Global Climate Finance Accelerator

Accelerating Climate Finance: Investing in Canada's low carbon energy transition

May 2024

FORWARD

Climate change and other global challenges - war, political polarization, inflation and the after-effects of the pandemic - make for an uncertain world and uncertain markets. In Canada, continuing dependence on oil, unclear carbon pricing policies and cancellation of renewable energy programs contribute to continuing uncertainty in industry, in capital markets and among international observers.

Nevertheless, the investment needed for Canada and the world to meet climate goals and undertake an energy transition continues to grow.

Government, industry, capital markets and universities must be part of finding the way to meet these needs. In 2023, with the support of the Dobson Climate Project, the Rotman School of Management launched an experiential learning program in collaboration with the Global Climate Finance Accelerator and the University of Toronto's Climate Positive Energy initiative. Graduate students in science, engineering, policy, and finance explored innovative ways to enable investment in promising climate positive projects.

The proposed financing structures they developed are presented in this report. They are not new. Rather, they adapt existing structures to build finance solutions that make climate positive projects "investible" when otherwise they would face traditional financing, policy and regulatory barriers. Whether these proposed solutions unlock capital remains to be seen, and lessons will be learned either way. By developing a process for working together with project developers, financiers, and policymakers to advance climate solutions, Rotman's experiential learning program has provided Canada's future leaders with the tools to accelerate progress against society's pressing climate goals.

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"In an age of discovery, the balance between risk and reward tips in favour of taking bold action. The economic equivalent of courage is to invest. Yet the universe of possible solutions is so vast that only a well-honed intuition can keep you on a productive path.

Find your Florence."

Ian Goldin & Chris Kutarna
Age of Discovery: *Navigating the Storms of Our Second Renaissance*; Bloomsbury, 2017

Executive Summary

BACKGROUND

The transition to a net-zero economy necessitates substantial capital investment, estimated at approximately US$3.5 trillion per year globally. Leveraging lessons from global climate and impact finance, Canada is becoming increasingly adept at launching blended capital structures that combine private capital with concessional finance and grants, crucial for advancing climate positive projects that are not yet economical due to myriad factors.

The Global Climate Finance Accelerator is a not-for-profit intermediary with a mandate to catalyze the relatively nascent Canadian blended finance ecosystem to alleviate access to capital challenges for climate solutions. The Accelerator evaluates prospective projects on their climate impact, feasibility, and potential for financial return. Common financial obstacles such as outdated risk perceptions, policy uncertainty, and legislative barriers are also identified and assessed. Strategies to adapt mainstream structures are proposed to potential investors and other financial backers, as well as government and other facilitators.

The University of Toronto's Climate Positive Energy initiative develops social, scientific, technical, economic, and policy solutions to transform Toronto's energy systems, ensure energy access and production is equitable, and help Canada become a global clean-energy model. It facilitates collaborative research, builds partnerships, promotes knowledge translation, and provides training opportunities for students and faculty.

The Rotman School of Management's Accelerating Climate Finance experiential learning program was launched in 2023 to scale up investments in climate-positive technologies and infrastructure in Canada and beyond. Working with graduate students across finance, business, engineering, science, and policy, the program identifies, evaluates, and proposes strategies to address common financing challenges that often include outdated risk perceptions, capital costs, infrastructure capacity, policy and legislative barriers, and technological uncertainty. The objective is to implement financing strategies applying mainstream structures in new ways to support first of a kind and pioneering projects not yet implemented at scale.

The program focuses on bottom-up financing solutions to identify and address gaps between top-down financial commitments, models, and tools, and on-the-ground results. **The objective of this work is to develop and refine a process – one project at a time to capture new opportunities and lessons learned - for expediting the decarbonization and increasing the resilience of Canada's economy.**

Program analytics were supported by Bloom ESG's insights and suite of digital tools.

FINANCING THE SUSTAINABLE DEVELOPMENT GOALS (SDGs)

Section 1 proposes strategies for financing solutions that could directly advance four of the 17 Goals and indirectly influence six.

DIRECT

#7 – Affordable and clean energy
#9 – Industry, innovation and infrastructure
#13 – Climate action
#17 – Partnerships for the goals

INDIRECT

#1 – No poverty
#4 – Quality education
#5 – Gender equality
#8 – Decent work and economic growth
#10 – Reduced inequalities
#11 – Sustainable cities and communities

There are trillions of dollars that can be invested by the private sector into the SDGs through procurement strategies and joint ventures, as noted by Global Climate Finance Accelerator co-founder and Managing Partner Lida Preyma in her blog following the United Nations High Level Political Forum held in July 2023. Despite the opportunity, the world is still lacking funding and investment at the levels required to achieve economically resilient and equitable societies.

If we have any hope of achieving the SDGs, all stakeholders must work in collaboration. Business needs a front seat at the international fora where pathways forward are being created.

INVESTING IN DECARBONIZATION

A detailed financing proposal for decarbonizing buildings is provided in Section 2, leveraging existing solutions that simply need to be scaled. The Accelerator modelled retrofits financed through a “Financial Aggregator”, which invests the full cost of the retrofit in return for a cash flow waterfall comprising energy and financial incentive savings under different scenarios over the life of the project. Under five of the six scenarios modelled, the equity NPV and IRR were positive. The sixth scenario, replacing air source heat pumps with geothermal, was not economically viable on a single project basis, however, should benefits from multiple properties be incorporated, the project economics potentially shift to positive as well.

Section 3 illustrates a financial structure for mine site decarbonization that leverages the one used in building retrofits. According to an IEA report, there is a large variation in the GHG footprint of different producing sites for the same material, which indicates significant opportunities to further decrease emissions globally through fuel switching and electrification alongside process efficiency improvements. In the case of a simulation mine site, a Special Purpose Vehicle (SPV) invests the CAPEX required to electrify an open-pit mine haul fleet so that what could otherwise be a prohibitive cost is off the company's balance sheet and the techno-economic risk is shared among multiple partners.

Different decarbonization technologies were evaluated for their ability to achieve a scientifically credible net-zero outcome. Investment in trolley assist over fleet electrification, for example, can be a beneficial interim measure while waiting for full electrification technologies to become more cost-effective and widely available. The systems, however, are at risk of becoming stranded as more advanced and efficient electrification solutions come to market, resulting in underutilized infrastructure and a poor return on any government funding to support such interim investments.

Implementing a credible, science-based, standardized taxonomy provides a framework that can help guide these types of investment decisions by categorizing investments based on their long-term viability and alignment with national and global climate mitigation goals. Taxonomies play a crucial role in guiding investment decisions in uncertain and long-term technological scenarios by initially including technologies that facilitate the transition to net zero, and then systematically phasing them out in favour of higher impact alternatives as market readiness and technological advancements allow.

The Accelerator’s analysis found that the most profitable technology assuming an escalating price on carbon to $170/tCO2e by 2030 and stable carbon credit revenues for the pilot open-pit mine site is replacing the diesel truck fleet with an electric fleet. The trolley assist generates a high IRR for investors primarily due to extremely low comparative CAPEX alongside government grants and incentives captured in the savings cash flows. It has, however, the lowest GHG emission abatement potential, which negatively impacts cash flows over the life of the mine under an escalating carbon price scenario.

POLICY AND MARKET ENABLERS

MINING

Despite possessing vast reserves of essential metals and minerals necessary for manufacturing batteries and electronic devices, Canada has yet to fully capitalize on these resources due to current market conditions and prevailing regulatory hurdles that deter potential investors. The current investment environment for critical minerals is summarized in Section 3. Work is underway to foster a conducive investment environment for advancing the nation's critical minerals strategy and securing its position in the global supply chain. The global investment community is starting to recognize the opportunities for patient capital in the critical minerals sector with sustainable and responsible investment management firms starting to provide long-term patient capital to the mining and metals sector.

REAL ESTATE

The Municipal Act (2001) is extremely relevant to building retrofits. It regulates if and how multi-unit residential buildings (MURBs) receive financing. New financing mechanisms such as property tax repayments, which was one of the investment scenarios modelled, require new interpretations or adjustments in the Municipal Act. Partnerships with the municipalities are required to innovate financing models for buildings. A loan platform to expedite the approval process will mitigate the issue of building owners waiting on lengthy government financing approval processes, which hinder private capital investment.

Private capital has to date not come in at a cost that makes retrofits for small commercial buildings and MURBs economically viable for building owners at scale. Options to address this gap are explored in Section 4, including the design of a program level capital stack that includes senior debt from commercial banks, specialized mezzanine funds, equity from impact investors, and grants, subsidies, and other mechanisms such as loan guarantees and first-loss capital from municipalities. Bundling multiple MURBs into a retrofit portfolio financed through a green bond, for example, serves as collateral for banks to unlock financing solutions for multiple autonomous individuals that reside in MURBs. For MURB decarbonization in Toronto, the City of Toronto and Government of Ontario would have to work together to modify the current green bond structure and expand eligibility. Other financing mechanisms currently not available to private sector MURBs, were also evaluated.

GREEN ELECTRICITY CAPACITY

In a 2023 report, the IEA once again highlighted the significant potential of electrification to mitigate emissions. The agency also notes that the world is not on track for reaching the share of electricity in total final energy consumption that is required to achieve its Net Zero Emissions by 2050 (NZE) Scenario.

The analysis illustrates the enormous opportunity of industrial electrification in achieving net-zero targets. Renewable energy development in Canada, however, remains a challenge, particularly in an environment with high political uncertainty. Recommendations to address this challenge are summarized below and outlined in further detail in Section 4.

- Review and refine current policies to facilitate easier, more efficient grid interconnections for renewable energy producers.
- Review and modify existing, or create new, incentives for the development and integration of energy storage solutions.
- Re-purpose regulatory frameworks for a more flexible electricity market that facilitates distributed energy resources and new business models.
- Develop new utility models to account for the changing role of consumers to prosumers and the bi-directional communications of the grid.
- Identify regulatory changes required to incentivize utilities to innovate.
- Expand the scope of electricity service operations' cost guarantee to increase developers' eligibility.
- Ensure incentives are transferable and stackable with other funding support.
- Implement a streamlined process for private or corporate PPAs with producers alongside carbon credits for offtake corporations.
- Implement a two-layer all-in tariff to help increase the certainty of cash flows and thereby enhance equity and debt investor confidence.
- Build a concessional financing platform to leverage low-cost debt financing for on-site renewable energy.

TRANSMISSION AND DISTRIBUTION INFRASTRUCTURE

Transmission and Distribution (T&D) infrastructure presents a critical bottleneck in the deployment of renewable energy projects. Existing grid infrastructure has limited capacity to integrate and manage the variable and decentralized nature of renewable power sources such as solar and wind. Current grids also are not designed for the bidirectional flow of electricity characteristic of distributed renewable systems such as rooftop solar. Policy and regulatory frameworks must evolve to support faster grid integration of renewables. Without addressing these T&D infrastructure challenges, renewable energy project delays are likely to continue, hindering progress towards clean energy goals. Section 4 explores this theme further, highlighting the work of the University of Toronto's Climate Positive Energy initiative.

COLLABORATION

The transformation of the electricity sector presents a wealth of career development opportunities, particularly as the industry shifts towards sustainable and renewable energy sources. For historically marginalized communities, this shift can mean not only jobs but also pathways to long-term careers and leadership roles. People from these communities have opportunities beyond simply participating to actually shaping the new energy landscape. New roles include policy and advocacy positions to guide the electricity sector's regulatory and ethical compass in ensuring it meets the needs of underserved populations. Opportunities for entrepreneurs will also grow to help launch and scale energy-focused businesses.

Recognizing these opportunities, and the fact that electrification in Canada relies on lands and resources to which Indigenous nations are rights-holders, the First Nations Major Projects Coalition (FNMPC) and Mokwateh partnered to create a National Indigenous Electrification Strategy to "position Indigenous nations as leaders of Canada's net zero transition and remove economic, political, and regulatory barriers to support and promote the development of Indigenous-partnered and -led clean energy projects in Canada". The Transition Accelerator's Electrifying Canada also supports "sustained collaboration" among power producers, regulators, system operators, industry, organized labour, Indigenous organizations, financial institutions, and civil society to eliminate identified barriers to accelerated electrification.

TRANFORMATION CULTURE

In the wake of the pandemic, many people have forgotten that cities can and should be more than just centers of work and habitation. Designed correctly, they become engines of innovation, propelling economic growth and social evolution. They house commercial activity, leading universities, and research institutions that generate cutting-edge knowledge and attract global talent, building a community of practice that transcends knowledge into craft by putting theory into action, sharpening practical skills through shared experience and dialogue. Individuals expand their ideas through chance encounters on the streets or the various knowledge-sharing and ideation collective hubs and events. This collaborative environment fosters an instinctive understanding of which approaches are likely to succeed and which may falter, informed by the collective wisdom and diverse perspectives of the group[1].

1 Goldin, Ian & Kutarna, Chris. Age of Discovery. Bloomsbury; 2017

STRATEGIC PLANNING

One key challenge in appropriately allocating capital to an equitable energy transition in Canada lies in how the country decides to define and articulate its vision. Critics often characterize Canada's business environment as an oligopolistic hegemony, which potentially leads to less favourable conditions for employees, consumers and other stakeholders due to a lack of competitive pressure. Those who support Canada's current economic environment believe that industry consolidation is an imperative for global investment (e.g., favourable investment opportunities for shareholders).

This difference in approach highlights a fundamental debate about the role of government in the economy: Whether to protect certain industries considered vital for national interest and ensure stability through regulation or to promote an open competitive market environment that encourages companies to innovate and differentiate themselves independently. A clear strategic vision for determining which industries need government-protected competitive advantages, and when these protections should be lifted to foster technological progress and economic growth, will support the development of long-term, non-partisan policies designed to increase Canadian innovation and productivity.

Section 5 outlines the Accelerator's two next steps:

1. Pilot the hypothetical financing structures proposed in this Report at two facilities, one in commercial real estate and one in mining.
2. Evaluate new opportunities to expedite the flow of capital toward climate solutions: Investment in technologies that support (from left to right) carbon removal, resilience of coastal regions facing increasing threats from rising sea levels and more frequent and severe extreme weather events; and, commercial development of Canada's natural resources beyond critical minerals.

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1. Introduction

Accelerating Climate Finance

The level of capital investment required to build a net-zero global economy is estimated at approximately US$3.5 trillion ***per year*** according to the Energy Transitions Commission (ETC). A key challenge in attracting private capital lies in the capacity of climate-positive investments to yield market-competitive returns. ETC notes that, in many cases, climate solutions will cost money, such as with early coal phase-out, moratoriums on deforestation, and bringing carbon removal solutions to market. Accelerating blended capital structures that combine private capital with concessional finance and grants is therefore crucial. Another important but underutilized mechanism to redirect the flow of capital from high emitting to low emitting industries is the carbon markets. Impact funds and philanthropy can also be leveraged to strategically support the scaling of climate solutions.

The Global Climate Finance Accelerator ("the Accelerator") is a not-for-profit intermediary with a mandate to catalyze the relatively nascent Canadian blended finance ecosystem to alleviate access to capital challenges for climate solutions. The Accelerator evaluates prospective projects on their climate impact, feasibility, and potential for financial return. Common financial obstacles such as outdated risk perceptions, policy uncertainty, and legislative barriers are also identified and assessed. Strategies to adapt mainstream structures are proposed to potential investors and other financial backers, as well as government and other facilitators. The objective is to support first of a kind (FOAK) or otherwise currently uneconomical projects.

The Accelerator's mandate is twofold:

1. Convene partnerships across business, finance, government, and academia on strategies, policies, procedures, and tools to align capital with net-zero commitments and ambition.
2. Provide a professional forum for emerging leaders in finance, science, engineering, and policy to build the expertise and technical skills required to transform our current economy to one that is net zero and equitable.

The 2023-24 Accelerating Climate Finance experiential learning program was piloted by the University of Toronto's Rotman School of Management in collaboration with the Global Climate Finance Accelerator and Climate Positive Energy. Participating faculties are Rotman, the School of the Environment, which launched Canada's first environmental finance course, Munk School of Global Affairs and Public Policy, and the Faculty of Applied Science and Engineering.

Learn more about the program here.

The Accelerator focuses on bottom-up financing solutions to identify and address gaps between top-down financial commitments, models, and tools, and on-the-ground results.

Five demonstration projects were selected that, if implemented at scale, would collectively make a significant contribution to advancing global climate goals. These projects are listed below.

1. A multi-unit residential building (MURB) retrofit in Toronto;
2. An electric fleet conversion for a mine site in a clean grid- connected region.
3. Clean energy generation projects in Ontario and Alberta;
4. Small modular reactor (SMR) implementation challenges in Ontario; and,
5. A climate and socioeconomic resilience learning lab in the Bahamas.

