

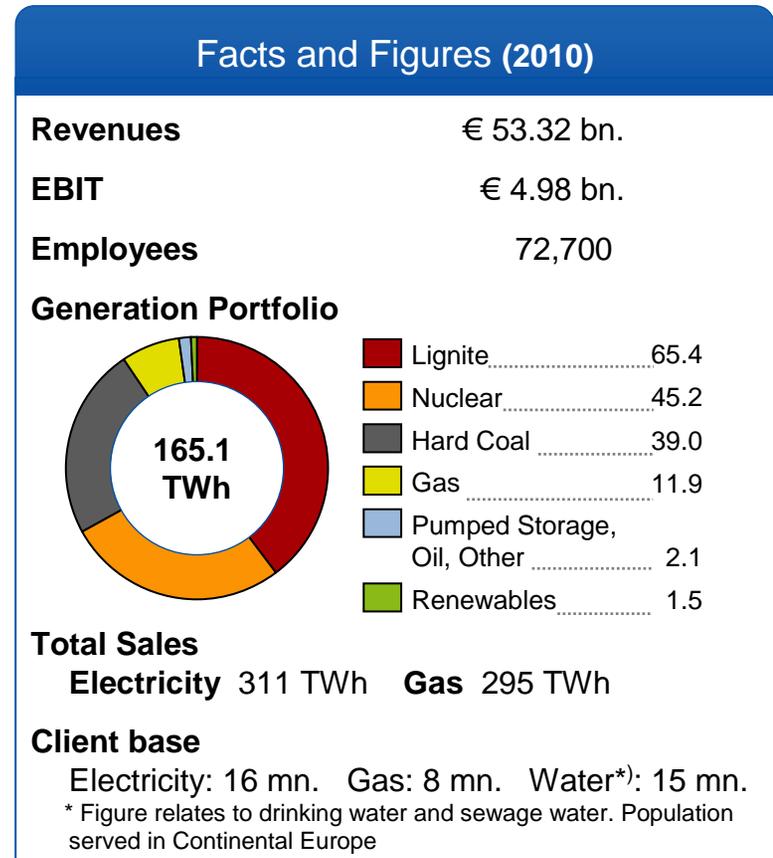
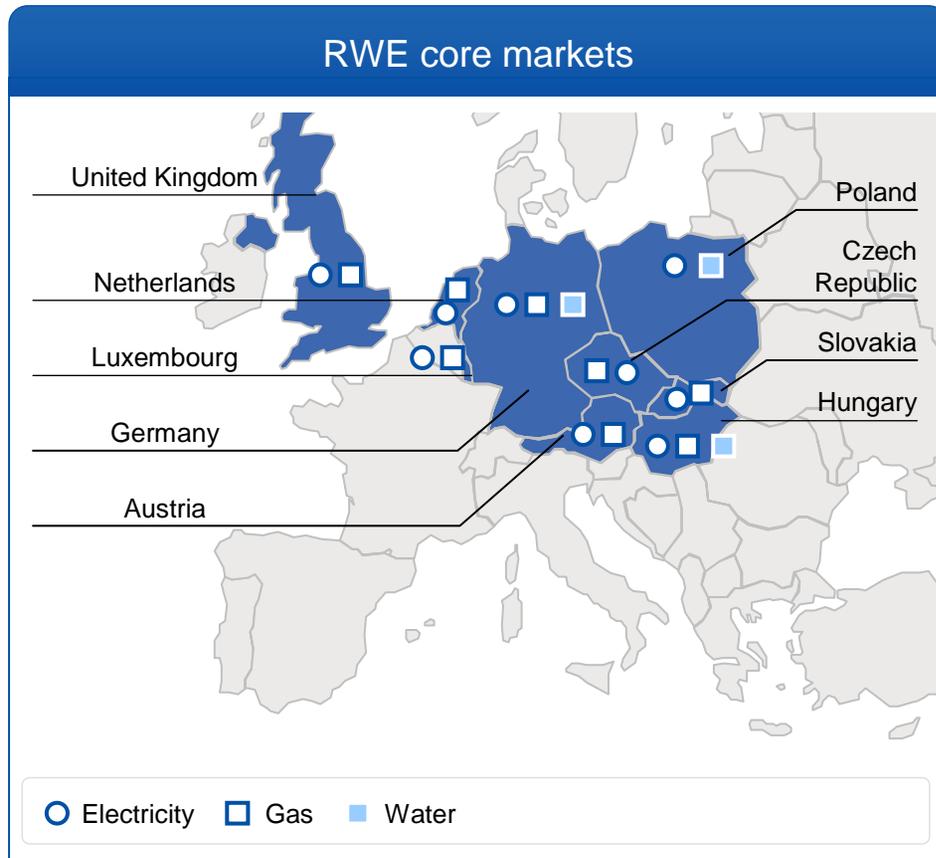
# The fallout from Fukushima on Germany and Europe

