



# HEAT PUMPS SKILLS FOR NZEB CONSTRUCTION (HP4ALL)

Report of best practice initiatives designed to  
increase the skills in the energy sector

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*This report is review of best practice initiatives designed to increase the skills in the energy sector and is led by IERC.*

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# 1 Executive summary

HP4ALL brings together leading experts across Europe to enable capacity and skills development within the Heat Pump (HP) sector and to ensure that the energy efficiency gains afforded by HPs are realised. HP4ALL will work both with the supply side (manufacturers, SMEs, installers etc.) and demand side (building owners, public sector etc.) to enhance, develop, and promote the skills required for high quality, optimised HP installations within residential and non-residential buildings. The project has received funding from the European Union's Horizon 2020 programme, grant agreement no. 891775.

The objective of this report is two-fold:

- To review the current best practice initiatives for increasing the skills in the energy sector with a specific focus on the HP market; and
- To identify the key learning points from these best practice initiatives and how they can be applied to HP4ALL to ensure the success of the project.

Information of state-of-the art initiatives, projects, incentives and policies were gathered through a thorough desk-based literature review and where necessary, telephone interviews were conducted to gather more detailed information. Details such as description, outcome, barriers, key learning points and relevance to HP4ALL were recorded in initiative templates, to ensure consistency in the approach. The project looked at twelve European countries, namely:

- the three pilot countries: Austria, Ireland, Spain
- the three observer countries: Croatia, Portugal and Romania
- and six other European countries: Finland, France, Italy, Germany, Norway and Sweden; these six countries have been selected based on a HP market review conducted by the European Heat Pump Association that revealed these were the countries with most HP sales in Europe in 2017.

The main key learning points identified from these best practice initiatives are summarized below:

- Associations can act as a facilitator who can liaise between key stakeholders and use their networks to reach large audiences and professional bodies.
- In terms of education, it is important to:
  - Ensure training quality for energy professionals and installers by: choosing the right training provider; continuously updating the curriculum; tailoring the training to the audience; and ensuring that the training format is appropriate for the audience.
  - Ensure high levels of uptake of training by: undertaking focussed marketing activities to attract participants; embedding training programmes in a wider policy framework to create an incentive for people to be trained; leveraging the support of professional bodies and networks; and embedding the training into existing education and training structures to this ensure that knowledge is transferred widely.
  - Ensure lasting impact of training programmes by developing suitable train-the-trainer materials.
- Energy advice services and one-stop-shops can help by:



- Providing a combination of technical, legal and financial advice to individuals and/or companies that helps them through the decision making process to find the best option for their project.
  - Offering impartial advice in order to build trust with clients.
- The creation of energy networks of experts proved to be a strong driving force for innovation, as they:
  - Ensure the information and awareness activities reach a broad audience.
  - Can leverage the social capital that exists within networks of similar businesses.
  - Enable peers to learn from each other and encourages them to take action if members of their peer group have already taken action.
- Initiatives that drive the demand for skills should be embedded into a wider policy framework that links financial incentives with certification schemes for products and installers, all backed up by easily accessible information and advice and supported by robust policies and regulation.
- Training tools are a useful means of increasing awareness of nZEB, and therefore HPs, for all stakeholders in the value chain and beyond. Providing free, easy and understandable tools in line with the most recent means of communication can help to bring citizens closer to sustainable energy issues, increasing their knowledge on the subject, promoting their involvement and inspiring behavioural changes, as well as being a useful tool for technicians and professionals in the sector.
- Monitoring and analysing the installed HPs performance is necessary to avoid HPs performing poorly and not achieving the expected energy savings. Monitoring the different training schemes and maintaining a database of competences can help to provide mutual recognition of the training throughout Europe.

These key learning points will be relevant in each of the HP4ALL pilot countries and will inform the activities that will be implemented in the different regions, taking into account each region's market needs. These best practices will also be incorporated into the knowledge hub that will be developed within the project.



## 2 Acronyms and abbreviations

<b>ASHP</b>	Air Source Heat Pumps
<b>BER</b>	Building Energy Rating
<b>COP</b>	Coefficient of Performance
<b>EHPA</b>	European Heat Pump Association
<b>EPBD</b>	Energy Performance of Buildings Directive
<b>ESV</b>	OÖ Energiesparverband, the energy agency of the region of Upper Austria
<b>GWP</b>	Global Warming Potential
<b>HP</b>	Heat Pump
<b>NCE</b>	Norwegian Centres of Expertise
<b>NZEB</b>	Near Zero Energy Buildings
<b>PV</b>	Photovoltaic
<b>RES</b>	Renewable Energy systems
<b>SEAI</b>	Sustainable Energy Authority Ireland
<b>SME</b>	Small and Medium Enterprise
<b>SSRH</b>	The Support Scheme for Renewable Heat

## 3 Introduction

### a. Background

The European HP sector has seen a growth of 100% since 2006. Over 1.4 million heat pumps (HPs) were installed in Europe in 2019, representing an increase of 17.7% over the previous year. It is anticipated that this growth will continue in the coming years and is likely to accelerate with many European markets declaring their intention to roll out HPs in the domestic sector as part of the transition to low carbon heating and cooling. Thus a doubling of the European HP market can be expected by 2024. With this anticipated growth, there is an urgent need to maintain and improve the knowledge and expertise of the stakeholders directly involved in the HP value chain including those responsible for research, design, manufacturing, installation, commissioning and maintenance of HPs as well as the end users.

HP4ALL aims to facilitate the large scale deployment of HPs in residential and non-residential buildings by working with the entire HP value chain including both the supply side (manufacturers, engineers, designers, installers) and the demand side (building owners and end users). The project will focus on the value and contribution of skills to the reduction in the energy performance gap in near Zero Energy Buildings from a holistic and systemic point of view.

HP4ALL will develop a set of tools and resources that can be used by the different stakeholders which will be validated through 3 regional plans being implemented in Upper Austria, Spain and Ireland. These regional implementation plans are intended to drive market change, to



influence end-user decisions and to plan for new innovations and emerging technologies in the HP market. A board of leading experts in the HP and energy sector will support the regional actors to prepare the market for new innovations. A replication plan will be developed to address the HP skills in all countries, for all building types and for all types of innovations.

## b. Aim of this report

The objectives of this report are to (i) review the current best practice initiatives for increasing the skills in the energy sector with a specific focus on the HP market; (ii) identify the key learning points from these best practice initiatives and how they can be applied to HP4ALL to ensure the success of the project.

## c. Methodology & limitations

A list of state-of-the art initiatives, projects, incentives and policies were gathered through a thorough desk-based literature review. Where necessary, telephone interviews were undertaken with the key project representative (such as the project coordinator or technical expert) to gather more detailed information on the barriers that the project faced, level of impact that the project had, critical factors that contributed to the project's success and to better understand the relevance of those key learning points to the HP4ALL project. To ensure consistency in the approach, details about each project were recorded in a template (See Section Appendix 1 – Literature review templates) and then reviewed and compared to identify common themes or evidence of best practice that can be applied to HP4ALL.

There are a huge array of projects and initiatives working on various elements of skills development around Europe. A comprehensive review of all of them is outside the scope of this project so the analysis has focussed on those within the pilot and observer regions and those countries with the most well-developed HP market.



## 4 HP market context in Europe

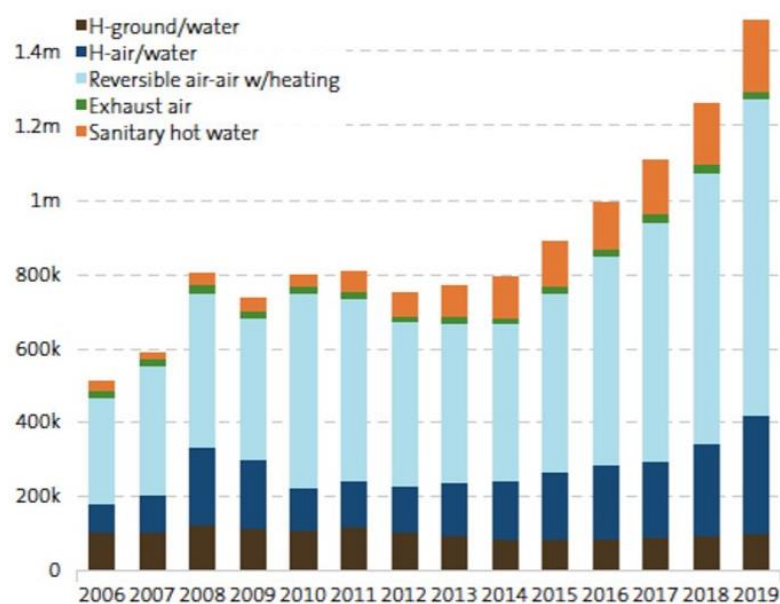
To provide a context for the report, this section presents a summary of the current status of the HP market in Europe and in the countries represented by the HP4ALL consortium partners.

### a. Europe

By the end of 2019, a total of 13.27 million HP units had been installed in the 21 countries covered by the European Heat Pump Market and Statistics Report 2020 (EHPA, 2020 p.7). This is an increase of 17.7% or 1.49 million units over 2018. The leading markets continue to be France, Italy and Spain. Together they are responsible for more than half of annual HP sales in Europe.

Most remarkably, France is now close to a 10-year growth path and continues to be the engine for further growth in Europe. A recent assessment by AFPAC (Association Française pour la pompe à chaleur) has revealed a positive outlook of 44.3% growth in a market that has already been growing very strongly in the past. Other countries are likely to follow. The Netherlands has declared its aim to become “gas free” in residential heating, the UK has announced a ban on the installation of oil and gas boilers in new buildings, Austria has put in place a “ban on oil heating” in new buildings with further restriction currently in the legislative pipeline, and Ireland has put HPs at the centre of its efforts to decarbonize the building stock. Even those countries that have no specific policy in place see a positive market development.

While HPs by now are the #1 heating technology in the new build segment of many national markets, they are also making an inroad into the renovation sector. Improved technologies and new business models that assist with financing HP installation help their deployment and prepare the technology for continued growth. This will be further fuelled by the implementation of the revised Energy Performance of Buildings Directive (EPBD) that requires a high standard of energy efficiency for new buildings and is now also mandating that Member States address the renovation sector.



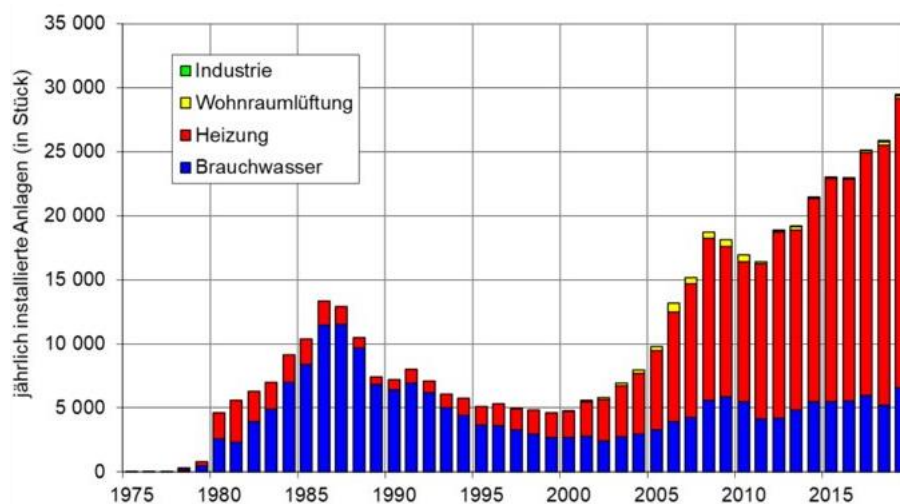
European Heat Pump Market and Statistics Report 2020 (EHPA, 2020, p.8)

Figure 4.1 Sales development by type ("H" indicates primary heating function)

With 1.49 million units sold across Europe in 2019, another new sales record has been achieved. Assuming a life expectancy of approximately 20 years, the current European HP stock amounts to 13.27 million units. With approximately 244 million residential buildings in Europe, the HP market share in the building stock is about 5%. In 2019, HPs with a thermal capacity of 12.7 GW were installed producing approximately 25.1 TWh of useful energy and integrating 15.6 TWh of renewables in heating and cooling while avoiding 4.0 Mt of CO<sub>2</sub>-equivalent emissions. In order to produce the 2019 sales volume and to maintain the installed stock, a total of 79,000 person-years of employment were necessary. Obviously real employment related to the HP market is larger, as not all employees work full-time on HPs only with Eurostat reporting direct and indirect employment in the sector (2018) at approximately 225,000.

## b. Austria/Upper Austria

The HP market in Austria started taking off in the 1980s and has experienced steep growth since the turn of the century. Today, there are over 300,000 HPs in operation. Almost 30,000 new systems were installed in 2019 (Figure 4.2). Of these systems, 70% are used for space heating, 27% for hot water, 2% for room ventilation and 1% in industry. The strongest growth has been seen for HPs for space heating up to 10 kW - which currently accounts for about 50% of new systems installed each year. Overall, the HP sector in Austria, including production, trade, installation and monetary value of heat, represents a market of 600 million Euro/year, provides 1,500 full-time jobs and exports 10,000 HPs annually.



Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, Report "Innovative Energietechnologien in Österreich Marktentwicklung 2019" (p.171)

Figure 4.2 HP Market in Austria (installed numbers per years)



Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, Report "Innovative Energietechnologien in Österreich Marktentwicklung 2019" (p.172)

Figure 4.3 Installed HPs for space heating (red) and for space cooling (blue) in Austria

Upper Austria, one of Austria's 9 regions with a population of 1.5 million, is well on its way in the clean energy transition: 73% of the electricity, 56% of all space heating and 31% of the primary energy come from renewables (Figure 4.4). Through significant increases in energy efficiency and renewable energy, greenhouse gas emissions from buildings have been reduced by 32% in the last 10 years. Around 6 % of Upper Austrian dwellings are equipped with HPs (Figure 4.5), and the trend is increasing.

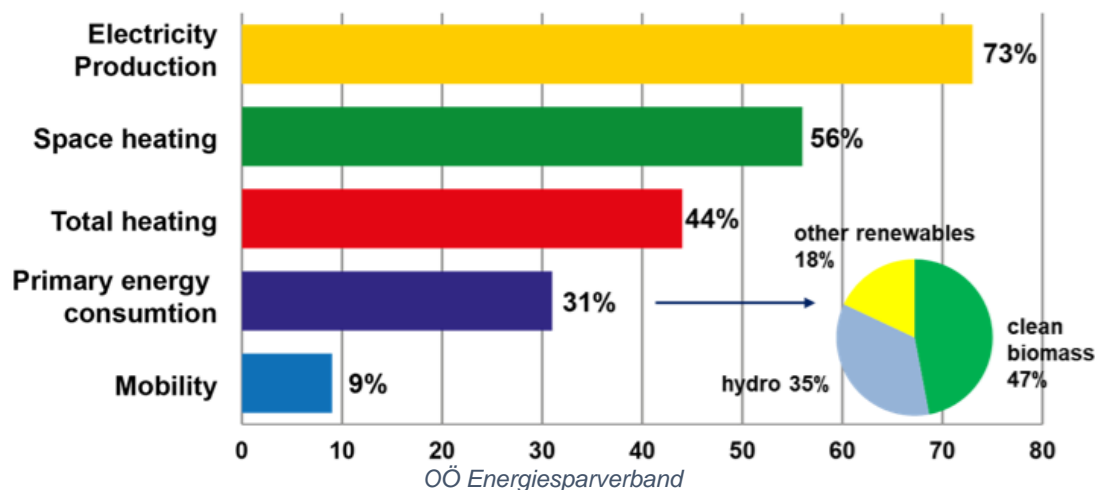
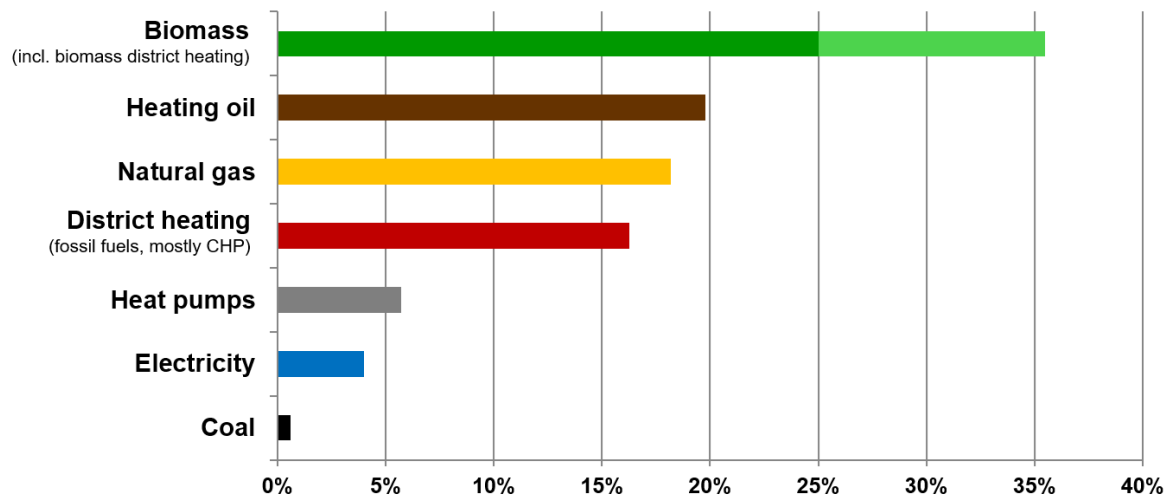


Figure 4.4 Renewable shares in sector in Upper Austria



OÖ Energiesparverband

Figure 4.5 Heating % of all dwellings in Upper Austria

Since the mid-90s, the regional government, supported by the regional energy agency OÖ Energiesparverband (ESV), has been following a strategic and long-term vision in the face of the changing global energy world. Well-established policy structures to tackle the energy transition are already in place. The region's multi-faceted approach is based on a combination of regulatory measures ("sticks"), financial incentives ("carrots") and information and training activities ("tambourines").

In Austria, due to the country's federal structure, building legislation and the implementation of the European Buildings Directive are regional matters. This offers the regions flexibility in choosing which measures to apply to achieve energy and climate targets. In Upper Austria, legislation for buildings and heating and cooling systems are strategically used to drive innovation by regularly updating them towards higher efficiency and lower emissions. Funding programmes that target the various steps of the innovation process are also strong tools. Different programmes support R&D, market introduction of new technologies and their subsequent mass deployment.

Regarding the HP sector, trends that have emerged in recent years include combined systems (heating and cooling) and hybrid systems (biomass and heat pump systems). Strict efficiency criteria in funding programmes assure that only high-quality technologies are installed and that the further development of the HP sector contribute to energy efficiency and renewable goals. Such criteria include:

- performance requirements, based on a seasonal efficiency calculation
- strict noise limits for air-source HPs
- refrigerant Global Warming Potential (GWP) must be below 1,500, maximum flow temperature of the heat distribution system: 40°C
- must be combined with 3 kW PV, 4 m<sup>2</sup> solar thermal or green electricity contract



## c. Ireland

The Irish HP market became established around 2000 and in its early years was comprised mainly of the sale of Ground Source Heat Pumps (GSHPs) in one-off dwellings and a small number of commercial projects. A number of EU manufacturers entered the market along with one indigenous product. Early installations of Air Source Heat Pumps (ASHPs) struggled with the high humidity at low temperatures typically experienced in the Irish climate, as this leads to excessive ice build-up and poor HP performance. As a result ASHPs represented a small proportion of overall sales during the early years of market establishment.

From 2005-2008 a grant scheme run by the Sustainable Energy Authority of Ireland (SEAI) supported approximately 5,000 HP installations. Then in 2008, the Irish Building Regulations introduced the requirement that dwellings contain at least one Renewable Energy Technology (Technical Guidance Document L – Conservation of Fuel and Energy –Dwellings, 2008). This was an important step in guiding designers and builders of new dwellings towards the installation of HPs as the primary heat source. However, following the global financial crisis in 2008, the building of new homes slumped to very low levels and with it fell the sales of HPs. This situation persisted until around 2013.

The combination of economic recovery and more stringent building regulations has led to a recovery of the HP market. Since 2013 the percentage of new build dwellings fitted with HPs has grown year on year, increasing steadily to around 60% in 2020 (based on data from the first 9 months of the year) as shown in Figure 4.7. Most of these HPs (>90%) are ASHP due to their wider applicability in the Irish climate and ease of installation. In 2019, sales of HPs reached their highest level to date at 7,500 units. The latest building regulations published in 2019 has set even more stringent targets for renewable energy contribution and CO<sub>2</sub> reduction of new build dwellings. This, coupled with the Climate Action Plan published by the Irish Government in 2019 which envisages 600,000 HPs installed by 2030 (of which 400,000 should be retrofitted to existing properties), is expected to rapidly drive up the number domestic HPs installed from the current overall stock estimate of 33,000 (EHPA, 2019).

In 2020, grants are available to support the installation of domestic HPs for dwellings that can demonstrate that their performance exceeds a certain standard of building fabric and ventilation heat loss. The non-domestic HP sector has also seen an increase in activity since 2016 due to the availability of grant funding from the Better Energy Community Scheme run by SEAI. In addition, the Support Scheme for Renewable Heat (SSRH) was launched in September 2018 and supports ground, air and water source electric HP installations with grant funding to cover up to 30% of the capital outlay.



### BER Data: % of houses with HP

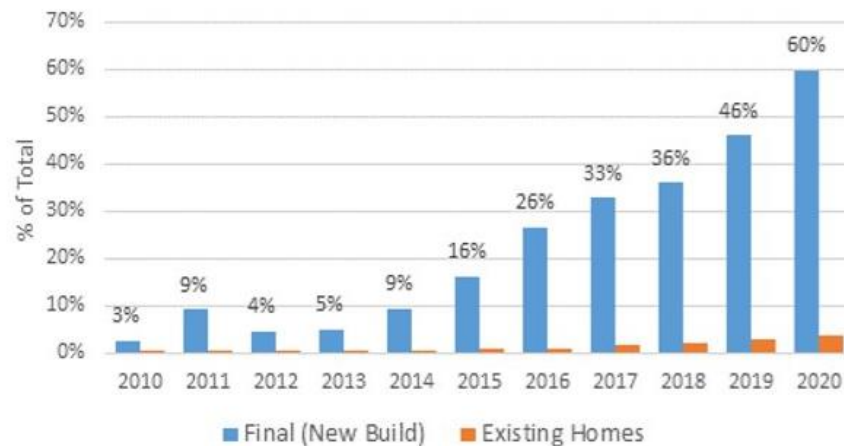


Figure 4.6 % of Irish houses with HPs installed

### BER Data: Number HP Installed

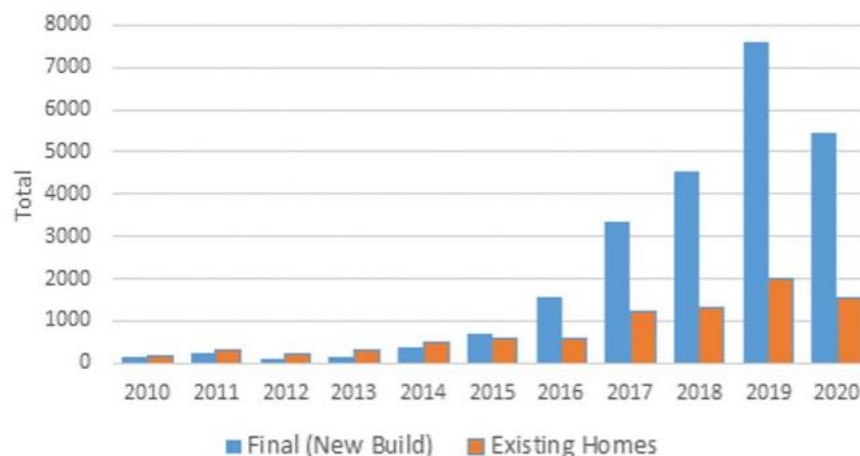


Figure 4.7 Number of HPs installed in Ireland

The Key stakeholders involved in Irish HP installations include:

- **Energy Auditors** who calculate the peak heat load, inputs heat emission system. They are also responsible for administering the HP grant for the homeowner.
- **Heating System Designers** who design heating and DHW systems and select the most appropriate HP type, make and model. This may or may not be the same person that carries out the energy audit.
- **Heating System Installer** who installs & commissions all aspects of heating system. They should provide adequate hand-over and follow-up maintenance services.
- **Building contractor** who is responsible for enabling works including: the provision of the HP base, drainage, trenching, pipe & cable pathways; organising the electrical supply; and coordinating other trades on site.
- **Drilling Contractor** who completes borehole installations in the case of GSHPs.
- **Refrigeration Engineer** who completes the installation of split systems and carries out repairs on the refrigeration circuit.

- **Electrical contractor** who completes and certifies electrical works.
- **Plumbing contractor** who connects the sanitary hot and cold-water systems to the DHW tank.

The Heat Pump Association of Ireland represents HP manufacturers and importers in the Republic of Ireland. The aims of the association are to:

- Raise awareness of the features and benefits of HP technology.
- Co-ordinate technical and market research.
- Freely transfer and share information on international best practice within the Irish HP Industry.
- Influence national legislation, regulatory and energy efficiency standards.
- Provide advice, technical and costing information to national government, local authorities and public bodies.
- Actively promote best practice design, professional installation and the appropriate application of HP technology in the Irish market

#### d. Italy

The Italian HP market is the second largest in Europe and is still growing.

