Political Frameworks and Private Investments in Power Generation for the German energy transition

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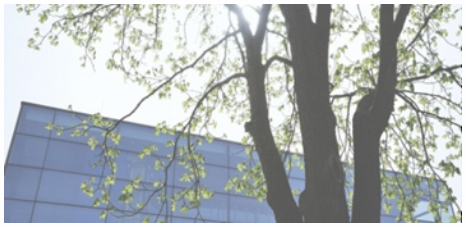


Institute for Advanced Sustainability Studies
IASS in Potsdam

Political frameworks and private investments in power generation for the German energy transition

Dominik Schäuble

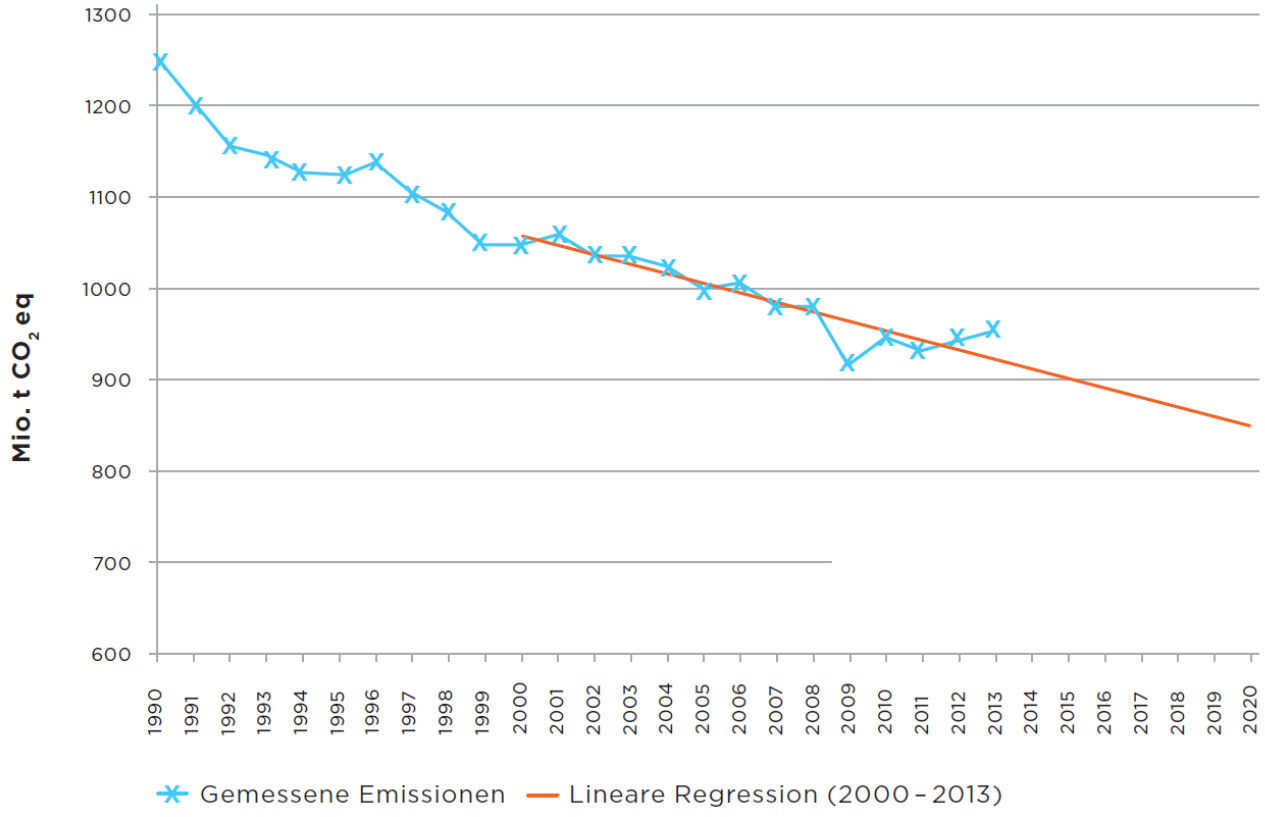
Transdisciplinary Panel on Energy Change

The objectives of this talk are …

- …to briefly illustrate the **status** of the **Energiewende** in Germany
- …to review the **investment environments** for conventional and renewable **power generation** and the **current political discussion** on the reform of the **electricity market design**
- …to discuss a suggestion on a **new refinancing mechanism** for renewables

