

Environmental dimension of the EEP – Renewable sources of energy and energy efficiency

Filip Černoch
cernoch@mail.muni.cz

Environmental dimension of EEP

Climate change – EU aims to develop a low-carbon economy

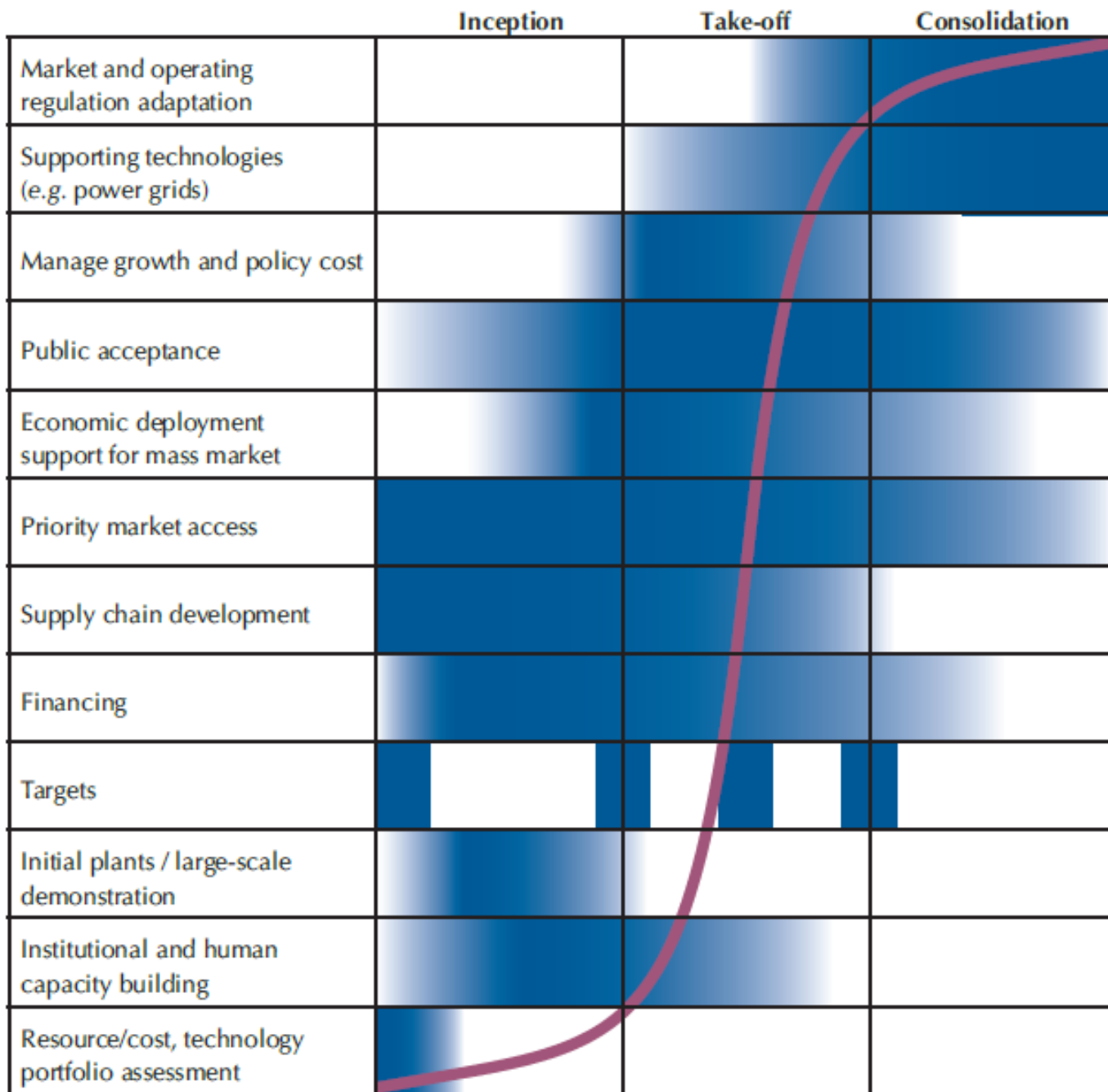
- Measures primarily to reduce GHG emissions
 - EU ETS – covers 40% of EU emissions
 - individual targets of MS for the non-EU ETS sectors (housing, agriculture, transport, waste) – cover 60% of EU emissions
 - CCS
- Measures to transform the energy sectors
 - RES
 - Energy Efficiency
 - Research and development, new technologies

Deployment of RES

- Why should RES be part of an any energy mix?
- Why should RES be supported (subsidized)?

Deployment of RES

- 1) Inception phase – creates a climate allowing investment in early projects
- 2) Take off phase - managing support policy costs
- 3) Consolidation phase – to integrate RES in the system (RES can no longer be considered in isolation due to their impacts across the whole electricity system that needs to acomodate them)



Note: Shading reflects relative importance

Inception phase

1997 – indicative target of 12% RES in gross domestic consumption of the EU by 2010

2001 – Directive 2001/77/ES – indicative targets for individual states to 2010

2009 – Directive 2009/28/ES – aim 20% by 2020, 10% in transport sector (Energy and climate package). With indicative targets for 2013