Graham Weale, Chief Economist RWE AG

UN Sustainable Energy Committee 16.11.2011

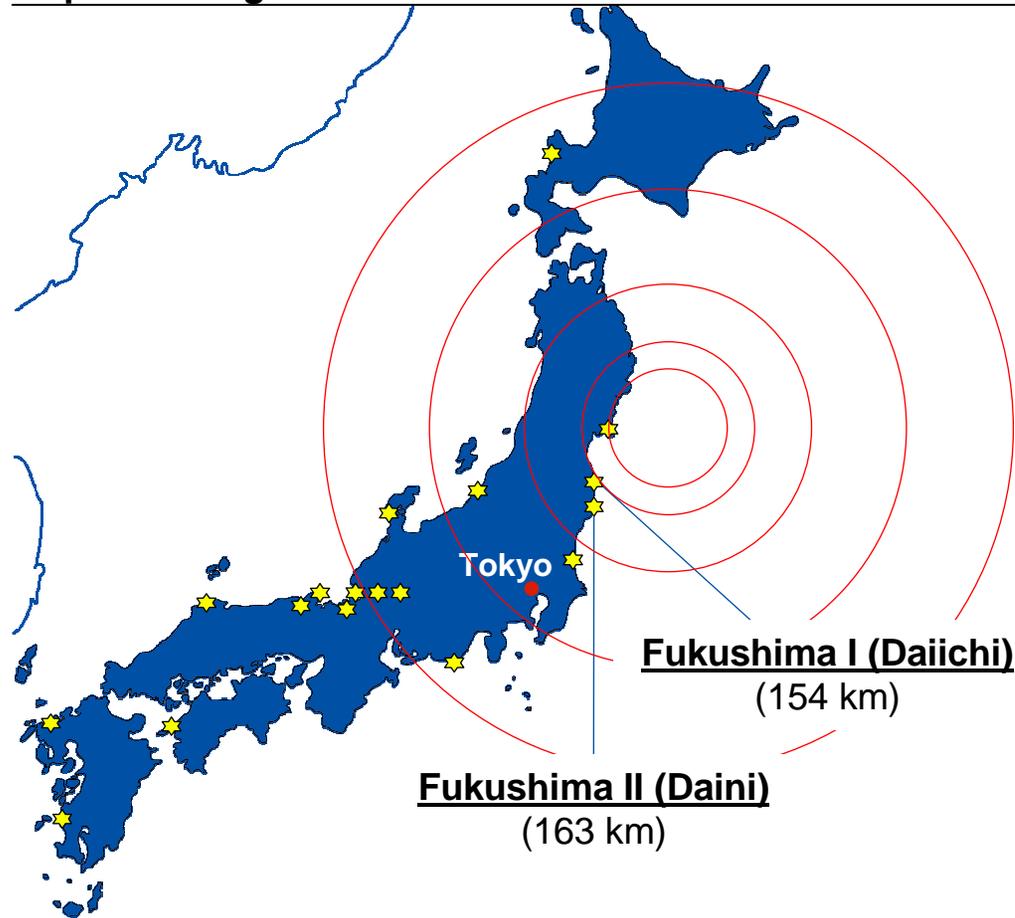
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# RWE is a Leading Integrated European Utility



# Tsunami in Japan on March 11 caused a nuclear catastrophe in Fukushima

## Map of the region



## Direct Effects

- Failure of diesel generators and, as a result, failure of cooling systems
- Temperature and pressure in reactor pressure vessel increase, water level decreases
- Fuel rods become uncovered and heat up

## Consequences

- Reactor core damage
- Release of fission products (xenon, iodine, caesium)
- Hydrogen production and release to reactor service floor (hydrogen explosion)

