Agenda

Welcome: Doug Miller, Texas State Representative from New Braunfels

Overview: Dr. Michael Webber, UT Energy Institute
“Why Germany and Texas?”

Moderated panel discussion

Moderator: Bentham Paulos, consultant

Introduction to issues in Germany
• Titus Rebhann, staff to Oliver Krischer, Member of the German Parliament
• Dr. Felix Matthes, Öko Institute
• Dr. Christoph Maurer, Consentec

Introduction to issues in Texas
• John Fainter, Association of Electric Companies of Texas
• Phil Oldham, Thompson & Knight
• Walter Reid, The Wind Coalition
DOES THE GERMAN ENERGIEWENDE NEED A NEW MARKET DESIGN?

TITUS REBHANN
(MP OLIVER KRISCHER – ALLIANCE 90/THE GREENS)
Share of Renewable Energies in Germany's Energy Market from 1998 to 2013

Source: BMU; as of 03/2014

www.renewables-in-germany.com
Germany's Power Mix in 2013

Renewable Energies contributed 147 bn kilowatt hours or 23.4 percent to gross electricity production. The share of renewables in electricity consumption increased to 24.7 percent, which equalled 596 billion kilowatt hours.

- natural gas: 66 bn kWh (10.5%)
- hard coal: 124 bn kWh (19.7%)
- nuclear energy: 97 bn kWh (15.4%)
- lignite: 162 bn kWh (25.8%)
- renewable energies: 147 bn kWh (23.4%)
- others: 33 bn kWh (5.2%)

- photovoltaics: 28 bn kWh (4.5%)
- hydro power: 21 bn kWh (3.4%)
- biomass (incl. biogenic waste): 48 bn kWh (7.6%)
- wind power: 50 bn kWh (7.9%)

Source: AG Energiebilanzen, as of 12/2013

www.renewables-in-germany.de
Installed solar system prices have plummeted by 66% since 2006

Average end-customer system prices for installed rooftop solar of up to 100 kilowatts-peak

Source: EUPD Research and BSW-Solar

Figure 2-6. PV Solar Resource: United States and Germany

Germany's installed solar PV capacity is already half of power demand

Germany has most solar PV installed in absolute (30GW) and relative terms (50% of peak demand)

Source: REN 21, own calculations
European and German energy and climate targets

2020 goals

» 20 % improvement in energy efficiency
» 20% increase in the proportion of REs used for energy supply
» Reduction in EU-wide emissions by 20% compared to ‘90 levels

2050 goals

» Greenhouse gas emissions should fall by 80-95% compared to ‘90 levels
» share of REs used for the supply of electricity should climb to at least 80%
» Primary energy savings at least 50%

Energy markets will:
• have more REs
• be more decentralized
• be smarter
• need more back-up capacities

20% improvement in energy efficiency
20% increase in the proportion of REs used for energy supply
Reduction in EU-wide emissions by 20% compared to ‘90 levels
Greenhouse gas emissions should fall by 80-95% compared to ‘90 levels
share of REs used for the supply of electricity should climb to at least 80%
Primary energy savings at least 50%
CHALLENGES FOR THE GERMAN ENERGIEWENDE

SECURITY OF ENERGY SUPPLY
- missing profit margins/operating hours for existing power plants
- not enough investment incentives for new power plants/storage sites/DSM

GRID INFRASTRUCTURE
- huge investment needs for retrofitting and new grids
- missing incentives for smart grids

RENEWABLES
- Fluctuation of REs, „produce + forget“ and missing incentives for storage

A NEW MARKET DESIGN IS NEEDED WITH BACK-UP CAPACITIES THAT GENERATE ELECTRICITY IN A CLIMATE-FRIENDLY, FLEXIBLE AND COST-EFFICIENT WAY

UNS GEHT’S UMS GANZE

BÜNDNIS 90 DIE GRÜNEN
BUNDESTAGSFRAKTION
www.gruene-bundestag.de
Requirements for capacity markets

**Efficiency**
- As a rule, the most efficient technology in each case should be used. DSM, storage and gas-fired power plants with a heat supply from cogeneration must have priority in auctions.

**Emissions**
- To prevent capacity auctions contradicting climate protection goals, lowest-possible emissions are a further key criterion (= no coal!).

**Flexibility**
- Capacities must be flexible in order to adapt to REs. They must be able to be controlled quickly in order to be able to balance fluctuations.

