



Welcome to the Canadian Advanced Manufacturing in Nuclear Alliance (CAMiNA)

Virtual Launch

April 5, 2022



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Agenda

10.30 am

- Welcome & Opening Remarks

10:50 am

- Overview of CAMiNA & Advanced Manufacturing Roadmap

11:10 am

- Upcoming CAMiNA Events & Activities

11:15 am

- CAMiNA Group Discussion



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Welcome & Opening Remarks

- Ron Oberth, President, OCNl
- Robin Manley, VP New Nuclear Development, Ontario Power Generation
- CAMiNA Chair, Stephen Veldhuis, Director, McMaster Manufacturing Research Institute



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Overview of CAMiNA

- Promote greater use of Advanced Manufacturing technologies in the Canadian nuclear industry and advocate for research, development, and application of various Advanced Manufacturing technologies to maintain or improve Canada's nuclear fleet's cost, reliability, safety performance, and support SMRs
- A community for all stakeholders to share, learn and collaborate
- Visit our website: www.ocni.ca/camina/



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CAMiNA Structure

➤ Chair

- Dr. Stephen Veldhuis, McMaster Manufacturing Research Institute

➤ Executive Committee:

- Ron Oberth and Brian Fehrenbach, OCNi
- David Marttila, Kinectrics
- Stephan Braun, KSB

➤ Program Director

- Christine Burow



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What is Advanced Manufacturing?

- Additive Manufacturing (3D Printing)
- Advanced Welding & Joining Techniques
- Advanced Cladding Techniques
- Powder Metallurgy-Hot Isostatic Pressing (PM-HIP)
- Advanced Machining & Metrology
- Any Advanced Manufacturing technologies important to CAMiNA members



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Wide range of opportunities for leveraging advanced manufacturing

- Existing fleet
- SMRs



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Benefits for the Nuclear Industry



Reduced Component Obsolescence



Increased Manufacturing Speed



Increased Part Complexity



Increased Component Efficiency



Waste Reduction



SMR Design



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- Replacing parts no longer being manufacturing
- Fewer production steps = Less production time
- Shorter supply chain
- Complex parts that are difficult or impossible to manufacture conventionally
- Complex designs for increased heat transfer
- Up to 90% less production waste vs. traditional methods
- Can reduce overall size, weight, cost and time

What led up to CAMiNA?

- OCNi Advanced Manufacturing Seminar and Exhibit – April 16, 2019
- OCNi Advanced Manufacturing Forum – November 10/11, 2020
- COG / CNL Advanced Manufacturing Workshop – March 19, 2021
- Drafts of Advanced Manufacturing Roadmap for the Canadian Nuclear Industry shared with stakeholders throughout 2021
 - Received and incorporated many comments and additions from a broad range of stakeholders
- AM Roadmap released on January 12, 2022



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Advanced Manufacturing Roadmap for the Canadian Nuclear Industry

- Broad participation
- Enthusiasm
- Interest to build on the momentum
- Therefore CAMiNA established to support the roadmap's implementation
- Grow and evolve CAMiNA over the coming years to meet the needs of the members; and then accordingly seek new funding sources for our Alliance (cluster)



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Membership information

- Membership growing weekly. To date:
 - 25 organizations
 - 43 individuals
- No membership fee
- No limit on organizations who can apply, only requirement is to support our goals and to participate
- No limit on the number of people per organization
- Quick to apply at www.ocni.ca/camina/



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Members to date:



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Why interested in joining?

Summary from applications

13

- Help us determine the needs
- Interested in expanding in the nuclear market, networking, to showcase our capabilities and to collaborate
- Learn about activities in nuclear
- Help advance Advanced Manufacturing as a solution for nuclear power in both new builds and existing plants
- How AM can be permitted to reliably produce low-impact parts for station installation



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Why interested in joining?

Summary from applications, continued

- Address obsolescence
- Digital twins
- Learning (very frequent mentions)
- Become a supplier in the Nuclear industry
- Networking, sharing knowledge
- Support development of world-leading advanced manufacturing capabilities in Canada

Why interested in joining?

Summary from applications, continued

15

- Share knowledge and experience in utilizing additive manufacturing in other regulated industries to assist and promote adaptation of AM in the nuclear industry
- Learn and share knowledge
- Champion advanced manufacturing initiatives
- Support business growth and expansion



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Why interested in joining?

Summary from applications, continued

16

- To connect with various stakeholders to better understand the types of parts, the quality certification / component testing requirements
- Additive manufacturing of custom hard to produce parts
- High performance machining of difficult to machine materials
- Use of advanced data analytics to improve decision making for process parameter selection, condition-based monitoring and process performance assessment
- Local parts availability



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Which technologies of most interest?