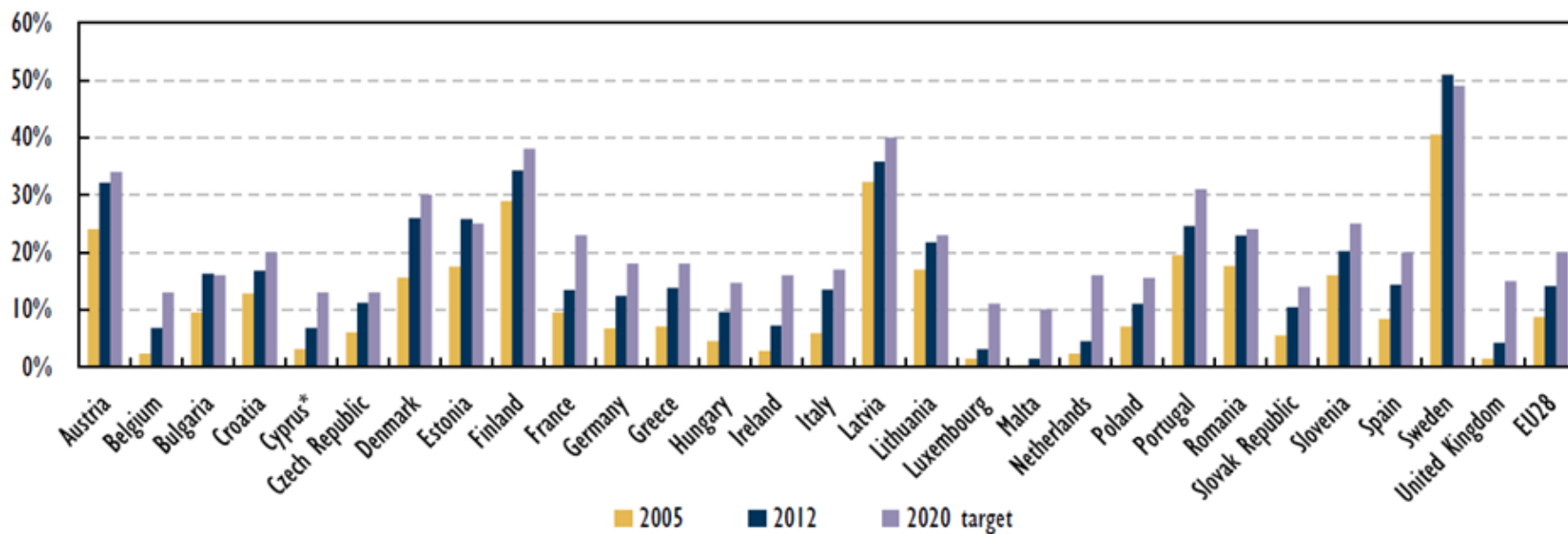
2014 – A policy framework for climate and energy in the period from 2020 to 2030 - 27% target by 2030

Inception phase

Member State	Share of renewables in 2005	Share required by 2020
Austria	23.3%	34%
Belgium	2.2%	13%
Bulgaria	9.4%	16%
Cyprus	2.9%	13%
Czech Republic	6.1%	13%
Denmark	17%	30%
Estonia	18%	25%
Finland	28.5%	38%
France	10.3%	23%
Germany	5.8%	18%
Greece	6.9%	18%
Hungary	4.3%	13%
Ireland	3.1%	16%
Italy	5.2%	17%
Latvia	32.6%	40%
Lithuania	15%	23%
Luxembourg	0.9%	11%
Malta	0%	10%
The Netherlands	2.4%	14%
Poland	7.2%	15%
Portugal	20.5%	31%
Romania	17.8%	24%
Slovak Republic	6.7%	14%
Slovenia	16%	25%
Spain	8.7%	20%
Sweden	39.8%	49%
United Kingdom	1.3%	15%

Source: thinkcarbon.wordpress.com

RES in final energy consumption



Take off phase – Feed in Tariffs

- 21 EU states, provides a fixed rate of subsidy for fixed period. Cover all producer's costs and profit, essentially replace the market
- Instrument of choice for big RES players (Germany, Spain). Government sets the price, market (investor response) sets the quantity. Many recent amendments to control costs
 - Very successful in triggering large deployment of RES, but at a high cost
 - Could be more cost-effective – greater security around income to investors, therefore reducing financial costs

Take off phase

- FiT could be tailored to different technologies.
- But:
 - difficulty of setting the right price – too high and money is wasted, too low and no deployment. Once the price is set, it is hard to make radical changes without breaking contracts
 - they insulate the RES producer from the market (a limited compatibility with internal energy market)
- Grid priority - the grid must take RES electricity first

Take off phase: Quota obligations

- Power plant operators receive certificates for their green energy to sell to the actors (distributors) obliged to fulfil the quota obligations
- Selling the certificate provides an additional income on top of the market price of electricity
- Quota obligations with tradeable certificates. Here government sets the quantity, the market the price
- Compatibility with market principles, competitive price determination

Take off phase: Quota obligations

- High risk premium – increase policy costs
- Technology neutral way – only the most cost-effective technologies supported (windfall profits for the lower cost technologies)

= Quota systems with tradable certificates tend to be cheaper, but favour mature technologies like onshore wind and biomass

