

DELIVERABLE D3.3 CASE STUDIES

D3.3 Case studies



CASE STUDIES	
TITLE	COUNTRY
Automotive, SFS 6002 Electrical Safety Training in the Finnish Automotive Sector	FINLAND
Live Work / High Voltage Battery Repair Training / in the Finnish Automotive Sector	FINLAND
Specialist Technician in Automotive Mechatronics for Electric and Hybrid Vehicles	PORTUGAL
Certification of Technicians for Intervention in Air Conditioning Systems Installed in Motor Vehicles	PORTUGAL
Learning Pathway for Electric and Hybrid Vehicle Technologies	PORTUGAL
Electromobility Microcredentials (FPCAT-UPC). Catalonia	SPAIN
Catálogo de Especialidades Formativas	SPAIN
Upskilling VET teachers technical competences on the safety and maintenance of electric and hybrid vehicles. Navarra	SPAIN
Automotive Skills Alliance (ASA) – Skills Hub Digital Badge	INTERNATIONAL
Credential As You Go (CAYG) – Incremental Credentialing Ecosystem, USA	INTERNATIONAL
MicroCreds, Ireland	INTERNATIONAL

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1 FINLAND - Automotive, SFS 6002 Electrical Safety Training in the Finnish Automotive Sector



Lists of abbreviations

ABBR	...	Description
AKL	Autoalan Keskusliitto (Finnish Central Federation of Automotive Industry)	The key actor who led the working group that prepared Appendix U.
Appendix U	Appendix U	A specific annex to the SFS 6002 standard addressing occupational safety for repairing electric vehicles.
Appendix Y	Appendix Y	A specific annex to the SFS 6002 standard addressing live work.
CENELEC	The European Committee for Electrotechnical Standardization	The European committee that developed EN 50110-1.
EN 50110-1	European Standard	The European basis for the SFS 6002 standard.
MC	Micro-credential	The proposed future development for the training to enhance its value and transparency.
OEM	Original Equipment Manufacturer	In this context, a car manufacturer or their representative.
SFS 6002	Finnish National Electrical Safety Standard	The standard sets the requirements for electrical work safety across all voltage ranges and is a core component of Finnish occupational safety legislation.
Sesko Ry	Sesko Ry	The organization that created the standard in Finland.
VET	Vocational Education and Training	The educational system into which SFS 6002 electrical safety training is integrated as part of the qualification for new mechanics.

1.1 Executive summary

This report examines the Finnish national electrical safety standard SFS 6002, which provides the legislative foundation for electrical safety across all voltage ranges and includes specific provisions for the automotive sector. The primary focus is on the Automotive SFS 6002 Electrical Safety Training, a mandatory qualification for mechanics working on high-voltage electric and hybrid vehicles. The report evaluates the characteristics of this training against the criteria for a national micro-credential (MC) and identifies the modifications required to transform it into a recognized and credible MC.

Key findings regarding the current state and quality assurance include:

- **Organizational Understanding Gap:** While the mandatory nature of the automotive SFS 6002 training is widely acknowledged, interviews reveal deficiencies in broader organizational comprehension—particularly at management level—regarding responsibilities for implementing a comprehensive electrical safety culture (AutoCredify WP3 Interviews, Finland 2024).
- **Quality Challenges:** The credibility of the qualification is undermined by inconsistent assessment practices, primarily self-produced multiple-choice tests, and the absence of pedagogical requirements for trainers. Stakeholders also expressed concern that integration into Vocational Education and Training (VET) may have diluted standards, as the course is now delivered universally rather than targeted to high-risk roles (Brauer, 2023; Cedefop, 2024).
- **Transparency Deficit:** The lack of a centralized national register for completed qualifications prevents systematic monitoring of training impact and limits the benefits of modern digital credentialing, such as portability and verifiability (Opetushallitus, 2025c).

The analysis concludes that the Automotive SFS 6002 Electrical Safety Training is highly suitable for development as a national micro-credential. Such a transition would address current weaknesses by introducing objective, standardized assessment criteria, embedding quality assurance mechanisms, and leveraging digital infrastructure for secure credential verification. It would also enable more agile updates in response to technological change, consistent with the principles outlined in the Council Recommendation on a European approach to micro-credentials (2022) and the OECD (2025) call for anticipatory governance in VET systems. Future development must also consider the implications of European harmonization: while alignment with EN 50110-1 could enhance portability, excessive simplification of national annexes may risk weakening established safety standards.

1.2 Introduction

This case study examines the Finnish national electrical safety standard SFS 6002, focusing on its application within the automotive sector and its implications for micro-credential development. SFS 6002, based on the European standard EN 50110-1, establishes mandatory requirements for electrical work safety across all voltage ranges and is embedded in Finnish occupational safety legislation. Its automotive-specific annex, Appendix U, addresses the competence requirements for repairing electric and hybrid vehicles, including high-voltage systems. Compliance with this standard is operationalized through the Automotive SFS 6002 Electrical Safety Training, which is compulsory for mechanics and other professionals working on high-voltage vehicles.

The relevance of this case extends beyond technical compliance. It illustrates a systemic tension between regulatory stability and sectoral agility—a theme highlighted in the OECD (2025) report on Vocational Education and Training and the Green Transition in Finland. The OECD analysis emphasizes the need for anticipatory governance, modular learning pathways, and micro-qualifications to enable rapid adaptation to technological change while safeguarding quality and equity. In the automotive sector, the electrification of vehicle fleets and the emergence of high-voltage systems exemplify these dynamics: safety-critical competence must be standardized and legally enforced, yet updated quickly to reflect evolving technologies.

This study therefore explores two interrelated questions:

1. How does the current governance and delivery model of SFS 6002 training balance legitimacy (legal compliance, public trust) with responsiveness (adaptation to technological change)?
2. What design changes would be required to transform this mandatory training into a quality-assured micro-credential, aligned with Finnish and EU frameworks for transparency, portability, and labour-market relevance?

By analyzing the institutional context, governance arrangements, assessment practices, and stakeholder perspectives, the case provides insights into the challenges and opportunities of embedding safety-critical training within a micro-credential ecosystem. It also identifies policy levers—such as digital credentialing, external quality assurance, and sector-endorsed validation—that could strengthen both agility and legitimacy in Finland's skills system.

1.3 Institutional Context and Governance

Finland's approach to electrical safety in the automotive sector is anchored in the national standard SFS 6002, which operationalises statutory duties for electrical work and aligns them with the European norm EN 50110-1 through Finnish annexes. The standard codifies the hierarchy of controls—prioritising work on de-energised systems wherever feasible, requiring documented planning and risk assessment before electrical tasks, and prescribing methods to render installations dead and to verify absence of voltage—and it extends these rules to vehicle contexts through national clarifications. The 2025 revision streamlined text and strengthened annexes relevant to automotive work, including the treatment of live-work conditions, EV battery repair, arc-flash protective clothing and organisational responsibilities during electrical work, thereby improving clarity while preserving rigor in high-risk domains (SESKO, 2025; Sähköinfo, 2025; Sähköliitto, 2025).

Within this framework, the Automotive SFS 6002 Electrical Safety Training is the principal mechanism by which competence obligations are implemented for personnel working with high-voltage (HV) systems in electric and hybrid vehicles. The training is delivered through short, intensive courses by private providers and is also integrated

into vocational education and training (VET) programmes to ensure a broad baseline of electrical safety knowledge among new entrants. Certificates issued upon successful completion carry five-year validity, and working with high voltage vehicles also require first-aid competence covering electrical accidents (often renewed on a three-year cycle), reflecting the dual emphasis on technical and medical preparedness in safety management (SESKO, 2025; Sähköinfo, 2025). Workshop-level obligations accompany individual competence: clear safety markings, documented procedures and regular drills form part of routine controls; premises must be prepared for contingencies specific to traction batteries, notably potential thermal runaway, and cleanliness requirements must be enforced to protect product integrity and worker safety (SESKO, 2025; Sähköinfo, 2025).

Governance of the training exhibits the hybrid character typical of Finland's skills system. National standardisation and consensus processes confer legitimacy and coherence, while sectoral actors—original equipment manufacturers (OEMs), importers and private training providers—deliver content that can adapt quickly to proprietary technologies and emerging risks. This duality produces strengths and tensions. It secures compliance and public assurance but can create variability in practice. Stakeholder interviews conducted for AutoCredify indicate that universal delivery through VET has, in some instances, lowered the required standard, and that assessment practices and trainer requirements have not fully kept pace with the competence signalling expected in life-critical HV tasks, particularly when knowledge checks substitute for structured observation of performance (AutoCredify WP3 Interviews, Finland 2025). Trainer requirements emphasise subject-matter expertise in EV electrical safety, yet do not mandate minimum pedagogical or assessor qualifications, a gap that constrains consistency in short-format delivery and evaluation.

These features map directly onto the governance challenges identified by the OECD (2025) review of Finland's VET under the green transition. The report foregrounds anticipatory governance: accelerating unit and qualification updates, strengthening teacher readiness, and deploying micro-qualifications as strategic tools to address critical skills in safety-relevant domains. It also highlights a practical mechanism for reconciling responsiveness with system coherence: The OECD report highlights a mechanism for reconciling responsiveness with system coherence: local units signalling emerging skill needs can be elevated to national status when demand is country-wide. Finland has already applied this principle in the automotive sector, where "Sähköauton huolto" (Electric Car Maintenance) is part of the nationally recognised VET qualification structure (Opetushallitus, 2025d). This example demonstrates that specialist units—such as Live Work training—could also be integrated into national frameworks with enhanced quality assurance and digital verification, ensuring agility without fragmentation (OECD, 2025: 48, 58–59).

Applied to the Automotive SFS 6002 training, this framing suggests a credible pathway to formal micro-credential recognition: retain the national rigour and stakeholder legitimacy while upgrading assessment design, trainer capability and digital traceability so that the qualification can function as a portable competence signal in recruitment and mobility.

The Council Recommendation on a European approach to micro-credentials (2022) provides a design grammar for such credentials. Micro-credentials should articulate explicit learning outcomes, use transparent and reliable assessment methods, embed quality assurance within institutional processes, and be issued as digital certificates that are portable and verifiable across contexts. Finland's quality evaluation ecosystem (Karvi) and the Digivisio 2030 programme—including the Opin.fi service for discoverability and verification of short learning—are building national infrastructure that can surface, audit and verify short-form credentials. Embedding the Automotive SFS 6002 training in this ecosystem would enable secure verification of completions, support workforce mobility across multi-brand repair shops and OEM supply chains, and generate system-level data on renewal cycles and

coverage to inform content updates and policy decisions (Council of the European Union, 2022; Digivisio 2030, 2025; Karvi, 2025).

International portability is facilitated—but not guaranteed—by anchoring SFS 6002 in EN 50110-1. Finnish experts have cautioned that simplifying national annexes to achieve easy mobility risks weakening established safety levels. The path to recognition across borders lies less in minimisation than in transparent documentation of scope, methods and assessment, coupled with digital credentialing and metadata that reference EQF/NQF levels, validity periods and assessment types. In this way, the national rigor of Automotive SFS 6002 training can be preserved while making competence signals legible to employers and authorities elsewhere in Europe (SESKO, 2025; Council of the European Union, 2022; Karvi, 2025).

In summary, the institutional context and governance of the Automotive SFS 6002 Electrical Safety Training provide both the legitimacy needed for safety and the scaffolding required to develop a quality-assured micro-credential. The necessary changes are structural rather than cosmetic: clarifying learning outcomes; strengthening performance-based assessment and assessor competence; and integrating certification into national digital services to improve transparency, portability and system learning. With these reforms, the training can fulfil a dual role—remaining a compliance instrument for electrical safety and becoming a strategic competence signal that supports agility in a rapidly electrifying sector (OECD, 2025; Council of the European Union, 2022).

1.4 Assessment and Quality

The credibility of the Automotive SFS 6002 Electrical Safety Training rests on how competence is assessed, documented, and assured across providers. In current practice, verification of learning is predominantly conducted through self-produced multiple-choice examinations designed by training organisations and administered at the end of short courses. While administratively efficient for compliance-oriented provision, these instruments largely confirm exposure to course content rather than demonstrated application of basic electrical safety principles in practice and the genuine understanding of electrical hazards required for safe operational performance. This is consistent with the course's purpose: SFS 6002 training is designed as a foundational safety qualification. It does not authorise work on high-voltage systems; such tasks require additional specialist training in HV maintenance, HV repair, or live work. (AutoCredify WP3 Interviews, Finland 2025; SESKO 2025; Sähköinfo, 2025; Sähköliitto, 2025).

A second quality issue is variability of assessment across providers. The course relies exclusively on multiple-choice tests, which are self-produced by training organisations. There is no common national rubric or external moderation process governing these tests, and providers differ in the difficulty, scope and weighting of their questions. This limits comparability and weakens the evidentiary strength of certificates, even though the underlying safety standard is uniform.

This fragmentation weakens comparability between certificates and undermines the system's ability to give a consistent, portable signal of competence to employers. Where short courses are integrated into VET programmes, stakeholders expressed concern that universal delivery has, at times, lowered the expected standard to accommodate heterogeneous cohorts, further diluting the evidentiary value of assessments (AutoCredify WP3 Interviews, Finland 2025). By the yardstick of the Council Recommendation on a European approach to micro-credentials (2022), credible short-form credentials require transparent, reliable assessment against explicit learning outcomes; provider-specific tests that vary substantially in rigour do not meet that threshold (Council of the European Union, 2022).

A third determinant of assessment quality is trainer competence. SFS 6002 rightly requires subject-matter expertise in electrical safety for those delivering the training, and this requirement is essential for ensuring accurate interpretation of the standard. However, the course relies exclusively on multiple-choice tests, which do not require assessor judgment in the same way as performance-based assessments. The absence of pedagogical requirements for trainers still matters because effective delivery of safety content and learner engagement depend on didactic skills, even in theory-focused courses. The OECD (2025) analysis of Finland’s VET system under the green transition identifies teacher readiness—combining technical mastery and pedagogical capability—as a systemic bottleneck and calls for targeted professional development as part of anticipatory governance. This observation applies to safety training because the clarity and consistency of instruction influence how well learners internalise rules that underpin workplace safety.

A fourth, structural weakness concerns transparency and traceability. Certificates issued under the SFS 6002 regime typically record validity cycles and complementary requirements (e.g., five-year training validity and first-aid renewal, often on a three-year cycle), yet there is no national digital register of completions. Employers must verify paper or PDF attestations, and the system lacks verifiable records to support portability, compliance audits, or aggregated analytics on renewal, sectoral coverage and incident-driven updates. By contrast, Finland’s emerging digital infrastructure—the Opin.fi service under Digivisio 2030—is designed to surface and verify short learning within institutional quality assurance processes (Digivisio 2030, 2025; Karvi, 2025). Until the Automotive SFS 6002 certificates are integrated into such platforms, assessment outcomes will remain difficult to audit and compare, and opportunities for system learning will be constrained.

Finally, the relationship between assessment quality and safety outcomes must be kept central. The codified safeguards in SFS 6002—documented risk assessment, correct work organisation, and premises preparedness—assume assessors who can elicit and judge performance at the level of procedural detail those safeguards require. Where EV-specific annexes clarify additional hazards and duties, the competence signal must credibly show that candidates can apply these rules in practice, not merely identify them in a test (SESKO, 2025; Sähköinfo, 2025). Stakeholder reflections underline the point: employers value the training as a compliance instrument, but their trust in certificates improves when assessments demonstrate applied competence and when providers maintain consistent standards across cohorts and delivery modes (AutoCredify WP3 Interviews, Finland 2025).

Taken together, the assessment and quality profile of Automotive SFS 6002 training explains why it is functionally well-suited to micro-credential design yet evidentially weak in its current form. The conversion to a formal micro-credential would require assessment to be anchored in explicit learning outcomes, structured performance observation, and auditability, delivered by assessors with recognised didactic competence, and supported by digital verification integrated with national services. None of these elements would replace the authenticity of practical verification; rather, they would convert provider-specific conventions into system-recognised evidence—meeting the Council Recommendation (2022) requirements and addressing the OECD (2025) call for VET systems that combine legitimacy with responsiveness in the context of rapid electrification (Council of the European Union, 2022; OECD, 2025).

1.5 Policy Implications and Future Development

The analysis of the Automotive SFS 6002 Electrical Safety Training demonstrates that the qualification is structurally well-suited to the micro-credential format but requires substantive reforms to meet the evidentiary and governance standards associated with formal recognition. These reforms are not cosmetic; they involve reconfiguring

assessment, strengthening trainer competence, embedding digital infrastructure, and aligning governance with anticipatory principles.

The first policy implication concerns assessment design. Current reliance on provider-specific multiple-choice tests does not fully meet the transparency and reliability criteria set out in the Council Recommendation on micro-credentials (2022). However, given that SFS 6002 Electrical Safety Training is a foundational safety course—not an authorisation for high-voltage repair—assessment reform should remain proportionate to its purpose. A nationally standardised and externally validated multiple-choice test could provide sufficient assurance while improving comparability across providers. This approach would meet micro-credential requirements for clarity and reliability without imposing unnecessary complexity or cost on the sector. Introducing heavy practical components would be impractical and risk undermining acceptance of a course that is currently simple and widely implemented.

A second implication relates to trainer capability and quality assurance. While subject-matter expertise is indispensable, the absence of minimum pedagogical standards undermines consistency in short-format delivery. Introducing didactic requirements and assessor training would ensure that evaluation practices are defensible and aligned with national QA frameworks. Continuous professional development should be embedded to maintain both technical and pedagogical currency as electrical safety standards and automotive technologies evolve. This recommendation reflects the OECD (2025) emphasis on teacher readiness as a critical enabler of agile VET systems in the green transition.

The third implication concerns digital infrastructure and transparency. Certificates issued under the current regime remain paper-based or PDF artefacts, limiting portability and precluding system-level monitoring. Embedding the micro-credential in Finland's emerging digital ecosystem—through Opin.fi and the Digivisio 2030 platform—would enable secure verification, support workforce mobility, and generate data for continuous improvement. Metadata referencing EQF/NQF levels, validity periods and assessment methods would enhance interpretability across borders and employers, addressing the reporting gaps identified by OECD for local units and micro-qualifications.

A fourth implication is the need for agile update cycles. The statutory five-year validity and three-year lapse rule provide a framework for competence maintenance, but the content of SFS 6002 training is determined by the standard itself. Updates to the training must therefore follow revisions to SFS 6002, while ensuring that changes are communicated promptly and integrated into delivery. Linking micro-credential metadata and renewal processes to SESKO's standard updates would operationalise anticipatory governance without undermining compliance. This approach ensures that the credential remains aligned with the authoritative safety framework while avoiding the inertia of full qualification reform.

Finally, the question of harmonisation and portability requires careful calibration. While alignment with EN 50110-1 supports European mobility, excessive simplification of Finnish annexes could weaken established safety levels. Portability should be achieved through transparent documentation and digital verification rather than through reduction of national rigor. In this way, the micro-credential can preserve Finland's high safety standards while making competence signals legible to employers and authorities across borders.

In conclusion, converting the Automotive SFS 6002 Electrical Safety Training into a micro-credential offers strategic benefits: it would strengthen trust in competence signals, enhance portability, and embed agility in a domain where safety and technological innovation intersect. Implemented effectively, these reforms would advance Finland's compliance with the Council Recommendation (2022) and respond to the OECD (2025) call for VET systems that combine legitimacy with responsiveness in the context of the twin transition.

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2 FINLAND - Live Work / High Voltage Battery Repair Training / in the Finnish Automotive Sector



Lists of abbreviations

ABBR	...	Description
AKL	Autoalan Keskusliitto (Finnish Central Federation of Automotive Industry)	An industry representative whose interviews were used in the report.
EQF	European Qualifications Framework	The framework to which the MC qualification could be linked to improve international recognition.
EU	European Union	The region where electrical safety standards are based on the common EN 50110-1 standard, and where worker mobility is facilitated.
EV	Electric Vehicle	The type of vehicle whose operation uses dangerously high voltage.
HV	High Voltage	The dangerously high voltage present in electric vehicle battery systems and other electrical installations.
Live Work	Work carried out on live parts	Electrical work on high-voltage components in situations where de-energisation is not possible (e.g., inside the battery) or has failed, making it an exception to the primary safety rule.
MC	Micro-Credential	The model proposed to enhance the transparency and portability of the SFS 6002 competence.
OEM	Original Equipment Manufacturer	For example, a vehicle manufacturer who often has internal training requirements stricter than the national standard.
SFS 6002	Finnish Standard 6002	The national electrical safety standard on which the Live Work principles in Finland are based.

2.1 Executive summary

This case study examines Finland's Live Work / High-Voltage Battery Repair Training, a safety-critical qualification governed by the national electrical safety standard SFS 6002 and its annexes Appendix Y (Live Work) and Appendix U (Electric Vehicles). The training addresses exceptional circumstances where

de-energisation cannot be achieved, notably internal repairs on high-voltage battery packs. It is mandatory for technicians performing such work and includes theoretical instruction, practical exercises, and a certificate valid for five years, with renewal required if live work has not been performed within three years. Certificates must document voltage level, working methods, training content, duration, and trainer details. Additional safeguards include the team-of-two rule for battery repairs and premises requirements for thermal-runaway risk.

The analysis finds that the training is functionally well-suited to micro-credential design: it is short, tightly scoped, and anchored in regulated standards. However, significant gaps remain in assessment validity, trainer competence, and digital transparency. Current assessment relies on a single provider-designed practical exercise without standardised rubrics, external moderation, or auditable artefacts, limiting comparability and trust. Trainers must hold subject-matter expertise but are not required to demonstrate pedagogical or assessor competence. Certificates are issued in paper or PDF form, with no national digital register, constraining portability and system-level monitoring.

To transition Live Work training into a quality-assured, digitally verifiable micro-credential, reforms are needed in four areas. First, assessment should be aligned with explicit learning outcomes and supported by structured observation protocols, hybrid knowledge-plus-performance tasks, and external moderation. Second, trainer standards should incorporate minimum didactic competence and continuous professional development. Third, digital infrastructure must enable secure verification and portability through national platforms such as Opin.fi under Digivisio 2030, with metadata referencing EQF/NQF levels and validity periods. Fourth, update cycles should be linked to skills intelligence and SESKO standard revisions to maintain alignment with technological change.

These recommendations respond to the Council Recommendation on micro-credentials (2022) and to OECD (2025) guidance on anticipatory governance in VET systems. Implemented effectively, they would strengthen trust in competence signals, enhance workforce mobility, and embed agility in a domain where safety and innovation converge—without compromising the rigour required for life-critical work.

2.2 Introduction

The rapid electrification of road transport in Finland has introduced high-voltage (HV) systems into routine maintenance and repair, reshaping the safety profile of automotive work and the competence requirements of technicians. The national electrical safety standard SFS 6002, aligned to EN 50110-1 and updated in 2025, provides the legislative and technical foundation for electrical work across voltage ranges, setting out the hierarchy of controls that prioritises working de-energised wherever feasible and prescribing documented procedures both to make an installation dead and to verify the absence of voltage (SESKO, 2025; Sähköliitto, 2025). In practice, there are strictly defined situations in which de-energisation cannot be achieved or has failed, most notably when work must be undertaken inside traction batteries of electric vehicles. In these exceptional circumstances, Live Work is permitted, and the rules governing such work—including training, competence maintenance, and certification—are codified in Appendix Y (general live work) and Appendix U (electric vehicles), both comprehensively revised in the 2025 edition to reflect the evolving technological landscape and clarify organisational responsibilities (SESKO, 2025; Sähköinfo, 2025).

This case study examines the Live Work / High-Voltage Battery Repair Training that operates under SFS 6002 in the Finnish automotive sector. It retains full technical fidelity to the standard and its appendices: the competence scope, prerequisites and delivery, mandatory practical exercise, certificate content, validity, renewal conditions, and work organisation and premises requirements. The training functions as a specialist course intended to qualify technicians to perform fault diagnosis and repairs on HV battery systems in electric and hybrid vehicles, typically delivered as an intensive classroom programme over one or two days. Participation presupposes a valid SFS 6002 electrical safety certificate and first-aid training covering electrical accidents; familiarity with HV systems and de-energisation procedures gained through hybrid/EV training or work experience is strongly recommended. The certificate issued on successful completion documents the voltage level of the training, the working methods covered, the content of theoretical and practical components, the duration of the training and the trainer's contact details, and it confers validity for five years. Where live work has not been performed within three years, renewal is required before live work can resume. In the specific case of internal HV battery repairs, the standardised work organisation includes a team-of-two norm, permitting deviation only on the basis of a compelling and documented risk assessment, and stipulates that battery repairs be conducted in premises suitable for potential thermal runaway and with appropriate cleanliness controls (SESKO, 2025; Sähköinfo, 2025). In multi-brand repair environments, the training is generally accepted as evidence of compliance with SFS 6002; within original equipment manufacturer (OEM) ecosystems, brand-specific requirements are often stricter than the national baseline, limiting the generic portability of the training for OEM-internal pathways while still offering baseline signal value in recruitment and workforce mobility. Stakeholder interviews undertaken for the AutoCredify project emphasise both the safety-critical importance of the training and a recurrent concern about foundational competence, namely the risk that learners might attempt to enter advanced HV work without the necessary basics (AutoCredify WP3 Interviews, Finland 2025).

