A close-up, low-angle shot of an orange industrial robotic arm in a factory. The arm is positioned diagonally across the frame, with its joints and cables clearly visible. The background is a blurred industrial environment with bright lights and structural elements.

August 2022

Next Generation Manufacturing Canada

ANNUAL REPORT 2022

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Next Generation Manufacturing

Next Generation Manufacturing Canada (NGen) is the industry-led, not-for-profit organization leading Canada's Global Innovation Cluster for Advanced Manufacturing.

NGen is dedicated to building world-leading advanced manufacturing capabilities in Canada, for the benefit of Canadians.

We aim to strengthen the Canadian economy and create high value jobs for Canadians while contributing solutions that address some of the world's most pressing challenges in areas like health care, energy and resource management, and environmental sustainability.

NGen Canada works to achieve these objectives by leveraging the research, technology, and industrial strengths of Canada's advanced manufacturing ecosystem.

We create new opportunities by combining the capabilities of our country's manufacturers, engineering and technology companies, business services, researchers, academic institutions, innovation centres, business networks, and our high-quality workforce. By enhancing collaboration, NGen aims to improve Canada's industrial innovation performance, connect and strengthen our advanced manufacturing ecosystem, and increase the competitiveness and growth potential of Canada's advanced manufacturing companies.

Catch up with what's happening in Canada's Global Innovation Cluster for Advanced Manufacturing at



www.ngen.ca
McMaster Innovation Park - #301
175 Longwood Road S., Hamilton, ON, L8P 0A1
CANADA
info@ngen.ca

Message from Our CEO
Jayson Myers

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Take a look at how we are
impacting Canadians

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Message from The Honourable François-Philippe Champagne



Investment in innovation is fundamental to growing Canada's economy and maintaining our position as a global innovation leader.

The Global Innovation Clusters, known as the Superclusters during the period of this report, bring together businesses, academia, not-for-profit organizations, and governments to advance innovation at the speed of business. The clusters focus on highly innovative Canadian industries, including plant-based protein agri-food; advanced manufacturing; ocean-based industries; artificial intelligence; and digital technologies.

From the beginning, our government's investment in the clusters has been about finding new and innovative ways to build connections. By incentivizing collaboration and growing strong Canadian ecosystems, the Global Innovation Clusters are generating good, well-paying jobs across the country, developing a highly skilled and diverse workforce, and contributing to our economic recovery by creating stronger and more resilient economic growth.

And the numbers speak for themselves. As of March 31, the clusters have approved more than 490 projects worth over \$2.1 billion and involving over 2,100 partners. This includes more than 80 COVID-19 response projects with a total investment of over \$225 million.

Our government will continue to build on the success of this collaborative model. Budget 2022 is proposing an additional \$750 million investment over the next six years to further support the growth and development of the clusters. We look forward to seeing the clusters grow their impact, including in key priority areas such as fighting climate change and improving supply chain resiliency.

Over the past four years, the clusters have supported inno-

vators, researchers, and entrepreneurs to grow bold ideas into global opportunities through better access to experience and expertise, in turn advancing Canada's edge internationally. I am proud to see that each cluster is propelling innovation beyond our borders into the global market.

Next Generation Manufacturing Canada (NGen) in particular is positioning Canada's leadership in advanced manufacturing capabilities. Over this past year, the NGen cluster has led cutting-edge projects: from zero-emission vehicle investments, which will develop the most efficient, high-quality, and greenest domestic production capabilities, to leveraging breakthrough manufacturing processes to commercialize ultra-thin graphene membranes which have the potential to radically transform facets of everyday life.

Thank you to everyone involved with the NGen cluster for your perseverance during the challenges we have faced over the past year and for your commitment to strengthening our innovation ecosystems and helping to establish a diverse and skilled workforce ready for the jobs of the future.

Message from Linda Hasenfratz Chair of NGen



Four years ago, in 2018, when NGen's Board of Directors set out the strategic objectives we wanted the organization to pursue, we set our sights high.

We wanted NGen to play a pivotal role in building

world-leading advanced manufacturing capabilities in Canada that would benefit Canadians. We recognized that success would depend on focusing on industry-driven initiatives with the potential to transform the way manufacturing is done in Canada. They would need to be collaborative in order to leverage the great research, technology, and manufacturing strengths we have across the country and provide opportunities for smaller and larger companies alike to find innovation partners and grow. And they would need to support the application and scale-up of innovative solutions in manufacturing that have significant potential for commercial success.

NGen would also need to work with, connect, and strengthen collaboration across a wide network of technology companies, manufacturers, academic and other supporting organizations. The challenge was to build an ecosystem with the potential to attract talent and investment and to address common innovation challenges, above all the development of a highly skilled, diverse, and inclusive advanced manufacturing workforce.

Our strategy has more than paid off. NGen's Annual Report for 2021-2022 details the accomplishments achieved to date. And they are impressive.

There are a few things that really stand out. The commercial success of NGen-funded projects that have already wrapped up – almost \$2 billion in sales, over 1,100 new jobs and 18 new companies created, and 67 IP licenses granted to date – is important. But, as stewards of taxpayer's money, our Board is particularly pleased that those projects are already on track to deliver back to the federal government tax revenues 4.5X more than what NGen has invested in them. That's a stellar rate of return for any

investment fund. And the revenues from successful projects keep growing.

NGen's Careers of the Future Campaign has generated a buzz about advanced manufacturing among 1.5 million young students across Canada and has already become influential in forming our next generation workforce. Likewise, NGen's support for Indigenous entrepreneurship is helping to prepare an important and growing segment of our population for productive jobs in advanced manufacturing.

NGen's initiatives are building the workforce of the future and improving the competitiveness and growth potential of Canada's advanced manufacturing sector. They are strengthening the resilience of supply chains to ensure that Canadians have access to the critical products we need. They are contributing to environmental sustainability and improving health and safety for us all.

Now it's time to step things up! We intend to build on our success, to do even more to transform manufacturing, particularly when it comes to our transition to a greener low-carbon economy. We want to focus on strategic innovation opportunities for Canada, on bigger and more targeted initiatives that will position Canada as a leader in critical sectors of global value chains. We want to build an even more dynamic ecosystem that becomes a magnet for talent and investment from around the world. And we want to attract investment from multiple sources to support the industry-led initiatives that will get us there.

Over the past year, the Government of Canada has demonstrated its confidence in NGen and Canada's Global Innovation Clusters, increasing our funding in Budget 2021 as well as in Budget 2022. We are committed to ensuring that their confidence is well placed by continuing to beat expectations and delivering superior results for Canadian industry and for Canadians.

I want to thank my fellow Board members for their commitment and hard work.

We look forward to another exciting year ahead!

Message from Jayson Myers Chief Executive Officer of NGen



Wow. What a year!

It's been a year of some tough challenges for NGen members, but for many it's also been a year of new opportunities, innovation, and business growth.

For our team at NGen, it's been a time of sadness, accomplishment, and pride in the results we've realized to date.

This report is a record of NGen's achievements over the past financial year and up to the end of March 2022.

Looking back, the challenges have been daunting, and they continue that way. Having to navigate through a second year of pandemic, supply and logistics disruptions, rising trade tensions, and the impacts of climate change, the invasion of Ukraine, and rapidly rising inflation has been no easy feat for Canadians or for any Canadian business.

It's been a tough time for our members and project partners alike. But the past year has also demonstrated the importance of Canada's advanced manufacturing sector, and especially of those tech companies, manufacturers, and researchers that have worked together to develop new products, services, and ways of doing business, contributing solutions that are today playing an important role in sustaining economic growth, strengthening the resilience of our supply chains, improving environmental sustainability, and protecting the health and safety of Canadians.

It has also underscored the importance of NGen's role in supporting many of the industry-led collaborative initiatives that have helped develop and commercialize those solutions while equipping companies with the capabilities they need to respond rapidly and flexibly to changing business conditions.

NGen's investments are already paying off. We fully com-

mitted our cluster funding in 2021-2022. By the end of the year, we were investing close to \$236 million in 166 projects involving 626 industry and research partners, which are expected to leverage \$371 million in additional innovation investments. Many projects have also been completed. By March they had generated over \$1.9 billion in new revenue and had led to the creation of 18 new companies and 1,137 new high paying jobs.

We have also made significant contributions to Canada's advanced manufacturing ecosystem. NGen helped our members connect with innovation partners across Canada and internationally. We supported the development of 17 advanced manufacturing clusters and four technology working groups across the country and facilitated cross sector collaborations that had never happened before.

NGen also took the lead in a widely influential campaign to attract more young people into careers in advanced manufacturing. We introduced manufacturing entrepreneurship into Canada-wide Indigenous education programs. And we helped manufacturers access other programs to enhance the digital skills of their employees as well as the transformative leadership skills that senior managers need today.

It's been an exciting year for NGen, but a sad one too. We lost a dear friend and colleague to cancer. Rhonda O'Keefe led our Intellectual Property support initiatives. She developed them into a highly valued service for project partners and other NGen members as well. We'll continue to build on Rhonda's contributions. And we will remember just how valuable life is for us all.

Our Board of Directors set ambitious targets for NGen in 2021-2022. I'm pleased to say that we have surpassed them. Our accomplishments are due to the incredible dedicated team of professionals with whom I have the pleasure to work and to the guidance and support from the members of our Board.

We've benefited greatly from the engagement and support of our ecosystem partners. My thanks go as well to our colleagues with the Government of Canada's Global Innovation Clusters team who in no small way have supported us as NGen has grown into an effective innovation investment agency that has proven itself by delivering superior results.

In April 2022 the federal budget allocated an additional \$750 million in funding for the Cluster program. NGen intends to leverage our share to do even more to build world-leading advanced manufacturing capabilities in Canada and position Canada as a leading green supplier to the world. Stay tuned!



Meet our diverse team of professionals the real people who run **NGen Canada**— Canada's Global Innovation Cluster for Advanced Manufacturing.

Our Team



Jayson Myers
Chief Executive Officer



Bilal Haffejee
Chief Financial Officer



John Laughlin
Chief Technology Officer



Stewart Cramer
Chief Manufacturing Officer



Carol Cutrone
Office Manager &
Executive Assistant



Wendy Young
Vice President, Data
Systems & Security



Steven Bell
Vice President, Project
Management



Shelley J Aubry
HR Business Partner



Jonathan D. Cutler
Vice President, Intellectual
Property & Contracts



Kelly O'Neill
Director, Education &
Training



Christy Michalak
Director, Advanced
Manufacturing
Development Programs



Bridget Bohan
Director, Business
Development



Robbie MacLeod
Director, Strategic
Communications &
Corporate Secretary



Frank Defalco
Director, Member Relations



Gillian Sheldon
Director, Investment
Partnerships



Robert Mastrotto
Program Director



Ken Morris
Director, Technical
Partnerships



Arthur Kong
Director, Project
Development



Roshan Mohan
Director, Project
Development



Stephanie Holko
Director, Project
Development



Jeff Montag
Director, Project Finance



Deb Brintnell
Financial Controller



Mary Toth
Contracts Manager &
In House Paralegal



Frank Haas
Senior Program Manager



Ashley Leung
Business Process &
Financial Claims Manager



Nelson Netzereab
Manager, Digital Marketing



Ron Pope
Program Manager



Steve Pilkington
Program Manager



Kim D'Souza
Client Engagement
Manager



Joanne MacKinnon
Senior Project Coordinator



Adam Balogh
Senior Project Coordinator



Tammy Smith
Program Engagement
Administrator &
EA to CMO



Arun Lavishetty
Senior System Admin



Nicholas Pett
Application Support Analyst



Emily Blodale
Financial Claims Analyst



Kim Quines
Marketing Coordinator



Widad Rezai
Financial Analyst



Parneet Kaur
IT Service Desk Analyst

Our Interns



Birva Shah
Summer Intern



Hashir Aziz
Summer Intern



Yuraj Khandpur
Summer Intern



Julien Demaere
Summer Intern





IN LOVING MEMORY

Rhonda O'keefe

NGen remembers our cherished friend and colleague, Rhonda O'Keefe.

It is with deep sadness that we mark the passing of our dear friend and colleague, Rhonda O'Keefe. Generous with her time, kind, caring, an expert in her field, Rhonda was held in high regard by her colleagues as well as all those she worked with across the NGen network.

As NGen's lead on Intellectual Property and contracting, Rhonda took pride in supporting some of Canada's best and brightest innovators. With a wealth of practical experience, Rhonda played a valuable role in helping NGen's project partners and other NGen members navigate the intricacies of developing, protecting, and commercializing their critical IP assets.

Rhonda approached every day with openness, optimism, and dedication that our team at NGen aspires to emulate. Her passing is a tremendous loss for NGen and Canada's advanced manufacturing ecosystem - we will miss her greatly.



Our Board of Directors

Linda Hasenfratz, Chair
President, Chairman & CEO, Linamar

Mike Andrade
CEO, Morgan Solar

Mike Baker
CEO, Wood Manufacturing Cluster of Ontario

Rhonda Barnet, B.Sc., C.Dir.
CEO, Palette Skills

Chris Brown
Vice President, GDLS Canada

Tony Chahine
CEO, Myant

Moirra Harvey
Executive Director, Ontario Aerospace Council

Sandra Ketchen
President & CEO, Spectrum Health Care

Jennifer Maki
Corporate Director,
Franco Nevada, Baytex Energy

Carol McGlogan
President & CEO, Electro-Federation Canada

Joris Myny
Senior Vice President, Digital Industries, Siemens Canada

Angela Pappin
Chief Transformation Officer, ArcelorMittal North America

Thomas Ferns
General Counsel and Corporate Secretary, Mohawk College

Angela Mondou
President & CEO, Technation

Lyne Dubois
Vice President, Investissement Québec - CRIQ

Michel Toutant
Senior Partner, Novacap

NGen's Strategy for Success

NGen builds world-leading advanced manufacturing capabilities in Canada, for the benefit of Canadians.

Our long-term objective is to strengthen the competitiveness and growth potential of Canada's advanced manufacturing sector, enhance the support capacity of Canada's advanced manufacturing ecosystem, and contribute to the well-being of Canadians. We focus on strategic opportunities to make Canada the leading green supplier of products to the world.

Funding for NGen's initiatives is derived primarily from the Government of Canada's Global Innovation Cluster (Super-cluster) initiative, with additional contributions from other public funding programs as well as from industry.

By 2028 NGen aims to deploy that funding to:

- Facilitate more than \$900 million in industry investments in research, development, and innovation.
- Boost GDP by more than \$23 billion and industry revenue by more than \$34 billion.
- Create more than 23,000 well-paying full-time jobs in advanced manufacturing.
- Help over 500 small and medium sized enterprises (SMEs) scale their technology capabilities into commercially viable solutions for manufacturing.
- Engage at least 5,000 industry and ecosystem partners from every province across Canada in NGen programs and other ecosystem initiatives.
- Make significant contributions to workforce development, supply chain resiliency, environmental sustainability, and the health and safety of Canadians.

NGen's strategy for achieving these long-term goals is to leverage the research, technology and industrial strengths, workforce skills, and supporting innovation infrastructure resident across Canada in order to accelerate industry investment in innovation and the development, scale-up, and the productive deployment of advanced technologies in Canadian manufacturing and their commercialization in global markets. Accordingly, NGen works to:

- Provide leadership for Canada's advanced manufacturing sector by identifying strategic opportunities for innovation and commercial success.
- Promote Canada's advanced manufacturing capabilities across the country and internationally.
- Make connections, facilitate innovation partnerships, and improve access to ecosystem resources, including facilities enabling technology demonstration, pilot projects, scale-up, and adoption.
- Fund and support the commercialization of collaborative, industry-led projects that have the potential to transform advanced manufacturing in Canada and make significant contributions to GDP, job creation, and the well-being of Canadians.
- Develop and attract a highly skilled, diverse, and inclusive advanced manufacturing workforce, with a special emphasis on attracting youth and under-represented groups into advanced manufacturing careers.
- Provide training, services, and connections to other resources to help companies improve the management of advanced manufacturing processes and implement net-zero emission facilities.

All NGen initiatives are designed to be:

- Transformative – building world-leading advanced manufacturing capabilities in Canada or strategic capabilities that enhance the competitiveness of Canada's advanced manufacturing ecosystem.
- Applied – developing, piloting, testing, and demonstrating advanced manufacturing solutions with significant near-term commercial potential.
- Collaborative – enabling capabilities that no individual company or organization can achieve on its own.
- Enduring – contributing know-how and resources that strengthen Canada's advanced manufacturing ecosystem.

Our vision for NGen in 2028 is to be:

- The leading enabler of green transformation and business growth in Canada's advanced manufacturing sector.
- The nucleus of an ecosystem that supports the success

of Canada's advanced manufacturing sector and that is a magnet for talent and investment in Canada.

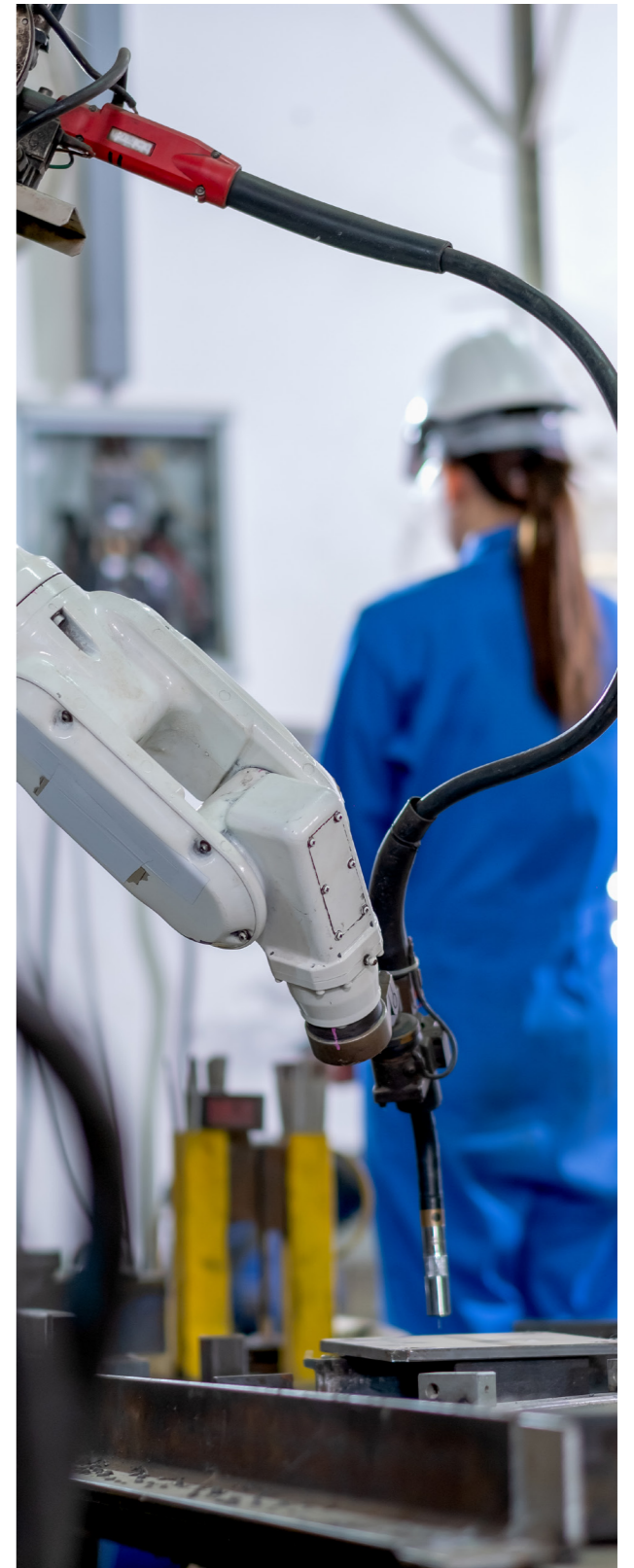
- A dynamic, highly motivated, and expert team of change makers committed to the success of Canada's advanced manufacturing sector.
- A financially sustainable organization investing in advanced manufacturing transformation that outperforms the expectations of our funders.

Our success therefore depends on the distinct value we deliver to:

- Our customers (the manufacturers and technology companies that define Canada's advanced manufacturing sector), by enabling their successful transformation and business growth.
- Our ecosystem partners (the academic and research institutions, business services, industry and innovation networks, and other public sector organizations that support Canada's advanced manufacturing sector), by guiding and supporting their initiatives, connecting and coordinating their activities, and leveraging the power of our network.
- Our employees, by maintaining a work environment that ensures equity, diversity, and inclusion, personal respect, and opportunities for professional development.
- Our funders, by responsibly managing the funds we receive and achieving superior investment results.

It also depends on building upon NGen's own strategic advantages. As an industry-led organization NGen focuses on the innovation and business challenges facing Canada's advanced manufacturing sector, and the opportunities that industry identifies for investment. NGen's extensive network of manufacturers, technology providers, and support organizations allows us to mobilize and engage partners from across Canada's advanced manufacturing ecosystem in an efficient and timely way. Our emphasis on collaboration offers individual companies and ecosystem partners innovation and business opportunities they would not be able to realize on their own, whether those entails participating in the development of integrated technology solutions for manufacturing, taking advantage of shared industry knowledge and best practices, or amplifying and taking advantage of the support services provided by ecosystem partners. In addition, NGen's focus on funding later-stage technology pilots, scale-up, and implementation in manu-

facturing fills a critical funding gap in Canada's innovation support system. NGen provides a unique non-dilutive funding service that complements financial support for innovation in advanced manufacturing from other public funding agencies and private sector investors in Canada.



Objectives for 2021-2022

NGen set three priority objectives in its Corporate Plan for 2021-2022:

1. Complete the allocation of the initial \$230 million in funding allocated to NGen from the Global Innovation Cluster (GIC) program and facilitate the successful completion and commercialization of projects in which NGen invested GIC funds.
2. Raise additional funding in order to sustain NGen's ability to support world-leading, industry-led advanced manufacturing projects and ecosystem development initiatives.
3. Focus greater attention on ecosystem development.

These priorities are reflected in the initiatives undertaken by NGen over the past financial year. Between April 1st, 2021 and March 31st, 2022:

- All funds managed by NGen were fully allocated to projects.
- NGen closed out 30 projects (another 12 projects have been completed but have yet to be officially closed out). Our completed and closed projects account for

\$64.3 million in NGen funding and \$110.4 million in total investment. By the end of March 2022, they had delivered \$1.92 billion in new sales and IP licensing revenues and have directly generated 1,137 full-time jobs.

- NGen secured \$20.5 million in additional funding. NGen was allocated \$20 million from new Cluster funding announced in Budget 2021, which we targeted primarily to support collaborative initiatives that will enhance advanced manufacturing capabilities across Canada's Electric Vehicle value chain. NGen also secured \$500 million in NRC-IRAP funding to support SMEs in testing new applications in additive manufacturing.
- NGen approved an additional \$38.3 million in direct funding support for ecosystem development activities, including industry-led Ecosystem Development Projects, SME Capacity-Building Projects, and Strategic Ecosystem Initiatives funded by NGen out of our operating budget.

The priorities were also reflected in the ambitious targets that our Board of Directors set for NGen to achieve by the end of March 2022. We surpassed most of those objectives by the end of the year.

Strategic Priority	Targets for 2021-2022	Status by March 31st, 2022
Leadership	- Net Promoter Score of 35* - 350 respondents - 75% of project partners reporting	- NPS of 52 - 363 respondents - 81% of project partners
Project Realization	- \$200 million in NGen funding contracted - \$25 million raised in additional funding for projects in addition to original tranche of ISI funding	- \$224.9 million contracted - \$20.5 million raised in additional funding
Ecosystem Support	- 500 registrants in NGen skills development programs - Virtual robotics simulation program launched with 100 users - Transformation Leadership Program launched with 100 registrants	- 501 registrants - 2,965 students enrolled in simulations - 112 registrants in TLP
Financial Management & Compliance	- \$3.0 million raised in industry contributions to operating expenses - Financial statements signed off by external auditor - No compliance violations	- \$5.8 million in industry contributions - Clean audit - No violations
Impact	- 4,000 members - 50% of completed projects reporting NGen assistance in commercializing results - 50 recorded cases of innovation partnerships brokered by NGen - 50,000 engaged visits to NGen's CareersoftheFuture.ca website - 50% of engaged visits from female students	- 4,756 members - 89% of completed projects - 416 companies in 167 recorded partnerships - 319,981 engaged site visits - 49% female

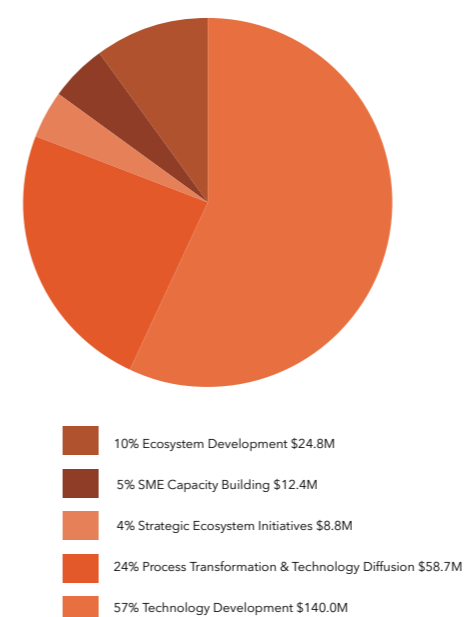
* A Net Promoter Score is a method of gauging customer satisfaction. We surveyed NGen project partners and program participants to ask on a scale of 0 to 10 how likely they are to recommend our services to others. The NPS is calculated by subtracting the number of detractors (those scoring 6 or below) from the number of promoters (those scoring 9 and 10).

Program Funding Streams

By the end of March 2022 NGen had committed a total of \$244.7 million in GIC funding to support five program streams.

1. High Potential Technology Development projects that develop and scale new manufacturing processes with the potential to give Canadian manufacturers a significant competitive advantage in world markets.
2. Ground-Breaking Process Transformation and Technology Diffusion projects that involve the adoption of advanced technologies to transform existing manufacturing processes in critical sectors of Canadian manufacturing.
3. Industry-led Ecosystem Development projects that enhance education and training, research and testbed infrastructure, and scale-up supports for Canada's advanced manufacturing ecosystem, and particularly for SMEs.
4. SME Capacity Building projects that support smaller-scale pilots, technology and commercialization feasibility studies, and cluster-building activities.
5. Strategic Ecosystem Initiatives that address critical gaps in Canada's advanced manufacturing ecosystem and are funded directly from NGen's own operating budget.

Total Funding Allocations to NGen Program Streams



Manufacturing Revolutionized

NGen projects are securing supply chains, protecting the environment, improving healthcare, and supporting technology adoption across Canada.

NGen's industry-led approach enables private sector leaders to pursue game changing, market-driven innovations.

We are founded on the principle that digital transformation in advanced manufacturing will enrich the lives of Canadians, delivering better products and good jobs while generating the economic growth essential to a better future.



Strengthening Canada’s Advanced Manufacturing Ecosystem

All NGen initiatives, including the industry-led projects in which we co-invest, are intended to contribute to and strengthen Canada’s advanced manufacturing ecosystem.

NGen has a unique role to play in this regard by focusing the attention of ecosystem partners on advanced manufacturing, identifying and supporting industry-led innovation priorities, and building connections and collaboration across an extensive network of manufacturers, technology companies, academic and research institutions, innovation networks, other support organizations, and individual experts that are all part of NGen’s membership.

