HOW TO TRANSFORM EUROPE INTO A LOW-CARBON ECONOMY BY 2050

Climate and energy policy for the long-term. Experience from Europe, implications for the US?

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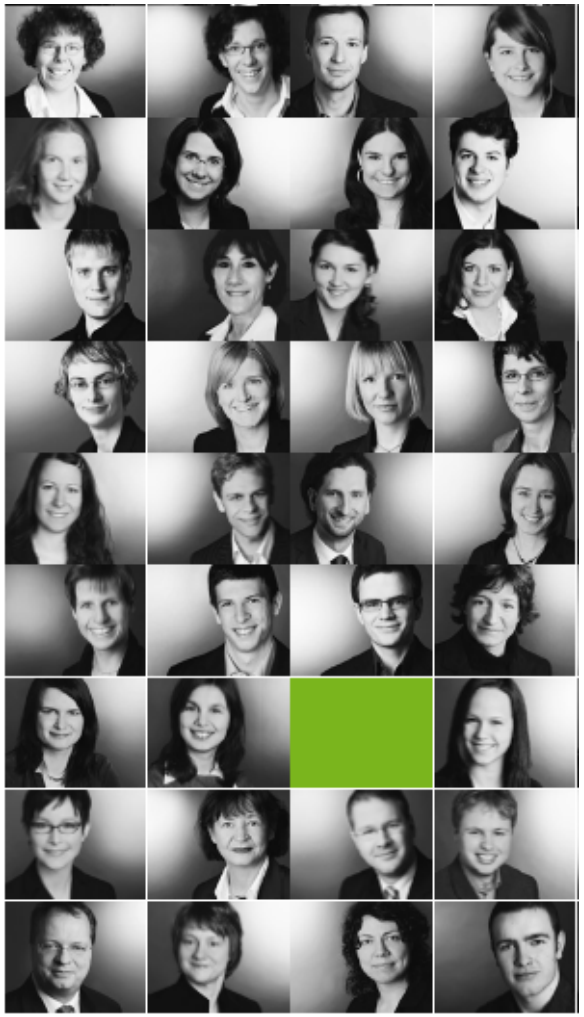
by **Matthias Duwe -** Ecologic Institute, Berlin

Funded by the European Union

SEVENTH FRAMEWORK PROGRAMME

Ecologic Institute: Who we are

- Research for applied environmental research, policy analysis and consultancy
- Founded in 1995
- Offices in Berlin, Brussels, Washington D.C., San Mateo
- 140 staff in total
- Private, not-for-profit, independent, non-partisan
- Among top 10 "Environmental Think Tanks" in the University of Pennsylvania's Global Index in both 2010 and 2011
- Long standing experience in bridging the gap between science and environmental policy
- **Ecologic Institute US is celebrating its fifth anniversary this week! Congratulations!**



Our topic today

- CECILIA2050 project
- The 2050 challenge: what does it mean
- Policies to trigger decarbonisation
  - Development of climate policy in the EU and Germany
  - Lessons learnt: two case studies (EU ETS and German Renewables Support)
- The next step: post-2020 policy instruments
  - Main issues under debate
  - Political landscape
  - The role of the US – as seen from Europe
- Summary and conclusion

Tackling the 2050 policy mix – the CECILIA2050 project

Choosing

Efficient

Combinations of Policy

Instruments for

Low-carbon development and

Innovation to

Achieve Europe's

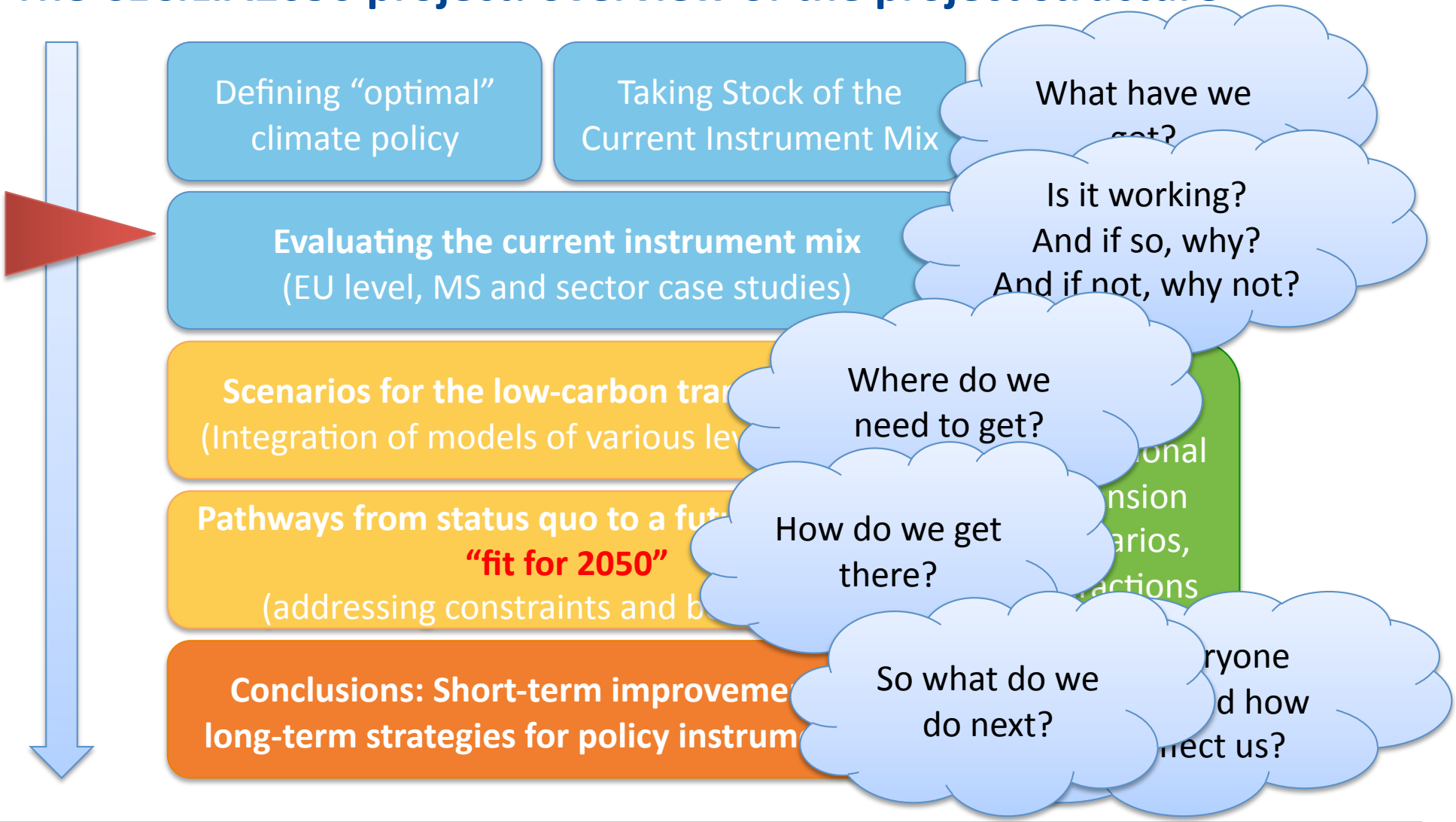
2050 climate targets

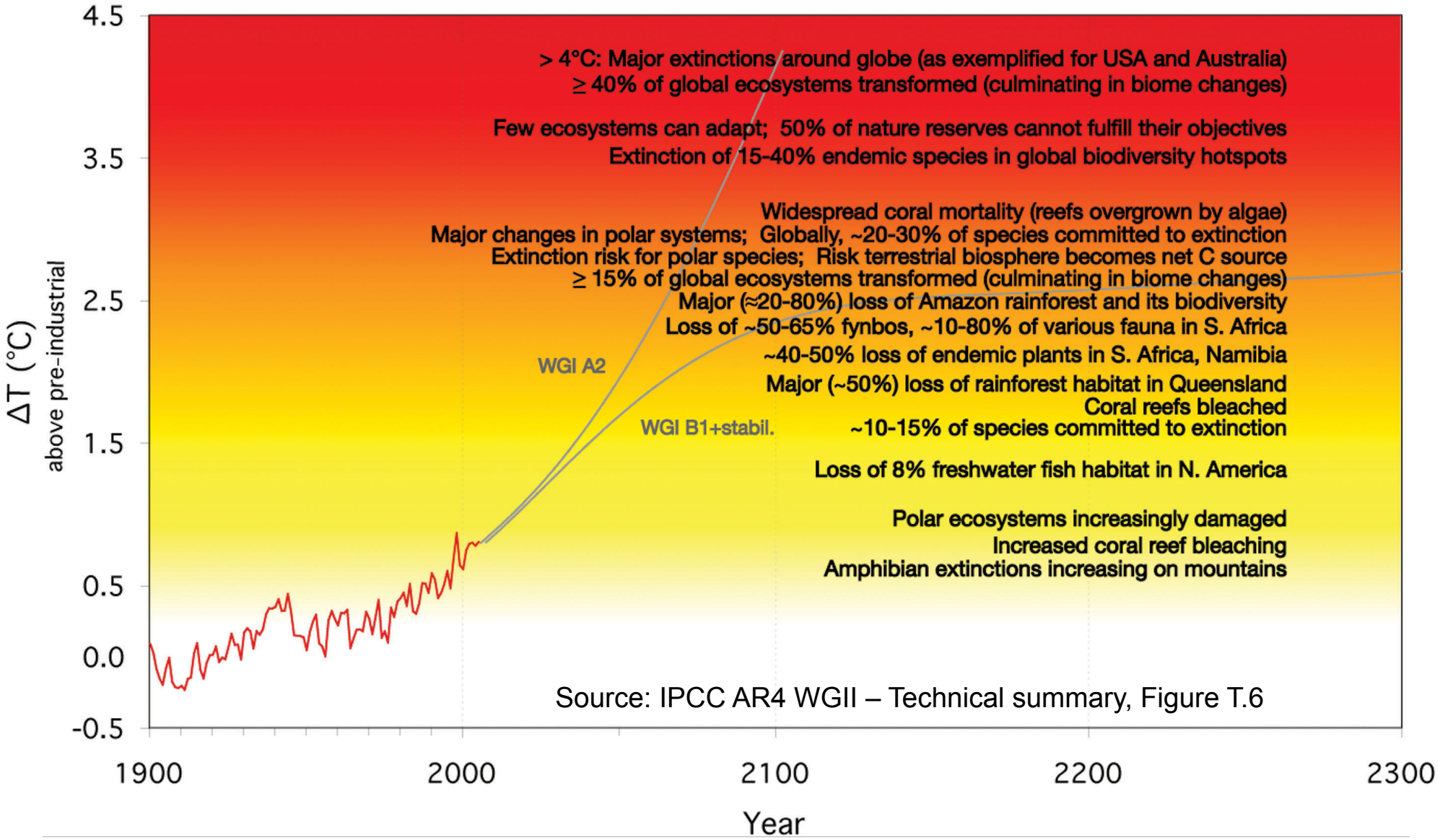
Funded by the European Union

Who we are: 10 partners from 8 countries

- **NL:** Institute of Environmental Sciences (CML) at Leiden University
- **NL:** Institute for Environmental Studies (IVM) at the Free University of Amsterdam
- **CZ:** Charles University Prague (CUNI)
- **PL:** University of Warsaw
- **UK**: University College London (UCL)
- **F:** Centre International de Recherche sur l'Environment et le Developpement (CIRED)
- **ES:** Basque Centre for Climate Change (BC3)
- **IT:** University of Ferrara (UNIFE)
- **DE:** Institute of Economic Structures Research (GWS) in Osnabrück/Germany
- **DE:** Ecologic Institute in Berlin as project leader

