

# Illinois Basin (IB) Carbon Ore, Rare Earth, Critical Minerals (CORE-CM) Initiative



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USEA Consensus Webinar

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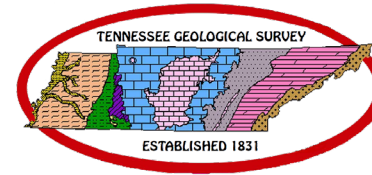


## **Illinois Basin CORE-CM Initiative Mission**

Expand and transform the use of coal and coal-based resources  
in and around the Illinois Basin  
to produce Rare Earth Elements (REE), Critical Minerals (CM) and  
novel high-value, nonfuel, Carbon-Based Products (CBP)



## Collaborators/Stakeholders



# Illinois Basin CORE-CM Task Lead Team

## ***Basinal Assessment of CORE-CM Resources***

- **Dr. Frank Delpomdor** – Sedimentologist, University of Illinois  
Illinois State Geological Survey



## ***Basinal Strategies for Reuse of Waste Streams***

- **Dr. Liliana Lefticariu** – Professor, Southern Illinois University



## ***Infrastructure Industries and Businesses***

- **Scott Elrick**–Coal Geologist and Head, University of Illinois  
Illinois State Geological Survey



## ***Technology Assessment, Development, and Field Testing***

- **Dr. Rick Honaker**–Mining Engineer, University of Kentucky



## ***Technology Innovation Center***

- **Dr. Yongqi Lu**– Chemical Engineer and Head, University of Illinois  
Illinois State Geological Survey

