EDDIE

Education for Digitalization of Energy

Deliverable 5.3

Templates for documenting and presenting educational programs

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Abstract:

This deliverable consists of a presentation of the final web form and template that allows for the capture of data from existing programs as well as the design of new educational programs and training activities within the EDDIE project. The deliverable is started with an overview of the purpose of the template as well as a review of the design process leading up to the final deliverable. The main parts of the deliverable are the user guide and the data about educational programs – presented in appendices. The deliverable also presents technical integration options and future fuse cases for prospective students.

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Document Reviewers

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Definitions, Acronyms and Abbreviations

EC	European Commission
ESCO	European Skills, Competences, Qualifications and Occupations
EQF	European Qualifications Framework
EU	European Union
ICT	Information and Communication Technology
ISCED	International Standard Classification of Education
IT	Information Technology
VET	Vocational Education and Training

Executive Summary

The objective of this deliverable is to present the template, or design tool, for gathering, structuring, and presenting data for educational programs. The objective of this deliverable is to present the template for structuring and presenting data for educational programs. The design of an educational programs, and the presentation of its curriculum and format to prospective students is if course dependent on which information about the program is available. During design of the program, information about both the educational aspects, such as program objectives, knowledge gap addressed, and format of lectures needs to be developed and documented. Similarly, once the program is operational, prospective students will want to know what to expect from the program and the information developed during design must be accessible in a coherent and easily accessible format. Hence, the program template should is not merely suggested headlines in a document describing the program curriculum documentation, it actually leads both the design process of new programs as well as facilitates presentation of data for students.

The development of the template, or design tool, has been done iteratively during a critical formative stage of the EDDIE project involving extensive work by several project partners. The work has involved identifying educational programs of several different formats and educational levels. This has created a multitude of data relevant to the training needs in the future digital energy system, ranging from self-paced online programs on artificial intelligence to vocational education training for practicing engineers and technicians. Providing a structure to such a wide array of training and learning activities the template, in essence a webform – is essential.

The template also allows for further structuring of both existing and new programs thanks to the integration with EDDIE internal and external educational taxonomies. Within EDDIE, the syllabus elements developed in WP4 has been a key part of the template by providing structure to data entry and program design. Furthermore, as example of an external taxonomy, the ISCED standard classification of education and training, provides further structure to facilitate not only design but also searching for programs fitting the need of prospective students and/or their employers.

The deliverable consists of a description of the design of the template illustrating the design steps and the gradual refinement of the data structure. It also provides a user guide to the template as well as outlining use cases and proposals for further technical integration. Data from programs that have been used to test the deliverable is appended at the end of the deliverable.

1. Introduction

This deliverable presents the results of the subtasks within WP5 that have focused on capturing and presenting information about existing and future envisioned educational programs of all types and educational levels. The work is the result of a two-stage process in which the first stage was reported in Deliverable D5.2 Draft intermediate templates for educational programs. The work has involved partners from across the EDDIE consortium representing all kinds of educational providers and educational programs. This first introductory chapter serves to introduce the deliverable and set the scope of the program template within EDDIE and beyond.

1.1.   The objective of program templates

As stated in the goals of the project, EDDIE is a four-year Erasmus+ European Union funded collaborative project aiming to create a Sector Skill Alliance for the digitalization the European Energy sector. The focus is on current and future demand of skills necessary for the digitalization of the Energy sector and the supply of improved Vocational Education and Training (VET) systems and beyond.

3. General template for programmes:

The goal of this task is the definition of a general template valid for any training programme. This template will be a set of structured data describing its business model and its academic model.

Since the training programme is at the core of the skill-acquisition process, this task is related to tasks and services (see Figure 8):

- It will use the results of "1. Syllabus elements" to describe the contents of the programmes -at least in an advanced version of the template.
- It is of course critical for the training portal, to allow uploading and searching programmes in a systematic way.
- The template will be used in the description of "7. Flagship programmes".
- The elements of the template will be useful to classify in a systematic way the "4. Best practices" in the whole skill-acquisition process.
- Finally, it might be related to the jobs portal in two ways: first, in cases where recruiting and training are integrated in a single activity; second, because certain job profiles may be specific targets of some training programmes.

In the EDDIE context, this task belongs mainly to the WP5 itself; it is indirectly related to other WPs, such as WP2 and WP4, but just because of the overall consistency of the project.

Figure 1 Overall role of the programme templates as defined in
Deliverable D5.1 *Blueprint. Strategies, exploitation, challenges*

With the scope of EDDIE in mind, the nature of the educational programs – and other forms of training activities – included within the program is quite wide and heterogeneous. The training activities envisioned could include everything from short focused on-the-job activities, via online vocational and/or academic training courses to fully fledged master level programs. To create a structure by which a large variety of educational programs can be identified, documented and above all presented to prospective students and learners the EDDIE program template has been developed.
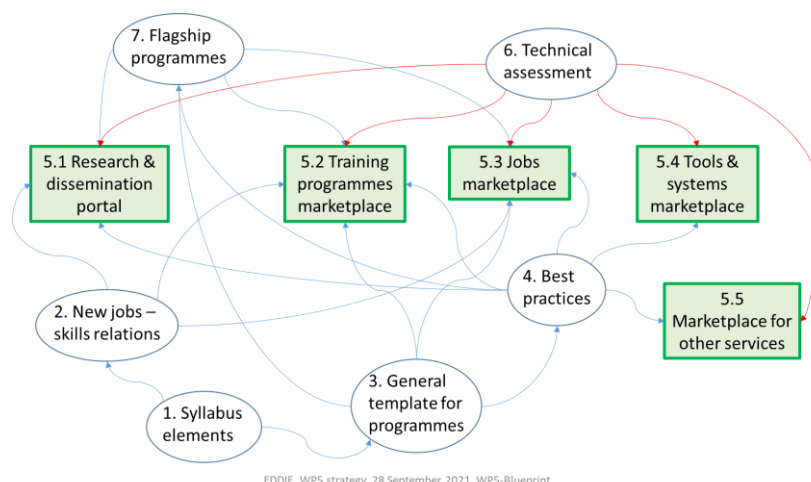
EDDIE, WP5 strategy. 28 September 2021. WP5-Blueprint.   5

Figure 2 Relation of the template to other parts of the EDDIE project

As is shown in Figure 2, the template is related to several other activities and concepts within the project. For instance, the skill gaps addressed, and syllabus elements have provided important input to the template, similarly the template has provided input to the capture of best practices. The template is also a key element in the training programs marketplace, since it provides the interface to students and program designers.

The general principles for use of the program template are presented further in Chapter 3. In summary, there are two main user groups – out of which one has so far been most active. The first group, active during the development of the template are education providers. As an *education provider* – of any type and educational level – the template is used to enter data about a program. The second user category are *prospective students*, their employer or agents that are looking for educational programs or activities that fit their educational needs. The template allows for use by educational providers both during development of the program, as well as when it is operational and ready to be accessed by prospective students.

As a next step, the educational program template will be integrated into the overall data management platform of EDDIE. This integration is further described in chapter 4 of this deliverable.

1.2. Structure of document

The main deliverable consists of 4 chapters.

This introductory chapter presents the content of the deliverable as well as discusses the role of the program templates in the overall EDDIE project as well as intended future use of the template.

Chapter two describes the development of the program template, including a review of the development work done during the first year of EDDIE which was also reported in D5.2 Intermediate draft of program templates. In addition, the interrelations between the work presented herein and work in WP2, WP4 and WP6 is presented.

Chapter three provides a user guide to the Program template specifically focused on the user category working to add new programs to the EDDIE database of programs.

Chapter four presents three different options for future integration of the program template with the EDDIE platform. The work outlined here should be seen as first specifications of coming technical integration work to be done within the EDDIE project, or possibly in follow-up activities.

Finally, to provide additional context for the use and development of the templates, two appendices are included in the deliverable.

The first appendix, Appendix A presents data gathered about six educational programs using the final and updated template are presented. These programs include the pilot programs of the EDDIE project.

The second appendix, Appendix B presents data gathered about 10 educational programs as part of the work to define the first version of the templates. The data is repeated from Deliverable D5.2 Draft intermediate templates for educational programs in order to provide a consistent source of program data in this deliverable and also to illustrate the differences between data gathered during the first and final stages of design of the template.

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2. Design of the Template

his chapter describes the development of the program templates, including the initial development work done during 2021 which was primarily reported in deliverable D5.2 Intermediate draft templates for educational programs. The chapter is started with a recap of development activities during the initial stage of development. Thereafter follows a presentation of recent development, finally a short outline of possible next steps in development are given.

2.1. Initial development of the template

The work with the templates has from start been an iterative development process. The initial stage focused on documents and a web survey using a series of workshops – total of 6 workshops - starting in early June 2021, progressing during the fall, and continuing into 2022. There was been active participation from all partners during the work and for each of the workshops the number of participants has been around 10 individuals representing the relevant partners. The participants of the workshops in both workstreams have been the same individuals, ensuring coordination. The workshops have all been centred around program data gathered and prepared by the participants. The work includes for example presentation of examples of novel programs at the partners or from elsewhere as well as presenting documentation describing these programs – both formal and marketing related. During the end of 2021 the workstreams have been merged into one focusing on gathering data from selected programs and populating a first database of existing and planned programs of fulfilling the selection criteria.

2.1.1. Workstreams

During the initial stage of the work with the template, the work was divided into workstreams. This approach was not used further (see section 2.2 below) during the finalisation of the template. To provide a complete view of the development process, this section describes the work during the first stage of development. The rationale for separating the work into workstreams was to focus the discussions during workshops and meetings on the two related topics of *How to describe programs* and Which types of programs to describe.
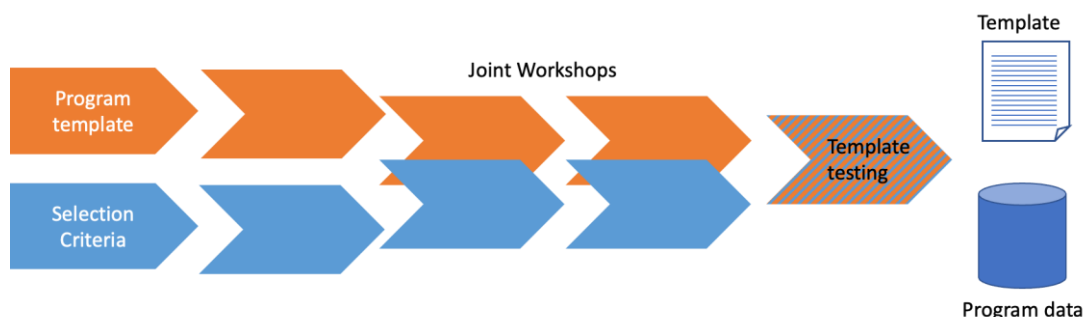
Figure 3 Overview of the workstreams in the development of the program template

Program template workstream

The focus of the program template workstream is to define the core information that is needed to describe a program including both topical content as well as operational and logistical aspects. This includes with regards to topic content for instance target group, objectives, teaching format, educational level etc. For operational and logistical aspects, it includes matters such as resources needs, online or on-site training, tuition fees, scheduling, etc. The main input to the work has been studies of programs available across partners and from other initiatives within Europe and internationally.

Program selection criteria workstream.

The focus of the Program selection criteria workstream has been to agree on which type of programs should be the target of the activities within EDDIE. Type here refers both to the format and educational level of the programs as well as to the topical content. The output from the work has been a taxonomy of relevant program dimensions, such as for example educational level, knowledge gap addressed, format and business model. These criteria were used during the later part of the work to identify which programs to use to test the viability of the template developed in the other work stream.

Template testing

A final and crucial step of the development during stage one, has been gathering feedback on use of the template. This activity was partly integrated into the iterative development process. In addition, at the end of the development cycle, a final set of comments for further improvement was gathered and reported upon in Deliverable D5.2. A summary of these findings and recommendations was also presented at the start of the refinement work, and summarized in three main items listed below

1. It is too time consuming to enter data into the template.
2. The person doing the work needs proper motivation for the coming use of the data in order to ensure sufficient quality
3. The structure of the template could be improved by simplifying input, e.g. in drop-down menus.

As is described in section 2.2 below, the comments were used as input to the refinement of the template. In addition to this input, the first version of the template was also reviewed by the agency, and input along similar lines was provided, see high level summary below:

1. Too complex template; concentrate in essentials.
2. It should be concentrated in energy sector/digitalization
3. Lack of representation of lower EQF levels in the examples.

The two first comments from the agency are very much aligned with the experiences from the use of the template with the project and was handled as is described in section 2.2 below. The additional comment #3 provided by the agency has been address by addition of data representing also Vocational education, see one concrete example in Figure 8 in section 4.2.

2.2. Refinement and process for final template

In addition to the feedback from use of the template as illustrated above, the development during the second stage of the template – main work reported in this deliverable – was to integrate the template with the activities of WP4 and WP6. A listing of the development requirements is given in Figure 1 above.

The work during the second stage was also partly iterative, involving development of new functionality – in three steps - by the KTH team and gathering of comments and recommendations from the other task participants.

2.2.1. First refinement step

The first step of development was focused on feedback received during template testing and consisted of simplification of data entry into the template. The refinements included:

- Limiting the use of free text fields
- Limiting the length of Free text fields
- Inclusion of dropdown menus to limit the selection of data for several fields
- Removal and/or clarification of instructions for ambiguous data fields
- Refinement of the *Program fact sheet* (second part of template) as a meta-data section intended to enable searching

The testing of the new features from the first refinement step was made internally by the development team and was concluded in mid-August 2022.

2.2.2. Second refinement step

The second refinement step included structuring of information to enable integration with the syllabus elements developed within WP4 and to include also the ISCED task lists. The integration of the syllabus elements implied a significant restructuring of the template, since it involves use of several selection lists in various subjects providing a more structured approach for program content entry. The complete listing of syllabus elements available in the template can be found in section 3.5. The testing of the second refinement step was made taking feedback from all task participants leading to minor modifications and was concluded late October 2022.

2.2.3. Third refinement step

The third refinement step involved user experiences from design of flagship programs in WP6. The refinement included minor clarifications of instructions, and also the inclusion of a link to ISCED task codes URI:s as given in the ISCED database. This third step was conducted in collaboration with WP6 and the program design therein.

2.3. Potential next steps

Completion if this deliverable means that no further development of the structure of the template is foreseen. However, the integration of the template with the technical platform for the project and beyond is planned as is further described in section4.1. No further changes are intended for the structure of the template however, since this is necessary to allow for a stable design process and data capture for the pilot programs of WP6 and for upcoming program development within and outside of EDDIE. However, there are still two main avenues of further development involving the program template that can be foreseen.

First, the technical integration of the template and the data storage into the overall EDDIE data platform is a necessary next step to enable operationalization of the use of the template both for program design and data capture as well as for offering a marketplace to prospective students and their agents.

Second, refinement of the template and data structure as based on experiences of the use of the templates during the operational stage. Although it is recommended that no further refinement of the template is done before it is operationalized – in order to allow for a stable set of requirements for the technical integration – it is possible that further refinement is needed. This is especially true for the student user group which has not been actively participating in the development of the template. Here, matters such as search criteria, which may imply that more data about programs must be gathered, is a possible area of further development.

3. User Guide

The general template is designed to gather information about those training programs which are included in the EDDIE project. The data entered is supposed to be displayed to potential students interested in training programs within the framework of EDDIE. In this chapter, the general principles of using the template as well as the structure of the updated template and web form are presented.

3.1.   General principles

The general principle of using the template involves three distinct groups of use cases, involving separate specific uses and user groups. These three use cases are

- Design of a of new program using the template
- Entry of data for an existing program using the template
- Searching for programs

The use cases and intended user groups and examples of usage are presented below.

3.1.1.   Design of a new program using the template

During design of a new template, the envisioned user groups are teachers, operational staff and managers of the training institution wishing to create the new program. The template allows for selection of "Future envisioned program" in the Program fact sheet (see 3.2 below) to indicate that the data about the program is tentative and under design.

During the design process, the template outlines critical data that must be provided by the designers. The template goes beyond traditional program descriptions as used by most educational institutions today by including syllabus elements, ISCED codes, EQF levels and program format. This ensures that relevant data for the future training marketplace can be secured.

This use case has been tested to some extent during the refinement of the template thanks to the collaboration with the pilot program development in WP6.

3.1.2.   Entry of data for an existing program using the template
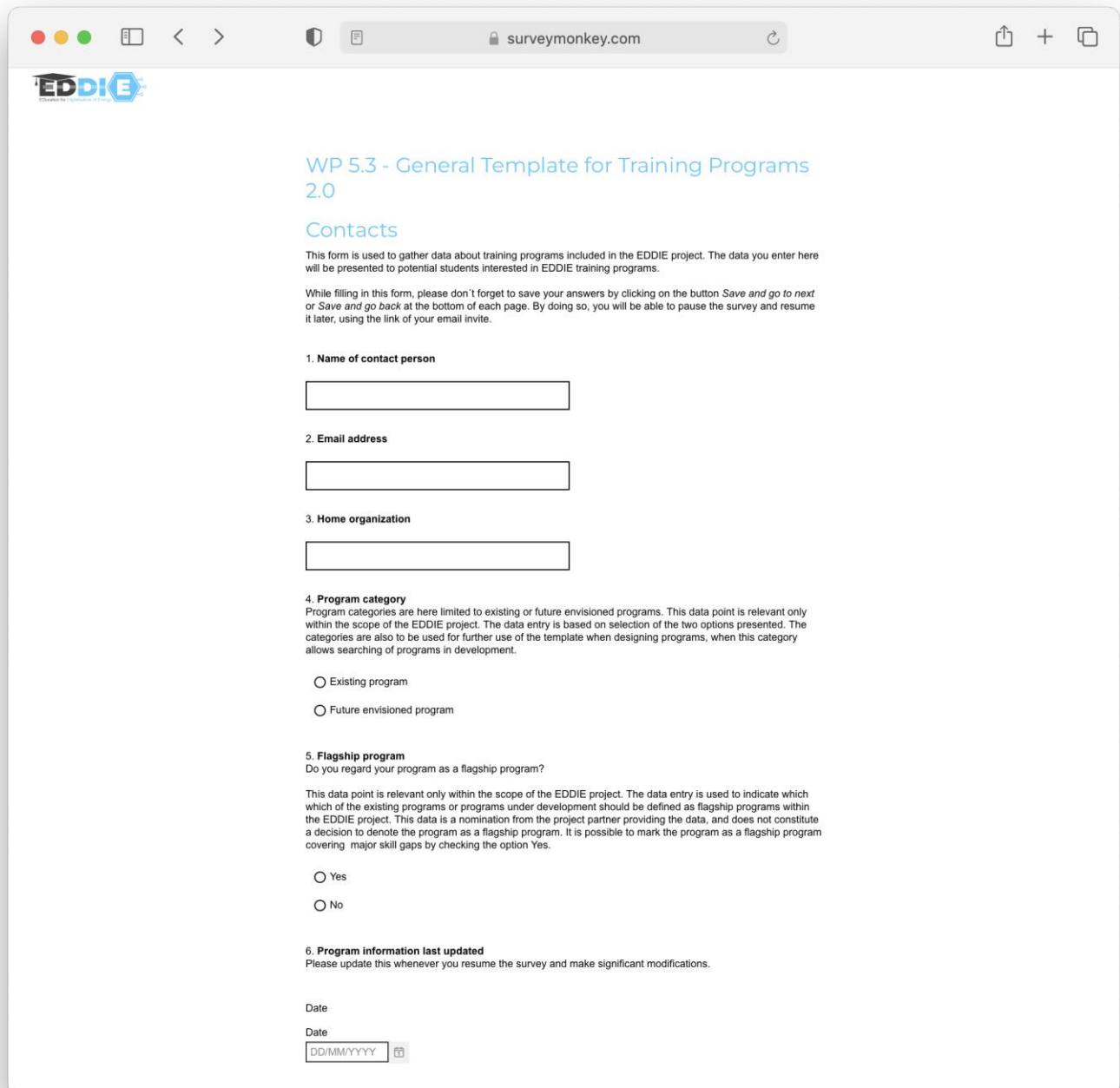
This use case has been the essential format for developing the template and data about 10 programs using the draft template and an additional 5 using the final version of the template has been entered in the database using the template. The process involves the user data gathering about the program from existing sources and inputting into the template. Since the template requires entry of data not always available about programs, such as syllabus elements, the template does allow for a quality improvement of the program data. With this is meant, that by requiring consistent presentation of data for all types of programs it is ensured that data is made available for all programs. An experience from the development has been that different educational institutions describe their programs differently, and in some cases relevant information, e.g., student fees, software to be used, is hard to find. By including the programs in the database via data gathering or program design using the template, the database of information is kept consistent and complete.