Take off phase: Feed-in Premium

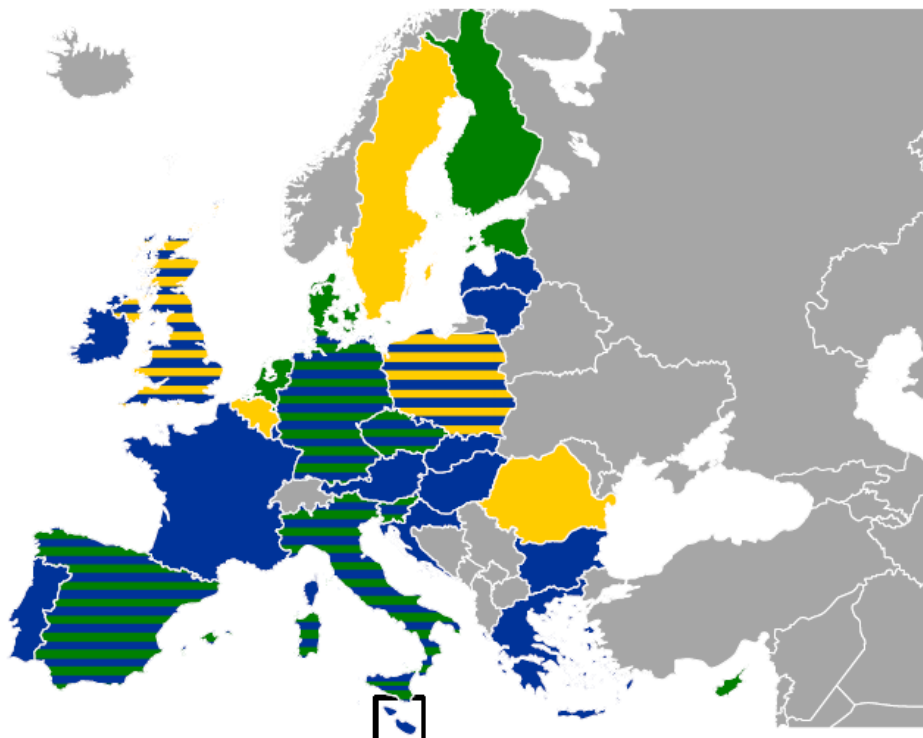
- Plant operators have to sell the electricity at the market
- To receive a fixed payment for each unit of electricity generated independent of the market price of electricity
- More market oriented, higher risk for producer (compensated by the level of the premium)
- Used sporadically, as a second option to supplement FiT's

Subsidy schemes

Renewable support schemes in the European Union, 2013



- Feed-in tariff
- Premium
- Quota



Source: EU submission, 2013.

Take off phase

„A solar RES case“ – Spain, Italy, Czech Republic...

- Generous FiT tariffs in place, volumes of deployment not controlled or capped and support mechanisms not sufficiently responsive to rapidly falling costs
- PV developers earn high rates of return on their capital – overheated markets and rapid rises in support costs
- Policy makers react by dramatically reducing tariffs and introducing retrospective measures to recouple some of the costs – detrimental impact on investor confidence in the government
- Also impact on the other RES in given country