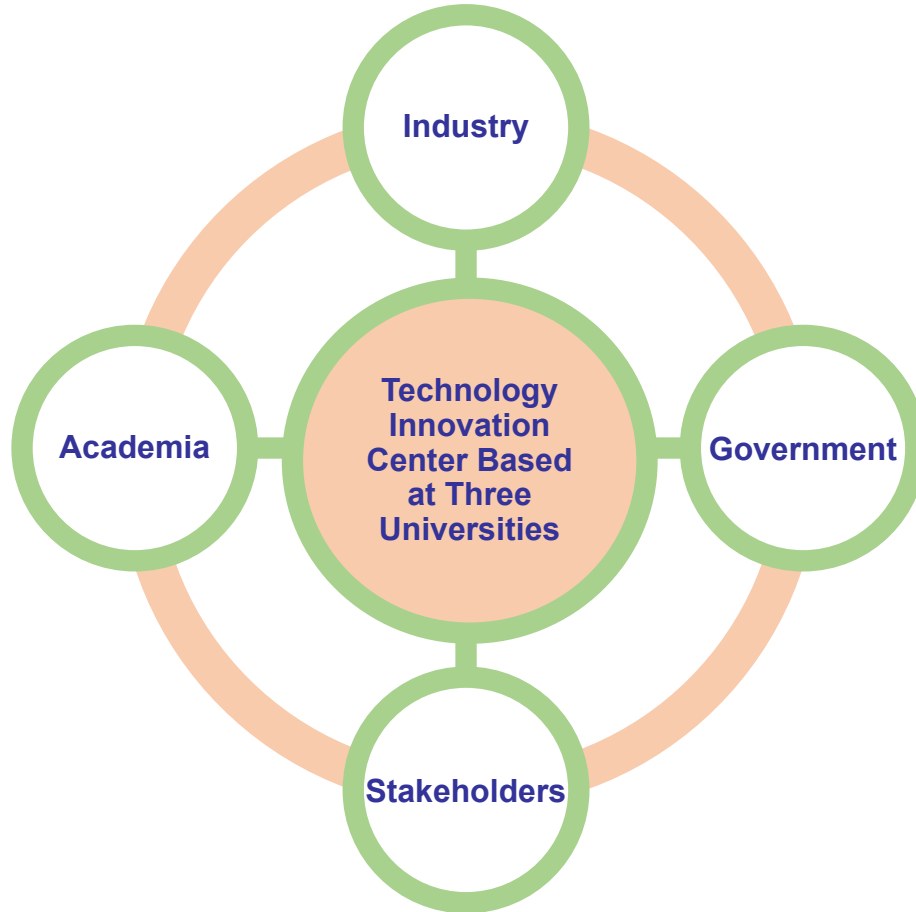


## ***Stake Holder Outreach and Education***

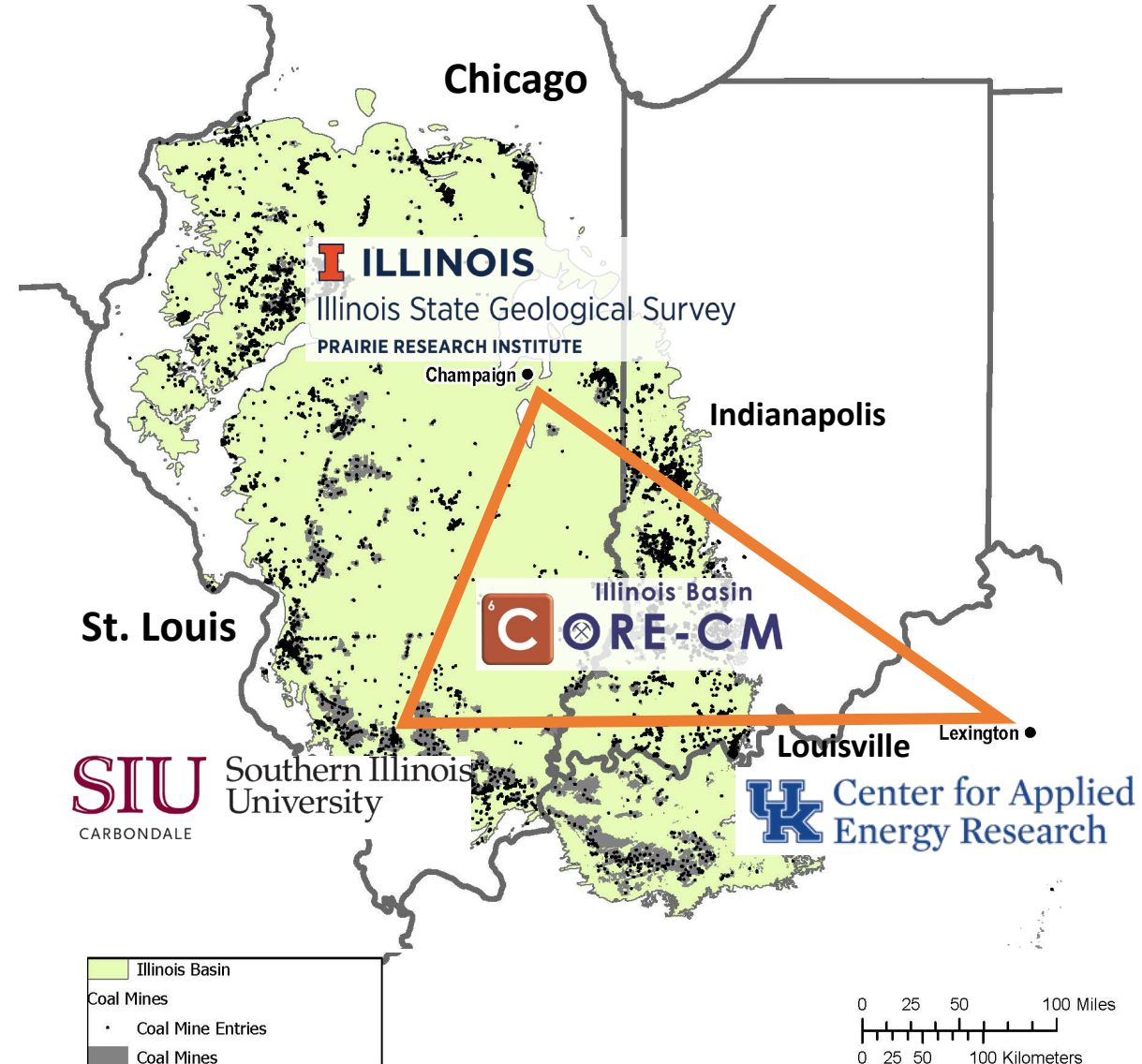
- **Dr. Sallie Greenberg**– Associate Director, Southern Illinois University  
Illinois State Geological Survey



