Participatory energy research policy: The case of a Conference on Future Search & Assessment in Austria

Michael Ornetzeder*
Institute of Technology Assessment of the Austrian Academy of Sciences
Strohgasse 45/5, A-1030 Wien, Austria
Tel.: +43-1-51581/6589
Fax: +43-1-710 98 83
ornetz@oeaw.ac.at
http://www.oeaw.ac.at/ita

Ulrike Bechtold
Institute of Technology Assessment of the Austrian Academy of Sciences
Strohgasse 45/5, A-1030 Wien, Austria
Tel.: +43-1-51581/6593
Fax: +43-1-710 98 83
ubecht@oeaw.ac.at
http://www.oeaw.ac.at/ita

Michael Nentwich
Institute of Technology Assessment of the Austrian Academy of Sciences
Strohgasse 45/5, A-1030 Wien, Austria
Tel.: +43-1-51581/6583
Fax: +43-1-710 98 83
mnent@oeaw.ac.at
http://www.oeaw.ac.at/ita

Paper prepared for the Conference on Human Dimensions of Global Environmental Change / International Social-Ecological Research Conference
22-23 February 2008, Berlin

* corresponding author

Abstract: This paper reports on experiences using a participative technology assessment (pTA) approach to discuss and evaluate research and development goals for sustainable energy technology in Austria. In a two-day Future Search & Assessment conference in November 2007, 36 per representative quota selected laypeople discussed the future of energy research in Austria on two different levels: long-term visions aiming at long-term changes as well as deduced short-term aspects regarding the present end-user related energy research agenda. The strategy chosen consists of a well-balanced mix of focus groups, plenary sessions, expert inputs, and moderated working groups. We aim to show that pTA can contribute twofold: First of all, it can contribute to the social robustness of the underlying strategies and scenarios of the research programme; and secondly, the research topics that directly refer to the end-users can be critically evaluated in terms of social acceptability and user friendliness. Moreover the chosen approach serves as a platform to discuss long-term energy policies as well as practical consequences.

1. Introduction

The current energy system is mainly based upon fossil energy sources. To minimize or avoid severe negative consequences in terms of costs and effects for humankind and the biosphere this system has to face radical changes. The widely accepted goal is an efficient and secure energy supply system mainly based on renewable resources. Research and development activities will undoubtedly have to play a crucial role in this substantial transition, predominantly regarded as the only future option. However, end-users of new technological options will be of decisive importance for the success of such a transition.

The transition of the energy system is linked to long-term goals in a twofold manner. In order to avoid or at least mitigate negative effects caused by climate change experts recommend a long list of short-term political and technological measures (IPCC 2007). A great number of them are directly related to the way we serve our energy demand today. The second long-term aspect of energy relates to the fact that fossil fuels are limited and have to be replaced in the future.

Energy supply is of vital interest for end-users too. According to the Austrian Energy Agency households spend more than 10 billion Euros per year for energy needs. Within the last five years the energy demand of private households have increased extraordinarily. In addition, climate change has recently become a problem of great public concern and people are aware, that there is a need to change their behaviour. Beyond doubt this high level of public awareness concerning energy is a good precondition to run a participatory process.

This paper reports on a still ongoing research project funded by three public sponsors: (1) the Austrian Council for Research and Technology Development (RFT), an advisory body to the Austrian Federal Government; (2) the Federal Ministry of Transport, Innovation and Technology (BMVIT) and (3) the Federal Ministry of Economics and Labour (BMWA). The Austrian Council is particularly interested in the project from a technological and research policy perspective. As outlined below in more detail (section 2), the Austrian Council has a role to play in formulating research agendas and wants to do so in the future not only with the help of experts and stakeholders, but is curious to experiment with participatory methodology involving laypeople. At the same time, it sees participatory events as a means to foster awareness of innovation and technology. By contrast, the two ministries joined their forces amongst other things with regard to support research and development in energy technologies and started together in 2007 the research programme “Energy of the Future” (see below in section 3). Their interest in our project is therefore a direct input into future calls of the programme.

Three sponsors are not only an administrative challenge; it is additionally a challenge in terms of devising a process, which satisfies the expectations of all contractors. We planned a tailor-made process (described in more detail below in section 4) that will give answers both to the questions of the Austrian Council and the needs of the ministries. While the former mainly wants to know whether our experiment can serve as a model for future involvement of citizens, what effect the conference had on the perception of those involved, and how the process was perceived in public, the latter are mainly interested in having their concept put in perspective, in supplementing ideas, in adding new perspectives and in receiving user-centred input with regard to their programme. Hence we devised several phases of the process, including a feedback and evaluation phase after the main event.

In this paper we will give a detailed description of the whole participation process, focussing on the two-day conference. We will present some preliminary results and discuss the role of long-term perspectives in our case.

2. Participatory TA in the Austrian context

In the context of research and technology policy we frequently face conflicts of values. These conflicts as well as, to some extent, conflicts of knowledge and interests, are perhaps not capable of being solved; nevertheless, they can be negotiated more transparently, comprehensively and with more structure by holding a structured dialogue procedure involving citizens (laypeople) who have not previously participated, alongside experts and stakeholders. Thus, there is a chance to arrive, on the one hand, at better decisions, as this would incorporate, on a broader base, knowledge, interests and value judgements; and on the other hand, decisions would be better legitimised. These proposed procedures take effect alongside the established decision-making processes; they extend the decision base but are not intended as a substitute for those processes.

