

Mission from MaRS: Creating Climate Impact



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Executive summary

Between February 2021 and June 2022, the Mission from MaRS (MfM): Climate Impact Challenge introduced an innovative approach to cleantech acceleration.

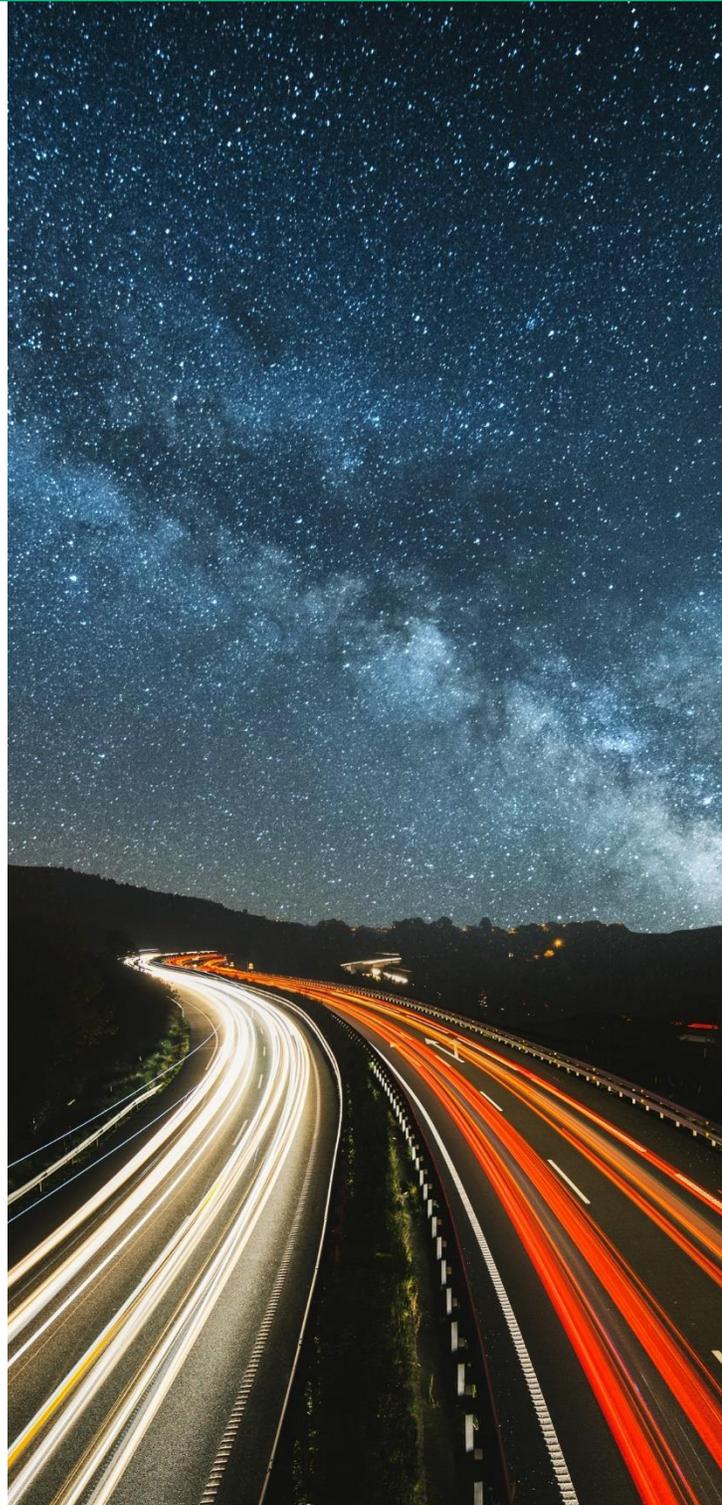
The initiative worked closely with 10 Canadian climate ventures, curating a coalition of stakeholders for each company in an effort to identify and then address barriers to commercialization.

The program's core strategy was to provide ventures with sounding boards so they could access insights about markets, fundraising, communications and public policy that might not be otherwise available to them in order to help them realize their potential to reduce greenhouse gas (GHG) emissions.

The program resulted in several key outcomes:

- Establishing a first-of-its-kind municipal procurement strategy aimed at purchasing cleantech services and products from the 10 participating ventures.
- Enabling the creation of a corporate climate accelerator in partnership with KPMG Canada.
- Supporting three ventures through acquisition and/or strategic partner processes that will scale their technologies.
- Raising \$42 million in investment capital and generating \$27 million in new revenues.
- Providing all 10 ventures with insights on pursuing new markets, honing marketing messages, and advancing policy reforms geared at enabling cleantech adoption.

In its next phase, the MfM program will launch additional missions with a new set of participants, including a mission focused specifically on public sector procurement.



Creating impact

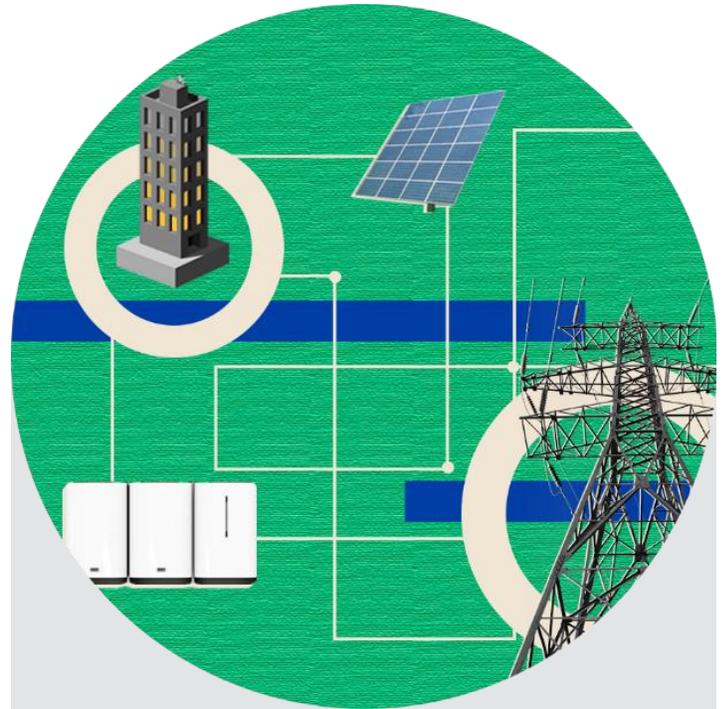


Climate change is accelerating, and the opportunity to limit global warming to a maximum of [1.5 degrees by 2100](#) is closing rapidly. The COP27 conference in Egypt in November 2022, yielded little in the way of meaningful progress, while global emissions from fossil fuels reached a [record high in 2022](#).

The time to act is now, and even modest gains make a difference. “Scientists do know,” [The Economist](#) observed, “that the less the temperature rises, the better. 1.6 degrees Celsius is better than 1.7 degrees Celsius; 1.7 degrees Celsius is better than 1.8 degrees Celsius. As a new mantra has it, ‘every fraction of a degree matters.’”

The world is experiencing overlapping crises. These highly disruptive events — from the pandemic to the war in the Ukraine and the economic uncertainty — present a unique opportunity to change direction, to both build resilience and reduce emissions.