# Technology Innovation Center(s)

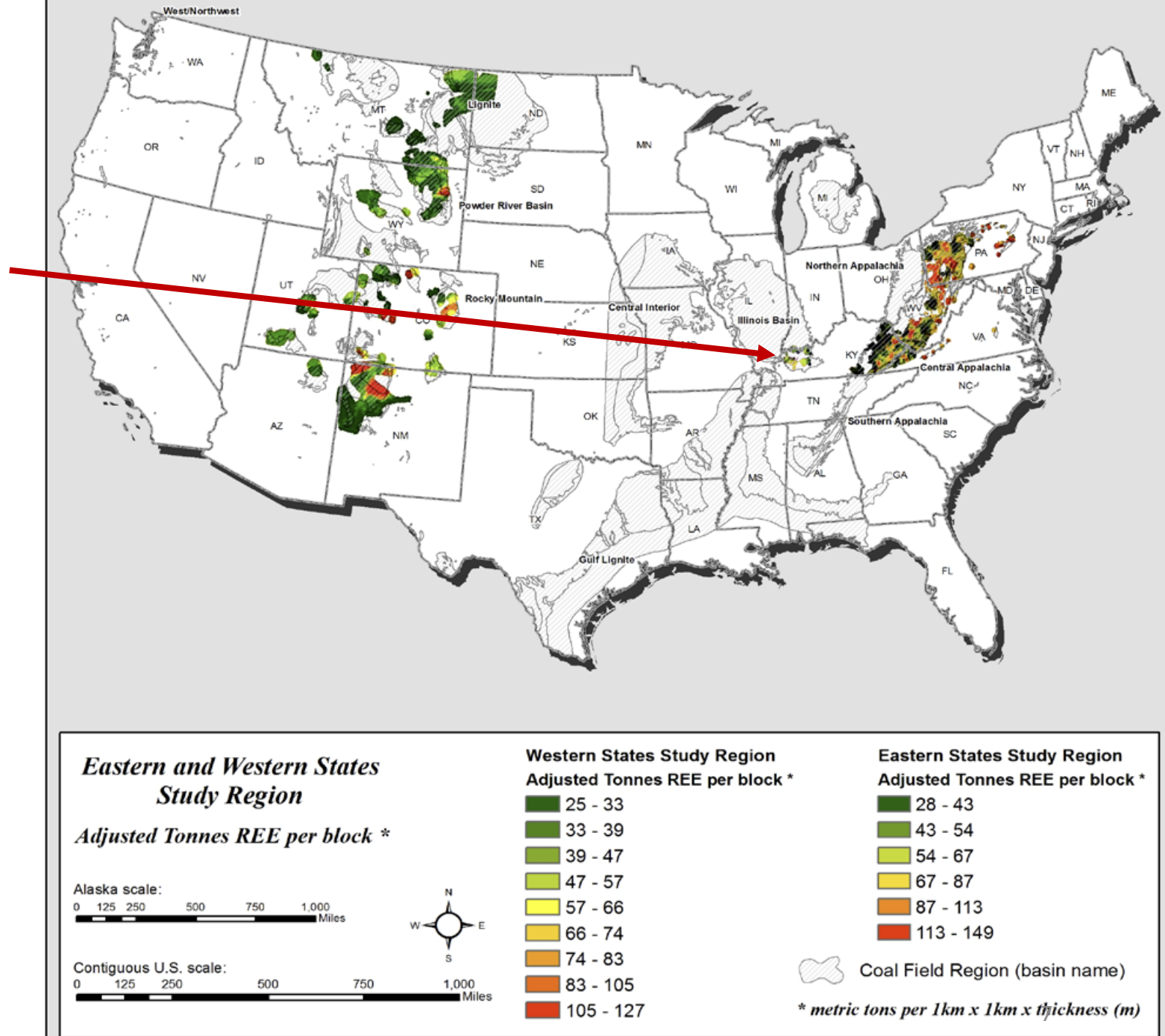


- Materials **Evaluation & Characterization**
- **Extraction & Purification** Technologies
- Product **Development**



