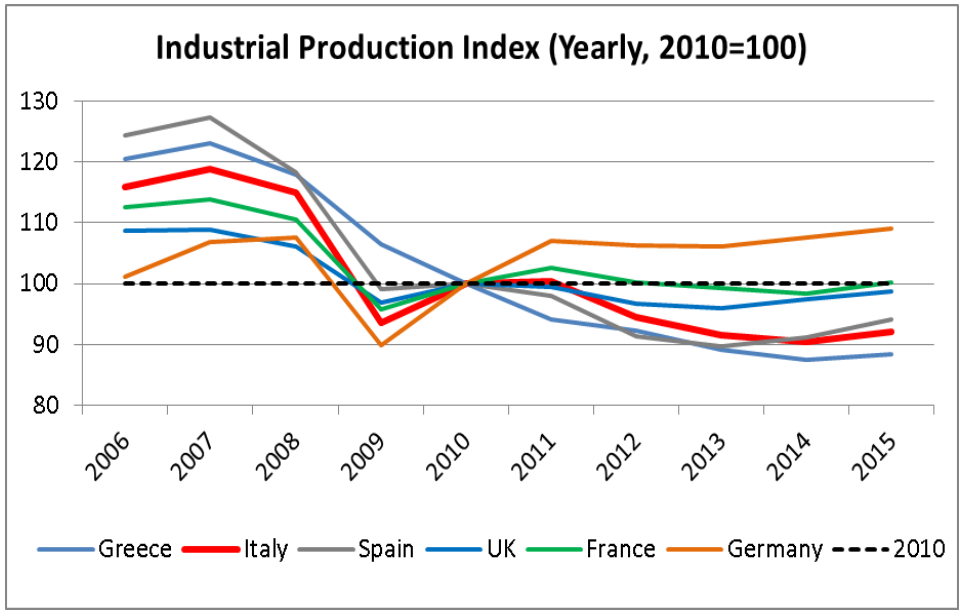


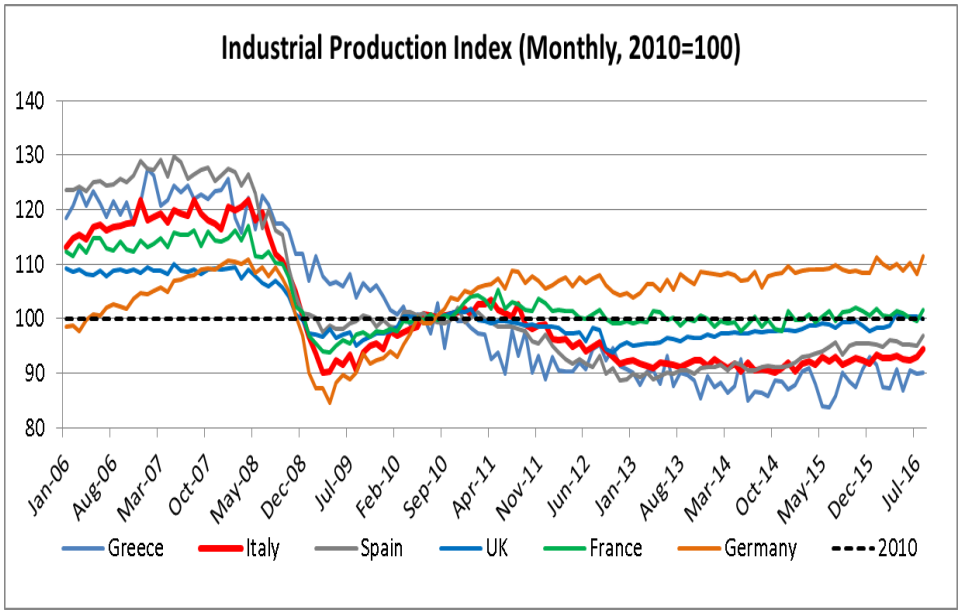




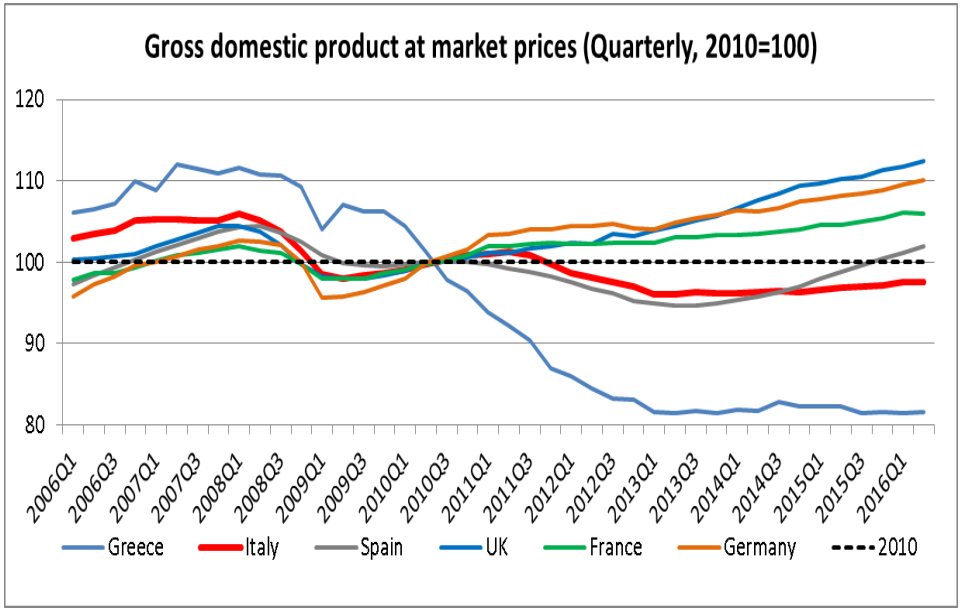


… due to weak economic activity

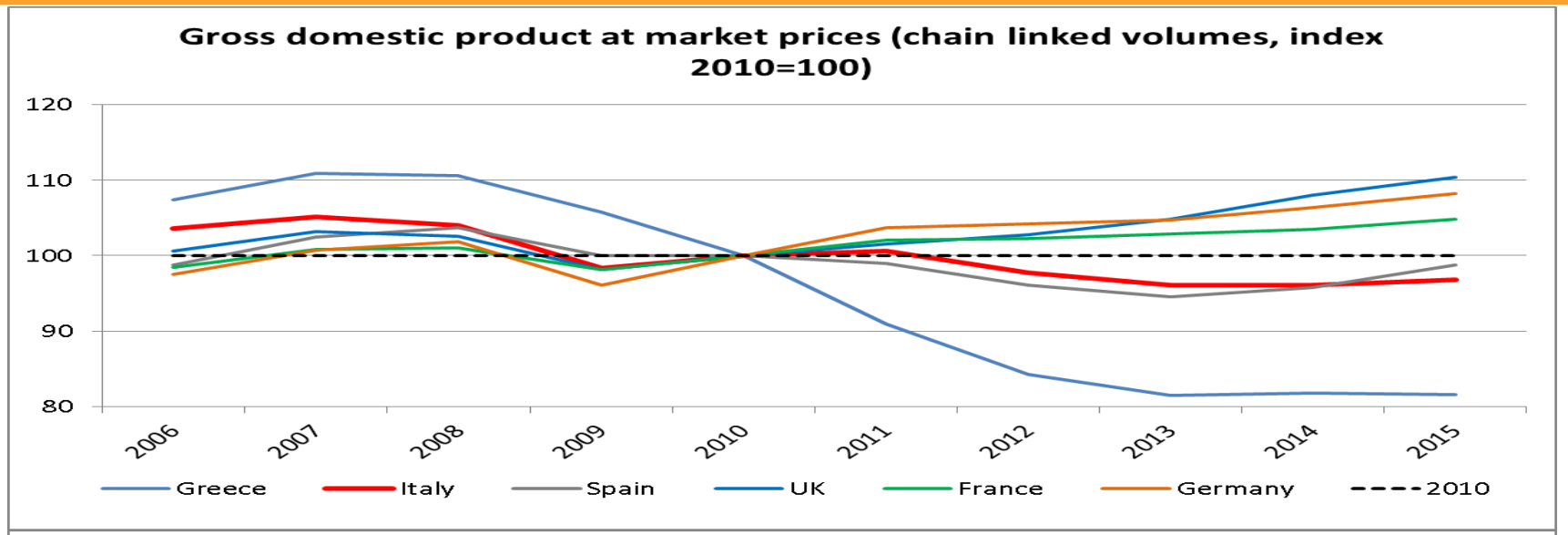


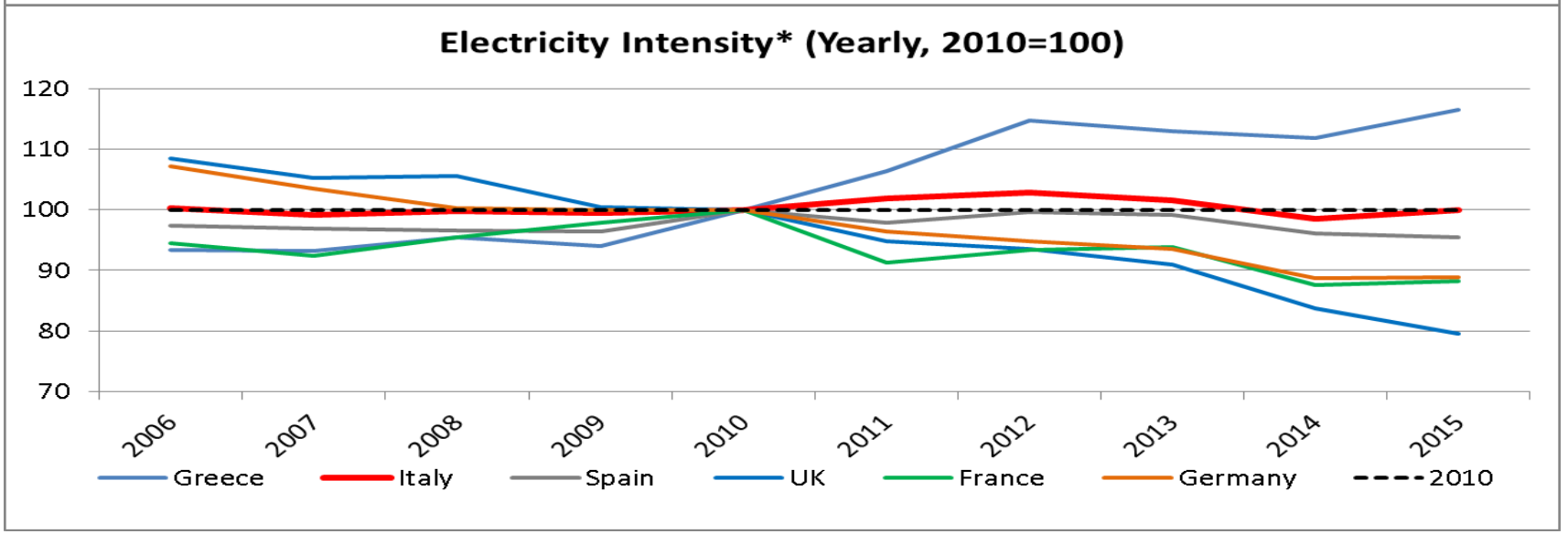


- Strong weakness of economic activity
- Collapse of industrial production in many countries (excl. Germany)
- Industrial production indexes still remain below 2010's levels
- Growth of the tertiary service



