



## Education for Digitalization of Energy

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### *Deliverable 5.1.*

# *Specification, conceptual design and application to the partial results compiled from other work packages*

## *(WP5-Blueprint: approach)*

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#### **Abstract:**

EDDIE is an Erasmus+ project funded by the EC within the SSA framework. The goal is to develop a self-sustainable long-driven strategy (Blueprint) towards the digitalisation of the European Energy sector, bringing together all the relevant stakeholders. This document describes an early version of the strategy, based in the creation of an institution that would provide –or help provide- services to the main stakeholders. This institution would manage a WEB platform to support the services and perform dissemination tasks. The services to be provided should help the digital-skills acquisition process: training, recruiting, working, re-training, identifying current skill gaps, and forecasting future needs. Some candidate services are proposed in the document. The main stakeholders considered are Industry (Energy and ICT sectors), Education (VET, University, and others), local Administration (national and regional levels), research institutions of any kind, and the European framework (projects, institutions, programs and centres). Other special stakeholders are related to potential partnership opportunities: associations, clusters, social networks and platforms. Some tasks described in the document are directly related to the services, while other tasks are useful to perform and/or to add value to those services – mainly the definition of standard templates and models.

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## Definitions, Acronyms and Abbreviations

|       |  |
|-------|--|
| BSDE  | Blueprint Strategy for Digitalisation of Energy              |
| EACEA | Education, Audiovisual and Culture Executive Agency          |
| EC    | European Commission  |
| ECTS  | European Credit Transfer System                              |
| EDDIE | Education for Digitalization of Energy                       |
| EQF   | European Qualifications Framework                            |
| ESCO  | European Skills, Competences, Qualifications and Occupations |
| ICT   | Information and Communication Technologies                   |
| P.O.  | Project Officer  |
| SSA   | Sector Skills Alliances                                      |
| VET   | Vocational Education and Training                            |
| WP#   | Working Package number #                                     |

## Executive Summary

This document is the deliverable “D5.1 Specification, conceptual design and application to the partial results compiled from other work packages” (WP5-Blueprint: approach), due for December 31<sup>st</sup>, 2021 (Month 24 of project EDDIE).

The structure of the document responds to the chronological evolution of tasks and partial results. However, detailed descriptions are gathered in annexes, in order to ease the understanding of the overall strategy.

EDDIE is an Erasmus+ project funded by the European Commission within the Sector Skills Alliances (SSA) framework. The goal is to develop a self-sustainable long-driven strategy (Blueprint) towards the digitalisation of the European Energy sector, bringing together all the relevant stakeholders. This goal requires facing relevant challenges in order to match the current and future demand of digital skills, such as:

- Contribute to the evolution of the training ecosystem to include the required digital skills -Vocational Education and Training (VET) and beyond.
- Contribute to an effective re-training in digital skills of the current and future workforce of the Energy Sector
- Improve the attractiveness of the Energy Sector as a career choice for digitally skilled workforce.

EDDIE will produce relevant documents and recommendations, but the main expected result is the BSDE (Blueprint Strategy for Digitalisation of Energy). The strategy is based in the creation of an institution (hereinafter the ENTITY) that would provide –or help provide- services to the main stakeholders involved in the digitalisation of the Energy Sector.

The legal nature of the ENTITY is still to be defined. Currently, it is conceived as a non-profit, low-cost and self-sustainable organisation. The main tasks performed by the ENTITY would be (1) Management of a WEB platform to support the intended services, and (2) Dissemination, including the organisation of events and the elaboration of reports.

The analysis of services to be provided is based in helping the digital-skills acquisition process. This process includes training, recruiting, working and re-training, based on identifying current skill gaps and forecasting future needs. Some candidate services are currently: (1) Research and dissemination portal, (2) Training programmes marketplace, (3) Jobs marketplace, and (4) Tools and systems marketplace. All these services would be specific for the core area of EDDIE: the digitalisation of the Energy Sector.

The main stakeholders considered are Industry (Energy Sector and sub-sectors, ICT Sector), Education (training providers in VET, University, and others), local Administration (national and regional levels), research institutions of any kind, and the European framework (projects, institutions, programs and centres). Other special stakeholders are related to potential partnership opportunities: associations, clusters, social networks and platforms.

Some tasks included in the Working Package, and therefore described in this document, are directly related to the services, analysed as business models –because of the desired sustainability of the strategy. Some other tasks are useful to perform and/or to add value to the services; for instance, the definition of a standard template for training programmes, or a standard “language” to describe skills.

# 1. Introduction

This document is an early –draft- version of deliverable “D5.1 WP5-Blueprint. Strategies, exploitation, challenges”, due for December 31<sup>st</sup>, 2021 (Month 24 of project EDDIE).

The reason for this particular version is the request from the P.O. (EACEA) after the assessment of the Technical Report #1, in order to provide early feedback to the Blueprint Strategy.

The structure of the document responds to the chronological evolution of tasks and partial results. However, detailed descriptions may be gathered in annexes, in order to ease the understanding of the overall strategy.

Section 2 describes the role of Work Package 5 in project EDDIE. First, the original role assigned in the proposal. Then, the evolution of the concept during the execution of the project, according to the strategy devised as an EDDIE result.

Section 3 explains the different stages of the analyses that have been carried out to define the strategy. The skill-acquisition process is modelled, in order to identify relevant stakeholders and tasks. A second analysis is applied to the main element of the process, the specialised training programme, identifying products, tasks, and targets related to its development process. Finally, the tasks identified in the former phases of the analysis are classified by type and subject; this classification will be later useful to define the roles or participation of stakeholders, and especially the role of the ENTITY – the organisation in charge of succeeding EDDIE beyond its termination as a sponsored project.

Section 4 is devoted to the strategy itself, and particularly to the roles and services provided by the ENTITY. First, those tasks in which the ENTITY may help but not participate actively. Second, the tasks in which the ENTITY would be actively involved. Finally, some candidate services are proposed and briefly described, together with some auxiliary tasks –subordinated or useful for the implementation of those services.

Section 5 describes how the different tasks in WP5 (and in the Blueprint definition) are planned, assigned to specific teams and leaders, and correlated to the original project proposal (original tasks and deliverables).

Section 6 is devoted to the individualised description of the tasks described in Section 4. These tasks will be developed in parallel by different teams, and led by different partners, but they must be consistent with an overall strategy. This section is devoted to the description of the individual guidelines that should be followed and will be subject to supervision and coordination. A separate sub-section is devoted to each task, including a description, the expected results, and some directions suggested to perform it.

Finally, attached documents or folders will gather extended descriptions, partial results and plans for each parallel task in the WP5 planning.

## 2. Role of WP5 in the EDDIE project

This section is devoted to placing WP5 and its tasks in context. First, according to the original proposal; second, within the development of the project during its first half, stressing the difference between the tasks performed during EDDIE and the long-term strategy to be devised.

### 2.1. Description of WP5 goals in the EDDIE proposal

The long-term objective is to help create (and continuously maintain in a sustainable way) a highly skilled workforce available for:

- The improvement of the competitiveness of the European Energy Sector
- The harmonisation of processes for an accurate and successful digitization
- A smart, inclusive, and sustainable growth

The WP5 goals, at the core of the EDDIE project, are:

- Develop: Blueprint Strategy for Digitalisation of Energy value chain (BSDE)
  - Based on a sustainable cooperation (and partnership) among key industry stakeholders, such as education/training providers, social partners, public authorities
  - Matching (1) current and future demand of skills, and (2) supply of improved/adapted transnational contents, tools, and methodologies from education/training providers
- Provide concrete examples –and recommendations– of policies/initiatives
  - At national/regional level
  - Aiming at addressing skills shortages and mismatches
- Including:
  - VET and beyond, at EQF levels 4 to 8, both for I-VET and C-VET
  - References to ECTS, ECVET, EQF, EQAVET, ESCO.
  - Technical, green, soft, and digital skills

Some EDDIE and WP5 extra features are:

- Energy-worker skill-profile database, foresight tools and modules, curricula for addressing sector skill gaps at local and member state level
- Europe wide certification strategy, for informal and formal education across Europe
- EU targets, two global frameworks: Energy Union Package, commitments in COP21
- Sustainable, low carbon, climate-friendly economy, ... consumers at centre, smart-grid technologies, active neutral market facilitation, integrate of flexibility services
- Stakeholders, database (organisations, profiles, interests, contacts, etc.) :
  - Education community, tools vendors, in-company universities, ...
  - Energy sector
  - Cross-cutting sectors: Decision-makers, environmental, social, public, media...

The EDDIE project is structured into the Work Packages shown in Figure 1. The planning of Work Package 5 is described in Figure 2, in terms of tasks, deliverables and participation of partners (workforce).

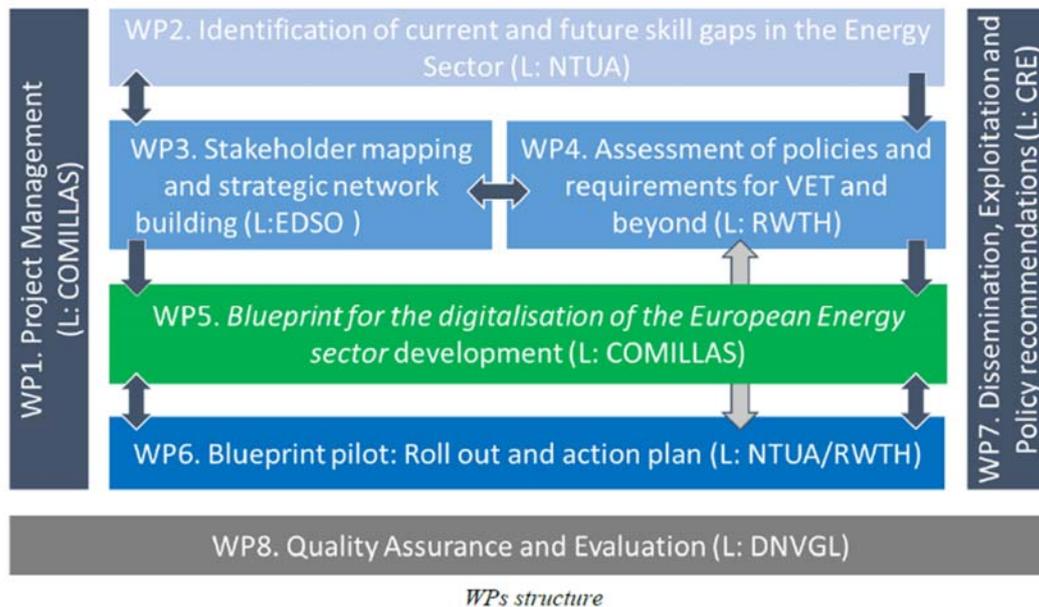


Figure 1. Structure of Work Packages in EDDIE

### Scheduling

| WP   | Title   | Leader   | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 |  |  |
|------|---|----------|---|----|----|----|----|----|----|----|--|--|
| WP5  | Blueprint for the digitalisation and decarbonisation of the European Energy | COMILLAS |   |    |    |    |    |    |    |    |  |  |
| T5.1 | Review and structuring of the current skill map in the energy sector        | COMILLAS |   |    |    |    |    |    |    |    |  |  |
| T5.2 | Analysis of levers to reduce skill gaps                                     | KTH      |   |    |    |    |    |    |    |    |  |  |
| T5.3 | Design of specific recommendations and overall action set                   | COMILLAS |   |    |    |    |    |    |    |    |  |  |
| T5.4 | Blueprint strategic roadmap   | COMILLAS |   |    |    |    |    |    |    |    |  |  |

### Deliverables

| WP   | Title   | Leader   | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 |  |  |
|------|---|----------|---|----|----|----|----|----|----|----|--|--|
| WP5  | Blueprint for the digitalisation and decarbonisation of the European Energy | COMILLAS |   |    |    |    |    |    |    |    |  |  |
| D5.1 | Specification, conceptual design and application to the partial results com | COMILLAS |   |    |    |    |    |    |    |    |  |  |
| D5.2 | Intermediate draft templates for educational programs                       | KTH      |   |    |    |    |    |    |    |    |  |  |
| D5.3 | Final education programmes and training activities                          | KTH      |   |    |    |    |    |    |    |    |  |  |
| D5.4 | Recommendations on how to improve the educational frameworks in the fo      | COMILLAS |   |    |    |    |    |    |    |    |  |  |
| D5.5 | BSDE presentation and strategic roadmap for the deployment of the action    | COMILLAS |   |    |    |    |    |    |    |    |  |  |

### Partners participation (days)

| WP  | Title   | Leader   | 1. COMILLAS | 2. NTUA | 3. RWTH | 4. FOSS | 5. POLIMI | 6. KTH | 7. PIQUER | 8. CRE | 9. REPSOL | 10. IBERDROLA | 11. GE | 12. DNV | 13. EDSO | 15. NOVEL | 16. UCES | 17. EWI |
|-----|---|----------|-------------|---------|---------|---------|-----------|--------|-----------|--------|-----------|---------------|--------|---------|----------|-----------|----------|---------|
| WP5 | Blueprint for the digitalisation and decarbonisation of the European Energy | COMILLAS | 792         | 201     | 149     | 258     | 134       | 352    | 211       | 262    | 272       | 321           | 220    | 60      | 155      | 189       | 60       | 114     |

Figure 2. WP5 planning in EDDIE: tasks, deliverables, and workforce

## 2.2. Blueprint definition and exploitation: during and after EDDIE

The BSDE (Blueprint Strategy for Digitalisation of Energy value chain) includes the long-term strategy, a business model to sustain it, and a roadmap to implement them in a progressive way.

