RES and energy efficiency

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Climate and environmental policies of the EU

Multiple overlapping activities relevant to the EU energy policy:

- International regime of climate change mitigation (EU plays a significant role).
- Environmental dimension of the European energy policy:
    - Climate aims and tools to reduce GHG emissions – EU ETS, GHGs outside of the EU ETS.
    - Energy related environmental aims - RES, energy efficiency.
- Environmental policy of the EU – local environmental protection.
    - Air, land and water pollution, noice, light pollution.
    - Industrial (energy) waste.
    - Protection of biodiversity.
    - Extraction of non-conventional sources of energy.

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EU energy/environmental targets

- 2020 aims (Energy and climate package, 2009)
  - reduce greenhouse gases by at least 20%
  - increase the share of renewable energy in the EU's energy mix to at least 20% of consumption
  - improve energy efficiency by at least 20%
- 2030 aims (Climate and energy framework, 2014)
  - At least 40% cuts in greenhouse gas emissions (from 1990 levels). EU ETS to cut emissions by 43% (compared to 2005); Non EU ETS sector to cut emissions by 30 (compared to 2005). National targets range from 0% - 40%.
  - At least 27% share for renewable energy
  - At least 27% improvement in energy efficiency

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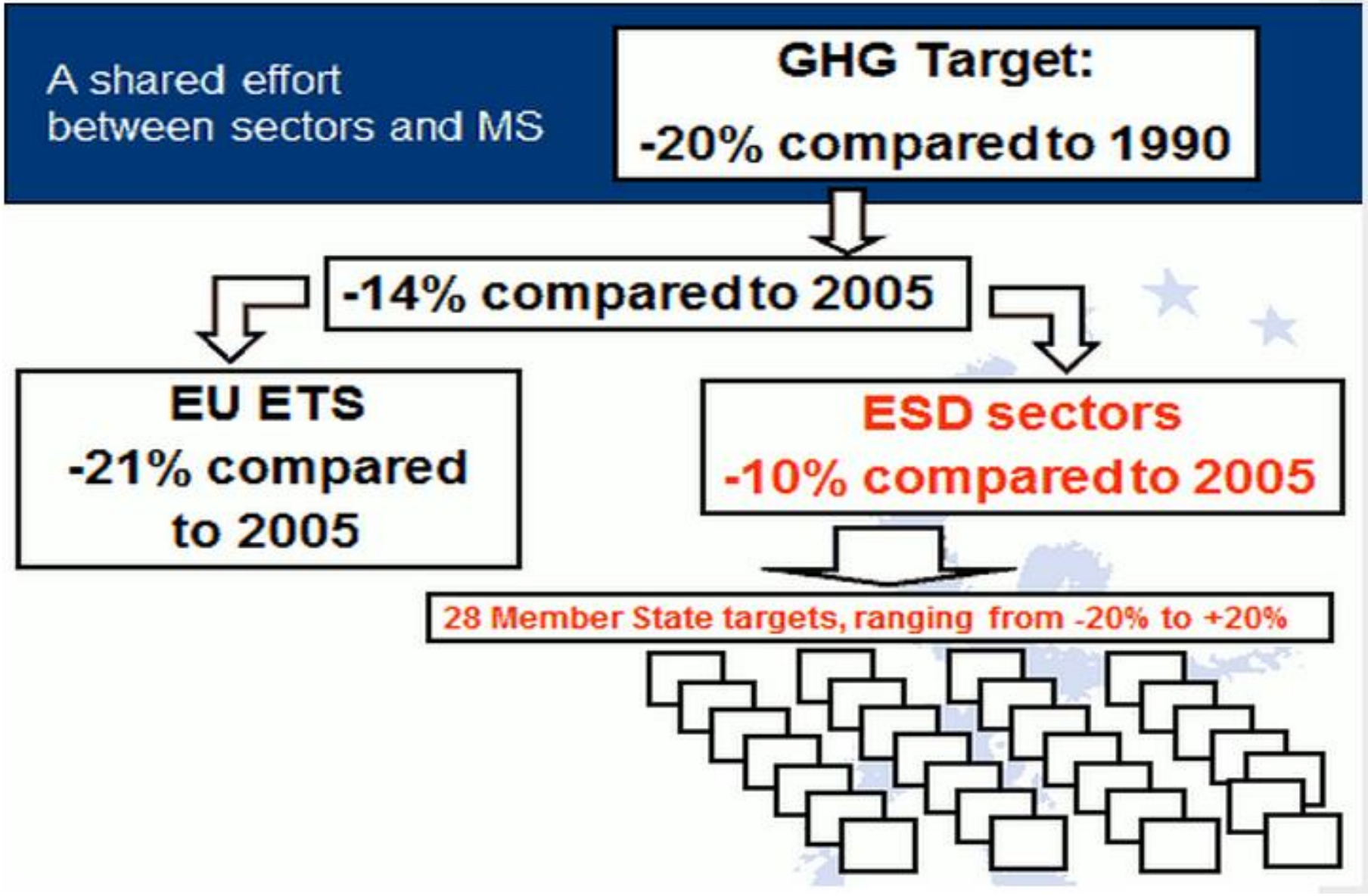
A shared effort
between sectors and MS
GHG Target:
-20% compared to 1990
-14% compared to 2005
EU ETS
-21% compared
to 2005
ESD sectors
-10% compared to 2005
28 Member State targets, ranging from -20% to +20%

Non-EU ETS emissions

- 20% target is divided between a) a 21% target compared to 2005 for EU ETS emissions and b) a 10% target compared to 2005 for the non-ETS emissions.
- The later goal is split into national sub-targets.
  - Traffic management, low-GHG transport, biofuels, urban planning, improved energy performance standards for public building, labeling system, eco design…
- To support it some measures at the EU level – emission standards for vehicles, fuel quality directive…

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What are RES?