The CECILIA2050 project: overview of the project structure





Source: IPCC AR4 WGII – Technical summary, Figure T.6

Background: the 2050 challenge

- Intergovernmental Panel on Climate Change (IPCC) on the size of the challenge:
  - By 2020:
    - Industrialised Countries: -25 to -40% from 1990 levels
    - Developing countries: -15 to -30% below BAU baseline
  - By mid-century:
    - Global emissions need to halve
    - Industrialised Countries: -80 to -95% from 1990 levels

- Stern Report: cost of inaction HIGHER than the cost of action

Background: the 2050 challenge

- Copenhagen accords:
  - "We agree that **deep cuts in global emissions** are required (…) with a view to reduce global emissions so as to hold the increase in global temperature **below 2 degrees Celsius**"
- G8 leaders:
  - "… the increase in global average temperature above pre-industrial levels ought **not to exceed 2°C**. Because this global challenge can only be met by a global response, we reiterate our willingness to share with all countries the goal of achieving **at least a 50% reduction of global emissions by 2050**, recognising that this implies that global emissions need to peak as soon as possible and decline thereafter. As part of this, we also support a goal of developed countries reducing emissions of greenhouse gases in aggregate by 80% or more by 2050 compared to 1990 or more recent years. (2008)
- President Obama:
  - "This is not fiction, **this is science**. Unchecked, climate change will pose unacceptable risks to our security, our economies, and our planet." (December 2009 in Copenhagen)

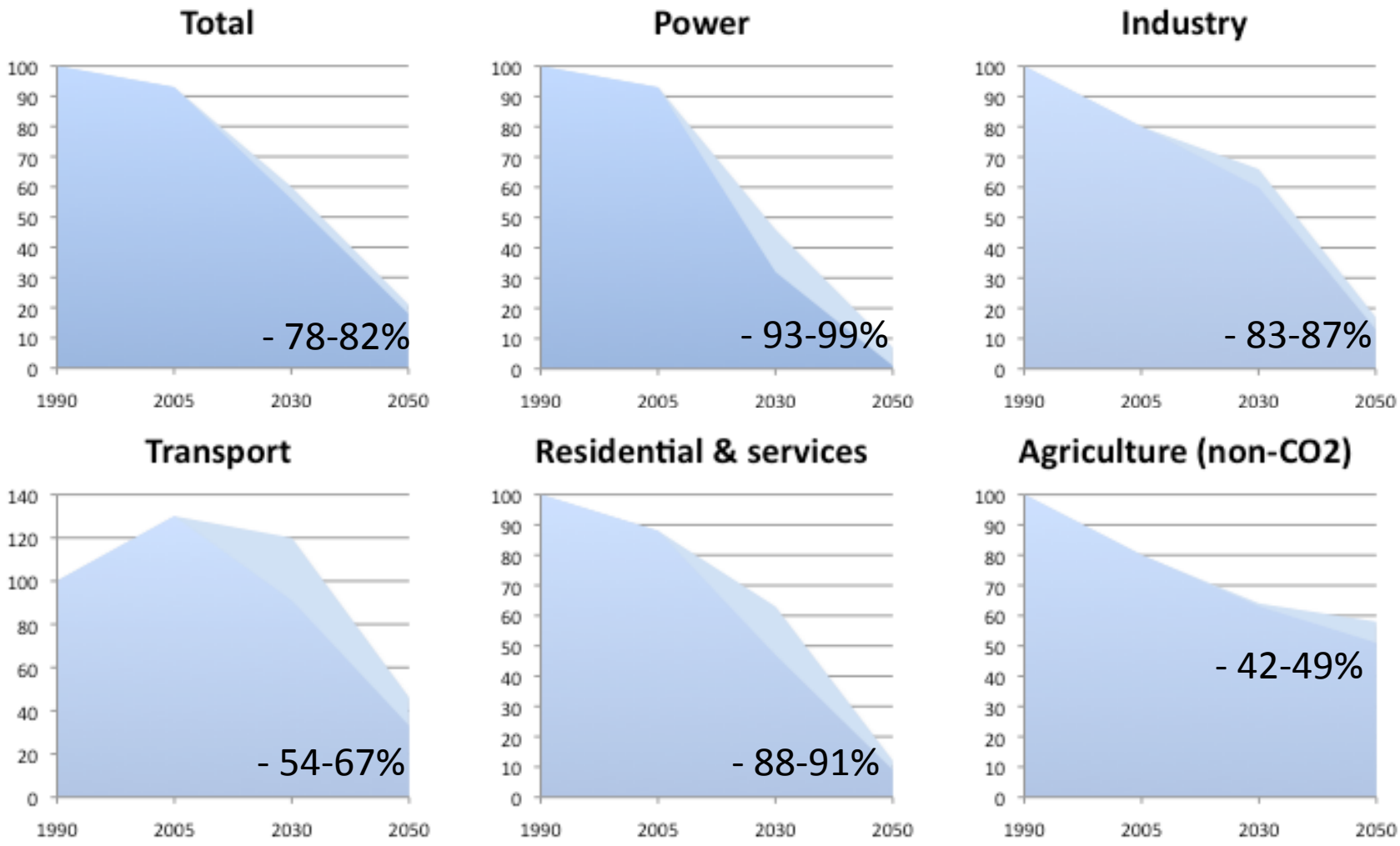
The EU's 2050 target: 80-95% reductions = decarbonisation

BRUSSELS EUROPEAN COUNCIL
29/30 OCTOBER 2009

PRESIDENCY CONCLUSIONS

The European Council calls upon all Parties to embrace the 2°C objective and to agree to global emission reductions of at least 50%, and aggregate developed country emission reductions of at least 80-95%, as part of such global emission reductions, by 2050 compared to 1990 levels; such objectives should provide both the aspiration and the yardstick to establish mid-term goals, subject to regular scientific review. It supports an EU objective, in the context of necessary reductions according to the IPCC by developed countries as a group, to reduce emissions by 80-95% by 2050 compared to 1990 levels.

Radical transformation required in all parts of the economy



Source: Roadmap Impact Assessment SEC(2011) 288

Background the 2050 challenge

- Staying below two degrees means: decarbonisation of industrialised country economies
- HOW can it be done?
  - Deploy existing clean technology
  - Stimulate innovation for further R&D
  - Mobilise capital at the level and speed necessary
- What are tools for helping to bring it about?
  - Targets
  - Policies

EU targets

- Multi-target structure

		2010	2020	2030	2040	2050
GHGs	Reductions from 1990	-8% (Kyoto I)	-20% (-30% conditional)	?		80-95%
RES	Final energy consumption	10%	20%	?		
	In transport	5%	10%			
EEff			-20% below BAU	?		

German targets on energy and climate – up until 2050

		2020	2030	2040	2050
Climate	Greenhouse gases (vs. 1990)	- 40%	- 55%	- 70%	- 80 to - 95%
Renewable energies	Share of electricity	35%	50%	65%	80%
	Overall share (Gross final energy consumption)	18%	30%	45%	60%
Efficiency	Primary energy consumption	- 20%	••••••••••••▶		- 50%
	Electricity consumption	- 10%			- 25%
	Energy consumption in buildings	20% heat demand			80% primary energy

Source: BMU

Policies for 2050

- EU policy development in 4 phases
  - 1990s: pre-Kyoto
  - 2000 – 2006 **ECCP** => Kyoto I (2008-12)
  - 2007 – 2010 **CEP** => Post-2012 (Kyoto II)
  - 2011 - ? **"the next step"** => post-2020 (now)

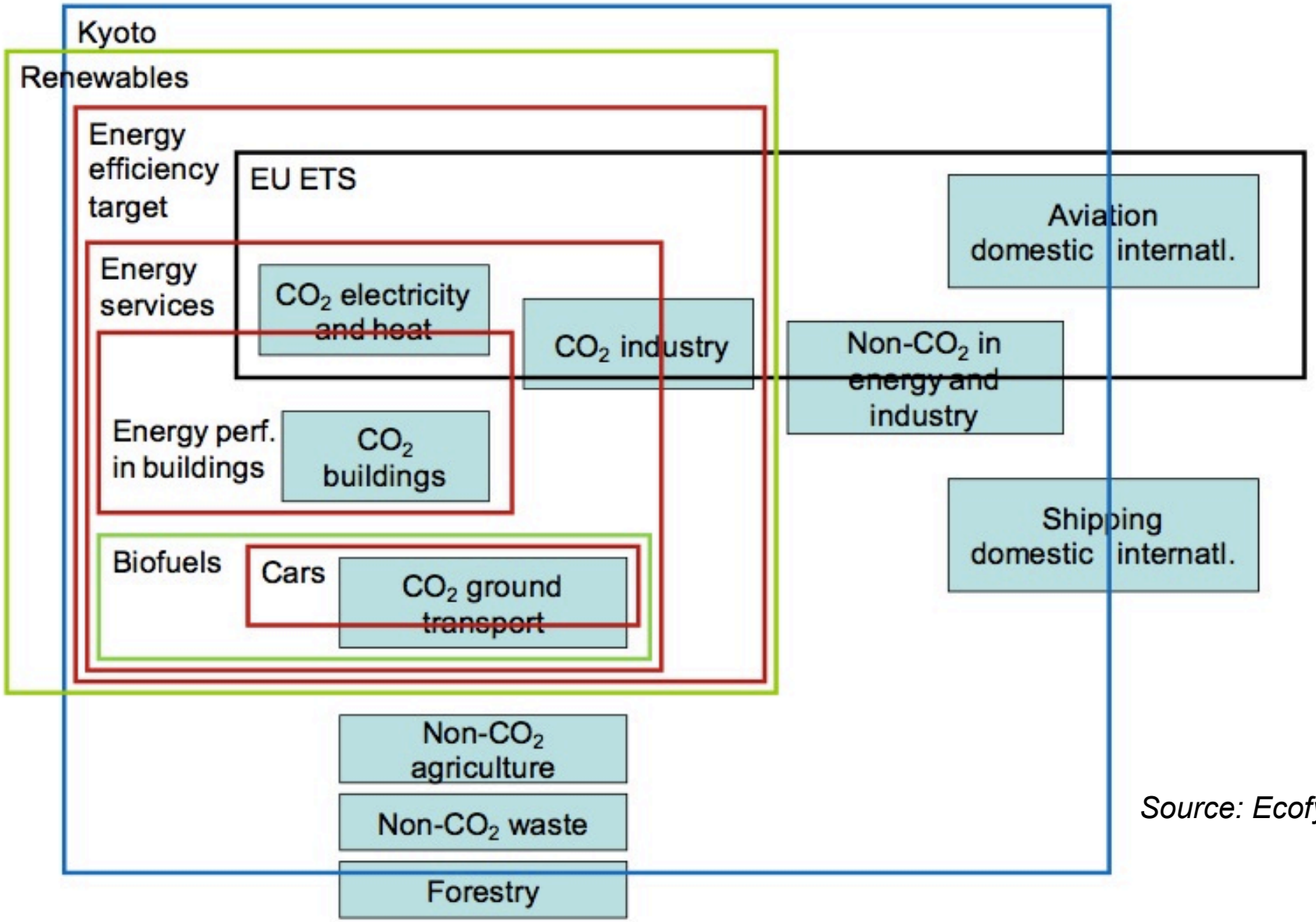
(ECCP = European Climate Change Programme)

(CEP = Climate and Energy Package)

Policies for 2050

	Pre-Kyoto (1990s)	ECCP => Kyoto1 (2000-2006)	CEP =>Post-2012/Kyoto2 (2007-2010)	Future => Post-2020 (2011 - ?)
GHGs	Carbon/ energy tax	EU ETS (2003)	EU ETS review	ETS review
		Voluntary agreement with car manufacturers (1998/1999)	Mandatory CO2 standards for cars and vans	future targets
			(Effort Sharing Decision)	future targets
RES	ALTENER	Renewable Energy Directive (2001)	Renewables Directive review	future targets?
		Biofuels Directive		
EEff	SAVE	Energy Services Directive (ESDir)	Energy Efficiency Directive	future targets?
		CHP Directive		
		Ecodesign of Energy Using Products Directive	further implementation	?
		Energy Labelling Framework Directive	Labelling Directive review	?
		Energy Performance of Buildings Directive	Buildings Directive Review	?

