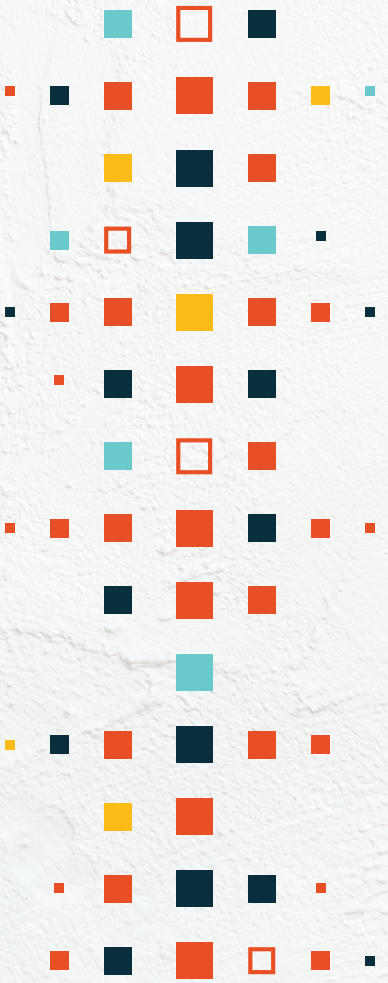
NGen

Next Generation
Manufacturing Canada

Annual Report

2023



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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 are founded on the principle that digital transformation in advanced manufacturing will enrich the lives of Canadians, delivering better products and good jobs, improving environmental sustainability, supply chain resiliency, health and security, while generating the economic growth essential to a better future.

NGen creates new opportunities by enhancing and leveraging the capabilities of our country's manufacturers, engineering and technology companies, business services, researchers, academic institutions, innovation centres, business networks, and workforce. By facilitating 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

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Message from the Honourable François-Philippe Champagne

The Government of Canada is working to secure Canada's economic growth and prosperity in a green, digital and resilient world economy. We are in a position to seize the moment and build on our solid innovation investments so that Canada succeeds in the new global economy.

The Global Innovation Clusters are accelerating Canada's global competitive edge by bringing together companies of all sizes, academic institutions and not-for-profits to generate bold new ideas. These clusters have helped build successful and growing innovation ecosystems across the Canadian economy in five areas where Canada has an innovative advantage: plant-based protein alternatives, ocean-based industries, advanced manufacturing, digital technologies, and artificial intelligence for supply chain and logistics.

The clusters are spurring innovation and collaboration across Canada by launching projects that are helping grow our economy and bringing tangible benefits to Canadians. Since the launch of the program in 2017, the clusters have been finding new ways to build connections, bringing together experts in their fields to create high-quality, well-paying jobs; invest in promising projects; help firms scale up; and position Canada as a global leader in the innovation space.

The Global Innovation Clusters are delivering tangible benefits to Canadians with their unique model, creating stronger ecosystems, de-risking the adoption of technology, maximizing the value of intellectual property and forging new partnerships that increase firms' market potential. As of March 2023, the clusters announced more than 500 projects worth $2.37 billion and involving more than 2,500 partners.

They are on track to meet or exceed the overall job creation target of 15,000 direct, indirect and induced jobs by 2023 and 50,000 by 2028.

Because of these strong results, our government confirmed Canada's commitment to the clusters in Budget 2022, investing an additional $750 million through to 2028 to support the further growth and development of Canada's Global Innovation Clusters. Building on their success to date, the five clusters will expand their national presence and will continue to collaborate with partners to deepen their impact at home and abroad, including through joint missions aligned with key global priorities such as fighting climate change and addressing supply chain disruptions.

The clusters are also helping to build a skilled and diverse workforce by creating opportunities for women, racialized Canadians, Indigenous communities and other under-represented groups and by offering workshops and formalized training in response to the industry's need for members of these groups to develop their talent, gain relevant knowledge or learn new skills.

Since the inception of the program, the clusters have developed a new approach to innovation through co-investment with industry to build accelerated, strong ecosystems that are taking innovators further, faster through collaboration. The clusters have exceeded expectations while delivering tangible results, both at home and globally.

Next Generation Manufacturing Canada (NGen) in particular is positioning Canadian manufacturing for the future in order to seize emerging opportunities in areas of new growth. Over this past year, the NGen cluster has led initiatives that are enabling critical industry-led investments to build EV value chains that will be the foundation for the future of automotive manufacturing in Canada, positioning our country as a green supplier of choice to the world.

I would like to extend a heartfelt thank you to everyone involved with the NGen cluster for your commitment to strengthening Canada's innovation ecosystems and helping to establish a diverse and skilled workforce ready for the jobs of the future.

The Honourable François-Philippe Champagne, P.C., M.P.
Minister of Innovation, Science, and Industry

Message from our Chair Linda Hasenfratz

NGen has developed a remarkable track record over the past five years of its operations. Now our Board of Directors is looking to the next five years and beyond.

In 2022-2023 we updated our corporate strategy and set even more ambitious targets for NGen to achieve by 2028.

Our ultimate objective remains the same – to build word-leading advanced manufacturing capabilities in Canada by accelerating the scale-up, adoption, and commercialization of innovative solutions in Canada's manufacturing sector. We also reaffirmed the strategic criteria that NGen applies to all of its initiatives. They need to be industry-led, transformative, collaborative, applied, with significant potential for commercialization, and contribute benefits to Canada's broader advanced manufacturing ecosystem in the form of shared IP or industry knowledge, education and training, or the establishment of testbeds or demonstration and scale-up facilities.

What we added to our strategic plan was a more explicit focus on turning NGen from a funding mechanism to a business that will be financially self-sustaining by 2028. We have asked NGen to leverage funding from a variety of public and private sources both within Canada and internationally. Our Board is fully confident that NGen will be able to achieve that goal based on its record to date.

We also expect that NGen will continue to support initiatives that create strategic advantage for Canadian companies and significant environmental, health, and employment benefits for Canadians. We want NGen to become the leading enabler of transformation in Canada's advanced manufacturing sector.

Our Board emphasized the importance of the connections and collaboration that underlie so much of what NGen does. We want NGen to go further in developing a cross-Canada ecosystem that is connected, aligned in addressing the challenges and strategic opportunities facing Canada's advanced manufacturing sector, and globally recognized as leading force for building advanced manufacturing capabilities. We also want NGen to up its game when it comes to attracting young people and equity seeking groups into advanced manufacturing careers and supporting skills and workforce development in the sector.

There is much that we expect NGen to achieve over the next five years, a time when manufacturers in Canada and around the world will face unprecedented business challenges and opportunities for growth. Innovation will be key to their success. NGen's strategy of combining the best of Canadian research, technology, manufacturing, and workforce strengths to build new capabilities and commercialization opportunities for our industry will be even more important in the years ahead.

I am delighted to serve as Chair of NGen along with Board colleagues who are all equally committed to the success of the organization and to the goal of building a more competitive and dynamic advanced manufacturing sector in Canada. I would like to thank my fellow Board members – volunteers all – for their service.

I would also like to acknowledge the passing of Moira Harvey, former CEO of the Ontario Aerospace Council. Moira was an active contributor to NGen's Board. Her wit, wisdom, and always straightforward advice was valued and is sadly missed.

Linda Hasenfratz
Chair of Next Generation Manufacturing Canada

Message from our CEO Jayson Myers

Looking back over the past five years it's difficult not to be impressed and maybe even a little overwhelmed by the breadth of activity in which NGen has been involved.

When NGen was first established in 2018 we referred to ourselves as an experiment. As is the case now, we were committed to building world-leading advanced manufacturing capabilities for the benefit of Canadians. But our plans to do so by connecting manufacturers, technology providers, researchers, and supporting organizations across the country, focusing on collaboration, and acting as a catalyst to help companies scale up and adopt technologies and build a next generation advanced manufacturing workforce had yet to be demonstrated.

Our strategy has proved to be a success. We have made it a priority to become more than simply a funding agency. NGen builds ecosystems. We build ecosystems to carry out and commercialize Technology Leadership and Ecosystem Development projects, accelerate the adoption of advanced technologies in manufacturing, and develop a highly skilled, diverse, and inclusive advanced manufacturing workforce across Canada.

To that end, we have developed a cross-country network of project partners, clusters, and supporting organizations all working to enhance the competitiveness and grow Canada's advanced manufacturing sector. We have shown that NGen and our ecosystems can pivot rapidly to respond to urgent challenges like COVID-19 or to identify and take advantage of strategic innovation opportunities arising in fields like zero-emission vehicles, industrial decarbonization, circular manufacturing, and biomanufacturing. And we have worked with ecosystem partners to attract more young Canadians and people from equity-seeking groups into advanced manufacturing careers, provide advanced technical and manufacturing skills education and training to students and employees, and enhance transformation management capabilities on the part of smaller companies and entire supply chains.

I am delighted that our members who are engaged in NGen initiatives give us high marks for the quality, efficiency, and effectiveness of our services. We have contributed to innovation policy and programming at both federal and provincial levels. Our operating processes have also instilled confidence on the part of our funders, as have our results.

NGen is delivering solutions that reduce emissions, improve environmental sustainability, supply chain resilience, food security, and the health and safety of Canadians. To date we have helped create 44 new companies, close to 3,100 direct new jobs, and $3.2 billion in new revenue. We have returned twice the amount we have invested in tax revenues back to the federal government. The progress we have made was instrumental in raising an additional $231 million in funding in 2022-2023.

What follows is a record of NGen's achievements to the end of March 2023. We have even more ambitious plans for the future.

And rightly so. Advanced manufacturing is becoming even more critical to Canada and to Canadians. It is the sector that will make the things and the improvements in the way things are made which will be required to address many of the world's future challenges. Advanced digital, materials, and production technologies will be instrumental in helping Canadian manufacturers in both traditional and brand-new industries overcome demographic, supply chain, and other transformational challenges, compete, and grow.

I am very proud of our team of highly qualified professionals at NGen and what they continue to accomplish. Our success is also a reflection of the leadership, guidance, and support of our Board of Directors, as well as close collaboration with our colleagues at Innovation, Science, and Economic Development Canada and our other funders. My thanks go to them all.

Jay Myers
Chief Executive Officer of NGen

Delivering Innovation that Counts for Canadians

Driving Innovation

$237 million approved for investments in 171 projects across Canada leveraging $375 million in additional innovation investments by industry and other funders.

Delivering Real Economic Benefits for Every Region and Industry in Canada

Tangible Results Already Achieved:

- $3.2 billion in new industry revenue
- 3,098 new jobs directly created
- 44 new companies created
- 5,000+ students & employees being trained
- 2X estimated return on taxpayer investments from completed projects

Creating Collaborative Partnerships that Help Canadian Companies to Compete, Win and Grow

- 5,393 Members
- 698 Project Partners
- 387 Industry Partners including 339 SMEs
- 311 Research Partners

Connecting Canada

- Members & Partners in every Province
- 40% of Project Partners outside Ontario
- 35% of Projects with Partners from more than one Province

Making a Difference

- Climate Change
- Supply Chains
- Health Care
- Food Security

Building the Ecosystem

- 17 Advanced Manufacturing Clusters Partnering in a Cross-Canada Network
- 5 Technology Working Groups Accelerating Technology Adoption
- 5 Strategic Opportunity Roadmaps for Electric Vehicles, Decarbonization, Biomanufacturing, Advanced Materials, Small Modular Reactors
- 510,000+ Students – 48% Female – Learning about Careers in Advanced Manufacturing
- 567 Indigenous Students Enrolled in Manufacturing Entrepreneurship and Financial Literacy Courses
- 235 Manufacturing Executives enrolled in Transformation Leadership Programs

Promoting Canadian Capabilities around the World

- World Manufacturing Forum Advisory Board
- Canada's Industry Leader at the Hannover Fair
- 32 International Trade and Investment Events
- World Top Ten AI Solution for UN Sustainable Development Goals
- Canadian and North American Media Awards

Our Commitment to the Future

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

We aim to strengthen the competitiveness and growth potential of Canada's critical advanced manufacturing sector and deliver step-change improvements in greenhouse gas (GHG) emission reductions, environmental sustainability, health and safety, food and water security, and supply chain resilience for Canadians and the world.

NGen builds ecosystems. Our strategy for achieving our long-term goals is based on enhancing and leveraging Canada's research, technology and industrial strengths, workforce skills, and supporting innovation ecosystem to increase industry investment in innovation and accelerate the development, scale-up, and the productive deployment of advanced technologies in Canadian manufacturing and their commercialization in global markets.

To fulfil our mission NGen works to:

- Provide leadership for Canada's advanced manufacturing sector by identifying strategic opportunities for innovation and commercial success.
- Make connections, facilitate innovation partnerships, and improve access to ecosystem resources that support technology demonstrations, pilot projects, scale-up, and commercialization.
- Fund and support the commercialization of collaborative industry-led Technology Leadership 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.
- Support the development and attraction of a highly skilled, diverse, and inclusive advanced manufacturing workforce in Canada, placing special emphasis on attracting youth and equity-seeking groups into advanced manufacturing careers.
- Provide training, tools, services, and access to other resources that can help companies improve the management of advanced manufacturing processes and implement net-zero emission facilities.
- Promote Canada's advanced manufacturing capabilities across the country and around the world.

Building on Success

2022-2023 marked the fifth year of NGen's operations. When NGen launched our first strategic plan in 2018, we aimed to:

1) Build up and strengthen Canada's advanced manufacturing ecosystem;

2) Encourage industry investment in manufacturing innovation in Canada;

3) Support the development of Canada's advanced manufacturing workforce;

4) Improve the capacity of Canada's manufacturers and technology companies to manage successful technology development, adoption, and scale-up for production in Canada; and

5) Provide new commercialization opportunities for manufacturers and technology companies within Canada and internationally. Our target was to generate $13.5 billion in GDP and 13,500 new direct and indirect jobs over a ten-year period.

Five years later, we are well on our way to surpassing those objectives. NGen's Technology Leadership projects have stimulated industry investments in innovation, improved manufacturing productivity, generated new business opportunities for small and medium-sized enterprises (SMEs) in global supply chains, created new jobs and new business ventures, and led to improvements in environmental sustainability, emission reductions, supply chain resilience, food security, and health and safety. Some saved lives during the COVID pandemic.

By the end of March 2023, NGen had approved investments of $237 million in 171 Technology Leadership projects with total innovation investments of $612 million. Those projects involve 387 industry partners – 90% of which are SMEs – and 311 academic and other research partners. To date, completed projects have generated $3.2 billion in revenue, about 27X the amount that NGen has invested in them. They have led to the creation of 44 new companies and 734 new Intellectual Property rights, 116 of which are available for licensing to other NGen members – with 160 licenses actually granted. Our Technology Leadership projects have so far delivered the federal government a return in tax revenues amounting to double the amount of NGen funding. They have stimulated industry investments in innovation, led to the creation of 3,098 new jobs, and delivered significant benefits in terms of productivity enhancement, environmental sustainability and greenhouse gas emission reductions, health care, supply chain resilience, and food security.

NGen had also invested in a variety of Ecosystem Development initiatives that have:

- Supported and strengthened collaboration among 17 advanced manufacturing clusters and five technology advisory groups across Canada.
- Offered transformation management and skills development support to more than 300 manufacturers across the country.
- Provided manufacturing entrepreneurship and financial literacy education to 567 Indigenous students in 10 elementary and secondary schools in northern Canada.
- Engaged more than 510,000 young Canadians in investigating future careers in advanced manufacturing and provided $100,000 in financial support to secondary students entering advanced manufacturing programs in Canadian colleges and universities.
- Promoted NGen and Canada's advanced manufacturing ecosystem at more than 200 international trade shows, conferences, and investment promotion events in the United States, Europe, and Asia.
- Contributed to Canada's selection as Partner Country in 2025 at Hannover Messe, the largest advanced manufacturing trade fair in the world.

NGen's achievements reflect many of the strategic advantages we have developed over the past five years. 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 entail 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 manufacturing 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. The governance and operating processes we have developed allow us to administer funding in a secure, impartial, efficient, and responsible way.

Renewing our Strategic Plan

In 2022, NGen's Board of Directors refreshed our Strategic Plan, leveraging our strengths and articulating an even more ambitious vision for the next five years to 2028.

Our Board reaffirmed the strategic criteria that guide all NGen activities. We will continue to focus on initiatives that are:

Transformative: building world-leading advanced manufacturing capabilities in Canada and strategic capabilities that enhance the competitiveness of Canada's advanced manufacturing ecosystem.

Applied: supporting the development, scale-up, and adoption of 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.

The Board also approved a new set of strategic objectives for NGen. Over the next five years we will aim to be:

- The leading enabler of green transformation, innovation, 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 is a catalyst for talent development and investment in Canada.
- A dynamic, highly motivated, and expert team of change makers committed to the success of Canada's advanced manufacturing sector and pursuing their career objectives in a respectful, equitable, diverse, and inclusive work environment.
- A financially sustainable organization raising money from public and private sources in Canada and internationally to invest in advanced manufacturing capabilities and outperforming the expectations of our funders.

These objectives are closely aligned to the goals of the Government of Canada's Global Innovation Clusters (GIC) program which aims to support the acceleration of world-leading innovation clusters in Canada that translate the country's technology strengths into new commercial opportunities for Canadian firms. Our government funders expect that NGen will deploy GIC funding as a:

- *National Force* – Developing ecosystems that create a global advantage for Canada by leveraging and attracting industry investment, developing a global profile, and collaborating on projects at a national scale.
- *Driver of Growth* – Accelerating the scale up of small and medium-sized enterprises (SMEs) by fostering collaboration and integration into emerging value chains, to drive international opportunities, expand market share, and grow revenues.
- *Creator of Networks* – Strengthening connections and collaborations among private, public, and academic organizations to drive impactful commercialization outcomes and develop domestic capacity.
- *Catalyst for Skills Development* – Addressing skills gaps, acting as a magnet for global talent, collaboration, and skills and talent development, and fostering opportunities for equity-seeking groups to benefit from connections to drive innovation and contribute to inclusive economic growth.

Accordingly, our Board has set new targets for NGen to achieve by 2028. By that date we are aiming to:

- Increase industry investments in research, development, and innovation by more than $800 million.
- Boost GDP by more than $15 billion.
- Create more than 15,000 direct and indirect jobs.
- Help over 500 small and medium sized enterprises (SMEs) scale their technology capabilities into commercially viable solutions for manufacturing.
- Engage at least 10,000 industry and ecosystem partners from every province and territory across Canada in NGen projects, cluster building, workforce development initiatives.
- Make significant contributions to skills development, supply chain resiliency, environmental sustainability, and the health and safety of Canadians.

Our strategy for the future builds on our achievements to date – NGen's accomplishments over the past five years and more recently the progress that we made in 2022-2023.

Objectives for 2022-2023

NGen set three priority objectives in our Corporate Plan for 2022-2023:

1. Facilitate the successful completion and commercialization of our Technology Leadership projects and conclude program funding for our Ecosystem Development initiatives under our Contribution Agreement for Phase I GIC funding.
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.

These priorities were reflected in the targets that our Board of Directors set for NGen to achieve over the course of the year. We surpassed most of those objectives by the end of March 2023.

Priority	Targets for 2022-2023	Status by March 31st, 2023
Leadership	• NPS of 70 among 75% of project partners • NPS of 40 among 50% of program registrants	• NPS = 76 (91% of project partners) • NPS = 68 (52% of registrants)
Project Realization	• Projects approved under NGen's Phase I Contribution Agreement will have reached at least 90% completion • PCAIS funding program launched and $5 million in project funding approved	• 91% completion with claims for $198 million received out of $218 million in available funding • AI4M program launched and $9.9 million in PCAIS project funding approved
Capacity Building	• 500 participants in capacity building initiatives • 15% of participating companies from Quebec • Strategic plans for International Engagement, EV Value Chain, Industrial Decarbonization/ Circular Manufacturing, and Advanced Automation, each supported in writing by at least one funding partner	• 647 participants • 11% from Quebec • Plans developed and Phase II funding secured.
Financial Management & Compliance	• $250 million in additional funding raised • Contracts and job descriptions in place for full-time employees required for additional funding programs • Financial statements signed off by external auditor • No compliance violations	• $230.9 million in funding raised • Job descriptions and Employment Agreement in place • 2022 statements signed off • No violations
Impact	• 5,500 members • 100% of completed projects with IP commercialization strategies facilitated. • 50,000 students (50% female) engaged in education and Careers of the Future programs	• 5,393 members • 100% projects with IP strategies • 67,394 students engaged • 510,239 students engaged to date • 48% female engagement

* A Net Promoter Score (NPS) 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).

Completion and Commercialization of Phase I Projects

By the end of March 2023 NGen had approved investments of $227 million in 165 Global Innovation Clusters Phase I projects.

With a total estimated project value (including contributions from industry and other sources) of $584 million. Phase I projects involve 683 partners, including 372 industry partners, 328 of which are SMEs, and 311 academic and research partners. In addition to Project funding, NGen had also invested $8.8 million in Strategic Ecosystem initiatives funded from our own operating expenses.

