



- Oslo Centre of Research on Environmentally friendly Energy

The European energy industry in 2030

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Forskningsparken

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Stiftelsen Frischsenteret for samfunnsøkonomisk forskning

Ragnar Frisch Centre for Economic Research

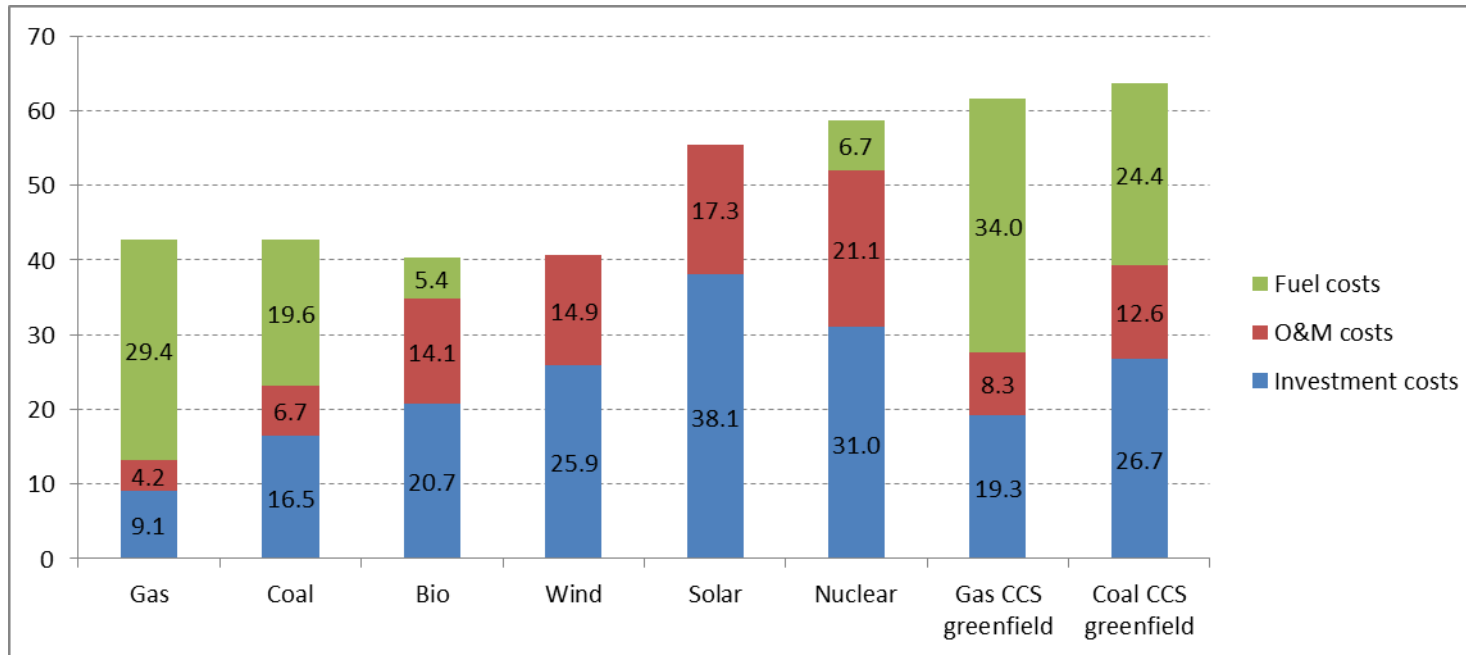
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The main driving forces

- Economic and population growth
- Energy and environmental policy targets
 - EU Commission proposal from January 2014
- Energy and environmental policy instruments
 - National vs. common EU, technology neutral vs. tailor-made
- Technological development and production site differences
- The market
 - Market structure (competitive)
- Interrelationships!



Cost of new electricity in 2030 (€2009/MWh)