While there is a tradition of involving stakeholders – in particular the social partners in all kinds of policy formulation including technology policy –, performing technology assessment (not in the classical expert-oriented manner, but with participatory methodology) has never been widespread in the Austrian context so far. An internationally comparative study at the European level in 2000 (Belucci et al. 2000, published as (Joss and Bellucci 2002)) included only a few examples from Austria, not all of which actually involving laypersons, but also stakeholders. The record so far includes two consensus conferences, one on tropospheric ozone in 1997 (Torgersen 1999), the other on genetic data in 2003 (Bogner 2004); the EUROpTA report also describes an interesting stakeholder participation process leading to the Austrian technology Delphi 1996–98 (Aichholzer, Cas et al. 1998) and the Salzburg Traffic Forum in 1995/96.

Furthermore, a number of experiences with participatory processes have been made in particular in the environmental sector. On the one hand those participatory events have been made within formal activities, for instance in the framework of strategic environmental impact assessment procedures. On the other hand informal endeavours have been carried out in the framework of various research projects. Examples cover ecological building concepts (Ornetzeder 2003), smart home technology (Rohracher 2006), or ecological sanitation technology (Starkl, Ornetzeder et al. 2007). In those cases new technological options have been discussed and evaluated in focus groups by different types of users.

In the particular context of TA the focus was hitherto on stakeholder and expert involvement. More recently an increasing practical interest in including pTA elements in current projects have been implemented, such as the EU project PRISE (Jacobi and Holst 2007), in which lay persons assessed different scenarios of futures with privacy enhancing or threatening security technologies and in particular the project reported in more detail in this paper.

In 2003 a consensus conference on genetic data was carried out on behalf of the Austrian Council for Research and Technology Development (RFT). The external evaluation of this event (Bogner 2004) – carried out at the Institute of Technology Assessment – showed a number of shortcomings and encouraged us to propose the RFT to solicit a new study that would lay the foundation of a systematic and well-balanced approach to participatory technology policy formulation.

This study (Techpol 2.0: Awareness – Participation – Legitimacy) took up two major concerns of Austrian technology policies: Firstly, we addressed the aims set out in the second call of the initiative "Innovative Austria" of creating more awareness amongst the population for technology policy issues by conducting participatory procedures. Secondly, going beyond the creation of awareness, we proposed to exploit the potential of participatory procedures to increase legitimacy and strengthen "social robustness", i.e. anchoring technology policy decisions in society, in a similar way as already proven to be successful in other countries. In the final report (Nentwich, Bogner et al. 2006) we developed, first, a scheme to analyse topics in order to come up with a suitable participatory methodology. This scheme distinguishes methods according to three axes: the form of representation needed, the ways a topic is negotiated, and the possible forms of political action. Second, on the basis of experience at the international level, we proposed a list of criteria that can be used to examine possible technology policy issues in order to identify whether they can be negotiated at a specific time in a participatory procedure with prospects of success. Important criteria include in particular the potential interest of the media and the political salience of the subject matter. In addition, a major role is played by the complexity of the matter and how it has previously been addressed politically. Based on an analysis of a dozen topical issues in 2006/07 we proposed three specific subjects matters to the Austrian Council, among them a consensus conference on pre-implantation diagnosis, a citizens' jury on RFID (radio frequency identification) chips and a future search conference on the topic of energy efficiency. The Austrian Council decided in December 2006 to go for the third issue, which finally became the topic of the project reported in this paper.

3. Focus of the project: energy research in Austria

In Austria, energy research funded by public authorities became more and more mission-oriented in the 1990s. In 1999 the Federal Ministry of Science launched the first Austrian Programme on Technologies for Sustainable Development, originally slated for five years. Although the main focus of this programme was on technological development the authors designing the programme were, however, aware that they would have to seek solutions oriented not only on technological criteria. Research and development with the goal of sustainable development, they have argued, requires balancing a variety of interests. For the first time a research and development programme in Austria called not only for innovation in the field of technology, but also was open for socio-economic aspects. As defined within this first programme, sustainability should refer to the following:

- An increasingly efficient consumption of energy with respect to the entire life cycle
- A greater use of renewable sources of energy (especially the use of solar energy)
- The greatest possible use of organically renewable raw materials as well the efficient use of materials
- And increased attention to service and use from users' point of view (BMWF 1999).

In 2004, based on seven years of experience and more than 200 funded research projects, the responsible department within the meanwhile unlabelled Ministry of Transport, Innovation and Technology (BMVIT) started activities to develop a follow-up programme. Within these activities (Austrian Strategy Finding Process ENERGY 2050) a broad range of experts and relevant stakeholders had been invited to discuss requirements for a new research programme. In this preparatory phase it was important to develop long-term strategies and measures along with adequate research goals aiming at the transformation of the existing energy system

within the next 40–50 years. Compared to the first programme in this case mitigation of climate change turned out to be the major force behind the reorientation of the Austrian energy research agenda (BMVIT 2007).

The new programme "Energy of the Future" which was launched in 2007 aims at more energy efficiency, the improvement and development of renewable energy technologies and the design of smart energy networks (BMVIT 2007). The programme is subdivided into seven research areas, whereof one will focus on energy and consumer. Research projects in this area should contribute e.g. to the development of new or significantly improved home devices (like new lightning systems, micro-CHP, solutions to avoid stand-by losses or smart meters) or to the design of completely new systems to provide energy services on the household-level. Beside projects with a technological focus the programme supports research concentrating on organisational aspects of energy and the behaviour of users too. Examples for this kind of socio-economic research cover models for energy contracting or leasing, new concepts for information and education or the interrelation of energy demand and lifestyles.