NGen's GIC Phase I funding was channeled through five program streams:

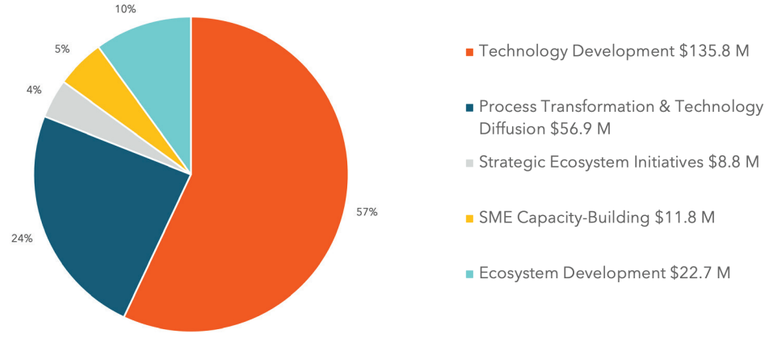
1. *High Potential Technology Development* projects that develop and scale new manufacturing processes with the potential to give Canadian manufacturers a significant competitive advantage in world markets.
2. *Ground-Breaking Process Transformation and Technology Diffusion* projects that involve the 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, funded directly from NGen's own operating budget.

In our Corporate Plan for 2022-2023, NGen aimed to complete all projects funded under Phase I of the GIC program by March 31st, 2023. We expected that we would actually disburse $200 million of funding by that date and an additional $18 million over the next three months as final claims were reconciled. By the end of March 2023, 100 projects had been completed, accounting for an NGen contribution of $133.7 million and total innovation investments of $278.5 million. (By the end of the year, $248.5 million for eligible expenses had actually been claimed by project partners, accounting for a NGen investment of $123.1 million.)

While most Phase I projects finished by the end of March 2023, the opportunity to offer projects an extension in end dates into 2024 has provided additional time for their completion – a benefit especially for partners in large projects facing delays as a result of supply chain and production constraints, as well as for those working on very short timelines.

A total of $185.4 million of NGen Phase I funding and $423.6 million in total innovation investments were actually incurred and reconciled by all projects by March 31st.

Total Funding Allocations to NGen Program Streams



New Funding Opportunities

In our Corporate Plan for 2022-2023, NGen aimed to raise additional funding to invest in world-leading advanced manufacturing projects, support ecosystem development initiatives, and sustain NGen's operating budget. We said that we would deploy those funds to invest in five types of Technology Leadership projects aligned with the federal government's innovation priorities and opportunities identified by NGen members:

1. Zero-Emission Vehicles.
2. Net Zero-Emission Manufacturing Processes and Facilities.
3. Circular Manufacturing of Materials.
4. Accelerated Scale-Up and Adoption of Transformative Manufacturing Technologies.
5. The commercialization of Artificial Intelligence (AI) solutions in manufacturing.

We set a target to raise $250 million in additional funding in 2022-2023. By March 2023, NGen had secured a total of $230,947,212 in additional funding, including:

- $177,153,038 from Phase II of the Global Innovation Clusters program.
- $30,000,000 from the Pan Canadian AI Strategy.
- $7,000,000 from the National Quantum Strategy.
- $15,839,000 from Employment and Social Development Canada (ESDC).
- $400,000 from NRC-IRAP.
- $555,174 in industry contributions for our operating expenses.

Of that amount, $224,042,038 has been allocated to support projects, ecosystem initiatives, and operating expenses over the next five years. We allocated $165 million specifically for Technology Leadership projects, including:

- $135 million from Phase II of the Global Innovation Clusters (GIC) program.
- $25.8 million from the Pan Canadian AI Strategy (PCAIS) program.
- $6.2 million from the National Quantum Strategy (NQS) program (a joint initiative with Canada's Digital Innovation Cluster).

NGen's Contribution Agreement with Innovation, Science, and Economic Development Canada (ISED) for PCAIS funding was concluded in September 2022 and we launched our first call for project proposals under the PCAIS funding stream that same month. We received 17 applications involving 42 industry partners (35 of which were SMEs) with a total funding request of $32.5 million and overall project value of $93.8 million. Following our assessment process in February, six projects were approved for NGen funding amounting to $9.9 million. Those projects involve 15 industry partners, 11 of which are SMEs, and will result in total innovation investments of $28.3 million. At the end of March 2023, we had 60 AI project proposals left in our pipeline with a total funding request of $33 million and an overall estimated value of $100.6 million.

Conditional approval for Phase II GIC funding was received in December 2022. We concluded our amended Contribution Agreement with ISED at the end of March 2023 and launched a call for proposals for Transformative Advanced Manufacturing projects in April.

NGen and Digital also received conditional approval for NQS funding in December 2022. Our Contribution Agreement with ISED was concluded in June 2023.

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.

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.

A systemic ecosystem approach is vital to solving 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 management techniques. Deployment, scale-up, and commercialization of those solutions depend in turn on maximizing the potential of shared intellectual property and rely on 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 and de-risking collaboration and for strengthening Canada's advanced manufacturing ecosystem. All NGen Technology Leadership 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 also invests in strategic initiatives that address critical gaps in Canada's advanced manufacturing ecosystem, which it has funded from its own operating budget up to the end of March 2023.

NGen invested $31.8 million and leveraged a total of $78.4 million in support of Canada's advanced manufacturing ecosystem in 2022-2023. We contributed:

- $7.3 million to ecosystem activities undertaken by partners in our larger Technology Leadership projects.

- $14.6 million to industry-led Ecosystem Development projects.
- $6.0 million to SME pilot projects and feasibility studies.
- $463.1 thousand to cluster-building initiatives.
- $692.0 thousand to Strategic Ecosystem Initiatives funded from GIC Phase I operating budget.
- $400.0 thousand to help SMEs participating in NRC-IRAP's Additive Manufacturing Industrial Demonstration Program.
- $2.1 million to develop and deliver our Future Ready skills and employment development initiative funded by ESDC.

NGen expects to invest $65.5 million from GIC Phase I funding in ecosystem development initiatives between 2019 and 2024, with total contributions including industry investments amounting to $172.1 million.

NGen Support for Ecosystem Development from GIC Phase I Funding

Initiative	2022-2023		2019-2023		Total Approved for 2019-2024	
	NGen Funding	Total Investment	NGen Funding	Total Investment	NGen Funding	Total Investment
Technology Leadership Projects (estimate)	$7.3 M	$17.7	18.0 M	$41.1 M	$22.1 M	$66.8 M
Industry-Led Ecosystem Development Projects	$14.6 M	$42.6 M	$14.8 M	$43.0 M	$22.7 M	$70.0 M
SME Capacity Building Pilot Projects & Feasibility Studies	$6.0 M	$13.8 M	$9.2 M	$21.1 M	$10.7 M	$24.1 M
Cluster Building Projects	$463.1 K	$924.8 K	$724.9 K	$1,434 K	$1,160.3 K	$2,435.8 K
Strategic Ecosystem Initiatives	$889.7 K	$889.7 K	$8.8 M	$8.8 M	$8.8 M	$8.8 M
Total Ecosystem Support	**$29.3 M**	**$75.9 M**	**$51.5 M**	**$115.4**	**$65.5 M**	**$172.1 M**

Strategic Ecosystem Development Initiatives

NGen's Strategic Ecosystem Development Initiatives are designed to support transformation across Canada's advanced manufacturing ecosystem. In our Corporate Plan for 2022-2023 NGen made it a priority to support Ecosystem Development initiatives that would 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, including their transformation to net-zero facilities.

NGen invested $3.4 million in Strategic Ecosystem Development Initiatives in 2022-2023, bringing our total spending on strategic initiatives up to $11.3 million since 2019. Strategic initiatives supported by Phase I of the GIC program were funded through NGen's operating expenses. Additional funding came from ESDC support for our Future Ready program as well as from NRC-IRAP for our Additive Industry Demonstration program. Our funding breakdown for 2022-2023 is as follows:

Strategic Initiative	NGen Investment 2022-2023	Source of Funding
Strategic Insights	$150,554	GIC Phase I
Collaboration Events	$101,000	GIC Phase I
Education and Training	$351,727	GIC Phase I
Careers of the Future	$286,417	GIC Phase I
Total GIC Phase I	**$889,698**	**GIC Phase I**
Future Ready (Skills & Employment)	$2,129,000	ESDC
Additive Industry Demonstration Program	$400,000	NRC-IRAP
Total Ecosystem Support	**$3,418,698**	

We plan to increase our support for Ecosystem Development Initiatives over the next five years. In our updated Five-Year Strategic Plan, NGen has allocated a total of $32.37 million from our new funding programs ($22 million from Phase II GIC, $3.75 million from PCAIS, $6.3 million from ESDC, and $0.32 million from NRC-IRAP) specifically for strategic Ecosystem Development initiatives between 2023 and 2028.

a) Strategic Insights

In 2022-2023, NGen aimed to provide strategic insights to our members and the ecosystem at large by conducting industry and technology trend analysis, webinars, and conference participation. Over the year NGen:

- Researched and published industry and technology trend analyses related to decarbonization in manufacturing, circular manufacturing of materials, industrial applications of small modular nuclear reactors, and technologies for In-Situ Resource Utilization in outer space.
- Hosted an executive conference on the EV value chain in partnership with Electric Autonomy. The conference was held in-person with over 250 industry leaders and was subsequently posted online as a podcast with 520,000 social media impressions.
- Made presentations about strategic trends and Canada's advanced manufacturing ecosystem at 117 other conferences, 85 to Canadian and 32 to international audiences.
- Hosted 16 educational workshops on strategic business issues like IP management, cybersecurity, technology trends, and supply chain risks and opportunities.
- Hosted a CEO roundtable on manufacturing supply chain risks, opportunities, and mitigation strategies.

NGen Membership Across Canada March 31, 2023

To enable a greater range of connections and collaboration opportunities, NGen planned to expand our network of engaged members across Canada and set a target of 5,500 members by the end of March 2023.

b) Promotion, Connections & Collaboration

NGen membership is free of charge. Members are, however, required to report how they contribute to Canada's advanced manufacturing ecosystem. This information allows us to customize our communications to members, identify potential project partners and participants in NGen ecosystem development initiatives, and strengthen collaboration on the basis of member interests and capabilities.

We said in 2022-2023 that we would put special emphasis on engaging researchers, technology providers, and manufacturers in our Technology Advisory Groups which focus on commercializing applications of AI, additive manufacturing, automation and robotics, digital twins, and cybersecurity solutions in manufacturing. We planned to convene online collaboration events to facilitate innovation partnerships. NGen also planned to enhance our media presence to promote our activities and the capabilities of our member companies.

NGen undertook to work collaboratively with ecosystem partners, including colleges, universities, research organizations, industry and innovation networks, business services, public and private sector funders, as well as federal and provincial departments across Canada, to help promote, coordinate, and support their efforts on behalf of our advanced manufacturing sector. We aimed to expand the number of formal working arrangements between NGen and other funding organizations and ecosystem partners in 2022-2023.

We're Growing!

NGen had grown its ecosystem to 5,393 members, including 3,019 companies and other ecosystem partners and 1,733 individual experts. We had 641 international members and 4,752 members representing every province and one territory across Canada.

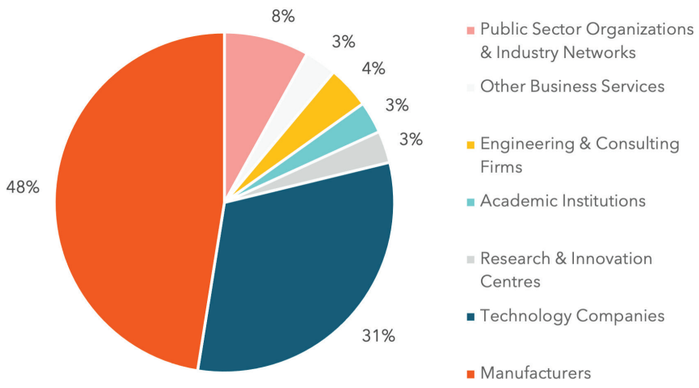
To promote NGen and the capabilities of our members last year, we:

- Hosted 18 online podcasts showcasing NGen projects and the capabilities of partner companies with 3,718 views on LinkedIn and YouTube and 170 downloads.
- Partnered with the Rideau Hall Foundation to nominate NGen projects for the Governor General's Innovation Awards.
- Partnered with MaRS and Electric Autonomy to promote NGen and NGen projects in public media across Canada.
- Posted 36 media spots highlighting NGen with over 517,000 impressions.
- Took part in 32 media interviews highlighting NGen activities.

NGen's collaboration events assist in defining project opportunities and identifying potential project partners. We hosted a collaboration event in November 2022 following our call for proposals for projects to commercialize AI applications in manufacturing. The event attracted 489 technology providers, manufacturers, and other ecosystem members, and allowed NGen to identify AI solution providers from across Canada and engage them in our AI for Manufacturing cluster.

By the end of the year, NGen had developed 11 formal agreements with other ecosystem partners, including additional funding agreements with NRC-IRAP and Employment and Social Development Canada. Our relationships with cluster partners are detailed below.

NGen Members by Type of Organization



c) Advanced Manufacturing Cluster Accelerator Network

NGen has supported the development and growth of 17 advanced manufacturing clusters across Canada. NGen's cluster ecosystem brings together more than 1,750 companies and research organizations from across the country with an industry footprint valued in excess of $50 billion in sales. 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 as well as 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.

As a result of NGen cluster-building funding:

Saskatchewan Indigenous Manufacturing and Construction Network (IMCN) 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. In 2022-2023, the Network grew to 45 Indigenous-owned companies, provided Indigenous awareness training to 30 other organizations across Saskatchewan, and exhibited at ten mining and manufacturing trade shows in Canada and the United States. Two collaborative ventures have been undertaken between IMCN members and NGen project leads. NGen has also facilitated a partnership between IMCN and the Martin Family Initiative (MFI) to create a summer work experience program for Indigenous students in IMCN member companies.

Ontario Aerospace Council created a B2B aerospace matchmaking platform to improve competitiveness, generate business opportunities, and grow revenues for its members.

Canadian Association of Mold Makers (CAMM), 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) 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, based in Quebec, developed 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 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. In 2022-2023 it grew to 49 organizations including nine universities. Canada Makes engaged in collaborative ventures with SIMSA, MARIOS, the Verschuren Centre, and the Net Zero Approaches Cluster). It has partnered with the Additive Manufacturing Green Trade Association and participated over the past year in four international trade shows at the AM Forum in Berlin, Formnext in Munich, OMTECexpo, and Rapid and TCT in Chicago. 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 established 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.

AI4Manufacturing 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) ran a virtual trade mission to South America which generated $20 billion in new business opportunities. NGen support also enabled the cluster to organize its Saskatchewan Mining Supply Chain Forum, events on gender equity, women leadership in the mining supply chain, Indigenous awareness (in partnership with IMCN), mining and opportunities in West Africa, supplier forums with large mining companies, and a trade missions to Kazakhstan. SIMSA's membership has grown from 215 to 330 companies as a result. 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 developed a virtual platform to deliver agile workshops, best practices, and collaboration and procurement events.

The Verschuren Centre, 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. The Centre also includes ten universities across Canada and works with other members of NGen's Cluster Accelerator Network including MARIOS, SIMSA, and the Net Zero Approaches Cluster.

The Net Zero Approaches Cluster (formerly Materials Atlantic), 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, 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. In 2022-2023 Photons Canada published two reports on skills required in the photonics industry – one focusing on industry requirements in collaboration with McGill, CMC Microsystems, and Optonique and another focusing on research requirements with UBC, University of Toronto, University of Ottawa, and McGill. It formed alliances with the Lithuanian Photonics Community and the Global Photonics Alliance in order to broaden its outreach to potential technology partners and business opportunities. The cluster also organized its Photonics North event which was held in April 2023. Over 500 participants took part.

Alberta Manufacturers & Exporters Enhancement Cluster (Alberta MEE) 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. In March Alberta MEE organized its Smart MTX conference in Red Deer, AB with both NGen and ISED participating as presenters and exhibitors at the event.

Materials & Reliability in Oil Sands (MARIOS), a pan-Canadian cluster based in Alberta, was established to help 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, a pan-Canadian cluster based in BC, worked with CMC Microelectronics to create Canada's first nano-medicines group to advance medical device, vaccine, diagnostics, and new medical innovations. The Network was incorporated into DeepTech Canada in 2022. NGen funded and participated DeepTech's From Space to Earth Conference in June 2022 and Quantum Days conference in January 2023. Our funding also enabled DeepTech to participate in two international trade missions – to Tokyo in January and Seoul in February 2023.

Canadian Advanced Air Mobility Network, 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. NGen also facilitated the Network's membership in the University of Waterloo's Institute for Sustainable Aeronautics (WISA).

In our 2022-2023 Corporate Plan, NGen undertook to facilitate, support, and strengthen collaboration across the advanced manufacturing clusters that we funded, with a particular focus on helping grow membership and services provided by start-up clusters, including the Saskatchewan Indigenous Manufacturing Cluster.

Over the past year, we hosted two all-cluster meetings, resulting in six joint initiatives involving 15 of those clusters. We participated in and supported ten conferences and networking events hosted by our cluster partners, including those organized by IMCN, CME-NL, DeepTech Canada (Nano-Canada and Quantum Days), Canada Makes, and AI4M. NGen has facilitated over 450 recorded introductions between clusters and NGen members including manufacturers, technology providers, academic partners, business services, and individual industry experts. Clusters are also sharing their tools and services with each other as well as across NGen's broader membership. For instance, SIMSA has made its carbon calculator available and helped facilitate the establishment of the Saskatchewan Indigenous Manufacturing and Contracting Network. The Verschuren Centre has integrated a Net-Zero Accelerator cluster under its umbrella to advance its work on advanced materials for battery research and storage. The Verschuren Centre also used its cluster-building initiative to develop the Bio-Processing Centre subsequently funded as a NGen Technology Leadership project.

NGen put special emphasis on starting up and supporting the Saskatchewan Indigenous Manufacturing and Contracting Cluster, Canada's first Indigenous Manufacturers' Cluster which is dedicated to developing training opportunities for Indigenous youth, sharing best practices in manufacturing management and technology adoption, and generating new business opportunities for Indigenous manufacturers. IMCN has facilitated collaborations between Indigenous suppliers and BHP, SaskTel, and SaskPower and is working with SIMSA to connect suppliers with mining companies in Canada and around the world. The network is consulting with businesses and not-for-profit organizations, including members of the Alberta Chamber of Commerce, the Regina Airport Authority, City of Saskatoon, and SaskPower to advise them on Indigenous workforce development and Indigenous procurement strategies. It is also partnering with NGen's education partners to develop placement opportunities for Indigenous youth.

NGen also engaged industry and ecosystem partner participation in five Technology Advisory Groups involving 152 members focusing on how to accelerate the adoption of advanced technologies in Canadian manufacturing. The Technology Groups cover the fields of Artificial Intelligence and Machine Learning, Additive Manufacturing, Automation and Robotics, Digital Twins, and Cybersecurity. Our AI and Additive Groups have established themselves as self-governing clusters supported by NGen while attracting additional contributions from their members to fund market needs assessments, participation in international trade shows, and promotion activities and education workshops for NGen's general membership.

d) Transformation Leadership and Workforce Development

The profitable adoption, deployment, and scale-up of technologies in manufacturing depends on strategic 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. It also depends on the development and productive deployment of a highly skilled, diverse, and inclusive workforce.

NGen works to enhance the capacity of companies, and especially SMEs, to manage technology transformation productively and profitably through our Transformation Leadership Program (TLP). TLP was 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. The program is designed to guide manufacturing leadership teams through the steps required for successful digital transformation, including workforce development and training, 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.

In our Corporate Plan for 2022-2023 NGen undertook to develop and commercialize our Transformation Leadership Program (TLP) with the goal of building a stream of business services revenue to finance future operating expenses for program delivery. We also said that we would explore new funding opportunities to provide smaller manufacturers access to online skills development programs through our AmpUp program – NGen's open source upskilling program which offers manufacturers easier and lower cost access to modular education and training programs provided by colleges, universities, and private sector training providers across Canada that are relevant to advanced manufacturing.

Over the past year, NGen delivered TLP to 123 participants, including 17 manufacturers in aerospace and fabricated metal product supply chains. We launched the development of an online system for scaling up the delivery of TLP courses in both official languages. In 2022, NGen was awarded $15.8 million from ESDC to support our Future Ready initiative in which we will deliver our TLP and AmpUp upskilling programs, recruit new manufacturing employees from underrepresented groups and recent immigrants, documenting how manufacturers are accommodating them, and lead research projects on advanced manufacturing workforce requirements. We expended $2.1 million of ESDC's contribution last year.

e) Attracting Talent into Advanced Manufacturing

By 2030, 25% of Canada's manufacturing workforce will retire. The youngest cohort – employees aged 30 and under – currently constitute 6% of the workforce. In order to remain competitive, let alone grow, manufacturers will need to automate. They will also need to recruit more young people into the industry and supporting technology sectors.

NGen works to attract young Canadians into advanced manufacturing careers through:

- Our Careers of the Future Campaign, a multimedia campaign and educational website (www.careersofthefuture.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

financial literacy skills required to pursue meaningful career opportunities.

