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Platform for Electrification Skills & Competences

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P4ELECS WP8
Co-creating Skills Ecosystems

System Mapping Results from Italy

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GLOSSARY

BB Building Block
Piece of educational material, consisting of elements (reader, PowerPoint presentation, video, exercises, self-assessment with answer keys, …) related to a particular question or topic.

BBP Building Block Platform
BBP is hosted by Xdemia

CDIO Conceive, Design, Implement, Operate.
Based on the CDIO initiative of MIT

ECOSYSTEMS CONSTRUCTS AND ROLES

Adner 2017 introduced the structural view of the ecosystem, with the following main features:

- Anchored in a value proposition : The value proposition, not a firm or a platform, sets the ecosystem's boundaries. Different value propositions imply different ecosystems, even with overlapping actors.
- Multilateral: The relationships cannot be reduced to a sum of bilateral ties. Success depends on several partners aligning at the same time, including partners with no direct contract with the focal firm.
- Alignment structure: The analytical focus is on whether partners agree on, and accept, their roles and the flows between them.

The consequences for the relevant characteristics to be observed are:

- Supply chains and value chains: Ecosystems include actors and links outside the focal firm's direct transactions, beyond linear and bilateral view of the chains.
- Platforms and multisided markets: A platform is one possible way to organize an ecosystem, not the ecosystem itself.
- Networks and alliances: The ecosystem-as-structure view focuses on the configuration of activities a value proposition needs.
- Business models: The ecosystem view puts the multilateral context that a business model depends on in the foreground, beyond the single value creation and capture logic.

As far as roles, the roles' analysis in this study have been based on Jacobides et al. 2018 2024, in order to contribute to the analysis on why actors take certain roles and what holds the roles together. Roles definition are the following:

- Orchestrator (hub firm, platform owner or sponsor): Designs the architecture, sets the rules, aligns members
- Complementors : provide co-specialized components, products or services that add to the joint value proposition
- End Users, costumers : Consume, and often assemble, the joint offer
- Suppliers : Provide inputs without ecosystem-specific investment

HEI Higher Education Institutes

INNOVATION ECOSYSTEM
A dynamic, interconnected network of diverse actors and resources that collaborate to drive innovation and create value, a system where innovation is not just a solitary act but a collective, collaborative process.

MATURITY LEVELS (Moore 1996+ Jutting 2024):

1. birth- emergence of the ecosystem: definition of value proposition among partners, identification of stakeholders. Problem definition, collaboration design, resources definition
2. expansion: value proposition capture value for a large number of stakeholders and make possible the concept scaling up to broader or new markets. needs perspectives, solution components identification, additional knowledge
3. authorities: value adding components and processes are stable and leaders set direction for partners to work together. Implementation capacity, dissemination, political regulation
4. renewal: new ideas and new innovations. Ecosystem value proposition refinement, foresight, impact evaluation

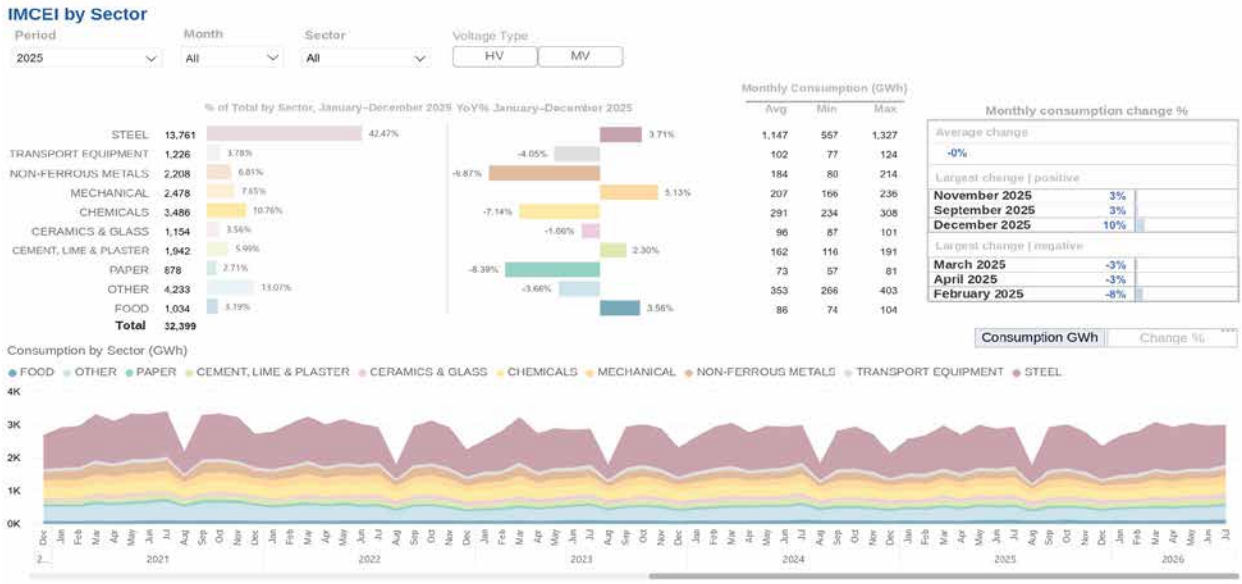
SESCO	Skills Ecosystem Coordinator Individual supporting the establishment of a skills ecosystem, a collaboration between education, government, industry and research to support learners and employees in acquiring requested skills (skills intelligence) and competences.
SKILLS ECOSYSTEM	a network of interconnected actors—including education providers, industry, policymakers, and civil society—that collaborates to ensure people acquire relevant skills in an evolving labour market
SPIDER	CDIO map that contains BBs relevant to the topic of the spider
SPIDERCO	Spider coordinator Individual responsible for the content and quality of a spider
VET	Vocational Education and Training

