

Carbon Fibre Grand Challenge Phase III Webinar

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Bryan Helfenbaum, Executive Director – Advanced Hydrocarbons

May 3, 2023



ALBERTA INNOVATES



AGENDA

- Alberta Innovates
- Background
- Grand Challenge Program Details
- Eligibility & Funding
- Samples & Spinning Facility
- Application & Evaluation Criteria
- FAQs
- Q&A



Land Acknowledgement

We acknowledge the many First Nations, Métis and Inuit who have lived in and cared for these lands for generations. We are grateful for the traditional Knowledge Keepers and Elders who are still with us today and those who have gone before us. Alberta Innovates respectfully acknowledges that we are situated on traditional territory of the Treaty 6, Treaty 7, and Treaty 8 First Nations; home to Métis Settlements, the Métis Nation of Alberta, and Regions 2, 3 and 4 within the historical Northwest Métis Homeland. We respect the histories, languages, and cultures of First Nations, Métis, and Inuit whose presence continues to enrich our vibrant community.

Alberta Innovates At A Glance



11 Locations
1 million+ sq ft
of lab space
600+ acres of
research
farmland



Employees
589 FTEs
Including 73
PhDs



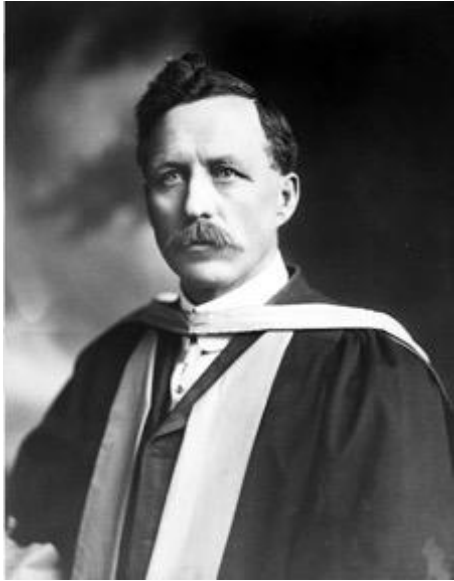
2 Subsidiaries
InnoTech Alberta Inc.
*C-FER Technologies
(1999) Inc.*



Operating
Budget
\$250 million



100 Years of Driving Innovation



H. M. Tory (1919)



Dr. K. Clark (1920)



**Scientific and Industrial Research
Council of Alberta (1921)**

Foster and accelerate research and innovation to benefit citizens and drive economic growth