The analytical lens for this study is drawn from recent work on Finland's vocational education and training (VET) system in the context of the green transition. The OECD (2025) report highlights the governance tension between system legitimacy—grounded in national standardisation, statutory safety rules and consensus-based stakeholder processes—and sectoral agility, which is required to keep pace with the rapid evolution of traction batteries, power electronics and associated diagnostic and repair practices. The report argues for anticipatory governance, including faster qualification and unit update cycles, strengthened teacher readiness, and the strategic deployment of micro-qualifications in safety-relevant domains. The OECD report highlights a mechanism for reconciling

responsiveness with system coherence: local units signalling emerging skill needs can be elevated to national status when demand is country-wide. Finland has already applied this principle in the automotive sector, where “Electric Car Maintenance” is now a nationally recognised qualification component. This precedent illustrates how well-defined specialist units—such as Live Work training—could similarly be integrated into national frameworks with strengthened quality assurance and reporting (OECD, 2025: 48, 58–59). In parallel, the Council Recommendation on a European approach to micro-credentials (2022) defines a design grammar for short, quality-assured and portable competence signals—explicit learning outcomes, transparent and reliable assessment, embedded quality assurance and digital certification—which Finland is operationalising through national quality evaluation and audit integration and via the Opin.fi service under Digivisio 2030 for discoverability and verification of short learning (Council of the European Union, 2022; Digivisio 2030, 2025; Karvi, 2025). This framework provides the yardstick for evaluating Live Work training’s suitability as a micro-credential, with particular attention to assessment validity and reliability, trainer competence, and the digital infrastructure required for verifiable records and portability.

Methodologically, the case synthesises primary regulatory sources (SFS 6002:2025 and appendices; SESKO notices; sector summaries) to establish the legal and technical requirements, policy literature to develop the analytical framing and criteria for micro-credential design and governance, and stakeholder interviews to contextualise competence expectations, assessment credibility and variability across providers and OEM ecosystems (SESKO, 2025; Sähköinfo, 2025; Sähköliitto, 2025; OECD, 2025; Council of the European Union, 2022; Karvi, 2025; Digivisio 2030, 2025; AutoCredify WP3 Interviews, Finland 2024). The contribution is twofold: it preserves the technical content of Live Work training as defined in Appendix Y and Appendix U, and it interprets that content against contemporary principles for short-form credentials and anticipatory governance in VET, identifying assessment design, trainer capability and digital transparency as decisive levers for credibility and portability.

The remainder of the report proceeds as follows. Chapter 2 analyses the institutional context and governance, setting out the legal basis and the detailed requirements of Appendix Y and Appendix U, the training delivery and prerequisites, the certificate rules, and the trade-offs inherent in the hybrid governance model. Chapter 3 interrogates assessment and quality, examining current practice around the mandatory practical exercise, the quality assurance gaps and trainer competence needs, and the implications of these for trust and portability. Chapter 4 develops policy implications and future development, outlining how Live Work training can be credibly transitioned into a quality-assured, digitally verifiable micro-credential integrated with national services, while preserving the rigour needed for safety-critical work.

2.3 Live Work

Finland’s framework for electrical work safety in the automotive sector is grounded in SFS 6002, the national standard that operationalises the requirements of EN 50110-1 through Finnish annexes. The 2025 revision of SFS 6002 updated the core text and comprehensively revised annexes relevant to the vehicle context, including Appendix Y (Live Work), Appendix U (Electric Vehicles), and organisational responsibilities in Annex X. In line with Finnish legislation, SFS 6002 provides the recognised route to compliance: it sets out the hierarchy of controls that prioritises working de-energised wherever feasible, requires documented planning and risk assessment prior to electrical work, and prescribes methods to render installations dead and to verify absence of voltage before contact with previously energised parts (SESKO, 2025; Sähköliitto, 2025).

2.3.1 Legal basis and standardisation

SFS 6002 establishes the legal and technical foundation for safe electrical work across voltage ranges. It does so by translating general safety requirements into work practice rules and competence obligations that are applicable to vehicle systems as much as to stationary installations. As a consensus standard developed under the auspices of SESKO, SFS 6002 is explicitly referenced as the pathway by which duty-holders demonstrate that statutory safety duties are met. The 2025 edition sought to clarify text and reduce unnecessary national additions to the EN standard while strengthening guidance where Finnish practice demanded specificity—most notably in live-work definitions, EV battery work, arc-flash protective clothing, the hazards of direct current, and organisational responsibilities for maintaining electrical safety (SESKO, 2025; Sähköinfo, 2025).

2.3.2 Electric-vehicle clarifications under Appendix U

Within this framework, Live Work is strictly defined as work carried out on live parts or in proximity where contact with live parts is possible. The standard limits Live Work to circumstances where de-energisation cannot be achieved or has failed, and where a documented risk assessment justifies and governs the method. For the automotive sector, Appendix Y sets definitions and instructions that apply wherever appropriate, requiring that Live Work training be organised to ensure competence for the specific work to be performed, and that training rests on theoretical instruction integrated with practical exercises. These practical components must familiarise candidates with tools, protective equipment and working methods relevant to the qualification sought. Appendix Y also specifies the content of the certificate issued on successful completion: it must state the voltage level at which training was provided, the working methods covered, the content of theoretical and practical training, the duration of the training, and contact information for the trainer. Competence maintenance rules are strict: validity is five years, and if an employee has not performed Live Work within three years, training must be renewed before resuming Live Work. Annual review of employee suitability for current tasks is recommended to ensure continued fitness for safety-critical work (SESKO, 2025; Sähköinfo, 2025).

2.3.3 Live Work under Appendix Y

Appendix U was created to address technological change and anticipated skill needs in electric vehicles. It clarifies that internal work on high-voltage battery packs constitutes Live Work because the battery cannot be de-energised in the sense used for conventional installations. It further establishes sector-specific exceptions and obligations. Unlike building electrical work, EV battery Live Work does not require the worker to be a fully qualified “electrical professional” under the general regime, but it does require sufficient familiarisation and dedicated Live Work training for battery work, which may be provided by a vehicle manufacturer or importer. For internal battery repairs, Appendix U prescribes a team-of-two norm; deviation from this norm is permitted only on compelling, documented risk-assessment grounds. The Appendix also stipulates that battery repairs must be performed in suitable premises, taking into account the potential for thermal runaway and the cleanliness requirements of the work. Finally, training content must explain the rationale for proper procedures and the consequences of non-compliance for occupational safety and end-user safety, thereby linking competence to both worker protection and product integrity (SESKO, 2025; Sähköinfo, 2025).

2.3.4 Live Work under Appendix Y

Live Work / high-voltage battery repair training operates as a specialist qualification intended to prepare technicians for fault diagnosis and repair on HV battery systems across passenger cars, buses and trucks. Providers predominantly offer intensive classroom formats delivered over one or two days; the market price cited by stakeholders is approximately €400 per day. Entry presupposes a valid SFS 6002 electrical safety certificate and first-aid training covering electrical accidents; prior familiarity with HV systems and de-energisation procedures—achieved through hybrid/EV training or relevant work experience—is strongly recommended to ensure foundational competence before undertaking advanced, life-critical tasks. Competence verification includes a mandatory practical exercise, embedded within the curriculum, and successful completion leads to a certificate valid for five years with the three-year lapse rule described above. In multi-brand repair environments, the standardised certificate functions as the accepted proof of competence; in OEM ecosystems, internal brand requirements often exceed national baseline expectations, limiting generic portability of the national training for OEM-internal progression while retaining value as a baseline signal in recruitment (AutoCredify WP3 Interviews, Finland 2025; SESKO, 2025).

2.3.5 Certification, validity and organisational responsibilities

Certification in this regime is not simply a record of course attendance but a regulated document whose fields and validity are defined by the standard. By requiring the explicit recording of voltage level, covered methods, theoretical/practical content, duration and trainer contact details, Appendix Y seeks to make competence transparent and auditable. The validity and renewal rules are designed to ensure that technicians remain current in practice, and the recommendation to review employee suitability annually embeds continuous oversight within workshop management. In parallel, Annex X of SFS 6002 clarifies organisational responsibilities for electrical safety during work, strengthening the governance of competence, supervision and safe systems of work at the enterprise level (SESKO, 2025).

2.3.6 Hybrid governance: legitimacy and agility

The governance of Live Work training in the automotive sector reflects a hybrid model. SFS 6002 provides the legally anchored baseline for electrical safety, ensuring system-wide coherence and compliance. OEMs, importers and private providers operate within this framework but often impose stricter internal requirements to address proprietary technologies and risk models. This arrangement combines the stability of national standardisation with the agility needed for rapid technological change. This hybrid model combines the stability of national standardisation with the agility needed for rapid technological change. OEMs operate fully within the national framework and typically tighten requirements to meet their own risk models, without concern for cross-brand portability. Variability in delivery and assessment practices arises primarily among independent providers, who interpret the standard differently in the absence of detailed national rubrics. Variability in provider practices can challenge comparability of assessment outcomes; the standard's current focus on subjectmatter expertise rather than pedagogical competence for trainers may reduce consistency in delivery; and the absence of a national digital register of completions limits transparency and portable verification, complicating workforce mobility and system learning (AutoCredify WP3 Interviews, Finland 2025; OECD, 2025).

2.3.7 Position within Finland's VET and micro-credential agenda

Recent analysis of Finland's VET system in the OECD (2025) report situates training like Live Work within a broader call for anticipatory governance. The report highlights the need to accelerate unit and qualification updates, enhance teacher readiness, and deploy micro-qualifications as strategic tools to address critical skills in sectors pivotal to the green transition. The OECD report highlights a mechanism for reconciling responsiveness with system coherence: local units signalling emerging skill needs can be elevated to national status when demand is country-wide. Finland has already implemented this principle in the automotive sector, where "Electric Car Maintenance" is a nationally recognised qualification component. This precedent demonstrates that well-defined specialist units—such as Live Work training—could similarly be integrated into national frameworks with strengthened quality assurance and digital reporting, ensuring agility without fragmentation (OECD, 2025: 48, 58–59). For Live Work training, this implies that a well-scoped specialist unit could be integrated more firmly into national systems with strengthened quality assurance and reporting. In parallel, the Council Recommendation on micro-credentials (2022) defines design principles—explicit learning outcomes, transparent and reliable assessment, embedded quality assurance and digital certification—that Finland is working to embed in institutional audit practices and to surface through national digital services like Opin.fi under Digivisio 2030 (Council of the European Union, 2022; Digivisio 2030, 2025; Karvi, 2025). The current training's governance and delivery arrangements provide much of the functional structure required for a micro-credential, but they also reveal the quality levers that would need attention (assessment comparability, trainer didactics, digital verification) to meet formal MC expectations.

2.3.8 International portability and harmonization

Because SFS 6002 is anchored in EN 50110-1, training aligned to its annexes benefits from a degree of European recognisability. Yet, as Finnish experts have cautioned, excessive minimisation of national annexes to facilitate mobility may weaken established safety levels. The pathway to international portability lies less in simplification than in transparent documentation of scope, methods and assessment, coupled with digital credentialing and metadata that reference EQF/NQF levels, validity periods and assessment types. In this way, the national rigour of Live Work training can be preserved while enabling employers and authorities abroad to interpret competence signals reliably (SESKO, 2025; Council of the European Union, 2022; Karvi, 2025).

2.4 Assessment and Quality

The evidentiary value of the Live Work / High-Voltage Battery Repair Training hinges on how competence is assessed, documented, and assured across providers. Under Appendix Y, a mandatory practical exercise constitutes the principal mode of verification. In practice, this exercise is typically designed and administered by the training provider, observed by the trainer, and recorded as part of the completion dossier. While such an approach has the virtue of situating assessment in the authentic work context—tool handling, personal protective equipment (including arc-flash garments), safe measurement and isolation procedures, and controlled battery interventions—it generally lacks standardised outcome descriptors, external moderation, or auditable artefacts beyond the certificate itself. This constrains reliability and comparability of results across providers, and it raises questions about the extent to which the certificate evidence applied competence rather than attendance in a short, compliance-driven format (SESKO, 2025; Sähköinfo, 2025).

The implications for validity are most salient in tasks where the margin for error is narrow. Internal work on high-voltage battery packs cannot be rendered de-energised in the conventional sense, and therefore the

competence signal must unambiguously demonstrate the candidate's ability to operate safely under live-work conditions while adhering to procedural safeguards codified in Appendix U, including work organisation (the team-of-two norm and documented grounds for any deviation), premises suitability for thermal-runaway risk, cleanliness requirements, and an understanding of the consequences of non-compliance for occupational and end-user safety (SESKO, 2025). A single, provider-designed exercise, however authentic, does not guarantee that these dimensions are assessed to a common standard across the system. Interviews conducted for AutoCredify confirm employers' support for live-work training as essential to safety yet highlight reservations about assessment credibility when providers rely on idiosyncratic practical tasks without external checks; stakeholders also emphasise the need to ensure that participants possess adequate foundational competence before entering advanced HV battery work so that the exercise authentically tests advanced skills rather than remedial basics (AutoCredify WP3 Interviews, Finland 2025).

Trainer competence is a second determinant of assessment of quality. SFS 6002 requires subject-matter expertise in electrical safety in the EV domain, and this requirement is indispensable for life-critical work. However, the standard does not prescribe pedagogical qualifications or assessor training. Given that Live Work training is intended for experienced technicians with prior competence in high-voltage systems, the expectation is that participants already possess foundational skills. Even so, short, intensive specialist courses must produce robust and defensible judgements of performance in highly complex tasks. Without minimum didactic standards and assessor training, observation and evaluation practices can vary significantly across providers, reducing consistency in a domain where safety margins are extremely narrow. In the absence of minimum didactic standards, it is difficult to ensure that observation protocols, questioning, and feedback are applied consistently, or that borderline cases are resolved against shared criteria rather than provider-specific conventions. The OECD's analysis of Finland's VET in the green transition identifies teacher readiness—encompassing technical mastery and pedagogical capability—as a systemic bottleneck and recommends targeted professional development as part of anticipatory governance (OECD, 2025). This observation is directly applicable to live-work training, where assessor proficiency is inseparable from safety assurance.

Transparency and traceability constitute a third quality dimension. Certificates in this regime contain regulated fields—voltage level, working methods, theoretical and practical content, duration, trainer contact details—and confer validity for five years with a renewal requirement if live work has not been performed within three years. Despite this structured documentation, there is no national digital register of completion. Employers in multi-brand environments typically accept paper or PDF attestations if they comply with SFS 6002, but portability and trust would be strengthened by verifiable records accessible through national services. The Council Recommendation on a European approach to micro-credentials frames digital certification as a cornerstone of portable, trustworthy competence signals, and Finland's *Opin.fi/Digivisio 2030* initiatives are explicitly designed to surface and verify short learning within institutional quality systems (Council of the European Union, 2022; *Digivisio 2030*, 2025; Karvi, 2025). Absent for such infrastructure for live-work certificates, system-level monitoring (e.g., renewal cycles, sectoral coverage, cohort outcomes) remains limited, and audit trails for safety-critical assessments are more fragile than they need to be.

Taken together, these features explain why the current training is functionally well-suited to the micro-credential form yet does not, as currently implemented, meet the stronger evidentiary thresholds associated with formal micro-credentials. Converting live-work training into an MC would require that learning outcomes be made explicit and assessed through structured performance tasks aligned to those outcomes, that observation be supported by common rubrics and external moderation to stabilise reliability across providers, and that assessments generate auditable artefacts capable of sustaining verification over time (Council of the European Union, 2022; Karvi, 2025).

None of these shifts would dilute the authenticity of the practical exercise; they would instead convert it from a local convention into a system-recognised assessment with documented standards, thereby strengthening trust in the certificate's competence claims.

Sectoral constraints must also be acknowledged. Within OEM ecosystems, internal brand requirements frequently exceed national baselines and reflect proprietary technologies and risk models. Employers interviewed for AutoCredify indicate that a generic national MC would add limited value for internal progression in such contexts unless integrated with brand-specific modules; at the same time, they recognise that a rigorously designed MC could serve as credible baseline proof in recruitment and could support mobility across multi-brand repair environments (AutoCredify WP3 Interviews, Finland 2025). This hybrid pattern is consistent with Finland's broader governance of VET under the green transition, in which local and sectoral units can be elevated to national status when they signal widely distributed needs, but quality assurance and reporting must keep pace so that system coherence is preserved alongside responsiveness (OECD, 2025).

Finally, the relationship between assessment of quality and safety must be kept at the centre of the discussion. The codified safeguards for live work—risk assessment, team-of-two requirements, premises criteria, and explicit training on the rationale for correct procedures and the consequences of deviation—assume assessors who can elicit and judge performance at the level of detail those safeguards require. A micro-credential conversion that strengthens assessment design, assessor competence, and digital traceability would therefore not merely improve portability and recognition; it would also deepen the alignment between competence signalling and the safety outcomes the standard is designed to secure (SESKO, 2025; Sähköinfo, 2025; Council of the European Union, 2022).

2.5 Policy Implications and Future Development

The analysis of Live Work training under SFS 6002 reveals a dual reality: the training is structurally well-suited to the micro-credential format, yet its current implementation falls short of the evidentiary and governance standards required for formal recognition as a micro-credential. This chapter synthesises the implications for policy and system design, situating them within Finland's broader VET reform agenda and the European framework for micro-credentials.

The first implication concerns assessment reform. At present, competence verification relies on a single practical exercise observed by the trainer, without standardised rubrics, external moderation or auditable artefacts. While authentic, this model does not guarantee comparability or reliability across providers. Transitioning to a micro-credential requires assessment to be explicitly aligned with defined learning outcomes and supported by structured observation protocols. Hybrid models that combine digital knowledge checks with performance-based tasks—documented through video or structured logs—would strengthen validity and create audit trails. External moderation or peer review would further stabilise reliability. These measures would not dilute authenticity; rather, they would convert local practice into system-recognised evidence of competence.

A second implication relates to trainer capability and quality assurance. The standard currently mandates subject-matter expertise but does not require pedagogical competence or assessor training. For safety-critical work, this omission is problematic. Introducing minimum didactic standards and assessor certification would ensure that evaluation practices are consistent and defensible. Continuous professional development should be embedded to maintain both technical and pedagogical currency as battery technologies evolve. This recommendation aligns with OECD's emphasis on teacher readiness as a precondition for agile VET systems in the green transition.

The third implication concerns digital infrastructure and transparency. Certificates issued under SFS 6002 contain regulated fields, but they remain paper-based or PDF artefacts without integration into national registries. The absence of a verifiable digital record limits portability, complicates compliance audits and precludes system-level monitoring of renewal cycles and coverage. Embedding live-work micro-credentials in Finland's emerging digital ecosystem—through Opin.fi and the Digivisio 2030 platform—would enable secure verification, support workforce mobility and generate data for continuous improvement. Metadata referencing EQF/NQF levels, validity periods and assessment types would enhance interpretability across borders and employers.

A fourth implication is the need for agile update cycles. The statutory five-year validity and three-year lapse rule provide a framework for competence maintenance, but content refresh must be responsive to technological change. Linking micro-credential updates to signals from skills intelligence, OEM bulletins and SESKO standard revisions would operationalise anticipatory governance, a priority identified by OECD for sectors undergoing rapid transformation. This approach would ensure that the credential remains aligned with emerging risks and practices without imposing the inertia of full qualification reform.

Finally, the question of sectoral endorsement and international portability must be addressed. In multi-brand repair environments, a national micro-credential would offer clear value as a transparent competence signal. Within OEM ecosystems, its utility for internal progression may be limited unless integrated with brand-specific modules. Policy design should therefore recognise the hybrid nature of governance: a national MC can function as a baseline proof of competence while coexisting with proprietary training regimes. At the European level, portability depends not on reducing Finnish safety requirements to the lowest common denominator but on making them legible through transparent documentation and digital verification. This strategy preserves national rigour while enabling employers abroad to interpret competence signals reliably.

In sum, converting Live Work training into a micro-credential is not a cosmetic exercise; it is a structural reform that touches assessment design, trainer standards, digital infrastructure and governance processes. Implemented well, it would strengthen trust in competence signals, enhance portability and embed agility in a domain where safety and technological change intersect. It would also advance Finland's compliance with the Council Recommendation on micro-credentials and respond to OECD's call for VET systems that combine legitimacy with responsiveness in the green transition.

2.6 Conclusions and Future Development

Electric vehicle Live Work Training is a clearly defined and strictly regulated body of specialist expertise that arose from the essential need established by SFS 6002 Standard Appendix U to protect workers from the life-threatening risks posed by high-voltage systems. The structure of the training—short duration, specific focus (battery repair), mandatory practical exercise, and the precise certificate content defined by Appendix Y—makes it inherently suitable for the national micro-credential (MC) model. This is also confirmed by our interviews in which a leading electrical expert confirms the strong fit of SFS 6002-based training for micro-credentials. At the national level, a micro-credential would improve the transparency of competence in independent repair shops where brand-specific restrictions do not apply.

One limitation for the MC model in the automotive sector is its applicability in large brand organizations. While OEMs (Original Equipment Manufacturers) require their own, highly specific, and mandatory training modules, which a national MC cannot provide. This was noted also in the interviews by one of our industry representatives:

"Especially in a brand organization, I do not see an advantage in the professional development of existing personnel, as I doubt that the level of training can be maintained at the manufacturer's required standard." Therefore, the MC model's primary use case in the automotive sector remains in generic competence provision, supporting vocational education, and filling competence gaps in multi-brand repair shops. Crucially, at the national level, a micro-credential would improve the transparency of competence in independent repair shops where brand-specific restrictions do not apply.

The agility and easy updateability of the micro-credential are also easily applicable to the training's statutory five (5) year validity period and the renewal requirement after a 3-year pause. The micro-credential model could also facilitate the updating of Live Work Training as technology evolves. The core strategic value of this agility is emphasized by the industry, noting that "if the knowledge being taught is up to date, this would function as a good means of advancing employee competence... technology is developing at a rapid pace, and mechanics are constantly being trained alongside their work." As a short (1–2 days) and affordable (approx. €400/day) regulation-based qualification training, its primary value to the employee and employer is ensuring mandatory safety compliance and obtaining the required authorisation for high-voltage work. The impact of the training on significantly improving the employees' immediate labour market standing is limited. However, an employer representative we interviewed pointed out that certified specialist competence "always increases a job applicant's 'points'."

The biggest challenge in national refinement relates to current quality assurance mechanisms. The sector's self-produced assessment methods conflict with the externally validated and comparable competence assessment required by micro-credentials. The assessment of Live Work Training is based on a "practical exercise" without more detailed requirements and thus does not meet the requirements of micro-credentials. The trainer monitors the completion of the exercise, and it is not further analysed or evaluated. Furthermore, no digital register of completions is collected, meaning the qualification is not digitally verifiable. For this reason, there is also no national level data on the total number of qualified people.

The standard does not take a position on the pedagogical requirements for trainers. The lack of a formal pedagogical qualification requirement in the standard weakens the systematic quality assurance and auditability required by the micro-credential model in the delivery of training. In addition to pedagogical competence, the trainers' subject matter expertise should also be ensured, and their competence maintenance and verification should be facilitated at a sufficiently agile level when the training is moved to the micro-credential level. In this respect, the Finnish Central Federation of Automotive Industry representative stated that "ensuring the competence of teachers is one of the most important things for quality assurance".

Although the Finnish national electrical safety standard, SFS 6002, is based on the European standard EN 50110-1, it includes many Finnish national additional requirements. However, an official micro-credential should be able to cross national borders. As an official micro-credential, the training must be internationally portable. Appendix Y's precise requirements for the content of the certificate (voltage level, working methods, and duration) are already in line with European transparency principles. As a micro-credential, the qualification could be directly linked to an EQF level and would be more easily recognisable in other EU countries, facilitating the mobility of workers in the sector. However, at the international level, the specific electrical safety requirements of other EU countries must be considered.

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3 PORTUGAL - Specialist Technician in Automotive Mechatronics for Electric and Hybrid Vehicles



3.1 General information

Title of the case study: Certification of Técnico/a Especialista em Mecatrónica Automóvel de Veículos Elétricos e Híbridos (Specialist Technician in Automotive Mechatronics for Electric and Hybrid Vehicles)

Country / Region: Portugal

Organisation(s) involved: ATEC

Sector(s): Repair & Maintenance

Implementation phase (initiation, planning, delivery, evaluation): Delivery

Contact person (name, role, email): João Alves, Cooperation Projects and Certifications Coordinator, joao.alves@atec.pt

3.2 Context and objectives

3.2.1 Background of the initiative

This case study examines the integration of micro-credentials into Portugal's National Qualifications System (SNQ) via the Technological Specialisation Courses (CET) model. It focuses on the CET 525RA019 – Specialist Technician in Automotive Mechatronics for Electric and Hybrid Vehicles, illustrating how national instruments such as the Catálogo Nacional de Qualificações (CNQ) and the Units of Competence (UC) converge to form a coherent and digitally verifiable qualification system aligned with the European Qualifications Framework (EQF).

The Catálogo Nacional de Qualificações (National Catalogue of Qualifications)

The CNQ is regulated under **Decree-Law no. 396/2007, of 31 December**, as amended by **Decree-Law no. 14/2017, of 26 January**, which redefined the legal framework of the SNQ and introduced mechanisms for greater flexibility, transparency, and lifelong learning opportunities.

To ensure coherence and quality in Portugal's system of qualifications, it is designed to provide a **comprehensive and structured list of all nationally recognised qualifications**, organised by levels and areas of education and training. According to Article 6 of Decree-Law 14/2017, the CNQ integrates qualifications that are **based on competencies and learning outcomes**, aligning each with the corresponding level of the **Quadro Nacional de Qualificações – QNQ (National Qualifications Framework)**.

