

## Market demand for green power products

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### Abstract

"Green tariffs" or "green pricing" have received considerable attention in the last few years in electricity marketing. The ongoing deregulation of electricity markets in most industrialized countries is likely to increase the importance of these marketing strategies even further. Very probably, this will lead to the emergence of new "green power products" and specialized enterprises offering these products. The overall ecological benefit of green power products will, on the one hand side, depend on the environmental characteristics of the offered products, i.e. which technologies will be offered in what combination and for what prices, and on the other side, the size and structure of the demand for these products.

The paper will concentrate on the market potential for green power products. Three segments will be analyzed in more detail. (1) The willingness to pay of environmentally conscious households has been analyzed in many countries, already. The major findings of these studies will be discussed. (2) Besides, service and industry firms might become an important demand segment for green power products. As voluntary agreements are likely to increase in importance as instruments of environmental policy in a number of industrialized countries, green power products could receive additional appeal for business. In this segment, we will discuss the results of our own surveys, mainly from Switzerland. (3) Finally, local distributors could act as an intermediary for the demand of green electricity. Demand articulation will here be influenced by local political processes. First indications for demand articulating processes in this segment will be discussed in the paper.

Effective demand for green power products will be determined through the combined development of these three market segments. The paper will discuss different ways in which the partial demands could sum up to lead to either limited market niches, or alternatively, to more important shares of the electricity market.

## 1. "Green electricity" in liberalized electricity markets<sup>1</sup>

In the past few years deregulation of electricity markets has been a major topic in energy policy. After public transport, and telecommunications, the energy sector is going to be deregulated and privatized all over the world (Loskow 1998). The new market order is intended to bring a number of advantages to the customers. The major effect should be a lowering in prices. As electricity is a basic input to most commodities and services, a major increase in welfare could result from this endeavor. From an environmental point of view, these positive effects are impaired by the risk of giving advantage to energy forms with less attractive environmental characteristics. An increase in the environmental impact of the electricity sector may be expected if cheap energy from low standard power plants will compete against high standard plants with higher production costs. The overall effect of deregulation on welfare could then become largely negative.<sup>2</sup>

The protection and support of environmentally less polluting energy forms has therefore become a major concern in the context of market liberalization. The EU's guidelines for the liberalization opens the possibility for prioritizing renewable energy. Besides, new promotional instruments which are more compatible with a liberalized market order have been developed, in the last few years. In this paper we will elaborate on the role of "green electricity"<sup>3</sup> products. We want to identify major demand generating processes which will eventually determine the potential of "green electricity" for achieving a more "sustainable" power generation system under condition of a liberalized electricity market.

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<sup>1</sup> Research leading to this paper was funded in the context of a transdisciplinary research project on the topic of "Ökostrom" (eco-power) regarding the relationship between green electricity and hydropower conducted at EAWAG. A more detailed description of the overall project is given by Truffer, et al. (1998). Earlier versions of the paper profited from comments from L. Bieri (who carried out most of the interviews) and from R. Wüstenhagen. Special thanks for support are due to W. Blum, VSE, Zürich for the provision of data on energy consumption and to B. Hürlimann, EWZ, Zürich for many useful comments and the possibility to report on their survey.

<sup>2</sup> Environmental impact from deregulation is, however, not clear. The experience in some countries which already have deregulated seems to tell a slightly different story. In a first step, the major polluters are taken out of production (often old coal fired plants) and are substituted by new more efficient power stations (gas plants) (Fouquet 1998, Schelling 1998). These experiences did take place within well defined national boundaries. The overall effect may however be negativ if plants from countries with widely differing environmental standards begin to compete against each other.

<sup>3</sup> Throughout this paper, we will use "green power", "green electricity and "green pricing" as synonyms.

The idea of offering customers the choice over their electricity mix was — perhaps for the first time coherently — formulated by Moskowitz (1993). With the unfolding debate on deregulation, green pricing received more and more attention. Originally conventional electric utilities, with regional monopolies, were at the forefront of promoting green power products. With ongoing deregulation, however, a number of newly founded firms have emerged both in the US and Europe (Markard and Truffer 1998).

Several studies evaluated the first experiments with regard to market potentials and conditions for success (see Markard 1998, Holt 1997a, Farhar and Ashley 1996). Major lessons from these studies are that green power products are successful in the market if they are conceived as competitive products, if they are marketed professionally, if the use of the surplus-payments is transparently communicated and if the electric utility is able to position itself as a trustworthy promoter of environmentally profitable technologies.<sup>4</sup>

In the last few years, green pricing experiments received a lot of attention and were in general quite successful. However, they currently cover only a tiny share of the electricity market. Whether or not green power will become an effective means to transform the electricity sector into a more sustainable mode will depend — among other things — on the market share that eventually will be reached and the actual profile of future green power products. Currently, we are far from being able to predict the size of this market. However, we may analyze the major demand generating processes which support or hinder a deeper market penetration of green power products.

