


RESEARCH **OUTPUT**



STUDENTENERGY



**Building the
Clean Energy
Workforce of
Tomorrow:**

**Global Best
Practices for
Attracting
Youth to the
Clean Energy
Workforce**

EMPOWERING PEOPLE INITIATIVE (EPI)

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Executive Summary

The global clean energy transition is well underway and already generating a huge demand for skilled workers across renewable energy generation, energy efficiency, grid modernization, clean fuels, battery supply chains and critical minerals, and other sub-sectors. The International Energy Agency (IEA) estimates that the global energy workforce increased to 76 million workers in 2024, growing at nearly twice the pace of overall global employment, and that an additional USD \$2.6 billion per year is needed to train new qualified workers and prevent the energy sector skills gap from widening by 2030.¹ An IEA Future of Energy Skills Workshop, funded by the European Commission for the Clean Energy Ministerial's Empowering People Initiative (CEM EPI) in March 2026, underscored that “the energy transition is a skills transition,” with the growing skills bottleneck widely observed by policymakers, industry and trade unions, education, and civil society.² This is also corroborated by annual data in the IEA's World Energy Employment report.

There is a cost to not acting on this skills gap. As an example of just one clean energy sector, WindEurope's 2025 Workforce Report identifies critical shortfalls in technicians and engineers needed before 2030 and warns that “without serious workforce planning on par with infrastructure and permitting, the sector risks falling behind on its [wind expansion] ambitions.” The report notes that eight out of 10 of the most critical roles facing a shortage rely on vocational education and training (VET) pathways.³ Similarly, the Global Wind Energy Council (GWEC) estimates that the industry will need more than 628,000 skilled wind technicians by 2030.

Every year, millions of young people enter a labour market that is continuously being reshaped by the energy transition, often without the necessary training, networks, or financial support they need to join the clean energy workforce. At the same time, energy sector employers and governments are clearly facing a growing workforce shortage. Many governments, industry actors, and other organizations in the energy sector are actively addressing this issue through workforce development and training programs. This report maps 14 such programs across 10 countries, to attempt to draw out what works, for whom, and why.

The goal of this research compendium is to identify the primary characteristics that define effective programs for bringing young people into the clean energy workforce, and to highlight gaps and opportunities for improved design and implementation of these programs. This research is intended to support policy and program implementers reaching and supporting young people to enter and stay in the clean energy sector, as regions around the world experience transitions to low or zero carbon sectors.



The International Energy Agency (IEA) estimates that in 2024 the global energy workforce grew to **76 million workers**



Key Findings and Recommendations

Across the 14 programs analyzed, six patterns are described here as key findings.

What the evidence shows:

Employer financial co-investment is the strongest predictor of participant outcomes.

The clearest evidence comes from the United Kingdom's Skills Bootcamps, where participants whose training was co-funded by an employer achieved a positive outcome rate (defined in this case as receiving a job offer, promotion, or new workplace responsibilities) more than double that of independently-funded participants: 66% versus 31%. This gap held regardless of the learner's background. The same pattern appears in Australia's New Energy Apprenticeships Program (NEAP), which required employers to register formally as apprenticeship sponsors and saw an 85% retention rate, the strongest published retention figure in this compendium. South Africa's Quality Council for Trades and Occupations (QCTO) program makes employer contribution a licensing condition rather than a voluntary choice, producing near-guaranteed placement outcomes. Employers who have a financial stake in a program have a structural reason to follow through on hiring.

Recommendation 1. Require employer co-investment as a structural program condition, not an optional tier. The evidence consistently shows that financial co-investment predicts placement outcomes; the programs that treat it as mandatory produce better results than those that treat it as a bonus.

Nationally recognized qualifications and structural employment pathways are distinct features, and both matter.

Programs that are co-designed with industry tend to produce graduates with skills that employers recognize and value. However, co-design

alone is not sufficient as the credential also needs to be nationally or internationally recognized for a worker to carry it beyond any single employer. A program can't have one without the other. The stronger finding is about what happens after training: programs with a structural commitment to hire that are built into procurement conditions, licensing obligations, or formal internship covenants consistently outperform programs that train graduates and then rely on employers to voluntarily follow through. Voluntary follow-through fails not because of poor intent, but because there is no structural obligation once the training cost has been paid. The mechanism matters as much as the intent.

Recommendation 2. Co-design programs with industry and align credentials to national qualifications frameworks. Employer involvement at the curriculum design stage (not just at the hiring stage) produces graduates whose skills are recognized. Credentials should be portable across employers and jurisdictions, not locked to any single program or placement.

Where procurement or licensing mechanisms exist, attach training obligations to them. Programs embedded in regulatory conditions produce more durable employer engagement than those dependent on voluntary participation or annual budget renewals. The Renewable Energy Skills Partnership also recommends enabling cross-border recognition of qualifications to support workforce mobility across jurisdictions.⁵



Equity outcomes follow integration into program design, not only eligibility. Data on equity outcomes remains thin despite serious representation issues across the sector. A program that is open to everyone is not the same as a program designed for anyone in particular. Programs that embed equity into their incentive structures through tiered subsidy rates for underrepresented hires, mandatory requirements on host employers, or procurement-linked diversity obligations seem to reach more underrepresented youth than programs that rely on broad eligibility alone. Women currently account for less than one-third of the clean energy workforce and only around one-fifth of workers in trades and VET roles⁶, which are also the exact roles growing fastest in the sector. The evidence on equity outcomes across the programs in this study is the thinnest in the dataset, which makes a stronger data collection standard a practical, as well as a principled, priority.

Recommendation 3. Embed equity targets into program design and funding conditions, and collect disaggregated data. Broad eligibility is not equity by design. Disaggregated data collection by gender, ethnicity, and geography should be a funding condition, not an optional add-on.

Short-cycle and long-duration models serve different segments of the labour market and should not be compared according to the same metrics. Bootcamp-style programs can reach work-adjacent young people who need rapid credentials to enter or move within the sector. Apprenticeship and internship models are better suited to first-time entrants to trades pathways. Neither substitutes for the other. The Renewable Energy Skills Partnership has independently identified incentivizing apprenticeships for new trade entrants as a priority recommendation for clean energy workforce development, consistent with the evidence in this compendium.⁵

Recommendation 4. Offer both short-cycle and long-duration pathways, calibrated to the demographic profile and labour market structure of the jurisdiction, rather than designed as universal models.



Cost per placement is not interpretable without outcome data, and most programs do not publish it.

Public cost per placement across the programs in this study range significantly and are not comparable without knowing what outcomes they produced and over what time period. Nine of the 14 programs do not publish standardized post-placement outcome data. This is the most significant gap in the evidence base. It means that for the majority of programs in this study, it is not possible to determine whether the investment is producing durable careers or cycling youth through short-term placements.

Recommendation 5. Establish a minimum reporting standard for post-placement outcomes, including disaggregated equity data. A shared minimum standard across CEM member governments which includes completion rate, equity mechanisms and outcomes, three-month job offer rate, and 6-to-12-month retention rate would enable the cross-country learning this field currently lacks and make cost-effectiveness comparisons meaningful for the first time.

2. About This Research

Context

This compendium was developed under the CEM EPI, co-led by the Government of Canada and the European Commission, to identify and share evidence-based approaches to workforce development in the clean energy transition. The research was led by Student Energy, with input from CEM member government officials, NGO and IGO partners, and youth and employer participants from across the case study programs.

This work was funded by the Government of Canada through Natural Resources Canada (NRCan), as part of broader efforts to support workforce development, sustainable jobs, and a people-centred clean energy transition.

Scope and Definitions

Youth are defined in this report as individuals ages 18 to 30. As programs that support youth participation in the clean energy workforce often need to start engaging young people under the age of 18, we have included several programs who target youth outside of this range. Where programs include younger participants (15+) or have no upper age limit, this is noted in the relevant case study.

The **clean energy workforce** is defined broadly to include roles that directly contribute to sustainable energy transitions. These sub-sectors broadly comprise renewable energy generation, energy efficiency, grid modernization, clean fuels, battery supply chains and critical minerals, as well as other connected sectors.

Programs were included if they were launched or updated since 2020, and if they met the following inclusion criteria: (a) youth-targeted or youth-inclusive workforce programming; (b) tangible work-based learning or wage/apprenticeship supports; (c) energy transition relevance; (d) credible delivery by a public agency, recognized NGO, or industry body; and (e) active or evaluated since 2020.

Programs were excluded if they were primarily awareness campaigns with no work or skills outcomes, were general industrial policy without a youth/workforce mechanism, or lacked public documentation.



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Glossary of Acronyms

The following acronyms are used throughout this report and are spelled out on first use in each section. A consolidated reference is provided here for ease of reading.

ACE Network — Apprenticeships in Clean Energy Network (IREC, USA)

B-BBEE — Broad-Based Black Economic Empowerment (South Africa)

BIBB — Federal Institute for Vocational Education and Training (Bundesinstitut für Berufsbildung, Germany)

BMWK — Federal Ministry for Economic Affairs and Climate Action (Bundesministerium für Wirtschaft und Klimaschutz, Germany)

CEDEFOP — European Centre for the Development of Vocational Training

CEM — Clean Energy Ministerial

DfE — Department for Education (United Kingdom)

ECCC — Environment and Climate Change Canada

EIT — European Institute of Innovation and Technology

EPI — Empowering People Initiative (Clean Energy Ministerial)

ESDM — Ministry of Energy and Mineral Resources (Indonesia: Kementerian Energi dan Sumber Daya Mineral)

EUD — Erhvervsuddannelse (Danish upper-secondary vocational education and training pathway)

GWO — Global Wind Organisation

IBEKA — People-Centered Business and Economic Institute (Indonesia: Institut Bisnis dan Ekonomi Kerakyatan)

ICE — Indigenous Clean Energy (Canada)

IEA — International Energy Agency

ILO — International Labour Organization

IMF — International Monetary Fund

IREC — Interstate Renewable Energy Council (USA)

MBO — Middelbaar beroepsonderwijs (Dutch intermediate vocational education, approximately equivalent to upper-secondary VET)

NEAP — New Energy Apprenticeships Program (Australia, closed July 2025; succeeded by KAP)

NRCan — Natural Resources Canada

OECD — Organisation for Economic Co-operation and Development

OEM — Original Equipment Manufacturer

QCTO — Quality Council for Trades and Occupations (South Africa)

REIPPPP — Renewable Energy Independent Power Producer Procurement Programme (South Africa)

SCGJ — Skill Council for Green Jobs (India)

STIP — Science and Technology Internship Program (Canada)

TPaaS — Talent Pipeline as a Service (InnoEnergy proprietary product name)

UNDP — United Nations Development Programme

VET — Vocational Education and Training

YCCBC — Youth Climate Corps British Columbia

Note: Full details of the research methodology, including desk review scope, interview protocol, and indicator extraction framework, are provided in Appendix A



Case Studies Examined

This report presents case study snapshots for 14 programs: four from Canada, six from Europe (EU-level and national initiatives from Germany, Denmark, the UK, and the Netherlands), and five from Australia, India, South Africa, Indonesia, and the United States.

#	Program	Country
1	Science Horizons Youth Internships	Canada
2	Science and Technology Internship Program (STIP) — Green Jobs	Canada
3	Indigenous Clean Energy (ICE) — Generation Power	Canada
4	Youth Climate Corps BC (YCCBC)	Canada
5	InnoEnergy — Skills & Early Career	European Union
6	Greening Apprenticeships	Germany
7	Wind and Electrification VET Pathways	Denmark
8	Skills Bootcamps — Green Skills	United Kingdom
9	New Energy Apprenticeships Program (NEAP)	Australia
10	Skill Council for Green Jobs	India
11	Wind Turbine Service Technician (QCTO)	South Africa
12	Patriot Energi	Indonesia
13	Scalda WindDock / NedZero T-shore Offshore Wind VET	The Netherlands
14	IREC / ACE Network — Clean Energy Registered Apprenticeships	United States



3.Literature review: Why youth workforce inclusion in clean energy matters

The 14 case study snapshots in this compendium reflect what could be documented and compared from publicly available sources. A larger set of programs was reviewed, but not included, most because they lacked a youth or youth-inclusive focus, verifiable program data, or were no longer active since 2020. This section situates the case studies within the broader literature on green jobs, workforce transition, future skills, and other kinds of policies and public or private sector initiatives that aim to develop the future clean energy workforce.

