FABrIC

Semiconductor Fabrication Process Challenge - Round 1 Guide

Propulsé par CMC Microsystèmes
Powered by CMC Microsystems

Financé par le gouvernement du Canada
Funded by the Government of Canada

FABrIC

fabricinnovation.ca

FABrIC is a five-year, $223M project to secure Canada's future in semiconductors. FABrIC will lower barriers faced by Canadian companies to develop semiconductor manufacturing processes, to create semiconductor Internet-connected products and services (IoT), and to export into a global market.

FABrIC will build the national ecosystem and foster collaboration between industry, not-for-profits, academics, and government and leverage Canada's technological reputation, strengths, and existing assets.

Powered by CMC Microsystems

In its 40-year history, CMC Microsystems has been at the forefront of technological change, managing federal and provincial government investments to introduce advanced technology, to support research, and to impact Canada's industrial high-tech landscape.

Acknowledgements

FABrIC is an Innovation, Science and Economic Development Canada (ISED) Strategic Innovation Fund (SIF) investment.

Canada

Thank you to FABrIC founding partners Applied Nanotools (ANT), 1Qbit (1QB Information Technologies), C2MI – Centre de Collaboration MiQro Innovation, INO – Institut National d'Optique, Teldio, Teledyne MEMS, TELUS Communications, Xanadu Quantum Technologies, McMaster University, University of British Columbia, Université de Sherbrooke, University of Toronto, and University of Waterloo.

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1. Introduction

FABrIC is a five-year, $220M project to help secure Canada's future in semiconductors.

Semiconductors power digital economies and are enablers of economic growth: In 2022 the semiconductor industry was valued above $500B and is expected to reach one trillion dollars by 2030. However there have been significant changes in the global semiconductor landscape in the past few years driven by the disruption of supply through the pandemic and recent geopolitical shifts. Governments around the world have committed unprecedented investments to bolster their semiconductor industries, to onshore manufacturing and stimulate research and product development in strategic technologies. Canada also has an opportunity to bolster our position in the global semiconductor market and to benefit from the growth in this sector.

To compete, we believe that we must invest in strategic areas to accelerate the development and commercialization of technologies and products where Canada already has significant capability and global recognition.

Call to Industry and Academics in Canada

The FABrIC Semiconductor Fabrication Process Challenges are calls for industry and academics to develop new or enhance existing processes for the fabrication of prototypes and low to medium volume production of products in Canada. Aligned with our strategic objectives, challenges are intended to:

- ✔ **DEVELOP** widely accessible semiconductor fabrication capacity and capability in Canada in four key technology areas, including related advanced packaging and test technologies:
  - photonics
  - microelectromechanical systems (MEMS)
  - compound semiconductors
  - quantum/superconducting technologies
- ✔ **STRENGTHEN** and deepen Canada's supply chain for the design, prototyping, fabrication, assembly, and test of new advanced sensors and other made-in-Canada semiconductor products addressing the rapidly growing Internet of Things (IoT) market.
- ✔ **ENHANCE** national security and resiliency in the supply of critical semiconductor products and technologies by creating enhanced supply chains with trusted Canadian partners and a larger pool of highly trained specialists in semiconductor product design and fabrication technologies.

Funding Opportunities

FABrIC will provide funding to reimburse up to 50% of eligible project expenses for projects led by small and medium-sized enterprises (SMEs) in Canada and up to 100% of eligible project expenses incurred by academics and researchers. Note that multinational enterprises (MNEs) may also qualify for funding in some fabrication challenge calls. **The average project funding in this call will be 40%.**

up to

50%

of eligible project expenses
for projects led by SMEs in Canada

up to

100%

of eligible project expenses
incurred by academics

This is a call for expressions of interest which, if accepted, may lead to invitation to prepare a full proposal.

2. Definitions

1) "**Lead Organization**" means the organization leading the project proposal application process, seeking funding through FABrIC, the FABrIC main point of contact and, if successful, the organization that ultimately becomes the "Lead Ultimate Recipient" to the Project Agreement responsible for overall management of the project. The Lead Organization must be a FABrIC member.