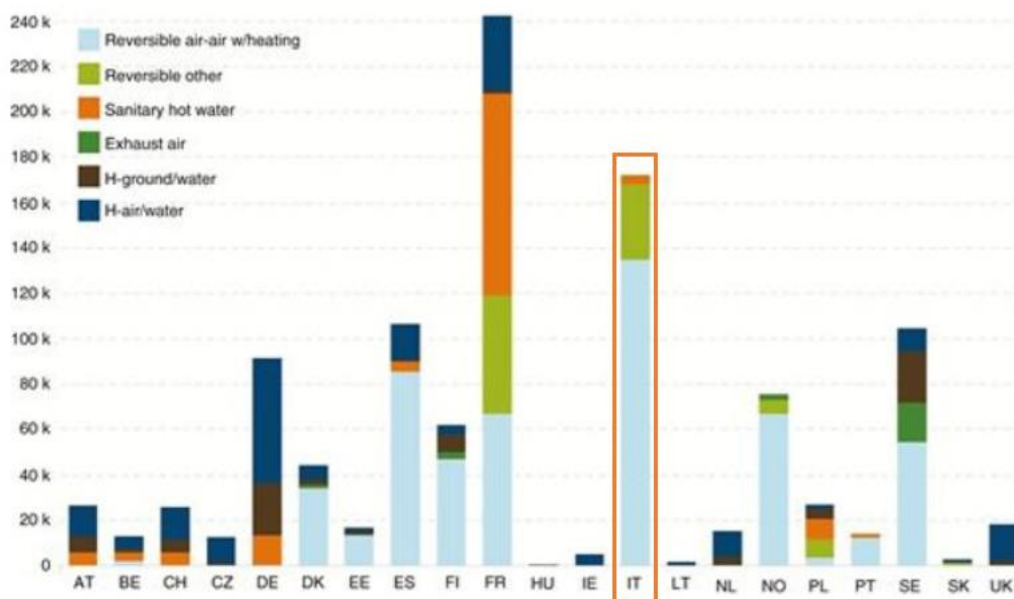


Figure 4.8 HP market in EU by type and by country in 2017

97 % of the HPs installed in Italy are ASHPs while the rest are mainly ground-source devices. As shown in Figure 4.9, the majority of the installed HPs are reversible air-air devices, mainly used for cooling. Lately, hybrid systems which combine a gas boiler with a HP have entered the market and experience a positive upward trend.

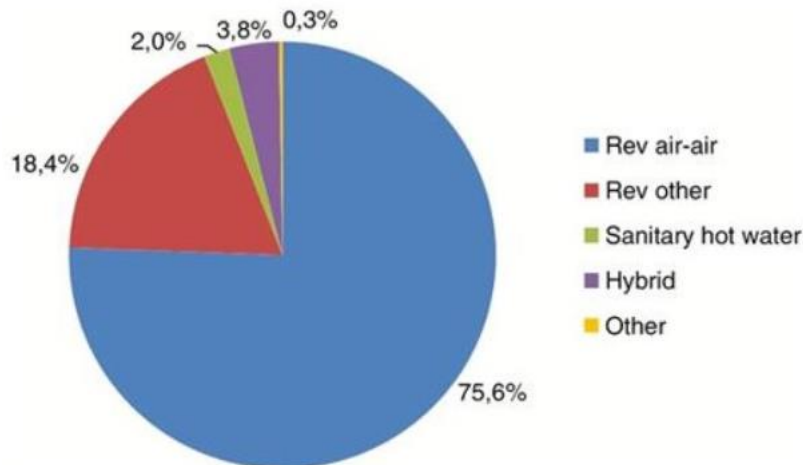


Figure 4.9 Italian HPs share by type

The HP market growth in Italy is largely driven by government incentive mechanisms. One of the most important of these incentives, available since 2014, is a special reduced electricity tariff available only to residential consumers who use a HP as their main heating system. A further financial incentive, introduced earlier in 2020, provides consumers with a 110% refund on the cost of a new heating pump or other green energy source via tax rebate. This generous incentive programme is only available until 31 December 2021, and is being marketed as part of a post Covid-19 recovery package.

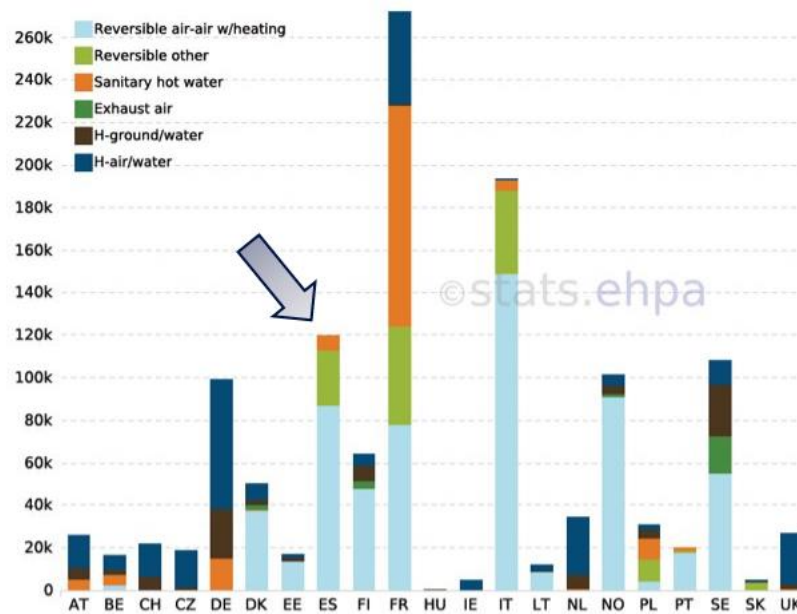
Despite its size and rapid growth over several years, there is still ample room for continued growth in the Italian market. For example, in the Nordic countries the number of sales per 1000 households (index of market penetration) is 5 times higher than in Italy indicating that the use of HPs in Italy has not yet reached its peak. The most important barriers currently restricting the Italian HP market are:

- Energy prices: electricity is around 3 times more expensive than gas per useful kWh leading to a preference for gas heating in most buildings.
- Lack of knowledge: installers may not be aware of the advantages of the technology, and the consumer may only see the high investment cost rather than the longer-term advantages.

### e. Spain

According to the HP Eurobarometer (EurObservER, 2018) the Spanish HP Market is the third largest in Europe. In 2015, more than 35% of Spanish households and facilities were equipped with HPs with an average COP of 3.5. 95% of the HPs were used to provide both heating and cooling with the remaining 5% providing cooling only. Nearly 90% of units installed were in domestic settings whilst industry and commerce are lagging behind.





Webinar: EHPA market report and statistics outlook 2019 | Thomas Nowak | 24.06.2019

Figure 4.10 HP sales in 2018 per type

The Spanish climatization market experienced a turning point between 2014 and 2017, with 71% reported cumulative increase in HPs installed and an 85% increase in RES share (Spanish Association of HP Manufacturers - AFEC Online Yearly Report 2019). From 2017 onwards the climatization market levelled off overall, the HP market continued to grow.

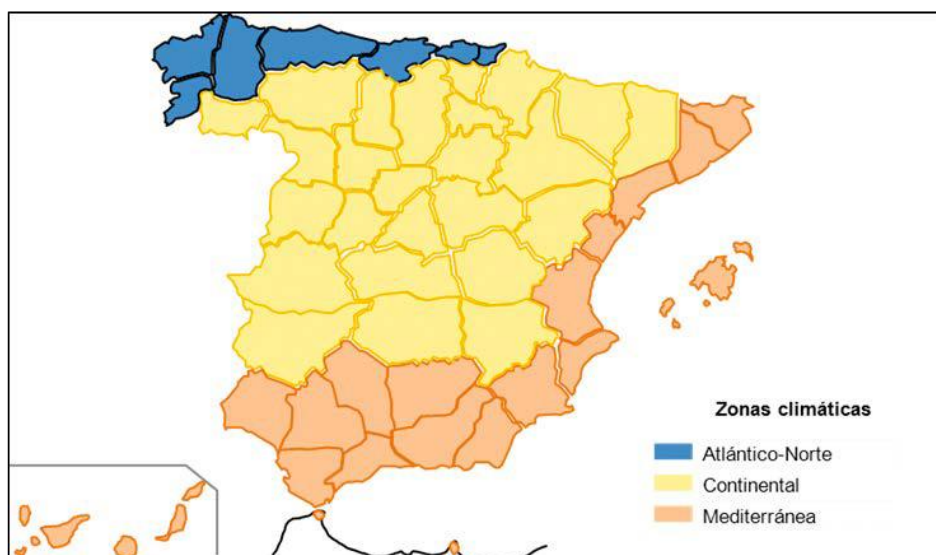


Figure 4.11 Spanish climatic zones

By 2019, 830,00 units were in operation. This represents nearly a 20% annual growth rate and 7% in geothermal HPs. 95% of these are multipurpose ASHPs (EHPA Market Report 2019, AFEC Online Yearly report 2019). There was a 320 M € annual turnover in 2019, with nearly

40% annual growth rate in some segments like multipurpose air-water systems (AFEC Online Yearly report 2019).



Figure 4.12 Evolution of the heating and cooling market in Spain Vertical axis: Global annual turnover in M€. Source: AFEC online yearly report 2019

The year 2020 experienced a sharp reduction in HP installations (-19.5%) due largely to the COVID-19 outbreak. Installations decreased by a relatively modest 13% in the domestic sector, but the impact has been more severe in the industrial sector, which saw a 27% decline, and the commercial sector, which saw a 29% drop in installations. sectors (AFEC Online Yearly report 2019).

According to the Spanish Institute for Energy Savings and Diversification (Spanish HP Market Report 2018), there is a clear untapped potential for HP usage in providing sanitary hot water applications and the use of geothermal RES to supply both residential and tertiary applications. This is particularly true in Central and Northern Spain where, so far, HPs are considered less favourable and less economically competitive compared to traditional systems such as biomass combustion heating. The lack of information about HP applications, and a misconception among consumers that HPs are only suitable for household cooling and lag other technologies in terms of cost-efficiency when used for other purposes like heating, has thus far restricted market growth in Central and Northern Spain. Although HP sales soared during the period 2014 - 17 much of this growth can be accounted for by the sale of HPs for vacation homes. These properties, mainly located in Mediterranean areas, have demanding cooling needs but little need for heating and small hot water requirements due to the low occupancy in winter months. Currently, the projected HP market share by 2030 ranges from 10% to 70% depending on the type and region of application. However, the political HP deployment targets for 2030 (reflected in the Spanish Strategy for Energy Efficiency in Buildings) are currently under revision and are likely to be more ambitious in the context of the renewed EU Commitments relating to climate change and the energy transition.

## 5 Summary of best practice initiatives

This section presents a summary of the best practice initiatives for increasing the skills in the energy sector in Europe. These initiatives were identified through a desktop literature review and with the help of interviews conducted by consortium partners with key individuals. The project looked at twelve European countries, namely:

- the three pilot countries: Austria, Ireland, Spain
- the three observer countries: Croatia, Portugal and Romania
- and six other European countries: Finland, France, Italy, Germany, Norway and Sweden

These six countries have been selected based on a HP market review conducted by the European Heat Pump Association (EHPA, 2018, p64). They are the countries with the most HP sales in Europe in 2017, apart from the pilot and observer countries (Figure 5.1).

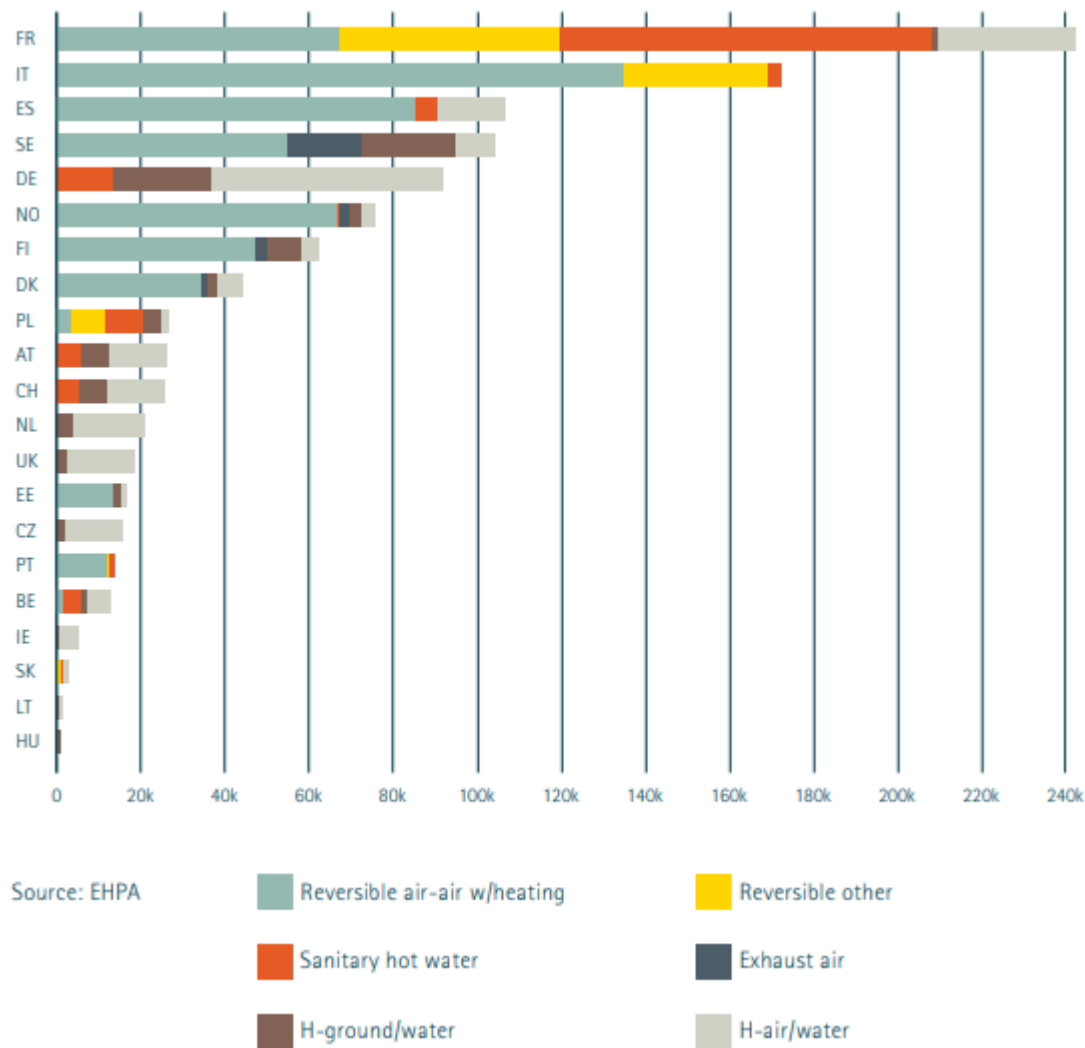


Figure 5.1: HP sales development by technology in 2017 (source EHPA, 2018, p64)

Figure 5.2 shows that Norway had the highest number of units sold per 1000 households in Europe, for the year 2017. Figure 5.3 shows the market growth for HPs in Europe by country,

or how many units have been sold, compared to the previous period. France recorded the highest increase in sales in 2017, compared to the previous year, and it was closely followed by Spain and Germany.

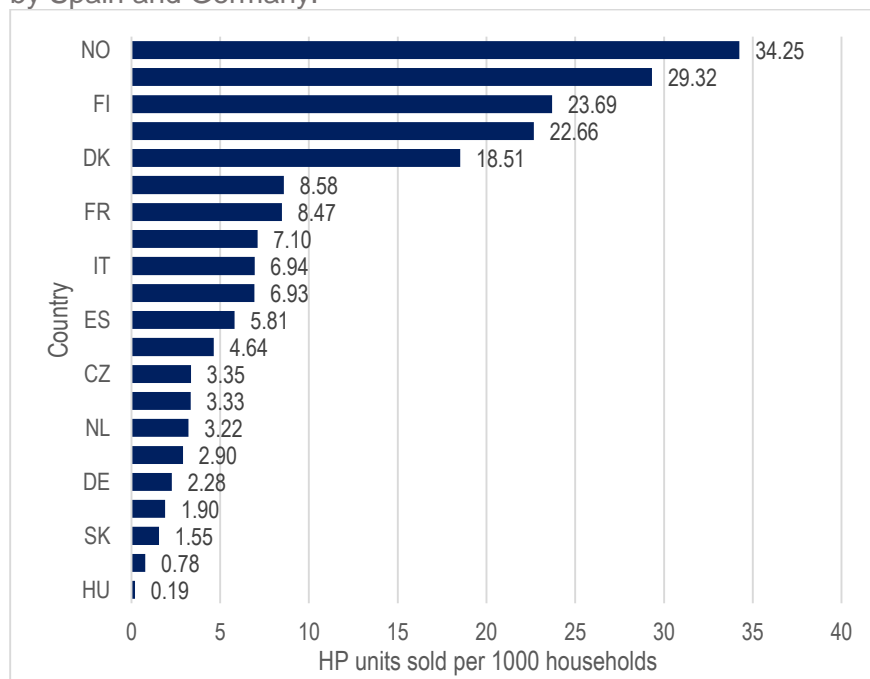


Figure 5.2 HP units sold per 1000 households by country for the year 2017 (source EHPA, [http://www.stats.ehpa.org/hp\\_sales/story\\_sales/](http://www.stats.ehpa.org/hp_sales/story_sales/))

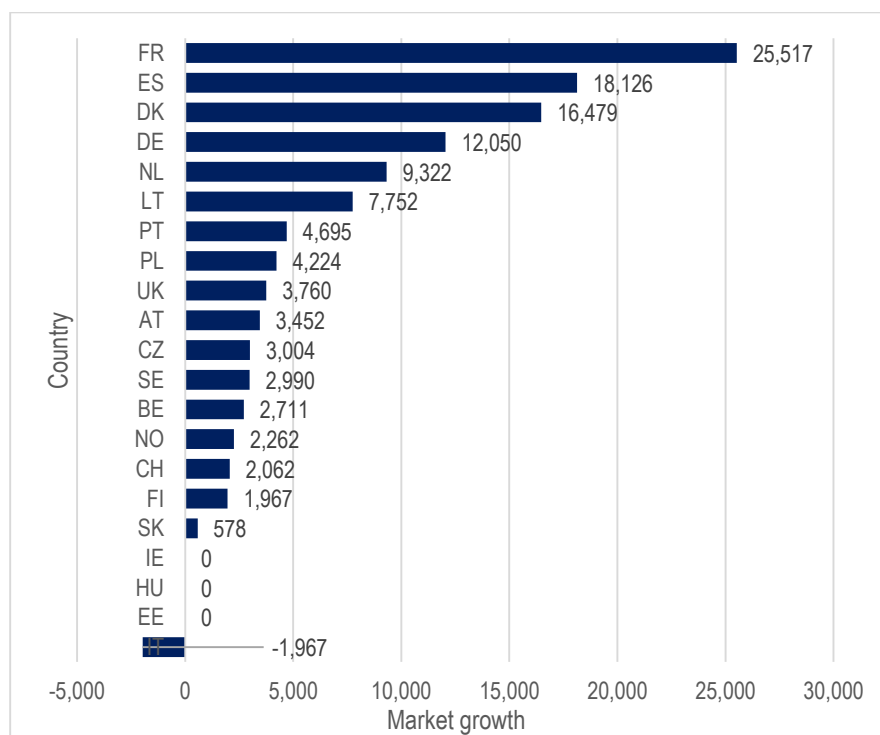


Figure 5.3 HP market growth by country in 2017 (source EHPA, [http://www.stats.ehpa.org/hp\\_sales/story\\_sales/](http://www.stats.ehpa.org/hp_sales/story_sales/))

Table 5.1: Overview of best practice initiatives for 12 European countries and their relevance to HP4ALL

Country	Initiative name	Type	Learning points relevant to HP4ALL
Austria/ Upper Austria	Training of energy advisors	Education and training	Trainings must offer high-quality, relevant and interesting content; trainers must be knowledgeable, well recognized and trusted; training must follow and adapt to the market needs; promotion is important in reaching the right target groups and attracting participants.
	Energy Academy of the OÖ Energiesparverband	Education and training	Technical knowledge & communication skills of trainers must be of high level; excellent promotion of training activities and up-to-date training content is essential for high participation.
	Training programme for HP installers	Education and training	Potential direct link to HP4ALL as this programme increases the number of highly-qualified HP installers on the market in Austria/ Upper Austria. Regional or local training is important since participants are not likely to spend time and money travelling for training.
	Energy Advice Service of the OÖ Energiesparverband	Service	This one-stop-shop service reaches householders while they are in an actual decision-making process, so it is important that energy advisers have accurate information about HPs; product independence is important to build trust ; advice that is embedded in a wider framework of incentives, information, and regulation has greatest impact in increasing the demand for skills.
	The OÖ Energiesparverband's Facilitation service for energy performance contracting	Service	The facilitation service reaches commercial and public sector end users during an actual decision-making process so it plays an important role in delivering information about HPs to end users. As an impartial party, the ESV is trusted by end users and service providers. Setting up such a service requires the availability of (public) funds.
	PV goes to school	Funding and training programme	Awareness and knowledge of a topic like HPs can be increased in the general public by training schoolteachers who can pass knowledge on to children; training schoolteachers ensures long lasting impact through a multiplier effect.
	NEWCOM	Project	The project has a register of skilled professionals and a database of training materials. HP4ALL could add this database of common harmonised descriptors for HP competences to the knowledge hub. Train-the-trainer activities are important to ensure long lasting impact and training should be harmonised between Member States.



<b>Croatia</b>	BUILD UP SKILLS HR	National Roadmap for education	EE training should include all the building value chain, including engineers, construction workers, installers of building equipment and even financial institutions. Public sector tendering requirements on demonstrating skill levels, led to more tradespeople undertaking training.
	CROSKILLS	Project (training)	Training must be tailored to the needs of each country and sector because the baseline skills level in terms of understanding of concepts like nZEB is different in each Member State.
	FIT-to-NZEB	Project (training)	Further evidence supporting the need to tailor training to the particular needs of the country and sector.
<b>Finland</b>	BUILD UP SKILLS BEEP	Project	For HP market penetration, it is essential to do a National Roadmap analysis to ensure that the workers and professionals have the skills needed to deliver energy efficient buildings; onsite training has proved successful for improving standards of installations; site based 'change agents' have been a successful means of reaching large number of the workforce; a variety of training materials is needed to reach all types of audience.
	KETO-5-TEM	Financial incentive	Financial incentives can boost HP sales, but alone, they do nothing to drive demand for skills.
<b>France</b>	RGE label	Public initiative	This is a good example of a joined-up approach between regulation, financial incentives and information. To obtain financial aid, end users must select registered professionals who meet certain qualifications. Registered professionals are regularly spot checked. The financial incentive boosts demand for installations. The requirement to use only registered professionals boosts demand for skills and increases trust between public and installers.
	MaPrimeRenov	Public incentive	Drives citizens to choose a recognized registered professional, thus driving the skills in the construction sector.
	PTRE	Public initiative	Another example of a one-stop-shop solution that provides free advice to end users. Local groups are important in reaching large numbers of people. Ensuring the advisers have up to date knowledge of HPs means that they can give the best advice to end users and ensures the right actions are taken. This drives skills by boosting demand for particular measures.





	BIMplement	Project	Training tradespeople on site is highly effective at upskilling the sector but persuading them to take time out of their schedule to undertake the training is difficult as it adds cost to the job, even if it is mandated by the client.
Germany	Deutschland machts effizient	Public initiative	It is important that information on HPs is available and accessible to all parties.
	Efficient initiative networks	Public initiative	Networks of businesses can help to disseminate information and raise awareness of particular technologies. It helps decision makers to learn from each other's experience by creating synergies between companies to find energy efficient solutions together and improve. Social pressure also encourages those in the network to take actions the otherwise would not have considered.
	Energiewende	National Strategy	A trusted strategy from government helps to ensure that all stakeholders are reached. Constant contact with stakeholders ensures the program can adapt and develop as needed and impact can be properly monitored.
	House turnaround	Public campaign	This is an online resource giving people information and advice on improving energy efficiency of their homes. Having a large register of trained experts was essential to the success of the service. Taking into account of national and regional differences in demand for renovation and creating working networks that stay active even after end of project is important. A large marketing effort was required to make sure the online service was well known and used.
	NTRI	Initiative	Retailers can heavily influence the purchasing decisions of buyers. It is important for HP4ALL to identify and train those stakeholders that can influence the design, purchasing and installation decisions of end users relating to HPs.
Ireland	HP Installer Course	Training course	Training courses in isolation do not drive demand for skills. In this case, there is no requirement for HPs to be installed by a registered professional and a lack of demand for training has led to a stagnation of demand for this course.
	TEA HP Training Course	Training	This existing training course was developed as an online module for engineers and is popular, showing that system designers are interested to learn more about HPs. HP4ALL could work with Engineers Ireland to promote this and other training to Engineers.
	GAI RDD project	Project	This training course relates to geothermal HPs and has taken a long time to establish. A clear strategy is needed to ensure that training related to all types of HPs is available to those that need it.



	HP Grants	Public incentive	This scheme gives grants to homeowners for installation of HPs if certain conditions are met on minimising building heat loss. It has not had high uptake because the conditions are too difficult to meet. Grant schemes are of limited value if they seek to rectify problems relating to issues outside of the technology they are directly seeking to promote.
	HP Tool	Tool	This tool was designed to assist building energy assessors in giving a rating to buildings with HPs. A review shows that even with training, those using the tool still make mistakes. This shows that tools must be fit for purpose to be of use, those using them must be properly trained to do so, and checks are required to ensure effectiveness.
	NSAI SR 50-4	National Standard recommendation / policy	Developing national and/or international standards for installation/design requirements of HPs can help to determine the content of any training that is required. Standards can be used as a reference guide for all actors in the HP industry
	Superhomes 2.0 Best Practice Report	Project Report	The project showed that installed HPs often do not achieve predicted COPs. HPs need to be correctly designed commissioned and installed to maximise performance. A report targeting designers, installers, trainers and policy makers shows the importance of robust performance monitoring, data collection and analysis
Italy	ITALY IN CLASS A	Training	This program shows that a range of tools is necessary to catch the attention of all types of stakeholders.
	ENEA E-Learning	Training tools	Free video lessons can be a powerful instrument to implement in the HP knowledge hub to spread awareness about HPs. They should be free of charge, well publicised and short for maximum impact and awareness raising.
	Collective Consumption and Communities Self-schemes Energy	Policy	Promote collaboration between citizens and energy professionals through networking. This shows that networks can be a useful tool in spreading collective action.
	Superbonus 110%	Incentive	Initiatives that bring actions and technologies closer to citizens but also improve their understanding of them, drive the acceptance of new technologies. Financial incentives drive uptake, but bureaucracy can drive people away. This scheme





			gives a large enough bonus that it is worth investigating, even to those people that would not normally be interested in energy efficiency.
	Heat Pump Table	Network associations of	Associations play an important role in adding credibility to the training and reaching a wide range of stakeholders. The associations that compose the HP Table can be considered important stakeholders for the HP4ALL project.
Norway	IAEE-Norway	Association	Networks are an important method of engaging professionals, particularly in the case of young people to create a group of experts for tomorrow; creation of a public resource database to share useful information is also important.
	BUILD UP SKILLS Norway	Project	Letters of endorsement for skills programs are important for attracting participants as are remuneration instruments to remove financial barriers and competence indicators to show skill level after training.
	NCE Smart Energy Markets	Clusters	Interdisciplinary interaction between different business areas for sustainable development. This programme also shows the importance of networks in reaching large numbers of stakeholders.
	Nordic thematic groups	Co-operation programmes	This promotes exchange of knowledge and experience between regional policy stakeholders. Exchange of knowledge on HPs has to be considered at European level to ensure lifelong learning that is transferrable and useful and meets the needs to stakeholders.
	Enova's Energy Challenge	Education	This creates primary/secondary education activities for a responsible approach towards the energy issues. Education activities in schools can be a useful way of raising general awareness of the population of energy efficiency activities. Train the trainer, in the form of training school teachers, acts as a multiplier to ensure a lasting impact.
Portugal	FaturaAmiga	Project (training)	This initiative helps consumers to reduce electricity bills via a web-based information service. It provides evidence that increasing understanding of end users helps to increase their awareness and encourages them to take action. This principle can be applied to HP4ALL.
	Programa de Apoio a Edifícios mais Sustentáveis	Public initiative	This initiative aims to boost employment by encouraging a green recovery after the COVID-19 pandemic. This could be an important leverage factor to consider for HP4ALL as many governments have declared their intention to take the same approach. it is important to include the benefits such as job creation and support for the local economy in relation to HPs.



