

Talent Strategy for the Critical Minerals Sector in Ontario

Strategic and Policy Insights Report

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Foreword



For over 100 years, Ontario has been a leader in automotive manufacturing, with a renowned history of being one of North America's foremost vehicle production and assembly hubs. As we enter the next century of automotive excellence, our province is committed to leading the charge in building the next generation of vehicles and the innovative technologies that power them.

Today, we are at the forefront of a once-in-a-generation opportunity to lead the global shift to electrification and build an end-to-end electric vehicle supply chain. As Ontario's flagship initiative for the automotive and mobility sector, the Ontario Vehicle Innovation Network (OVIN) is pioneering an all-electric future driven by made-in-Ontario electric

vehicles and batteries. Recognizing that the path to this future starts in the North and its wealth of critical minerals, OVIN is responding to the call to reinforce Ontario's position as the global hub for the responsible sourcing of critical minerals and vehicle and battery manufacturing, for generations to come.

The Critical Minerals Talent Strategy provides a roadmap to harnessing Ontario's strengths to build a resilient, end-to-end supply chain, starting with the most pivotal component—its people. Informed by labour market forecasts and key insights from stakeholders, the Talent Strategy outlines a clear path to developing a highly skilled workforce with the ability to lead the exploration and production of the materials that will power the shift to electrification.

This pivotal step towards empowering current and future generations of talent was made possible by the invaluable collaboration with the Ministry of Labour, Immigration, Training and Skills Development; the Ministry of Economic Development, Job Creation and Trade; the Ministry of Northern Development; the Ministry of Indigenous Affairs; and the Ministry of Mines.

As we charge forward to an electric future, the Critical Minerals Talent Strategy will serve as the foundation for engaging talent, advancing training and education programs, promoting meaningful engagement of women and other underrepresented groups in the sector, and establishing long-term trust and partnership with Indigenous communities. Together, these approaches support Ontario's vision of a future-ready workforce primed to lead the automotive and mobility sector globally.

Raed Kadri
Head of the Ontario Vehicle Innovation Network

Acknowledgements

The Critical Minerals Talent Strategy, developed by the Ontario Vehicle Innovation Network (OVIN) in close collaboration with partners across Ontario's critical minerals, automotive, and mobility ecosystem, underscores the province's commitment to innovation. Ontario's vast educational, manufacturing, natural resource, and R&D capabilities are strengthened by its greatest asset: its people and collaborative culture.



OVIN acknowledges the support of the Government of Ontario, particularly the Ministry of Labour, Immigration, Training and Skills Development, the Ministry of Economic Development, Job Creation, and Trade, the Ministry of Northern Development, and the Ministry of Mines, whose insights and guidance were instrumental in crafting this talent strategy amid Ontario's EV transition. Special thanks to the project's key industry stakeholder – the Ontario Mining Association, who contributed valuable feedback and support for elements of the final reports.

We extend sincere gratitude to all other individuals, leaders and organizations who contributed to this project through various stakeholder discussions and interviews. OVIN's holistic approach to the Critical Minerals Talent Strategy mirrors the interconnected nature of the sector's shift to electrification and the substantial investments drawn to Ontario.

Furthermore, we appreciate the insights of community groups, particularly women and Indigenous communities, who will be impacted by sector developments. The collaboration of stakeholders from Northern Ontario's mining industry, post-secondary institutions, non-profit organizations, and community stakeholders has resulted in a strategy that positions Ontario as a global leader in the EV transition.

Introduction



¹ International Energy Agency, "Critical Minerals."

² Ontario, "Ontario's Critical Minerals Strategy 2022–2027: Unlocking potential to drive economic recovery and prosperity."

Ontario is at the forefront of a burgeoning critical minerals sector, driven by rising demand for clean technologies like the specialized batteries required in electric vehicles (EVs). Use of critical minerals like cobalt, lithium, graphite, copper, nickel, and manganese is expected to increase two to six times by 2040¹.

To capitalize on this growth, Ontario will need to further develop and expand its critical mineral value chain capacity², stay at the forefront of changes in EV battery technology and their mineral composition, and remain competitive with and integrated into the North American EV production industry and marketplace. To succeed, the province will need to quickly implement an enduring talent strategy that ensures the associated mining, manufacturing, and recycling industries have a workforce with the necessary skills and capabilities for long-term success.

This report summarizes the key strategic and policy insights of a larger analysis based on three scenarios regarding the long-term jobs and skills needs of Ontario's critical minerals sector: a baseline projection with limited expansion in Ontario's critical minerals sector; a high-demand, high-supply (HDHS) scenario showing strong expansion in the sector with sufficient labour supply to support it; and a high-demand, low-supply (HDLS) scenario showing strong potential expansion in the sector but insufficient labour supply to meet the opportunity, resulting in a surge of job vacancies.

¹ International Energy Agency, "Critical Minerals."

² Ontario, "Ontario's Critical Minerals Strategy 2022–2027: Unlocking potential to drive economic recovery and prosperity."

Key Takeaways



To build a robust talent pipeline for the long-term, the critical minerals sector should:



Ensure Ontario has the skilled workforce needed to meet the evolving talent requirements of the sector, with a focus on “skilled” and “certified” occupations. These jobs require skills in machinery operation and control, equipment monitoring, quality control testing, tool selection, and troubleshooting.



Improve awareness of the sector, and attract new talent, through early engagement and promotion.



Develop a robust education and training ecosystem, including hands-on learning and employer-sponsored training opportunities.



Increase the participation of women and other underrepresented groups by addressing childcare needs, discrimination, and the lack of representation in leadership positions.



Begin early and meaningful partnerships with Indigenous communities for the long-term.

Future Skill Gaps



Employment in the critical minerals sector is forecast to grow faster than any other area of the Ontario economy – increasing by 125% from 2023 to 2040 in the baseline scenario (Chart 1). However, the sector remains relatively small – accounting for just 0.2 per cent of total employment in the province by 2040.

Chart 1: Employment growth in the critical minerals sector outpaces all other sectors in Ontario over the next two decades.

