For Action

TTC's Draft Innovation and Sustainability Framework

Date: April 11, 2024
To: TTC Board
From: Chief Executive Officer

Summary

At its meeting on December 20, 2023, the TTC Board received an update on the development of the 2024-2029 Corporate Plan, reiterating the Board's prior commitment to drive innovation and sustainability. This report summarizes the TTC's Draft Innovation and Sustainability Framework, attached as Attachment 1, describing the context, approach, and actions proposed to embed sustainable innovation practices into how the TTC operates.

A companion document to the Corporate Plan, the Draft Innovation and Sustainability Framework is aligned with directions from the TTC Board and City Council relative to innovation and sustainability, including objectives set out in TransformTO's Net Zero Strategy. The draft framework was developed through extensive research and consultation with industry peers internationally, colleagues at the City of Toronto, and personnel in academia. While the Draft Innovation and Sustainability Framework is substantially advanced, further consultation will be undertaken over the coming months to educate and gather feedback from employees and the public. The Innovation and Sustainability Framework will be refined based on the Board's feedback on the attached Framework (Attachment 1) and further consultations.

Recommendations

It is recommended that the TTC Board:

1. Approve the TTC's Innovation and Sustainability Framework (Attachment 1) and direct staff to report back to the TTC Board in mid-2024 with the final Innovation and Sustainability Strategy.

Financial Summary

The Draft Innovation and Sustainability Framework outlines actions requiring capital investments that are either fully funded, partially funded, or unfunded under the TTC 2024-2038 Capital Investment Plan (CIP). Actions requiring ongoing funding or resulting in net savings to the operating budget are fully accounted for under the 2024 TTC Conventional and Wheel-Trans Operating Budgets. For clarity, this report contains no

new capital or operating funding requirements beyond what was approved by the TTC Board at its meeting on December 20, 2023, and by the City Council on February 14, 2024.

2024-2038 Capital Budget Status

The following table reflects capital programs under the CIP that progress the Framework and details what is fully funded, partially funded, or unfunded.

The scope includes significant elements of the TTC's state-of-good-repair backlog and growth and improvements required to maintain and green the TTC's operations.

Table 1
Innovation and Sustainability Framework
2024-2038 Capital Funding Requirements

Ref. No[1]	Capital Program Description[2] ($ Millions)	2024-2038 Capital Investment Plan				
		Funded	CIP Unfunded			Total CIP
			2024-2033	POST	TOTAL	
1.1 - 1.3	Bus Design Innovation Program	5.3	23.6	13.6	37.2	42.5
2.1 - 2.4	Climate Mitigation and Adaptation Studies	0.8	29.0	7.6	36.6	37.4
2.1	Green Bus Procurement • Hybrid-Electric • eBus/Battery-Electric	681.7	2,669.6	1,349.6	4,019.2	4,700.9
2.1	Green Wheel-Trans Bus Program • Gas 6m and 7m ProMaster • eWT Buses	27.5	168.2	183.2	351.5	378.9
2.1	eBus and Wheel-Trans Charging Systems Program	66.8	763.2	220.7	983.9	1,050.8
2.1	Bus Rebuild – Midlife Overhaul	536.5	215.0	375.0	590.0	1,126.5
2.1	New Streetcar Program	325.0	-	-	-	325.0
2.1	Streetcar – Midlife Overhaul	0.6	270.2	118.1	388.3	388.9
2.1	New Subway Train Program	918.8	1,833.1	471.8	2,305.0	3,223.8
2.1	Non-Revenue Vehicles • Rail • Tired	97.1	-	8.2	8.2	105.3
2.1	Green Facility Program • Energy Efficiency Retrofit • Decarbonization • Roofing/HVAC Systems[3]	108.5	308.2	148.6	456.8	565.3

Ref. No[1]	Capital Program Description[2] ($ Millions)	2024-2038 Capital Investment Plan				
		Funded	CIP Unfunded			Total CIP
			2024-2033	POST	TOTAL	
2.1, 2.4	Renewable Energy Program • Non-Revenue Vehicle Charging Systems • Employee Parking Charging Systems • Customer Parking Charging Systems • Wayside Energy Storage • Renewable Energy Generation • Energy Storage System • Energy Management System	7.9	215.5	61.8	277.3	285.2
2.1	• RapidTO • Queue Jump Lanes • Transit Signal Priority	58.9	104.5	-	104.5	163.5
2.1	TransformTO Service Frequency Increase - Bus (70%) - Streetcar (50%). Cost TBD - Subway (3-min. Headway Maximum). Cost TBD	-	3,110.9	2,228.8	5,339.8	5,339.8
Total		2,835	9,711	5,187	14,898	17,734

Notes:

1. Innovation and Sustainability Framework work stream reference aligned with the capital program.
2. See Innovation and Sustainability Framework (Attachment 1) for a description of each work stream.
3. Funding required starting in the year identified with an opportunity to phase in multi-year commitments over the 10-year horizon and/or to establish steady-state, predictable funding.
4. The current scope and estimated costs are for natural-gas-fuelled HVAC Systems. The scope change to reflect fuel switching to electric heat pumps and boilers is to be reflected in future budgets.

