Local utilities, liberalisation and the EU Emission Trading Scheme:

Emerging strategies and their determinants

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Abstract

Local utilities are important players for climate protection innovations, such as combined heat and power (CHP) and renewable energy resources (RES). The impact of the European Emission Trading Scheme (EU ETS) on their strategic choices in these fields is significant for the German Climate Change Strategy and for a sustainable energy supply in the future. Based on data from a survey among all German local utilities, from the German Emissions Trading Authority, and the MARCUS data base, this paper empirically analyses such impacts in the context of a changing regulatory environment. First, we look at the current performance of German local utilities in innovative generation strategies. We analyse its influence on the allocation situation of the utilities in the first trading phase and test for a probable influence of size and private shareholdings. Second, we identify EU ETS compliance options considered by local utilities and analyse the factors influencing their EU ETS strategy choice. Putting the focus on activities in RES and CHP we test for a probable influence of size and private shareholdings. Finally we associate our findings with future developments of the EU ETS and provide an outlook on future research.

Key Words: Climate Policy, Emission Trading; Environmental Regulation; Liberalisation; Innovation

JEL-code: O-33

Introduction

In January 2005, the EU wide emission trading scheme (EU ETS) for large stationary emitters of CO_2 started in all 25 Member States. The general objective of this novel economic instrument is to help the EU cost-efficiently achieve its Kyoto commitment of reducing its greenhouse gas emissions (GHG) by -8% by 2008-2012 (compared to 1990) and future - possibly more stringent - GHG reduction goals. With a view to the scale of long-term emission reduction requirements, climate protection innovations will have to play a major role. It is therefore of utmost importance to understand how the EU ETS influences activities in these technologies.

Up to now, research on innovation effects of emission trading has been rather limited and tended to focus on theoretical concepts[1]. Only a handful of emission trading schemes has actually been practised for more than five years, mostly in the US. Therefore, empirical studies of their innovation effects are still limited and focus on US schemes for trading SO_2, NO_x and lead[2].

Specifically concerning the EU ETS, a small number of theoretical studies looked at its potential innovation impact in an ex ante perspective[3]. These publications identify design elements that could be important in determining its innovation effects. Empirical research on the EU ETS has concentrated on its implementation at the level of firms[4]. Besides, research also focuses on design options based on lessons learnt from the first trading phase (2005-07) and on comparing the national allocation plans of Member States[5]. Empirical research on innovation effects of the EU ETS is still in its infancy. A first qualitative study is currently under way for the German electricity sector.[6] Now that the EU ETS has

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1 For an overview see Jaffé et al. (2002) and Requate (2005).

2 For an overview, see Gagelmann and Frondel (2005). They analyze experiences from these pioneering US emission trading schemes in order to conclude some lessons learnt for the choice of EU ETS design options with regard to innovation incentives.

3 E. g. Schleich/Betz (2005); Gagelmann/Hansjürgens (2002); Anger et al. (2005).

4 This includes monitoring, risk management, trading, accounting, etc. See e. g. Betz et al. (2005).

5 See Schleich et al. (2007), Betz et al. (2006); DEHSt (2005); Betz et al. (2004).

6 See Cames/Weidlich (2006) for the theoretical background and Cames (2004) for first interview results.

been up and running for two years, it is possible to carry out first analyses on a broader empirical basis.

Background and Methodology

Our analysis of the innovation effects of the EU ETS focuses on German local utilities. In Germany, some 260 of the approximately 1,850 installations subject to the EU ETS belong to local utilities (i.e. 14 %). These installations received an allocation of approx. 32 million EU emission allowances (EUAs) per year, which represents only about 6 % of the German ETS budget. Despite the relatively small amount and share of emissions covered by the EU ETS, local utilities are important players for the diffusion of climate protection innovations because they control "the last mile" of the electricity grid and can rely on established customer relations. These aspects make local utilities a particularly interesting group to look at. We further focus on the innovation fields of CHP and RES because their promotion is, among others, a priority of the European Union and its Member States for reasons of environmental protection and security of energy supply.

Our results are based on a postal survey that was conducted among all German local utilities subject to the EU ETS (n=122)[7]. The survey was composed of two questionnaires addressed to the Executive Board and to the staff responsible for the EU ETS. It was carried out in spring 2006 by the German Research Institute for Public Administration Speyer in cooperation with the Fraunhofer ISI. The response rate was 36 % (n=44) for the Executive Board questionnaire and 47 % (n=57) for the EU ETS questionnaire, respectively. In addition to the survey data, we used registry data from the German Emissions Trading Authority (DEHSt)[8], e. g. for the amount of allocated allowances. Data for the size of the utilities and their ownership structure were taken from the MARCUS database[9].