- Renewable energy is energy derived from natural processes that is replenished at a higher rate than it is consumed.
- Solar, wind, geothermal, hydropower, bioenergy, ocean power.
- Variable/non-dispatchable (wind, solar) vs. dispatchable (hydro, biomass/biogas) RES.

Drivers for deployment

- Energy security – RES are spread globally, in contrast to the conventional (fossil) fuels that are more geographically concentrated. (Import savings €16bn in 2015, expected to be €58bn in 2030).
- Environmental concerns - low environmental impact (vary according technology) – GHG emissions, local pollutants.
- Strategic economic development (rural development, agriculture sector, high-tech manufacturing – 30% of RES patents in the EU).
- Energy access through distributed or off-grid sollutions → de-centralized energy system.
- Diversification of energy sources.

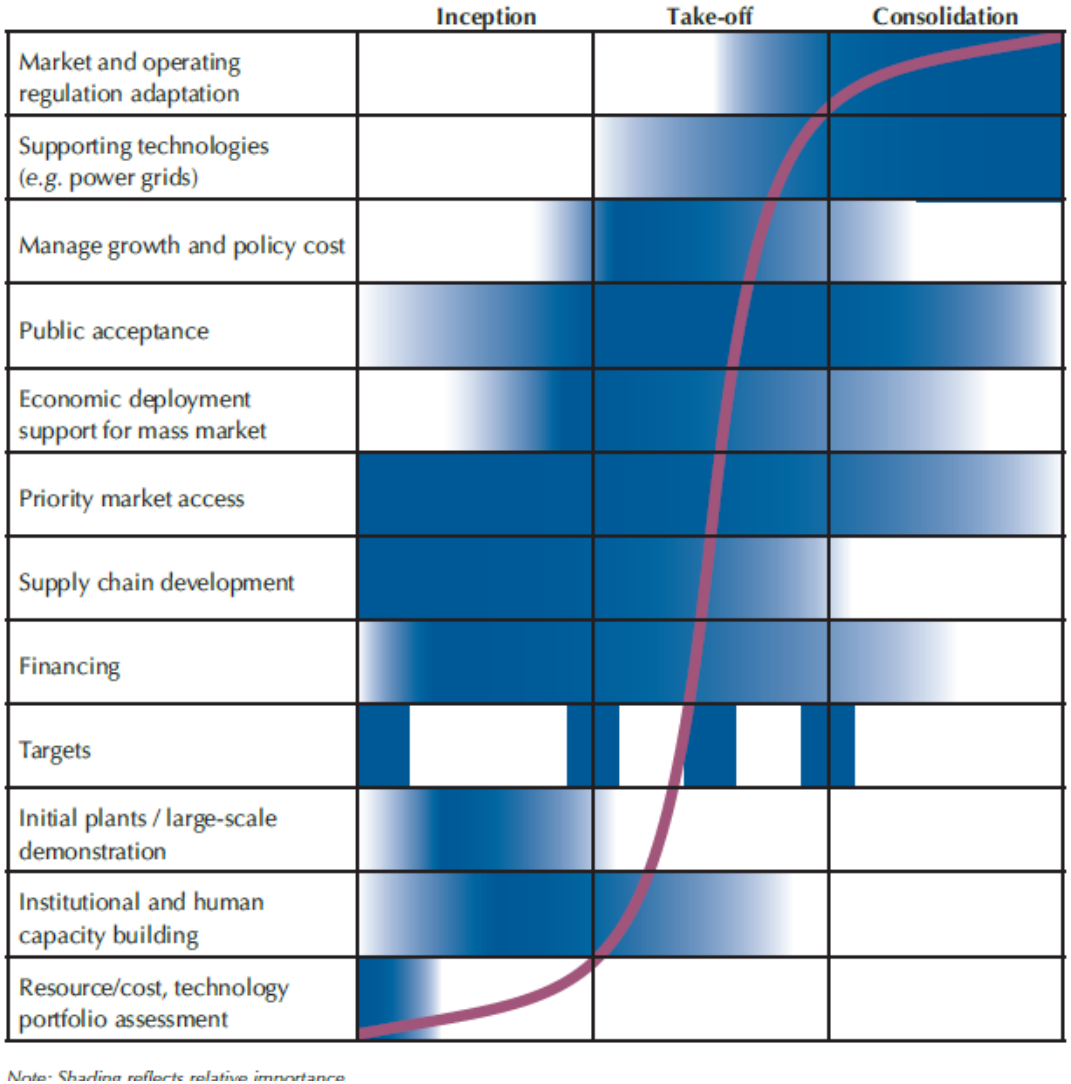
Deployment of RES – governmental perspective

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 to the system (RES can no longer be considered in isolation due to their impacts across the whole electricity system that needs to acomodate them).

RES deployment curve



Note: Shading reflects relative importance

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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 of 20% final energy consumption from RES by 2020, 10% in transport sector (Energy and climate package). With indicative targets for 2013 and national targets ranging from 10% in Malta to 49% in Sweden.

2014-2016 – A policy framework for climate and energy in the period from 2020 to 2030 - 27% target by 2030. *(this target re-opened now, discussion about 35%*).

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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.wordpres.com

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 replacing the market.
- Instrument of choice for big RES players (Germany, Spain). Governmen sets the price, market (investor response) sets the quantity.
  - Very successful in triggering large deployment of RES, but at a high cost.
  - 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 – increases policy costs.
- Technology neutral way – only the most cost-effective technologies supported.

