



**PennState**

# Consortium to Assess Northern Appalachian Resource Yield (CANARY) of CORE-CM for Advanced Materials

**Sarma Pisupati**

Principal Investigator and Director of CANARY

[sxp17@psu.edu](mailto:sxp17@psu.edu)

**Barbara Arnold**

Co-Principal Investigator and Managing Director of CANARY

[bj4@psu.edu](mailto:bj4@psu.edu)

**US EA Division of Critical Minerals Program Plan Rollout**

**December 2, 2021**



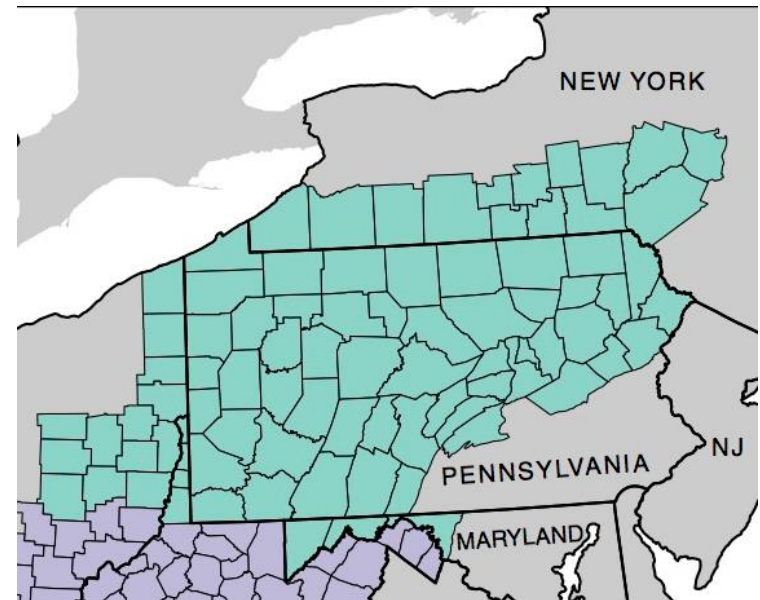
# CANARY's Mission and Goals

CANARY's mission is to

- Develop plans for regional growth and job creation related to CORE-CM for domestic production to sustain the development of an advanced, technology-driven society

Goal is to

- Evaluate the carbon ore, rare earth element, and critical mineral (CORE-CM) production potential of the **Northern Appalachian (NA) basin** covering **MD, OH, PA, and WV.**



# CANARY Partners / Members

- **Penn State (LEAD)**

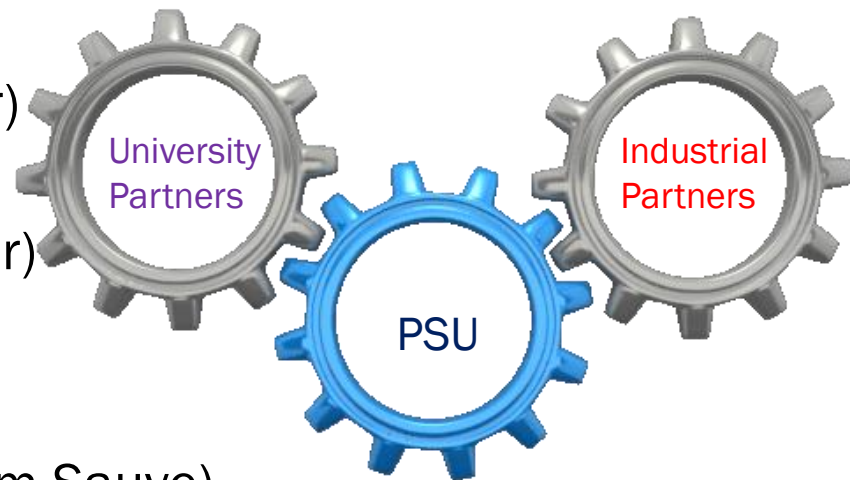
- Sarma Pisupati (PI and Director)
- Barbara Arnold (Co PI and Managing Director)