Canada is the home of many technology leaders in advanced manufacturing, world-renown research in the field, and manufacturing companies already active in global supply chains and export markets. But many of the country’s advanced manufacturing assets and capabilities are not widely known. Linkages between researchers and technology companies on one hand and manufacturers on the other, are underdeveloped. Our objective is to build Canada’s advanced manufacturing supercluster by expanding and engaging NGen’s membership and by networking, supporting, and developing collaborative innovation and commercialization opportunities for members across the ecosystem.

An systemic ecosystem approach is vital to solve the technical and manufacturing problems facing Canadian industry and tackling many of the bigger economic, social, and environmental challenges confronting Canadians, now and in the future. Advanced manufacturing is powering many of the solutions that we need. But it takes an ecosystem to achieve success, and to ensure that the opportunities and value of innovation are captured in Canada.

Collaboration is at the heart of NGen’s strategy. World-leading capabilities in advanced manufacturing cannot be built one company or one organization at a time. The pace of technological change, business disruption, and emerging market opportunities is simply too fast for any one entity to

take all the risks or command all the resources needed to succeed on its own.

Unique manufacturing solutions depend on integrating knowledge, tools, and capabilities that employ a variety of advanced digital, materials, and production technologies and techniques. Deployment, scale-up, and commercialization of those solutions depend on maximizing the potential of shared intellectual property and support from innovation networks, business services, public sector, and investment infrastructures for their success. Business knowledge and best practices shared across organizations, sectors, and regions are instrumental in enhancing the leadership and management capabilities required to develop and execute new business strategies effectively. Everyone in Canada’s advanced manufacturing ecosystem has a stake in developing and gaining access to a highly qualified workforce.

NGen funding provides an important incentive for building collaboration and for strengthening Canada’s advanced manufacturing ecosystem. All NGen technology-related projects are expected to make a significant contribution in the form of intellectual property, education and workforce development opportunities, business knowledge, and/or tools and testbeds that can be shared with other NGen members. NGen also invests in industry-led projects that specifically aim to enhance ecosystem capacity, providing direct support for the development of local innovation clusters, as well as funding for feasibility and pilot projects to help SMEs demonstrate, test, and scale up innovative manufacturing solutions.

NGen is uniquely positioned to work on behalf of its members by building collaborative approaches to programming, funding, and policy making that supersede organizational and jurisdictional boundaries. To that end, NGen invests in strategic initiatives that address critical gaps in Canada’s advanced manufacturing ecosystem which it funds from its own operating budget.

In 2019-2020, NGen conducted a series of consultations with our Board as well with other industry and ecosystem leaders across the country to identify critical gaps and opportunities for strengthening support systems for Canada’s advanced manufacturing sector. Priorities are summarized in NGen’s Ecosystem Consensus Report published in May 2020. The report indicates that over 95% of members expect NGen to promote Canada’s advanced manufacturing capabilities across the country and around the world. A majority of members also expect NGen to inform public- and private-sector innovation policies about the capabilities, opportunities, and constraints affecting the growth potential of the sector. Other priorities for NGen initiatives include:

- Identification of innovation partnership and business opportunities within Canada and internationally.
- Curated access to thought leadership on advanced manufacturing trends and best management practices around the world.
- Initiatives that address current and future skills shortages in advanced manufacturing, including the attraction of more young people into advanced manufacturing careers.
- Initiatives that enhance diversity and inclusion in Canada’s advanced manufacturing workforce.
- Programs that enhance advanced manufacturing leadership and management capabilities.
- Cluster development in new fields of advanced manufacturing like advanced materials, digital twinning and

simulation, biomanufacturing and medical technologies, cybersecurity, quantum computing, and artificial intelligence.

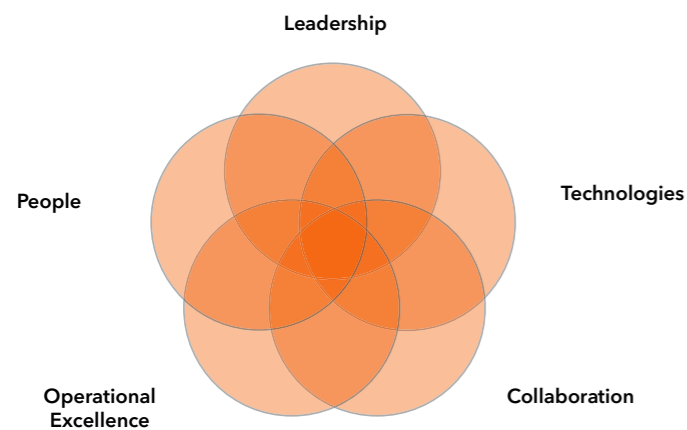
- The development of online platforms for diagnostics, training, partnering, IP commercialization, and data sharing.
- Facilitated access to public- and private-sector funding and procurement.

These priorities inform the direct investments that NGen is making in ecosystem development through our project funding as well as our own Strategic Ecosystem Initiatives.

In 2021-2022 NGen invested \$5.8 million from our operating budget in Strategic Ecosystem Initiatives. We also approved \$7.7 million in additional funding for SME capacity-building projects leveraging, including \$1.2 million to support the development of advanced manufacturing clusters across Canada, and \$15.6 million for industry-led Ecosystem Development projects. Based on project plans and updated project budgets, we estimate that the investments approved for technology development, adoption, and diffusion projects will contribute an additional \$66.8 million in NGen and industry funding for ecosystem support. This funding brings NGen’s total approved investments for ecosystem development to \$68.1 million which will leverage an estimated \$120.9 million in additional industry other public sector contributions. Total funding support for ecosystem development initiatives is estimated at \$189.0 million.

Support for Ecosystem Development	Approved NGen Funding	Total Investment
Technology Projects (Estimate)	\$22.1 million	\$66.8 million
SME Capacity Building Projects	\$12.4 million	\$27.3 million
Industry-Led Ecosystem Development Projects	\$24.8 million	\$86.1 million
Strategic Ecosystem Initiatives	\$8.8 million	\$8.8 million
Total Allocated to March 31, 2022	\$68.1 million	\$189.0 million

Strategic Ecosystem Initiatives



- Participation in innovation and industry speaking engagements and events.
- Providing advice on advanced manufacturing to public and private sector organizations.
- Media outreach to industry and the general public.

In its 2021-2022 Corporate Plan, NGen undertook to commission and publish a series of reports on strategic trends and industry opportunities in advanced manufacturing. During the year, NGen partnered with 13 organizations and published 10 reports providing in-depth analysis and insights on:

NGen's Strategic Ecosystem Initiatives are aligned to supporting transformation across Canada's advanced manufacturing ecosystem. They are activities that NGen funds directly from our operating budget that provide leadership and strategic direction for Canada's advanced manufacturing sector, support existing programs that enhance ecosystem capabilities, connect and encourage collaboration among ecosystem members, and address priority issues identified in NGen's Ecosystem Consensus Report where NGen can play a value-adding role by addressing some of the gaps in ecosystem support.

Leadership

NGen's Leadership initiatives are designed to inform NGen members and the public about strategic trends and opportunities reshaping Canada's advanced manufacturing sector, promote Canada's advanced manufacturing capabilities to Canadians as well as on the world stage, and provide expert advice to business as well as policy leaders about advanced manufacturing.

Our Leadership initiatives include:

- Analysis and reports on strategic industry trends and opportunities.
- Participation in Boards and Advisory Groups related to advanced manufacturing.
- *What's Next* Workshops on current and upcoming industry issues.

- Canada's advanced manufacturing skills gap (prepared by EMC, the Excellence in Manufacturing Consortium).
- The standards, certification, and testing infrastructure for PPE products critical in the fight against COVID-19 (in partnership with CSA and NRC-IRAP).
- PPE supply chain constraints and opportunities for improvement (in partnership with the University of Windsor and the Canadian Association of PPE Manufacturers).
- Autonomous Material Discovery and Development (prepared by UBC's School of Engineering).
- How NGen might positively address the problem of single-use plastics (in partnership with Ivey Business School).
- The Circular Food Economy (prepared by the Guelph-Wellington Our Food Future initiative).
- Canadian Automotive Supplier Capability and Electric Vehicle Value Chain Analysis (in partnership with Porsche Consulting, the Automotive Parts Manufacturers Association, and the Trillium Network for Advanced Manufacturing).
- The effectiveness of Ontario's Advanced Manufacturing Consortium model in meeting the needs of industry (prepared by McMaster University's Manufacturing Research Institute).
- The state of advanced manufacturing in Newfoundland and Labrador (prepared by Canadian Manufacturers & Exporters Newfoundland & Labrador Division).
- The competitiveness of Canada's manufacturing supply chains (an inhouse NGen report).

All reports are published on NGen's website at [NGen.ca](https://ngen.ca).

NGen also partnered with the Innovation Economy Council in its research and analysis of opportunities for accelerating IP commercialization and the commercialization of Canadian cleantech (<https://innovationeconomyCouncil.ca/reports/>), as well as with the Brookfield Institute for Innovation and Entrepreneurship in the preparation of Canada's Moonshot: Solving Grand Challenges through Transformational Innovation (<https://brookfieldinstitute.ca/canadas-moonshot/>).

Members of the NGen team sit on 25 Boards and Advisory Groups related to advanced manufacturing, including:

- The World Manufacturing Forum's Advisory Board.
- The World Economic Forum's Advanced Manufacturing Industry Community.
- The European Commission's INNOWWIDE selection committee for advanced manufacturing.
- The Trillium Network for Advanced Manufacturing.
- The Martin Family Initiative's Advisory Committee for Indigenous Entrepreneurship Education.
- The Supply Chain Advancement Network in Health (SCANH).
- Vineland Research Centre's Advisory Board.
- The National Research Council's Automotive and Surface Transportation Advisory Board and Advanced Manufacturing Sub-Committee.
- Canadian Advanced Air Mobility's Ontario Executive Committee.
- The Automotive Parts Manufacturers Association's Digital Manufacturing Committee.

NGen has played an instrumental advisory role in establishing the Canadian Food Innovation Network (CFIN) and has worked with CFIN over the past year in publicizing its calls for proposals related to advanced manufacturing solutions for the food sector. NGen has also been invited to join the World Economic Forum's Global Lighthouse Network of leading advanced manufacturing cluster initiatives.

NGen undertook to organize at least six online events in 2021-2022, including a national summit on supply chain resiliency. The summit took place in June 2021 with 291

participants attending online. In July NGen held its third Collaboration Day with a special emphasis on the Electric Vehicle Value Chain. The event attracted 409 online participants. NGen's What's Next workshops are opportunities to disseminate strategic insights and engage members in discussions about important trends affecting the industry. We organized seven online workshops in 2021-2022 focusing on Adaptive Leadership in the Face of Crisis, Innovation Challenges in the EV Value Chain, Industrial Applications of Cobots, Accelerating Workforce Development through Digital Work Instructions, Technology Innovation and Adoption in Canada's Mining Sector, Smart Factory Trends to Unlock the Potential of Digital Production Operations, and the Global Outlook for Manufacturing. The workshops attracted 388 online participants. In total during the year, NGen's online events attracted 1,088 participants and 59,127 subsequent web views. They enjoyed a quality rating of 8.4 out of 10.

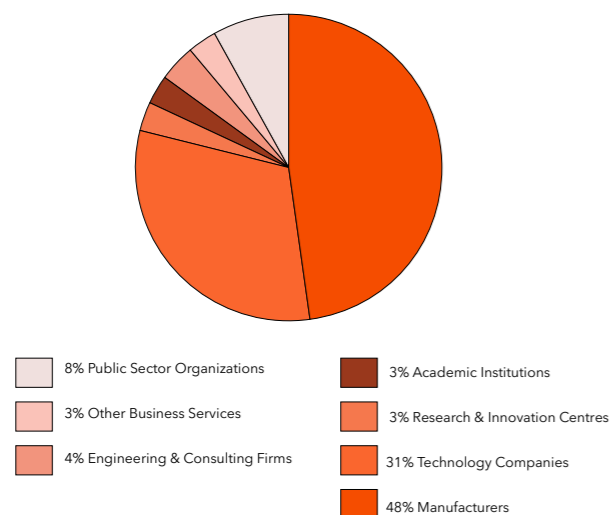
We also launched our Project Podcast series at the end of March of 2022. The bi-weekly podcasts highlight NGen projects and project partners, drawing attention to the ground-breaking solutions that NGen is supporting. Podcasts are streamed on NGen's LinkedIn site and then posted on our YouTube channel. Six podcasts have been produced between March and the end of June 2022. They have attracted 306 unique livestream viewers on LinkedIn and another 3,476 viewers on our YouTube channel.

NGen also committed to ramping up our efforts to promote Canada's advanced manufacturing capabilities within Canada and internationally. In 2021-2022, NGen participated in 191 industry- and academic-hosted online events and in-person conferences, including 25 speaking engagements with an international audience. During the year NGen also generated over 197 million offline media impressions, 54 million social media impressions, and over 2 million engaged visits to our website.

Connections and Collaboration

Building connections and strengthening collaboration across Canada's advanced manufacturing ecosystem is at the heart of NGen's strategy to build world leading capabilities in Canada.

NGen's initiatives to strengthen ecosystem connectivity

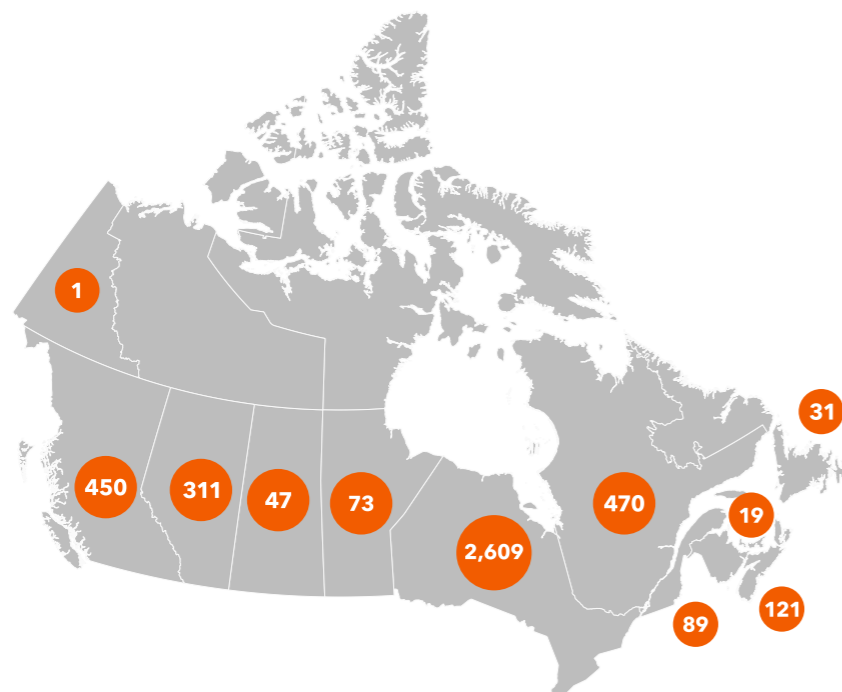
NGen Members by Type of Organization


and collaboration within Canada include:

- Membership development enabling the identification and matching of member capabilities.
- Advanced manufacturing Cluster Building Projects and support for cross-cluster collaboration.
- Collaboration workshops and events, as well as facilitating one-on-one connections for NGen members.
- Partnerships with other innovation funding organizations.

NGen builds its network – and connects the ecosystem – by expanding its membership of manufacturers, technology providers, academic and research centres, innovation and industry clusters, supporting services, public sector agencies, and individual researchers and industry experts. NGen members do not pay a fee to belong to the network, but they are screened and expected to describe their capabilities and how they contribute to advanced manufacturing. That information is then made available for all NGen members, allowing them to identify and connect with potential innovation partners as well as providing NGen with a rich database that we use to map out the ecosystem, promote capabilities, and help facilitate collaborative partnerships and new business opportunities.

In its 2021-2022 Corporate Plan, NGen set a target of reaching 4,000 members by the end of March 2022. The purpose was not only to grow our network but to increase opportunities for engagement in ecosystem initiatives in addition to possible project participation. By the end of March 2022, NGen's membership network had grown to 4,756 members, including 2,819 organizations and 1,408 individual researchers, industry, and technology experts in Canada as well as 529 international members. Over 92% of our organizational members from Canada are SME manufacturers and technology companies.

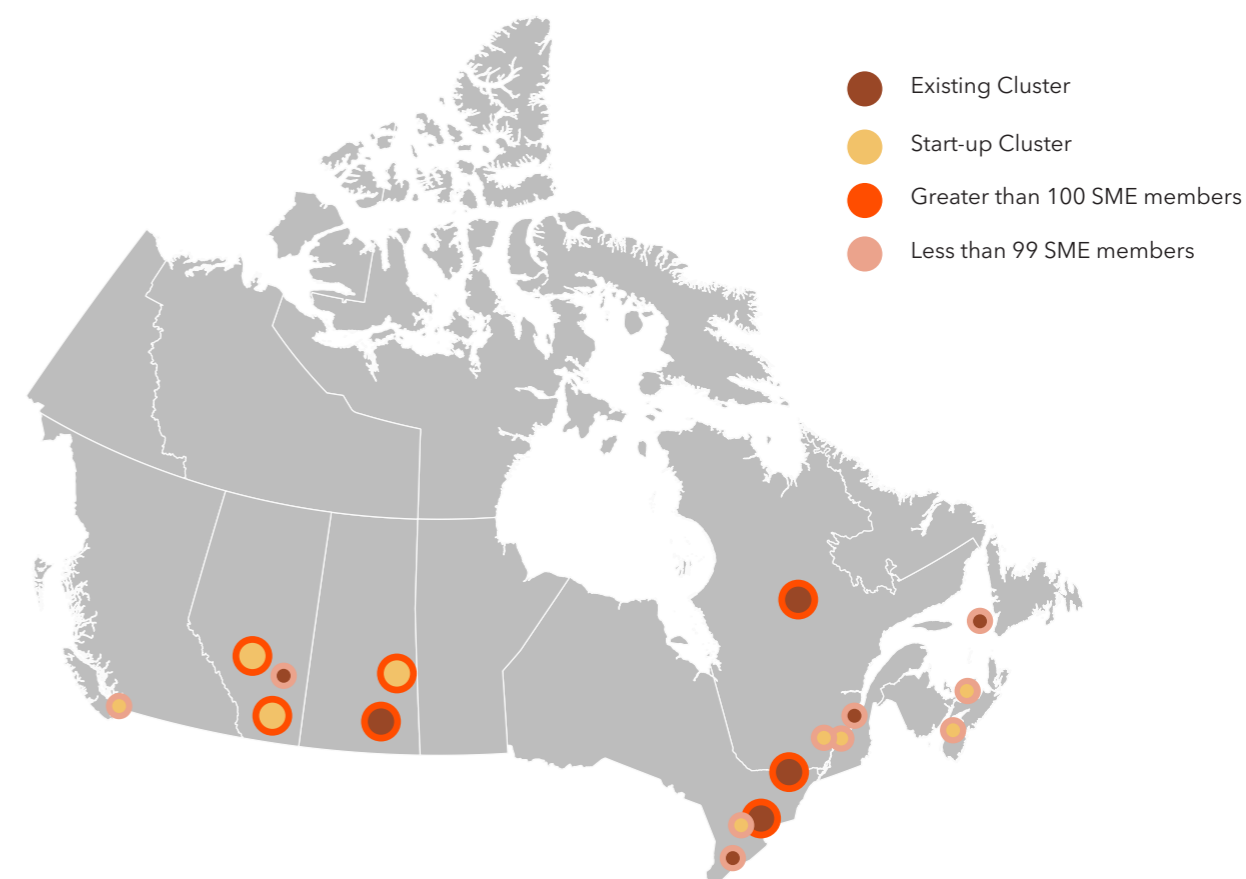
**NGen Membership across Canada
March 31st, 2022**


NGen members are located in every province across Canada, as well as in the Yukon. While Ontario accounts for a majority (55%) of members, other regions are also well represented – Quebec, BC, and the prairie provinces each account for about 10%, and Atlantic Canada for just over 5%, of our total membership.

NGen members include industry and business networks as well as organizations that lead advanced manufacturing clusters across the country. NGen Capacity Building Projects provide funding support for industry-led initiatives to establish or enhance the digital services of advanced manufacturing clusters across the country. In our Corporate Plan for 2021-2022 we aimed to increase the total amount of NGen and industry investment in cluster-building projects to at least \$2 million and to develop connections and collaborative relationships among advanced manufacturing clusters across Canada. Over the year NGen approved funding for 15 advanced manufacturing clusters, bringing

the total to 17 clusters in our project portfolio. Nine are start-up clusters established as a result of NGen support, including the Saskatchewan Indigenous Manufacturing and Construction Network, the first Indigenous advanced manufacturing cluster in Canada. By the end of March 2022, total NGen and industry investment in all clusters amounted to \$2.9 million.

NGen's cluster ecosystem brings together more than 1,750 companies and research organizations from across Canada with an industry footprint that addresses a market in excess of \$50 billion. In addition to funding, NGen plays an active role in providing advice and other support services for cluster management and service delivery, as well as in facilitating collaboration among clusters. All clusters and cluster members have access to NGen services and workshops and our database of member capabilities. They serve as important channels for NGen communication and engagement with the ecosystem beyond NGen membership. They all work to support their own networks of advanced manufacturing companies and ecosystem partners.

NGen's Cluster Ecosystem


As a result of NGen cluster-building funding:

Saskatchewan Indigenous Manufacturing and Construction Network (start-up cluster, 22 organizations) was created, forming Canada's first Indigenous Manufacturers Cluster, to develop training opportunities for Indigenous youth, share best practices in manufacturing management and technology adoption, and generate new business opportunities for Indigenous manufacturers.

Ontario Aerospace Council, (existing cluster, 200 SMEs) created a B2B aerospace matchmaking platform to improve competitiveness, generate business opportunities, and grow revenues for its members.

Canadian Association of Mold Makers (CAMM), (existing cluster, 200 organizations) an Ontario-based pan-Canadian cluster, developed a virtual platform for industry stakeholders to deliver collaborative solutions critical for the continued success of Canadian mold makers. CAMM is now working with Photons Canada to manufacture smart products.

Canadian Association of PPE Manufacturers (CAPPEM) (start-up cluster, 42 organizations) was established as a pan-Canadian collaborative network of PPE manufacturers to expedite standards certification, enhance the resilience to Canada's PPE supply chain, and commercialize made-in-Canada PPE.

Reseau Trans AL, (existing cluster, 252 organizations) based in Quebec, is piloting a training program combining photonics, machinery and big data to educate over 250 metal machine shops on the efficiencies that data can deliver.

Canada Makes, (start-up cluster, 42 organizations) was able to become self-sustaining as a pan-Canadian additive manufacturing cluster. Canada Makes brings together leading additive experts from industry and academia to collaborate with manufacturers in solving complex machining challenges in a more competitive way and establish a Canadian brand for additive manufacturing technologies. Members of Canada Makes have also benefited from NGen's Metal and Engineered Plastics Additive Manufacturing Industrial Demonstration Program, funded by NRC-IRAP, which assists SME manufacturers pilot and test new additive manufacturing applications.

Canadian Manufacturers & Exporters, Newfoundland & Labrador Division, (existing cluster, 28 organizations) establis-

hed a special interest group of manufacturers across the province to better understand the benefits, best practices and efficiencies of Industry 4.0 solutions and help grow business opportunities in an underserved region of Canada.

Destination AI, (start-up cluster, 30 organizations) was established as a pan-Canadian cluster of technology experts in artificial intelligence working with manufacturers to raise awareness about the benefits, use cases, and requirements involved in commercializing AI applications in manufacturing and accelerate the adoption of those solutions by manufacturers across Canada.

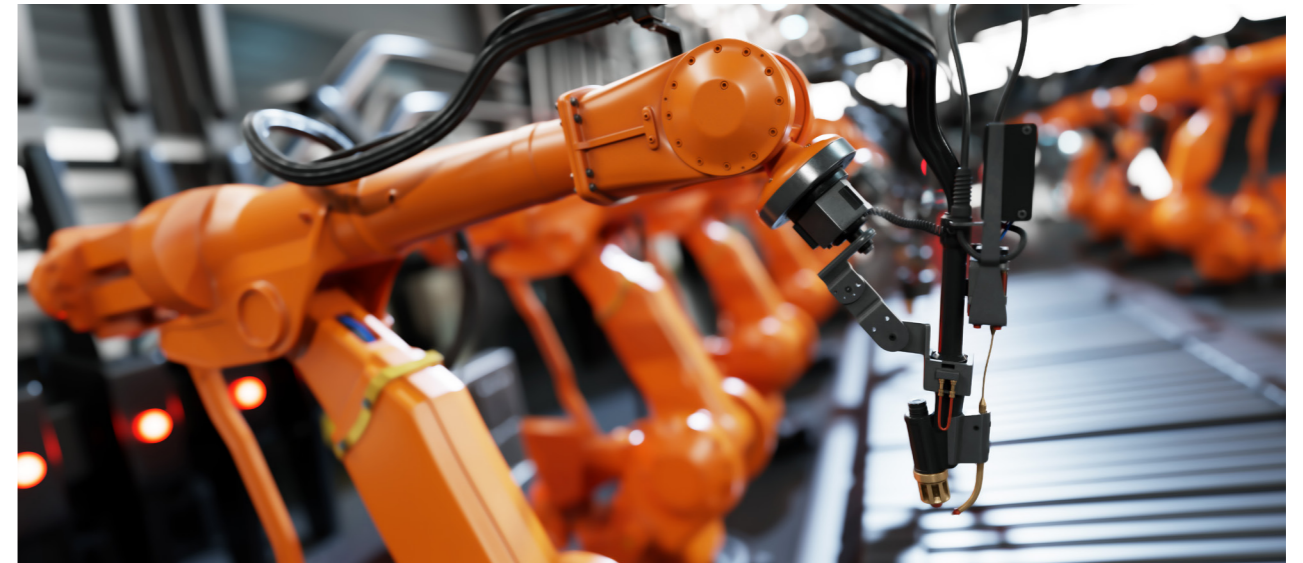
Saskatchewan Industrial Mining Suppliers Association (SIMSA), (existing cluster, 300 SMEs) ran a virtual trade mission to South America which generated \$20 billion in new business opportunities. SIMSA's membership has grown by 23% due to the delivery of digital services enabled by NGen. SIMSA's Carbon Calculator tool is now available to all NGen members. SIMSA and NGen are also partnering to support the Saskatchewan Indigenous Manufacturing and Construction Network.

Wood Manufacturing Cluster of Ontario, (existing cluster, 140 organizations) developed a virtual platform to deliver agile workshops, best practices, collaboration and procurement events.

The Verschuren Centre, (start-up cluster, 30 organizations) a pan-Canadian cluster based in Nova Scotia, designed its bio-ingredient circular economies program which brings SME clean technology companies together with manufacturers to replace petrochemical ingredients with bio-ingredients.

Materials Atlantic, (start-up cluster, 10 organizations) a pan-Canadian cluster also based in Nova Scotia, developed a program that brings technology experts in advanced, nano, energetic and battery materials together in collaborative ventures with manufacturers. The Verschuren Centre and Materials Atlantic are working together to leverage their expertise in advanced bio-materials.

Photons Canada, (existing cluster, 50 organizations) a pan-Canadian cluster based in Quebec, developed a program to bring photonics and optic technology companies together in collaborative ventures with manufacturers to deliver new production efficiencies.