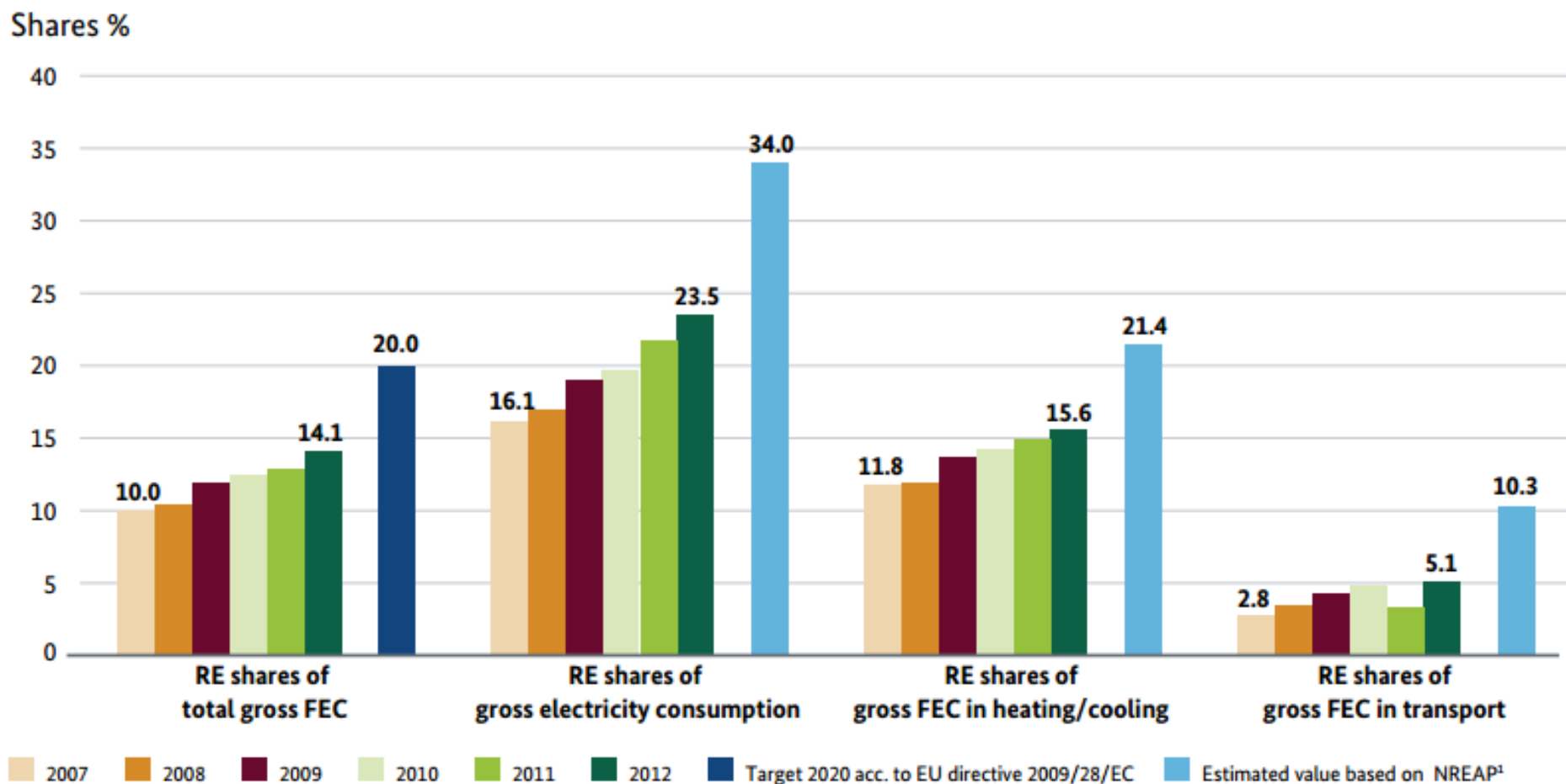
Czech Republic – Installed PV capacity

Source: ERÚ

Year	Installed capacity (in MWe)
2006	0,2
2007	3,4
2008	39,5
2009	464,6
2010	1959,1
2011	1971
2012	2086

Estimated costs in Czech Republic – 1,76 bn. euro in 2013

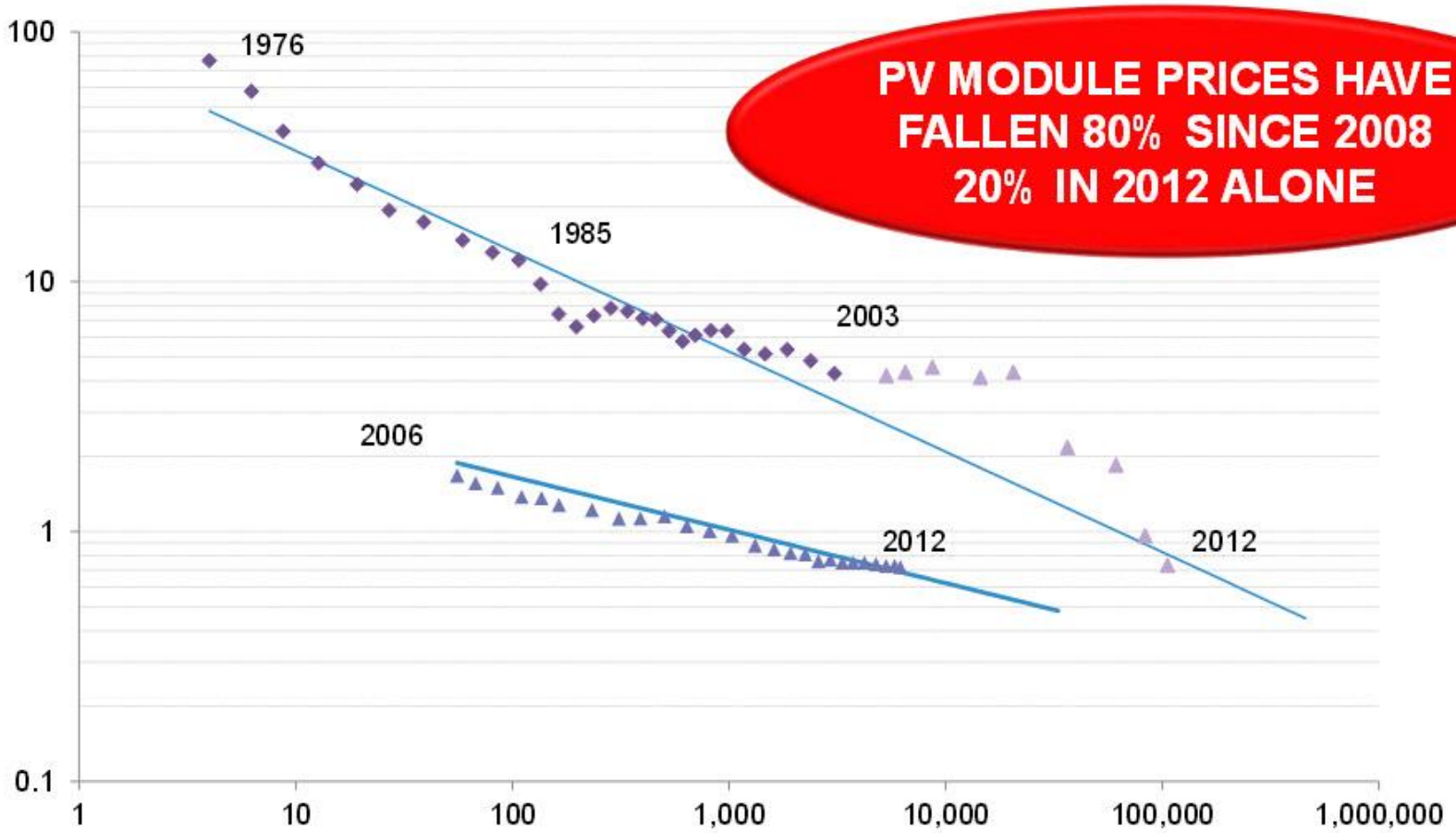
RES in the EU



1 the Energy Research Centre of the Netherlands (ECN) was commissioned by the European Environment Agency to process and evaluate the EU member states' National Renewable Energy Action Plans (NREAPs) with the aim of generating estimates for the EU-27. The resulting shares for heating/cooling, electricity and transport are entered here as target figures. The share for the transport sector does not match the transport sector target laid down in Directive 2009/28/EC