- **University Partners**

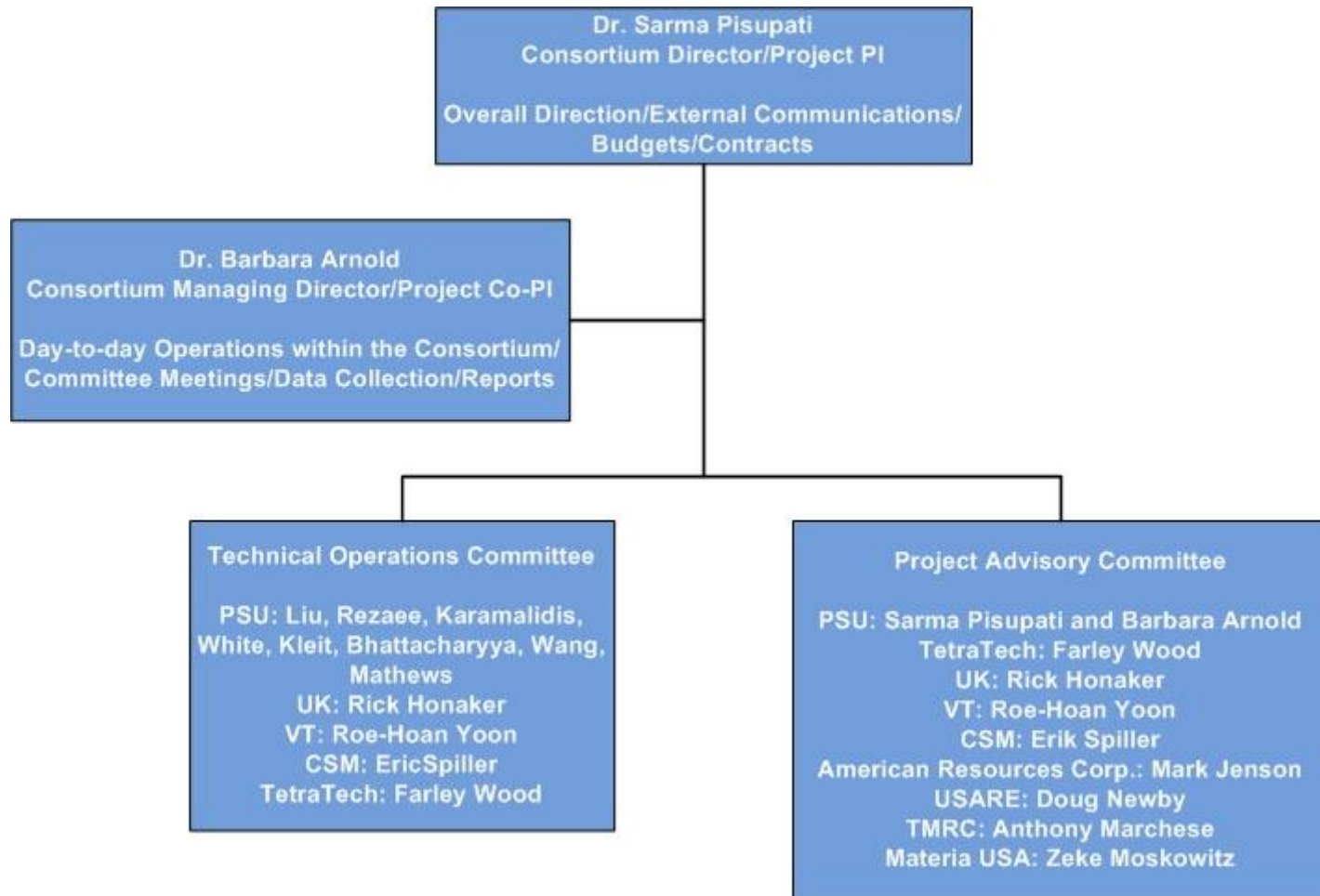
- University of Kentucky (Rick Honaker)
- Virginia Tech (Roe-Hoan Yoon)
- Colorado School of Mines (Erik Spiller)

- **Industrial Partners**

- Tetra Tech (Farley Wood)
- American Resources Corporation (Tom Sauve)
- Materia USA (Zeke Moskowitz)
- Texas Mineral Resources Corp. (Anthony Marchese)
- USA Rare Earths (Douglas Newby)



# CANARY Organizational Chart



# CORE CM Program Key Pieces

1. **Assess and catalog** NA basin CORE-CM resources including **NA basin waste streams** and **develop strategies** to recover CORE-CM from these streams;
2. **Assess the infrastructure, industries, and businesses** in the NA basin to **determine CORE-CM supply chain gaps and technology gaps** related to coal-derived carbon, REE, and CM production; and
3. **Formulate** plans for **Technology Innovation Centers** and develop additional stakeholder outreach and engagement.



