The practical aspects of renewable energy industry

Oldenburg, April 11, 2015

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EnKliP
Energy and Climate Policy | Consulting
What is EnKliP?

EnKliP stands for Energy and Climate Policy I Consulting

EnKliP is Uwe Nestle as a freelancer

Uwe Nestle is

• Engineer for Technical Environmental Protection
• Expert for Energy Policy
• Gained experience in the Federal Ministry for the Environment for about 12 years
• Member of the bord of Green Budget Germany

EnKliP is ready to

• Produce studies and analyses
• Give talks
• Work national and international
Content

General Aspects of the German Energiewende
Economic and Social Effects of the RES-E Policy
RES-E Costs
Instruments to Finance RES-E
The Political Discussion of the Energiewende
Conclusions
Challenges

Kofi Annan 2014
Former Secretary General of the United Nations

“The Climate Crisis threatens the well-being of hundreds of million people. It undermines the human right to food, water, health and security.

This is not only a worrying future scenario but is already happening today.”
Challenges

Reductions in EU GHG emissions in order to achieve a domestic reduction of 80% by 2050 (100% = 1990)
(EC 2011, Roadmap for moving to a competitive low carbon economy in 2050)
In the power sector, affordable and almost zero-emissions technologies exist:

**Renewables:**
- Wind power
- Solar power
- Hydro power
- Geothermal power
- Biomass

**Carbon Capture, Transport and Storage (CCTS):**
- Still relevant GHG-emissions
- Not available before 2020

**Nuclear:**
- No sustainable option
German energy infrastructure needs modernisation

A) For climate protection reasons

B) Many power plants are old
   - 50% of installed coal capacity is older than 30 years
   - 25% of installed coal capacity is older than 40 years
   - 40% of installed natural gas capacity is older than 30 years
     (source: BNetzA)

C) Phase out of nuclear power until 2022
Possible energy future of Germany (Government Study)

Lead Scenario 2011A

Source: DLR et al. 2012

Nuclear Energy
Mineral Oil
Coal
Natural Gas
Renewable Energy
GHG Emissions

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RES-E development 1990 to 2014

Gross power RES-E production

RES-E share of 5% in 2000

RES-E share of 27.2% in 2014

Source: Agora Energiewende 2015
Investments into RES-installations in 2012

Investitionen in die Errichtung von Anlagen zur Nutzung erneuerbarer Energien in Deutschland im Jahr 2012

Gesamtes Investitionsvolumen: 19,5 Mrd. Euro

Windenergie: 3,8 Mrd. €  
Biomasse (Strom): 1,5 Mrd. €
Biomasse (Wärme): 1,1 Mrd. €
Solarthermie: 1 Mrd. €
Geothermie, Umweltwärme: 0,9 Mrd. €
Wasserkraft: 0,1 Mrd. € (0,3 %)
Photovoltaik: 11,2 Mrd. €

Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW); Stand: Dezember 2013; Angaben vorläufig
Turnover in the RES-sector (excluding investments)

Umsätze aus dem Betrieb von Anlagen zur Nutzung erneuerbarer Energien in Deutschland im Jahr 2012
Gesamter Umsatz aus Anlagenbetrieb: 14,9 Mrd. Euro

- Windenergie: 1,4 Mrd. €
- Photovoltaik: 1,2 Mrd. €
- Biokraftstoffe: 3,7 Mrd. €
- Geothermie, Umweltwärme: 0,8 Mrd. €
- Wasserkraft: 0,4 Mrd. € (2,6 %)
- Solarthermie: 0,3 Mrd. € (1,7 %)
- Biomasse: 7,2 Mrd. €

Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW); Stand: Dezember 2013; Angaben vorläufig
Entwicklung der Bruttoprovision im Bereich der erneuerbaren Energien in Deutschland

Abschätzungen für 2011 und 2012; O'Sullivan (DLR), Edler (DIW), Bickel (ZSW), Lehr (GWS), Peter (Prognos): "Bruttobeschäftigung durch erneuerbare Energien im Jahr 2012 - eine erste Abschätzung"; Stand: März 2013; Zwischenbericht des Forschungsvorhabens "Kurz- und langfristige Auswirkungen des Ausbaus erneuerbarer Energien auf den deutschen Arbeitsmarkt".
Financing system of the EEG provided in general
• relatively high investment security
• relatively low rates of return

Traditional large utilities did not invest

Many new small players jumped into the market
• Private households
• Farmers
• Cooperations and citizen groupes
• Other new companies

This lead to more competition, more technical development, lower prices
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RES-Costs

Electricity price for households (Ct/kWh)

<table>
<thead>
<tr>
<th>Year</th>
<th>Price</th>
</tr>
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<tbody>
<tr>
<td>1995</td>
<td>15</td>
</tr>
<tr>
<td>2000</td>
<td>10</td>
</tr>
<tr>
<td>2014</td>
<td>25</td>
</tr>
</tbody>
</table>

Increase > 100%
Electricity price increase and inflation until 2014, against base year 1995 and 2000 (%)
RES-Costs

EEG-surcharge 2015: 6.2 Ct/kWh, for 27 % RES-E

EEG-surcharge ≠ extra costs for RES-E extension

EEG-surcharge compares

- full costs of new RE-installations with
- operation costs of old, written down and subsidised conventional power plants

➢ A fair calculation would compare the electricity generation costs of new conventional and new renewable power plants
Production costs for power generation with new power plants