Defining ‘green’ or ‘clean energy’ jobs

Though several have been proposed, there is no universally agreed upon definition of a green job, which may influence how clean energy workforce programs are designed. The International Labour Organization’s (ILO) Green Jobs Initiative defined green jobs as those that reduce environmental impact while providing decent work.⁷ The European Skills, Competences, and Occupations (ESCO) taxonomy used by the European Commission takes a skills-based approach, classifying jobs by whether the tasks they involve reduce environmental harm.⁸ The O*NET taxonomy maintained by the United States’ Department of Labor to classify over 1,000 occupations defines occupations as green based on whether green economy activities and technologies create any new occupations, increase in demand for existing occupations, or change their required skills.⁹

These frameworks were largely developed in advanced economic contexts, and the ILO has noted explicitly that they do not transfer automatically to developing country contexts. In its Practitioner’s Guide to Assessing Green Jobs Potential in Developing Countries, the ILO notes that green employment in lower-income economies includes a much broader range of manual, informal, and elementary occupations (e.g., rural electrification work, waste recovery, sustainable agriculture, etc.) These may fall outside the



The IEA estimates that an additional USD 2.6 billion per year is needed to train qualified workers in the global energy industry and prevent the skills gap from widening by 2030

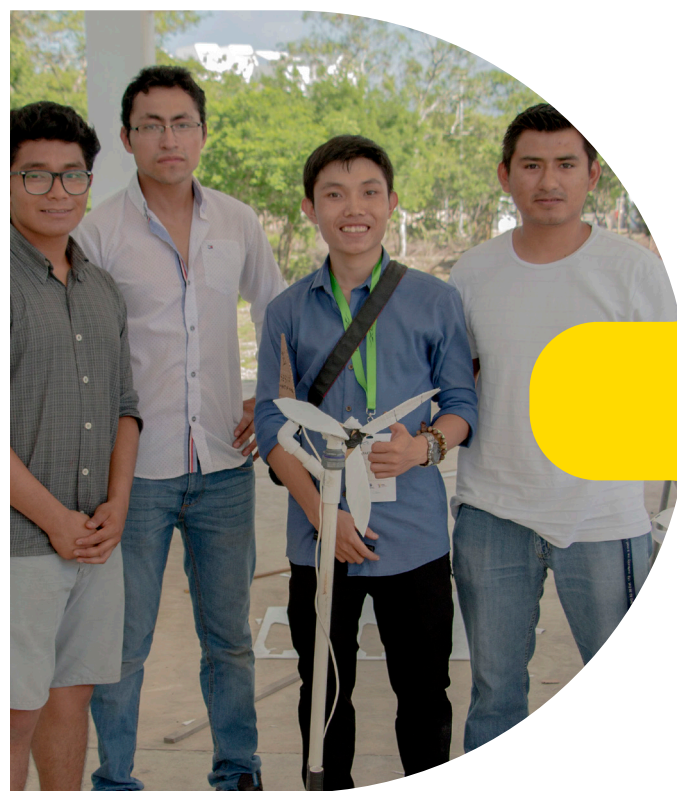


formal sector taxonomies that governments build.¹⁰ The consequence of this may be visible in the data: while green jobs in advanced economies tend to cluster at the high end of the qualifications/education spectrum, the International Monetary Fund (IMF) (2024) finds they are distributed more evenly across education levels in emerging markets and low-income countries, because so much of the relevant work happens in informal and semi-formal settings.¹¹

The way green jobs are defined also raises the question of whether job quality is part of the definition of a green job, and whether supply chain also influences whether a job can be considered green.¹² The ILO and Bohnenberger¹³ both include job quality as part of their definition (i.e., a green job that pays poverty wages or involves unsafe conditions is not a fully green job). The Organisation for Economic Co-operation and Development (OECD) Employment Outlook 2024 claims that while high-skill green-driven jobs typically pay above-average wages, low-skilled green-driven jobs tend to have worse job quality than other low-skilled jobs, including lower wages and less labour market security, which is likely to be prohibitive for young people who are most in need of a pathway to enter the clean energy workforce and who highlight job quality as a priority.¹⁴ It also means that not all clean energy credentials are sector-exclusive, as many of the most in-demand skills may be transferable across sectors, which can both support worker resilience and complicate sector-specific pipeline planning.

THE SCALE OF THE GAP AND WHO IS MISSING FROM IT

The demand for workers with green skills is growing faster than supply across all major economies. Between 2022 and 2023, job postings requiring at least one green skill increased by 22%, while the share of workers acquiring green skills grew by only 12%.¹⁵ In the energy sector specifically, the IEA estimates that the global energy workforce reached 76 million workers in 2024, growing at nearly twice the pace of overall global employment. Power sector jobs are increasing the fastest of all. The IEA further predicts that an additional USD \$2.6 billion per year is needed to train qualified workers and prevent the skills gap from widening by 2030, an investment representing less than 0.1% of total global spending on education.¹ As underscored at the IEA Future of Energy Skills Workshop in March 2026, the energy transition is fundamentally a skills transition,² and its growing bottleneck is regularly corroborated by annual data in the IEA's World Energy Employment reports.



Student Energy Archive

The definition gap noted above has a practical skills consequence. A global review published jointly by the ILO and the European Centre for the Development

of Vocational Training (CEDEFOP) found a consistent gap between the skills required for green sector jobs and what national VET institutions were providing, documented across 21 countries.¹⁶ The effect is visible in individual cases: when Kenya built its largest wind farm, 80% of the technicians needed were recruited internationally because domestic training had not anticipated the demand—a capacity and planning gap.¹⁷



The programs in this compendium are, among other things, attempts to close that kind of gap before it opens.

The gender distribution of the skills gap is a structural concern that remains largely unaddressed in most of the programs reviewed here. The green talent pool is currently 66% male and 33% female.¹⁵ An International Monetary Fund (IMF) Staff Discussion Note finds that while green jobs carry a wage premium for both men and women, the premium for women is higher (12% versus 7% for men), suggesting that women's labour supply is not meeting demand, even where financial incentives exist.¹¹ The same analysis finds that economies with more equal treatment of women are better placed to transition faster and at a lower cost, with climate policies in more gender-inclusive

economies associated with emission reductions two to four percentage points larger than in less inclusive ones. The business case for gender equity in clean energy workforce programs is not separate from the transition case; they are the same case.

The ILO estimates that two in three young people globally are worried about losing their jobs in a changing economic environment, and that one in three live in countries that are off track of their national targets to achieve SDG 8.6: “substantially reduce the proportion of youth not in employment, education or training”.¹⁸ The ILO's 2025 analysis finds that while employment gains from the green and digital transitions will extend across age groups, women are projected to acquire a smaller share of additional job creation than men.¹⁹ At the same time, 68% of energy-focused university degrees globally still focus on fossil fuels, with only 32% on renewables. This is not a temporary lag: at current rates of change, renewable energy degrees will not overtake fossil fuel degrees at universities worldwide until 2107, according to a 2024 analysis by Vakulchuk and Overland of 18,400 universities in 196 countries.²⁰ The implication is that a large share of young people who study energy at university are being trained for a sector that is contracting, while the sector that is growing is struggling to attract them.

ARE SKILLS THE PRIMARY POLICY LEVER TO SUPPORT YOUTH ENTERING THE CLEAN ENERGY WORKFORCE?

Most government employment strategies focus heavily on skills as the primary policy lever: upskilling, reskilling, curriculum reform, and qualification frameworks. The TransEuroWorks report notes that knowing which sectors will undergo a green transition doesn't necessarily indicate how many jobs will actually be created, or whether skilled workers will be able to find them.¹² As additional validation to this point, in Student Energy's Energy Transition Skills Project report, young people highlighted lack of awareness or exposure to clean energy jobs as the largest barrier, ranking above even access to the necessary training to obtain them.²¹ This was also independently corroborated at the IEA

Future of Energy Skills Workshop, where industry representatives consistently identified awareness of what and where jobs are as the biggest gap for youth.²

According to the Beyond Reskilling report, this pattern is also clearly evident in fossil fuel transition contexts in Germany, Canada, and the United States.²² Workers who complete retraining programs regularly find no jobs waiting for them, not because the training was poor, but because no one secured the demand side from the employer first. The report also highlights that most current energy transition policies treat the shift as a linear economic and workforce problem of retraining and compensation, rather than a complex transformation that also threatens workers' sense of identity, community structure, and purpose that was captured in their work. Programs that treat this as a purely economic problem tend to see poor uptake, even when they are well-funded and technically well-designed. The implication for clean energy workforce programs is that financial support and good curriculum design are necessary, but not sufficient, particularly in communities where working in clean energy does not yet carry the same cultural weight as the industry it is replacing. The programs in this compendium that produce the strongest published employment outcomes—Canada's Science and Technology Internship Program (STIP) — Green

Jobs, Australia's NEAP, and the Netherlands' Scalda WindDock / NedZero T-shore Offshore Wind VET—are those where employer demand was built into the mechanism before training began. Denmark's Wind and Electrification VET Pathways and the Interstate Renewable Energy Council's (IREC) Apprenticeships in Clean Energy (ACE) Network in the United States demonstrate that structural guarantees of placement (a guaranteed paid apprenticeship at an industry partner and Inflation Reduction Act-mandated apprenticeship registration, respectively) produce strong structural pathways, even where post-completion outcome data is not yet available. The IEA's three-part framework from the Future of Energy Skills Workshop in March 2026—collaboration between stakeholders, well-designed and accessible training, and quality jobs—aligns with this finding.²

Portugal's Employment and Vocational Training Institute (IEFP) Green Skills and Jobs Program, reviewed in Section 5.6 of this report, built in a concrete demand-side condition: if a company trained an unemployed person, it had to employ them within 12 months. However, the OECD notes it reached 12,100 workers in 2023 against a target of 35,000 and found a significant gap in provision for high-skilled workers.²³ Both findings are likely common across CEM member jurisdictions.



4. Case Study Snapshots

The 14 case study snapshots in this section are presented in a standardized format to enable cross-program comparison. Each snapshot includes a program overview table, a feature grid, a data gaps note, a key observation, and, where available, participant testimonials. A short introductory paragraph for each program explains what it is and why it was selected.

Program Features Grid: The feature grid in each snapshot assesses the program against eight design features identified in the research literature as characteristics that are correlated with stronger outcomes for youth workforce programs: (1) wage subsidy or stipend, (2) employer co-investment (financial), (3) employer co-designed curriculum, (4) equity target or designated cohort, (5) wrap-around supports, (6) formal or recognised certification, (7) procurement or regulatory mandate, and (8) post-placement outcome tracking.

Each feature is assessed as **YES** (clearly present and documented), **PARTIAL** (present in design but inconsistently implemented across delivery agents, limited to certain sub-programs, or partially evidenced in available public data), or **NO** (not present or not documented in available sources). A cross-case summary of all 14 programs against all 8 features appears in Section 5 (Discussion and Analysis).



14

case study snapshots



Student Energy Archive



PART 1

4.01 Science Horizons Youth Internships – Clean Technology (Canada)²⁴

Science Horizons connects young people in Canada with paid internships in clean technology and environmental organizations, covering up to 80% of wages for youth and prioritizing underrepresented groups. The program has placed over 1,300 young people in clean energy roles since 2023, with four in five

participants going on to secure full-time employment in the sector. At the time of this report's release, Science Horizons is not currently active, though the Government of Canada's Youth Employment and Skills Strategy (YESS) continues under Employment and Social Development of Canada (ESDC).

CANADA | ENVIRONMENT AND CLIMATE CHANGE CANADA (ECCC) MODEL: WAGE-SUBSIDIZED PAID INTERNSHIP

Sectors: Clean technology, energy efficiency, renewables, environmental STEM

Age eligibility

15–30

years old (varies by delivery agent; core youth target is 18–30)

Duration

4–12

months, full-time

Stipend / wage support

Up to \$25,000 wage subsidy (50% standard; 80% for equity-deserving youth). Up to \$5,000 additional for training and wrap-around supports.

Wrap-around supports

Barrier funds for transport, childcare, PPE, certifications, adaptive technology, remote work. Delivered flexibly through delivery agents (ECO Canada, Clean Foundation, CIGan, BioTalent Canada).

Equity targets

Explicit targets for women, Indigenous youth, persons with disabilities, racialized groups, newcomers. Higher subsidy rate (80%) tied to equity group status.

Certification

No standardized national credential; sector-specific credentials may be funded via the CAD \$5,000 training allowance.

Employer involvement

Employers must create new, full-time, permanent positions and co-contribute a minimum 20% of salary. Delivery agents provide matching support and employer guidance.

Net zero alignment

Aligned to Canada's Federal Sustainable Development Strategy and Sustainable Jobs Act; supports clean technology and net-zero mandate.

Scale and Outcomes

~650 placements/year;

~1,300 over 2023–2025 cycle. 80% of participants secure full-time employment following placement; 80% remain in clean energy sector post-placement.

Public cost per placement

~\$25,000–\$30,000

(subsidy + wrap-around)



PART 2

4.01 Science Horizons Youth Internships – Clean Technology (Canada)²⁴CANADA | ENVIRONMENT AND CLIMATE CHANGE CANADA (ECCC)
MODEL: WAGE-SUBSIDIZED PAID INTERNSHIP

Sectors: Clean technology, energy efficiency, renewables, environmental STEM

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	NO
4. Equity target / designated cohort	YES
5. Wrap-around supports	YES
6. Formal / recognized certification	PARTIAL
7. Procurement or regulatory mandate	NO
8. Post-placement outcome tracking	PARTIAL

"I think the Science Horizons Program is an amazing opportunity allowing early career environmental professionals to take the first step into the green job market in Canada. It certainly allowed me to do so as a newcomer!"

Priscilla Costa dos Santos, Nature Canada

DATA GAPS

Post-placement retention rate not publicly aggregated. Age range varies by delivery agent; 15–30 lower bound confirmed by some delivery agents but 18–30 is the core CEM-relevant cohort.

KEY OBSERVATION

Canada's flagship clean-tech internship, operated by multiple delivery agents with a strong equity co-investment structure. The 80%/50% tiered wage subsidy is the most explicit equity pricing mechanism of any program in this study. It creates a direct financial incentive for employers to hire from underrepresented groups.

"This was a fantastic internship – truly unique in the support I was offered. I have never been a part of an internship where regular workshops were open for individuals from all over the country to join in and learn from one another."

Jennifer Woods, South Shore Watershed Association



PART 1

4.02 Science and Technology Internship Program (STIP) — Green Jobs (Canada)²⁵

STIP — Green Jobs is Canada’s national green jobs internship program, placing young people 15-30 years old in jobs with natural resources employers including clean energy organizations, for up to 12 months of paid work experience. Since 2020, the program has created

over 4,000 green jobs for youth across Canada, with a focus on reaching young people experiencing barriers to employment, including Indigenous youth, youth with disabilities, and youth from Northern and remote communities.

