Gulf of Mexico CORE-CM Initiative

USEA CONSENSUS Webinar: Introduction to the Carbon Ore, Rare Earth, and Critical Minerals (CORE-CM) Initiative for U.S. Basins: Part Two

December 8 , 2021

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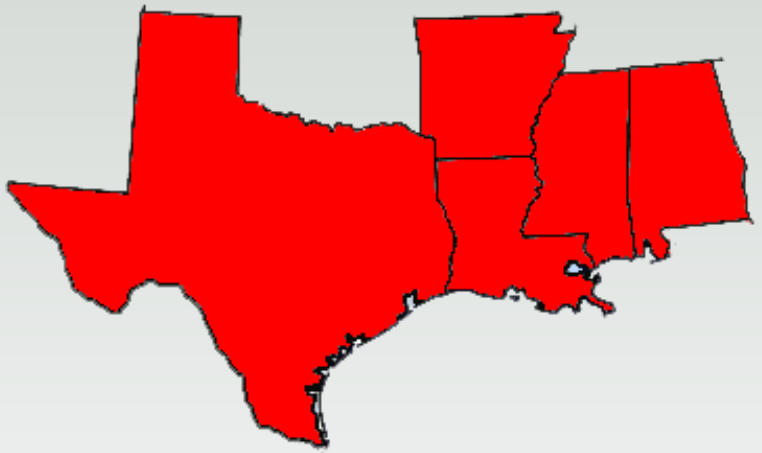
BUREAU OF ECONOMIC GEOLOGY

