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Project Insights Report

Amped Up: Upskilling Canada's Heavy Duty Vehicle Mechanics to Support the Transition to Electric School Buses

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The Pollution Probe Foundation

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Executive Summary

School buses are a cornerstone of Canada's education and transportation systems, carrying millions of children each day. Historically diesel-powered, these vehicles contribute to air pollution, adverse health outcomes, and greenhouse gas emissions. Electric school buses offer a cleaner alternative, producing zero tailpipe emissions while delivering health, environmental, and symbolic benefits for communities and younger generations. At the same time, electric school bus deployment presents economic opportunities in vehicle manufacturing, battery production, electricity systems, and charging infrastructure. However, recent financial challenges faced by some electric bus manufacturers have underscored a critical vulnerability: Canada's ability to sustain school bus electrification depends on a workforce equipped to maintain and repair these vehicles.

This project examined how heavy-duty diesel mechanics can be effectively upskilled to support the transition to electric school buses. Using a combination of literature review, desktop research, and stakeholder interviews, the research pursued four objectives: establishing a baseline of existing upskilling initiatives in Canada; identifying best practices; clarifying the roles of federal and provincial governments; and assessing skills-related measures that support workers' transitions from declining to growing occupations.

Findings show that while battery-electric school buses retain similarities with diesel buses, they introduce fundamentally new systems, including high-voltage batteries, power electronics, and charging infrastructure. Informal or one-time training approaches are insufficient to manage these technologies safely and effectively. Training needs span vehicle and charging systems, and require a structured, tiered, and role-based approach aligned with recognized standards. Current upskilling efforts led by manufacturers, colleges, non-profits, and governments are growing. However, they remain fragmented and uneven across jurisdictions, with limited national coordination and inconsistent public investment in workforce development.

Overall, the research shows that workforce readiness is essential to realize the climate, health, and economic benefits of electric school buses. Embedding training into electrification strategies, aligning programs with standards and certifications, and integrating equity considerations are key to building a resilient, inclusive workforce capable of supporting Canada's transition to zero-emission school transportation.

KEY INSIGHTS

1. Heavy-duty vehicles produce 24% of Canada's transportation greenhouse gas emissions, but represent about 2% of on-road vehicles. Electric vehicles offer an alternative to achieve climate targets, but workforce readiness in their use and maintenance is critical.

2. Electric school bus deployment has outpaced workforce preparation. Fragmented and largely proprietary training has left fleets depending on manufacturers rather than building in-house maintenance capacity.

3. Structured, role-based upskilling aligned with recognized safety and certification standards is essential because informal, one-time training has proven insufficient to manage high-voltage systems and charging infrastructure.

The Issue

Canada's transition to zero-emission transportation is accelerating, yet critical workforce gaps threaten to slow progress, particularly in the heavy-duty vehicle (HDV) sector. Although HDVs account for only about 2% of on-road vehicles, they generate approximately 24% of transportation-related greenhouse gas emissions. In response, the Government of Canada has set a target for 100% of new HDV sales to be zero-emission by 2040, where feasible. Among HDVs, school buses represent one of the most practical and immediate opportunities for electrification due to their predictable routes, centralized depots, and return-to-base operations.

Electric school buses are increasingly being deployed across Canada, supported by rapid advancements in battery-electric technology and targeted public investments such as the federal Zero Emission Transit Fund and complementary provincial incentives. Jurisdictions such as Prince Edward Island and Quebec have set ambitious targets for fleet electrification, while other provinces are advancing pilot programs and incentive-based deployment. Beyond emissions reductions, electric school buses deliver significant health benefits by eliminating tailpipe pollution near children, schools, and residential communities. They also serve as visible demonstrations of climate action that can help address growing climate anxiety among youth. In addition, electrification presents economic opportunities across vehicle manufacturing, battery production, electricity generation, grid services, and charging infrastructure.

However, the successful scaling of electric school bus fleets depends on a workforce capable of maintaining and repairing these vehicles. Battery-electric school buses retain similarities with diesel buses in chassis and body design, but they also introduce fundamentally new systems, including high-voltage batteries, power electronics, software-based diagnostics, and charging infrastructure. While these systems can reduce long-term mechanical complexity and maintenance costs, they require new safety protocols, tools, and technical competencies. Heavy-duty diesel mechanics, who currently support the majority of school bus fleets, are often not adequately trained to service electric powertrains.

Early electric school bus deployments have relied heavily on manufacturers to meet maintenance needs. Fleets have increasingly sought extended warranty and maintenance agreements during procurement. In some regions, such as Prince Edward Island, most electric school bus repairs are currently covered by manufacturer warranties, signalling limited in-house capacity among maintenance staff. Recent financial difficulties among Canadian electric bus manufacturers – including the bankruptcy of Vicinity Motor and creditor protection proceedings involving Lion Electric – have heightened concerns about long-term reliance on manufacturer support and underscored the urgency of developing domestic maintenance expertise.