Alberta Manufacturers & Exporters Enhancement Cluster (Alberta MEE) (start-up cluster, 7 organizations) was formed, bringing together SMEs from across Alberta to connect and collaborate in developing new lines of business in advanced manufacturing and support workforce development.

Materials & Reliability in Oil Sands (MARIOS), (existing cluster, 38 organizations) a pan-Canadian cluster based in Alberta, is helping SME manufacturers with an oil and gas focus broaden their customer base and increase revenues by de-risking Industry 4.0 solutions for greater efficiencies. MARIOS and Alberta MEE are working closely together in support of their members.

NanoMedicines Innovation Network (start-up cluster, 40 organizations) a pan-Canadian cluster based in BC, is working with CMC Microelectronics to create Canada's first nano-medicines group to advance medical device, vaccine, diagnostics, and new medical innovations.

Canadian Advanced Air Mobility Network, (start-up cluster, 30 organizations) a pan-Canadian cluster also based in BC, has created a collaborative program involving established aerospace and automotive organizations and companies to develop Zero-Emission air mobility solutions.

In addition to our cluster-building initiatives, NGen works to build connections and collaboration among our members and identify potential partners for innovation projects through a series of collaboration workshops and events, as well as one-on-one interactions with members. In 2021-2022, we hosted 12 online workshops involving over 500 members focusing on partnership opportunities for Capacity Building

Projects and our Electric Vehicle Value Chain challenge.

NGen set a target of brokering at least 100 industry partnerships in 2021-2022. By the end of March 2022, NGen had brokered partnerships involving 416 companies (392 of them SMEs), including 28 international partnership engagements, in addition to the partnerships formed among companies and research organizations in NGen-funded projects.

Collaboration with other funding agencies is also an important way for NGen to leverage financial and program support for advanced manufacturing projects and other ecosystem initiatives. Over the past year, NGen has worked jointly with federal and provincial departments including Innovation Science and Economic Development Canada, Natural Resources Canada, Global Affairs Canada, Agriculture and Agri-Food Canada, Health Canada, Environment and Climate Change Canada, Employment and Social Development Canada, BC's Ministry of Jobs, Economic Recovery and Innovation, the Ministry of Economic Development, Job Creation, and Trade as well as the Ministry of Education in Ontario. We have worked as well with a number of other public sector agencies like the National Research Council, NRC-IRAP, Invest in Canada, BDC, EDC, the National Science and Engineering Research Council, the Federal Development Agency for Southern Ontario, Prairies Economic Development Canada, the Atlantic Canada Opportunities Agency, Investissement Québec, and Innovate Alberta. We have also co-developed and co-funded projects with the Digital Supercluster and Scale-AI, Sustainable Technologies Development Canada, MITACS, Vineland Research Centre, the Trillium Network for Advanced Manufacturing, and the Canadian Food Innovation Network.

International Strategy

International engagement is a key aspect of NGen's efforts to promote Canada's advanced manufacturing capabilities to the world, find opportunities to build collaborative innovation partnerships in multinational supply chains, attract advanced manufacturing talent and investment to Canada, and develop international commercialization opportunities for NGen members and project partners.

NGen's strategy for international engagement prioritizes promotion, partnerships, investment and other commercial opportunities with those countries, international companies, and innovation programs that are leaders in advanced manufacturing. Country/regional targets include the European Union (particularly Germany, Italy, Sweden, France, Belgium, and the Netherlands), the United Kingdom, Japan, South Korea, and the United States. Corporate targets include international technology providers, manufacturing companies, and investment firms that have indicated a potential interest in locating or investing in Canada to gain access to the country's advanced manufacturing ecosystem or high-quality talent pool. International partners include advanced manufacturing clusters, export and economic development agencies, and advanced manufacturing innovation centres, as well as the Eureka! program managed in Canada by NRC-IRAP. NGen is also an active participant in key events related to advanced manufacturing like the World Manufacturing Forum, Hannover Fair, and other international trade shows showcasing advanced manufacturing technologies. NGen works in conjunction with Canadian partners, including Global Affairs, Export Development Canada, NRC-IRAP, Invest in Canada, as well as federal and regional economic development agencies in pursuit of its international strategy objectives.

In its 2021-2022 Corporate Plan, NGen undertook to increase its international engagement and collaboration efforts, placing particular emphasis on the strategic business opportunities that its members have identified – med-tech and bio-manufacturing, cleantech and clean energy, aerospace, autonomous vehicles, machine learning and robotics. Over the past year, NGen has taken an active international role, in spite of the cancellation of in-person international events due to COVID-19. Key international engagements in 2021-2022 included:

- Participation in the World Manufacturing Forum, including membership of the Foundation's Scientific Advisory Council and input into WMF reports.
- Leading Canadian participation in 2021's online version of the Hanover Messe, the world's leading advanced manufacturing trade fair. NGen organized a conference program involving Canadian Minister Champagne, Ontario Minister Fedeli, and Quebec Minister Fitzgibbon and featuring four Ontario and Quebec leaders in electric vehicle technology. NGen also organized livestream presentations and networking opportunities for seven Canadian AI, additive manufacturing, and robotics companies during the week-long virtual event resulting in 1,116 qualified business leads from around the world during the event and 43 connections afterwards.
- Presentations to international audiences, including policy makers and companies involved in the European Union's Horizon program (the event which highlighted Canadian AI and robotics capabilities was organized by NGen in partnership with Science Business and Canada's Mission to the EU), the Canada-EU Workshop on Opportunities in Cleantech (a panel with Canada's Minister of Environment and Climate Change), the Canada-Italy symposium on the hydrogen economy, the Toronto International Investment Forum, Japan Investment Forum, NRCan's symposia on critical minerals and the EV value chain, the Canada-UK Dialogue on Aerospace, Canada-Sweden forum on cybersecurity, as well as online conferences with the US-based Association for Manufacturing Excellence, South Korea Technology and Information Promotion Agency, Confederation of Indian Industry, and Asia Business Leaders Advisory Council.

NGen has gained international recognition over the past year as a result of our initiatives. One of our projects, led by the Aspire Food Group which is developing a fully automated facility for processing high quality protein powders, was named by UNESCO as one of the top ten AI solutions in the world in pursuit of the United Nations Sustainable Development Goals. (The only other North American organization recognized among the top ten was NASA.) Our Careers of the Future Campaign to attract young people into careers in advanced manufacturing won the North

American SABRE award for media promotion by business associations. NGen was highlighted by the OECD as a leading example of an innovative cluster initiative. We have also been invited by the World Economic Forum to join its Global Network of Advanced Manufacturing Hubs which showcases and connects leading examples of cluster development in the sector.

People - Workforce Development

World leading advanced manufacturing capabilities are not built on technology alone. They depend on the development and productive deployment of a highly skilled, diverse, and inclusive workforce. NGen is working to build Canada's advanced manufacturing workforce capabilities by attracting more young people into the sector, preparing them with the skills they will need for a successful career in advanced manufacturing, helping current workers upskill their technology and digital competencies, assisting more female and BIPOC workers to find jobs in advanced manufacturing, and encouraging best Equity, Diversity, and Inclusion (EDI) practices in workforce recruitment and human resource management.

NGen's workforce development initiatives include:

- Our Careers of the Future Campaign, a multimedia campaign and educational website (www.careersoftwarefuture.ca) aimed at attracting more young people, and particularly females and BIPOC students, into careers in advanced manufacturing.
- Student outreach initiatives and connections to Work Integrated Learning opportunities with NGen members.
- An Indigenous Manufacturing Entrepreneurship program to educate Indigenous youth about manufacturing and prepare them with the skills required in the sector.
- Support for the Virtual Robotics Training Academy (VRTA), an online platform for students and employees to learn coding and practice with robotics and computer network simulations.
- AMPUP – NGen's open source upskilling program which offers manufacturers easier and lower cost access to modular education and training programs relevant to advanced manufacturing provided by colleges, universities, and private sector training provi-

ders across Canada.

- Development of advanced manufacturing micro-credentials in partnership with colleges and universities across Canada.

In its 2021-2022 Corporate Plan, NGen undertook to launch its Careers of the Future multimedia campaign and educational website. We aimed to realize at least 50,000 engaged visits to the website and set a target of 50% for female engagement. The campaign began in May 2021. By the end of March 2022, it had resulted in more than 390 million offline and social media impressions and 319,981 engaged site visits, 49% of them by females. According to our surveys of students and parents across the country at the beginning of the campaign and again in the autumn of 2021, the first phase of NGen's Careers of the Future campaign made 144,000 students more aware of advanced manufacturing and helped 1.5 million more young Canadians see themselves potentially in an advanced manufacturing career in the future. The campaign also allowed NGen to award 10 students across Canada a \$10,000 bursary based on winning essays explaining the importance of advanced manufacturing and why they would like to work in the sector.

The Careers of the Future campaign allowed NGen to engage with more student groups across the country and encourage NGen members to increase work integrated learning opportunities for students. In 2021-2022, we participated in 32 online interviews with youth groups including Youth Culture, the Interview Dudes, First Robotics Canada's Youth Council, Brilliant Labs in Atlantic Canada, as well as School Boards in Vancouver, Nova Scotia, Edmonton, and the Greater Toronto Area, leading to virtual appearances in 254 schools across the country and an online audience of more than 80,000 students. Working with MITACS and CEWIL Canada partners, NGen also facilitated more than 3,000 work integrated learning placements for university and college students in our projects as well as with members across the country.

NGen launched our Indigenous Manufacturing Entrepreneurship Education Program in 2021. The program aims to inspire First Nations, Inuit, and Métis youth to consider careers in manufacturing, prepare them with the knowledge and skills needed to pursue entrepreneurship and jobs in manufacturing, and provide educational resources for teachers, including connections with local manufacturers.

NGen has partnered with the Martin Family Initiative to incorporate manufacturing and financial literacy into its curricula for primary, secondary, and adult Indigenous education. By the end of March 2022, pilots were underway at two First Nations elementary schools – Clearwater River Dene in northern Saskatchewan and Morley Community School in Alberta. The pilots involve 215 grade 6 to 8 students and 12 staff members. The program will be rolled out across Canada in 2022-2023.

Our Corporate Plan for 2021-2022 also stated that NGen would support the development of an online robotics simulation platform that would allow students and other users to design, build, program, and test drive robots in a virtual environment and encourage its adoption by school boards across Canada. Over the past year, NGen has worked with InspireTech Canada and Cisco to develop VRTA-Online, a cloud-based learning platform that provides students and employees easy low-cost access to industry-relevant STEM-based simulation programs. The platform currently includes coding courses (Python, Java, R) along with four robotics and eight Cisco network simulator packages. NGen supported a Virtual Robotics bootcamp in the summer of 2021. By the end of March 2022, 2,965 students from 14 Ontario school boards had been enrolled in VRTA.

NGen also undertook to expand the curriculum, the number of education and training partners, and the number of trainees in its AMPUP program and set a target to support at least 400 trainees in the program by the end of March 2022. Over the course of the year, NGen added six new

education and training partners and increased industry enrolment in AMPUP by 216 trainees. By the end of March 2022, 389 trainees from 67 companies across Canada had participated in NGen supported training through AMPUP. Just over 40% of the training involved interprovincial connections facilitated by NGen. Over \$720,000 of training value had been delivered through discounts negotiated between NGen and 22 AMPUP training providers including business schools, schools of engineering, industry associations, and private training organizations.

NGen's AMPUP program was the catalyst for developing three new micro-credentials in Data Analytics (at Conestoga College) and 3D Visualization and Data Systems and Visualization for Manufacturing at Mohawk College in 2021. It has also helped NGen establish connections and new advanced manufacturing micro-credentialing opportunities with 14 university business schools across the country.

Our plan for 2021-2022 also committed NGen to expanding our workforce equity, diversity, and inclusion initiatives to engage more members in the 50/30 Challenge, identify best diversity and inclusion practices, and connect members to programs across the country that are working to increase the participation of women and BIPOC communities in manufacturing. Accordingly, NGen has continued to promote the 50/30 challenge to its members. We have partnered with Ryerson University's Diversity Institute and the Centre for Global Inclusion to identify global diversity and inclusion benchmarks and best EDI practices in industry and share them with our members. In addition to



NGen's support for Indigenous education and the priority we have placed on diversity and inclusion in our Careers of the Future campaign and VRTA initiative, we have also facilitated industry connections with and contributions to organizations promoting diversity and inclusion in Canada's advanced manufacturing workforce. Over the past year, NGen has actively promoted and provided in-kind organizational support to Engineers Canada for its Women in Engineering campaign, CME's Women in Manufacturing campaign, Women in AI, the See it Be it STEM it program, and Black North.

Managing Technology Adoption and Scale-Up

The profitable adoption, deployment, and scale-up of technologies in manufacturing depends on strong business leadership and the effective and efficient management of innovation in pursuit of well-defined productivity improvement and business growth objectives. It is a challenge faced by most manufacturers in Canada and around the world. According to a survey conducted by Statistics Canada in 2017, which has served as the basis for NGen management support programming, 93% of manufacturers in Canada do not conduct any competitive benchmarking. Moreover, while 80% of companies claimed that they have invested in some form of advanced technology in the previous three years, fewer than half reported that they had achieved their business objectives as a result of the investments they made.

NGen works to enhance the capacity of companies, and especially SMEs, to manage technology transformation productively and profitably through our Transformation Leadership and Factory Forward programs, as well as through industry education initiatives led by our Advanced Technology Advisory Groups.

NGen's Transformation Leadership Program (TLP) has been developed in partnership with Dr. Dan Shunk, professor emeritus in Process Engineering at Arizona State University and an international expert in process excellence and manufacturing change management. TLP is designed to guide manufacturing leadership teams through the steps required for successful digital transformation, providing them with insights and tools that will enable them to gather the information they need to make good business improvement decisions. TLP aims to reduce the risks and costs

of making poor decisions about technology adoption and deployment, strengthen competitiveness by improving organizational and supply chain alignment, and enhance collaboration by sharing experiences and best practices about advanced manufacturing management.

NGen undertook to launch TLP online in its Corporate Plan for 2021-2022 and to increase enrolment in the program. Online development of TLP modules is underway. By the end of March 2022, 112 manufacturing leaders had completed the TLP program. Training cohorts have included MHI and its suppliers as well as a consortium of SMEs in British Columbia supported by the BC government.

Factory Forward is a joint venture between NGen and RBC that led to the production of a series of videos showcasing leading advanced manufacturing companies in Canada and best practices in innovation management, together with podcasts on related management and skills development issues. NGen undertook to launch Factory Forward in 2021. By March 2022, two videos had been produced along with a series of related podcasts. They are now available on NGen's website, social media, and our Careers of the Future media channels.

As part of its effort to educate manufacturers about how best to deploy advanced technologies and to strengthen connections and collaboration between researchers and technology providers on one hand and Canadian manufacturers on the other, NGen established four Technology Advisory Groups in 2021-2022 focusing on Artificial Intelligence and Machine Learning, Additive Manufacturing, Robotics and Automation, Digital Twins, and Cybersecurity. The Advisory Groups bring together more than 200 technology leaders from across Canada to work collaboratively in disseminating knowledge and technical know-how to manufacturers with the aim of accelerating the adoption of advanced technologies and promoting their productive deployment more widely in the sector. Members also work together to identify strategic opportunities for promoting and developing a competitive Canadian advantage for their technology sectors.

NGen's Technology Advisory Groups have each undertaken industry surveys and by March 2022 had published four strategic white papers describing the current state of technology adoption within Canadian manufacturing and

opportunities for future application. Their collaborative efforts have resulted in the formation of two new cluster organizations – Canada Makes and Destination AI.

Working with our Additive Manufacturing Group (Canada Makes), NGen invested \$350,000 in additional funding from NRC-IRAP in 2021-2022 supporting the participation

of 53 SME manufacturing companies in small pilot projects to demonstrate new applications of additive technologies. The companies that received funding come from NGen’s Metal and Engineered Plastics Additive Manufacturing Industrial Demonstration Program come from across Canada and include:

Company	Location	Company	Location
3D Bridge Solutions Inc.	Waterloo, ON	Nemak/Burloak	Oakville, ON
Advanced BioCarbon 3D Ltd.	Rossland, BC	P3D	Gatineau QC
AEM Power Systems	Windsor, ON	PADM	Winnipeg, MB
Airshare	Gloucester, ON	Parkland Welding & Machine Ltd.	Yorkton, SK
Alstom/ Axis Prototype	Saint-Léonard, QC	PM Casting	Mississauga, ON
AON 3D	Montréal, QC	Precision Hydraulique	Gatineau QC
Axis Prototype/Pal Aerospace	Saint-Léonard, QC	Press Lock Technologies	Hamilton, ON
Canadian Wear Technologies Ltd.	Cobourg, ON	Promation	Oakville, ON
Cosm Medical Inc.	Toronto, ON	Rainhouse Manufacturing Canada	Victoria, BC
Diacarb	Saint-Laurent, QC	Raytheon/AMM	Concord, ON
Duxion Motors Inc.	St. Johns, NL	Regen Villages	Rossland BC
Equispheres	Kanata, ON	RF Wireless Systems Inc.	Burlington, ON
Equispheres	Kanata, ON	SafeSight Exploration Inc.	North Bay, ON
GasTops	Gloucester, ON	Solaxis	Bromont, QC
Groupe Fordia Inc.	North Bay, ON	Spike Ladder	St. John’s NL
Idea Oven Labs Inc.	Burnaby, BC	Stacktech	Brampton, ON
IMP/Trosojet	Charlottetown, PEI	Synaptive Medical Inc.	Toronto ON
Karma Machining & Manufacturing Ltd	Edmonton, AB	Taiga Robotics	Toronto ON
Leesta	Pointe-Claire, QC	Thordon Bearings Inc.	Burlington, ON
Lincoln Conveyors	Oldcastle, ON	UpCycle	St. Catharines, ON
Mach32 Inc.	Edmonton, AB	Voyageur Aviation Corp.	North Bay, ON
Magna /AMM	Concord, ON	VPM Research	Mississauga, ON
Maya HHT	Westmount, QC	Warren Industries Ltd.	Concord, ON
McGuire Aero Propulsion Solutions Inc.	Toronto, ON	Wellmaster	Tillsonburg, ON
Metafold	Toronto, ON	Westboro Photonics	Ottawa, ON
MI Intégration	Sherbrooke, QC	Xtended Hydraulics	Emerald Park, SK
MSLR Electric E-Foil	Kelowna, BC		

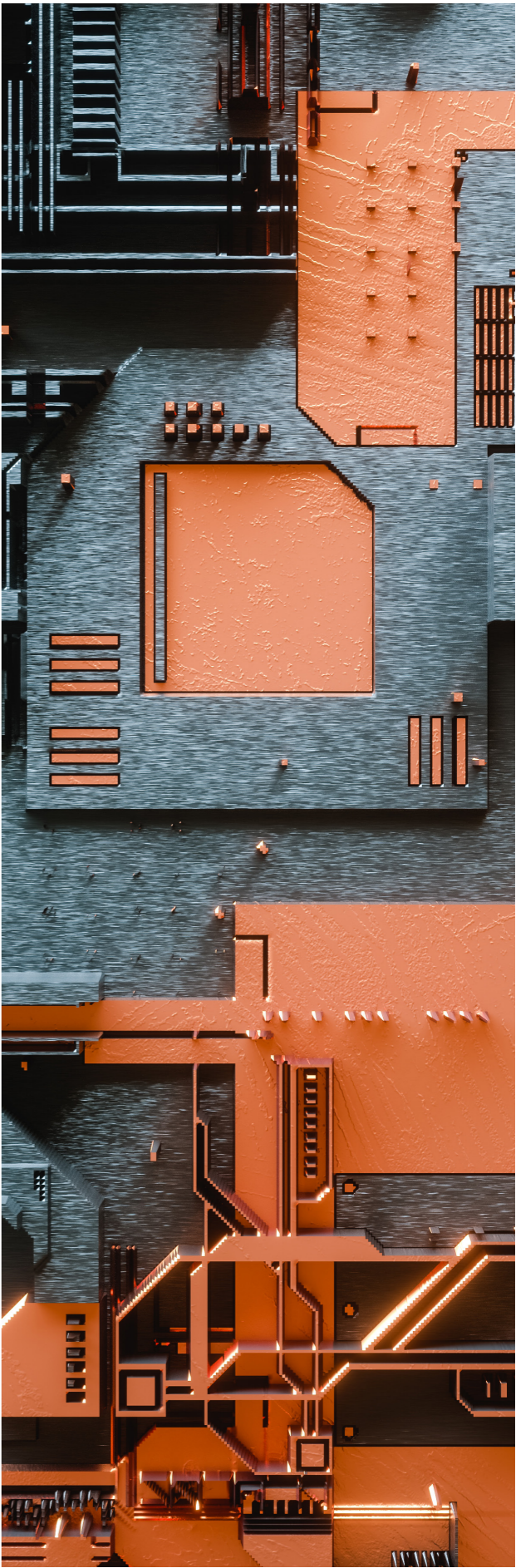
Operational Excellence

In NGen’s Corporate Plan for 2021-2022, we undertook to provide our members with access to online tools to help them improve performance and grow their business. Three types of tools have been developed over the past year:

- NGen’s online IP Registry containing 57 IP Assets arising from NGen-funded projects that are available for licensing. There were 141 licenses executed in 2021-2022.
- Strategic Assessment Tools (SATs) based on NGen’s Transformation Leadership Program. The SATs are worksheets that provide guidance and assessment criteria for companies looking to improve their management of digital transformation.
- An Industry Carbon Calculator, developed and shared by SIMSA, which provides a methodology and allows companies to calculate their carbon footprint.

In line with its IP and Data Strategies, NGen also aimed to enhance operational excellence among its industry members by running a series of educational workshops and one-on-one consultations, as well as participating in industry conferences, on IP commercialization and cybersecurity. Over the past year:

- NGen’s Vice President for Intellectual Property conducted 143 meetings with individual companies to help them develop their IP strategies.
- NGen organized five virtual IP workshops for members with over 632 participants.
- NGen’s VP for Intellectual Property also participated in three industry panels involving an additional 497 attendees and led a class at the University of Toronto Law School on IP commercialization in advanced manufacturing.
- NGen’s VP for Cybersecurity participated in six industry conferences on cybersecurity in manufacturing.



Our Project Portfolio

NGen co-invests in industry-led collaborative projects that integrate technologies and manufacturing capabilities into transformative solutions or ecosystem supports that improve the competitiveness and growth potential of Canadian manufacturing.

In our 2021-2022 Corporate Plan, NGen committed to fully allocate our funding for technology and ecosystem development projects, approve an additional \$5 million for SME Capacity Building projects, conclude contracting with projects accounting for at least \$200 million in NGen funding, and actually invest \$82.7 million to fund eligible project costs, bringing NGen’s cumulative project investment to \$165.3 million.

NGen fully committed its entire project budget by the end of March 2022. Over the past year we approved \$81.4 million in funding for 75 projects with total projected investments amounting to \$258 million. That brought the total amount of project funding approved by NGen to \$235.9 million allocated among 166 projects with total investments at \$607.0 million.

Included in those project funding totals are allocations for SME Capacity Building projects. NGen approved \$7.7 million in funding for 48 feasibility, pilot, and cluster building projects with total project investments of \$16.9 million in 2021-2022. Those amounts brought our total approved funding for Capacity Building projects to \$12.4 million, the total number of projects involved to 79, and total Capacity Building project investments to \$27.3 million.

By the end of March 2022, NGen had contracted 156 projects accounting for \$224.7 million in approved NGen investment. (Nine projects were subsequently approved in April 2022.)

Actual project spending has, however, fallen short of expectations. Financial pressures, market uncertainties, closures, and staff shortages resulting from COVID-19 and supply chain disruptions have delayed many projects. NGen has taken steps to mitigate financial risks for project partners by providing funding advances. Nevertheless,

NGen investment (the funding actually flowing to projects to offset eligible costs) amounted to \$56.1 million for 2021-2022. That will bring NGen’s total actual project investment up to \$112.4 million (about \$50 million short of target) with approximately \$107.0 million left to disburse in 2022-2023.

Project Funding Streams

Four of NGen’s five program funding streams provide support for industry-led collaborative projects in the fields of High Potential Technology Development, Process Transformation and Technology Diffusion, Industry-Led Ecosystem Development, and SME Capacity Building feasibility studies, pilot projects, and cluster-building initiatives.

As of the end of March 2022, NGen had approved funding amounting to:

- \$140.0 million for 54 technology development projects with total investments projected at \$375.3 million.
- \$58.7 million for 27 process transformation projects with total investments projected at \$118.4 million.
- \$24.8 million for six industry-led ecosystem development projects with total investments projected at \$86.1 million.
- \$12.4 million for 79 SME capacity building projects with total investments projected at \$27.3 million.

NGen’s industry-led ecosystem development projects have the highest rate of partner participation (an average of six partners per project) as well as the highest degree of investment leverage. Technology development projects have the next highest rate of investment leverage while process transformation projects rank second with respect to partner engagement (4.3 per project).

Funding Challenges

NGen has run five types of funding challenges which have shaped our technology development, process transformation, and ecosystem development project portfolio. In June 2019, NGen launched an open call for proposals for world-leading advanced manufacturing projects. In March

Funding Stream	# of Projects	Total # Project Partners	# of Industry Partners	# SME Partners	# Research Partners	NGen Investment	Total Project Investment	Investment Leverage Ratio
Technology Development	54	209	128	111	81	\$140.0M	\$375.3M	168%
Process Transformation & Technology Diffusion	27	117	72	58	45	\$58.7M	\$118.4M	102%
Industry-Led Ecosystem Development	6	36	18	17	18	\$24.8M	\$86.1M	247%
Capacity Building of which: - Feasibility Studies - Pilot Projects - Cluster Building	79 19 43 17	264 64 160 40	156 45 93 *18	142 35 90 18	108 19 67 22	\$12.4 M \$1.8 M \$9.4 M \$1.2 M	\$27.3 M \$4.1 M \$20.3 M \$2.9 M	121% 123% 116% 142%
			*Project Leads					
Total Projects	166	626	374	328	252	\$235.9M	\$607.0M	157%

2020, we launched our COVID-19 Rapid Response Challenge to develop and bring to market critical products required to fight the pandemic within a six-month period. NGen launched another call for project proposals in June 2020 targeted to developing autonomous disinfecting robots for health care and other workplaces. In September 2020 we launched our Made Smarter Challenge to build competitive production and supply capabilities in Canada to ensure the sustainable long-term supply of products critical for fighting the pandemic. Our final targeted call for project

investments in those projects. The highest rates of project participation (5.5 partners per project) and investment leverage were realized in our open call projects.

Project Status

By the end of March 2022, 47 NGen projects had been completed or closed out, accounting for \$64.3 million of NGen funding and total investments of \$110.4 million.

Project Challenge	# of Projects	Total # Project Partners	# of Industry Partners	# SME Partners	# Research Partners	NGen Investment	Total Project Investment	Investment Leverage Ratio
COVID-19 Rapid Response Challenge	16	30	23	21	7	\$38.9M	\$51.8M	33%
Disinfecting Robot Challenge	5	7	7	7	0	\$4.6M	\$9.5M	107%
Made Smarter Challenge	12	46	35	34	11	\$27.2M	\$62.4M	129%
EV Challenge	14	60	34	28	26	\$32.9M	\$67.0M	103%
Open Call Projects	40	219	119	95	100	\$119.9M	\$389.0M	225%
Total Projects	87	362	218	185	144	\$223.5M	\$579.7M	159%

applications related to the development of advanced manufacturing capabilities in Canada’s Electric Vehicle value chain was launched in September 2021.

