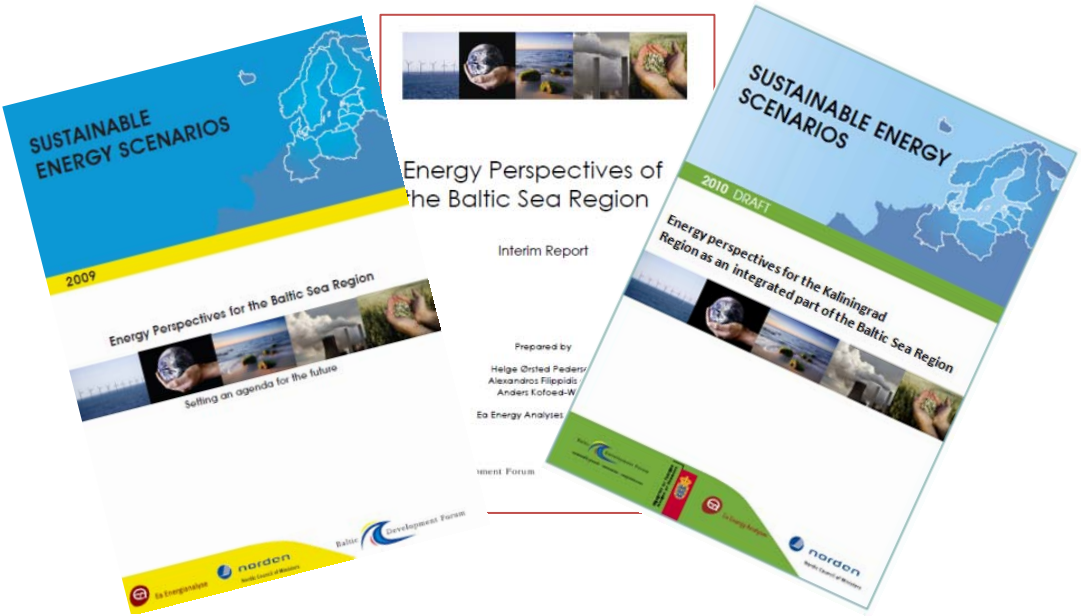
“Potentials for sustainable exploitation and utilisation of renewable energy resources in the Baltic Sea Region”

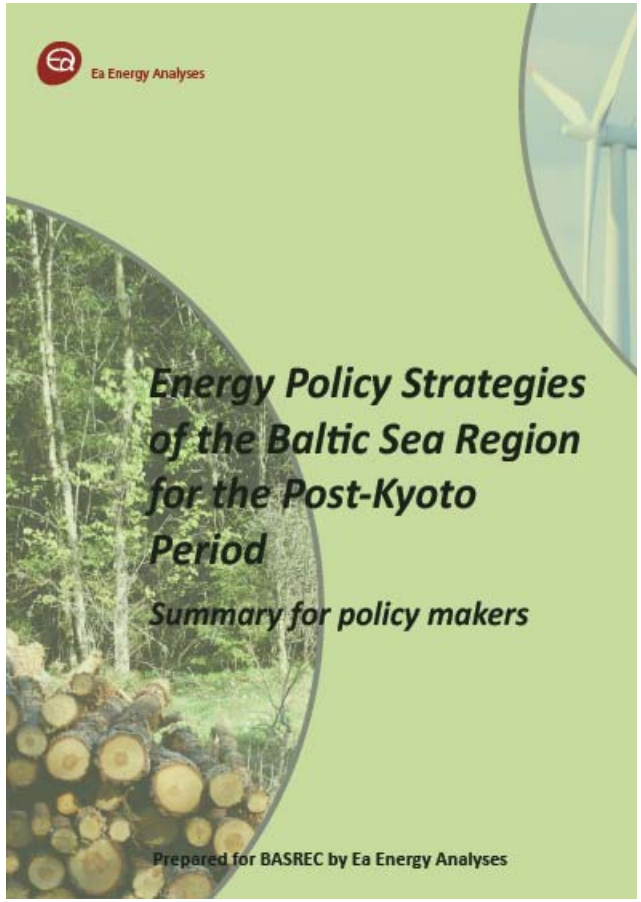
Energy politics and climate protection

Anders Kofoed-Wiuff, Ea Energy Analyses

Riga, 23 Feb, 2012

Background



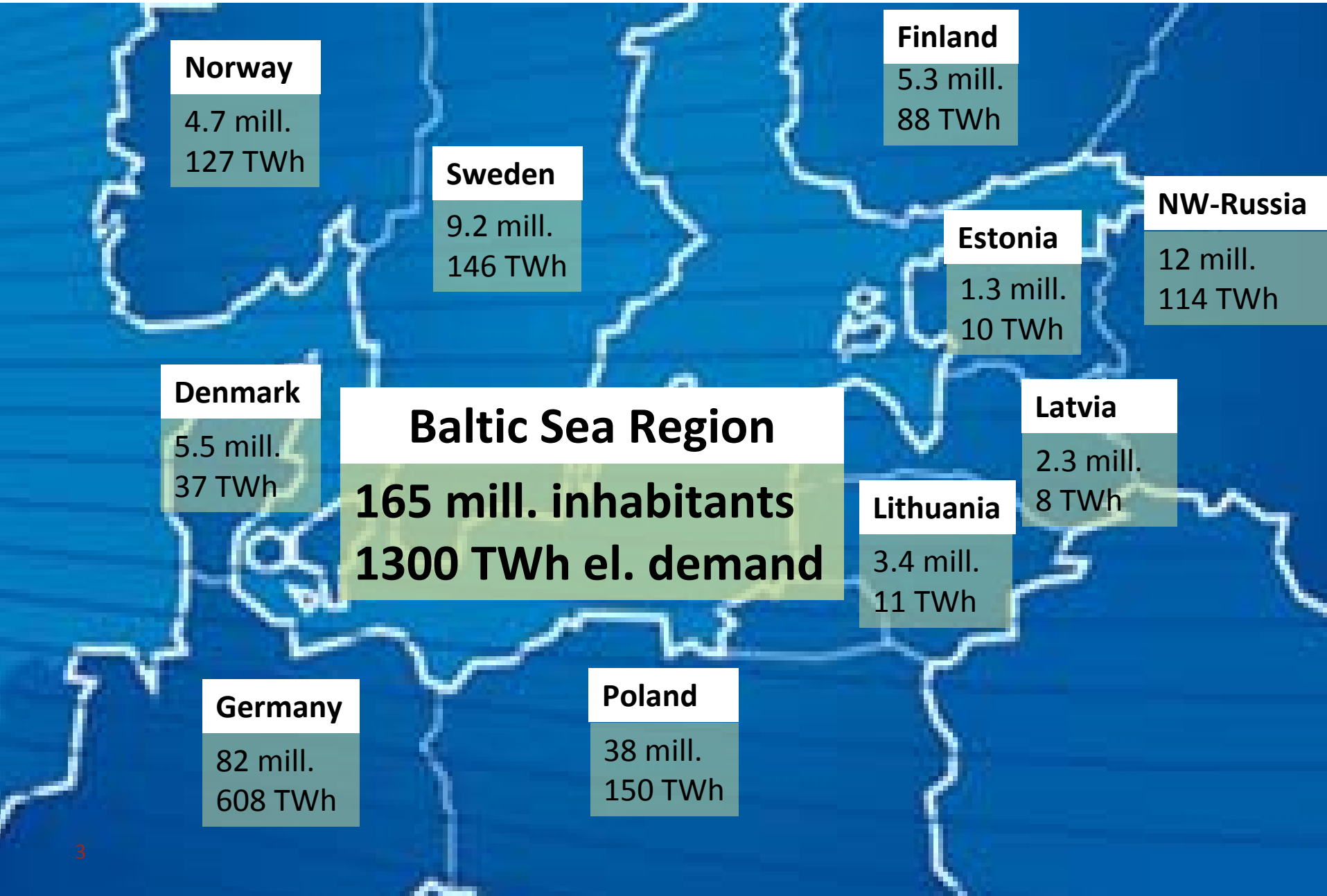


Energy Policy Strategies of the Baltic Sea Region for the post-Kyoto Period

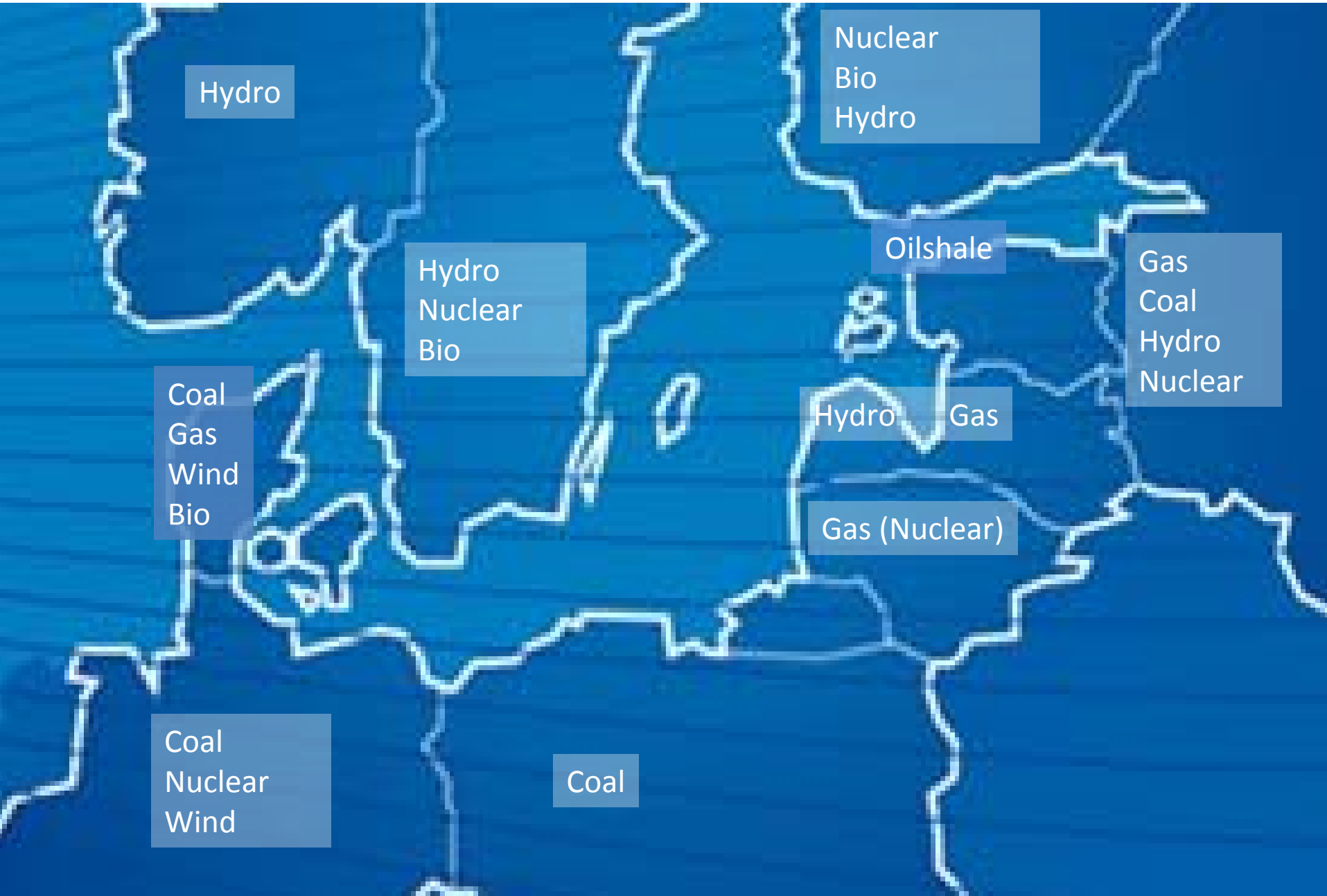
A study commissioned by the Baltic Sea Region Energy Co-operation (BASREC)