<b>Romania</b>	Green Homes & Mortgages	Initiative / toolkit	This initiative uses Green mortgages as a means of promoting uptake of energy efficiency measures among homeowners. The use of the green mortgage as a financial instrument, coupled with the requirement to use certified assessors and an information and awareness programme leads to an increase in demand for skills, and brings new knowledge to the finance sector. This approach could be beneficial to HP4ALL.
	Romania Efficianta	Private project	This project promotes energy efficiency to the public and has shown that increasing awareness and understanding of technologies for energy efficiency stimulates demand for those technologies. Alone, this will not drive a demand for skills but it is a starting point for generating interest.
<b>Spain</b>	Andalusian Sustainable Construction Development Plan	Strategic plan	This project shows how a combination of regulatory actions, training and financial incentives, boosts demand for skills which has a significant impact on the local economy. It is important for HP4ALL to consider how to leverage these existing schemes and target the right market actors to boost HP skills.
	AFEC (Spanish association of heating and cooling systems manufacturers and importers)	Promotional campaign	This example of training programme run by an association through a web portal shows that recognisable branding and log could be a useful tool in reaching the target audience. Support from associations is important to reach the stakeholders needed. It takes a lot of effort to reach the right stakeholders, especially citizens and householders. Reaching the right people can lead to increase in HP uptake.
	CONSTRUYE 2020 project	Education and training	This example shows the importance of having available a range of training materials and media that is appropriate for different stakeholder groups.
<b>Sweden</b>	BUILD UP SKILLS SWEBUILD	Project	This project aimed to strengthen the qualifications of the building work force in energy efficiency and renewables. It found that onsite training, including onsite train the trainers, free access to all materials is important in reaching large numbers. However, it is a challenge to persuade tradespeople to make time to undertake training whilst onsite, and massive marketing efforts are needed to attract individuals and companies to the training.
	Chalmers Initiative for Innovation and Sustainability Transition	Education	This knowledge node promotes the idea that it is important to understand the interactions between the HP sector and other energy sectors. This ensures that technologies complement each other and skilled professionals learn from each other.



	Energy Efficiency Networks for SMEs	Project	This project supports the idea that networks can be useful to reach SMEs. However, it is challenging to find the right person and for them to have time to participate. Competent coordinators and experts to run the network are of high importance and this should be considered by HP4ALL.
	Healthy and eco-smart dietary recommendations	Guidelines	Whilst not energy related this programme shows the importance of targeting of key groups like teachers and persons of influence who have the ability to influence decision-makers. Training targeted at these groups is important to increase reach and longevity of any skills and awareness programmes.



## a. Key learning points from the best practice initiatives in Europe

This section presents the key learning points that can be outlined from the literature review and interviews with key players in the 12 European countries. These have been grouped in different categories, based on the type of initiative.

### Associations and professional bodies

Associations and professional bodies have a key role to play in developing and coordinating activities that support upskilling of the HP sector, acting as a **facilitator** who can liaise between key stakeholders and use their networks to reach large audiences. Of the many associations with relevance to HPs that exist throughout Europe, three examples were identified during the literature review: Heat Pump Table in Italy (page 78), the Spanish Association of heating and cooling system manufacturers and importers (page 96), and the International Association for Energy Economics in Norway (page 80). Although each has a slightly different focus area, what these associations have in common is that they are able to mobilise action throughout the value chain in response to the specific needs of the market in which they are located. For example, through their involvement in the development of the Italian National Energy and Climate Plan, Heat Pump Table was able to ensure that the policy framework included actions that support the HP roll out in Italy. Their reach and influence, which often extends from end-user level through to policy makers level, makes associations a powerful ally in effecting change in the market and therefore it is important that HP4ALL actively engages with relevant associations in the pilot and observer regions to maximise project impact.

### Education and training

#### ***Ensuring training quality for energy professionals and installers***

The quality of training courses for energy professionals and equipment installers is a critical factor in ensuring that training achieves its intended goal of upskilling the workforce. Several examples of successful training programmes were identified during the literature review, indicating that the following factors should be considered in the design of any successful training programme:

**Choosing the right training provider** is of critical importance to guarantee the quality of the training. Training providers must have both a high level of technical knowledge and excellent communication skills to ensure that key messages are delivered. Of equal importance is ensuring that trust is maintained between trainee and training provider.

- It is important that the **curriculum is continuously updated** so that professionals get the most up to date knowledge. Training should be **tailored to the audience** and the **format should be appropriate for the audience** and aim. For example, site visits and hands-on workshops may be more appropriate for installation skills whilst online modules and blended learning approaches may be more appropriate for skills relating to system design.
- It's also important to recognise that the general awareness level of nZEB or energy efficiency is different in each Member State reinforcing the need to tailor the training to the needs of the audience. In addition, the training should provide workers with an understanding of the responsibility of their own profession and actions, as well as the importance of the relationship with the other involved professions and actions. (BIMplement, page 58).



- The GAI RDD (page 69) project showed that greater resources are required in Ireland to develop training related to all types of HPs. Industry standards, such as the Standard Recommendation guideline produced by the National Standards Authority of Ireland, can be useful tools to help identify the necessary training topics for development of skills in designers and installers of HPs and can also be used as a reference guide for all actors in the HP industry (NSAI SR 50-4, page 71).

### ***Ensuring high levels of uptake of training***

High quality, professionally designed and delivered training is not enough on its own to ensure that large numbers of individuals participate in the training. The Austrian examples (pages 37,38,39,43) show that attracting participants to attend training courses requires a considerable amount of time and **focussed marketing effort** to reach the right people and persuade them to attend. Indeed, the experience of the BIMplement project (see page 58) shows that persuading installers and tradespeople to attend training courses is challenging even when it is mandated. For this reason, it is imperative that training is both well-advertised and easy to access. The Austrian training programme for HP installers (see page 39) found that local training attracts more participants overall as it is more convenient for tradespeople to attend.

**Training programmes that are embedded in a wider policy framework** can help to create an incentive for people to be trained. For example, requiring installations to be undertaken by certified professionals in order to access grants or incentives, can create a market for trained or registered installers, thereby incentivising them to undertake the training. An additional technique that can be used to enhance uptake of training is to **leverage the support of professional bodies and networks**. Since people tend to be influenced by the actions of their peers, this approach can be an effective way of persuading people to attend training as shown by the Efficient Networks Initiative in Germany (see page 60) and the Energy Efficiency Networks for SMEs in Sweden (see page 101).

A further method of ensuring that knowledge is transferred widely is to embed it into existing education and training structures. The Norwegian BUILD UP skills initiative (page 82) concluded that this method is considered more effective than building up new systems of training as it leverages existing networks rather than having to build new ones.

### ***Ensuring lasting impact of training programmes***

Several of the initiatives that were examined in the literature review stressed the importance of developing suitable **train-the-trainer** materials to ensure the long-term sustainability of knowledge transfer through a **multiplier effect**. Choosing the right trainers and equipping them with the skills and resources they need to train others is essential for reaching a large proportion of the workforce.

The train-the-trainer concept can also be extended to wider groups like energy advisers, school teachers, retailers and equipment installers, who have a unique opportunity to pass on knowledge and information to members of the general public. Equipping these groups of 'influencers' with knowledge and resources that can be passed on to the stakeholders (e.g. householders or business owners) with whom they engage on a day-to-day basis ensures that decision makers have the right information available to them at the right time to inform their





choice on energy related projects. The Health and eco-smart dietary recommendations in Sweden (see page 103), and PV goes to Schools programme in Austria (page 43) are excellent examples of using influencers as a means of passing information to the general public.

## Energy advice services and one-stop-shops

The set-up of energy advice services and one-stop-shops has been identified as a recurring success factor for upskilling the building construction sector, including the HP sector, in several European countries. This has taken different forms in different regions, but ultimately, they all provide **a combination of technical, legal and financial advice** to individuals and/or professionals (companies) to help them through the decision-making process, remove any uncertainty and find the right option for their project. It is important that providers of these services are impartial in order to build trust with clients, and have knowledge of all the possible technologies, incentive schemes and regulations in order to provide the best advice to their clients.

- In Upper Austria these energy services are offered by the OÖ Energiesparverband, the regional energy agency, through the Energy Advice Service (page 41) and the Facilitations service for Energy Performance Contracting (page 42). The latter goes beyond offering financial advice, they actually receive and process funding applications and also check and control the investment measures on behalf of the regional government.
- In France, these advice services are offered for free through regional platforms or PTREs (page 56) in a personalized and individual manner, but they also inform the community about news in the energy renovation sector, thus keeping them up-to date with the latest changes and options available for them. What has made the energy advice service successful in France and Austria is that they are part of a **wider policy framework**, including regulatory measures, financial incentives and information, advice and training, as well as being supported by regional legislation.
- In Germany, public campaigns have been organized through the Deutschland macht's effizient initiative (page 60) to deliver quick and simple access to the right information for all stakeholders in the building sector, including homeowners, companies and municipalities.

## Energy networks

A widespread initiative in some European countries was the creation of networks of experts in energy efficiency which proved to be a strong driving force for innovation. Networks are useful tools not only to ensure that information and awareness activities reaches a broad audience but to **leverage the social capital** that exists within networks of similar businesses. Peers are able to learn from each other through experience and are more likely to take action if members of their peer group have already taken action. Some examples of successful networks from the literature review include the following:

- In Germany, the Efficient networks initiative (page 60) links companies and public institutions under Energy Efficiency Networks whose energy managers meet on a regular basis to share experiences on energy savings, to learn from each other and to get advice on how to implement solutions.
- The Norwegian NCE Smart Energy Markets initiative (page 84) has created an international network composed of public-private companies that led to increasing the public sector efficiency, creating business development and facilitating significant



future market opportunities nationally as well as internationally. The key success factor for this particular initiative was the **interdisciplinary interaction** between the different business areas while leveraging local smart specialisation in line with national policy orientations and global trends. Norway has also created the Nordic thematic groups (page 85) to allow for exchange on knowledge and experiences between regional policy stakeholders.

- The Swedish Energy Efficiency Network program for SMEs (page 101) has created networks to try to decrease the energy consumption of companies. Each network comprised of several companies who were led by a **trusted network coordinator** and received energy efficiency advice by an energy expert, either on an individual basis or as a group consultancy service.
- The Irish National Standards Authority (NSAI SR 50-4, page 71) has gathered key stakeholders from the industry, training providers, government, academic and research organisations to cooperate and produce the Standard Recommendation to support the Irish Climate Action Plan.

### **Initiatives that drive the demand for skills**

The most successful examples of training and upskilling described in this report are found in countries where it is embedded into a wider policy framework that links **financial incentives** with **certifications schemes** for products and installers, all backed up by **easily accessible information and advice**, supported by **robust policies**. Often this is provided via the one-stop-shops or energy advice services described above, so it is important for the HP4ALL project to leverage relationships with these organisations in order to maximise its impact.

### ***Financial Incentives***

Financial incentives are often used as a means of boosting market demand for a particular technology or action. In order to ensure that they also boost the demand for specific skills, financial incentives should be linked to a certification scheme (see below) that specifies the qualification that suppliers and/or installers of particular technologies, including HPs, should have. The requirement to use certified professionals encourages tradespeople to upskill as they are only able to access the market created by the financial incentive if they have undertaken the required training and can demonstrate that they are sufficiently qualified.

Two successful examples of financial incentives linked to certification schemes are: MaPrimeRenov in France (page 55) which requires equipment to be installed by certified installers in order to qualify for the grant funding, and; the Green Homes and Mortgages initiative in Romania (page 91) which requires the use of certified energy auditors to undertake the energy assessments on behalf of the mortgage underwriters. These have both driven the need for particular skills whilst at the same time leading to an increase in general knowledge and awareness of energy related technologies for the general public.

In contrast, the HP Grants, Ireland (page 69) have been less successful and have not led to an increase in demand for HP skills because the conditions for receiving the grant are so strict that few households can qualify. As a result, there is no incentive for installers to gain the necessary qualifications to become certified installers, and the market for HP training in Ireland has stagnated.



The Italian Superbonus 110% scheme (page 77) is driving the market by ensuring that the promised incentive is large enough to be of interest to individuals that would otherwise not have considered energy efficient building refurbishments, but the exact conditions for the grant are unclear, and the level of bureaucracy involved in claiming the associated tax rebate are onerous. The Italian Superbonus 110% pointed out that the public's knowledge can be increased since they can personally achieve a benefit through the incentive programs and are therefore more interested in investigating what they can achieve with different energy saving interventions.

### ***Certification schemes***

Having a certification in place for the professionals ensures that they can be easily found, gives end-users confidence that they are reliable, proves that they are qualified to deliver the services promised and requires that the professional is insured in case of a problem. This leads to a higher level of trust between citizens and certified professionals to properly carry out the energy efficiency measures. The BUILD UP SKILLS HR project (page 47) emphasized that public procurement should use certified labour force to drive up the workforce skills in Croatia. In France, this concept has been successfully used since 2011 (the Label RGE, page 54) and it ensures that the customer has a guarantee of the quality of the service provided. It is not mandatory for the professionals to have this title, but for the customers to obtain financial aid for energy renovations or installing energy saving equipment, a certified professional must perform the works. Certification schemes have the biggest impact when they are coupled with other support mechanisms like financial incentives or regulations which drive demand for certified professionals.

### ***Regulation***

A combination of economic measures and other actions such as regulatory, training and fiscal is needed to promote the energy rehabilitation, to improve the competitiveness of companies in the construction sector, to create skilled employment and reduce energy poverty. A good example is the Sustainable construction programme in Andalusia, Spain (page 94). The key for the successful adoption of guidelines is succeeding in communicating them to consumers in a way that achieves behavioural change.

The on-going Energiewende Strategy in Germany (page 62) showed that the development of a national energy strategy can increase the trust of citizens in energy efficiency and also position the transition to energy efficiency as something co-owned and positively assessed by them. It is important to continuously adapt the energy policy by regular dialogue with the national stakeholders in the Federal Government and the business and scientific communities. The national strategy should also include a plan for the continuous education and energy efficiency training of the current and future building construction workforce, as highlighted in the BUILD UP SKILLS HR initiative in Croatia (page 47).

## **Tools**

### ***Awareness and training tools***

Several of the initiatives in this report have outlined that it is critical to increase awareness on nZEB, and therefore HPs, of all stakeholders in the value chain and beyond. For the general public, training and awareness can start as early as primary schools and it is particularly important for reaching less qualified workers. The knowledge and competence in product-







related energy efficiency has to be strengthened along the value chain, from manufacturers, to the retailer and the consumers, as it can be seen in the German National Top Runner Initiative's or NTRI (page 65).

Some projects have explored a digital education concept to increase student's understanding and of energy use and to raise their awareness on the existing solutions to climate change and resource shortage. The Enova's Energy Challenge (page 87) indicates that the digital tool is a cost effective, awareness raising and lifestyle-changing concept that has been successfully deployed in primary schools in Norway since 2014. The critical points were securing teacher's commitment and providing them with adequate technical support. The BUILD UP Skills SWEBUILD (page 99) project points out that an interactive web based educational tool seems to be an effective and inspiring learning method but very time consuming and complex to develop. However, easily accessible training material, always available free online has been a great success in this initiative.

Various tools have been identified that empower citizens to take better and informed decisions on energy efficiency. The Spanish CONSTRUYE 2020 project (page 97) stressed the importance of the audio-visual information and communication technology for dissemination, awareness raising, education and training regarding energy efficiency and renewable energy, especially with the less qualified workers and key stakeholders such as labour foundations, trade unions, etc. Providing free, easy and understandable tools in line with the most recent means of communication can help to bring citizens closer to sustainable energy issues, increasing their knowledge on the subject, promoting their involvement and inspiring behavioural changes, as well as being a useful tool for technicians and professionals in the sector. Some excellent examples are the ENEA E-learning program (page 75) and the FaturaAmiga service (page 89). Video lessons, info-reality, information campaigns, opinion leaders, webinars, street art, a portal dedicated to information, television collaborations, events, seminars, meeting platforms have been proven to reduce the distance between energy sustainability and citizens, as in the Italy in class A initiative (page 74)

Through the BUILD UP SKILLS BEEP project (page 51), Finland has developed a comprehensive publicly available on-line toolbox with a wide variety of material in different formats and languages to ensure wider adoption and acceptance for use. Visual illustrations/photos/graphs complement the text and translate the message in a comprehensible way by a glance. Awareness on the importance of energy efficiency and energy efficient technologies can be raised by providing the public and local authorities with information on energy savings solutions. For example, a practical guide as well as training are good means to inform the public authorities, as it was outlined in the Romanian initiative România Eficientă (page 92).

### ***Monitoring tools***

Monitoring is another prevalent key success factor from different initiatives. The NEWCOM project (page 45) proposes monitoring the different training schemes and maintains a database of competences to provide mutual recognition of the training throughout Europe. The KETO-5-TEM measure (page 52) from Finland's national energy efficiency programme recommend proper monitoring of HP sales, as this can indicate to responsible ministries to take corrective measures which may be promotional measures, financial incentives or new regulations. The Superhomes 2.0 project's Best Practices Report (page 72) showed that monitoring and



analysing the installed HPs performance is necessary to avoid HPs performing poorly and not achieving the expected energy savings.

## 6 Conclusion

The review of various projects and initiatives around Europe has yielded some important learning points for the HP4ALL project, as described above in section 5. As the HP4ALL knowledge hub is developed, it is important to keep these learning points in mind to maximise its impact. One of the key findings is that it is important to tailor any training and skills programme to the needs of the particular market, so the following sections break down some of the activities that could be relevant in each of the HP4ALL pilot countries.

### a. Upper Austria/Austria

The region of Upper Austria already has a well-developed system of support for energy efficiency measures, so focus should be put on leveraging these existing initiatives and enhancing them with additional details about HPs to further develop the market. The professional and well thought out communication strategy should continue to be used to reach the target groups and encourage them to participate in the trainings. Energy advisers are considered key players in the HP market development as they already offer advice to a large number of end users, so ensuring that their knowledge is up to date with the latest information on HPs will help enhance the HP roll out. Existing training programmes for energy advisers can be enhanced through engaging with the relevant training providers. The one-stop-shop of the regional energy agency of Upper Austria is also an important and trusted entity with a large reach and the ability to support decision makers at key points in the decision-making process with information, advice and guidance and therefore an important stakeholder with which to engage.

### b. Ireland

In Ireland, even though the Government's Climate Action Plan aims to have 600,000 HPs installed in Irish homes by 2030, Ireland does not yet have training capacity in place to upskill large numbers of HP installers. A national requirement for installers of these HPs to be trained to a centrally coordinated standard, possibly linked to a financial mechanism could help to upskill the sector but it is unlikely that this will happen within the lifetime of HP4ALL, therefore it will be necessary to find alternative routes to upskilling the supply chain. The literature review highlighted that there is significant demand from Engineers and Architects for HP training and a strong link via Engineers Ireland and other national associations. These links should be leveraged to ensure that the HP4ALL knowledge hub has the maximum impact.

### c. Spain

Although the Spanish HP market is the third largest in Europe, the literature review and detailed discussions with key stakeholders revealed some particular considerations for upskilling the Spanish construction sector. In particular, dissemination and communication (including public quality assurance and reporting mechanism of suppliers and installers), together with education & training of installers and homeowners are crucial for any initiative, whether it is





technical or financial. If this aspect is not properly addressed, it could lead to the failure of the initiative. Fostering innovation and a sustainability culture within the construction sector at all levels is also important if the sector as a whole is to move beyond traditional construction methods and equipment installations. Achieving this will require long term political commitment and solid coordination beyond evolving political contexts.

An additional finding is that it is important to keep any support initiatives simple, and avoid excess paperwork and bureaucracy in order to ensure wide uptake of the solutions. Finally, it is important to find an optimal balance of subsidies and loans that avoids excessive dependence long term dependence on state aid and encourages market and technology development.





## 7 References

European HP Market and Statistics Report 2020, V1.2 . Authors: Thomas Nowak, Secretary General European Heat Pump Association, Rue d'Arlon 63-67, B-1040 Brussels and Pascal Westring Vocaldata Ltd 3/7 Rodney Place, EH74FR Edinburgh, UK

Heat pumps: Integrating technologies to decarbonise heating and cooling White Paper, 2018, Authors: Thomas Nowak, Secretary General European Heat Pump Association, Rue d'Arlon 63-67, B-1040 Brussels, European Heat Pump Association



## 8 Appendix 1 – Literature review templates

### a. Austria

#### Training of energy advisors

<b>Name</b>	Training of energy advisors	<b>Location</b>	<i>Upper Austria and the other 8 regions of Austria</i>
<b>Type</b>	Education and training	<b>Funding</b>	Participant fees
<b>Start date</b>	1992	<b>End date</b>	ongoing
<b>Website</b>	<a href="http://www.energiesparverband.at/veranstaltungen/grundkurs-fuer-energieberaterinnen">www.energiesparverband.at/veranstaltungen/grundkurs-fuer-energieberaterinnen</a> (in German only)		
<b>Description</b>			
<p>In Austria, an association called "Arge EBA" focusses on the training of energy advisors for all nine Austrian regions. The Regional Energy Agency of Upper Austria (OÖ Energiesparverband, ESV) is a founding member of the "Arge EBA" and is responsible for training energy advisors in the region of Upper Austria.</p> <p>Various levels of multi-day, comprehensive courses are offered and train qualified energy advisors. The basic training for energy advisors consists of 50 hours of training with a final exam. This course can be followed by an advanced training of 120 hours with practical training and an exam. Passing the final exam is mandatory in order to receive recognition of completion for the courses.</p> <p>This structure ensures that qualified energy advisors are available in Austria to help drive the energy transition. Continuous further training (e.g., in the Energy Academy of the OÖ Energiesparverband), special training courses, advisors' meetings and networking events help to maintain the high level of energy advisor's knowledge and, thus, of the energy advice services.</p>			
<b>Outcome / Impact</b>			
<ul style="list-style-type: none"><li>• 1-2 trainings have been carried out per year in Upper Austria since 1992. Over 60 courses have been held with more than 1,000 participants passing the final exam.</li><li>• All of the ESV's energy advisors have followed advanced trainings for energy advisors.</li></ul>			
<b>Barriers</b>			
<ul style="list-style-type: none"><li>• Assuring quality training of energy advisers throughout all nine regions is challenging. A high-quality training is decisive for the success of the energy advisors' training and thus the quality of energy advice services in Austria.</li><li>• Continuous efforts must be invested in further trainings to keep energy advisors' knowledge up to date with the latest technical developments, subsidies and market developments.</li></ul>			
<b>Key learning points</b>			

- By being responsible for the training of energy advisors in Upper Austria, the ESV can ensure the quality of the training and, thus, ensure that qualified professionals are available and can offer effective advice sessions in the region.
- Keeping energy consultants up to date with the latest technical developments, subsidies and current market developments is very important. This is why the ESV organises regular trainings, networking meetings and other relevant events and information material for its energy advisors.
- Monitoring is necessary to ensure the high quality of energy advice. The ESV therefore invites its clients to rate the advisory service (briefly and easily using the school grading system and the possibility of verbal feedback) after the advice session is complete. Clients' satisfaction level is generally extremely high.

#### Relevance to HP4ALL

- Energy advisers are key players in the HP market development.
- Such trainings contribute to increasing the knowledge and skills of advisors in the energy sector.
- The curriculum is constantly updated to include the latest technical developments and market developments, such as those relevant to the HP sector.

### Energy Academy

<b>Name</b>	Energy Academy of the OÖ Energiesparverband	<b>Location</b>	Upper Austria
<b>Type</b>	Education and training	<b>Funding</b>	Participant fees, Regional Government of Upper Austria
<b>Start date</b>	2009	<b>End date</b>	ongoing
<b>Website</b>	<a href="http://www.energiesparverband.at/veranstaltungen/energy-academy">www.energiesparverband.at/veranstaltungen/energy-academy</a> (in German only)		

#### Description

The Energy Academy of the OÖ Energiesparverband (the Regional Energy Agency of Upper Austria) trains a wide range of stakeholders on the clean energy transition. It offers training seminars, site-visits, workshops and more on topics relating to energy efficiency, renewable energy, construction technologies, energy technologies, energy management, e-mobility, etc. Trainings focus on technology innovations, cost-efficient planning, financing and available subsidies, and the overall implementation of energy solutions.

The activities of the Energy Academy are tailored for specific target groups, including persons responsible for energy matters in companies, municipalities and institutions, planners, building services specialists, facility managers, builders, installers, property developers, energy advisors, energy auditors, producers of building energy performance certificates, architects, providers of energy and building-related products and services, banks, etc. More than 70 experts from companies, the public sector and research teach at the Energy Academy. A key element is that training contents, trainers and participants represent key aspects and actors along the value chain.



Many of the trainings are listed at the Austrian Energy Efficiency Monitoring Centre (EEffG) and points can be collected towards the qualification for becoming an energy auditor or energy advisor.