3.1.3.   Searching for programs

With the refinement of the second part of the template (See 3.3 below) to focus only on program metadata – the process of searching for programs is facilitated. Searching for programs in the database is an obvious use case for an operational marketplace, and thanks to the fact sheet this is now possible. The use case has however not been an integral part of development of the template. The process to search for programs is further illustrated in section 4.2 below.

3.2.   Part 1 – Contacts

The first contacts page is the starting, anchoring page, of the program content. Here, the program designer or data gatherer enters input about the home organization t and its contact persons, the categorization of the program, and about (3) the latest update of the data entered. This part gathers data only for internal purposes, and the data is not presented to prospective students. The use of date to keep track of updates provides a level of management to the data entry if several authors are updating the data.

1. Name of contact person

The contact person for the program is asked to enter his or her name in a free text box. This can be used both for the program designer – if the template is being used in design mode – or data gathered if the template is used to gather data about an existing program

2. Email address

The contact person for the program is asked to enter his or her email address in a free text box.

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3. Home organization

The contact person for the program is asked to enter the name of the home organization in a free text box.

4. Program category

Program categories are here limited to existing and future envisioned programs. This data point is relevant only within the scope of the EDDIE project. The data entry is based on the selection of the two options presented. These categories are also to be used for further program designs when this category will enable a search for programs under development. Here, the "Envisioned" tag is used for programs under design. For complete programs, the existing tag is used. Once completed, the status can be changed, and the program can then be made searchable in the database.

5. Flagship program – Do you regard your program a flagship program?

This data point is relevant only within the scope of the EDDIE project. The data entry is used to indicate which of the existing programs or programs under development should be defined as flagship programs within the EDDIE project. This data is a nomination from the project partner providing the data and does not constitute a decision to denote the program as a flagship program. It is possible to mark the program as a flagship program covering major skill gaps by checking the option Yes. This status tag is used only within the context of the EDDIE project.

3.3. Part 2 – Program Fact Sheet

The first part of the web form, referred to as the Program fact sheet is focused on meta-data about the program to enable more efficient searching and sorting of the program once operationalized. This second part of the web form is designed to gather general information about the training programs included in the project. This information is intended to help potential students find the best programs for their needs.

Entering data in the fact sheet requires having access to data about the program or alternately if the program is in the design stage, the data can be gathered in the form of minutes from workshops involving teaching and operational staff.

1. Name of program

Enter the name of the program in the provided free text box. The name does not have to be unique in the system.

2. Program URL

Enter your URL link to the program landing page. This link will be used to connect the platform to the webpage of the program provider.

3. Program format

Describe the program format(s) offered to participants. Select all the options that apply, the available options are:

 (1) On campus/ On-site,

(2) Live virtual,

(3) Online,

(4) Blended.

4. Program language

Enter the official language(s) of the program in the provided free text box. During the design, the work has been done in English. However, the delivery of the actual program can of course be made in any language of the European Union. For consistent data entry, enter the name of the languages in English.

5. Length of program

Enter the duration of the program in weeks, months or years by choosing an option from the dropdown menu.

6. Student´s estimated effort in working hours

Give an estimate of the total amount of working hours a student/ participant needs to study in order to successfully complete the program. Enter the total amount of hours in the provided free text box.

7. Industrial challenges addressed 1.- Economic and organizational

Mark those economic and organizational challenges that your program addresses. Select all that apply, the available options are

(1) High economic costs,

(2) Business model adaptation,

(3) Funding,

(4) Low top management commitment, and

(5) Goals/target-tracking

8. Industrial challenges addressed 2.- Social

Mark those social challenges that your program addresses. Select all that apply, the available options are:

(1) Privacy concerns,

(2) Loss of jobs due to automatic processes,

(3) Acceptance of new technologies, and

(4) Lack of citizen engagement.

9. Industrial challenges addressed 3. – Technical and regulatory

Mark those technical and regulatory challenges that your program addresses. Select all that apply, the available options are:

(1) IT security issues,

(2) Reliability and stability need for machine-to-machine communication,

(3) Need to protect industrial know-how,

(4) Lack of adequate skills from employees,

(5) Data Management,

(6) Data protection issues,

(7) Technology integration (compatibility with existing processes/technologies),

(8) Lack of regulation standards and forms of certification, and (

9) Unclear legal issues.

10. Industrial challenges addressed 4. – Energy system

Mark those energy challenges that your program addresses. Select all that apply, the available options are:

(1) Customers: Remote services to customers,

(2) Customers: Dedicated information about their energy profiles,

(3) Customers: Remote fault announcement,

(4) Customers: Remote metering,

(5) Customers: Remote fault repairs,

(6) Network planning: Digital tools for network planning,

(7) Network planning: Geographical information systems,

(8) Network planning: Data for longer term load forecasting,

(9) Network planning: Load profiles,

(10) Network operation: Automation and fault clearance,

(11) Network operation: Remote switching,

(12) Network operation: Automatic fault indicators,

(13) Network operation: Crew management,

(14) Network operation: Online security assessment,

(15) Network operation: Short-term load forecasting,

(16) Maintenance and asset management: Predictive maintenance,

(17) Maintenance and asset management: Asset management

11. Industrial challenges addressed 5. – Extreme situations

Does your program address any challenges due to extreme situations (e.g., pandemic, extreme weather conditions)? Select Yes or No.

12. Industrial challenges addressed 6. – Other

Describe any other challenges your program may address. Fill in the provided free text box.

13. Skill gap areas

Select those skill gap areas that your program addresses. Select all that apply, the available options are

(1) Data management and analysis,

(2) Big Data,

(3) Cybersecurity and

(4) Programming and development competences.

14. ISCED code of program content

The UNESCO has published a detailed list of disciplines with their corresponding International Standard Classification of Education (ISCED) codes (find the full list of codes here). Select the ISCED code(s) of your program from the dropdown menu.

The available options are:

- 0500 – Natural sciences, mathematics and statistics, not further defined
- 0540 – Mathematics and statistics, not further defined
- 0541 – Mathematics
- 0542 – Statistics
- 0588 – Inter-disciplinary programmes and qualifications involving natural sciences, mathematics and statistics
- 0610 – Information and Communication Technologies (ICTs) not further defined
- 0611 – Computer use
- 0612 – Database and network design and administration
- 0613 – Software and applications development and analysis
- 0619 – Information and Communication Technologies (ICTs) not elsewhere classified

- 0688 – Inter-disciplinary programmes and qualifications involving Information and Communication Technologies (ICTs)
- 0700 – Engineering, manufacturing and construction not further defined
- 0710 – Engineering and engineering trades not further defined
- 0711 – Chemical engineering and processes
- 0712 – Environmental protection technology
- 0713 – Electricity and energy
- 0714 – Electronics and automation
- 0715 – Mechanics and metal trades
- 0716 – Motor vehicles, ships and aircraft
- 0719 – Engineering and engineering trades not elsewhere classified
- 0788 – Inter-disciplinary programmes and qualifications involving engineering, manufacturing and construction

15. Starting point of program design

Categorize your program as an ICT program with an Energy add-on, an Energy program with an ICT add-on or both. This is useful as a high-level assessment of pre-requisites needed, and helps to identify the emphasis within the program. The available options are:

(1) ICT program with an Energy add-on,

(2) Energy program with an ICT add-on, and

(3) Both.

16. Funding 1.- Available for free?

Is your program available for free? You can select Yes or No.

17. Funding 2.- Types of funding

In case your program is NOT available for free, mark all types of funding available for students, the available options are

(1) Public funding, i.e. some form of government grant or scholarship is needed to participate

(2) Corporate funding, i.e. participation is paid for by the students employer

(3) Individual, i.e. the students is personally responsible for tuition fees.

18. Target groups

Describe your target groups in terms of employment status. Select all that apply, the available options are:

(1) Students (Pre-career stage),

(2) Employees (Mid-career stage), and

(3) Professionals between jobs.

19. EQF level

Select the overall EQF level of your program. The webform contains a link for eacy access to the description of EQF levels here: https://europa.eu/europass/en/description-eight-eqf-levels.

The available options in the webform, in line with the scope of EDDIE, are

(1) Level 4 – Upper secondary general, technical and vocational education

(2) Level 5 – Post-secondary diploma or certificate,

(3) Level 6 - Bachelor´s degree,

(4) Level 7 - Master´s degree, Postgraduate diploma or certificate, and

(5) Level 8 – Doctoral degree

20. Lifelong learning and certification

Describe the general plans for lifelong learning and the modularization of the program. Select Yes or No for each individual question. This section includes the following questions:

(1) Is it possible to combine the program with a job?

(2) Does the program provide credits (ECTS)?

(3) Can you study parts of the program? and

(4) Does it provide any certification per module?

21. Certification

Select the type of certificate the program provides from the dropdown menu, the available options are:

(1) University degree,

(2) Vocational degree,

(3) Professional certification,

(4) Diploma, and

(5) Certificate of Accomplishment.

3.4. Part 3 - Business and Operational Model

The third part of the web form seeks to gather more detailed information about the business and operational model of the registered training programs.

1. Relevance of program

Explain the relevance of the program from a professional and technical point of view. A maximum of 5 bullet points can be entered in the provided free text boxes.

2. Definition of targets

Give information about the targeted skills, occupations, and tools/ systems with the help of ESCO codes and descriptions by filling in the provided free text boxes.

Please find the ESCO skills URL here: https://esco.ec.europa.eu/en/classification/skill_main
Please find the ESCO codes for occupations here: https://esco.ec.europa.eu/en/classification/occupation_main

3. Financial structures

Give detailed information about program financing and include your plans for e.g. sponsorship, subsidies/ grants, tuition, and remuneration. Please enter max. 5 bullet points in the provided free text boxes.

4. Use of resources

Describe the required resources and virtual/ physical facilities for the program. A maximum of 5 bullet points can be entered in the provided free text boxes.

5. Licences for digital tools

Are digital tools which require a license used in the program? Select Yes or No. In case the answer is Yes, the licences needed must be specified in the provided free text box.

6. Marketing and student recruiting procedures

Describe the marketing strategy and plans for student recruitment. A maximum of 5 bullet points can be entered in the provided free text boxes.

7. Employer feedback

Describe the types of feedback you expect from the employers and how you will manage and use this in the analysis and development of the program. A maximum of 5 bullet points can be entered in the provided free text boxes.

8. Alumni feedback

Describe the expectations and plans for alumni engagement, including experiences from using alumni in the development and operation of the program. A maximum of 5 bullet points can be entered in the provided free text boxes.

3.5.   Part 4 - Learning and Teaching Model

The fourth part of the web form seeks to gather more detailed information about the learning and teaching model of the registered training programs.

1. Admission requirements

Describe the admission requirements of your program. Select all that apply, the available options are

(1) No requirements,

(2) Bachelor degree,

(3) Master degree,

(4) Graduate,

(5) PhD,

(6) High school diploma,

(7) Working experience.

2. Training goals

Describe the top 5 training goals of the program. A maximum of 5 bullet points can be entered in the provided free text boxes. Try keep the goals short and succinct to allow for ease of comparison when students are looking for programs.

3. Program content- Syllabus elements in ICT/ Digital

The syllabus elements this aims to provide a quick glance of the program content, using a standard classification of topics. Select the ten most important ICT/ Digital syllabus elements from the dropdown menu.

The available options are

- Programming languages – Algorithms
- Programming languages – Programming principles, basics and fundamentals
- Programming languages – Computer Technology
- Programming languages – C, C++, Matlab, Python
- Communications, networks and buses – Remote monitoring
- Communications, networks and buses – Remote Control Systems, SCADA systems
- Communications, networks and buses – Industrial communications, networks & buses
- Data analysis & Big Data – Data analysis, Data structures, analysis
- Data analysis & Big Data – Big Data for engineers
- Machine Learning – Machine learning for engineers
- Information Technology – Information Systems
- Information Technology – Internet of Things
- Information Technology – Networking, communication, and security

- Information Technology – Technical communications
- Information Technology – Blockchain
- Information Technology – New Trends in Information Technology
- Digital Electronics – Digital electronics basics
- Digital Electronics – Instrumentation
- Digital Electronics – Assembly Management of RES
- Digital Electronics – Microelectronic circuits
- Digital Electronics – Microprocessors
- Control – Dynamic Systems
- Control – Distributed Control
- Control – Digital Control
- Control – Remote Control and Automation
- Control – Applications: Electric Drives and Controllers
- Control – Instrumentation
- Control – Robotics
- Control – Advanced Control Techniques
- Control – Advanced Automation
- Control – Industrial Automation, Industrial Control (PLC, PID etc.)
- Modelling, Simulation & Optimisation – Statistics
- Modelling, Simulation & Optimisation – Reservoir Simulation
- Modelling, Simulation & Optimisation – Modelling, Simulation & Optimisation
- Modelling, Simulation & Optimisation – Simulation tools (Matlab, Labview, R)
- Data Modelling – Operations Research, Logistics, Game Theory
- Data Modelling – Multiphysics Simulation
- Engineering Projects & Reports – Project (Thesis) Bachelor
- Engineering Projects & Reports – Project (Thesis) Master
- Engineering Projects & Reports – Field Evaluation Project
- Engineering Projects & Reports – Field Management Project
- Engineering Projects & Reports – Engineering Projects, Management & Control
- Engineering Projects & Reports – Papers, Reports
- Security – Data In-transit Security
- Security – Data In-Rest Security
- Security – Governance
- Security – Risk Analysis
- Security – Penetration Test and Vulnerability Assessment
- Security – OT Security
- Privacy – Online tracking and Cookies
- Privacy – Cryptography
- Privacy – Data storage
- Privacy – Identification and Authentication
- Privacy – Video Surveillance
- Privacy – GDPR and Other Privacy Regulations
- Mobile App Development – Development Languages & Frameworks
- Mobile App Development – Usability & User Interface
- Mobile App Development – IOS and Android Operating Systems
- Embedded Systems – Assembly Programming
- Embedded Systems – Microprocessors and Microcontrollers
- Embedded Systems – Device Drivers Programming
- Embedded Systems – Digital Image Processing
- Embedded Systems – Wireless Sensor Networks
- Cloud Computing – DevOps
- Cloud Computing – Cloud Load Balancing, Scalability and Analytics
- Cloud Computing – Containerization

- Cloud Computing – Cloud Security

4. Program content- Syllabus elements in another STEM than ICT/Digital

Select the ten most important syllabus elements in another STEM from the dropdown menu.

The available options are

- Digital Electronics – Digital electronics basics
- Digital Electronics – Instrumentation
- Digital Electronics – Assembly Management of RES
- Digital Electronics – Microelectronic circuits
- Digital Electronics – Microprocessors
- Control – Dynamic Systems
- Control – Distributed Control
- Control – Digital Control
- Control – Remote Control and Automation
- Control – Applications: Electric Drives and Controllers
- Control – Instrumentation
- Control – Robotics
- Control – Advanced Control Techniques
- Control – Advanced Automation
- Control – Industrial Automation, Industrial Control (PLC, PID etc.)
- Modelling, Simulation & Optimisation – Statistics
- Modelling, Simulation & Optimisation – Reservoir Simulation
- Modelling, Simulation & Optimisation – Modelling, Simulation & Optimisation
- Modelling, Simulation & Optimisation – Simulation tools (Matlab, Labview, R)
- Data Modelling – Operations Research, Logistics, Game Theory
- Data Modelling – Multiphysics Simulation
- Engineering Projects & Reports – Project (Thesis) Bachelor
- Engineering Projects & Reports – Project (Thesis) Master
- Engineering Projects & Reports – Field Evaluation Project
- Engineering Projects & Reports – Field Management Project
- Engineering Projects & Reports – Engineering Projects, Management & Control
- Engineering Projects & Reports – Papers, Reports
- Basic Maths – Algebra
- Basic Maths – Geometry
- Basic Maths – Mathematics for Engineering and Technology
- Basic Maths – Calculus
- Basic Maths – Differential Equations
- Basic Physics – Classical Physics
- Basic Physics – Quantum Physics
- Basic Physics – Nuclear
- Basic Mechanics - Particles, systems & rigid bodies
- Basic Mechanics – Thermodynamics
- Basic Mechanics - Thermal stations and cogeneration
- Basic Mechanics - Fuels, Biomass, Biogas
- Basic Mechanics - Thermal engines (heating and cooling)
- Basics Mechanics - Heat transfer
- Basic Mechanics - Fluid mechanics
- Basic Mechanics - Kinematics & dynamics in 1-D, 2-D, 3-D
- Basic Electricity - Electromagnetic fields, induction
- Basic Electricity – Electrical & Controls
- Basic Electricity - Linear circuits
- Basic Electricity - Electricity theory, Current, voltage & components

- Basic Electricity - Circuits in DC & AC
- Manufacturing - Mechanical design
- Manufacturing - Manufacturing engineering
- Manufacturing - Materials engineering
- Manufacturing – Mechatronics
- Manufacturing - Tests & quality control
- Manufacturing - Product Design
- Manufacturing - Productions & Manufacturing Systems
- Chemistry & Materials – Chemistry
- Chemistry & Materials - Rock Mechanics, Geomechanics and Geophysics
- Chemistry & Materials - Geoscience for Petroleum Engineering
- Chemistry & Materials - Materials science
- Chemistry & Materials - Advanced materials & union/attachment techniques
- Power Electronics - Electronic basics & semiconductor devices
- Power Electronics - Power electronics
- Power Electronics - Applications: electric drives & controllers
- Electrical Engineering - Electrical machines
- Electrical Engineering - Electric drives
- Electrical Engineering - Electrical instrumentation
- Electrical Engineering - Configuration of RES Installations
- Electrical Engineering - Assembly Management of RES
- Electrical Engineering - Power plant (conventional and RES) Operation and Maintenance
- Electrical Engineering - Electrical Substations
- Electrical Engineering - Electrical design
- Electrical Engineering - Electrical safety and Hazard Avoidance
- Electrical Engineering - Electrical protections
- Electrical Engineering - Electrical engineering
- Mechanical Engineering - Graphical design
- Mechanical Engineering - Materials Elasticity & Resistance
- Mechanical Engineering - Mechanical elements & machines
- Mechanical Engineering – Turbomachines
- Mechanical Engineering - Assembly Management of RES
- Mechanical Engineering - Power plant (conventional and RES) Operation and Maintenance
- Mechanical Engineering - Electrical safety and Hazard Avoidance
- Mechanical Engineering - Combustion engines
- Mechanical Engineering - Aerospace engineering
- Mechanical Engineering - Design, integration & testing of machinery
- Construction/ Infrastructure - Structures & construction
- Construction/ Infrastructure - Dynamic analysis & vibrations
- Construction/ Infrastructure - Assembly Management of RES
- Construction/ Infrastructure - Industrial constructions & infrastructures
- Construction/ Infrastructure - Health & Safety engineering
- Construction/ Infrastructure - Industrial subsystems & installations
- Production of Oil & Gas Fields - Reservoir Concepts
- Production of Oil & Gas Fields - Design of Surface Facilities
- Production of Oil & Gas Fields - Digital Twins for production installations
- Production of Oil & Gas Fields - Managing Reservoir
- Production of Oil & Gas Fields - Optimising Recovery
- Production of Oil & Gas Fields - Formation Evaluation
- Production of Oil & Gas Fields - Cessation of production
- Production of Oil & Gas Fields - Managing the Wells
- Production of Oil & Gas Fields - Producing Field Practices
- Production of Oil & Gas Fields - Reservoir Engineering - Well test Analysis

- Production of Oil & Gas Fields - Reservoir Sedimentology
- Production of Oil & Gas Fields - Drilling Engineering
- Production of Oil & Gas Fields - Reservoir Engineering
- Electronics Engineering - Digital Electronics
- Electronics Engineering - Electronic systems
- Chemical Engineering - Chemical Engineering
- Heat & Cooling Engineering - Heat & cooling installations
- Heat & Cooling Engineering - Oleohydraulics & Pneumatics

5. Program content- Syllabus elements in Energy

Select the ten most important syllabus elements in Energy.from the dropdown menu.