Another 109 projects had been contracted and were underway, accounting for \$160.4 million in approved NGen funding and \$471.9 million in total project spending.

While NGen was not required to raise industry contributions for our COVID-related projects, we were able to leverage additional funding amounting to 75% of NGen’s

Project Challenge	# of Projects	Total # Project Partners	# of Industry Partners	# SME Partners	# Research Partners	NGen Investment	Total Project Investment	Investment Leverage Ratio
Completed/Closed	47	125	91	86	34	\$64.3M	\$110.4M	72%
Contracted/Underway	109	471	262	224	209	\$160.4M	\$471.9M	194%
Approved/Not yet contracted	10	48	21	18	9	\$11.2M	\$24.7M	120%
Total Projects	166	624	372	328	252	\$235.9M	\$607.0M	1.57%

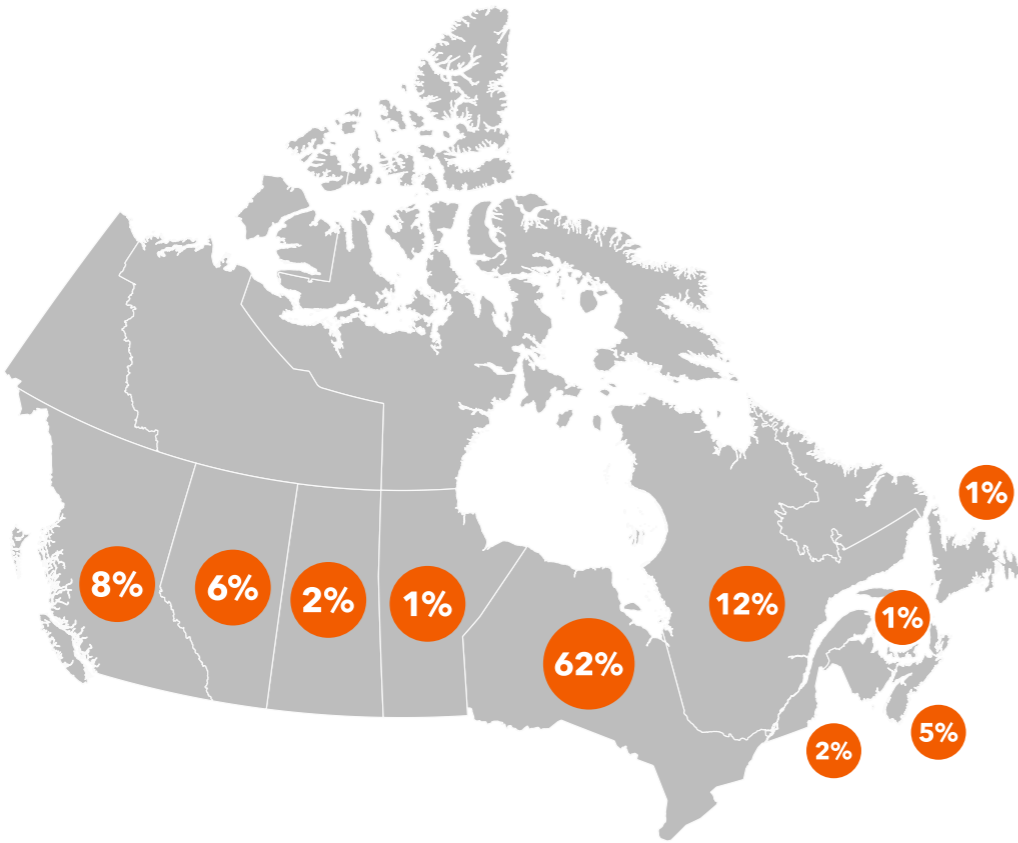
Project Partners

As of March 31st, 2022, NGen’s project portfolio involved 626 partners working collaboratively to develop transformative manufacturing solutions – an average of 3.8 partners per project. There were 374 industry partners (2.3 per project) as well as 252 research partners from universities, colleges, hospitals, and the National Research Council (1.2 per project). These numbers do not include the more than 1,750 members of the advanced manufacturing clusters funded by NGen. Each cluster is counted as one SME project partner.

There were 328 SME industry partners with fewer than 500 employees involved in NGen projects – an average of 1.9 per project. They account for 88% of industry partners and 52% of all project partners. They are primarily involved in NGen’s capacity-building and technology development projects. SMEs lead 150 or 90% of all projects, which in turn involve 83% of all industry partners. A full 133 projects (80% of the total) involve only SMEs.

Large companies account for 36 industry partners (10%) and are involved in 32 projects (20%) primarily in the field

Project Partners across Canada



of process transformation. There are 13 different large companies headquartered outside Canada engaged in 15 projects (4%) and 14 different large Canadian-based companies involved in 21 projects (13%). While 16% of all NGen funding is allocated for large companies (6% to foreign-based and 10% to Canadian firms), reflecting the relatively larger size of their investments, projects with large company participation have higher rates of partner participation (5.2 partners per project) than those that do not (3.4 per project). They also have higher rates of investment leverage. This enables their smaller project partners to participate at lower levels of contribution or attract more co-investment from other funding sources.

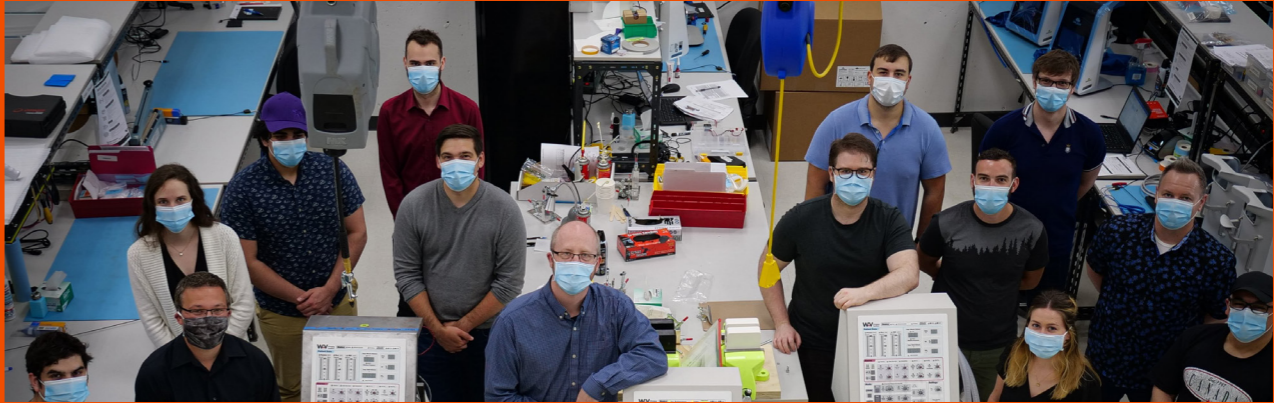
Research partners are primarily involved in technology development and SME pilot projects. NGen does not fund research partners directly. Their involvement is at the invitation of industry partners that receive NGen funding and

may also be supported by research grants from other federal and provincial R&D funding agencies.

The strategic role that NGen plays in knitting together Canada’s advanced manufacturing ecosystem by connecting and supporting collaboration among researchers, technology companies, and manufacturers across the country is evident in the geographic distribution of project partners.

Project partners are involved in every province across Canada. While 62% are based in Ontario, 12% are located in Quebec, 8% in British Columbia, 9% in the prairie provinces, and 9% in Atlantic Canada. NGen projects also bring partners together across provinces – 55 projects (one-third of the total) involve interprovincial collaboration. Four projects involve international research partners.

NGen projects are securing supply chains, protecting the environment, improving healthcare, and supporting technology adoption across Canada.

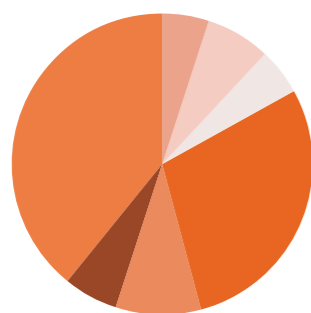


Enabling World-Leading Advanced Manufacturing Solutions

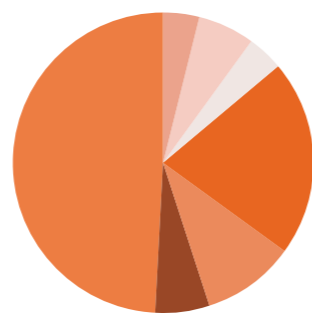
NGen's projects integrate advanced digital, materials, and production technologies in the development, adoption, and scale-up of unique solutions for manufacturing. Our project portfolio indicates the type of solutions we have supported as well as the degree of investment leverage

achieved for each. New manufacturing processes account for the largest proportion of NGen funding and for almost half of all projected investment. They usually involve several types of technology solutions.

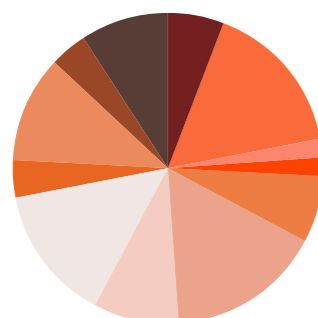
NGen Funding by Type of Solution



Total Project Investment by Type of Solution

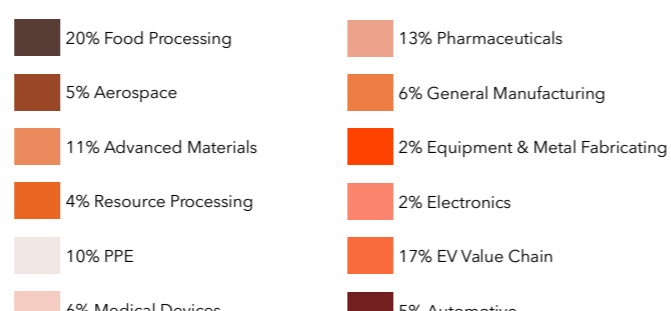
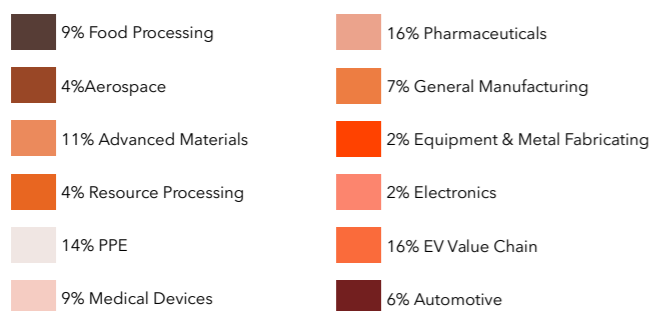
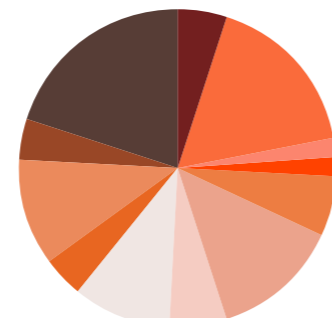


NGen Funding by Sector of Primary Application



<These solutions are being developed for and applied in a variety of industry sectors.

Total Investment by Sector



The health care sector (encompassing pharmaceutical products, medical devices, and personal protective equipment) accounts for the greatest share of funding approved by NGen and total project investments. The automotive sector (including the Electric Vehicle value chain), food processing, and advanced materials sectors also account for relatively large proportions of NGen funding and total investment.

A full list of projects approved by NGen and officially announced by the end of June 2022, identifying project leads, the number of project partners, and amounts of NGen funding and total project investment can be found in Appendix A of this report.

Health Care

NGen's project investments in Canada's health care sector not only have the benefit of developing new products, production processes, and commercial opportunities for the sector but also protecting the health and safety of Canadians, and ultimately saving lives.

NGen has supported the creation of two health care related clusters. The Canadian Association of PPE Manufacturers was formed to assist manufacturers of personal protective equipment meet testing, verification, and regulatory requirements in order to sell their products in Canada and open up new channels for commercialization. CAPPEM is working with Health Canada, the Standards Council of Canada, and Canadian Standards Association to develop standards and expedite regulatory approvals for PPE. The cluster is also negotiating with provincial health care procurement organizations to secure contracts for Canadian suppliers. Thanks to CAPPEM's advocacy, the Parliament of Canada and the Canadian Government have prioritized the purchase of made-in-Canada PPE.

The NanoMedicines Innovation Network was created by NanoCanada in partnership with CMC Microelectronics to advance medical device, vaccine, diagnostics, and new medical innovations.

Among the projects NGen has funded in the field of therapeutics:

- Providence Therapeutics with operations in Toronto

and Calgary partnered with Northern RNA in Calgary to expand manufacturing capacity for Providence's PTX-COVID19-B mRNA vaccine leading to Phase 3 clinical trials and commercialization. The project has been completed and closed. To date, 65 new jobs have been created as a result of the project. Providence entered into a US\$90 million agreement with US-based Emergent BioSolutions in September 2021 to provide additional manufacturing services for its vaccine production. Also, in September Providence announced a US\$500 million licensing agreement with Shanghai-based Everest Medicines to manufacture and distribute PTX-COVID19-B for the Asian market. In December Providence secured an additional \$2.118 million in funding from the Bill and Melinda Gates Foundation to support process development and validation of the vaccine at affordable prices in low- and middle-income countries. The vaccine has been included by the WHO in its Solidarity Trial Vaccines Program of international randomized clinical trials designed to rapidly evaluate the efficacy and safety of new vaccines. Subsequently Providence has negotiated a term sheet with Biological E in India to supply 30 million Canadian-made doses of the vaccine plus technology transfer to achieve 1 billion doses annually. Providence has also signed an agreement with VaxThera and the Government of Colombia that will allow production and commercialization of the vaccine in that country. In March 2022 Providence was recognized by BioAlberta as company of the year for their achievements.

- Immunovaccine Technologies in Dartmouth, NS is working with researchers at Dalhousie University to establish a complete end-to-end Canadian supply chain for the development and manufacturing of synthetic vaccines allowing production of large-scale quantities of the DPX-COVID-19 vaccine.

- iVexSol Canada partnered with the Canadian Centre for Regenerative Medicine and GE Health Care in Toronto to develop a new process for manufacturing lentiviral vectors, an essential product for delivering cell- and gene-based therapies to patients suffering from cancer or rare or inherited genetic disorders. This project was closed as a result of the pandemic.

- In Victoria, Axolotl Biosciences is working with Starfish

Medical and researchers from the University of Victoria to scale up the production of BrainPrint bioink. BrainPrint can be used to print human brain tissue models as a tool for understanding neurodegenerative diseases as well as for drug screening.

Over the past two years, NGen has also invested in projects to manufacture test kits for COVID-19:

- Sona Nanotech in Halifax partnered with the VIDO-Intervac Research Centre in Saskatoon, University of Saskatchewan, and the Runnymede Health Centre to deploy Sona's proprietary nanotechnology to develop a rapid point-of-care antigen test to screen for COVID-19. While the company has yet to obtain Health Canada approval for marketing the test in Canada it has secured CE Mark status which acknowledges conformity with EU regulations and allows Sona to commercialize its test throughout Europe as a screening tool allowing organizations to screen individuals in high-risk congregate settings. By March 2022, Sona reported \$100 million in sales for its Rapid Antigen Test Kits.
- Response Biomedical in Vancouver scaled up the production of its rapid point-of-care RAMP screening test for COVID-19. The company has also secured the CE Mark for the test and by March 2022 was reporting \$4 million in test kit sales and the creation of 15 new jobs.
- Precision Biomonitoring in Guelph, ON partnered with EVIK Diagnostics in Kanata, ON to repatriate production of lyophilized COVID-19 rapid PCR tests (using freeze-dried reagent beads) from the United States. TRIPLELOCK Test Strips were approved by Health Canada in November 2020 and are being commercialized across North America and Europe. By March 2022 the project had created one new company, 23 new jobs, and sales of the test kits had reached \$86.7 million. The business line was acquired by SQI Diagnostics of Toronto in February 2022.
- LuminUltra Technologies of Fredericton developed and scaled up production of a rapid portable RNA-based PCR tests for COVID-19 which have been approved by Health Canada and are in use at Toronto Pearson Airport. The company expanded test kit production

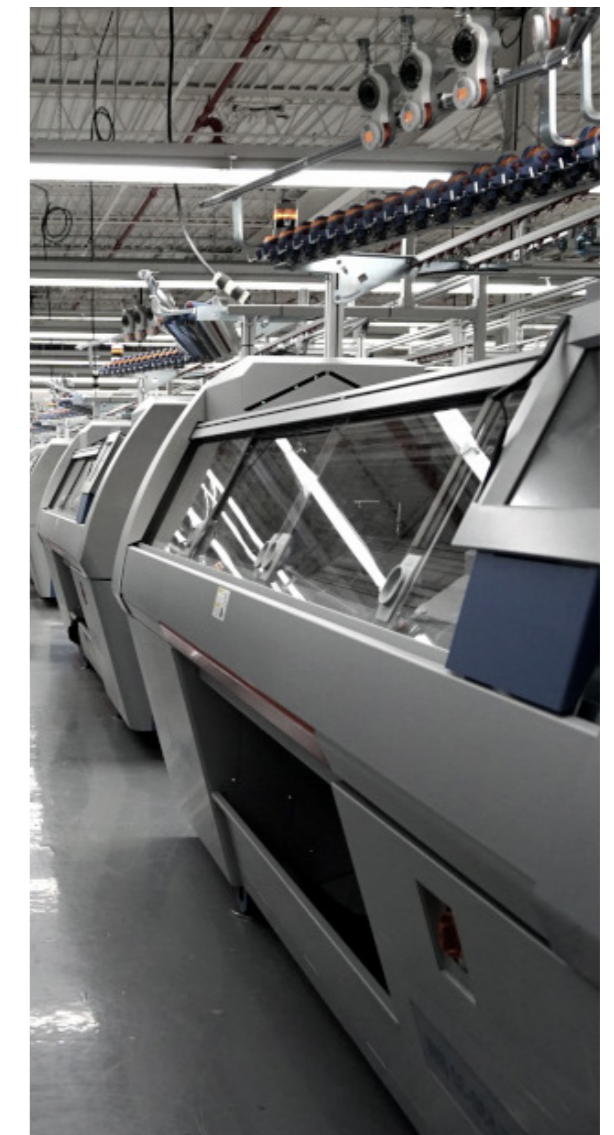
to 500,000 per week, allowing it to grow revenue by 10X, develop and manufacture 17 new products (15 of which are now being commercialized), and double its R&D investments as well as its client base. LuminUltra has reported 80 new jobs created and \$300 million in additional revenue as a result. The technology and manufacturing capabilities supported by NGen's project have also allowed LuminUltra to develop other COVID-19 tests, most notably its new wastewater test which has received funding from the National Research Council, Public Health Agency of Canada, and the Innovative Solutions Canada program.

- International Point of Care in Toronto partnered with Precision Biomonitoring, Immune Response Diagnostics in Toronto, and Suncor Energy's facility in Calgary to expand production of its COVID-19 In-Vitro Diagnostic Products. As a result of the project, IPOC installed a number of advanced manufacturing stations that has led to a 60% increase in production capacity. IRD successfully developed their Lumivi diagnostics rapid serology test for lab-based and point-of-care COVID-19 detection. And Suncor developed and filed a patent application for its proprietary algae-based spiked protein used in Lumivi test kits. By March 2022, one new company had been created as a result of the project and revenues amounted to \$15 million.
- Exacad of Broisbriand, QU also developed a fast method of manufacturing plastic injection molds for COVID-19 tests. Exacad's production filled a critical supply chain shortage in 2020 and led to sales of more than \$1 million by March 2022.
- In the field of medical devices, NGen-funded projects have not only responded to requirements during the pandemic but have also led to the development and scale-up of equipment for other health care purposes.
- At the onset of COVID-19 Starfish Medical in Victoria led the Canadian Emergency Ventilators project. Starfish partnered with eight companies idled by the pandemic to redesign, re-engineer, and produce a state-of-the art ventilator with components sourced in Canada. The fully digitized device was based on a patent licensed in the 1990s and early 2000s by Dr. Magdy Younes, Scientific Founder of Cerebra Health in

Winnipeg. The patent was for an analogue device that has been used throughout the world, including during the 2003 SARS outbreak. Components were sourced from manufacturers across Canada. Dorigo Systems in Burnaby, BC provided the PCB assembly, Advance Test Automation in Milton, ON the pneumatics, Powersonic Industries in Bolton, ON the power module, and Dometic in Vancouver the sub-assemblies for the pump. Yorkville Industries in Pickering, ON provided the user-interface module, creating a new opportunity for the company that had previously been a supplier for the musical instruments industry. Celestica procured the materials and manufactured the device at its facility in Newmarket, ON. The Canadian Emergency Ventilator was approved by Health Canada and one of the first ventilators procured by the federal government during the pandemic. It has been deployed in health care facilities across Canada and internationally. The project created two new companies and 350 new jobs. Total sales to date are estimated at \$200 million.

- BOMImed in Winnipeg worked with Synergy Mouldworks in Brantford, ON and Precision ADM also based in Winnipeg to design filters, design and fabricate moulds (including 3D moulded components), and manufacture and assemble breathing filters for ventilators and other breathing devices. Production has been increased to 300,000 filters per month.
- DMF Medical in Dartmouth, NS partnered with a research team at Dalhousie University to scale up production of its Memsorb™ filters that remove carbon dioxide from the breathing stream of anaesthesia machines, allowing for their repurposing as ICU ventilators. Sales reached \$2.5 million by the end of March 2022 and are expected to amount to \$20 million by 2028.
- Myant, a textile computing company based in Toronto is ramping up production of smart garments for patients and front-line health care workers that can read body temperature, blood pressure, and body chemistry. Biometrics from the user's body is collected via sensors, analyzed by Myant's Platform which uses AI to identify signs of health issues, and alerts are then forwarded to health care providers. The project is expected to generate \$112 million in sales and create 2,500 new jobs by 2028.

- Cloud Diagnostics in Kitchener, ON is partnering with researchers at the University of New Brunswick to scale up production of its Cloud DX Pulseware Solution for monitoring hallway health care patients. This project is facing delays related to COVID-19.
- The Orthopedic Innovation Centre (OIC) in Winnipeg is partnering with Pega Medical in Laval, QC, Spinologics in Montreal, Conceptualiz in Halifax, and Precision ADM in Winnipeg to develop and Validate Automated Patient Specific Medical Device Software for Improved Additive Manufacturability. The purpose of this project is to create a fully integrated platform for additive manufacturing of patient-specific, customized implants based on pre-operative imaging and physician input. Project partners estimate that 100 new jobs will be created and \$100 million in new revenues generated by 2028.





- Synaptive Medical in London, ON is working with MRIdt and researchers at Western University also in London to develop a process to manufacture complex gradient electromagnets for use in magnetic resonance imaging (MRI). The project will scale up production of Canada's first compact head-only MRI system that has the potential to greatly increase access to magnetic resonance imaging (MRI) at point of care in the healthcare system.
- AiimSense and Sorena Tech in Waterloo are working together with researchers from Georgian College, University of Waterloo, and Grand River Hospital to undertake a feasibility demonstration of sensors for stroke diagnosis.
- Other sterilizing solutions have also been developed. Envision SQ in Guelph, ON partnered with the University of Guelph and the Xerox Research Centre to develop large-scale processes to produce an advanced self-sterilization coating that kills the COVID-19 virus on contact. Intended applications are on hard and high touch areas. The project has enabled production of 1,000 litres of coating per week and has generated revenues of \$20 million to date. McRae Imaging in Mississauga is also working with Dot Automation in Vaughan, ON, Lumentra in Toronto, and researchers from the University of Toronto to develop and manufacture nano-material antimicrobial shielding. In addition, MPC partnered with Niigon Machines in Vaughan and Georgian College to develop a continuous manufacturing and bottling system for hand sanitizers. This project was closed early as a result of COVID-related supply chain problems.
- Three projects were undertaken under NGen's COVID-19 Rapid Response Challenge to scale up production of protective face shields. Mosaic Manufacturing partnered with Rockmass Technologies and Redetec also in Toronto and Gila in London, ON to develop a distributed network to 3-D print face shields. This three-month project designed and produced over 20,000 face shields via 77 3D printers, across 21 locations. It was able to send PPE, in many cases free of charge, to those in need in nursing homes, hospitals, child care facilities, dental offices, grocery stores, and many other front-line and second-line areas and has generated revenues in excess of \$100,000 to date. In a second project, Burloak Technologies in Oakvil-
- Five projects led by Global DWS in Toronto, a partnership between PrescientX and Clearpath Robotics in Cambridge, A&K Robotics and Sanctuary Cognitive Systems in Vancouver, Advanced Intelligent Systems in Burnaby, BC, and CrossWing in Aurora, ON developed autonomous robots to disinfect large floor spaces and high-touch surfaces in health care, commercial, and other public settings. Our Disinfecting Robot Challenge led to the creation of six companies to commercialize new products and 63 new jobs. Robots are now in use across Canada and the United States. As of March 2022, sales amounted to \$13.4 million.

NGen has also made significant investments to enable the sustainable manufacturing and supply of critical personal protective equipment (PPE) in Canada.

le worked with Hamilton Health Sciences to design, test and scale up additive manufacturing of 500,000 shields that generated \$4.2 million in revenue by the end of March 2022. Molded Precision Components in Oro Medonte, ON partnered with Sterling Industries in Concord, ON and Georgian College to manufacture face shields as well. MPC has produced 15 million shields for the federal government, 11 million shields for the Ontario government, one million for Alberta, and donated 25,000 shields to local community organizations. To date, the project has generated sales amounting to \$140 million and created 260 new jobs.

- Four projects focus on the automation of high-quality respirators and face masks. Armfoam in Longueuil, QU partnered with Roswell DHT in Calgary. Proprietary pressure molding technology enabled the development and production of different sizes of mask with different filter material. The project scaled production up from 60,000 to 400,000 respirators per week, implemented a waste recycling program for unused textiles, and developed biodegradable filter materials. Sales revenue was estimated at \$19 million by March 2022. Eclipse Automation in Cambridge, ON also automated production of N95 masks and created a new business for commercializing mask production which has generated sales revenue of \$30 million to date. Fidelity Machine and Mould Solutions in Calgary is currently partnering with Sentinent Tools Engineering and Fidelity Medical Manufacturing based in Calgary to improve the manufacturing process for medical grade surgical and procedural face masks using advanced manufacturing technologies. A fully functional production system is slated for completion in 2022. PrescientX in Cambridge, ON is also partnering with Big-Nano in Waterloo, ON, and research teams from McMaster, Guelph, and Waterloo to develop and automate the production of N100 masks.
- Other projects involve the development and manufacturing of new materials for PPE. Carmina de Young Fashion Design in London, ON partnered with Lifecycle Health in London and Lifecycle Revive in Brantford, ON and researchers from McMaster University and Lambton College to create a unique, self-contained sustainable supply chain of disposable isolation gowns and other PPE. The project will divert 11M pounds of

single use plastics from Canadian landfills. The project created three new companies and has resulted in sales of \$19 million to date. Fine Cotton Factory in Toronto is working with Microbonds in Markham, ON and George Brown College to achieve mass production of antimicrobial textiles containing metals such as silver, zinc, and copper for PPE. Waterloo-based Big-Nano is partnering with Swenco in Waterloo, PrescientX in Cambridge, APC Filtration in Brantford, and Titan Clean Energy in Craik, SK to set up a pilot plant to produce melt-blown nanofiber filter material for PPE with the objectives of helping Canada gain self-sufficiency for critical nanofiber melt-blown material supply. Titan Clean Energy Products in Craik, SK is also developing and scaling up systems for biodegradable melt-blown resin and fabric production in partnership with Panther Industries in Davidson, SK, Big-Nano in Waterloo, and Canada Masq in Markham, ON, and K+S Potash in Saskatoon.

