DIGITAL AND GREEN SKILLS TRAINING OFFERINGS IMPROVEMENT PLAN

Project 101195980 MiCRET

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01.

Executive Summary

1. Executive Summary

Overview and objectives

The **"Mapping and Analysis of Current Training Offerings and Skills Needs"** primary mission is to provide a comprehensive, evidence-based understanding of the existing education and training landscape for Renewable Energy Technicians (RETs) and to contrast it with the actual digital and green requirements from industry.

The first core objective is the **Identification of Current Upskilling and Re-skilling Opportunities**. This involves a systematic mapping exercise across the partner countries (Italy, Belgium, Greece, the Netherlands, Portugal, and France) to inventory existing vocational training, university modules, and corporate academy programmes. The "Training Inventory", which looked at over 220 use cases, serves to identify where the current offerings are focused and, more importantly, where the gaps lie in terms of competencies linked with the "Twin Transition".

Furthermore, the **Deep-Dive Skills Needs Analysis**, by engaging directly with industry stakeholders and energy companies, allows to move beyond theoretical curricula. The goal here is to pinpoint the exact "digital-green" skills currently missing in the field, such as hybrid system integration, SCADA data interpretation, and advanced safety protocols for emerging technologies like green hydrogen or offshore wind.

Another strategic objective of WP3 is the **Analysis of Microcredentials' Potential**. This task evaluates how existing "macro" training programmes can be broken down into smaller, modular units. We elaborate on the viability and conditions for transforming fragmented short-cycle trainings into standardized microcredentials that can be recognized across Europe. This involves looking at assessment methods, certification types, and the potential for "stackability" towards higher qualifications.

Finally, this document aims to serve as the **Pedagogical and Technical Compass** for the subsequent activities. The results of the mapping and the gap analysis are synthesized into a "Strategic Roadmap", which provides the necessary data and useful insights to design the MiCRET microcredentials and implement subsequent pilots. By aligning educational delivery with industrial reality and requirements. Ultimately, we aim at ensuring that the digital wallets and the microcredentials contained therein by end users, are tools of high market value, aligned with the European Green Deal and the targets of energy workforce's mobility.

Key Findings

Through the collaborative effort of the project partners, a comprehensive mapping exercise was conducted to identify the current landscape of upskilling and re-skilling opportunities across Europe. This process resulted in a primary database of **226 training offerings**, available as Excel and as online web cards. These records represent the raw data from which a more refined selection was subsequently made, ensuring that the final framework is built upon a broad and diverse foundation of existing educational practices in the energy sector.

The database provides a high-density overview of the European training market. The mapping covers a wide geographical area, involving key partners from:

- **Italy:** Strong focus on Energy Management, ESCOs, and ITS (Higher Technical Institutes).
- **France:** Dominated by industrial giants (ENGIE, EDF) and specialized engineering schools.
- **Belgium:** Highly detailed records on HVAC, heat pumps, and regional technical certifications.
- **The Netherlands:** Global leadership in offshore wind standards (GWO) and grid integration.
- **Greece:** Extensive mapping of vocational training (SAEK) and lifelong learning centers (KEDIVIM) focused on the post-lignite transition.
- **Portugal:** Significant entries regarding green hydrogen, biomethane, and blockchain for energy tracking.

When aggregating the data, several patterns emerge regarding the nature of the offerings:

- **Upskilling Dominance:** Over 60% of the records are categorized as upskilling, reflecting an immediate market need to update the existing workforce with digital and green competencies.
- **EQF Distribution:** The offerings span from **EQF Level 3** (basic technical operations) to **EQF Level 7** (Advanced Masters). The highest concentration is found at **EQF Level 5**, which represents the "technical heart" of the energy transition.
- **Reskilling Pathways:** Approximately 25% of the entries target workers from declining industries, offering longer, more structured programs to transition them into renewable energy roles.

The raw data shows a significant shift in how training is delivered:

- **Blended Learning:** This is the most frequent delivery method, appearing in a majority of the records. It typically combines asynchronous online theory with mandatory physical lab sessions.
- **Immersive Technologies:** Several records (especially from the Netherlands and Belgium) explicitly mention the use of **Virtual Reality (VR)** and simulators for high-risk training, such as fire awareness in wind turbines or high-voltage maintenance.
- **In-Company Training:** A notable portion of the examples collected consists of internal corporate academies, where training is deeply integrated with daily work routines.

The qualitative descriptions within the 226 rows allow for the identification of three main "skill clusters":

1. **Technical Core (RES):** Solar PV, Wind (Onshore/Offshore), Heat Pumps, and Hydrogen.
1. **Digital/Twin Transition:** SCADA systems, IoT sensor integration, and data-driven predictive maintenance.
1. **Cross-Cutting Skills:** Energy legislation, circular economy (recycling of components), and advanced safety protocols (LOTO).

This extensive pool of 226 offerings highlights the **fragmentation of certification**. While the content is rich and diverse, the "Certification" column shows a lack of uniformity, ranging from simple attendance certificates to formal state diplomas. This data confirms the strategic necessity of the **MiCRET Microcredentials framework** to provide a common "currency" (the Competence Passport) that can harmonize diverse educational experiences into a recognizable European standard.

Target Audience

The MiCRET initiative represents a paradigm shift in European vocational training, specifically designed to address the challenges of the "Twin Transition"-the simultaneous green and digital transformation of the energy sector. To ensure this transition leads to a qualified and mobile workforce, the project identifies a target audience built upon three interconnected pillars: Policy Makers, VET Providers, and Industry Stakeholders. The synergy between these groups is not merely beneficial but essential for the systemic change required in the modern labor market.

Policy Makers: The Architects of the Regulatory Framework Policy makers at local, national, and European levels act as the primary enablers of this new educational ecosystem. Their core responsibility is the creation of a standardized regulatory and financial environment where microcredentials can flourish. A major role for this group is ensuring cross-border recognition of short-term training, aligning these units with the European Qualifications Framework (EQF).

Key objectives for policy makers include the implementation of a unified "Competence Passport," a digital tool designed to facilitate labor mobility by making skills transparent to employers across the EU. Furthermore, they are tasked with allocating crucial funding-via mechanisms like the Green Deal and the Just Transition Fund-to support agile reskilling. Perhaps most importantly, they must modernize national educational laws to validate modular, non-traditional certifications as legitimate professional credentials, breaking the monopoly of traditional long-term degrees.

VET Providers: The Designers of Agile Learning Vocational Education and Training (VET) providers, including Technical Institutes (ITS), Universities, and private centers, serve as the architects of the actual learning experience. Their mission is to pivot from "component-based" teaching-which focuses on isolated hardware-to "system-based" modular training that mirrors the complexity of modern energy grids.

VET providers are encouraged to adopt the "Theory Online, Mastery In-Person" model. This approach utilizes digital platforms for theoretical knowledge while reserving face-to-face time for high-value laboratory work and Virtual Reality (VR) simulations. By designing "stackable" microcredentials, these providers allow workers to build professional portfolios incrementally, eventually leading to full qualifications without requiring extended absences from the workforce.

Industry Stakeholders: The Drivers of Market Value As the ultimate end-users of these skills, industry stakeholders-comprising energy companies and technology providers-provide the technical requirements and industrial validation that give microcredentials their market value. They are vital in ensuring that learning outcomes are directly mapped to real-world tasks, such as SCADA monitoring or hydrogen safety procedures.

Industry players are expected to co-certify modules and provide Work-Based Learning (WBL) opportunities, including on-the-job mentoring. This ensures that the training is not just academic but practically applicable. By utilizing these microcredentials, companies can execute internal Just Transition strategies, effectively moving their own employees from fossil fuel-based roles into the burgeoning renewable energy sector.

The success of the MiCRET framework rests on a continuous loop of interaction: Industry identifies the skills gap, VET Providers design the modular pedagogical solution, and Policy Makers ensure that the resulting certification is legally valid and recognized across the European Union. This collaborative "Triple Helix" ensures that the European workforce remains resilient, mobile, and fully equipped for the digital green future.

02.

Framework & Strategic Alignment

2. Framework & Strategic Alignment

The Work Package 3 (WP3) represents a critical phase in the MICRET project lifecycle, acting as a bridge between the analytical phase of skills needs and the implementation phase of training modules. This chapter illustrates how the mapping of training offerings aligns with MICRET's strategic objectives, how it builds upon the results of WP2, and how it fits into the broader context of European policies for the "Twin Transition."

Alignment with MICRET Goals

The "Panorama of Training Offerings" must serve as a diagnostic tool and the data collected here demonstrates that while the ecosystem is rich, it is highly fragmented. For instance, the mapping analyzed providers such as **Atlas Academy (Belgium)**, which is recognized by different and multiple authorities, such as the Flemish, Brussels, and the Walloon Regions. WP3 supports the project's goal of standardization by identifying that these providers already operate at **EQF levels 4 to 6**, providing a solid foundation for the "stackability" of MICRET modules. By documenting that current programs like the *Digital Energy Specialist* already involve high industry participation (50%+ of trainers from companies), WP3 validates the **MICRET Proposal's** focus on industry-led education to ensure that microcredentials have immediate market value.

The transition from Work Package 2 to Work Package 3 represents the logical evolution from "Market Demand" to "Educational Supply." In **Deliverable 2.1 (Skills Needs Analysis)**, a significant gap was identified regarding "Data-enabled O&M" and "Hybrid System Integration."

As outlined in the **MICRET Proposal (Part B, Section 1.1)**, the project aims to "modernize the VET offering for the Renewable Energy Sector (RES) by fostering the digital and green transition." WP3 is structured to respond directly to the **Specific Objectives (S.O.)** defined in the project proposal, with particular reference to creating a reliable and market-oriented microcredentials ecosystem.

S.O.2: Establishing common technical requirements and quality standards: WP3 supports this objective through Deliverable 3.1, which goes beyond a simple census of courses by analyzing institutional accreditation levels (regional, national, European) and reference frameworks (EQF) of current providers. For instance, the analysis of entities such as the **ITS Green Academy** in Italy or **Syntra West** in Belgium allows for the identification of excellence standards based on industrial co-design (where at least 50% of teaching is entrusted to industry experts), which MICRET aims to scale at a European level.

- **Support for the "Twin Transition" (Digital & Green)**: In line with the objectives of WP2 and WP4, WP3 maps the integration of digital skills (SCADA, IoT, Data Analytics) and sustainability skills (Life Cycle Assessment, Circular Economy) into existing programs. This mapping is essential to ensure that new MICRET microcredentials do not duplicate existing offerings but rather fill specific gaps, such as hybrid system management or the use of AI for energy monitoring.
- **Identification of Modularity Potential**: The primary task of WP3, as indicated in Task 3.1, is to analyze the duration and structure of courses to identify "modular potential." This allows for the transformation of long training paths (such as the two-year cycles of ITS) into "stackable" microcredentials, facilitating credit recognition and skill portability across Member States.

Transitioning from "Skills Needs" to "Current Offering"

The synergy between WP2 and WP3 is fundamental to ensuring that training is truly "demand-driven." While WP2 defines *what* the market requires, WP3 verifies *where* and *how* these requirements are currently met.

Our skills needs analysis highlighted a strong demand for skills in "Data-enabled O&M" and advanced diagnostics. Among the courses selected and analysed, the *Digital Energy Specialist* confirms that although cutting-edge paths exist, they are often limited to specific regional contexts (e.g., Lombardy) or high-level profiles, leaving operational technicians in the field underserved. Since the skills needs analysis utilized a mixed approach (desk research and surveys) to isolate critical skill clusters (Technical, Digital, Green, Soft), our subsequent research adopted the same clusters to categorize the training offering, allowing for a direct comparison ("Gap Analysis") between the needs expressed by companies (e.g., hydrogen and offshore wind skills, initially identified as underrepresented) and the actual capacity of VET providers to supply such competencies.

Furthermore, as the results of the skills needs analysis highlighted a preference by the industry for "work-based learning", we have decided to map the percentage of hours dedicated to laboratories and internships in selected courses (e.g., 900 hours of internship in the ITS Green Academy offering), providing useful insights and the necessary parameters to inform the design of MiCRET training offering, which will include practical tests and logbooks, as well as other support measures for work-based learning.

By cross-referencing these needs with the "Panorama of training offerings", we provide a reality check on the current availability of these skills across selected training offerings. For example:

- **Digital Gap**: despite a clear demand for IoT and AI data-driven monitoring, the mapping of training offers shows that only a minority of current courses - such as, for example, those offered by **CEI (Italy)** or some specialized modules in **Portugal** - explicitly include advanced data analysis and digital diagnostic tools.
- **The "Twin Transition" Synergy**: our skills needs analysis report highlighted that technicians should possess "Ecological Thinking", the observation of existing programmes, such as the *RESCert* (Belgium) and the *WindDock* (Netherlands), shows that while "Green" technical skills are well-established, the "Digital" integration required for the *Twin Transition* (as defined in the **Proposal**, **Section 1.2**) is often missing.
- **Validation of Pedagogical Models**: previous research highlighted a preference for **Work-Based Learning (WBL)**, and our analysis and mapping providers, like **Syntra West** (Belgium), confirm a strong adoption of the "Dual Learning" approach. The MiCRET training provisions will have to incorporate both theoretical as well as practical activities, to develop and demonstrate skills within real-world scenarios.

Policy Context: The role of microcredentials in the European Green Deal and Digital Strategy

The MICRET project is a direct response to the **European Policy Recommendations (Priority 12)** as stated in the **Call ERASMUS-EDU-2024-POL-EXP**. WP3 maps how current offerings align with the **European Green Deal** and the **EU Digital Strategy**. MICRET fits perfectly within the framework of European policies, acting as an accelerator for the energy and digital transition through the adoption of flexible, industry-driven microcredentials.