The Status of the Energiewende

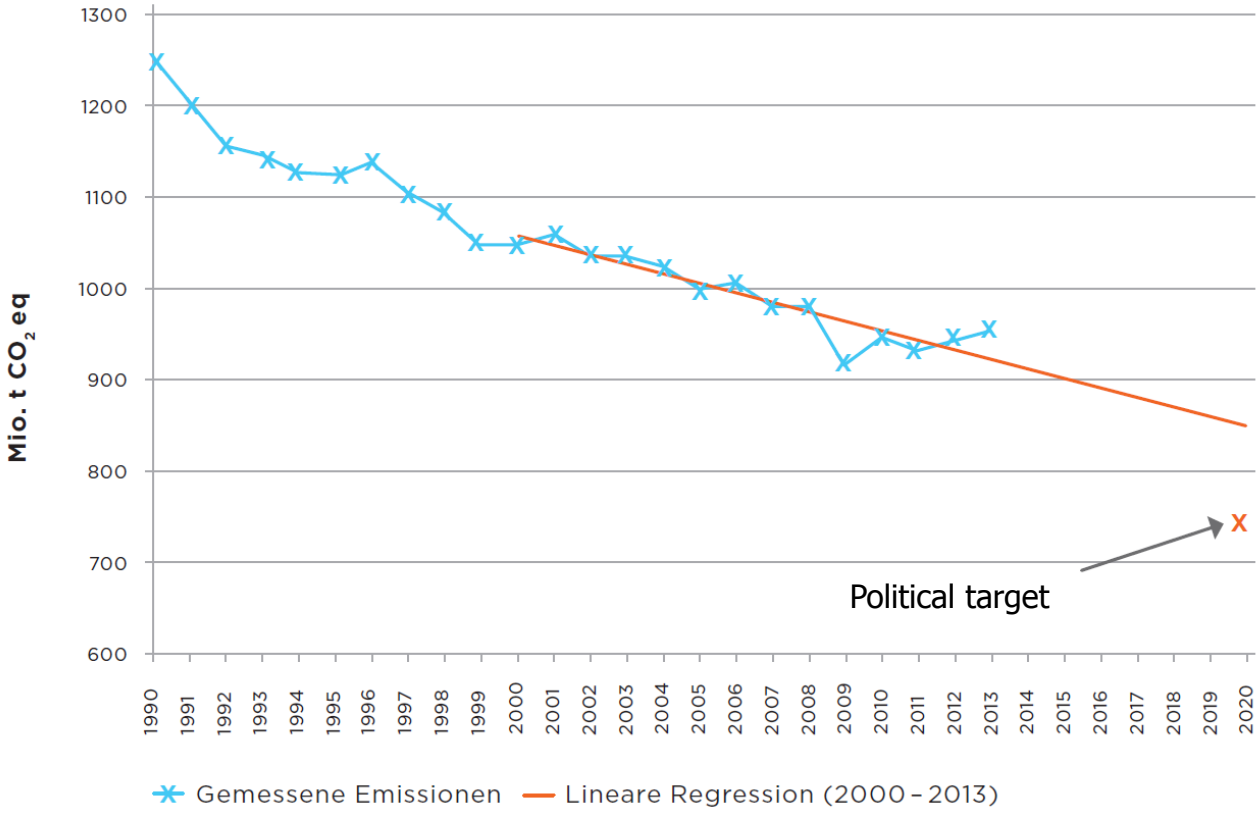
Status
Reduction of GHG-Emissions



Source: UBA, 2014

- Reduction of **24%** until 2013 (wrt 1990)