Each qualification in the CNQ includes:

- a) A **Competence Referential**, defining the professional profile and associated skills, knowledge, and attitudes required for the occupation.
- b) A **Training Referential**, which details the curriculum, learning outcomes, and training methodologies.
- c) The **qualification level** according to the QNQ and its **credit value**, expressed in points under the **National Credit System for Vocational Education and Training (Sistema Nacional de Créditos do Ensino e Formação Profissionais)**, established by Article 6-A of the same decree-law.

The CNQ thus serves as a **national reference tool** ensuring that all training and certification processes are aligned with standardised frameworks of learning outcomes and competency-based education. This guarantees that

qualifications are transparent, comparable, and transferable across Portugal and the broader European context through alignment with the **European Qualifications Framework (EQF)**.

The CNQ is a **living instrument**, continuously adapted to reflect economic, technological, and social transformations. According to Decree-Law 14/2017 (Article 6, paragraphs 5–8), the **Agência Nacional para a Qualificação e o Ensino Profissional, I.P. – ANQEP (National Agency for Qualifications and Vocational Education)** is responsible for the **elaboration, evaluation, and permanent updating** of the CNQ.

This process is conducted in cooperation with:

- **Sectoral Councils for Qualification (Conselhos Setoriais para a Qualificação), which include representatives of employers, trade unions, and education experts;**
- **Public bodies responsible for employment and training policies;**
- **Other social partners involved in the labour market and qualification policy-making.**

Revisions to the CNQ are **published in the Official Gazette (Boletim do Trabalho e Emprego)** and on ANQEP's website, taking immediate effect upon publication. This mechanism ensures that the Catalogue remains relevant and responsive to the evolving needs of Portugal's economy and society.

It is organised according to the **Classificação Nacional das Áreas de Educação e Formação (National Classification of Education and Training Areas)**, grouping qualifications into distinct sectors of activity.

Thus, CNQ plays a **central strategic role** in Portugal's approach to education, training, and employment. It bridges formal education and vocational training, linking secondary schools, training centres, and employers through a shared qualification structure.

By articulating all qualifications around **learning outcomes** rather than input-based measures (such as hours of instruction), the CNQ contributes to a **competency-based learning paradigm**. This shift ensures that qualifications correspond directly to the skills and knowledge demanded by the labour market, enhancing the employability of graduates and supporting innovation and productivity across sectors.

Moreover, the CNQ underpins **recognition of prior learning** mechanisms, such as the **Reconhecimento, Validação e Certificação de Competências – RVCC (Recognition, Validation and Certification of Competences)** process, by defining the standards and competencies that must be demonstrated for certification.

The CNQ provides the **structural basis** for several key educational offers in Portugal, including **CETs, Adults Vocational Education and Training (EFA courses), and apprenticeship programmes**. All these pathways are built upon the same competency frameworks defined within the Catalogue, ensuring coherence and mutual recognition between different learning routes.

This structure enables learners to transition smoothly between education and work, as well as across different qualification levels.

Cursos de Especialização Tecnológica (Technological Specialisation Courses)

Cursos de Especialização Tecnológica - CET (Technological Specialisation Courses) represent one of the most critical post-secondary, non-higher education pathways within Portugal's National Qualifications System (SNQ). These courses occupy Level 5 of the NQF and are characterized by their dual-certification nature—combining academic learning with professional qualification.

CETs are governed primarily by Decree-Law no. 88/2006, of 23 May, as amended by Decree-Law no. 39/2022, of 31 May, and further regulated by Portaria no. 206/2022, of 19 August. Together, these legislative instruments define their structure, functioning, target audience, and certification framework. CETs are explicitly designed to bridge the gap between secondary education and higher education, as well as between education and the labour market, promoting upskilling, employability, and lifelong learning.

The most recent reform, introduced by **Decree-Law 39/2022**, reaffirmed the strategic role of CETs as part of Portugal's national agenda for **skills development and requalification**. This reform followed the “*Acordo sobre Formação Profissional e Qualificação: um desígnio estratégico para as pessoas, para as empresas e para o país*” (2021), which emphasised the need to strengthen post-secondary technical education to respond to labour market needs.

CETs thus play a dual role: they serve both **economic objectives** (by providing skilled professionals to the labour market) and **social objectives** (by enabling individuals to advance in education and employment).

Unidades de Competência (Competence Units)

The UC system lies at the heart of the **SNQ**, as it translates qualifications into coherent, measurable, and certifiable blocks of learning outcomes. This modular organisation not only enhances flexibility and personalisation of learning but also strengthens the connection between training and the real needs of the labour market.

The legal basis for UCs is primarily found in **Decree-Law no. 14/2017**, which amended the SNQ framework established by **Decree-Law no. 396/2007**, and in the regulations governing CETs, notably **Decree-Law no. 39/2022** and **Portaria no. 206/2022**.

Under **Article 3(v)** of Decree-Law 14/2017, a *Unit of Competence* is defined as a “*coherent combination of learning outcomes, capable of independent assessment and validation.*”

Each unit, therefore, represents a discrete component of a qualification, focusing on specific skills, knowledge, and attitudes that are meaningful and applicable in a professional context.

Units of Competence can be:

- **Standalone learning modules, which may be individually certified; or**
- **Constituent elements of a broader qualification, forming part of a progressive learning pathway.**

Together with **UFCDs**, UCs make up the “**units of qualification**” that compose each CNQ-listed qualification (Article 3(x) of the same decree-law).

This structure allows the Portuguese qualifications system to move beyond traditional input-based models (based on study hours) and adopt a **learning-outcome-based approach**, focused on what the learner knows, understands, and can do.

Each Unit of Competence is accompanied by a detailed **referential description**, developed and maintained by the **ANQEP, I.P.**, as part of the CNQ.

This refers to:

- **The learning outcomes that the learner must demonstrate;**
- **The knowledge, skills, and attitudes to be developed;**

- **The assessment criteria and evidence required for validation;**
- **The associated credit points (ECVET), defining its weight within the full qualification; and**
- **Any links to related units or qualifications.**

Through this system, each UC becomes a **transparent and measurable unit of learning**, recognised domestically in the **National Credit System for Vocational Education and Training** (Article 6-A of Decree-Law 14/2017).

The modular structure based on UCs enables learners to **build qualifications progressively**, either through formal training or by combining training with recognition of prior learning.

Each completed unit is **individually certified**, meaning that learners can accumulate credits over time without losing previously acquired achievements — a crucial aspect of the **lifelong learning philosophy** underpinning the SNQ.

In practice, this modularity offers:

- **Flexibility in training design and participation, especially for adults balancing education with employment;**
- **Customisation of learning paths according to individual or sectoral needs;**
- **Recognition of partial learning achievements; and**
- **Transferability of credits between qualifications and training providers.**

This model is particularly relevant in CETs, where courses are built upon UCs that collectively correspond to a Level 5 qualification. Each completed UC is recorded in the **Passaporte Qualifica**, the digital portfolio of the learner's qualifications and competencies (Decree-Law 14/2017, Article 8), which enables individuals to **track and accumulate credits** obtained from different learning experiences, including CETs, recognition processes or other learning activities.

When all UCs that constitute a qualification are completed successfully, the learner receives the **corresponding national qualification** and its associated certificate or diploma. However, even if only some units are completed, the learner retains the **partial certification**, which can later be used to complete the qualification or to demonstrate employable competencies.

This cumulative model fosters a **lifelong and stackable learning system**, where every learning achievement contributes to personal and professional development.

3.2.2 Target group(s)

CETs target **adults aged 18 or older**, as specified in **Article 7 of Decree-Law 39/2022**, who meet at least one of the following conditions:

- **Hold a secondary education diploma or equivalent qualification;**
- **Have completed basic education and are attending a secondary-level course or a Recognition, Validation and Certification of Competences (RVCC) process; or**
- **Already possess a Level 5 qualification, diploma of technological specialisation, or higher education degree, and wish to pursue requalification or reskilling.**

Exceptionally, younger learners who have not yet turned 18 may also enrol if they meet the above educational requirements and receive authorisation from the **Direção-Geral dos Estabelecimentos Escolares (DGEstE)**.

This inclusivity reflects Portugal's policy objective of promoting **lifelong and flexible learning pathways**, consistent with the principles of the SNQ established in **Decree-Law 14/2017 (Articles 1 and 2)**.

3.2.3 Primary objectives

According to **Article 3** of Decree-Law 39/2022, CETs are defined as *“a modality of dual-certification training of post-secondary, non-higher education level, designed to confer a qualification based on specialised technical training.”*

They serve four main objectives:

- **Requalification and reconversion of adults for reintegration or progression in the labour market;**
- **Deepening of technical and technological skills to improve job performance and adaptability;**
- **Consolidation of initial training pathways, enhancing professional qualification; and**
- **Encouragement of progression to higher education, through credit transfer and articulation mechanisms.**

The rapidly evolving automotive industry, demands a workforce equipped with advanced skills, particularly in electric and hybrid vehicle technologies. The qualification **CET 525RA019 – Técnico/a Especialista em Mecatrónica Automóvel de Veículos Elétricos e Híbridos**, a post-secondary Level 5 qualification under the CNQ, is designed to address the technical and industrial needs of the modern automotive repair and maintenance sub-sector.

3.3 Stakeholder roles and collaboration

A TEC played a central role in shaping, coordinating and delivering the initiative, ensuring its alignment with national qualification frameworks and sectoral requirements.

The initiative involved a limited but highly strategic group of stakeholders, whose roles were primarily linked to qualification design, validation and system-level alignment rather than direct training delivery:

- **A reference training provider in the automotive field in Portugal**
 - **Contributed expert knowledge and benchmarking experience.**
 - **Supported technical validation of training content and learning outcomes.**
- **ANQEP – National Agency for Qualifications and Vocational Education**
 - **Ensured alignment with the National Qualifications System and the National Catalogue of Qualifications.**
 - **Oversaw compliance with competence-based qualification standards.**
- **Sectoral Council for Transport and Logistics**
 - **Provided sectoral validation of the qualification profile.**
 - **Ensured that learning outcomes reflected occupational and labour-market needs.**

Although the automotive industry was not directly involved as a stakeholder, its requirements were indirectly embedded through the use of internationally recognised standards.

- **Industry input through international standards**
 - **The qualification design drew on the** DGUV 209-093, an internationally recognised standard for high-voltage safety. These courses ensure that learning is aligned with best practices in safety and technical intervention.
 - **This standard reflects established industry requirements and safety expectations, ensuring labour-market relevance without direct employer participation.**

3.4 Micro-credential design and implementation

Credential Title: Qualificação em Técnico/a Especialista em Mecatrónica Automóvel de Veículos Elétricos e Híbridos (Qualification as Specialist Technician in Automotive Mechatronics for Electric and Hybrid Vehicles).

Type of credential: Post-secondary Level 5 diploma and qualification certificate. If a learner completes only specific competence units or short training units, they are issued a partial certificate of qualifications, enabling learners to continue their education or apply their recognised skills in the labour market.

Mode of delivery: in-person (at the training center and on-the-job).

The pedagogical approach is intended to be learner-centred and competency-oriented, promoting practical application of knowledge through tasks and projects related to real work situations.

UCs are combined with work-based learning modules under the coordination of both the training provider and the host company, ensuring close articulation between theoretical instruction and professional practice, aligning education outcomes with occupational standards and labour market demands.

Workload / Duration: 1400 hours (1000h at the training center and 400h on-the-job)

Learning outcomes:

The learning outcomes are set in accordance with the NQF level 5 Specialist Technician in Automotive Mechatronics for Electric and Hybrid Vehicles qualification – CET 525RA019, using the methodology defined by the National Agency for Qualification and Vocational Education.

By the end of the course, participants must be able to:

- **Organise and manage workshop work.**
- **Supervise maintenance, fault detection and repair work on electric and hybrid motor vehicles, evaluating technical solutions in response to customer requests.**

- Supervise the analysis and monitoring of the performance of internal combustion engines, transmission systems, steering, suspension and braking systems in electric and hybrid vehicles.
- Budget technical interventions in electric and hybrid vehicles, considering the diagnosis made.
- Monitor and control the quality of work carried out in the workshop, with a view to optimising results.
- Supervise the marketing of the workshop's services/products, promoting customer satisfaction.

Assessment methods:

Assessment in CET focuses on performance-based evaluation of the learner's capacity to demonstrate the required learning outcomes of each Competence Unit.

The evaluation methods are flexible but must align with the competence referentials defined in the CNQ. Training entities are responsible for designing assessments that integrate both theoretical and practical dimensions, often combining written tests, project work, simulations, and workplace performance evaluations.

Furthermore, the Recognition, Validation, and Certification of Competences (RVCC) process — also regulated by Decree-Law 14/2017 (Articles 12 and 15) — allows individuals to achieve certification for one or more UCs based on professional or life experience, without the need to attend formal training.

This recognition mechanism strengthens inclusivity and ensures that informal and non-formal learning are equally valued within the qualification framework.

Quality assurance system:

Training providers must comply with:

- Possess DGERT certification in education and training areas 525
- Authorization of functioning by the competent body (IEFP the National Employment and Vocational Training Institute), including the verification of regional needs, pedagogical conditions, available resources for both theoretical and practical delivery and available partnerships
- Follow SIGO procedures for certification issuance

Prerequisites:

- Secondary education diploma or equivalent.
- An integration program of 500 hours precedes the CET, aiming to equip participants with the technical skills they need to complete the course.

Integration / Stackability

- Complements initial vocational qualifications in automotive maintenance and repair, particularly those at NQF/EQF level 4.

- **Is integrated into the National Catalogue of Qualifications via Technological Specialization Course nr. 525RA019, enabling coherence with formal vocational training routes.**
- **Stackable Qualification, with credits transferable to Bachelor's programs in Higher Education Institutions in Portugal.**
- **Partial certificate of qualifications enables learners to continue their education in any other training provider in Portugal, with the pre-learning automatically recognized.**

Type of recognition:

Formal Recognition

- **Integrated in the National Catalogue of Qualifications through the Technological Specialization Course nr. 525RA019.**

Professional Recognition

- **Endorsed by the Sectoral Qualification Council for Transport and Logistics.**

3.5 Digital infrastructure and tools

Platform used:

Common digital elements include:

- **LMS platforms (e.g. Moodle) and Collaboration platforms (e.g. MS Teams), in the delivery phase, to ensure proper availability of learning material and video meetings, when necessary.**
- **SIGO, the national Integrated Information and Management System for Education and Training Provision, in which all certified training providers register delivered training and issue the certificates to the participants.**
- **Passaporte Qualifica is the national Technological tool for recording the qualifications and skills acquired or developed throughout an adult's life.**

3.6 Alignment with national/EU systems

Although the initiative is not formally designated as a micro-credential, it operates within regulatory and qualification frameworks that reflect several core elements of the European approach to micro-credentials.

Link with National Qualification Framework (NQF)

CETs are structurally and conceptually anchored in the Catálogo Nacional de Qualificações. In accordance with Article 3(3) of Decree-Law 39/2022 and Article 3(b) of Portaria 206/2022, CETs must adhere to the competence and training referentials associated with Level 5 qualifications listed in the CNQ.

This means that every CET corresponds to a recognised qualification profile defined within the CNQ, ensuring standardisation, quality assurance, and national recognition. The learning outcomes, structure, and certification processes are therefore consistent across training entities, regardless of where the course is delivered.

The CNQ also determines the UCs and UFCDs that make up each qualification, allowing learners to obtain partial certifications when completing one or more units with success. This modular approach, regulated by Article 5(2) of Decree-Law 39/2022, reinforces flexibility and lifelong learning, enabling individuals to gradually build their qualifications according to their personal and professional trajectories.

Integration with EU Tools

This initiative demonstrates a weak regulatory alignment with European tools, besides its **indirect alignment with the EQF, achieved through the NQF level of the qualification.**

The initiative does not currently make systematic use of:

- **Europass credential supplements,**
- **ESCO-based skills referencing,**
- **European Digital Credentials for Learning (EDCI) formats.**

Compliance with EU principles for micro-credentials

While not formally structured as a micro-credential, the certification can be assessed against the EU principles for micro-credentials in terms of quality, relevance, recognition, and portability.

- **Quality is ensured through national defined referential, authorised providers, and mandatory assessment.**
- **Relevance is very high, as the qualification responds to a technological shift in the automotive industry.**
- **Recognition is formal and nationwide.**
- **Portability is fully ensured at national level.**
- **Transparency is supported by clearly defined learning outcomes, workload, assessment methods, and validity period, although not yet presented in a standard EU micro-credential format.**

3.7 Outcomes and impact

CETs occupy a **key strategic position** in Portugal's qualifications architecture. They complement other pathways, such as **Professional Courses** and **Apprenticeships**, by focusing on **technological and sector-specific expertise** at the intermediate level.

Through their connection to the CNQ, CETs:

- **Strengthen alignment between education, training, and employment;**
- **Provide a structured route for upskilling and requalification;**

- **Facilitate social and professional mobility by connecting secondary education, vocational training, and higher education; and**
- **Contribute to Portugal's national goals for increasing the proportion of the population with post-secondary qualifications.**

They are therefore not only a training modality but also a **policy instrument** for addressing structural skills gaps and promoting competitiveness within a rapidly changing labour market.

However, the first editions of this Technological Specialisation Course (CET) were launched in the course of the previous year. As the initiative is still at an early stage of implementation, no consolidated results are yet available.

At this point, it is therefore not possible to assess measurable outcomes or impacts, such as learner completion rates, employability effects, career progression, or changes in employer practices. The collection and analysis of outcome data are expected to take place once a sufficient number of cohorts have completed the programme, allowing for a more robust evaluation of its impact on learners and the labour market.

3.8 Sustainability and scalability

The initiative is fully financed through the operational funding model of the lead organisation, which has a direct influence on its design, delivery and sustainability.

- **The execution of the training is 100% funded through ATEC's operational financing model.**
- **No external project-based or ad hoc funding instruments were required for implementation.**
- **Full internal financing:**
 - **Ensures stability and predictability in delivery.**
 - **Allows rapid adaptation of content to technological developments.**
- **The use of existing infrastructure, trainers and quality-assurance systems supports cost efficiency and long-term viability.**

The institutional and regulatory framework within which the initiative is embedded creates favourable conditions for continuity and wider adoption beyond the lead organisation.

- **As the qualification is listed in the National Catalogue of Qualifications, it can be delivered by any accredited training provider that:**
 - **Obtains the required authorisation to operate.**
 - **Complies with the competence referentials and quality requirements defined in the CNQ.**
- **This regulatory openness:**
 - **Supports institutional sustainability beyond a single provider.**
 - **Facilitates replication at national level.**
- **The standardised competence-based structure ensures:**
 - **Consistency of learning outcomes across providers.**

- National recognition of certifications, regardless of the delivering entity.
- The model is therefore highly transferable:
 - Across regions within Portugal.
 - To providers serving similar labour-market needs.
- Wider scaling would benefit from:
 - Stronger coordination among providers.
 - Alignment with emerging national and European approaches to micro-credentials.

3.9 Strengths, challenges, and recommendations

Key success factors

Several factors contributed to the effectiveness, relevance and scalability of the initiative.

- Full integration into the National Catalogue of Qualifications, ensuring formal recognition and system coherence.
- Standardised competence referentials enabling delivery by any authorised training provider.
- Strong alignment with national skills governance structures and quality-assurance mechanisms.
- Use of internationally recognised competence standards to reflect industry requirements.
- Institutional capacity and operational stability of the lead organisation.

Main challenges faced

Despite its strengths, the initiative faced a number of structural and operational challenges.

- Rapid technological evolution requiring continuous updating of competence referentials.
- Limited direct involvement of employers during design and delivery.
- Absence of a dedicated national micro-credential framework.
- Variability in capacity and resources across potential training providers.

These challenges were addressed through:

- Reliance on CNQ governance and periodic revision mechanisms.
- Use of international standards to ensure labour-market relevance.
- Strong internal quality-assurance processes by the lead organisation.

Recommendations for replication or policy action

Based on the experience of this initiative, several recommendations can be formulated for practitioners and policymakers.

- **For training providers**
 - **Seek authorisation to deliver CNQ-listed qualifications to expand provision.**
 - **Invest in trainer upskilling and technical infrastructure to ensure consistent quality.**
- **For policymakers**
 - **Leverage CNQ-listed qualifications as a mechanism for scalable and standardised replication.**
 - **Strengthen coordination among authorised providers to ensure consistency.**
 - **Promote clearer articulation between CNQ qualifications and emerging micro-credential frameworks.**
- **For system-level development**
 - **Encourage wider adoption of CNQ-based qualifications by authorised providers.**
 - **Support interoperability and credit transfer across providers and learning pathways.**

3.10 Supporting materials (Optional attachments)

Decree-Law no. 396/2007, of 31 December, as amended by Decree-Law no. 14/2017, of 26 January

Decree-Law no. 88/2006, of 23 May, as amended by Decree-Law no. 39/2022, of 31 May

Decree-Law no. 39/2022

Portaria no. 206/2022, of 19 August

CET 525RA019

4 PORTUGAL - Certification of Technicians for Intervention in Air Conditioning Systems Installed in Motor Vehicles



4.1 General information

Title of the case study: Certification of Técnico de Intervenção em Sistemas de Ar Condicionado instalados em Veículos a Motor (Technicians for Intervention in Air Conditioning Systems Installed in Motor Vehicles)

Country / Region: Portugal

Organisation(s) involved: ATEC

Sector(s): Repair & Maintenance

Implementation phase (initiation, planning, delivery, evaluation): Delivery

Contact person (name, role, email): João Alves, Cooperation Projects and Certifications Coordinator, joao.alves@atec.pt

4.2 Context and objectives

4.2.1 Background of the initiative

Portugal doesn't yet have an officially established national micro-credential framework. Nevertheless, several forms of short, targeted, competence-based training have long existed in the Portuguese vocational system. These include modular training units (UFCDs), CET unit structures, and a range of specialized, regulator-mandated courses that certify professionals for legally restricted activities. Although these are not designated as "micro-credentials", they share many of their key characteristics, such as short duration, focused learning outcomes, employer relevance, formal assessment, and stackability within professional pathways.

The Certification of Técnico de Intervenção em Sistemas de Ar Condicionado instalados em Veículos a Motor (Technicians for Intervention in Air Conditioning Systems Installed in Motor Vehicles) is a clear example of this type of training. It is a mandatory, competence-based, short-duration course required for technicians who work with fluorinated greenhouse gases (F-gases) in automotive air-conditioning systems. Developed and regulated under European and national legislation, the course ensures that professionals can safely, legally, and environmentally responsibly conduct interventions on AC systems.

This case study examines the design, implementation, and regulatory role of this certified training course, illustrating how it behaves as a micro-credential-type qualification within the Portuguese context. It follows the same structure as the other case studies, enabling coherence across the national mapping exercise.

4.2.2 Target group(s)

European and national regulations governing fluorinated greenhouse gases, particularly Regulation (EU) n° 517/2014 and Regulation (EC) n° 307/2008, require that any **automotive professionals who work on systems containing fluorinated greenhouse gases from air conditioning systems installed in motor vehicles** must hold a formal attestation of competence.

4.2.3 Primary objectives

The course analysed in this case study – Certification of Técnico de Intervenção em Sistemas de Ar Condicionado instalados em Veículos a Motor (Technicians for Intervention in Air Conditioning Systems Installed in Motor

Vehicles) - is a short, highly focused, legally required training action designed to ensure safe, compliant handling of refrigerants in air conditioning systems installed in motor vehicles. This course, despite not being labelled a micro-credential, meets several core characteristics associated with micro-credential-type provision.

4.3 Stakeholder roles and collaboration

This process is regulated by the Agência para o Clima I.P. (ApC) under Decreto-Lei n.º 122/2024, 31-12-2024. Designated training providers are authorised to deliver a course that prepares technicians for this qualification, upon prior recognition.

4.4 Micro-credential design and implementation

Credential Title: Atestação de Técnicos de Intervenção em Sistemas de Ar Condicionado instalados em Veículos a Motor (Certification of Technicians for Intervention in Air Conditioning Systems Installed in Motor Vehicles).

Type of credential: Training attestation (legally required to work). Attestation is valid for 7 years and renewable upon: i) proof of at least 3 years of relevant activity, and ii) completion of 7 hours of refresher training.

Mode of delivery: in-person or hybrid (practice is mandatory to be in person).

Workload / Duration: Legally defined minimum of 12 hours of training (6h theory + 6h practice), plus 1,5h for assessment.

Learning outcomes:

The learning outcomes are set in accordance with Annex I of Regulation (EC) No 307/2008 of 2 April, with no direct mapping to the European Qualification Framework. However, considering that these learning outcomes were incorporated in a level 4 Competence Unit in the National Catalogue of Qualifications, this should be mapped to EQF level 4.

By the end of the course, participants must be able to:

- **Correctly use air conditioning systems containing fluorinated greenhouse gases installed in motor vehicles;**
- **Understand the environmental impact of fluorinated greenhouse gases and the corresponding environmental regulations;**
- **Carry out the environmentally sound recovery of fluorinated greenhouse gases.**

Assessment methods:

Technicians must pass a final exam comprising:

Component	Duration
Theoretical assessment	0.5 h
Practical assessment	1 h

The practical component weighs at least 50%, and the theory component at least 35%.

Quality assurance system:

Training providers must comply with:

- Possess DGERT certification in education and training areas 522 or 525
- Be designated by APA/ApC as an attesting body for the training of technicians for interventions in air conditioning systems installed in motor vehicles, confirming the capabilities of the institution to deliver both theoretical and practical training, in terms of pedagogy, trainers, facilities, equipment and materials.
- Follow SIGO procedures for certification issuance
- Verified conditions for both theoretical and practical delivery

Prerequisites:

- Minimum mandatory schooling
- Knowledge in the field of intervention in air conditioning systems installed in motor vehicles.