# On the one hand, German reactors are built in a way that prevents a similar catastrophe...

## Additional safety features of a typical German power plant

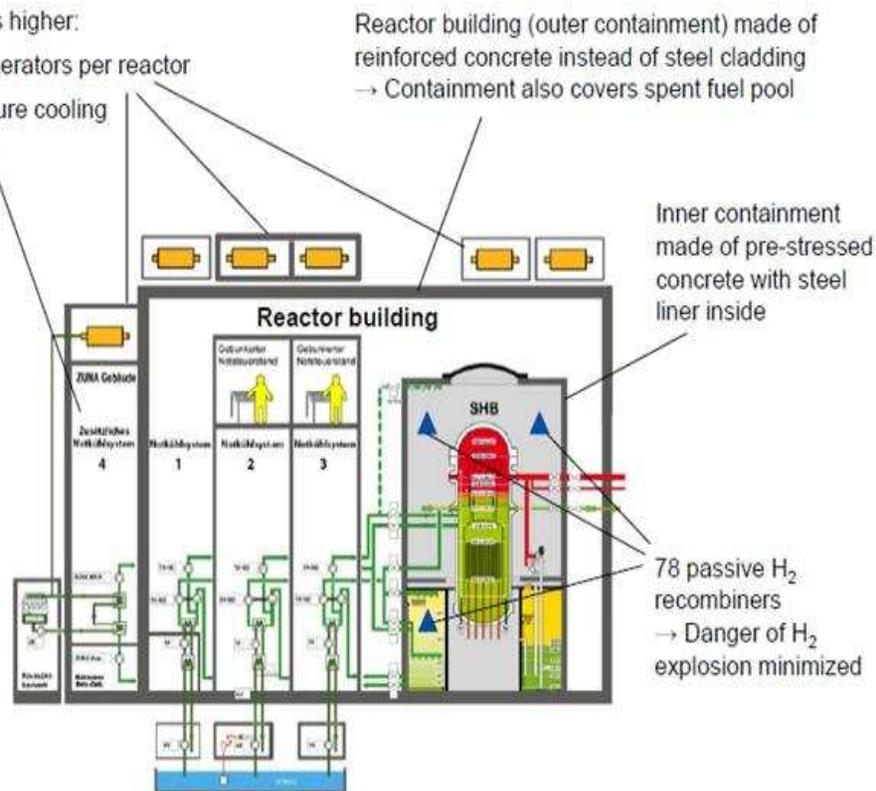
Number of safety systems higher:

- 6 instead of 2 diesel generators per reactor
- 4 instead of 2 low-pressure cooling systems per reactor

In addition, the safety systems are:

- flood-proof location
- physically protected
- spatially separated

Additionally temporary motor-driven pumps are available

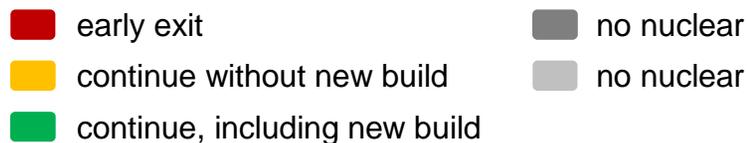
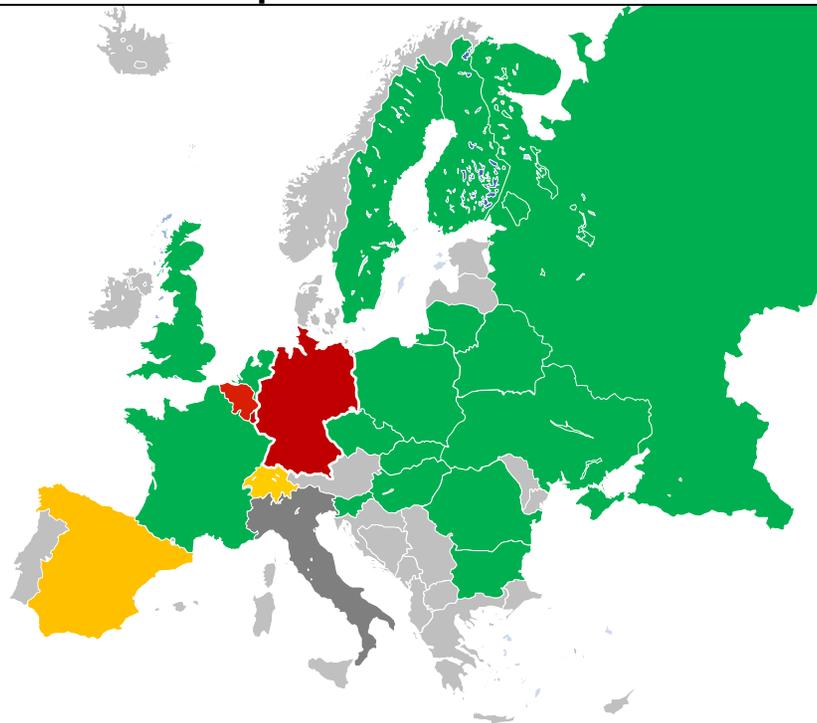