Another eight projects in the health care sector have been approved and are underway but have not yet been officially announced.

Automotive and EV Value Chain

Automotive manufacturing, including vehicle assembly and parts production, is one of Canada's largest industrial sectors, accounting for 10% of manufacturing GDP and 23% of our trade in manufacturing products. The industry is in the midst of a major transformation away from vehicles powered exclusively by internal-combustion engines to Electric Vehicles (EVs).

NGen is investing in projects that will improve the competitiveness of Canada's automotive sector and develop manufacturing capabilities throughout the Electric Vehicle Value Chain that not only address the innovation challenges of building a sustainable EV industry but also contribute to the development of stationary batteries and new energy storage and hydrogen energy solutions.

We have supported the development of the Canadian Association of Moldmakers' Virtual Transformation Program that has helped its member companies shift their business plans to include a hybrid of virtual and in person business development strategies. VTP is a virtual trade show plat-

form for customers, government, and other clusters to view and promote the technology and manufacturing capabilities of CAMM members allowing them to sustain and expand their international business development activities during the pandemic.

Among NGen's automotive-related technology development and process transformation initiatives:

- Axiom Plastics in Aurora, ON is partnering with MS Falcon in Toronto, Kytech Machine Works in Mount Albert, ON, and Bulldog Polymers in Alliston, ON to create a new production process to manufacture interior and exterior vehicle plastic panels featuring a visually uninterrupted transition between different polymers. These transitions are typically between harder and softer polymers. The new process will result in lower overall part costs compared to incumbent technology processes.
- Kepstrum in Vaughan, ON is working on a pilot project with Stackpole International in Mississauga, ON and Armo-Tool in London, along with researchers from McMaster, University of Toronto, Conestoga College, and Queen's University, to build an advanced end-of-line tester for bushing components which are critical subcomponents of Stackpole's hydraulic powertrain solutions. The pilot system will utilize the analytical algorithms developed in a prior feasibility study to correlate the gap-to-failure of parts that passed the end-of-line production test system based on variations in material properties and critical manufacturing parameters in the manufacturing process. This new and advanced multi-functional end-of-line tester is an industry-first type of test system that can detect compound production deficiencies that are not detected by current uncorrelated and parallel production quality control processes.
- KSL Lubricants and Wolfdale Stamping in Mississauga collaborated along with researchers from McMaster University to set up a pilot line for a new lubrication technology for automotive manufacturers. The pilot showed that the solution was able to reduce the amount of lubricant used by 65%, improve air quality, and cut overall waste by 80% from current methods used by the industry.
- MPC in Oro-Medonte, ON undertook a pilot project with Niigon Machines in Vaughan that developed, designed, and tested a new cube molding process for manufacturing automotive check arm components. The project has the potential to completely transform the way automotive components are made by allowing cycle times to be cut in half through paralleling manufacturing processes and doubling the volume of product made in the same current footprint. It also allows companies that deploy the new process to bring jobs typically done in China, Mexico, and India back to Canada. The project enabled MPC to secure sales with Tesla and the company is currently pursuing opportunities with other large auto manufacturers as well. As of March 2022, current sales were estimated at \$2 million.
- Magna's Stronach Centre for Innovation in Aurora, ON is partnering with Maple Advanced Robotics in Thornhill, ON as well as the University of Waterloo, University of Toronto, and Toronto Metropolitan University to develop an Autonomous Adaptable Robot System, a novel robot integration solution for manufacturers who require flexible solutions for their growing product mix but may not have the scale of work or capital resources needed to justify larger investments in automation systems. The new system integrates 3D vision technology, artificial intelligence, and collaborative robots. It allows any operator with minimal training to be able to quickly modify the robot path and workspace. AARS will be able to carry out labor-intensive and dangerous processing tasks under dynamic and unstructured shop floor conditions. The solution will significantly expand the role of robots not only in large-scale or small and medium-size production, but also in the service sector, such as car body repair shops.
- ThinkData Works in Toronto is working with Martinrea in Vaughan, ON and Palantir Technologies whose Canadian operations are based in Vancouver to develop a digital solution based on external data analytics and predictive modeling to analyze supply chain risks. The solution can be used to provide logistical, geopolitical, and market-level assessments of supply chain risks and can be applied across all manufacturing sectors to improve supply chain transparency and resilience.

In addition to projects that will improve the competitive performance and reduce supply chain risks for Canada's auto parts sector, NGen has also invested in collaborative initiatives that are building new advanced manufacturing capabilities throughout the Electric Vehicle Value Chain.

With respect to critical minerals:

- Cnem in Mississauga, ON and partners Talon Metals Services based in Thornhill, ON and Palcan Energy in Burnaby, BC, together with researchers from the Universities of Guelph and Toronto, are developing a new recycling method for processing EV battery black mass using an environmentally friendly approach. (Black mass is the shredded material left after battery recycling and consists of high amounts of critical minerals such as lithium, manganese, cobalt, and nickel.) This green, energy-effective process will be applicable to recycling black mass of all lithium ion-based batteries and the project aims to develop a mini plant to demonstrate the scalability of the process with an annual capacity of 20 metric tons of spent lithium-ion batteries.
- Li-Metal in Markham, ON is partnering with Blue Solutions in Boucherville, QC to develop a lower cost, lower carbon passenger electric vehicle format solid-state battery for next-generation automotive platforms. The project will focus on the development of high-performance ultra-thin lithium metal anodes suitable for use in large-format all-solid-state pouch cells for automotive applications and which will include recovered lithium metal from both end-of-life batteries and production by-product generated at Blue Solutions manufacturing operations in Quebec. The lithium metal will be reprocessed using refining technology that will be developed during the course of the project, for circular re-introduction into Blue Solutions' cell production process both in lithium ingots as well as in next-generation physical vapor deposited ultra-thin anodes.
- Summit Nanotech in Calgary is using advanced materials to disrupt and transform conventional lithium mining processes by manufacturing and exporting environmentally sustainable lithium extraction modules. Summit uses nanotechnology-based materials that will

be deployed in extraction modules for lithium mining customers globally. Along with partner Ionic Solutions, also based in Calgary, as well as researchers from the University of Calgary, the companies will build out the manufacturing and assembly line for these advanced materials and the extraction modules. The process will aim to double lithium yield, reduce GHG emissions by 50%, minimize freshwater use, reduce land use area 26x, and cut chemical waste by 90% compared to traditional methods.

When it comes to batteries:

- Damon Motors in Vancouver is building a 110,000 sq ft state-of-the-art cleantech EV manufacturing centre for its flagship HyperSport and HyperFighter all electric smart motorcycles. This center aims to create over 300 new high-tech manufacturing jobs and more than



500 operations jobs by 2025. Damon and partners Darwin AI from Waterloo, ON and Moment Energy in Richmond, BC are working together with researchers from Simon Fraser and Dalhousie Universities to showcase key innovations that address the full manufacturing production and end-of-life recycling of EV battery systems at both Damon and Moment Energy's new facilities, demonstrating manufacturing scale-up of components, assembly systems and targeting design for a near zero waste production operation.

- Calogy Solutions, a rapidly growing start-up in Sherbrooke, QC with a novel battery thermal management solution for lithium-ion batteries in electric vehicles, is working together with Linear Automation in Barrie, ON and researchers from the University of Sherbrooke and Trois-Rivières College to develop an intelligent pilot manufacturing line for the process with an innovative and unique magnetic pulse welding method, as well as supporting automation and AI. It will be designed for high throughput but will initially enable Calogy to offer test samples to its customers before a large volume order.
- The manufacturing processes used to produce lithium-ion batteries remain expensive and environmentally problematic. ElectroVaya in Mississauga is partnering with Lantern Machinery Analytics in Vancouver, EECOMOBILITY in Hamilton, and researchers from UBC to scale up and commercialize a Li-battery electrode processing technology that is free of hazardous solvents. The project process will reduce the environmental impact of lithium ion battery manufacturing

and enable a breakthrough in cost reductions which has the potential to realize significant global benefits.

- ElectroVaya and EECOMOBILITY are also working on a project, together with researchers from McMaster University, Waterloo, Western, Windsor, and UQAM, to develop pilot advanced manufacturing capabilities for high voltage electric truck and bus battery modules implementing a versatile, semi-automated laser welding line that can be adapted to a range of module architectures. Following this project ElectroVaya will work on scaling up the module assembly manufacturing line and supply made-in-Canada modules for heavy duty e-mobility applications.
- As an industry-led Ecosystem Development project, the Flex-Ion Battery Innovation Centre, a division of Ventra Group in Windsor, ON, will establish a centre of excellence for advanced Li-Ion battery manufacturing, in collaboration with partners eCAMION based in Toronto, and the University of Toronto, University of Waterloo, Ontario Technical University, University of Windsor, and UBC. The partners will focus on developing new advanced manufacturing processes that will improve battery performance, minimize waste, and reduce costs and environmental impacts in battery production.
- The Flex-Ion Battery Innovation Centre is also working with Inspectech Analygas Group in Toronto and researchers from the University of Waterloo, Western, Windsor, McMaster, and UQAM to develop and commercialize advanced manufacturing innovations and



equipment to improve the performance of electric vehicle propulsion batteries and battery manufacturing systems. The partners will develop a localized mineral supply chain to enable cost-effective Li-Ion cell manufacturing in Canada, develop new processes to achieve a 20% increase in battery cell energy density along with a similar reduction battery weight, and design new AI-enabled manufacturing systems that will reduce battery production time, cost, and scrap.

- NOVONIX Battery testing Services in Dartmouth, NS is collaborating with Well Engineered Solutions in Dartmouth, Dalhousie University, and Materials Atlantic (a cluster that is also supported by NGen) to develop manufacturing technology for the dry synthesis of cathode materials for use in lithium-ion batteries. It will also support the growth of a new specialist collaborative cathode dry synthesis research and development and manufacturing team. Another key objective of this project is to achieve automated handling and storage of the cathode powder materials from a high temperature cathode production line. All told, this will enable efficient and transformative manufacturing of highly engineered lithium-ion battery cathode materials through increased process flexibility, parameter controls, and safety.

With respect to hydrogen-powered vehicles:

- Ballard Power Systems in Burnaby, BC is working with Macrodyne Technologies in Concord, ON and Eclipse Automation in Cambridge, ON to develop a Next Generation Grafoil Plate Forming Pilot Line enabling new manufacturing and inspection methods. The project creates a potential opportunity for the project partners to develop future hydrogen fuel cell plate fabrication and enhanced automation capabilities.
- Cummins Canada, which acquired Hydrogenics in Toronto, is partnering with AIS Technologies in Windsor, Shelley Industrial Automation (ON) in Toronto, and Konnexio in London, ON to build a pilot production process for their core technology and Center of Excellence for high volume manufacturing of hydrogen fuel cells. The consortium is collaborating with researchers from universities like Toronto, Waterloo, Quebec, and Alberta to address some of their material develop-

ment and technology improvement requirements and characterization. The project will help to consolidate Canada's position as a global leader in hydrogen and hydrogen fuel cell expertise and supply capabilities.

- Membrane electrode assembly (MEA) is the heart of a hydrogen fuel cell. The global market for MEAs is projected to be \$15 billion by 2025. However, the cost of producing MEAs is high and durability is often poor. Momentum Materials Solutions, a University of Calgary spin-off venture, has developed a new reproducible, high performance, high durability, and low-cost MEA technology that is a potential solution for the hydrogen fuel cell market and is partnering with BlissEarth Energy Research also in Calgary and researchers from the university to scale up development and manufacturing of its next generation MEA process.





In the field of powertrain, components, and advanced materials:

- Polar Sapphire in Oakville, ON is working with Nature Alu in LaBaie, QC, Dynamic Concept in Saguenay, QC, and researchers from McMaster, Toronto, Queen's, and Western to establish a Canadian High Purity Alumina (HPA) consortium to demonstrate commercial production of superior grade alumina powder suitable for new and emerging electronics applications, primarily lithium-ion battery separators (LIBs) used in electric vehicles (EV), as well as future generation solid state batteries and other electronic components. The consortium will develop the use of an advanced rotary calcination furnace, along with new milling and acid recycling systems that will demonstrate world-leading economic and environmental outcomes unmatched by conventional production methods. This will be Ca-

nada's first high-grade HPA production facility, spearheading new supply for this high-demand material and establishing Canada as a competing supplier to world markets based on production processes invented in Canada.

- Precision Resource Canada and partner Miltera Machining Research both in Cambridge, ON are collaborating with research teams from the Universities of Waterloo and Aachen in Germany to achieve best-in-class advanced manufacturing solutions to establish, scale-up and commercialize critical zero emission vehicle components for universal on-road mobility platforms. In addition to on-road mobility the technology can be leveraged to produce sustainable green energy, stationary and back-up power, and has the potential to transform other critical industries such as aerospace, off-road and heavy duty applications.
- Rayleigh Solar Tech in Halifax and partner Magna International in Aurora, ON are collaborating with researchers from Concordia, Dalhousie, l'École supérieure de technologie, and Nova Scotia Community College on a project to develop a production-ready process for fabrication of solar integrated automotive polymer panels and to optimize Rayleigh's solar thin film manufacturing process for application in Magna's automotive polymer panel manufacturing process. The energy from the polymer panels can be used to extend the range of electric vehicles and reduce GHG emissions by reducing consumption of grid electricity produced from fossil fuels.
- Linamar in Guelph, ON is partnering with Westhill Innovation in Simcoe, ON and McMaster University to scale up production of Westhill's inverter technology for use in zero-emission vehicles. (Inverters are electronic devices that convert Direct Current energy from the sun, for instance, to the Alternating Current electricity used in Electric Vehicles.) The technology uses 1/12th the space and mass of other competing inverters. This project proposes to develop a manufacturing process to produce smaller, lighter inverters for use in Zero-Emission Vehicles.
- Macrodyne in Concord, ON is working with Ridgetech Automation in Cambridge, ON to develop an automa-

ted slitter table with weight compensation technology for reducing scrap rate and reducing labour costs for compression molding of sheet molding compounds with a particular focus on Electrical Vehicles.

Aerospace

Aerospace manufacturing is another strategically important sector of the Canadian economy. The industry contributed over \$22 billion to GDP, employed nearly 207,000 highly skilled workers, and exported more than 75% of its total production to 186 countries around the world in 2020.

NGen is investing in industry-led ecosystem development projects as well as technology-related projects to enhance competitiveness and support innovation in the aerospace sector. With respect to the ecosystem, we have supported:

- The creation of the Canadian Advanced Air Mobility Network which brings together automotive, aerospace, and other advanced technology partners to support the development of nimble, green, and affordable air transportation system that can move people and cargo between places previously not served or underserved by aviation, supporting local, regional, intraregional, rural, tribal and urban needs.
- The development of a B2B aerospace matchmaking platform for the Ontario Aerospace Council that will improve competitiveness, generate business opportunities, and grow revenues for its members.

Among the NGen-funded projects involving development, scale-up, and adoption of technology solutions in Canada's aerospace industry:

- DeepSight Réalité Augmentée in Montreal has partnered with Avior Integrated Products in Laval, QC to add a new holographic guide module to the DeepSight's augmented reality platform that will help workers assemble aerospace components and composite parts. The project will significantly improve productivity and reduce the number of faults with employees empowered with immersive and intuitive instructions. The project generated \$2 million in sales up to the end of March 2022.

- Formula Solutions in Burlington, ON is collaborating with XYZ Automation Group in Burlington and Promotion Nuclear in Midland, ON, McMaster University, Mohawk College and Fanshawe College to automate the manufacturing process for vacuum-injected carbon fibre reverse thrusters (cascades) for the aerospace industry while improving product efficiency by more than 18%. This technology has not been previously applied in the sector.

- McGuire Aero Propulsion Solutions of Toronto, Burloak Technologies in Oakville, and Tekna Advanced Materials in Sherbrooke, QC to scale up and test additive ma-





manufacturing processes for large, complex, zero-emission turbomachinery for the aerospace industry.

- MDA in Ste.-Anne-de-Bellevue, QC is partnering with Promark Electronics in Pointe-Claire, QC, AV&R in Montreal, and researchers from the National Research Council, Laval, Concordia, and l'École polytechnique to develop and demonstrate applications of advanced and highly flexible technologies in manufacturing environments while successfully managing constant changes and maintaining mandatory manufacturing traceability. Focused on quality and efficiency, the new systems aim to improve manufacturing methods around high-volume assembly, automated testing & inspection, and autonomous data management.
- Reaction Dynamics Lab in Montreal is working with Amrikart Ressource Cybernetique in Brossard, QC and researchers at the National Research Centre and McGill University to develop large-scale additive manufacturing capabilities for next generation eco-friendly hybrid rocket engines that will pave the way towards routine access to outer space.

Food Processing

The food and beverage processing sector is the second largest manufacturing industry in Canada accounting for approximately 20% of manufacturing GDP. It supplies approximately 70% of all processed food and beverage products available in Canada and is the largest buyer of Canadian agricultural products. About a third of Canada's output is exported to 192 countries around the world, making the sector a critical supplier supporting the food security of

Canadians and a broader global population.

NGen has invested in projects that involve the application of advanced manufacturing technologies to improve production efficiencies and develop new methods of handling and processing food products:

- Aspire Food Group in London, ON is partnering with Telus Agriculture and Regenerative Waste Labs in Vancouver, Darwin AI in Waterloo, and researchers from the universities of Laval, McGill, Guelph, Western, Toronto, and Waterloo, to build the lowest-cost, highest-density, and most ethical automated food-grade protein production system in the world based on processing crickets into all natural, sustainable, super-food ingredients that are nutritionally and environmentally superior to most alternatives. Aspire is targeting markets that utilize crickets and their by-products in human and pet nutrition, biomedicine and agrochemicals with a vision to mitigate climate change and alleviate global food insecurity. The project incorporates industrial automation and robotics, IoT, and deep learning/analytics in the development of fully automated and modular production systems that can be scaled to any size in any geography. In 2022, the project was selected by UNESCO as one of the Top Ten AI applications in the world in support of the United Nations' Sustainable Development Goals.
- Mycionics is working with Whitecrest Mushrooms in Putnam, ON, Piccioni Mushroom Farm in Dundas, ON, and researchers at Western University to develop and manufacture robotics mushroom harvesters capable

of continuously picking mushrooms for fresh market quality and precise sizing. The technology will be the first of its kind in the world.

- Panevo Services based in Vancouver partnered with AccuEnergy Canada in Toronto in a pilot to trial and validate a novel, pre-commercial real time Operating Equipment Efficiency monitoring and reporting solution for equipment in dairy processing operations and assess its potential impact for the Canadian Advanced Manufacturing ecosystem. The pilot was supported by Microsoft Canada. Upon completion of the pilot, Panevo and AccuEnergy are now working with Saputo Dairy Products in St.-Laurent, QC to implement and demonstrate their solution which can be applied in many manufacturing sectors in addition to food processing.
- Quali Artificial Intelligence based in Kitchener, ON worked on a pilot project with Riverside Natural Foods in Vaughan, ON, Axiom Plastics in Aurora, ON, and Terra Cotta Foods in Georgetown, ON to develop and scale up an AI powered plug-and-play camera solution that automates a visual quality inspection for food processing.

Advanced Materials

NGen is funding initiatives that support the ecosystem for advanced materials:

- NGen co-invested with ACOA, the Government of Nova Scotia, and the Verschuren Centre in Sydney, NS to establish the first of its kind bioprocessing facility in Canada that will provide small biotechnology firms access to its bio-reactor enabling them to pilot and scale up technologies for production of environmentally sustainable materials and products. The Verschuren Centre is also developing a bio-ingredient circular economies cluster with NGen support. The cluster brings SME clean technology companies together with manufacturers to replace petrochemical ingredients with bio-ingredients.
- Materials Atlantic, in Lunenburg, NS is developing a program that brings technology experts in advanced, nano, energetic and battery materials together in collaborative ventures with manufacturers. The Verschu-

ren Centre and Materials Atlantic are working together to leverage their expertise in advanced biomaterials.

We are also investing in projects that develop new processes for manufacturing advanced materials. In addition to the materials-related health care, automotive, and aerospace applications described above, other projects involving advanced materials are led by:

- 3D BioFibR in Halifax which is undertaking a feasibility study with researchers at Dalhousie University to develop a large-scale manufacturing process for its dry spinning technology for that produces collagen nanofibers at 600X the rate of previous methods and with mechanical strength 3X greater than native collagen structures. Its spider silk manufacturing has produced fibers that are as strong as steel, and more than 1000 times as tough. The adaptability of this technology to include a variety of proteins allows production of various biofibers for applications in multi-billion-dollar industries including life science research, medical applications, sustainable textiles, aerospace engineering, and defence.
- Advanced BioCarbon 3D in Rossland, BC which is conducting a feasibility study and a pilot project with KF Hemp based in Regina, SK, Virtual Layer in Kelowna, BC, along with a research team at UBC to support the development of a commercial-scale biorefinery for the production of high-performance bioplastics and other advanced materials made from hemp.
- CarbiCrete in Lachine, QC which is working with Patio Drummond in St.-Nicéphore, QU, Innovotive in Montreal, and researchers at McGill to pilot and scale up production of cement-free, carbon-negative concrete, drastically lowering the emissions involved in cement production which accounts for 8% of all greenhouse gas emissions worldwide.
- Datec Coating in Mississauga which is collaborating with Process Research Ortech also in Mississauga, and Sheridan College to assess the feasibility of developing a commercial-scale process for manufacturing an alternative method of disinfecting wastewater that is safer and more environmentally friendly than current water treatment methods using sodium hypochlorite



or chlorine dioxide as disinfectants.

- Evercloak in Kitchener, ON which partnered with Zen Graphene Solutions in Thunder Bay and researchers at the universities of Guelph and Waterloo on a pilot that developed a breakthrough manufacturing process capable of producing the world's thinnest and most uniform graphene oxide nano-coatings with the highest water vapour permeance ever measured. Evercloak is now working with Environmental Systems in Barrie, ON, Waterloo, Guelph, Lakehead Universities, Georgia College, and the US National Renewable Energy Laboratory to scale up its process for manufacturing nano-scale-thin Graphene 2D films. The films will allow dramatic energy efficiency improvements in heating and ventilation systems in critical environments to support sustainable manufacturing. ESC specializes in creating Cleanroom systems that meet rigorous

critical environment requirements. ESC will integrate Evercloak's membranes into their systems to develop net-zero Cleanrooms, helping their advanced manufacturing clients in sectors like pharmaceutical, nuclear, optical, medical device, electronics and indoor agriculture. The project will be the first in the world to produce graphene oxide membranes at commercial scale, making Canada a leader in the emerging field of nanofilms as well as in high-standard Cleanrooms.

- Exergy Solutions in Calgary which is undertaking a study with Suncor Energy, Archer BD, and the University of Calgary to explore the feasibility of converting bitumen-derived asphaltene into high-value carbon fibre with the potential to create a new industry for Alberta while lowering GHG emissions. The feasibility study will determine the pilot plant design and capital and operating costs to inform a go-forward decision.
- Genecis Bioindustries in Toronto which is working with Stormfisher in London, ON and researchers at the universities of Guelph, Waterloo, and Toronto to manufacture high-value bioplastics and chemicals from organic waste streams, contributing to a Canada's circular and bio-based economy.
- Macrodyne Technologies in Concord, ON which is developing alternate compression blow molding technology that can effectively process bioplastics along with partners Competitive Green Technologies in Waterloo, ON and Fourmark Manufacturing in Oakville, ON. The project aims to manufacture a viable biodegradable bioplastic alternative to single-use plastics using state-of-the-art compression blow molding technology incorporating automation and machine vision and inspection processes that can leverage this innovative material commercially across large-scale applications.
- Nano Cnet in Waterloo, ON which is partnering with Evercloak also in Waterloo along with researchers from the University of Waterloo to scale up a roll-to-roll continuous printing technology that merges graphene and nano-silver strands to significantly increase the conductivity and transparency of flexible transparent conductors while also reducing their thickness. This innovation in manufacturing will dramatically change the printed electronics industry, and the electronics

industry in general, with applications in both automotive and aerospace sectors.

Digital & Advanced Automation Solutions

NGen is also co-investing in cutting-edge digital, automation, and robotics solutions for manufacturing:

- Addem Labs worked with COR Engineering in Toronto and researchers at the University of Toronto to scale up a new manufacturing process for printed circuit boards (PCBs) to develop a patented material and light-based technology to manufacture professional Printed Circuit Boards (PCBs).
- Apex Industries in Moncton, NB is collaborating with partner 709960 N.B Ltd. to complete the development of a novel manufacturing process and installation method for manufactured stone veneer panels. This manufacturing process will include the development of an automated concrete colour 3D printer providing precise volumetric and positioning control. The process will significantly reduce manufacturing and installation costs of colour veneer stone panels.
- ArcelorMittal Dofasco is partnering with IBM Canada out of London, ON, Tenova Goodfellow in Mississauga, IFIVEO in Windsor, ON, and researchers at McMaster, Western, and Mohawk College to digitize Dofasco's hot-ladle steel manufacturing process. Digitalization in heavy industry lags that of other manufacturing sub-sectors. This project will create value in advancing the state of understanding of the digitalization process in Canada—in a real heavy manufacturing environment—including the process execution required to implement intelligence, the standards needed to enable the flow of data, and the impact on the workforce.
- Autometrics in Vancouver, Marcon Metal Fab in Delta, BC, and Mohawk College are partnering to develop and test an automated inspection system for robotics welding operations. The project accomplishes a key step in AutoMetrics' product and business development plans, equips Marcon with the latest technology in quality inspection, and engages staff and students at Mohawk College in an advanced manufacturing project that requires multidisciplinary expertise and interactions.

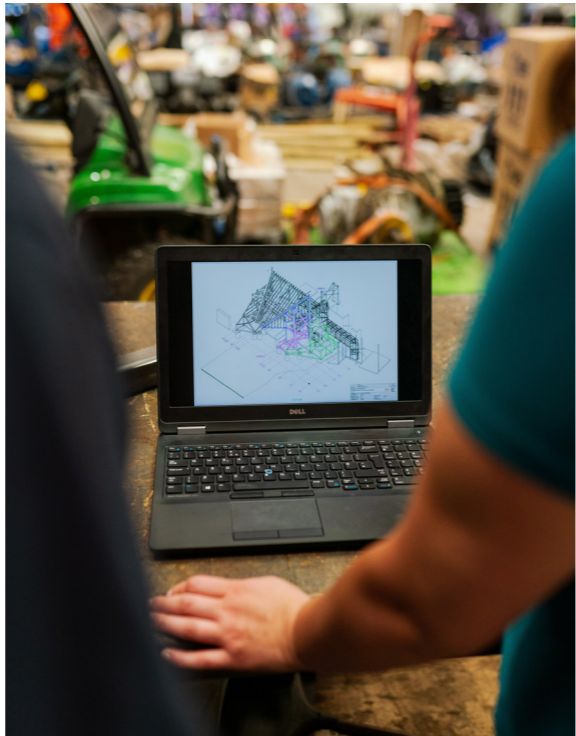
- Cast Analytics in Vancouver, Empower Operations in Surrey, BC, and Applied CCM in Ottawa are working together with researchers at UBC and Simon Fraser University on a pilot project to develop and demonstrate a digital twin for metal casting with integrated AI-driven optimization capabilities, a transformational step for the foundry industry which traditionally relies on trial-and-error methodologies alongside the engineer's experience to generate "acceptable" manufacturing processes. The project will allow the partners to offer practical and cost-efficient manufacturing process optimization services and sell a software product to the Canadian and international manufacturing sector to improve productivity and product quality and reduce development times and costs.