(Per cent change in employment, 2023 – 2040, Ontario)

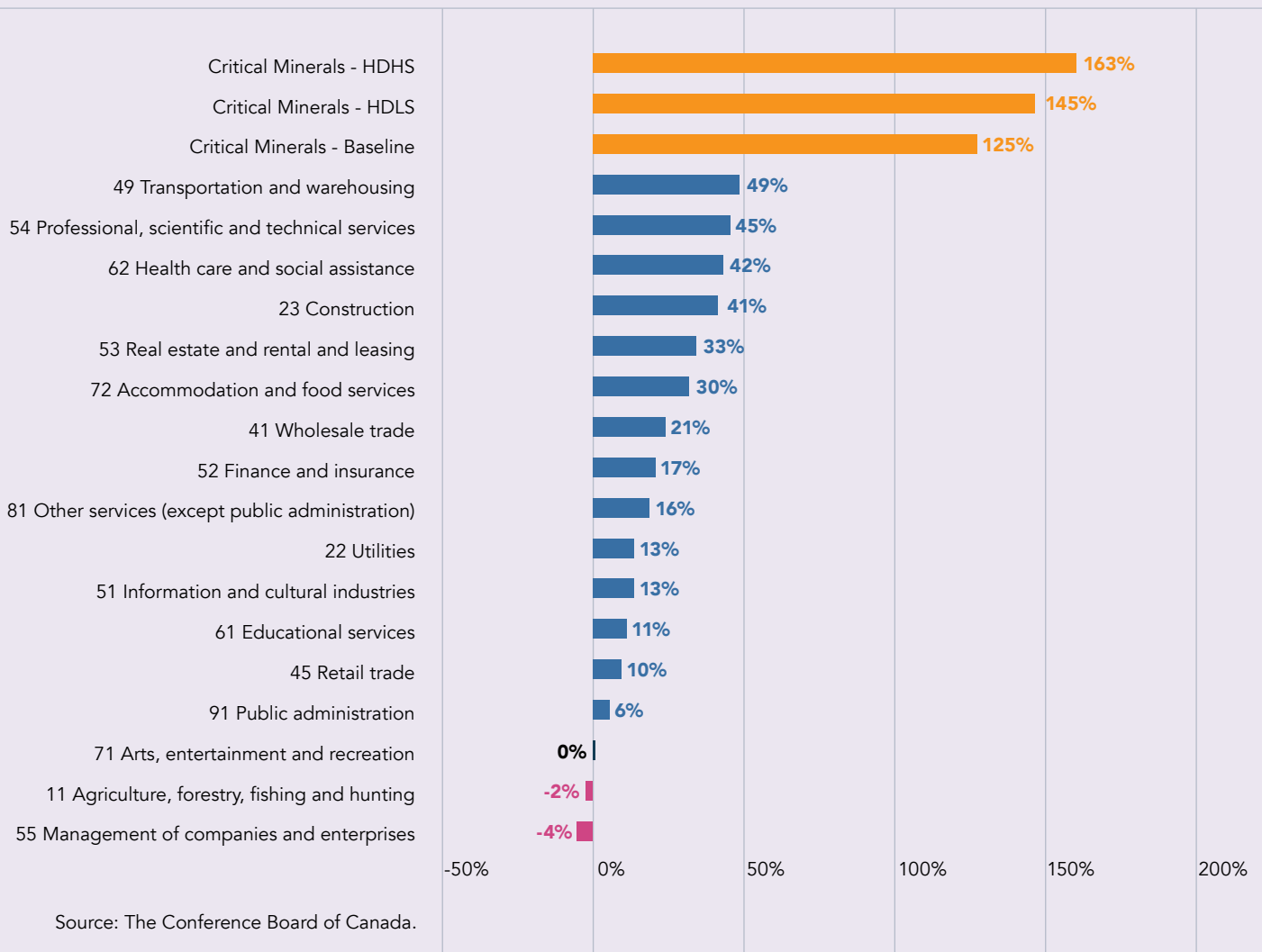


Table 1: Employment and Vacancies in the Critical Minerals Sector

Source:
The Conference Board of Canada.

	Baseline	High-demand High-supply (HDHS)	High-demand Low-supply (HDLS)
Employment			
2023	8,709	8,709	8,709
2030	13,794	15,634	15,028
2040	19,551	22,887	21,344
Vacancy Rate			
2023	3%	3%	3%
2030	3%	7%	11%
2040	3%	8%	14%

There is a potential need for 3,340 additional workers to be employed in the critical minerals sector resulting in nearly 23,000 jobs in the sector by 2040, an increase of 163 per cent from today’s level (Table 1).

However, without a supportive talent strategy, there is a risk of having an insufficient labour supply resulting in over 3,500 vacancies – **meaning about one in seven jobs going unfilled.**

Vacancy rates are higher in both the HDHS and HDLS scenarios, reflecting the practical challenges of ramping up employment quickly under any circumstance. The higher vacancies under the high-supply scenario captures, in part, the constraints on the future size and structure of Canada's labour supply. Specifically, the HDHS scenario assumes more workers are attracted to the sector from other, adjacent sectors as compared to the HDLS scenario but does not model changes in the training and educational pipeline nor the potential for an increased working age population in Ontario.