## Observations

- Japanese safety measures planned with most violent natural disturbances to occur once every ~100 years
- German nuclear power plants built to withstand the most violent natural disturbances in history with a further margin (1 in 10,000 years)
- The catastrophe in Japan did not lead to new insights about risk in German plants

# ... on the other hand, Germany reacted much more strongly than the rest of Europe

## Reactions in Europe



## Germany as an outlier

- German government made a quick and radical change in nuclear energy politics
- While nuclear exit had been planned as long term perspective before, the government quickly reacted with a moratorium:
- Eight nuclear plants were shut down immediately
- Comprehensive additional security checks initiated for all 17 nuclear plants
- Germany turns from a net export nation of power to a net import nation, importing mostly from pro-nuclear nations France and the Czech Republic
- The only other country to pursue an early exit strategy is Belgium

?

**What were the reasons for the strong reaction in Germany?**

# Lighting the touch paper - the political reaction in Germany was predictable

## Historic context - German character & post-war democracy

- German public opinion swinging between two extremes since the industrial revolution:
  - Complete assent and belief in power of technology
  - Scepticism of technology and more romantic idealism

1950s  
1960s

The opposition labour party wanted nuclear power, while power companies (with brown coal) were sceptical

1970s

Political development emerging, starting with the 1968 student unrest, from which Green party was born

- Desire for democracy beyond the ballot box

Industry boom, base load increase, cross party consensus pro-nuclear and in much of society

1980s  
1990s

Green party obtains parliamentary seats and form first coalition in Hessen, Green party rules with SPD on federal level from 1998

2002

Red-Green coalition agrees nuclear exit plan with operators

2010

CDU-FDP coalition extends lifetimes, but large parts of the public are sceptical

2011

Fukushima results in the „100-hour decision“ to exit nuclear ASAP

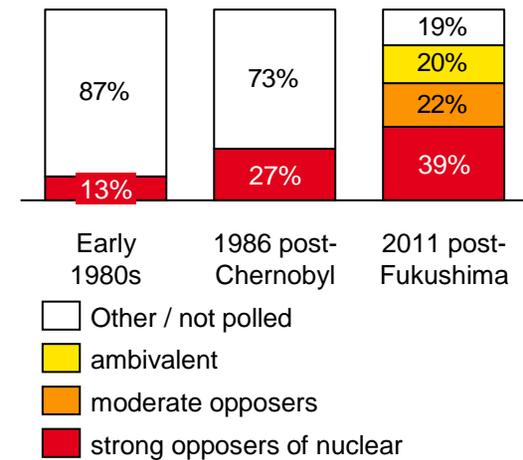
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## Public resistance



