Social Acceptance of Renewable Energy Innovations
Low Carbon Societies
Stakeholder Seminar EU Roadmap
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http://www.lowcarbon-societies.eu/
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Stakeholder Seminar EU Roadmap 2050
Good Energies Chair for Management of Renewable Energies at the University of St. Gallen

- Established in 2009 (Chair: Prof. Dr. Rolf Wüstenhagen)
- Part of one of Europe’s leading business universities
- Dedicated team (10-15 people)
- 30+ Bachelor/Master Theses, ≈ 3-4 PhD dissertations p.a.
- Research and teaching on...
  - Investment Decisions and Venture Capital
  - Consumer Decisions and Marketing
  - Business Models for Renewable Energies
  - Energy Policy
- Annual Forum and Diploma of Advanced Studies in Renewable Energy Management (REM-HSG)
Agenda

1. EU Roadmap 2050 & Current State of RES
2. Social Acceptance of RES Investments
3. Conclusion
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Electricity will play a central role in the low carbon economy.

Analysis shows that electricity can almost totally eliminate CO₂ emissions (-93 – 99%) by 2050 in the EU, and offers the prospect of partially replacing fossil fuels in transport and heating.

Share of low carbon technologies in the EU electricity mix from 45% today to:
- around 60% in 2020
- 75 to 80% in 2030, and
- nearly 100% in 2050

Source: EU Roadmap 2050, EU Commission (2011)
On average additional public and private investments amount to approx. EUR 270 bn p.a.* over the next 40 years in the EU
  - additional 1.5% of EU GDP p.a. on top of overall current investment (e.g. 19% of GDP in 2009)
  - **power sector only:** EUR 30 bn p.a. (approx. 11%)

**Major challenge:**
- Unlocking the investment potential of the private sector and individual consumers!

* Various forms of low carbon energy sources, their supporting systems and infrastructure, incl. smart grids, passive housing, CCS, advanced industrial processes and electrification of transport (incl. energy storage technologies)

Source: EU Roadmap 2050, EU Commission (2011)
EU Roadmap 2050
...two questions remain...

- What are the most important renewable energy technologies (today)?

- What does “private sector” exactly mean? Who is this?
Newly installed power generation capacities per energy technology and per years in MW in the EU

- RES-Share in 2010: 41%
- PV and Wind most important

Source: EWEA Annual Statistics (2011)
Investor structure for total RES in Germany 2010 (53 GW) …renewable energies in “private hands”

Private persons: 40%

"Big four" power companies (EnBW, E.ON, RWE, Vattenfall) 6,50%
Project developers 14%
Other power companies 7%
Funds/Banks 11%
Industry 9%
Others 1,50%
Farmers 11%

Source: trend research (10/2011)
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Social acceptance triangle of renewable energy innovation (Wüstenhagen et al., 2007)

Social acceptance triangle of renewable energy innovation (Wüstenhagen et al., 2007)

Consumers
Three possibilities how consumers can engage in renewable energies

- Large-scale RES power plants, e.g. wind parks
- Small-scale RES power plants, e.g. residential PV
- Green electricity
Three possibilities how consumers can engage in renewable energies

Small-scale RES power plants, e.g. residential PV
The puzzle about consumers – Problem (1)

“To what extent are you in favour of or opposed to the use of the following sources of energy in (OUR COUNTRY)?“

Source: Eurobarometer 2011 (N=13,091; Survey from February 2011)
The puzzle about consumers – Problem (2)

“Do you plan to install renewable energy technology at your home“

- No, I don’t. 13%
- I have not thought about it yet. 6%
- I have already thought about it but I have not decided yet. 56%
- Yes, I have already decided and will install renewable energy technology at my house. 24%

Percentage of respondents (non-RES user only)

Source: IWÖ-HSG/Uni Halle/BMU (N=353; Survey from 2010)
The puzzle about consumers – Problem (3)

“What are the barriers for an investment in RES?“

- Missing profitability
- No financial resources
- Investment of too long duration
- Constructional or technical reasons
- Need to take out a loan
- Immature technology
- Optimal energy efficiency achieved
- Time consuming installation/information
- Too complex funding structure
- Missing information
- Instable private/professional affaires
- Opposition against government subsidies

