PACE

Pathway to a Competitive European Fuel Cell micro-CHP Market

REPORT

D1.2- Report on the lessons learned in setting up the servicing and after sales support

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REPORT

1. Introduction to PACE and D1.2

1.1 Introduction to PACE

PACE is a five-year project that will deploy more than 2,800 of the next generation Fuel Cell micro-Combined Heat and Power (FC mCHP) units in 10 European countries.

The project brings together the five leading European suppliers (BDR Thermea, Bosch, SOLIDpower, Sunfire and Viessmann), and will focus on customer homes and small enterprises.

Manufacturers are supported by four partners –associations, consultancies, and research organisations – providing specific expertise (COGEN Europe, Danish Technical University, Element Energy and Lucerne University of Applied Sciences and Arts).

With around 100 million boilers installed in residential buildings across Europe, a further development of Fuel Cell micro-Cogeneration technologies is key to delivering significant energy savings and emission reductions in the building sector.

The PACE project will bring various and significant benefits that will drive Fuel Cell micro-Cogeneration sector closer to mass market uptake:

1) Reducing costs and improving competitiveness
2) Improving performance
3) Establishing FC micro CHP as a standard technology
4) Raising awareness on Fuel Cell micro-Cogeneration

PACE is a € 90 million public-private project co-funded by the Fuel Cells and Hydrogen 2 Joint Undertaking (FCH JU).

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 700339. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme and Hydrogen Europe and Hydrogen Research.

Figure 1 below presents an overview of the project, the partners involved, and the location of the PACE field trial.

