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PNNL-31909

Coal-dependent Communities in Transition

Identifying Best Practices to Ensure Equitable Outcomes

September 2021

Bethel W. Tarekegne
Kamila Kazimierczuk
Rebecca S. O'Neil

U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
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Pacific Northwest National Laboratory
Richland, Washington 9935

Executive Summary

The U.S. coal industry is experiencing a sharp increase in the numbers of retired and/or decommissioned coal-fired power plants across the U.S. In the years between 2010-2019, around 102 gigawatts (GW) of coal-fired generating capacity has been announced to be decommissioned, representing more than 546 coal-fired power plant units, and an additional 17 GW is planned to be decommissioned by 2025.

This change in the energy production landscape presents an impact on the social, environmental, and economic prospects of coal-dependent communities (Table 1). This report examined the role of communities in the coal power plant decommissioning process and provided community-identified best practices to ensure an equitable process. The experiences of four coal-dependent communities—Wise County, VA, Anderson County, TN, Muskegon, MI, and Becker, MN—are presented as case studies to understand the impacts of the decommissioning process, and associated best practices, from the communities' perspective. The map below (Figure 1) shows the locations of the coal plants identified in these case studies— the Virginia City Hybrid Energy Center, Wise County, VA; the Bull Run Fossil Plant, Anderson County, TN; the Cobb Power Plant, Muskegon, MI; and the Sherburne Generating Station, Becker, MN.

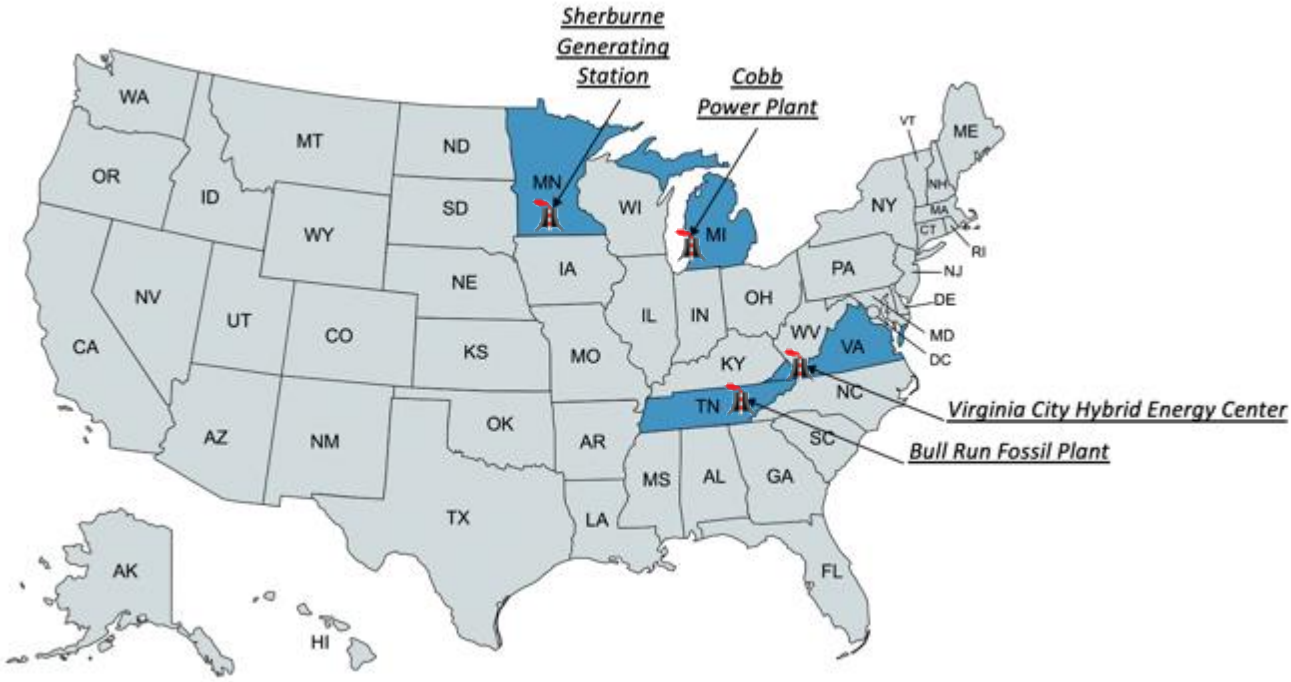

Figure 1. Map of case study coal plants.

Table 1. Summary of coal plant operation benefits to be impacted by decommissioning.

