

ed well with the representative from Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) also participating in the Fellowship.

CSIRO is the national science agency and one of the largest and most diverse research agencies in the world. CSIRO contributes to policy development by providing independent scientific and technical advice as required, assisting Government to decide how to best meet the challenges Australia faces. Central to the organization's strategic plan is being regarded as a "trusted advisor". Over the years, CSIRO has contributed scientific input into a range of disruptive emergencies, including, but not limited to, bushfires, (i.e. from weather warnings to firefighter training and predicting fire behavior), extreme weather events (i.e. cyclone observations, drought and flood modeling and recovery), and marine mining accidents (i.e. monitoring the extent of oil spill in the Gulf of Mexico). While the CSIRO representative in attendance was not personally involved with these or any disruptive emergencies, the experiences shared at the Fellowship were still relevant, highlighting that there are some challenges in evidence-based policy which are universal, despite the context or the domain. Trust certainly seems to be one of these universal elements.

CSIRO also undertakes research in areas where science and technologies are new and emerging, where scientific uncertainty exists and where issues are often socially contested, and this is where the representative at the Fellowship had most familiarity, and was able to share experiences from. For the past nine years, the Science into Society Group at CSIRO has been exploring Australian society's acceptance of energy technologies. In this research, trust in the information source has certainly shown to be a key element for engaging members of society. Providing information on a variety of options as in the role of an "honest broker" is thought to be particularly pertinent to garnering this trust.

3 Conclusions

Throughout the Fellowship's remaining presentations and discussions, presented in smaller

group formats such as master classes and "speed dating", issues regarding how to practically deal with difficulties of uncertainty of evidence, complexity and framing were pervasive. Also discussed was the observation that demands for more and sounder scientific evidence often arise when concrete policy decisions would be more necessary, such as with the issue of climate change, which was commonly used as an example familiar to many attendees at the Fellowship.

Exchanging the experiences gained in these situations, in formats such as the fellowship, can help address crucial questions and strengthen the knowledge required to deal with disruptive challenges. In the end, the fellowship didn't offer solutions to these predicaments (if these are even possible), but rather practical courses of action in everyday interactions between scientists, policy makers and the public. The organizers are currently planning further fellowships throughout the world which aim at bringing together experts from different fields and disciplines and are recommended to anyone working in positions crucial to connecting science and policy, particularly those dealing with disruptive emergencies.

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Will the World Energy System Turn Sustainable?

Report from the Conference "Energy Systems in Transition: Inter- and Transdisciplinary Contributions"

Karlsruhe, Germany, October 9–11, 2013

by Arnd Weber, ITAS

Several countries have implemented regulations to encourage the use of renewable energy generation, with Germany being the most ambitious. What progress are these transitions making? Will they lead to a reduction in the use of fossil fuels? This is the sort of question that has been addressed at a conference which took place in Karlsruhe last year. It was supported by Germany's largest research organisation, the "Helmholtz Association", more precisely by its project "Alliance ENERGY-TRANS".

1 Background to the Conference

Germany began planning for an energy turnaround in 2000, essentially based on the approach of a feed-in tariff granting certain prices per kWh for producers of renewable energies such as wind and photovoltaic power. This legislation followed grassroots movements, larger public discussions and demand by the electorate, which have grown since the 1970s. Following the Fukushima reactor explosions in 2011, Germany also decided to phase out nuclear energy. Since then, a transition has been planned in Germany with the objective to largely replace fossil and nuclear sources of energy with renewable ones by 2050. This transition is supposed to reduce greenhouse gas effects, to save fossil fuel resources for future generations – in short, to demonstrate the feasibility of a sustainable path.

Various legislative tools are used to achieve the German turnaround, such as feed-in tariffs of different magnitudes (e.g. offshore generation with higher subsidies), distribution of costs across private households, obligation of network operators to buy electricity from producers of renewable energy, rules for the insulation of new houses, etc. This is in some contrast to legislation at the European level, which comprises measures such as an emissions trading scheme.

In the German media, in state and federal governments as well as in science, there is a lively discussion about how and with what rules exactly this transition should take place. There is, e.g., discussion about the noise of wind rotors, about the exemption of many companies from paying a share of the costs, about the reduction in the value of houses alongside new power lines, and about emerging “energy poverty”. Furthermore, it is debated how exactly the ambitious goals can be achieved, taking into account issues such as energy for cars.

