


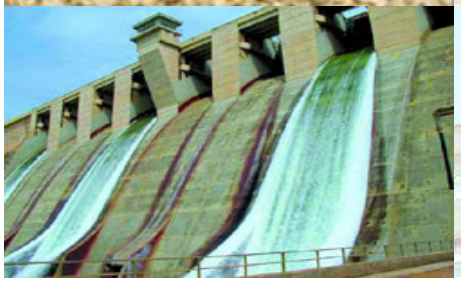

Feasibility, costs and regional distribution for RES-E in 2020

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Content

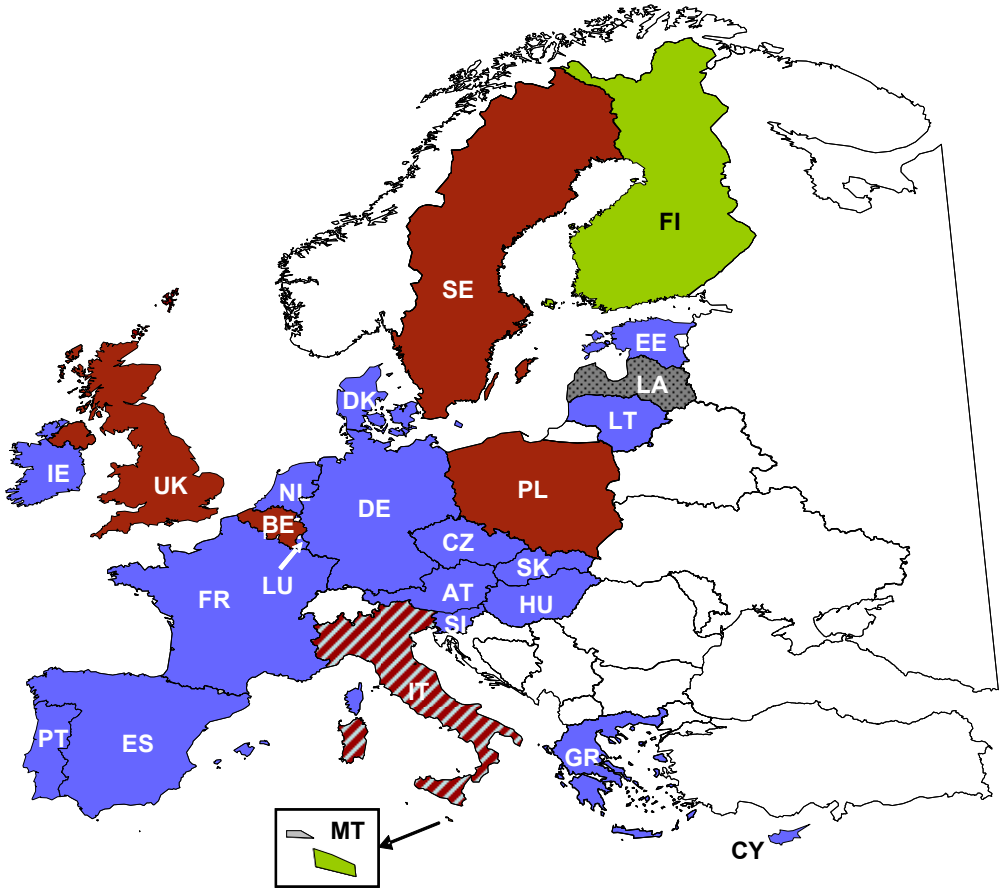
- **Current status of RES policies and markets**
  - ✓ Implemented policy schemes
  - ✓ Historic evolution of RES-E generation
- **Future potential of RES-E in EU Member States**
- **Scenario on the evolution of RES in Europe up to 2020 based on the model *Green-X***
  … outcomes of the projects OPTRES & FORRES 2020
  - ✓ General assumptions & methodology
  - ✓ Key results

Background

- The share of 20% RES in total energy consumption was agreed by the heads of state of the EU MS in March 2007
- No sector specific targets were set, but 20% in final energy with roughly correspond to 33-35% in electricity consumption
- The European Commission currently prepares the new "RES framework Directive", which contains 2020-targets for each MS
- Different flexibility options are currently discussed in connection with the new Directive
- Target sharing is currently discussed based on a flat rate approach (~+11% points for each MS) & GDP modulation

Currently implemented policies in the EU

Dominating support schemes for RES-E in the EU



- Feed-in tariff
- Quota / TGC
- Feed-in tariff and Quota / TGC
- Tax incentives / Investment grants
- Other system

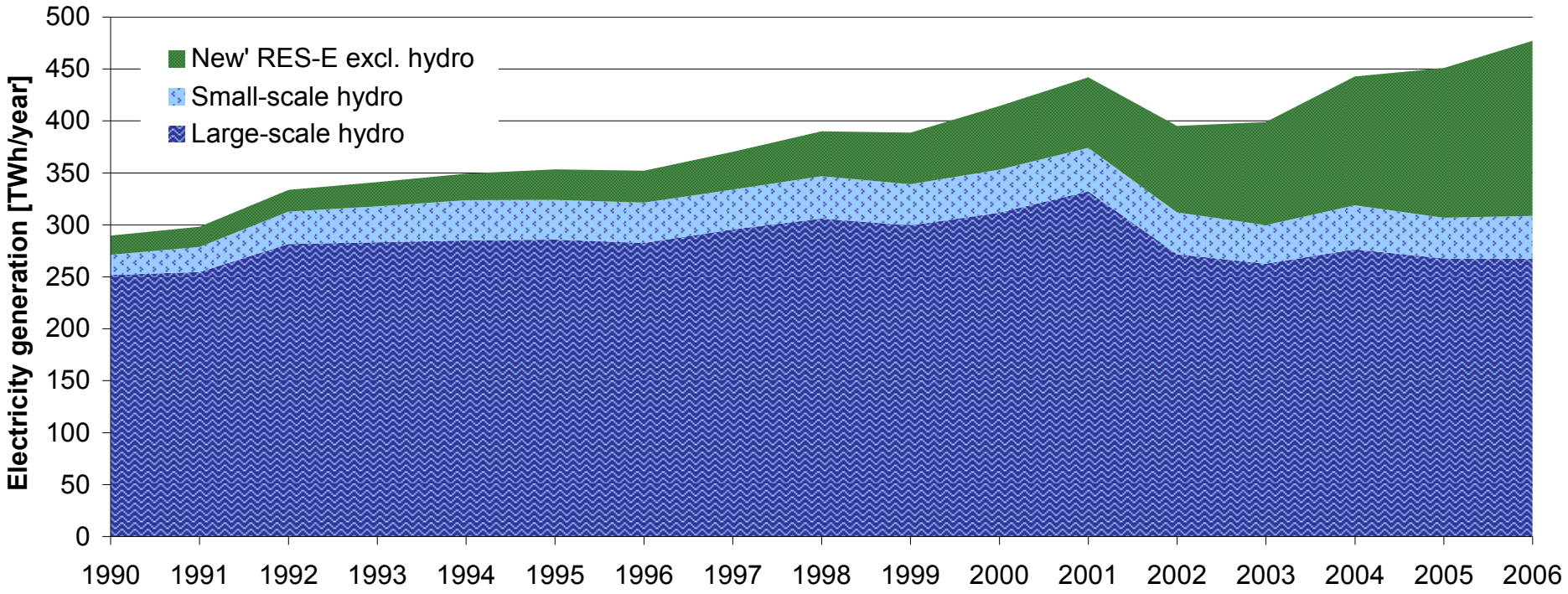
A clear majority of EU countries uses feed-in tariffs as main instrument
5 countries have implemented a quota obligation with TGCs

Historic trends of RES-E and target compliance

Historical development of RES-E in the EU-27

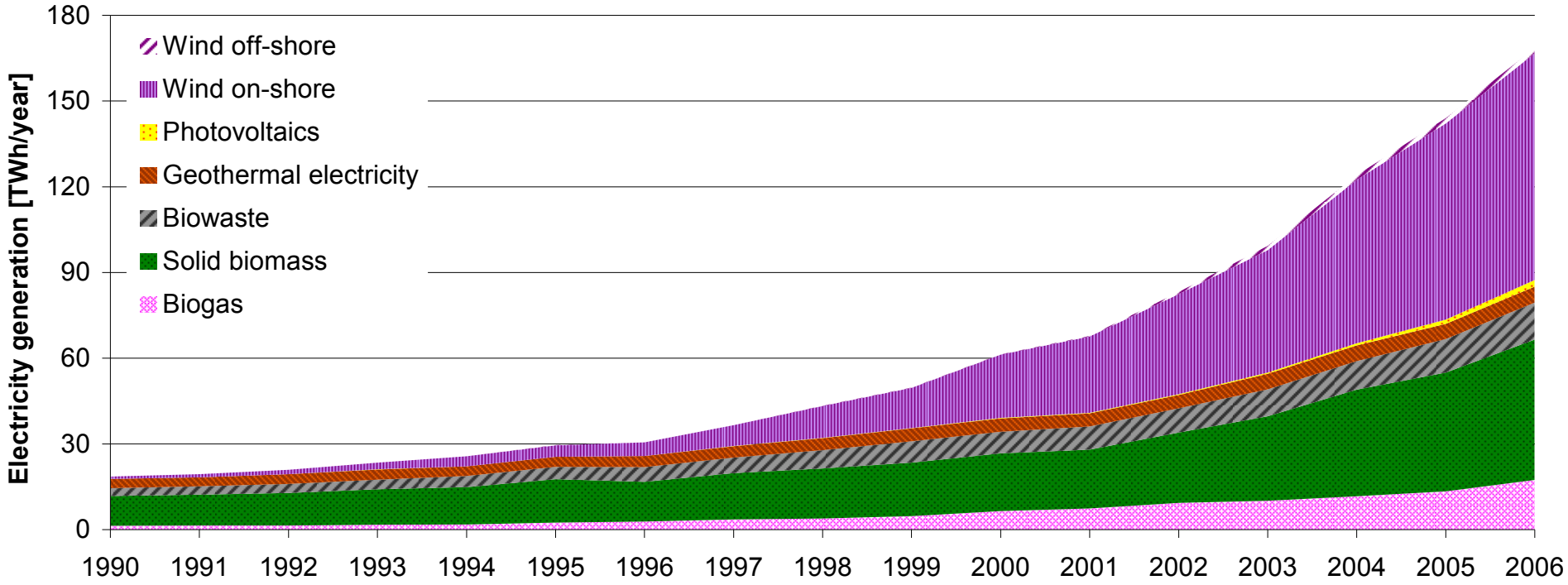
- "New Renewables" show a significant growth
- Hydropower stagnates (in the EU-15)

