Smart Energy Solutions for a Sustainable Future
S3SF

Comprehensive analysis report:
Analysis of Current Training Programs & Best Practices.

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Comprehensive analysis report: Analysis of Current Training Programs & Best Practices.

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Produced by	Technological University of the Shannon
Main authors	Benny McDonagh (TUS)
Co-authors	Popi Christopoulou (PPC), Giannis Oikonomou (CETRI), Sara Caboni (Training 2000), Maria Ioli Amanatidi (NETFI), Yanbo Wang (Aalborg University)
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The S3SF Project

The Smart Energy Solutions for a Sustainable Future (S3SF) project aims to develop a transnational vocational education and training program. It will equip professionals with smart energy system skills and provide a methodology and digital platform for simulating energy savings.

The training will focus on energy efficiency, user-centric systems, entrepreneurial attitudes, and digital skills. It also promotes a decentralized training approach and smart energy system adoption through simulations.

The project will develop an innovative curriculum and implement a digital platform for energy savings simulation. Pilot training sessions across partner countries will assess and refine the project. Additionally, S3SF seeks to build a network of VET providers, engage stakeholders, and disseminate results. S3SF targets digital skills, energy & resources, and green skills, addressing the demand for a skilled green energy workforce and enhancing the Smart Energy Systems (SES) workforce across the value chain. It involves analysing current training programs and engaging stakeholders to identify gaps and opportunities. This analysis will inform the development of training and SES strategies.

The project also includes skills mapping in the construction industry, identifying existing gaps and informing future training development.

The program aims to foster collaboration, and encourage diversity, business attitudes, and digital skill development, contributing to upskilling in Smart Energy Solutions.

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1. Introduction

1.1 Smart Energy Systems approaches to the built environment.

The built environment profoundly influences the economy, job market, quality of life, and natural environment. It contributes significantly to environmental degradation, including high greenhouse gas emissions, resource overuse, and biodiversity loss. Often, buildings are constructed without considering their ecosystem impacts. Remarkably, human-made mass now surpasses all-natural biomass.
Buildings in the EU account for 40% of energy consumption and 36% of greenhouse gas emissions. The building life cycle contributes an additional estimated 10% to emissions. Over half of all extracted materials are for building purposes, and construction generates about 36% of the EU's waste.
Historically, integrating nature into building practices has been seen more as a burden than an opportunity. However, a shift toward building environments that are resource-efficient and supportive of nature is emerging. Smart buildings, integrating smart systems, can enhance energy efficiency. However, challenges like technological limitations, financial barriers, regulatory complexities, and resistance to change are universal.
In reviewing Smart Energy Systems training and best practices across the EU, it's evident that many markets are underdeveloped. Ireland is growing, while Greece is still in early stages. A significant barrier is the lack of awareness about energy efficiency in both the domestic and commercial sectors. Energy efficiency as a service could become a key aspect of the building sector.
This analysis underscores the need for mapping the skills required in the construction industry's value chain to identify areas for upskilling and enhancing knowledge, especially in smart building approaches.

2. Approach

2.1 The key elements of the Smart Energy Systems

Our approach builds on the core principles of Smart Energy Systems (SES): integrating building design with interaction, fostering regenerative ecosystems, and facilitating peer-to-peer energy trading.

After reviewing 30 trainings and best practice projects aimed at initiating smart, integrated, and holistic energy systems in the built environment, this project has pinpointed specific current training interventions within the

construction value chain. These have been mapped onto the framework, adding a new layer of depth. This enhancement will aid various stakeholders in the built environment to upskill, particularly in understanding smart systems and their intercommunication for efficient operation. The framework now offers insights into real-time power requirements, weather conditions, and renewable energy management, fostering a smart and sustainable approach.
The integration of Energy Systems within the built environment is rapidly evolving, with new smart technologies being incorporated into the framework and methodology. This circular Smart Systems approach provides a comprehensive overview of various strategies and interventions currently in use, enhancing our understanding of Smart Energy Systems across multiple sectors.

2.2 Methodology for the current training analysis

All partners engaged in the following activities:

- Conducted desktop research to identify existing smart energy systems training programs and best practices.
- Reached out to training providers in academia and vocational education and training (VET) centres.
- Planned to organize focus groups and interviews with relevant stakeholders, including VET providers, industry experts, and academics.

These efforts facilitated the analysis and synthesis of findings from research, focus groups, and interviews, enabling the rapid collection of extensive data The methodology aimed to pinpoint current training and best practices, skills required in various processes, and professions related to Smart Energy Systems. The goal was to map these trainings with stakeholder input, identifying current and future levels for implementing Smart Energy Solutions for a Sustainable Future.

3. Mapping of the current trainings required skills needs and skill-gaps

3.1 Mapping of current training courses

Step 1: The survey of current courses in Europe offers insights into the available educational levels in smart energy systems (SES). These courses serve as benchmarks for future SES training programs, illustrating how basic systems can be integrated to educate professionals in a sector where all equipment is interlinked and communicates with the building owner. This approach underlines the evolving nature of SES education, catering to the sector's need for interconnected and owner-responsive systems.

3.2 MAPPING CURRENT PROFESSIONS

Step 2: Involves refining the list of current professions identified during data collection. While heavily relying on the initially compiled list, modifications were necessary. This was due to the variation in job titles across different geographic areas. Consequently, the list was slightly altered, with numerous subheadings added to comprehensively represent each profession within the scope of our study. This ensured a more accurate and inclusive representation of professional roles in the field.

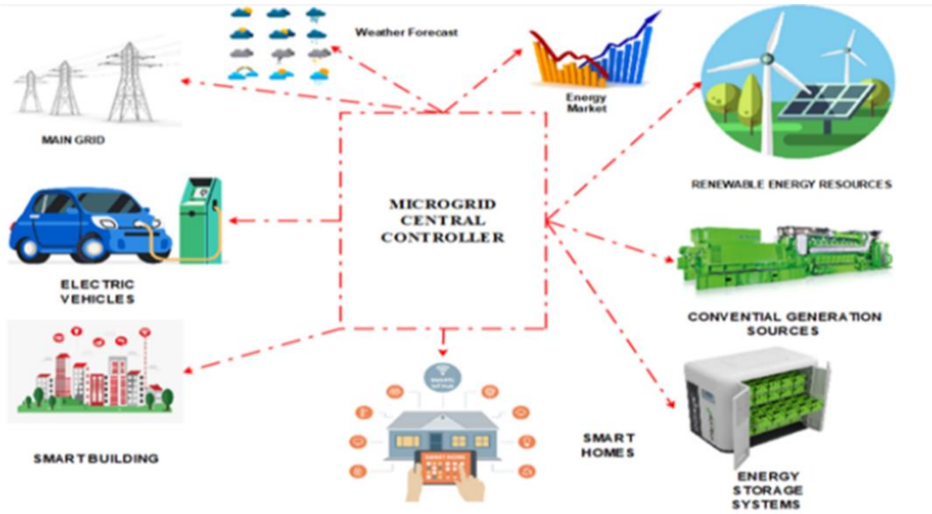


Figure 3: Smart Energy Systems

3.3 Summary of Professions relating to Construction Industry & Smart Energy Systems

Reference Profession / Trade	Ref Code	Enter national name for profession / type of profession	Definition of the professions (proposal, change if necessary)
Architect	AR	Architect / building designer, project manager, building construction manager, director of the execution of the works, urban architect, structures' calculist, health and safety coordinator, Building Energy Auditor, Building Energy Chief Auditor) technical architect	Architects investigate, design and oversee the implementation of buildings considering functional, architectural, aesthetic, structural, technical, regulatory, cost and contextual requirements with due regard to public health and safety.
Civil Engineer	CE	Designer, Electronics engineer, Structural/Building/Installations engineer, Energy engineer, Management engineer, technical engineer	Designer of materials and structures, considering the limitations imposed by practicality, regulation, safety, and cost. Specialisation is possible on topics like construction safety, thermal performance, acoustics, building physics.
Mechanical Engineer	ME	Energy engineer, Multifunctional use for solar PV / Urban wind turbines	Designer of materials and systems for HVAC and sanitary equipment, considering the limitations imposed by practicality, regulation, safety, and cost.
Electrical Engineer	EL	ICT engineer, building automation engineer, Sensoring and Building Management Systems	Designer of power, lighting, data and or communication installations, considering the limitations imposed by practicality, regulation, safety, and cost. Designer of building automation systems, system engineer / system integrator, considering the limitations imposed by practicality, regulation, safety, and cost.
Construction Engineer	CE	Construction design engineer, building construction engineer,	Engineer of the building construction safety
Environmental	EE	Air protection environmental engineer,	Designer of solutions to protect human health,

