



# Strategies for Energy Investments: Is There a Case of Foreign Country Bias? Case of Switzerland

*WP2 of the Project*

*“Lowering the Financing cost of Swiss Energy Infrastructure” for SFOE*

AIEE Energy Symposium  
Milan, Dec 1, 2016

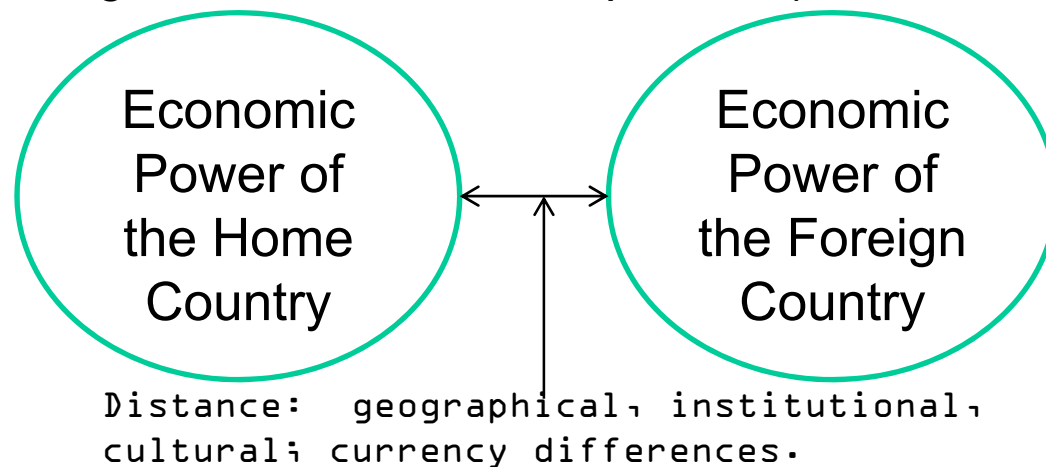
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- Motivation for the Topic: Theoretical Background and Empirical Puzzle
- Step 1: Analysis of the Realised Investments in Energy Projects and their Performance – Main Results
- Step 2: Analysis of The Factors Affecting the Choice of Future Projects, Including the Country Factor – Methodology and Further Proceeding

# Theoretical Background: What Determines Energy Investment Flows

- Energy policies address a heterogeneous pool of investors, which have different preferences, policy risk perceptions and return evaluations  
(*Bergek, Mignon, & Sundberg, 2013; Wuestenhagen & Menichetti, 2012*)

Rational Approach: Gravity theory - economy power and distance matter (see, for example, *Tinbergen, 1962, Portes & Rey, 2005; Moschieri, Ragozzino, & Manuel Campa, 2014*)