  … natural fluctuations cause a comparatively high volatility of the yearly output



Historical development of new RES-E in the EU-27

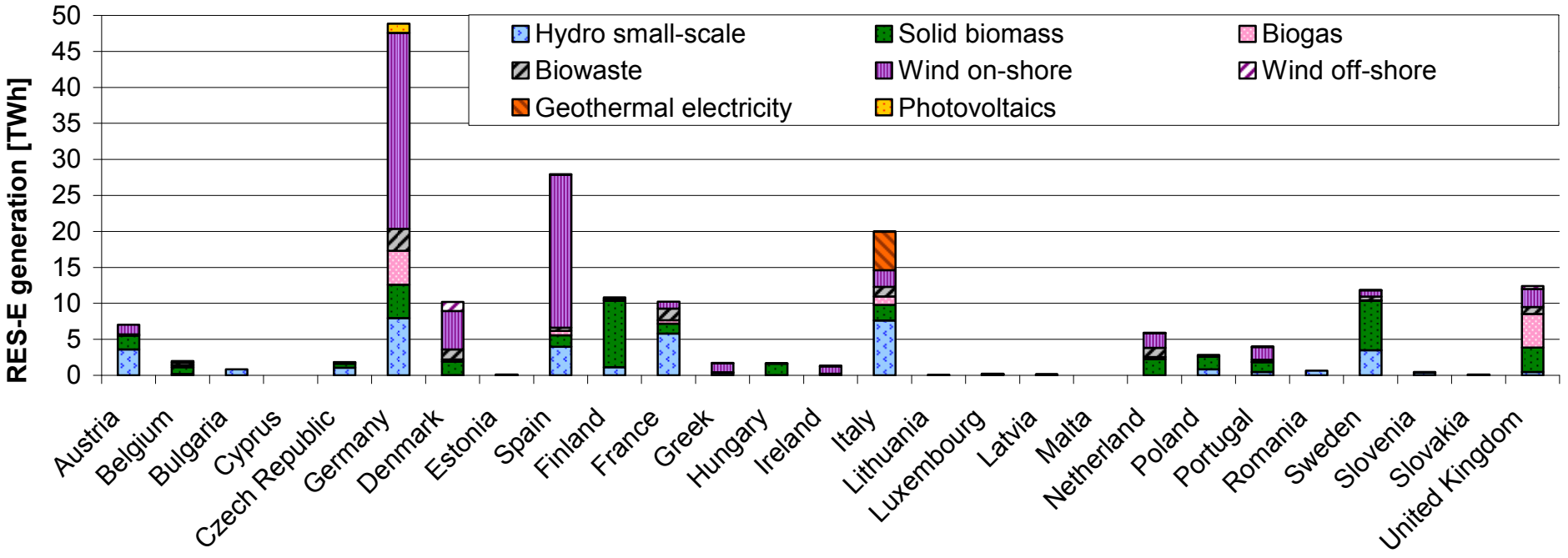
- **"New Renewables" in the EU-27**
- Dominating: Wind energy (in the EU-15) & Biomass (in the new member states)



Progress in "new" RES-E at Member State level

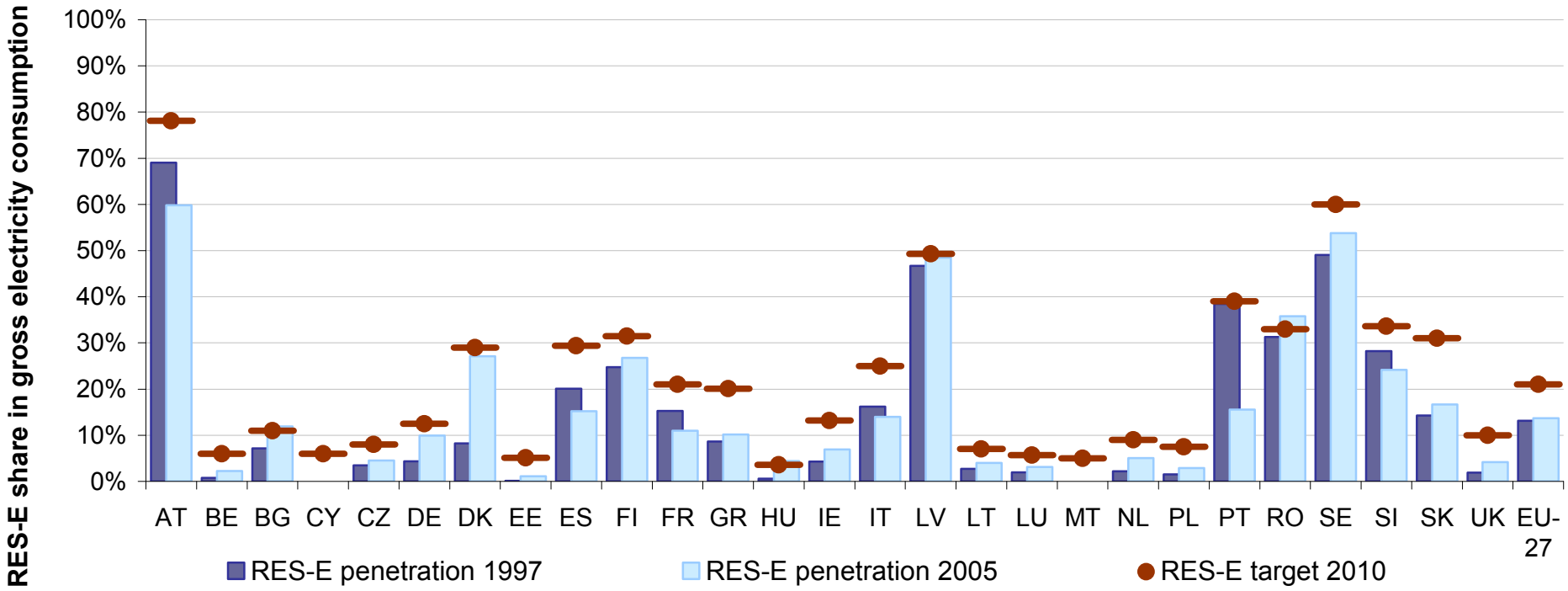
- New RES-E generation excl. large hydropower
- Dominating:

  Wind energy, solid biomass, small hydropower and biogas



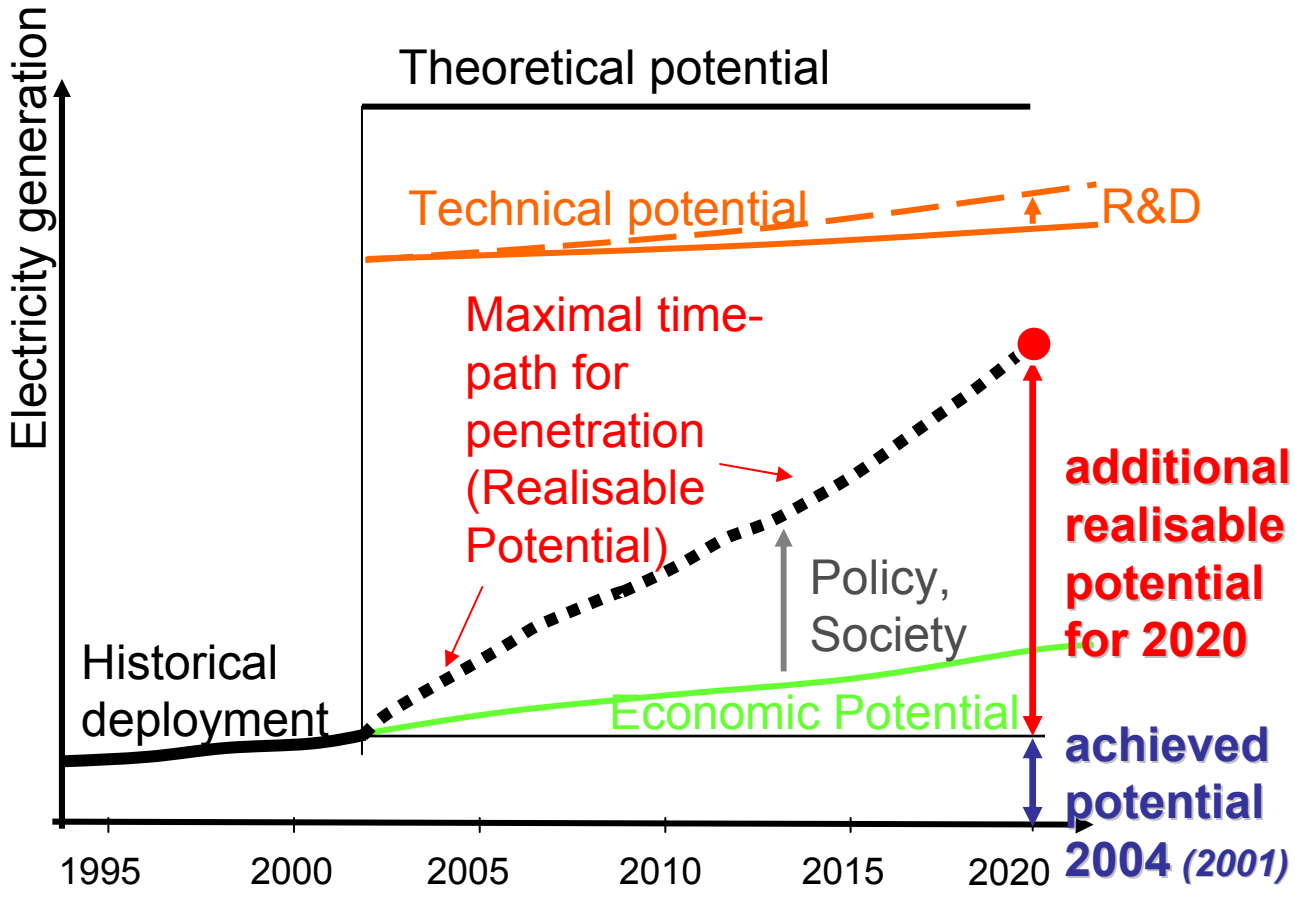
Progress towards the RES-E target for the EU-27