Final report available in May 2012

Inhabitants and electricity demand



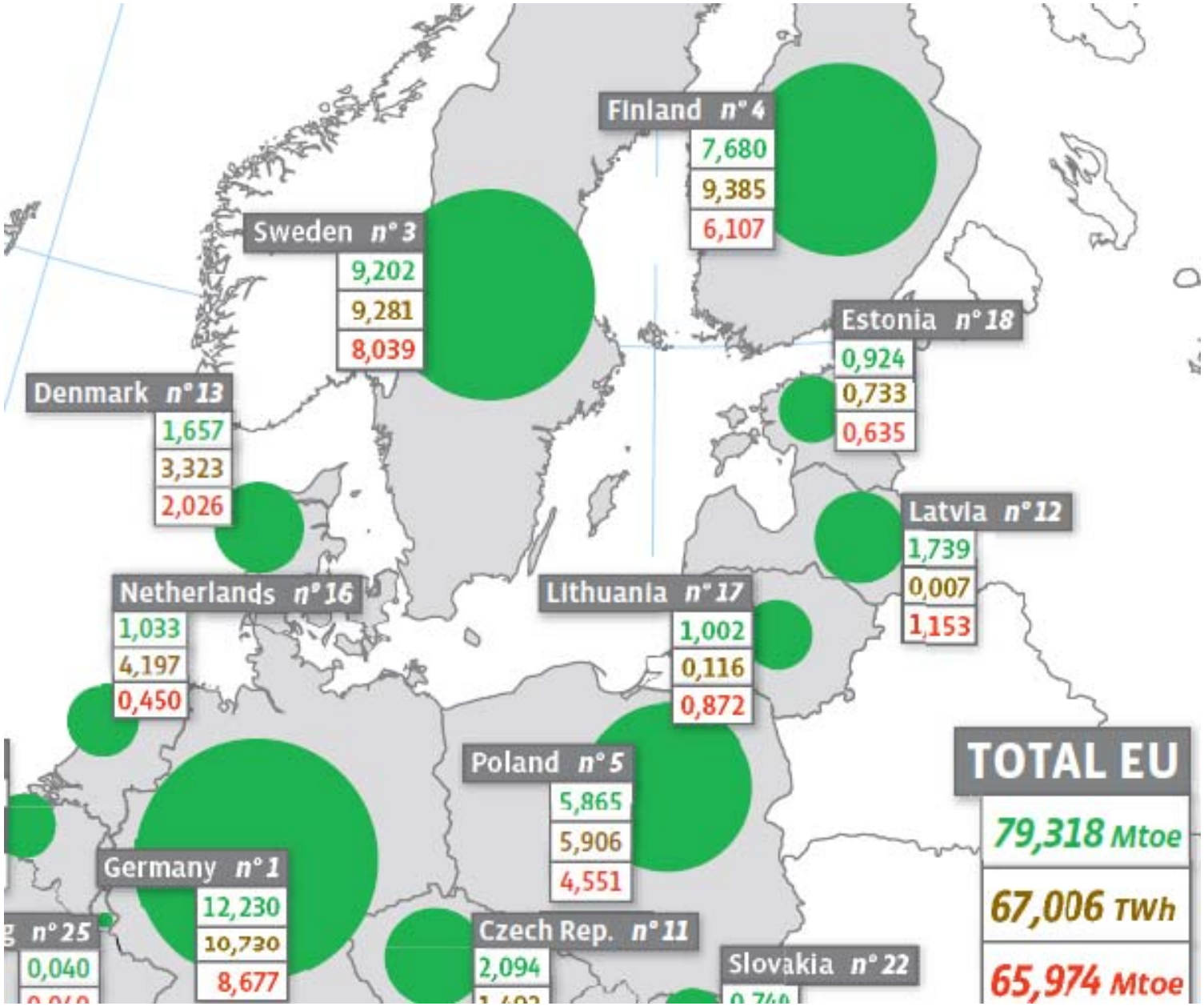
Main sources of electricity generation



PJ	Energy crops and grass cuttings	Forestry residues	Biogas	Biowaste - wood like	Biowaste - straw like	Total
Germany	980	201	149	133	177	1.640
Denmark	4	40	36	11	29	120
Finland	54	75	9	215	17	370
Sweden	59	100	15	347	21	542
Estonia	54	8	2	35	2	102
Lithuania	331	17	7	40	10	405
Latvia	63	25	3	1	4	96
Poland	1.273	50	79	59	121	1.583
Norway	-	160		9	8	177
Russia	109	151	18	430	33	740
BALTIC SEA REGION	2.927	828	317	1.280	423	5.775

Long-term bioenergy resource	Baltic Sea Region	EU25	World
PJ	6,800	12,400	200,000
Inhabitants in 2050 (mill.)	160	460	9,000
GJ/capita	42	27	22

Solid biomass



Utilisation by end 2010

Primary prod.

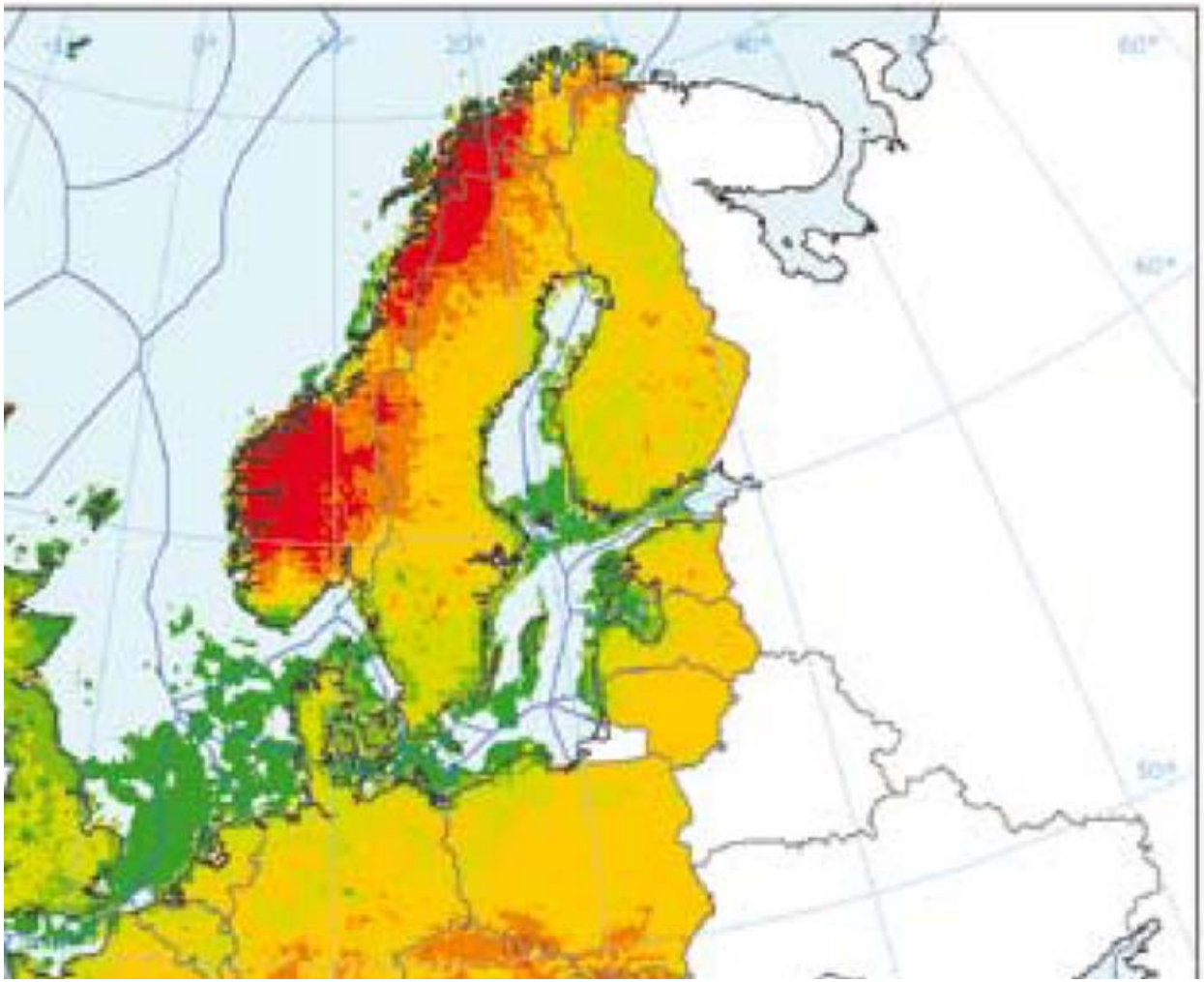
Electricity

Heat

Source: EurObserv'ER 2011.

Ea Energy Analyses

Wind speed in Baltic Sea Region



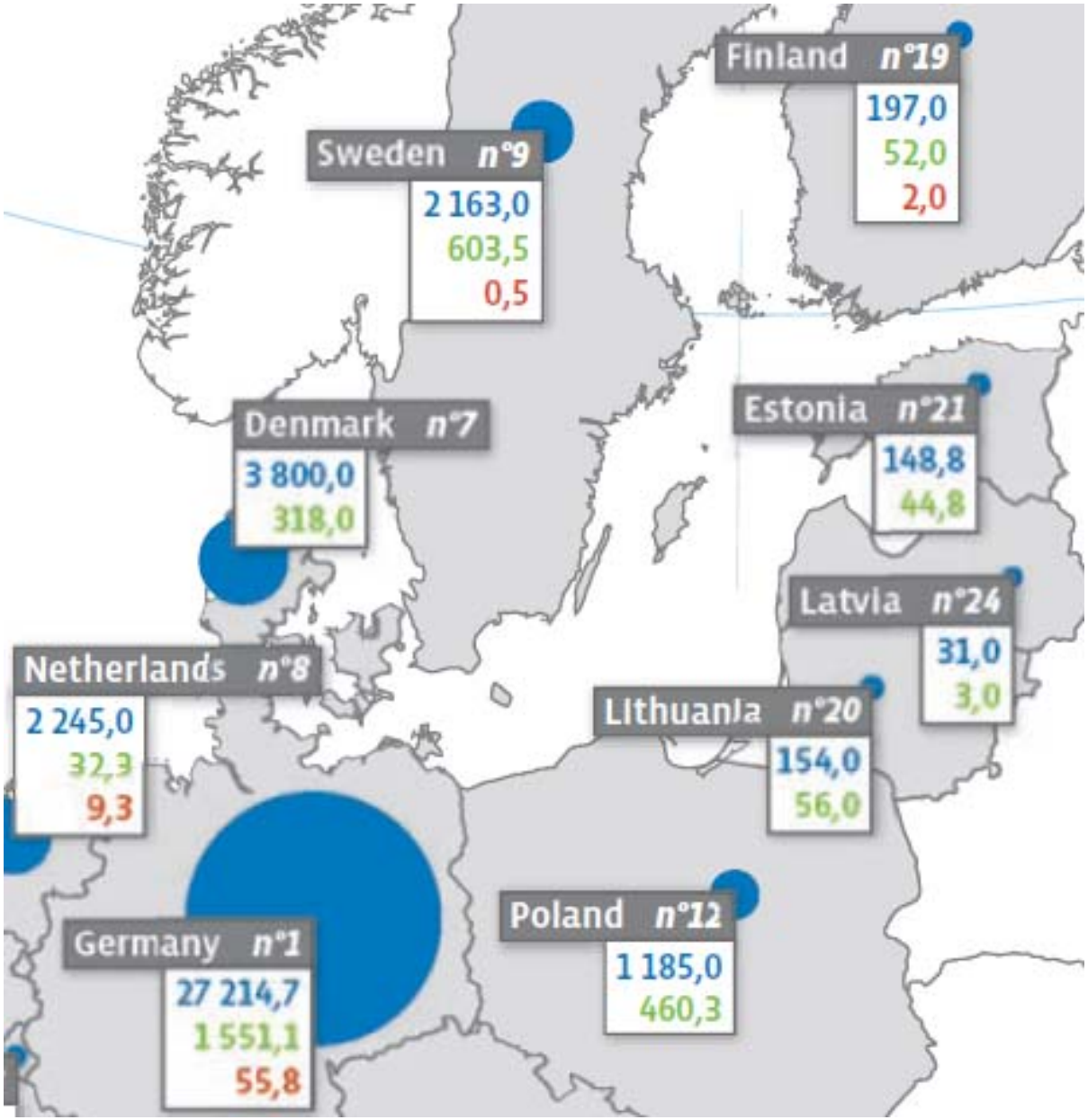
Average wind velocity at hub height 2000—2005 [m/s]

- 0–4
- 4–5
- 5–6
- 6–7
- 7–8
- > 8
- Countries outside subject area

corrected for orography and local roughness

Source: EEA, 2009:
" Europe's onshore and offshore wind energy potential "

Wind power by end 2010 (MW)