#### Outcome / Impact

Around 30 training events with more than 1,000 participants take place every year. The events strengthen the skills and knowledge about renewable energy and energy efficiency in Upper Austria. Overall, the Energy Academy makes an important contribution to the energy strategy of the region of Upper Austria.

#### Barriers

- The organisation that offers such trainings should be knowledgeable, well-recognised and trusted.
- Trainings must be of high-quality, relevant and interesting
- Constant need to follow the market and offer new and pertinent topics
- Trainings need to be promoted effectively to reach the right target groups and gain participants

#### Key learning points

- A professional and well-thought out communication strategy is required to reach the target groups and encourage them to participate in the trainings.
- When creating the course programme and its learning content, strong emphasis is put on the technical and communication expertise of the trainers (from in-house or external experts).
- A large network of experts on energy-related topics is helpful to ensure high-quality training programmes.
- Public support and a long-term strategy increase the positive impact of such training programmes.

#### Relevance to HP4ALL

- These trainings reach relevant professionals and end users.
- Trainings on HP technologies are already part of the programme of the Energy Academy, but they will be adapted and/or new courses for HP actors can be added. Also, relevant content can be included in other courses.
- The experiences from the Energy Academy can be used to develop similar trainings in other European regions and/or on other energy-related topics, such as HP skills and knowledge.

### Training programme for HP installers

<b>Name</b>	Training programme for HP installers	<b>Location</b>	<i>Austria/Upper Austria</i>
<b>Type</b>	Education and training	<b>Funding</b>	Participant fees
<b>Start date</b>		<b>End date</b>	on-going

<b>Websites</b>	<a href="http://www.ait.ac.at/themen/training-education/weiterbildung-im-bereich-waermepumpen/planung-errichtung-und-wartung-von-waermepumpen-inkl-kategorie-ii-zertifizierung/">www.ait.ac.at/themen/training-education/weiterbildung-im-bereich-waermepumpen/planung-errichtung-und-wartung-von-waermepumpen-inkl-kategorie-ii-zertifizierung/</a> (in German only) <a href="http://www.energiesparverband.at/fileadmin/esv/Broschueren/Kursprogramm_Energy_Academy_2020_2021.pdf">www.energiesparverband.at/fileadmin/esv/Broschueren/Kursprogramm_Energy_Academy_2020_2021.pdf</a> (in German only)
<b>Description</b>	
<p>In Austria, the Austrian Institute of Technology (AIT), in cooperation with the Austrian Heat Pump Association, offers a technical and certification programme on planning, installing and servicing HPs in single-family homes.</p> <p>This six-day course teaches participants about the technological basics, but also the correct planning, installation and maintenance of HPs and air conditioning systems, including intervention in the cooling circuit. Following completion of the course and passing of the corresponding exam, participants receive the following certification:</p> <ul style="list-style-type: none"> <li>• Certified HP installer or planner</li> <li>• Refrigeration certificate according to category II</li> </ul> <p>The course is targeted at installers, planners, energy advisors, customer service technicians, building technology providers and property developers. It contributes to increasing expertise on HPs and the number of highly qualified HP installers on the market. Training by technical experts is supplemented with hand-on experience gained through site visits.</p> <p>In 2020 the course was offered for the first time in Upper Austria, in cooperation with the OÖ Energiesparverband, the Regional Energy Agency of Upper Austria.</p>	
<b>Outcome / Impact</b>	
<p>The course increases the quality of HP installations in single-family homes by training the relevant target groups. It contributes to improving the knowledge and skills of installers, planners, energy advisors, customer service technicians, building technology providers and property developers on HPs. These professionals are trained by highly-qualified specialists and experts in the field.</p>	
<b>Barriers</b>	
<p>Attracting participants is always a challenge, as leading professionals are very busy.</p>	
<b>Key learning points</b>	
<ul style="list-style-type: none"> <li>• It is necessary to offer very technical and high-quality courses for relevant target groups to increase the quality of HP installations.</li> <li>• Offering such a training in more regions permits to reach more professionals throughout the country.</li> </ul>	
<b>Relevance to HP4ALL</b>	
<ul style="list-style-type: none"> <li>• Increases the number of highly-qualified HP installers on the market in Austria/Upper Austria</li> </ul>	



## Energy Advice Service

<b>Name</b>	Energy advice service of the OÖ Energiesparverband	<b>Location</b>	<i>Upper Austria</i>
<b>Type</b>	Service	<b>Funding</b>	Regional Government
<b>Start date</b>	1991	<b>End date</b>	ongoing
<b>Website</b>	<a href="http://www.energiesparverband.at/energieberatung/privathaushalte">www.energiesparverband.at/energieberatung/privathaushalte</a> <a href="http://www.energiesparverband.at/energieberatung/gemeinden">www.energiesparverband.at/energieberatung/gemeinden</a> <a href="http://www.energiesparverband.at/energieberatung/unternehmen">www.energiesparverband.at/energieberatung/unternehmen</a> (all in German only)		

### Description

The Regional Energy Agency of Upper Austria (OÖ Energiesparverband, ESV) offers a comprehensive advice service and one-stop shop for energy efficiency and renewable energy projects:

- Over 10,000 face-to-face energy advice services/year for households, companies & municipalities on all topics relating to energy efficiency and renewables, taking place in the ESV office (drop-in advice in our one-stop shop) or on-site
- It reaches potential end-users while they are in an actual decision-making/ investment process (key time for influencing good decision-making)
- The programme is embedded in a wider policy framework including regulatory measures "sticks", financial incentives "carrots" and information, advice and training activities "tambourines", which has shown to be very successful in Upper Austria.

### Outcome / Impact

- Over 10,000 face-to-face energy advice services/year for households, companies & municipalities on all topics relating to energy efficiency and renewables
- More than 60 % of space heating in Upper Austria already comes from renewable energy sources and district heating. In the past 10 years, greenhouse gas emissions in the building sector have been reduced by 32%. The energy advice service is a key element of this success.

### Barriers

To develop a new energy advice service, the following success factors had to be considered:

- high-quality training and continuous further training of the energy advisors
- product independent and customer-orientated advice
- Networking, infrastructure and synergy effects
- high quality standards, quality control and monitoring
- Continuous communication activities and public relations
- Quick and uncomplicated availability of advice and on-site consultation
- Consideration of the technical feasibility of proposed measures
- long-term commitment and public support (public funding)
- Embedding the advice in a comprehensive package of strategies and measures
- Support so that the investment decisions that are made anyway are made "right"

### Key learning points

Key aspects of the advice service are product independence, strong customer orientation and uncomplicated, fast and free advice. The energy advice service accompanies people and companies in their decision-making process, supports them in investing in energy efficiency and renewables, and helps them find the right funding option for their project.

It works best, if the programme is embedded in a wider policy framework including regulatory measures "sticks", financial incentives "carrots" and information and training activities "tambourines". This has shown to be very successful in Upper Austria. The long-term commitment and funding by the regional government is a crucial success factor.

### Relevance to HP4ALL

- The service reaches potential end-users while they are in an actual decision-making/ investment process (key time for influencing good decision-making)
  - Brochures/information about HP technology can be used in energy advice sessions
- Product independence is important

## Facilitation service for energy performance contracting

<b>Name</b>	The OÖ Energiesparverband's facilitation service for energy contracting	<b>Location</b>	<i>Upper Austria</i>
<b>Type</b>	Service	<b>Funding</b>	Regional Government
<b>Start date</b>	1998	<b>End date</b>	ongoing
<b>Website</b>	<a href="http://www.energiesparverband.at/energie-contracting">www.energiesparverband.at/energie-contracting</a> (in German only)		

### Description

In Upper Austria, the Regional Energy Agency, OÖ Energiesparverband, is a one-stop-shop for energy performance contracting (EPC). It offers comprehensive support for clients (public administrations and companies) and ESCOs of energy contracting projects.

The overall objective of the service is increasing the number of investment projects in municipalities, the social sector and businesses through energy contracting in the region of Upper Austria. Therefore, it triggers and supports energy efficiency and renewable energy investments through energy contracting by:

- activating potential EPC clients and potential ESCOs
- advising, informing and facilitating throughout the customer journey
- receiving and processing funding applications on behalf of the regional government
- checking and controlling investment measures on behalf of the regional government.

### Outcome / Impact

More than 250 EPC projects implemented in Upper Austria since the beginning of the programme.

Some examples of the range of projects implemented include: converting street lighting to LED, renovation/optimisation of building services, LED lighting for indoor tennis halls, optimisation of hot water/heating/cooling in the food industry, biomass heating for a cinema chain, renewable heating for administrative company buildings, biomass district heating for

a holiday village (with 59 chalets, indoor pool and spa), thermal renovation for a district office building of the Red Cross, modernisation of the heating control for a wholesale company, biomass district heating and renovation of public buildings in a medium town, various contracting projects in buildings of the regional government (office buildings, road maintenance service buildings, vocational schools, nursing & care facilities, museums), building renovation and heating optimisation of school buildings.

### Barriers

Continuous information, awareness-raising and facilitation is necessary to keep the programme going.

Public funding and long-term commitment are necessary.

Especially at the start, very large communication and information efforts were needed to inform relevant actors about EPC, explain how it works and build knowledge and trust in the EPC model. Trainings, information campaigns, brochures, information events, etc. were realised by the OÖ Energiesparverband.

### Key learning points

It works best if the programme is embedded in a wider policy framework including regulatory measures "sticks", financial incentives "carrots" and information and training activities "tambourines". This has shown to be very successful in Upper Austria. The long-term commitment and funding by the regional government has also been a crucial success factor.

### Relevance to HP4ALL

Such a facilitation service and one-stop-shops can be used to support the market development for HPs (e.g., heat supply contracting project with HPs).

## PV goes to school

<b>Name</b>	PV goes to schools	<b>Location</b>	Upper Austria
<b>Type</b>	Funding and training programme	<b>Funding</b>	Regional Government
<b>Start date</b>	2011	<b>End date</b>	2018
<b>Website</b>	<a href="http://www.pv-schule.at">www.pv-schule.at</a> (in German only) <a href="http://www.energiesparverband.at/fileadmin/esv/Schaufenster/PV-Schule-de.pdf">www.energiesparverband.at/fileadmin/esv/Schaufenster/PV-Schule-de.pdf</a> (in German only)		

### Description

"PV goes to school" was an innovative and comprehensive programme developed and run by the regional energy agency of Upper Austria, OÖ Energiesparverband (ESV).

Objectives of the programme included:

- increase environmental awareness of children, teachers, parents and more
- achieve energy savings
- reduce energy costs in municipalities

Main programme elements:

- 75 % subsidy for a 3-kWp PV system
- novel age-appropriate and ready-to-use educational material on renewable energy
- a customised 1-day training for teachers (mandatory for one educator per school)
- guidance on how to save electricity in schools
- a programme website, also for peer-to-peer inspiration

### Outcome / Impact

The programme made solar energy and energy saving an integral part of the everyday lives of Upper Austrian children in 362 schools and 188 kindergartens. 40% of all Upper Austrian Schools and 25% of all kindergartens took part in the programme. In total, PV systems with an output of more than 2 MWp were installed. 600 teachers were trained on energy efficiency and renewable energy in 29 training courses. Schools were required to carry out a school project, which got the children involved and led to higher visibility of the programme beyond the school's walls. All participating educational institutions are required to monitor their monthly solar energy production and report it on the programme website for at least 3 years.

The programme stands out in its:

- Scope: More than 55,000 children and their communities were reached! The online database with hundreds of PV installations delivers valuable data on the operation of PV plants in practice.
- Participatory approach: The school authorities (in most cases the municipality), the teachers and the students were actively involved in all stages of the project, including financing and data monitoring.
- Educational strategy: The ESV developed new interactive pedagogical tools focussing on "learning-by-doing", such as "solar test boxes" for different age groups and ready-to-use training sessions for teachers. The greatest novelty was the creation of tools for nursery school children. The teachers were trained on how to use these and integrate them into their curriculum.
- Long-lasting effect: Training at least one teacher per school (in total, over 600 educators) allows the knowledge to be carried over from year to year. The strong involvement of the students offered them valuable knowledge for their personal and future professional lives. The school project and fund-raising activities got the entire community engaged, thus also increasing the environmental awareness of the larger public.

### Barriers

After installation, PV systems are often "invisible" and are "forgotten" by the users of the building. The programmes "PV goes to school" and "PV kindergarten" aimed at anchoring the idea of saving energy and knowledge about solar energy in the minds of those involved in the long term. The following measures contributed to this:

- newly developed age-appropriate and interactive teaching aids on the topics of energy efficiency and renewable energy, including didactic material for educators
- digital display board, mounted in a clearly visible place in the educational institution, which shows the solar yield
- tailor-made training event for educators
- project-oriented integration of solar energy in school lessons

### Key learning points

- Getting children involved can lead to higher visibility of a subject beyond the school's walls.
- Training the trainers and a comprehensive, well thought-out package can ensure long-lasting impact.

### Relevance to HP4ALL

- Mostly as inspiration on how awareness and knowledge of a topic can be increased in the general public.
- Training at least one teacher per school allows the knowledge to be carried over from year to year. The strong involvement of the students offered them valuable knowledge for their personal and future professional lives. The school project and fund-raising activities got the entire community engaged, thus also increasing the environmental awareness of the larger public.

## NEWCOM

<b>Name</b>	NEWCOM	<b>Location</b>	<i>Austria</i>
<b>Type</b>	European wide research project	<b>Funding</b>	EU H2020
<b>Start date</b>	01/09/2017	<b>End date</b>	30/11/2020
<b>Website</b>	www.newcomtraining.com		

### Description

NEWCOM (New qualification schemes to build high quality) is a European-wide project developing on the one hand training schemes to enable construction workers and building professionals to build the nearly zero-energy building (nZEB) standard and on the other hand a basis for the mutual recognition of the developed training schemes.

As basis for the mutual recognition of the developed training schemes, a database of competences (pilot version) was developed. Here the gained knowledge, skills and competences of professionals can be collected. Professionals who have passed trainings or companies who have trained craftsmen can be registered in this database. This way professionals and/or companies can promote themselves or their work. Moreover, companies in search of qualified professionals can compare competences of registered craftsmen.

### Outcome / Impact

The main project outputs are:

- Development of needed training modules for building professionals.
- Implementation of respective "train the trainer" trainings in the participating countries.
- Preparation of mutual recognition of the developed training schemes between different member states (incl. the preparation of a European database of certified building professionals).
- Development of strategies to raise the market demand for the developed training schemes to guarantee the sustainability beyond the project lifespan as well as the replication across the EU by involving national associations and training centres.

### Barriers



Construction errors are responsible for most of poor energy performance of buildings in practice. Reasons for construction mistakes are often that workers on construction sites, who make up relevant parts of the building envelope or the HVAC systems, are not aware of the complexity of nearly zero-energy buildings. This is because of the very limited availability of further education in the construction sector in many countries around Europe especially regarding on the possibility of mutual recognition between different member states. Furthermore, actual offered courses in the building sector do not cover topics like cross craft understanding, lifelong service approaches or continuous controlling and monitoring for the construction and maintenance of nZEBs (nearly zero-energy buildings). In addition, quality control also lacks in many cases. These factors all result in construction mistakes on-site.

NEWCOM addresses these barriers by establishing training modules that can be used both as standalone and as a complement to already established courses and by developing of missing certification schemes for building professionals.

#### Key learning points

- It is important to start with the identification and evaluation of existing training, certifications schemes and implementation methods for blue collar workers and building inspectors
- Then a database was created of common/harmonised descriptors (terms and phrases to be used in qualification standards/Units of Learning Outcomes (ULOs) to describe the skills, knowledge and competences required) as well as the assessment and certification of the needed qualification schemes for professionals for the missing competences was developed
- Lastly, the project developed and implemented the missing certification schemes and training for building professionals. These training modules were developed in cooperation with educational institutions, further education institutes as well as public and private stakeholders. For developing the training modules, a knowledge hub was created. Moreover, demonstration pilot “train the trainer”-courses were implemented to test and evaluate the developed training modules.

#### Relevance to HP4ALL

HP4ALL could add this database of common harmonised descriptors for HP competences to the knowledge hub that will be developed in WP4



## b. Croatia

### BUILD UP SKILLS HR

Name	BUILD UP SKILLS HR	Location	Croatia
Type	National Roadmap for education	Funding	EU
Start date	2012	End date	2013
Website	<a href="https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-hr">https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-hr</a>		
Description			
<p>This project aimed at developing a national strategy for the continuous education and training of the (current and future) building construction workforce. Its subsequent implementation should lead to an increased application of energy efficiency (EE) and renewable energy sources (RES) in the construction sector daily practices, through increased practical knowledge of on-site workers specialized on all phases of the building's construction and maintenance processes. This will ultimately contribute to achieve the goals proposed by the EPBD.</p>			
Outcome / Impact			
<ul style="list-style-type: none"><li>Ministry of Labour and Pension Scheme was invited to participate in development to improve skills and competitiveness of existing construction workers in the energy efficiency field.</li><li>Members of the National Qualification Platform were mobilized to work further towards the targets set in the National Roadmap</li><li>National qualification platform (NQP) and stakeholder engagement with 60 active participants. NQP concluded that lack of education of blue-collar workers is a huge problem in Croatia. New connections between stakeholders of NQP were made and it is expected to have closer cooperation between stakeholders related to this problem.</li><li>Number of workers involved in the (construction/building/craftsmen and other on-site workers): 50,218 on-site workers (2011)</li><li>Number of workers requiring training: 37,600 (including RES).</li><li>Professions with the highest needs of training: plasterer, bricklayer, carpenter, wall painter/painter, roofer, dry-liner.</li><li>The main measures identified in Qualification and training roadmap were the need for education and lifelong education of the existing qualified workers in the fields of EE and RES. Use of public tendering system to promote certification of workers (after the sufficient number of educated workers have entered the market) and the mechanism for protection of local contractors. Marketing plan for the purpose of workers lifelong education.</li><li>The Roadmap was endorsed by 23 relevant stakeholders (project partners are not included).</li></ul>			
Barriers			
<p>Croatia was lacking a National Roadmap for the education of the building construction workforce and this project created one.</p>			

### Key learning points

In Croatia, continuous Program for Education and Training for construction in the field of energy efficiency are only held for engineers. There is no lifelong education or certification for workers and craftsmen related to building energy performance improvement.

In Croatia green public procurement is very rarely in use. In the future it should be necessary to use certified labour force in public procurement. The "energy-efficient" public procurement will enable a faster entry of certified construction workers into the refurbishing activities and it is expected that employment of certified construction workers will eventually take place on a broader level.

### Relevance to HP4ALL

Energy efficiency training should not only be reserved for engineers, but should include all of the building value chain, including the construction workers, installers of building equipment and financial institutions.

## CROSKILLS

<b>Name</b>	CROSKILLS	<b>Location</b>	Croatia
<b>Type</b>	Project (training)	<b>Funding</b>	
<b>Start date</b>	2014	<b>End date</b>	2017
<b>Website</b>	<a href="http://www.croskills.hr/">http://www.croskills.hr/</a>		

### Description

CROSKILLS project, as part of the Build Up Skills initiative, focuses on developing the training plan that includes curricula and training modules with accompanying teaching materials, in order to close the educational gap in the construction sector. Activities have been implemented in cooperation with relevant institutions and organisations from industry, vocational training and administration, to comply with the needs of the sector and the legal requirements.

The training modules have been developed for each of the 6 priority construction professions (plasterers, roofers, drywall fitters, house painters, carpenters and bricklayers), in 4 modules in accordance with the Croatian Qualifications Framework (levels 2 and 3) - a total of 24 modules. Training plans covered:

- permanent on-the-job training of qualified on-site workforce;
- qualification of unqualified workers for on-site construction jobs;
- pre-qualification of (un)employed construction workforce for other/additional on-site construction profiles;
- certification of non-formal and informal learning outcomes - certification exam without a course taken.

Target groups: Local, regional, national authorities and facilitators, building professionals.

### Outcome / Impact

- 330 construction workers have been trained and certified by CROSKILLS curriculum, getting them ready for the changing market and new challenges in the field of energy efficiency in building
- 11 vocational schools and polytechnics have been selected as first training centres which also implemented pilot trainings of workers in 6 key professions – plasterers, roofers, drywall fitters, house painters, carpenters and bricklayers.

- Around 290 trainers have been equipped for implementing lectures and practical teaching, and the training centres received the teaching material and modern demonstration models of energy efficient construction, which will facilitate the learning process and enhance practical work sessions. Special attention has been paid to new materials, products and technologies in the (re)construction of buildings, with focus on nZEB which currently are not part of formal education curricula in vocational schools.

### Barriers

Croatia, with some exceptions in the institutional vocational education, has no systematic training of students and construction workers in energy efficiency (EE), and there is also no certification scheme for workers or companies related to EE in buildings.

This project has developed training modules for the construction workforce to help them understand the notions in energy efficiency and nZEB and provided a certification scheme for workers.

### Key learning points

For new building materials and technologies to be used in the design of buildings, a system should be in place to teach the building professionals how to integrate these in their daily practice.

### Relevance to HP4ALL

In some countries, the building professionals might not have the knowledge to deliver energy efficient or nZEB buildings, as these concepts are not taught in the educational institutions yet. Proper training for building professionals could help them better understand the role of HPs in nZEB buildings.

## FIT-to-NZEB

<b>Name</b>	FIT-to-NZEB	<b>Location</b>	Croatia
<b>Type</b>	Project (training)	<b>Funding</b>	EU
<b>Start date</b>	2017	<b>End date</b>	2019
<b>Website</b>	<a href="http://www.fit-to-nzeb.com/">http://www.fit-to-nzeb.com/</a>		

### Description

FIT-to-nZEB is a partnership of 10 European countries. It presents a follow-up to CROSKILLS, focused on the development of innovative training programs for qualified workers and construction experts for energy renovation up to the nZEB level, in order to enhance the speed and quality of energy renovation in general.

### GOALS

- To increase the demand for training on energy efficiency in buildings and particularly on deep energy retrofit;
- To increase the number of qualified workers and specialists along the whole construction chain,
- To accelerate the energy renovation of the existing building stock and to raise the quality of the renovated buildings.

### OBJECTIVES

- To elaborate a set of required technological competences related to the Energy Efficiency and Renewable Energy in building retrofit;
- To develop new training programmes at all levels of the vocational education system;
- To review the national educational plans for the relevant professions and introduce the necessary changes;
- To train and certify (on behalf of the project) a sufficient number of trainers.
- To support and monitor the first courses on the new programmes.

#### Outcome / Impact

- Compendium of learning targets
- Design of demonstration and training models
- Training programme for higher education establishments
- Training programme for professional colleges and high schools
- Two training programmes for specialization of adult workers
- Scheme for validating of knowledge, skills and competences acquired at the workplace
- Educational content on building renovation for the initial education
- Train-the-trainer courses
- Pilot courses on the new programmes
- Large-scale communication campaign

#### Barriers

Reaching the 2020 and 2030 energy and climate objectives represents a major challenge to the construction sector, which needs to be ready to deliver high energy performing renovations and, in particular, nearly zero-energy buildings.

This goal requires a major effort to increase the number of qualified construction specialists at all levels, which is directly related to the accessibility and quality of the training and educational programmes and the inclusion of training on intelligent energy efficiency and RES solutions in building renovation.

#### Key learning points

Because there aren't enough skilled professional in energy efficiency and deep energy renovation, the energy renovation is slow in Croatia and the quality of the buildings that have been renovated could still be improved. This can be achieved by changing the educational system to include training material about nZEB, energy efficiency and Renewable Energy Solutions. Having this knowledge will empower the building professionals and will help them design and construct energy efficient buildings that use renewable technologies, installed by qualified professionals.

#### Relevance to HP4ALL

New training programs should be developed for all professionals in the building value chain, focusing on energy efficiency and nZEB performance and hence the role of HPs should be defined within these. This should include reviewing and amending the national education plans and implementing certification schemes.

## c. Finland

### BUILD UP SKILLS BEEP

Name	BUILD UP Skills BEEP	Location	Finland
Type	Project	Funding	EU
Start date	2013	End date	2016
Website	<a href="https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-beep">https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-beep</a>		
Description			
<p>The overall aim of the BEEP project was to increase the number of skilled construction workers, leading to Finland's construction sites achieving ambitious energy efficiency targets. The practice-oriented approach focused on on-site training and practical exercises. The specific objectives were:</p> <ul style="list-style-type: none"><li>• Identify and document best practice in energy efficient construction;</li><li>• Produce training material for trainers, develop a teacher training scheme, and arranging pilot trainings to test the approach and improve the competence of trainers;</li><li>• Introduce practical on-site training for workers.</li><li>• Produce training materials and new methods, develop and pilot on-site training scheme for training of change agents</li><li>• Ensure interaction between the operating environment and relevant strategic initiatives.</li><li>• The project combined practical and theoretical expertise in construction, energy issues and education. Wide engagement of stakeholders has been ensured.</li></ul>			
Outcome / Impact			
<ul style="list-style-type: none"><li>• A comprehensive publicly available (on-line) toolbox of training material was prepared in different forms (PPT-slides, instruction cards, booklets and videos) and in 5 languages (Finnish, Swedish, English, Russian, Estonian) based on best energy efficient practices in construction. Instruction cards were particularly well received by workers and the wider construction training community (also in Europe)</li><li>• Recommendations on practical energy efficient implementation on construction sites with solutions related to heat and moisture physics and building technology were presented through innovative and easily accessible materials (videos, instruction cards, booklets, informative posters) based on practical examples:</li><li>• Production of teacher training scheme and pilot trainings led to improved competence and motivation of teachers/trainers to take up energy efficient solutions into training programmes. As a result of training carried out by the trained teachers, the competence of construction workforce has been improved (35 teachers were trained during the action)</li><li>• On-site training scheme and pilot trainings for "change agents" was designed. Change agents were selected from construction workers to act as multipliers of the training concept on construction sites: 58 workers (change agents) were trained during the action and 800 will be trained by 2020</li><li>• Various activities were developed to foster collaboration of stakeholders and implementation of the roadmap activities: 240 stakeholders were active in the</li></ul>			



platform during the action and it is expected that a total of 450 will be part of the platform by 2020

### Barriers

The project aimed to implement the Roadmap produced in Finland's Pillar I project, which showed that most construction workers would benefit from further training, and energy should be a cross-cutting theme in all basic and further education. The need for short-duration precision training was especially evident. The Roadmap suggested three themes:

- Development of learning and knowledge;
- Dissemination of know-how & verification, and
- Supporting the development of knowledge.