2) "**Project Agreement**" means the agreement that will eventually follow a successful proposal and be signed by the Lead Organization setting out the terms and conditions of the proposed and approved Project.

3) "**Ultimate Recipient**" means one or more Post Secondary Participant or Industry Participant who are receiving funding and are carrying out Eligible Projects as part of a Challenge Project.

3. Key Dates

1) **September 3, 2024** – Round 1 Challenge Call Issued, Challenge Guide and EOI template released

2) **September 20, 2024**, 9:00 pm EDT – Deadline for Submission of Expression of Interest (EOIs)*

3) **October 11, 2024**, 9:00 pm EDT – Deadline for Submission of Full Project Proposals

***EOIs will be reviewed when received and applicants will be notified of results as soon as possible after receipt.**

4. FABrIC Challenge Support

To accelerate the adoption by the ecosystem of processes developed through these challenges, with agreement from the lead organization(s), the FABrIC technical team may produce design tools and flows, including process design kits etc. for use by FABrIC Members. Resources will be developed based on priorities established by the FABrIC Advisory Committee (see section six, Selection Process, below).

5. Key Requirements

Semiconductor Fabrication Process Challenge – Round 1

- The project must be aligned with the overall strategic objectives of FABrIC. See the FABrIC Program Guide < www.fabricinnovation.ca >.

- The project must develop and install new or enhance existing fabrication processes for rapid prototyping (including multi-project wafer flows where practical) and low to medium volume semiconductor manufacturing in Canada. The process(es) must be in one (or more) of the key areas of focus including:

    - **Photonics**
    - **Microelectromechanical Systems (MEMS)**
    - **Quantum / Superconducting devices**

- The project should leverage and expand existing Canadian fabrication capabilities and infrastructure in industry (SMEs, MNEs, and NFPs) as well as in academia (university labs, etc.).

- The project must contribute to the development and growth of coherent supply chains for the development and manufacturing of new and innovative products in Canada. Collaboration between fabrication partners is encouraged.

- Challenge recipients will be required to provide broad and favourable access to these fabrication processes to the Canadian ecosystem, including SMEs and academics.

- Ownership of all foreground IP created through the project must remain in Canada and be used for the benefit of Canada for a minimum of five years after the completion of the project. See the FABrIC IP Strategy document < www.fabricinnovation.ca >.

- Projects can include costs related to capital equipment purchases, however, this will require pre-approval by ISED prior to procurement. Other terms may apply.

- The project must contribute to the development and retention of highly qualified personnel in Canada including for example training for interns, job creation, job retention, etc.

- The project should demonstrate other benefits to Canada including social, environmental, and economic benefits.

- The project should demonstrate alignment and advancement of the principles of diversity, equity, and inclusion.

- The Lead (and co-lead, as applicable) must demonstrate that they have sufficient resources to carry out the project to conclusion.
- Estimated project costs must be between $200K to $2.5M CDN. (Please contact us for exceptional requests at challenges@fabricinnovation.ca.)
- Typical project duration is expected to be 12 to 24 months; however projects must conclude no later than December 31, 2026.
- The process(es) must have evidence of market pull at proposal time and be at TRL 7 or higher at the end of the project with the intent of providing commercial access to the Canadian ecosystem at that time.
- Applicants must provide evidence for the need for funding from FABrIC. Applicants should also co-apply to provincial funding programs, where available.
- Projects must be incremental to the regular business of the participating organizations. The proposed project must not already be approved or in progress, must be distinct from investments that would have otherwise occurred, and would not be undertaken at the same scope or scale without the support of FABrIC.
- Projects related to experimental or theoretical work without any direct commercial application or use will not be considered.

Basic Eligibility for Applicants

- Applicants must be a member of FABrIC and only organizations (companies, institutions, corporations, etc.) may apply to Challenges (individuals are not eligible to apply).