The definition of the BSDE comprises a systematic analysis of:

- What to do? Meaning the tasks related to the strategy, and the purposes of those tasks (products, results)

- Who may do the tasks? Meaning the identification of the different stakeholders and their roles (contributions, collaborations) in the strategy.
- Why would they do the tasks? Meaning the cost/benefit analysis that could drive the different stakeholders to participate in the strategy in a sustainable and regular way
- How to manage, promote and coordinate the strategy? The answer to this question is related to the definition of a new stakeholder, the EDDIE-entity (or the ENTITY)

The definition and creation of the ENTITY, maybe just a prototype of it, is one of the main results expected from EDDIE-WP5. Some characteristics to be defined are: type of organisation (association, foundation, institute, chair...), structure (regional, sectorial), funding strategy (membership, access fees...), membership rules if any, services provided (roles-tasks), contributions, etc.

A critical point that deserves some clarification is the relation between the EDDIE project itself and the BSDE model after the termination of EDDIE, or even better, the transition from EDDIE to the ENTITY.

Every task and role about the present and future of EDDIE should be analysed to define the Blueprint strategy. However, it does not imply that those tasks and roles must be performed in full during EDDIE.

The idea -during EDDIE- is to define tasks and roles, to propose systematic procedures to perform them, and to propose a business model for the future ENTITY (such that the initiative can be self-sustainable). In order to prove the feasibility and consistency of the concept, some of those tasks will be partially performed within the EDDIE project scope:

- analysis of skill needs and gaps (WP2)
- analysis of stakeholders (WP3 and WP5)
- analysis of the current education context (WP2 and WP4)
- definition of program templates and examples (WP5)
- development of program instances in depth (WP6)
- suggestions of policies and action plans (WP4 and WP5)
- dissemination actions (WP7)

However, it is critical during EDDIE-WP5 to define a strategy and a business model that allows all these and other tasks to be performed without the explicit funding of the Agency (EACEA-EC) in a sustainable way and in a much more ambitious context, i.e., at a European scale for the whole Energy Sector. In other words, EDDIE must lead to a self-sustainable and scalable ENTITY in charge of managing and promoting the BSDE model. The exploitation model and strategy of EDDIE is identified with this transition process.

### 3. WP5. Systematic analyses towards a strategy

EDDIE will produce relevant documents and recommendations, and even some pilot training programmes, but the main expected result is the BSDE (Blueprint Strategy for Digitalisation of Energy). The strategy must seek the sustainability of the activities beyond EDDIE. We believe that the only way to keep stakeholders engaged is to provide useful services, and those services should be beneficial enough as to be monetizable to a certain extent.

The strategy is based in the creation of an institution (hereinafter the ENTITY) that would provide –or help provide– services to the main stakeholders involved in the digitalisation of the Energy Sector.

The legal nature of the ENTITY is still to be defined. Currently, it is conceived as a non-profit, low-cost and self-sustainable organisation. The main tasks performed by the ENTITY would be (1) Management of a WEB platform to support the intended services, and (2) Dissemination, including the organisation of events and the elaboration of reports.

There are relevant questions to be answered in order to design the strategy in detail. Some of them are:

- What types of tasks and services are relevant in the skill-acquisition process?
- What results or products would be valuable to the stakeholders?
- Who are the stakeholders that will provide or receive those services, and which would be their roles?
- How should the ENTITY be defined, in terms of legal nature, funding, membership, roles, tasks and contributions?
- Finally, how can the strategy fit best in the European framework (institutions, plans and projects)?

The analysis required to answer these questions has been carried out in several steps.

First, the adaptive-learning process for digital skills has been analysed. This process includes training, recruiting, working, and re-training, based on identifying current skill gaps and forecasting future needs. It provides a first sketch of the types of stakeholders involved in the process, and the types of tasks to be performed.

Second, the training programme has been analysed in detail because it plays a leading role in the abovementioned learning process. The analysis has been carried out following (1) the standard phases of development, from specification to test/validation, and (2) its two main dimensions, the business model, and the academic model. The results of the analysis have helped in two main aspects. On one hand, the refinement of tasks and stakeholders' identification. On the other hand, it provided the guidelines for the definition of a training programme template, a key element for some of the services that are proposed later in the document.

Third, and based in the two previous steps, an exhaustive list of tasks related to the strategy has been gathered in a structured way. This helps in the tasks, services and stakeholders analysis.

The fourth step is the proposal of specific services to be analysed. Some candidate services are currently: (1) Research and dissemination portal, (2) Training programmes marketplace, (3) Jobs marketplace, and (4) Tools and systems marketplace. All these services would be specific for the core area of EDDIE: the digitalisation of the Energy Sector.

Finally, some auxiliary tasks and products have been defined because they are useful to perform and/or to add value to the services. These tasks include the definition of a standard template for training programmes, a standard “language” to describe skills, the identification of best practices in different aspects of the process, and the definition of “flagship programmes” for the digitalisation of the Energy Sector. Another relevant and transversal task is the technical assessment – estimation of software and resources required for the different services, and implementation at a prototype level of those services.

#### 3.1. The adaptive-learning process for digital skills

Figure 3 shows a schematic representation of the target process to be improved, i.e., the digital skills acquisition through training and recruiting. This process is already working (of course) and in constant evolution. The main stakeholders (Energy Sector companies, digital systems developers, and Education & Training providers) do their

best to adapt to the constantly-changing needs, with the participation of other entities such as administrations, research groups and professional associations.

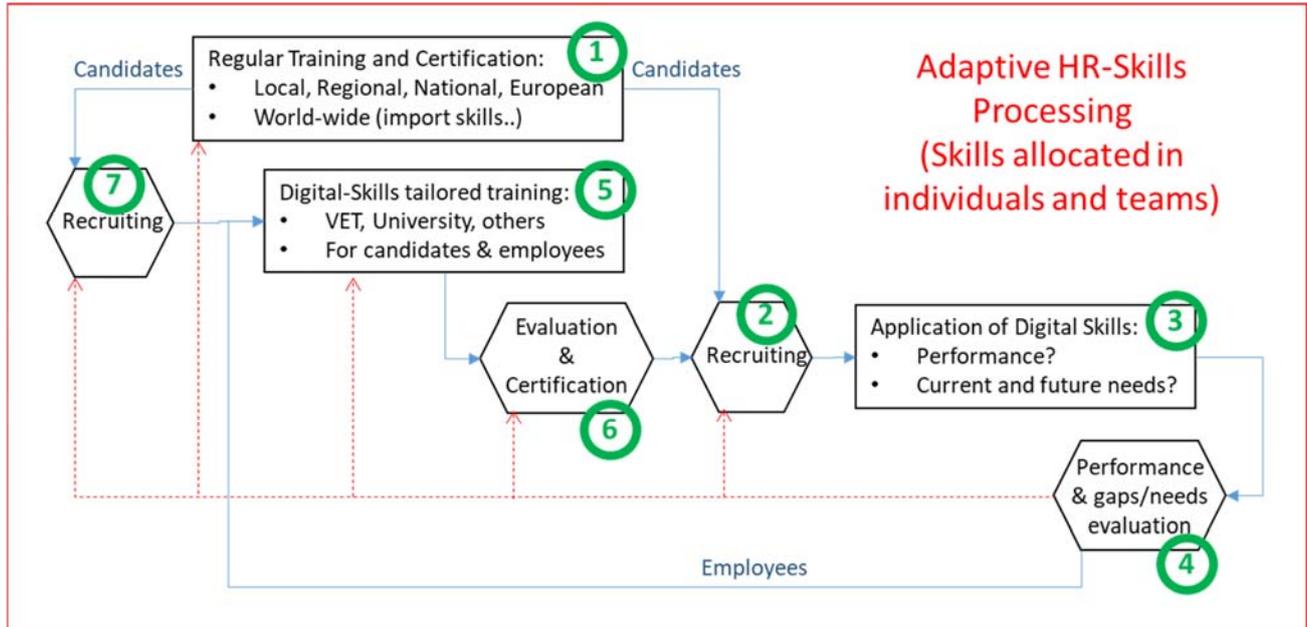


Figure 3. The adaptive-learning process for digital skills

In Figure 3, concepts are represented as follows:

- Blue arrows represent the flow of skilled individuals and therefore the flow of their skills and expertise.
- Black boxes represent activities. Using their numeric labels, the main activities are:
  - In (1) and (2), training
  - In (1) and (6), certification
  - In (2), recruiting of employees
  - In (7), recruiting of students
  - In (3), job development in the Energy Sector
  - In (3) and (4), research about digital tools and systems, new and upgraded jobs in the Sector, and the digital skills related to them
- Red arrows represent information flows from research about technology trends, methods, tools and future jobs (including diagnoses, prospective results, needs and requirements, suggestions, directions and policy recommendations)

This breakdown of the process into blocks and skill-flows allows a first-pass analysis of stakeholders and tasks:

- 1. Regular training and certification (standard national/regional systems).**
  - a. Stakeholders: Universities, VET schools, national/regional administrations, research institutions (for recommendations and guidelines), national/regional Industry (for dual training and internships)
  - b. Tasks: Training, research (about training needs and methods)
- 2. Recruiting of employees.**
  - a. Stakeholders: Industry, and –because of their job marketplaces and platforms- training providers, social networks, head-hunter companies and platforms, administrations
  - b. Tasks: Forecasting of future needs, performance evaluation, requirements definition (skill-based), selection, dissemination and search of job openings
- 3. Job development (application of digital skills).**
  - a. Stakeholders: Energy Sector Industry
  - b. Tasks: Job definition, performance evaluation, forecasting of future needs

#### 4. Performance & gaps/needs evaluation. 1

- a. Stakeholders: Energy Sector Industry, ICT Industry, research institutions, consulting companies
- b. Tasks: Research, forecasting of technologies and future needs, evaluation of performance

#### 5. Digital-skills tailored training (any system)

- a. Stakeholders: Universities, VET schools, MOOC platforms, research institutions (for current and future needs), Energy Sector and ICT Industry (companies may be training providers and partners collaborators)
- b. Tasks: Training, forecasting, research (about training needs and methods), sponsorship

#### 6. Evaluation & Certification (any system).

- a. Stakeholders: Universities, VET schools, MOOC platforms, Energy Sector and ICT Industry, administrations, certification and quality agencies.
- b. Tasks: Quality evaluation, certification

#### 7. Recruiting of students –for tailored training.

- a. Stakeholders: Universities, VET schools, MOOC platforms, Energy Sector and ICT Industry, training marketplaces and platforms
- b. Tasks: Requirements definition (skill-based), selection, dissemination and search of training opportunities, sponsorship

The main challenge of EDDIE is to design and implement a strategy to improve this process in terms of efficiency, flexibility, adaptability, agility, and quality in general.

## 3.2. Analysis of elements of training programmes

Skills acquisition in general, and digital skills in particular, will take place by a combination of daily work and specialised training. Training is critically required for qualitative improvements or changes of skill-sets. So we may use the context of a specialised training programme to analyse the “what to do” issue (tasks, products and results).

Figure 4 shows the first version of this analysis. The training programme is described as a project in a waterfall model, with its typical phases: specification, design, implementation, and the final test-validation phases (in this case, certification and feedback/validation). The target is just to identify as thoroughly as possible all the relevant topics and concepts related to the tasks in the BSDE model.

In Figure 4, for each phase of development, three groups of concepts are gathered:

- Targets and products, which are the main results of the phase
- Tasks and resources required to obtain the expected targets or products
- Related topics, tasks and products. These are general research activities and products that may help the systematic development of specialised programmes. For instance, the definition of a general template for training programmes may help in classifying best practices or describing programmes in a standard style, which will help providing recommendations, and finding the right programme for each need.

With respect to the results from the previous sub-section, this analysis provides further details about tasks such as sponsorship, research, jobs and skills definitions, and -especially- about the tailored training process.

