Financing the Next Stage of the Global Green Energy Transformation

Stanford Energy Seminar
Stanford, 15 October 2012

Jochen Harnisch, Competence Center Environment and Climate
Presentation Outline

1. About KfW
2. Renewable energy promotion in Germany: at a turning point
3. Global renewable deployment: consolidation in progress
4. Status and challenges of international climate finance
5. Towards a new phase of renewable energy promotion
6. Outlook
Presentation Outline

1. About KfW
2. Renewable energy promotion in Germany: at a turning point
3. Global renewable deployment: consolidation in progress
4. Status and challenges of international climate finance
5. Towards a new phase of renewable energy promotion
6. Outlook
About KfW Group

› Promotional bank of Germany
› Founded in 1948 for implementation of the Marshall Plan
› 5200 employees

› We finance investment in Germany & Europe
› We provide international project & export finance
› We provide support for developing countries

› USD 102 bn. disbursements in 2011
  › thereof USD 33 bn. for renewable energy, energy efficiency & environment (world no. 1)
  › thereof USD 5 bn. in developing countries
› Grants, concessional and commercial loans, mezzanine and equity finance
KfW’s Domestic Business Model: State Liability, Strong Promotional Mandate and On-lending Principle in Germany

Range of products: e.g.

- Loans to SMEs: innovation and modernization
- Green Loans to private households
- Student Loans
Green Finance Activities of KFW Group

World largest financier of climate and environment investments: US$ 33 bln. in 2011
Instruments: grants – concessional and commercial loans – guarantees – equity – mezzanine
The International Development Finance Club (IDFC)

- Network of 19 leading development finance institutions with mandates for national, sub-regional, regional and international activities around the world.

- Combined assets of more than USD 2,100 billion (WBG: USD 502.9 billion).
- New commitments added up to approx. USD 390 billion (WBG: USD 73 billion).
- Activities in 2012: Green finance mapping, exchange on good practices in private sector mobilization and support of GCF implementation.

Overview of green finance flows provided by IDFC Members

- Institutions based in OECD countries: 45 billion US$
- Institutions based in non-OECD countries: 44 billion US$
- Total: 89 billion US$

- 2 billion US$: Projects in OECD country (other than home country of institution)
- 28 billion US$: Projects in OECD country (Home country of institution)
- 15 billion US$: Projects in non-OECD country
- 44 billion US$: Projects in non-OECD country (Home country of institution)

Share of Green Finance of new commitments of individual IDFC members in 2011

Relevance of green finance areas

- Adaptation to climate change
- Other
- Green energy & mitigation of greenhouse gas emissions projects
Presentation Outline

1. About KfW
2. Renewable energy promotion in Germany: at a turning point
3. Global renewable deployment: consolidation in progress
4. Status and challenges of international climate finance
5. Towards a new phase of renewable energy promotion
6. Outlook
Energy Generation from Renewable Energy Sources in Germany

In 2011 about 20% of the electricity in Germany has been generated by renewable energy (RE) sources according to BDEW.

Data: BMU, BDEW. Graph: PSE AG 2012
First half-year electricity production

Change in electricity production: first half year 2012 versus first half year 2011

- More run of river due to different weather conditions.
- More wind and solar due to increased installed capacity.
- Less gas due to peak load production of PV.
- Less uranium due to switch-off of 8 nuclear power plants in March 2011.

Graph: B. Burger, Fraunhofer ISE; data: Statistisches Bundesamt; EEX Transparency Platform
Detailed Electricity Production: June 2012

Actual production

Legend:
- Run of River
- Uranium
- Brown Coal
- Hard Coal
- Gas
- Pumped Storage
- Wind
- Solar

<table>
<thead>
<tr>
<th>RoR</th>
<th>Uran</th>
<th>BC</th>
<th>HC</th>
<th>Gas</th>
<th>PSt</th>
<th>Wind</th>
<th>Solar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.7</td>
<td>5.9</td>
<td>6.9</td>
<td>2.1</td>
<td>1.8</td>
<td>0</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>2.9</td>
<td>10.5</td>
<td>19.1</td>
<td>17.2</td>
<td>9.5</td>
<td>3.1</td>
<td>15.3</td>
<td>19.7</td>
</tr>
<tr>
<td>1.8</td>
<td>6.7</td>
<td>11.3</td>
<td>7.1</td>
<td>2.9</td>
<td>0.46</td>
<td>2.9</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Graph: Bruno Burger, Fraunhofer ISE; Data: EEX Transparency Platform

© Fraunhofer ISE
Detailed Electricity Production: February 2012

Actual production

Legend: Run of River, Uranium, Brown Coal, Hard Coal, Gas, Pumped Storage, Wind, Solar

RoR   Uran   BC   HC   Gas   PSt   Wind   Solar
1.3   11.0   14.1 3.8  4.2   0     0.23   0
2.0   12.2   20.6 22.0 22.4  4.0   21.5  12.8
1.2   8.4    12.7 11.2 6.5   0.55  4.6   1.0

Graph: Bruno Burger, Fraunhofer ISE; Data: EEX Transparency Platform and German Federal Statistical Office