Although end-users of energy – at least hypothetically – play a very prominent role within the programme, laypeople have not at all been involved in the preparatory process. Therefore this lack of direct contact between energy experts and end-users served as one of the starting points for the presented pTA project.

4 The Conference on Future Search & Assessment

The overall aim of the future search & assessment conference was to invite laypeople and reflect on selected topics from the research programme "Energy of the Future". Furthermore the conference should have given the public the opportunity to be involved in the development of a research agenda – by means of the participants as well as through the media. Citizens should have had the opportunity to learn more about ongoing research and development in the field of sustainable energy technology but also to influence the direction of activities in a certain way. However, to deal with such objectives is quite uncommon in the Austrian context.

Given the technological complexity and comprehensiveness of the research programme it was clear that it would not be possible to present all details to the participants. Rather the challenge was to give an overview of the genesis and purpose of that programme and discuss only those issues that more or less relate directly to end-users. In order to reduce complexity and variety we decided to select five research topics previous to the main event. In the preparatory phase it also turned out that we could not focus on specific research issues without discussing the wider socio-political context of sustainable development. Laypeople should have been able to raise common-good issues as well as more individualistic arguments.

In order to meet these requirements we chose the following 3-step approach:

1. A preparatory workshop to reduce the number of 11 possible topics down to 5 to be addressed within the following pTA conference
2. A two-day future search & assessment conference with 30 to 40 laypeople and seven external experts concerning three main points: (a) discussion of relevant aspects underlying the long-term visions ("Leitbilder") for the future of energy research, (b) assessment of five specific energy and end-user related research topics in detail; and

(c) presentation of main results and participants' experiences within a conference for stakeholders and energy experts on behalf of the programme initiators.

3. A follow up ex-post survey of the participants to track potential effects as a consequence of the citizens' conference (to be realised in February 2008).

Preparatory workshop

As a first step to broadly embed the programme design within the end-users' perception, a three-hour preparatory workshop was held at the end of September 2007. The main idea was to confront the general public in an exploratory manner with the research agenda and discuss and finally prioritise the presented topics. For this aim three different social groups were invited: end-users (3 participants representing diverse lifestyles), representatives of consumer organisations (3 persons), and journalists (5 journalists with experiences in energy issues).

In order to select a maximum of 5 areas of interest from the research programme "Energy of the Future", 11 possible topics were pre-selected and briefly presented in a poster session. For each topic basic information was presented in an explicitly simple and neutral style followed by a discussion of all topics in three homogenous groups (The following question served as the main selection criterion: "Which topics require active user-integration in the course of their development?"). Each group selected three to five of the most relevant topics. These results were presented and discussed within the final plenary session. At the end of the workshop participants were asked to rank all 11 topics individually.

After the workshop the project-team selected, in cooperation with the sponsors, five topics to be presented and discussed at the main event. Table 1 gives a short overview and brief definitions.

Research topics	Brief description
Micro-CHP	"Micro Combined Heat and Power" is the simultaneous production (cogeneration) of heat and electricity in individual homes. Effectively the micro-CHP unit replaces the central heating boiler and provides heat, hot water and the majority of the home's electrical needs ("power station for every household"). First marketable products are already available. Research could help to improve existing technology.
New system solutions and avoidance strategies	Research in this field should completely explore new ways to provide various energy services on the household-level. Such systems have to be significantly more effective than current practices. System solutions could be realised through miniaturization of devices and/or through the integration of functions into larger units (e.g. by the use of ventilation systems for heating and cooling purposes).
Smart metering and „intelligent" end-user equipment (IRON)	A smart meter is a type of advanced electrical meter that identifies consumption in more detail than a conventional meter; generally, it communicates this information via a network back to the utility for monitoring and billing purposes (telemetering). Integral Resource Optimization Network (IRON): Electric appliances are equipped with an "IRON-box" that provides information on future energy demands to electricity suppliers. Intelligent end-user equipment enables load management.

Innovative contracting and leasing models	Energy contracting (and leasing) comprises different forms of energy services with main emphasis on the use of energy saving procedures and efficient technologies. The main focus is on a contractual relation between an energy provider (contractor) and its customer (energy consumer). While contracting and leasing is quite common in industry, the public sector products for end-user markets have to be developed.
Visualization and monitoring of energy use	The aim in this field is to visualize the energy consumption of single appliances and/or of a household. It could be displayed directly on the device itself or on a central unit, e.g. on a PC. The presented information may relate to the current consumption and/or to a specific period, such as a year. Visualization of the energy consumption could contribute to the dealing of energy in a more conscious way and and/or shed light on weak points.

Table 1: Selected research topics to be discussed at the conference

Selection of participants

In order to obtain representative results we decided to select participants for the main conference on the basis of a controlled quota sample, roughly typifying the Austrian population (see table 2). A specialized social research institute conducted the recruiting process. A large number of interviewers all over Austria informed potential participants in short face-to-face interviews. At this first personal contact potential participants got a short description of the event including the time and topic of the conference. If someone was interested, he or she was asked to sign a mandatory declaration. This process started five weeks ahead of the event. In a second phase we then contacted all the future participants personally via telephone and started to send out more detailed information (not exceeding 5 pages in length) by mail or email. We also sent out a written questionnaire asking for personal preferences to be able to organise their stay in Vienna (if necessary).