Virginia City Hybrid Energy Center—Wise County, VA
153 full-time jobs 350–400 external jobs supported $6 million–$8.5 million local tax revenue $25 million–$40 million local economic activity
Bull Run Fossil Plant—Anderson, TN
125 full-time jobs supported (~100 regional, ~25 local) $450,000 annual payments
Cobb Plant—Muskegon, MI
100 full-time jobs $70 million in local tax revenue $4 million in property tax revenue
Sherco Plant—Becker, MN
300 full-time jobs 14% of County tax base supported 75% of Becker's tax base 54% of school district's tax base

Key Takeaways and Summary of Community-identified Best Practices

The report results highlight the need to recognize that the decommissioning decision-making process must be community-based to be equitable. Each community's input is key to the transition away from coal power because there is no one-size-fits-all development plan. In other words, each community's trajectory through the decommissioning process—from the retirement decision-making stage to the final site redevelopment phase—is unique because each community has distinct needs and wants from the energy transition. What is best for one community may not be suited for another. Ultimately, the framework for site development and community revitalization post-decommissioning cannot be universal because each community's profile—from a social, cultural, and economic perspective—is different.

Community impacts of power plant decommissioning are not limited to job and revenue losses. Communities are likely to be impacted culturally, socially, environmentally, and have long-term health-based impacts that should be acknowledged and addressed in post-retirement plans.

Commonly identified decommissioning best practices include:

- Early and continued engagement throughout, with a number of mediums for communication and feedback (e.g., in-person sessions, virtual meetings, written comment opportunities);
- Early planning of post-decommissioning projects to replace lost jobs, revenue, and economic activity;
- Recognition (and mitigation, if possible) of social impacts on the community due to plant closure;
- Transparency throughout the process, with trusted information being provided about the decommissioning process and timeline; potential impacts on the workforce, economy, and environment; and the feasibility of alternative site uses;
- Identification of funding sources, technical experts, and/or strategic partnerships to support decommissioning and the affected communities upfront; and

- Acknowledgment of communities as stakeholders who have a role in the conversation and right to determine their futures.

Three key areas for assisting coal-dependent communities affected by the energy transition:

- **Technical assistance**: assessment of site feasibility for alternative uses or to repower with new technologies.
- **Cross-partnership engagement and collaboration**: facilitate knowledge-sharing of "lessons learned" about the decommissioning process between communities and provide guidance for decision-making processes
- **Financial assistance**: access to grant and/or loan programs to assist with redevelopment survey, bolster community economic security through job creation, and cover environmental clean-up costs

Technical assistance, cross-partnership engagement, and financial aid can be mobilized to help communities throughout various stages of the decommissioning process, including the retirement decision, the site reclamation phase, and eventual revitalization of the site and surrounding community. Table 2 below identifies key considerations that stakeholders may need to address when considering their role for assisting and engaging with affected communities.

Table 2. Stakeholder engagement considerations for the decommissioning process.

Retirement Decision	Site Reclamation	Community Revitalization
- Awareness of the decommissioning timeline: need to know retirement dates and redevelopment schedules - Decision-making authority: need to identify the community's role in the process - Early economic planning: consider avenues to replace lost jobs and revenue	- Environmental remediation: need to know the human health risks associated with coal generation waste (if it remains on site) and methods for clean up - Financial considerations: need to identify funding mechanisms for remediation efforts and consider how site reclamation can be coupled with community revitalization efforts (e.g., job creation)	- Workforce transition: need to identify how jobs will be replaced - Economic improvements: consider projects for enhancing community economic security following decommissioning - Site redevelopment: need to consider the best future plant site uses and how to pair redevelopment plans with the community needs and local economy

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A special thanks to City Administrator of Becker Minnesota and the City Manager of Muskegon Michigan for sharing information about their transition efforts.

Acronyms and Abbreviations

ACS	American Community Survey
BRFP	Bull Run Fossil Plant
DOE	U.S. Department of Energy
GW	gigawatt(s)
IRP	Integrated Resource Plans
MPUC	Minnesota Public Utilities Commission
MW	megawatt(s)
TVA	Tennessee Valley Authority
VCHEC	Virginia City Hybrid Energy Center