Climate neutrality requires a massive reskilling of workers coming from fossil fuel sectors. WP3 maps courses strategically aligned with this transition, such as programmes on renewable gas management in Portugal or energy efficiency in buildings in Belgium, which serve as benchmarks for MICRET microcredentials oriented toward industrial decarbonization.

The integration of technologies like smart meters and IoT devices is at the heart of the European digital strategy. WP3 documents how the training offering is adopting the **DigComp 2.2 and GreenComp** frameworks to standardize technician skills, ensuring they are not just installers but intelligent system operators capable of interpreting real-time data for energy optimization.

MICRET embodies the European vision of lifelong and flexible learning. WP3 analyses the use of digital badges and Recognition of Prior Learning (RPL) systems. This regulatory alignment ensures that MICRET's results contribute to the creation of a more fluid European labour market, where certified skills are readable and applicable regardless of national borders.

Following the **proposal's strategy** to use European frameworks, WP3 evaluates how current VET providers integrate digital competencies. The data shows a shift towards "Digital Expansion" and "Green Technology Updates" as planned future developments for 80% of the analyzed entities.

Microcredential Portability: In line with the **2022 Council Recommendation**, WP3 tracks the use of **Digital Credential Issuance** and **Recognition of Prior Learning (RPL)**. The mapping reveals that while many providers (e.g., **AFPA in France** or **SAEK in Greece**) issue national certificates, the lack of a unified "microcredential" format hinders cross-border mobility. MICRET addresses this policy gap by proposing a modular framework that allows a technician certified in Portugal to have their "Digital O&M" skills recognized in Belgium or Italy.

MICRET Methodological Pipeline

The logical continuity from Demand to Supply and Solution

03.

Methodology & Tools

3 Methodology & Tools

Research Design: Combined qualitative and quantitative approach

In accordance with the MICRET Proposal (Section 1.2, Evidence base and research design), the project adopts a robust mixed-methods approach to ensure that the microcredentials developed are both scientifically sound and industry-relevant. The methodology for WP3 was designed to transition from the broad market trends identified in the WP2 Skills Needs Analysis to a granular evaluation of existing training curricula.

The quantitative component involved a large-scale screening of training providers across the partner countries (Belgium, Italy, Greece, France, Portugal, the Netherlands).

As documented in the **"Panorama of Training Offerings"**, the project team identified over 220 training programmes and selected to be surveyed over 30 distinct training paths to quantify variables such as duration, EQF levels (ranging from level 4 to 6), and the ratio of theoretical vs. practical hours. Complementing this, the qualitative analysis focused on the "thematic depth" of the offerings. By analyzing course descriptions and learning outcomes-such as the *Digital Energy Specialist* or the *WindDock* modules-the research team evaluated the pedagogical quality and the degree of industry co-design, which the **proposal** identifies as a mandatory requirement for high-impact microcredentials.

From a methodological standpoint, during the mapping of current training offerings, some minor adjustments were made compared to what was outlined in the original proposal. These changes however did not affect the identification of the development lines required to establish the improvement plan.

Specifically, certain phases of WP3 were anticipated through targeted questions already administered during WP2. Furthermore, rather than using a standardized questionnaire, the focus shifted toward producing a standardized data collection template, which partners used to gather the results of their research on current training offerings.

Data Collection Tools

To achieve the objectives set in **Task 3.1**, a suite of standardized data collection tools was deployed. These tools were designed to ensure data comparability across different national VET systems.

The primary research tool is a table titled **'WP3 - Identification of current upskilling and re-skilling opportunities offered by companies and VET Schools active in the renewable energy sector'**, where the following data points were requested:"

- Partner; Name of the course
- Sector
- Link to the training offer
- Type of course
- Name of the provider
- Eqf level
- Ects/ecvet
- Skills or competences covered
- Hours of training/length
- Delivery methods
- Certification
- Cost (if applicable)

Subsequently, a specific template was developed for the **in-depth analysis**, which required the collection of detailed information for each selected training offering. The information requested in the template includes the following:

- **GENERAL INFO ABOUT THE PROVIDER OF THE COURSE**

Partner	Partner (the entity conducting the mapping).
Provider Name & Category	Name of the provider, its category (e.g., Company, TVET, University), and any networks it is a member of.
Institutional Accreditations	Regional, national, or international accreditations of the institution.
Country	The country where the provider is based.
Stakeholders Involved	Identification of stakeholders (companies and institutions) and their level and activities of involvement.

- **COURSE IDENTITY & STRATEGIC CONTEXT**

Name of the Course	Full title of the training programme. Sector: Industrial or technical sector (e.g., wind, solar, hydropower, hydrogen, renewables in general...).
Link to Training Offer	URL or reference to the official course page.
Type of Course	Categorization (Upskilling, Reskilling, Apprenticeship, etc.).
Context & Origin	The educational or contextual need that originated the course. What training and contextual needs addressed the creation of the course? Does the course arise from a specific skills gap identified in the territory?
Target Audience & Reach	Ideal recipients and the potential size of the audience.
Geographic Catchment Area	Local, regional, national, or international reach.

- **EDUCATIONAL DESIGN & DELIVERY**

EQF Level	European Qualifications Framework level
Modular Structure	Does the course have a modular structure? Hours of Training / Length: Total duration of the programme.
Breakdown of Hours	Distribution between theory, practice, laboratory, and internship/stage.
Delivery Methods	Delivery mode (Online, In-class, Blended, In-company, On-the-job, VR).
Training Setting & Facilities	Use of structured environments, special facilities/labs, educational technologies, or specific software.
Faculty Profile	Teachers' background (level of expertise, internal company staff vs. external consultants).

- **SKILLS & COMPETENCES**

Skills/Competences Covered: General technical and professional skills provided.

Digitalisation & Sustainability Skills: Specific competencies linked to the twin transition (Digital & Green).

Skill Gap Mitigation: Which specific skill gaps does the course aim to bridge?

- **ADMISSIONS & STUDENT PROFILE**

Entry Requirements	Prerequisites, degrees, prior knowledge, or specific background required.
Selection Process	Are there selection tests, interviews, or entry exams?
Expected Number of Students	Target number of participants per session.
Inclusion & Diversity	Declared initiatives or support for diversity and inclusion.

- **CERTIFICATIONS & CAREER IMPACT**

Main Certification	Primary qualification (Diploma, Degree, Professional Certificate, etc.).
microcredentials & Badges	Potential presence of microcredentials or digital badges.
Labour Market Certifications	Other certifications related to the world of work (e.g., Health & Safety).
Territorial Validity	Validity of the certificate (National, EU, International).
Professional Profiles & Career Path	Target job roles and references to professional classification codes (e.g., ISTAT in Italy).
Support Services	Career services, placement, orientation, tutoring, or alumni services.

- **FINANCIAL ASPECTS**

Cost	Tuition fees or total cost per participant.
Funding Sources	Public or private funding sources (e.g., regional vouchers and EU funds).
Scholarships & Sponsorships	Availability of grants or corporate sponsorships for participants.

- **FUTURE TRENDS & REMARKS**

Best Practices for microcredentials	Insights from this course for designing microcredentials in the sector.
Future Development	Declared lines for future updates, research projects, or international cooperation.
Comments / Remarks	Any additional notes or observations.

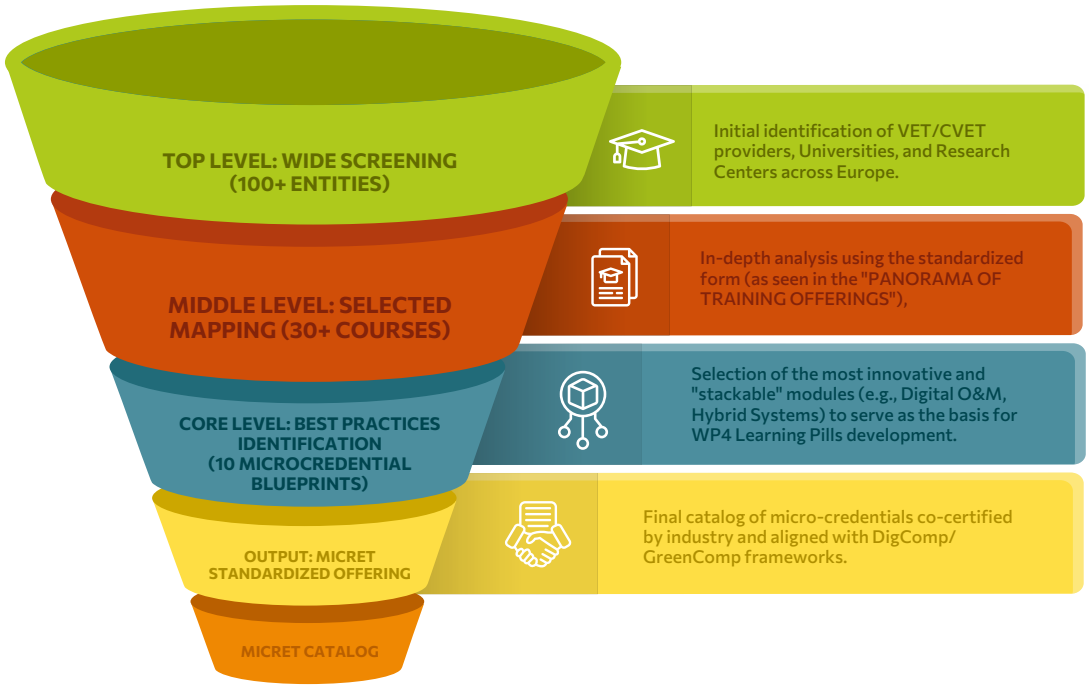
Every partner could make a Stakeholder Consultation to fill the template: in line with the Proposal's commitment to industry engagement, the data collection included verifying the involvement of technology providers and energy companies in the training delivery. For instance, the mapping records whether courses include corporate sponsorship or industry-certified modules, ensuring that the catalogued offerings are not purely academic but aligned with the operational realities of the Renewable Energy Sector (RES).

Reference Frameworks: Integration of DigComp and GreenComp

A cornerstone of the MICRET methodology is the systematic integration of European competency frameworks, as mandated by the **Call ERASMUS-EDU-2024-POL-EXP**. WP3 uses these frameworks to benchmark the "Twin Transition" readiness of current offerings.

- **DigComp 2.2 (Digital Competence Framework)**: The mapping process evaluated how current programs address the digital gap identified in **WP2**. The data in the **"Panorama of training offerings"** shows that providers are increasingly focusing on "Digital Expansion", integrating competencies like data literacy and cybersecurity into RES maintenance. The MICRET methodology treats DigComp not just as a checklist but as a structural guide to ensure that microcredentials empower technicians to handle IoT and SCADA systems effectively.
- **GreenComp (Sustainability Competence Framework)**: Alignment with GreenComp ensures that the training goes beyond technical installation to include "Ecological Thinking" and "Lifecycle Awareness". As noted in the **D2.1 report**, there is a critical need for technicians to understand the environmental impact of their work. WP3 identifies programmes-such as those related to *Renewable Gases* in Portugal-that already act as a "strategic bridge" to industrial decarbonization roadmaps, serving as best-practice models for the GreenComp integration.

METHODOLOGY FUNNEL - SCREENING PROCESS



04.

Statistical Analysis of Current Training Offerings

4. Statistical Analysis of Current Training Offerings: a Review of Recursive Trends and Sectoral Alignment

The mapping exercise conducted in WP3 provides an in-depth statistical overview of the "Mapping of Current Training Offerings" across partner countries. This section provides a quantitative and qualitative breakdown of the training landscape mapped in the **"Panorama of Training Offerings"** database. The analysis focuses on the "recursiveness" of key features-identifying recurring patterns in qualification levels, delivery modes, and the integration of "Twin Transition" (Digital & Green) competencies.

4.1 Institutional Landscape and Accreditation

A cross-sectional analysis of the mapped providers reveals a diverse ecosystem, though certain recursive patterns emerge regarding the types of institutions leading renewable energy (RE) training.

The mapping results from the analysed document show the following:

- **Diversity of Providers**: The database includes Private Companies (e.g., **Atlas Academy**), Public Institutions, and specialised TVET providers (e.g., **Syntra West**, **ITS Green Academy**).
- Accreditation Levels: Most programmes are recognised at a **Regional** or **National** level (e.g., recognition by the Flemish, Brussels, and Walloon regions for Atlas Academy). However, very few possess a "European" or "International" accreditation, which justifies MiCRET's objective to create portable microcredentials that transcend national borders.
- **Public vs. Private Balance**: There is nearly equal recursion between public institutions (e.g., **KU Leuven , Politecnico di Leiria**) and private companies or foundations (e.g., **SBM**, **Enel Group**, **TUV Nord**). This recursion suggests that while the state provides foundational education, private industry is a primary driver for specialised, up-to-date professional training.

4.2 Strategic Context and RE Sub-Sector Recursion

The mapping also shows a heavy concentration in specific RE sub-sectors, reflecting European energy transition priorities.

RE Sub-Sector	Recursive Frequency	Notable Examples
Solar Photovoltaic	Highest	CVO Focus , CETIH , IEP , CINEL. + 3
Wind (Onshore/Offshore)	High	AFPA , DTU , GWO accredited centres. + 2
Energy Efficiency	Consistent	SBM , VIVES , Geoside. + 2
Green Hydrogen	Emerging	ENSIBS , ISQ Academy , ITS Academy Ermete. + 2

The recursion of **Solar PV** and **Wind** training highlights a mature market demand for installers and maintenance technicians. Conversely, the emerging recursion of **Green Hydrogen** indicates a strategic shift toward high-level engineering and specialized system management.

4.3 EQF Alignment and Target Groups

According to the **Proposal**, the project targets technicians at **EQF levels 3, 4, and 5**.