Source: © Ecologic Institut 2012

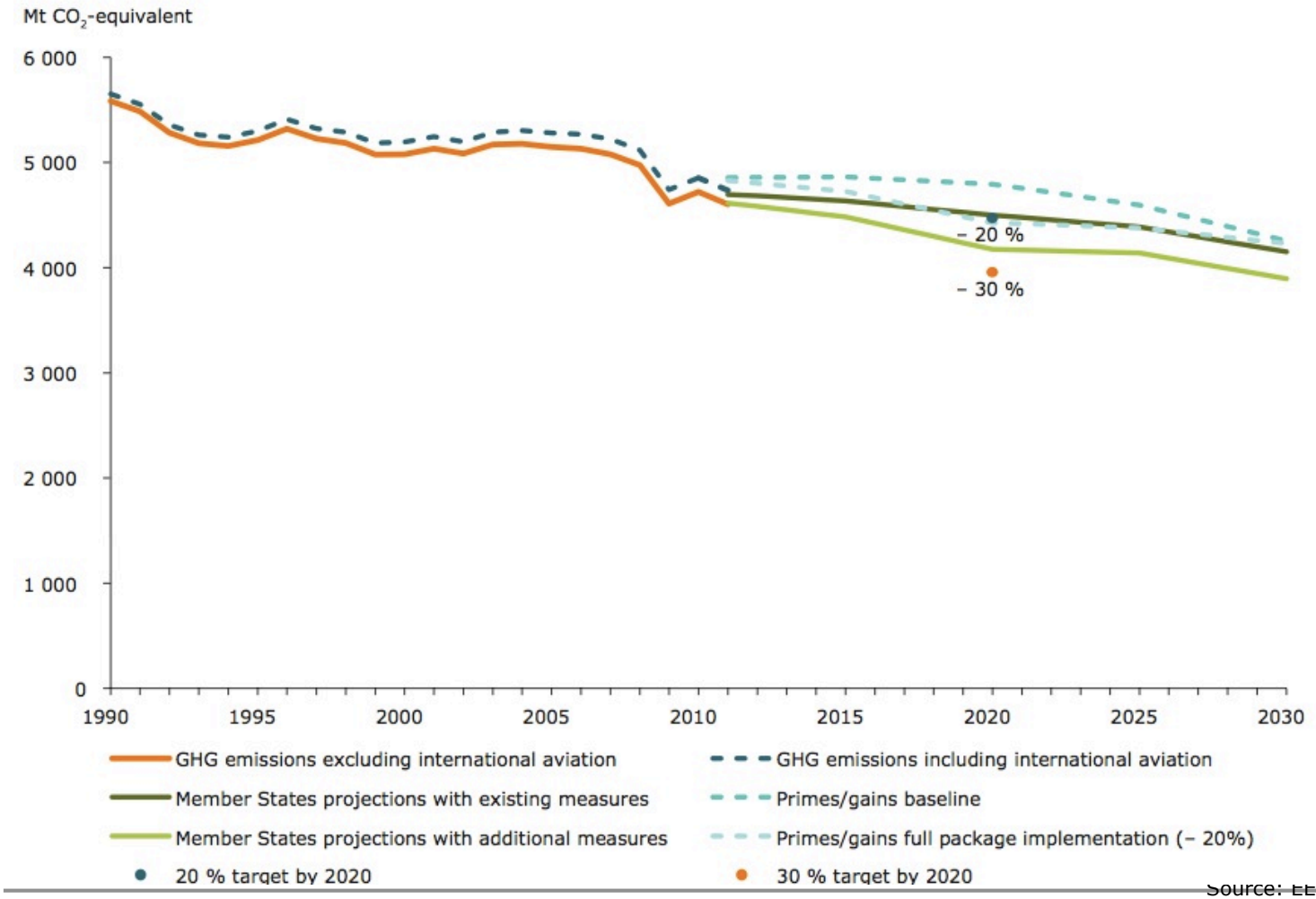


Source: Ecofys

Figure 1 Overlap of EU targets and policies. The blue shaded boxes represent emissions sectors. The coloured squares encompass the sectors (or parts of sectors) which are included in the scope of a particular target.[1]

Low carbon progress: EU GHG emissions

Figure 6.1 Trends and projections of EU total GHG emissions, 1990–2030



Source: EEA **Greenhouse gas emission trends and projections in Europe 2012**

EU data:
At present, 17.6% below 1990

2020 target (-20%) to be met with existing measures

Existing measures keep reducing towards 2030

Low carbon progress: EU Renewable energy

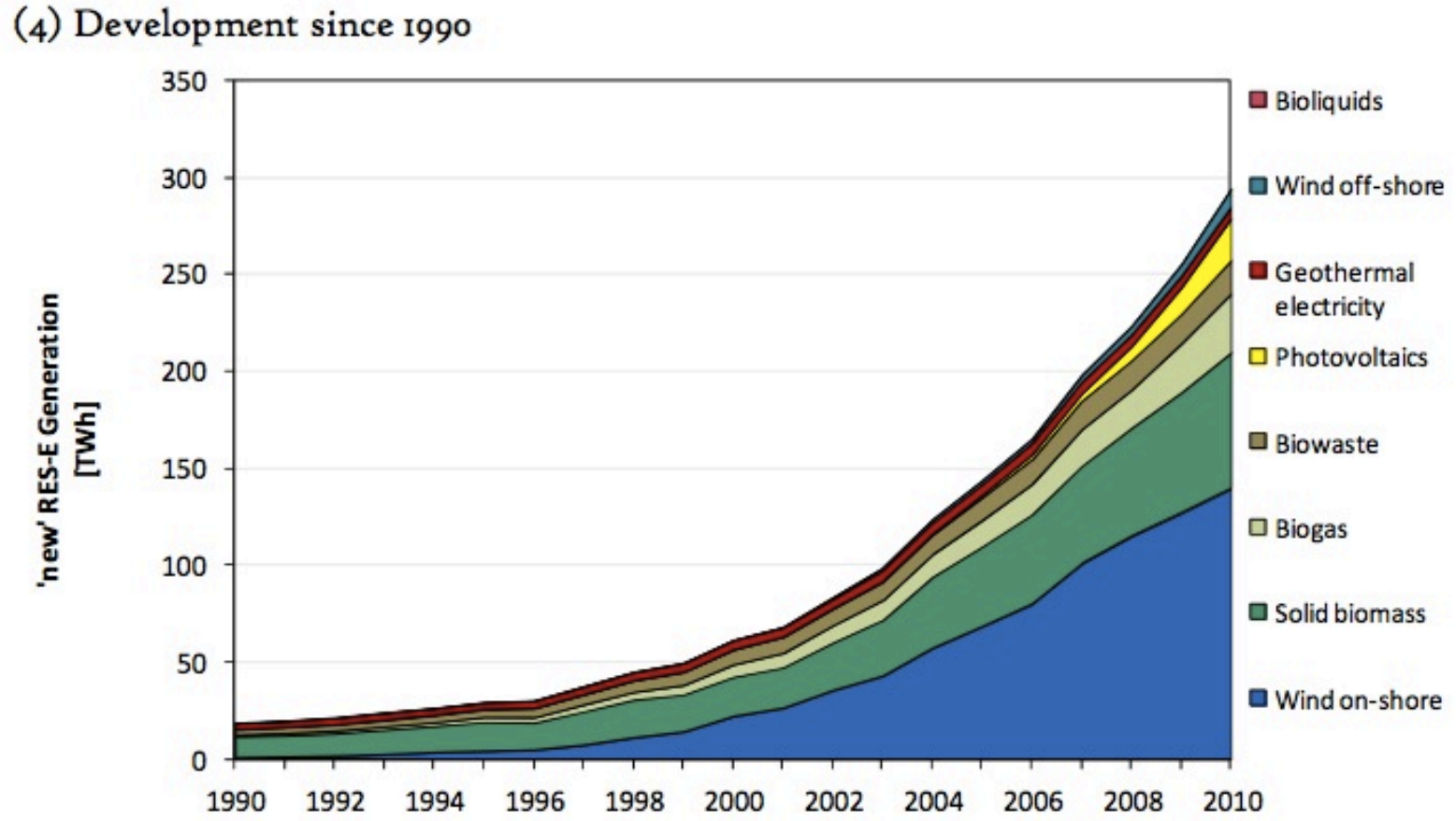


Figure 7. Electricity generation from 'new' RES-E technologies (excluding hydro) in the EU-27 in TWh. Data source: EUROSTAT, complemented by Eur'ObservER.

Source: Ecofys

Onshore wind, and biomass largest capacity contributers for renewable electricity productions

Germany's key policy instruments: main elements

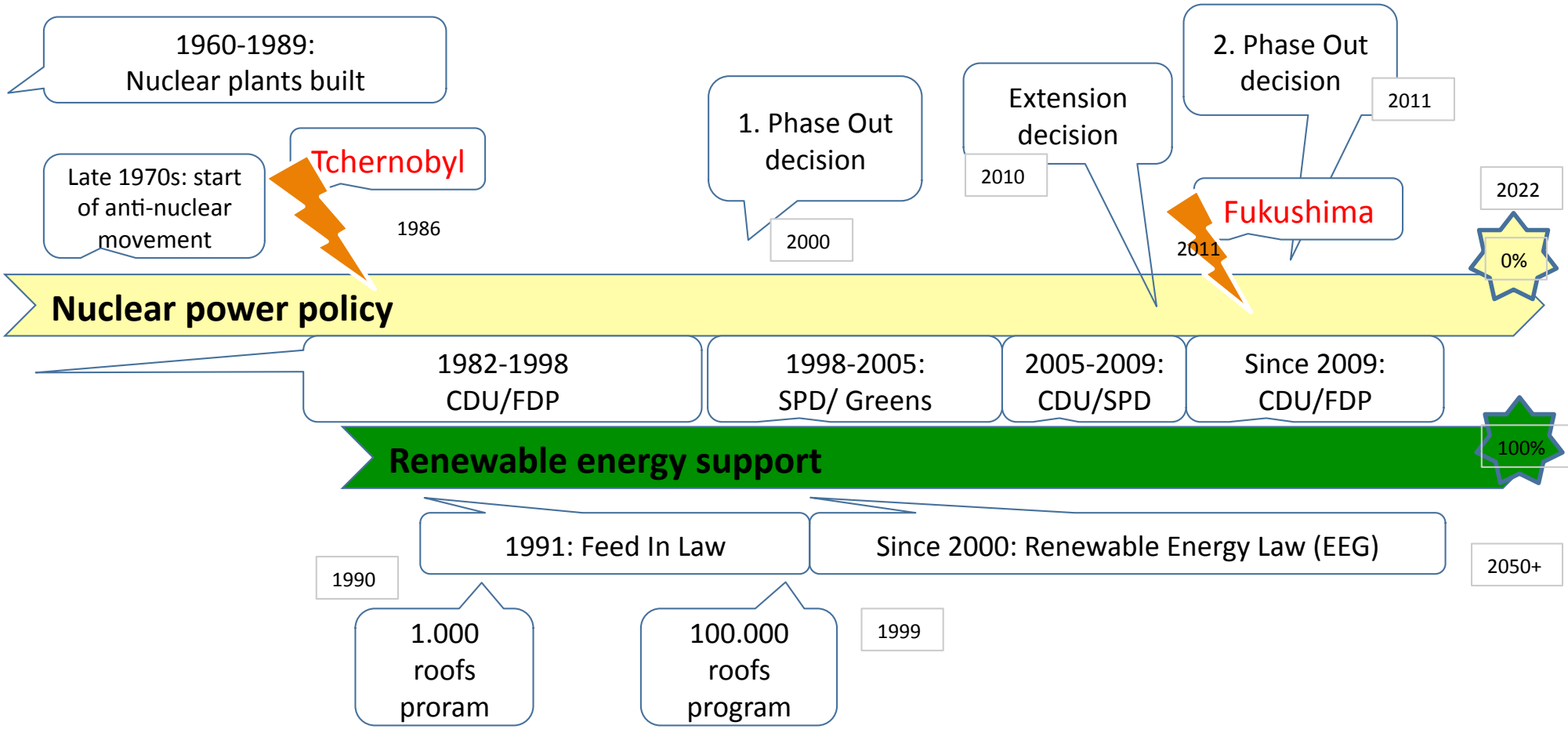
- GHG emission reductions
  - Emissions Trading: participation in EU system (all industry sectors)
  - Performance standards for cars (EU legislation)
- Renewable energy
  - Renewable energy law (EEG) – a feed-in tariff system with > 20 years experience
- Energy efficiency (more in the next presentation)
  - Development of energy services
  - Promoting energy management in industry
  - new energy efficiency fund (up to 300 million €/year)
  - CO2 Building Modernisation Programme + codes & standards for new built
  - National Climate Initiative (funds innovative projects)
  - CHP support act