BACKGROUND

Alberta Oilsands Bitumen



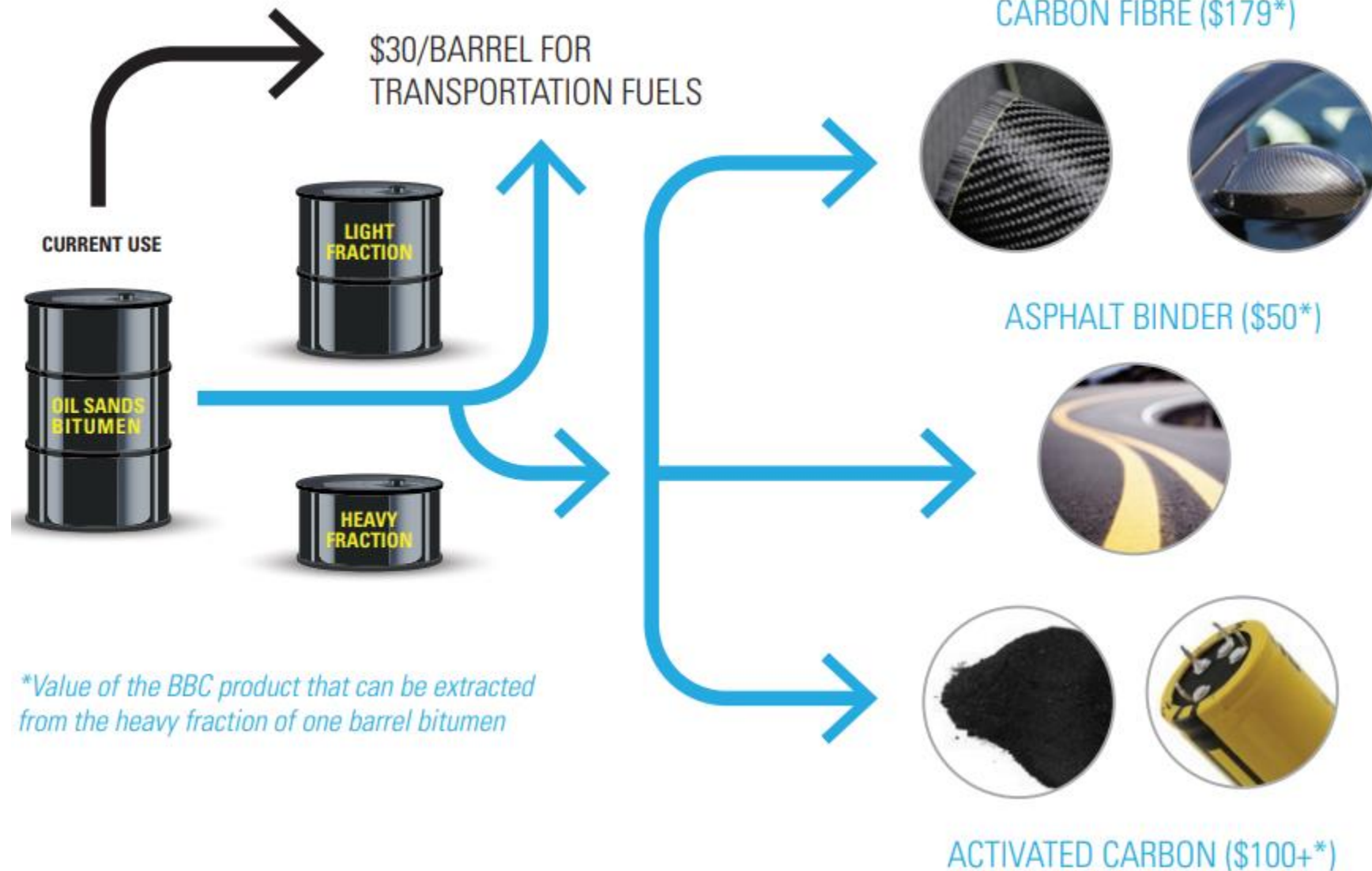
- Reserves: 180 Billion bbl
- Production: 3 Million bpd

Combustion Products (~90%)