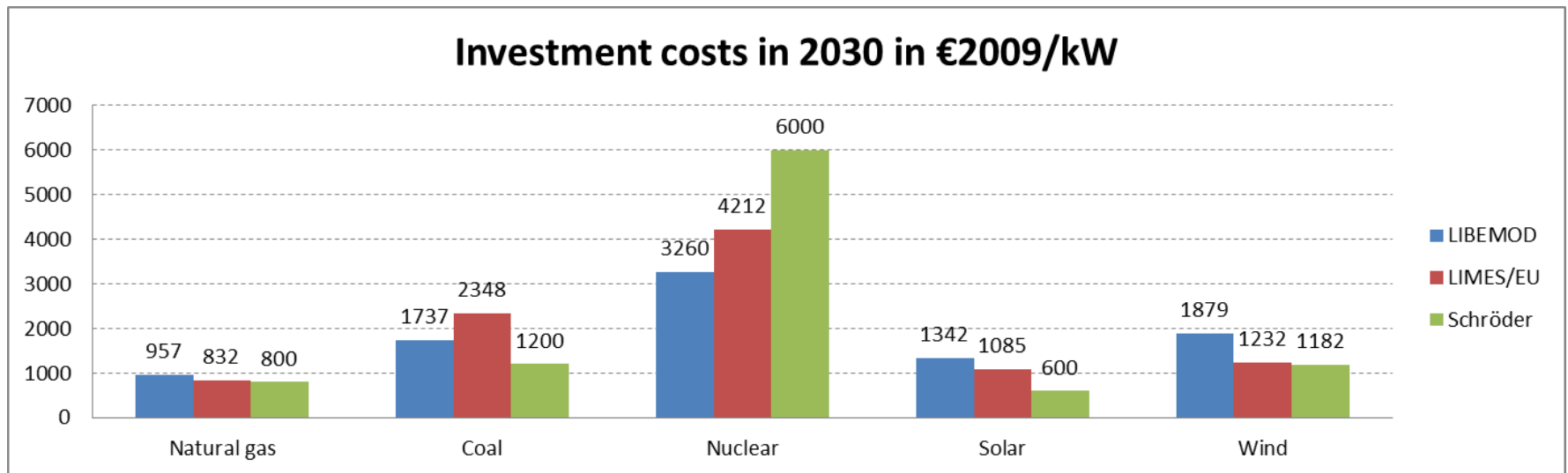
Assumptions

Fuel prices: Coal and gas prices for electricity generation in Germany 2009, Bio based on Schröder et al. (2013), Nuclear from OECD (2011).

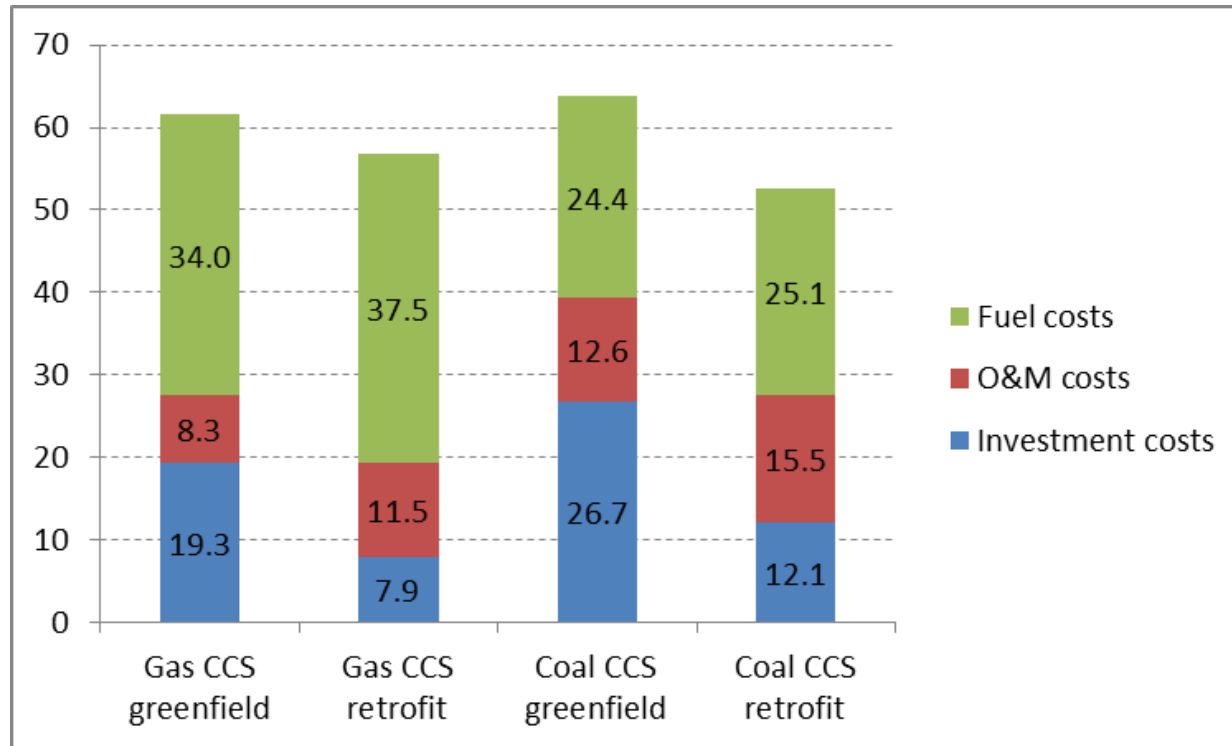
Load hours: 70% for coal, gas, nuclear, CCS and bio. Wind and solar based on good locations in Europe.