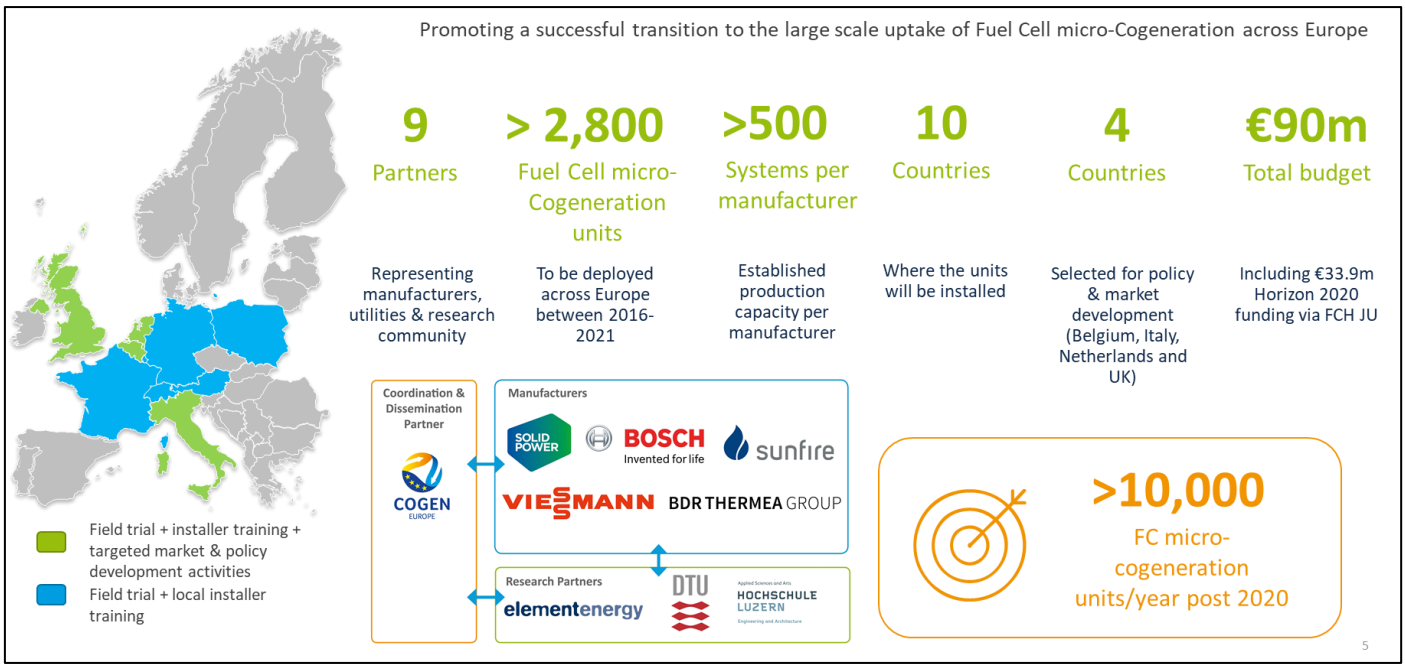

Figure 1: Overview of the PACE project

1.2 Introduction to WP1 and D1.2

Work Package 1 focuses on **Product Innovation and Field Demonstration**, where all 2,800 fuel cell mCHP units are developed, manufactured and demonstrated in 10 countries.

In order to prepare for the field trial, PACE project partners have worked to build robust routes to market for FC mCHP. This has been realised through installer training, marketing and sales development, and building relationships initiated in previous trials (such as ene.field, Callux, SOFT-PACT).

Each original equipment manufacturer (OEM) has built upon experience from previous trials and has initiated the processes to better incorporate FC mCHP into existing sales and marketing channels,

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improving the viability of the commercial offer. This will help to develop a sustainable future and market for the technology, contributing towards the other PACE Work Packages.

Within PACE, each FC mCHP supplier has a target to:

- Establish innovative sales and marketing channels suitable for ramp-up to 1,000 systems/year and higher.
- Train a minimum of 100 installers to increase awareness, enable expansion and establish specialist field support teams to provide expert after-market support for the products in the field.
- Develop options for risk transfer away from the consumer through offering of extended service packages.

D1.2 gives an overview of key lessons learned in setting up sales and support channels, and any implications for future expansion of the sector.

This report was prepared by Element Energy, with contributions from all PACE OEMs. During bi-annual in-person Consortium Meetings, each PACE OEM presents an overview of ongoing work on market development, innovative sales channels, installer recruitment & training, and the offer to customers. The information presented during these meetings is aggregated and serves as the basis for this report, from which key conclusions are derived. Unless information is publicly available, references to any specific OEM are removed. This report is intended to give an overview of general trends and different possible strategies for market development, and therefore does not represent the views of any PACE OEM in particular. The following chapters will address the topics of innovative sales and marketing, installer recruitment and training, the offer to customers and key lessons learned in turn.

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2. Innovative sales and marketing channels

A key objective within the PACE project is for OEMs to set up new sales and marketing channels, enabling the development of new routes to market for the technology. Not only do these activities enable the deployment of over 2,800 FC mCHP units in 10 countries, but they lay the foundations for further ramp-up of the technology to over 1,000 units per year as part of a viable commercial offer beyond the project. The new sales and marketing channels are to an extent enabled by additional activities to recruit and train new installers, as well as the offer to the customer, both of which are explored in the following chapters.

In order for PACE partners to develop the market for FC mCHP, specific audiences are targeted as end-users. These customers must be suitable, both in terms of having the correct building type and energy profile, but also in terms of general attitudes towards the technology.

The specific building type is important for unit choice: FC mCHP units are broadly split into electricity-led and heat-led units. Electricity-led units should be installed in buildings with high electricity needs in order to meet the electricity consumption of the building. For residential settings, it may be beneficial to target customers who already own one or more battery-electric vehicles and/or heat pumps. Heat-led units, on the other hand, are more suited to older buildings which are difficult to insulate (such as heritage buildings), and therefore have a high heat demand. It is a common strategy for the OEM to confirm building/customer suitability before an order is accepted.

Furthermore, the customer profile is important, with affluent customers who display favourable attitudes towards 'green' climate change agendas generally being targeted by OEMs. During early phases of market development, these customers are 'early adopters' of the technology, keen to advance the technology and less averse to the financial and operational risks involved in FC mCHP as a new and innovative technology. This is reflected in the first iteration of the PACE report on customer attitudes to fuel cell micro-CHP (D2.11), shown below in Figure 2. The figure shows that OEM targeting of such consumers has led to their views being reflected in the wider make-up of all PACE customers.

