# COAL-BASED ASPHALT BINDER
# PAVING THE WAY FOR ECONOMIC SUCCESS IN WYOMING

***Dedicated to promoting energy-driven economic development for Wyoming, the School of Energy Resources (SER) engages in cutting-edge and transformative research to assist the energy industry in an evolving market.***

***Through the development of coal-processing technology in the Center for Carbon Capture and Conversion, SER has created valuable feedstocks and resulting high-value products derived from Wyoming coal. This effort is focused on innovation to identify new uses for Wyoming's coal resources.***

## BACKGROUND

- Asphalt binder is the 'glue' that holds asphalt pavement together. It makes up a significant portion of the cost of commercial asphalt
- Current feedstock for asphalt binder comes from oil refineries. Refining is flat in the US, but asphalt demand is growing at *3.6%/year
- There is insufficient feedstock and prices have risen and are unpredictable
- The US market for asphalt binder is about 25 million tons per year and the global market is about *140 million tons per year
- Funded by the state, UW faculty, SER and Western Research Institute in Laramie have collaborated to develop a Wyoming coal-derived extract that can be used to make asphalt binder
- The intellectual property for this technology is owned by the University of Wyoming
- The last step of this research and development program is to demonstrate the technology (called solvent extraction) to produce coal-derived asphalt binder and use it in a WYDOT paving project
- SER is requesting $17 million to build the demonstration solvent extraction system and has, or will obtain, industry funds to operate the demonstration plant and build a coal-derived asphalt road
- This is a parallel project to the pyrolysis demonstration also at the Wyoming Innovation Center that produces a coal char used for soil amendment and construction materials (including bricks)

* Data is from the report *Asphalt Binder Market Assessment* Commissioned by Alberta Innovates, February 2021

**Deliverables from $17 million request**

- Demonstrate the solvent extraction process at a scale large enough to collect engineering data
- Produce sufficient amounts of solvent extract (asphalt binder) to demonstrate product performance
- Use coal-derived asphalt binder to construct a test road to demonstrate the product under real-world conditions

**Deliverables from successful commercialization**

- Incremental coal production: At 10% US market penetration, this would result in 3.6 million tons Wyoming coal/year
- Increased sales tax if solvent extraction system is built in Wyoming
- Licensing revenue to the University of Wyoming from intellectual property
- Local, stable source of binder for WYDOT

University of Wyoming
School of Energy Resources
Center for Carbon Capture and Conversion

## FUTURE OUTLOOK

SER and our collaborators believe this technology can progress to commercialization due to favorable circumstances and outcomes:

- Costs for the coal-derived asphalt binder are competitive with current prices
- There is a need for new feedstock for binder
- The total greenhouse gas emissions for coal-derived asphalt binder are lower, which may help with access to markets
- Due to Wyoming's low-sulfur coal, the emissions from laying asphalt can be lower than conventional asphalt

## SCHEDULE TO COMMERCIALIZATION

| Fiscal Year | FY24 | | | | FY25 | | | | FY26 | | | | FY27 | | | | FY28 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calendar Year | 2023 | 2024 | | | | 2025 | | | | 2026 | | | | 2027 | | | | 2028 |
| Calendar Year Quarter | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 |
| Solvent Extraction (SE) Pilot Plant Scale Up Construction | | | | | | | | | | | | | | | | | | | |
| Solvent Extraction Start Up and Commissioning | | | | | | | | | | | | | | | | | | | |
| Recycle Optimization on Pilot Plant | | | | | | | | | | | | | | | | | | | |
| Production Runs for SE Pilot Plant | | | | | | | | | | | | | | | | | | | |
| Coal Asphalt Binder Performance Validation/ Optimization in Light of Specifications | | | | | | | | | | | | | | | | | | | |
| Detailed Engineering for SE Field Demonstration Plant in Gillette | | | | | | | | | | | | | | | | | | | |
| Procurement and Construction for SE Field Demonstration Plant in Gillette | | | | | | | | | | | | | | | | | | | |
| Coal Asphalt Binder Production | | | | | | | | | | | | | | | | | | | |
| Pre-construction and Construction Phase of Test Section Including Field Testing of Coal to Asphalt Road | | | | | | | | | | | | | | | | | | | |
| Follow Up Field Performance Testing | | | | | | | | | | | | | | | | | | | |

Work already funded  Work to be completed with requested funding

## WYOMING COLLABORATORS

Wyoming Innovation Center by Energy Capital Economic Development

- Demonstration will occur at the Wyoming Innovation Center administered by Energy Capital Economic Development in Campbell County

Western Research Institute

- Western Research Institute has globally-recognized expertise in asphalt production and is a partner in the technology development

Wyoming Department of Transportation

- Wyoming Department of Transportation is supporting SER in understanding the business case and will be consulted throughout the process, including building the demonstration road