Without targeted upskilling initiatives, school boards and fleet operators risk maintenance bottlenecks, operational disruptions, and increased costs as electrification expands. Addressing this skills gap is essential to ensure the reliability and safety of electric school bus fleets, to support Canada's broader transportation decarbonization goals and to equip existing heavy-duty diesel mechanics with competencies to remain relevant in a rapidly evolving labour market.

What We Investigated

This project examined how Canada can better prepare heavy-duty diesel mechanics to transition to electric school buses, particularly in light of growing concerns about long-term reliance on original equipment manufacturer (OEM) warranties.

With the aim of identifying how to support a resilient, future-ready workforce capable of maintaining electric school bus fleets, the research was guided by four questions:

1. What is the baseline of existing initiatives related to upskilling heavy-duty diesel mechanics in Canada to work on electric vehicles and electric school buses?
2. What are the best practices when it comes to upskilling?
3. What is the optimal role for federal and provincial governments in supporting the creation of upskilling initiatives to support the transition to electric school buses in Canada?
4. What skills-related measures are most effective at optimizing the transition of workers from declining to growing sectors or occupations?

To address these questions, an exploratory and descriptive research design was adopted. First, a baseline inventory of existing public- and private-sector initiatives related to upskilling heavy-duty diesel mechanics was developed. Desktop research and a literature review were conducted to identify federal and provincial programs, training initiatives led by colleges and universities, and private-sector efforts, including those offered by OEMs. Both the electric school bus and electric transit bus initiatives were included due to overlapping skill requirements.

Qualitative data were gathered through interviews with electric school bus sector stakeholders, including fleet operators, training providers, OEMs, and industry organizations. These interviews explored practical experiences with electric school bus maintenance, workforce readiness challenges, and perspectives on effective upskilling models. The project also drew on stakeholder networks and pilot project experience to identify emerging practices and implementation lessons. International case study evidence from the United States was incorporated to benchmark Canada's progress and identify transferable approaches.

This mixed-method approach was chosen to generate a comprehensive understanding of existing initiatives, capture real-world operational insights, and inform policy-relevant recommendations. The project aimed to provide actionable guidance for governments, fleet operators, and training institutions seeking to strengthen workforce capacity and ensure a smooth transition from diesel to electric school bus fleets.

What We're Learning

The transition to electric school buses requires a fundamentally different and more structured approach to workforce training
While battery-electric school buses share similarities with diesel buses in chassis and body design, they introduce critical new systems, including high-voltage batteries, power electronics, and charging infrastructure. These changes significantly alter maintenance tasks and safety requirements for heavy-duty diesel mechanics. Findings from the literature review and stakeholder interviews show that informal, on-the-job knowledge transfer, commonly used in diesel maintenance, is insufficient for safely and effectively supporting electric school bus fleets. A structured training approach, with clearly defined competency levels aligned to job roles, is necessary to ensure consistent skills development across regions and fleets.

Training needs for electric school bus maintenance span both vehicle systems and charging infrastructure, expanding the scope of traditional mechanic roles
Stakeholder interviews revealed that maintenance staff are increasingly responsible for vehicle diagnostics and repair, as well as for monitoring and troubleshooting charging systems and related software. Training must therefore cover high-voltage safety procedures, battery and powertrain diagnostics, and coordination with electricians and charging equipment providers. This shift reflects a broader move from mechanical work to electromechanical and software-supported troubleshooting. Without comprehensive training across both domains, school bus fleets risk maintenance delays, safety incidents, and increased dependence on external service providers.

Current upskilling initiatives exist but are fragmented and unevenly distributed across Canada
A growing number of training efforts led by original equipment manufacturers, colleges and polytechnics, unions, governments, and non-profit organizations exist. However, most programs are either proprietary, limited to initial vehicle delivery, or focused on light-duty electric vehicles rather than heavy-duty or school bus applications. Jurisdictional differences are significant: while Quebec has begun investing directly in heavy-duty electric vehicle technician training, most federal funding to date has prioritized vehicle deployment and charging infrastructure rather than workforce development. The absence of a coordinated national framework limits consistency, scalability, and access to training for heavy-duty diesel mechanics across provinces.

Reliance on OEM warranties has masked underlying workforce readiness gaps, creating long-term operational risk

Early electric school bus deployments have depended heavily on OEMs to provide maintenance and repairs through extended warranty agreements. Interviews with fleet operators indicated that this reliance reflects limited in-house capacity rather than a long-term operational preference. Financial instability among some electric bus manufacturers has exposed the vulnerability of this model and underscored the importance of building domestic maintenance expertise. Without proactive upskilling, fleets may face service disruptions, higher costs, and reduced confidence in electrification efforts as OEM support becomes less certain.

Equity considerations are critical to ensuring that the benefits of electrification extend to the existing workforce and new entrants alike

The project found that without intentional design, upskilling initiatives risk excluding equity-deserving groups who are already underrepresented in the heavy-duty vehicle maintenance sector. Stakeholders emphasized the importance of accessible training formats, financial support, flexible scheduling, and mentorship to broaden participation. Embedding equity into program design was identified as essential for supporting the transition from heavy-duty diesel mechanics and declining diesel-related work to growing electric vehicle occupations.