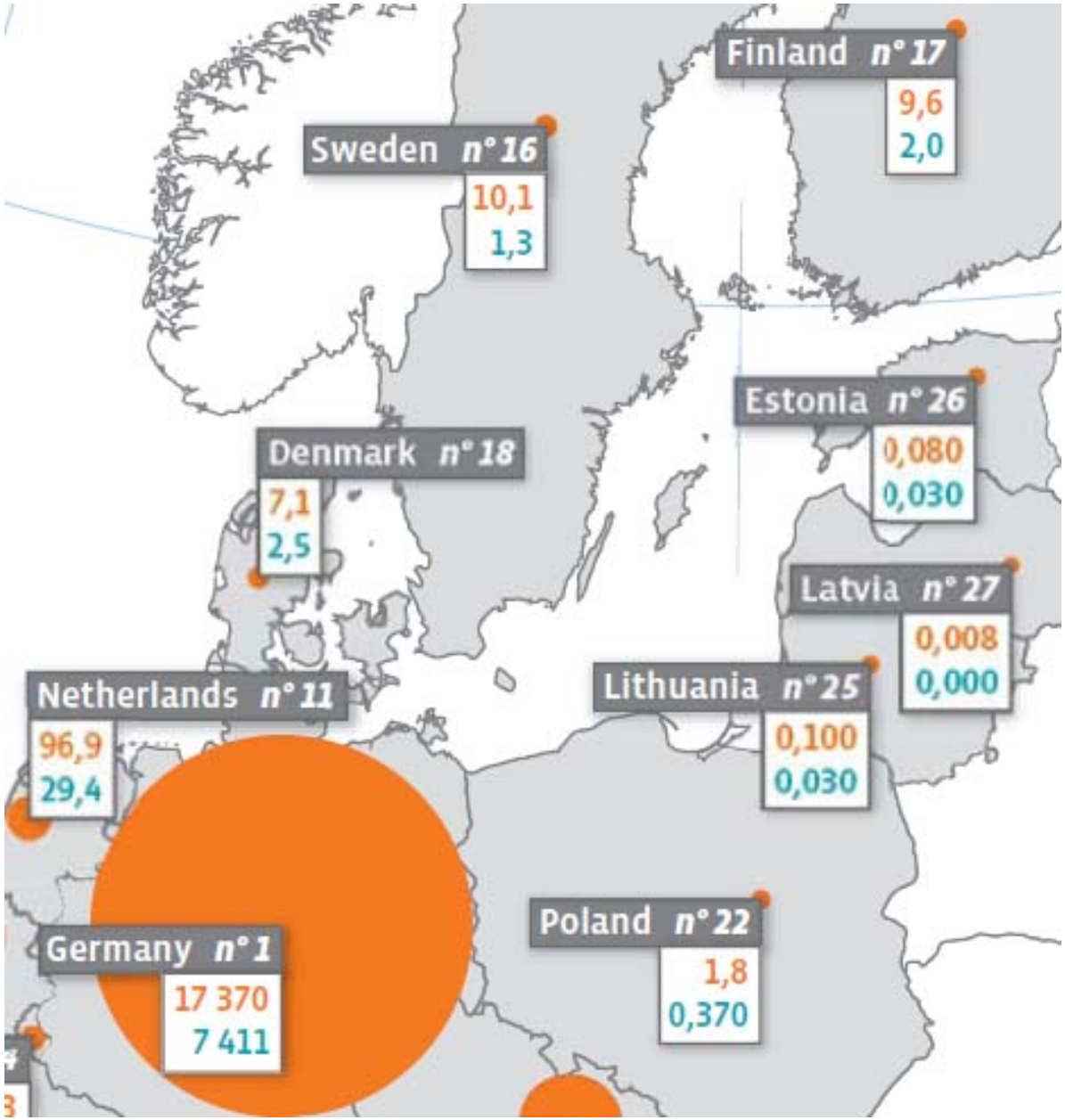
Cumulated installed capacity in the countries of the European Union by the end of 2010 (in MW).

Capacity installed in the countries of the European Union during 2010 (in MW).

Capacities decommissioned during 2010 (in MW).

Source: EurObserv'ER 2011.

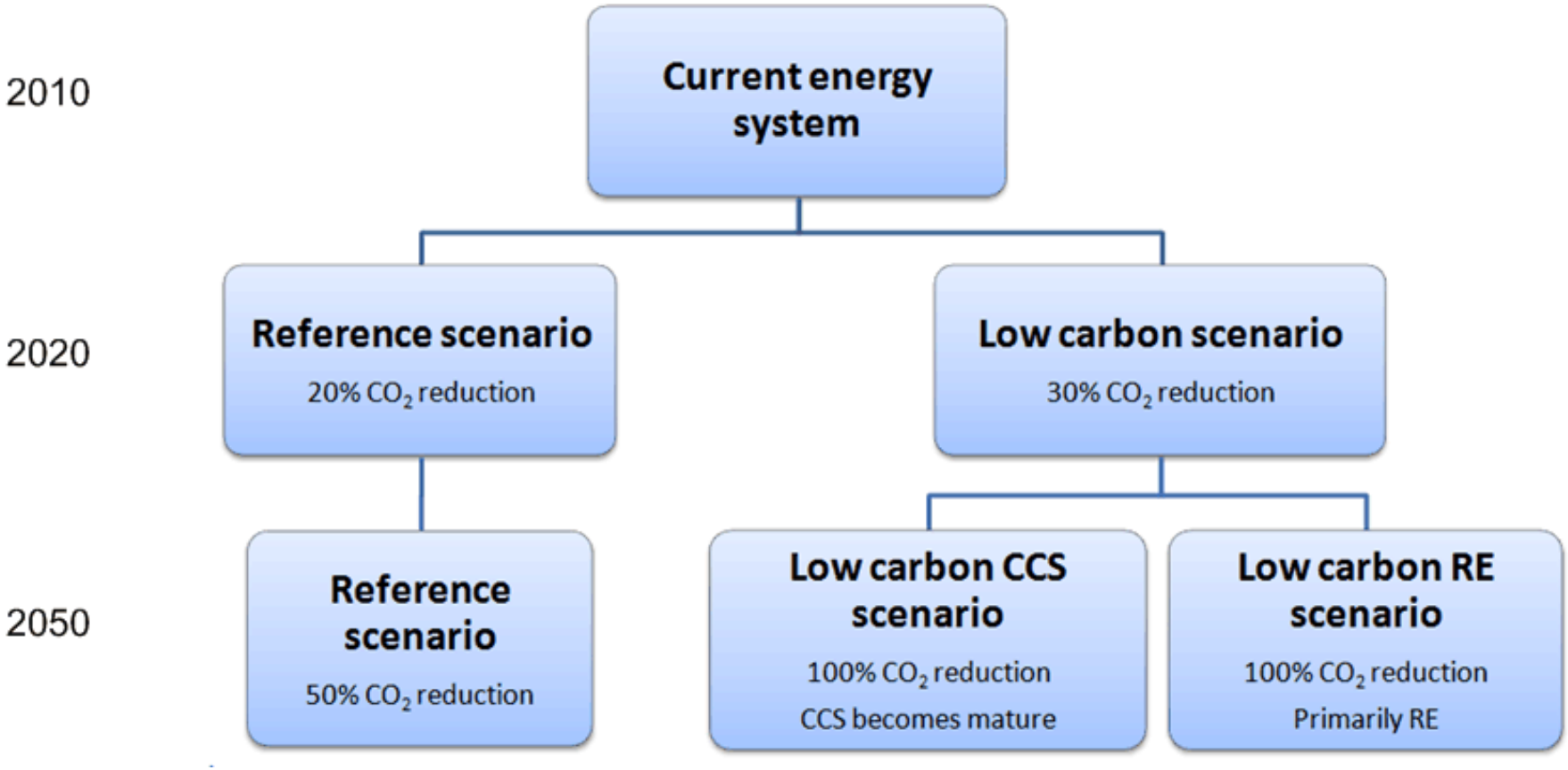
Ea Energy Analyses



Solar PV by end 2010 (MW)

Ea Energy Analyses

Study: Energy Policy Strategies of the Baltic Sea Region for the post-Kyoto Period



*Reductions are relative to **2005** and concern the BASREC countries except Russia*

In North West Russia the reference assumes stable CO_2-emissions in 2020 and 25 % reduction in 2050 compared to 2010 emissions. The low carbon scenarios assume 15 % reduction in 2020 in Russia and 50 % reduction in 2050 compared to 2010 emissions..

Emissions from municipal solid waste are not subject to the cap.

Ea Energy Analyses

Model setup for the study

- Least cost optimisation
- Balmorel model decides new investments in
  - generation capacity except nuclear and hydro power
  - Transmission capacity
  - 10 % rate of return
- Fuel prices according to International Energy Agency World Energy Outlook 2011
- CO_2-target is gradually tightened
- Wind, biomass, biogas, waste and solar and hydro resources

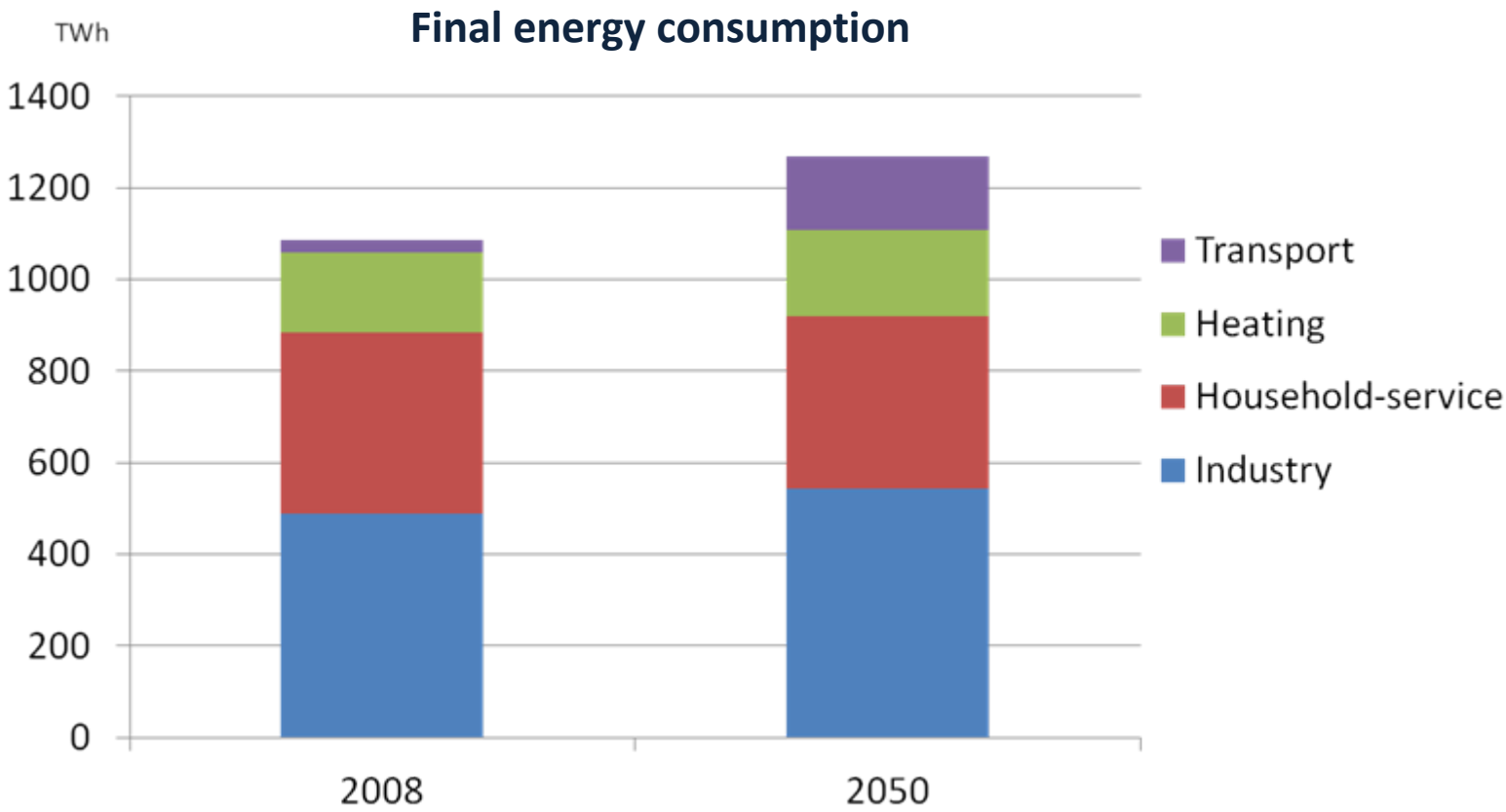
The Balmorel model is used to simulate investments in power capacity and the dispatch

Ea Energy Analyses

Other key assumptions

- EU National Renewable Energy Action Plans incorporated to 2020
  - German 80 % target for 2050 included in low-carbon scenarios
- Specified nuclear development assuming
  - German phase out by 2022
  - New nuclear generation capacity in Finland, Lithuania, Kaliningrad and Poland
  - Stable development in Sweden