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

In 2022-2023, NGen aimed to expand delivery of our Indigenous Manufacturing Entrepreneurship and Financial Literacy courses and launch another phase of our Careers of the Future campaign to attract young Canadians into careers in advanced manufacturing. We also planned to promote the enrolment of more students across Canada on the Virtual Robotics Training Program platform developed by InspireTech with financial support from NGen.

In 2021-2022, 196 Indigenous students were enrolled in Manufacturing Entrepreneurship and Financial Literacy courses that NGen developed in partnership with the Martin Family Initiative (MFI), in five schools in northern Saskatchewan and Alberta. Over the past year another 371 Indigenous students enrolled in these courses in ten schools in Saskatchewan, Alberta, BC, and Nunavut.

We recorded 67,394 engaged site visits to our Careers of the Future website in 2022-2023, 48% of them from females. There have been 510,239 engaged site visits (49% from females) to learn more about advanced manufacturing careers since the initiative was launched in 2021.

There have been 8,917 students who have been enrolled on InspireTech's digital skills for manufacturing platform since 2021, with 4,615 added over the past year.

Our plan for 2022-2023 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 underrepresented groups in manufacturing. Accordingly, NGen has continued to promote the 50/30 challenge to its members. We have partnered with Toronto Metropolitan 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.

f) Metal and Engineered Plastics Additive Manufacturing Industrial Demonstration Program

In 2022-2023, NGen committed to identify and engage SME manufacturers in projects to develop, test, and apply metal and engineering grade plastic additive solutions in support of NRC-IRAP's Additive Manufacturing Industrial Demonstration Program.

NGen successfully completed IRAP's Additive Manufacturing (AM) Demonstration Program for a third year running. The program is designed to help Canadian companies learn about the potential of AM and de-risk early trials of this exciting technology. The goal of this program is to create awareness, encourage the adoption of AM technology, and reinforce Canada's AM supply chain, thereby improving Canada's manufacturing and exporting sectors and our global competitiveness.

The program provided companies with project funding to develop a better understanding of the advantages and business opportunities resulting from the adoption of additive manufacturing technology and processes including cost savings, reduced new product development cycle times, new materials, improved design, and efficiency.

With the support of NRC-IRAP we were able to invest $400,000 in the program. Working closely with Canada Makes, NGen built a roster of leading Canadian AM service providers from all regions of the country including companies, academia, and research institutes with advanced AM capabilities. These organizations provided participating companies with a finished part or coupon as well as guidance and advice about the advantages offered by AM. Project costs ranged from a low of $450 to $10,000 and with NRC-IRAP's financial support and in-kind support from the service providers NGen was able to offer this service free of charge to Canadian SMEs.

In 2022-2023 NGen was successful in engaging 102 companies and completing 57 projects that matched manufacturers with AM technology services providers. NGen surpassed both last year's project total of 54 and the program's target of 52 completed projects. We connected an additional 45 SMEs with AM providers; while projects for these participants did not proceed, they still learned about the technology and requirements for successful implementation.

The projects involved a variety of materials (metals, polymers, composites). The motivation for engaging with additive manufacturing was driven in large part by both speed to market and the desire to investigate a competitive new production process. Elimination of tooling, lightweighting, design of complex parts, and part consolidation were also often important factors.

Feedback from project participants was very positive.

Action Aero Inc. "We found that using 3D printing with soft/flexible plastics allows us to make unique non-marring work-holding fixtures."

Mosaic Manufacturing "This project was critical in validating a compelling medical application for AM where a lightweight plastic could be used to replace a heavy and expensive metal part."

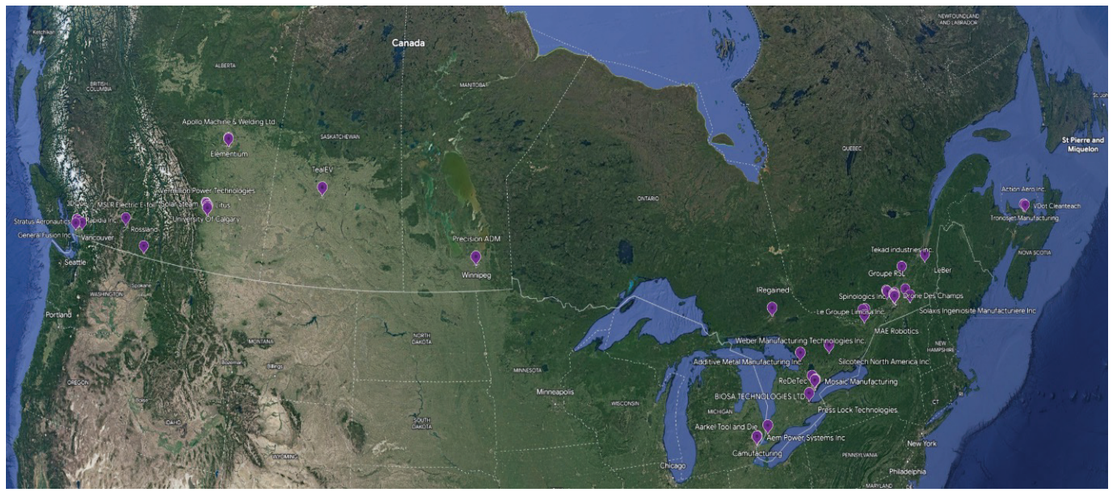
SolarSteam Inc. "It is incredibly beneficial to use AM in rapid prototyping, testing, and production. We were able to leverage AM to create advanced part geometry and topology that traditional fabrication processes could only do with very skilled labour and a lot of time, or couldn't create at all. Production costs are also becoming more competitive when considering labour, tooling costs, and material waste."

General Fusion Inc. "The objective was to additive manufacture high strength metal alloys and perform lithium compatibility testing. As we are considering additive manufacturing 1000s of parts with the alloy."

Tronosjet "This must be the easiest government programme ever to deal with. It opened the door with major OEMs who often struggle to find a good fit project for metal printing where there can be sticker shock at the price of the first print."

Plantaform Technology Inc. "We were able to validate the CAD files and move forward with steel mold production. This step helped our company save thousands of dollars in mistakes before purchasing the mold, and we were able to make the correct adjustments."

The program continues to be an important stepping stone for many companies in understanding the capabilities of additive manufacturing and what it is possible to do in Canada. Through delivery of this program NGen helps uncover a world class AM supply chain. We learn about solutions companies are looking for, how AM can help and who best matches those needs in terms of technology, location and capacity. In March 2023, NGen secured an additional $400,000 in funding from NRC-IRAP to continue the program for another year.



Project leads in the Additive Industry Demonstration program were located across Canada and include:

3D Que Vancouver, BC	Exergy Solutions inc. / Suncor Calgary, AB	Rapidia/Syncrude Vancouver, BC
AarKel Tool and Die Inc Wallaceburg, ON	General Fusion / AMM Vancouver, BC	Redetec Toronto, ON
Advanced BioCarbon 3D Ltd. Rossland, BC	General Fusion / PADM Vancouver, BC	Silcotech North American inc. Bolton, ON
Action Aero Inc. Charlottetown, PEI	Groupe R.S.L. Inc. Saint-Jérôme, QC	Solar Steam Calgary, AB
AEM Power Systems Windsor, ON	IRegained Sudbury, ON	Solaxis / MDA Bromont, QC
Additive Metal Manufacturing, Concord, ON	Le Ber Sainte-Marie, QC	Solaxis / GDLS Bromont, QC
Axis / Alstom Saint-Léonard, QC	Limosa Inc. Montréal, QC	Spinologic Montréal, QC
Axis / Nexan Saint-Léonard, QC	Litus Calgary, AB	Stratus Aeronautics Inc Burnaby, BC
Appolo Machine Edmonton, AB	MAE Robotics Inc. Ottawa, ON	Talon Wellbore Technologies Calgary, AB
Ayerton Energy Calgary, AB	Megatech Distribution Inc Richmond, BC	TealEV Saskatoon, SK
Beacon Geospatial Consulting Ltd Maple Ridge, BC	Mosaic Toronto, ON	Tekad 9300-7490 Qc. Inc (RIDD) Trois-Rivières, QC
BIOSA Technologies Toronto, ON	MSLR Electric E-Foil Kelowna, BC	Tronosjet / Avmar Aviation Charlottetown, PEI
CAMufacturing Windsor, Ontario	Nanogrande Montréal, Quebec	Tronosjet / DeHavelind Charlottetown, PEI
Conception Génik inc. Saint-Jérôme, QC	Plantaform Gatineau, QC	Tronosjet / PAL Charlottetown, PEI
Dominis Engineering Ltd. Gloucester, ON	Precision ADM Winnipeg, MB	VDot Cleantech Inc. Stratford, PEI
Drone Des Champs (DDC) Laval, QC	Precision ADM/L3 Winnipeg, MB	Vermillion Power Technologies Calgary, AB
Elementium Edmonton, AB	Precision ADM / PWC Winnipeg, MB	Violinergy Saint-Dominique, QC
Elementium / Suncor Edmonton, AB	Press Lock Hamilton, ON	Weber Manufacturing Technologies Inc. Midland, ON

International Strategy

NGen's international engagement objectives are to:

1. Promote Canada as a world leader in green manufacturing and the strengths of Canada's advanced manufacturing ecosystem globally.
2. Attract advanced manufacturing talent and investment to Canada.
3. Assist our project partners commercialize their solutions in global value chains.
4. Help our members connect with innovation partners, suppliers, and potential customers in markets at the forefront of advanced manufacturing, particularly the USA, European Union, United Kingdom, Japan, Singapore, South Korea, and Taiwan.

In 2022-2023, NGen undertook to increase our international engagement activities and the participation of our members and ecosystem partners in international events and networking opportunities, including participation in the World Manufacturing Forum and Hanover Messe.

Over the course of the year NGen participated in 32 presentations highlighting investment opportunities in Canada's advanced manufacturing ecosystem to international audiences. We took part in two investment roadshows organized by Global Affairs to St. Louis, New York, Boston, and Chicago. NGen was represented on the Advisory Board and Scientific Committee of the World Manufacturing Forum. In May representatives from NGen and Canada Makes attended the Rapid + TCT additive manufacturing trade show in Detroit where we re-established connections with America Makes, the US additive manufacturing cluster. In November NGen partnered with Canada Makes to lead a delegation representing 30 companies to the Formnext additive manufacturing show in Frankfurt, Germany. The delegation also toured Trumpf, one of Germany's leading companies providing advanced manufacturing solutions in the fields of additive manufacturing, machine tools, laser technology, electronics, and Industry 4.0 applications. And in June 2022, NGen organized an exhibition space in partnership with the Governments of Canada, Ontario, Quebec, and Alberta, and led a delegation of eight SME manufacturers and technology companies to Hannover Messe, the largest advanced manufacturing trade fair in the world. Our discussions with Hannover Messe organizers and our ISED partners were instrumental in obtaining Canada's participation as partner country at the fair in 2025.

Our Project Portfolio

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

In 2022-2023 our portfolio of approved projects was supported by funding from two sources:

1. Phase I of the Global Innovation Clusters (GIC) program from which we have allocated a total of $218 million for project investments; and
2. The Pan Canadian AI Commercialization Strategy (PCAIS) from which $24 million has been allocated to project funding.

As of the end of March 2023, NGen had approved funding amounting to $237.1 million for 171 industry-led projects with total project investments estimated at $611.9 million, including:

- $135.8 million for 54 Phase I Technology Development projects with total investments projected at $370.2 million.
- $56.9 million for 27 Phase I Process Transformation projects with total investments of $116.8 million.
- $22.7 million for six Phase I industry-led Ecosystem Development projects with total investments of $70.0 million.
- $11.8 million for 78 SME Capacity Building projects with total investments of $26.6 million.
- $9.9 million for six AI commercialization (PCAIS) projects with total investments of $28.3 million.

(NGen's GIC Phase I projects are experiencing a 7.5% underspend. We expect that our actual funding will come in on target at $218 million by the time Phase I projects complete in 2023.)

The actual amount of money NGen invested projects from Phase I GIC funding in 2022-2023 amounted to $77.6 million which leveraged $187.6 million in total project spending. Between 2019 and the end of March 2023, we invested $185.4 million in our Phase I project portfolio with $423.6 million in total project costs. Total claims for reimbursement of eligible expenses were higher at the end of March 2023, totaling $198 million or 91% of our available Phase I project funding.

NGen Approved Project Funding

Funding Stream	# Projects	Total # Project Partners	# Industry Partners	# SME Partners	# Research Partners	Approved NGen Investment	Total Project Investment	Investment Leverage Ratio
Technology Development	54	234	128	111	106	$135.8 M	$370.2 M	172%
Process Transformation & Technology Diffusion	27	127	72	58	55	$56.9 M	$116.8 M	105%
Industry-Led Ecosystem Development	6	35	18	17	17	$22.7 M	$70.0 M	208%
Capacity Building	78	287	154	142	133	$11.8 M	$26.6 M	125%
Feasibility Studies	18	54	43	34	11	$1.6 M	$3.8 M	138%
Pilot Projects	43	171	93	90	78	$9.0 M	$20.4 M	127%
Cluster Building	17	62	18 (Project Leads)	18	44	$1.2 M	$2.4 M	100%
Total Phase I Projects	**165**	**683**	**372**	**328**	**311**	**$227.2 M**	**$583.6 M**	**157%**
PCAIS	**6**	**15**	**15**	**11**	**0**	**$9.9 M**	**$28.3 M**	**176%**
Total Projects	**171**	**698**	**387**	**339**	**311**	**$237.1**	**$611.9**	**158%**

Calls for Proposals

By the end of March 2023, NGen had run six types of funding challenges which have shaped our project portfolio. In June 2019, we launched an open call for proposals for world-leading advanced manufacturing projects as well as for our SME capacity-building projects. In March 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 call for project applications related to the development of advanced manufacturing capabilities in Canada's Electric Vehicle value chain was launched in September 2021. Our sixth call for project proposals to accelerate the commercialization of AI solutions in manufacturing was launched in September 2022.

Projects by Funding Challenge

Project Challenge	# Projects	Total # Project Partners	# Industry Partners	# SME Partners	# Research Partners	NGen Investment	Total Project Investment	Investment Leverage Ratio
COVID-19 Rapid Response Challenge	16	32	23	22	9	$38.5 M	$50.7 M	32%*
Disinfecting Robot Challenge	5	7	7	7	0	$4.6 M	$9.5 M	107%*
Made Smarter Challenge	12	54	35	34	19	$25.2 M	$56.3 M	123%*
EV Challenge	14	59	34	28	25	$32.3 M	$67.3 M	108%
Open Call Projects	118	531	273	237	258	$126.6 M	$399.8 M	216%
AI Commercialization	6	15	15	11	0	$9.9 M	$28.3 M	176%
Total	**171**	**698**	**387**	**339**	**311**	**$237.1**	**$611.9**	**158%**

* Note that NGen was not required to raise industry contributions for our COVID-related projects.

Project Status

By the end of March 2023, 84 NGen projects had been closed out with all claims for eligible expenses reimbursed. Another 46 were completed with claims yet to be fully reconciled. The remaining 35 GIC Phase I projects, the largest in our portfolio, were still underway, with an extension of final completion set at September 2023. Six PCAIS-funded projects were approved but not yet contracted by the end of March 2023.

NGen Approved Project Funding

Project Status	# Projects	Total # Project Partners	# Industry Partners	# SME Partners	# Research Partners	NGen Investment	Total Project Investment	Investment Leverage Ratio
Closed	84	274	170	160	104	$83.4 M	$156.9 M	88%
Completed	46	225	109	92	116	$50.3 M	$121.6 M	142%
Approved & Underway	35	184	93	76	91	$93.5 M	$305.1 M	226%
Approved/ Not yet Contracted	6	15	15	11	0	$9.9 M	$28.3 M	176%
Total Projects	**171**	**698**	**387**	**339**	**311**	**$237.1**	**$611.9**	**158%**

Project Partners

As of the end of March 2023, NGen's project portfolio involved 698 partners working collaboratively to develop transformative manufacturing solutions – an average of 4.1 partners per project. (These numbers do not include the more than 1,750 members of the advanced manufacturing clusters funded by NGen.)

There were 387 industry partners (2.3 per project) including 339 SME partners with fewer than 500 employees (2.0 per project) involved in NGen projects. SMEs account for 88% of industry partners and 49% of all project partners. They are primarily involved in NGen's capacity-building and technology development projects. SMEs lead 154 or 90% of all projects, which in turn involve 83% of all industry partners. A full 135 projects (79% of the total) involve only SMEs.

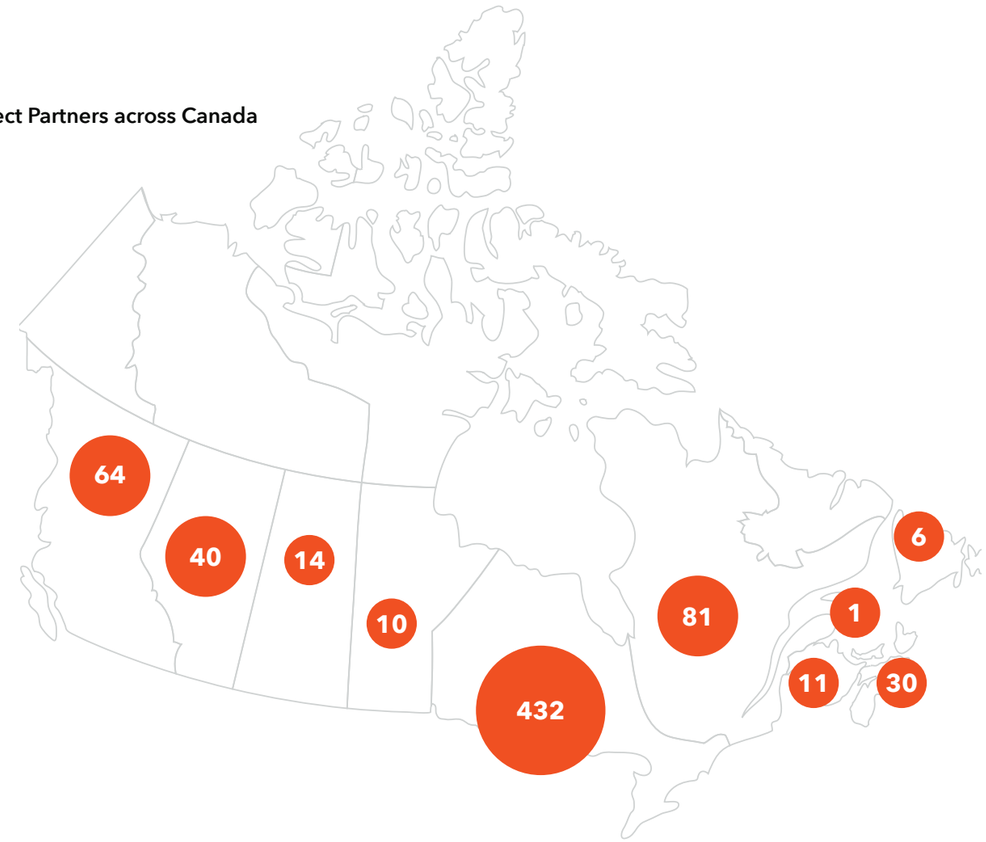
Large companies account for 40 industry partners (10%) and are involved in 36 projects (21%) primarily in the field of process transformation. There are 13 different large companies headquartered outside Canada engaged in 15 projects and 16 different large Canadian-based companies involved in 21 projects. 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.

NGen's Technology Leadership projects also involve 311 academic and research partners from universities, colleges, hospitals, the National Research Council, and other research organizations (1.8 per project). Research partners are primarily involved in our technology development and SME capacity-building projects. Among the research groups involved in NGen projects, 220 are from universities, 62 from colleges, 22 from research institutes including seven from the National Research Council, and seven from hospitals and health care centres. The top ten ranked academic research partners in terms of engagement in NGen projects are listed below.

Rank	Institution	# of Projects	Rank	Institution	# of Projects
1	University of Waterloo	30	**6**	Dalhousie University University of Guelph	10
2	University of Toronto	28	**7**	McGill University Université du Québec	9
3	McMaster University	20	**8**	University of Alberta Georgian College	7
4	Western University	15	**9**	Université Laval Queen's University Conestoga College	6
5	UBC	14	**10**	University of New Brunswick Humber College Lambton College	5

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 across Canada



Distribution of Industry Partners and Research Groups

Location	Industry Partners	Research Teams	Total Project Partners
British Columbia	43	21	64
Alberta	23	17	40
Saskatchewan	8	6	14
Manitoba	5	5	10
Ontario	240	192	432
Quebec	43	38	81
New Brunswick	6	5	11
Nova Scotia	16	14	30
Prince Edward Island	-	1	1
Newfoundland & Labrador	3	3	6
International	-	9	9
Total	**387**	**311**	**698**

Project partners are involved in every province across Canada.