ECOSYSTEM REPORT ITALY

1.1 Context

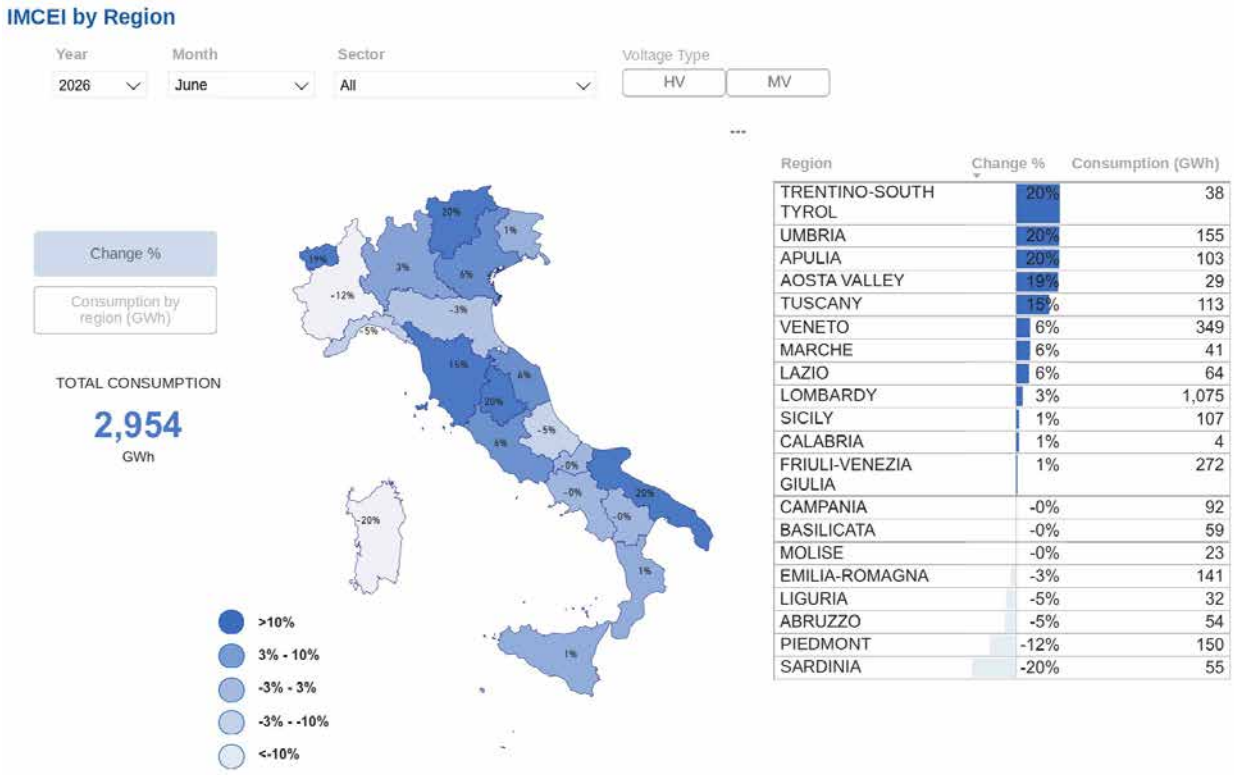
Italy's electrification skills ecosystem is developing within a national context shaped by energy transition targets, industrial restructuring, and uneven territorial capabilities. In 2024, 49% of Italy's electricity was generated from low-carbon sources, while fossil fuels still accounted for 51%, indicating that the transition is advancing, but remains structurally incomplete. At the same time, Italy aims to reach 69% renewable electricity by 2030, a target that raises the need for stronger technical, managerial, and vocational capabilities across energy, mobility, and industrial value chains.