One of the large public research organisations in Germany, the Helmholtz Association, therefore set up a project to accompany the transition with the objective to conduct research on the systemic interactions of the transition. The project is scheduled to run from 2011 to 2016, and two years after starting, it organised an international conference to discuss the dynamics and impacts of the transition in Germany and similar transitions abroad.

The conference was organised in three parallel tracks. The report specifically comments on some of the sessions, namely discussions on the progress towards achieving sustainability, including the issue of economic efficiency. Other sessions dealt, besides the above-mentioned topics, with rebound effects, the role of scenarios in deciding on future legislative measures, the role of participation in setting up plants, power lines or storage facilities, etc. Speakers came from several continents and analysed energy transition initiatives in not less than 17 countries all over the world.¹

2 Justification of Regulations Enforcing the Use of Renewables

Traditional economic thinking recommends setting upper limits for pollution or for the use of exhaustible resources and leaving the economic players the freedom to adapt in their own way, thus inducing a search for the cheapest solutions. Prevailing thinking at the conference was that this is not possible. It was argued that new technologies, i.e. renewable types of energy generation, initially have higher costs. Investors would not invest in reducing their costs through spending on research or through achieving economies of scale because these investors were locked into investments in existing technologies. Therefore, the government would have to subsidise investors to encourage them to invest in new technologies. This kind of thinking became apparent in the presentations by Frank Geels and Paul Lehmann. However, other speakers such as Uwe Pfenning argued that the energy system in industrialised countries had already changed paths in the past, e.g. from coal to oil and nuclear energy. This shows that the sector can move if new paths promise to be more profitable.

A related argument goes that non-renewable energies would not bear their full costs, such as e.g. costs of climate change or catastrophes, so subsidies would be justified.

3 State of the Energy Transition in Germany and around the World

Costs of renewables

There remains the question whether global energy producers will move towards renewables now

that a large market has been created. Speakers mentioned that prices of photovoltaic electricity are now in the range of 10 cents per kWh (Rainer Quitzow; already in 2004, it was argued that wind prices had come down to 5–9 cents, e.g. by Grubb²). However, speakers also mentioned that these costs do not yet cover the costs of storage if the wind doesn't blow and the sun doesn't shine (neglecting biofuels, which often have undesired consequences in terms of food production). It was pointed out that costs of capacity provision need to be added, such as gas turbines. Setting up renewable facilities does not guarantee grid availability and stability, so this needs to be addressed with additional, costly means (Katherina Grashof, Sandra Wassermann). The bottom line appears to be that renewables are still, after about 30 years of transition, more expensive than coal, which has a price in the order of 5 cents per kWh.

To a lesser degree, countries such as The Netherlands and the UK have followed similar strategies (Florian Kern et al.). Germany largely addresses the problem of volatility by exporting electricity within the European grid (Grashof). This, however, will not scale very well if every European country produced that much renewable power. It was also mentioned that the German approach is simply too expensive for countries such as Hungary (Magdolna Prantner). Last but not least, the technologies developed are not necessarily applicable in other countries. For instance, in Japan more greening of walls may be needed to reduce the demand for air-conditioning (Yusuke Kishita et al.), while in a country like India there is a need for more efficient wood stoves (Leena Srivastava).

State of investment into renewables

One could think that the price of renewables will continually decrease with increasing investment. However, it seems that a peak has been reached. There is already a decrease of investment in renewables in Europe (Frank Geels, Dierk Bauknecht). Also, support for photovoltaics is decreasing worldwide, so there is overcapacity in photovoltaic module production in China (Quitzow). Economically, this means that renewables are still in the “valley of death”. It turns out

that investors were wise not to invest into them without governmental incentives.

Effect of using renewables

It would have been nice if the increasing use of renewables had shown a global effect on resource consumption. Germany, with its huge ambitions, works under the assumption that the world will take over its approach. When Germany implemented the law on renewable energies in 2000, the so-called Kyoto countries emitted about as much as non-Kyoto countries such as China. Meanwhile, global CO₂ emissions have grown by about 35 percent, with the largest increase coming from China. There, a new coal power plant is opened every week (Ortwin Renn). So, with fossil fuels being cheaper than renewables, there is no apparent reason why the world should take over the German approach. Germany has a share of about 2 percent of global emissions; whether it slashes part of it is irrelevant from the perspective of climate and resource availability.

