



Energy & Environmental Research Center (EERC)

State Energy Research Center (SERC) – Discussion of Follow-on Funding

Presented to the Senate Energy and Natural Resources Committee
January 20, 2023

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COO and VP for Intellectual Property

SERC ACCOMPLISHMENTS

\$21 Million in
Other Proposals

\$9 Million in
Pending Proposals

\$6 Million in
Other Awards

Nearly **60**
Energy Hawks from
5 Higher Education
Institutions

50 Projects
Focused on ND Energy

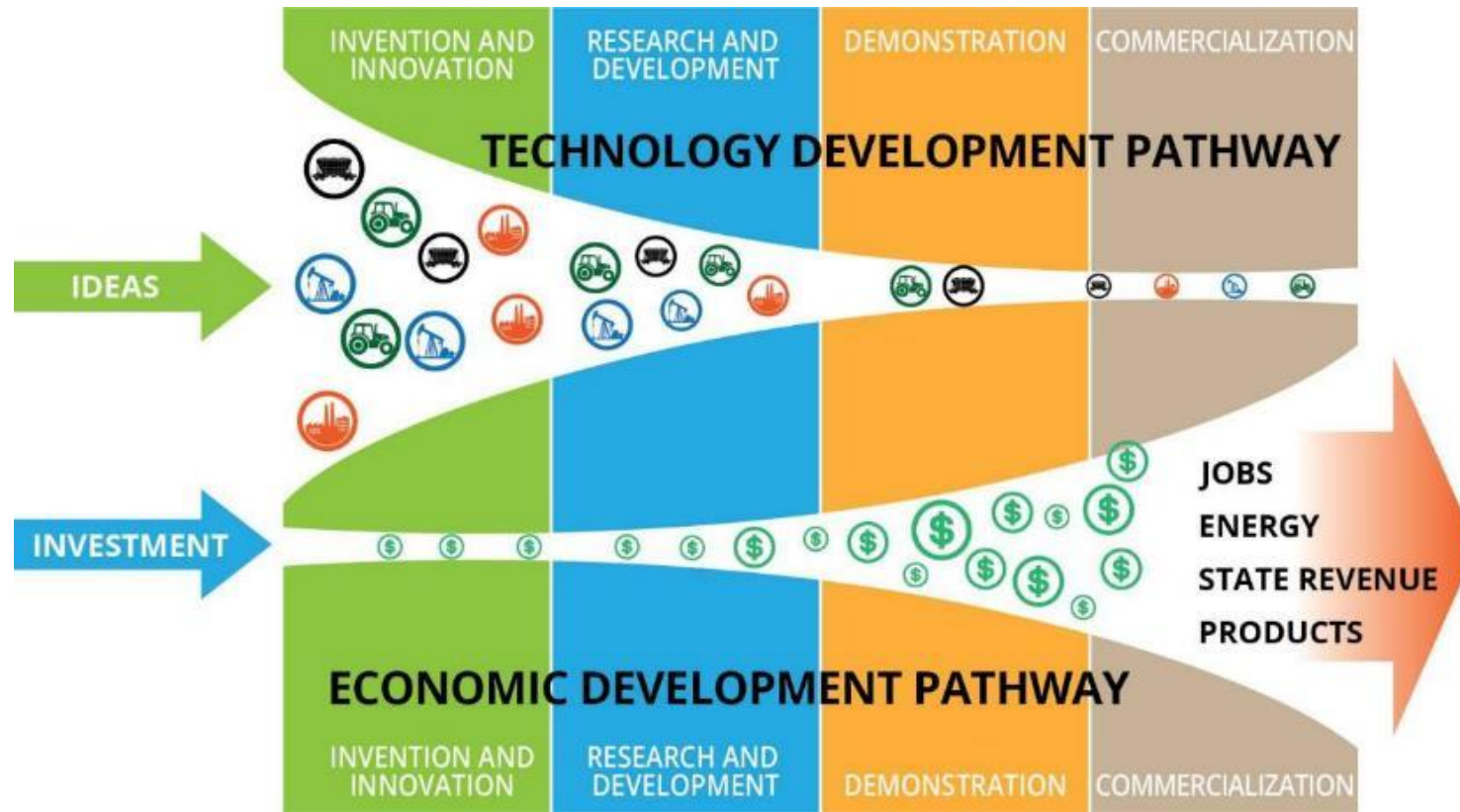
3 Federal Opportunities
Pursued for the State – Grid,
Hydrogen, Direct Air Capture

13 Invention
Disclosures

8 Patent
Applications

3 Patents
Granted

GENERAL Distribution of Federal Funding for Energy Research



As a nonprofit, 100% of all revenue received by the EERC is spent conducting the research we are contracted to do.