Of these five projects, a financing solution was proposed for the first and second. As clean electricity capacity was identified as an issue for both, high level solutions across the policy and financing landscape for accelerating clean energy development were also proposed.

SOLVING TOGETHER

While there has been a steady flow of capital in climate technology ventures, there is a demonstrable lag in growth stage investment to support technological commercialization and scale. To bridge this gap, the Accelerator has proposed an off-balance sheet financing solution to help smaller companies and assets invest in cleantech integration. This approach mitigates financial risks to the project sponsors and maximizes leverage available from the project's expected future cash flows.

For both the MURB retrofit and mine site fleet electrification projects, a non-recourse project financing structure was adapted to the specific project's economics and revenue-generating potential through projected energy savings, tax incentives, government grants, and carbon credit revenues. By shifting the up-front capital investment from the constrained balance sheets of companies (or condo owners in the case of the MURB) to a hybrid public-private consortium, technology and cash flow risks are allocated among many stakeholders including project developers, investors, suppliers, and future customers (offtakers).

This solution works well for small and mid-market companies by circumventing glacial legislative change and capital reallocation. To maximize the impact of bottom-up financing solutions, however, enabling top-down strategies must be employed in tandem.

Policy support: As illustrated in Section 4, project financing solutions in some cases require a change in current legislation. Establishing more favourable regulatory frameworks and incentives will also greatly facilitate uptake of these solutions. Tax incentive innovations such as flow through shares could be expanded beyond exploration to include, for example, decarbonization expenditures across heavy industry. As the structure is dilutive, however, care must be taken in its design to ensure it doesn't place the company at greater financial risk over time. Tax relief for investments in higher risk start-ups or small businesses could also be reviewed to ensure they're commensurate with capital gains taxes and designed to facilitate greater investments in climate solutions sectors such as technology start-ups and heavy asset commercialization projects. In Canada, such loss relief rules could be simplified along the lines of Section 1244 of the U.S. Internal Revenue Code to expedite access for small businesses.

Widened access to capital: An IEA Special Report on clean energy financing noted that, while a much greater level of private sector investment is needed generally, the capital structure of investments for clean energy transitions is likely to shift to a greater allocation from debt. The required flow of capital into electricity, corporate-led efficiencies and retrofits, and consumer purchases such as electric vehicles is more commonly aligned to debt. The same report also highlighted the need for sustainable finance frameworks and taxonomies to promote the allocation of capital to clean energy, particularly in emerging economies that currently experience a much higher cost of capital than in advanced economies.

Co-investments with more and new types of partners than in a typical project financing deal is likely to be required. Greater diversity among investors will spread risk and potentially attract more patient capital from private equity, family offices, sovereign wealth funds, export credit agencies (ECAs), development financial institutions (DFIs), and even suppliers and future customers. Low cost capital from government climate funds may be required, as well as government-backed security or new types of insurance products to underwrite the risk of lower than projected - or delayed - cash flows.

Capacity building: Various levels of support will be required for project planning and management, especially for private citizens (e.g., condo owners) and resource-constrained companies (e.g., small and mid-cap mine sites). Access to information and technical training to enable the design of a FOAK solution based on technical decarbonization milestones are also necessary.

Collaborative partnerships: Partnership agreements between project developers, governments, and financiers will be more challenging to design given the diversity of investors and the fact that commercial aspects of such FOAK financing solutions tend to under-perform proven vanilla investments. Engagement with local entities and NGOs is also more common in such arrangements.

Building a financing solution for a specific demonstration project provides insights into why greater volumes are not flowing into these projects at scale. This insight helps market participants address these barriers. Evaluating a variety of small-scale projects also enables market participants to identify and test novel approaches that can then be amalgamated and built into a broader financing platform. This strategy will help mitigate the risk of top-down platforms launching with investment criteria that excludes the individual projects they were designed to support.

The Accelerator's next step is to work with potential investment partners to build a proposed financing platform for decarbonizing two projects:

1. A small commercial real estate building; and,
2. A grid-connected critical mineral producing mine site.

A constrained capital environment presents a chance to explore novel financing approaches as the opportunity cost of missing business as usual (BAU) deals isn't as significant. The global recognition of climate change as an urgent issue has spurred unprecedented investment in sustainable and renewable energy sources, creating myriad prospects for innovation and growth. Public and private sector commitments to net zero are accelerating the demand for climate-themed financial products and services, including more ambitious green and transition bonds. Technological advancements are enhancing the viability and profitability of sustainable practices, improving both environmental and financial returns on investments.

A recent first of kind example is the deal structure for the building of H2 Green Steel (H2GS)'s first plant in Boden, Sweden. This off-balance sheet financing solution differs from traditional non-recourse project financing deals in the breadth of partners involved. Co-investors include private equity firms, family offices, sovereign wealth funds, industrial corporates, as well as offtakers and suppliers. Debt was raised through commercial banks and private lenders, which were supported by concessional debt, export credit agencies, and use of government backed loan guarantees.

The U.S. Department of Energy (DOE) recently announced its US$6 billion Industrial Demonstrations Program, the largest U.S. investment in industrial decarbonization to date. The program has selected 33 projects across hard-to-abate sectors, including steel, cement, and aluminum. The DOE gave notice that negotiations between project developers, investors, and lenders will be a critical success factor and, should the DOE be unable to secure a favourable financing arrangement, it will walk away. The selected projects, many of which are located in disadvantaged communities, also incorporate community and labour development goals.

Current economic uncertainties and geopolitical tensions also create unique opportunities for innovative research and experimentation, which can lead to breakthroughs in climate finance. Lessons learned from the Global South, where financing small-scale projects is common, are increasingly being leveraged in Canada in the relatively nascent social finance space. These financing structures help mitigate risk and attract new sources of capital into Canada to fund climate solutions. Blended capital, which combines public, private, and philanthropic funds often cover initial costs and provide guarantees to de-risk projects. They are also used to finance pilot projects that can be scaled, as well as fund the development of expertise and infrastructure required to implement climate solutions.

The objective of showcasing two case studies, one for a Toronto condominium retrofit and the other for a simulation mine site, is to illustrate a financing strategy and risk-sharing mechanism for an economically viable decarbonization financing solution in the built environment.

RESIDENTIAL BUILDINGS

A 2022 report by the BMO Climate Institute stated that buildings account for 16 percent of Canada's annual GHG emissions, of which 57 percent (66 Mt CO2e annually) is from residential buildings. In a 2023 survey by Natural Resources Canada, Canadians called for "new or scaled financing models and solutions that help support and set investment milestones for decarbonizing buildings". They noted the need for mechanisms to determine if government funding is effective in incentivizing low carbon, climate resilient buildings, and to help identify where strategies could be improved. Survey participants also noted that "retrofits were unlikely to occur if they are not affordable."

In addition to the GHG reduction imperative, many MURBs across Canada require retrofits simply to replace existing systems reaching the end of their life cycle. These required upgrades to maintain or improve the current quality of life create an opportunity for a parallel decarbonization strategy. Other benefits include expanding employment opportunities through investments in building decarbonization technologies, supply chain capacity, and workforce training.

A bottom-up analysis of one MURB provides insights into how public and private market mechanisms can be scaled to achieve a decarbonized buildings sector.

MINING

According to the International Energy Agency (IEA), achieving global net zero by 2050 will require “six times more mineral inputs in 2040 than today.” The same report notes that “consumers and investors are increasingly calling for companies to source minerals that are sustainably and responsibly produced.”

In its Critical Mineral Strategy, the Government of Canada recognizes that the country’s significant exposure to off-grid mining operations increases the average carbon intensity of its material output. The government has identified investments that could help develop the energy infrastructure required to support mine electrification in regions with high critical mineral potential. These investments include grid-scale energy generation and transmission lines as well as off-grid renewable and alternative energy sources such as wind, hydrogen, and SMRs. In a simulation of an indicative copper project, from mine-site to refining and smelting, the IEA report reveals that “electrification and renewable-based electricity, when combined, have the potential to reduce emissions intensity by over 80%.”

With limited budgets for capital expenditure, small cap mining companies often have less financial flexibility and ability to influence shareholders for investment in large-scale decarbonization projects compared to their multinational peers. They also haven’t established the same track record and relationships with investors and lenders, and so face higher costs of capital.

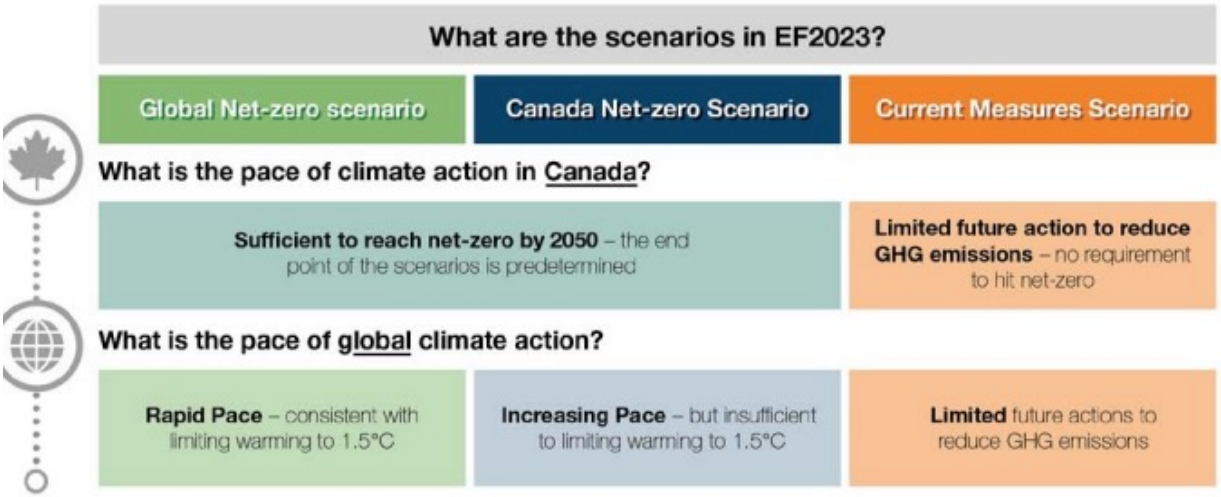
A bottom-up analysis of one hypothetical mine site connected to a clean electricity grid provides insights into how public and private market mechanisms can be scaled to decarbonize Canada’s mining sector.

GREEN ELECTRICITY

In a 2023 report, the IEA once again highlighted the significant potential of electrification to mitigate emissions. The agency also notes that the world is not on track for reaching the share of electricity in total final energy consumption that is required to achieve its Net Zero Emissions by 2050 (NZE) Scenario.

Under both Canadian Energy Regulator (CER)'s net-zero scenarios, Canada's electricity use will more than double from 2021 to 2050. By 2050, over 99% of electricity will be from non-or-low-emission technologies, primarily wind, nuclear, hydro, natural gas with CCUS, and bioenergy with CCS.

Solar generation is projected to increase under both scenarios to comprise 5% of total generation by 2050. The Accelerator analysis evaluated the economic viability of solar generation projects with storage in two provinces, Ontario and Alberta, to compare the impact of market structure on investment attractiveness. Investment in independent power production at site along with energy storage and transmission would enable grid-connected sites to offload excess energy onto the power grid, offsetting their costs over the long term. Due to the confidentiality of the specific projects, the analysis and associated recommendations are presented at the market level rather than the specific project level.



Source: CER *Canada's Energy Future 2023*

FINANCING THE SDGS

Lida Preyma, Co-founder and Managing Partner,
Global Climate Finance Accelerator

This is the last chance decade to realize the Sustainable Development Goals (SDGs), adopted by world leaders at the 2015 UN Summit. This paper proposes strategies for financing solutions that could directly advance four of the 17 Goals and indirectly influence six.

DIRECT

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If we have any hope of achieving the SDGs, all stakeholders must work in collaboration and business needs a front seat at the international fora where pathways forward are being created.

Globally, there are trillions of dollars that can be invested by the private sector into either companies' own initiatives as they transition into more sustainable products and practices or invested into micro, small and medium sized enterprises (MSMEs) through procurement strategies and joint ventures. MSMEs are the leading source of economic growth and jobs worldwide. They are also more likely to be founded on purpose, developing innovative solutions to complex problems because they are nimble, and hyper focused. With the technical advancement during COVID, their ability to reach consumers all over the world has exploded. They are, however, still lacking funding and investment at the levels required to achieve economically resilient and equitable countries.

While an important part of the solution, Canada's large financial institutions are not the only source of financing for these companies. We need to get more creative about the sources of capital and the forms in which they come. In addition to government grants, there are myriad investment groups that focus on sustainable finance projects. Most asset managers have investment arms that include private equity and alternative investments. There are small boutique investment banks, venture capital funds, private equity firms, as well as corporate investment divisions, to name just a few. The hurdle to overcome is the investment timeline. Patient capital is required for investments in the net-zero transition such as those described in this paper, particularly for critical minerals projects.

The regulatory landscape is likewise not conducive to global private sector collaboration or innovative advancement. When there are over 30 taxonomies from countries and regions around the world, with different regulatory frameworks, how can a business decipher, much less choose, which to apply to their multi-jurisdictional enterprise? While national circumstances are important, governments should work together in concert to provide uniform regulatory policy to incentivize business formation, growth and where needed, transition to climate positive processes, products and even new industries.

While the SDGs were not written for the private sector, there is a high expectation that private markets will drive their success. Without closer collaboration between governments, the private sector and civil society, however, the result are likely to be business as usual.

Source: https://unglobalcompact.org/sdgs/about

2. Case Study A
Retrofitting Buildings

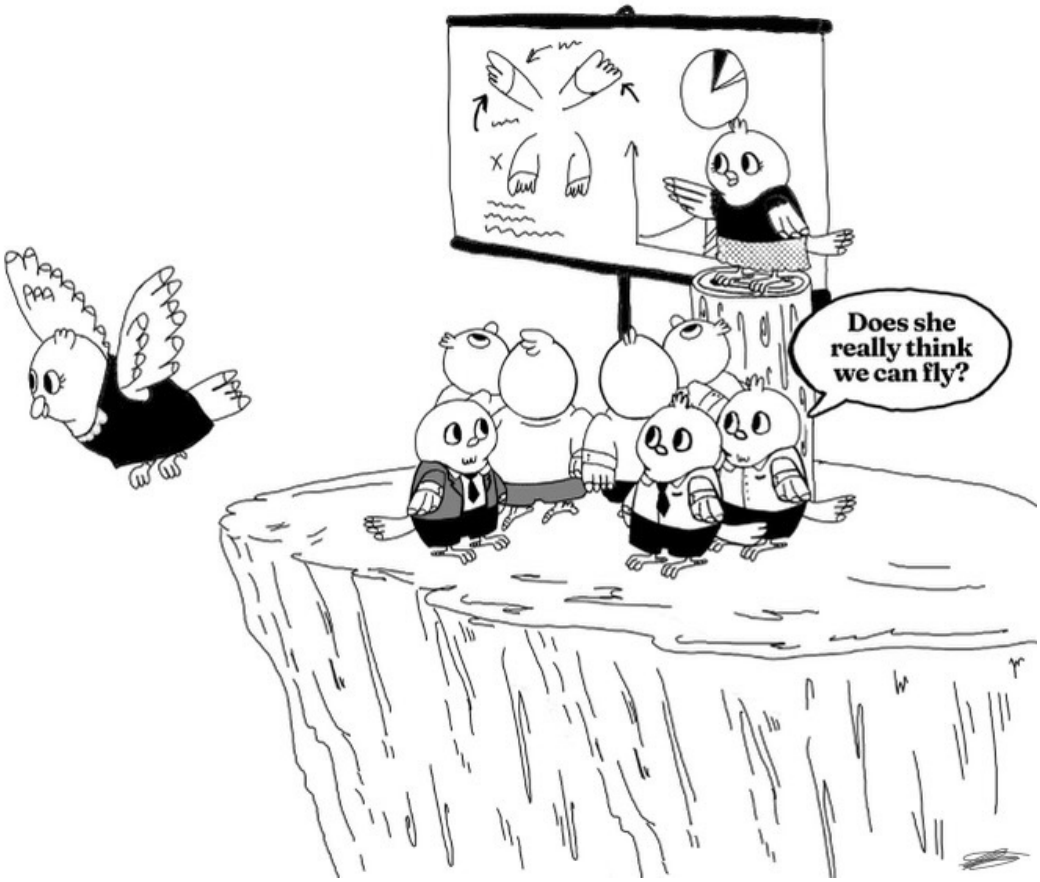
Evaluating technology scenarios enables investors to assess the economic viability of each climate solution. Many energy transition projects and most investments in adaptation and resilience simply are not economical compared to a business as usual (BAU) scenario. Another barrier to investment is the increasing number of technologies coming online, which can create confusion on which option is likely to be the most effective for corporate leaders, site operators, government funding agencies, and investors, as well as the planet. In any project, different stakeholders have their own objectives. To advance, therefore, climate solutions need carefully planned, interconnected financing and associated policy interventions.

