



Energy & Environmental Research Center (EERC)

State Energy Research Center (SERC) – Driving North Dakota's Energy Future

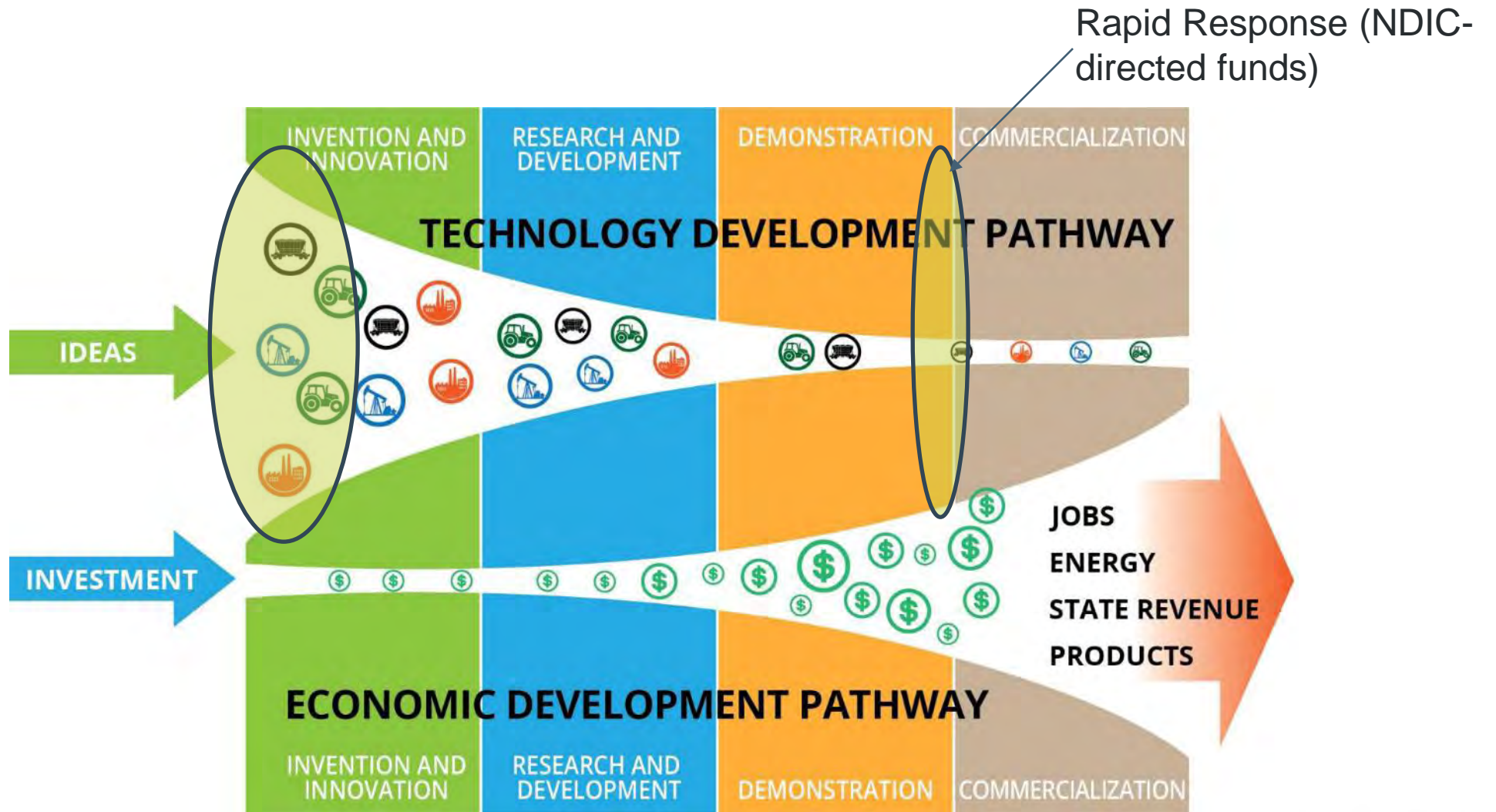
Presented to the Senate Energy and Natural Resources Committee
January 5, 2023

