

Decision Making on the Energy Transition in Germany

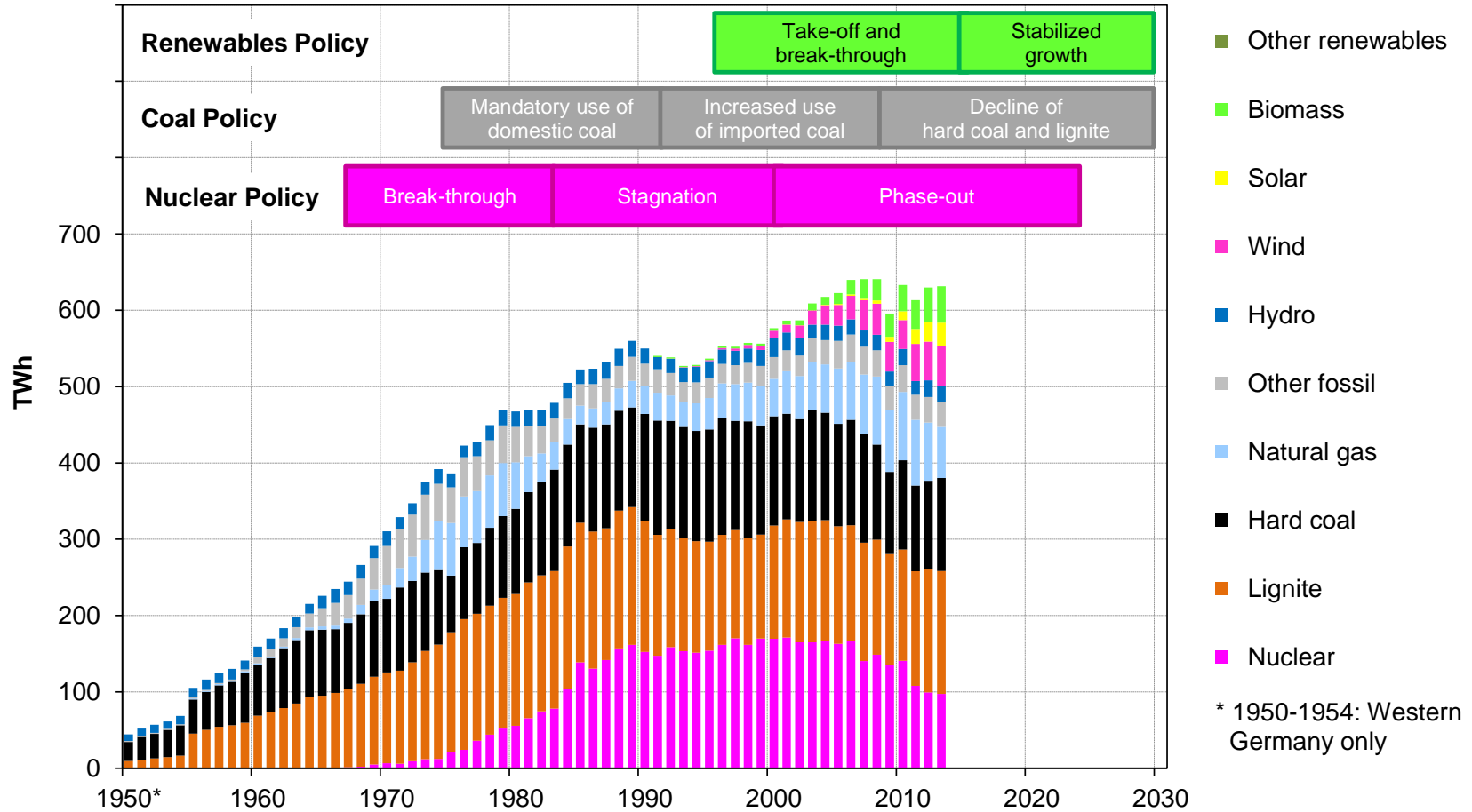
**Friedrich-Ebert-Stiftung (FES) / Energia Klub Workshop
» Options for Sustainable Alternatives of Nuclear Energy in Hungary «**