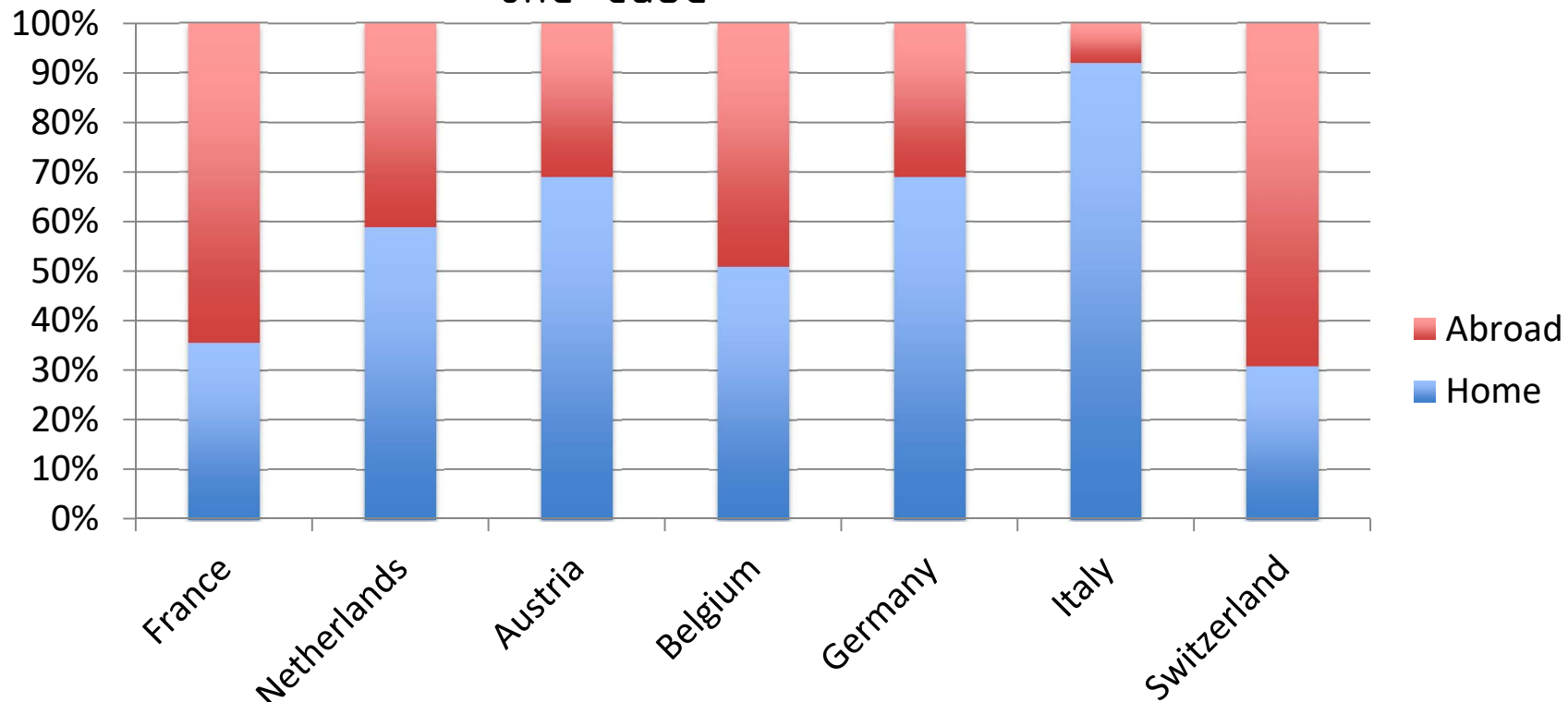


Behavioural approach:

- home bias affects investment strategies of investors: familiarity, uncertainty avoidance, etc. (*Lewis 1999, Chan et al. 2005, Levy & Levy 2014, Beugelsdijk & Frijns, 2010*)
- or 'foreign country bias': individualism leads to more investment abroad  
(*Beugelsdijk & Frijns, 2010*)

# Explaining Realised Investments: Energy Projects Financed in 2004-2015 by Selected European Countries (BNEF)

According to gravity theory, all small countries could have had invested more abroad than home and vice versa. This is not the case.



Source: Bloomberg New Energy Finance 2015

# Positioning of the Study in the Existing Literature

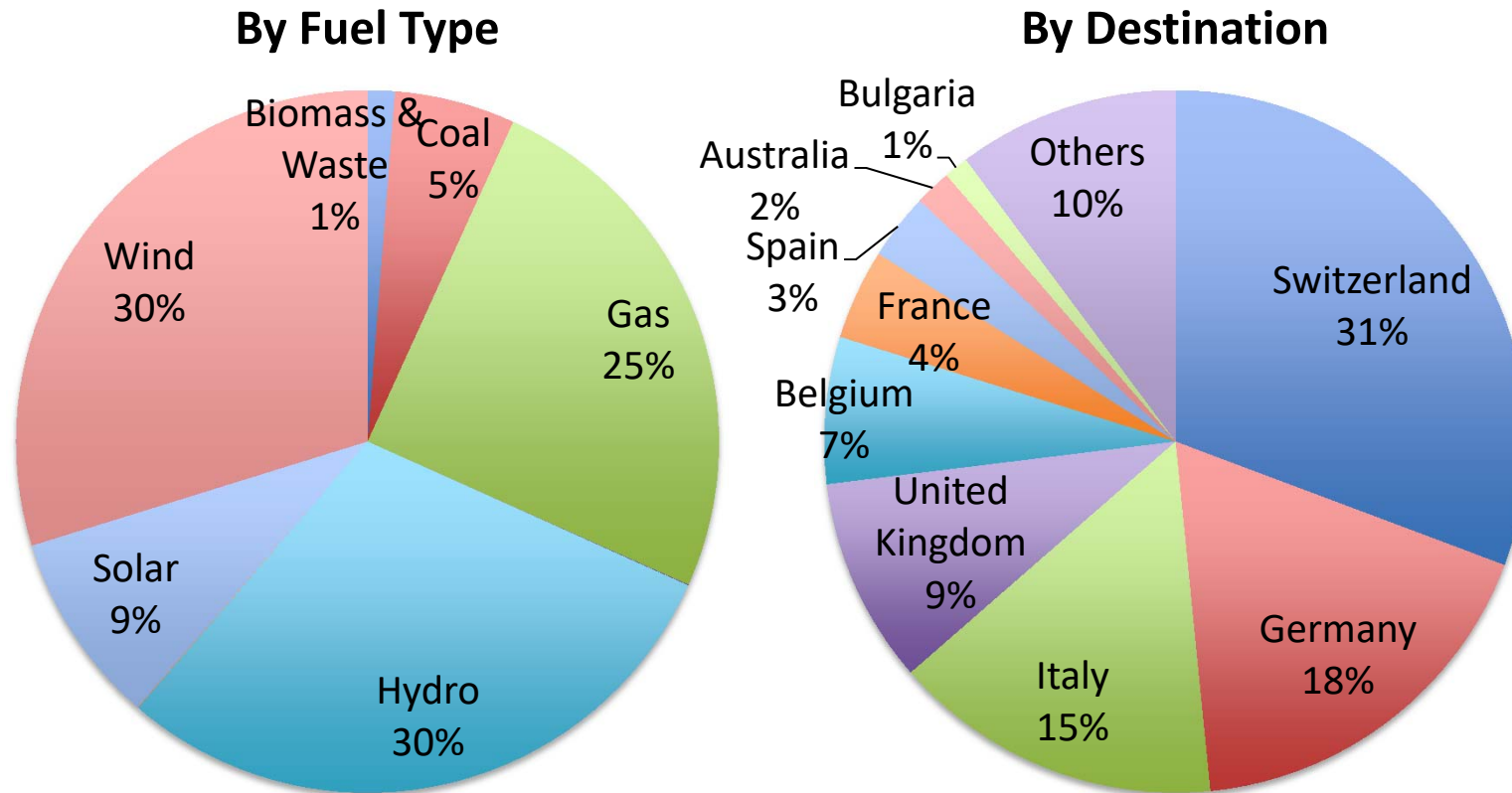
Management literature: studies analysing reasoning differences and individual bias through experiments with quantitative or content (qualitative) analysis (Mathias & Williams, 2014; Stanovich & West, 2000; Bigelow et. al. 2014.)