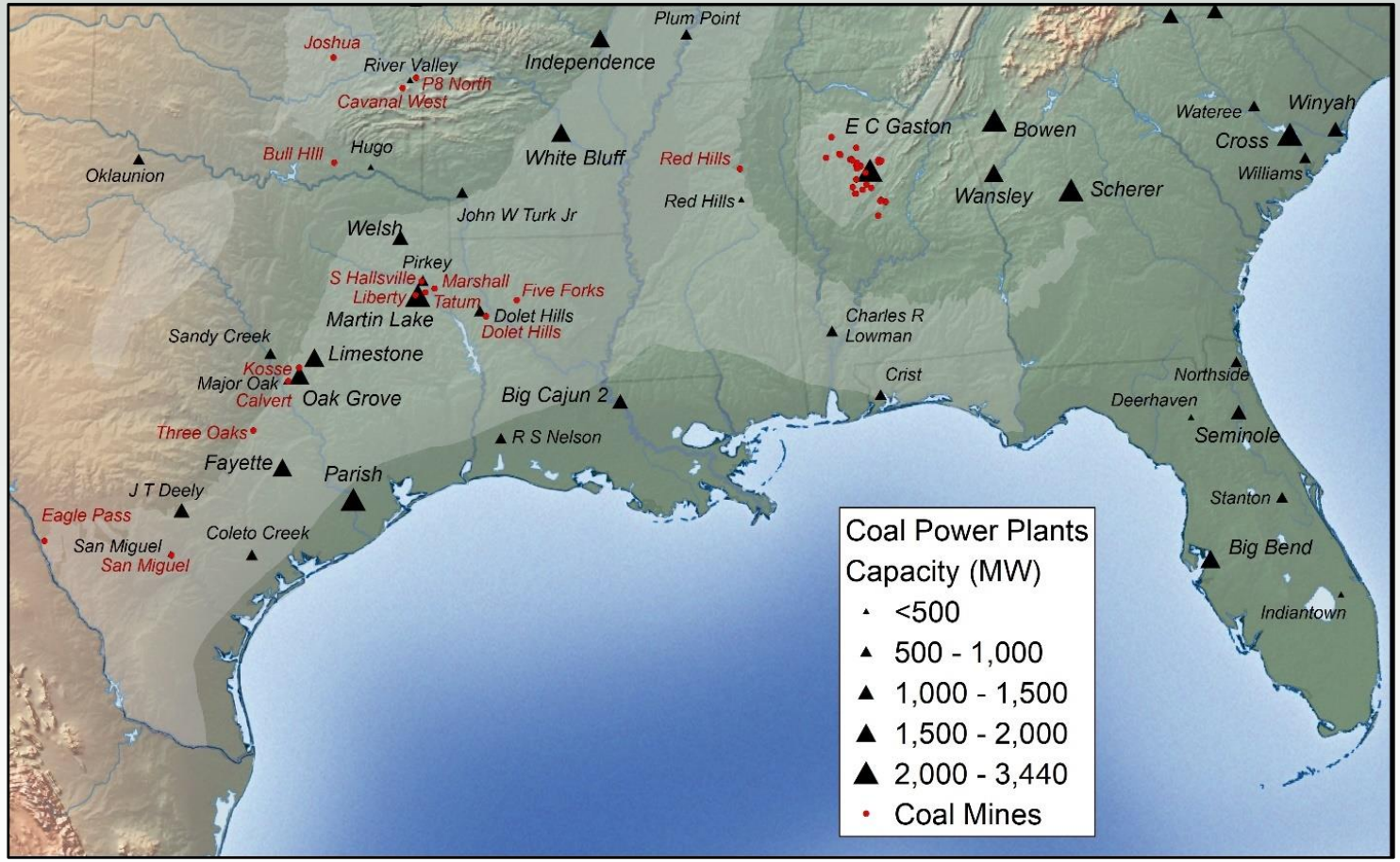
Mission

- Provide economic benefit to Gulf of Mexico Basin (TX, LA, MS, AL, AR) by turning coal and coal waste (ash) to carbon ore, REE, and CM resources



- Leverage trained workforce, energy infrastructure, and growing demand for products, in the Gulf of Mexico Basin to integrate stakeholders and develop plans to optimize carbon ore, REE, and CM value chains.

Where: Gulf Coast Basin



33 power plants in study area

1.5 B tons coal burned (2008 – 2020)

15% of US coal used in power plants

60% of coal from Wyoming

175 M tons of ash

~17% of US inventory, (1 B tons)