Development electricity demand

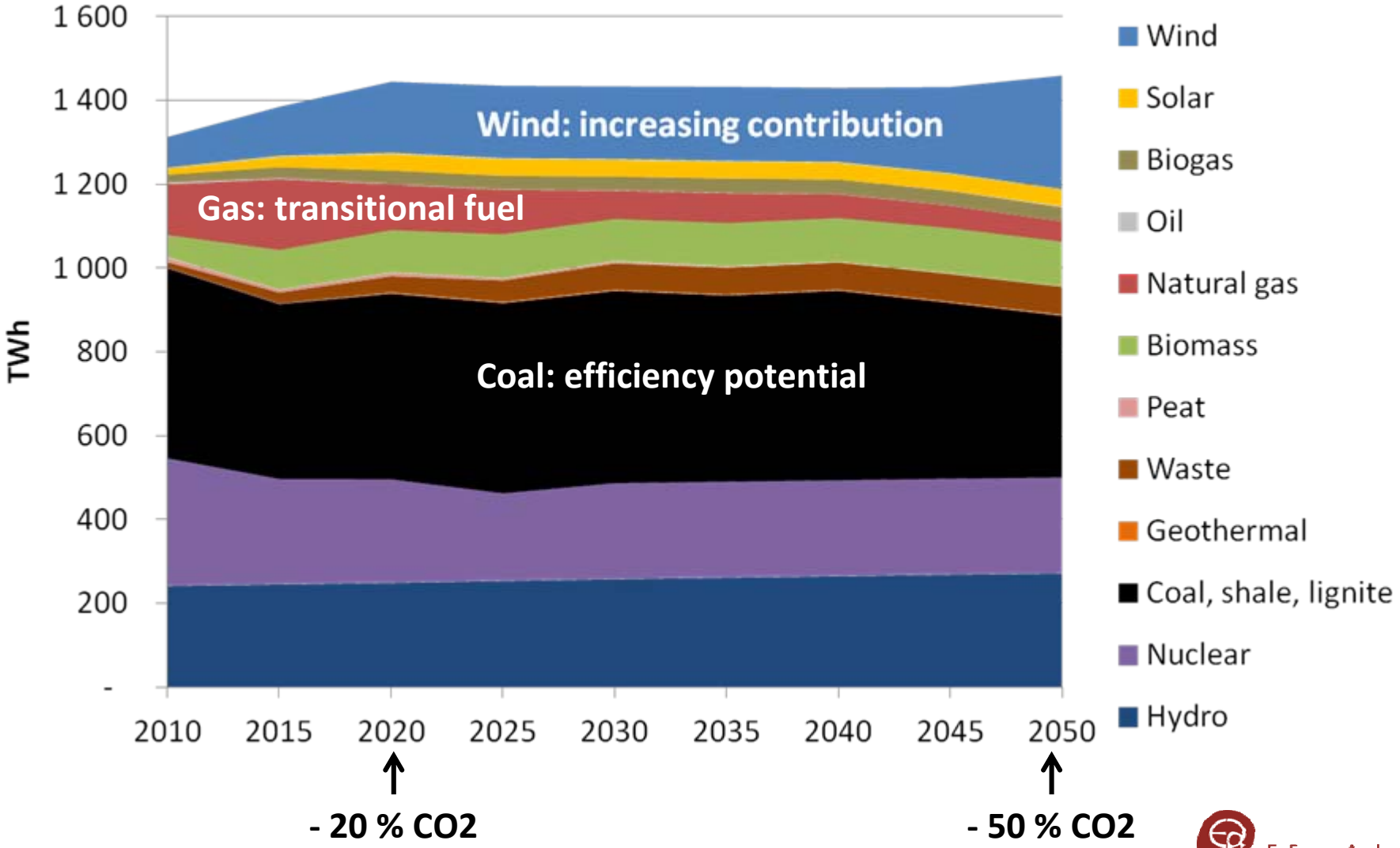


Long-term GDP-growth: 0.8-2.7 % p.a.

Energy sector electricity consumption, for example electricity for producing district heating, is not included