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<sup>1</sup> Regarding the block “Performance & gaps/needs evaluation”, which is among other concerns devoted to measure the effects of actions taken and skill gaps, we have started a brief review of techniques to measure the performance of education systems. We believe that it could be interesting to review how to measure the way the energy system as a whole is obtaining the talent it needs. The references already reviewed are:

- Academic logics in changing performance measurement systems.
- Measuring motivation from the Virtual Learning Environment in secondary education.
- Quantifying Learning: Measuring Student Outcomes in Higher Education in England.
- What matters in education: a decomposition of educational outcomes with multiple measures.

| Training PROGRAMMES |                                     | EDDIE AND BEYOND: STAKEHOLDERS roles, cost/benefit analysis |  |
|---------------------|-------------------------------------|---|--|
| PHASE               | TARGETS/PRODUCTS                    | TASKS/RESOURCES   | RELATED TOPICS/TASKS/PRODUCTS            |
| Specification       | Target skills                       | Strategic prospective of skill needs, trends                | Academic taxonomy of skills              |
|                     | Target jobs                         | Local/particular assesment of skill needs                   | Functional taxonomy of jobs              |
|                     | Students profiles, requirements     | Employees performance assesment                             | Functional taxonomy of tools/systems     |
|                     | Skill-increments, target gaps       | Graduate-skill assesment, official education                | Models/templates of questionnaires       |
|                     |                                     | Labour market assesment, any education                      | Policies for education administrations   |
|                     |                                     |   | Help skill-jobs research & standards     |
| Design              | Academic model                      | Define admission requirements (profiles)                    | (Taxonomy of tools and systems)          |
|                     | Business model                      | Define training contents and goals (skills)                 | Re-use of training modules. IPRs?        |
|                     |                                     | Select digital tools and licensing                          | Analysis/dissemination of best practices |
|                     |                                     | Develop detailed contents                                   | Define training-programmes templates     |
|                     |                                     | Select facilities (virtual/physical)                        |  |
|                     |                                     | Tuition model, grants, internships                          |  |
|                     | Define hiring mechanisms and market |   |  |
|                     | Sponsorship                         |   |  |
| Implementation      | Recruited students                  | Dissemination, marketing, prescription                      | Pilot programmes                         |
|                     | Training                            | Recruiting  |  |
|                     | Individual evaluation               | Teaching and evaluation                                     |  |
|                     | Economic results                    | Management, including PPRR                                  |  |
| Certification       | Certified skills                    | Certify individual skills                                   | Analysis of certification processes      |
|                     | Certified programme                 | Certify training programme                                  |  |
| Feedback/           | Hired individuals, good yield       | (Employees performance assesment)                           | Monitor employees/alumni                 |
| Validation          | Good performance in company         | Employees/alumni feedback                                   | (Models/templates of questionnaires)     |

Figure 4. “Training programme” analysis: tasks and products

The second step of the analysis is shown in Figure 5. The different tasks are here split into two categories, (1) the business model, for management and organisation topics that may be shared by many similar programmes, and (2) the academic model, for the specific skills-acquisition process (contents, teaching/learning methods, and so on). This table will be used later as the starting point for the definition of a general template for training programmes.

| PHASE                                  | BUSINESS MODEL   | ACADEMIC MODEL   |
|--|--|--|
| Specification                          | Methods of interaction with industry (energy and digital) for: technology trends, labour market, skill needs | Definition of target jobs, target skills. Taxonomies: skills, jobs, tools/systems. |
|  | Methods for employees performance assesment  |  |
|  | Methods for graduate-skill assesment, official education   |  |
| Design                                 | Use of training-programmes templates: business   | Use of training-programmes templates: academic                                     |
|  | Select facilities (virtual/physical) and resources   | Definition of requirements/profiles for students                                   |
|  | Roles and functions of different stakeholders involved. Includes hiring mechanisms (if any)                  | Definition of skill-increments, target gaps. Contents and training goals.          |
|  | Financial structure: sponsorship, subsidies/grants, tuition, remuneration and costs                          | Develop detailed contents. Re-use of training modules. IPRs?                       |
|  | Design of recruiting process: dissemination, marketing, recruiting procedures                                | Teaching and evaluation methods  |
|  | Digital tools licensing  | Select digital tools   |
|  | Detailed operations planning   | Detailed timetables academic planning  |
|  | Define certification entities and methods  | Certification criteria (detailed)  |
| Define feedback and validation methods | Validation criteria (detailed)   |  |
| Implementation                         | Dissemination, marketing, prescription   | Teaching and evaluation  |
|  | Recruiting   |  |
|  | Management, including PPRR   |  |
| Certification                          | Certify individual skills. Process.  | Individual certification: results  |
|  | Certify training programme. Process.   | Programme certification: results   |
| Feedback/                              | Alumni feedback: process   | Alumni feedback: results   |
| Validation                             | Employers feedback: process  | Employers feedback: results  |

Figure 5. “Training programme” analysis: tasks according to business or academic models

### 3.3. Analysis of tasks related to the BSDE

The analyses described in previous sections allows a further step, focussed in the types of tasks and their characterization: topics addressed, products and results, and their ultimate purpose in the BSDE context. The results are shown in Figure 6.

| TASKS (1)                               |  | OUTCOMES (1)                                |  |
|---|--|---|--|
| TYPE                                    | TOPIC  | PRODUCTS AND RESULTS                        | PURPOSE                                      |
| Research                                | Strategic (long-term) prospective:                               | Reports                                     | Help skill-jobs research & standards         |
|   | skill needs, trends, tools, jobs, labour market, graduate skills | Databases, WEB portals                      | Policies for education administrations       |
|   | Consider: skill-jobs research, projects (ESCO, CEDEFOP)          | Tools, models (templates of questionnaires) | Policies for companies: training, recruiting |
| Consulting                              | Specific and short-term diagnosis: performance,                  | Reports                                     | Policies for education providers             |
|   | skill gaps, tools, jobs, labour market, graduate skills          |   | Policies for companies: training, recruiting |
| Research                                | Job-Tools-Skills-Background skills analyses                      | Re-usable academic/training patterns        | Help skill-jobs research & standards         |
|   | Consider: skill-jobs research, projects (ESCO, CEDEFOP)          | Programmes design criteria                  | Help programmes design                       |
|   | Consider academic curricula (skills-courses-programs)            |   | Help curricula updating/adaptation           |
| Design                                  | Programmes: Types of business models                             | Training programmes templates               | Dissemination of best practices              |
|   | Programmes: Types of academic models                             | Classification criteria                     | Create databases for training programmes     |
| Research                                | Training techniques and methods                                  | Identification of best practices            | Help training                                |
|   | Training contents, resources, cases                              | (Re-usable) training modules and contents   | Dissemination of best practices              |
| Design                                  | Specific training programmes                                     | (Re-usable) training programmes             | Help training                                |
|   |  |   | Dissemination of best practices              |
| Supply resources                        | Trainees (students) from companies                               | Students                                    | Training feasibility and quality             |
|   | Trainees (students) from recruiting processes                    | Contents                                    |  |
|   | Trainers, teachers   | Academic resources, tools                   |  |
|   | SW licences for tools, simulators, systems                       | Financial resources                         |  |
|   | Contents and cases (re-usable, adaptable, copyrights)            |   |  |
|   | Physical facilities (classrooms, labs)                           |   |  |
|   | Virtual facilities (on-line platforms)                           |   |  |
| Training                                | Specific programmes (diverse types and models):                  | Skills acquisition                          | Education for Digitalization of Energy       |
|   | recruiting, teaching, evaluation, management                     |   |  |
| Research                                | Validation and certification methods and entities                | Reports                                     | Policies for administrations, companies,     |
|   | (certification of training and certification of skills)          | Validation/Certification methods & tools    | education providers, candidates, others...   |
| Validation & certification & monitoring | Training providers   | Certified providers and programmes          | Quality assurance                            |
|   | Training programmes  | Certified skills and candidates             | Better hiring processes                      |
|   | Skills and candidates (students)                                 | Performance assesment (reports)             | Better performance of employees              |
| Compilation & dissemination             | Research contents  | Research portal                             | Education for Digitalization of Energy       |
|   | Training Programmes  | Programmes marketplace, recruiting          | (promotion of the process in general)        |
|   | Tools and systems  | Tools marketplace                           |  |
|   | Jobs & openings, Candidates, CVs                                 | Jobs marketplace                            |  |
| Sponsorship & dissemination             | Specific programmes  | Marketing                                   | Sustainability of the process (in general)   |
|   | Specific tasks: research, consulting, design...                  | Funds, resources                            |  |
|   | The ENTITY (EDDIE) in general                                    | Recruiting                                  |  |

Figure 6. Compilation of tasks related to the education (training) for digital skills

The tasks may be organised by types and topics as follows – all of them focussed in the training for digitalisation of the Energy Sector;

#### 1. Research

- Skills: validation, certification and standardisation. Existing and future frameworks.
- Future tools, technologies and businesses: skill gaps, job profiles
- Training models, methods and contents
- Best practices, policies and recommendations

#### 2. Consulting (specific companies and businesses)

- Short-term analysis: available skills, short-term needs, skills gaps
- Recruiting and re-training strategies

#### 3. Design

- Templates for efficient training programmes; “flagship” training programmes for usual needs
- Specific training programmes and training contents

#### 4. Supply resources (by partnership, collaboration or sponsorship)

- Human: managers, trainers, supervisors, students

- Physical: facilities, platforms, labs, HW, SW licenses, advertisement resources
- Academic: designs, contents, methods, documentation
- Financial: funds, grants, internships, tuition fees

#### **5. Training**

- Management, organisation
- Teaching, supervision and evaluation

#### **6. Validation, certification and monitoring**

- Training institutions, programmes, skills
- Performance. alumni career

#### **7. Compilation, dissemination and networking**

- Research contents
- Training Programmes
- Tools and systems
- Jobs & openings, Candidates, CVs

These tasks may be later related to the stakeholders, in order to analyse their roles and motivations to join –or collaborate with- the BSDE business model (cost/benefit analyses). In fact, a critical issue is to relate them to the special stakeholder, the EDDIE-entity (or the ENTITY), since the future failure or success of the initiative will depend on an adequate and realistic design.

## 4. Blueprint

Most of the tasks identified in the previous section require intensive resources, and therefore the possibility of being performed by the ENTITY does not seem realistic. During EDDIE, some research and design results are expected from the different WPs, using the EACEA funding. However, the ENTITY should be conceived as a low-cost non-profit organisation, with a reduced –hopefully stable workforce (unless its fund-raising be extremely successful). It is more likely that the ENTITY may serve as a showcase or marketplace to connect stakeholders and disseminate useful information, by means of specialised WEB portals.

The development of the ENTITY should follow a prototyping-style lifecycle. Viable intermediate products should be planned attending the cost/benefit criteria of the potential members (stakeholders), focussing on the maximum value/effort ratio of the different ideas.

There is clearly some potential in developing marketplaces for research and events, training programmes, training contents, specialised jobs, tools and systems and so on. The question is to find which ones could be more useful, covering current gaps of the education-digitalization-energy ecosystem, while requiring a reasonable effort for development and maintenance. In other words, the ones that could -more likely- be sustainable during a bootstrapping roadmap. It is also a point to be further analysed which are the current marketplaces that could be leveraged to make it possible to obtain EDDIE's objectives without developing a new solution from scratch.

The first two sub-sections will be devoted to the possible roles of the ENTITY in the tasks already identified in previous sections. The last ones will propose some services –to be analysed as business models- and some auxiliary tasks initially identified as required for the success of those models.

### 4.1. Tasks in which the ENTITY may help

These are tasks that the ENTITY will hardly perform itself, but it could help other stakeholders in doing them:

#### 1. Research

About jobs, skills, trends, best training practices, and so on. The contribution of EDDIE could be:

- During the project, the participants will do some research, and some tools may be developed and shared (such as questionnaires, or guides/tutorials to other existing tools and databases).
- After the project, the ENTITY may upgrade and extend the toolset, but it mostly may help by networking and dissemination services.

#### 2. Consulting (specific companies and businesses)

Conceived as applied research tailored for specific clients (companies or ET providers).

- After the project, the ENTITY may help by networking and dissemination services

#### 3. Design

- The design of templates, taxonomies and databases should be part of the EDDIE project, at least in draft or initial versions. Some specific programmes will be designed in detail as pilots and demonstrators.
- After the project, the design of specific programmes and courses is a task for other stakeholders - such as ET providers, systems vendors, open-source communities or companies.
- The design and standardisation of “Sectorial Flagship Programmes” could be performed during and after EDDIE, and this is a special task to be analysed.

#### 4. Supply resources (by partnership, collaboration or sponsorship)

Either human (trainees, teachers), virtual (SW, platforms) or physical (facilities, HW, laboratories).

- The ENTITY might help connecting supply with demand (networking), and maybe help in the dissemination of specialized recruiting processes.

- The ENTITY may assist in fund-raising and sponsorship tasks, providing visibility to projects and proposals. It may also help-for instance- in giving access to EC funds, such as those related to the Pact of Skills.

## 5. Training

- This is a job for other stakeholders, mainly ET providers, but also companies with training structures, and systems vendors.
- Some actual training may happen during EDDIE (Pilot programmes), but in the long term the ENTITY would be just a facilitator of resources and visibility (networking).