Investment costs in 2030 in €2009/kW

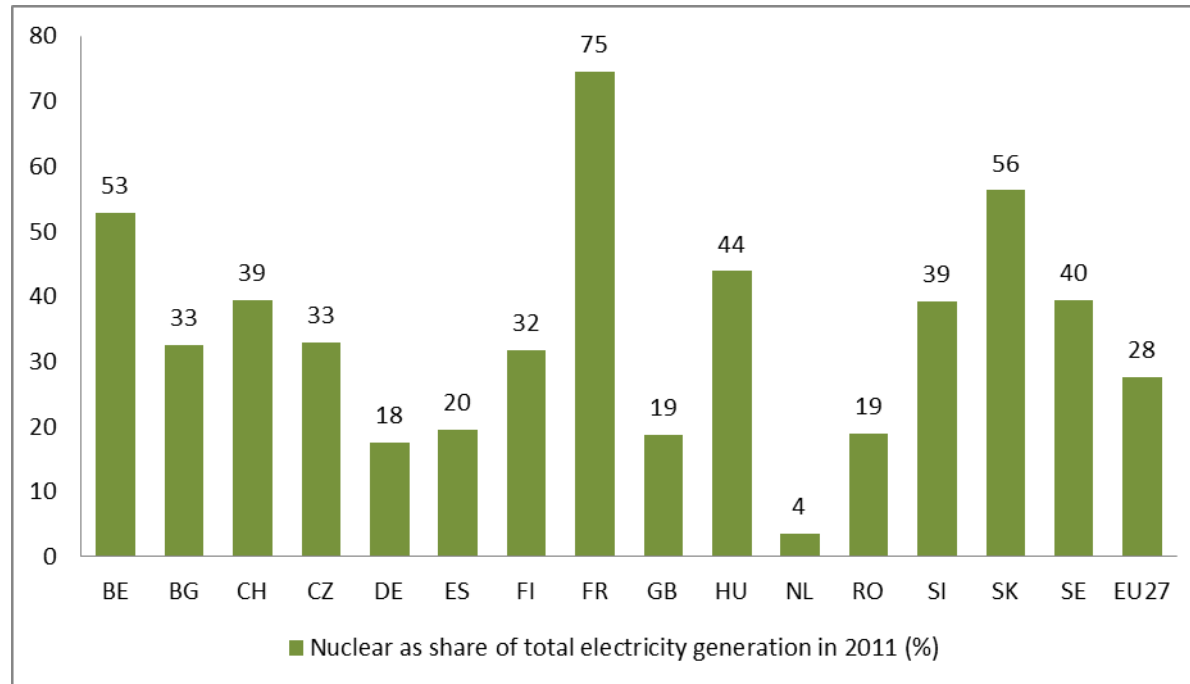


Cost of electricity from CCS (€2009/MWh)

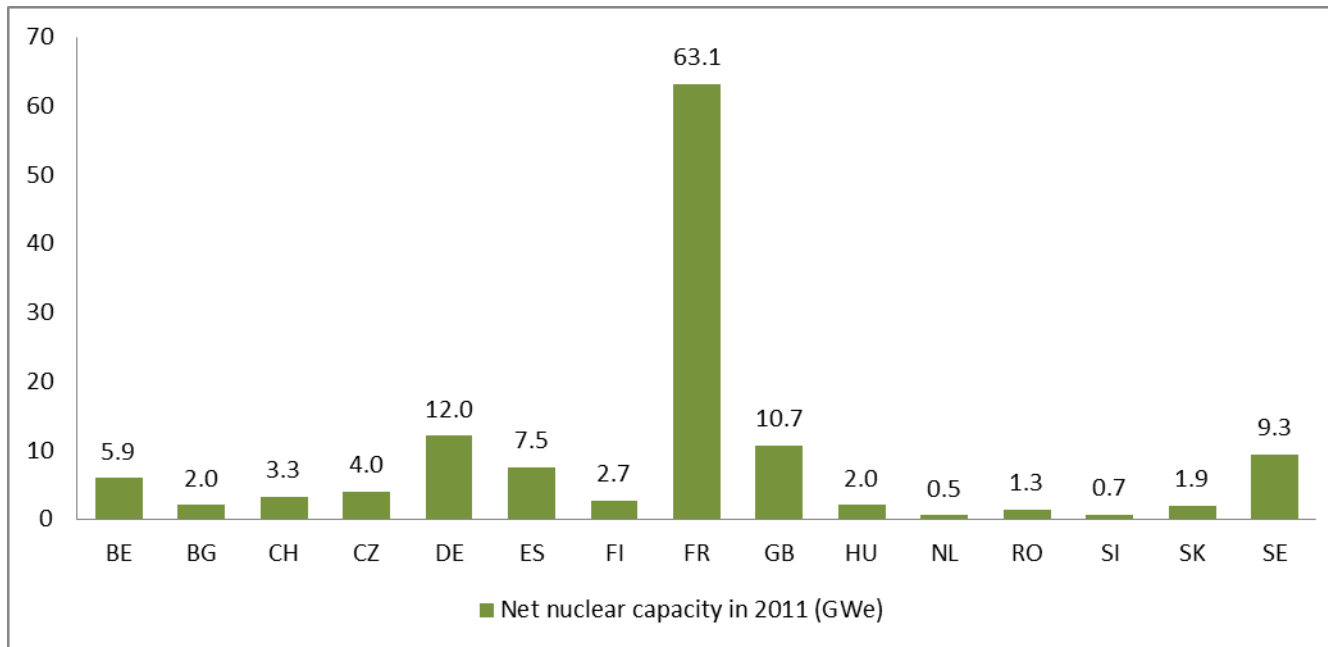


Sources: ZEP (2011), IEA GHG (2011) and own assumptions.