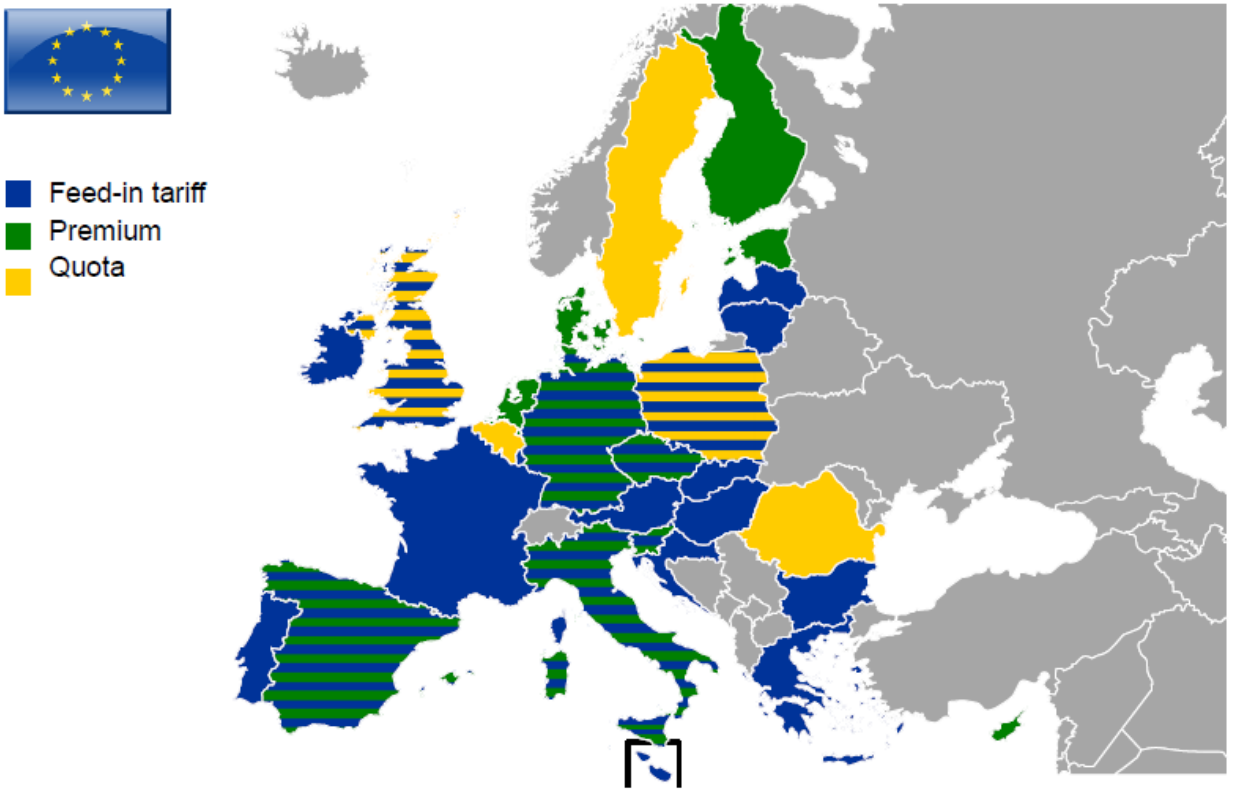
= Quota systems with tradable certificates tend to be cheaper, but favour mature technologies like onshore wind and biomass.

Take off phase: Feed-in Premium

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

Subsidy schemes

Renewable support schemes in the European Union, 2013



Source: EU submission, 2013.

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Take off phase

„A solar RES case“ – Spain, Italy, the 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

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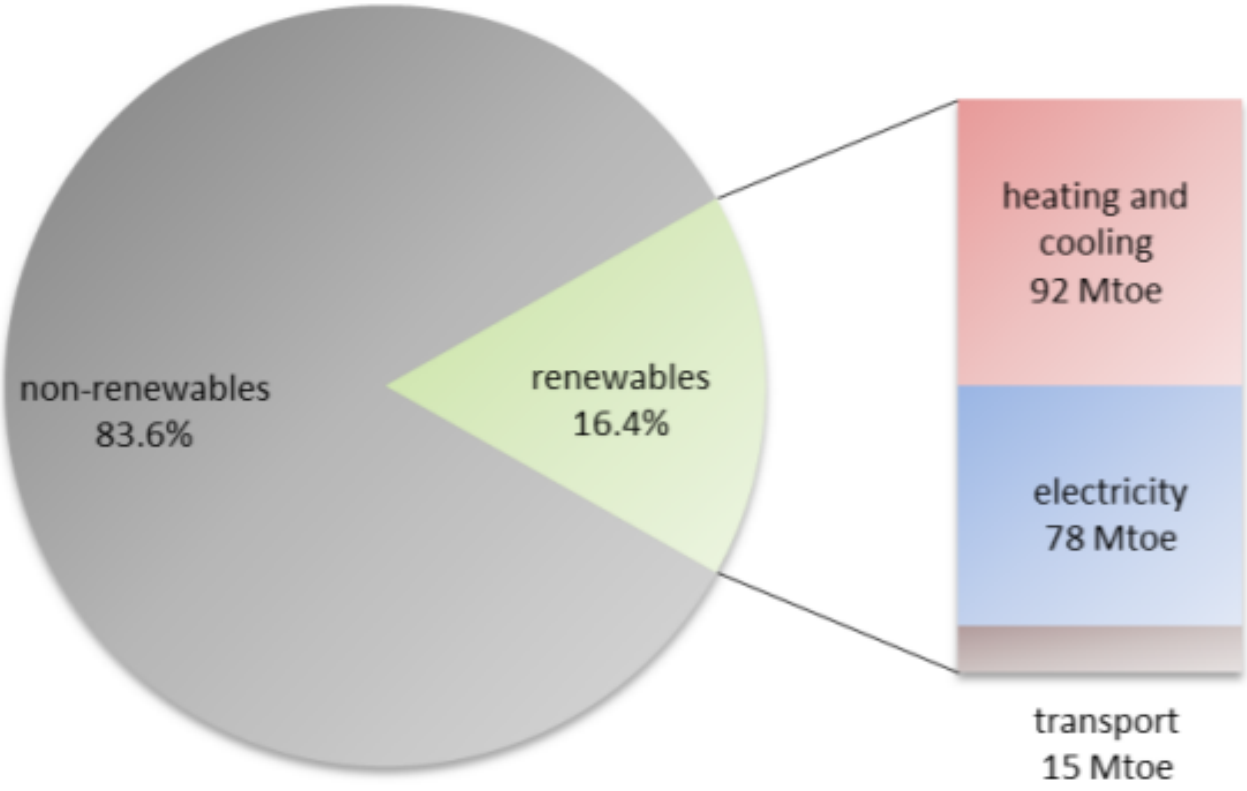
Final Energy Consumption in the EU28 (2015)