In the next chapter, we will ask what customers will get when paying more for green power products. We will argue that besides the ecological characteristics of the product a more "political" or "strategic" decision criterion enters as a motivating factor. Furthermore, we will show that a common strategy of "new" and "old" renewables would increase the environmental benefit resulting from green power products. In the following three chapters, we will analyze market segments in more detail, which differ fundamentally in their motivation to buy green power and the way demand will be articulated: households, firms and local communities. In the last section, we will synthesize the

analysis in the form of three scenarios which sketch the potential contribution of green power products to reduce environmental impact from the electricity sector.

## **2. Green power for what and for whom?**

What does the consumer get with green power?

The high attention that green power received in the market place is quite astonishing, because the immediate utility to the consumer of such a consumption act is not readily apparent. The electricity consumer has to pay an additional amount of money<sup>5</sup> for a product which continues to have the same uniform quality as before. Nothing changes at the power outlet of the individual consumer. Why should then consumers be interested at all to opt for such a product? One has to broaden the definition of the relationship between user and product in order to resolve this "paradox".

As there is no immediate material benefit for the consumer which is associated with the consumption of green power, there might be some other individual benefits which are less visible. People could try to find relieve for their bad feelings about the ecological characteristics of their own life style and especially about the way they consume electricity. However, in general the awareness of electricity consumption is very weak for most individuals and there may be other more efficient means to get relief for this bad feeling.<sup>6</sup>

A second hypothesis is that people are directly concerned about the state of the environment and attach a great importance to the impact of the respective product sector. By buying green consumer goods they want to decrease this impact. The contribution of every individual user would however be diluted by the many customers which do not contribute their share to reduce the negative impact. The concerned consumers would be confronted with a bad cost-benefit ratio of his or her investment

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<sup>4</sup> To illustrate the latter point, Markard (1998) shows empirically an inverse relationship between size of the utility offering green electricity products and their market success. One major reason for this may be that credibility of small providers is higher which have no environmentally doubtful power plants in their portfolio.

<sup>5</sup> Prices are quite substantially higher in many of these schemes. The solar power scheme of the Swiss city of Zurich sells solar power of 1.2 Sfr/ kWh this has to be compared to the "normal" price of 0.18 SFr/kWh.

<sup>6</sup> A more efficient form might be to donate money to specific environmental pressure groups. However, experience with green pricing showed that schemes which were perceived as being very close to donation programs were less successful than schemes which were offered as competitive products.

and it would be more rational to divert the funds to options with more immediate chances for success. This means that we are here in a classical situation of a social dilemma with a high risk of free riding behavior. The motivation to participate in a green product scheme would therefore be extremely low, at least for rational consumers.

A more elaborate form for overcoming this social dilemma exists if the individual consumers are able to understand the dilemma situation and to prefer a situation in which their own contribution is diluted over one where there is no contribution at all (de Jasay 1989). In this view, the individual will act responsibly — and hence buy green products — because his specific contribution may make "all the difference".

Such a behavior becomes even more rational if learning effects and economies of scale at the level of the market may be expected for the technology. The size of an initial market may then be crucial to help the new technology to compete over the conventional rivals and drive them out of the market. This will be all the more true if the conventional product is associated with a strong negative image.<sup>7</sup> In such situations well informed and concerned consumers of green products may find it rational to make their contribution to the market success of a preferred technology or product even if their immediate return seems to be nil.

The above analysis suggests that the two first arguments are not likely to resolve the paradox (at least for the households segment), whereas the last effect could be seen as a rational explanation for the interest of consumers to buy green power products.<sup>8</sup> If these arguments prove to be empirically valid then green power products should be transparent with regard to at least two important aspects: First the environmental benefits that result from a substitution of an amount of conventional electricity through green power under current conditions of competition. Second, and perhaps even more

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<sup>7</sup> This is certainly the case for fossil and nuclear power plants.

<sup>8</sup> One could argue that consuming green power may not be explained by "rational" behavior but has to do with emotions and perceptions. We would argue that this is rather a gradual distinction than a categorical one. Emotions and perceptions enter into play in all three levels. The farther away motivations are from immediate consumers utilities the stronger will be the role of emotions and perceptions.

important, these products sell a "promise" for the future competitiveness of renewable energies. It should be communicated clearly how this promise could be fulfilled.<sup>9</sup>

#### Implications for product design: the role of hydropower

Most offers of green power products concentrate today on some sort of mix of "new" renewables. These technologies have in common that production costs are in general quite high and quantities produced are negligibly small in the overall mix of the respective countries. On the other hand, prospects for achieving considerable economies of learning (through research and development) and of scale are widely discussed in the media and should in the long run lead to a competitive market position of these technologies.

