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Lowering The Financing Cost of Swiss Renewable Energy Infrastructure: Reducing the Policy Risk Premium and Attracting New Investor Types

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Institut für Wirtschaft und Ökologie

Universität St.Gallen

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Bundesamt für Energie BFE
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CH-3003 Bern
www.bfe.admin.ch

Kofinanzierung:
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Auftragnehmer/in:
Institut für Wirtschaft und Ökologie, Universität St. Gallen (IWÖ-HSG),
Tigerbergstrasse 2, CH-9000/St. Gallen
http://www.iwoe.unisg.ch

Autoren:
Rolf Wüstenhagen, IWÖ-HSG, rolf.wuestenhagen@unisg.ch
Yuliya Karneyeva, IWÖ-HSG, yuliya.karneyeva@unisg.ch
Anna Ebers, IWÖ-HSG, anna.ebers@unisg.ch
Sarah Salm, IWÖ-HSG, sarah.salm@unisg.ch
Peter Hettich, IFF-HSG, peter.hettich@unisg.ch

BFE-Bereichsleitung: Matthias Gysler, Matthias.Gysler@bfe.admin.ch
BFE-Programmleitung: Anne-Kathrin Faust, Anne-Kathrin.Faust@bfe.admin.ch
BFE-Vertragsnummer: SI/501293-01

Bundesamt für Energie BFE
Mühlestrasse 4, CH-3063 Ittigen; Postadresse: CH-3003 Bern
Tel. +41 58 462 56 11 · Fax +41 58 463 25 00 · contact@bfe.admin.ch · www.bfe.admin.ch

Project goals

As renewable energy technologies' prices drop, there is an urgent need to lower the "soft costs" of renewable energy infrastructure. In the context of current policy debates and challenges to attract more financial capital to renewable energy in Switzerland, the project aims to help reduce the soft cost of such investments without increasing the cost to the Swiss public. This project defines soft cost as a combination of capital cost and policy risk premium and aims to analyse these two crucial dimensions of soft cost for Swiss investors. The research is conducted in three inter-related work packages (WPs) and will conclude with implications for designing "investment-grade" policies.
The main research questions that are addressed in the three Work Packages are:

1. How can the policy risk premium for administrative processes including permitting, inspection, and interconnection of large RE projects in Switzerland be quantified and reduced?
2. What are the risk and return expectations of Swiss investors for domestic compared to foreign energy projects? Did the reality meet these expectations?
3. Are pension funds able to finance large-scale Swiss hydropower plants at capital costs that are lower compared to utilities?

Summary

- In WP1, we collected proprietary data on duration and cost of permitting procedures for large wind projects, based on 22 in-person interviews with project developers. In addition, we constructed a cantonal database summarizing permitting regulations and visualised the permitting process. We also classified main policy risks and identified most important bottlenecks, such as the lack of clear deadlines, unclear requirements in connection to environmental impact assessments (EIAs), and the need for improved coordination among authorities. A list of preliminary policy recommendations has been developed together with the discounted cash flow model which will be applied to quantify the policy risk premium.
- In WP2, we conducted an analysis of past investments based on the BNEF database and conducted a cross-case study analysis of 19 realised energy projects by Swiss utilities in Switzerland and abroad. The analysis showed that nearly 70% of the projects are realized abroad, while return rates in most popular foreign destinations and in Switzerland are similar. In the meantime, expected returns for locations abroad are higher. Focus group discussions showed that the reason for higher return expectations abroad might be associated with higher risk sensitivity at home than abroad. Further interviews in 2017 and verbal protocol analysis will test this hypothesis as well as provide additional information about factors affecting the location choice for new projects.
- In WP3, we constructed and sent out a questionnaire to 400 professional investors that could potentially invest in Swiss hydropower. 53 investors participated in a choice experiment, completing 1,129 experimental investment decisions. The results show that (a) utilities prefer co-investing with their peers rather than with pension funds, and vice versa; (b) pension funds are more risk-averse towards operational risk; (c) pension funds do not in general finance hydropower at lower cost than utilities; (d) pension funds are able to provide substantial capital, but most likely in cooperation with electric utilities.

Work undertaken and findings obtained

WP1
Work undertaken
In 2016, we successfully completed extensive data gathering:

- Reviewed permitting approaches in cantons and evaluated the progress of each canton with respect to choosing a zoning approach;
- Conducted, transcribed and analysed semi-structured interviews in German and French with 22 Swiss wind project developers, 12 Swiss cantontal authorities, two German zoning authorities, one international energy consultant;
- Collected and analysed proprietary information on permitting costs and policy-related delays in the pre-construction stage of Swiss wind energy projects;
- Visualized the permitting process, mapping five project development steps (feasibility study, pre-project, main project, construction, operation) and showed connections of each project step to the regulatory framework (e.g. one-stop-shop, also known as *guichet unique*, cantonal and local authorities), the KEV application process, and social acceptance;
- Developed a DCF model to quantify policy risks under four scenarios (no KEV received, fewer turbines permitted, three objections that create a 3-year-delay, lower production than planned);
- Developed a list of preliminary policy recommendations based on interviews and model results.