“The only thing that is safe / for sure is the risk” – Green Party

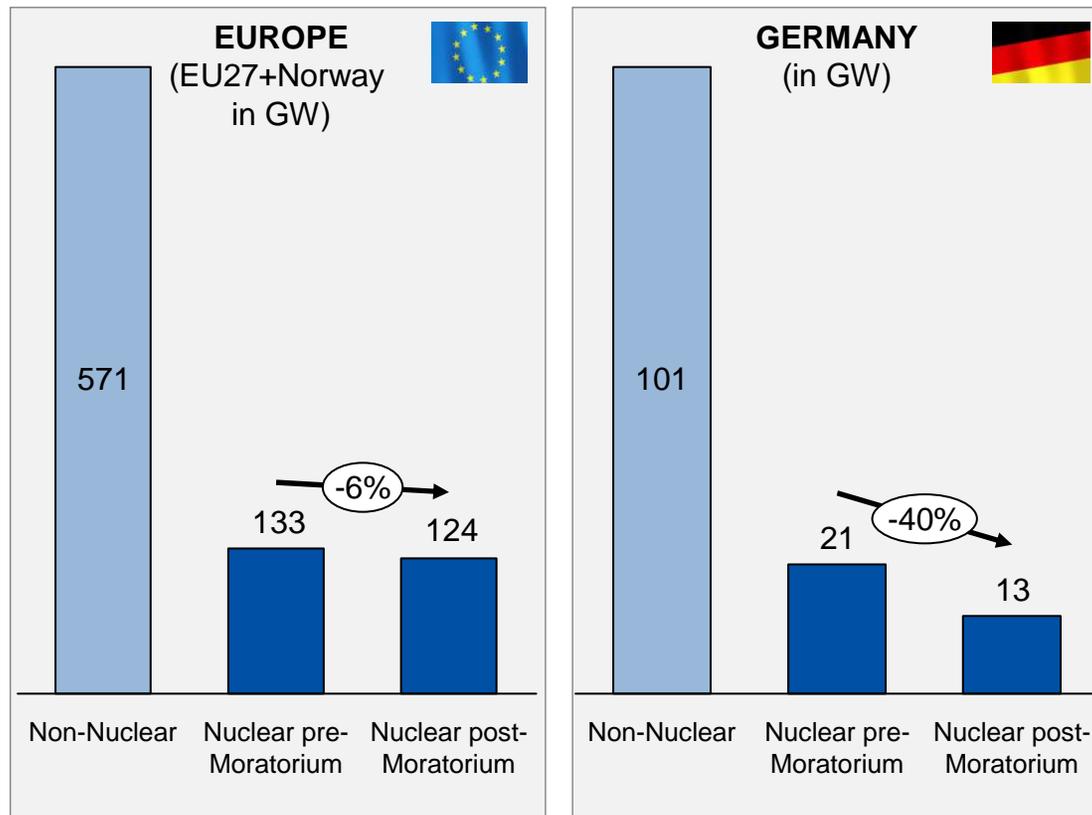
## German public opinion



Source: FAZ, Forsa

# The moratorium took 8 GW of installed nuclear capacity out of the picture overnight...

## Impact on installed conventional capacity<sup>1)</sup>



## Capacity impact

- Germany had 17 reactors with capacity of 21 GW
  - 8 GW closed in March
  - Others to close in stages by 2022
- 14 GW in conventional plants under construction, reduce impact of closures till 2020