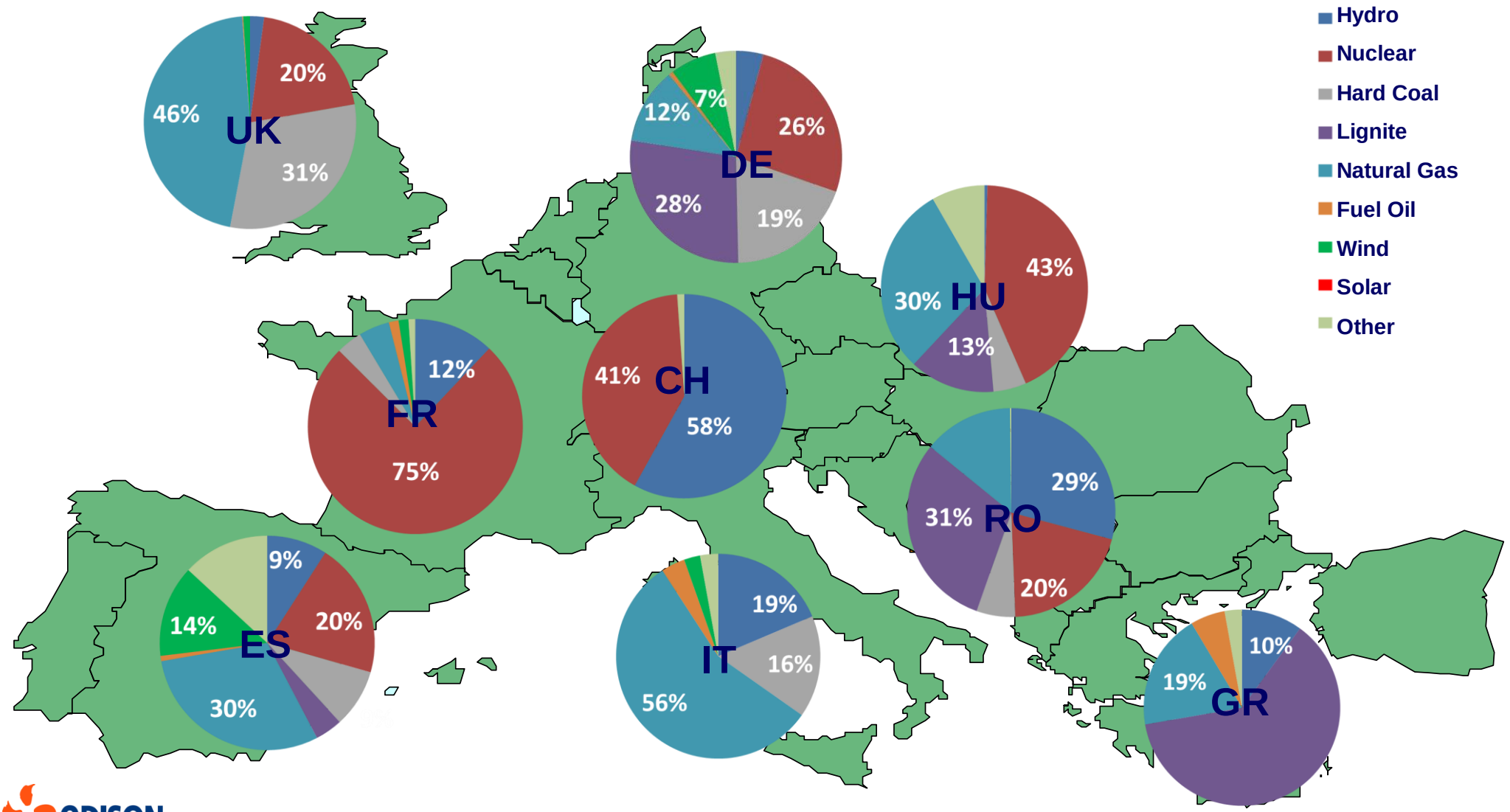
… and energy efficiency improvements



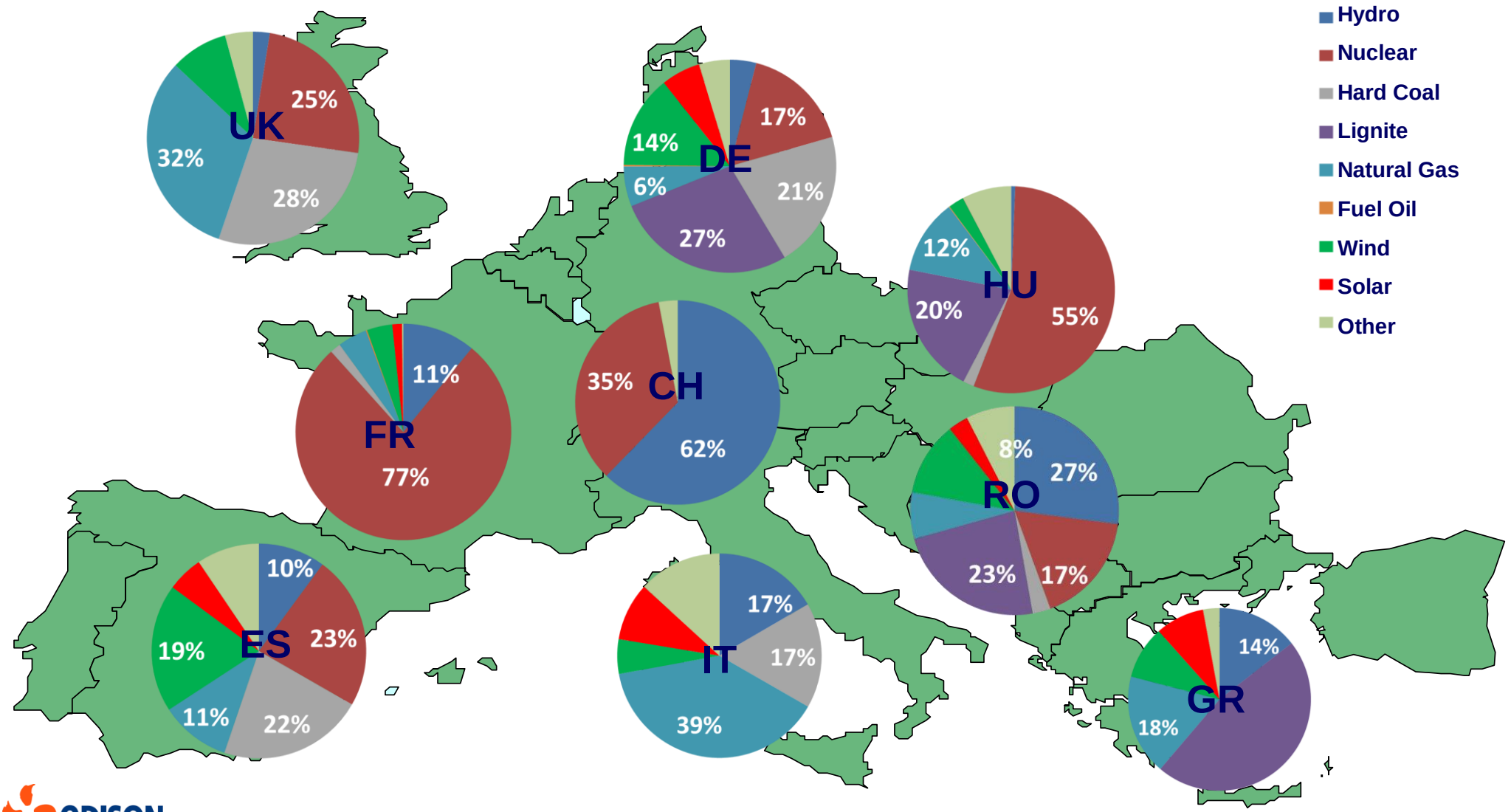


* The electricity intensity of an economy is defined as the ratio between the electricity consumption and Gross Domestic Product (market prices chain linked volumes)

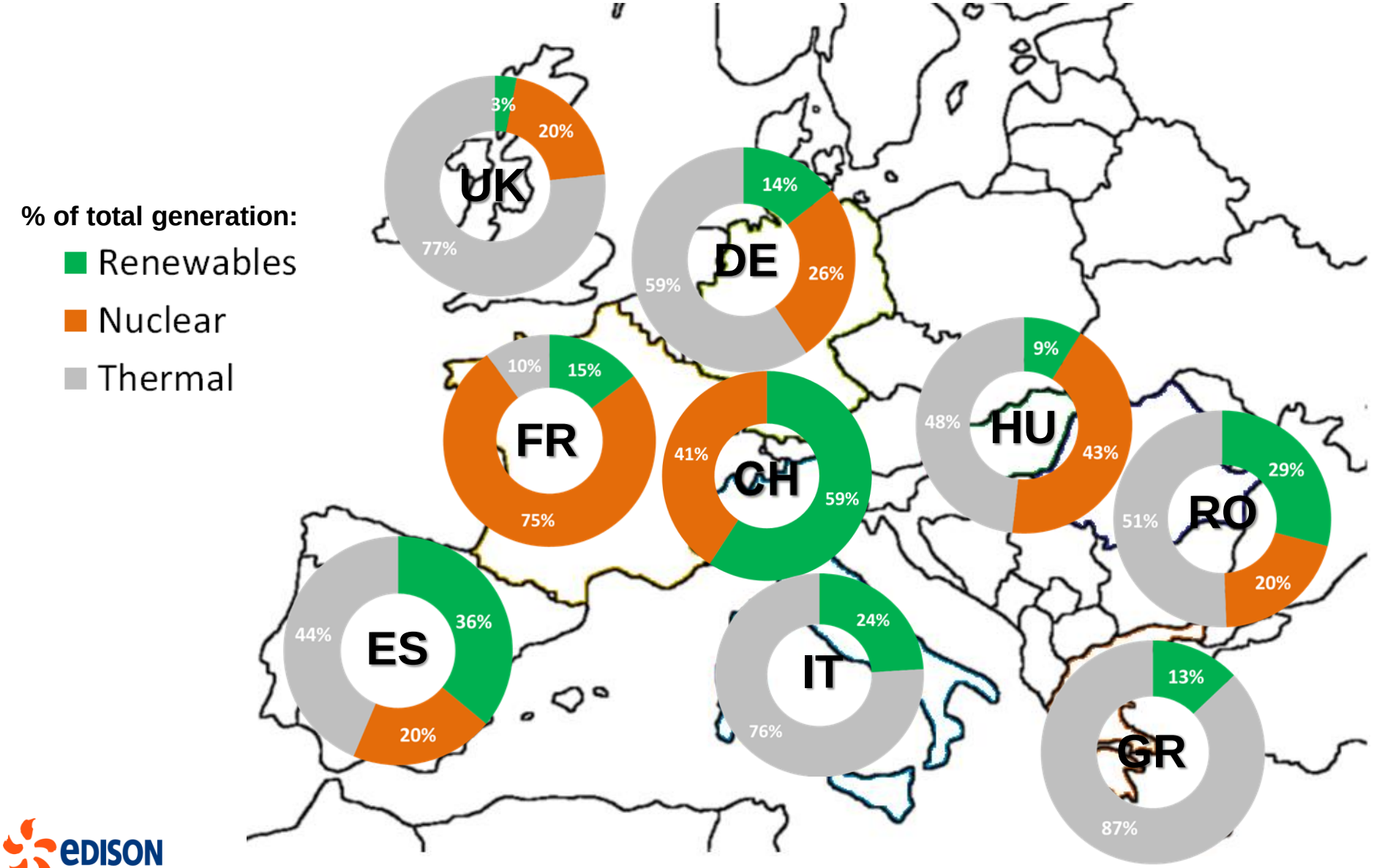
Generation mix (2009)