Energy policy, energy economics literature: survey-based studies focused on finding out the factors affecting investors' decision-making (Lüthi & Wüstenhagen, 2012; Lüthi & Prässler, 2011; Wuebker et. al, 2015; Masini & Menichetti, 2012)

Economics, finance literature: investment performance-focused studies that quantitatively show or assume benefits of diversification/non-diversification and show that investors do otherwise (French & Poterba 1991; Tesar & Werner, 1995; Huberman, 2001; Ahearne et. al., 2004 )

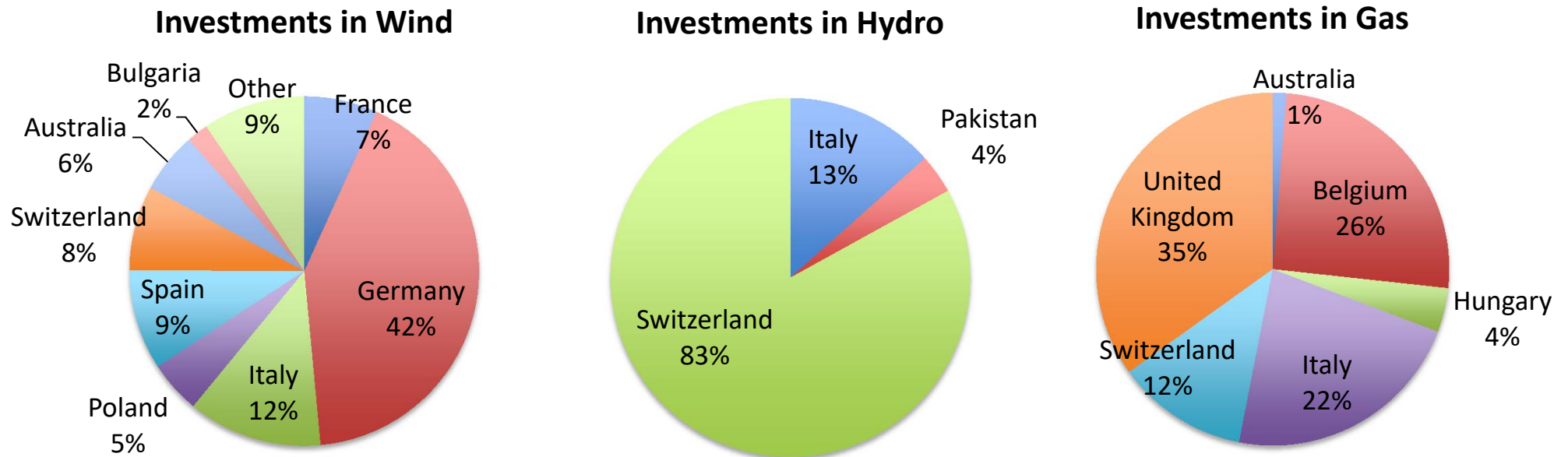
WP2 of the Project  
“Lowering the financing cost of Swiss Energy Infrastructure”:  
1) analysis of realised investments and their performance; 2) survey to find out the importance of decision factors to invest at home/abroad and potentially – foreign country bias