CANADA | NATURAL RESOURCES CANADA (NRCAN) MODEL: WAGE-SUBSIDIZED PAID INTERNSHIP

Sectors: Renewables, clean fuels, energy efficiency, clean mining

Age eligibility
15–30
years old

Duration
Placements of up to
12
months

Stipend / wage support
75%
wage subsidy up to ~CAD \$22,500 per year; up to CAD \$30,000 per year for youth experiencing barriers (Indigenous youth, youth with disabilities, and youth in Northern and remote communities)

Wrap-around supports

Enhanced subsidy cap for youth experiencing barriers to employment as a structural financial incentive for employers to provide higher wages or wrap-around supports.

Equity targets

Prioritizes 60% participation of youth from employment equity groups (women, Indigenous Peoples, persons with disabilities, and members of visible minority communities); no requirement for post-secondary education.

Certification

No standardized national credential.

Employer involvement

Employer-led placements with youth directly within host company throughout internship placement.

Net zero alignment

Strong alignment with Canada’s Sustainable Jobs approach and clean energy workforce priorities

DATA GAPS

Annual placement number isn’t disaggregated from NRCan’s broader sector council reporting, along with completion rate.

Scale and Outcomes

Program created
4,000 green jobs for youth
across Canada between 2020 and 2025; ~80% of youth transitioned into full-time employment following their internships.

Public cost per placement

~CAD 18,000
per placement;
~CAD 30,000 per
equity-deserving placement.



PART 2

4.02 Science and Technology Internship Program (STIP) — Green Jobs (Canada) ²⁵

CANADA | NATURAL RESOURCES CANADA (NRCAN)
MODEL: WAGE-SUBSIDIZED PAID INTERNSHIP

Sectors: Renewables, clean fuels, energy efficiency, clean mining

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	YES
5. Wrap-around supports	YES
6. Formal / recognized certification	NO
7. Procurement or regulatory mandate	NO
8. Post-placement outcome tracking	PARTIAL

+ PROGRAM FEEDBACK

“In 2019, after recognizing lower participation rates by Indigenous youth and youth with disabilities, STIP — Green Jobs conducted several rounds of youth engagement to better understand the experiences of young people in the workforce, in particular Indigenous youth. Through this engagement, NRCan heard that youth are facing: barriers to employment (e.g., education requirements and pressures to leave local community); and negative experiences in the workplace, including racism, tokenization, and bias. In response, STIP — Green Jobs made a series of program design changes, which have broadly increased participation of youth from employment equity groups, including increasing Indigenous youth from 5% in 2018-19 to 28% in 2024-25.”

KEY OBSERVATION

As a notable distinction among the case studies, STIP gives a stronger financial reason to hire diverse youth, as a design principle of the program.



PART 1

4.03 Indigenous Clean Energy (ICE) — Generation Power (Canada)²⁶

Generation Power is a youth fellowship program that connects Indigenous young people with paid placements in clean energy organizations, combining work experience with mentorship, cultural programming,

and community connections. This is one of the few programs in this report designed by and for Indigenous people, centering Indigenous self-determination and cultural safety into the program itself.

CANADA | NATURAL RESOURCES CANADA (NRCAN) MODEL: WAGE-SUBSIDIZED PAID INTERNSHIP

Renewables, community energy, energy leadership

Age eligibility
Indigenous youth
18–30
years old

Duration
4–12
months (placement-dependent)

Stipend / wage support
75%
wage subsidy up to ~CAD 30,000

Wrap-around supports

Culturally grounded mentorship, professional development, leadership and technical training for youth, and mandatory cultural competency training for host employers.

Net zero alignment

Supports Indigenous reconciliation and clean energy sovereignty; aligned to Canada's Indigenous clean energy priorities and community renewable energy sector pathways.

Equity targets

Targets Indigenous youth; program design explicitly addresses systemic barriers to participation in clean energy.

Certification

Internal professional development certification framework delivered by ICE.

Employer involvement

Placements hosted and facilitated by employers who are required to undergo structured equity training and capacity-building alongside youth participants.

DATA GAPS

Program-wide completion and employment conversion rates/retention unclear.

Scale and Outcomes

~40 placements

in program's first year (2021); ~50 supported in 2024

Public cost per placement

~CAD 30,000 to 32,000

per placement



PART 2

4.03 Indigenous Clean Energy (ICE) — Generation Power (Canada)²⁶CANADA | NATURAL RESOURCES CANADA (NRCAN)
MODEL: WAGE-SUBSIDIZED PAID INTERNSHIP

Renewables, community energy, energy leadership

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	YES
5. Wrap-around supports	YES
6. Formal / recognized certification	PARTIAL
7. Procurement or regulatory mandate	NO
8. Post-placement outcome tracking	NO



PROGRAM FEEDBACK

“One of the main goals of Generation Power was not only to find careers and positions for Indigenous youth to work in clean energy, but to find safe careers and positions . . . A lot of employers either have never hired Indigenous individuals, they just don’t know culture and practices. . . That’s where the equity training for

Alex Lemay, Generation Power Program Manager

KEY OBSERVATION

Mandatory employer cultural competency training places the accountability for a safe and respectful workplace with the host organization, as a notable design feature of this program. This is a structural shift that any program serving Indigenous youth, or youth from communities where cultural safety is a real retention risk, could incorporate. It requires employer willingness to be trained.



Student Energy Archive



PART 1

4.04 Youth Climate Corps (BC) (Canada)²⁷

The Youth Climate Corps BC deploys young people in paid climate-focused jobs in communities across British Columbia, where they lead locally relevant projects ranging from habitat restoration to energy

efficiency. The program is cohort-based and place-based, where youth work alongside peers in their own communities, supported by a living wage and coaching.

CANADA | GOVERNMENT OF BRITISH COLUMBIA & NGO PARTNERS MODEL: PAID, COMMUNITY-BASED CLIMATE CORPS PLACEMENTS

Sectors: Energy efficiency, local clean energy, climate infrastructure, ecosystem restoration, wildfire risk reduction

Age eligibility

17 to 30

years old

Duration

4 to 6

months (varies by regional program)

Stipend / wage support

Direct localized living wage paid to youth participants.

Wrap-around supports

Direct mentorship, training workshops and certifications, and place-based program design to reduce geographic barriers to participation.

Equity targets

Explicit targets for recruitment of women, Indigenous youth, newcomers, youth from rural and remote communities, and other equity-deserving groups.

Certification

No standardized credential scheme; some programs include general workplace certifications (e.g., grant writing, first aid, safety training).

Employer involvement

Programs developed in collaboration with municipalities community partners to address locally relevant climate goals.

Net zero alignment

Direct contributions to emissions reduction, energy efficiency, and local climate resilience, with alignment to provincial and national clean energy workforce goals through pathways into skilled trades.

Scale and Outcomes

35 youth placements

between April 2024 and March 2025 across six distinct programs;
150+ placements in BC total since 2020

Public cost per placement

Information not available.



4.04 Youth Climate Corps (BC) (Canada)²⁷

CANADA | GOVERNMENT OF BRITISH COLUMBIA & NGO PARTNERS MODEL: PAID, COMMUNITY-BASED CLIMATE CORPS PLACEMENTS

Sectors: Energy efficiency, local clean energy, climate infrastructure, ecosystem restoration, wildfire risk reduction

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	YES
5. Wrap-around supports	YES
6. Formal / recognized certification	PARTIAL
7. Procurement or regulatory mandate	NO
8. Post-placement outcome tracking	PARTIAL

DATA GAPS

Post-placement rates and participant metrics not available across programs. As this is an emerging program, the data may become more comparable as national expansion proceeds. Duration and certification to be confirmed via interview.



PROGRAM FEEDBACK

“The program has demonstrated a very high success rate, with close to 100% of participants completing the program. This success is driven by a combination of paid, hands-on training, a cohort-based model, and strong community integration. Between 2021 and 2025, we have delivered 25 programs across different regions, each composed of small cohorts of youth. These cohorts bring together emerging climate leaders within a community to carry out meaningful, locally relevant work. This structure enables youth to learn, contribute, and build connections while directly supporting climate action in their own communities.”

KEY OBSERVATION

This case study was selected because of its unique design. The place-based model where youth are deployed as paid climate service workers in rural, remote, and Indigenous communities as contributors rather than purely trainees is similar to Indonesia’s Patriot Energi program, but with an explicitly climate framing. The commitment to expand federally also signals government confidence in the model.



PART 1

4.05 InnoEnergy — Skills & Early Career (European Union)²⁸

InnoEnergy is a European Institute of Innovation and Technology program that connects post-secondary graduates with industry co-designed masters degrees and talent pipeline programs in batteries, hydrogen, renewables, and grid technologies. One example of

these talent pipeline programs discussed below is Ireland's Green Tech Skillnet. InnoEnergy boasts a self-reported employment rate of 94% within six months of graduation, one of the strongest outcomes featured in this report.

EUROPEAN UNION | EUROPEAN INSTITUTE OF INNOVATION AND TECHNOLOGY MODEL: TALENT PIPELINE, EDUCATION, AND CLEAN TECHNOLOGY WORKFORCE TRAINING

Sectors: Batteries, hydrogen, renewables, grids

Age eligibility

Post-secondary graduates and early-career professionals

~ **22–30**

years old

Duration

1 to 2 years

(Masters+, Talent Pipeline as a Service (TPaaS) program); year-long industry coaching component (Career Impact Program)

Stipend / wage support

Financial support varies by program and is not available publicly (scholarships, employer-paid placements, recruitment-linked employment).

Wrap-around supports

Coaching, mentorship, and professional development support

Equity targets

Noted 35% women participation in Masters+, though no formal equity targets

Certification

EU-recognized Master's degree (Masters+); specialized clean technology certifications

Employer involvement

Masters+ curricula co-designed with industry; employers leverage academy Skills Institute programs as bespoke recruitment engines; additional employer engagement in coaching and mentorship.

Net zero alignment

Strong alignment with the European Battery Alliance, European Green Deal, and battery, hydrogen, renewables, and grid sector workforce strategies.

Scale and Outcomes

2,000+

graduates of the Masters+ program (cumulative) with 94% employment rate within six months of graduation; 125,000+ additional workers upskilled via programming under the Skills Institute. 94% employment rate within 6 months of graduation, 77% placed within Europe.

Public cost per placement

Information not available.



PART 2

4.05 InnoEnergy — Skills & Early Career (European Union) ²⁸EUROPEAN UNION | EUROPEAN INSTITUTE OF INNOVATION AND TECHNOLOGY
MODEL: TALENT PIPELINE, EDUCATION, AND CLEAN TECHNOLOGY
WORKFORCE TRAINING

Sectors: Batteries, hydrogen, renewables, grids

Feature	Present?
1. Wage subsidy / stipend	PARTIAL
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	NO
5. Wrap-around supports	YES
6. Formal / recognized certification	YES
7. Procurement or regulatory mandate	NO
8. Post-placement outcome tracking	PARTIAL

KEY OBSERVATION

InnoEnergy's self-reported employment rate of 94% within six months of graduation (drawn from its 2024 Impact Report) would, if verifiable, represent the strongest headline outcome in this study. The mechanism behind this employment rate is that industry co-designs the curriculum, uses the program as its own talent pipeline, and has every incentive to hire graduates it helped train. InnoEnergy does not seem to have formal equity documented, and an older graduate cohort that sits at the edge of the 18 to 30 definition.

DATA GAPS

Limited program-specific data within the Skills Institute (across TPaaS, Green Talent Accelerator, Community Programs), including placement rates. Limited data regarding wage support for skills programs and bursary availability for Masters+ students. Lack of formal equity targets.

"The energy field is one of the most important in the world, and urban environments are the ones that struggle with energy the most. I'm excited to solve challenges that can have a direct, positive effect on people!"

Miguel Mosca, Masters+ Alumni and Vice President at European Youth Energy Network



PART 1

4.06 Greening Apprenticeships (Germany)²⁹

Integrated with Germany's dual-system apprenticeship model, one of the most established vocational training frameworks globally, was updated to embed clean energy competencies across its more than 325 nationally

recognized trade qualifications. This program represents a systems-wide curriculum reform impacting how thousands of young people in Germany train for trades in solar, heat pumps, hydrogen, and energy efficiency.

GREENING APPRENTICESHIPS — GERMANY [UNDER REVIEW]

GERMANY | BIBB / BMWK

MODEL: MODERNIZED DUAL-SYSTEM APPRENTICESHIPS WITH INTEGRATED CLEAN ENERGY COMPETENCIES

Age eligibility

Standard apprenticeship entry ages, typically

16–25

No strict upper age cap.

Duration

2–4

years (dual-system)

Stipend / wage support

Paid apprenticeship wage throughout (employer-paid, as per German dual system). No direct public stipend.

Wrap-around supports

Integrated into national dual-system infrastructure; employer provides on-the-job training component.

Equity targets

Not formally documented in available public sources.

Certification

Standard nationally recognized trade certifications with mandatorily integrated green competencies. Includes hydrogen systems (H2PRO project).

Employer involvement

Core of the dual-system: employers provide on-the-job training in solar, heat pumps, and hydrogen systems. BIBB and BMWK set curriculum integration frameworks.

Net zero alignment

Supports German Energiewende and climate targets. BMBF funds BIBB's H2PRO and BBNE greening VET projects.

