



SonoAsh LLC

Claudio Arato, P.Eng., Chief Technology Officer

COAL 2.0: A Path to Closed Loop Coal

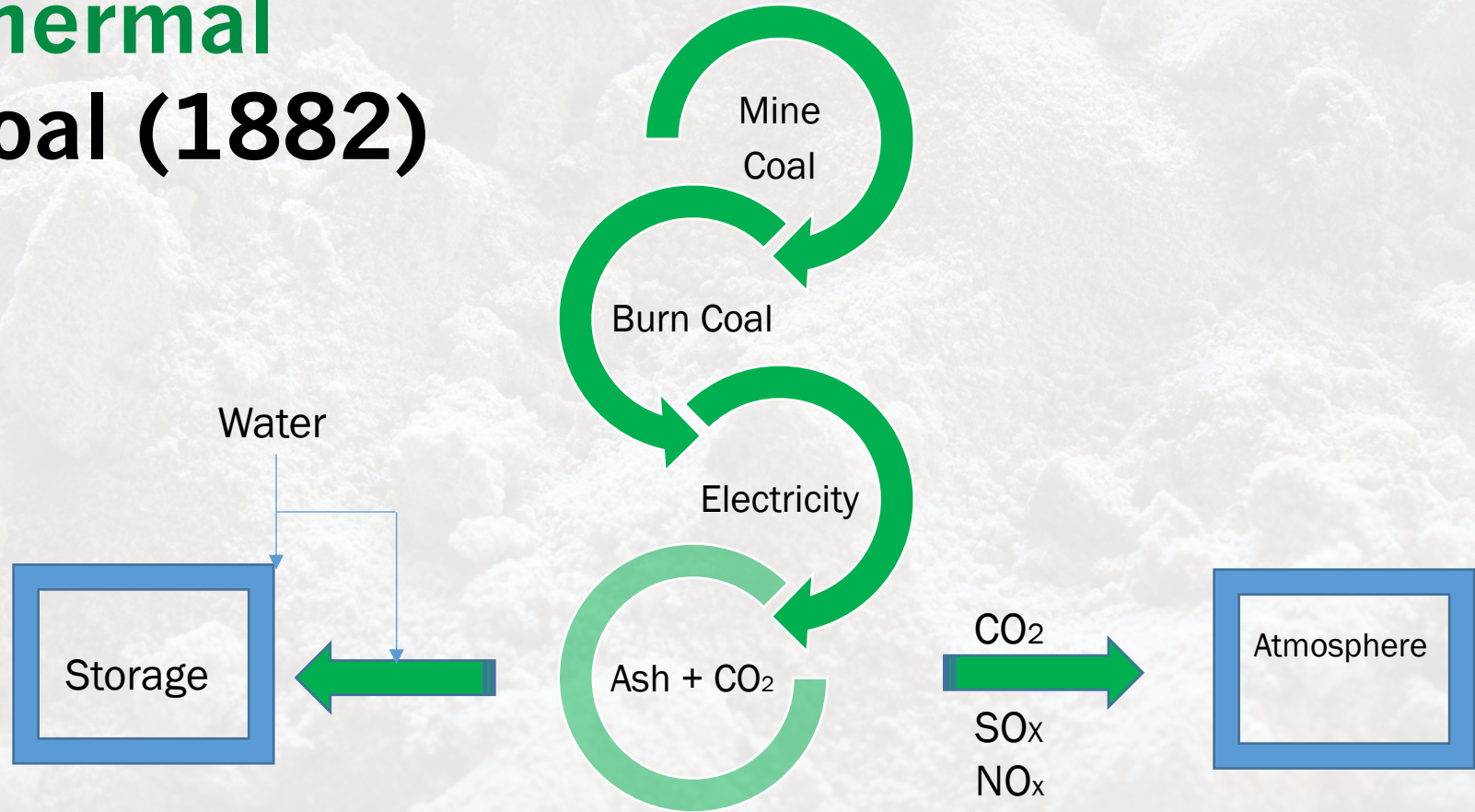
SSEB 2018, Kingsport, TN



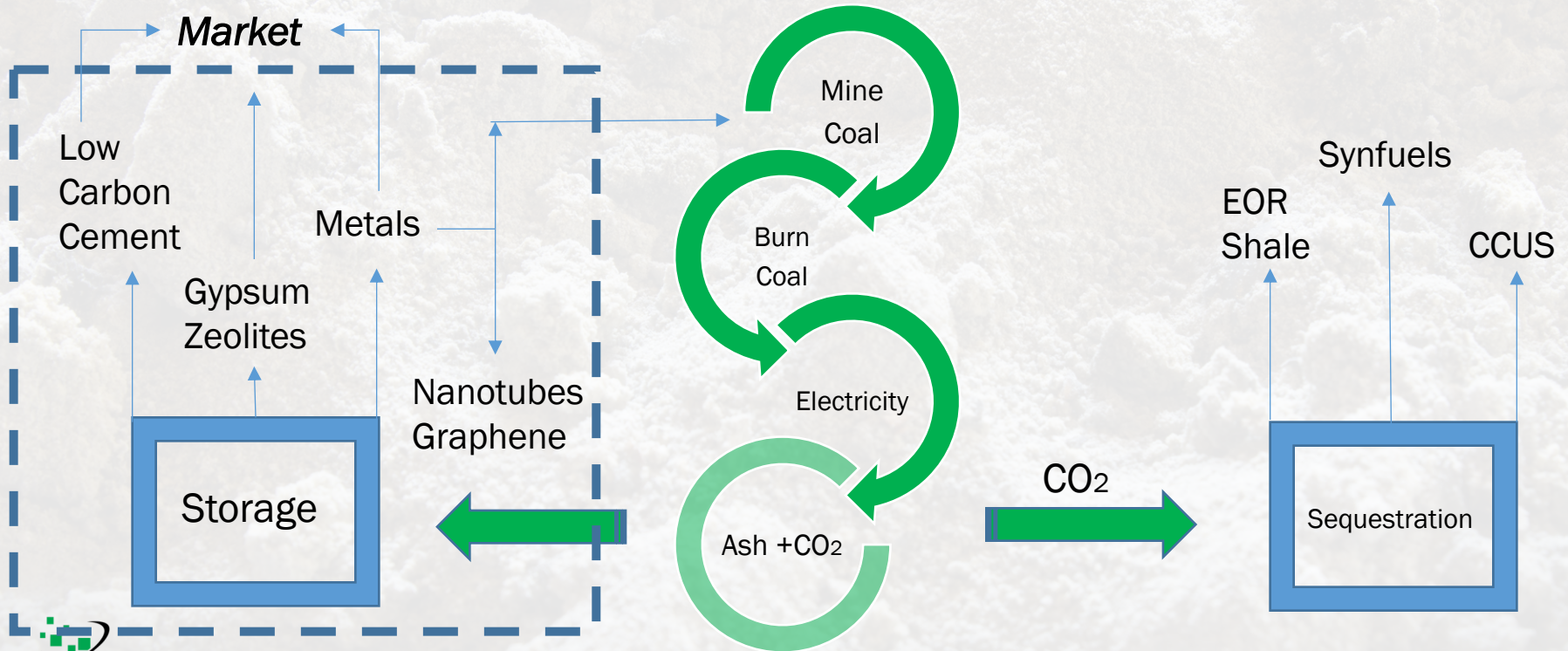


