

Regional Market Studies

North Sea Regional Workshop with Stakeholders on
“TYNDP & RgIP 2012 results”

December 15, 2011

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- Conclusions



OBJECTIVES MARKET STUDIES

Objectives Market Studies

- Enable an assessment of the grid development needs based on market needs, using common Pan European scenario's (identify system dispatch and market flows as input for the grid studies).
- Analyse the impact of long-term investments for increase of exchange capacity on the energy system in the year 2020 for different scenarios.

These objectives are achieved by chronological , probabilistic market models based on a pan European market database. Market tools provided by 3 TSOs to secure results and analysis.



MAIN ASSUMPTIONS & INPUTS

- PERIMETER OF MARKET MODEL
- GENERATION/LOAD SCENARIOS
- EXCHANGE CAPACITIES

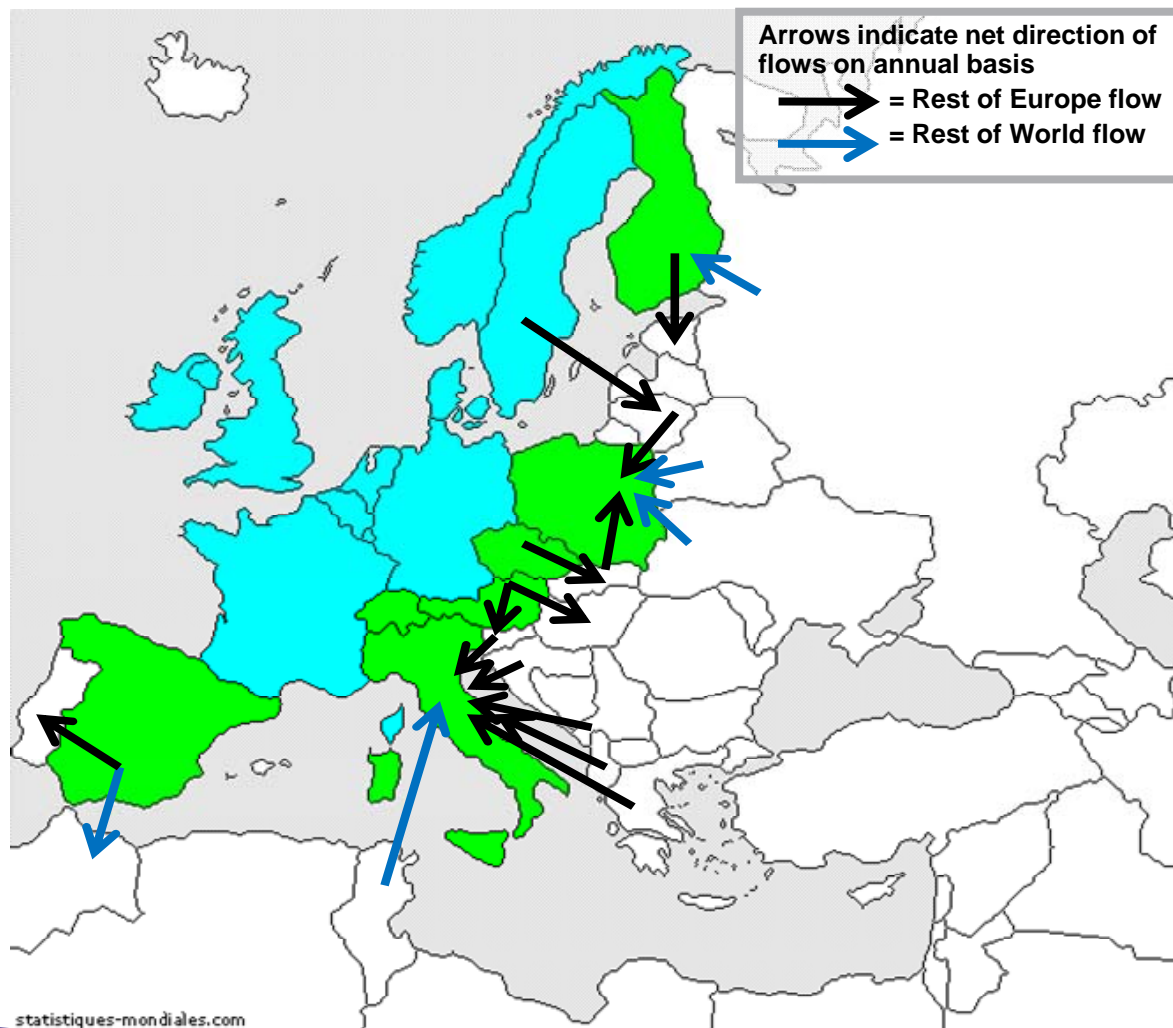
Market Modelling Methodology

Market model based on RGNS countries plus first neighbours.

First neighbours are taken into account to reduce the influence of the fixed (but profiled) flow to rest of Europe/World

Each market node is modelled without internal congestion.

Exchange capacities are based on firm information available when scenarios were frozen.