Tom Erickson
COO and VP for Intellectual Property

SERC FOCUS AREAS

- Exploratory energy research
 - Explore fundamental, transformational ideas to shape the future energy portfolio of North Dakota.
- Rapid response to critical North Dakota issues
 - At the request of the North Dakota Industrial Commission (NDIC), conduct research to address emerging issues.
- Education and outreach
 - Provide opportunities for all ages and demographics to learn about North Dakota energy – not academic.
- \$5 million/biennium (currently has a sunset clause in 2027)
- Funded through an NDIC contract, with reporting requirements to NDIC and the interim Energy Development and Transmission Committee (EDTC)

FOCUS OF SERC



SUMMARY OF SERC TO DATE

\$15 Million in
Other 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

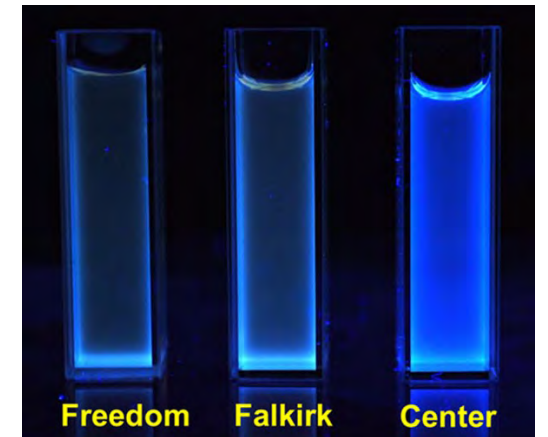
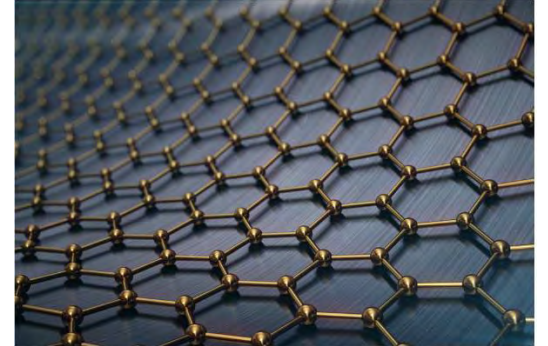
12 Invention
Disclosures