Scale and Outcomes

387,700

total renewable energy workers in Germany (2022). Entire national VET pipeline — not a discrete cohort program.

Public cost per placement

Not disaggregated for green competency component.



4.06 Greening Apprenticeships (Germany)²⁹

GREENING APPRENTICESHIPS — GERMANY [UNDER REVIEW]

GERMANY | BIBB / BMWK

MODEL: MODERNIZED DUAL-SYSTEM APPRENTICESHIPS WITH INTEGRATED CLEAN ENERGY COMPETENCIES

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	NO
5. Wrap-around supports	PARTIAL
6. Formal / recognized certification	YES
7. Procurement or regulatory mandate	PARTIAL
8. Post-placement outcome tracking	PARTIAL

DATA GAPS

Youth placement number for green tracks not disaggregated from broader VET statistics. Because this is a system-level curriculum reform rather than a discrete program with cohorts or outcome reporting, some necessary data is not available: equity data, isolated cost per placement data, and participation numbers broken down by program.

KEY OBSERVATION

Germany's dual-system VET is a well known workforce development architecture with significant policy and industry support. The challenge for this study is that 'Greening Apprenticeships' is not a discrete program with an enrolment number, a budget estimation, or a set of published youth-specific outcomes. It is a curriculum reform applied across an entire national system.

PART 1

4.07 Wind and Electrification VET Pathways (Denmark)³⁰

Denmark's Wind Electrician pathway gives students a four-year vocational qualification with a guaranteed paid apprenticeship at one of the program's industry partners, including major operators like Ørsted, RWE, and Global Wind Service. The program was directly modelled on the Dutch Scalda/NedZero approach and is an example of how proven workforce development models can be adapted and transferred across borders.

WIND ELECTRICIAN VET PATHWAY — SKIVE COLLEGE / T-SHORE

DENMARK | MINISTRY OF CHILDREN AND EDUCATION + INDUSTRY PARTNERS (ØRSTED, RWE, SEMCO MARITIME, GLOBAL WIND SERVICE, SWIRE RENEWABLE ENERGY, KK WIND SOLUTIONS); SKIVE COLLEGE; T-SHORE COVE
MODEL: SPECIALIZED VET PATHWAY + GUARANTEED OEM PAID APPRENTICESHIPS

Sectors: Wind energy (onshore and offshore), electrification

Age eligibility

Standard EUD entry ages; average EUD student age

~24

European Centre for the Development of Vocational Training (Cedefop) Spotlight 2025). Youth-inclusive, not exclusively youth-targeted.

Duration

4-year

EUD (Erhvervsuddannelse) wind electrician pathway. Launched October 2025 at Skive College — no completion data available yet.

Stipend / wage support

During school phase (no apprenticeship contract): SU (Støtte til Uddannelse — state education maintenance grant) DKK 982–3,181/month (EUR 132–427). During main course (apprenticeship contract): DKK 9,500–12,500/month (EUR 1,275–1,678) — employer-paid. AUB (Arbejdsgivernes Uddannelsesbidrag — employers' reimbursement fund) covers wages during school periods.

Wrap-around supports

Guaranteed paid OEM apprenticeship placement eliminates placement uncertainty — the primary attrition driver in most VET systems. GWO Basic Safety Training (BST) + Basic Technical Training (BTT) included in program.

Equity targets

Not formally documented in available public sources.

Certification

Global Wind Organisation (GWO) internationally mandated certification; nationally recognized Danish EUD qualification. T-shore cross-border recognition across EU member states.

Employer involvement

Direct partnership with Ørsted, RWE, Semco Maritime, Global Wind Service, Swire Renewable Energy, KK Wind Solutions: guaranteed paid apprenticeships structured with industry. OEMs co-develop and deliver curriculum. GWS currently supporting 5 apprentices (January 2026).

Net zero alignment

Supports Denmark's offshore wind sector and national renewable energy targets. Integrated into T-shore European cross-border VET network and GWO certification framework. Inspired by Scalda/NedZero Dutch model via T-shore knowledge sharing.



PART 2

4.07 Wind and Electrification VET Pathways (Denmark)³⁰

WIND ELECTRICIAN VET PATHWAY — SKIVE COLLEGE / T-SHORE

DENMARK | MINISTRY OF CHILDREN AND EDUCATION + INDUSTRY PARTNERS (ØRSTED, RWE, SEMCO MARITIME, GLOBAL WIND SERVICE, SWIRE RENEWABLE ENERGY, KK WIND SOLUTIONS); SKIVE COLLEGE; T-SHORE COVE
MODEL: SPECIALIZED VET PATHWAY + GUARANTEED OEM PAID APPRENTICESHIPS

Sectors: Wind energy (onshore and offshore), electrification

Scale and Outcomes

National EUD scale via Skive College pilot, with T-shore network.

DKK 660M/year

committed from 2030 for national VET quality and attractiveness reform (current funding not yet at this level).

Public cost per placement

DKK 660M

/year system-level commitment (from 2030; not current). Per-placement cost not disaggregated.

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	NO
5. Wrap-around supports	YES
6. Formal / recognized certification	YES
7. Procurement or regulatory mandate	NO
8. Post-placement outcome tracking	NO

DATA GAPS

Program launched October 2025; no completion, labour market, or outcome data available yet. Annual youth cohort size not published yet. Equity data not published. First cohort completion is expected 2029.

KEY OBSERVATION

The wind electrician EUD pathway at Skive College launched in October 2025, so there is no completion data, no outcome data, and no first cohort yet. This case study was selected here due to its program design: students enter knowing they have a guaranteed paid apprenticeship with a named OEM partner. Placement uncertainty seems to drive attrition in other VET systems—but this is eliminated here from the start. This program is also included as an example of building on successful pilots and case studies (i.e., Skive College modelled its approach directly on the Scalda/NedZero program in the Netherlands, via the T-shore network).



PART 1

4.08 Skills Bootcamps – Green Skills Track (United Kingdom)³¹

The UK's Skills Bootcamps offer free, short-cycle training up to 16 weeks in green trades including heat pumps, solar photovoltaic (PV), retrofits, and electric vehicles, with a guaranteed employer interview on completion. The program reports a 35 percentage

point gap in positive outcomes between learners whose employer co-funded their training and those who enrolled independently, making this the clearest quantification of the impact of employer co-investment in this report.

SKILLS BOOTCAMPS — GREEN SKILLS TRACK

UNITED KINGDOM (ENGLAND) | DEPARTMENT FOR EDUCATION (DfE) MODEL: SHORT-CYCLE FREE TRAINING + EMPLOYER CO-FUNDING + GUARANTEED EMPLOYER INTERVIEW

Sectors: Retrofit, heat pumps, solar PV, EVs, green construction, electrification

Age eligibility

Adults

19+

(England). Note: 18-year-olds are explicitly excluded from Skills Bootcamps under DfE funding rules. Youth-accessible from age 19, not exclusively youth-targeted.

Duration

up to

16

weeks

Stipend / wage support

Free training for participants. No direct wage subsidy. Employer co-funding: ~30% of course cost for large employers, ~10% for SMEs.

Wrap-around supports

Guaranteed employer job interview on completion. Co-funded learners receive higher employer support during training.

Equity targets

Demographic data tracked and published by DfE (age, sex, prior qualification level, employer co-funding status). Gender and access gaps acknowledged in published evaluations — no formal equity targets in program design.

Certification

Level 2–5 competencies: residential retrofitting (Level 4–5), heat pump / solar PV / EV (Level 3), smart metering (Level 2). Sector-specific credentials vary by training provider.

Employer involvement

Employer co-funding required as core feature. Co-funded learners achieve 66% positive outcome rate (as % of completions) vs. 31% for independent unemployed learners, the strongest employer co-investment outcome signal in this study. Note: previously cited 78%/31% figures are from the Wave 3 (2022-23) evaluation; the 66%/31% figures are from 2023-24 official DfE statistics.

Net zero alignment

Core component of UK green skills strategy; aligned to net-zero 2050 and retrofit/ electrification targets. Named in Skills for Jobs white paper and Green Jobs Taskforce recommendations.



PART 2

4.08 Skills Bootcamps – Green Skills Track (United Kingdom) ³¹

SKILLS BOOTCAMPS — GREEN SKILLS TRACK

UNITED KINGDOM (ENGLAND) | DEPARTMENT FOR EDUCATION (DFE)
 MODEL: SHORT-CYCLE FREE TRAINING + EMPLOYER CO-FUNDING + GUARANTEED
 EMPLOYER INTERVIEW

Sectors: Clean technology, energy efficiency, renewables, environmental STEM

Scale and Outcomes

60,410 starts

starts in FY2023-24 (all sectors); 43,020 completions (71% completion rate); 47% positive outcome rate (as % of starts); 66% (as % of completions). £136M government funding for 2025–26 targeting 40,000+ learners.

Public cost per placement

~£3,400/learner

in public funding (£136M ÷ 40,000). Employer co-funding adds additional private investment.

Feature	Present?
1. Wage subsidy / stipend	NO
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	PARTIAL
5. Wrap-around supports	PARTIAL
6. Formal / recognized certification	YES
7. Procurement or regulatory mandate	NO
8. Post-placement outcome tracking	YES

“This Skills Bootcamp is certainly a value addition to those looking to augment their skills, start fresh, or want to learn and pursue a career in sustainability.”

[Investors in the Environment](#)

DATA GAPS

The program appears to have closed to new enrolments as of October 2025, and the future model under the UK government’s new skills strategy remains uncertain as of now. Gender and racial outcome gaps were noted in the DfE statistics, but unclear if program design changes were made to address this.



4.08 Skills Bootcamps – Green Skills Track (United Kingdom) ³¹

SKILLS BOOTCAMPS — GREEN SKILLS TRACK

UNITED KINGDOM (ENGLAND) | DEPARTMENT FOR EDUCATION (DFE)
 MODEL: SHORT-CYCLE FREE TRAINING + EMPLOYER CO-FUNDING + GUARANTEED
 EMPLOYER INTERVIEW

Sectors: Clean technology, energy efficiency, renewables, environmental STEM

“Great knowledgeable tutors and insightful variety of subjects covered. On day 1 I felt exactly in the right place, discussing and learning about sustainability with like-minded people and others eager to learn and do better to create a positive impact – tutors included! Very inspiring! I will do it all over again! Thank you!”

[Investors in the Environment](#)

KEY OBSERVATION

The most important number in this compendium may be a gap: 66% versus 31%. This is the difference in positive outcomes between Skills Bootcamp learners whose employer co-funded their training and those who enrolled independently. A similar pattern is visible in the design of Canadian, Australian, Danish, and Dutch programs in this study. At roughly £3,400 per learner in public funding, it is also a notably low-cost model, which is achieved by keeping the program short-cycle and offloading significant cost to employers. Three caveats: the 19-plus age minimum excludes the youngest adults; the program’s own data shows a 12-point gender gap and a 30-point racial equity gap in positive outcomes that have not been addressed through design changes; and the program appears to have closed to new enrolments as of October 2025.

“I highly recommend this course and the delivery organisations. The whole team really made this Skills Bootcamp very insightful, engaging, participative, and fun (which is a little difficult in a virtual environment).”

[Investors in the Environment](#)



PART 1

4.09 New Energy Apprenticeships Program (Australia)³²

Australia’s New Energy Apprenticeships Program supported over 17,000 apprenticeship starts in clean energy trades, including solar, wind, hydrogen, and grid technologies, offering staggered financial incentives to both apprentices and employers throughout the training period. The program saw an 85% first-year

retention and a strong focus on reaching young people from regional and remote communities, one of the most scaled work-integrated learning models in this report. NEAP closed to new enrolments as of July 2025 and has been succeeded by the Key Apprenticeship Program’s New Energy stream.

AUSTRALIA | DEPARTMENT OF EMPLOYMENT AND WORKPLACE RELATIONS MODEL: WAGE SUBSIDIES FOR CLEAN ENERGY APPRENTICESHIPS

Sectors: Solar, wind, hydro, hydrogen, bioenergy, geothermal, EV infrastructure, grid technologies, energy efficiency retrofits

Age eligibility

No strict age gap (~43% of participants under age 19)

Duration

3 to 4
year apprenticeships (average)

Stipend / wage support

Up to

AUD \$10,000

for full-time apprentices, disbursed in staggered payments throughout the training period; up to AUD 5,000 for part-time apprentices across apprenticeship duration.

Wrap-around supports

Dedicated mentorship support to improve retention, staggered wage disbursement to offset cost-of-living pressures, personalised non-financial support services including peer-support and networking, and income-contingent loans.

Equity targets

Informal equity targets, with dedicated mentoring program to increase retention of youth and individuals from other underrepresented groups; one-third of apprenticeship commencements from regional and remote communities.

Certification

Vocational education and training (VET) qualification, in alignment with the Australian Apprenticeships Priority List and identified as new energy.

Employer involvement

Mandatory provision of meaningful exposure, experience, and work in the clean energy sector; involvement in apprentice mentorship infrastructure.

Net zero alignment

Program directly contributes to the Australian Government’s Future Made in Australia initiative, a AUD 22.7 billion commitment over ten years that aims to maximize the economic and industrial benefits of the net zero transition

Scale and Outcomes

17,000+

apprenticeship commencements over program lifespan. 85% first-year retention in new energy stream.