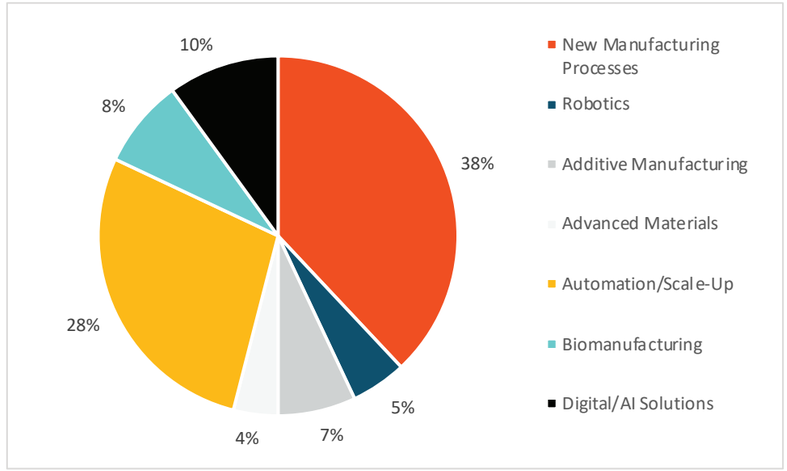
The distribution of industry partners and research groups is detailed (in the chart on the left).

While 62% of NGen project partners are based in Ontario, 12% are located in Quebec, 9% are in British Columbia, 9% in the prairie provinces, and 7% in Atlantic Canada. NGen projects also bring partners together across provinces – 59 projects (35% of the total) involve interprovincial collaboration. Nine projects involve collaboration with international research partners – three based in Germany, two in the United States, and one each in the United Kingdom, Japan, France, Italy, and Germany.

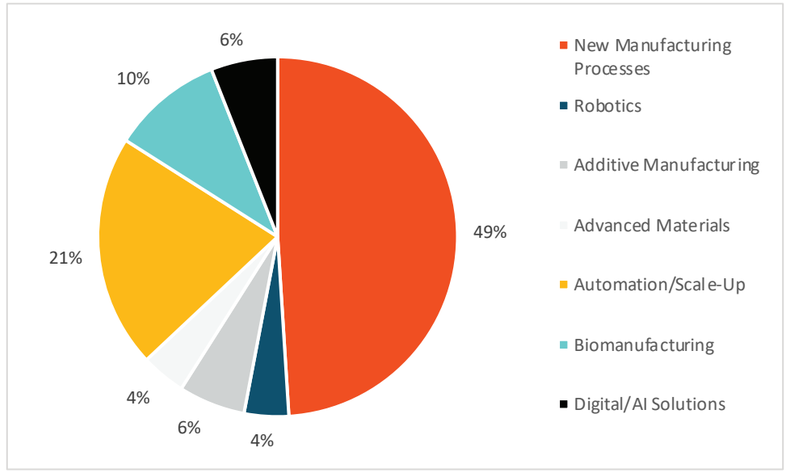
World-Leading Advanced Manufacturing Solutions

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



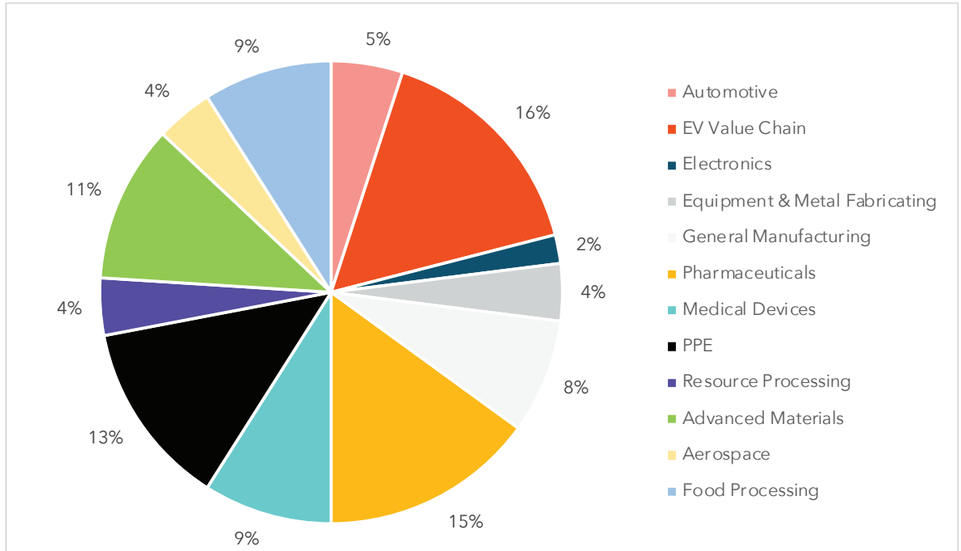
Total Project Investment by Type of Solution



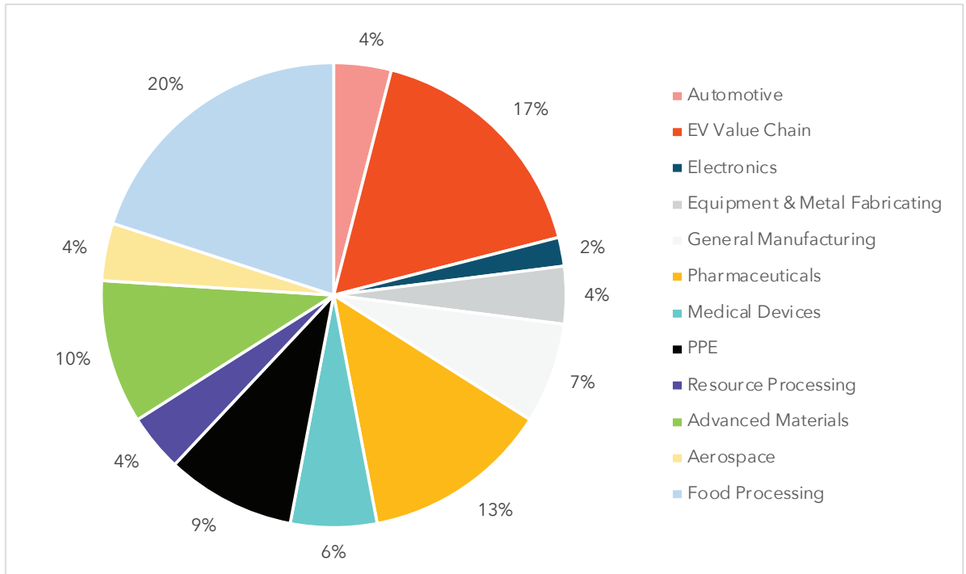
These solutions are being developed for and applied in a variety of industry sectors.

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 to date. 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.

NGen Funding by Sector of Primary Application



Total Investment by Sector



A full list of projects contracted by NGen at the end of March 2023, identifying project leads, the number of project partners, and amounts of NGen funding and total project investment can be found in Annex 2 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 (CAPPEM)** 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 DeepTech Canada in partnership with CMC Microelectronics to advance medical device, vaccine, diagnostics, and new medical innovations. Progress is described above in the overview of NGen's Cluster Network.

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

- In Victoria, **Axolotl Biosciences** is working with Starfish Medical and researchers from the University of Victoria, University of British Columbia, and Simon Fraser University 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. BrainPrint represents a first in its class technology, which will further promote Canada as a leader in 3D printing. The project will promote the capabilities of both companies in the Canadian Additive Manufacturing landscape and grow manufacturing capacity in 3D bioprinting in Canada.
- **Immunovaccine Technologies** in Dartmouth, NS worked with researchers at Dalhousie University and the Canadian Centre for Vaccinology 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 for Medicago.
- **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.
- **Mediphage Bioceuticals** in Toronto and Ardra in Ottawa, along with researchers at the University of Waterloo, University of Toronto, and Lambton College completed a pilot project that developed bacterial frameworks for biomanufacturing of industrial and therapeutic products. The fermentation-based framework extracts biomaterials in a less resource intensive way than existing processes and can also be deployed in the food industry.
- **OmniaBio**, based in Hamilton, ON, has partnered with ExcellThera, Morphocell Technologies, and the Canadian Advanced Therapies Training Institute in Montreal, Aspect Biosystems in Vancouver, as well as research teams from BioCanRx, the Ottawa Hospital Research Institute, Canadian Centre for Regenerative Medicine, Deeley Cancer Centre, University Health Network, and Krembil Research Institute, and McMaster University in Ontario, Université Laval and Hôpital Maisonneuve-Rosemont in Quebec, and the University of Alberta to develop a biomanufacturing ecosystem with a R&D hub based at McMaster Innovation Park in Hamilton. This project will facilitate the attraction of a broader supply chain of companies that supply viral vectors, plasmids, biobanking, cell culture, logistics, and other services critical to the biomanufacturing ecosystem. OmniaBio's targeted focus on process development, advanced manufacturing platforms, analytics and regulatory development through the NGen project, will catalyze further technology

development in Good Manufacturing Processes production and commercial scale biomanufacturing.

- **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.

At the outbreak of the pandemic NGen also invested in projects to manufacture test kits for COVID-19:

- **International Point of Care** in Toronto partnered with Precision Biomonitoring in Guelph, ON, Immune Response Diagnostics in Toronto, and Suncor Energy in Calgary to expand production of its COVID-19 In-Vitro Diagnostic Products.

- **LuminUltra Technologies** of Fredericton, NB developed and scaled up production of rapid portable RNA-based PCR tests for COVID-19.

- **Precision Biomonitoring** in Guelph 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.

- **Response Biomedical** in Vancouver scaled up the production of its rapid point-of-care RAMP screening test for COVID-19.

- **Sona Nanotech** in Halifax partnered with the VIDO-Intervac Research Centre in Saskatoon, the University of Saskatchewan, and the Runnymede Healthcare Centre to deploy Sona's proprietary nanotechnology to develop a rapid point-of-care antigen test to screen for COVID-19. The project also led to the development of a digital app that enhances lateral flow tests and readers improving the end user experience. Sona has now been transformed into a medium-size rapid test manufacturing facility that has the ability to develop and manufacture multiple rapid tests.

- **Exacad** of Boisbriand, QC developed a fast method for manufacturing plastic injection molds for COVID-19 tests. Exacad's production filled a critical supply chain shortage in 2020 and helped to sustain Canadian production of test kits.

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 including, Dorigo Systems in Burnaby, BC, Advance Test Automation in Milton, ON, Powersonic Industries in Bolton, ON, Dometic in Vancouver, and Yorkville Industries in Pickering, ON. Celestica procured the materials and manufactured the device at its facility in Newmarket, ON. The Canadian Emergency Ventilator was approved by Health Canada and was 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.

- **AiimSense** and Sorena Tech in Waterloo worked together with researchers from Georgian College, University of Waterloo, and Grand River Hospital to undertake a feasibility demonstration of sensors for stroke diagnosis. The project led to a solution that will reduce costs and improve user experience for patient care.

- **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.

- **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.

- **DMF Medical** in Dartmouth, NS partnered with a research team at Dalhousie University to scale up production of its MemsorbTM filters that remove carbon dioxide from the breathing stream of anaesthesia machines, allowing for their repurposing as ICU ventilators.

- **Myant,** a textile computing company based in Toronto ramped 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.

- **Myant's** second project funded by NGen allowed it to partner with UrTech in Burlington, ON, Applied Brain Research in Toronto, and Microart Services in Markham, as well as with research teams at the University of British Columbia, University of Toronto, Toronto Metropolitan University, RWTH Aachen, and Tokyo Institute of Technology to test and validate its smart textile technology and digital monitoring system for patient care taking different environmental and demographic conditions into account. The project helped prove that Myant's smart textiles can be used for remote monitoring of hospitalized patients and seniors in long-term care homes.

- **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 along with researchers from the Centre de metallurgie du Québec, Red River College, McGill University, and the University of Manitoba to develop and validate automated 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 results related to the rapid design and additive manufacturing of customized and complex parts are also transferable to other manufacturing sectors.

- **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 is scaling up production of Canada's first compact head-only MRI system that has the potential to greatly increase access to MRI scans at point of care in the healthcare system.

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

- 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. The projects also led to improvements in autonomous robot technology that project partners are now deploying in further development and commercialization activities.

- Other sterilizing solutions were also developed. **Envision SQ** in Guelph partnered with the University of Guelph and the Xerox Research Centre in Mississauga to develop large-scale processes to produce an advanced self-sterilization coating that kills the COVID-19 virus on contact. Applications are on hard and high touch areas. **McRae Imaging** in Mississauga worked with Dot Automation in Vaughan, ON, Lumentra in Toronto, and researchers from the University of Toronto to develop and manufacture nano-material antimicrobial shielding.

- Three projects were undertaken under NGen's COVID-19 Rapid Response Challenge in 2020 to scale up production of protective face shields on an urgent basis. **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 which were distributed to nursing homes, hospitals, chid care facilities, dental offices, grocery stores, and many other front-line and second-line areas. In a second project, **Burloak Technologies** in Oakville worked with Hamilton Health Sciences to design, test and scale up additive manufacturing of 500,000 shields. **Molded Precision Components** in Oro Medonte, ON partnered with Sterling Industries in Concord, ON and Georgian College to manufacture face shields as well. MPC 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.

- Four projects focused on the automation of high-quality respirators and face masks. While partners in these projects have been unable to maintain production and sales as demand

for respirators has dropped significantly post-pandemic, they have nevertheless created production capacity in Canada for domestic procurement. **Armfoam** in Longueuil, QC partnered with Roswell DHT in Calgary using proprietary pressure molding technology to develop and produce different sizes of mask with new biodegradable filter material. **Eclipse Automation** in Cambridge, ON also automated production of N95 masks and now has the capacity to manufacture 20 million masks annually because of the project. **Fidelity Machine and Mould Solutions** in Calgary partnered with Sentient Tools Engineering and Fidelity Medical Manufacturing based in Calgary and researchers from the University of Alberta to improve the manufacturing process for medical grade surgical and procedural face masks using advanced manufacturing technologies. **PrescientX** in Cambridge, ON also partnered with Big-Nano in Waterloo, ON, and research teams from McMaster, Guelph, and Waterloo universities 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. **Fine Cotton Factory** in Toronto worked with Microbonds in Markham and researchers at George Brown College, Waterloo University, York University, and McMaster University to achieve mass production of antimicrobial textiles containing metals such as silver, zinc, and copper for PPE and other applications of metal-infused fibre. **MEA Health** in Kitchener and MLD Solutions in London partnered with researchers at Conestoga College to develop advanced recycling and integrated supply chain processes for single-use PPE. The project has created a ERP software system for material recycling. Waterloo-based **Big-Nano** partnered with Swenco in Waterloo, PrescientX in Cambridge, APC Filtration in Brantford, Titan Clean Energy in Craik, SK and researchers at the University of Waterloo to set up a pilot plant to produce melt-blown nanofiber filter material for PPE and air purification filters with the objectives of helping Canada gain self-sufficiency for critical nanofiber melt-blown material supply. The project led to the development and approval of biodegradable filter media, as well as the development of marine-safe biodegradable filters, and the development of an electric battery separator. **Titan Clean Energy Products** in Craik, SK also develop and scaled up systems for biodegradable melt-blown resin and fabric production in partnership with Panther Industries in Davidson, SK, Big-Nano in Waterloo, Canada Masq in Markham, ON, and K+S Potash in Saskatoon along with researchers from Saskatchewan Polytechnic, University of Saskatchewan, Western University, and the University of Guelph. The project led to the development of new processes for biodegradable material production.

NGen has also supported other advanced manufacturing applications in the health care sector:

- **Baxter Corporation** based in Mississauga partnered with Technology Trace in Rockwood, ON and Cheme Engineering in Campbellville, ON to optimize its medical device remanufacturing process.
- **Cosm Medical** in Toronto completed a pilot project along with partner Mui Scientific in Mississauga and researchers from Sheridan College, Western, Waterloo, and Guelph universities to scale up an advanced manufacturing process for medical consumables used in pelvic diagnostic imaging. Cosm Medical also worked with Agile Manufacturing in Beaverton, ON and researchers from Sheridan, Centennial, Humber, and Mohawk colleges, Western University, and the University of Waterloo on a pilot to 3-D print and semi-automate production of patient-specific pessaries.
- **Daxsonics Ultrasound** in Halifax is working with Synaptive Medical in Toronto and researchers at Dalhousie University to develop an automated manufacturing system for ultrasound transducers used in sterile surgery. The project will enable both companies to integrate advanced electronics into complex surgical technologies leading to better surgical outcomes for patients.

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). The EV value chain offers significant innovation, investment, and economic growth opportunities for the automotive sector and for Canada.

NGen's projects 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.

With respect to cluster support, NGen has supported the development of the Canadian Association of Moldmakers' Virtual Transformation Program (VTP) 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 platform 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 and after the pandemic.

NGen also worked with the Trillium Network for Advanced Manufacturing, Accelerate, and Electric Autonomy to map out Canada's Zero-Emission Vehicle supply chain. The interactive map was unveiled in July 2023.

Among NGen's automotive-related Technology Leadership projects:

- **AEM Power** in Windsor is working with Additive Metal Manufacturing and Macrodyne Technologies in Concord, ON, along with a research team at the University of Windsor, to develop a novel gas oscillation system for forming lightweight aluminum and magnesium automotive panels.
- **Apera AI** worked with Magna's Stronach Centre for Innovation in Aurora, ON and researchers from UBC, Simon Fraser University, the University of Victoria, and Georgian College to develop a 3D vision guided robotic assembly process.
- **Axiom Plastics** in Aurora, ON partnered with MS Falcon in Toronto, Kytech Machine Works in Mount Albert, ON, and Bulldog Polymers in Alliston, ON, along with researchers from the University of Toronto, Ontario Tech University, Seneca College, and Humber College to create a new production process to manufacture interior and exterior vehicle plastic panels featuring a visually uninterrupted transition between different types of plastic. These transitions are typically between harder and softer polymers. The new process will result in lower overall part costs compared to incumbent technology processes. The project will allow Axiom to support lightweighting initiatives in the automotive sector, which is key to improving fuel economy and lowering emissions.
- **Kepstrum** in Vaughan, ON worked 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 utilized analytical algorithms developed in a prior feasibility study that 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. The new 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 Tool & Stamping in Mississauga collaborated with researchers from McMaster University to set up a pilot line for a new nanogel superabsorbent 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.

- **Magna's Stronach Centre for Innovation** in Aurora, ON partnered 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 (AARS), 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.

- **Marwood International** based in Tillsonburg, ON partnered with Dieffenbacher North America in Windsor, Aerlyte in London, and researchers from Western University and the Fraunhofer Centre for Composites Research to develop a novel process of lightweight automotive part manufacturing based on the recycling of thermoplastics.

- **Polyalgorithm Machine Learning** in Waterloo worked with Martinrea, one of Canada's largest auto parts manufacturers based in Vaughan, ON to develop an AI solution that will optimize output and reduce defects and equipment downtime.

- **ThinkData Works** in Toronto also worked with Martinrea and Palantir Technologies whose Canadian operations are based in Vancouver, along with researchers from the universities of Toronto and Waterloo 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, have completed a project to develop 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 is applicable to recycling black mass of all lithium ion-based batteries.

- **Li-Metal** in Markham, ON has partnered 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 focuses 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 includes 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 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 has built out the manufacturing and assembly line for these advanced materials and the extraction modules. The process aims 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:

- **Calogy Solutions** is a rapidly growing startup in Sherbrooke, QC with a novel and patent pending battery thermal management solution for Lithium-ion batteries in electric vehicles called TGP (Thermal Ground Plane). Along with partner Linear Automation in Barrie, ON and researchers from Université de Sherbrooke, Cégep de Sherbrooke, Centre de métallurgie du Québec à Trois-Rivières, and l'École nationale supérieure des Arts et Métiers (in France), the consortium is developing an intelligent pilot manufacturing line for the TGP with an innovative and unique manufacturing method, 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 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 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.

- **Electrovaya** also completed a pilot project with Ortech in Mississauga, the NRC, and researchers from the University of Toronto, UBC, and Waterloo University to develop a manufacturing process for solid state lithium batteries. As a result of the project Electrovaya has developed pilot scale manufacturing know-how to produce solid state batteries with 20% to 40% energy density.

- **E-Zn** in Toronto piloted an air cathode production line with AlumaPower and Lambton College in Sarnia, ON. The project set out to design the optimal process and construction specifications for a semi-automated facility to produce e-Zinc's air cathodes for AlumaPower's aluminum air battery, which exceeds the capabilities of Li-ion battery systems.

- As an industry-led Ecosystem Development project, the **Flex-Ion Battery Innovation Centre**, a division of Ventra Group in Windsor, ON, is establishing 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 are focusing 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, UQAM, and Ontario Tech University to develop and commercialize advanced manufacturing innovations and equipment to improve the performance of electric vehicle propulsion batteries and battery manufacturing systems. The partners are developing a localized mineral supply chain to enable cost-effective Li-Ion cell manufacturing in Canada, developing new processes to achieve a 20% increase in battery cell energy density along with a similar reduction battery weight, and designing new AI-enabled manufacturing systems that will reduce battery production time, cost, and scrap.