PV EXPERIENCE CURVE, 1976-2012

2012 \$/W



PV MODULE PRICES HAVE FALLEN 80% SINCE 2008 20% IN 2012 ALONE

- ◆ historic prices (Maycock)
- ▲ Chinese c-Si module prices (BNEF)
- ▲ First Solar thin-film module cost

- experience curve
- Thin-film experience curve

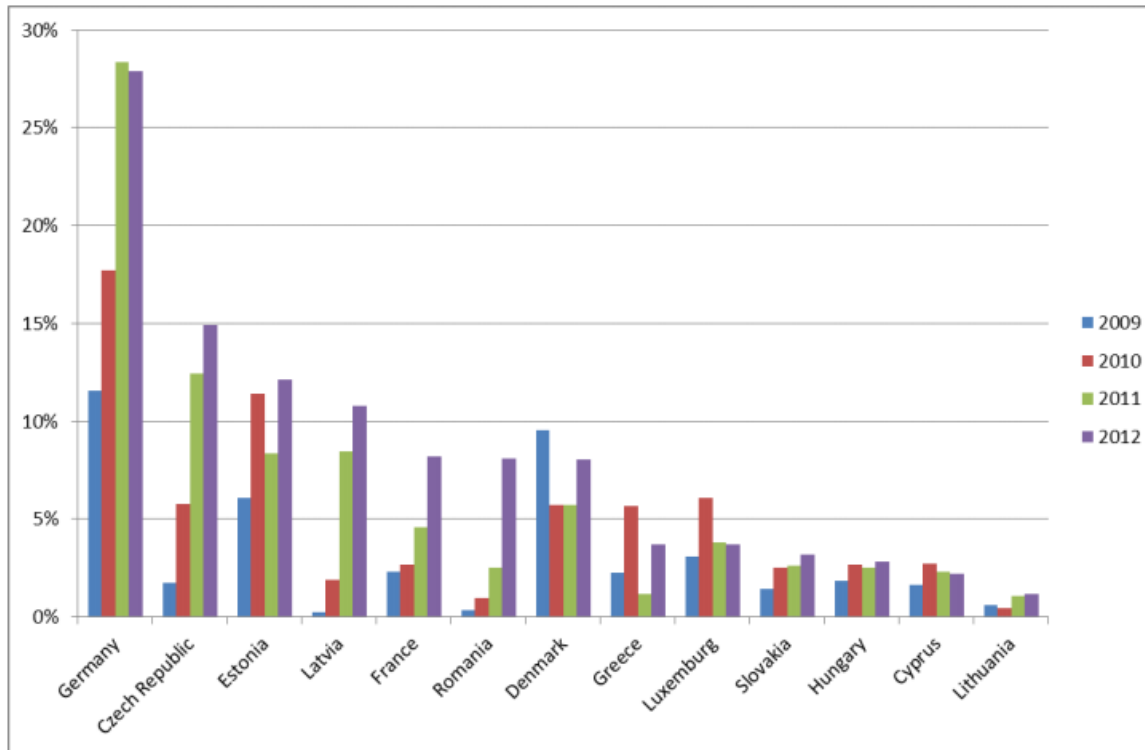
Source: Ragwitz

Note: Prices inflation indexed to US PPI.

Source: Paul Maycock, Bloomberg New Energy Finance

Consolidation phase - costs

Evolution of the share of RES-E levies in the electricity price for industrial consumers in selected EU countries (2009-2012)



Note: Only states with data for all the years in the period 2009-2012 included. Calculated as % of price for consumers with annual consumption between 500 and 2000 MWh (Eurostat consumption band IC), excluding VAT and other recoverable taxes.

Source: Commission services calculations based on Eurostat and Member State data

Consolidation phase - costs

- Sigmar Gabriel, federal minister for economic affairs and energy: *“we have reached the limit of what we can ask of our economy”*
- In 2013 German consumers paid €21,8 bn in RES subsidies
- FiTs for new installations are to be reduced: from 17 to 12 cents/kWh (for onshore wind power to maximally 9 cents/kWh)
- Practice of excluding large corporations from burden sharing is to be restricted to operations exposed to foreign competition
- But – first installations (in favourable nature conditions and receptive business environment) in Europe and USA competitive without subsidies.