The "old renewable" energy form of hydropower is fundamentally different in all the respects: there are considerable production capacities at competitive price all over Europe. Economies of scale and learning effects have been reaped throughout the last century. The construction of new facilities is confronted with often fierce political opposition. Because of these difficulties, hydropower is often excluded from the green power mix or else it is treated in a most arbitrary way which defies any transparent and credible communication about the ecological benefits of the product (Markard and Truffer 1998). This is most unfortunate as the mix of old and new renewables could resolve a major problem of prices and quantities of current green power products. Furthermore, combined products could enhance the promotion effect for new renewables substantially. However, up to date no consistently conceived mix has yet been offered on the market.

In order to understand this neglect we have to analyze the situation of hydropower in green electricity products in somewhat more detail: In most green power products which have been developed in recent years hydropower was not taken into consideration. The major reason for this neglect may be seen in the above mentioned difficulty to combine new and old renewables into a single product and the ambiguous environmental image that hydropower has in many countries.<sup>10</sup>

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<sup>9</sup> Such a double role may not only be important for green power, but is also important for the motivation to buy green food. Besides the immediate effect for the consumer with regard to taste and improved anticipated health, bio-food also holds the promise of promoting environmentally responsible forms of farming. In the sector of "green investments", the promotion aspect is dominant and the direct individual utility is largely absent.

<sup>10</sup> This bad image is often influenced by current big scale projects like the three-gorges project in China.

Those schemes which did incorporate hydropower have treated it in a very inconsistent way which is quite loosely tied to either environmental impact criteria or technology promotion aspects. In some rare cases, power from big dams has been sold as green power without any qualification.<sup>11</sup> Most schemes set a limit on installed capacity, i.e. those plants which have less than a certain amount of kW are considered as environmentally benign the others are not.<sup>12</sup> Another criterion is related to the construction date. Some ecolabeling schemes only consider already existing power plants, others restrict themselves to new plants.<sup>13</sup> Only in a few exceptions green payments are used to achieve specific environmental improvements for the plants.<sup>14</sup> This great variety of approaches is due to a lack of a clear analysis what green power products have to sell and communicate, as well as a lack of a scientifically grounded method for assessing the environmental impacts of hydropower (Truffer and Bratrach 1998).

Hydropower is almost emission free in its use. It is therefore considered as a very favorable energy form, seen from a global environmental point of view.<sup>15</sup> Locally however, the storage and diversion of waters may cause a wide number of negative environmental effects which are irreversible and which endanger the survival of natural ecosystems and indigenous people (IUCN and World Bank 1997). An environmental balance sheet of this energy form has to take both sides, the local and the global, into account, else there will always be strong political opposition against the involvement of hydropower into green electricity offers.

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<sup>11</sup> Several initiatives are reported in Holt (1997a).

<sup>12</sup> An impressive variety of approaches exists: In California the "green-e" label sets the limit at 30 MW, in Canada the limit of 20 MW seems to be acceptable (Buhl et al. 1998). In Germany the discussion is about a limit of 10 MW (Scheer 1998). Finally in the Swiss city of Berne the level has been set at 100 kW (EWB 1998).

<sup>13</sup> The certification scheme which is under preparation by the TÜV (Technischer Überprüfungsverein) in Southern Germany demands that only newly constructed plants should be entitled to sell green power. Sweden is following an opposite course as they only certify hydropower plants that went into operation before 1995 (Buhl et al., 1998).

<sup>14</sup> Bonneville Power Administration in Portland has commissioned the Environmental Resource Trust to develop and market green power products which aim at restoring salmon in rivers (ERT 1998). Somewhat more encompassing is the Californian green-e label which demands that hydropower stations should get into contact with local environmental groups in order to define and establish concrete improvements in the catchment area. However, the framework for these negotiations has not yet been spelled out sufficiently (green-e, 1998).

<sup>15</sup> Very often greenhouse gas potentials are very low per produced energy output. However, in cases of shallow storage lakes in tropical forest regions, submerged biomass may be a considerable source of greenhouse gases, which may even exceed the figures of coal fired power plants.

As a second aspect, hydropower is not consistently incorporated if the promotional aspects of this energy form is not credibly communicated. As the new construction of hydropower facilities is confronted with political opposition, green power payments should not be used to finance new power generation capacity. Green pricing schemes should rather aim at decreasing the environmental impact of existing power stations (Truffer et al. 1998). Green power consumers would then help to improve an existing technology in the same time as investing in the build up of new capacity for the new renewables.

If hydropower is treated in such a way, a mix of new and old renewables may be consistently built up and communicated to the customers. New renewables would then profit by being part of a competitive product. Hydropower would profit from a positive image transfer and couldby achieve a higher price in the market.

#### Categories of customers for green power

In order to estimate the actual environmental benefits that could be reached — both short and long term — by green power products, we have to indicate what proportion of the electricity market could be reached by green power products. We will distinguish three actor groups: households, firms and communities. The first two are end consumers and the last one could act as an intermediary between several groups of end-consumers.