engineer		environmental engineering expert, environment engineer, industrial environmental engineer, water pollution engineer, environmental engineering adviser, chemical environmental engineer, environmental engineering specialist, environmental engineering consultant,	nature's beneficial ecosystems, and to improve environmental-related enhancement of the quality of human life.
Data analyst (Software Engineer)	DA	BIM programmers, BIM designers, BIM Software engineers, 3D image technician / engineer, Building Information Modelling/management, Digital twin, Predictive maintenance as roof has shorter lifespan than building	Building Information Modelling, Digital twin, Predictive maintenance as roof has shorter lifespan than building
Material Purchaser (material scouts)	MS	Procuring and buying bio-based and secondary materials for MGRFIE	Procuring and buying bio-based and secondary materials for MGRFIE
Project manager	C	Management engineer, Industrial Engineer / Project manager Building company or Project manager Installation company, Cost engineer, Quality assurance	The person responsible for the planning, execution and closing of any building project
Project developer	PD	Management engineer, Industrial engineer / Project manager Building company or Project manager Installation company	The project developer takes responsibility for the associated risks involved in the building process for the customer and hands over the project to the tenant / buyer after completion and use of the building
Onsite Manager (building process)	C	Architect, Structural/Building engineer, Construction manager/ Building Surveyor	The person responsible for quality assurance during on-site construction works in the realization of MGRFIE
Building owner/Operator	FaM, BO	Facility manager, housing corporation, Asset manager, Real estate investor	The person responsible to maintain the real estate as it was realised at the end of the MGRFIE building process (including facility

			management). The person responsible for management, monitoring and improvement of operation of facilities.
Financial manager	C	Cost expert	The person responsible for all finances involved during planning, execution and closing of any building project
Procurer co-ordinator (Tenders)	PM	Buyer, chief procurement officer	The person responsible for facilitating the process of MGRFIE tenders and (sub)contracts
Landscape Architect	LA	Landscapes architect, landscape engineer, landscape design expert, landscape artist, landscape design specialist, landscape specialist, landscape expert	The person responsible for the construction of gardens and natural spaces in MGRFIE design. Design multi-functional green roofs and facades, Specific plant design based on size, weight, water needs etc
Insulation Installers	II	Lagger, cavity insulation installer, energy saving materials installer, insulation installation worker, insulator	Insulation workers install a variety of insulation materials to shield a structure or materials from heat, cold, and noise from the environment. Roof insulation (on top / below), Root Resistant material selection
Electrical installers and technicians	EI	Installation electrician, electrical services installer, electrical maintenance technician, maintenance electrician, electrical systems installer, electrical maintenance worker, electrical installer, electrical worker	Electricians fit and repair electrical circuits and wiring systems. They also install and maintain electrical equipment and machinery. Solar PV, cables and mounting of sensors, Roof accessibility (Lighting)
Renewable energy systems installers (electric)	RESI		Solar PV, cables and mounting of sensors
Renewable energy systems installers (thermal)	RWT		Solar thermal systems

Heat pump installers	HPI		Placement of outdoor unit heat pump
Repair and maintenance operatives	RM	Maintenance planner, Safety maintenance operative (check on safety measures)	
Ventilation installers	VI	Heating, ventilation, air conditioning engineers design and develop heating, ventilation, air conditioning and possibly refrigeration systems	Placement of air handling unit
Building energy consultants	BEC	Energy assessors, energy saving consultant, energy procurement consultant, energy advice consultant, energy procurement advisor,	Energy consultants advise clients on the advantages and disadvantages of different energy sources. They help clients to understand energy tariffs and try to reduce their energy consumption and carbon footprint by using energy efficient products and methods.
Policy maker for building	PA		Setting ambition and providing regulation. Advising on advantages (and disadvantages) of multi-functional roof use policy
Green Public Procurement (GPP) advisor in construction	GPPA		Advising on how to make use of GPP for stimulating MFGRIE in combination with other climate goals
Green Roofers	R		Design specifically for green roof and facades. Material, weight, water etc specialist when consideration is made for green roof design

3.4 Mapping of Current Trainings

The training table was developed using insights and information from partner analyses. It organizes the trainings into five sections for each partner, focusing on Smart Energy Systems (SES) as detailed in Table 3. While these trainings do not encompass the entire future scope of smart buildings, they are influential in integrating various equipment and systems within the SES framework. This structure ensures a targeted and comprehensive approach to training in the rapidly evolving field of smart energy systems.

Partner	**Course Title**	**Qualification**	**Type**	**EQF - Preconditions**	**EQF-OP**	**Degree**	**Educational program**	**Training provider**
Ireland- Technological University of the Shannon (TUS)								
TUS	Ventilation	Certificate	Blended	Requires EQF level 5 in a technical area.	5 to 7	City & Guilds Certificate	Ventilation Solutions for Energy-efficient Buildings	Waterford ETB VET Centre
TUS	BIMzeED	Certificate	Various	No initial qualification necessary	5 to 7	Certificate	BIMzeED -LU4: NZEB REALIZATION AND COMMISSIONING : BUILDING SERVICES & SMART TECHNOLOGIES	Technical University of the Shannon

TUS	Renewable Energy	Certificate	Classroom - Lab	The entry requirement is an overall pass of the Irish Leaving Certificate or equivalent examination. Recognition of Prior Learning criteria may also be applied to applicants.	Continuous Professional Development (CPD)	Certificate	Certificate in Renewable Energy addresses the fundamental principles of renewable energy technologies	Dundalk Institute of Technology / Ireland
TUS	Energy Conservation & Environmental Services	Certificate	Blended	A level 8 Bachelor (Hons) degree with a minimum grade classification of H2.2 or equivalent, in an appropriate Built Environment undergraduate programme or equivalent. Candidates who do not meet the requirements will be required to pass a qualifying assignment	Level 8	Certificate	Certificate In Energy Conservation and Environmental Services	Atlantic Technological University-Ireland

TUS	Specification & Design of Heating Systems with Heat Pumps	Certificate	Online Self-Directed	All in construction Sector- contact TEA to assess qualification	5 to 7	Certificate	Heating Systems with Heat Pumps	Tipperary Energy Agency-Ireland
TUS	Sustainable Energy System Management	Post Grad	Blended	The minimum entrance criteria are a background in economics, social sciences, management or studies providing a systemic point of view. Admission of students with a different bachelor's degree will be decided by the University after assessment of equivalence. The criteria may be waived for applicants with relevant work experience deemed equivalent to the academic admission	Level 9	Masters	European Master in Sustainable Energy System Management	University of Zaragoza/Hanze University of Applied Sciences

				requirements				
Greece PPC								
PPC Greece	Renewable Energy Systems and Sustainable Power Generation	Certificate	Various	No initial qualification necessary	5 to 7	Certificate		Department of Electrical and Computer Engineering at the National Technical University of Athens (NTUA)/ Greece
PPC Greece	Renewable Energy Technology Program	Certificate	CPD course	6-7 EQF	6-7 EQF	Certificate		Athens Metropolitan college
PPC Greece	Renewable Energy and Energy Conservation Program	Certificate	CPD course	6-7 EQF	6-7 EQF	Certificate		Aristotele university of Thessaloniki
Cyprus- CETRI								
CETRI Cyprus	Renewable Energy and Sustainability Training Programs	Certificate	Online	6-7 EQF	6-7 EQF	Certificate		Cyprus Energy Agency (CEA)
CETRI Cyprus	Renewable Energy and Sustainability Programs	Certificate	CPD Seminar	No initial qualification necessary		Certificate		Cyprus University of Technology (CUT)

CETRI Cyprus	Sustainable Energy Training Programs	Certificate - when fee is paid	MOOC	No initial qualification necessary		Certificate		Cyprus Sustainable Energy Agency (CSEA)
Italy-Training 2000								
Training 2000 Italy	HVAC system & RES design – EE Expert project		Online self-directed	No initial qualification necessary	EQF 5 to 7	Certificate	Energy Efficiency Expert Academy	Torino Polytechnic University – Energy Department
Training 2000 Italy	Renewable energy technologies – ASSET project		MOOC	No initial qualification necessary	EQF 5 to 7	Certificate	Energy Transition Academy	University of Naples “Federico II” – Industrial Engineering Department
Training 2000 Italy	Mechanics, Mechatronics, Energy/ Electronics and electrical engineering	Upper secondary school Diploma	Classroom/ Lab	Lower Secondary school diploma	EQF 5	Mechanical technician / Electrical technician	Mechanics, Mechatronics and Energy Electronics and electrical engineering	ITIS “E.Mattei” VET school of Urbino (Central Italy)
Training 2000 Italy	Electrical Machines & Smart Grids	Post-grad	Classroom/ Lab	No initial qualification necessary	EQF 7	Masters	Green industrial Engineering	Marche Polytechnic University – Industrial Engineering and Mathematical Sciences Department