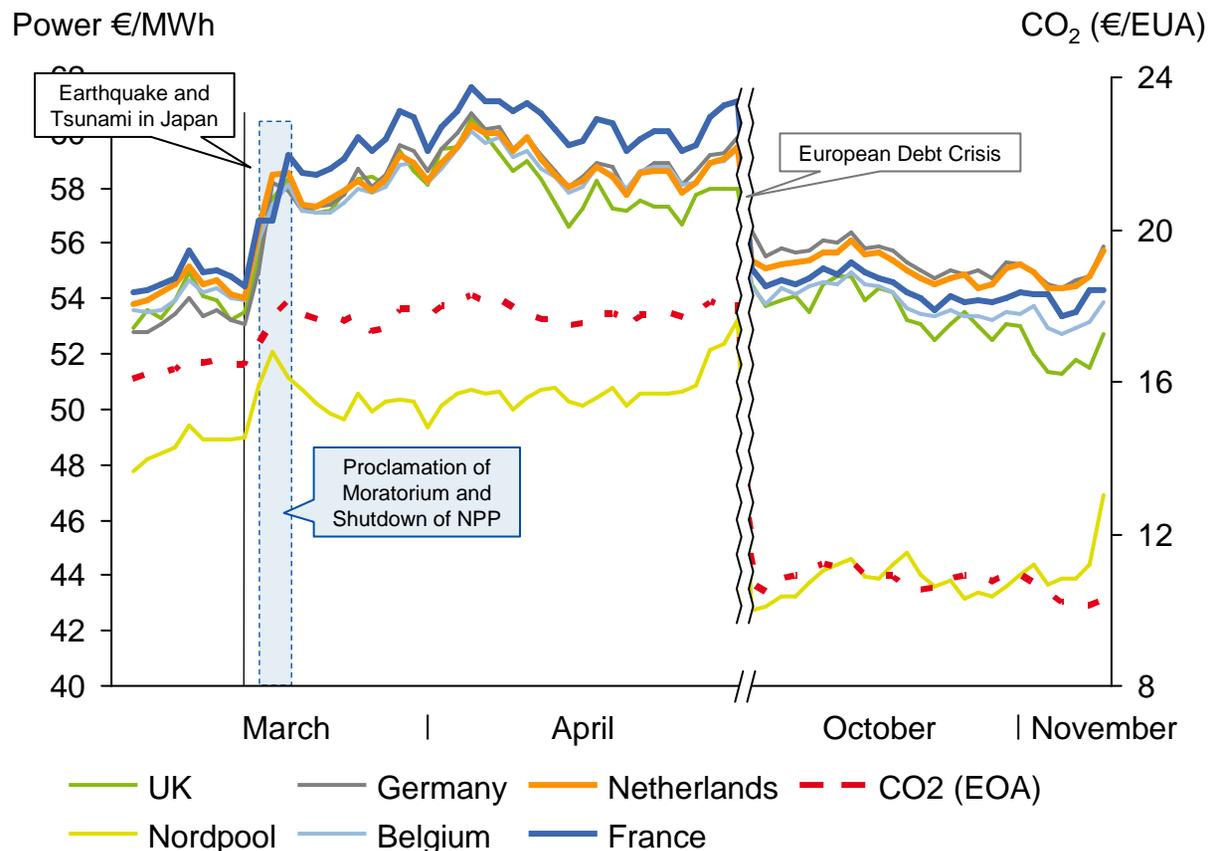
## Macroeconomic impact

- Annual gross value of the total production from nuclear plants in Germany was €8 bn. (that is 0.3% of GDP)
- Twelve year life-time extension originally agreed was worth €100 bn.

<sup>1)</sup> Includes Coal, lignite, Gas, Water, Nuclear, Biomass, but not wind + solar, that are weather dependent  
Source: EIA, BDEW RWE Consulting Analysis

# ...and the decision significantly effected CO<sub>2</sub> and power prices beyond German borders

## Observed energy and CO<sub>2</sub> prices since March 2011



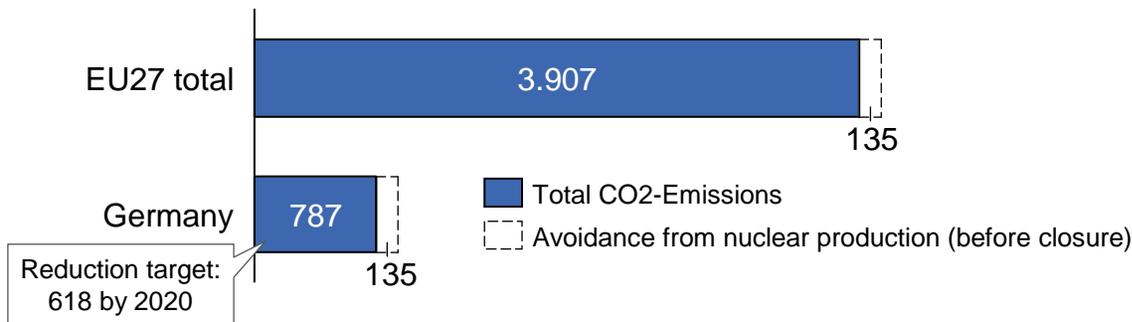
## Observations

- Power prices quickly increased after the event
- CO<sub>2</sub> prices increased significantly
- Steepest increase in prices during the proclamation in Germany