The current (1997) splitting of electricity consumption is in Switzerland about 31% for households and 59% for firms (33% industry, 26% services). The final 10% are used by transport and agriculture. The figures are quite representative for other industrialized regions in the world. In the OECD, electricity consumption (1996) is divided along the following lines: households 31%, industry 39%, services 27%, transport and agriculture 3%.<sup>16</sup>

The motivations to buy green electricity are quite different depending on the consumer segment that is analyzed. Until recently households have been in the focus of marketing departments. Depending on the frame conditions also firms and communities could have an active interest in the promotion of

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<sup>16</sup> Figures for Switzerland are from BfE (1998), for the OECD see IEA (1997).

renewable energy. We will analyze the above mentioned three segments in turn with regard to their motivations for green power

### **3. Households**

Several market studies have been carried out by electric utilities in the US and Europe. Households have been of primary interest in these studies because of their high propensity to donate for environmental programs. As a consequence, the first offers were started under the heading of "green pricing" (or *grüne Tarife* in Germany). However, it has been shown that programs which position their offer as competitive product fare much better than donation programs (Farhar and Ashley 1996).

Electricity has traditionally be considered as a homogenous product. Prospects for product differentiation seem to be feasible in the context of market liberalization. Environmental damage is one of the few criteria of differentiation. In order to see how much interest could come from households as electricity consumers we have to be aware of the following facts: Households do not spend a big proportion of their salaries on electricity. In Switzerland, for instance, average expenditure is of about 900 SFr per year and represents 1-2% of an average households budget. Electricity is seen as a fixed expenditure which may only marginally be influenced by changing behavior. Therefore, electricity ranges very low as a saving option in the households budget (EWZ 1996).<sup>17</sup> Consumers do not have a clear idea about the amount they spend on electricity. In fact, they have a rough idea about monthly expenditures but a very inaccurate estimate about price per unit service delivered (i.e. kWh). A recent survey on environmental awareness showed that only 15% of the respondents were able to "grossly" estimate their costs per kWh (Diekmann und Franzen, 1995). At the same time, prices are considered as rather fair by the majority of the households. In a survey of the utility of the city of Zürich, 61% claimed that prices were right, only 18% said that they had to pay too much and another 10% thought that prices were too low (EWZ 1996).

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<sup>17</sup> EWZ conducted a representative telephone survey with 500 households and 254 firms in the city of Zürich for which it holds a distribution monopoly.

These figures form the baseline for a green power market to develop. Willingness to pay for green electricity is in general quite high. In the above mentioned Swiss study, about 80% were in favor of paying more for environmentally benign electricity. Out of these 43% were willing to pay a price premium of up to 25%. 57% stated even higher willingness to pay (EWZ 1996). These findings are consistent with studies from other countries. In the US, 40-70% are willing to pay a premium for the promotion of renewable energy (Farhar and Ashley 1996). In a German study, between 21% and 28% of the households were identified market segment with a strong interest. Another 22% were considered as being interested (Wortmann 1996). Similar studies in the UK, the Netherlands and the US come to the same conclusion that about 20% of the customers are willing to pay a 20% premium (Fouquet 1998).

However actual participation rates are much lower in current green pricing programs. Markard (1998) showed in a comparison of green pricing schemes world wide, that currently about 0.1 and 3.5% of the households are participating in the respective market areas. In Switzerland participation rates are currently at about 0.02% to 2.6% and actual market share is of 0.01% to 0.07% (Wüstenhagen 1998).

Customer segments are not clearly defined. In the Swiss study, for instance, women, rather young age groups (18-34) with higher education and high political interest have a higher propensity to invest in green power programs. In Germany, the customer profile is more of a male, above 40 and above average education kind. Life style groups with relatively strong environmental concerns which are politically active are considered as target markets (Markard 1998, Wortmann 1996). In the US however, evidence seems to be not so clear cut. No correlation between income and education could be identified (Farhar and Ashley 1996).

Summarizing the results, we may state that in the household sector a considerable potential for green power markets could be identified. Opinion polls state a very positive image for green power initiatives. However, actual purchasing behavior is often only weakly correlated with positive attitudes. Actual participation rates are currently at 1% in the average. The positive image effect shows that green power products are at least suited to for creating a positive image of the electric utilities who develop and offer such products. Therefore , customer fidelity could be improved and

utilities could have an interest in actively promoting such schemes, even if they do not earn a lot of money immediately. In order to reach a market potential above the 10% limit additional effort would be necessary, especially with regard to transparency of the use of the green power payments. The definition of a Europe wide ecolabel would certainly reduce the complexity of this task.

#### 4. Firms

Market research for green power has mainly concentrated on households. Firms have received far less attention (Holt 1997b). As firms are consuming about two thirds of total electric power, this market segment could become decisive. We conducted about a dozen qualitative interviews with representatives from industry and the service sector. Furthermore, we sent a standardized survey to the members of an association of environmentally concerned firms.<sup>18</sup> Until September 24, we got a response from 49 of the 350 member firms of this association.