Training 2000 Italy	Energy cooperation – R-Aces project		Online/ self-directed	No initial qualification necessary	EQF 5 to 7		R-Aces Knowledge Hub	Ecoregion of Bergamo (Northern Italy)
Training 2000 Italy	POLYSUN: optimised design and management of a complex energy system	Certificate- when fee is paid	Classroom/ Lab	Architects, Civil engineers, plant technicians, energy consultant	EQF 6 to 7	CPD course		Institute of Applied Sustainability to the Built Environment ISAAC – department of Environment Construction and Design of SUPSI
Denmark-Aalborg University								
Aalborg University Denmark	Wind Power System and Microgrid Technology	Certificate after payment and training	Mixed	No initial qualification necessary	EQF 5 to 7	Certificate	Industrial Ph.D& Master in Energy Technology	Department of Energy Technology, Aalborg University
Aalborg University Denmark	Renewable energy technologies	Certificate after payment and training	Mixed	No initial qualification necessary	EQF 5 to 7	Certificate	Industrial Ph.D& Master in Energy Technolog	Department of Energy Technology, Aalborg University
Aalborg University Denmark	Power electronics for renewable energies	Certificate after payment and training	Mixed	No initial qualification necessary	EQF 5 to 7	Certificate	Industrial Ph.D& Master in Energy Technolog	Department of Energy Technology, Aalborg University
Finland-NETFI								
NETFI Finland	Smart Energy (Smart Grids)	Masters	Blended	Bachelor's degree in relevant field	7	Master’s Degree	EQF 7 to 8	Vaasa University
NETFI Finland	Climate Neutral	Online course certificate 10	Self-Directed	No qualification needed	7	Micro-credential in	EQF 7	University of Helsinki/ Climate

	Energy System course	ECTS				Sustainability) included in the Master's Programme for Atmospheric Sciences		University/ Una Europa
NETFI Finland	Energy and Environmental Technology	Certificate	Classroom and lab	Certificate, sat test	5 to 6	Certificate	7	Turku University of Applied Sciences

4. Interviews, focus groups and data validation

After establishing the training table and a comprehensive list of professions, we initiated the creation of focus groups. The interview process was divided into three categories across partner countries and European organizations. These groups, guided by TUS-set standards for consistency, allowed each partner country to conduct at least one session per focus group. This structure enabled a tailored approach to surveying and interviewing, accommodating the specific needs of involved stakeholders. Feedback levels will vary, reflecting diverse European perspectives.

The next phase will allow collating this data to develop a European skills benchmark for our training course. Experts will assist in refining the data, considering the variability and unique challenges it presents.

Chapter 4 details feedback from stakeholder responses gathered through these focus groups and surveys.

5. Reflection on methods and approach

LIMITATIONS

The current overview recognizes the unique positions of each partner country. To address this, we first examined each country individually before collating the information. This approach revealed significant differences, offering valuable insights. However, as our goal is to establish a European-level framework, we didn't delve deeply into these variations. The collected data is available upon request for those interested in further exploration.

The main challenge in creating the training table lies in the limited availability of Smart Energy Systems (SES) trainings that significantly impact building operations in the context of sustainable energy solutions. Despite these limitations, the outcomes of our project hold the potential to greatly improve building operational performance in a positive manner.

POSITIVE FINDINGS

The research indicates a strong interest in the development of Smart Energy Systems (SES) and their potential to meet numerous sustainability goals. Key findings include the speed, scope, and adaptability of SES initiatives, reflecting their capacity to effectively address and adapt to sustainability challenges.

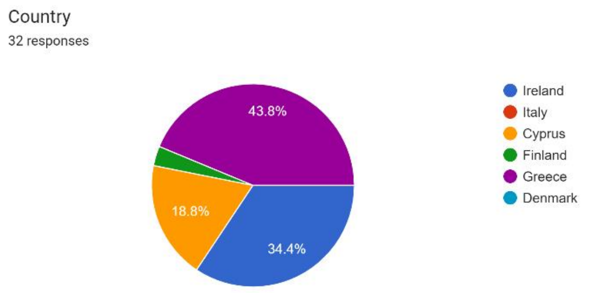
6. Future development and applications

The mapping of required skills and gaps in the construction industry provides a foundation for identifying upskilling needs. This helps pinpoint prevalent gaps, informing the creation of targeted training programs, especially in circular strategies within the construction value chain. The development of a Smart Energy System qualification framework will build upon this, transforming identified skills into Units of Learning Outcomes (ULOs) directly addressing these gaps. These findings will guide the consortium in designing a program that applies the frameworks, facilitates capacity building, and supports national implementations.
Feedback from focus groups and stakeholder surveys will allow for future refinement of the training program. Additionally, applying the Smart Energy Systems framework to buildings yields insights into broader applications, like inter-building communication and grid balance, contributing to energy cost and carbon footprint reduction.

6.1 Focus group feedback

An online focus group was conducted in Ireland on January 12th, with similar events in other partner countries. Feedback was gathered through a survey distributed to all participants, which has received 32 responses to date. This survey, open throughout the project, seeks updated feedback on Smart Energy Systems development. It comprises 17 questions, categorized into six sections: Introduction and Personal Details, Effectiveness of Current Programs, Collaboration Among Stakeholders, Integration of Emerging Technologies, Industry Feedback Mechanisms, and Competencies and Training Areas with Module Preferences. Participant emails were collected and are available upon request.

6.2 Survey analysis

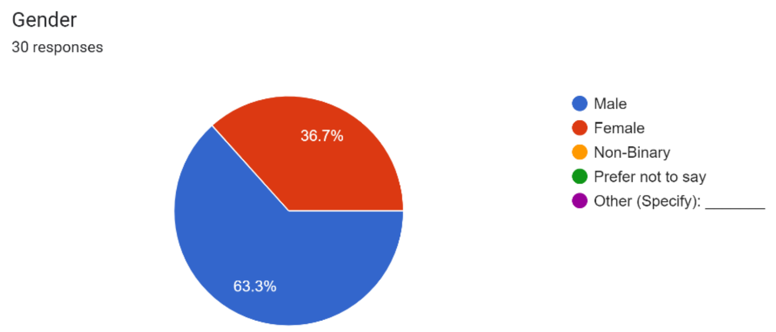


Survey question 1 response

The first main question is regarding the country the participant is from. The Chart indicates the 32 responses:

- Greece-14
- Ireland-11

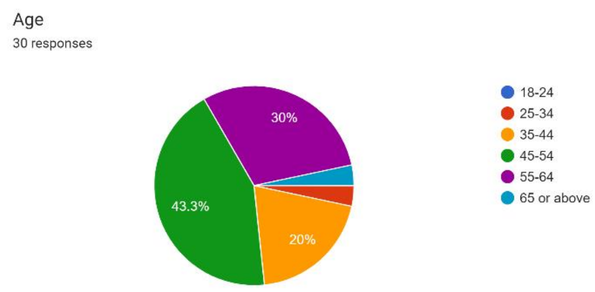
- Cyprus- 6
- Finland- 1



Survey question 2 response

The second question is about gender. As the chart indicates that the respondents gender balance was closer than the EU average of women in the construction sector of 4-6% a positive result which improves and balances diversity

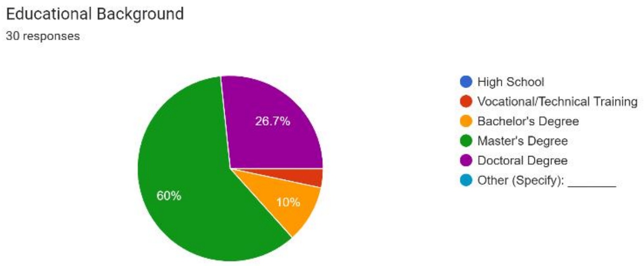
- Men 63% - 19
- Women 36% - 11



Survey question 3 response

The third question is regarding age. The chart indicates that the age balance of responses was also in a wide range:

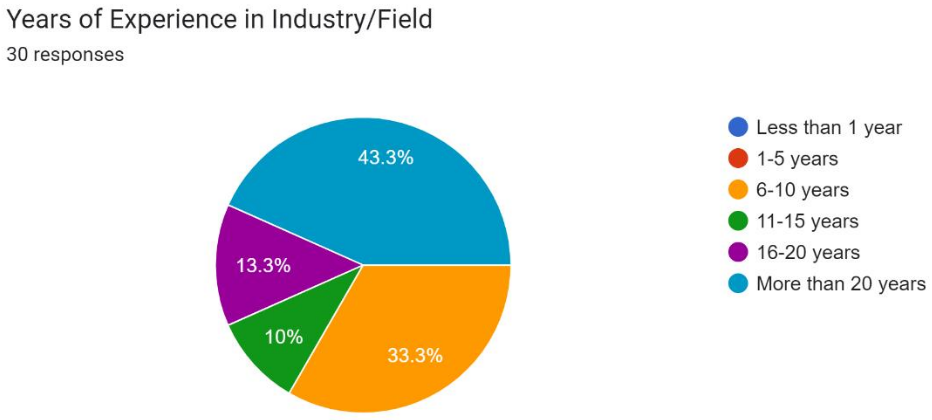
- 18-24 – 0 response
- 25-34 – 1 response
- 35-44 – 6 responses
- 45-54 – 13 responses
- 55-64 – 9 responses
- 65 + – 1 response



Survey question 4 response

The fourth question is regarding age. The chart indicates that the educational backgrounds were wide ranging and covered many European Qualification Framework (EQF) levels:

- High School - 0
- Vocational/Technical Training - 1
- Bachelor's Degree - 3
- Master's Degree - 18
- Doctoral Degree - 8