Conditions for attending the conference included the following: an allowance of € 200 for attending the two days, travel costs and accommodation for those not from Vienna, free meals and coffee breaks.

In terms of the accountability of the process, the participants were informed at a very early stage that their personal contribution will have an indirect effect in so far as the programme makers and the decision makers are (a) interested in the results and (b) will be given that information in terms of an instantaneous presentation the very next day and of course in an evaluated way in terms of further proceeded reports. It was made clear that the citizens' contribution would be of great value and a necessary precondition for the further development of the energy research agenda.

The recruiting process was successful in terms of the absolute number of participants as well as of the structure of the sample (see table 2). In the end 36 laypeople from all over Austria attended the conference.

Socio-demographic attribute	Target sample	Sample at the conference
Gender	50% female 50% male	52,8% 47,2%
Age	50% 18 to 40 50% older than 40 years	42,9% 57,1%
Education	50% maximum apprenticeship 50% professional school, secondary school and all higher education as e.g. university	28,6% 71,4%
Professional status	50% employed 50% non employed (household, retirement, unemployed)	62,8% 37,2%
Region	40% East (Vienna, Lower Austria, Burgenland) 40% Central (Styria, Carinthia, Upper Austria) 20% West (Salzburg, Tyrol, Vorarlberg)	41,6% 27,8% 30,6%

Table 2: Comparison of target sample and sample of participants

The two-day conference

The main event was composed of different group settings and working methods; presentations by external experts alternated with various moderated small working groups and plenary sessions as well as some playful elements. Seven facilitators and five experts were available to support the 36 laypeople. On the first day two more experts provided additional information. The whole event was carried out at the same location where participants from outside Vienna were being accommodated. This turned out to be a good solution that also helped to keep the majority of the group of laypeople together for the whole event. To facilitate participation for the various social groups, the main event was scheduled on a weekend.

Day 1

The aim of the first day was to discuss the wider socio-political context of energy research and to prepare a common ground for the discussions on research topics the following day. After a general introduction by the project team and a welcome address, external experts held two presentations: one on the Austrian Strategy for Sustainable Development, another one on the research programme “Energy of the Future”. Thereafter the audience’s sight was directed towards a long-term perspective.

The concept of “Leitbild” was presented briefly so as to have the main function of guiding the view of heterogeneous participants towards a certain vision in the future, somewhere at the intersection of desirable and feasible future developments (Dierkes, Hoffmann et al. 1992). In our case laypeople were asked to discuss various elements of already existing political concepts in order to develop a kind of common understanding. Therefore 12 relevant political statements presenting five political strategies were coined in advance and explained in detail at this point at the conference. The selection process was guided by the basic notion that sustainable development is a strategy to combine social, economical and ecological aspects (see table 3 for a short overview).

Thereafter five small groups (one homogenous female, one male and three mixed groups) performed a "silent negotiation" to obtain a commonly approved arrangement of the items. (Pictet and Bollinger 2005). A sheet (1200 x 1500 mm) was placed in the middle of the table containing a zero line on which all the items of table 3 were placed written on cards. Each group member standing around this picture took several turns to move these cards according to their individually perceived importance, either into the positive direction (max. +5) or the negative direction (min. –5). The goal was to make people watch and react to the other participants and thereby consciously reflect on the issues at stake, weighing and relating them to one another. After a certain period of reflection, the positioning of the items was analysed, before other rounds were conducted. Five distinct rankings were negotiated in that way.

At the end of day 1, all cards were merged to produce a common ranking. This synthesis was posted alongside the documents used and produced on the second day, which was to weigh highly normative issues that underlie technological development and the respective discussion in terms of assumptions, and guiding principles.

Element	**Meaning**	**Source**
Promotion of socially and environmentally sound consumption	▪ Avoidance and reduction of environmental impairment ▪ Decoupling economic growth and environmental impairment ▪ Thermal restructuring of residential buildings	EU, ON, RP
Measures against climate change	▪ Limiting costs of climate change ▪ Put Kyoto protocol into action and thereafter 2012 contribute to a succeeding international agreement ▪ Fostering innovations that tackle climate change	EU, FE, RP
Cost transparency in the environmental sector (fair pricing)	▪ Integration of environmental costs for resources and energy use ▪ Incentives to foster sustainable behaviour ▪ Federal government supports sustainability and commits its behaviour to ecological, social and economical aspects	ON, RP
Increased expansion of renewables	▪ Increase of electricity production based on renewable resources to 85% in 2020 ▪ 400,000 Austrian households using renewables in 2020 ▪ Doubling of biomass use by 2010	RP, FE ON
Increase of energy efficiency	▪ Improving energy intensity ▪ Supporting innovations for energy efficient equipment ▪ Expansion of combined heat and power ▪ Successful economic development through eco-efficiency	RP, FE, ON
Social Justice	▪ Equal access to social services ▪ Poverty reduction, foster social cohesion ▪ Affordable energy supply	EU, ON, RP
Saving of energy	▪ Mobilisation of savings capacity ▪ Expansion of combined heat and power ▪ Supporting innovations for energy efficient equipment	FE, RP, FE
Safe energy supply	▪ Reducing import of fossil fuels ▪ More decentred energy production ▪ Innovation for grid stability and security	RP
Promotion of comprehensive system approaches	▪ Technological and organisational developments for products and design of solutions ▪ Technology and development for solutions for structural and societal transitions	FE, ON