In term of consumption, ENEA's *Analisi trimestrale del sistema energetico italiano* repeatedly reports stagnation of consumption electrification and a transition already off the PNIEC trajectory. Terna, Italy's exclusive high-voltage electricity transmission system operator (TSO), who manages roughly 98% of the country's national power grid, issues the IMCEI index elucidating sectoral industrial electricity consumption for ~1,000 energy-intensive firms.
The latest results per industry are the following:



Source: Terna (2026)

The consumption evolution is also analyzed depending on the yearly regional consumption variation:



Region	Change %	Consumption (GWh)
TRENTINO-SOUTH TYROL	20%	38
UMBRIA	20%	155
APULIA	20%	103
AOSTA VALLEY	19%	29
TUSCANY	15%	113
VENETO	6%	349
MARCHE	6%	41
LAZIO	6%	64
LOMBARDY	3%	1,075
SICILY	1%	107
CALABRIA	1%	4
FRIULI-VENEZIA GIULIA	1%	272
CAMPANIA	-0%	92
BASILICATA	-0%	59
MOLISE	-0%	23
EMILIA-ROMAGNA	-3%	141
LIGURIA	-5%	32
ABRUZZO	-5%	54
PIEDMONT	-12%	150
SARDINIA	-20%	55

Source: Terna (2026)

While industrial consumption of electricity decreased over the years, the consumption from the service sector evolved in the opposite direction, specifically in sellable services and with an evenn regional distribution, as reported by the analysis 2000-2020 provided by Terna. The term sellable solutions is related to design, engineering, deplpyment and maintenance of infrastructure.

The Italian electrification ecosystem must be understood against the backdrop of rapid change in both energy and mobility. In the passenger-car market, Italy registered 1,525,722 new passenger cars in 2025; battery electric vehicles reached 94,230 units, up 46.1% year on year, while BEVs and PHEVs together accounted for 12.7% of total registrations.

PwC Strategy& analyzed Italy's top 350 suppliers and found about 38% focused on internal combustion powertrain components, needing to rethink their value proposition.
Motus-E's “Rapporto sulle trasformazioni dell'ecosistema automotive italiano” (Report on Italian automotive eco-system transformation) built a firm-level risk indicator across the sub-supply-chains and projected that EU employment in firms working exclusively on combustion engines would fall ~42% by 2030 while others grow 10%, but because few Italian employees sit in wholly ICE-dedicated firms, the net Italian employment effect could be positive at +6%.

Public charging infrastructure also continued to expand, with more than 70,000 public charging points reported nationwide by the end of 2025.

This mobility transition is accompanied by significant change in the electricity system. Italy's largest source of clean electricity in 2024 remained hydro at 19%, while wind and solar together provided 22% of generation; overall, low-carbon electricity reached 49%. Looking at system dynamics, renewable sources covered 49.5% of electricity demand in April 2026, and solar generation exceeded 5 billion kWh in that month alone, rising 23.7% versus April 2025. These trends reinforce the strategic importance of workforce capabilities linked not only to electric vehicles, but also to solar deployment, grid integration, power electronics, storage, thermal management, and digital operation of assets.