- Conrex Steel in Toronto partnered with Macrodyne Technologies in Concord, ON, Source Industrial Services in Brampton, ON, Toronto Metropolitan University, and George Brown College to build North America's largest and most sophisticated steel forming press, capable of advancing industrial fabrication of dished and formed steel used in assembling large pressure vessel tanks, spherical storage vessels, ship-building, and other large industrial structures.
- Deep Cryogenics International in Lunenburg, NS is working with Induspec in North Bay, ON, Lethbridge University and Red Deer and Canadore Colleges on a pilot project manufacture a production ready, scale-up deep cryogenic treatment tank (DCT) for use in the mining, power, marine and energy industries. The project will introduce the first manufactured, industrial-use DCT tank in the world, create the only DCT tank capable of harnessing the technology for large size/economy-of-scale items and will produce a made-in-Canada IP-protected product for domestic and export use. This breakthrough post-heat treatment technology simultaneously reduces wear, corrosion and material fatigue in metal alloys by 20-60% using a one-time, through-material process that is fast, inexpensive, environmentally friendly and permanent. It will increase DCI's export activities beyond Atlantic Canada by 70%, increase the company's skilled workforce by 60% and extend a Canadian-built innovation onto the world stage.
- Exergy Solutions and Suncor Energy's division in Beaverton, ON, and Precision ADM in Winnipeg, along with researchers from the University of Calgary, Red River College, University of New Brunswick, and the University of Alberta to deploy additive manufacturing technology within Canada's oil sands industry to reduce costs and wearability of tooling, improve performance, and eliminate tailings ponds.
- Hazelett CASTechnology ULC in Kingston, ON and Aluminum Valley in Alma, QC are working together with researchers from Queen's University, St. Lawrence and Loyalist Colleges to install and commercialize a new high-speed thin-strip twin belt demonstration/pilot to produce high quality aluminum alloy sheet at a fraction of the conversion cost and carbon footprint of

conventional processes. This investment in new technology will represent a new and transformative process and will position Canada as a world leader in the advanced aluminum manufacturing sector.

- Petra Hygienic Systems in Concord, ON, Sidac Automated Systems in Toronto, and a research team at the University of Toronto are undertaking a pilot project to develop and scale up an autonomous bottle/pump insertion solution that utilizes computer vision along with advances in machine learning, robotics and mechanical engineering. The purpose of this project is to build new machine vision technology applied to CO-BOTs for randomized product selection.
- Sanctuary Cognitive Systems in Vancouver worked with Dr. Christian Doherty Inc. also in Vancouver and Forcen in Toronto to develop an AI-enabled robotic hand with human-level dexterity for assembly operations. Sanctuary and its partners are developing a robotic hand to mimic the mechanical capability of a human hand for functional small part assembly and object manipulation, which is currently considered a technology barrier due to the lack of direct fingertip sensor feedback. This pilot project will fully integrate advanced control systems to allow for greater robotic dexterity and freedom of automation.



Intellectual Property Strategy

NGen's Intellectual Property Strategy is central to achieving our objectives of maximizing the commercial potential and economic impact of NGen-funded projects, enhancing the IP management capacity of SMEs, and creating new business opportunities for NGen members. NGen's collaborative projects provide opportunities to share background IP among project partners, create new IP assets, and commercialize that foreground IP in solutions relevant to a variety of industry sectors.

NGen has established clear, transparent, and predictable IP ownership policies and licensing structures with respect both to the Background IP that project partners bring to their collaborative activities as well as to the Foreground IP arising from Supercluster-funded projects, including procedures for NGen members to request and negotiate licenses to use Foreground IP in future commercial applications.

An IP strategy is expected for all industry partners participating in NGen-funded projects. It is an important criterion in evaluating and selecting projects for NGen investment. It is also a prerequisite for Collaboration Agreements among project partners that must be concluded before Master Project Agreements are signed off and funding ultimately approved by NGen. Collaboration Agreements are based on model Lambert Agreements developed in the UK to facilitate sharing IP among industry, academic, and other research partners. Each Collaboration Agreement includes:

- Assurance of adherence to commitments set out in NGen's IP Strategy;

- A right for each participant in a project to access on fair, reasonable, and non-discriminatory terms and subject to relevant competitive issues all Foreground IP arising from the project, at least for research and development purposes; and,
- A commitment from each project participant to enter negotiations regarding access to Foreground IP arising from the project with other NGen members subject to any limitations placed on such access.

Foreground IP is thus shared among partners participating in project consortia. Wherever feasible, and as determined by IP owners, IP arising from projects is also shared with other members of NGen. Balancing this availability is a mechanism that enables companies to recoup their investment through licensing or other sharing agreements.

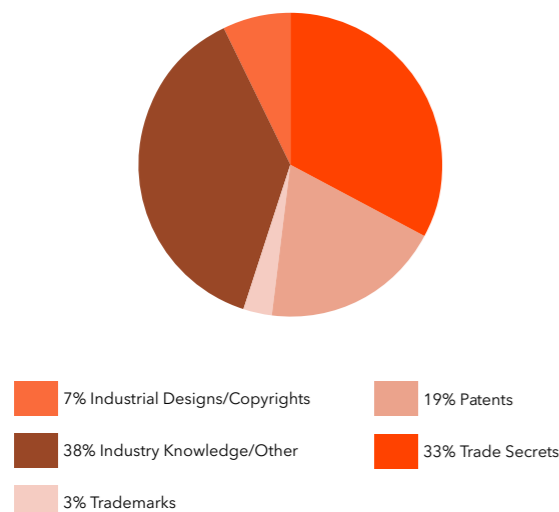
Profiles of foreground IP arising from projects are listed in NGen's IP Registry which is available to NGen members at <https://portal.ngenconnects.ca/ipRegistry>.

No updates to NGen's Intellectual Property Strategy were made in 2021-2022. NGen's IP Strategy has operated as intended and has supported the objectives as outlined in NGen's Long-Term Strategy and 2021-2022 Corporate Plan.

During the year IP strategies were developed for 106 projects, bringing the total to all 156 projects that had been contracted to the end of the financial year. Results as of the end of March 2022 are detailed in the following table.

	2021-2022	Total to March 31, 2022
IP Strategies developed for contracted projects	106	156
Background IP Assets contributed to projects	579	888
Background IP Assets shared with project partners	435	669
Foreground IP Assets expected to be created by projects	495	862
IP Rights created	371	446
Licenses issued for sharing IP among project partners: - For duration of project - On-going	N/A N/A N/A	218 141 77
IP Assets in NGen's IP Registry available for sharing or licensing with other NGen members	34	57
Post-Project Licenses granted to other than project members	68	68

Foreground IP Assets Expected to be Created in NGen Projects

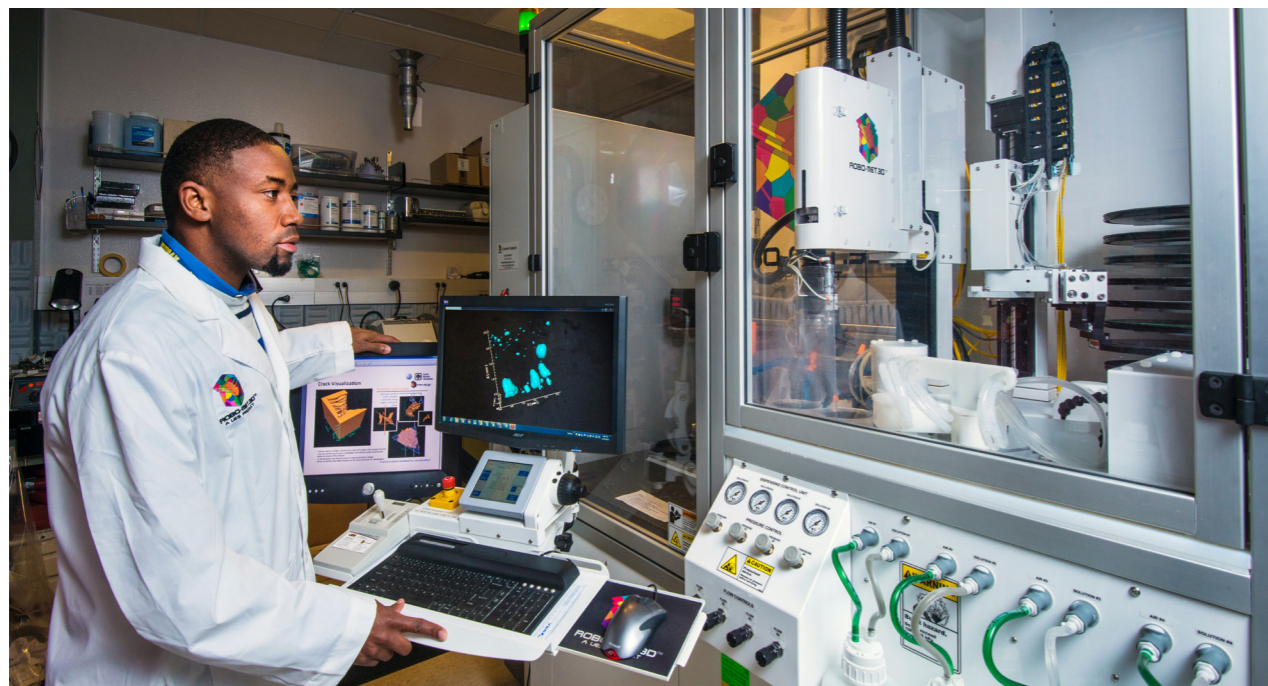


All contracted projects have agreed IP licensing obligations in their Master Project Agreements with NGen. There have been no cases in which project partners have been denied access to Foreground IP arising in their projects. Only one case has been recorded where project partners refused to enter eligible Foreground IP onto NGen's IP Registry. In that case, the IP arising from the project related to production methods for a novel COVID-19 therapeutic product whose commercialization was covered by prior IP agreements with international companies. There have been no IP disputes arising among project partners that have been referred to dispute resolution.

IP in advanced manufacturing comes in various forms ranging from patents, trademarks, and copyright to raw and analyzed data, algorithms, industry secrets, customized techniques, and employee know-how, as reflected in the range of expected foreground IP assets that are expected to be created by NGen projects.

NGen also provides advisory support to assist project applicants develop and implement their IP strategies. In 2021-2022, our Vice President for Intellectual Property and our Chief Technology Officer together provided direct IP support for 75 projects and recorded 1,181 touchpoints to advise NGen members on IP issues, 89% of which were with SMEs. Twelve of those touchpoints were with SMEs that are not participating in projects. In addition, NGen directed 143 project partners (including 123 SMEs) to other IP resources.

NGen delivered three IP-related workshops in 2021-2022 with 188 online participants, 166 of which were SMEs. We also participated in the Innovation Economy Council's Roundtable on Canada's Intellectual Property Puzzle in June 2021 with 497 attendees. Updates and articles on IP management are posted regularly on NGen's website, including the IEC's Report Beyond Patents: Canada's Intellectual Property Puzzle published in May 2021. In October 2021, NGen's VP for IP led a law class on IP management and commercialization for law and engineering students at the University of Toronto.



Data Strategy

NGen's data strategy outlines how we acquire, store, govern, manage, use, and share data to accomplish our mission, achieve our strategic objectives, create value for its clients, carry out our operations, and ensure our long-term business success.

NGen's data strategy is based on leveraging data as a strategic asset - focusing on business results, using data as a competitive advantage for NGen and our members, and supporting NGen's strategic objectives. NGen has implemented robust operational, governance, and compliance processes to ensure data integrity, privacy, and security.

There were no changes to NGen's Data Strategy in 2021-2022. NGen continues to leverage data as a strategic asset and provide strong security policies and procedures to ensure governance and compliance of data activities.

NGen's Vice President of Data, Technology, and Cybersecurity is responsible for developing, implementing, and overseeing the policies and procedures related to the governance and management of data contained in and transferred into, out of, and between Third Party platforms and NGen's corporate services IT stack.

In 2021-2022, NGen undertook important initiatives in the implementation of its data strategy. Analyses of advanced manufacturing capabilities and priorities were published based on data provided by NGen members. NGen upgraded its online collaboration platform that helps members identify prospective partners for innovation projects. We also expanded content in our online IP Registry and increased the information and tools housed on the NGen website.

With respect to NGen's internal management systems, all project application processes and NGen programs were administered online. All project information related to application status, assessments, financial data, as well as project monitoring and outcomes was consolidated into a single platform enabling real-time performance reporting.

NGen also focused on hardening cybersecurity protection for the data we manage. We conducted a Cyber Threat

Assessment with MNP PLC to support the cybersecurity maturity of NGen's data environment. The framework includes core principles and supporting controls, providing the foundation for leading practice cybersecurity programs. We continually implement safeguards to mitigate the risks identified in the assessment, and to secure the changing technology that serves as our infrastructure backbone. Employee awareness training has been a strong focus over the past year and has helped to increase awareness of our responsibility to maintain a high level of cybersecurity compliance at all levels of the business.

NGen also ran five virtual workshops for NGen members and other industry participants on cybersecurity. NGen is a member of Canada's Cybersecurity Advisory Council (CSAC) and the Cybersecurity Working Group of the Canadian Centre for Cybersecurity (CCCS). It is a participant in the Government of Canada's Data Trust Project.

NGen continues to enhance the security of its data systems on a regular basis. We are expanding our online services platform, including upgrades to the NGen and Careers of the Future website, enhancements to our virtual education and training programs, developing more innovation partnership and IP sharing opportunities on our collaboration platform, and providing our SME members access to online digital tools that will enable them to improve business performance. NGen also leverages the data it collects from members and website traffic to assess the impacts of its projects and Ecosystem Development Initiatives, increase funding opportunities for its members, and generate additional revenue to sustain the organization on an ongoing basis.

Impacts that Benefit Canadians

Leveraging Investments in Innovation

An important goal for NGen and the Global Innovation Cluster program is to leverage additional industry and public sector investments in research, development, and innovation.

- Total project funding approved by NGen is expected to generate an additional \$371.1 million in innovation spending, approximately 157% more than what NGen has committed.
- Industry-led Ecosystem and Technology Development projects are expected to generate the greatest degree of investment leverage at 247% and 168% of NGen funding respectively.
- The cumulative amount NGen actually spent to the end of March 2022 was \$142.4 million. These investments have been matched by \$137.1 million in additional contributions, \$128.5 million from industry.
- Projects that were completed or closed by the end of March 2022 actually generated \$46.1 million in additional innovation investments, which amounted to 72% of NGen funding. Many of these projects were related to addressing COVID-19 and did not require an industry match.
- Eighty-one projects expect to receive follow-on investments for further development or commercialization purposes, forecast at \$62 million, after project completion.

Economic Impacts

NGen aims to generate \$15 billion in additional GDP and create 15,000 new jobs by 2028 as a result of the commercialization of the new products, processes, and IP arising from the projects that we fund. By the end of March 2022, NGen completed and closed projects had:

- Generated **\$1.92 billion** in new business revenues from

product sales and IP licensing. This amounts to 30X NGen's actual investments in those projects. Assuming that 15% of that revenue will be recovered by the federal government in the form of income, corporate, and sales taxes, NGen has already delivered a 4.5X return to the federal government and Canadian federal taxpayers from those investments!

- Directly created **1,137** new jobs, with more than **32,000** new jobs projected by 2028.
- Started up **18** new companies to commercialize their manufacturing solutions.
- Led to the development of **95** new products and services and **44** new manufacturing processes.
- Granted **68** IP licenses to other NGen members, **48** for purposes of commercializing their IP and another **20** to use the IP for further product development.

Improving Productivity and Supply Chain Resiliency

In addition to generating new revenues for Canada's advanced manufacturing sector, NGen supports the development and adoption of new processes that lead to significant improvements in manufacturing productivity either through significant reductions in costs, materials, inventories, product development, production, and delivery times, defects, physical waste and other non-value-adding activities, through enhancements in agility, flexibility, quality, functionality, reliability, and customization, or by better methods of identifying, predicting, and mitigating market and supply chain risks.

Productivity improvements such as these are the basis for building advanced manufacturing capabilities that allow companies to respond rapidly to changing market conditions, pivot to manufacture new products as needed or in order to take advantage of new business opportunities, compete effectively in global markets, and grow their business internationally. They help to build resilience and secure supply chains in Canada and cement the role of Canadian companies in global supply chains.

Just over **55%** of NGen's projects identify productivity improvements as a key objective while **46%** identify supply chain resiliency as a priority. Just over **35%** of projects aim to support the localization of supply chains within Canada. The projects include those intended to meet immediate critical shortages at the beginning of the COVID-19 pandemic and others that are part of NGen's Made Smarter Challenge which explicitly aimed to establish globally competitive manufacturing processes in Canada to secure domestic supply of products required to fight the pandemic. They also include projects that involve the development and application of new digital solutions to improve the management of manufacturing processes and supply chain risks.

As a result, 68% of project partners expect to see an improvement in overall operating efficiency while 78% of project partners expect to see improvements in supply chain integration.

Health & Safety

Within NGen's portfolio 47 projects (28% of the total) explicitly aim to secure the health and safety of Canadians. The projects involve developing new manufacturing processes to produce personal protective equipment, test kits, therapeutics, medical devices, disinfectants and disinfecting robots, as well as other peripheral products that have been used in the fight against COVID-19. They include new manufacturing processes for medical devices and therapeutics to improve productivity and scale up production of new products, textile-based and digital monitoring solutions for patient care, as well as the development and use of new materials to support innovations in medicines, PPE, and biomanufacturing. They also include major initiatives to support the development of advanced manufacturing ecosystems around nanomedicines and novel gene and cell therapies related to biomanufacturing.

Food security is closely related to health and safety. Six projects approved by NGen explicitly aim to improve the security of Canadian and global food supplies. They include projects that develop new manufacturing processes for high quality protein, improve productivity in the food processing industry, and enhance Canada's circular food economy by repurposing food waste to produce advanced materials.

Environmental Impacts

Projects that reduce energy and waste as a result of pro-

ductivity improvement initiatives have a positive impact on the environment. So to do projects that enable the development of bio-materials to replace carbon-intensive products and processes, extract and process natural resources in a more environmentally friendly way, or support the development, scale-up, and adoption of new technologies that are critical to addressing the innovation challenges facing the electric vehicle industry and other cleantech sectors that aim to achieve Canada's net-zero economy. NGen has gained international recognition from the United Nations for the impact that one of its projects is having on sustainable development.

In terms of the environmental goals explicitly stated in the projects being funded by NGen:

- 69% aim to have a positive environmental impact.
- 60% will reduce GHG emissions.
- 52% will improve resource processing efficiencies and reduce waste.
- 39% will contribute to significant improvements in air quality through reductions in emissions of particulates, nitrogen oxides, and volatile organic compounds.
- 36% are using or creating new sustainable materials.
- 34% will improve energy management and reduce GHG emissions as a result.
- 32% will improve the environmental life cycle management of products.
- 20% involve the circular reuse, recycling, and remanufacturing of materials and products.
- 17% will support the development of zero-emission vehicles.
- 7% aim to reduce land degradation.



1,137

new jobs created directly.



+32,000

new jobs projected by 2028



Started up 18 new companies to commercialize their manufacturing solutions.



95

Led to the development of 95 new products and services

44

and 44 new manufacturing processes.



Granted IP Licenses

Granted **68** IP licenses to other NGen members, **48** for purposes of commercializing their IP and another **20** to use the IP for further product development.

\$1.92 bn

Generated in new business revenues from product sales and IP licensing.



30X NGen's actual investments in those projects.

NGen Next Generation Manufacturing Canada



Measuring Success

NGen monitors the effectiveness and efficiency of our internal operating processes as well as the progress of projects and programs in order to ensure that risks are mitigated, operating processes are improved, and that projects meet the goals they set as part of their project application, remain compliant with funding rules, and deliver value for the funds committed to their execution.

NGen’s project monitoring process aims to help projects achieve the best results possible while ensuring adherence to program deliverables. NGen monitors the progress of projects in our project portfolio on a quarterly basis. Monitoring consists of meetings between project partners and NGen project staff to review key metrics such as the project’s progress and performance, risk management, financial management and forecasting; facilitate the project team’s IP, exploitation, and commercialization strategy; and report on project outcomes. Upon the completion of every project, a final report is issued describing outcomes and detailing results. Under the terms of NGen’s Master Project Agreement, funding recipients are expected to report on the impacts of their projects over a five-year period following the completion of their project.

Project performance and that of NGen as a whole is regularly monitored and evaluated according to the strategic outcomes defined by NGen’s Five-Year Cluster Strategy and those of the Global Innovation Cluster program as a whole. We track performance according to a number of targets and metrics related to:

- Leadership.
- Member and Ecosystem Engagement.
- Commercialization.
- Job Growth.
- Scaling SMEs.
- Ecosystem Benefits related to Workforce Development and Business Transformation Management.
- Workforce Equity, Diversity, and Inclusion.
- Environmental Benefits.
- Health and Safety and other Social Benefits.

Progress - Outcomes to March 31st, 2022

Objectives & Initiatives	Performance Metrics - Results by March 31st, 2022
Leadership - Promote and raise awareness about Canada’s advanced manufacturing capabilities and trends transforming the industry.	
Strategic analysis of key industry trends	<ul style="list-style-type: none">• 12 reports on strategic opportunities prepared in collaboration with 15 ecosystem partners.
Supply Chain Summit and What’s Next webinars	<ul style="list-style-type: none">• 1,088 participants in 8 online events focusing on strategic trends in advanced manufacturing with 59,127 subsequent online views.• Webinar quality rating = 8.4/10.
Public speaking engagements	<ul style="list-style-type: none">• Speaking engagements in 191 events in Canada and internationally.
Media promotion	<ul style="list-style-type: none">• 197 million offline media impressions• 54 million NGen social media impressions• 2 million engaged visits to www.NGen.ca
Expert advice on industry conditions and trends	<ul style="list-style-type: none">• Participation in 25 Boards and Advisory Groups related to advanced manufacturing.
International Promotion	<ul style="list-style-type: none">• Participation in World Manufacturing Forum and World Economic Forum working group for advanced manufacturing.• Engagement in 32 international events including Hannover Fair.• Participation in 10 international Invest-in-Canada events.• Project named by UNESCO as one of Top Ten AI applications in the world in support of the UN’s Sustainable Development Goals.

Engagement - Grow and engage NGen’s membership network and facilitate connections and collaboration across Canada’s advanced manufacturing sector and internationally.	
Expand membership and support network growth across Canada	<ul style="list-style-type: none">• 4,756 members contributing to advanced manufacturing in Canada.• Support for 17 advanced manufacturing clusters across Canada.• 10 advanced manufacturing cluster start-ups.
Increase participation in NGen funded projects	<ul style="list-style-type: none">• 626 partners in 166 projects.• 374 industry partners including 328 SMEs• 252 academic and research partners.• 38% of project partners from outside Ontario.• 1 in 3 projects involves interprovincial collaboration.• 4 international research partners.
Foster new innovation partnerships	<ul style="list-style-type: none">• 4 partnerships created on average per project.• 89% of project partners expect to sustain their partnerships.• 416 companies in 167 innovation partnerships facilitated in addition to project teams (including 392 SMEs).
Broker new business opportunities	<ul style="list-style-type: none">• 40,000+ automated matches for quality verified made-in-Canada PPE.• 29 funding partners.
Enhance international business and partnership opportunities	<ul style="list-style-type: none">• Participation in 28 international collaboration events.• Three Canadian delegations to Hannover Fair.
Commercialization - Add at least \$13.5 billion in GDP to the Canadian economy by 2030 by increasing industry investment and revenue opportunities from the IP, new products and services, and improved processes created by NGen funded projects.	
Increase investment in innovation	<ul style="list-style-type: none">• \$371.1 million in incremental innovation investments forecast from approved projects.• \$1.57 in incremental investment forecast for every dollar invested by NGen.• \$137.1 million in incremental investments realized to date.• \$128.5 million in incremental industry investments realized to date.• 81 projects expect to receive follow-on investments.• \$62 million in follow-on investments after project completion.
Increase industry revenue generated from sales and IP licenses	<ul style="list-style-type: none">• \$1.92 billion in additional revenue.• 30X more revenue generated than invested in closed projects.• Approximately 4.5X federal tax revenue generated per dollar of NGen investment.
Promote IP creation and commercialization	<ul style="list-style-type: none">• 156 IP strategies developed for NGen-funded projects.• 888 instances of Background IP contributed to projects.• 669 instances where Background IP was shared with project partners.• 862 instances of Foreground IP expected to be created by projects.• 446 IP rights created.• 57 IP profiles in its IP Registry available for sharing or licensing with other NGen members• 68 post-project licenses granted to date.• Over \$825 million in IP license fees realized.
Develop new products, services, and processes	<ul style="list-style-type: none">• 350 new manufacturing processes expected.• 319 new products and services expected.
Improve manufacturing productivity and supply chain resilience in Canada	<ul style="list-style-type: none">• 55% of projects aim to enhance manufacturing productivity.• 46% of projects aim to strengthen supply chain resilience.• 35% of projects aim to localize supply in Canada.• 68% of project partners expect to see an improvement in overall operating efficiency.• 78% of project partners expect to see improvements in supply chain integration.
Employment Benefits - Create at least 13,500 new full-time well-paying jobs by 2030.	
Create new jobs directly as a result of NGen funded projects	<ul style="list-style-type: none">• 1,137 full time jobs created directly as a result of completed projects.• 32,799 new jobs expected to be created by 2028.