Amendment to the Atomic Energy Act

- 7 oldest plants + Krümmel: Immediate decommissioning
- Gradual phasing out of all nuclear power by **2022**
- Shutdown years: 2015, 2017, 2019, 2021, 2022

Source: UBA

Political process developments of Germany's „Energiewende"



The so-called „Energiewende" (energy transformation) is a long-term project that started more than twenty years ago – but which was reinforced and sped up by the Fukushima incident.

Source: © Ecologic Institut 2012

Low carbon progress: Germany's GHG emissions

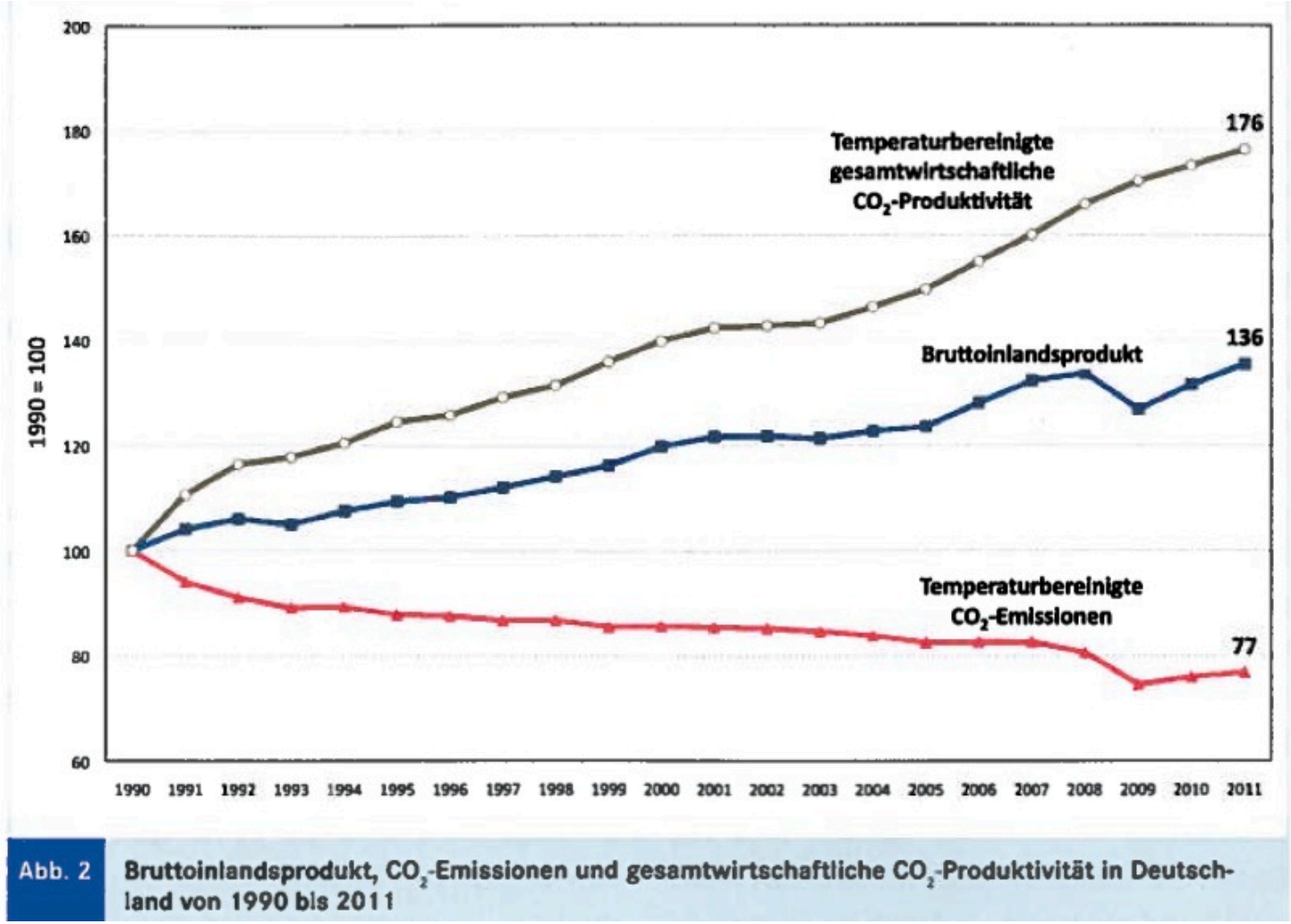


Abb. 2 Bruttoinlandsprodukt, CO_2-Emissionen und gesamtwirtschaftliche CO_2-Produktivität in Deutschland von 1990 bis 2011

Latest figures: -27% from 1990 in 2011.

This graph is CO2 only (-23%)

Kyoto target achieved.

2020 target needs addl effort to meet.

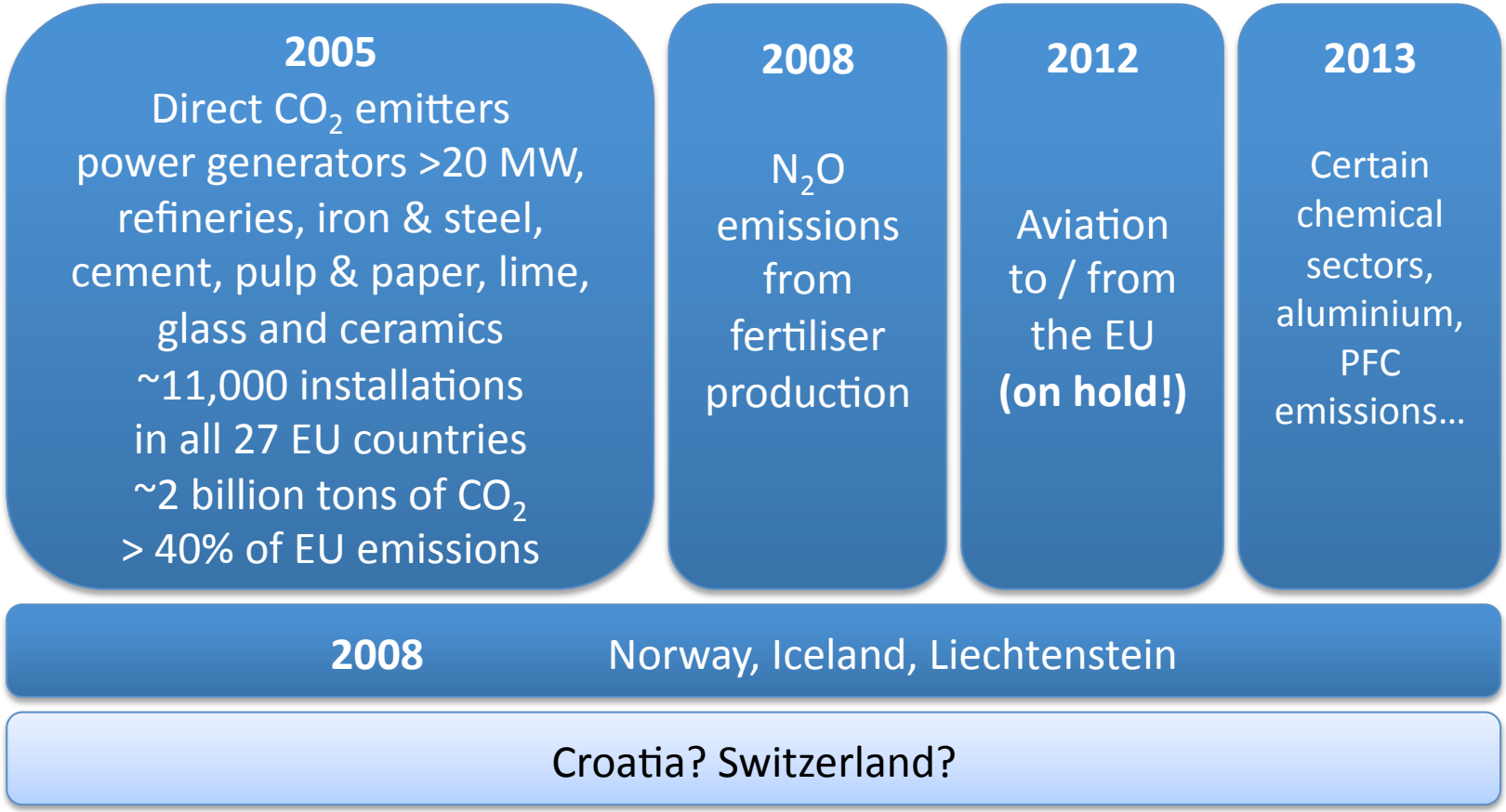
Source: Ziesing in „Energiewirtschaftliche Tagesfragen", Nr 62, issue 4, 2012