To reverse warming, we need to invest in massive and far-reaching energy-transition solutions in every facet of the economy: agriculture, buildings, industry and natural resources. And that transition must be just and equitable. According to a 2020 study in [The Lancet](#), the global north is responsible for 92 percent of excess emissions — a level higher than previously estimated. Consequently, those who live in wealthy nations need to change their consumer habits and support poorer nations’ efforts to invest in a low-carbon economy. Besides ambitious mitigation efforts, we also need to adapt to harsher climates, rising sea levels and catastrophic storms. The challenge of climate change is all-encompassing.



Rapid change is possible

The rise of solar power over the last 15 years shows just how quickly climate technology can scale: Moore's Law applies to a rapidly expanding family of technologies that now encompasses not just rooftop panels but also large-scale solar farms, flexible adhesive photovoltaic (PV) cells and two-way metering. In 2021, PV energy accounted for [3.6 percent of global electricity generation](#), up 22 percent from the year previous. At the same time, [the cost of solar power](#) has plunged steadily, as is the case with wind.

A recent study on renewable power generation costs published by the International Renewable Energy Agency (IRENA) found "that almost two-thirds or 163 gigawatts (GW) of newly installed renewable power in 2021 had lower costs than the world's cheapest coal-fired option in the G20." IRENA estimates that the newly installed renewable power saved U.S.\$55 billion in energy generation costs in 2022.

The Paris Agreement established [a countdown clock](#), setting 2040 as the deadline for entire sectors to transition to net-zero operations. Human ingenuity, scientific inquiry and innovation play a critical role in bending the warming curve. Scientists, engineers, inventors and venture investors are building and commercializing technologies that will support both mitigation and adaptation efforts. Some solutions have already become part of the global economy, while others are still in development.

What's more, the evolution of the innovation cycle, which has accelerated steadily in the digital era, is becoming increasingly important. "In the last 10 years, it was all around innovation: 'Can we find the right solutions to solve our global problem?'" observes Sam Ramadori, CEO of [BrainBox AI](#), one of the 10 Climate Champions in Mission from MaRS (MfM). "But now I see a lot of attention by people who are very involved in the climate change fight talking about scalability. It's nice to invent something in the lab, but if we can't deploy it at mass scale around the planet, we're done."

Indeed, new and promising technologies need to scale at an extremely rapid pace. It's a trajectory that can be accelerated with far-sighted investment and regulatory reform. Conversely, it could be impeded by opposition from entrenched vested interests to policy-makers' lack of imagination. "The next few years are critically important," says [Susan Rohac](#), the managing partner of the Climate Tech Fund at BDC Capital. She points out that only five percent of venture capital currently finds its way into Canadian cleantech companies — a figure that lags well behind the global rate of 14 percent. "We have the right technologies and innovations to have significant impact if they were commercialized. It's just a matter now of rallying the right people, the right money and the right policies to make sure the commercialization happens."

The Mission from MaRS: Climate Impact Challenge asks: How can promising climate ideas become so widely adopted that they make a meaningful dent in emissions? How do ventures attract sufficient investment capital to jump from pilot projects to full-scale commercialization? And what do governments, financial institutions and large corporations need to understand about their own roles in this process?

The MfM program identified several scalable climate technologies at various stages of development and commercialization, and then focused on the constellation of conditions required to scale them at the pace required. MaRS selected 10 companies whose potentially transformational technologies are aimed at sectors that generate large quantities of carbon: forestry, transportation, real estate, and electrical utilities.

These technologies are disruptive to incumbents, from private sector firms to government agencies. As such, they can only begin to gain traction by overcoming both systemic and commercial barriers. For many innovation-driven ventures, founders are preoccupied with refining and piloting their technologies — an engineering-driven orientation that may overlook contextual issues, such as regulatory barriers, investor goals and effective marketing.



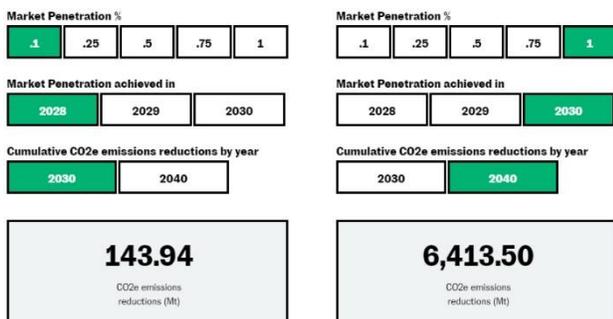
Scaling solutions: How Mission from MaRS assembled the first cohort

The core idea animating the MfM program is this: to drive reductions in anthropogenic carbon emissions, we need to identify and scale reduction technologies. MaRS held a national call for applicants to find ventures with promising solutions. After an extensive judging process, in May 2021 MaRS announced its first cohort of [Climate Champions](#): 10 Canadian ventures working to green carbon-intensive industries.

The ventures selected for the first phase of MfM were chosen for having carbon reducing solutions with the highest potential. The team then identified the best way MaRS could help these ventures reach that goal.

Emissions Reduction Calculator

This infographic, based on Carbon Reduction Assessment of New Enterprises (CRANE) data, demonstrates what the potential emissions-reduction impacts could be for some of the technologies within the MfM portfolio, depending on how much market share they can secure and how soon they do so.



Source: missionfrommars.ca/news/the-scale-up-challenge

Measuring potential

The MfM team calculated the potential impact these 10 Climate Champions could have. Using the CRANE tool, the modelling indicates that if these technologies achieved even a 0.1 percent global market share in their respective sectors, they'd collectively cut greenhouse gas (GHG) emissions by 42 megatonnes of carbon dioxide equivalent, or about 6 percent of Canada's total carbon output. If these technologies reach a 1 percent share, the total reductions will exceed 400 megatonnes — roughly the annual amount of carbon used by 87 million cars or 8.3 million U.S. households. Canada — and the rest of the world — needs cleantech solutions that can achieve significant reductions quickly and sustainably to meet its emissions-reduction targets. To do so, there needs to be clear methods of determining which solutions can have the greatest impact.



Climate Champions

The Climate Impact Challenge focused on three carbon-intensive sectors, which, combined, account for more than 70 percent of Canada's GHG emissions: energy, real estate and transportation.

Energy

Carbon Engineering builds large-scale facilities for removing carbon dioxide from the atmosphere.

Extract Energy has developed a heat engine that converts low-grade waste heat into electricity.

Opus One's smart-grid software platform integrates renewable energy into the electrical grid.

StormFisher transforms organic waste into biogas for renewable natural gas distribution.

Real Estate

BrainBox AI optimizes HVAC systems to minimize energy use and carbon emissions.

Peak Power enables intelligent management of energy use, energy storage and EV-grid integration in buildings.

Stash Energy's smart air-source heat pumps also provide energy storage, reducing reliance on fossil fuel sources or electric baseboards.

Transportation

Effenco electrifies heavy-duty vehicles, such as dump trucks, to support carbon reduction for fleets.

Flash Forest uses aerial mapping technology, drones and seed pods to support biodiverse reforestation initiatives.

Pantonium's on-demand bus-route platform increases ridership, reduces operating costs and minimizes use of diesel fuel.

Building the roadmap to transformative change

The MfM program sought to support the 10 ventures' growth plans by assembling coalitions — groups of individuals drawn from academia, industry, government, the investment community and non-profit organizations — that could provide critical feedback, serve as a sounding board, as well as identify key clients, funders and policy-makers to address barriers to adoption. A special coalition of business and innovation experts was established for each venture to address market barriers and strategize for financial and environmental success. The goal was to provide the ventures with a high level of situational awareness as they moved from technological innovation to full commercialization.