**Availability**
- The capacities on the market must be available at any time and must offer at least a minimum degree of reliability.

**Regionality**
- In order to avoid electricity shortages in individual regions, new capacities can be restricted to regions or transmission network zones with specific capacity shortages.
Markets, regulation and the need for a sustainable economic basis for the transition towards a clean/carbon-free electricity system (in Germany)

University of Texas Energy Institute / George and Cynthia Mitchell Foundation / Heinrich Böll Foundation / Clean TX panel discussion
» Texas and Germany: Energy Twins «

Dr Felix Chr Matthes
Austin, September 29, 2014
Starting point: The emerging market design debate at the intersection of three transition processes

- **Policy-driven decommissioning of significant high-risk power generation capacities (up to 20% of total firm capacity)**
  - Nuclear phase-out (Germany, Belgium, Switzerland …), European Union clean air legislation – 40 GW in less than a decade
  - Concerns on system adequacy after ‘the shock’

- **Policy-driven transition towards renewables (mainly solar & wind)**
  - Major impact on the energy-only market (from 2015 for each decade to come: 1,000 hours with power prices at zero or negative prices)
  - Collapsing business models of the conventional utility industry (and the call for compensation)

- **End of the transition phase towards a fully liberalized (EU!) market**
  - Major investments needed for back-up plants, demand response, and storage – for the first time solely paid back by the market
  - Structure of incumbent assets, additional uncertainties from variable RES and challenging price trends for gas, coal & CO2 will probably not allow pay back investments for RES and non-RES
Germany: Transformation to renewable energy sources to decarbonize the power system (1)

Historical data
Legal EU commitment
National goals

Expansion corridor for power generation from RES to 80-100% in 2050
Minimum expansion Energy Concept 2010/2011
Expansion corridor EEG 2014

BMU 2011+2013, Öko-Institut
Case study DE: Transformation to renewable energy sources to decarbonize the power system (2)

![Graph showing the expansion corridor for power generation from RES to 80-100% in 2050.](image)

- **Historical Data**
- **Legal EU commitment**
- **National goals**

- **Maximal effective load coverage of the RES-based generation fleet**

**Load range**

**BMU 2011+2013, Öko-Institut**
Towards a decarbonized power market
The many dimensions of the debate

- It is about the sustainable economic basis of a future power market
- Fundamentally there are two dimensions to be addressed
  - How to create/maintain a robust investment framework?
  - How to coordinate an increasingly complex system based on price signals (for operations & investments)?
  - How to combine these two functions of a market?
- There are however other (“secondary”) dimensions of the debate
  - Collapsing business models after the transition period has started
  - Risk asymmetries between the renewable, the conventional (generation) and the “third” segment (demand response, storage)
  - Major distributional conflicts
  - Increasingly conflicting competence sharing between the Member States of the European Union & very different stages of transformation in different EU Member States
- Pragmatic – and non-fundamentalist – reforms will be needed
The challenge: Transition to a market design for a decarbonized power system

Premium RES support schemes: Capacity-only, segmented products & pricing

Post-liberalisation market: Energy-only, uniform products & pricing model

a) “Invest, produce & forget”
b) Strictly national

a) “Produce & forget about investments”
b) Regionally integrated

The future power system: coordination-, capital- & infrastructure-intensive, CO2-free (renewable)

Prices/revenues for energy and system services

Prices/revenues for firm capacity

Prices/revenues for other (CO2-free/RES) capacity

a) How to get there? From vision to transition!
b) How much Europe?
The challenge of market design
The way forward

• **Existing market segments need to strengthened**
  - energy-only market segment as the key coordination mechanism for operations of all options
  - system services market segment to be opened to all flexibility options
  - re-animated EU ETS should be seen as the clean dispatch market segment

• **Complementary market segments will be essential**
  - a market segment for (system-suitable) firm capacity (including demand response): wait and see or strategic reserve et al. is not a sustainable option – and will sooner or later lead to ad hoc policies
  - a market segment for (system-suitable) RES capacity: formerly known as support mechanism and transferred to fixed-premium approaches
  - a longer term challenge: a separate market segment for energy efficiency (in the world of capacity payments …)

• **Infrastructure regulation must trigger (major) investments in infrastructure roll-out and upgrades**
A productive way forward: On both sides market realism and attempts to learn

Enter a reform process: complement the two market segments step by step by the lacking elements and go for learning.
Thank you very much

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Does Germany need an evolution or a revolution in electricity market design?