Public cost per placement

~\$10,000

(subsidy)



PART 2

4.09 New Energy Apprenticeships Program (Australia) ³²

AUSTRALIA | DEPARTMENT OF EMPLOYMENT AND WORKPLACE RELATIONS MODEL: WAGE SUBSIDIES FOR CLEAN ENERGY APPRENTICESHIPS

Sectors: Solar, wind, hydro, hydrogen, bioenergy, geothermal, EV infrastructure, grid technologies, energy efficiency retrofits

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	PARTIAL
5. Wrap-around supports	PARTIAL
6. Formal / recognized certification	YES
7. Procurement or regulatory mandate	NO
8. Post-placement outcome tracking	NO

"I would recommend a career in renewable energy because it gives you purpose. You'll work with cutting-edge technologies, solve real-world problems, and learn something new every day. Career opportunities are endless, and the industry offers both stability and growth."

[Megan Rice, Mentor](#)

DATA GAPS

NEAP-specific outcomes not publicly disaggregated, but included in broader data across all Australian apprenticeships (NCVER); this includes program commencements, withdrawals, completions, and training trends, as well as gender metrics.



4.09 New Energy Apprenticeships Program (Australia)

AUSTRALIA | DEPARTMENT OF EMPLOYMENT AND WORKPLACE RELATIONS
MODEL: WAGE SUBSIDIES FOR CLEAN ENERGY APPRENTICESHIPS

Sectors: Solar, wind, hydro, hydrogen, bioenergy, geothermal, EV infrastructure, grid technologies, energy efficiency retrofits

KEY OBSERVATION

- NEAP's 85% first-year retention is the strongest published retention figure for any long-duration program in these case studies that have this data available. The figure comes from a March 2026 DEWR ministerial release and reflects the new energy stream specifically. The program design structure is notable: payments are structured at 6, 12, 24, and 36 months specifically to offset cost-of-living pressure points which was identified as a primary driver of apprenticeship attrition.
- Two other outcomes to note: 17% women participation against a 5% sector average (source: NCVET), supported by a dedicated mentoring program; and nearly a third of enrolments from regional and remote communities (DEWR, March 2026).



4.10 Skill Council for Green Jobs (SCGJ) (India)³³

India's Skill Council for Green Jobs has trained over 550,000 workers across more than 900 institutions since 2015, using national occupational standards to provide formal credentials to workers entering clean

energy, many of whom are entering from the informal economy. This program represents the largest scale of all case studies in this report.

INDIA | MINISTRY OF NEW AND RENEWABLE ENERGY MODEL: CERTIFIED TRAINING AND PLACEMENT PROGRAMS

Sectors: Renewable energy; Environment, forestry and climate change; Sustainable development

Age eligibility

Youth and adults, no strict age cap (minimum age for some skills courses is 16)

Duration

Short-term courses aligned with India's National Skills Qualification Framework (NSQF) (varies by qualification level and sector); facilitated via 1,000 training centres and 20 national Centers of Excellence

Stipend / wage support

Residential training program provides free boarding/lodging; physical internships and entry-level placements typically provide ₹10,000–₹18,000/month.

Wrap-around supports

Residential delivery model with programs for rural youth, dedicated job portal, and digital training platform.

Equity targets

Strong focus on supporting youth in informal economies to enter the formal clean energy workforce, rural learners, and first-generation formal workforce entrants.

Certification

National certifications aligned with the NSQF, including 77 qualifications across clean energy and sustainability sectors; additional network of ~5,500 certified trainers and ~900 assessors cumulatively.

Employer involvement

Occupational standards and curricula co-designed by SCGJ's Standards & Research Group, with training linked to active government-funded deployment projects; engagement with bilateral and multilateral agencies, and universities and colleges for NSQF alignment.

Net zero alignment

Supports India's 500 GW non-fossil capacity target by 2030, which is projected to create 3.4 million jobs, and the National Green Hydrogen Mission.

Scale and Outcomes

~₹30,000 to ₹50,000

per placement, as part of a ₹2 billion outlay for the Ministry of New and Renewable Energy (MNRE)'s Human Resource Development (HRD) Program (2021-2026).

Public cost per placement

~₹627,000

candidates trained and certified cumulatively since 2015, with ~900 affiliated training institutions; ~100,000 green jobs secured nationally as of 2024-25 annual report. Retention problems documented in some cohorts due to wages and outstation relocation.



4.10 Skill Council for Green Jobs (SCGJ) (India)³³

INDIA | MINISTRY OF NEW AND RENEWABLE ENERGY MODEL: CERTIFIED TRAINING AND PLACEMENT PROGRAMS

Sectors: Renewable energy; Environment, forestry and climate change; Sustainable development

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	PARTIAL
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	YES
5. Wrap-around supports	NO
6. Formal / recognized certification	YES
7. Procurement or regulatory mandate	NO
8. Post-placement outcome tracking	PARTIAL

DATA GAPS

Annual throughput more challenging to disaggregate vs. cumulative training numbers; retention rates not clearly tracked.

KEY OBSERVATION

550,000-plus workers trained through roughly 900 institutions since 2015, and 100,000+ green jobs facilitated across India as of the 2024–25 annual report. These are the largest numbers in this study by a considerable margin.

The model, using national occupational standards to give formal credentials to workers entering clean energy from the informal economy, is particularly relevant for emerging economies where a large share of the energy workforce arrives without recognised qualifications. But documented retention problems in some cohorts, attributed to low post-placement wages of ₹13,000 to 15,000 per month and outstation relocation requirements, raise the question about long-term outcomes, as this data is not measured or available.

“Joining the solar technician course through the Skill Council for Green Jobs changed my life. I not only gained hands-on training but also landed a job within two months of completion. Today, I’m proud to be part of India’s clean energy workforce.”

Amit Kumar, Solar PV Technician Trainee



PART 1

4.11 Wind Turbine Service Technician (QCTO) (South Africa)³⁴

South Africa's QCTO wind technician pathway is funded directly by private wind farm operators as a mandatory condition of their renewable energy operating licenses, which creates a near-guaranteed pathway from training to local employment. The program operates in one of South Africa's highest unemployment regions and prioritizes participants from equity-deserving communities, embedding equity into the procurement processes the program feeds into.

WIND TURBINE SERVICE TECHNICIAN (WTST) PATHWAY — QCTO

SOUTH AFRICA | QUALITY COUNCIL FOR TRADES AND OCCUPATIONS (QCTO); FUNDED BY PRIVATE WIND FARM OPERATORS UNDER REIPPPP MODEL: PROCUREMENT-MANDATED PAID APPRENTICESHIP + NATIONAL CERTIFICATION

Sectors: Wind energy (onshore)

Age eligibility

18–34;

specifically prioritizes Black, female candidates from historically disadvantaged groups.

Duration

5–7

months theoretical training + 2 months on-site experiential training = ~7–9 months total.

Stipend / wage support

R7,000/month

(confirmed, Cookhouse Wind Farm cohort); range of R6,000–R10,000/month across documented cohorts. Covers transport and baseline living expenses.

Wrap-around supports

Stipend covers transport and living expenses. On-site practical placement at operational wind farms in Eastern Cape.

Equity targets

Draws strongly from historically disadvantaged communities in the Eastern Cape. Female participants prominently featured. B-BBEE compliance requirements embedded via REIPPPP procurement mandate.

Certification

QCTO national qualification: Wind Turbine Service Technician (WTST). Nationally recognized.

Employer involvement

Private wind farms (Cookhouse, Jeffreys Bay) directly fund training cohorts under REIPPPP economic development and local content obligations. Employment mandated by procurement framework.

Net zero alignment

Driven by REIPPPP procurement frameworks. QCTO qualification and procurement mandate ensure alignment between qualification supply and operational demand.

Key outcome

Near-guaranteed employment pipeline into localized wind farm operational roles.

Scale and Outcomes

Cohorts of ~15–20

per regional wind farm intake; scales with wind farm operational requirements. Near-guaranteed employment pipeline into local wind farm roles; employment mandated by procurement framework. No published completion or retention rate.

Public cost per placement

R7,000/month

stipend per trainee; training costs funded by private wind operators under national mandate (no direct public expenditure on training).



PART 2

4.11 Wind Turbine Service Technician (QCTO) (South Africa)³⁴

WIND TURBINE SERVICE TECHNICIAN (WTST) PATHWAY — QCTO

SOUTH AFRICA | QUALITY COUNCIL FOR TRADES AND OCCUPATIONS (QCTO);
FUNDED BY PRIVATE WIND FARM OPERATORS UNDER REIPPPP
MODEL: PROCUREMENT-MANDATED PAID APPRENTICESHIP + NATIONAL CERTIFICATION

Sectors: Wind energy (onshore)

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	YES
5. Wrap-around supports	PARTIAL
6. Formal / recognized certification	YES
7. Procurement or regulatory mandate	YES
8. Post-placement outcome tracking	PARTIAL

KEY OBSERVATION

South Africa's REIPPPP model answers a question that voluntary programs cannot: what happens when employer participation in training is not a choice? Wind farm operators fund training cohorts and provide stipends because it is a condition of their operating licence under the renewable energy procurement framework. The result is near-guaranteed employment into local wind farm roles, and training costs borne almost entirely by the private sector.

DATA GAPS

Annual cohort size across all wind farms not aggregated publicly. Post-placement retention rate not formally reported. Cost per placement calculation (stipend + training + administration) not publicly disclosed.

"This has been a game-changer for me. I've learned so much about renewable energy systems and the importance of safety and efficiency in wind turbine design. The course has given me valuable insights into the complex engineering behind harnessing wind energy. I'm excited to apply what I've learned in real-world situations and to contribute to a more sustainable future."

[Globeleq](#)



4.12 Patriot Energi (Indonesia)³⁵

Patriot Energi deploys young people on year-long fellowships to remote and underserved communities across Indonesia, where they facilitate the governance and management of off-grid solar and micro-hydro energy

systems. The program's success is defined by whether communities retain energy access and operational capacity after the youth placement ends, to ensure long-term community ownership and project resilience.

INDONESIA | MINISTRY OF ENERGY AND MINERAL RESOURCES (ESDM) MODEL: COMMUNITY RENEWABLE ENERGY FELLOWSHIP DEPLOYMENT PROGRAM

Sectors: Energy access, off-grid solar, micro-hydro, rural electrification

Age eligibility

Youth ages

17 to 35,

with a Bachelor's degree

Duration

50-day

intensive technical and social pre-deployment training, plus 9-month deployment in remote village

Stipend / wage support

Direct stipend to cover cost of living for year-long remote village deployment.

Wrap-around supports

Residential pre-deployment training including technical training, survival training, community-based development skills, and live-in simulation; village hosting arrangements.

Equity targets

Targets youth in the 4T (Frontier, Outermost, Least Developed, and Transmigration) regions of the Indonesian archipelago; positioning youth as governance facilitators and community capacity builders, rather than visiting technicians, ensures local ownership and operational sustainability beyond youth deployment period. Equity and inclusivity further embedded in Patriots' training curriculum.

Certification

Technical certification following national standards in renewable energy and one-year national certification provided after deployment.

Employer involvement

Institutional framework provided by the Ministry of Energy and Mineral Resources (ESDM), with community assemblies hosted to set equitable tariffs, establish Village Electricity Management Units, and recruit and train local long-term operators.

Net zero alignment

Supports Indonesia's national rural electrification mandate and energy sovereignty goals; embedded in ESDM ministry infrastructure; aligned to off-grid solar, micro-hydro, and rural electrification sector pathways integrating technical skills with community energy governance.

Scale and Outcomes

~100 Patriots deployed per batch/cohort.

Program has reached 261 participants total (137 men and 124 women), 55 of whom pursued careers in the renewable energy sector.

Public cost per placement

Information not reported;

funded via national budget and CSR contributions from companies.



4.12 Patriot Energi (Indonesia)³⁵

INDONESIA | MINISTRY OF ENERGY AND MINERAL RESOURCES (ESDM)
MODEL: COMMUNITY RENEWABLE ENERGY FELLOWSHIP DEPLOYMENT PROGRAM

Sectors: Energy access, off-grid solar, micro-hydro, rural electrification

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	NO
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	YES
5. Wrap-around supports	YES
6. Formal / recognized certification	YES
7. Procurement or regulatory mandate	YES
8. Post-placement outcome tracking	YES

KEY OBSERVATION

Patriot Energi is not a typical youth employment program. Youth are deployed as community energy governance facilitators who host assemblies, establish Village Electricity Management Units, and train local operators during their 9-month placement. The measure of success appears to be whether the community retains energy access after the placement ends. This case study was selected to highlight that the energy transition workforce also includes dynamic models and types of work that are not captured in standard labour market data yet.



PROGRAM FEEDBACK

“The Patriot Energi program is unique because it has a strong focus on how youth can adapt to a new area, a new village. IBEKA supports this through live-in simulations and social training focusing on community empowerment and self-awareness, learning how to interact with others and build equal relationships. Additionally, about 70% of the program focuses on social and community aspects, while only 30% is technical. Patriot Energi can prepare social empowerment and local communities through local champions for the future.” —

Dita Anggun Lestari, Program Coordinator, IBEKA Foundation

DATA GAPS

Documentation primarily in Bahasa; public investment per participant not disclosed.