- **MicroGreen Solar** in Markham, ON carried out a pilot project with Rematek-Energie in St.-Laurent, QC and researchers at the University of Toronto and Centennial College that developed a mid-scale battery storage system demonstrating an assembly-disassembly process that enables the replacement of single cells and eliminates the need to scrap entire battery packs.

- **NOVONIX** Battery testing services in Dartmouth, NS partnerd 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.

- **Weber Manufacturing Technologies** in Midland, ON undertook a pilot project with VPN Research in Mississauga and the University of Waterloo to develop a production and recycling process for nickel materials used in EV batteries. Weber established a new carbonyl system as a result of the project which was able to produce high quality nickel powder from the black mass of spent batteries.

In the field of hydrogen-powered vehicles:

- **Ballard Power Systems** in Burnaby, BC worked 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 a Centre of Excellence for high volume manufacturing of hydrogen fuel cells. The consortium is collaborating with researchers from universities of Toronto, Waterloo, Quebec, and Alberta to address some of their material development 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 of Calgary 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 Canada'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, stationery and back-up power, and has the potential to transform other critical industries such as aerospace, off-road, and other heavy-duty applications.

- **Rayleigh Solar Tech** in Halifax and partner Magna International in Aurora, ON have completed a project in collaboration with researchers from Concordia, Dalhousie, l'École supériere de technologie, Nova Scotia Community College, and the University of Rome 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 has partnered 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 will lead to the development of a manufacturing process to produce smaller, lighter inverters for use in Zero-Emission Vehicles.

- **Macrodyne** in Concord, ON has worked with Linear Transfer Automation in Barrie, ON, Ridgetech Automation in Cambridge, ON, and researchers at the University of Guelph to develop an automated 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 a affordable, 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 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 solution will significantly improve productivity and reduce the number of faults with employees empowered with immersive and intuitive instructions and can be used for training and skills development in other sectors of manufacturing.
- **Formula Solutions** in Burlington, ON collaborated with AXYZ Automation Group in Burlington and Promation Nuclear in Midland, ON, McMaster University, Mohawk College and Fanshawe College to automate the manufacturing process for parts for aerospace engines. The solution is key to developing a domestic manufacturing capability in Canada for critical components for the aerospace industry.
- **McGuire Aero Propulsion Solutions** of Toronto, partnered with Burloak Technologies in Oakville, and Tekna Advanced Materials in Sherbrooke, QC to scale up and test additive manufacturing processes for large, complex, zero-emission turbomachinery for the aerospace industry. The project will result in significant environmental benefits in the form of reduced materials requirements and associated carbon emissions. It will also help scale up large additive parts manufacturing capabilities in Canada.
- **MDA** in Ste.-Anne-de-Bellevue, QC partnered 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 manufacturing technologies while successfully managing constant changes and maintaining mandatory manufacturing traceability. Focusing on quality and efficiency, the new systems will improve manufacturing methods around high-volume assembly, automated testing & inspection, and autonomous data management.
- **Reaction Dynamics Lab (RDX)** in Montreal worked with Amrikart Ressource Cybernetique in Brossard, QC and researchers at the National Research Centre, McGill University, and Polytechnique de Montréal 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. RDX's breakthrough propulsion technology provides the means to a Zero-Carbon footprint orbital launch solution. RDX intends to manufacture and operate its orbital rockets for small satellite launch as a service while turning recycled polymers into high-performance rocket fuel.

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 partnered 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.
- **Enertics** in Milton, ON carried out a successful pilot with Skjodt-Barrett Foods in Brampton and researchers at Mohawk, Lambton, George Brown, and Humber colleges that implemented an online monitoring and predictive maintenance system for critical assets in the food and beverage sector. The project created a use case in the industry and provided a test bed for the further development of Enertics technology.
- **Mycionics** worked with Whitecrest Mushrooms in Putnam, ON, Piccioni Mushroom Farm in Dundas, ON, and researchers at Western University to develop and manufacture robotic 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 worked with Saputo Dairy Products in St.-Laurent, QC and researchers from Waterloo and Toronto universities to implement and demonstrate their solution in four Saputo processing plants. Panevo's solution can also be applied in a variety of manufacturing sectors in addition to food processing.
- **Quali Artificial Intelligence** based in Kitchener, ON undertook a project with Riverside Natural Foods in Vaughan, ON, Axiom Plastics in Aurora, ON, and Terra Cotta Foods in Georgetown, ON to assess the feasibility of developing and scaling up an AI powered plug-and-play camera solution that automates a visual quality inspection for food processing. The project tested a variety of Quali AI solutions across use cases in food processing as well as the automotive sector, proving that the company's AI solutions achieved greater quality control accuracy than human inspectors.

Advanced Materials

NGen has funded initiatives that support Canada's 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-rector 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 Verschuren 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 carried out a feasibility study with researchers at Dalhousie University to develop a large-scale manufacturing process for its dry spinning technology 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 process 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 conducted a feasibility study and 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. The project helped scope out equipment and operating requirements for the facility.
- **Brilliant Matters Organic Electronics** in Quebec City which carried out a pilot project with Raymor Industries in Boisbriand, QC and researchers at the National Research Council, Université Laval, and Université de Montréal that successfully scaled up a production process for organic semiconductors from bench to pilot scale while maintaining desired quality and stability. Organic semiconductors use only one-tenth the energy of silicon chips. The semiconductors produced at pilot stage were tested with highly positive results.
- **CarbiCrete** in Lachine, QC which worked with Patio Drummond in St.-Nicéphore, QC, 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. The pilot project successfully captured all emission monitoring and reporting requirements, validated the carbon quantification methodology, and helped fine tune and optimize Carbicrete's process for sequestering CO2.
- **Datec Coating** in Mississauga which collaborated with Ortech also in Mississauga, and researchers at Sheridan College, the University of Saskatchewan, and University of Waterloo 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.
- **Dispersa** in Laval, QC which partnered with Project Clean in Vancouver and researchers at the Institute national de la recherche scientifique in Quebec City and Centre d'études des procédés chimiques du Québec in Montreal to scale up the world's first waste-derived process for manufacturing biosurfactants, which are active compounds secreted by the skin or produced on cell surfaces. They provide a natural ingredient for herbicide and pesticide formulations, detergents, health care and cosmetic products, pulp and paper, textiles, food, and fuel products.
- **Enersion** in Toronto which has developed an innovative product based on nano-porous materials that provides on-site energy with 4X the efficiency of solar panels, allowing buildings to reduce their energy costs by up to 60%. Enersion partnered with the University of Toronto and UofT's Impact Centre to audit Enersion's existing manufacturing process and develop a process for mass production. The project resulted in the development of a powder twice as effective as its previous product and has allowed Enersion to develop AI solutions to optimize its supply chain and smart manufacturing systems including component quality control, cobots for welding, and predictive maintenance.
- **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 also worked with Environmental Systems in Barrie, ON, Waterloo, Guelph, Lakehead Universities, Georgian 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. The project was 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 undertook 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.
- **Genecis Bioindustries** in Toronto which worked 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.
- **Geomega Resources** in Boucherville, QC which partnered with Rio Tinto Alcan in Montreal to conduct a feasibility study for the production of iron, aluminum, and rare earths from bauxite residues. The project established the technological feasibility of the process and has strengthened collaboration between the project partners.
- **Graphite Innovation and Technologies** in Dartmouth, NS which partnered with K&D Pratt in Mount Pearl, NL and researchers at Dalhousie University to develop an innovative process to produce graphene-based marine coatings that prevent the leaching of toxic chemicals into water.
- **Imperial Mining Group** in Montreal, which worked with Fusia Groupe in Ste.-Eustache, QC, and researchers from McGill and McMaster universities on a project to develop a vertically integrated ecosystem for the production of novel scandium aluminum alloys for 3-D printing with applications in electric vehicle and aerospace manufacturing. The project was successful in developing a cost-effective replacement for titanium enhanced aluminum allows and helped to de-risk industrial adoption of the technology.
- **Lantern Machinery Analytics** in Vancouver which undertook a study with Zentek in Thunder Bay, ON and researchers at UBC, Western University, and the University of Waterloo to develop an algorithm that can characterize the dimensionality of nanomaterials. The project will allow Zentek to control the physical parameters of the graphene and graphene derivatives it produces allowing to target specific nanotechnology applications in advanced materials, biomedical treatments, and green fuel additives.
- **Macrodyne Technologies** in Concord, ON

which developed an 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 led to the manufacture of 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.

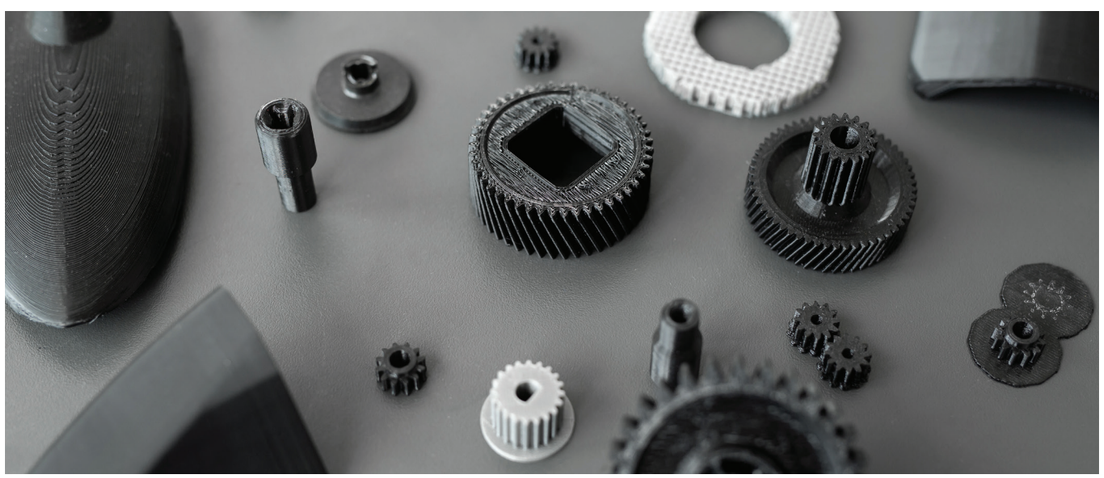
- **Nano Cnet** in Waterloo, ON which partnered with Evercloak also in Waterloo along with researchers from the University of Waterloo to scale up a roll-to-roll continuous printing technology that merges graphene and nano-silver strands to significantly increase the conductivity and transparency of 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.
- **NetProCore** in Burlington which worked with AI-Innovate in Hamilton, Hazelett CASTechology in Calgary, and researchers from McMaster and Queen's universities and Fleming College successfully on a pilot project to create a digital twin of the aluminum strip casting process using computational materials science and data analytics. The project provided a use case for the deployment of digital twins in other advanced materials processes.
- **Ora Graphene Audio** in Montreal which completed a pilot with Locus Precision in Pontiac, QU, McGill University, and the International Certificate Centre in Richmond Hill, ON that developed the tooling and demonstrated full-scale production of high-graphene membranes that can be customized for a variety of applications in water filtration, PCB manufacturing, micro-speakers, hearing aids, TV speakers, cellphones, and gaming consoles to reduce energy requirements.
- **Polar Sapphire** in Oakville which collaborated with Nature Alu and Dynamic Concept in Saguenay, QC along with researchers at McMaster, Toronto, Queen's, and Western Universities to develop an advanced process for High Purity Alumina (HPA) production. The project will showcase North America's first HPA production line, focusing first on battery applications.
- **ReDeTec** in Toronto which partnered with an industrial partner in Brantford, ON and researchers from George Brown College, Lambton College, and Toronto Metropolitan University to scale up its advanced plastics reprocessing and recycling process. ReDeTec's technology mitigates plastic degradation in the recycling process and unlocks increased recyclability by using AI algorithms to determine optimal processing parameters.
- **Universal Matter** in Burlington, ON which partnered with Hatch Engineering, Carbionix in Kitchener, and researchers from the University of Toronto and Rice University in the United States to scale up its "Flash Joule Heating" graphene manufacturing process. The project successfully developed automation and scalability with commercial opportunities in asphalt, rubber, and industrial coatings sectors.
- **USP Technologies** in Vancouver which completed two successful feasibility studies. The first was with Brown and Caldwell Consultants in Burnaby, BC, Western University, and the Municipality of Middlesex Centre in Ontario to assess opportunities for the development of a new manufacturing process for the recovery of value-added materials from wastewater using advanced vacuum technologies. The second with researchers from Toronto Metropolitan University and the Municipality of Middlesex Centre assessed the feasibility of a new process to extract iron-based coagulants from metal wastes to improve environmental sustainability.
- **ZS2 Technologies** in Calgary which completed a project with Progressive Planet Solutions in Vancouver, Occam's Technologies in Calgary and researchers from the University of Calgary to develop a pilot plant for magnesium concrete tiles for the construction industry that can significantly lower the emissions from conventional concrete manufacturing processes.

Additive Manufacturing

Canada accounts for only 2% of the world's $15 billion production based on 3-D printed or additive manufacturing processes. However, Canada, and the National Research Council in particular, was a pioneer in the development of additive manufacturing technologies. The Canadian additive manufacturing ecosystem is relatively diverse and has a well-integrated value chain of knowledge, research, materials, engineering, and manufacturing capabilities including peripheral AI, robotics, computer automated design management, and printer manufacturing. Canada's additive sector also has globally recognized capabilities particularly in the fields of powder development and metal additive printing. The benefits of additive processes over traditional subtractive methods of manufacturing include waste and associated emission reductions and the design and manufacturing of complex products. Additive processes have also seen widespread adoption in Canadian manufacturing, especially in aerospace and biomedical sectors.

NGen provides financial and administrative support for Canada Makes, Canada's advanced manufacturing cluster, which has now grown to 63 members across the country. We have also invested in a number of additive manufacturing applications in addition to those in medical, automotive, and aerospace sectors:

- **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, the University of Alberta, SAIT, NAIT, McGill, and the University of Manitoba worked on a project to deploy additive manufacturing technology within Canada's oil sands industry to reduce costs and wearability of tooling, improve performance, and eliminate tailings ponds.
- **Mosaic Manufacturing** in Toronto partnered with Objex Unlimited, ReDeTec, and Athletic Knit, also in Toronto, and PolyUnity in St. John's, NL to develop a novel large-scale additive manufacturing solution called Array. The solution is capable of cutting 3-D printing costs by 95%, increasing throughput by over 10X, and integrating eight different materials into a 3-D printed product. It allows one operator to run a system that is the equivalent of 250 individual 3-D printers.
- **Mosaic Manufacturing** also worked with Dyze Design in Longueil, QC, Matter and Form in Toronto, and researchers from McMaster and Queen's universities to develop a new additive process called Vector which will allow the 3-D printing of metal filaments in textiles. The project has allowed Mosaic to develop a deal with the world's largest manufacturers of textile emblems (World Emblem) to support the rapid expansion of the Vector and Array additive systems for use in emblem manufacturing across North America.



Digital & Advanced Automation Solutions

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

- **ACQBuilt** in Edmonton completed a pilot project with Promise Robotics and researchers from Humber College, AMII, and the University of Alberta leading to the development of a prototype compact robotic cell for building wall panels. The prototype is on display at Promise Robotics lab as a showcase of the building industry and other companies interested in factory-based building component prefabrication and related robotic technologies.

- **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). The objective was to develop a patented material and light-based technology to manufacture professional PCBs.

- **Aixel** in Waterloo completed a pilot project with Quali AI in Kitchener and Conestoga College to develop an AI-enabled quality inspection system. The project allowed the partners to demonstrate the vision system as well as the software platform that integrates automation, quality inspection, and data analytics.

- **Apex Industries** in Moncton, NB undertook a feasibility study with partner 709960 N.B Ltd. to help de-risk the development of a novel manufacturing process and installation method for manufactured stone veneer panels. This manufacturing process includes an automated concrete color 3D printer providing precise volumetric and positioning control. The process will significantly reduce manufacturing and installation costs of color veneer stone panels and help reduce both waste and carbon emissions.

- **ArcelorMittal Dofasco** partnerd 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. Digitization in heavy industry lags that of other manufacturing subsectors. This project will create value in advancing the state of understanding of the digitization 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 impact on the workforce.

- **Autometrics** in Vancouver, Marcon Metal Fab in Delta, BC, Mohawk College, and BC Institute of Technology partnered in a pilot project to develop and test an automated inspection system for robotics welding operations. The project accomplished a key step in AutoMetrics' product and business development plans, equipped Marcon with the latest technology in quality inspection, and engaged 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 worked 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.

- **Clearpath Robotics** in Kitchener partnered with Siemens Canada and Conestoga College to develop an autonomous intelligent mobile forklift for advanced manufacturing. The project took the solution from proof of concept to full scale production and installation of the V1 Otto Lifter which has been demonstrated at several international trade shows.

- **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, shipbuilding, and other large industrial structures. The 3,500 ton hydraulic press was commissioned in November 2021.

- **CrossWing** in Aurora, ON completed a project with ASC Canada in Toronto and researchers from York University to develop an AI-enabled quality control and predictive maintenance system based on the visual identification of defects. The solution has greatest commercial potential in the automotive and aerospace sectors.

- **Deep Cryogenics International** in Lunenburg, NS worked with Induspec in North Bay, ON, Lethbridge University and Red Deer and Canadore Colleges on a pilot project to manufacture a production-ready, scale-up deep cryogenic treatment tank (DCT) for use in the mining, power, marine and energy industries. The project helped 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 has led to 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.

- **Distributive** in Kingston, ON partnered with Honeyvision in Nepean, ON to demonstrate the application of Distributive's remote data server modified to redirect on-premises latent compute resources towards new tasks to a machine vision system. The project showed that the solution was 13X less costly and significantly more efficient and secure than conventional cloud-based computing.

- **Guidebolt** in Mississauga, Candor Industries in Toronto, and researchers at Concordia University and Sheridan College completed a pilot project involving the use of humanoid telepresence robots for safer, more efficient, and consistent PCB manufacturing.

- **Hazelett CASTechnology ULC** in Kingston, ON and Aluminum Valley in Alma, QC worked 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. The technology represents a new and transformative process and will position Canada as a world leader in the advanced aluminum manufacturing sector.

- **Intelligent City** in Vancouver and Brave Control Systems in Windsor completed a project to develop a robotic mass timber milling centre that is superior to existing technologies on the market. The solution will increase lumber throughput, lower lead times, increase quality, and reduce equipment downtimes by using robotics and digital twins to reduce the gap between design and manufacturing.

- **Interaptix** in Toronto undertook a pilot project with Gastops in Gloucester, ON to develop and deploy an augmented reality remote in-process inspection solution for discrete manufacturing. For high complexity discrete manufacturing processes that do not lend themselves easily to automation, the introduction of a remote spatial inspection platform offers opportunities for increased efficiency and accuracy, more effective training, and hiring from an expanded catchment area.

- **Linamar** partnered with PolyML, as well as ABB in Brampton, ON, Ferro Technique in Mississauga, and researchers from the National Research Council, Vector Institute, and Waterloo, Toronto, McMaster, and Western universities in a project that aims to prove out Canada's capability to build an automated factory by mimicking an existing factory cell, but autonomously using the latest in advanced manufacturing technology. This cell will act as a pilot and proof of concept that can then be disseminated throughout Linamar's factories and, through its partners, to the rest of Canada's manufacturing ecosystem.

- **Linamar** is also working with the same research partners along with 2CM Automotive in Guelph and AIS Technologies in Windsor to develop an automated defect inspection system based on AI-enabled vision system technology.

- **Luxmux Technology Corp** in Calgary completed a pilot project with partners Dream Photonics in Vancouver and researchers from Laval, McGill, McMaster, Queen's, UBC, and Polytechnique de Montréal to scale up a

manufacturing process for integrating super-broadband super-luminescent diodes on silicon photonics.

- **Petra Hygienic Systems** in Concord, ON, Sidac Automated Systems in Toronto, and a research team at the University of Toronto undertook 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 was to build new machine vision technology applied to COBOTs for randomized product selection. It led to significant improvements in automation efficiency, waste reduction, and quality control.

- **Pulsenics** in Toronto completed two projects based on its data analytic capabilities. The first was a feasibility study with BioLargo Water in Edmonton which allowed BioLargo to improve the health and lifetime of their graphene electrodes. The second was a pilot with CERT Systems in Toronto and researchers from the University of Toronto that developed a process for non-disruptive monitoring of electrochemical activity to advance state-of-the-art ethanol production processes for the fuel industry.

