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Los Incentivos de Corto y Largo Plazo para la Protección del Medio Ambiente: El Caso de Alemania

Michael Mehling
Ecologic Institute

*La Cumbre de la Tierra Rio+20:
Las Implicancias para el Desarrollo de Chile*
18 de abril de 2012



Economic Incentives for Environmental Protection

- ▶ Unprecedented levels of **investment in clean technology** and infrastructure needed to “green” the economy
- ▶ Example climate change: avoiding dangerous, irreversible climate change estimated to cost 1% of GDP per year, or nearly \$500 billion annually in the near term, rising to over **\$1 trillion per year** after 2020
- ▶ More than 80% of “green investment” will come from the private sector in response to policy incentives; **public investment** remains important in areas where private investment faces barriers (e.g. in education, research & development, planning, and large-scale infrastructure)

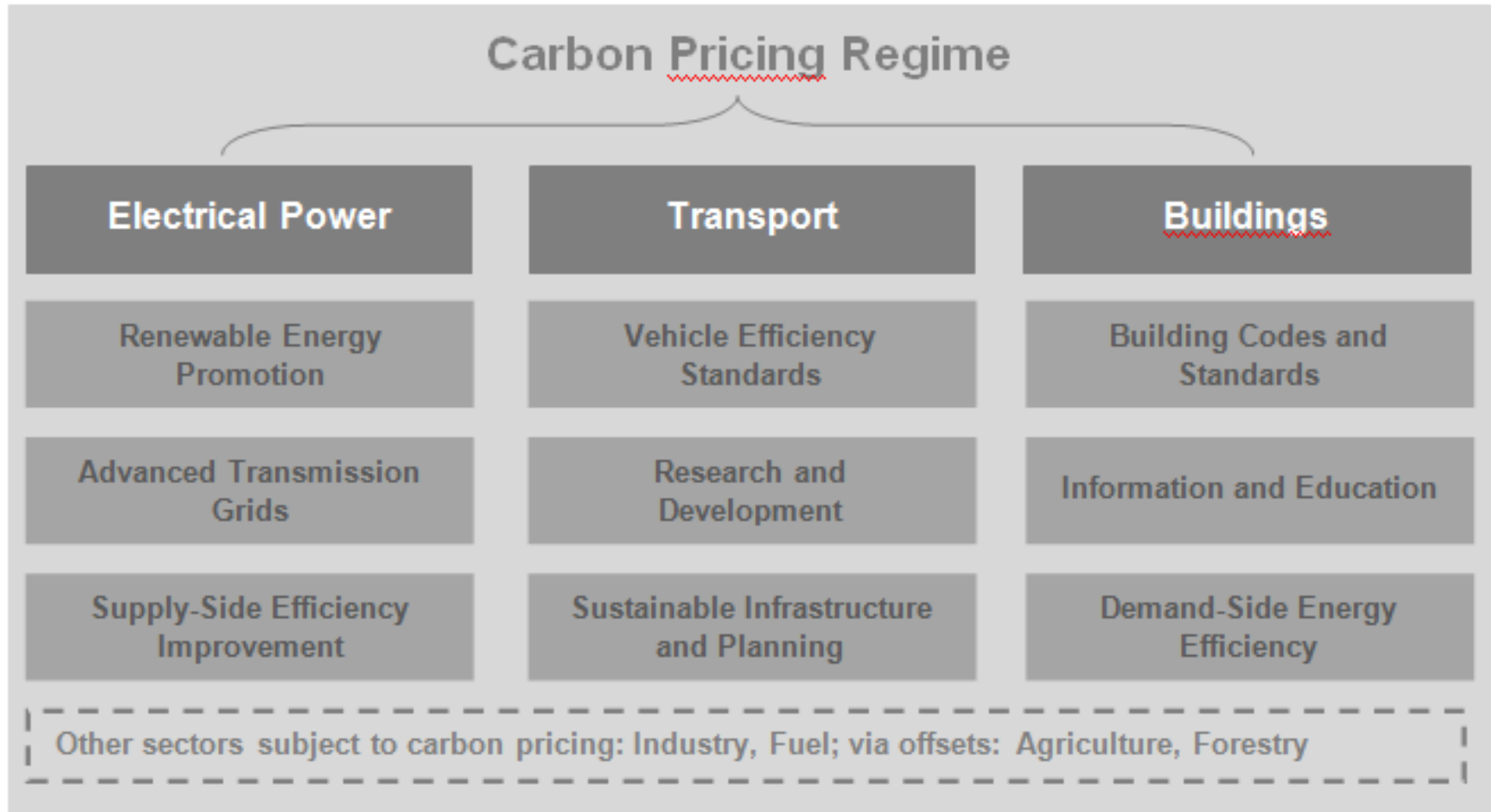


German Energy Concept of 2011: Targets and Timeline

	Climate	Renewable Energy		Efficiency		
	Greenhouse Gases (vs. 1990)	Share Electr.	Share Total	Primary Energy	Energy Productivity	Building Renovation
2020	- 40%	35%	18%	- 20%	increase by 2.1%/year	doubling of rate 1% --> 2%
2030	- 55%	50%	30%			
2040	- 70%	65%	45%			
2050	- 80-95%	80%	60%	- 50%		



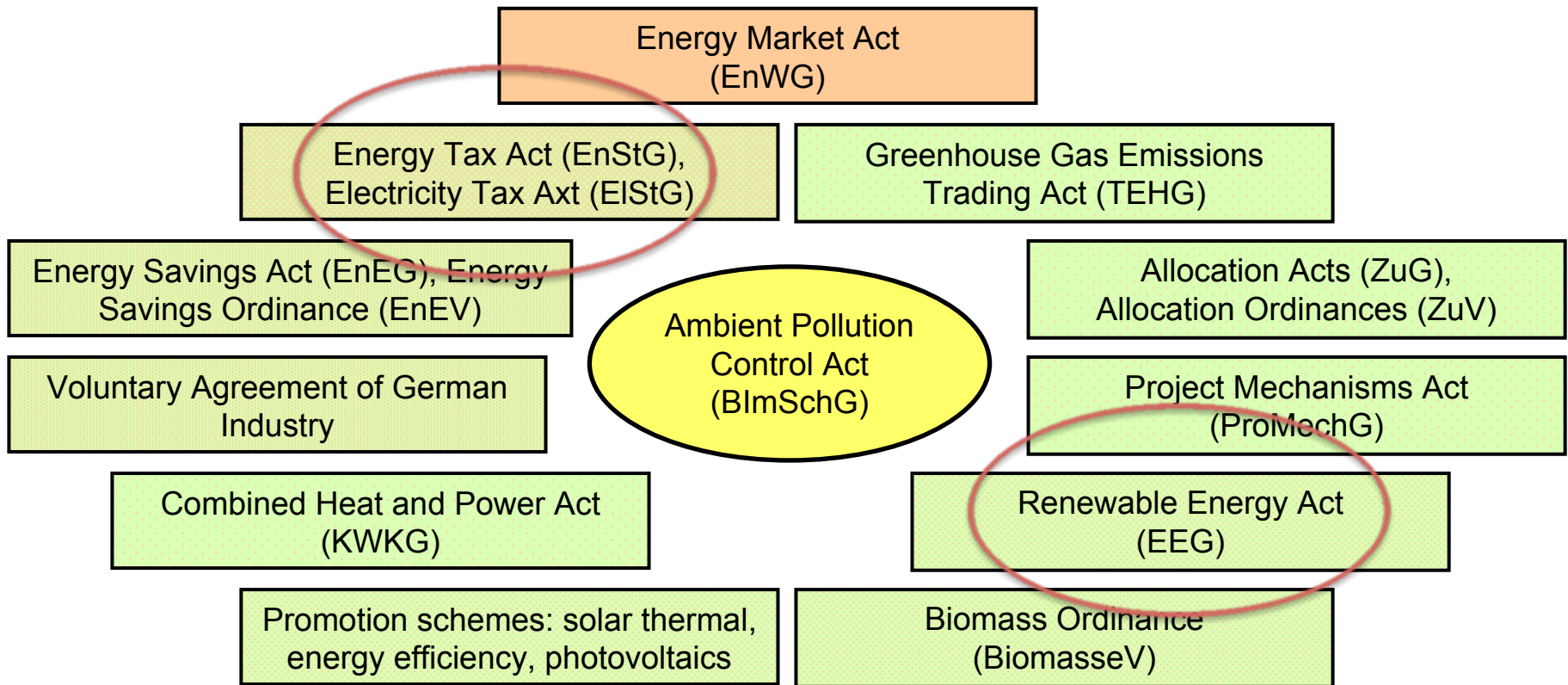
Policy Portfolio for Green Transformation



Source: Mehling et al., 2010



German Framework for Energy and Climate Policy





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Part 2: Ecological Tax Reform



Pricing Carbon: Cornerstone of a Sustainable Energy Economy

- ▶ A **price on carbon emissions** is “the logical foundation of any policy regime for clean energy” (World Economic Forum, 2009) – if sufficiently robust, it is the single policy action that can have the largest effect in promoting economically efficient low-carbon growth over the longer term
- ▶ A consistent price signal for carbon emissions can be provided through **emissions trading** or a **carbon tax**
- ▶ **Revenue** from carbon taxes or allowance auctioning can yield a key source of financing for public investment needs



“Ecological Tax Reform”: Principles and Evolution

- ▶ Basic Principle: “*Tax Evils, not Goods*” - shift fiscal burdens from production factors to negative externalities
- ▶ “*Double Dividend*”: a market failure is corrected while revenue is generated for the state to provide necessary public services
- ▶ Following nearly a decade of fruitless discussion at the level of the European Union, the German Parliament passed the “*Act for the Introduction of the Ecological Tax Reform*” in 1999
- ▶ Phased increase of tax rates on fuels and electricity in five stages