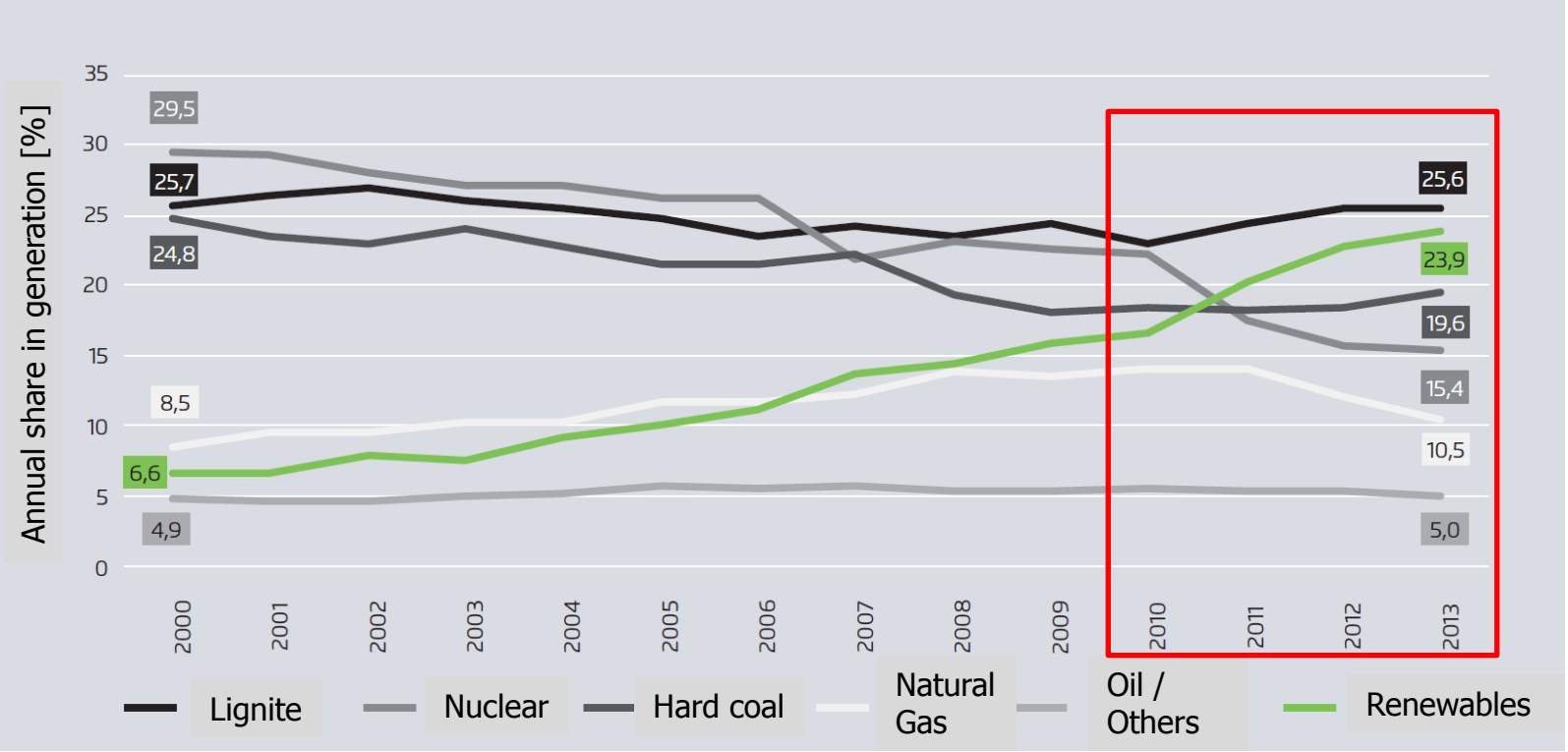
Status
Reduction of GHG-Emissions



Source: UBA, 2014

- Reduction of **24%** until 2013 (wrt 1990)
- Reduction target for 2020 (-40% wrt 1990) will be **failed** without strong additional measures