Some speakers mentioned that investment in renewables will lead to energy autarky and will thus pay off in the long run (e.g. Grashof). With modules coming from China and raw materials and other components for wind generators or future car batteries from all over the world, autarky does not seem to be within reach, though.

4 Perspectives

The balance between fossil and renewable forms of energy might only change if fossil fuels become relatively more expensive or if there are voluntary self-restrictions. As the availability of shale gas and coal reserves is large, there is no trend towards a significant cost increase in the near future. Three developments can be imagined which would make a renewables system competitive:

1. new ways of living and voluntary restrictions;
2. lower prices for renewables, including their backup and storage systems;
3. Politically determined price increases on a global scale, as with a system of permits or taxes.

Regarding 1: While some OECD countries save energy, the dynamics of the world economy, including the demand by the poor as well as the

living style of the rich, shows that, from a sustainability perspective, this is irrelevant.

Regarding 2: Some presentations showed that there is room for making the German system more efficient by more experimentation. Currently, essentially one set of regulations applies to the whole country, and providers are bound to comply with laws. Hence, no risky tests or tests of a variety of systems are conducted (Andreas Lösch, Christoph Schneider). This could be changed. Also, it could be considered to provide more scope for new solutions, such as leaving it up to the players how to save energy, thus using the market as a discovery process in the sense of Hayek and Schumpeter.

Regarding 3: Any global scheme for increasing the prices of fossil fuels would make renewables more competitive. In his presentation, the author of these lines proposed to pursue a permit scheme instead of a tax scheme because the burden would be set in relation to the savings objective and would thus become smaller when approaching the goal (the text is available, like all other abstracts, in the Book of Abstracts). In order to create public demand for such a scheme, it has been proposed to redistribute its revenues on a per capita basis to the world population. This could be accompanied by a scheme of positive and negative income taxes. Taxes should also be imposed on rents earned on the basis of the scarcity of resources. This would mean globally more levelled incomes, which creates a strong motivation for a global policy change into this direction. Such a global shift towards permits would integrate the results of the efforts of sustainability enthusiasts in Germany and other countries into an ecologically effective scheme.

Notes

- 1) The Book of Abstracts and a number of presentations are available at: <http://www.energy-trans.de/conference-2013/index.php>.
- 2) *Grubb, M.*, 2004: Technology Innovation and Climate Change Policy: An Overview of Issues and Options. In: *Keio Economic Studies* 41/2 (2004), pp. 103–132

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Transhumanism: at the Rim of Science

Report from the Conference “The Posthuman: Differences, Embodiments, Performativity”, the 5th Beyond Humanism Conference

Rome, Italy, September 11–14, 2013

by Martin Sand, ITAS

1 Visions in Technology Assessment – Introducing Remarks

Following its name, Technology Assessment (TA) apparently deals with technologies. But as indicated by the difference between technique and technology, a technology is a system that includes much more than just a specific artifact. The way it is used, the motives of its use, its design and the ways it is promoted are elements of a technological system. At the earliest stages of a new technological system, there may be only ideas of its possible design and use. These ideas are expressed in visions of our future, and in some of them technology plays an important or even a core role. Some technological visions seem to be less and some seem to be more far-fetched. However, visions raise hopes, fears and expectations in society (Simakova/Coenen 2013), they influence decisions of politicians, entrepreneurs and stakeholders and thereby shape technological development. As decision makers and citizens, we may even need these visions if we want to answer the question how we want to live in the future in terms of technological development (Grunwald 2012). If TA aims to critically evaluate the potential impact of technologies, then it must consider the assessment of technological visions as a part of its approach. This assessment can include evaluation of the values underlying the visions, critical assessment of the explicit goals, plausibility of the prospects, and observations and description of the promoters and their further political and social activities aimed at the realization of the visions (McCray 2013). Transhumanism is an example of such an extreme technological vision. It has attracted public attention at the latest since the debate about Converging Technologies (CT) (Coenen 2006) and increasingly