We are here to talk about a dying industry

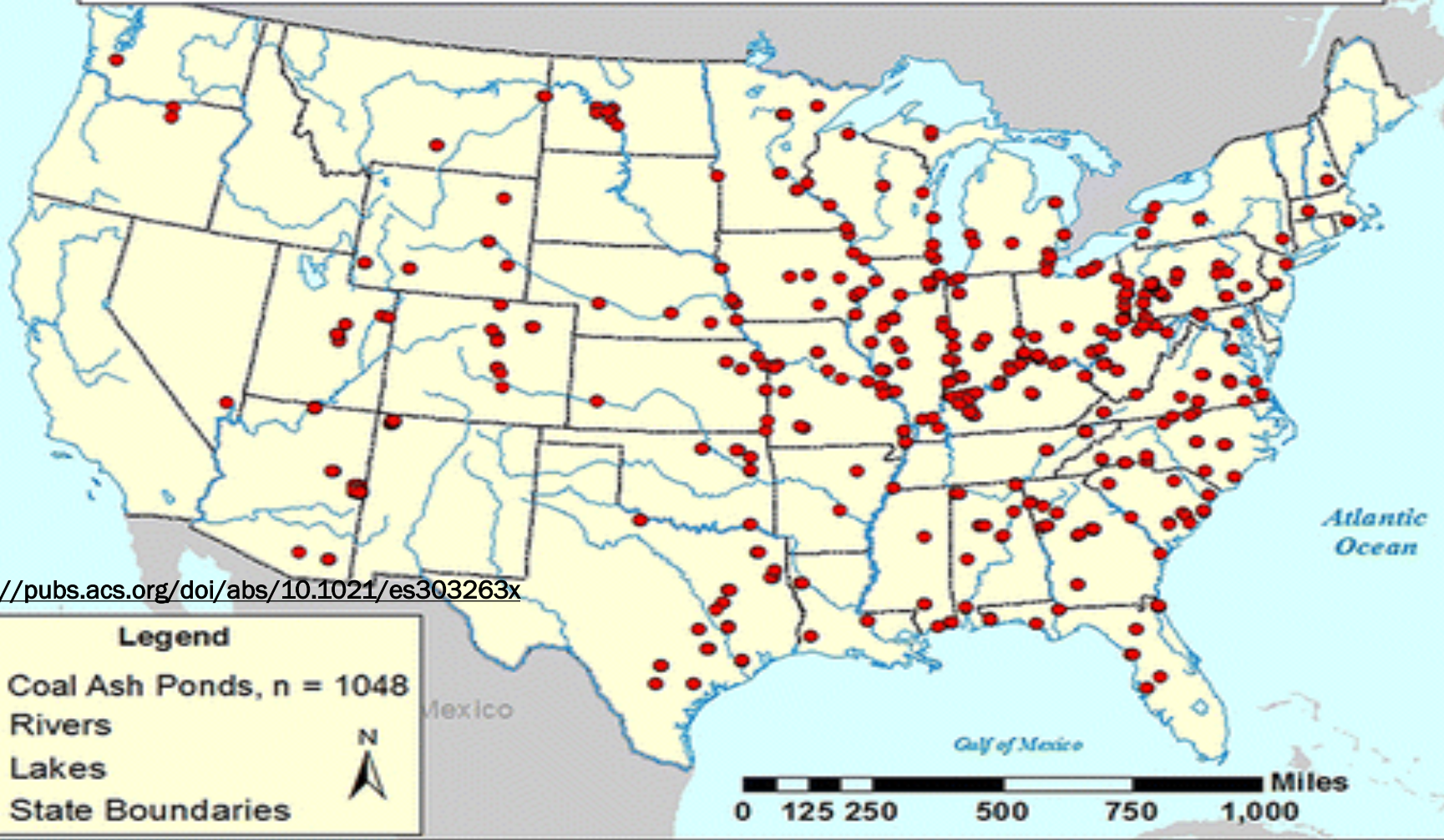
Thermal Coal (1882)



Closed Loop Coal: Orefinery (2030)



Coal Ash Ponds Distribution in the United States



<https://pubs.acs.org/doi/abs/10.1021/es303263x>

Legend

- Coal Ash Ponds, n = 1048
- ~ Rivers
- ☞ Lakes
- State Boundaries

N

0 125 250 500 750 1,000 Miles

Workers Required to Produce the Same Amount of Electric Power (2016)