The available options are

- Modelling, Simulation & Optimisation – Statistics
- Modelling, Simulation & Optimisation – Reservoir Simulation
- Modelling, Simulation & Optimisation – Modelling, Simulation & Optimisation
- Modelling, Simulation & Optimisation – Simulation tools (Matlab, Labview, R)
- Data Modelling – Operations Research, Logistics, Game Theory
- Data Modelling – Multiphysics Simulation
- Engineering Projects & Reports – Project (Thesis) Bachelor
- Engineering Projects & Reports – Project (Thesis) Master
- Engineering Projects & Reports – Field Evaluation Project
- Engineering Projects & Reports – Field Management Project
- Engineering Projects & Reports – Engineering Projects, Management & Control
- Engineering Projects & Reports – Papers, Reports
- Chemistry & Materials – Chemistry
- Chemistry & Materials - Rock Mechanics, Geomechanics and Geophysics
- Chemistry & Materials - Geoscience for Petroleum Engineering
- Chemistry & Materials - Materials science
- Chemistry & Materials - Advanced materials & union/attachment techniques
- Power Electronics - Electronic basics & semiconductor devices
- Power Electronics - Power electronics
- Power Electronics - Applications: electric drives & controllers
- Electrical Engineering - Electrical machines
- Electrical Engineering - Electric drives
- Electrical Engineering - Electrical instrumentation
- Electrical Engineering - Configuration of RES Installations
- Electrical Engineering - Assembly Management of RES
- Electrical Engineering - Power plant (conventional and RES) Operation and Maintenance
- Electrical Engineering - Electrical Substations
- Electrical Engineering - Electrical design
- Electrical Engineering - Electrical safety and Hazard Avoidance
- Electrical Engineering - Electrical protections
- Electrical Engineering - Electrical engineering
- Mechanical Engineering - Graphical design
- Mechanical Engineering - Materials Elasticity & Resistance
- Mechanical Engineering - Mechanical elements & machines
- Mechanical Engineering – Turbomachines
- Mechanical Engineering - Assembly Management of RES
- Mechanical Engineering - Power plant (conventional and RES) Operation and Maintenance
- Mechanical Engineering - Electrical safety and Hazard Avoidance
- Mechanical Engineering - Combustion engines
- Mechanical Engineering - Aerospace engineering

- Mechanical Engineering - Design, integration & testing of machinery
- Construction/ Infrastructure - Structures & construction
- Construction/ Infrastructure - Dynamic analysis & vibrations
- Construction/ Infrastructure - Assembly Management of RES
- Construction/ Infrastructure - Industrial constructions & infrastructures
- Construction/ Infrastructure - Health & Safety engineering
- Construction/ Infrastructure - Industrial subsystems & installations
- Production of Oil & Gas Fields - Reservoir Concepts
- Production of Oil & Gas Fields - Design of Surface Facilities
- Production of Oil & Gas Fields - Digital Twins for production installations
- Production of Oil & Gas Fields - Managing Reservoir
- Production of Oil & Gas Fields - Optimising Recovery
- Production of Oil & Gas Fields - Formation Evaluation
- Production of Oil & Gas Fields - Cessation of production
- Production of Oil & Gas Fields - Managing the Wells
- Production of Oil & Gas Fields - Producing Field Practices
- Production of Oil & Gas Fields - Reservoir Engineering - Well test Analysis
- Production of Oil & Gas Fields - Reservoir Sedimentology
- Production of Oil & Gas Fields - Drilling Engineering
- Production of Oil & Gas Fields - Reservoir Engineering
- Electronics Engineering - Digital Electronics
- Electronics Engineering - Electronic systems
- Chemical Engineering - Chemical Engineering
- Heat & Cooling Engineering - Heat & cooling installations
- Heat & Cooling Engineering - Oleohydraulics & Pneumatics
- Electrical Power Systems - Power plants, lines & substations
- Electrical Power Systems - Medium & Low Voltage installations
- Electrical Power Systems - RES (Solar Energy, wind energy)
- Electrical Power Systems - Optimal Power Flow, systems operation & control
- Electrical Power Systems - Protection coordination, stability & fault isolation
- Electrical Power Systems - Grid development in the area of Smart Grids
- Electrical Power Systems - Power plant maintenance
- Electrical Power Systems - Operation & management of power systems
- Electrical Power Systems - Planning & Operation of future distribution networks
- Energy Management & Green Skills - Environmental engineering
- Energy Management & Green Skills - Sustainable Development
- Energy Management & Green Skills - RES (Solar Energy, wind energy)
- Energy Management & Green Skills - Regulation & new Business Models
- Energy Management & Green Skills - Assembly Management of RES
- Energy Management & Green Skills - Flexible demand and Smart home/buildings
- Energy Management & Green Skills - Energy Transition
- Energy Management & Green Skills - Sustainable Transportation, E-mobility

6. Program content- Syllabus elements in transversal skills

Select the five most important syllabus elements in transversal skills from the dropdown menu.

The available options are

-
- Engineering Projects & Reports – Project (Thesis) Bachelor
- Engineering Projects & Reports – Project (Thesis) Master
- Engineering Projects & Reports – Field Evaluation Project
- Engineering Projects & Reports – Field Management Project
- Engineering Projects & Reports – Engineering Projects, Management & Control

- Engineering Projects & Reports – Papers, Reports
- Foreign Languages – English (mandatory)
- Foreign Languages - French, German, others
- Management & Business – Economy
- Management & Business - Business administration
- Management & Business - Venture Capital & Investment Banking
- Management & Business - Economic Analysis of electrical systems
- Management & Business - Petroleum Economics
- Management & Business - Project Economics - CAPEX, Cash Flow, Rate of Return
- Management & Business - Entrepreneurship & Innovative Businesses
- Management & Business - Creation, Organisation & Management of Enterprises
- Management & Business - Electrical safety and Hazard Avoidance
- Management & Business - Economy of Energy, Markets and Regulation
- Management & Business - Strategy and Planning
- Management & Business - Business communication
- Management & Business - Actuarial Science
- Management & Business - Costs & financial analysis
- Management & Business - Supply Chain: Strategy, Planning & Management
- Transversal Professional Skills – Leadership
- Transversal Professional Skills - Verbal & written communication
- Transversal Professional Skills – Teamwork
- Transversal Professional Skills - Problem solving
- Transversal Professional Skills - Negotiation & meeting dynamics
- Transversal Professional Skills - Technical communications
- Transversal Professional Skills - Microsoft Office
- Transversal Professional Skills - Computer Technology
- Transversal Professional Skills - Business communication
- Transversal Professional Skills - Optimising Productivity
- Transversal Professional Skills - Professional Training and Guidance
- Transversal Professional Skills - Risk Management
- Transversal Professional Skills - Human Resources
- Transversal Professional Skills - Leadership & Change Management
- Humanities & Ethics – Ethics
- Humanities & Ethics - Social sciences
- Humanities & Ethics - Critical thinking
- Humanities & Ethics - Volunteering & cooperation
- Humanities & Ethics - Ethics & Corporate Responsibility

7. Program content- Re-use of training modules

Does the program re-use any of the training modules? Select Yes or No. In case your answer is Yes, please specify what licence you need in the provided free text box.

8. Program content- Intellectual Property Rights

Give information about the Intellectual Property Rights involved. Fill in the provided free text boxes.

9. Methodologies

Describe the training methodology(ies) utilized in the program. Select all that apply, the available options in the webform are:

(1) Practical learning,

(2) Problem-based learning,

(3) Project-based learning,

(4) Magistral lecturing,

(5) Flipped classroom,

(6) Worked examples,

(7) Interactive lectures,

(8) Socrating questioning

(9) Discussion-based learning,

(10) Scenario-based learning,

(11) Case-based learning,

(12) Collaborative learning, and

(13) Inquiry-based learning.

10. Teaching methods

Describe the specific teaching methods. Select all that apply, the available options are

(1) Magistral lectures,

(2) Practical lab sessions,

(3) Projects,

(4) Personal study,

(5) Practical exercises

(6) Problem solving,

(7) Continual assessment of student performance,

(8) Search for and selection of bibliographical material, data or statistics.

11. Evaluation methods

Describe the evaluation methods used in the program. Select all that apply, the available options are:

(1) Written examination,

(2) Oral examination,

(3) Projects,

(4) Aptitude tests, and

(5) Other.

In case you choose the option Other, please specify details in the textbox provided.

12. Internships

Does your program include internships or "on-the-job" trainings? Select all that apply, the available options are

(1) Yes - Internships,

(2) Yes – On-the-job-trainings, and

(3) No.

13. Scheduling

What is the overall scheduling model of the program? Select an option from the dropdown menu, The available options are

(1) Full-time,

(2) Part-time,

(3) Evening attendance,

(4) Weekend attendance, and

(5) Self-paced.

4. Integration and use of Template in Web platforms

This section provides an overview of the integration of the template into the EDDIE web platform and training marketplace and presents overview of how data from the template can be presented to a prospective student wishing to find information about programmes.

4.1. Technical integration of program template
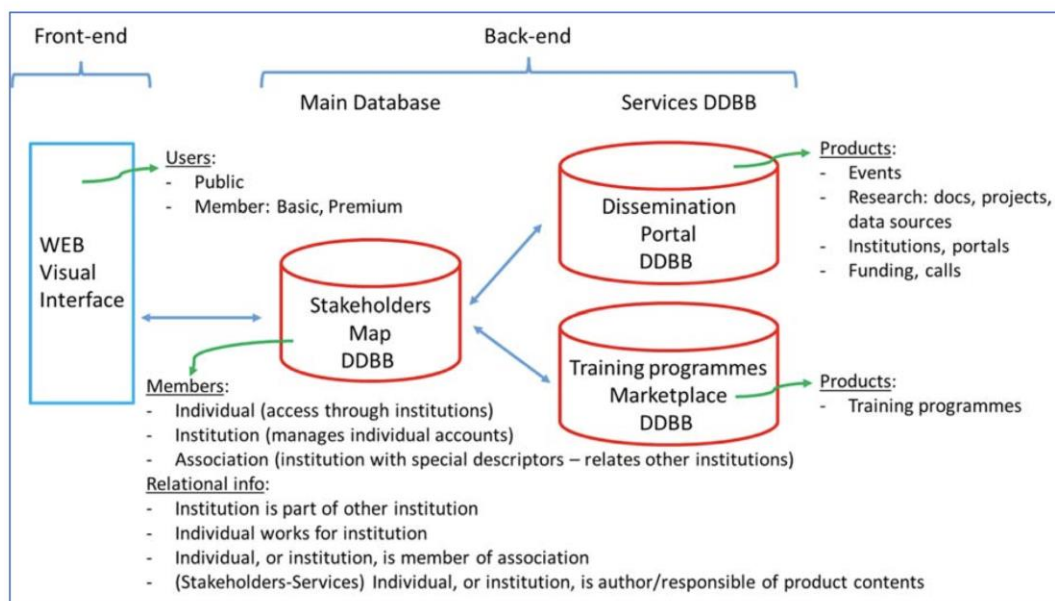
Figure 4 Overview of intended system platform as illustrated in
D5.1 Blueprint. Strategies, exploitation, challenges

With regards to the technical integration of the program template to enable the future EDDIE training program marketplace, three stages of integration are envisioned:

- Webform linking
- Webform integration
- Database integration

Note that these steps are not sequential, but should rather be seen as levels of ambition. Step one is easy to achieve and can be done within the scope of the EDDIE project. Step two is similarly a lightweight choice creating a more coherent environment, but its use is limited to within the EDDIE project. The third step should be considered only if a legal entity will develop a training market place beyond the EDDIE project.

4.1.1. Integration level one – Webform linking

The simplest form of integration involves including the webform for the program template into the EDDIE website. This step will be conclude during Q1-2023 and enables the authorized user to directly access the webform from the EDDIE website. Some details with regards to user authorization and authentication needs to be resolved before the integration can be completed. Once implemented, the logged in user can access the webform to use it for design of new programs and for entry of data for existing programs. It does not allow for searching of programs in the database, e.g. functionality outlined in section 4.2 below.

4.1.2. Integration level two – Webform integration

A further step in integration wis to include the webform – developed in the Surveymonkey (https://www.surveymonkey.com) tool into the EDDIE website – developed using Wordpress (https://www.wordpress.com). This integration requires a commercial license for usage and therefore implies that the website is operationalized and operated by a commercial entity holding the license for the software needed. It does however – as for step one – not include integration of the database and therefore does not enable searching for programmes by prospective students.

4.1.3. Integration level three - database integration

This integration step involves porting of the Surveymonkey structure into Wordpress and setting up of a database within the EDDIE platform to store program data. The Step is the significantly more resource demanding than the two previous steps but is essential for operationalization of the template for any legal entity wishing to offer a program marketplace. This step would provide better control of development of the webform/template since the development can be contained within one platform and does also allow for development of a search functionality for prospective students.

4.2. Student interaction with program template

As discussed previously, the development of the program template has been made by educational providers using the process of gathering data about existing and planned program and inputting them into the program database as a means to create and refine the template.

A further critical user group is of course prospective students. In order to illustrate how this user group can interact with the database of programs in a future educational marketplace, this section describes the overall work-flow and provides screenshot examples of how such interaction is foreseen. The technical integration and development needed to implement this student-facing functionality is outside the scope of this deliverable. The screenshots provided herein should be seen as suggested requirements feeding into such implementation.

4.2.1. Searching for educational programs

A first assumed step in interacting with the training marketplace and educational program database is that a prospective student, his or her employer or other agent wishing to identify training programs that match a specific educational level, format and business model would interact with the database via simple search. Figure 5 below provides an illustration of such a search page. The search criteria used are indicative and any data field in the template Fact sheet section is a candidate for inclusion.

Figure 5 Sample illustration of the search page envisioned for the training marketplace**.**

Based on search criteria entered on the search page, the prospective students or representative will be presented with search results as illustrated in Figure 6 below.

Figure 6 Search page with results presented in the righthand column

By clicking on the search results in the right hand column, the program details can be presented as illustrated in the figures below.

Introduction to Artificial Intelligence Series

Why this program?

This program provides technical and non-technical, including historical and political, notions on artificial intelligence.

It gives basic groundings for a preliminary approach to the area.

It investigates why artificial intelligence is nowadays considered the most disruptive enabling technologies up to at least 2050.

It also deepens ethical issues and national strategies.

Program content - What will you learn?

Artificial Intelligence: An Overview

Technologies and platforms for Artificial Intelligence

Ethics of Artificial Intelligence

Artificial Intelligence and legal issues

Home organization
| Politecnico di Milano - METID

Program website
| www.pok.polimi.it/courses?search_query=AI101,AI102,AI103,AI104,AI105

EQF level of program
| EQF 6

Target skill gap
|Data management and analysis
|Big Data

The program is for
| Employees and professionals between jobs

Admission requirements
| No requirements

Language
| English

Length of program
| 14 weeks

Schedule
| Self-paced

Program format
| Online

Teaching methods
| 4 MOOCs

Certification
| Certificate of Accomplishment

Funding
| Available free of charge

Figure 7 Example of self-paced program of life-long-learning type

Please note that these are examples of data currently stored in the program database and are presented here only as illustration on how the training marketplace can be used to present training programs to prospective students.

Home Energy Efficiency and Electrical Installations Course

Why this program?

- Specific and short training for electrical installers
- Training aimed at improving the energy efficiency of households
- Telecommunications and computer applications for consumption management
- Introduction of home automation as a digital tool to reduce energy consumption

Program content - What will you learn?

- Remote monitoring
- Internet of Things
- Technical communications
- Usability & User Interface
- IOS and Android Operating Systems
- Flexible demand and Smart home/buildings
- Problem solving
- Teamwork

Home organization
| Escuelas Profesionales Padre Piquer

Program website
| www.padrepiquer.es

EQF level of program
| EQF 4

Target skill gap
| Data management and analysis
| Programming and development competences

The program is for
| Students, Employees, Professionals between jobs

Admission requirements
| High school diploma

Language
| Spanish

Length of program
| 1 week

Schedule
| Full-time

Program format
| On campus

Teaching methods
| Practical lab sessions, practical exercises, problem solving

Certification
| Diploma

Funding
| Public funding

Figure 8 Example of a VET program focused on electrical installations

Master's Degree in Smart Grids

Why this program?

This program responds to the growing demand for engineers.

It is designed to help you lead the ongoing process of the digitalization of the electric grid.

It provides students with a detailed understanding of the operation and planning of grids under this new paradigm, along with new business opportunities and models that are arising in this constantly changing field.

It has been developed in close collaboration with Iberdrola. This alliance guarantees both the practical component, thanks to the participation of industry, and the academic rigor of the courses.

Program content - What will you learn?

Operation and Planning of Future Distribution Networks

Offsore and Pan European Supergrids

5G Communications Networks

Leadership, Change Management and Corporate Responsibility

Power Electronics for Transmission and Distribution Networks

Telecommunications for Smart Grids

Control and Protection of Future Networks

Hardware IoT Communications System Design

Data Analytics and AI for Energy System

Home organization
| Institute for Research in Technology - Comillas Pontifical University

Program website
| https://www.comillas.edu/en/masters/master-degree-in-smart-grids

EQF level of program
| EQF 7

Target skill gap
| Data management and analysis, Cybersecurity, Big Data
| Programming and development competences

The program is for
| Students

Admission requirements
| Bachelor degree

Language
| English

Length of program
| 1 year

Schedule
| Full-time

Program format
| On campus

Teaching methods
| Magistral lectures, Projects

Certification
| University degree

Funding
| Individual

Figure 9 Example of master program from the training marketplace database.