Financing solutions can be adapted from BAU projects through negotiation between stakeholders on the level of risk and return each will be willing to accept, and level of low cost and free capital, along with risk sharing mechanisms, required to take a project forward. This analysis also provides insight into the solution most aligned to a net-zero pathway to avoid wasting the project stakeholder's limited financial resources. Identifying the level and term of investment required for different decarbonization levers enables companies and their funders to determine whether they are on a net-zero or "dead end" pathway.

Despite technologically mature solutions to - and proven investment returns in - decarbonizing buildings, for example, retrofits in the MURB sector are under-utilized. The Global Retrofit Index, which ranks 16 countries on national retrofit performance notes that "long-standing policies on renewable energy and the energy performance of buildings" are critical to achieving retrofit outcomes. The Index places Canada 9th out of 16, tied with Brazil and Korea, behind Mexico (8), Australia (7), UK (4), France (3), Netherlands (2), and Germany (1).

Upfront capital requirements, cost recovery timelines and other uncertainties, cheaper fossil-fuel derived energy, integration risk, and lack of expertise and capacity in the current workforce for retrofits continue to impede progress. These barriers apply to industrial decarbonization solutions as well, for example, mine site fleet electrification, which face additional hurdles such as lower technology readiness levels (TRLs), availability of charging infrastructure, and electricity capacity constraints.

The good news for retrofits is that financing solutions already exist, as demonstrated by companies such as Efficiency Capital, and need to be scaled. Evaluating various options for deal structuring provides line of sight on how costs, risks, and returns can be distributed across project stakeholders to meet the the varying risk appetites and expected returns of each capital partner.



The Bedford Glen Condominium (BGC) is a MURB recognized on the City of Toronto's heritage register as a significant landmark. This condo complex requires an energy retrofit to adapt to modern energy use standards, reduce GHG emissions, and replace building systems reaching their end of life cycle. The BGC CondoCorp has developed an energy retrofit plan with engineering firm WSP, which includes installing unit-by-unit air-source heat pumps to manage energy intensity, replacing the outdated HVAC systems, recladding the building, and installing new windows to improve the building envelope performance. Stakeholders in the project include the BGC CondoCorp and the building's residents, the City of Toronto, and financiers.

The cost of the retrofit ranges from $16.8 million to $44 million, depending on the level of retrofit involved. (The $44 million price tag replaces air-source heat pumps with geothermal.) Residents, most of whom are retired on a fixed income, can only afford the lowest cost option using debt financing with a maximum interest rate of 4%. Residents are seeking a one-year timeline to complete the required retrofits to minimize disruption; however, are seeking repayment terms over the life of realized savings.

GHG REDUCTION POTENTIAL

To qualify for concessional capital, projects must meet certain GHG reduction thresholds. The Canada Infrastructure Bank (CIB) Buildings Retrofit Initiative requires a minimum of 30% GHG emissions reductions from a buildings baseline. WSP's analysis shows an 80% reduction of BGC's emissions totalling 347 tCO2e/yr, thereby meeting the CIB requirement. CIB also, however, requires a minimum investment size of $25 million, which is higher than the desired BGC retrofit investment. BGC, therefore, must work with a Financial Aggregator (FA), which pools capital to finance a portfolio of projects.

ENERGY EFFICIENCY POTENTIAL

The BGC retrofit will result in a 39% reduction of electricity consumption totalling 1,024,420 kWh/yr, even with the electricity requirement for the air source heat pumps that will replace natural gas burners. This reduction supports the City of Toronto's goals to increase efficiency as it prepares for growing electricity demand to meet the needs of greater electrification initiatives in buildings and transportation.

NATURAL GAS REDUCTION POTENTIAL

The retrofit will result in an 88% reduction of natural gas consumption totalling 1,750,991 kWh/yr, contributing to the City's net-zero goals under TranformTO to phase out natural gas from buildings by 2040. Systems using natural gas to heat water and common areas will be replaced with air source heat pumps, leaving one backup natural gas boiler.

The financing issue for BGC residents is the ability to secure a loan at a 4% interest rate, which is the cost of capital considered affordable for residents by the CondoCorp. For residents to repay the loan through energy savings, the term of the loan must align with the term of savings. The solution evaluated in this case is to remove the retrofit cost and savings from condo residents entirely. The Accelerator modelled five deal structure scenarios for achieving this outcome for residents. An 80:20 debt:equity split with a 10-year loan repayment term, held by a ”financial aggregator” (a type of general partner) was held constant in all five scenarios. A summary of the financial analysis is available in Appendix A.

SCENARIO 1

The Financial Aggregator (FA) finances the full cost of the retrofit through an 80:20 blend of debt and equity, which it raises. Total costs and savings over the full life of the project are based on projections provided by WSP. Project returns are based on a 12% hurdle rate for equity and 2% cost of debt from CIB, managed by FA for a fee of 2% of the total retrofit investment contribution. The debt is repaid from savings over a period of ten years. Once the project’s equity partners’ initial contribution of $3.4 million is repaid through net savings (after debt repayments and FA’s fees), the remaining cash flows from savings are distributed to the equity partners and FA as agreed in the Limited Partnership Agreement (LPA).

SCENARIO 2

The FA secures 40% of the total debt from CIB at a 2% rate and the other 40% from the City of Toronto at a 4% rate. The distribution waterfall is the same as Scenario 1.

SCENARIO 3

The FA secures 40% from the City at the 4% concessional rate and 40% debt from a commercial bank at 7%. The distribution waterfall is the same as Scenario 1.

SCENARIO 4

The FA secures the total debt from a commercial bank at a 6% interest rate, with the same distribution waterfall as Scenario 1.

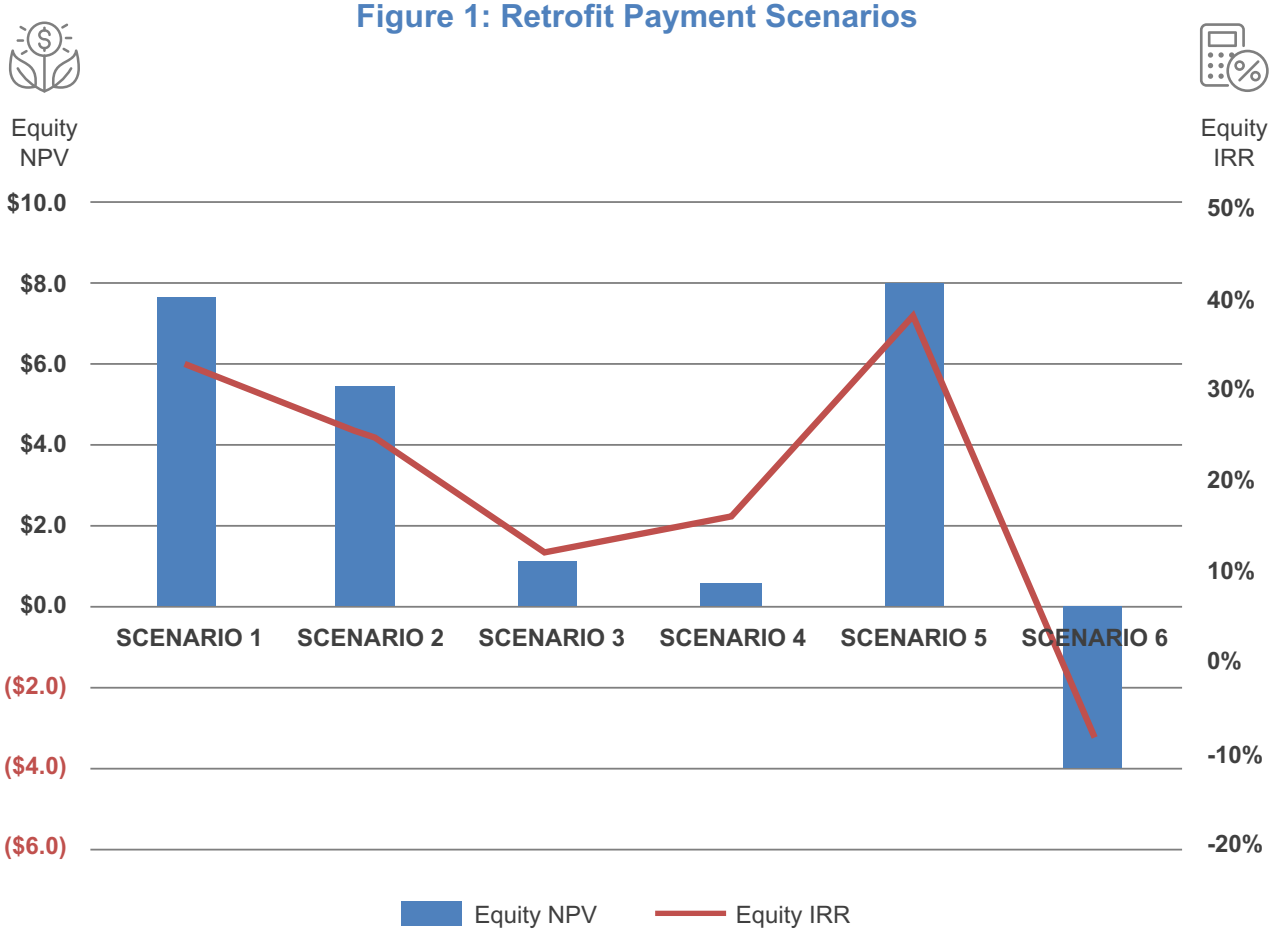
SCENARIO 5

Instead of a low cost retrofit loan or grant, the City’s contribution comes from an allocation of 100% property tax savings integrated into cash flow distributions, which repay 60% of the debt to commercial banks at a lower interest rate of 4%. The remaining 20% debt is from CIB at 2%. Tax savings are allocated over the life of the bank’s ten-year term.

Results in **Figure 1** demonstrate that off-balance sheet financing for building retrofits is profitable under favourable legal and regulatory conditions. If rolled out at scale, it is feasible that Toronto could achieve its TransformTO objective of 100% net-zero buildings by 2040 with a blend of efficiency measures and electrification through air source heat pumps.

Replacing air source heat pumps with geothermal at a cost of $44 million (**SCENARIO 6**) is not economically viable on a single project basis, however, should benefits from multiple properties be incorporated, which is possible in the case of BGC through surrounding neighbourhood townhomes, the project economics could shift to positive as well.

Figure 1: Retrofit Payment Scenarios



DRILL DOWN ON GEOTHERMAL

Geothermal offers the potential for significant energy savings, minimal OPEX requirements, and reduced GHG emissions. The high CAPEX and complexities associated with installations, however, pose several barriers.

1. **High Initial Investment:** The initial cost of implementing geothermal systems in MURBs is considerable, often exceeding that of traditional systems due to the need for extensive underground work and specialized equipment. These costs can deter building owners and managers from investing in geothermal technology despite its long-term benefits. It is also more expensive to replace existing systems with geothermal on a retrofit versus a new build.

2. **Financing:** Financiers are hesitant to take on the risk of construction without collateral, which geothermal projects do not offer. There is also concern over the viability of the technology.

3. **Payback Period:** Although geothermal systems offer lower operating costs over time, residents are required to pay back back the infrastructure investment over time through their energy bills, with an estimated payback of 7 – 10 years. The current Condo Act has a provision to protect owners from taking over non-market contracts, allowing them to overturn contracts if the contracted cost of energy exceeds the market price, which may happen under this fee-for-service scheme, putting the initial capital contribution at risk.

Potential solutions

Two solutions are being explored in Toronto to overcome these challenges.

i. **Incentives and Grants:** Programs like the Retrofit Accelerator convened by the Toronto Atmospheric Fund provide financial support that can help offset some of the initial costs associated with geothermal installations.

ii. **Energy-for-Service Model:** Geothermal infrastructure companies are working with the federal government to update the Condo Act, educate investors and lenders, and attract long term, patient capital.

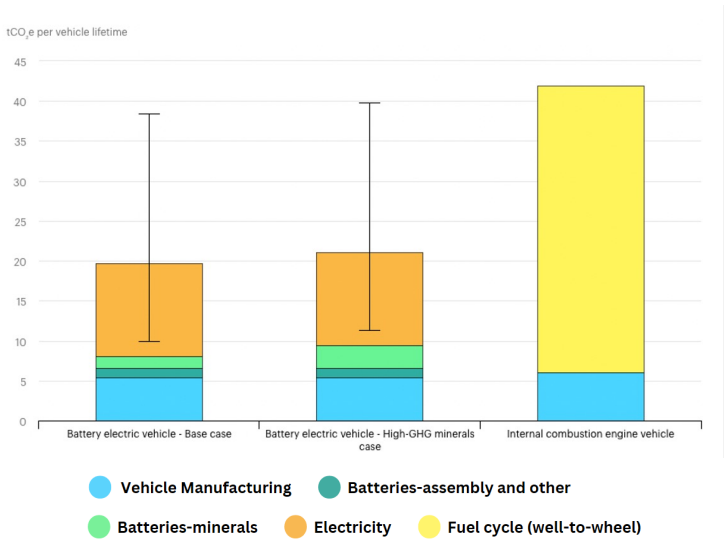
3. Case Study B
Decarbonizing Mines

One of the many advantages of creating and implementing innovative financing solutions in sectors with technologically mature solutions is that the lessons learned can be transferred to the more complex decarbonization needs of heavy industry. The rapid expansion of critical mineral development is needed in the transition to a more sustainable and low-carbon economy. Will this expansion cause more harm than good? The IEA seems to think not: “Emissions along the mineral supply chain do not negate the clear climate advantages of clean technologies.” The IEA report did note, however, that mitigating negative environmental and social impacts of mineral developments and maximizing opportunities to transfer mineral wealth to local communities will be essential.

The surge in **demand for critical minerals is shaping government policies worldwide**, aimed at diversifying supply sources and incorporating environmentally and socially responsible mining practices into energy security strategies.

According to the IEA’s analysis, there is a large variation in the GHG footprint of different producing sites for the same material, which indicates significant opportunities to further decrease emissions globally through fuel switching and electrification alongside process efficiency improvements.

Comparative life-cycle greenhouse gas emissions of a mid-size BEV and ICE vehicle



THE ECONOMIC ADVANTAGE OF DECARBONIZATION

Owing to the important role critical minerals will play in the global low-carbon transition, a balance between decarbonization, economic growth, and financial returns is required, as major investments are being made to support uncertain, long-term technologies. According to the IEA, achieving global net-zero goals could quadruple demand for critical metals and minerals for clean energy technologies by 2040. Achieving the global net-zero target by 2050 could require a six-fold increase in supply of these minerals. The International Council on Mining and Metals (ICMM), which represents 28 mining companies and 35 commodities associations worldwide, committed to a goal of net-zero scope 1 and 2 GHG emissions by 2050 or sooner, in line with the ambitions of the Paris Agreement.

The global record deployment of clean energy technologies is boosting a rising demand for minerals such as lithium, cobalt, nickel, and copper. From 2017 to 2022, demand for lithium, cobalt, and nickel increased by 300%, 70%, and 40%, respectively. The market for energy transition minerals reached US$320 billion in 2022. Such growth was supported by a 30% investment increase compared to 20% in 2021 and a 20% rise in exploration during the same year. Critical minerals start-ups raised a record US$1.6 billion in 2022 (+160% YoY), with the critical minerals sector responsible for 4% of all venture capital (VC) funding for clean energy. Given the sector's consequence, financing instruments that were previously restricted (e.g., green bonds and impact investments) are now being implemented and new innovative instruments are in development. ESG efforts in the sector are currently being funded largely through sustainability-linked bonds, ESG funds, and project finance structures[2].