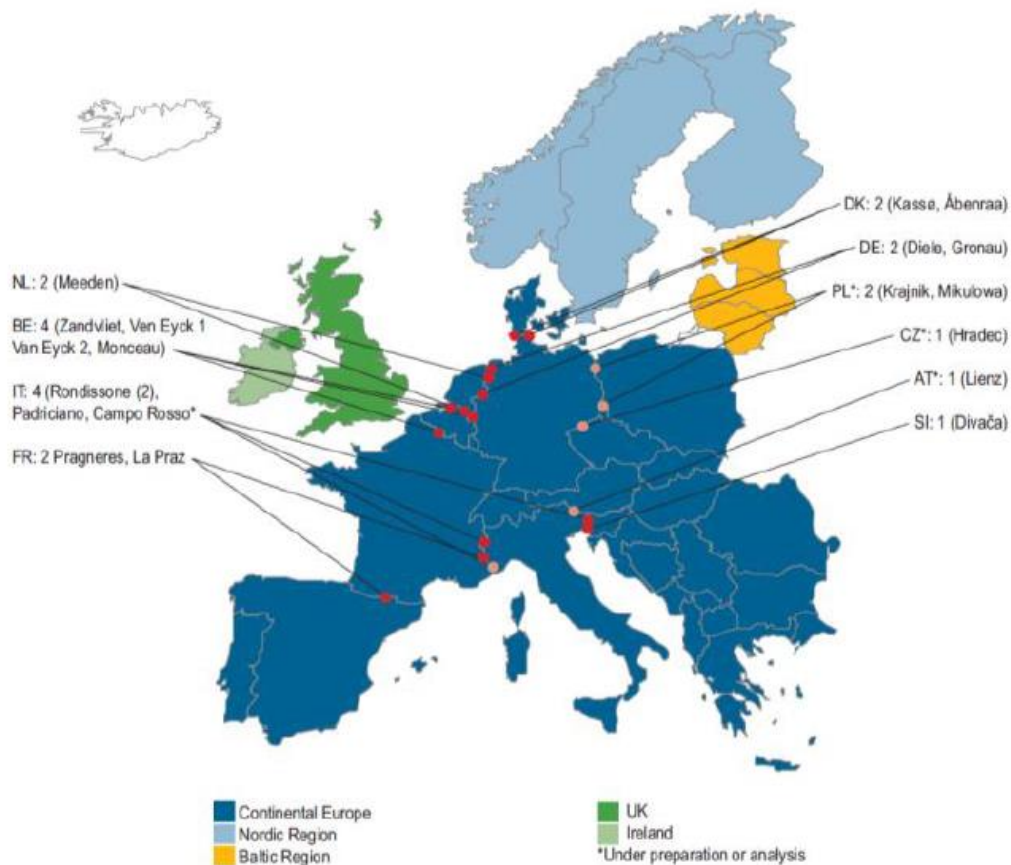
Consolidation phase – grid expansion in Germany

- To redistribute the renewable energy from the wind and solar farms in/at the Nord Sea, about 2600km (4600km) of grid expansion need to be realized
- In the beginning of 2014 – 322km completed – protests from regions ensuing landscape degradation with no local economic benefits

Consolidation phase – unreliability/intermittency of RES

- Common interconnected internal market
- Back-up capacities of conventional sources

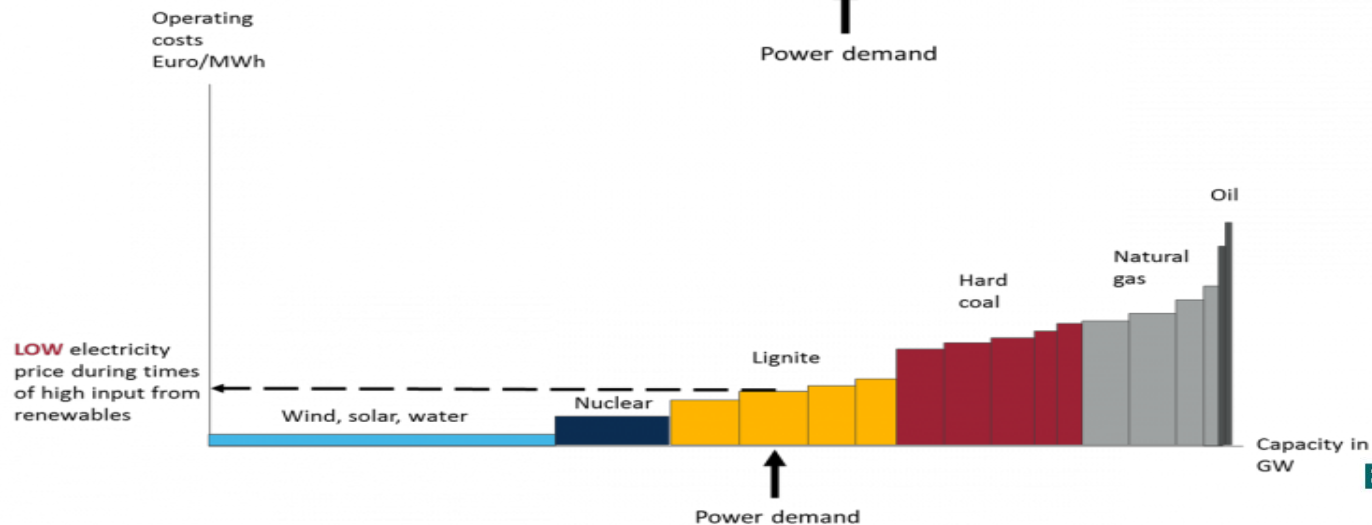
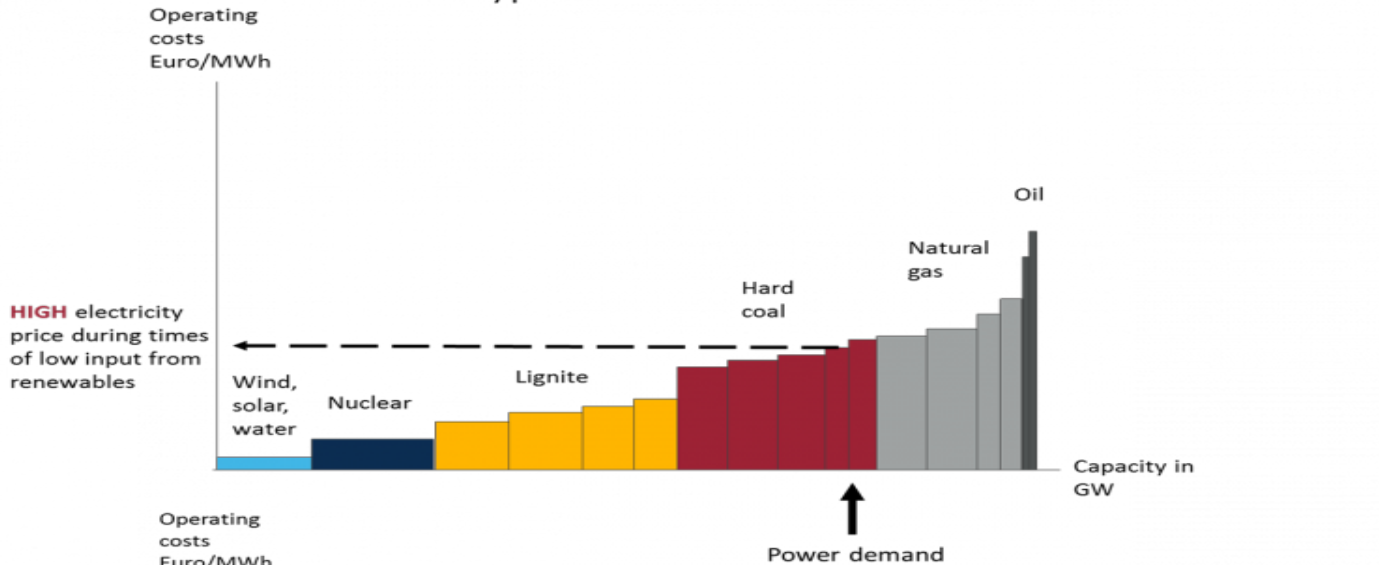
Phase-shifting transformers installed and planned in the European Union at a selection of borders (as of June 2012)