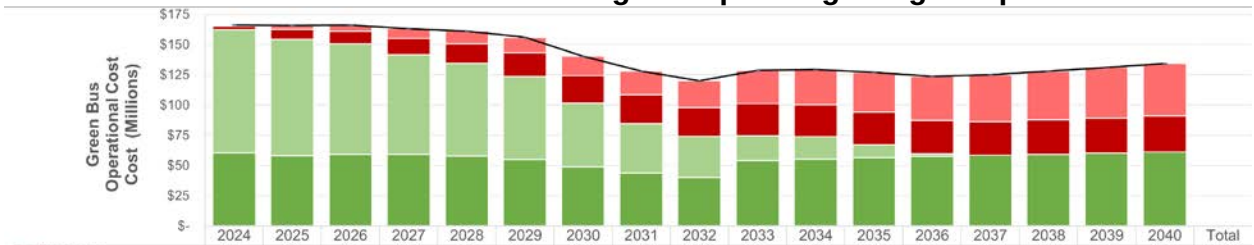
TTC Operating Budget Savings

Generally, decarbonization results in net operating savings. While the Draft Innovation and Sustainability Framework outlines a comprehensive plan to decarbonize all of the TTC's operations, the TTC's Greenhouse Gas (GHG) Emissions Inventory Baseline (see Attachment 1, pp. 50-51) identifies the Green Bus Program as the single largest decarbonization effort required. The Green Bus Program, subject to full funding, transitions the TTC fleet of more than 2,000 buses from diesel to battery-electric propulsion between 2018 and 2040. As a climate action, this one program results in a reduction in tailpipe fleet emissions by over 97% from the TTC fleets, including buses, Wheel-Trans buses, non-revenue vehicles. When considering all emissions from both

fleet and facilities, including indirect emissions from the production of the electricity the TTC consumes, the Green Bus Program reduces emissions by 80%.

The costs of bus fleet operations through the planned energy transition from diesel to electricity is shown in Figure 1. Based on current costs for fuel, electricity, and maintenance of both types of vehicles and associated charging infrastructure, the net operating cost savings is currently estimated at $190 million over the transition period from 2024 to 2040 (inclusive). Once fully electrified in 2040, the ongoing operating cost savings is estimated at $18 million.

Figure 1[1]
2024-2040 Green Bus Program Operating Budget Impact



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Electricity	$1	$3	$5	$8	$11	$13	$16	$19	$22	$27	$29	$33	$37	$39	$40	$42	$44	$389
Infrastructure	$3	$8	$10	$13	$16	$19	$23	$24	$24	$27	$26	$27	$27	$28	$29	$29	$30	$364
Diesel	$102	$96	$92	$83	$77	$69	$53	$41	$34	$20	$19	$11	$2	$-	$-	$-	$-	$698
Maintenance	$60	$58	$59	$59	$58	$55	$49	$44	$40	$54	$55	$56	$58	$58	$59	$60	$61	$944
Total	$166	$166	$166	$163	$161	$156	$141	$128	$120	$129	$130	$127	$124	$125	$128	$131	$135	$2,396
Operating Budget Impact	$14.2	$(1)	$0	$(3)	$(2)	$(5)	$(15)	$(13)	$(8)	$9	$1	$(2)	$(3)	$1	$3	$3	$3	$(18)
Total Annual Savings	$14.2	$14	$14	$11	$9	$4	$(12)	$(24)	$(32)	$(23)	$(23)	$(25)	$(28)	$(27)	$(24)	$(21)	$(18)	$(190)

Fuel savings were calculated based on the 2024 budgeted fuel cost of $1.44/litre and the actual electricity costs for charging the existing eBus fleet. Estimated maintenance savings were based on the experience of other transit agencies with older eBus fleets than the TTC's eBus fleet and are assumed to be a reduction of 25% starting in 2032.

In addition to the operating budget impact noted above, the TTC would also benefit from more stable energy prices and avoid potential future increases in diesel fuel prices. While not as certain as the calculated operating savings, the cost avoidance compared to a conventional fleet and forecasted escalation in fuel prices projected through the U.S. Energy Information Administration's Annual Energy Outlook suggest that the Green Bus Program could result in a further avoidance of $600 million to $1.2 billion in operating costs between 2024 and 2040.

There would be other costs savings that have not yet been quantified, such as lower ventilation requirements in garages and indoor stations, lower diesel fuel management costs, and lower diesel remediation costs. When estimating cost avoidance, one must also consider factors currently hard to predict, such as changes to the cost of electricity. While both the cost savings and costs avoided have been estimated conservatively using available data, we will continue to refine estimates to fully assess the net operating cost impact that will be realized from electrification.

Accuracy of Capital Estimates and Operating Impacts

The capital budget estimates and operating budget impacts in this report reflect data available when this report was written. The capital cost estimates for scope included in

Table 1 reflect a range of confidence from placeholder amounts put forward in advance of any formal scope study (Stage Gate 0, needs assessment stage, AACE International practice guideline 18R-97) to the budget baseline cost estimates for scope that is better defined (Stage Gate 3, preliminary design stage). The capital cost estimates for the TransformTO bus service frequency increase is an example of Stage Gate 0 and the capital cost estimates for revenue vehicle procurements is an example of Stage Gate 3.

Where there is not yet sufficient information even for a placeholder budget amount, such as for climate adaptations/resiliency, enhancing biodiversity at TTC properties, and service frequency increases required for streetcar and subway under TransformTO, capital cost estimates are not included in the TTC's CIP. Staff will work to include estimates for this additional scope for inclusion in the CIP as they become available and continue to update the scope and cost definition for programs already captured. As regulatory requirements and government and community expectations for climate actions increase over time, staff will endeavour to maintain a CIP that is reflective of the scope and investment required for the TTC to remain a leader in public transit.

Additionally, operating budget impacts from programs that require further study, such as the TransformTO service increases, or programs that require annual operating budget updates, such as the 5-Year Service and Customer Experience Action Plan, will be refined and reported through the TTC's Operating Budget as part of the annual budget process.