# Analysis of Past Investments: Energy Projects Financed by Swiss Investors in 2004-2015 (BNEF)



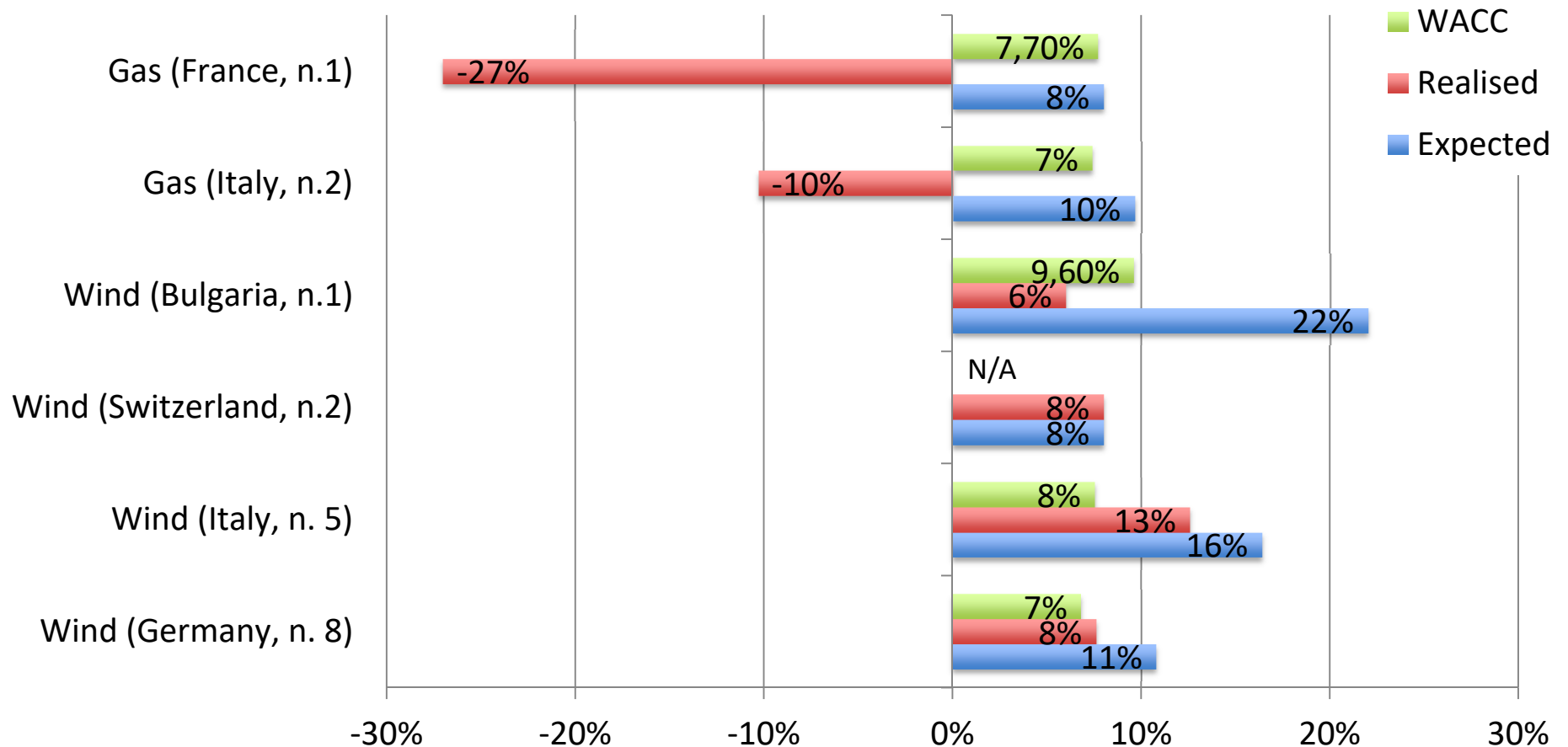
Source: Bloomberg New Energy  
Finance 2015

# Analysis of Past Investments: Destination Countries by Energy Type (3 Most Popular Ones, 2004-2015)



Source: Bloomberg New Energy  
Finance 2015

# Analysis of the Past Investments' Performance: Expected vs. Realised Returns on Selected Wind and Gas Projects (19 Projects in Total)