PART 1

4.13 Scalda WindDock / NedZero T-shore Offshore Wind VET (The Netherlands)³⁶

The Netherlands' Scalda WindDock program offers MBO-level vocational qualifications in offshore wind, with signatories of NedZero's Wind Netherlands Internship Covenant legally committed to providing guaranteed internship placements and covering associated training costs. Unique to the case studies in this report, this program is formally embedded in Dutch offshore wind

tender criteria, meaning that developers compete for operating licenses partly on the basis of their workforce development commitments. This structural integration has helped fill 70% of offshore wind vacancies at the MBO level through this pathway. The program has a mandate through 2029 and is governed by a steering group of industry, national and regional authorities, VET

SCALDA WINDDOCK / NEDZERO T-SHORE — OFFSHORE WIND VET

NETHERLANDS | SCALDA (MBO COLLEGE, ZEELAND); NEDZERO; T-SHORE COVE; PROVINCE OF ZEELAND; MINISTRY OF EDUCATION (RIF SUBSIDY MODEL: EMPLOYER-GUARANTEED VET APPRENTICESHIP (MBO LEVEL 3 & 4) + NATIONAL INTERNSHIP COVENANT

Sectors: Offshore wind, onshore wind, GWO safety certification, North Sea operations

Age eligibility

MBO students, typically

16–25.

Youth-targeted by design of MBO vocational track.

Duration

MBO Level 3:

2–3 years;

MBO Level 4:

3–4 years.

Stipend / wage support

Internship stipend estimated at €3,735 (5 months at €747 per month). Industry Covenant signatories bear additional training and internship costs. The Province of Zeeland and RIF (Ministry of Education) fund program delivery and equipment.

Wrap-around supports

Place-based design: Scalda campus 1,000m from Ørsted maintenance base and North Sea Port, which reduces geographic and transport barriers for Zeeland students. GWO certification costs covered within program funding.

Equity targets

No formal equity targets documented. Gender gap acknowledged nationally (Dutch wind sector skews heavily male). NedZero and T-shore monitoring workforce diversity under EU CoVE obligations.

Certification

GWO Basic Safety Training (internationally mandated for offshore access); MBO Level 3 and 4 national qualifications; T-shore cross-border recognition across participating EU member states.

Employer involvement

Covenant signatories (RWE, Vattenfall, Eneco, Siemens Gamesa, Deutsche WindTechnik, Noorderpoort, Scalda, ROC van Amsterdam – Flevoland, and NedZero) commit contractually to guaranteed internship placements. Formally embedded in Dutch offshore wind tender criteria — unique structural integration. The program has a mechanism for non-compliance: if a company cannot meet its internship target, it must make a financial contribution to vocational schools

Net zero alignment

Formally embedded in Dutch offshore wind tender criteria. Aligned to the Netherlands' CO₂-free electricity target (2035) and North Sea 70 GW by 2030. T-shore



PART 2

4.13 Scalda WindDock / NedZero T-shore Offshore Wind VET (The Netherlands)³⁶

SCALDA WINDDOCK / NEDZERO T-SHORE — OFFSHORE WIND VET

NETHERLANDS | SCALDA (MBO COLLEGE, ZEELAND); NEDZERO; T-SHORE COVE; PROVINCE OF ZEELAND; MINISTRY OF EDUCATION (RIF SUBSIDY)
 MODEL: EMPLOYER-GUARANTEED VET APPRENTICESHIP (MBO LEVEL 3 & 4) + NATIONAL INTERNSHIP COVENANT

Sectors: Offshore wind, onshore wind, GWO safety certification, North Sea operations

Scale and Outcomes

The tender requirement is a human capital strategy and a guarantee of at least 2 interns per year. First certified cohort: 7 graduates (2024). Scale growing with Dutch offshore wind expansion pipeline (70 GW by 2030). 70% of offshore wind vacancies at MBO level filled through this pathway.

Public cost per placement

Province of Zeeland + RIF Ministry of Education subsidy; industry bears placement costs. Covenant estimates costs per intern at

~€12,585.

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	NO
5. Wrap-around supports	YES
6. Formal / recognized certification	YES
7. Procurement or regulatory mandate	YES
8. Post-placement outcome tracking	PARTIAL

DATA GAPS

Annual throughput not yet formally reported (program scaling). Covenant signatory list: RWE, Vattenfall, Eneco, Siemens Gamesa, Deutsche WindTechnik, Noorderpoort, Scalda, ROC van Amsterdam – Flevoland, and NedZero as signatories. Equity data not published.



PART 3

4.13 Scalda WindDock / NedZero T-shore Offshore Wind VET (The Netherlands)

SCALDA WINDDOCK / NEDZERO T-SHORE — OFFSHORE WIND VET

NETHERLANDS | SCALDA (MBO COLLEGE, ZEELAND); NEDZERO; T-SHORE COVE;
 PROVINCE OF ZEELAND; MINISTRY OF EDUCATION (RIF SUBSIDY
 MODEL: EMPLOYER-GUARANTEED VET APPRENTICESHIP (MBO LEVEL 3 & 4) +
 NATIONAL INTERNSHIP COVENANT

Sectors: Offshore wind, onshore wind, GWO safety certification, North Sea operations

Key outcome

70%

of offshore wind vacancies at MBO level filled via Scalda/WindDock pathway. WindEurope recognition. Scalda/NedZero model shaped Denmark's Skive College wind electrician EUD.

KEY OBSERVATION

Two things make Scalda/NedZero worth studying. First, the Wind Netherlands Internship Covenant is a legal commitment, not a memorandum of understanding: signatories guarantee internship placements and bear the costs. Second, the training infrastructure is formally embedded in offshore wind tender criteria which means that developers compete for licenses partly on the basis of their workforce development commitments. That combination, legal employer obligation plus procurement integration, is the same logic that makes South Africa's REIPPPP model work. The T-shore network's export of this model to Denmark's Skive College is also notable: it is a documented example of cross-border VET knowledge transfer with a traceable outcome. The Covenant model offers a blueprint to other institutions adopting this model: (1) Recognize Need; (2) Establish Collaborative Framework; (3) Develop Covenant Structure; (4) Finalize and Sign; and (5) Learning by Doing.



PART 1

4.14 IREC / ACE Network — Clean Energy Registered Apprenticeships (United States)³⁷

The ACE Network, led by the Interstate Renewable Energy Council, helps clean energy employers build federally registered apprenticeship programs across solar, wind, energy efficiency and battery storage, growing from 15 apprenticeships to over 1,100 since its launch in 2023. Its growth was spurred by the Inflation Reduction Act's apprenticeship requirements which

helped create a commercial incentive for employers to register programs, an example of where integrated tax and workforce policy can reinforce each other. As of the end of funding from the Department of Energy in June 2025, there have been no direct apprentice placements, though the program continues via funding from Invest in Our Future.

IREC / ACE NETWORK — CLEAN ENERGY REGISTERED APPRENTICESHIPS

UNITED STATES | INTERSTATE RENEWABLE ENERGY COUNCIL (IREC); DOL OFFICE OF APPRENTICESHIP (2023–2025); INVEST IN OUR FUTURE (SUSTAINING FUNDER) MODEL: NATIONAL REGISTERED APPRENTICESHIP INTERMEDIARY — 'EARN WHILE YOU LEARN' EMPLOYER-LED

Sectors: Solar PV, wind, energy efficiency, EVs, battery storage, weatherization, clean energy construction

Age eligibility

16+

(Registered Apprenticeship minimum); youth-inclusive with explicit focus on young and transitioning workers.

Duration

1 to 4

years depending on occupation (solar installer ~1 year; energy auditor ~3 years).

Stipend / wage support

Apprentices are paid employees from day one ('earn while you learn'). IRA prevailing wage requirements mandate annual wage step increases for apprentices on federally funded projects.

Wrap-around supports

IREC provides no-cost technical and financial assistance to employers. Wrap-around supports for participants vary by employer and state.

Equity targets

No published demographic breakdown of apprentice cohort. Equity access is a stated program goal, with partners including HBCU CDAC, Service Year Alliance, and GRID Alternatives providing targeted outreach to underrepresented communities. Demographic outcomes not yet publicly reported.

Net zero alignment

Directly aligned to IRA prevailing wage and apprenticeship requirements — IRA created structural market demand for this program. Covers full clean energy value chain.

Certification

Nationally recognized Registered Apprenticeship credential (portable across employers and states, equivalent to a college degree on completion). NABCEP (solar), BPI (energy efficiency). 7 National Guideline Standards developed for clean energy occupations.energy occupations.

Employer involvement

Employer-led by design: IREC provides technical assistance for employers to build their own Registered Apprenticeship programs. 40 Local program Standards; 32 Employer Acceptance Agreements established by June 2025. 200+ organizations engaged.



PART 2

4.14 IREC / ACE Network — Clean Energy Registered Apprenticeships (United States) ³⁷

IREC / ACE NETWORK — CLEAN ENERGY REGISTERED APPRENTICESHIPS

UNITED STATES | INTERSTATE RENEWABLE ENERGY COUNCIL (IREC); DOL OFFICE OF APPRENTICESHIP (2023–2025); INVEST IN OUR FUTURE (SUSTAINING FUNDER)
 MODEL: NATIONAL REGISTERED APPRENTICESHIP INTERMEDIARY — ‘EARN WHILE YOU LEARN’ EMPLOYER-LED

Sectors: Solar PV, wind, energy efficiency, EVs, battery storage, weatherization, clean energy construction

Scale and Outcomes

1,100+

apprentices registered as of June 2025 (up from 15 at launch in August 2023). 200+ organizations engaged. Program tracks apprentice registration, not post-completion outcomes.

Public cost per placement

DOL funding 2023 to 2025 (amount not publicly disclosed). IRA tax credits provided 30% ITC bonus to qualifying employers — significant indirect public investment mechanism.

Feature	Present?
1. Wage subsidy / stipend	YES
2. Employer co-investment (financial)	YES
3. Employer co-designed curriculum	YES
4. Equity target / designated cohort	YES
5. Wrap-around supports	YES
6. Formal / recognized certification	YES
7. Procurement or regulatory mandate	PARTIAL
8. Post-placement outcome tracking	PARTIAL

DATA GAPS

DOL funding amount not published. Per-placement cost not publicly available. Post-completion employment rate not separately tracked at network level. Disaggregated apprentice data by demographic not directly tracked.



PART 3

4.14 IREC / ACE Network — Clean Energy Registered Apprenticeships (United States) ³⁷

IREC / ACE NETWORK — CLEAN ENERGY REGISTERED APPRENTICESHIPS

UNITED STATES | INTERSTATE RENEWABLE ENERGY COUNCIL (IREC); DOL OFFICE OF APPRENTICESHIP (2023–2025); INVEST IN OUR FUTURE (SUSTAINING FUNDER) MODEL: NATIONAL REGISTERED APPRENTICESHIP INTERMEDIARY — ‘EARN WHILE YOU LEARN’ EMPLOYER-LED

Sectors: Solar PV, wind, energy efficiency, EVs, battery storage, weatherization, clean energy construction

KEY OBSERVATION

The ACE Network grew from 15 apprentices to 1,100-plus in under two years. The structural driver behind that growth was the Inflation Reduction Act’s prevailing wage and apprenticeship requirements, which created a direct commercial incentive for clean energy employers to register apprenticeship programs. This was a 30% investment tax credit bonus for qualifying projects. IREC supported that growth by providing technical assistance to more than 200 organizations, developing 7 National Guideline Standards for emerging clean energy occupations, and helping employers navigate a registration system that was not designed with clean energy in mind. What this produces in equity terms is not yet publicly measured. The network does not publish demographic breakdowns of its apprentice cohort. Future of the program: The DOL federal contract concluded in June 2025, the IRA tax incentives that drove employer demand face regulatory uncertainty, and the technical assistance pipeline that converted employer interest into registered programs will not automatically sustain at the same pace.



5. Discussion: Cross-Case Comparison

5.1 Program typology

The 14 selected case study programs cluster into three broad types, each with distinct program design features, cost structures, and outcome profiles:

- 1. Market-placement models (wage subsidy/internship):** These programs create demand for youth labour in existing markets by reducing employers' costs and risk associated with hiring youth. Case studies in this profile: Canada's Science Horizons, Canada's STIP — Green Jobs, ICE's Generation Power, and YCCBC.
- 2. Market-creation models (technical VET/certification):** These programs invest in supply-side training and qualification of workers rather than direct placements. Cost per program participant may be lower, but outcomes are more dependent on whether employers have demand for these skills at the time of completion. Case studies in this profile: UK's Skills Bootcamps — Green Skills, Australia's NEAP, India's SCGJ, the Netherlands' Scalda/NedZero, South Africa's QCTO, and Germany's Greening Apprenticeships.
- 3. Community-embedded models (corps/deployment):** These programs deploy youth as service workers into underserved communities, with post-placement career outcomes as a secondary rather than primary metric of success. Case studies that fit this profile: Indonesia's Patriot Energi and partially YCCBC.



The most urgently needed roles globally to include electricians; line workers; solar PV installers; pipe and gas fitters; welders; heating, ventilation, and air conditioning (HVAC) installers, and battery technicians—all of which are skilled trades relying on VET pathways.²



The typology matters because it sets the frame for what a program can reasonably be expected to deliver. Market-placement models are optimized for speed and employer uptake, but their outcomes depend on whether employers would have hired youth anyway without the subsidy. Market-creation models may build deeper and more consistent skills among youth trained by aligning with broadly recognized certification standards, but they do carry the risk that employer demand may change or not materialize when the training ends. Programs like the Netherlands' *Scalda/NedZero* attempt to mitigate this risk by working in close collaboration with major employers throughout the program design and implementation processes. Community-embedded models are the least comparable to the others in terms of outcome metrics, because employment rate or retention is not their primary goal; they are building energy access and community capacity as much as youth career outcomes. However, similar to market-placement models, this model is designed to be responsive to demonstrated existing needs by employers or by communities.