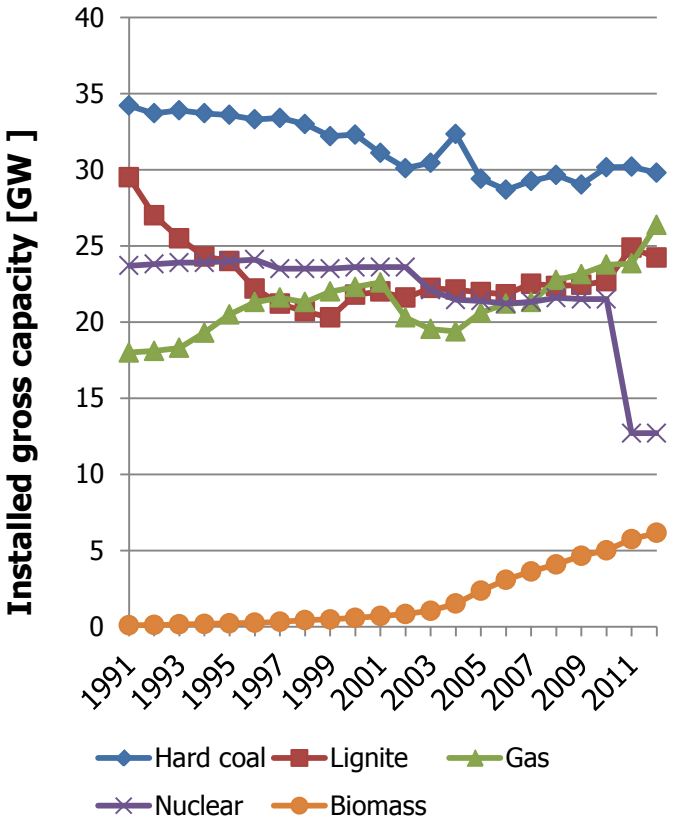
Status
Power Generation Mix Germany

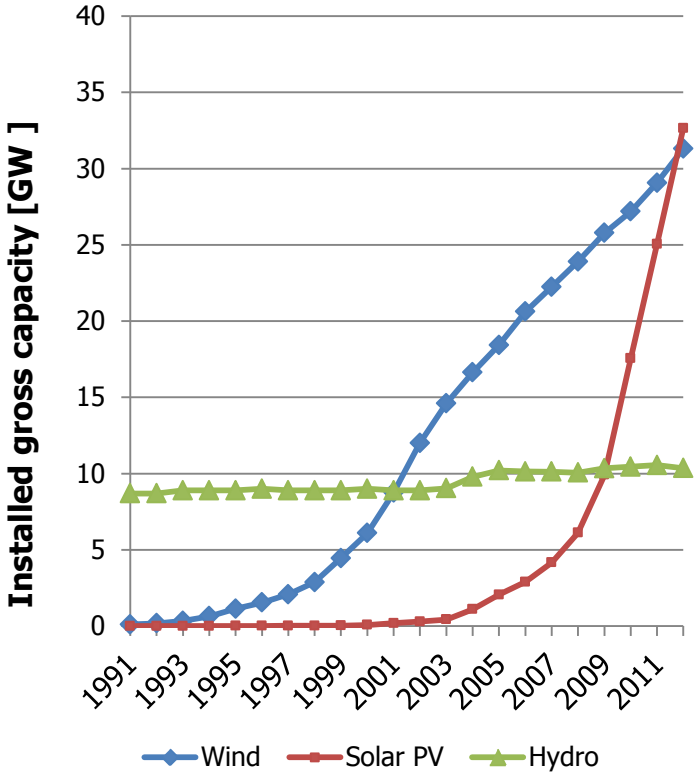


Source: AG Energiebilanzen, Agora Energiewende

- Recent development determined by Energiewende policies and fuel/CO_2-prices

Status
Installed Power Generation Capacity Germany





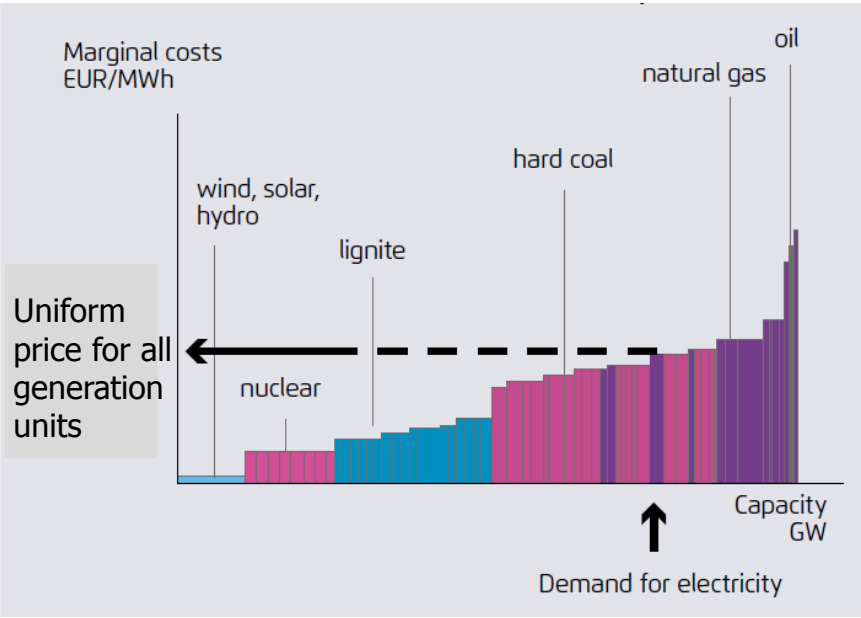
Source: Ministry for Economics and Energy, 2014

- Despite the shut-down of 8 nuclear power plants installed generation capacity increased in recent years
- Generation overcapacity

Investment environment I: conventional power generation – current conditions and discussions

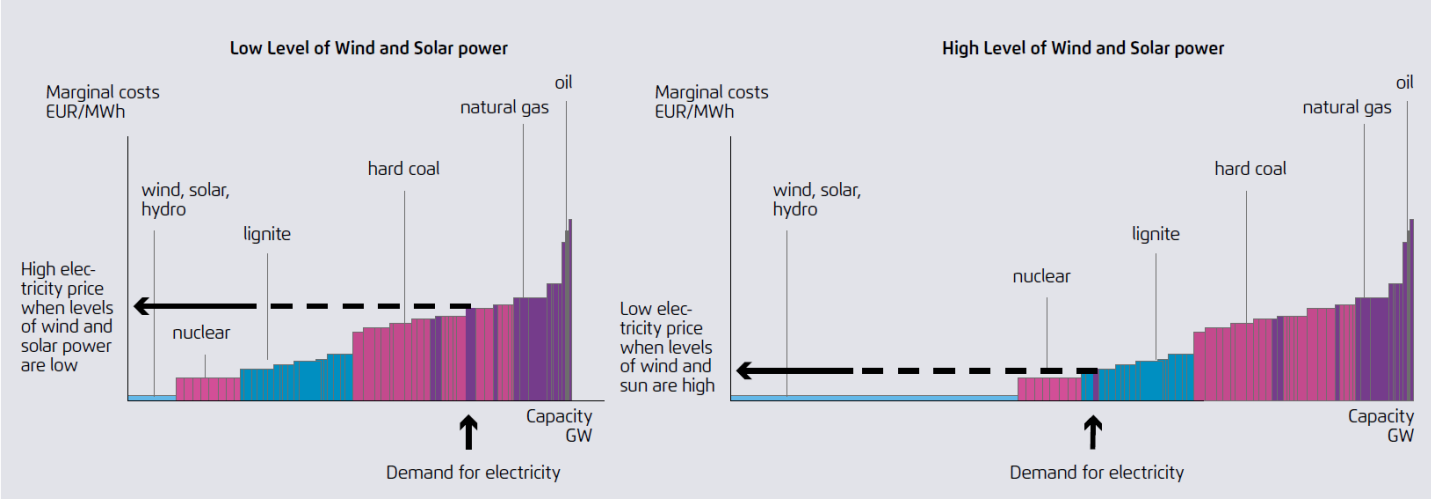
Conventional generation
Revenues for investors