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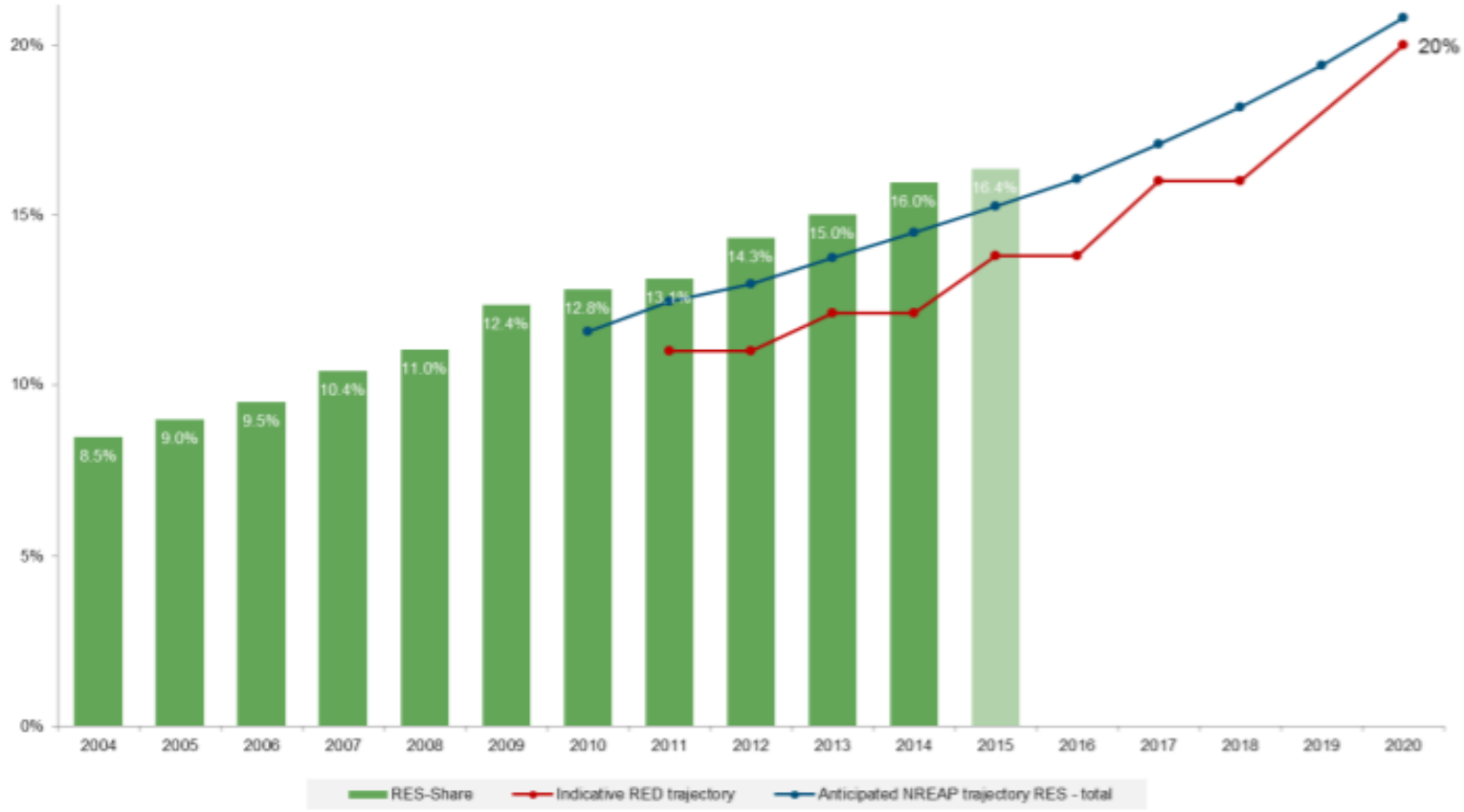
RES in the EU vs. RED and National Renewable Energy Action Plans trajectories