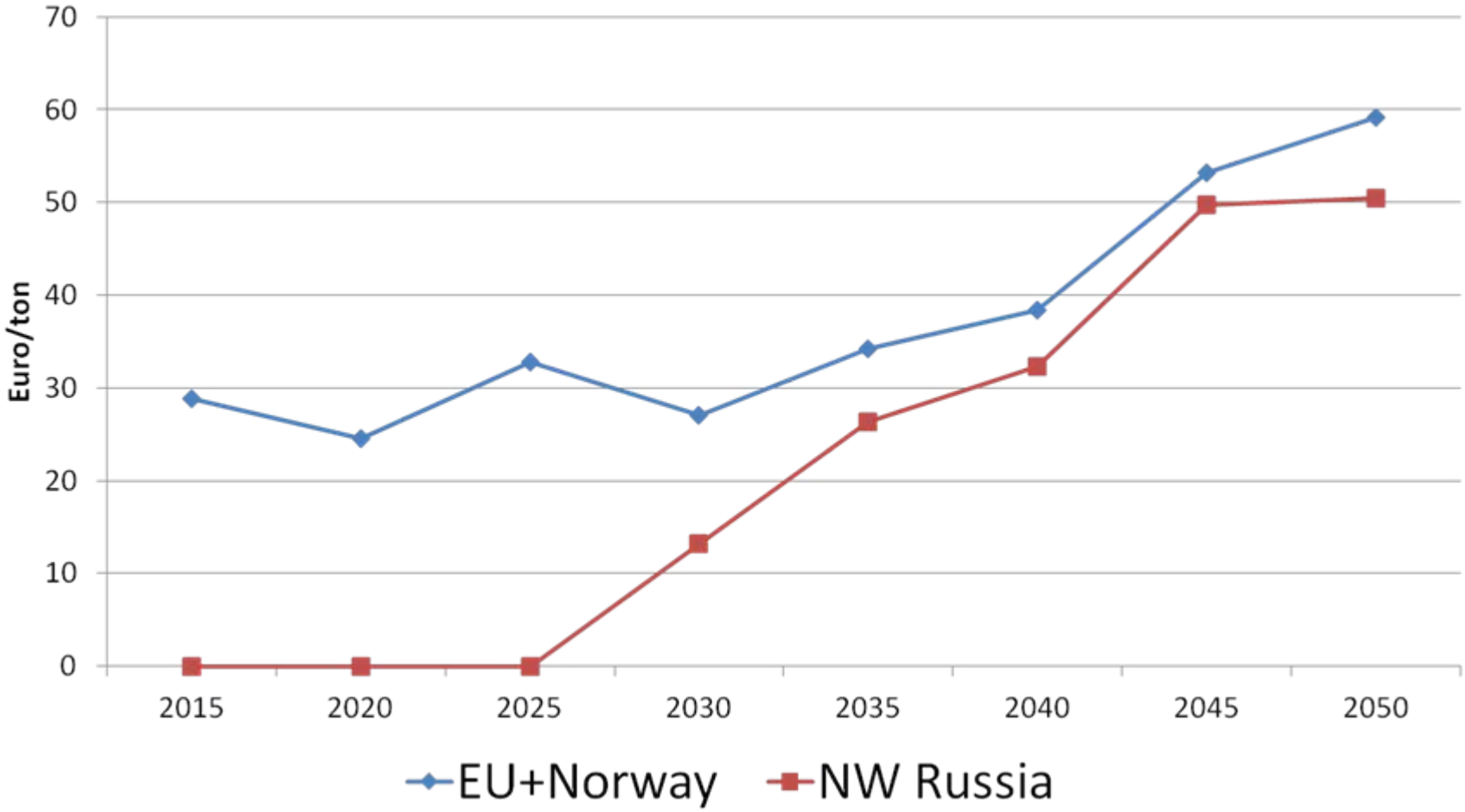
Ea Energy Analyses

Reference case: Electricity generation



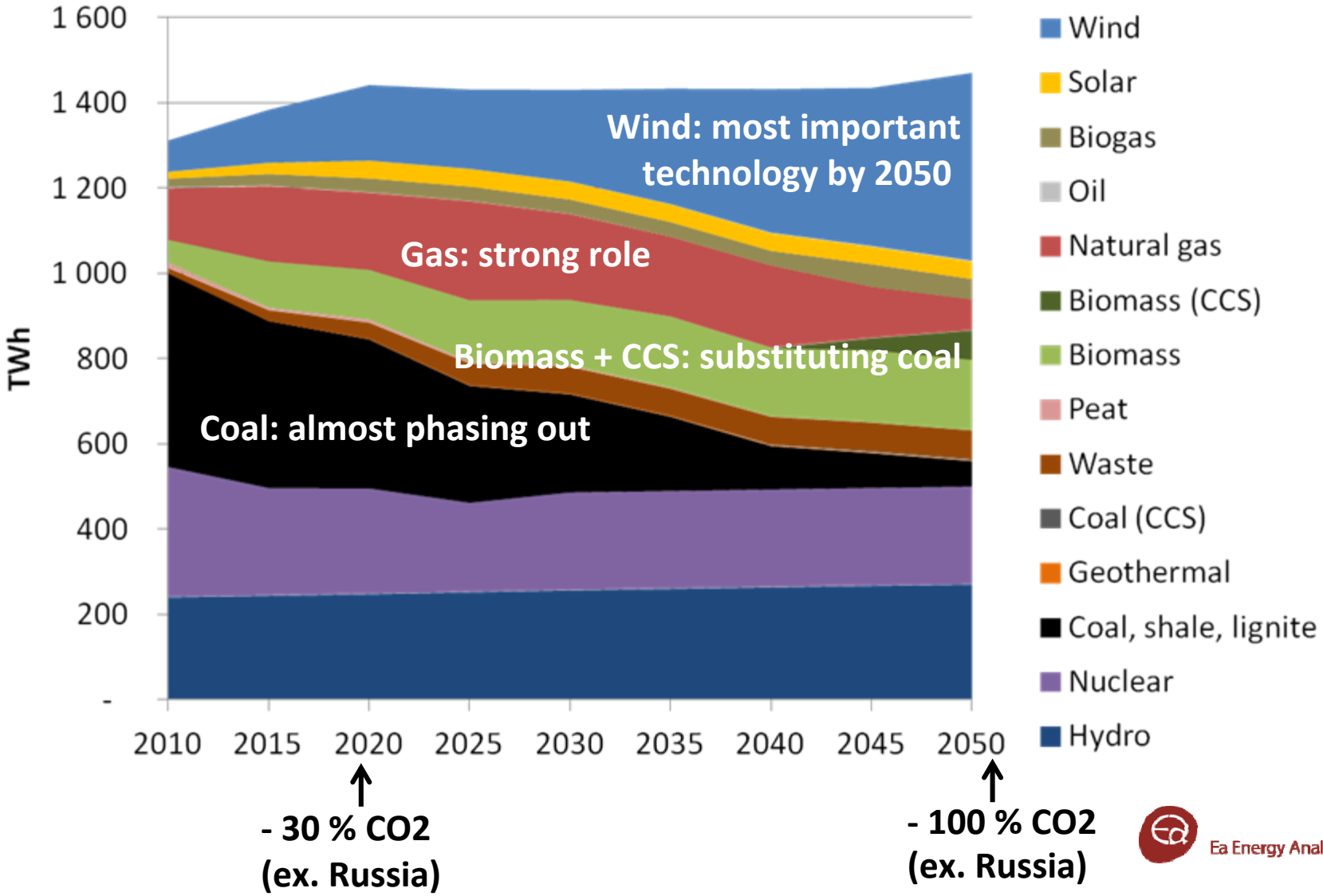
Ea Energy Analyses

Reference: CO_2 price rising to EUR 60



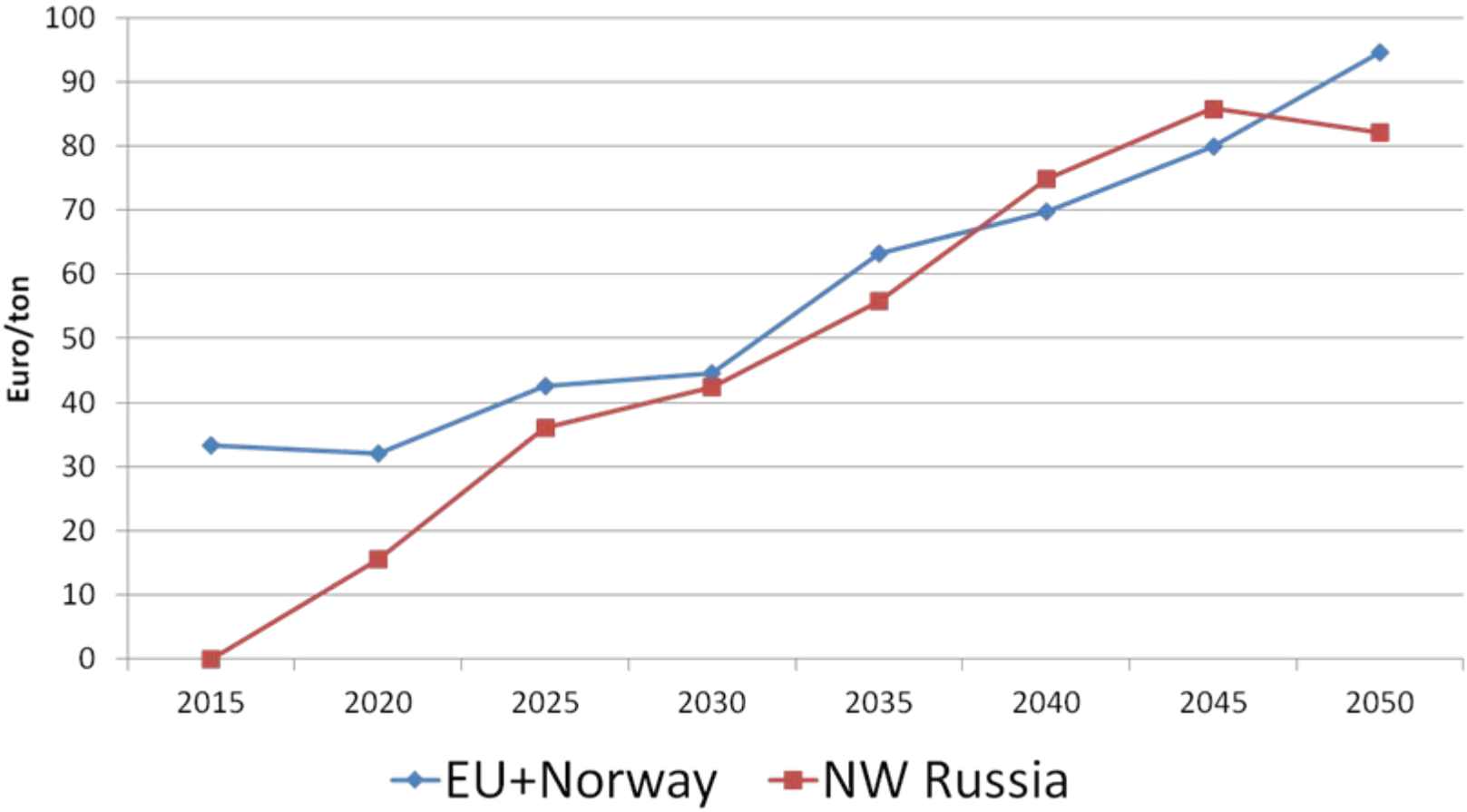
Ea Energy Analyses

Low carbon case + CCS: Electricity generation



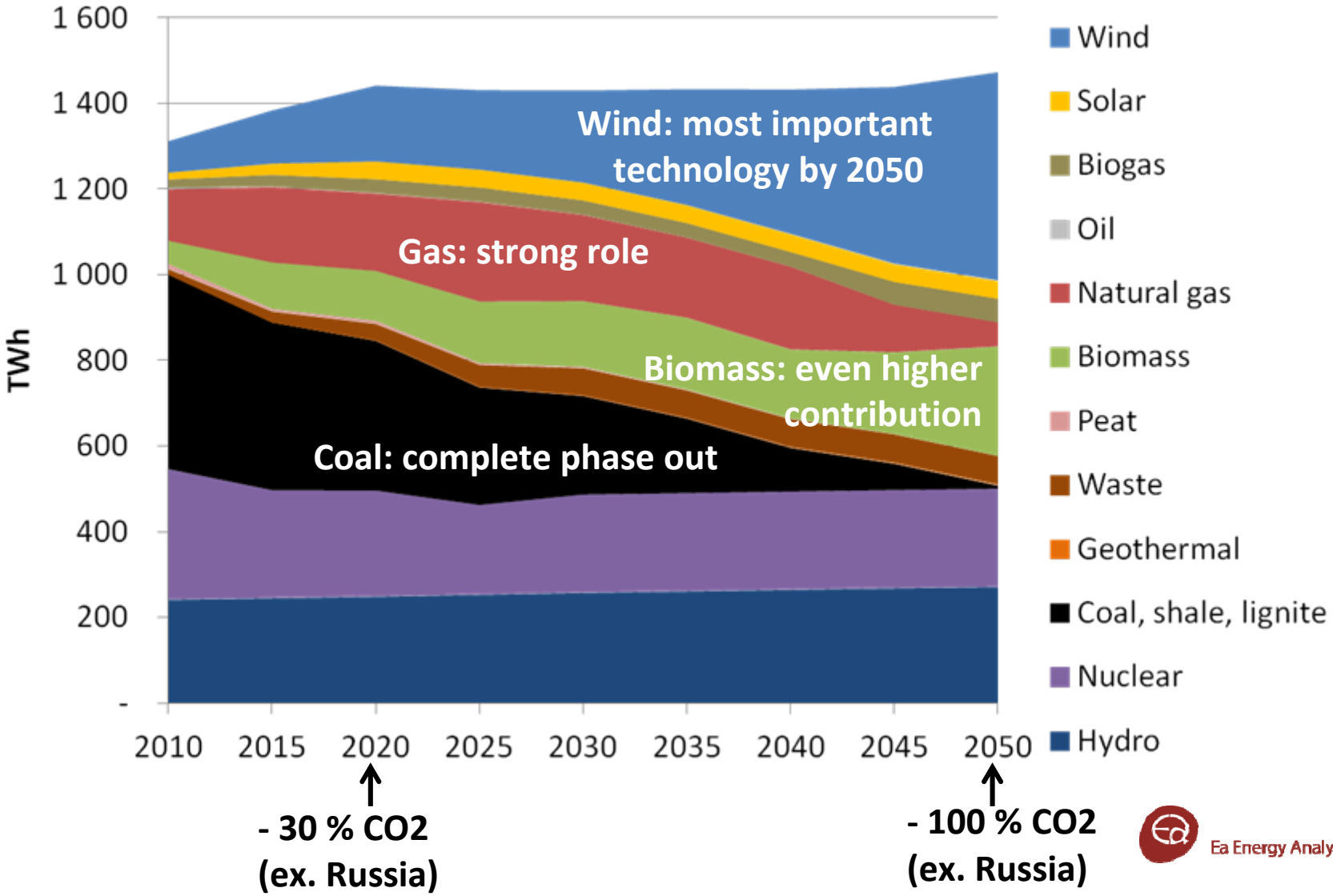
Ea Energy Analyses

Low carbon case + CCS: CO_2 price rising to EUR 95



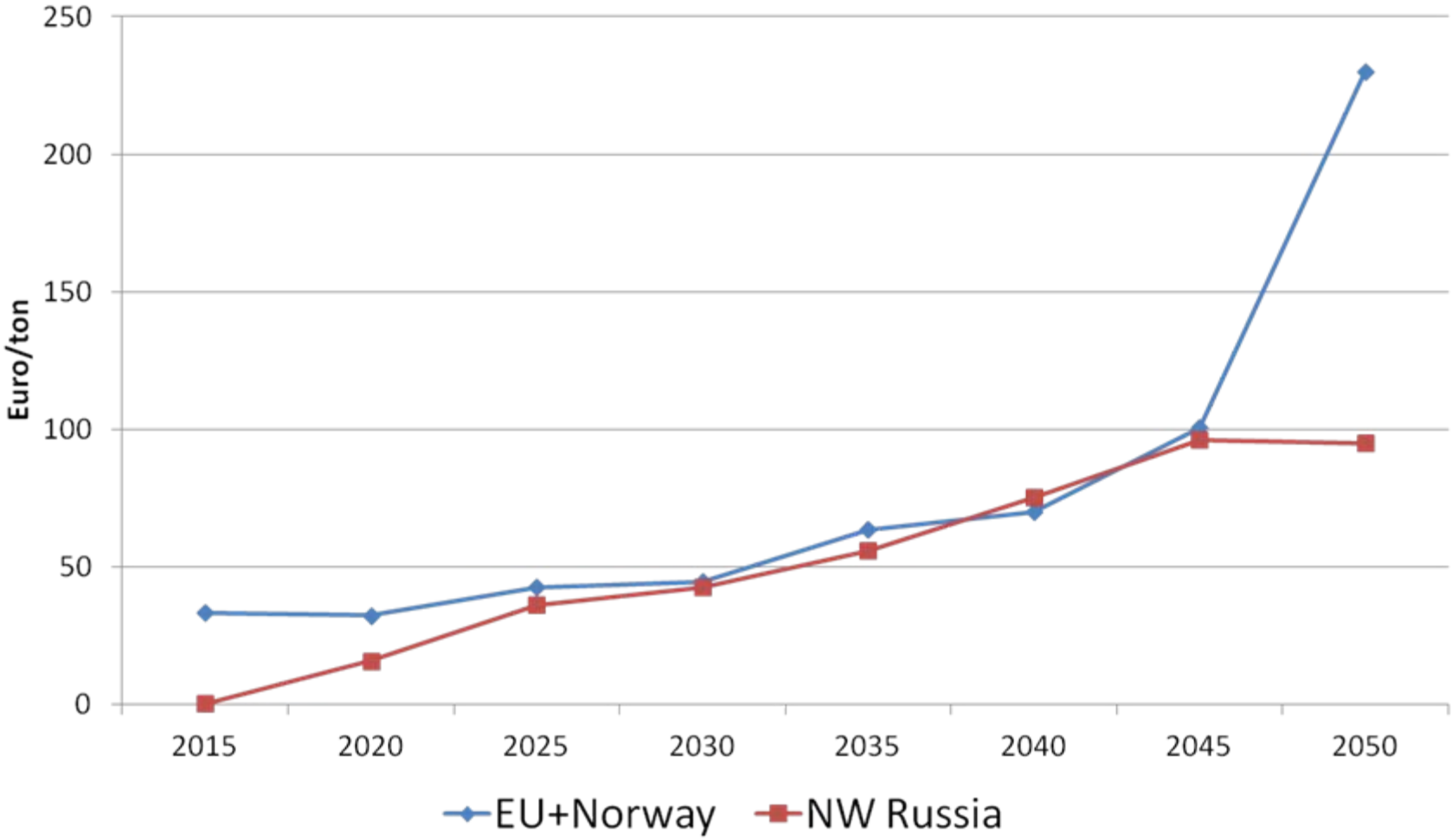
Ea Energy Analyses

Low carbon case (renewables): Electricity generation



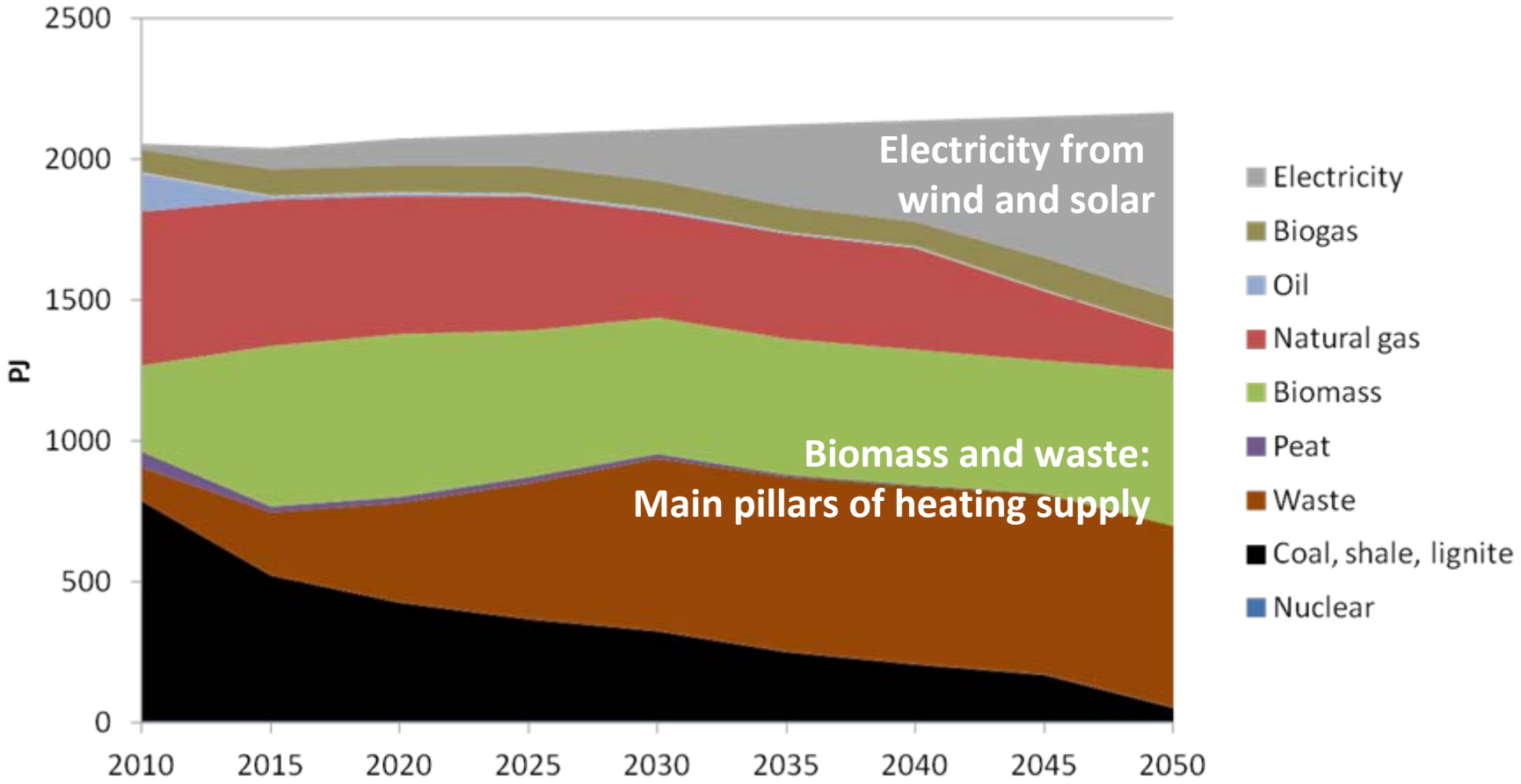
Ea Energy Analyses

Low carbon case (renewables): CO2 price rising to EUR 230



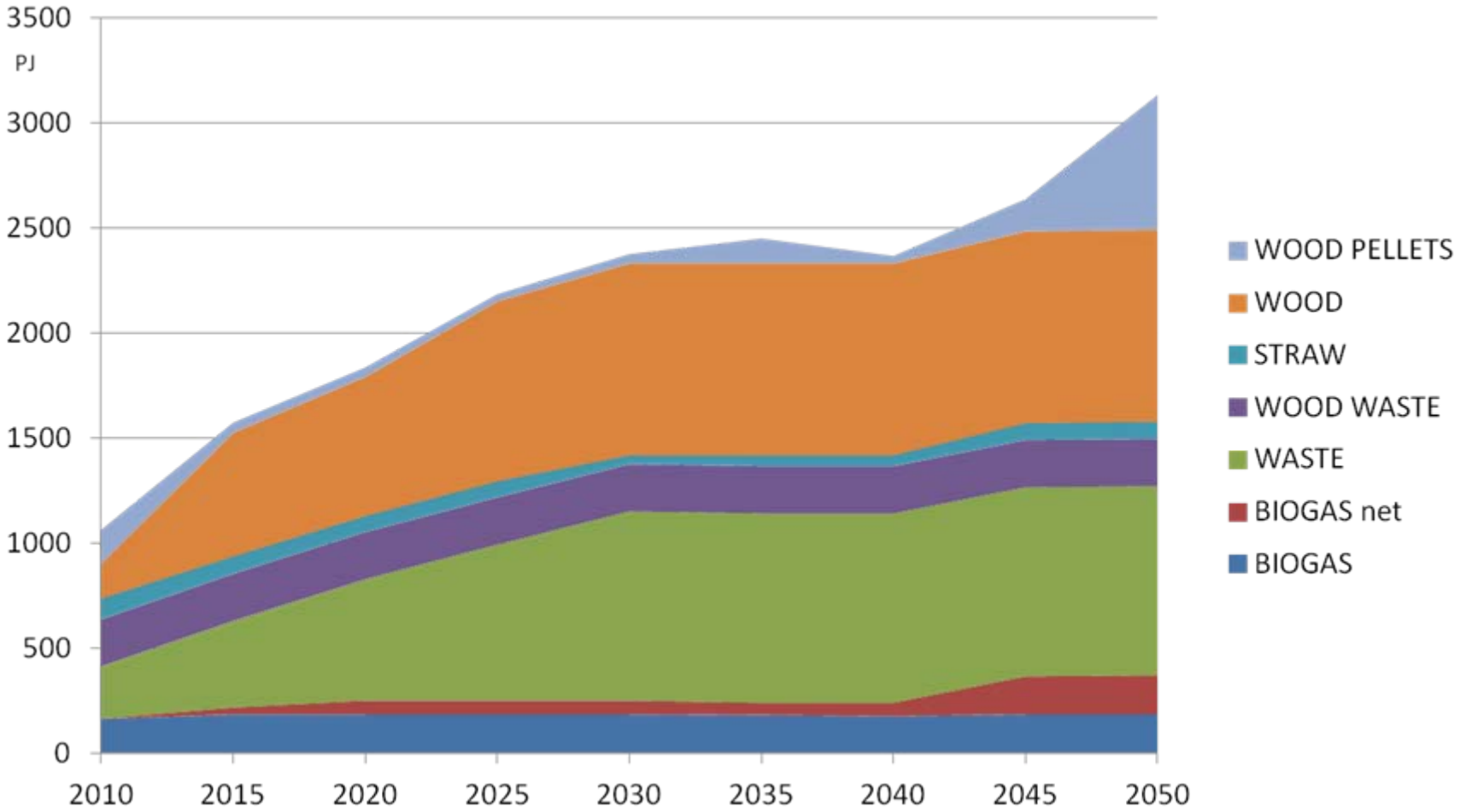
Ea Energy Analyses

Low carbon case (renewables): District heating generation



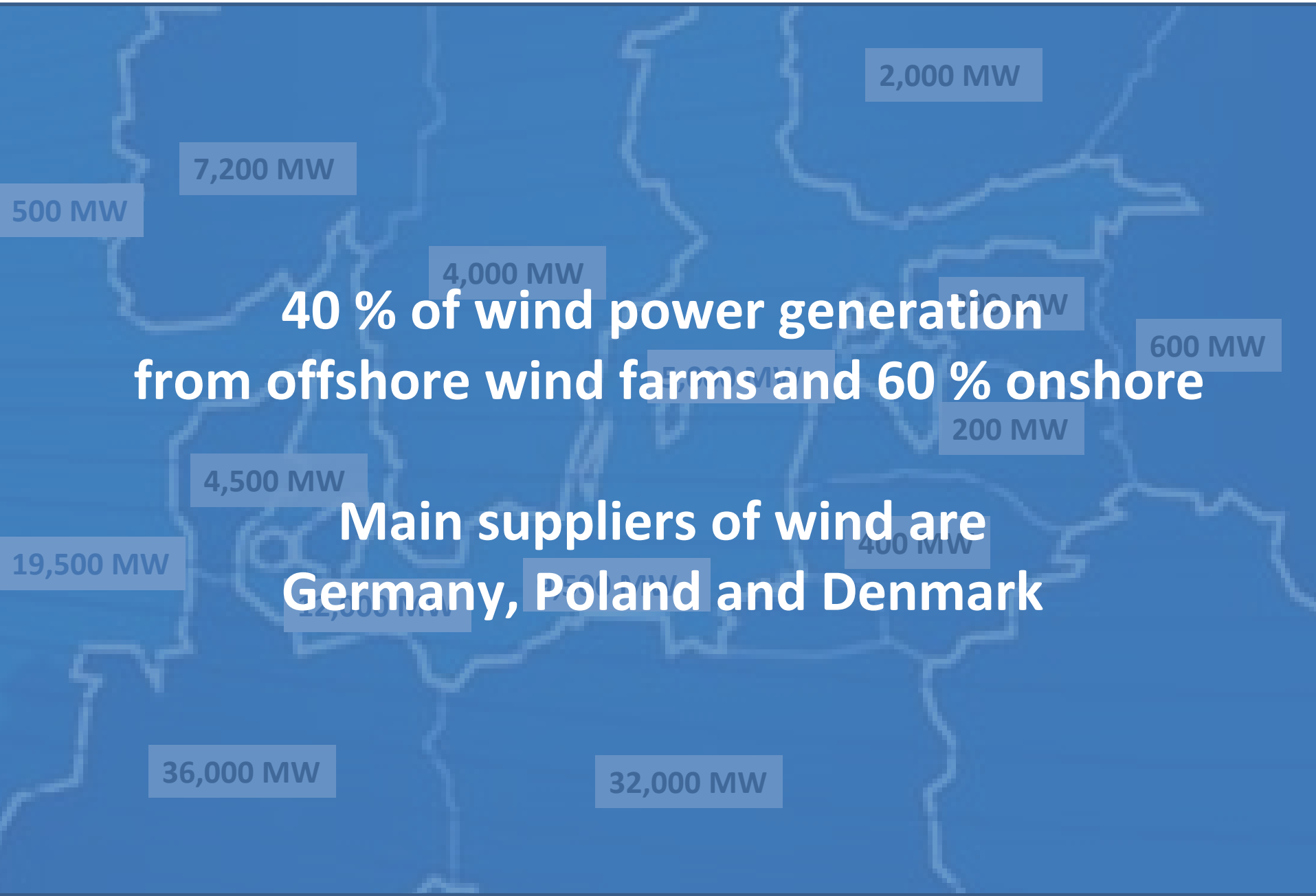
Ea Energy Analyses

Utilisation of biomass resources



Ea Energy Analyses

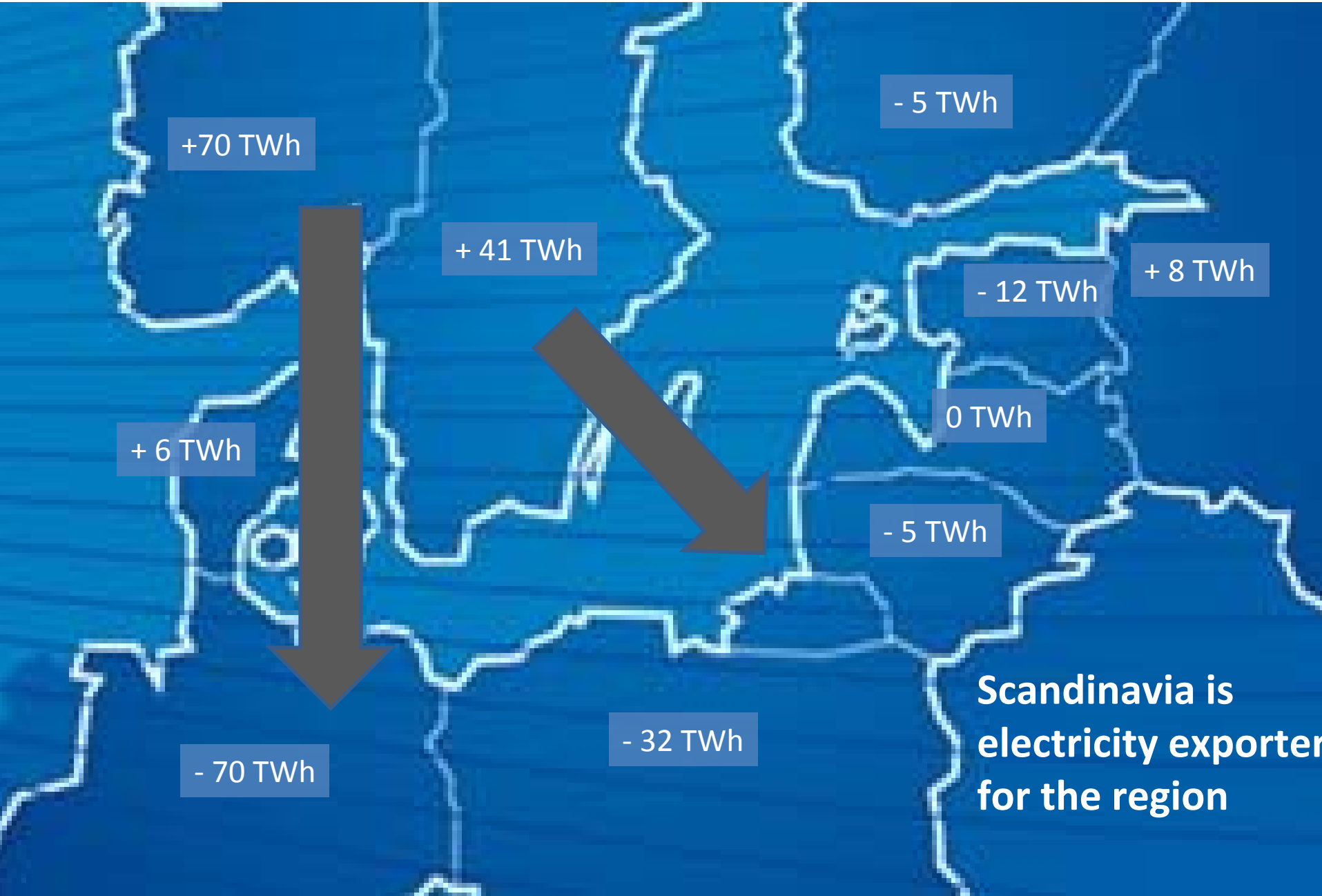
Wind power capacity 2050



40 % of wind power generation from offshore wind farms and 60 % onshore

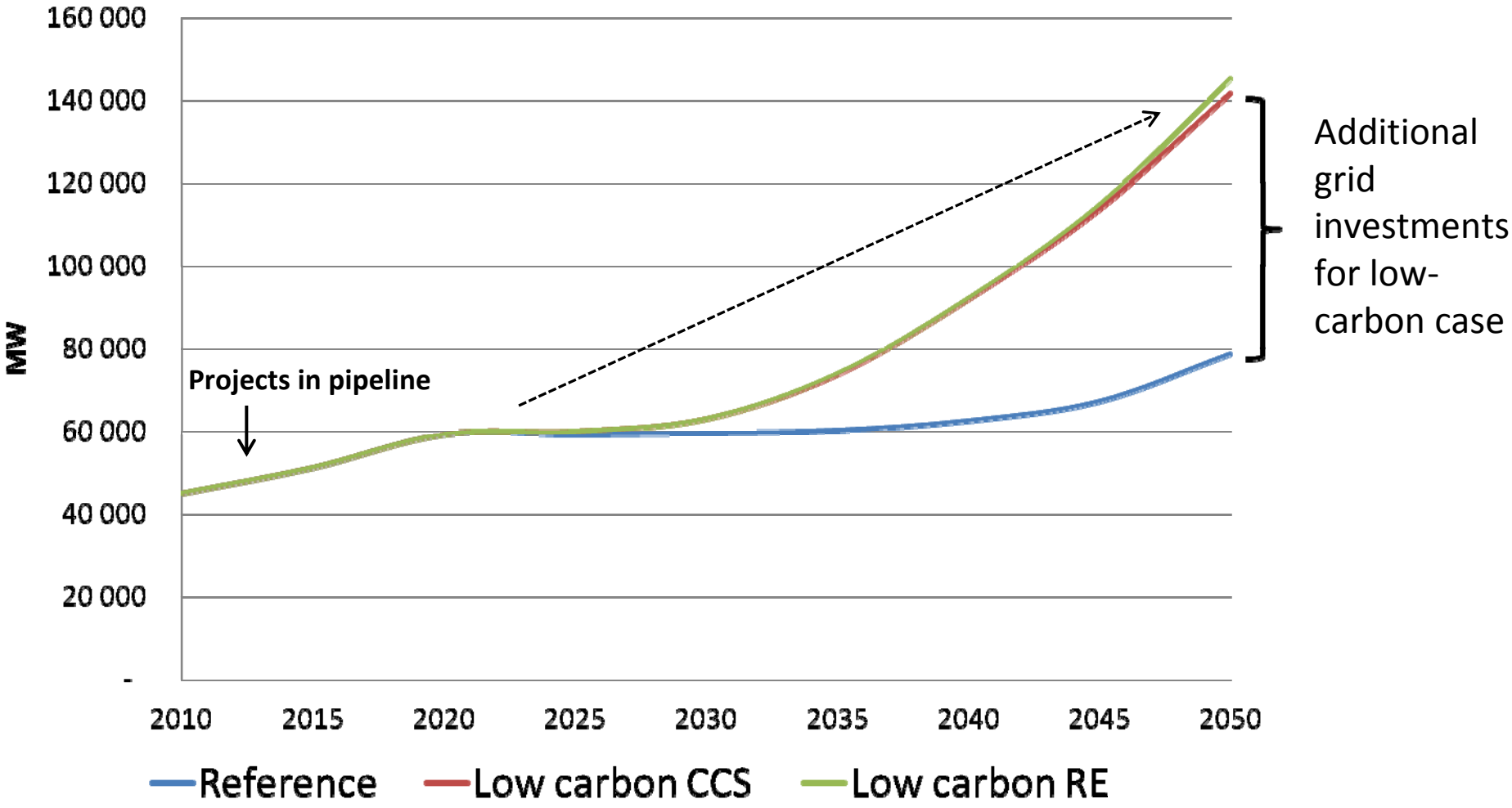
Main suppliers of wind are Germany, Poland and Denmark

Electricity import and export in 2050



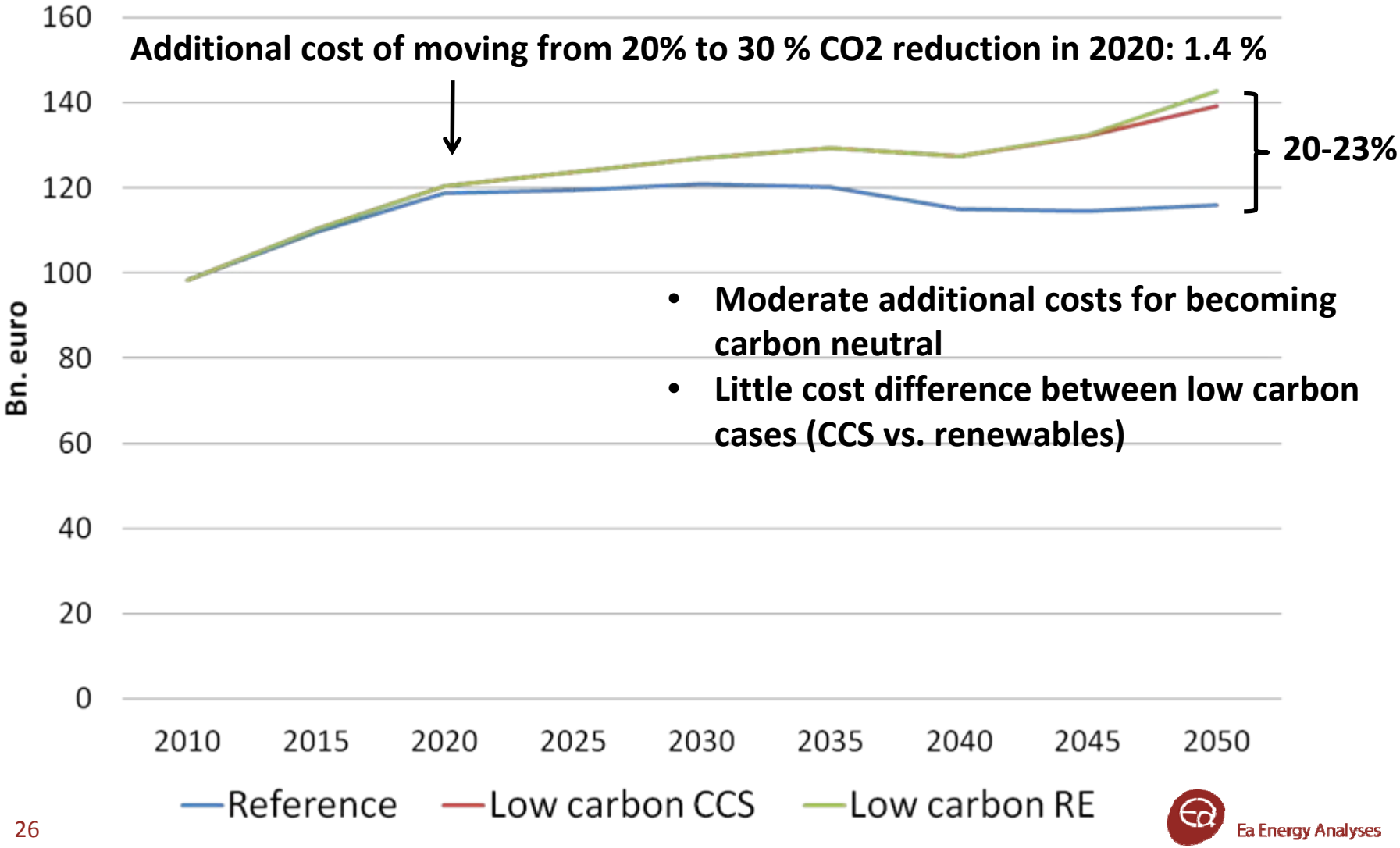
Interconnector capacity in 2050 (GW)

Investments in electricity grid



Ea Energy Analyses

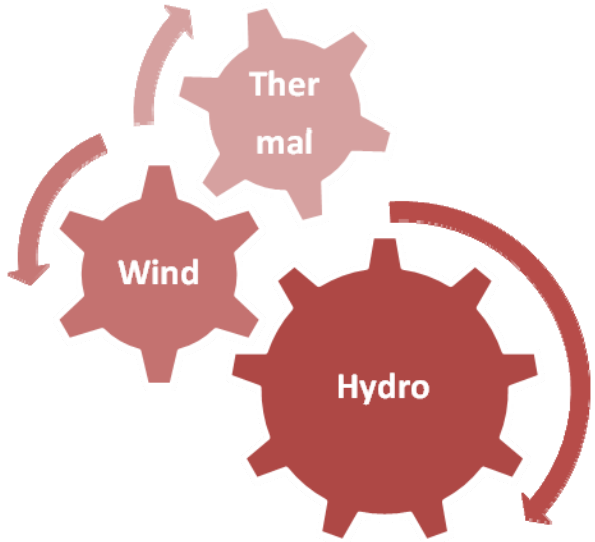