- Electricity sales in energy-only market EOM [€/MWh]
- Pricing based on marginal cost merit-order
- Spot market: Intraday, Day-ahead
- Derivatives market: Futures/Options (up to 6 years ahead)

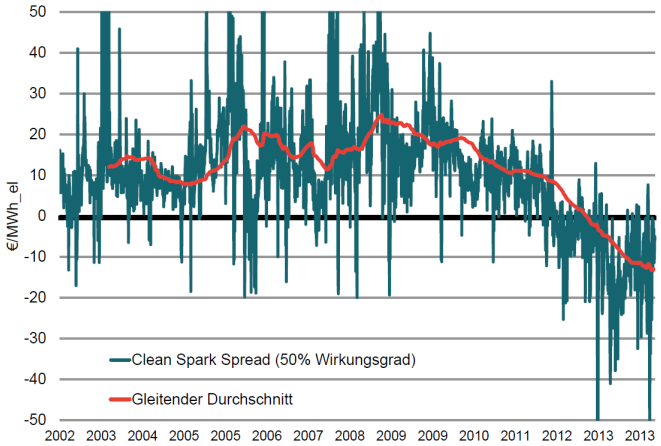


Source: Agora Energiewende, 2013

Conventional generation
The Problem



Source: Agora Energiewende, 2013



Quelle: Frontier auf Basis von Platts Power Vision

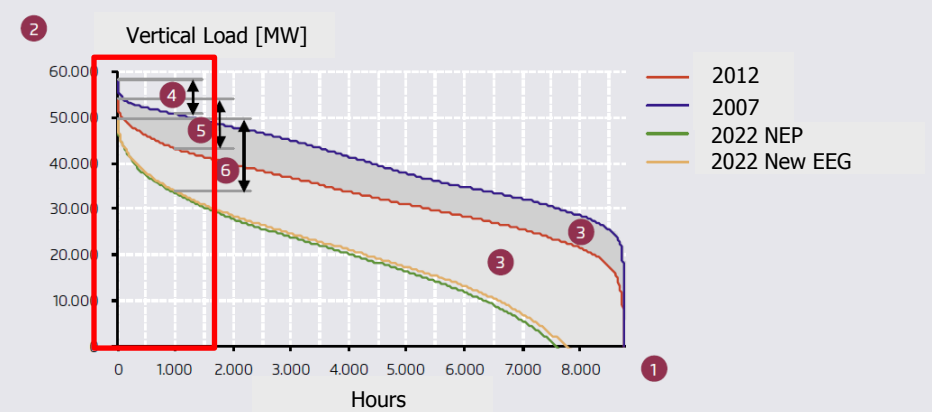
Source: Frontier Economics, 2014

Supply from renewables has resulted in…

- …a **decrease in operating times** of gas- and hard coal-fired generation
- …a **decrease in electricity prices** especially at midday

➢ Many hard coal-fired and most gas-fired power plants are not able to generate sufficient revenues to cover their fixed costs

Conventional generation
The Problem



Source: LBD, 2014

Range below maximum annual load	2007	2012	2022 New EEG
100 MW	1	1	1
1.000 MW	1	5	5
5.000 MW	210	140	70
10.000 MW	1.870	810	340

- In the future significant capacities will be needed for a short time only

Conventional Generation
How to Secure Supply?

The **fundamental questions**:

- Does the current market design (EOM with minor modifications) guarantee security of supply in the long run?
- In other words: Given the current market design, will there be sufficient investment in dispatchable power generation to have a secure supply at all times?
- If not, what major market design changes are needed to guarantee security of supply in the long run?

Basically, there are **two concepts** discussed at the moment:

- Refinancing of investments **entirely through revenues from the EOM** (high prices in scarcity situations) [€/MWh]
- Partial refinancing of investments through **payments for the provision of dispatchable generation capacity** [€/MW]

Conventional Generation
The Discussion Process – Capacity Mechanisms

- **Energy only market 2.0** with **strategic reserve**
  - Revenues for electricity sales [€/MWh] only
  - Reserve outside the market [€/MW and €/MWh] for rare scarcity situations
  - Size of reserve determined by regulatory authority

- **Centralized capacity market**
  - Revenues for provision of generation capacity [€/MW] and electricity sales [€/MWh]
  - All generators can bid
  - Capacity requirement determined by regulatory authority

- **Focused centralized capacity market**
  - Revenues for provision of generation capacity [€/MW] and electricity sales [€/MWh]
  - Only selected generators can bid: with low operating times, flexible, clean
  - Capacity requirement determined by regulatory authority

- **Decentralized capacity market**
  - Revenues for provision of supply capacity [€/MW] and electricity sales [€/MWh]
  - All generators can provide capacity certificates
  - All consumers (i.e. end consumers, traders) are required to back up their electricity demand by capacity certificates

Conventional Generation
The Discussion Process – 4 Official Assessments

- **Federal Ministry for Economics and Energy** commissioned four assessments to evaluate the ability of the energy-only market to provide **security of supply** and to evaluate the suggested **capacity mechanisms**