Nuclear as share of total electricity generation in 2011 (%)



Net nuclear capacity (GWe) in 2011 by country



LIBEMOD

- Numerical equilibrium model of the energy markets in Europe
- Builds on standard economic theory
- Investment, extraction, production, trade, consumption of energy
- Energy goods: coal (3), oil, natural gas, bio (2), electricity
- Electricity technologies
 - Conventional fossil fuel (4), CCS (2), nuclear, hydro (3), wind power, solar
- LIBEMOD determines all prices and quantities in the European energy industry



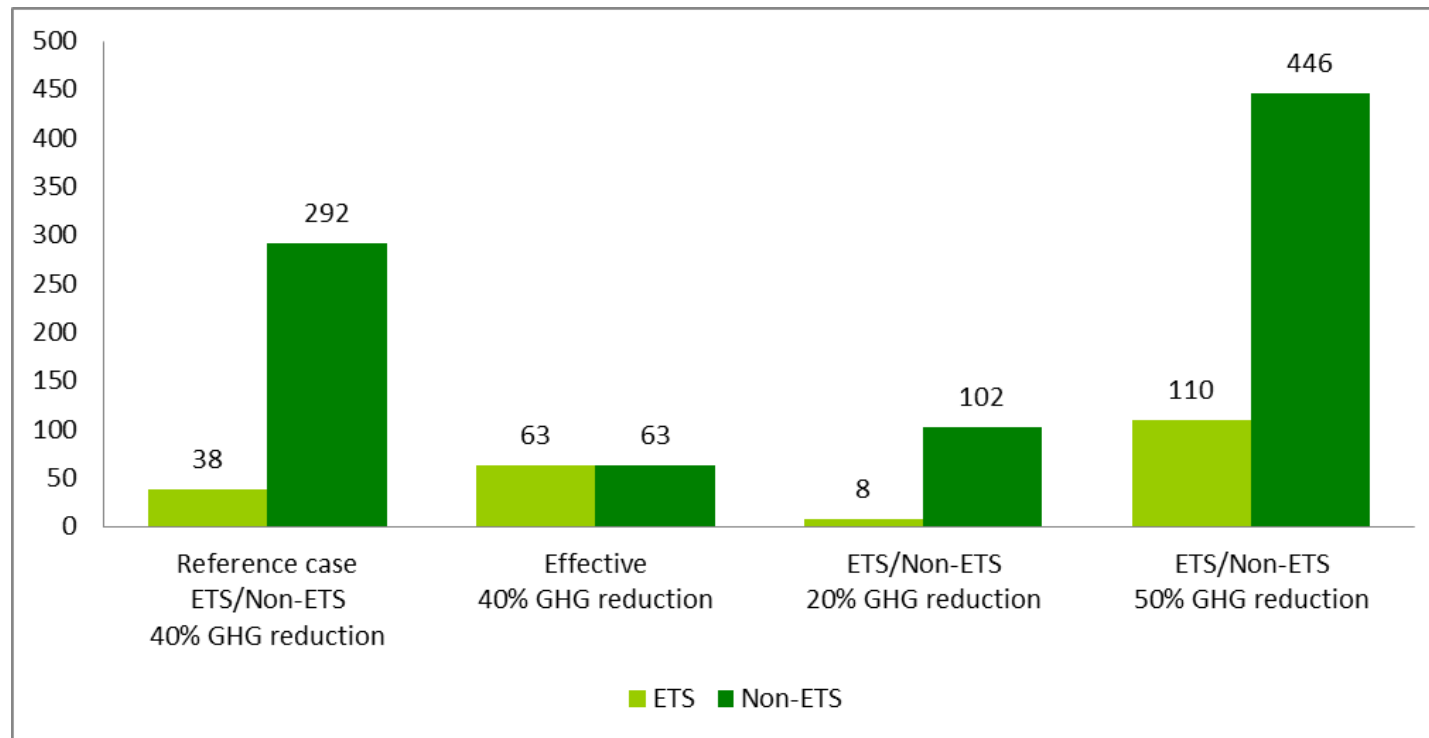
LIBEMOD scenarios

- Reference case: Separate targets for ETS and non-ETS (in line with the proposal of the EU Commission, published in January 2014)
- Reduced emissions: 40 % reduction in 2030 (from 1990-levels)
 - No differentiation between ETS/Non-ETS («Effective»)
 - 20 % and 50 % reduction
- Phasing out nuclear power
- Subsidies for CCS plants
- All results are for EU27 + 3 («Europe»)