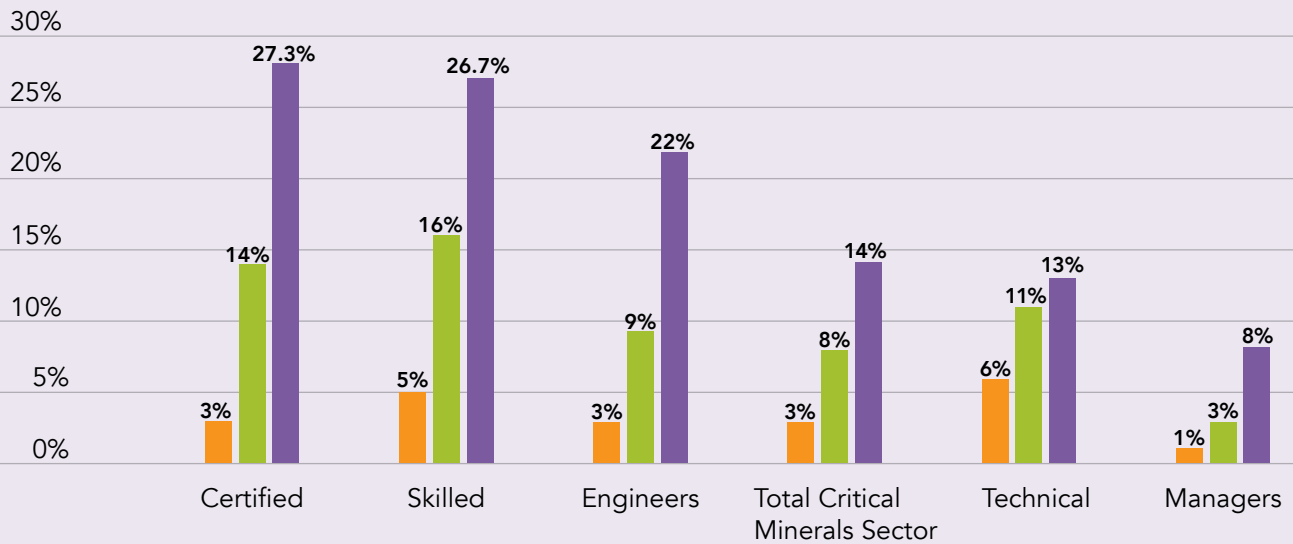
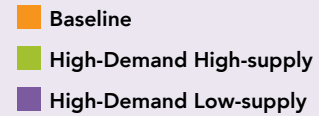
Therefore, improvements to the critical minerals sector talent pipeline is a critical path through which the higher vacancies in the HDHS or HDLS scenarios can be addressed. While there is no "natural" or "optimal" level of vacancies to target, action on the talent pipeline today can help alleviate the potential vacancies forecasted.

The largest number of job vacancies will be for certified and technical jobs, but the largest job vacancy rates will be in the skilled and certified job categories, suggesting these jobs will be the most difficult to fill (Chart 2). Furthermore, the skills needed in these jobs are often the most difficult to find and train for. These include machinery operation and control, equipment monitoring, quality control testing, tool selection, and troubleshooting.



One in seven jobs in the critical minerals sector are at risk of going unfilled by 2040 without a sufficient talent pipeline.

Chart 2: Skilled and certified jobs most at risk of talent supply bottlenecks. (Vacancy rate, 2040)



Source: The Conference Board of Canada.
 *Vacancy rate = vacancies/(vacancies + employment) x 100%

Since skilled jobs generally do not require any post-secondary education, most of the skills required are obtained through on-the-job training. For certified jobs, the requisite capabilities are typically obtained from college, from apprenticeship training of less than two years, or from more than six months of on-the-job training. Certified jobs also often require other specific licenses such as heavy equipment or truck driving licenses. These requirements mean that it will require several years to expand the workforce for skilled and certified jobs. The sector must therefore act promptly to ensure that training programs are widely recognized and accessible now, to meet the demand for workers in the coming decades.

Certified occupations include heavy equipment operators, transport truck drivers, drillers and blasters, and underground production and development miners. Skilled occupations include electronics assemblers, fabricators, inspectors and testers, machine operators, and inspectors in electrical apparatus manufacturing and underground mine service and support workers. (Table 1.3).

Risks and Caveats to this Outlook



01 Volatility in global commodity markets for critical minerals

Prices for critical minerals can be quite volatile and can even fall to levels that would make developing and operating new mining capacity uneconomic for extended periods³. This is a key risk to any long-term employment forecast and related talent strategy.

02 Changes in EV battery technology

EV battery technology is in a state of flux as new mineral combinations and battery compositions are being researched and developed. The potential for the emergence of a new form of high-capacity, fast rechargeable battery that employs a new and novel mix of minerals is a risk to the sector's advancement.

03 Climate change and carbon pricing policies

The potential for significant increases in costs for mining and manufacturing operations in the critical minerals sector due to climate policies and planned escalations in the price of GHG emissions presents a moderate risk to development of the sector.

04 Weak and/or significantly delayed uptake in demand for electric vehicles

Although Canada has put in place a policy that will require all new vehicle sales to be zero-emission vehicles by 2035, this would be a small part of the continental EV marketplace. Delays or retrenchment in US demand for electric vehicles stands as a risk to the development of the North American critical minerals sector.

³Jamasmie, Cecilia, "First Quantum to halt Ravensthorpe nickel mine."

Policy Recommendations



Educational and training institutions should expand programs across Ontario – including apprenticeships, diplomas, and degrees – targeted to train more workers for certified and skilled jobs. (See Appendix Table 1.2 for examples of education and training programs in Ontario.) Action on this should start in the next few years, to ensure an adequate supply of skilled workers over the coming 10 to 20 years.

Increased collaboration between industry and relevant educational and training institutions is needed to ensure students are getting training in the machinery operation and control, equipment monitoring, quality control testing, tool selection, and troubleshooting skills they will need.

These recommendations align with the detailed recommendations provided in Ontario Mining Association's Labour Market Assessment report (2023).⁴

⁴ Ontario Mining Association, "OMA-OLMP Labour Market Assessment."



Case Study: Agnico Eagle Mines Ltd. Partners with Northern College to Offer Free Training Programs

In 2022, Agnico Eagle Mines and Northern College announced they are partnering to deliver fully-funded training for skills development in the mining industry in Northern Ontario.⁵

“The \$4.58 million project aims to develop a new skilled workforce through collaboration, innovation, diversification and experiential learning in a wide range of mining-related programs including career readiness, trades pre-apprenticeships, underground mining, diamond drilling, mineral processing and environmental monitoring.”⁶

The project will be funded through Ontario’s Skills Development Fund. Up to 146 people will be able to access the free programs that include job training at Agnico Eagle’s sites such as Detour Lake Mine and Macassa Mine. Funding may also be available to help with childcare, travel and accommodations.⁷

“The creation of partnerships and talent pipelines for specialized roles within our industry is critical to our long-term success. In 2021, we hired nearly 600 workers for our operations in Northern Ontario and we have many more positions to fill now and into the future.”⁸

~ Andre Leite, Vice President, Ontario, Agnico Eagle Mines.

⁵ Northern College, “Agnico Eagle Mines Limited And Northern College Partner To Deliver Tuition-Free Training Programs.”
^{6,7,8} Ibid.

Attract Talent to the Critical Minerals Sector



Increase Awareness of and Access to Employment Opportunities

A successful talent strategy will need to address a lack of awareness of job options in the critical minerals sector. Providing educators and career development professions with materials and resources about the nature and diversity of roles in the sector can help increase awareness for prospective job seekers. This is especially important during high-school and post-secondary when students are considering their career options.

