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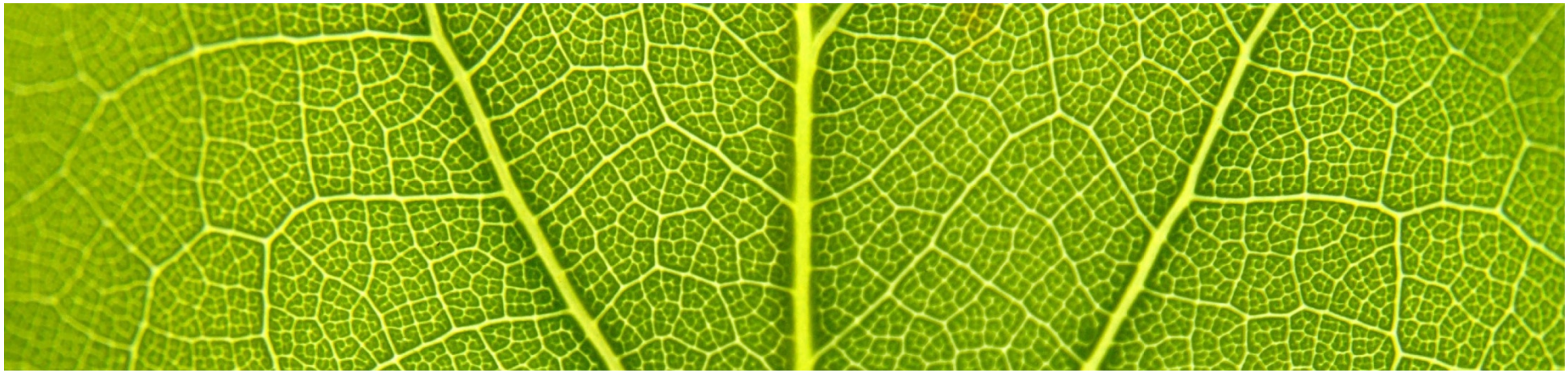

How to reduce Europe's energy import dependency significantly by deep renovation of buildings

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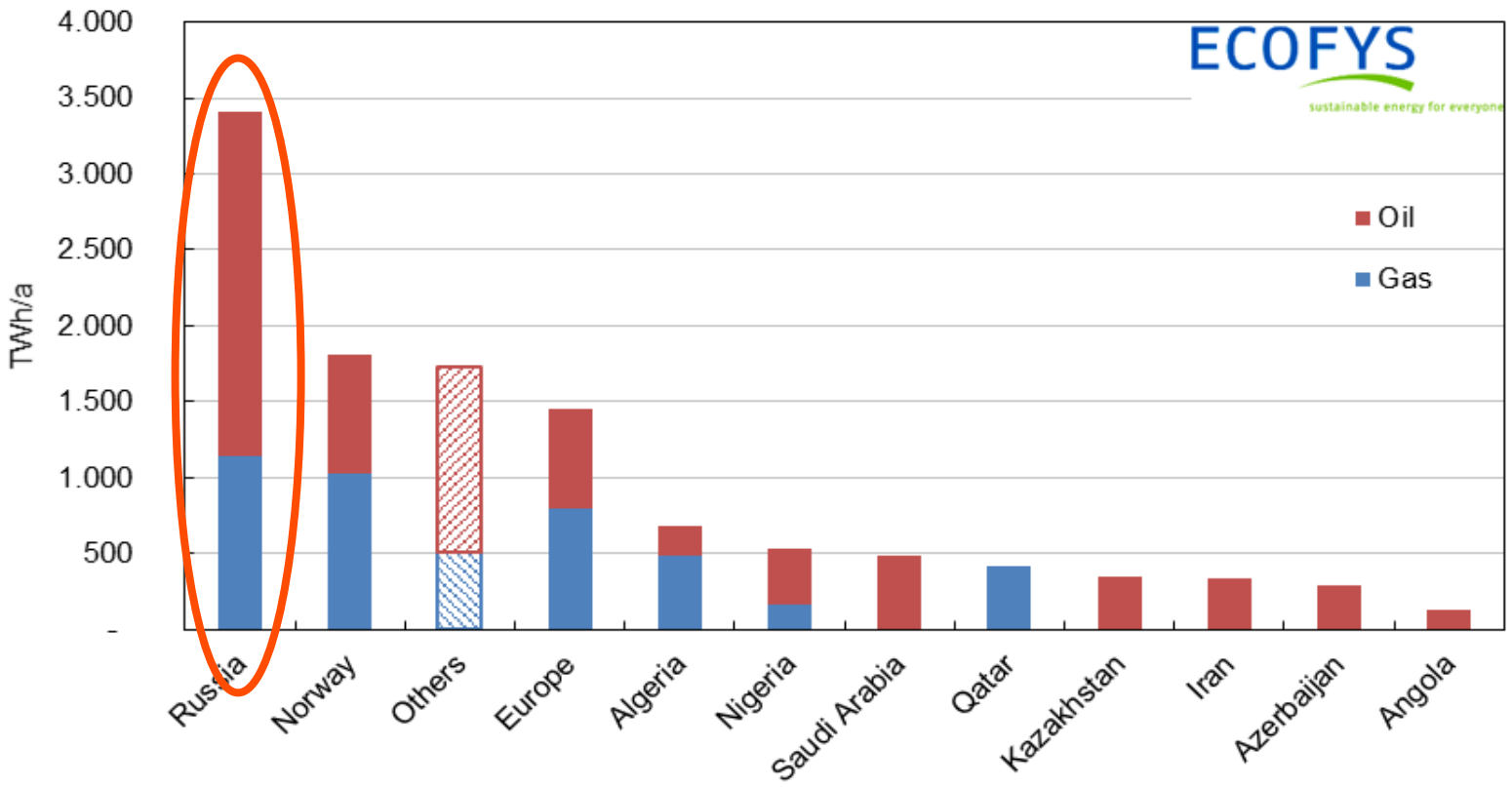
Dr. Kjell Bettgenhäuser