Provide more work integrated learning opportunities for students	<ul style="list-style-type: none"> 203 students engaged with industry partners in NGen projects. 3,000+ work integrated learning placements with NGen members.
Scaling SMEs - Provide SMEs opportunities to grow their business that they would not otherwise be able to achieve on their own.	
Increase SME participation in NGen-funded projects	<ul style="list-style-type: none"> 328 SME project partners (88% of all industry partners). Average 2 SME partners per project.
Provide SMEs with scale-up opportunities through feasibility and pilot projects	<ul style="list-style-type: none"> 125 SMEs involved in collaborative pilot projects and feasibility studies. 76% of project partners expect scale-up potential to increase. \$350,000 for 56 SMEs to pilot additive demonstration applications.
Create new companies to commercialize IP arising from NGen projects	<ul style="list-style-type: none"> 18 new companies created.
Connect SMEs with global supply chain opportunities	<ul style="list-style-type: none"> 68 SMEs partnering with multinational companies. 64% of project partners expect to access new global markets because of their projects.
Ecosystem Benefits - Strengthen the development of Canada's advanced manufacturing workforce and enhance the transformation management capabilities of SMEs.	
Attract and prepare more young people for future careers in advanced manufacturing	<ul style="list-style-type: none"> 319,981 students, parents, and educators accessing information about advanced manufacturing from www.CareersoftheFuture.ca. 1.5 million more students see themselves in advanced manufacturing careers thanks to our Careers of the Future campaign (Abacus Survey). Virtual presentations with 254 schools and student groups across Canada to 80,000+ students. 2,965 students enrolled in online coding courses and virtual robotics simulations.
Provide upskilling opportunities to enhance the capabilities of Canada's advanced manufacturing workforce	<ul style="list-style-type: none"> 89% of project partners will upskill their workforce because of their project. \$720,000+ in training value delivered by 23 education and training partners to 371 employees from 67 companies. 3 new micro-credentials in advanced manufacturing for students and adult learners.
Raise awareness about best practices involved in technology adoption and scale-up	<ul style="list-style-type: none"> 125 technology leaders working together in 4 Technology Advisory Groups to educate manufacturers and increase the adoption of Additive Manufacturing, AI/Machine Learning, Robotics and Automation, and Digital Twin technologies. 8 webinars focusing on specific technology adoption issues with 732 participants. 682 participants in NGen IP workshops and conferences.
Improve the capacity of manufacturers to manage technology and business transformation.	<ul style="list-style-type: none"> 130 manufacturing executives graduated from NGen's Technology Leadership Program. (Quality rating 9.2/10)
EDI Benefits - Create better employment opportunities for female, BIPOC, LGBTQ+, and handicapped workers in advanced manufacturing.	
Promote industry engagement in Canada's 50/30 Challenge and the adoption of EDI best practices across advanced manufacturing	<ul style="list-style-type: none"> 82 of the original signatories to 50/30 Challenge are NGen members. Quarterly updates and outreach to members about the 50/30 Challenge. 81% of project partners will increase investments in training for employees from under-represented groups because of their project.
Enhance innovation and business opportunities for Indigenous manufacturers	<ul style="list-style-type: none"> Supported the formation Canada's first Indigenous Manufacturing Cluster.

Support technical skills development, manufacturing entrepreneurship and financial literacy education for Indigenous youth	<ul style="list-style-type: none"> 215 Indigenous students and 12 staff members piloting new manufacturing entrepreneurship and financial literacy courses. Program established to train Indigenous youth in digital design technologies.
Provide easy low-cost access to online coding and simulation courses for youth in remote communities	<ul style="list-style-type: none"> Over 900 students enrolled in VRTA from northern Ontario school boards.
Support ecosystem initiatives that educate, mentor, and increase employment opportunities for female, BIPOC, LGBTQ+, and handicapped individuals and help them focus on advanced manufacturing	<ul style="list-style-type: none"> In-kind support for Women in Engineering, Women in Manufacturing, Women in AI, See It Be It STEM It, Black North initiatives.
Environmental Benefits - Facilitate the transition to a net zero economy through significant reductions in industrial waste and GHG emissions, improvements in environmental management practices, and the development of globally competitive capabilities for manufacturing more eco-friendly products.	
Reduce industrial waste and GHG emissions and improve environmental management practices	<ul style="list-style-type: none"> 114 projects aim to have a positive environmental impact. 100 projects will reduce GHG emissions. 86 projects will improve resource processing efficiencies and reduce waste.
Facilitate the transition to a net zero economy and circular manufacturing	<ul style="list-style-type: none"> \$37.6 million for NGen investments in 23 projects to build a globally competitive EV value chain in Canada, leveraging total project investments of \$102.4 million. 59 projects are using or creating new sustainable materials. 53 projects improve the environmental life cycle management of products. 33 projects involve the circular reuse, recycling, and remanufacturing of materials and products.
Health and Safety - Save lives and protect Canadians.	
Develop new medical devices and therapeutics to improve health care for Canadians	<ul style="list-style-type: none"> \$58.4 billion for NGen investments in medical device and health care projects with total project investment of \$121.2 million. 20 new devices, test kits, and therapeutic products to fight COVID-19, including 2 vaccines. 13 new manufacturing processes for medical devices. 14 new manufacturing processes for health care products and therapeutics.
Increase the supply of Canadian-made PPE and improve PPE manufacturing processes	<ul style="list-style-type: none"> \$32.6 billion for NGen investments in PPE manufacturing projects with total project investment of \$60.2 million. 19 new PPE products to protect Canadians from COVID-19. 17 new processes for PPE manufacturing.
Enhance food security	<ul style="list-style-type: none"> \$16.8 million for NGen investments in 6 projects that will enhance food security, leveraging total project investment of \$115.4 million.

Objectives for 2022-2023

NGen has set three priority objectives for 2022-2023:

1. Facilitate the successful completion and commercialization of its projects and conclude program funding under its existing Supercluster Contribution Agreement.
2. Obtain additional funding to continue to invest in world-leading advanced manufacturing projects, support ecosystem development initiatives, and sustain NGen's operating budget.
3. Continue to support ecosystem development initiatives that promote Canada's advanced manufacturing capabilities, build connections and collaboration, attract more young people into advanced manufacturing, develop a more highly skilled, equitable, diverse, and inclusive advanced manufacturing workshop, and help manufacturers manage business and technology transformation.

1. Program Completion

NGen will use Supercluster funding from its current Contribution Agreement to reimburse eligible project expenses and offset the costs of Ecosystem Development Initiatives incurred up to the end of March 2023.

For the 2022-2023 Financial Year, NGen is planning to make:

- \$106.4 million in actual disbursements enabling the completion of approved and contracted projects. These investments are expected to leverage an additional \$251.7 million in funding from industry and other sources.
- \$883,000 in direct investments from its operational budget in support of Ecosystem Development Initiatives.

Throughout the year ahead, NGen will continue to work with project partners to monitor and expedite the successful completion of projects and to provide ongoing assistance

where needed in the form of IP strategy support, further connections with potential partners and additional sources of investment, and facilitation of new business opportunities to enhance the commercialization of project outcomes.

At the end of FY2022-2023, NGen will leave a \$2.0 million contingency for cash reserves funded from its industry contributions to cover operating expenses that will be used after March 2023 to support our ongoing operating expense requirements.

2. New Funding

Pan-Canadian AI Strategy Manufacturing Commercialization Program (AI4M)

NGen has applied for additional funding from the federal government's Pan-Canadian AI Strategy (PCAIS) Commercialization Program. In line with our overall goal of building world-leading advanced manufacturing capabilities in Canada, NGen's PCAIS initiative (AI4M) aims to:

- Expand and accelerate the adoption of Artificial Intelligence and Machine Learning (AI/ML) solutions by Canadian manufacturers;
- Help applied research centres and technology companies scale their capabilities by facilitating the application and commercialization of their AI solutions for manufacturing in Canada and around the world; and,
- Develop a top-tier AI talent pool specializing in advanced manufacturing applications.

AI4M will provide support for the commercialization of manufacturing-related AI solutions that NGen's AI/ML Technology Advisory Group has identified as strategic opportunities to build technological and manufacturing leadership in Canada, including:

1. Rapid Prototyping and Testing of materials, products, and processes, including applications in Form and Function Engineering where AI enables design and

engineering based on the analysis of what alternative solutions could look like. These applications would build on Canada's expertise in Canada enabling the rapid design, characterization, and testing of materials, motors and powertrains for electric vehicles, medical devices, and genomic applications in biomanufacturing.

2. Systems Optimization, including applications for predictive maintenance and asset optimization, energy efficiency and carbon reduction, demand planning, materials and inventory management, supply chain resilience, and circular manufacturing.
3. Autonomous vehicles and robotics.
4. The development of new AI-enabled digital manufacturing services.

Funding under the program will be made available on a matching basis for collaborative, industry-led initiatives that:

- Promote and raise awareness about Canadian research and technology capabilities in AI for manufacturing as well as potential opportunities identified by manufacturers for AI research, technology development, and employment opportunities in the sector;
- Support the development of a highly qualified and diverse talent pool with expertise in manufacturing-related AI, including support for secondary, college, and Indigenous AI-related education programs as well as groups like Women in AI that are committed to attracting and supporting the inclusion of employees from under-represented groups;
- Raise awareness among manufacturers about potential benefits, use cases, and best practices for adopting AI solutions and help companies understand how to develop data strategies that will enable them to deploy AI applications effectively;
- Offer companies access to and use of rapid design, engineering, prototyping, and testing platforms that have been developed by Canadian research centres and technology companies; and,

- Develop, pilot, demonstrate, and prove out AI solutions offered by Canadian technology providers in actual manufacturing operations, including support for developing talent pools in manufacturing companies capable of managing data for successful AI deployment.

Global Innovation Cluster Funding

Based on indications of industry interest from our industry consultations and current project pipelines, NGen has identified approximately \$650 million in potential industry investments related to four main streams of activity that will enhance Canada's role as a leading secure and green supplier to the world:

1. Zero-Emission Vehicles.
2. Net-Zero Emission Processes and Facilities.
3. Circular Manufacturing of Materials.
4. Scale-Up and Adoption of Transformative Manufacturing Solutions.

NGen will apply for additional funding from the Global Innovation Cluster program to support strategic projects and ecosystem initiatives in these fields.

NGen will also continue to pursue other opportunities to obtain funding for advanced manufacturing projects and sustaining our business beyond March 2023. NGen is well equipped to pursue two types of funding opportunities:

1. Programs where NGen itself obtains funding to support projects and receives a proportion of that funding for related operating expenses, which can be complemented by management fees charged to funding recipients (our current funding model).
2. Programs that fund projects directly. Here NGen can play a facilitation role in project development and raise revenue to offset its operating expenses from management fees charged to project partners without having to administer actual funding or project approvals and monitoring itself. This is the model employed by clusters in the Eureka! program.

NGen's network of members, established systems for efficient and responsible administration of projects and pro-

ject financing, and our strong pipeline of project opportunities are advantages for NGen in pursuing opportunities to assist federal and provincial governments in spending funds already allocated in program budgets.

3. Ecosystem Development Initiatives

NGen will continue to build support for its Ecosystem Development Initiatives, placing special emphasis on attracting youth and under-represented groups into advanced manufacturing careers and providing training and resources to help companies improve the management of advanced manufacturing processes and implement net-zero emission facilities.

In 2022-2023, NGen plans to:

- Launch another phase of its Careers of the Future campaign with increased financial support from industry sponsors. The next stage of the campaign will engage younger students in grades 6 to 8, update the Careers of the Future website with new video content in addition to more educational materials for students and educators, and organize another contest for students providing bursaries for those with the best projects tied to themes in advanced manufacturing. NGen plans to invest \$600,000 in the next phase of the campaign in 2022-2023 and is aiming to attract additional sponsorships from industry of at least \$2 million.
- Promote the enrolment of more students across Canada on the VRTA platform and especially its adoption by BIPOC learners and schools in remote communities.
- Support the expansion of MFI’s Indigenous manufacturing entrepreneurship and financial literacy courses to at least 50 schools across Canada.
- Facilitate support and strengthen collaboration across the advanced manufacturing clusters that NGen has funded, with a particular focus on helping grow membership and services provided by the ten start-up clusters that have been created, including the Saskatchewan Indigenous Manufacturing Cluster.
- Develop and commercialize our Transformation Leadership Program with the goal of building a stream of

business services revenue to finance future operating expenses for program delivery.

- Raise industry contributions for carrying out the program agendas developed by our Technology Advisory Groups and add additional Groups, particularly in the fields of cybersecurity and advanced materials.
- Provide IP advisory support and develop IP Commercialization Strategies for all of our project partners. Our goal is to provide licensable access to more than 100 IP assets on NGen’s IP Registry by the end of March 2023.
- Build our network of engaged members to 5,000 across Canada in order to identify a broader range of advanced manufacturing capabilities and facilitate more industry connections and partnerships. We will put special emphasis of engaging researchers, technology providers, and manufacturers around the activities of our Technology Advisory Groups, including partners that we intend to engage in our AI4M program.
- Continue to provide strategic insights to our members and the ecosystem at large through webinars and conference participation.
- Increase our engagement activities and the participation of our members and ecosystem partners in international events and networking opportunities, including participation in the World Manufacturing Forum, World Economic Forum’s Global Network of Advanced Manufacturing Hubs, and Hanover Messe.
- Support our ecosystem partners in attracting multinational investments and product mandates to Canada.

Statements and Affirmations for the Year ending March 31st, 2022

Ecosystem Investments

NGen invested \$5.8 million in Strategic Ecosystem Initiatives directly from our operating expenses and approved additional investments of \$7.7 million for SME Capacity Building and \$15.6 million for industry-led Ecosystem Development projects in 2021-2022. All open call advanced manufacturing projects approved for NGen funding are also required to contribute to building Canada’s advanced manufacturing ecosystem.

Investment Policy

There have been no updates to NGen’s investment policies, standards, and procedures.

Executive Compensation

Total compensation comprising salary and benefits for one employee was in excess of \$300,000.

Financial Controls

NGen management maintains a system of financial and internal controls to provide reasonable assurance that transactions are accurately recorded on a timely basis, are properly approved, and result in reliable financial information. NGen’s financial and internal controls have operated as intended.

IP Strategy

There have been no updates to NGen’s Intellectual Property Strategy. NGen’s IP Strategy has operated as intended and has supported the objectives as outlined in NGen’s Corporate Plan.

There were no instances in 2021-2022 where project partners refused to enter eligible Foreground IP onto NGen’s IP Registry or where project partners have been denied access to Foreground IP. There have been no disputes arising among project partners that have been referred to dispute resolution.

Data Strategy

There have been no updates to NGen’s Data Strategy. NGen continues to leverage data as a strategic asset and provide strong security policies and procedures to ensure governance and compliance of data activities.

Evaluations and Audits

NGen conducts regular reviews of its financial controls and project performance. NGen’s financial statements for 2021-22 were subject to independent financial audit. The results of the audit are appended at the end of this report.

Statements of Funding

- a. Funded Eligible Costs incurred and paid by NGen in the Fiscal Year amounted to \$130,611,159.
- b. Unfunded Eligible Costs incurred in the Fiscal Year amounted to \$33,686,738.
- c. Industry matching funds contributed in the Fiscal Year amounted to \$101,191,993.
- d. Total funding received from all sources to support NGen’s eligible operating and administrative expenses during the Fiscal Year amounted to \$17,117,805.

Industry Matching Funds

Type of Cost	Industry Matching Funds	Cumulative Industry Match to March 2022	Total Industry Match Committed
Operating & Administrative Costs	\$5,576,062	\$11,024,549	\$11,562,049
Technology Development and Process Transformation Projects	\$91,620,584	\$114,192,098	\$268,739,552
Of which COVID-19 Projects	\$28,134,945	\$43,606,935	\$43,400,011
SME Capacity Building Projects	\$2,817,725	\$3,950,658	\$14,194,768
Industry-Led Ecosystem Development Projects	\$177,622	\$177,622	\$49,034,990
Total	\$101,191,993	\$129,344,927	\$343,531,359

Operating & Administrative Costs

Type of Funding Organization	Contributions to O&A Costs in 2021-2022	Cumulative Contributions to O&ACosts March 2022
Industry	\$5,576,062	\$11,024,549
ISED	\$11,303,893	\$24,859,447
Other Sources	\$237,850	\$1,342,000
Total	\$17,117,805	\$37,225,996

Financial Statements of

**NEXT GENERATION
MANUFACTURING
CANADA**

And Independent Auditors' Report thereon

Year ended March 31, 2022



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INDEPENDENT AUDITORS' REPORT

To the Shareholder of Next Generation Manufacturing Canada

Opinion

We have audited the financial statements of Next Generation Manufacturing Canada (the Entity), which comprise:

- the statement of financial position as at March 31, 2022
- the statement of operations and changes in net assets for the year then ended
- the statement of cash flows for the year then ended
- and notes to the financial statements, including a summary of significant accounting policies

(Hereinafter referred to as the "financial statements").

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of the Entity as at March 31, 2022 and its results of operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the **"Auditors' Responsibilities for the Audit of the Financial Statements"** section of our auditors' report.

We are independent of the Entity in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada and we have fulfilled our other ethical responsibilities in accordance with these requirements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.



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Responsibilities of Management for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Entity's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Entity or to cease operations, or has no realistic alternative but to do so.

Auditors' Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinion.

Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists.

Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the financial statements.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit.

We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion.

The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Entity's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.



Page 3

- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Entity's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditors' report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditors' report. However, future events or conditions may cause the Entity to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Chartered Professional Accountants, Licensed Public Accountants

Hamilton, Canada

July 27, 2022

NEXT GENERATION MANUFACTURING

Statement of Financial Position

March 31, 2022 with comparative information for 2021

(In thousands of dollars)	2022	2021
Assets		
Current assets:		
Cash	\$ 32,428	\$ 15,591
Accounts receivable	463	98
HST receivable	—	652
Project/program advances (note 3)	8,325	15,268
Prepaid expenses (note 8)	448	5,419
	41,664	37,028
Capital assets (note 4)	34	56
Intangible assets (note 5)	922	1,348
	\$ 42,620	\$ 38,432

Liabilities and Net Assets

Current liabilities:		
Accounts payable and accrued liabilities (note 7)	3,199	1,311
HST payable	163	—
Project/program holdbacks	3,147	1,174
Unearned revenue	314	40
Deferred contributions (note 8)	29,425	31,602
	36,248	34,127
Deferred capital contributions (note 9)	773	1,199
	37,021	35,326
Net assets	5,599	3,106
COVID-19 (note 14)		
Subsequent event (note 15)		
	\$ 42,620	\$ 38,432

See accompanying notes to financial statements.

On behalf of the Board:

Director

Director

NEXT GENERATION MANUFACTURING

Statement of Operations and Changes in Net Assets

Year ended March 31, 2022 with comparative information for 2021

(In thousands of dollars)	2022	2021
Revenues:		
Federal contributions	\$ 67,548	\$ 64,536
Administration fees	5,129	4,774
Industry in-kind contributions	410	83
Industry sponsorships	105	6
Interest income	170	202
	73,362	69,601
Expenses:		
Project and program expenditures	56,069	56,120
Salaries & benefits	5,484	3,677
Advanced manufacturing ecosystem initiatives (note 10)	5,793	2,240
Outsourced services (note 11)	1,764	1,635
Administration and governance	572	506
Communications and events	210	236
Amortization of capital assets	977	234
	70,869	64,648
Excess of revenues over expenses	2,493	4,953
Net assets (deficiency), beginning of year	3,106	(1,847)
Net assets end of year	\$ 5,599	\$ 3,106

See accompanying notes to financial statements.

NEXT GENERATION MANUFACTURING

Statement of Cash Flows

Year ended March 31, 2022 with comparative information for 2021

(In thousands of dollars)	2022	2021
Cash provided by (used in):		
Operations:		
Excess of revenues over expenses	\$ 2,493	\$ 4,953
Items not involving cash:		
Amortization of capital assets	977	234
Intangible asset contributed in-kind	(497)	—
Deferred capital contributions from in-kind	497	—
Changes in non-cash operating working capital:		
Increase in accounts receivable	(365)	(45)
Increase in HST receivable	—	(512)
Increase in HST payable	815	—
Decrease in contributions receivable	—	30,665
Decrease (increase) in project/program advances	6,943	(15,268)
Decrease (increase) in prepaid expenses	4,971	(5,305)
Increase (decrease) in accounts payable and accrued liabilities	1,888	(445)
Increase in project/program holdbacks	1,973	1,174
Increase in unearned revenue	274	40
Increase (decrease) in deferred contributions	(2,177)	507
	17,792	15,998
Financing:		
Bank overdraft	—	(154)
Investing:		
Purchase of capital assets	(33)	(54)
Purchase of intangible assets	—	(950)
Deferred capital contributions	(922)	751
	(955)	(253)
Increase in cash	16,837	15,591
Cash, beginning of year	15,591	—
Cash, end of year	\$ 32,428	\$ 15,591

See accompanying notes to financial statements.

NEXT GENERATION MANUFACTURING CANADA

Notes to Financial Statements

Year ended March 31, 2022
(in thousands of dollars)

1. Corporate information:

Next Generation Manufacturing Canada ("NGen") was incorporated under the laws of Canada as a not-for-profit corporation without share capital on November 23, 2017. NGen is an industry-led, organization dedicated to building next generation manufacturing capabilities nationally. Our mission is to help Canadian companies become global leaders in the application of leading technologies to manufacturing products and/or processes.

NGen projects and programs are aimed at driving greater technology development and technology adoption in Canadian manufacturing. To further support cluster growth, we also use data and systems to increase connections and collaboration across the Canadian advanced manufacturing network.

With the signing of the Contribution Agreement between the Federal Government, represented by Minister of Industry and NGen dated November 9, 2018, the Federal Government's Ministry of Innovation, Science and Economic Development ("ISED") committed to fund NGen for eligible project costs over a five year period commencing in Fiscal Year 2018/19. Under the terms of the contribution agreement, ISED will provide a non-repayable contribution to NGen for 75% of eligible operating expenses that do not exceed 15% of the total contribution, and 100% of eligible project costs. The total is not to exceed the lesser of \$229,765 or 100% of total Industry Matching Funds obtained by the organization over the five-year period. The amount of ISED contributions varies from year to year based on forecasted operating and project spend and amounts may be reallocated to other fiscal years within the five year period with the written approval from the Minister of ISED.

NGen was approved for an additional \$20,000 on July 29, 2021 via an amendment to the Contribution Agreement to support projects in NGen's pipeline related to Automotive Zero-Emissions.

Payment by the Federal Government of the contribution is conditional on there being a legislated appropriation for the fiscal year in which the contribution is due. The Minister shall have the right to terminate or reduce the contribution in the event that the amount of the appropriation is reduced or denied by Parliament.

2. Significant accounting policies:

These financial statements are prepared in accordance with Canadian accounting standards for not-for-profit organizations. NGen's significant accounting policies are as follows:

(a) Revenue recognition:

NGen receives grant revenue from ISED under the Innovation Superclusters Initiative ("ISI") and from industry.

NGen follows the deferral method of accounting for contributions. Unrestricted contributions and sponsorships are recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

Externally restricted contributions are recognized as revenue in the year in which the related expenses are incurred.

NEXT GENERATION MANUFACTURING CANADA

Notes to Financial Statements (continued)

Year ended March 31, 2022
(in thousands of dollars)

2. Significant accounting policies (continued):

(a) Revenue recognition (continued):

Deferred capital contributions related to capital and intangible assets represent amounts received specifically for the purpose of purchasing capital and intangible assets. Externally restricted contributions related to the purchase of capital and intangible assets are deferred and amortized to revenue on the same basis as the related capital or intangible asset. An administration fee of 2.5% of total eligible project costs is charged to recipients prior to contracting. Revenue related to this non-refundable fee is recognized when invoiced.

(b) Cash:

Cash consists of amounts held in a bank account which earns interest on a monthly basis.

(c) Project/program advances

Project/program advances consist of funding provided to projects in advance of project costs being incurred. Advances are drawn down and recognized as revenue when a claim for project costs incurred is submitted and approved by NGen.

The year-end balance includes an accrual for project claims submitted for costs incurred and not yet approved.

(d) Capital assets:

Purchased capital assets are recorded at cost.

Capital assets are amortized on a straight-line basis using the following annual rates:

Asset	Rate
Computers	55%
Furniture and fixtures	20%

(e) Intangible assets:

Intangible assets are measured at cost less accumulated amortization. Amortization is provided for, upon the commencement of the utilization of the asset, on a straight-line basis over the remaining term of the Contribution Agreement.

Development activities are recognized as an asset provided they meet the capitalization criteria, which include NGen's ability to demonstrate: technical feasibility of completing the intangible asset so that it will be available for use; NGen's intention to complete the asset for use; NGen's ability to use the asset; the adequacy of NGen's resources to complete the development and to use the asset; NGen's ability to measure reliably the expenditures during the development; and NGen's ability to demonstrate that the asset will generate future economic benefits.

NEXT GENERATION MANUFACTURING CANADA

Notes to Financial Statements (continued)

Year ended March 31, 2022
(in thousands of dollars)

2. Significant accounting policies (continued):

(f) Project/program holdbacks:

Project/program holdbacks represent unpaid amounts for reconciled project costs which become payable to projects upon project closeout. NGen will hold back 15% of total available project funding until the closure of a project to ensure the receipt and acceptance of all project deliverables from the project. Holdbacks are recorded when a claim for project costs incurred is submitted and approved by NGen and reconciled funding exceeds 85% of total available funding.

The year-end balance includes an accrual for project claims submitted for costs incurred and not yet approved.

(g) Contributed services:

The value of in-kind services for professional fees, materials and administrative services is recognized in the financial statements at the fair value of such services at their date of contribution.

(h) Income taxes:

NGen is a not-for-profit organization under the Income Tax Act (Canada) and accordingly is exempt from income taxes.

(i) Financial instruments:

Financial instruments are recorded at fair value on initial recognition. Freestanding derivative instruments that are not in a qualifying hedging relationship and equity instruments that are quoted in an active market are subsequently measured at fair value. All other financial instruments are subsequently recorded at cost or amortized cost, unless management has elected to carry the instruments at fair value. NGen has not elected to carry any such financial instruments at fair value.

Transaction costs incurred on the acquisition of financial instruments measured subsequently at fair value are expensed as incurred. All other financial instruments are adjusted by transaction costs incurred on acquisition and financing costs, which are amortized using the straight-line method.

Financial assets are assessed for impairment on an annual basis at the end of the fiscal year if there are indicators of impairment. If there is an indicator of impairment, NGen determines if there is a significant adverse change in the expected amount or timing of future cash flows from the financial asset. If there is a significant adverse change in the expected cash flows, the carrying value of the financial asset is reduced to the highest of the present value of the expected cash flows, the amount that could be realized from selling the financial asset or the amount NGen expects to realize by exercising its right to any collateral. If events and circumstances reverse in a future year, an impairment loss will be reversed to the extent of the improvement, not exceeding the initial impairment charge.

NEXT GENERATION MANUFACTURING CANADA

Notes to Financial Statements (continued)

Year ended March 31, 2022
(in thousands of dollars)

2. Significant accounting policies (continued):

(j) Use of estimates:

The preparation of the financial statements in conformity with Canadian accounting standards for not-for-profit organizations requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the year. Significant items subject to such estimates and assumptions include the carrying amounts of capital and intangible assets. Actual results could differ from those estimates.

3. Project/program advances:

Project/program advances of \$10,423 have been reduced by an accrual amount of \$2,098 (2021 - \$5,394) for project claims received but not yet approved by NGen at year-end.

4. Capital assets:

				2022	2021
	Cost	Accumulated amortization		Net book value	Net book value
Computers	\$ 101	\$ 75	\$ 26	\$ 43	
Furniture and fixtures	24	16	8	13	
	\$ 125	\$ 91	\$ 34	\$ 56	

Cost and accumulated amortization at March 31, 2021 amounted to \$92 and \$36 respectively. During the year, NGen disposed of fully amortized assets with cost and accumulated amortization of \$Nil.

NEXT GENERATION MANUFACTURING CANADA

Notes to Financial Statements (continued)

Year ended March 31, 2022
(in thousands of dollars)

5. Intangible assets:

	Cost	Accumulated amortization	2022 Net book value	2021 Net book value
Project pipeline and claims portal	\$ 597	\$ 398	\$ 199	\$ 398
Collaboration platform	1,447	724	723	950
	<u>\$ 2,044</u>	<u>\$ 1,122</u>	<u>\$ 922</u>	<u>\$ 1,348</u>

Cost and accumulated amortization at March 31, 2021 amounted to \$1,547 and \$199 respectively.

i. Project pipeline and claims portal

This asset reflects a portal that is being used to capture project and program application intake and is utilized to manage the internal workflow from the application stage through to the contracting stage. Project participants also use this portal to submit claims and supporting documentation for processing and reimbursement.