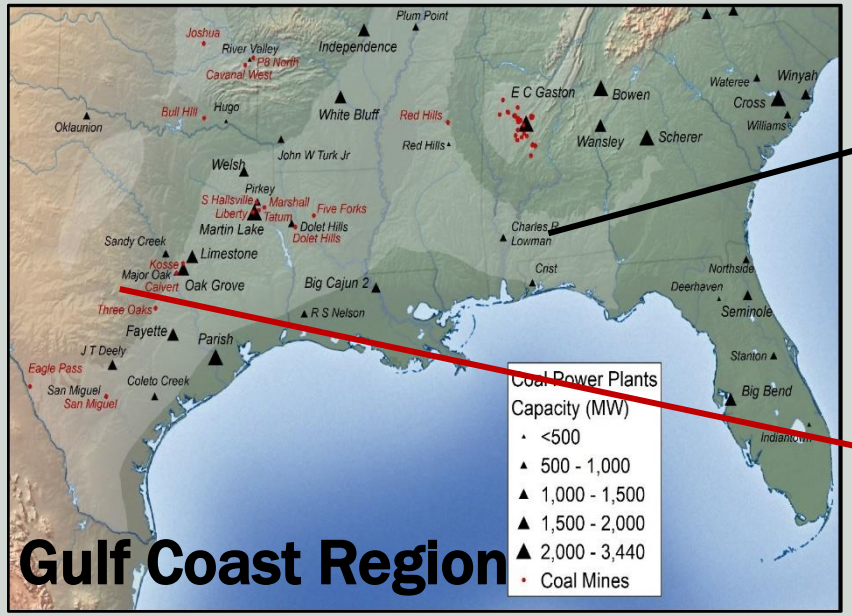
~100 M tons in landfills

Coal mine refuse piles

Co-produced water from oil wells

The What: Key Parts of CORE-CM Program

Coal & Ash Resource Assessment



Power Plants → **Ash**

Mines → **Coal**

Coal/Ash Resources
- Coal
- Fly ash
- Bottom ash
- Refuse

Databases
- USGS mapping
- NCRDS
- USGS CoalQual
- NETL EDX
- EIA power source

Geologic Models
- Coal resource assessment
- Deposition
- Structure

REE + CM + CBP Resource Assessment

- Rare earth elements (REEs)
- Critical Minerals (CMs)
- Nonfuel Coal Based Products (CBPs)

Development

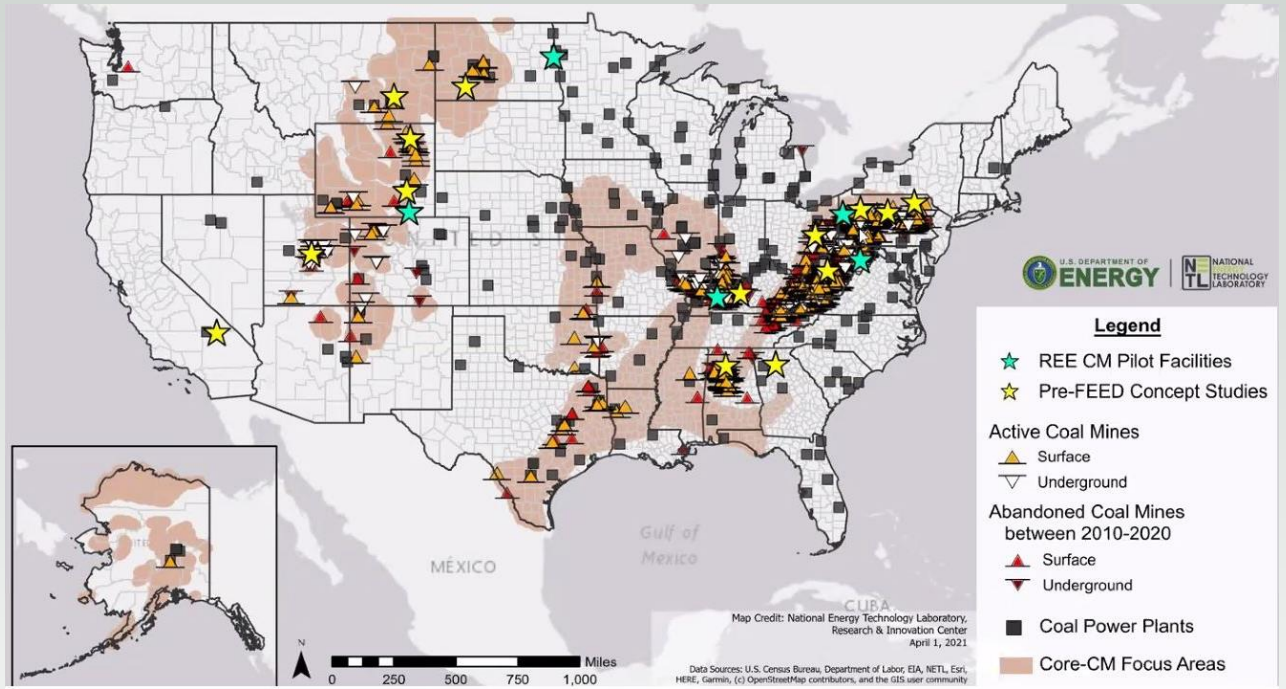
- Technology Innovation Center (TIC) Planning
- Commercial Processing Industry/Business Markets
- Training Outreach Workforce

NCRDS: USGS National Coal Resources Data System; CORD: Carbon Ore Resources Database; NETL EDX; Energy Data Exchange

The What: Objectives:

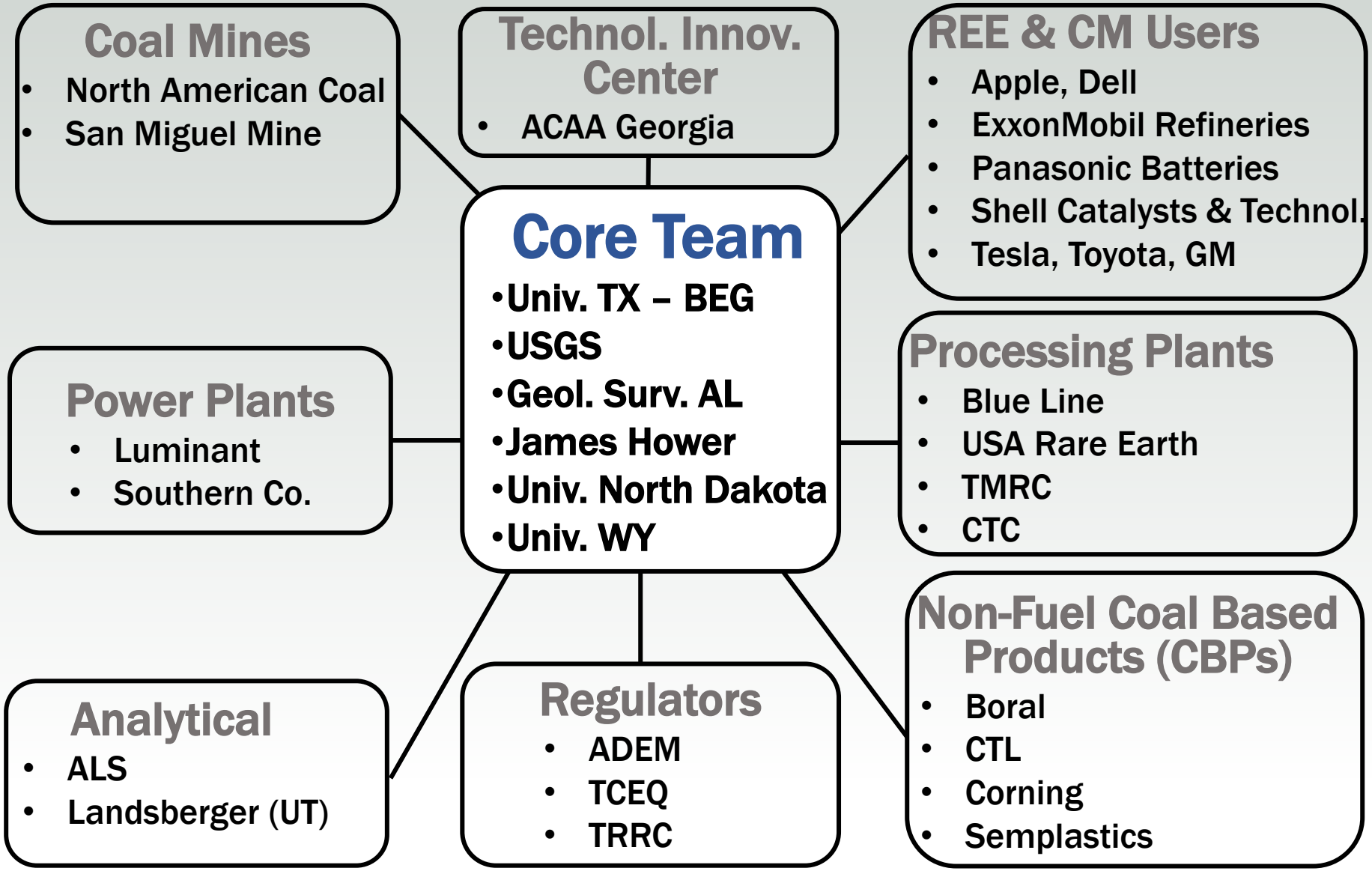
- Quantify **coal** (mostly lignite) and **coal ash** resources as feedstocks for production of REEs and critical minerals (CMs) in Gulf Coast Basin
- Evaluate **refuse** at coal mines and power plants and link REEs, CMs, and nonfuel carbon-based products (CPBs) production potential to enhanced economic growth and job creation
- Initiate planning the development of a **Technology Innovation Center**
- Conduct **stakeholder outreach** and **education** to support workforce and economic development