To meet the increasing need for investment in climate mitigation and adaptation, staff proposes to leverage existing Federal and Provincial capital funding sources to secure green grant funding and, where possible, continue to explore financing options that maximize operating cost savings to help fund this program. These new sources would be applied to implement the Draft Innovation and Sustainability Framework actions, with priority to be given to the renewal of existing assets from the TTC's state of good repair backlog.

The Chief Financial Officer has reviewed this report and agrees with the financial impact information.

Equity/Accessibility Matters

Diversity, equity, inclusion, and accessibility is a focus area under the proposed Corporate Plan 2024-2028, targeting ongoing application of diversity, equity, inclusion, and accessibility in day-to-day work. As a leader in providing accessible public transit in Toronto, the TTC is also committed to supporting individuals with accessibility needs by working towards a barrier-free service.

Equity

While the subject of this report does not have direct equity impacts, the actions outlined in the Innovation and Sustainability Framework will include equity considerations in the development, implementation, and evaluation of actions. We will continue to seek feedback from customers to ensure diverse perspectives are included.

Accessibility

While the subject of this report does not have direct accessibility impacts, all transit vehicles, regardless of propulsion technology, are required to be compliant with relevant accessibility standards under the Canadian Standards Association (*e.g.* CSA D437 standard for accessible transit buses) and the Integrated Accessibility Standards – Part IV (Transportation Standards) under the Accessibility for Ontarians with Disabilities Act.

The TTC strives to exceed minimum requirements through active engagement with the Advisory Committee on Accessible Transit (ACAT). This collaboration starts at the contract requirements stage and progresses through the design and evaluation stages of all transit vehicle procurements.

The TTC will continue to work with ACAT and seek new opportunities to advance the TTC's efforts toward a barrier-free transit system when adopting sustainable innovation technologies.

Decision History

At its November 13, 2017 meeting, the TTC Board approved the Green Bus Technology Plan, which helped lead the way in prioritizing sustainability. The introduction of eBuses and vehicle electrification in the transit system has helped pave the way for 'greening' the city of Toronto.

At its June 12, 2018 meeting, the TTC Board received the Green Bus Technology Plan update. The Board approved TTC staff exercizing contract options to increase the procurement quantity of eBuses to 60 from 30 eBuses and delegated authority to the TTC CEO to work with Toronto Hydro in modifying one of the TTC's bus garages to accommodate up to 300 zero emissions (or near zero emissions) buses through the supply of a substation and a backup generator.
Report: Green Bus Technology Plan Update (Presentation)
Decision: Green Bus Technology Plan Update

At its October 22, 2020, meeting, the TTC Board received the TTC's Fleet Procurement Strategy and Plan. The Board directed the TTC to continue to work with Toronto Hydro and Ontario Power Generation and report back to the Board with draft agreement(s) for the delivery of the required bus, Wheel-Trans bus, and non-revenue vehicle charging infrastructure to enable achievement of the TTC's target for a fossil-fuel-free/zero-emissions fleet by 2040.
Report: TTC Fleet Procurement Strategy and Plan
Presentation: TTC Fleet Procurement Strategy and Plan
Decision: TTC Fleet Procurement Strategy and Plan

At its April 14, 2021, meeting, the TTC Board received a report summarizing the preliminary results of the TTC's eBus Head-to-Head Evaluation. The Board approved the following recommendations:

1. The Board delegated authority to the TTC CEO to undertake a public procurement through the issuance of a negotiated Request for Proposal (nRFP) and enter into up

to two contracts for the supply of approximately 300 long-range, battery-electric buses (eBuses), based on the following:

a. Limit the total contract award amount, including all applicable taxes, and project delivery costs to within the approved funding of approximately $300 million;
b. Apply lessons learned through the TTC's eBus Head-to-Head Evaluation to prequalify potential suppliers based on demonstrated compliance with system compatibility requirements and Transport Canada's Motor Vehicle Safety Standards;
c. All 300 eBuses to be delivered between Q1 2023 and Q1 2025; and
d. Negotiation of an acceptable agreement that is satisfactory to the TTC General Counsel

Report: TTC's Green Bus Program: Preliminary Results of TTC's Head-to-Head eBus Evaluation
Decision: TTC's Green Bus Program: Preliminary Results of TTC's Head-to-Head eBus Evaluation

At its July 7, 2021 meeting, the TTC Board requested the CEO report back by Q4 2021 on the creation of an organization-wide Innovation and Sustainability Program at the TTC, with a mandate to advance planning, delivery, integration, and reporting of innovation initiatives, while incorporating a climate and resiliency lens.
Decision: Contract Award for SAP Time and Attendance Project

At its December 8, 2021 meeting, the TTC Board received the CEO's Report, which announced the establishment of the TTC Innovation and Sustainability Program to help deliver on the TTC's commitments under the TTC's Corporate Plan and the City's TransformTO Climate Action Plan.
Report: Chief Executive Officer's Report – November/December 2021

At its December 15, 2021 meeting, City Council adopted the TransformTO Net Zero Strategy, which outlined a pathway to achieve net zero emissions in Toronto by 2040. The Net Zero Strategy presented critical steps to achieve that target including, but not limited to: the TTC's transition to a zero-emissions fleet and the need to phase out fossil fuel use for the heating of buildings by 2040.
TransformTO Net Zero Strategy: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/

At its February 10, 2022 meeting, the TTC Board received a report about a Principal Agreement between the TTC and PowerON Energy Solutions LP (PowerON) for the provision and installation of electric vehicle charging systems infrastructure by PowerON.
Report: Principal Agreement with PowerON Energy Solutions LP (OPG) to Decarbonize TTC Operations, Fleet, and Facilities
Decision: Principal Agreement with PowerON Energy Solutions LP (OPG) to Decarbonize TTC Operations, Fleet, and Facilities