### Key learning points

Involvement of key stakeholders towards the project objectives, activities and outputs is crucial for success. Endorsement and support of the Strategic Advisory Group represented by the key authorities in the construction and training sector was essential for the successful implementation of the action. Investing in thorough material preparation is essential.

Wide variety of material in different formats ensures wider adoption and acceptance for use. Visual illustrations/photos/graphs complement the text and translate the message in a comprehensible way by a glance. Using new or uncustomary methods to raise interest in target groups was crucial.

The on-site training ambassador promoted the training concept and materials to construction companies. The method was very successful. The on-site training ambassador was welcomed and construction companies committed to send workers to pilot trainings. The on-site training ambassador has been invited to various occasions to train professionals and present the training scheme.

Construction industry is very fast-paced with strict schedules not often allowing extra activities like training for workers. Other companies' workers are not allowed on the construction sites due to strict security. Company specific trainings works the best.

### Relevance to HP4ALL

For those countries where HPs are to penetrate the market, there should be an analysis of the National Roadmap that ensures that the workers and professional have the skills needed to deliver energy efficient buildings.

## KETO-5-TEM

<b>Name</b>	KETO-5-TEM	<b>Location</b>	<i>Finland</i>
<b>Type</b>	Legislation	<b>Funding</b>	
<b>Start date</b>	2001	<b>End date</b>	2020
<b>Website</b>	<a href="https://ec.europa.eu/energy/sites/ener/files/documents/article7_en_finland.pdf">https://ec.europa.eu/energy/sites/ener/files/documents/article7_en_finland.pdf</a>		
<b>Description</b>			
Finland's national energy efficiency programme, which will implement the obligations of Article 7(9) of the Energy Efficiency Directive, includes eight energy efficiency measures, one of which is "Heat pumps for single family houses and terraced houses" (Measure KETO-5-TEM)			
Households have been allowed since 2001 to apply a domestic help credit in their tax returns for paying for work related to the installation of a HP. The financial impact of this domestic			



help credit is EUR 200 to 3,500 depending on the type of pump. The acquisition and commissioning of HPs is actively promoted through information and communication measures and projects financed by ministries. The popularity of HPs follows from sustained work which started in the early 2000s. HPs in single-family houses and terraced houses fall under categories (b), (d) and (f) of Article 7(9).

Entrusted parties:

Motiva: The Ministry of Employment and the Economy designated Motiva Oy as the national coordination centre for energy guidance in 2010. As part of its energy guidance to consumers, Motiva Oy promotes the commission of HPs in its own communications and in communication projects coordinated by it.

Implementing public authority:

Tax administration: The domestic tax credit has to be applied for on a separate form annexed to the tax return. The taxpayer has to keep the receipts for six years and the tax office may request them as needed.

### Outcome / Impact

HPs are installed as an energy saving measure in existing single-family houses and terraced houses and in new houses as an energy efficient main or additional heating system. The sales of HPs started to soar in 2000, when the Finnish Heat Pump Association (SULPU) and Motiva Oy started to promote their use. In 2012 around 60,000 HPs were sold, up from fewer than 1,000 units in 1999. By the end of 2012, a total of 522,000 HPs had been installed in Finnish single-family houses and terraced houses. In Finland HPs are a crucial measure in achieving both the 2020 renewable energy target and energy efficiency target.

It is estimated that 845,000 HPs would have been installed by 2020, including geothermal, air source, air-to-water and exhaust air HPs. These installations were expected to yield 11,811 GWh cumulative energy savings between 2014 and 2020.

### Barriers

The Finnish Heat Pump Association gathers annual information on HP sales in Finland for Statistics Finland. If the annual HP sales figures are not sufficient to meet the RES target for 2020 and the Energy Efficiency Directive target for the period 2014–2020, the responsible ministries can take corrective measures, which may be promotional measures and/or regulations.

### Key learning points

The sales of HPs increased when the Ministry of Employment and the Economy (Motiva Oy) started to promote their use.

The initiative shows that by supporting HP installation through policy and financial incentives, 845,000 HPs would have been installed from 2000-2020.

### Relevance to HP4ALL

This initiative shows that supporting HP sales and installation through legislation and financial incentives can give considerable results.

## d. France

### RGE label

<b>Name</b>	RGE label	<b>Location</b>	France
<b>Type</b>	Public initiative	<b>Funding</b>	Government + ADEME
<b>Start date</b>	2011	<b>End date</b>	-
<b>Website</b>	<a href="https://www.quelleenergie.fr/rge-reconnu-garant-environnement">https://www.quelleenergie.fr/rge-reconnu-garant-environnement</a> <a href="https://www.service-public.fr/professionnels-entreprises/vosdroits/F32251">https://www.service-public.fr/professionnels-entreprises/vosdroits/F32251</a> <a href="https://www.economie.gouv.fr/entreprises/batiment-label-rge">https://www.economie.gouv.fr/entreprises/batiment-label-rge</a>		

### Description

The label RGE (Reconnu Garant de l'Environnement) stands for Recognized as Guarantor of the Environment. It is a title that the energy professionals can obtain voluntarily. While it is not mandatory for the professionals to have this title, the energy renovations and installations of energy saving equipment must be performed by a RGE professional for the end-users to obtain financial aid.

It is intended for companies performing energy works and installation of renewable energy equipment, such as solar panels, wood heating, HPs, etc.). Once the label is obtained, it is awarded for 4 years, with an annual check-up. At the end of the 4 years, a renewal procedure must be initiated.

### Outcome / Impact

In 2015, more than 60,000 companies had the label RGE, or approximately 500,000 professionals. About 2500 qualifications were delivered each month.

The label guarantees:

- That the professional has taken work and civil liability insurance
- Ensures the supply and installation of equipment and has the resources (human and material) necessary to do so
- Has references in the domain concerned
- Has at least one site technical advisor who has completed the mandatory training in the field of energy efficiency and / or renewable energies.
- Has had at least one of its sites checked within the last 24 months and that has received a quality award.
- It obliges professionals to follow the training courses indicated by the corresponding organization that awards the label. At least one of the company's employees must be trained and then they can become a "technical reference" for the company.

### Barriers

To fight against fraudulent or abusive practices, the Government has decided with professionals to strengthen this RGE label, in particular by tightening the level of requirements to increase confidence in the label and allow virtuous companies to be better identified and recognized.

More concretely:

- The selection of controlled sites would henceforth be made randomly by the qualification body.
- 6 so-called "critical" areas of work, who are particularly at risk (insulation of attics or change of boiler for example), will see the number of audits increased. For example,

a company with at least one critical area will be subject to 2 audits per period of 4 years for its first critical area and to 1 audit per additional critical area.

- The penalties for companies at fault will also be reviewed and additional controls will automatically be triggered in the event of major non-compliance.
- The qualification body may also make the "RGE" qualification conditional on additional training.

These changes are expected to come into force in the first half of 2020.

### Key learning points

Having a certification in place for the professionals ensures that they can be easily found, makes them reliable, ensures they can deliver the services promised and that the professional is insured in the case of a problem. This way, the customer has a guarantee of the quality of the service provided.

### Relevance to HP4ALL

Energy works, including installing HPs should be provided by certified professionals who are insured and easily found.

## MaPrimeRenov

<b>Name</b>	MaPrimeRenov	<b>Location</b>	France
<b>Type</b>	Public incentive	<b>Funding</b>	French Government – l'Agence Nationale de l'Habitat (Anah)
<b>Start date</b>	January 2020	<b>End date</b>	
<b>Website</b>	<a href="https://www.ademe.fr/sites/default/files/assets/documents/guide-pratique-aides-financieres-renovation-habitat-2020.pdf">https://www.ademe.fr/sites/default/files/assets/documents/guide-pratique-aides-financieres-renovation-habitat-2020.pdf</a> <a href="https://www.ecologie.gouv.fr/sites/default/files/19164_maPrimeRenov_DP_web_octobre2020.pdf">https://www.ecologie.gouv.fr/sites/default/files/19164_maPrimeRenov_DP_web_octobre2020.pdf</a>		

### Description

With MaPrimeRenov, the government is offering financial aid for thermal renovations in the residential sector to achieve improved comfort in the houses, a reduction of the electric bill and less GHG emissions.

Launched in January 2020, the incentive targets building owners - occupants (that live in the houses they own), with modest and very modest incomes as a first step. The amount of the incentive is calculated based on the revenue of the owner and on the ecological impact of the thermal renovations.

The incentive will be expanded as of October 2020 to provide financial aid to condominiums and landlords and to all residential owners that live in their house or rent it out, regardless of their level of income.

### Outcome / Impact

As of October 1 2020, more than 100,000 households have applied for the premium and more than 75,000 have already been agreed to help the work planned. To meet the strong demand, the 2020 budget of MaPrimeRenov was extended by 185 million euros in June 2020.

Part of this initiative, there were two incentives that paid for the insulation of attics and floors as well as for the replacement of old boilers. As a result, 1.2 million homes have been insulated and more than 400,000 boilers replaced since January 2019.

### Barriers

The incentive created so much demand, that in 2021 the initiative will extend by 2 billion euros over a period of two years.

Wealthier homeowners were only entitled to a tax credit on the works - known as the residual tax credit - which in many cases proved less advantageous and unfair. The initiative is now available to all residential owners, regardless of their household income.

### Key learning points

HPs (air water and geothermal) are mentioned in the list of work eligible for financial incentive. The initiative calculates the amount of aid offered for each individual based non only on their salary, but also on the ecological footprint (i.e., the more GHG saved, the more financial aid is received)

The document mentions what kind of qualification the installers of the different technologies should have to be eligible for financial aid.

The initiative became the main financial aid for energy renovation, but it can be combined with other relevant financial aids. The accumulation of these aids can result in a reduction of 90% of the total cost of works for the poorest households.

The initiative proposes a bonus for households with energy labels F (331 – 450 kWh/m<sup>2</sup>/year) and G (>450 kWh/m<sup>2</sup>/year) that manage to improve their building energy label above F.

### Relevance to HP4ALL

The initiative drives citizens to choose the label RGE, thus driving the skills in the construction sector.

While this initiative provides financial incentives for various works that lead to reductions in GHG emissions, it directly relates to HPs, as the installation of HPs (air water and geothermal) is included in the list of work eligible for financial incentives. It provides a structured way to integrate HP technology in the energy transition plan and it is innovative because it allows for accumulation of different financial incentives and it calculates the amount of rebate based on both the salary of the household, as well as the reduction in GHG emissions of the implemented measures.

## PTRE

<b>Name</b>	PTRE	<b>Location</b>	France
<b>Type</b>	Public initiative	<b>Funding</b>	Public subsidies (from ADEME, from Europe and regional and local communities)
<b>Start date</b>	2014	<b>End date</b>	-
<b>Website</b>	bretagne.developpement-durable.gouv.fr https://www.legifrance.gouv.fr/jorf/article_jo/JORFARTI000031044495 file:///C:/Users/andreea.lecam/Desktop/HP4ALL/WP2/T2.1/France/synthese20p-evaluation-plateformes-territoriales-renovation-energetique-ptre-2018.pdf		
<b>Description</b>			
PTRE stands for “Plateforme territoriale de rénovation énergétique de l’habitat”, or the territorial energy renovation platform.			



The PTREs are local public service systems implemented by regions and / or inter-municipal sectors. Their objective is to provide technical advice, legal support, and financial aid in the energy renovation of buildings, for individuals or professionals. The advice provided is personalized, free and independent. They also inform the community on news and changes in the energy renovation sector.

The PTREs have 5 missions:

- Stimulate demand from individuals and simplify the renovation process
- Structure the technical offer (for the building professionals)
- Mobilize, organize and structure the financing offer
- Structure and position the platform in line with its environment and create territorial dynamic
- Study and create a legal form and an economic model allowing the sustainability of the platform

Stakeholders targeted:

- Public agency of inter-municipal cooperation
- The public / consumers
- Local social economic actors

The local PTREs are managed by different organisms: The Environment and Energy Management Agency (ADEME), the National Housing Agency (ANAH), the departmental housing information agencies (ADIL), local energy and climate agencies (ALEC), town planning agencies, architecture, town planning and environment councils (CAUE), regional energy agencies.

Article L.232-2 of the Law on Energy Transition for Green Growth (LTECV), published in 2015, defines the role, missions and operating procedures of PTREs.

## Outcome / Impact

There were 154 PTREs created in 3 years.

These platforms managed to:

- promote the mobilization of skilled professional and the banking sector,
- lead a network of professionals and local actors
- structure the skills development of professionals
- they direct consumers, according to their needs, to competent professionals throughout the renovation project.

## Barriers

When individuals have the will to reduce their energy bills, they often don't know how to do it and who to contact. This initiative provides free advice for individuals as well as information for local communities on the latest developments in energy renovation.

## Key learning points

- It offers a structure to the skills development of professionals
- It provides a free service of energy renovation advice for both individuals and professionals



- It maintains a network of professionals and acts as a facilitator, putting in contact clients with professionals
- It has a legal character
- The PTRE initiative is complementary to existing initiatives and tools in the field of energy renovations

#### Relevance to HP4ALL

Such an initiative can help structure the development of skills of energy professionals, thus including the HP value chain. It can also help connect consumers willing to install HPs in their buildings to the different professionals needed for such a renovation project. A success factor for this initiative, as well as many initiatives in France, has been its definition in the LTECV.

#### BIMplement

<b>Name</b>	BIMplement	<b>Location</b>	France
<b>Type</b>	Project	<b>Funding</b>	EU H2020
<b>Start date</b>	01/09/2017	<b>End date</b>	31/08/2020
<b>Website</b>	<a href="https://www.bimplement-project.eu/about-bimplement/">https://www.bimplement-project.eu/about-bimplement/</a>		

#### Description

BIMplement fully builds on the available results of the related BUILD UP Skills (BUS) and Construction Skills projects combining quality assurance with large scale qualification schemes.

BIMplement offers the trainers and the learners a range of tools that fit the objective of developing a fully qualified and equipped workforce, capable to implement, execute and perform all the necessary labour actions.

The BIMplement Qualification Framework consists of a flexible methodology that allows definition of professional activities, related skills, required competences in order to achieve a desired quality in the field of nZEB. It is composed out of tasks and related subtasks that have to be performed at a certain time in a process and by individuals with a particular skillset.

#### Outcome / Impact

The main aim is to achieve an improved quality for NZEB construction and renovation by setting up a large scale, training, CPD and qualification scheme, addressing the entire process in a cross-crafts and cross level multidisciplinary approach, strengthened with hands-on and BIM-enhanced workplace learning tools. The project has the following objectives:

1. To improve the overall quality of renovations and new constructions, based on a BIM-enabled workplace learning, addressing the entire process phases in a cross-crafts multidisciplinary approach.
2. To create a new generation of professionals and craftsmen, equipped and enabled by BIM skills, to enhance the overall quality of construction and renovation across the entire process.
3. To foster interactions between different trades and professions enabled by a flexible qualification, certification and accreditation methodology for implementing BIM as a workplace learning environment.



4. To sustain the qualification and training schemes a replication and exploitation strategy will be developed and validated.

BIMplement has trained more than 1,100 professionals (blue-collar and white-collar workers) and the methodology has been tested in more than 40 construction or renovation projects in France, the Netherlands, Spain, Lithuania, and Poland.

### Barriers

The BIMplement project highlighted two conflicting observations:

- for BIM to drive to a maximum improvement on the final quality of the construction, it is essential that all execution phase stakeholders, and especially on-site operators, use the models on the worksite, made accessible with freeware viewers and/or collaborative platform by companies,
- it is difficult to organize and carry out training sessions for site workers, from the site manager to the companions and craftsmen, because of the constraints of the construction site, even if the owner imposes these trainings. One of the major constraints is the difficult mobilization of companions and craftsmen for a full day training session.

### Key learning points

NZEB construction needs an enhanced systematic approach for the quality control of the entire process to reduce the gap between designed and actual performances of buildings. This requires a fully qualified and equipped workforce, capable to implement, execute and perform all the necessary labour actions with understanding of the responsibility of their own profession and actions, as well as the relation with the other involved professions and actions.

### Relevance to HP4ALL

The HP4ALL could consult the BIMplement Qualification Framework for skills in HPs.

## e. Germany

### Deutschland machts effizient

<b>Name</b>	Deutschland machts effizient	<b>Location</b>	Germany
<b>Type</b>	Public initiative	<b>Funding</b>	Federal Ministry for Economic Affairs and Energy
<b>Start date</b>	2016	<b>End date</b>	On going
<b>Website</b>	<a href="https://www.deutschland-machts-effizient.de/KAENEF/Navigation/DE/Home/home.html">https://www.deutschland-machts-effizient.de/KAENEF/Navigation/DE/Home/home.html</a>		
<b>Description</b>			
<p>The aim of the campaign is to provide all of the different consumer groups with quick and simple access to the right information. This includes details on what efficiency measures are open to them, where they can gain expert advice, and how much government support is available to them.</p> <p>Consumers, home-owners, municipalities, and companies can use it to find out everything they need to know about improving energy efficiency in the home, at work, as well as in other areas of life – from energy-saving domestic appliances, to renovation work on private homes, to electric vehicle fleets for companies, through to efficient ventilation for municipal swimming pools.</p>			
<b>Outcome / Impact</b>			
<ul style="list-style-type: none"><li>• a better energy performance benefits the climate. Better energy efficiency means lower carbon emissions.</li><li>• Money savings for private households, companies and municipalities.</li><li>• Energy efficiency can put German companies in a better position to compete globally</li><li>• Energy efficient as a driver of new business models and innovative technologies that can give German businesses an edge over their competitors from abroad.</li></ul>			
<b>Barriers</b>			
<p>Rising pricing inequity (the difference between the market for electricity and the guaranteed price to producers for renewables is passed on to consumers, therefore, the bills have been raising for years)</p> <p>The information campaign launched by the Federal Government aims to accompany the energy efficiency measures and to show consumers, companies and public bodies how to use energy as efficiently as possible, so, partly, they can eventually reduce their energy bill.</p>			
<b>Key learning points</b>			
<p>Accessible information makes everyone take part on striving for energy efficiency</p> <p>Energy efficiency can put German companies in a better position to compete globally</p>			
<b>Relevance to HP4ALL</b>			
<p>It is important to take into account business perspective</p>			

### Efficient networks initiative

<b>Name</b>	Efficient networks initiative	<b>Location</b>	Germany
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Type	Public initiative	Funding	Federal Ministry for Economic Affairs and Energy
Start date	2014	End date	2020
Website	<a href="https://www.effizienznetzwerke.org/">https://www.effizienznetzwerke.org/</a>		
Description			
<p>The agreement aims to support and do everything in its power to promote the initiation and implementation of around 500 new energy efficiency networks of companies by the end of 2020. On the basis of previous experience with existing or completed energy efficiency networks in Germany, the German government assumes that the initiation and implementation of 500 additional networks can lead to savings of up to 75 PJ of primary energy or 5 million tonnes of GHG emissions by 2020.</p> <p>An Energy Efficiency Network (EEN) is a group of companies or public institutions whose energy managers meet regularly to share experiences on energy savings and to implement solutions.</p>			
Outcome / Impact			
<ul style="list-style-type: none"><li>• 282 registered networks</li><li>• 15 newly registered networks (in the last 6 months)</li><li>• 14 networks currently looking for partners</li><li>• 2504 companies involved in networks</li><li>• Results from a network project funded by the Federal Government have shown that the participating companies make significantly better improvements in their energy efficiency after three to four years than the average for their sector.</li></ul>			
Barriers			
<ul style="list-style-type: none"><li>• Rising pricing inequity (the difference between the market for electricity and the guaranteed price to producers for renewables is passed on to consumers, therefore, the bills have been raising for years)</li><li>• This initiative aims to further increase the use of energy efficiency through economic measures as an important instrument also for increasing cost efficiency of the entire energy system.</li><li>• There is a big diversity of companies and the need for individually tailored concepts.</li><li>• The German government and industry are focusing in particular on the perception of entrepreneurial self-responsibility in increasing energy efficiency</li></ul>			
Key learning points			
<ul style="list-style-type: none"><li>• Energy managers in each network must meet regularly to share experiences on energy saving and to implement solutions.</li></ul>			
Relevance to HP4ALL			
<p>It is important to encourage among different companies to achieve better results in the sector.</p> <ul style="list-style-type: none"><li>• Importance of creating of synergies between companies to find energy efficient solutions together and improve.</li></ul>			

## Energiewende

<b>Name</b>	Energiewende	<b>Location</b>	Germany
<b>Type</b>	National Strategy	<b>Funding</b>	Ministry for Economic Affairs and Energy dedicated to Energy and Sustainability (Fund for Climate and Energy), several other Federal Ministries and German Development Bank
<b>Start date</b>	2010	<b>End date</b>	On-going
<b>Website</b>	<ul style="list-style-type: none"> <li>• <a href="https://www.cleanenergywire.org/easyguide">https://www.cleanenergywire.org/easyguide</a></li> <li>• <a href="https://www.centreforpublicimpact.org/case-study/renewable-energy-germany/#:~:text=The%20initiative&amp;text=The%20German%20government%20set%20two,80%20percent%20of%20total%20electricity">https://www.centreforpublicimpact.org/case-study/renewable-energy-germany/#:~:text=The%20initiative&amp;text=The%20German%20government%20set%20two,80%20percent%20of%20total%20electricity</a></li> <li>• <a href="https://ec.europa.eu/info/sites/info/files/mission_oriented_r_and_i_policies_case_study_report_energiewende-de.pdf">https://ec.europa.eu/info/sites/info/files/mission_oriented_r_and_i_policies_case_study_report_energiewende-de.pdf</a></li> </ul>		

### Description

The Energiewende is a national long-term strategy for the development of a low-carbon energy system based on renewable energy and energy efficiency. The national initiative is an integrated policy that addresses all sectors of the economy and is framed by two key policy documents, namely the Renewable Energy Act (EEA) in 2000 and the Energiekonzept (Energy Concept) strategy in 2010. Energiewende is driven by four objectives: fighting climate change (through a reduction of CO<sub>2</sub> emissions), phasing-out nuclear power, improving energy security (through a reduction of fossil-fuel imports) and guaranteeing industrial competitiveness and growth (through industrial policies targeting technological, industrial, and employment development). The goal of the initiative is to phase out Germany's nuclear power plants by the end of 2022, and the transition of the energy system to become strongly reliant on renewable energy resources by the year 2050. The Energiewende's success depends on the technological innovations realised through research and development activities. In its 6th Energy Research Programme, the German Federal Government outlined the principles and focus of its funding policy. It envisages concentrating funding to an even greater extent on those

### Outcome / Impact

- Over 146 million tons of CO<sub>2</sub>-equivalent emissions were offset by renewables in 2013, 105 million tons of which were in the power sector alone.
- Germany reduced its carbon emissions by 27 percent between 1990 and the end of 2014. (Although they rose by one percent in 2015).
- Germany was the third largest market for solar thermal in the world behind China and the US. By 2014, more than 2 million solar thermal systems had been installed in Germany across approximately 18.4 million square metres.
- The Federal Government's Energy Research Programme is an integral part of Energiewende and contributes to the energy transition by developing technologies that aim to secure a reliable and competitive supply of power and heat based on renewable sources of energy. The direction of energy research policy is subject to continuous adaptation, which is conducted through stakeholder dialogue with the national stakeholders in the Federal Government and the business and scientific communities.

### Barriers

	Drivers	Barriers/challenges
Political	<ul style="list-style-type: none"> <li>Strong public and political consensus on Energiewende's targets.</li> <li>International climate change mitigation agenda.</li> </ul>	<ul style="list-style-type: none"> <li>Multi-level governance (Federal State and German Länder) may lead to ineffective decision-making processes.</li> </ul>
Economic	<ul style="list-style-type: none"> <li>Dependence on energy imports.</li> <li>Scarcity and prices of conventional energy sources.</li> <li>Creation of new domestic industry.</li> <li>Decentralised ownership of the energy system (consumers as energy producers).</li> </ul>	<ul style="list-style-type: none"> <li>Overall costs of the energy transition.</li> <li>A rapid increase in electricity prices due to the EEG surcharge for renewable energies.</li> <li>Nuclear and coal phase out has also destroyed jobs in the conventional energy sector.</li> </ul>
Societal	<ul style="list-style-type: none"> <li>Anti-nuclear movement since 1970s.</li> <li>Climate change concerns.</li> <li>Strong public support to the targets of the energy transition.</li> </ul>	<ul style="list-style-type: none"> <li>The elevated electricity prices may eventually erode public support.</li> </ul>
Technological	<ul style="list-style-type: none"> <li>Technological leadership and pioneering work in renewable energy technologies.</li> </ul>	<ul style="list-style-type: none"> <li>Grid infrastructure capacity and digitalisation of energy transmission.</li> <li>Energy storage technologies.</li> </ul>
Legal	<ul style="list-style-type: none"> <li>Nuclear phase out law.</li> <li>European directives and regulation related to climate and energy.</li> </ul>	

Table 1 : Drivers and barriers/challenges.

### Key learning points

- The initiative not only does increase the trust of citizens in energy efficiency, but also positions the transition to energy efficiency as something co-owned and positively assessed by them.
- There has been a strong commitment by the German government, through the Bundesministerium für Wirtschaft und Energie (BMWi), the economy and energy ministry, to promote energy efficiency resources with the help of the Energiewende organisation.
- The various targets that have been set by the German government are specific, measurable and consistent
- There is a proper mechanism and governing structure in place to monitor the project, with skilled programme managers.
- There has been a strong alignment between the actors involved in the initiative, and the government has taken various steps to promote the results, such as the segregation of utility firms to manage resources in a more energy-efficient way
- The Federal Government's Energy Research Programme is an integral part of Energiewende and contributes to the energy transition by developing technologies that aim to secure a reliable and competitive supply of power and heat based on renewable sources of energy. The direction of energy research policy is subject to continuous adaptation, which is conducted through stakeholder dialogue with the national stakeholders in the Federal Government and the business and scientific communities.