- Challenges are open to organizations that are incorporated or registered in Canada and have significant operations in Canada and include (a) for-profit organizations, (b) not-for-profit organizations, (c) post-secondary institutions in Canada, (d) research institutes in Canada that are wholly owned by post-secondary institutions in Canada, (e) Indigenous organizations in Canada.

- Recipients of FABrIC funding must be in compliance with economic sanctions, financial sanctions, and trade embargoes administered by the Government of Canada.

- Designated Projects (as per applicable federal environmental and impact assessment legislation) are not eligible.

Basic Requirements During Project Execution

- All project work must be performed in Canada, unless otherwise pre-approved in writing. A maximum of ten percent (10%) of work may be performed outside of Canada with pre-approval.

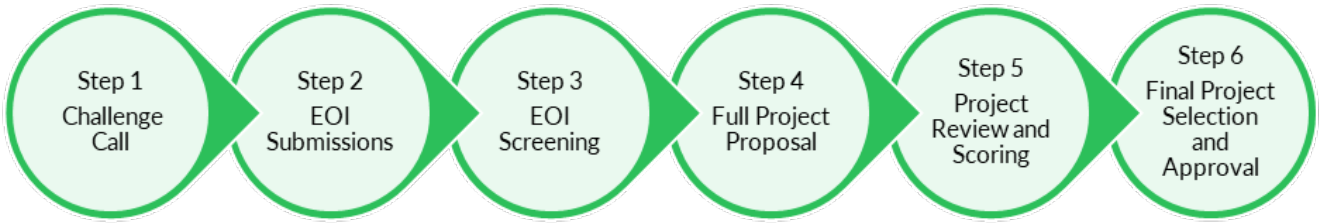
- Eligible expenditures must comply with the requirements that are described in the Eligible Project Expenses Guide < www.fabricinnovation.ca >.

- Stacking: Total Government Funding (including FABrIC and other federal funding, provincial and federal investment tax credits) must not exceed seventy five percent (75%) of Eligible Supported Costs for any industry participant and one hundred percent (100%) of Eligible Supported Costs for any Post-Secondary participant.

- The lead organizations are required to report on all project activities and submit financial claims and supporting documents on a quarterly basis.

- Further terms and conditions will be required as stated in the Project Agreement.

6. Selection Process



Step 1: Call for Challenge Projects

Challenge calls will be issued on the FABrIC website. Challenge guides, EOI templates and supporting documents will be posted on the FABrIC Members Portal.

Step 2: EOI Submissions

Lead organizations will complete the Expression of Interest (EOI) document according to the Challenge Guide and submit the EOI to challenges@fabricinnovation.ca prior to the posted submission deadline.

Step 3: EOI Screening

The FABrIC Challenge team will review EOIs to ensure that the proposals meet the eligibility requirements as provided in the Challenge Guide according to Table 1 below. Applicants that submit an accepted EOI will be notified by the FABrIC Challenge team and will be invited to submit a full project proposal.

Step 4: Full Project Proposal

Lead organizations will complete the full project proposal.

Upon request, the FABrIC Challenge team will provide support to facilitate the applicants' efforts to produce project proposals that best address FABrIC project goals.

The FABrIC Challenge team will undertake a financial assessment of participating lead organizations to ensure they will be able to support their commitment to the project for its entire duration.

Step 5: Project Review and Scoring

All project proposals will be subject to an independent assessment process undertaken by the FABrIC Advisory Committee (FAC). The FAC will select up to five members from FABrIC Challenge Committee to form an expert assessment panel to review, score, and rank the submitted project proposals using the criteria in Table 2 and scoring in Table 3. The expert assessment panel will ensure that approved projects are of high quality, meet FABrIC's strategic objectives, and will recommend projects for funding on a fair basis.

The FABrIC Advisory Committee is a group of up to 15 independent, recognized Canadian experts in the five key technology areas covered by FABrIC: Compound Semiconductors, Silicon Photonics, MEMS, Quantum, and IoT including Edge AI.