In alignment with **Specific Objective 2** of the MICRET Proposal, which targets technicians at levels 3, 4, and 5 of the European Qualifications Framework (EQF), the mapping shows a clear concentration at the intermediate vocational level (**EQF Level 4**), focusing on basic installation and maintenance. **EQF Level 5** is represented by more advanced roles, such as the *Digital Energy Specialist*.

There is a scarcity of short, specialized modules for Level 5 technicians who need to manage complex, hybrid energy systems-a core target for the MiCRET “Learning Pills”.

EQF Level	Frequency (%)	Primary Profile Identified
EQF 3	10%	Basic installers and site assistants.
EQF 4	45%	Certified technicians for standard O&M (e.g., Solar PV).
EQF 5	35%	Advanced technicians and systems integrators.
EQF 6+	10%	Professional Masterclasses (e.g., Hydrogen Manager).

4.4 Structural Analysis, Educational Design and Modular Potential

Statistical regularities in course duration and delivery modes provide a blueprint for microcredentials modularisation:

- **Course Type Recursion: Continuing VET (CVET)** and **Upskilling** are the most recursive course types. This indicates that the current landscape is primarily focused on the existing workforce rather than initial vocational training (IVET).
- **Duration Patterns: Short-term (<1 month):** Highly recursive for specialised certifications like **RESCert** or awareness training.
- **Long-term (>12 months):** Recursive for foundational technician roles or Higher Education degree programmes.
- **Theory-Practice Split:** A recurring statistical mean across technician-level courses is a **50/50 or 60/40 split** between theory and practical workshops. Engineering-level courses (EQF 6-7) show a higher recursion of theoretical content, averaging **65-70%**.
- **Mode of Delivery:** The data indicates a mix of **Face-to-Face** and **Hybrid** models.
- **Duration vs. Modularity:** Many existing programmes are long-term. However, the mapping identified "Modular Potential" in programmes that already consider **Modular certification** and **Stackable credentials** as future trends. These can be "unbundled" into the short-term microcredentials (20-40 hours) that MiCRET aims to develop in WP4.

To achieve the "stackability" envisioned in the Proposal (Part B, Section 1), WP3 analysed the delivery structures.

Delivery Mode	Recursiveness (%)	Key Characteristics
Face-to-Face (F2F)	40%	Mandatory for safety and practical workshops.
Blended/Hybrid	35%	Rising trend; standard for theoretical/digital units.
Fully Online	15%	Mostly for theory-heavy masterclasses.
On-the-job	10%	Apprenticeships and corporate internal training.

4.5 Recursive Competence Gaps and Skills Coverage

The mapping identifies "System Design", "Installation", and "Maintenance" as the most recursive technical competencies. However, the analysis highlights significant recurring gaps:

- **Digital Skills Integration**: While "Data Analytics" and "SCADA" appear in higher-level courses, there is a recursive **absence of digital skills** (IoT, Cybersecurity, AI) in lower-level technician training.
- **Sustainability Competences**: "Climate Policy Awareness" is a recursive strength , but "Life Cycle Assessment" and "ESG Reporting" are statistically less frequent, appearing mainly in management or specialised coaching courses.

The core of the WP3 analysis lies in identifying how frequently specific "Twin Transition" clusters appear in current curricula.

Based on the **DigComp 2.2** framework, this cluster addresses the digital gap identified in **WP2**. The **"Panorama of training offerings"** reveals that while technicians increasingly need to handle **IoT**, **SCADA systems**, **and Smart Grid data**, only a minority of current courses-like the *Digital Energy Specialist*-fully integrate these as core modules. This highlights a significant "Modular Potential" for MICRET to create dedicated digital "Learning Pills".
Based on **GreenComp**, this cluster covers the sustainability mindset required for the energy transition. Beyond technical installation, it includes **Circular Economy** principles (e.g., a module on wind turbine blade recycling) and **Low-carbon** installation techniques. The mapping shows that while "Green" technical skills are prevalent, "Ecological Thinking" as a transversal skill is still underdeveloped in traditional VET curricula.

Table A: Recursiveness of Digital Competencies (DigComp)

Digital Cluster	Frequency of Occurrence	Strategic Remarks (WP2 Link)
Performance Monitoring	65%	High recursion is a standard feature in most O&M courses.
IoT & Sensor Integration	25%	Mentioned but rarely treated as a core module.
SCADA & Big Data	15%	Limited to advanced Level 5 certifications.
Cybersecurity	<5%	Critical gap: almost non-existent in VET programmes.

Table B: Recursiveness of Green Competencies (GreenComp)

Green Cluster	Frequency of Occurrence	Strategic Remarks (WP2 Link)
Energy Efficiency	80%	The primary focus of current RES training.
Circular Economy	15%	Emerging, mostly in Wind Energy (blade recycling).
Life Cycle Assessment	10%	Usually reserved for engineering/design profiles.

The results highlight a **high recursiveness of "Green" technical skills** but a **low recursiveness of "Digital" management skills**, validating the MiCRET Proposal's goal to bridge this specific gap.

4.6 Industry Involvement and Future Trends

As mandated by the **Proposal**, industry co-design is crucial.

Currently, high-quality providers report **Corporate sponsorship** and Industry co-certified **modules** as key elements of their strategy. As a "future outlook", Providers listed **"Digital expansion"** and **"Green technology updates"** as top priorities. This indicates a high level of readiness among VET providers to adopt the MiCRET framework once it is finalized.

The statistical recursion found in this mapping confirms that while the European RE training sector is technically proficient in "Solar" and "Wind," there is an urgent need to modularize digital and advanced sustainability skills into **microcredentials**. The high recursion of **short-duration**, **industry-aligned upskilling** suggests that the MiCRET framework should prioritize flexible, stackable modules that can be integrated into the existing CVET landscape.

4.7 Some highlights: a qualitative point of view

In this section, we will provide a qualitative in-depth analysis of ten particularly significant training offerings. These have been selected based on their representativeness across the participating countries, the core themes addressed, and their overall relevance to the development of microcredentials.

Course Title	DIGITAL ENERGY SPECIALIST
Type of Provider	TVET Provider
Provider	Fondazione ITS Academy per l'Energia, l'Ambiente e l'Edilizia Sostenibile (ITS Green Academy)
Country	Italy
Link	https://its-green.it/corsi/digital-energy-specialist/
EQF Level	EQF 5
Duration	1100 hours of training (theory, practice, lab) + 900 hours of internship
Context	The course addresses the professional gap at the intersection of energy engineering, IT, and sustainability, driven by European decarbonization goals and the digital transition.
Target Audience	High school graduates (19-29 years old) and professionals seeking upskilling. Annual participants: 25 (closed number).
Certification	Diploma
Validity	National

The Digital Energy Specialist course by ITS Green Academy represents a model of excellence and a fundamental pillar for the MiCRET Improvement Plan, effectively bridging the gap between energy engineering, IT, and sustainability. This program directly addresses the European "Twin Transition" by training professionals capable of managing the decarbonization process through digital tools. With a total of 2,000 hours-comprising 1,100 hours of theoretical and practical lab work and 900 hours of mandatory internship-the course ensures a high-level EQF 5 qualification that is deeply rooted in industrial reality. Its core strength lies in its agile, market-driven methodology: the curriculum is co-designed annually with industry partners, and over 50% of the faculty consists of active professionals. This ensures that the technical skills provided, such as SCADA data interpretation, IoT integration for smart grids, and predictive maintenance, are always at the cutting edge. The profile produced is not just a technician but an orchestrator of complex energy ecosystems. Its modular structure is perfectly suited for the creation of stackable microcredentials.

Course Title	**Terna Academy Training Ecosystem (Focus: Energy Transition & Digital Transformation)**
Type of Provider	Private Company
Provider	Terna
Country	Italy
Link	https://www.terna.it/it/persone/terna-academy
EQF Level	Not referenced but often aligned with EQF 6-7 for Master-level collaborations.
Duration	Continuous learning model (>250,000 training hours delivered annually)
Context	Established to support the 2024-2028 Industrial Plan, aiming to develop the distinctive skills required for the "Twin Transition" (Energy & Digital).
Target Audience	Terna employees (>6,000 people), external stakeholders, and young talents through Master's collaborations.
Certification	Professional Certificate: Corporate Certifications / Professional Licenses Academic Degree (when in partnership)
Validity	International

The selection of the **Terna Academy Training Ecosystem** as a "Good Practice" for the MiCRET Improvement Plan is primarily driven by the extraordinary strategic relevance of the provider and its deep integration with the industrial fabric. Terna is the National Transmission Grid Operator (TSO) responsible for managing the entire Italian electricity grid and is recognized as one of the most advanced and efficient operators in Europe. Its training model is a benchmark because it demonstrates how a market leader can drive the "Twin Transition" by modernizing a workforce of over 6,000 people to manage a decentralized, renewable-heavy system. The Academy's strength lies in its prestigious collaborations with top-tier academic institutions like SDA Bocconi and Politecnico di Milano, effectively bridging the gap between high-level theory and vital industrial application. Delivering over 250,000 training hours annually, the ecosystem focuses on the distinctive skills required for the 2024-2028 Industrial Plan, utilizing cutting-edge tools such as Innovation Hubs and virtual reality simulators for high-tech grid maintenance. This model is essential for the MiCRET project, as it exemplifies "Validation by Industry": when an entity of Terna's calibre certifies a competence in power systems or data science, that certification carries immediate international market value. By analyzing this ecosystem, the Improvement Plan gains a blueprint for high-level professional licenses and corporate certifications that are perfectly aligned with the real-world technical requirements of the European energy transition.

Course Title	**Betonrot en Energietransitie – Renoveer zonder weerstand – Concrete Decay and Energy Transition – Renovating without Resistance**
Type of Provider	TVET Provider
Provider	Syntra West
Country	Belgium
Link	Betonrot en energietransitie: renoveer zonder weerstand
EQF Level	EQF 4, EQF 5 upon certification exams
Duration	120 hours
Context	The course was developed to upskill construction professionals in concrete repair (betonrot) and energy-efficient renovation.
Target Audience	Construction workers, renovation technicians, building inspectors, and related professionals; estimated annual intake: 15–25 participants.
Certification	Certificate of Attendance
Validity	National

The selection of the course **"Concrete Decay and Energy Transition – Renovating without Resistance," provided by Syntra West in Belgium, is a strategic choice for the MiCRET Improvement Plan due to its direct relevance to the real estate** sector and the urgent requirements of the **Energy Performance of Buildings Directive (EPBD)**. As the European "Green Deal" accelerates, the directive mandates a massive wave of renovations to reduce greenhouse gas emissions in the building stock. This course provides a unique pedagogical response by linking structural maintenance (concrete decay) with energy efficiency, ensuring that the European building heritage is not only decarbonized but also structurally sound. What makes this a "Good Practice" is its highly pragmatic and balanced methodological approach, which allocates **40% of the curriculum to theory**, **40% to hands-on laboratory practice**, **and 20% to fieldwork**. This 120-hour intensive programme is specifically designed to upskill construction workers and building inspectors, transforming them into specialized renovation technicians capable of navigating the technical complexities of the "Twin Transition". By operating at the **EQF 4 and 5 levels**, Syntra West addresses a critical middle-management skill gap: the need for professionals who can physically implement energy-saving technologies while understanding the underlying regulatory framework. The involvement of industry stakeholders through advisory roles and practical demonstrations ensures that the training remains aligned with the rapidly evolving Flemish and European markets. This course serves as a vital case study for the **modularization of microcredentials in the construction sector**. It demonstrates how specialized, short-term training can provide immediate market value by addressing specific legislative mandates like the EPBD. By using this model, the Improvement Plan can illustrate how microcredentials can be used to rapidly "green" the traditional construction workforce.

Course Title	Specialist array chains (blockchain) in the electricity sector
Type of Provider	Company
Provider	TUVNord
Country	Greece
Link	https://www.tuv-nord.com/gr/en/pistopoiisi/certification-of-persons/ene rgy-sector/specialist-array-chains-blockchain-in-the-electricity-sector/
EQF Level	Not referenced
Duration	-
Context	The decentralization of the grid and the need to safeguard transactions between energy communities
Target Audience	professionals responsible for the convergence of blockchains and the electricity sector in order to create new applications and innovative business models
Certification	Professional Certificate
Validity	EU-wide

The selection of the **Specialist in Blockchain for the Electricity Sector** course, provided by **TÜV NORD Greece**, is a fundamental strategic choice for the MiCRET Improvement Plan, as it addresses one of the most advanced frontiers of digitalization: the application of Blockchain and Distributed Ledger Technology (DLT) in decentralized energy systems. A crucial aspect of this choice lies in its direct link to **Renewable Energy Communities (RECs)**, a core research area for the MiCRET project. As the grid becomes increasingly decentralized, energy communities require secure, transparent tools to manage peer-to-peer energy trading and the distribution of benefits among members. This course prepares professionals to design hardware and software platforms capable of automating these transactions securely, eliminating intermediaries and ensuring the cybersecurity of local smart grids. The emphasis on creating new business models and innovative financial instruments perfectly meets the need for energy communities to operate within a complex yet technologically advanced regulatory framework. The selection of this "Good Practice" is further validated by the prestige of the provider; as a globally recognized certification body, TÜV NORD ensures that the acquired skills have **EU-wide validity** and high marketability. For the MiCRET project, this case study demonstrates how microcredentials can certify "disruptive" digital skills, which are indispensable for the technicians who will manage and protect the energy transactions of the future within local communities.