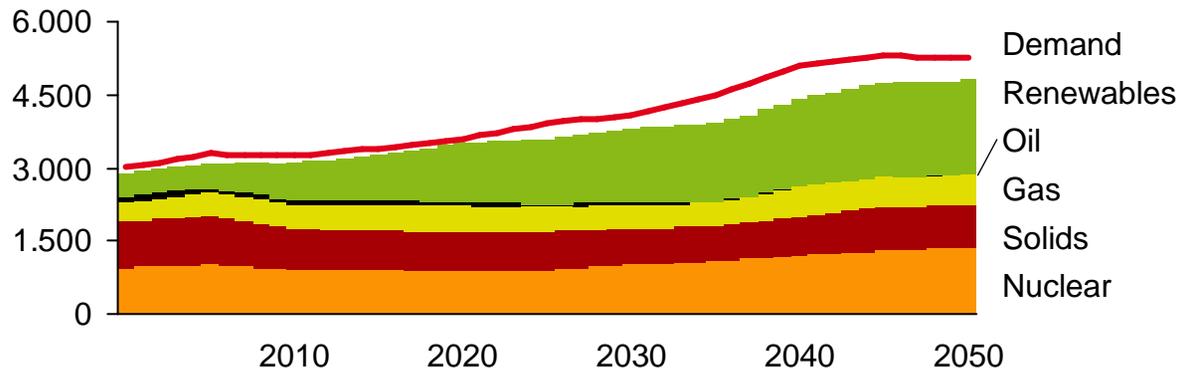
Note: Prices for UK given in GBP per MWh rather than €/MWh, they align to the same numeric scale  
 Source: ECX, EEX, Endex, Bloomberg

# The decision affects the CO<sub>2</sub>-footprint in Europe and brings forward the need for new capacity...

## CO<sub>2</sub>-Emissions



## Power supply & demand in Europe (in TWh, 2000-2010 and forecast)



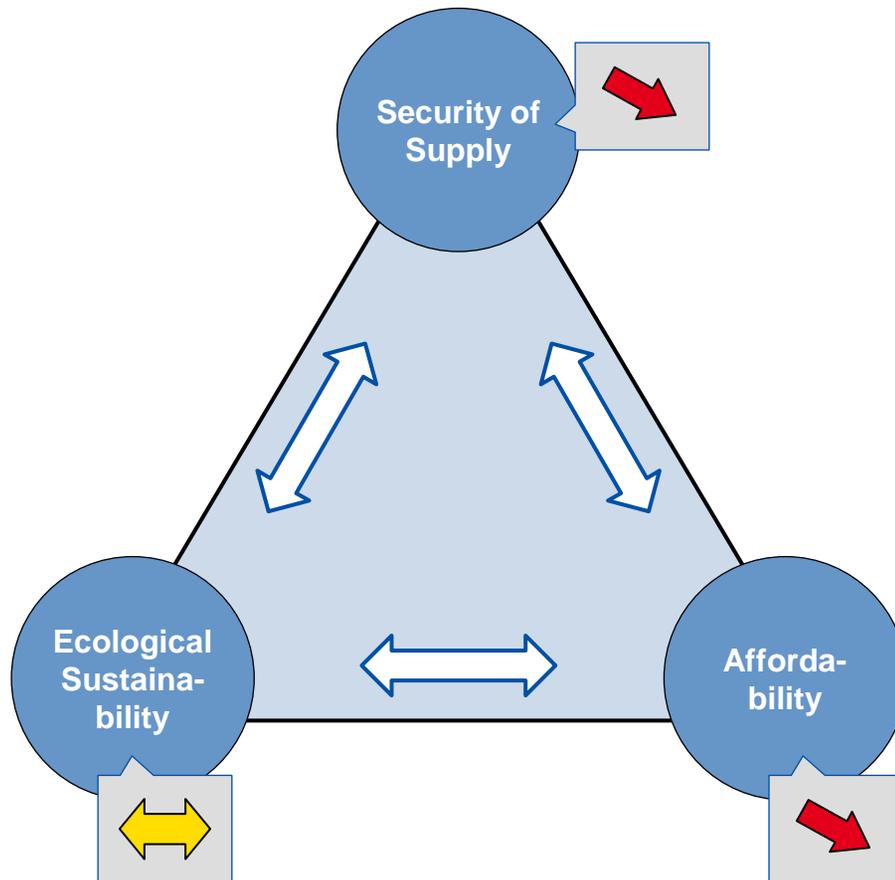
Source: Globaldata, BMU, Eurelectric: Power Choices