Sources:
- Prognos 2013
- Agora 2013
- DECC 2012
- Fhg ISE 2013
- FÖS 2012

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Production costs for power generation with new power plants

External costs:
- Brown coal: 9.2 Ct/kWh
- Hard coal: 7.5 Ct/kWh
- Gas: 3.8 Ct/kWh
- Nuclear: 9-35 Ct/kWh
Production costs for power generation with new power plants

- **Maximum costs**
- **Minimum costs**

**Trend:**
- RES-E (Renewable Energy Sources) decreases
- Fossil increases
- Nuclear increases

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Fossils | Onshore Wind | Offshore Wind | PV large | PV small
EEG surcharge: the wrong indicator

Ct/kWh

Subsidy needed

Power price EPEX | LCOE fossil | EEG 2014 strike price onshore wind | Average EEG strike price (2013 installations)

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Balancing of fluctuating RES-E

Average EEG strike price for age groups from 2001 to 2015 compared to the Federal Government target and LCOE for fossil power plants

- Photovoltaik
- Wind an Land

- Ziel der Bundesregierung für die durchschnittliche Vergütung neuer EE-Anlagen
- Kostenbereich konventioneller Kraftwerke nach Bundesregierung

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German Government study on RES extension: Cumulative differential costs

- Scenario 2011 A; all renewables; pricepath A -

Cumulative differential costs, billion EUR (2009)

-250 -200 -150 -100 -50 0 50 100 150 200 250

Cumulative value 2041-2050: -543 billion EUR

RES-share 2040
Total 50%
RES-E 75%
Heating 40%
Fuels 30%
GHG-reduction: 72%

Source: DLR et al. 2012
RES Costs

Conclusions on the costs of renewables

• Some RES-E are no more expensive than conventional energies, such as onshore wind and photovoltaics

• Photovoltaics cost reduction is a great deal for the global development and climate protection

• If external costs are internalised, most RES-E are cheaper than conventional energies

• RES extension is an investment in the future – also from the economical point of view
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Source: Fraunhofer ISI et al. 2011
The support of electricity from renewable energy sources

"This report presents an updated review of the performance of support schemes using the same indicators presented in the 2005 report. It finds that, as in 2005, well-adapted feed in tariff regimes are generally the most efficient and effective support schemes for promoting renewable electricity."
Effectiveness of RES-E financing instruments

Figure 4-3: Policy Effectiveness Indicator for wind onshore power plants in the period 2004 – 2010. Countries are sorted according to deployment status indicator.

Source: Fraunhofer ISI et al. 2011
Efficiency of RES-E financing instruments

Figure 4-5: Remuneration ranges (average to maximum remuneration) for Wind Onshore in the EU-27 MS in 2011 (average tariffs are indicative) compared to the long-term marginal generation costs (minimum to average costs)

Source: Fraunhofer ISI et al. 2011
In 2014, EU COM decided to request from all MS to switch to a tendering system

- Only little experience in the EU and global
- Unclear if Germany is suspect or victim
- Safe instrument to prevent fast RES-E extension
- Will most likely put large utilities in better position
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The new EEG and new energy policy in Germany

Discussion lead by

- Misunderstandings
- Market oriented thinking
- More negative atmosphere against RES
- Unfavorable responsibilities
Increasing RES-E-shares and increasing CO\textsubscript{2}-emissions?

Reduced CO\textsubscript{2}-emissions in the power sector:
\[\Rightarrow\] Minus 6 % since 2000, minus 16 % since 1990

Reasons for the increase of CO\textsubscript{2}-emissions from 2010-2013:
- Emission trading system: Dramatically dropped CO\textsubscript{2}-price
- Phase out of 8 nuclear power plants in 2011
- Increasing power export
- Increasing price for natural gas

Source: Agora Energie-wende 2015
More market is needed

- **Market integration of wind and solar power plants**
  ➔ With and without market: Wind and sun provide energy only if wind blows and sun shines

- **Change to tender system**
  ➔ EU-COM 2008: „well-adapted feed in tariff regimes are generally the most efficient and effective support schemes for promoting renewable electricity.“

- **RES-E investors should take more investments risks, e.g. long time price risks**
  ➔ Not reasonable as long as states sets extension targets
Fundamental changes in the EEG

- RES-E corridor: From minimum to maximum targets
  - Max. 2500 MW/a onshore wind and photovoltaics
  - Max. 750/500 MW/a offshore wind
  - Max. 100 MW/a biomass

- Corridor will clearly reduce RES-E extension
- Still strong increase, share of 80% in 2050 can be reached

- Change to tender system
  - Scheduled for „latest 2017“
  - Pilot project for open space photovoltaics

- International experience: few evidence for cost savings
- Disadvantage for small and medium companies
- Risk for the dynamic extension
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Major RES-E are no more expensive than conventional power

Who ever wants to head for more RES-E does not have to take the burden Germany did

Phase out of nuclear power and climate protection can be combined

Feed-in-tariff-system is still the best instrument to finance RES-E

Political discussion is lead by misunderstandings
Conclusions

There are a number of positive side effects with the Energiewende

• Job creation
• More competition in the energy market
• Reduction of dependence from fuel from geopolitical instable regions with unpredictable price changes
• Reduction of dependence from fuel with unpredictable price changes
• Reduction of traditional environmental damages

Political disadvantage:
Energiewende comes with (strong) structural changes
Thank you for your attention

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