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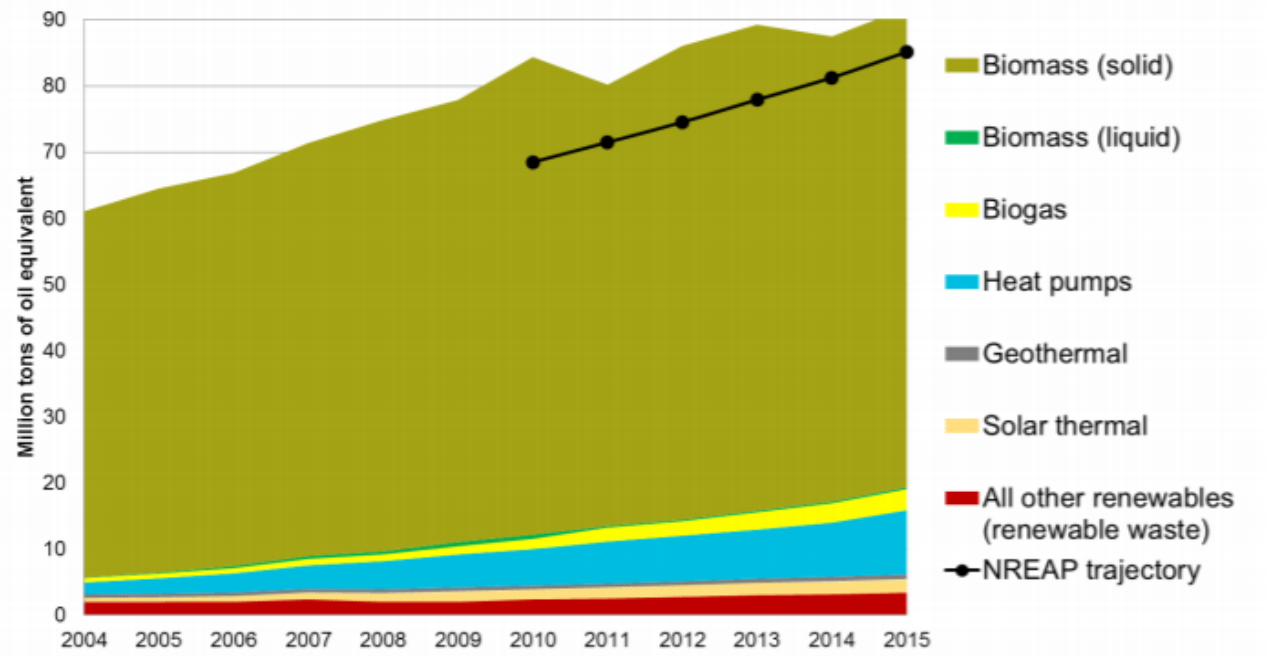
EU-28 renewable heating and cooling by source



RES electricity grew by 1.4 percentage points per year between 2014 – 2014, RES heating and cooling by 0.8 percentage points and transport 0.5 percentage points.

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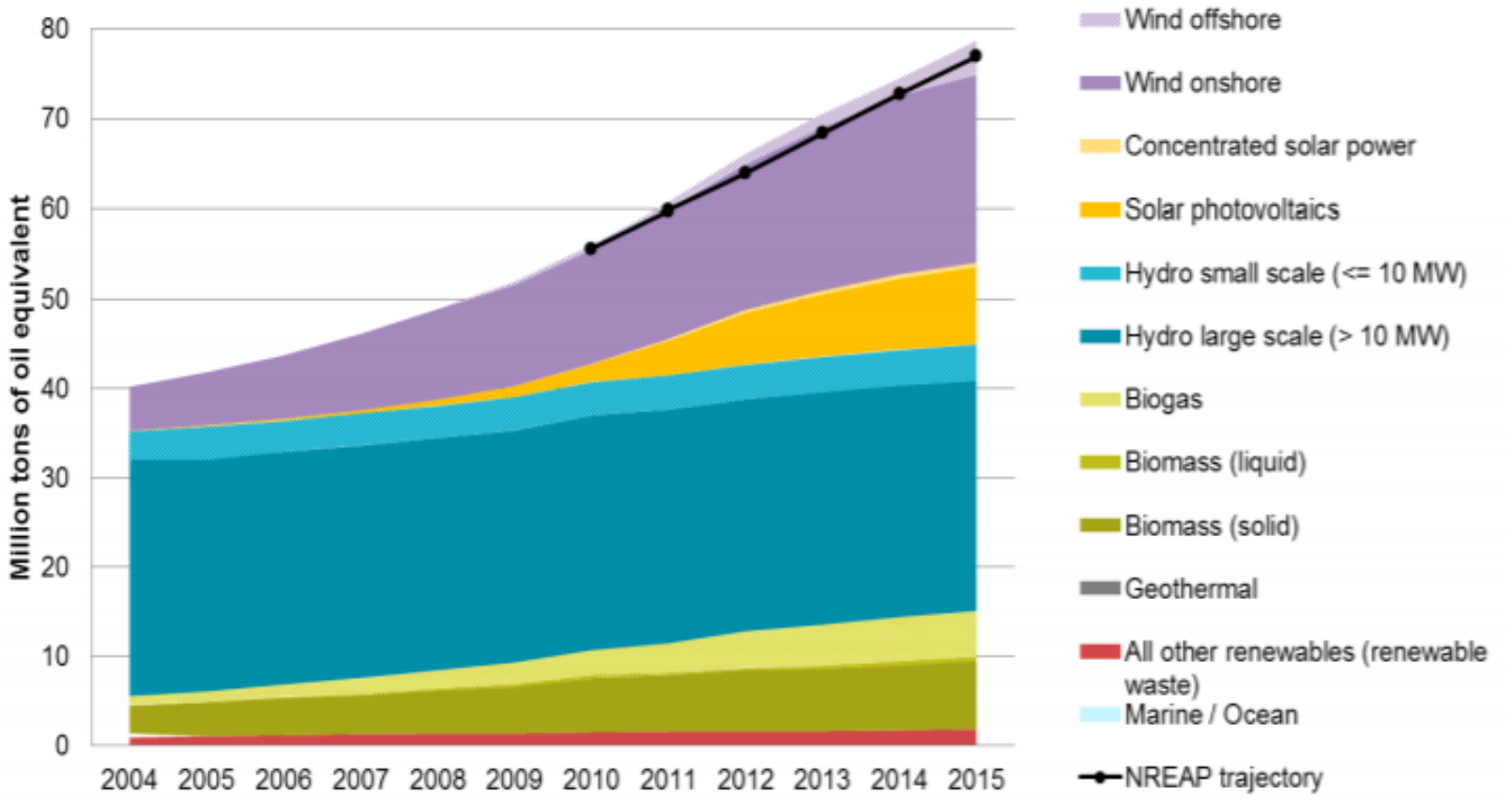
Renewable electricity by source