COAL



The benefit of coal baseloading to humanity

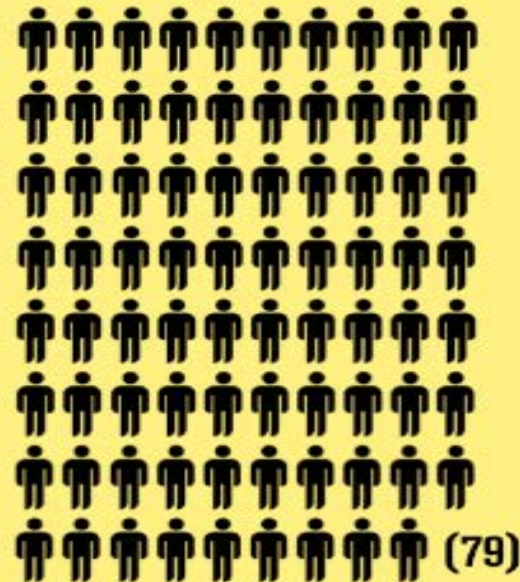
160,119 coal workers produced 1.24 billion megawatt hours (7,745 per worker)

NATURAL GAS



362,118 natural gas workers produced 1.38 billion megawatt hours (3,812 per worker)

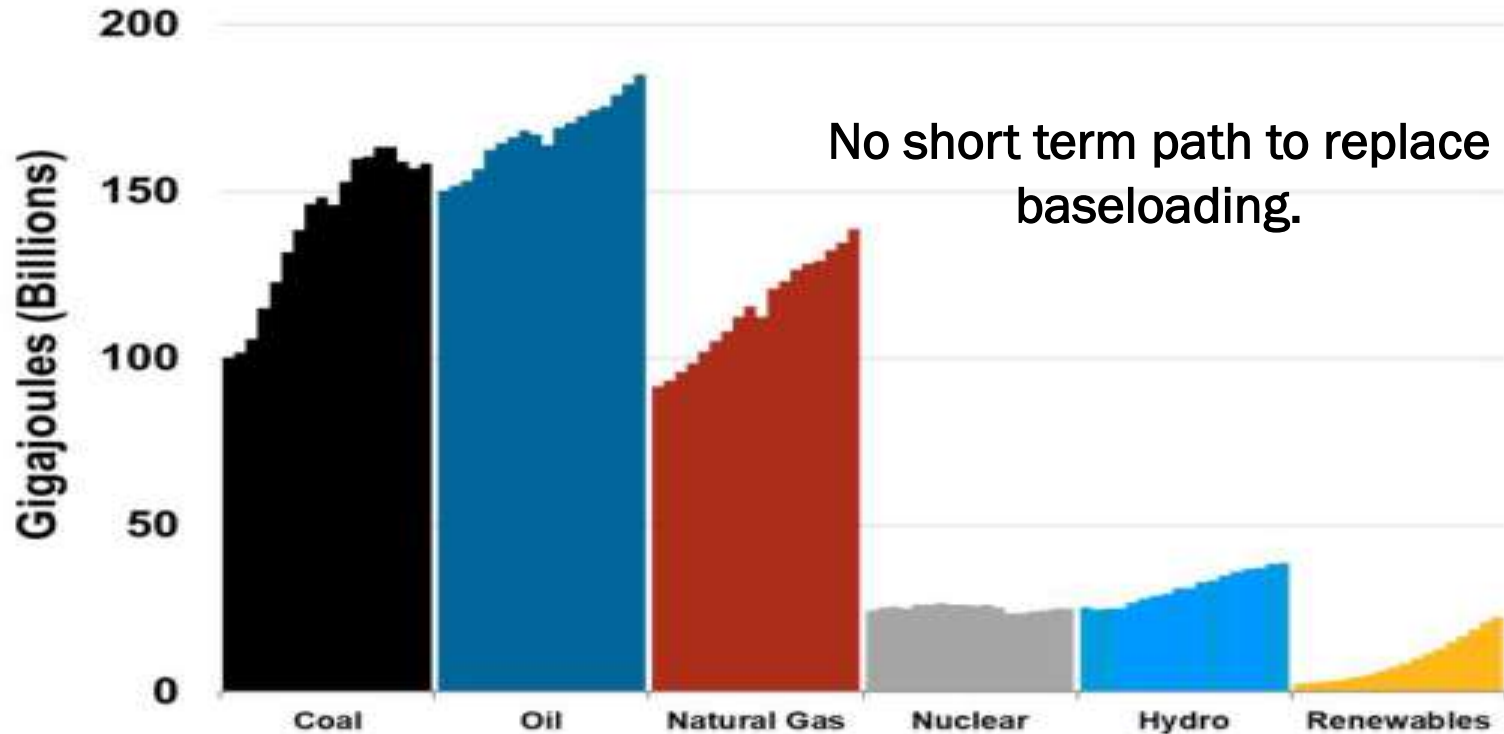
SOLAR



373,807 solar workers produced 36.75 million megawatt hours (98 per worker)