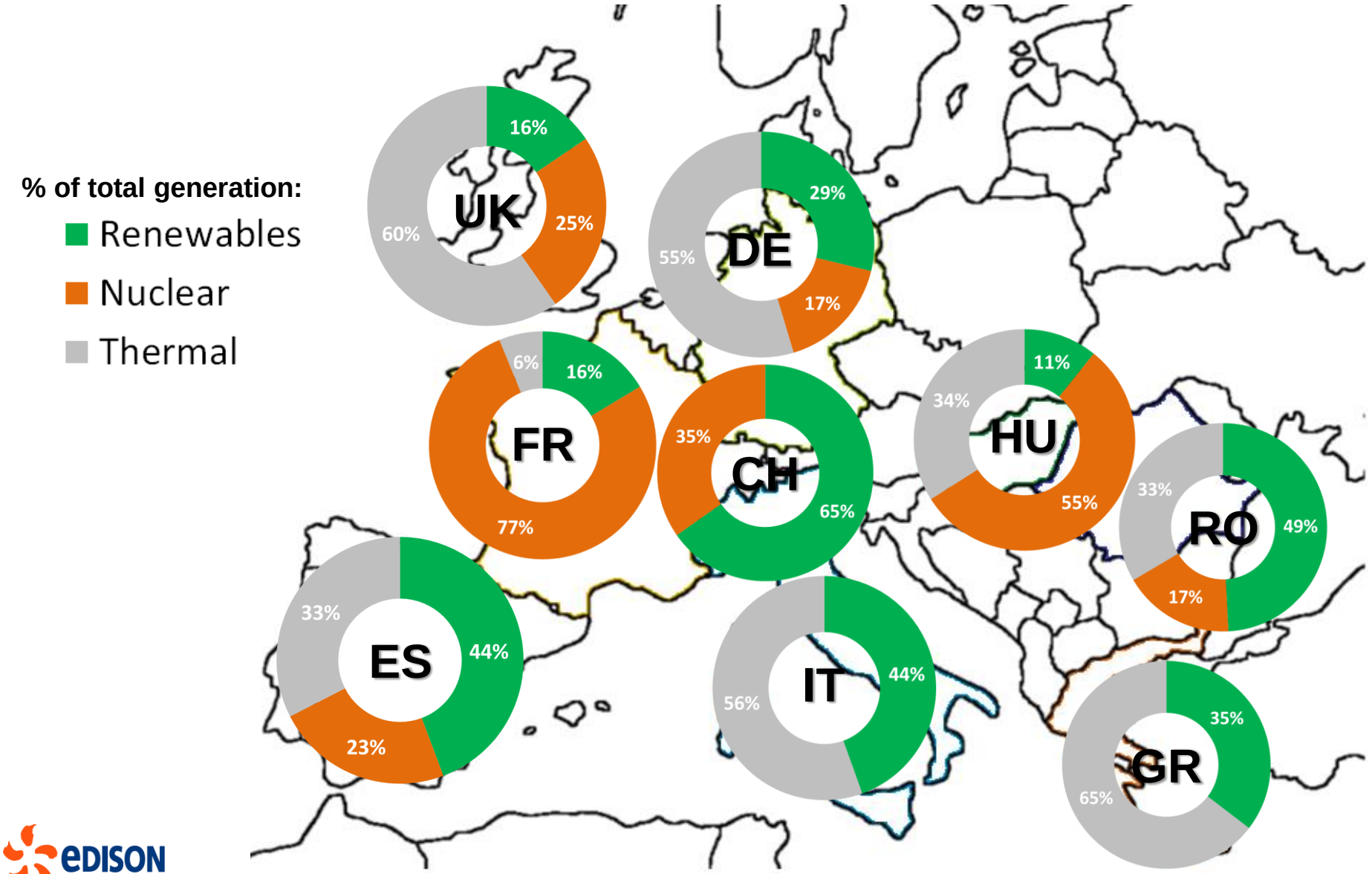
Generation mix (2015)



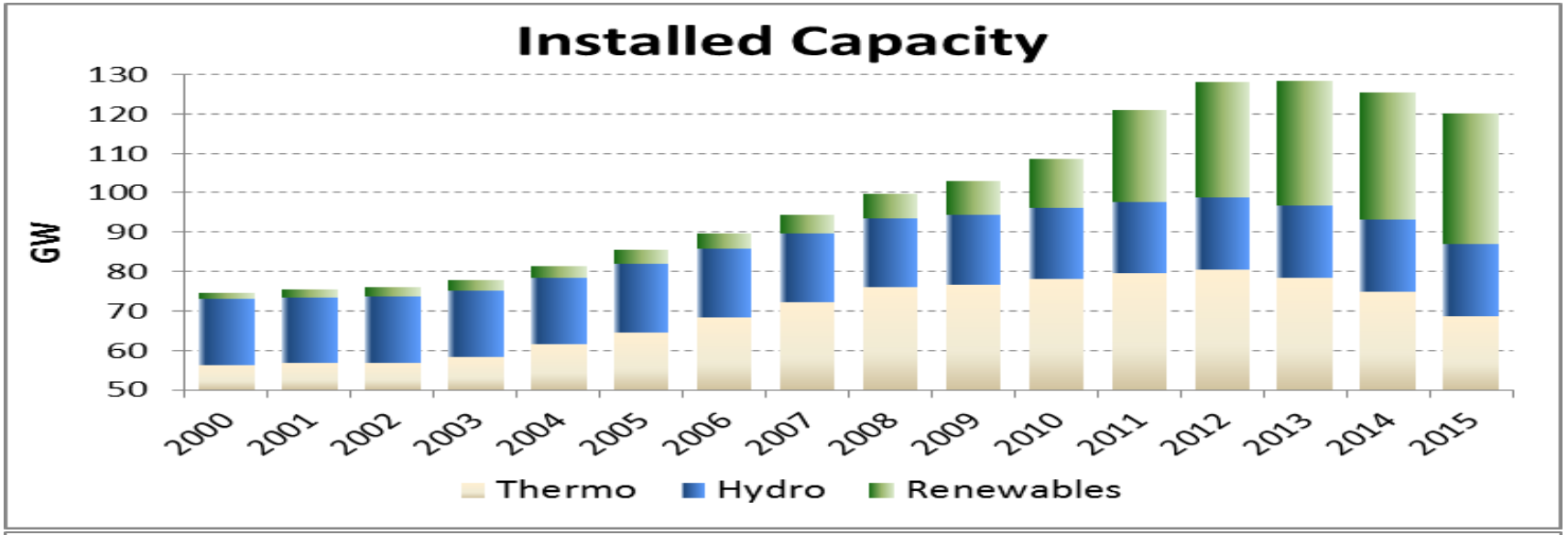
Renewables penetration (2009)

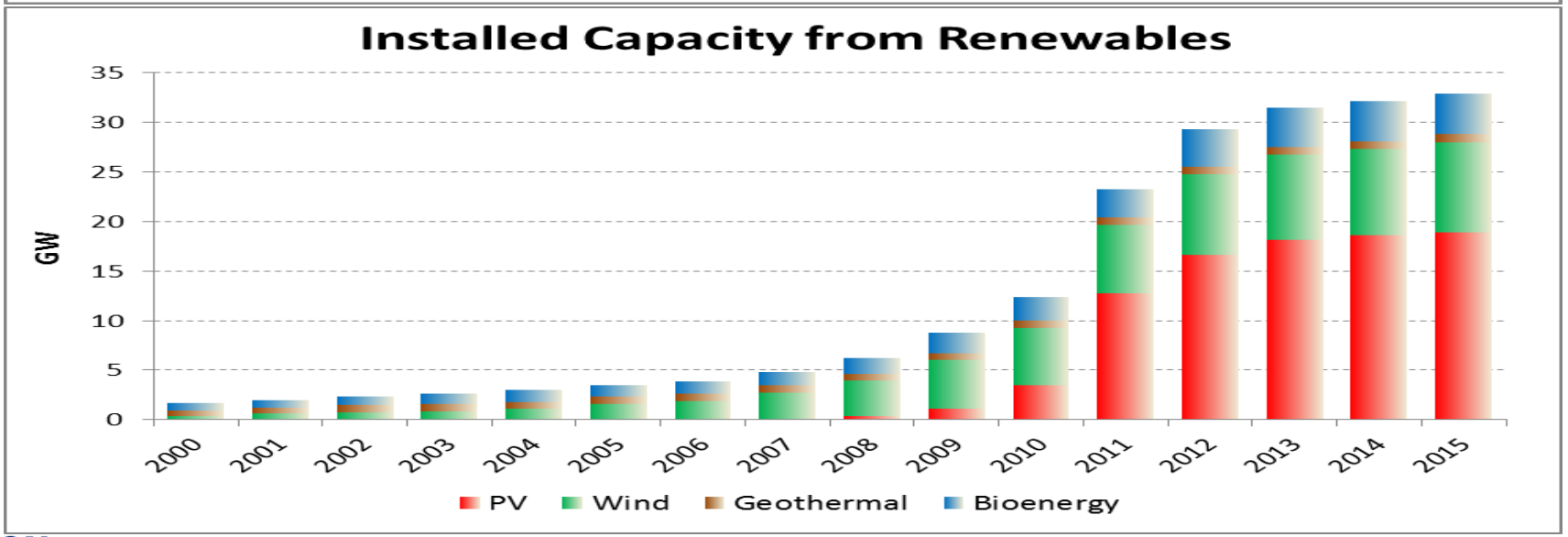


Renewables penetration (2015)



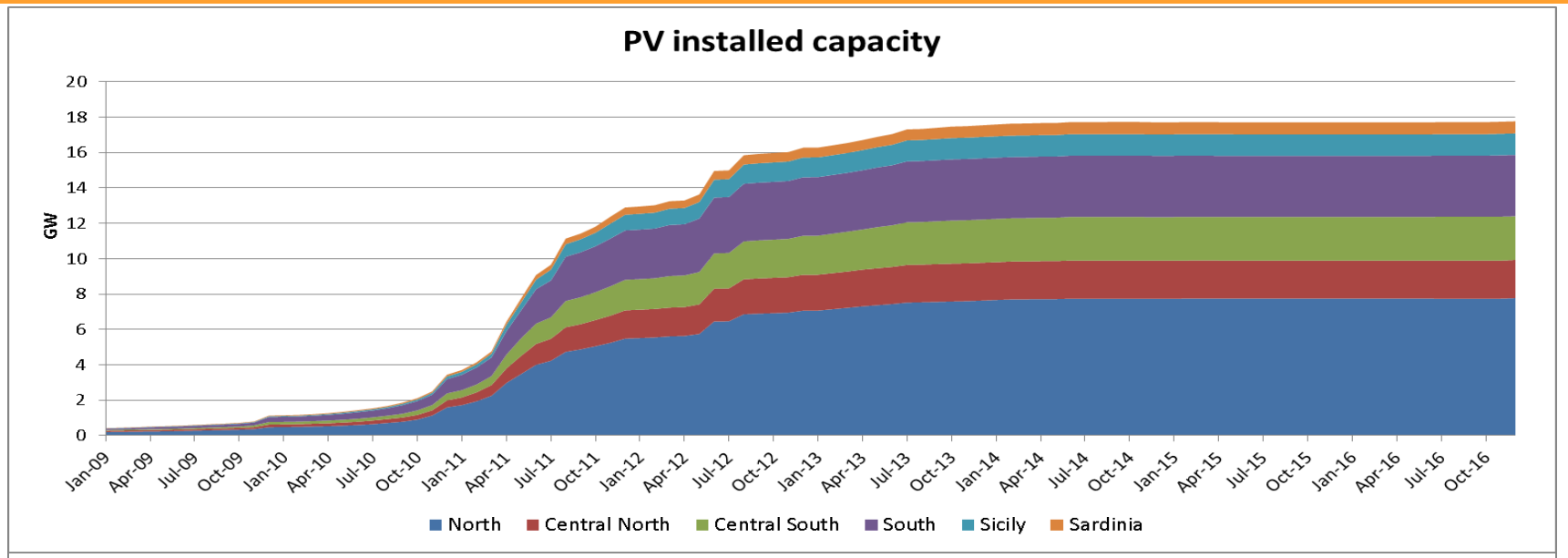
Evolution of installed capacity in Italy