Reducing energy imports…



- Currently the EU is the **worlds largest consumer of natural gas**
- **65%** of an average yearly gas consumption (4.700 TWh) are **net imported**
- 76% of oil and gas consumption in 2011 was imported

Aim and background

- **Turmoil in the Ukraine** has triggered a discussion around the **European energy security strategy**. The European Commission adopted its Energy Security Strategy and the Energy Union.

- This paper

  (i) analyses **EU`s current energy consumption** of all sectors,

  (ii) goes in **details for the EU building sector** with heating, hot water, cooling and electricity consumption and

  (iii) analyses the **effects of deep renovation measures** (building shell and HVAC systems) in EU´s building sector on the energy import balance.

Underlying study

Building renovation in Europe - what are the choices?

RENOVATION TRACKS FOR EUROPE UP TO 2050

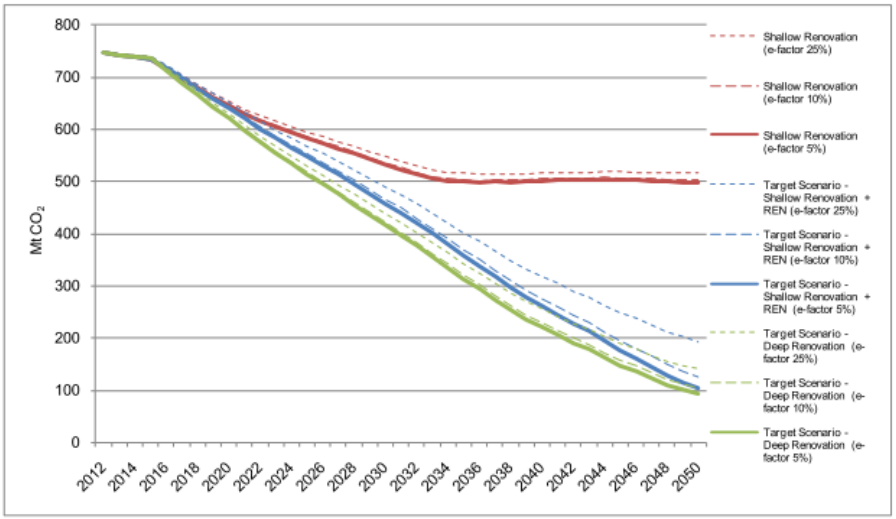
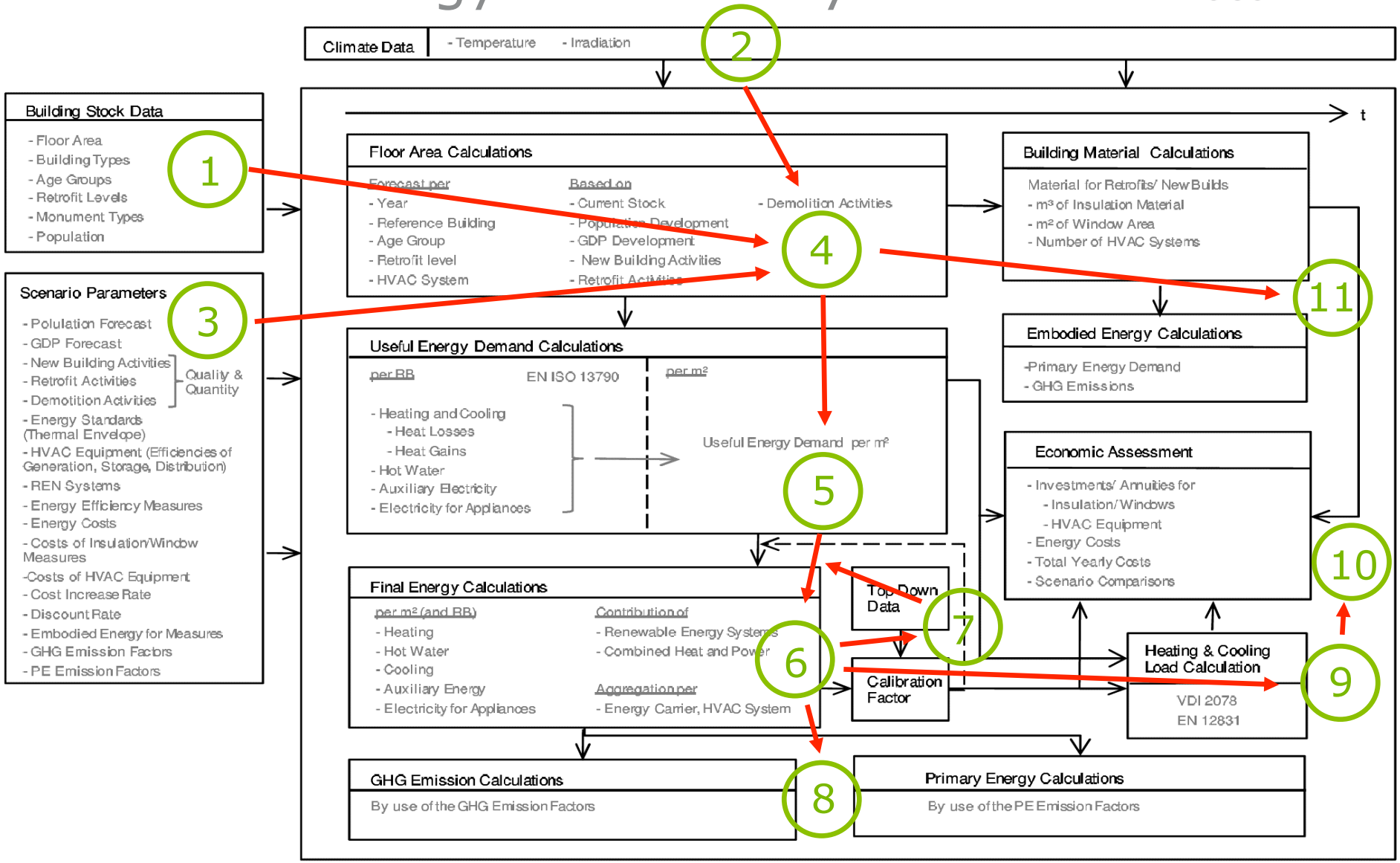
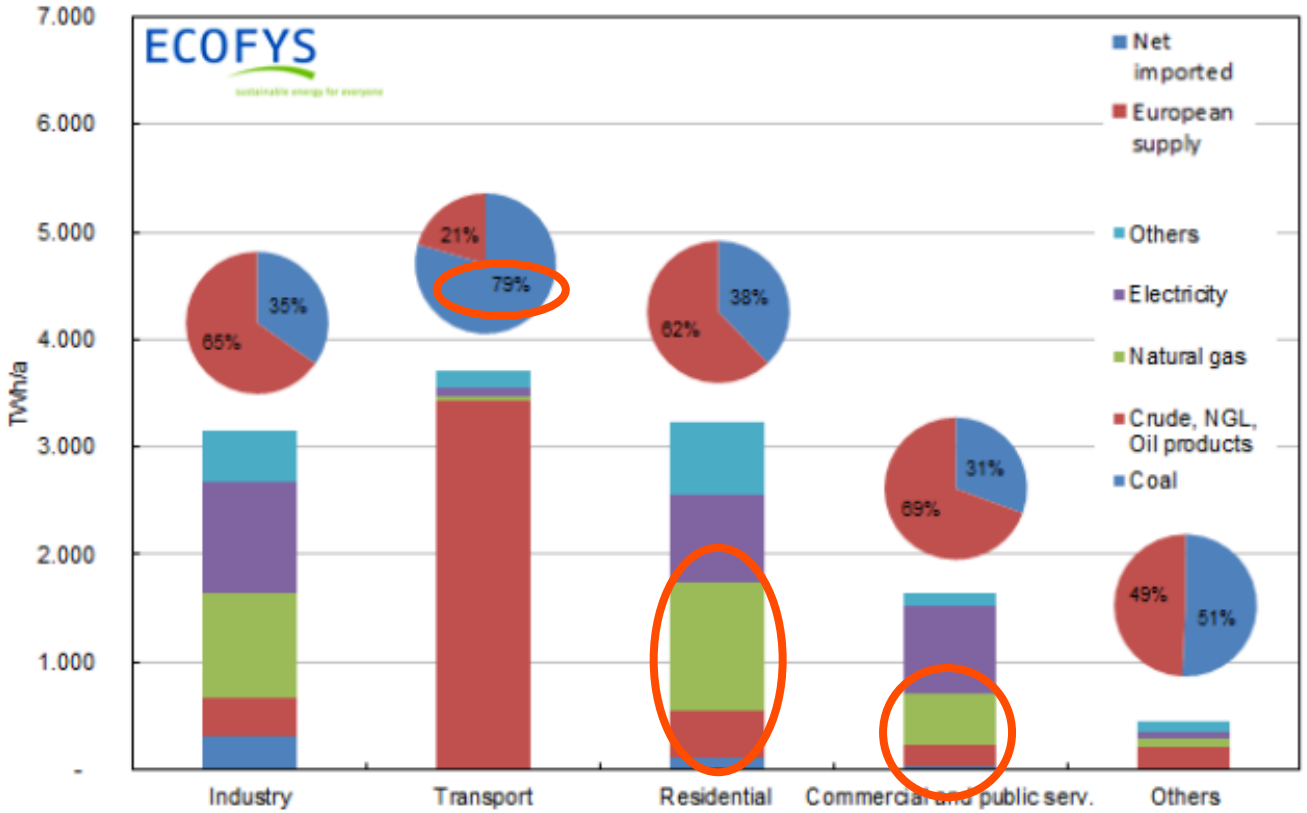