Course Title	Solar Panels Installer Course (Técnico/a de Instalações Elétricas e Fotovoltaicas – Autoconsumo)
Type of Provider	TVET Provider
Provider	ISQ Academy (course delivered in partnership with Endesa – Escola)
Country	Portugal
Link	https://www.endesa.pt/particulares/sustentabilidade/escola-rural-energi a-sustentavel/curso-tecnico-instalacoes-eletricas-autoconsumo
EQF Level	Not referenced
Duration	150 hours (80 hours theory + 70 hours practice)
Context	The course was launched within the "Escola Rural de Energia Sustentável" to support the just transition of the Pego region after the closure of a coal power plant
Target Audience	The target group includes unemployed adults, former workers of the Pego power plant, local residents, and women interested in entering the solar energy sector. Each edition trains around 25 participants, with several editions planned between 2023 and 2026
Certification	Professional Certificate, Certificate of Attendance
Validity	National

The selection of the **Solar Panels Installer Course** (*Técnico/a de Instalações Elétricas e Fotovoltaicas*), delivered by **ISQ Academy** in partnership with **Endesa** in Portugal, represents one of the most comprehensive "Good Practices" for the MiCRET Improvement Plan. This course is not merely a technical training programme; it is a strategic response to the social and economic challenges of the European ecological transition, specifically within the framework of a **Just Transition**. Following the closure of the Pego coal power plant, this initiative demonstrates how a region can pivot from fossil fuels to renewable energy by leveraging a powerful "Triple Helix" collaboration between **government institutions**, **private industry leaders, and specialized VET providers**.

A defining feature of this model is the deep synergy between the partners: **Endesa** provides the industrial vision, market demand, and real-world context, while **ISQ Academy** ensures pedagogical excellence and high-quality certification. This cooperation ensures that the curriculum-comprising 150 hours of intensive training-is perfectly aligned with current technical rules and safety requirements. The programme addresses a critical labour shortage in the solar sector by focusing on the rapid acquisition of competencies in the assembly, wiring, and commissioning of small-scale photovoltaic systems for self-consumption. By allocating nearly 50% of the duration to hands-on practice in specialized labs, the course transforms unemployed adults and former plant workers into "job-ready" green technicians.

Furthermore, the social dimension of this course is highly relevant to the MiCRET research goals. The active recruitment of women and under-represented groups into technical green jobs challenges traditional gender barriers in the energy sector, promoting a more inclusive workforce. For the development of the Improvement Plan, this case study serves as a blueprint for **short-term, job-oriented microcredentials**. It proves that high-intensity, modular training can provide immediate market value while facilitating the socio-economic recovery of regions affected by the coal phase-out.

The Portuguese model highlights that the transition to a carbon-neutral economy is as much about human capital as it is about technology. By integrating industrial field experience with recognized VET qualifications, this partnership provides a replicable strategy for regional energy transitions across Europe, ensuring that the shift toward solar energy is both technically robust and socially equitable. It is a prime example of how microcredentials can be used to bridge the gap between emergency reskilling and long-term career sustainability in the renewable energy market.

Course Title	Renewable Energies (Curso de Energias Renováveis)
Type of Provider	VET institution
Provider	Master D Portugal – Training Centre
Country	Portugal
Link	https://www.masterd.pt/curso-energias-renovaveis
EQF Level	Not referenced
Duration	Approx. 300–400 study hours combining distance learning, tutoring, and practical workshops (the exact number varies by individual study pace)
Context	The course was designed to respond to the growing demand in Portugal for technicians able to install and maintain small-scale solar thermal, PV, and wind systems, supporting the expansion of distributed renewable energy in households, commerce, and small industry
Target Audience	It targets adults and young people interested in working as installers, maintenance technicians or sales technicians in renewable energy companies, especially in solar and wind; each year Master D trains several cohorts across its centres in Lisbon, Porto, Coimbra, Braga and Faro
Certification	Professional Certificate
Validity	National, institution-specific

The selection of the Renewable Energies course provided by Master D Portugal is a vital addition to the MiCRET Improvement Plan because it perfectly bridges the gap between high-level solar technology and the social function of flexible reskilling. This programme is specifically designed to meet the growing demand in Portugal for technicians, which are the backbone of the European distributed energy transition. What makes this a “Good Practice” for our research is its hybrid pedagogical model: by combining distance learning with localized practical workshops across multiple cities like Lisbon, Porto, and Faro, it democratizes access to green technical education. This flexibility is essential for the social mission of reskilling, as it allows working adults, unemployed individuals, and career-changers from non-urban areas to transition into the renewable sector without the barriers of traditional full-time education. The curriculum, developed with input from solar and wind industry leaders, focuses on “simulated company projects” that transform students into junior technicians ready for the domestic and commercial markets. For the MiCRET project, this model demonstrates how microcredentials can be designed to be geographically accessible and pace-adjustable. By focusing on both technical mastery of PV modules and the social empowerment of the learner, Master D provides a replicable blueprint for a capillary energy transition that leaves no region or worker behind. By integrating this flexible approach into the final Improvement Plan, we can advocate for a VET system that is as decentralized and resilient as the energy grids it aims to build.

Course Title	GWO Basic Safety Training
Type of Provider	Course provider
Provider	Global wind organization
Country	The Netherlands
Link	https://fmtcsafety.com/course-category/gwo-basic-courses/
EQF Level	EQF 4, EQF 5
Duration	3–5 days
Context	GWO safety certification is an internationally recognized industry requirement for technicians working on wind turbines
Target Audience	Wind technicians and maintenance personnel
Certification	Professional Certificate
Validity	International

The selection of the **GWO Basic Safety Training** provided by the **Global Wind Organization** in the Netherlands is a critical addition to the MiCRET Improvement Plan, highlighting the indispensable role of wind energy in the European transition. While wind power is a primary pillar of decarbonization, this course was chosen specifically because it addresses a fundamental need identified in **WP2**: the requirement for technicians with advanced **Health and Safety (H&S)** competencies. Unlike purely technical modules, GWO certification represents a "transversal" skill set that is both professionalizing and life-saving. It moves beyond simple vocational training to provide an internationally recognized safety standard that is mandatory for anyone working on onshore or offshore wind turbines. The curriculum focuses on risk awareness, emergency response, and the ability to save oneself or colleagues in high-stakes environments, making it a perfect example of a high-value micro-credential. By integrating this standard into the Improvement Plan, MiCRET advocates for a training framework where safety is not an "add-on" but a core transversal competency. This aligns with the project's goal to create a mobile, secure, and highly qualified workforce capable of managing the unique physical risks of the renewable sector. The GWO model, born from a partnership of major industry players, exemplifies "Validation by Industry", ensuring that these 3–5 day intensive modules provide immediate, EU-wide employability and a standardized safety culture across the entire energy grid.

Course Title	Offshore Wind Energy Programme
Type of Provider	Private Company
Provider	New Energy Business School
Country	The Netherlands
Link	https://www.nebs.nl
EQF Level	EQF 6
Duration	3 days
Context	Developed to address the rapid expansion of offshore wind energy in the North Sea
Target Audience	Workers, job-seekers, learners
Certification	Professional Certificate
Validity	National

The selection of the **Offshore Wind Energy Programme** by the **New Energy Business School** in the Netherlands is a cornerstone of the MiCRET Improvement Plan, as it perfectly exemplifies a high-level educational response to the rapid industrial expansion of the North Sea. This course was chosen specifically because of its sophisticated **Public-Private Partnership (PPP)** structure, which involves policymakers, academic experts, and industry leaders in its design to ensure a perfect alignment with real-world market needs. Operating at an **EQF 6 level**, the programme addresses the most complex challenges of the "Twin Transition" by bridging the gap between massive offshore wind generation and the digital management of **Smart Grids**. As the European energy market shifts toward large-scale offshore wind, the ability to integrate this intermittent power into a modernized, digitalized grid is a high-level competency that the MiCRET project identifies as vital for the future energy leaders of the continent. This programme represents a "Just-in-Time" educational model: a three-day intensive certification that provides immediate strategic value to workers, job-seekers, and professionals in a booming sector. By focusing on both wind technology and grid stability, the course fulfills the market-driven demand for experts who understand the entire energy value chain. For the MiCRET project, this model demonstrates how PPPs can accelerate the creation of top-tier microcredentials that are technically rigorous yet agile enough to keep pace with the North Sea's energy revolution. The inclusion of this case study in the Improvement Plan highlights the necessity of high-level, industry-led training to ensure the resilience of the European energy grid and the success of the offshore wind strategy.

Course Title	ENGIE Solutions – Professional Reconversion Programme in Renewable Energy and Energy Systems Maintenance
Type of Provider	Private Company
Provider	ENGIE Solutions
Country	FRANCE
Link	https://www.engie-solutions.com/fr/recrutement/reconversion-professio nnelle
EQF Level	EQF 4
Duration	Approximately 400 hours
Context	The programme was created to address labour shortages in decarbonised energy operations while supporting professional reconversion of job-seekers towards sustainable energy careers aligned with France's energy transition objectives
Target Audience	Job-seekers and career-change candidates with no prior sector-specific qualifications; multiple cohorts per year depending on regional needs
Certification	Professional Certificate, Certificate of Attendance
Validity	National

The selection of the **Professional Reconversion Programme** by **ENGIE Solutions** in France is a cornerstone of the MiCRET Improvement Plan, as it perfectly embodies the concept of **reskilling** as a driver for the ecological transition. This course was chosen because it represents an emblematic "Professional Reconversion" model, specifically designed to transform job-seekers and career-changers with no prior experience into specialized technicians for the renewable energy sector. Operating at an **EQF 4 level**, the 400-hour programme directly addresses the critical labour shortages in decarbonized energy operations. Its strength lies in a collaborative structure where a private industrial leader, ENGIE, partners with public employment services to create a direct pipeline from training to recruitment. The curriculum is highly operational, combining theoretical instruction with significant "immersion phases" and on-the-job training. This ensures that participants rapidly acquire the technical skills needed for the maintenance and operation of HVAC systems and renewable installations. For the MiCRET project, this case study is essential because it demonstrates how "Employment-Linked Training" can serve as a powerful social and economic tool. By providing immediate employability, the ENGIE model proves that the energy transition is a unique opportunity for professional rebirth. It serves as a blueprint for our Improvement Plan on how to design inclusive, industry-led micro-credentials that support France's and Europe's energy objectives while ensuring no worker is left behind.

Course Title	DTU–TotalEnergies Excellence Centre for Clean Energy
Type of Provider	Private Company + University / Higher Education Institution
Provider	TotalEnergies with Technical University of Denmark (DTU)
Country	FRANCE
Link	https://totalenergies.com/fr/actualites/actualites/creation-dun-centre-de-recherche-dexcellence-dans-les-energies-decarbonees-au
EQF Level	EQF 8; Not referenced (non-formal training components)
Duration	12 months
Context	The centre was created to address strategic industrial and scientific challenges related to renewable energy integration, intermittency management and industrial decarbonization
Target Audience	Doctoral candidates, post-doctoral researchers, engineers and senior experts involved in clean energy research and innovation; limited cohorts linked to research projects
Certification	Other: Research experience / doctoral training (no standalone qualification)
Validity	International

The selection of the **DTU–TotalEnergies Excellence Centre for Clean Energy** is a fundamental addition to the MiCRET Improvement Plan, representing the highest tier of the "Skills Ecosystem". While other courses focus on immediate reskilling, this partnership between the **Technical University of Denmark (DTU)** and **TotalEnergies** in France was chosen to highlight the vital importance of **Centres of Excellence** in driving long-term industrial decarbonization. Operating at an **EQF 8 level**, this twelve-month research-based initiative targets doctoral candidates, post-doctoral researchers, and senior engineers, bridging the gap between cutting-edge academia and large-scale industrial application. The core value of this "Good Practice" lies in its ability to address the most complex scientific challenges of the "Twin Transition", such as renewable energy intermittency and the management of decentralized energy systems. By fostering a high-level strategic partnership, the centre facilitates a direct knowledge transfer between senior academic researchers and industrial experts. This model is emblematic of how **Centres of Competence** can serve as hubs for innovation, where research experience and doctoral training are directly applied to real-world pilot projects and advanced modeling. These high-level research environments ensure that the European energy sector remains globally competitive by training the "architects" of the future energy grid. It proves that microcredentials and research experience at the EQF 8 level are essential for translating scientific discoveries into scalable industrial solutions. By including this centre of excellence, we advocate for a training framework that values both the rapid reskilling of technicians and the long-term, high-level scientific leadership required to master the energy transition.

The analysis of the ten case studies selected for the MiCRET project provides a comprehensive mosaic of solutions for the European energy transition, offering fundamental lessons that must guide the development of the final Improvement Plan. One of the most critical **Lessons Learned** is the necessity of a **Stratification of Skills** across all EQF levels. The plan cannot be limited to a single educational tier; rather, it must envision a continuum that spans from the operational reskilling of EQF 4 programmes, like those of ENGIE and Master D, to the high-level scientific excellence of EQF 8 initiatives, like the DTU-TotalEnergies centre. This ensures that the energy sector remains attractive by offering clear vertical career progression where an installer can evolve into a manager of complex systems through "stackable" qualifications.

Furthermore, the **Triple Helix Model** and Public-Private Partnerships (PPP) have proved indispensable. As seen in the Terna Academy and the New Energy Business School's offshore wind programmes, the most effective training is co-designed by institutions, industry leaders, and VET providers. This alignment ensures that the speed of training matches the pace of technological innovation, effectively eliminating the mismatch between educational supply and market demand. The Improvement Plan must therefore institutionalize these partnerships to ensure that training curricula remain dynamic and market-driven.

Another vital lesson is the **Transversality of Safety and Digitalization**. The GWO wind safety standards and the TÜV NORD blockchain specialist course highlight that these are no longer "extra" or optional skills but essential foundations for the entire workforce. Digital competence and health and safety (H&S) must be integrated into every training module, as a modern solar technician must be as proficient with a digital interface and data security as they are with high-voltage hardware and physical risk management.