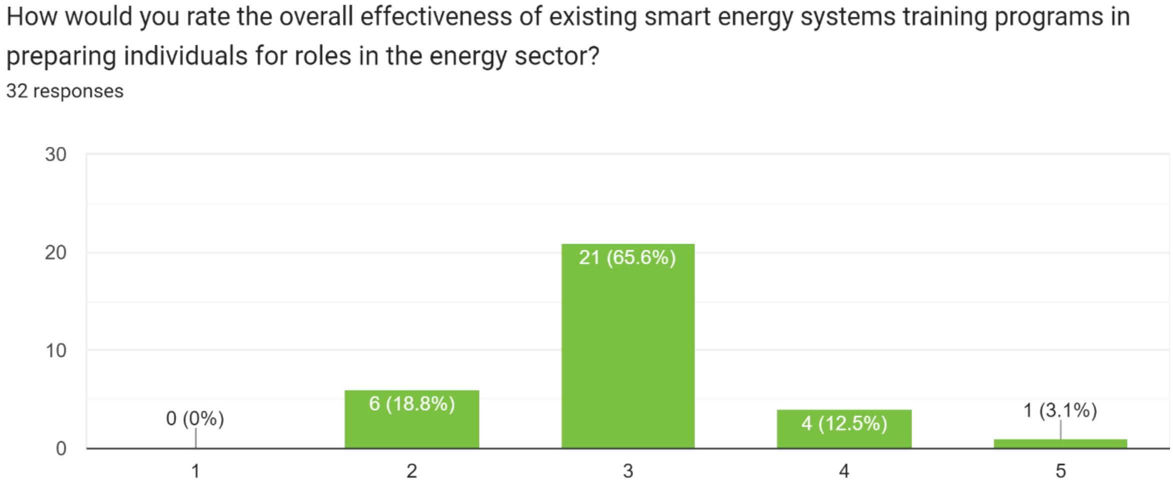


Survey question 5 response

The fifth question enquires as to the years of experience in the industry. The chart demonstrates that experience in the industry had a varied and high experience levels
6-10 years - 10
11-15 years - 3
16-20 years - 4
More than 20 years - 13

When effectiveness of current programmes was examined in the next section:

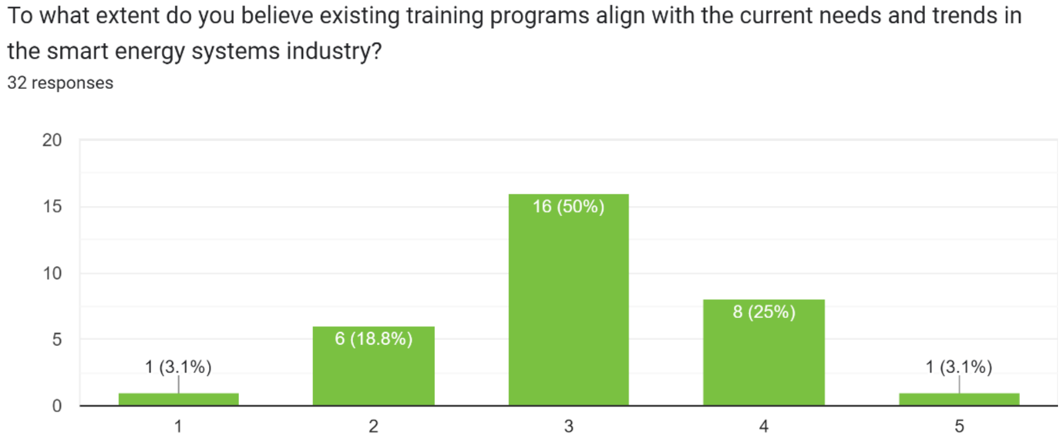
The question:



Survey question 6 response

Was responded as the chart indicates out of 32 responses, 21 participants indicated no. 3 neither excellent or poor, 6 participants indicated 2 = on the excellent side, 4 participants indicated 4= on the poorer side, 1 participant indicated = on the very poor side excellent side agree. This shows that the respondents found that the overall quality of the current training programs is not overly effective.

The ninth question is about:

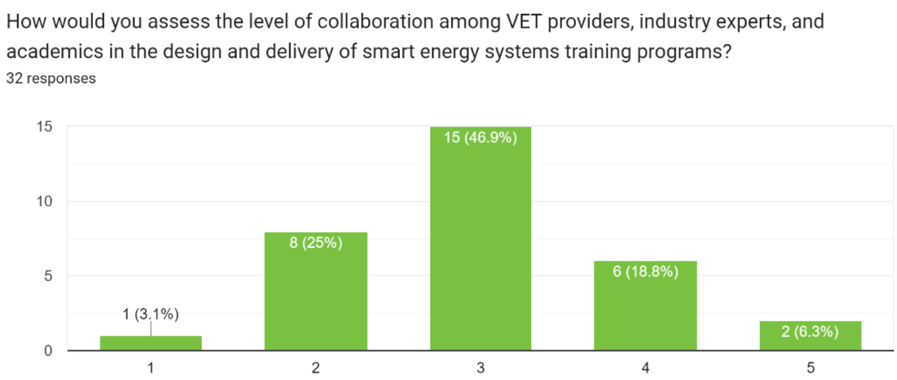


Survey question 9 response

As the chart indicates out of 32 responses, 16 participants indicated no. 3 neither aligned nor unaligned i.e. neutral, 8 participants indicated no. 4 =

towards the not aligned direction, 1 participant indicated no. 5= not aligned at all, 6 participants indicated no. 2 towards the completely aligned direction, and finally 1 participant indicated no. 1= completely. This shows that the respondents found that the alignment was currently quite neutral.

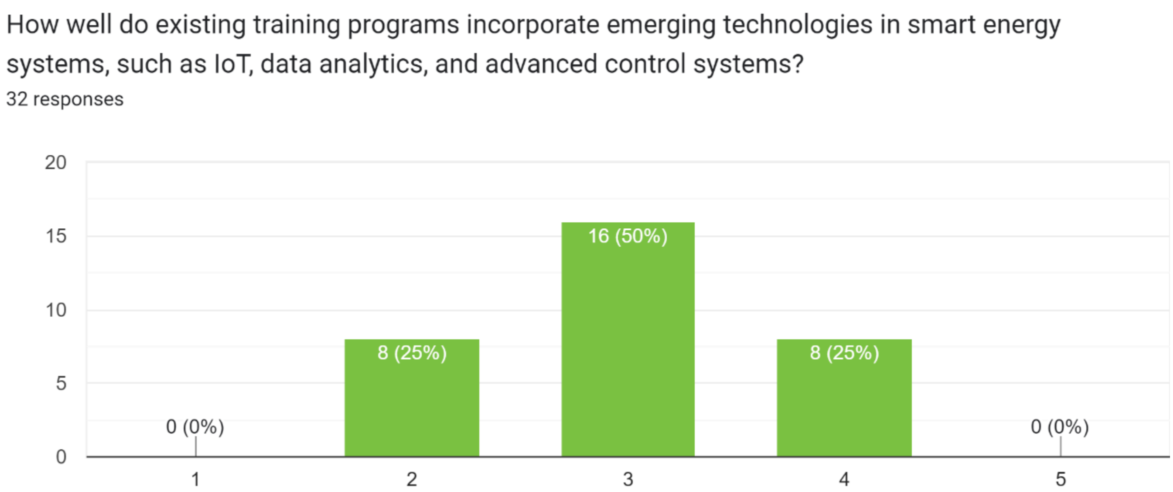
The tenth question is about collaboration:



Survey question 10 response

As the chart indicates out of 32 responses, 15 participants indicated no. 3=no real collaboration i.e. neutral, 6 participants indicated no. 4 = towards the low collaboration, 2 participants indicated no. 5= very low collaboration, 8 participants indicated no. 2 some collaboration, and finally 1 participant indicated no. 1= very high collaboration. This shows that the respondents found that collaboration is on average not happening which is a good indicator for the project to prioritise this measure, among others.

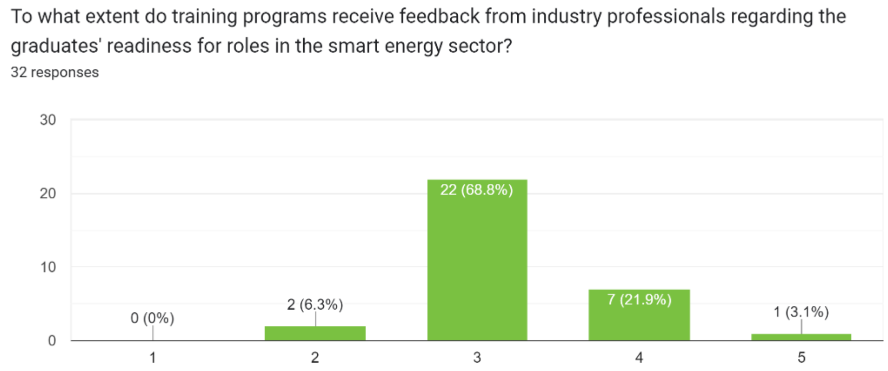
The eleventh question is about Integration of Emerging Technologies:



Survey question 11 response

As the chart indicates out of 32 responses, 16 participants indicated no. 3= neither very well or very poorly i.e. neutral, 8 participants indicated no. 4 = towards the very poor incorporation and 8 participants indicated no.2 = towards the very well incorporation. This shows that the respondents found that the incorporation also is on average not happening which is again good gauge for the project to prioritise this as the dissemination and training is developed.