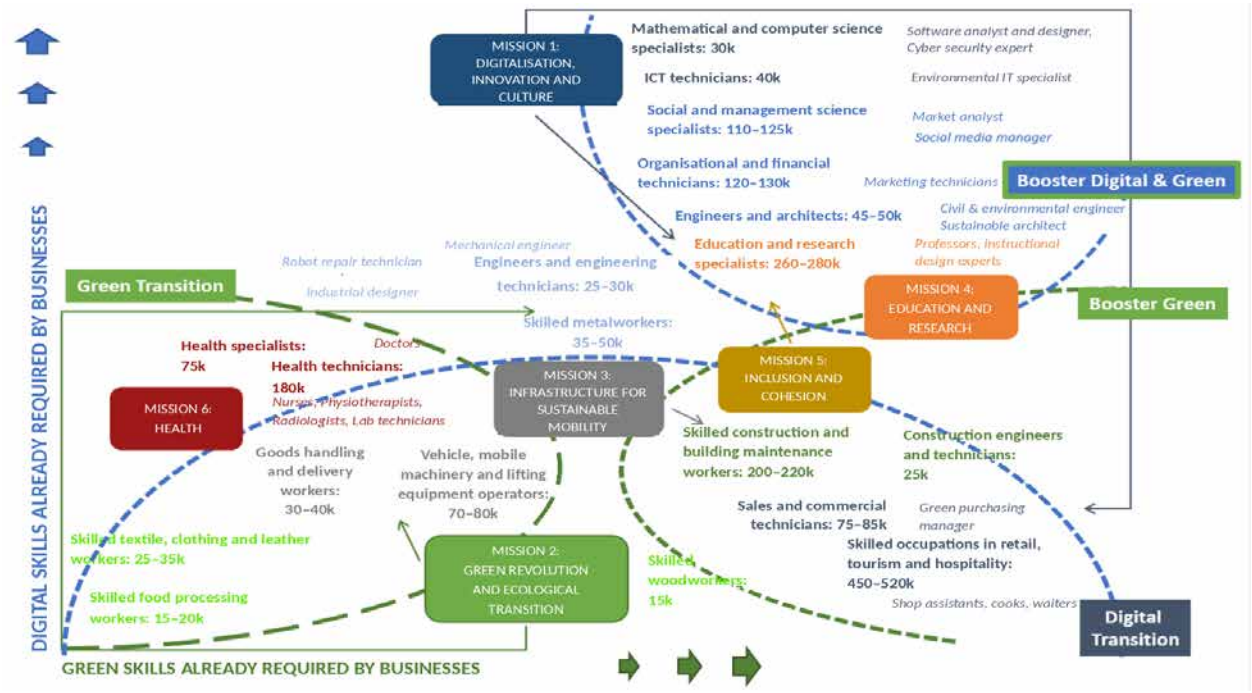
Labour-market evidence confirms the scale of the challenge. Cedefop's 2025 forecast expects Italy's employment to continue growing more slowly than in the pre-pandemic period, increasing the importance of productivity and skills quality rather than simple labour expansion. At the same time, Italian reporting on green employment indicates that demand for workers with green skills could reach 4 million in the 2025-2029 period, equal to around two-thirds of overall

labour demand, with particularly strong need for technical profiles linked to energy efficiency, renewable energy, and circular-economy activities.

According to the Unioncamere jobs forecast for 2022-2026, to achieve the green transition, Italy needs specific professions. These include, for example, sustainable architects; designers of sustainable building components and structures; installers of low-environmental-impact air-conditioning systems in the construction sector; and specialists in technologies for electric motors and/or their components in the mechanical engineering sector. In addition, other green jobs that cut across different sectors are likely to become increasingly strategic within organisations. These include environmental IT specialists, who will be responsible for developing software and applications focused on environmental issues; environmental lawyers; mobility managers; energy managers; eco-designers; experts in Life Cycle Assessment, green procurement specialists; and environmental marketing specialists, as environmental considerations are becoming increasingly important in consumers' purchasing decisions.

Nevertheless, potential shortages are emerging in the supply of graduates in STEM fields, healthcare and medicine, and economics and business. Unioncamere estimates also point to a significant mismatch in vocational education and training (VET), with the overall supply of training programs able to meet only around 60% of potential demand. The situation is particularly critical in mechanical engineering, energy engineering, logistics, and construction.

The emerging needs per industrial sector are indicated in the following image:



Source: Unioncamere 2022

The electrification skills ecosystem in Italy exhibits a regionally anchored structure with distributed roles, moderate flexibility constrained by funding flows, and a mix of tight regulatory links alongside loosen collaborations.

This ecosystem leans flexible regionally, (coop variety, territorial aid) but rigid via the centrality of the power distribution actor, regulatory locks, and funding filters that constrain resources. Funding organizes vertically (EU-national-regional-municipal) with associations as gatekeepers, enabling tenders but risking unevenness (Piemonte vs. Emilia Romagna/Puglia).
The vertical funding structure described by interviewees mirrors the architecture of Italy's National Recovery and Resilience Plan (PNRR), where Mission 4 channels EU Next Generation EU resources for skills through national ministries down to regional and territorial implementers.

Italy's wider energy-transition policy for 2025–2027 sets seven priorities — including industrial decarbonisation, electrification of transport, and acceleration of PNIEC/PNRR implementation — with €31.47 billion allocated to ecological transition and €1.97 billion to the REPowerEU chapter.

This vertical, mission-based funding logic helps explain the unevenness across regions that interviewees flagged: territorial and university research highlights that Italian regional productivity and innovation gaps are strongly associated with the historical concentration of human capital, R&D infrastructure and university-industry collaboration in the north of the country.

Italy's national digital strategy, "Italia Digitale 2026," embedded in the PNRR, and the National AI Strategy (2022–2024) developed by the Ministry of Enterprises and Made in Italy, provide the policy scaffolding within which electrification-specific digital skills (grid digitalization, smart monitoring, predictive maintenance) are expected to develop, even though they are not sector-specific.

Italy nonetheless lags the EU average on basic digital skills coverage (45.8% versus an EU average of 55.6%) and on the share of ICT specialists in employment, a structural digital-skills deficit that compounds the electrification-specific gaps reported by stakeholders.