Moreover, the social dimension of the **Just Transition** cannot be overlooked. The Portuguese and French experiences show that the energy transition is a unique opportunity for professional rebirth for those in declining sectors, such as coal power. The Improvement Plan must therefore include flexible, inclusive reskilling models-such as the hybrid and distance learning approaches used by Master D-to ensure that the green economy is accessible to job-seekers and under-represented groups, including women, across all geographical areas.

Finally, the shift toward **Decentralization and Renewable Energy Communities (RECs)** requires a capillary training approach. We must not only train high-level experts for massive offshore farms but also thousands of technicians distributed across local territories. The plan should promote the creation of regional "Centres of Competence" and short-form microcredentials that support the growth of local energy communities and residential solar markets. By synthesising these lessons, the MiCRET Improvement Plan will act as a dynamic ecosystem: inclusive in its social reach, rigorous in its safety standards, advanced in its digital integration, and always anchored to solid industrial partnerships.

4.8 Comparative Analysis between Skills Needs and Training Offerings

The analysis of WP2 leads to a fundamental conclusion: the MiCRET Improvement Plan must be a dynamic ecosystem built on five strategic pillars.

First, we must ensure a **Stratification of Skills** across all EQF levels, creating "stackable" pathways from operational reskilling to scientific excellence.

Second, we must institutionalize the **Triple Helix Model**, where industry and VET providers co-design curricula to eliminate the market mismatch.

Third, **Safety and Digitalization** are no longer optional; they are transversal foundations that every technician must master. Fourth, we must prioritize a **Just Transition,** using flexible models to turn industrial shifts into opportunities for professional rebirth, especially for under-represented groups. Finally, our focus remains on **Decentralization**, training the capillary workforce needed for **Renewable Energy Communities**.

Below, we begin to include the comparison between the WP2 results and the selection of the training offers. By integrating these lessons, we ensure a technically robust transition, socially inclusive, and anchored to industrial reality. This framework provides the essential blueprint for a resilient European energy workforce.

4.8.1 Classification by Provider Type

The MICRET project identifies a multi-layered landscape of education and training providers, which is essential for creating a versatile microcredentials ecosystem. The project aims to integrate various VET pathways to ensure widespread impact. The mapping in the **"Panorama of training offerings"** categorizes these providers into three primary streams:

- **iVET (Initial Vocational Education and Training):** Represented by institutional bodies like the **SAEK (Greece)** and **ITS Green Academy (Italy)**. These programs provide foundational, long-term training for young students entering the energy sector, often resulting in national diplomas.
- **cVET (Continuing Vocational Education and Training):** Entities such as **Syntra West (Belgium)** and **AFPA (France)** focus on upskilling and reskilling adult learners. These are the primary targets for MICRET "Learning Pills" due to their existing modular structures and flexibility for workers.
- **In-company training programs:** Data from the mapping highlights specialized academies (e.g., **Eni/Terna Academy**) and technology-specific training like the **WindDock** modules. These programs are highly industry-aligned, often featuring corporate sponsorship or full scholarships to meet immediate labor market needs.

4.8.2 Categorization of courses by EQF Levels

The project seeks to standardize technical requirements across the European Qualifications Framework (EQF). The analysis of the 30+ training paths reveals a heavy concentration on **EQF Levels 4 and 5**.

- **EQF Level 3/4**: Primarily focused on operational installation and basic maintenance (e.g., standard Solar PV installers).
- **EQF Level 5**: Focused on specialized technicians and system managers (e.g., *Digital Energy Specialist* or *Hydrogen Energy Systems Manager*). The mapping identifies that Level 5 qualifications bridge the gap between manual labor and digital management, making them the "sweet spot" for the development of high-value microcredentials.

4.8.3 Definition of Learning outcomes for Renewable Energy Technicians

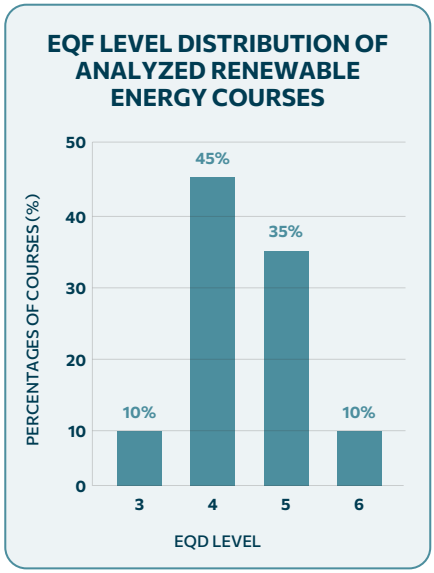
Following the skills needs analysis, learning outcomes have been categorized to move beyond purely mechanical tasks. MICRET defines outcomes through:

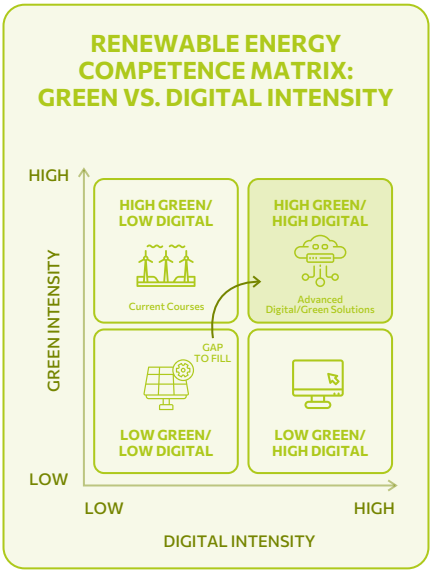
- **Knowledge**: Understanding energy physics, regulatory frameworks, and sustainability principles.
- **Skills**: Performing troubleshooting, digital monitoring, and preventive maintenance using IoT tools.
- **Responsibility/Autonomy**: Managing site safety and data-driven optimization.
  The mapping confirms that high-quality providers (e.g., Atlas Academy) are already shifting toward outcome-based assessments, allowing for easier translation into microcredential units.

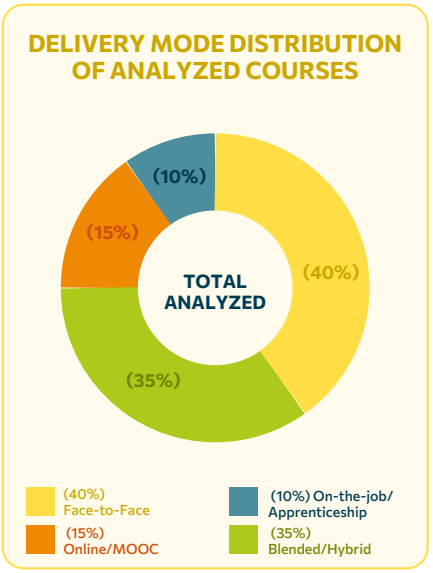
4.8.4 Delivery & Structural Analysis

The analysis of current offerings shows a definitive shift toward hybridity. While **Face-to-Face (F2F)** remains mandatory for practical workshops (e.g., safety training at heights), there is a growing trend in **Blended** and **Online** formats for theoretical components. Providers like **Syntra West** are leading this shift, allowing for the flexibility required for the rapid upskilling envisioned in the **MICRET Proposal**.

A critical discovery in the **"Panorama of training offerings"** is the vast disparity in course duration, ranging from 3-day technical certifications to 2-year specialized degrees. To fulfill the goal of creating "stackable" credentials, WP3 identifies the "modular potential" by extracting specific high-demand segments. For example, a 20-hour module on *Remote Diagnostics* can be extracted from a larger maintenance course to serve as a standalone, industry-certified microcredential.







4.9 Conclusions & Strategic Recommendations

The skills analysis leads to a fundamental conclusion: the MiCRET Improvement Plan must be a dynamic ecosystem built on five strategic pillars. First, we must ensure a **Stratification of Skills** across all EQF levels, creating "stackable" pathways from operational reskilling to scientific excellence. Second, we must institutionalize the **Triple Helix Model**, where industry and VET providers co-design curricula to eliminate the market mismatch. Third, **Safety and Digitalization** are no longer optional; they are transversal foundations that every technician must master to manage modern smart grids. Fourth, we must prioritize a **Just Transition**, using flexible models to turn industrial shifts into opportunities for professional rebirth, especially for under-represented groups. Finally, our focus remains on **Decentralization**, training the capillary workforce needed for **Renewable Energy Communities**.

Below, we begin to include the comparison between the results from the skills needs analysis and the analysis of the selected training offers. This transition marks the bridge between the analytical phase and the design of the MiCRET pilot actions. Based on this analysis, the shift to the design of MiCRET training offerings phase will prioritize a **"Digital-Green" Synergy**, focusing on modules that teach technicians how to utilize advanced digital tools for green energy optimization, specifically in areas like biomethane and renewable-gas projects. Furthermore, we will address the identified accreditation gaps to ensure **Cross-Border Recognition**, ensuring the MiCRET digital credentials add tangible "European value" and open mobility opportunities for the workforce. Finally, we will **Leverage Best Practices** from identified industry-integrated models, using them as structural blueprints for the new, agile and industry-driven training programmes designed to meet the immediate needs of the evolving energy market.

By integrating these lessons, we ensure a transition that is technically robust, socially inclusive, and anchored to industrial reality. This framework provides the essential blueprint for a resilient European energy workforce, moving from the diagnostic results of training needs analysis and mapping of existing training toward the practical implementation into new curriculum development.

05.

Benchmarking of Microcredentials Practices

5. Benchmarking of Microcredentials Practices

5.5 Identification of Current Digital Credentials/Certificates: Analysis of existing non-formal recognitions

Since MiCRET aims to address the fragmentation of the VET market, this benchmarking phase identifies how current training is certified and skills are recognised. The data from the **"Panorama of training offerings"** reveals that the majority of existing certificates are still tied to traditional national or regional frameworks, with limited use of "digital-native" credentials or microcredentials.

- **Regional & National Diplomas**: Most providers, such as **ITS Green Academy (Italy)** and **Syntra West (Belgium)**, issue certificates recognized by regional authorities (e.g., Flemish or Lombardy regions). These are robust but often rigid, covering long-term curricula that are difficult to "unbundle" into smaller units.
- **Industry-Specific Certifications**: High-quality practices like the **WindDock (Netherlands)** or **RESCert (Belgium**) issue certifications that are highly valued by the industry but are often limited to specific technical niches (e.g., safety at heights or heat pump installation).
- **Non-Formal Badges**: The analysis shows that while "Digital Expansion" is a future trend for 80% of providers, the actual issuance of **Open Badges** or blockchain-verified credentials is still in its infancy. Most "non-formal" recognition consists of simple "Certificates of Attendance," which lack the metadata required for the stackability envisioned in the **MICRET Proposal**.

5.2 Recognition & Portability: How current certifications are perceived across borders

The **Proposal** identifies "Cross-border Portability" as a major challenge for the Renewable Energy Sector (RES) workforce. The mapping results confirm a significant "Portability Gap":

- **The Recognition Barrier**: Current certifications like those from **AFPA (France)** or **SAEK (Greece)** are legally valid within their respective countries but lack a common European "language" for credit transfer. This forces technicians to undergo redundant training when moving across the EU.
- **Market Perception**: Industry stakeholders surveyed expressed a strong desire for a unified "MICRET Digital Credential" that could guarantee a specific set of Digital and Green skills regardless of the country of origin.
- **Strategic Alignment**: The mapping identifies **Modular Certification and Recognition of Prior Learning (RPL)** as planned developments for providers like **Atlas Academy**. However, without a shared framework like the one MICRET is developing, these efforts remain isolated. The benchmarking proves that the European labor market is ready for a modular system, but currently lacks the technical infrastructure (metadata standards) to ensure international portability.

5.3 Microcredentials Fact Sheets: Comparison of Best Practices

The following table summarizes 10 identified "Best Practices" from the mapping database, evaluated against the criteria for MICRET-ready microcredentials.

Note on Methodology: These practices were selected based on their "Modular Potential." While some (like ITS) are currently long-term, they contain high-quality 20-40 hour units that could be extracted and transformed into standalone MICRET microcredentials. The goal for WP4 will be to move all these practices toward the "Digital Issued" and "EU Recognized" categories.

Best Practice Case	*Duration*	*Cost*	Certificate Type	*Recognition*
Atlas Academy (BE)	40h - 120h	Medium	Regional Certificate	National (BE)
WindDock (NL)	20h - 40h	Industry-Led	Technical Certificate	Sector-wide (EU)
ITS Green Academy (IT)	900h+ (Modular)	Low (Co-funded)	EQF 5 Diploma	National (IT)
Syntra West (BE)	20h - 80h	Medium	CVET Certificate	Regional (VL)
RESCert (BE)	30h	Fixed Fee	Mandatory Qualif.	Cross-border (Limited)
Digital Energy Spec. (IT)	60h	High (Specialized)	Non-formal Badge	Industry-Led
SAEK / KDY (GR)	6-12 Months	Low	National VET Cert.	National (GR)
Renewable Gas (PT)	40h	Corporate	Specialist Cert.	National/Industrial
AFPA (FR)	100h+	Medium	Title (National)	National (FR)
DTU Masterclass (DK)	20h	High	Academic ECTS	International

06.

Gap Analysis & Skills Mismatch

6. Gap Analysis & Skills Mismatch

6.1 The "Double Transition" Gap: Identifying where the current offering fails to meet Digital/Green requirements

The concept of the "Twin Transition" (Digital and Green) is central to the **MICRET Proposal (Section 1.1)**. However, the cross-analysis between the skills required by the industry (WP2) and the current VET supply (WP3) reveals a significant misalignment, particularly in the digital domain.