A key distinction for firms as potential customers of green power is the share of electricity costs on annual turnover or on total profits. In Switzerland, the vast majority of firms pays less than 1% for their electricity relative to annual turnover. Some energy consuming sectors like paper or cement production are an exception. Here the proportion may be 15% or higher. Measured in proportion to profits, electricity costs may be much more important and reach the order of magnitude of 10% to 50% for many industries and service firms.<sup>19</sup>

#### The motivation to buy green power

Compared to the motivation of households, feelings of responsibility and emotional affection for the symbolic of a product are probably less important for firms. Due to a strong competition on cost and orientation at shareholder value, a firm will skeptically analyze the cost-benefit ratio of a green power purchase. Furthermore, liberalization of electricity markets creates expectation of reducing

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<sup>18</sup> the association is called *Schweizerische Vereinigung für ökologisch bewusste Unternehmensführung* (ÖBU) and assembles the environmental leaders of most economic sectors. The questionnaire was sent by mail in August 1998. Results are reported in Bieri (1998).

<sup>19</sup> Data are extremely difficult to get for these cost terms. In our survey 47% of the respondents claimed that they were paying less than 1% and 36% estimated 1-5% of their annual turnover. However, even these data are fraught with major uncertainties. From our interviews we may conclude that the orders of magnitude are adequate.

electricity costs substantially.<sup>20</sup> Paying more for an environmentally differentiated product with no immediate change in the physical qualities of the product seems therefore to be quite an odd option in this context.

The importance which is attributed to savings on the electricity bill is, however, widely varying between different firms. In the survey of the electric utilities of the city of Zurich, electricity bills were considered as not too expensive by most of the small shops (53% found tariffs were largely adequate and 5% found that they were even too low). A bigger proportion of the larger customers considers their electricity costs as too high (42%), especially if they compare with competitors in other countries (EWZ, 1996). On this background, more than 60% of the 254 interviewed firms state that they would be willing to pay more for green electricity. Their willingness to pay is however somewhat smaller than the one of the households. Some 25% of these firms state that they would pay a mark-up of more than 25% for green power, compared to 57% of the households who supported the same claim (EWZ 1996).

Given the skeptical first guess and the surprisingly positive empirical result, potential motivations of firms have to be analyzed in more detail. These motivations may be located at different levels:

- Firms may buy green power for essentially the same reasons as individuals. E.g. owners of small shops may buy green electricity because they like the idea from a personal point of view. Alternatively, an environmental manager may act as a promoter of the idea of green energy in a bigger firm. The purchase of the product will then have to be considered as a sponsoring activity of the firm which competes with other expenditures for sports, cultural activities and the like. The expenditures for green power will mainly be considered as an additional cost. Market potentials will be limited.
- The purchase of green electricity may have a positive effect on the profits of a firm if it is suited as a marketing argument which may be communicated to the customers. This will be the case if the consumption of electricity is an important element of the service or the product and if, additionally, the market success of the product is sensitive to its eco-performance. One example is eco-tourism, for instance in a winter ski resort. Another might be vegetarian restaurants. Still

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<sup>20</sup> However, the cost savings potential of the liberalization seems to be grossly overestimated by the majority of

relevant, but far less attractive is green power for shops with a direct customer contact in homogenous product sectors like hair dressers, retail shops, banks, etc. which want to differentiate themselves by their environmental image.<sup>21</sup>

- Besides increasing market share, green power could serve to actually reduce cost. Environmental management systems (like ISO 14001) demand a reorganization of the firms purchasing system to achieve specific environmental criteria. Energy is a dominant element in the ecological balance sheet of most firms. Saving energy up to the level where it will save cost will certainly be the first option to consider. A wide variety of saving options are cost effective under current market conditions (Hennicke and Seifried 1996). However, saving is often associated with additional investments and (perceived) high transaction costs.<sup>22</sup> The purchase of green power may then be a second-best alternative and may be part of a general green purchase strategy (Russel 1998).
- The cost saving aspect could not only be expected at the level of the firm but also at the level of an economic sector or of the national economy as a whole. Voluntary agreements become widely accepted policy tools in environmental legislation. The environmental performance of a sector may be improved by setting guidelines for power consumption for its member firms. At an international level an instrument like tradable CO<sub>2</sub>-credits in the context of the climate convention may be another important motivation for the purchase of green power. In an open and liberalized European electricity market prospects of green power producers could grossly enhance if a consistent credit scheme for green power will be developed.

### Result from the surveys

In our survey we wanted to assess the relative importance of these different motivations for firms in the industry and service sector. As a general conclusion, we found a more skeptical response to green power products than the Zurich survey of 1996. Green power was considered a potentially innovative means for promoting renewables. Market pressure to reduce costs and increase shareholder value were, however, claimed to be of overriding and increasing importance in all the

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the firms (Interview with an energy consultant for industry).

<sup>21</sup> As a variation of this idea, "green power credits" could be sold along with power consuming machines which fulfill specific environmental standards (like photokopiers, faxmachines, etc.).

<sup>22</sup> In an interview an energy consultant claimed that many cost effective measures were still not realized because of somewhat "distorted" perception of transaction costs.

firms we interviewed. The marketing of green electricity will, therefore, have to be very clearly targeted to the specific advantages a firm could get.