Figure 6 to Figure 9 above illustrate potential web design for the program searching and presentation in the education platform developed within EDDIE. The data presented is the data available in the EDDIE database, and for further information the student will be forwarded to the program page at the educational provider. This is facilitated by the URL provided in the data about the program.

5. Conclusions and further work

This final chapter provides, and summary of the experiences gained during development of the template as well as suggestions for further refinement and work.

5.1. Experiences and lessons learned

The development of the template, or design tool, has been an iterative development process spanning approximately 18-20 months of the project. This approach has proven very valuable, since the development has been able to partly shape the work in other parts of the project and also be shaped by them. Three concrete examples of this iterative interaction are provided below:

First, the skill gaps identified in WP2 as part of the effort to investigate industry needs for the future digital energy system provided very important input into how the program data should be structured with regards to which skill gap a program addresses. This information clearly impacted the design of the template.

Second, the curriculum elements developed in WP4 were available in the second year of the project and could only be integrated once they had been identified which in turn was based on best practices and data from several sources. Since the template was developed iteratively, the work could be complemented in the final iteration with this data.

Third, the template was completed in time for the definition of the Pilot programs in WP6, thereby helping to shape the data to be gathered and presented for these programs. Here, the template partly filled its role as a tool for design, at least presentation, of program data.

In summary, the iterative approach has provided value to the project and similar approaches can be recommended for future projects.

5.2. Technical development of program template

The main technical refinements needed in the template are outlined in section 4 above focused on integration with the educational platform. However, in addition to this development there are two main lines of development that could be considered.

First, to better support the design process the database supporting the template should allow for several concurrent versions of the program to be stored in order to allow for parallel development of different parts of the program. For example, one team may be developing the educational content of the program focused on program objectives and syllabus elements, while another team focuses on the operational aspects and financing model. These two aspects of a program are obviously related, but still requires different skillsets for development. Here, improved version handling of the data entered in the template would provide better support.

Second, automated data entry of key parts of data from already existing programs at educational institutions could be considered. This, however, requires that some form of access can be granted to the EDDIE platform to access program data at the education institutions. This opens up some cybersecurity risks, but as long as such concerns can be managed properly the data entry process would be simplified significantly.

Annex A: Data gathered using updated template

Home organization

The following organizations submitted data via the updated web form:

- **EWI**
- **Escuelas Profesionales Padre Piquer**
- **RWTH Aachen**

Programs included

- **EWI – EWI Academy**
- **EWI – Smart Energy Certificate Programme**
- **EWI - Certificate in Future Energy Business**
- **Escuelas Profesionales Padre Piquer - Home Energy Efficiency and Electrical Installations Course**
- **RWTH Aachen - Archimedischer Sandkasten**

Program category

- **EWI Academy** - Existing program
- **Smart Energy Certificate Programme** - Future envisioned program
- **Certificate in Future Energy Business** - Future envisioned program
- **Home Energy Efficiency and Electrical Installations Course** - Future envisioned program
- **Archimedischer Sandkasten** – Existing program

Flagship program – Do you regard your program a flagship program?

This data point is relevant only within the scope of the EDDIE project. The data entry is used to indicate which of the existing programs or programs under development should be defined as flagship programs within the EDDIE project. This data is a nomination from the project partner providing the data and does not constitute a decision to denote the program as a flagship program. It is possible to mark the program as a flagship program covering major skill gaps by checking the option Yes.

- **EWI Academy** - No
- **Smart Energy Certificate Programme** - No
- **Certificate in Future Energy Business** - No
- **Home Energy Efficiency and Electrical Installations Course** - Yes
- **Archimedischer Sandkasten** – Yes

Part 2 – Program Fact Sheet

The second part of the web form is designed to gather general information about the training programs included in the project. This information is intended to help potential students find the best programs for their needs.

3. Program format

Describe the program format(s) offered to participants. Select all the options that apply. The available options are (1) On campus/ On-site, (2) Live virtual, (3) Online, (4) Blended.

- **EWI Academy** - On campus / On-site, Online
- **Smart Energy Certificate Programme** - Online
- **Certificate in Future Energy Business** - On campus / On-site
- **Home Energy Efficiency and Electrical Installations Course** - On campus / On-site
- **Archimedischer Sandkasten** – On campus / On-site

4. Program language

Enter the official language(s) of the program in the provided free text box.

- **EWI Academy** – German, English
- **Smart Energy Certificate Programme** - English
- **Certificate in Future Energy Business** - German
- **Home Energy Efficiency and Electrical Installations Course** - Spanish
- **Archimedischer Sandkasten** – German

5. Length of program

Enter the duration of the program in weeks, months or years by choosing an option from the dropdown menu.

- **EWI Academy** - 1 month
- **Smart Energy Certificate Programme** - 5 months
- **Certificate in Future Energy Business** - 1 year
- **Home Energy Efficiency and Electrical Installations Course** - 1 week
- **Archimedischer Sandkasten** – 3 weeks

6. Student´s estimated effort in working hours

Give an estimate of the total amount of working hours a student/ participant needs to study in order to successfully complete the program. Enter the total amount of hours in the provided free text box.

- **EWI Academy** - 8-32 hours
- **Smart Energy Certificate Programme** – 40 hours
- **Certificate in Future Energy Business** – 99 hours
- **Home Energy Efficiency and Electrical Installations Course** – 30 hours
- **Archimedischer Sandkasten** – 0-30 hours

7. Industrial challenges addressed 1.- Economic and organizational

Mark those economic and organizational challenges that your program addresses. Select all that apply.

The available options are (1) High economic costs, (2) Business model adaptation, (3) Funding, (4) Low top management commitment, and (5) Goals/target-tracking

- **EWI Academy** - High economic costs, Business model adaptation
- **Smart Energy Certificate Programme** - Business model adaptation
- **Certificate in Future Energy Business** - Goals/ target-tracking

8. Industrial challenges addressed 2.- Social

Mark those social challenges that your program addresses. Select all that apply.

The available options are (1) Privacy concerns, (2) Loss of jobs due to automatic processes, (3) Acceptance of new technologies, and (4) Lack of citizen engagement.

- **EWI Academy** - Acceptance of new technologies, Lack of citizen engagement
- **Smart Energy Certificate Programme** - Acceptance of new technologies
- **Certificate in Future Energy Business** - Acceptance of new technologies
- **Home Energy Efficiency and Electrical Installations Course** - Acceptance of new technologies, Lack of citizen engagement
- **Archimedischer Sandkasten** – Acceptance of new technologies

9. Industrial challenges addressed 3. – Technical and regulatory

Mark those technical and regulatory challenges that your program addresses. Select all that apply.

The available options are (1) IT security issues, (2) Reliability and stability need for machine-to-machine communication, (3) Need to protect industrial know-how, (4) Lack of adequate skills from employees, (5) Data Management, (6) Data protection issues, (7) Technology integration (compatibility with existing processes/technologies), (8) Lack of regulation standards and forms of certification, and (9) Unclear legal issues.

- **EWI Academy** - Lack of adequate skills from employees, Data management
- **Smart Energy Certificate Programme** - Lack of adequate skills from employees
- **Certificate in Future Energy Business** - Lack of adequate skills from employees
- **Home Energy Efficiency and Electrical Installations Course -** Reliability and stability need for machine-to-machine communication, Lack of adequate skills from employees
- **Archimedischer Sandkasten** – Technology integration (compatibility with existing processes/ technologies)

10. Industrial challenges addressed 4. – Energy system

Mark those energy challenges that your program addresses. Select all that apply.

The available options are (1) Customers: Remote services to customers, (2) Customers: Dedicated information about their energy profiles, (3) Customers: Remote fault announcement, (4) Customers: Remote metering, (5) Customers: Remote fault repairs, (6) Network planning: Digital tools for network planning, (7) Network planning: Geographical information systems, (8) Network planning: Data for longer term load forecasting, (9) Network planning: Load profiles, (10) Network operation: Automation and fault clearance, (11) Network operation: Remote switching, (12) Network operation: Automatic fault indicators, (13) Network operation: Crew management, (14) Network operation: Online security assessment, (15) Network operation: Short-term load forecasting, (16) Maintenance and asset management: Predictive maintenance, (17) Maintenance and asset management: Asset management

- **EWI Academy** - Network planning: Load profiles
- **Smart Energy Certificate Programme** - Customers: Remote metering, Network planning: Digital tools for network planning, Network planning: Load profiles, Network operation: Short-term load forecasting
- **Certificate in Future Energy Business** - Customers: Remote metering, Network planning: Digital tools for network planning, Network planning: Load profiles, Network operation: Short-term load forecasting
- **Home Energy Efficiency and Electrical Installations Course** - Customer: Remote services to customers, Customers: Remote metering

11. Industrial challenges addressed 5. – Extreme situations

Does your program address any challenges due to extreme situations (e.g., pandemic, extreme weather conditions)? Select Yes or No.

- **EWI Academy** - Yes
- **Smart Energy Certificate Programme** - No

- **Certificate in Future Energy Business** - Yes
- **Home Energy Efficiency and Electrical Installations Course** - No
- **Archimedischer Sandkasten** – No

12. Industrial challenges addressed 6. – Other

Describe any other challenges your program may address. Fill in the provided free text box.

- **Certificate in Future Energy Business** - Energy transition due to war in Ukraine
- **Home Energy Efficiency and Electrical Installations Course** - Home automation
- **Archimedischer Sandkasten** – Promoting young talent / labor shortage

13. Skill gap areas

Select those skill gap areas that your program addresses. Select all that apply. The available options are (1) Data management and analysis, (2) Big Data, (3) Cybersecurity, (4) Programming and development competences.

- **EWI Academy** - Data management and analysis, Programming and development competences

- **Smart Energy Certificate Programme** - Data management and analysis, Big Data, Programming and development competences
- **Certificate in Future Energy Business** - Data management and analysis, Big Data, Programming and development competences
- **Home Energy Efficiency and Electrical Installations Course** - Data management and analysis, Programming and development competences

14. ISCED code of program content

The UNESCO has published a detailed list of disciplines with their corresponding International Standard Classification of Education (ISCED) codes (find the full list of codes here). Select the ISCED code(s) of your program from the dropdown menu.

- **EWI Academy** - 0713 - Electricity and energy; 0613 - Software and applications development and analysis; 0712 - Environmental protection technology
- **Smart Energy Certificate Programme** - 0713 - Electricity and energy; 0610 - Information and Communication Technologies (ICTs) not further defined; 0712 - Environmental protection technology
- **Certificate in Future Energy Business** - 0588 - Inter-disciplinary programmes and qualifications involving natural sciences, mathematics and statistics; 0713 - Electricity and energy; 0712 - Environmental protection technology
- **Home Energy Efficiency and Electrical Installations Course** - 0714 - Electronics and automation; 0619 - Information and Communication Technologies (ICTs) not elsewhere classified; 0713 - Electricity and energy
- **Archimedischer Sandkasten** – 0713 - Electricity and energy

15. Starting point of program design

Categorize your program as an ICT program with an Energy add-on, an Energy program with an ICT add-on or both. This is useful as a high-level assessment of pre-requisites needed, and helps to identify the emphasis within the program. The available options are: (1) ICT program with an Energy add-on, (2) Energy program with an ICT add-on, and (3) Both.

- **EWI Academy** - Energy program with an ICT add-on
- **Smart Energy Certificate Programme** - Both
- **Certificate in Future Energy Business** - Energy program with an ICT add-on
- **Home Energy Efficiency and Electrical Installations Course** - Both

- **Archimedischer Sandkasten** – Energy program with an ICT add-on

16. Funding 1.- Available for free?

Is your program available for free? You can select Yes or No.

- **EWI Academy** - No
- **Smart Energy Certificate Programme** - No
- **Certificate in Future Energy Business** - No
- **Home Energy Efficiency and Electrical Installations Course** - No
- **Archimedischer Sandkasten** – Yes

17. Funding 2.- Types of funding

In case your program is NOT available for free, mark all types of funding available for students.

The available options are (1) Public funding, (2) Corporate funding, and (3) Individual.

- **EWI Academy** - Corporate funding
- **Smart Energy Certificate Programme** – Individual
- **Certificate in Future Energy Business** - Individual
- **Home Energy Efficiency and Electrical Installations Course** - Public funding
- **Archimedischer Sandkasten** – Public funding

18. Target groups

Describe your target groups in terms of employment status. Select all that apply.

The available options are (1) Students (Pre-career stage), (2) Employees (Mid-career stage), and (3) Professionals between jobs.

- **EWI Academy** - Employees (Mid-career stage)
- **Smart Energy Certificate Programme** - Employees (Mid-career stage)
- **Certificate in Future Energy Business** - Students (Pre-career stage)
- **Home Energy Efficiency and Electrical Installations Course** - Students (Pre-career stage), Employees (Mid-career stage), Professionals between jobs
- **Archimedischer Sandkasten** – Students (Pre-career stage)

19. EQF level

Select the overall EQF level of your program.

Please find the description of EQF levels here: https://europa.eu/europass/en/description-eight-eqf-levels.

The available options are (1) Level 4 – Upper secondary general, technical and vocational education (2) Level 5 – Post-secondary diploma or certificate, (3) Level 6 - Bachelor´s degree, (4) Level 7 - Master´s degree, Postgraduate diploma or certificate, and (5) Level 8 – Doctoral degree

- **EWI Academy** - Level 5 - Post-secondary diploma or certificate
- **Smart Energy Certificate Programme** - Level 7 - Master´s degree, Postgraduate diploma or certificate
- **Certificate in Future Energy Business** - Level 6 - Bachelor´s degree
- **Home Energy Efficiency and Electrical Installations Course** - Level 4 - Upper secondary general, technical or vocational education

20. Lifelong learning and certification

Describe the general plans for lifelong learning and the modularization of the program. Select Yes or No at each question.

This section includes the following questions: (1) Is it possible to combine the program with a job? (2) Does the program provide credits (ECTS)? (3) Can you study parts of the program? and (4) Does it provide any certification per module?

- **EWI Academy** – 1, 3-4: Yes, 2: No
- **Smart Energy Certificate Programme** – 1: Yes; 2-4: No
- **Certificate in Future Energy Business** – 1: Yes; 2-4: No
- **Home Energy Efficiency and Electrical Installations Course** – 1,2,4: Yes; 3: No
- **Archimedischer Sandkasten** – 1-4: No

21. Certification

Select the type of certificate your program provides from the dropdown menu.

The available options are: (1) University degree, (2) Vocational degree, (3) Professional certification, (4) Diploma, and (5) Certificate of Accomplishment.

- **EWI Academy** - Certificate of Accomplishment
- **Smart Energy Certificate Programme** - Professional certification
- **Certificate in Future Energy Business** - Certificate of Accomplishment
- **Home Energy Efficiency and Electrical Installations Course** - Diploma

Part 3 - Business and Operational Model

The third part of the web form seeks to gather more detailed information about the business and operational model of the registered training programs.

1. Relevance of program

Explain the relevance of your program from a professional and technical point of view. Please describe it in max. 5 bullet points in the provided free text boxes.

- **EWI Academy** - #1: Understand the concepts and challenges related to the energy transition; #2: Understand the role of digitization in the energy transition; #3: Develop new business opportunities in the energy sector; #4: Promote skills in energy modelling; #5: Help companies to develop a skilled labor force that understand the energy sector
- **Smart Energy Certificate Programme** - #1: Understand the concepts and challenges related to the energy transition; #2: Comprehend the role of digitalization for the energy transition; #3: Develop new business opportunities in the energy sector; #4: Combine theoretical knowledge with practical experience; #5: Help companies to develop a skilled labor force that understand smart technologies and the energy sector
- **Certificate in Future Energy Business** - #1: Understand the concepts and challenges related to the energy transition; #2: Work on real world problems and connect with industry experts; #3: Develop new business opportunities in the energy sector; #4: Combine theoretical knowledge with practical experience; #5: Help companies to develop a skilled labor force that understand the energy sector
- **Home Energy Efficiency and Electrical Installations Course** - #1: Specific and short training for electrical installers; #2: Training aimed at improving the energy efficiency of households; #3: Telecommunications and computer applications for consumption management; #4: Introduction of home automation as a digital tool to reduce energy consumption
- **Archimedischer Sandkasten** – #1: Raising interest and awareness around the young generation, on modern power systems engineering and energy transition topics, #2: Promoting young talent in engineering and IT professions

2. Definition of targets

Give information about the targeted skills, occupations, and tools/ systems with the help of ESCO codes and descriptions by filling in the provided free text boxes.

Please find the ESCO skills URL here: https://esco.ec.europa.eu/en/classification/skill_main
Please find the ESCO codes for occupations here: https://esco.ec.europa.eu/en/classification/occupation_main

- **EWI Academy** - Skills: 0713, 0612 - electricity and energy, database and network design and administration; Occupations: 215, 2421, 2422 - Electrotechnology engineer, Management and organisation analysts, Policy administration professionals
- **Smart Energy Certificate Programme** – Skills: 0713, 0612 - electricity and energy, database and network design and administration; Occupations: 215, 2421, 2422 - Electrotechnology engineer, Management and organisation analysts, Policy administration professionals
- **Certificate in Future Energy Business** Skills: 0713, 0612 - electricity and energy, database and network design and administration; Occupations: 215, 2421, 2422 - Electrotechnology engineer, Management and organisation analysts, Policy administration professionals
- **Home Energy Efficiency and Electrical Installations Course** – Skills: Electronics and automation; Occupation: 7411.1.1.1 - Domestic electrician; Tool/System: Smart appliances for demand response
- **Archimedischer Sandkasten** – Skills: Electricity and energy

3. Financial structures

Give detailed information about program financing and include your plans for e.g. sponsorship, subsidies/ grants, tuition, and remuneration. Please enter max. 5 bullet points in the provided free text boxes.

- **EWI Academy** - #1: Companies need to pay for their employees to take part in the program; #2: Companies either pay for a whole course, or register individual employess for a course
- **Smart Energy Certificate Programme** - #1: Students need to pay to participate in the programme; #2: Sponsorships can be applied to via the Cologne Graduate School
- **Certificate in Future Energy Business** - #1: Participating companies pay between 4500-6000€ a year to be part of the program; #2: Students pay 100€ for one year (in order to reduce the drop-out rate); #3: Further expensive are sponsored by the EWI sponsoring associating
- **Home Energy Efficiency and Electrical Installations Course** - #1: Public funds for the teaching activity; #2: School´s own funds for the equipment

4. Use of resources

Describe the required resources and virtual/ physical facilities for the program. Please enter max. 5 bullet points in the provided free text boxes.

- **EWI Academy** - #1: Laptop and projector; #2: 2 EWI employees per course; #3: EWI classroom or MS Teams
- **Smart Energy Certificate Programme** - #1: MS Teams; #2: E-learning platform
- **Certificate in Future Energy Business** - #1: Laptop and projector; #2: EWI classroom or on site a participating companies; #3: 2 EWI employees per course or 2 company representatives
- **Home Energy Efficiency and Electrical Installations Course** - #1: Classroom / lab; #2: Computers; #3: Multimedia projector; #4: Air conditioning equipment; #5: Electrical and home automation equipment
- **Archimedischer Sandkasten** – #1: physical facilities at ACS, seminar room; #2: research assistant from ACS as a lecturer; #3: wind park and energy grid model; #4: dissemination material

5. Licences for digital tools

Do you use any digital tools which require a licence? Select Yes or No. In case your answer is Yes, please specify what licence you need in the provided free text box.