Source: IWÖ-HSG/BAER-Project (N=303; Survey Feb. 2011)
The puzzle about consumers – Solution (1)

Barrier: “No financial resources”

The puzzle about consumers – Solution (2)

- Costs are perceived to be less if amounts are smaller
  - e.g. daily payment of EUR 1 over a whole year is preferred over a lump sum of EUR 365

- Possible approach to solve problem: new financing models e.g. solar leasing (residential PV or solar thermal)
  - Leasing contract with monthly payments over a period of 10 to 20 years
  - PV system remains in ownership of firm

Source: Gourville (1998): „Pennies a Day“
Homo oeconomicus?

Fully rational utility maximiser?

Source: von Neumann and Morgenstern (1944)
Example:
How Venture Capitalists perceive policy support in RES

“If there is no clear need for the government, let them stay out of the way.”

– VC quote from Wüstenhagen & Teppo, 2006

Evidence for a “policy aversion bias”?

“Affect Heuristic”
(“Classify an object as ‘good’ or ‘bad’ before cognitive processes begin”)

Source: Slovic et al. (2002)
Evidence for a “policy aversion bias”…in VC decisions

<table>
<thead>
<tr>
<th>Dep. Var.: Clean energy deals passed to due diligence</th>
<th>regression output</th>
<th>marginal effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>General experience as venture investor</td>
<td>0.090</td>
<td>0.076</td>
</tr>
<tr>
<td>Experience as venture investor in clean energy industry</td>
<td>0.079</td>
<td>0.067</td>
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<tr>
<td>Age</td>
<td>-0.065</td>
<td>-0.055</td>
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<tr>
<td>US / UK</td>
<td>0.423</td>
<td>0.356</td>
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<tr>
<td>Number of employees</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>Number of partners</td>
<td>0.117</td>
<td>0.099</td>
</tr>
<tr>
<td>Number of funds</td>
<td>-0.211***</td>
<td>-0.178***</td>
</tr>
<tr>
<td><strong>Strongly policy averse</strong></td>
<td><strong>-2.152</strong>*</td>
<td><strong>-1.812</strong>*</td>
</tr>
<tr>
<td>Policy averse</td>
<td>-1.363</td>
<td>-1.149</td>
</tr>
<tr>
<td>Constant</td>
<td>21.099***</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>112</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Chassot, Hampl and Wüstenhagen (2011)*
Other Examples for behavioural or social phenomena…

Swiss PV project market:

- First investigation shows that **number and location** of realized projects can **only partly** be explained by **attractiveness of prevailing support system** and administrative processes
  → **“home equity bias”?** (Lewis, 1999): “individuals tend to hold too little of their wealth in foreign assets”

European/international energy market:

- Empirical evidence shows that **some energy companies are faster in adapting to new challenges** in the market than others
  → **“social embeddedness”?** (Granovetter, 1973, 1985)

*Source: Lewis (1999); Granovetter (1973, 1985)*
A more realistic model of economic choice under uncertainty – e.g. the case for renewable energy

\[
\text{Choice} = \frac{\text{Risk}}{\text{Return}} + \varepsilon
\]

- Uncertainty
- Status Quo Bias
- Social Network
- etc.

„Rationality Land“

Areas of Bounded Rationality

Source: Wüstenhagen (2011)
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Conclusion

- In order to achieve a **low carbon future** according to the EU Roadmap 2050 **huge public and private investments are needed**
- Even if public support is given **private investments often lag behind**
- **Major challenge**: Unlocking the investment potential of the private sector and individual consumers!
- **Behavioural and social factors influence** decision making under uncertainty – what is the case for renewable energy investments
- **Policy makers should take into account behavioural and social effects** in decision making in renewable energy!
Questions? Thanks for your attention!

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Diploma of Advanced Studies (DAS) Renewable Energy Management (REM-HSG)

- Part-time executive education programme in renewable energy management
- Programme started in February 2011 with participants from 7 countries
- 8 Modules in St. Gallen, Berlin and Singapore
- Next programme start: February 2012; application deadline: November 15, 2011
- More information: http://www.es.unisg.ch/rem