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7 The most comprehensive survey of firms subject to the EU ETS conducted on behalf of the European Commission concentrated on larger players only. See McKinsey & Company/Ecofys (2006).

8 European Commission (2006a).

9 MARCUS database administered by Creditreform contains data about all German and Austrian enterprises listed in the commercial register. For our analyses we used the update 65 of the year 2006.

About half of the utilities subject to the EU ETS are still fully publicly owned. The majority (81.1 %) of them disposed of a surplus of allowances in 2005 and 42 % employ more than 250 employees. Controlling for a potential bias in our sample, the size of the responding local utilities is slightly larger (45% more than 250 employees). With respect to the frequency distribution of public ownership (45%) and of overallocation of allowances (82%) responding local utilities correspond to the population. There is neither a bias in regional distribution nor in membership of public sector organizations such as the association of municipal firms. Thus, there is no problematic bias in our sample.

The remainder of the paper is structured in the following way: First, we look at the current performance of German local utilities in innovative generation strategies. We analyse its influence on the allocation situation of the utilities in the first trading phase and test for a probable influence of size and private shareholdings. Second, we identify EU ETS compliance options considered by local utilities and analyse the factors influencing the EU ETS strategy choice of the utilities. Putting the focus on activities in RES and CHP we test for a probable influence of size and private shareholdings. Finally we associate our findings with future developments of the EU ETS and provide an outlook on future research.

The performance of local utilities in innovative generation strategies

First, we take a look at the innovation performance of the utilities subject to the EU ETS that responded to the Executive Board questionnaire. The measurement of the innovation performance is based on a factor analysis of the power generation profile of the complete sample (n=128, n= 102 active in power generation). Conventional technologies such as power generation based on fossil energy carriers, cogeneration with fossil energy carriers and hydro-power characterize conventional generation. Micro cogeneration (< 50 kW_{el}) as well as generation and cogeneration based on innovative renewable energy sources characterize innovative generation. For both dimensions count variables are used to operationalize high and low engagement of the specific profiles. For the total sample there is a significant positive correlation between the two indicators (Phi= 0.24, n= 102) which looses significance for the smaller subsample subject to EU ETS (Phi= 0.17). The innovation performance in gen-

eration depends on activity and knowledge in conventional generation. In addition, a positive attitude towards the new opportunities of liberalization, an innovative service performance in distribution, engagement in environmentalism in distribution and public relations, and horizontal collaboration in generation have positive effects on the performance in innovative generation strategies. The data show that utilities which are currently engaged in innovative generation technologies or are planning activities in the future less often received an underallocation of EUAs (Cramer's V=0.21, n=44).[10] This shows that German allocation rules for the first trading phase did not punish proactive emission reduction efforts in domains outside the scope of the EU ETS. A look at the shareholding structure reveals that public utilities are much more active in innovative forms of power generation, particularly in RES. Private shareholdings seem to slow down investments in these activities (Phi=-0.24, n=37). By contrast, private ownership has a small positive effect on overallocation (percentage difference +13). The size[11] of a local utility is irrelevant for the allocation situation but furthers the entry into innovative generation technologies (Cramer's V=0.20, n=44).

The response of local utilities to the EU ETS

EUAs introduce a new cost factor into the calculations of local utilities – both for existing and planned installations. In consequence, local utilities have to reconsider their energy production strategies. They have several compliance options at their disposal. These can be classified into three categories, which are complementary rather than mutually exclusive. First, local utilities can make use of the market mechanism by selling (or purchasing) allowances in excess (or needed) on the carbon market. Second, they may try to lower their emissions using technological or organisational measures such as fuel switching, or demand-side-management. Third, local utilities can try to avoid the obligations resulting from the EU ETS, e.g. by decreasing their energy production.

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10 Note that this is so although large CHP installations which receive a bonus allocation under the EU ETS, are counted as conventional generation.

11 Organisations with less than 250 employees were classified as small, organisations with more than 250 employees as large utilies.

In our survey, we asked local utilities to indicate in a list of ten possible compliance options those considered as possible choices for their response to the EU ETS. The top five choices are the active use of the carbon market (sale and purchase of allowances), increased activity in the innovation fields of RES and CHP, and energy efficiency improvements of existing installations. Figure 1 shows the resulting ranking of all compliance options for the whole sample.