Figure 1 Total $C0_2$-Emissions EU27 [Mt/a]

Methodology in the study: BEAM²

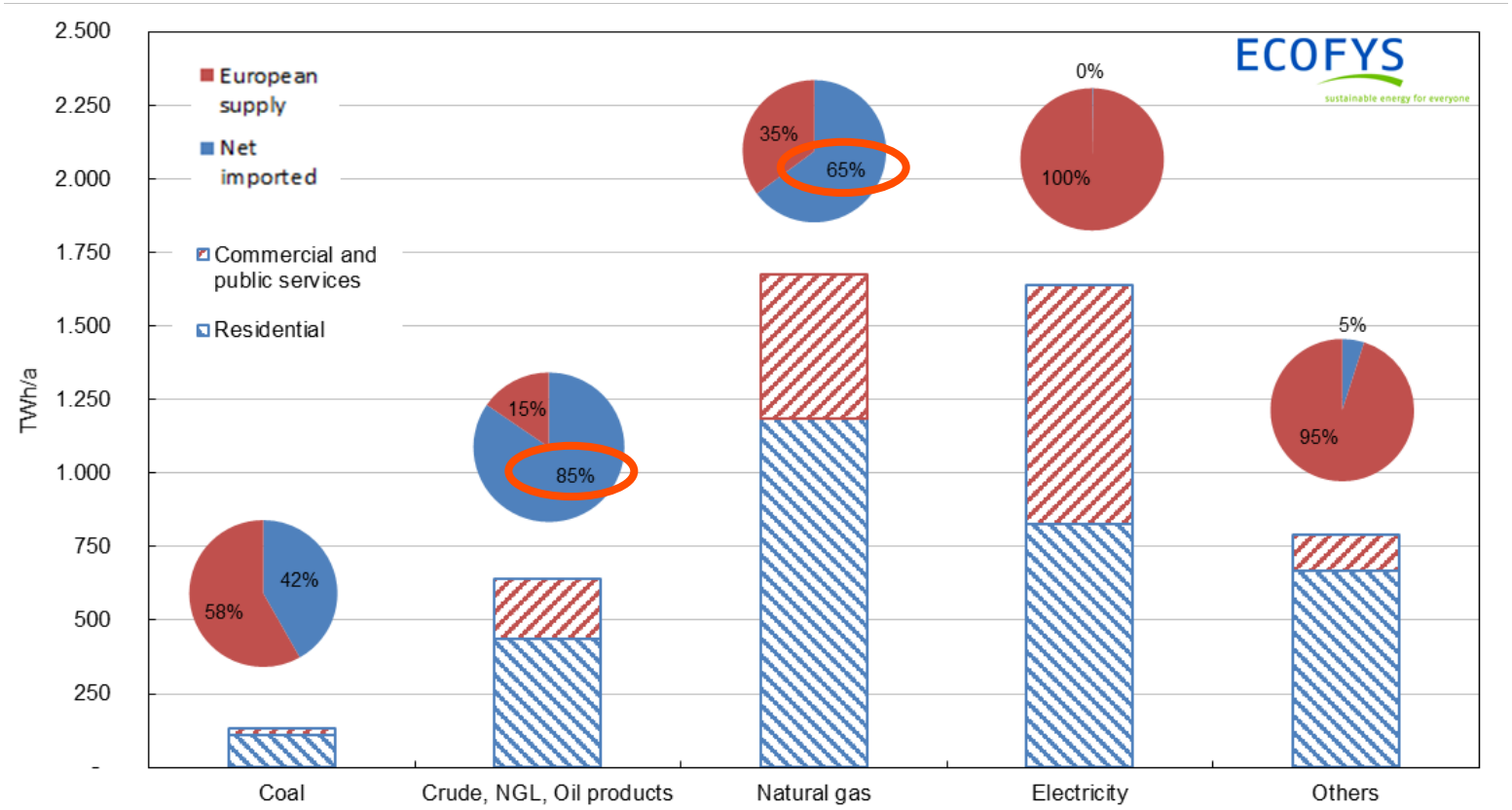


EU's final energy consumption



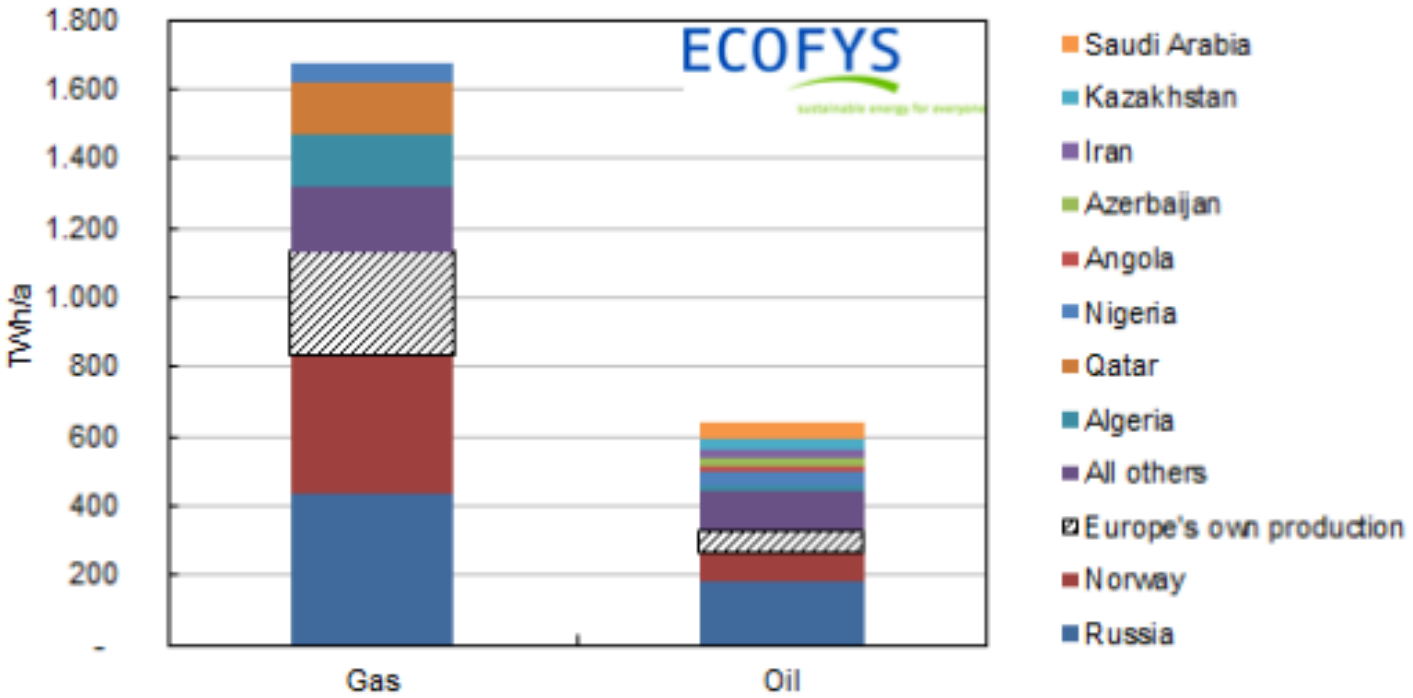
- In 2011, **76% of all gas and oil** (65% of gas, 85%% of oil) was **imported from outside** of the EU
- About **one-third** of these imports originates **from Russia**