Additionally, streamlining credential evaluation processes, minimizing costs associated with accreditation, and reducing wait times for qualification recognition can enhance the accessibility of the mining industry for job seekers looking to transition from another sector or occupation and for immigrants with the required skills.

Case Study: Engaging Youth in Ontario

Ontario Vehicle Innovation Network (OVIN) and Mining Matters are working to educate youth about careers in the critical minerals sector.

OVIN has launched the Regional Future Workforce (RFW) Program, designed to encourage all types of students (kindergarten to post-secondary) across Ontario to pursue careers in the automotive and mobility sector.⁹ The RFW program prioritizes engagement with students from underrepresented groups with the aim to get students in these groups interested in the automotive and mobility sector. Applicants looking to create programs to engage youth (minimum 500 students) can apply for up to \$500,000 in funding as part of the RFW program.¹⁰

Mining Matters is a national organization dedicated to educating young people to develop knowledge and awareness of Earth sciences, the mining industry, and their roles in society.¹¹ They provide educators with resources about rocks, minerals, metals, mining, and the diverse career opportunities available in the mining industry that meet provincial curriculum expectations. They also have targeted education and outreach programs for Indigenous communities where they provide Indigenous youth and educators with hands-on Earth science activities and field trips.¹²



⁹ OVIN, "Regional Future Workforce Program."

^{10 12} Ibid.

¹¹ Mining Matters, "About Us."

Improve the Attraction of Jobs in the Sector



Potential employees need to be made aware of how the mining industry has advanced, becoming more automated, and integrating more green technology. This will help combat the negative stereotypes of the industry having only manual labour jobs and not being a good steward of the environment. Job seekers will need more “green skills” which encompass the knowledge, abilities, values, and attitudes required to develop and sustain a resource-efficient society. The industry has shifted from traditional, manual labour jobs toward roles requiring digital skills to oversee newly automated processes and operate more automated equipment.

In addition, a culture change is needed if the critical minerals sector is to attract domestic and international job seekers with the skills, backgrounds, and interests directly relevant to the sector. The sector needs to improve its equity, diversity, and inclusion (DEI) practices. More pervasive DEI practices will build the knowledge and abilities necessary to combat discrimination based on race, ethnicity, gender, and sexuality, foster cultural awareness; and mitigate biases that make the sector seem unwelcoming to underrepresented groups.



Case Study: This is Mine Life Campaign

The Ontario Mining Association (OMA) is implementing This Is Mine Life, a multi-year, multi-stage, multi-partner collaborative effort aimed at changing perceptions of mining and helping to attract a diverse talent pool into the industry. The campaign involves a number of Ontario/Canadian-based organizations and institutions that have aligned interests, including industry stakeholders, government, community and educational organizations.

For example, the OMA has partnered with technology influencer, Amber Mac, to produce an award-winning podcast, and created a careers hub on TalentEgg. It is working with Edge Factor to produce and distribute high-impact stories of people working in mining, career paths, essential skills, and technologies used in the industry. Content from this campaign can be used by parents, teachers, and mining employers to promote careers in the industry to youth.

“Setting up the people of Ontario for success, both now and in the long-term, has always been at the core of our government’s mission... That is why we are proudly supporting the Ontario Mining Association and Edge Factor’s initiative to inspire brilliant people across Ontario to be the skilled labourers of tomorrow and work in our world-class mining industry. Mining in Ontario is thriving, and the world needs us to build a made-in-Ontario critical mineral supply chain that will power the electric vehicle revolution and the technologies of tomorrow.” ~ Hon. George Pirie, Ontario Minister of Mines

Bring Training and Development Closer to the People



Industry stakeholders reported the lack of centralized information about programs such as apprenticeships, certification, diploma courses, and degree programs is hurting industry efforts to recruit. Similarly, more training and development opportunities are needed for people who face barriers to participating in full-time, in-person programs. This is particularly true for persons in remote communities, women with family commitments, and international students who are less able to relocate for training.

Online and hybrid programs (programs that are mostly online but include in-person field work experiences) can help to remove such barriers. Similarly, increasing experiential learning opportunities or work-integrated learning (WIL) for students enrolled in mining programs provides prospective employees with hands-on experience, which ultimately increases their interest and retention in the mining sector.



Case Study: Micro-credentialling in Ontario

Micro-credentials are short training programs offered by post-secondary education institutions that can help workers get the skills that employers need, ultimately helping people retrain and upgrade their skills to find new employment.¹³ Since 2021, the Government of Ontario has been supporting the development and expansion of micro-credentials across Ontario. This program encourages collaboration between post-secondary institutions and industry to develop relevant training programs.

OVIN's Content Partnerships Program aims to provide online learning content, including micro-credentials, that is relevant to the various segments of the automotive and mobility workforce in Ontario.¹⁴ Applicants can apply for up to \$50,000 in funding to develop one or more micro-credentials or up to \$100,000 only if they intend to develop at least four (4) inter-connected micro-credentials, in both English and French. Micro-credentials developed must be developed in response to the automotive and mobility industry's workforce needs and vetted by the industry.¹⁵ OVIN's efforts to expand micro-credentialling relevant to the critical minerals sector is a key strategy for equipping job seekers with the skills and training necessary for entry into the sector.

¹³ Ontario Government, "Micro-credentials from Ontario's postsecondary schools."

^{14,15} OVIN, "Content Partnerships Program."

Policy Recommendations



The government and industry should work to increase awareness of Ontario's critical mineral mining sector through early engagements and activities at the elementary and high school level, for example by supporting initiatives like OVIN's RFW program or Mining Matters.

Educational and training institutions and government agencies should collaborate to better organize and centralize information about programs that allow direct entry into the sector such as apprenticeships, certification, diploma courses, and degree programs.

Funding and scholarships from the government and private sector are needed to ensure training programs and education are accessible.

Educational institutions and industry need to coordinate and expand their program offerings to include more online and hybrid learning to accommodate a wider range of students and provide students with opportunities for more relevant hands-on learning. OVIN's Content Partnerships Program is an example of a program working towards this goal.