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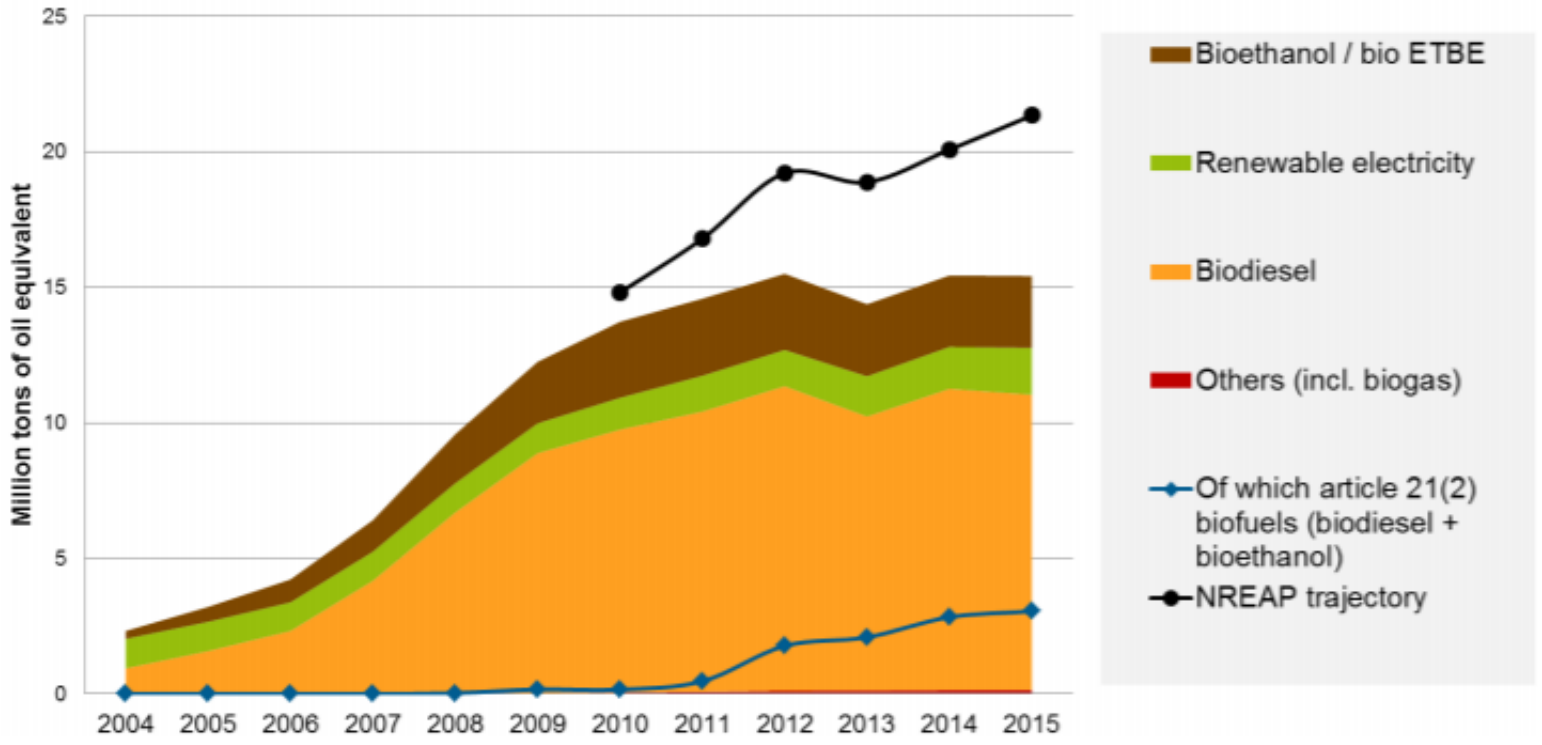
Renewable transportation by source