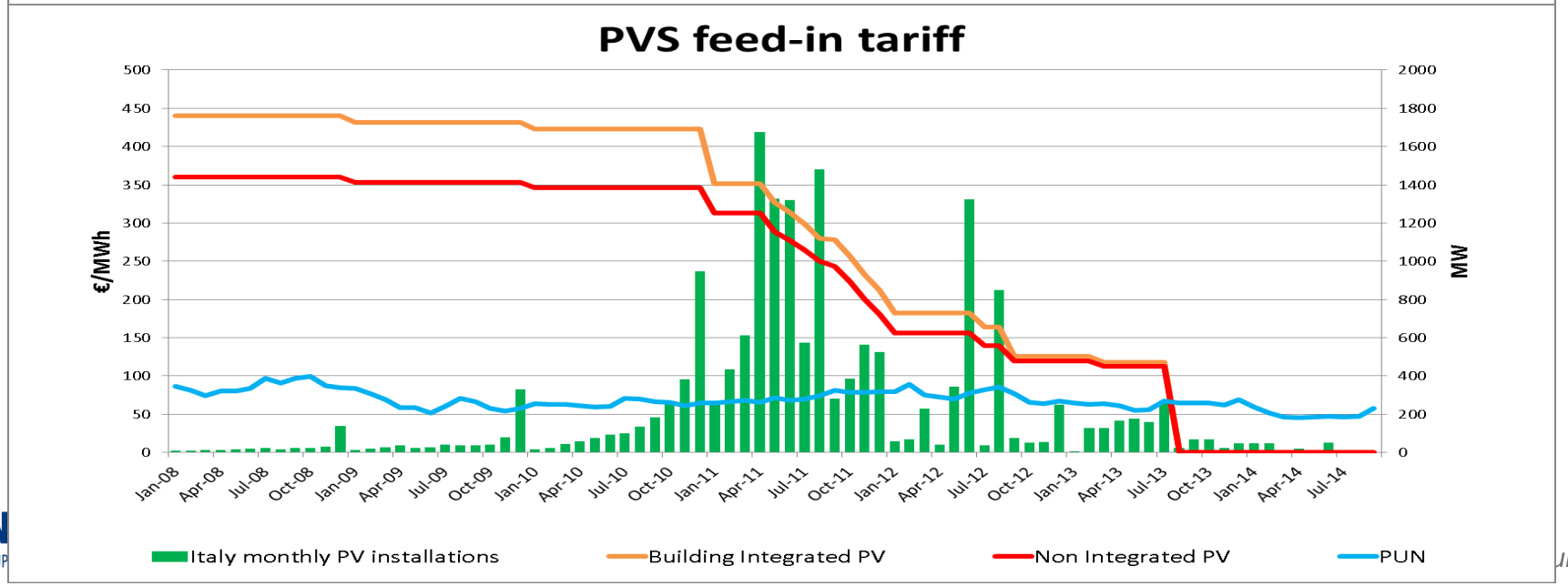




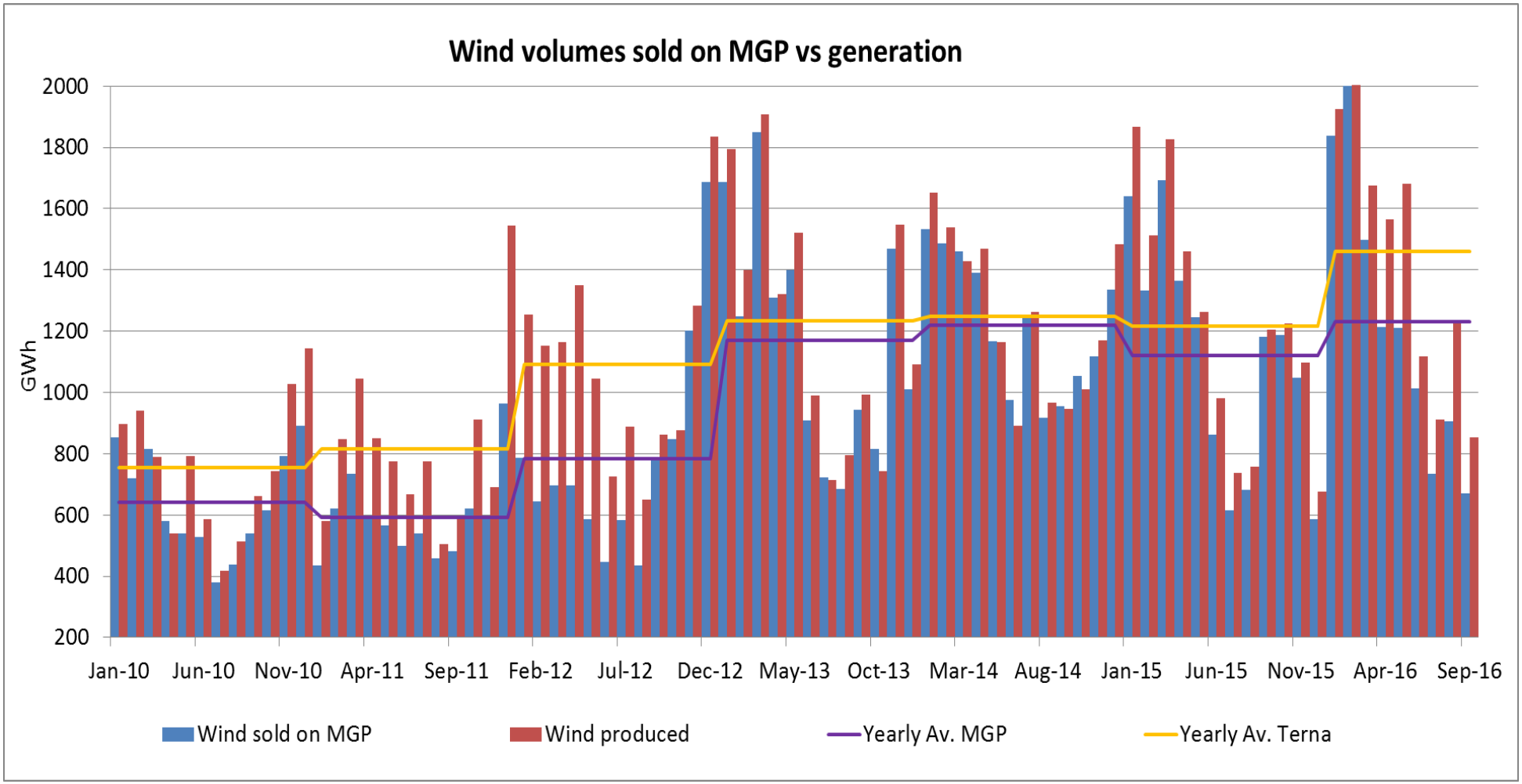
Note: data on 2015 are GSE estimates

Italy: Solar generation



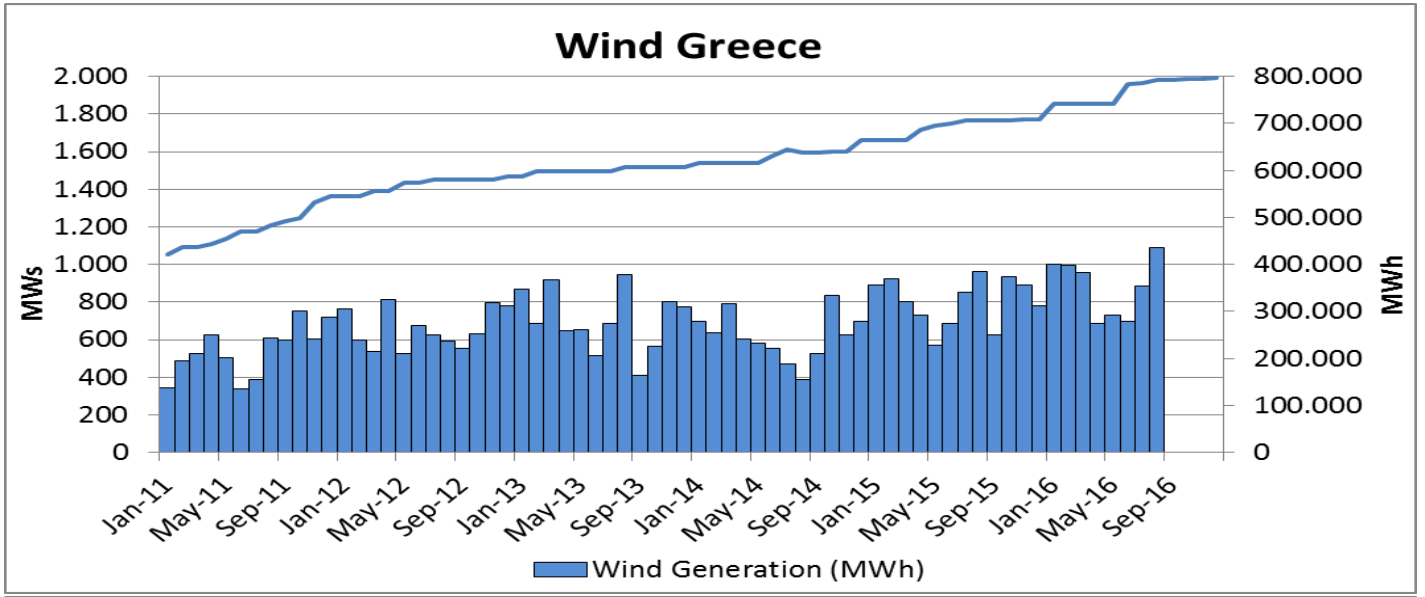


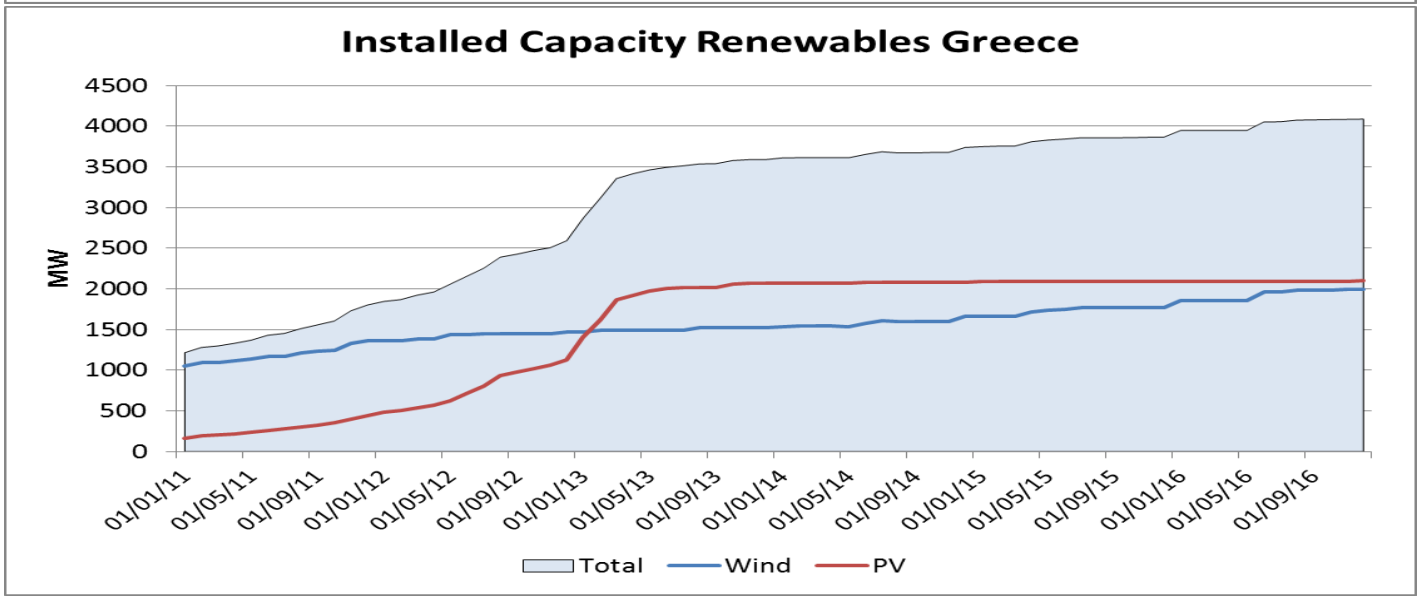
Italy: Wind generation



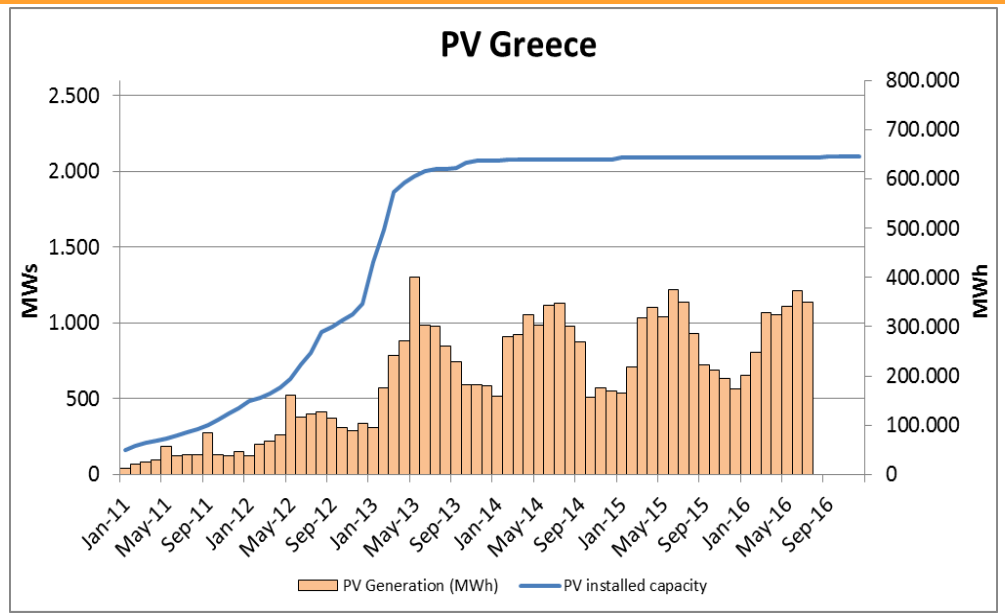
Greece: Wind generation

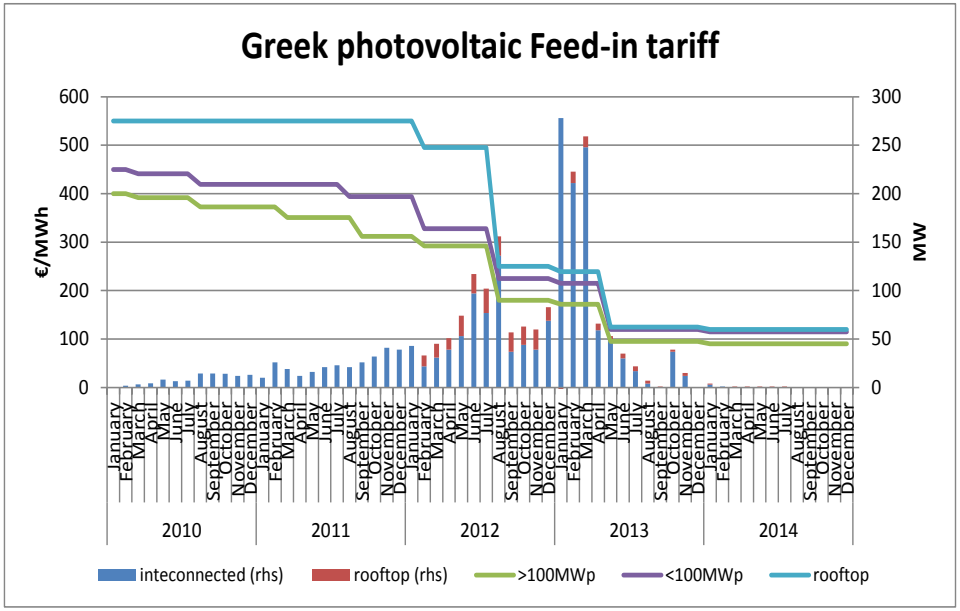
- Wind installed capacity rapidly increased between 2008 and 2011
- Since 2012 investments in RES have levelled off
- Currently, installed capacity is approximately 2 GWs