Integration / Stackability

This credential functions as a mandatory, specialised competence unit within the professional pathway of automotive technicians. It:

- Complements initial vocational qualifications in automotive maintenance and repair, particularly those at NQF/EQF level 4.
- Is integrated into the National Catalogue of Qualifications via Competence Unit UC02441, enabling coherence with formal vocational training routes.
- Supports continuous professional development (CPD) through a renewal cycle that requires evidence of professional practice and refresher training.

National recognition is ensured through legal regulation and standardised requirements defined at EU and national levels, ensuring institutional portability within Portugal. Limited cross-border portability is in practice, but based on EU-harmonised regulatory learning outcomes, supporting indirect recognition in other Member States.

Type of recognition:

Formal Recognition

- **Mandatory qualification for any intervention involving fluorinated refrigerants.**
- **Direct compliance with EU and national legislation.**
- **Integrated in the National Catalogue of Qualifications through the Competence Unit nr UC02441 “Diagnosticar e reparar sistemas de climatização” (Diagnose and repair air conditioning systems).**

Professional Recognition

- **Recognised by automotive workshops, dealerships, and fleet operations.**
- **Essential for legally performing AC servicing activities.**

4.5 Digital infrastructure and tools

Platform used:

Common digital elements include:

- **LMS platforms (e.g. Moodle) and Collaboration platforms (e.g. MS Teams), in the delivery phase, to ensure proper availability of learning material and video meetings in hybrid delivery training.**
- **SIGO, the national Integrated Information and Management System for Education and Training Provision, in which all certified training providers register delivered training and issue the certificates to the participants.**
- **Passaporte Qualifica is the national Technological tool for recording the qualifications and skills acquired or developed throughout an adult's life.**

4.6 Alignment with national/EU systems

Although the initiative is not formally designated as a micro-credential, it operates within regulatory and qualification frameworks that reflect several core elements of the European approach to micro-credentials.

Link with National Qualification Framework (NQF)

In the absence of a formally defined micro-credential framework in Portugal, alignment with the National Qualification Framework occurs primarily through indirect integration into existing vocational qualification structures rather than through explicit NQF labelling.

- **The certification is not assigned a standalone NQF level as an independent qualification.**
- **Its learning outcomes are embedded in a Level 4 competence unit within the National Catalogue of Qualifications.**
- **This positioning establishes an implicit correspondence with NQF level 4, and by extension EQF level 4.**
- **The credential therefore functions as a regulated, partial qualification component within the national vocational education and training system.**

Integration with EU Tools

This initiative demonstrates a strong regulatory alignment with European legislation, while making limited operational use of EU transparency and credentialing tools commonly associated with micro-credentials.

- **Learning outcomes are defined directly by EU Regulations governing fluorinated greenhouse gases.**
- **Indirect alignment with the EQF is achieved through the NQF level associated with the corresponding competence unit.**
- **Certification data are recorded in national digital systems (SIGO and Passaporte Qualifica).**
- **The initiative does not currently make systematic use of:**
 - **Europass credential supplements,**
 - **ESCO-based skills referencing,**
 - **European Digital Credentials for Learning (EDCI) formats.**

Compliance with EU principles for micro-credentials

While not formally structured as a micro-credential, the certification can be assessed against the EU principles for micro-credentials in terms of quality, relevance, recognition, and portability.

- **Quality is ensured through legally defined standards, authorised providers, and mandatory assessment.**
- **Relevance is very high, as the certification is a legal prerequisite for professional practice.**
- **Recognition is formal and nationwide, grounded in EU and national legislation.**
- **Portability is fully ensured at national level, with partial portability at EU level based on harmonised regulatory requirements.**
- **Transparency is supported by clearly defined learning outcomes, workload, assessment methods, and validity period, although not yet presented in a standard EU micro-credential format.**

4.7 Outcomes and impact

Provides technicians with legal authorisation for specialised work, enhancing employability and supporting environmental and safety compliance. Several thousand Technicians have gone through this training since 2011 in different accredited training providers to obtain the necessary attestation and be legally authorised to work with A/C systems.

4.8 Sustainability and scalability

Funding sources

The certification operates within a stable funding model that is closely linked to its regulatory nature, rather than to time-bound project funding or external financial incentives.

- The initiative is primarily funded through participant or employer fees.
- Delivery is embedded in the regular activity of authorised training providers, using existing infrastructures and resources.
- The absence of reliance on short-term public or project-based funding has contributed to its long-term continuity and predictability.
- Regulatory requirements, rather than funding conditions, have been the main influence on course design and delivery.

Plans for continuation or scaling

The long-term continuation of the initiative is structurally assured by its legal status, while its design offers clear potential for adaptation and scaling beyond its current scope.

- Sustainability is guaranteed through its mandatory nature and periodic renewal requirements.
- The certification is fully institutionalised within the national regulatory and vocational training system.
- The model is highly transferable to:
 - Other regulated automotive domains (e.g. electric vehicles, high-voltage systems),
 - Other sectors requiring legally mandated competence certification (environment, energy, safety).
- With targeted adaptations (e.g. explicit EQF referencing, EDCI-compatible digital issuance, standardised credential documentation), the initiative could be scaled into a formal micro-credential framework without altering its regulatory function.
- The case demonstrates a replicable and scalable model for embedding micro-credential-type provision within regulated professional ecosystems.

4.9 Strengths, challenges, and recommendations

Although the **Certification of Technicians for Intervention in Air Conditioning Systems Installed in Motor Vehicles** is not formally labelled as a micro-credential, its long-standing operation provides valuable insights into how micro-credential-type provision can function effectively within regulated professional contexts.

Key success factors

Several interrelated factors have contributed to the durability, relevance, and operational success of this initiative.

- **Strong regulatory anchoring, grounded in EU and national legislation, which ensures mandatory uptake and clear purpose.**

- **Direct labour-market relevance, as the certification is a legal prerequisite for professional practice.**
- **Clearly defined learning outcomes and assessment standards, harmonised at European level.**
- **Robust quality assurance mechanisms, including authorised providers, mandatory practical assessment, and periodic renewal.**
- **Institutional integration, embedding the certification within existing vocational training and qualification systems.**
- **Sustainability over time, supported by a self-financed model independent of short-term project funding.**

Main challenges faced

Despite its success, the initiative has faced several structural and conceptual challenges, particularly when viewed through a micro-credential policy lens.

- **Lack of formal micro-credential recognition, due to the absence of a national micro-credential framework.**
- **Limited transparency and portability at European level, as the certification is not issued in an EQF- or EDCI-compatible format.**
- **Conceptual fragmentation, where similar short, competence-based certifications exist but are not framed within a coherent national micro-credential ecosystem.**
- **Administrative complexity associated with regulatory compliance and provider authorisation processes.**

These challenges have been mitigated primarily through regulatory clarity rather than educational policy instruments.

- **EU legislation provides a common technical and competence baseline, reducing ambiguity across providers.**
- **National digital systems ensure traceability and formal recognition within Portugal.**
- **Periodic renewal requirements support ongoing relevance and skills updating, compensating for the absence of formal stackability mechanisms.**

Recommendations for replication or policy action

Based on the experience of this initiative, several recommendations can be formulated for policymakers and practitioners seeking to develop or support micro-credential-type provision.

- **Build on existing regulatory and vocational structures, rather than creating parallel micro-credential systems from scratch.**
- **Ensure explicit referencing to qualification frameworks (NQF/EQF) to enhance transparency and comparability.**

- **Standardise credential documentation, including learning outcomes, workload, assessment, and quality assurance, in line with EU micro-credential principles.**
- **Leverage European digital tools, such as Europass and EDCI, to improve portability and learner control over credentials.**
- **Design clear stackability pathways, whether towards formal qualifications or recognised professional profiles.**
- **Maintain strong labour-market linkage, particularly in regulated sectors where legal compliance and safety are critical.**
- **Avoid over-bureaucratisation, ensuring that micro-credential frameworks remain flexible and responsive to sectoral needs.**

Overall, this case demonstrates that micro-credential-type provision can be highly effective when it is **regulator-driven, competence-based, and institutionally embedded**. Policymakers should therefore consider how existing certified short courses can be progressively aligned with European micro-credential standards, enhancing transparency and mobility without undermining their established legal and professional functions.

4.10 Supporting materials

<https://apambiente.pt/avaliacao-e-gestao-ambiental/organismos-de-atestacao-de-formacao-ar-condicionado-em-veiculos-motor>

<https://apambiente.pt/avaliacao-e-gestao-ambiental/listagens-de-certificados-e-atestados-emitidos>

[Regulation \(EU\) n° 517/2014](#)

[Regulation \(EC\) n° 307/2008](#)

[Commission Implementing Regulation \(EU\) 2025/1893](#) of 17 September 2025 (repealed Regulation 307/2008)

[Decreto-Lei n. ° 122/2024](#), 31-12-2024

5 PORTUGAL - Learning Pathway for Electric and Hybrid Vehicle Technologies



5.1 General information

Title of the case study: Learning Pathway for Electric and Hybrid Vehicle Technologies

Country / Region: Portugal

Organisation(s) involved: ATEC

Sector(s): Repair & Maintenance

Implementation phase (initiation, planning, delivery, evaluation): Delivery

Contact person (name, role, email): João Alves, Cooperation Projects and Certifications Coordinator, joao.alves@atec.pt

5.2 Context and objectives

5.2.1 Background of the initiative

The rapid growth of electric and hybrid vehicles (EV/HV) in Portugal and across Europe is reshaping the skills requirements of the automotive workforce. The increasing presence of high-voltage systems, advanced power electronics, and complex battery technologies demands specialised training to ensure that professionals can intervene safely, effectively, and in accordance with technical and safety standards. While Portugal does not yet have a formal national micro-credential framework, a growing number of short, modular, and competence-based training courses fulfil similar functions by addressing specific skills needs and supporting continuous professional development.

The EV/HV training offer delivered by ATEC represents a structured response to these emerging demands. Structured and delivered by trainers certified in accordance with DGUV 209-093, an internationally recognised standard for high-voltage safety, these courses ensure that learning is aligned with best practices in safety and technical intervention. This case study analyses the design, implementation, and progression logic of ATEC's EV/HV training pathway, highlighting how it operates as a micro-credential-type learning ecosystem within the Portuguese vocational training landscape.

5.2.2 Target group(s)

The EV/HV learning pathway is primarily targeted at practising automotive professionals who are currently active in vehicle maintenance, repair, and diagnostics, or who are preparing to work with electric and hybrid vehicles as part of their professional duties. The target groups include:

- **Automotive technicians and mechanics working in authorised dealerships, independent workshops, and fleet maintenance services who require updated competencies to handle electric and hybrid vehicle systems safely.**
- **Workshop staff and technical personnel responsible for diagnostics, maintenance, and repair activities involving high-voltage components.**
- **Professionals seeking to upskill or reskill in response to the increasing penetration of electric and hybrid vehicles in the national vehicle fleet.**

- **Companies and employers in the automotive sector aiming to ensure their technicians are adequately trained to manage safety risks and technical complexity associated with EV/HV technologies.**

The training is not legally mandatory for the exercise of the occupation in Portugal; however, participation is strongly driven by employer demand and sectoral needs, particularly in relation to workplace safety and technological adaptation.

5.2.3 Primary objectives

ATEC's EV/HV training provision consists of **four complementary courses**, designed to address different levels of knowledge, responsibility, and professional need. Together, they form a coherent and progressive pathway that supports both initial familiarisation and more specialised technical competence.

5.3 Stakeholder roles and collaboration

The Learning Pathway for Electric and Hybrid Vehicle Technologies is primarily designed, delivered, and coordinated by ATEC, which acts as the central stakeholder responsible for curriculum development, training delivery, quality assurance, and certification. ATEC ensures that the training content responds directly to the evolving technical and safety requirements associated with electric and hybrid vehicle technologies.

While there is no specific legal or regulatory framework in Portugal mandating training for technicians working on electric and hybrid vehicles, the pathway is strongly aligned with recognised international safety standards, notably DGUV 209-093, which defines best practices for safe intervention in high-voltage vehicle systems. Trainers involved in the delivery of the courses hold certification under this standard, ensuring that the training reflects established safety principles and technical rigour.

Collaboration with the automotive sector plays an important role in shaping the initiative. Employers and workshops contribute indirectly by identifying skills gaps, safety concerns, and emerging competence needs linked to the increasing presence of EV/HV vehicles in the national fleet. This employer-driven demand informs course design and progression logic, even in the absence of formal regulatory requirements.

Quality assurance is further supported through compliance with national training system requirements, including DGERT certification of the training provider and registration of training outcomes in the national information systems. Together, these stakeholder roles and collaborative mechanisms ensure that the learning pathway remains credible, relevant, and responsive to both technological change and labour market needs.

5.4 Micro-credential design and implementation

Credential Title: Learning Pathway for Electric and Hybrid Vehicle Technologies.

Type of credential: Each course of the Learning Path leads to a Certificado de Formação Profissional (Vocational Training Certificate)

Mode of delivery: hybrid (online and in person).

Workload / Duration: Total of 30 hours of training:

1. **Course 1 - Introdução aos Veículos Elétricos e Híbridos – Introduction to Electric and Hybrid Vehicles (2h – Flash Training, 100% online)**
2. **Course 2 - Veículos Elétricos e Híbridos – Electric and Hybrid Vehicles (7h)**
3. **Course 3 - Condições para uma Intervenção Segura em Veículos Elétricos e Híbridos – Conditions for Safe Intervention in Electric and Hybrid Vehicles (14h)**
4. **Course 4 -Diagnóstico e Manutenção em Veículos Elétricos e Híbridos - Diagnosis and Maintenance of Electric and Hybrid Vehicles - (7h)**

Learning outcomes:

Across the four courses, participants progressively develop the ability to:

- **Identify electrical and high-voltage risks in EV/HV systems**
- **Apply appropriate safety procedures and manufacturer protocols**
- **Interpret electrical schematics and identify system components**
- **Understand EV/HV propulsion architectures and operating modes**
- **Diagnose faults using appropriate measurement and diagnostic tools**
- **Perform safe maintenance and repair interventions**

The depth and complexity of outcomes increase progressively across the pathway.

Assessment methods:

Assessment is course-specific and may include:

- **Observation of practical activities**
- **Evaluation of safety procedures**
- **Interpretation of schematics and diagnostic data**

Quality assurance system:

Training providers must comply with:

- **Possess DGERT certification in education and training areas 522 or 525**
- **DGUV 209-093 certification of trainers**

Prerequisites:

Prerequisites are defined for each course on the learning path:

- **Course 1 – Introduction to Electric and Hybrid Vehicles: none**
- **Course 2 – Electric and Hybrid Vehicles: none**
- **Course 3 - Conditions for Safe Intervention in Electric and Hybrid Vehicles: recommended basic electrical knowledge**
- **Course 4 - Diagnosis and Maintenance of Electric and Hybrid Vehicles: completion of the safe intervention course**

Integration / Stackability

Although not formally designated as micro-credentials, the courses form a clearly stackable progression:

- **Course 1 – Introduction to Electric and Hybrid Vehicles**
- **Course 2 – Electric and Hybrid Vehicles**
- **Course 3 - Conditions for Safe Intervention in Electric and Hybrid Vehicles**
- **Course 4 - Diagnosis and Maintenance of Electric and Hybrid Vehicles**

This structure supports flexible entry points and gradual skills development aligned with professional roles.

Type of recognition:

The courses that make up the Learning Pathway for Electric and Hybrid Vehicle Technologies lead to the award of a Certificado de Formação Profissional (Vocational Training Certificate) issued by ATEC and registered in the national training information system (SIGO).

This recognition is classified as non-formal vocational training, supporting continuous professional development rather than conferring a statutory licence or regulated professional title. Despite the absence of a legal requirement to hold this certification, the training is widely valued by employers due to its practical relevance and its strong emphasis on safety and technical competence.

The credibility of the training is further reinforced by the fact that instruction is delivered by trainers certified in accordance with DGUV 209-093, a recognised international reference for safe intervention in high-voltage vehicle systems. As such, the certificates function as trusted evidence of competence within the automotive labour market.

5.5 Digital infrastructure and tools

Platform used:

Common digital elements include:

- **LMS platforms (e.g. Moodle) and Collaboration platforms (e.g. MS Teams), in the delivery phase, to ensure proper availability of learning material and video meetings in hybrid delivery training, which includes Digital technical documentation and schematics and Diagnostic interfaces connected to vehicle systems.**

- **SIGO, the national Integrated Information and Management System for Education and Training Provision, in which all certified training providers register delivered training and issue the certificates to the participants.**
- Passaporte Qualifica is the national Technological tool for recording the qualifications and skills acquired or developed throughout an adult's life.

5.6 Alignment with national/EU systems

Although there is currently no formal legal or regulatory requirement in Portugal mandating specific training for technicians working on electric and hybrid vehicles, the ATEC learning pathway demonstrates a clear alignment with broader national and European policy objectives.

At national level, the training contributes to lifelong learning and workforce upskilling priorities, supporting the adaptation of vocational competences to technological change in the automotive sector. It complements existing vocational education and training structures by addressing emerging skills needs that are not yet formalised in occupational regulations.

While the training does not carry formal EQF or credit allocation, its content reflects competence areas that are increasingly relevant across European labour markets, thereby supporting skills relevance and professional mobility.

5.7 Outcomes and impact

Despite the absence of a regulated occupational requirement for EV/HV training in Portugal, the ATEC learning pathway has generated clear and tangible outcomes at both individual and organisational levels.

Automotive companies have increasingly recognised the need to prepare their technical staff for the safe handling of electric and hybrid vehicles, particularly due to the risks associated with high-voltage systems. As a result, employers actively seek this type of training to ensure compliance with internal safety policies and to maintain service quality as vehicle technologies evolve.

For participants, the training contributes to improved technical confidence, enhanced awareness of safety procedures, and strengthened professional credibility. The involvement of trainers certified under DGUV standards provides additional assurance regarding the quality and reliability of the learning experience.

Overall, the initiative supports safer working environments, addresses sector-identified skills gaps, and reinforces the employability of technicians in a rapidly transforming automotive labour market.

5.8 Sustainability and scalability

Funding sources

This certification operates within a funding model closely linked to market needs, rather than time-bound project funding or external financial incentives.

- **The initiative is primarily funded through participant or employer fees.**

- **Delivery is embedded in the regular activity of the training provider, using existing infrastructures and resources.**
- **The absence of reliance on short-term public or project-based funding has contributed to its long-term continuity and predictability.**
- **Market needs, rather than funding conditions, have been the main influence on course design and delivery.**

Plans for continuation or scaling

The Learning Pathway for Electric and Hybrid Vehicle Technologies is designed to be sustainable and adaptable over time, responding directly to market demand rather than temporary funding mechanisms.

Plans for continuation and potential scaling include:

- **Ongoing updating of course content to reflect technological developments in electric and hybrid vehicle systems, batteries, and diagnostics.**
- **Strengthening collaboration with automotive companies, dealer networks, and equipment suppliers to ensure continued relevance and alignment with industry needs.**
- **Exploration of future alignment with national or European competence recognition frameworks, should such mechanisms be developed.**

These measures support both the long-term viability of the initiative and its capacity to scale in line with the continued growth of electric mobility.

5.9 Strengths, challenges, and recommendations

The following chapter provides a reflective assessment of the Learning Pathway for Electric and Hybrid Vehicle Technologies, examining the key factors that have supported its effectiveness, the main challenges encountered during its implementation, and the lessons that can be drawn for future development. This analysis highlights how the initiative responds to evolving skills needs in the automotive sector and identifies considerations relevant for strengthening similar training provision in contexts characterised by rapid technological change.

Key success factors

The Learning Pathway for Electric and Hybrid Vehicle Technologies illustrates how Portugal's vocational training ecosystem already delivers short, modular, and labour-market-oriented learning that closely resembles micro-credential-type provision, even in the absence of a formally defined national framework. Several factors have been central to the success and relevance of this initiative.

A key strength lies in the clear definition of learning outcomes and short, focused course duration, which allow the training to respond efficiently to specific and emerging skills needs in the automotive sector. The pathway's modular and stackable structure enables technicians to progress gradually, deepening their expertise as professional responsibilities evolve, while maintaining flexibility for both learners and employers.

Strong employer relevance has been another decisive success factor. Automotive companies increasingly recognise the risks associated with high-voltage systems and proactively seek training solutions that ensure

workplace safety and service quality. The delivery of training by DGUV 209-093 certified instructors further reinforces trust in the initiative, positioning the certificates as credible evidence of competence despite the absence of legal obligation.

Finally, the integration of the pathway into ATEC's regular training provision, rather than reliance on temporary project funding, has ensured continuity, sustainability, and responsiveness to technological change.

Main challenges faced

The implementation of the EV/HV training pathway has also revealed a number of structural and contextual challenges. The most significant is the absence of statutory regulation or mandatory certification for technicians working on electric and hybrid vehicles in Portugal. While this offers flexibility, it also limits formal recognition beyond employer-driven contexts and reduces incentives for universal uptake.

A second challenge is the rapid pace of technological development in electric vehicle systems, batteries, and diagnostics. This requires continuous updating of curricula, equipment, and trainer competences to ensure that training content remains current and aligned with industry practice.

Additionally, uneven awareness across the sector, particularly among smaller and independent workshops, can hinder broader participation. In some cases, EV/HV training is still perceived as optional rather than as a preventive investment in safety and future readiness.

Recommendations for replication or policy action

Based on the experience of this learning pathway, several recommendations can be identified for supporting similar initiatives and for strengthening skills development in emerging technological domains.

Greater institutional recognition of modular, competence-based training would enhance the visibility and value of initiatives such as this pathway, particularly in sectors undergoing rapid technological transformation. Explicit referencing to national or European competence frameworks, where appropriate, could further reinforce transparency and portability of learning outcomes.

Support for structured collaboration between training providers and automotive industry stakeholders would help ensure that curricula remain up to date and closely aligned with real workplace needs, especially in relation to safety-critical competences.

Finally, policies that encourage lifelong learning and continuous upskilling, even in the absence of regulatory obligation, would strengthen workforce preparedness and contribute to safer and more resilient service provision as electric and hybrid vehicle technologies continue to expand.

5.10 Supporting materials (Optional attachments)

<https://www.atec.pt/cursos-empresas-particulares/mecatronica-automovel/veiculos-eletricos-e-hibridos/>

DGUV 209-093

6 SPAIN - Electromobility Microcredentials (FPCAT-UPC). Catalonia



6.1 General information

Country / Region:	SPAIN/CATALONIA
Organisation(s) Involved:	Campus de la Movilidad Sostenible FPCAT-UPC
Sector(s):	Automotive sector, Vocational Education & Training
Implementation:	Delivery
Contact Person:	Tamara Rodríguez Fontao. Communications Officer. marketing.cms@cms.upc.edu
Interview:	27/10/2025. 10AM-11AM
Interviewees:	David Díez Gallegos. Executive Director. Tamara Rodríguez Fontao. Communications and Marketing Officer.

6.2 FPCAT-UPC , a pioneering training hub on sustainable mobility

In 2022, the Generalitat de Catalunya and the Universitat Politècnica de Catalunya (UPC) formalised an agreement to transform the Centre de Formació Professional d'Automoció (CFPA) [Automotive Industry VET Provider] into a pioneering training hub — the Campus FPCAT-UPC de la Mobilitat Sostenible [FPCAT-UPC Sustainable Mobility Campus] in Martorell. This initiative marked the beginning of a new model that integrates vocational, occupational, and continuing education within a university context. The Campus was conceived as a space that bridges the gap between advanced education and industry, fostering a continuous learning ecosystem aligned with the evolving needs of the automotive and sustainable mobility sectors.

The Campus operates as a collaborative initiative led by the UPC in partnership with the regional government [Generalitat de Catalunya], the regional Public Employment Service [Servei Públic d'Ocupació de Catalunya], the Consorci per a la Formació Contínua de Catalunya, and the Martorell City Council. Managed by UPC Formació i Mobilitat S.A., the UPC's dedicated entity for lifelong learning, the Campus was granted operational responsibility for a 15-year period, renewable for an additional decade. It delivers a wide range of training programmes — from occupational training for job seekers and continuous professional development for employees, to specialised certifications in emerging fields such as electric battery maintenance. The objective is to strengthen professional qualifications and promote employability through practical, high-value training opportunities.

As a centre for innovation and skills development, the Campus focuses on driving the transformation of the mobility industry, with training organised around key areas such as manufacturing and materials, industrial management, automotive mechanics, sustainability, electrification, autonomous and connected vehicles, and mobility innovation. Its educational offer includes intermediate and higher VET programmes, specialisation courses, employment training, and lifelong learning programmes (masters and postgraduate degrees).

Most recently, the Campus has introduced microcredentials as a nascent but promising addition to its portfolio — a valuable complement to the existing training offer. As of today, the Campus is providing masters and postgraduates in the field of automotive industry and, therefore, considering the new microcredentials scheme coming for this University training activities, Campus developed both together: University and VET microcredentials to have a complete offer. These short, flexible learning formats enable professionals and companies to acquire targeted, up-to-date competencies aligned with rapid technological change. By offering adaptable, modular pathways, microcredentials enhance the Campus's capacity to respond quickly to industry needs and support continuous, career-long learning in the evolving mobility sector.

6.3 Designing a budding portfolio of microcredentials

At present, the UPC-FPCAT website¹ lists three microcredentials in electromobility as part of its Vocational Training for Employment offer, all of which align with the Council Recommendation of 16 June 2022 on a European approach to micro-credentials for lifelong learning and employability.