- Major **evaluation criteria**: effectiveness, efficiency, regulatory risk, international compatibility

- Consistent **conclusion**
  - **Adjusted Energy-only market** is the means of choice
  - If a safety net is politically desired, the EOM 2.0 can be supplemented by a **reserve**
  - The **decentralized capacity market** performs better than the centralized capacity markets in most evaluation categories

- However these conclusions depend on several **preconditions**…

Conventional Generation
Preconditions that need to be discussed

- Amount of **demand-side capacity** that can be activated without capacity payments
- Longterm **self-committment of decision-makers** concerning the acceptance of high scarcity prices (no price limits)
- **Stable long-term political frameworks** concerning e.g. support for renewables and combined-heat-and-power, EU emissions trading scheme
- „Peak-load-pricing" vs. Abuse of market power
- Difference in **Weigthed Average Cost of Capital** (WACC) between EOM2.0 and capacity markets (1%)

➢ What about **resilience** of regulation? -> Sensitivity Studies

Investment environment II: renewable power generation – recent developments

Renewables
Revenues for investors

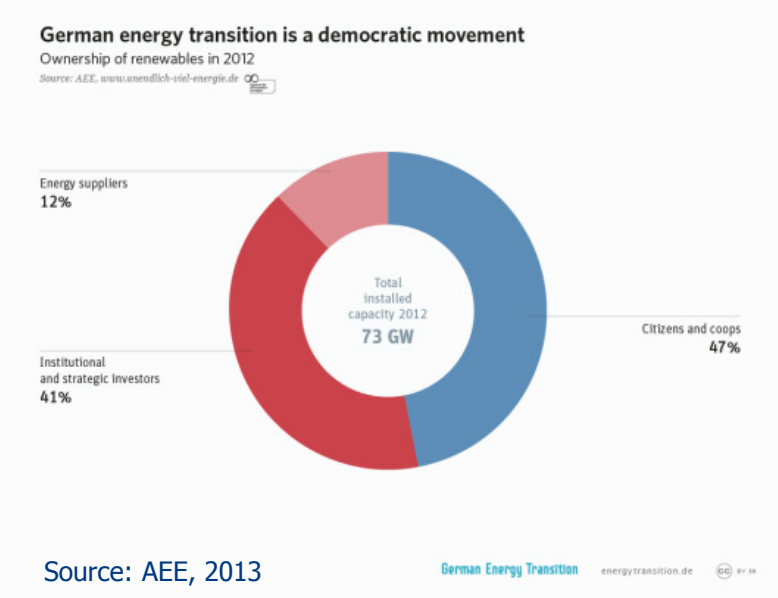
The **basic concept** so far:

- **Regulated** technology-specific **prices** for electricity generation from renewables (feed-in tariffs or rolling market premium) **guaranteed for 20 years**
- **Feed-in guarantee** for renewables
- Feed-in tariffs and their degression with time **determined by legislative bodies**
- **Costs** are allocated to the **electricity consumers** (EEG surcharge)

➢ **Low risk** investment with decent revenues

➢ **Dynamic deployment** of renewables

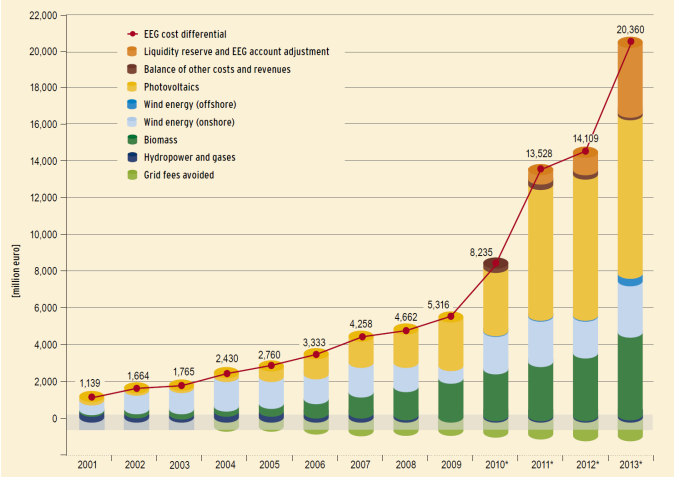
➢ Extraordinary **structure of investors**



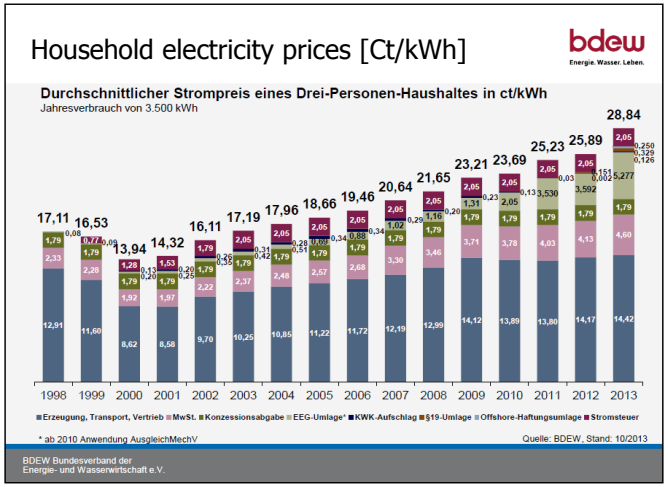
Source: AEE, 2013

Renewables
The (Perceived) Problems

- Increasing costs and electricity prices
- Distribution of costs
- Market integration of renewables
- Uncoordinated deployment
- EU state aid regulations



Source: AGEE-Stat, 2014



Source: BDEW, 2014

Renewables
Reform of the EEG 2014 - The solution?