“Ecological Tax Reform”: Core Elements

- ▶ Increased tax rates on *mineral oil and gas* (“Mineralölsteuer”):
 - 3.07 cents per liter and year for gasoline and diesel from 1999 to 2003
 - 2.05 cents per liter and year for heating oil from 1999 to 2003
 - 36 cents per kWh of natural gas by 2003
- ▶ Introduced *new levy on electricity* (“Stromsteuer”):
 - 1.02 cents per kWh, increased by 0.26 cents per kWh from 2000 to 2003
- ▶ Tax of 33 cents per Gigajoule introduced in 2006 for coal used for heating purposes, but further increases of tax rates deferred until further notice

Source: Mehling 2000, 2006



Reactions to the “Ökosteuer”: Not Without Controversy

- ▶ Perception of undue burden on industries and competitiveness
- ▶ Consequence: Politically negotiated tax exemptions (60%) and rebates for manufacturing industries and agriculture
- ▶ Increased social transfers to the public instead of exemptions



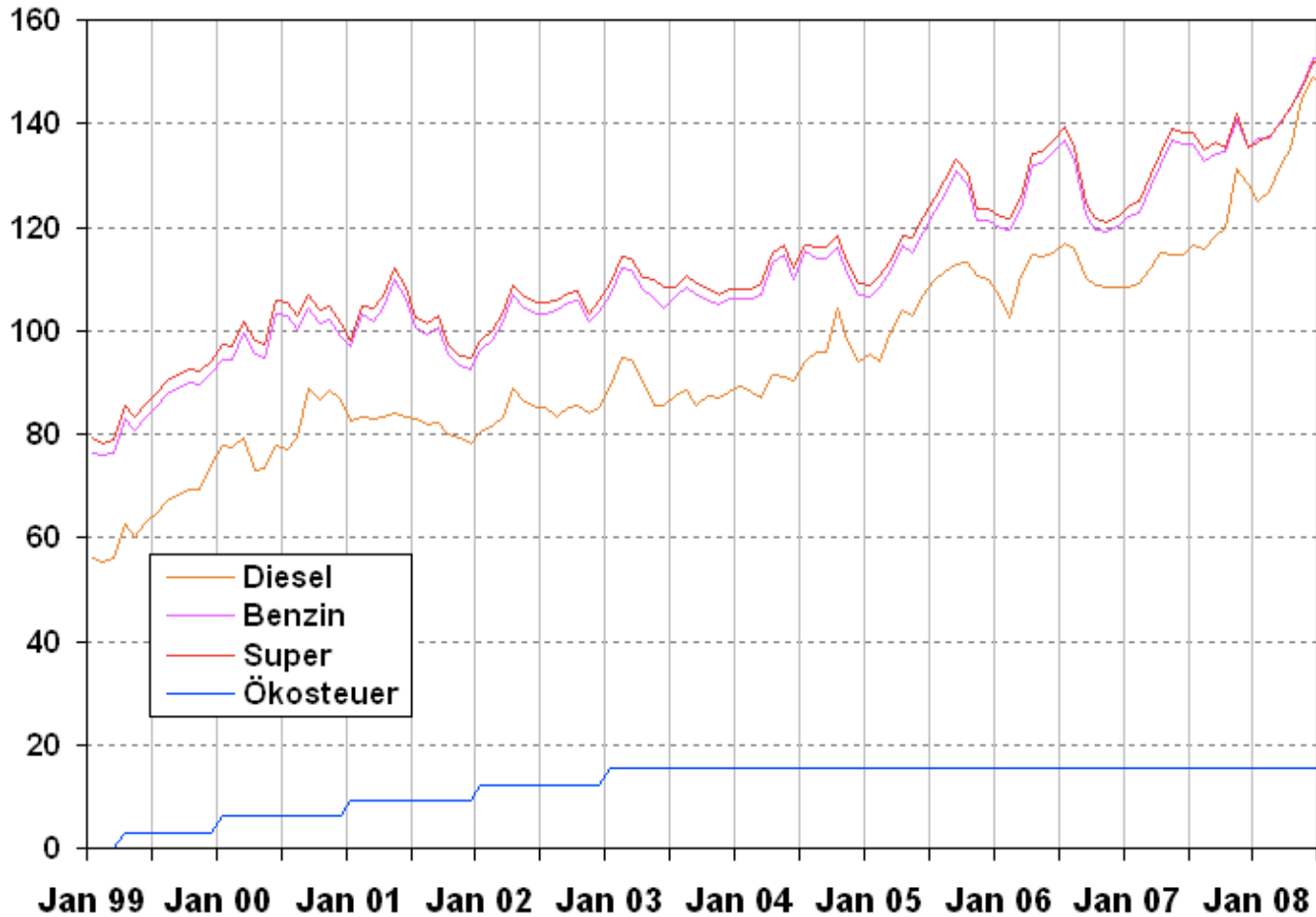
Bild: ADAC fordert Stopp der Ökosteuer

Berlin (AFP) - Angesichts neuer Rekordstände bei den Benzin- und Dieselpreisen hat der ADAC eine steuerliche Entlastung der Autofahrer in Deutschland gefordert. Verbandspräsident Peter Meyer sagte der "Bild"-Zeitung (Freitagsausgabe), der ADAC fordere eine sofortige Aussetzung der Ökosteuer. Nach Berechnungen des Verbands zahlt ein typischer Verbraucher mit einem VW Golf bei einem Verbrauch von acht Litern auf 100 Kilometern und 15000 Kilometer Jahreslaufleistung mittlerweile jährlich 1759 Euro für Normal- beziehungsweise Superbenzin. Das seien 151 Euro mehr als im Vorjahr und entspreche einem Anstieg um 9,4 Prozent. Gegenüber April 2002





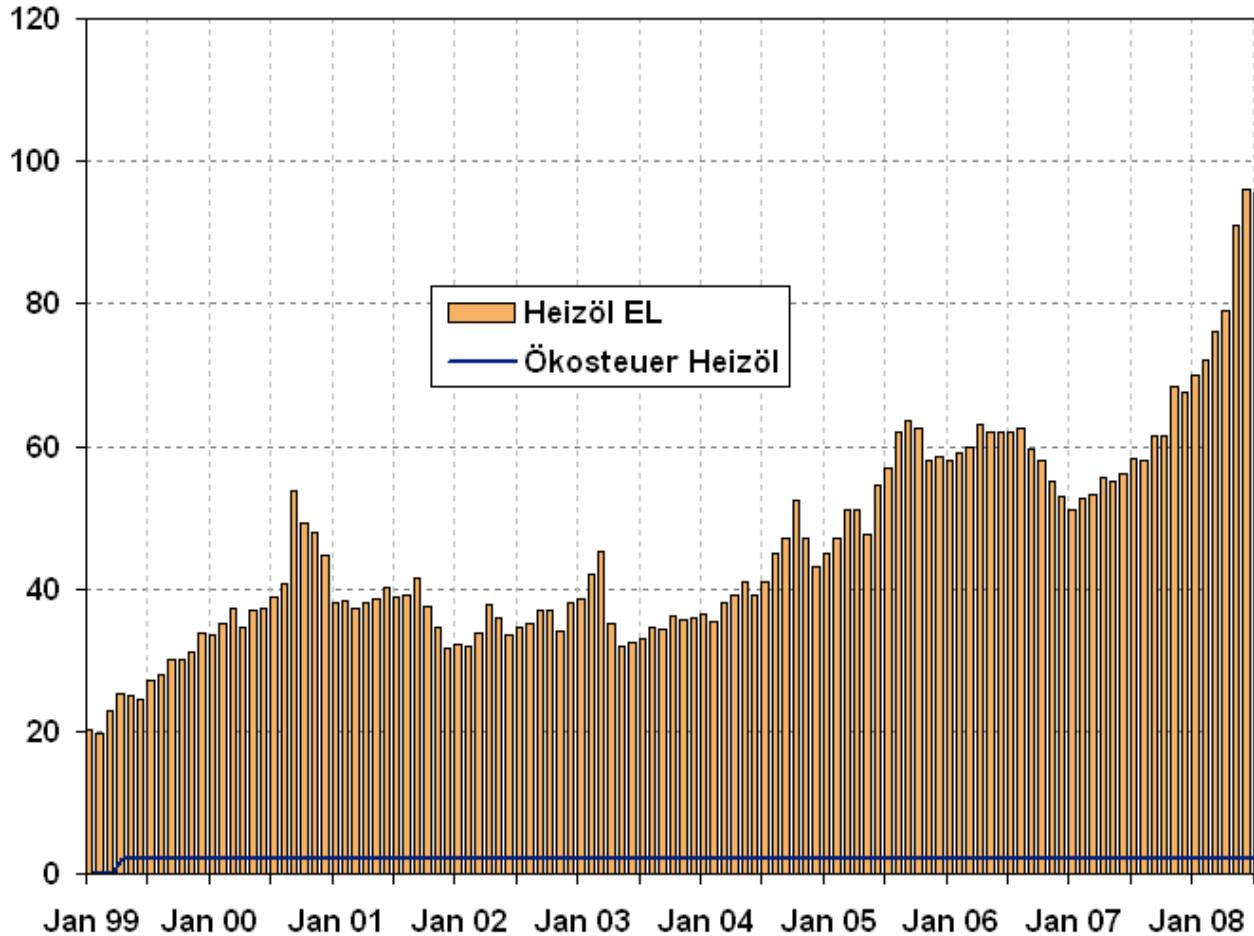
Ecological Tax in 1l of Transport Fuel (ct/l)