- **EWI Academy** - No
- **Smart Energy Certificate Programme** - No
- **Certificate in Future Energy Business** - No
- **Home Energy Efficiency and Electrical Installations Course** – Yes, they require license but they are free access.
- **Archimedischer Sandkasten** – No

6. Marketing and student recruiting procedures

Describe your marketing strategy and plans for student recruitment. Please enter max. 5 bullet points in the provided free text boxes.

- **EWI Academy** - #1: Advertising to EWI customers and via EWI homepage; #2: Adverising via energy email list server (Strommarktverteiler); #3: Contact previous customers
- **Smart Energy Certificate Programme** - #1: Advertising through the Cologne Graduate School; #2: Reach out to EWI customers and advertise educational program; #3: EWI Website; #4: Email list server (Strommarktverteiler)
- **Certificate in Future Energy Business** - #1: Advertise at university lectures at University of Cologne and surrounding universities; #2: EWI homepage; #3: Blackboard at the University; #4: Website
- **Home Energy Efficiency and Electrical Installations Course** - #1: Students that are already finishing their studies at our School; #2: Short-term course before going into an internship to finish their studies
- **Archimedischer Sandkasten** – #1: Dissemination by the City of Aachen in the press; #2: Dissemination by the City of Aachen in the Future Lab Forum; #3: Dissemination at local schools

7. Employer feedback

Describe the types of feedback you expect from the employers and how you will manage and use this in the analysis and development of the program. Please enter max. 5 bullet points in the provided free text boxes.

- **Home Energy Efficiency and Electrical Installations Course – Not applicable**

8. Alumni feedback

Describe your expectations and plans for alumni engagement, including experiences from using alumni in the development and operation of the program. Please enter max. 5 bullet points in the provided free text boxes.

- **EWI Academy** - #1: Use Alumni as testimonials on the website; #2: Advertise follow-up moduls to alumni; #3: Receive feedback for the course
- **Smart Energy Certificate Programme** - #1: Use Alumni as testimonials on the website; #2: Advertise follow-up moduls to alumni; #3: Receive feedback for the course
- **Certificate in Future Energy Business** - #1: Use Alumni as testimonials on the website; #2: Create alumni network; #3: Receive feedback for the course; #4: Create email list server for job announcement and follow up courses
- **Home Energy Efficiency and Electrical Installations Course** - #1: A survey will be conducted after the internship to find out if the contents of the course have been used; #2: After 2 years there will be a follow-up on how the employability of the students who have taken the course has improved

Part 4 - Learning and Teaching Model

The fourth part of the web form seeks to gather more detailed information about the learning and teaching model of the registered training programs.

1. Admission requirements

Describe the admission requirements of your program. Select all that apply.

The available options are (1) No requirements, (2) Bachelor degree, (3) Master degree, (4) Graduate, (5) PhD, (6) High school diploma, (7) Working experience.

- **EWI Academy** - Working experience
- **Smart Energy Certificate Programme** – Graduate, Working experience
- **Certificate in Future Energy Business** - Bachelor degree
- **Home Energy Efficiency and Electrical Installations Course** - High school diploma
- **Archimedischer Sandkasten** – No requirements

2. Training goals

Describe your Top 5 training goals. Please enter max. 5 bullet points in the provided free text boxes.

- **EWI Academy** - #1: Understand the regulatory framework of energy markets; #2: Understand electricity, gas and heating grid infrastructure; #3: Understand new business opportunities in the energy markets; #4: Understand the importance of scenarios and know how to interpret them; #5: Understand the next steps of the energy transition towards carbon neutrality
- **Smart Energy Certificate Programme** - #1: Understand the regulatory framework of energy markets; #2: Understand the role of digitilization and smart technologies for the energy transition; #3: Understand new business opportunities in the energy markets; #4: Develop a new mindset on design thinking and change management
- **Certificate in Future Energy Business** - #1: Understand the regulatory framework of energy markets; #2: Understand electricity, gas and heating grid infrastructure; #3: Understand new business opportunities in the energy markets; #4: Understand the challenges of businesses in the energy field; #5: Develop a new mindset on design thinking and change management
- **Home Energy Efficiency and Electrical Installations Course** - #1: Extend the training of the participants; #2: Specific training in Energy-Efficient Homes; #3: Specific training in "phantom energy use" generated by devices in standby
- **Archimedischer Sandkasten** – #1: wind energy is not a constant energy producer due to weather dependencies; #2: electricity supply and electricity demand in the energy grid must match; #3: without conventional energy producers and volatile renewable energy sources in the energy grid of the future, energy storages are needed and the energy grid is getting complex; #4: complex energy grid provides new challenges and needs new skills; #5: generate interest in STEM subjects and promote young talent

3. Program content- Syllabus elements in ICT/ Digital

Select your ten most important ICT/ Digital syllabus elements from the dropdown menu.

The available options are

- **EWI Academy** - #1: INFORMATION TECHNOLOGY – Blockchain; #2: MODELLING, SIMULATION & OPTIMISATION - Modelling, simulation & optimization; #3: MODELLING, SIMULATION & OPTIMISATION - Simulation tools (Matlab, Labview, R)
- **Smart Energy Certificate Programme** - #1: INFORMATION TECHNOLOGY - New Trends in Information Technology
- **Certificate in Future Energy Business** - #1: PROGRAMMING LANGUAGES - Programming principles, basics & fundamentals; #2: INFORMATION TECHNOLOGY - New Trends in Information Technology; #3: MODELLING, SIMULATION & OPTIMISATION - Simulation tools (Matlab, Labview, R); #4: MODELLING, SIMULATION & OPTIMISATION - Modelling, simulation & optimisation

- **Home Energy Efficiency and Electrical Installations Course** - #1: COMMUNICATIONS, NETWORKS & BUSES - Remote monitoring; #2: INFORMATION TECHNOLOGY - Internet of Things; #3: INFORMATION TECHNOLOGY - Technical communications; #4: MOBILE APP DEVELOPMENT - Usability & User Interface; #5: MOBILE APP DEVELOPMENT - IOS and Android Operating Systems; #6: CONTROL - Remote Control and Automation

4. Program content- Syllabus elements in another STEM than ICT/Digital

Select your ten most important syllabus elements in another STEM.from the dropdown menu.

- **EWI Academy** - #1: BASIC MECHANICS - Fuels, Biomass, Biogas; #2: BASIC MECHANICS – Thermodynamics; #3: BASIC MECHANICS - Heat transfer; #4: BASIC ELECTRICITY - Electricity theory, Current, voltage & components; #5: ELECTRICAL ENGINEERING - Electrical design; #6: MECHANICAL ENGINEERING - Power plant (conventional and RES) Operation and Maintenance
- **Certificate in Future Energy Business** - BASIC MECHANICS - Thermodynamics
- **Archimedischer Sandkasten** – #1: BASIC ELECTRICITY - Electricity theory, Current, voltage & components; #2: ELECTRICAL ENGINEERING - Power plant (conventional and RES) Operation and Maintenance

5. Program content- Syllabus elements in Energy

Select your ten most important syllabus elements in Energy from the dropdown menu.

The available options are

- **EWI Academy** - #1: ENGINEERING PROJECTS & REPORTS - Engineering projects, management & control; #2: ELECTRICAL ENGINEERING - Configuration of RES Installations; #3: ELECTRICAL POWER SYSTEMS - RES (Solar Energy, wind energy); #4: ENERGY MANAGEMENT & GREEN SKILLS - Sustainable Transportation, E-mobility; #5: ENERGY MANAGEMENT & GREEN SKILLS - Energy Transition; #6: ENERGY MANAGEMENT & GREEN SKILLS - Regulation & new Business Models; #7: NERGY MANAGEMENT & GREEN SKILLS - RES (Solar Energy, wind energy)
- **Smart Energy Certificate Programme** - #1: ENERGY MANAGEMENT & GREEN SKILLS - Energy Transition; #2: ENERGY MANAGEMENT & GREEN SKILLS - Sustainable Transportation, E-mobility; #3: ENERGY MANAGEMENT & GREEN SKILLS - Flexible demand and Smart home/buildings; #4: ENERGY MANAGEMENT & GREEN SKILLS - Regulation & new Business Models; #5: ENERGY MANAGEMENT & GREEN SKILLS - RES (Solar Energy, wind energy); #6: ELECTRICAL POWER SYSTEMS - Grid development in the area of Smart Grids; #7: ELECTRICAL POWER SYSTEMS - RES (Solar Energy, wind energy)
- **Certificate in Future Energy Business** - #1: ELECTRICAL POWER SYSTEMS - RES (Solar Energy, wind energy); #2: ELECTRICAL POWER SYSTEMS - Grid development in the area of Smart Grids; #3: ENERGY MANAGEMENT & GREEN SKILLS - Energy Transition; #4: ENERGY MANAGEMENT & GREEN SKILLS - Sustainable Transportation, E-mobility; #5: ENERGY MANAGEMENT & GREEN SKILLS - Regulation & new Business Models; #6: ENERGY MANAGEMENT & GREEN SKILLS - Sustainable Development; #7: ENERGY MANAGEMENT & GREEN SKILLS - Flexible demand and Smart home/buildings
- **Home Energy Efficiency and Electrical Installations Course** - #1: ENERGY MANAGEMENT & GREEN SKILLS - Flexible demand and Smart home/buildings
- **Archimedischer Sandkasten** – #1: ENERGY MANAGEMENT & GREEN SKILLS - Energy Transition; #2: ENERGY MANAGEMENT & GREEN SKILLS - RES (Solar Energy, wind energy); #3: ENERGY MANAGEMENT & GREEN SKILLS - Regulation & new Business Models; #4: ELECTRICAL ENGINEERING - Configuration of RES Installations; #5: ELECTRICAL ENGINEERING - Electrical design; #6: ELECTRICAL ENGINEERING - Electrical engineering

6. Program content- Syllabus elements in transversal skills

Select your five most important syllabus elements in transversal skills.from the dropdown menu.

The available options are

- **EWI Academy** - #1: MANAGEMENT & BUSINESS - Entrepreneurship & Innovative Businesses; #2: MANAGEMENT & BUSINESS - Project Economics - CAPEX, Cash Flow, Rate of Return
- **Smart Energy Certificate Programme** - #1: FOREIGN LANGUAGES - English (mandatory); #2: HUMANITIES & ETHICS - Critical thinking; #3: TRANSVERSAL PROFESSIONAL SKILLS - Leadership & Change Management; #4: MANAGEMENT & BUSINESS - Project Economics - CAPEX, Cash Flow, Rate of Return; #5: MANAGEMENT & BUSINESS - Economy of Energy, Markets and Regulation
- **Certificate in Future Energy Business** - #1: ENGINEERING PROJECTS & REPORTS - Field Management Project; #2: MANAGEMENT & BUSINESS - Economy of Energy, Markets and Regulation; #3: TRANSVERSAL PROFESSIONAL SKILLS - Problem solving; #4: TRANSVERSAL PROFESSIONAL SKILLS - Leadership & Change Management; #5: HUMANITIES & ETHICS - Critical thinking
- **Home Energy Efficiency and Electrical Installations Course** - #1: TRANSVERSAL PROFESSIONAL SKILLS - Problem solving; #2: TRANSVERSAL PROFESSIONAL SKILLS - Teamwork
- **Archimedischer Sandkasten** – #1: TRANSVERSAL PROFESSIONAL SKILLS - Teamwork; #2: TRANSVERSAL PROFESSIONAL SKILLS - Problem solving; #3: HUMANITIES & ETHICS - Critical thinking; #4: HUMANITIES & ETHICS - Volunteering & cooperation

7. Program content- Re-use of training modules

Do you re-use any of the training modules? Select Yes or No. In case your answer is Yes, please specify what licence you need in the provided free text box.

- **EWI Academy** - No
- **Smart Energy Certificate Programme** - No
- **Certificate in Future Energy Business** – Yes, theoretical lectures will be partially reused in the EWI academy program
- **Home Energy Efficiency and Electrical Installations Course** – Yes, future envisioned
- **Archimedischer Sandkasten** – Yes, reuse of the landscape model for the Girl's Day at ACS

8. Program content- Intellectual Property Rights

Give information about the Intellectual Property Rights involved. Fill in the provided free text boxes.

- **Home Energy Efficiency and Electrical Installations Course** - Property of Piquer
- **Archimedischer Sandkasten** – All material are open to public.

9. Methodologies

Describe your methodology. Select all that apply.

The available options are (1) Practical learning, (2) Problem-based learning, (3) Project-based learning, (4) Magistral lecturing, (5) Flipped classroom, (6) Worked examples, (7) Interactive lectures, (8) Socrating questioning (9) Discussion-based learning, (10) Scenario-based learning, (11) Case-based learning, (12) Collaborative learning, and (13) Inquiry-based learning.

- **EWI Academy** - Practical learning, Interactive lecture, Discussion-based learning
- **Smart Energy Certificate Programme** - Magistral lecturing, Interactive lecture, Discussion-based learning, Case-based learning
- **Certificate in Future Energy Business** - Practical learning, Project-based learning, Magistral lecturing, Interactive lecture, Discussion-based learning, Collaborative learning
- **Home Energy Efficiency and Electrical Installations Course** - Practical learning, Problem-based learning, Interactive lecture, Scenario-based learning

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menting and presenting educational
programs*

- **Archimedischer Sandkasten** – Practical learning, Problem-based learning, Worked examples, Interactive lecture, Discussion-based learning

10. Teaching methods

Describe your teaching methods. Select all that apply.

The available options are (1) Magistral lectures, (2) Practical lab sessions, (3) Projects, (4) Personal study, (5) Practical exercises (6) Problem solving, (7) Continual assessment of student performance, (8) Search for and selection of bibliographical material, data or statistics.

- **EWI Academy** - Magistral lectures
- **Smart Energy Certificate Programme** - Magistral lectures, Personal study, Problem solving
- **Certificate in Future Energy Business** - Magistral lectures, Projects, Personal study, Problem solving
- **Home Energy Efficiency and Electrical Installations Course - Practical lab sessions, Practical exercises,**
- **Archimedischer Sandkasten** – Practical exercises, Practical lab sessions, Problem solving

11. Evaluation methods

Describe your evaluation methods. Select all that apply.

The available options are (1) Written examination, (2) Oral examination, (3) Projects, (4) Aptitude tests, and (5) Other. In case you choose the option Other, please specify.

- **EWI Academy** – Other: Attendance
- **Smart Energy Certificate Programme** - Written examination
- **Certificate in Future Energy Business** - Projects
- **Home Energy Efficiency and Electrical Installations Course** - Written examination, Projects

12. Internships

Does your program include internships or "on-the-job" trainings? Select all that apply.

The available options are (1) Yes - Internships, (2) Yes – On-the-job-trainings, and (3) No.

- **EWI Academy** - No
- **Smart Energy Certificate Programme** - No
- **Certificate in Future Energy Business** - No
- **Home Energy Efficiency and Electrical Installations Course** - No
- **Archimedischer Sandkasten** – No

13. Scheduling

What is the schedule of your program? Select an option from the dropdown menu.

The available options are (1) Full-time, (2) Part-time, (3) Evening attendance, (4) Weekend attendance, and (5) Self-paced.

- **EWI Academy** - Weekend attendance
- **Smart Energy Certificate Programme** - Self-paced
- **Certificate in Future Energy Business** - Weekend attendance
- **Home Energy Efficiency and Electrical Installations Course** - Full-time
- **Archimedischer Sandkasten** – Self-paced

Annex B: Data Gathered via draft template

This annex is a re-print of the data provided in Deliverable D5.2 Intermediate draft program templates – it is included here for completeness about all data gathered about programs as well as to provide an insight into the development of the program template.

This appendix presents, in raw form, the data gathered from project partners using the program template developed and presented in this appendix. The data is presented in a structure following the template. The data entered is to be seen as samples of relevant programs, it is not a set of official EDDIE programs.

B.1 Statistics on Program fact sheet

Programs included in the project

- **Master's in Smart Electrical Networks and Systems (SENSE)** – KTH Royal Institute of Technology, Electrical Engineering and Computer Science
- **Smart Distribution Grids** – Romanian Energy Center – CRE, Research and Innovation
- **Energy Technologies and Sustainable Design** – University of Cyprus, Electrical and Computer Engineering
- **Smart Energy - Mastering the Energy Landscape of the Future** - Energiewirtschaftliches Institut an der Universität zu Köln GmbH, Digital Energy
- **EWI Academy** – Institute of Energy Economics – EWI
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation)** – Comillas Pontifical University, Institute for Research in Technology, ICAI School of Engineering
- **MSc Energy Production and Management** - National Technical University of Athens (NTUA), Electrical and Computer Engineering
- **Executive Program in Infra Service Management** – KTH Executive School
- **Master's Degree in Smart Grids** - Institute for Research in Technology - Comillas Pontifical University, Smart and Sustainable Networks
- **Artificial Intelligence MOOC Series** - Politecnico di Milano, METID

Program Category

All ten programs are existing programs.

Q4 Program category

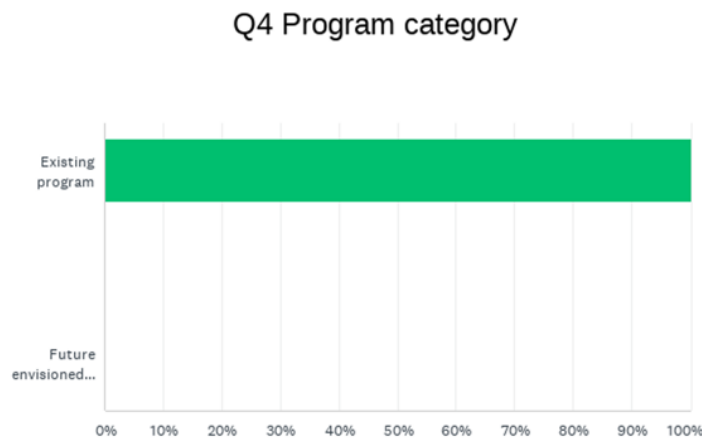**Figure 10 Program Category data**

Number of flagship programs

Out of ten programs, there are six programs which are regarded as flagship programs.
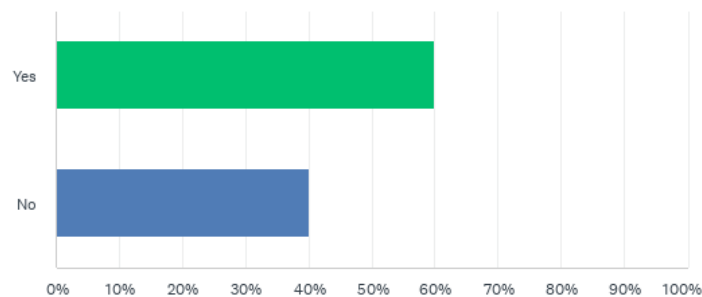
Q5 Do you regard it as a flagship program?

Figure 11 Program Flagship status data

Format

Out of ten programs, there are

- six on-campus/ on-site programs
- one live virtual program
- three online programs
- two blended programs

Q6 Format
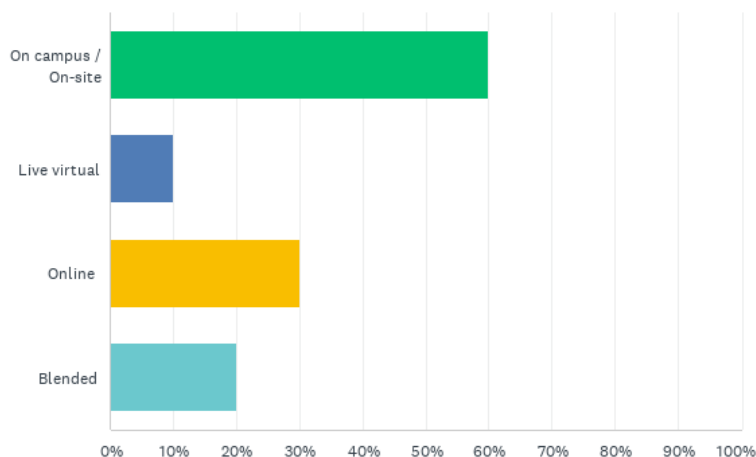
Figure 12 Program format data

Language

Out of ten programs, there are

- four English
- one English/Rumanian
- one English/Greek
- one English/German
- one Spanish
- one Greek
- one Swedish

Length of program

Please find information about the length of the programs below.