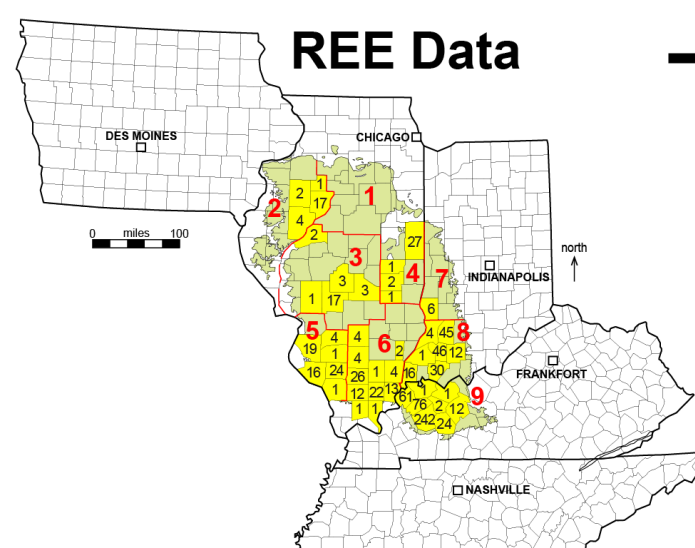
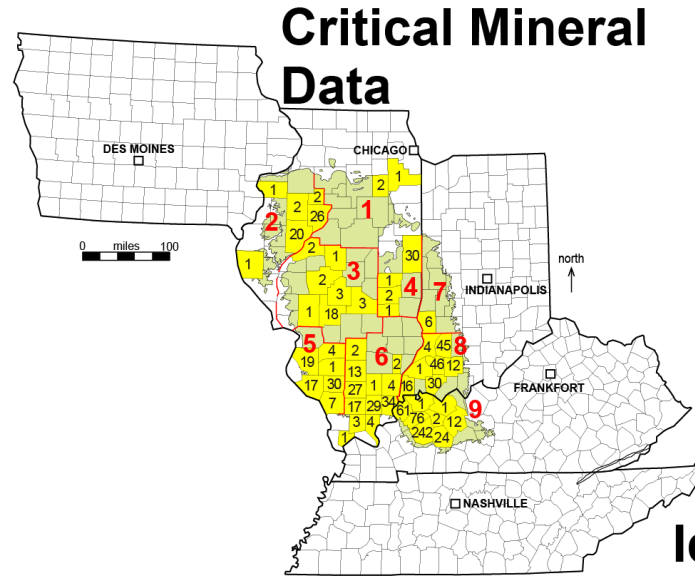
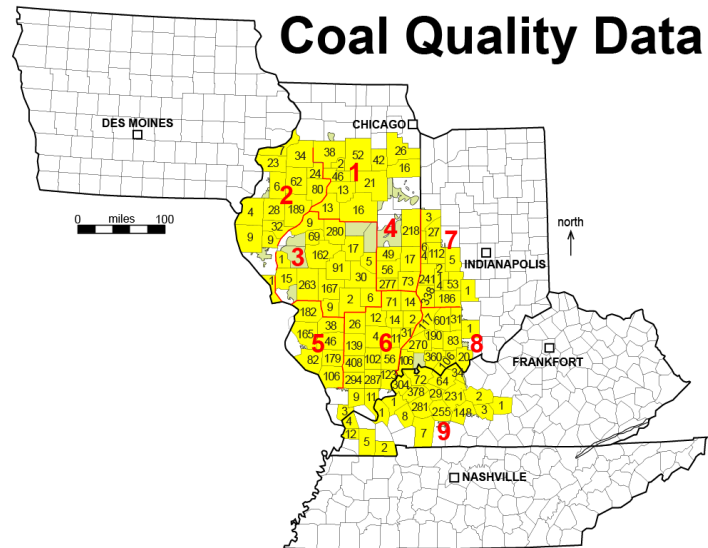
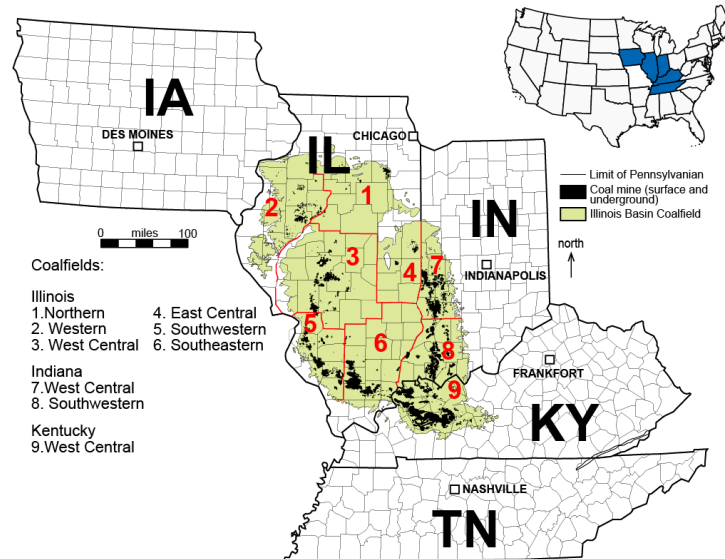
# REE Characterization in U.S. Coal