“To achieve material GHG emission reductions, the theory here is that climate innovation without adoption is a dead end — no matter how much money you throw at the climate



“Climate innovation without adoption is a dead end.”

— **Tyler Hamilton**, Director,
Cleantech Ecosystem, MaRS

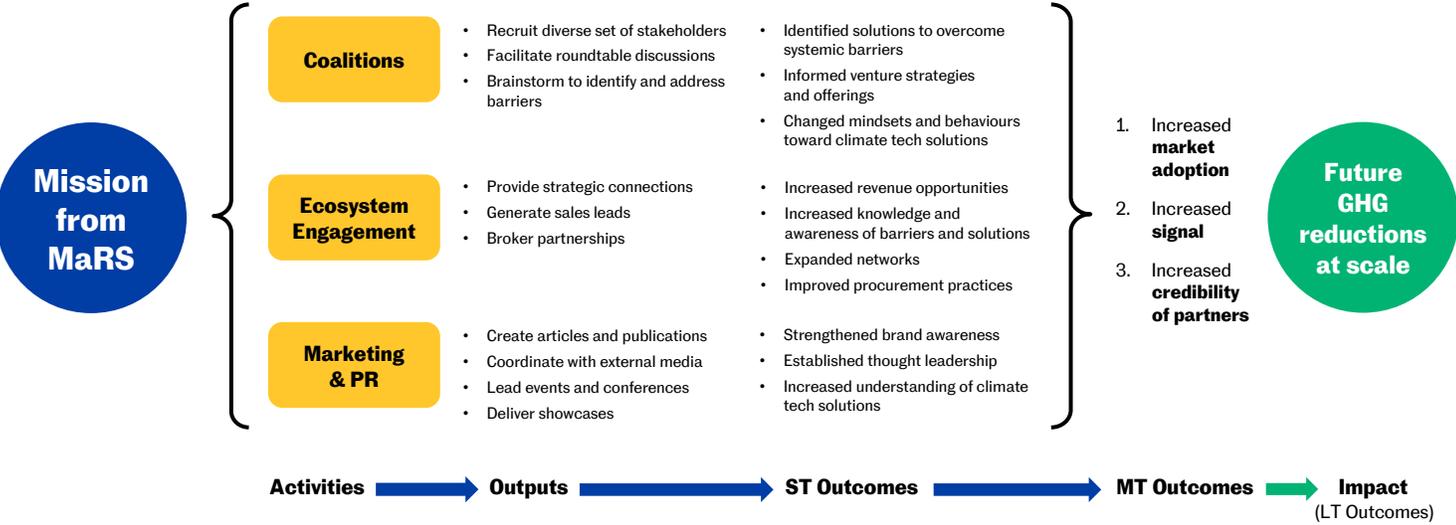
problem,” explains Tyler Hamilton, who leads the MfM program. “Adoption will not happen at the scale required unless we do a better job of engaging and collaborating with the broader ecosystem, particularly large industry and government organizations that represent the lion’s share of global emissions, and which have net-zero targets they need to achieve.”

MfM worked to build highly engaged industry coalitions whose advisors would raise the bar on adoption. The coalition advisors “aren’t just passive observers,” Hamilton says. “They are active participants helping accelerate the uptake of new solutions.” The goal was to strengthen relationships within the cleantech community to drive faster and greater impact far beyond the program. Through their work on the coalition, for instance, advisors would gain key insights and skill sets that would help them partner more effectively with ventures.

[Lynn Côté](#), who is the national lead for cleantech ecosystems and market intelligence at Export Development Canada, adds that the program’s other main benefit focused introductions that were made to relevant industry players. “Getting in front of potential adopters and investors is something that many ventures struggle with: how do I get in the door? It’s hard to get in front of the right adopter,” she says. “A process that facilitates those kinds of introductions is critical.”

Mission from MaRS theory of change model

The program employed a Theory of Change (ToC) model in its program design. These models are premised on the logic that progress is best achieved by first identifying the desired outcome and then working backward to identify the logical or causal steps needed to get there.



Creating change

The ToC concept traces to the [work of a handful of scholars](#) in the mid-1990s. Widely adopted by nonprofits, foundations and charities, conversations about the ToC model extend into debates about the approaches of multilateral bodies tasked with confronting climate change, among [them the Intergovernmental Panel on Climate Change](#) and the United Nations Environmental Programme, which [rely on ToC models](#) to evaluate its own work.

The power of collaboration

To help scale these climate solutions, Hamilton tapped into a network of expertise, recruiting top leaders in the field: suppliers, manufacturing partners, investors, regulators, policy-makers and potential customers. Some coalition advisors had pre-existing financial or commercial relationships with the ventures, while others brought expertise relevant to each company's mission and goals. In all cases, the coalitions paid particular attention to confronting systemic barriers, such as standards or outmoded policies and regulations, with an eye to tackling the climate crisis as quickly as possible.

Coalition advisors also received something valuable in return for their help: the chance to learn about the challenges of achieving net-zero goals. "They are going to need innovation, but many don't have a history or knowledge of working with small companies," Hamilton says. "This was an opportunity to learn so they can better engage with those earlier-stage players when they are ready to move forward."



Pantonium was looking to find ways to expand into new markets.

“Climate change cannot be solved by individual companies. We need to collaborate. We need to combat climate change with a consolidated effort.”

— **Norio Matsunaga**, Senior Vice President, Mitsubishi Corporation (Americas)

At the start of each coalition, the Climate Champion was asked to identify the top barrier that was inhibiting mass-scale adoption. [Pantonium](#), for example, has developed a platform for on-demand bus service that could revolutionize the way smaller cities deliver transit; it was looking to expand into new markets. [Flash Forest](#) has pioneered an approach to reforestation that uses drones to deliver seed pods and drastically increase the pace at which re-planting can occur while improving the biodiversity of forest ecosystems; it was looking to solidify its value propositions and address supply-chain issues. Some, like BrainBox AI and [StormFisher](#), were fully commercialized businesses, while others, such as [Stash Energy](#) and [Extract Energy](#), were still seeking partners for proof-of-concept or pilot projects.

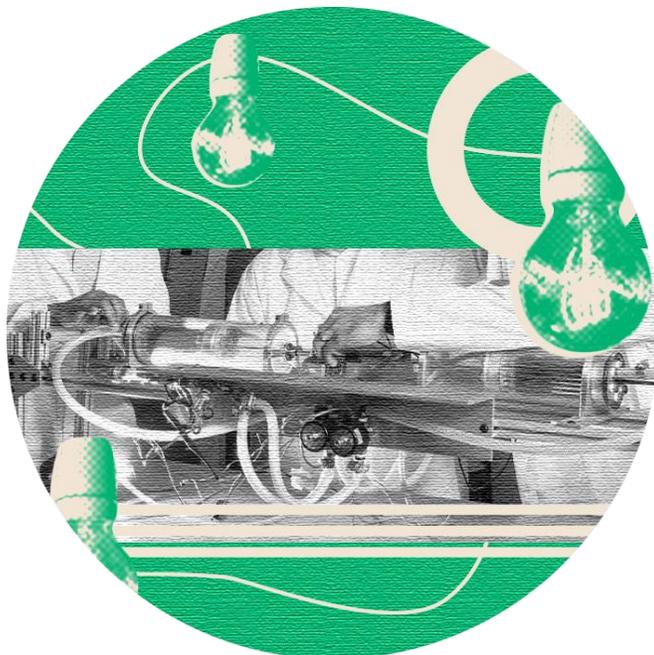
With MaRS serving as the facilitator, the ventures and their coalition advisors held a series of monthly roundtables, each focusing on specific objectives. The ventures gave coalition advisors a sense of what their technology did and what their concerns were. The coalition advisors then shared what was preventing their own companies from potentially acquiring the particular technology. The sessions included candid conversations with policy-makers, potential customers and

industry associations; discussions about shaping marketing and advocacy communications materials; and exchanges about aligning the venture's products with potential markets.