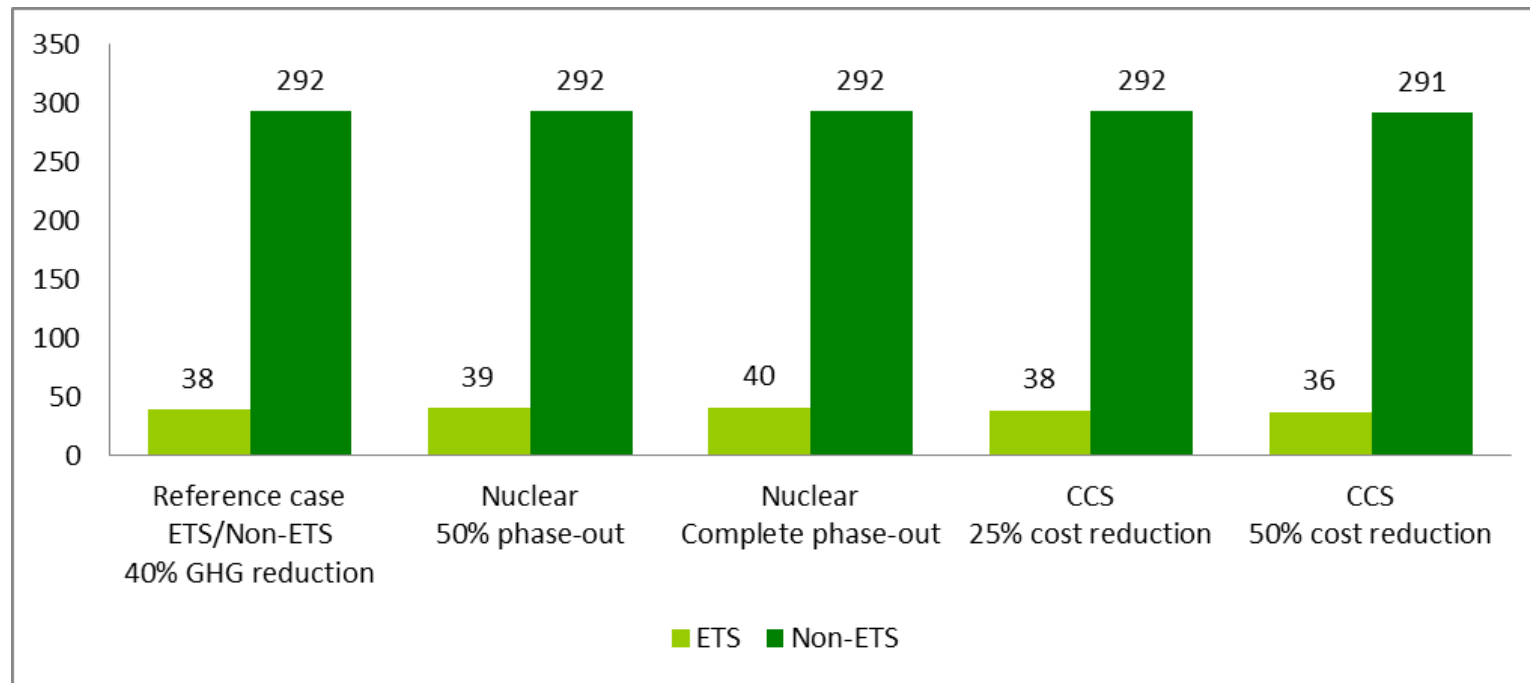
CO₂ price in Europe in 2030 (€/tCO₂)

