

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

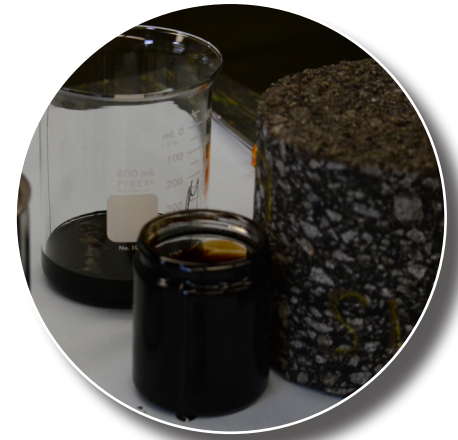
- Incremental coal production: At 10% US market penetration, this would result in 3.6 million tons Wyoming coal/year
- Increased sales tax if solvent extraction system is built in Wyoming
- Licensing revenue to the University of Wyoming from intellectual property
- Local, stable source of binder for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



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	Work already funded																		
Solvent Extraction Start Up and Commissioning		Work already funded																	
Recycle Optimization on Pilot Plant		Work already funded																	
Production Runs for SE Pilot Plant		Work already funded																	
Coal Asphalt Binder Performance Validation/ Optimization in Light of Specifications		Work already funded																	
Detailed Engineering for SE Field Demonstration Plant in Gillette		Work already funded																	
Procurement and Construction for SE Field Demonstration Plant in Gillette						Work to be completed with requested funding													
Coal Asphalt Binder Production										Work to be completed with requested funding									
Pre-construction and Construction Phase of Test Section Including Field Testing of Coal to Asphalt Road										Work to be completed with requested funding									
Follow Up Field Performance Testing														Work to be completed with requested funding					

Work already funded Work to be completed with requested funding

WYOMING COLLABORATORS



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



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



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



School of Energy Resources
Center for Carbon Capture and Conversion



uwyo.edu/ser