8 Patent
Applications

3 Patents
Granted

GRAPHENE/GRAPHITE

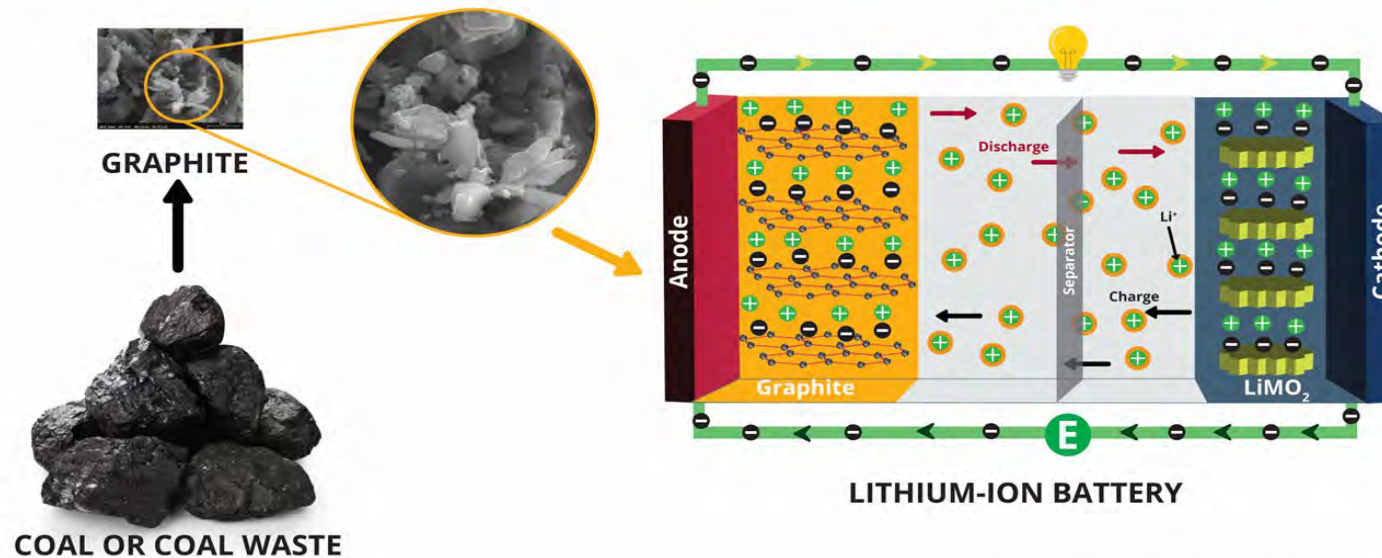
- SERC funded
 - Evaluation of high-value solid carbon products from North Dakota lignite
 - Evaluation of graphene-enhanced low-viscosity engine oil for automotive, aerospace, and unmanned aerial vehicle applications
- Led to:
 - Federal proposal awarded for laboratory-scale graphene production: \$930,000
 - Additional proposal awarded to use North Dakota lignite to produce graphite for lithium battery anodes: \$1 million plus cost share



PROJECT OVERVIEW: OBJECTIVE AND DURATION

The overall objective is to validate an approach to make high-grade graphite from North Dakota lignite and lignite coal waste and to fabricate and test a fast-chargeable lithium-ion battery anode prototype made from the produced graphite.

Project Duration: 36 months, April 2022 – March 2025



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PROJECT OVERVIEW: FUNDING AND PARTNERS



U.S. DEPARTMENT OF
ENERGY



NATIONAL
ENERGY
TECHNOLOGY
LABORATORY

\$1,000,000



Lignite

Energy Council

\$500,000



\$45,000



UNIVERSITY OF
NORTH DAKOTA



Total Funding = \$1,545,000

RARE-EARTH ELEMENTS

- SERC funded
 - Recovery of REEs from coal ash
 - Quantifying REEs in coal seams and shale
 - Electrochemical extraction of REEs from coal and produced water
 - Tunable electrochemical extraction for purification of REEs and CM
- Led to:
 - Williston Basin CORE-CM: \$1.5 million federal funding with additional cost share from Lignite Research Program, North American Coal, BNI, Basin Electric Cooperative, and Minnkota Power