The use of green power as a marketing argument was seen as being not very attractive by most of the respondents. Environmental investments to optimize the internal logistics of the firm are seen as having a very low communication value.<sup>23</sup> Environmental improvement of products are much more efficient for transporting a green image of the firm. These claims were mostly supported by experiences with environmental management systems like ISO 14001. Firms were preferring possibilities to sponsor specific facilities which are directly visible in the context of the firm, like solar panels being placed on the buildings. In the standardized survey 18% of the respondents claim that green electricity is an interesting option for their marketing. 57% are rather skeptical and 25% exclude this possibility outright. This largely negative assessment has certainly to do with the lack of a transparently defined product identity of green electricity. A credibly defined eco-label would certainly enhance the marketability of green power consumption considerably. However, green power sold for marketing purposes of firms will probably still not reach an important market.

Green electricity found much more positive response with regard to the possibility to improve the overall ecological performance of the firm. 43% of the firms in the standardized survey claim that green power consumption would be a relevant strategy to improve their purchase system and another 22% claim that they would consider this in more detail. 33% excluded this role of green power for their firm. In our interviews, the respondents repeatedly claimed that saving was their first choice but if a transparent accounting of eco-credits would be defined, which could be used in the context of an environmental management system they would consider this a very interesting option. They especially consider the purchase of green power a worthwhile option for their economic sector as a whole. About 80% of the respondents are in favor of supporting guidelines of green electricity consumption in their economic sector.

Positive attitudes of managers are very strongly dependent on the actual form of the green power products which are offered. To the question what the product of green power was actually selling, a

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<sup>23</sup> One interviewee stated that, obviously, bad environmental performance gets much better media attention than good ones.

very clear statement was given in favor of the promotion aspects. The existence of a favorable ecological balance sheet of an energy system was also important, but clearly ranged second behind the promotion aspect. We shortly described the two aspects and asked how important they were to them. The following table summarizes the results:

	crucial	important	unimportant
Promotion	69%	27%	4%
Environmental performance	29%	61%	10%

A major precondition to buy green power was the credibility of the supplier and the transparency of the use of additional payments for the greener product. The credibility of conventional electric utilities is perceived as being very low, because of their long monopoly tradition. Transparency has to be guaranteed with regard to the environmental benefits the purchase of green power will achieve. Once these conditions are met, the actual composition of the green power products are of secondary importance, res. would be delegated to a trustworthy labeling committee. The creation of a widely shared ecolabel for electricity would, therefore, be very welcome. Regarding the eligible energy systems, wind and solar power score relatively high (85% res. 92%). Biomass and hydropower are seen far more skeptical (78% and 57%) but are still considered as a necessary component of a green power product mix. 29% enumerated other options like saving energy, combined heat and power, geothermal energy, etc. Only one respondent claimed that nuclear power would also have to be included in the mix.

Hydropower is considered as being environmentally benign without any additional qualification by only 8% of the respondents. 59% claimed that at least the best legal standards should be fulfilled. The remaining 28% had additional requirements, such as locally adapted minimum flow regimes, conditions on fish reproduction, etc. Finally, only 20% were in favor of the proposition that hydropower was environmentally benign below a certain limit of installed capacity.<sup>24</sup>

Willingness to pay was rarely given with high accuracy. About half of the respondent did not fill out that part of the questionnaire. For the remaining, a price premium of some 10-20% was considered

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<sup>24</sup> We did not indicate any specific limit in this question.

as being realistic. Heavy consumers wanted the possibility of buying only a part of their electricity as green power, because a 10% increase on their total electricity bill would be a serious threat to their profitability. When asked which of the product variants they would prefer between a pure solar power product, a mix of new renewables or a mix of renewables including environmentally upgraded hydropower, the majority was in favor of an overall mix (48%), a mix of new renewables was favored by 41% of the respondents and only 11% were in favor of a pure solar power product.

Estimates about market potentials for green power were quite diverse. About 12% claim that it will stay below 1% in the next 10 years if a price premium of 10% is demanded. 31% estimate up to 5% of the market, 22% up to 10% and 22% of the firms estimate even more than 10% of the market. This indicates that frame conditions play a major role in the estimation of the final market potential.

Finally, firms were asked how they perceived the effectiveness of green power as a policy instrument compared to other regulations. Green electricity is in general considered as a very promising approach to promote renewable energy. With regard to the role of this instrument when compared to an energy or CO<sub>2</sub>-tax, 57% think that they have to play a complementary role. 22% were in favor of having only the tax, whereas 18% want to focus on the green power scheme exclusively. 10% think that both instrument are not sensible or workable. The difference between these two policy instruments lies in the regulation mechanism to achieve an improved competitive position for renewables. Green power products emphasize the direct expression of individual preferences, whereas a CO<sub>2</sub> tax is determined in a political decision process. The vast majority of the firms claimed that green power sales were not a general alternative to other energy policies. It will at best be a complement.