The What: Vision for Technology Innovation Center



- Proposed Technology Innovation Center(s) will leverage strengths of existing centers (e.g. Carbon Capture and Storage, Industrial Associates programs)
- Identify opportunities for new centers across CORE-CM value chain
- Consider virtual Centers
- Base on Public/Private partnership

Who



Bureau of Economic Geology

Who: Project Team

University of Texas at Austin

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Jim Hower

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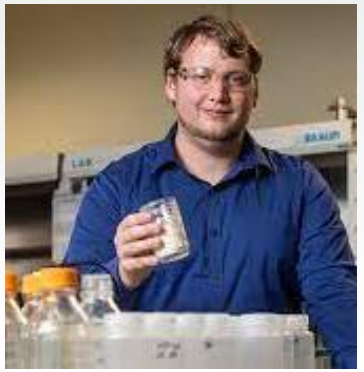
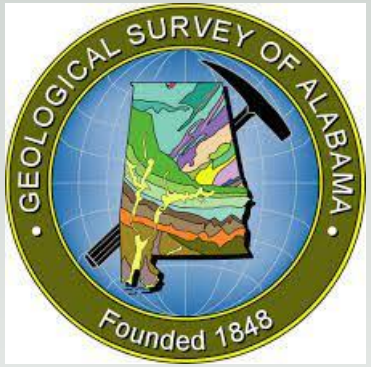
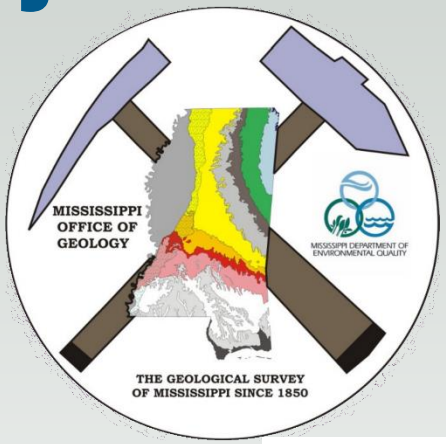


Nolan Theaker

Sheldon Landsberger

Who: Project Advisory Board





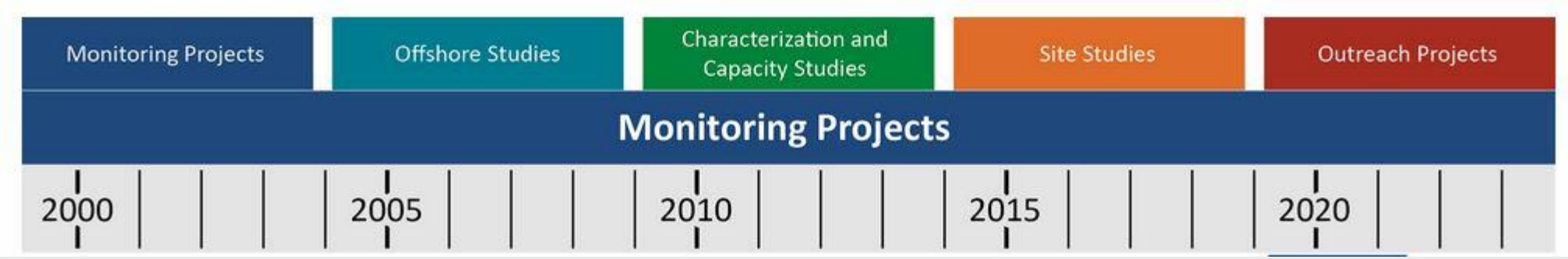
Why Gulf of Mexico?