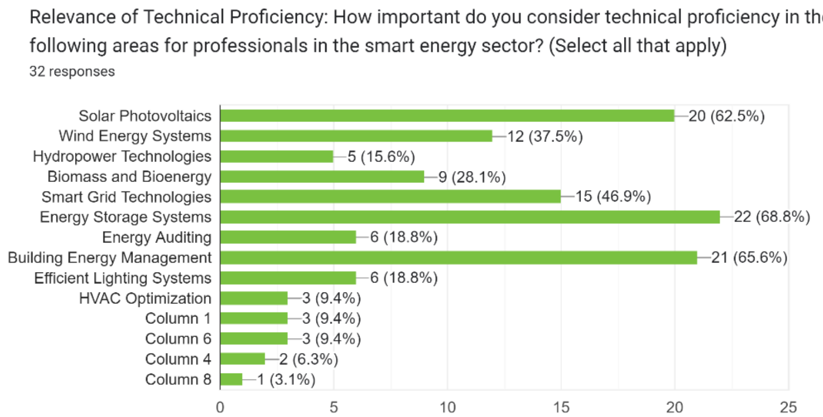
The twelfth question is about Industry Feedback Mechanisms



Survey question 12 response

As the chart indicates out of 32 responses, 22 participants indicated no. 3 = no current feedback i.e. 7 participants indicated no. 4 = towards the never receiving feedback and finally 2 participants indicated no. 2= some feedback. This shows that the respondents found that generally there is not adequate feedback therefore this can be developed through the project to have required surveys and feedback before courses are finalised and graded. Another good indicator for the project to prioritise.

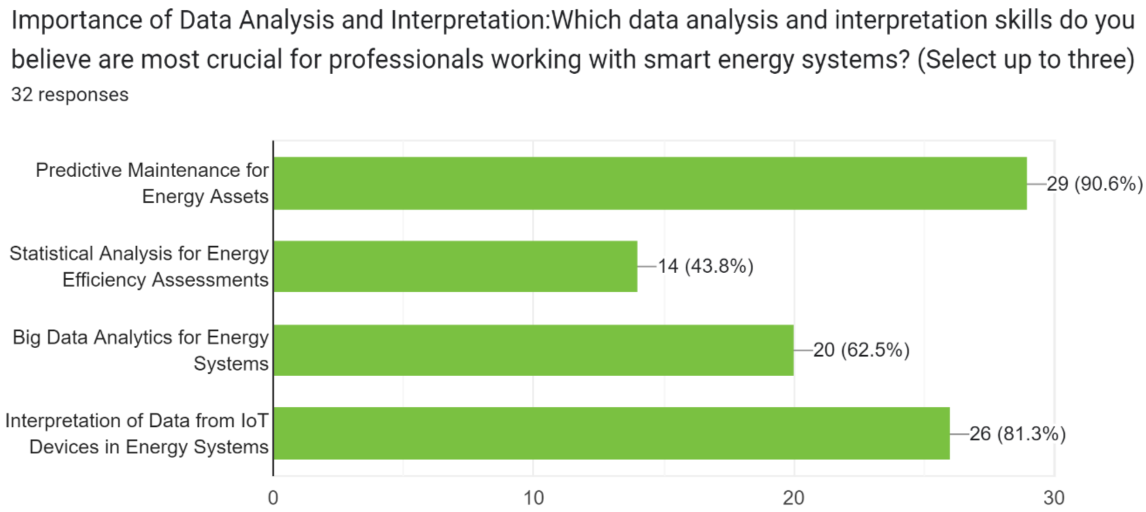
The thirteenth question is about Competencies & Training Areas with Module Preferences:



Survey question 13 response

All areas were proposed with high amounts of the 32 participants indicating a holistic approach to all equipment systems and assessment, such as energy auditing. This was a positive finding that all competencies should be aligned in the future.

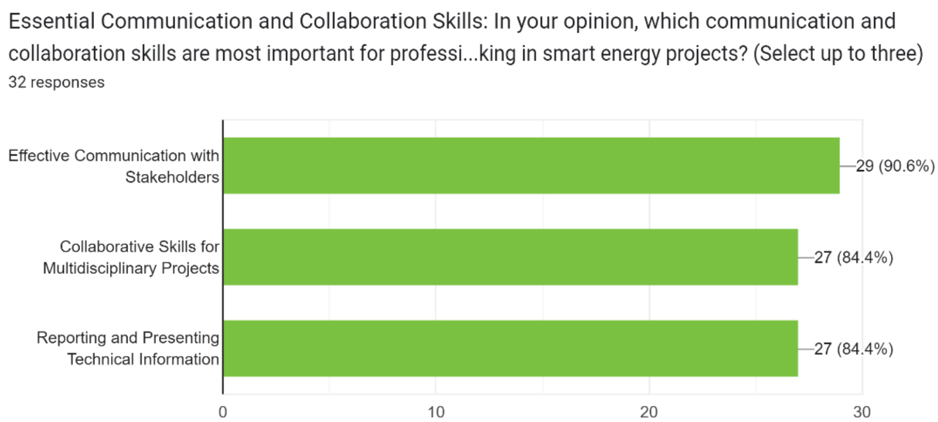
The fourteenth question is about:



Survey question 14 response

Of the 32 participants a high number: 29 participants- Predictive Maintenance for Energy Assets, 20 participants - Statistical Analysis for Energy Efficiency Assessment, 26 participants -Interpretation of Data from IoT Devices in Energy Systems and 14 participants- Big Data Analytics for Energy Systems highlighted that analytics and interpretation was an important measure to monitor the performance of smart energy systems, another positive finding.

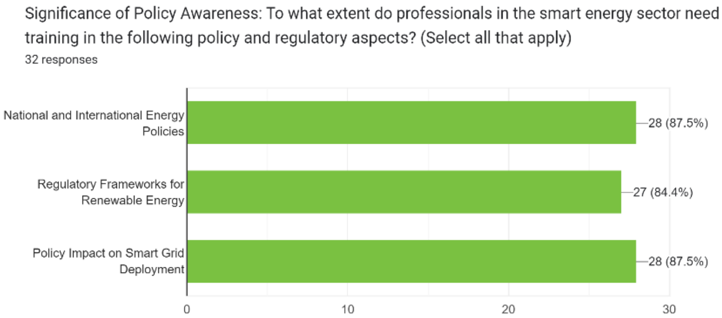
The fifteenth question is about:



Survey question 15 response

Of the 32 participants a high number: 29 participants stated that effective communications with stakeholders are important, 27 participants selected multidisciplinary projects collaborative skills as highly important and 26 participants also highlighted that technical information being reported and presented is important too therefore all the suggested skills are important.

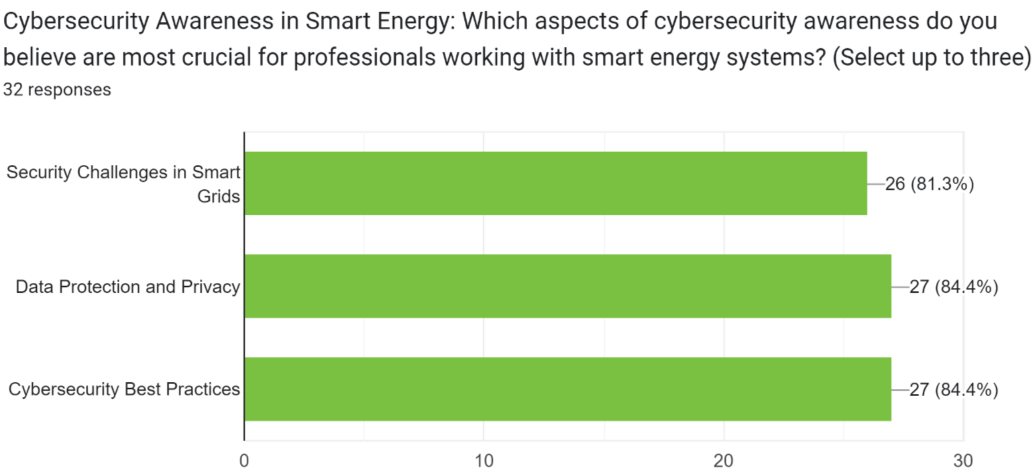
The sixteenth question is about:



Survey question 16 response

Of the 32 participants a high number, 28 participants stated National and International Energy policies are required training effective communications with stakeholders are important, 27 participants selected Regulatory Frameworks for Renewable Energy as a requirement and 28 participants chose Policy Impact on Smart Grid Deployment as a mandatory training. This presented that all responders believe policy and regulations should be taught to all in the sector.