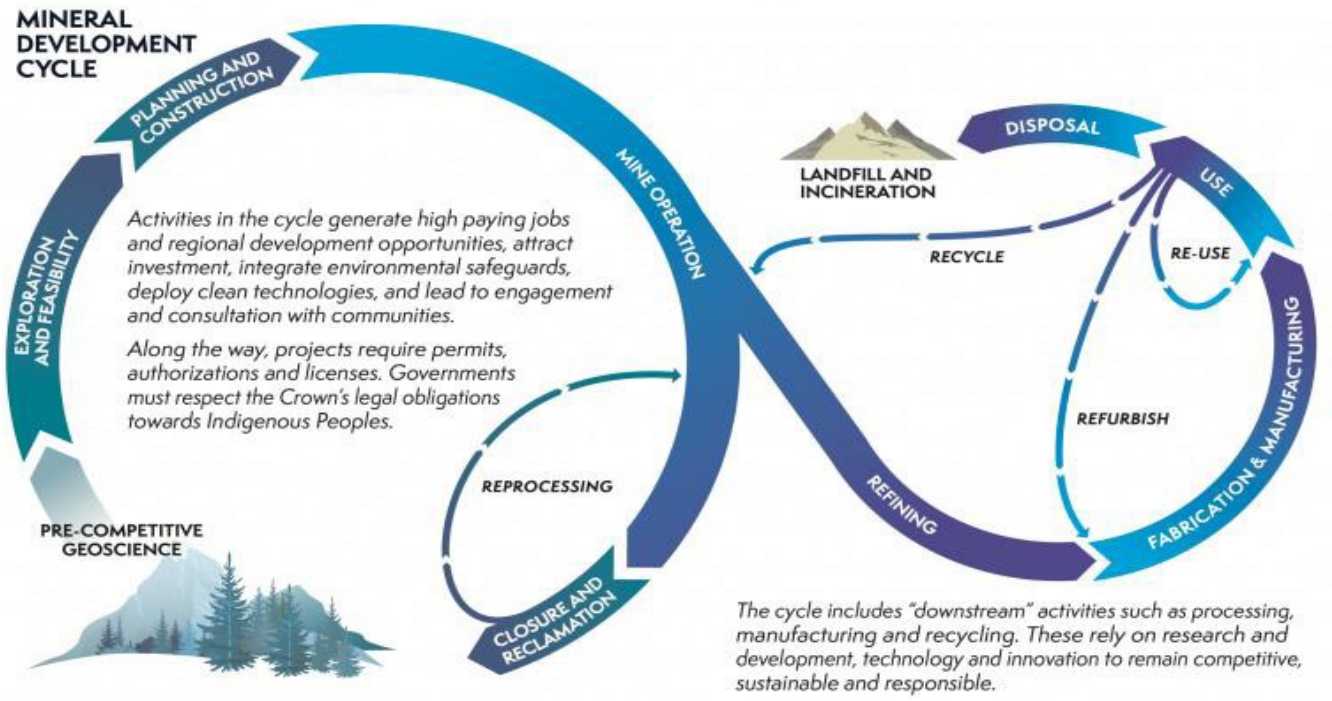
Across the globe, countries are seeking to diversify mineral supplies with a wave of new policies. Developed markets have introduced critical minerals supply into energy security policies to avoid the current dependence on China. These nations are mobilizing efforts through export credit agencies, development financial institutions, commercial banks, and other entities, to develop the sector while securing alternative sources of supply[3]. For example, the Minerals Security Partnership (MSP) was launched in October 2023 with the United States and Canada among 12 partner countries announcing a collaboration to promote ethical mining practices across the sector's value chain in parallel with developing EU efforts to reform mine and refinery permitting processes and launch a central purchasing agency for critical minerals.

Government policies are increasingly geared towards ensuring mining practices are sustainable, with a focus on decarbonization and a robust circular economy to manage indirect emissions and secure future success. Although sustainable development practices have become more prominent within mining, the sector acknowledges that challenges such as water usage, tailings management, CO2 emissions, energy efficiency, renewable power sources integration, and waste management and recycling pathways remain.

2 IEA: *Critical Minerals Market Review*; 2023
3 White and Case: *don't let a crisis go to waste*; 2023

With increased awareness about environmental and social issues, as well as the growing imperative to manage the cascading climate crisis, investors and consumers are increasingly demanding sustainable practices from mining companies, making decarbonization a pillar of future success. Increasing production must be accompanied by the deployment of low-carbon technologies

Establishing a robust circular economy model that prioritizes collaboration with upstream suppliers and downstream customers is key to tackling scope 3 emissions, which are indirect emissions generated across the value chain from both upstream suppliers and downstream customers. These emissions are more difficult to track, and present challenges when it comes to assigning accountability. To manage their scope 3 emissions, mining companies must commit to sustainably sourcing input materials and equipment, while also distributing materials to companies with environmentally friendly methods of processing and production.



Source: Northern Miner
https://www.northernminer.com/commentary/quo-vardis-mining-metals-and-minerals-in-a-circular-economy/1003825693/

Appropriately identifying and managing key environmental and social factors (ESG) is increasingly crucial for mining companies. **Success in ESG can lead to benefits such as access to capital and operational license**, which can generate long-term value.

An analysis conducted by EY demonstrates the complex operating environment miners will face in 2024. According to the report, ESG and capital are the main opportunities for mining and metal companies as of 2024 – up 8 and 4 spots respectively from 2023 reports. The increased attention to these key success factors illustrates the importance of committing to environmental goals.

According to the report: ”Miners will need to balance ESG priorities with other business goals, including productivity. Many are focused on achieving net-positive impact across a number of ESG factors, with significant benefits for those that get it right, including improved access to capital, a healthier talent pipeline and stronger license to operate.”[4]

The Canadian government is allocating **substantial funding to boost clean energy, transportation, and critical mineral projects**, with a focus on infrastructure development and emissions reductions.

GOVERNMENT GRANTS AND SUBSIDIES

Government financing mechanisms can facilitate electrification by reducing fleet acquisitions costs and promoting adoption. Companies can take advantage of financing available from sources such as federal and local grants and incentives, which can help offset the cost of electric vehicles and charging infrastructure. Understanding and qualifying for these incentives can be complicated, however, and they often will not cover the additional costs associated with project development, planning, construction, and more.

Examples of public sector finance incentives in the mining industry are:

- The Strategic Innovation Fund’s Net Zero Accelerator Initiative (NZA), which will provide up to C$8 billion on the decarbonization of large emitters, industrial transformation, and clean technology and battery ecosystem development.
- The Low Carbon Economy Fund (LCEF), which will invest C$2.2 billion over 7 years and support projects to reduce GHG emissions and generate clean growth among other objectives.
- The Clean Growth Fund (CGF), which is a C$15 billion arm’s length public fund to achieve net zero carbon emissions by investing in companies with innovative solutions.

4 EY Canada: Top 10 business risks and opportunities for mining and metals in 2024; 2023.

TAX CREDITS

In Canada, a variety of tax credits and incentives are available to support investments in mine decarbonization, reflecting the country's commitment to reducing the environmental impact of its natural resources sector. Support for transitioning to zero-emission heavy-duty vehicles is available for the mining and construction industries through a new tax credit from the federal government. The 30% refundable tax credit will apply to both hydrogen and electric heavy-duty equipment used in those industries, as well as charging and refueling infrastructure. The government will phase the credits out in 2032 and end their availability in 2035. The Canadian government also offers the Investment Tax Credit for CCUS, which can cover up to 60% on capture equipment using direct ambient air and up to 50% of the capital costs on other capture equipment. The Accelerated Investment Incentive allows businesses to write off a larger portion of the cost of new capital assets in the year the investment is made, encouraging quicker adoption of cleaner technologies. These fiscal measures are designed to make it more financially feasible for mining companies to invest in advanced technologies that reduce carbon emissions by aligning economic incentives with net-zero goals.

CLIMATE FINANCE

The benefit of financing instruments adapted to support climate positive outcomes for companies has historically been an increased investor base, improved liquidity, and enhanced reputation and visibility (for their investors and lenders as well). As interest in these products grows, they have an increasing potential for lowering the cost of capital, which may conversely result in an increased cost, or more limited availability of capital for companies not aligned to net zero.

Some of the more common sustainable finance products are listed below.

- Green Bonds, which are debt instruments designed to fund specific environmental outcomes, for which an independent party provides assurance on the use of proceeds. The money is held in an escrow account to be released to the issuer once the stipulated conditions have been met.

- Sustainability Linked Bonds/Loans, which align the interest rate with the borrower’s sustainability performance through established environmental and/or social KPIs or targets related to operational improvements or other pre-determined outcomes.

- ESG Funds, including Exchange Traded Funds (ETFs), which increase an issuer’s depth of market through inclusion in funds that select companies based on their ability to appropriately identify and manage environmental, social, and governance factors most likely to affect future financial performance.

- Impact or Thematic Investment Funds, which select companies in which to invest based on their potential for positive environmental and/or social outcomes in addition to a financial return.

In the recognized urgency for building a secure critical minerals supply chain, financial instruments to support sustainability objectives are now more accessible to the mining sector than they were before. Some recent examples include Nexa Resources' first sustainability-linked revolving credit facility for US$320 million with a five-year tenor and an interest rate of 1.60% plus Term SOFR (Secured Overnight Financing Rate), depending on the company's compliance with a carbon reduction key performance indicator. Another is SQM's US$750 million senior unsecured green bonds due in 2033 at 6.5%, for eligible green projects related to clean transportation and energy efficiency. Anglo American launched a €745 million sustainability-linked bond with targets to reduce greenhouse gas emissions and freshwater abstraction, as well as support job creation in host communities.

INVESTMENT ENVIRONMENT

A 2024 article in CBC found that: "According to data from TMX Group and PDAC, the share of money going to mineral exploration from the overall amount of equity raised by the mining industry has been decreasing for three years in a row." While companies with "deep pockets" can weather commodity price cycles, many juniors are forced to shut down or curtail exploration, which will create a supply gap from Canada when the expected demand for critical minerals is finally realized. Calls for Canadian pension funds to invest more in Canadian mining were heard throughout the 2024 Prospectors and Developers Association of Canada (PDAC) conference. Globally, the investment community is starting to recognize the opportunities for patient capital in the critical minerals sector. Appian Capital Advisory LLP, a London-based asset management firm founded by a Canadian with a focus on sustainable and responsible investments, is one example of long-term, patient capital for the mining and metals sector.

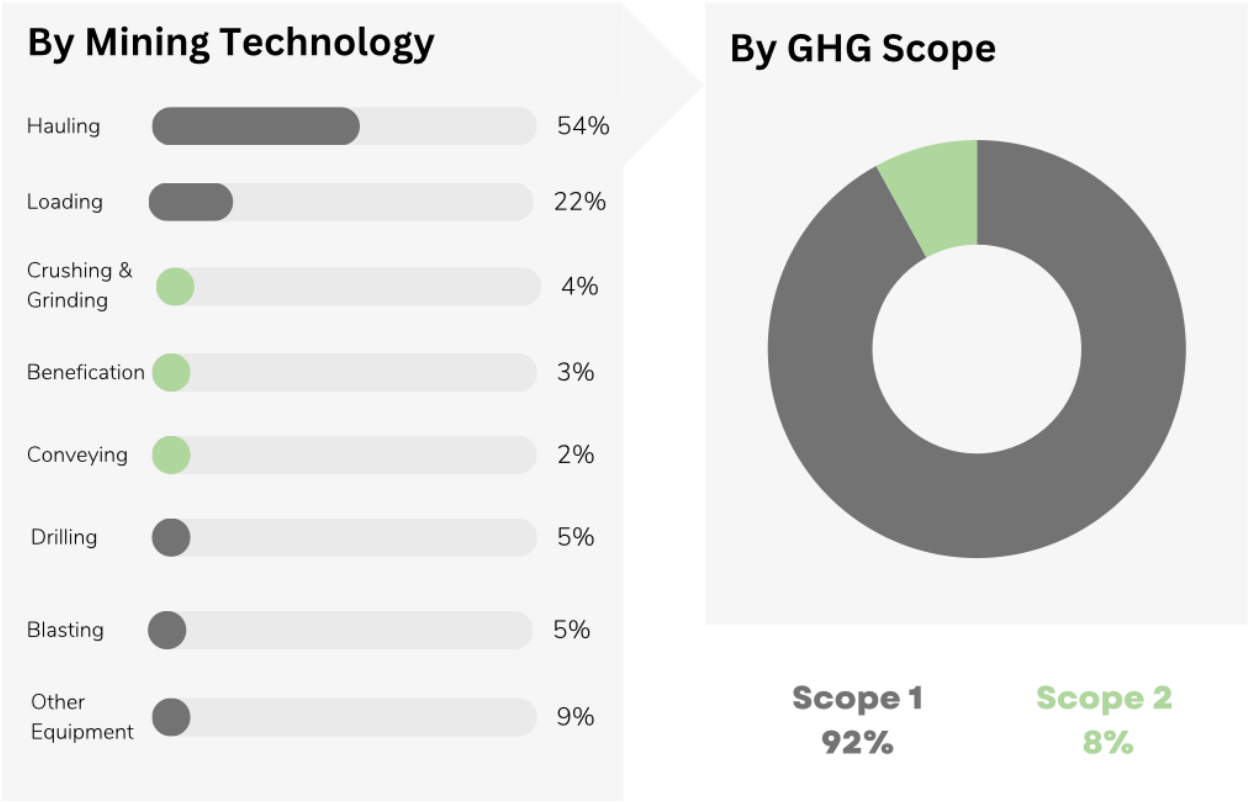
MINE DECARBONIZATION FINANCING SOLUTION

Securitizing a revenue stream from energy and carbon cost savings, along with carbon credit revenues through a Special Purpose Vehicle (SPV) illustrates a solution that leverages the one used in MURBs. An SPV invests the CAPEX required to electrify an open-pit mine so that what could otherwise be a prohibitive cost is off the company's balance sheet and the techno-economic risk is shared among multiple partners.

Although a much more complex operating environment, financing solutions for building decarbonization can be leveraged to fund industrial decarbonization. Using its suite of digital tools, Bloom ESG modelled and evaluated net-zero aligned options for a typical sample mine site connected to a clean grid based on the Accelerator's analysis. Bloom's results, depicted in **Figure 2**, demonstrate that a minimum 80% reduction in scope 1 is required to be on a net-zero pathway.

Figure 2: Decarbonization Levers

% of total emsisions (Scope 1+ 2) by mining technology



Source: Bloom ESG
https://bloom-esg.com/

Mining companies can reduce site emissions with lower cost mature technologies or invest in costlier net-zero aligned solutions with higher technological risks and uncertainties in the availability of infrastructure support.

For sites connected to clean power, Trolley Assist solutions have gained momentum in recent years. They are most effective in operations with fixed routes and significant incline sections, where electric power can most efficiently replace diesel. They cannot, however, achieve a scientifically credible net-zero outcome as a stand-alone solution since diesel is still used for zones not covered by the trolley system. Bloom modelled the contribution of Trolley Assist versus fleet electrification on a net-zero pathway to identify the gap between a net-zero target and realistic outcomes (**Figures 3 and 4**).