Figure 1: Global Consumption of Primary Energy Sources

Annual; 2000 to 2017e



No short term path to replace baseloading.

Source: BP Statistical Review (2000 – 2016), International Energy Agency (2017 estimate)



Drivers

Rate payer impact

Rural Development

Strategic Resource

Infrastructure

Risk Management



**SONOASH:
MANUFACTURED
COAL ASH**



Source **variable** coal ash

Address **environmental** liability

Specified product

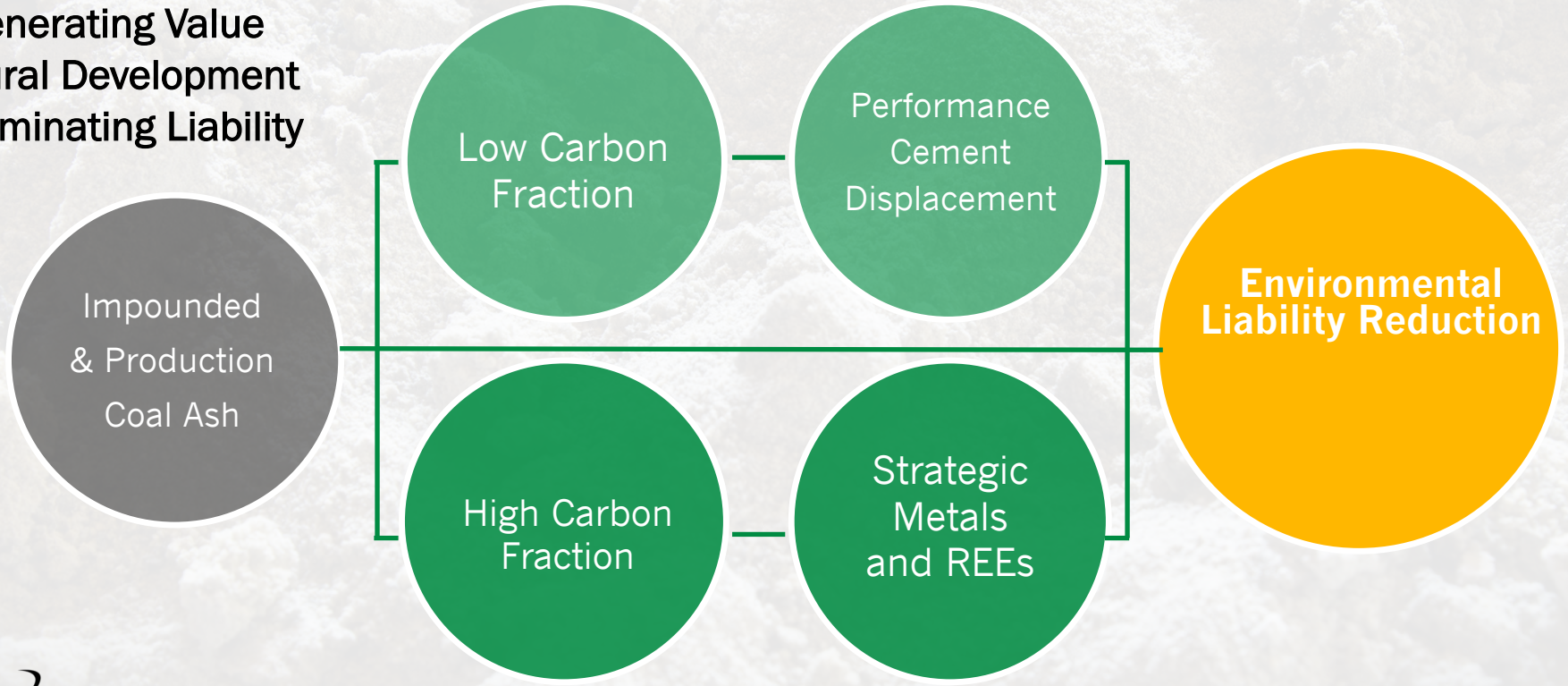
Uniform small particle size ($10 < d_{90} < 100$ um)