- **The "Green" Over-Reliance:** As shown in the **"Panorama of training offerings"**, 80% of current courses are strongly focused on traditional green skills (installation, safety, and basic maintenance). While these are essential, the **WP2 Skills Needs Analysis** highlights a shift toward more complex sustainability requirements, such as **Circular Economy** principles and **Life Cycle Assessment (LCA)**, which are present in only 10-15% of the mapped offerings.
- **The "Digital" Vacuum:** The most critical gap exists in advanced digital competencies. Industry stakeholders in the **Skills needs analysis report for the Renewable Energy Sector** expressed an urgent need for technicians capable of performing **Data-enabled O&M**, **IoT sensor integration**, and **SCADA data interpretation**. Conversely, the WP3 mapping shows that digital skills are often limited to basic computer literacy, with specialized modules like **Cybersecurity for Energy Grids** almost entirely absent (<5% recursion).
- **System Integration vs. Siloed Training:** we identified "System Integration" (managing hybrid systems like PV + Heat Pumps + Storage) as a top priority. In contrast, the current training offering remains largely siloed, with certifications focusing on single technologies rather than the integrated, data-driven "Smart Grid" environment envisioned by the **EU Digital Strategy**.

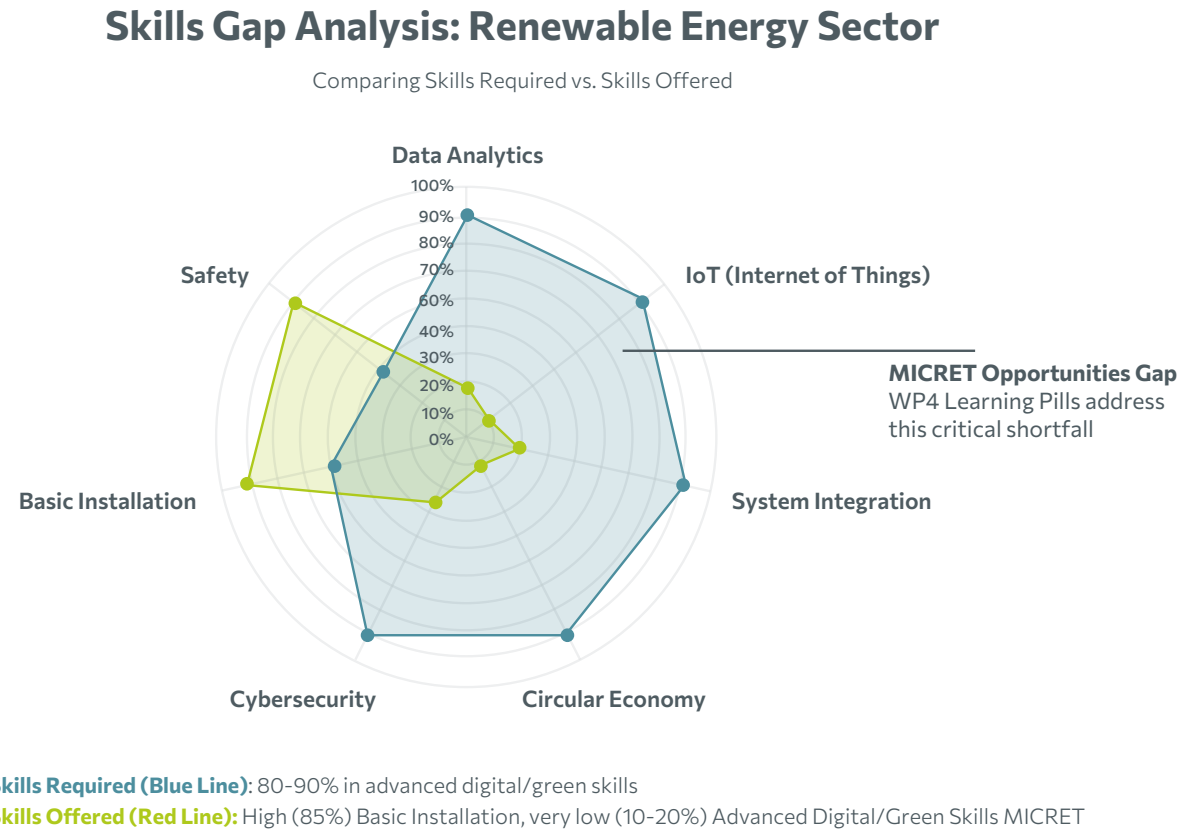
6.2 Barriers to Adoption: Why microcredentials are not fully adopted

Despite the clear need for flexible upskilling mentioned in the **Proposal**, the transition to a microcredential-based system faces several structural and cultural barriers identified during the mapping process:

- I**nstitutional Fragmentation**: As documented in the "**Panorama" report**, 45% of providers operate within rigid national or regional accreditation frameworks. These systems often do not recognize short-term "Learning Pills" (20-40 hours) as formal qualifications, discouraging VET providers from investing in modular design.

- **The "Portability" Uncertainty**: Many providers (e.g., **SAEK in Greece** or **AFPA in France**) express concern that microcredentials lack a unified European quality label. Without guaranteed cross-border recognition, companies are hesitant to invest in training that may not be recognized if a technician moves to another Member State.
- **Cost and Resource Intensity for SMEs**: our research indicates that while large companies (e.g., **Enel**, **Floene**) have internal academies, SMEs-which represent the bulk of the RES workforce-struggle with the costs of specialized digital training. The mapping shows a lack of "stackable" financial support or corporate sponsorship for microcredentials at the SME level.
- **Lack of Metadata Standardization**: A technical barrier identified in the **"Panorama" database** is that current certificates often lack the digital metadata (standardized learning outcomes, ECTS/ECVET equivalents) required for digital credential issuance, making the "stacking" process manually intensive and prone to error.

Radar Chart (The Gap Analysis) – Overlapping two spiders: "Skills Required" (from WP2) vs "Skills Offered" (from WP3).



07.

Policy Recommendations & Conclusions

7. Policy Recommendations & Conclusions

7.1 Framework for Policy Makers: Suggested steps for standardizing microcredentials in the energy sector

To overcome current market fragmentation and the identified lack of trust from employers, it is recommended that policy makers adopt a standardized framework based on the following pillars:

- **Adoption of Common European Standards**: Align microcredentials with the Council Recommendation of June 2022 and the **European Learning Model (ELM)**. Every credential must include transparent metadata, such as specific learning outcomes, assessment methods, EQF levels, and ECTS/ECVET credits to ensure cross-border portability.
- **Quality Assurance (QA) and Accreditation**: Establish QA mechanisms that verify the pedagogical alignment between expected outcomes and assessment methods. Validation should involve direct cooperation with national or sectoral certification bodies-such as **RESCert** in Belgium or **GWO** for the wind sector-to ensure legal recognition and compliance for insurance purposes.
- **Incentivizing "Stackability"**: Create regulatory pathways that allow microcredentials to be accumulated ("stacked") toward full formal qualifications. This is vital in fast-evolving sectors where workers need "just-in-time" updates without committing to multi-year programs.
- **Public-Private Partnerships (PPP)**: Support the co-design of programs between VET/Higher Education institutions and industry. Qualitative evidence suggests credentials only hold market value if they are endorsed by employers or Original Equipment Manufacturers (OEMs).

7.2 Selection of key areas for the development of MiCRET training offerings

The transition to Design and Piloting of new training offering will be guided by the critical gaps identified in the skills analysis. The educational offer will be structured into three macro-areas and composed by short-cycle modules (approximately 10 hours each):

- Digital Energy & Data Operations (Digital Pillar)
  Based on the high demand for "operational literacy" over advanced programming, these pills will focus on:
  - **SCADA/IoT Fundamentals:** Remote monitoring and control of installations.
  - **Data-to-Decision:** Interpreting dashboards and performance KPIs for predictive maintenance.
  - **Cybersecurity Baseline:** Protecting connected energy infrastructure from OT threats
- System Integration & Emerging Technologies (Technical Pillar)
  To bridge the gap between installing individual components and managing systemic performance:
  - **Hybrid Integration**: Coordinating PV, heat pumps, and Battery Energy Storage Systems (BESS/BMS).
  - **Smart Grids and Energy Communities (CER)**: Technical and regulatory management of local energy exchanges.
  - **Advanced Diagnostics**: Troubleshooting complex software-mediated systems.
  - **Safety Protocols**: adopting safety protocols in maintenance of energy infrastructure.
- Sustainability Compliance & Lifecycle Management (Green Pillar)
  Moving beyond simple installation toward "lifecycle readiness":
  - **Circular Economy in the Fiel**d: Waste management, dismantling, and recycling of PV modules and batteries.
  - **ESG Reporting and Documentation**: Regulatory compliance and traceability of environmental impacts.
  - **Efficiency Optimization**: Practical techniques to maximize the yield of existing installations.

As a methodological note, the recommendation from our research is focused to ensure that every training programme should adopt a **blended** format in its delivery combining in person or online theory, practical activities or lab work, XR training and simulation. Validation of skills should include **evidence-based assessment** (practical tasks, scenario-based tests) to ensure the issued microcredentials represent a verified "can-do" competence requested by the market.

7.3 Proposed MiCRET microcredentials Standard: Digital Competences for RE Technicians

7.3.1 Rationale and Strategic Alignment

The statistical analysis in section 4.4 above highlighted a recursive **absence of digital skills** in lower EQF technician training. While current offerings excel in physical installation, they lack the "Eco-Digital" competences required for modern smart energy systems. This standard provides a modular blueprint to integrate **Digitalization**, **Smart Energy Management**, and **Sustainable Data Practices** into technician pathways.

7.3.2 Standardized microcredentials Metadata Template

To ensure cross-border recognition and interoperability within the Europass Digital Credentials Infrastructure (EDCI), every MiCRET digital credential must include a number of mandatory elements, including:

- Identification: Learner, issuing organisation and awarding body.
- EQF Level: Explicitly stated (targeting EQF 3, 4, or 5).
- Workload: Expressed in ECTS credits or notional hours (typically 25–150 hours for technician modules).
- Learning Outcomes: Defined using the "Knowledge, Skills, and Autonomy/ Responsibility" triad.
- Assessment Type: Mandatory supervised assessment (online or onsite).
- Stackability: Clear indication of how the module integrates into larger professional qualifications (e.g., Solar PV Installer + Digital Monitoring module).
- Referencing: whenever applicable reference to existing International, European or National repositories (e.g., ESCO, ISCO, NVQ, etc.)

7.3.3 Core Digital Competence Modules (EQF 3–5)

The following stackable modules address the identified gaps by translating abstract digital concepts into practical technician tasks:

Module Title	Target EQF	Key Competences	Duration (Notional)
Smart Grid Basics & IoT Connectivity	03-apr	Configuration of IoT sensors; basic network troubleshooting for RE systems.	25 Hours
Data-Driven Performance Monitoring	04-mag	Interpretation of SCADA dashboards; reporting efficiency anomalies via digital tools.	50 Hours
Cybersecurity for RE Installations	04-mag	Implementing local security protocols and identifying unauthorized access to plant controllers.	30 Hours
Digital Maintenance & Remote Diagnostics	04-mag	Use AR/VR tools for remote technical support; execute digital firmware updates.	40 Hours

7.3.4 Quality Assurance and Validation

Following the MiCRET systemic approach, validation is recursively tied to industry needs:

- **Co-Design**: Every digital module must be validated by at least one industrial stakeholder (e.g., Enel, Engie, or regional PV associations).
- **Workplace-Based Assessment**: Wherever possible, digital competence validation should occur during on-the-job training or simulated laboratory environments.
- **Transparency**: Standardized formats ensure that a technician certified in Italy or Portugal can have their digital skills recognized by a wind farm operator in the Netherlands.

This implementation roadmap outlines the required digital tools and laboratory infrastructure for the European deployment of the MiCRET microcredentials modules. This framework is designed to bridge the technical gap identified in Section 4.4, providing technicians with "Eco-Digital" competencies through high-fidelity simulations and hands-on laboratory experiences.

7.4 MiCRET Implementation Roadmap: Labs and Digital Tools

7.4.1 Recommended Software Tools for Training (2026 Trends)

To address the digital skills gap, MiCRET modules should leverage industry-standard software that integrates AI-driven diagnostics and digital twin technology.

Module Title	Essential Software Tools	Application for Technicians
Solar PV & Smart Grid	PVsyst, HOMER Grid, and CircuitLogix	Simulating plant layout, grid-connected self-consumption, and basic circuit troubleshooting
Wind Energy Maintenance	QBlade, UWiSE (TNO suite)	Performing aerodynamic simulations and logistics planning for turbine part replacement.
Energy Management (EMS)	OpenEMS, PLEXOS, Blynk Application	Monitoring real-time generation and load balancing via mobile and cloud interfaces
Predictive Analytics	Siemens Gamesa AI, Digital Twin environments	Discerning anomalies in vibration and temperature data to forecast equipment failure

7.4.2 Hardware Lab Requirements (EQF Levels 3–5)

Effective training for digital technicians requires specialized laboratories that bridge physical installations with virtual supervisory layers.

- **Core Microcontroller Kits**: Labs must be equipped with platforms such as **Arduino Mega**, **ESP8266**, or **STM32**. These allow students to build IoT-connected sensors for real-time monitoring of current flow and environmental conditions (LDR, DHT11).
- **SCADA & Control Interface**: A physical server environment (Quad-core, 16GB+ RAM) is required to host supervisory layers like **Geo SCADA**. Technicians must learn to manage real-time data acquisition and centralized control interfaces.