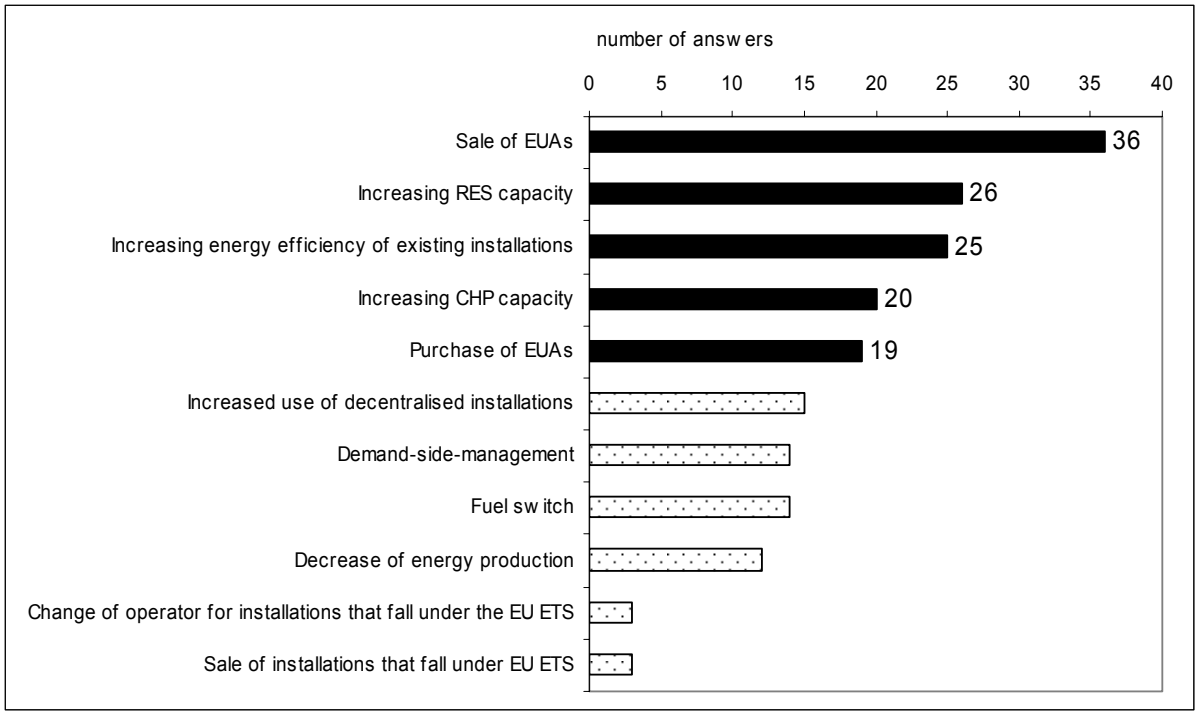

Figure 1: EU ETS compliance options considered by all local utilities (Source: Fraunhofer ISI)

Figure 1 shows that CHP and RES appear under the top five compliance options considered by our respondents. The high ranking of CHP may be explained by the special allocation rules of the EU ETS in Germany. For the first trading phase a bonus allocation of EUAs for existing CHP plants and a double allocation based on both the amount of energy and the amount of heat produced (the so-called "double benchmark") for new CHP plants was applied. This allocation rule led to a surplus allocation in most cases and therefore set a positive incentive to invest in CHP. This conclusion is supported by further findings of our survey showing that the German bonus allocation for CHP plants is considered as "important" or "very important" for their EU ETS strategy by 64 % of the respondents (cf. figure 3).

Apparently, the German implementation of the EU ETS in the first trading phase has been successful in providing an economic incentive for investments in CHP plants.

The high ranking of RES as an EU ETS strategy option may seem surprising because RES installations do not benefit from a surplus allocation of EUAs. Findings from a survey among international power and gas utilities come to the same conclusions showing that the majority of the European respondents (66 %) increased investments in RES in response to the EU ETS.[12] One possible explanation is that the exclusion of RES plants from all EU ETS obligations (including monitoring and reporting activities) represents a possibility to sidestep the scheme and might therefore lead to additional investments in RES. However, further findings of our survey show that the exclusion of RES plants is perceived as "less important" or "not important" by 80 % of the respondents (cf. figure 3). A better explanation for the high ranking of RES could be the overriding effect of the German Renewable Energy Sources Act 2004 (Erneuerbare-Energien-Gesetz) which obliges grid operators to pay a fixed tariff above the market price for "green" electricity fed into their grid. In the literature, the RES Act is considered to be still the most important policy instrument supporting the diffusion of RES in Germany.[13] An additional explanation for the high ranking of RES might be the generally rising interest in RES in the past years that is also felt by local utilities.[14]

Figure 2 shows the ranking of compliance options for the subgroup of utilities that are engaged in innovative generation strategies. A comparison of figures 1 and 2 shows that increasing their RES capacity moves up as top compliance option for those utilities engaged in innovative generation technologies while CHP as a compliance option looses of importance.

