ENERGY

External innovation management of energy service providers in Germany

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Energy service providers support stationary fuel cells through local field tests, activities in networks and concerted lobbying at the national level. This 'external' innovation management opens up opportunities but there are also problems.

In recent years the framework conditions of energy service providers (ESP) in Germany have been influenced and changed by market liberalization and the climate change debate. Different innovation activities have emerged at the level of firms and utilities' strategies have become more heterogeneous (Markard & Truffer, 2006). As a result some ESP not only improved their technology and innovation management at the firm level but also started with the external creation of supportive structures for preferred new technologies, including technological standards and knowledge or support programs (Musiolik & Markard, 2011). With the nuclear power phase-out in Germany on the agenda there has been a renewed focus on the transition of energy systems and on the role of energy service providers. Internal innovation management has to be complemented with 'external' innovation activities to foster the development of new technologies that are radically different from existing ones.

Despite the far-reaching changes in the energy supply sector, most of the energy service providers in Germany have remained rather passive in supporting new technological innovations. Many firms have started internal activities to test new methods of energy production but only a few have made strategic choices and are actively supporting their preferred innovative technology. In one interesting case, however, the energy suppliers are jointly active and organized: the field of stationary fuel cells. The stationary fuel cell is an important technological option for the future strategy of some energy service providers as well as for the transition of energy systems. In this contribution we will briefly describe the role of ESP and discuss which kinds of opportunities and potential problems arise from a systemic (external) management and support of a new technology.

Stationary fuel cell technology as an important element of a new energy systems

The stationary fuel cell is an efficient and radical technology which may bridge and facilitate the shift of the centralized mode of energy production towards a more decentralized and climate-friendly one. They are heating systems which produce energy and heat for one and two family homes and are connected to the natural gas supply system. The technology is currently applied in field tests but is not yet ready for the mass market. Many technical and organizational obstacles have yet to be resolved and a supporting entrepreneurial infrastructure must be established before the technology is launched into the market (Van De Ven, 1993). The technology nonetheless offers many advantages. Stationary fuel cell systems can be interconnected in a smart grid and operated as a virtual power plant to produce electricity at peak times. By managing a virtual power plant energy suppliers can create an added value. The technology helps them to enter new markets and to offer contracting and other energy-related services to their costumers while stabilizing the gas demand.

Energy service providers have strategically invested to varying degrees in the development of fuel cell technology. 3 of the 5 biggest ESP in Germany, EWE AG, E.on Ruhrgas and EnBW are all engaged in different innovation activities to support the development of fuel cell technology. Some of these firms clearly follow a strategy in promoting fuel cell technologies, while others are just 'followers', with limited effort and investments (Markard & Truffer, 2008). All of these ESP started with local field tests before going further to found networks and start joint lobbying, as they realized that the market launch of the technology could only take place through cooperative joint activities.

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Local field tests and market preparation

The successful market launch of stationary fuel cells highly depends on the attitudes of end customers, the availability of service providers (e.g., craftsmen, architects) and the development of business opportunities for ESP. The latter have to find, develop and legitimize business models in a future market and in the emerging value chain. In other words the role of craftsmen, wholesalers and ESP is not yet defined in the field of stationary fuel cells. This is why energy service providers are active in market preparation through field tests and are trying to shape the direction of market formation towards their visions and business models. Field tests are thus highly interrelated with market preparation (i.e., the creation of initial markets, the training and integration of service providers and the generation of a public interest.

EPS are providing an initial market for fuel cell manufacturers. For instance EWE is a multiservice utility (providing and combining energy, telecommunication and IT technologies) which has been testing fuel cell pilot plans since 1998. Like other energy service providers, EWE pays higher prices for pilot plants not only to test different fuel cell types but also to support the business units of fuel cell manufacturers and signal that there is a market and interest in this technology. An artificial nursing market for the fuel cell technology is provided with financing, pilot customers and distribution channels as well as contacts to local craftsmen. Furthermore EWE has fostered the development of routines between different parties through locally concentrated and continuously extended field tests while also establishing a value chain and business model. For example the firm developed important pre-conditions for the introduction of energy services and contracting. During the field tests EWE accumulated applied knowledge and gave structured feedback to the manufacturer, thereby influencing the next generation of prototypes towards a better fit between the technology and the utilities' requirements (e.g., connection and integration into a virtual power plant). Additionally a platform between EWE and the local association of craftsmen was founded in order to introduce contracting models on to the market and to prepare technical infrastructure for operating micro CHP technologies (e.g., installation of routers). Consequently the involved actor groups (i.e., energy supplier, craftsmen and end-customers) accumulated experiences with contracting and gave feedback for further improvements, thus routinizing their interaction.

Energy service providers also contributed to the generation of broader interest and increased the awareness of stationary fuel cells. ESP such as EnBW conducted information campaigns to raise the interest of potential customers in addition to the training they provided for craftsmen. EWE successfully founded an information centre to provide information on smart energy and building technologies. There craftsmen were educated and a wider public was prepared for future technologies. With each different activity EWE directly prepared end-customers and service providers. The utility could combine contracting and fuel cell technology with the company name, thus developing a regional market for the technology which became visible in the self-image of the region as hub of stationary fuel cells in Germany.

Finally the energy service providers have been engaged in founding and supporting regional fuel cell networks and initiatives. These regional networks have been important in bringing different parties together and circulating fuel cell-related knowledge and information. However as regional initiatives have their limits the active ESP in the field also formed a strong network at the federal level to support the technology.