Source: Author's Calculations



# Factors Affecting the Decision to Invest at Home or Abroad: Literature Overview

| Attribute  | Literature  |
|--|---|
| Return – expressed either as % or as total level of compensation through tariff/combination quota and electricity price) | Lüthi & Prässler, 2011; Lüthi & Wüstenhagen 2012; Masini & Menichetti 2012; Wuebker et. al. 2015; Salm & Wüstenhagen, 2016. |
| Business model – combination of, one or none of the following: development, construction, operation                      | Salm & Wüstenhagen, 2016  |
| Administrative process – applicable if business model includes development and construction                              | Lüthi & Wüstenhagen 2012  |
| Legal security (Policy risk)   | Lüthi & Prässler, 2011; Lüthi & Wüstenhagen 2012  |
| Electricity price risk   | Salm, S., 2016  |
| CEO Gender   | Bigelow et. al., 2014   |
| Technology Type  | Wuebker et. al. 2015, Salm & Wüstenhagen, 2016  |
| Distance to Investment Location/Country of Investment  | French & Poterba 1991; Lewis 1999, Beugelsdijk & Frijns, 2010; Tesar & Werner, 1995   |

# Methodology: Adaptive Choice-Based Conjoint Analysis

## *Finding out the Relative Importance of Selected Factors*

### Choice of the attributes affecting investment streams and the levels of these attributes

Literature review, preliminary Interviews, focus group discussion

### Forming the list of survey participants

Getting contacts from internal institute database, BNEF, public company websites

### Adaptive conjoint analysis

Screening tasks, unacceptables, choice task tournament

### Data analysis: average importance; part-worth utility; willingness-to-accept

Hypothesis: Foreign bias exists if two (both) conditions are fulfilled: 1) Average importance of the attribute "Destination" is higher than the importance of other attributes; 2) Part-worth utility of the level "Switzerland" is lower than part-worth utilities of other levels (countries).