FABrIC Challenge Committee is a pool of up to 50 independent experts from each of the key FABrIC technology areas and include members from industry (including SMEs, MNEs and NFPs) and academia, from across Canada. The members have a variety of sector specific manufacturing and technology backgrounds and technical and strategic expertise.

The identity of experts participating in individual project assessments will be kept confidential.

Members of the FAC and FABrIC Challenge Committees will sign non-disclosure agreements as well as conflict of interest disclosures to ensure independence and confidentiality.

Step 6: Final Project Review and Approval

Based on the Challenge Committee's ranking results and the available funding envelope, the FAC will recommend the final approval for funding of selected projects to the CMC Board.

The CMC Board will review the recommendations from the FAC to ensure the selection process has been followed, and if so, will approve the corresponding funding. Note the CMC Board will not assess or be directly involved in the selection of projects.

The FABrIC Challenge team will notify Innovation, Science and Economic Development Canada (ISED) of the selected projects and the funding allocation.

The FABrIC Challenge team will notify each successful applicant and will proceed with the development and completion of a Project Agreement with the Lead Organization(s).

Applicants for projects that are not recommended for approval will be notified, with a summary outlining the reasons why they were not approved, as well as any recommendations to strengthen their applications. These applicants may re-apply for subsequent Challenges.

Table 1: Challenge Project Pass/Fail Criteria

Criteria	Scoring
1) Ultimate Recipient (UR) is one of the following: ▪ An organization that is incorporated or registered in Canada and had significant operations in Canada and include (a) for-profit organizations, (b) not-for-profit organizations, (c) post-secondary institutions situated in Canada, (d) research institutes situated in Canada that are wholly owned by post-secondary institutions in Canada. ▪ For not-for-profit organizations based in Canada: incorporated under the Canada Not-for Profit Corporations Act (CNCA) or similar Provincial Act. ▪ Indigenous Organization in Canada.	Pass/Fail
2) There is a minimum of one UR who is a SME (where feasible). MNEs can participate as URs in Semiconductor Process Challenges.	Pass/Fail
3) Project is aligned with FABrIC objectives (develop/advance semiconductor manufacturing technology in Canada, develop made-in-Canada IoT products and services, stimulate the development of quantum technologies in Canada, and/or train next generation of Canadian highly qualified personnel (HQP)). For post-secondary institutions: project intent is the development of technology with commercial application for use by industry situated in Canada.	Pass/Fail
4) Evidence of sufficient working capital and other resources to meet FABrIC funding requirements, with no more than 75% of total industry Ultimate Recipient project costs coming from government sources (up to 100% for post-secondary Ultimate Recipients and NFPs)	Pass/Fail
5) Project meets the eligibility requirements (including for example, funding structure, overall budget, project start/end date requirements etc.) as specified in the Challenge call.	Pass/Fail

Table 2: Challenge Project Assessment Criteria

Criteria	Description
1) Skills Development	Corporations: Project will create and/or retain jobs in Canada. Post-secondary: Project will train HQP in relevant tools, technologies, and disciplines to address the skills needed by industry in Canada. Collaborative (corporation/post-secondary): project will create and/or retain jobs in Canada and/or train HQP.
2) IP Development	Project will create novel or competitive IP with plan to exploit this IP to the benefit of Canada. Project aims to contribute IP and/or other tangibles back to the Canadian ecosystem for use by other participants accessing the Innovation Platform.
3) Collaboration	Proposal fosters and demonstrates collaboration between large corporations, SMEs, NFPs, and/or academia.
4) Commercialization and Manufacturing in Canada	Proponents have differentiated and protectable technology (existing and planned for development), evidence of market pull and a plan to Commercialize in Canada specifically.
5) Basic Project Structure a) Need for Support	Proponents have a demonstrated need for financial support for a project that would otherwise not happen or happen to the extent proposed.
b) Skills and Financial Means	Proponents have the skills and financial means to complete the project proposed.
c) Detailed Workplan & Budget	There is evidence of a detailed workplan outlining planned activities, milestones, budget, and secured partners.
d) Equity, Diversity & Inclusion	Proposal includes elements and activities to advance principles of equity, diversity, and inclusion.