Health promotion	▪ Equal access to public health services and improvement of preventive measures ▪ Preserve earth's capacity to reproduce life, respect of carrying capacities and approval of a high level of environmental protection	E, U
Promotion of Innovation	▪ Bring ideas and concepts, pilot- and demonstration activities to the markets that tackle climate change ▪ Technological and organisational developments for products and technological systems ▪ Technology and development of solutions for structural and societal transitions	E2050, FE, ON
Reduce dependence of energy imports	▪ Raising diversity of energy resources, more electricity production based on renewables and strict standards for nuclear power plants ▪ Reduce national dependence and keep access to various markets as to reduce monopolies	RP

Table 3: Pre-selected elements used as input for silent negotiation

Sources:
EU: Review of the EU Sustainable Development Strategy (EU SDS) - Renewed Strategy, Brussels, 26th of June, 2006
RP: Austrian Government Programme (Regierungsprogramm für die XXIII. Gesetzgebungsperiode)
ÖN: Austrian Sustainability Strategy (Leitziele der Österreichischen Nachhaltigkeitsstrategie)
RP: Austrian Government Declaration (Regierungserklärung vom 16. Jänner 2007)
E2050: Austrian Strategy Finding Process ENERGY 2050 (Strategieprozess ENERGIE 2050)
FE: Austrian Energy research Programme "Energy of the Future" (Energie der Zukunft)

Day 2

The second day of the conference was devoted to the assessment of five specific end-user related research topics. In advance, experts of the respective areas had prepared short written reports covering a brief definition, a description of the functionality, the current technological state-of-the-art, potential future developments, the relevance for the end-users, the possible ecological potential, potential risks in the course of operation, and questions to be still addressed by research. The challenge for the experts was to treat these aspects for each topic in only one and a half pages using language easy to understand for all levels of education. These short descriptions served as a basis for the participants' pre-information, which they received about 10 days in advance. Furthermore this accurately composed information also provided a standardized scheme for the presentations the experts held at the beginning of day 2 of the conference.

After these inputs the participants could chose between five rooms that represented the five topics to be dealt with in three rounds (see above Table 1). Each topic was uniformly discussed using three consecutive slots. After each time-slot the discussants had to move to a different room. The only restriction for the participants changing to another topic consisted of a limited number of chairs in each room. Using this procedure enabled participants to choose three topics of their own interest. It guaranteed that each topic was discussed by approximately 20 laypeople and at the same time enabled focused discussions in smaller groups within the available overall time. The role of the facilitator was to guide and document the process, involve the expert – if necessary – and to guarantee that the given advice was well balanced and neutral. All experts were explicitly asked to strictly stay on a neutral informative level and to exclude their personal point of view when answering concrete thematic questions that would appear in each round. At the beginning of the second and third round a short summary was provided by the moderators to avoid too much redundancy.

The aim of these discussions was to collect, discuss, weigh and summarize as many points on the respective technology fields as possible in terms of (a) positive and negative aspects and (b) opportunities and threats. Finally, at the end of each round, participants were asked to notionally provide research grants in order to find out what questions they would like to be addressed.

The afternoon sessions were formed according to the participants' interest and in respect to the content they were based upon the outcomes of the morning and framed as "editorial boards". The moderator's role was, as before, neutral and that of a coordinator, one whose main task was to guide the work groups towards a reorganisation of the results of the morning group's brainstorming. The physical presence of the "Leitbild" (from day 1) was of importance in terms of a commonly produced and aligned guideline (displayed on a poster in each room).

The aim of the editorial boards was to critically examine, condense and reorganise what was collected in the morning session in order to finally formulate recommendations that would embrace the core issues from the point of view of laypeople. For this purpose the first task was to cluster the elements and then score them. Subsequently the top ranked issues were preferentially treated when consecutively completing the following phrases:

- "We as a group claim that technology (service) should be …"
- "We as a group want the experts and politicians to know that …"

The advice directed towards the diverse decision-makers brought in direct communication that would take place the next day and thus channelled extra-commitment. At the end of the conference all results of day 2 were presented in a final plenary session.

5. Results

Although the main focus of the FSA conference was to inform the research programme and to critically assess future technologies (and services), in this section we will first present the results of the silent negotiation. The laypeople's political preferences did not only serve as a guideline to discuss research topics and technology, the process also reflected the socio-political orientation of the participants. This ranking of political targets could be useful as input for the further development of the energy-related research agenda in Austria.

Political preferences and common "Leitbild"

The overall ranking is presented in figure 1. Only two statements have been ranked highest in all five discussion-groups: "Measures against climate change" and "Promotion of socially and environmentally sound consumption". To get an impression of how the elements were presented the main meanings and sources are given in table 3 (section 4). The redundancy in meanings proves the interrelation of these politically accorded goals.

Closely related to the aspect of "Promotion of socially and environmentally sound consumption" was that in this context information and public understanding is of utmost importance in terms of raising awareness and stimulating conscious patterns of energy use. "Promotion of Innovation" and "Promotion of comprehensive approaches" were said to not obviously refer to the energy topic, to be poorly understood, and moreover to affect the public authorities rather than the end-users. Innovation without mission and without people's involvement was coined as "blind-ended".

