Place-Based Industrial History:
A Research and Practice Brief for Engaging Communities in Advanced Nuclear Energy Facility Siting

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In November[i] 2021, the private company TerraPower, in partnership with electric utility PacifiCorp and the United States Department of Energy (DOE) via its Advanced Reactor Demonstration Program (ARDP), announced plans to site its Natrium advanced nuclear reactor near the retiring Naughton coal-fired power plant in Kemmerer, located in southwest Wyoming.[1] This project marks the first commercial advanced nuclear energy facility to begin construction in the United States.[2] This research explores the case of the Natrium project in Kemmerer, Wyoming.[3] Findings can inform an adaptable community engagement process for advanced nuclear energy siting and development, as proposals to develop similar facilities are rapidly increasing.[4]

As a first step in this project, researchers conducted an 'Historical Energy and Industrial Analysis' to better understand the environmental and energy histories in this context. The full report includes four components:

1. Cultural History Analysis.
2. Radiating Justice Map Prototype.
3. Contextual Rhetorical Analysis.
4. Place-Based Industrial History.

Introduction

This research and practice brief summarizes the Historical Energy and Industrial Analysis chapter "Informing Energy Facility Siting through Place-Based Industrial Histories: A Case Study of Kemmerer, Wyoming." A place-based industrial history focuses on the spatial and temporal patterns of multiple industrial activities in a specific place or community and catalogs the relationships that exist between that place, its people, and a set of economic activities.[5] In this brief, we first introduce the concept of an industrial history as a research process and product. We then apply this process as a case study of Kemmerer, Wyoming. Ultimately, we argue that industrial histories can help support environmental justice analyses, broadly, and informed community engagement, specifically, for advanced nuclear energy facility siting and development.

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Why Engage in Place-Based Industrial Histories to Inform Siting Decisions?

Place-based industrial histories may reveal important information about a community's experience with energy development and drivers of energy facility siting decisions.[6] This approach can complement screening tools, such as the Environmental Protection Agency's (EPA) EJSCREEN or the Climate and Economic Justice Screening Tool (CEJST)[ii], which are limited for several reasons:

1. **The use of census blocks may misrepresent rural areas where many energy communities are located.[7]**

2. **The focus on current populations and environmental indicators may overlook historical industrial impacts.[8]**

3. **Proximity to an industrial activity overlooks the intensity of activity and history of environmental violations.[9]**

4. **Other proximate industries such as pipelines, gas processing facilities, mining activities, renewable energy generation facilities, or concentrated animal feeding operations, and their related operating histories are excluded.**

In Kemmerer, Wyoming, the history of coal mining, power generation, petroleum coking, and their associated environmental hazards necessitates a more comprehensive industrial history assessment.

Coal seams in "The Big Pit" of the Kemmerer Coal Mine.

Process

We developed and applied the following approach for conducting a place-based industrial history which others can replicate and adapt in future advanced nuclear energy facility siting activities:

1 Define the Study Area:

Identify the community that could be affected by a potential or plant facility based on nearby industrial activity. Use GIS data to map out natural barriers and population centers to define the study area.

2 Review Industrial Infrastructure and Land Ownership:

Gather information on existing and planned industries, infrastructure, and land ownership in the area. List major industrial facilities and determine which regulatory agencies oversee their records. Search these records by location and keywords.

3 Collect Documentary Evidence:

Collect public documents and submit request records related to land ownership, permits, environmental regulations, enforcement actions, and historical industrial activity.

4 Summarize Data:

Summarize the key details and history of each industrial facility or infrastructure feature based on the collected documents and records.

5 Assess Risks:

Analyze the potential social-environmental risks about each industrial facility or infrastructure feature from the summarized data and other supporting research.

6 Compare Findings with Environmental Screening Tools:

Identify any additional concerns related to environmental justice.

Smokestacks at the Naughton Power Plant.

Coal silos and conveyor belts at the Kemmerer Coal Mine.

An Industrial History Case Study of Kemmerer, Wyoming

The study area begins near the southern edge of the Wyoming range and includes Kemmerer, Frontier, Diamondville and land about 25 miles to the east, west, and south of those population centers.[iii] The full report includes a map of the study area (report Figure 2.1) and a list of data types and sources (report Table 2.1) used. We reviewed and analyzed the following industrial sites and activities in the study area:

- **Railroad infrastructure**, including infrastructure transporting coal from local mines.
- **Kemmerer Coal Mine**—and earlier coal operations at the same site under various names and ownership—have been active in some form for over 125 years, beginning as a network of underground mines before transitioning to an open-pit operation.[10]
- **Naughton Power Plant** historically operated as a coal-fired facility but currently is transitioning to burn natural gas.[11] There are also six ponds on site at the power plant for managing coal ash.[12]
- **FMC Corporation Coke Plant** operated near Kemmerer from 1960 to 2001.[13]
- **Pipeline infrastructure** facilitates transportation of natural gas extracted in the area.[14]
- **Transmission lines** transport electricity from the Naughton Power plant to consumers in Wyoming and other states, including Utah and Idaho.[15]