Figure 3: Trolley Assist + Operational Electrification

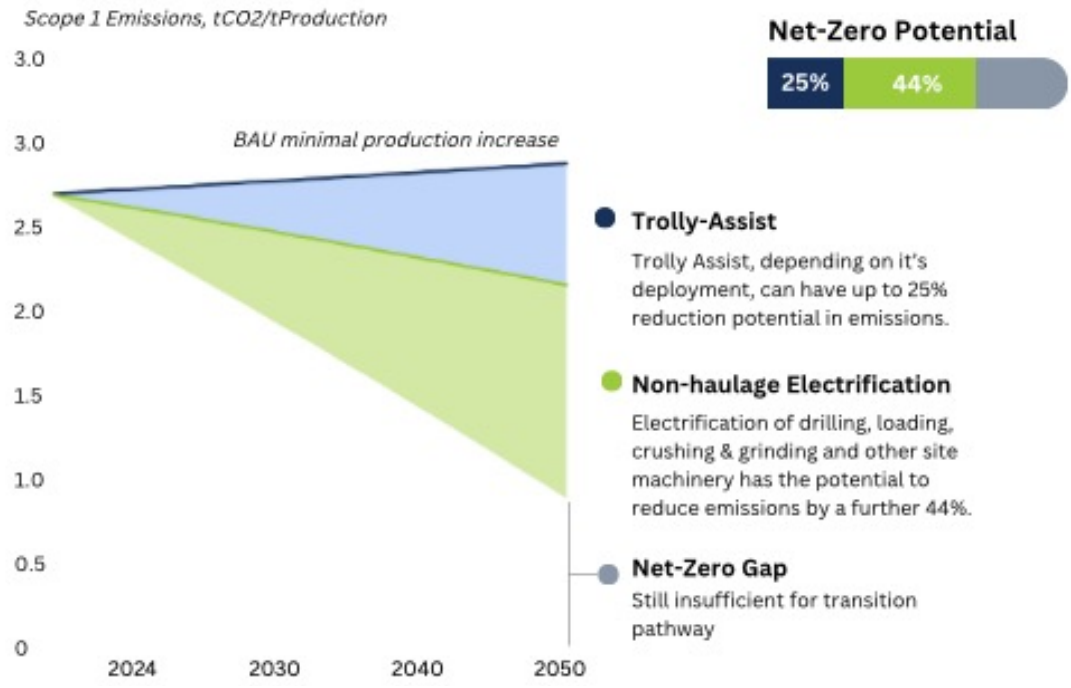
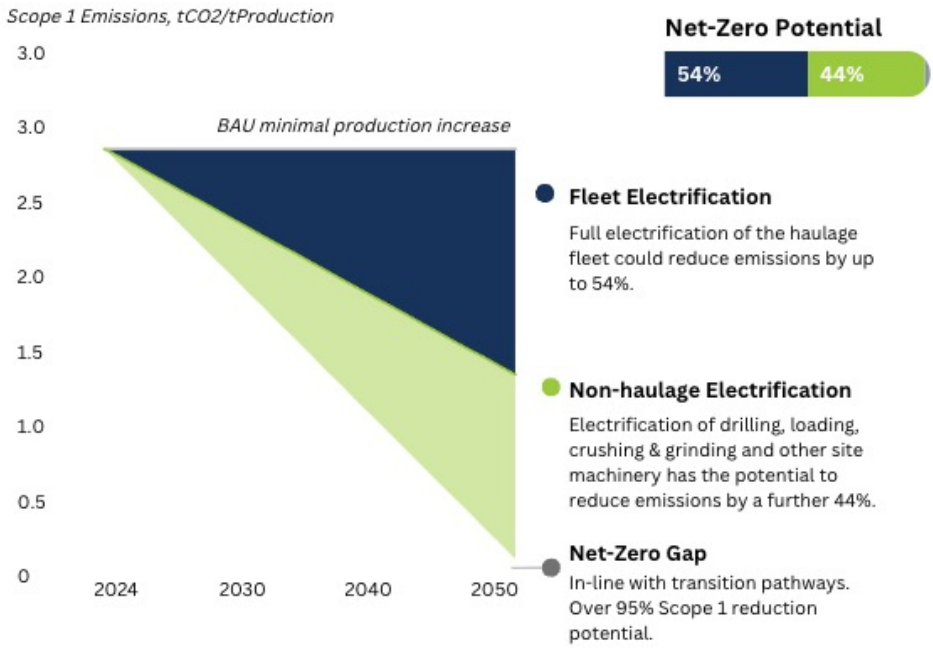


Figure 4: Fleet + Operational Electrification



Source: Bloom ESG
https://bloom-esg.com/

Trolley assist can be a beneficial interim measure while waiting for full electrification technologies to become more cost-effective and widely available. The systems help reduce diesel consumption and associated carbon emissions by powering trucks with electricity on designated routes. They can also be implemented relatively quickly and scaled as needed.

From the perspective of strategic allocation of public capital to support net-zero goals, however, investment in trolley assist systems may become redundant once full electrification is feasible. The technology might also become obsolete as more advanced and efficient electrification solutions come to market, resulting in underutilized infrastructure. Decisions on public sector investment in trolley assist systems should consider the expected timeline for full electrification availability and affordability, and the projected longevity and adaptability of the trolley assist infrastructure.

Implementing a credible, science-based, standardized taxonomy provides a framework that guides both government and private investments towards more strategic and impactful net-zero outcomes. Taxonomies inform investments based on their long-term viability and alignment with national and global climate mitigation goals. They play a crucial role in guiding investment decisions in uncertain and long-term technological scenarios by initially including technologies that facilitate the transition to net zero, and then systematically phasing them out in favour of higher impact alternatives as market readiness and technological advancements allow.

The greater adoption of electric vehicles in underground over open-pit mining is large due to the benefits of the former, particularly reduced ventilation requirements and confined tracks, which do not translate to open-pit mining with its more sprawling, complex routes. The smaller EVs can also navigate the tight tunnels in underground mines more easily, enhancing productivity and safety.

Conversely, electric haul trucks for open-pit mining involve several risks related to a higher initial investment for both the trucks and charging infrastructure, and the technology risk related to the impact of cold weather on batteries. The return on investment depends heavily on factors such as fuel savings, maintenance costs, and carbon tax prices, which can vary widely based on local energy prices, operational efficiency, and availability and price of carbon credit revenues.

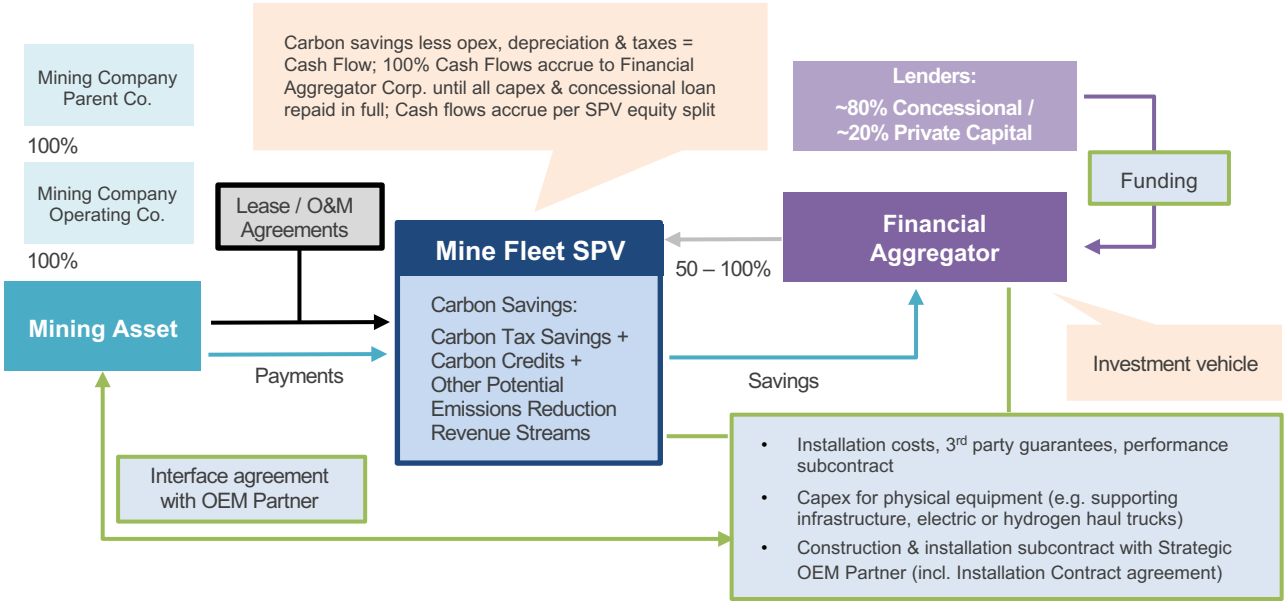
Despite these challenges, the shift toward electric vehicles in both open pit and underground mining is a crucial step towards sustainable mining practices, necessitating ongoing innovation and investment to overcome technical and financial hurdles.

The Mine Decarbonization Financing Solution utilizes the SPV structure discussed previously, which invests the CAPEX required to electrify an open-pit mine. What could otherwise be a prohibitive cost, therefore, is removed from the company's balance sheet and the techno-economic risk is shared among multiple partners. The Accelerator evaluated financing solutions under two scenarios.

1. The SPV partners with the selected original equipment manufacturer (OEM) for fleet integration, timed with the replacement of end-of-life diesel trucks. Risk would be diversified across multiple mining operations, each with their own "Mine Fleet SPV", with funding sourced from government and private sector investors. The SPV's revenue model is based on service agreements with the mining company, aligning payments with realized fuel, maintenance, and carbon tax savings, ensuring a financially feasible and operationally seamless transition.

2. The "Financial Aggregator Corp." is the majority owner of a "Mine Fleet SPV", providing upfront capital, managing integration risks, and realizing financial benefits associated with energy and carbon costs as well as new carbon-related revenue streams including grants, credits and other operational savings relating to fleet decarbonization (**Figure 5**).

Figure 5: Risk sharing through SPV financing structure



As with the retrofit financing case study, evaluating financing scenarios for mine site decarbonization provides line of sight on how costs, risks, and returns can be distributed across project stakeholders to meet the risk tolerances and return requirements of different investors. In the mining industry, many energy transition projects don't make economic sense compared to business as usual (BAU). Financing solutions must therefore be adapted from BAU projects through negotiation between stakeholders on the level of risk and return each will be willing to accept until solutions can be scaled.

Under Scenario 2, the Accelerator evaluated four decarbonization scenarios for an open-pit mine. The models assume a 3.5% loan from Canada Infrastructure Bank (CIB) and a below market rate return requirement of 10% from a consortium of investors, which includes impact investors, to support early adoption to help get technologies to scale.

SCENARIO A: Trolley Assist + Diesel Trucks: Trolley Assist solutions can reduce operating GHG emissions. As they cannot fully abate emissions and are unable to span the full site, however, they will not achieve a net-zero outcome.

SCENARIO B: eLHDs / BEVs: Battery electric haul trucks have the potential for up to 100% fleet operating emissions reduction and could decrease Total Cost of Ownership (TCO) by ~20% by leveraging instant torque for improved haul speeds and incorporating regenerative braking. BEVs face challenges in battery size, need for charging infrastructure, and are affected by extreme temperatures. Their adoption hinges on advancements in battery technology and cost-effective charging solutions.

SCENARIO C: Green Hydrogen FCEVs: Fuel cell haul trucks offer a potential for up to 100% fleet operating emissions reduction, producing no direct emissions when combined with green hydrogen production (hydrogen produced using renewable electricity). The major barrier to FCEV implementation is the relative infancy of supporting infrastructure and energy supply chains for hydrogen production vs. electricity. Hydrogen fuel cells' viability is closely tied to advancements in green hydrogen production technologies and the establishment of secure, scalable supply chains. FCEVs do not face the same cycle-time or temperature constraints as BEVs, however, making them a highly attractive option.

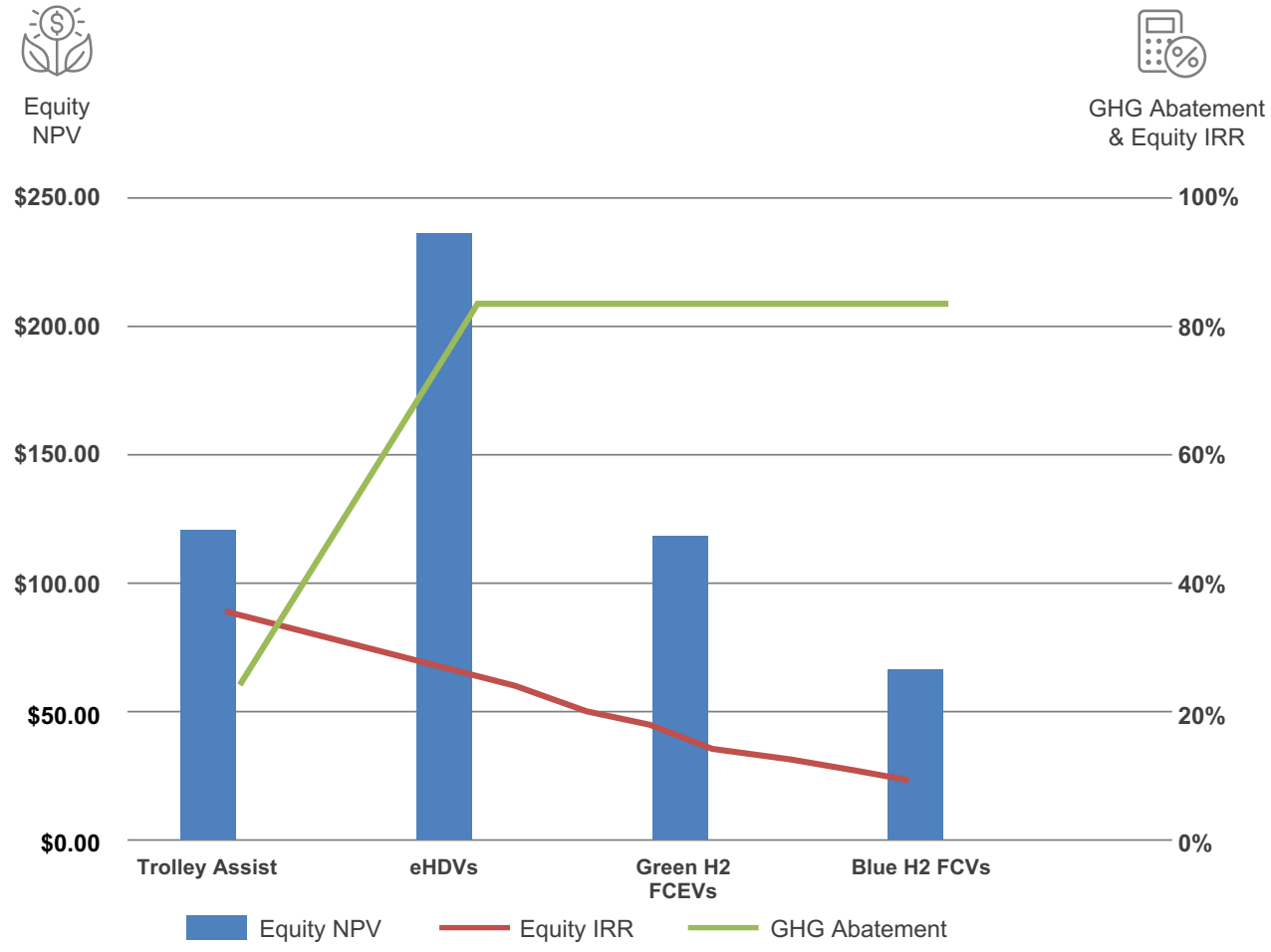
SCENARIO D: Blue Hydrogen FCEVs: Same as Scenario C using natural gas instead of renewables to produce hydrogen.

Results illustrate the inverse relationship between GHG abatement potential and IRR on investments in decarbonization. This relationship can vary depending on factors such as technological advancements, scale of implementation, regulatory frameworks, and shifts in market demand for green products. As technologies mature and economies of scale are achieved, the cost of implementing GHG reduction initiatives is likely to decrease, potentially improving the IRR. Improved regulatory incentives for low-carbon investments and customer-driven "greeniums" can also achieve a more positive correlation between GHG reductions and IRR.

Figure 6 demonstrates that the most profitable technology assuming an escalating price on carbon to $170/tCO2e by 2030 and carbon credit revenues is replacing the diesel truck fleet with an electric one. The trolley assist generates a high IRR for investors primarily due to extremely low comparative CAPEX alongside government grants and incentives captured in the savings cash flows. It has, however, the lowest GHG emission abatement potential, which negatively impacts cash flows over the life of the mine under an escalating carbon price scenario.

More concessional financing and risk transfer support for heavy duty battery electric (eHDV) hauling trucks will yield the greatest GHG abatement aligned to a net-zero pathway. The challenge is access to a sufficient level of electricity capacity. While the high CAPEX associated with new infrastructure for hydrogen makes these technologies economically challenging, they are high potential in terms of achieving net zero and expanding energy capacity. Achieving the equity returns required to attract private capital, however, requires an escalating price on carbon; in this case assumed to reach $170/tCO2e in 2030, at which time the price remains stable.

Figure 6: Fleet Investment Analysis[6]



6 Inputs sourced from McKinsey & Company: *Creating the zero-carbon mine;* 2021

4. Beyond Finance

Addressing Policy and Market Gaps

Governments can best crowd in private capital for decarbonization solutions, including the energy efficiency retrofits and industrial decarbonization projects explored in this report, by implementing backstopping mechanisms, such as loan guarantees and insurance products, alongside tax credits, subsidies, co-investment strategies and other incentives focused on risk mitigation to enhance returns for private sector investors and lenders. The most effective solutions are coordinated across all levels of government to streamline access and avoid competitive or duplicative initiatives. Options provided in this section focused on specific opportunities to advance the two case studies detailed in Sections 2 and 3.

MARKET DEVELOPMENT

REAL ESTATE

Although improving, there remains a dearth of innovative financing tools for MURB retrofits at the scale required. Existing government programs target individual homes and social housing. A framework is needed to support single platform financing solutions for multiple autonomous individuals in MURBs. On-Bill Financing (OBF) could be leveraged. The program typically uses ratepayer funds or utility shareholder funds to service energy related projects at a very low interest rate. This loan is then added to the monthly utility bill payments. On-Bill Repayment (OBR), which is established through a similar structure as OBF, instead uses private capital from institutional investors, who are repaid through monthly utility bills. The property and the newly installed building systems serve as collateral for these types of repayment tools. OBR is easily scaled to other projects and asset types once the utility supplier has established this program. The program allows for investors to secure their lending to a property asset and not only rely on energy cost-savings as a form of security.