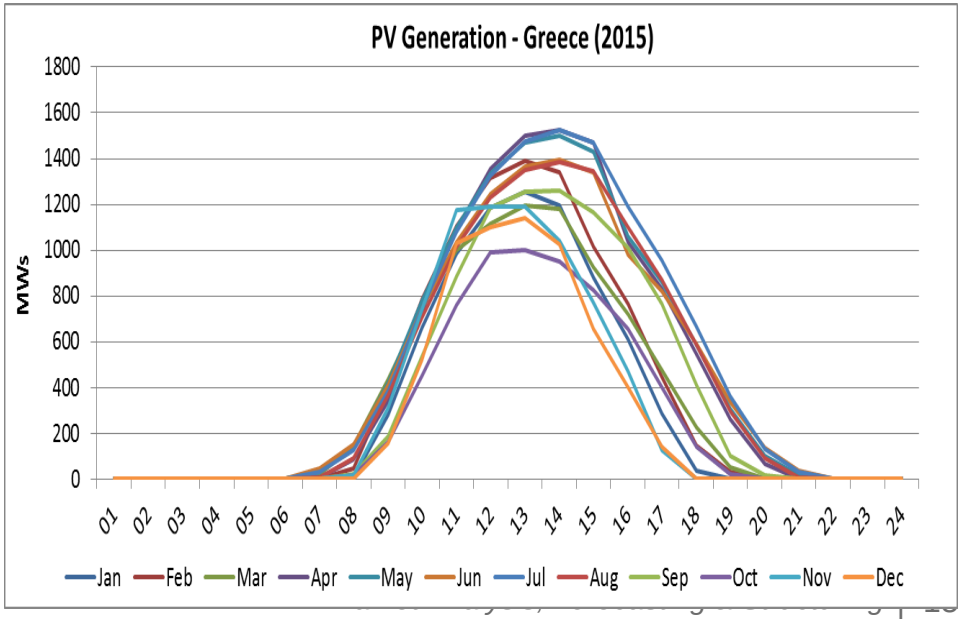


Greece: Solar generation

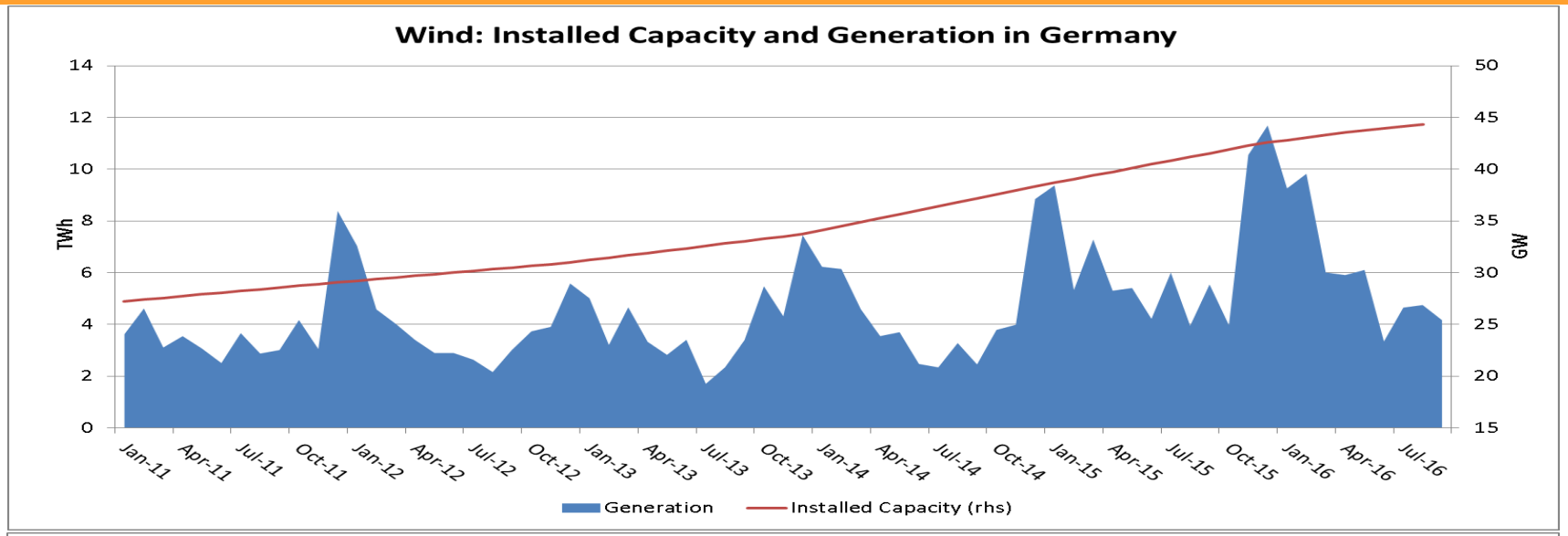


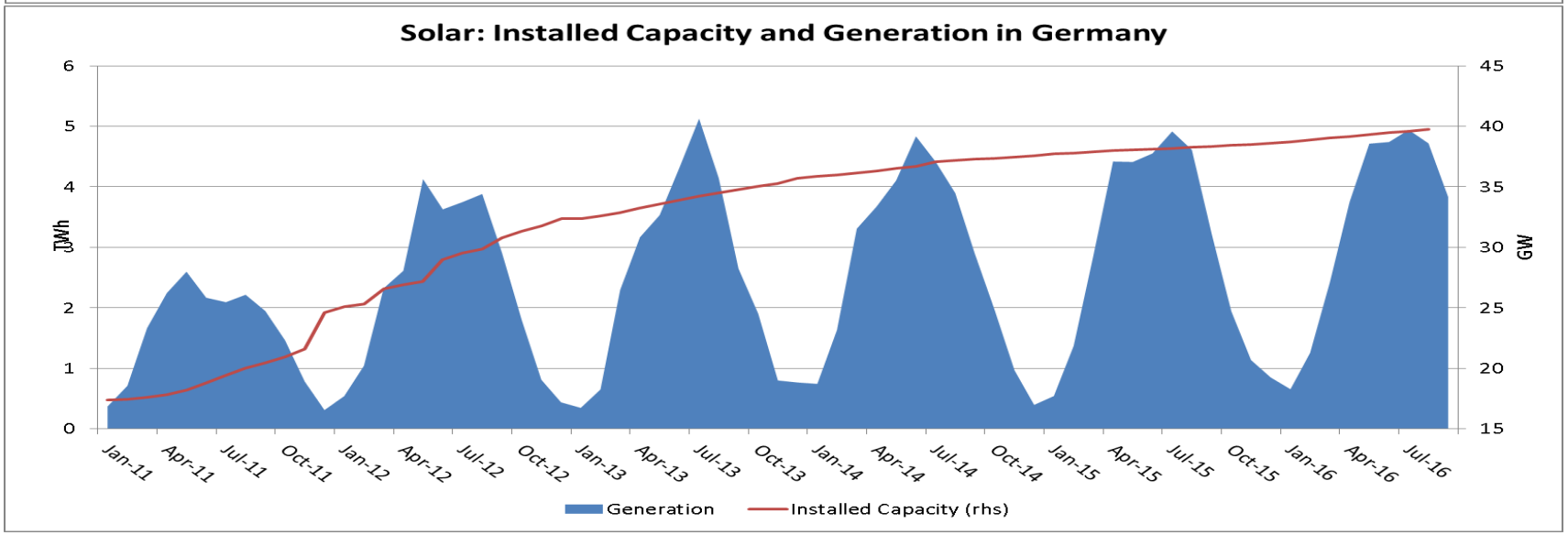


- Installation of solar panels, though years later than other countries, has shown remarkable growth rates (especially during 2012)
- The pace of expansion has been strongly affected by the generous package of incentives (mainly feed-in tariffs). Recently, incentives to solar generation were largely reduced
- PV generation, usually higher in Q2 and Q3, strongly depends on temperatures and radiation factors, which affect panels' performances
  - At this regard, June could potentially be interested by higher production rates

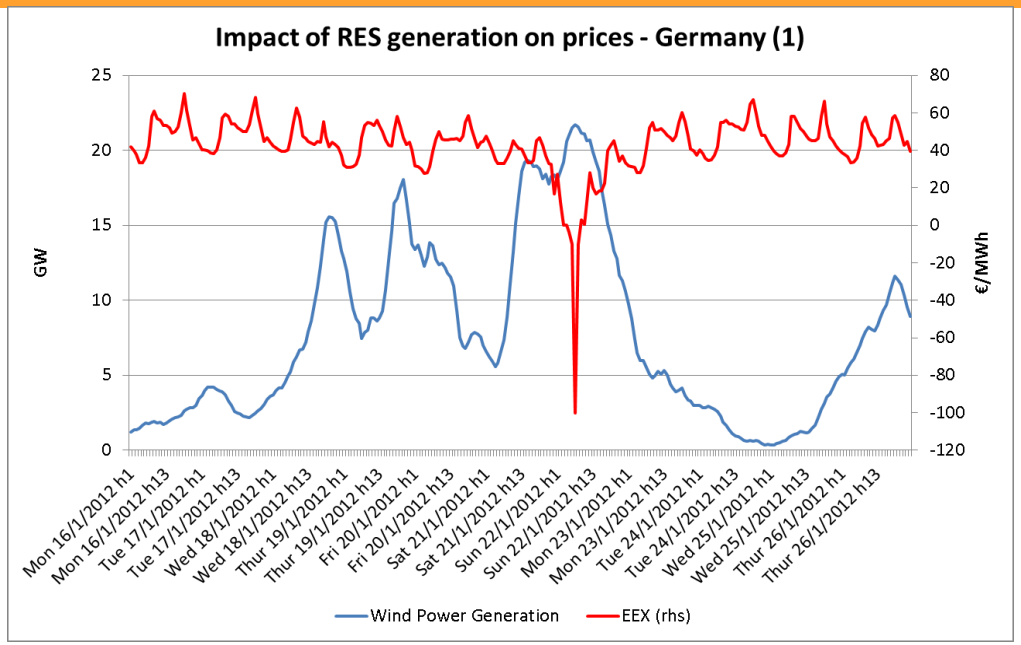


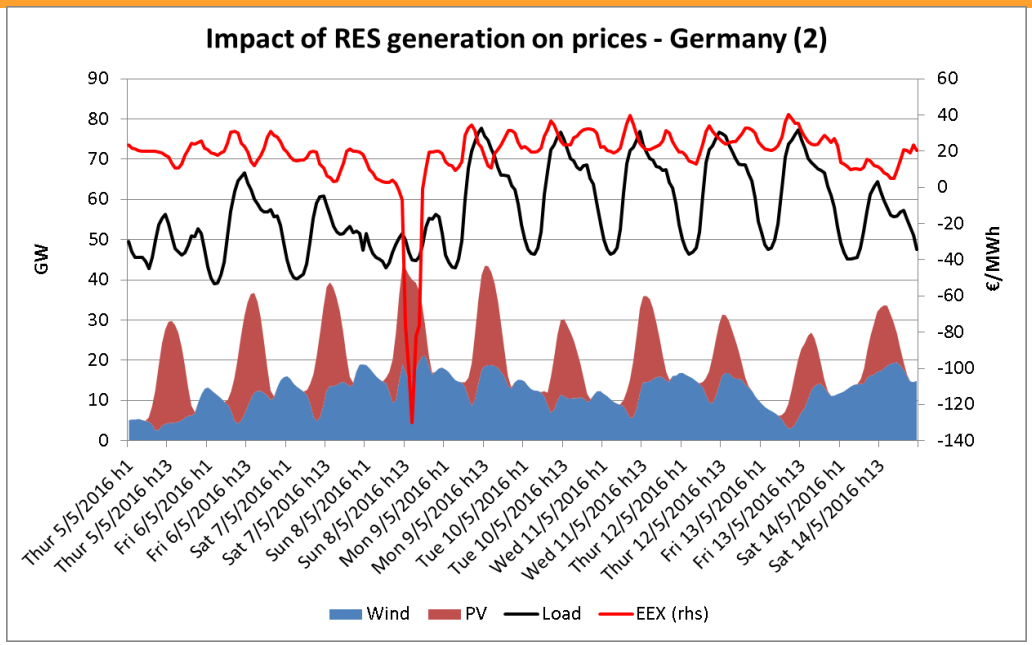
Evolution of PV and wind installed capacity in Germany