The seventeenth question is about cybersecurity. This is a popular topic as Increasing internet connectivity in smart energy systems can pose serious cyber security concern.



Survey question 17 response

Of the 32 participants a high number, 26 participants highlighted that Security Challenges in Smart Grid were to be addressed, 27 participants believed Data Protection and Privacy were important aspects and 27 participants chose Cybersecurity Best Practice as a crucial topic to be addressed. As it is a very hot topic at the moment as increasing internet connectivity in smart energy systems can pose serious cyber security concerns because Digitalisation1 of the energy sector could accelerate its sustainable transition.
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6.3 Focus Group meeting feedback

In the Irish context a focus group meeting was held online on the Jan 12th at 13.00.
7 stakeholders attended and additional responses from those who could not attend were submitted by email.
The attendees worked in a broad range of sectors ranging from renewable energy and building analytics software companies, those working in local authorities, and quantity surveyor, energy auditors and engineers.

Based on comprehensive responses from the meeting, participants believe that current training programs can be enhanced and better integrated through project deliverables. It was also suggested that the platform should be more user-friendly. Among the feedback, they offered several constructive ideas that could benefit the project in the future. These insights are invaluable for guiding the project's ongoing development and refinement.
Some of these comments were:

- *There are obviously specific areas within the industry that have strong potential training programs.*
- *In smart grid technologies, it's definitely lacking.*
- *In terms of training around it, I don't see anything specific out there at the minute for smart technologies.*
- *On the incentivization of interoperability and open API so devices can communicate with each other, this is opposed to the business concept of the business model of propriety ownership you know to command the maximum amount of the market as possible by locking other people out, that's a very anti-European you know.*
- *There is an issue of proprietorial how you can have two or three different systems in the same residential building, then you need the regulator bringing in the new rules.*

- *So, the design of a training course has to be active learning, along with the fact that the curriculum is going to regularly change every year.*
- *It should also be for homeowners and people who do want to make their way around.*
- *Every member of Sustainable Energy Communities need training in Smart Energy Systems this area, but they need to go to back to basic clean energy.*
- *We need cross sectoral discipline, such as BIM which handles the data.*
- *We need post occupancy monitoring to as some highly efficient buildings don't perform the way they were designed to as occupants aren't trained to operated them correctly.*
- *Mutual recognition of trainings across EU states is a good idea to deliver.*

An online focus group was held in Greece on December 7, 2023, featuring various energy sector professionals.
Participants included an Energy Sector Employee focusing on smart energy systems, a Chemical Engineer with expertise in energy storage and renewable technologies, an Agronomist emphasizing environmental impacts in energy training, and a Renewable Energy Expert/Technical Manager.
The group discussed the need for practical training experience, integration of advanced technology, and specialized industry training, and highlighted emerging technologies like advanced solar systems. Key themes across the discussion included the significance of data analysis, cybersecurity, policy awareness, and effective communication in the energy sector.

Focus Group 2 in Greece, held on December 21, 2023, brought together diverse energy sector professionals.
It included a Project Management Expert with a focus on practical training in the oil, gas, and chemical sectors, emphasizing safety and risk management. A Modelling and Optimization Specialist who stressed the importance of training in predictive optimization and modelling, particularly for real-world industry applications. A Multidisciplinary Integration Advocate who highlighted the need to include economics, policy, and telecommunications in smart energy education. An Environmental Management and Material Science Expert who emphasized balancing experimental and computational skills and improving practical lab skills in environmental management and material analysis.
The group's collective insights pointed to the need for more hands-on training, multidisciplinary integration, and advanced skill development in smart energy systems.

In the Cyprus Focus Group, professionals from the smart energy systems field shared their expertise. They emphasized sustainable development in energy solutions, particularly addressing practical training gaps in solar energy optimization, given Cyprus's unique geography and climate. The group also discussed the importance of aligning renewable energy training with the fast-paced evolution of technologies in this sector. Key topics included the integration of advanced technologies like IoT and AI (Artificial Intelligence), collaboration between academia and industry, the necessity of effective communication skills, cybersecurity awareness, and the significance of practical project-based learning. Understanding energy policies and regulations was also highlighted as critical for comprehensive training in this area.

During the Finnish Focus Group, held online on the 22th January 2024, NETFI had a constructive discussion and gathered information with three stakeholders while 4 more stakeholders submitted their answers via email, which were also discussed. The group included employees and scholars on smart energy sector, ICT experts, electronic and energy engineers as well as consultants that have participated in projects on innovating technologies in the smart energy sector.

Based on responses gathered both from the online meeting and via email, participants seem to believe that the Effectiveness of the current smart energy systems training and education seems to be lacking awareness. These systems need to be promoted properly; gain the outreach they deserve and reach not only the stakeholder side but also the everyday people who seek for better solutions and tangible outcomes.

Regarding the alignment with the industry needs, participants stated that they feel a gap between the Industry and Smart Energy Solutions in terms of direct relations and explicit way of communicating the benefits, initiatives, challenges, and/or other issues on the divergence of both the Companies as well as the Energy Sector. Participants also pointed out that Universities in Finland are quite active when it comes to collaboration between stakeholders and interrelation among experts, stakeholders, VET providers, researchers and other interested parties.

On the Integration of emerging technologies participants stated that AI-featured smart apps, as well as IoT but also XR/VR may be very interesting new additions to training programs, even though some extra work may be needed in the incorporation of such features. ICT companies may lack the needed information and direct communication with the Smart Energy sector to understand the advantages of moving towards this direction.

As far as data analysis and interpretation are concerned, participants discussed the importance of integrated data analysis algorithms in predicting consumption of energy in order to optimize production, network and storage needs. It seems to be significant to have a full understanding of the collected data but also to have a knowledge of how they can be analyzed in order to make conclusions on savings (energy, economic, efficiency). For example, if there are IoT devices, the collected

measurements should not only be observed but also analysed deeply so that respective adaptations of used models can be improved. If such are based on predictive energy algorithms, it is needed to have a short and long-term evaluation and adaptation of those, to take full advantage of such solutions.
As a general feedback, participants believe that the knowledge of graduates of smart energy systems training programs in Finland are at quite a high level (for example from the University of Vaasa, Aalto University or University of Eastern Finland). Technical proficiency and competency are crucial skills that software developers of smart apps need to have. Energy engineers should be aware of the energy domain, of various energy sources and how the grid is related. IoT technology is critical for all domains, while AI features must also be considered. The importance of further awareness in fields of solar wind systems (and how these can be implemented in the most easy and professional way and what will be the economic impact for the companies), energy storage systems and building energy management was also commented on. Participants also seem to believe that it is needed to have professional technical competencies coming out from real implemented projects to be used to demonstrate actual results and improvements. Participants also consider high importance communicational and collaborative skills, policy awareness and the issue of cybersecurity.

The Italy Focus Group 1, held on 15 December 2024, consisted of a diverse group of professionals in the smart energy system sector:
A professional from an energy and sustainable development agency, focusing on sustainable energy management and professional training course coordination.
An educator with experience in internationalization and Erasmus+ projects, teaching at a technical institute.
An energy engineer consultant specializing in carbon management and consultancy for a private organization in the UK.
A professional working in a technological and innovation transfer hub, with experience in Erasmus+ project design and implementation.
A researcher and educator in a university of applied sciences, teaching courses on the optimized design and management of complex energy systems.

The Italy Focus Group 1, convened on December 15, 2024, brought together diverse professionals from the smart energy system sector. This group included a sustainable energy management expert from an energy and development agency, an educator experienced in international projects and technical instruction, an energy engineer consultant specializing in carbon management, a professional in technology and innovation transfer, and a researcher and educator in applied sciences focusing on energy system optimization. Their discussions revolved around enhancing current SES training programs, bridging practical training gaps, better integrating industry needs into education, fostering collaboration among stakeholders, and emphasizing the need for various competencies such as technical proficiency, data analysis, effective communication, policy awareness, and cybersecurity in the SES sector.

7. Conclusions

7.1 Summary of current trainings mapping

The analysis of current training programs revealed a lack of comprehensive courses covering the combined fundamentals of existing and emerging energy systems. Present courses focus separately on aspects such as heat pumps, renewable energy, and nearly zero energy buildings. The Masters in Sustainable Energy System Management, however, plans modules like Integrated Controls and Internet of Things, which aim to optimize energy usage and costs through a network of interconnected devices and technology.

This research and focus group feedback suggests the need for holistic and integrated training designs. These should incorporate innovative systems proposed by focus groups and project partners. Such a design would significantly improve the efficiency of buildings, industrial facilities, district heating networks, and grid systems, enhancing understanding of smart systems among citizens.

General Findings:

- Effectiveness of Current Programs: Current training programs are theoretical, lacking in practical application.
- Integration of Emerging Technologies: There is a strong consensus on the need to integrate technologies such as IoT, data analytics, and advanced control systems.
- Alignment with Industry Needs: Training programs are slowly aligning with industry trends but must keep up with rapid technological advancements.
- Collaboration Among Stakeholders: While collaboration exists, it needs strengthening, especially in aligning academic curricula with industry requirements.
- Industry Feedback Mechanisms: Industry professionals seek graduates with more practical, industry-relevant skills.