►Only a limited number of Member States is on track for reaching the 2010 targets for RES-E



Future potentials of RES-E in the EU

Definition of the (additional) realisable mid-term potential (up to 2020)



Definition of potential terms

Theoretical potential ... based on the determination of the energy flow.

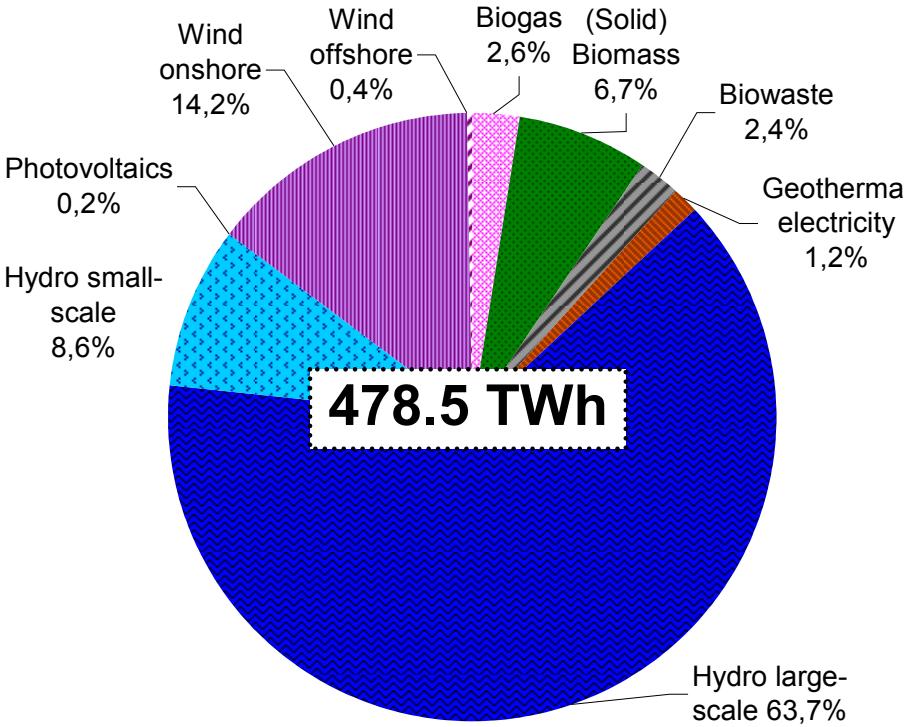
Technical potential … based on technical boundary conditions (i.e. efficiencies of conversion technologies, overall technical limitations as e.g. the available land area to install wind turbines)

Realisable potential … The realisable potential represents the maximal achievable potential assuming that all existing barriers can be overcome and all driving forces are active.
Thereby, general parameters as e.g. market growth rates, planning constraints are taken into account in a dynamic context – i.e. the realisable potential has to refer to a certain year.