Table 3: Assessment Scoring by Technology Focus

Criteria	Quantum Fabrication Processes	MEMS Fabrication Processes	Photonics Fabrication Processes
1) Skills Development	30	15	15
2) IP Development	15	15	15
3) Collaboration	15	15	15
4) Commercialization and Manufacturing in Canada	5	20	20
5) Basic Project Structure a) Need for Support	10	10	10
b) Skills and Financial Means	10	10	10
c) Detailed Workplan & Budget	10	10	10
d) Equity, Diversity & Inclusion	5	5	5

7. Equity, Diversity and Inclusion

FABrIC is powered by and managed by CMC. CMC is unwavering in its commitment to the principles of Equity, Diversity, and Inclusion (EDI). We believe that fostering an inclusive environment enhances innovation, creativity, and excellence. We recognize that a breadth of perspectives, skills, and experiences contribute to excellence in research and innovation. This culture is the responsibility of every participant in the ecosystem, including employees, funders, investors, sponsors, institutions, companies, researchers, advisors, administrators, and reviewers. As part of our dedication to EDI, CMC is also actively participating in the Government of Canada's 50-30 Challenge, which aims to accelerate gender parity and the inclusion of under-represented groups in leadership roles.

EDI is a cornerstone of our governance and operational practices. FABrIC Challenge, Innovation Platform and Ecosystem Development proposals that advance EDI principles are given additional assessment points, reflecting our commitment to creating a diverse and inclusive community. We recognize that embracing EDI is not just a goal, but a continuous journey. By embedding these values into our decision-making and resource allocation processes, we aim to ensure that our investments yield the maximum benefit for all members of our community.

8. Technology Readiness Levels (TRLs)

For the purposes of FABrIC Challenge projects, applications should **describe the TRL the research is currently working to achieve.**

Activities for proposed projects will generally fall under Technology Readiness Levels (TRLs) 3 to 7 but could cover the whole range of TRLs 1 to 9. Innovation, Science and Economic Development Canada (ISED) (Innovation Canada) describes stages of development, including a TRL assessment tool and checklist, online at https://ised-isde.canada.ca/site/innovation-canada/en/technology-readiness-levels.

Technology Development Stage	TRL	Definition	Description
Fundamental Research	1	Basic principles observed and reported	Scientific research begins to be translated into applied research and development (R&D). Activities might include paper studies of a technology's basic properties.
	2	Technology concept and/or application formulated	Invention begins. Once basic principles are observed, practical applications can be invented. Activities are limited to analytic studies.
Research and Development	3	Analytical and experimental critical function and/or proof of concept	Active research and development is initiated. This includes analytical studies and/or laboratory studies. Activities might include components that are not yet integrated or representative.
	4	Product and/or process validation in laboratory environment	Basic technological components are integrated to establish that they will work together. Activities include integration of "ad hoc" hardware in the laboratory.
	5	Component and/or validation in a simulated environment	The basic technological components are integrated for testing in a simulated environment. Activities include laboratory integration of components.
Pilot and Demonstration	6	System/subsystem model or prototype demonstration in a simulated environment	A model or prototype that represents a near desired configuration. Activities include testing in a simulated operational environment or laboratory.
	7	Prototype ready for demonstration in an appropriate operational environment	Prototype at planned operational level and is ready for demonstration in an operational environment. Activities include prototype field testing.
Levels 7 through 9 represent the pre-commercialization gap for innovations.	8	Actual technology completed and qualified through tests and demonstrations	Technology has been proven to work in its final form and under expected conditions. Activities include developmental testing and evaluation of whether it will meet operational requirements.
Early Adoption	9	Actual technology proven through successful deployment in an operational setting	Actual application of the technology in its final form and under real-life conditions, such as those encountered in operational tests and evaluations. Activities include using the innovation under operational conditions.

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