Case Study: Building Australia's Talent Pool

Australia's mining sector is facing similar labour market challenges to those faced in Ontario. There are not enough skilled workers, young people, and recent graduates wanting to join the mining industry, threatening the growth of their critical mineral sector. In response, the Australian government is taking steps to grow the talent pool by funding the following initiatives¹⁶:

- Australia Apprenticeship Initiatives System, which provides financial support to apprentices, trainees, and employers working in priority industries.¹⁷
- Jobs and Skills Councils (JSCs), not-for-profit organizations that provide leadership to address skills and workforce challenges for their industry. JSCs will identify skills and workforce needs for their sectors, map career pathways across education sectors, develop contemporary training products, support collaboration between industry and training providers to improve training and assessment practice, and act as a source of intelligence on issues affecting their industries.¹⁸
- New Energy Apprenticeship and New Energy Skills Programs that will provide 10,000 eligible apprentices with up to \$10,000 to help with the cost of living during their apprenticeship, and industry-based mentoring, peer support, and networking opportunities to assist in developing the next generation of skilled clean energy workers.¹⁹
- Fee-Free TAFE initiative, which makes vocational education and training more accessible and affordable, providing opportunities for individuals to upskill, reskill, or start their career in high-demand industries.²⁰

¹⁶ Australia Government, "Critical Mineral Strategy 2023–2030."

¹⁷ Australia Government, "Strategic Review of the Australian Apprenticeship Incentive System."

¹⁸ Australia Government, "Jobs and Skills Councils."

¹⁹ Australia Government, "Critical Mineral Strategy 2023–2030."

²⁰ Queensland Government, "Fee-Free TAFE."

Improve Women's Participation in the Sector



Women represent 14 per cent of the workforce in mining and 25 per cent in manufacturing in Ontario, compared to their 47 per cent representation across all industries.²¹ The critical minerals sector continues to face systemic challenges arising from a history of male dominance, making it challenging for women to enter or advance. Enduring discrimination has caused many women to exit the mining industry, which not only affects those who leave but also discourages other women from considering careers in the industry.

For women, the mining industry's lack of reliable daycare, remote locations, and demanding hours present daunting barriers to their working in the sector. Moreover, women interviewed reported work environments in the mining industry sometimes lacked equipment and facilities that help ensure the safety and well-being of women workers.

A stronger commitment to equity, diversity and inclusion (DEI) training for leadership, managers, supervisors, and peers would help equip those individuals with the knowledge and skills to effectively navigate diversity; address instances of harassment, bias, and discrimination; and cultivate workplaces that are supportive and welcoming to women.

Only 19 per cent of women hold senior management positions in the mining and oil and gas industry and 27 per cent in the manufacturing industry, both well below the 37 per cent level seen across all industries in Ontario.²² To attract and retain women in the critical minerals sector, especially in senior leadership positions, there must be a concerted push for inclusive hiring practices that address discrimination and bias against women in the hiring process.

²¹ Mining includes mining, quarrying, and oil and gas extraction (NAICS 21, 2100) and manufacturing includes manufacturing durable goods (NAICS 321, 327, 331-339). Statistics Canada, "Table 14-10-0023-01 Labour force characteristics by industry, annual (x 1,000)".

²² Statistics Canada, "Table 33-10-0660-01 - Average percentage of women and men in management positions, first quarter of 2023"



Case Study: Learning from Manufacturing Companies

Recent work done by the Trillium Network for Advanced Manufacturing outlines best practices from five manufacturing companies who successfully implemented policies and practices to improve gender diversity and inclusion.²³ Based on these examples, they provide ten key lessons for employers:

- 1. Progress takes deliberate efforts.**
- 2. Collecting and tracking data is essential.**
- 3. Prioritize flexibility and work-life balance.**
- 4. Women need to be involved in the development and implementation of policies or programs designed to support gender diversity.**
- 5. Recognize bias.**
- 6. Transparency and communication help ensure accountability.**
- 7. Identify and promote career development.**
- 8. Ensure senior leaders in the company are on-board with diversity and inclusion initiatives.**
- 9. Provide training and support to managers and staff.**
- 10. Start today.²⁴**

These are valuable guidelines that can apply to all employers in the critical minerals sector, when it comes to developing and implementing policies or programs intended to improve representation of women.

²³ Trillium Network for Advanced Manufacturing, "Gender Diversity and Ontario Manufacturing: Lessons from Five Leading Companies."

²⁴ Ibid.

Policy Recommendations



All levels of government in partnership with industry should support the provision of quality daycare in remote areas.

Mining companies/businesses should offer competitive maternity/parental leave.²⁵

Mining companies/businesses should enforce stricter anti-harassment and discrimination policies coupled with DEI training for all staff.

Mining companies/businesses need to provide equipment designed and properly sized for women workers and provide facilities that ensure women's safety and well-being.

Mining and manufacturing companies/businesses need to hire and promote more women, especially in leadership roles. Implementing targets for representation could be a good first step. Companies should encourage mentorship and leadership training for women at their organization.

Mining companies/businesses should offer more flexible work arrangements.

²⁵ Based on a survey of 159 large- and medium-sized business across Canada, on average, maternity leaves are topped up for 14.8 weeks, at an average of 89.6 per cent of the employee's salary. Marcil, Liz, and Tabatha Thibault. "Benefits Benchmarking 2023: Inclusive Benefits Offerings."



Case study: WORK180 Connecting Women and Employers

Currently operating in the US, UK, and Australia, WORK180 provides a platform to help women find companies that are committed to diversity and equality while also helping employers hire more women.²⁶ WORK180 vets companies based on rigorous standards, including a minimum criteria for parental leave and flexible work arrangements, commitment to ongoing DEI improvements, and transparent employee policies, to ensure those approved are truly dedicated to supporting and advancing women's careers. By gaining WORK180 endorsement, mining companies can improve their recruitment of women by signaling to them that they are a high-quality employer.

"By becoming a WORK180 Endorsed Employer, we are signaling to potential employees that we take our commitment to diversity and inclusion seriously. The process for becoming a WORK180 partner is stringent, with accepted companies having to prove their their credentials in areas around diversity and inclusion," said Newcrest Mining Limited.²⁷

²⁶ WORK180, "Our Approach."

²⁷ Newcrest Mining Limited, "Newcrest launches partnership with WORK180."