## Observations

- In the European context, 3.4% of total emissions are avoided by the nuclear plants in Germany
- Cost of meeting emission targets will increase for all countries as a result
- In 2020, German nuclear plants would have generated 103 TWh CO<sub>2</sub>-neutral energy, avoiding 75 mn. t. of CO<sub>2</sub>
- The additional use of gas and coal due to the fast exit threatens to produce more than 12% of the total 618 mn. tonnes of CO<sub>2</sub> to be emitted in Germany

# ...and has a threefold impact on European energy policy objectives

## Summary of impact for Europe



Note: Prices for UK given in GBP per MWh rather than €/MWh, they align to the same numeric scale  
Source: ECX, EEX, Endex, Bloomberg

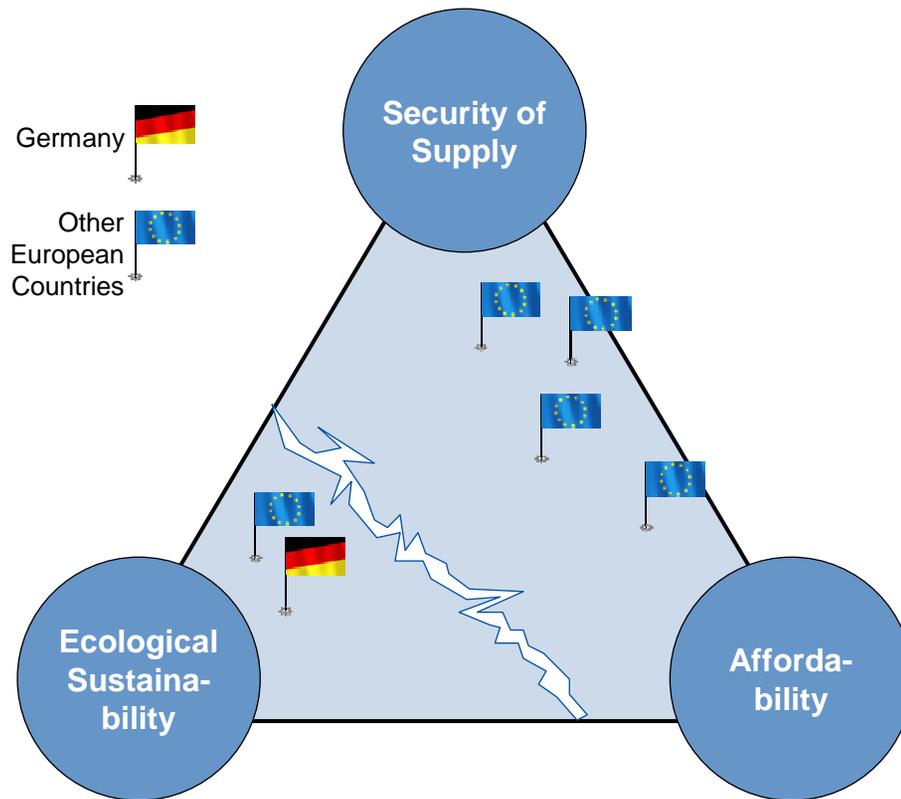
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## Observations

- **Security of supply impacted**
  - Capacity reduction in NW Europe
  - New challenges for high voltage grids (e.g. German north-south connection)
  - Plans to accelerate build-up of renewable in Germany but political concerns about cost, realisation & reliability
- **Increasing prices**
- **Ecological impact is matter of opinion:**
  - nuclear waste problematic, risk of nuclear incidents**vs.**
  - impact of CO<sub>2</sub> emissions from other base load technologies on climate change
  - Ecological & acceptance issues with renewables

# Heterogeneous energy political preferences in an integrated market are an international issue

## Heterogeneous energy political preferences



## Potential Role of UN

- Identify and discuss the different political streams in member countries and where those could be leading
- Engage a broad-based dialogue with experts on the range of normative instruments to ensure sustainable energy production & use
- Assist in the harmonisation of legislation and policies
- Assist member states on framework conditions for upstream investment
- Address issues such as the restructuring of the energy sector in the context of sustainable development

Thank you for your attention

**Graham Weale**

Chief Economist

RWE AG

Opernplatz 1

45128 Essen

T +49 201 12 17471

F +49-201-12-15227

mailto: [Graham.Weale@RWE.com](mailto:Graham.Weale@RWE.com)