### Relevance to HP4ALL

- It is necessary to take into account increasing stakeholder's trust on the project
- It is of vital importance to strive for governmental support for carrying out the project
- Necessity to have a proper mechanism in place to monitor the project.
- It is important to keep Constant contact with stakeholders to keep adapting and developing. Communication with stakeholders is a constant process



## House turnaround

<b>Name</b>	House turnaround (hauswende)	<b>Location</b>	Germany
<b>Type</b>	Public campaign	<b>Funding</b>	German Energy Agency (Deutsche Energie Agentur - DENA); German Ministry of Economy and Energy (Bundesministerium für Wirtschaft und Energie)
<b>Start date</b>	2014	<b>End date</b>	2016
<b>Website</b>	<a href="https://ec.europa.eu/docsroom/documents/29803/attachments/5/translations/en/renditions/native">https://ec.europa.eu/docsroom/documents/29803/attachments/5/translations/en/renditions/native</a>		

### Description

The main objective of the campaign was to motivate single family and two-family homeowners to carry out energy saving renovations on their houses. In order to achieve this, the House Turnaround implemented the following activities:

- The House Turnaround (Hauswende) website ([www.die-hauswende.de](http://www.die-hauswende.de)) is an online resource that provides homeowners with comprehensive information on energy saving renovations. The resource also features a calendar of relevant events and information on funding and financing options;
- National advertising campaign targeting one-and two-family house owners to communicate the benefits of energy saving renovations;
- A pool of qualified energy renovation experts – using a list of experts that have registered with the Federal Ministry for Economic Affairs and Energy<sup>6</sup> – to assist with the installation of energy saving renovations. Interested homeowners can use the website to search for qualified experts in their area
- 1 The main objective of the campaign was to motivate single-family and two-family homeowners to carry out energy saving renovations on their houses. via a post code search function;
- Organisation of 100 information events in many regions of Germany to provide consumers with first-hand information. Local energy experts, regional energy agencies and the craft industry were involved in the events;
- Open home events: homeowners opening their houses to show and demonstrate the benefits of energy saving renovations that they have implemented and are using;
- Participation in trade fairs on energy efficient construction
- Information evenings with Members of the German Parliament

### Outcome / Impact

The campaign has received significant attention with more than half a million webpage views from approximately 270,000 visitors and more than 1,100 Twitter and 500 Facebook followers. Consumers visiting the website also showed significant interest in the energy renovation expert search facility, with around 18,000 visitors having consulted the expert database. Moreover, the campaign was widely covered in national media with more than 1,500 articles and 20 national press releases.

The House Turnaround project proved to be a successful marketing campaign which has received significant attention in digital and print media. The Campaign has also exceeded (by over 100%) expectations in terms of the number of regional events organised.



### Barriers

Lack of sufficient resources to organise more regional events and make a greater difference in convincing homeowners to invest in energy efficiency renovation work.  
Strong regional differences in Germany with relatively different demands for renovation.

### Key learning points

- Home renovations are individual, personal measures which require a more face-to-face approach.
- The federal energy renovation expert list played an important role in creating links with local energy renovation experts.
- An additional value is seen in the creation of the Alliance's network which has continued to collaborate reliably even after the end of the campaign. According to the BDH, the House Turnaround project is a good example of how PPP models can be successfully implemented in campaigns
- it did not involve the participation of consumer organisations or housing associations
- Strong regional differences in terms of demand for renovation

### Relevance to HP4ALL

It is vital to take into account not only national, but regional differences in demand for renovation.  
It is important to create working networks that are still active even after the end of the project

## NTRI

<b>Name</b>	NTRI	<b>Location</b>	Germany
<b>Type</b>		<b>Funding</b>	Ministry for Economic Affairs and Energy dedicated to Energy and Sustainability (Fund for Climate and Energy), several other Federal Ministries and German Development Bank
<b>Start date</b>	2016	<b>End date</b>	On-going
<b>Website</b>	<a href="https://epub.wupperinst.org/frontdoor/deliver/index/docId/6942/file/6942_Barthel.pdf">https://epub.wupperinst.org/frontdoor/deliver/index/docId/6942/file/6942_Barthel.pdf</a>		

### Description

National Top Runner Initiative (NTRI) -Retailers as gatekeepers between manufacturers and consumers. How to address retailers to promote energy efficient appliances.  
The NTRI is intended to bring energy efficient and high-quality appliances (so called Top Runners) onto the market more quickly, thus accelerate market replacement. For this purpose, motivation, knowledge and competence in product-related energy efficiency is to be strengthened and expanded along the whole value chain - from the appliance manufacturer to the retailer and the consumer. Manufacturers are pushed to develop more efficient products and consumers get valuable information about Top-Runner products and how they can benefit. In this context, retailers are especially relevant as they act as "gatekeeper" between manufacturers and consumers. They play a key role in advancing an energy efficient production and consumption. They do not only select the products but they also have a direct contact to consumers and influence the purchase decision.

### Outcome / Impact

- Increase market penetration of highly energy efficient appliances
- Appropriate size of appliances depending on household size and living conditions
- Energy efficient use of appliances
- On the long run reduce the energy consumption of appliances along the value chain from the development to the distribution to the purchase of appliances.

### Barriers

Slow market penetration of energy-efficient and high-quality devices.

Consumers not attaching greater importance to energy efficiency as a purchase criterion.

The initiative increases the amount of information provided and exchanged on product efficiency, focusing in three main points:

- A product finder informs consumers about energy-efficient products and their use. Consumers can access a range of online materials on energy-efficient products. Plans are also in place for information campaigns on various product groups and the revision of the EU energy label.
- Retailer network allows the exchange and development of information on sales activities, customer information or the joint establishment of training courses for retailers, for example.
- Manufacturers are encouraged to innovate, for example by means of innovation workshops.

### Key learning points

- It motivates manufacturers with networking events and exchange of ideas, new energy-efficient products to develop and thus become a pioneer on the market.
- It also provides information on new regulations and developments around the topic of energy efficiency.
- There is also a series of dialogues on the subject of Product efficiency, in which manufacturers interact with consumers, retailers and other

### Relevance to HP4ALL

It is important to increase the knowledge and understanding of those market actors that influence the purchasing decision of consumers. In the case of NTRI that is retailers. In the case of HP4ALL energy advisers, plumbers, designers or other tradespeople could all influence the purchase decision.

## f. Ireland

### HP Installer Course

<b>Name</b>	HP Installer Course – DKIT/METAC	<b>Location</b>	Ireland
<b>Type</b>	Training course	<b>Funding</b>	Participants pay a fee
<b>Start date</b>	September 2019	<b>End date</b>	Ongoing
<b>Website</b>	<a href="https://www.dkit.ie/courses/school-of-engineering/engineering-trades/heat-pump-installer-foundation-programme.html">https://www.dkit.ie/courses/school-of-engineering/engineering-trades/heat-pump-installer-foundation-programme.html</a>		

#### Description

HP installers in Ireland do not have to register with an industry body in the same way as gas (RGI) and oil boiler (OFTEC) installers do, and so there has not been an apprenticeship level HP training module or course offered in conjunction with plumbing or allied trades. In the mid to late 2000's, Sustainable Energy Ireland ran a grant scheme for domestic HPs and an associated training course was developed by a collaboration of SEAI, Arsenal Research and training providers in Ireland and Northern Ireland. The end of the grant scheme and the drop in HP installations caused by the global financial crash of 2008 led to a fall in demand and eventual closing of these training courses around 2012. A new HP grant in 2018 required an updated training course. Content was developed by a collaboration of SEAI, training providers, the Irish Heat Pump Association and other industry parties. It is up to individual training providers to achieve their own FE certification for this training module.

Course details:

FETAC/QQI code: 6N5646

Level: 6

Credit Value: 10

The purpose of this award is to equip the learner with the knowledge, skill and competence to design, install and commission domestic HP systems in a safe and competent manner and in accordance with appropriate legislation, regulations and standards.

The course is typically delivered over 30 hours of class contact with a further 30 hours of additional work.

Demand for the course is mainly driven by companies with a desire to participate in the SEAI HP grant scheme.

#### Outcome / Impact

Dundalk IT (DKIT) achieved QQI accreditation for their version of the course and their training facilities and began running courses in September 2019. To date they have trained approx. 50 people.

METAC achieved QQI accreditation for their version of the course and their training facilities in February 2020 and began running courses in September 2020, to date they have trained approx. 14 people.

SEAI have a list of 10 accredited training providers but at the time of writing, no other training organisation is offering this course.

#### Barriers

There was no national training material for HP installers. A collaboration of training providers, industry and government bodies overcame this by developing training content.

#### Key learning points

Ireland does not yet have training capacity in place for large numbers of HP installers. Most HPs will be installed outside of grant programmes, but there is no national requirement for installers of these HPs to be trained to a centrally coordinated standard.

#### Relevance to HP4ALL

Lack of any requirement (regulatory or in relation to access to grants) for HP installers to meet particular training standards has resulted in stagnation in the number of training providers offering HP related courses and the number of individuals with qualifications relating to installing HPs.

### TEA HP Training Course

<b>Name</b>	TEA HP Training Course	<b>Location</b>	Ireland
<b>Type</b>	Training	<b>Funding</b>	Participants pay a fee
<b>Start date</b>	September 2019	<b>End date</b>	Ongoing
<b>Website</b>	<a href="https://devmoodle.lit.ie/course/view.php?id=6">https://devmoodle.lit.ie/course/view.php?id=6</a>		

#### Description

Aimed at Engineers and other specifiers of HPs. The course headings are:

- Overview of Low Carbon Heating
- HPs & Appropriate Selection Criteria
- Design for HPs (residential and non-residential)
- Commissioning for High Performance & Long Life
- Results from Superhomes 2.0 Research Project on Air Source HPs

#### Outcome / Impact

The course was delivered to an audience of approx. 50 engineers in Autumn 2019. It is now available online through the LIT Moodle site. The course is promoted by Engineers Ireland as a CPD module. This has been delivered online twice in 2020 to a further audience of approximately 100 people.

#### Barriers

Covid-19 significantly impacted on delivery of this programme. This was overcome by switching to online delivery followed up by a Q&A webinar.

#### Key learning points

There is significant demand from Engineers and Architects for HP training.

#### Relevance to HP4ALL

HP4ALL could work with Engineers Ireland to promote training to Engineers.

## GAI RDD project

<b>Name</b>	Geothermal Association of Ireland (GAI) RDD Project	<b>Location</b>	Ireland
<b>Type</b>	RD&D project	<b>Funding</b>	SEAI
<b>Start date</b>	2016	<b>End date</b>	2017
<b>Website</b>	<a href="http://geothermalassociation.ie/">http://geothermalassociation.ie/</a>		
<b>Description</b>			
<p>The GAI has developed draft training modules focused on the design and installation of shallow geothermal collectors in Ireland. Final revisions of this content have yet to be carried out. The draft content was developed under a 2016 SEAI RD&amp;D programme and was designed to be used in conjunction with the FETAC (QQI) Level 6 (C30263) course for installers.</p> <p>GAI is involved with the EU group <i>Geotrainet</i> which is developing and delivering training for ground source HP systems.</p>			
<b>Outcome / Impact</b>			
<p>The content has yet to be finalised, but it was useful as GAI contributed to the development of the NSAI SR50-4 HP code of practice in 2020/2021.</p>			
<b>Barriers</b>			
<p>Consultations with stakeholders took longer than anticipated. The content was not fully completed and certified within the timeframe of the RD&amp;D project.</p>			
<b>Key learning points</b>			
<p>Greater resources are required to develop a comprehensive shallow geothermal training course that is fully connected to other HP training initiatives</p>			
<b>Relevance to HP4ALL</b>			
<p>Establish a clear strategy for all training related to HPs – all aspects, not just air source. i.e., ground source, waste heat recovery, water source</p>			

## HP Grants

<b>Name</b>	HP Grants	<b>Location</b>	Ireland
<b>Type</b>	Grant assistance	<b>Funding</b>	SEAI/Government
<b>Start date</b>	2018	<b>End date</b>	ongoing
<b>Website</b>	www.seai.ie <a href="https://www.seai.ie/grants/home-energy-grants/heat-pump-systems/">https://www.seai.ie/grants/home-energy-grants/heat-pump-systems/</a> <a href="https://www.seai.ie/business-and-public-sector/business-grants-and-supports/support-scheme-renewable-heat/">https://www.seai.ie/business-and-public-sector/business-grants-and-supports/support-scheme-renewable-heat/</a>		
<b>Description</b>			
A government grant of €3,500 toward the cost of installing an air and ground source HPs to water HP became available from April 2018. The grant is available to homes built before 2011. In 2019, the Support Scheme for Renewable Heat (SSRH) was launched. This provides up to 30% grant funding for capital expenditure on non-domestic HPs.			

### Outcome / Impact

By April 2019 the domestic scheme had received 550 applications. For an installer to be approved to work on the domestic grant scheme, they have to have a level 6 plumbing qualification, have undertaken the additional level 6 HP module described above, and have received training on the product they are installing by the product manufacturer/agent.

### Barriers

Homes must have a Heat Loss Indicator (HLI) of 2 Watts/Kelvin/m<sup>2</sup> or 2.3 W/K/m<sup>2</sup> with some caveats. Shortage of installers with sufficient training. Administrative burden of the grant can be a barrier to uptake.

### Key learning points

There is much debate about the HLI requirement. It can often cost tens of thousands of euro for a house to meet this requirement, yet reducing the HLI from say 2.5 to 2.0 will not yield significant heat load reductions.

### Relevance to HP4ALL

Grant schemes are of limited value if they seek to rectify problems relating to issues outside of the product/technology they are directly seeking to promote or have conditions that are difficult to satisfy.

## HP Tool

<b>Name</b>	HP Tool	<b>Location</b>	<i>Ireland</i>
<b>Type</b>	Building energy rating tool, excel based	<b>Funding</b>	Used in the Building Energy Rating process
<b>Start date</b>	September 2016	<b>End date</b>	ngoing
<b>Website</b>	<a href="https://www.seai.ie/publications/Heat_Pump_Examples_2016.pdf">https://www.seai.ie/publications/Heat_Pump_Examples_2016.pdf</a>		
<b>Description</b>			
The SEAI Dwelling Energy Assessment Procedure (DEAP) launched an accompanying Heat-Pump tool in 2016, the aim of the tool was to improve the treatment of HPs in the DEAP assessment by including the test results from standards aligned to the Energy Labelling and Eco-design directives, specifically EN14825 for space heating and EN16147 for DHW. The addition of the Heat-Pump tool would bring the predicted energy and efficiency values of the dwelling closer to real life. A Building Energy Register assessor is responsible for completing both the DEAP and Heat-Pump tool with input from heating system designer or installer.			
<b>Outcome / Impact</b>			
Incorporation of heat-pump test result standards increased the robustness of the DEAP methodology. Improve accuracy in energy and efficiency dwelling predictions.			
<b>Barriers</b>			
Extra layer of complexity added to the DEAP methodology for the stakeholders involved. SEAI produced training material in the form of guidance documents and produced technical bulletins.			



### Key learning points

Methodologies for calculating building performance and thus predict energy efficiency and energy use can be improved by the addition of technical standards. In house research done a number of DEAP heat-pump tool files show mistakes are happening i.e., inputs not selected or wrong information entered which shows further re-education is needed by the stakeholders using the tool.

### Relevance to HP4ALL

Tools can be a useful way of assisting stakeholders to change their approach but must be fit for purpose, and those using them must be properly trained to use them. It is important to check if tools are being correctly used by those who have received the training to ensure effectiveness. Linking of EU product energy labelling with national home energy rating software is an important step in ensuring the correct equipment is installed.

## NSAI SR 50-4

<b>Name</b>	NSAI SR 50-4	<b>Location</b>	Ireland
<b>Type</b>	National Standard Recommendation	<b>Funding</b>	National Standards Authority of Ireland
<b>Start date</b>	November 2019	<b>End date</b>	Planned Q1 2021
<b>Website</b>	<a href="http://www.nsai.ie">www.nsai.ie</a>		

### Description

In response to Action 66 of the Climate Action Plan 2019, and at the request of the Dept. of Communications, Climate Action & Environment (DCCAE), the Dept. of Housing, Planning & Local Government (DHPLG), and the Sustainable Energy Authority of Ireland (SEAI), NSAI Standards formed a new Technical Committee, namely, NSAI TC31 SC6 – HPs. Delivery of Action 66 requires the NSAI to develop a Standard Recommendation for the design, installation, commissioning and maintenance of HPs in dwellings. Key stakeholders within the sector were invited by NSAI Standards to express an interest in participating on the committee in late 2019. The draft SR was produced during 2020 and issued for public consultation in August. Publication of the final draft is due in Q1 2021.

### Outcome / Impact

A draft document has been produced and sent out to public consultation. SR5-4 was produced to provide a code of practice for the design and installation of domestic HPs. It is published in support of the Irish Government's Climate Action Plan 2019 (CAP 2019), Action 66: Roadmap to develop supply chain to support the phase out of fossil fuel boilers in new dwellings. The focus in the document is on the transfer of heat from a HP system to a dwelling and how the components of the HP operate to deliver this heat efficiently. The thermal performance and heat distribution system of a dwelling will have an impact on the success of a HP system, therefore designing and installing a HP system can involve more steps than for the case of a traditional heating appliance. This document concentrates on the types of HP that are the most common to be installed in dwellings to provide space heating and/or domestic hot water. It is intended that the SR will be used in the development of skills training for designers and installers of HPs and as a reference guide for all actors in the HP industry.

### Barriers



There is a need to gather inputs from as wide a range of key stakeholders as possible including industry, training providers, government, academic and research organisations. This is challenging to achieve.

#### Key learning points

An active national standards authority is an important factor in designing and setting realistic standards for installations, which can be used as the basis for any training materials developed. It is also important to consult with all the key stakeholders during the development of standards to ensure that the important factors are considered.

#### Relevance to HP4ALL

It is intended that the SR will be used in the development of skills training for designers and installers of HPs and as a reference guide for all actors in the HP industry. This will need to form part of the knowledge hub for the Irish market.

### Superhomes 2.0 Best Practice Report

<b>Name</b>	Superhomes 2.0 Best Practice Report	<b>Location</b>	Ireland
<b>Type</b>	Research project	<b>Funding</b>	Government fund via IERC
<b>Start date</b>	April 2017	<b>End date</b>	March 2019
<b>Website</b>	<a href="https://lit.ie/en-ie/research-development/development/energy/superhomes-2-0-optimisation-of-air-source-heat-pum">https://lit.ie/en-ie/research-development/development/energy/superhomes-2-0-optimisation-of-air-source-heat-pum</a>		

#### Description

The Superhomes 2.0 project investigated how HP performance could be optimised in dwellings that had undergone a deep retrofit through a pilot project with 20 homes. The final report resulting from this project identified the key steps in the process of retrofitting a HP to a domestic dwelling. Analysis of data from comprehensive monitoring systems was used to present examples of how the completion of these steps in real life affected the performance of the systems and led to improved HP COPs.

#### Outcome / Impact

Optimisation of ASHP installations achieved additional energy savings of 10-20% per year above the original levels following the deep retrofit activities. The project discovered that errors during the design, installation and/or commissioning phases led to underperformance of HPs in many settings, and simple adjustments could be made to system parameters to optimise performance.

#### Barriers

Generation of high-quality monitoring data is difficult and can be expensive. This project was helped by the fact that monitoring equipment had been fitted during grant funded retrofits, and a systematic data management, collection and analysis procedures were developed.

#### Key learning points

Without ongoing monitoring and analysis, HPs may not yield the intended energy savings. It is therefore important that commissioning is carried out correctly when systems are installed and that system performance is regularly checked by qualified professionals, who



are able to make any necessary adjustments to ensure that the system performs within the expected parameters.

## Relevance to HP4ALL

This report resulted from detailed analysis of performance data for 20 ASHPs in deep retrofit. The report focused on the importance of proper commissioning and handover and how this can affect system performance. It is intended to be read by designers, installers, those tasked with developing training programmes. It is also aimed at policy makers to show the importance of robust performance monitoring, data collection and analysis.



## g. Italy

### ITALY IN CLASS A

<b>Name</b>	ITALY IN CLASS A	<b>Location</b>	Italy
<b>Type</b>	Training	<b>Funding</b>	
<b>Start date</b>	2016	<b>End date</b>	2020
<b>Website</b>	<a href="http://italiainclassea.enea.it/programma/">http://italiainclassea.enea.it/programma/</a>		

#### Description

ITALY IN CLASS A is a national campaign promoted by the Ministry of Economic Development and carried out by the National Agency for Energy Efficiency (ENEA) that aims at promoting more awareness and efficient use of energy. It provides the tools and opportunities to accelerate the energy transition process in Italy. The campaign provides a series of training and information activities aimed at the Public Administration, large companies and SMEs, banking institutions, families and students that will take place from 2016 to 2020 throughout the national territory. Therefore, ENEA was given a mandate to prepare, involving public and private players in the sector, a three-year information and training program, aimed at promoting and facilitating the efficient use of energy.

#### Outcome / Impact

- Stimulate behaviours that contribute to reducing energy consumption in the Public Administration.
- Raise awareness among families, especially those who live in condominiums, on conscious use of energy and the advantages of energy audits and the Energy Performance Certificate.
- Educate students of all levels to behave more responsibly towards available energy resources.
- Support and encourage large companies and SMEs in carrying out energy audits and in using incentive tools, aimed at the installation of efficient technologies.
- Inform domestic customers and businesses about the benefits of existing incentive mechanisms, tax deductions in order to stimulate its intensive use.
- Promote training programs for the qualification of subjects operating in the field of energy services, with particular reference to the auditors and installers.

#### Barriers

There is a lack of information among citizens, families and students. It should be more publicized. Given the collaboration with the local TV through which some of the initiatives have been broadcast (such as info reality for example), they should think about a possible advertising campaign of these activities through this tool.

#### Key learning points

Several tools have been outlined to reduce the distance between energy sustainability and citizens. These include video lessons, info-reality, information campaigns, opinion leaders, webinars, street art, a portal dedicated to information, television collaborations, events, seminars, and meeting platforms.

#### Relevance to HP4ALL

This project has tested a number of different tools. Of the those highlighted above, those deemed most useful for the project could be selected.

## ENEA E-Learning

Name	ENEA E-Learning	Location	Italy
Type	Training	Funding	
Start date	2016	End date	-
Website	http://italiainclassea.enea.it/e-learning/		
Description			
ENEA (the National Agency for New Technologies, Energy and Sustainable Economic Development) made available free video lessons on energy efficiency. The video lessons (each lasting about 20 minutes), created ad hoc by ENEA experts from the Energy Efficiency Unit Department, can be used not only by technicians and professionals but also by students, teachers, citizens who wish to deepen energy issues.			
Outcome / Impact			
This initiative brings citizens closer to sustainable energy issues, increasing their knowledge on the subject, promoting their involvement and inspiring behavioural changes, as well as being a useful tool for technicians and professionals in the sector.			
Some of the main themes addressed are:			
<ul style="list-style-type: none"><li>• Condominium 4.0</li><li>• Energy audit of buildings</li><li>• Energy efficiency and indoor well-being</li><li>• Thermal plants</li><li>• Lighting</li><li>• Energy consumption</li><li>• Design solutions</li><li>• Ventilation</li><li>• Rainwater recovery</li></ul>			
Barriers			
The initiative is still not so well known to citizens and should be more publicized.			
Key learning points			
The importance of providing <u>free</u> tools in line with the most recent means of communication and the importance of providing easy and understandable tools also for students and families.			
Relevance to HP4ALL			
Free video lessons can be useful instruments to implement in our tools to spread the knowledge related to the HPs towards experts but also to citizens.			

## Collective Self-Consumption schemes and Energy Communities

<b>Name</b>	Collective Self-consumption schemes and Energy Communities	<b>Location</b>	Italy
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Type	Policy	Funding	
Start date	28 February 2020	End date	-
Website	<a href="https://dossierse.it/17-2020-gli-schemi-di-autoconsumo-collettivo-e-le-comunita-dellenergia/">https://dossierse.it/17-2020-gli-schemi-di-autoconsumo-collettivo-e-le-comunita-dellenergia/</a>		
Description			
<p>Collective self-consumption schemes and Energy Communities are tools that can give a boost towards the achieving decarbonization objectives at national and European level. The tools are essentially methods that citizens can adopt to collectively respond to certain needs in the energy, social and environmental fields, recognized as priorities by the community and consistent with decarbonization objectives at the Italian and European level. Thanks to two directives recently promoted by the European Commission, the Council and the European Parliament as part of the Clean Energy for All Europeans Package - the Renewables Directive (RED II2) and the Electricity Market Directive (IEM3) - it is formally recognized and promoted at an institutional level.</p> <p>The 28<sup>th</sup> of February 2020, Law 8/2020 was used to make enable the activation of Collective Self-consumption schemes and to establish Renewable Energy Communities and to define:</p> <ul style="list-style-type: none"><li>• A regulatory model to be applied to these new entities</li><li>• Incentive schemes for the energy shared.</li></ul>			
Outcome / Impact			
<p>Citizens are placed at the center of a new energy model, which increases the efficiency of household energy production and consumption, to fight energy poverty by reducing supply tariffs for individual users and for collective energy users.</p> <p>Law 8/2020 allowed to quickly start some experiments, creating new plants powered by renewable sources with modest power but strongly integrated at an urban or territorial level. Recently, actions to promote and evaluate some case studies were performed with the implementation of the first pilots.</p>			
Barriers			
<p>The greater the complexity of the configurations that the Renewable Energy Communities will be able to assume, the greater and more diversified will be the <u>competences in the energy field that the partners or members will have to possess</u>. For this reason, the Renewables Directive highlights the need for <u>collaboration between citizens and those who already operate in the energy field, such as ESCOs, local distributors or other industrial operators</u>. The concept has just started to gain traction and there will be a need to analyze the technological, territorial, legislative and regulatory barriers that will have to be overcome in order to ensure adequate dissemination.</p>			
Key learning points			
<p>Thanks to the increase in distributed generation of energy, it will be possible to create local networks with an increase in autonomy and the possibility of choice in terms of solutions more suited to local needs, to <u>promote greater and more aware participation of citizens in the current evolution of the national energy scenario</u>.</p>			
Relevance to HP4ALL			



HPs may be one of the technologies that will allow to boost the autonomy and self-consumption and the tools (HP Knowledge Hub, HP benchmarking tool) developed during the project can be a useful instruments to spread the knowledge needed to understand this technology in the energy communities.

## Superbonus 110%

<b>Name</b>	Superbonus 110%	<b>Location</b>	Italy
<b>Type</b>	Incentive	<b>Funding</b>	
<b>Start date</b>	July 2020	<b>End date</b>	December 2021
<b>Website</b>	<a href="https://www.mise.gov.it/index.php/it/incentivi/energia/superbonus-110">https://www.mise.gov.it/index.php/it/incentivi/energia/superbonus-110</a>		

### Description

The initiative is aimed at encouraging energy efficient refurbishments, installation of solar PV and development of infrastructure for electric vehicle charging. The aim is to help buildings to achieve higher Energy Performance Certifications through renovation activities by allowing building owners to reclaim 110% of the costs incurred for the upgrades via tax breaks.