Effect of RES generation on prices

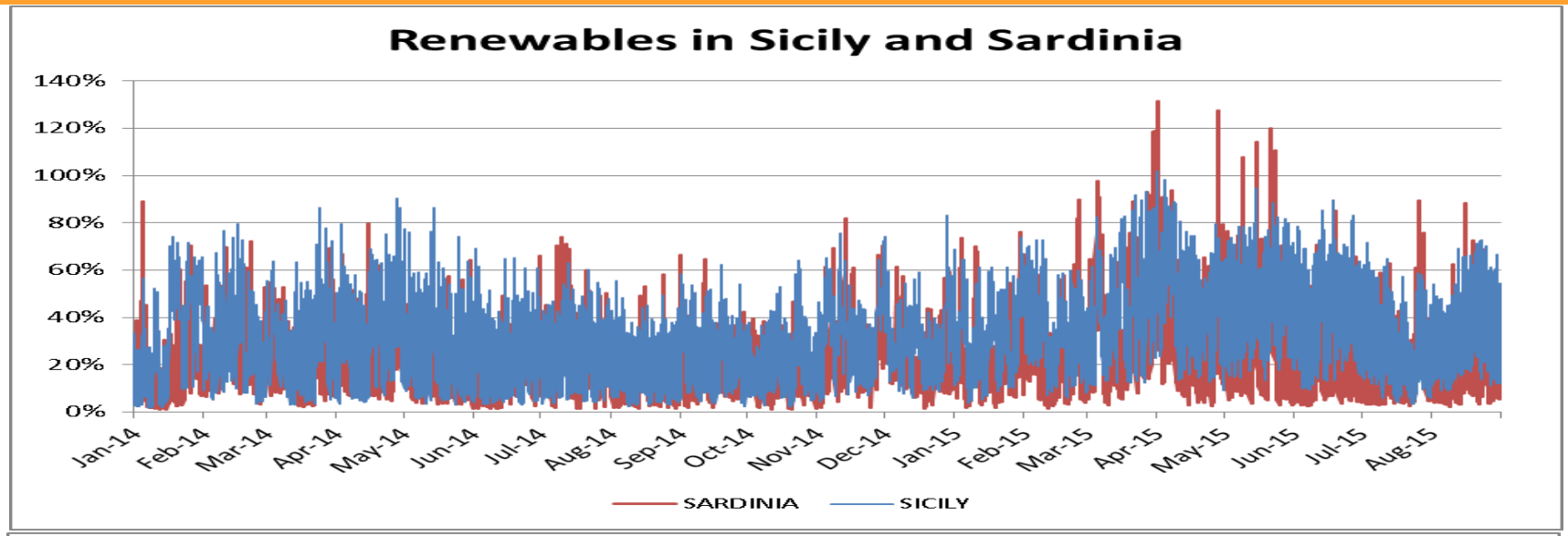


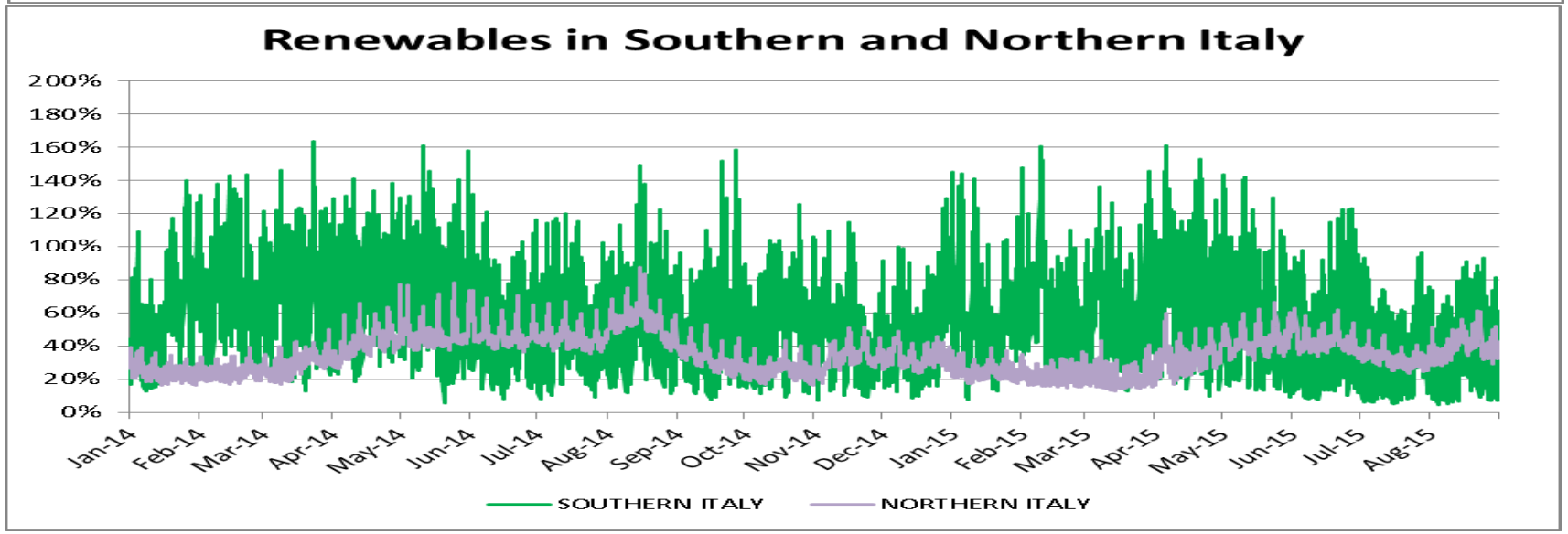


- Saturday 21st January 2012:
  - As largely expected, wind power generation increases by 15GWs in a few hours
  - Power plants' flexibility is hugely employed in order to prevent prices from collapsing
- Sunday 22nd January 2012, late evening:
  - Nevertheless, as demand decreases, prices plummet: during hour 7 for each MWh sold, operators must pay 110 euros

- Sunday 8th May 2016:
  - During a couple hours, wind and PV generation surpasses 42 GWs
  - These two energy sources combined satisfy around 90 percent of total electricity demand
  - Production from conventional thermal power plants goes in real trouble
  - Again, power prices crash reaching a minimum of -130€/MWh

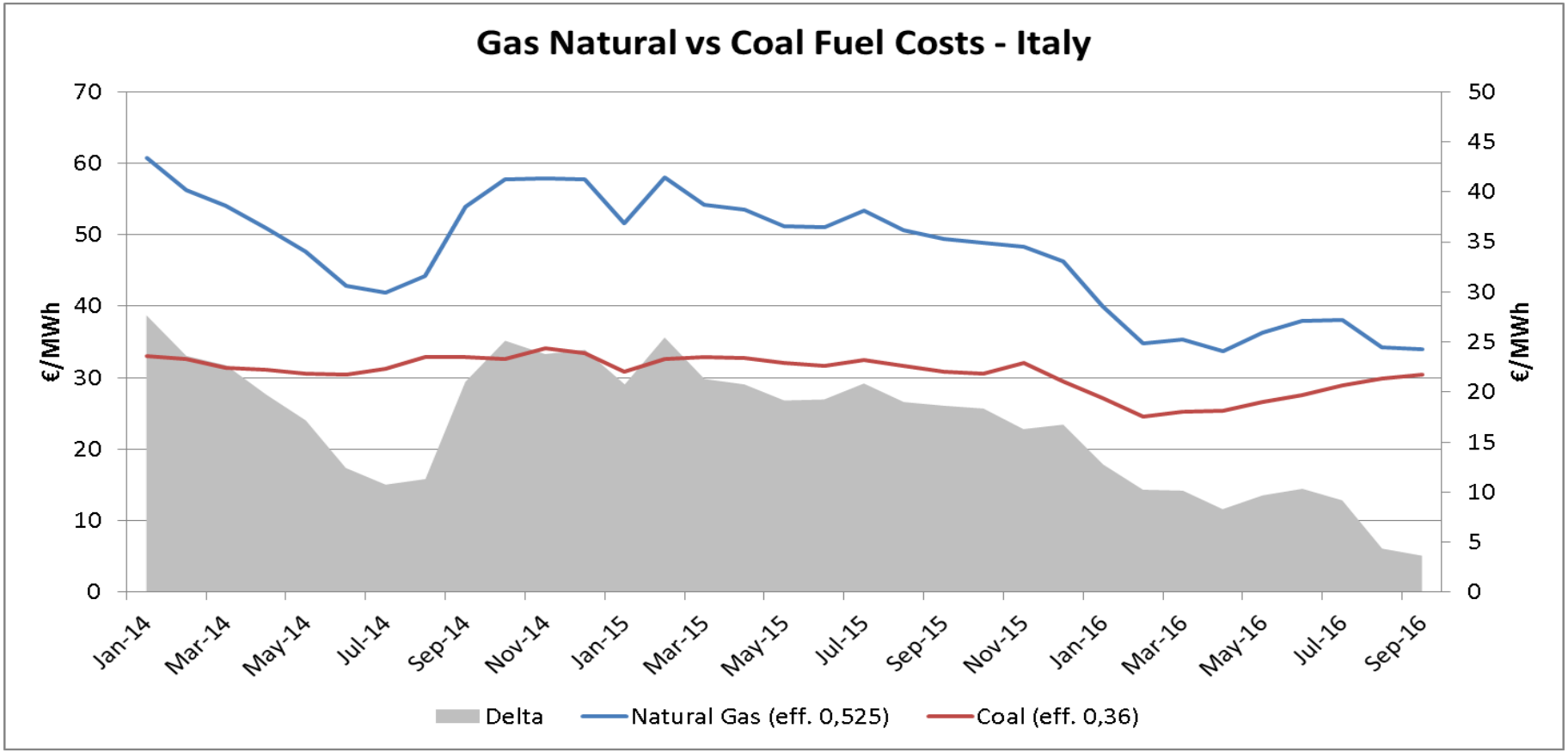
overcapacity for renewables in Italy in some hours