LOI < 1%

Stabilizing ash supply markets

SONOASH

Generating Value
Rural Development
Eliminating Liability



WE KNOW

Re-use of coal ash is locally beneficial:



One ton produced cement releases one ton of CO₂

Using coal ash causes a direct reduction in CO₂ generation.

Increased demand of rare earth metals

Above Ground Mining of rare metals is more cost efficient and environmentally friendly than traditional mining.

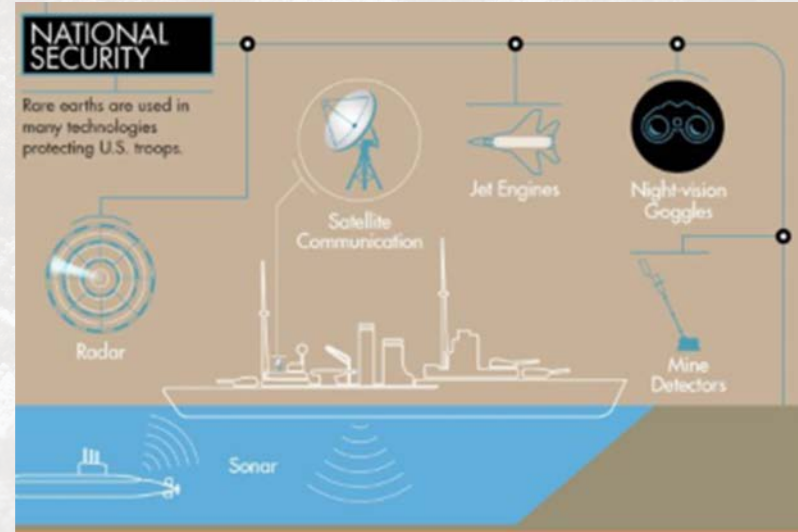
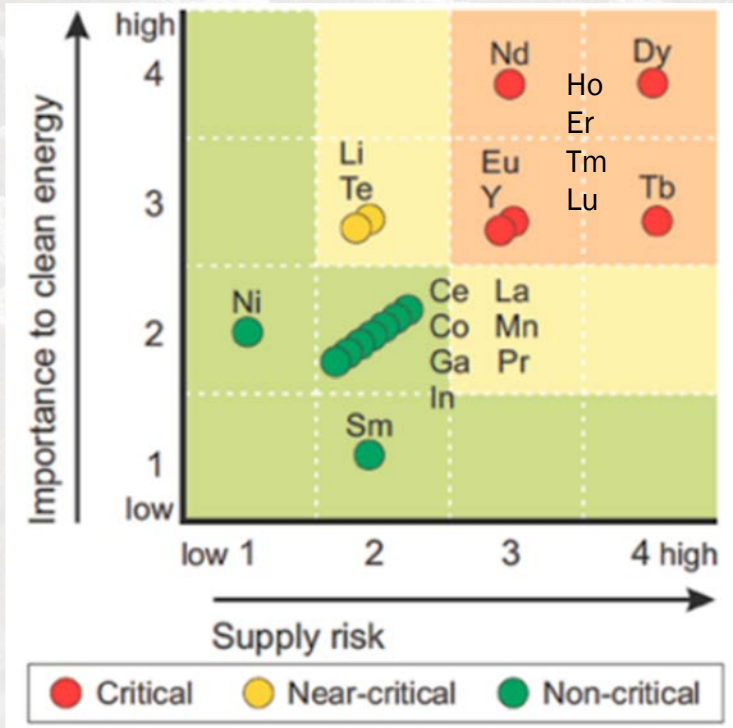
[Washington Post Energy and Environment](#)