# Adaptive choice-based conjoint analysis: example of the questionnaire

| Order   | ACBC   |  |   |   |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
|---|--|--|---|---|----|------------|---------------------|---------------------|---------------------|--------------------------|--------------------------|------------|---|------------------------|-----------------------------------|------------|------------------------|----------------|--|--|--|----------------|--|---|--|---|--|---|---|---|---|
| <p><b>1) Screening tasks</b></p> <ul style="list-style-type: none"> <li>- Accept &amp; reject investment options</li> <li>- More and less realistic options included</li> </ul> | <table border="1"> <tr> <td>Total return before taxes</td> <td>6%</td> <td>1%</td> <td>9%</td> <td>5%</td> </tr> <tr> <td>Technology</td> <td>Storage power plant</td> <td>Storage power plant</td> <td>Run-of-river hydro plant</td> <td>Run-of-river hydro plant</td> </tr> <tr> <td>Partner</td> <td>Consortium with institutional investors</td> <td>No partner</td> <td>Consortium with utility companies</td> <td>No partner</td> </tr> <tr> <td>Electricity price risk</td> <td>50%</td> <td>0%</td> <td>100%</td> <td>0%</td> </tr> <tr> <td>Business model</td> <td>Outsourced development and construction, own operation</td> <td>Own development, construction and operation</td> <td>Outsourced development, construction and operation</td> <td>Own development, construction and operation</td> </tr> <tr> <td></td> <td><input type="radio"/> Yes<br/><input type="radio"/> No</td> <td><input type="radio"/> Yes<br/><input type="radio"/> No</td> <td><input type="radio"/> Yes<br/><input type="radio"/> No</td> <td><input type="radio"/> Yes<br/><input type="radio"/> No</td> </tr> </table> | Total return before taxes                              | 6%  | 1%  | 9% | 5%         | Technology          | Storage power plant | Storage power plant | Run-of-river hydro plant | Run-of-river hydro plant | Partner    | Consortium with institutional investors | No partner             | Consortium with utility companies | No partner | Electricity price risk | 50%            | 0%   | 100%   | 0%   | Business model | Outsourced development and construction, own operation | Own development, construction and operation | Outsourced development, construction and operation | Own development, construction and operation |  | <input type="radio"/> Yes<br><input type="radio"/> No | <input type="radio"/> Yes<br><input type="radio"/> No | <input type="radio"/> Yes<br><input type="radio"/> No | <input type="radio"/> Yes<br><input type="radio"/> No |
| Total return before taxes   | 6%   | 1%   | 9%  | 5%  |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
| Technology  | Storage power plant  | Storage power plant                                    | Run-of-river hydro plant                              | Run-of-river hydro plant                              |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
| Partner   | Consortium with institutional investors  | No partner   | Consortium with utility companies                     | No partner  |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
| Electricity price risk  | 50%  | 0%   | 100%  | 0%  |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
| Business model  | Outsourced development and construction, own operation   | Own development, construction and operation            | Outsourced development, construction and operation    | Own development, construction and operation           |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
|   | <input type="radio"/> Yes<br><input type="radio"/> No  | <input type="radio"/> Yes<br><input type="radio"/> No  | <input type="radio"/> Yes<br><input type="radio"/> No | <input type="radio"/> Yes<br><input type="radio"/> No |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
| <p><b>2) Unacceptables</b></p> <ul style="list-style-type: none"> <li>- Adaptive system captures “unacceptables“</li> </ul>   | <p>We've noticed that you've avoided certain characteristics shown below. Would any of these features be <b>totally unacceptable</b>?</p> <p>If so, mark the feature that is <b>most unacceptable</b>, so we can just focus on the ones that meet your needs.</p> <ul style="list-style-type: none"> <li><input type="radio"/> Business model - Outsourced development, construction and operation</li> <li><input type="radio"/> Partner - No partner</li> <li><input type="radio"/> Technology - Run-of-river hydro plant</li> <li><input type="radio"/> Electricity price risk - 100%</li> <li><input type="radio"/> None of these is totally unacceptable.</li> </ul>  |  |   |   |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
| <p><b>3) Choice task tournament</b></p> <ul style="list-style-type: none"> <li>- Decision about best and worst possibility</li> <li>- Calibrating decision-making</li> </ul>    | <table border="1"> <tr> <td>Total return before taxes</td> <td>9%</td> <td>5%</td> <td>7%</td> </tr> <tr> <td>Technology</td> <td>Storage power plant</td> <td>Storage power plant</td> <td>Storage power plant</td> </tr> <tr> <td>Partner</td> <td>No partner</td> <td>No partner</td> <td>Consortium with utility companies</td> </tr> <tr> <td>Electricity price risk</td> <td>0%</td> <td>100%</td> <td>0%</td> </tr> <tr> <td>Business model</td> <td>Outsourced development, construction and operation</td> <td>Outsourced development and construction, own operation</td> <td>Outsourced development, construction and operation</td> </tr> <tr> <td></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> </table>   | Total return before taxes                              | 9%  | 5%  | 7% | Technology | Storage power plant | Storage power plant | Storage power plant | Partner                  | No partner               | No partner | Consortium with utility companies       | Electricity price risk | 0%                                | 100%       | 0%                     | Business model | Outsourced development, construction and operation | Outsourced development and construction, own operation | Outsourced development, construction and operation |                | <input type="radio"/>                                  | <input type="radio"/>                       | <input type="radio"/>                              |   |  |   |   |   |   |
| Total return before taxes   | 9%   | 5%   | 7%  |   |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
| Technology  | Storage power plant  | Storage power plant                                    | Storage power plant                                   |   |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
| Partner   | No partner   | No partner   | Consortium with utility companies                     |   |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
| Electricity price risk  | 0%   | 100%   | 0%  |   |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
| Business model  | Outsourced development, construction and operation   | Outsourced development and construction, own operation | Outsourced development, construction and operation    |   |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |
|   | <input type="radio"/>  | <input type="radio"/>                                  | <input type="radio"/>                                 |   |    |            |                     |                     |                     |                          |                          |            |   |                        |                                   |            |                        |                |  |  |  |                |  |   |  |   |  |   |   |   |   |

Source: Salmieri, 2016

# Adaptive choice-based conjoint analysis: example of the results

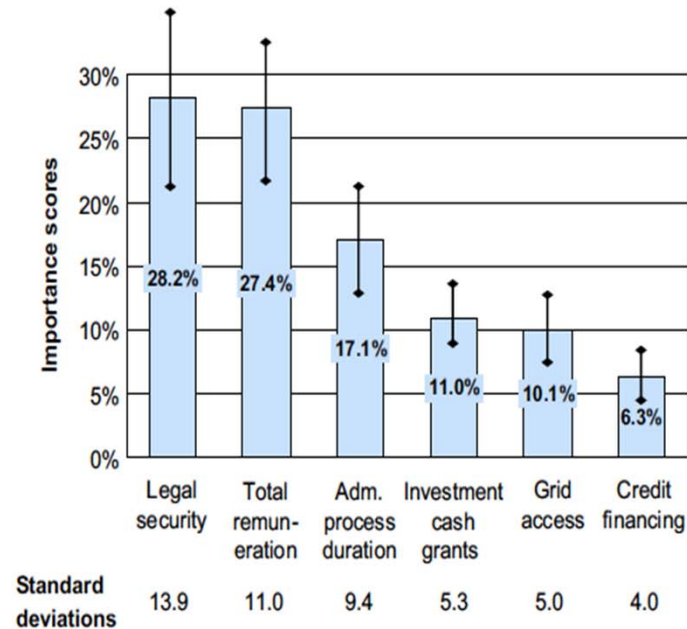


Fig. 4. Importance scores and standard deviations.