At its July 14, 2022 meeting, the TTC Board endorsed staff to continue efforts to develop a financial mechanism through which the TTC can reallocate operating budget savings from fleet electrification and other innovation and sustainability initiatives to use as direct offsets for the TTC operating budget expenditures to self-fund implementation of the TTC's Innovation and Sustainability Program.
Decision: Green Bus and Wheel-Trans Green Bus Program Update

At its September 26, 2023 meeting, the TTC Board adopted the Sustainable City of Toronto Fleets Plan (2023 Update and Status Report). As a critical component of TransformTO, the Sustainable City of Toronto Fleets Plan set city fleet goals of, (1) transition City Fleets to sustainable, resilient, net zero operations by 2040, including 45% emissions reduction by 2025, and 65% by 2030; (2) transition 20% of City-owned fleet to zero-emission vehicles by 2025, and 50% by 2030; (3) achieve resilient fleet assets and operations by 2040; and (4) achieve net zero procurement by 2040.
Decision: City Council Transmittal – IE3.5 – The Sustainable City of Toronto Fleets Plan (2023 Update and Status Report)

At its December 7, 2023 meeting, the TTC Board received a briefing on the TTC's Role Under TransformTO. There are two primary roles for the TTC in helping the City of Toronto to achieve its TransformTO goal of net-zero, community-wide emissions by 2040: (1) transition our own operations to zero emissions; and (2) increase the frequency of our bus, streetcar, and subway service to avoid community-wide emissions.
Presentation: TTC's Role Under TransformTO

At its December 20, 2023 meeting, the TTC Board received a presentation on the Benefits of Transit Investment by professors from the University of Toronto's Mobility Network, Drs. E.J. Miller, R. DiFrancesco, S. Farber, and M. Hatzopoulou. For the first time, the benefit of investment in the TTC was systematically and impartially identified, including (1) quantitative benefits to the local, provincial, and national economy; and (2) qualitative and quantitative social, equity, health, environmental, and other spin-off benefits.
Presentation: Benefits of Transit Investment Interim Findings Phase 2

At its December 20, 2023 meeting, the Board endorsed the TTC's 2024-2038 Capital Investment Plan: A Review of Unfunded Capital Needs, including the estimate of what it would cost the TTC to implement TransformTO's action to increase bus service frequency by 70% over 2016 levels to meet the net-zero, city-wide emissions target by 2040. While more work is to be done to reflect additional costs of increasing streetcar service frequency by 50% and subway off-peak headways to three minutes or less, the Capital Investment Plan was the first to begin reflecting what it would take for the TTC to do its part to increase avoided emissions as required in the City of Toronto's TransformTO Net Zero Strategy.
Report: TTC's 2024-2038 Capital Investment Plan: A Review of Unfunded Capital Needs

At its December 20, 2023 meeting, the TTC Board received the Update on the TTC's Corporate Plan 2024-2028, including draft objectives to apply an innovation lens to all aspects of the business, with the aim of maximizing the benefits of transit, and mitigate

the TTC's impact on the environment, and build climate resilience as the TTC renews its assets and grows system capacity.
Report: Update on the TTC's Next 5-Year Corporate Plan 2024-2028

Issue Background

As the backbone of Toronto's transportation system, the TTC needs to continuously identify, evaluate, and implement innovative solutions to improve the effectiveness and efficiency of transit service. At the same time, the climate crisis and the increasing frequency and severity of extreme weather events has already begun to impact Toronto's critical infrastructure, including the TTC. Sustained actions are necessary to maximize the benefits of public transit, prevent irreversible climate damage, harden the TTC's infrastructure against extreme weather events, and secure a more resilient and sustainable future for all.

Corporate Innovation

As presented to the TTC Board at its December 20, 2023 meeting, the benefits of public transit are wide-reaching and deliver significant value, not only to transit customers, but also to public health, the environment, the social and economic welfare and prosperity of the city of Toronto, the region, and beyond.

The Draft Innovation and Sustainability Framework sets out specific actions to engage innovative technologies through a transparent process to identify and apply ideas that deliver the benefits in operating public transit.

Environmental Sustainability

In October 2019, Toronto City Council declared a climate emergency in response to the climate crisis. At its December 7, 2023 meeting, the TTC Board was presented with the following two primary roles for the TTC in helping the City of Toronto to achieve its TranformTO goal of net-zero, community-wide emissions by 2040: (1) Transition the TTC's own operations to zero emissions; and (2) Increase the frequency of the TTC's bus, streetcar, and subway service to avoid community-wide emissions.

The actions set out in the Draft Innovation and Sustainability Framework are aimed at fulfilling the TTC's commitments to TransformTO and further establishing the organization as a climate action leader in public transit across North America.

The Draft Innovation and Sustainability Framework aligns with the draft TTC 2024-2028 Corporate Plan and will help the TTC prioritize and inform the TTC's 15-Year Capital Investment Plan.

The Draft Innovation and Sustainability Framework also aligns with, or exceeds, GHG emission reduction targets set out under the United Nations' Sustainable Development Goals, the Government of Canada's 2030 Emissions Reduction Plan, the Province of Ontario's Made-in-Ontario Environment Plan, the City of Toronto's TransformTO Net Zero Strategy, and the Sustainable City of Toronto Fleets Plan.

Framework Development

When developing the Draft Innovation and Sustainability Framework, TTC staff researched and reviewed opportunities to embed innovation, environmental sustainability, and climate resilience across the TTC. This included consultations with TTC employees, personnel from various divisions of the City of Toronto, and experts in innovation and environmental sustainability from industry and academia. Benchmarking against other leading transit agencies and private sector innovation and sustainability leaders has also helped inform this plan.