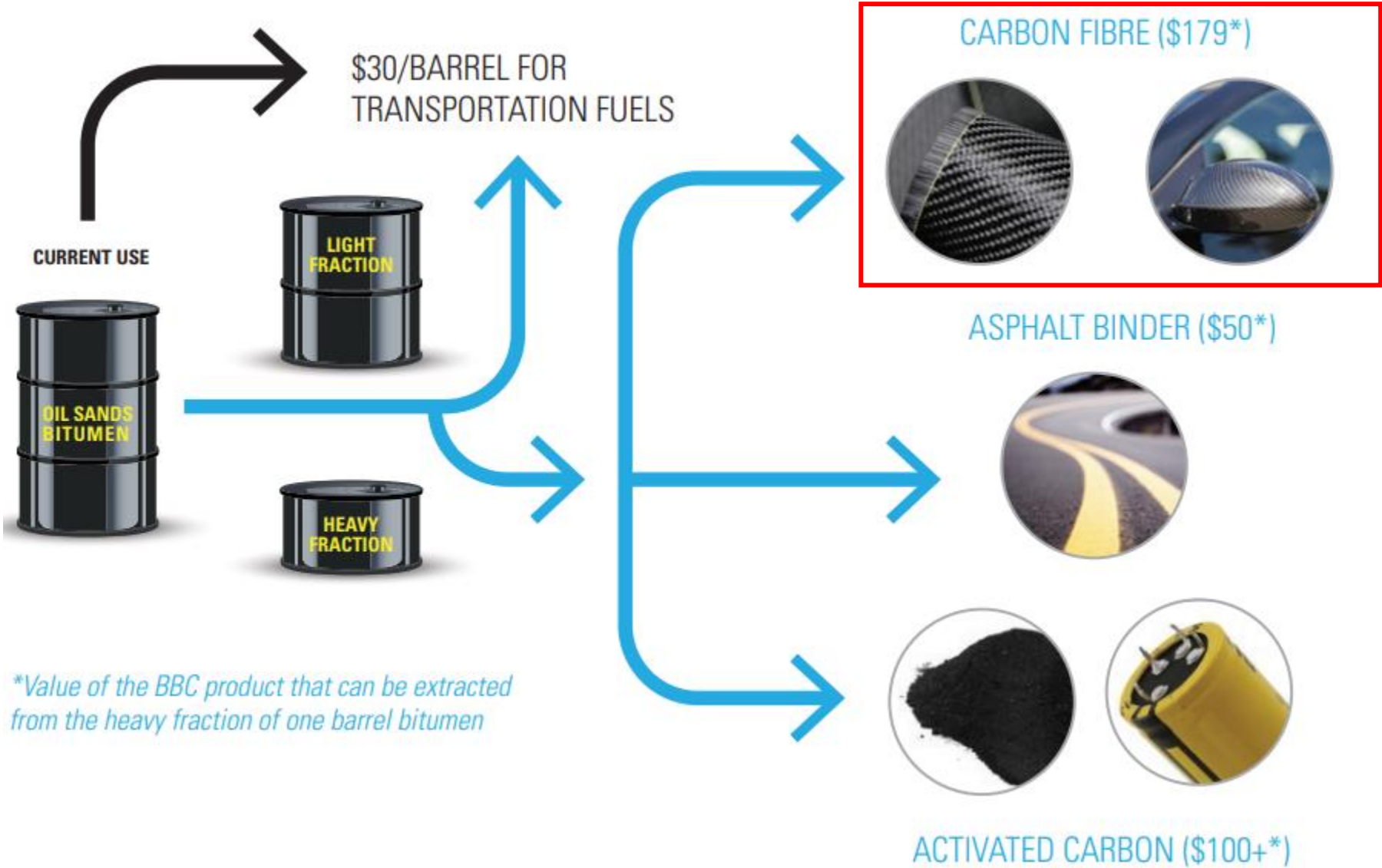
Non-combustion Products (~10%)

- Non-combustion products are produced by refineries (e.g. lubricants, etc.)

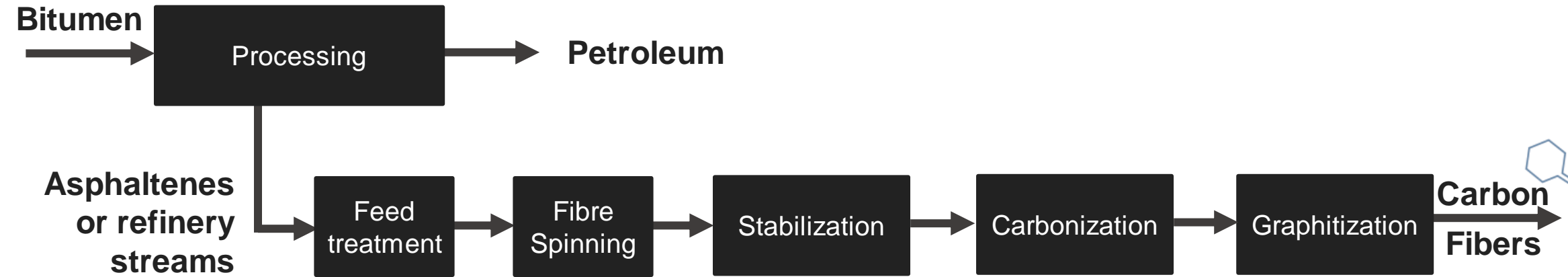
Bitumen Beyond Combustion (BBC)