Contents

Executive Summary iii
Acknowledgments vi
Acronyms and Abbreviations vii
Contents viii
1.0 Introduction 1
2.0 Industry Trends, Effects, and Transition Needs 1
2.1 Energy Transition Ripple Effects 2
2.1.1 Equitable Decision-Making Framework and Best Practices Needed 3
2.2 Affected Communities and Decommissioning Process Outcomes 4
3.0 Communities in Transition 5
3.1 Case Study: The Virginia City Hybrid Energy Center, St. Paul, Virginia 5
3.1.1 Plant Background 5
3.1.2 Community Background 6
3.1.3 Motivations for Decommissioning 7
3.1.4 The Community's Perspective on Decommissioning 8
3.1.5 Best Practices for Coal Plant Decommissioning for Wise County 8
3.2 Case Study: The Bull Run Fossil Plant, Anderson County, Tennessee 9
3.2.1 Plant Background 9
3.2.2 Community Background 10
3.2.3 Motivations for Retirement 11
3.2.4 The Community's Perspective on Decommissioning 11
3.2.5 Best Practices for Coal Plant Decommissioning for Anderson County 14
3.3 Case Study: The Cobb Generating Plant, Muskegon, Michigan 14
3.3.1 Plant Background 14
3.3.2 Community Background 16
3.3.3 Motivations for Retirement 17
3.3.4 The Community's Perspective on Decommissioning 18
3.3.5 Best Practices for Coal Plant Decommissioning for Muskegon County 18
3.4 Case Study: The Sherburne County Generating Station, Becker, Minnesota 19
3.4.1 Plant Background 19
3.4.2 Community Background 20
3.4.3 Motivations for Decommissioning 21
3.4.4 The Community's Perspective on Decommissioning 21

3.4.5 Best Practices for Coal Plant Decommissioning for Sherburne County 21
4.0 Decommissioning Best Practices to Ensure Equitable Community Outcomes 22
4.1 Key Takeaways 22
4.2 Stakeholder Roles and Timeline for Engagement 24
4.2.1 Technical Assistance 24
4.2.2 Cross-partnership Engagement and Collaboration 24
4.2.3 Financial Assistance 25
5.0 Conclusion 26
6.0 References 27

Figures

Figure 1. Map of case study coal plants. iii
Figure 2. National coal mining jobs. Yearly average of all employees in the coal mining industry between 2011 – 2020. (Data source: BLS; Analysis by: PNNL) 2
Figure 3. Status of coal-fired power plants. Recent and planned retirements (2011–2024), operating plants with probable retirement post 2024 overlayed on poverty rate in the region. (Data source: EIA, US Census; Analysis by: PNNL) 4
Figure 4. Virginia City Hybrid Energy Center. (Source: Google Earth 2021a) 6
Figure 5. Bull Run Fossil Plant. (Source: Google Earth 2021b) 10
Figure 6. The BRFP facility's dry fly ash stack, located next to children's playground in Anderson County. 13
Figure 7. B.C. Cobb Generating Plant. (Source: Google Earth 2021c) 15
Figure 8. The Sherburne County Generating Station. (Source: Google Earth 2021d) 20
Figure 9. Timeline for engagement. 26

Tables

Table 1. Summary of coal plant operation benefits to be impacted by decommissioning. iv
Table 2. Stakeholder engagement considerations for the decommissioning process. v
Table 3. Decommissioning options. 3
Table 4. Virginia City Hybrid Energy Center operation benefits and decommissioning impacts. 7

Table 5. Funding resources to support plant decommissioning and impacted communities. 8
Table 6. Bull Run Fossil Plant operation benefits and decommissioning impacts. 11
Table 7. Funding resources to support plant decommissioning and impacted communities. 13
Table 8. Cobb Generating Plant operation benefits and decommissioning impacts. 17
Table 9. Sherburne County Generating Station operation benefits and decommissioning impacts. 20

1.0 Introduction

Technological advances, increasingly cost-effective alternative sources of cleaner energy, and increased regulatory pressure have been driving the decline of the U.S. coal industry, leading to increasing numbers of retired and/or decommissioned plants across the United States. In this changing energy production environment, community engagement is critical to assuring that all stakeholders voices are heard and needs are met equitably in plant decommissioning and equitable transition to the new energy economy.

This report uses four case studies from transitioning coal-dependent communities across different geographic settings to identify best practices in coal plant decommissioning processes. Involving community stakeholders is a large part of ensuring an equitable transition from coal and recognizing the needs of communities to ensure economic stability. Pacific Northwest National Laboratory researchers partnered with two community organizations, Appalachian Voices and Just Transition Fund, to gather information about community experiences with the decommissioning process and to identify community-guided best practices for leading an equitable energy transition. Due to the lack of a national plan that guides the phase out of coal, the role of the U.S. Department of Energy (DOE) in the decommissioning process may not be obvious. This work is intended to outline the potential areas of engagement for the DOE to support its ongoing efforts[1] in revitalizing transitioning communities.