Key themes from the consultations and research were consolidated and used to shape the proposed framework. The strategies and actions described in the Draft Innovation and Sustainability Framework will inevitably be revised to respond to new circumstances and incorporate emerging technologies as they evolve.

Prior to finalizing the Innovation and Sustainability Strategy, further consultations will be held with employees, customers and the public. With feedback incorporated from the Board and through these last engagements, the final Strategy will be reported to the Board mid-2024.

Comments

Recognizing that corporate innovation and environmental sustainability are key priorities for the TTC, the TTC's CEO established the new Innovation and Sustainability Program. The mandate of this program is to advance planning, integration, delivery, and reporting of innovation initiatives, with a climate and climate resiliency lens.

In 2022, a programmatic review was conducted. The review focused on embedding innovation, environmental sustainability, and climate resilience at the TTC. This report presents the Draft Innovation and Sustainability Framework – a strategic roadmap toward a more innovative and sustainable public transit system. The Draft Innovation and Sustainability Framework describes the actions the TTC will take in corporate innovation, environmental sustainability, and culture of innovation and sustainability. The aim is to better serve customers, reduce the TTC's impact on the environment, and harden the TTC's operational resiliency for extreme weather events. By achieving the actions within the Framework, the TTC is poised to not only adapt to change, but to define its trajectory, and therefore shaping the future of transit and enriching the lives of those who the TTC serves.

Corporate Innovation

The TTC is facing competing pressures to deliver high-quality service while under increasing fiscal constraint. This is also a time of an ever-increasing pace of change in technology, competition, and expectations.

The TTC must innovate to identify new ways of doing business that maximize the benefits of transit and to stay relevant in the face of rising competition and expectations.

The Draft Innovation and Sustainability Framework establishes an innovation process through which the TTC will communicate the purpose of innovation and engage innovators to generate ideas. The process includes corporate innovation work streams for engaging innovators to identify problems and generate ideas as follows:

1.1: Identify and Solve Problems through Innovation Challenges: Tap into the collective knowledge of innovators who know the business best to identify and solve specific business or customer problems.

1.2: Scout for Emerging Technologies and Solutions: Stay up-to-date with emerging technologies and trends to maintain a competitive edge. Shape the future of transit and build strategic partnerships.

1.3: Build an Open Intake Process: Formalize the intake of unsolicited ideas from innovators and screen, evaluate, prototype, and implement through a transparent innovation process.

The process will also outline how ideas will be captured, screened, evaluated, funded, prototyped, implemented, and validated to ensure value-for-money, where applicable, and that in all cases, the ideas advance the benefits that result from investment in the TTC.

Environmental Sustainability

Environmental Sustainability at the TTC is the pursuit of impactful action toward the reduction of GHG emissions, the increase in operational resiliency, and the responsible consumption of limited resources, all while maximizing service reliability for the TTC's customers.

The TTC is the one of the largest operators of battery-electric buses (eBuses) in North America and has established the City of Toronto as the leader in environmental sustainability throughout the industry. Recognizing the urgency with which the climate crisis must be addressed, the TTC has built on this early success by establishing an organization-wide program of innovation and sustainability. Key objectives under the TTC's draft 2024-2028 Corporate Plan include the mitigation of the TTC's impact on the environment and the building of climate resilience.

The Draft Innovation and Sustainability Framework broadens the scope and scale of the TTC's planned climate actions to drive down city-wide emissions and undertake systematic improvements in the TTC's resiliency to extreme weather events. It will also advance the TTC's climate leadership through a comprehensive set of work streams as follows:

2.1: Eliminate Greenhouse Gas (GHG) Emissions: Support continued transit ridership growth to maximize city-wide avoided emissions and decarbonize TTC assets to minimize direct and indirect emissions.

2.2: Reduce Consumption: Reduce water usage, minimize waste to landfill, increase recycled materials, and move toward a more circular economy to minimize indirect GHG emissions.

2.3: Protect our Natural Ecosystem: Integrate natural ecosystems into the plans, designs, and development of TTC assets.

2.4: Build Climate Resilience: Identify assets vulnerable to extreme weather events, adopt mitigation measures to increase resilience against extreme weather events, and increase energy resiliency.

2.5: Maximize Economic Returns: Maximize net operating savings, cost avoidance, and the potential revenue from capital investments made to decarbonize TTC operations.

Within the scope of the TTC's control and influence, this work will drive transformative action to mitigate the climate crisis and improve health outcomes for TTC employees, customers, and the broader public. The Framework also includes an objective of reinvesting the savings toward furthering the benefits of transit investment.

Culture of Innovation and Sustainability

A Culture of Innovation and Sustainability at the TTC is embedding innovative and sustainable thinking into the TTC's culture, holding TTC employees accountable for the actions that are their responsibility, and being transparent to the TTC Board and the public about the progress of the Framework, including the challenges and successes.

Building a culture of innovation and sustainability at the TTC will require ongoing effort to educate, engage, and convince employees, customers, and the broader public through many communications channels. The TTC has already begun enhancing internal and external communications to inform people of the work being done by the City of Toronto, the TTC Board, and our employees. There is also a strong focus on recognizing members of the public who have already made the right choice in taking low-to-zero carbon trips using the TTC.

These work streams accelerate communications and drive accountability and transparency as follows:

3.1: Foster a Culture of Innovation: Build a corporate innovation process where innovators across the organization and beyond feel seen and heard. Build a sandbox-like environment where we can test ideas with speed and agility. Training, incentivizing, recognizing, and rewarding employees for their innovative ideas and tangible contributions.