Source: UPI



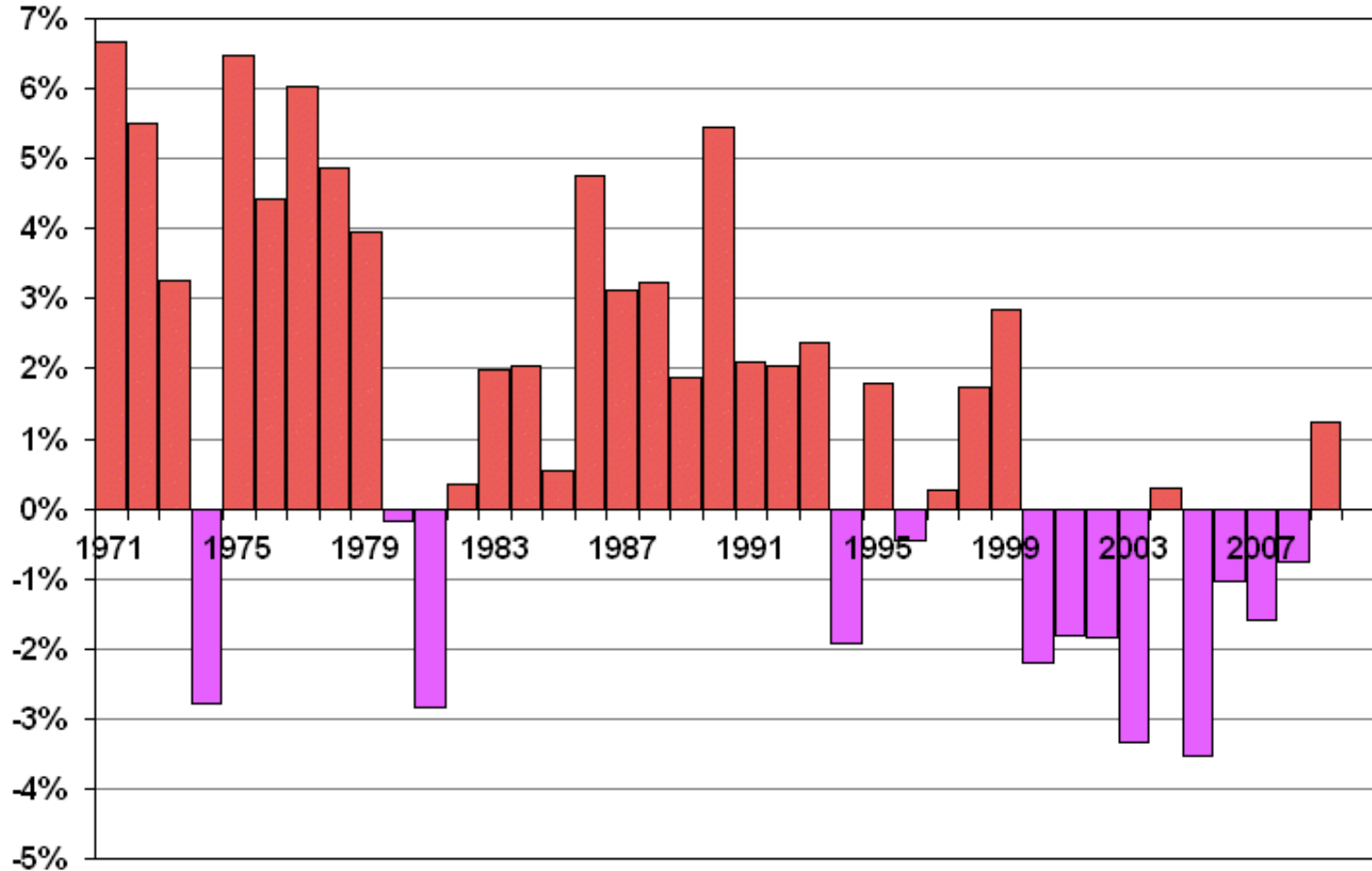
Ecological Tax in 1l of Heating Fuel (ct/l)



Source: UPI



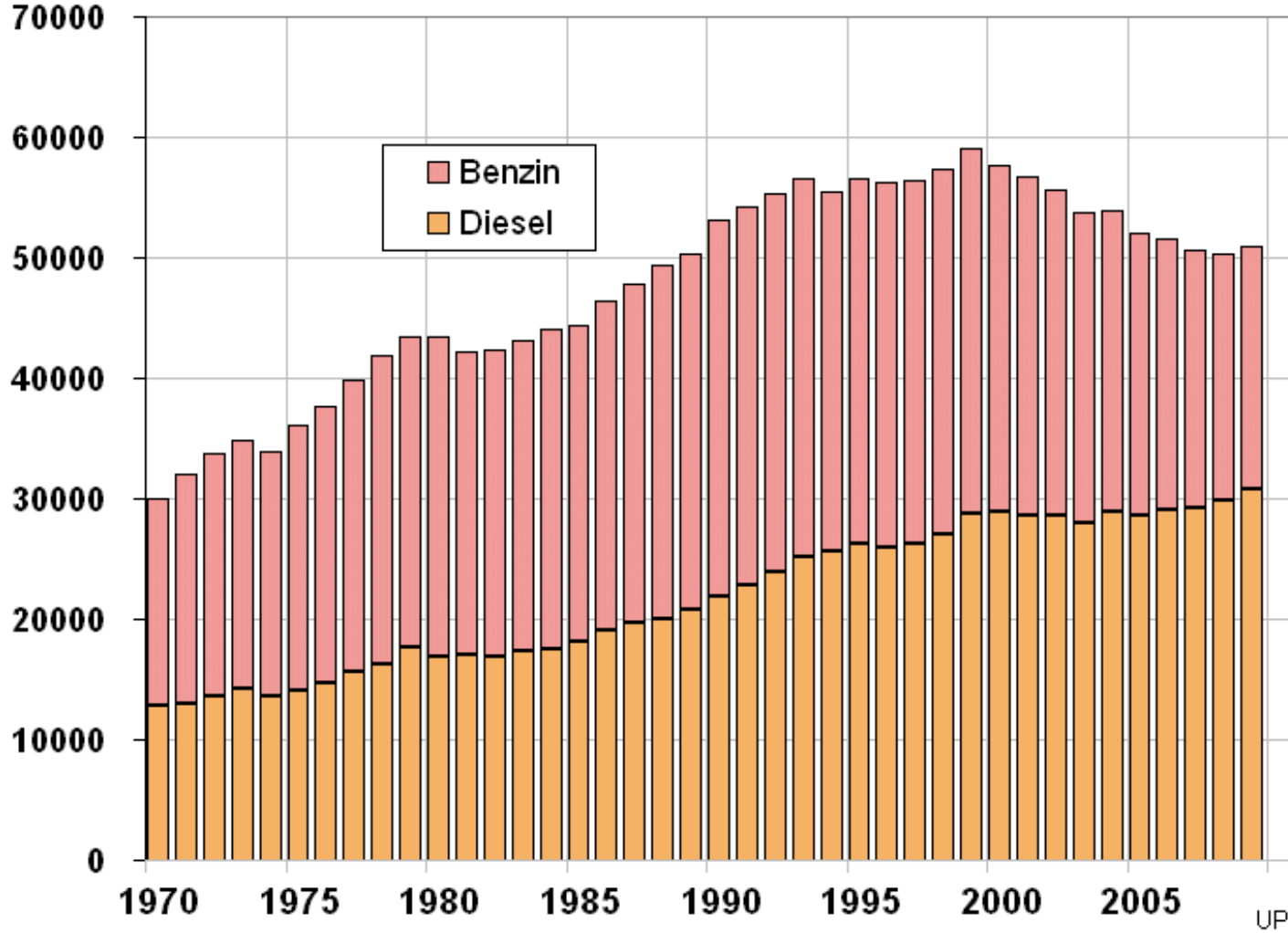
Changes in the Consumption of Gasoline and Diesel



Source: UPI



Changes in Transport Fuel Consumption (kt/year)





“Double Dividend” of the Ecological Tax Reform

- ▶ Revenue largely earmarked to **reduce non-wage labor cost**:
In 2003, roughly 16.1 billion EUR in revenue allowed a reduction of pension contributions by 1.7 % of wage costs
- ▶ Empirical studies suggest a **positive macroeconomic balance**:
Tax reform is officially estimated to have created 250.000 new jobs by 2005, and yielded 100 mio. annually invested in subsidies and tax credits for renewable energy and energy efficiency
- ▶ **Behavioural change**: By 2010, the reductions of CO₂ emissions were estimated at 3 percent, or roughly 24 million tons of CO_{2eq} per year

Source: Mehling et al., 2011



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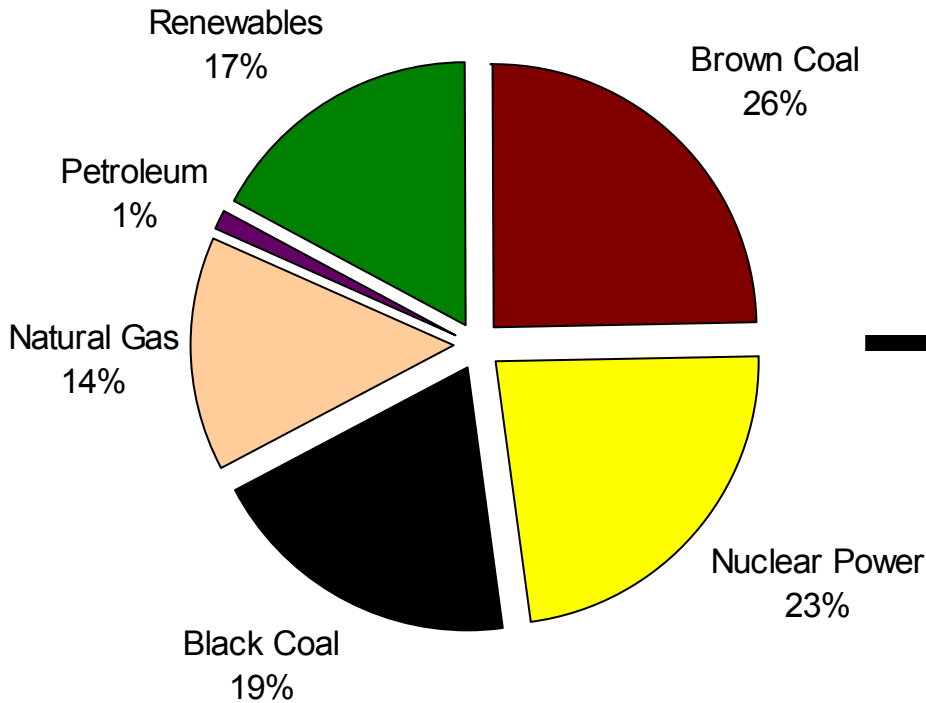