## 4.2. Tasks in which the ENTITY may participate actively

These are tasks that the ENTITY might perform itself, and could help others in performing them as well. The level of participation will depend on sustainability and demand issues. If a particular task performed by the ENTITY adds real value to the stakeholders and the Energy Sector, it should be feasible to find the required resources.

Some tasks to be analysed under these criteria are:

### 6. Validation, certification and monitoring

- These tasks are applicable to training (providers and programmes), systems and tools (vendors and products), and even to candidates and curricula (skills)
- The ENTITY may participate in these tasks, but mainly establishing quality standards or evaluation criteria

### 7. Compilation, dissemination and networking

Applicable to research contents, training programmes, tools and systems, jobs and candidates.

- Dissemination and networking implies by itself some type of sponsorship
- The design and standardisation of “Sectorial Flagship Programmes” could be performed during and after EDDIE, and this is a special task to be analysed

As said before, the ENTITY may serve as a showcase or marketplace to connect stakeholders and disseminate useful information, by means of a specialised WEB portal. However, there is a relevant decision to be made about each task or service, related to the level of implication and responsibility of the ENTITY with respect to the information displayed. Some examples of implication degrees are:

- a. The ENTITY generates and stores the information. This is highly resource-consuming and implies full responsibility.
- b. The ENTITY validates (evaluates and even certify) and stores the information. This is resource-consuming, and implies being responsible for the quality of the information, the sources and the methods.
- c. The ENTITY validates (evaluates and even certify) the sources, and provides links to information stored elsewhere. This is less resource-consuming, but implies being responsible for the quality of the sources.
- d. The ENTITY provides links to information stored elsewhere. The added value relies on the organization, centralisation and ease of use (not quality assurance)

The current strategy is that the ENTITY will evaluate the stakeholders before they are registered and enabled to publish contents. Stakeholders will be responsible for their own contents, although the ENTITY may supervise the quality and adequacy of the contents. Only short contents –news, descriptors and summaries- will be stored by the ENTITY, being large amounts of information referred to by links.

## 4.3. Candidate services to be provided by the ENTITY

These are the services that have been initially selected because of their potential to be part of the BSDE (Blueprint Strategy for Digitalisation of Energy):

**1. Research and Dissemination platform:**

Online platform in which EDDIE stakeholders share research and dissemination contents about digitalisation of the Energy Sector. Contents may include -or provide links to- papers, reports, projects, events, databases, institutions, news, posts, interviews, and so on.

**2. Training Programmes marketplace:**

Online platform in which EDDIE stakeholders -mainly training providers- advertise training programmes devoted to the digitalisation of the Energy Sector. Training programmes will be described by standard templates, attributes and keywords, to allow "search and select" functions according to specific needs. It may include "flagship programmes" and re-usable contents provided by EDDIE as an additional service.

**3. Jobs marketplace:**

Online platform in which EDDIE stakeholders -mainly from Industry- advertise job openings, directly related to the digitalisation of the Energy Sector. Job profiles and requirements will be described by standard templates, attributes and keywords, to allow "search and select" functions according to specific needs. It may include candidate profiles (normalised CVs) from individuals or from other job marketplaces.

**4. Tools and Systems marketplace:**

Online platform in which EDDIE stakeholders -mainly vendors and consulting companies- advertise digital tools, systems and services directly related to the digitalisation of the Energy Sector. Products will be described by standard templates, attributes and keywords, to allow "search and select" functions. It may include SW and platform communities, open source contents, technologies, and standards.

**5. Marketplace for other services:**

To be defined, according to feedback and proposals from stakeholder. They may include consulting, assessment, validation, certification, or recruiting/head-hunting (always focussed on the digitalisation of the Energy Sector).

Figure 7 represents how each of these services are elated to the main blocks of the adaptive-learning process for digital skills.

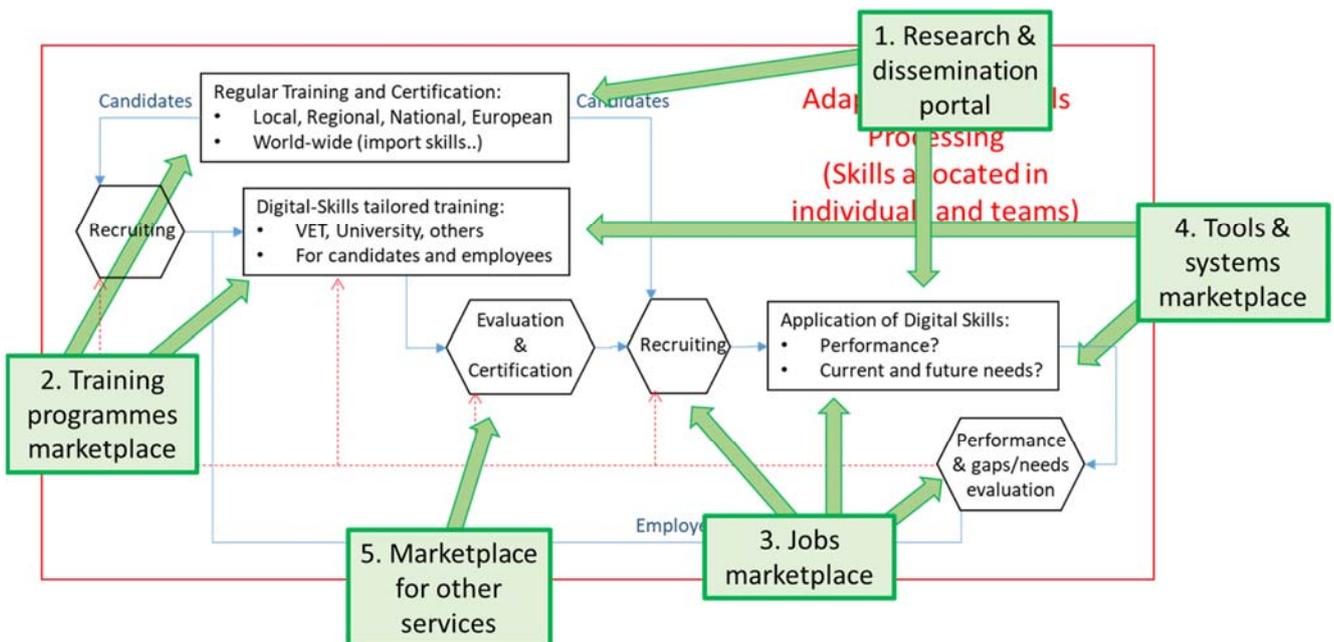


Figure 7. Services proposed: improving the adaptive-learning process for digital skills

The added value of these services –to be analysed as business models- are critical for their successful and sustainable implementation. Some auxiliary tasks have been identified with this purpose, and because they provide interesting results from the research and best practices viewpoint.

## 4.4. Auxiliary tasks related to the candidate services

Some auxiliary tasks are expected to provide added value to the candidate services and research results for best practices and recommendations. They are closely related to one another and to the services, as shown in Figure 8.

The auxiliary tasks identified here will be developed during EDDIE; however, they are subject to continuous improvement and extension, so that the ENTITY must keep some research activities running, by itself and with the collaboration with other stakeholders. The enumeration and brief description of these auxiliary tasks is provided next.

### 1. Syllabus elements:

Definition of a structured catalogue of training contents, as a common language for skills, skill gaps, training goals, profile requirements for candidates to jobs and training programmes. This common language must cover different dimensions: knowledge areas, functional and transversal skills, specific tools/languages/technologies, and quantifiers both for extension (ECTS) and for level of abstraction (EQF). It may constitute the “body of knowledge” of the digitalised-energy ecosystem.

The fact of being a common language explains why this task is directly relevant for “2. New jobs-skills relations” and “3. General templates for programmes”, and indirectly relevant for services such as research, training, and job portals (see Figure 8). The task is related to WP2 and WP4 in the EDDIE context.

### 2. New jobs-skills relations:

A new job profile may be generated in the Energy Sector because of a new type of business that require new jobs, or because of the upgrading of existing jobs. In any case, new job profiles will arise to handle new technologies, tools, and systems, and therefore there will be some skills to acquire.

This task consists in finding a systematic way of relating the new job profiles to the required skills. It is critical to reach a good version of the common language described in task “1. Syllabus elements”, by testing in real cases how comprehensive, useful and practical it is. This task is relevant for services such as research, training, and job portals (see Figure 8). In the EDDIE context, it is related to WP2.

### 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.

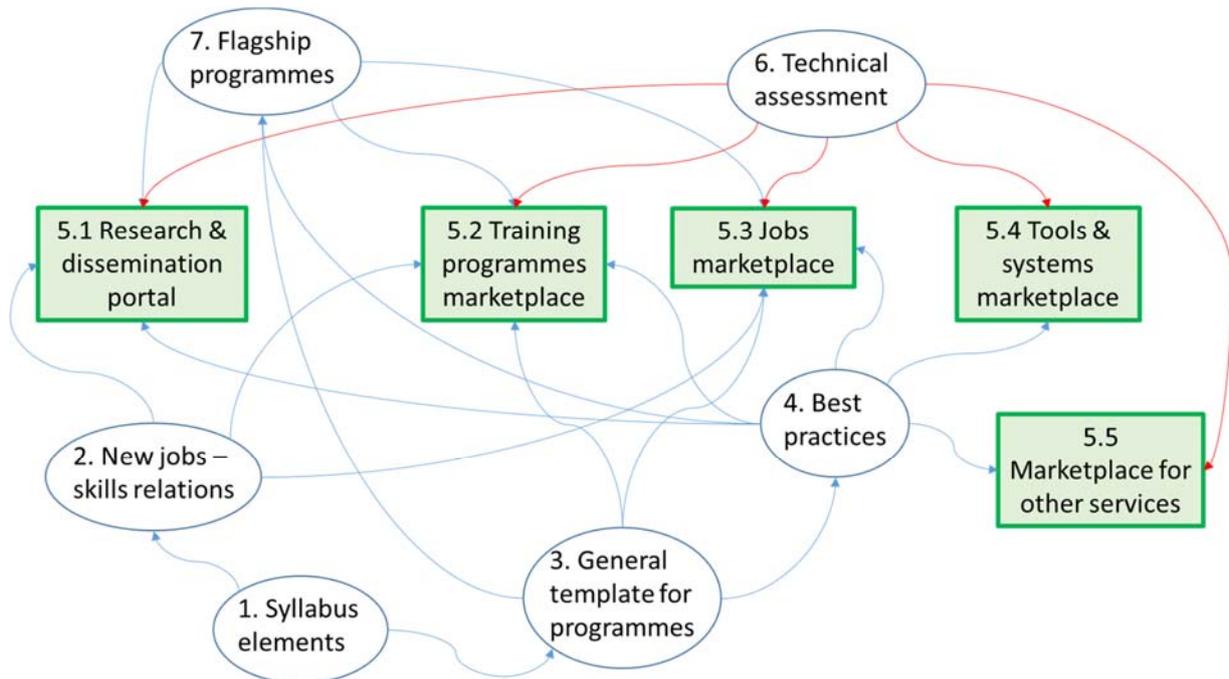


Figure 8. Relations among services and auxiliary tasks

#### 4. Best practices:

This task is meaningful in WP5 at multiple levels.

In the strict context of the EDDIE project (see Figure 2), it will be a relevant component of a specific deliverable, “D5.4 Recommendations on how to improve the educational frameworks in the focus countries”. Moreover, the compilation and analysis of best practices must inspire the whole strategy, so it will have a strong influence in the final deliverable “D5.5 BSDE presentation and strategic roadmap for the deployment of the action plans”. This task is closely related to WP4, in terms of the analysis of education systems in Europe, and it will provide interesting reports as a product of the EDDIE project.

In terms of the sustainable extension of the EDDIE activities (i.e., the future services provided by the ENTITY) Figure 8 shows some relations to tasks and services. On one hand, the comparative analysis of best practices is a subject of continuous research and dissemination, and therefore is a potential content of the research portal. On the other hand, the business models of the different services must take into consideration potential competitors and partners. Current best practices in research portals, training portals, etc., must be identified and analysed, in order to think of functionalities that could add value to the services (competition) and synergies with other platforms (partnerships).

Finally, Figure 8 shows other relations among tasks. One is the use of the elements of programme templates to classify best practices (already mentioned), and the other represents the fact that a “flagship programme” may be selected because of being a best practice for a given training purpose.

#### 6. Technical assessment:

The services of the ENTITY proposed here are WEB portals for different -but partially complementary- purposes. Therefore, their prototype versions and the business models of their final implementations will require technical work, in terms of database technology and design, contents specifications, functional requirements, architectural designs and interaction requirements, hosting requirements (including costs and technical specifications), management, security, and so on.

Other topics included in this task are the reliance on existing social networks towards maximum efficiency, techno-economic analysis of design options, and the legal implications: data protection, copyright and intellectual property issues.