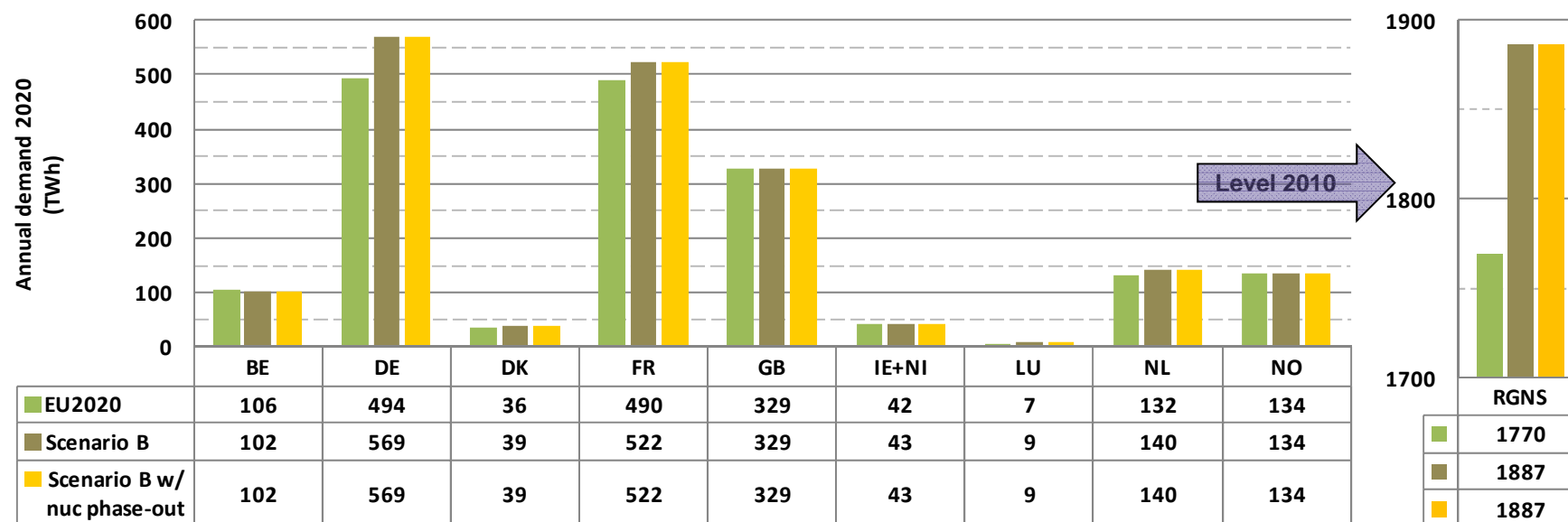


Scenario & hypothesis 2020



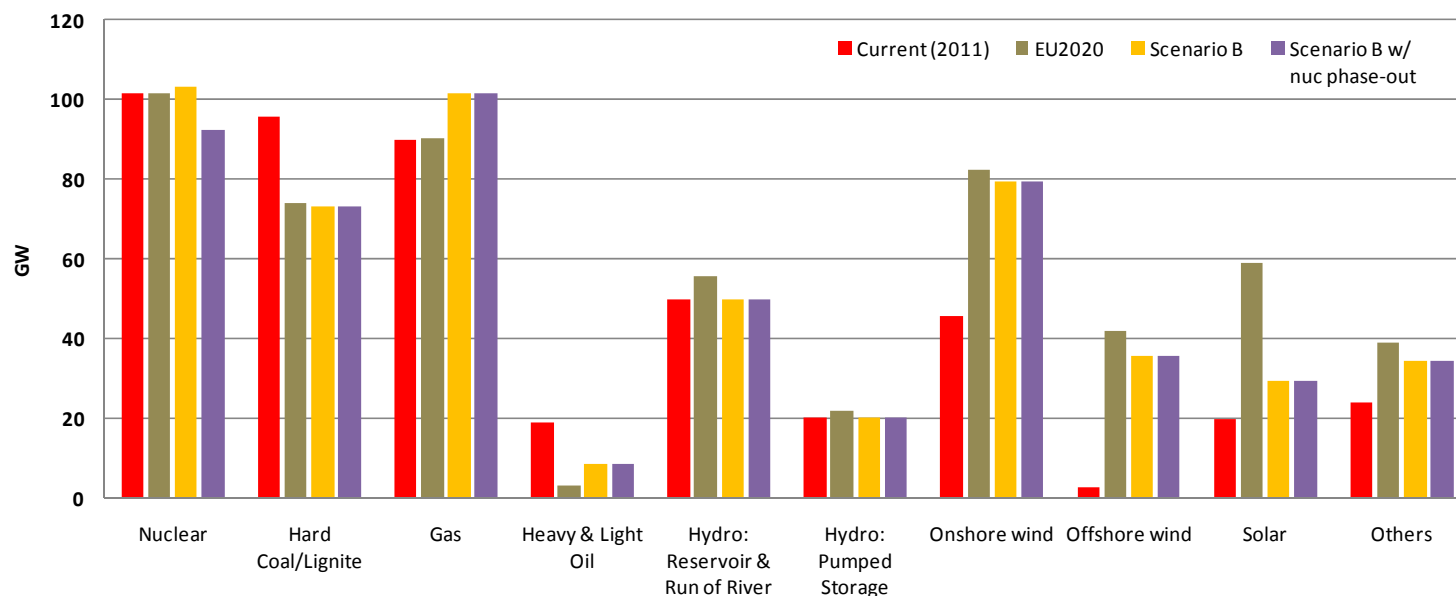
- 2 scenarios **SCENARIO EU 2020 + SCENARIO B**
- Scenario **EU2020**
 - Based on national Renewable Energy Action Plans
 - 20-20-20 objectives are met at EU-Level
 - Lower demand growth
 - More Wind and Solar
 - Gas before Coal in order to meet CO2 targets
- Scenario **B**
 - Based on TSOs best estimates
 - 20-20-20 objectives are not necessarily met at EU-Level
 - Higher demand growth
 - Less Wind and Solar
 - Coal before gas
- Sensitivity analysis on nuclear phase-out in Germany (scenario B with Phase-out in Germany)

Annual native demand for 2020 in TWh (input)



- Mainly due to lower electricity demands in Germany and France, the EU2020 scenario foresees in a 120 TWh lower electricity demand compared to Scenario B.

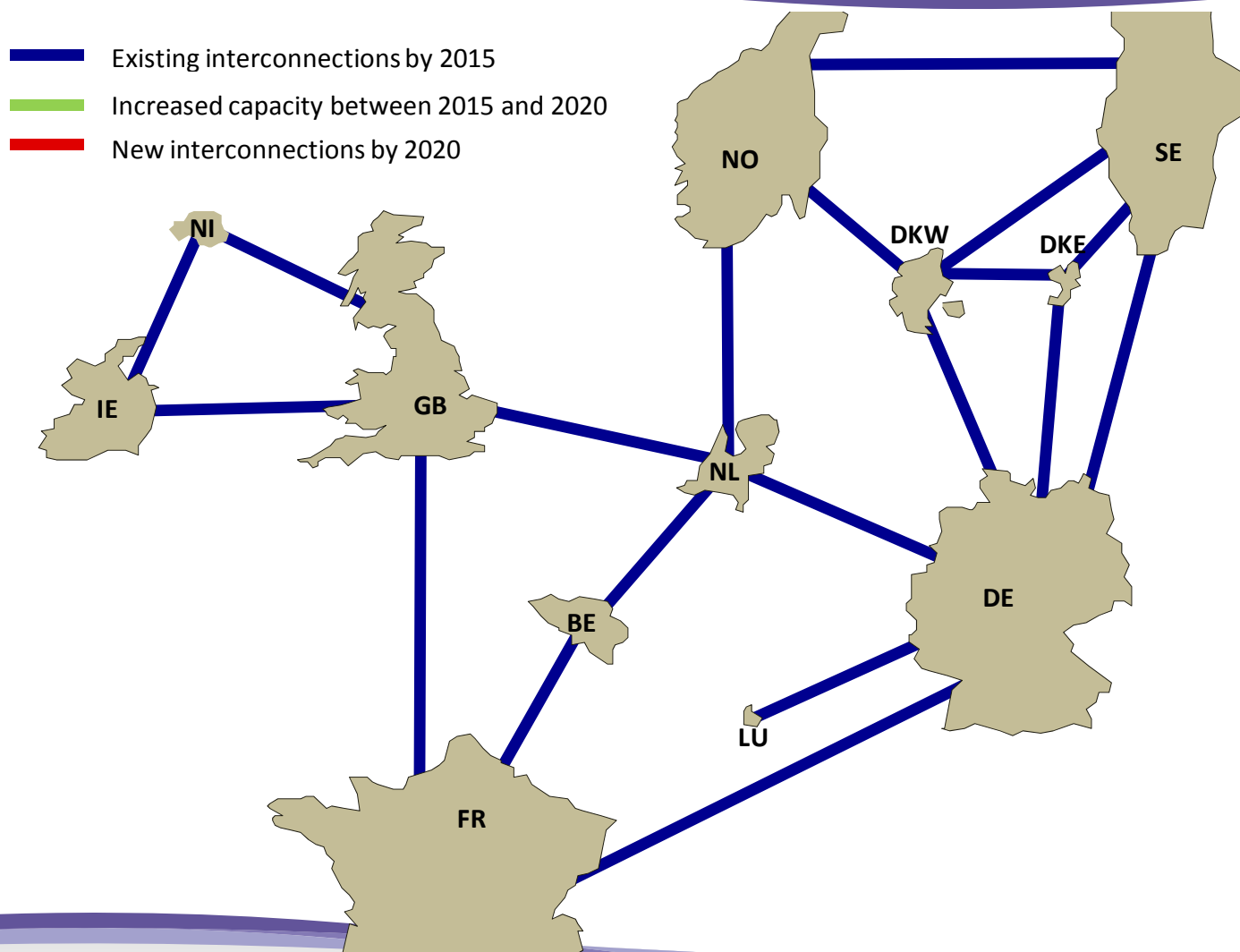
Regional installed capacities for 2020 in GW (input)