An explicit argument for “Reduce dependence of energy imports” to be of lower importance was on the one hand the assumption, that importing energy can, clearly, not be avoided and on the other hand that the degree of autonomy was estimated comparably low. Although the avoidance of high costs for building and maintaining infrastructure by using decentralised structures (if the regional conditions allow it) was positively estimated in terms of economic potential, the ranking was still –4 in that group.

“Saving energy” was quite contested in all groups except for the female group. It was – predominantly by male participants – said to be expensive, often adopted incorrectly and contains a lack of information. The discussion was marked by different values. Another argument was that if there were clean energy production, there would no longer be the need to save energy – as opposed to the argument that saving or not saving energy is a question of attitude towards a resource. It was emphasized that the delegation for save energy should not be directed only towards “the little people”, but also towards the rich and powerful. Statements considered important were those explicitly referring to the clear application in the reality of every day life and were given higher ranks, whereas statements perceived as decoupling with the end-user, were given lower ranks. Giving a statement a low or negative ranking was also used to emphasise the elements remaining in the positive area. “Social Justice” was seen as a fundamental condition for sustainable behaviour, as a kind of counterpart to the dominant group of ecological targets.

If we try to examine the selection made in agreement in all groups, two aspects are of interest: (1) The majority of the goals considered to be of special importance may be coined as long-term goals. They have not yet been reached and their implementation will have effects in the future. As opposed to those elements that have not been achieved sufficiently but it is desirable to do so in the future (e.g. energy system based on renewable sources). The notion of “Social justice” must be seen differently. From a historical point of view, there is nothing new about the plea for social justice, although its remaining relevant in the future could hardly be labelled a long-term goal. (2) The end-user is potentially affected in terms of the ability to act and actively implement changes within all elements. “Social justice” is probably seen differently as the individual room for change is limited.

All of the elements regarded as important are rather long-term oriented and bear room for action on the household-level. Underlying is the aspect of “social justice” that can be interpreted as a kind of validation for the other elements.

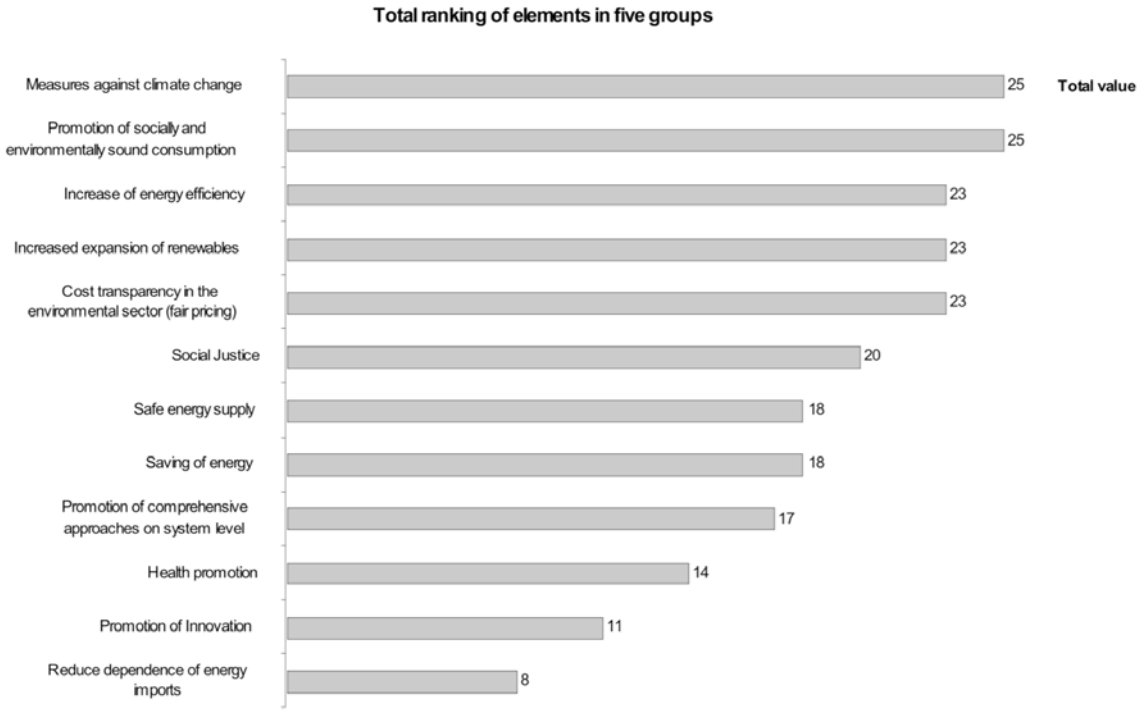

Figure 1: Total ranking of the political statements from "silent negotiations"

Recommendations for the energy research agenda

On the second day of the conference five end-user-oriented research topics were discussed in detail. Table 4 gives an overview of selected results. Generally, it is important to mention that in spite of some critical discussions the involved laypeople approved of the presented technologies (or subjects) as meaningful approaches to transforming the existing energy system towards sustainability. Based on that general agreement a number of detailed recommendations for each research topic were formulated.