Existing screening tools did not identify additional industrial sites. They did, however, show that the census tract containing Kemmerer, Diamondville, and Frontier is not classified as containing disadvantaged communities, does not classify as an energy community, and does not exceed a 70% index threshold for any of the 13 environmental indicators tracked by EJSCREEN. In part, this is because the Naughton Power Plant is in a different census tract, despite being only several miles from these communities. Additionally, the tools did not capture the FMC Coke Plant because it is now closed but is not a superfund site, nor did they consider potential groundwater contamination from coal ash storage areas. Table 1, below, summarizes our findings by industrial facility/feature type, including specific activities and past events along with potential associated hazards.

Transmission line infrastructure at Naughton Power Plant.

Table 1: Summary of Environmental Hazards Identified in Kemmerer Industrial History Cases

Industrial Facility/ Feature Type	Study Area Specific Industry and Past Events	Potential Hazards
Railroads	• Oregon Short Line Railroad with leads to 1) Elkol tipple of the Kemmerer Mine and 2) a now-abandoned lead to the closed Cumberland Mine[16] • 17 reported incidents in Lincoln County since 1975 (no hazardous materials released or fatalities)[17]	• Polycyclic aromatic hydrocarbons and heavy metal plant and soil contamination[18] • Hazardous materials release from accidents[19] • Particulate matter air pollution[20] • Wildfire source[21] • Coal dust pollution[22]
Coal Mines	• Operations at the Kemmerer Coal Mine • 125-year history of accidents and illness associated with coal mining in Kemmerer	• Fine particulate matter from fugitive dust contaminating air and water[23] • Coal dust, a particular risk to mine workers[24] • Use of heavy machinery, leading to increased risk of workplace accidents[25]
Power Plant	• Operations at the Naughton Power Plant • Naughton has been listed by the Environmental Integrity Project as the fourth-most contaminated power plant in the nation[26]	• Air pollutants from power plant operations, including carbon dioxide, sulfur dioxide, nitrogen oxides, fine particulate matter, mercury and other heavy metals, ozone, methane, and volatile organic compounds[27] • Coal ash ponds polluted by lithium, selenium, cobalt, and radium[28]
Coke Facility	• Legacy pollution from the FMC Corporation coke plant[29]	• Decanter tank sludge contaminating tarry water ponds[30] • Increased risk of cancer and non-cancer illness from exposure to soil and contaminated groundwater[31]
Pipelines	• High density of pipelines related to the nearby Opal gathering hub[32] • 12 incidents (e.g. leaks, fires, explosions) reported since 1976[33]	• Natural gas spills and leaks • Fires and explosions from pressurized gas[34]
Transmission Lines	• Numerous transmission lines running from the Naughton Power Plant[35]	• Habitat fragmentation and destruction, particularly hazardous for threatened bird and plant species[36] • Electrocution hazard, particularly for raptors perching on transmission lines[37]

Infrastructure and coal ash ponds at Naughton Power Plant.

Conclusion

This industrial history identified the existence of potential hazards in the study area, which may not be fully captured by screening tool criteria. Although Kemmerer is not officially classified as an energy community or disadvantaged community, it has faced serious environmental hazards from industry over the past century. These include mine accidents, exposure to carcinogens, pipeline and railway incidents, coal dust, and wastewater contamination. At the same time, the local economy depends on the very industries that create these conditions, making Kemmerer vulnerable as the energy sector changes.

Environmental justice is not merely a question of whether a community has experienced environmental and social stressors, but whether they are disproportionate to those experienced elsewhere.[38] Industrial histories can, therefore, help document polluting and extractive activities over generations, therefore supporting comparative analyses. Understanding these histories can support more culturally sensitive engagement strategies for siting activities related to advanced nuclear energy facilities and other new industrial development. Additionally, industrial histories may be important for communities like Kemmerer that continue to experience environmental risks from industry but do not qualify for benefits that are linked to classifications in federal screening tools.

Read the full report:

Righetti, T., Budowle, R., Duba, A.W., Edwards, C., Hughes, M., Vigil, E., Reese, D., & Welch, C. (2024). Chapter 2- Informing energy facility siting through place-based industrial histories: A case study of Kemmerer, Wyoming. In R. Budowle & A.W. Duba (Eds.), *Engaging Wyoming communities in an environmental justice approach for advanced nuclear energy facility siting: Historical energy and industrial analysis report* (Milestone #M3NU-22-WY-UW_-030210-032) (pp. 88-107). Department of Energy Nuclear Energy University Program: Award #DE-NE0009297. https://doi.org/10.15786/wyoscholar/10101

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Endnotes

i. An earlier version of this brief incorrectly identified June 2021 as the date of the Kemmerer site selection. TerraPower announced plans to locate a Natrium facility in Wyoming in June 2021 and subsequently selected Kemmerer as the site in November 2021. This brief has been corrected accordingly.

ii. Since completing the full report for this research, these tools are no longer in use at the federal level, and they are no longer accessible online. However, the point that relying solely on quantitative demographic and socioeconomic tools may miss critical industrial history remains pertinent (e.g., for state, local, and community-based environmental justice considerations).

iii. We defined the study area to limit our scope for this Industrial History; however, other kinds of siting activities may require a different and broader study area.