### Outcome / Impact

The 110% tax deduction can be requested if any of the following interventions are implemented:

- Thermal insulation interventions
- Condominium interventions for the replacement of existing winter air conditioning systems
- Interventions on single buildings
- Energy requalification works
- Installation of infrastructure for charging electric vehicles in buildings
- Installation of photovoltaic systems connected to the electricity grid and integrated storage systems
- Anti-seismic interventions

This initiative encourages and enables citizens who are in a weaker financial position, and therefore those who are usually discouraged from implementing energy efficiency projects due to the high cost, to invest in deep energy efficiency renovations.

### Barriers

There are still many uncertainties concerning the realistic savings opportunity for citizens and the necessary conditions that must be met in order to qualify for the bonus. Excessive bureaucracy of the authorization process may put off some people from applying. From the 27<sup>th</sup> of October 2020 it is possible to send the documentations required for the 110% Superbonus to the ENEA's website to help make the process easier.

### Key learning points

The Superbonus scheme is a great opportunity to invest in building refurbishment and support the energy transition by reducing the economic barriers to citizens who wish to carry out deep energy retrofits of their buildings. Citizens can personally take advantage of the final benefit as the renovation is implemented in their own building / home / condominium.

The scheme incentivises the installation of measures that would normally not be financially attractive. The initiative also increases the knowledge of citizens on energy efficiency since the measures are applied to their homes and via their personal taxes, so there is an incentive for them to learn about which measures are most suited to their building in order to maximise the opportunities.

#### Relevance to HP4ALL

The installation of HPs and hybrid systems is included in the 110% Superbonus which could further drive an increase in HP sales in Italy. The initiative removes economic barriers that prevent citizens from investing and the bonus is favorable enough that it incentivizes subjects who would not normally be interested in energy efficiency (either due to its cost or through a lack of knowledge and understanding) to consider it.

### Heat Pump Table

<b>Name</b>	Heat Pumps Table	<b>Location</b>	Italy
<b>Type</b>	Network of associations	<b>Funding</b>	
<b>Start date</b>	July 2019	<b>End date</b>	-
<b>Website</b>	<a href="https://www.elettricitafutura.it/public/editor/Position_Paper/2019/Documento%20Tavolo%20Filiera%20PdC.DOCX.pdf">https://www.elettricitafutura.it/public/editor/Position_Paper/2019/Documento%20Tavolo%20Filiera%20PdC.DOCX.pdf</a>		

#### Description

The Heat Pump Table is a new entity in which numerous associations representing the sector participate, including: Assistal, Assotermica, AiCARR, Angaisa, Elettricità Futura.

The table was born with a triple objective:

- Develop a coordinated support activity towards the legislator;
- Organize training activities for all the players in the supply chain;
- Spread the knowledge of HP technology to the end user.

Its aim is to collect experiences, skills, relationships and initiatives of the individual associations to direct the institutions towards actions that can be useful for an even more significant development of HP technology.

#### Outcome / Impact

The Heat Pump Table was involved in the launch of the National Integrated Energy and Climate Plan (NECP) for Italy in 2019 and in 2020 in which they intervened in specific points for the consolidation of the policy framework necessary for the widespread deployment of HPs. The indications and proposals formulated by the Heat Pump Table include four areas of intervention:

- Electricity tariffs.
- Incentive tools.
- Training.
- Information and communication.

#### Barriers

Today the penetration rate of HPs as a building air conditioning system, in particular in residential buildings, is inadequate to achieve the 2030 goals. It is essential to plan an

agreed and coordinated support activity with the legislator, and with all the relevant institutional actors in the processes essential for achieving decarbonisation goals.

#### Key learning points

Shared indications and active role of the stakeholders in the HP supply chain - users, producers, designers, installers, producers and distributors of electricity - can give essential support to the formulation and the implementation of the policies necessary for the diffusion of HPs as a necessary tool for the implementation of the objectives.

Medium-long term intervention lines to promote the role of HPs for the decarbonisation objectives through communication campaigns, information and training are decisive.

#### Relevance to HP4ALL

The associations that compose the Heat Pump Table can be considered important stakeholders for the project.

## h. Norway

### IAEE-Norway

<b>Name</b>	IAEE-Norway	<b>Location</b>	Norway
<b>Type</b>	Association	<b>Funding</b>	-
<b>Start date</b>	1984	<b>End date</b>	-
<b>Website</b>	<a href="https://www.iaee.org/en/affiliates/norway.aspx?ID=21">https://www.iaee.org/en/affiliates/norway.aspx?ID=21</a>		

#### Description

IAEE-Norway, the Norwegian affiliate for IAEE, is a gateway to the multitude of energy-related industries and resources in Norway. IAEE-Norway consists of approximately 120 individual members with backgrounds ranging from energy companies, government, consulting, policy research and academic organisations in Norway, that want to increase the understanding of how energy and economics relate to each other, and to provide a forum for the free exchange of these concepts. They arrange quarterly member meetings and conferences occasionally, which cover energy topics and issues, and discuss how these issues relate to the broader issues of the global energy scene. Their members are public authorities, oil and electricity industry, research communities and consulting companies.

#### Outcome / Impact

They provide tools for student members as well as regular members to gain a broader understanding of energy economics, policy making and theory.

- IAEE provides Summer Schools to graduate students, under-graduate students and young professionals. These events are open to all IAEE members and may happen in any part of the world. Every time it is held, the Summer School focuses on a specific topic in the field of energy economics, which is usually timely and widely interesting to attendees. Tutors of the Summer Schools are IAEE Senior professors or professionals. These events may be co-hosted by local institutions.
- IAEE Conferences attract delegates from the most influential government, corporate and academic energy decision-making institutions. Conference programs address critical issues of vital concern and importance to governments and industries and provide a forum where policy issues are presented, considered and discussed at both formal sessions and informal social functions.
- They provide the Energy Data Links (EDL) service, a public resource for energy economists to find and share new sources of energy data from around the world. There are already links to nearly 400 sites.



## Search

Category:  
Electricity

Sub-Category: (optional)  
Power plants  
Transmission, Networks, Distribution  
Distributed Generation  
Markets & Prices  
Policy & Regulation  
Other

Search Site Names...

Search

Reset

Region:  
Europe

Country:  
Norway

☐ Only free data

Figure 8.1. Energy Data Links Service

- They provide also a Job Bank tool in collaboration with CareerBuilder to bring the best in job searching, resume posting, and online recruiting in the energy economist jobs. Employers are invited to use this database, at no cost, to advertise their graduate, senior graduate or seasoned professional positions to the IAEE membership and visitors to the IAEE website seeking employment assistance.
- IAEE provides also an Energy Economics Education Database. Members from academia are invited to list to the Energy Economics Education database, at no cost, graduate, postgraduate and research programs as well as their university and research centres. For students and interested individuals looking to enhance their knowledge within the field of energy and economics, this is a valuable database to reference.

The Membership Benefits in brief include:

- Subscriptions to both professional journals, The Energy Journal and Economics of Energy and Environmental Policy
- Subscription to the Energy Forum (quarterly newsletter)
- Access to a robust line-up of Podcasts and Webinars
- Complimentary access to Conference Proceedings
- Exposure to a multitude of IAEE sponsored conferences throughout the world
- Opportunity to network with a worldwide membership base of energy and economics specialists.
- Participation in our active Working Paper Series
- Search for employees and post resumes via the Job Market database
- Robust offering a student support services and scholarship/award possibilities
- Join the IAEE Speaker Bureau to announce your availability to give non-technical talks on energy industry technology, market developments, and policy issues.
- Access Energy Data Links, a resource for energy economists to find and share new sources of energy data from around the world.



- Access to a dynamic and active Association website to stay current on all products/services

### Barriers

The initiatives are not well known, in particular among the target to which it aims the most (students, young professionals).

### Key learning points

There are many benefits from membership in the IAEE. Members gain a broader understanding of energy economics, policymaking and theory. Members are kept well informed by the publications and conferences on matters within the energy industry and the challenges that lie ahead. Membership provides the opportunity to network within the largest Association of energy professionals. Anyone with an active interest in the field of energy economics is eligible for membership in the IAEE and will benefit from belonging.

In addition, they focus on attracting students and young professionals in order to direct them towards important factors in the energy field that allow the development of the experts of tomorrow. The aim is to provide information to students and faculty about courses and programs in energy economics offered by universities all over the world. By using this service students can identify suitable courses and programs, while faculty can knowledge about existing courses and programs as input when designing energy economics courses and programs at their own university

### Relevance to HP4ALL

Focus on young people and professionals in order to create a group of experts of tomorrow, looking for a way to attract their interest. Creation of a database, a public resource to find and share new sources of energy data from around the world, focused on the HPs (e.g., database on the manufacturers, the location, the expertise, the technologies, or statistical information that can convince final users to change their current heating/cooling systems).

## BUILD UP SKILLS Norway

<b>Name</b>	BUILD UP Skills Norway	<b>Location</b>	Norway
<b>Type</b>	Project	<b>Funding</b>	
<b>Start date</b>	2011	<b>End date</b>	2013
<b>Website</b>	<a href="https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-no">https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-no</a>		

### Description

A highly skilled building workforce is necessary in order for the construction industry to contribute to energy efficient buildings and climate targets. Build Up Skills Norway brought together stakeholders from the Norwegian construction industry and made it possible to share a common position with the different central authorities dealing with energy and education issues. It is organized by the Norwegian Low-Energy Program, a national co-operation program between public authorities and the construction industry to increase competence on energy efficient building and the use of renewable energy and hosted by the Federation of Norwegian Construction Industries.

### Outcome / Impact

The main objective for Build Up Skills Norway was to identify actions for education, training and life-long learning for on-site construction workers on energy efficient building and use of renewable energy. The Build Up Skills project has reviewed the competence level in the field of energy among tradesmen and skilled workers in Norway. Part 1 of the initiative carried out a status analysis. The analysis showed a need to raise competence levels so as to achieve the goals of the EU and the Norwegian authorities for significant energy savings in our buildings. Competence targets for the different trades were defined as part of the project.

The next part of the Build Up Skills project was to arrive at measures that should be taken to close the gap between today's knowledge and that of the future and develop a roadmap to implementation. This work looked at the education and training system, formal further or post-qualifying education and training and other post-qualifying education and training. The report is based on three different scenarios, from introducing a basic package of measures to a very ambitious package of measures.

### Barriers

- Lack of motivation was a major barrier to the implementation of competence enhancements in the field of energy. Barriers relating to lack of motivation can be countered by giving participants more visible and documentary evidence of the effect of course participation.
- Lack of time and money is a significant barrier to competence enhancements. Making more courses available on the web, to avoid travel costs and allow trainees to study in their own time were considered as potential solutions.
- The lack of public recommendations and support for the training was also identified as a barrier preventing other from signing up.

### Key learning points

- To identify competence goals for different trades in the construction industry through the Build Up Skills project is an important step.
- It is important to focus to some strategic measures.
- It is important to get endorsement letters so as to ensure the sustainability of the project. Other ideas might also serve this goal, as for instance a competence indicator which will monitor the competence of blue collars.
- The analysis performed indicates that it is beneficial socio-economically to invest on raising the competence level
- Knowledge of energy efficiency and energy conversion can be implemented in existing education and training structures. This is looked upon as being more effective than building up new systems.
- Energy efficiency and energy conversion must be a natural part of all initial and post-qualifying education and training.

### Relevance to HP4ALL

One point was highlighted in the project: when it comes to increasing the use of local, renewable heat in buildings, the lack of a proper market, lack of infrastructure and low profitability are clearly the biggest barriers. It is important to avoid unnecessarily expensive heating systems, since the motivation behind the choice of a particular heating system is

often financial. Remuneration instruments should be provided to attract an audience that would not choose alternative solutions from the existing ones for economic reasons. These mechanisms should be studied and promoted. The definition of a competence indicator could be interesting also for HP4ALL project.

## NCE Smart Energy Markets

<b>Name</b>	NCE Smart Energy Markets	<b>Location</b>	Norway
<b>Type</b>	Cluster	<b>Funding</b>	
<b>Start date</b>	2009	<b>End date</b>	-
<b>Website</b>	<a href="https://en.smartinnovationnorway.com/about/">https://en.smartinnovationnorway.com/about/</a>		

### Description

NCE stands for Norwegian Centres of Expertise – Norway’s most ambitious initiative to develop competitive and dynamic business clusters across national and international industries and sectors. The program is administrated by Smart Innovation Norway and the Norwegian Research Council. NCE Smart Energy Markets has unique competences and knowledge within energy and digital technologies. It is a strong driving force of innovation, increasing public sector efficiency, creating business development and facilitating significant future market opportunities nationally as well as internationally. They have established several working groups that have identified different issues to be raised and addressed and contribute to sustainable development of society and business by facilitating sharing culture in a vibrant cluster.

NCE Smart Energy is an international network composed of 41 public-private companies that provide expertise and equipment globally for commercial energy trading. Microsoft, SAAB and COWI are among the partners.

### Outcome / Impact

The purpose of the program “Cluster as driver of change” is to systematically share knowledge and technology from the best clusters and environments to other clusters and sectors in Norway. They develop a world-class competence centre and are an accelerator for start-ups and growth. The strategy is oriented towards a cultural change and a new mindset as much as it is about the integration of shared platform across business areas. The platform is called Innovation Platform and ensures interdisciplinary and simultaneous interaction, which creates efficiency, new values, economic growth and societal impact.

### Barriers

Such a broad interaction between different business areas and interdisciplinary areas is not easy to face and build. It takes time to build the network and to create a trusted community.

### Key learning points

The interdisciplinary and simultaneous interaction between different business areas, even if complex, is the key approach for the strategy building process, leveraging local smart specialisation in line with national policy orientations and global trends.

### Relevance to HP4ALL

The contact points with other business areas and other technologies should be considered to create join forces towards sustainable development and the achievement of the final objective of net-zero emission.

### Nordic thematic groups

Name	Nordic thematic groups	Location	Norway
Type	Co-operation programmes	Funding	
Start date	2017	End date	2020
Website	<a href="https://nordregio.org/wp-content/uploads/2019/08/Discussion_Paper__Skills-Policies-Building-Capacities-for-Innovative-and-Resilient-Nordic-Regions.pdf">https://nordregio.org/wp-content/uploads/2019/08/Discussion_Paper__Skills-Policies-Building-Capacities-for-Innovative-and-Resilient-Nordic-Regions.pdf</a>		
Description			
<p>The main purpose of the thematic groups is to contribute to the exchange of knowledge and experience between regional policy stakeholders in the Nordic countries, the Faroe Islands, Greenland, and Åland. The programme period is four years (2017-2020) and the thematic groups are expected to develop projects throughout the full period.</p> <p>The goal for the Nordic thematic group is to contribute to the development of policies and new solutions to the challenges that the Nordic countries face in relation to the creation of innovative and resilient regions.</p> <p>The new groups have the following themes:</p> <ul style="list-style-type: none"><li>• Sustainable Rural Development</li><li>• Innovative and Resilient Regions</li><li>• Sustainable Cities and Urban Development</li></ul> <p>Within this context skills development is regarded as crucial.</p>			
Outcome / Impact			
<p>The overall aim is to increase knowledge of how Nordic regions work with skills in order to provide relevant knowledge to the regional labour markets and best practise, new ideas and joint learning concerning how actors in the Nordic regions work with skills.</p> <p>Norwegian strategy for skills policy 2017-2021(Norwegian Government, 2017):</p> <ul style="list-style-type: none"><li>• Contribute to making informed choices, regarding skills, for the individual and for society</li><li>• Promote learning in the workplace and effective use of skills</li><li>• Enhance skills among adults with weak labour market attachment</li><li>• Digital Skills: the development of digital learning platforms and online courses for industry</li></ul> <p>The key actors identified are:</p> <ul style="list-style-type: none"><li>• Ministry of Labour and Social Affairs, Ministry of Justice and Public Security, Ministry of Local Government and Modernisation, Ministry of Education and Research, Ministry of Trade, Industry and Fisheries</li><li>• Employer's Association Spekter, Norwegian Association of Local and Regional Authorities (KS), Confederation of Norwegian Enterprise (NHO), Enterprise Federation of Norway (Virke), Federation of Norwegian Professional Associations</li></ul>			

(Akademikerne), Norwegian Confederation of Trade Unions (LO), The Confederation of Unions for Professionals (Unio) and Confederation of Vocational Unions (YS)

- Norwegian Association for Adult Learning (VOFO)

### Barriers

One of the tasks of formal education systems is to address social inequalities by providing equal opportunities to all members of society. However, the lack of resources may pose barriers to the effectiveness of education systems (e.g., measured by graduation and repetition rates amongst pupils/students) and, therefore, increase social inequalities. Thus, educational attainment should be considered as a process in which social factors play an important role.

Important challenges and perspectives that should be considered regarding how regions work with skills development are:

- Demographic and socio-economic factors: Skills development in all regions have to take the demographic and socio-economic changes into account, however the character of these changes will affect the regions differently.
- Institutional factors: Skills development is part of an international, national and regional socio-economic framework that to a large degree sets the rules of the game and the room for manoeuvre for the regions to work with skills development.
- Governance: Skills development is characterised by multilevel and cross sectoral governance, which implies important governance challenges as regards coordination, possible conflicts of goals, efficiency and accountability.

### Key learning points

Skills shortages have been often attributed to the failure of education systems in providing the skills required for the labour market. However, the shift from industrial to knowledge economies, paired with demographic transitions causing longer working lives, has broadened the perspectives on the role of education in society. Lifelong learning strategies, non-formal training systems or workplace learning initiatives have been envisaged to update, upgrade and better adjust the skills needs of the labour market in developed societies.

To succeed on the completion of the priorities the following point have been identified:

- Establish a Future Skills Needs Committee with the mission to compile/forecast and analyse knowledge about the country's skills needs.
- Strengthen regional responsibilities and cooperation between different actors.
- Provide a coherent system for career guidance focusing on regional career centres as well as strengthening the expertise of guidance counsellors.
- Strengthen cooperation between education actors and social partners.
- Strengthen and developing digital skills and implementing a new division of labour.
- Strengthen the knowledge on learning in the workplace with a special emphasis on the value of investing in skills.
- Develop career opportunities on vocational education.
- Work more systematically on the linking of businesses needs and education providers.
- Facilitate the documentation and to evaluation skills acquired at work.



- Improve systems of assessment and recognition of qualifications.
- Provide flexible training and opportunities for adults to complete upper secondary education.
- Stimulate more people to find learning motivation.

#### Relevance to HP4ALL

The initiative wants to promote the exchange of knowledge and experience between regional policy stakeholders in the Nordic countries. The same has to be done in HP4ALL for the European framework in the HPs field, then all the previous learning points should be evaluated in the project. In the study of how European countries work with skills four crucial themes are important to shed light on, namely how they work with:

- Skills anticipation;
- Skills development;
- Skills mismatch,
- Skills governance.

### Enova's Energy Challenge

<b>Name</b>	Enova's Energy Challenge	<b>Location</b>	Norway
<b>Type</b>	Education	<b>Funding</b>	-
<b>Start date</b>	2014	<b>End date</b>	-
<b>Website</b>	<a href="https://www.enova.no/about-enova/">https://www.enova.no/about-enova/</a> <a href="https://www.oneplanetnetwork.org/initiative/enovas-energy-challenge-digital-energy-education-concept-primary-schools">https://www.oneplanetnetwork.org/initiative/enovas-energy-challenge-digital-energy-education-concept-primary-schools</a>		

#### Description

Enova has launched a digital educational concept for teaching primary school students about energy. The focus is on learning about energy: What is energy; What can energy be used for; What are the different energy sources; What is the link between energy use and climate change and what are the consequences of climate change? The digital "toolbox" used includes presentations, a film for each theme and different types of tasks for the students to do in class and at home. Time for these types of lessons has been allocated in the official curriculum in Norwegian schools. The primary focus of the concept is on schoolchildren aged from 9 to 12.

Enova SF is owned by the Ministry of Climate and Environment and contributes to reduced greenhouse gas emissions, development of energy and climate technology and a strengthened security of supply.

#### Outcome / Impact

The aim of the project was to strengthen students' understanding and awareness of energy use and its link to climate change and explain what kinds of solutions exist for addressing such challenges. The goal was to raise school children's; awareness and increase understanding as early as possible. One of the primary objectives has been to design a cost effective, awareness raising and lifestyle-changing concept, which is easy to distribute, maintain and update.

### Barriers

Time for these types of lessons has had to be allocated in the official curriculum in schools and supported by the Ministry of Education.

### Key learning points

One of central success criteria will be securing the commitment of teachers to this approach. Another critical success factor is giving adequate technical support to those teachers needing help getting started. So far, both teachers as well as students have shown interest and high motivation to apply the toolbox. The goals, which have been set regarding enrolment have been exceeded.

The feedback received so far indicates that students have been highly motivated by the concept and that the teachers appear pleased with having an up to-date tool that helps the planning and implementation of lessons in a subject which is perceived as challenging to teach. The digital concept is more cost efficient in the longer term than a paper based educational concept, which previously used by some schools. The contents of the digital platform are easy to change and distribute when the concept and its contents are in need of updating to reflect the newest information available or current events.

### Relevance to HP4ALL

Creating primary/secondary education activities helps to grow the citizens of tomorrow to have a responsible approach towards the energy issues. School education is therefore a possible important issue to focus on. More in general, design a cost effective, awareness raising and lifestyle-changing concept, which is easy to distribute, maintain and update is fundamental.

## i. Portugal

### FaturaAmiga

<b>Name</b>	FaturaAmiga	<b>Location</b>	Portugal
<b>Type</b>	Project (training)	<b>Funding</b>	Financed by the electricity tariff (Initiative on the context of Plano de Promoção da Eficiência no Consumo de Energia Elétrica 2017-2018. approved by the Energy Services Regulatory Authority)
<b>Start date</b>	2018	<b>End date</b>	On going
<b>Website</b>	<a href="https://www.fatura-amiga.pt/">https://www.fatura-amiga.pt/</a>		
<b>Description</b>			
<p>FATURA AMIGA is an initiative by DECO (Associação Portuguesa para a Defesa do Consumidor). It is a project that aims to help consumers interpret and reduce the value of their electricity bills, encouraging a more conscious use of electricity. On the Fatura Amiga website, the consumer can register their electricity bills on a monthly basis, build energy saving targets and check what DECO's tips are for reducing consumption in this sector. In addition, the website also provides a detailed explanation of all the components of your electricity bill, depending on the service provider.</p> <p>Apart from offering help to consumers, FATURA AMIGA also organizes training courses for technicians aimed at technicians of city councils, parish councils, autonomous information centres for consumers and private social solidarity institutions on saving electricity in the residential sector, with special emphasis on the electricity bill as an information and support tool for consumers, for greater energy efficiency in their homes.</p>			
<b>Outcome / Impact</b>			
<p>The Fatura Amiga, launched in 2018, has already involved 200 thousand consumers looking to make a more efficient control of their electricity consumption, encouraged to change some behaviours and thus contributing to ensuring sustainability and environmental protection.</p>			
<b>Barriers</b>			
<p>In a recent study, DECO found that 50% of consumers only have a minimal check on their electricity bill and 39% say that it is not easy to read and understand all the information provided. Understanding electricity bills is essential so that consumers can better control their consumption and are able to save energy more easily.</p>			
<b>Key learning points</b>			
<p>Education and easing processes encourage changes on behaviours that can contribute to sustainability</p>			
<b>Relevance to HP4ALL</b>			
<p>It is not only about stimulating demand but making the technology and its characteristics understandable for all the stakeholders. Understanding increases involvement.</p>			

## Programa de Apoio a Edifícios mais Sustentáveis

Name	“Programa de Apoio a Edifícios mais Sustentáveis”	Location	Portugal
Type	Public initiative	Funding	Fundo Ambiental
Start date	2020	End date	2021
Website	<a href="https://www.fundoambiental.pt/avisos-2020/mitigacao-das-alteracoes-climaticas/programa-de-apoio-a-edificios-mais-sustentaveis.aspx">https://www.fundoambiental.pt/avisos-2020/mitigacao-das-alteracoes-climaticas/programa-de-apoio-a-edificios-mais-sustentaveis.aspx</a>		
Description			
<p>The initiative Edifícios mais sustentáveis, is part of the Programa de Estabilização Económica e Social (PEES), and establishes, among others, a set of measures to boost employment economically, through the launch of small works to be implemented rapidly and spread throughout the territory. Part of the aim is to absorb some of the impact of the economic crisis caused by the COVID-19 pandemic. Interventions in buildings aimed at their sustainability and energy rehabilitation are among the measures with the greatest multiplier effect on the economy, generating employment and wealth at local and national level. It is therefore identified in several studies as one of the most relevant measures to foster the recovery of the economy in the post-COVID phase. Buildings are at the heart of the concerns underlying the European Ecological Pact. The initiative is directed to natural persons who own existing and occupied single-family dwellings, self-contained units in multi-family buildings or multi-family buildings, constructed before the end of 2006.</p>			
Outcome / Impact			
<p>Rehabilitating and making buildings more energy-efficient enhances the achievement of multiple objectives, including:</p> <ul style="list-style-type: none"><li>• reducing the country's energy bill and dependency, reducing greenhouse gas emissions, improving indoor air quality and comfort levels, health benefits;</li><li>• promoting labour productivity, reducing energy poverty, extending the useful life of buildings and increasing their resilience, promoting improvements in other dimensions of building performance such as resource efficiency, in particular water resources, through a strong link with their energy consumption</li><li>• making an important contribution to the climate resilience of buildings, cities and, consequently, the country itself.</li></ul>			
Barriers			
<p>The main challenge to overcome is fostering the recovery of the economy in the post-COVID-19</p>			
Key learning points			
<p>Renovation is considered a relevant measure to foster the recovery of the Economy in the post-COVID era.</p>			
Relevance to HP4ALL			
<p>Now it is the perfect moment to promote HPs as the most suitable technology for renovation</p>			

## j. Romania

### Green Homes & Mortgages

<b>Name</b>	Green Homes & Mortgages	<b>Location</b>	Romania
<b>Type</b>	Initiative/toolkit	<b>Funding</b>	Romania Green building Council
<b>Start date</b>	2008	<b>End date</b>	On going
<b>Website</b>	<a href="http://rogbc.org/en/projects/green-homes">http://rogbc.org/en/projects/green-homes</a>		

#### Description

A successful and growing initiative that combines rewarding the greenest residential projects with innovative, discounted green financing, with awareness-building activities for homebuyers, with an accessible and widely-promoted Green Homes initiative. The program is offered on an "open source" basis to interested financial institutions who wish to explore and implement a green mortgage program.