As highlighted in IEA 2025 report on World Energy employment, in Italy there are initiatives to cover specific needs in practical skills. The national grid operator Enel has introduced initiatives that connect schools with small and medium-sized enterprises (SMEs) to equip students with skills that reflect evolving industry needs and improve alignment with future workforce requirements. Its "Energie per la Scuola" initiative, launched in 2022, works with vocational schools to prepare students for entry-level positions in the electricity sector.

Through the program, Enel partnered with 127 schools and 70 companies, reaching an estimated 10,000 students through career-oriented events. Approximately 1,700 of these students subsequently completed training courses and were hired by Enel's suppliers. Participating companies contribute by providing practical, hands-on training at their facilities, enabling students to gain direct industry experience. These partnerships bring schools, utilities, and suppliers together to address skills shortages and facilitate the transition from education to employment. They are also often linked to public procurement processes, helping ensure that local training programs are aligned with forthcoming infrastructure projects and associated workforce needs.

1.2 Opportunities

The analysis of the collected data elucidates that values centered on climate action enablement, organizational relevance, and regional value creation, driving participation in the electrification skills ecosystem through empowerment and continuity. The values interviewed stakeholders highlighted are the following:

- Regional Value creation in term of human resources: upskilling/reskilling not limited to funding use and tech testing, but also to increase lifelong learning, research-to-pedagogy transfer, and territory links.
- Regional Value creation in term of region contribution to national goals: emphasize scientific/technical excellence, innovation, industry/public engagement.

The above elements contribute to the structure of the electrification skills ecosystems, as activities like pedagogy transfer links academy and industry positions, and complementarities could foster flexible regional cooperation toward electrification.

- Network continuity value for services: in order to foster the evolution of electrification in territories, value is generated by specialist services in the local territory, currently ensured by the presence of dedicated associations (as local energy associations), which complement the ambition of major national service providers actors, as power distribution actors. Strengthening the articulation among typologies of services is an opportunity.

- Network continuity value for policy implementation legitimacy and efficacy: actors in the network can increase the policy implementation rate, as values defined at regional levels and linked to short-term projects can be translated into long term results overcoming fragmented national ties.

- Collaboration in innovation across actors through the competence centers and the digital innovation hubs

- Strong Industry-Academic links in regions where there is a history of collaboration among research lab and specific local industries.

1.3 Needs

At national level, recent Italian labour-market analysis based on MIMIT, AGID, ACN, Istat, Confindustria and Unioncamere's Excelsior survey data identifies green energy and sustainability engineering, and advanced manufacturing/Industry 4.0, among the ten most in-demand skill areas for 2025–2026, alongside persistent shortages in digital and cybersecurity profiles that compound electrification-specific shortages.

Cedefop's earlier European Green Deal scenario work similarly found that employment effects of the green transition concentrate in sectors such as extraction, construction and electrical-equipment manufacturing, with a need for accelerated up- and re-skilling and occupational mobility support — directly echoing the field interviews' emphasis on "intermediate post-Master levels" and cross-sector mobility.

The main needs to support the energy transition in Italy expressed by the first round of interviews of stakeholders in the electrification skills ecosystem revolve around five main areas: skills development and experiential learning, collaborative networks and governance, regulatory agility and enabler roles, funding flexibility and involvement, and strategic communication and awareness. These needs reflect tensions between rigid public structures and demands for flexible, practical alignment to drive systemic change.

Stakeholders in the electrification skills ecosystem express needs clustered into four main categories: skills pipeline development, collaborative infrastructure, funding access and stability, and regulatory/territorial alignment. These needs drive participation by addressing gaps in talent, coordination, resources, and contextual fit within the regional structure.

Stakeholders in the electrification skills ecosystem articulate diverse needs clustered into five key categories:

1. Skill development & experiential learning needs

Dominant need: bridging academia-industry gaps through practical, systemic training rather than siloed or fashionable programs.

- Interdisciplinary, experiential activities (stages, testing, train-the-trainer), scenario-based learning, and wide exposure to avoid specialization silos; skills for cross-audience dialogue (engineers to citizens)
- Practical tools over research software, empirical stages, intermediate post-Master levels between PhD and operations, English courses for international students, and training in regions lacking skilled manpower

2. Collaborative networks and Governance Needs

Stakeholders seek expanded, structured relationships with clear roles to foster trust and innovation beyond big firms.

- Long- term partnerships, university-firm ties in product development, transnational leadership, innovation cluster dialogue, geographically diffused training, and new collaboration typologies (e.g. energy communities).
- Agile governance free from bureocracy, shared KPIs/responsibilities, networks generating tools/resources, and fertile grounds for human resources via multi-agent relationships (individuals, associations).

3. Regulatory agility & enabler needs

Expressed needs are focused on regulators and public institutions acting as facilitators rather than barriers, with faster adaptation to emerging technologies.