In the EDDIE context, this task belongs mainly to the WP5 itself; but it is directly related to WP3, since the analysis, compilation and implementation of the network of stakeholders is linked to the services portals. We believe that the only way to maintain an active network of stakeholders is to get them involved in specific activities of mutual interest.

### **7. Flagship programmes:**

This task consists in the selection and/or development of outstanding training programmes, in the context of digitalisation of the Energy Sector. They may be selected for different reasons: adequate training goals, good structure and organisation, or any other characteristic considered an example of “good practices”. This is why Figure 8 shows a relation with “4. Best practices”. It also shows direct relations to several services, since these flagship programmes may be specific contents of the dissemination and training portals, and even in the jobs portal when -as mentioned before in the description of “3. General template for programmes”- recruiting and training are integrated into a single activity.

## 5. WP5 organisation: tasks, teams and planning to approach the BSDE

### 5.1. Relations among tasks and deliverables

Tasks and sub-tasks performed in WP5 must be closely related to the planned and proposed deliverables (see Figure 9):

**Deliverables D5.1 and D5.5** correspond to the BSDE development. D5.1 is an intermediate stage strongly anchored in WP2, WP3 and WP4 results. D5.5 must add the creative and strategic elements: business models analyses, design, roadmap for deployment, first prototyping stages.

**Deliverables D5.2 and D5.3** are related to training programmes templates and examples. Some of these examples may become “Sectorial Flagship Programmes” as described before.

**Deliverable D5.4** should be the outcome of in-depth analyses of best practices, referred to the main elements of the template (business-model and academic-model elements). Some measures and recommendations from D5.4 will be applicable to the BSDE itself, while others will be addressed to other agents, such as administrations, companies and training providers.

| Id   | Title (report)  | Leader   | Due | Description   |
|------|---|----------|-----|---|
| D5.1 | Specification, conceptual design and application to the partial results compiled from other work packages | COMILLAS | 24  | It will contain a consolidated view of the skill gaps, the stakeholders and the current policies and requirements, assessing and stressing the ones with the highest usefulness to define the BSDE and providing an initial draft view on how this can be applied to build the blueprint  |
| D5.2 | Intermediate draft templates for educational programs   | KTH      | 24  | This deliverable contains the pre-design of education programmes, initial and continuous training activities  |
| D5.3 | Final education programmes and training activities  | KTH      | 36  | This deliverable contains the main results of the works in T5.2, i.e., education programmes, initial and continuous training activities, together with their expected relative impact in the correction of skill gaps.  |
| D5.4 | Recommendations on how to improve the educational frameworks in the focus countries                       | COMILLAS | 43  | This deliverable will contain the list of actions identified to improve the educational frameworks. The report will present the results covering a set of focus countries in representative regions, so that these results can also be applied to other countries with similar characteristics. The pre-defined focus countries are Germany, Spain, Sweden, Greece      |
| D5.5 | BSDE presentation and strategic roadmap for the deployment of the action plans                            | COMILLAS | 48  | This report will present the priorities assigned to each of the actions defined in the previous tasks. Based on these priorities, the report will propose a strategic roadmap for their deployment. The results of the pilot will be compiled and analysed to determine if corrective actions to the roadmap are required, according to the scheme proposed in Figure 1 |

Figure 9. Description of deliverables in WP5

Figure 10 gathers in the same planning diagram:

- In yellow, the different WPS of EDDIE
- In light blue, the original tasks WP5, from the EDDIE proposal
- Red cells represent milestones for specific deliverables
- The tasks defined in Section 4, i.e. the plan defined during the EDDIE project, are represented in white background, and their expected duration in light green

| WP   | Title  | Leader     | 12 | 18 | 24 | 30 | 36 | 42 | 48 |
|------|--|------------|----|----|----|----|----|----|----|
| WP2  | Identification of current and future skill needs in the Energy Sector              | NTUA       |    |    |    |    |    |    |    |
| WP3  | Stakeholder mapping and strategic network building                                 | EDSO       |    |    |    |    |    |    |    |
| WP4  | Assessment of policies and requirements for VET and beyond                         | RWTH       |    |    |    |    |    |    |    |
| WP5  | Blueprint for the digitalisation and decarbonisation of the European energy sector | COMILLAS   |    |    |    |    |    |    |    |
| T5.1 | Review and structuring of the current skill map in the energy sector               | COMILLAS   |    |    |    |    |    |    |    |
| T5.4 | Blueprint strategic roadmap  | COMILLAS   |    |    |    |    |    |    |    |
|      | (5) BSDE roadmap: analysis of options, priorities, sustainability                  |            |    |    |    |    |    |    |    |
|      | (5.1) Research and dissemination portal  |            |    |    |    |    |    |    |    |
|      | (5.2) Training programmes marketplace  |            |    |    |    |    |    |    |    |
|      | (5.3) Jobs marketplace   |            |    |    |    |    |    |    |    |
|      | (5.4) Tools and systems marketplace  |            |    |    |    |    |    |    |    |
|      | (5.5) Marketplaces for other services  |            |    |    |    |    |    |    |    |
|      | (6) Technical assessment on BSDE implementation (WEB portal development)           |            |    |    |    |    |    |    |    |
| T5.2 | Analysis of levers to reduce skill gaps  | KTH        |    |    |    |    |    |    |    |
| T5.3 | Design of specific recommendations and overall action set                          | COMILLAS   |    |    |    |    |    |    |    |
|      | (1) Modular and hierarchical structure of syllabus elements                        |            |    |    |    |    |    |    |    |
|      | (2) Analysis of skills demand (and job profiles) due to digital innovation         |            |    |    |    |    |    |    |    |
|      | (3) Definition of a General Template for training programmes                       |            |    |    |    |    |    |    |    |
|      | (3.1) Definition of academic model   |            |    |    |    |    |    |    |    |
|      | (3.2) Definition of business model   |            |    |    |    |    |    |    |    |
|      | (4) Analysis of best practices to produce recommendations                          |            |    |    |    |    |    |    |    |
|      | (7) Design and standardisation of "Sectorial Flagship Programmes"                  |            |    |    |    |    |    |    |    |
| WP6  | Blueprint: Roll out and action plan  | NTUA, RWTH |    |    |    |    |    |    |    |
| WP   | Title  | Leader     | 12 | 18 | 24 | 30 | 36 | 42 | 48 |

Figure 10. Tasks and sub-tasks in WP5 and in the context of EDDIE

A simplified matching between the tasks identified in Section 4 and the original tasks planned in the proposal is also represented in Figure 10 by their vertical order. In simple terms:

- Tasks (5) – from 5.1 to 5.5- and task (6) are directly related to the original tasks T5.1 and T5.4. Therefore, they should be the main sources to produce deliverables D5.1 and D5.5.
- Task (3) and task (7) are related to the original task T5.2. Therefore, they should be the main sources to produce deliverables D5.2 and D5.3.
- Task (4) is directly related to the original task T5.3. Therefore, it should be the source to produce deliverable D5.4.
- Tasks (1) and (2) are auxiliary to other tasks, as explained in their respective descriptions (see Section 4)

Of course, there are multiple indirect -or weaker- relations among the different tasks, but it is not worth trying to describe all those relations. In fact, the concepts present in the proposal -such as strategy, recommendations, roadmap, levers, and action sets- are more or less related to one another:

## 5.2. Assignment of partners to tasks: leaders and teams

Figure 11 shows the current assignment of tasks to partners, defining leadership roles according to their dedication to WP5 in the proposal and their profiles –training providers (university or VET) and industry (energy or ICT).

In Figure 11, the columns devoted to partners are ordered by relative weight in terms of workforce (WP5 in the original proposal). Leaders of specific tasks –the ones defined in Section 4-are represented by orange cells, and explicitly mentioned in the “LEADER” column. Partners that are assigned to the teams -for each task- are represented by green cells. Being Comillas the leader of the whole WP5, the member of the Comillas team that will be present in each team is explicitly mentioned in column “COMILLAS”. Estimated workloads are expressed as numeric values of cells. Finally, tasks and cells in light blue mean formal deliverables and their assigned workload.

| Teams: |  |           |             | MAIN participants |        |               |           |        |         |                  |           |         |           |          |         |           |         |          |  |
|--------|--|-----------|-------------|-------------------|--------|---------------|-----------|--------|---------|------------------|-----------|---------|-----------|----------|---------|-----------|---------|----------|--|
|        |  |           |             | 1. COMILLAS       | 6. KTH | 10. IBERDROLA | 9. REPSOL | 8. CRE | 4. FOSS | 14. NTT / 11. GE | 7. PIQUER | 2. NTUA | 15. NOVEL | 13. EDSO | 3. RWTH | 5. POLIMI | 17. EWI | 16. UCES |  |
| WP     | Title  | LEADER    | COMILLAS    | 792               | 352    | 321           | 272       | 262    | 258     | 220              | 211       | 201     | 189       | 155      | 149     | 134       | 114     | 60       |  |
| T5.1   | Review and structuring of the current skill map in the energy sector | COMILLAS  | Fernando    | 100               |        |               |           |        |         |                  |           |         |           |          |         |           |         |          |  |
| T5.4   | Blueprint strategic roadmap  | COMILLAS  | Fernando    | 100               |        |               |           |        |         |                  |           |         |           |          |         |           |         |          |  |
|        | (5) BSDE roadmap: analysis of options, priorities, sustainability    | COMILLAS  | Fernando    | 100               |        | 30            | 32        |        |         | 20               |           |         |           | 15       |         |           |         |          |  |
|        | (5.1) Research and dissemination portal                              | EDSO      | Miguel Áng. | 22                |        |               |           | 38     | 20      |                  | 10        |         | 35        | 30       | 30      |           |         |          |  |
|        | (5.2) Training programmes marketplace                                | REPSOL    | Carlos      | 22                |        | 57            | 80        |        |         | 20               | 40        |         |           | 29       | 30      |           |         |          |  |
|        | (5.3) Jobs marketplace   | IBERDROLA | Carlos      | 22                |        | 51            | 20        |        |         | 20               | 40        |         | 38        | 35       |         |           |         |          |  |
|        | (5.4) Tools and systems marketplace                                  | NTT       | Miguel Áng. | 22                |        | 16            | 30        | 38     | 20      | 60               |           |         |           |          |         |           |         |          |  |
|        | (5.5) Marketplaces for other services                                |           |             | 22                |        | 16            |           |        | 20      |                  |           |         |           |          |         |           |         |          |  |
|        | (6) Technical assessment on BSDE implementation (WEB portal de       | CRE       | Carlos      | 22                |        |               |           | 38     |         | 40               |           |         |           | 40       |         |           |         |          |  |
| T5.2   | Analysis of levers to reduce skill gaps                              | KTH       | Álvaro      |                   | 42     |               |           |        |         |                  |           |         |           |          |         |           |         |          |  |
| T5.3   | Design of specific recommendations and overall action set            | COMILLAS  | Álvaro      | 100               |        |               |           |        |         |                  |           |         |           |          |         |           |         |          |  |
|        | (1) Modular and hierarchical structure of syllabus elements          | FOSS      | Fernando    | 50                | 20     |               |           |        | 65      |                  | 31        | 40      | 25        |          |         |           |         |          |  |
|        | (2) Analysis of skills demand (and job profiles) due to digital inno | NTUA      | Miguel Áng. | 20                |        | 45            | 30        |        | 68      | 40               | 71        |         |           |          |         |           |         |          |  |
|        | (3) Definition of a General Template for training programmes         | KTH       | Carlos      | 50                | 70     |               |           | 37     |         |                  | 50        |         | 15        |          |         |           |         |          |  |
|        | (3.1) Definition of academic model                                   | POLIMI    | Álvaro      | 20                | 70     |               |           |        |         | 50               |           | 44      |           | 30       | 55      | 50        |         |          |  |
|        | (3.2) Definition of business model                                   | KTH       | Fernando    | 20                | 70     |               |           | 37     |         |                  |           |         |           | 30       | 20      |           |         | 7        |  |
|        | (4) Analysis of best practices to produce recommendations            | RWTH      | Álvaro      | 50                |        | 52            | 40        | 37     |         | 50               |           | 44      |           | 30       |         |           |         |          |  |
|        | (7) Design and standardisation of "Sectorial Flagship Programmes     | EWI       | Miguel Áng. | 50                | 20     | 54            | 40        | 37     | 65      | 20               |           |         |           |          |         |           | 50      | 30       |  |

Figure 11. Teams and leaders proposed for tasks and sub-tasks in WP5

### 5.3. Initial phase: selected tasks

Figure 12 shows a partial view of the overall plan, in which only the tasks belonging to the initial phase have been included. It is relevant to note that tasks (6) has already started –despite it was not planned that way- because of the relations of WP5 with WP3 (database of stakeholders).

| WP   | Title  | Leader   | 12 | 18 | 24 | 30 | 36 | 42 | 48 |
|------|--|----------|----|----|----|----|----|----|----|
| WP5  | Blueprint for the digitalisation and decarbonisation of the Europea  | COMILLAS |    |    |    |    |    |    |    |
| T5.1 | Review and structuring of the current skill map in the energy sector | COMILLAS |    |    |    |    |    |    |    |
|      | (5) BSDE roadmap: analysis of options, priorities, sustainability    | COMILLAS |    |    |    |    |    |    |    |
|      | (5.1) Research and dissemination portal                              | EDSO     |    |    |    |    |    |    |    |
|      | (5.2) Training programmes marketplace                                | REPSOL   |    |    |    |    |    |    |    |
|      | (6) Technical assessment on BSDE implementation (WEB portal de       | CRE      |    |    |    |    |    |    |    |
| T5.2 | Analysis of levers to reduce skill gaps                              | KTH      |    |    |    |    |    |    |    |
|      | (1) Modular and hierarchical structure of syllabus elements          | FOSS     |    |    |    |    |    |    |    |
|      | (2) Analysis of skills demand (and job profiles) due to digital inno | NTUA     |    |    |    |    |    |    |    |
|      | (3) Definition of a General Template for training programmes         | KTH      |    |    |    |    |    |    |    |
|      | (3.1) Definition of academic model                                   | POLIMI   |    |    |    |    |    |    |    |
|      | (3.2) Definition of business model                                   | KTH      |    |    |    |    |    |    |    |

Figure 12. Planning for the initial phase

## 6. Brief description and specification of tasks

The tasks described in Section 4 will be developed in parallel by different teams, and led by different partners. However, tasks are related to one another, so they must be subject to an overall consistent strategy. The agreement in goals and strategies has been achieved through multiple brainstorming and coordination meetings. This section is devoted to the description of the individual guidelines that should be followed and will be subject to a flexible supervision and coordination process.

