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**MICROPOWER IN RESIDENTIAL BUILDINGS - AN ANALYSIS OF  
CUSTOMER PREFERENCES AND BUSINESS MODELS**

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### **Overview**

One vision of future energy systems is based on an increasingly decentralized supply of electricity and heat in small-scale systems that are installed on the individual building level, which we refer to as micropower. Our understanding of micropower includes systems that provide electricity (such as photovoltaics), heat (such as wood pellet stoves, heat pumps, or solar thermal collectors) or both heat and electricity (micro-CHP, either based on natural gas or biomass). Our focus is on micropower systems that have lower environmental impact than incumbent technology, which tends to be oil heating and conventional electricity from the grid in most European countries. While the technological potential of micropower has been widely acknowledged and some policies are explicitly trying to support this market, the market adoption of micropower systems ultimately depends on customer decisions to buy them, and on adequate business models (Chesbrough and Rosenbloom 2002, Stähler 2001) for suppliers of micropower systems to successfully meet demand. Compared to other aspects of micropower, research on customer preferences and business models are two relatively underdeveloped streams of research. Our project uses a two-step approach to investigating customer preferences: In a first phase (which is the subject of this paper), we are using qualitative research methods (interviews and focus groups) to gain a comprehensive understanding of underlying attitudes and other factors influencing customers' buying decisions, while in a second phase, a quantitative survey (using conjoint analysis) will be conducted to assess the relative attractiveness of different systems. On the supply side of our research, we are investigating key aspects of successful business models.

Based on the findings of the first phase of our research, this paper aims at answering the following research questions:

- What are the attitudes, values and beliefs of Swiss residential customers towards various micropower systems?
- Which attributes of micropower systems are most relevant for customers' buying decisions?
- Who else plays an important role in the decision process for or against micropower systems, and what are the most relevant sources of information for preparing buying decisions?
- What are promising target segments for marketing various micropower systems to Swiss consumers?
- What different types of business models for micropower can be identified in the micropower market (with an emphasis on solar thermal collectors) and how successful are they?

### **Methods**

On the demand side, the paper reports on the initial findings from our qualitative research on customer preferences. At this point, we have conducted 12 individual interviews and 8 focus groups (with a total of 42 participants) with homeowners, tenants and installers in Switzerland and Germany. Focus groups, moderated group discussions around a given topic, have been widely used in marketing for various consumer goods (Morgan 1996, Krueger 2000). Research in the area of sustainable energy has only recently discovered this method, e.g. focus groups are found in research by social psychologists or scholars in science and technology studies on consumer preferences for green electricity (Wortmann 1996, Truffer, Bruppacher, Behringer 2001) or in the design of electricity disclosure labels (Tutt and Davis 1998, Mark-

ard and Holt 2003). The advantage of focus groups is that they provide information about emerging customer preferences for micropower systems, and also on the interactions between various consumers as they form their attitudes and opinions towards new innovative micropower technologies. While focus group results do not provide for representativeness, they will provide a good basis for our following quantitative research.

On the supply side, the research presented in this paper is based on a survey conducted among players in one particular subsector of the micropower market, namely suppliers of solar thermal collectors. An e-mail questionnaire has been sent out to the executives of 311 manufacturers and retailers of solar heating equipment in Germany, Switzerland and Austria that were identified by internet research. Thus, it has been ensured that the sample represents a significant share of the market under consideration. The questionnaire was designed in a way that allows drawing conclusions on the different aspects of a business model as will be explained in the according section below.

## Results

As for our **demand-side** research, our research has provided new insights about consumer attitudes towards different micropower systems, important aspects of the purchasing process, and the most relevant product attributes in consumers' buying decisions. Some of our key findings from focus group research so far can be summarized as follows:

- Average Swiss customers are relatively uninformed about aspects of heating supply of their homes, and are even less informed about aspects of electricity supply. The connection between heating and electricity is rarely made, which may constitute a strong barrier to diffusion of micro CHP systems.
- Buying decision processes and criteria for heating systems differ between two typical situations, namely an emergency replacement of the existing boiler, and a more planned search for a new system (mainly in the case of new buildings, but to some extent also in the refurbishment market). In emergency replacements, which account for a large percentage of buying decisions, customers tend to be conservative and often choose the same system as before. The new building market is a more promising route for innovative micropower systems.
- Architects and installers play a key role in influencing buying decisions, and many homeowners expressed their preference for getting independent advice in their decision process (e.g. by regional energy agencies).
- Among different micropower systems, heat pumps and solar thermal collectors are relatively popular in Switzerland, while micro-CHP technologies are less present in customers' minds and their value proposition is not immediately clear to many of them.

On the **supply-side** (i.e. business models for micropower), our survey of suppliers of solar thermal collectors has provided new insights on business model configurations in the solar heating market. In particular, the research has highlighted the dominant importance of quality (versus price) in the positioning of most firms. In terms of revenues, most players in the industry tend to focus on hardware sales, with only few capturing the potential of new value-added services including financing packages.

## Conclusions

Our paper reports on intermediate results of our research project on micropower in residential buildings, which aims at providing fresh insights by adopting a marketing perspective to this area of research. On the demand-side, our results from focus groups help to add the voice of "the ordinary customer" to a debate that has traditionally been dominated by technical experts. This demonstrates that technologies that are well-established in expert circles, such as micro-CHP, fail to meet the expectations of mainstream customer segments, who perceive electricity and heating as two separate issues. This may partly explain why micropower technologies that produce either heat (such as wood pellets, solar thermal or heat pumps) or electricity (such as photovoltaics) have more successfully penetrated the market than CHP. Also, our results indicate that upfront cost is what many homeowners are mainly concerned about, and that systems with higher upfront cost but lower operating cost are often refused by customers. Finally, we could give some first hints for market segmentations, indicating that the various micropower technologies might appeal to different groups of customers.

On the supply-side of the micropower market, based on a survey of companies in the solar thermal energy sector, we found confirmation for the idea that different market segments value different product attributes, once again highlighting the need for proper segmentation strategies. We could also demonstrate that suppliers differ with regard to their positioning in the price and quality dimensions and also give evidence for their plans to increasingly internationalize their business. In terms of innovative revenue models, the solar industry seems to be in a very early stage, where the dominant paradigm is to generate revenues from selling hardware (i.e. solar collectors). New solutions, such as financing packages or contracting services, are only offered by 6% and 9% of firms, respectively, which is puzzling given the importance of lowering upfront cost as shown by our consumer research. Another aspect that deserves further scrutiny is the shift from the traditional installer-centered distribution model towards direct sales, which was expected by some of the respondents. How this move towards solar collectors as do-it-yourself-type equipment can be matched with consumer preferences for convenience is an interesting question for our further research on the demand-side of the market. Also, a technology-by-technology approach seems to be fruitful, given the strong differences in technological features, segment-specific appeal and market structures across different micropower technologies.