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12 PWC (2007), p. 37.

13 Walz (2005) analyzes the interaction effects of the German RES Act and emission trading, and concludes that, with rather low allowance prices, the RES Act will continue to be an important element of German climate policy as it ensures the consideration of technological long-term perspectives.

14 The PWC study shows that the encouragement of renewable energy is now leading the list of key issues for the European power industry. PWC 2007, p. 5

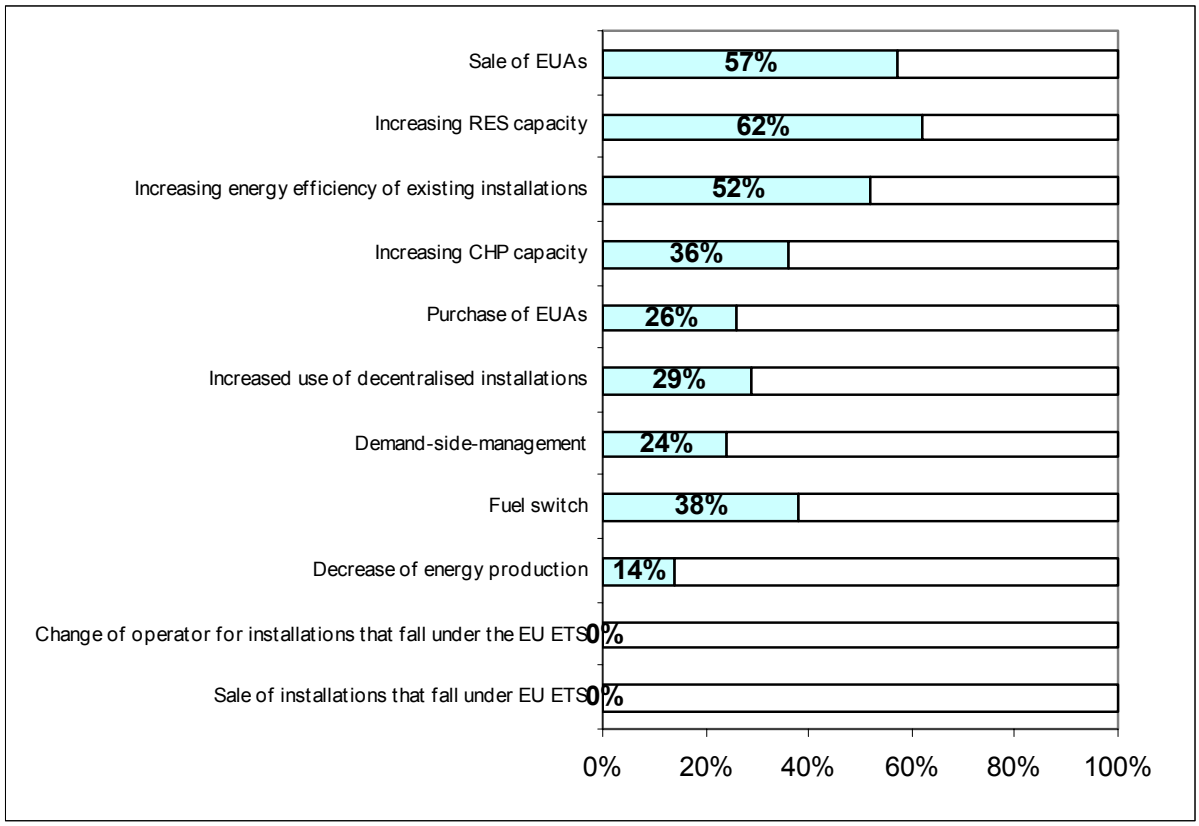

Figure 2: EU ETS compliance options considered by local utilities engaged in innovative generation strategies (Source: FÖV Speyer)

Factors of influence on the EU ETS compliance strategy

In order to gain deeper insights into the factors influencing the EU ETS strategy choice of local utilities, we asked them to indicate the importance ascribed to 10 factors given in a list. Each had to be ranked on a scale of four, ranging from "very important" to "not important". Figure 3 shows the resulting ranking. These findings indicate that the EU ETS strategies of local utilities in Germany depend on economic signals, regulatory uncertainty, and price uncertainty generated by the carbon market. The price of EUAs is by far considered most important (more than 90% of the answers). Focussing only on the group of local utilities considering innovative responses to the EU ETS, i.e. activities in CHP and/or RES, our data show that these utilities perceive the uncertainties about future allocation rules and about the price for EUAs more often as "very important" than other utilities. For example, 29.2 % of them rate the EUA price-uncertainty as "very important". This is true for only 10.7 % of the other

utilities (Cramer's V = 0.291). Apparently, the utilities considering innovative responses to the EU ETS are more sensitive to the uncertainties linked to the scheme.