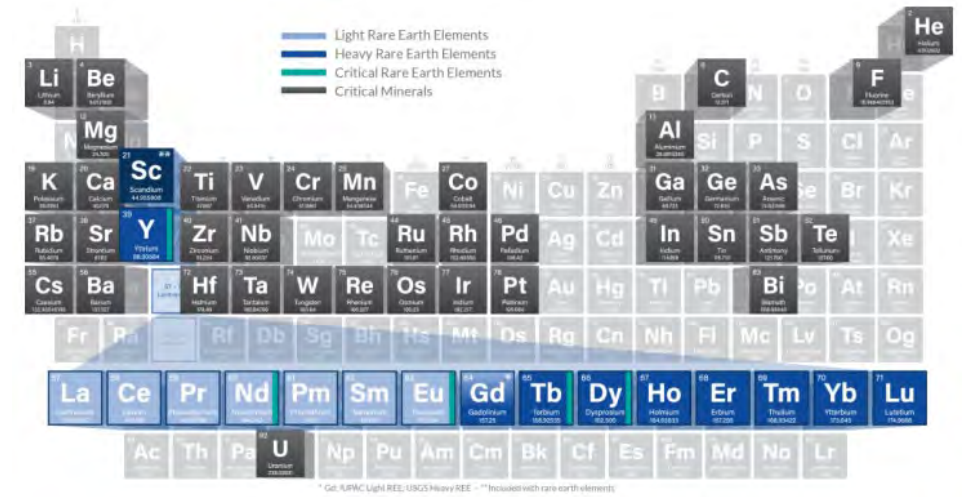
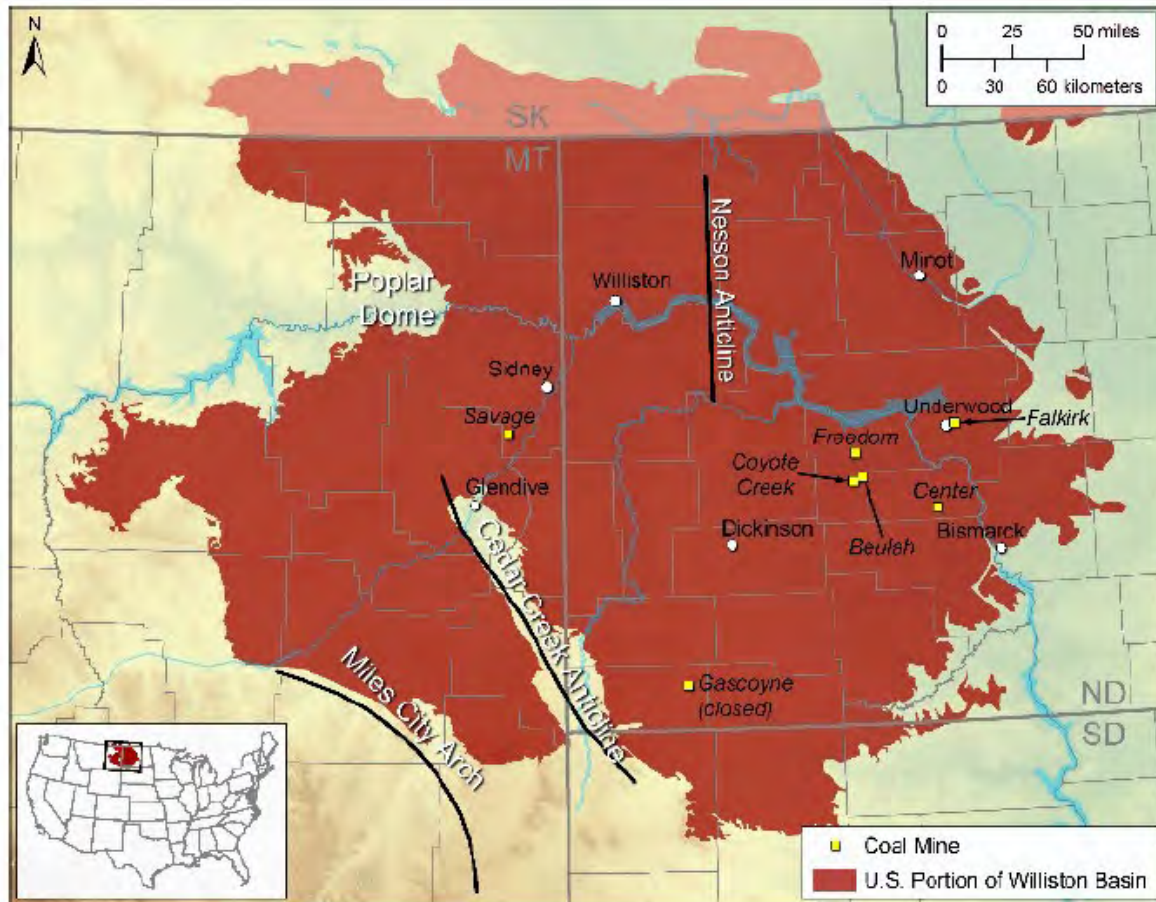


Image Credit: DOE NETL

WILLISTON BASIN CORE-CM INITIATIVE



- 1) Assess the existing information available for resource characterization, waste streams, and technologies and identify options for business development, innovation centers, and stakeholder engagement.
- 2) Identify the gaps where additional research and technology development are necessary.
- 3) Create a series of plans to provide a pathway for future development.
- 4) Initiate stakeholder engagement.