Reference case: 40 GHG-reduction, separate targets for ETS/non-ETS

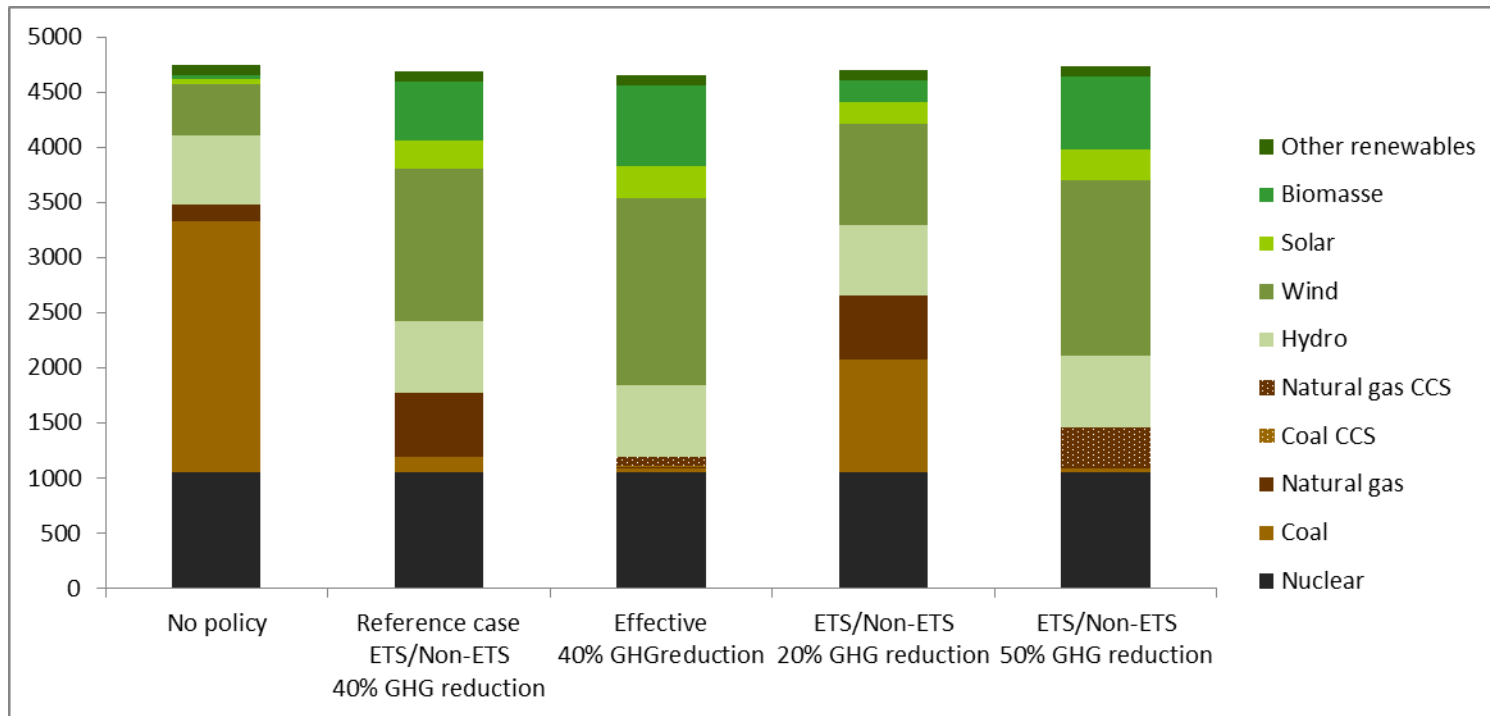


CO₂ price in Europe in 2030 (€/tCO₂)

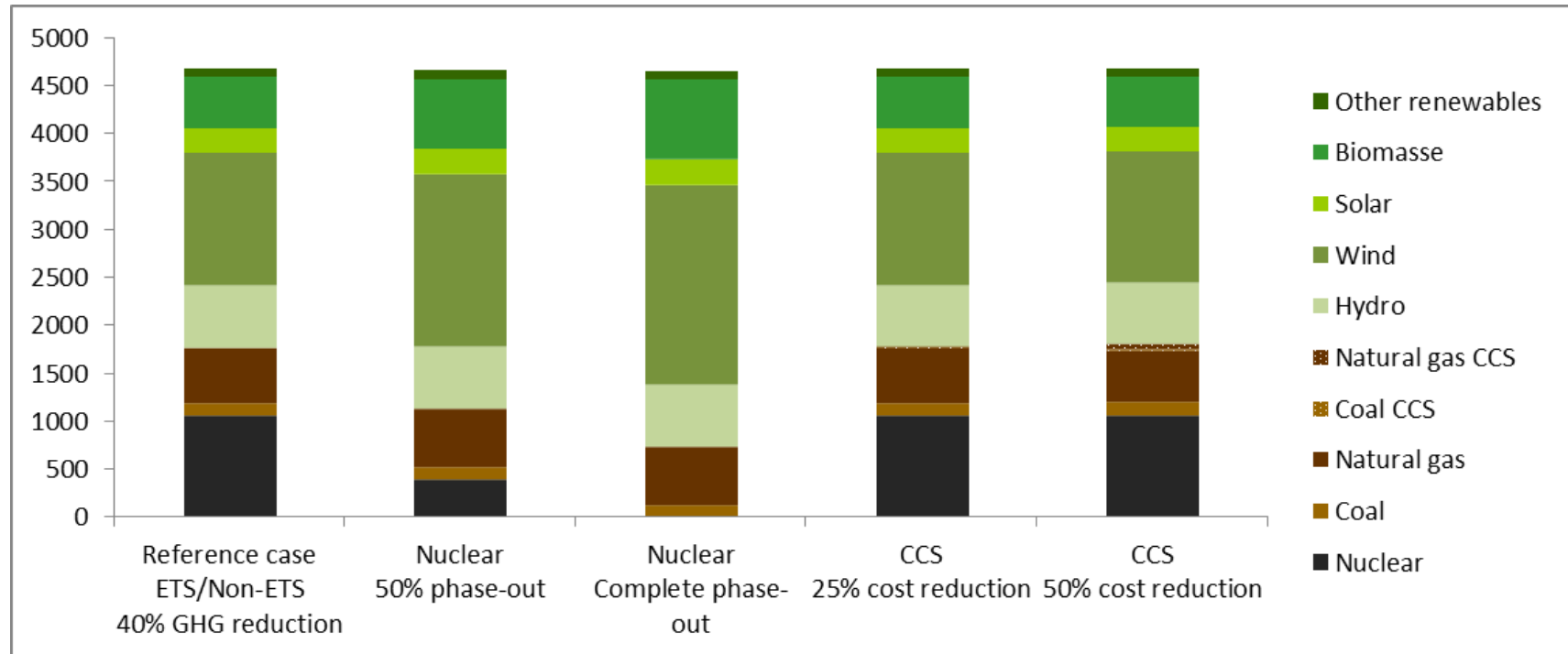
Reference case: 40 GHG-reduction, separate targets for ETS/non-ETS