The denomination of the three microcredentials — Basic Concepts on Electromobility, Advanced Concepts on Electromobility, and Electromobility: Technology and Future Trends — hints at a structured and progressive learning pathway that enables participants to build specialised competencies in a rapidly evolving field. The first two modules, launched in 2024–2025, each require approximately 24 hours of study and award 3 ECTS credits,

¹ https://cms.upc.edu/esp/estudis/formacio/?microcredencial_select=1

providing a concise yet focused introduction to core and advanced topics. The third, introduced in 2025–2026, extends to 48 hours and 6 ECTS credits, offering a more comprehensive exploration of emerging technologies and future developments in electromobility.

Table 1. Microcredentials

Name	Since	Duration	Credits
Basic concepts on Electromobility	2024-2025	24 hrs	3ECTS
Advanced concepts on Electromobility	2024-2025	24 hrs	3ECTS
Electromobility: Technology and future trends	2025-2026	48 hrs	6ECTS

6.3.1 Training needs identification

The electromobility microcredentials were developed in response to the growing demand for specialised professionals in the sector, targeting a wide range of automotive workers such as mechanics, sales advisors, and mobility consultants. Designed as a flexible complement to the Campus's broader training offer, these programmes address the skills needs identified by key industry and professional organisations at European, national, and regional levels. For example, the Campus started to discuss about new training activities and trending topics within this area which can be required to new professionals by companies with the aim to set up new skilling, reskilling and upskilling procedures with associations within the automotive industry such as the Fédération Internationale des Sociétés d'Ingénieurs des Techniques de l'Automobile (FISITA) and its Spanish member, the Sociedad de Técnicos de Automoción (STA), a non-profit organisation founded in 1947 that promotes technological progress in the automotive and mobility industries in Spain.

6.3.2 Learning outcomes and contents

The learning outcomes show a gradual deepening of competencies—from developing basic advisory and post-sales skills to handling advanced technical tasks and managing specialised workshops. The first microcredential, Basic Concepts on Electromobility, focuses on foundational understanding and customer advisory skills. The second, Advanced Concepts on Electromobility, expands on these competencies by incorporating technical mastery of electric vehicle systems, data interpretation, and full post-sales processes. The final course, Electromobility: Technology and Future Trends, takes a broader and forward-looking perspective, integrating knowledge of industrial vehicles, connected and autonomous systems, and emerging business models.

Table 2. Learning outcomes

Basic Concepts on Electromobility	Advanced Concepts on Electromobility	Electromobility: Technology and Future Trends
<ul style="list-style-type: none"> Develop the skills necessary to advise individuals. Perform after-sales tasks. Manage workshops specialising in electric vehicles. 	<ul style="list-style-type: none"> Develop the skills necessary to advise individuals, companies and fleets. Perform comprehensive after-sales tasks, including knowledge of systems and components. Ability to collect and interpret data and information related to electromobility. Manage workshops specialising in electric vehicles. 	<ul style="list-style-type: none"> Develop the skills necessary to advise individuals. Manage workshops specialising in electric vehicles Capacity to select electrified vehicles depending on the needs of individuals and companies Understand new trends in the electromobility industry such as AI and business models. Perform vehicle assessments from light vehicles to commercial vehicles, understanding specific application of general technologies.

The content structure reinforces this progressive pathway. The introductory course covers essential principles such as market overview, regulatory frameworks, and key components of hybrid and electric vehicles. The advanced

module then delves deeper into the technologies underpinning electromobility—electric motors, batteries, power electronics, and energy management—while introducing practical diagnostic and maintenance tasks. The final module expands the focus to future developments, including light and industrial electric vehicles, artificial intelligence applications, and the convergence of electrification, autonomy, and connectivity.

Table3. Contents

Basic Concepts on Electromobility	Advanced Concepts on Electromobility	Electromobility: Technology and Future Trends
Introduction to electromobility Market analysis, current and future trends Regulatory framework for electric vehicles Hybrid and electric vehicle technologies (I) Hybrid and electric vehicle components (I) Recharging systems	Hybrid and electric vehicle technologies (II) Electric motors Batteries Power electronics Energy management Testing, diagnostics and maintenance	Light mobility vehicles Industrial vehicles Intersection of electrified vehicles, autonomous vehicles and connected vehicles New related business models AI applied to electromobility Four practical sessions at the FPCAT-UPC Cam

Together, these courses illustrate a stackable learning design, where each microcredential builds on the previous one to form an integrated pathway. In any case, learners can enter at different points depending on prior experience, while those completing all three achieve a comprehensive and future-oriented understanding of electromobility. This structure supports flexible lifelong learning, allowing professionals to upskill progressively in line with technological and industry evolution.

6.4 A collaborative effort

The design and implementation of these microcredentials result from collaboration with a wide range of local, regional and national authorities including the Sant Boi de Llobregat City Council, the Barcelona Provincial Council, the Catalanian Public Employment Service (SOC), the Government of Catalonia, the Spanish Ministry of Education, Vocational Training and Sports, and CitiMOB (Sant Boi Motor for Sustainable Mobility).

Among these, the active involvement of the local authority—the Sant Boi City Council—stands out in two key areas. First, the council visits local VET providers to promote the microcredential programs among Intermediate VET students in the Transport and Vehicle Maintenance professional family. Second, it allocates specific funding, through the Next Generation EU funds, to fully cover the cost of participation in the program (approximately €250–€300/participant) for these students.

6.4.1 Participant Profile

The microcredentials cater for the needs of a broad spectrum of professionals and technicians in the automotive sector, including mechanics, sales advisors, and mobility consultants. In the first edition (academic year 2024–2025), two microcredentials were offered—Basic Concepts of Electric Mobility (3 ECTS) and Advanced Concepts of Electric Mobility (3 ECTS)—each enrolling 12 participants. The typical participants are technicians and professionals aged between 20 and 40, with a minimum of two years' experience in the sector. The admissions process includes individual interviews, which are a critical step for assessing candidates' prior knowledge and experience, ensuring alignment with the program's learning objectives.

6.4.2 Trainer profile

Having extensive experience in the automotive sector is an essential requirement for joining the teaching team, which is deliberately structured to combine both engineering/academic expertise and technical/vocational skills.

David Gallegos Díez, who holds a PhD in Mechanical Engineering from the Universitat Politècnica de Catalunya (UPC) and serves as Executive and Academic Director of the FPCAT-UPC Sustainable Mobility Campus, contributes over 20 years of experience in multinational automotive companies, bringing a strong academic and engineering perspective to the program. Complementing this, Felipe Archilla Fernández, a Senior Automotive Technician and professor specializing in Vehicle Maintenance, offers deep technical and vocational expertise. His practical background in training on emerging automotive technologies—particularly Hybrid and Electric Vehicle Maintenance—ensures that the program remains closely aligned with industry needs. Together, their profiles reflect a deliberate balance between theoretical knowledge and hands-on experience, providing learners with a comprehensive and industry-relevant education. Training staff stay abreast of tech and regulatory developments by engaging in RDI projects.

6.5 Teaching, learning and assessment

The delivery format of all microcredentials is in-person, taking place over one or two weeks in the afternoon. The presence-based structure is pivotal in balancing theoretical content with hands-on learning. The instructional methodology integrates lectures, case studies, and practical workshop sessions, providing a comprehensive approach to learning. All course materials, including presentations and documentation, are made available in advance via the My_Tech_Space virtual campus, which also facilitates communication between students, instructors, and program administrators. Additionally, the Campus manages job offers related to microcredentials.

Assessment for the microcredentials is based on a written multiple-choice exam. Survey data from the first edition indicate that students generally found the training beneficial. However, there was a consensus that more emphasis should be placed on practical learning—an adjustment currently under consideration for future iterations of the program. The program director noted that while a purely practical focus is not always feasible or desirable, particularly in cross-disciplinary programs like these, it is essential to first cover some foundational theoretical knowledge before progressing to hands-on application in the workshop.

While specific impact metrics on labor market outcomes have yet to be developed, there is anecdotal evidence of positive effects. For example, one student from a VET Intermediate level program reported that the microcredentials were a distinguishing factor in securing a position in the after-sales division at Volkswagen.

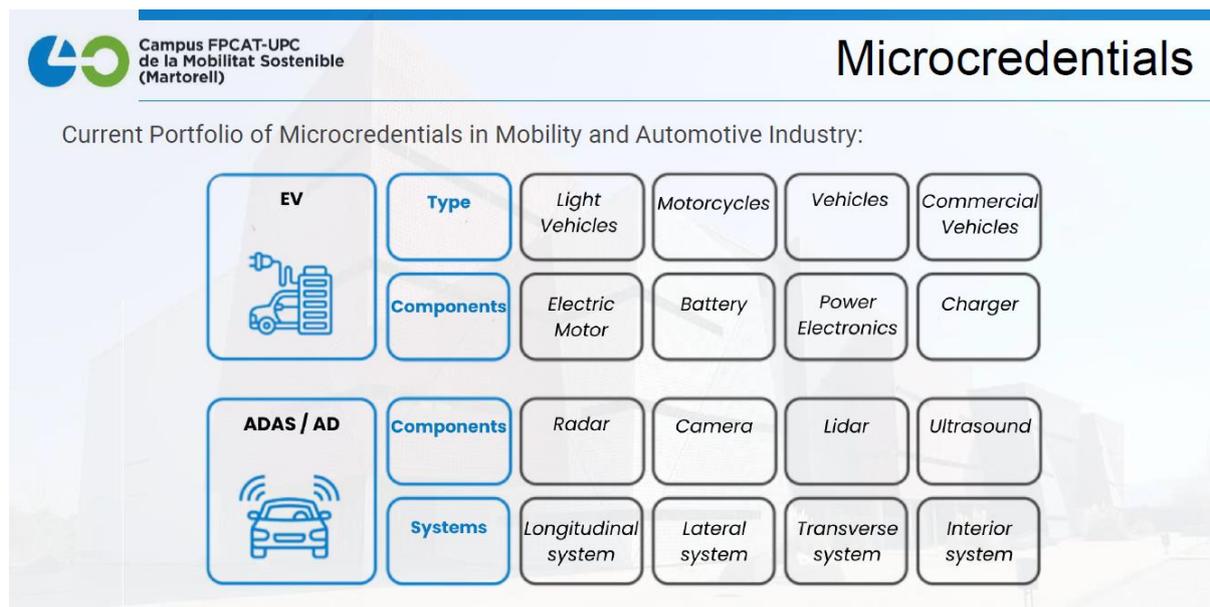
6.6 Digital Certification based on Europass

Upon successful completion of the program and the final assessment, participants receive a portable digital certificate based on the Europass framework. This process is triggered once the final evaluation report is submitted by the teaching team to the UPC Foundation, the issuing organization. The learning programme includes an informational session explaining the Europass accreditation process. The director highlighted that while the Europass certification procedure is already complex, the option to introduce the microcredentials within the Microcred funding program of the Ministry of Education, Vocational Training and Sports is quite challenging due to the frequent updates of procedures and new criteria introduced in the evaluation of applications.

Digital credentials are generated automatically once the program concludes, for all students who meet the criteria. Students are notified via email once their certificates are available on the Europass platform, ensuring transparency and accessibility.

6.7 Quality Assurance and future developments

The evaluation process consists of an initial review by an ad hoc committee, which drafts an evaluation report to be submitted to the specific evaluation commission within the Institutional and Program Evaluation Commission. This commission issues a preliminary evaluation report, to which the university may submit comments or appeals. Following a review of these comments, the commission issues a final report, which can either be favorable or unfavorable. The program director considers this process to be sufficiently streamlined and not an impediment to the timely implementation of the microcredential offerings.



Campus UPC-FPCAT has developed a comprehensive roadmap for 20 additional microcredentials, focused on emerging areas such as electric vehicles, autonomous vehicles, and connected vehicles. These programs are designed not by fragmenting formal courses but by responding directly to the evolving needs of the automotive industry. The full portfolio of microcredentials will be released after the completion of the initial validation process adjusting microcredentials and developing learning pathways based on emerging demand and industry trends. The application of new microcredentials is approved internally at the University following the same process than other continuous training activities and validated in the Europass platform. Therefore, the quality assurance is guaranteed by the own University procedures.

7 SPAIN - Catálogo de Especialidades Formativas (Spain)

“Most organisations involved in the Vocational Training System for employment in the workplace believe that the Catalogue of Training Specialities can be used as a reference for implementing the European approach to micro-credentials.” (PAE Executive Summary, 2023)



7.1 General aspects

The Catalogue of Training Specialisations [Catálogo de Especialidades Formativas] is a key tool within the Vocational Training System for Employment in the workplace to respond swiftly to the training demands of emerging sectors and occupations in Spain. This instrument is managed by the Spanish Public Employment Service [Servicio Público de Empleo] and serves as a transparent and accessible tool for disseminating information on Spain's integrated vocational training system.

The structure and content of the Catalogue of Training Specialities is regulated by law². The Catalogue contains a wide offer of short-courses and training itineraries in 26 vocational sectors and 5 qualification levels with three modes of delivery: face-to-face, distance learning and blended learning.

Table1. Key concepts

Training specialisation	Training itinerary
A training specialisation is a bundle of professional skills, content, and technical specifications that responds to a set of work activities framed within a phase of the production process and with related functions or the acquisition of transversal skills necessary for adequate performance in the professional environment and context.	An itinerary is a learning process constructed by grouping together training specialisations and/or training modules that form part of the Catalogue. They can combine specialisations or modules that belong to the same or different Vocational sectors and levels of qualification.

Source: FUNDAE

The Catalogue applies nationwide and organizes all training offered within the framework of the National Employment System, covering both formal and non-formal programs. Formal training refers to specialisations aimed at obtaining professional certificates [Certificados de Profesionalidad] linked to the National Qualifications Framework [Catálogo Nacional de Estándares de Competencias Profesionales (CNECP)], while the remaining specialties constitute non-formal training. This case study puts the focus on the non-formal training programmes on the Electric/Connected Vehicle.

In 2020, a redistribution of responsibilities in the area of Vocational Training for Employment was introduced. Under this framework, the Ministry of Labour and Social Economy retains competence, among others, over company-led training aimed at improving workers' skills, as well as training programmes for employed workers included in the Catalogue of Training Specialities of the State Public Employment Service (SEPE) whereas professional certificates fall under the remit of the Ministry of Education and Vocational Training³.

The Catalogue provides a common reference for training institutions designing and planning vocational training initiatives for both employed and unemployed individuals, excluding company-specific in-house training programs.

The main objectives of the Catalogue are

- to ensure that training offerings are aligned with the needs of the labor market
- to support the monitoring and continuous improvement of training quality, and

² Orden TMS/283/2019, de 12 de marzo, por la que se regula el Catálogo de Especialidades Formativas

³ Royal Decree 499/2020 on the basic organisational structure of the Ministry of Labour and Social Economy and Royal Decree 498/2020 on the basic organisational structure of the Ministry of Education and Vocational Training.

- to serve as a tool for Public Employment Services in providing career guidance and designing personalized employment pathways.

The State Public Employment Service, in coordination with the Autonomous Communities, is responsible for the ongoing development of the Catalogue. This process is informed by continuous monitoring and identification of training needs through the Occupations Observatory [Observatorio de las Ocupaciones], in collaboration with social partners, other ministerial departments, and relevant experts in each field.

The training courses linked to the catalogue are completely free of charge for both employed and unemployed people. Users can search for specialties, pathways and training providers using the online search tools^{4 5} provided by the State Public Employment Service.

Fig 1. Screenshot of the Training Specialisations Search Tool

Each training offer included in the Catalogue identifies a set of competencies, technical content, and work-related activities, along with the transversal skills needed for effective professional performance. Training programmes can be easily downloaded and adhere to the same structure that includes a precise description of the level of qualification, trainer and trainee requirements, learning goals, modules and contents, duration, space and equipment requirements and related occupations (8-digit national occupation classification [CNO-11])

Updates to the Catalogue follow a structured approach. All training programmes undergo a periodic review at least every five years. This systematic updating process ensures that the Catalogue remains aligned with the dynamic demands of the labor market and the productive system. For all the above, the Catalogue is seen as an "ideal instrument to host and identify micro-credentials" (González-Palazuela, 2023)⁶.

⁴ https://sede.sepe.gob.es/FOET_CATALOGO_EEFF_SEDE/flows/buscarEspecialidadesNA?execution=e1s1

⁵ https://sede.sepe.gob.es/FOET_BuscadorDeCentros_SEDE/flows/buscadorReef?execution=e1s2

⁶ <https://www.sepe.es/HomeSepe/es/que-es-observatorio/Hipatia/cuadernos-mercado-trabajo/revista-cuadernos-mercado-trabajo/detalle-articulo.html?detail=/revista/Cuarta-revoluci-n-industrial-y-su-impacto-en-el-mercado-laboral-y-la-formaci-n/microcredencialesunenfoqueuropeoparaelaprendizajepermanenteylaempleabilidad>

7.2 Training providers

Public or private training providers intending to deliver courses listed in the Catalogue must be registered in the National Registry of Training Providers [Registro Estatal de Entidades de Formación]. Training providers should demonstrate compliance with the requirements outlined in each training programme included in the Catalogue they intend to deliver. The deadline for resolving the accreditation procedure is six months and is the responsibility of regional Public Employment Services. This registration ensures public access to information regarding the courses they offer, the quality assurance procedures they implement, and the documentation required to monitor their training activities.

Training providers submit their applications in response to the annual call for grants issued by the regional Public Employment Services, which also define the priority training specialities. The model for prioritizing training specialities is based on both quantitative and qualitative sources, including employers' surveys, interviews, and participatory workshops with experts aimed at identifying training needs. It should be noted that this model may vary depending on the region. For instance, the regional Public Employment Service in Asturias commissions four reports every year to identify skill gaps and shortages in specific sectors..

Based on this list and their own capacities—such as available human resources and training equipment—training providers apply for funding. The amount of the grant is determined according to the maximum number of participants per course established by the State Public Employment Service.

Data on participation, completion and labour market integration 6 and 12 months after graduation are collected by the regional public employment services and sent to the SEPE via the Public Employment Services Information System (SISPE), a digital platform that links the State Public Employment Service (SEPE) with the regional employment services in Spain.. Employment data do not indicate transition to labour market relevant to the training undertaken.

7.3 Micro-credential-like offers on electric and connected vehicles included in the Catalogue

The catalogue search tool has been used to identify trainings related to the green and digital transition within the vehicle maintenance and repair sector, focusing on two vocational sectors: Transport and Vehicle Maintenance and Information and Communications Technology.

The search results indicate that since 2018, the Catalogue has added 26 courses related to electric and/or connected vehicles. (see Annex 1 for a full list). Most of them are related to the Electric/Hybrid Vehicle (84.6%), with a smaller proportion linked to the Connected Vehicle (15.4%). Most correspond to qualification level 2 (65.4%), although examples are found across all levels from 1 to 5. Over half of these specialisation (56.7%) have been published in the last two years. The predominant mode of delivery is face-to-face (84.6%), with the remainder offered in hybrid formats. The duration of these courses ranges from 8 to 575 hours (Avg = 99, Mdn = 40), with 50% falling between 25.5 and 90 hours.

This variability is also reflected in the number of accredited training providers offering these specialities. Each training specialisation in relation to Electric/Connected Vehicle has an average of 24 approved entities to provide that training (Min=0, Max=106). In any case, the majority (53.8%) are offered by 10 or fewer entities throughout the country. As can be seen in the Table, the number of training entities decreases depending on the year of publication

of the training speciality. This reflects the maturity and recency of each specialty in the catalogue: the newer the course, the fewer accredited entities have completed the registration process.

Table 2. EV/HV/CV Training specialisations and accredited training providers (2018-2025)

Release year	2018	2020	2021	2022	2023	2024	2025
Trainings (n)	1	2	6	1	6	8	1
Training providers (Avg)	102	82,5	23,8	83	4,8	4	0

It is important to understand the inclusion of a qualification in the catalogue does not guarantee its uniform or immediate availability across all regions. Moreover, a limited number of training providers deliver a significant proportion of the available courses, underscoring the importance of engaging these providers to gather insights on micro-credentials and their potential to complement and enhance existing programmes.

In the case of Navarre, only 5 of these 26 training specialities (19.2%) are offered by two training providers, the Navarre Association of Vehicle Repair Workshops (ANTRV) and Alma Formación. The Navarre Association of Vehicle Repair Workshops (ANTRV) has set up a training programme entitled 'Electromechanical Vehicle Maintenance' (271 hours) which includes two training specialities related to hybrid vehicles (TMVG0004 Hybrid Vehicle Maintenance) and connected vehicles (TMVG08 Advanced Driver Assistance Systems (ADAS) alongside other specialities in the catalogue, demonstrating the potential of this tool for stackability.

Training itinerary Electromechanical vehicle maintenance (271 hours) (ANTRV)
TMVG13 Engine fault diagnosis 60 hours TMVG005PO Car safety devices 16 hours TMVG0004 Hybrid vehicle maintenance 40 hours TMVG08 Advanced driver assistance systems (ADAS) 70 hours Digital transformation, sustainable development and gender mainstreaming 10 hours MOD07080 Maintenance of engines and auxiliary engine systems (60 hours). (Speciality: TMVG0021) MOD06708 Tools for use and handling (15 hours). (Speciality TMVG0008 Fault diagnosis using an oscilloscope and diagnostic machine. Advanced level) 15 hours.

In some cases, different levels are defined within training specialities that share a common title. As illustrated in the example, the objectives and learning outcomes demonstrate increasing levels of complexity and progression.

Table 3. Goals and Learning Outcomes ELECTRIC VEHICLE TECHNOLOGY. Levels 1, 2 and 3. (Released: April 2023)

Level	1	2	3
Code	TMVG0011	TMVG0012	TMG0013
Hours	16 h.	16 h.	24 h.
Goal	Analyse the electrification of a vehicle, differentiating between electrical and electronic components and interpreting the information included in technical, environmental and occupational risk prevention manuals.	Select the verification processes in electric vehicle systems, interpreting the information included in technical manuals and applying procedures in accordance with occupational risk prevention and environmental regulations.	Apply techniques for dismantling and assembling energy storage systems, following safety protocols to comply with established regulations for the verification, repair or replacement of these systems
LOs	<ul style="list-style-type: none"> •Distinction between the traction components of electric vehicles •Explanation of the power electronics and control systems of electric vehicles •Comparison of traction motors with electric vehicles 	<ul style="list-style-type: none"> •Demonstration of compliance with disconnection protocols prior to handling and checking electric vehicles •Application of established working procedures in electric vehicles to locate and determine the causes of faults •Identification and analysis of data from energy management, charging and storage systems 	<ul style="list-style-type: none"> •Application of established working procedures in electric vehicles to locate and determine the causes of faults. •Safe handling and removal of an electric vehicle battery •Planning the procedure for rebuilding the battery and accumulator assembly of the electric vehicle

In a conversation with one of the trainers at ASPA, the sectoral organisation of car repair and maintenance workshop in Asturias, noted that, despite the large number of training specialisations on HV/EV, some differ only in minor details. In other words, there is considerable overlap in contents, and it is believed that there is scope to reduce the number of specialities and to better emphasise the complementarity between them.

By way of example, in 2024, five training programmes on the handling of electric vehicle batteries and the prevention of electrical risks were added to the Catalogue.

Table 4. EV batteries and prevention of electrical risks training specialisations

Level of qualification	Code	Denomination	Year	Hours	Forma t	Accredited Training Providers
2	<u>TMVG0040</u>	Handling of Hybrid or Electric Vehicle Batteries (*)	2024	40	Hybrid	8
2	<u>TMVG0041</u>	Electrical Risk Prevention in the Handling of High-Voltage Vehicles. Level I	2024	60	Hybrid	7

2	<u>TMVG0042</u>	Electrical Risk Prevention in the Handling of High-Voltage Vehicles. Level II	2024	60	Hybrid	7
2	<u>TMVG0044</u>	Batteries and Storage	2024	35	In-person	0
2	<u>TMVG0056</u>	Assembly, Diagnosis and Repair of Lithium-Ion Batteries	2024	575	In-person	1

(*) In the context of vehicle dismantling/scraping.

A more detailed look at some of the learning outcomes reveals some overlap in safety and technical handling, but the outcomes vary in complexity and focus. The five learning outcomes share a focus on safety and technical competence in handling electric and hybrid vehicle batteries. Outcomes 1, 2, 3, and 5 emphasize practical skills and risk prevention, with Outcome 3 covering the most advanced scenarios involving live voltages. Outcome 4 is primarily theoretical, addressing energy storage technologies and future trends.

Table 5. Overlaps and complementarities in Learning Outcomes.

TMVG0040	TMVG0041	TMVG0042	TMVG0044	TMVG0049
Properly use tools and materials for proper handling of an electric and/or hybrid vehicle battery.	Disconnect and restart a vehicle's high-voltage system, including troubleshooting and replacing components only when it is certain that the voltage is off.	Safely perform high-voltage system disconnection activities in cases where it cannot be done using the usual procedure, as well as in tasks that involve direct contact with live parts and live voltages of up to 1000 Vac or 1500 Vdc.	Understand the technical aspects of different energy storage technologies based on their final application and future trends associated with batteries.	Identify the risks associated with handling lithium-ion batteries, applying safety measures to prevent accidents during assembly, disassembly, and repair.