Case study: EU ETS

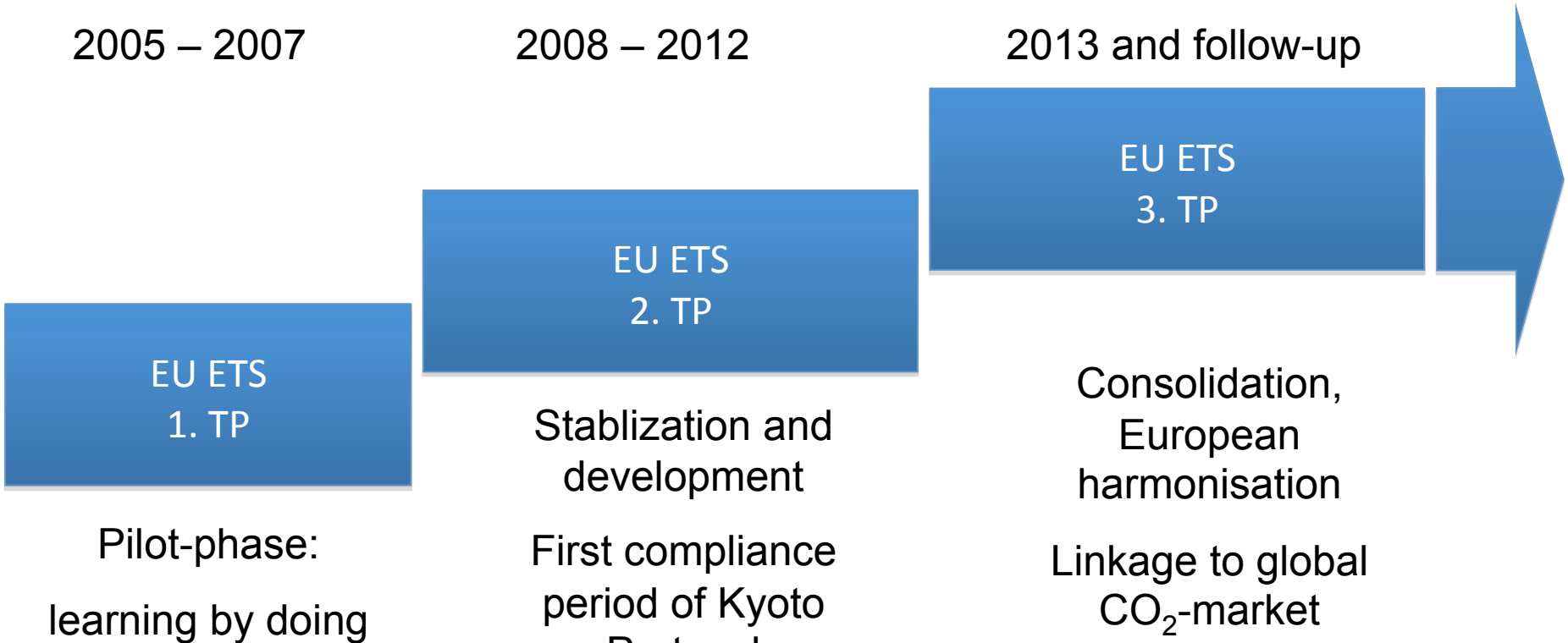
- What is it – how does it work?
- Experience so far – adjustments over time
  - Design changes following pilot phase
  - Price development
- Current state of play
  - Price related debates
  - Reasons for current over overallocation in the system

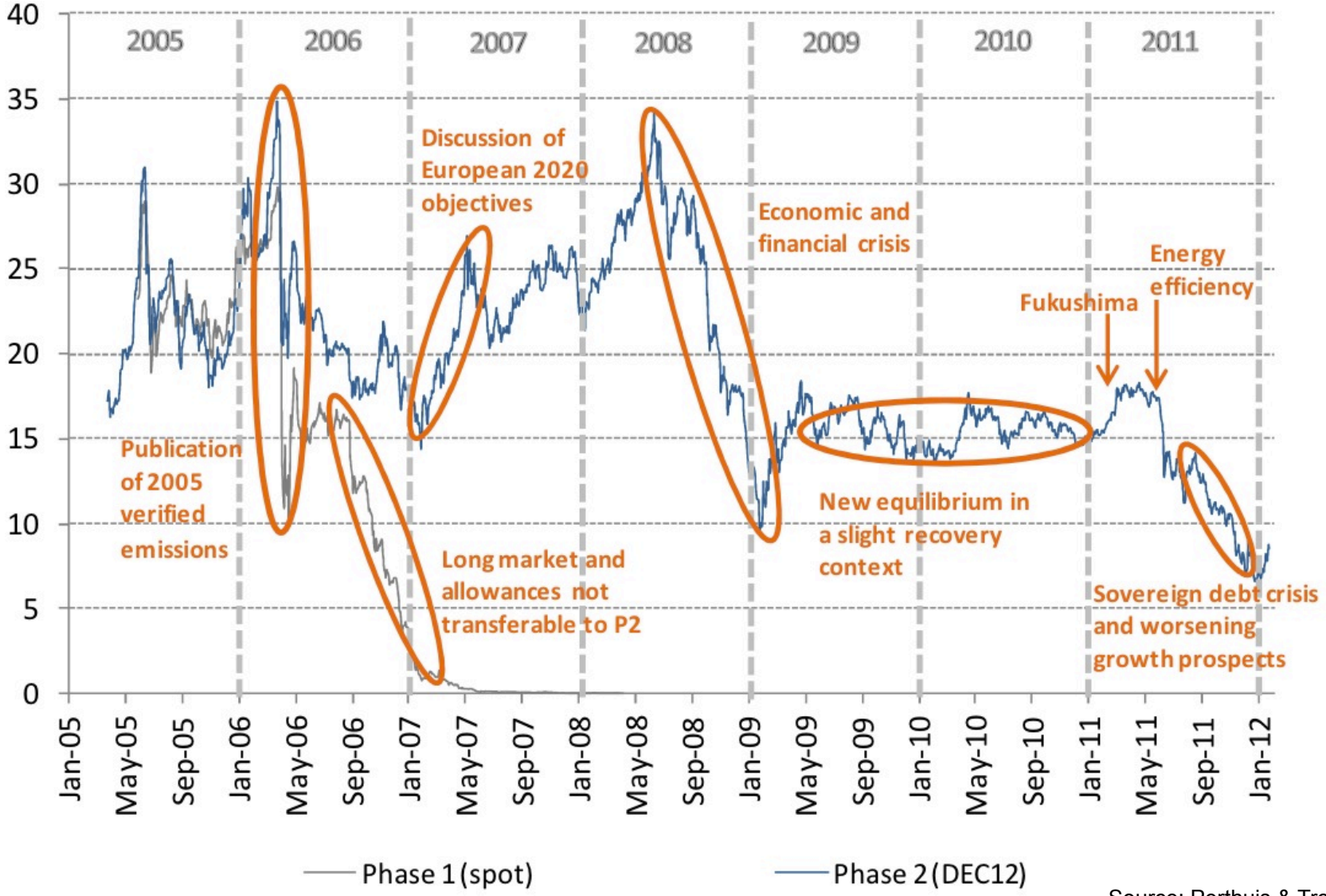
The EU Emissions Trading Scheme

- The world's largest, first international cap-and-trade scheme, covering:



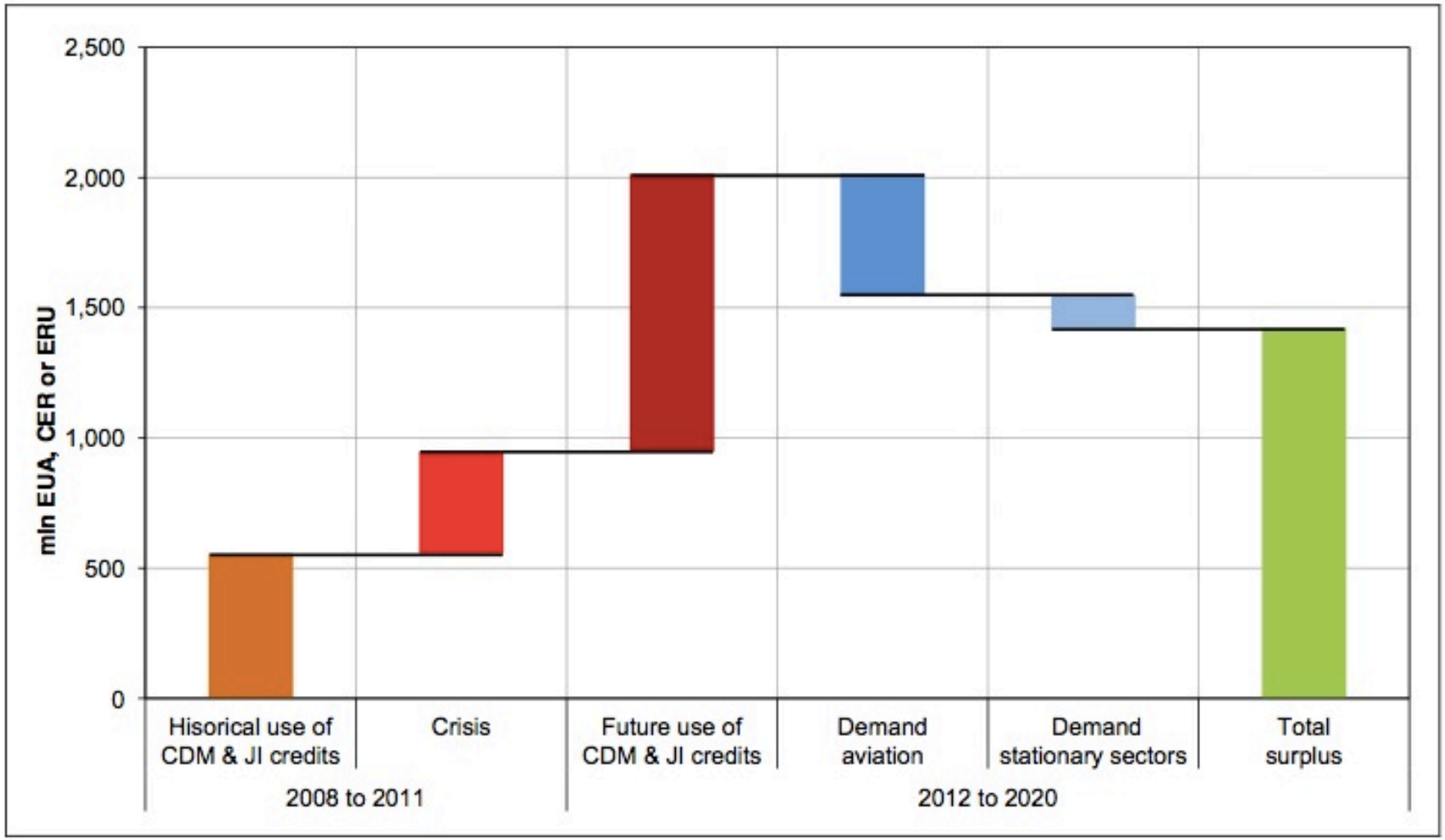
Overview of the EU-ETS





Source: Perthuis & Trotignon, 2012

Contributions of different sources to the current surplus in EU ETS



Source: Öko Institut

Case study: EU ETS

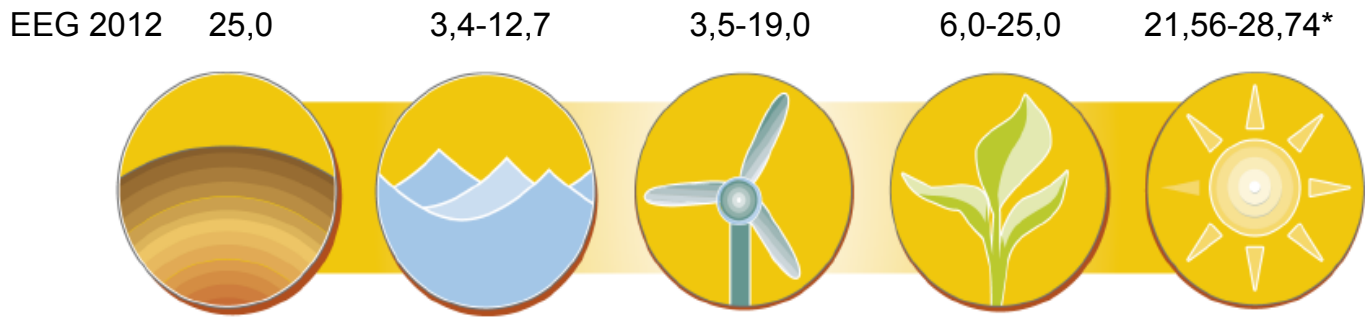
- Policy learning effects very visible from Phase I to Phase III
- Establishing the system marked a threshold after which the debate moved from “do we really need to cap emissions” to “how do we design the policy more effectively”
- Lessons drawn in review: harmonisation and centralisation make sense for an EU wide market to function well
- Establishment of the system itself allowed for expansion to other sectors
- Current debate shows that additional structural measures are required to ensure future effectiveness of the system
- Future design may need to find a way of avoiding current price crisis and create more stability and predictability