### 6.1. Modular and hierarchical structure of syllabus elements

As described in Section 4, this task consists in the definition of a structured catalogue of training contents, as a common language for skills, skill gaps, training goals, profile requirements for candidates to jobs and training programmes. This common language must cover different dimensions: knowledge areas, functional and transversal skills, specific tools/languages/technologies, and quantifiers both for extension (ECTS) and for level of abstraction (EQF). It may constitute the “body of knowledge” of the digitalised-energy ecosystem.

Figure 13 represents relations among innovation, skills demand, skills supply and the corresponding gaps to be covered by training programs. The training side is highlighted because in this task the existing training programmes will be used as starting point to define the right syllabus elements and classes, although the final version will require iterations and interaction with the job-profiles task (see next sub-section).

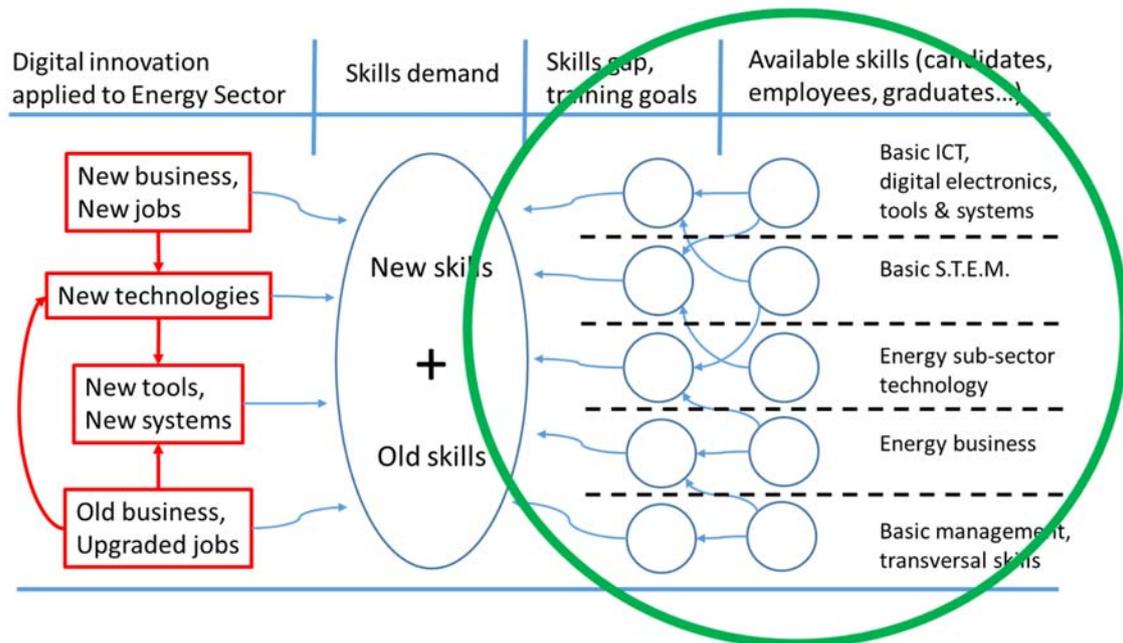


Figure 13. Syllabus elements (skills) from the training-contents side

The systematic classification and characterisation of skills is an instrumental task. The classes should be based as much as possible in already existing standards and keywords, but subject to their practical application to the Blueprint. This classification may constitute the “body of knowledge” (term borrowed from other Blueprint projects) of the digitalised-energy ecosystem.

With respect to the Blueprint tasks and strategies, this task is related to:

- Research, dissemination and consulting about the demand of –present and future- job profiles, tools and skills derived from the digital innovation applied to the Energy Sector.

- Research and dissemination about the present supply of skills for the Digitalisation of the Energy Sector (employees, graduates), and therefore about the present and expected skills gaps.
- Enable filters and queries in marketplaces for jobs and programmes, and indirectly for the tools and systems, related to the digital innovation in the Sector.

A generic training programme is defined as a structure of training blocks. For instance, degree→ semesters→ courses/subjects→ modules/units. The criteria to stop breakdown are not theoretical, but administrative and practical: minimum block to be evaluated/certified/validated (for professional or academic purposes). Syllabus elements will be used to describe the contents of elementary training blocks, and therefore –by extension and accumulation- the contents of any training programme.

### Expected results:

It is expected to generate a structured set of generic descriptors, such that a particular subset of them, completed by some specific attributes, may describe (1) The skills required for a job profile, (2) the target skills of a training program, or of any of its parts, (3) The background or already acquired skills required to follow a program. In other words, the skills demand, the skills gap, and the skills available (see Figure 13).

The main elements in this “body of knowledge” can be organised as families (such as the five groups shown in Figure 13), and should have contents-related identifiers:

- Name, or main descriptor (for instance “Basic mathematics”)
- A set of explanatory descriptors to define the actual scope and possible synonyms (for instance, “Basic Calculus”, “Basic Algebra”)

Special blocks may be used to specify training details, such as:

- A type of block with a generic descriptor plus optional keywords (to describe tools or systems used/trained). For instance, a generic “programming languages” block, may allow an attribute to name the language. Similar approach for operating systems, digital tools, or any other technology details.
- Blocks for transversal or domain-independent skills, such as modelling, design, implementation, testing, validation, communication. These are transversal to multiple domains (SW, HW, Mathematics, Business) and technologies/sectors (management, electricity, oil & gas...)

With respect to attributes present in any type of block, they should be enough to characterise the specific training block in terms of quality and quantity. For instance:

- The ECTS load
- An orientative EQF level (roughly identifiable with VET levels, and Bachelor-Master-PhD levels)
- Some information related to the balance between realistic practice and theory

The final version of the blocks must be thoroughly documented in a dictionary or user-manual style: main descriptor and synonyms, second level descriptors, main contents included in the block. This documentation should be implemented as a “help” functionality in the interactive edition tools (see Task 5)

### Suggested directions and methods:

Descriptors should be based as much as possible in already existing standards and keywords, but subject to their practical application to the Blueprint. The use of synonyms may be exploited to solve conflicts and improve the quality of description.

The level of granularity in the description is a key issue, and it must be balanced carefully.

The methodology suggested is bottom-up and case-based. Specifically:

- Try to model existing programmes, starting with the engineering and VET examples provided by the partners
- Combine parallel efforts with consensus meetings, in order to converge to the unified structure
- Check partial results against established research and ongoing projects, in order to enhance compatibility and acceptability

A natural step would be to relate knowledge blocks to one another –in addition to their classification into families– because of logic sequences and pre-requisites. For instance, a “power electronics” block would require some previous knowledge about “electrical circuits”. However, this topic has not been included in the “expected results” because it would be difficult and controversial to agree in every detail, and it adds complexity –especially if we consider the quantity and quality factors– maybe with little reward.

A general direction would be “keep it simple and useful”, adding complexity only if it really adds value to the final applications. A practical direction is to define digital skills (family: ICT, digital electronics, tools and systems) in more detail than the rest of families, since EDDIE is especially devoted to digitalisation. Another practical suggestion is to start with University degrees as examples, and check the results against VET programs and on-line short courses. This is because University degrees are more structured and less diverse by nature.

## 6.2. Analysis of skills demand (and job profiles) due to digital innovation in the Sector

As described in Section 4, this task consists in finding a systematic way of relating the new job profiles to the required skills. It is critical to reach a good version of the common language described in task “1. Syllabus elements”, by testing in real cases how comprehensive, useful and practical it is. A new job profile may be generated in the Energy Sector because of a new type of business that require new jobs, or because of the upgrading of existing jobs. In any case, new job profiles will arise to handle new technologies, tools, and systems, and therefore there will be some skills to acquire.

Figure 14 represents relations among innovation, skills demand, skills supply and the corresponding gaps to be covered by training programs. The new-job-profiles side is highlighted because in this task the new skill needs will be used as starting point to define the right syllabus elements and classes, although the final version will require iterations and interaction with the training-contents task (see previous sub-section).

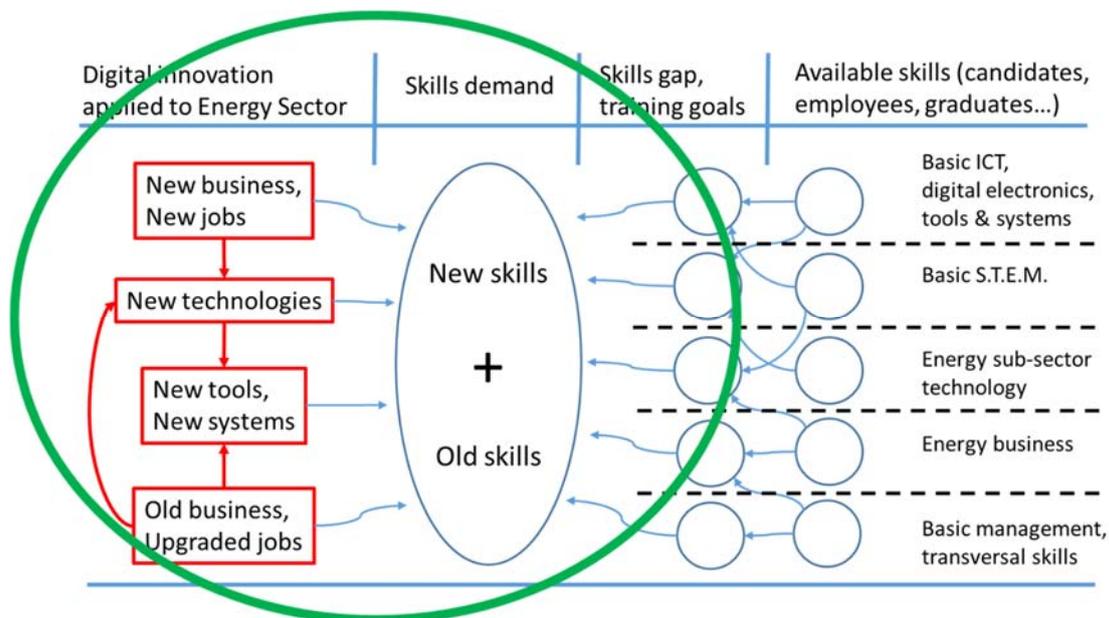


Figure 14. Syllabus elements (skills) from the job-profiles side

### Expected results:

They are common to the ones described in the previous sub-section, but starting from a different point of view (job profiles). The main contributions of this particular point of view is to provide the adequate level of granularity and to define a good set of transversal skills- common to different domains and profiles.

### Suggested directions and methods:

In contrast with Task 1 (previous sub-section, the method suggested here is top-down, i.e., from generic descriptors to elements. It is also recommended to try skills breakdown from different starting points:

- Skills gaps found through questionnaires in WP2 (most of them are new technologies).
- New or updated job profiles
- New business and/or systems (for instance, Smart Grids, Energy Communities...)
- New tools or systems. Languages, platforms, protocols, standards...

It is important to gather the “classical” Energy Sector skills together with the new digital skills. In most of the job profiles, domain knowledge will be mandatorily required in order to apply successfully the new digital tools to the Energy business. For instance, the general topic “Big Data” has its own knowledge and training requirements; however, “Big Data applied to Smart Grids management” requires also specific skills in Smart Grids.