© Fraunhofer ISE
Electricity Production in Germany: Calendar Week 34

Actual production

Graph: Bruno Burger, Fraunhofer ISE; Data: EEX Transparency Platform

© Fraunhofer ISE
Priority to Renewable Energies

**GOALS**
- Increasing the share of renewables in gross final energy consumption up to 60% (until 2050, 2010: 11%)
- Increasing the share of renewables in the gross electricity consumption up to 80% (until 2050, 2010: 17%)

**CHALLENGES**
- Massive uncoordinated expansion of solar and wind energy generation; delays offshore
- Additional fossil power plants for reserve capacity
- EU-ETS with weak incentive effects
- Early participation of affected citizens and municipalities
- Flexibilization of energy demand via extended usage of smart metering

**INVESTMENTS**
- **EUR 135 bn.** until 2020
## Needed: Power Grids and Storage Capacity

### GOALS
- Integration of renewable energy into existing power generation infrastructure
- Innovation in storage technologies and smart grids

### CHALLENGES
- Massive expansion of grids and storage capacities
- Provision of sufficient long-term financial funds required to avoid a slowdown in investment
- Promotion of research & development, promotion and rapid approval of best practice projects
- Acceleration of planning- and approval procedures
- Early participation of affected citizens and municipalities

### INVESTMENTS
- **Up to EUR 90 bn.** until 2030
Inevitable but neglected: Fostering Energy Efficiency

<table>
<thead>
<tr>
<th>GOALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Reduction of primary energy consumption by 50%</td>
</tr>
<tr>
<td>● Reduction of electricity consumption by 25%</td>
</tr>
<tr>
<td>● Increasing energy productivity by 2.1% p.a. (until 2050, vs. 2009)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHALLENGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Almost 100% decarbonisation of production, consumption and mobility</td>
</tr>
<tr>
<td>require:</td>
</tr>
<tr>
<td>- Financial incentives</td>
</tr>
<tr>
<td>- Information and consulting for households and companies.</td>
</tr>
<tr>
<td>● Mobilisation of potential by fostering energy efficiency in the</td>
</tr>
<tr>
<td>building and heat sector</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INVESTMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Up to EUR 23 bn. until 2020</td>
</tr>
</tbody>
</table>
Promotion of renewable energy in Germany is part of an international success story.
Main instrument is dynamic feed-in law plus comprehensive removal of barriers.
Incentive driven bottom-up process.
Economic efficiency and sustainability had second priority to effectiveness.
Political acceptance to businesses and voters.
Comprehensive overhaul underway because of electricity costs and grid stability.
1. About KfW
2. Renewable energy promotion in Germany: at a turning point
3. Global renewable deployment: consolidation in progress
4. Status and challenges of international climate climate finance
5. Towards a new phase of renewable energy promotion
6. Outlook
Trends of Global Energy Investment

- **Fossil fuel**
- **Clean energy**

**Note:** Investment for new build – fossil fuel calculated from EIA & IEA numbers, clean energy taken from Bloomberg New Energy Finance totals. Clean energy capacity includes small distributed capacity.

Source: IEA, EIA, Bloomberg New Energy Finance
Price Degression: Electricity from Wind Energy 1984-2012 (€/MWh)

Source: BNEF, 2012
Price degradation for photovoltaics 1976-2012 (USD/W)

Prices have fallen 75% since 2008. 45% in past year.

Notes: Inflation adjustment using US PPI. R² of c-Si regression = 0.94, R² of FSLR regression = 0.98; data since 2007 based on Bloomberg New Energy Finance Solar Spot Market Price Index.

Source: Paul Maycock, Bloomberg New Energy Finance, FSLR filings
Development of regional markets for renewable energy (2004-2011)

Note: New investment volume adjusts for re-invested equity. Total values include estimates for undisclosed deals. This comparison does not include small-scale projects or R&D estimates. Source: Bloomberg New Energy Finance
Consolidation of Global Renewable Energy Investment (Regions)

Source: BNEF, Oct 2012
Consolidation of Global Renewable Energy Investment (Technologies)

Source: BNEF, Oct 2012
NEX CLEAN ENERGY INDEX 2003 – 2012 YTD

Note: Values as of 19 March 2012; NASDAQ and S&P 500 rebased to 100 on 01 Jan 2003

Source: Bloomberg New Energy Finance
Section Summary

› Massive policy-driven market growth of new renewables over last decade

› Substantial cost degressions:
  - incremental technological change and economies of scale
  - below grid parity for solar & commercial competitiveness for wind

› Expansion of renewable energy promotion is slowing down in core countries

› Equity investors are largely bearish about the sector

› A phase of regionally broader dissemination of renewable energy technology is coming
Presentation Outline

1. About KfW
2. Renewable energy promotion in Germany: at a turning point
3. Global renewable deployment: consolidation in progress
4. Status and challenges of international climate finance
5. Towards a new phase of renewable energy promotion
6. Outlook
Emissions from greenhouse gases to limit global warming to below 2 degrees
Mitigation Investment: The Global Financing Challenge

Annual additional spending on low-carbon energy technologies in the 450 Scenario relative to the Current Policies Scenario