Power generation in Europe in 2030 (TWh)

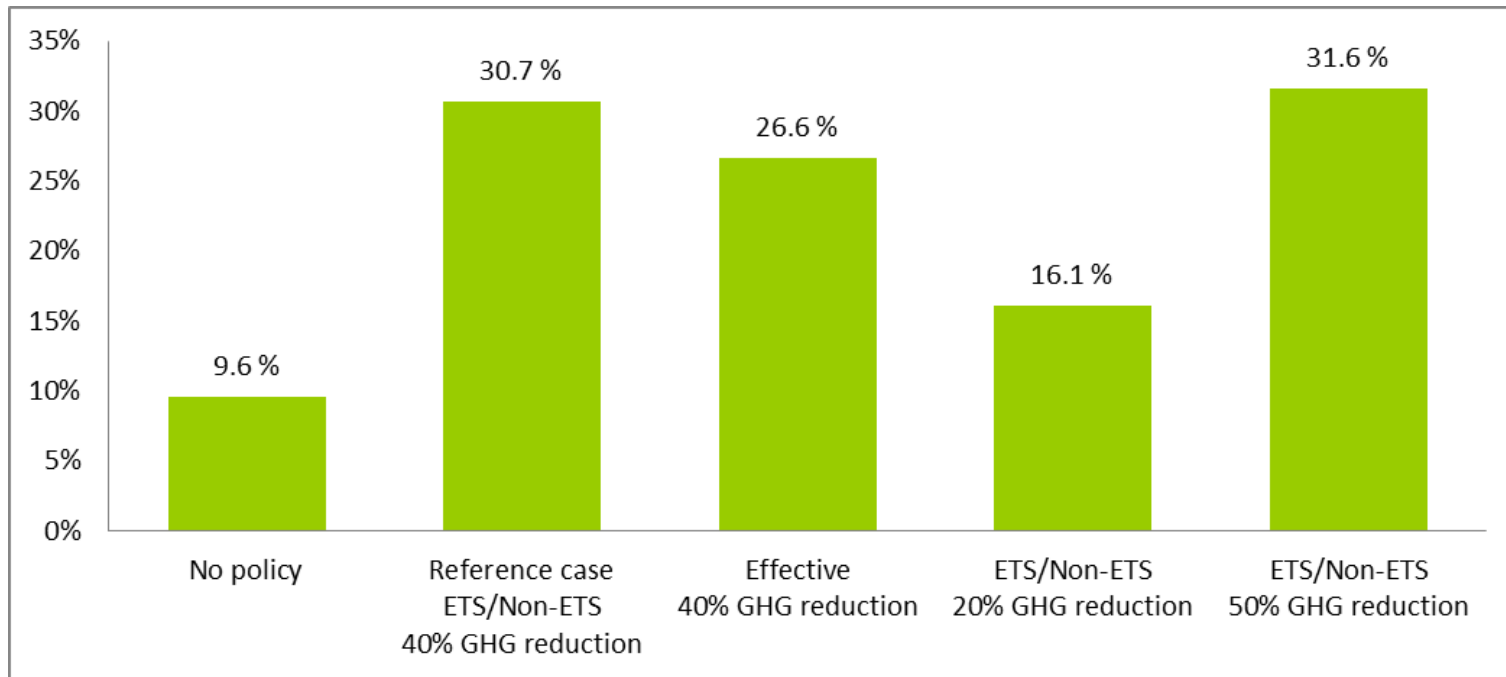


Power generation in Europe in 2030 (TWh)