- **Renewable Energy Lab Kits**: Mandatory hardware includes:
  - **Solar Units**: Grid-tied and off-grid trainers for testing charge controllers and inverters.
  - **Wind Units**: Mechanical rigs for testing wind turbine mechanics and pitch control under simulated load.
  - **Mixed Energy Trainers**: Platforms integrating hydrogen fuel cells with battery storage and smart grid simulators.
- **AR/VR Simulation Hubs**: Dedicated spaces for **Virtual Reality sessions** to safely train technicians in high-risk operations, such as working at height on wind turbines or maintaining high-voltage substations.

7.5 Partner Country Rollout Strategy

The roadmap follows a modular rollout across MiCRET partners, ensuring that labs are compliant with ISO 17024 and European quality standards for microcredentials.

- **Phase 1: Pilot Deployment (2026)**: Introduction of the **"Waiter" job occupation methodology** adapted for RE, focusing on identifying specific regional skill gaps and co-designing modules with technology providers.
- **Phase 2**: **Digital Stacking**: Integrating the **Europass Digital Credentials Infrastructure (EDCI**) to issue digital badges for each completed module, ensuring cross-border portability.
- **Phase 3**: **Industry Validation**: Mandatory final assessment in a simulated "real work" environment (e.g., TNO Wind Center or partner university labs).

7.6 Strategic Improvement Plan: Harmonizing Training with the Twin Transition

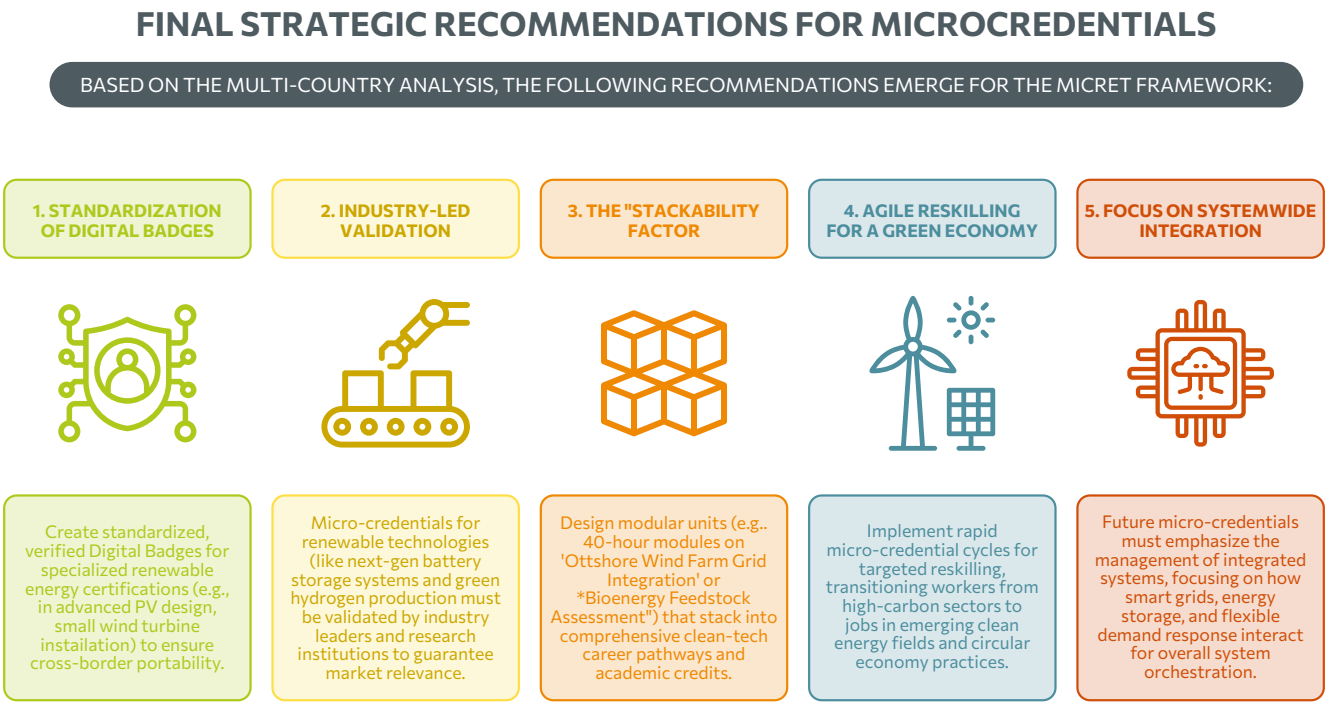
Based on the synthesis of the **Mapping of Current Training Offerings** and the **Skills Needs Analysis Report**, the following **Improvement Plan** outlines a strategic roadmap to bridge the gap between current educational delivery and the urgent industrial requirements of the energy transition.

The data indicates that while Europe possesses a robust foundation of renewable energy training , there is a significant mismatch between the "component-based" approach of many current courses and the "system-based" reality of the modern labor market.

The following recommendations emerge for the MiCRET framework:

1. **Standardisation of Digital Credentials:** Move beyond paper certificates to **Digital Credentials** (like the GWO or Atlas Academy models) aligned with European and international standards, to ensure cross-border portability.
2. **Industry-Led Validation:** microcredentials must be **co-certified by industry leaders** (e.g., Enel, EDF, TUV) to guarantee market value.
3. **The "Stackability" Factor:** Design small units (e.g., 40-hour modules on "Hydrogen Safety" or "Heat Pump Fluids") that can be recognised and "stacked" into full professional qualifications or credits.

4. **Agile Reskilling:** Use microcredentials specifically for **Just Transition** scenarios, allowing workers from fossil fuel sectors to gain certified green skills in short, intensive cycles.
5. **Focus on System Integration:** Future microcredentials should move from "component installation" to "system orchestration", focusing on how different green assets communicate via digital protocols.



7.6.1 From Technology Installation to System Integration

Current Status: Existing mapping shows a concentration of courses on specific technologies, such as separate RESCert certifications for heat pumps or solar PV installers.

Gap Identified: Stakeholders consistently report a lack of "integration skills"-the ability to make diverse assets (PV, storage, heat pumps, EV chargers) work as a single optimized system.

- **Improvement Action**: Develop a flagship microcredentials bundle titled **"Hybrid System Integration & Interoperability"**.
- **Description**: This should move away from pure hardware installation toward software-driven commissioning and performance tuning across multi-vendor platforms. Training must cover communication protocols (how devices "talk" to each other) and building management interfaces (BMS/HEMS).

7.6.2 Operational Digitalization (Data-Enabled O&M)

Current Status: Current mapping reveals that digital skills in many vocational programmes are limited to basic ICT or general literacy.

Gap Identified: The industry requires technicians who can navigate SCADA systems, interpret diagnostic dashboards, and utilize IoT sensors for predictive maintenance.

- **Improvement Action**: Integrate **"Data-to-Decision"** modules into every technical pathway.
- **Description**: Technicians should not just collect data but be trained to interpret alarms and performance KPIs to optimize system yield. This includes a baseline in Industrial Cybersecurity-ensuring field technicians can maintain secure connections for remote assets.

7.6.3 Safety and Compliance as a "Training Spine"

Current Status: While safety is present in most programmes, it is often treated as a peripheral module or a theoretical lecture.

Gap Identified: Qualitative reports from the field emphasize a persistent gap in safety discipline and the ability to work safely with High/Medium Voltage (HV/MV) and DC circuits under pressure.

- **Improvement Action**: Implement a **"Safety & Compliance Spine"** across all microcredentials.
- **Description**: Shift from theoretical safety to **Scenario-Based Training**. This involves practical assessments of Lockout/Tagout (LOTO) procedures, safe measurement routines, and rigorous compliance documentation that mirrors actual permit-to-work systems used in the industry.

7.6.4 Lifecycle Readiness & Applied Green Competences

Current Status: Sustainability is often taught as an abstract policy concept rather than a set of technical work habits.

Gap Identified: There is a clear need for skills in circular economy practices: dismantling, recycling, and understanding the environmental impact (LCA/ESG) of operational decisions.

- **Improvement Action**: Launch **"Lifecycle & Circularity in the Field"** modules.
- **Description**: Training should focus on the practical handling of hazardous materials, waste reduction at the site, and the "repowering" logic-how to extend the life of existing assets through sustainable maintenance choices.

7.6.5 Pedagogical Pivot: Blended & Work-Based Learning

Current Status: Many mapped offerings remain classroom-heavy or have shifted to purely online formats that fail to engage technicians after long physical shifts.

Gap Identified: Stakeholders demand more hands-on practice, simulated environments, and workplace integration.

- **Improvement Action**: Adopt a **"Theory Online, Mastery In-Person"** delivery model.
- **Description**: Use digital platforms for the "knowledge" phase and reserve face-to-face time for high-value lab work, simulators (VR/AR), and on-the-job mentoring. This reduces the time technicians spend away from productive work while increasing the quality of the learning experience.

7.6.6 The microcredentials Framework for Recognition

Current Status: National granularity is high, but cross-border recognition and stackability are currently weak.

Gap Identified: Employers view microcredentials as useful but often do not recognize them during recruitment because the learning outcomes are not transparent or assessed rigorously.

- **Improvement Action**: Establish the **MiCRET "Competence Passport"**.
- **Description**: Every module must result in a digital badge backed by a standardized "passport" template including specific tasks performed, EQF level, assessment evidence, and industry endorsements. This ensures that small units of learning are "stackable" into full diplomas or recognized professional certifications across the EU

08.

Policy Recommendations & Conclusions

8. Annexes

Annex A: List of the analyzed training paths

Partner	Country	Name of the course	Type of provider	Provider	Link	Why
ITS Green	Italy	Digital Energy Specialist	TVET Institution	ITS Green Academy	Click here	It deals with 'digitalization' in the energy sector
ITS Green	Italy	Hydrogen Energy Systems Manager	TVET Institution	ITS ERMETE	Click here	It deals with Hydrogen
ITS Green	Italy	Engineering technologies for energy and environmental sustainability	University	UNIBG	Click here	It deals with Hydrogen and provide a EQF 6 level
ITS Green	Italy	Energy Manager: Senior Technician for renewable energy communities in Smart Cities	TVET Institution	ITS Academy Green Energy Puglia	Click here	It deals with CER
ITS Green	Italy	Terna Academy Training Ecosystem (Focus: Energy Transition & Digital Transformation)	Company	Terna	Click here	Terna is a major operator of energy transmission networks
ITS Green	Italy	Enel Global Digital Solutions & Sustainability Training Ecosystem	Company	Enel	Click here	Enel's initiative is a strategic training program designed to promote skills related to the energy transition through professional technical training.
ITS Green	Italy	Eni Corporate Training & Lifelong Learning Programme	Company	Eni	Click here	It is interesting because it combines the Eni Academy program, dedicated to new hires with little experience (junior), with Welcome for Experts, which is aimed at experienced professionals (senior)
ITS Green	Italy	Geoside Energy Efficiency & Digital Transformation Training	Company	Italgas + Geoside	Click here	The Academy is aimed at both professionals and the world of education, with the aim of spreading technical skills and awareness about energy transition.
ITS Green	Italy	ERG Academy Learning Ecosystem (Just Transition & Skills Development)	Company	ERG	Click here	The initiative is not only an internal training center, but also an open project that aims to spread the culture of energy transition by involving employees, young people, and local communities.
Syntra West	Belgium	Master in de ingenieur-swetenschappen: energie	University	KU Leuven	Click here	A Master program to deal with the challenges of sustainable energy supply

Partner	Country	Name of the course	Type of provider	Provider	Link	Why
Syntra West	Belgium	Betonrot en energietransitie: renoveer zonder weerstand	TVET Institution	SW	Click here	Specialized training for real estate professionals to persuade and engage owners in the journey toward green transition.
Syntra West	Belgium	Installateur fotovoltaïsche systemen (RESCert)	TVET Institution	SW	Click here	Practical, skills-focused course leading to the official RESCert exam.
Syntra West	Belgium	Bachelor in de energietechnologie	TVET Institution	VIVES	Click here	A 1-year Bachelor program specializing in renewable energy and electrical engineering
Syntra West	Belgium	Basisopleiding hernieuwbare energie voor bedienden	Company	SBM	Click here	Introduce renewable energy terminology to non-technical staff to allow efficient and correct information sharing with professionals & private customers
Syntra West	Belgium	Duurzaamheidscoach	Company	SBM	Click here	Training for entrepreneurs, managers, business leaders on how to implement & integrate sustainability strategies in their organizations
Syntra West	Belgium	Technicus hernieuwbare energie	Company	CVO Focus Lokeren	Click here	Technical training to work on heat pumps and to install renewable systems including solar, biomass, and photovoltaic technologies.
Syntra West	Belgium	Energiezuinig verlichten in publieke gebouwen	Company	SBM	Click here	This training guides designers, installers, and technicians on sustainable, efficient lighting in public buildings for energy reduction.
Syntra West	Belgium	Rescert opleiding warmtepompen (Avond)	Company	Atlas Academy	Click here	A regional course covering residential heat pump systems
PPC Inspectra	Greece	Ανανεώσιμες Πηγές Ενέργειας (ΑΠΕ)	University	University of West Macedonia	Click here	Training for graduates, engineers, executives, and industry professionals that outlines the legal and political aspects of RES developments and provides a comprehensive introduction in the RES industry, opportunities and challenges
PPC Inspectra	Greece	Κατάρτιση και Πιστοποίηση Εγκαταστατών Φωτοβολταϊκών Συστημάτων	VET provider	Ευρωπαϊκό Κέντρο Κατάρτισης για την Απασχο΄ληση	Click here	A certification program aiming at trainingprofessionals in installing and maintaining PV systems
PPC Inspectra	Greece	Operation Specialist for PV and Wind Systems	Company	TUVNord	Click here	Training program for installation, operation, and maintenance of PV and wind systems, as well as occupational H&S concerns