Summarizing, we may state that requirements of credibility and transparency will be even more important in the firm segment of green electricity customers than in the households segment. Firms will be more cost-sensitive. A credible mix of renewable energy which is based on a clear concept of promoting new technologies will have the best chances for achieving a considerable market share. The creation of a trustworthy label is considered as being of prime importance. However, firms will remain reluctant towards buying green power as long as it is not associated with specific advantages, for instance in the form of a clearly defined system of eco-credits which could be realized with an

additional unit of green power, especially if this benefit may be appropriated (at least at a calculatory basis) by the firm. A clear definition of the ecological characteristics of green power products would therefore grossly enhance the appeal of this promotion instrument.

## **5. Communities and cities**

Individual households and firms are not be the only demand generating actors for green power. Traditionally, local communities played an important role for pooling and aggregating demand for electricity of households and local firms. By joining a community of consumers, an individual may enhance the utility it gets from the product and it may reduce costs. This was historically the motivation for building up communal electric utilities to deliver power to households and firms in a specific area. With deregulation these communal distributors will come increasingly under pressure. Nevertheless, experiences in the US show that demand aggregating institutions still have an important function to fulfill (Ridley 1998).

By aggregating consumers the decision process to consume power changes from an individual expression of preferences into a social or political decision. A radical example is the Community Schönau in southern Germany (Schönau, 1998) which decided in a popular vote to buy its communal electricity transmission network in order to guarantee an environmentally benign provision of power to its citizens and firms.<sup>25</sup> Much less dramatic examples exist all over the world. The first offers of green power, for instance, were developed by local distributors of cities with an environmentally sensitive political environment.<sup>26</sup>

Political processes could determine a minimal percentage of green electricity which will then be delivered to the connected households or they could decide about the construction of a local production plant. An important motivation to set a certain percentage could be if the consumption of green electricity may be used as a marketing argument. Tourist resorts may be a good case. Also cities and regions which want to attract a specific kind of residents could profit from green power

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<sup>25</sup> The transmission network was actually bought at the 1st of July 1998.

<sup>26</sup> Most of these demand aggregating examples are related to households, as they are normally entitled to decide in popular votes. Demand aggregating processes for firms have been mentioned in chapter 4 in the context of voluntary agreements as a policy tool for achieving certain environmental standards for an economic sector.

arguments. Finally, green power consumption could be an important strategy for regions which want to build up an industry in the field of new energy technologies (like Basel).

At a more general political level, green power demand could get articulated in a region through explicit political discourse. Such political opinion formation processes may happen for instance in the context of "local agenda 21" initiatives. A policy dialogue with citizens could identify energy targets for a specific region. The contribution of green electricity percentages in the electricity mix would then be an interesting option to consider. Here, the discussion would have a much broader scope, namely how to deal with energy issues at a local level. Cities who want to be certified for the quality of their energy policy could be an interesting test field. In Switzerland, for instance, so called the energy cities (*Energiestädte*) have to fulfill a certain number of local energy policies. Investments in renewable energy is one of the major options.

Finally, local communities could demand that the public sector, such as schools, administration, public buildings, etc. consume a certain amount of green electricity. Standards for green purchasing have been defined in many European countries especially for the administrative sector (Russel 1998).

In order to assess the potential mechanisms which could lead to a market demand from local communities, we carried out about half a dozen interviews with representatives of energy cities in Switzerland. These representatives welcomed this opportunity. However, transparency and credibility are seen as crucial issues. Furthermore, the tangibility of the products would be a crucial factor for the success of such local decision processes. Communal projects for setting up solar panels or for renovating local hydropower plants should actively be taken into consideration. The market potentials are estimated more positively by the respondents of the community sector. They conclude that a market potential of 20% or more could be feasible, at least in the more concerned communities and if the process of awareness creation and communication was handled carefully.

Summarizing, we may expect that demand generating processes may also be enhanced through political endeavors. Green electricity should then take the tangibility of the installations into account. Local production facilities should be included or visits of green power production plants should be made part of the products.

## **6. The role of green power beyond mere market potentials**

We have analyzed the motivations of households, firms and local communities to buy green power. It was stated and empirically corroborated that the promotional effects are of prime importance for the customers. The environmental impact parameters of the energy technologies and of the green power mix should fulfill some basic criteria, but they are of secondary relevance. Major conditions for market success are the credibility of the firm which offers green power and the transparency of the use of additional payments. An ecolabel for electricity which regulates these aspects and which may be used to facilitate communication about the complex product would increase the market potential considerably in all of the customer segments.

The criteria for green electricity are quite complex (Kiefer 1998). Only solar power seems to be accepted in a quite undifferentiated way as being part of green power. The remaining energy systems have to fulfill additional criteria. Once these are fulfilled, however, green power mixes are more attractive than products which are based on single energy systems.