- Flexible regulations for external teachers, shorter course approval cycles, adequate rules for new tech/entities, direct national regulator links, and public coordination of energy efficacy to enable private dynamism.
- Region -specific policies abandoning assistance-driven attitudes, updated power/gas regulations, and enablers for academia-practitioner contamination.

4. Funding flexibility and Involvement Needs

Stakeholders expressed the need of more adaptive resource flows and voice in allocation to match real needs.

- Flexible time/budget in public projects, firm involvement in regional funding decisions, shared design of training projects, and support for high cost R&D via category associations.
- Increased regional/national instruments linked to local competence networks, balancing power asymmetries in funding distribution.

5. Strategic communication & Awareness Needs.

Interviewed stakeholders expressed the need of a cross-cutting activity, aimed at emphasizes narrative and behavioral change to build motivation and trust among stakeholders. This could be concretized in:

- Constructive storytelling on electrification vision, EU regulation consequences, social impacts/compensations; countering fake news via science vulgarisation.
- Motivating youth through visible individual contributions, awareness of territorial/societal needs (e.g., agriculture generational gaps), national strategies signaling belief in new tech, and coordinated Young Energy Ambassadors.

Cluster of needs	Core needs	Theoretical link	Flexibility driver
Skills development	Experiential, systemic training	Activities/actors for deployment value proposition	Flexible links vs. academic silos
Collaboration	Long-term networks, agile governance	Lead complementor complementarities	Modular regional expansion
Regulatory agility	Fast adaptation, bureocracy burden reduction, enabler roles	Hub facilitation	Rigid regulations block links
Funding flexibility	Fast adaptation, enabler roles	Resource-controlled positions	Tender dynamism needed
Communication	Adaptive allocation, firm voice	Resource-controlled positions	Flexible behavioural change

These needs' clusters reveal a push for flexible structures (experiential activities, networks) against rigid hubs (regulations, funding), with communication as a lever for the orchestration of the ecosystem.

1.4 Main roles in the ecosystem with functions

Ecosystem roles in the electrification skills interviews reveal a distributed, multi-level structure with regional anchors (e.g., Region office for energy management, municipalities administration) and interstitial intermediaries (e.g., technology parks, local energy associations), rather than singular hubs, emphasizing activities like training deployment and feedback loop.
Structure analysis (following Adner, 2017)
Data analysis elucidates a value proposition around transforming public funding into industry competences, with clear activities but contested positions and links.
Activities: Orientation/motivation (regional school bureaux), PhD pre-recruiting, course updating (track coordinators), training design/deployment (technology Parks, companies, learners), technology transfer (Competence Centers), and policy translation (Regions via PNRR). Key gap: innovative methodologies for critical systems electrification (engines/storage).

Actors & Positions: Upstream knowledge shapers (Universities, high schools); downstream deployers (production firms, Iren as service provider, solid battery manufacturers); interstitial bridgers (technology parks for stages/jobs, local energy

associations for resilience incentives, regional banks/foundations); public enablers (EC Horizon, Ministero Ambiente, Regions, municipalities). Media shapes societal positioning indirectly.

Links: Feedback loops (companies/learners to designers), collaboration mandates (regional funding rules), networked systems (local energy agencies-Ministry), and evolving ties (energy communities potentially replacing public roles). Misalignments persist in transparency for end-users and silo-breaking.

Roles analysis (following Jacobides *et al*.,2018, 2024)

Roles cluster around contested orchestration (no dominant hub like the power distribution actor), with lead complementors driving practical alignment and generics filling support functions.

Orchestrator/Hub functions: Regions as rule-setters (mandatory collaboration via funding), EC Horizon structuring disconnected actors, Competence Centers (via the role of funding at regional level, multiple partner POC project coordinator via tech transfer), Iren via technical centrality, and emerging potentials (energy communities, foundations for social goals). Track coordinators and top management (translating values to competences) exercise localized orchestration. Regionally resilient but fragmented nationally, the Italian ecosystem lacks clear platform orchestrator, aligning with distributed leadership findings.
Lead complementors: Industrial research centers (PhD funding/pre-recruiting), technology park (bridging ITS/stages/jobs), Competence Centers (tech transfer), and production firms (technical competence decisions). These co-shape training via tight complementarities with academia, providing feedback and practical pull.
Generic complementors: Regional school offices (orientation), media (opinion-driving), learners (feedback), Young Ambassadors (challenges), municipalities/small villages (implementation), and one-stop-shops (building requalification). These conform to upstream rules but enable broader diffusion.

Regional mandates enforce flexible collaboration (breaking silos), but misaligned messaging and opaque role descriptions create rigidity. Intermediaries like technology park/energy local associations fill gaps in deployment links, supporting distributed roles, where value emerges from feedback-structured complementarities rather than centralized control.