# Assessment Plan

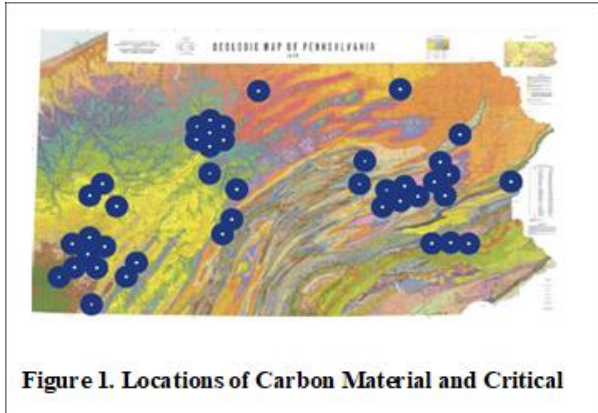
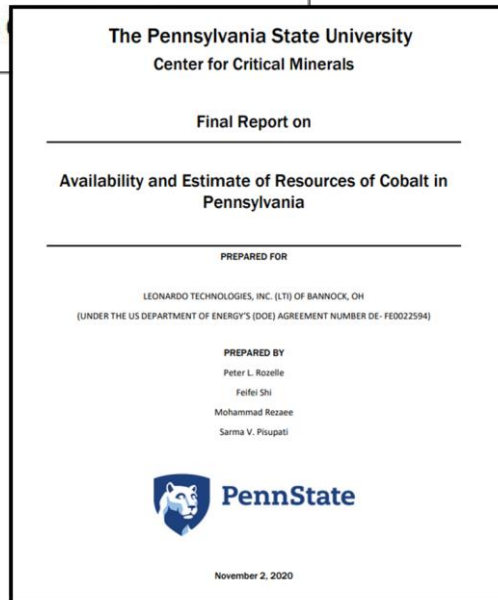


Figure 1. Locations of Carbon Material and Critical Mineral Companies in PA



- The resource characterization includes all the public domain data available under the resource categories and the use of data visualization and optimized GIS-based resource mapping to provide an optimized resource assessment.
- Penn State will add additional information from its in-house coal database, additional coal refuse and metallurgical byproduct inventories and analyses, and data from research in the region involving power plant ash
- Expand database to the entire basin

# Stakeholders Engagement and Investment

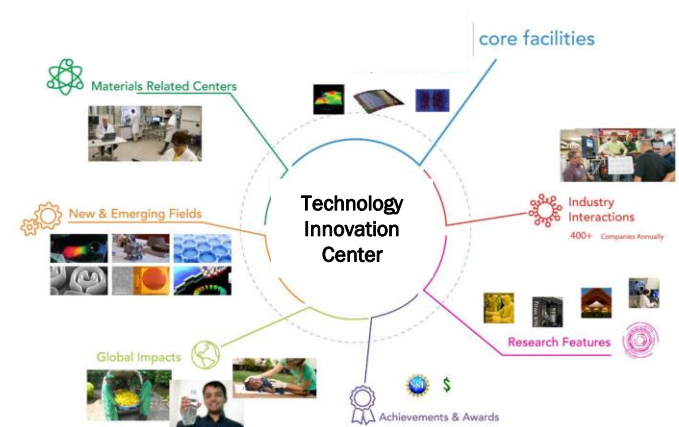
- **Current Penn State's Power and Mineral Industrial Stakeholders Group (PMISG) includes mining, equipment, engineering and environmental, and transportation companies, as well as landowners and has been meeting since 2017.**
- **PA Economic Development & Workforce specialists**
- **Quehanna Industrial Development Corporation**
- **PMISG and industrial members from US Carbon HUB in PA**

**Organize biannual Outreach workshops in Central PA to promote Stakeholder Outreach and Education activities**



# Technology Innovation Center's Vision

- **Develop and operate by a basin-specific public-private partnership, built around Penn State and its partners.**
  - **The Technology Innovation Center(s) will provide a centralized and consistent platform to develop and validate CORE-CM technologies at laboratory-scale, including technologies that utilize advanced manufacturing techniques.**
  - **The center(s) will also have an ongoing focus on the geological and mineralogical work of the NA coal measures to identify new carbon products and critical mineral opportunities.**





# Regional Importance and Benefits

- **Catalyze regional growth and job creation** related to CORE-CM for domestic production of these critical components.
- Re-mine and Reclaim Abandoned Mined Lands
- Remediate Acid Mine Drainage
- Reclaim Mineral Processing and Metallurgical Waste Dumps
- Address both **near- and longer-term challenges** facing coal-producing regions and research needs/opportunities.
- Assess and address the **needs and possibilities of value-added carbon products** from coal such as carbon fibers, foams, furnace electrodes, golf clubs, fishing rods, automotive applications, etc.

Resulting in the alleviation of the dramatic decrease in Coal mining employment in the NA region and Addressing environmental justice concerns



# Progress Update

- Convene a meeting of all the project partners and expanded Penn State Power and Mineral Industry Stakeholders Group meeting.
- Form Technical Operations Committees (TOC) for each Task, and
- Form Project Advisory Committee (PAC) consisting of one person from each project team member and up to four at-large members representing stakeholder companies



# Thank You!