Introductory Statement for Panel Discussion:
Texas and Germany: Energy Twins?

Christoph Maurer | Austin, TX | September 2, 2014
### Situation of German Electricity Market

**From a general perspective market seems to be healthy**

> Restructuring in 1998  
> Liquid long-term and spot markets → highest liquidity among European electricity markets  
> Satisfying level of competition in wholesale and retail markets → no major concerns on market power → low level of regulatory intervention  
> High level of interconnection with European neighbors → EU internal market  
> RES share has reached 25% → at least partly integrated into markets  
> Cap-and-Trade scheme for controlling carbon emissions

**But discussion on capacity payments for conventional generation**

> 40% price drop since 2008  
  » currently no incentives for new build of plant  
  » mothballing or retirement of existing plants due to economic reasons  
> Nuclear phase out until 2022 → concerns on system adequacy  
> Do intermittent RES need a 1:1 fossil-fuel capacity backup?  
  » GenCos claim capacity payments necessary to guarantee adequacy  
> Capacity payments also introduced in other European countries
Is there any evidence for a market failure?

Multiple reasons for price drop since 2008

> Increasing share of RES generation only partly explains today’s prices
> Consequences of economic crisis in Southern Europe
  » Closely interconnected European electricity system and market → crisis has major consequences also for German market
  » Load growth much lower than expected (pre-crisis level not yet reached)
  » Very low prices for carbon certificates → low incentives for new efficient plants (like CCGT) → instead increasing share of hard coal and lignite
> Overcapacity in European generation system
  » partly due to historic reasons, but also driven by inefficient investments during last years

But this does not mean a market failure

> Current prices are a valid signal to indicate overcapacity
> Typical causes for introduction of capacity payments not fulfilled
  » Up to now no “missing money problem” due to regulatory price caps
  » No significant risk of abuse of market power
  » Efficient investment decisions do not need long-term contracts
How should Germany proceed?

No economic need for capacity payments

- Efficiency and generation adequacy not endangered
- Main proponents pursue additional objectives, among others
  - subsidies for power industry suffering from inefficient investments
  - increasing the level of regulatory intervention
  - more direct control of fuel mix for electricity generation

Nevertheless: Evolutionary steps could improve market performance

- stability and foreseeability of political boundary conditions (e.g. binding targets for RES and CHP generation as well as long-term carbon reduction targets)
- commitment of policy makers to accept (rare) price peaks in situations with exceptionally high load
- optimization of regulatory boundary conditions for new entry of DSM
- foster market integration of RES
- full internalization of imbalance costs

- Optimized “energy-only” market preferential to capacity payments
- Will be able to deliver an efficient level of generation adequacy
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Reliability and Competition in Texas Electricity Markets: Why Less is More

Phil Oldham
Thompson & Knight

University of Texas Energy Institute Symposium—Texas and Germany
September 2, 2014
Texas & Germany: Energy Twins?

- Fundamental Principles of the Texas Electricity Market
  - Economics is king (security constrained economic dispatch).
  - Avoid interferences that distort the market.
  - Build cost-effective transmission and allow ALL resources to compete.
  - Environmental rules should be set without regard to energy policy.
  - Design the market to meet reliability goals without mandates.
Q: How has it worked? A: Exceedingly well.

- Very efficient dispatch.
- All resources have equal access.
- Individual customer choices are maximized.
- Very high level of reliability.
- Creativity and efficiency are rewarded.
- Very few mistakes.
Texas & Germany: Energy Twins?

- Resource Adequacy Debate – No Capacity Market

  - 2011-14: The story highlights the problems with mandated capacity constructs.
    - Costly and inefficient.
    - Creates regulatory uncertainty.
    - Construct is not based on “real competition.”

- Why is an “energy only” market better?
Texas & Germany: Energy Twins?

- Lessons Learned
- Questions?
TEXAS AND GERMANY
ENERGY TWINS?