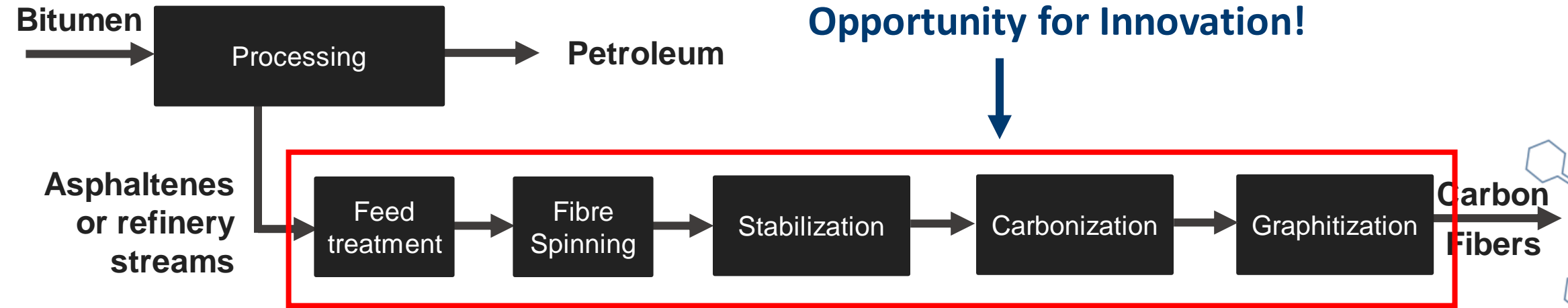
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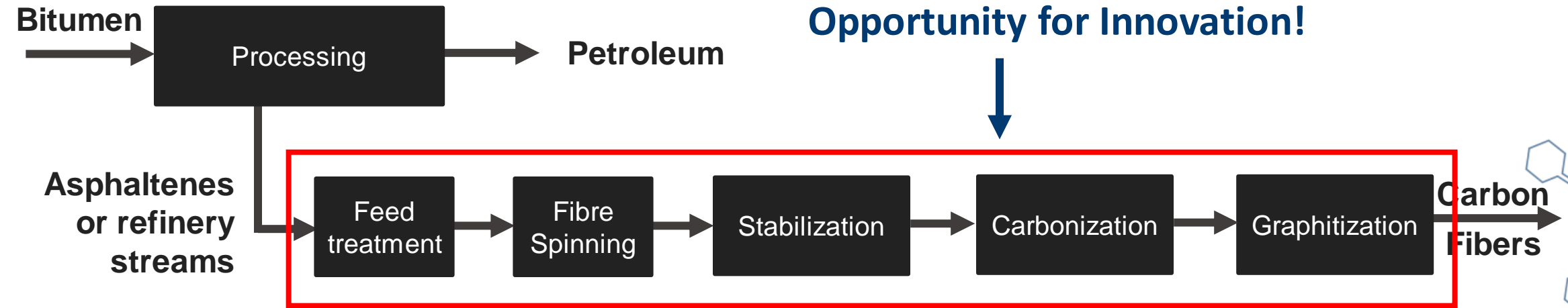
Carbon Fibres: Areas for Innovation



Carbon Fibres: Areas for Innovation



Carbon Fibres: Areas for Innovation



Advantages

- Favourable chemistry
- Lower cost, abundant supply
- Divert hydrocarbons away from combustion

Challenges

- Feed treatment requirements
- Rapid stabilization
- Sulfur and metal content
- Scale-up & making Tows
- Carbon efficiency & GHGs
- End use implementation

Bitumen Derived Sample Types of Interest

	Asphaltenes	Refinery Streams
Abundance	15% of every barrel of bitumen	thousands of bbls per day based on refinery stream
Need to treat prior to spinning	Yes	Yes
Commercially Available	No – but could be by early 2030's based on carbon fibre development in Phase III	Yes, and expected to be available well into the 2030's
Interest in Phase III	Yes	Yes



CARBON FIBRE

GRAND CHALLENGE

Grand Challenge Objectives

- Greatly accelerate the development of technologies that can convert feedstocks derived from bitumen into carbon fibre
- Create line of sight to production capacities and costs that would enable rapid uptake of carbon fibre into major existing and new markets
- Advance technologies that will benefit industry in Alberta