Why It Matters

Canada's ability to meet its zero-emission transportation targets depends not only on deploying electric vehicles but on ensuring those vehicles can be safely, reliably, and cost-effectively operated over their lifecycle. This project shows that workforce readiness, particularly the upskilling of heavy-duty diesel mechanics, is a prerequisite for the successful electrification of school bus fleets. Without a skilled maintenance workforce, electric school buses risk increased downtime, higher operating costs, and safety challenges, undermining both emissions reduction goals and public confidence in electrification.

The findings have immediate implications across the school transportation sector. Many early electric school bus deployments have relied heavily on original equipment manufacturers (OEMs) for maintenance and repairs through extended warranty agreements. While this approach enabled early adoption, the research highlights the importance of building in-house and third-party maintenance capacity so that fleets are not dependent on manufacturer solvency. For school boards and fleet operators, this means treating workforce training as essential infrastructure alongside vehicles and charging equipment.

State of Skills: Sustainable Jobs for Economic Growth

Green-related skills and knowledge are growing in significance and are becoming widespread across many sectors and occupations, requiring more workers to upskill by building upon their existing competencies.

Read Thematic Report

The project also highlights critical gaps within education and training systems. Existing college, polytechnic, and apprenticeship programs provide limited coverage of electric medium- and heavy-duty vehicles, leaving many mechanics dependent on informal, one-time, or proprietary training. The findings show that informal knowledge transfer is insufficient. Modular, role-based, and stackable training pathways aligned with recognized standards are needed to ensure consistent, scalable skills development across jurisdictions. This has broader implications for how training programs are designed, funded, and accredited to support mid-career transitions in a rapidly changing labour market.

The findings suggest that effective transitions require early and proactive upskilling, clearly defined competency frameworks matched to job roles, and public coordination to reduce fragmentation across provinces. These lessons are transferable to other parts of the low-carbon economy, including electric transit buses, freight vehicles, and clean transportation infrastructure more broadly.

Funding and program design emerge as levers for enabling workforce readiness. To date, federal and provincial funding has largely prioritized vehicle procurement and charging infrastructure, with limited and uneven investment in technician training. The research indicates that electrification programs are more effective when workforce development is embedded as a core requirement rather than treated as an optional add-on. Integrating training expectations into deployment funding programs can help ensure that skills development keeps pace with capital investment and prevents bottlenecks that slow adoption or increase lifecycle costs.

Equity considerations further elevate the importance of this work. The heavy-duty vehicle maintenance sector already faces workforce shortages, an aging labour force, and persistent underrepresentation of women and other equity-deserving groups. Electrification introduces both risks and opportunities: while fewer mechanical components may reduce some traditional tasks, higher technical skill requirements can create pathways to more specialized and higher-value roles. Without deliberate action, inequities in access to training and certification may widen. Embedding equity into workforce development through targeted outreach, financial supports, flexible delivery models, and accountability mechanisms is essential to ensure that the transition benefits a broad and diverse workforce.

In the broader context of climate change and economic competitiveness, the stakes are significant. Heavy-duty vehicles account for a disproportionate share of transportation emissions. School buses are among the most feasible segments to electrify due to predictable routes and return-to-base operations. Ensuring a skilled maintenance workforce protects public investment, supports emissions reductions, and strengthens Canada’s position in the clean transportation economy. The central lesson from this project is clear: workforce development is not ancillary to climate policy—it is fundamental to delivering it at scale.

What’s Next

Further work is needed to translate research findings into accessible training solutions. Collaboration with colleges, polytechnics, and unions can support the design of modular, role-based upskilling programs tailored to in-service heavy-duty diesel mechanics. Developing public-facing resources that clearly map training needs by job role would help fleets, technicians, and training providers better understand required competencies and identify appropriate learning pathways.

Opportunities have also been identified to expand the scope of this work. Future research could examine upskilling needs for technicians working on electric transit buses, delivery vehicles, and heavy-duty freight trucks, where similar workforce challenges are emerging. Skills gaps related to the installation, operation, and maintenance of electric vehicle charging infrastructure and other clean energy technologies could be explored.

Pollution Probe has also released companion reports to further the impact of this work, including a resource guide and a case study from Edmonton.

Have questions about our work? Do you need access to a report in English or French? Please contact communications@fsc-ccf.ca.

How to Cite This Report
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The Future Skills Centre acknowledges that the Anishinaabe, Mississaugas and Haudenosaunee share a special relationship to the 'Dish With One Spoon Territory,' where our office is located, bound to share and protect the land. As a pan-Canadian initiative, FSC operates on the traditional territory of many Indigenous nations across Turtle Island, the name given to the North American continent by some Indigenous peoples. We are grateful for the opportunity to work in this territory and commit ourselves to learning about our shared history and doing our part towards reconciliation.