Section 2 describes the decline of the coal industry, related economic ripple effects, the need for community engagement in the decommissioning process, and the need for an equitable transition to the new energy economy. Section 3 chronicles the decommissioning stories of the four U.S. communities. Section 3 provides a synthesis of the best methods for engaging communities throughout the decision-making process, identifying community needs and post-retirement plans best suited to the local community's environment and economic profile, and supporting resource and technical engagement opportunities at the community level.

2.0 Industry Trends, Effects, and Transition Needs

Over the last decade, the economic viability of the U.S. coal power plant fleet has continued to decline. Between 2010 and 2019, plant owners announced the decommissioning of approximately 102 gigawatts (GW) of coal-fired generating capacity—representing more than 546 coal-fired power plant units—and the planned retirement of another 17 GW by 2025 (EIA 2019). Increased regulatory pressure and market competition from cost-effective, cleaner energy sources such as natural gas, wind, and solar are a few of the key factors driving the industry decline, the effects of which are most acutely felt by the local communities that have immediate economic ties to coal-fired generation (Carley et a. 2018). Coal-dependent communities have varying needs and wants when making an energy transition away from coal, including ensuring jobs for workers affected by plant shutdowns, replacing the tax base that funds public schools, supplying clean energy for local use, or in some cases, retaining access to the grid for future industrial activity.

[1] Recently, the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization at the DOE has been working to identify the resources that could revitalize the economies of fossil-fuel and power plant dependent communities. The Working Group was formed under Executive Order 14008 Sec. 218 https://www.energy.gov/sites/default/files/2021/02/f83/eo-14008-tackling-climate-crisis-home-abroad.pdf.

Coal-dependent communities have faced economic decline stemming from technological innovation, shrinking power demand, and environmental regulatory pressure for decades. Between 1985 and 2001, coal industry employment fell by 59 percent, despite a 28 percent increase in coal production, because of efficiencies gained by shifting power production from Appalachia to the West (DOE 2017). More recently, in 2019, U.S. coal production hit its lowest levels since 1978—the number of coal mining employees dipped to just over 43,000 workers, down from over 90,000 in 2012 (Figure 2Figure 2) (BLS n.d.). Demand for coal-fired power generation is forecasted to continue declining as decarbonization of the electricity sector becomes more prevalent and other, more economic, technologies take over the role of power production.

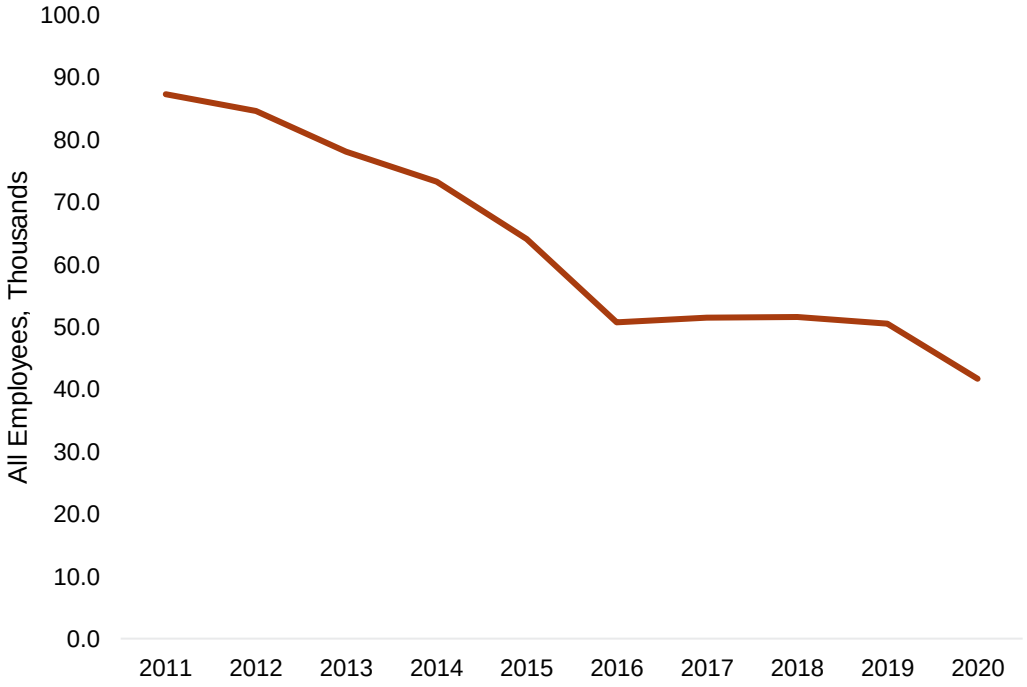

Figure 2. National coal mining jobs. Yearly average of all employees in the coal mining industry between 2011 – 2020. (Data source: BLS; Analysis by: PNNL)