- Regional installed wind capacities differ only slightly between EU2020 and Scenario B
- Difference in regional installed solar (PV) capacity is explained by differences in Germany.
- The sensitivity analysis on the nuclear phase-out takes 10 GW less nuclear installed capacity into account for Germany.

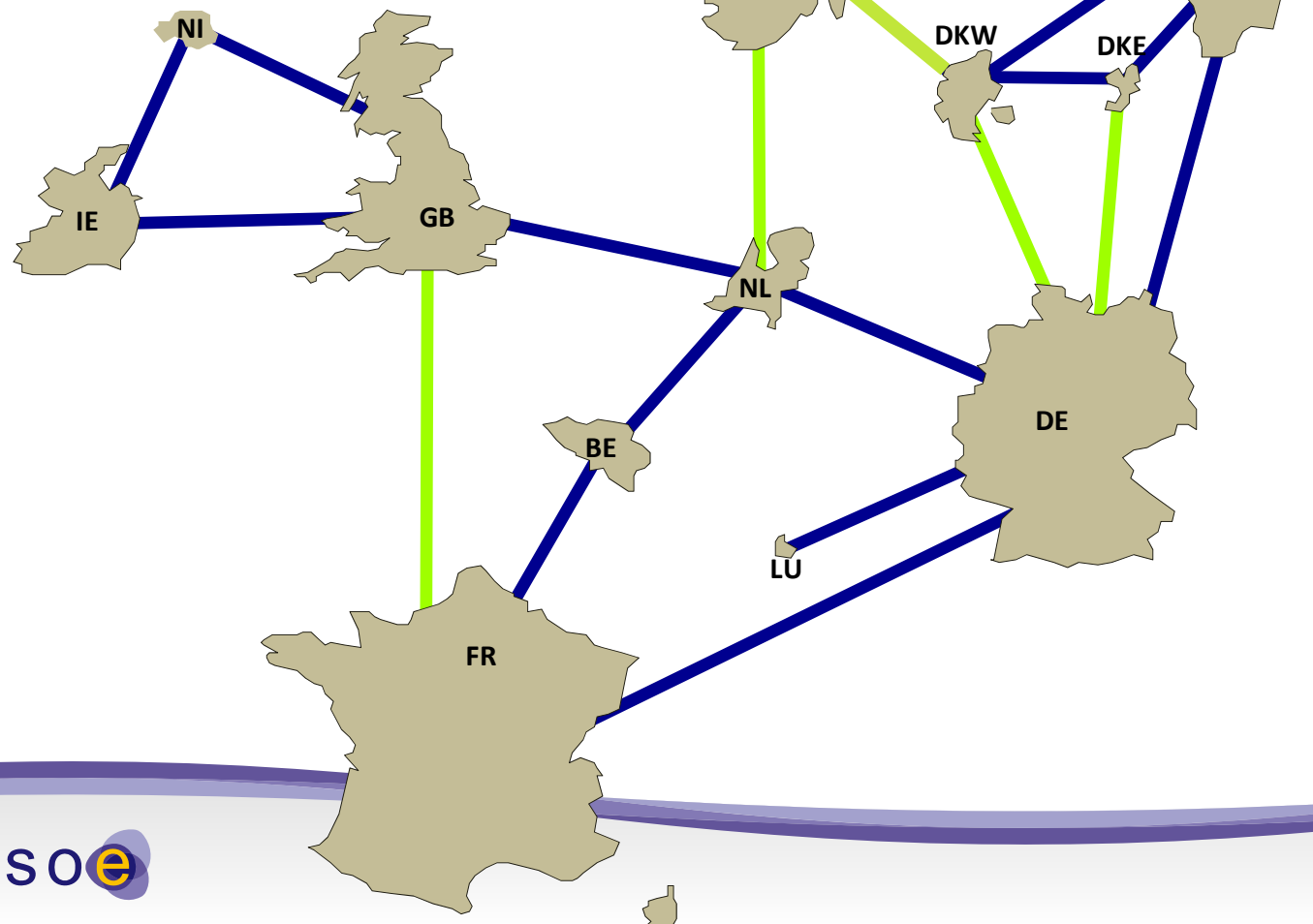
Evolution of transfer capacities between markets