- Gulf of Mexico (onshore and offshore) one of most important regions for energy resources and infrastructure (EIA, GoM Fact Sheet)
- Oil production: ~50% of US petroleum refining capacity and ~50% natural gas processing plant capacity
- Market for REEs and CMs and nonfuel CBPs (computer & automotive industry)
- Carbon Capture and Storage program
- Energy infrastructure and workforce in place to support CORE-CM development

Panasonic

TOYOTA

Gulf Coast Carbon Center (Bureau of Economic Geology)



UT Scientists Monitor Country's First Commercial CO2 Sequestration Operation

APRIL 5, 2017

CO_2 from coal fired power plant (Parrish Plant) near Houston piped 80 miles to SW where it is pumped into West Ranch oil field (~ 1 mile deep)

Petra Nova Project
Post combustion
C capture facility installed on an existing coal-fueled power plant

GCCC
GULF COAST CARBON CENTER

Partnership for carbon capture & offshore geologic storage
GoMCarb

Bureau of Economic Geology

Regional Benefits

- Large work force with long history of mining
  - 14% of US population in participating GC states
- Leveraging current energy infrastructure
  - Growing renewable energies will require plentiful critical minerals – local sources are ESG competitive
- Large and geographically extensive coal resources
- Improved regional ESG
  - Reclaiming land via recycling waste into new resources; repurposing coal resources for GHG-free or low GHG products; provide economic opportunity for towns, entrepreneurs, and businesses

How: Stakeholder Engagement

- Advisory Board (Industry, Government, Academia), meet quarterly
- Webinars on critical topics, recorded, posted on website
- Outreach via universities, community colleges, and public speaking
- Technology and Innovation Center planning and development

How: Integrating Environmental Justice, ESG, and standards development

Environmental Justice (Social Vulnerability Index (SoVI) and parameters (poverty, race etc) mapping relative to mines, power plants, and landfills etc).