- Analyses of REE in Illinois Basin coal-based material is lacking compared to the Western and Eastern Coal Basins.
- In Illinois alone, 150 billion short tons of coal has been mined
- The Illinois Basin has abundant fly ash impoundments
- Geochemical characterization needed!

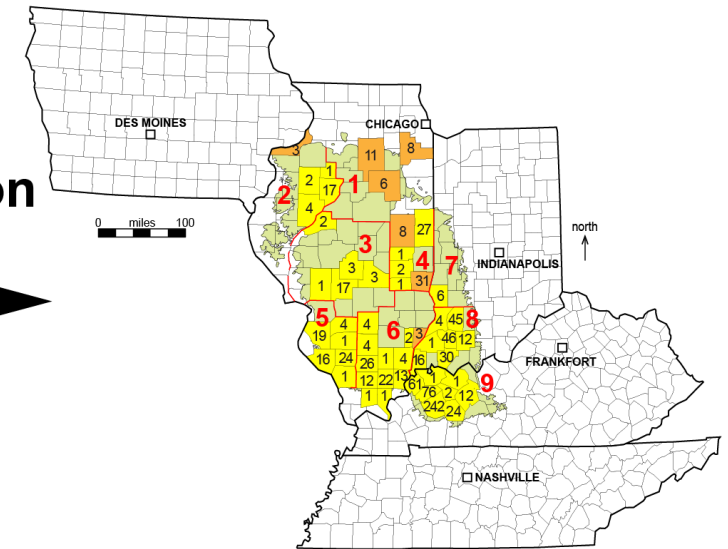




# Evaluation & Characterization



Identification  
of gaps





# CORE-CM Extraction Technologies

- Coal-based material is a relatively low-grade source.
- As such, heap leach is preferred as a 'cheap' option to minimize cost.
- Tank leaching is common for high grade sources.
- Bioleaching has the potential to selectively extract REEs and other critical elements directly from the solids and avoid/minimize contaminant recovery.