Since 2021, in addition to technical learning outcomes, the training programmes have explicitly included a range of personal, social, and management skills. These competences generally refer to abilities such as adaptability, autonomy, engagement, initiative, communication, and teamwork, as well as to occupational and environmental risk prevention and the application of safety protocols. This is illustrated in the following example from ELECTRIC VEHICLE TECHNOLOGY Level 2 (TVMG0012) training programme:

- Awareness of the environmental and occupational risks associated with professional activities.
- Attention to the causes of occupational risks.
- Willingness to apply safety protocols and preventive measures.
- Engagement in applying communication techniques to convey the procedures used in technical and safety processes.

- Respect for the autonomy and competence of colleagues in the workplace.

The complexity of transversal competences varies with the level of qualification, as demonstrated by the communication skills required in three connected vehicle training programs incorporated in the catalogue in 2021.

Table 6. Increasing sophistication of communication and collaboration skills across qualification levels in three Connected Vehicle Specialisations

Name	Advanced Driver Assistance Systems (ADAS)	Connected Vehicle Technologies	ADAS Systems for Vehicles
Level	2	4	5
Code	TMVG08	TMVG10	TMVG11
Hours	70	240	175
Personal, social and management skills	Use of communication and collaboration skills with the rest of the team during vehicle inspections in the automotive workshop.	Use of communication and motivational skills in coordination and planning with the team on communications network projects	Coordination of teams and innovation projects for ADAS products.

The generic guidelines included in the training programs of the Training Specialties Catalogue specify that the assessment will have both theoretical and practical components, conducted systematically and continuously throughout each module and at the end of the course. An initial diagnostic assessment may be included to determine the participants' starting level. The evaluation will use the most appropriate methods and instruments to assess the various learning outcomes, ensuring their reliability and validity.

However, interviews with trainers and Public Employment Services revealed the primary assessment tool is a multiple-choice test, and in accordance with the established guidelines, the final result is reported as either "Pass" or "Fail". While most programmes incorporate a practical component and specify the required tools and equipment for workshops, the reliance on a multiple-choice test as the main assessment tool is not appropriate for evaluating practical or transversal skills.

Training institutions are required to submit evaluation data to the Regional Public Employment Service. In Asturias, this information is published annually, disaggregated by training specialty, and includes employment indicators at six and twelve months. According to the latest available data for training specialties completed in 2022, the completion and outcome indicators for the specialty Maintenance of Hybrid and Electric Vehicles (TMVG02) are presented in the following table.

Table 7. HV/EV Maintenance Training Specialisation (TVMG02) Participation and labor market outcomes data. Asturias 2022.

Courses	Participants	Completion with positive assessment	Labour market integration 6 Months	Social Security Affiliation. 6 Months	Labour market integration 12 Months	Social Security Affiliation 12 Months
1	9	8	87.5%	87.5%	100%	100%

Source: Acciones de formación para el empleo dirigidas prioritariamente a trabajadores/as desempleados/as 2022⁷

7.4 Conclusions and future developments

In 2022, the Spanish Public Employment Service (SEPE) conducted a diagnostic assessment to evaluate the capacity of the Vocational Training System for Employment in the Workplace to adopt the European approach to micro-credentials. The participatory process involved SEPE, FUNDAE, regional administrations, trade unions, and employers' associations through interviews and expert workshops. The findings were published in The Annual Assessment Plan on the Quality, Impact, Efficacy and Efficiency of the Vocational Training System for Employment in the Workplace 2020–2021 (SEPE, 2023)⁸.

Most stakeholders recognised the Catalogue of Training Specialities as an effective framework for introducing micro-credentials, recommending that implementation be coordinated by SEPE in partnership with regional branches, using existing accreditation procedures and resources. While all vocational sectors were considered suitable for this approach, it was deemed particularly relevant for emerging industries and the development of transversal competences linked to the twin transition. Participants identified several barriers to implementation, including limited human and technical capacity, the absence of a clear national regulatory framework, weak coordination between vocational and formal education, and low awareness of the value of micro-credentials among employers and workers.

Although recently added training programmes already reflect elements of the 2022 Council Recommendation, further refinement is needed in defining learning outcomes, specifying workloads, establishing assessment and quality assurance mechanisms, and enhancing integration and stackability. A digital certification system has yet to be introduced.

Micro-credential development should be guided by sectoral needs identified through social dialogue within joint committees, complementing formal training programmes and involving both public and private actors. Evaluation of learning outcomes would be conducted by accredited providers, with results reported to regional public employment services or SEPE for formal accreditation.

These findings offer a strong basis for the forthcoming regulation on the integration of micro-credentials within the National Employment System, in line with the EU Council Recommendation of 16 June 2022. The Royal Decree 438/2024 of 30 April, which implements the Common Service Portfolio of the National Employment System pursuant to Law 3/2023 of 28 February on Employment, offers some pointers for the introduction of micro-credentials in workplace training system. Micro-credentials should be designed through social dialogue between employers and

⁷ https://trabajastur.asturias.es/documents/36440/2983926/Informe_insercion_2022.pdf/302b5d0d-1118-83d3-50cf-b9f88f04fd55?t=1719904653159

⁸ https://www.sistemanacionalempleo.es/HomeSne/dam/sne/pdf/20230628_Abstract-PAE-20-21.pdf

workers and open to issuance by a wide range of public and private providers. Micro-credentials are expected to operate independently of the NQF (National Catalogue of Competence Standards) enhancing access to training for groups facing greater barriers—such as young people, low-qualified and older workers, persons with disabilities, and SME employees— and on supporting the continuous professional development of employment service staff.

Potential and limitations of the micro-credential approach to face the twin transition challenge in the automotive repair and maintenance sector

As regards the repair and maintenance sector, the term “microcredential” is simply not part of the vocabularies of the trainers interviewed for this case study. However, the increasing offer of EV/HV/CV micro-credential-like courses included in the catalogue and the fact that sectoral organisations are already registered as accredited training providers to deliver these courses attest to the potential afforded by the Catalogue. Yet, some caveats merit further attention.

From a user perspective, and in spite of the online search tools available, it is hard to obtain a full-picture of all EV/HV/CV trainings available. The landscape is not easy to navigate and puts at risk the transparency and clarity of the existing offer for employers, accredited training providers and of course, the final beneficiaries. The creation of specific itineraries or roadmaps could help in addressing concerns aired in the interviews around content overlaps and the lack of complementarity. A comprehensive review of existing offer led by the Public Employment Service with the participation of key stakeholders could help in addressing this issue.

The decision not to tie non-formal courses to NQF is a way to ensure flexibility and agility in regards to the creation of new offers and updating existing ones. The 5-year span to update content may be considered very long given the speed of change in tools, technologies, software updates, regulations impacting skills in the EV sector. Yet, the regulation says “at least every five years” which in principle, does not preclude the option that the content is updated within a shorter span of time.

Despite some overlaps, the broad definition of learning outcomes provides valuable flexibility and scope for personalisation. Trainers interviewed noted that curricula are frequently adapted to accommodate diverse learner profiles—for example, courses may bring together both long-term unemployed individuals and experienced mechanics transitioning into the electric vehicle (EV) sector. While such breadth can create a degree of uncertainty regarding specific competencies, it also helps extend the “shelf life” of course content by keeping it adaptable to technological and market changes. An agnostic approach that avoids overcommitment to particular technologies is especially advantageous at this early stage of EV deployment, when multiple technologies from different OEMs coexist. Moreover, stronger engagement from OEMs—through contributions such as trainer development and the provision of specialised equipment—could significantly enhance the quality and relevance of the training delivered.

The experience with the EU F-gas Regulation (EU) 2024/573, which established uniform certification and training standards for handling fluorinated gases, illustrates the power of regulation to drive the uptake of training. Similarly, the demand for courses such as those related to the handling of electric vehicle batteries could expand significantly if supported by regulatory requirements and clear certification frameworks. This alignment between regulatory policy and skills recognition would enhance the credibility and utility of MCs across the market.

Most micro-credential courses involve low-stakes assessments that are often not fully aligned with the practical competencies they intend to measure. While this is understandable given the short duration and focused nature of such courses, it raises questions about the level of quality assurance (QA) required for their validation. Even when not formally linked to National Qualifications Frameworks (NQFs), non-formal MCs can still provide valuable supporting evidence for the Recognition of Prior Learning. Therefore, a proportionate QA system is needed—one

that ensures credibility and consistency without imposing excessive administrative burdens, balancing flexibility with trust in the recognition process.

Last but not least, a robust digital infrastructure could play a pivotal role in enhancing both the portability and navigability of learning achievements. Beyond portability, digital systems could also offer learners a clearer sense of progression and purpose transforming fragmented experiences into coherent learning journeys, fostering both motivation and trust in the recognition process.



7.5 Annexes

Annex 1. Electric/Hybrid vehicle training programmes

Level	Code	Name	Release year	Hours	Format	Registered VET providers
1	<u>TMVG015P</u> <u>Q</u>	Maintenance of Hybrid Vehicles	n.a.	40	In-person	81
1	<u>TMVG0039</u>	Awareness in High-Voltage Vehicles	2024	8	Hybrid	9
2	<u>TMVG06</u>	Structure and Operation of the Electric Vehicle	2020	40	In-person	86
2	<u>TMVG03</u>	Basic Maintenance of Hybrid and Electric Vehicles	2020	40	In-person	79
2	<u>TMVG07</u>	Electrification of Hybrid and Electric Vehicles	2021	300	In-person	37
2	<u>TMVG05</u>	Testing and Diagnosis of the Electric Vehicle	2022	40	In-person	83
2	<u>TMVG0011</u>	Electric Vehicle Technology. Level I	2023	16	In-person	7
2	<u>TMVG0012</u>	Electric Vehicle Technology. Level II	2023	16	In-person	6
2	<u>TMVG0013</u>	Electric Vehicle Technology. Level III	2023	24	In-person	6
2	<u>TMVG0014</u>	Hybrid Systems in Automobiles. Level I	2023	16	In-person	4
2	<u>TMVG0015</u>	Hybrid Systems in Automobiles. Testing and Diagnosis. Level II	2023	24	In-person	3
2	<u>TMVG0034</u>	Electric Drive Motorcycles	2023	30	In-person	3
2	<u>TMVG0040</u>	Handling of Hybrid or Electric Vehicle Batteries	2024	40	Hybrid	8
2	<u>TMVG0041</u>	Electrical Risk Prevention in the Handling of High-Voltage Vehicles. Level I	2024	60	Hybrid	7
2	<u>TMVG0042</u>	Electrical Risk Prevention in the Handling of High-Voltage Vehicles. Level II	2024	60	Hybrid	7

2	<u>TMVG0044</u>	Batteries and Storage	2024	35	In-person	0
2	<u>TMVG0056</u>	Assembly, Diagnosis and Repair of Lithium-Ion Batteries	2024	575	In-person	1
2	<u>TMVG0058</u>	Disconnection Processes of New High-Voltage Systems	2025	16	In-person	0
3	<u>TMVG02</u>	Maintenance of Hybrid and Electric Vehicles	2018	90	In-person	102
4	<u>TMVG09</u>	Electric Vehicles	2021	200	In-person	10
5	<u>TMVG0049</u>	Energy Networks and Urban Charging Points	2024	90	In-person	0
5	<u>TMVG0050</u>	Propulsion and Storage Systems in Electric Vehicles: Materials and Design	2024	90	In-person	0

Annex 2. Connected vehicle training programmes

Level	Code	Name	Release year	Hours	Format	Registered VET providers
4	IFCD101	Cybersecurity for Vehicles	2021	240	In-person	56
2	<u>TMVG08</u>	Advanced Driver Assistance Systems (ADAS)	2021	70	In-person	28
4	<u>TMVG10</u>	Connected Vehicle Technologies	2021	240	In-person	6
5	<u>TMVG11</u>	ADAS Systems for Vehicles	2021	175	In-person	6

8 SPAIN - Upskilling VET teachers technical competences on the safety and maintenance of electric and hybrid vehicles. Navarra, Spain



8.1 General information

Country / Region:	SPAIN/NAVARRA
Organisation(s) Involved	Department of Education. Government of Navarre
Sector(s):	Automotive sector, Vocational Education & Training
Implementation:	Delivery
Inputs:	Sonia García Cifuentes, Sofia Egido Victoria, María José Pascual Bustamante (Department of Education, Government of Navarre). Rakel Laspidea Arnedo (CAP Pamplona)

8.2 Electric and hybrid vehicles-related contents in the initial VET in Navarre

With the aim of responding to the priorities set out in the 2009 Automotive Sector Competitiveness Plan for Navarre—which included, among its objectives, the shift towards more sustainable vehicle production (hybrid, electric and low-emission models) and the enhancement of VET provision to meet related upskilling and reskilling needs—the regional Department of Education introduced two compulsory modules on hybrid, electric, and hydrogen vehicles into the Intermediate and Higher VET programmes for the Automotive Industry⁹.

The modules were formally incorporated into the curriculum in 2011 and 2009, respectively, and required second-year students to complete between 50 and 70 hours of training on electric vehicles.

Table 1. Compulsory EV/HV Module in Intermediate and Higher VET programmes in Navarra.

VET program	EV/HV Module	Duration	Hours/week
CFGM Automotive Electromechanics (2000 hours)	Maintenance of hybrid, electric and hydrogen vehicles	50 hrs	2
CFGS Automotive (2000 hours)	Hybrid, electric and hydrogen vehicles	70 hrs	3

This arrangement remained in place until 2022, when the approval and subsequent implementation of the new Vocational Training Act brought about significant curricular changes across all initial VET programmes. In the case of these two programmes, the compulsory modules were removed, leaving it to each VET provider to decide whether to retain them as optional components.

8.3 A new upskilling opportunity for VET graduates: Specialisation courses on EV/HV safety and maintenance

The discontinuation of these two modules coincided with the introduction of two one-year specialisation courses in hybrid and electric vehicles, designed for Intermediate and Higher VET graduates. In 2021, the fundamental aspects of the Specialisation Course in Maintenance of Hybrid and Electric Vehicles (650 hours, 4 ECTS credits) were established. The following year, in 2022, the Specialisation Course in Maintenance and Safety in Hybrid and Electric Vehicle Systems (650 hours, 4 ECTS credits) was introduced¹⁰.

Table 2. Target group and general competence of EV/HV VET specialisation courses

Specialization course in Maintenance of hybrid and electric vehicles (650 hours, 40 ECTS)	Specialization course in Maintenance and safety in hybrid and electric vehicle systems (650 hours, 40 ECTS)
Target group: Intermediate VET graduates	Target group: Higher VET graduates
The general competence of this specialization course consists of performing maintenance operations, assembly of elements and assemblies, troubleshooting, repair, verification and adjustment, in vehicles with hybrid and electric propulsion systems, following technical specifications of safety and environmental protection, complying with current regulations.	The general competence of this specialization course consists of organizing, planning, diagnosing breakdowns and supervising the execution of maintenance operations and their logistics in the area of hybrid and electric vehicles, guaranteeing compliance with the technical specifications of safety and environmental protection, established in the current regulations.

Both specialisation courses comprise five professional modules, amounting to 650 hours of training in total, equivalent to 40 ECTS credits. The official curriculum, defined by the Ministry of Education, Vocational Training and

⁹ <https://www.lexnavarra.navarra.es/detalle.asp?r=29917>

¹⁰ https://www.boe.es/diario_boe/txt.php?id=BOE-A-2022-2057

Sport for implementation across the country, specifies for each module the number of credits, learning outcomes and assessment criteria, duration, and detailed core content, along with pedagogical guidance.

Table 3. Training modules of EV/HV VET specialisation courses

Specialization course in Maintenance of hybrid and electric vehicles (650 hours, 40 ECTS)	Specialization course in Maintenance and safety in hybrid and electric vehicle systems (650 hours, 40 ECTS)
5060. Safety in hybrid and electric vehicles.	5076. Safety in vehicles with high voltage systems.
5061. Propulsion systems in hybrid and electric vehicles.	5077. Electric and hybrid traction in vehicles.
5062. High voltage electrical systems, batteries and recharging.	5078. High voltage systems, storage and electric recharging.
5063. Power transmission and thermal management.	5079. Transmission systems, regenerative braking and thermal control.
5064. On-the-job training.	5080. On-the-job training. (FCT)

In Navarre, the Specialisation Course in the Maintenance of Hybrid and Electric Vehicles has been offered since the 2022–2023 academic year at CIP Virgen del Camino, a public VET institution located in Pamplona, the capital city of the region. Although enrolment numbers have remained stable, demand has been modest, and the 15 available places offered every year have not been fully filled in any cohort to date. One contributing factor is that graduates of intermediate VET programmes tend to prefer progression to Higher VET programmes rather than enrolment in the specialisation course.

Table 4. Students enrolled in the Specialization Course in EV/HV Maintenance for Intermediate VET graduates

	2021-2022	2022-2023	2023-2024
Spain	215	306	282
Navarre	0	7	5

Source: Prepared by the author based on Statistics of Non-University Education.

8.4 The development of EV/HV technology creates training needs among VET teachers

The core curricula of the specialisation courses stipulate that instruction in hybrid and electric vehicle (HV/EV) content is to be delivered by teaching staff in Secondary Education and Vocational Training. Separate annexes specify the qualifications and areas of expertise required to teach each module. In practice, however, the introduction of these specialisation courses has not been accompanied by the recruitment of teachers with specialised training in these emerging technologies. Instead, responsibility has largely been assumed by existing VET staff within the Transport and Vehicle Maintenance department.

In this context, VET teachers have expressed a clear need to update their knowledge and technical skills related to electric and hybrid vehicles, making use of the formal mechanisms for identifying training needs provided by the Department of Education of the Government of Navarre.

An initial response was the inclusion of the online course Introduction to Electric and Hybrid Vehicles in the 2022–2023 Teacher Training Plan, following a request from CIP Virgen del Camino. This 24-hour course, delivered by

industry experts, provided a general overview of the design features and technologies underpinning electric vehicles. However, evaluation feedback from participating VET teachers indicated that the course was overly theoretical and underscored the need for future face-to-face, practice-oriented training that would enable them to apply their newly acquired knowledge directly in the classroom.

8.5 Delivery of VET Teacher training program on high-voltage electric vehicle safety

In response to these needs, and following an initiative led by another public VET provider in the region, CIP Donapea IIP, the 2023–2024 Teacher Training Plan introduced three courses on high-voltage electric vehicle safety. These courses were specifically targeted at VET teachers responsible for the modules Organisation and Projects of Vehicle Maintenance and Vehicle Maintenance.

The objective of the initiative was to ensure that VET teachers were adequately prepared to guide students in the correct application of safety procedures when working with electric vehicles. The programme was implemented through collaboration between the VET provider, the Vocational Training Modernisation and Innovation Service within the Department of Education, and the Pamplona Teacher Training Centre (CAP).

Training delivery was entrusted to TÜV Rheinland, whose High Voltage Electric Vehicle Safety Technician programme follows a progressive three-level structure. This approach enables participants to develop their expertise incrementally, in line with established professional and safety standards.

Table 5. Structure of Training programme for high-voltage electric vehicle safety technicians

Short training	Delivery	Duration	Dates	VET teachers
Basic course on the safety of high-voltage electric vehicles – Level 1	Online	16 hours	15-18 Jan, 2024	20
Electric Vehicle High Voltage Safety Technician – Level 2	Offline	18 hours	19-19 Jan, 2024	10
Electric Vehicle High Voltage Safety Technician – Level 3	Offline	18 hours	5-7 Jun, 2024	10

While the introductory Level 1 training was delivered online, the Level 2 and Level 3 courses were conducted in person and combined theoretical instruction with a range of practical activities involving real vehicles, engines, and tools. Progression to Levels 2 and 3 was permitted only upon successful completion of the immediately preceding level.

Assessment for accreditation at Levels 2 and 3 consisted of a written multiple-choice examination and a 20-minute practical test. In this instance, the practical assessment was carried out using a Toyota Prius in the workshop facilities of the host VET provider.

Successful completion of both assessment components was required to obtain the DGUV 209-093 PerCert TÜV accreditation, an internationally recognised, industry-based certification. In total, ten instructors completed all three stages of the training programme and were awarded Level 3 certification issued by TÜV Rheinland.

Table 6. Certifications

Short training	Certification

Basic course on the safety of high-voltage electric vehicles – Level 1	None
Electric Vehicle High Voltage Safety Technician – Level 2	High Voltage Electric Vehicle Safety Technician
Electric Vehicle High Voltage Safety Technician – Level 3	Expert technician in the installation and handling of High Voltage Electric Vehicles

The evaluation report submitted by the TÜV Rheinland instructor to the Department of Education of the Government of Navarre presented a series of quantitative indicators measuring participants' satisfaction with various aspects of the training, including organisation, content, duration, methodology, teaching resources, facilities, and technical equipment. Overall, the results indicated a high level of satisfaction across all evaluated areas.

Teachers reported that the training had made a positive contribution to their professional development, enabling them to acquire new, workplace-relevant skills. They also expressed a willingness to share their knowledge and support colleagues who had not participated in the programme. With regard to areas for improvement, participants highlighted the need to review and refine the translation and wording of the presentation and assessment materials.

The report also included observations from the trainer concerning several issues related to the equipment and facilities at the training venue, particularly the availability of personal protective equipment (PPE) and other tools required for safe work on electric vehicles. The trainer provided specific recommendations—such as ensuring access to CAT III meters, improving the availability of the automated external defibrillator (AED), and using appropriate protective gloves—all of which were subsequently addressed and corrected.

8.6 Conclusions and future plans

The inclusion of a mandatory electric vehicles module in the Initial Vocational Education and Training (I-VET) curriculum more than fifteen years ago reflects the forward-looking approach of Navarre's vocational education system. In parallel, the Department of Education has established an effective mechanism for the regular identification of teacher training needs. Input from VET providers and teachers is collected twice a year and systematically incorporated into the design of annual professional development plans.

Although the training pathway developed by TÜV Rheinland was originally intended for industry professionals, its structure—comprising three short, stackable, and industry-certified courses—has proven effective in meeting the upskilling needs of VET teachers, a key group in the preparation of future automotive professionals. However, as the programme was not initially designed for an educational context, it could be further adapted to teachers' needs by incorporating additional pedagogical elements to support classroom application.

Looking ahead, closer collaboration with industry partners could further strengthen teachers' competencies through practical, modular training leading to recognised industry credentials. A potential next step would be to extend access to these micro-credentials to students, either by integrating them into, or offering them alongside the curricula of intermediate, higher, and specialist VET programmes. Such an approach would enhance alignment between vocational training and industry standards while improving students' employability through the acquisition of recognised, industry-relevant qualifications.

9 INTERNATIONAL - Automotive Skills Alliance (ASA) – Skills Hub Digital Badge

Consulted Stakeholders:

- Jakub Štolfa – President of the Automotive Skills Alliance (ASA)
- Marek Spányik – Project Manager at Automotive Skills Alliance (ASA)



9.1 Executive summary

The Automotive Skills Alliance (ASA) Skills Hub is a sectoral digital platform that connects skills intelligence, training provision, and micro-credentials across the European automotive and mobility ecosystem. It issues digital badges at learning-outcome level, enabling learners to stack competences from multiple providers towards defined job roles and qualification profiles. The system is co-funded mainly through Erasmus+ Blueprint projects and aligned with EU skills and industrial strategies, with recognition based on a “community” agreement among alliance members. Quality is assured through course-based assessment, a two-level (green/gold) badge model, and a trust-based provider approval process. The platform has reached 4,180 learners, 10,833 enrolments and currently hosts 87 courses, with strong uptake reflected in 15,303 badges issued for 2,823 completed courses. The initiative provides a lightweight, scalable, cross-border recognition solution that complements emerging European micro-credential frameworks, while still facing challenges linked to standardisation, long-term sustainability, and impact monitoring..

9.2 General information

Field	Details
Title of the case study	Automotive Skills Alliance – Skills Hub Digital Badges
Country / Region	European Union
Organisation(s) involved	Automotive Skills Alliance, automotive manufacturers, vocational institutions, sector associations, technology partners
Sector(s)	Automotive / Mobility
Implementation phase	Delivery

9.3 Context and objectives

9.3.1 Introduction to the Automotive Skills Alliance (ASA)

The Automotive Skills Alliance (ASA) is a collaborative initiative established under the European Commission's Pact for Skills, dedicated to supporting the green and digital transformation of the European automotive and mobility ecosystem. Created in November 2020 and formalised as a legal entity in January 2022, ASA brings together a broad coalition of stakeholders — including industry representatives, educational institutions, technology partners, and policymakers — to ensure that the European automotive workforce is equipped with the skills required to thrive in a rapidly evolving sector.

The establishment of ASA was driven by the urgent need to address the profound changes reshaping the automotive industry. The shift towards electrification, automation, and digitalisation has created significant skills gaps among current and future workers. Traditional competencies are being replaced or complemented by new technical and digital skills, particularly in areas such as electric vehicle maintenance, diagnostics, software integration, and sustainable production processes. In this context, ASA's Skills Hub platform emerged as a

cornerstone of its strategy — a structured, digital learning environment offering accessible, high-quality training opportunities closely aligned with emerging industrial and technological demands.

The initiative also responds to broader European policy and economic priorities, notably the EU's Green Deal, Digital Strategy, and Pact for Skills. These frameworks underscore the importance of developing a resilient, adaptable, and future-oriented workforce capable of supporting Europe's transition towards sustainable mobility. By aligning with these EU strategies, ASA ensures that its training initiatives promote both environmental sustainability and long-term employability, while contributing to industrial competitiveness.

