



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

Executive Summary

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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Vice-Dean, Research, Strategy, and Resources
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Professor, Economic Analysis and Policy
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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.

TRANSFORMATION 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 group¹.

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

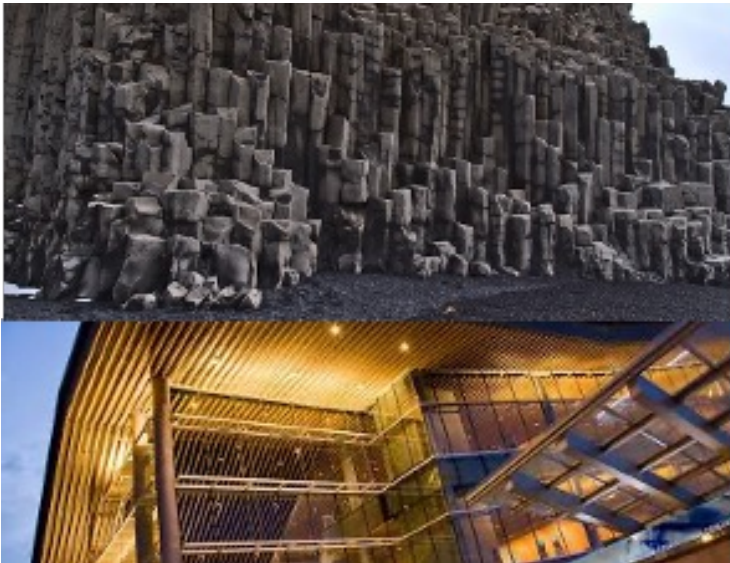
STRATEGIC PLANNING

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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COLLABORATORS

The Accelerator engages with a diverse group of organizations to collaboratively advance climate solutions.

Bloom.

DriveKey

PUBLIC VENTURES ●



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Appendices: Financial Analysis Summary

ADDPENIX A: Building Retrofit Financial Summary (Scenario 1) (1/12)

Commercial bank		City of Toronto		Financial Aggregator	
Interest Rate	7%	4%	0%	Equity	Concessional debt
Weight	20%	20%	0%	12%	2.00%
Capital Contribution				20%	80.00%
				\$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	9.62
Savings	\$7,572,524.45
NPV	\$1,899,318.99
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 Energy 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	233,951.75	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	237,997.58	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	252,532.49	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	23,8491.00	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	15,6136.00	563,904.30	289,493.38	229,847.47	-	563,904.30	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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)	\$ (335,370.44)
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)	\$ (335,370.44)
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)	\$ (335,370.44)
27	382,739.84	93,788.32	476,528.16	857,348.00	857,348.00	297,342.55	155,276.71	-	857,348.16	\$ (335,370.44)
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	\$ (335,370.44)
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)	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
33	431,027.22	93,788.32	524,815.55	(11,171,358.00)	(11,188,742.45)	(3,066,769.11)	122,177.44	-	(11,188,742.45)	\$ (335,370.44)
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)	\$ (335,370.44)
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)	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)
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	\$ (335,370.44)