Cost & Production Targets

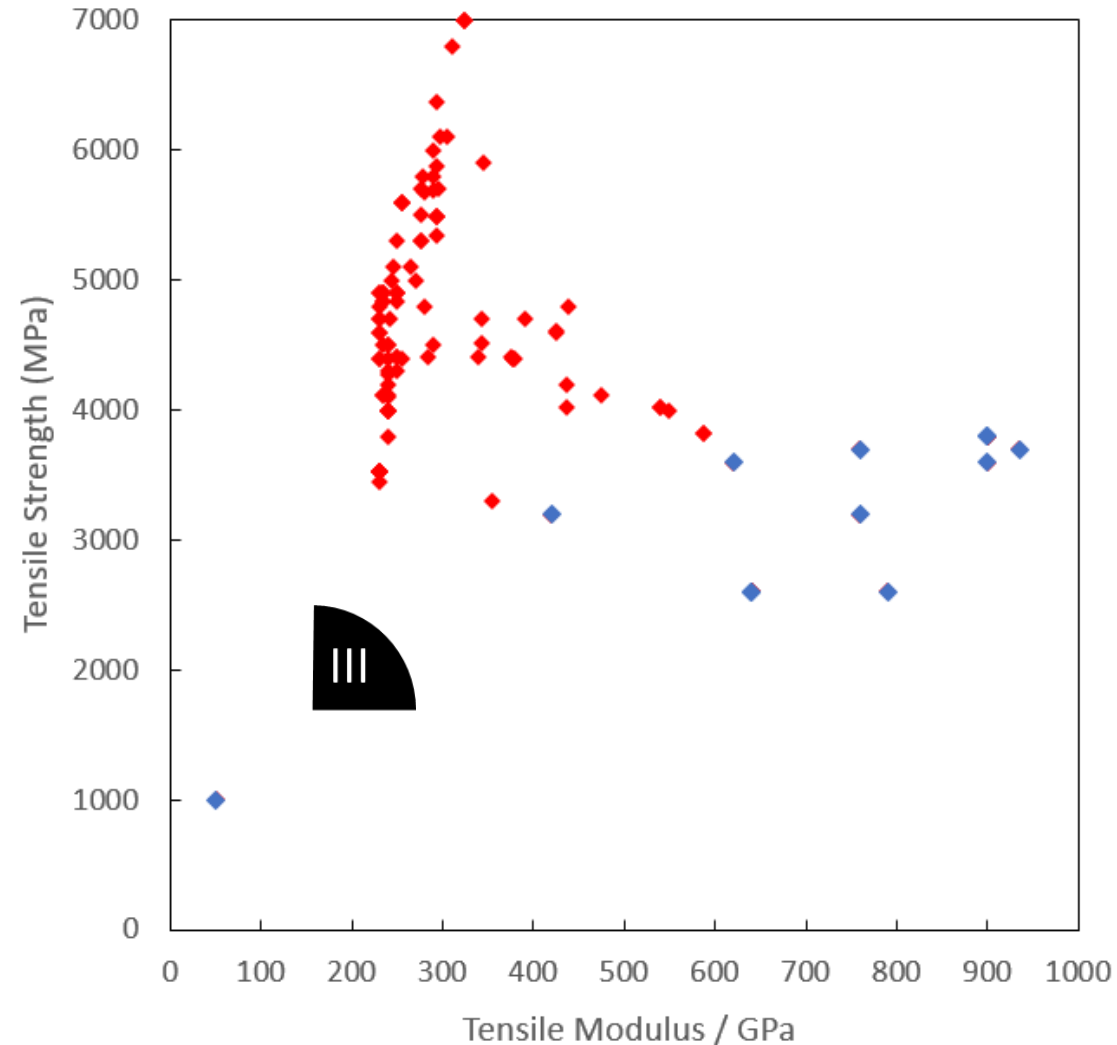
	Carbon Fibre Production	
	From PAN & Pitch (Current)	From Asphaltenes (Target)
Cost, US\$/kg	15 – 35	< 9 or 50% cheaper than incumbent
Global production, tpy ^a	120,000	400,000 ^a

^a requires approximately 100,000 barrels per day of bitumen

Target Property Characteristics

- Properties are driven by commercial needs
- Notional targets in table below but if an end user is asking for a different product, that can be pursued as well

Characteristic	Phase III Target
Diameter	7 μm
Length	Continuous or 6 mm
Tensile strength	>1,720 MPa
Modulus	>172 GPa



Grand Challenge Timeline

Date	Planned Activity
January 2020	Launch of Grand Challenge (COMPLETED)
July 2020 – Feb 2021	Phase I (COMPLETED)
August 2021 – July 2023	Phase II Projects execution (IN PROGRESS)
May – June 2023	Phase III Application process (IN PROGRESS)
October 2023 – September 2026	Phase III Projects execution (FUTURE)

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Phase III Objectives

Process Reproducibility: in a repeatable manner, manufacture carbon fibre from Alberta bitumen derived feeds with consistent performance properties aligned to market needs

End Use Validation: incorporate carbon fibre manufactured in Phase III into prototypes of end use products and evaluate/validate the performance of the prototypes.