"The whole purpose was that our ventures would be in a better position to refine their approach to the marketplace," Hamilton explains, "so that they're anticipating and addressing some of those perceived risks."

The coalition gave ventures the opportunity and time to tackle issues head-on. In Extract Energy's coalition, for instance, the advisors brainstormed how the company could best scale its heat engine. [Norio Matsunaga](#), senior vice president of Mitsubishi Corporation (Americas) and one of the advisors on the coalition, sees a lot of potential in the technology. "If you can harvest power from waste energy, you can change the world," he says, pointing to the fact that more than 60 percent of the energy produced on Earth is lost in the form of heat. "That concept resonates with me, and that is exactly what Extract Energy is doing."

Matsunaga pointed out, however, that Mitsubishi Corporation's clients and affiliate companies would need heat engines on a much bigger scale than Extract Energy's current capabilities. Understanding corporations' concerns and needs will be



Extract Energy gained insights on how to best implement its heat engine within potential customers' existing processes.

invaluable as the venture develops the technology, says Ibraheem Khan, CEO and co-founder of Extract Energy. "It will help us make our system as compatible with their existing processes as possible," he says. "At the same time, the financial people in our coalition were giving us real-time information on the value proposition and where our technology would be most valuable."

[Effenco](#) is a Montreal startup founded in 2006 that retrofits heavy-duty vehicles with electric powertrains. It couldn't support its growth and was seeking strategic investors to provide the financial heft for the next stage of expansion. Founder David Arsenault said the advisors of Effenco's coalition provided a wide range of valuable perspectives on investment, customers and strategic partners. But the MfM process also yielded an introduction to Martinrea, a large Canadian OEM that acquired Effenco, helping it meet its objectives. "We're now in touch with larger customers and OEMs," he says. "The goal is to make sure 17 years of effort is worth it."

Other MfM participants have had their scaling efforts impeded by cautious public sector monopolies, like large utilities or municipal transit agencies. Pantonium's CEO Remi Desa says he's confident that municipal bus operators will eventually shift toward an on-demand or hybrid model. "To remain sustainable and effective, it must change to attract more people to use public transit. It has to become more flexible and centred around the riders as opposed to the way it works right now."

[Opus One Solutions](#) sought to leverage its participation by securing introductions to potential customers. Others were interested in meeting investors, or soliciting advice about their marketing strategies. "They were connected to people and feedback that they wouldn't normally have access to," says Hamilton. "The process," adds StormFisher co-founder Brandon Moffatt, "allowed us to identify a set of customers that we didn't expect to be buyers."

**“MaRS builds a community.
And that is a really powerful
thing for a company like ours.”**

— **Ibraheem Khan**, CEO, Extract Energy

The coalition advisors pushed the ventures to ask themselves important questions about market position, strategy and customer communications. “They asked such questions as: Does this resonate with you as a potential customer or partner? Are we going about this the wrong way? Or do we not understand your own challenges and risks, and how can we adapt our approach to engaging with you so that it’s a little bit more seamless?” says Hamilton. “We found that the feedback the ventures received gave them a unique perspective about perceptions of risk and the things they struggle with on their end. It’s not as simple as knocking on a potential customer’s door and saying, ‘I’ve got a better widget.’”

Each coalition established an action roadmap identifying barriers and objectives — short-, medium- and long-term — that incorporate feedback and presentations from coalition advisors as well as other presenters. The outcomes varied according to the particular needs, including such assets as

narrative documents and letters of support. The coalitions and ventures also assessed ongoing challenges within their own sectors, such as fluid market conditions or policy barriers.

Moffatt, who serves as StormFisher’s vice president of development, is one of the pioneers in Canada’s renewable natural gas (RNG) sector. A veteran of the recycling sector in the Waterloo, Ont., area, he and his two co-partners have pushed municipalities as well as industrial, commercial and institutional food waste generators to divert organic waste from landfills for beneficial reuse. By processing the materials in engineered facilities and not allowing the organic material to leak into the atmosphere had they been disposed of in landfills, StormFisher helps them improve their environmental performance. The company has operated two large-scale organics processing facilities in southwestern Ontario, including a food-waste-recovery resource centre in Drumbo and a biogas plant in London.

He says the coalition feedback enabled his firm to gain a keener understanding of federal and provincial emission-performance standards and their role in determining RNG markets, as well as the deficiencies in existing regulations that pose a barrier to wider adoption. “Policy-makers are very important to our business,” says Moffatt. Those insights, in turn, have opened up new potential markets for RNG, such as plants that produce steel or ammonia, as well as the financing opportunities associated with securing long-term supply contracts with industrial users. “I’m very happy with the outcomes,” he adds.

Khan and his team at Extract Energy were able to apply the insights gleaned from their coalition. Since the beginning of the program, Extract has built a system that is 10 times larger than its pilot system. “MaRS builds a community,” Khan says. “And that is a really powerful thing for a company like ours.”



Common barriers facing climate tech ventures

While each coalition was tailored to the needs of that particular scaling venture, common challenges emerged during roundtable discussions.

Lack of universal ESG standards

There is a steadily growing demand for GHG-reducing solutions from governments and corporations seeking to meet their ESG targets. With the Securities and Exchange Commission's November 2022 announcement around public disclosure, there's also an increased need for compliance. Ventures are seeing this moment as an opportunity to better position their products and services, and to support customers in achieving their net-zero targets. However, this field is still evolving and there are no sets of standard measurements that everyone is consistently using, and no broad consensus on how to achieve Canada's net-zero goal.

A need for greater education

Many cited a general lack of awareness and understanding among potential clients and the general public about such emerging technologies as carbon removal as well how smart building solutions can help corporations reach ESG goals. Ventures need to build strong and accessible business cases to win over customers, governments and other stakeholders. They are also exploring how to best present the demonstrable climate impact associated with their technologies to avoid concerns about greenwashing.

Targeting the right stakeholders

Ventures are looking to reach the right individuals and stakeholders to get organizational buy-in. For instance, as a result of the MfM process, some of the real estate ventures that targeted operational personnel are now pitching strategic decision-makers looking to incorporate ESG solutions across the organization. As the traditional "buyer" changes, ventures are adapting their go-to-market tactics as well as their key relationships with prospective customers.

Public marketplaces and procurement

Procurement processes are long, and budget cycles are prone to constraints. Ventures recognize that government procurement presents an important opportunity but are struggling to navigate processes at all levels of government. Some ventures also struggle to move beyond pilot projects with government partners. One outcome of the MfM process was the recognition that it's important to ensure that early government adopters become advocates that are willing to provide referrals.