Case study: Germany's Renewable Energy Feed-In Tariff

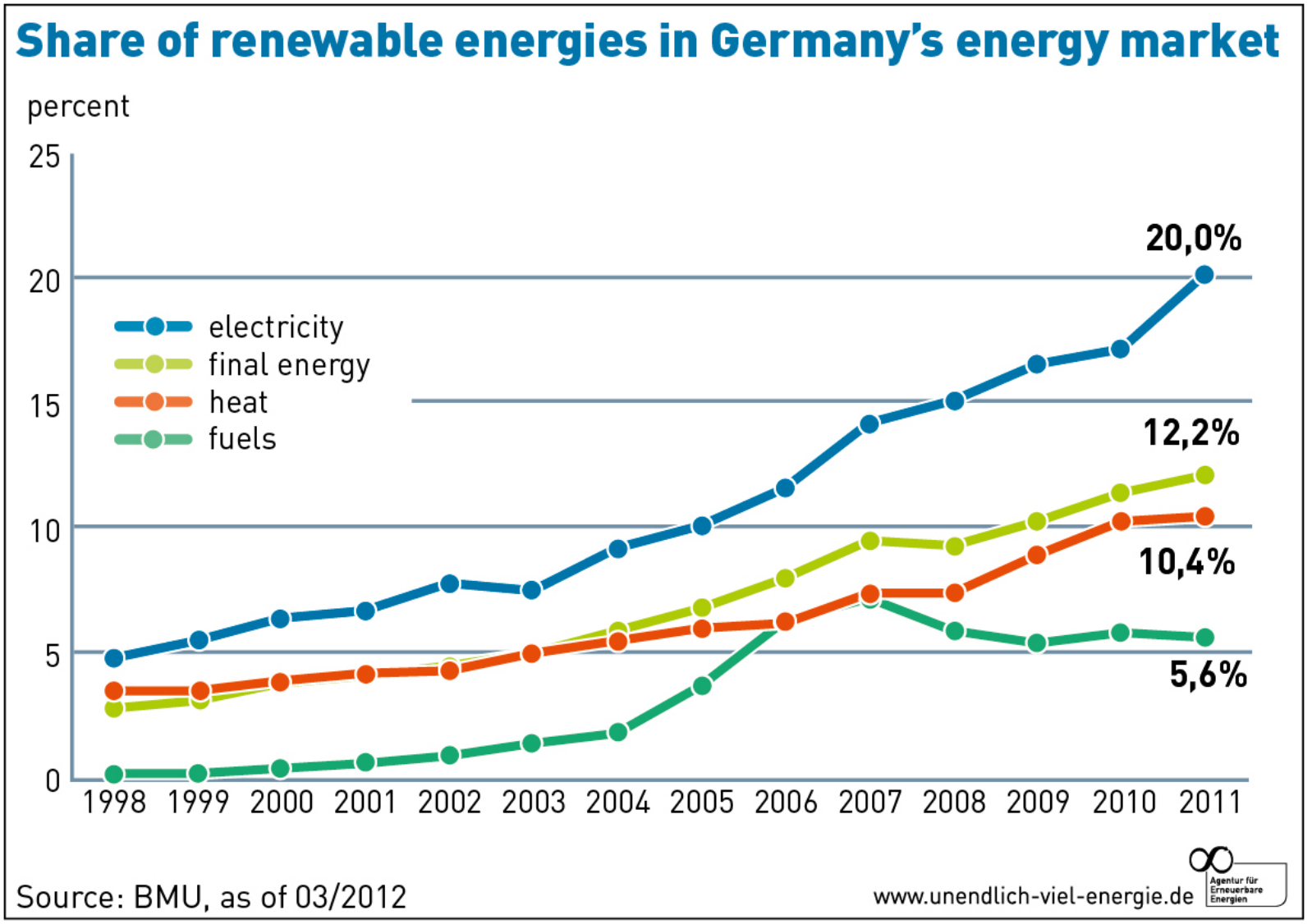
- What is it – how does it work?
- Experience so far – adjustments over time
  - Impact on deployment
  - Impact on technology cost
  - Impact on electricity price
  - Impact on energy imports/exports
  - Impact on grid infrastructure
- Current state of play

The Renewable Energy Sources Act = EEG

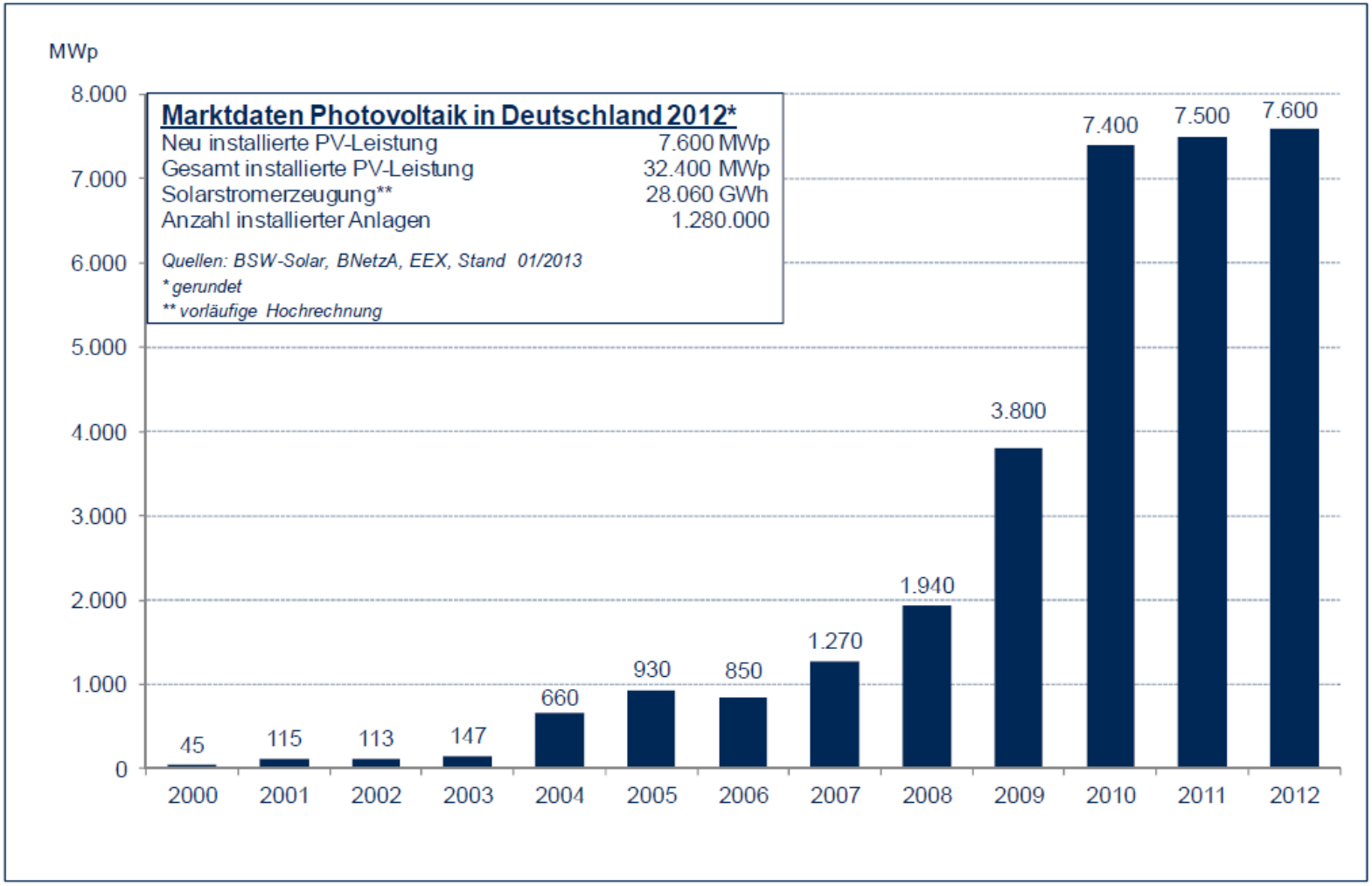
- Fixed price for every kwh produced from RES for 20 years - depending on technology and installation size
- Guaranteed access to the grid AND priority transmission through the grid
- Nationwide equalisation scheme (= independent of where RES are built)
- Sharing costs between consumers to ensure budget independence
- Reviews of the tariffs: was built in for some technologies. Adjusted over time



Share of renewable energies in Germany's energy market



Growth in Photovoltaic 2000-2012



Price Development for Photovoltaic Electricity

¹ Systempreise: Durchschnittliche Endkundenpreise fertig installierter Aufdach-Anlagen ohne USt.

Quelle: BSW-Solar, Bundesnetzagentur **www.solarwirtschaft.de**

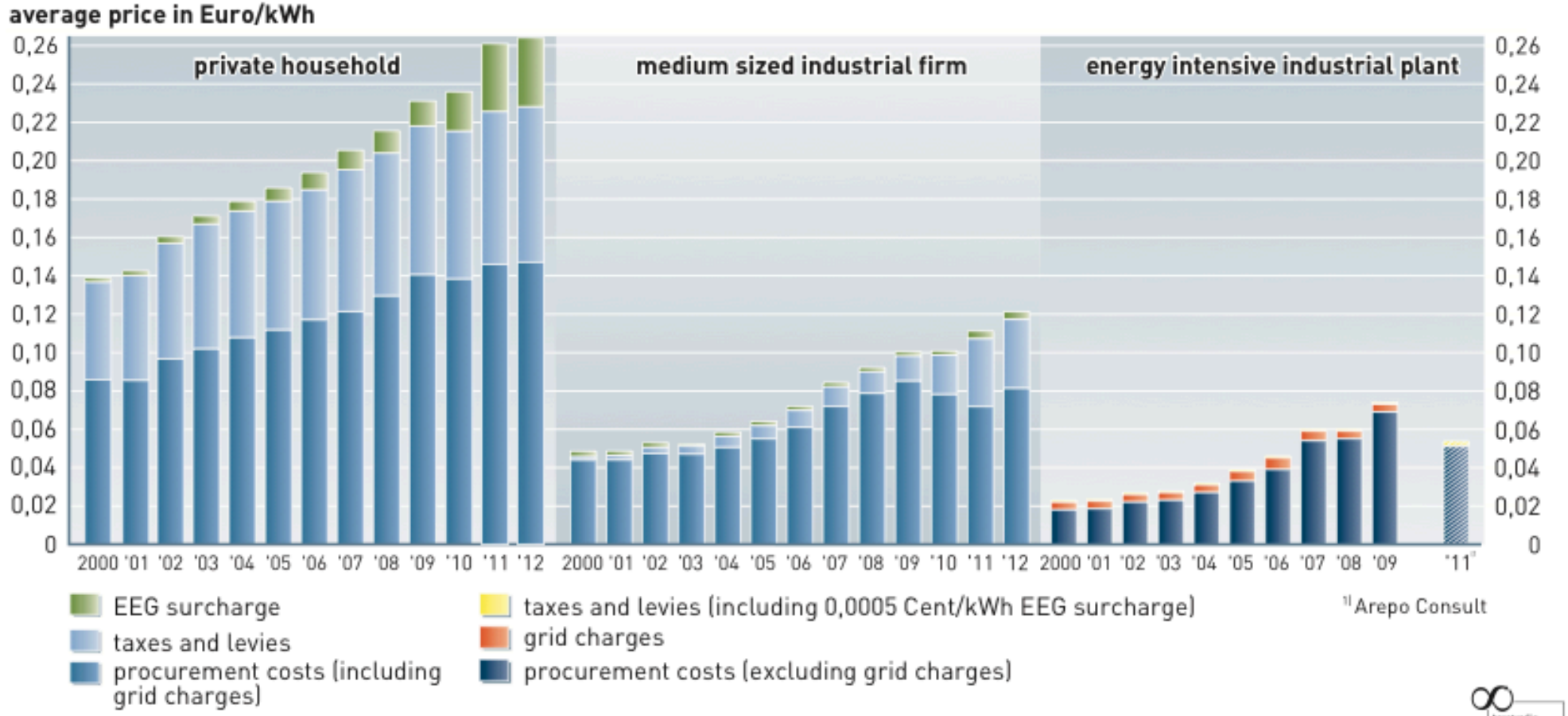
Renewables impact on market prices

Spot market prices have fallen by roughly 0.5 ct/kWh, saving industry € 1.2 billion in 2010