Through partner engagement and focus group feedback, specific competencies were identified for the course modules and objectives:

- Renewable Energy Technologies: This includes understanding various renewable energy sources like solar, wind, hydro, and biomass, and knowledge of energy conversion technologies.
- Grid Integration: Focuses on integrating renewable sources into the power grid and understanding smart grid technologies.
- Energy Storage Systems: Covers different energy storage technologies and their integration with renewable sources and the grid.
- BMS and Energy Management Control Systems: Encompasses smart meters, advanced metering infrastructure, and energy management systems.
- Data Analytics and IoT: Involves using data analytics for energy consumption optimization and IoT applications in smart energy systems.
- Cybersecurity: Focuses on cybersecurity principles and protecting smart grids and devices from cyber threats.
- Policy and Regulatory Environment: Knowledge of energy sector policies, regulations, and the dynamics of smart energy technology deployment.
- Economic and Environmental Impacts: Involves evaluating the economic feasibility and environmental impacts of smart energy projects.
- Communication and Interpersonal Skills: Emphasizes effective communication and collaboration in smart energy projects.
- Project Management: Includes planning, execution, budgeting, and risk management in energy system implementations.
- These competencies provide a comprehensive understanding necessary for designing, installing, managing, and comprehending Smart Energy Systems. The emphasis on these competencies might vary depending on module design, and additional topics could be included as course design evolves.

7.2 Future-Ready Smart Energy Training: Integrating Practical Skills and Emerging Technologies

- To develop a relevant, effective, and forward-looking curriculum for smart energy vocational education and training, key recommendations include:
- Integrate Practical Training: Emphasize hands-on experiences that focus on real-world applications and project management skills.
- Incorporate Emerging Technologies: Include training in areas like IoT, data analytics, AI, and advanced control systems to stay aligned with industry advancements.
- Align with Industry Needs: Regularly update programs to reflect current trends and technologies in renewable energy, including EU regulations and funding mechanisms.
- Enhance Collaboration: Strengthen partnerships between academia, industry, and other stakeholders in curriculum development and practical training.
- Focus on Industry-Relevant Skills: Design programs that offer a balance of technical knowledge and practical, industry-specific skills, including aspects like cybersecurity and policy awareness.

7.3 Strategic Roadmap for Enhancing Smart Energy Vocational Training: Key Focus Areas

- To advance smart energy vocational education and training, the curriculum development should prioritize:
- Renewable Energy Technologies: Tailoring training to focus on solar, wind, and other renewable sources, adapted to regional climates.
- IoT and Smart Grid Technologies: Courses on Internet of Things applications in energy management and smart grid tech.
- Data Analytics and AI in Energy Systems: Educating on big data and AI for energy system optimization and modelling.
- Project Management in the Energy Sector: Practical skills in managing energy projects, including EU regulations and funding aspects.
- Energy Storage Solutions: Training on emerging technologies for energy storage, critical for renewable integration.
- Cybersecurity in Energy Systems: Emphasizing the importance of securing energy systems against cyber threats.
- Policy and Regulation: Understanding the influence of national and EU policies on the energy sector.
- Practical Implementation Skills: Hands-on training in installation, maintenance, and optimization of energy systems.

7.4 Descriptor of Smart Energy Systems

The vision for Smart Energy Systems includes interconnected equipment and buildings, where authorized by owners, that communicate bi-directionally. This system would enable the distribution of excess renewable energy, potentially at low or no cost. Future considerations involve providing excess renewable energy to fuel-poor households or charities.

In terms of energy management, the system could optimize heating and water temperatures based on the availability of excess renewable energy, including the heating of water to higher temperatures when excess is available. The concept also extends to electric vehicle (EV) batteries, charging them during periods of excess or lower-cost electricity.

7.4.1 Smart Energy Systems

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A Time of Use (ToU) pricing system is envisioned, where electricity costs vary, possibly every hour. This system would signal buildings to optimize energy costs.

Additionally, there's potential for exporting energy to assist other buildings or the grid, particularly through EV vehicle-to-grid systems, which could generate revenue and contribute to grid optimization. EVs could serve as mobile energy sources, providing energy to fuel-poor homes.

The concept also includes managing non-critical energy usage in appliances like heat pumps or fridges to assist with grid demand and frequency response, potentially offering financial incentives.

Finally, the development of peer-to-peer energy trading, as seen in other EU countries, is a goal, enhancing energy distribution and community engagement. such as in Italy the Regal Grid-Energy Community

8. List of acronyms and abbreviations

BIM: Building Information Model / Management

BUS: Build Up Skills
CRM: Critical Raw Materials
CPD: Continuous Professional Development
EAB: External Advisory Board
EoSL: End of Service Life
GPP: Green Public Procurement
KE: Key Elements
ULO's: Units of Learning Outcomes
RES: Renewable Energy Source
SES: Sustainable Energy Systems
WP: Work Package ACD - Acceptable Construction Details
BER - Building Energy Rating
CIBSE - Chartered Institution of Building Services Engineers
DCCAE - Department of Communications, Climate Action and Environment
DEAP - Dwelling Energy Assessment Procedure
DECLG - Department of the Environment, Community and Local Government
EC - European Commission
EGFSN - Expert Group on Future Skills Needs
EU - European Union
EPBD - Energy Performance of Buildings Directive
EPC – Energy Performance Contracting
ESD - Energy Services Directive
FEC - Final Energy Consumption
GHG - Green House Gases
GWh - Gigawatt Hour
KWh - Kilowatt Hour
MPEPC – Maximum Permitted Energy Performance Coefficient
NZEB - Nearly Zero Energy Buildings
PV - Photovoltaic
QQI - Quality and Qualifications Ireland
SEAI - Sustainable Energy Authority Ireland
SME - Small and Medium Enterprise
TGD - Technical Guidance Documents
Mtoe - Mega tonnes of oil equivalent
MVHR - Mechanical Ventilation with Heat Recovery
NFQ - National Framework of Qualifications
REFIT - Renewable Energy Feed in Tariff scheme
REIA - Renewable Energy Installer Academy
RER - Renewable Energy Ratio
RES – Renewable Energy Systems
RM&I - Repair, Maintenance and Improvement
SCS - Society of Chartered Surveyors
SLMRU - Skills and Labour Market Research Unit
SME - Small and Medium Enterprise

SSC – Sector Skills Councils
VEC - Vocational Education Committee
VET - Vocational education and training

9. Glossary

Focus group: A small subset of experts within the construction industry which have been brought in to assist in verification of the work we have completed.
Additionality: Additionality is the procurement of renewable energy for a building's use which results in new installed renewable energy capacity that would not have occurred otherwise. The principles of additionality apply when an organisation / consumer self-generates renewable energy from their own facilities or closes an electricity purchasing contract that contributes to the construction of new renewable energy facilities. Projects that comply with the principle of additionality result in real and verifiable emission reduction or emission avoidance for the organisation / consumer, as their direct effect is to increase renewable energy generation.
BC(A)R- Building Control Amendment Regulation: Building Control Regulations provide for matters of procedure, administration and control for the purpose of securing the implementation of the requirements of the Building Regulations and of demonstrating how compliance with such requirements has been achieved in relation to the building or works concerned.
Building Life Cycle: A building's lifecycle can be broken down into sixteen modules across three stages as defined in EN15978. A further stage, stage D, includes the potential reuse and recycling benefits of the building's components after the useful life of the building. The definition of the specific life cycle stages of a building is defined in EN 15978. The life cycle stages include A1-3 production, A4-5 transport and construction, B1-7 use, and C1-4 end of life.
Building Renovation Passports: masterplans for retrofit and include a record of works. They ensure that any renovation works are planned and implemented in a holistic and technically sound manner, hence preventing "lockins" and facilitating a step-by-step approach to deep renovation.
Built Environment: ranges from the scale of the individual building to neighbourhoods, communities, and cities with their associated infrastructure.
Carbon offsets: Emission reductions or removals achieved by one entity can be used to compensate (offset) emissions from another entity.
Circular Economy: is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles. It demands a framework for implementation that encompasses cradle-to-cradle assessment of environmental impacts and the ability to

identify and assess the environmental impacts associated with each use life separately within the overall product lifecycle in order to preserve and reallocate value and thereby support economic actuation.

Cross Departmental Networks: The purpose of a Cross-Government Network is to bring together the wide range of actors across government departments, their agencies and local authorities who are responsible for implementing actions and policies which impact on an objective.

Decarbonisation: is the means of reducing carbon dioxide (and other greenhouse gas) emissions into the atmosphere. Climate neutrality is the goal of the decarbonisation process, i.e., to achieve zero net greenhouse gas emissions (Net Zero carbon footprint) by the target date.