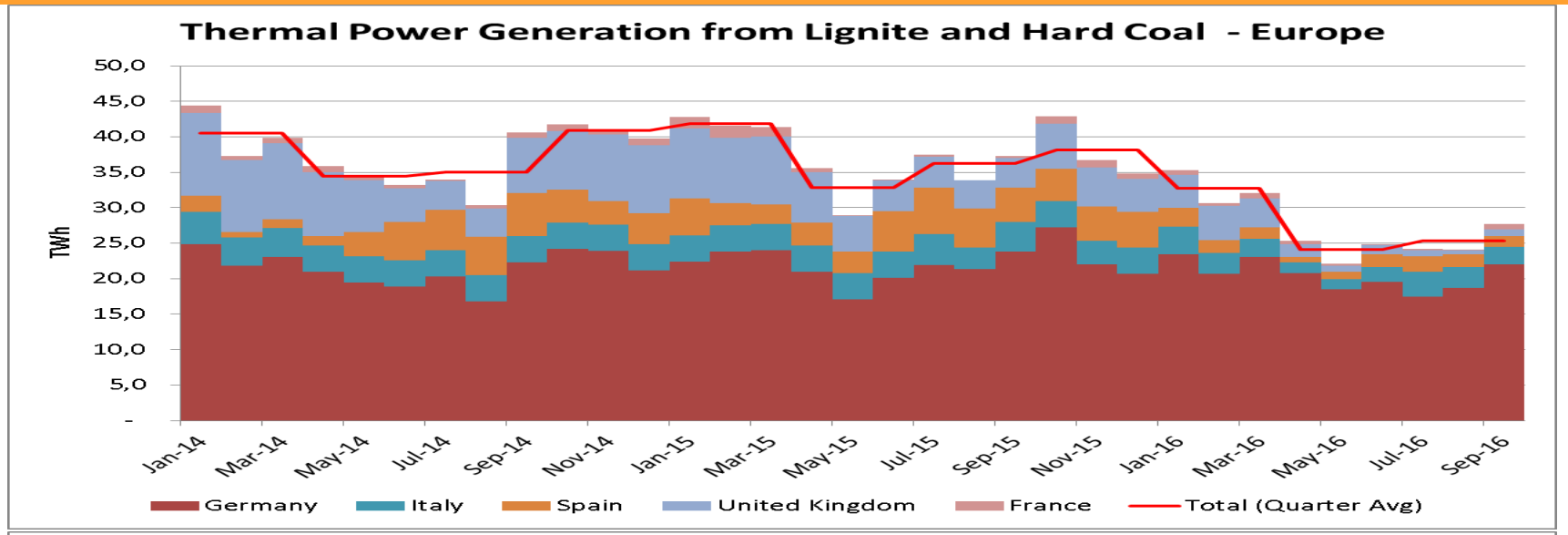


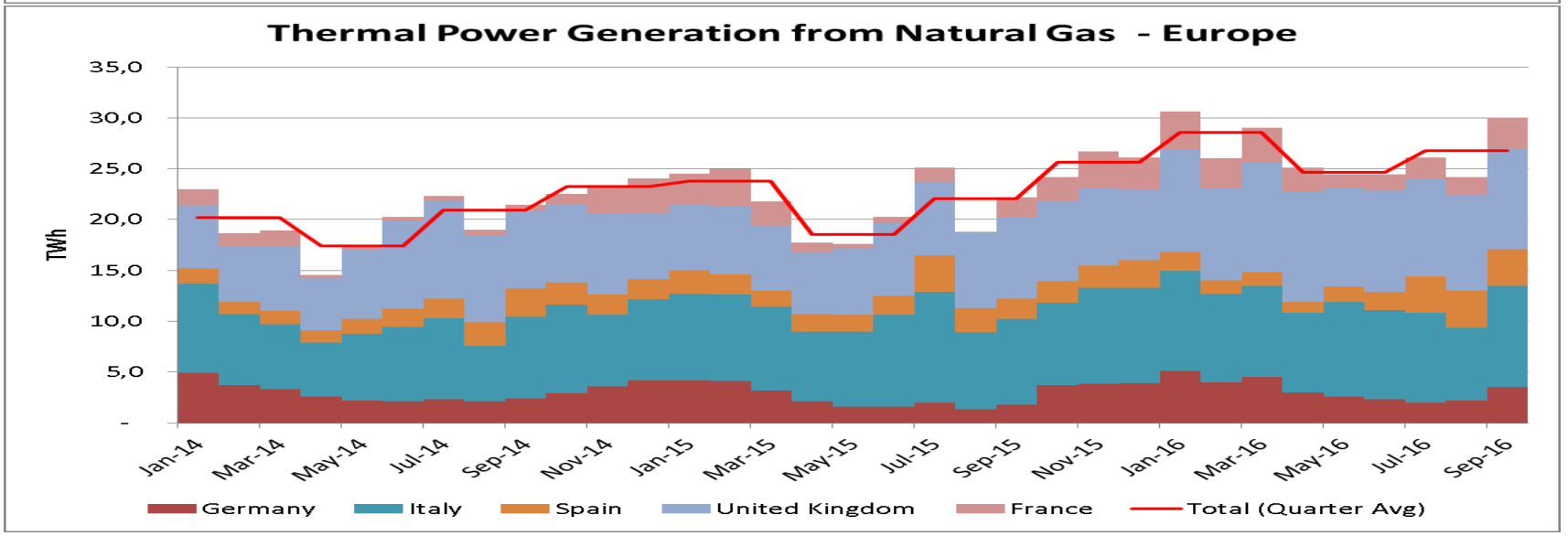
Coal/natural gas fuel switching: A new role for gas? (1/4)

- The possibility to replace hard coal with natural gas fueled power plants has been affected by a few factors. Mainly:
  - gas natural vs hard coal fuel costs;
  - environmental concerns.

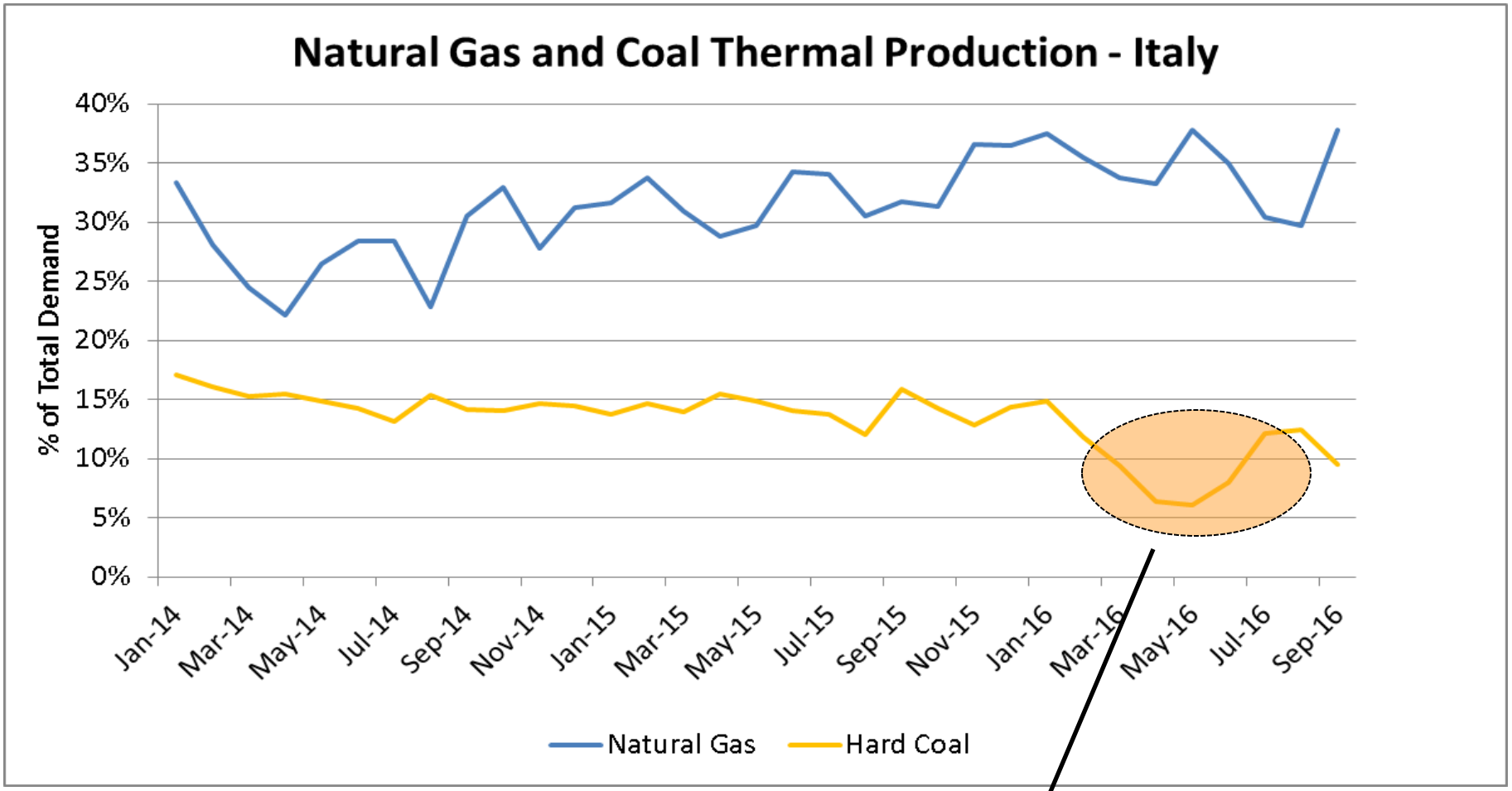


Coal/natural gas fuel switching: A new role for gas? (2/4)