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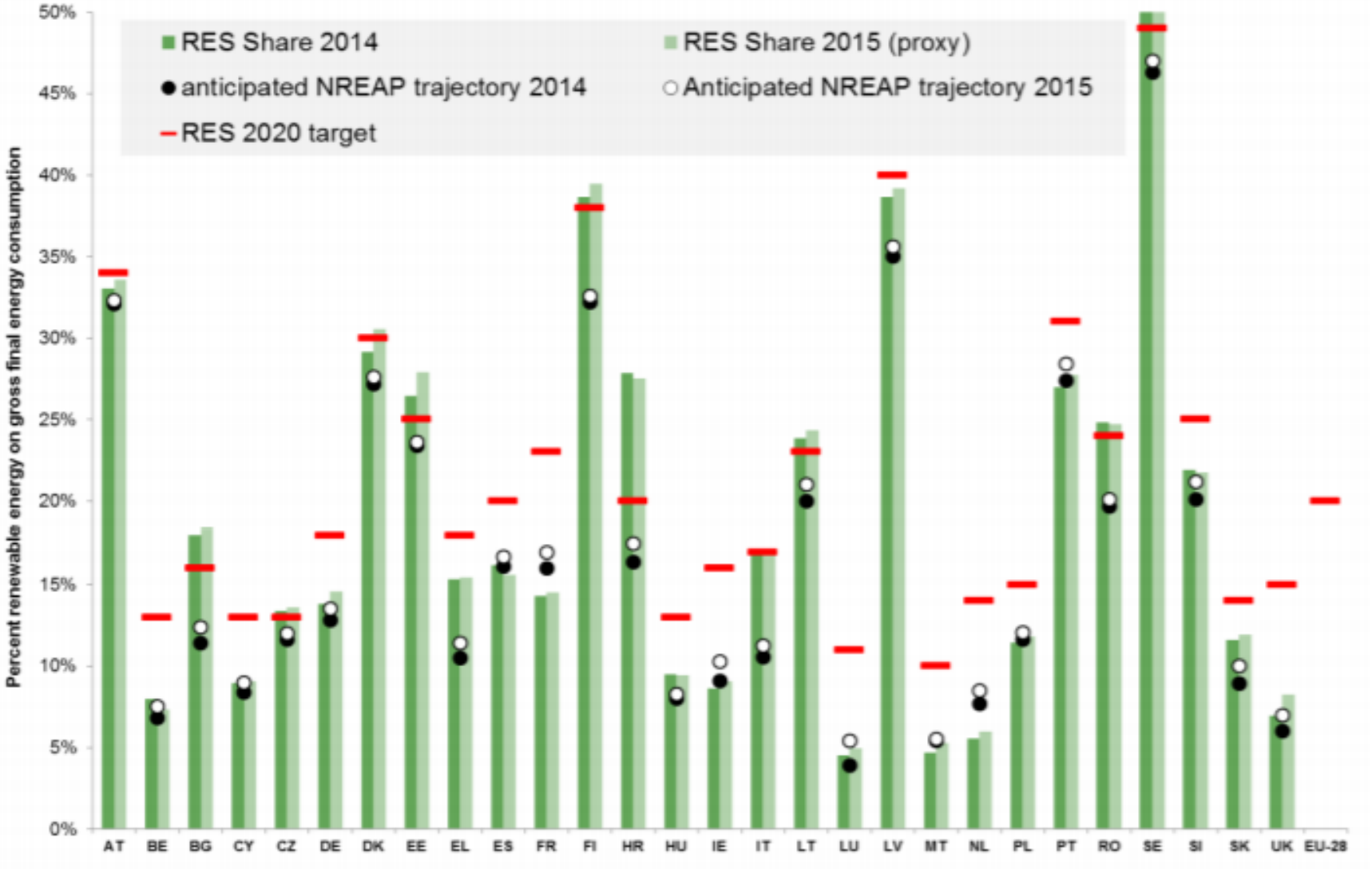
MS progress towards their indicative RED targets



Consolidation phase - costs

- RES gradually considered ´mature technology´ with significant level of penetration.
- Direct financial support decreasing, auctions replace FiTs.

Germany:

- PV from 9.2 to 5.7cts/kWh between 2015-2017. Bid bonds (deposit, €25-50/kW – 50 000 for 1 MW project); pre-qualification (local municipality´s consent etc.); flexibility. → 100% of bids realized.
- 900 MW wind farm ´He Dreiht´ in the Nord Sea without subsidies (EnBW).

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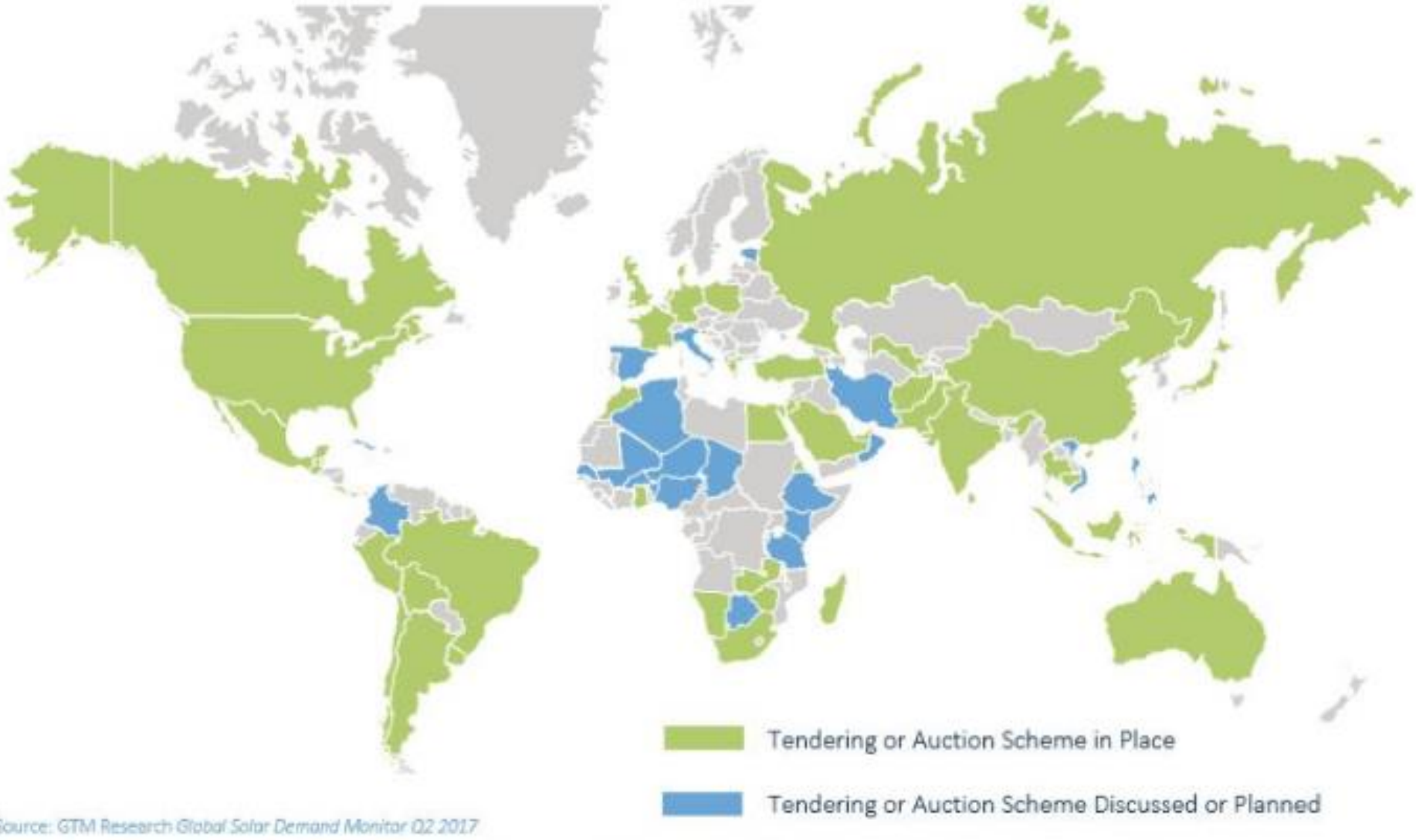
Global: Markets With Tendering or Auction Schemes in Place, Under Discussion, or in Planning Stages, Q2 2017*