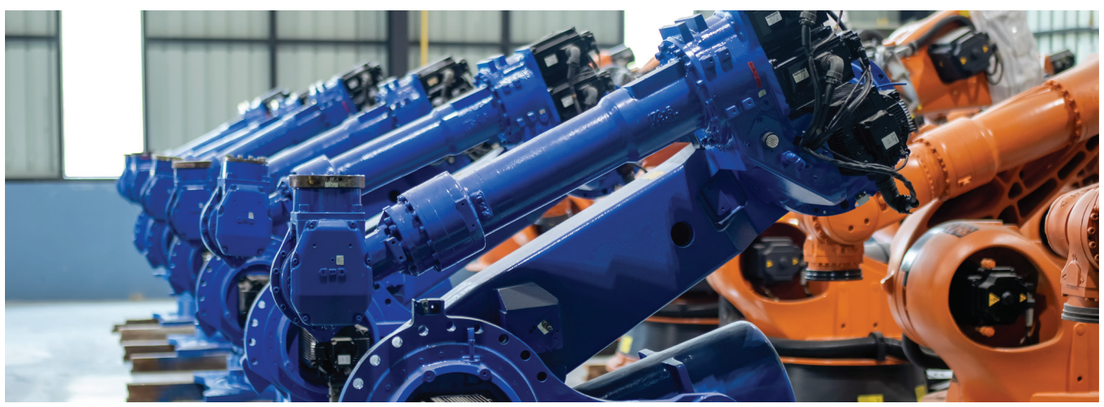
- **Quali AI** in Kitchener successfully completed a feasibility study with Novo Textiles in Coquitlam, BC to validate a low latency tele-robotics solution for pick and place. The solution, which can be retrofitted on existing equipment, enables a remote operator to take over control of a robotic arm when the robot is unsure about how to complete a particular task, improving the speed of teleoperation of unstructured robotic tasks. This capability will allow manufacturers to increase productivity and potentially outsource robotic teleoperations to a third party.

- **Ranovus** and Jabil Canada, both based in Kanata, ON, completed a project with research teams from McMaster and the University of Sherbrooke to develop a new process for Electro-Photonics Integrated Circuit (EPIC) manufacturing.

- **Sanctuary Cognitive Systems** in Vancouver worked with Dr. Christian Doherty Inc. also in Vancouver and Forcen in Toronto on a pilot project to develop an AI-enabled robotic hand with human-level dexterity for assembly operations. The objective was to develop 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. The project fully integrated advanced control systems to allow for greater robotic dexterity and freedom of automation.

- **Smart Skin Technologies** in Fredericton, NB worked with Coca-Cola Bottling in Toronto on a study to assess the feasibility of a predictive maintenance pilot. The project led to three use cases using sensors, digital twins, and drone technology to demonstrate how equipment failures can be predicted and bottling line delays avoided.

- **Top Hat** in Kitchener partnered with Demtool in Petersburg, ON, Clear Software in Waterloo, and researchers from the University of Waterloo and Ontario Technical University in a pilot project to develop an automated end-of-production-line testing of its electric sidewalk robots in simulated winter weather conditions.



Intellectual Property Strategy

NGen aims to maximize the commercial value, ecosystem impact, and the economic, environmental, and social benefits of intellectual property generated as a result of NGen investments, in Canada.

For the purposes of our IP strategy, intellectual property ("IP") refers to intangible intellectual assets contributed to ("Background IP") or arising from ("Foreground IP") projects and ecosystem development initiatives in which NGen invests. 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 investments are determined according to the transformative and commercial potential of the foreground IP expected to be generated by individual projects, as well as the extent to which resulting commercial, ecosystem, economic, environmental, and other social benefits are expected to accrue within Canada. The objective of NGen investment is not the creation of IP itself, but the application of that IP to create value for Canadian business and for Canadians.

NGen's IP Strategy is posted on our website and outlines how we work to:

- Maintain clear, transparent, and predictable IP ownership policies and licensing structures for the management of background IP applied in projects, treatment of foreground IP arising from projects, and processes by which NGen members can request and negotiate licenses to use foreground IP.

- Educate project partners and NGen members about the nature and value of their IP, methods for protecting it, and strategies for commercialization.

- Strengthen IP protections for NGen project partners.

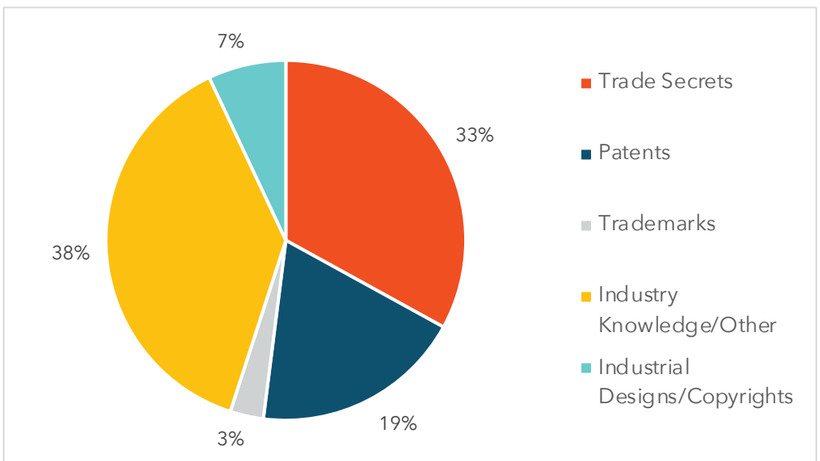
- Enhance the commercial value of Background IP contributed to projects.

- Enhance the commercial value of Foreground IP arising in projects.

- Support the commercialization and enhance ecosystem benefits of Foreground IP.

- Capture and maximize the value of IP retained and commercialized in Canada.

Foreground IP Assets Expected to be Created in NGen Projects



In 2022-2023, NGen updated our IP Strategy to reflect the specific initiatives that we undertake in pursuit of these objectives, including provisions that would make the continuation of NGen funding contingent on the benefits of Foreground IP remaining in Canada in the case of any change in control of a project partner.

NGen committed in our 2022-2023 Corporate Plan to provide IP advisory support and develop IP commercialization strategies for all completed projects. Our goal was to provide licensable access to more than 100 IP assets by the end of March 2023.

By the end of March 2023, NGen had recorded:

- 165 IP strategies developed for NGen-funded projects.
- 729 instances of Background IP contributed to projects.
- 507 instances where Background IP was shared with project partners.
- 734 Foreground IP rights created.
- 116 IP profiles in our IP Registry available for sharing or licensing with other NGen members.
- 160 post-project licenses granted to date.

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. Eighteen projects closed in 2022-2023 where all project partners have refused to enter Foreground IP in NGen's IP Registry due to competitiveness concerns. There have been no IP disputes arising among project partners that have been referred to dispute resolution.

Data Strategy

NGen's Data Strategy aims to maximize the value of the data collected by NGen for the benefit of Canada's advanced manufacturing ecosystem and to support the financial sustainability of NGen. The strategy determines how we acquire, store, govern, manage, use, and share data to accomplish our mission, achieve our strategic objectives, create value for our members and clients, carry out our operations, and ensure our long-term business success. Data privacy is a priority. NGen's Data Strategy is posted on our website, as are our policies regarding Privacy, Data Use, and Member Data Use.

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

NGen's Data, Information Technology, and Cybersecurity team 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. With respect to NGen's internal management systems, all project application processes and NGen programs are administered online.

NGen continuously works to harden cybersecurity protection for the data we manage. We undertake regular third-party audits of our cybersecurity systems. Cybersecurity awareness training is provided to NGen staff on a bi-weekly basis. NGen also runs regular 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).

Our data strategy was reviewed and updated in March 2023. The objectives of the strategy remain the same and we will continue to pursue them over the next five years. The updates reflect changes we are making in our IT infrastructure as well as in the terms of our privacy, terms of data use, and member data use policies to add further protections and bring them in line with our amended GIC Contribution Agreement.

In 2022-2023, NGen undertook important initiatives in the implementation of our data strategy. Analyses of advanced manufacturing capabilities and priorities were published based on data provided by NGen members. NGen upgraded our 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 have been 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 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 Clusters 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 $374.8 million in innovation spending, approximately 158% more than what NGen has committed.
- In our current project portfolio, Phase I industry-led Ecosystem and Technology Development projects and PCAIS projects aimed at accelerating the application of AI solutions in manufacturing are expected to generate the greatest degree of investment leverage at 208%, 172%, and 176% of NGen funding respectively.
- The cumulative amount NGen actually invested in projects by the end of March 2023 totals $185.4 million. These investments have been matched by $238.2 million in additional contributions from industry and other funding sources.
- The 130 projects that were completed or closed by the end of March 2023 generated $108.6 million in additional innovation investments. Sixteen of those 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 2023, NGen completed and closed projects had:

- Generated $3.2 billion in new business revenues including $2.3 billion in product sales and $900 million in IP licensing revenues. This amounts to 27X 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 2X return to the federal government and Canadian federal taxpayers from those investments!
- Directly created 3,098 new jobs, with 32,799 new direct and indirect jobs projected by 2028.
- Started up 44 new companies to commercialize their manufacturing solutions.
- Led to the development of 253 new products and services and 160 new manufacturing processes.
- Granted 160 IP licenses to other NGen members.

Improving Productivity &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 56% of NGen's projects identify productivity improvements as a key objective while 52% identify supply chain resiliency as a priority – with 35% of projects aiming to support the localization of supply chains within Canada. The projects include those that were 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, 74% of project partners expect to see an improvement in overall operating efficiency while 80% 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 productivity improvement have a positive impact on the environment. So too 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 target. 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:

Projects Being Funded by NGen:

71% aim to have a positive environmental impact.

60% will reduce GHG emissions.

54% 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.

37% 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.

Measuring Success

NGen measures success based on the value that our Technology Leadership projects and Ecosystem Development initiatives create by developing and commercializing unique advanced manufacturing solutions and supporting their adoption by Canadian industry.

Our targets and performance metrics build on progress achieved to date. They include core performance indicators that reflect the objectives of the Global Innovation Clusters program, as well as impact measures for tracking progress towards achieving NGen's strategic objectives, including metrics for organizational effectiveness and continuous improvement of our governance and operating processes.

a) Core GIC Performance Indicators

Short-Term Indicators	Status FY2023	Cumulative 2028 Target
Average number of collaborating partner organizations per project	4.1	
Ratio of program funding to total funding commitments leveraged from all other sources	1:1.9	1:1.7
Percentage of contracted projects with an agreed plan for IP Commercialization	100%	100%
Number of IP assets anticipated	734	
Number of projects funded	165	
Project funding commitment and average per project	$218 million (Ave=$1.32 million)	
Total and average number of industry partners per project	387 (Ave=2.3)	
Total and average number of SMEs per project	339 (Ave=2.0)	
Total and average number of research partners per project	311 (Ave=1.8)	
Ratio of NGen funding to industry contribution commitments (for non-COVID projects)	1:1.6	1:1.5
Funding for Strategic Ecosystem Development Initiatives	$8.8 million	$41.2 million

Medium-Term Indicators	Status FY2023	Cumulative 2028 Target
Average number of IP assets generated per project	4.5	
Progress towards products, processes or services developed, improved and/or commercialized by participants	253 new products	
Percentage of funded project partners that are owned/led by equity seeking groups (women, visible minorities, Indigenous peoples, persons with disabilities)	160 new processes	
Number and percent of projects completed	130 (79% Phase I)	
Project funding actually disbursed	$185.4 million (Phase I)	$512 million
Total and average number of IP assets available for licensing per project	116 (Ave=0.7)	

Long-Term Indicators	Status FY2023	Cumulative 2028 Target
GDP Impact	$3.2 billion new sales & IP licensing revenue	$15 billion new sales & IP licensing revenue
Direct & indirect jobs created or sustained	3,098 new jobs directly created	15,000 new direct & indirect jobs
Total actual leveraged investment from all sources	$238.2 million	
Revenue earned from sales of products and services	$2.3 billion	
Revenue earned from licensing IP assets	$900 million	

b) NGen Specific Impact Measures for Tracking Success

NGen also tracks progress against our strategic objectives to act as a national force, a driver of growth, a creator of networks, a catalyst for skills development, and an organization aiming to continuously improve our governance, operating processes, and service delivery, and achieve financial sustainability.

A National Force Developing Canada's advanced manufacturing ecosystem to create a global advantage for Canada by leveraging and attracting industry investment, developing a global profile, and collaborating on projects at a national scale.	Status FY2023	Cumulative 2028 Target
Amount of industry investment in projects and ecosystem initiatives (FY2023)	$102.5 million	$848 million
Total innovation investment in projects	$423.6 million	$1.3 billion
Percentage of projects and ecosystem initiatives that will deliver environmental, supply chain resilience, health and safety, productivity improvement, workforce training, EDI, and/or international business development benefits	71% Environment 80% Supply Chain 28% Health 74% Productivity	
Number of members and project partners by province	5,393 members	10,000
Number of multi-provincial projects approved	59	
Number of presentations to international audiences	32	
NGen participation in international trade shows and investment events	39	
Number of NGen members participating in international events	49	
Documented international recognition	World Manufacturing Forum	

A Driver of Growth Accelerate the scale up of SMEs by fostering collaboration and integration into emerging value chains, to drive international opportunities, expand market share, and grow revenues.	**Status FY2023**	**Cumulative 2028 Target**
Revenue generated per dollar of NGen investment	27X	35X
Federal taxes generated per dollar of NGen investment	2X	5X
New companies/joint ventures created	44	
Number and value of IP licenses granted	160	

A Creator of Networks Strengthen connections and collaborations among private, public, and academic organizations to drive impactful commercialization outcomes and develop domestic capacity.	**Status 2023**	**Cumulative 2028 Target**
Number of academic and research organizations partnering in projects and ecosystem initiatives	311	
Number and geographic scope of advanced manufacturing clusters supported by NGen	17 Clusters with 1,190 members 5 Tech Groups with 150 members	45 Clusters
Number of inter-cluster partnerships	6 involving 15 clusters	
Number of connections made in NGen collaboration events and activities	489	
Number and location of sources of co-investment and follow-on funding	12	
Number of NGen's ecosystem partnerships (backed by formal agreements)	11	50
Number and location of international cluster partnerships	3 (Germany, USA, S. Korea)	

A Catalyst for Skills Development Address skills gaps, acting as a magnet for global talent, collaboration, and skills and talent development, and fostering opportunities for equity-seeking groups to benefit from connections, to drive innovation and contribute to inclusive economic growth.	**Status FY2023**	**Cumulative 2028 Target**
Number of Indigenous students involved in manufacturing entrepreneurship and financial literacy courses	567	
Number of participants in NGen's Transformation Leadership Program	235	2,000
Number of participants in NGen IP & cybersecurity educational workshops	321	
Number of participants in strategic education workshops	690	
Number of participants in NGen Careers of the Future, talent attraction, or placement activities	67,394	510,239

A Sustainable & Best Practices Organization Make continuous improvements to our governance, operating processes, and service delivery, and achieving financial sustainability	**Status 2023**	**Cumulative 2028 Target**
Net promoter score for projects	76	
Net promoter score for ecosystem initiatives	68	
Amount of additional funding raised to support projects, ecosystem initiatives, and operating expenses	$231 million	$70 million
Female representation in NGen	53% Board 50% Exec Committee 55% NGen	50%
Representation of Visible Minorities in NGen	28% NGen	30%
Independent Board members	44%	> 33%
Compliance with legal and contractual obligations	100%	100%

Objectives for 2023-2024

NGen has set five priority objectives in our Corporate Plan for 2023-2024:

1. Facilitate the successful completion and commercialization of projects and conclude funding under Phase I of our Global Innovation Clusters (GIC) program.
2. Launch funding for Technology Leadership projects under Phase II of the GIC program, the Pan Canadian AI Strategy, and National Quantum Strategy, focusing specifically on: i) commercializing Artificial Intelligence solutions in manufacturing; ii) applications of Quantum technologies in manufacturing; iii) innovation challenges in the Electric Vehicle value chain; iv) scale-up and demonstration of de-carbonization and circular solutions in manufacturing; and v) other leading-edge advanced manufacturing solutions in fields like aerospace, electronics, advanced manufacturing systems, medical devices, biomanufacturing, robotics and customized automation.
3. Continue to support Ecosystem Development initiatives that promote Canada's advanced manufacturing capabilities across Canada and internationally, build connections and collaboration across Canada's advanced manufacturing sector, attract more young people into advanced manufacturing, develop a more highly skilled, equitable, diverse, and inclusive advanced manufacturing workforce, and help manufacturers manage business and technology transformation including their transformation to net-zero facilities.
4. Fulfil our obligations for delivery of our Future Ready and Metal and Engineered Plastics Additive Manufacturing Industrial Demonstration programs funded respectively by Employment and Social Development Canada (ESDC) and NRC-IRAP.
5. Secure additional funding to support transformative Technology Leadership projects, Ecosystem initiatives, and associated operating requirements.

NGen's Board of Directors has set the following performance targets for 2023-2024:

Strategic Priority	Targets for March 31st, 2024
Leadership	NPS of 70 among 75% of active project partners. NPS of 50 among 50% of program registrants.
Project Realization	100% of all projects approved under NGen's first Contribution Agreement worth $592 million have reached 100% completion by March 31, 2024, which means that $218 million of project funding will be disbursed. AI4M project funding worth $24 million fully allocated. $135 million in total new funding from PCAIS, NQS, and Phase II programs approved.
Capacity Building	100 use cases showcased on NGen's solution centre. 4,000 companies on collaboration platform. 300 companies registered in workforce and management development programs. 700 new employee placements. NGen supporting 20 companies enter international markets.
Finance & Compliance	$25 million raised from other revenue sources. 90% employee engagement rating. Financial statements signed off by external auditor. No compliance violations.
Impact	4 strategic roadmaps commissioned. 7,000 members. 24 clusters in advanced manufacturing cluster network. 1,000 companies in NGen events. 80 companies hosted at Hannover Messe. 50,000 students engaged in CareersoftheFuture.ca and Indigenous education programs.

Statements and Affirmations for the Year ending March 31st, 2023

Ecosystem Investments

NGen invested $14.6 million in industry-led Ecosystem Development projects, $6.0 million in SME capacity-building pilot projects and feasibility studies, $463.1 thousand in cluster building activities, and $889.7 thousand in Strategic Ecosystem Initiatives in 2022-2023. Our funding for open call advanced manufacturing projects contributed an estimated $7.3 million 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 four employees was in excess of $300,000 in 2022-2023.

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

NGen's IP Strategy has operated as intended and has supported the objectives as outlined in NGen's long-term strategy and Corporate Plan.

In 2022-2023, NGen updated our IP Strategy and our Master Project Agreements, in line with our amended Contribution Agreement for GIC Phase II funding, to require ultimate funding recipients to notify NGen in the event of a corporate change of ownership and allow NGen to terminate project funding if NGen deems that the overall benefits of the project no longer accrue within Canada.

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.

In 2022-2023, 18 projects closed in which all partners refused to enter any Foreground IP in NGen's IP Registry due to competitive concerns.

There have been no IP disputes arising among project partners that have been referred to dispute resolution.

Data Strategy

Our data strategy was reviewed and updated in March 2023. The objectives of the strategy, to protect and leverage data as a strategic asset, remain the same and we will continue to pursue them over the next five years. The updates reflect changes we are making in our IT infrastructure as well as in the terms of our privacy, terms of data use, and member data use policies to add further protections and bring them in line with our amended GIC Contribution Agreement.

Cybersecurity Protections

NGen test its cybersecurity maturity annually. NGen has demonstrated a high-medium level of cybersecurity maturity and a low-medium level of residual risk. This year, NGen scored overall 84% of required controls implemented, indicating a high-medium level of maturity. In addition to our audited cybersecurity systems, NGen undertakes regular staff training on cybersecurity threats and how to avoid them. As the cyber threats continue to evolve, NGen will make further investments in staff training, processes, and technologies to mitigate and reduce the risk of exposure, particularly in high-risk areas protecting our networks and data.

Evaluations and Audits

NGen conducts regular reviews of its financial controls and project performance. NGen's

financial statements for 2022-23 were subject to independent financial audit. The results of the audit are appended at the end of this report.

Statements of Funding

1. Funded Eligible Costs incurred and paid in the Fiscal Year amounted to $176,815,984.
2. Unfunded Eligible Costs incurred in the Fiscal Year amounted to $20,256,966.
3. Industry matching funds contributed in the Fiscal Year amounted to $102,525,245.
4. Total funding received from all sources to support NGen's eligible operating and administrative expenses during the Fiscal Year amounted to $8,954,333.

Funding Sources in 2022-2023

Funding Sources	GIC Phase I	PCAIS	Other (ESDC, NRC-IRAP)	Total
Contributions toward eligible project and O&A costs	$84,447,268	$365,773	$2,128,921	**$86,941,962**
Project Management Fees	$308,608		79,335	**$387,942**
Conference Fees & Sponsorships	$165,075			**$165,075**
Membership Fees	-	-	-	**-**
Other Govt Contribution	-	-	-	**-**
Interest Income	$581,281	$5,617	$48,992	**$635,890**
Other - In-Kind	$312,057			**$312,057**
Total	**$85,814,290**	**$371,390**	**$2,257,248**	**$88,442,927**

Industry Matching Funds in 2022-2023

Industry Matching Funds by Program	GIC	PCAIS	Other (ESDC, NRC-IRAP)	Total
Industry Contribution toward eligible project costs	$101,660,170	-	-	**$101,660,170**
Project Management Fees	$308,608	-	$79,335	**$387,942**
Membership Fees	-	-	-	**-**
Other Amounts and Fees (Conference, Sponsorships…)	$477,132	-	-	**$477,132**
Total	$102,445,910	-	$79,335	**$102,525,245**

Costs Incurred in 2022-2023

Nature of Cost	Operating and Administrative Costs (O&A)	Technology Leadership Project Cost	Ecosystem Development Project Costs	COVID-19 Projects (if applicable)	Total Cost
Funded Eligible Costs	$9,456,812	$129,419,539	$34,168,623	$3,771,010	$176,815,984
Unfunded Eligible Costs	-	$11,425,880	$8,476,461	$354,626	$20,256,966
Total	**$9,456,812**	**$140,845,419**	**$42,645,084**	**$4,125,636**	**$197,072,951**

Operating & Administrative Expenses

Type of Organization	Contributions Towards O&A Costs in 2022-2023	Contributions Toward O&A Costs to Date
Industry	$473,683	$10,967,662
ISED	$7,238,735	$32,098,182
Other Sources of Funding	$1,241,914	$2,147,368
Total	**$8,954,333**	**$45,213,212**

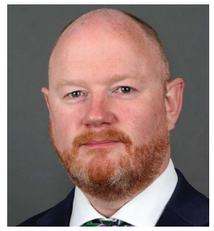
NGen's audited financial statements and auditors' report for 2022-2023 are appended below in Annex 3.