The target group of the initiative includes automotive workers seeking to upskill or reskill in response to technological changes, as well as mid-career professionals aiming to transition into green and digital roles. The identification of skill needs relies on a combination of skills intelligence developed in EU blueprint projects (such as DRIVES and ALBATTs), consultations with industry partners and sector associations, and analysis of evolving occupational profiles. As confirmed by consulted stakeholders, learning outcomes and job roles in the Skills Hub build on this shared skills intelligence and are agreed jointly within the alliance. ASA's overarching mission is to empower the European automotive workforce through targeted education and training initiatives that support both individual and collective adaptation to change. The primary objectives guiding the Alliance's work are threefold:

- Supporting sectoral transformation: Facilitating the adaptation of the workforce to emerging technologies and innovative production methods.
- Enhancing employability: Equipping individuals with practical, future-oriented skills that meet industry demands.
- Promoting quality jobs: Ensuring that the workforce is prepared for sustainable, rewarding, and innovation-driven employment within the sector.

These objectives were defined and prioritised collaboratively with stakeholders through workshops and strategic planning processes, focusing on areas with the greatest identified skill gaps and the highest potential for long-term relevance. Collectively, the ASA and its Skills Hub platform represent a forward-looking response to the dual green and digital transitions — ensuring that Europe's automotive workforce remains competitive, resilient, and ready for the future.

9.4 The Skills Hub: A digital platform for competency development

The Skills Hub functions as a centralized digital platform connecting learners with training opportunities tailored to the automotive and mobility sectors. By mapping training courses to specific job roles and competencies, it provides a structured approach to skill development that ensures alignment with industry standards and labour market needs. The platform serves as a key digital tool under the Automotive Skills Alliance (ASA), supporting the upskilling and reskilling of the workforce across Europe.

Designed as a comprehensive one-stop shop for training, the Skills Hub integrates a coherent framework for defining and recognising job roles, skills, and competence concepts through the use of microbadges. Training providers link and promote their courses within a structured mapping exercise that guarantees consistency and comparability across the ecosystem. Currently, more than 180 courses are accessible through the platform, covering a wide range of topics relevant to the automotive-mobility value chain. Figure 1 presents the main thematic areas covered by the training offer, ranging from automotive engineering to electric powertrain and robotics.

Figure 1: Training areas

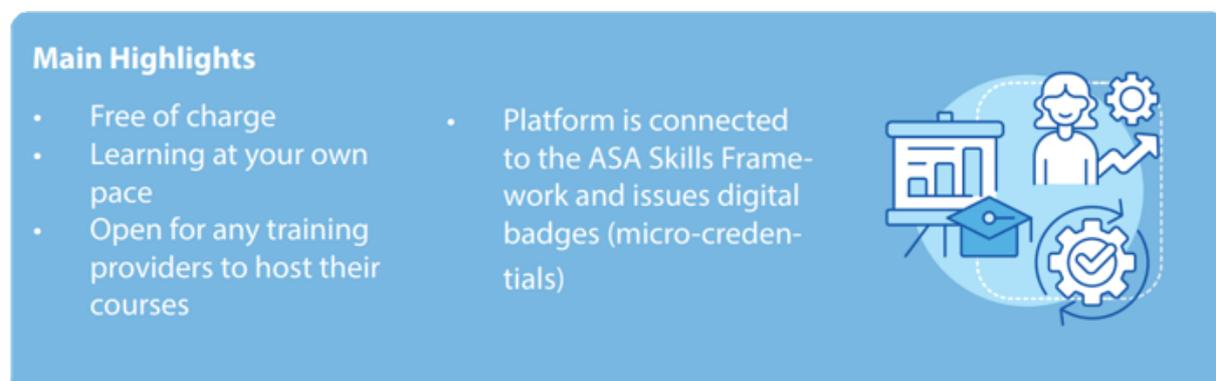
Source: ASA

Key features include:

Comprehensive training catalogue: The platform hosts over 180 courses covering various aspects of the automotive-mobility ecosystem.

- **Micro-credentials:** Learners complete practical tasks, short knowledge tests, and workplace-based assignments that demonstrate the required competences. Trainers review each submission and provide structured feedback. Learners who meet assessment criteria receive a digital badge that certifies the skills acquired.
- **Integration with AMEA:** The Skills Hub supports the Automotive-Mobility Ecosystem Academy (AMEA), enhancing its role as a one-stop-shop for education and training.

In addition to its extensive catalogue, the platform currently features more than 55 online courses, a number that continues to grow. The first set of training modules was originally developed through the ERASMUS+ co-funded project DRIVES, which laid the foundation for the Skills Hub's structure and content. Figure 2 illustrates key highlights of the platform's architecture and user interface, showcasing how training resources, microbadges, and job roles are interconnected.

Figure 2: Platform highlights

Source: ASA

9.4.1 Concept and importance

Digital badges are a form of micro-credential that visually represent an individual's competences, learning achievements, or qualifications. They provide a portable and verifiable means of recognising skills acquired through formal education, training, or work-based learning. This is particularly valuable in rapidly evolving sectors such as automotive and mobility, where new competences in electric mobility, battery technologies, digital diagnostics, and artificial intelligence are constantly emerging.

Digital badges offer a flexible and inclusive approach to recognising and validating skills at different levels. They can represent achievements ranging from participation in short training activities to verified competences linked to European qualification and quality assurance standards. As confirmed by consulted stakeholders, micro-credentials in the Skills Hub are issued at the level of specific learning outcomes or competences, and can be accumulated over time towards defined job roles or skill sets.

9.4.2 Implementation within the Automotive Skills Alliance

Within the framework of the Automotive Skills Alliance (ASA), digital badges are issued through the Skills Hub platform. The ASA operates under the Pact for Skills as a large-scale partnership within the automotive and mobility ecosystem, bringing together industry partners, training providers, and social actors to address evolving competence needs.

ASA digital badges are aligned with the European Qualifications Framework (EQF) and adhere to the Open Badges standard, ensuring interoperability and recognition across countries, institutions, and employers. Each badge functions as a micro-certificate that verifies an individual's competences or learning outcomes at a specific level and can be shared digitally—for instance, on professional platforms—to demonstrate achievement.

The ASA badge architecture follows a four-layer structure that defines the maturity level, content type, completion method, and recognition status:

- Layer 1: Maturity level – Awareness, Practitioner, and Expert.
- Layer 2: Concept type – Skill/Competence or Knowledge.
- Layer 3: Type of completion – Attendance or Exam.
- Layer 4: Recognition –
 - Recognised (Gold): training or certification provided by an approved entity (e.g. DRIVES project).
 - Unrecognised (Grey): training not endorsed by a recognised entity or without certification.

ASA recognises providers through a simple approval process. Providers must show strong quality systems, relevant industry links, and the capacity to deliver the required training. ASA reviews ISO 17024 certification, the use of ECTS or ECVET credits, and EQAVET implementation where relevant. The alliance also checks the provider's track record, staff qualifications, and links with industry partners. This ensures consistent standards and supports alignment with Europass and other European frameworks.

9.4.3 Adaptive learning, badge integration and issuance process

The ASA digital badge system is closely linked with adaptive learning pathways available on the ASA Learning Platform. For example, the Basic Batteries – ALBATTTS course is delivered through the Realizeit Adaptive Learning platform, which personalises learning paths based on learners' existing knowledge and progress.

As learners advance through the course, the Realizeit system continuously analyses their performance, adjusts the sequence of learning materials, and provides recommendations to strengthen weaker areas. This dynamic process supports more effective and tailored competence development, which is then formally validated through ASA's digital badge system.

Figure 3: Illustration of the Realizeit Learning Model



Source: ALBATTIS, 2024

This integration of adaptive learning and digital credentialing offers a comprehensive, learner-centred approach to skills validation, ensuring that badges reflect both verified competence and adaptive progression. As highlighted by consulted stakeholders, verification is embedded in course-level assessments, which may include online or onsite tests, written tasks or final exams, with providers responsible for confirming completion in the system.

Once all learning activities and assessments are completed, learners receive a notification email confirming their course completion and the issuance of the corresponding digital badge through the Skills Hub platform. Learners can then log in to access, download, or share their badges. Each badge includes detailed metadata outlining:

- the competences achieved,
- the assessment method,
- the issuing organisation, and
- the recognition status.

This transparency supports trust and usability across employers, education providers, and learners, while enabling future stackability and integration with other European skills and qualification initiatives.

9.5 Alignment with green and digital transitions

9.5.1 Addressing emerging skill needs

The ASA's training offer directly targets competences essential for electromobility, digitalisation, and automation. This includes:

- Maintenance and diagnostics of electric and hybrid vehicles;

- Battery assembly, recycling, and storage system management;
- Software integration and AI-based vehicle diagnostics; and
- Cybersecurity and connected mobility solutions.

Through these activities, ASA addresses both skills obsolescence and emerging professional profiles, ensuring a future-proof workforce.

9.5.2 Supporting sustainable employment

ASA's initiatives contribute to the creation of quality jobs by aligning skills development with sustainable production models. The Skills Hub's inclusive design ensures access for SMEs and smaller training providers, not just major OEMs. By embedding environmental awareness and digital literacy across all curricula, ASA promotes a circular and sustainable skills ecosystem, supporting the EU's broader industrial and climate objectives.

9.6 Governance and stakeholder engagement

9.6.1 Collaborative framework

The ASA operates within a multi-stakeholder governance model that brings together industry representatives, education and training providers, social partners, and public authorities. This collaborative framework ensures that initiatives under the ASA, such as digital badges and training modules, are closely aligned with sectoral skills needs, policy priorities, and education standards.

The governance model supports coordination between the European Commission, national and regional authorities, and industry-led networks such as project-flamenco.eu, enabling coherent action across countries and training ecosystems. By fostering shared ownership, the ASA ensures that both strategic planning and operational implementation reflect the evolving realities of the automotive and mobility value chain, particularly in the context of the green and digital transitions.

Partnerships with initiatives like Flamenco and ALBATTs further expand ASA's ecosystem, linking industry innovation with skills development and regional training clusters. As highlighted by consulted stakeholders, ASA follows a "community recognition" approach in which a broad set of stakeholders, including industry associations such as CLEPA, agree on common rules for recognising skills and accepting badges as evidence of competence. According to the consulted stakeholders, companies mainly support ASA through this community-recognition process rather than direct financial contributions or systematic funding of learners.

9.6.2 Role of social partners

Social partners play a central role in the design, validation, and endorsement of training content and micro-credentials. Their involvement ensures that skills frameworks remain relevant, up to date, and demand-driven, reflecting the needs of workers and employers alike. Through their participation, social partners help establish sectoral trust in ASA's digital credentialing system, promoting the recognition and acceptance of digital badges across the automotive ecosystem.

Moreover, social partners contribute to the co-creation of occupational standards, support the integration of training providers, and help align ASA activities with broader European initiatives such as the Pact for Skills and the EU Skills Agenda. Their engagement strengthens the link between training, employment, and industrial competitiveness, ensuring that ASA's outputs translate into tangible workforce benefits.

9.7 Results and impacts

Micro-credentials delivered under the learn.skills-framework.eu have reached a broad learner base and generated substantial credential uptake. A total of 10,833 course enrolments have been recorded, corresponding to 4,180 individual learners. The platform currently hosts 87 active courses, with several earlier modules no longer publicly available but still completed by users during previous cycles. Issuance data confirm strong engagement and completion levels. In the Skills Hub, 15,303 badges have been issued for 2,823 completed courses, averaging approximately 5.4 credentials per finished course. This demonstrates both recurring participation in modular learning pathways and the granular structure of the credential ecosystem, which awards multiple badges per learning journey.

9.8 Challenges and opportunities

Challenges	Opportunities
-	
Standardisation – Ensuring consistent recognition of digital badges across countries, institutions, and training systems.	Scalability – Expanding the Skills Hub to include additional training providers and learners across Europe.
Engagement – Encouraging wider participation among learners, employers, and training providers, particularly SMEs and regional centres.	Integration – Strengthening alignment with national and EU qualifications frameworks (e.g. EQF, Europass, ESCO) to enhance portability and recognition.
Sustainability – Securing long-term financial and institutional support beyond EU project cycles.	Innovation – Leveraging emerging technologies such as AI, adaptive learning, and digital verification to improve user experience and assessment methods.
Awareness – Increasing understanding among employers and workers of the value of digital badges for recruitment and career development.	Cross-sectoral transferability – Applying the ASA Skills Hub model to other industrial ecosystems to foster inter-sectoral mobility and skills intelligence.

9.9 Conclusion

The Automotive Skills Alliance demonstrates how a sectoral, cross-country partnership can operationalise micro-credentials within a coherent and future-oriented skills ecosystem. By linking industry co-creation, education innovation, and European interoperability frameworks, ASA's Skills Hub digital badges provide a replicable model for integrating short, stackable, and verifiable learning achievements into professional pathways. The initiative has shown strong potential to bridge the gap between training and employment, particularly in areas affected by the twin transitions — such as electric mobility, smart manufacturing, and sustainable supply chains. Its governance model, built on social dialogue and multi-level coordination, ensures that training content remains aligned with industrial needs and European skills strategies.

Nevertheless, the ASA experience also highlights persistent challenges: ensuring interoperability across national contexts, maintaining financial sustainability beyond project funding, and achieving widespread recognition and adoption among employers and SMEs. These issues underline the importance of embedding micro-credentials within permanent institutional frameworks and linking them to long-term workforce planning. Looking ahead, ASA's continued success will depend on its ability to evolve into a self-sustaining, data-informed, and widely recognised competence ecosystem. Strengthening ties with EU-level tools, expanding its geographical reach, and improving communication with industry actors will be key steps. The ASA case offers a valuable blueprint for how sectoral

alliances can translate European policy ambitions into tangible skills outcomes that benefit both workers and enterprises across the mobility value chain.

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10 INTERNATIONAL - Credential As You Go (CAYG) – Incremental Credentialing Ecosystem, USA

Consulted Stakeholders:

- Dr Nan Travers – Co-Lead, Credential As You Go
- Melissa Goldberg – Co-Lead, Credential As You Go
- Wendy Palmer – Director, Lifelong Learning Practice (external expert on micro-credentials and lifelong learning)



10.1 Executive summary

Credential As You Go (CAYG) is a U.S. movement to transform a degree-centric system into an incremental credentialing ecosystem that recognises learning through short-form, stackable credentials earned “along the way”. It brings together states, higher-education systems, employers and workforce actors under a structured governance model (the ten Bodies of Work) and a shared Incremental Credentialing Framework with six complementary approaches (e.g. Learn/Stack/Transfer As You Go). The initiative is supported by interoperable digital infrastructure, including CTDL-based metadata, registries, learner wallets, and practical implementation tools such as fourteen institutional playbooks. Early evidence from pilots in three states (21 institutions, 183 incremental credentials) indicates that incremental credentials perform at least as well as traditional programmes, while qualitative feedback points to stronger employer engagement, clearer learner pathways, and growing institutional buy-in. For Europe, CAYG offers a transferable example of how incremental, transparent and digitally enabled credential systems can support lifelong learning in decentralised education landscapes.

10.2 General information

Field	Details
Title of the case study	Credential As You Go – Incremental Credentialing Ecosystem
Country / Region	United States of America
Organisation(s) involved	Credential As You Go; State University of New York (SUNY); George Washington University Program on Skills, Credentials & Workforce Policy; Corporation for a Skilled Workforce; participating community colleges and state higher education systems (Colorado, North Carolina)
Sector(s)	Higher education, lifelong learning, workforce development
Implementation phase	Planning & delivery (prototype and system-design phase)

10.3 Context and objectives

The U.S. credentialing landscape proved rapidly outdated by the 2020s: millions of learners accumulated college credits without attaining a full degree, while employers increasingly emphasised **skills-based hiring** over traditional credentials. The legacy system, focused on four tiers of degrees (associate, bachelor’s, master’s, doctorat e), left abundant learning unrecognised and diminished labour-market visibility for many learners. Against this backdrop, [Credential As You Go](#) (CAYG) launched as a movement to create a **nationally-adopted incremental credentialing system**—one that recognises short-form credentials (certificates, badges, micro-credentials) that learners earn route to larger awards, thereby improving employability, transparency and lifelong learning. As one consulted expert observed, “the achievements recognised through CAYG are already embedded in current or proposed learning; the model simply offers a clear, consistent way to recognise them.” This is particularly important for learners who do not complete a full degree, as *“it acknowledges that learning is incremental and happens over time, and it helps shorten the time between learning and earning.”*

The target group for Credential As You Go primarily comprises learners who have accumulated post-secondary credits without completing a degree—an estimated 41.9 million individuals across the United States. It also includes adult learners in professional or life transitions, part-time students, and workers seeking to reskill or upskill in response to changing labour-market demands. Particular attention is given to underserved populations, such as first-generation learners and learners of colour, for whom traditional degree pathways often pose systemic barriers to participation and recognition. The primary objectives were to:

- **Design and pilot** a scalable framework for incremental credentials across institutions and states.
- **Improve portability and transparency** of credentials so that employer recognition becomes clearer and learner mobility increases.
- **Embed equity** in credentialing systems by ensuring under-served learners gain recognition and pathways.

These objectives were co-designed with partners through workshops, advisory boards and stakeholder networks.

10.4 Stakeholder roles and collaboration

Leadership of the initiative rests with CAYG, which orchestrates a coalition of higher education systems, states, workforce agencies and employers. For example, SUNY led the IES-funded research grant (Grant R305T210063¹¹) to prototype the framework across multiple states. Key stakeholders included:

- State higher education systems (e.g., Colorado, North Carolina) which piloted incremental credentials within their institutions.
- Community colleges and four-year institutions which implemented credentials and stackable pathways.
- Employers and industry credentialing bodies, providing input on skill needs and recognition.
- Policy bodies and accreditation agencies, engaging in quality assurance and system-level change.

To structure collaboration across this diverse network, CAYG defined ten **Bodies of Work**, each bringing together practitioners and experts to address a critical dimension of the emerging ecosystem. These Bodies of Work function as a distributed governance model, ensuring that the initiative evolves coherently despite the decentralised nature of the U.S. higher education sector.

Table 1: Ten Bodies of Work under CAYG

Body of Work	Primary focus	Key objectives and examples
Learner Supports	Integrate academic and career advising with financial guidance.	Develop advising models linking education to employment; adapt financial aid to short-form learning.
National Campaign	Raise awareness and build acceptance of incremental credentials.	Conduct national outreach and advocacy showcasing learner success stories and institutional pilots.
Professional Development	Build capacity for faculty and administrators.	Provide training, toolkits, and communities of practice for curriculum and assessment design.

¹¹ More info here: <https://ies.ed.gov/use-work/awards/credential-you-go-transforming-credentialing-system-u-s>

Trust	Ensure quality, transparency, and integrity of credentials.	Define shared standards for verification and metadata; align with Open Badges and other digital credentialing norms.
Technology	Develop interoperable infrastructure supporting credential issuance and recognition.	Promote use of Credential Transparency Description Language (CTDL), registries, and learner wallets.
Equity & Inclusion	Guarantee fair access and outcomes across demographic groups.	Monitor participation data; design inclusive credential pathways for underserved learners.
Incremental Credentialing	Expand the supply and coherence of incremental credentials nationwide.	Coordinate pilot implementation, refine frameworks, and harmonise credential taxonomies.
Building Connections	Link CAYG with related national initiatives.	Partner with the Credential Engine, National Skills Coalition, and state workforce systems.
Policy	Support reforms that institutionalise incremental credentialing.	Develop recommendations for credit transfer, funding eligibility, and state regulatory changes.
Research	Generate evidence of effectiveness and impact.	Conduct evaluations on learner outcomes, employability, and system scalability.

Source: [CAYG, 2024](#)

The Bodies of Work structure ensures that incremental credentialing is not a one-off innovation but a **sustained system-wide transformation**. By addressing quality, technology, policy, and equity in parallel, CAYG lays the groundwork for a coherent national ecosystem. One of the consulted stakeholders underlined the importance of the national network created under CAYG as interviewing members showed that participants “*weren’t alone in pursuing incremental credentials*” and that hearing peers’ experiences “*really helped them to promote the notion of incremental credentialing within their systems and institutions.*”

10.5 Incremental credentialing: framework, implementation, and supporting structures

Background

The first phase of CAYG, implemented between 2019 and 2021 with support from the **Lumina Foundation**, tested the feasibility of establishing a **nationally recognised incremental credentialing system** in the United States. This exploratory stage aimed to determine how learning achievements could be more visibly recognised within and across higher-education institutions and workforce systems. Three major outcomes emerged:

- A **national environmental** scan revealed that several states and higher-education systems were already experimenting with incremental credentialing, providing early examples to inform the design of a shared framework.
- **Pilot projects** at two community colleges and one university within the **State University of New York (SUNY)** system tested proof-of-concept models and refined the emerging framework with faculty participation.

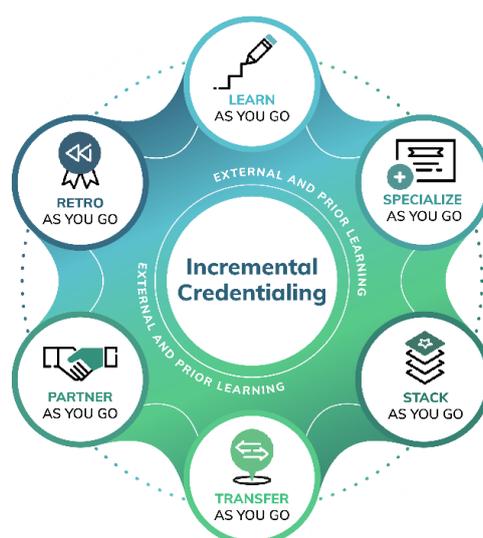
- **Consultations with national stakeholders**, including an advisory board, interviews, and a symposium involving hundreds of higher-education and workforce leaders, confirmed strong interest in scaling the model nationally.

These findings led to the creation of the Incremental Credentialing Framework, the central structure guiding how learning is recognised, verified, and connected through modular pathways.

10.5.1 Incremental Credentialing Framework

Incremental credentialing lies at the heart of the CAYG initiative. It represents both a structural reform of the credentialing system and a pedagogical philosophy centred on recognising learning progressively rather than solely at the completion of a degree. This approach formally acknowledges what learners know and can do along the way, offering recognition for meaningful achievements that often go undocumented in traditional higher education systems. The Incremental Credentialing Framework, developed through research and institutional pilots, identifies **six complementary approaches** (see Figure 1 below) that institutions can use to design and implement incremental credentials.

Figure 1: Incremental credentialing framework



Source: [CAYG, 2024](#)

These categories are not mutually exclusive — many programs combine them to create flexible and stackable pathways. The table below summarises these six approaches.

Table 2: The six approaches to incremental credentialing under CAYG

Approach	Description	Purpose and typical use	Examples / Application
Learn As You Go	Short, stand-alone credentials that allow individuals to upskill, reskill or gain new competences without committing to a degree.	Designed for immediate skill acquisition or entry into new roles; suitable for working adults and lifelong learners.	Industry-aligned micro-credentials in areas such as data literacy or project management; often linked to workforce training programs.

Add As You Go	Additional credentials pursued after an initial qualification to gain specialisation or advanced knowledge.	Enables professionals to deepen expertise or diversify competences; supports career progression.	Post-degree certificates in cybersecurity, leadership, or sustainable technologies; used to update skills in evolving sectors.
Stack As You Go	Sequential credentials that intentionally build upon one another, forming transparent learning pathways.	Provides clear progression routes and cumulative recognition; connects non-credit and credit learning.	Stacked pathways where short certificates or badges accumulate into associate or bachelor's degrees; modular degree programs.
Transfer As You Go	Credentials designed to transfer between institutions or levels of study.	Promotes mobility and cost-sharing between community colleges and universities; supports lifelong learning.	Articulation agreements allowing micro-credentials to carry credit across state systems or between technical and academic providers.
Partner As You Go	Credentials co-developed with industry and embedded in workplace learning.	Ensures relevance to employer needs and strengthens work-based learning recognition.	Jointly issued credentials with employers or sectoral bodies; integrated apprenticeships or competency-based certifications.
Retro Award As You Go	Credentials awarded retroactively for learning already achieved but not credentialed.	Targets adults with prior learning or incomplete degrees; acknowledges "milestones" already reached.	Awarding certificates for completed general education components or verified prior learning within degree programs.

Source: [CAYG, 2024](#)

These six approaches embody a **comprehensive rethinking of credentialing**: rather than positioning micro-credentials as supplementary to degrees, CAYG integrates them into a continuum of learning. This creates visibility for smaller learning units, empowers institutions to build **modular learning pathways**, and enables learners to “**earn, learn, and progress**” in ways that suit their personal and professional circumstances. One consulted stakeholder emphasised that the strength of the model lies in how it structures incremental learning so it can be recognised consistently, noting that “these building blocks can be standardised and combined – much like LEGO pieces – to support flexible pathways.” Crucially, incremental credentialing supports **stackability and transparency**. Each credential has a defined position within a larger framework, linked through consistent metadata and competency definitions. This transparency allows employers to interpret what a credential represents and enables learners to combine and transfer their learning between providers or states. Evidence from CAYG’s pilots suggests that incremental credentials co-designed with employers perform particularly well. An illustrative example is presented in Box 1 below, showing how the framework operates at programme level within the **automotive sector**.

Box 1. Example of an incremental credential under the CAYG framework

Automotive Technician Fundamentals Microcredential (SUNY Rockland Community College)

This undergraduate-level microcredential represents one of the first practical implementations of the *Credential As You Go* framework within the technical and trades domain. It awards three academic credits and exemplifies how several incremental approaches can operate simultaneously—**Stack As You Go**, **Partner As You Go**, **Learn As You Go**, **Specialise As You Go**, **Transfer As You Go**, and **Retro As You Go**—to support both educational progression and immediate employability.