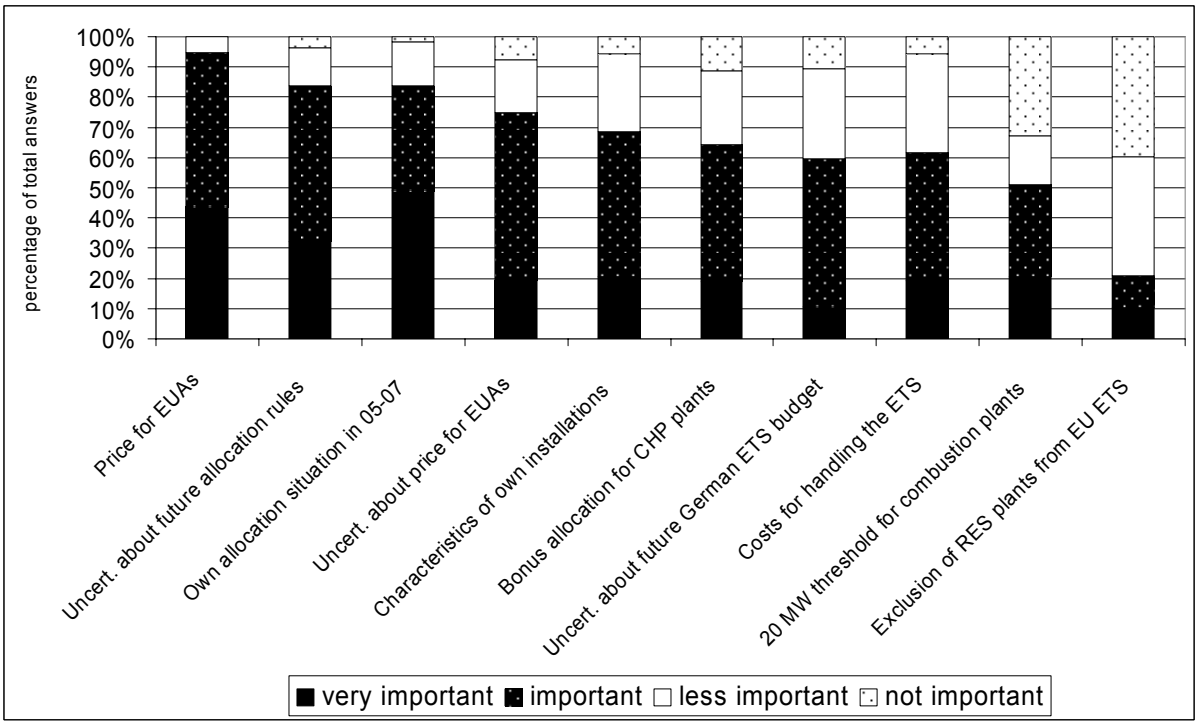

Figure 3: Factors of influence on the EU ETS strategy of local utilities (Source: Fraunhofer ISI)

Edler et al. (2007) assume that in combination with fluctuating allowance prices uncertainty about future reduction targets and allocation rules result in unreliability of investment planning, which might have both a negative and a positive effect on activities in low-carbon innovation fields. Organisations will either wait for more certainty making use of the market mechanisms for the time being, or they will try to reduce the economic risks accruing from the EU ETS via reduction efforts.[15] Our findings suggest that for the case of local utilities the above described uncertainties enhance the consideration of climate protection innovations, such as RES and CHP.