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Figure 2: PACE customer attitudes

To be able to reach the targeted customers, PACE OEMs may use several channels to sell and install FC mCHP units. Often established sales partners are used, building on the partnerships and networks that were initiated through the ene.field project. However, in addition to this other new distribution channels have been specifically set-up during the PACE project, such as:

- Installers (independent installers as well as groupings)
- Energy suppliers
- LPG-providers, attracted by the possibility to replace oil-based heating solutions
- Retailers and Online-Heating-Portals
- Residential developers
- Planners, architects
- Energy consultants
- Local utilities

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Indeed, one PACE OEM specifically targeted new-build developments as a key route to market. As such, they worked with developers and architects to set up new sales channels and opportunities to deploy FC mCHP technology in these settings.

A potential area for further development involves establishing new sales channels with wholesalers, a more conventional channel for traditional heating systems. Currently, the use of wholesalers is not preferred for many OEMs, as low volumes mean that there is little value added for both parties, and costing structures can create excessive complexity. However, if costs are reduced and power pricing increases, combined with a larger role for grid balancing solutions, there may be potential for the business case for larger units to improve. In future, new potential target customers could include grid-operators, ESCOs, aggregators, data-centres, OEMs, industry and utilities.

To support the establishment of new routes to market by reaching new target groups and new channels, FC mCHP products are regularly presented at regional and international trade fairs. These trade fairs are intended to not only promote the product but also allow engagement in additional marketing activities with new partners and installers, as well as new customers and end-users. For example, OEMs participate in activities such as interviews with politicians and other key stakeholders. Some OEMs have additionally worked on the development of the branding for the new FC mCHP product. This may include updates to logos, visual identities, colours, product themes, websites, social media and video media activities. One OEM debuted an entire new brand to act as a new distribution channel for FC mCHP units. An example of positive marketing is shown in Figure 3 below, with Senertec's 'customer success story' of the first installation of Dachs 0.8 (Gen Y), which was published on the PACE website and in the PACE Annual Bulletin, February 2020.

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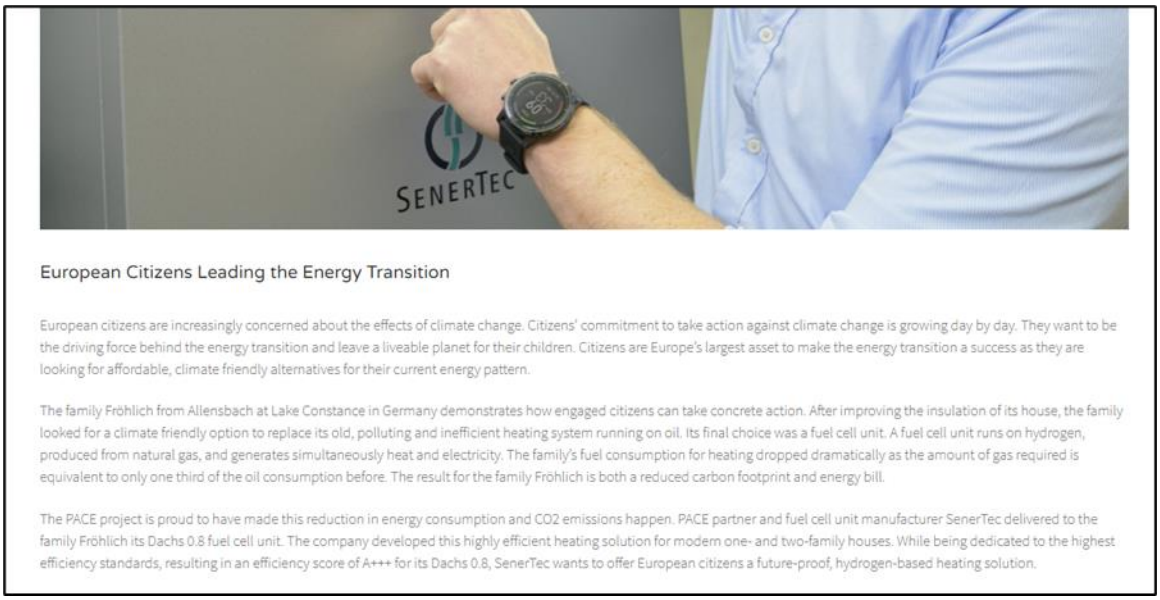