Transfer capacities between markets by 2015



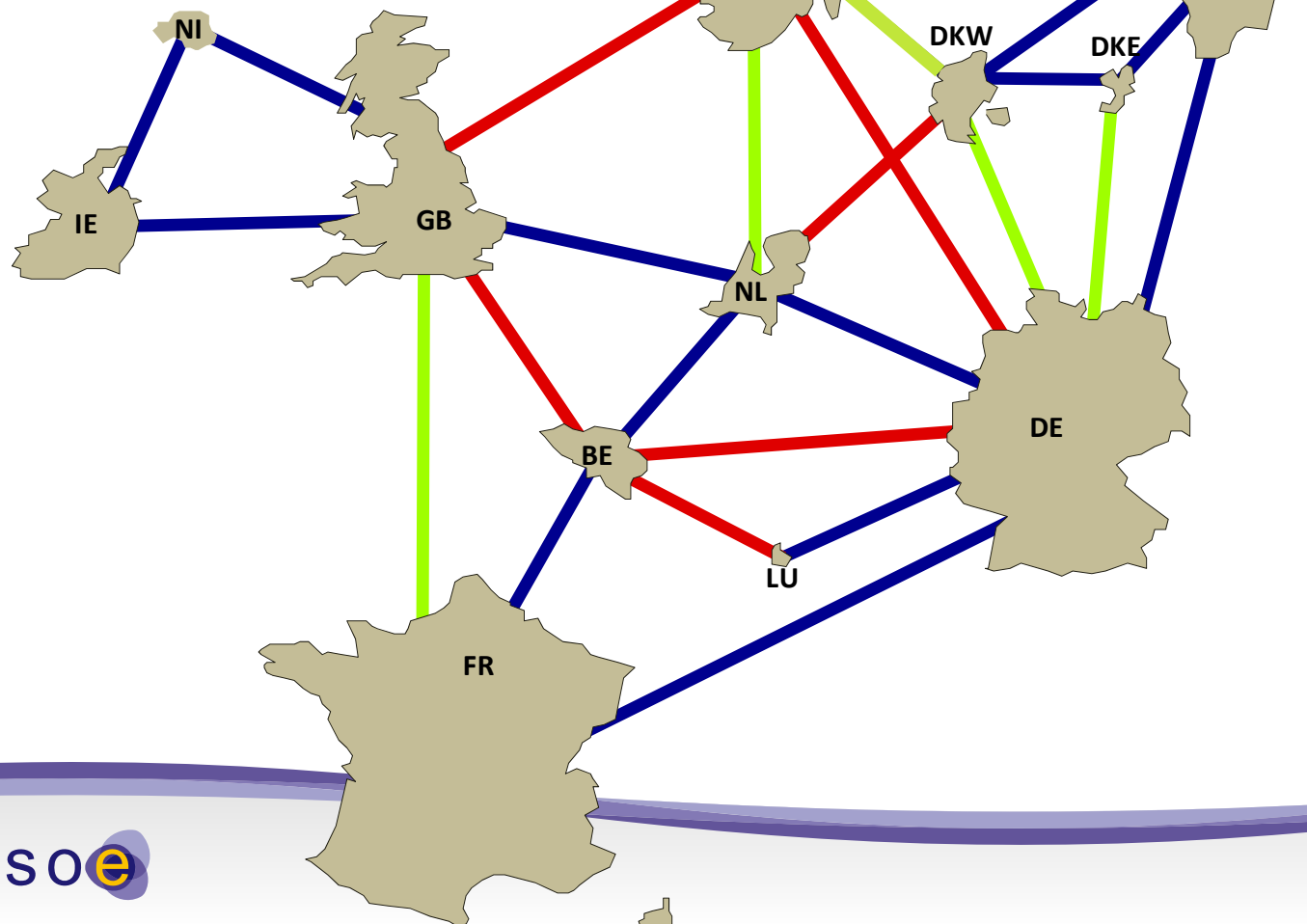
Transfer capacities between markets by 2020

- Existing interconnections by 2015
- Increased capacity between 2015 and 2020
- New interconnections by 2020



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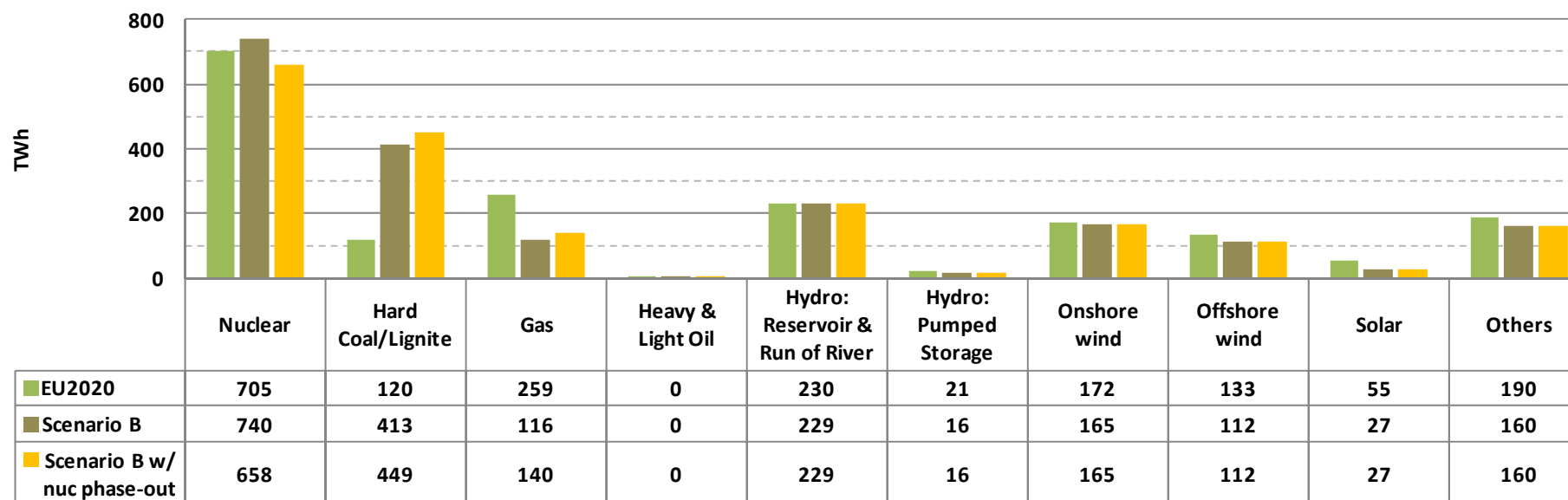


MAIN OBSERVATIONS

*(YEAR AROUND RESULTS FOR LOAD/GENERATION
SCENARIOS IN 2020 AND GRID SCENARIOS IN 2015 AND 2020)*

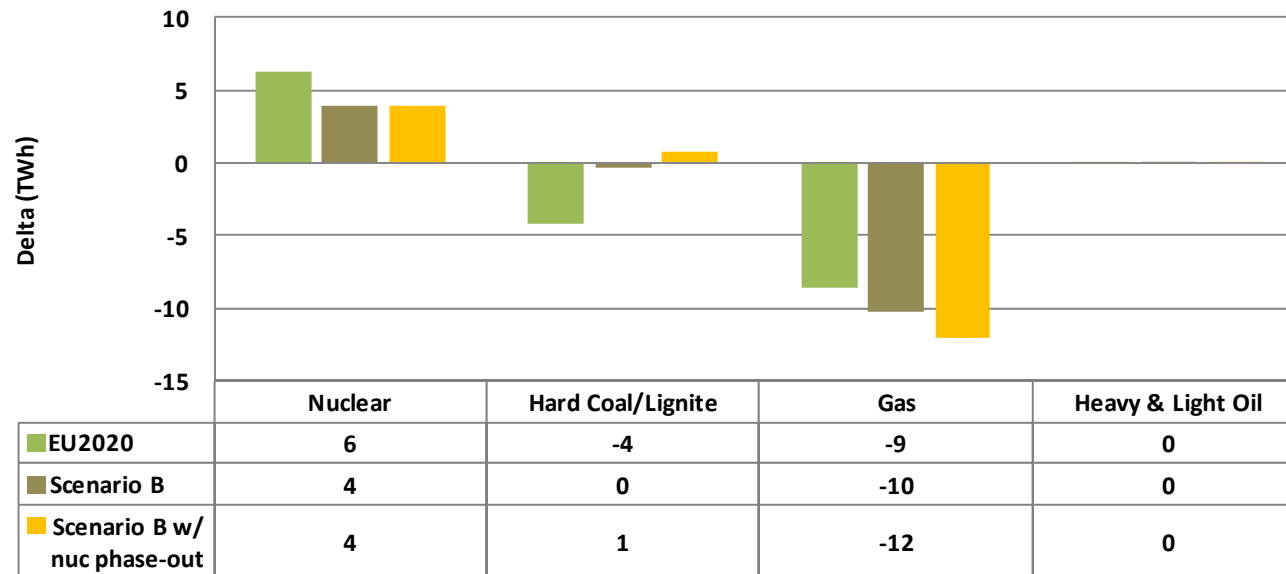
- FUEL MIX
- CURTAILMENT
- IMPORT/EXPORT
- CO₂
- PRODUCTION COST

Fuel Mix North Sea region / grid 2020



- Differences in merit order between the scenarios are clearly reflected in the fuel mix.
- The shutdown of nuclear units increases the energy production of coal and gas-fired plants within the region and reduces the net export to countries outside the North Sea Region.