Mid-term realisable potential for RES-E in EU-27

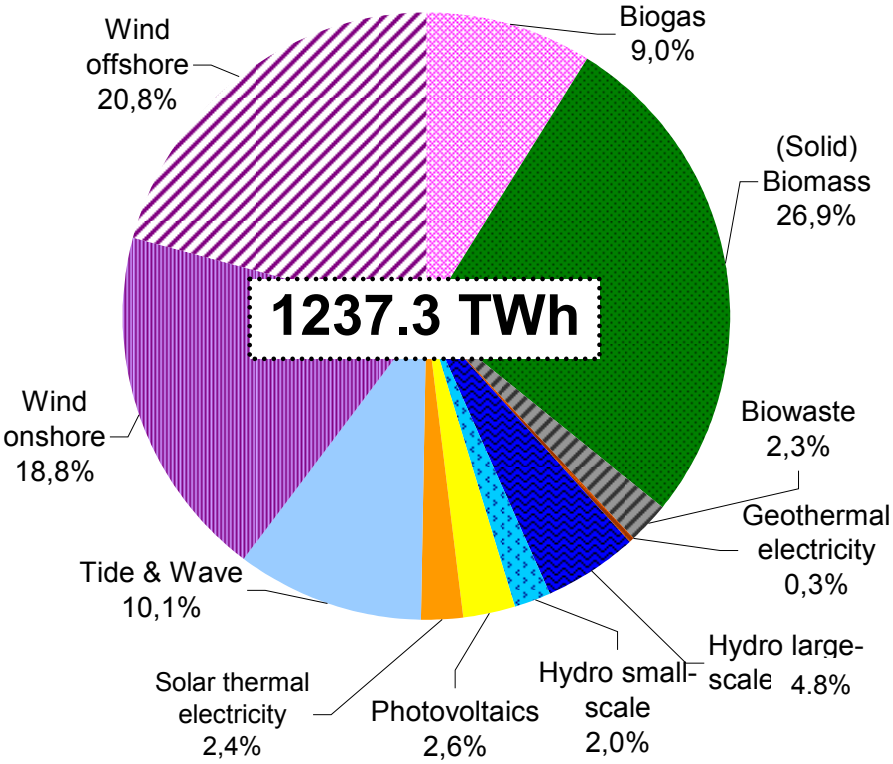
Achieved Potential

at the end of 2004

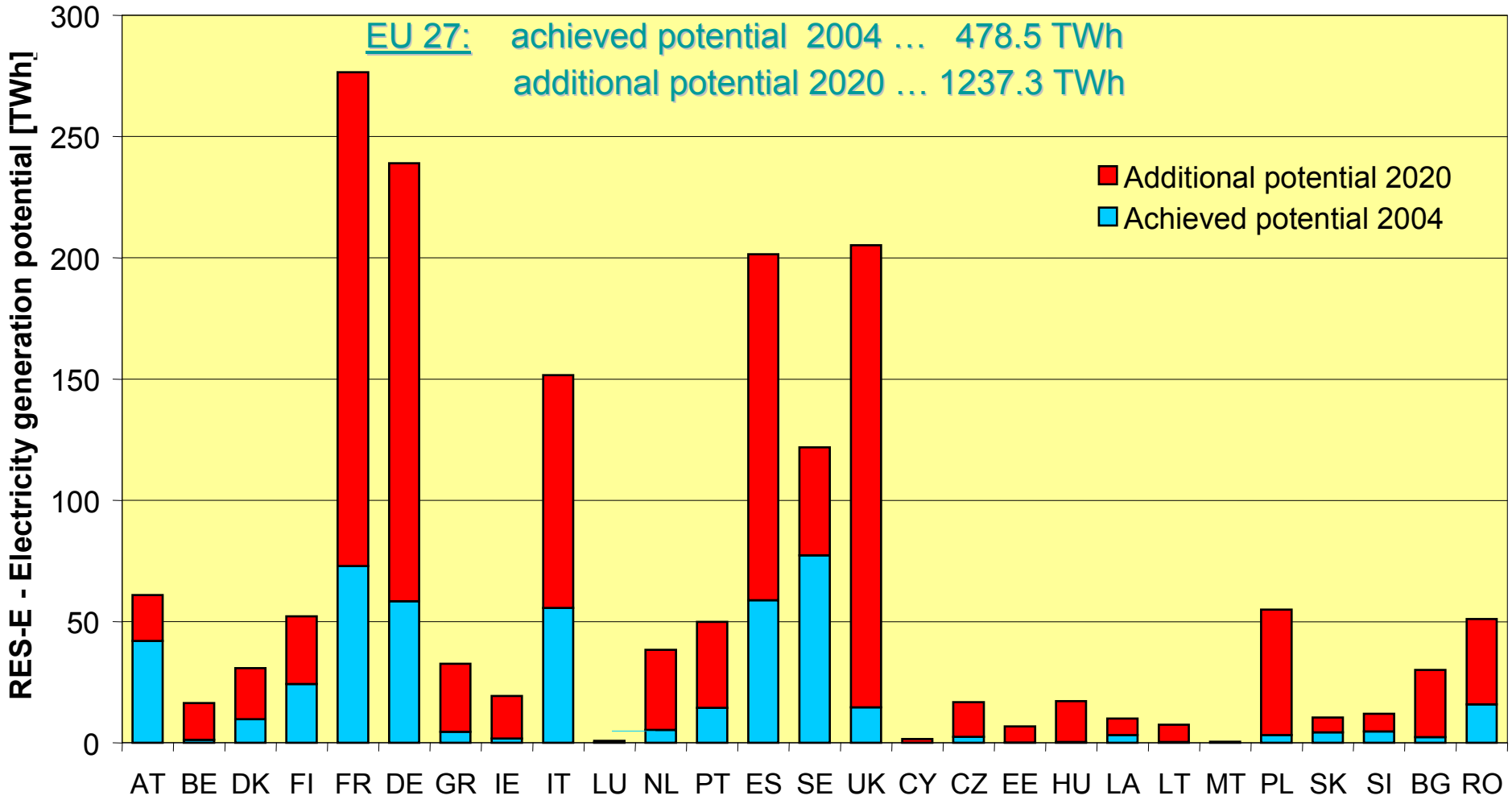


Additional Potential

up to 2020



Mid-term realisable potential for RES-E in EU-27



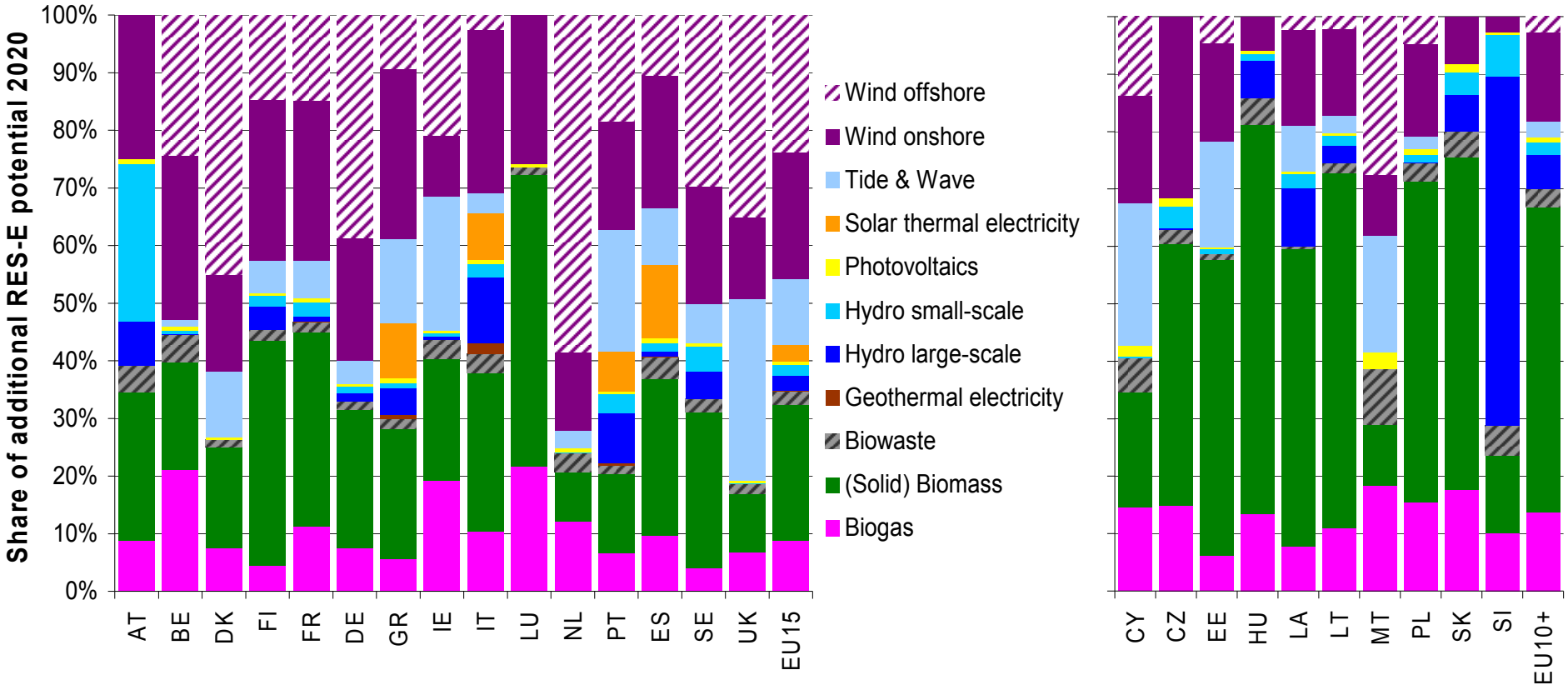
RES-E split of future potentials in Europe *(Additional potential up to 2020)*

EU-15

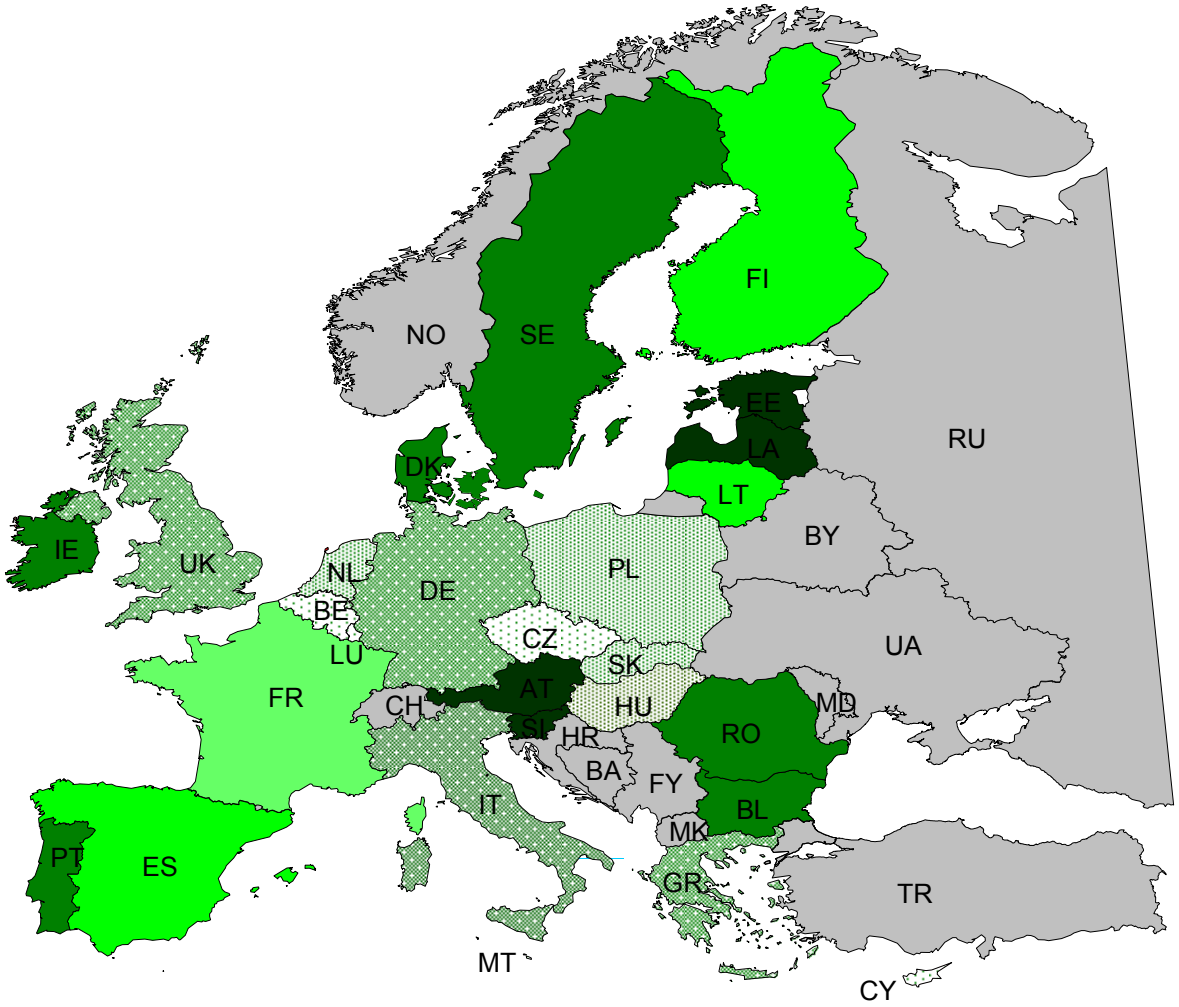
Dominating RES-E technologies:

Wind on- & offshore, Biomass, … Biogas, Wave & tidal

EU-10+



Mid-term realisable potential for RES-E on country level related to consumption



Share of total RES-E potential on gross electricity consumption 2020 (BAU scenario-Energy and Transport Outlook)