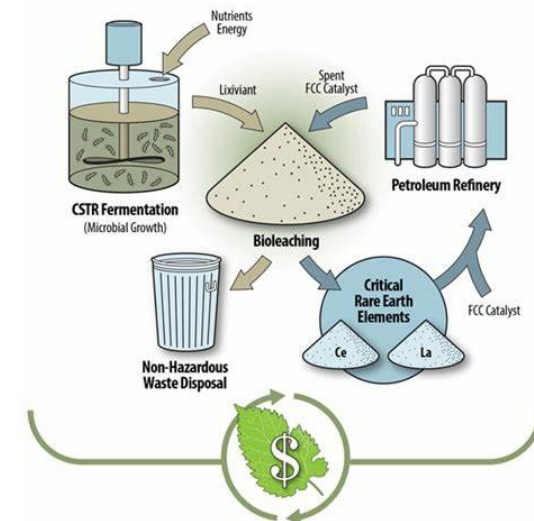
**Acid Leach Tank**



**Coarse Coal Refuse Bio-Assisted Leach Pad**

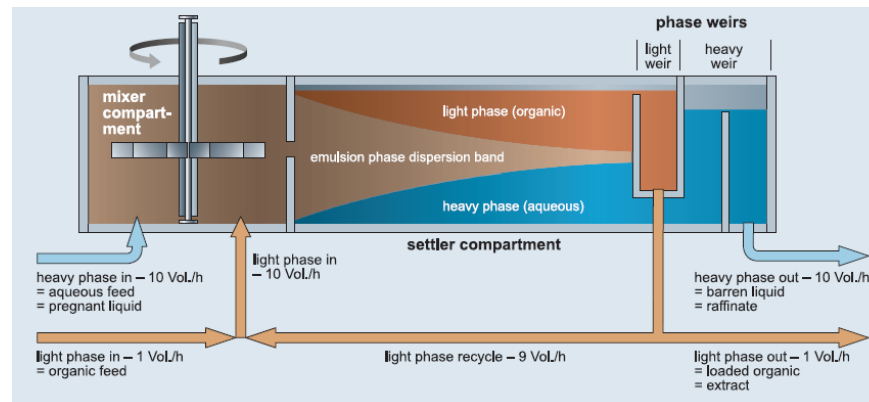


**Selective REE Bioleaching**

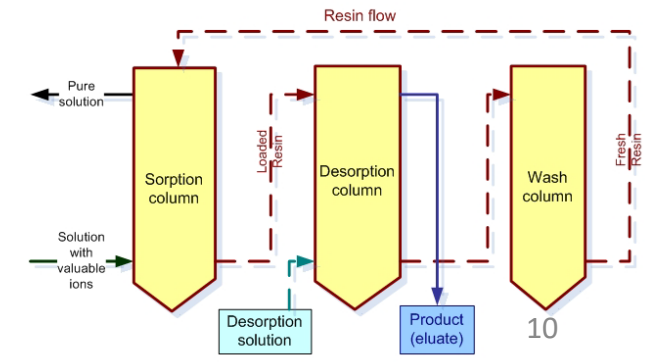


- SX is the most widely used technology
  - Requires 900 – 1000 mixer settlers to produce 16 individual REE products.
  - Environmental concerns
- Ion exchange is an alternative
- Emerging technologies:
  - Ion Chromatography
  - Membrane Separation
  - Molecular Recognition
  - Biofilm
  - Microbial Encapsulation