Energy, Environment, Economics: understand in great detail the environmental impacts of the manufacturing process and the techno-economics associated with the designed process.

Phase III Timelines

Date	Planned Activity
March 15, 2023	Launch of Grand Challenge Phase II
May 3, 2023	Webinar
May 15, 2023	Applications Open
June 26, 2023, at 2:00 PM MDT	Close of application submissions
September 2023	Successful Applicants Notified
September-October 2023	Contracting
October 2023	Phase II Projects begin
September 30, 2026	Latest completion date for funded projects

PROJECT ELIGIBILITY

Phase III – Outcomes

- i. Continuous & repeatable carbon fibre manufacture of >1 kg per week with consistent performance properties over a period of time that allows for the understanding of the environmental impacts and waste streams associated with the manufacturing process.
- ii. A minimum tensile strength >1,720 MPa and modulus >172 GPa or other strength/modulus combination that meets commercial needs and can be demonstrated through end user performance requirements.
- iii. Building small-scale prototypes of end use products (e.g. test parts) that include bitumen derived carbon fibre.
- iv. Estimate of lifecycle greenhouse gas emissions and other socio/environmental impacts of the carbon fibre and their products;

Phase III – Outcomes

- v. Projected commercial cost of carbon fibre <US\$9 per kg or a demonstrated carbon fibre cost-performance relationship that is at least 50% less expensive than incumbent competitors.
- vi. Line-of-sight to scale the carbon fibre manufacturing process to 2000 tonnes or greater per year.
- vii. Demonstrated market potential of products incorporating carbon fibre, utilizing >10,000 tonnes per year of bitumen derived feed use by 2030.
- viii. Potential of mass manufacture of identified end use products(s) in (iii), concepts for their re-use and end-of-life disposition.

APPLICANT ELIGIBILITY

Eligibility

Applicants

- Open to technology developers, industry (including small, medium, and large size enterprises), industry associations, research and development (R&D) organizations, post-secondary institutions, not-for-profit organizations, and government research labs.
- Applicants are not required to be based in Alberta but must demonstrate a clear value proposition to Alberta

Eligibility

Team Qualification Requirements

- a) Demonstrated ability to modify bitumen-based feeds
- b) Demonstrated ability to prepare carbon fibre (> 10 grams per day)
- c) Demonstrated ability to evaluate carbon fibre end use application

General Requirements

- a) Canadian IP ownership or guaranteed ability to license to Canadian entities
- b) Spinoff companies are not required
- c) Teams must supply at least 25% of all funding (cash/in-kind).

Eligibility

Proposal Requirements

- a) Have a proposed carbon fibre manufacturing process.
- b) Preliminary energy requirements for the manufacturing process.
- c) Potential end uses identified.

Additional Requirements

- a) Up to date corporate filings
- b) Authorized to undertake the project and execute a grant with Alberta Innovates on our standard terms.
- c) Not be prohibited from receiving Alberta Innovates funding

Eligibility – International Researchers

Export Controlled Substance

- Carbon Fibre may be a controlled material governed by the Applicant country's national export control laws.
- The Applicant will be required to report, in a confidential manner, technical details regarding the testing methods and manufacturing processes related to the carbon fibre developed in the Applicant's project.
- Export control regulations and/or failure to obtain an export clearance (to the extent required) **do not absolve** the Applicant from the responsibility of reporting on technical details in a confidential manner and providing a sample to Alberta Innovates (and the Alberta Government who is Alberta Innovates' sole shareholder).