Preliminary findings

- Majority of cantons (20) have acknowledged existence of wind potential in their territory and half of them have articulated a specific wind energy goal to be achieved. Even though only six cantons already have large wind installations, wind perimeters (defined as potential or priority sites or as exclusion zones) have been added to the zoning plans of 17 cantons;
- BE, FR, GR, JU, VD, and VS (alphabetically) were the most advanced cantons with respect to wind energy deployment, judging by a set of criteria: cantonal wind maps, wind potential studies, and wind development goals defined, wind projects commissioned, large capacity with positive KEV decision exists, specific zoning approach chosen, wind perimeters defined;
- Most cantons (12) opted for defining positive wind perimeters, where wind turbines can be installed; six cantons adopted a mixed approach, for example, deferring most zoning tasks to regional planners (e.g. BE, LU, VD, ZH, GR) or employing a matrix (SG), while eight remaining cantons (BS, GE, NW, OW, SZ, TI, UR, ND) have not yet picked their zoning approach;
- 13 cantons articulated a preference for larger wind installations, recommending either a wind park (BL, SO) with more than one (SG, SH), three (AG, AR, GR, LU), or five wind turbines (JU) that produce more than 10 GWh of power (FR, NE, VD, VS).
- Most cost overruns in wind project development happen during creation of an environmental impact analysis (EIA), as well as ecological compensation;
- Objections are one of the major hurdles for wind energy development and an average project faces nine objections, most of which are dropped or settled out of court;
- Planning expenses of abandoned and stalled projects have to be won back by successful wind projects, meaning that long and expensive permitting procedures create an expectation of higher remuneration (e.g. KEV) during the operating stage;
- Project financing is not a major hurdle for wind project developers, however, it is only easy to obtain with a positive KEV-decision;
- Permitting process can be improved among others by: increasing process transparency (e.g. enforcing clear deadlines for all parties), clarifying requirements (especially in connection to EIAs), improving coordination between different authorities, sending a clear signal about ES2050 and long-term support for renewable energy;

Dissemination

- Presentation at a meeting with federal and cantonal authorities from SG, GR, SH, TG. (in German). St.Gallen, 07.07.2016;
- Presentation at the advisory board meeting of Suisse Eole (Swiss Wind Power Association) (in German). Bern, CH, 22.06.2016;
- Poster presentation at 3rd SCCER-CREST Conference on Innovations for the Energy Transition, Winterthur, 01.09.2016;

- Submitted for peer review a case study titled 'Regulatory Headwinds for Wind Project Developers in Switzerland: a Case Study of Unexpected Costs and Project Delays';
- Advised three Master's theses on project-related topics.

WP2

Work undertaken

The three main steps in WP2 are a cross-case study analysis of past investments by Swiss investors in energy projects at home and abroad; focus group discussions and an analysis of the factors affecting preferences for future investments though verbal protocol analysis (VPA). The following tasks have been carried out in the reporting period:

- Analysed statistics on past energy investments of companies registered in Switzerland through the use of BNEF database and compared those to Netherlands, Austria, Belgium, Germany and Italy.
- Conducted cross-case study analysis of 19 energy projects through the following steps: 1) collecting data on lifetime, initial investment, electricity price in the given region before and during the operational time, expected and actual production amounts, operation and management costs, as well as CO2 and fuel costs where applicable; 2) calculation of expected and realised returns.
- Conducted 5 interviews to gain insider data for cross-case study analysis and to collect preliminary data about factors affecting the location choice of future investments.
- Organised a workshop titled "Should I stay or should I go? - Risk-return profiles of domestic versus international energy investments" that took place at the Forum for Management of Renewable Energies in St. Gallen on May 27, 2016. During this workshop a focus group discussion was organised in order to find out the factors affecting the choice of location for energy investments.
- Constructed the questionnaire and the experiment design to test the obtained findings from previous research steps and to find out the most important factors affecting the decision about investment location during the interviews and consequent verbal protocol analysis.