One dimension that cuts across all three models is the range of skills being built. The IEA Future of Energy Skills Workshop identified the most urgently needed roles globally to include electricians; line workers; solar



PV installers; pipe and gas fitters; welders; heating, ventilation, and air conditioning (HVAC) installers, and battery technicians—all of which are skilled trades relying on VET pathways.² The market-creation and market-placement programs in this compendium largely address these roles. Community-embedded models address different skillsets related to community governance, facilitation, and project management.

5.2 Access and Equity: What approaches reach underrepresented youth?

Before any program design feature can make a difference, young people have to consider the clean energy sector at all. The IEA Future of Energy Skills Workshop in March 2026 identified stigma and the low perceived attractiveness of trades pathways as a structural barrier.² Student Energy's Energy Transition Skills Project report found that lack of awareness and exposure is the single biggest barrier young people identify to entering clean energy, ranking above training access and financial barriers.²¹ This matters because equity interventions that focus only on what happens inside a program may be addressing the wrong point in the pipeline. If trades pathways carry social stigma that disproportionately

deters young people from underrepresented groups before they reach an enrollment decision, then equity by design inside a program is necessary, but insufficient.

The programs in this study that achieve the strongest equity outcomes share a common characteristic: they build equity targets into the design and incentive structure of the program, rather than the eligibility criteria. Having a program that is, in theory, open to everyone is easy to do, but this is not the same as being designed for anyone (i.e., young people) in particular.

Four distinct approaches are visible across the case studies. The first is tiered subsidy pricing: Canada's

Science Horizons, Canada's STIP — Green Jobs, and ICE's Generation Power all use higher subsidy caps for hiring young people from defined underrepresented equity groups. The financial incentive for employers is clear and does not require a separate equity stream. The second approach is demand-side accountability: ICE's Generation Power places mandatory cultural competency training requirements on host employers, with the goal of creating a more inclusive workplace that will enable youth to succeed when hired. The third approach is embedding equity in structural procurement: South Africa's QCTO pathway draws from historically disadvantaged communities by design, underpinned by Broad-Based Black Economic Empowerment (B-BBEE) compliance obligations which are built into the country's REIPPPP as a condition of operating a wind farm. The fourth approach is intentional recruitment targeting: Australia's NEAP has achieved 17% participation of women (compared to a 5% sector baseline) by providing dedicated mentorship and targeted outreach, drawing nearly a third of program commencements from regional and remote communities. IREC's ACE Network is also designed with targeted outreach, partnering with Historically Black Colleges and Universities (HBCUs), national service alumni networks, and community based organizations. However, due to the lack of available demographic breakdowns of its apprentice cohorts, the impact is not yet measurable from public data.

The contrast is sharpest when we look at programs that rely on broad eligibility rather than deliberate design. The UK's Skills Bootcamps data shows a 12 percentage point gender gap in positive outcomes (men at 50% versus women at 38%) and a 30 point gap between White and Black learners (57% versus 27%).³¹ Both gaps are documented in published DfE evaluations. Neither has been addressed through program design changes. The European Union's (EU) InnoEnergy, Denmark's wind and electrification VET pathways, and the Netherlands' Scalda/NedZero show the same pattern at a structural level: strong program design, no formal equity targets, and graduate cohorts that look more like the existing industry than the available youth population.



Student Energy Archive



India's SCGJ illustrates a different challenge that happens after the training period rather than before it. The program successfully reaches youth from the informal economy and issues nationally recognised certifications at scale. However, in areas where post-placement wages are between ₹13,000 to 15,000 per month and workers face mandatory relocation, retention breaks down. Getting young people into a program is not the same as getting them into a sustainable career. Equity design that stops at program entry is incomplete.

5.3 Labour and Employer Outcomes: What does the evidence say?

The central question for any workforce program is whether participants successfully end up in jobs, stay in those jobs, and whether those jobs are of good quality. Unfortunately, only five out of 14 selected programs have meaningful published outcome data:

- **STIP — Green Jobs (Canada):** 80% full-time employment conversion; 80% sector retention post-placement.
- **InnoEnergy (EU):** 94% employment within 6 months of graduation; 77% placed within Europe.
- **UK Skills Bootcamps (England):** 47% overall positive outcome rate as a share of commencements; 66% as a share of completions; 66% for co-funded learners versus 31% for independent unemployed learners.
- **NEAP (Australia):** 85% first-year retention, substantially above historical VET averages.
- **Scalda/NedZero (Netherlands):** 70% of offshore wind vacancies at MBO level filled through this pathway.

Three additional programs have strong structural employment guarantees even though published outcome data is not yet available. Denmark's Wind and Electrification VET Pathways guarantee a paid apprenticeship at an industry partner as a condition of the program, a structural commitment that is stronger than voluntary follow-through, even without a completion cohort yet. The UK's Skills Bootcamps guarantee an employer interview upon completion. IREC's ACE Network grew from 15 apprentices to 1,100+ in under two years, driven partly by the Inflation Reduction Act's prevailing wage and apprenticeship requirements which gave clean energy employers a direct commercial incentive to register apprentices.

Some initial indicators we had hoped to track, such as wage progression after placement, employer satisfaction data, and long-term retention data, have little or no publicly available data. This is a significant data gap, as outcomes data would provide the strongest evidence for decision-makers on whether the program is worth keeping, growing, winding down, or retooling.



5.4 Scale, Cost-Effectiveness, and Value for Money

The public cost per placement data that is available varies significantly across programs, and in isolation it provides limited insight into program effectiveness. Outcome data, such as completion rates, employment conversion, retention, and job quality, is required alongside cost data to make meaningful comparisons. All figures below represent public cost only; where programs are co-funded by employers or operated through licensing or procurement mandates with private costs, the full cost per placement may be higher and not fully captured in publicly available data.



To enable comparison, figures have also been converted to approximate CAD at rates current as of March 2026:

- **UK's Skills Bootcamps (England):** Roughly £3,400 (~CAD \$6,250) per learner in public funding. Short-cycle (up to 16 weeks). Employer co-funded. No direct wage subsidy.
- **WTST/QCTO (South Africa):** R7,000 (~CAD \$520) per month during training, with training costs borne by private wind farm operators under national mandate. Direct public expenditure is close to zero.
- **STIP — Green Jobs (Canada):** Roughly CAD \$18,000 standard; up to CAD \$30,000 for equity-deserving hires.
- **Science Horizons (Canada):** Roughly CAD \$25,000 to \$30,000 per placement, including wrap-around support.
- **SCGJ (India):** Part of a ₹200 crore (roughly CAD \$30M) allocation from India's Ministry of New and Renewable Energy for human resource development, covering 2021–2026, implying roughly ₹30,000 to 50,000 (CAD \$445 to 742) per placement. Part of the reason for this lower apparent cost may be due to the delivery model which is enabled through 900+ existing affiliated institutions rather than building bespoke infrastructure.
- **Patriot Energi (Indonesia):** Direct stipend plus 50-day residential pre-deployment training and a nine-month embedded village assignment. Public investment per placement not formally reported. This program operates with a different cost logic than any other in the study: the output being purchased is energy access for underserved communities as much as it is a youth career outcome.

Cost data is unavailable for nine of the 14 programs in this study, so no cross-study cost ranking can be confirmed.

WHY COST MATTERS FOR POLICY DECISIONS:

A £3,400 (~CAD \$6,250) program that produces a 47% positive outcome rate is not necessarily better value than a CAD \$30,000 program producing 80% full-time employment conversion. The UK figure is low because the program is short, does not include a wage subsidy, and offloads significant cost to employers. The Canadian figure is high because it includes six to 12 months of wage support plus wrap-around costs, but it also produces outcomes that the UK program does not publicly report equivalents for. India's SCGJ appears highly cost-efficient at the headline level but does not show the challenge of retention in which low post-placement wages contribute to workers leaving the sector.

Evidence from the IEA shows that cost is already a binding constraint within clean energy workforce systems. They

found that for workers, training costs and lost wages are among the primary barriers to participation in clean energy careers, which implies that governments must often subsidize training to achieve uptake.¹ This creates a direct policy implication: programs that effectively address participation barriers—through stipends, wage subsidies, or longer placements—typically involve higher per-participant costs, as they absorb expenses that would otherwise be placed on workers.



Youth-focused environmental workforce programs illustrate the challenge of maintaining funding for models that combine training, wages, and service

delivery. The San Francisco Conservation Corps, which provided paid training and work experience in environmental stewardship and green infrastructure for young people ceased operations after more than four decades, citing “severe financial distress”.³⁸ A comparable large-scale example from outside the clean energy sector illustrates how cost-effectiveness can directly shape program continuity. The United States’ Job Corps program, serving low-income youth, reported average costs of approximately USD \$80,000 to \$155,600 per graduate alongside low completion rates, and was subsequently paused following a USD \$140 million deficit, with officials citing weak outcomes relative to cost.^{39 40}

Without consistent outcome data, governments and program delivery organizations cannot determine the true cost per long-term job placement, whether higher-cost programs produce better long-term market outcomes, or whether program components such as wage subsidies and wrap-around supports tangibly impact the labour market’s equity outcomes or retention. The European Trade Union Confederation (ETUC) has made a related point that job quality cannot be separated from cost-effectiveness analysis.⁴¹ Training programs that produce workers in poor-quality, insecure roles—even at low cost—may be reproducing the conditions that make clean energy careers unattractive or difficult to fill in the first place.

5.5 Net Zero Alignment: Which programs are best positioned for the energy transition?

The Net Zero Alignment indicator tracked across each case study explores whether a program is structurally embedded in the government’s policy decisions and is considered to actively contribute towards national energy transition or climate goals.

The clearest case studies of policy alignment are the procurement-mandated models. South Africa’s REIPPPP requires wind farm operators to fund local training as a condition of their license. NedZero’s Wind Netherlands Internship Covenant is formally embedded in offshore wind tender criteria, in which developers receive points

for offering MBO internships — a direct expression of the Netherlands’ binding target of 70 GW of offshore wind capacity by 2030. Denmark’s Wind and Electrification VET Pathways were built directly around Ørsted, RWE, and other operators whose expansion is driven by Denmark’s own 35 GW offshore wind target by 2030, and by the broader Esbjerg Declaration commitment of approximately 300 GW across North Sea nations by 2050. In each case, the program’s existence is tied to a hard capacity target that has to be met regardless of which government is in office, with the training obligation attached to a power generation target that the grid requires.

This contrasts with programs that are not explicitly included in policy implementation. For example, the UK's Skills Bootcamps are described as supporting the net zero skills strategy and are helping to create qualified retrofit and heat pump installers. However, the Green Skills track is not protected within the broader program; it exists alongside digital and engineering tracks, without its own budget or procurement requirements. When the broader program closed due to the development of a new skills strategy, the Green Skills track closed with it, with uncertainty as to its future model.

In Germany's case, the Greening Apprenticeships umbrella describes a system-level reform where mandatory green competencies are embedded across all 325 dual VET occupations, deeply aligned with the national Energiewende policy. However, as there don't appear to be discrete measurable program outcomes, it is unclear what the outcomes are at the program level, despite strong alignment at the system and policy level.

Another notable case study is Australia's NEAP, which is strongly aligned with national renewable energy targets, formally administered by the Department of Employment and Workplace Relations (DEWR). Even though the program was closed in July 2025 and succeeded by a new program, its strong evidence base ensured the continuation of its design features (e.g., staggered payment model and equity targets) in the new program.

The UK government's Clean Energy Jobs Plan represents a significant recent development in how governments are framing this relationship, projecting that the clean energy workforce must nearly double from 440,000 to 860,000 by 2030, with 31 priority occupations identified.⁴² The plan links workforce criteria to public funding conditions, requiring companies receiving public grants and contracts to meet fair work standards, moving similarly toward the procurement-linked model that South Africa and the Netherlands have demonstrated at the program level.



The Renewable Energy Skills Partnership has independently identified cross-border recognition of qualifications and certifications as a priority policy lever for workforce mobility in clean energy.⁵ The Denmark case study is the clearest illustration in this compendium: the Skive College/T-shore pathway is built on GWO certification standards, precisely because they enable offshore wind technicians to work across North Sea jurisdictions without retraining. The Netherlands' Scalda/NedZero case has a similar cross-border dimension through the T-shore network. Qualifications that are internationally portable are structurally more durable than those locked to a single national framework, because their value persists independently of any one country's energy policy.

The pattern that emerges is that net zero policy alignment may be beneficial, but more specifically this alignment needs to be operationalized through a mechanism (e.g., procurement condition, licensing requirement, or project tender criteria) that gives employers a reason to participate, regardless of who is in office. Where such mechanisms exist, they should be used. Where they do not, programs may consider building in review and renewal triggers tied to measurable energy sector milestones, rather than budget cycles.



5.6 Programs Reviewed but Not Selected: What they Contribute

The programs below were reviewed and did not meet the inclusion criteria for this compendium. Each entry focuses on what the program contributes to the analysis, since the reasons for non-inclusion vary and are less important than what can be learned from the review.

BRAZIL — SENAI-RN / CTGAS-ER (WIND AND RENEWABLE ENERGY TRAINING, RIO GRANDE DO NORTE)⁴³

CTGAS-ER's institutional model, a regional technical VET centre building cumulative clean energy training capacity through successive employer partnerships, is a relevant reference for CEM governments considering technical VET infrastructure investment in regions with growing renewable energy sectors. The GIZ Phase 1 model involved employer-validated occupational standards, a 20%/80% theory-to-practical ratio, and National Skills Committees including Schneider Electric and Siemens, anticipating by a decade the curriculum co-design approach that appears in Denmark and the Netherlands. A 14-month offshore wind postgraduate course launched in January 2026 in Natal and a Basic Training pilot with 60 participants began in August 2025. Both are too new for outcome data but worth tracking as the program matures.