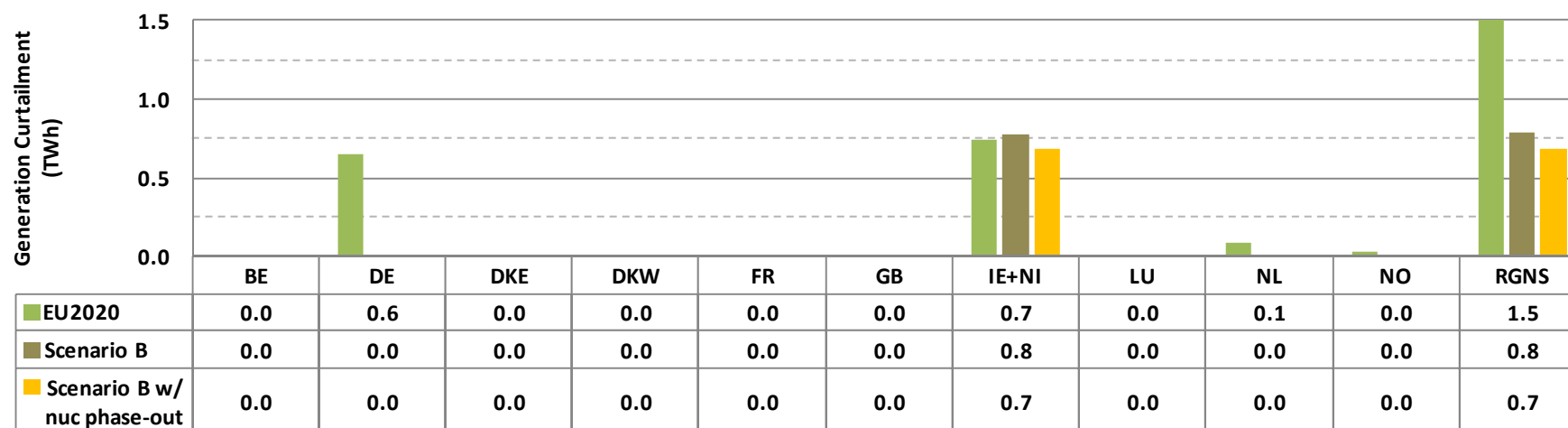
Impact interconnection reinforcements between 2015 and 2020 on thermal fuel mix for North Sea region



- Reinforcements lead in all scenarios to a decrease in output of gas units, which is substituted by production of nuclear energy and decreased regional export.
- Generation curtailment is not reflected in above diagram.