Energy imports for buildings



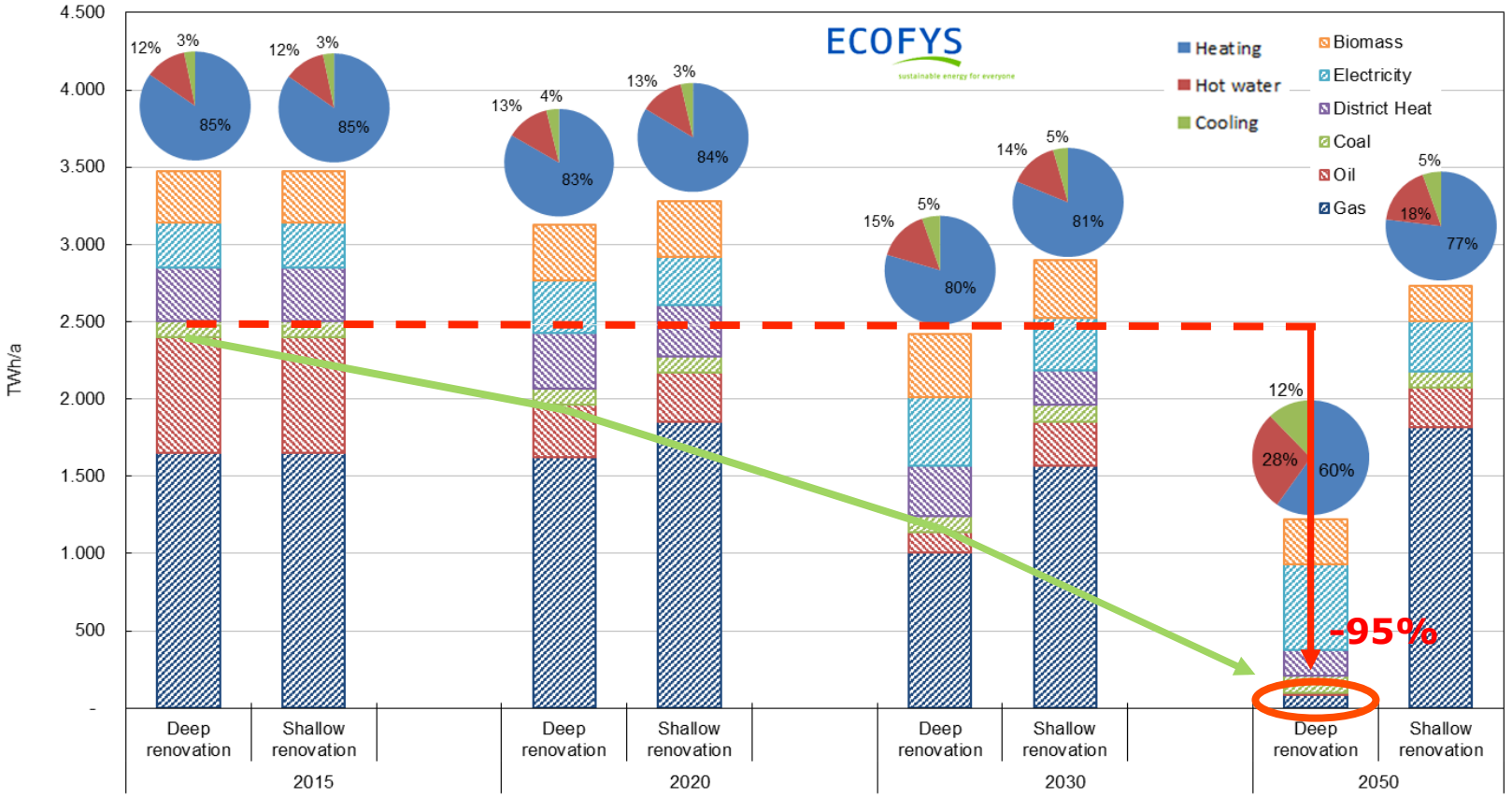
- EU`s building sector has a **net import share** for energy carriers of **37%** in 2011 (without energy carriers for electricity generation)
- The amount of **gas imported** is more than as twice as big as oil imports