Summary from applications

17

- Additive manufacturing (very frequent mentions)
- Additive manufacturing, especially to support rapid prototyping (and more)
- Obsolescence issues and reverse Engineering
- Non-Destructive Evaluation, Destructive testing, Qualifications and Nuclear Certifications



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Which technologies of most interest?

Summary from applications, continued

18

- Directed Energy Deposition and Powder Bed Fusion systems as well as related processes
- E-beam welding, all advanced manufacturing technologies including PM-HIP
- Approach for the fabrication of critical components in operation in high-performance applications
- Materials for advanced manufacturing
- Generative design



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Which technologies of most interest?

Summary from applications, continued

19

- All advanced manufacturing technologies that make Canadian companies more competitive
- Automation/robotics
- IoT and sensors
- Data analytics
- LPBF and EBM processes including post-processing; DED for large parts, part cladding, functionally graded materials, and component repair applications



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Which technologies of most interest?

Summary from applications, continued

20

- Digital twins
- Additive manufacturing of custom hard to produce parts
- High performance machining of difficult to machine materials
- Use of advanced data analytics to improve decision making for process parameter selection, condition-based monitoring and process performance assessment
- Investment Castings

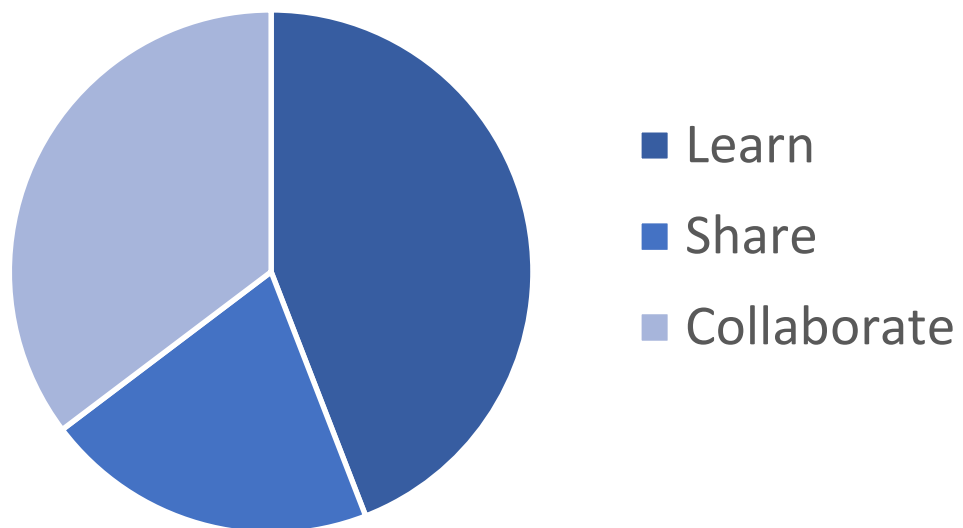


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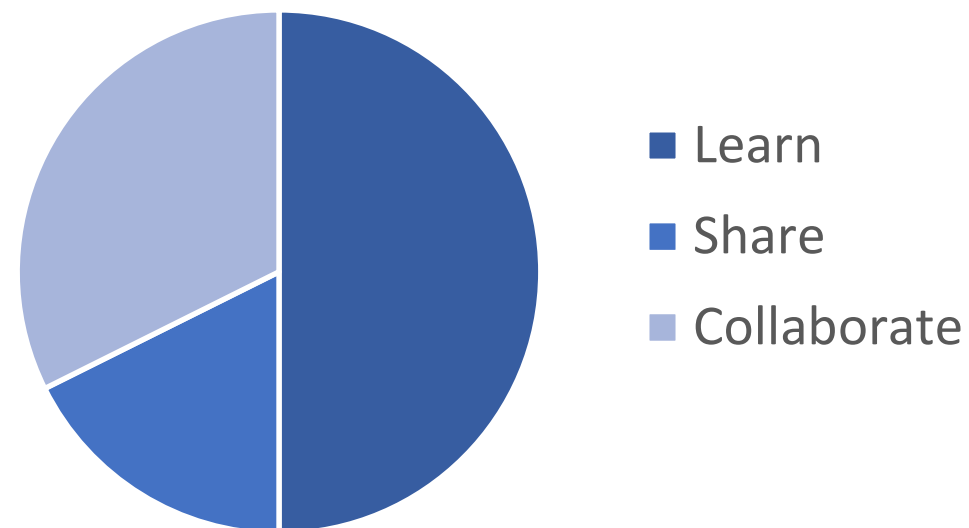
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Member interests:

Interest in additive manufacturing
(3D printing) technologies



Interest in materials
for advanced manufacturing

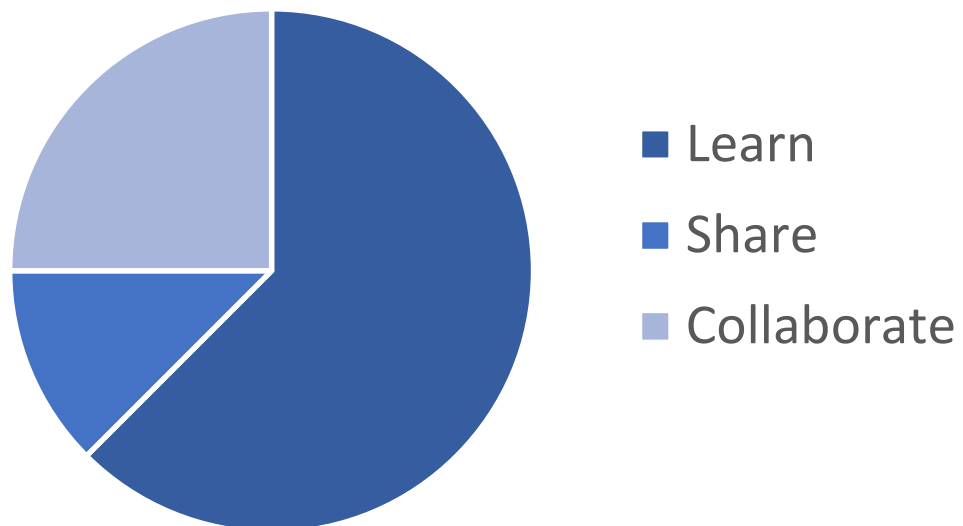


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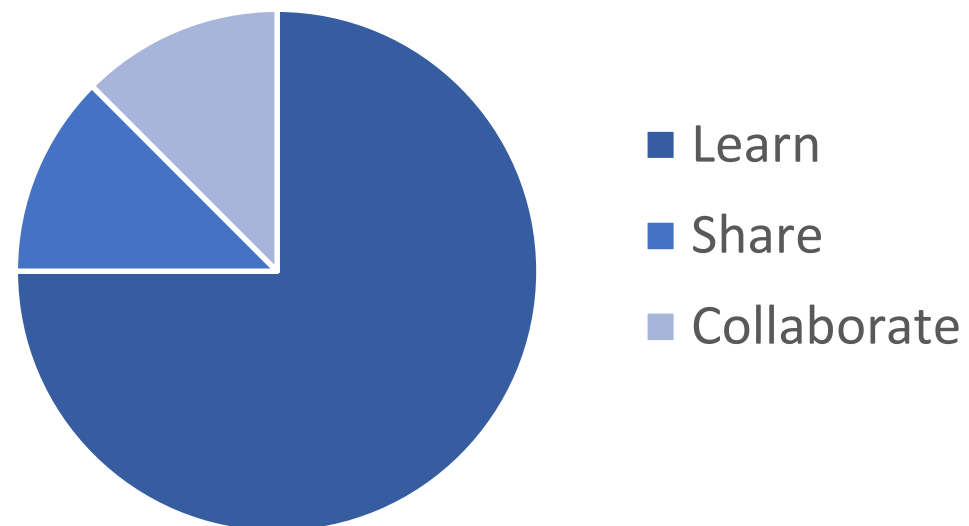
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Member interests:

Interest in powder metallurgy - hot isostatic pressing (PM-HIP)