3.2: Foster a Culture of Sustainability: Accelerate internal and external communications to deepen awareness of the TTC's role in fighting the climate crisis and motivate people to action.

3.3: Commit to Ongoing Consultation: Perform traditional and innovative engagement to understand customer concerns and potential solutions, barriers of transit, and the revitalization of this land in consultation with Indigenous communities.

3.4: Drive Transparency and Accountability: Make the TTC's sustainability commitments and ongoing environmental performance visible to the public by

providing an annual TTC Environmental Sustainability Performance report that measures progress against the Framework. This commitment to transparency to the TTC Board, the public, and TTC's funding partners will drive accountability.

Action Roadmap

The Draft Innovation and Sustainability work streams, initiatives, and actions are summarized in Attachment 1.

Continued Framework Development

To conclude the consultation process on the Draft Innovation and Sustainability Framework, the TTC will engage in additional education and consultation with employees and the public over the next two months and report back to the TTC Board with a final Innovation and Sustainability Strategy for approval. Further, the final Innovation and Sustainability Strategy will be a living and agile strategy that, applying a Plan-Do-Study-Act and continuous improvement process, will mature and be revised over time to adopt new approaches toward advancing innovation and sustainability at the TTC.

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Signature

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Attachments

Attachment 1 – TTC's Innovation and Sustainability Framework

Attachment 1: Draft Innovation and Sustainability Framework

Corporate Innovation	
Draft Work Stream	**Draft Initiatives and Actions**
1.1. Identify and Solve Problems through Innovation Challenges Goal: Tap into the collective knowledge of innovators who know the business best to identify and solve specific business and customer problems. Benefit: Efficient use of resources to target specific problems and generate novel and effective solutions by cross-pollinating ideas with thought leaders across boundaries.	**1.1.1 Internal Innovation Challenges** 1.1.1.i: Conduct problem framing, design thinking, and systems thinking workshops with business units to define problem statements to prioritize and solve 1.1.1.ii: Conduct internal innovation challenges to generate ideas and evaluate them through the Innovation Pipeline **1.1.2 External Innovation Challenges** 1.1.2.i: Conduct idea challenges or capstone projects with private organizations, non-profit organizations, and academic partners 1.1.2.ii: Evaluate ideas from challenges through the Innovation Pipeline **1.1.3 Work Stream Evaluation** 1.1.3.i: Assess the effectiveness of this work stream and its ability to identify problems, generate ideas, and progress ideas through the Innovation Pipeline 1.1.3.ii: Optimize the process and determine the frequency of future internal and external innovation challenges
Key Performance Measures	• Quantified increase in benefits of transit • Number of participants • Number of quality ideas • Number of ideas turned into pilots or future backlog ideas after evaluating feasibility, desirability, viability, and business cases

Corporate Innovation	
Draft Work Stream	**Draft Initiatives and Actions**
1.2 Scout for Emerging Technologies and Solutions Goal: Stay up-to-date with emerging technologies and trends to maintain a competitive edge. Shape the future of transit and build strategic partnerships. Benefit: Enable the TTC to adopt, build long-term viability, enhance efficiency, thrive in a dynamic environment, and shape our brand as a future-ready organization.	**1.2.1 Exploring and Adopting New Technologies** 1.2.1.i: Develop a standard and transparent approach to evaluating opportunities, piloting, testing, and evaluating the benefits of new technologies 1.2.1.ii: Host use case workshops for cutting-edge technologies across different business units 1.2.1.iii: Develop and implement strategic plans for known emerging technologies 1.2.1.iv: Successfully scope and implement the Bus Design Innovation Program that aims to reimagine bus design for operator safety and to enhance customer experience **1.2.2 Jurisdictional Scans and Peer Benchmarking** 1.2.2.i: Conduct jurisdictional scans to explore new technologies being explored by transit agencies and adjacent industries globally 1.2.2.ii.: Host technology demo days to showcase innovative solutions across different business divisions 1.2.2.iii.: Enhance our collaboration with transit industry associations 1.2.2.iv.: Attend local and global conferences to scout leading and disruptive technologies and solutions
Key Performance Measures	• Number of strategies developed and implemented • Number of emerging technologies or solutions being explored and adopted • Number of Proof of Concepts in flight • Leadership participation at demo day showcase

Corporate Innovation	
Draft Work Stream	**Draft Initiatives and Actions**
1.3 Build an Open Intake Process Goal: Formalize the intake of unsolicited ideas from innovators, screen, evaluate, prototype, and implement through a transparent innovation process. Benefit: Empower employees to take ownership of innovation at the TTC, enhance creativity, and build an ecosystem of partnerships with local and global partners.	**1.3.1 Internal Intake – Employees** 1.3.1.i: Create and implement an intake process with defined criteria for idea management through the Innovation Pipeline 1.3.1.ii.: Evaluate ideas through the Innovation Pipeline and shortlist solutions to implement **1.3.2 External Intake – Seek Inspiration from Next Gen Riders** 1.3.2.i.: Survey and interview youth and next-generation customers to understand their expectations and needs 1.3.2.ii.: Conduct innovation challenges for youth and Crowdsource ideas **1.3.3 External Intake – Customers and Public** 1.3.3.i.: Conduct customer surveys and focus groups with customers to tap into customer needs and pain points 1.3.3.ii.: Utilize the Customer Panel to seek insights on a continual basis 1.3.3.iii.: Capture innovative ideas in the rolling 5-Year Service and Customer Experience Action Plan and the Annual Service Plans **1.3.4 External Intake – Private and Not-for-profit Organizations** 1.3.4.i.: Create and implement an intake process for unsolicited proposals 1.3.4.ii.: Leverage industry tradeshows to identify innovative solutions to be evaluated through the Innovation Pipeline
Key Performance Measures	• Number of quality ideas vetted through Innovation Pipeline • Number of Partner proposals received through the new intake process • Number of ideas that resulted in pilot projects • Qualitative Survey to evaluate customers' brand perception