WILLISTON BASIN CORE-CM PROJECT TEAM

	Mining	Coal Utilities	Research/ Academic Institutions/ Mining Schools	State Geological Surveys	Mineral Processing	Manufacturing	Business/ Financial	CORE-CM Cooperation
Core Research Team								
UND Energy & Environmental Research Center			X					
UND Institute for Energy Studies			X					
UND Nistler College of Business & Public Administration			X					
Pacific Northwest National Laboratory			X				X	
North Dakota State University			X				X	
Montana Tech University			X					
Critical Materials Institute (Ames)					X			
Project Partners								
NDIC Lignite Research Program	X	X					X	
North American Coal	X				X			
BNI Energy	X	X						
Minnkota		X						
Basin Electric Cooperative		X						
Current Lighting Solutions					X	X		
Northrup Grumman						X		
General Atomics					X	X		
North Dakota Geological Survey				X				
South Dakota Geological Survey				X				
North Dakota Department of Commerce							X	
Semplastics					X	X		
Lignite Energy Council	X	X						
Western Dakota Energy Association	X	X				X	X	
North Dakota Governor's Office				X			X	
U.S. Geological Survey				X				
Wyoming School of Energy Resources CORE-CM Team								X
Illinois Geological Survey CORE-CM Team								X
U of Alaska CORE-CM Team								X
U of Utah CORE-CM Team								X

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ZERO EMISSIONS FROM WELL PADS

- SERC funded
 - Robust adaptive technology to economically capture flare gas
- Note: Additional work also done through OGRP (BPOP project)

Led to:

- First commercial prototype planned within the next few months
- Joint development agreement with Steffes Corporation
- Recent federal proposal submitted for \$1 million to expedite commercial development and deployment



STATE-LEVEL PROPOSAL DEVELOPMENT



- Formula grant for transmission reliability
 - submitted October 2022
 - \$3.7 million/year for 5 years
- Heartland Hydrogen Hub – submitted concept paper November 2022
 - Anticipated April submission of full proposal for up to \$1.25 billion of federal funding (with at least 50:50 cost share)
- Direct air capture hub – TBD, in preparation
- Other opportunities being considered

ENERGY HAWKS – CONCEPT

- Bring together a diverse group of college students and immerse them in all things North Dakota energy, resulting in the following:
 - A new perspective on the energy research needs for North Dakota
 - Future energy leaders
 - Knowledgeable North Dakota energy advocates/peers
 - Knowledgeable voters (North Dakota and beyond) on topics affecting energy



EDUCATION AND OUTREACH – ENERGY HAWKS

- Up to 14 students from multiple institutions of higher education are selected to participate.
- Immerse them in all things North Dakota energy, including a full week “out west.”
- Students develop a series of collaborative research white papers on topics of their choice.