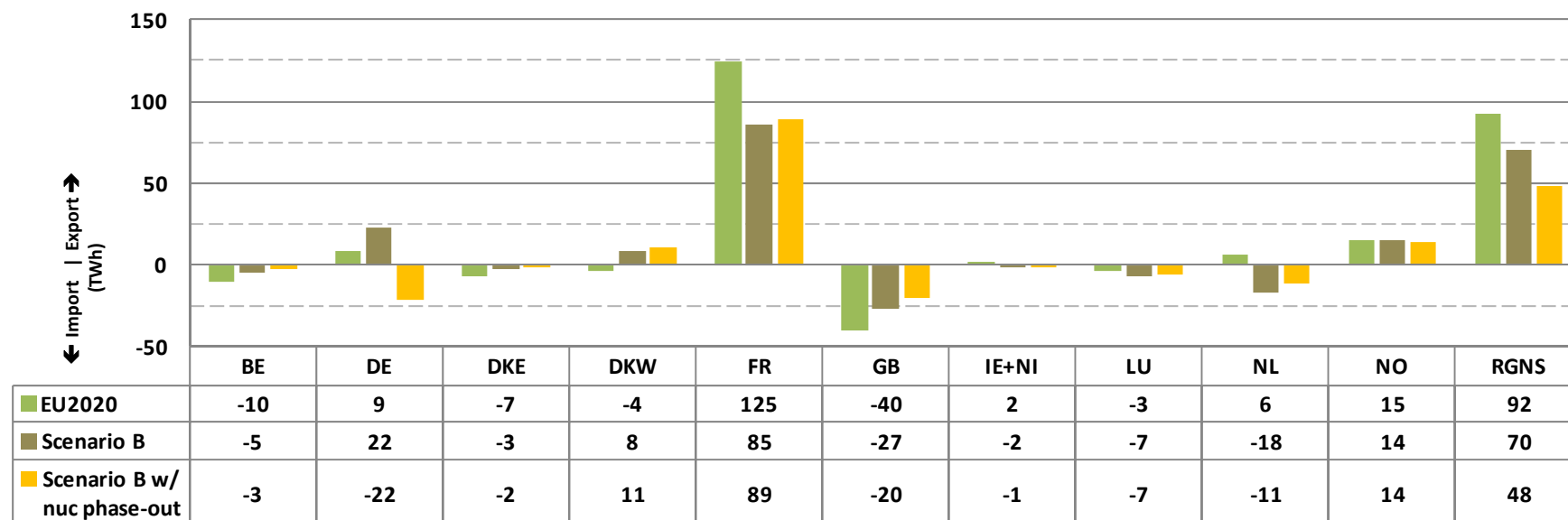
Generation Curtailment / grid 2020

Curtailment IE+NI \approx 2% of demand,
other countries $<$ 0.2% of demand



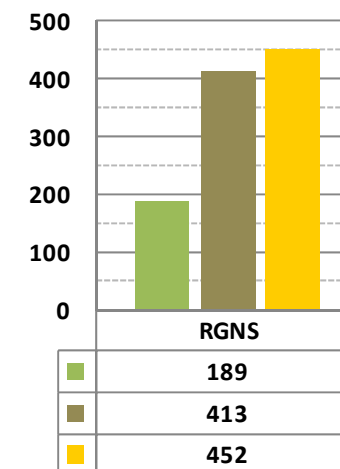
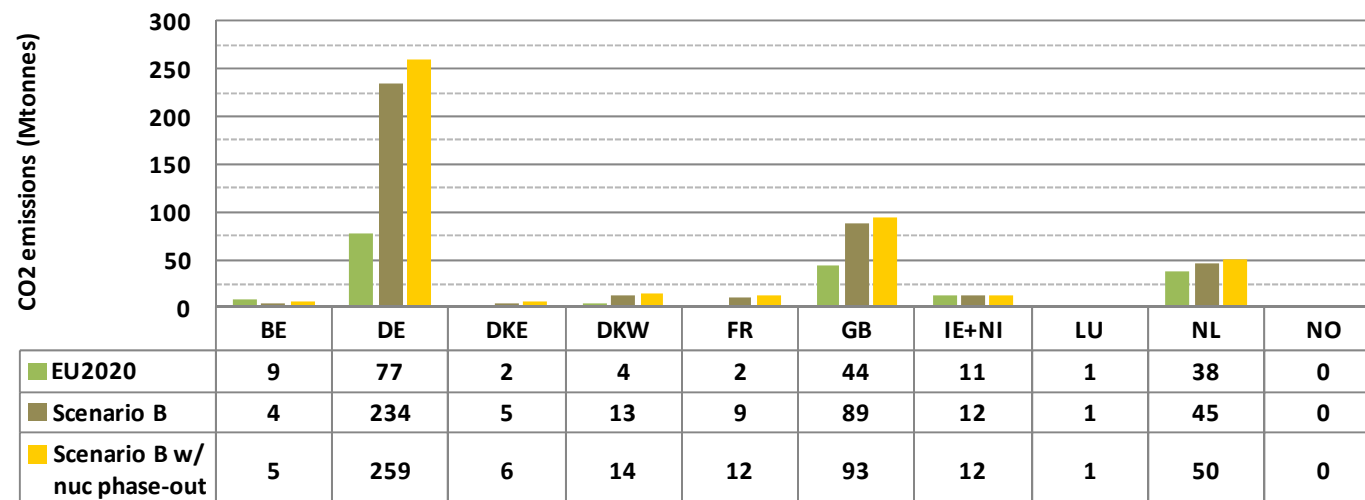
- Definition: excess of production compared to load and export potential
- Scenario EU2020 realises 85 TWh more RES-E than Scenario B, yet this leads only to 0.7 TWh more generation curtailment.
- Actual curtailment will be higher due to internal grid congestion.
- **The *interconnection capacity* foreseen by 2020 seems sufficient to integrate the RES-E objectives given by the National Renewable Energy Action Plans (reflected in the EU2020 scenario).**

Net export balance / grid 2020



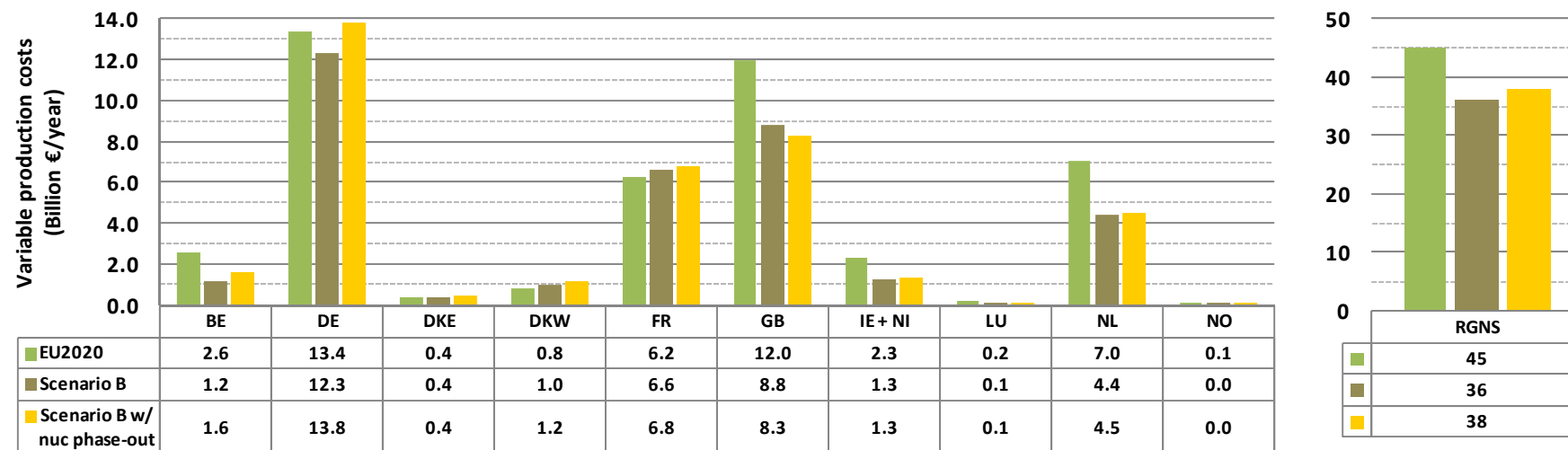
- The difference between EU2020 and Scenario B net export balances are predominantly explained by the substantial lower demand in France in the EU2020 scenario, allowing more export of French nuclear energy to countries within as well as outside the region.

CO₂ emissions / grid 2020



- The CO₂ emissions in the EU2020 scenario are about half compared to Scenario B emission, which clearly shows the impact of a "gas before coal/lignite" merit order.
- The nuclear phase-out leads to a substitution of nuclear energy by CO₂ emitting coal-fired, lignite-fired & gas-fired generation and thus, has a negative impact on CO₂ emission levels.
- Grid development only has a marginal effect on the regional CO₂ emissions.

Variable production costs / grid 2020



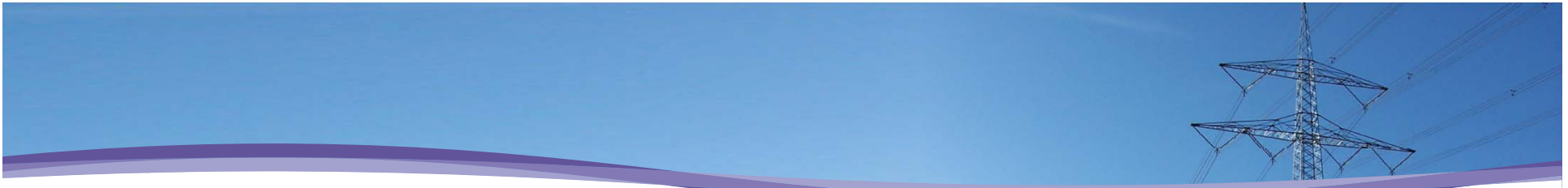
- The higher CO₂ in the EU2020 scenario has an obvious impact on the variable production costs.
- **With the expansion of the grid, the variable production costs drop around 600 to 1100 M€ per year for all scenarios. This implies an approximate reduction of the variable electricity production costs by 0.30 to 0.55 €/MWh.**



CONCLUSIONS

Conclusions

- The *interconnection capacity* foreseen by 2020 seems sufficient to integrate the RES-E objectives given by the National Renewable Energy Action Plans (except for Ireland).
- Interconnection reinforcements lead to a reduction of the variable production costs.
- Market model results have been used as an input for the grid studies