Part 3: Promoting Renewable Energy

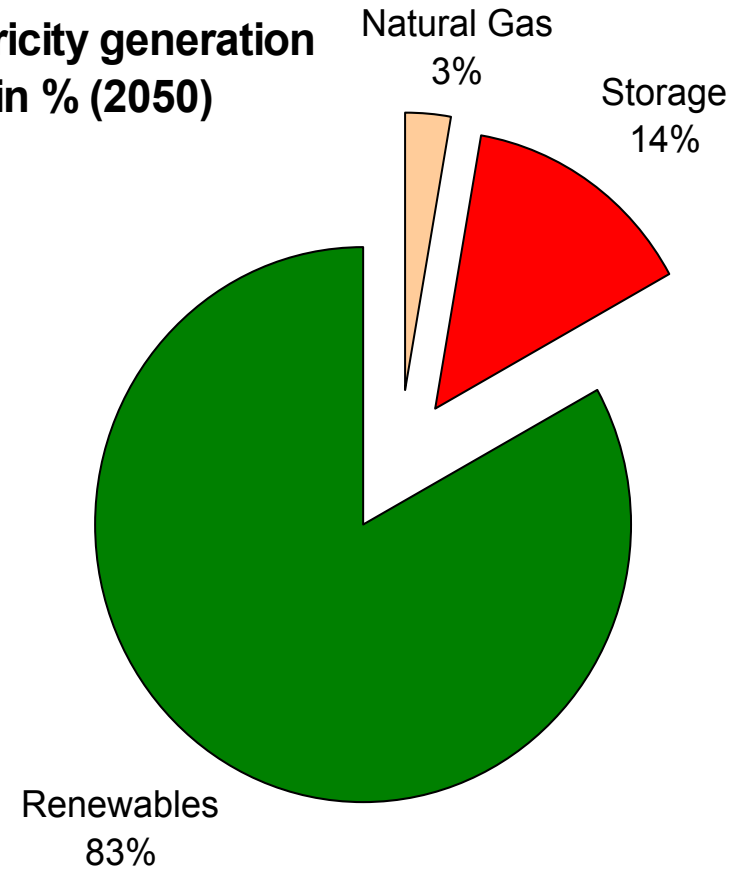


Electricity Generation 2010 - 2050

Electricity generation in % (2010)



Electricity generation in % (2050)



(Source: Prognos & Ökoinstitut, 2010)



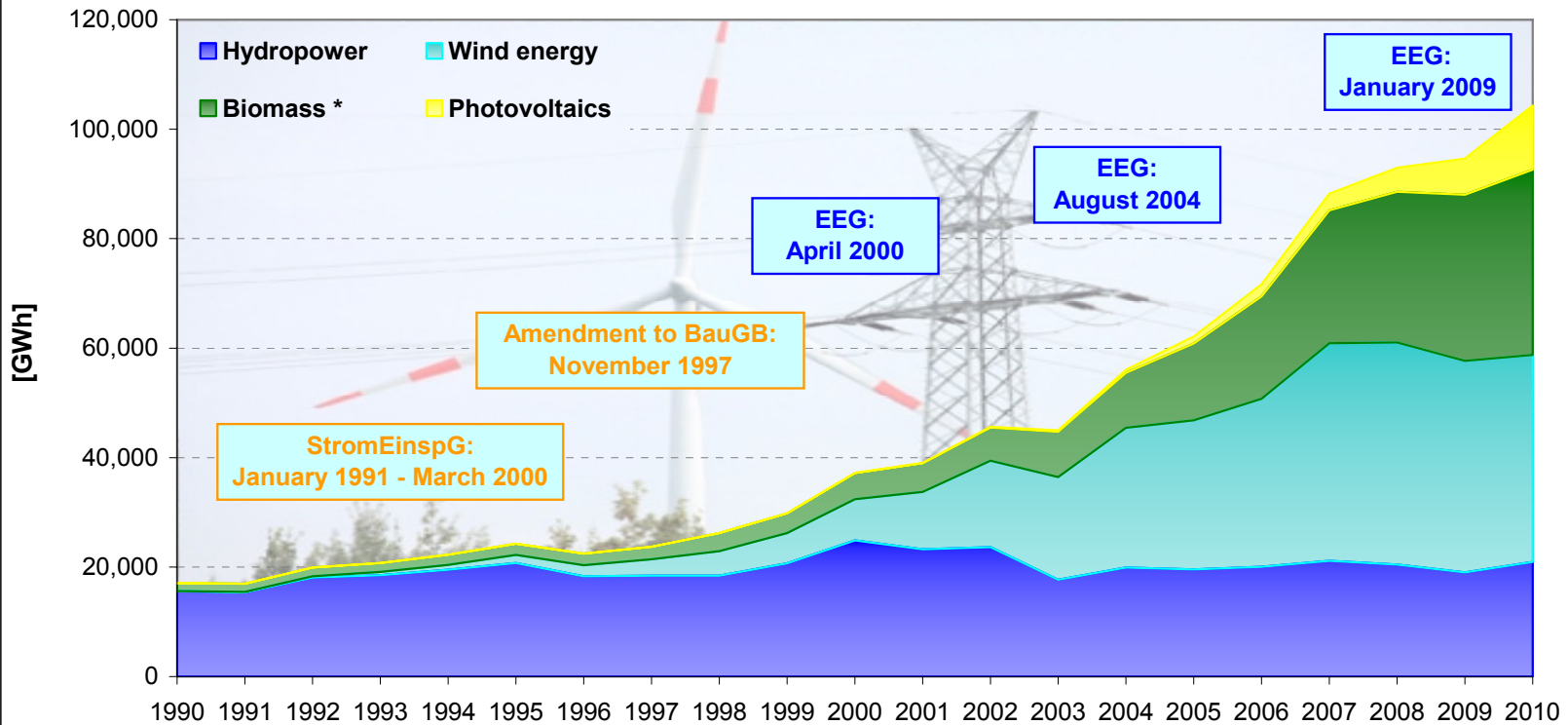
Germany's Approach: Feed-in Tariff (FIT)

Feed-in Priority and 20-Year Guaranteed Rates for Renewable Energy

- ▶ 2009 European Union directive on the promotion of renewable energy: 20% of energy in the EU to come from renewable sources by 2020.
- ▶ Germany: Feed-in guarantee since 1990, Renewable Energy Promotion Act since 2000; three major overhauls, most recently 1 January 2012
- ▶ Targets: 35% electricity generation from renewable sources by 2020, rising to 50% by 2030, 65% by 2040 and 80% by 2050
- ▶ Currently, renewable energy accounts for over 20% of electricity generation in Germany (approx. 14% of primary energy demand)



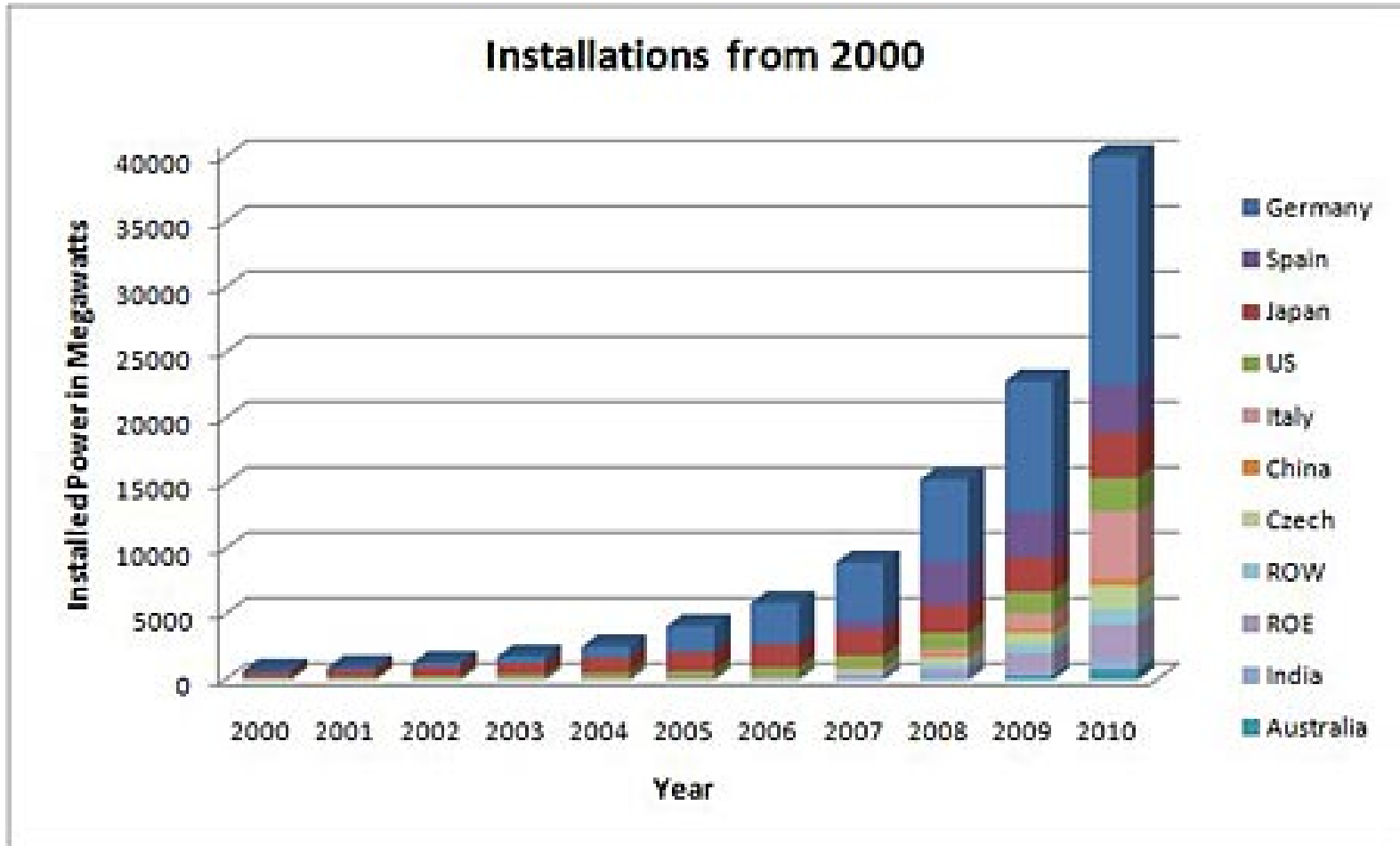
Contribution of renewable energy sources to electricity supply in Germany