Embodied carbon: covers the entire carbon emissions associated with materials and construction processes throughout the whole lifecycle of a building or infrastructure. Embodied carbon therefore include the following modules (or lifecycle stages of a building) under EN 15978: material extraction (module A1), transport to manufacturer (module A2), manufacturing (module A3), transport to site (module A4), construction (module A5), use phase emissions (module B1, e.g. refrigerant leakage but excluding operational carbon), maintenance (module B2), repair (module B3), replacement (module B4), refurbishment (module B5), deconstruction (module C1), transport to end of life facilities (module C2), processing (module C3), disposal (module C4). Benefits beyond the system boundary (modules D1 – D4) should also be reported separately to modules A-C.

EN 15978: European Standard specifies the calculation method for Sustainability, based on Life Cycle Assessment (LCA) and other quantified environmental information, to assess the environmental performance of a building, and gives the means for the reporting and communication of the outcome of the assessment. The standard is applicable to new and existing buildings and refurbishment projects.

EU Taxonomy: outlines the key criteria to be met for an economic activity to be regarded as “green” or “social,” with a view to tackling greenwashing. In simple terms, the more verifiably environmentally friendly a project is, the easier it should be to obtain funding at a lower interest rate.

Further Education and Training: FET is funded under an outcomes-based model that prioritises employment for the new entrants and upskilling for existing employees. Programmes are developed in partnership with employers – e.g. all retrofit programmes were developed with SEAI’s Approved Warmer Homes Contractors, and the Utilities Traineeship was developed with the Civil Engineering Contractors Association. The level of the programme is determined by the validation body (QQI/CABWI etc) based on programme content and ETBs utilise the programme heading that best suits the outcome (Skills to advance (STA) – for people who are currently in employment. SST (Specific Skill Training) – new entrants. Traineeship – can be employed or unemployed – Employed Traineeship is an option also. (SOLAS & DFHERIS)

Greenhouse Gases (GHG): In the context of the scope of the built environment only the following GHGs with Global Warming Potentials (GWP) are considered: carbon dioxide (CO_2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF6)40. Their GWP is quantified in units of carbon dioxide equivalent. A kilogram of carbon dioxide therefore has a GWP of 1 kg CO_2eq.

Level(s): Launched in October 2020, Level(s) is a framework of sustainability indicators that are common to all buildings. The key idea is that if all member states focus on these same indicators, we can use them to learn, set benchmarks and develop standards. The framework offers comprehensive manuals for the understanding and reporting of each indicator. Level(s) was developed as a detailed reporting framework to improve the sustainability of buildings from the life cycle perspective, including the transition towards a circular economy. It encourages life cycle thinking and supports users all the way from design stage through to operation and occupation of a building.

Life Cycle Assessment (LCA) is defined as a systematic set of procedures for compiling and examining the inputs of materials and energy into a process, and the outputs in terms of the associated environmental impacts directly attributable to the process. It defines the scope or system boundary of the process and assigns environmental impact factors to all energy and materials within that scope, which in turn becomes the inventory for measurement. ISO 14040- 44 provides a general overview of the principles, framework, and requirements; The detailed procedure for applying LCA methodology in the built environment is described in EN 15978 (ISO 14040: 2006) for single lifecycle assessment.

Life Cycle Costing (LCC) considers cost or cash flows, i.e., relevant costs (and income and externalities if included in the agreed scope) arising from acquisition through operation to disposal of buildings and constructed assets (ISO 15686- 5:2017(en)).

Major Retrofit: is retrofitting of a building where more than 25% of the total surface area of the building's envelope undergoes renovation and must reach a minimum B2 Building Energy Rating.

NABERS (a sustainability rating for the built environment. Like the efficiency star ratings that you get on your fridge or washing machine, NABERS provides a rating from one to six stars for buildings efficiency across: Energy, Water, Waste, and Indoor environment. This helps building owners to understand their building's performance versus other similar buildings, providing a benchmark for progress.

Nearly Zero Energy Building (NZEB) is not a separate standard; it is a definition for the energy performance required, i.e., to comply with the EU Energy Performance of Buildings Directive TGD Part L a building must achieve or exceed NZEB performance.

Net Zero (Whole Life) Carbon Asset is one where the sum total of all assets related GHG emissions, both operational and embodied, over an asset's life cycle (Modules A1-A5, B1-B7 (plus B8 and B9 for Infrastructure only), C1-C4) are minimized, meet local carbon, energy and water targets, and with residual 'offsets', equals zero. There are many different definitions of Net Zero which allow for various forms of offsetting to be counted, some of which are of dubious environmental benefit.

Net Zero carbon – operational energy asset is one where no fossil fuels are used, all energy use (Module B6) has been minimised, meets the local energy use target (e.g., kWh/m2 /a) and all energy use is generated on- or off- site using renewables that demonstrate additionality. Any residual direct or indirect emissions from energy generation and distribution are 'offset' in accordance with the rules for evaluation established by the metric author.

Net Zero embodied carbon building (new or renovated) or infrastructure asset is highly resource efficient with upfront carbon minimised to the greatest extent possible in accordance with the rules for evaluation established by the metric author and all remaining embodied carbon reduced or, as a last resort, offset in order to achieve net zero across the lifecycle.

Net Zero in-use carbon: A 'Net Zero In-Use Carbon Asset' is one where on an annual basis the sum total of all assets related GHG emissions, both operational and embodied are minimized, meets local carbon, energy and water targets, and with residual 'offsets,' equals zero. 'Offsets' are allowable in accordance with the rules for evaluation established by the metric author.

Offset: Where a certain quantity of carbon emissions is deemed too difficult or even impossible to mitigate directly within the building life cycle, the equivalent number of emissions may be mitigated elsewhere, either by purchasing certified carbon credits or by investing in carbon sequestration projects (e.g., reforestation). There are many different definitions of offsetting allowed in different metrics, some of which are of dubious environmental benefit.

Operational carbon: Operational Carbon – Energy are the GHG emissions arising from all energy consumed by an asset in-use, during the operational stage of its life cycle.

Resilient Society: Presence of capabilities for resilience. Systems, institutions and people are considered 'resilient' when they have absorptive, adaptive, anticipative, preventive and transformative capacities and resourced to cope with, withstand and bounce back from shocks. (UN Common Guidance)

Shallow Retrofit: is a small-scale alteration where one or two energy saving measures are taken. This may include single measures. A shallow retrofit can initially seem cost effective, though it can be less beneficial in the long run. Therefore, any single measure should form part of a long-term plan included in future Building Renovation Passport for the home a building that can build towards supporting a deep energy retrofit without having to retrofit the retrofit delivery of the EU overall zero emissions built environment target by 2050.

Skills Mapping: The identification of current and future skills levels in order to properly gauge the skills and knowledge gaps within a given sector. This is done to properly understand what is needed to bridge these gaps through training and upskilling processes (Authors own) on Helping Build Resilient Societies UN-ResilienceGuidance-Final-Sept.pdf

Training clauses: allow public procurers to require companies winning NZEB projects to train their staff in energy efficiency. This type of clause is currently in-use in the Hauts-de-France region (France), where the companies winning these projects must train staff working on a project (construction workers and site supervisors) in energy efficiency. The clause is currently being piloted in Ireland.

Whole Life Carbon (WLC) is simply the sum of the embodied and operational carbon. It includes all the major and immediate sources of a building's carbon footprint. It is based on lifecycle stages as defined in EN 15978, (i.e., modules A1 to C4, with module D reported separately).

ZEB: A Zero Emissions energy Building (ZEB) produces enough renewable energy to meet its own annual energy consumption requirements, thereby reducing the use of non-renewable energy in the building sector.

Key elements framework: The Key Elements (KE) framework is a conceptual framework of eight elements of circularity that can be applied at different intervention levels (for example, national, regional, sector, business, product, process, or material) towards a circular economy. The KE framework consists of three core elements and five enabling elements. Core elements deal with physical flows directly, whilst enabling elements deal with creating the conditions or removing barriers, for a circular transition.

Skills Mapping: Mapping of skills levels to gauge the skills gap existing within any given profession.

- Current Skills: The skills level at which professionals and experts see their current level of skill.
- Future Skills: The skills level at which professionals and experts see their future level of skill.
- Skills Gap: The gap which exists between the current and future skills levels.

The three core key elements are:

1. Prioritise regenerative resources: Ensuring that renewable, reusable, non-toxic resources are used in the manufacturing of built environment. Ensuring that all resources are used in an efficient way.
2. Preserve and extend what is already made / Stretch the lifetime: While resources are in-use, maintain, repair and upgrade them to maximise their lifetime and give them a second life through take back strategies when applicable.

3. Use waste as a resource: Utilise waste streams as a source of secondary resources and recover waste for reuse and recycling.

The five enabling key elements are:

1. Design for the future: Account for the systems perspective during the design process, to use the right materials, to design for appropriate lifetime and to design for extended future use.
2. Collaborate to create joint value: Work together throughout the supply chain, internally within organisations and with the public sector to increase transparency and create joint value.
3. Rethink the business model: Consider opportunities to create greater value and align incentives that build on the interaction between products and services.
4. Incorporate digital technology: Track and optimise resource use and strengthen connections between supply chain actors through digital, online platforms and technologies that provide insights.
5. Strengthen and advance knowledge: Develop research, structure knowledge, encourage innovation networks and disseminate findings with integrity.

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