Role tensions & Flexibility: The ecosystem shows rigid regulatory/funding positions constraining flexible activities (experiential deployment). Needs for "agile governance," "shorter approval cycles," and "flexible regulations" reveal contested orchestration—academy seeks lead complementor status, firms demand clearer positions, and regulators default to generic gatekeeping.

Concrete actions toward experiential deployment has been given through PNRR Mission 4, Component 1, Investment 1.5, as the Italian government has committed roughly €500 million to upgrade ITS Academy laboratories with 4.0 technologies, explicitly tied to the Transizione 4.0 and Energia 4.0 transformation processes that electrification training depends on.

A further €130 million tranche, signed in 2025, was earmarked specifically to strengthen ITS Academy laboratories, framed by the Ministry of Education and Merit as an investment in “technical training of excellence” for employment and growth — reinforcing the academia-industry bridging function the field interviews describe as currently fragmented and informal.

Nevertheless, the elucidated configuration has positive outcomes, as it allows differentiated regional pathways, reflects local industrial specialization, and creates multiple points of entry for innovation projects. Yet the same structure can also inhibit system learning. Where links depend excessively on specific calls, temporary project funding, or interpersonal trust, the ecosystem becomes discontinuous. This means that capabilities are built episodically rather than cumulatively, and training initiatives risk ending when the funding cycle closes rather than evolving into stable institutional practices.

1.5 Challenges

The main challenges emerging for the electrification sector and, in particular, the training of its workforce in Italy revolve around five clusters that are strongly aligned with, but also extend, current discussions on electrification and energy management (skills, governance, social acceptance, system integration, etc.).

The clusters are the following:

1.Human capital, skills, and pedagogy

Data analysis elucidated that there is in Italy a structural misfit between required competences for electrification/digital transition and how people are educated, recruited, and socialized into work.

- Shortage of adequately trained employees;
- doubts about validity/seriousness of available workforce;
- difficulty in recruiting for “dirty” sectors (e.g. waste management) although the jobs are not “dirty”
- How to increase practical, hands-on training (energy storage, maintenance, AI effective use depending on the goal, digital skills) versus overly theoretical curricula
- How to transfer project results (with students, universities) back into firm pedagogy and regional/national industrial practices
- Generational renewal: onboarding, transfer of tacit know-how, motivating young people to explore, tolerate ambiguity, and develop holistic understanding of sectors instead of expecting pre-analyzed problems and ready-made answers.
- Territorial mismatch: people are trained in one region but jobs are in another; challenges attracting them back or keeping them.

Skills gap in clean energy transitions is well covered by scientific literature, but data from P4Elecs stresses the micro-pedagogical level (problem-framing culture, curiosity, holistic vision) and the dirty-work stigma, which are less present in standard energy-management.

This diagnosis is consistent with sector evidence from renewable and electrification markets. Italy's renewable system is expanding in ways that require installation, maintenance, digital monitoring, grid coordination, and customer-facing advisory capabilities, not only high-level engineering design. In mobility, the continued growth of EV registrations and charging infrastructure implies increasing demand for technicians, planners, software-enabled maintenance roles, energy managers, infrastructure specialists, and professionals able to integrate vehicle, grid, and building perspectives. The training profile eqf5 might be reinforced from a institutional perspective.

The challenge is therefore qualitative as much as quantitative. Training systems must produce individuals who can move across interfaces: engineering and operations, education and deployment, local policy and technical implementation, innovation and communication. This is especially relevant in Italy, where industrial ecosystems are territorially varied and where small and medium-sized enterprises often need adaptable profiles rather than narrowly specialised ones.

2.Interdisciplinarity and cross-actor dialogue

Data show a fragmentation between disciplines, departments, and organizations hampers coordinated electrification strategies. Challenges are expressed in term of:

- understanding problems from multiple disciplinary perspectives and to talk across technical/non-technical departments in organizations
- increasing collaborations across academic institutions, fostering national level academic strategies to overcome regional competitions, and increasing cross-school and cross-discipline initiatives;
- training the employees in dialogue across and beyond organizational silos
- harmonizing and integrating industrial, academic and social systems awareness and priorities through the actions of intermediate actors such as stakeholders’ associations.

1. Motivation and social perception

Societal and cultural factors contribute to shape (cognitively, psychologically and emotionally) who selects, enters and stays in electrification-related careers and territories, while a big threat is coming from lower natality shrinking the pool of future students. Main challenges are expressed in term of:

- Broadening the representations of technical jobs and of electrification sectors to contribute to the evolution of the desirability perception of the jobs, addressing students and society at large (families).