Chart 3: Strategy timeline to increase women participation in the critical minerals sector.

Short-term (1-5 years)



- Implement DEI training.
- Update workplace policies to support flexible work arrangements and accommodations.
- Offer parental leave policies and top-ups programs.
- Review hiring practices to eliminate bias or discrimination, and prioritize hiring women.
- Ensure workplaces have appropriate facilities and equipment for women.

Medium-term (5-10 years)



- Ensure quality childcare facilities near worksites.
- Provide leadership training and mentorship programs for women.
- Review salaries to ensure women and men are being paid equally.
- Monitor representation, evolve policies or strategies accordingly.
- Review workplace policies and procedures, ensure DEI principals are followed.

Long-term (5-10 years)



- Promote networking and outreach among women in the sector.
- Review salaries to ensure women and men are being paid equally.
- Monitor representation, evolve policies or strategies accordingly.
- Review workplace policies and procedures, ensure DEI principals are followed.

Source: The Conference Board of Canada.

Partner with Indigenous Communities



There are 128 First Nations in Ontario as well as a substantial Métis population represented by the Métis Nation of Ontario. This diversity of nations encompasses a range of opinions and Indigenous policy perspectives on the risks and opportunities of mining and Ontario's evolving critical minerals sector. While some nations are opposed to any form of mining development on their lands, others aspire to be involved in every stage of responsible mining, not just in entry-level roles. During our interviews, representatives of these nations expressed a need for targeted training and foundational-level education, at the community level, in science, technology, engineering, and math (STEM) to prepare for such positions.

Approaching Indigenous communities (First Nations, Métis, and Inuit) and/or regional Indigenous Organizations (such as Political Territorial Organizations and Tribal Councils) at the beginning of a project is crucial for establishing trust and developing the social license required to initiate new critical minerals sector projects in Canada. It will also lead to the most success in attracting talent from each nation that wants to participate.

Racism and gender-based discrimination remain challenges within the industry. Proposals to tackle these issues include the introduction of Indigenous liaison roles and programs to provide culturally relevant support and advice from Elders.²⁸

²⁸ MacLaine, Fiser, Adam, and Lalonde, Melissa, "Working Together: Indigenous Recruitment and Retention."

Procurement strategies must include the unbundling of contracts to allow smaller Indigenous businesses to compete and should include mentorship programs to help Indigenous businesses navigate the industry's complexities.

The cost, and availability, of training programs create significant barriers to entry into the mining industry for Indigenous workers in remote communities. In addition, entry-level positions in mining, while necessary, may offer little job security and put prospective workers at greater financial risk.

Government funding and support are necessary to sustain training programs, particularly those developed in partnership with Indigenous organizations and the private sector. A collaborative approach can alleviate the financial burden on industry and ensure the culturally-aware provision of comprehensive training programs.

Addressing the unique social and environmental risks to Indigenous communities from mining developments requires a multifaceted approach that respects Indigenous self-determination, cultural values, and prioritizes community well-being and environmental sustainability.

High turnover among government and industry representatives involved at different stages of a major project development in the critical minerals sector can undermine the trust and continuity essential for meaningful partnerships with Indigenous nations. This highlights the need for strategies that ensure long-term engagement with Indigenous communities and their representative organizations.

Indigenous perspectives on responsible mining and development incorporate a long-term view, prioritizing the wellbeing of future generations. This approach demands a comprehensive consideration of a mine's lifecycle, from development through to closure and land rehabilitation, ensuring decisions are made with the seven generations principle in mind.



Case study: Hydro One's Equity Partnership Model

Hydro One has developed an industry-leading Equity Partnership Model that offers First Nations a 50 per cent equity stake in all new capital transmission line projects valued above \$100 million.²⁹ Hydro One and nine First Nations have entered into agreements which provide them with the opportunity to invest in 50 per cent of the Waasigan Transmission Line being developed in northwest Ontario. This model will also apply to the five new transmission lines being developed in southwest Ontario. Hydro One has also committed to ensuring that participating First Nations have adequate funding to acquire equity.³⁰

"Gwayakocchigewin's partnership agreement with Hydro One on the Waasigan Transmission Project provides a tremendous opportunity for our First Nations in northwestern Ontario, and demonstrates the right approach to Indigenous Participation", said Tom Johnson, President of Gwayakocchigewin Limited Partnership.³¹

Hydro One has been commended for their approach to Indigenous relations, considering it "best-practice" and the "gold standard".^{32,33}

²⁹ Hydro One, "Indigenous Relations."

³⁰ Wall, "Hydro One pledges 50:50 equity deals with First Nations on large transmission projects."

³¹ Environmental Journal, "Hydro One partners with First Nations on large transmission line projects."

³² Hydro One, "Hydro One awarded Gold level Progressive Aboriginal Relations certification for company's commitment to Reconciliation."

³³ Wall, "Hydro One pledges 50:50 equity deals with First Nations on large transmission projects."

Policy Recommendations



The Ontario and federal governments and businesses need to engage early and meaningfully with First Nations and the Métis Nation of Ontario whenever and wherever critical minerals sector projects present opportunities and impacts for their members. They need to engage with high level Political Territorial Organizations as well as the local Indigenous communities that may be impacted to ensure their capacity, needs, and interests are understood. This engagement needs to happen prior to the start of any mining project and continue throughout a project life cycle.

Collaboration between governments, educational institutions, and businesses is needed to develop localized training programs with employment guarantees.

Companies need to codevelop training and education opportunities with Indigenous communities and their representative organizations, and programs need to be offered at a foundational level to be successful. Effective training and education acknowledge the diverse learning styles and backgrounds of students, advocating for education that resonates with their heritage and experiences.

Governments should unbundle procurement contracts and provide mentoring to help smaller Indigenous businesses better understand and compete in the sector.

Governments and businesses need to prioritize the long-term sustainability of Indigenous community development and Indigenous-led land reclamation and environmental stewardship throughout a project's lifecycle and after a mine has closed.

Chart 4: Strategy timeline to increase Indigenous participation in the critical minerals sector.

Short-term (1-5 years)



- Early engagement on all proposed projects; targeted awareness campaigns highlighting opportunities for individuals and businesses.
- Support for community capacity building and training programs, including immediate needs such as housing, transportation, childcare and training subsidies.
- Unbundling contracts and upholding Indigenous procurement targets.