- > 70%
- 60-70%
- 50-60 %
- 40-50%
- 30-40%
- 20-30%
- 10-20%
- < 10%

RES potential and energy policy

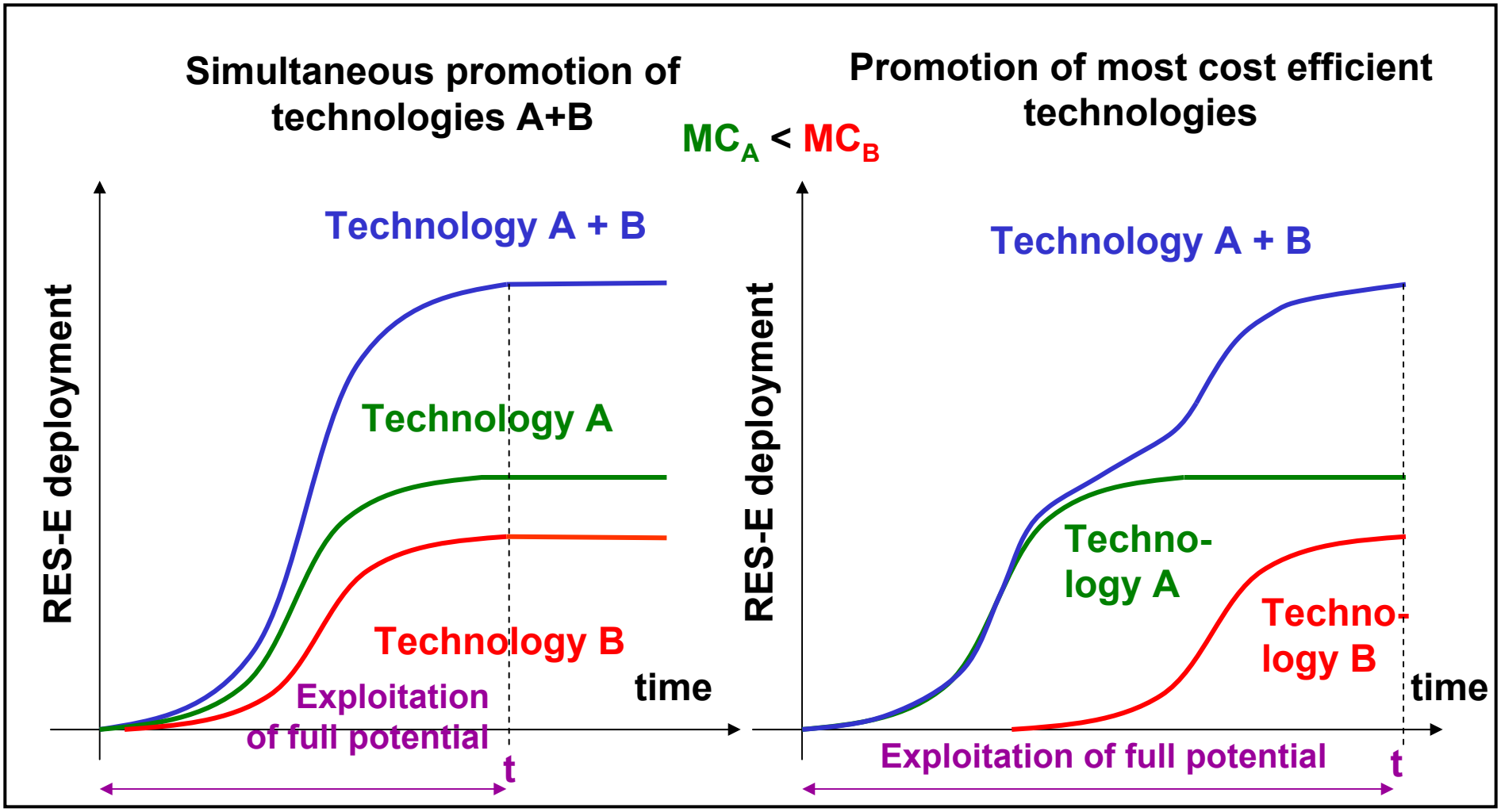
Scenario on the evolution of RES up to 2020 based on the model ***Green-X***

RES potentials in the future are a **function** of time as well as of **past and present policies**!

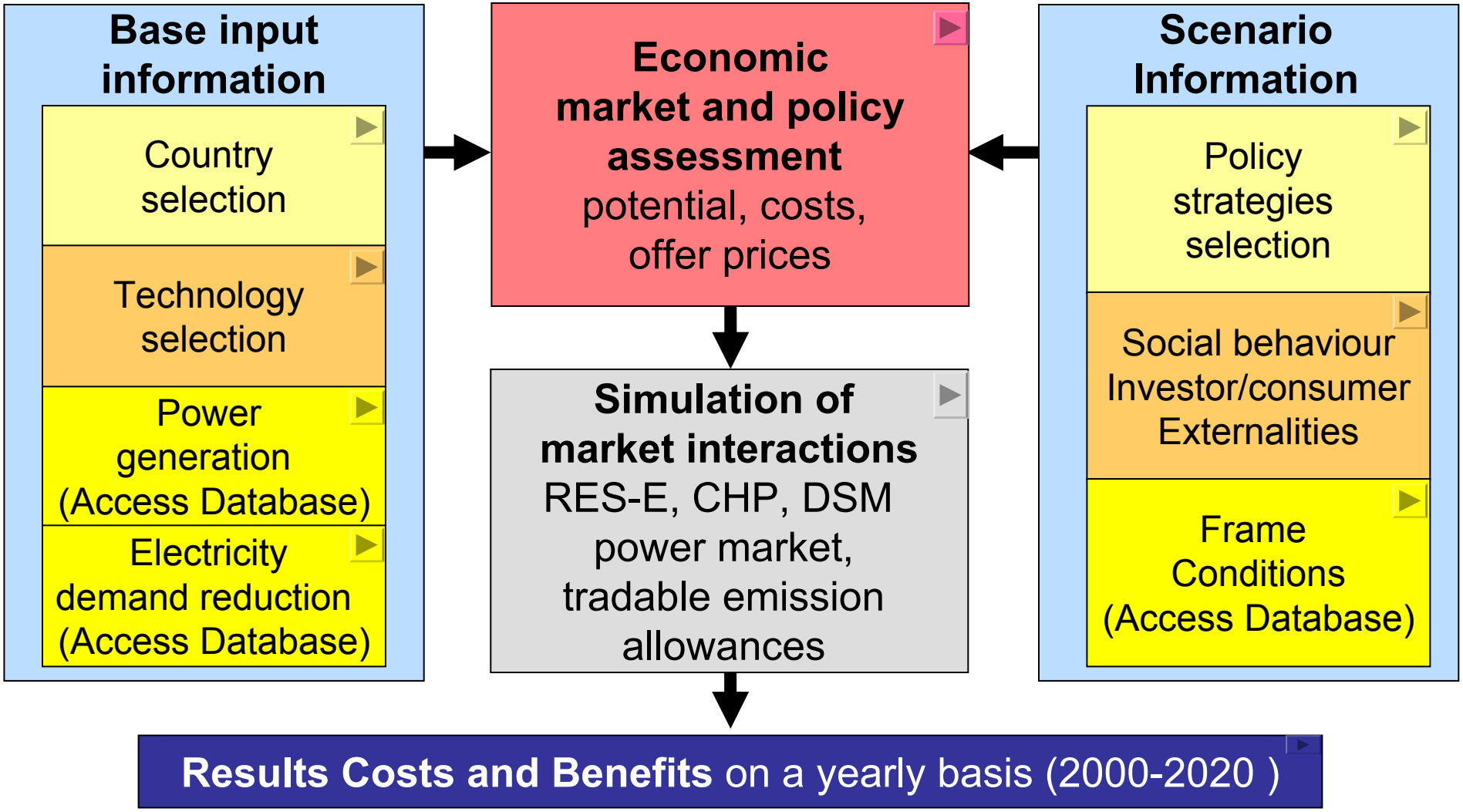
Large future potentials can only be developed by promoting a **broad spectrum of technologies at an early stage**!

The **dynamic efficiency** of any RES policy depends strongly on the **diversity of the technology portfolio** promoted at an early stage (technology learning)!

The dynamic influence of the promotion scheme



Overview computer-tool Green-X



Reference clients: DG RESEARCH, DG TREN, DG ENV,Sustainable Energy Ireland, German Ministry for Environment, European Environmental Agency, etc.

The Green-X approach:

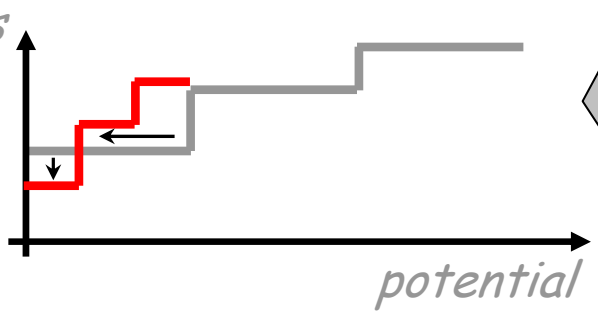
Dynamic

cost-resource curves

Potentials
- by RES-E technology *(by band)*
- by country

Costs of electricity
- by RES-E technology *(by band)*
- by country

DYNAMIC
COST-RESOURCE CURVES
- by RES-E technology
- by country
- **by year**



Dynamic aspects
- *Costs: **Dynamic cost assessment***
- *Potentials: **Dynamic restrictions***

(technological change)
(technology diffusion)