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

Commercial bank		City of Toronto	Financial Aggregator	
Interest Rate	7%	4%	Equity	Concessional debt
Weight	0%	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
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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)
1	\$ (3,353,704.40)		\$ (3,353,704.40)	\$ 335,370.44
2	\$ 1,394,639.28	(58.4%)	\$ 1,394,639.28	\$ 335,370.44
3	\$ 1,043,127.63	(19.7%)	\$ 1,043,127.63	\$ 663,064.82
4	\$ 1,638,471.92	10.1%	\$ 1,310,777.54	\$ 432,082.75
5	\$ 483,561.54	15.0%	\$ 386,849.23	\$ 438,836.71
6	\$ 517,331.33	18.8%	\$ 413,865.07	\$ 483,944.28
7	\$ 742,869.22	22.4%	\$ 594,295.37	\$ 318,117.87
8	\$ (86,262.87)	22.1%	\$ (69,010.30)	\$ 387,500.23
9	\$ 260,648.93	22.8%	\$ 208,519.14	\$ 1,075,361.12
10	\$ 3,699,953.42	28.9%	\$ 2,959,962.73	\$ 733,370.71
11	\$ 1,990,001.35	30.6%	\$ 1,592,001.08	\$ 642,416.26
12	\$ 1,535,229.12	31.5%	\$ 1,228,183.29	\$ 395,628.48
13	\$ 301,290.22	31.7%	\$ 241,032.18	\$ 351,142.41
14	\$ 78,859.85	31.7%	\$ 63,087.88	\$ 382,363.69
15	\$ 234,966.23	31.7%	\$ 187,972.98	\$ 349,765.57
16	\$ 71,975.63	31.8%	\$ 57,580.51	\$ 546,709.52
17	\$ 1,056,695.39	31.9%	\$ 845,356.31	\$ 7,871,045.29
18		31.89%	\$ 27.89%	\$ 463,002.66
	Equity IRR	31.89%	Equity NPV (post)	FA NPV (\$)
	Equity NPV (post)	\$ 7,572,524.45	\$ 7,871,045.29	\$ 5,692,575.58
				\$ 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%
Weight	20%
	3.5%
	80.0%

W/L 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	4,948,448.23	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	5,444,868.26	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	3,274,575.48	32,175,716.16	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	(651,551.77)	0.00	(40,000,000.00)	-	(40,000,000.00)	0.00
2	5,698,947.33	(4,000,000.00)	(4,651,551.77)	0.0%	(4,651,551.77)	4,000,000.00
3	13,664,426.85	(4,000,000.00)	1,698,947.33	0.0%	1,698,947.33	4,000,000.00
4	22,411,583.73	(4,000,000.00)	9,664,426.85	(39.2%)	9,664,426.85	4,000,000.00
5	26,543,716.16	(4,000,000.00)	18,411,583.73	(11.0%)	18,411,583.73	4,000,000.00
6	30,780,492.97	(4,000,000.00)	22,543,716.16	4.0%	18,034,972.93	8,508,743.23
7	35,197,687.90	(4,000,000.00)	26,780,492.97	13.2%	21,424,394.38	9,356,098.59
8	37,832,655.07	(4,000,000.00)	31,197,687.90	19.2%	24,958,150.32	10,239,537.58
9	40,917,550.18	(4,000,000.00)	33,832,655.07	23.1%	27,066,124.06	10,766,531.01
10	44,683,304.13	(4,000,000.00)	36,917,550.18	25.7%	29,534,040.15	11,383,510.04
11	49,332,014.53	(4,000,000.00)	40,683,304.13	27.6%	32,546,643.30	12,136,660.83
12	46,505,865.45	(4,000,000.00)	45,332,014.53	29.0%	36,265,611.63	13,066,402.91
13	45,675,855.44	(4,000,000.00)	42,505,865.45	29.9%	34,004,692.36	12,501,173.09
14	44,767,025.35	(4,000,000.00)	41,675,855.44	30.5%	33,340,684.35	12,335,171.09
15	43,943,656.21	(4,000,000.00)	40,767,025.35	31.0%	32,613,620.28	12,153,405.07
16	43,136,431.56	(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
	Equity NPV (post fees)	Equity IRR (%)	Equity NPV (\$)	31.5%	Equity NPV (\$)	FA NPV (\$)
	\$236,205,189.74	31.5%	\$92,872,017	28.4%	152,263,250.99	5,463,060
					\$	\$

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

Mine Fleet SPV Savings (Real)		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
Valuation date												
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									
Total Cost of Ownership Increase / (Decrease) - Non Diesel	%	10.0%	(20.0%)									
Proforma Decarbonization Fleet Expenses (Diesel + Non Diesel Fleet)												
Diesel Fleet % of Total Fleet	%	100%	75%	50%	25%	0%	0%	0%	0%	0%	0%	0%
Non Diesel Fleet % of Total Fleet	%	0%	25%	50%	75%	100%	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	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)	(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	85.9	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

Pre-Savings

Post-Savings