**Dr. Felix Chr. Matthes
Budapest, January 20, 2015**

- **The far-reaching energy policy decisions in Germany 2010/2011 are based on long process of system analysis and policy debates**
- **Nuclear policy**
 - Long history of controversial debates since 1975
 - Key decisions in 2000/2002 and 2010/2011
- **Alternative energy futures**
 - Alternative pathways considered in the energy policy debate since 1980
 - Long modeling tradition of alternative pathways
- **Climate policy**
 - Climate policy programs and packages since 1990
 - Non-partisan issue in German policy since the early 1990ies
- **Renewables policy**
 - Comprehensive support since 1990
 - Major modernisations in 2000 and 2014

Energy and nuclear policy in Germany

Power generation since 1950



Kohlenstatistik, Matthes (1999)

- **1955: Set-up of specific institutions to drive forward the use of nuclear energy (BMAAt, DAtK)**
- **1957: First Nuclear Program (focusing on research for German nuclear power technology)**
- **1967-1969: Commissioning of first demonstration projects (licensed US light water reactor concept) with heavy financial support by government**
- **1967: Strategy change by the electric utilities towards nuclear power, orders for 20,000 MW nuclear capacity by 1975**
- **1975-1986: Increasing and major protests at nuclear power plant sites, increasing relevance of nuclear waste issues**
- **1986-1989: Chernobyl disaster, social democrats changed position towards anti-nuclear, cancellation of the national nuclear waste reprocessing project (Wackersdorf, 1989), the high temperature reactor project (Hamm-Uentrop, 1989) and the fast breeder reactor project (Kalkar, formally in 1991)**

- **1989: Last nuclear power plant in (Western) Germany went into commercial operation (ordered in 1982)**
- **1990: Shut down of East German nuclear power plants (Soviet VVER design, four VVER 440/230 operational, four VVER 440/213 under construction or in trial operation)**
- **1994 (conservative-liberal government):
Revision of the Atomic Law (§ 7 Art.2a)**
 - Permitting of new nuclear power stations is limited to designs which guarantee that impacts from any incident can be restricted to the plant site and no major countermeasures will required outside the plant
 - Effectively a ban on new nuclear power plants (with respect to technologies available at this time (and today too?!))

- **2000/2002 (social democrat-green government):
Fundamental Revision of the Atomic Law**
 - Explicit ban on new nuclear power plants
 - Production quotas for existing plants (phase-out ~2025)
 - Increase of mandatory insurance to 2.5 bn €
- **2010 (conservative-liberal government):
Revision of the Atomic Law**
 - Revision of production quotas for existing nuclear power plants (8 to 14 years additional operation)
 - Phase-out to be finalized ~2040
- **2011 (conservative-liberal government):
Revision of the Atomic Law (post-Fukushima)**
 - Return to production quotas as of 2000/2002, complemented by fixed end dates of operation (2011 – 8 units, 2015/2017/2019 – 1 unit each, 2021/2022 – 3 units each)