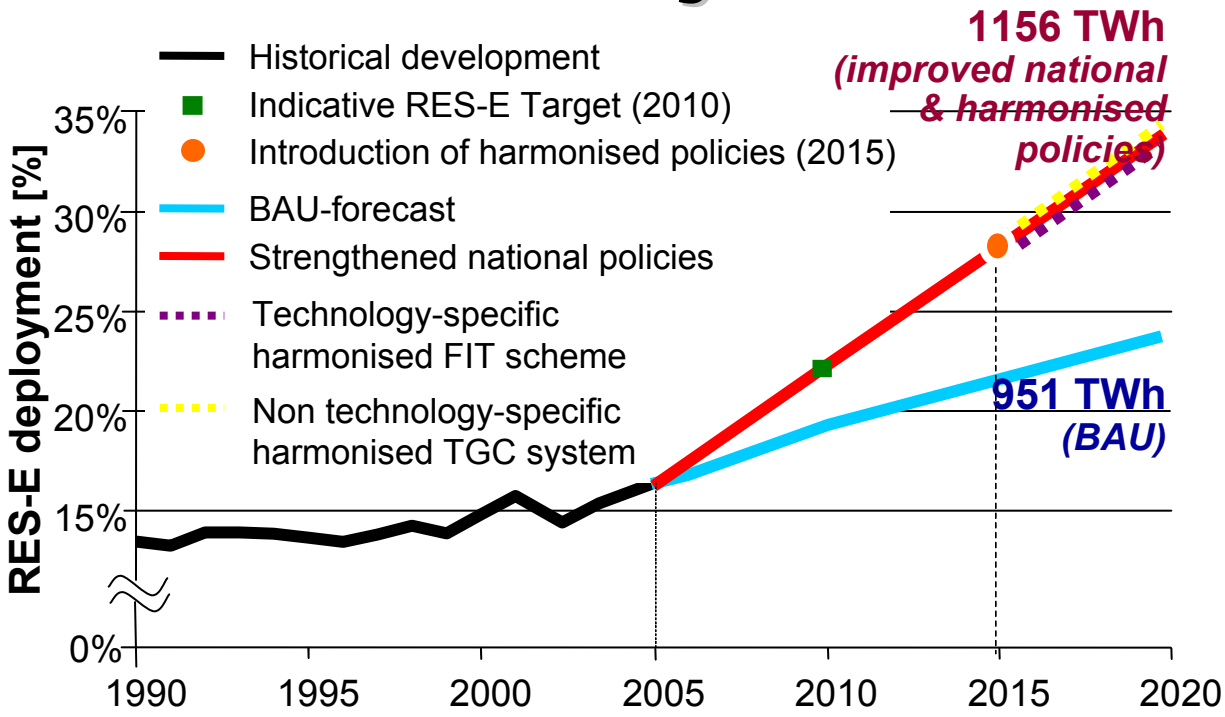
Policy optimisation versus harmonisation

– Results of *Green*-X model runs recently conducted within the EIE project

OPT RES

Investigated cases

Electricity EU-25



NO HARMONISATION

Business-as-usual (BAU)

Continuation of current national policies up to 2020

Improved national policies

Efficient & effective national policies

HARMONISATION IN 2015

Technology-specific support

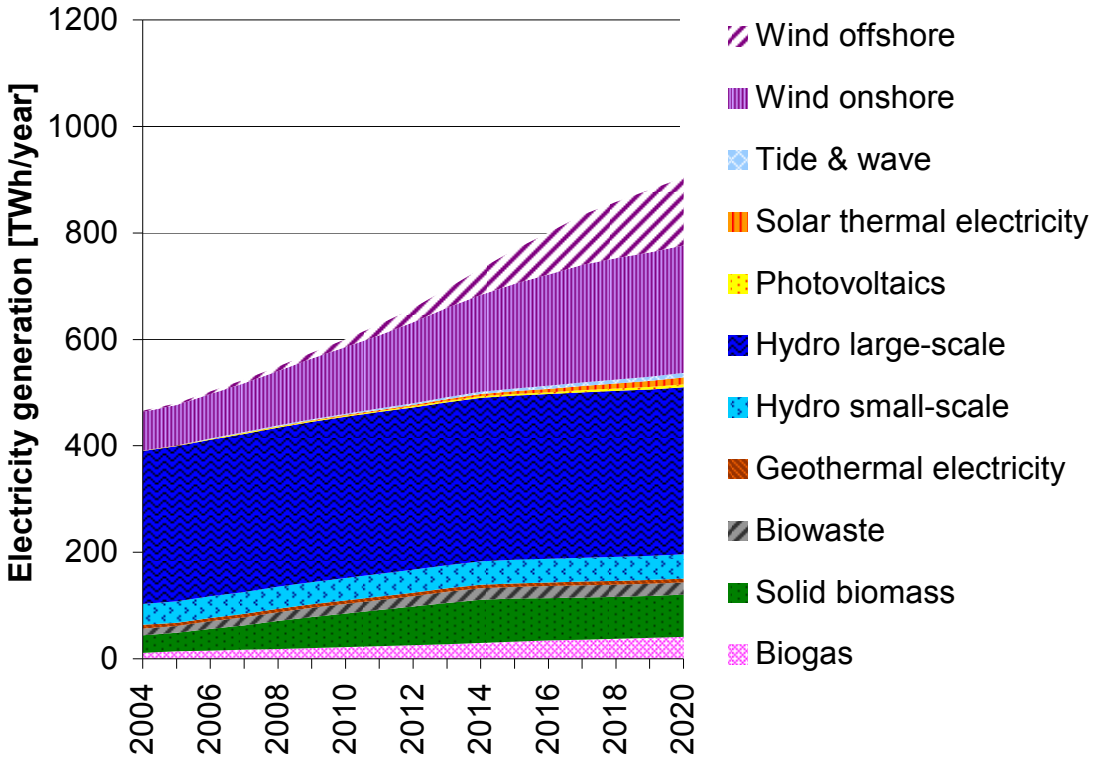
Feed-in tariffs - harmonised

Non technology-specific support

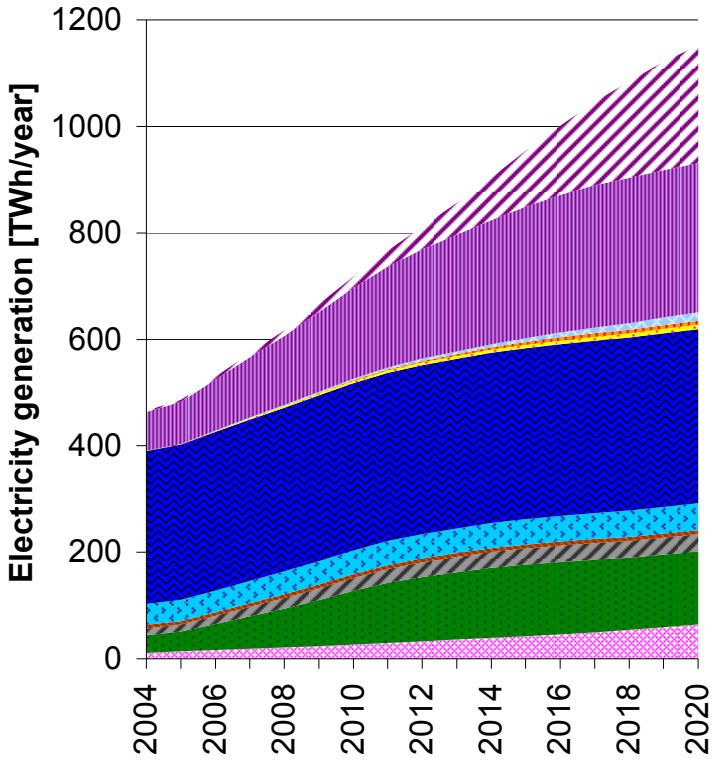
Quota obligation based on TGCs - harmonised