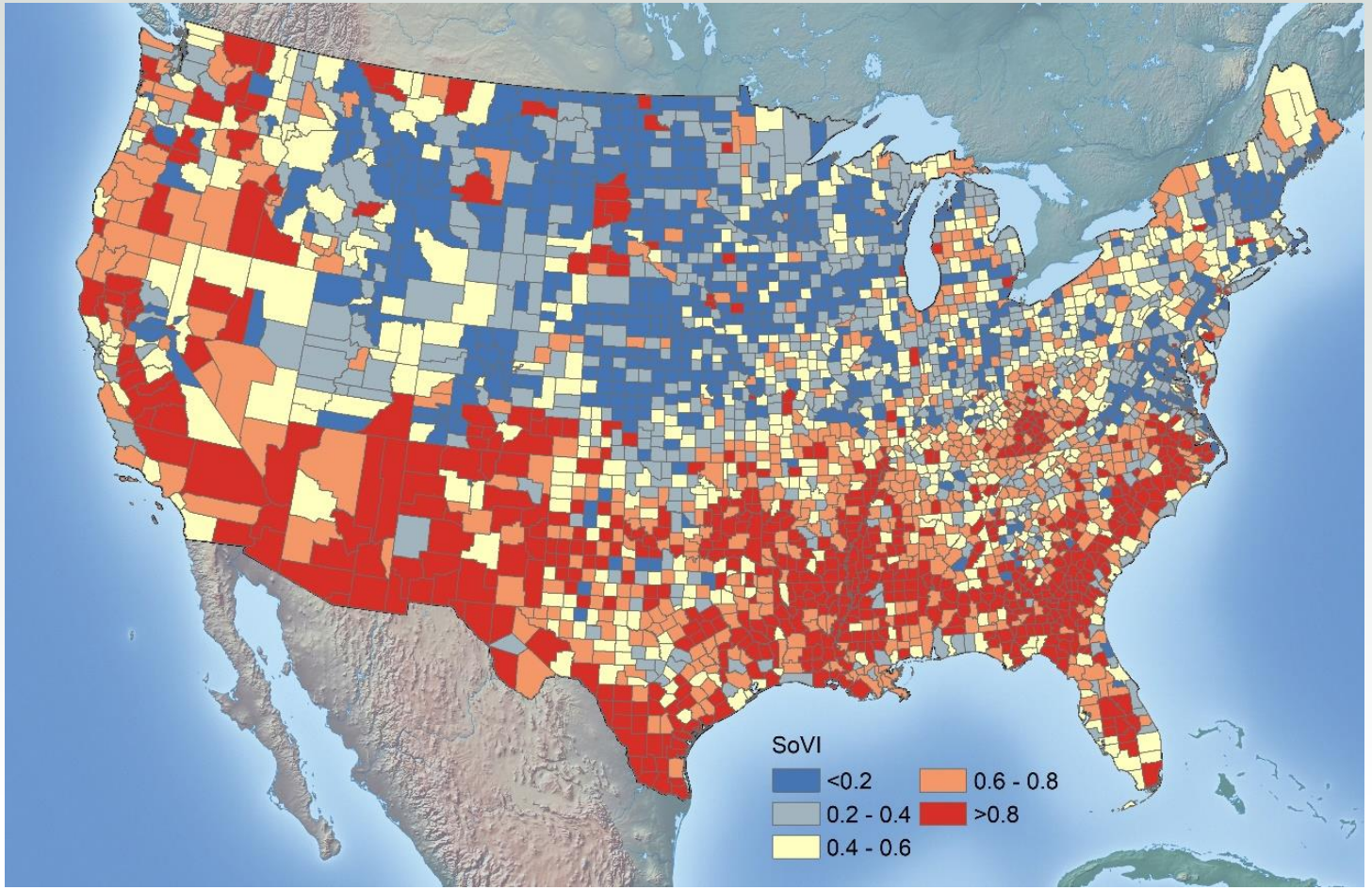
EPA EJSCREEN: 11 environmental indicators, 6 demographic indicators, 11 EJ indices
White House EJ Advisory Council Rept.
WHEJAC

Leveraging ES&G efforts related to
Oil and Gas and Carbon Capture & Storage

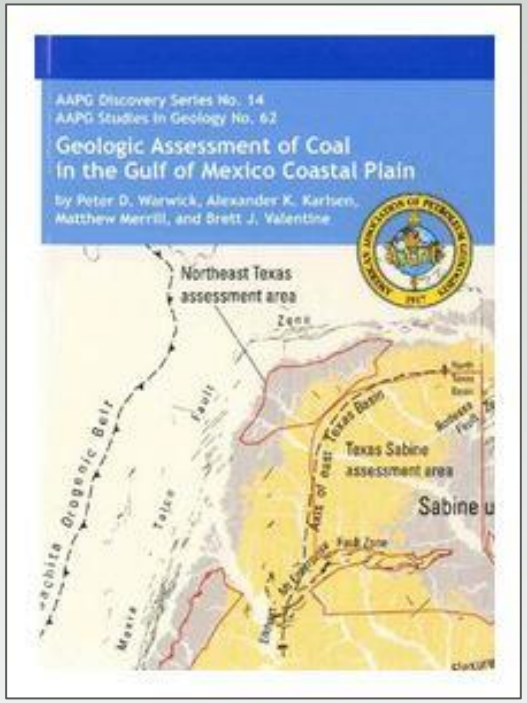
Working with campus group to develop new approaches to ESG and environmental standards