BACKUP SLIDES

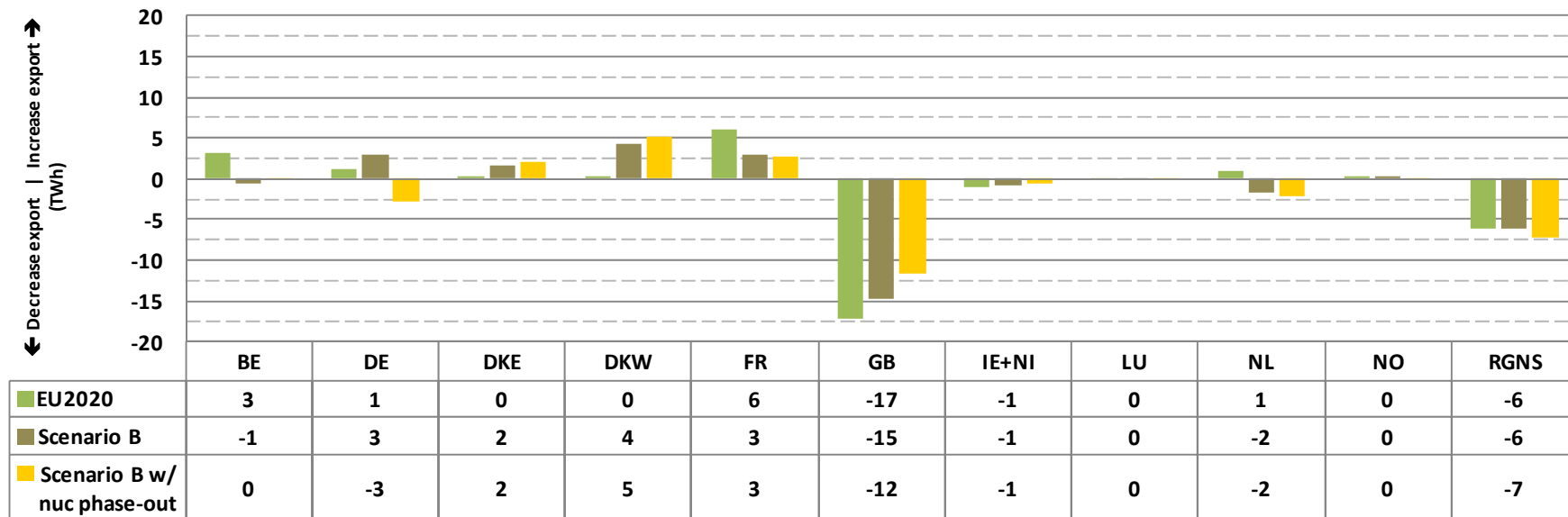
Overview scenarios

		EU 202020	Scenario B ¹⁾
Simulated Perimeter Fuel Prices		RGNS + first neighbour Based on IEA Forecast	
Indicative simplified thermal merit-order²⁾		1. Nuclear 2. Gas 3. Coal/Lignite 4. Oil	1. Nuclear 2. Coal/Lignite 3. Gas 4. Oil
RES	Wind	131 GW	120 GW
	Solar	59 GW	29 GW
Demand RGNS		1770 TWh	1877 TWh

1) TSOs best estimate scenario

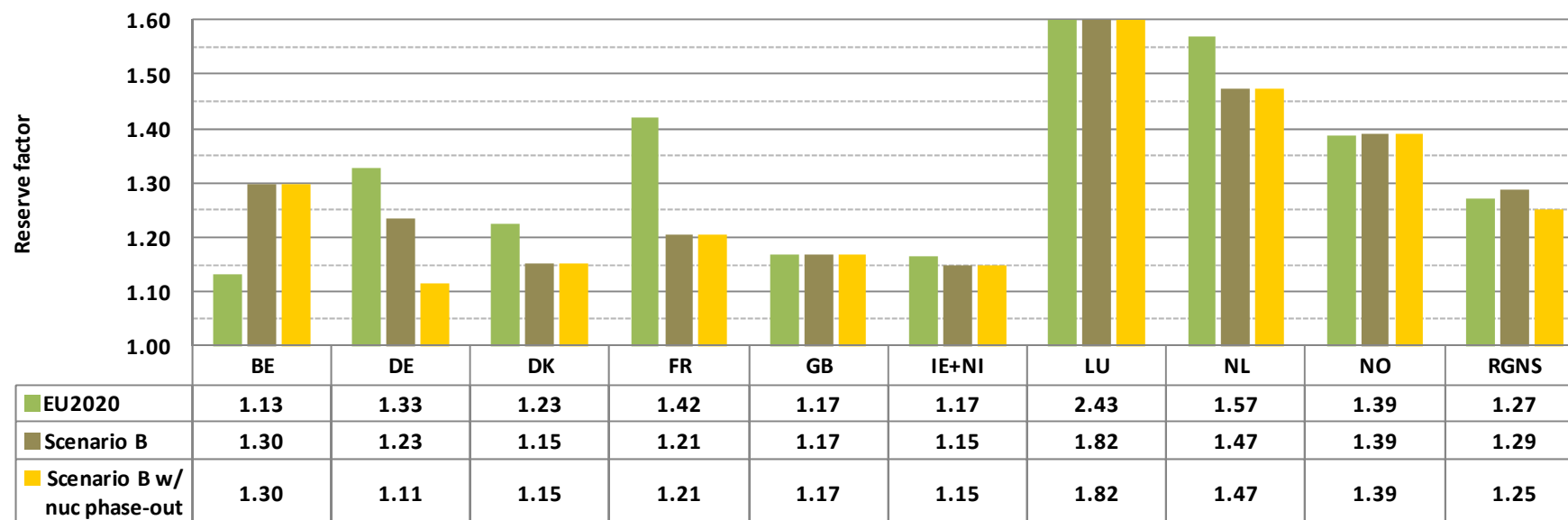
2) The EU202020 scenario has gas before coal in order to meet CO2 targets

Impact interconnection reinforcements between 2015 and 2020 on the net export



- With additional interconnections to Great Britain in place relatively expensive production plants in GB are replaced by cheaper energy from within the region. This results in a doubling of the import position of Great Britain.
- At regional level the net export position is about 6 TWh lower due to the reinforcements.