Total costs of supplying electricity and heating to the region



Ea Energy Analyses

Main findings

- It is technically possible for the Baltic Sea Region to become carbon neutral by 2050 at moderate economic costs
- Most important technologies are wind power, biomass and CCS
- Massive investments in the electricity grid will be required
- Substantial cost reductions through regional cooperation



Ideas for future cooperation

- **Developing a common Baltic Sea Region energy strategy and policy to reduce CO_2 emissions:**
- Developing a regional long-term strategy for new grid interconnectors.
- Further regional aligning of support schemes for renewable energy and other low-carbon technologies.
- Making strong efforts to improve energy efficiency in the region, e.g. through sharing and identifying of best national practices.
- Develop a regional action plan for efficient and sustainable heating involving the large cities in the Baltic Sea Region.

Ideas for future cooperation

- Requiring new large thermal power plants to be equipped with CCS or prepared to be retrofitted with CCS after 2025.
- Testing common carbon emissions trading schemes between BASREC countries and selected regions in the Russian Federation.
- Developing a Baltic Sea Region demonstration project that could serve as showcase for sustainable energy systems for specific technologies including regional R&D funding.
- Improve training and education of energy planners in the Baltic Sea Region building on an existing program such as the Baltic Rotating Energy Planning Academy (BALREPA).

THANK YOU!

akw@eaea.dk

EXTRA SLIDES

Background - Copenhagen Accord (2009)

EU countries submitted a target to the Copenhagen Accord, 20% reduction compared to 1990 and a conditional offer to increase the target to 30 % reduction

The Russian Federation submitted a conditional target (15-25 % reduction compared to 1990), which is subject to allowance for carbon sinks.

Norway submitted a target of 30-40 % reduction compared to 1990.

Engagement with the Copenhagen Accord. www.usclimatenetwork.org

Regional trade in biomass in 2050

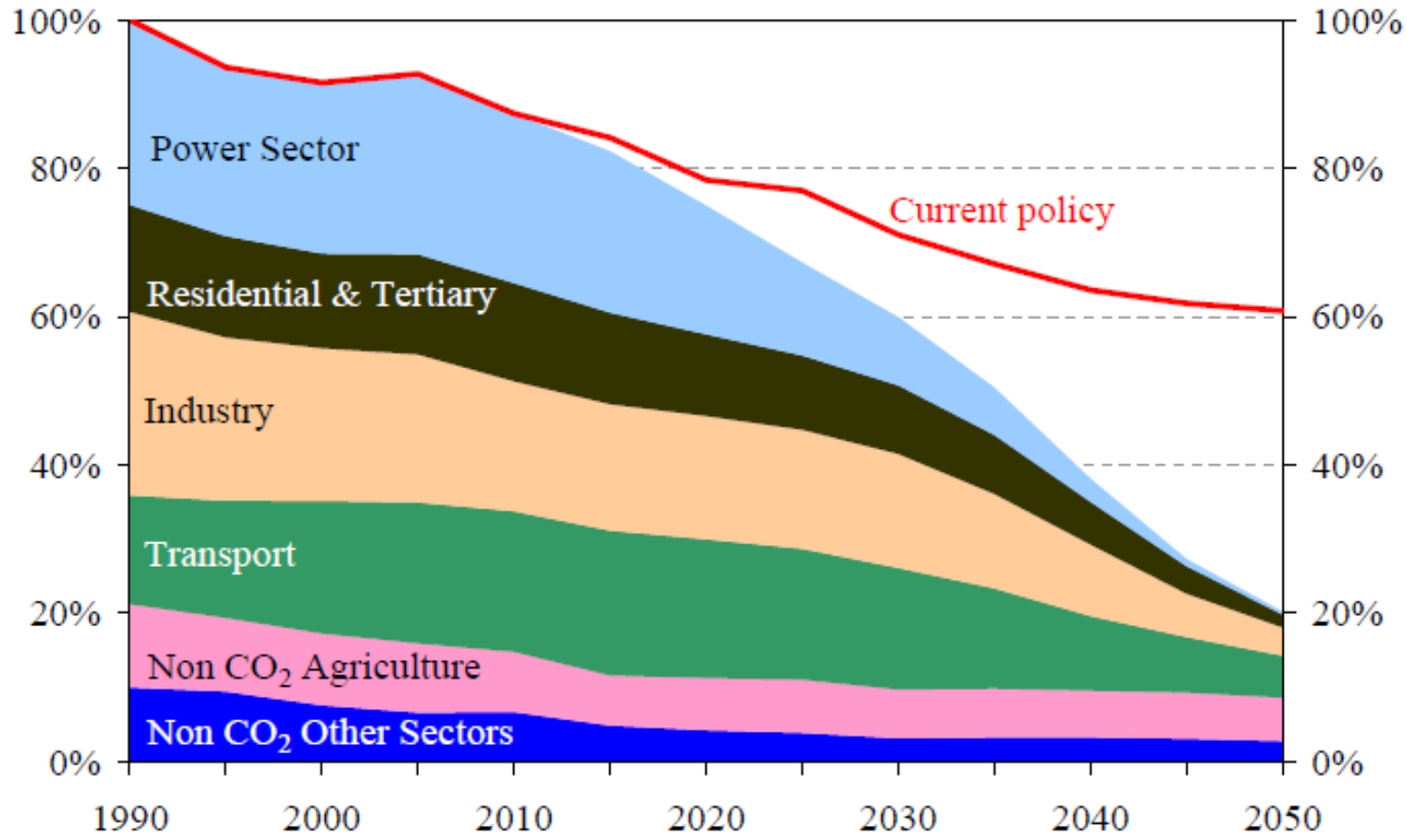
Challenge of reaching global climate agreements

- Increases the importance of **regional** energy and climate policy and strategies
- Baltic Sea Region has the potential to demonstrate successful international energy strategies
  - Studies have indicated that the Baltic Sea Region has a strong potential to develop a low-carbon energy economy.
  - Vast natural resources endowment for renewable energy (biomass, wind and hydro power)
  - Technology and knowledge base needed for a low-carbon transformation.