Figure 3: Example of a PACE customer success story

A key learning from the PACE field demonstration is that different national and/or regional contexts significantly impact the required marketing and sales strategies for FC mCHP. In countries where FC mCHP technology is more well-established (such as Germany), existing routes to market and existing sales channels are preferred. This may depend on several factors, such as where the core market for the particular brand is, how well known or established the brand is, and regulations on permitting and administrative requirements. The policy, energy market, grid connection, and other regulatory barriers can differ vastly between countries. Some national considerations are listed below:

- Stable low electricity prices stagnating demand (e.g. Austria), compared to high electricity prices (e.g. Belgium)
- Interest in technology and environmental awareness (e.g. UK)
- High administrative efforts (e.g. Germany)
- Differences in subsidies and tax policies for FC mCHP. For example in Belgium there are subsidies up to 200 kWh per year, where private and SME customers pay the same high power tariff, as opposed to the Netherlands where power becomes a lot cheaper above 10 MWh.
- Subsidies for other heating technologies like heat pumps (e.g. Germany)
- Cost of rival/incumbent technology (e.g. UK)

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- Regulation on how technology should be installed, for example the requirement to 'wall-hang' boilers in most smaller buildings in the Netherlands is a significant limitation for floor-standing units.

Differences in national context necessitate variable strategies for routes to market. For example, one OEM targets customers in the Netherlands by offering an 'energy as a service' package, to build scale by working with collaborators including local authorities and housing associations, in order to access volume purchases beyond the high spending private single-family home. OEMs will participate in strategic trade fairs in specific countries to develop sales channels in targeted regions. National context and policy also changes over time, potentially drastically changing the sales strategy for an OEM. In Belgium and the Netherlands, a change in grid connection processes and a lower price spread between natural gas and electricity, as well as a change in funding conditions, impacted the attractiveness of the system. The PACE project hosts a 'regulatory barriers working group', which meets on a 6 monthly basis to debate issues arising in different member states affecting the ability to install mCHP units. This work directly feeds into the PACE work package 3, 'Policy and Market Development', with several public deliverables as outputs.

OEMs within the PACE project have taken many different steps to develop routes to market through the creation of new sales channels and marketing strategies, influenced heavily by the national context. In order to fully establish these new channels, OEMs must work to recruit and train new installers. Strategies for this will be addressed in the next section.

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3. Strategies for training and recruiting installers

Installers are trained not only as individuals with the sufficient competency to install the new FC mCHP technology, but also as sales partners, and key channels through which units are deployed. As a new technology, FC mCHP has additional requirements for specialised training (e.g. electrician know-how, IT skills), and as such only trained and qualified installers can sell and install the technology.

Several OEMs have cited that the main challenge to the development of the business model is the timing of uptake by installers, and a potential shortage of installation capacity or motivation for installer training. In some cases the initial sales ramp-up was slower than expected in the project with training of installers required, negatively impacting the speed of FC mCHP roll-out. This highlights the importance of training and recruiting installers.

It is a PACE project target for each OEM to train a minimum of 100 installers to increase awareness, enable expansion and establish specialist field support teams to provide expert after-market support for the products in the field. As of May 2020, a total of 723 installers were trained by OEMs as part of PACE, significantly more than the project target.

Specialist OEM training centres have been set up since the start of the PACE project. Some OEMs have organised tours of targeted regions (for example around Germany) to train installers, energy consultants, planners and other key stakeholders to effectively implement FC mCHP technology in different settings. Installers should be able to assess the customers' suitability and requirements for the use of FC mCHP, specific heat/electricity demand, user behaviour, and other preconditions for the installation of the technology. Specific attention is given to the various planning requirements for FC mCHP, such as hydraulic integration, FC storage, supply & exhaust systems, and electrical installations. Installer training also covers the country-specific requirements and procedures that vary between different regions, for example electrical metering and safety requirements. For some OEMs, installer training involves more than the specific technical competency, requirements, and know-how. In addition, these OEMs provide specific marketing support and work with installers on the development of new marketing opportunities and activities, as well as new sales channels.