## 6.3. Definition of a General Template for training 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.

Figure 15 -an adaptation of Figure 5- shows a structured set of topics that could be used to describe any training programme, and therefore an orientative structure of the template.

| PHASE                          | BUSINESS MODEL   | ACADEMIC MODEL   |
|--------------------------------|--|--|
| Specification                  | Description of methods used and proof to support the professional/technical relevance of the programme | Definition of target jobs, target skills. Taxonomies: skills, jobs, tools/systems. |
| Design                         | Use of facilities (virtual/physical) and resources   | Definition of requirements/profiles for students                                   |
|                                | Roles and functions of different stakeholders involved. Includes hiring mechanisms (if any)            | Definition of skill-increments, target gaps. Contents and training goals.          |
|                                | Financial structure: sponsorship, subsidies/grants, tuition, remuneration and costs                    | Detailed contents. Re-use of training modules. IPRs?                               |
|                                | Dissemination, marketing and recruiting procedures   | Teaching and evaluation methods  |
|                                | Digital tools licensing  | Use of digital tools   |
|                                | Detailed operations planning   | Detailed timetables, academic planning   |
|                                | Certification entities and methods   | Certification criteria (detailed)  |
|                                | Feedback and validation methods  | Validation criteria (detailed)   |
| Implementation success records | Recruiting success (quantity)  | Individual certification: results  |
|                                | Financial success (profit, sustainability)   | Programme certification: results   |
|                                |  | Alumni feedback: results   |
|                                |  | Employers feedback: results  |

Figure 15. Topics that could be included in the Template to describe training programmes

### Expected results:

The definition of the template itself, and the design of a data structure to store the contents. For practical reasons, the edition should be guided by a questionnaire-form to be implemented. Careful trade-offs should be applied to the template and its data structure, between rigid/closed options and free texts. Rigid options allow efficient classifications and search/selection functions, but they may lead to an endless review and extension process. In fact, it is possible to define a range of alternative templates, depending on the size and type of the programme.

The academic model should use the results from tasks 1 and 2 (syllabus elements), to describe contents and requirements in a systematic way.

#### Suggested directions and methods:

After brainstorming sessions and initial designs, the template definition, structure and format must be tested against specific examples. These examples are directly related to deliverable D5.2. Gathering and describing a set of diverse examples will also be helpful for task 7, the one dealing with “flagship” programmes.

During 2021, intermediary templates have been developed, and during 2022 the next steps of the work will consist of mainly three topics: refinement of template and survey, coordination with work on syllabus elements and support of implementation of flagship and pilot programs.

## 6.4. Analysis of best practices to produce recommendations

As already mentioned in Section 4, this task is meaningful in WP5 at multiple levels. It will be a relevant component of a specific deliverable, “D5.4 Recommendations on how to improve the educational frameworks in the focus countries”. Moreover, the compilation and analysis of best practices must inspire the whole strategy, so it will have a strong influence in the final deliverable “D5.5 BSDE presentation and strategic roadmap for the deployment of the action plans”. This task is closely related to WP4, in terms of the analysis of education systems in Europe, and it will provide interesting reports as a product of the EDDIE project.

| PHASE                  | BUSINESS MODEL   | ACADEMIC MODEL   |
|------------------------|--|--|
| Specification          | Methods of interaction with industry (energy and digital) for: technology trends, labour market, skill needs | Definition of target jobs, target skills. Taxonomies: skills, jobs, tools/systems. |
|                        | Methods for employees performance assesment  |  |
|                        | Methods for graduate-skill assesment, official education   |  |
| Design                 | Use of training-programmes templates: business   | Use of training-programmes templates: academic                                     |
|                        | Select facilities (virtual/physical) and resources   | Definition of requirements/profiles for students                                   |
|                        | Roles and functions of different stakeholders involved. Includes hiring mechanisms (if any)                  | Definition of skill-increments, target gaps. Contents and training goals.          |
|                        | Financial structure: sponsorship, subsidies/grants, tuition, remuneration and costs                          | Develop detailed contents. Re-use of training modules. IPRs?                       |
|                        | Design of recruiting process: dissemination, marketing, recruiting procedures                                | Teaching and evaluation methods  |
|                        | Digital tools licensing  | Select digital tools   |
|                        | Detailed operations planning   | Detailed timetables academic planning  |
|                        | Define certification entities and methods  | Certification criteria (detailed)  |
|                        | Define feedback and validation methods   | Validation criteria (detailed)   |
| Implementation success | Recruiting success (quantity)  | Individual certification: results  |
|                        | Financial success (profit, sustainability)   | Programme certification: results   |
|                        |  | Alumni feedback: results   |
|                        |  | Employers feedback: results  |

Figure 16. Topics that could be used to identify and classify best practices

This task is also relevant for the sustainable extension of the EDDIE activities. On one hand, the comparative analysis of best practices is a subject of continuous research and dissemination, and therefore is a potential content of the research portal. On the other hand, the business models of the different services must take into consideration potential competitors and partners. Current best practices in research portals, training portals, etc., must be identified and analysed, to think of functionalities that could add value to the services (competition) and synergies with other platforms (partnerships).

Note also that some elements of programme templates could be used to classify best practices, and “flagship programmes” may be labelled as “best practices” for specific training purposes.

Examples of good practices could be specific programmes, projects, institutions, platforms, or almost anything that helps training with specific purposes. However, the “best practice” factor may be related to a partial phase of training, such as the specification or the implementation, or to a particular aspect of training, such as the organisation, the contents, or the methods. Figure 16 -an adaptation of Figure 5- shows a structured set of topics that could be used to identify best practices and to classify them by their purpose, type of activity, or level of success.

#### **Expected results:**

A list of examples of good practices, and the analysis on what elements or aspects of each example is considered a good practice. Finally, some relevant conclusions -“lessons learned”- including the criteria to identify a good practice in this context.

#### **Suggested directions and methods:**

Gather multiple examples of diverse nature and scope, analyse them in terms of strategy and success, establish the “good practice” criteria, and try to transform all this research into useful recommendations and patterns.

## **6.5. BSDE roadmap: analysis of options, priorities, sustainability**

These are the services that have been initially selected because of their potential to be part of the BSDE (Blueprint Strategy for Digitalisation of Energy):

### **1. Research and Dissemination platform:**

Online platform in which EDDIE stakeholders share research and dissemination contents about digitalisation of the Energy Sector. Contents may include -or provide links to- papers, reports, projects, events, databases, institutions, news, posts, interviews, and so on.

### **2. Training Programmes marketplace:**

Online platform in which EDDIE stakeholders -mainly training providers- advertise training programmes devoted to the digitalisation of the Energy Sector. Training programmes will be described by standard templates, attributes, and keywords, to allow “search and select” functions according to specific needs. It may include “flagship programmes” and re-usable contents provided by EDDIE as an additional service.

### **3. Jobs marketplace:**

Online platform in which EDDIE stakeholders -mainly from Industry- advertise job openings, directly related to the digitalisation of the Energy Sector. Job profiles and requirements will be described by standard templates, attributes and keywords, to allow “search and select” functions according to specific needs. It may include candidate profiles (normalised CVs) from individuals or from other job marketplaces.

### **4. Tools and Systems marketplace:**

Online platform in which EDDIE stakeholders -mainly vendors and consulting companies- advertise digital tools, systems and services directly related to the digitalisation of the Energy Sector. Products will be described by standard templates, attributes and keywords, to allow “search and select” functions. It may include SW and platform communities, open source contents, technologies, and standards.

### **5. Marketplace for other services:**

To be defined, according to feedback and proposals from stakeholder. They may include consulting, assessment, validation, certification, or recruiting/head-hunting (always focussed on the digitalisation of the Energy Sector).

All these services should be analysed in terms of business models, to evaluate their feasibility/sustainability beyond EDDIE, and their expected impact in the digitalisation of the Energy sector-

### Expected results:

In the first phase, a business model for each service proposed, developed in parallel but presenting the results in a common format to compare them, and to make easier their dissemination and understanding. Note that services must attract stakeholders and collaborators to be feasible and useful, and therefore the dissemination aspect is critical.

The second phase must produce a clear roadmap for the incremental implementation of the services. Those considered feasible and sustainable must be prioritised for practical reasons, and implemented in the best order to exploit synergies and maximise techno-economical benefits.

### Suggested directions and methods:

The independent analysis of the different services should cover the same topics and follow a similar structure. For instance, this is a tentative structure proposed for the document describing each service:

- Executive summary, introduction, conclusions
- Description of the business model. Mission, scope, main features, services provided, main roles and procedures, impact, KPIs
- Detailed operations and functional requirements
- Stakeholders' analysis: roles and procedures, cost/benefit/motivation, willingness to pay, existing networks (marketing, dissemination and collaboration potential)
- Detailed analysis of the EC and EU framework (as stakeholder, as ecosystem)
- Detailed analysis of the ENTITY as stakeholder: roles, functions, legal nature options, and organization options (regional/national aspects included)
- Required resources: human, digital, financial, legal support
- Sustainability and feasibility analysis: competition, partnerships and alliances, public funding potential, private income potential, costs (CAPEX and OPEX), time to market

The following sub-section provides an example of the types of contents and topics included in the analysis of these business models. The "Training Programmes Marketplace" has been selected because it is the first one addressed, and it will be a guide to the rest of them.

## 6.5.1. Training Programmes Marketplace

### 1. Introduction

This section provides an initial draft of the analysis of the business model for a "training programmes marketplace", including information compiled from multiple sources. As a particular example, we analyse the development of the business model of an e-marketplace for e-learning materials. According to current studies, marketplaces – either public or private – will converge and integrate their processes and technologies. Marketplaces are supposed to be an easy way to put learning materials into the market and to merge into a single environment the demand and provider sides.

A lot of e-Learning materials, contents, and resources have been produced recently by a wide diversity of institutions. Problems arise concerning marketing, as well as the re-use and re-targeting of the materials for specific user needs and target groups. Marketplaces are supposed to be an easy way for those institutions to put their learning materials into the market and to sharpen their profile. Marketplaces provide benefits for buyers (e.g. personalisation and easier access), benefits for sellers/providers (e.g. new potential markets for exploiting their knowledge bases), and benefits for other trusted parties acting as partners. In this section, we clarify the development of an e-marketplace for e-Learning materials and describe crucial factors that are to be considered.

### 2. Business model, scope, main features, services provided, roles and KPIs

Platforms that link buyers with sellers are known as online marketplaces. The marketplace operator typically does not maintain inventory of its own but instead assists buyers and sellers with completing a transaction.

Online Marketplace's responsibilities may include logistic management and facilitation of payments. However, it will allow sellers to focus on their primary competency: supplying the right product to the right customer. Although markets can take on various shapes and sizes, they are mostly classified as vertical or horizontal.

Markets that operate horizontally provide consistent service across numerous product categories. For example, eBay customers can buy anything from clothing to gadgets. On the other hand, vertical marketplaces are focused on a single product category but include various services. Let's take the market for unique sneakers as an example: StockX handles product identification and quality control, as well as payment and shipment. Additionally, it allows them to serve as a reliable source for prospective clients.

The main **advantages** of an Online Marketplace Business Model are the following.

- **Network effects** A platform can grow organically into a marketplace when it has enough consumers and sellers. It will naturally attract more customers and users if it's attractive and valuable to your target client group.
- **A high user engagement rate:** Marketplaces that typically rely on recurrent sales usually have a high level of engagement.
- **Hard to replicate:** People are almost certain to remain loyal to the platform once it is established. Competitors who wish to surpass will need a superior product and a network of comparable size.
- **Data creation:** Marketplaces produce many (consumer) data, which operators may sell or use to enter new businesses.

The main **disadvantages** of an Online Marketplace Business Model are the following.

- **Dependence on other platforms:** Many marketplaces (e.g., real estate or automobile listings) have a low purchase frequency, making brand building more challenging.
- **High set-up cost.** The cost of developing a marketplace includes building the necessary technology stack, advertising to attract buyers and suppliers, and hiring the essential personnel.
- **Many competitors.** Competition is often fierce in a marketplace concept because of its viability.
- **Varying seller quality.** Vendors and the products or services they offer can vary greatly.

The main **types of marketplaces** that we see in the modern era are the following.

1. Sign up fees
2. Commission Model
3. Subscription Model
4. Freemium Model
5. Selling fees
6. Listing Model
7. Featured Ad Placement
8. Transaction or payment processing fees
9. Sponsored products and stores
10. Ads from third-party advertisers
11. Pay per lead or lead fees
12. Bidding fees for auction marketplaces
13. Grow your marketplace through affiliates and referrals

A vital component of the approach is gauging your growth by tracking a few **key indicators**, such as the following:

1. Net Revenue
2. Gross Merchandise Value (GMV)
3. Gross & Contribution Margin
4. Customer Acquisition Cost (CAC)
5. Net Promoter Score (NPS)
6. Rake (Take Rate)
7. Average Order Value (AOV)
8. Liquidity
9. Repeat Purchase Rate (RPR)

### 3. Detailed operations and functional requirements

Portal set-up and operation costs are driven by the complexity of the functionalities of the portal and the required level of human involvement in the updating of the content of the portal.