Effective since 1 August 2014

Costs:

- **Corridor** for targeted renewable share instead of defined minimum shares
- Stricter **control of deployment rate** for each technology (2.5 GW/a for Wind Onshore and solar PV, 100 MW for Biomass, 6.5 GW until 2020 for Wind Offshore)
- Premium determination via technology specific **tendering** latest by 2017 (pilots for utility-scale solar PV and current discussion about design of tendering)

Cost distribution:

- EEG surcharge (30%) on **self-consumption**
- Total volume of exemptions (EEG surcharge) for energy-intensive industry probably stable

Market integration:

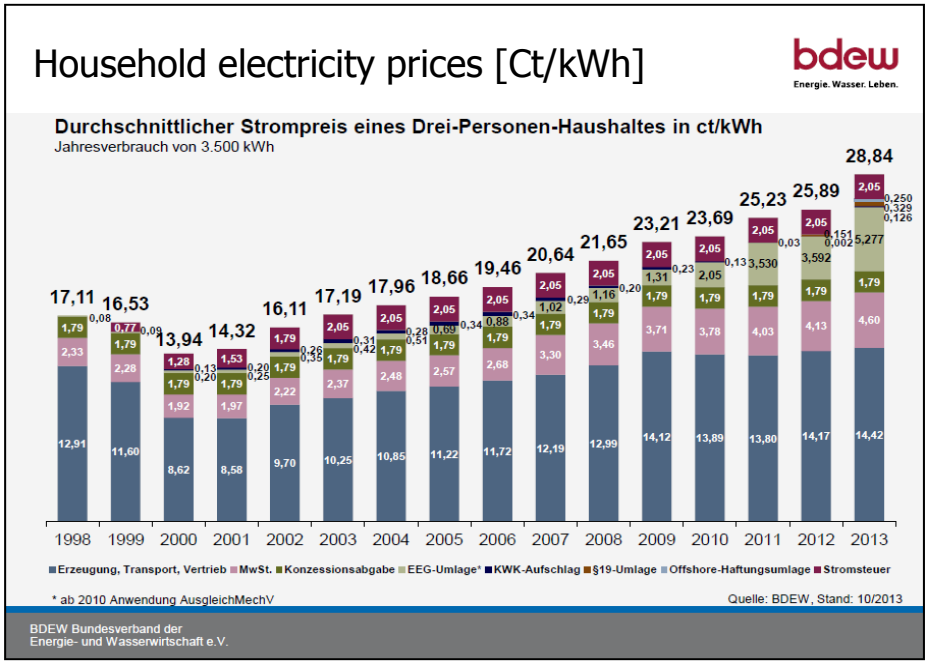
- Direct-to-market sale with **rolling market premium** instead of feed-in tariff as the future default mechanism

New refinancing mechanism for renewables:

If rising electricity prices are perceived as a problem (see EEG Reform), existing generation capacity needs to be adressed

The ‚Innovation Fund'
The Objective

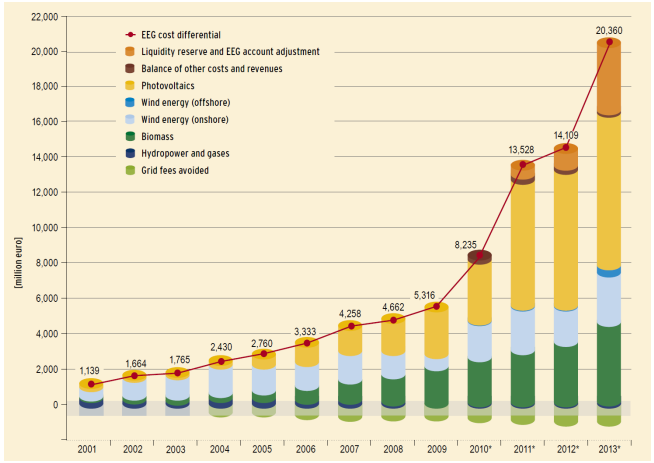
- Stabilize retail electricity prices for households and industry by stabilizing the EEG surcharge (price increases have an impact on the level of acceptance of the Energiewende)