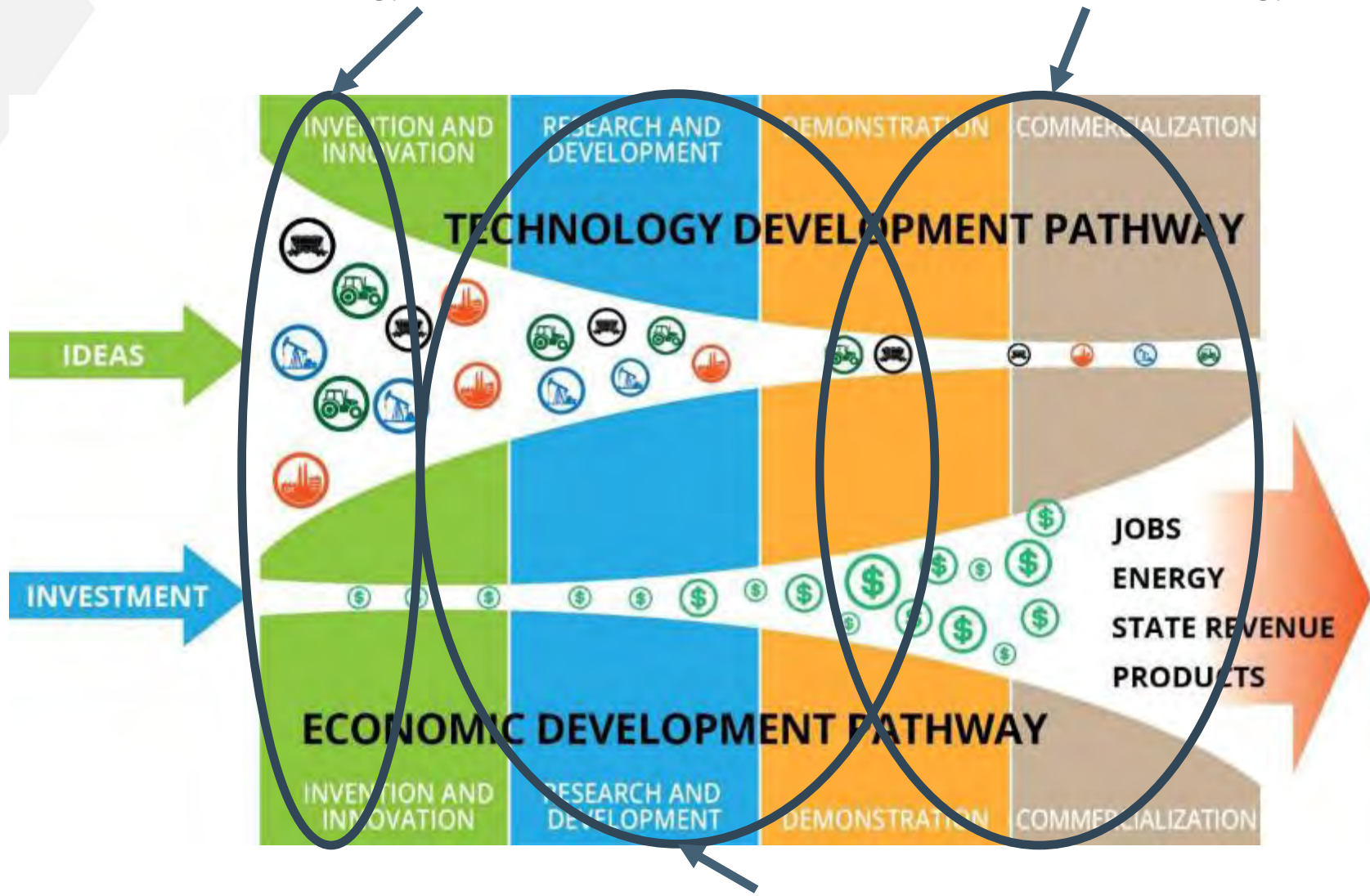
SUMMARY

- SERC has reignited invention and innovation by EERC researchers leading to
 - New energy technologies for
 - Additional federal funding in
 - Technology demonstrations in
 - Student experiences across

North Dakota!

State Energy Research Center

Clean Sustainable Energy Authority



Lignite, Oil and Gas, Renewable
Research Programs, and Legislatively Directed Projects



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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 yellowing leaves. In the background, there are several large, multi-story brick buildings and a parking lot filled with cars.

THANK YOU

Critical Challenges. Practical Solutions.