Based on the mentioned criteria, three scenarios are defined:

1. **Barebone portal**, with a low level of functionality and a low level of human operations.
2. **Content-edited portal**, with a low level of functional complexity of the portal, however increasing the number of human operations.
3. **User-generated content portal**, with an increasing level of functionality to automate the website portal operations, however the human resources needed to operate the portal remain low.

To fulfill the mission of the portal, i.e., to become an e-learning content exchange mechanism and networking facility for e-skills we propose to progressively deploy the website in accordance with the capacity to consolidate its presence in the e-skills sector.

The suggestion is to eventually deploy the three scenarios sequentially, moving from the first one (Barebone portal) to a user-generated portal, throughout consolidating first a content-edited portal.

The following are the most relevant issues identified and the envisaged contingency plans to overcome them.

1. **Need to encourage national portals to link to the European one.** The endorsement of the European Commission is a key factor to provide an access to the national portals and to key decision makers.
2. **Complicated architecture on the technical side.** The most critical aspect will be to keep the portal course calendar updated with the course providers' catalogues.
3. **Importance of defining common competences libraries.** A strategic partnership will have to be signed with the European Competence Framework so that the portal course catalogue is compliant with the framework.
4. **Building a federation of repositories that could be part of the system.** Import and export catalogue facility will have to be implemented to facilitate the update of the course catalogue.
5. **Integration between the European portal and existing networks and national web sites.** The e-learning4e-skills portal will have to devote a lot of efforts to marketing and communication during its first 3 years of operations. In parallel, the EC will have to devote efforts to assure enough visibility of the portal among Member States.
6. **Need to reach a critical mass of available learning objects.** Should it not be possible to find enough submission from providers, the portal will develop the contents itself during the initial phase of the portal development (scenario 1 and 2).
7. **IPR management, related to open content and to learning objects use, adaptation and re-use.** Content re-use could be an additional high-value service for the portal. The marketplace could have section to facilitate the deployment of a Learning Objects marketplace.
8. **Perception of the value added of the platform visible by providers and publishers.** It will be necessary to enhance the collaboration with other portals to gain visibility.
9. **The issue of blended-learning** E-learning provision can be a useful contribution to the training provision of e-skills, that would normally require some face-to-face session or work-based tutoring/mentoring.

### 4. Stakeholders analysis

Based on the results of best practice analysis, ongoing initiatives in the field of e-skills and e-learning for e-skills and consultation with experts, practitioners, and stakeholders, it was concluded that the European exchange mechanism for e-learning content for e-skills should take the form of a web-based platform, functioning as a virtual meeting, exchange and networking portal.

The elearning4eskills portal shall facilitate the development of the e-skills market in terms of supply (with the support to the creation of new value chains) so to enhance a more structured, integrated offer of e-skills e-learning courses and learning objects better serving a constantly increasing and specialised demand.

The portal should serve as a reference point and meeting place for providers, consumers of e-Skills, networking of research and training centres; and bring Europe-wide ICT e-learning resources, tools, and services together in one place. It shall facilitate the search for educational resources.

The Study “European Exchange mechanisms for e-learning for e-skills and networking of training and research centres” was launched 16 months ago. The Study demonstrated the need and feasibility of such a mechanism and managed to raise the interest of public and private actors and stakeholders involved in the provision of e-learning for e-skills in Europe. The final dissemination event, held in Brussels in April 2010 saw significant expressions of interest by key stakeholders and actors of e-skills supply in supporting the implementation of the exchange mechanism, thereby witnessing that a way forward is not only possible, but also recommended.

## 5. EC and EU Framework

The study “European Exchange Mechanisms for e-Learning content for e-skills and Networking of Training and Research Centres” is part of the follow-up of the communication on “e-Skills for the 21st century: Fostering Competitiveness, Growth and Jobs”, adopted on September 7th, 2007. The communication includes a long-term e-skills agenda for Europe and five action lines at the EU level:

1. Raising Awareness: exchanging information and good practice for the promotion of energy systems and ICTs.
2. Developing supporting actions and tools: supporting the development of a European e-competence framework, of a European e-skills and career portal.
3. Fostering employability and social inclusion: launching an initiative on e-Inclusion in 2008 with a view to halve the digital divide by 2010.
4. Promoting long-term cooperation and monitoring progress: maintaining a regular dialogue, and annual reports about the balance between supply and demand of skills.
5. Promoting better and greater use of e-learning: promoting the development of courses and mechanisms facilitating the exchange of e-skills training resources; supporting the networking of e-learning and training centres.

Of special focus to the Study is the 5th objective which is central in boosting e-Skills across sectors and players. Despite the current economic crisis, most of the reports and surveys indicate severe e-skills shortages and mismatches in the coming years. Companies and organizations need to bet on technology to boost their capacity to increase their productivity and innovate. These high performing tasks require a skilled workforce that trains and retrains along time.

## 6. Tasks and partners responsibilities

The sub tasks that need to be carried out for the analysis of this business model have been identified and a responsible team/institution has been proposed for each of them, as shown in the following figure.

| Sub task   | Institution           | Responsible/ team                                    |
|--|-----------------------|--|
| 2. Business model, scope, main features, services provided                                       | Repsol                | Ernesto Barrios                                      |
| 3. Detailed operations and functional requirements   | NTT                   | Martino Fumagalli, Flaminia Checchi, Giorgia Guajana |
| 4. Stakeholder analysis  | Iberdrola             | Maria Durán  |
| 5. EC and EU Framework   | Politecnico di Milano | Daniela Casiraghi                                    |
| 6. Analysis of the ENTITY: roles, functions, legal nature, organization options                  | Padre Piquer          | Genoveva Ponce, Sonia Reventun                       |
| 7. Required resources: human, digital, financial, legal. Sustainability and feasibility analysis | RWTH                  | Claudia Battistelli                                  |

Figure 17. Responsible team and institution for each subtask

## 7. Bibliography

“European Exchange Mechanisms for e-Learning Content and e-Skills Development”

Editors: Stefania Aceto, Fabio Nascimbeni (MENON Network)

Authors: Stefania Aceto, Claudio Dondi, Chiara Mellini (MENON Network), Anna Schmitthelm, Agnès Aguiló (P.A.U. Education)

“Business models for a European e-Learning marketplace”

Breuer, J., Hekman, B (University of Cologne, Germany)

“Business model in marketplace industry using business model canvas approach: An e-commerce case study”

Yana Eryana, Henny Hartono (Bunda Mulia University, Jakarta, Indonesia)

## 6.6. Technical assessment on BSDE implementation (WEB portal design)

As explained in Section 4, the prototype versions and the business models of the services will require technical work, in terms of database technology and design, contents specifications, functional requirements, architectural designs and interaction requirements, hosting requirements (including costs and technical specifications), management, security, and so on.

Other topics included in this task are the reliance on existing social networks towards maximum efficiency, techno-economic analysis of design options, and the legal implications: data protection, copyright and intellectual property issues.

This task is closely related to WP3 because the access to the WEB portal (or portals, depending on how the different services are implemented) will be linked to the stakeholders’ database, as shown in Figure 18.

The current specification of the stakeholders’ database includes the following statements:

- The main element of the database is the “institution” (a company, a university, and so on)
- The EDDIE manager will accept an institution as member, defining an individual account as “administrator” of the institutional contents and accounts.
- The administrator of the institution will have the right to define individual accounts with two different roles (permissions), the “representative” role or the “member” role. The former may upload and edit institutional and personal contents, while the latter may only upload and edit personal contents.
- Associations are special types of institutions, but they only differ in the attributes (descriptors). Examples are projects, consortiums, and professional associations.
- Individual may access the database only through institutions. The same individual may have different accounts if he or she is related to multiple institutions, each account with its specific role.
- The editing permissions are applicable to the description of elements in the database, and also to the contents of the different services: news or papers in the research portal, or training programmes in the corresponding portal. Each specific content will have a well-defined authorship and responsibility.
- The design of data structures, both for stakeholders and contents, should facilitate searches and queries. Therefore, closed menus of options and selection lists should be implemented whenever possible.

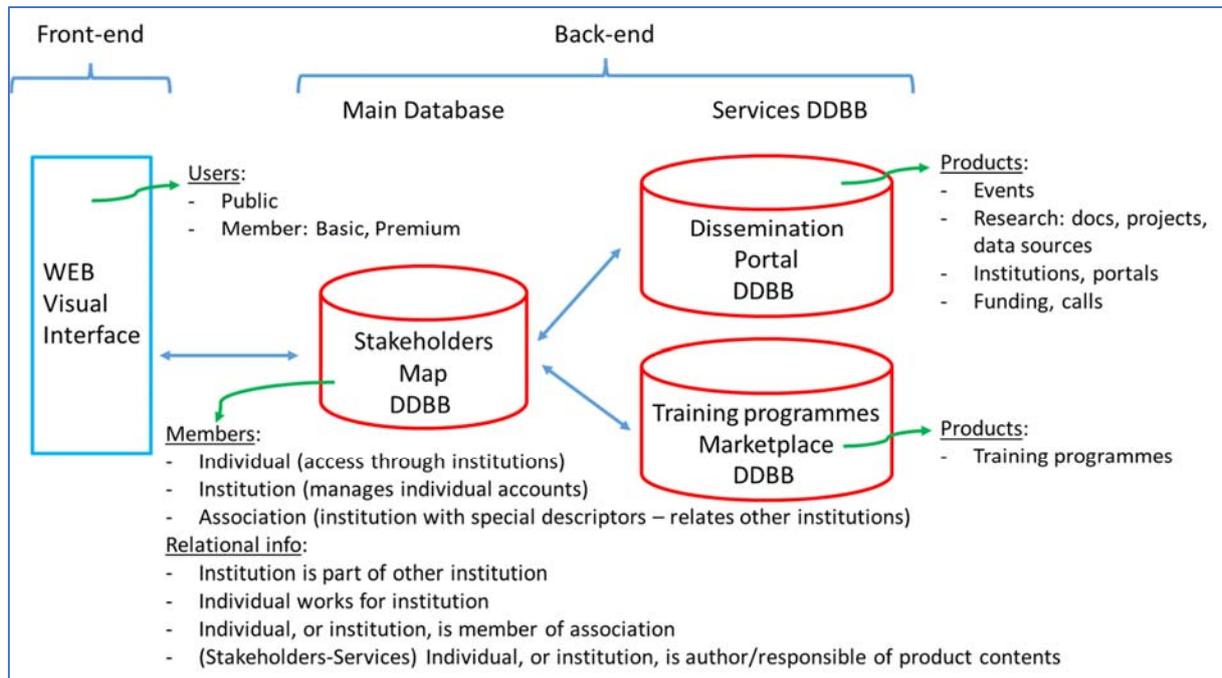


Figure 18. Relation between the stakeholders' database and the implementation of services

### Expected results:

Specification and design documents for the main database and some selected service portals. Several prototypes, with automatic data-import features for version upgrading -minimising editing efforts between successive prototypes.

Techno-economic estimations of the resources required for full-scale versions of the different databases and services, in order to analyse their business models.

### Suggested directions and methods:

In terms of methods, it is suggested to follow an incremental prototyping strategy. The implementation will be based in WordPress with plug-ins, at least the initial prototypes.

With respect to the contents of the databases, these are some directions and suggestions:

- Define contents trying to answer the following questions:
  - What information may and should be public?
  - What information should be stored in private sections (if any)?
  - What attributes of a stakeholder are relevant to define its specific profile?
- Structured information –as far as possible and as far as practical:
  - Only English language when possible + local identifiers when useful
  - Fixed menu of options + the “others” option if required.
  - Templates for database entries, enabling queries and easy uploading. This is applicable to stakeholders' info, and will be applied also to training programmes, job profiles, events, tools, systems, or any other entity handled by the Blueprint business models.
  - Links to additional information whenever the level of detail exceeds the database needs or the practical possibilities. Two examples: (1) beyond the basic attributes describing a company, a link to the WEB page of the company will be included as a standard attribute, and (2) beyond the basic attributes of a candidate to hiring or recruiting processes, a link to a CV document will be provided as a standard attribute.

## 6.7. Design and standardisation of “Sectorial Flagship Programmes”

As mentioned in Section 4, this task consists in the selection and/or development of outstanding training programmes, in the context of digitalisation of the Energy Sector. They may be selected for different reasons: adequate training goals, good structure and organisation, or any other characteristic considered an example of “good practices”.

### **Expected results:**

A set of programmes selected either because they compile standard contents based in most common skills gaps and needs, or because their organisational and teaching/learning models should be references of good practices. The ENTITY may contribute by selecting good programmes from the market, providing guidelines and contents to develop new programmes, and/or certifying the quality or adequacy of these programmes.

### **Suggested directions and methods:**

Rely on the results of WP4 and tasks 3 (templates) and 4 (best practices).