100% Federal, State, University	80-90% Federal	20-50% Federal	100% Non Federal
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5-10 % of EERC Workload

60-70 % of EERC Workload

20-35 % of
EERC Workload

GRAPHENE/GRAPHITE

- SERC funded
 - Evaluation of high-value solid carbon products from North Dakota lignite - **\$200,000**
 - Evaluation of graphene-enhanced low-viscosity engine oil for automotive, aerospace, and unmanned aerial vehicle applications - **\$192,000** (Currently underway)
- Led to two funded projects to advance the technology:
 - Federal proposal awarded for laboratory-scale graphene production –Total Funding **\$931,000** (DOE - \$744,00, NDIC LRC \$162,500, North American Coal - \$25,000)
 - Advanced Processing of Coal and Coal Waste for Anodes in Fast Charging Batteries - Total Funding **\$1.45 million** (\$1.0 million DOE, \$0.5 Million NDIC LRC, \$45,000 North American Coal) –

CO2 Removal/Precipitation Technology

- SERC Funded:
 - Developing Value from North Dakota Geologic Brines - **\$60,000**
- Follow-On Funding
 - ARPA-E, Total Funding **\$500,000 DOE** (100% DOE)
- Two additional proposals submitted
 - **Total Funding \$600,000: \$500,000 DOE, Talos Energy - \$100,000**
 - **Total Funding \$250,000: \$250,000 DOE, Talos Energy - \$50,000**

Project Title	PI(s)	Proposal Sponsor(s)	Proposed \$	Awarded \$
Novel Concepts in Support of Lignite Coal	Jivan Thakare	DOE	\$187,500	\$187,500
Solvent Extraction of Rare Earth Elements from Lignite Coal In-Situ Bench-Scale Extraction of Rare Earth Elements from Lignite Coal Ash	Bruce Folkedahl, Ian Feole	DOE (\$1,579,000 with \$337,924 for UND IES) NDIC (\$750,000) NACC (\$75,000) BNI (\$75,000) Minnkota (\$25,000) BEPC (\$25,000)	\$2,529,000	\$2,529,000
Evaluation of High-Value Solid Carbon Products from ND Lignite	Alex Azenkeng	DOE (\$744,064) NDIC (\$162,500) NACC (\$25,000)	\$931,564	\$931,564
Evaluation of High-Value Solid Carbon Products from ND Lignite	Alex Azenkeng	DOE (\$1,000,000) NDIC (\$500,000) NACC (\$45,000)	\$1,545,000	\$1,545,000
Developing Value in North Dakota's Produced Geologic Brines	Chris Martin	DOE, ARPA-E (\$500,000)	\$500,000	\$500,000
Hosting Capacity Analysis for Improved Planning and Operations of North Dakota Distribution Networks	Daisy Selvaraj	NDIC (\$75,000)	\$75,000	\$75,000
Examination of In-situ Hydrogen Conversion in Oil Reservoirs	Lu Jin	DOE (\$1,500,000) Turning Point Power (\$353,907) CMG (\$21,093)	\$1,875,000	
Polar Bear – Robust Adaptive Technology to Economically Capture Flared Gas in North Dakota	Darren Schmidt	DOE (\$1,000,000) NDIC (\$250,000)	\$1,250,000	
Low-Density Proppants from Low-Alumina Clays and Lignite Fly Ash	Bruce Folkedahl	DOE through Univ. of Utah (FORGE) (2,106,080) NDIC - LRP (125,000)	\$2,231,080	
300PEE for NH3	Ted Aulich	DOE (3,000,000) NDIC (500,000) Commercial partner (306,462)	\$3,806,462	
A Computational Approach to Facilitate Efficient Extraction and Isolation of PGMs (platinum group metals) and REEs (rare-earth elements)	Alex Azenkeng	DOE (\$1,041,698 with \$399,358 going to UND chemistry)	\$1,041,698	\$0
ND Wind Turbine Blade Recycling	Josh Strege	REMADE Institute, DOE flow through (\$273,593) NDIC (\$250,000) BNI (\$12,500) Allete Clean Energy (\$12,500)	\$548,593	\$0
ND Wind Turbine Blade Recycling	Josh Strege	DOE, EERE (\$800,000 with \$3,277 to UND Chemistry) NDIC (\$200,000) Allete Clean Energy (\$23,594)	\$1,023,594	\$0
Developing Value in North Dakota's Produced Geologic Brines	Chris Martin	DOE, ARPA-E (\$449,970) this is an add-on to 2020-0232	\$449,970	\$0
Developing Value in North Dakota's Produced Geologic Brines	Chris Martin	DOE, CO2 SolventRegen (\$1,250,000)	\$1,250,000	\$0
Waste Utilization for Bio-Based Alternatives to Chemicals and Fuels	Jasmine Oleksik	DOE, EERE, BETO (\$1,350,000) NDIC (\$562,500 with \$62,500 coming from SERC)	\$1,912,500	\$0

Big Picture Return on Investment – Past/Current Examples

- Lignite Utilization
 - \$Million on fundamental research understanding how lignite reacts/burns
 - Tens of \$Million on research and development for lignite utilization
 - Impact to the state - \$Billions
- Bakken Development
 - \$Millions on fundamental research understanding bakken and the associated by-products
 - Tens of \$Millions on research and development to enhance production and overcome issues
 - Impact to the state - \$Billions
- Carbon Capture and Utilization
 - Tens of \$Million on fundamental research understanding how to capture and store CO₂
 - Hundreds of \$Million on research and development for CO₂ capture and storage
 - Impact to the state - \$Billions

SUMMARY

- SERC has reignited invention and innovation by EERC researchers leading to:
 - New energy technologies for
 - Additional nonstate funding in
 - Technology demonstrations in
 - Student experiences across
- Removing the sunset clause will allow SERC to continue to do the same with certainty.
- Increased funding will be used effectively for even greater results.

North Dakota!



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A wide-angle photograph of a university campus at sunset. The sun is low on the horizon, casting a warm glow over the scene. In the foreground, there are large trees with some yellowing leaves. In the background, there are several large, multi-story brick buildings, likely university halls or administrative buildings. A parking lot with several cars is visible in the middle ground.

THANK YOU

Critical Challenges. Practical Solutions.