15 See Edler et al (2007).

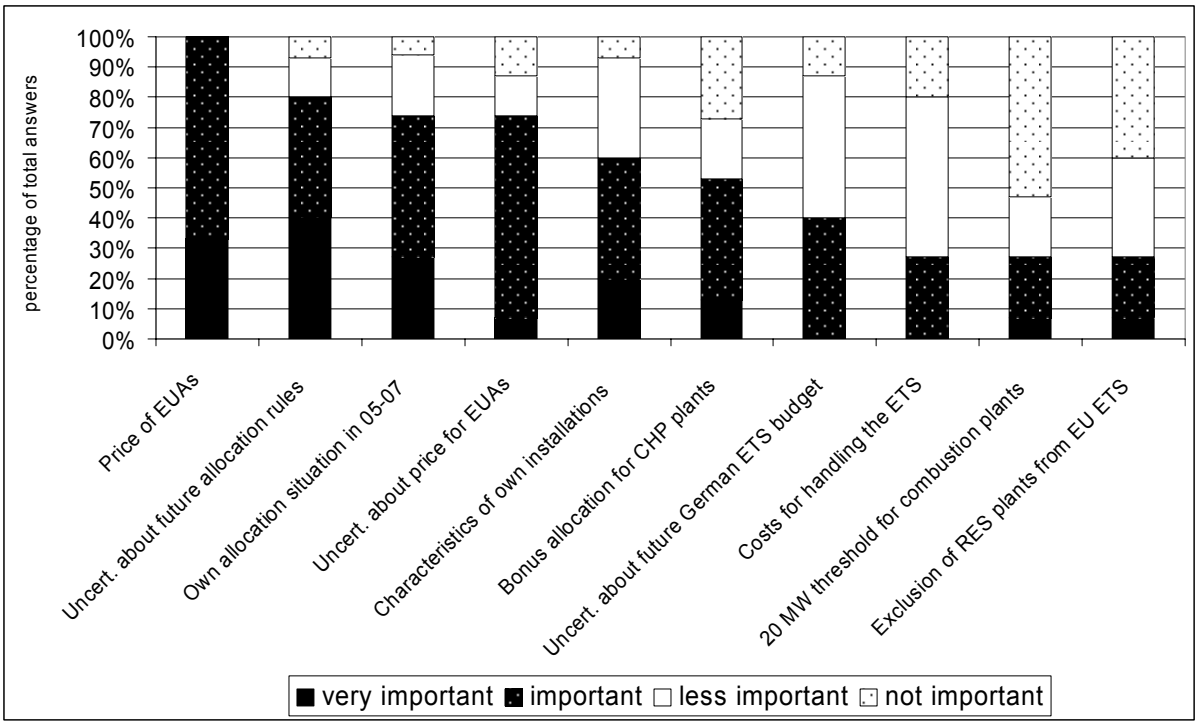

Figure 4: Factors of influence on the EU ETS strategy of utilities with an innovative generation portfolio (Source: FÖV Speyer)

Figures 4 and 5 compare two subgroups of the sample – those with an innovative generation portfolio (n=25) and those with a conventional generation portfolio (n=25)[16]. In comparison to those utilities considering innovative responses to the EU ETS (i.e. CHP and RES), utilities currently employing innovative generation technologies (i.e. micro-CHP and RES) seem to be less concerned about EUA price-uncertainty. Only 6.7% of the innovative group rate this factor as "very important" compared to 15.4% of those with a less conventional generation portfolio. They also consider their allocation situation in the first trading period as less important than the utilities with less innovative generation portfolios. This is not surprising as we showed earlier that these utilities more often dispose of a surplus of EUAs. A surplus of allowances makes them less vulnerable to volatility in EUA prices because they do not have to buy EUAs on the market, making them less concerned about this factor.

16 Note that the groups are not necessarily exclusive. Utilities with large CHP installations belong to the conventional group; only micro-CHP is considered as innovative generation technology.