Trump signs executive order to expand critical minerals production, says it will end America's 'vulnerability'

By [Juliet Eilperin](#) December 20, 2017



REE Impacts



Military & Energy: Magnets, motors, sensors, turbines

Demonstration Plant Location

Coronach, SK
Pop. 711

**Plant Size = 60,000
ft²**

50,000 tpy



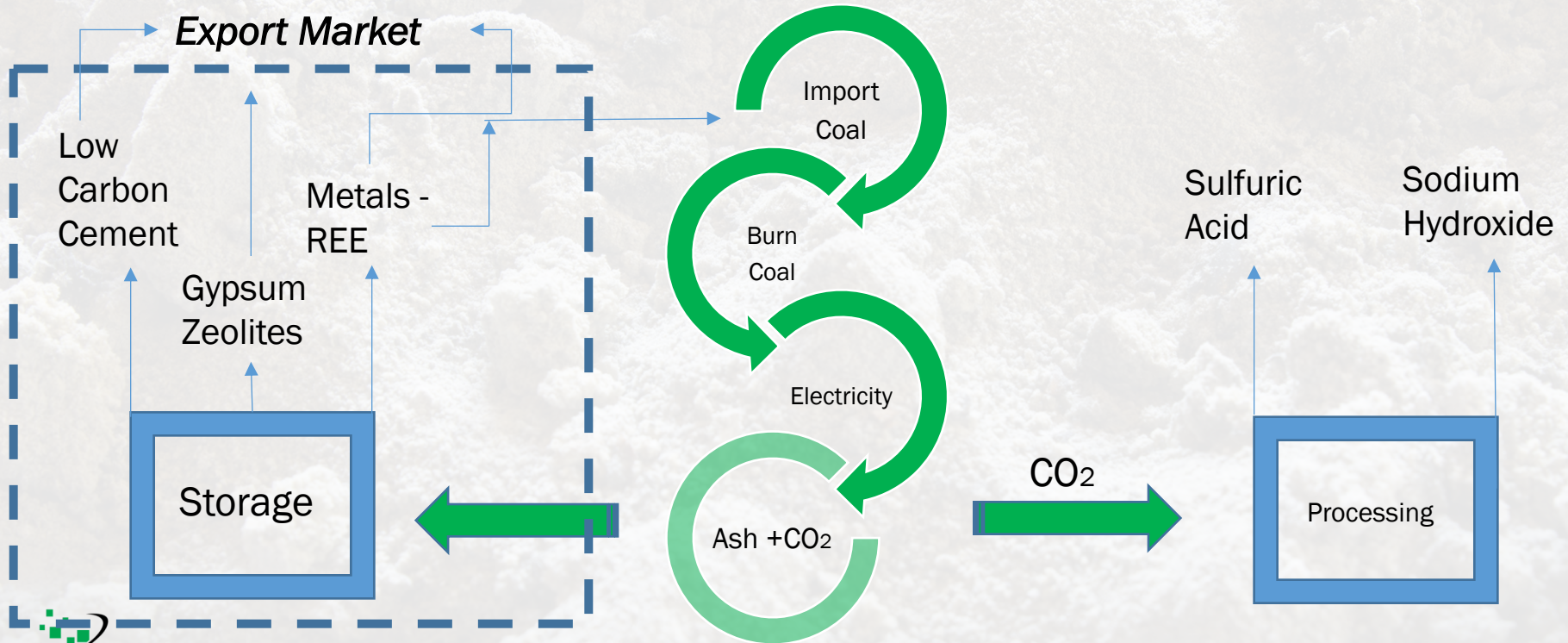
FEATURES:

Process wet production & mixed impounded ash

Create space in existing “pond” and “time” closure

Rural job creation

Closed Loop Coal: Puerto Rico (2022)



COAL IS GOOD



CLEAN TECHNOLOGY INNOVATION MINING VALUE FROM COAL ASH

SonoAsh

Patented, scaleable, coal ash beneficiation integration.

A robust, financial incentive path to clean coal.

Rural development and jobs.

Export market development.