- **Master's in Smart Electrical Networks and Systems (SENSE)** – 2 years
- **Smart Distribution Grids** – 3 months
- **Energy Technologies and Sustainable Design** – 18 months
- **Smart Energy - Mastering the Energy Landscape of the Future** - 5 months
- **EWI Academy** – 2 months
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation)** – 6 months
- **MSc Energy Production and Management** - 3 semesters, 2 years maximum
- **Executive Program in Infra Service Management** - 4-5 months, 12 days in classroom
- **Master's Degree in Smart Grids** - 1 year. It can also be done in two years as part of a double master degree.
- **Artificial Intelligence MOOC Series** - 17 weeks (divided in around 4 weeks for each of the 4 MOOCs)

Student´s estimated effort (total number of hours)

Please find the estimated number of hours needed in order to complete the program.

- **Master's in Smart Electrical Networks and Systems (SENSE)** – 5,040 hours (120 credits + autumn school, spring activities and a summer school)
- **Smart Distribution Grids** – 28 hours
- **Energy Technologies and Sustainable Design** – 91 ECTS X 25-30 hours
- **Smart Energy - Mastering the Energy Landscape of the Future** - 10 days for classes + several hours for a project work
- **EWI Academy** – Passive - Information Session for Corporate Graduate Programs
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation)** – 160 hours
- **MSc Energy Production and Management** - 5 hours per day
- **Executive Program in Infra Service Management** - 18 days
- **Master's Degree in Smart Grids** - 90 ECTS (2250 hours)
- **Artificial Intelligence MOOC Series** – 34 hours

The industry challenges the included programs address

- Economic and Organizational - High economic costs – 30%
- Economic and Organizational - Business model adaptation – 60%
- Economic and Organizational - Funding – 0%
- Economic and Organizational - Low top management commitment – 10%
- Economic and Organizational - Goals/target-tracking – 10%
- Social - Privacy concerns – 20%
- Social - Loss of jobs due to automatic processes – 10%
- Social - Acceptance of new technologies – 80%
- Social - Lack of citizen engagement – 10%
- Technical and Regulatory - IT security issues – 50%
- Technical and Regulatory - Reliability and stability need for machine to machine communication – 0%
- Technical and Regulatory - Need to protect industrial know-how – 0%
- Technical and Regulatory - Lack of adequate skills from employees – 40%
- Technical and Regulatory - Data Management – 80%
- Technical and Regulatory - Data protection issues – 30%
- Technical and Regulatory - Technology integration (compatibility with existing processes/technologies) – 70%
- Technical and Regulatory - Lack of regulation standards and forms of certification – 30%
- Technical and Regulatory - Unclear legal issues – 10%
- Energy System - Customers: Remote services to customers – 30%
- Energy System - Customers: Dedicated information about their energy profiles – 40%
- Energy System - Customers: Remote fault announcement – 10%
- Energy System - Customers: Remote metering – 30%
- Energy System - Customers: Remote fault repairs – 20%
- Energy System - Network planning: Digital tools for network planning – 40%
- Energy System - Network planning: Geographical information systems – 30%
- Energy System - Network planning: Data for longer term load forecasting – 50%
- Energy System - Network planning: Load profiles – 50%
- Energy System - Network operation: Automation and fault clearance – 10%
- Energy System - Network operation: Remote switching – 10%
- Energy System - Network operation: Automatic fault indicators – 10%
- Energy System - Network operation: Crew management – 10%
- Energy System - Network operation: Online security assessment – 0%
- Energy System - Network operation: Short-term load forecasting – 20%
- Energy System - Maintenance and asset management: Predictive maintenance – 50%
- Energy System - Maintenance and asset management: Asset management – 60%
- Extreme situations (e.g. pandemic, extreme weather conditions) – 40%

Comments:

- **Master's in Smart Electrical Networks and Systems (SENSE):** Developing a holistic understanding of electric power engineering in combination with entrepreneurial skills.
- **Smart Energy - Mastering the Energy Landscape of the Future:** The program addresses several topics related to different disciplines.
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** The program is not devoted to energy but to digital transformation. However, it tackles several topics that affect the energy system, and indeed, in all editions there is a significant share of energy-company professionals enrolled.
- **Artificial Intelligence MOOC Series:** The Series addresses specifically Ethics, legal issues, platform and technologies for AI

Skill gap areas the included programs plan to cover

- Data management and analysis – 90%
- Big Data – 70%
- Cybersecurity – 40%
- Programming and development competences – 40%
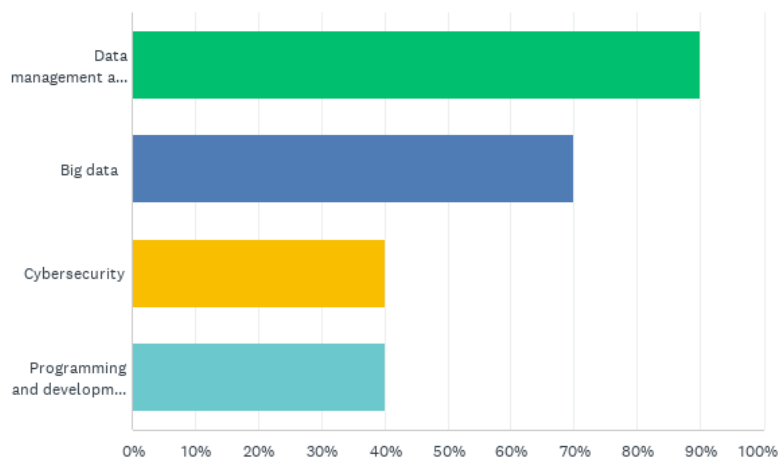- Other: (Digital organisation) Data platforms – 10%

Figure 13 Skill gaps covered data

ISCED codes

- **Master's in Smart Electrical Networks and Systems (SENSE):** 111 Education science, 713 Electricity and energy
- **Smart Distribution Grids:** 713 Electricity and energy

- **Energy Technologies and Sustainable Design:** 712 Environmental protection technology, 73 Architecture and construction, 788 Inter - disciplinary programmes and qualifications involving engineering, manufacturing and construction
- **Smart Energy - Mastering the Energy Landscape of the Future:** 413 Management and administration, 416 Wholesale and retail sales, 417 Work skills
- **EWI Academy:** 488
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** 688 Inter - disciplinary programmes and qualifications involving Information and Communication Technologies (ICTs), 788 Inter - disciplinary programmes and qualifications involving engineering, manufacturing and construction
- **MSc Energy Production and Management:** 713 Electricity and energy
- **Executive Program in Infra Service Management:** 499 Business, administration and law not elsewhere classified, 713 Electricity and energy, 610 Information and Communication Technologies (ICTs) not further defined
- **Master's Degree in Smart Grids:** 610 Information and Communication Technologies (ICTs) not further defined
- **Artificial Intelligence MOOC Series:** 061 Information and Communication Technologies (ICTs), 0619 Information and Communication Technologies not elsewhere classified, 022 Humanities (except languages), 0223 Philosophy and ethics, 048 Inter-disciplinary programmes and qualifications involving business, administration and law, 0488 Inter-disciplinary programmes and qualifications involving business, administration and law

Starting point in program design

- ICT program with an Energy add-on – 30%
- Energy program with an ICT add-on – 70%

Comments:

- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** As commented before, applications of digital technologies to the energy sector are commonplace in the program due to the interests of the students. However, the program is not defined or designed as energy specific.
- **Executive Program in Infra Service Management**: On a managerial level
- **Master's Degree in Smart Grids:** Both
- **Artificial Intelligence MOOC Series:** It's just ICT

Q12 What is the starting point in the design of your program?Select all that apply.
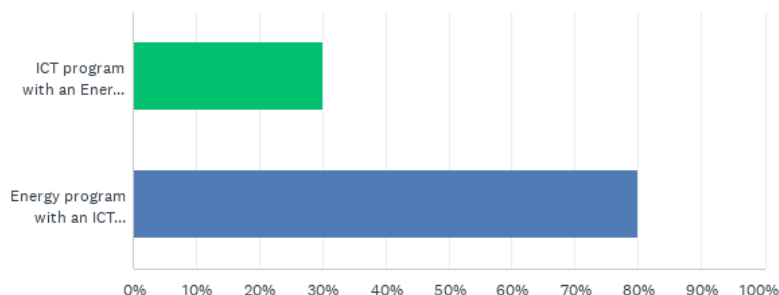
Figure 14 Program starting point data

Funding – Is the program available free of charge?

Three out of the ten programs are offered free of charge.

Comments:

- **EWI Academy:** Offered to Corporations to educate their staff / mostly used for Graduate programs

Q13 Funding - Is the program available for students free of charge?
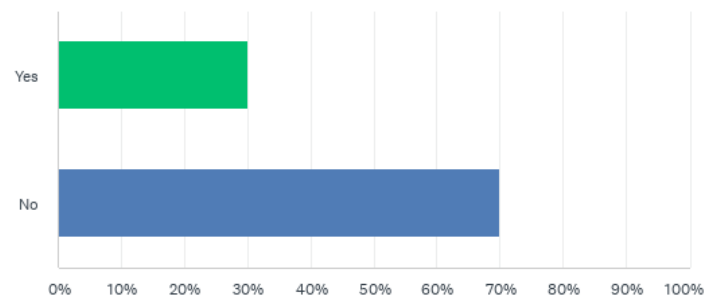
Figure 15 Program financing data

Funding- If the program is not free of charge, what type of funding is available for students?

Based on 7 answers, the programs are 86% corporate-funded and 71% individually-funded.

Comments:

- **Master's in Smart Electrical Networks and Systems (SENSE):** EIT InnoEnergy offers scholarships/fee waivers by selecting the top applicants based on a combination of skills.
- **Smart Energy - Mastering the Energy Landscape of the Future:** The program is a postgraduate certificate program that can either be funded by corporates but also by individuals
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** Most students have the program funded by their corporations.

Q14 Funding - If the program is not free of charge, what type of funding is available for students?Select all that apply.
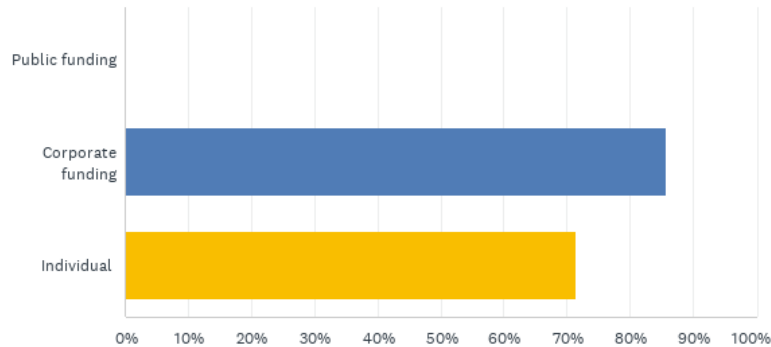
Figure 16 Program fundig model data

Targets in terms of employment status

- 50% of the programs target Students
- 80% of the programs target Employees
- 20% of the programs target Professionals between jobs

Comments:

- **Smart Energy - Mastering the Energy Landscape of the Future:** The program addresses postgraduates with min. 3 years postgraduate work experience
- **EWI Academy:** It is rather Employees in the early-career stage
- **Executive Program in Infra Service Management:** Senior professionals

Q15 Who do you target in terms of employment status?Select all that apply.
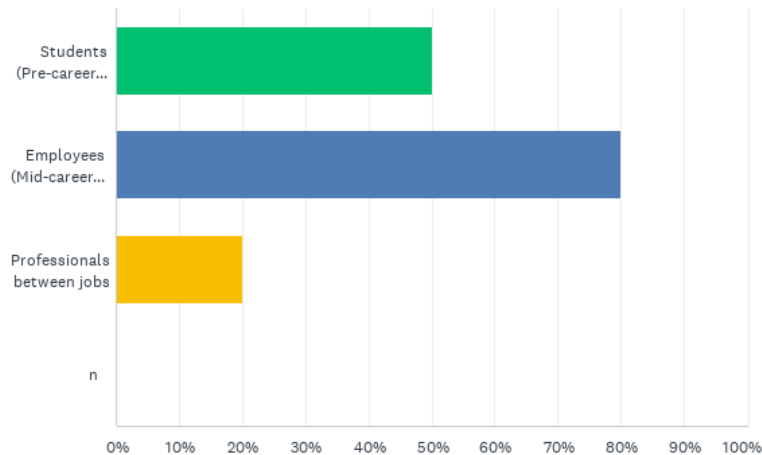
Overall EQF level

Out of the included ten program, one is on Level 5, five is on Level 6 and four is on Level 7.

Q16 What is the overall EQF level of the program?
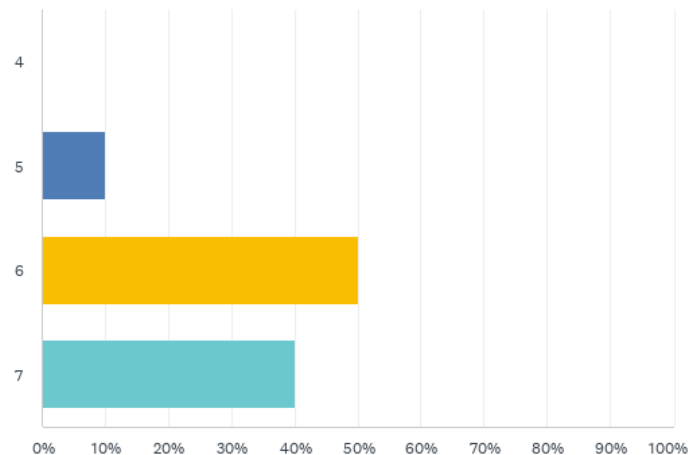
Figure 17 Program EQF level data

Plans for life-long learning

- 9 programs can be combined with a job and one - Energy Technologies and Sustainable Design - is part-time available.

- Four programs provide ECTS credits
  Energy Technologies and Sustainable Design – 91 ECTS
  MSc Energy Production and Management – 60 ECTS

- 6 programs can be modularized, 1 could be (Executive Program in Infra Service Management) and 1 can be partly modularized (MSc Energy Production and Management)

  Comments:
  MSc Energy Production and Management: Partly, on second semester
  Executive Program in Infra Service Management: Could be
  Master's Degree in Smart Grids: Yes, it can be part of a double degree master

- Does it provide any certification? If yes, what type of certification?

  Master's in Smart Electrical Networks and Systems (SENSE): Yes, Master's degree
  Smart Distribution Grids: Yes. Typhoon HIL Specialist
  Energy Technologies and Sustainable Design: Master
  Smart Energy - Mastering the Energy Landscape of the Future: Yes
  EWI Academy: No
 **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** Yes. An informal certification issued by the ICAI School of Engineering.
  MSc Energy Production and Management: MSc degree
  Executive Program in Infra Service Management: diploma
  Master's Degree in Smart Grids: No, it is not an official master. Comillas and Strathclyde titles are provided.
  Artificial Intelligence MOOC Series: No

General comments:

- **Master's in Smart Electrical Networks and Systems (SENSE):** The program is designed for full-time study. However, many of our students follow internships or part-time jobs during their studies.
- **Smart Energy - Mastering the Energy Landscape of the Future:** It is a certificate program

Is the program accredited?

- **Master's in Smart Electrical Networks and Systems (SENSE):** As the program is a double degree program, each education has to follow the national accrediting system. Exactly how this is done varies from country to country. All EIT programs also have an "EIT label". The EIT labeling is preceded by an extensive evaluation process of the "quality" of the program. Next year it has to be renewed.
- **Smart Distribution Grids:** Romanian National
- **Energy Technologies and Sustainable Design:** Cyprus Agency of Quality Assurance and Accreditation in Higher Education
- **Smart Energy - Mastering the Energy Landscape of the Future:** It has been designed
- **EWI Academy:** It is not.
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** It is not accredited by any Spanish Education Institution. As other programmes at Comillas, it is highly oriented to industry, and it works because it is accepted and recognized by companies.
- **MSc Energy Production and Management:** MSc degree
- **Executive Program in Infra Service Management:** By the Head of Education of KTH Executive School
- **Master's Degree in Smart Grids:** At the current stage, the program is not accredited by any external entity.

Certificate provided

- **Master's in Smart Electrical Networks and Systems (SENSE):** After successfully completing the two-year program, a master's degree will be provided from each of the students' two chosen universities.
- **Energy Technologies and Sustainable Design:** MSc
- **EWI Academy:** participation
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** An informal certification issued by the ICAI School of Engineering.
- **Executive Program in Infra Service Management:** diploma
- **Master's Degree in Smart Grids:** At the current stage, the program does not provide any certification.
- **Artificial Intelligence MOOC Series:** It provides a "Certificate of Accomplishment" which does not confer any academic credit, grade or degree

B.2 Data gathered on Business and operational model - Program specification

Relevance of program

- **Master's in Smart Electrical Networks and Systems (SENSE):** The Master's program enables students to develop the technical and entrepreneurial skills needed to design smart grids that integrate renewable energy sources, manage and control power quality, use data-driven applications to enhance electrical solutions, and lead the development of innovations such as battery applications, electric mobility and more.
- **Smart Distribution Grids:** It highlights the main technologies associated with the smart emerging grids, active distribution grids, microgrids and local energy communities. Simulations using Typhoon real-time simulator with HIL and SIL experiments.
- **Energy Technologies and Sustainable Design:** The Interdepartmental Postgraduate Programme Energy Technologies and Sustainable Design» (IPP-ETSD) offers specialization in the discipline of Energy Technologies within the frame of Sustainable Design.
- **Smart Energy - Mastering the Energy Landscape of the Future:** This Smart Energy Certificate Programme examines the complex role digital transformation plays in energy production, distribution and consumption. It also offers practical frameworks for devising a sophisticated deployment strategy. Core elements of digitalisation in the energy transition - demand flexibility methods like dynamic pricing, virtual power plants and smart city management - are approached from a technical as well as systemic angle. From the role of big data and machine learning in real-time digital energy transactions to anticipating the influence of regulatory changes and data privacy developments on consumer behaviour, the programme prepares participants to lead digital transformation inside their organisations.
- **EWI Academy:** The target group for this series is, in particular, lateral entrants and newcomers to the energy industry who would like to gain a compact insight into the most important current topics and a fundamental understanding of the complex economic structures of electricity supply.
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** It is designed to update senior professionals to help them understand how digital technologies may contribute to improving their business, processes, etc.
- **MSc Energy Production and Management:** Deepening of engineers in techniques and methods of a more integrated interdisciplinary approach, research and treatment of the individual topics of the energy subject. Training new engineers in the concept of developing new aknowledge through research in this continuously developing field.
- **Executive Program in Infra Service Management:** This program address strategical challenges that energy companies face by creating awareness, ensure understanding of ICT strategical impact and leverage on energy businesses as well as business model and operational opportunities and challenges.
- **Master's Degree in Smart Grids:** Because it responds to the growing demand for engineers, needed to lead the ongoing process of the digitalization of the electric grid.
- **Artificial Intelligence MOOC Series:** The series titled "Introduction to Artificial Intelligence" is aimed at providing technical and non-technical, including historical and political, notions on artificial intelligence for

professionals of every sectors. The series investigates why artificial intelligence is nowadays considered the most disruptive enabling technologies up to at least 2050 and gives basic groundings for a preliminary approach to the area. It also deepens ethical issues and national strategies.