A large quantity of materials, such as guidance documents, operation manuals and mobile phone apps, have been created to support installers as they develop competency with FC mCHP. Topics range from the basics of the technology, to the requirements and pre-conditions for FC mCHP, and to the procedures required for installers and customers, setting out actions to be taken before, during and after installation. Furthermore, OEMs keep installers informed of new developments to the product through various materials, such as regular newsletters and sales price updates as necessary.

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PACE also has a separate Task 1.4 for the creation of a **working group on training and certification**. One activity within this task was the preparation of the deliverable D1.9 'Report on training and certification' by Element Energy. This involved the compilation and collation of a set of training materials, providing an introduction to fuel cell mCHP as a technology and focused particularly at installers. This deliverable was split into 3 core modules of 'FC mCHP Basics', 'Planning, Dimensioning and Formal Requirements' and 'Electrical and Heating Installation'. In the next phase of Task 1.4, these training materials will be disseminated to key training and certification stakeholders in the FC mCHP industry. An example slide from D1.9 is presented in Figure 4 below.

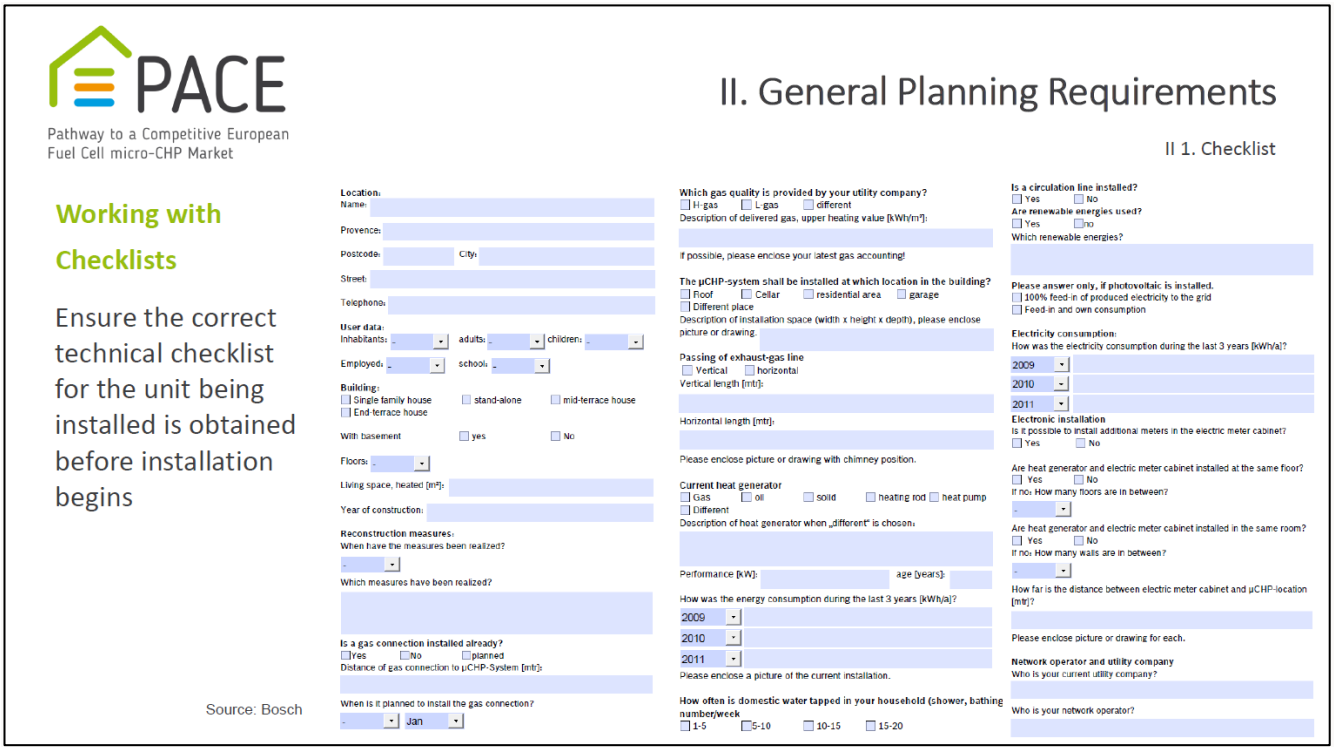

Figure 4: Example of training materials collated as part of PACE D1.9

One barrier which D1.9 aims to address is the fact that, at current, some OEMs require installers to attend their specific training before they become eligible to market and install their unit. Ideally in a fully scaled market, it would be possible for installers to attend a single generic training to become eligible to market units from a variety of OEMs. Such a training may lead to an official certification