Medium-term (5-10 years)



- Support role-model and mentorship programs for both individuals and businesses.
- Ongoing capacity support for businesses and increasing involvement as businesses grow.
- Funding and implementing wrap-around supports for community such as policing and community safety, health, recreation, and cultural programs.

Long-term (5-10 years)



- Ongoing mentorship and role-model programs.
- Ongoing support for individuals and businesses.
- Ensuring Indigenous-led monitoring and remediation of sites when the life-cycle of a mine is complete.

Source: The Conference Board of Canada.

The Way Forward

Ontario's critical minerals sector will need up to 3,340 more workers by 2040. Without proactive measures taken in the near-term, an estimated 3,570 jobs will remain vacant by 2040, severely limiting the sector's growth and productivity performance. To address this gap, the critical minerals sector needs to build a robust talent pipeline for the long-term.

The Ontario government, educational institutions, and private companies can improve awareness of and access to jobs in the critical minerals sector. Early engagement initiatives in elementary and high schools, alongside centralized information about career pathways and training programs, are crucial. The "This is Mine Life" campaign by OMA, along with educational material and outreach developed by Mining Matters and OVIN's RFW program are strategic initiatives working to change perceptions and increase awareness about careers in the sector.

¹ International Energy Agency, "Critical Minerals."

² Ontario, "Ontario's Critical Minerals Strategy 2022–2027: Unlocking potential to drive economic recovery and prosperity."



The Ontario government and private sector funding of apprenticeships and targeted training, coupled with expanded online and hybrid learning options, would enhance accessibility of training programs. Moreover, fostering partnerships between educational institutions and businesses is needed to ensure students gain relevant skills and are given hands-on learning opportunities. An example of this is being done is through the development and promotion of micro-credentialling for jobs needed in the critical minerals sector by the Ontario government and OVIN.

To attract more women into the mining industry, several key actions are imperative. Offering flexible work arrangements and

competitive maternity/parental leave policies are essential first steps. The Ontario government plays a crucial role in supporting working parents by ensuring the provision of quality daycare facilities, especially in remote mining areas. Mining companies must also prioritize stricter enforcement of anti-harassment and discrimination policies, complemented by more DEI training for all employees. Women's safety and well-being in the workplace requires companies to invest in appropriate equipment and facilities. Moreover, efforts should include hiring and promoting more women, particularly in leadership roles, and encouraging mentorship initiatives and leadership training programs.

To ensure meaningful engagement with Indigenous communities, governments and businesses must prioritize understanding their capacity, needs, and interests right from the inception of any mining project. Bringing education and training opportunities directly to the community, tailored to diverse learning styles and backgrounds, is essential for success. The Ontario government and businesses must also recognize and prioritize the long-term sustainability of Indigenous communities and their land.

Appendix

Table: 1.1: Employment, vacancies, vacancy rates, by job type and scenario

	Baseline			HD-HS scenario			HD-LS scenario		
Skilled Jobs	Employment	Vacancies	Vacancy rate (per cent)	Employment	Vacancies	Vacancy rate (per cent)	Employment	Vacancies	Vacancy rate (per cent)
2023	560	27	4.8	560	27	4.8	560	27	4.8
2030	679	45	6.6	918	229	24.9	875	272	31.1
2040	758	40	5.3	1,095	212	19.4	959	348	36.3
Certified Jobs									
2023	2,725	126	4.6	2,725	126	4.6	2,725	126	4.6
2030	2,534	70	2.8	3,080	310	10.1	2,868	521	18.2
2040	2,666	71	2.7	3,942	634	16.1	3,327	1,249	37.5
Technical Jobs									
2023	1,839	70	3.8	1,839	70	3.8	1,839	70	3.8
2030	3,292	181	5.5	3,692	365	10.1	3,595	399	11.1
2040	4,181	256	6.1	4,750	612	12.9	4,656	706	15.2
Engineers									
2023	657	28	4.3	657	28	4.3	657	28	4.3
2030	1,313	32	2.4	1,550	117	7.5	1,351	31	23.4
2040	1,704	48	2.8	2,035	197	9.7	1,750	483	27.6
Managers and Supervisors									
2023	2,869	45	1.6	2,869	45	1.6	2,869	45	1.6
2030	5,708	60	1.1	6,190	162	2.6	6,071	281	4.6
2040	7,545	82	1.1	8,368	255	3.0	7,955	667	8.4
Total									
2023	8,709	298	3.4	8,709	298	3.4	8,709	298	3.4
2030	13,794	399	2.9	15,634	1,193	7.6	15,028	1,800	12.0
2040	19,551	614	3.1	22,887	2,027	8.9	21,344	3,570	16.7

Table 1.2: Essential skills and point of acquisition for jobs in the critical minerals sector.

Job Category	Essential Skills (per ESDC OaSIS database)*	Where are the skills acquired?	Examples of relevant education and training programs
Skilled Jobs	machinery operation and control, equipment monitoring, quality control testing, tool selection, and troubleshooting	secondary school diploma, and/or several weeks of on-the-job training	Common Core Surface Miner Training Online at Ontario Stone, Sand, & Gravel Association Essential Skills Training from the Mining Industry Human Resource Council Mining Common Core Training at NORCAT Occupational Health And Safety Essentials at Conestoga College Surface Miner Common Core Program at Canadian Safety Group Inc.
Certified Jobs	machinery operation and control, equipment monitoring, tool selection, preventative maintenance, and troubleshooting	college diploma or apprenticeship training of less than two years, or more than six months of on-the-job training and other specific licenses	Common Core Training at NORCAT Drilling and Blasting Training at Fleming College Heavy Construction Equipment Operation at Conestoga College Heavy Equipment Operator at Fleming College Transportation Training Centre at Humber College
Technical Jobs	troubleshooting, numeracy, machinery operation and control, tool selection, quality control testing, and preventative maintenance	college diploma or apprenticeship training of two or more years	Earth Resource Technician at Fleming College Electrical Engineering Technician at Fanshawe College Electric Drive Vehicle Technician at St. Clair College Mineral Exploration Techniques at Northern College Mining Engineering Technician at Northern College Mining Engineering Technology at Cambrian College Manufacturing Engineering Technician at Algonquin College Mechanical Engineering Technician - Industrial (Millwright) at St. Clair College
Engineers	critical thinking, decision making, numeracy, preventative maintenance, product design, and reading comprehension	university degree	Automotive Engineering at Ontario Tech University Mineral Engineering at University of Toronto Mining Engineering at Laurentian University Mining Engineering at Queen's University Geological Engineering at Waterloo University
Managers and Supervisors	management of material resources, time management, management of financial resources, management of personnel resources, monitoring, and negotiating	college or university education in a relevant field, and significant on-the-job experience	Professional Management Certificate at Ontario Tech University Management Essentials at Georgian College Schulich-Lassonde Certificate In Project Management For Engineers Generic First Line Supervisor Common Core at Northern College Global Metals and Minerals Management Diploma at the Schulich School of Business