Importance levels of the attributes

- 1 years
- 3 years
- 5 years
- 7 year
  
- Guaranteed; priority dispatch
- Guaranteed; mostly priority dispatch
- Guaranteed; no priority dispatch
- Negotiated project-by-project
  
- 14 €/kWh / 19 \$ct/kWh
- 11 €/kWh / 15 \$ct/kWh
- 8 €/kWh / 11 \$ct/kWh
- 5 €/kWh / 7 \$ct/kWh
  
- Given in all cases
- Given in most cases
- Given in some cases
- Not given, corruption possible

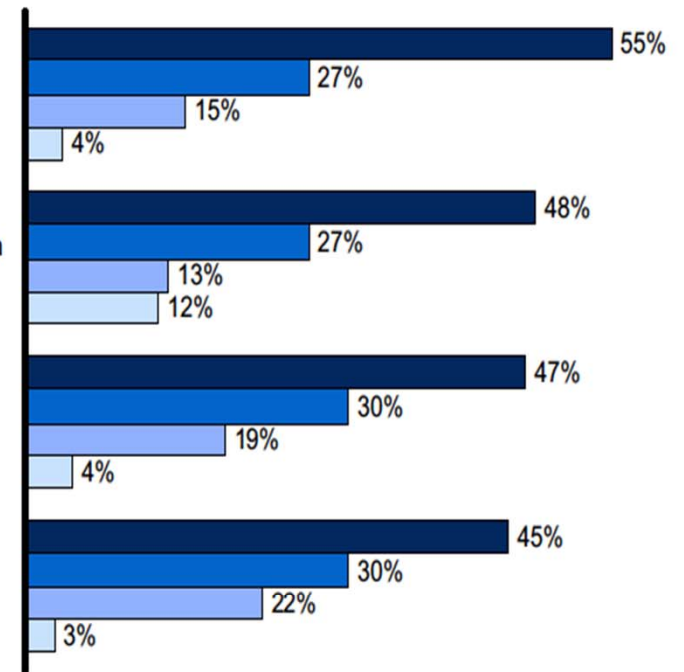


Fig. 6. Share of attribute level appearance in winning scenarios.

Importance levels of the attribute levels

Source: Lüthi & Prässler, 2011

# Adaptive choice-based conjoint analysis: calculating relative importances/cost of changes to preferred investment-related attributes

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WTA in % return premium

Difference between highest return (10%) and lowest return (2%)

$$WTA(u_{ij}) = (u_{ijmax} - u_{ij}) * \frac{p_{max} - p_{min}}{u_{pjmax} - u_{pjmin}}$$

Maximum part-worth utility of attribute level (e.g. location - Germany) minus investigated part-worth utility of attribute level (e.g. Switzerland)

Difference of part-worth utility of highest return (10%) and lowest return (2%)