THE ELECTRIC RELIABILITY COUNCIL OF TEXAS
(ERCOT) EXPERIENCE
PREPARED FOR THE WIND COALITION BY WALTER J. REID
AUSTIN TEXAS  SEPTEMBER 2, 2014
THE ERCOT EXPERIENCE
MARKET CONSIDERATIONS

• TRUE OPEN ACCESS TO TRANSMISSION
  • NO RESERVED TRANSMISSION – INCUMBENTS AND NEW GENERATION EQUAL
  • TRANSMISSION SERVICE PROVIDERS BUILD TO GENERATORS

• LOADS PAY FOR RELIABILITY
  • TRANSMISSION
  • ANCILLARY SERVICES
  • ERCOT

• VOLUNTARY DAY AHEAD MARKET
  • FINANCIAL ONLY
  • NO ARTIFICIAL PENALTIES
  • NO “SCHEDULES”

• HIGH PRICES ALLOWED
THE ERCOT EXPERIENCE
OPERATING CONSIDERATION

• NO SCHEDULES
  • VOLUNTARY DAY AHEAD MARKET IS ITS OWN REWARD - PUNISHMENT
  • ERCOT HAS THE RIGHT TO CALL ON GENERATORS NOT IN THE MARKET THROUGHOUT THE DAY
  • ERCOT RELIABILITY COMMITMENTS GUARANTEE COST RECOVERY – NOT PROFIT

• SHORT DISPATCH INTERVAL - SHORT DATA DELAY
  • FIVE MINUTE DISPATCH INTERVAL (15 MINUTE SETTLEMENT)
  • < ONE MINUTE SOLUTION TIME

• NODAL MARKET
  • LARGE CONTROL AREA (BALANCING AUTHORITY)
THE ERCOT EXPERIENCE
CAPACITY VS ENERGY ONLY MARKET

• ENERGY ONLY
  • PERIODIC HIGH PRICES NEEDED
  • RESERVE MARGINS COULD BE TIGHT
  • LOAD PARTICIPATION COULD BE CRUCIAL
    • RELIABILITY
    • PRICE FORMATION
  • PRICES LIKELY VERY VOLATILE

• CAPACITY MARKET
  • RESERVE REQUIREMENT “NUMBER” CRUCIAL
  • MUST DETERMINE CAPACITY VALUE OF RESOURCES
  • MANY ADMINISTRATIVE RULES REQUIRED
  • GENERATOR REVENUE MORE ASSURED
  • ACTUAL RESERVE MARGINS LIKELY LARGER
  • HOW ARE LOADS INCLUDED??
THE ERCOT EXPERIENCE
RENEWABLE ONLY CONSIDERATIONS

- THE ERCOT MARKET WORKS JUST AS IT IS
- CAPACITY VS ENERGY ONLY
  - BOTH WORK FOR RENEWABLES IF THEY IN FACT WORK
  - FAIR TREATMENT FOR RENEWABLES IS THE KEY
  - THE WIND COALITION POSITION IS NEUTRAL
- SHORTER DISPATCH INTERVAL – THREE MINUTES
- MORE RECOGNITION OF NEW TRANSMISSION VALUE
  - CO2 REDUCTIONS
  - WATER USE REDUCTION
  - SYSTEM LOSS REDUCTIONS
- MORE PAYMENT FOR “UNPAID” ANCILLARY SERVICES
  - ROUTINE FREQUENCY CONTROL
  - ROUTINE VOLTAGE CONTROL/REACTIVE
  - GENERATOR INERTIA
AES Wind Generation
Acciona
Apex Clean Energy
Blattner Energy, Inc.
BP Alternative Energy North America
Clean Line Energy
Duke Energy
Edison Mission Energy
EDP Renewables
ENEL
EDF Renewables
E.ON
Exelon
Electric Power Engineers, Inc
Gamesa Energy
GE Energy
Iberdrola Renewables
Infinity Wind
Invenergy
Lincoln Clean Energy
Novus Windpower
Pattern
RES Americas
Third Planet
TradeWind Energy, LLC
Vestas-Americas, Inc.
American Wind Energy Association (AWEA)
Environmental Defense Fund (EDF)
Public Citizen
Texas Renewable Energy Industries Association (TREIA)

http://windcoalition.org/

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Actual Peak Demands for 2013 and 2014

Based on Hourly Intervals

MW

2014 Actual  2013 Actual

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec
ERCOT IS AN ELECTRICAL ISLAND

ERCOT connections to other grids are limited to direct current (DC) ties, which allow control over flow of electricity.
WIND-POWER REDUCES WEST ZONE PRICES