Source: EEX

Comparison of electricity prices

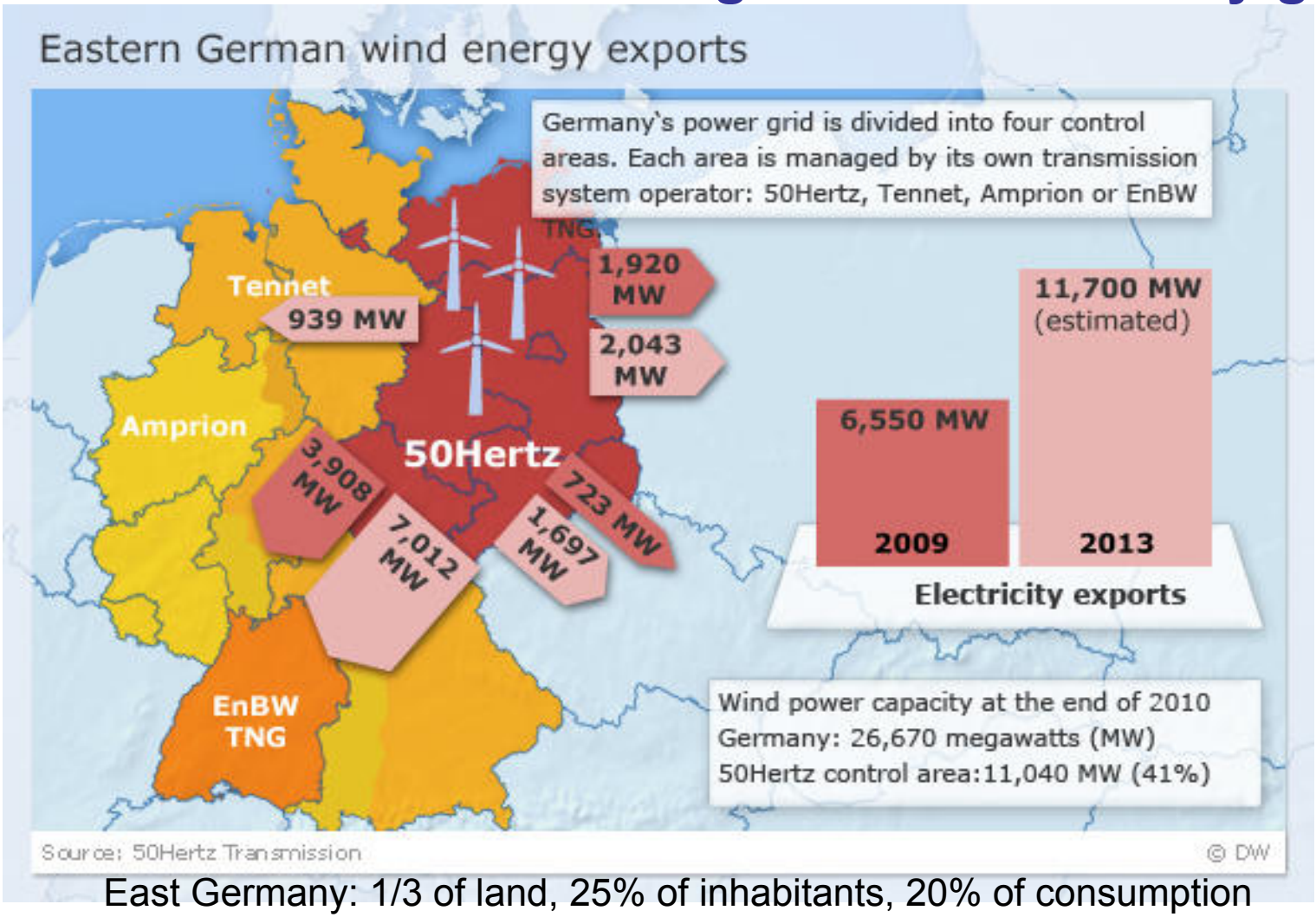
Energy intensive industries profit from low taxes and levies



Source: Frontier econmics / ewi, VIK, own calculations, Arepo consult, as of 04/2012

www.unendlich-viel-energie.de

20% renewables - a challenge for the electricity grid



East Germany: 1/3 of land, 25% of inhabitants, 20% of consumption

Public Perceptions of Renewable Energy

- Survey by Lichtblick in April 2012:
  - 87 % of Germans approve of the energy concept and believe the transition to renewable energy is successful, and 20% intend to generate part of their electricity themselves 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

- Survey by Forsa in March 2011:
  - 71% of citizens would pay € 20/month for renewable energy promotion

Case study: Germany's Renewable Energy Feed-In Tariff

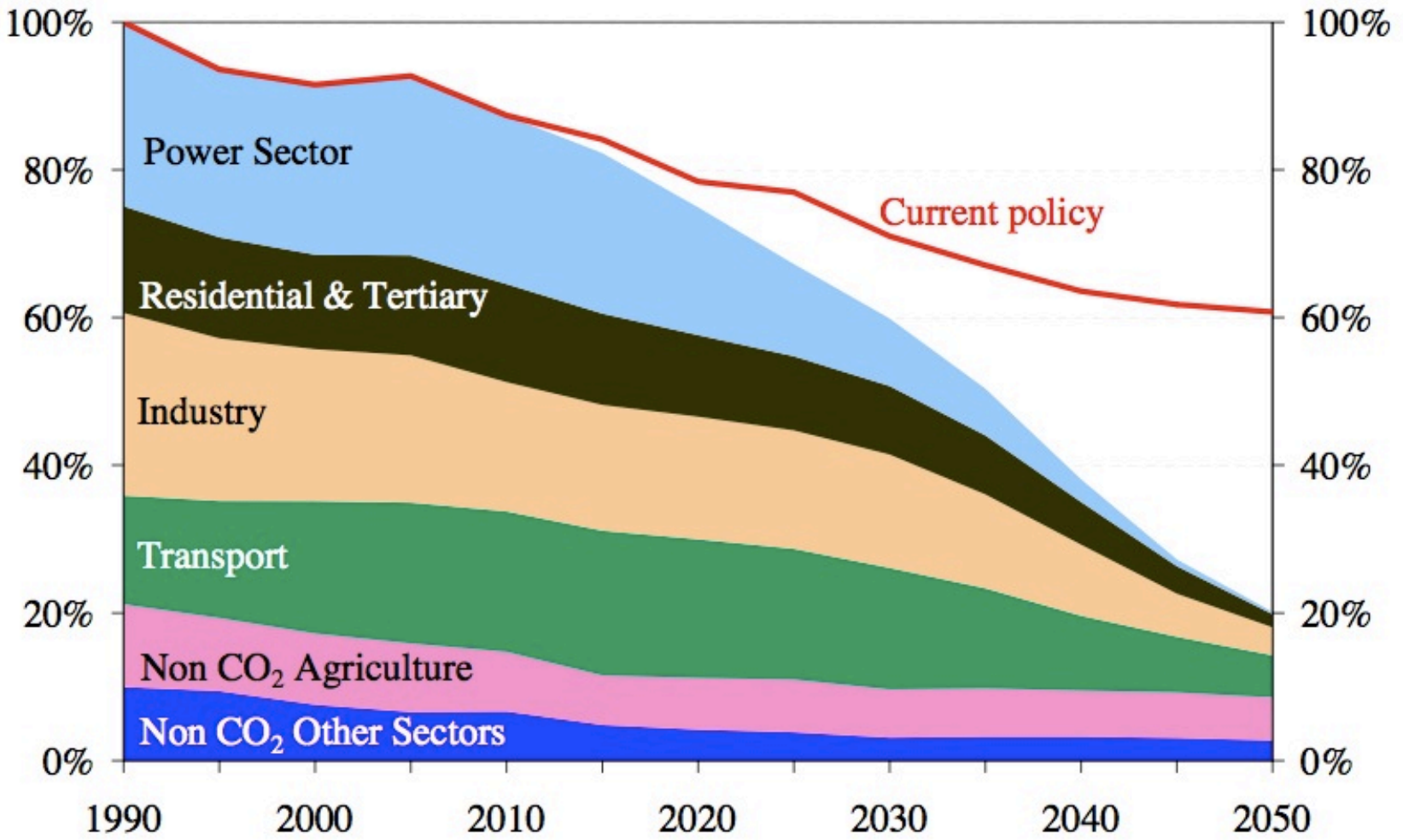
Lessons learned:

- The system works.
- Technology cost have come down faster than anticipated – innovation spurred by investments and economies of scale
- Renewables are bringing down the price of electricity on the spot market (which unfortunately means the Feed-in tariff cost go up)
- Future system reform will need to balance predictability of support with overall cost to consumers or find other ways of reducing or redistributing cost (e.g. by cutting exemptions)
- Future system reform will need to integrate infrastructure development to manage speed of further deployment

Policies for 2050: progress so far - summary

- A variety of useful lessons
- Proof of concept? Progress towards GHG reductions and RES deployment
- Things happen faster than expected (RES) (if still slower than necessary)
- Policy learning processes have been able to adapt and improve designs
- So far mainly incremental /getting started, next step **transformative**
- Policies not yet equipped for the big reductions
- Urgency: needing to avoid path dependency lock-in
- *…political situation tough at present (getting to that again in a bit)*

Current policy mix is not equipped for reaching the 2050 targets



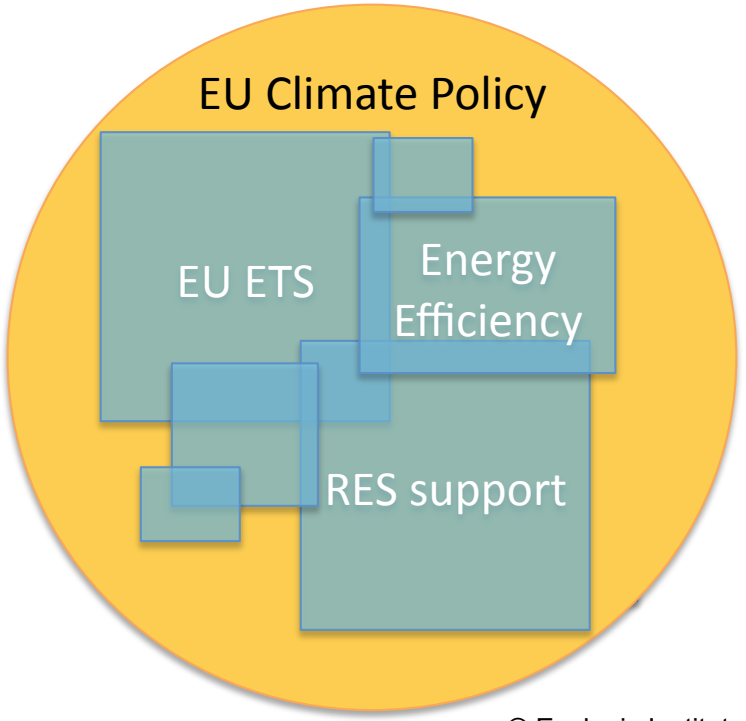
Source: "A Roadmap for moving to a competitive low carbon economy in 2050" COM(2011)112

Optimality: confounding factors from a wider perspective

- Multitude of objectives:
  - In climate policy alone (emission reduction, renewable share, energy efficiency),
  - In the wider policy context (energy policy, industrial policy and competitiveness, geopolitics …)
- Path dependency and lock-in risk:
  - Choices are contingent on past decisions: e.g. innovation, infrastructure;
  - Institutions matter – regulatory framework, e.g. in the energy market;
  - Systemic constraints and obstacles, e.g. landlord-tenant dilemma;
- Political economy of instrument choice
  - Not only the absolute level of costs matters, but their distribution
  - Instrument choice, and instrument design, reflects leverage of interest groups
- Surprises are possible:
  - Unforeseen economic and technological developments, e.g. economic crisis, fracking;
  - Political upheavals, e.g. Germany post-Fukushima
- System boundaries: Carbon leakage, small emitters, diffuse sources…

What kind of optimality? Questions for post-2020 policy

- Single or multiple **objectives**?
- **Interactions** of policies – can conflict resolution be built into their design?
- Should the EU aim for a well-integrated, clearly structured **orchestra** of instruments – or should we allow for some overlap and **redundancy** to insure against policy failure?
- What role for **pricing** tools in the optimal policy mix: even if we had a "proper" carbon price, how far would it take us in the transformation?
- How much **inefficiency** (imbalance) are we prepared to tolerate in the name of feasibility?
- How to deal with the fact that **feasibility** is both a constraint and a (legitimate) object of public policies?