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showing the installers' expertise in FC mCHP technology. It is a long-term desire of the PACE project to see such innovative certification brought about.

Several OEMs have recruited installers through attendance and exhibitions at trade fairs, promotional tours, and other marketing opportunities. As mentioned in Chapter 2, FC mCHP products are regularly presented at regular regional and international trade fairs, targeting key stakeholders through which FC mCHP units can be sold and/or installed. Indeed, the brand development and product marketing work through various media sources has also contributed to efforts to recruit new installers. Trade Fairs can be targeted strategically where market development is important, for example the VSK Trade Fair in Utrecht was cited as a key step into the Dutch market.

Recent restrictions on travel and mass gatherings due to the Covid-19 pandemic have limited the ability of PACE OEMs to promote the FC mCHP product and recruit new installers through regular trade fairs, tours, or other standard events and channels. Partners have instead switched their focus to webinars, digital information and online training and maintenance, which have been developed in new interactive video formats. Furthermore, social media and other brand development activities were reinforced, with a concerted effort to maintain a strong online presence for marketing to new partners and installers, as well as customers.

Throughout the PACE project OEMs have developed their network of installers through recruitment and training, enabling the deployment of FC mCHP with sufficient technical competency and know-how, where installers are also used as key sales channels. Such networks have been established that the PACE project has far exceeded its minimum target of 100 installers per OEM. Adapting to the Covid-19 pandemic with online activities and new training materials has ensured the robustness of installer networks and has enabled the further development of these networks despite Covid-19 restrictions. The network of qualified and certified installers who are able to implement and service FC mCHP units is a key factor in creating an attractive product to potential customers.

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4. Offer to customers

To create a viable route to market for such a new technology, PACE OEMs have worked to create an attractive offer to potential customers. Whilst some customers are 'early adopters', keen to progress the technology, there is still a relatively large degree of financial and operational risk taken on by customers, compared to the incumbent technology. As such, it is important that some of this risk is transferred away from the consumer in order to incentivise further uptake.

For FC mCHP to enter the mass market as a viable product, cost of the technology is a key factor. At present, a combination of PACE funding and other national and/or regional subsidies help to bring the cost down for customers. The survey analysis conducted as part of D2.11 demonstrated that the majority of customers expect to save money on their energy bills, however it was found that the expected subsidies vary by country and type of FC mCHP unit. For units installed as a replacement to existing heating systems, 32% of respondents expect to see further financial benefits in the form of government incentives or subsidies, compared to 58% for units installed in addition to existing heating systems. Most respondents in the UK and Germany expect additional financial benefits of some sort, whereas the majority of French customers expect to receive no money from government incentives. For Belgian customers, 60% of respondents with addition units expect government incentives, compared to only 15% of Belgian customers with replacement units.

In addition to receiving such financial incentives, the burden related to the administrative processes to access these incentives can be taken on by the OEM. For example, specific to the German market, Viessmann offers a funding application support service to customers, "Viessmann FörderProfi". This specialised service covers various funding programmes and deals with all administrative paperwork for the customer. These measures enhance the offer to the customer by mitigating any risks and inconvenience when applying for subsidies and financial support.

Installation costs can differ from customer to customer based on several factors, such as whether the end-user is a private customer or SME, differences in regulations, third party certification requirements, age of the building, and the specific type of installation. Further to this, the actual installers and/or sales partners may take the opportunity to alter the price of FC mCHP, increasing their profit margin dependent on demand and purchasing power.