Individually metered condo owners can contribute to the retrofit repayment through their own utility bill. The unit-level cost savings typically balance the added loan repayment resulting in utility bills that are within a cost range to which the ratepayer is accustomed. Although Ontario offers OBF and OBR programs, they are currently only available to single-family homes. The challenge for MURBs is that OBF and OBR programs rely on individuals making their own payments but with a shared collateral. Structuring the program for MURBs therefore is highly dependent on an understood shared risk and responsibility among condo residents. An example of an OBR program for MURBs is California's affordable rental property retrofit program, which bundles rental homes through a nonprofit housing provider. The BGC case study illustrated could serve as a pilot for building out a full financing platform for Toronto's vast supply of existing MURBs in need of retrofits by 2030 to achieve 2040 goals.

The City seeks to minimize its risk position by mobilizing private capital through incentives. Where it is a major investor, its primary goal is to de-risk this capital. Private capital, however, has to date not come in at a cost that makes these types of retrofits economically viable for building owners at scale. The City could design a program level capital stack that includes senior debt from commercial banks, specialized mezzanine funds, equity from impact investors, and grants, subsidies, and loan guarantees or other first-loss capital from the City. This structure can include required energy audits for MURBs, which would allow the City to create a tiered funding system based on performance, reporting, and financial capacity to eliminate the performance monitoring and reporting burden on commercial banks. Bundling multiple MURBs into a retrofit portfolio financed through a green bond, for example, serves as collateral for banks.

As funding through the Province of Ontario's Green Bonds Framework is only open to applications from other government agencies, the City of Toronto would be the most likely issuer of such a bond, which would require a need to expand eligibility beyond social housing projects. As Government green bonds are typically repaid through user fees e.g., clean transportation infrastructure repaid through fares, a new agreement must be developed for repayment through energy savings.

MINING

Despite the regularly noted urgency of building a secure critical mineral supply chain, "financing taps for critical minerals companies are all but shut off in Canada" according to a 2023 Globe and Mail article. The article recalls a time when Canada was once the "envy of the global sector…one of the best places in the world for junior miners to flourish."

> All the excitement seeded an ecosystem. Vancouver and Toronto were global hubs for mining capital, and the annual PDAC conference in Toronto, run by the Prospectors & Developers Association of Canada, was a must-attend event. Junior miners with projects in far-flung corners of the world would list their shares in Canada just to get recognized, allowing Bay Street to feast on the financing fees.
>
> So much of it has vanished – the bankers, the investors and the enthusiasm.[4]

A 2024 survey by KPMG found that the biggest challenges facing the critical minerals mining industry are decarbonization, lack of domestic refining capacity, and raising new capital.

Adapting non-recourse project financing structures to shift decarbonization risks from mining companies to third parties by leveraging government funds and private placements will help juniors overcome CAPEX constraints and operational transition challenges, and reshape its investor base to more patient capital.

Novel financing solutions for junior miners in critical minerals are presenting themselves, including offtake agreements with the end users, such as car manufacturers. The Globe and Mail article notes, however, that more is needed, particularly long-term, patient capital as China is doing. Investment firms are coming online globally to fill exactly this gap. The Canadian government can help secure a net-zero pipeline of critical minerals materials through a coherent strategy for its allocation of limited funds. investment in carbon reduction solutions that do not contribute to achieving net zero—representing a 'dead-end pathway'—wastes resources that could be directed towards more effective and impactful technologies.

Streamlining funds will also help. Government expenditures on decarbonization efforts can often be fragmented across various departments and initiatives, leading to duplicative investments in the same solutions. This not only risks crowding out private capital, which could potentially bring innovative solutions and additional funds, but also creates inefficiencies as project developers navigate multiple funding streams, waiting on decisions for low-cost or free capital rather than moving forward with innovative solutions potentially offered through private markets.

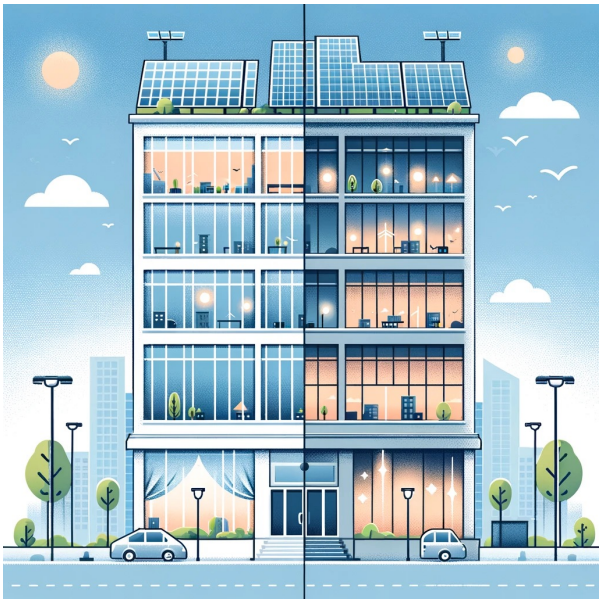
4 Globe and Mail: *How Canada – and Bay Street – squandered the chance to finance the critical minerals revolution*; November 10, 2023

MUNICIPAL LEGISLATION

The Municipal Act (2001) is extremely relevant to building retrofits. It regulates if and how multi-unit residential buildings receive financing. New financing mechanisms, such as property tax repayments require new interpretations or adjustments in the Municipal Act.

Partnerships with the City of Toronto are required to innovate financing models for MURBs in this city, including a loan platform to expedite the approval process. A retrofit financing mechanism through property tax payments, such as the US Property Assessed Clean Energy Programs (PACE) requires a lien to be placed on the property, versus owners of individual units. The lien is then passed through each unit until the full cost is recovered. The cost of investment including capital, interest, and administration costs are recouped through the property tax lien. Private investors invest in the annual property tax revenue to pay for the retrofits, with the payback period agreed within an annual property tax agreement. It works through the establishment of a governing body at the City to collect tax payments, which are allocated to the retrofit loan repayment. As this structure replaces City-issued loans and/or grants (to accommodate its loss of tax revenue), the City could redirect a portion of the property tax payments to a financial institution, which can top up the level of debt as required. This structure would also work well for commercial development.

Property tax revenue payments is not common practice in Canada. It would require the City and Province to implement new legislation regulating permissions for retrofit payments through property taxes, and for the City to agree to forgo property taxes associated with the asset for the stipulated payback period. As the City is already providing concessional loans and grants for retrofits, however, a strategic tax repayment solution would not necessarily cost the City money. It does create a new risk to the City with defaults on future property tax payments, although such risks are well understood and accounted for in all investment and credit programs.



ELECTRICITY CAPACITY

The Accelerator's mine site fleet decarbonization analysis in Section 3, powered by Bloom, illustrates the enormous opportunity of industrial electrification in achieving net-zero targets. The limited financing capacity of concessional partners and the timescales involved in developing technologies at scale require government to appropriately identify and then stay laser focused on advancing net-zero solutions. Recognizing the opportunity in mine site electrification, the Government of Canada's critical minerals strategy includes specific support for strategic investments in green energy infrastructure. Developing renewable energy in Canada, however, remains a challenge. To illustrate, the Accelerator evaluated a hypothetical solar power generator connected to an Ontario off-grid mine. The economics of the Ontario plant was compared to the same hypothetical power generator constructed in Alberta to evaluate power generation in two different electricity markets. Both scenarios incorporate the Clean Technology Investment Tax Credit introduced in the 2023 Canadian Federal Budget, which offers a 30% refundable tax credit for renewable energy projects, including solar, from March 2023 to 2034.

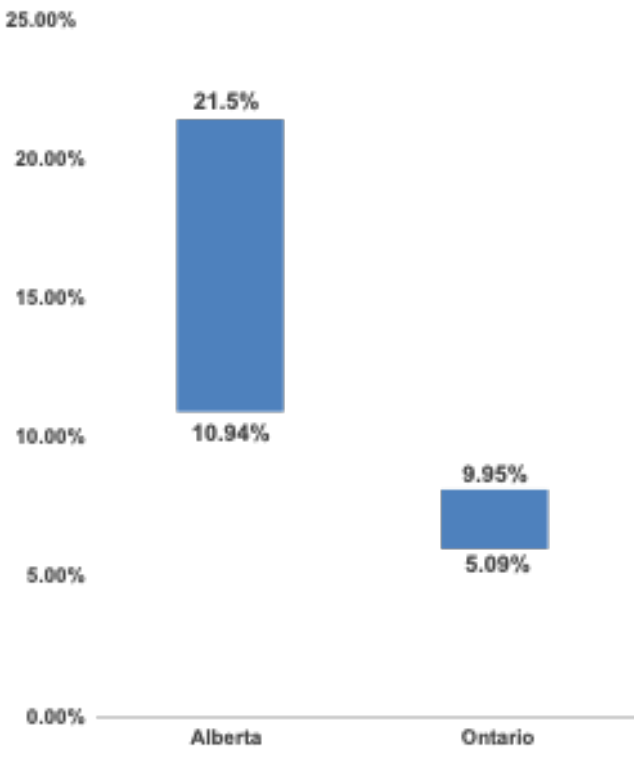
Ontario's solar energy market operates under a regulated, fixed pricing model, which creates less volatility in pricing. It also, however, results in lower competition within the market as illustrated in **Figure 7**. The fixed price structure incentivizes power generation during off-peak hours, as producers benefit from consistent pricing regardless of the time of day. The solar energy sector relies on long-term Power Purchase Agreements (PPAs) to secure investment and ensure stable revenue streams. The approval processes are overseen by the Independent Electricity System Operator (IESO) and are often lengthy, with transparency gaps in the Request for Proposal (RFP) processes. This creates a challenge for renewable energy projects in Ontario.

Image Source: Canadian Mining Journal; 2023

Alberta, which operates under a deregulated Free Merchant Market Model, must contend with price volatility and government uncertainty. According to the Canadian Renewable Energy Association (CanREA), Alberta accounted for more than 92% of Canada's overall growth in renewable energy and energy-storage capacity in 2023. In August 2023, however, the province announced a moratorium on all new renewable energy projects. While this moratorium does not impact approved projects, it will put projects with potential to come online in 2025 and beyond at risk.

CanREA lists Ontario as the province with the largest installed capacity and, while no new projects came online in 2023, the Association expects capacity to increase with energy storage.

Figure 7:
Range of Equity IRR – AB vs ON



Sources: Dunsky, NREL, OEB, NextEra Energy

Political uncertainty is the greatest risk for investment in Alberta, which otherwise enjoys strong fundamentals. Renewable energy projects could tap into the more mature carbon markets in the province. With the expected increase in carbon prices to $170/tCO2e by 2030, these projects could present a compelling investment opportunity, providing more lucrative opportunities for solar photovoltaic (PV) than other jurisdictions. Using assumed capacity factors of 20.0% and 22.0% and CAPEX of $1,450/kW and $1,500/kW for Ontario and Alberta, respectively, the equity IRR was compared for the two hypothetical 100 megawatts ("MW") solar power plants.

Theoretically, there is greater potential for strong IRR in Alberta compared to Ontario for renewable energy investments due to a more favorable market structure for competitive energy pricing and a less saturated renewable energy market. Alberta benefits from high solar irradiance and strong wind profiles, which can result in higher energy output and profitability. A deregulated energy market, which allows for competitive pricing that potentially results in higher returns for investors, creates a favourable investment potential. Ontario's fixed returns, while less risky, are less profitable. Ontario's earlier saturation of the market compared to its grid capacity may also result in reduced opportunities for high IRRs compared to Alberta, where the renewable market is less mature and therefore had room to rapidly expand. Ontario's market, however, is likely to shift with the need to increase electricity capacity and its recent investments in storage.

CLEAN ENERGY SUPPLY

In addition to an innovative financing structure, the following government actions are recommended to accelerate access to the level of clean energy required.

- Establish a market mechanism that decreases the current reliance on procurement (e.g., IESO RFP process) to lower costs and other barriers to entry for smaller developers.

- Expand the scope of IESO's cost guarantee to increase developers' eligibility, which will signal that market demand matches power generation, making banks more willing to lend money for project development.

- Ensure incentives, especially ITCs, are transferable and stackable with other funding support to expedite investment and maximize debt support from banks.

- Implement a streamlined process for private or corporate PPAs with producers alongside carbon credits for offtake corporations. Aggregated PPAs could accelerate renewable energy development by pooling corporations and developers to achieve more favourable terms and market access. Aggregation diversifies energy supply sources, thereby reducing the risk of relying on a single project and enables small developers to compete by joining larger developments.

- Implement a two-layer all-in tariff, traditionally used in electricity markets and still prevailing in some markets around the world. Such tools can help increase the certainty of cash flows and thereby enhance equity and debt investor confidence.

    a) The capacity tariff serves as a base unconditional (fixed) tariff that pays a developer for its CAPEX, factored to be paid over the service life of the project or other agreed timeline, repaid through ratepayers.
    b) The energy tariff is a variable expense driven by market forces, which covers the energy plant's operational expenses, with an additional margin that is attractive enough to make the project profitable.

- Build a concessional financing platform in Ontario to leverage low-cost debt financing for on-site renewable energy, which could be done in collaboration with the newly established Ontario Infrastructure Bank.

TRANSMISSION AND DISTRIBUTION (T&D)

T&D infrastructure presents a critical bottleneck in the deployment of renewable energy projects. Existing grid infrastructure has limited capacity to integrate and manage the variable and decentralized nature of renewable power sources such as solar and wind. In California, for example, the surge in renewable energy projects has outpaced the capacity of its T&D infrastructure. The state's ambitious renewable energy targets and the rapid adoption of these technologies have resulted in more available renewable power than the grid can handle at certain times. This mismatch is resulting in delays in project approvals, as grid operators grapple with the need to upgrade or expand the grid to accommodate the additional load and maintain reliability. Similarly, Barbados' goal of 100% renewable energy by 2030 has resulted in an increase in renewable installations. The existing grid, however, was not designed for the bidirectional flow of electricity characteristic of distributed renewable systems such as rooftop solar. This limitation has led to delays in connecting new renewable projects to the grid, as the infrastructure requires significant upgrades to manage these new energy flows without compromising grid stability.

The core problem to be addressed in any jurisdiction with renewable energy development ambitions is the need for substantial investment in T&D infrastructure, including smart grid technologies that can dynamically manage energy flows and storage solutions to balance supply and demand. Importantly, policy and regulatory frameworks must evolve to support faster grid integration of renewables. Without addressing these T&D infrastructure challenges, renewable energy project delays are likely to continue, hindering progress towards clean energy goals.

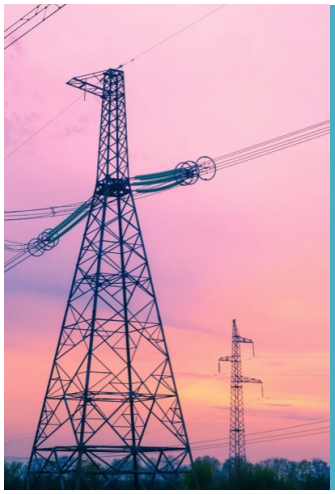
UNIVERSITY OF TORONTO'S CLIMATE POSITIVE ENERGY'S GRID MODERNIZATION AND TESTING CENTRE

Demand for grid capacity will greatly increase in the years ahead. As discussed in the examples of California and Barbados, adoption of new green technologies to meet this growth is being hampered by challenges inherent to both the demand and generation sides that were not anticipated when the grid was developed decades ago. A 'try it and see' approach will meet neither the risk management profile nor the necessary rate of change that is critical to achieve net-zero targets.

The University of Toronto's Climate Positive Energy (CPE)'s $23 million Grid Modernization and Testing Centre provides unique testing capabilities for the Canadian electricity industry to help in the evolution to a more decarbonized, decentralized, and digitalized power system. Its objective is to address the market capacity gap through technology testing and real time simulation of various grid models. Micro-grid connections to renewable energy in rural areas specifically in Northern communities is another important aspect that the centre will service through its modelling capabilities.

The Centre will accelerate the integration of energy solutions into the grid and provide critical data to decision-makers involved in the transition, including generators, utilities, regulators, municipalities, OEMs and SMEs. The Centre will work with these stakeholders to help grow their technologies in several areas of exploration that align with their technology roadmaps to accelerate the adoption of new technologies and solutions such as EV, charging infrastructure, renewable energy solutions, energy storage, electrolysers, micro-grids, cybersecurity, and protection and control devices.

The Centre creates visibility into the enablers that are required to expand T&D. A list of key enablers is provided below.



- Review and refine current policies to facilitate easier, more efficient grid interconnections for renewable energy producers. This can involve streamlining the application process for new connections and updating the technical requirements to accommodate the variable nature of renewable energy sources.
- Review and modify existing, or create new, incentives for the development and integration of energy storage solutions.
- Re-purpose regulatory frameworks for a more flexible electricity market that facilitates distributed energy resources and new business models such as power plants and demand response programs.
- Develop new utility models such as the DSO (Distribution System Operators) instead of the current LDC (Local Distribution Company) to account for the changing role of consumers to prosumers and the bi-directional communications of the grid.
- Identify regulatory changes required to incentivize utilities to innovate.