Definition of targets

- **Master's in Smart Electrical Networks and Systems (SENSE):** Designing electrical or electronic systems or equipment, ESCO: S1.11.2 – Targeted occupation: Science and Engineering Professionals, ESCO: 21
- **Energy Technologies and Sustainable Design:** Science and Engineering Professionals, ESCO: 21 – Targeted occupation: Architects, Planners, Surveyors and Designers, Building architects, ESCO: 216, 2161 – Tools: providing information regarding designs, materials, energy reservation
  Comments: compliance with specifications and quality standards, inspecting sites and consulting clients
- **Smart Energy - Mastering the Energy Landscape of the Future:** Data management and analysis, Big data, additional topics, ESCO: 041 Business and Administration – Targeted occupation: Employees (mid-career stage)
- **EWI Academy:** General Overview of the Energy Industry, ESCO: 242 – Targeted occupation: Regulatory issues, ESCO: 261
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** inter-disciplinary programmes and qualifications involving engineering, manufacturing and construction, ESCO: http://data.europa.eu/esco/isced-f/0788 - Targeted professionals: Senior profiles aiming at leading digital transformation processes – Tools: Innovative education techniques (case method, flipped classroom, etc.).
- **Executive Program in Infra Service Management:** Strategic implications of ICT in energy businesses – Targeted occupations: Senior Officials ,Administrative and Commercial Managers, ESCO: 11, 12
- **Master's Degree in Smart Grids:** ICT, big data analysis, operation and planning of distribution system, power electronics, electricity market regulation – Targeted occupations: Engineers for electric power utilities, electric power and system suppliers, administrative in government and regulatory agencies, energy sector consultants, researchers
- **Artificial Intelligence MOOC Series:** Principles of artificial intelligence, ESCO: http://data.europa.eu/esco/skill/e465a154-93f7-4973-9ce1-31659fe16dd2

Profiles of most important partners

- **Master's in Smart Electrical Networks and Systems (SENSE):**
  1) UPC, Grenoble INP, TU/e, KUL, Uppsala University and AGH – Role: University partners
  2) ESADE - Business school – Role: Providing an extensive course on Business creation and entrepreneurship
  3) Industrial partners – Role: Contribute with study visits, guest lectures, student projects and master thesis projects

- **Energy Technologies and Sustainable Design**
  No partners

- **Smart Energy - Mastering the Energy Landscape of the Future**
  1) University of Cologne Business School – Role: Host of the course

- **EWI Academy**
  1) Large German Utility Companies

- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation)**
  This program is pushed by the Chair in Smart Industry, which have 12 partners. But we should not say

that there are partners from the ICAI School of Engineering perspective.

- **Executive Program in Infra Service Management**
  1) Academic faculty
  2) Experts – Role: consultants and practitioners
  Comments: The operational planning is adapting the curriculum and secure a story line based on   - The strategic role of energy companies (history, new demands facing the business, the role of ICT and sustainability) - what is driving change and why - Business design for energy companies -. the role of ICT, cybersecurity, business models, ICT organisation, methods to create value - Take advantage of trends and ICT - platforms, ecosystems, market shaping, big data, - Leadership and change - acting in an uncertain business context

- **Master's Degree in Smart Grids**
  1) Comillas Pontifical University – Role: Teaching 30 ECTS
  2) Strathclyde – Role: Teaching 30 ECTS
  3) Iberdrola – Role: Internship and Master Thesis 30 ECTS
  Comments: There is a director and a coordinator in each partner. There is a management board to take decisions related to the operation and planning of the master. Every subject also has a coordinator.

- **Artificial Intelligence MOOC Series**
  No partners

B.3 Data gathered on Business and operational model - Program design

Operations management

- **Smart Distribution Grids:** The program is hosted within the Electrical Eng Dept at University Politehnica of Bucharest.
- **Energy Technologies and Sustainable Design:** The Inter-departmental Post-graduate Program "Energy Technologies and Sustainable Design" is offered by the School of Engineering of the University of Cyprus. Program courses are offered by all Engineering School Departments - the Department of Architecture, the Department of Civil and Environmental Engineering, the Department of Electrical and Computer Engineering and the Department of Mechanical and Manufacturing Engineering. The classes and labs are provided by the relevant to each subject department.
- **Smart Energy - Mastering the Energy Landscape of the Future:** yet to be decided
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** The director of the program is in contact with CEOs of local and global companies for them to have lunch with participants on Friday. He is also in charge of the list of professors and the committee which assesses the work of the different groups at the end of the program.   Then, there is an administrative assistant who takes care of everything is running smooth, which includes support to participants during enrolling, contact with IT support for professor before and during their lectures, etc.
- **Executive Program in Infra Service Management:** The operational planning is adapting the curriculum and secure a story line based on   - The strategic role of energy companies (history, new demands facing the business, the role of ICT and sustainability) - what is driving change and why - Business design for energy companies -. the role of ICT, cybersecurity, business models, ICT organisation, methods to create value - Take advantage of trends and ICT - platforms, ecosystems, market shaping, big data, - Leadership and change - acting in an uncertain business context.
- **Master's Degree in Smart Grids:** There is a director and a coordinator in each partner. There is a management board to take decisions related to the operation and planning of the master. Every subject also has a coordinator.

Plans for finance

- **Master's in Smart Electrical Networks and Systems (SENSE):** EIT InnoEnergy is partly funded by the EU through the European Institute of Innovation and Technology (EIT), and from the contributions of our 26 shareholders. As a commercial company, it is also financed by returns from the innovative products it sells, and the products and companies it invests in.
- **Smart Distribution Grids:** The program is financed as part of a Master Program.
- **Energy Technologies and Sustainable Design:** There are no sponsorships or subsidies/grants Students pay their own tuition. The fees for Master degrees are: €5.125.
- **Smart Energy - Mastering the Energy Landscape of the Future:** Via Tuition (9.750 €)
- **EWI Academy:** Paid by corporations for their staff. Price depending on booked modules and participants.
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** The tuition finances the program.
- **MSc Energy Production and Management:** The program is public and free of charge.
- **Executive Program in Infra Service Management:** The program fee is 15000 Euro per participant.
- **Master's Degree in Smart Grids:** The program is fully funded by the student's tuition fees.
- **Artificial Intelligence MOOC Series:** The University (POLIMI) will provide all the resource in terms of maintenance of the series on the POLIMI OPEN KNOWLEDGE PLATFORM (https://www.pok.polimi.it/)

Use of resources and physical/ virtual facilities

- **Master's in Smart Electrical Networks and Systems (SENSE):** The first year of the program is at KTH Royal Insitute of Technology in Sweden, and the students select the second year university to follow at one of four universities below: - Grenoble INP: Institute of Technology, France - KU Leuven, Belgium - UPC: Universitat Politècnica de Catalunya · BarcelonaTech, Spain - TU/e: Eindhoven University of Technology, the Netherlands
- **Smart Distribution Grids:** For simulations, students will need a laptop. The other experiments tools are provided by the existing infrastructure in the lab.
- **Energy Technologies and Sustainable Design:** Physical facilities in each department are used, electrical and computer engineering department provides the Photovoltaic   technology lab.
- **Smart Energy - Mastering the Energy Landscape of the Future:** On-Campus within the facilities of the University of Cologne Business School
- **EWI Academy:** Only online
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** The program takes place in a classroom, but it is offered in a blended format, so it is possible for participants to virtually attend classes, which requires the classroom to be equipped with camera, microphone, etc. Of course, we also require IT support for that.
- **MSc Energy Production and Management:** The resources needed for the program is just lecture classes.
- **Executive Program in Infra Service Management:** We use a faculty of experts in the specified fields. We used flipped class room - so we have recorded key elements that we process. We use IRL facilities.
- **Master's Degree in Smart Grids:** Teaching rooms and laboratories. Tools for remote connection during covid-19.
- **Artificial Intelligence MOOC Series:** We need the platform https://www.pok.polimi.it/. The program could be soon uploaded on COURSERA (https://www.coursera.org/polimi).

Does the program generate output which needs to be licensed?

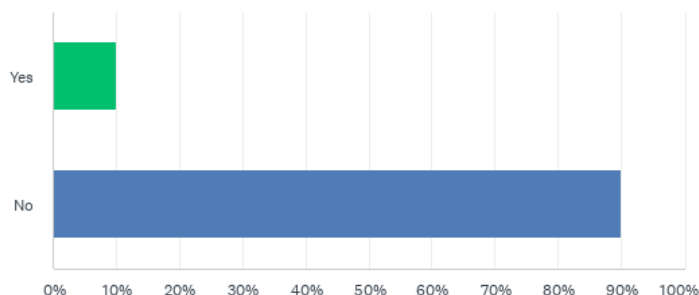## Q26 Does the program generate output which needs to be licensed?

Figure 18 Licensed output data

- **Artificial Intelligence MOOC Series:** The MOOCs are licensed under a Creative Commons Attribution-NonCommercial 4.0 International License (http://creativecommons.org/licenses/by-nc/4.0/)

Marketing and student recruitment

- **Master's in Smart Electrical Networks and Systems (SENSE):** Operating at the centre of the energy transition, EIT InnoEnergy builds connections worldwide, bringing together innovators and industry, entrepreneurs and investors, graduates and employers. It is the largest sustainable energy innovation ecosystem in the world and supports the SENSE master's program. The applications will be checked by the Admissions Office for general eligibility. The program selection committees will then check whether the applicants fulfil the program-specific eligibility criteria. Eligible candidates are then evaluated and ranked based on a range of criteria, such as grades, scores or GPA, the content of previous studies, the quality of your previous universities, and other relevant experience. There are no tests or interviews in the selection process.
- **Smart Distribution Grids:** The program is mandatory for first year master. The advertising is made using the UPB website and Faculty website
- **Energy Technologies and Sustainable Design:** Program is promoted in all engineering school departments with presentations. Hard copy and electronic Flyers are regularly sent to professional engineering bodies in the country.
- **Smart Energy - Mastering the Energy Landscape of the Future:** Marketing through the University of Cologne Business School
- **EWI Academy:** Acquisition through the network of the Institute
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** The program is mainly offered to industrial companies in Madrid. The marketing effort required is becoming less intense as the program alumni recommend it to pairs. The main pattern in the recruiting process is a company offering the program to an employee as part of her long life learning process.
- **MSc Energy Production and Management:** Promotion of the program could be realized through informative conferences. Also, through promoting website of the program. Via the website the achievements of graduates of the program, career opportunities and the many fields of energy section studied could be the highlights of a promoting procedure.
- **Executive Program in Infra Service Management:** Through alumni - Targeted e-mail - Direct sales
- **Master's Degree in Smart Grids:** The program is promoted by marketing in Social Networks, websites and by promoting activities with current students that may attract attention from future students.
- **Artificial Intelligence MOOC Series:** Social accounts (https://twitter.com/pokpolimi, https://www.facebook.com/polimiopenknowledge/), and University internal dissemination

B.4 Data gathered on Business and operational model - Implementation and success records

Certification – Types of certificate

- **Smart Distribution Grids:** Typhoon HIL, Matlab
- **Energy Technologies and Sustainable Design:** none
- **Smart Energy - Mastering the Energy Landscape of the Future:** yet to be decided
- **EWI Academy:** none
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** For its design, and target profiles, this program does not require to be certified. Nevertheless, the ICAI School of Engineering expedes a certificate for participants.
- **Executive Program in Infra Service Management:** Board review of methods and review of participating companies adaptation strategies
- **Master's Degree in Smart Grids:** Currently, there is no external certification
- **Artificial Intelligence MOOC Series:** No certification

Recruitment targets in terms of targeted skill gaps and content

- **Master's in Smart Electrical Networks and Systems (SENSE):** The target skills are to develop the technical and entrepreneurial skills needed to design smart grids that integrate renewable energy sources, manage and control power quality, use data-driven applications to enhance electrical solutions, and lead the development of innovations such as battery applications, electric mobility, and more. The program focuses on innovative solutions that are relevant to electric power.
- **Energy Technologies and Sustainable Design:** European energy efficiency introduction classes for buildings and means of achieving higher classes for the various cases. Technology issues New materials Energy conservation Heating and cooling Distributed energy generation for architects   Net-metering and net-billing mechanisms Subsidies and schemes
- **Smart Energy - Mastering the Energy Landscape of the Future:** open due to Covid-19
- **EWI Academy:** The target group for this series is, in particular, lateral entrants and newcomers to the energy industry who would like to gain a compact insight into the most important current topics and a fundamental understanding of the complex economic structures of electricity supply.
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** We target professionals with from 5 to 15 years of experience who require a deeper understanding of when technology may improve her company, and when it may not, i.e. professionals who aspire to leading digital transformation processes.
- **Executive Program in Infra Service Management:** We provide participants with clear view of our agenda with Clear learning objectives as well as clear personal impact objectives. We are based on our curriculum setting Impact objectives together with participants for organizational impact.
- **Master's Degree in Smart Grids:** ICT, big data analysis, operation and planning of distribution system, power electronics, electricity market regulation
- **Artificial Intelligence MOOC Series:** No specific targets

Financial targets in terms of profit and sustainability

- **Master's in Smart Electrical Networks and Systems (SENSE):** InnoEnergy as a whole has the financial target to run the different InnoEnergy programs completely on tuition fees. Presently 18 k€/student/year.
- **Energy Technologies and Sustainable Design:** Departments consider the number of students taking the program needs to be higher than 25 in order to be run sustainably.

- **Smart Energy - Mastering the Energy Landscape of the Future:** open due to Covid-19
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** 16-20 participants, which is the program target for optimal working dynamics reasons, make the program economically sustainable.
- **Executive Program in Infra Service Management:** 15 -20 participants annually
- **Master's Degree in Smart Grids:** The program does not seek any profit objectives. It is only after being financially sustainable.
- **Artificial Intelligence MOOC Series:** No financial targets

B.5 Data gathered on Learning and teaching model - Program design

Target groups

- **Master's in Smart Electrical Networks and Systems (SENSE):** Graduated students of Bachelor's in electrical engineering, physical engineering, mechanical engineering, electronic engineering or any energy-related engineering subject.
- **Energy Technologies and Sustainable Design:** 21 Science and engineering professionals conducting research, enlarging, advising on or applying scientific knowledge obtained through the study of structures and properties of physical matter and phenomena, chemical characteristics and processes of various substances, materials and products, all forms of human, animal and plant life and of mathematical and statistical concepts and methods; advising on, designing and directing construction of buildings
- **Smart Energy - Mastering the Energy Landscape of the Future:** mid-career employees/ lower top management
- **EWI Academy:** The target group for this series is, in particular, lateral entrants and newcomers to the energy industry who would like to gain a compact insight into the most important current topics and a fundamental understanding of the complex economic structures of electricity supply.   ESCO: Mostly 24
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** All occupations under code 13 Also, codes 214 and 215
- **Executive Program in Infra Service Management:** 11 Chief Executives, Senior Officials and Legislators; 12 Administrative and Commercial Managers
- **Master's Degree in Smart Grids:** Electrical and telecommunication engineers
- **Artificial Intelligence MOOC Series:** Professionals http://data.europa.eu/esco/isco/C2 ; Technicians and associate professionals http://data.europa.eu/esco/isco/C3

Admission requirements

- **Master's in Smart Electrical Networks and Systems (SENSE):** Bachelor degree - English language proficiency, 60 ECTS credits or equivalent from your Bachelor's degree must be in the area of electrical engineering, 30 ECTS credits or equivalent from your Bachelor's degree must be in mathematics, applicants must have achieved an average grade of at least 75%.
- **Smart Distribution Grids:** Bachelor degree
- **Energy Technologies and Sustainable Design:** Bachelor degree, Graduate
- **Smart Energy - Mastering the Energy Landscape of the Future:** Graduate
- **EWI Academy:** Master degree, Graduate
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** No requirements
- **MSc Energy Production and Management:** Bachelor degree, Master degree - Degree from Greek Polytechnic schools which award 5 year integrated Bachelor and Master's
- **Executive Program in Infra Service Management:** Master degree - Senior management
- **Master's Degree in Smart Grids:** Bachelor degree, Graduate

- **Artificial Intelligence MOOC Series:** No requirements
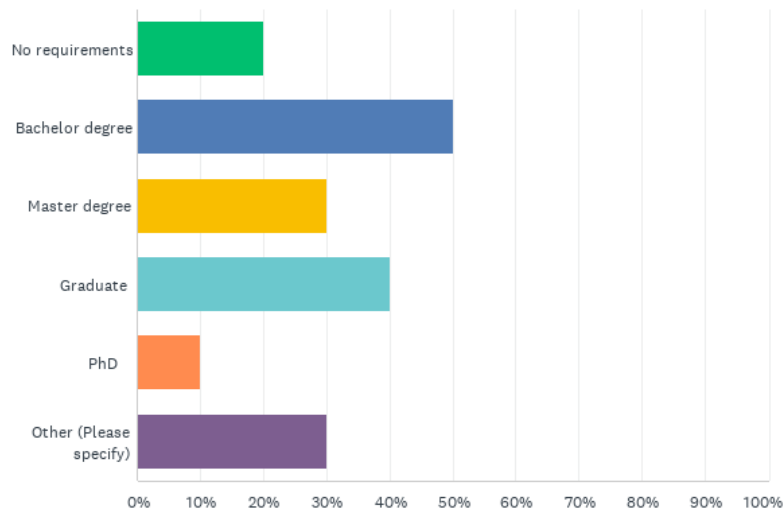
Q32 What are the admission requirements?

Figure 19 Admission requirements data

Training goals

- **Master's in Smart Electrical Networks and Systems (SENSE):** Master's in Smart Electrical Networks & Systems adds depth to students' studies while they engage directly with some of the biggest and most exciting companies in the field, meet business and technical experts, gain hands-on experience, and start building their own personal European network.
- **Smart Distribution Grids:** Students will understand how the smart distribution grids work, what are the technologies, the challenges, etc.
- **Energy Technologies and Sustainable Design:** Sustainability understanding efficiency understanding economic assessment of technologies skills Right choice of materials for the different types of construction Energy assessments
- **Smart Energy - Mastering the Energy Landscape of the Future:** On an organizational level? – support strategy development, support digital transformation. On an individual level? – form and educate leaders for energy sector
- **EWI Academy:** The workshop series offers an overview of current topics in the energy industry. To this end, the fundamentals of power supply and electricity markets and the most important trends are presented vividly.
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** Participants work on a digital transformation case. At the end of the program, it is possible to assess whether participants are able to focus on applying technologies to maximize their added value.
- **Executive Program in Infra Service Management:** This program addresses strategical challenges that energy companies face by   - creating awareness - ensure understanding of ICT strategical impact and leverage on energy businesses as well as   - business model and operational opportunities and challenges for energy companies.
- **Master's Degree in Smart Grids:** Train engineers to understand both the power system, telecommunications and regulatory aspects.