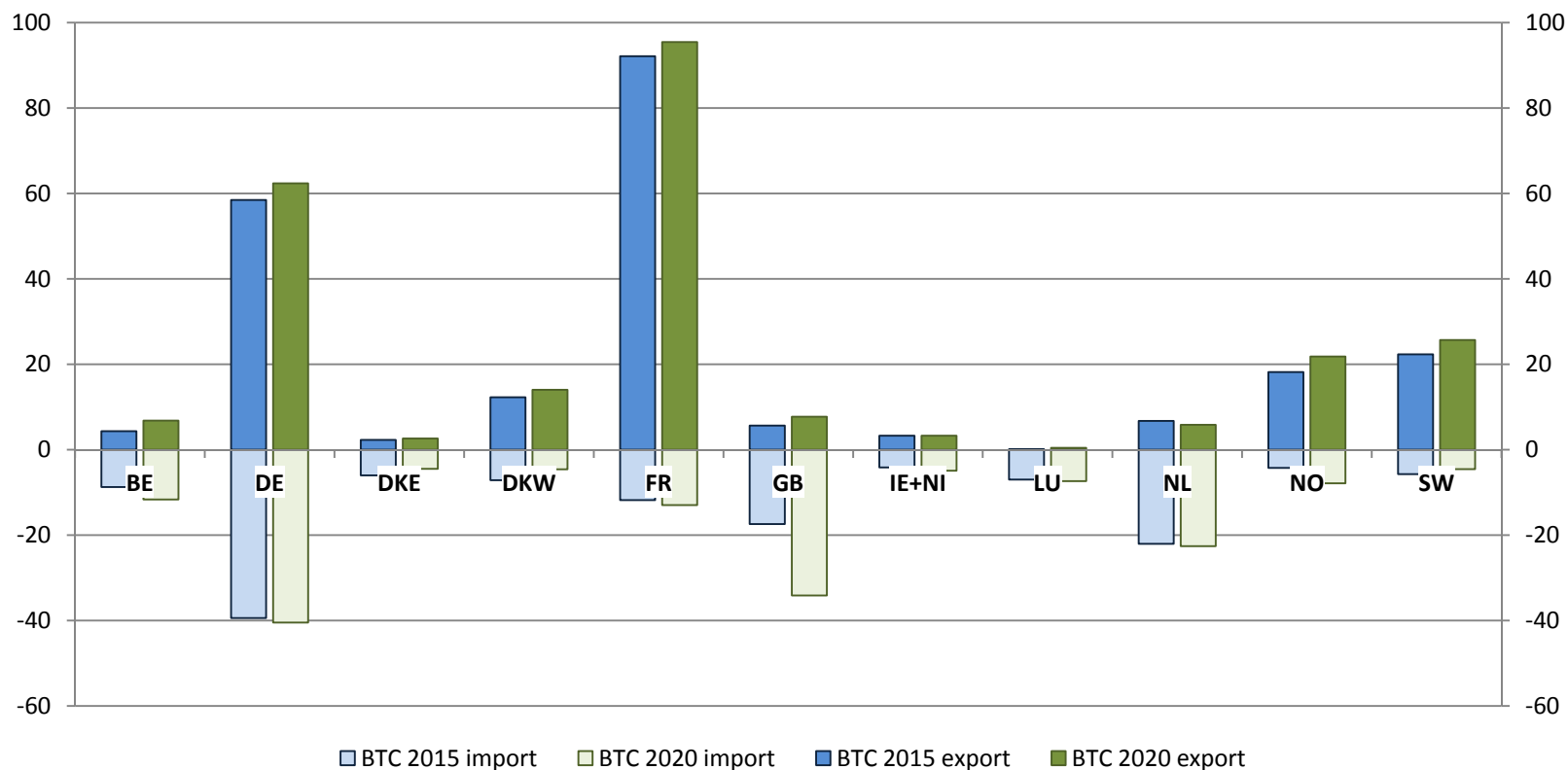
Reserve factor



- Definition: ratio between installed capacity and the peak demand, where solar and wind capacities are excluded.
- The lower demand in the EU2020 scenario influences the reserve factor especially for France.
- **Interconnections are an important aspect to achieve generation adequacy within the region.**

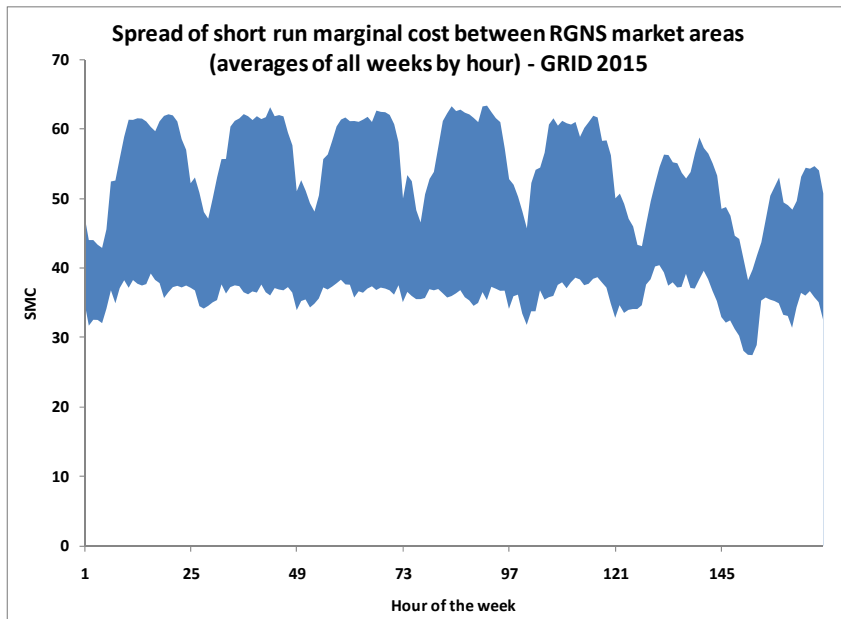
Gross import export vs net balance

Gross import/export Scenario B

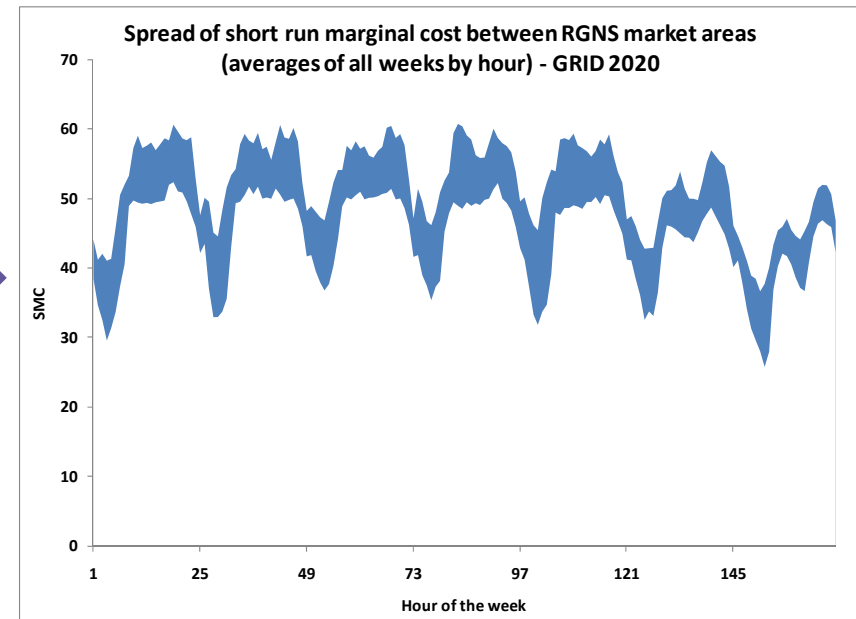


Impact of grid reinforcements on short run marginal cost

Spread SMC Grid 2015



Spread SMC Grid 2020



- Interconnection reinforcements show a convergence of the short run marginal costs within the region.