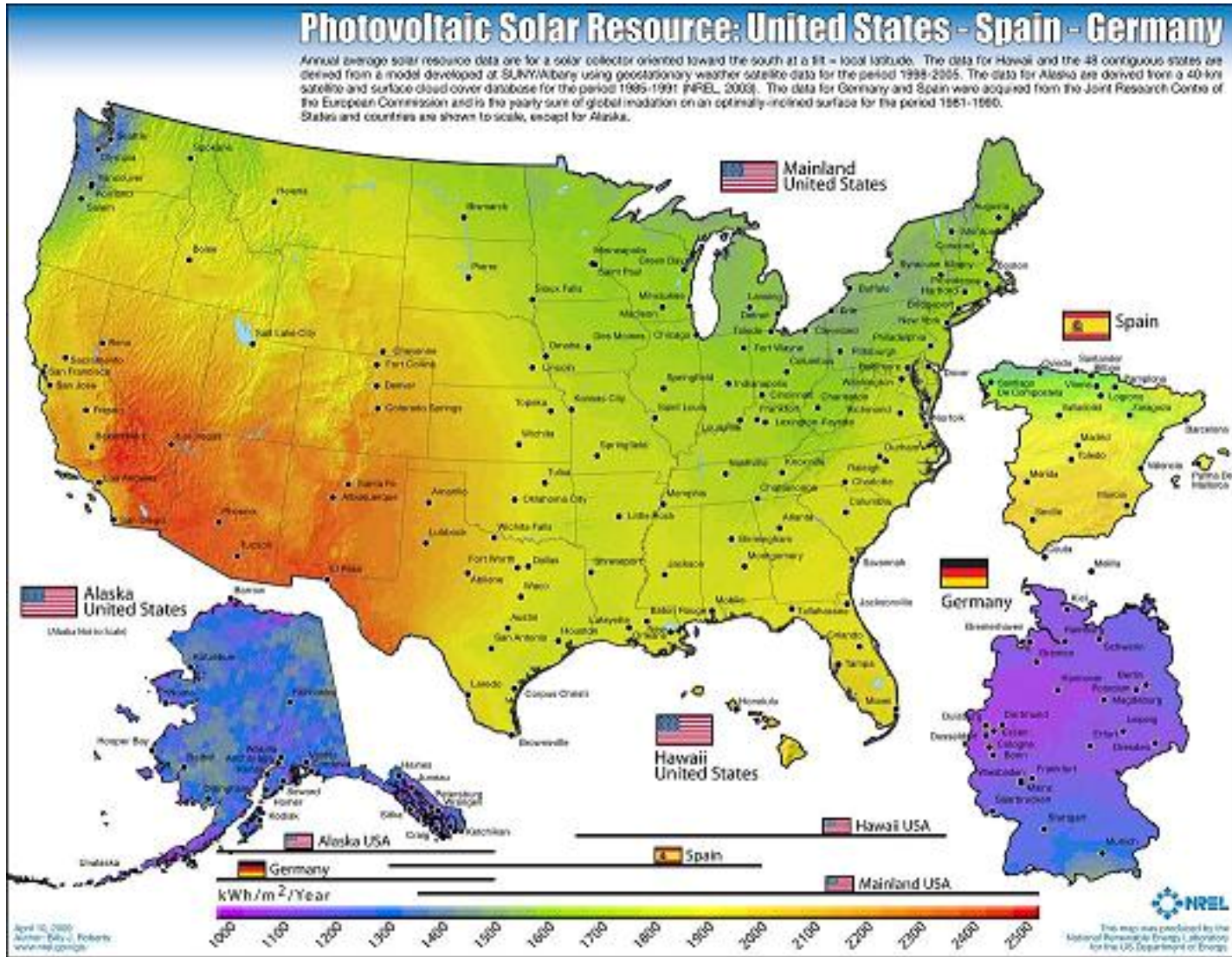
* Solid and liquid biomass, biogas, sewage and landfill gas, biogenic share of waste; electricity from geothermal energy not presented due to negligible quantities produced; 1 GWh = 1 Mill. kWh; StromEinspG: Act on the Sale of Electricity to the Grid; BauGB: Construction Code; EEG: Renewable Energy Sources Act; Source: BMU-KI III 1 according to Working Group on Renewable Energy-Statistics (AGEE-Stat); image: BMU / Christoph Edelhoff; as at: December 2011; all figures provisional