Learn about the Global Climate Finance Accelerator's partnership with Climate Positive Energy here.

COLLABORATION

The transformation of the electricity sector presents a wealth of career development opportunities, particularly as the industry shifts towards sustainable and renewable energy sources. For historically marginalized communities, this shift can mean not only jobs but also pathways to long-term careers and leadership roles. Opportunities extend beyond simply participating to actually shaping the new energy landscape.

With the development of smart grids, renewable energy technologies, and energy storage solutions, technological innovation is rapidly advancing. This advancement creates new policy and advocacy positions to guide the electricity sector's regulatory and ethical compass in ensuring it meets the needs of underserved populations. Jobs in installation, maintenance, and operations of renewable energy infrastructure are growing, with a focus on providing these skills to those in disadvantaged regions.

Technological advancement also promotes entrepreneurship, which is facilitated through financial support, mentorship, and access to networks that can help launch and scale energy-focused businesses. The goal is to create an inclusive environment that not only welcomes diverse talent but also amplifies their voices and addresses historical imbalances in access to opportunities. This comprehensive approach ensures the benefits of the sector's growth are widely shared and that the future of energy is built by a workforce as diverse as the communities it serves.

Recognizing these opportunities, combined with the fact that electrification in Canada relies on lands and resources to which Indigenous nations are rights-holders, the First Nations Major Projects Coalition (FNMPC) and Mokwateh partnered to create a National Indigenous Electrification Strategy, “guided by two goals: (1) to position Indigenous nations as leaders of Canada’s net zero transition, and (2) to remove economic, political, and regulatory barriers to support and promote the development of Indigenous-partnered and -led clean energy projects in Canada”.

In addition to the benefits of advancing Indigenous economic reconciliation, partnerships between Indigenous Peoples and all parts of the electricity sector benefit from Indigenous knowledge gained from the leadership roles Indigenous nations have played in electrification from renewables (hydro, wind, and solar), to storage, to SMRs and geothermal.

The Transition Accelerator’s Electrifying Canada supports ”sustained collaboration” on electrification by “coordinating, convening, and facilitating national and regional dialogues among a diverse group of power producers, regulators, system operators, industry, organized labour, Indigenous organizations, financial institutions, and civil society to share knowledge and perspectives on challenges and solutions.” The initiative produces analysis and insights on electrification system pathways and engages policy decision-makers to address and eliminate identified barriers to accelerated electrification.

TRANSFORMATION CULTURE

In the wake of the pandemic, many people have forgotten that cities are more than just centers of work and habitation, but rather engines of innovation, propelling economic growth and social evolution. They house commercial activity, leading universities, and research institutions that generate cutting-edge knowledge and attract global talent, building a community of practice that transcends knowledge into craft by putting theory into action, sharpening practical skills through shared experience and dialogue. Individuals expand their ideas through chance encounters on the streets or the various knowledge-sharing and ideation collective hubs and events[8].

Urban planning is critical to fostering this innovation by designing spaces that encourage serendipitous interactions through accessible public areas that become living laboratories for experimentation and entrepreneurship. The interconnectivity within a city allows for rapid dissemination and iteration of ideas, transforming the urban landscape into an incubator for scalable and sustainable solutions to global challenges.

This collaborative environment fosters an instinctive understanding of which approaches are likely to succeed and which may falter, informed by the collective wisdom and diverse perspectives of the group. It creates a network of expertise, enabling members to identify and connect with the right peers who help each other navigate and overcome specific challenges.

Municipal governments can amplify this effect by implementing policies that encourage innovation, such as investing in specific areas of development on which to focus and then supporting R&D and start-ups in these areas along with fostering public-private partnerships. Federal governments can help their citizens *"become bolder"* by "*supporting people's risk taking in new flexible labour markets…and widen eligibility rules (for social safety nets) to recognize new varieties of work."*[9]

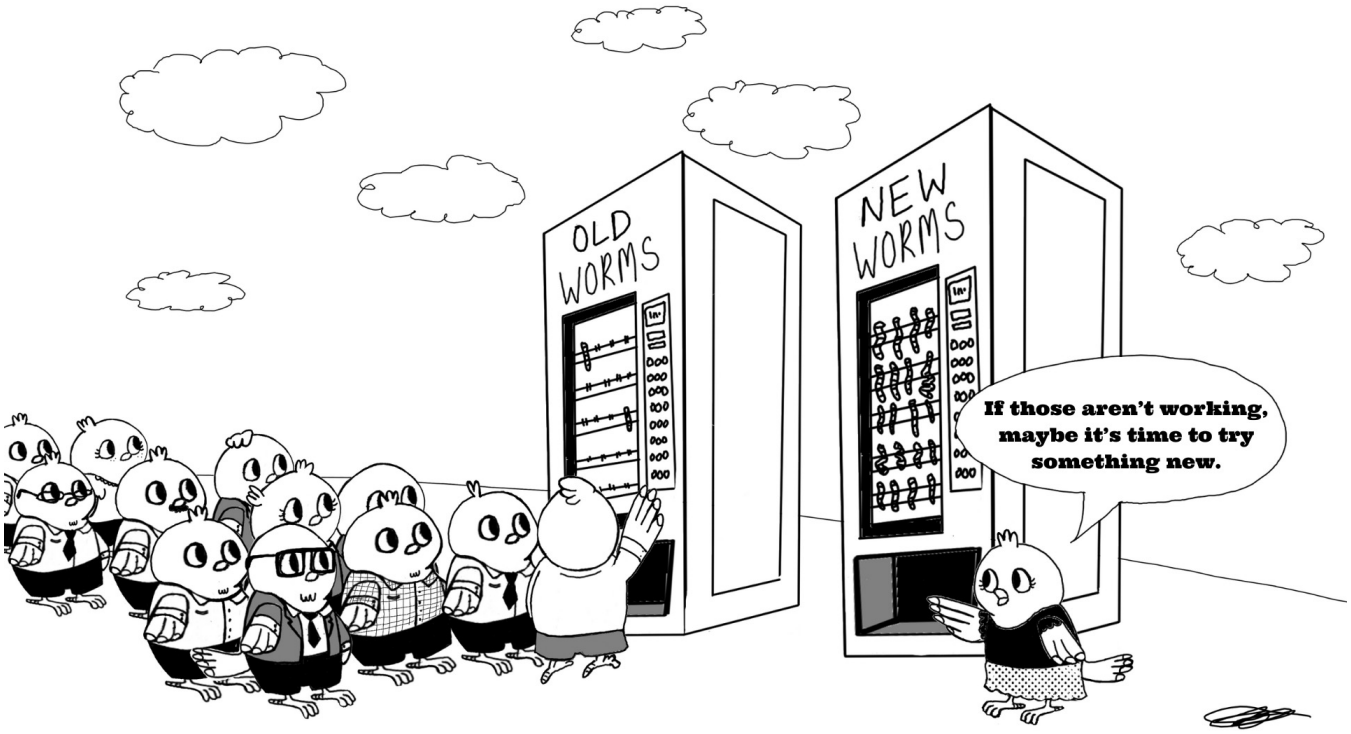
While venturing into new ideas is the path through which true innovation and breakthroughs occur, it also exposes an individual to negative repercussions because the responsibility is not diffused among many. As the adage goes: "You'll never get fired for buying an IBM". In other words, to align with widely accepted norms carries less risk as any one individual is shielded from blame due to the widespread nature of the determined course of action. But "*they* (individuals taking risks on innovation) *and their families shouldn't have to bear those costs alone – not least because society as a whole suffers when their productivity lapses."*[10]

8 Goldin, Ian & Kutarna, Chris. Age of Discovery. Bloomsbury; 2017, pages 401 – 407.
9 & 10 Ibid.

STRATEGIC PLANNING

One key challenge in appropriately allocating capital to an equitable energy transition in Canada lies in how the country decides to define and articulate its vision. Critics often characterize Canada's business environment as an oligopolistic hegemony, which potentially leads to less favourable conditions for employees, consumers, and other stakeholders due to a lack of competitive pressure. Those who support Canada's current economic environment believe that industry consolidation is an imperative for global investment (e.g., favourable to shareholders).

This difference in approach highlights a fundamental debate about the role of government in the economy: Whether to protect certain industries considered vital for national interest and ensure stability through regulation or to promote an open competitive market environment that encourages companies to innovate and differentiate themselves independently. A clear strategic vision for determining which industries need government-protected competitive advantages, and when these protections should be lifted to foster technological progress and economic growth, will support the development of long-term, non-partisan policies designed to increase Canadian innovation and productivity. Transparently communicating this vision will enable current and would-be citizens to make informed decisions on where, and how, to establish business. A clear roadmap for the future can help identify the appropriate advisors to develop the policy and market infrastructure required to avoid contradictory actions that could undermine stated objectives.



5. Next steps

Advancing climate solutions one project - one partnership - at a time

The Accelerator's immediate next step is to pilot the proposed financing solutions with two project developers in the mining and real estate sectors. **The objective of this work is to develop and refine a process – one project at a time to capture new opportunities and lessons learned - for expediting the decarbonization of Canada's economy.**

Contact us at info@globalclimfin.com to express your interest in participating in our research and pilot initiatives and lay the groundwork for securing the necessary capital to realize your net-zero aligned industrial decarbonization projects.

Alternatively, join us in our efforts to move three pivotal projects from vision to reality, ultimately contributing to the resilience and sustainability of communities on both a global and local scale.

2024 – 2025 PROJECT DEVELOPMENTS

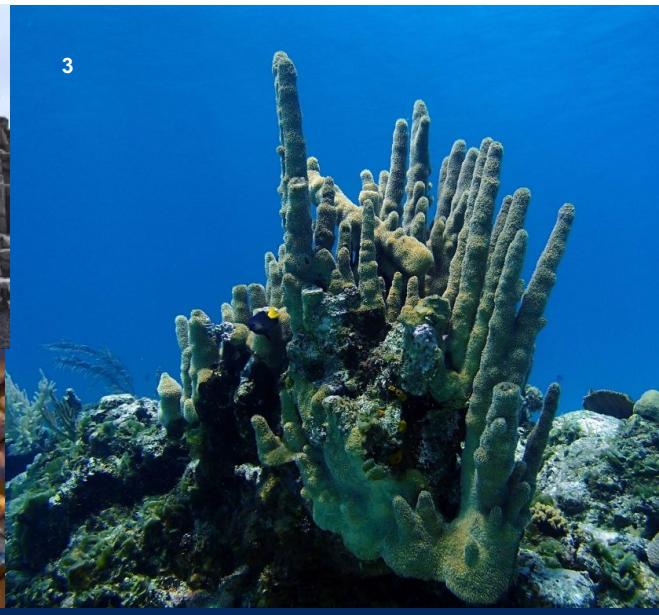
The Accelerator is working with academic institutions globally to explore opportunities in the following:

1. Demonstration project to create a financing platform for carbon removal technologies.

2. Policies and collaborative financing strategies to promote a circular economy that capitalizes on the sustainable development of national resources. In Canada, for example, supply and demand gaps, lack of local production, building code compliance, and higher cost of products versus alternatives hinder development of a mass timber industry, according to Mantle Developments. Meanwhile, Canada may be losing ground in the race to build and export Small Modular Reactor (SMR) technology.

3. A cohesive international climate finance strategy for marine conservation and education. The proposed project promotes youth development and community-building conservation work throughout The Bahamas, Wider Caribbean and East Africa. Research supports practical application of the critical interlinkages between capacity building and innovative financing solutions for the blue economy and effective community-driven marine protected area management, the objective of which is to develop, implement, and finance resilience structures that effectively mitigate the physical impact of climate change on small island states.

Image sources:
1. https://www.bbc.com/news/science-environment-65648361
2. https://www.britishcolumbia.ca/industries/mass-timber/
3. https://www.ymebahamas.org/



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Appendices: Financial Analysis Summary

ADDPENIX A:
Building Retrofit Financial Summary (Scenario 1) **(1/2)**

			Financial Aggregator	
	Commercial bank	City of Toronto	Equity	Concessional debt
Interest Rate	7%	4%	12%	2.0%
Weight	0%	0%	20%	80.0%
Capital Contribution			$3,353,704.40	$13,414,817.60

Weighted Average Interest Rate	4.00%
Retrofit Project Cost	$16,768,522.00
No. of Years FA Owns Savings	9.62
NPV	$7,572,524.45
Equity IRR	31.89%
Project Life (Years)	16

Average Annual Unit Property Tax	$2,870
No. of Units	156
Total Annual Cost	$447,720.00
Debt payments	$268,296.35
Fees (%)	2.00%
FA Fees (US$)	$335,370.44
Distribution to FA (%)	20.00%

Year Since Start	Energy Savings ($)	Carbon Cost Savings ($)	Carbon and Energey Savings ($)	Capital Plan Savings ($)	Total Savings ($)	PV Savings ($)	PV Property Tax ($)	Debt Outstanding ($)	Post-Debt CFs to Investors (Non-Discounted) ($)	FA Fees ($)
1	228,717.40	22,578.67	251,296.07	1,747,010.00	1,998,306.07	1,921,448.14	430,500.00	13,683,113.95	$ 1,730,009.72	$ (335,370.44)
2	233,291.75	22,578.67	255,870.42	1,390,924.00	1,646,794.42	1,522,554.01	413,942.31	11,461,829.64	$ 1,378,498.07	$ (335,370.44)
3	237,957.58	27,789.13	265,746.72	1,976,392.00	2,242,138.72	1,993,253.15	398,021.45	9,554,661.53	$ 1,973,842.36	$ (335,370.44)
4	242,716.73	32,999.59	275,716.33	811,512.00	1,087,228.33	929,367.33	382,712.93	7,002,098.87	$ 818,931.98	$ (335,370.44)
5	247,571.07	38,210.06	285,781.13	835,217.00	1,120,998.13	921,378.75	367,993.20	5,576,493.55	$ 852,701.77	$ (335,370.44)
6	252,522.49	43,420.52	295,943.01	1,050,593.00	1,346,536.01	1,064,186.97	353,839.62	4,087,930.93	$ 1,078,239.66	$ (335,370.44)
7	257,572.94	48,630.98	306,203.92	211,200.00	517,403.92	393,184.46	340,230.40	2,339,548.42	$ 249,107.57	$ (335,370.44)
8	262,724.40	93,788.32	356,512.72	507,803.00	864,315.72	631,547.03	327,144.62	1,401,912.99	$ 596,019.37	$ (335,370.44)
9	267,978.89	93,788.32	361,767.21	3,941,853.00	4,303,620.21	3,023,666.47	314,562.13	91,674.81	$ 4,035,323.86	$ (335,370.44)
10	273,338.47	93,788.32	367,126.79	1,958,245.00	2,325,371.79	1,570,937.86	302,463.59	-	$ 2,325,371.79	$ (335,370.44)
11	278,805.23	93,788.32	372,593.56	1,498,006.00	1,870,599.56	1,215,105.80	290,830.37	-	$ 1,870,599.56	$ (335,370.44)
12	284,381.34	93,788.32	378,169.66	258,491.00	636,660.66	397,656.37	279,644.59	-	$ 636,660.66	$ (335,370.44)
13	290,068.97	93,788.32	383,857.29	30,373.00	414,230.29	248,775.98	268,889.03	-	$ 414,230.29	$ (335,370.44)
14	295,870.35	93,788.32	389,658.67	180,678.00	570,336.67	329,355.21	258,547.14	-	$ 570,336.67	$ (335,370.44)
15	301,787.75	93,788.32	395,576.07	11,770.00	407,346.07	226,184.81	248,603.02	-	$ 407,346.07	$ (335,370.44)
16	307,823.51	93,788.32	401,611.83	990,454.00	1,392,065.83	743,235.33	239,041.37	-	$ 1,392,065.83	$ (335,370.44)
17	313,979.98	93,788.32	407,768.30	156,136.00	563,904.30	289,493.38	229,847.47	-	$ 563,904.30	$ -
18	320,259.58	93,788.32	414,047.90	307,453.00	721,500.90	356,153.13	221,007.18	-	$ 721,500.90	$ -
19	326,664.77	93,788.32	420,453.09	500,198.00	920,651.09	436,980.06	212,506.91	-	$ 920,651.09	$ -
20	333,198.06	93,788.32	426,986.38	346,743.00	773,729.38	353,119.99	204,333.56	-	$ 773,729.38	$ -
21	339,862.03	93,788.32	433,650.35	417,181.00	850,831.35	373,373.38	196,474.58	-	$ 850,831.35	$ -
22	346,659.27	93,788.32	440,447.59	320,987.00	761,434.59	321,291.43	188,917.87	-	$ 761,434.59	$ -
23	353,592.45	93,788.32	447,380.77	873,817.00	1,321,197.77	536,044.73	181,651.79	-	$ 1,321,197.77	$ -
24	360,664.30	93,788.32	454,452.62	(2,805,972.00)	(2,351,519.38)	(917,378.21)	174,665.19	-	$ (2,351,519.38)	$ -
25	367,877.59	93,788.32	461,665.91	(2,961,845.00)	(2,500,179.09)	(937,859.19)	167,947.29	-	$ (2,500,179.09)	$ -
26	375,235.14	93,788.32	469,023.46	(2,723,575.00)	(2,254,551.54)	(813,192.47)	161,487.78	-	$ (2,254,551.54)	$ -
27	382,739.84	93,788.32	476,528.16	380,820.00	857,348.16	297,342.55	155,276.71	-	$ 857,348.16	$ -
28	390,394.64	93,788.32	484,182.96	194,500.00	678,682.96	226,325.48	149,304.53	-	$ 678,682.96	$ -
29	398,202.53	93,788.32	491,990.85	(5,898,738.00)	(5,406,747.15)	(1,733,681.12)	143,562.05	-	$ (5,406,747.15)	$ -
30	406,166.58	93,788.32	499,954.90	1,630,979.00	2,130,933.90	657,006.70	138,040.43	-	$ 2,130,933.90	$ -
31	414,289.91	93,788.32	508,078.23	897,993.00	1,406,071.23	416,844.24	132,731.19	-	$ 1,406,071.23	$ -
32	422,575.71	93,788.32	516,364.03	152,583.00	668,947.03	190,688.66	127,626.14	-	$ 668,947.03	$ -
33	431,027.22	93,788.32	524,815.55	(11,713,558.00)	(11,188,742.45)	(3,066,769.11)	122,717.44	-	$ (11,188,742.45)	$ -
34	439,647.77	93,788.32	533,436.09	(547,960.00)	(14,523.91)	(3,827.81)	117,997.54	-	$ (14,523.91)	$ -
35	448,440.72	93,788.32	542,229.05	(10,585,038.00)	(10,042,808.95)	(2,545,003.16)	113,459.17	-	$ (10,042,808.95)	$ -
36	457,409.54	93,788.32	551,197.86	4,309,981.00	4,861,178.86	1,184,517.24	109,095.36	-	$ 4,861,178.86	$ -
37	466,557.73	93,788.32	560,346.05	2,173,330.00	2,733,676.05	640,491.68	104,899.38	-	$ 2,733,676.05	$ -
38	475,888.88	93,788.32	569,677.21	1,189,629.00	1,759,306.21	396,346.06	100,864.79	-	$ 1,759,306.21	$ -
39	485,406.66	93,788.32	579,194.98	9,360,043.00	9,939,237.98	2,153,043.76	96,985.38	-	$ 9,939,237.98	$ -
40	495,114.80	93,788.32	588,903.12	351,854.00	940,757.12	195,949.40	93,255.17	-	$ 940,757.12	$ -
41	505,017.09	93,788.32	598,805.41	2,175,127.00	2,773,932.41	555,557.43	89,668.43	-	$ 2,773,932.41	$ -
42	515,117.43	93,788.32	608,905.75	636,787.00	1,245,692.75	239,889.20	86,219.65	-	$ 1,245,692.75	$ -