Gas and oil in buildings: Origin



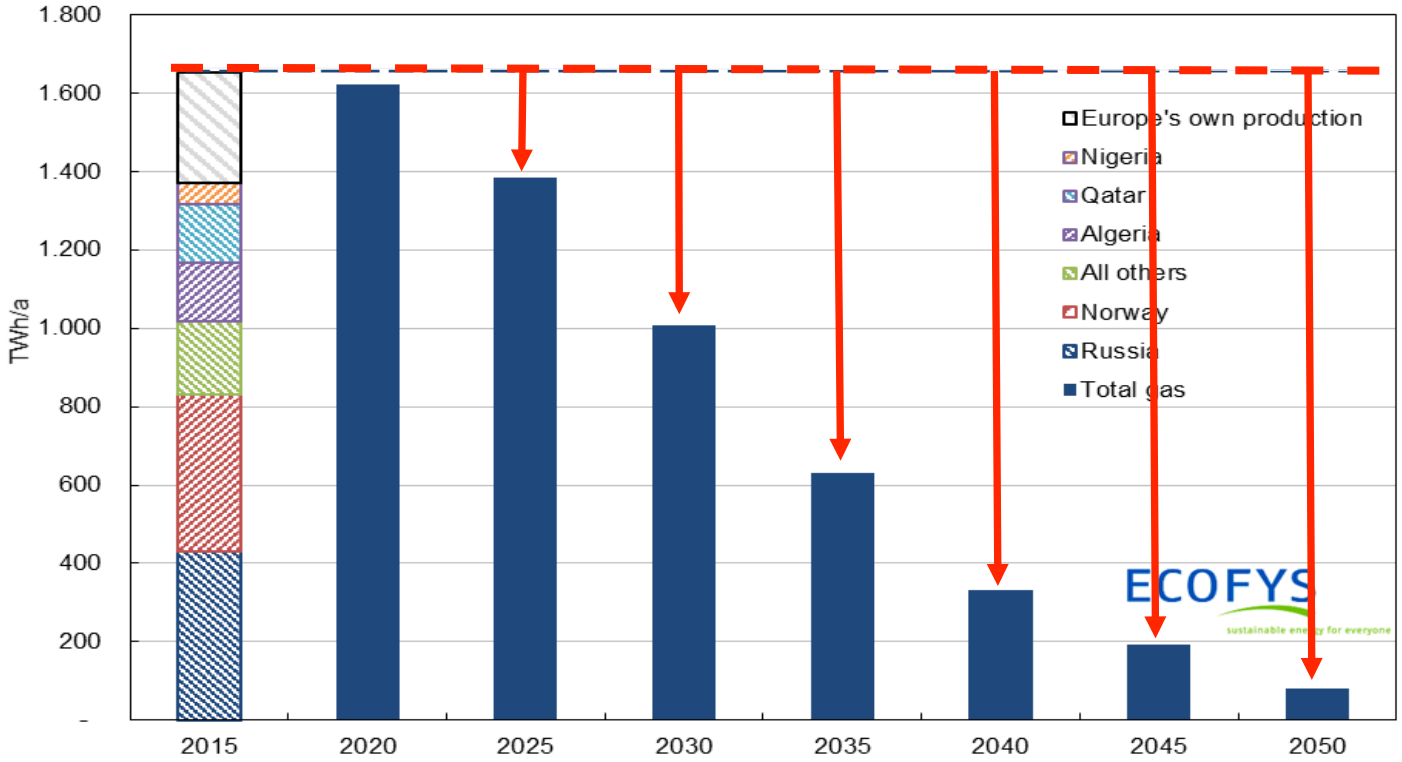
- 31% of all net imported oil and gas is consumed in the **building sector** (**61% of all imported gas and 14% of all imported oil**)
- **Russia** and Norway account for about **1/4** of the imports each

Effects of deep renovation



- **Energy imports** can be reduced to **nearly zero** by 2050
- Deep renovation reduces **gas consumption in bldgs. by 95%** and **oil by 97%** by 2050
- With Shallow renovation the **total final energy** can only be reduced by 24% by 2050 (whereas **66% for deep renovations** incl. heating, hot water, cooling and aux. electricity)