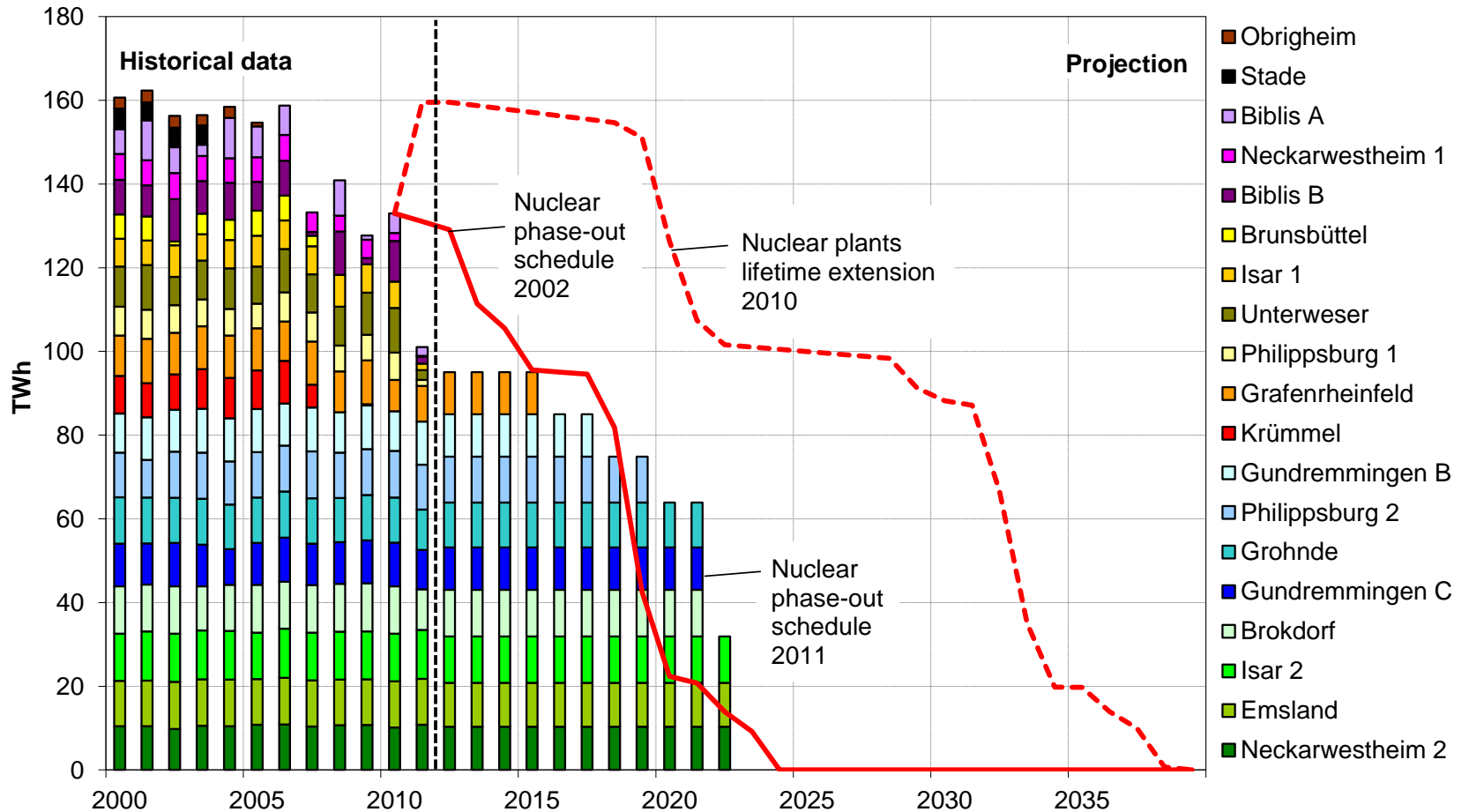
- **Alternatives to nuclear energy have been a key pillar of the energy policy debate in (Western) Germany**
 - 1980: Öko-Institut's book on "Energiewende"
 - 1980: The Study Commission "Future Nuclear Policy" considers for the first time a non-nuclear pathway ("Path 4") as one of the energy pathways for (Western) Germany
 - 1998: Official projections consider a gradual phase-out of nuclear energy for the first as best guess (Prognos/EWI "Trendskizze")
 - 1999: Official projections include a gradual phase-out of nuclear power in combination with ambitious GHG emission reductions by 2020 (FZ Jülich et al. "Politikszenerarien II")
 - 2002: First comprehensive long-term (2050) projections for nuclear-free decarbonisation pathways for Germany (German Bundestag's Study Commissions "Sustainable Energy")
- **Memo item: 2005: EU Energy Roadmap – the first official consideration of a low-nuclear decarbonisation pathway to 2050**

The 'Double U-turn' of German Policy

Neither badly prepared nor only about nuclear!