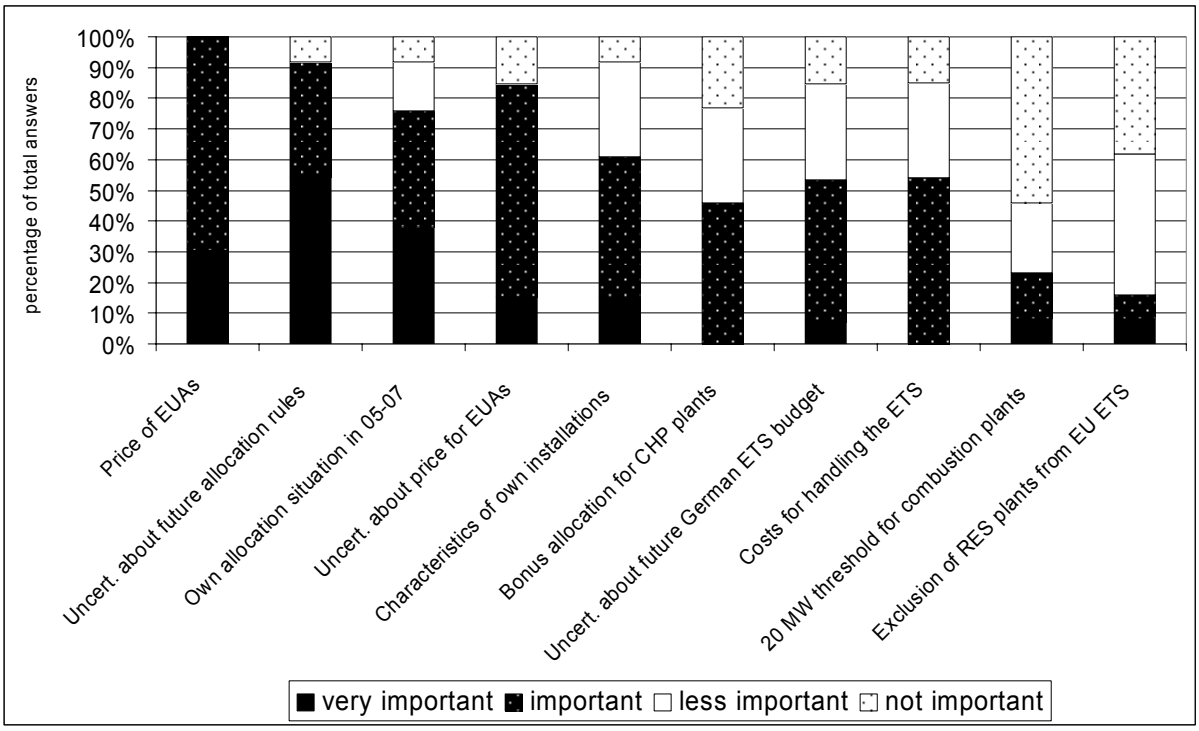

Figure 5: Factors of influence on the EU ETS strategy of utilities with a conventional generation portfolio (Source: FÖV Speyer)

Contrary to the utilities considering CHP as an EU ETS compliance option, the CHP bonus allocation is less important for utilities already engaged in innovative generation technologies (13%), probably because their installations less often exceed the 20MW threshold (6.7%). The smaller size of the installations of these utilities also shows up in the lesser importance they ascribe to the characteristics of their installations (Cramer's V=0.20). Instead, the exemption of RES plants is much more important to them. Utilities with a conventional generation portfolio tend to be more worried about their allocation situation, EUA prices and the future German EU ETS budget. The 20MW threshold and the exclusion of RES plants are less important to them.

Finally, we take a closer look at the influence of size and ownership structure of utilities on their consideration of CHP and RES as an EU ETS strategy. Concerning RES, our data shows that there is a slight correlation between ownership structure and the consideration of increased RES activities (Phi= 0.23). 66.6 % of the utilities owned by their municipality regard RES as a possible EU ETS compliance option vs. only 43.3 % of the privatized utilities. Results from the survey among the Executive

Board also show an overall strong negative correlation between engagement in RES and private ownership (Phi=-0.34). A potential reason might also be a risk aversion of private shareholders which is corroborated by the data (Phi=-0.15).

In addition, values of local utilities seem to have some effect on the consideration of RES as a compliance option. While a self concept as a firm managed according to private sector standards lowers the probability to invest in RES (Phi=-0.36, n=34), a self concept as a risk taking local utility increases the probability (Phi=0.26, n=34).

As to ownership structure, privatised utilities are significantly less often engaged in fossil CHP than the public ones (Phi=-0.30, n=49). In contrast, the correlation of private ownership structure and the consideration of CHP as an EU ETS strategy is a moderately positive (Phi= 0.18, n=49). A control for size makes the picture clearer. For the subset of small utilities there is a moderate negative effect of private shareholder involvement on current fossil CHP activities (Phi= -0.26, n=27), while there is a strong positive effect for large utilities (Phi=0.62, n=22). While small utilities are probably not able to mobilize financial resources for a CHP generation strategy from private shareholders, this might be a viable strategy for large utilities. Again there is a negative effect of a private sector self concept on the probability that CHP is considered as a compliance option (Phi=-0.46), while – probably because of size of the necessary investments – the willingness of risk taking for municipal goals has a moderate positive effect (Phi = 0.26, n=34).

We find no correlation between size and current activity in fossil based CHP for the subsample. By contrast, there is a strong correlation between the size of a utility and its consideration of CHP as an EU ETS compliance option (Cramer's V = 0.56). On the one hand this might be due to the higher financial and human resources of larger utilities to react to the EU ETS and to decreasing average transaction costs. Further findings from our data support this argument. They show that the costs related to the handling of the EU ETS are perceived less often as "very important" by larger utilities (Cramer's V = 0.334). On the other hand, a higher exposure of larger utilities to the scheme might also be a reason. Larger utilities emit more CO_2 in absolute terms and they therefore dispose of a higher number of

EUAs which represent a bigger financial value. As they also dispose of a higher abatement potential in absolute terms their pressure to act might be higher than for smaller utilities.[17]

Conclusions and future perspectives

In this paper we analysed the effects and working mechanisms of the EU ETS on strategic choices of German local utilities' activities, putting the focus on activities in the fields of RES and CHP. Summing up our findings, we see that publicly owned municipal utilities falling under the EU ETS are more likely to be active in innovative forms of power generation, defined here as RES (except hydropower) and micro-cogeneration. By contrast, private shareholdings hinder investments in such generation technologies. Further findings from the same research project show that, with respect to RES, this higher level of activities is positively influenced by the stronger commitment of municipality-owned utilities to the issue of environmental protection (Jansen et al. 2007)[18]. Innovative performance in generation in general depends on size and on knowledge in conventional generation. Thus, size is an important limiting factor. Utilities with innovative generation portfolios profited from their climate friendly generation profile in the allocation of allowances.