UNITED STATES — AMERICAN CLIMATE CORPS⁴⁴

The American Climate Corps was launched by executive order in August 2023 and terminated by executive order in January 2025, before generating a single published outcome data point. Its design—corps-style paid placements in clean energy and conservation work, explicitly youth-targeted and federally funded—was structurally comparable to YCCBC in this study. It is the clearest example in this review of program termination through political transition, because its continuation depended on executive discretion rather than legislative or procurement mandates that would enable the program to run independent of these processes.

PORTUGAL — IEPF GREEN SKILLS AND JOBS PROGRAM (PROGRAMA TRABALHOS E COMPETÊNCIAS VERDES)⁴⁵

This program closed in December 2024 and primarily targeted unemployed adults and workers at risk of displacement, rather than youth. It is reviewed here because of its demand-side obligation, requiring that if a company trains an unemployed person, it must employ them within 12 months. It is structurally the same mechanism as the Wind Netherlands Internship Covenant, applied in a just-transition rather than offshore wind context. The OECD notes this as one of the program's strengths and flags as a weakness the absence of an equivalent green skills mechanism for high-skilled workers, as the program primarily targets unemployed or new workers.²³

GERMANY — AUSBILDUNGSCLUSTER 4.0 IN DEN BRAUNKOHLEREGIONEN (TRAINING CLUSTERS 4.0 IN LIGNITE REGIONS)⁴⁶

Three clusters launched in June 2024 in the Lausitz, Central German, and Rhineland lignite regions, funded by BMWK at up to €1.96M per cluster, running through December 2027. The program focuses on general Energiewende-adjacent trades in transition regions, rather than clean energy as the specific target



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sector, and no published youth enrollment numbers or outcome data were identified. What the clusters contribute is a model of place-based just transition, where workforce development is embedded in regional economic restructuring, rather than sector-specific skills pipelines. According to the Beyond Reskilling report, current transition policies typically treat the shift as a linear economic problem versus a sociopolitical transformation.²² The cluster model is an attempt to respond to that complexity. For CEM governments managing regional energy transitions, particularly those involving fossil fuel communities, it may be a relevant comparator, even without clean energy-specific outcome data.

THE NETHERLANDS — TOPSECTOR ENERGIE HUMAN CAPITAL⁴⁷

Topsector Energie is the Dutch government's energy sector public-private partnership and is the broader policy framework that created the conditions for the Scalda/NedZero model in this compendium. The Wind Netherlands Internship Covenant operates within this framework. Understanding Topsector Energie helps CEM governments see the Dutch case study not as a standalone apprenticeship program, but as one component of a sector-wide human capital strategy coordinated between government, industry, and education providers—one that explicitly embeds training commitments in offshore wind tender criteria.

NORWAY — OFFSHORE WIND EDUCATION PATHWAYS⁴⁸

Norwegian offshore wind education is delivered through a network of providers including Zephyros Ocean Academy, supported by Norway's mature offshore oil and gas training infrastructure and GWO certification ecosystem. The transferability of the

Norwegian model is limited by its fossil fuel training heritage, but the principle of repurposing existing infrastructure for clean energy trades is relevant to the UK, Gulf states, and other oil and gas-heavy economies in transition.

NEW ZEALAND — JUST TRANSITIONS UNIT⁴⁹

New Zealand's Just Transitions Unit coordinates regional just transition plans, notably for Taranaki (oil and gas region) and Whanganui but does not deliver youth workforce training directly. New Zealand is not a current CEM member government, but New Zealand's experience with place-based just transition planning, particularly the Taranaki 2050 roadmap developed with community, industry, and Māori partners, is one of the more thoroughly documented examples of the community engagement model that is implicit in several programs in this compendium, including YCCBC, ICE's Generation Power, and Patriot Energi. According to the Beyond Reskilling report, workforce transition policy designed without community co-ownership consistently fails to address the identity and structural dimensions of economic change.²²

SOUTH KOREA — CLEAN ENERGY YOUTH WORKFORCE PROGRAMS⁵⁰

South Korea is a CEM member with significant clean energy industrial capacity (Hanwha, LG Energy Solution, Samsung SDI in battery and solar manufacturing; KEPCO in grid and renewable deployment). Verifiable public data on youth-specific clean energy workforce programs was not available in English-language sources within this review's scope. South Korea's combination of industrial capacity and strong vocational education infrastructure makes it a high priority for inclusion in subsequent editions of this compendium.

6. CONCLUSIONS AND NEXT STEPS

What we can conclude from an emerging evidence base

Employer financial co-investment predicts outcomes. This is the most robust finding in the study. The UK's Skills Bootcamps differential (66% versus 31% positive outcomes for co-funded versus independent learners) is the clearest quantification. The pattern holds across program types: Australia's NEAP achieved 85% first-year retention under a formal employer sponsorship model; South Africa's QCTO achieves near-guaranteed placement because training is a licensing condition; and IREC's ACE Network grew rapidly when the Inflation Reduction Act created commercial incentives for employer registration. The Beyond Reskilling report found that programs relying on retraining alone, without structural employer demand, consistently produce the same result: workers complete training but find no jobs waiting.²² The programs in this compendium that produce the strongest outcomes are those where employer demand was built into the mechanism before training began.

Procurement and regulatory mandates may help sustain employer engagement over time, compared to voluntary participation. In our case studies, both South Africa's REIPPPP and the Wind Netherlands Internship Covenant have maintained employer participation across multiple years and through political cycles, suggesting that when workforce obligations are tied to procurement or licensing criteria, they can support continuity. Although this sample is small, broader policy analysis supports the underlying logic that linking labour market requirements to government policy and incentives can strengthen employer involvement in workforce development programs. Many OECD countries use targeted incentives such as training subsidies, grants, or tax deductions to encourage employers to upskill and reskill workers for green jobs, helping to align training supply with labour.⁵¹ At the system level, the World Bank has updated its procurement requirements for projects it finances to require local labour participation in civil works contracts, explicitly tying job creation and skills development outcomes to eligibility for major contracts.⁵² The Beyond Reskilling report reaches a related conclusion from a different angle, finding that Germany's Coal



Many OECD countries use targeted incentives such as training subsidies, grants, or tax deductions to encourage employers to upskill and reskill workers for green jobs, helping to align training supply with labour.⁵¹

Commission succeeded in part because it attached transition obligations to the legally mandated coal phase-out timeline, which had to be met regardless of political preferences.²² Where training obligations or incentives are linked to requirements or incentives that persist through political cycles, they appear more likely to sustain employer engagement than when participation is purely voluntary.



Equity outcomes seem to follow design. **Programs that build financial or structural incentives for diverse recruitment outperform programs that rely on broad eligibility.** This finding is directionally consistent, but it is worth noting that published equity outcomes data across the 14 programs was one of the thinnest data categories that we encountered. The IEA Future of Energy Skills Workshop reinforced that VET stigma and low perceived attractiveness of trades pathways are

structural barriers before any program design features can even begin to make a difference.² This makes communications and narrative shifts an important strategy to pursue, as social or cultural stigma can prevent youth from even considering the program, which would render structural equity improvements ineffective.

Short-cycle and long-duration models serve different segments of the youth labour market and should not be evaluated on the same metrics.

A well-designed national system needs both, calibrated to national demographics and specific skills gaps. The Renewable Energy Skills Partnership independently identifies incentivizing apprenticeships for new trade entrants as a priority recommendation, consistent with the evidence here.⁵ The programs that have most reliably closed the gap between training completion and employment are the longer-duration models with structural employer guarantees.

Nine of the 14 programs in this study do not publish standardized post-placement outcome data.

This is the most significant gap in the evidence base. Without a minimum reporting standard covering completion rate, three-month job offer rate, and six-to-12-month retention rate, it is not possible to determine whether a training investment is producing durable careers or short-term placements. The International Organisation of Employers (IOE)-International Trade Union Confederation (ITUC) Joint Statement at COP29 called for transitions to be structured in ways that address educational misalignments and decent work deficits.⁵³ A shared reporting standard is the minimum infrastructure needed to know whether that is happening.

Key Recommendations

The six recommendations below follow from these conclusions.

1. Require employer co-investment as a structural program condition. Employer co-investment is correlated with better placement outcomes across geographies and program types. The UK's Skills Bootcamps data quantifies this at 35 percentage points. Designing co-investment as a mandatory condition—not a premium tier—is the single most direct policy lever available.

2. Co-design programs with industry and align credentials to national and international qualifications frameworks. Employer involvement at the curriculum design stage, not just at the hiring stage, produces graduates whose skills are recognized. Credentials aligned to national qualifications frameworks, and where available, to international standards such as GWO certification, ensure portability across employers and jurisdictions. The Renewable Energy Skills Partnership's recommendation on cross-border qualification recognition is directly relevant.⁵

3. Attach training obligations to procurement conditions and licensing requirements. South Africa and the Netherlands demonstrate that structural obligations produce more sustained engagement than voluntary participation or time-limited grant programs. The UK's Clean Energy Jobs Plan moves in this direction.⁴² Where procurement mechanisms or licensing conditions exist, they should be used to embed training obligations.

4. Embed equity targets into program design and funding conditions, and collect disaggregated data. Programs with tiered subsidy rates, employer accountability requirements, and targeted outreach consistently reach more underrepresented youth. VET stigma operates upstream of enrollment and requires communications strategies, as well as structural design changes. Disaggregated outcome data should be a condition of public funding.

5. Offer both short-cycle and long-duration pathways, calibrated to national labour market needs. Short-cycle programs can reach work-adjacent youth needing rapid credentials; longer-duration apprenticeship and internship models are better suited to first-time trades entrants. The balance should reflect national demographics, labour market structure, and evidence about where gaps actually are.



6. Establish a shared minimum reporting standard for workforce outcomes, including disaggregated equity data. A minimum standard covering completion rate, three-month job offer rate, and six-to-12-month retention rate, disaggregated by gender, ethnicity, and geography, should be a condition of public funding across CEM member governments.

The programs documented in this report represent genuine progress. The design choices predicting good outcomes are identifiable. The data gaps preventing stronger conclusions are closeable. What is needed is the institutional commitment to make outcome reporting a funding condition, employer co-investment a structural requirement, and equity targets a design feature rather than an aspiration.

Disclaimers

- This is an initial draft for internal review and co-lead feedback only. It is not for citation, distribution, or external use.
- Data presented in case study snapshots is sourced from publicly available documentation as of the date of this draft. Programs may have been updated, expanded, or discontinued since publication of source materials.
- Not all indicators were available for all programs. Where data gaps exist, they are noted explicitly. The absence of data on an indicator does not necessarily mean the program does not address that area, it may reflect a reporting or documentation gap.
- Testimonials included in snapshots are drawn from publicly available program websites and reports. They have not been independently verified.
- This report does not constitute an official CEM position or endorsement of any program or government policy.



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APPENDICES

Appendix A: Methodology

RESEARCH QUESTIONS

A government program designer or a clean energy company planning for the future may want to know, what kinds of training models support lasting employment? Who is left out of these programs historically, and how can we proactively change that? Who should invest, and where is that investment best placed?

This research compendium explored six questions:

- Which models have demonstrated positive workforce outcomes for youth, and what program characteristics are associated with those outcomes? Effectiveness was assessed based on available evaluation evidence and reported outcomes.
- What conditions are necessary to enable this transition?
- What specific program characteristics (i.e., employer incentives, training design, wage subsidies, etc.) of effective programs support uptake and retention?
- Do programs advance equity and inclusion? If so, how? (e.g., wrap-around supports, equity targets, paid placements, supports for youth with disabilities, access for rural, remote and Indigenous communities)
- What are the public costs per placement, and what job continuity or immediate post-placement outcomes are publicly reported by programs on government or program-specific websites?
- Which models are most scalable and/or transferable across CEM member countries?

METHODOLOGY

Research for this compendium was conducted using a mixed-method approach across three phases:

PHASE 1: DESK SCAN AND DOCUMENT REVIEW

Researchers conducted a structured desk review of publicly available program documentation, including program guides, calls for applications, evaluation reports, government budget documents, and published statistics. Sources include government websites, national statistics agencies, and program delivery organizations. All factual claims in case study snapshots are sourced from publicly verifiable documentation. Source URLs are provided for each case study.

PHASE 2: INTERVIEWS

Where possible, the research team conducted targeted interviews with government program officials, CEM member representatives, NGO and IGO partners, employers, and youth alumni. Short employer and participant surveys were used to capture outcomes not available through public documentation—including net-new job effects, retention rates, and satisfaction.

PHASE 3: INDICATOR EXTRACTION AND CROSS-CASE SYNTHESIS

Indicators were extracted from each case study using a standardized framework organized around six domains:

1. Access and Equity
2. Training and Placement Quality
3. Labour Outcomes
4. Employer Outcomes
5. Scale and Cost; and
6. Alignment with National Net-Zero Objectives.

Note that not all indicators were available for every program, and where data gaps exist they are noted explicitly in the case study snapshot. Cross-case analysis and synthesis are presented in Section 5: Discussion.



APPENDICES

Appendix B — Acknowledgements

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RESEARCH **OUTPUT**

Building the Clean Energy Workforce of Tomorrow:



EMPOWERING PEOPLE INITIATIVE (EPI)



Global Best Practices for Attracting Youth to the Clean Energy Workforce