Complicated markets

Ventures whose technologies can create carbon offsets find that purchasing credits is a complicated process for prospective customers, and this complexity discourages adoption. The proliferation of low-quality offset projects has heightened concern among investors and the public about greenwashing, and this impression hampers the growth and scaling of the overall industry. Developing proper standards and accreditations could help increase confidence and decrease risk for customers. Ventures are working to demonstrate that carbon removal is not only widely available, but also easy to purchase and not cost prohibitive.

Finding the right manufacturing partners

Original equipment manufacturers can be reluctant to add relatively niche products to their supply chains. Startups developing these products need to work with tier-one or contract manufacturers with a reputation for producing quality standards and a history of on-time product delivery.

Building credibility

When it comes to novel solutions, there is often a lack of historical data to prove the potential benefits these technologies can offer. It can require significant time, resources and education to validate these solutions.

Commercial barriers

Some prospective customers regard solutions that require significant upfront capital and installation costs as prohibitive, and ventures are looking to find new business models to better accommodate their customers' cash flow constraints.

Venture wins

The venture participants in MfM reported a wide range of “wins” associated with the program. The feedback and connections provided by coalition advisors were particularly valuable. Says Anna Stukas, [Carbon Engineering](#)’s vice president of business development, “For any startup technology company, being able to leverage a coalition in this way provides an opportunity to better understand your market, which is absolutely critical.”

Each of these 10 firms were provided with structured feedback from corporates, investors and non-profits, focusing on everything from marketing and communications to changes in business models. They received introductions to strategic

partners and investors, and engaged in detailed discussions about improving the climate benefits of their respective technologies. Many of the ventures were simultaneously pursuing financing arrangements, re-thinking their go-to-market tactics, negotiating new partnerships and addressing issues of cash-flow sustainability.

Several ventures underwent significant shifts during the course of the program. For instance, StormFisher sold its organics business to focus on hydrogen, and two ventures — Effenco and Opus One Solutions — were acquired.



Sam Ramadori
CEO
BrainBox AI

Its solution: Machine-learning algorithm that overlays commercial HVAC systems, automates and optimizes the modulation of individual components, and drives reductions in HVAC energy consumption by as much as 25 percent.

Wins:

- Closed a [U.S.\\$30-million Series A raise](#) including Export Development Canada, which is an MfM partner.
- Participating in the MaRS and KPMG Canada’s Climate Impact Accelerator.
- Improved communications to show how the technology helps clients reach net-zero goals and capture new value streams by monetizing data.
- Winner of the Tech for our Planet challenge, organized by the COP26 U.K. Government in 2021.





Anna Stukas

VP Business Development

Carbon Engineering

Its solution: Direct-air-capture (DAC) technology designed to sequester atmospheric carbon dioxide and use it as feedstock for low-carbon fuels. Carbon Engineering has become widely known for inventing and promoting this process.

Wins:

- Through its [strategic partnership with 1PointFive](#), a subsidiary of Occidental Low Carbon Ventures, plans were announced to develop between 70 and 135 large-scale DAC facilities by 2035.
- Created [new materials](#), [thought leadership](#) and a [playbook](#) to bolster awareness of carbon dioxide removal.
- Airbus pre-purchased the removal and sequestration of 400,000 tonnes of carbon dioxide from 1PointFive's planned first DAC facility using Carbon Engineering's technology.



David Arsenault

Founder

Effenco

Its solution: Energy efficiency and GHG reduction involving hybrid batteries/electric drivetrain designed to cut diesel use in industrial vehicles deployed in municipalities, ports, mines, forestry and construction. The company plans to evolve the technology to create a unique electric powertrain that will produce zero emissions.

Wins:

- Acquired by Canadian OEM Martinrea through connections made during the MfM coalition process.
- Met MfM objectives, such as scaling with OEM partners to retrofit new or used vehicles with its technology, but did so more directly with Martinrea deal.
- Introduced to a large port owner, and is now engaging in ongoing discussions to identify potential opportunities to work together.



Ibraheem Khan

CEO

Extract Energy

Its solution: Specialized alloy-based technology designed to extract energy from low-grade waste heat (LGWH) produced by industrial sites and other similar sources, and then converting it into electricity. Extract Energy estimates that tapping LGWH globally could reduce carbon emissions by 3,000 megatonnes, or more than four times Canada's total, by 2040.

Wins:

- Launched a [pilot project](#) with Hamilton Community Enterprises, which will capture hydrothermal energy from a City of Hamilton district heating and cooling plant and convert it into grid-quality electricity.
- Identified beachhead markets, including data centres, mining, and combined heat and power (CHP) plants.
- Explored potential test sites with coalition advisor Martinrea, which has shared data with Extract Energy to run simulations.
- Secured \$6.5 million in funding for piloting, scaling and manufacturing efforts.



Angelique Ahlström

Co-founder, CSO

Flash Forest

Its solution: Drone-based tree planting capable of seeding reforestation sites that are difficult to access by more traditional means. The company's technology deposits specially developed seed pods in hard-to-access areas.

Wins:

- Secured a [\\$1.3-million grant from Natural Resources Canada](#) through the government's commitment to the Two Billion Trees initiative, with a focus on replanting in forest-devastated regions.
- Set strategy to gain control over the supply chain of seeds.
- Received a contract with One Tree Planted, one of Flash Forest's coalition advisors.



Joshua Wong

Founder

Opus One Solutions

Its solution: The company has developed an advanced analytics platform to support distributed energy resources and smart grids that optimize energy consumption within local energy markets. It has built up a base of customers in off-shore markets.

Wins:

- Established connections through energy regulators, policy-makers and system operators.
- Compiled lessons and key learnings from Opus One Solution's activities in the U.K. market.
- Developed a business model with coalition partners to introduce Local Energy Markets to the Ontario landscape and is co-developing an action plan with coalition advisors to integrate it into the Ontario energy system.
- Acquired by GE.



Remi Desa

CEO

Pantonium

Its solution: The company has developed a platform to allow bus-based transit agencies to provide on-demand service in smaller communities, thereby servicing larger areas, increasing ridership and optimizing energy consumption in vehicles. The technology is a scalable, pop-up transportation service that can be deployed anywhere.

Wins:

- Refined Pantonium's sales process.
- Received feedback from transit operators to refine target markets and better understand key drivers and metrics.
- Pantonium's market footprint now includes 12 municipalities across North America, including Stratford, Belleville and Fort Erie.



Imran Noorani
Chief Strategy Officer
Peak Power

Its solution: Using an AI-driven platform, the firm has created an analytics tool that allows property managers and building owners to optimize their energy consumption through ongoing monitoring of the performance of HVAC and other systems, reducing carbon emissions and operating expenses across a real estate portfolio.

Wins:

- Developed customer personas and case studies to support sales and marketing tactics.
- [Secured \\$5 million in funding](#) from Sustainable Development Technology Canada to expand its Distributed Energy Resource Aggregation platform across North America.



Dan Curwin
Director of Business Development
Stash Energy

Its solution: The firm has invented a ductless heat pump system that can also store electricity for use in high-cost periods, thus providing a means of both reducing carbon from space heating — but also optimizing the electricity used by the heat pump. Stash Energy targets homeowners, and its technology is well suited to jurisdictions that still have a carbon-intensive grid.