Source: The Conference Board of Canada

* Essential skills based on results from the HDLS scenario and the Occupational and Skills Information System (OaSIS).

For more information on education and training programs available see OVIN's report [A Spotlight on Skills, Talent & Workforce Development: Critical Minerals for Electrification](#).

Table 1.3: Job Categories including occupations.

Source: The Conference Board of Canada

Job Category	List of Included Occupations (NOCs)
Managers and Supervisors	90010 - Manufacturing managers* 70012 - Facility operation and maintenance managers 80010 - Managers in natural resources production and fishing 82020 - Supervisors in mining and quarrying
Engineers (Occupations usually require a university degree)	21310 - Electrical and electronics engineers 21330 - Mining engineers 21331 - Geological engineers
Technical Occupations (Occupations usually require a college diploma or apprenticeship training of two or more years; or supervisory occupations)	22101 - Geological and mineral technologists and technicians 22302 - Industrial engineering and manufacturing technologists and technicians 22310 - Electrical and electronics engineering technologists and technicians 72400 - Construction millwrights and industrial mechanics
Certified Occupations (Occupations usually require a college diploma or apprenticeship training of less than two years; or more than six months of on-the-job training)	73400 - Heavy equipment operators 73300 - Transport truck drivers 73402 - Drillers and blasters - surface mining, quarrying and construction 83100 - Underground production and development miners
Skilled Occupations (Occupations usually require a secondary school diploma; or several weeks of on-the-job training)	94201 - Electronics assemblers, fabricators, inspectors, and testers 94205 - Machine operators and inspectors, electrical apparatus manufacturing 84100 - Underground mine service and support workers



Research Ethics and Data Protection

The Conference Board of Canada upholds a strict standard of research ethics and data protection. The qualitative research component of this project is governed by our research ethics policy which ensures:

- our research projects adhere to the highest standards of ethical practice
- our practices foster integrity, credibility, and accountability in research involving human participation
- and that we are well positioned to build public confidence in our work

For research that requires ethical review, the Conference Board of Canada retains Veritas, an independent REB, to provide ethics review services for projects involving human participants. The Veritas Institutional Review Board (IRB) assessed this project and granted unconditional approval.

Prior to initiating interviews, participants were reminded of their rights regarding confidentiality and informed consent. Assurance was provided regarding the anonymization and confidential treatment of all collected data. Permission for recording was sought solely for note-taking purposes, with strict protocols in place for its restricted use and protection.

All data is maintained according to the confidentiality and security promised to the study participants. All responses collected during the project are stored with high security on a Conference Board of Canada server, ensuring that access is strictly limited to individuals directly involved in the project. To further protect the privacy of participants, all identifying details have been meticulously omitted from the final analysis.

OCAP Statement

The project's Indigenous engagement process was carefully designed to align with the principles of Ownership, Control, Access, and Possession (OCAP), which are of paramount importance when conducting research that involves Indigenous communities in Canada. Below is an overview of how the project's methodology and practices adhere to these principles:

Ownership and Control: By informing Chiefs of Ontario, the Métis Nation of Ontario, and First Nations Political Territorial Organizations about the project before proceeding, we are recognizing the inherent right of Indigenous groups to own and control information that pertains to them. This upfront communication respects the principles of Ownership and Control by acknowledging that any data or knowledge generated belongs to the communities it represents.

Control: Sharing our interview guide and questions with participants ahead of time and allowing them the opportunity to discuss the research and any concerns prior to participating exemplifies the principle of Control. This approach ensures that Indigenous communities have significant input and influence over the research

process, including the nature of questions asked and the topics discussed. Furthermore, seeking explicit permission to record and use the interviews for project purposes reinforces their control over how their information is used.

Access: Ensuring that research participants can request their interview recordings and transcripts, as well as review the Conference Board's analysis before the final client report is finalized, aligns with the principle of Access. This ensures participants have full access to the information collected from them and can see how their input is being utilized in the research findings.

Possession: The secure storage of all data on Conference Board of Canada servers, with access limited to the research team, addresses the principle of Possession. By maintaining strict control over who can access the data and reminding participants of their rights to withdraw from the research and request the deletion of their interview data, the project demonstrates a commitment to respecting the communities' rights to possess and protect their own information.

Reminding participants of their rights to withdraw from the research and withdraw their interview data at any time, further emphasizes respect for their autonomy and control over their participation and the information they share.

These measures, taken together, demonstrate our commitment to conducting the research in a manner that respects and upholds the OCAP principles, ensuring that the research is not only compliant with ethical standards but also respectful of the rights and sovereignty of the Indigenous communities involved.

Disclaimer

This report was commissioned by the Ontario Centre of Innovation (OCI) through a Request for Proposals titled “Ontario Centre of Innovation – OVIN Skills, Talent & Workforce Development: Critical Minerals Talent Strategy” dated May 2, 2023, and has been prepared by the Conference Board of Canada. This report, along with the accompanying policy insights paper, is intended to support the Ontario Vehicle Innovation Network (OVIN) in the development of a long-term talent strategy for Ontario’s critical minerals sector.

This report contains general information only, and by means of this communication, OCI is not rendering professional advice or services. Accordingly, readers are cautioned not to place undue reliance on this report and to perform their due diligence, investigations, and analysis before making any decision, relying on the report, or taking any action that may affect readers’ finances or business. Neither OCI nor the Conference Board of Canada shall be liable or responsible for any loss or damage arising directly or indirectly in connection with any person relying on this report.

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