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Understandably, the quality and benefits of FC mCHP as a product are important prerequisites to attract potential customers. FC mCHPs are compatible with most types of buildings and conditions, enable demand driven operation as part of a smart grid, can be optimally adjusted to the energy requirements of the building, and can act as a supporting technology for renewables & low-carbon gases such as hydrogen. As a highly efficient technology, the reduction in primary energy usage for FC mCHP compared to incumbent technologies results in greenhouse gas emissions reductions. As mentioned in Chapter 2, many customers place a high degree of importance on the ability to support the decarbonisation of energy, driving the transition to low-carbon and renewable energy sources.

Aside from the cost factor and the quality of the product itself, OEMs have reduced the risks for customers through the provision of 10-year full service contract with warranties, lifetime and efficiency guarantees. Service contracts can include service and spare parts for the fuel cell and the peak load boiler as well as commissioning of the whole system. The risk is transferred away from the customer, who is provided guarantees of continued operation for a fixed, upfront cost, enabling clear and accurate payback calculations.

New service structures and networks have been developed, usually involving installers with first level competency and the OEMs for second level maintenance. Support starts with the commissioning and develops into regular maintenance via signed contracts, ensuring the availability of sufficient spare parts and available technicians. Service protocols have been formalised with checklists, error route cause evaluation, error reports and appliance histories. Customers have access to various resources, technical support hotlines and help desks. For one OEM, all units are connected to a real-time online monitoring system, generating an alert for any part of the system requiring online or in-person support or maintenance. Installers and servicing partners may also have access to ‘expert’ help desks, as experience and expertise is developed with the new technology, particularly around any issues and/or failures with the units.

It appears that the provision of such service and aftersales support packages remains relatively localised, with the creation of service regions at the early stage of market proliferation. Geographically dispersed installations necessitate high travel distances for servicing until local competencies and networks are fully established. This presents a particular difficulty for countries and regions where the technology is less well-established. As new sales and marketing channels are established to access new markets and countries, new service and maintenance clusters are required.

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As scale of production increases (into more than 1000 units per year) and more installers recruited, a wider geographical range of regional service teams will be possible. Furthermore, this scale will also allow a higher degree of automisation and production cost reductions, as well as the ability to agree volume contracts based on sustainable pricing forecasts, ultimately resulting in a lower price and more attractive offer for the customer. Increased market proliferation will continue to improve the viability of FC mCHP for potential customers.

5. Key conclusions and lessons learnt

It is clear that the work being done as part of the PACE project is key to the development of routes to market for FC mCHP in Europe. The establishment of new sales and marketing channels, training and recruiting new networks of installers with sufficient competency, and the development of an attractive and low-risk offer to potential customers must all be considered in parallel to one another. Routes to market involve the full value chain from production, sales, distribution, installation and after-sales. In order to access new markets, robust sales channels, installers, and maintenance structures must be established.

Providing a high-quality product to the customer, in terms of functionality, environmental and cost benefits is a vital prerequisite, which must be supported by well-established servicing and aftersales support mechanisms. Targeted marketing and robust sales channels can then access such customers, enabled by a large pool of qualified and certified installers, as well as other sales and servicing partners.

The work undertaken by PACE OEMs has laid the foundations for further proliferation into European markets, moving beyond early adopters of the technology and towards mass market roll-out. As scale of production and sales increase to more than 1000 units per year, the viability of FC mCHP as a business model will continue to improve, with cost reductions and access to a growing range of markets.

Despite this, there are still many barriers to market development, often affected by country-specific factors. Regional funding mechanisms are required to help ‘open up’ certain markets. For example, the KfW 433 programme has supported the uptake of FC mCHP in Germany, subsidising units for potential

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customers and promoting training on installation and maintenance of the systems. The development of a marketing and servicing ecosystem in Germany as a result of this uptake serves as a model: the German success case provides a good example for other European markets to continue the momentum towards reaching mass commercialisation for these home energy solutions. There is not one single route to market for FC mCHP, but it is clear that administrative efforts and bureaucracy should be simplified, and long-term, stable regulatory support established to enable route-to-market actors to engage with and invest in the technology. This will allow FC mCHP to reach its full potential as a key domestic decarbonisation technology for Europe.

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