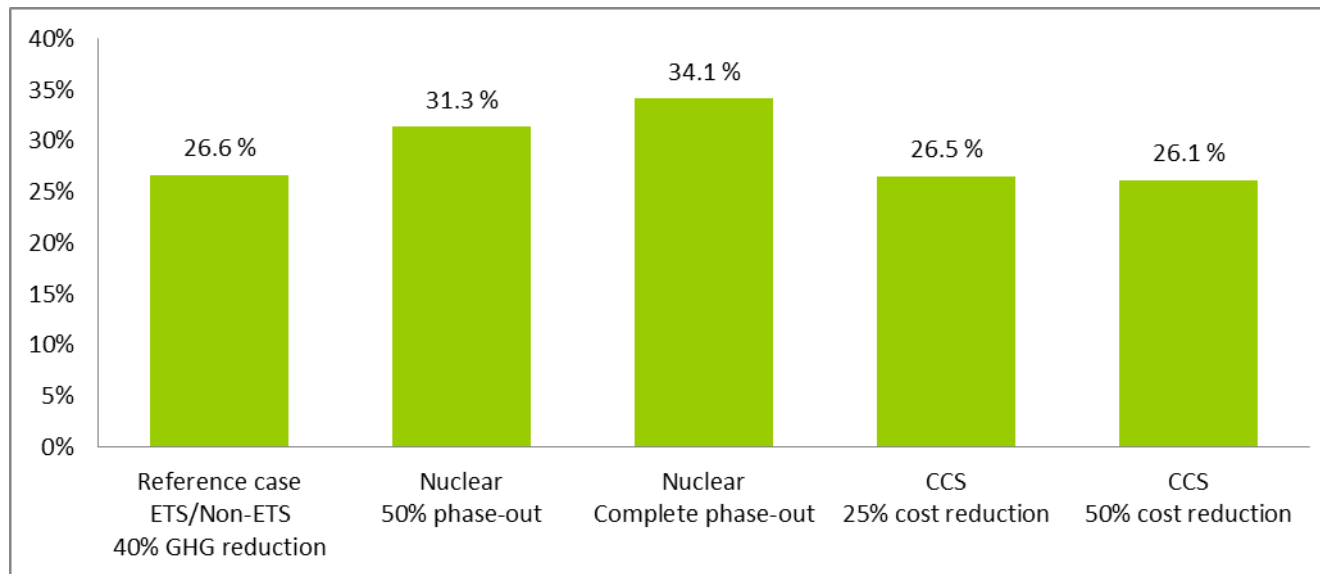
Renewable share in Europe in 2030

Reference case: 40 GHG-reduction, separate targets for ETS/non-ETS

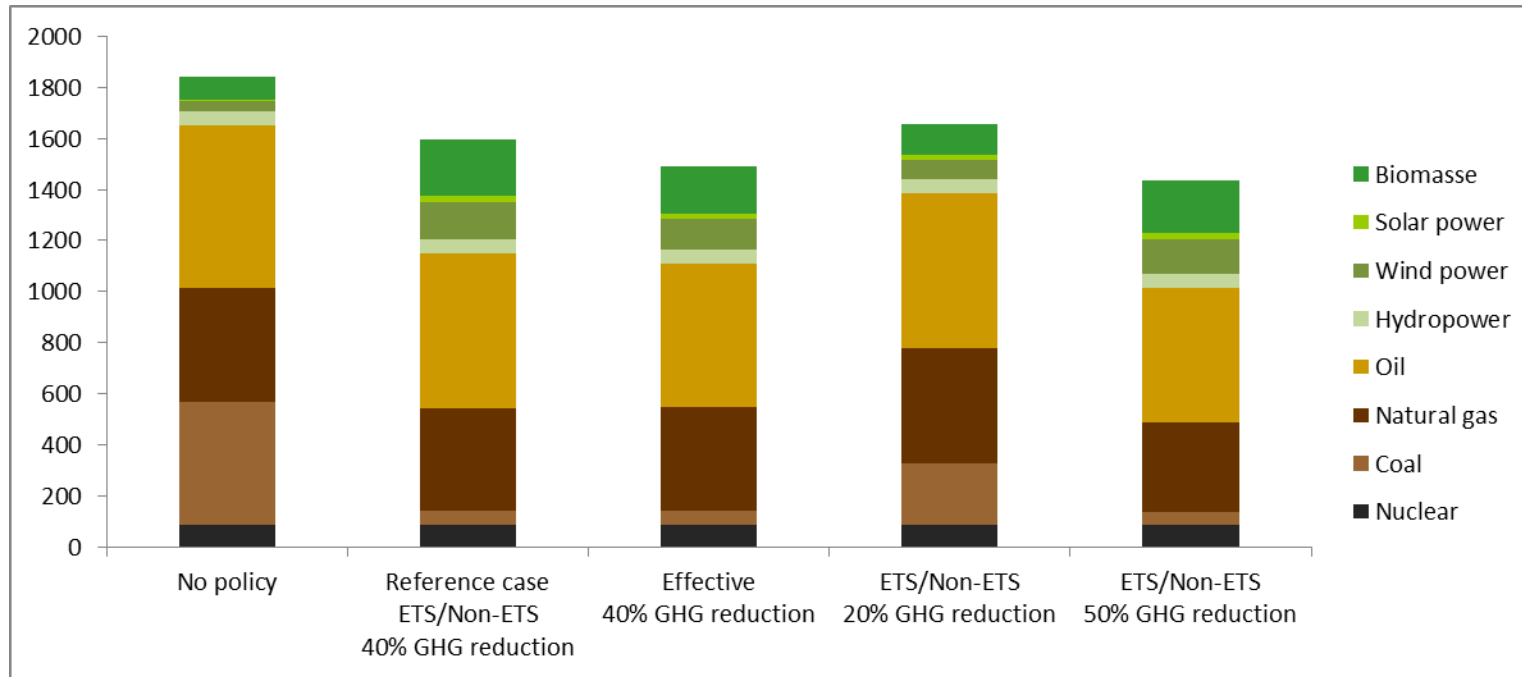


Renewable share in Europe in 2030

Reference case: 40 GHG-reduction, separate targets for ETS/non-ETS



Energy consumption in Europe in 2030 (Mtoe)



Energy consumption in Europe in 2030 (Mtoe)