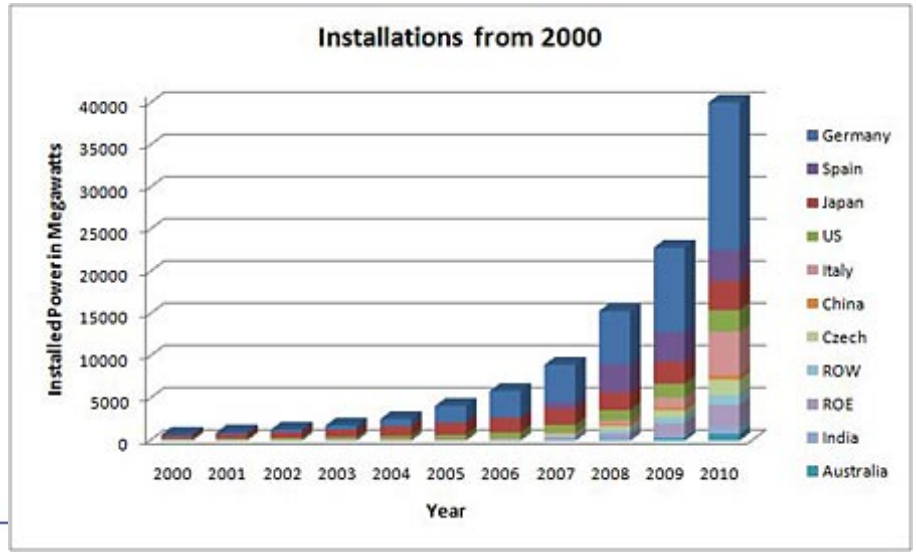
Context for the EU's post-2020 debate

- EU climate policy is in a holding pattern
- Climate has lost its place in the sun: other issues dominate the agenda (Euro crisis)
- Political commitment is in question (=> Polish vetos)
- Few dedicated and unequivocal champions (UK? DE… ☹)
- Emissions are going down – targets are being overshot
- Technology cost are down (certainly for renewables)
- Success in reductions has both improved and reduced EU credibility
- (supposed) core instrument is facing a crisis: ETS carbon price is down
- Commission and Parliament will be replaced over the next two years
- UNFCCC process scheduled to run until 2015 – EU needs to do its homework
- IPCC AR5 publications coming in 2013-14

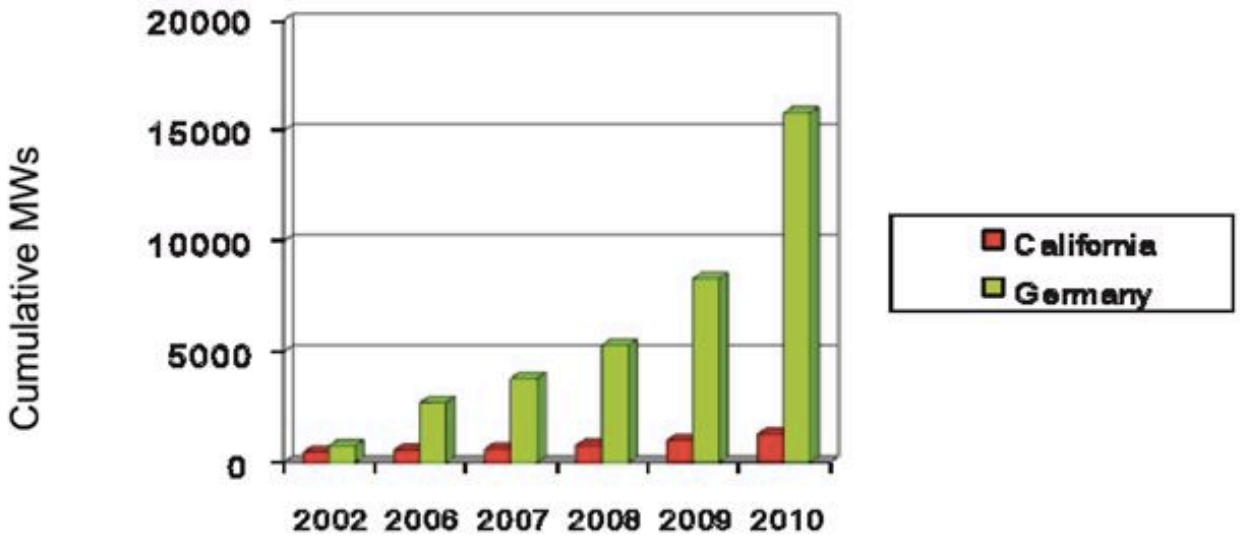
Role of the US – as seen from Europe

- US critical to global solution – need clarification on role at UN level
  - Must not repeat the Kyoto situation (negotiation and agreement and then inability to ratify)
  - EU policy-makers understand the constraints of the domestic political situation
- Main domestic driver right now (in the US) has repercussions abroad: natural gas boom… (and unconventional oils). LNG and/or coal exports to Europe – impact on prices
- You have potential: renewables development is picking up but still underutilised (see figures on global deployment and solar radiation map).
- Common interest: major emerging economies to go for a low carbon development path. At present these ongoing dialogues seem to happening in parallel (without connection) and not in coordination with each other

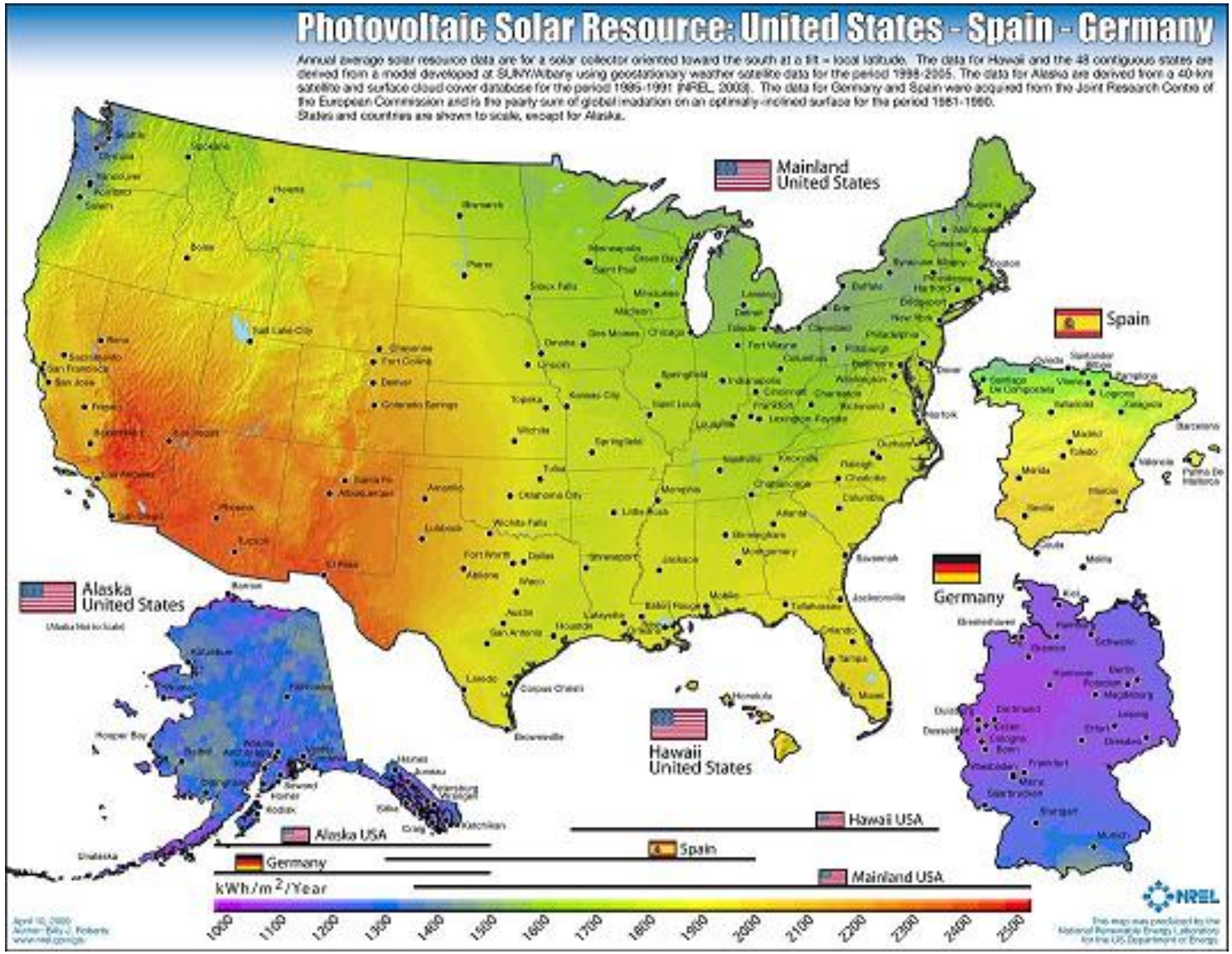
Growth in Photovoltaic 2000-2010



California vs. Germany: Solar PV Capacity



(Source: CLEAN)


Photovoltaic Solar Resource: United States - Spain - Germany
Annual average solar resource data are for a solar collector oriented toward the south at a tilt = local latitude. The data for Hawaii and the 48 contiguous states are derived from a model developed at SUNY/Albany using geostationary weather satellite data for the period 1998-2005. The data for Alaska are derived from a 40-km satellite and surface cloud cover database for the period 1985-1991 (NREL, 2003). The data for Germany and Spain were acquired from the Joint Research Centre of the European Commission and is the yearly sum of global irradiation on an optimally-inclined surface for the period 1981-1990.
States and countries are shown to scale, except for Alaska.
Mainland United States
Spain
Germany
Alaska United States
Hawaii United States
Hawaii USA
Alaska USA
Spain
Germany
Mainland USA
kWh/m2/Year
1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500
NREL

Source: NREL

Summary

- EU and Germany have done pioneering work in climate policy development, charted new territory
- Proof of concept has been achieved, many lessons learnt
- Policy learning process have been used to adapt and improve policies based on early experience
- Significant strides forward have been made towards emission reductions and renewable energy deployment
- Current (economic and) political landscape makes forward-looking debate difficult at present
- Going forward, many fundamental questions need to be answered
- Non-disruptive intervention mechanisms need to be built in upfront to allow for further adjustments of policies when necessary
- US-EU collaboration on climate and energy policy has several areas to be addressed

Thank you for your attention.

Matthias Duwe, Ecologic Institute

www.cecilia2050.eu