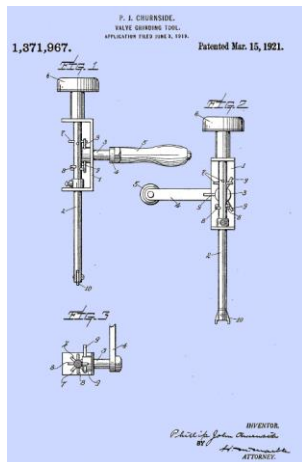




# Observations on the Appalachian Critical Mineral Supply Chain



**Pete Rozelle**  
**Churnside Technology Management**  
**17 December, 2020**

# What is Needed



## To Get from Here:

- Underclays
- Sandstones
- Coal Preparation Byproducts
  - Coarse Refuse
  - Tailings
- Acid Mine Drainage
- Metallurgical Byproducts
  - Tailings
  - Slags
- New Pitch Sources
- New Needle Coke Sources



## To Here?:

- RE Magnets
- Alloy Steels
- Li-Ion Batteries
- Graphite Articles
- Carbon Fibers
- Superalloys
- High Frequency, High Power Transistors
- Refractory PM Parts

# Where Might We Find Supply Chain Parts?



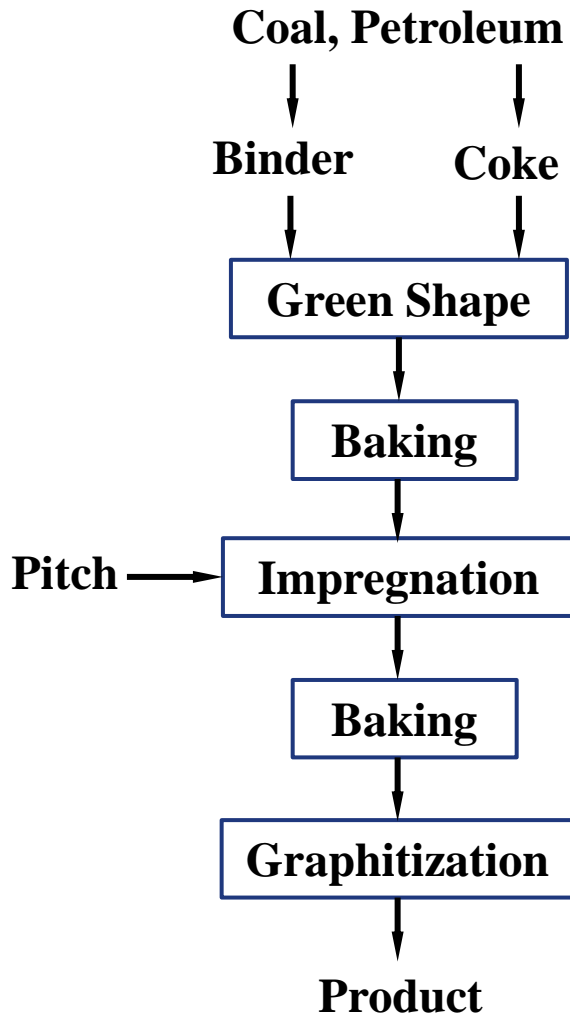
<b>STATE APPALACHIAN TOTALS</b>	<b>2009 Population Estimate</b>
<b>Appalachian Pennsylvania</b>	<b>5,736,617</b>
<b>Appalachian Alabama</b>	<b>3,024,719</b>
<b>Appalachian Georgia</b>	<b>2,924,921</b>
<b>Appalachian Tennessee</b>	<b>2,768,846</b>
<b>Appalachian Ohio</b>	<b>2,013,203</b>
<b>West Virginia</b>	<b>1,819,777</b>
<b>Appalachian North Carolina</b>	<b>1,662,282</b>
<b>Appalachian Kentucky</b>	<b>1,194,500</b>
<b>Appalachian South Carolina</b>	<b>1,167,523</b>
<b>Appalachian New York</b>	<b>1,049,686</b>
<b>Appalachian Virginia</b>	<b>760,060</b>
<b>Appalachian Mississippi</b>	<b>623,260</b>
<b>Appalachian Maryland</b>	<b>247,997</b>