Wins:

- Stash Energy will be testing its heat-pump technology with a large utility in Quebec, which responded to MfM's communications and branding activities.
- [Partnered with New Brunswick Power](#) to develop a smart-energy community project.
- Partnering with coalition advisors to support capital fundraising efforts.



Brandon Moffatt
Co-founder
StormFisher

Its solution: The firm is a veteran player in the tapping and refining of methane generated by municipal waste streams into renewable natural gas (biogas) that can be used as an additive. The company's facilities divert some 160,000 tonnes from landfill sites each year, and produces organic fertilizers.

Wins:

- Expanded operations with the 2021 [launch of a \\$20-million food recovery facility](#) in partnership with Generate.
- [Partnered to deliver RNG to Modern Niagara](#), a building systems firm, whose services include carbon reduction on new and existing projects.
- Developed consistent messaging around the role of renewable gases as part of provincial and federal decarbonization programs and policies.
- Pivoted its business to concentrate on the production of hydrogen, renaming the venture StormFisher Hydrogen.

Program wins

Throughout the MfM program, MaRS sought to capture experiences and data to document the outcome, both quantitatively and qualitatively. Overall, the program has been a success on both fronts. A survey of the ventures gave the program a [100 Net Provider Score](#) and revealed the following aggregated results through 2021:

- \$42 million in funding was raised.
- \$27 million in revenue was generated.
- 471 FTEs were employed at the end of 2021.
- Nine patent applications were submitted and 12 patents issued.

The participant surveys further demonstrated these high-level program benefits:

- Collaboration with other cleantech companies.
- Networking access to government, industry partners, funding partners, consultants and subject-matter experts.

- Customer and partnership opportunities with coalition advisors or through the coalitions' networks.
- Coalitions' ability to gain insights and discuss topics such as: value proposition, barriers, marketing, funding, and strategy.
- Exposure: demo days; a *Toronto Star* 10-part [article series](#), which profiled each of the Climate Champions; [Solve for X](#) podcast, a magazine-style audio documentary exploring the latest ideas in tech and science; a special feature in the *Innovate Toronto* coffee-table book; plus inclusion in more than 50 articles created by the MaRS Content Studio and media coverage earned by the MaRS PR team.
- Funding opportunities and improved ability to raise funding.

Of the nine ventures that responded to the survey, the following three benefits were most frequently cited:

- Better understand your customers and market (7)
- Open up opportunities likely to lead to future business (7)
- Raise your company profile (7)



Amplifying the message

Raising awareness about the work of the Climate Champions and the broader issues facing ventures in the cleantech sector was a key aim of the MaRS Content Studio over the course of the MfM program. The Climate Champions were featured in more than 50 articles that ran in the *Toronto Star*, *Canadian Business* and in *MaRS Magazine*. These articles had a media ad equivalency of \$1,810,456 and received 434,703 impressions on social media. MfM and the MaRS Content Studio also created the first season of the *Solve for X* podcast, featuring the Climate Champions along with such guests as former federal minister for the environment Catherine McKenna, NASA scientist Lola Fatoyinbo and IPCC co-author Chris Bataille. *Solve for X* was selected for Apple's New & Noteworthy category and made the top 10 of tech and science podcasts.

Two key initiatives emerged as a result of the MfM program:

City of Toronto

On December 15, 2021, Toronto council approved the [second iteration of its TransformTO climate strategy](#), to help the city achieve net zero by 2040. The ambitious plan, which was initially tabled in 2017 and dovetails with council's [2019 declaration of a climate emergency](#), marked an acceleration of the city's decarbonization efforts.

Alongside a suite of other goals and strategies, the new strategy included a significant endorsement of the MfM program. As part of the overall TransformTO plan, council voted to use the city's procurement powers to enter into agreements with the 10 MfM Climate Champions as a means of both advancing municipal net-zero plans while providing important opportunities for these Canadian firms to gain experience and traction with a major public sector customer — a significant development.

In the past four years, Toronto's climate strategy has evolved and matured, encompassing both the municipality's own operations and emissions related to the city more generally. TransformTO 2.0 includes a range of objectives, as well as shorter-term goals to reduce carbon by 6.8 megatonnes — equivalent to removing 2 million vehicles from the roads — by 2030.

Council approved a wide range of implementation strategies. Among them: accelerating the pace of deployment of the Toronto Green Standard, which regulates emissions in new buildings; establishing a carbon budget; quickly reducing natural gas consumption in both new and existing buildings; increasing access to low-carbon transportation; and investing in a carbon-free local electrical grid.

Some of these targets will be achieved through municipal regulation and planning approvals. Others involve increased investment in transit service, bike lanes and walkable streets. The City of Toronto is also the sole shareholder of Toronto Hydro, the local electrical distribution company, and, as the document states, TransformTO low-carbon electricity goals will involve the utility. "By increasing opportunities for local renewable generation to be located within the City's boundary," the report notes, "Toronto will be more resilient and will contribute to a decarbonized provincial electricity grid."





“It’s time to move beyond pilot projects and toward creating sustainable models that will move Canada’s innovation agenda forward.”

Public sector procurement is a powerful tool for advancing carbon-reduction goals. Municipalities can invest in hybrid or electric buses, as well as low- or no-emission fleet vehicles, such as police cars. In their own real estate portfolios, they can invest in high-efficiency HVAC systems or commission net- or near-net-zero buildings, from community centres to libraries or daycare facilities.

In particular, the City of Toronto’s refreshed TransformTO advances the use of green procurement by enabling city staff to enter into agreements with the 10 MfM ventures.

This component of TransformTO represents a major win for the MfM program, as it provides opportunities for several of the 10 ventures to partner with the country’s largest municipal government as a customer. “We are working with the City of Toronto to push that into a deployment, and it’s going ahead fairly positively right now,” says Hamilton. Large government customers represent an affirmation of a startup’s success in scaling up, allows them to access valuable feedback and provides a leg up for other public sector procurements.

The alignment between the MfM Climate Champions’ respective technologies and TransformTO’s 2030 goals is worth noting. Two firms — BrainBox AI and [Peak Power](#) — work in the commercial real estate sector, which, in Toronto, will see increased demand, both through regulation and market signals, for carbon reduction in office and industrial buildings. StormFisher could support the City’s goal to reduce carbon through the diversion of municipal solid waste. Pantonium’s bus route platform potentially offers the Toronto Transit Commission an opportunity to pilot on-demand service in under-served areas. Opus One Solution’s platform could benefit as Toronto Hydro begins deploying distributed energy resources as a way of boosting use of renewables to address growing demand for electricity. For Effenco/Martinrea, the City maintains large fleets of heavy-duty vehicles, including garbage trucks and snow plows.

The City’s policy, of course, is clear that these firms must meet certain pre-conditions, the most significant of which is ensuring that their products/services fit within both existing program budgets and the overall aims of the TransformTO initiative.