The idea to produce heat and electricity for one's own needs on the household-level was very attractive for most of the discussants. Micro-CHP technology – which is not just yet available on the Austrian market – should be affordable in purchase and maintenance and powered by regionally available, renewable resources. Based on information material and expert know-how laypeople also gave some technology-specific recommendations. Future research on this technology should aim at highest possible energy efficiency and the ability for effective power-management. Moreover micro-CHP technology should be seen as part of larger systems (e.g. in accordance with locally available renewable forms of energy, micro-CHP as a part of a smart grid). From the various technological options to produce electricity, laypeople preferred Stirling engine and fuel cell technology. Research funding should be concentrated on these two options.

As it was rather difficult to discuss completely new socio-technical systems to serve energy needs on the household-level, most recommendations in this area focus on conditions for future research projects. Such projects should include experts from many different fields of expertise and should operate in close connection with future users and other practitioners. The outcome of this kind of research should be actively disseminated. R&D activities should take social aspects – like different lifestyles, economic situations and household conditions – into account and lead to concrete outcomes.

Smart metering and "intelligent" end-user equipment supporting load management will be accepted only when consumers profit directly in financial terms and when individual data on energy consumption and user behaviour is treated anonymously. Laypeople think that smart meters could initiate changes in attitude and lead to raising awareness, but the given information must be clear, simple and plain. Positive ecological effects could not only be achieved by changes on the user-side but also through effects on the supply-side (load management). Laypeople concluded, that they would provide energy suppliers with specific information on intended energy needs, if they profit directly by lower energy tariffs. They suggested the development of devices that are able to find the lowest tariffs available at a given time automatically. However, load management in combination with variable tariffs have been seen as a radical change in the electricity system, which can only work when the entire energy industry, including the government, act in concern.

Contracting and leasing models have been quite common in commercial and public contexts for many years. However, models that work for private households remain to be developed. Such models would be of interest for the general public under two conditions: firstly, the expertise of the contractor – regarding best available technology as well as regarding sound energy consultation – have to be up-to-date and guaranteed by public agencies (e.g. underlined by a seal of approval). Secondly, the information and recommendations given by the contractor should be neutral (non-product related). Contracting models for private households should ensure that the customer's loss of autonomy is as little as possible. Moreover laypeople asked for contracts with highly flexible provisions and guaranteed energy savings.

Applications for visualization and monitoring of energy use were seen as helpful, however, awareness campaigns using different forms of media should be implemented to get these systems to work. Such programmes should be tailor-made for different social groups in cooperation with communities. From a user's point of view the usability of monitoring devices was considered to be very important. Specific designs for different user groups appear necessary, including simple to operate devices for elderly people. Information on the household's energy consumption should be combined with useful recommendations on how to save energy. Quite similar to discussions on smart metering, participants required that monitoring devices should enable households to remain completely independent from energy suppliers.

Research topics	**Recommendations by laypeople**
Micro-CHP	▪ Micro-CHP should support the energy-independence of households ▪ Devices have to be affordable in purchase and maintenance ▪ Use of regionally available, renewable resources is important ▪ Technology should be improved as part of a larger system (e.g. in accordance with available renewable fuels) ▪ Stirling engine and fuel cell technology to be used on the household-level are a high priority ▪ Research should aim at highest possible energy efficiency and the ability for effective power-management (micro-CHP as part of virtual plant)

New system solutions and avoidance strategies	▪ Focus on saving resources and foster awareness for resources ▪ R&D should lead to concrete outcomes (e.g. sponsorship for ecological housing) ▪ The research programme should be aware that involved social players (e.g. architects, planners, handcrafter, users) represent different perspectives which should be included ▪ Results of research should be actively disseminated ▪ Social aspects should be taken into account
Smart metering and „intelligent“ end-user equipment	▪ Presented information should be simple and plain (in order to support changes in attitude and raising awareness for natural resources) ▪ Data security should be guaranteed (concerning recording, interpretation and transmission) ▪ Households should profit in financial terms (e.g. by automatic selection of lowest tariff) ▪ All relevant players of the energy industry should support the system
Innovative contracting and leasing models	▪ Offer is attractive for users when expertise of contractor is guaranteed ▪ Information and recommendations by contractors should be neutral (non-product related) ▪ Loss of autonomy should be minimized, contractor should find constructive ways to deal with loss of control and autonomy ▪ Provisions of a contract should be highly flexible ▪ Overall energy savings should be guaranteed
Visualization and monitoring of energy use	▪ Awareness raising should start as soon as possible (e.g. programmes for different age-groups, cooperation with communities) ▪ Usability of monitoring devices is very important (e.g. for the elderly) ▪ Monitoring devices should enable households to remain independent from energy suppliers ▪ Information on energy consumption should be combined with recommendations ▪ Connection to social policy issues should be considered

Table 4: Selected research-orientated recommendations by laypeople

The list of recommendations embodies both requirements related to general aspects of social acceptability as well as requirements derived from more individual orientations. For most of the general requirements we can see a strong connection to the common “Leitbild”. All of the discussed research topics are considered to be useful contributions in reaching the desired ecological goals – most importantly finding strategies to address the challenges of climate change. The discussed technologies should be as efficient as possible and based on renewable energy sources only. Moreover they should be treated as integrated parts of larger socio-technical systems. Unsurprisingly such recommendations match up well with the guidelines from the programme “Energy of the Future“ and the laypeople’s “Leitbild”. In this case citizens have more or less confirmed already agreed strategies and programmes. In doing so, laypeople have contributed to the social robustness of these goals and related measures.