Data from the Appalachian Regional Commission Web Site, 2020

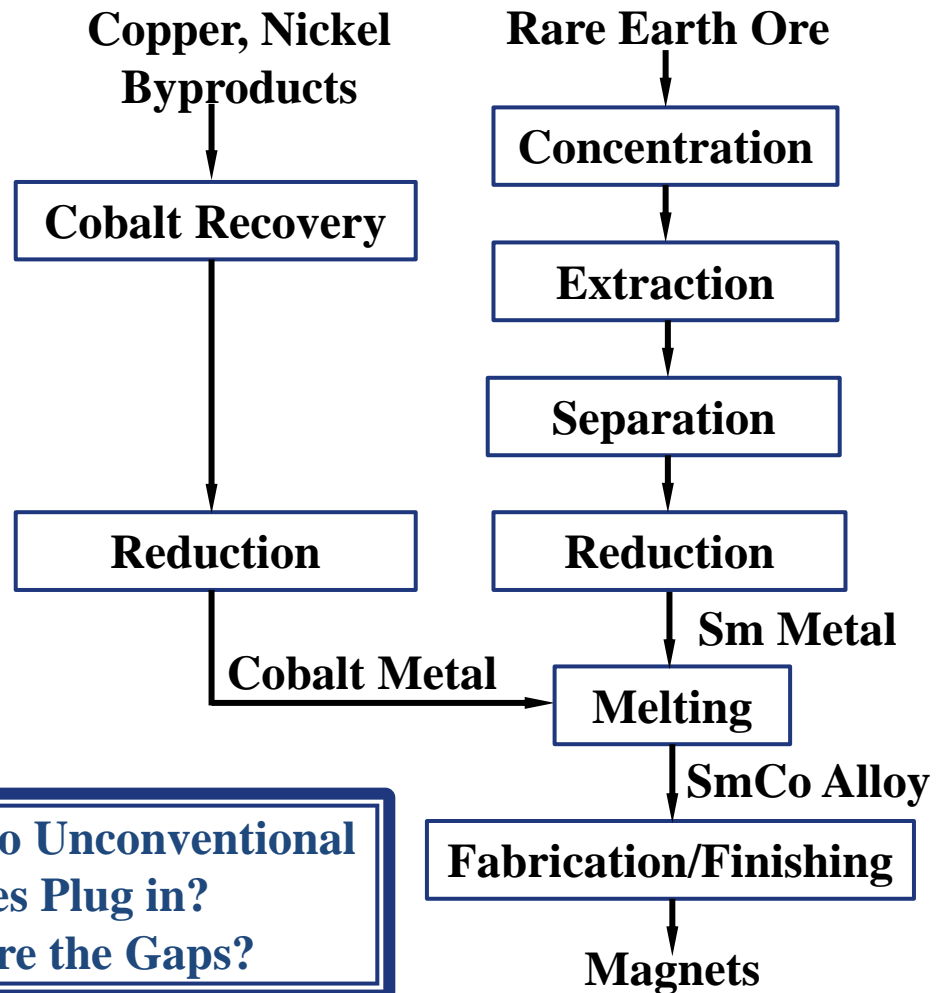
# Example Supply Chain Operations



## Synthetic Graphite



## SmCo Magnets



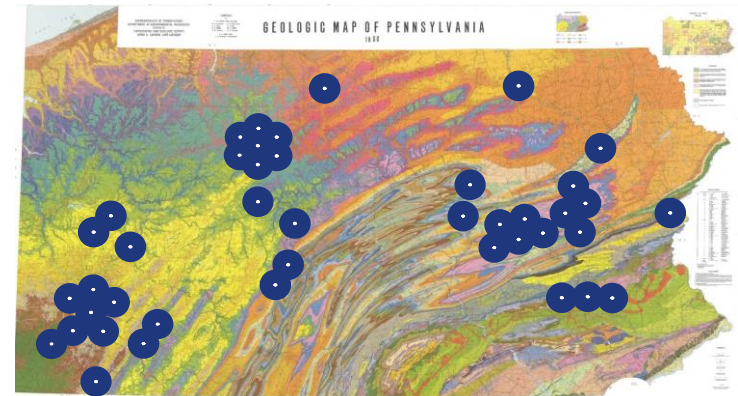
- Where do Unconventional Resources Plug in?
- Where are the Gaps?

# Industry in Pennsylvania: Critical Minerals and Carbon Products Businesses



## • There's Also:

- ✓ Mine Equipment Dealerships
- ✓ Process Equipment Vendors
- ✓ Transportation Firms
- ✓ Engineering Firms
- ✓ Fabrication Shops
- ✓ Environmental Firms
- ✓ Geology Firms
- ✓ Law Firms
- ✓ Maintenance Contractors
- ✓ The Lunch Truck



**Examples of Supply Chain  
Operations**

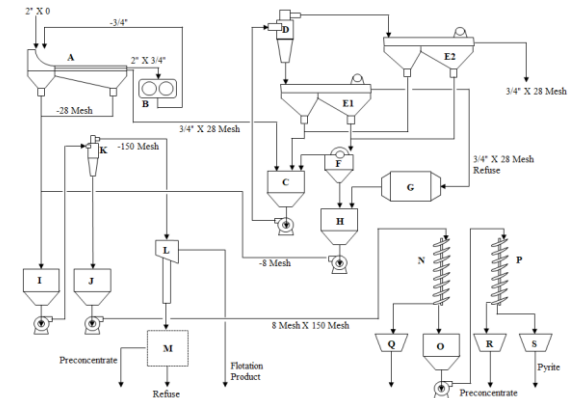
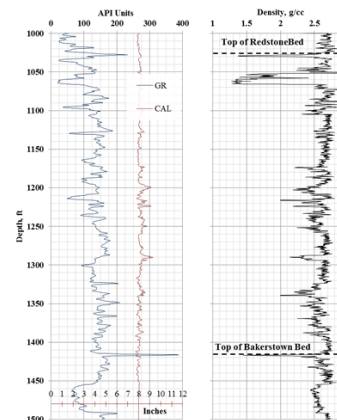
- Where do Unconventional Resources Plug in?
- Where are the Gaps?
- How can New Production Processes Fill the Gaps?

# If the Goal is Integrating New Production into Existing Supply Chains:



## Things that can Contribute:

- **Finding Resources**
  - Geosciences
  - Mineralogy
- **Process Design**
  - Mining Engineering
  - Mineral Processing
  - Extractive Metallurgy
- **Good Financial Models**



- **Where do Unconventional Resources Plug in?**
- **Where are the Gaps?**
- **How can New Production Processes Fill the Gaps?**
- **It Needs to be Economic**

# The Opportunities:



**Multiple Unconventional Critical Mineral Resources are in Appalachia**

**Industries in the Region**

- **Metallurgy (Critical Minerals)**
- **Carbon Products**
- **Manufacturing**

- **Where do Unconventional Resources Plug in?**
- **Where are the Gaps?**
- **How can New Production Processes Fill the Gaps?**
- **It Needs to be Economic**
- **A Good Start**