Collaborate with sociology faculty to refine social vulnerability issues

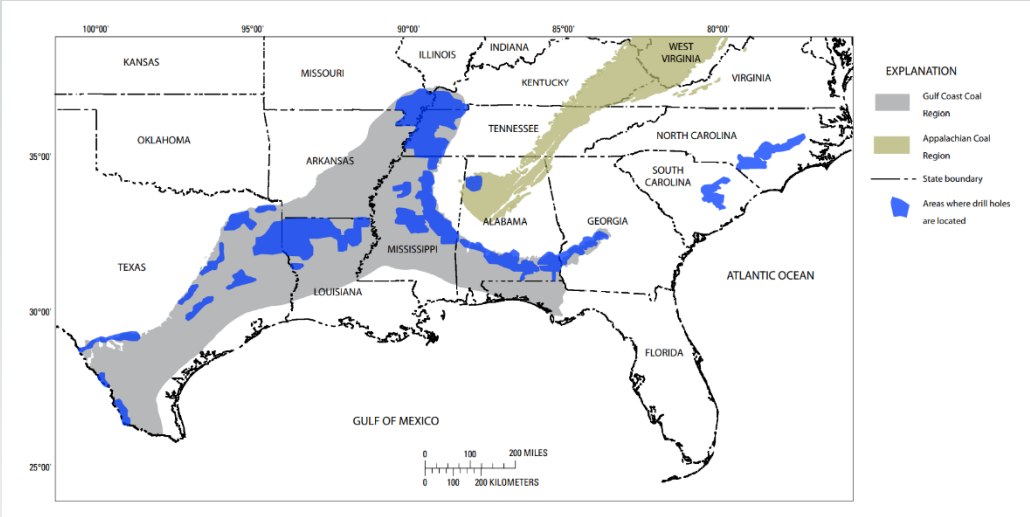
CDC Social Vulnerability Index, 2018



How: Progress to Date

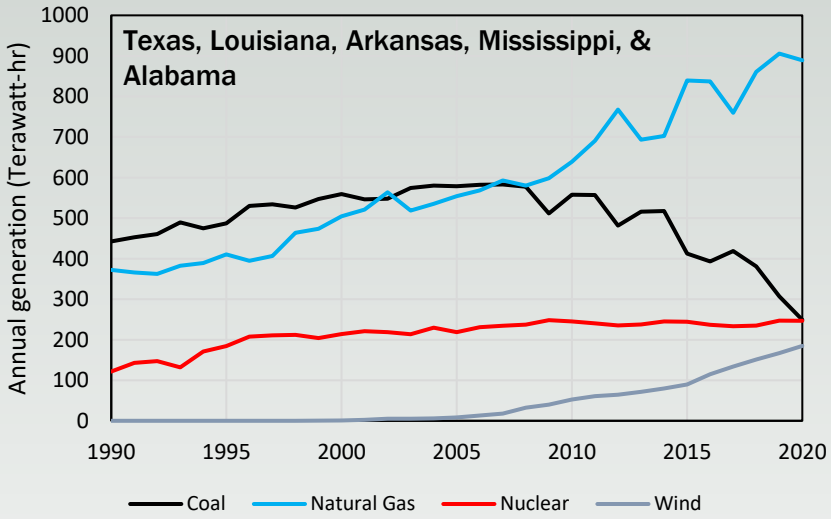


Gulf Coast Update
Warwick et al., 2011
AAPG



Additional drill hole data in 24,000 wells in 10 states
Valentine and Dennen, 2012

Electricity Generation by Fuel Sour
Annual Generation (Twh)



Power plants switching from coal to natural gas

Legacy **archived coal samples** at the USGS, currently being sorted for REE/CM analyses
Ash deposits, EIA, disposition; Gulf of Mexico ~ 15% of US accessible ash resources
Landfills and ponds, 60% from Powder River Basin, 30% local lignite
Communicating with NETL on ash disposition

How: Challenges and Opportunities

- Large and diverse geography/geology and interstate boundaries
- Access to ash sampling (ponds, landfills)
- Mine and power plant turnover and closures
- Communicating opportunities to businesses, regulatory authorities, and environmental groups
- Linking CORE-CM resources to midstream processing and downstream manufacturing
- Leveraging ESG aspects from other energy work (CCS, EPA tool)