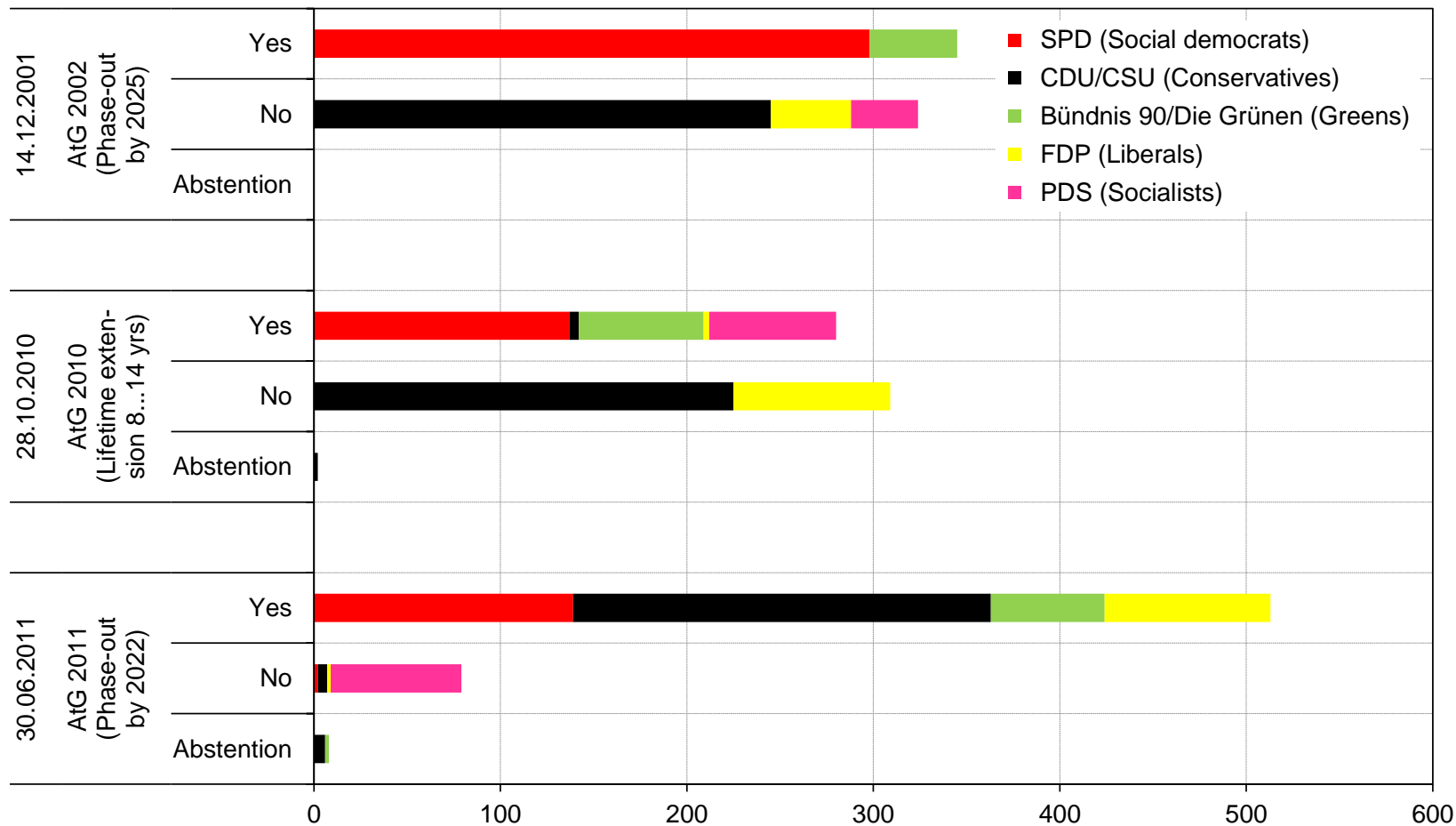
- **Highly controversial Energy Concept 2010 (September 2010)**
 - Lifetime extension of nuclear plants (by 8 to 12 years)
 - Ambitious climate and energy policy targets
 - Some additional policies (Energy & Climate Fund!), significant gaps in respective policies
- **Revision of the 2010 decisions (Spring/Summer 2011)**
 - Reversion of NPP lifetime extension, acceleration of phase-out
 - Confirmation of targets
 - Additional policies (efficiency, CHP, renewables, infrastructure, regulation)
 - Result: continuation of (well-discussed and well-prepared) strategies, now with a clear long-term focus
- **Comparable debates within the EU (apart from nuclear):
Low-carbon Economy Roadmap 2050, Energy Roadmap 2050)**