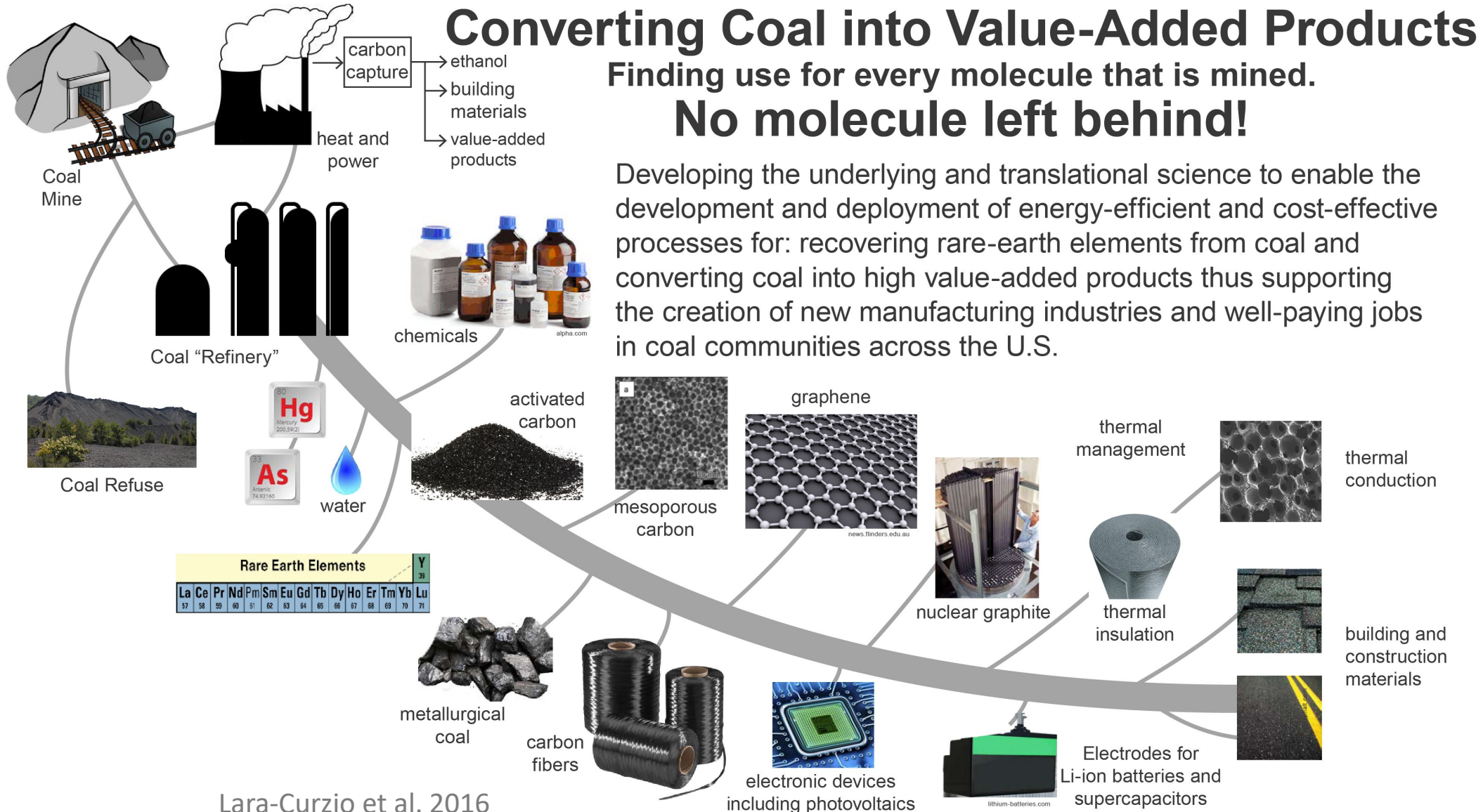
## Solvent Extraction (SX)



## Ion Exchange (IX)









# Why CORE-CM in the Illinois Basin?

- Centralized transportation hub to the US
- 3<sup>rd</sup> largest U.S. city in the region
- Enormous manufacturing footprint (i.e. Caterpillar, John Deere, Boeing, Ford Motor Co., Rivian)
- Abundant natural resources