The portal was available for use and subject to amortization commencing April 1, 2020.

ii. Collaboration platform

The collaboration platform allows NGen members to easily locate partners to collaborate on advanced manufacturing initiatives and will support the needs of our members to:

- identify potential opportunities to partner in innovation projects in Canada and internationally and identify potential partners or suppliers for projects or other innovation initiatives,
- identify potential solutions to technology adoption/scale-up challenges and identify potential tech adoption/scale-up challenges based on what companies want to do,
- Identify individual experts/researchers who can support projects,
- Identify supporting intellectual property or opportunities to commercialize intellectual property, including from NGen projects, and
- Identify sources of public and private funding for innovation initiatives, tech adoption and scale-up.

The collaboration platform was available for use and subject to amortization commencing April 1, 2021.

NEXT GENERATION MANUFACTURING CANADA

Notes to Financial Statements (continued)

Year ended March 31, 2022
(in thousands of dollars)

6. Bank overdraft:

NGen has an authorized operating line of credit of \$1,000, repayable on demand. The interest rate charged on the operating line is prime plus 1.00%, payable monthly in arrears. At year-end, the balance drawn on the operating line was \$nil (2021 - \$ nil). In addition, NGen has credit facilities in the form of corporate credit cards which total \$100 (2021 - \$100) of which \$8 (2021 - \$nil) was utilized.

7. Accounts payable and accrued liabilities:

Included in accounts payable and accrued liabilities are trade amounts due, project and program reimbursements payable and performance-based incentive accruals.

8. Deferred contributions:

Deferred contributions represent unspent externally restricted government funds from the ISED program, for the purpose of providing funding to eligible recipients for future projects and for the payment of NGen's subsequent years' operations. The change in the deferred contributions balance is as follows:

	2022	2021
Balance, beginning of year	\$ 31,602	\$ 31,095
Funding received	64,696	64,845
Amount recognized as revenue	(66,873)	(64,338)
Balance, end of year	<u>\$ 29,425</u>	<u>\$ 31,602</u>

Total revenues include amortization of deferred capital contributions of \$675 (2021 - \$199) referenced in Note 9.

Included in deferred contributions is \$448 (2021 - \$5,419) for prepaid IT support, media and consulting contracts supporting a youth in manufacturing campaign, delivery of an advanced manufacturing gap analysis, and other ecosystem initiatives. Revenue related to these prepaid contracts is recognized when the expense is incurred, and the contract deliverables are accepted by NGen.

NEXT GENERATION MANUFACTURING CANADA

Notes to Financial Statements (continued)

Year ended March 31, 2022

(in thousands of dollars)

9. Deferred capital contributions:

Deferred capital contributions represent the unamortized amount of restricted government funds from the ISED program received for the purchase of intangible assets and in-kind contributions from the platform service provider. Details of the change in the unamortized deferred capital contribution balance is as follows:

	2022	2021
Balance, beginning of year	\$ 1,199	\$ 448
Funding received	–	950
Amount recognized as revenue	(675)	(199)
In-kind contribution on Collaboration Platform	497	–
Amount recognized as in-kind revenue	(248)	–
Balance, end of year	\$ 773	\$ 1,199

10. Advanced manufacturing ecosystem initiatives:

Advanced manufacturing ecosystem initiatives represent payments to external parties who will carry out activities on behalf of NGen to help build out and strengthen Canada's advanced manufacturing ecosystem. These activities will:

- Raise awareness about the importance of advanced manufacturing for Canada's economic prosperity and about the world-leading technologies, skills, and manufacturing capabilities that Canada has to offer,
- Enhance connectivity and strengthen collaboration among manufacturers, technology providers, researchers, educators, government organizations, business networks, and supporting business and financial services across Canada and internationally,
- Help coordinate and align services and capacity building initiatives across the ecosystem, especially for SMEs,
- Facilitate access to existing public and private sector funding, expertise, resources, tools, and testbeds,
- Identify gaps in Canada's supporting advanced manufacturing infrastructure based on needs and interests identified by NGen members, and
- Support the development of new workforce programs, tools, and testbeds that support technology development, adoption, and scale-up in manufacturing.

11. Outsourced services:

Outsourced services include payments for independent expert assessors for project reviews, contractor payments for monitoring of projects and technology costs.

NEXT GENERATION MANUFACTURING CANADA

Notes to Financial Statements (continued)

Year ended March 31, 2022

(in thousands of dollars)

12. Committed funding:

NGen invests in projects and programs which drive greater technology development and technology adoption in Canadian manufacturing. Projects are selected through a competitive process and successful proponents enter into Master Project Agreements outlining the terms of the investment. As of March 31, 2022, commitments for funding by stream are as follows:

	Total committed funding	Estimated remaining commitment	Total estimated funding
Projects	\$ 136,985	\$ –	\$ 136,985
COVID-19 projects	71,528	–	71,528
Capacity building programs	11,487	513	12,000
	\$ 220,000	\$ 513	\$ 220,513

13. Financial risks and concentration of risk:

NGen has a risk management framework to monitor, evaluate and manage the principal risks assumed with its financial instruments. The following analysis provides a summary of NGen's exposure to and concentrations of risk at March 31, 2022:

(a) Liquidity risk:

Liquidity risk is the risk that NGen will be unable to fulfill its obligations on a timely basis or at a reasonable cost. NGen manages its liquidity risk by monitoring its operating requirements and prepares budget and cash forecasts to ensure it has sufficient funds to fulfill its obligations. As described in Note 6, the organization also has access to an operating line of credit. There has been no change to the risk exposures from 2021.

(b) Interest rate risk:

Interest rate risk arises from fluctuations in interest rates depending on prevailing rates. NGen has exposure to interest rate risk through its operating line of credit, however, management has assessed that the impact on NGen's financial position would be insignificant.

(c) Projects and Programs risk:

Projects and Programs risk is the risk where companies that have contracted with NGen may not be able to continue to fund their portion of the costs given unstable economic conditions described in Note 14. If requested by companies, NGen will provide advances to cover eligible project and program expenditures to assist companies with cash flow.

NEXT GENERATION MANUFACTURING CANADA

Notes to Financial Statements (continued)

Year ended March 31, 2022
(in thousands of dollars)

14. COVID-19:

On March 11, 2020, the World Health Organization declared the Coronavirus COVID-19 (COVID-19) outbreak a pandemic. This has resulted in governments worldwide, including the Canadian and Ontario governments, enacting emergency measures to combat the spread of the virus. These measures, which include the implementation of travel bans, self-imposed quarantine periods and social distancing, have caused material disruption to businesses globally and in Ontario resulting in an economic shutdown. Governments and central banks have reacted with significant monetary and fiscal interventions designed to stabilize economic conditions however the success of these interventions is not currently determinable. During fiscal 2022, the easing of restrictions and re-opening measures introduced have mitigated the impacts to NGen in the foreseeable future. Supply chain disruptions globally and within Canada continue to have an impact on the economy and management will continue to monitor, assess and respond to impacts on NGen and the projects and programs that are funded. From the declaration of the pandemic to the date of approval of these financial statements, NGen experienced the following in relation to the COVID-19 pandemic:

NGen has committed to funding \$71,528 of the total contribution of \$229,765 for the purpose of funding COVID-19 related projects. In the year ended March 31, 2022, NGen has recognized \$23,826 (2020 - \$47,432) in revenue related to COVID-19 projects from the total contribution and has fulfilled its committed funding.

15. Subsequent event:

The Federal Budget 2022 proposes to provide \$750M over six years, starting in 2022-23 to support the further growth and development of Canada's Superclusters (now called Global Innovation Clusters). Building on their success to date, these clusters will expand their national presence and will collaborate to deepen their impact, including through joint missions aligned with key government priorities, such as fighting climate change and addressing supply chain disruptions. To maximize the impact of this funding and to ensure it corresponds with industry and government needs, it will be allocated between the five clusters on a competitive basis.

NGen has been conditionally approved for up to \$30,000 (of the \$125,000) earmarked for the Pan-Canadian Artificial Intelligence Strategy Commercialization Stream ("PCAIS") to support inclusive innovation to advance the commercialization of artificial intelligence (AI) applications in Canada and promote AI adoption by businesses and communities. Funding is dependent on completion of due diligence to ISED's satisfaction and the negotiation and execution of a contribution agreement. The additional funding will be a non-repayable contribution to NGen over a period of four (4) years ending March 31, 2026.

Appendix 1: NGen Projects

Projects Announced and Completed or Closed by March 31st, 2022

Project Partners							
Project Lead	Short Title	Total	Industry	SMEs	Research	NGen Investment	Total Investment
Pilot Projects							
Addem Labs Inc	New PCB Manufacturing Process	3	2	2	1	\$249,912	\$521,149
DeepSight Realite Augmentee Inc.	Module for digitalizing work instructions to augmented reality	2	2	2		\$126,204	\$197,329
Evercloak Inc.	Advancing large-scale graphene and thin-film membrane manufacturing	4	2	2	2	\$199,882	\$503,058
KSL Lubricants Inc.	Pilot scale of Nanogel Lubricants, or Superabsorbent (SAC) Lubrication for the automotive stamping industry	3	2	2	1	\$76,304	\$153,708
Molded Precision Components	Development and Testing of Cube Molding Methodology	3	2	2	1	\$239,213	\$503,631
Nano Cnet Ltd.	Roll to Roll Continuous Printing of Transparent Conductors and Heaters	3	2	2	1	\$250,000	\$500,000
Panevo Services Limited	Real Time Overall Equipment Effectiveness Monitoring & Optimization	2	2	2		\$128,218	\$256,435
Sanctuary Cognitive Systems	AI-enabled robotic hand with human-level dexterity for assembly	3	3	3		\$252,474	\$517,358
Feasibility Studies							
3D BioFibR Inc.	3D Advanced Biofiber Manufacturing	3	2	2	1	\$74,294	\$213,117
Advanced BioCarbon 3D Ltd	Bio-refinery Engineering Study	3	2	2	1	\$100,000	\$200,000
AiimSense	Technology Feasibility Demonstration for Stroke Diagnosis	5	2	2	3	\$54,341	\$140,625
Datec Coating Corporation	Novel Clean Tech. Manufacturing Process for the Catalytic Production of a Green Disinfectant for Water Treatment	3	2	2	1	\$82,052	\$199,103
Exergy Solutions Inc.	Asphaltene Carbon Fiber Feasibility Study	4	3	2	1	\$81,835	\$174,670
Kepstrum Inc.	Create Analytical Baselines to Predict Service Life	5	2	1	3	\$96,468	\$276,106
Quali Artificial Intelligence Inc.	AI powered Visual Quality Inspection	4	4	4		\$91,468	\$183,445

Project Partners							
Project Lead	Short Title	Total	Industry	SMEs	Research	NGen Investment	Total Investment
Cluster Building							
Bluewater Wood Alliance	Cluster Digital Transformation Program (DTP) - COVID19 Response	4	1	1	3	\$66,851	\$133,703
Canadian Advanced Air Mobility	Aerospace & Automotive Next Generation Advanced Air Mobility Manufacturing	1	1	1		\$74,532	\$149,063
Saskatchewan Industrial and Mining Suppliers Association	Digitising SIMSA Cluster	1	1	1		\$71,100	\$142,200
COVID-19 Rapid Response Challenge							
BOMImed	Increased manufacturing capacity for critical ventilator breathing circuit components	3	3	3		\$925,604	\$978,365
Burloak	3D Print Protective Face Shields	1	1	1		\$1,137,857	\$1,305,840
Canadian Emergency Ventilators Inc. (aka- Starfish Medical)	Canadian Pandemic Ventilator	1	1	1		\$5,000,000	\$6,918,289
DMF Medical Incorporated	Regulatory and Manufacturing Fast Track of memsorb™ - supporting the modification of anesthesia machines into ICU ventilators to deal with Covid-19	2	1	1	1	\$276,008	\$632,084
Eclipse Automation Inc.	N95 Respirator Automation Project	1	1	0		\$2,106,775	\$2,989,879
Envision SQ	Scaling-up Production of Next-Generation Self-Sterilization Coating	1	1	1		\$1,500,478	\$1,738,493
ExaCad	Fast manufacturing of plastic injection molds for COVID-19 diagnostic and treatment	1	1	1		\$1,831,373	\$1,965,950
LuminUltra Technologies	LuminUltra COVID19 RNA Test Kit	1	1	1		\$2,858,729	\$4,610,854
Molded Precision Components	Manufacture Protective Face Shields	3	2	2	1	\$4,930,576	\$4,932,741
Mosaic Manufacturing Ltd.	45K COVID Shields	4	4	4		\$425,147	\$428,952
Myant	Textile based wearable health monitoring system	1	1	1		\$2,489,771	\$5,062,943

Project Partners							
Project Lead	Short Title	Total	Industry	SMEs	Research	NGen Investment	Total Investment
COVID-19 Rapid Response Challenge							
Precision Biomonitoring	Canadian Manufacture of Lyophilized SARS-CoV-2 RNA detection kits	2	2	2		\$4,551,388	\$4,721,762
Response Biomedical	Pandemic preparedness COVID-19 test development & manufacturing scale-up	1	1	1		\$2,740,298	\$2,900,398
Sona Nanotech	Manufacture Rapid Response Point-of-Care Virus Screening	4	1	1	3	\$3,896,295	\$3,896,295
COVID-19 Disinfecting Robot Challenge							
A&K Robotics	Amrud (Autonomous mobile robotic UV disinfecter)	2	2	2		\$608,583	\$1,217,166
Advanced Intelligent Systems Inc.	Disinfection Robot	1	1	1		\$944,600	\$1,889,201
CrossWing Inc.	CrossWing Cleanbot Mist and UV	1	1	1		\$1,599,905	\$3,474,324
GlobalDWS Corporation	GlobalDWS Disinfection Service Robot Solution	1	1	1		\$718,220	\$1,493,657
IPC Technologies Inc. (Prescientx)	Autonomous Mobile UV-Light Emitting Robotic Vehicle for Sanitizing Workplaces Against COVID-19	2	2	2		\$687,445	\$1,410,897
COVID-19 Made Smarter Challenge							
Armfoam Inc.	Automated production of N95 Respirators	2	2	2		\$2,441,034	\$7,942,824
Carmina de Young Fashion Design Inc.	Lifecycle PPE	5	3	3	2	\$1,994,409	\$3,988,818
INTERNATIONAL POINT OF CARE, INC. (IPOC)	Advanced manufacturing expansion for large-scale covid-19 reagents and test kits	4	4	3		\$2,083,723	\$5,771,241
MPC	Automated Sanitizer Advanced Manufacturing System - Pellet to Pallet.	5	2	2	3	\$6,061,897	\$12,123,794
Novo Textiles Inc.	Automated Original Equipment Fabrication for N95 Mask Production	2	2	2		\$906,338	\$2,398,339
Providence Therapeutics Holdings Inc.	A Made-In Canada COVID-19 mRNA Vaccine	2	2	2		\$5,050,000	\$10,930,021
Mainstream Advanced Manufacturing Projects							
Conrex Steel Ltd	Advancing Large Steel Press Technology	5	3	3	2	\$3,487,712	\$7,976,475

Projects Announced and Underway by March 31st, 2022

Project Partners							
Project Lead	Short Title	Total	Industry	SMEs	Research	NGen Investment	Total Investment
Pilot Projects							
Advanced BioCarbon 3D Ltd	Test and Development Center - Replacing All Petrochemical Plastics with 100% Bio based Materials that perform as well	4	3	2	1	\$249,981	\$504,462
CarbiCrete Inc.	Data Acquisition and Visualization Platform for the Manufacturing of Carbon-Negative Concrete	3	2	2	1	\$250,000	\$500,000
Deep Cryogenics International Inc.	A Deep Cryogenic Treatment Tank for Industrial Applications	5	2	2	3	\$225,469	\$450,937
Hazelett Casttechnology ULC	Hazelett CASTechnology ULC	5	2	2	3	\$248,822	\$497,643
Kepstrum Inc.	New and Innovative End-of-Line Tester	7	3	2	4	\$249,941	\$499,881
Petra Hygienic Systems International Limited	Development and Implementation of an autonomous novel bottle/ pump insertion solution that utilizes computer vision with advancements in machine learning, robotics and mechanical engineering.	3	2	2	1	\$249,982	\$743,173
Synaptive Medical Inc.	Manufacturing Process for MRI Gradient Coil Production	3	2	1	1	\$240,000	\$803,000
Feasibility Studies							
Apex Industries Inc.	Transformation of the Stone Veneer Panel Manufacturing and Installation Process	2	2	2		\$99,813	\$209,625
Quali Artificial Intelligence Inc.	Low latency tele-robotics for manufacturing pick and place	2	2	2		\$100,000	\$200,000
Cast Analytics	Development and Industrial Demonstration of Metal Casting Digital Twin with Integrated AI-Driven Optimization	5	3	3	2	\$96,613	\$236,101
Cluster Building							
Alliance of Manufacturers & Exporters Canada	Advanced Manufacturing Cluster - CME NL	2	1	1	1	\$41,404	\$84,607
Canadian Additive Network (CAN) - Reseau Canadien de Fabrication Additivea	Canadian Additive Network - Reseau Canadien de Fabrication Additive	4	1	1	3	\$75,000	\$180,000
Canadian Association of Moldmakers Inc.	CAMM Transformation Virtual Program	3	1	1	2	\$75,000	\$156,000
Canadian Association of PPE Manufacturers	Canadian Association of PPE Manufacturers	1	1	1		\$75,000	\$281,619

Project Partners							
Project Lead	Short Title	Total	Industry	SMEs	Research	NGen Investment	Total Investment
Cluster Building							
Canadian Photonics Industry Consortium	CLUSTER - Virtual Photon Cluster	1	1	1		\$25,000	\$56,000
Central Alberta: Access Prosperity	Manufacturing & Export Enhancement (MEE) Cluster	1	1	1		\$75,000	\$205,535
Destination AI	Destination AI	4	2	1	2	\$75,000	\$155,000
InnoTech Alberta	MARIOS - Sustainable Manufacturing	4	1	1	3	\$74,988	\$149,975
NanoCanada	Canadian Nanomedicine Cluster	1	1	1		\$75,000	\$156,025
ONTARIO AEROSPACE COUNCIL	CLUSTER: OAC Virtual Aerospace Matchmaking Platform and Intelligence Hub	1	1	1		\$75,000	\$459,500
Reseau Trans-AI Inc.	CLUSTER Advanced metal machining using data	2	1	1	1	\$75,000	\$159,160
Verschuren Centre Inc.	Cluster: Materials Atlantic	7	1	1	6	\$74,993	\$224,985
Verschuren Centre Inc.	AscendBio	1	1	1		\$75,000	\$149,999
Xtended Hydraulics & Machine Inc.	Indigenous Manufacturers Network - Saskatchewan (IMN-Sask)	2	1	1	1	\$75,000	\$150,000
COVID-19 Rapid Response Challenge							
Cloud Diagnostics Canada ULC	Cloud DX Pulsewave 2.0 Solution to COVID Hallway Medicine Crisis	2	1	1	1	\$1,756,325	\$3,647,168
Immunovaccine Technologies Inc.	DPX-COVID-19: Manufacturing and scale Up of neutralizing-epitope based synthetic vaccine	2	1	1	1	\$2,500,000	\$5,053,937
COVID-19 Made Smarter Challenge							
Fidelity Machine & Mould Solutions Inc	Automation of Procedure Mask Machines	3	3	3		\$1,508,589	\$3,397,723
The BIG-nano Corporation	Nanofiber Meltblown production using proprietary Canadian technology for PPE and Air Purification Filters	6	5	5	1	\$1,763,740	\$3,527,480
IPC Technologies Inc. dba Prescientx	Canadian N100 SuperMask - Breathing Is Believing	5	2	2	3	\$1,322,704	\$2,979,065
Titan Clean Energy Projects Corp.	Biodegradable melt-blown resin and fabric production	5	5	5		\$902,980	\$1,809,160
Fine Cotton Factory Inc.	Advanced Manufacturing Scale-up for Metal-Infused Antimicrobial Textiles	3	2	2	1	\$1,390,852	\$3,132,550
McRae Imaging Inc	Antimicrobial Shielding of Shared Spaces with Nanomaterial Coatings	4	3	3	1	\$1,800,120	\$4,432,824

Project Partners							
Project Lead	Short Title	Total	Industry	SMEs	Research	NGen Investment	Total Investment
Zero-Emission Vehicle Value Chain Challenge							
Ballard Power Systems Inc.	Next Generation Grafoil Plate Forming Pilot Line	3	3	1		\$3,180,735	\$6,361,470
Calogy Solutions	T-Man	4	2	2	2	\$1,308,349	\$2,616,698
Cnem Corporation	Green Recycling of EV Battery Black Mass	5	3	3	2	\$410,000	\$910,000
Damon Motors Inc.	AI-Assisted Smart-Optic Manufacturing of Modular EV systems	5	3	3	2	\$3,976,675	\$7,953,350
Electrovaya Inc.	Next Generation NMP-free Cell Manufacturing	4	3	3	1	\$932,901	\$1,865,801
Electrovaya Inc.	Automated Module Assembly with Advanced Laser Welding and In-line QC Methods	3	2	2	1	\$1,214,542	\$2,478,983
Hydrogenics Corporation (Cummins)	Establish CoE for HVM of HFCs for HDCV to realize Canada's GHG & Net-Zero emissions target by 2030 & 2050	8	4	4	4	\$3,666,868	\$7,773,736
Li-Metal Corp.	Recycling of Solid-State Lithium metal Batteries for EV Powertrains	2	2	1		\$2,385,228	\$5,060,456
Linamar	Compact Inverter Manufacturing Development	3	2	1	1	\$3,477,100	\$7,024,200
Momentum Materials Solutions Corp.	Development of Next Generation Membrane Electrode Assembly Using Novel Nanoporous Carbon Materials for High Performance Polymer Electrolyte Membrane Fuel Cell	3	2	2	1	\$428,838	\$977,676
Precision Resource Canada Ltd.	Scale-up to Commercialization of Metallic Bipolar Plates for Fuel Cell Road Vehicles using Advanced Manufacturing in Canada	4	2	2		\$3,999,252	\$7,998,504
Rayleigh Solar Tech Inc.	Development of scalable manufacturing processes for solar film integrated body panels	6	1	1		\$395,092	\$806,184
Summit Nanotech Corporation	Manufacturing denaLi C Green Lithium Extraction Modules	3	1	1		\$3,967,804	\$7,935,608
Ventra Group Co. (Flex-n-Gate)	Advanced Manufacturing Methods for Electric Vehicle Propulsion Batteries	7	1	1		\$3,600,048	\$7,200,095
Mainstream Advanced Manufacturing Projects							
ArcelorMittal Dofasco G.P.	Digital Transformation of Secondary Metallurgy Facility at ArcelorMittal Dofasco	7	4	2	3	\$5,330,203	\$12,126,960
Aspire Food Group Limited	Novel Application of Advanced Manufacturing Approaches to High Quality Protein	10	4	3	6	\$16,800,000	\$118,123,887
Axiom Plastics	Zero Transition	4	4	4		\$877,003	\$1,975,233

Project Partners							
Project Lead	Short Title	Total	Industry	SMEs	Research	NGen Investment	Total Investment
Mainstream Advanced Manufacturing Projects							
CarbiCrete Inc.	Industrial Implementation of CarbiCrete's Carbon-Negative Concrete Manufacturing Process at Patio Drummond	4	3	3	1	\$3,436,560	\$7,740,000
Evercloak Inc.	Scaling up graphene-based membrane manufacturing and sustainable manufacturing of net-zero energy cleanrooms	7	2	2	5	\$2,030,239	\$4,572,611
Exergy Solutions Inc.	Advanced manufacturing applications in mining and mineral processing- TA0027	7	3	2	4	\$3,539,844	\$7,972,621
Formula Solutions Inc	UpIntegrating automation for scale up of carbon fibre cascade production	6	3	3	3	\$3,625,956	\$9,790,567
Genecis Bioindustries Inc.	Transforming Food Waste Anaerobic Digester into a Bioplastic Manufacturing Hub	5	2	2	3	\$2,676,543	\$6,028,250
Macrodyne Technologies Inc.	Bioplastic as an alternative to single-use plastics	5	4	4	1	\$3,552,000	\$8,000,000
McGuire Aero Propulsion Solutions Inc.	Micro-Power-Plant Advanced Manufacturing Demonstrator	3	3	3		\$2,977,525	\$7,581,515
MDA Corporation	Advanced manufacturing for highly adaptive manufacturing environments	7	3	2	4	\$4,998,829	\$11,258,623
Mosaic Manufacturing	Array Additive Manufacturing Production System (ARRAY)	4	4	4		\$3,550,546	\$7,996,726
Mosaic Manufacturing Ltd.	Vector Mass Production Metal 3D Printing System	5	3	3	2	\$3,551,956	\$7,999,902
Mycionics Inc.	Mycionics robotic mushroom harvester	4	3	3	1	\$1,723,318	\$3,882,135
Novonix Battery Testing Services Inc.	NGEN, Novonix, Enginuity & ABCO - Partnering to Deliver a Transformative Industry 4.0 Capability Enhancement for the East Coast Battery Materials Development & Manufacturing Sector	3	2	2	1	\$1,675,000	\$17,749,986
OIC	Development and Validation of Automated Patient Specific Medical Device Software for Improved Additive Manufacturability	6	5	5	1	\$3,430,475	\$7,726,295
Panevo Services Limited	Real Time Overall Equipment Effectiveness Monitoring, Optimization & Supply Chain Collaboration	5	3	2	2	\$1,383,422	\$3,715,815
Polar Sapphire Ltd.	Advanced Systems for High Purity Alumina (HPA) Production	7	3	3	4	\$2,222,740	\$5,006,171
Reaction Dynamics Lab Inc.	Development of large-scale additive manufacturing capabilities for next-generation, eco-friendly hybrid rocket engines	3	2	2	1	\$1,506,088	\$4,892,091

Project Partners							
Project Lead	Short Title	Total	Industry	SMEs	Research	NGen Investment	Total Investment
Mainstream Advanced Manufacturing Projects							
Stronach Centre for Innovation, a division of Magna International Inc.	Autonomous Adaptable Robot System	5	2	1	3	\$2,615,269	\$5,890,246
ThinkData Works Inc.	Driving Advanced Manufacturing Practices Through Supply Chain Resiliency Analytics	5	3	1	2	\$3,552,000	\$8,000,000
Ventra Group Co.	Flex-Ion Advanced Battery Innovation Center - Advanced Manufacturing Research - Project Tau	7	2	1	5	\$3,551,849	\$9,699,660
Verschuren Centre	National Bio-Manufacturing Ecosystem	2	2	2		\$2,409,700	\$8,427,250

Projects Yet to Be Announced as of March 31st, 2022

Project Partners							
Type of Project	# Projects	Total	Industry	SMEs	Research	NGen Investment	Total Investment
Pilots	28	107	60	60	47	\$6,211,394	\$13,191,185
Feasibility Studies	9	28	21	13	7	\$864,377	\$1,958,769
Mainstream Advanced Manufacturing	16	93	47	33	46	\$35,363,218	\$94,862,076