Growth in Photovoltaic 2000-2010



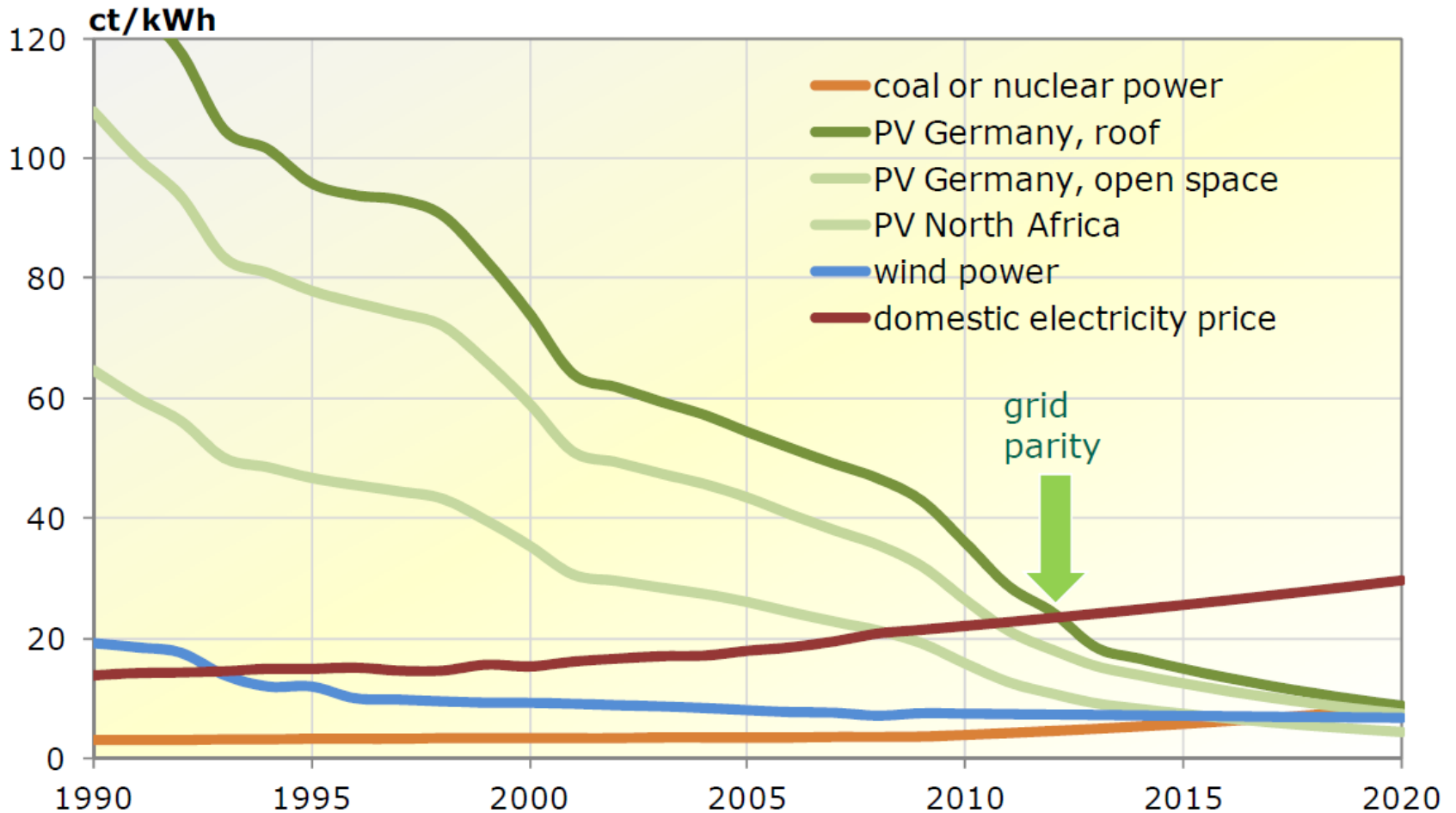
Source: EPIC



Source: NREL



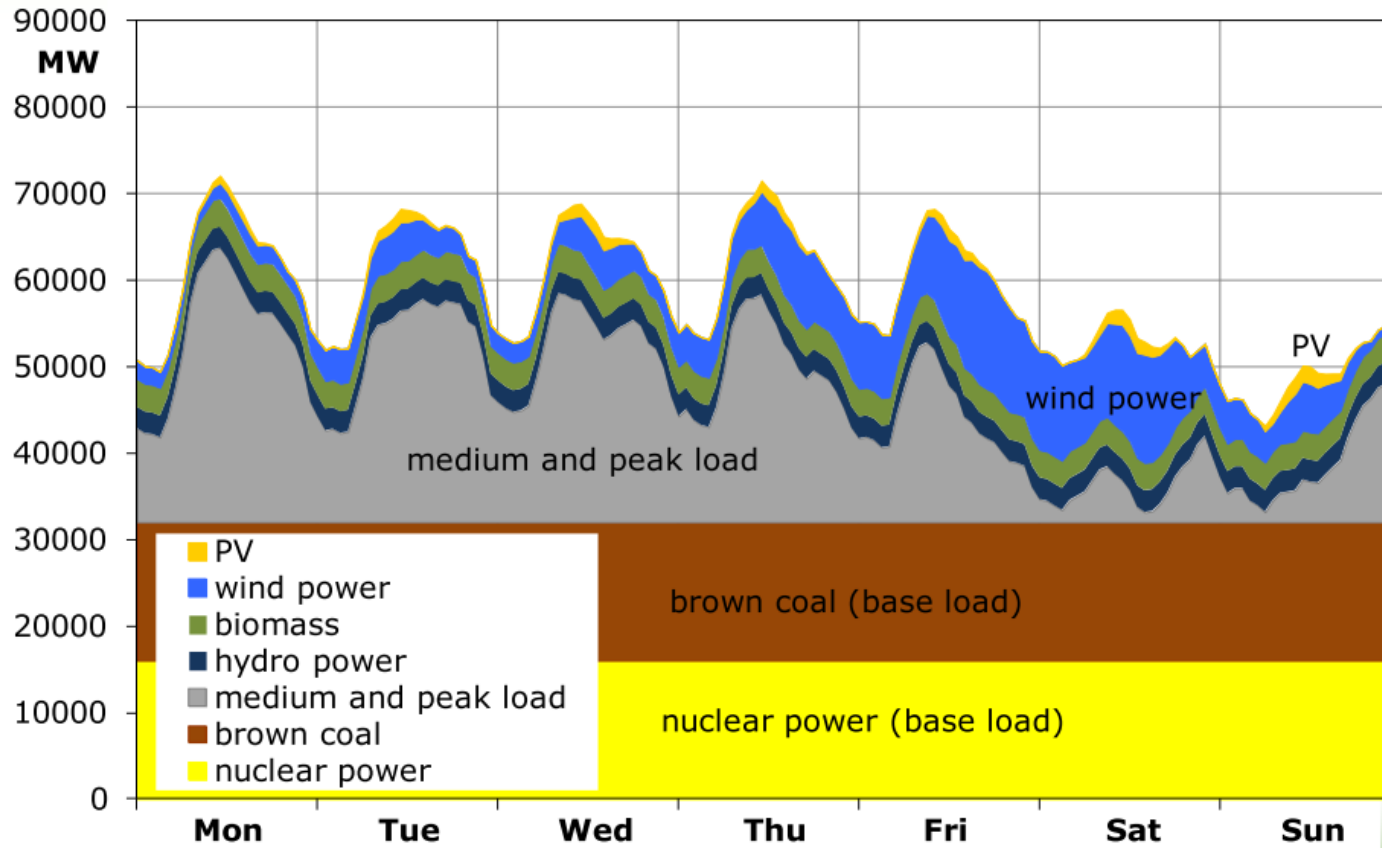
Price Development for Photovoltaic Electricity



Source: HTW Berlin



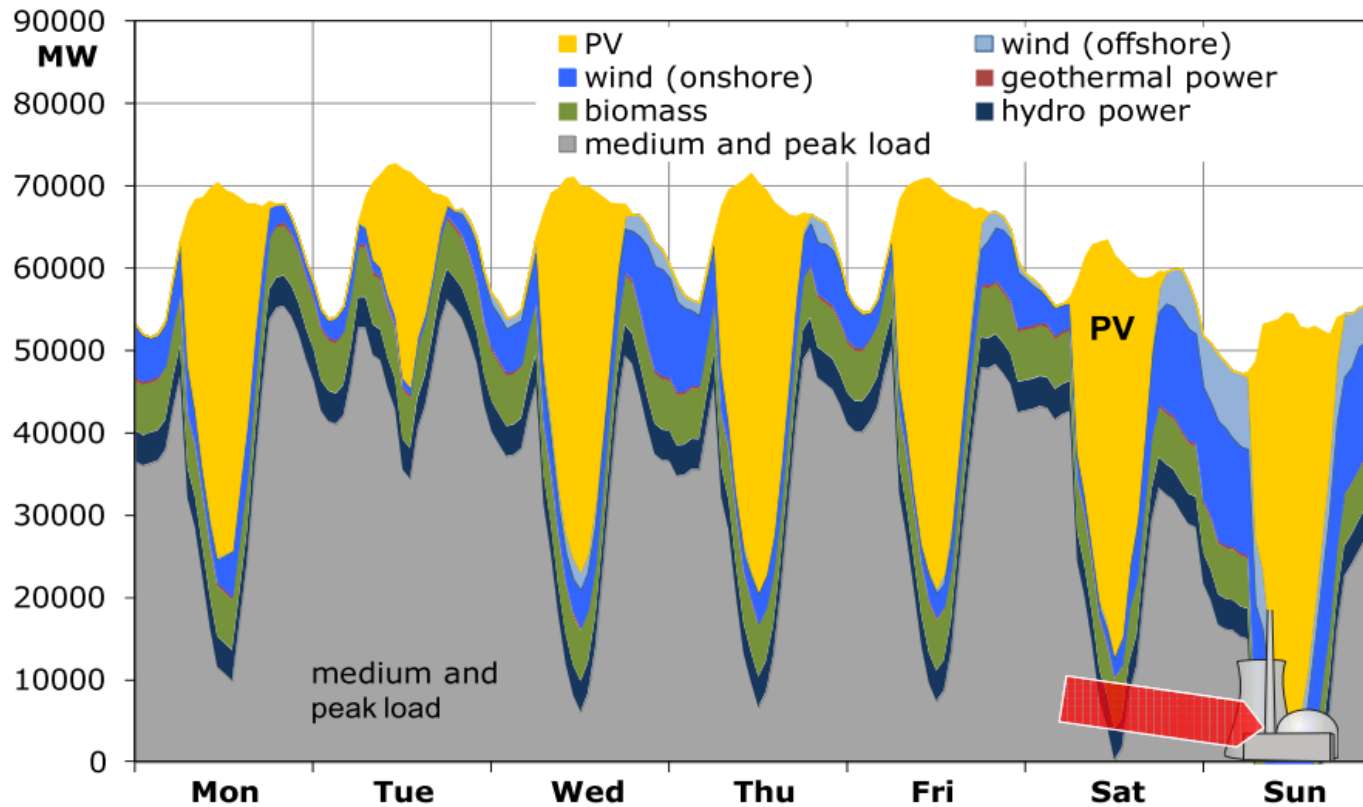
A Spring Day in 2008: Baseload Power Needs