Compared with the descriptions of end-user related research in the programme “Energy of the Future”, the discussions have brought about some new aspects, too. According to the notion of social justice in the “Leitbild”, laypeople argued for affordable end-user products and guaranteed energy savings; it was generally agreed that social policy issues should be taken into account more seriously. The prominent role of autonomy – defined as being independent from energy suppliers – and the importance of privacy issues (data security) may also be seen as new and fruitful inputs for the Austrian energy research agenda.

6. Conclusions

In this paper we have presented experiences with a recently conducted participatory TA process on energy research in Austria. The recently launched research programme “Energy of the Future” served as starting point and subject matter. The main idea of the tailor-made participation process was to combine elements of vision assessment with an innovation-oriented TA approach. In this case, citizens were involved in the development of a research agenda for the first time. Within the conference we provided comprehensive up-to-date information about energy research and citizens had the opportunity to reflect on long-term strategies as well as concrete technologies or energy services. Another goal was to uncover and make use of everyday experiences and attitudes of laypeople as end-users of energy. In other words it was the attempt to assess technology at a very early stage of development.

As the results show laypeople clearly support the idea of mission-orientated innovation policy. Research and development in the energy sector should be lead directly to solutions to mitigate climate change. Citizens are very aware that problems of the future cannot be solved by technological innovation alone. New technology therefore must be embedded in wider socio-political contexts such as changed price relations and new consumption patterns. The ranking of different political targets made clear that the principal orientation of the Austrian research agenda is widely supported by the general public. However, energy policy should seriously consider social issues as an integrated part.

The chosen conference design made it possible to discuss various aspects of future technology in detail. Laypeople came up with a list of recommendations covering general aspects of social acceptability as well as requirements derived from more individual orientations (e.g. aspects of usability). Laypeople therefore contributed not only as citizens (in a political sense) but also as end-users with specific experiences, habits and attitudes. All in all the conference produced a broad range of recommendations and a considerable number of new aspects came to light. The results represent an interesting input for the development of the Austrian energy research agenda.

Acknowledgement

This research was funded by the Austrian Council for Research and Technology Development (RFT), the Federal Ministry of Transport, Innovation and Technology (BMVIT) and the Federal Ministry of Economics and Labour (BMWA). We would like to thank Wolfgang Gerlich for valuable advice and doing a great job as responsible facilitator. We also like to thank Barbara Schmon, Michael Hübner, Monika Auer, Peter Molnar, Lothar Rehse, Friederich Kupzog, Georg Benke, Karen Kastenhofer, Ulrich Fiedeler, André Gazo and 36 laypeople from all over Austria.

References

Aichholzer, G., J. Cas, et al. (1998). Technologie Delphi Austria; 3 volumes: I: Konzept und Überblick; II: Ergebnisse und Maßnahmenvorschläge; III: Materialien.

BMVIT, Ed. (2007). Diskussionspapier. Strategieprozess ENERGIE 2050. Zwischenstand zum Forschungsprogramm. Wien.

BMVIT, Ed. (2007). Forschungs- und Technologieprogramm Energie der Zukunft. 1. Ausschreibung. Leitfaden für die Projekteinreichung. Wien.

BMWF, Ed. (1999). Konzept Impulsprogramm Nachhaltig Wirtschaften. Vienna.

Bogner, A. (2004). Partizipative Politikberatung am Beispiel der BürgerInnenkonferenz 2003 (Analyse); final report, sollicited by: Rat für Forschungs- und Technologieentwicklung and Wiener Wissenschafts- und Technologiefonds. Vienna.

Dierkes, M., U. Hoffmann, et al. (1992). Leitbild und Technik – Zur Entstehung und Steuerung technischer Innovationen. Berlin, Rainer Bohn.

IPCC, Ed. (2007). Working Group III contribution to the Intergovernmental Panel on Climate Change, Fourth Assessment Report, Climate Change 2007: Mitigation of Climate Change. Geneva.

Jacobi, A. and M. Holst (2007). Privacy enhancing shaping of security research and technology – A participatory approach to develop acceptable and accepted principles for European Security Industries and Policies, European Commission.

Joss, S. and S. Bellucci, Eds. (2002). Participatory Technology Assessment. European Perspectives. London, Centre for the Study of Democracy.

Nentwich, M., A. Bogner, et al. (2006). Techpol 2.0: Awareness – Partizipation – Legitimität. Vorschläge zur partizipativen Gestaltung der österreichischen Technologiepolitik; Zwischenbericht September. Vienna, Rat für Forschungs und Technologieentwicklung.

Ornetzeder, M. (2003). Sustainable technology and user participation. Assessing ecological housing concepts by focus group discussions. Culture, Environmental Action and Sustainability. R. G. Mira, J. M. S. Cameselle and J. R. Martinez. Cambridge and Göttingen, Hogrefe & Huber: 145-160.

Pictet, J. and D. Bollinger (2005). "The silent negotiation or How to obtain collective information for group MCDA without excessive discussion." Journal of Multi-criteria decision analysis 13(5-6): 199-211.

Rohracher, H. (2006). "Sustainability as a matter of social context: information technologies and the environment." International Journal of Environmental Technology and Management 6(6): 539-552.

Starkl, M., M. Ornetzeder, et al. (2007). "An Integrated Assessment of Options for Rural Wastewater Management in Austria." Water Science & Technology 56(5): 105-113.

Torgersen, H. (1999). The Ozone Consensus Conference in Austria. Case Study for EUROpTA. Vienna, EUROpTA.