- Evolving the connections between high schools and university for more effective “advanced” recruiting processes
- Deepening the relationships of local training actors with local industrial needs in order to transform the local job market into a visible and desirable one.

2. Organizational capacity and innovation culture

Analysis of data highlighted that organizations struggle in allocating people, time and attention to collaboration around electrification. This has also organizational design roots, which impact the trajectory of innovation for the ecosystem. Main challenges are:

- To allocate resources to projects coherently with projects’ needs and with employees’ workload including training time,
- To foster organizational cultures that support curiosity on how the broader context evolves toward a shared holistic sector vision (actors, history, resources, bottlenecks)
- To create design situations to support dialogue between firms and employees’ innovative ideas across-firms

3. Governance, regulation and multi-level coordination

From stakeholders at different geographical scales, a clear challenge to incentives effective deployment toward electrification is a diffused mis-alignment. Governing multi-level network of stakeholders is a complex task, while struggling with operational mechanisms, legal frameworks and competing positioning among stakeholders. Main challenges are:

- the missing synchronization across initiatives and international and national political calendars.
- the missing harmonization among European regulations and projects implementation across countries
- the lack of opportunities to transfer to EU consultations the tacit/hidden knowledge locally created
- the lack of local/national actors to deal with legal configurations (ex: foundations) that would be an enabler of social value generation and transfer to local actors
- the harmonization and integration of municipal interests, and consequently actions.
- the lack of transparency of decision-making priorities across levels
- the lack of established mechanisms to ensure that strongest actors regularly collect incentives
- the lack of extra- public tender aids to sustain the engagement and initiatives of local communities (ex energy communities), which rely on non-refundable public aids.
- the lack of simple financial-reporting instruments to link performance in electrification innovation initiatives and skills increase at local level with the local municipality financial results.
- the lack of vision in balancing the social aims of public regulators and the action of electrification deployment of large industrial groups
- the missing scaling (from regional to national) of some pilot initiatives as they fall between national public priorities and private firms interests

As a secondary data complement to the above elements on coordination challenge, Terna reported over 300 GW of grid-connection requests from more than 6,000 projects as of late 2024, alongside the launch of a centralized digital “Permitting” portal intended to shorten authorization timelines — a concrete illustration of the multi-level coordination bottleneck stakeholders describe.

At the European level, the Pact for Skills estimated that roughly 800,000 workers across the battery value chain alone would need to be re-skilled or up-skilled by 2025, prompting the European Commission and EIT InnoEnergy to launch the European Battery Academy with a €10 million REACT-EU grant in 2022.

By 2025–26 the European Battery Alliance Academy reported having trained over 100,000 learners, and in 2024 the Automotive Skills Alliance and the European Battery Alliance Academy formalized a partnership to create a single pan-European framework connecting industry, education providers, regions and policymakers across the mobility and battery value chain — a model of cross-level orchestration that Italian stakeholders say is currently missing domestically.

These EU-level mechanisms offer a partial answer to the “missing orchestrator” gap identified in the field interviews, but their effectiveness in Italy depends on the same vertical funding and regulatory channels (national ministries, Regions, Competence Centers, ITS Academy) that stakeholders already describe as slow and fragmented.

Italy does not lack commitment to electrification, nor does it lack pockets of excellence. What it lacks is a sufficiently integrated skills ecosystem capable of transforming dispersed initiatives into a cumulative national advantage. The underlying problem is therefore one of coordination architecture: how to align funding, regulation, education, industrial demand, and territorial development so that capability formation becomes continuous rather than episodic.

Based on the above analysis, six main challenges emerge as a priority to be addressed at ecosystem level:

1. How might we improve multi-level coordination for better deployment of regulation from EU -> national -> region -> local municipalities?
2. How might we identify areas of rigidity in the electrification ecosystem to improve the processes and structures for experiential learning pathways?
3. How might we redesign funding flows structures to achieve long term, trust-based partnerships across the ecosystem?
4. How might we foster a common vocabulary and integrated culture to achieve interdisciplinary learning across the electrification ecosystem?
5. How might we create new learning pathways across EQF to build practice and theoretical understanding for on-site fluency?
6. How might we build a different narrative around the electrification sector to attract a new talent pipeline and change the social perception problem?

1.6 Research methodology

Data from the field:
Collection: interviewed people (8) were informed of the scope of the interviews and agreed upon.
Typologies of interviewees: Industry representative, Academic representative, Power generation manager, Regional public authority, Power distribution manager, Building management manager, Public Private partnership manager, Energy Management Association manager.

Transcript of interviews: data have been pseudonymized, complying with Article 4(5) of Regulation (EU) 2016/679 (General Data Protection Regulation, GDPR)

Methodology: coding - Di Gioia framework- 1st order code to be enriched with further interviews and a second analysis round.

1.7 Main references

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