Source: HTW Berlin



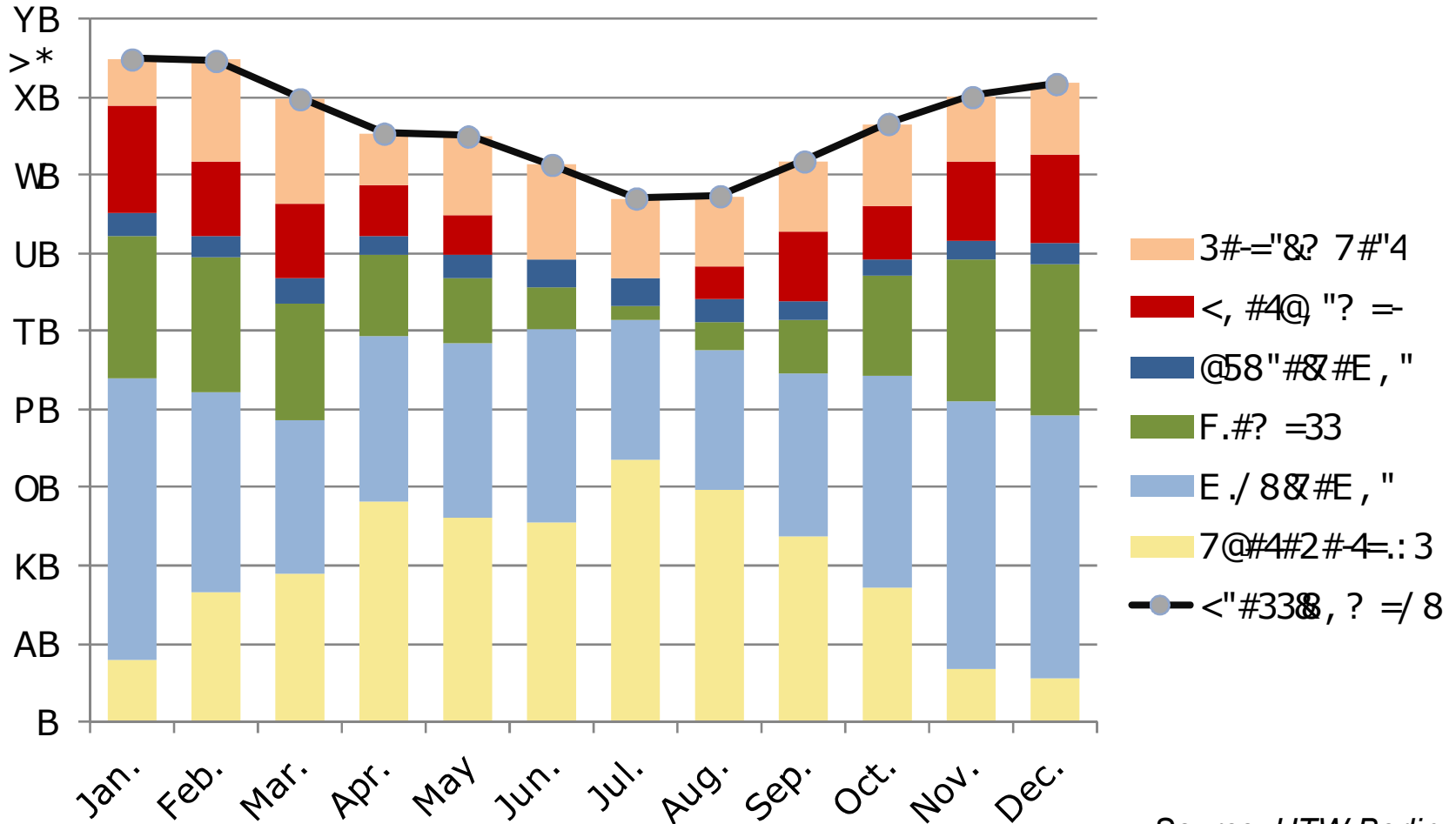
A Spring Day in 2020: Baseload Power Needs



Source: HTW Berlin



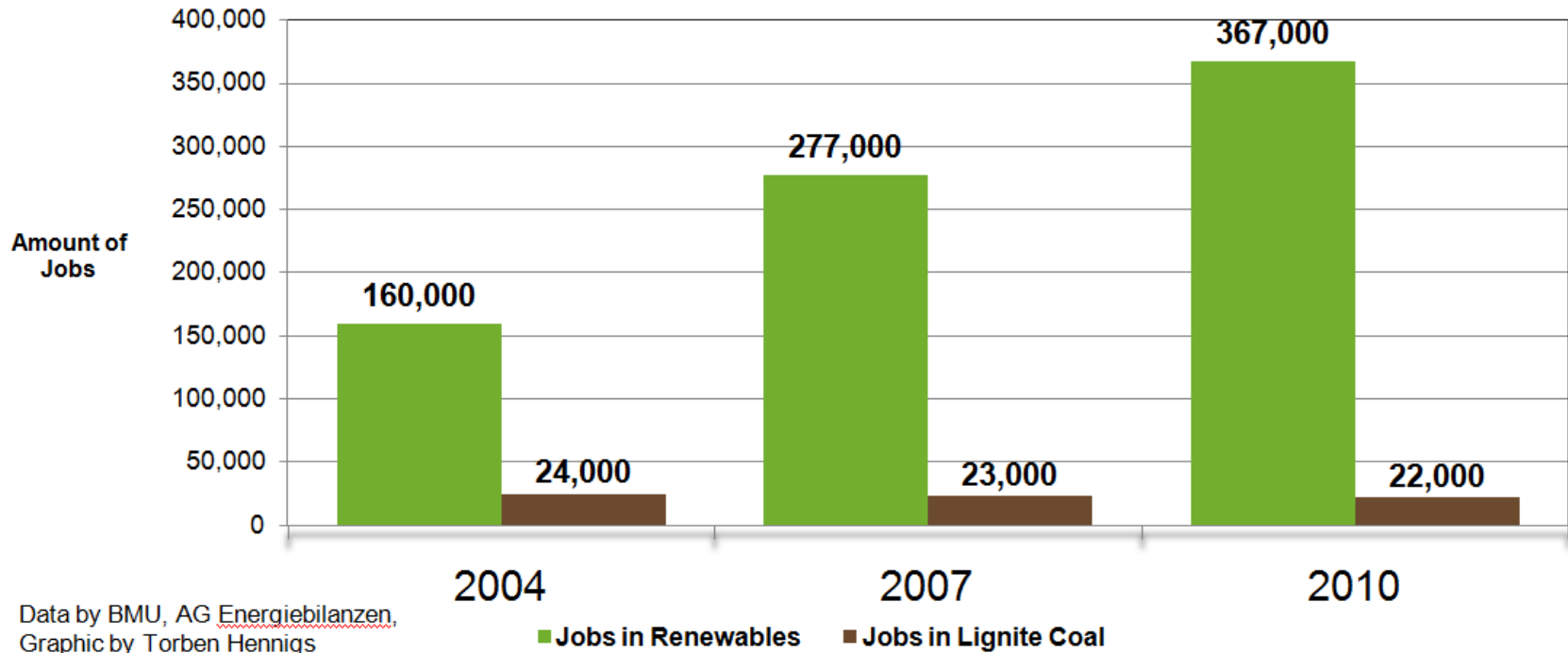
A Vision for 2050: 100% Renewable Energy



Source: HTW Berlin



Employment Effects: Renewable Energy Sector vs. Lignite Coal Sector (2004-2010)

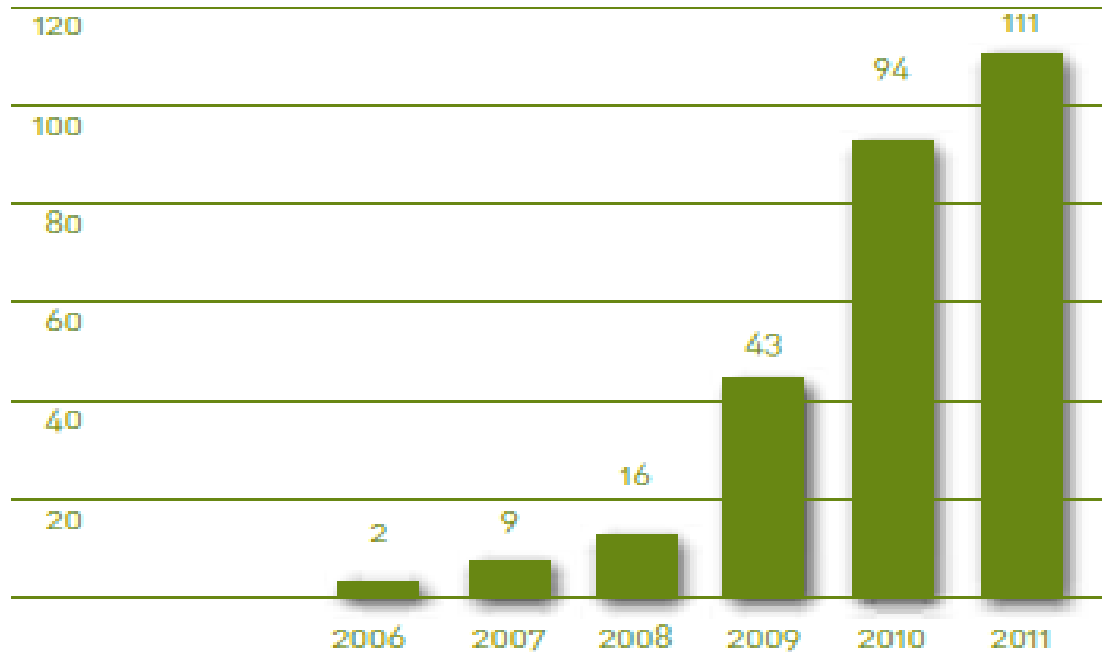


Data by BMU, AG Energiebilanzen,
Graphic by Torben Hennigs

Source: HBF



Participatory Effect in Energy Generation: Energy Autonomous Communities Energy Cooperatives (2006-2011)



Source: DGRV



Example: 3 Energy-Independent Communities in Germany

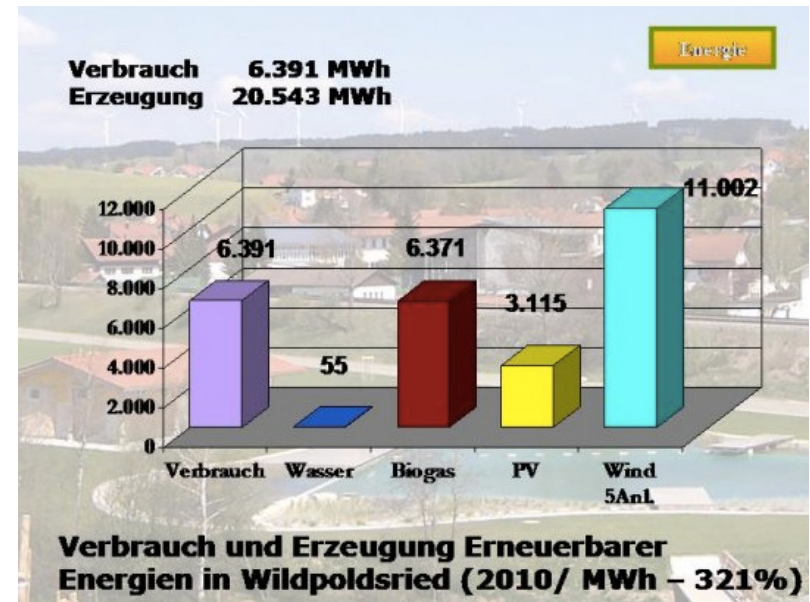




Wildpoldsried, Bavaria

- ▶ Launch of “W.I.R.” Initiative in 1999
- ▶ Established 2 companies (1999, 2001) to invest in renewable energy

- ▶ 4 biogas digesters, 7 windmills, 190 private PV facilities, district heating network, 3 small hydro power plants
- ▶ Now produces 321% more energy than it needs and is generating € 4 million (US \$5.7 million) annually





<http://www.wildpoldsried.de/index.shtml?Energie>



Wildpoldsried

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Klimaschutz
Erneuerbare Energie
↳ Holz als Baustoff
↳ Wasser / Abwasser
↳ WiWaLaMoor
↳ Biogas
↳ Biomasse
↳ Dorfheizung
↳ Photovoltaik/Solar/NEH
↳ Brettstapelbauweise
↳ ...