- **Artificial Intelligence MOOC Series:**
  MOOC 1: Artificial Intelligence: An Overview
  WEEK 1 explains the seminal ideas leading to the birth of AI, the major difficulties and how the international community overtook them. WEEK 2 describes what AI is today in terms of goals, scientific community, companies' interests. WEEK 3 describes the taxonomy of the know-how on AI in terms of techniques, software and hardware methodologies, and how they are related to each other. WEEK 4 explains the need for national strategies on AI. WEEK 5 identifies the major Italian and European players on AI and their scope.
  MOOC2: Ethics of Artificial Intelligence
  Week 1 describes the reasons for an ethical analysis applied to AI and Recognizes how the notion of responsibility is challenged when designing and using AI tools. Week 2 identifies the ethical and social impacts and implications of AI. Recognize and analyze ethical and social issues inherent in AI by means of examples and case-studies analyzed with the use of the main ethical frameworks. Week 3: Learn how to analyze problems through an ethical lens. Use critical skills in clarifying and ethically analyzing AI in different domains of life. Week 4: Critically analyze the current policies for AI. Use ethical and socially responsible principles in your professional life.
  MOOC3: Artificial Intelligence and legal issues
  Week 1 - Recognize that the use of AI requires to be analysed, evaluated and addressed also from a legal point of view. Week 2 - Indicate the main legal concepts of liability for the conduct and choices made by or through intelligent systems and compensation for any consequential damage. Identify the practical impacts of responsibility and compensation for damages caused from AI, with specific reference to case-studies. Verify whether and which criminal law principles apply when an offence is committed by an AI system. Week 3 - Recognize the difference between copyright and patent with respect to the protection of AI systems created. Identify legislative gaps with respect to the protection of works created autonomously by AI. Week 4 - Recognize the risks to fundamental rights and freedoms deriving from non-regulated uses of AI. Identify the principal conditions for data processing and the limits set out by the law to protect privacy and human rights.
  MOOC4: Technologies and platforms for Artificial Intelligence
  Week 1 - Describe the technological scenario of AI (Cloud, Edge, IoT) from an IT perspective. Week 2 - Explain the Cloud-based approaches for AI comprising machine- and deep-learning-as-a-service. Describe the role of Hardware Accelerators in the growth of AI. Week 3 - Identify the Machine and Deep Learning techniques and solutions developed for IoT and Edge Computing systems. Week 4 - Explain the main challenges and opportunities of technologies and platforms for AI.

Detailed description of program content

- **Master's in Smart Electrical Networks and Systems (SENSE):** All students follow their first year of studies at KTH: Royal Institute of Technology, in Stockholm, Sweden. There, you focus on the fundamentals of electric energy systems, including power systems, power electronics, electrical machines, renewable generation, high-voltage engineering and more. Students also take part in the program's European Modules which cover topics such as energy efficiency, storage options, energy generation, and more. Students learn from experts located across the continent at our partner universities and engage in industry visits to companies such as ABB and Scania, leaders in the electrification of the transport industry in Sweden. For the second year, students choose an area in which to specialize at one of four universities: - Energy Management in Buildings and Power Grids at Grenoble INP: Institute of Technology, France - Power Distribution and Storage, at KU Leuven, Belgium - Power Electronics as Enabling Technology for Renewable   integration, at UPC: Universitat Politècnica de Catalunya · BarcelonaTech, Spain   -Sustainable Electrical Energy Systems, at TU/e: Eindhoven University of Technology, the Netherlands   Students complete the second and final year with a Master's thesis, which they undertake at one of EIT industrial or research partners.
- **Energy Technologies and Sustainable Design:** ECTS   MME 516 Renewable Energy Technology 8, POL 500 Basic Principles of Interdisciplinary Engineering 1, POL 601 Graduate Seminar 1, POL 604 Capstone Design and Research Project 1, 8 CEE 536 Energy Efficiency of Buildings 8 ARH 538 Environmental Building Design 8 ECE 687Building Integration of Photovoltaic (PV): Towards nearly zero energy buildings (NZEB) 8 POL 700 Engagement With Practice and Industry

1 POL 704 Capstone Design and Research Project II 8 POL 804 Capstone Design Research Project III 8   Electives from all departments available"

- **Smart Energy - Mastering the Energy Landscape of the Future:** Module 1 Transforming the Energy Business -Understand the essentials of energy, digitalisation and data analytics -Learn the most important fundamentals regarding today's energy landscape. -Be able to assess the impact of digitalisation on the modern energy sector. -Learn about future developments and the influence of innovation in the energy landscape. Module 2 Smart Mobility -Learn about the history of transportation from the industrialisation age up to today and gain an outlook into future developments and new business models. -Gain insights into different energy sources for transportation and their advantages and disadvantages regarding economics and sustainability. -Assess the impact of mobile solutions with the help of modern data analysis techniques. Module 3 Smart Customer and Home -Be up to date on the latest developments and innovations in home automation and learn about its risks and opportunities. -Gain insights into human behaviour and preferences, including non-monetary preferences in energy. -Learn about the analytic potential of data gained from Smart Home technology. Module 4 Smart City and Infrastructure -Learn about the newly defined role of cities and their infrastructures in the digital era. -Gain insights into energy infrastructures, their implications, and the regulatory framework surrounding them. -Get to know the latest methods and technology in the energy sector including: Blockchain, Smart Contracts, Energy Virtualisation and Urban Analytics.
- **EWI Academy:** 1. Energy Management Compact, 2. Crash course energy scenarios, 3. Hydrogen economy - challenges and opportunities, 4. E-Mobility - Challenges and Opportunities
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** https://www.comillas.edu/postgrado/programa-avanzado-en-industria-conectada
- **MSc Energy Production and Management:** Successful completion of studies requires: 1.adequate attendance of all courses and workshops 2.successful examination in all courses 3.elaboration of a postgraduate thesis and successful examination
- **Executive Program in Infra Service Management:** The operational planning is adapting the curriculum and secure a story line based on   - The strategic role of energy companies (history, new demands facing the business, the role of ICT and sustainability) - what is driving change and why - Business design for energy companies -. the role of ICT, cybersecurity, business models, ICT organisation, methods to create value - Take advantage of trends and ICT - platforms, ecosystems, market shaping, big data, - Leadership and change - acting in an uncertain business context
- **Master's Degree in Smart Grids:** First period (Comillas) 30 ECTS Fundamentals of Power Systems or Fundamentals of   Telecommunications Regulations and New Business Models Operation and Planning of Future Distribution Networks Telecommunications for Smart Grids Leadership, Change Management and Corporate Responsibility   Second period (Strathclyde) 30 ECTS Data Analytics and AI for Energy System Control and Protection of Future Networks Offsore and Pan European Supergrids Hardware IoT Communications System Design Power Electronics for Transmission and Distribution Networks 5G Communications Networks   Third period (Iberdrola) Internships + Master Thesis
- **Artificial Intelligence MOOC Series:** MOOC1: Artificial Intelligence: An Overview, The course is structured in 5 weeks: Week 1: History of AI, Week 2: AI Today, Week 3: AI Research Areas Week 4: AI National Strategies Week 5: Italian and European Players In particular, Week 1 introduces the history of AI explaining what AI is, when it was born and its phases. Week 2 explores the situation of AI today focusing on its goals, its problems and progresses in the scientific community and companies. Week 3 explores research areas, while Week 4 examines national strategies in the USA, in China and in Europe. Finally, Week 5 focuses on Italian and European players: MISE, CINI Labs, AIxIA, and European Networks of Excellence.   MOOC2: Ethics of Artificial Intelligence, The course is organized in 4 weeks. Week 1: Ethics, AI and Responsibility Week 2: Case-studies, examples and ethical frameworks Week 3: Issues and challenges Week 4: Governance and policies In particular, Week 1 introduces the concepts of ethics, AI and moral responsibility, explaining why it is necessary to consider ethical issues in AI and the relationship between responsibility and AI; Week 2 and 3 explore different ethical frameworks, case-studies, examples, such as digital medicine, sustainability, cybersecurity, analyze privacy in relation to AI and the so called moralizing technologies and their issues. . Week 4 introduces some of the issues about governance of AI and presents some of the current policies for AI.   MOOC3: Artificial Intelligence and legal issues. The course is structured in 4 weeks. Week 1 – Artificial Intelligence, Law and legal issues Week 2 – Artificial Intelligence and Liability, Week 3 – Artificial Intelligence and Intellectual Property,

Week 4 – Artificial Intelligence and risks to fundamental rights. In particular, Week 1 will introduce the topic of Artificial Intelligence and the state of the art of its regulation at legislative level. The main legal issues will also be introduced. In Week 2 the liability aspects of using and manufacturing Artificial Intelligence will be analysed, focusing on the existing legal framework about civil liability both arising from contractual and non-contractual damages and eventually about criminal liability. Week 3 will focus on Artificial Intelligence systems's intellectual property aspects, both in terms of the protection of the AI system created and the protection of the work created by an AI system. Week 4 focuses on the risks to fundamental rights arising from the usage of Artificial Intelligence, such as privacy, information and massive surveillance and related potentially compressed freedoms.   MOOC4: Technologies and platforms for Artificial Intelligence, The course is structured in 4 weeks.   Week 1: IT and AI, Week 2: AI on the cloud, Week 3: Embedded and Edge AI, Week 4: Challenges and opportunities. In particular, Week 1 explains the IT perspective for AI and describes hardware technologies for AI; Week 2 focuses on AI on the Cloud by exploring the typical architecture of Cloud-based AI applications and the role of AI hardware accelerators (i.e., GPU, TPU and FPGA). Week 3 is about Embedded and Edge AI, and finally Week 4 explores challenges and opportunities for AI and technologies. In particular, Week 1 explains the IT perspective for AI and describes hardware technologies for AI; Week 2 focuses on AI on the Cloud by exploring the typical architecture of Cloud-based AI applications and the role of AI hardware accelerators (i.e., GPU, TPU and FPGA). Week 3 is about Embedded and Edge AI, and finally Week 4 explores challenges and opportunities for AI and technologies.

Teaching and evaluation methods

- **Master's in Smart Electrical Networks and Systems (SENSE):** All possible teaching and evaluation methods are used like lectures, exercises, seminars, projects, laboratory exercises, internships, etc. Evaluation methods vary from written exams, project reports, oral presentations, short written tests.
- **Energy Technologies and Sustainable Design:** Lectures Tutorials Labs Exams
- **Smart Energy - Mastering the Energy Landscape of the Future:** yet to be decided
- **EWI Academy:** Live surveys
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** Classes are scheduled to deliver the required tools for participants to work on their cases.   Professors use innovative methods like the flipped classroom, etc.   For the seniority of participants, evaluation is performed in a qualitative way, with a personalized detailed report at the end of the program.
- **MSc Energy Production and Management:** Teaching methods include lectures in class but also lab facilities so the students get hands on experience with the equipment. Final exams but also, half-year reports in some courses are the evaluation methods.
- **Executive Program in Infra Service Management:** A combination of Flipped class room, Action based learning, Traditional learning, Case based learning
- **Master's Degree in Smart Grids:** Combination of theory exams, tests, practices and laboratory reports, and analysis of practical cases.
- **Artificial Intelligence MOOC Series:** To successfully complete this course, and henceforth receive the certificate of accomplishment, it is necessary to pass the weekly quizzes with 60% or more.

Use of digital tools

- **Master's in Smart Electrical Networks and Systems (SENSE):** The teachers use in general many teaching methods based on digital tools such as different LMS systems like Canvas. InnoEnergy has partnered with Learnify Repository for collecting and sharing developed digitalized tools. These tools can be anything from small Matlab mlx examples to more advanced game types of software. InnoEnergy has invested in at least one Virtual Hybrid Class Room (VHCR) in each university (based on zoom). These rooms provide the opportunity to use hybrid forms of teaching.
- **Energy Technologies and Sustainable Design:** Virtual labs on PVs and zero energy buildings are integral part of the program
- **Smart Energy - Mastering the Energy Landscape of the Future:** yet to be decided

- **EWI Academy:** Zoom and Live surveys
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** All the tools required for virtual teaching. Specific applied tools like virtual reality and others, oriented to make participants understand their disruptive potential.
- **MSc Energy Production and Management:** The program is trying to adjust to the digital transformation in all sectors. Digital tools relevant to the requirements of the aims of each course are used. Such tools include programming tools like MATLAB, Simulink, Smath, EnergyPlus, Python, TEE-KENAK (Greek standard for electrical installations).
- **Executive Program in Infra Service Management:** LMS
- **Master's Degree in Smart Grids:** By using digital tools (MATLAB/MATPOWER, Python, etc.) it is possible to simulate real cases to better understand the concepts.
- **Artificial Intelligence MOOC Series:** The course is uploaded on a digital platform and it is totally asynchronous.

Does the program include internships or "on-the-job" training?

- **Master's in Smart Electrical Networks and Systems (SENSE): -** Year 1 students take an Industrial Innovation Project where they work in close collaboration with industry players on developing innovative solutions to some of the problems they face. - In the summer between your first and second year, students attend a four-week course on entrepreneurship at the ESADE Business School in Barcelona. - The Battle of Green Talent is an online entrepreneurship competition designed for all EIT InnoEnergy students. During 6 months, students transform their bright ideas into promising businesses while competing with peers, interacting with virtual investors from top business schools around the world, and getting advice from experienced business creation professionals. - Year 2 students undertake master thesis at one of the program's industry partners.
- **Energy Technologies and Sustainable Design:** Laboratory work as part of final project.
- **Smart Energy - Mastering the Energy Landscape of the Future:** No, but one Capstone Seminar
- **EWI Academy:** No
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** No. Participants are indeed working at their companies during the program.
- **MSc Energy Production and Management:** The program provides the students in the last year with career opportunities, providing information for job vacancies in several energy entities.
- **Executive Program in Infra Service Management:** No
- **Master's Degree in Smart Grids:** Yes, it includes an internship and Master Thesis of 30 ECTs in Iberdrola.
- **Artificial Intelligence MOOC Series:** No

General program schedule

- **Master's in Smart Electrical Networks and Systems (SENSE):** SENSE master's program is a full-time two-year program.
- **Energy Technologies and Sustainable Design:** Three semester program - Can be extended for part time students by allowing to be extended up to 3 years.
- **Smart Energy - Mastering the Energy Landscape of the Future:** intensive short course
- **EWI Academy:** intensive short course
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** The program duration is 6 months, but the equivalent load is only 16 ECTS. It takes place on Friday afternoon and Saturday morning for professionals to conveniently attend classes.
- **Executive Program in Infra Service Management:** 4 modules, three days each

- **Master's Degree in Smart Grids:** One year course, from September to mid-May in Comillas and Strathclyde, and then an internship and thesis master in Iberdrola from mid-May to early September.
- **Artificial Intelligence MOOC Series:** 4 Short courses of 5 (MOOC1) or 4 weeks (MOOC 2, 3 and 4). Each MOOC has an estimated effort of 1-2 hours per week.

Certification criteria

- **Energy Technologies and Sustainable Design:** Fulfill the assessment requirements of all courses and labs
- **Smart Energy - Mastering the Energy Landscape of the Future:** Min 3 Years of postgraduate work experience
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** We mainly measure their performance by assessing their work on their case.
- **MSc Energy Production and Management:** The certification criteria for joining the program are: the general degree of the diploma / degree, the order of the diploma / degree in relation to the grades of the other graduates in the same School / Department and academic year, the score in the undergraduate courses that are related to the postgraduate program, the performance in the diploma thesis, where it is foreseen at the undergraduate level, any other postgraduate qualifications related to the subject of the IPR, the research, professional and / or technological activity of the candidate, knowledge of foreign languages and at least English, and for foreigners the knowledge of the Greek language, letters of recommendation.
- **Executive Program in Infra Service Management:** Completion and engagement during the modules
- **Master's Degree in Smart Grids:** Students must pass all subjects in order to get the master's degree from both Universities.
- **Artificial Intelligence MOOC Series:** No certification

B.6 Data gathered on Learning and teaching model - Implementation and success records

Target results for individual certification

- **Energy Technologies and Sustainable Design:** No individual certification
- **Smart Energy - Mastering the Energy Landscape of the Future:** yet to be decided
- **EWI Academy:** obtain a high level Overview of the Energy sector
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** Again, this is made in a qualitative way. We assess whether they are able to apply digital technologies to maximize their added value to the company.
- **Executive Program in Infra Service Management:** NA
- **Master's Degree in Smart Grids:** Currently, only titles by Strathclyde and Comillas are provided. Currently, no official individual certification is provided.
- **Artificial Intelligence MOOC Series:** No targets

Target results for program certification

- **Energy Technologies and Sustainable Design:** All programs of study in the country provided by the Graduate School of the University of Cyprus are accredited by The Cyprus Agency of Quality Assurance and Accreditation in Higher Education (CYQAA).
- **Smart Energy - Mastering the Energy Landscape of the Future:** yet to be decided

- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** Not applicable.
- **Executive Program in Infra Service Management:** NA
- **Master's Degree in Smart Grids:** Currently, there is no official certification of the program.
- **Artificial Intelligence MOOC Series:** No targets

Expectations for alumni engagement

- **Master's in Smart Electrical Networks and Systems (SENSE):** It is really the plan to have them in the ecosystem of InnoEnergy during their lifetime. Hopefully, they also create start-ups, etc.
- **Energy Technologies and Sustainable Design:** Alumni are expected to promote the program usefulness within the engineering community engaged in new building designs and refurbishments.
- **Smart Energy - Mastering the Energy Landscape of the Future:** Limited due to the short time frame
- **EWI Academy:** None
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** We indeed have a formal mechanism for alumni to keep in touch. They are stablished as a community which meets once a month. In these meetings, they invite a professional who presents a technology or a good practice to the Advanced Program Alumni community.
- **Executive Program in Infra Service Management:** Yearly meeting and base for future recruitment
- **Master's Degree in Smart Grids:** Alumni engagement is carried out by involving the alumni in talks where they explain to students currently taking the program what their jobs after the master are like. Also, yearly meeting are created to help alumni stay connected between different cohorts.
- **Artificial Intelligence MOOC Series:** -

Expectations for employment feedback

- **Master's in Smart Electrical Networks and Systems (SENSE):** Around 94% of students are employed within six months after graduation. The most common job titles of the graduates are business dev. engineer, data/energy analyst, design engineer, energy management project engineer, and more. The top employers of the graduates are ABB, ASML, Deloitte, ENGIE, EDF, Fraunhoffer, Siemens, McKinsey & Company.
- **Energy Technologies and Sustainable Design:** Employees are expected to consider the program as desirable qualification.
- **Smart Energy - Mastering the Energy Landscape of the Future:** Positive, since their mid-career employees are enhanced to take on the next step.
- **EWI Academy:** Throughout positive so far
- **Programa Avanzado en Industria Conectada, Liderazgo y Transformación Digital (Advanced Program in Smart Industry, Leadership and Digital Transformation):** Employers are regularly offering the program to their employees, edition after edition, which we regard as the best feedback from companies.
- **MSc Energy Production and Management:** Employers can upskill or reskill employees by acquiring a strong theoretical background in the field of energy production, management and methods of energy saving, but also in the policy and regulation in the constantly changing energy sector.
- **Executive Program in Infra Service Management:** They are positive - we intend to make an impact from each module that the employer will experience.
- **Master's Degree in Smart Grids:** Response is very good. All students are employed after doing the master.
- **Artificial Intelligence MOOC Series:** We do not gather feedback from employers, but the MOOCs series offer an overview of a disruptive technology in a small amount of time.