Annex 1: The People who Power NGen

NGen Team

Jayson Myers
Chief Executive Officer

Bilal Haffejee
Chief Financial Officer



John Laughlin
Chief Technology Officer

Stewart Cramer
Chief Manufacturing Officer

Wendy Young
VP, Data Systems & Security

Rob Mastrotto
VP, Projects

Jonathan Cutler
VP, IP & Contracts

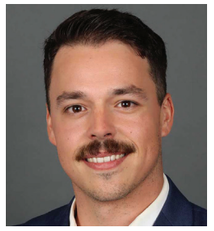
Stuart Kozlick
VP, Strategy

Shelley J. Aubry
HR Business Partner

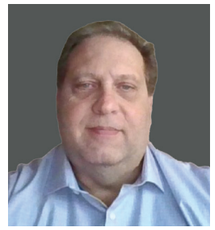
Carol Cutrone
Office Manager & EA

Christy Michalak
Director, Manufacturing Development Programs

Bridget Bohan
Director, Business Development



Robbie MacLeod
Director, Strategic Communications



Frank Defalco
Director, Member Engagement

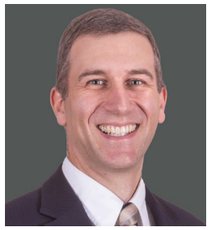
Gillian Sheldon
Director Investment Partnerships

Ken Morris
Director, Digital Development Programs

Arthur Kong
Director Project Development

Roshan Mohan
Director Project Development

Stephanie Holko
Director, Project Development



John F. Cigana
Director, Project Development (Quebec)

Jérôme Lafrenière
Director, Intellectual Property

Jeff Montag
Director, Project Finance

Deborah Brintnell
Financial Controller

Frank Haas
Senior Manager, Program

Ron Pope
Manager, Program

Stephen Pilkington
Manager, Project

Joanne MacKinnon
Senior Coordinator, Project

Mary Toth
Manager, Contracts & Paralegal

Mélanie Stevan
Manager, Contracts & Paralegal

Ashley Leung
Manager, Financial Claims & Business Process

Nelson Netzereab
Manager, Digital Marketing

Kim D'Souza
Manager, Client Engagement

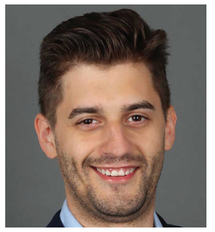
Nicole Mullings
Manager, Data

Arun Lavishetty
Manager, IT

Blake Helka
Manager, Project Development

Aakash Rao
Manager, Project Development

Tammy Smith
Admin, Program Engagement



Adam Balogh
Analyst, Cybersecurity Governance

Nicholas Pett
Analyst, Business Systems

Kimberly Quines
Coordinator, Marketing

Emily Blosdale
Senior Analyst, Financial

Liana Biktimirova
Analyst, Financial Claims

Parneet Kaur
Analyst, Service Desk

Missing: **Beatrice Respall**, Analyst, Financial Claims

Annex 1: The People who Power NGen

Board of Directors

Linda Hasenfratz
Board Chair
Executive Chair & CEO
Linamar Corporation

Jennifer Maki
Chair, Finance & Audit Committee
Corporate Director

Joris Myny
Chair, Human Resources & Nominating Committee
Senior VP, Digital Industries
Siemens Canada

Tom Ferns
Chair, Governance & Compliance Committee
General Counsel & Privacy Officer
Halton Heathcare

Mike Andrade
Director
CEO, Morgan Solar

Mike Baker
Director
CEO, Wood Manufacturing Cluster of Ontario

Rhonda Barnet
Director
CEO, Palette Skills

Chris Brown
Director
Vice President
GDLS Canada

Tony Chahine
Director
CEO, Myant

Lyne Dubois
Director
Corporate Director

Sandra Ketchen
Director
President & CEO
Spectrum Health

Carol McGlogan
Director
President & CEO
Electro-Federation Canada

Angela Mondou
Director
President & CEO
Technation

Angela Pappin
Director
Chief Transformation Officer
ArcelorMittal North America

Michel Toutant
Director
Senior Partner
Novacap

In memoriam:
Moira Harvey
Director
CEO, Ontario Aerospace Council

Andrea Johnston
Observer
Assistant Deputy Minister
ISED

Chris Padfield
Observer
VP, Policy, Partnerships & Communications
FedDev

Ben Rogers
College Observer
Dean of Innovation
Seneca College

Michael Worswick
University Observer
Professor, Faculty of Engineering University of Waterloo

Annex 2: NGen Projects

Phase I Projects Completed by March 31st, 2023

Project Lead	Short Title	Project Partners				Actual NGen Investment	Actual Total Investment
		Total	Industry	SMEs	Research		
Pilot Projects							
KSL Lubricants Inc.	Pilot scale of Nanogel Lubricants, or Superabsorbent (SAC) Lubrication for the automotive stamping industry	3	2	2	1	$76,304.24	$153,707.94
Sanctuary Cognitive Systems Corporation	AI-enabled robotic hand with human-level dexterity for assembly	3	3	3	0	$252,474.00	$517,357.56
Panevo Services Limited	Real Time Overall Equipment Effectiveness Monitoring & Optimization	2	2	2	0	$128,217.73	$256,435.46
CG Belle Industries Inc.	Advancing Ablation Processes for Automotive Applications	3	2	2	1	$29,618.50	$59,237.00
DeepSight Réalité Augmentée Inc.	Module for digitalizing work instructions to augmented reality	2	2	2	0	$126,203.58	$197,329.09
TopHat	Development of automated end-of-production-line testing of 100% electric sidewalk robots in simulated winter conditions	5	3	3	2	$178,208.64	$356,549.96
Hazelett CASTechnology ULC	Hazelett CASTechnology ULC-High Speed Temperature Measurement for Aluminum Strip for Processing Line	5	2	2	3	$197,465.48	$493,195.67
AutoMetrics Manufacturing Technologies Inc.	Automated inspection system for robotic welding operations	5	3	2	2	$181,287.49	$370,751.86
Synaptive Medical Inc.	Manufacturing Process for MRI Gradient Coil Production	3	2	1	1	$240,000.00	$848,414.59
Deep Cryogenics International Inc.	A Deep Cryogenic Treatment Tank for Industrial Applications	6	3	2	3	$215,867.63	$447,006.55
Macrodyne Technologies Inc.	Automated Slitter Table Technology with Weight Compensation	2	2	2	0	$106,944.86	$512,060.47
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	$249,981.50	$988,270.52
CarbiCrete Inc.	Data Acquisition and Visualization Platform for the Manufacturing of Carbon-Negative Concrete	3	2	2	1	$250,000.00	$512,503.18
AIXEL Inc.	AIXEL AIoT Quality Inspection Automation	4	3	2	1	$209,797.08	$420,482.06

Project Lead	Short Title	Project Partners				Actual NGen Investment	Actual Total Investment
		Total	Industry	SMEs	Research		
ACQBuilt Inc.	The Development of a Robotic Solution for Building Component Prefabrication	4	2	2	2	$244,677.24	$1,012,921.16
Luxmux Technology Corporation	Manufacturing Process for integrated super-broadband superluminescent diodes on silicon photonics	8	2	2	6	$195,110.14	$441,515.12
Cosm Medical Corp.	Advanced manufacturing for novel medical consumables used in proprietary pelvic diagnostic imaging system	5	1	2	4	$210,318.83	$420,637.66
Electrovaya Inc.	Solid State Lithium Batteries	6	2	2	4	$211,561.02	$423,122.04
Interaptix Inc.	Deployment of an Augmented Reality Remote In-Process Inspection Solution in Discrete Manufacturing.	2	2	2	0	$34,902.48	$77,490.96
Axolotl Biosciences	Scaling up the manufacturing process for BrainPrint Bioink	5	2	2	3	$105,866.66	$211,733.32
Weber Manufacturing Technologies Inc.	Production and recycling of nickel materials for EV batteries via carbonyl technology	3	2	2	1	$211,136.23	$429,772.46
Ora Graphene Audio	First Canadian Graphene Commercial Supply Chain	4	2	2	2	$160,155.43	$320,310.86
Pulsenics Inc.	Non-disruptive monitoring of electrochemical activity to advance the state-of-the-art in electrolytic ethanol production processes	3	2	2	1	$233,542.76	$472,224.41
NetProCore Inc.	Digital Twin of the Aluminum Strip Casting Process via Computational Materials Science and Big Data Analysis	6	3	3	3	$63,461.34	$128,986.86
Brilliant Matters Organic Electronics Inc.	Reliable Supply of New Generation Organic Semiconductors	5	2	2	3	$147,860.79	$295,721.58
MicroGreen Solar Corp.	Mid-scale Battery Storage system with proactive SOH maintenance feature	4	2	2	2	$55,934.27	$111,868.54
Enertics Inc.	Online monitoring, diagnostics and predictive analytics of critical assets in food & beverage use-case	6	2	2	4	$171,233.70	$342,467.40
Mediphage Bioceuticals Inc.	Development of bacterial frameworks for biomanufacturing of industrial and therapeutic products	4	2	2	2	$249,983.98	$535,604.31
Kepstrum Inc.	New and Innovative End-of-Line Tester	7	3	2	4	$161,538.80	$323,077.60
ZS2 Technologies Ltd.	Made in Canada Magnesium TechTiles- Pilot Plant	4	3	3	1	$214,172.13	$444,058.30
Guidebolt Inc.	Humanoid Telepresence Robots for More Safe, Efficient, and Consistent PCB Fabrication	4	2	2	2	$152,286.38	$368,433.82

Project Lead	Short Title	Project Partners				Actual NGen Investment	Actual Total Investment
		Total	Industry	SMEs	Research		
Dispersa Inc.	Biosurfactant Scale Up	4	2	2	2	$189,858.85	$379,717.70
Evercloak Inc.	Advancing large-scale graphene and thin-film membrane manufacturing	4	2	2	2	$199,882.11	$503,057.86
Molded Precision Components	Development and Testing of Cube Molding Methodology	3	2	2	1	$239,213.00	$503,630.87
Addem Labs Inc.	New PCB Manufacturing Process	3	2	2	1	$249,912.01	$521,149.40
Nano Cnet LTD.	Roll to Roll Continuous Printing of Transparent Conductors and Heaters	4	2	2	2	$165,027.08	$347,544.08
Feasibility Studies							
AiimSense Inc.	Technology Feasibility Demonstration for Stroke Diagnosis	5	2	2	3	$54,341.37	$140,624.87
Quali Artificial Intelligence Inc.	AI powered Visual Quality Inspection	4	4	4	0	$91,468.25	$183,444.96
Kepstrum Inc.	Feasibility of a New and Innovative Production End-of-Line Tester	3	2	1	3	$96,467.85	$276,105.70
Apex Industries Product Development & Automation Group Inc.	Transformation of the Stone Veneer Panel Manufacturing and Installation Process	2	2	2	0	$99,432.84	$208,250.30
Exergy Solutions Inc.	Asphaltene Carbon Fiber Feasibility Study	4	3	2	1	$81,835.00	$173,706.76
Advanced BioCarbon 3D Ltd.	Bio-refinery Engineering Study	3	2	2	1	$100,000.00	$228,600.68
Datec Coating Corporation	Novel Clean Tech. Manufacturing Process for the Catalytic Production of a Green Disinfectant for Water Treatment	5	2	2	3	$82,051.50	$173,421.68
Geomega Resources Inc. (Innord)	Production of aluminum, iron and rare earths from bauxite residues	2	2	1	0	$80,708.00	$261,997.28
3DBioFibR Inc.	3D BioFibR Advanced Biofiber Manufacturing	2	2	2	1	$74,293.50	$154,008.42
USP Technologies	Development of a new manufacturing process for the recovery of value-added products from wastewater using advanced vacuum technologies	5	4	1	1	$80,621.05	$194,813.70
Quali Artificial Intelligence Inc.	Low latency tele-robotics for manufacturing pick and place	2	2	2	0	$100,000.00	$203,626.74
Cast Analytics Inc.	Development and Industrial Demonstration of Metal Casting Digital Twin with Integrated AI-Driven Optimization	5	3	3	2	$96,213.00	$215,480.95
Pulsenics Inc.	Real-time Condition Monitoring of Component Degradation for an Electrooxidation Water Treatment Process	2	2	2	0	$99,958.91	$200,677.31

Project Lead	Short Title	Project Partners				Actual NGen Investment	Actual Total Investment
		Total	Industry	SMEs	Research		
Smart Skin Technologies	Weston Predictive Maintenance Pilot	2	2	1	0	$83,900.00	$227,378.48
USP Technologies Canada ULC	Towards a Canadian Circular Economy: Novel Manufacturing Processes for Iron-based Coagulants from Metal Wastes for Environmental Applications	4	3	1	1	$80,524.77	$161,049.54
Enersion Inc.	Feasibility Study of Manufacturing of Enersion's Tri-Generation	3	2	2	1	$68,254.64	$208,766.06
Distributive	Distributive Computing	2	2	2	0	$100,000.00	$219,045.09
Cluster Building							
Wood Manufacturing Cluster of Ontario	Digital Transformation and Business Development	4	1	1	3	$66,851.42	$133,702.84
Saskatchewan Industrial and Mining Suppliers Association (SIMSA)	Digital Transformation and Business Development	1	1	1	0	$71,100.15	$142,200.30
NanoCanada	Digital Transformation and Business Development	8	2	2	6	$67,191.36	$121,425.58
Central Alberta: Access Prosperity	Digital Transformation and Business Development	2	1	1	1	$75,000.00	$96,691.00
Ontario Aerospace Council (OAC)	Digital Transformation and Business Development	1	1	1	0	$74,993.32	$149,986.64
Verschuren Centre Inc.	Digital Transformation and Business Development	7	1	1	6	$74,992.50	$150,000.00
Verschuren Centre Inc.	Digital Transformation and Business Development	8	1	1	7	$73,345.48	$146,690.96
Canadian Photonic Industry Consortium	Digital Transformation and Business Development	1	1	1	0	$24,722.50	$53,738.00
Canadian Association of Moldmakers, Inc	Digital Transformation and Business Development	3	1	1	2	$75,000.00	$165,590.42
Canadian Advanced Air Mobility	Digital Transformation and Business Development	1	1	1	0	$71,850.95	$143,701.90
InnoTech Alberta	Digital Transformation and Business Development	6	1	1	5	$74,987.50	$152,453.44
Canadian Association of PPE Manufacturers	Digital Transformation and Business Development	5	1	1	4	$42,737.70	$85,475.40
Reseau Trans-AI Inc.	Digital Transformation and Business Development	4	1	1	3	$13,826.00	$27,652.00
Destination AI	Digital Transformation and Business Development	3	1	1	2	$14,034.65	$28,069.30

Project Lead	Short Title	Project Partners				Actual NGen Investment	Actual Total Investment
		Total	Industry	SMEs	Research		
Alliance of Manufacturers & Exporters Canada (NL Division)	Digital Transformation and Business Development	3	1	1	2	$17,531.95	$35,063.90
Indigenous Manufacturing & Contracting Network [IMCN]	Digital Transformation and Business Development	2	1	1	1	$31,059.13	$62,118.26
COVID-19 & Disinfecting Robot Challenge							
Sona Nanotech Inc.	Rapid Response Point-of-Care COVID-19 Virus Screening	5	1	1	4	$3,896,295.31	$3,896,295.31
Mosaic Manufacturing Ltd.	45K COVId Shields	4	4	4	0	$425,147.15	$428,952.06
Response Biomedical Corp.	Pandemic preparedness COVID-19 test development & manufacturing scale-up	1	1	1	0	$2,740,298.00	$2,900,397.57
BOMImed Inc.	Ventilator Filters for COVID-19 Patients in Canada	3	3	3	0	$925,603.67	$978,365.26
Molded Precision Components	Shield-U	3	2	2	1	$4,930,576.13	$4,932,740.91
Precision Biomonitoring Inc.	Canadian Manufacture of Lyophilized SARS-CoV-2 RNA detection kits	2	2	2	0	$4,551,388.45	$4,721,762.13
DMF Medical Incorporated	Regulatory and Manufacturing Fast Track of memsorb™ - supporting the modification of anesthesia machines into ICU ventilators to deal with COVID-19	1	1	1	1	$276,007.50	$632,084.40
Cloud Diagnostics Canada ULC	Cloud DX Pulsewave 2.0 Solution to COVID Hallway Medicine Crisis	1	1	1	1	$1,756,325.00	$3,530,659.70
Canadian Emergency Ventilators Inc.	Winnipeg Ventilator	1	1	1	0	$5,000,000.00	$6,918,289.21
ENVISION SQ INC.	Scaling-up Production of Next-Generation Self-Sterilization Coating	2	1	1	2	$1,500,478.01	$1,738,492.76
Burloak Technologies Inc.	3D Printed Protective Fasemasks	1	1	0	0	$1,137,856.77	$1,305,840.32
Eclipse Automation Inc.	N95 Respirator Automation Project	1	1	1	0	$2,106,775.00	$2,989,879.46
Myant Inc.	Myant 2020	1	1	1	0	$2,489,771.00	$5,062,942.52
GlobalDWS Corporation	GlobalDWS Disinfection Service Robot Solution	1	1	1	0	$718,220.32	$1,493,656.56
IPC Technologies/ Prescientx	Autonomous Mobile UV-Light Emitting Robotic Vehicle for Sanitizing Workplaces Against COVID-19	2	2	2	0	$687,444.54	$1,410,896.53
A&K Robotics	DISINFECTION ROBOT – Amrud (Autonomous mobile robotic UV disinfector)	2	2	2	0	$608,583.18	$1,217,166.36

Project Lead	Short Title	Project Partners				Actual NGen Investment	Actual Total Investment
		Total	Industry	SMEs	Research		
Advanced Intelligent Systems Inc.	DISINFECTION ROBOT	1	1	1	0	$944,600.29	$1,889,200.58
Exacad Fabrication de moules inc.	Fast manufacturing of plastic injection molds for COVID-19 diagnostic and treatment	1	1	1	0	$1,831,373.00	$1,965,950.47
LuminUltra Technologies Ltd.	LuminUltra COVID19 RNA Test Kit	1	1	1	0	$2,858,729.19	$4,610,853.52
Immunovaccine Technologies Inc.	DPX-COVID-19: Manufacturing and scale up of neutralizing-epitope based synthetic vaccine	3	1	1	2	$2,054,168.68	$4,108,337.36
CrossWing Inc.	DISINFECTION ROBOT - CrossWing Cleanbot UV	1	1	1	0	$1,599,905.00	$3,474,323.60
Made Smarter Challenge							
Fidelity Machine and Mould Solutions	Automation of Procedure Mask Machines	4	3	3	1	$890,902.70	$2,006,537.67
Carmina de Young Fashion Design Inc.	Lifecycle PPE	5	3	3	2	$1,994,409.00	$4,075,041.60
The BIG-nano Corporation	Nanofiber Meltblown production using proprietary Canadian technology for PPE and Air Purification Filters	6	5	5	1	$1,763,740.00	$3,592,351.27
IPC Technologies/ Prescientx	Canadian N100 SuperMask - Breathing Is Believing	5	2	2	3	$1,322,704.01	$3,066,384.07
Novo Textile Company Ltd.	Automated Original Equipment Fabrication for N95 Mask Production	2	2	2	0	$770,387.55	$1,946,356.46
Titan Clean Energy Projects Corporation	Biodegradable melt-blown resin and fabric production	5	5	4	4	$898,140.00	$1,929,655.58
Fine Cotton Factory Inc.	Advanced Manufacturing Scale-up for Metal-Infused Antimicrobial Textiles	6	2	2	4	$1,390,851.99	$3,142,719.51
McRae Imaging Inc.	Antimicrobial Shielding of Shared Spaces with Nanomaterial Coatings	4	3	3	1	$1,743,058.77	$3,976,659.65
International Point of Care Inc.	ADVANCED MANUFACTURING EXPANSION FOR LARGE-SCALE COVID-19 REAGENTS AND TEST KITS	4	4	3	0	$2,083,723.07	$5,771,241.13
Molded Precision Components	Automated Sanitizer Advanced Manufacturing System - Pellet to Pallet.	5	2	2	3	$4,772,292.85	$9,648,997.16
Armfoam Inc.	Automated production of N95 Respirators	2	2	2	0	$2,441,034.03	$5,677,433.07
Providence Therapeutics Holdings Inc.	A Made-In Canada COVID-19 mRNA Vaccine	2	2	2	0	$5,050,000.01	$10,930,020.66