Electricity Generation in EU-25

BAU scenario



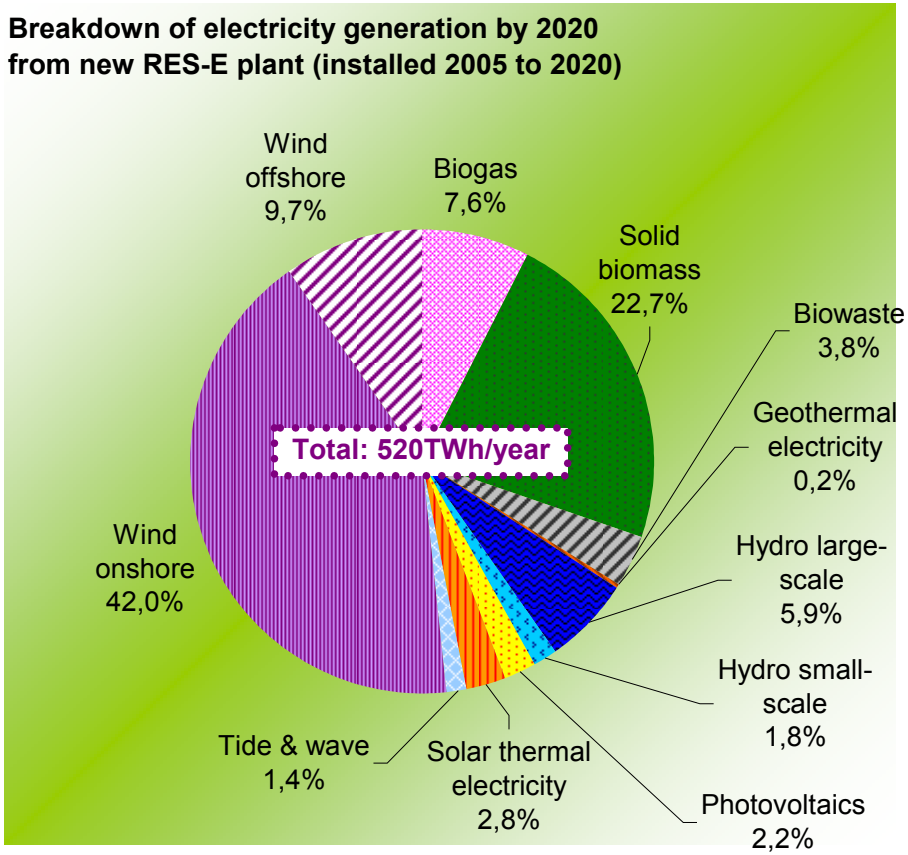
Improved national policies scenario



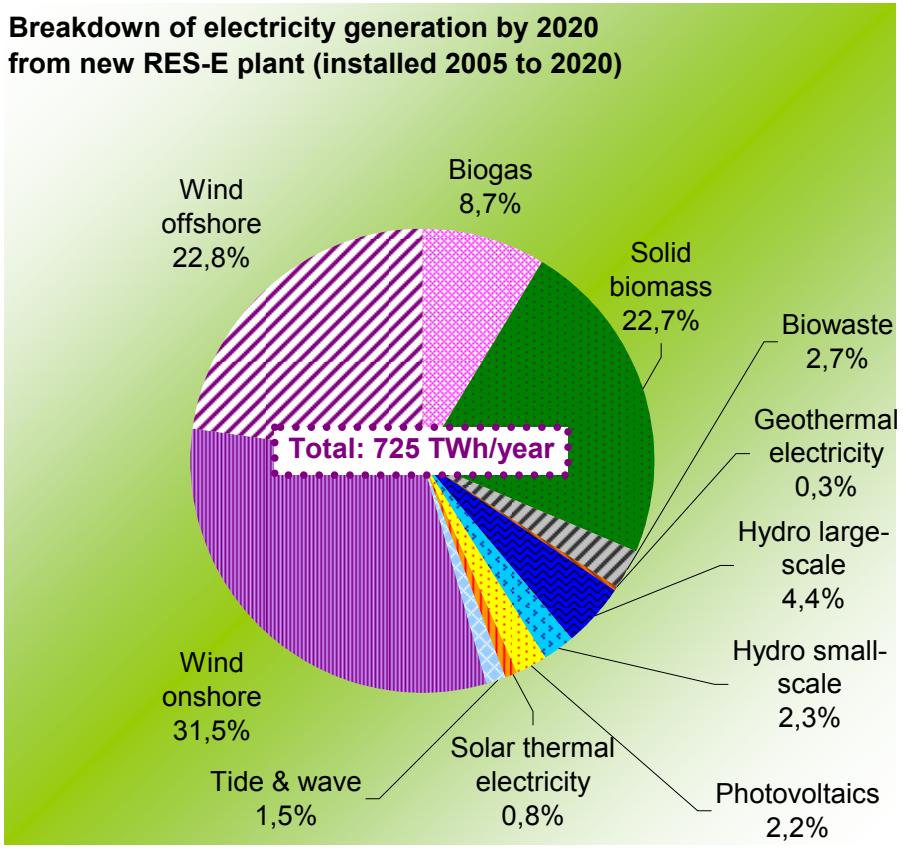
Breakdown of electricity generation from new RES-E plant

