The Perils of Efficiency
Impacts of an Unexpected Closure of the Poe Lock

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Iron Ore-Steel-Automobile Manufacturing Supply Chain

• One of the most consequential supply chains in the United States has a potential single point of failure.
• A six-month disruption could cost $1.1 trillion and 11 million jobs.
• Optimization for efficiency has resulted in loss of resilience, an example of self-organized criticality.
Shaped by 160 years of History

• First shipment of iron ore passed through Soo Locks in 1855.

• By 1907, it cost seven times as much to move ore by rail.

• Steel mills were built along the Great Lakes to receive ore from freighters, not rail.

• There are no redundancies or alternatives.
Iron Ore Mining

...actually, it’s taconite.
Iron Ore Shipping
Steel Production

Integrated mills produce over 1,500 different recipes
Auto Manufacturing
Requires steel from all the integrated mills
## Possible Scenario Timeline

| MAR   | • March 25: Poe Lock remains closed at the end of winter for 6-month period  
|       | • At least 78% of mining capacity will shutter immediately. |
| APR   | • By April 15: Great Lakes steel mills likely close 75% of U.S. capacity  
|       | • Remaining steel goes to the construction, steel center, and tubular markets. |
| MAY   | • By May 15: Domestic automobile, farm, construction and mining equipment, and appliance operations forced to curtail operations. |
| SEP   | • End of September: Poe Lock re-opens  
|       | • Blast furnaces and coke batteries must be inspected for damage due to shutdown.  
|       | • Given the 4 months remaining until the winter closure, much of the initial re-stocking will be directed at building up winter inventory. |
| DEC   | • Mid-December: Steel production re-starts. |
| APR   | • Early April: Automobile production re-starts. |
Impacts

A Loss of Gross Domestic Product Attributable to the Scenario (in billions)
Are there Alternatives?

- Building a Twin to the Poe Lock
- Moving Iron Ore by Rail
- Moving Iron Ore by Truck
- Shipping through the Port Of Escanaba
- Lightering
- Importing Foreign Iron Ore
- Importing Foreign Steel
- Producing Aluminum Cars
- Increasing Stockpiles
Twin Lock

USACE has an unfunded plan to build a second Poe-sized lock using both closed locks.
Moving Iron Ore by Rail

70,000 tons of ore per freighter equals 7 x 100-car trains
Takeaways

• Inherent tradeoffs exist between economic drivers and resilience.
• Stakeholders know their own processes and requirements but may not understand the supply chain as a whole.
• Single, localized failure can create risks for dependent systems that span multiple jurisdictions and industries.
• Risk analysis is the starting point for mitigation.

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