Becoming independent of gas imports



- **By 2035** the equivalent **imports of today from i.e. Norway and Russia** can be saved by means of energy efficiency and renewable energy measures in buildings
- **After 2040**, the equivalent of the 2011 **EU domestic supply would be sufficient** for all heating and cooling demand in EU´s buildings, thus **further savings** in buildings can help to become independent from gas imports in other sectors as well

Deep renonvation vs. other options

As another source of information on renewable energy costs, the recent Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)[15] reports costs for renewable electricity production of different kinds to range from 2 €c/kWh to 45 €c/kWh (equivalent to 5 €c/kWh – 18 €c/kWh for useful energy in the buildings[16]) . Compared to these production costs, the costs of saved energy in deep renovation (if cost effectively combined with anyway due maintenance measures) show spans from 2 to 9 €c/kWh[17], putting the costs of deep renovation on the safe side.

Also further options to reduce fossil fuel dependencies do not show better economics than a deep renovation strategy. The IPCC report ranges the costs of *nuclear energy* between 4 €c/kWh and 20 €c/kWh (equivalent to 6 €c/kWh – 11 €c/kWh for useful energy in the building) and fossil fuelled power with carbon capture and storage (CCS) between 4 €c/kWh and 23 €c/kWh (equivalent to 6 €c/kWh – 12 €c/kWh for useful energy). Meanwhile, these sources would require in some cases substantially more time in order to be fully operational (with the subsequent uncertainty) and raise some other obstructive issues in health, safety, environment or public acceptance.

The same barriers occur in *shale gas* domestic production or imports. Moreover, costs are not expected to be lower than those for conventional gas. Several authoritative studies (Joint Research Centre, Global Energy Assessment) refer to the fact that EU shale gas will most likely have higher production costs than conventional gas and also higher costs than US imported shale gas. Also, US gas prices are expected to rise in the coming years and decades, because of increasing production costs and increasing demand (also from Asia).

Conclusion

Key message 1
Deep renovation of buildings helps the EU becoming significantly less dependent on energy imports. A reduction of gas and oil by >95% by 2050 is possible.

Key message 2
Other supply side options to reduce the energy dependency are not cheaper and might create other dependencies and/or risks.

Key message 3
Building sector deep energy efficiency measures generate significant GHG emission reductions (>90% from 1990 to 2050).

Happy to discuss!

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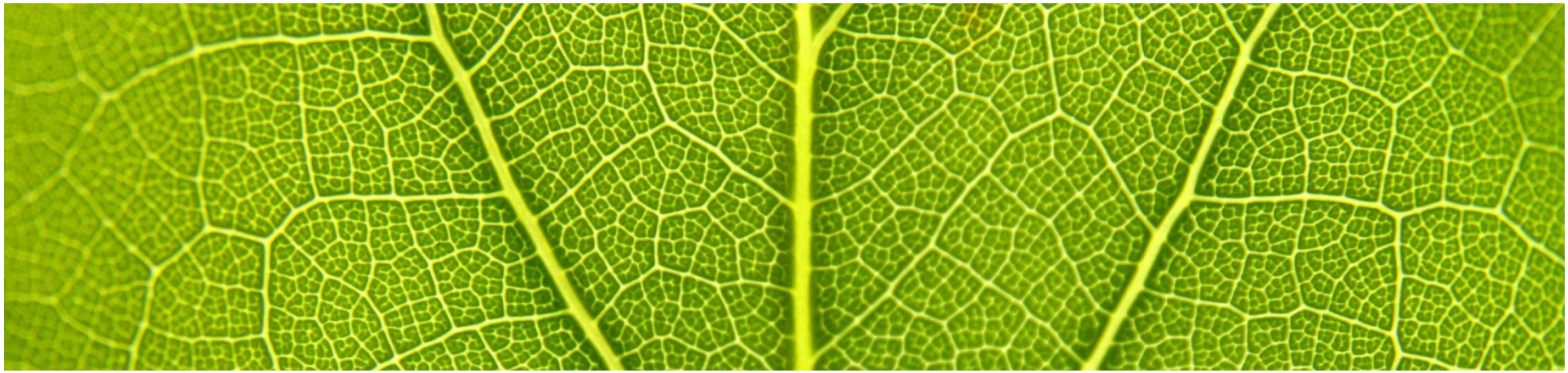

Dr. Kjell Bettgenhäuser

Ecofys Germany

E: k.bettgenhaeuser@ecofys.com

T: +49 221 270 70-157