#### Outcome / Impact

This program consists of 33 residential projects that include over 7,500 residential units certified or pre-certified for including in the Green Homes program and related Green Mortgage program; providing discounted interest rates for environmentally-responsible, energy-efficient, and healthy homes.

#### Barriers

- Lack of demand for housing, green or otherwise: A Green Homes certified by the project should have a higher demand than regular buildings in every market situation; that has been demonstrated by strong sales of the first generation of green residential projects.
- Overestimation of the energy efficiency savings by the certified auditors: The Green Homes certification process is carefully constructed to ensure planned objectives deliver expected results. The energy auditor and the Certifier assessor must be engaged at the earliest possible moment to instruct the design team on likely outcomes of their decisions. This risk is also mitigated by choosing energy auditors for the project who share the goals of estimating and realizing energy savings rather than "checking the box" of an administrative task.
- Lower than expected performance of energy savings equipment and installations delivering less energy savings: Critical components of green homes must function correctly to achieve the promised economic performance necessary to reduce mortgage default risk. Solutions recommended for the program have been thoroughly researched, implemented elsewhere with clear results and, in the case of most systems, backed by manufacturers' guarantees.
- Falling energy prices: energy prices and energy scarcity are predicted to go substantially higher. An increasing willingness of the EU and local government to "price carbon" and tax inefficient behaviour greatly reduces the likelihood that the energy price to the end consumer will decrease. Dramatic technological advances in "green" energy might reduce long term prices but the widespread, positive economic benefits that would accompany this welcome scenario should clearly outweigh the smaller differential in expected national savings from energy efficiency measures.



### Key learning points

- Growing energy security concerns exist.
- Rising energy costs reward residential projects that require less costly and natural scarce resources to build and operate. By contributing to the creation of certified Green Homes, residential investors and developers can greatly facilitate a rapid and equitable transformation of the construction and real estate industry toward a low carbon/green economy.
- Value is provided to all stakeholders (Certifier and energy auditor, home buyer, project developer, participating bank)
- The initiative is a success that has received H2020 funding for replicating the model in 11 countries (The SMARTER Finance for Families H2020 project)

### Relevance to HP4ALL

This is an example of initiative that provides value to all its stakeholders. There are energy security concerns that need to be solved: we have a technology that can calm those anxieties. Energy costs are increasing we have an energy efficient technology, that can be applied to new buildings and used for renovation that in the long term will be less expensive than other kind of heating and cooling technologies. The demand for green mortgages will stimulate the demand for energy auditors and certified assessors, thus increasing the need for HP skills in this market.

## Romania Eficienta

Romania Eficienta			
Name	România Eficientă	Location	Romania
Type	Private project	Funding	OMV PETROM, EPF (Energy Policy group)
Start date	2019	End date	2022
Website	<a href="https://www.romania-eficienta.ro/">https://www.romania-eficienta.ro/</a>		
Description			
It is the largest private project, of national public interest, to promote energy efficiency, which runs until 2022. The main objectives of the initiative are raising awareness and creating a culture in energy efficiency through public campaigns and educational programs; implementing an integrated educational, information and public awareness program and to develop policy recommendations for the decision-makers on energy efficiency, and improving energy efficiency of 5 buildings owned by the Romanian State and energy audits.			
Outcome / Impact			
The general public and local authorities, who manage a large number of buildings of public interest, will have access to information on practical energy-saving solutions that reduce utility bills and environmental impact. In addition, a practical energy efficiency guide and energy efficiency trainings will be developed for representatives of public authorities. Also, at a later stage, projects will be financed to increase the energy efficiency of public buildings through extensive renovation.			
Barriers			
Over 80% of the buildings in Romania were built before the 1990s and therefore have a low energy performance.			





Yearly consumption often ranges today between 180 and 400 kWh per sqm. With extensive renovation, energy consumption can be reduced by 40% to below 100 kW per sqm, which can not only lead to significant savings but also a positive impact on the environment.

### Key learning points

The specific energy consumption of homes in Romania is above the EU average. There is thus a huge potential for energy savings in both the residential and transport sectors.

- Awareness on the importance of energy efficiency is raised by providing General public and local authorities with information on practical energy-saving solutions.
- Furthermore, a practical energy efficiency guide and energy efficiency trainings will be developed for public authorities' representatives

### Relevance to HP4ALL

Potential to stimulate demand for technologies that provide energy savings. It is not only about stimulating demand but making the technology and its characteristics understandable for all the stakeholders. Understanding increases involvement.

## k. Spain

### Andalusian Sustainable Construction Development Plan

<b>Name</b>	Andalusian Sustainable Construction Development Plan – Andalusian Energy Agency	<b>Location</b>	Andalusia -SPAIN
<b>Type</b>	Strategic Plan from a Regional Energy Agency	<b>Funding</b>	529 M€ total expected leveraged budget
<b>Start date</b>	2015	<b>End date</b>	2020
<b>Website</b>	<a href="https://s3platform.jrc.ec.europa.eu/picsa-sustainable-construction-programme">https://s3platform.jrc.ec.europa.eu/picsa-sustainable-construction-programme</a>		
<b>Description</b>			
The Sustainable Construction Programme in Andalusia (PICSA) is a combination of economic measures and other actions such as regulatory, training and fiscal, that seek, through energy saving and renewable energy generation or integration, to promote the energy rehabilitation of buildings and the urban rehabilitation, to improve the competitiveness of companies of the construction sector, to create skilled employment and reduce energy poverty.			
<b>Outcome / Impact</b>			
Quantitatively, the results from the incentive scheme have been the following:			
<ul style="list-style-type: none"><li>• Boost economic recovery of the construction sector<ul style="list-style-type: none"><li>○ 36,419 actions</li><li>○ 242 M€ investment</li><li>○ 8,247 collaborating partner companies</li></ul></li><li>• Generation and maintenance of employment<ul style="list-style-type: none"><li>○ 20,000 direct jobs in the implementation and management of the actions</li><li>○ More than 60% of the companies have generated new job positions</li><li>○ 22% of the collaborating companies formed working relationships with other companies participating in PICSA</li><li>○ 43% of the collaborating companies carry out other types of actions different to those included in PICSA.</li></ul></li><li>• Use of efficient energy<ul style="list-style-type: none"><li>○ 36,322 toe/year of energy saved and 85,964 tons of CO2 avoided.</li></ul></li><li>• Reduction of the energy bill<ul style="list-style-type: none"><li>○ Economic saving of more than 280 million euros in companies, citizens, neighbourhood and other entities.</li></ul></li><li>• Vulnerable groups – energy poverty</li><li>• Almost 23% of the incentives have been used to improve the housing quality of over 7,000 low-income families</li><li>• Future perspectives</li><li>• The impacts of the new incentive scheme launched in 2016 are expected to be higher than the previous ones, due to the improvements implemented in the new incentive scheme as a result of the evaluation process and a greater participation of private finance:<ul style="list-style-type: none"><li>○ 50.860 actions</li><li>○ 1,425 million of economic saving</li></ul></li></ul>			

- 23.500 new jobs.

In addition to these above-mentioned impacts of the incentive schemes, there are other actions included in the Development Plan which will have an even more positive impact on the construction sector and buildings (80.000 new jobs in the next 5 years).

### Barriers

One of the main challenges was to facilitate the accessibility of the incentives to society through simplification. In this sense, the incentive aimed to achieve:

- A single and simpler procedure
- Fewer documentary obligations.
- A new clearer and more complete classification of actions.

Another challenge was to achieve a better energy culture:

- New technical conditions for greater energy savings and satisfying needs.
- Possibility of opting for more sustainable, energetic and environmentally friendly solutions.

Finally, it was necessary to offer the maximum guarantee to beneficiaries by improving business development and the competitiveness of the collaborating companies.

### Key learning points

At the end of the incentive scheme in 2015, an evaluation process was carried out. From this evaluation, a series of lessons learned were drawn that have been taken into account in the design of the new incentive scheme launched in 2016.

To highlight:

- Improve the training of collaborating companies relating to the documentation requirements for the justification of expenditure.
- Carry out a pre- and post-analysis of the energy impact of the action undertaken implemented through the requirement of a previous and post certificate.
- Facilitate complementary financing tools.

And progress in the improvement of the justification, facilitating the verification process of expenditure.

### Relevance to HP4ALL

This programme is especially relevant to draw lessons on how to approach homeowners and the whole value chain especially installers and product manufacturers.

It is also relevant as to the conducted dissemination and communication campaign. Based on this, further actions can be devised to introduce more added value products apart from conventional passive constructive measures (insulation designs and materials and more conventional (RES based) heating and cooling systems

## AFEC

<b>Name</b>	Spanish Association of heating and cooling systems manufacturers and importers (AFEC) HP Promotion Plan and specific Portal	<b>Location</b>	(Country/Region) Madrid- Spain
<b>Type</b>	Professional Association-Promotion Plan	<b>Funding</b>	Own resources from AFEC
<b>Start date</b>	2015	<b>End date</b>	Ongoing
<b>Website</b>	<a href="https://www.bombadecolor.org/">https://www.bombadecolor.org/</a>		
<b>Description</b>			
<div></div> <p>AFEC designed and launched a specific portal with an identifiable logo aimed at generating branding, visibility and trademark identity. They participated in and promoted of a number of events (info days, congresses, trade fairs etc.). The plan included the design and production of specific merchandising and publicity materials (brochures, leaflets, videos etc.), and the editing and publication of a specific handbook “HP fundamentals, technology and examples” 3rd edition. This publication is now widely distributed amongst firms, citizenship, homeowners, technical and business schools, technicians, professional training schools, professional Associations etc.</p>			
<b>Outcome / Impact</b>			
<ul style="list-style-type: none"><li>• Participation in more than 50 top ranked national and international events. 25 associated HP manufacturers taking actively part in the rolling out and outreach activities in a coordinated way.</li><li>• More than 10,000 copies of the HP handbook distributed so far.</li><li>• Wide support received from a number of international HP related bodies (EHPA, EPEE, EUROVENT) and national (IDEA) and regional (AAE, EVE, FENERCOM, ICAEN, IVACE) Energy Agencies</li></ul>			
<b>Barriers</b>			
<p>So far, the website has not turned into a proper B2B/B2C platform, which could contribute to a faster consolidation of it as a digital marketplace or at least a one stop shop. The institutional outreach of the initiative has been achieved but access to citizens and homeowners is limited.</p>			
<b>Key learning points</b>			
<p>More effort through door-to-door field campaigns, e-marketing and e-commerce is needed to reach citizens and homeowners. The promotional campaign certainly contributed to an increase in HP installations, although there are no surveys or cause-effect studies to estimate the scope.</p>			
<b>Relevance to HP4ALL</b>			
<p>It is clearly an experience from which HP4ALL could get inputs as to how to design and deploy its D&amp;C effort, particularly at institutional level</p>			

## CONSTRUYE 2020 project

<b>Name</b>	Spanish Construction Labour Foundation (FLC) CONSTRUYE 2020 project	<b>Location</b>	Madrid-Spain
<b>Type</b>	Foundation-Education and Training programme	<b>Funding</b>	400 k€ (+2-3 times national complementary funding funding)
<b>Start date</b>	2013	<b>End date</b>	2016
<b>Website</b>	<a href="http://construye2020.eu/en/">http://construye2020.eu/en/</a> <a href="https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-es">https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-es</a>		

### Description

After leading the first part of Build Up Skills Spain (BUS), the Spanish Construction Labour Foundation was awarded the second part of the project which, under the slogan "Build 2020", which seeks to promote the qualification of workers in the building and construction sector, with the aim of having sufficient skilled labour force in Energy Efficiency (EE) and Renewable Energy (EERR) so as to meet the energy objectives set by Europe for the year 2020.

During this first part of the BUS initiative, a Roadmap was created that included a total of 29 actions and 11 recommendations, aimed at contributing to the achievement of these energy objectives. On this basis, this second part is implementing those actions identified by the experts as more relevant.

In this way, the Labor Foundation together with the National Institute of Qualifications (INCUAL), the State Foundation for Training in Employment (FEFE), and the Institute of Construction Sciences Eduardo Torroja (IETCC. CSIC), collaborate to improve existing vocational training on EE and EERR in the building sector.

CONSTRUYE 2020 Main Objectives are:

- To conduct the design of training schemes and training actions related to those occupations and professional skills which the status quo (SQ) analysis has proved the Spanish VET system nowadays lacks. These permanent training actions will allow covering these needs in short-term as well as serving as a trusted base to develop professional certificates later on.
- To put into practice the training actions that have been developed, by carrying out some assessments, in which the actions will be validated from a technical and pedagogical point of view.
- To review and upgrade those existing qualifications that, as it is stated in the SQ analysis, need updating.
- To develop those mechanisms identified on the roadmap in order to improve the Vocational Education and Training Spanish system.
- To get the involvement of the market actors and stakeholders relevant to the topics covered in the project.
- To ensure the dissemination and communication of the BUS "Construye 2020" proposal in order to reach all key actors and target groups related to the actions proposed in the project as well as raise awareness on the necessity of undertaking energy restoration of buildings.

### Outcome / Impact

- 9 new training courses were designed, matching the training needs detected during BUS Phase I, including teaching and learning didactic guides for each course. These include: Profitability in EE; Insulation; Aluminium and pvc carpentry; Heating and air



conditioning; Energy efficiency in buildings; Renewable energies in buildings; Geothermal energy installations; Biomass energy installations; Training of trainers on EE & RES.

- Implementation and launching of an App on good practices for EE that includes valuable information for energy renovation such as insulation, energy efficiency, installations
- Multimedia resources have been created for users to learn about EE and RES.
- Two open webinars are available on the project website that aim to support face-to-face training actions and foster self-learning (Good practices on energy rehabilitation of buildings and Energy Efficiency in Buildings)
- Based on the contents from the App a shorter version thereof was produced for PC (Good practices on energy rehabilitation)
- 25 courses were carried out with a participation of 429 trainees for more than 1.400 hours of training. It is noteworthy that five of these courses were funded by the project, while the rest 20 were financed by national funds, concretely by the National VET Plan for Permanent Training for Employment.
- Upgrading existing qualifications: Development of two core tasks within the National Qualification Framework: Revision of qualifications having account on energy efficiency criteria and new competencies on geothermal energy systems. Also, several contents related to professional certificates were adapted to e-learning modality, with the aim of starting to provide the theoretical part of the training throughout this mean.
- New mechanisms and tools to enhance the VET system: Sectorial observatory of training needs, stakeholders training platform, energy issues clearinghouse.
- The project got direct endorsement of 121 different stakeholders such as City Councils, Regional Governments, VET public entities, companies, workers, employers' associations, trade unions, etc. The project has had a massive dissemination with more than 250 news published in different media.

## Barriers

To reach end users, it is essential to interact with them in a more simple and straightforward way and providing them with accessible basic, clear, well founded information and general concepts regarding EE and RES solutions in order to stimulate the market demand. It is necessary to couple these training actions with complementary financing at national level.

## Key learning points

Importance of ICTs (audio-visual) for dissemination, awareness raising, education and training regarding EE and RES solutions.

## Relevance to HP4ALL

Construye 2020 is a reference point to design training courses and materials, as well as targeting less qualified workers and key stakeholders such as labour foundations, trade unions and so forth



## I. Sweden

### BUILD UP SKILLS SWEBUILD

<b>Name</b>	BUILD UP Skills SWEBUILD	<b>Location</b>	Sweden
<b>Type</b>	Project	<b>Funding</b>	1,961,304 € (EU contribution: 75%)
<b>Start date</b>	2014	<b>End date</b>	2017
<b>Website</b>	<a href="https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-swebuild">https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-swebuild</a> <a href="http://www.energibyggare.se">www.energibyggare.se</a>		

#### Description

The BUILD UP Skills SWEBUILD project is the first step in strengthening qualifications for an adequately educated building workforce in Sweden regarding energy efficiency and renewable energy. Targeting craftsmen, construction workers and installers, the project will:

- 1) create conditions for the efficient rollout of large-scale trainings in energy efficient building techniques and techniques for use of renewable energy in buildings;
- 2) identify and prepare quality assured curriculums and training materials of high international standards, and;
- 3) train trainers which will deliver fit for purpose on-site training for craftsmen.

#### Objective:

- Establish an Action-plan for life-long learning in the building sector based on the Swedish roadmap.
- Establish a joint basic further training course on sustainable building based on an on-site training concept.
- Establish a training-the-trainers education concept with freely available course material.
- Develop a quality control system of the Swedish training curriculum based on international standards.

#### Outcome / Impact

- New training concept for the Swedish building industry with (i) training on-site and (ii) training of trainers that will supervise the onsite training.
- Freely accessible course curricula and training material for training of trainers and for on-site training of craftsmen/skilled workers.

#### Barriers

- Finding working hours for the target group trainers to teach their colleagues
- Finding the right learning level in the education material.
- Swedish delay of the nearly zero energy buildings definition.
- Several issues call for attention in the building sector, energy efficiency is only one of many
- The construction industry is expected to be very busy due to predicted strongly increased investments in the construction and renovation of buildings during 2016 and 2017.

#### Key learning points

- Although using massive marketing activities it is not easy to reach out and get a high interest from businesses in the construction and installation sector.
- To reach out and implement the education in very large construction companies is complex and a time-consuming process.
- An interactive web based educational tool seems to be an effective and inspiring learning method but very time consuming and complex to develop. An easy-accessible training material, always available free online has been a great advantage.

#### Key needs:

- The nearly zero energy buildings definition as a driver
- A stable continuous financing of the education scheme
- Success stories
- Secured future management and updating of the training material.

#### Relevance to HP4ALL

The project encountered difficulties in defining training activities in a broad sector such as the construction one and promotes the dissemination of easily accessible training material, always available for free online. This could be the main tool for HP4ALL which wants to increase the number of skilled workers across the HP value chain as well as final consumers. The HP sector is not as large as the construction sector, but it is no less complex to reach all the actors targeted (> 400 actors in supply chain provided with training / upskilling across the pilot regions). Online training can certainly be a good solution to reach this numbers.

Success stories should be also shown to convince citizen to adopt new technology or make any renovation action in their building.

### Chalmers Initiative for Innovation and Sustainability Transition

<b>Name</b>	Chalmers Initiative for Innovation and Sustainability Transitions (CIIST)	<b>Location</b>	Sweden
<b>Type</b>	Education	<b>Funding</b>	
<b>Start date</b>	2015	<b>End date</b>	
<b>Website</b>	<a href="https://www.chalmers.se/en/areas-of-advance/energy/joint_initiatives/Pages/default.aspx">https://www.chalmers.se/en/areas-of-advance/energy/joint_initiatives/Pages/default.aspx</a>		
<b>Description</b>			
<p>Chalmers Initiative for Innovation and Sustainability Transitions (CIIST) is a knowledge node that brings together scientists from multiple disciplines to develop an understanding of the complex transformation processes needed to achieve a sustainable society.</p> <p>Chalmers Initiative for Innovation and Sustainability Transitions is developing the expertise to support the necessary transition processes.</p> <p>The approaches are cross-border collaborations, high level of excellence, and integration of research, education and utilisation.</p>			
<b>Outcome / Impact</b>			

The initiative offers knowledge on how to implement transitions and supports advances towards achieving the sustainability objectives at the regional, national and international levels. It aims to promote the transition to sustainable societies by serving as a resource for stakeholders such as government agencies, businesses and the academic world.

This initiative covers different aspects including:

- research on a sustainable housing environment
- create knowledge to develop an understanding of the complex transformation processes needed to achieve a sustainable society
- contribute to satisfy future building energy and climate requirements inactivate the use of RES

### Barriers

Support for active participation in the transition is not always easy. Different methods of involvement and dissemination must be tried.

### Key learning points

Interdisciplinary knowledge is the key. The initiative links different insights to create an understanding of the interaction between processes and systems at many levels – from the global level to individuals' daily lives. The goal is to understand what governments, businesses and civil society can do to stimulate the transition.

### Relevance to HP4ALL

The same learning point should be applied to HP4ALL. Not only focusing on the HP sector (which is certainly the first step of the project, as well as the most important), but also to begin to understand what kind of interaction there is with other energy sectors and with other existing technologies that can be complementary.

## Energy Efficiency Networks for SMEs

<b>Name</b>	Energy Efficiency Networks for SMEs	<b>Location</b>	Sweden
<b>Type</b>	Project	<b>Funding</b>	
<b>Start date</b>	2015	<b>End date</b>	2020
<b>Website</b>	<a href="http://www.energimyndigheten.se/en/">http://www.energimyndigheten.se/en/</a> <a href="https://energy-evaluation.org/wp-content/uploads/2019/06/2017-johansson-paper.pdf">https://energy-evaluation.org/wp-content/uploads/2019/06/2017-johansson-paper.pdf</a>		

### Description

Since 2015 the Swedish Energy Agency operates a national energy efficiency network program for small and medium sized enterprises (SMEs). The program will continue until 2020 and is a part of the Swedish Energy Agency's initiative to increase energy efficiency in SMEs through Industrial Energy Efficiency Networks (IEEN).

Each network consists of 6 to 16 companies led by a network coordinator. To the network is assigned an energy expert, which provides the companies with both individual counselling and group consultancy within energy efficiency issues. The networks operate on a common methodology based on energy management and theory behind learning networks.

### Outcome / Impact

The aim of the program is to increase the participating company's knowledge regarding energy efficiency. After completing the project, the companies are expected to work with energy efficiency in a systematic and structured manner. Some may have chosen to implement energy management systems according to ISO 50 001. The project goal is to decrease the energy consumption of companies with 15% by 2020.

SMEs often lack internal energy management systems but a participation in an industrial energy efficiency network can provide them with vital services and support such as energy auditing, energy and investment plans, advice and implementation of measures as well as monitoring of results.

### Barriers

- Identification of the initial phone contact. It is not always easy to get in touch with the responsible person, resulting in multiple calls and messages, often with no feedback.
- Once contact was established, the lack of time in the companies has been a major barrier for companies to participate. The lack of time and the high workload makes it difficult to appoint someone responsible for the issue.
- Companies value their energy efficiency potential too low to spend time on energy efficiency improvements and prioritize the issue.
- SMEs often are part of a larger corporation where the SMEs are restricted to follow the decisions made in the corporate group management.

### Key learning points

- There are good practice examples where SMEs take part in networks and thereby join forces and cooperate to build energy management capacities. For the first time formalized and applied, on a regional level in Sweden, an Industrial Energy Efficiency Network (IEEN) model currently operates with the aim to attract the participation of at least 80 SMEs in ten local networks.
- The first step for a successful network is to agree on expectations and rules
- The recruitment process and the process of conducting energy audits has been much more time consuming than expected.
- Energy audits and action plans are both key factors in making the enterprises more engaged in their networks.
- Do not underestimate the importance of competent network coordinators and energy experts.
- Monitoring and evaluation activities aims to contribute with learning and practical results for partners and stakeholders

### Relevance to HP4ALL

Based on the initial experience with marketing the IEEN towards potential participants by email, a major shift in marketing approach was made: the contacts were involved by carrying out physical meetings. This is not possible of course during this period (due to the Covid-19 pandemic), but this is an important issue to be considered also for HP4ALL project, which wants to involve several actors from the HPs value chain. More engaging methods for stakeholder involvement should be evaluated (requesting an on-line meeting, and creating more attractive content to send, could be more stimulating. This is a time-consuming step and this should be taken into account.

## Healthy and eco-smart dietary recommendations

<b>Name</b>	Healthy and eco-smart dietary recommendations	<b>Location</b>	Sweden
<b>Type</b>	Guidelines	<b>Funding</b>	
<b>Start date</b>	2015	<b>End date</b>	
<b>Website</b>	<a href="https://www.oneplanetnetwork.org/initiative/healthy-and-eco-smart-dietary-recommendations-swedish-national-food-agency">https://www.oneplanetnetwork.org/initiative/healthy-and-eco-smart-dietary-recommendations-swedish-national-food-agency</a>		
<b>Description</b>			
<p>Healthy and eco-smart dietary recommendations by the Swedish National Food Agency. The kind of food we eat is important for our health and well-being and also for the environment. One fourth of the climate impact of households comes from the food we eat or throw away. These are the reasons why the Swedish National Food Agency has produced new dietary guidelines and related promotional materials, which highlight how consumers can make healthy and eco-smart food choices in their daily lives. The aim is to encourage people to learn more about healthy and eco-smart food choices and how to minimize food waste.</p>			
<b>Outcome / Impact</b>			
<p>The agency launched new dietary guidelines in 2015. The eco-smart dietary guidelines are based on extensive research and the dietary guidelines published by the Nordic Council of Ministers (Norden) in 2013. The agency works towards promoting healthy dietary habits, safe foods and fair practices in the food trade as well as promoting eco-smart food choices in order to reduce the impacts of these high-intensive energy processes.</p> <p>The incorporation of environmental and ethical recommendations in the dietary guidelines seems to be quite unique internationally. Few national level guidelines by food agencies include recommendations for a healthy diet, where sustainability and ethical aspects are combined with recommendations for energy balance and exercise.</p>			
<b>Barriers</b>			
<p>The challenge is reaching the public and consumers and especially socioeconomically challenged groups. Even if people know what a healthy diet is, ingrained behaviours are difficult to influence. Therefore, communication efforts target especially key groups such as dieticians, teachers and nurses.</p>			
<b>Key learning points</b>			
<p>Key for the success of the adoption of the dietary guidelines is succeeding to communicate the guidelines to consumers in a way, which achieves behavioural change. Key stakeholders and gatekeepers in the communication are e.g., dieticians, nurses and teachers, who are in a position to distribute information to the public and especially to vulnerable groups. These gatekeepers are targeted with systematic communication measures by the Swedish National Food Agency.</p>			
<b>Relevance to HP4ALL</b>			
<p>Key stakeholder should be also identified in the HP4ALL project to increase the possibility to reach all actors who want to learn something new about HPs, such as citizens, who are usually difficult to reach and tend to be excluded from this process.</p>			