A look on Germany: Nuclear-phase-out was not a (very) surprising policy



Voting results on nuclear phase-out

The 2011 decision won't be reversed



Reminder: Awareness on risks of nuclear power is deeply rooted in major parts of society



- **“Die Wolke” (“The Cloud”)**
 - The bestselling novel (on a teenage couple during the time of a major nuclear accident) has been read by almost all German pupils at school
 - The movie has also been a blockbuster
 - Might have had the same impact than the “The China Syndrome” movie in the US
- **Memo item**
 - Germany was planned to be the (nuclear) battleground for World War III

- **The ethical dimension**
 - How to deal with risks of the level of potential damages is huge although the probability of occurrence is very low?
 - How to deal with extremely long-term risk and burdens of nuclear waste disposal?
- **The economic dimension**
 - Upfront technology costs (research etc.) (>>100 bn €)
 - Investment costs and (capital-intensive) cost structures (recently >5,000 €/kW)
 - Back end costs for decommissioning and waste disposal (DE: 1,000...2,000 €/kW)
 - Costs for major nuclear accidents (DE: 3,000-14,000 bn €) (DE: unlimited liability but (mandatory) insurance of 2.5 bn €)

- **The dimension of alternatives**

- Availability of alternatives (DE & Europe: sufficient low-carbon alternatives exist)
- Cost of alternatives
 - DE & Europe: wind and solar power is competitive with gas and coal – based on LCOE, appropriate power market design is crucial
 - nuclear becomes the most expensive option – UK nuclear CfD: 10.9 ct/kWh for 35 years, with inflation adjustment, DE renewable FiT 6...9 ct/kWh for wind, for 18 years, without inflation adjustment, <10 ct/kWh for solar for 20 years, without inflation adjustment
- System suitability (and the respective economics) of nuclear as a typical base-load option: the “baseload opportunity” disappears with shares of variable renewables >30%

- **The nuclear regulatory framework**
 - Designed to support nuclear power (before 2000), limited adjustments of safety standards for existing plants (airplane crash, terrorism etc.)
 - Formalistic approach to deal with the nuclear waste challenge (interim storage and reprocessing accepted as ‘proof of disposal’)
 - Legally binding nuclear phase-out (2000/2010, 2010, 2011)
 - A remaining issue: decommissioning funds hold by the companies
- **The energy market framework**
 - 1935-1998: monopolistic structure of the system, regional monopolies, approval of investments by the regulator and guaranteed payback for approved investments
 - 1998: liberalization of the electricity market (EU-wide), freedom of choice for all customers (increased vulnerability of utilities), wholesale market with price formation based on short term marginal costs
 - 2010: nuclear fuel tax
 - Since 1991: targeted support of alternatives (renewables, CHP etc.)

- **The framework for renewables**
 - Initial support schemes and programmes from 1990
 - Major modernisation and large-scale take-off in 2000
 - Major modernisation and first steps towards market integration
 - Targeted support schemes for non-electricity use of renewables (Renewable Heat Act, Market Incentives Programme)
- **The framework for energy efficiency**
 - Regularly updated building codes
 - Large-scale incentive programmes for renovation of buildings
 - Cogeneration Support Act
 - Ecological tax reform (most significant impact probably from indirect effects)
- **The framework for low-carbon energies**
 - European Union Emissions Trading Scheme
 - Complementary instrument to come in 2015?

**Thank you
very much**

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