

Elemental Carbon Market Assessment – Joint Industry Project

Methane pyrolysis produces hydrogen and solid elemental carbon from natural gas with low GHG emissions and energy intensity, without needing carbon capture, utilization, and storage (CCUS). Pyrolysis solid carbon by-products comprise a wide range of elemental carbon forms with various properties and market values. Technology developers and end users see the development of carbon applications as a key challenge and opportunity to make methane pyrolysis economic. In this Joint Industry Project (JIP), InnoTech Alberta and the project partners are supporting adoption and growth of methane pyrolysis by identifying applications, valuating markets, and assessing technoeconomic feasibility for elemental carbon products.



RECIPIENT:
InnoTech Alberta



PARTNERS:
County of Grande Prairie
Ekona Power
FortisBC
6 Undisclosed Partners



TOTAL BUDGET:
\$398,486



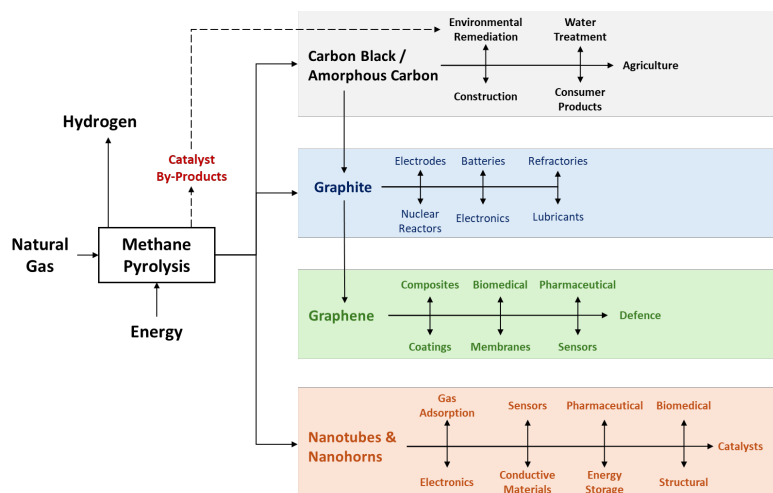
AI FUNDING:
\$130,500



PROJECT DATES:
**AUG 2024 –
OCT 2025**



PROJECT TRL:
**Start: N/A
End: N/A**



APPLICATION

The JIP will evaluate potential applications for solid carbon products derived from methane pyrolysis:

- Carbon black and derivative products – construction, consumer products, environmental, steelmaking, water treatment
- Graphite -- batteries, electrodes, electronics, lubricants, nuclear reactors, refractory materials, structural components
- Graphene -- biomedical, coatings, composite materials, defence, membranes, pharmaceuticals, sensors
- Nanotubes and nanohorns -- biomedical, catalysts, electronics, energy storage, gas adsorption, pharmaceuticals, sensors

PROJECT GOALS

The anticipated outcomes of the JIP are to:

- Identify and characterize carbon forms produced by methane pyrolysis
- Identify potential carbon applications, markets, and incumbent products
- Match elemental carbon products with suitable properties to potential applications
- Conduct technoeconomic and emissions intensity analysis demonstrating potential feasibility for up to 20 elemental carbon product applications in 2 to 3 defined methane pyrolysis use cases based on geography, industry type, production scale, target products, etc.

BENEFITS TO ALBERTA

The Alberta Energy Regulator forecasts that hydrogen production in Alberta will increase to 3.4 million tonnes per year by 2030. Methane pyrolysis offers several opportunities for Alberta compared to other hydrogen production methods. It has the second lowest GHG emissions intensity (4.5 kgCO_{2e}/kgH₂) and lowest water use intensity (as low as 8L/kgH₂) on average relative to other hydrocarbon-derived hydrogen production processes coupled with CCUS. The carbon products of methane pyrolysis offer significant opportunities for new revenue streams and carbon credit creation for project developers/owners as well as job, market, and wealth creation in Alberta. Some of the identified carbon application areas to be evaluated in the project (environmental remediation, water treatment, agriculture/horticulture) may contribute to positive environmental outcomes (e.g., contamination cleanup, increased soil productivity).



**3 Students
Trained**



**340 kt/yr Future
GHGs Reduced**



2 Project Jobs



100 Future Jobs

CURRENT STATUS

AUG 2025

- Collected market intelligence for 52 carbon applications and 37 reference products
- Characterized 4 methane pyrolysis carbon samples
- Completed first version of a technoeconomic model including emissions intensity analysis
- Defined 20 carbon product / application and methane pyrolysis use case scenarios for technoeconomic and emissions intensity analysis