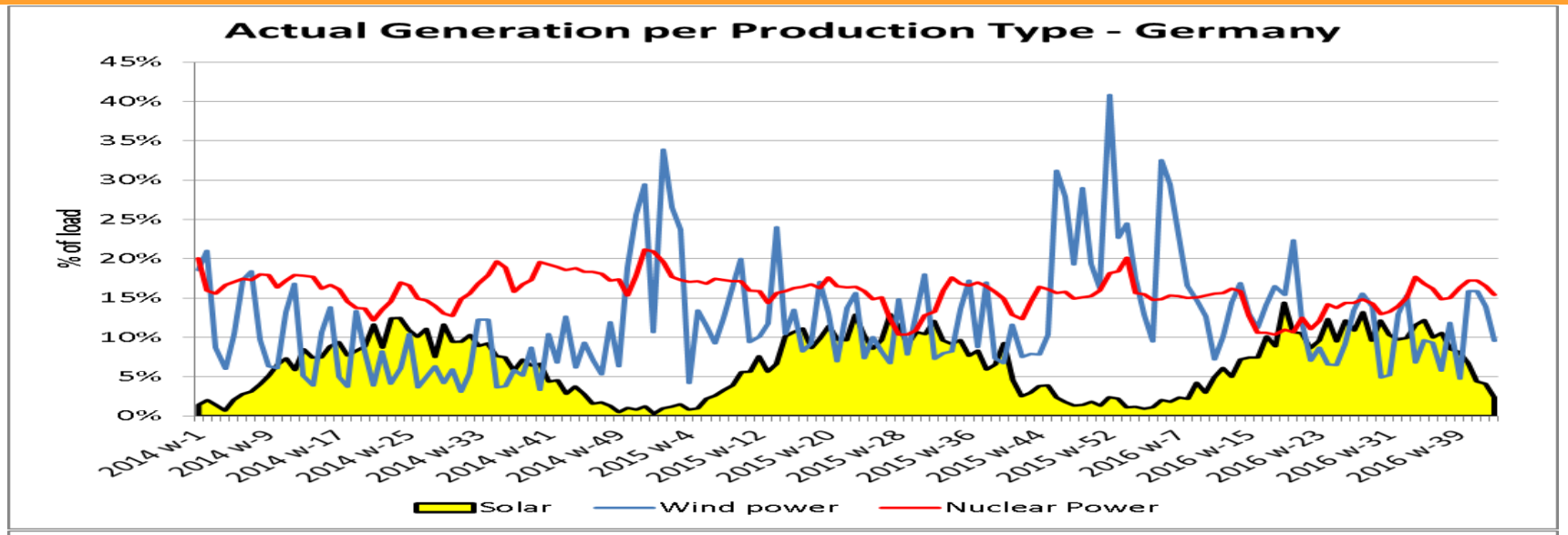


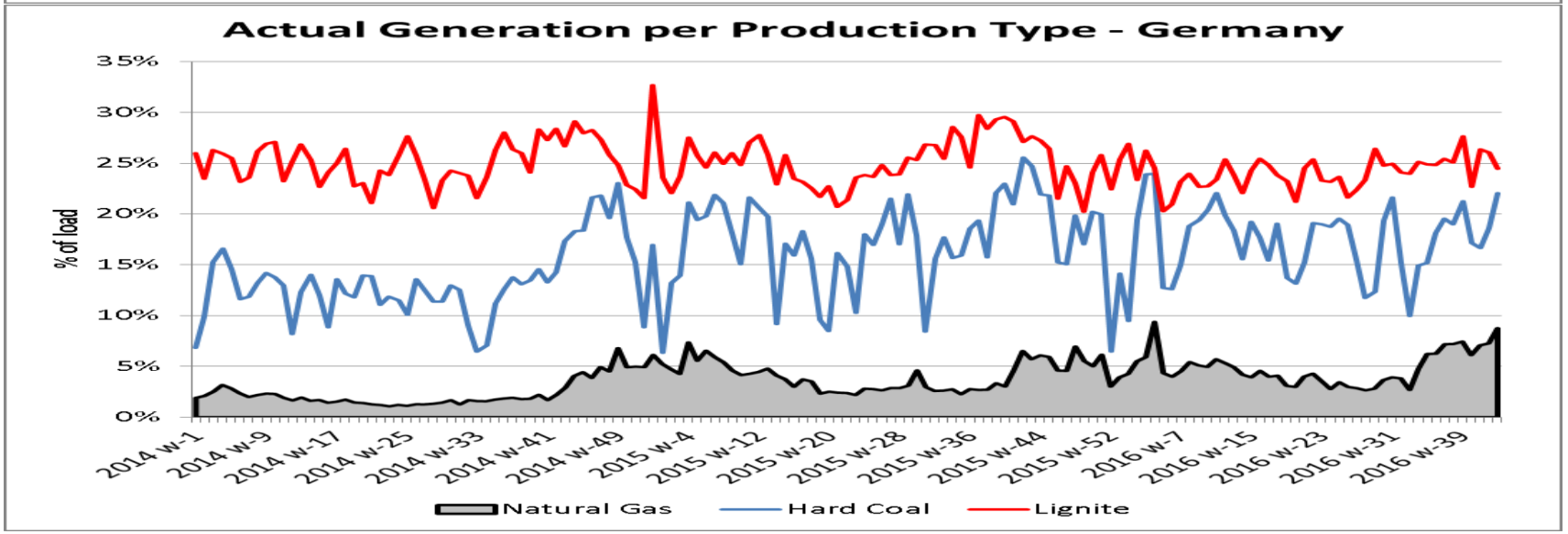
Coal/natural gas fuel switching: A new role for gas? (3/4)



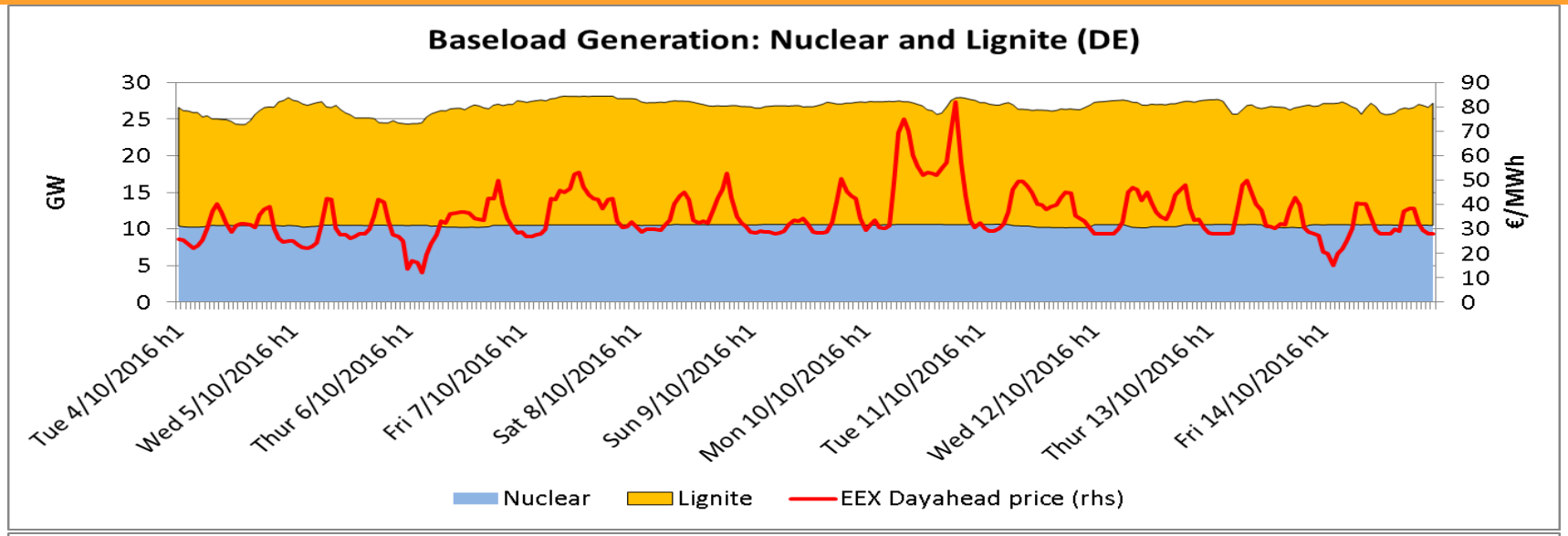
ATTENTION: high number of outages!!

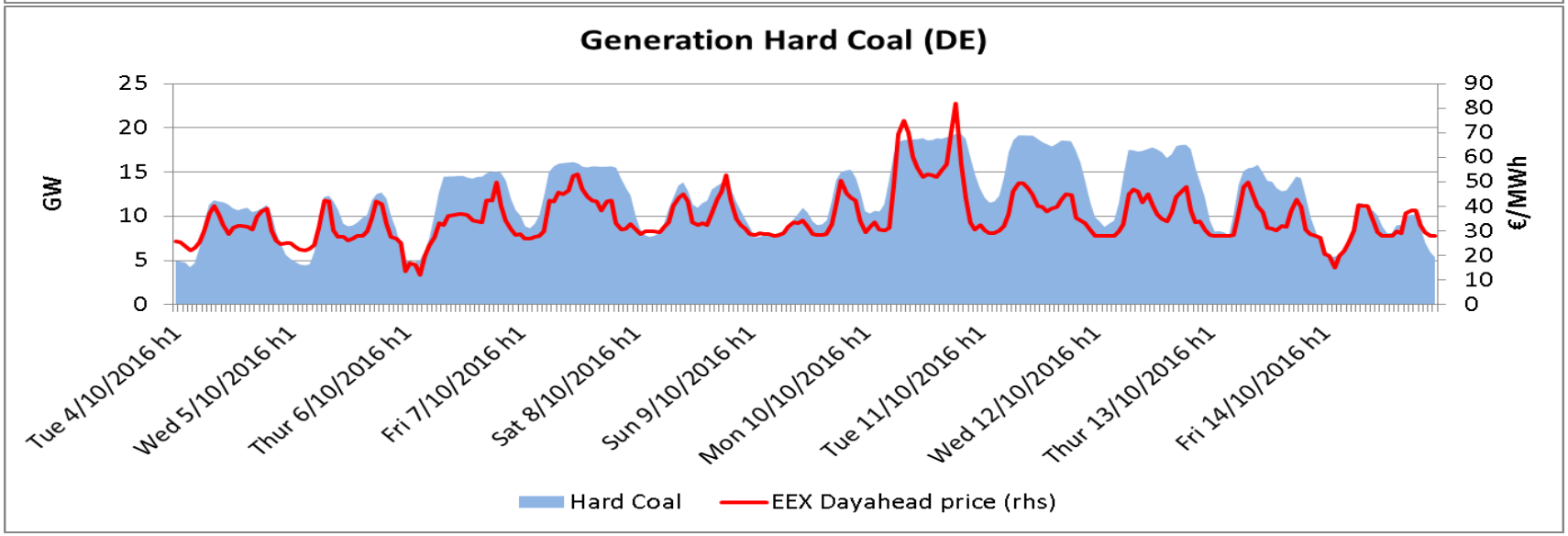
Coal/natural gas fuel switching: A new role for gas? (4/4)



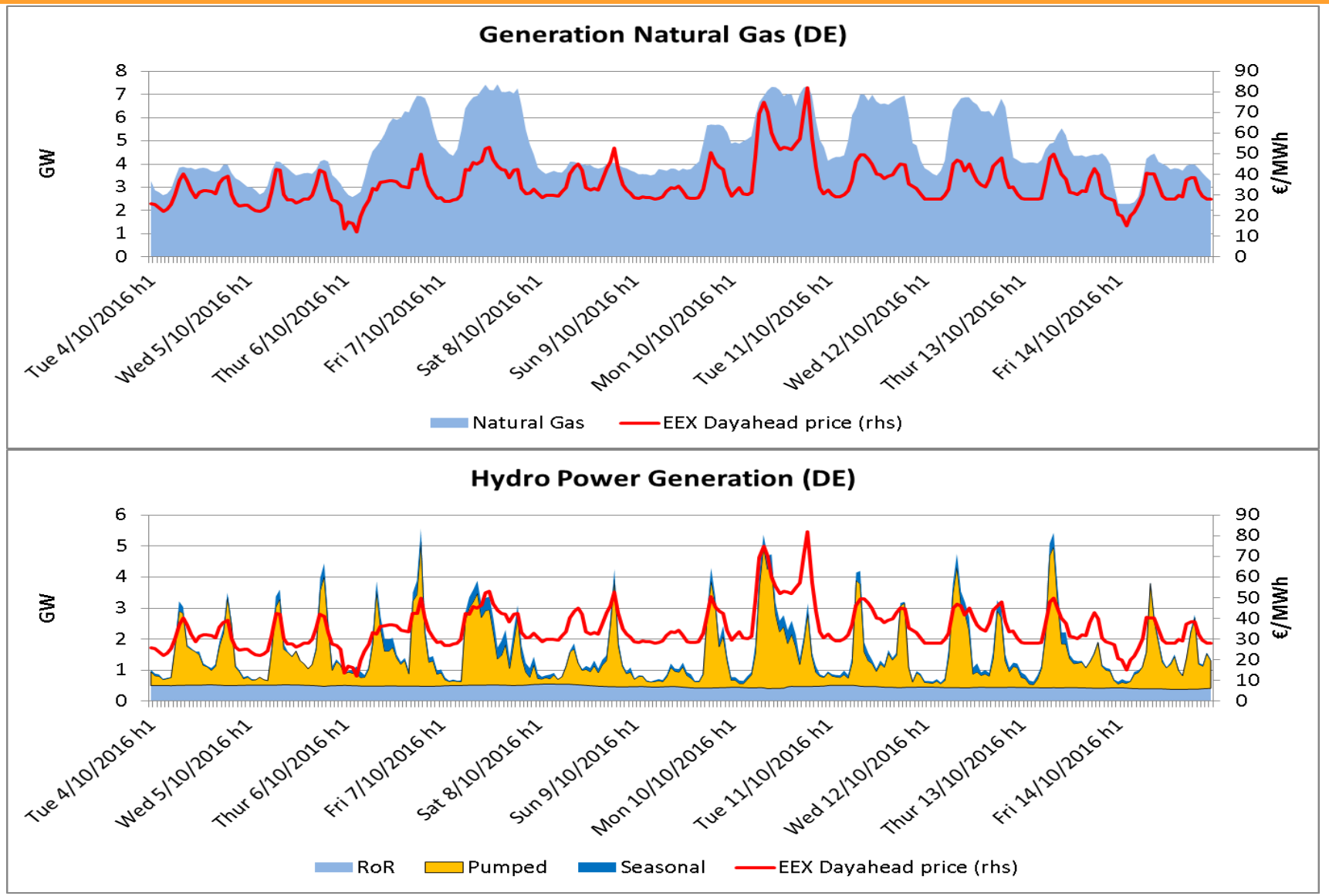


Desperately seeking … flexibility (1/2)





Desperately seeking … flexibility (2/2)



Conclusions (1/2)

- A remarkable **(r)evolution** has recently characterized European power sector

- New challenges (as well as opportunities) are now standing at the crossroad

    - Demand across European countries is shrinking

    - RES generation is still expanded but their intermittent nature requires a rethinking of conventional (thermal) generation technologies

    - Important changes in the relationships among fuel prices (gas-coal switching) are also under way

Conclusions (2/2)

- But how to ensure the reliability of the system when RES generation is low?
- Under certain market conditions, other types of production units have to be employed to grant the security of the system
- In this context, **flexibility** is *desperately* needed: **CCGT power plants** can, consequently, play an increasing role in providing instant back-up capacity
- Natural gas could potentially become the **most important source** to ensure supply-demand balancing

Thank you!

Elisa Scarpa
Head of *Market Analysis, Forecasting & Structuring*

Edison S.p.A.
Foro Buonaparte, 31 - 20121 Milan – ITALY
Phone +39 02 6222.6575
Mobile +39 3316283747
Fax +39 02 6222.7831
Mail elisa.scarpa@edison.it