Project Lead	Short Title	Project Partners				Actual NGen Investment	Actual Total Investment
		Total	Industry	SMEs	Research		
Automotive Zero-Emission Manufacturing Challenge							
Cnem Corporation	Green Recycling of EV Battery Black Mass	5	3	3	2	$143,349.91	$317,957.82
Calogy Solutions	T-Man	6	2	2	4	$787,029.56	$1,574,742.52
Damon Motors Inc.	AI-Assisted Smart-Optic Manufacturing of Modular EV systems	5	3	3	2	$2,180,266.05	$4,360,532.10
Rayleigh Solar Tech Inc.	Development of scalable manufacturing processes for solar film integrated body panels	7	2	1	5	$220,700.47	$522,614.27
Open Call Advanced Manufacturing Projects							
Formula Solutions Inc.	Integrating automation for scale up of carbon fibre cascade production	6	3	3	3	$3,241,409.23	$10,050,419.98
Ranovus Inc.	Process development for Electro-Photonics Integrated Circuit (EPIC) Manufacturing	7	2	1	5	$3,108,052.31	$7,000,117.91
Axiom Plastics Inc.	Zero Transition	8	4	4	4	$623,278.36	$1,405,630.10
Clearpath Robotics Inc.	OMEGA - A Canadian Built, Autonomous, Intelligent Mobile Forklift for Advanced Manufacturing	3	2	1	1	$657,169.00	$2,613,911.34
Baxter Corporation	Optimizing Medical Device Remanufacturing Process	3	3	2	0	$526,672.10	$1,222,737.37
Mycionics Inc.	Mycionics robotic mushroom harvester	4	3	3	1	$1,460,418.38	$4,414,411.42
Panevo Services Limited	Real Time Asset Monitoring, Optimization & Food Processing Supply Chain Collaboration	5	3	2	2	$1,383,422.04	$4,509,483.67
MacDonald, Dettwiler and Associates (MDA) Corporation	Advanced manufacturing for highly adaptive manufacturing environments	7	3	2	4	$4,724,885.27	$10,722,824.03
Myant Inc.	New Advanced Manufacturing Production Environment for Smart Textiles as Medical Devices	9	4	4	5	$5,341,479.54	$12,414,451.44
Apera AI Inc.	3D Vision Guided Robotic Assembly	6	2	1	4	$508,264.82	$1,230,920.57
Macrodyne Technologies Inc.	Bioplastic as an alternative to single-use plastics	5	4	4	1	$3,010,359.40	$6,948,075.17
Evercloak Inc.	Scaling up graphene-based membrane manufacturing and sustainable manufacturing of net-zero energy cleanrooms	8	2	2	6	$1,459,683.05	$3,425,898.45
Stronach Centre for Innovation, a division of Magna International Inc.	Autonomous Adaptable Robot System	5	2	1	3	$1,290,749.49	$3,074,534.47

Project Lead	Short Title	Project Partners				Actual NGen Investment	Actual Total Investment
		Total	Industry	SMEs	Research		
Universal Matter Inc.	Large Scale Industrialization of the “Flash Joule Heating” Graphene Manufacturing Process	5	3	2	2	$1,938,343.13	$4,365,637.68
Imperial Mining Group	A Vertically Integrated Canadian Ecosystem for the Production of Novel Scandium Aluminum Alloys for 3-D Printing	4	2	2	2	$572,257.58	$1,580,976.25
ReDeTec Inc.	MixFlow Advanced AI Plastics Processing and Recycling	5	2	2	3	$336,142.28	$757,077.17
CrossWing Inc.	Quality Control and Predictive Maintenance with AI/ML	3	2	2	1	$1,257,994.08	$3,283,197.58
McGuire Aero Propulsion Solutions Inc.	Micro-Power-Plant Advanced Manufacturing Demonstrator	3	2	2	1	$456,653.55	$1,069,924.63
Reaction Dynamics Lab Inc.	Development of large-scale additive manufacturing capabilities for next-generation, eco-friendly hybrid rocket engines	4	2	2	2	$1,088,897.63	$2,452,472.21
Intelligent City Inc.	Robotic Mass Timber CNC Processing Center	2	2	2	0	$814,063.75	$1,905,626.44
ThinkData Works Inc.	Driving Advanced Manufacturing Practices Through Supply Chain Resiliency Analytics	5	3	1	2	$3,330,000.01	$8,070,384.73
IVEXSOL Canada Inc.	Commercialization of a next generation, advanced lentiviral vector manufacturing platform	3	3	2	0	$285,253.91	$797,024.57
Orthopaedic Innovation Centre Ltd.	Development and Validation of Automated Patient Specific Medical Device Software for Improved Additive Manufacturability	9	5	5	4	$2,068,519.21	$4,658,827.77
Conrex Steel Ltd.	Advancing Large Steel Press Technology	5	3	3	2	$3,437,922.59	$7,904,247.66

Phase I Projects Underway as of March 31st, 2023

Project Lead	Short Title	Project Partners				NGen Investment	Total Investment
		Total	Industry	SMEs	Research		
Pilot Projects							
e-Zn Inc	Air Cathode Pilot Production Line	3	2	2	1	$250,000.00	$500,000.00
Advanced BioCarbon 3D Ltd.	Pilot Scale Bio refinery - Replacing petrochemical plastics with 100% bio based materials that perform as well	4	3	2	1	$249,981.00	$504,462.00
Graphite Innovation and Technologies Inc. (GIT)	Innovative Process to Produce Marine Coatings	3	2	2	1	$249,416.00	$498,832.00
Daxsonics Ultrasound Inc.	Automated Manufacturing for Ultrasound Transducers used in Sterile Surgery	3	2	2	1	$246,290.00	$492,580.00
MEA Health Corporation	Advanced recycling technologies for single-use PPE	3	2	2	1	$248,689.50	$497,379.00
AEM Power Systems Inc.	Development of Gas Oscillation System for Superplastic Forming Process	4	3	3	1	$249,535.00	$499,070.00
Cosm Medical Corp.	3D Printing and Semi-Automation of Advanced Manufacturing Processes for Patient-Specific Pessaries	8	2	2	6	$269,917.50	$539,835.00
Feasibility Studies							
Lantern Machinery Analytics Inc.	Characterization of the Dimensionality of Two-Dimensional Nanomaterials	5	2	2	3	$99,975.00	$199,950.00
Cluster Building							
Canadian Additive Network (CAN) - Reseau Canadien de Fabrication Additivw	Digital Transformation and Business Development	4	1	1	3	$75,000	$180,000
Automotive Zero-Emission Manufacturing Challenge							
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	$428,838.00	$977,676.00
Linamar	Compact Inverter Manufacturing Development	3	2	1	1	$3,477,100.00	$7,024,200.00
Ballard Power Systems Inc.	Next Generation Grafoil Plate Forming Pilot Line	3	3	1	0	$3,180,735.00	$6,361,470.00
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	2	$3,999,252.00	$7,998,504.00
Hydrogenics Corporation	Establish CoE for HVM of HFCs for HDCV to realize Canada’s GHG & Net-Zero emissions target by 2030 & 2050	8	4	4	4	$3,666,868.00	$7,784,986.00

Project Lead	Short Title	Project Partners				NGen Investment	Total Investment
		Total	Industry	SMEs	Research		
Electrovaya Inc.	Next Generation NMP-free Cell Manufacturing	4	3	3	1	$932,900.50	$1,865,801.00
Ventra Group Co.	Advanced Manufacturing Methods for Electric Vehicle Propulsion Batteries	8	2	1	6	$3,600,047.50	$7,200,095.00
Li-Metal Corp.	Recycling of Solid-State Lithium metal Batteries for EV Powertrains	2	2	1	0	$2,385,228.00	$5,060,456.00
Electrovaya Inc.	Automated Module Assembly with Advanced Laser Welding and In-line QC Methods	3	2	2	1	$1,214,541.50	$2,478,983.00
Summit Nanotech Corporation	Manufacturing denaLi C Green Lithium Extraction Modules	3	2	2	1	$3,967,804.00	$7,935,608.00
Open Call Advanced Manufacturing Projects							
Mosaic Manufacturing Ltd.	Array Additive Manufacturing Production System (ARRAY)	5	5	5	0	$3,550,546.79	$7,996,727.00
Aspire Food Group Canada Ltd.	Novel Application of Advanced Manufacturing Approaches to High Quality Protein	11	5	4	6	$16,800,000.17	$118,123,887.84
Marwood International Inc.	TaComp: Global First Advanced Process for Lightweight Part Manufacturing	5	3	1	2	$2,084,026.78	$4,843,754.00
Polyalgorithm Machine Learning Inc.	Zero Downtime, Zero Defects and Output Optimization	2	2	1	0	$858,258.22	$1,933,014.00
OmniaBio Inc.	Global Leadership in Life Sciences by Enabling Commercial Scale Manufacture of Cell & Gene Therapies.	14	5	5	9	$10,543,346.10	$23,746,276.00
Linamar Corporation	Automated Manufacturing Development Cell	9	3	2	6	$1,484,009.62	$3,342,364.00
Linamar Corporation	Automated Defect Inspection	9	3	1	6	$1,282,684.66	$2,888,929.42
Polar Sapphire Ltd.	Advanced Systems for High Purity Alumina (HPA) Production	7	3	3	4	$2,222,739.92	$5,014,012.00
Genecis Bioindustries Inc.	Transforming Food Waste Anaerobic Digester into a Bioplastic Manufacturing Hub	5	2	2	3	$2,676,543.00	$6,028,250.00
Mosaic Manufacturing Ltd.	Vector Mass Production Metal 3D Printing System	5	3	3	2	$3,551,956.49	$7,999,902.00
Novonix battery testing services Inc.	Cathode Material Development and Pilot Manufacturing Line	3	2	2	1	$1,674,999.99	$17,749,986.00
CarbiCrete Inc.	Industrial Implementation of CarbiCrete's Carbon-Negative Concrete Manufacturing Process at Patio Drummond	4	3	3	1	$3,436,560.00	$7,740,000.00

Project Lead	Short Title	Project Partners				NGen Investment	Total Investment
		Total	Industry	SMEs	Research		
Ventra Group Co.	Flex-Ion Advanced Battery Innovation Center - Advanced Manufacturing Research - Project Tau	7	2	1	5	$3,551,849.04	$9,699,660.00
Verschuren Centre (Beth Mason)	National Bio-Manufacturing Ecosystem	2	2	2	0	$2,409,699.86	$8,427,250.00
ArcelorMittal Dofasco	Digital Transformation of Secondary Metallurgy Facility at ArcelorMittal Dofasco	7	4	2	3	$5,235,761.88	$12,126,960.40
Exergy Solutions Inc.	Advanced manufacturing applications in mining and mineral processing-TA0027	11	3	2	8	$3,539,843.73	$7,972,622.00

PCAIS Projects Approved but not yet Announced as of March 31st, 2023

Type of Project	# of Projects	Project Partners				NGen Investment	Total Investment
		Total	Industry	SMEs	Research		
AI Applications in Manufacturing	6	15	15	11	0	$9,893,537	$51,470,700

Annex 3: Audited Financial Statements for 2022-2023

Financial Statements of

NEXT GENERATION MANUFACTURING CANADA

And Independent Auditor's Report thereon

Year ended March 31, 2023

KPMG

KPMG LLP
Commerce Place
21 King Street West, Suite 700
Hamilton ON L8P 4W7
Canada
Tel 905-523-8200
Fax 905-523-2222

INDEPENDENT AUDITOR'S 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, 2023
- 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, 2023 and its results of operations, its changes in net assets 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 ***"Auditor's Responsibilities for the Audit of the Financial Statements"*** section of our auditor's 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.

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.

Auditor's 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 auditor's 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.

- 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 auditor's 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 auditor's 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.

KPMG LLP

Chartered Professional Accountants, Licensed Public Accountants

Hamilton, Canada

July 27, 2023

NEXT GENERATION MANUFACTURING

Statement of Financial Position

March 31, 2023 with comparative information for 2022

(In thousands of dollars)	2023	2022
Assets		
Current assets:		
Cash	$ 23,866	$ 32,428
Accounts receivable	55	463
HST receivable	250	–
Project/program advances	302	8,325
Prepaid expenses	529	448
	25,002	41,664
Capital assets (note 3)	29	34
Intangible assets (note 4)	–	922
	$ 25,031	$ 42,620
Liabilities and Net Assets		
Current liabilities:		
Accounts payable and accrued liabilities (note 6)	$ 1,303	$ 3,199
HST payable	–	163
Project/program holdbacks	4,383	3,147
Unearned revenue	184	314
Deferred contributions (note 7)	15,766	29,425
	21,636	36,248
Deferred capital contributions (note 8)	–	773
	21,636	37,021
Net assets	3,395	5,599
COVID-19 (note 13)		
	$ 25,031	$ 42,620

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, 2023 with comparative information for 2022

(In thousands of dollars)	2023	2022
Revenues:		
Federal contributions	$ 83,179	$ 67,548
Administration fees	309	5,129
Industry in-kind contributions	313	410
Industry sponsorships	244	105
Interest income	635	170
	84,680	73,362
Expenses:		
Project and program expenditures	73,019	56,069
Salaries and benefits	6,781	5,484
Advanced manufacturing ecosystem initiatives (note 9)	692	5,793
Outsourced services (note 10)	3,871	1,764
Administration and governance	1,279	572
Communications and events	280	210
Amortization of capital assets	962	977
	86,884	70,869
Excess (deficiency) of revenues over expenses	(2,204)	2,493
Net assets beginning of year	5,599	3,106
Net assets end of year	$ 3,395	$ 5,599

See accompanying notes to financial statements.

NEXT GENERATION MANUFACTURING

Statement of Cash Flows

Year ended March 31, 2023 with comparative information for 2022

(In thousands of dollars)	2023	2022
Cash provided by (used in):		
Operations:		
Excess (deficiency) of revenues over expenses	$ (2,204)	$ 2,493
Items not involving cash:		
Amortization of capital assets	962	977
Intangible asset contributed in-kind	(497)	(497)
Deferred capital contributions from in-kind	497	497
Changes in non-cash operating working capital:		
Decrease (increase) in accounts receivable	408	(365)
Increase in HST receivable	(413)	–
Increase in HST payable	–	815
Decrease in project/program advances	8,023	6,943
Decrease (increase) in prepaid expenses	(81)	4,971
Increase (decrease) in accounts payable and accrued liabilities	(1,896)	1,888
Increase in project/program holdbacks	1,236	1,973
(Decrease) increase in unearned revenue	(130)	274
Decrease in deferred contributions	(13,659)	(2,177)
	(7,754)	17,792
Investing:		
Purchase of capital assets	(35)	(33)
Deferred capital contributions	(773)	(922)
	(808)	(955)
(Decrease) Increase in cash	(8,562)	16,837
Cash, beginning of year	32,428	15,591
Cash, end of year	$ 23,866	$ 32,428

See accompanying notes to financial statements.

NEXT GENERATION MANUFACTURING CANADA

Notes to Financial Statements (continued)

Year ended March 31, 2023
(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.

Contribution Agreements with the Federal Government by Department:

a) Innovation, Science and Economic Development (“ISED”), represented by the Minister of Innovation, Science and Industry (“Minister”)

I. To support building up next-generation manufacturing capabilities, and promoting collaboration in areas such as advanced robotics research and innovation by strengthening linkages between researchers in industry, academia, and research institutes in Canada and abroad, and providing financial support for the scaling and adoption of 4.0 technologies, effective November 9, 2018, 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, ending March 31, 2023. 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.

II. With effect March 23, 2023, ISED, has agreed to amend the original contribution agreement (in I.) to, among other things, increase the amount of the non-repayable contribution by a further $145,708 of which $19,930 is to be used towards eligible operating expenses and $125,778 is to be used towards 100% of eligible project costs. The total is not to exceed the lesser of $145,708 or 100% of total Industry Matching Funds obtained by the organization over the five-year period, ending March 31, 2028.

The Minister may provide a further optional contribution of $31,445 towards eligible project costs provided that NGen has met certain conditions to the Minister’s satisfaction.

III. To support the commercialization of artificial intelligence as part of the broader investment in the Pan-Canadian Artificial Intelligence Strategy (PCAIS), effective September 13, 2022, ISED will provide a non-repayable contribution to NGen for 75% of eligible operating expenses that do not exceed 10% of the total contribution, and 100% of eligible project costs. The total is not to exceed the lesser of $30,000 or 100% of total Industry Matching Funds obtained by the organization over the four-year period, ending March 31, 2026.

1. Corporate information (continued):

IV. Effective January 13, 2023, NGen has been conditionally approved for up to $7,000 to support building the groundwork for a National Quantum Strategy (NQS) by flowing funding to existing programs that will help advance Canada's talent base, research activities, and commercialization efforts related to quantum technology, over the four-year period, ending March 31, 2026.

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 program term with the written approval from the Minister of ISED.

b) Employment and Social Development Canada ("ESDC"), represented by the Minister of Employment, Workforce Development and Disability Inclusion ("Minister")

To support companies in onboarding new and diverse workers to Canadian manufacturing and in upskilling the existing workforce by developing and validating tools for skills assessment and development and providing hiring and training supports, effective November 21, 2022, ESDC will provide a non-repayable contribution in the amount of $15,854 towards eligible expenditures over the two-year period, ending March 31, 2024.

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"), grant revenue from ESDC and administration fees, sponsorships and other revenue 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.

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 bank accounts which earn 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.

(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.

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 up to 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.

(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, 2023
(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. Capital assets:

	Cost	Accumulated amortization	2023 Net book value	2022 Net book value
Computers	$ 135	$ 110	$ 25	$ 26
Furniture and fixtures	24	20	4	8
	$ 159	$ 130	$ 29	$ 34

Cost and accumulated amortization at March 31, 2022 amounted to $125 and $91 respectively. During the year, NGen disposed of fully amortized assets with cost and accumulated amortization of $Nil.

4. Intangible assets:

	Cost	Accumulated amortization	2023 Net book value	2022 Net book value
Project pipeline and claims portal	$ 597	$ 597	$ –	$ 199
Collaboration platform	1,447	1,447	–	723
	$ 2,044	$ 2,044	$ –	$ 922

Cost and accumulated amortization at March 31, 2022 amounted to $2,044 and $1,122 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. The project pipeline is being phased out and will be decommissioned on or before December 31, 2023. The claims portal was purchased on April 1, 2023 for a total cost of $200.

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 and was decommissioned on May 30, 2023.

5. 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 (2022 - $nil). In addition, NGen has credit facilities in the form of corporate credit cards which total $150 (2022 - $100) of which $79 (2022 - $8) was utilized and included in accounts payable and accrued liabilities.

6. 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.

7. Deferred contributions:

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

	2023	2022
Balance, beginning of year	$ 29,425	$ 31,602
Funding received	68,994	64,696
Amount recognized as revenue	(82,653)	(66,873)
Balance, end of year	$ 15,766	$ 29,425

Total revenues include amortization of deferred capital contributions of $nil (2022 - $675) referenced in Note 8.

Included in deferred contributions is $nil (2022 - $448) 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.

8. 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:

	2023	2022
Balance, beginning of year	$ 773	$ 1,199
Amount recognized as revenue	(526)	(675)
In-kind contribution on Collaboration Platform	–	497
Amount recognized as in-kind revenue	(247)	(248)
Balance, end of year	$ –	$ 773

9. 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.

10. Outsourced services:

Outsourced services include payments for technology costs, independent expert assessors for project reviews, contractor payments for the monitoring of projects and service provider costs related to the onboarding and upskilling of the Canadian workforce under the ESDC program.

11. 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, 2023, commitments for funding by stream are as follows:

	Total committed funding	Estimated remaining commitment	Total estimated funding
Projects	$ 134,053	$ –	$ 134,053
COVID-19 projects	72,513	–	72,513
Capacity building programs	11,465	–	11,465
PCAIS	3,372	24,378	27,750
	$ 221,403	$ 24,378	$ 245,781

12. 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, 2023:

(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 5, the organization also has access to an operating line of credit. There has been no change to the risk exposures from 2022.

(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 13. If requested by companies, NGen will provide advances to cover eligible project and program expenditures to assist companies with cash flow.

13. 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 2023, 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 spent $72,513 of the total contribution of $229,765 for the purpose of funding COVID-19 related projects. In the year ended March 31, 2023, NGen has recognized $1,401 (2022 - $19,326) in revenue related to COVID-19 projects from the total contribution and has fulfilled its committed funding.

14. Subsequent event:

With effect June 23, 2023, the Contribution Agreement for the National Quantum Strategy outlined in 1.a) IV was executed.