Source: ACER/CEER (2012).

Consolidation phase – impacts on wholesale prices

Electricity price due to merit-order-effect



Consolidation phase – impacts on wholesale prices

Conflict with conventional sources – capacity market?

- E.ON in France is to close a gigawatt of coal-fired capacity
- GDF Suez to mothball three of its gas turbines
- E.ON in Germany loses money in its gas turbine in Irsching
- Norway's Statkraft is closing its 510 MW gas turbine in Landesbergen
- In Czech Republic a brand new gas power plant in Počerady is mothballed

Environmental dimension of EEP

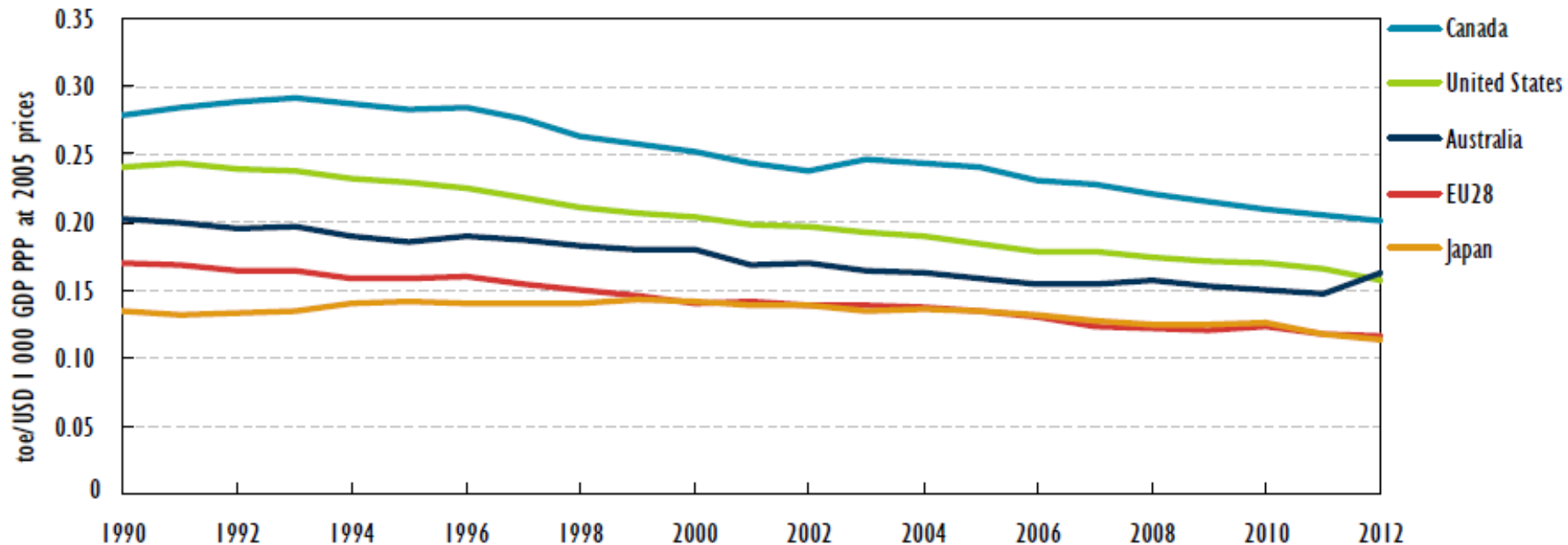
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Energy efficiency (conservation?)