Environmental Sustainability	
Draft Work Stream	**Draft Initiatives and Actions**
2.1 Eliminate GHG Emissions Goal: Support continued transit ridership growth to maximize city-wide avoided emissions and decarbonize TTC assets to minimize direct and indirect emissions. Benefit: Improve air quality, reduce environmental impact, and meet GHG emission reduction targets.	**2.1.1.i Maximize Avoided GHG Emissions (Scope 4)** 2.1.1.i.: Deliver a new 5-Year Service and Customer Experience Action Plan and implement its actions 2.1.1.ii.: Work with the City of Toronto on additional net-zero scenarios 2.1.1.iii.: Investigate the use of smaller vehicles on fixed routes during periods of low ridership demand 2.1.1.iv.: In partnership with Metrolinx, deliver rapid transit projects 2.1.1.v.: In partnership with Metrolinx and municipal transit partners, implement fare and service integration 2.1.1.vi.: Mature the draft budget that reflects the order of magnitude to implement the current TransformTO Net Zero scenario to achieve community-wide net-zero emissions by 2040 **2.1.2 Minimize Direct and Indirect GHG Emissions (Scope 1) through Decarbonization of our Fleets** 2.1.2.i.: Continue to build and implement the TTC's Green Fleet Plan, targeting: 20% zero emissions vehicles by 2025, 50% by 2030, and 100% by 2040 2.1.2.ii.: Implement electric charging infrastructure to support zero emissions vehicles **2.1.3 Minimize Direct and Indirect GHG Emissions (Scope 1 & 2) through Decarbonization of our Facilities** 2.1.3.i.: Develop a portfolio-level net-zero facility transition plan 2.1.3.ii.: Complete site-specific net-zero transition plans for all facilities, starting with high-impact sites 2.1.3.iii.: Develop a net-zero guideline for building retrofits 2.1.3.iv.: Develop a net-zero carbon database to track progress 2.1.3.v.: Develop a refrigerant management plan establishing a refrigerant inventory and adopting a process to minimize emissions through leak management and responsible disposal

Environmental Sustainability	
Draft Work Stream	**Draft Initiatives and Actions**
2.1 Eliminate GHG Emissions Continued	**2.1.4 Reduce indirect GHG Emissions (Scope 3) from our value chain** 2.1.4.i.: Conduct upfront embodied carbon assessments for all new buildings in alignment with the Toronto Green Standard 2.1.4.ii.: Develop a Scope 3 inventory and reduction plan
Key Performance Measures	• Percentage of GHG emissions reduced compared to the 2019 baseline • Energy consumption and greenhouse gas intensity per facility

Environmental Sustainability	
Draft Work Stream	**Draft Initiatives and Actions**
2.2 Reduce Consumption Goal: Reduce water usage, minimize waste to landfills, increase recycled materials, and move towards a more circular economy to minimize indirect GHG emissions. Benefit: Protect the environment and maximize the value of our investments and resources while providing new opportunities for employment in a circular economy.	**2.2.1 Use Sustainable Materials** 2.2.1.i.: Embed material selection criteria into applicable procurements and ensure transparency and accountability from suppliers 2.2.1.ii.: Develop a sustainable materials guideline for the inclusion of measures into new construction, retrofit projects, and operational plans **2.2.2 Improve Waste Management Practices** 2.2.2.i.: Conduct site-specific waste audits at high-waste consuming sites 2.2.2.ii.: Conduct a portfolio waste assessment 2.2.2.iii.: Develop a waste reduction guideline for the inclusion of measures into new construction, retrofit projects, and operational plans **2.2.3 Reduce Water Consumption** 2.2.3.i.: Conduct site-specific water audits at high-water consuming sites 2.2.3.ii.: Conduct a portfolio water assessment 2.2.3.iii.: Develop a water reduction guideline for the inclusion of measures into new construction, retrofit projects, and operational plans 2.2.3.iv: Develop a water reduction database to track implementation measures and monitor effectiveness and lessons learned
Key Performance Measures	• Percentage of water reduced compared to the baseline • Water use intensity per facility • Percentage of waste generated and diverted • Waste use intensity per facility • Percentage of assets that meet the sustainable materials guideline

Environmental Sustainability	
Draft Work Stream	**Draft Initiatives and Actions**
2.3 Protect our Natural Ecosystem Goal: Integrate natural ecosystems into the plans, designs, and development of TTC assets. Benefit: Protect and restore local natural habitats, functions, and biodiversity.	**2.3.1 Restore Ecological Performance** 2.3.1.i.: Conduct a portfolio landscape assessment 2.3.1.ii.: Develop an ecological restoration guideline prioritizing the implementation of nature-based climate solutions 2.3.1.iii.: Conduct a portfolio exterior lighting audit and implementation plan
Key Performance Measures	• Percentage of landscaping with native trees, plants and shrubs • Percentage of exterior lighting fixtures that are fully cut off • Percentage of windows with bird-friendly glazing