Partner	Country	Name of the course	Type of provider	Provider	Link	Why
PPC Inspectra	Greece	Specialist in RES	Company	TUVNord	Click here	Training program in all RES forms (hydro, wind, PV, Geothermal, Biomass)
PPC Inspectra	Greece	Specialist array chains in the electricity sector	Company	TUVNord	Click here	Digital training in the use of blockchain for the energy sector
ANESPO	Portugal	Renewable Energy - Green Skills & Jobs Programme	VET Institution	IEFP - Instituto do Emprego e Formação Profissional	Click here	DGERT Certification; National requalification programme for the energy transition.
ANESPO	Portugal	Renewable Energies and Energy Efficiency (TeSP)	VET Institution	Polytechnic of Leiria	Click here	2-year higher VET programme training EQF-5 technicians to design, install and operate solar, wind and hydro systems and improve energy efficiency in buildings and industry.
ANESPO	Portugal	Solar Panels Installer Course	VET Institution	Endesa - ISQ Academy	Click here	Partnership with sector leader; Practical focus on assembly and sizing.
ANESPO	Portugal	Photovoltaic Panels Installer - Green Skills	VET Institution	CINEL - Centro de Formação Profissional	Click here	Flexible online/E-learning methodology; Specialisation in Solar PV.
ANESPO	Portugal	Electronics and Automation Technician	VET Institution	Escola Profissional de Braga (EPB)	Click here	Focus on Automation and Digital Energy; Aligned with 2026 needs.
ANESPO	Portugal	Green Hydrogen Specialisation	VET Institution	ISQ Academy	Click here	Advanced blended course that upskills engineers and technicians to design, operate and manage green hydrogen projects across industry and energy systems.
ANESPO	Portugal	Renewable Energies	VET Institution	Master D Portugal	Click here	Semi-presential VET course training technicians for design, installation and maintenance of solar thermal, solar PV and small wind systems.
ANESPO	Portugal	Production and Use of Biomethane	Research and training institute (university-linked)	INEGI – Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial (Universidade do Porto)	Click here	Advanced short course on biogas upgrading, biometane production, uses, regulation and business models, relevant for industrial biometane projects such as Capwatt and Dourogás Renovável in Portugal.
ANESPO	Portugal	Advanced Training in Renewable Energies	Course provider	SGS Academy	Click here	DGERT Certification; Pro quality seals; High recognition in the job market.
ANESPO	Portugal	Training in Renewable Energies	Course provider	Academia ADENE	Click here	National regulatory body; Maximum technical authority in energy and efficiency.

Partner	Country	Name of the course	Type of provider	Provider	Link	Why
ANESPO	Portugal	Installation and Design of Photovoltaic Systems	VET Institution	IEP - Instituto Electrotécnico Português	Click here	Short, hands-on VET course upskilling technicians for safe and efficient PV installation in buildings.
ANESPO	Portugal	Advanced Training Courses – Renewable Gases in Industry	VET Institution	Floene – Indústria de Futuro (with ISQ Academy and INEGI)	Click here	Free upskilling and reskilling courses on renewable gases for industrial professionals, covering decarbonisation strategies and operation of installations using green gases
CINOP	NL	Windenergie en slimme netwerken	University (applied science)	Hogeschool Rotterdam	Click here	Wind integration and smart grid competences
CINOP	NL	Offshore Wind Energy Programme	Course provider	New Energy Business School	Click here	Sector knowledge, policy and business of offshore wind
CINOP	NL	WindDock training programme	VET Institution	Scalda	Click here	Modular technician training with clear competence units
CINOP	NL	Microcredential Energy Transition	Course provider	NCOI	Click here	Already microcredential-structured programme
CINOP	NL	Offshore Wind Technician Training	VET Institution	STC Group	Click here	Wind integration and smart grid competences
CINOP	NL	Wind Turbine Technician programme	VET Institution	Noorderpoort	Click here	Typical technician transition programme
CINOP	NL	GWO Basic Safety Training (BST)	Company	Global Wind Organisation	Click here	Short modular training, widely recognised industry microcredentials
AFPA	France	Neutral Carbon Technologies (previous name: Zero Carbon Technologies)	Private Company offering training	ENGIE – Sustainability Academy	Click here	Provides a structured overview of key low-carbon technologies (renewables, hydrogen, storage) and their maturity, supporting professional understanding of energy transition technologies and decarbonisation strategies.
AFPA	France	ENGIE Solutions – Professional Reconversion Programme in Renewable Energy and Energy Systems Maintenance	Private Company	ENGIE Solutions	Click here	Supports workforce reskilling into renewable energy and energy systems maintenance, addressing labour shortages in technical roles linked to decarbonised energy infrastructure.
AFPA	France			EDF Renouvelables and École Nationale des Ponts et Chaussées	Click here	Develops multidisciplinary expertise in renewable energy engineering and project management, preparing professionals to design and operate complex renewable energy systems.

Partner	Country	Name of the course	Type of provider	Provider	Link	Why
AFPA	France	Découverte du photovoltaïque et dimensionnement d'un projet PV (CFC 14)	Private Company	CETIH – Training Centre	Click here	Provides practical training in photovoltaic system design and installation sizing, responding to growing demand for solar deployment skills in the energy transition.
AFPA	France	DTU-TotalEnergies Excellence Centre for Clean Energy	Private Company / University / Higher Education Institution	TotalEnergies with Technical University of Denmark (DTU)	Click here	Focuses on research and innovation in low-carbon energy systems, particularly renewable integration, storage and industrial decarbonisation technologies
AFPA	France	Technician Superior in Wind Turbine Maintenance	TVET Provider	AFPA	Click here	Addresses the shortage of qualified wind turbine technicians by developing specialised maintenance, safety and diagnostic skills for wind energy infrastructure.
AFPA	Fance	DTEC — DTU–TotalEnergies Excellence Centre for Clean Energy			Click here	Strengthens competencies in hybrid renewable systems, grid integration and energy system modelling, which are essential for large-scale renewable deployment.
AFPA	France	Master – Renewable Energies / Energy Transition Professions	University / Higher Education Institution	École nationale des ponts et chaussées (ENPC)		Trains engineers capable of managing renewable energy projects by combining technical engineering knowledge with regulatory, economic and territorial energy planning expertise.
AFPA	France	Zero Carbon Technologies – Professional Upskilling Programme	Private Company	ENGIE	Click here	Supports professional upskilling in decarbonisation technologies and energy transition strategies, improving understanding of low-carbon infrastructure and regulatory frameworks.
AFPA	France	Engineer Program – Energy, Hydrogen, and Renewable Energies (ENSIBS, University of Southern Brittany)	University / Higher Education Institution	ENSIBS (Univ. Bretagne Sud)	Click here	Addresses emerging skills needs in hydrogen and renewable energy engineering, preparing specialists to design and integrate hydrogen systems within future energy infrastructures.
AFPA	France	Master Energy – Sustainable Energy Engineering (Ingénierie énergétique durable)	University / Higher Education Institution	UPEC	Click here	Develops advanced competencies in sustainable energy system design, optimisation and management aligned with energy transition and decarbonisation objectives.

MiCRET

Panorama of training offerings

Project 101195980 MiCRET

Ecological Thinking!

Think before printing, if it is necessary. In case something needs to be printed, it is worth thinking about where to print it (e.g., local print shop, ecofriendly online print shop, etc.), on what kind of paper (e.g., recycled paper, grass paper, other alternatives to usual white paper) and with what kind of colors.

Let's protect our environment!

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1. GENERAL INFORMATION ABOUT THE TRAINING PROVIDER

MiCRET Partner:

ITS GREEN ACADEMY

Provider Name:

ITS GREEN ACADEMY

Legal Status:

- ☐ Private Company
- ☐ Public Institution
- ☑ ~~TVET Provider~~
- ☐ University / Higher Education Institution
- ☐ Research Center
- ☐ Industry Association
- ☐ NGO / Foundation
- ☐ Other: _____

Institutional Accreditation Level:

- ☐ Regional
- ☐ National
- ☐ European
- ☐ International
- ☐ Not formally accredited

Accrediting Authority (if applicable):

_____

Country:

_____

Stakeholders Involved:

- ☐ Energy Companies
- ☐ Technology Providers
- ☐ Public Authorities
- ☐ Sectoral Associations
- ☐ Universities / Research Bodies
- ☐ Social Partners

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☐ Other: _____

Describe the level and type of stakeholder involvement (co-design, internships, certification, etc.):

_____

2. COURSE IDENTITY & STRATEGIC CONTEXT

Course Title:

_____

Link to Official Training Offer (URL):

_____

Renewable Energy Sub-Sector:

☐ Solar Photovoltaic
☐ Solar Thermal
☐ Wind (Onshore)
☐ Wind (Offshore)
☐ Hydropower
☐ Green Hydrogen
☐ Bioenergy / Biomass
☐ Energy Storage
☐ Smart Grids
☐ Energy Efficiency
☐ Other: _____

Course Type:

☐ IVET
☐ Continuing VET (CVET)
☐ Upskilling
☐ Reskilling
☐ Apprenticeship
☐ Higher Education Programme
☐ Corporate Training

Context & Origin: What training or territorial need led to the creation of the course?

_____

Target Audience & Expected Reach (profile and estimated annual participants):

_____

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Geographic Catchment Area:

- ☐ Local
- ☐ Regional
- ☐ National
- ☐ EU-level
- ☐ International

3. EDUCATIONAL DESIGN & DELIVERY

EQF Level:

- ☐ EQF 3
- ☐ EQF 4
- ☐ EQF 5
- ☐ EQF 6
- ☐ EQF 7
- ☐ EQF 8
- ☐ Not referenced

Modular Structure:

- ☐ Yes
- ☐ No

Micro-credential Based:

- ☐ Yes
- ☐ No
- ☐ Partially

Total Duration (hours):

_____

Programme Length:

- ☐ < 1 month
- ☐ 1–3 months
- ☐ 3–6 months
- ☐ 6–12 months
- ☐ > 12 months

Breakdown of hours (theory, practice, lab, internship %):

_____

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Delivery Mode:

- ☐ Fully Online
- ☐ In-person
- ☐ Blended
- ☐ On-the-job
- ☐ In-company
- ☐ VR / Simulation-based

Training Setting & Facilities (labs, equipment, software, field sites):

_____

Faculty Profile:

- ☐ Academic Faculty
- ☐ Industry Experts
- ☐ Certified Technicians
- ☐ External Consultants
- ☐ Mixed

Describe faculty expertise and industry experience requirements:

_____

4. SKILLS & COMPETENCES

Technical Competences Covered:

- ☐ System Design
- ☐ Installation
- ☐ Maintenance
- ☐ Commissioning
- ☐ Grid Integration
- ☐ Monitoring & Performance Analysis
- ☐ Regulatory Compliance

Digital Skills Integration:

- ☐ SCADA
- ☐ IoT
- ☐ Data Analytics
- ☐ AI-based Monitoring
- ☐ Cybersecurity
- ☐ None

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Green & Sustainability Competences:

- ☐ Life Cycle Assessment
- ☐ Environmental Impact Assessment
- ☐ Circular Economy
- ☐ Climate Policy Awareness
- ☐ ESG Reporting

Which specific skill gaps does the course aim to bridge?

_____

5. ADMISSIONS & STUDENT PROFILE

Entry Requirements:

- ☐ No formal requirement
- ☐ Secondary diploma
- ☐ VET qualification
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ Professional experience required

Selection Process:

- ☐ Open enrolment
- ☐ CV screening
- ☐ Written test
- ☐ Technical skills test
- ☐ Interview
- ☐ Competitive selection

Cohort Size:

- ☐ < 15
- ☐ 15–25
- ☐ 26–50
- ☐ > 50

Inclusion & Diversity initiatives (if any):

_____

6. CERTIFICATION & CAREER IMPACT

Qualification Awarded:

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- ☐ Diploma
- ☐ Professional Certificate
- ☐ Academic Degree
- ☐ Certificate of Attendance
- ☐ Micro-credential
- ☐ Digital Badge

Alignment with Occupational Standards:

- ☐ National Qualification Framework
- ☐ ESCO classification
- ☐ Sectoral Skills Framework
- ☐ Not specified

Additional Certifications:

- ☐ Health & Safety
- ☐ Electrical Safety
- ☐ Vendor Certification
- ☐ None

Territorial Validity:

- ☐ National
- ☐ EU-wide
- ☐ International
- ☐ Institution-specific

Target Professional Profiles & Career Path:

_____

Career Support Services:

- ☐ Job placement
- ☐ Internship placement
- ☐ Career counselling
- ☐ Alumni network
- ☐ Entrepreneurship support
- ☐ None

7. FINANCIAL ASPECTS

Participation Cost:

- ☐ Free

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- ☐ < €500
- ☐ €500–€2,000
- ☐ €2,000–€5,000
- ☐ > €5,000

Funding Sources:

- ☐ Self-funded
- ☐ Regional funding
- ☐ National funding
- ☐ EU funding
- ☐ Private sponsorship
- ☐ Employer-funded

Scholarships / Financial Support:

- ☐ Full scholarship
- ☐ Partial scholarship
- ☐ Corporate sponsorship
- ☐ Study loan options
- ☐ Not available

8. FUTURE TRENDS & REMARKS

Contribution to Micro-credential Design:

- ☐ Modular certification
- ☐ Stackable credentials
- ☐ Digital credential issuance
- ☐ Industry co-certified modules
- ☐ Recognition of Prior Learning (RPL)

Planned Future Developments:

- ☐ New specialization modules
- ☐ International partnerships
- ☐ Research projects
- ☐ Digital expansion
- ☐ Green technology updates

Additional Comments / Remarks:

_____

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09.

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