=> Impact assessment of future energy policy strategies

EU (2011): A Roadmap for moving to a competitive low carbon economy by 2050

Figure 1: EU GHG emissions towards an 80% domestic reduction (100% =1990)



2. INTRODUCTION TO THE BALTIC SEA REGION

Electricity interconnectors

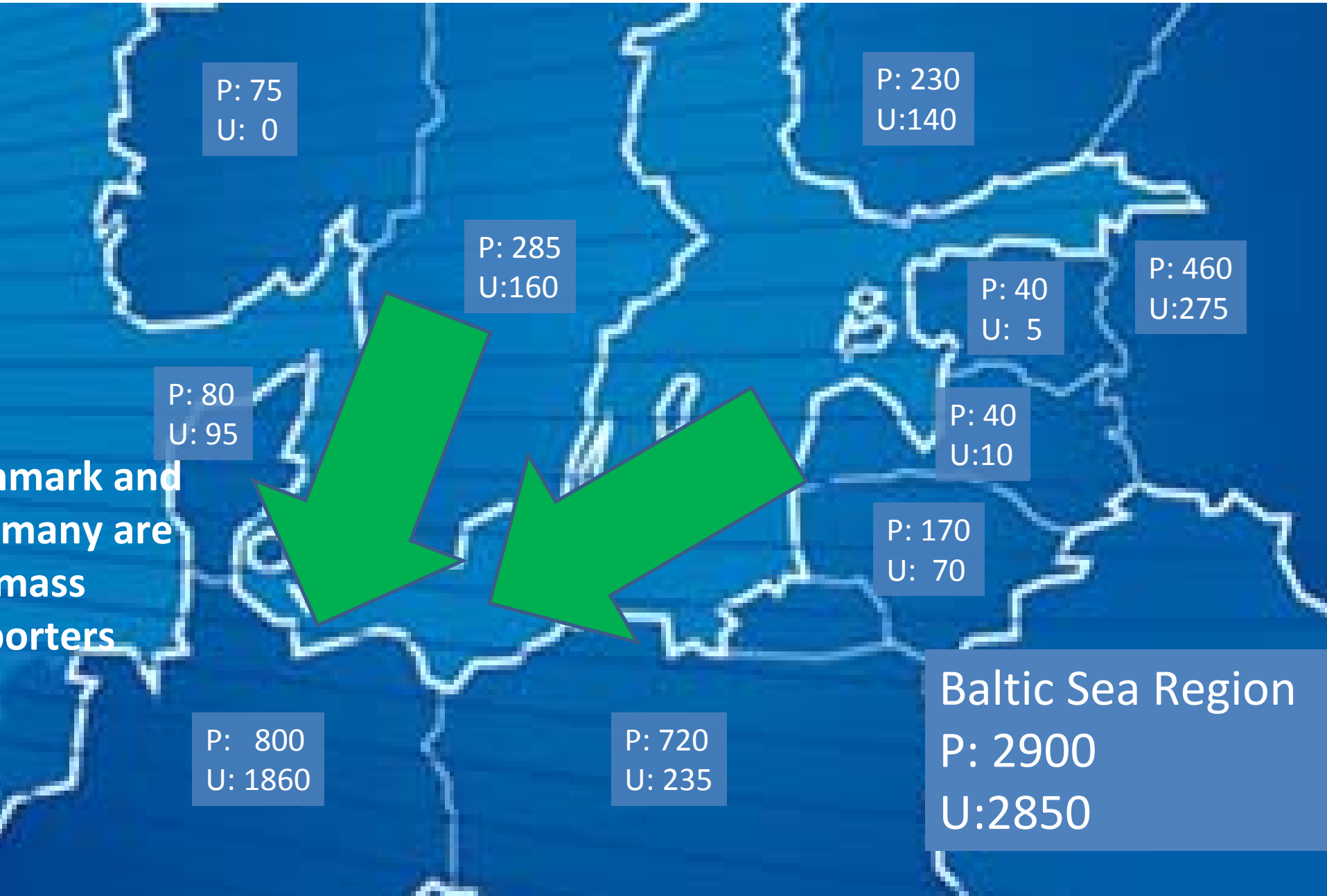
Ea Energy Analyses

Biomass in 2050

(high electricity demand)

P: Potential
U: Utilization

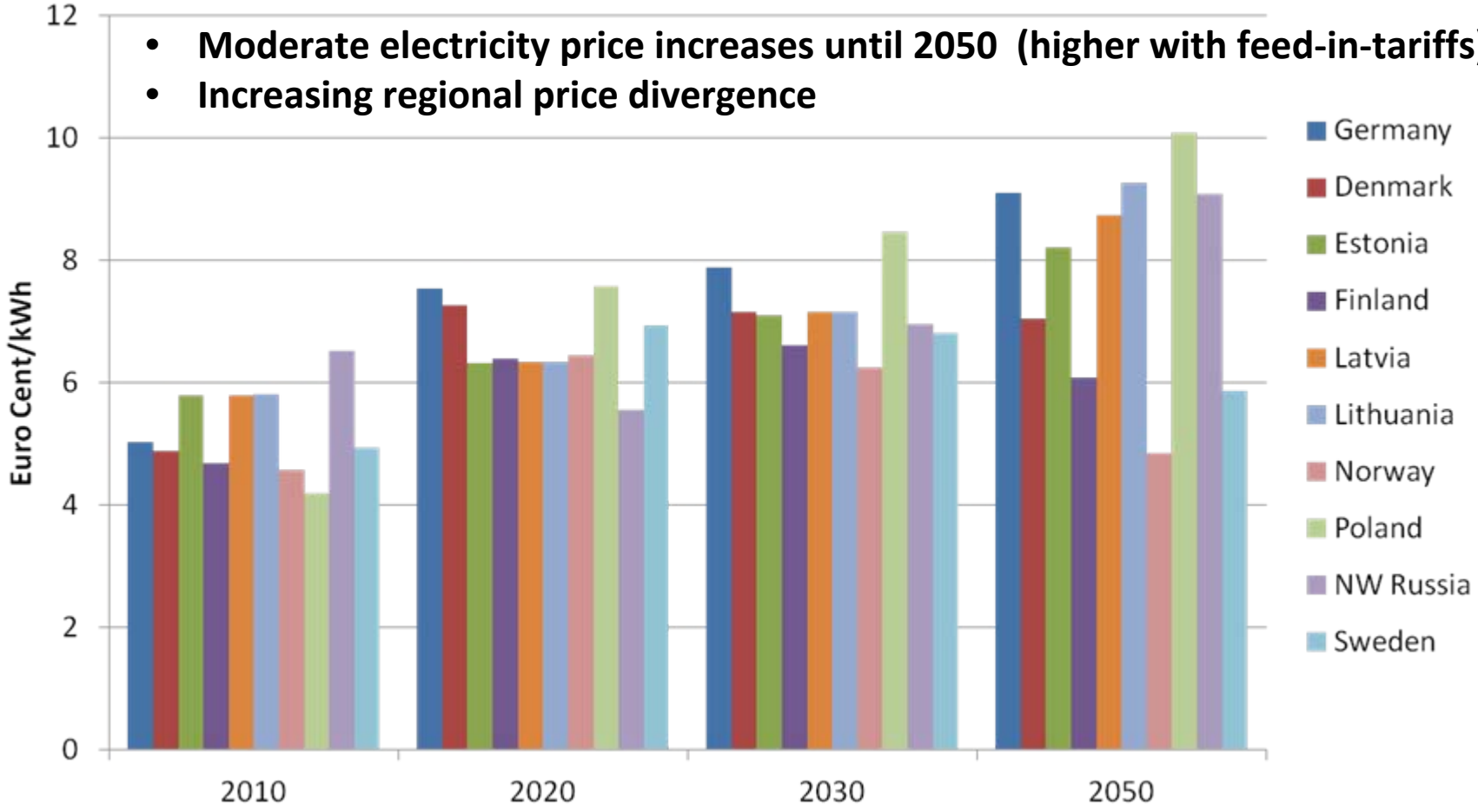
(municipal waste not considered)



nmark and
many are
mass
porters

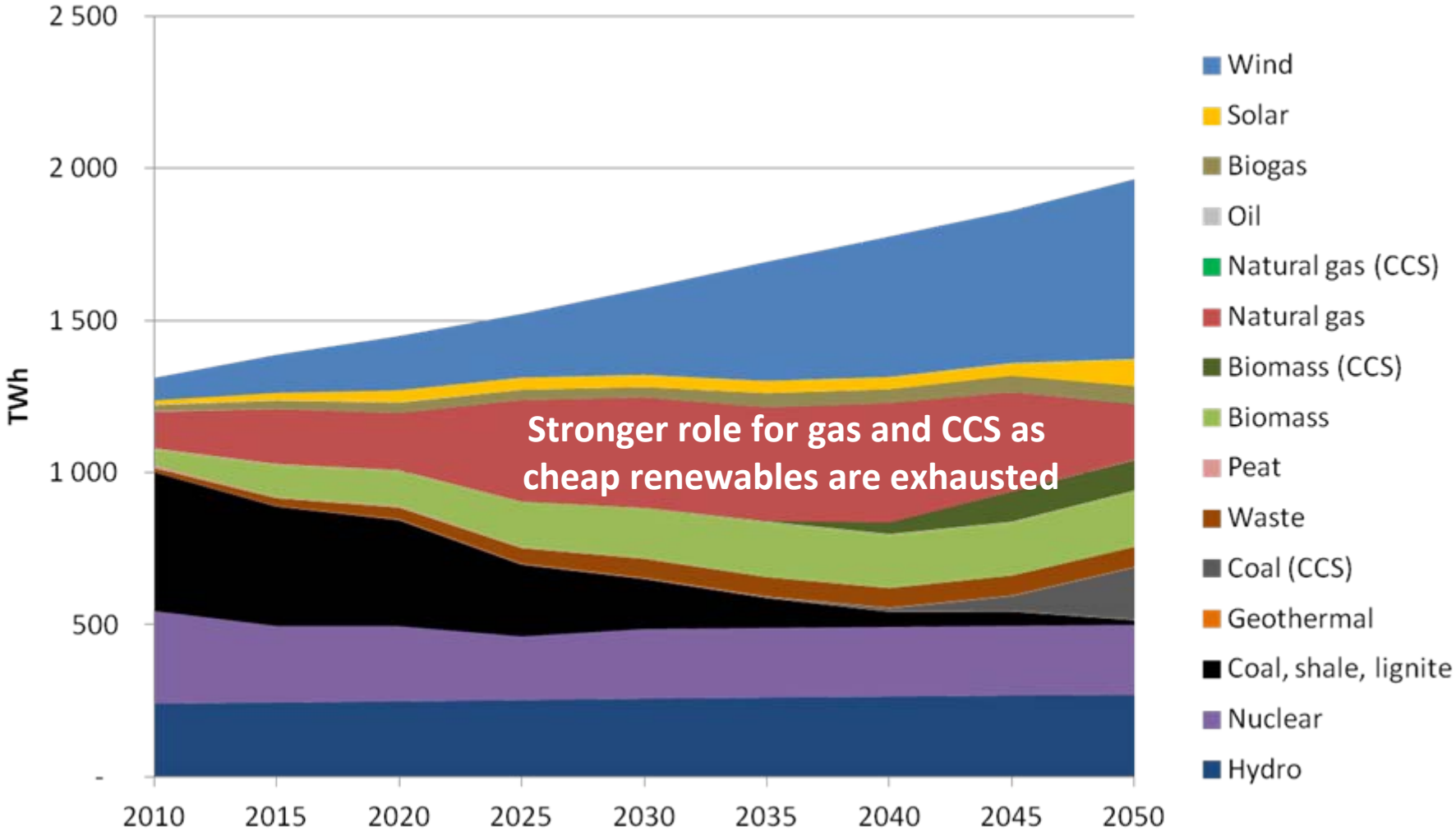
Low carbon case (renewables): Electricity market prices

- **Moderate electricity price increases until 2050 (higher with feed-in-tariffs)**
- **Increasing regional price divergence**



Ea Energy Analyses

Low carbon case + CCS:
Higher electricity demand assumption (+40% in 2050)



Ea Energy Analyses

3. ANALYTICAL SETUP

Research questions addressed in the study

- Can the Baltic Sea region become CO_2-neutral by 2050?
- What is the additional cost of achieving 30% CO_2-reduction in 2020?
- What are the benefits of linking EU ETS with Russian CO_2-regulation?
- What are the benefits of a coordinated planning and expansion of the electricity transmission grid?
- What are the benefits of harmonizing the renewable energy support scheme?

Focus: Electricity and district heating systems

Research questions addressed in the study

- Can the Baltic Sea region become CO_2-neutral by 2050?
- What is the additional cost of achieving 30% CO_2-reduction in 2020?