Source: GTM Research *Global Solar Demand Monitor Q2 2017*

*Some markets not pictured due to scale: Bermuda, Cape Verde, Cayman Islands, El Salvador, French West Indies, Martinique, Palestine, Singapore, Qatar

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Consolidation phase – other issues

- Necessary regulatory, legal, trading mechanisms.
- Related infrastructure – grids, back-up capacities.
- Capacity mechanisms for sources providing stability and reliability (back-up).
- Priority dispatch (according to the Winter Package only installations up to 500 kW (250 kW after 2026), existing generators, and innovative technologies.

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Energy efficiency

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 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.

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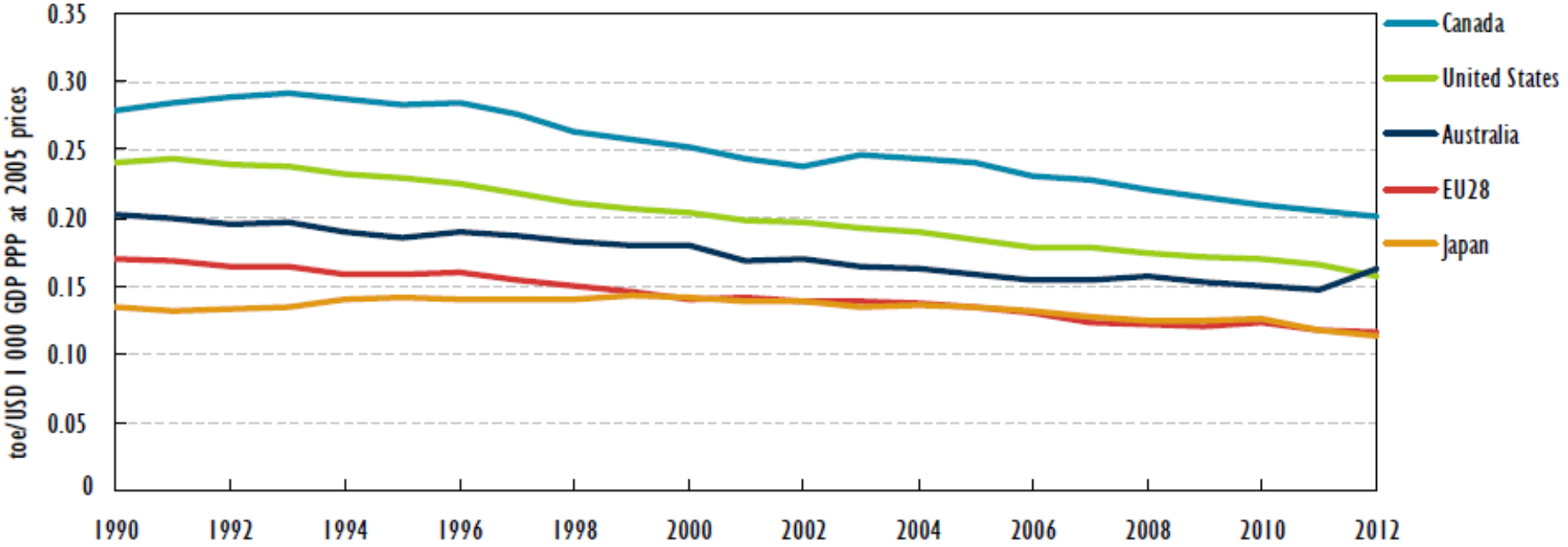
Energy intensity in the EU and in selected IEA MS



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

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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 (updated in 2016 with 30% goal)

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

Energy Efficiency Directive 2012/27/EC (updated in 2016 with 30% goal)

- Introduce the metering and billing of actual energy consumption in all sectors.
- Prepare public procurement rules ensuring that central governments purchase only high-efficiency producs.
- 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 government every year.

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Latest development in emission targets

- 2020 aims (Energy and climate package, 2009)
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Sources

- IEA (2014): Energy Policies of IEA Countries – The European Union.
- Yeo, S.(2017): EU energy package: What it means for coal, renewables and efficiency.
- EC (2017): EU Energy in Figures.

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