ADDPENIX B:
Building Retrofit Financial Summary (Scenario 1) **(2/2)**

			Financial Aggregator	
	Commercial bank	City of Toronto	Equity	Concessional debt
Interest Rate	7%	4%	12%	2.0%
Weight	0%	0%	20%	80.0%
Capital Contribution			$3,353,704.40	$13,414,817.60

Weighted Average Interest Rate	4.00%
Retrofit Project Cost	$16,768,522.00
No. of Years FA Owns Savings	9.62
NPV	$7,572,524.45
Equity IRR	31.89%
Project Life (Years)	16

Average Annual Unit Property Tax	$2,870
No. of Units	156
Total Annual Cost	$447,720.00
Debt payments	$268,296.35
Fees (%)	2.00%
FA Fees (US$)	$335,370.44
Distribution to FA (%)	20.00%

Year Since Start	Equity Holder CF ($)	Rolling Equity IRR (%)	Equity Holder CF (post FA distribution)	FA CF (Fees + Distribution)		
	$ (3,353,704.40)		$ (3,353,704.40)			
1	$ 1,394,639.28	(58.4%)	$ 1,394,639.28	$ 335,370.44		
2	$ 1,043,127.63	(19.7%)	$ 1,043,127.63	$ 335,370.44		
3	$ 1,638,471.92	10.1%	$ 1,310,777.54	$ 663,064.82		
4	$ 483,561.54	15.0%	$ 386,849.23	$ 432,082.75		
5	$ 517,331.33	18.8%	$ 413,865.07	$ 438,836.71		
6	$ 742,869.22	22.4%	$ 594,295.37	$ 483,944.28		
7	$ (86,262.87)	22.1%	$ (69,010.30)	$ 318,117.87		
8	$ 260,648.93	22.8%	$ 208,519.14	$ 387,500.23		
9	$ 3,699,953.42	28.9%	$ 2,959,962.73	$ 1,075,361.12		
10	$ 1,990,001.35	30.6%	$ 1,592,001.08	$ 733,370.71		
11	$ 1,535,229.12	31.5%	$ 1,228,183.29	$ 642,416.26		
12	$ 301,290.22	31.7%	$ 241,032.18	$ 395,628.48		
13	$ 78,859.85	31.7%	$ 63,087.88	$ 351,142.41		
14	$ 234,966.23	31.7%	$ 187,972.98	$ 382,363.69		
15	$ 71,975.63	31.8%	$ 57,580.51	$ 349,765.57		
16	$ 1,056,695.39	31.9%	$ 845,356.31	$ 546,709.52	**FA NPV ($)**	
17	**Equity IRR**	**31.89%**	**27.89%**	$ 7,871,045.29	**$ 5,692,575.58**	
18	**Equity NPV (post**	**$ 7,572,524.45**		$ 463,002.66	$ 334,857.39	/yr

ADDPENIX C:
Mine Fleet Decarbonization Financial Summary (Scenario B – eLHD Haul Trucks)

eLHD Fleet	Financial Aggregator	
	Equity	Concessional Capital
Interest Rate	10%	3.5%
Weight	20%	80.0%

Wt. Avg. Interest Rate (Pre-Tax)	4.80%
Haul Fleet Project Cost (US$M)	$200.00
No. of Units Replaced Annually	7
No. of Years FA Owns Savings	11.73
NPV (100% Basis)	$157,998,759.88
NPV (Equity Partner)	**$236,205,190**
Equity IRR	**31%**

Emissions Abatement (%)	100%
TCO Incr. / (Decr.): 2020	10.0%
TCO Incr. / (Decr.): 2030	(20.0%)
TCO Incr. / (Decr.): 2040	(20.0%)

Debt payments	$5,600,000.00
Fees (%)	2.00%
FA Fees (US$)	$4,000,000.00
Distribution to FA (%)	20.00%
Project Life (Years)	16

Year Since Start	Fuel + Maintenance Savings ($)	Carbon Tax Savings ($)	Fuel + Maint. + Carbon Tax Savings ($)	Lease Financing Savings ($)	Total Savings ($)	PV Savings (100% Basis) ($)	PV Savings (Equity Partner) ($)	Debt Outstanding ($)
1	-	-	-	-	0.00	0.00	0.00	0.00
2	186,222.36	4,642,288.44	4,828,510.79	119,937.43	4,948,448.23	4,505,536.01	817,925.33	207,000,000.00
3	770,836.15	9,983,242.92	10,754,079.07	544,868.26	11,298,947.33	9,816,442.71	1,697,813.27	214,245,000.00
4	1,705,333.93	15,963,279.46	17,668,613.39	1,595,813.46	19,264,426.85	15,970,222.32	2,631,572.55	216,621,931.09
5	2,982,937.96	22,428,960.80	25,411,898.76	2,599,684.97	28,011,583.73	22,158,035.33	3,478,597.93	212,509,288.19
6	3,669,869.70	25,231,270.98	28,901,140.68	3,242,575.48	32,143,716.16	24,262,100.01	3,628,857.96	200,008,431.49
7	4,335,270.49	28,371,423.20	32,706,693.69	3,673,799.28	36,380,492.97	26,202,311.24	3,733,789.06	178,016,737.43
8	4,687,534.80	31,910,153.10	36,597,687.90	4,200,000.00	40,797,687.90	28,037,887.59	3,806,484.50	150,978,577.01
9	4,687,534.80	35,885,120.27	40,572,655.07	2,860,000.00	43,432,655.07	28,481,629.66	3,683,937.12	118,609,016.99
10	4,687,534.80	40,430,015.38	45,117,550.18	1,400,000.00	46,517,550.18	29,107,439.83	3,586,905.86	80,534,725.60
11	4,687,534.80	45,455,769.33	50,143,304.13	140,000.00	50,283,304.13	30,022,696.67	3,524,798.27	38,400,643.00
12	4,687,534.80	44,564,479.73	49,252,014.53	80,000.00	49,332,014.53	28,105,638.69	3,143,740.03	-
13	2,775,199.05	43,690,666.40	46,465,865.45	40,000.00	46,505,865.45	25,281,978.43	2,694,218.53	-
14	2,775,199.05	42,860,656.39	45,635,855.44	40,000.00	45,675,855.44	23,693,473.45	2,405,576.06	-
15	2,775,199.05	41,991,826.30	44,767,025.35	-	44,767,025.35	22,158,430.61	2,143,373.99	-
16	2,775,199.05	41,168,457.16	43,943,656.21	-	43,943,656.21	20,754,662.04	1,912,683.98	-
17	2,775,199.05	40,361,232.51	43,136,431.56	-	43,136,431.56	19,440,275.28	1,706,862.60	-

Year Since Start	Post-Debt CFs to Investors (Non-Discounted) ($)	Other Fees ($)	Equity Holder CF ($)	Rolling IRR (%)	Equity Holder CF (post FA distribution)	FA CF (Fees + Distribution)	
1		0.00	(40,000,000.00)		(40,000,000.00)	0.00	
2	(651,551.77)	(4,000,000.00)	(4,651,551.77)	0.0%	(4,651,551.77)	4,000,000.00	
3	5,698,947.33	(4,000,000.00)	1,698,947.33	0.0%	1,698,947.33	4,000,000.00	
4	13,664,426.85	(4,000,000.00)	9,664,426.85	(39.2%)	9,664,426.85	4,000,000.00	
5	22,411,583.73	(4,000,000.00)	18,411,583.73	(11.0%)	18,411,583.73	4,000,000.00	
6	26,543,716.16	(4,000,000.00)	22,543,716.16	4.0%	18,034,972.93	8,508,743.23	
7	30,780,492.97	(4,000,000.00)	26,780,492.97	13.2%	21,424,394.38	9,356,098.59	
8	35,197,687.90	(4,000,000.00)	31,197,687.90	19.2%	24,958,150.32	10,239,537.58	
9	37,832,655.07	(4,000,000.00)	33,832,655.07	23.1%	27,066,124.06	10,766,531.01	
10	40,917,550.18	(4,000,000.00)	36,917,550.18	25.7%	29,534,040.15	11,383,510.04	
11	44,683,304.13	(4,000,000.00)	40,683,304.13	27.6%	32,546,643.30	12,136,660.83	
12	49,332,014.53	(4,000,000.00)	45,332,014.53	29.0%	36,265,611.63	13,066,402.91	
13	46,505,865.45	(4,000,000.00)	42,505,865.45	29.9%	34,004,692.36	12,501,173.09	
14	45,675,855.44	(4,000,000.00)	41,675,855.44	30.5%	33,340,684.35	12,335,171.09	
15	44,767,025.35	(4,000,000.00)	40,767,025.35	31.0%	32,613,620.28	12,153,405.07	
16	43,943,656.21	(4,000,000.00)	39,943,656.21	31.3%	31,954,924.97	11,988,731.24	
17	43,136,431.56	(4,000,000.00)	39,136,431.56	31.5%	31,309,145.25	11,827,286.31	**FA NPV ($)**
		Equity IRR (%)	**31.5%**		**28.4%**	152,263,250.99	**$92,872,017**
		Equity NPV (post fees)	**$236,205,189.74**			$ 8,956,662	$ 5,463,060 /yr

ADDPENIX D:
Detailed Mine Fleet Decarbonization SPV Valuation Analysis (Scenario B – eLHD Haul Trucks)

Pre-Savings

Post-Savings

Mine Fleet SPV Savings (Real)													
Valuation date	date		1-Jan-23	31-Dec-23	31-Dec-24	31-Dec-25	31-Dec-26	31-Dec-27	31-Dec-28	31-Dec-29	31-Dec-30	31-Dec-38	31-Dec-39
eLHD Fleet													
Diesel Fleet Expenses (Pre-Savings)													
Diesel Fleet % of Total Fleet	%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Carbon Tax (Attributable to Diesel Fleet)	US$m		552	13.9	15.8	17.7	19.9	22.4	25.2	28.4	31.9	41.2	40.4
Haulage Fuel + Maintenance Opex (Diesel)	US$m		358	23.6	23.6	24.9	24.9	24.9	24.9	24.9	23.4	13.9	13.9
Diesel Fleet Expenses	US$m		910	37.5	39.4	42.6	44.8	47.3	50.1	53.3	55.3	55.0	54.2
Equipment Lease Financing Payments	US$m		178	12.9	15.2	17.6	23.3	21.7	22.0	21.1	21.0	–	–
Diesel Fleet Expenses (Incl. Lease Financing)	**US$m**		**1,088**	**50.4**	**54.6**	**60.2**	**68.1**	**69.0**	**72.1**	**74.4**	**76.3**	**55.0**	**54.2**
eLHD Fleet													
	2020	**2030**	**2040**										
Total Cost of Ownership Increase / (Decrease) - Non Diesel	10.0%	(20.0%)	(20.0%)	*1.00*	*0.97*	*0.94*	*0.91*	*0.88*	*0.85*	*0.83*	*0.80*	*0.80*	*0.80*
Proforma Decarbonization Fleet Expenses (Diesel + Non Diesel Fleet)													
Diesel Fleet % of Total Fleet	%			100%	75%	50%	25%	0%	0%	0%	0%	0%	0%
Non Diesel Fleet % of Total Fleet	%			0%	25%	50%	75%	100%	100%	100%	100%	100%	100%
Carbon Tax (Attributable to Diesel Fleet)	US$m		27	13.9	8.3	3.9	1.0	–	–	–	–	–	–
Carbon Tax (Attributable to Non-Diesel Fleet)	US$m		10	–	2.8	3.9	3.0	–	–	–	–	–	–
Haulage Fuel + Maintenance Opex (Diesel)	US$m		60	23.6	17.7	12.4	6.2	–	–	–	–	–	–
Haulage Fuel + Maintenance Opex (Non Diesel)	US$m		247	–	5.7	11.7	17.0	21.9	21.2	20.6	18.8	11.1	11.1
Equipment Lease Financing Payments (Diesel)	US$m		39	12.9	11.4	8.8	5.8	–	–	–	–	–	–
Equipment Lease Financing Payments (Non-Diesel)	US$m		118	–	3.7	8.3	15.9	19.1	18.8	17.4	16.8	–	–
Diesel + Non Diesel Fleet Expenses (Incl. Lease Financing)	**US$m**		**501**	**50.4**	**49.6**	**48.9**	**48.9**	**41.0**	**40.0**	**38.0**	**35.6**	**11.1**	**11.1**
Total Mine Fleet Decarbonization Savings	**US$m**		**586**	($200.0)	**4.9**	**11.3**	**19.3**	**28.0**	**32.1**	**36.4**	**40.8**	**43.9**	**43.1**
Post-Debt CFs to Investors (Post Debt Repayment)	US$m		**530**		(0.7)	5.7	13.7	22.4	26.5	30.8	35.2	43.9	43.1
Financial Aggregator Fees	US$m		**(64)**		(4.0)	(4.0)	(4.0)	(4.0)	(4.0)	(4.0)	(4.0)	(4.0)	(4.0)
Mine Fleet SPV Net Cash Flow	**US$m**			($200.0)	**0.3**	**13.0**	**28.9**	**46.4**	**54.7**	**63.2**	**72.0**	**83.9**	**82.3**
Discount rate	%	4.80%											
Mine Fleet SPV Net Present Value	US$m	442											
Mine Fleet SPV IRR	%	20.6%											
Equity NPV	**US$m**	**236**											
Equity Only IRR	**%**	**31.5%**											

80% CIB debt @ 3.5% /
20% equity