FUNDING

Funding Available

- Up to \$20,000,000 is available for the entire program.
- Between \$200,001 up to \$4,000,000 CAD awarded to successful applicants.
 - 25% of the total eligible costs must be provided by applicants
 - Cash is preferred and in-kind is accepted
 - No stacking limit for government funding
- Co-funding opportunity may exist with Emissions Reduction Alberta's Partnership Intake Program

SAMPLE SUPPLY

Feedstock Samples

- Samples used in Projects funded by the Grand Challenge must be derived from Alberta oilsands bitumen. **No exceptions will be made.**
- Applicants can use their own sourced samples or the CFGC Program can connect successful Applicants with samples – indicate on the application
- Sample options will be available on the CFGC website by May 15, 2023

Feedstock Samples

- Suppliers will engage with Applicants selected for funding
- There is no cost for the samples up to 175 kg.
- If you expect more sample is needed, please speak with Paolo Bomben.
- **Any project that does not involve the production of carbon fibre from an Alberta bitumen derived feed will be immediately disqualified and not reviewed.**

SPINNING FACILITY

Spinning Facility

- Process in motion to establish a small-scale continuous spinning facility in Alberta next year
- Throughput will be 10 g – 1 kg per day; Tow capabilities
- Public access
- Cost to access will be determined
- If you plan on spinning more than 1 kg per day and need access to a spinning line – email Paolo Bomben (paolo.bomben@albertainnovates.ca)
- CFGC Program **will not** fund costs associated with Applicants building a spinning line larger than bench scale in size

APPLICATION

Diversity, Equity, Inclusivity

We believe the Alberta Research and Innovation (R&I) ecosystem is stronger and more sustainable when it is broadly representative of the overall diversity of our community.

We strive to ensure that all interested and qualified parties have an equitable opportunity to participate and contribute to the ecosystem and that our processes are inclusive.

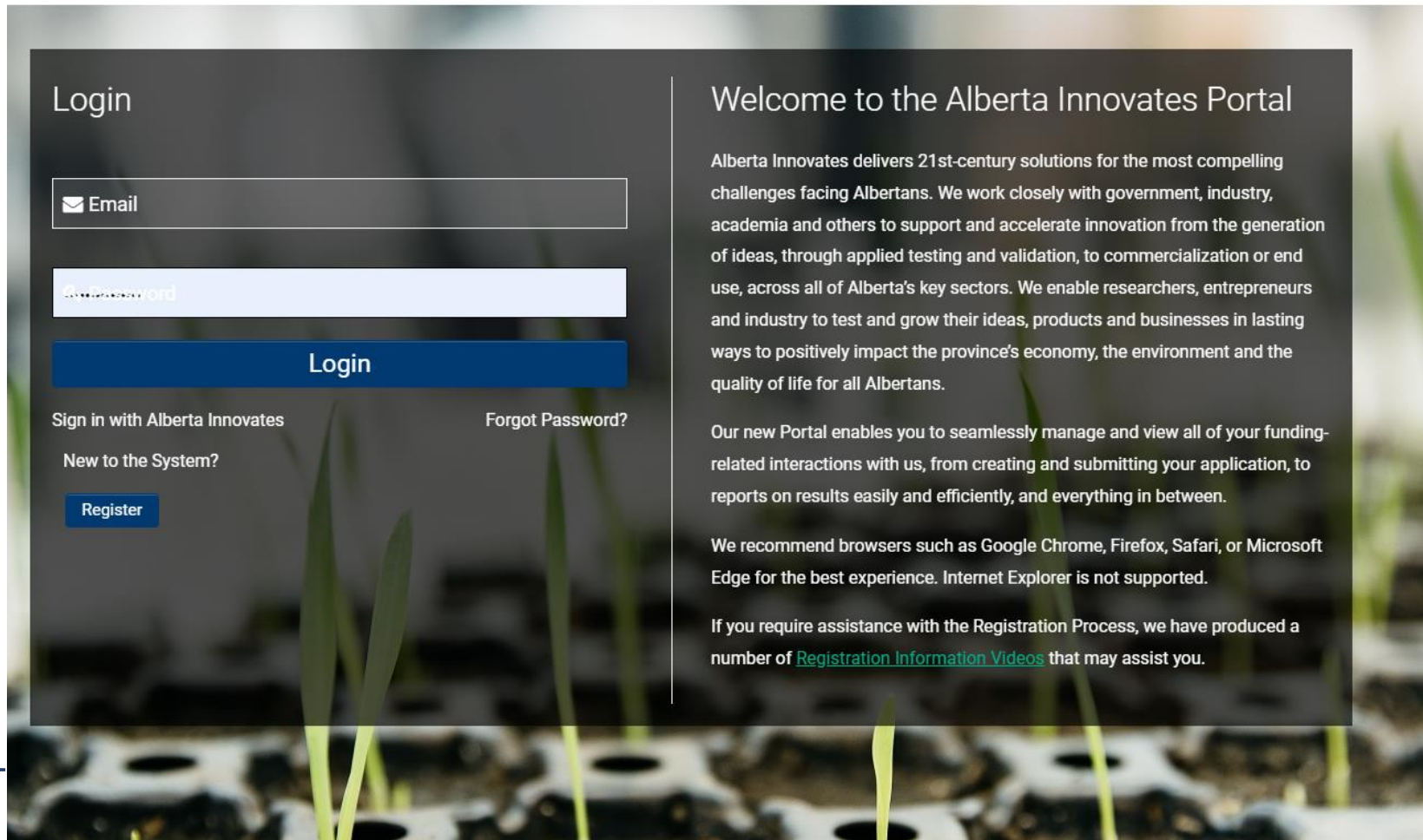
Historically, there have been several groups/populations that have been under-represented in the R&I landscape including:

- Women entrepreneurs/researchers
- Indigenous entrepreneurs/researchers
- Remote/small community entrepreneurs/researchers
- New immigrant entrepreneurs/researchers

We encourage ALL entrepreneurs/researchers to apply!

Phase III Application Process

- Online application portal (<http://albertainnovates.smartsimple.ca>)



Phase III Application Process

- Online application portal (<http://albertainnovates.smartsimple.ca>)

Welcome Paolo Bomben



Organization Profile



Personal Profile



Change Password

Applications

Click here to view all of your applications.



Funding Opportunities

0

Draft Applications

0

Submitted Applications

0

Approved/Declined
Applications

Phase III Application Process

- One-stage application
- Applications open May 15, 2023
- **Submission deadline is June 26, 2023, at 2:00 PM MDT**
- How to instruction guide will be posted to the website by May 18, 2023

Application Evaluation Criteria

- Innovation Opportunity
- Market Opportunity
- Proposed Commercialization Pathway
- Project Overview and Work Plan
- Budget
- Team
- Project Risk Analysis
- Impacts: Economic, Environmental and Social
- Alberta Implementation

Advice for Preparing a Successful Submission

- Read the Program Guide
- Use clear and concise language
- Define what problem/challenge you are trying to address in Phase III
- Define who the end-users are for the carbon fibres you are trying to develop
- Address each question in the application template and read the question guidance carefully
- **Give serious thought and include in your application responses how your solution to producing carbon fibre will be implemented in Alberta**
- Don't wait until the last day to submit

Visit the Program Website

Carbon Fibre Grand Challenge

[BACK TO ALL PROGRAMS](#)



CARBON FIBRE
GRAND CHALLENGE

*The term “bitumen” is used throughout this web page and in Carbon Fibre Grand Challenge documentation. Bitumen is the heavy oil extracted from Alberta’s oil sands. No exceptions will be made to this definition. There are other definitions for bitumen around the world but those

Program Resources

Coming soon.

To be posted:

- Program Guide
- Investment Agreement Template
- Sample Options
- How to Guide for Applying

Q&A

Frequently Asked Questions

Question	Answer
What expenses are eligible?	A list of eligible expenses can be found in Schedule C of the Investment Agreement that will be posted on the website by May 15, 2023.
Is overhead an eligible expense?	Overhead cannot be reimbursed but can be used as an in-kind contribution to the project.
Is the proposal material kept confidential?	Yes, the material is kept behind the Alberta Innovates firewall and all external proposal reviewers are required to sign NDAs. Internal reviewers are protected by Alberta Innovates confidentiality requirements.
Are the results of the project shared publicly?	Successful applicants will complete a public final report and an internal confidential report. The public final report will be posted on Alberta Innovates' website.
Can I submit multiple applications?	Yes, there is no limit on the number of applications. It is recommended that each application be on entirely different scope to differentiate them clearly.
Do I own my new IP?	Yes, the intellectual property remains with the proponent.



Contact Information

- Dr. Paolo Bomben (CFGC Program Manager), Paolo.Bomben@albertainnovates.ca
- Bryan Helfenbaum, P. Eng. (Executive Director – Advanced Hydrocarbons), Bryan.Helfenbaum@albertainnovates.ca

Thank you.