# Adaptive choice-based conjoint analysis: example of the results showing relative importance

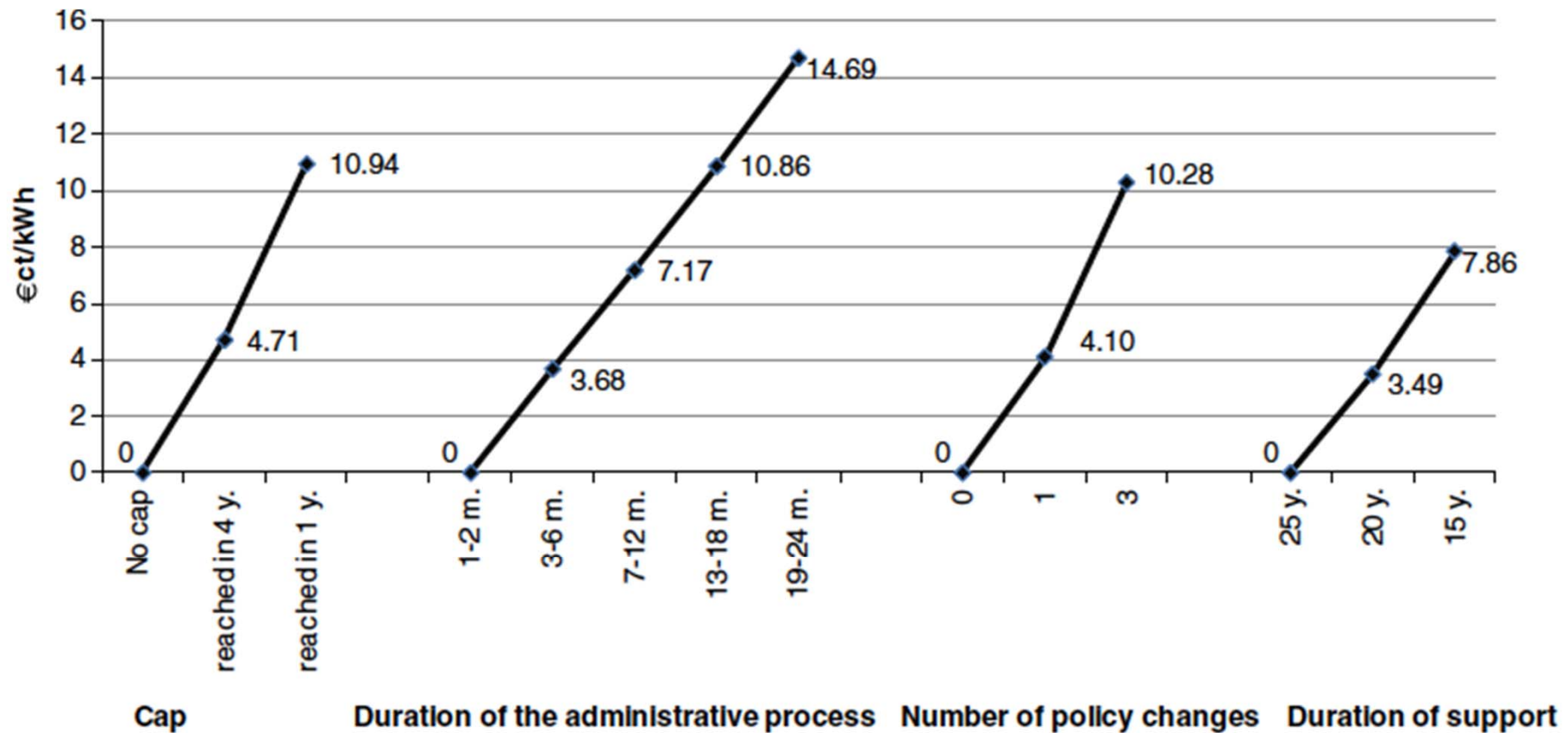


Fig. 4. Willingness-to-accept certain policy risks.

Source: Lüthi & Wüstenhagen, 2012  
1.12.2016

# Methodology and proceeding – attributes and attribute levels extracted from literature review and interviews

| Attributes                                | Attribute levels  |
|---|---|
| <b>Total return before taxes (%)</b>      | <ul style="list-style-type: none"> <li>• 3%</li> <li>• 5%</li> <li>• 10%</li> </ul>   |
| <b>Technology</b>                         | <ul style="list-style-type: none"> <li>• PV</li> <li>• Wind onshore</li> <li>• Run-of river hydro plant</li> </ul>  |
| <b>Business Model</b>                     | <ul style="list-style-type: none"> <li>• Outsourced development, construction &amp; operation</li> <li>• Outsourced development &amp; construction, own operation</li> <li>• Own development, construction &amp; operation</li> </ul> |
| <b>Country</b>                            | <ul style="list-style-type: none"> <li>• Switzerland</li> <li>• Germany</li> <li>• Poland</li> </ul>  |
| <b>Source of electricity compensation</b> | <ul style="list-style-type: none"> <li>• Feed-in tariff</li> <li>• Feed-in premiums/green certificate payments + electricity price</li> <li>• Power-purchase agreement (PPA)</li> </ul>   |

# Summary of the Results and Next Research Steps

- 
- Past investment strategies:
    - Swiss investors invest abroad more than other European investors
    - Main project types: wind, gas, hydro. Out of wind 92% abroad, out of gas – 88%
  - Comparison of expected and realised IRR to WACC:
    - Expected IRR on the projects abroad is higher than WACC. Possible reason: risk premium
    - Realised IRR on wind abroad is lower than expected but covers WACC. Main reason: lower wind performance than expected
    - Realised IRR on wind projects abroad is comparable to IRR for wind in Switzerland
    - Realised IRR on gas projects is much lower than expected and does not cover WACC. Main reason: low demand.
  - Next steps:
    - Adaptive choice-based conjoint analysis to find out relative importance of decision-affecting factors and confirm or deny the hypothesis about foreign country bias
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**Thank you for your attention!**

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