Natürlich energisch!

Wildpoldsried
I nnovativ
R ichtungweisend

Idealist sein, heißt Kraft haben für andere!
Novalis

Wir in Wildpoldsried haben einige „Idealisten“, denen wir es zu verdanken haben, dass in Wildpoldsried regenerative Energien in einer solchen Bandbreite erzeugt werden.



Insbesondere aus dem Bereich der Landwirtschaft kommen eine Vielzahl von Aktivitäten, die sowohl ökologisch als auch ökonomisch vorbildlich sind. Orstansässige Betriebe und Unternehmer ergänzen diese Palette durch innovative Produkte und Dienstleistungen.

Wir stellen Ihnen unsere Projekte vor:

innovativ

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- [Thermografieaktion](#)



Feldheim, Brandenburg

- ▶ Starting in 1994 through a private holding company, advised by Energiequelle GmbH
- ▶ Individual households are supplied with heat and power from renewable energy power plants at their own doorstep via autarchic local grids
- ▶ A wind farm (75 MW) is the backbone of the local power supply grid, whereas heat (500 KW) is supplied by a local biogas plant. Fluctuations in wind power production will be balanced in future by a next-generation Na-S accumulator; a heating plant fired with woodchips is available for additional thermal energy requirements on particularly cold days

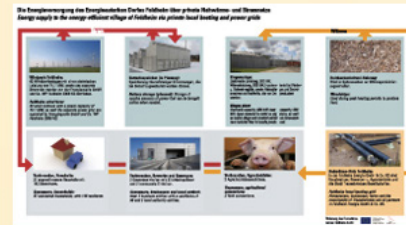


<http://www.neue-energien-forum-feldheim.de>



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The energy self-sufficient village



Energy supply to the energy-efficient village of Feldheim via private local heating and power grids

Success through cooperation

One of the most spectacular concepts for supplying enterprises, private households and local government with renewable energies on a decentralised, self-sufficient basis is currently being implemented in Feldheim, a district in Treuenbrietzen, a town in Brandenburg. The project owes its success to the excellent partnership between the municipality of Treuenbrietzen, the inhabitants of Feldheim and the project developer, Energiequelle GmbH.

The energy self-sufficient village

The individual households in Feldheim, Treuenbrietzen, are supplied with heat and power from renewable energy power plants at their own doorstep via autarchic local grids.

Energiequelle GmbH designed the various components of this concept – which includes cutting-edge, state-of-the-art wind power systems and biogas plants –, installed them as turnkey systems and linked them via the new heat and power distribution system to form a regional energy supply grid.

Reliability under peak loads

The nearby wind farm is the backbone of the local power supply grid, whereas heat is supplied by the local biogas plant. Natural fluctuations in wind power production will be balanced in future by a next-generation accumulator to be installed in a second, expansion phase of the project. A sophisticated heating plant fired with woodchips is available for additional thermal energy requirements on particularly cold days.



Jühnde, Lower Saxony

- ▶ Biogas digester with 700 kW (annual output: 5 million kWh), twice the amount required by the community
- ▶ Biomass power plant can provide 550 kW when needed (annual thermal output approximately 3.2 million kWh)
- ▶ Participating households (70%+) are saving approx. 750 € annually, the town has generated 680.000 € in revenue with biomass



<http://www.bioenergiedorf.de>

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Gemeinde Jühnde

Vielleicht möchten Sie mehr über die Gemeinde Jühnde wissen und sich einen eigenen Eindruck verschaffen.

Die Gemeinde ist die erste in Deutschland in der in beiden Orten Jühnde und Barlissen das Bioenergiedorf-Konzept umgesetzt haben.

Klicken Sie hier

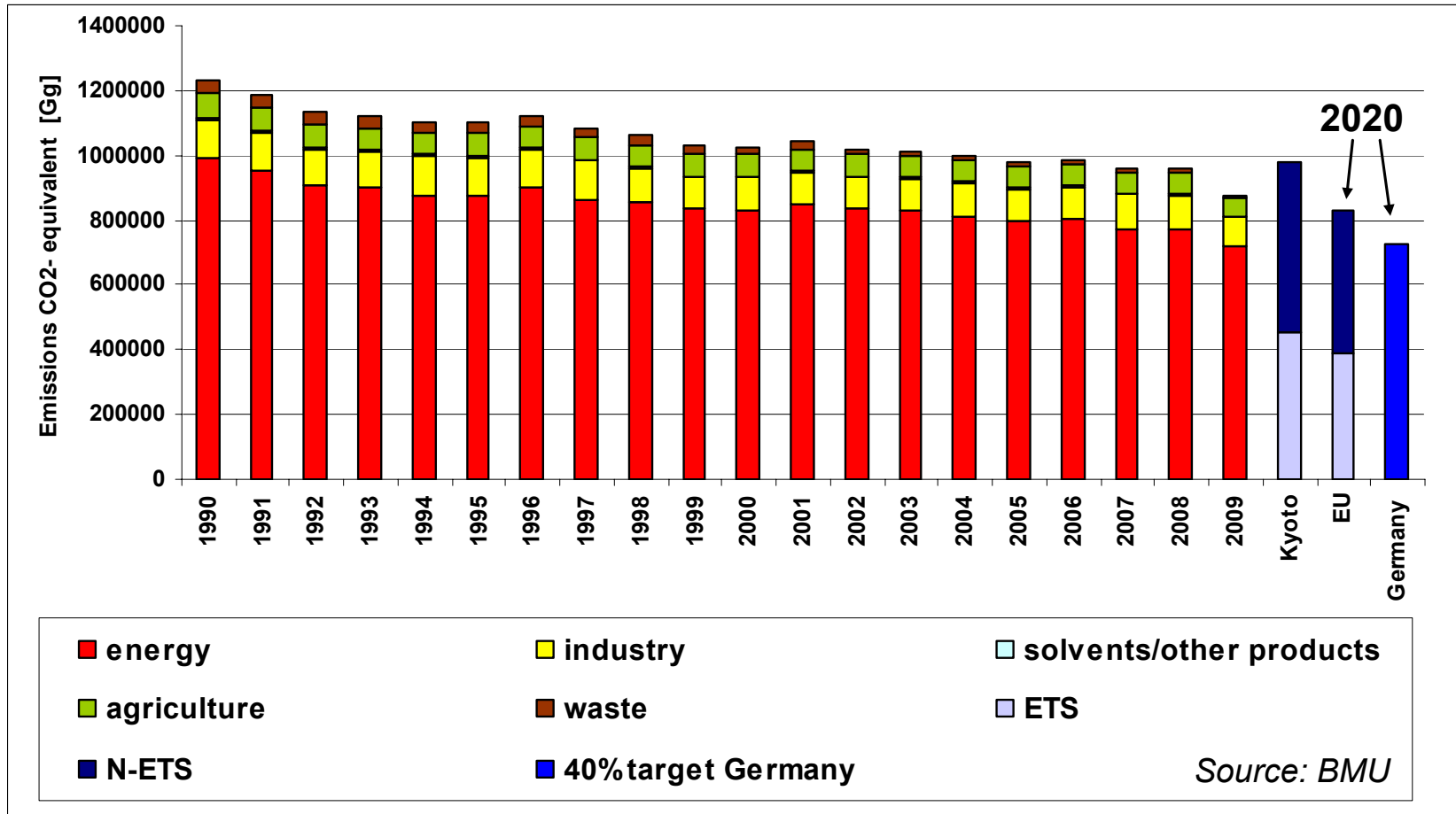
AKTIONEN | NEWS



Part 4: Conclusions



GHG Emissions in Germany Trend and Targets





Public Perception of the Energy Transition

Survey by Lichtblick in April 2012:

- ▶ 87 % of Germans approve of the energy concept and believe the transition to renewable energy is successful
- ▶ One in five Germans intend to generate part of their electricity themselves through renewable energy sources by 2020
- ▶ Two in five Germans assume that more than half of all electricity generated by 2020 will be from renewable sources
- ▶ Only 13% of Germans fear the energy concept will fail



Further Reading (*selection*)

- ▶ Bühler, Ralph, Arne Jungjohann, Melissa Keeley and Michael Mehling (2011): “How Germany Became Europe’s Green Leader: A Look at Four Decades of Sustainable Policymaking.” *2 Solutions* (2011): 51-63.
- ▶ Mehling, Michael et al. (2010): *Transforming Economies through Green Investment: Needs, Progress, and Policies*. Washington, D.C., United States: 2010.
- ▶ Mehling, Michael (2006): “Germany’s New Energy Tax Act – A Sign of Progress?” in Jon Almeras (ed.), *Energy: A Tax Analysts Special Supplement*. 132-135. Arlington, VA: Tax Analysts.
- ▶ Mehling, Michael (2000): “The Ecological Tax Reform in Germany.” *26 Tax Notes International* (2000): 871-878.



Thank You!

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