Interest in E-beam and advanced welding technologies

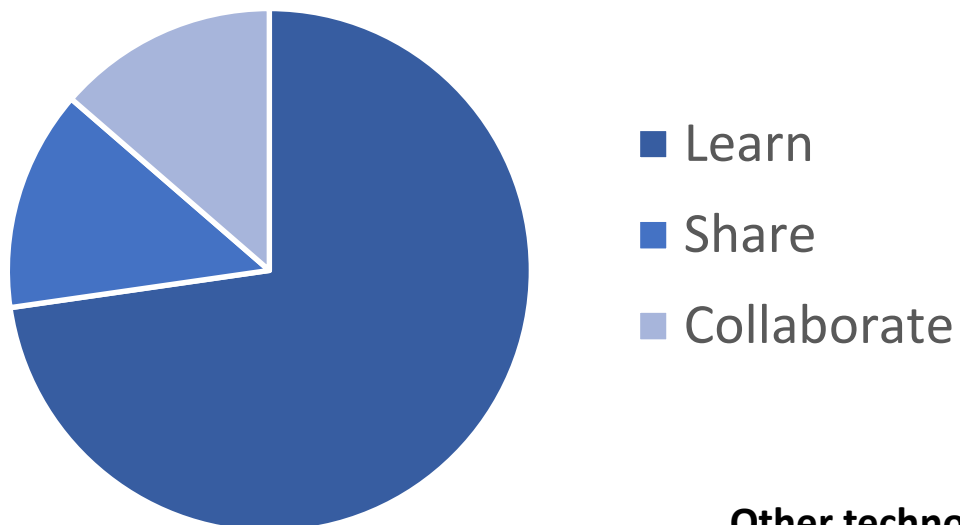


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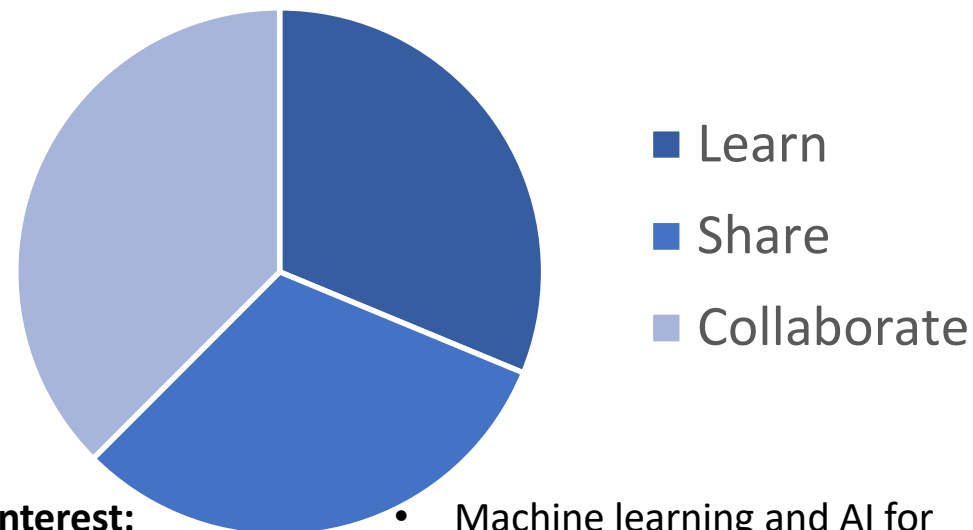
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Member interests:

Interest in advanced cladding technologies



Interest in other advanced manufacturing technologies



Other technologies of interest:

- Laser Peening, metal treatment
- Pump & valve manufacturing & design
- Conventional subtractive technologies and the latest innovations
- Training and simulation
- Machine learning and AI for manufacturing.
- Advanced inspection techniques including non-contact 3D scanning and CT scanning
- High performance machining

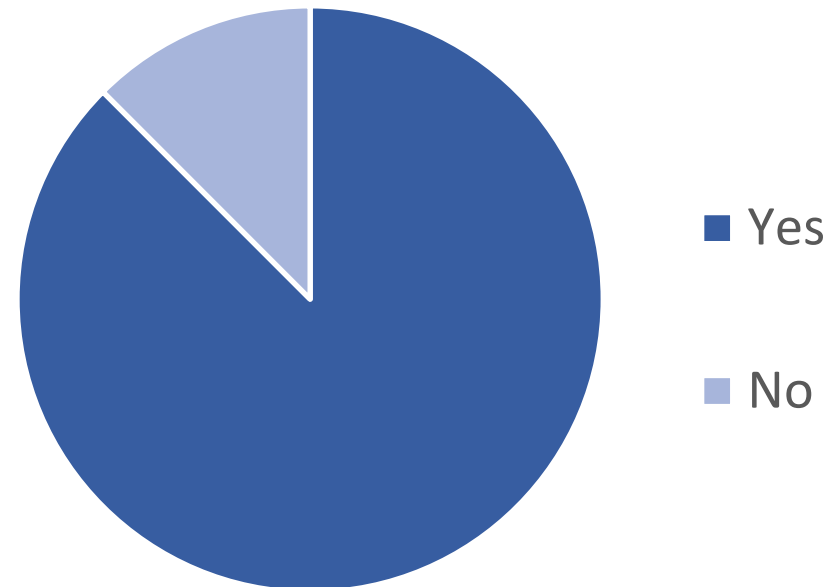


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Member interests:

Interest in potential working groups



Upcoming events and activities

- April 28, 10-11am ET, virtual
 - Presentation by Marc Albert, EPRI on advanced manufacturing standards
 - CAMiNA member meeting

- May 12, 10-11am ET, virtual
 - Presentation by Nejib Chekir, Liburdi, on the state of the art in directed energy deposition (DED is a type of additive manufacturing)
 - CAMiNA member meeting

- Presentations in planning: CanadaMakes, NGen Canada, Kinectrics – Burloak nuclear additive project,

Upcoming events and activities

- October 3, all day, in-person, Toronto
 - Advanced Manufacturing workshop at G4SR-2022, organized by CAMiNA and GIF
 - CAMiNA in-person member meeting on margins of G4SR-2022
- Other activities:
 - Tours and demonstrations at new manufacturing facilities of both McMaster Manufacturing Research Institute and University of Waterloo's Multi-Scale Additive Manufacturing Lab
 - CAMiNA member input needed on topics and events of highest interest



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CAMiNA Members

➤ Discussion



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Thank you!

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