References

Note, this section includes abbreviated references. Complete references are available in the full report.

1. Bleizeffer, D. (2021). TerraPower selects Kemmerer for advanced nuclear power plant.
2. Patel, S. (2024). Kemmerer 1 breaks ground: A look at TerraPower's Natrium fast reactor nuclear power plant.
3. Budowle, R., et al. (n.d.). Engaging Wyoming communities in an environmental justice approach for advanced nuclear energy facility siting.
4. U.S. Department of Energy, Office of Nuclear Energy. (2024). Coal-to-nuclear transitions: An information guide; Wald, M. (2024). 2024: The state of advanced reactors; World Nuclear News. (2024) DOE releases community guide on coal-to-nuclear conversion
5. Aumeier, S. E.,et al. (2021). Emerging energy market analysis initiative.
6. Ibid
7. U.S. Environmental Protection Agency. (n.d.). Limitations and caveats in using EJScreen (site no longer active, accessed 9/30/24); Scally, C. P., et al. (2020). In search of "good" rural data
8. White House Council on Environmental Quality. (n.d.). Climate & economic justice screening tool (site no longer active, accessed 9/12/24); U.S. Environmental Protection Agency. (2015). EJScreen: Environmental justice screening and mapping tool (site no longer active, accessed 9/12 24)
9. Nost, E., et al. (2022). Refining CEJST by including compliance and inspection data and analysis by industrial sector: Comment on Council on Environmental Quality's request for information on the Climate and Economic Justice Screening Tool Beta Version (Docket No. CEQ-2022-0002).
10. U.S. Department of the Interior. (n.d.). National mine map repository: Preserving mine maps for future generations
11. PacifiCorp. (2023). 2023 Integrated resource plan
12. Environmental Integrity Project. (2019). Coal's poisonous legacy: Groundwater contaminated by coal ash across the U.S.
13. Solid and Hazardous Waste Division. (n.d.). RCRA facility fact sheet FMC corporation: Former coke plant, Kemmerer, Wyoming.
14. U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration. (2003). Incident report gas transmission and gathering systems No. 20030099-2425.
15. U.S. Energy Infrastructure Administration. (n.d.). Electric energy infrastructure and resources
16. Wyoming Department of Transportation. (n.d.). Wyoming 2021 statewide rail plan
17. Wyoming Department of Transportation. (n.d.). DOT open catalog
18. Wilkomirksi, B., et al. (2011). Railway transportation as a serious source of organic and inorganic pollution
19. Liu, X., et al. (2013). Integrated risk reduction framework to improve railway hazardous materials transportation safety
20. Abbasi, S., et al. (2013). Particle emissions from rail traffic: A literature review
21. California Department of Forestry and Fire Protection. (1999). Railroad fire prevention field guide
22. Ostro, B., et al. (2023). The impact of coal trains on PM2.5 in the San Francisco Bay area
23. Aneja, V. P., et al. (2012). Characterization of particulate matter (PM10) related to surface coal mining operations in Appalachia; Finkelman, R. B., et al. (2021). The future environmental and health impacts of coal
24. Ibid.
25. U.S. Bureau of Labor Statistics. (2010). Injuries, illnesses, and fatalities in the coal mining industry fact sheet

26. Environmental Integrity Project. (2019). Coal's poisonous legacy: Groundwater contaminated by coal ash across the U.S.
27. Baig, K. et al (2017). Coal fired power plants: Emission problems and controlling techniques
28. Environmental Integrity Project. (2019). Coal's poisonous legacy: Groundwater contaminated by coal ash across the U.S.
29. FMC Corporation. (1989). Resource Conservation and Recovery Act post closure permit application
30. Ibid
31. Gradient Corp. (2015). Human health and ecological risk assessment, former Kemmerer coke plant site, Kemmerer, Wyoming
32. U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration. (2003). Incident report gas transmission and gathering systems No. 20030099-2425.
33. U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration. (2023). Hazardous liquid pipeline accident heat map 2010-present; U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration. (2023). Gas transmission pipeline incident heat map 2010-present
34. Emanuel, R. E., et al. (2021). Natural gas gathering and transmission pipelines and social vulnerability in the United States

Cover photo: Heavy coal truck at the Kemmerer Mine kicks up a thick plume of dust.