(installed in the period 2005 to 2020) on EU-25 level

BAU scenario



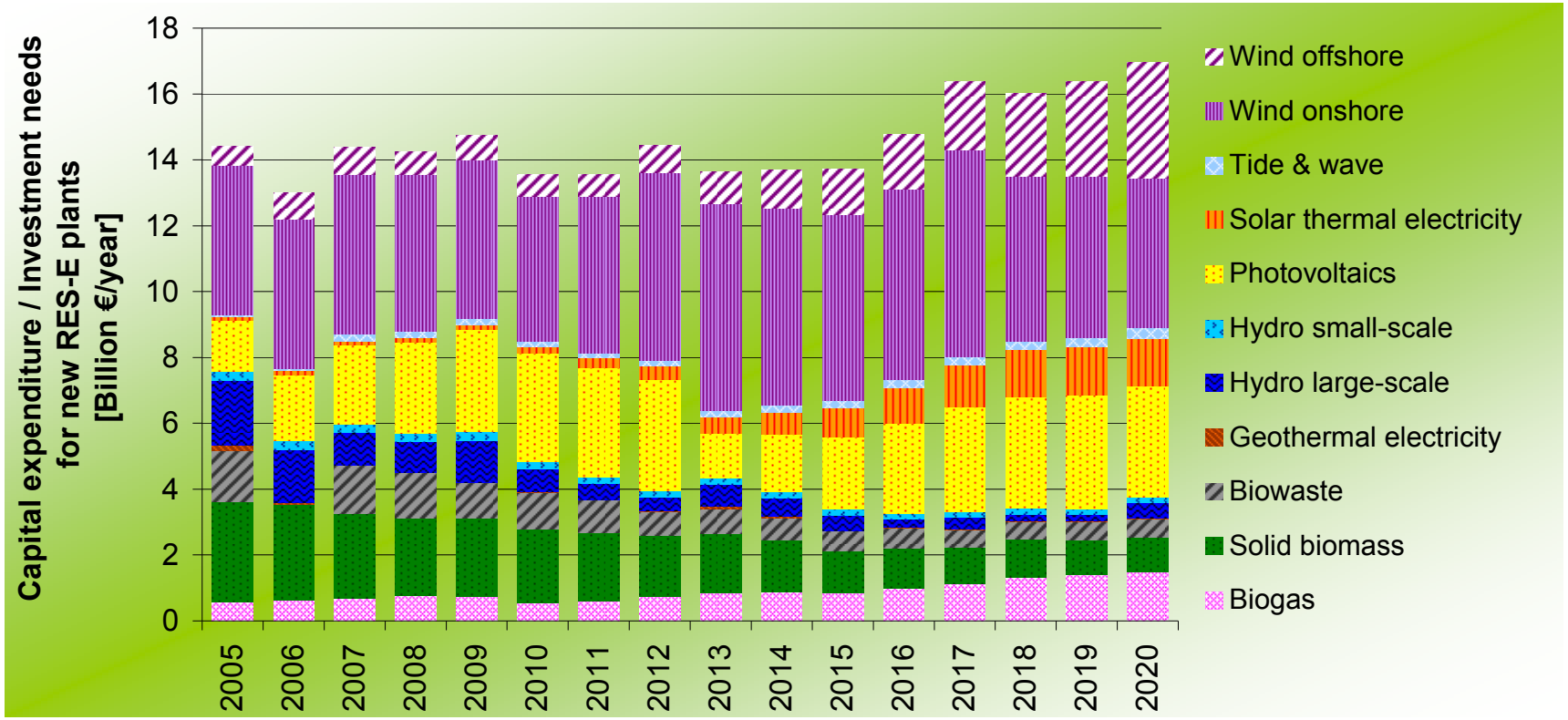
Improved national policies scenario



Capital expenditure / investment needs for new RES-E plant

(installed in the period 2005 to 2020) on EU-25 level

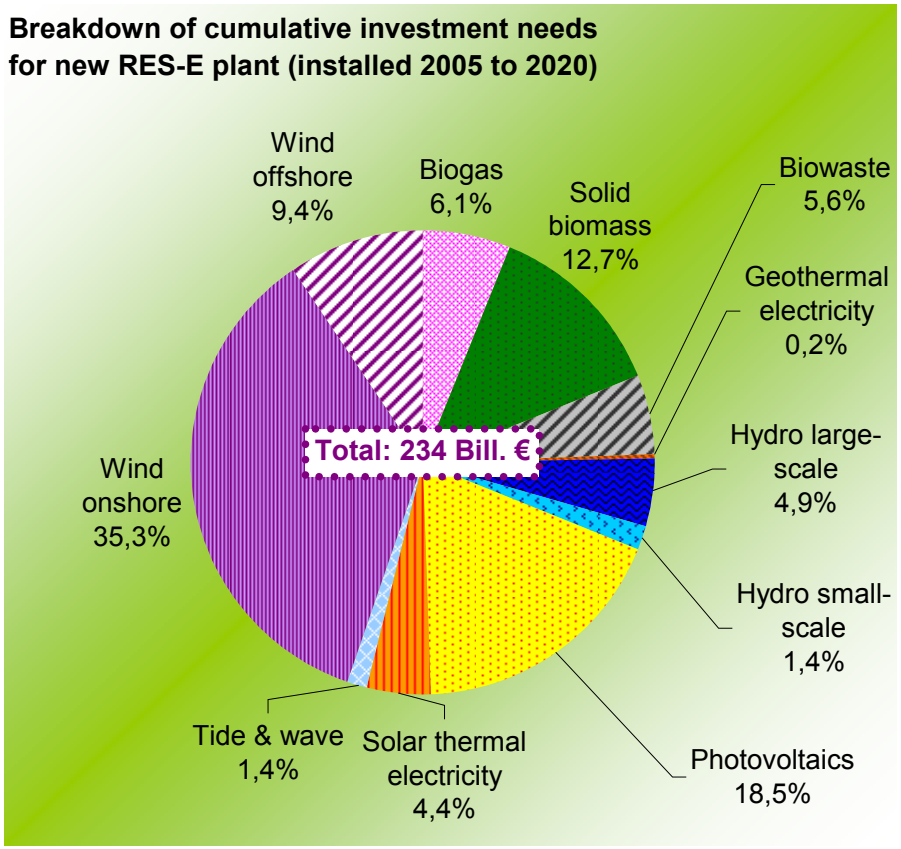
BAU scenario



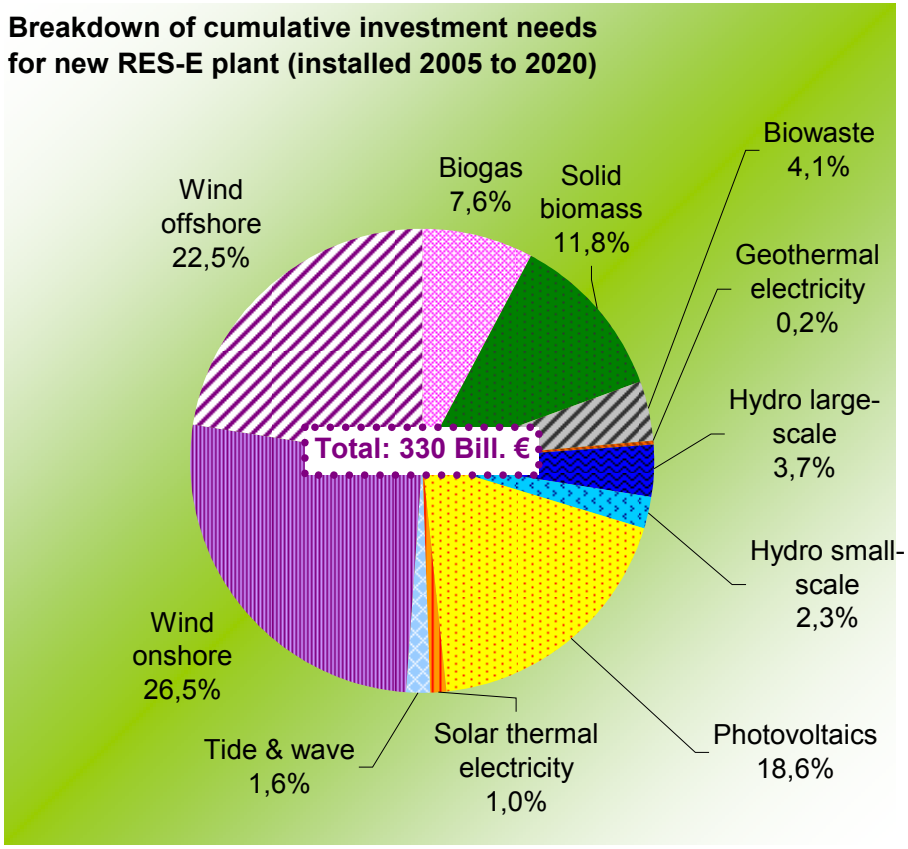
Breakdown of investment needs for new RES-E plant

(installed in the period 2005 to 2020) on EU-25 level

BAU scenario



Improved national policies scenario



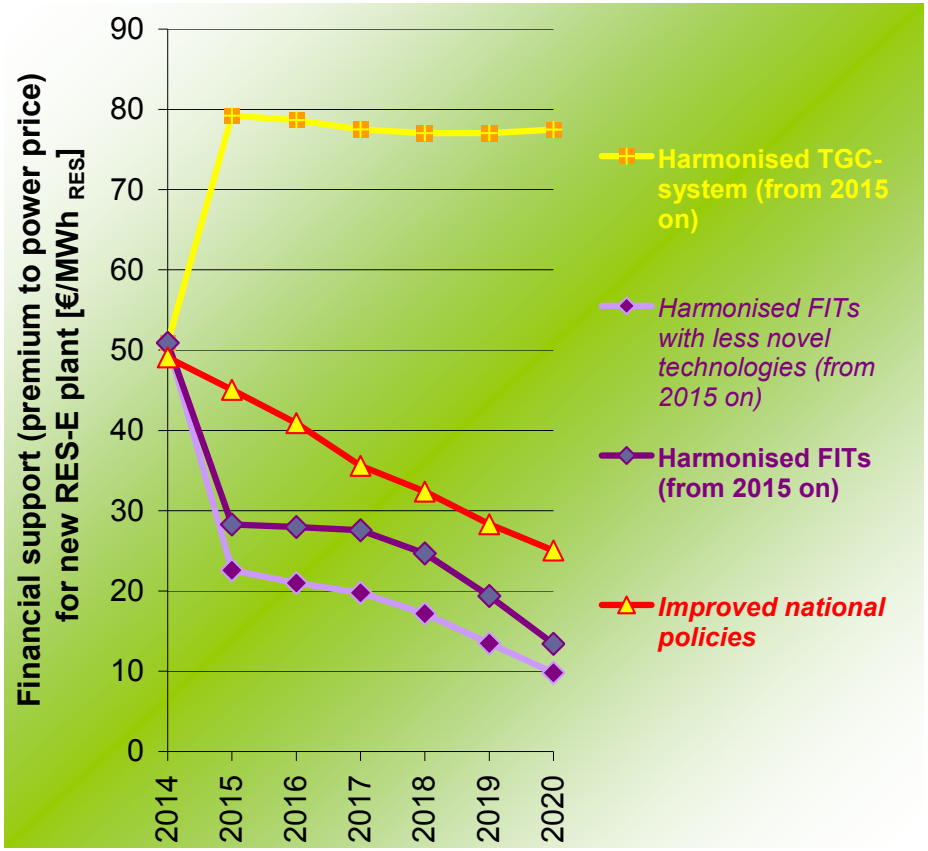
(Average) financial support for new RES-E plant

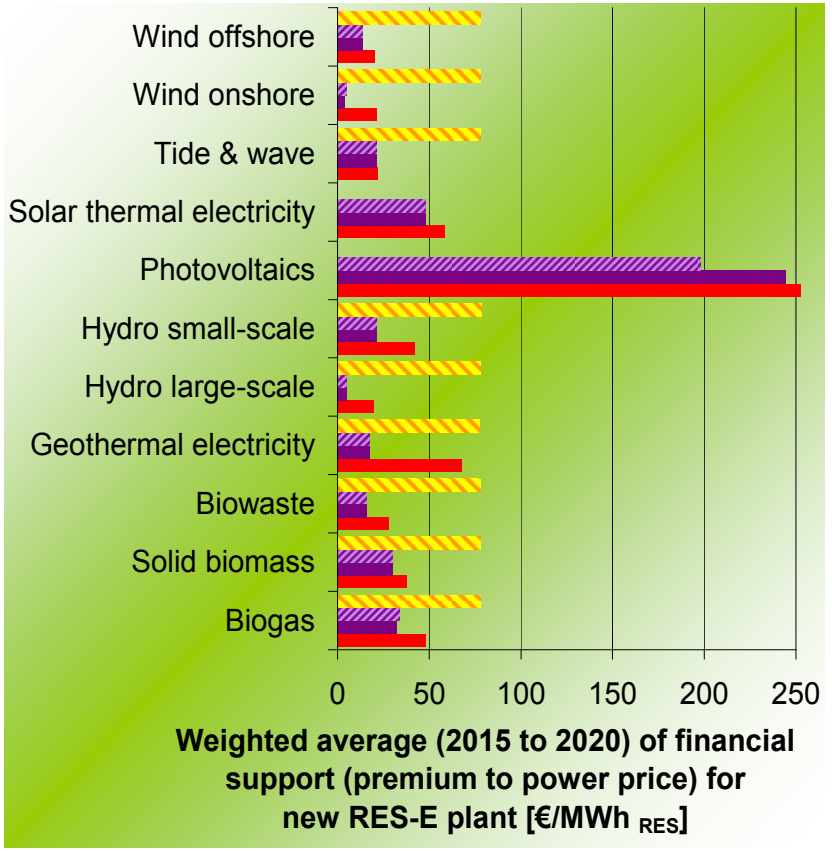
Unit: €/MWh$_{RES}$

… represents ***the average additional premium on top of the power price guaranteed (for a period of 15 years) for a new RES-E installation in a certain year…***

Improved national policies

versus **Harmonisation**





Conclusions and Implications (1)

RE-Share 2020 of 20% is an ***ambitious but feasible*** *target in general but also for the* ***RES electricity sector***

All Member States have to exploit their potentials, most technologies are required *in order to create a high long term dynamic efficiency*

New Directive has to be ***compatible with successful MS policies and instruments*** *in order to guarantee continued growth at low costs for consumers*

Any ***disruption of markets*** *will make the fulfillment of the* ***RES 2020 target more difficult***

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Conclusions and Implications (2)

The results suggest that the most significant efficiency gains can be achieved through an ***optimisation of national RES-E support measures already*** *–* ***more than two thirds of the total cost reduction potential can be attributed to the optimisation of national support schemes****.*

-> Optimise present Feed-in and Quota Systems first!

Further efficiency improvements at a considerably lower level *(at less than one third of the overall cost reduction potential)* ***are possible by an EU wide harmonisation of support schemes provided that a common European power market exists, which is presently not the case****!*

On the way to an EU wide harmonisation the ***regional coordination represents an essential step****, half of the additional cost benefits of an EU-wide harmonisation as compared to the nationally optimised schemes can be tapped through a regional coordination already.*

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Conclusions and Implications (3)

Technology specific Feed-in tariffs **have proven to more effective and efficient than** ***non-technology Quota systems*** **in the past for the reason of** ***investment stability*** **and lower** ***risk premium*****.**

Technology specific instruments have also good prospects for the future **because of higher impacts on** ***technology learning*** **and lower** ***windfall profits*** **(especially in case of ambitious targets)!**

If a harmonised policy is pursued, ***a technology specific support is superior*** *to non-technology specific with respect to cost minimisation.*

Generally one should also consider that ***a premature EU-wide harmonisation*** *can* ***hamper the national optimisation process*** *as well as* ***the overcoming of non-economic barriers at Member State level*** *and can* ***lead to significant market distortions if power markets are not fully liberalised****.*

Additional benefits can arise from the competition of non-harmonised systems during some time as the ***promotion schemes can learn mutually from each other****.*

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Conclusions and Implications (4)

*On the **path towards an EU-wide harmonisation** the following steps are suggested by the present analysis:*

1. ***Diminish the key barriers for RES-E development*** *in each Member State*
2. ***Set long term targets on EU level***
3. ***Set correct framework conditions for conventional power markets*** *(full liberalisation)*
4. ***Set minimum design criteria for support schemes*** *(generic and instrument specific)*
5. ***Start regional coordination of RES-E markets*** *e.g. Nordic TGC market, Feed-in Cooperation*
6. ***Full EU-wide harmonisation only after successful completion of steps 1-5***

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Mid-term potentials will be significantly smaller if only the "low hanging fruits" will be harvested, i.e. if only the cheapest technologies are supported!
Thank You!
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