Toronto's 2030 net-zero targets include:

- All new buildings should be designed and built to achieve near net-zero emissions
- A 50 percent reduction of carbon from existing buildings, a goal that entails retrofitting about 12,500 buildings annually
- 50 percent of community-wide energy to be sourced from renewable or low-carbon sources, which translates into bringing online about 35 million MWh of electricity
- 25 percent of commercial/industrial floor space connected to low-carbon thermal energy
- 75 percent of school trips are taken by foot, bicycle or transit
- 70 percent diversion from residential solid waste
- 65 percent reduction, compared to 2008 levels, in emissions from corporate (i.e., municipal) operations and demonstrating climate leadership in order to achieve this goal
- Identify pathways to more sustainable consumption in both the City and the local economy more broadly

KPMG Climate Impact Accelerator

A core goal of the MfM program is to support cleantech ventures in bridging the gap between the startup sector and large corporate customers that can provide opportunities to scale. In June 2022, MaRS and KPMG Canada made an important move to address that issue with the launch of the Climate Impact Accelerator. The project aims to connect KPMG Canada's corporate clients with Canadian cleantech firms that are building out highly scalable emissions technologies to mitigate or reduce emissions. In particular, the corporate accelerator will help corporations speed up their innovation adoption process by helping them work with ventures. The corporate accelerator will match companies looking to acquire or implement cleantech solutions with Canadian cleantech ventures, including the participants in the MfM program.

"Often, startups and corporates don't talk to each other, and they tend to operate in silos," says Yung Wu, CEO of MaRS. "This collaboration brings together their complementary capabilities and helps bridge the gap in Canada's innovation ecosystem. In today's economy, there's no one stakeholder with the ability to solve the climate crisis on their own, so together with KPMG Canada we're creating strong coalitions with the Climate Impact Accelerator. It's time to move beyond pilot projects and toward creating sustainable models that will move Canada's innovation agenda forward."

The initiative will leverage Canada's leadership in the global cleantech sector. "Canada is home to more than a dozen of the top global cleantech companies, second only to the United States," says Armughan Ahmad, president and managing partner of digital at KPMG Canada. "Our innovation economy represents 12 percent of GDP but it's growing three to six times faster than the rest of the economy. Canada clearly has a strong foundation in research and innovation, but we're lagging in commercialization. The Climate Impact Accelerator helps solve that disconnect."

Building a pipeline of talent

As part of the MfM program, MaRS engaged York University's Schulich School of Business to involve undergraduates in the coalition process as fellows. A [York fellow](#) was assigned to each Climate Champion to support the lead MaRS facilitator, attended monthly roundtables and workshops, conducted research, and helped draft strategy documents.

Irene Lam, one of the program managers for Mission from MaRS who led this partnership, sees mutual benefits among the students and companies. "In addition to doing essential behind-the-scenes work, the fellows brought a fresh perspective to the barriers we're trying to address," says Lam. "And because they met with the Climate Champions frequently, they were crucial in shaping the strategies and conversations of the coalition."

These experiences supported students aiming to build careers in Canada's growing cleantech ecosystem. They gained valuable experience in stakeholder engagement, strategic

planning and information synthesis. In fact, many of the students either started or pivoted their careers to sustainability fields as a result of the program.

A [2020 survey of 81 Canadian cleantech employers conducted by EcoCanada](#) found that almost half of respondents planned to hire cleantech positions in the next 24 months, for a combined total of more than 1,800 new jobs. "Employers are currently struggling to fill a number of cleantech positions," the report noted, citing a shortage of engineers, drafters, designers, technicians, geologists, laboratory specialists, environmental technicians, scientists, project managers, directors, as well as other skilled trades.

The MfM program sought to help fill that gap, by providing opportunities for students to develop tactical skills and gain hands-on experience.



“This program really influenced my thoughts on who I eventually want to work for. Even with limited budgets, these companies want to make a positive impact — it shows that they care about young people. We’re the generation that has to deal with the environment.”

— **Troy Dhillon**, coalition fellow, Flash Forest

Role of philanthropy



When a commercial technology delivers benefits beyond the conventional metrics of private enterprise, scaling up involves wider societal stakes. As such, non-profits and civil society organizations as well as corporate partners were integral to the design of the program. MfM's mixed funding model — the program was funded by corporate partnerships and philanthropic donations — represents one of the program's many distinctive features.

The Nature Conservancy of Canada (NCC), one of the country's most venerable environmental non-profits, was among a handful of charities and foundations that participated in the MfM as a coalition advisor, offering perspectives distinct from those brought by corporates and governments.

When the Flash Forest team sat down with advisors of its coalition, they received not only feedback on their marketing, but also insights about the environmental value of their company's offering. In particular, [Margo Morrison](#), director of

conservation with the NCC, had questions about the company's approach to conservation. In one session, she pointed out that the company, which uses drones for forest planting operations, needs to ensure that the seeds and tree species being distributed in a given area are appropriate to that site. It was a constructive conversation about biodiversity and forest health, she recalls. "They were open and actively seeking information."

"What's really interesting about this project is that it fills that cultural gap between incubators and investment readiness," says [Laura Butler](#), managing director of the Trottier Family Foundation. She adds that MfM's goals were "very aligned" with Trottier's outlook, which focuses on supporting climate initiatives, including those with a systems-based approach.

Mitigating climate change is one of the Trottier Foundation's core goals. Butler readily points out that philanthropic grants to climate initiatives represent a tiny slice of the overall funding needed to address the impact of the problem. She says it's important for funders like Trottier to use their convening powers to bring together key stakeholders, as happened with the MfM coalitions. At the same time, foundation boards can also leverage their endowments to co-invest in promising environmental technologies, as a means of providing capital to support scaling efforts.

Indeed, Trottier and MaRS are currently collaborating on Climate Action Accelerator to Net Zero (CAANO), a new fund that aims to help small- and medium-sized municipalities access capital to invest in solutions such as those offered by the MfM Climate Champions. "Municipal government is a great place to scale these ventures and really get them on the next level," Butler observes. "And this can be funded through blended finance — some philanthropic dollars and municipal dollars. What I like about this is that it keeps us thinking about how we get these initiatives to the next level, and how do we bring in more players as we go?"

Lessons learned

The MfM program adopted a unique approach to solving a long-standing problem in the Canadian venture space, which is creating the conditions that allow startups to grow into established mid-sized companies that are investment-ready and export-oriented. “The program was its own pilot project,” says Hamilton, noting that it is being refined for future iterations.

As the program feedback surveys conducted in 2022 indicated, the level of satisfaction with the MfM program was high, both among ventures and coalition advisors. Follow-up interviews provided other anecdotal insights. An overview:

Survey findings

The aggregated participant feedback indicated the following high-level observations:

- there was a perception that the program was aimed for earlier-stage ventures
- the strategy summaries could be shortened or simplified
- the process could be streamlined with fewer check-in sessions and emailed updates

When asked how the program helped, most ventures noted softer benefits relating to understanding customers, raising their profile and exploring opportunities that could lead to new business. Outcomes — such as reducing customer GHGs, increased revenues or raising capital — require a longer time period to realize. Some ventures garnered early wins in these areas, and the insights gained from them will help other participants accelerate their trajectory. The MfM team will continue to work with and track these Climate Champions to measure progress on an on-going basis. Government participants said the program provided new opportunities to build networks, and cited as noteworthy the streamlined City of Toronto climate initiative that allows MfM ventures to bypass the cumbersome request-for-proposals process.

Expect the unexpected

While the MfM program's Theory of Change model is premised on a logical sequence of stages and events, derived by working backwards from the goal, the practical reality is that the maturation and adoption of technologies can be a non-linear process that includes imponderables, detours and other X-factors, such as rapidly shifting markets, the recent surge in investor demand for ESG investments, and an influx of government support for specific solutions, such as carbon capture and storage.