Environmental Sustainability	
Draft Work Stream	**Draft Initiatives and Actions**
2.4 Build Climate Resilience Goal: Identify assets vulnerable to extreme weather events, adopt mitigation measures to increase resilience against extreme weather events, and increase energy resiliency. Benefit: Reduce frequency, duration, and severity of service interruptions and associated economic impacts.	**2.4.1 Identify Climate Crisis Risks and Vulnerabilities and Implement Adaptive Measures** 2.4.1.i.: Conduct a portfolio climate risk assessment 2.4.1.ii.: Conduct asset or site-specific resilience assessments 2.4.1.iii.: Monitor and document the impacts of regional extreme weather events on the TTC's assets and operations 2.4.1.iv: Develop a resilience database to track implementation measures and monitor effectiveness and lessons learned 2.4.1.v.: Develop a resilience guideline for the inclusion of adaptation measures into new construction, retrofit projects, and operational plans **2.4.2. Increase Energy Resiliency** 2.4.2.i.: Implement on-site renewable energy sources 2.4.2.ii.: Continue advancing the use of energy storage across facilities
Key Performance Measures	• Percentage assets with a very high-climate crisis risk rating • Amount of energy generated from distributed renewable sources • Energy storage capacity

Environmental Sustainability	
Draft Work Stream	**Draft Initiatives and Actions**
2.5 Climate and Fiscal Responsibility Goal: Maximize net operating savings, cost avoidance, and the potential revenue from capital investments made to decarbonize our operations. Benefit: Apply savings and revenue to generate capital funding toward the TTC's Innovation and Sustainability Program to 2040. Apply savings, cost avoidance, and revenue to reduce fares post-2040.	**2.5.1 Maximize Economic Returns** 2.5.1.i.: Actively seek 'Green' grant funding from all levels of government 2.5.1.ii.: Capture the operating savings and revenue that result from green initiatives to self-fund implementation of the TTC's Innovation and Sustainability Strategy
Key Performance Measures	• Number of Innovation and Sustainability strategy actions supported by grants or incentives • Percentage of the total ISS funded, inclusive of City share

Culture of Innovation and Sustainability	
Draft Work Stream	**Draft Initiatives and Actions**
3.1 Foster a Culture of Innovation Goal: Build a corporate innovation process where innovators across the organization and beyond feel seen and heard. Build a sandbox-like environment where we can test ideas with speed and agility. Training, incentivizing, recognizing, and rewarding employees for their innovative ideas and tangible contributions. Benefit: Equitable and aligned innovation embedded across all levels of the Commission, promoting diversity of thought and collaboration.	**3.1.1 Supporting Employee Innovation** 3.1.1.i.: Present an Innovation and Sustainability award as part of the TTC's Rewards and Recognition Program 3.1.1.ii.: Introduce and expand innovation-oriented training content 3.1.1.iii.: Release periodic internal innovation newsletters
Key Performance Measures	• Number of Innovation and Sustainability Award submissions • Percent of employees that complete innovation-oriented training

Culture of Innovation and Sustainability	
Draft Work Stream	**Draft Initiatives and Actions**
3.2 Foster a Culture of Sustainability Goal: Accelerate internal and external communications to deepen awareness of the TTC's role in fighting the climate crisis and motivate people to action. Benefit: Improve awareness of the work underway inside and outside the organization and integrate climate action into everyday responsibilities.	**3.2.1 Make Every TTC Job a Sustainable Job** 3.2.1.i.: Release periodic internal sustainability communications 3.2.1.ii.: Host collaborative workshops with departmental groups 3.2.1.iii.: Develop and provide sustainability awareness and training for all TTC employees **3.2.2. Integrate Climate Action into the Organization** 3.2.2.i.: Incorporate a resiliency lens into capital projects (where applicable) 3.2.2.ii.: Embed climate action into the corporate governance structure 3.2.2.iii.: Create a framework to standardize site-specific climate risk assessments 3.2.2.iv.: Continue collaborating with interdependent organizations and peers by sharing knowledge and insights on the climate crisis impacts, adaptation measures, and resiliency planning 3.2.2.v.: Provide interdepartmental support in the integration of resiliency in projects and delivery
Key Performance Measures	• Percent of employees that complete sustainability awareness and training

Culture of Innovation and Sustainability	
Draft Work Stream	**Draft Initiatives and Actions**
3.3 Commit to Ongoing Consultation Goal: Perform traditional and innovative engagement to understand customer pain points and potential solutions, barriers of transit, and the revitalization of this land in consultation with Indigenous communities. Benefit: Create meaningful and impactful results for our diverse range of customers.	**3.3.1 Ensure the work of Innovation and Sustainability at the TTC is informed by customers and through lenses that consider accessibility, diversity, equity, and inclusion** 3.3.1.i.: Utilize the Customer Panel, Advisory Committee on Accessible Transit, and Indigenous Consultant to seek advice and guidance on corporate innovation and environmental sustainability efforts 3.3.1.ii.: Incorporate accessibility, diversity, equity, and inclusion considerations at the early stages for the actions outlined in this Strategy
Key Performance Measures	• Percent of Innovation and Sustainability Strategy's actions that incorporate accessibility, diversity, equity and inclusion considerations

Culture of Innovation and Sustainability	
Draft Workstream	**Draft Initiatives and Actions**
3.4 Drive Transparency and Accountability Goal: Make TTC's sustainability commitments and ongoing environmental performance visible to the public by providing an annual TTC Environmental Sustainability Performance report that measures progress against the strategy. This commitment to transparency to the TTC Board, the public, and TTC's funding partners will drive accountability. Benefit: Drive accountability for the actions outlined in this strategy and encourage sustainable transportation choices.	**3.4.1 Annual Progress Reporting** 3.4.1.i.: Release an annual innovation and sustainability progress report **3.4.2. Disclose Sustainability Performance** 3.4.2.i.: Release annual sustainability performance 3.4.2.ii.: Complete a third-party verification of the TTC's Scope 1 and 2 GHG emissions inventory
Key Performance Measures	• Release annual innovation and sustainability progress report • Release annual sustainability performance