Joint innovation activities in new established networks

A decade ago a cycle of fuel cell hype and a subsequent disappointment in the media and the financial sector threatened to harm fuel cell technology (Ruef & Markard, 2010). At this point energy suppliers recognized that they had to cooperate to influence expectations and create a supportive environment for the technology. Energy service providers came together to found the fuel cell initiative (IBZ). Later on key manufacturers (e.g., Vaillant, Viessmann) also joined the strategic alliance to influence collective expectations, to raise public awareness of stationary fuel cells, to arrive at joint technological solutions and standards and to shape and create joint market measures.

A positive image, public awareness and positive expectations are essential for new technologies as they have to cope with a low level of legitimation and high degree of uncertainty (Aldrich & Fiol, 1994). Through joint marketing and communication activities, the IBZ members were able to increase public awareness of stationary fuel cells. At the same time the individual firm level communication was consolidated in a joint communication strategy to prevent both competition in marketing and the generation of further hype. Additionally trust between the members emerged within the IBZ. In the wake of the hype the energy suppliers could stabilize the fuel cell manufacturers in the disappointment cycle and safeguard further R&D investments. And by initiating a joint field test EWE was able to further accelerate the commitment of the other energy service providers in the IBZ.

Callux, the joint field test within IBZ, focused on joint market measures and the creation and use of syner-

gies through concerted demonstration and communication. The ESP and manufacturers started to work jointly on training craftsmen, solving technical problems and working on regulations, codes and standards (e.g., the standardization of interfaces between fuel cells and the ESP's energy management system). Consequently joint technical solutions as well as a vocational training module for services providers were established. The joint field test thus contributed to market preparation and formation in areas where local field tests were not sufficient. Callux built a bridge between research, technology improvement and development of markets while the public awareness of stationary fuel cells at a national level was also increased (Andersson & Jacobsson, 2000).

As an outcome of the IBZ activities pre-conditions for a market formation were created and shaped. Activities in Callux and the fuel cell initiative led to the establishment of standards and to the qualification and integration of downstream service providers. The formation of the IBZ network and the subsequent influence of ESP were also important for lobbying and informing politicians about the potential of stationary fuel cells.

Concerted lobbying at the national level

EWE and the IBZ also played a prominent part in the establishment of the National Innovation Program (NIP) Hydrogen and Fuel Cell Technology in 2008. The NIP is an integrated support program in which research, development and demonstration are closely interlinked. The Federal government, science and industry support the development of a German fuel cell industry with €1.4 billion until 2016 (Bonhoff, 2009; Garche, Bonhoff, Ehret, & Tillmetz, 2009).

To realize this support program many different activities had to be carried out. Organizing and structuring of the fuel cell community in Germany was one of the main tasks the ESP of the IBZ were involved in. In 2005, when the ministry of transport announced that € 500 million would be pledged for a new innovation program, key firm representatives perceived a window of opportunity and developed a joint strategy to promote fuel cell technology. Key persons from the field of stationary, mobile and portable application of fuel cells came together. They started to write fuel cell strategy papers, to organize meetings with politicians and to activate an advocacy coalition (Jacobsson & Lauber, 2006). Working groups, networks and actors in the field were organized into the Fuel Cell Alliance Germany and various discussions of development goals became structured, leading to the establishment of a joint fuel cell roadmap, the National Development Plan (NEP). As a result a public-private partnership between industry, science and federal government (i.e., NIP) was realized. A program organization was created (NOW GmbH) to implement the NIP.

The ESP of the IBZ were highly involved in the creation process of the National Innovation Program (NIP) Hydrogen and Fuel Cell Technology. As they professionally participated in the competition for funding they were able to ensure that one third of the NIP budget was reserved for stationary fuel cells. This example shows that energy service providers can attain benefits if they strategically create and shape the environment of new technologies.

Benefits and potential problems of external management of new technologies

The external innovation management of new technologies through ESP brings different opportunities and potential problems. Opportunities emerge as the ESP can influence and control the institutional set-up and the creation of further supportive structures while developing the complementary internal requirements (e.g., fuel cell and contracting know-how and competence) for success in the future energy market. In other words ESP can influence the emergence of a new value chain, the role of complementary actors (e.g., craftsmen) and their final margins and business model. Therefore they may achieve an even more strategic and powerful position between manufacturers and craftsmen in which they can determine which variant of a fuel cell heating system is installed. Besides these major advantages firms which are proactive in the creation and the shaping process might also create a reputation in the field, therefore combining their name with fuel cell technology. Finally they have better access to insider knowledge and may better understand the chances for success and obstacles than outsiders with limited access.

External support of new technologies comes with some potential problems. The market launch of contracting and other energy services is highly dependent on the influence of established value chains, on the creation of legitimacy and on a speedy learning and knowledge generation process within the firm. Energy service providers have to introduce both organizational innovation (contracting) and technological innovation (stationary fuel cells) on to the market at the risk of overstraining costumers. They have to bring many different actors in with them into the field to safeguard their firm's strategy and legitimize and realize their business model. There is always the risk that firms fail to convince and involve complementary actors such as end-customers, other energy service providers, technology manufacturers or the government in the creation of a new technological field. Problems with the technology for example can be supported but not resolved by energy service providers. The establishment of networks and the involve-

ment and guidance of complementary actors is essential. Therefore both networking competence and influence in an emerging field are important prerequisites for a utility firm to succeed and implement this strategy.

Finally the field of stationary fuel cells shows that ESP have already started playing an active role in the formation of a future energy system. This process is currently very much influenced by visionary first movers but, as the followers catch up, ESP may have quite an important impact on the selection and diffusion of climate-friendly technologies and the transition of the energy system in Germany. ★

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