Developed in partnership with **Ford Automotive Career Exploration (ACE)**, the credential enables participants to acquire foundational automotive technician skills under the guidance of certified Ford ACE instructors. Learners gain exposure to industry pathways, including the Ford ASSET and automotive technology degree programmes, while developing key competences in vehicle inspection, maintenance, and diagnostics.

Learning outcomes include:

1. Demonstrating safe work habits while servicing automobiles;
2. Performing multipoint vehicle inspections and communicating results and recommendations;
3. Conducting routine maintenance such as oil changes and tyre rotations.

Core skills: vehicle inspection and maintenance, tyre and wheel safety, engine fundamentals, shop safety, brake systems, HVAC, electrical and electronic basics, steering and suspension fundamentals.

The credential is credit-bearing (*AUT 10100*) and contributes to degree pathways within the institution, while also holding immediate industry relevance through its partnership structure.

Source: [CAYG, 2024](#)

10.5.2 Micro-credential design and implementation

Building on its framework and operational pillars, CAYG provides guidance for institutions designing micro-credentials and other short-form credentials within incremental pathways. The focus is on transparency, quality assurance, and alignment with workforce needs. Table 3 illustrates the key design dimensions and characteristics of micro-credentials under the CAYG framework.

Table 3: Design dimensions and characteristics of micro-credentials under CAYG

Design dimension	Description
Credential type	Courses, micro-credentials, badges, and certificates purposefully designed for stacking within broader pathways.
Delivery mode	Online, blended, or in-person formats adapted to institutional capacity and learner preference.
Workload / duration	Typically short, ranging from a few hours to one semester, calibrated to defined learning outcomes.

Learning outcomes	Co-developed with employers and aligned with occupational skills frameworks to ensure labour-market relevance.
Quality assurance	Grounded in the <i>Trust</i> body of work, ensuring reliability, transparency, and interoperability across issuers.
Prerequisites	Many credentials are open-entry, incorporating recognition of prior learning to widen participation.
Stackability and recognition	Each credential builds toward a larger qualification or industry-recognised certification.
Type of recognition	National and state-level recognition through higher-education systems and employer partnerships.

Although CAYG is developed within the U.S. context, its underlying principles—modularity, stackability, learner ownership, and quality assurance through digital transparency—strongly parallel the European Union’s approach to micro-credentials under the 2022 Council Recommendation. For Europe, the CAYG model offers a practical illustration of how incremental recognition can bridge education and employment, supporting lifelong learning and systemic reform.

10.6 Digital infrastructure and tools

Digital infrastructure is a central component of CAYG, ensuring that incremental credentials are interoperable, verifiable, and portable across states, institutions, and employers. The initiative supports the development of shared metadata frameworks and digital tools that enable the discovery, comparison, and stacking of credentials within the national ecosystem. The CAYG website and its affiliated Learn & Work Ecosystem Library host key resources such as the Incremental Credentialing Framework, the Learning Recognition Toolkit, and Technology-Integrated Credential Management guidance, which together define technical and operational standards for issuing and managing incremental credentials.

Box 2: CAYG Playbooks: Practical tools for institutional implementation

CAYG developed practical tools such as fourteen playbooks to support institutions adopting incremental credentialing. These playbooks act as practical “how-to” guides covering key components of implementation—including credential structure, assessment design, employer engagement, recognition of prior learning, and sustainability planning. Each playbook includes:

- a concise purpose statement;
- templates, guiding questions, and planning checklists;
- examples and short case studies from CAYG pilots and the wider network;
- links to complementary resources, such as the CAYG Dictionary, webinars, and the Learn & Work Ecosystem Library.

Consulted stakeholders noted that the playbooks help institutions address challenges related to governance, internal coordination, and policy alignment. The playbooks are updated regularly as new credentials are designed and tested, ensuring they remain “living documents” that reflect lessons learned and evolving practice across the ecosystem.

Table 4: Core components of the digital infrastructure underpinning Credential As You Go

Digital infrastructure element	Description and function
Metadata and interoperability standards	Use of the Credential Transparency Description Language (CTDL) and related open standards ensures machine readability, common terminology, and interoperability across digital systems.
Credential registries and dashboards	Digital registries visualise relationships among credentials, pathways, and stackability options, allowing users to navigate learning progression.
Digital learner wallets	Pilots explore the use of secure, learner-owned digital wallets to store verified credentials and share them with employers.
Data-driven learning navigation	Tools integrate advising, recognition of prior learning (RPL), and e-guidance, helping learners to identify next steps and avoid redundancy in learning.
Accessibility and inclusion design	All digital tools incorporate accessibility standards and inclusive design principles to ensure usability across diverse learner groups.
Quality and trust protocols	The <i>Trust</i> and <i>Technology</i> bodies of work define verification and authenticity processes, ensuring data integrity and secure credential exchange.

This **digital ecosystem underpins CAYG's incremental approach** by creating transparent connections between learning achievements and labour-market opportunities. It not only supports learners in visualising their educational trajectory but also enables institutions to recognise and build upon credentials issued elsewhere.

From a European perspective, the CAYG model provides valuable insight into how digital infrastructure can anchor micro-credential systems. Its reliance on open data, shared standards, and learner-centred credential storage mirrors the direction of EU initiatives such as the European Digital Credentials Infrastructure (EDCI) and Europass Learning Model, positioning **CAYG as a translatable reference for interoperable and portable credential ecosystems.**

10.7 Alignment, sustainability, scalability and transferability

The United States lacks a single national qualifications framework comparable to the European Qualifications Framework (EQF). Instead, Credential As You Go functions as a system-level reform initiative operating within a decentralised higher education landscape. It promotes shared principles and tools for recognising incremental learning across states, institutions, and workforce systems. Its design—centred on **portability, transparency, and structured learning pathways**—positions it as a relevant reference point for European discussions on micro-credential ecosystems.

CAYG's sustainability model follows a **staged development trajectory**, combining philanthropic and public funding to progressively broaden scope and participation. The proof-of-concept phase (2019–2021, Lumina Foundation) established feasibility and stakeholder engagement; the subsequent evidence-building phase (2022–2024, Institute of Education Sciences, U.S. Department of Education) tested implementation and evaluation methods; and the current scaling phase, supported by private partners such as Walmart, extends the model to new states and institutions. This phased approach allowed CAYG to mature from experimental pilots to a structured framework for

national coordination. In terms of scalability, the initiative demonstrates that incremental credentialing can operate across diverse and autonomous higher education systems. By 2023, over thirty new organisations had joined the CAYG network, expanding the testing ground for interoperability and refining the Incremental Credentialing Framework. Key to this expansion has been the adoption of **shared metadata standards**, particularly the Credential Transparency Description Language (CTDL), and the creation of a **networked governance model** linking policy, equity, and technology actors through the Bodies of Work framework. Nonetheless, long-term sustainability depends on the institutionalisation of incremental credentialing within policy, funding, and recognition systems. Incremental credentials must become embedded not only in higher education governance but also in employer practices, professional certification schemes, and public financing mechanisms that support modular and lifelong learning.

From a European perspective, CAYG offers valuable lessons for scaling modular and transparent credential systems across decentralised education structures. Its underlying principles—**recognition of incremental learning, portability, and quality through transparency**—strongly align with the EU Council Recommendation on Micro-credentials (2022) and the European Skills Agenda.

10.8 Challenges and opportunities

10.8.1 Potential challenges

Replicating the CAYG model within the European context would, however, entail several adjustments:

- **Regulatory fragmentation:** CAYG thrives in a flexible, non-regulated environment, whereas most EU Member States operate within structured qualification and quality-assurance systems. Adapting incremental credentials to such environments requires harmonised credit systems, validation frameworks, and transparent quality standards to ensure mutual recognition.
- **Funding and sustainability:** The reliance on philanthropic and project-based funding in the U.S. underlines the need for stable, public financing mechanisms in Europe. Integrating micro-credentials into **national lifelong learning budgets, ESF+ programmes, and reskilling initiatives** would be key to continuity and scaling.
- **Employer engagement and recognition:** Securing consistent employer recognition remains a challenge in both contexts. In Europe, stronger collaboration with **sectoral social partners** and **skills alliances** would be necessary to ensure that micro-credentials signal verifiable value in recruitment and career progression.
- **Quality assurance and trust:** CAYG's "Trust" body of work underscores the importance of transparent verification and quality processes. For Europe, alignment with **EQAVET** and the **European Standards and Guidelines (ESG)** will be essential to build and maintain confidence across borders.

10.8.2 Opportunities for replication in the EU

CAYG's experience illustrates several transferable practices for European systems:

- **Systemic alignment and interoperability:** The use of open metadata standards and registries demonstrates how micro-credentials can be integrated into existing European infrastructures such as **Europass, ESCO, and the European Digital Credentials Infrastructure (EDCI)**. Shared data models and learner-owned digital wallets could strengthen portability and verification across borders.

- **Governance and partnership models:** CAYG’s distributed governance through its Bodies of Work shows how multi-actor coordination—spanning education providers, employers, and public authorities—can sustain coherence in a decentralised system. This model could inspire European cooperation frameworks, notably within the [Pact for Skills](#) or sectoral alliances.
- **Equity and inclusiveness:** The initiative’s focus on recognising learning “along the way” mirrors EU priorities on lifelong learning and social inclusion. Incremental credentialing can help adults with incomplete qualifications, workers in transition, and underrepresented groups re-enter learning through shorter, flexible pathways mapped to the **European Qualifications Framework**.

10.9 Outcomes and impacts

Research conducted as part of the Credential As You Go initiative provides early but valuable insights into the outcomes of incremental credentialing across diverse institutional and state contexts. Within the three participating states (Colorado, New York, and North Carolina), **21 institutions** designed and implemented **183 incremental credentials** during the study period. Of these, **156 credentials** generated usable student-level data, reflecting considerable engagement from learners across different programmes and pathways.

However, methodological constraints imposed by the research design significantly reduced the analytical sample. The U.S. Department of Education required the use of a comparative interrupted time-series approach with matched samples—a method typically suited to uniform, standardised interventions. Because incremental credentials varied widely in structure, design, and learner profiles, only **16 credentials** met the strict matching criteria required for this form of analysis. Despite the limited sample, the findings were considered meaningful by the project team and consulted stakeholders. The analysis revealed no statistically significant differences between learners pursuing incremental credentials and those enrolled in traditional programmes in terms of the measured outcomes. Stakeholders emphasised that this “no harm” finding is an important first step: it confirms that incremental credentials perform at least as well as established models, even in their initial stages of development, and do not disadvantage learners.

More importantly, the experience exposed the limitations of conventional linear modelling for analysing complex, multi-pathway systems. Because incremental credentials differ significantly in their purpose, structure, level, and learner population, stakeholders noted that traditional regression-based approaches “do not work anymore” for such heterogenous ecosystems. As a result, the next stage of research will adopt **multi-dimensional and AI-enabled analytical approaches**, including neural-network modelling, to better capture variation across credentials, learner profiles, and institutional designs. This shift aims to produce a more accurate and nuanced understanding of the effectiveness and long-term impact of incremental credentialing. Beyond quantitative findings, qualitative evidence from the CAYG network highlights several early impacts:

- **Growing institutional engagement**, with network partners reporting increased interest from faculty, administrators, and state agencies once early models were demonstrated.
- **Strengthened employer participation**, especially in programmes co-designed with industry, which showed higher enrolment and completion.
- **Positive learner feedback**, particularly in contexts where incremental credentials created clear milestones or enabled re-entry for adults with “some college, no credential.”

- **Improved internal awareness and coordination**, as institutions used CAYG tools such as playbooks and planning instruments to align teams and define roles.

These emerging outcomes suggest that incremental credentialing is gaining traction as a viable approach for recognising learning, supporting mobility, and responding to changing labour-market demands. Further evaluation will continue to refine understanding of its long-term effects.

10.10 References

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11 INTERNATIONAL - MicroCreds, Ireland

Consulted Stakeholders:

- Jools O'Connor – MicroCreds Project Lead, Irish Universities Association (IUA)
- David Corscadden – Communications Manager, MicroCreds, Irish Universities Association (IUA)



11.1 Executive summary

MicroCreds is Ireland's first national initiative to mainstream university-led micro-credentials, developed by the Irish Universities Association with support from the Higher Education Authority. It establishes a shared framework for quality-assured, credit-bearing micro-credentials aligned with the National Framework of Qualifications and EU standards. The initiative enables flexible, modular learning pathways for adult learners and professionals, supported by strong employer engagement and a national digital platform. By 2024, eight universities had developed more than 600 micro-credentials, with an estimated 20,000 learners expected to participate by 2026. MicroCreds positions Ireland as a European frontrunner in embedding micro-credentials within higher education systems and lifelong learning strategies.

11.2 General information

Field	Details
Title of the case study	MicroCreds – Building a National Micro-Credential Framework
Country / Region	Ireland
Organisation(s) involved	Irish Universities Association (IUA); individual Irish universities; employer and sectoral partners
Sector(s)	Higher education, lifelong learning, professional development
Implementation phase	Quality and Qualifications Ireland (QQI); Higher Education Authority (HEA); National Forum for the Enhancement of Teaching and Learning (NFETL);

11.3 Context and objectives

The Irish higher education system, traditionally organised around full qualifications and degree cycles, faced growing pressure to respond to rapid upskilling and reskilling needs. Learners and employers increasingly demanded short, flexible learning options that recognised competences and supported mobility between education and work. This demand intensified during the digital and green transitions and was reinforced by national skills intelligence pointing to persistent gaps across sectors.

In response, the Irish Universities Association (IUA) launched **MicroCreds in 2020**, creating Ireland's first coordinated effort to mainstream university-led micro-credentials as a recognised and quality-assured component of higher education. Supported by the Higher Education Authority (HEA) through the Human Capital Initiative (HCI) Pillar 3 – Innovation and Agility, the project set out to establish a coherent national ecosystem for micro-credentials aligned with European and global standards. Implementation expanded rapidly, progressing from initial pilots to now mainstreaming across eight partner universities (**Dublin City University, Maynooth University, Trinity College Dublin, TU Dublin, University College Cork, University College Dublin, University of Galway & University of Limerick**).

The initiative targets a broad population: adult learners in employment, workers in transition, individuals seeking to update or broaden skills, and professionals needing accredited learning that complements or leads toward formal qualifications. Micro-credentials offer a way to reframe relationships between learners, universities, enterprises and civil-society partners. They support the development of agile learning pathways and strengthen the responsiveness of higher education to labour-market needs. The initiative seeks to address long-standing barriers to participation in lifelong learning—such as limited time, cost, and inflexible provision—by enabling learners to complete short, discrete learning units at their own pace. This flexibility, combined with strong employer engagement, is central to the ambition of MicroCreds to support lifelong and life-wide learning and to modernise how Irish universities deliver short-form learning.

Figure 1: Lifelong learning core principles



Source: MicroCreds

A fully developed framework for micro-credentials can provide learners with agile pathways from stand-alone, bite-sized micro-credentials to in some cases larger awards, allowing learning to align with and adjust to changes in learner priorities over time. The ambition is that MicroCreds will leave a legacy framework and infrastructure supporting engagement with wider cohorts of learners. Primary objectives include:

- Establishing a **national framework** and common definition for micro-credentials across Irish universities.
- Embedding **quality assurance** and alignment with the **National Framework of Qualifications (NFQ)**.
- Enhancing employer engagement and recognition of short-form learning.
- Building a **shared digital platform for the promotion and awareness of micro-credentials**.
- Ensuring **alignment with EU policy instruments**, particularly the 2022 Council Recommendation on Micro-credentials.

MicroCreds now involves eight partner universities and is explicitly designed to change how adults engage with lifelong learning. Consulted stakeholders confirmed that the project *“is trying to reinvent how people engage with lifelong learning through micro-credentials”*, targeting mainly people in employment but also those in transition between roles or sectors. Communications and digital engagement, including the creation of the national platform MicroCreds.ie, have become central to raising awareness among learners and enterprises.

11.4 Stakeholder roles and collaboration

MicroCreds operates as a **multi-stakeholder initiative** coordinated by the Irish Universities Association and implemented currently across eight partner universities.

Core partners and roles:

- **Irish Universities Association (IUA):** Project coordinator responsible for national leadership, shared framework development, and institutional implementation. Supporting the design and deliver micro-credentials embedded in existing curricula, applying shared definitions, credit standards, and metadata conventions.
- **Higher Education Authority (HEA):** Provides funding and strategic oversight through the Human Capital Initiative.
- **Enterprise Advisory Group** comprising senior enterprise members from business representative organisations, enterprise agencies, private sector companies and state bodies with responsibility for skills to change thinking about and engagement structures with university learning. Employers and professional bodies co-develop learning outcomes and validate relevance for skills shortages and emerging occupations.

Collaboration occurs through **working groups** on policy, quality, technology, and employer engagement. A **project Steering Group** and Enterprise Advisory Group guides system-level coherence and ensures that institutional practice aligns with national strategy. Consulted stakeholders confirmed that having “the voice of business at the centre of everything we were doing” represented in the Enterprise Advisory Group was a game changer for the project. Labour-market intelligence is further supported by collaboration with Ireland’s Expert Group on Future Skills Needs, whose sectoral studies help to inform the design of new micro-credentials. In addition, within the sector in Ireland there is:

- **Quality and Qualifications Ireland (QQI):** Ensures quality assurance policy and alignment with NFQ level descriptors and credit conventions at a national level in Ireland.
- **National Forum for the Enhancement of Teaching and Learning (NFETL):** Supports pedagogical and curriculum design innovation.

11.5 Framework, implementation, and supporting structures

11.5.1 National MicroCreds Framework

The MicroCreds initiative provides Ireland’s first **nationally coordinated micro-credential framework**, defining what constitutes a micro-credential and how it integrates into the NFQ. Each micro-credential is a stand-alone, credit-bearing learning unit between 1 and 30 ECTS credits, designed to validate specific skills and learning outcomes that may stack toward larger awards.

The framework is built on four pillars:

1. **Quality and standards:** All micro-credentials are quality assured by the university under standard quality assurance policies as Designated Award Bodies ensuring consistency with higher-education quality norms.

2. **Credit and level definition:** Every credential carries ECTS credit and is aligned to NFQ level, ensuring comparability and transferability.
3. **Recognition and stackability:** Micro-credentials may in some pre-defined pathways stack horizontally (specialisation) or vertically (progression) toward major awards.
4. **Employer engagement:** Each credential must demonstrate labour-market relevance through consultation or co-development with industry partners.

The framework promotes transparency, learner mobility, and lifelong learning through modular credential design.

11.5.2 Governance and collaboration structures

MicroCreds is managed through a **national coordination office** within the IUA, supported by institutional project teams at each participating university. The IUA coordinates national communication, framework updates, and digital infrastructure development. Regular consultations with state agencies and advisory groups (e.g. National Skills Council, Expert Group on Future Skills Needs, Enterprise Ireland and Skillnet Ireland) help maintain alignment with labour-market priorities. Table 1 below summarises the main components of this governance model.

Table 1. Governance structure and roles within the MicroCreds initiative

Body	Primary focus	Key functions and activities
Irish Universities Association (IUA)	Strategic project leadership	National co-ordination, policy dialogue, national promotion and awareness
HEA	Funding and monitoring	Oversees HCI Pillar 3 implementation
Partner Universities	Design, Accreditation and delivery	Develop and accredit micro-credentials within shared guidelines, enterprise collaboration
Employers / professional bodies	Labour-market validation	Input on design, relevance, and awareness of micro-credentials

Source: IUA, 2024

11.5.3 Micro-credential design and implementation

MicroCreds defines design principles to ensure transparency, portability, and employer recognition. To be included under the MicroCreds brand, each micro-credential demonstrates a clear element of enterprise engagement, either in its design or delivery. Table 2 presents the key design dimensions and characteristics.

Table 2. Design dimensions and characteristics of micro-credentials

Design dimension	Description
Credential type	Credit-bearing learning units (1–30 ECTS) linked to NFQ levels 6–9.
Delivery mode	Flexible (online, blended, or in-person) to suit working learners.
Workload / duration	From several hours to two semesters, proportionate to awarded ECTS.
Learning outcomes	Developed with employer input; aligned with occupational and academic frameworks.

Quality assurance	Quality assured under university policy and standard as Designated Awarding Bodies, informed by national policy.
Prerequisites	Entry requires for all courses but generally open-entry, with recognition of prior learning (RPL) where relevant.
Stackability and recognition	Micro-credentials can stack through pre-defined pathways, work on-going on national stacking framework.
Recognition type	Nationally and internationally recognised credentials under ECTS and aligned to the NFQ

In practice, the vast majority (around 80-90%) of micro-credentials are delivered online, with blended formats mainly used where laboratory or practical work is essential (e.g. engineering, science) and a small number delivered fully in-person in specialised fields such as medicine. This flexibility supports working learners while preserving high-quality, practice-based experiences where required. Assessment has been adapted to make learning immediately applicable in the workplace. Consulted stakeholders highlighted that many assignments are designed so that “learners work on projects they can take back to their company, such as developing a sustainability strategy for their organisation”.

Box 1. Example of a micro-credential under the Irish MicroCreds framework

Sustainability and the Circular Economy (University College Dublin)

This 5 ECTS Level 8 micro-credential equips learners with knowledge of circular-economy principles and sustainable business models. Developed with Enterprise Ireland and IBEC, it aligns with national green-skills priorities. Learning outcomes include:

1. Understanding circular-economy frameworks and their policy context.
2. Applying sustainable-design and resource-efficiency principles.
3. Evaluating corporate sustainability practices.
4. Delivery is online and asynchronous, enabling flexible participation for professionals.
5. The credential can stack toward UCD’s Postgraduate Certificate in Sustainability.

Source: MicroCreds, 2024

11.6 Digital infrastructure and tools

Digital interoperability is central to the MicroCreds strategy. The IUA and partner universities developed a **national micro-credential platform** integrating course listings, metadata, and learner records. Key digital components include:

- **National micro-credential portal:** A searchable database (www.microcreds.ie) listing all accredited micro-credentials with NFQ aligned level, ECTS, learning outcomes, and delivery mode.
- **Metadata standards:** Adoption of the **Credential Transparency Description Language (CTDL)** to ensure alignment with the **European Digital Credentials Infrastructure (EDCI)**.

- **Digital badging:** Various forms across partner universities

Table 3. Core components of the digital infrastructure underpinning MicroCreds

Digital element	Description and function
Metadata and interoperability	Common data standards (CTDL) for national and EU-level exchange.
Registry and dashboard	Aggregated information on all university micro-credentials via MicroCreds.ie.
Digital badges	Portable and verifiable credentials for learners and employers.
Learner wallet integration	Compatibility with Europass and EDCI for EU-wide recognition.
Data governance	Compliance with GDPR and QQI digital-trust principles.

Source: IUA & QQI, 2024

11.7 Alignment with European frameworks

MicroCreds is fully aligned with EU instruments supporting micro-credentials and lifelong learning.

- **Council Recommendation on Micro-credentials (2022):** The Irish framework directly references its definition and principles.
- **European Qualifications Framework (EQF):** NFQ levels 6–9 correspond to EQF 5–8, enabling cross-border comparability.
- **ECTS and Europass:** Each micro-credential carries ECTS credits and metadata compatible with Europass Learning Model standards.
- **European Digital Credentials Infrastructure (EDCI):** Ireland’s adoption of CTDL ensures technical alignment with EU interoperability guidelines.

Through these mechanisms, MicroCreds positions Ireland as one of the most advanced EU Member States in integrating micro-credentials within national higher education systems.

11.8 Outcomes and impact

By 2024, all eight partner universities actively offered accredited micro-credentials under the national framework. Consulted stakeholders reported that “just over 600 micro-credentials” had been developed across the eight universities and that funding reports estimate “around 20,000 learners” will have engaged with micro-credentials by the end of the project. Provision covers priority areas such as digital transformation, sustainability, leadership, health innovation and transversal competences.

There is a mix of public micro-credentials, openly advertised on MicroCreds.ie, and closed-cohort programmes co-developed with specific companies over two- to three-year partnerships. According to stakeholders, transversal skills micro-credentials in areas such as communication, business and digitalisation are among the most popular, attracting learners from multiple sectors.

Early evaluation results show:

- Increased participation of **adult learners** and professionals seeking upskilling opportunities with 20,000 learners projected to completed micro-credentials by March 2026.
- Enhanced **university–employer collaboration**, leading to more responsive curriculum design with approximately 600 micro-credentials on offer.
- Improved **institutional awareness and quality consistency** across universities.
- Emerging **recognition by employers**, particularly in ICT, engineering, and healthcare sectors.

MicroCreds has strengthened Ireland’s position as a European frontrunner in micro-credential implementation.

11.9 Sustainability and scalability

MicroCreds sustainability relies on embedding micro-credentials within university governance and funding structures. The initiative has benefited from a secured budget of €14.3 million under the Human Capital Initiative, which enabled national coordination, platform development, and institutional capacity-building. Scalability is supported through:

- Shared national frameworks and QA standards.
- Ongoing employer partnerships.
- Integration with lifelong learning policies and NFQ structures.

With the current MicroCreds project due to finish in March 2026 work is at an advantaged stage to move the MicroCreds.ie to a new national home which will allow for additional universities to join the platform. Existing partner universities continue to mainstream micro-credentials into their core university functions for longevity.

11.10 Challenges and opportunities

Challenges	Opportunities
Ensuring financial sustainability beyond initial HEA funding.	Embedding micro-credentials within university funding models and quality processes.
Achieving consistent employer recognition across all sectors.	Deepening employer validation through partnerships with sectoral skills bodies.

11.11 References

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