- Energy supply per capita: 3,2 toe vs. 4,5 toe of the IEA average (-8,2% since 2002)
- Energy intensity: 0,12 toe/USD 1000 vs. 0,14 toe/USD 1000 of the IEA average
- TFC: 1139,2 Mtoe, -4,1% since 2002
- Energy and climate package 2009: an energy consumption is to be cut by 20% by 2020 relative to the BAU scenario, non-binding target (cap of 1483 Mtoe in 2020)
 - Limited consumption of energy + increased energy efficiency
 - The only one that the EU is not on track to meet. (18-19% by 2020)

Energy intensity in the EU and in selected IEA MS



Sources: IEA (2014a), *Energy Balances of OECD Countries*, OECD/IEA, Paris; IEA (2014b), *Energy Statistics of Non-OECD Countries*, OECD/IEA, Paris.

Energy efficiency instruments

- EU instruments
 - Products (energy labeling, eco-design)
 - Transport (measures to cut vehicle emissions)
 - Buildings (40% of all energy in the EU is consumed in building. Energy performance standards on new building).
 - Public procurement (energy efficiency a criteria when govts buy goods and services)
- National instruments
 - National plans with national measures

Energy efficiency in the EU

- Limited achievements only due to:
 - Relatively cheap energy (IEM)
 - Limited impact of (sometimes expensive) measures
 - Rebound effect

Energy Efficiency Directive 2012/27/EC

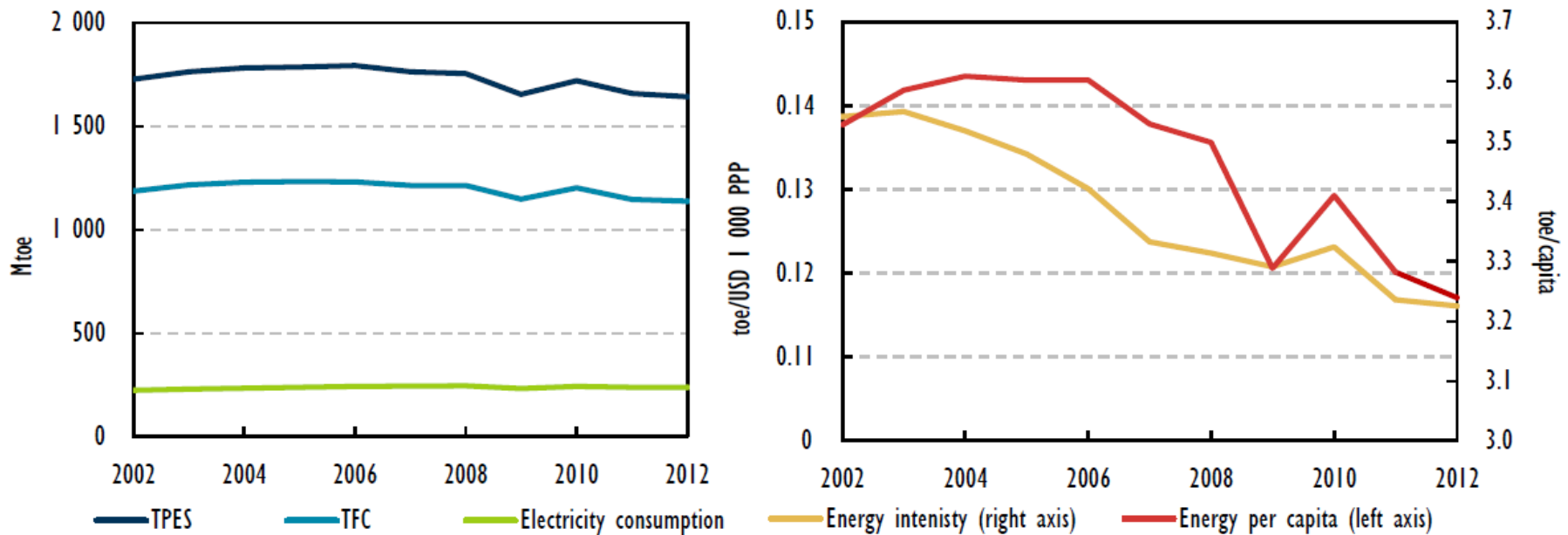
- Developed to reach 20% target savings
- Binding measures, not binding targets
- MS are required to:
 - Evaluate the situation in national heating and cooling systems, suggest some cost-effective measures to improve them
 - The same for gas and electricity infrastructure
 - Oblige energy providers to achieve cumulative end-use energy savings by 2020 equivalent to 1,5% of annual energy sales over the period 2014-2020

Energy Efficiency Directive 2012/27/EC

- Introduce the metering and billing of actual energy consumption in all sectors
- Prepare public procurement rules ensuring that central governments purchase only high-efficiency products
- Large industry enterprises to carry out an energy audits at least every four years
- Buildings – new buildings and buildings under renovation to be „nearly zero energy“ by the end of 2020. To improve the energy performance of 3% of the total floor area of heated and/or cooled buildings owned and occupied by the central govt every year

Energy efficiency

Energy supply, consumption, intensity and use per capita, 2002-12



Note: TPES = total primary energy supply.

Sources: IEA (2014a), *Energy Balances of OECD Countries*, OECD/IEA, Paris; IEA (2014b), *Energy Statistics of Non-OECD Countries*, OECD/IEA, Paris.

Sources

- IEA (2014): Energy Policies of IEA Countries – The European Union