Hydropower is perceived in Switzerland as being a necessary part of green electricity. Only hydropower will be able to deliver a sufficient amount of green electricity and may bring down price to a level where green power mixes become attractive to a broader market share, both for households and for firms. Anyway, hydropower has to actively work hard for a positive image and may achieve this only if green power payments are invested into environmental upgrading of the facilities.

An important factor which will influence the actual market size relates to the incentives for firms to buy green power. As was shown in the surveys, marketing arguments will be a very weak motivation for firms to buy green electricity. The environmental benefits have to be attributable to the environmental performance of the firm. Therefore, the definition of sound criteria for getting credits in environmental performance measures should be worked out and means for accounting for this improvement should be developed. As international trade of green power will become more and more important with ongoing liberalization of electricity markets, national standards should be coordinated.

We may now put all these pieces together in order to estimate an overall market potential for green power. Demand for green electricity will not develop independently in the three customer types there will be important feedback loops in and between the segments. With an increasing market share the products will be more widely known. For firms, green power could increasingly be used as a marketing tool with an increasing market segment in the household sector. With an increasing market, the promotion effect will get more visible results (i.e. more production sites with the label, lowered production costs for new renewables, improved environmental situation for hydropower plants) and will therefore make the product even more attractive. On the other hand, market demand expressed through political preference formation processes will substitute the individual demand from the customers which would have chosen green power at an individual level.

The overall development of the market will therefore depend on many interrelated processes which make it impossible to estimate the ultimate market share with any accuracy. On the basis of our analysis we may, nevertheless, identify three qualitative development paths:

- Green power for a fundamentalist niche market: If the product is restricted to new renewables, in order to profit from its positive and non-questioned positive image, prices will stay high. Labeling would be not really important because energy technologies have an undifferentiated positive image. Electricity trading companies will then consider the product of green electricity as a mere additional offer for some households with peculiar preferences. A diffusion of green power products from urban centers to second order cities could take place, but ultimately, market success is likely to remain in the current orders of magnitude. This means that less than one percent of the households will consume some fractions of a percent of total electricity consumption. Green power would be delivered to the "happy few", but would very quickly lose attractiveness to those people as well, because promotion effects would not really show up even in the middle range terms.<sup>27</sup>
- Green power as a public relations vehicle of electric utilities: If competition on quality will become stronger — and this is likely to happen in liberalized electricity markets — investments into public relations activities are likely to increase. Green power will prove to be a positive differentiation

strategy in the market, it will increase customers identification with the firm. Survey in the US have shown that the vast majority of the consumers thinks that offering green power products is a positive strategy an electric utility should pursue, even those who do not want to buy it for their own (Farhar and Ashley 1996). Market prospects could be improved if all renewables will be grouped under the heading of green power products. An ecolabel would facilitate communication and be a tool for quality control. Green power products will then essentially be offered to environmentally aware households at a competitive price. Depending on how the products are designed and promoted, 2% to 5% of the households and some individual firms will begin to buy green electricity. Overall market share for the electricity consumed will then perhaps reach something like 1%. The promotional effect on renewable energy will be very small but could be sufficient to stabilize the market share over a longer period.

- Green power as a major product variant in the electricity market: A different order of magnitude may be reached if green power will be defined in a credible and transparent way and will be accepted by a broad range of societal actors (NGOs, electric utilities, governments, consumer organizations, etc). Price increase will have to be limited to about 10% and the environmental benefits which are realized by the consumption of green power should be clearly defined. A considerable number of households could then afford to cover their electricity consumption with green power. Firms would buy parts of their consumption basket in green power to meet environmental obligations. Local communities could set up green power targets. The overall market share could then reach 20% or even more of the total electricity consumed. In order to reach this stage, green power would have to be aggressively marketed in national and international markets by specialized green power traders and it would have to be build consistently into environmental legislation with a target for the promotion of renewable energy.

Which of these scenarios will be realized is quite unclear at the moment. All depends on the strategies of electric utilities and of the energy policy environment in which green power products will be placed. Green power may be an important instrument to promote renewable energy. It may create a stimulus for a wide variety of actors to cooperate towards a common goal (especially

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<sup>27</sup> Withdrawal of pioneer consumers from eco-markets because of a frustration with regard to promotion effects is well known from other product sectors, e.g. for electric vehicles see Truffer, Harms and Wächter (1997).

environmental organizations and electric utilities). It is a market compatible policy instrument and should be efficient in the achievement of the stated goals.

Perhaps the importance of green power products may not only be measured by the market share it will eventually reach, i.e. by the square meters of photovoltaics which will additionally be installed on top of roofs of environmentally concerned communities and by the catchment areas of rivers which have regained a more natural state. The emergence of green power products will differentiate a commodity which was homogeneous for most of its history. The product meaning will be radically transformed and new definition of what environmentally benign electricity means will emerge. This will happen in the next few years. An important element of this social definition process might happen in processes of political discourse in which citizens begin to actively analyze the energy problem and potential solutions in their local communities. If green power products contribute to such learning processes this could ultimately prove more important than the actual market share.

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