Effenco offers a case study in how it overcame the so-called valley of death, but only after hitting a financial brick wall. The company had developed a bridging technology that would allow users and manufacturers of heavy diesel-powered machinery to transition to hybrid powertrains, as a means of reducing operational emissions. Founder David Arsenault says the company commercialized the first phase of its growth strategy over more than a decade, with capital from Business Development Canada, Investissement Quebec, SDTC and private investors. But, he adds, "We got to the point where we needed to transition to higher production, and that required a lot of capital."

Facing a cash-flow crisis and mounting debt, Effenco was forced into liquidation in the summer of 2022. Its liquidified assets were acquired by [Martinrea](#) to continue where it left off, helping it meet its overall objectives of scaling the technology. This wasn't the only acquisition during the MfM program. Opus One Solutions, another Climate Champion, was [acquired by General Electric](#) in December 2021. This acquisition was part of its strategic objective, to help Opus One Solutions grow and expand.

Prior to the program, Arsenault says, he had "knocked on every door" but found no buyers. The transaction, he says, enables Effenco to scale up with larger customers while continuing to develop the technology in collaboration with Martinrea's team.



“We were very pleased that we planted some seeds for some very good relationships.”

— **Anna Stukas**, Carbon Engineering

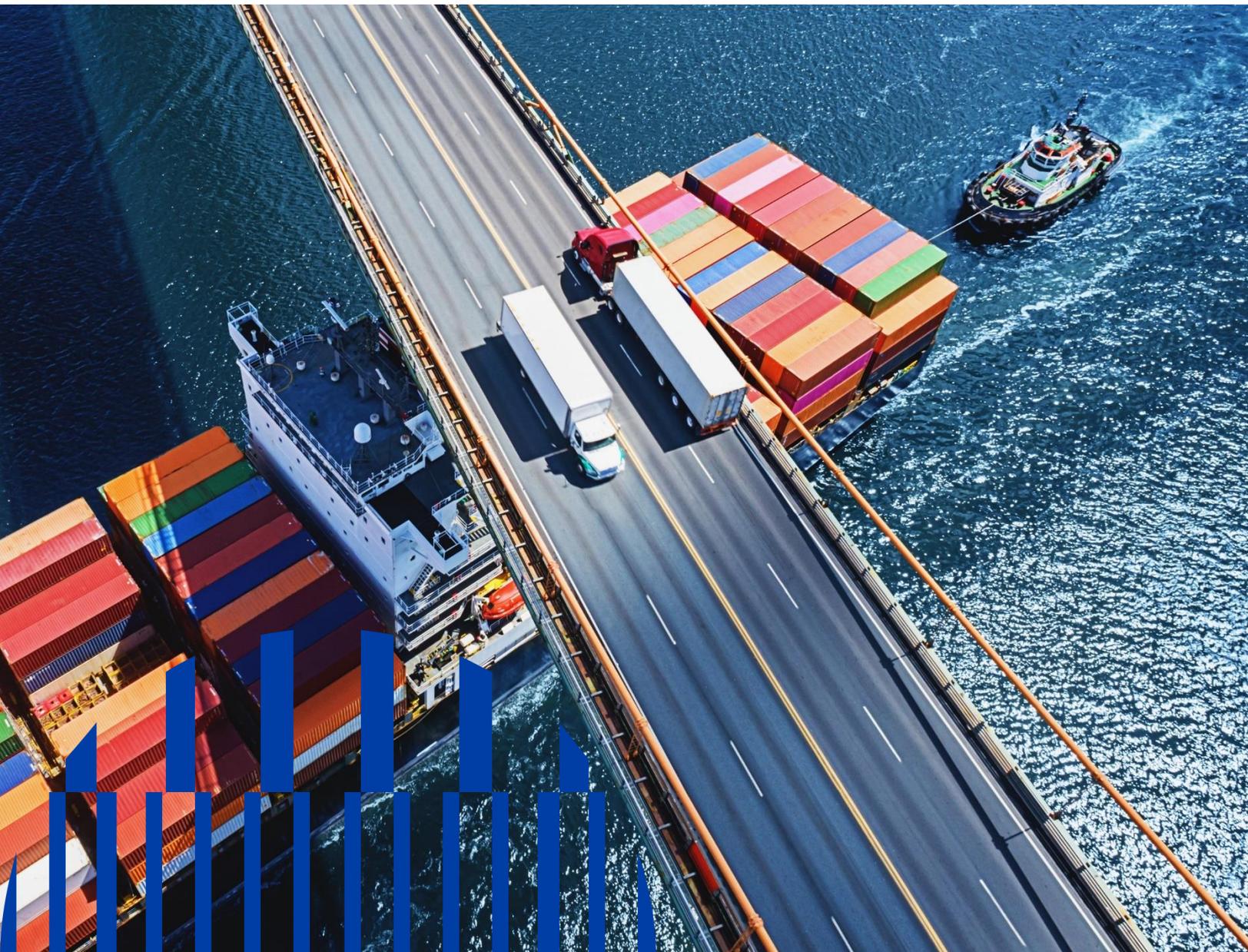
Added value for coalition advisors

The MfM program involved a time commitment for coalition advisors over several months. As Stukas points out, many benefits — for example, market soundings — accrue to the venture. But the benefits didn't just flow in one direction: the coalition advisors gained insight into emerging solutions, perspectives on how to best partner with startups and connections at other organizations.

A key takeaway is that the clean innovation economy in Canada cannot be scaled in a vacuum. "It can't just be about ventures talking to ventures. The whole community needs to be engaged," says Hamilton. "When you get these different

stakeholders to the table, you realize soon enough that a lot of them haven't been talking to each other. Once a venture understands where these different stakeholders are coming from, it better prepares them when they're trying to actually conduct business and grow a company."

It's important to manage expectations on both sides. Just as the process of scaling a technology is highly non-linear, the coalition advisors should be clear on the difference between their primary role — as sounding boards — and their secondary roles, as potential sources of funding and revenue opportunities.



Next steps

The lessons and results of the first phase of MfM are informing the design and focus of the next iteration of the program. MfM is launching a new series of net-zero missions — specialized initiatives with a mandate to continue dismantling common barriers to wide-scale adoption of venture’s technologies. Upcoming missions are set to tackle public procurement, carbon management and sustainable mining. The program’s next iteration will continue to leverage the coalition approach, and individual ventures will again be key stakeholders.

Given the need for government support for climate solutions, the first of the net-zero missions is zeroing in on the issues of public procurement. “We’re trying to build a marketplace, as

well as an adoption-ready certification program for ventures, where they can go through a checkbox of what they need to do to get on the radar of public sector procurement folks,” says Hamilton.

The first cohort of MfM ventures consistently reported that they would be better positioned to enter new markets with proven track records at home. Governments, which represent the single largest purchasers of goods and services in Canada, can play a huge role in helping grow Canada’s cleantech sector while making strides in their own efforts to decarbonize heavily regulated sectors such as energy, transportation, industry and real estate.



Participating organizations

Mission from MaRS: Climate Impact Challenge has received generous donations from its founding funders: HSBC, RBC Foundation, Trottier Family Foundation and Thistledown Foundation. Program donors and partners also include Peter Gilgan Foundation, Business Development Bank of Canada (BDC), Export Development Canada (EDC) and Mitsubishi Corporation (Americas).

For more information on Mission from MaRS: Climate Impact Challenge, visit missionfrommars.ca

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