Source: WEO 2010
Regional Distribution Incremental Costs for GHG Mitigation

Global subsidies to renewables-based electricity and biofuels by region in the New Policies Scenario

Source: WEO 2011
The Landscape of Climate Finance

2010-2011 climate finance flows (in USD billions)

Source: modified draft of CPI, Sep 2012
Green Climate Fund

- Agreed at COP-16 in Cancun in December 2010
- Governing Instrument agreed at COP-17 in Durban in December 2011
- Interim Secretariat in Bonn (Germany), permanent seat tbd at COP-18 in Doha
- Board with balanced representation from developing and industrialized countries

- Pledging round in 2013: target volume of 10 bln. USD for first period
- Business model, instruments & access: learn fr. GEF, CIFs and Adaptation Fund
- Private sector facility: focus, instruments and access unclear
- Windows likely for adaptation, forest protection & technology based mitigation
- Ressource allocation framework and monitoring / evaluation politically challenging
- Direct and international (IFI) access modalities
Section Summary

- Private sector is main investors for international renewable energy projects
- Central role for development banks in several key markets and many developing countries
- Fragmented delivery of international support - limited room for more of the same due to budgetary constraints: improve coordination and efficiency
- Little progress on finance in UN climate negotiations
- High hopes but limited progress and funding for UN Green Climate Fund
- Scope for renewables initiative by limited group of countries?
Presentation Outline

1. About KfW
2. Renewable energy promotion in Germany: at a turning point
3. Global renewable deployment: consolidation in progress
4. Status and challenges of international climate finance
5. Towards a new phase of renewable energy promotion
6. Outlook
Different Phases of Renewable Energy Deployment

- **Phase 1: Wood, wind and water**

- **Phase 2: Expansion of hydroelectricity**

- **Phase 3: Expansion of new renewables**
  a) Demonstration and exploratory incentive schemes
  b) Scaling-up of deployment through ad-hoc national promotional schemes
  c) Broader regional dissemination with focussed support measures
Mobilizing Private Sector Investment for Low Carbon Investment: The silver bullet?

- Additional investment needs
- Low carbon investment
- Incremental cost
- Additional and unfamiliar risks

- Costs and risks generally do not disappear
- Mixed experiences with international PPP approaches over last decades
- New international instruments not necessarily attractive: strengthen the existing
- Cost degressions continue and familiarity with specific risks increases
Roughly 80% of global GHG emissions (w/o LULUCF) in investment grade countries with <300 bp risk premium (1/2012)

Mobilizing Private Sector Investment for Low Carbon Investment: Different Definitions and Approaches

I. Mobilisation of private capital for public sector investments
   Example Instruments:
   - Agency/MDB Bonds
   - NAMA Bonds
   - Public Private Partnerships
   - Structured Funds

II. a Incentives for private sector mitigation investments
   Example instruments:
   - Internat. Carbon markets
   - Feed-in tariffs
   - Concessional loans
   - Loan guarantees
   - Green credit lines

II. b Policy frameworks for private sector mitigation investments
   Example instruments:
   - Emission trading schemes
   - Regulation
   - Demonstration & advisory Voluntary initiatives

Efficiency and effectiveness: integration and coordination
Drivers of an International Deployment of Renewable Energies

A. Price degressions facilitate commercial expansion into new regional markets
B. Reduction of fossil fuel subsidies
C. Capacity development and policy advice on national frameworks
D. Soft loans from international finance institutions & national development banks
E. Subsidised credit guarantees (MIGA-type) for specific technologies & countries
F. Global performance-based support: CDM, Feed-in tariffs, auctioning schemes
G. ...more?
Section Summary

- No silver bullet at hand
- Main mitigation potentials are in investment grade countries - universal energy access in Africa requires different set of instruments
- Scope to strengthen the existing instruments in a complementary fashion to new structures like the GCF
- Mix of international measures available and necessary to support a broad international expansion of renewable energy
- Challenge of coordination and integration of output-based approaches, risk-mitigation, soft loans and technical assistance
Presentation Outline

1. About KfW
2. Renewable energy promotion in Germany: at a turning point
3. Global renewable deployment: consolidation in progress
4. Status and challenges of international climate finance
5. Towards a new phase of renewable energy promotion
6. Outlook
A Personal Outlook

› Expansion of renewable energy in key markets is a great success – but costly & slowing: climate targets may warrant an increase of international efforts

› Foster, develop and test financial innovations – but do not wait for them: strengthen proven modalities of private-public cooperation & risk mitigation

› Development banks, IFIs and ECAs because of their implementation know-how, access to capital markets and familiarity to investors could play a strong role

› Establish an attractive and politically acceptable international framework for coordinated activities by countries to promote international RE-deployment

› Technological innovation so far has been largely incremental: any breakthrough innovations reaching market?
Thank you for your attention

Dr. Jochen Harnisch
*Head of Division*
Competence Center Environment and Climate
KfW
Frankfurt
Germany

phone +49 69 7431 - 9695
Fax +49 69 7431 - 3796
Jochen.Harnisch@kfw.de

Bank aus Verantwortung