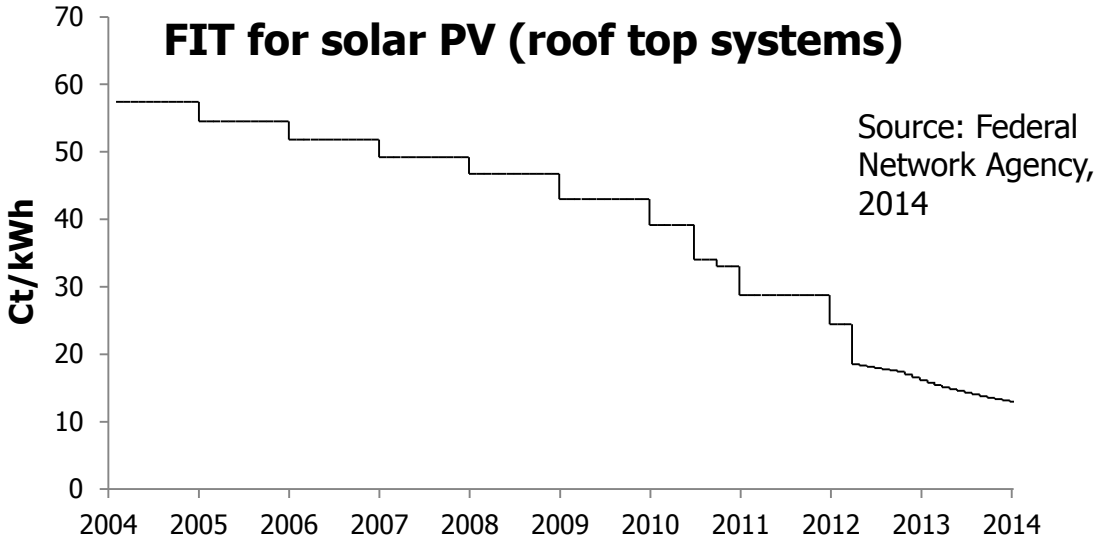


Source: BDEW, 2014

The ‚Innovation Fund'
The Rationale

- A large share of the current costs for renewables is attributable to the **deployment of renewables in the past** (mainly solar PV between 2009 and 2012)



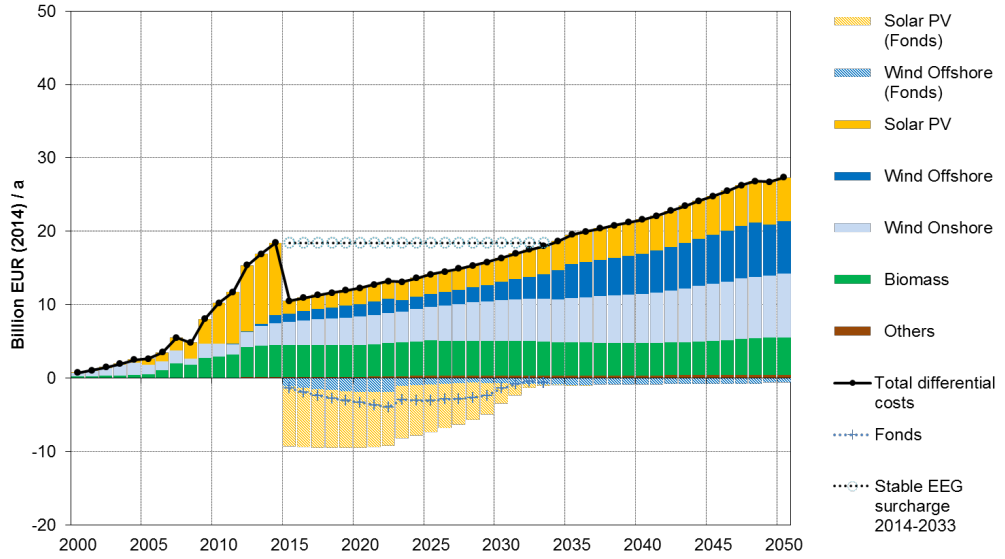


- The strong decrease of renewable technology costs suggests a **technology development** process and creation of **economies of scale**
- Renewable technology development creates **positive externalities** -> public support and financing justified (Future generations enjoy the benefits of renewable technology development)
- Other power generation technologies have been supported through public expenses (e.g. nuclear) -> **leveling the playing field**

The ‚Innovation Fund'
The Concept

- So far the feed-in tariffs have been refinanced entirely via a **surcharge on the electricity price**
- We suggest a **partial refinancing via a fund** which is fed from the state budget or from the capital market (debts)

➢ Total differential costs for the deployment of renewables are refinanced via a **reduced surcharge** (FIT < e.g. 9 Ct/kWh) **and the fund** (FIT > e.g. 9 Ct/kWh)



Source: Matthes et al., 2014; own calculations

Refinancing options and open questions

- State budget or debts, but who pays? (Distributional effects)
  - Tax payers via tax increases (which?)
  - Specific societal groups via reduction of state expenses elsewhere (where?)
  - Future tax payers via debts and tax increases
  - Future electricity consumers via debts and EEG surcharge
  - Future electricity generators via debts and levying of RES-profits after FIT-period

General open question:

- Is the government willing to incur debts to finance parts of the transformation effort (despite the current austerity policy)?

➢ Costs for electricity consumers will rise anyway (further expansion of renewables, grid development,…), stretching costs for investments which have long lasting benefits should be considered seriously

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