Preliminary findings

- About 70% of Swiss investments in energy projects were conducted abroad in the period 2004-2015, which stands out in comparison to other European countries, where most investments are conducted at home. Main project types: wind, gas, hydro. 92% of wind investments are conducted abroad, 88% of gas investments and 17% of hydro investments.
- Expected returns on projects abroad are higher than the cost of capital of respective companies, and higher than expected returns on projects in Switzerland.
- Realised returns on wind projects abroad are lower than expected returns but cover the cost of capital, and on average are similar to realised returns on wind projects in Switzerland. The main reason for a mismatch between expected and realized return for wind projects abroad is lower wind performance in selected locations than expected. Despite similar realised returns, only 8% of the wind projects are conducted in Switzerland.
- Realised returns on gas projects are lower than expected due to low demand for electricity from gas. Sensitivity analysis shows that even with higher electricity prices, the realized low full load hours do not allow to reach the expected returns.
- The focus group discussion shows that it is not only risk and return factors, but also emotional factors that affect the decision to invest in a given location. This provides preliminary support for our hypothesis about inverse home-country bias.

Dissemination

- IAEE International Conference "Energy: Expectations and Uncertainty", Bergen, 22.06.2016
- AIEE Energy Symposium "Current and Future Challenges to Energy Security", Milan, 1.12.2016.
- Advised a Bachelor's thesis on project-related topic.

WP3

Work undertaken

The three main steps in WP3 are qualitative interviews with institutional investors, utilities as well as major stakeholders to evaluate the risks they associate with investments in large Swiss renewable energy projects; quantitative web-based experiment applying adaptive choice-based conjoint (ACBC) analysis, and deriving willigness to invest through analysis of ACBC experiment data. Data analysis was supported by hypotheses testing.

The researchers responsible for WP3 carried out the following tasks in 2016:

- Started and finished reviewing relevant literature (i.e. literature on investor-specific differences in risk-return perception, the choice of investment partner, the moderating influence of experience, the technology preference) and the regulatory framework for investments of institutional investors and utility companies (e.g. FINMA, Swiss Solvency Test, Ordinance on Occupational Retirement, Survivors' and Disability Pension Plans) for the interviews, experimental design and subsequent hypothesis testing.
- Started and finished recruiting survey participants for both the interviews and the subsequent ACBC analysis. Contact details were derived from conference lists, social media platforms and generous internet research. Decision-makers in either utility companies or pension funds were elicited using keyword searches. We invited survey participants from all company size ranges to participate, and, in the case of pension funds, from different industrial sectors.
- Designed and conducted the ACBC with the help of relevant literature, interviews and stated hypotheses. After pre-testing the choice experiment, sent out 400 survey invitations (154 utilities and 246 pension funds) and closed our survey with a completion rate of 17%.
- Started and finished data analysis with the help of a hierarchical Bayes (HB) model and SPSS data analysis to derive individual investor preferences and their willingness to accept less desired investment features for a return premium. Susequently, we derived answers for the stated hypotheses from our previous data analysis.
- Scientific paper was written and submitted to scientific journal and is currently under review.

Preliminary findings

- Conducting 1,129 experimental investment choices with 53 professional investors
- Utilities prefer co-investing with their peers rather than with pension funds, and vice versa
- Pension funds are more risk-averse towards operational risk
- Pension funds do not in general finance hydropower at lower cost than utilities
- Pension funds are able to provide substantial capital, but most likely in cooperation with electric utilities

National cooperation

Preliminary findings were discussed with participants of the SCCER CREST Annual Conference in September 2016, and have provided input for the research programme of the newly created Work Package 4 of phase II of SCCER CREST.

International cooperation

In order to learn best practices from abroad, we established cooperation with researchers from the USA (University of Maryland) and Sweden (Linkoping University). The two project-related dissertations are co-advised by researchers from Chalmers University of Technology (Gothenburg, Sweden) and Munich University of Technology (Germany). Preliminary findings were discussed with researchers and practitioners in Ireland at a conference hosted by University College Cork and the Environmental Protection Agency in Dublin in December 2016.

Evaluation 2016 and outlook for 2017

The work in 2016 has been productively carried out in accordance with the timeline of the project. The project team is looking forward to continuing and succesfuly finalizing the project in 2017 in accordance with the timeline. In 2017, the researchers in WP1 will be focusing on: evaluating international best practices, refining the DCF model to quantify policy risks, and further developing policy recommendations to reduce the project soft costs. The researcher in WP2 will conduct final interviews to find out the most important factor affecting the choice of investment location for energy projects. The work on WP3 has been completed in 2016. The final results of the project should be informative for both policy-makers and investor community.

Appendix

Work Package	Task		4Q15	1Q16	2Q16	3Q16	4Q16	1Q17	2Q17
WP 1	1.1	Permitting database							
	1.2	Classification of policy risk							
	1.3	Quantifying policy risk premium							
	1.4	Developing policy recommendations							
WP 2	2.1	Analysis of past investments							
	2.2	Focus group on inverse home-country bias							
	2.3	Factors influencing choice home vs abroad for future investments							
WP3	3.1	Literature review / Qualitative interviews							
	3.2	Programming / Conducting conjoint experiment / Data analysis							
	3.3	Creation of scientific report							
Dissemination			✓						