We find that RES and CHP figure highly among the compliance options considered as most important by local utilities. For the sample as a whole, we further found that size is a limiting factor for considering CHP whereas RES appears attractive even for the smaller utilities. For utilities with innovative generation portfolios, increasing their RES capacity is even the EU ETS strategy most often considered for the future. Concerning the factors of influence on a utility's EU ETS strategy, in general, our findings indicate that, besides the price for EUAs, uncertainties related to the regulatory scheme itself – such as uncertainty about future allocation rules, EUA prices and ETS budgets - figure highly among

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17 These results on the influence of size and private shareholdings complement our findings on the preconditions for the entry into the business field of generation with respect to ownership structure and size (Jansen et al. forthcoming).

18 The research project « Diffusion of innovations in energy efficiency and in climate change mitigation in the public and private sector » is funded by the VW foundation. For further information see also http://www.isi.fhg.de/n/Projekte/Diffusion_Klimaschutzinnovationen.htm or http://www.foev-speyer.de/diffusion/inhalte/01_home.asp

them. This is in line with a recent empirical study by Cames (2004), who finds that significant investments in new power plants in Germany will be postponed because of uncertainty about future allocation rules. Utilities with innovative generation portfolios seem to differ in that respect. They are relatively less concerned about uncertainties arising from the EU ETS. By contrast, utilities engaged in conventional generation are still more worried about future allocation rules, and also about their own actual allocation situation. This suggests that innovative generation technologies may serve as a safeguard against regulatory inconveniences. Further, our results lend support to the request that future allocation rules and emission targets should be known long time in advance to be more in line with the length of innovation cycles (see e.g. Schleich, Betz 2005).

The special allocation rules for CHP in Germany figure highly among the factors influencing the choice of the compliance strategy and explain why CHP is among the compliance options most often considered by utilities. These findings show that the technology specific provisions for CHP in the German National Allocation Plan do have some effect in promoting this technology. The degree to which an emission trading system should actually set such technology specific incentives is controversial. As Schleich and Betz (2005) point out, the merits of a trading system are that carbon market prices and the flexibility in the choice of the compliance strategy guide investment decisions thereby providing a variety of different energy/carbon-saving technologies and a least cost solution. In their view, technology specific allocation rules for new installations inhibit these working mechanisms and decisions by policy makers, rather than the market, determine the incentives (see also Schleich et al. 2007). Against this background, our findings on the effectiveness of these technology policy elements within the EU ETS have the following implications for further policy making. First, they underline the necessity of constantly watching over the rationale for such technology policy elements and their continued appropriateness. Secondly, these provisions need to be kept in accordance with other policy instruments used for the same purpose, such as the German CHP law of 2002 (see e. g. ASUE without year).

Future research should aim at validating our current findings, in particular with respect to determining the rationale underlying a utility's response to the EU ETS. Furthermore, comparing our results to the

responses of large, national utilities to the EU ETS and with the activities of other actors in the fields of CHP and RES would allow conclusions to be drawn on the specific role of local utilities in these fields.

Our study was limited by the fact that the introduction of the EU ETS is rather recent and the allocation of EUAs in the first round was rather generous. As a result, the data available are still limited and the effects to be expected are rather weak. However, the decisions of the EU Commission (EU COM) on the National Allocation Plans (NAPs) of EU Member States for the second trading phase suggest that the allocation of allowances will be more stringent and EUAs scarcer and possibly more expensive in the second trading phase[19]. The effect of the rising scarcity of EUAs on climate protection innovations, and in particular the role of German local utilities in this field given the background of energy market liberalisation, thus remains an important research topic.

Finally, a comparison with other European countries could shed more light on the role and interdependencies of specific national allocation rules, environmental regulations, and national specificities with respect to liberalisation in the energy sector. The interaction between liberalisation and climate policy needs to be well understood, if economic efficiency and environmental goals are to be reconciled.

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19 Cf. http://ec.europa.eu/environment/climat/2nd_phase_ep.htm. The total quantity of EUAs available in Germany in the second trading phase amounts to 453 Mio tonnes, 50 Mio. tonnes less than in the first trading phase. The German NAP also foresees that almost 10 % of the allowances allocated to the energy producing industry will not be given out for free but sold on the market.

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