2.1 Energy Transition Ripple Effects

Apart from employment, coal communities face other economic concerns surrounding the transition away from coal-based power generation. Twenty-six counties in the United States are classified as “coal-mining dependent,” meaning that coal-related revenue may fund a third or more of local budgets including property taxes, sales taxes, and school districts (Morris et al. 2019). All across the nation, coal-dependent communities are faced with economic, environmental, and social challenges presented by the energy transition process. The United States has neither federal guidelines to facilitate the energy transition, nor any precise procedures to regulate the coal plant decommissioning process, which exacerbates uncertainty in the pace and direction of the transition for all stakeholders involved—communities, shareholders, and utilities alike (Carley et al. 2018).

2.1.1 Equitable Decision-Making Framework and Best Practices Needed

As the energy landscape in the U.S. continues to change, the question of how to engage community stakeholders in the decision-making process and meet their needs through an equitable transition remains unanswered. An equitable transition is underscored by the fair treatment and meaningful involvement of affected stakeholders (EPA 2020). Within an environmental context, the concept of equity refers to the sharing of environmental benefits and burdens in society. Similarly, in the energy justice context, equity refers to the application of recognition,[1] distributive,[2] procedural,[3] and restorative[4] justice notions in the decision-making process. In other words, it means the distribution of social, economic, and environmental benefits and burdens are not disproportionately shouldered by any one community group. An equitable transition must therefore involve an inclusive approach, by which community members' needs are voiced, meaningfully recognized, and treated with fair consideration throughout the process.

Such an approach is vital in the energy transition given that the coal industry is forecasted to continue to decline, and no standard framework exists to guide an equitable energy transition process. Coal-dependent communities are often marginalized communities, including those in rural areas, of low-income status, communities of color, and indigenous populations that have been historically ignored in the environmental decision-making process. As the U.S. federal government works to mobilize resources to revitalize hard-hit coal-dependent communities all across the nation and design new strategies for incorporating principles of equity into the conversation, uplifting community voices will be important.

Because coal plant retirements are addressed on a plant-by-plant basis and the decommissioning process is often left to the discretion of the plant owner, and the role of the community in the decision-making process can be unclear. After a power plant is retired, the site goes through a complex and expensive multi-year process that can include decommissioning, remediation, and redevelopment of the site (see Table 3), and the latter can be subject to stakeholder disagreement about future land uses. For example, the redevelopment of the brownfield sites containing Chicago's former Fisk and Crawford coal-fired plants was a major point of contention within the predominantly immigrant and Latino neighborhoods of Pilsen and Little Village. To collect community input and develop a shared vision for the redevelopment plans, Mayor Rahm Emanuel organized the Fisk and Crawford Reuse Task Force, which was aligned with a number of grassroots organizations in the area (Hamilton et al. 2017).

Table 3. Decommissioning options.

Terms	Definitions
Retirement/Shutdown	Announce retirement/closing and cease power production.
Mothballing	Deactivate and preserve the production facility for possible future use or sale.
Decommissioning	Remove equipment and materials. Close or comply with permits, as necessary. Demolish buildings.
Remediation	Clean up contamination to support new use.
Redevelopment	Repurpose or construct a new site or repower for another generation technology.

[1] Recognition justice emphasizes the need to understand different types of vulnerabilities and needs of social groups.
[2] Distributive justice involves identifying where energy injustices emerge in society.
[3] Procedural justice evaluates decision-making processes to assess whether all stakeholders have been included.
[4] Restorative justice focuses on mitigating past energy injustices/inequities.

One of these groups, the Little Village Environmental Justice Organization, was critical in organizing community pushback against developers' plans to build a massive warehousing facility on the brownfield sites. The organization helped negotiate a Community Benefits Agreement[1] that prohibits any fossil-fuel industry from operating on the property and requires new owners to present site use plans to the community (Lydersen 2020). Although the community was successful in negotiating a solution that would prioritize their need for both a clean environment and having more influence over how the sites would be converted for future use, the case study also highlights the need for a programmatic framework to guide decommissioning processes in an equitable way.

2.2 Affected Communities and Decommissioning Process Outcomes

Communities directly affected by coal plants, both in terms of economic burdens (e.g., unemployment, tax revenue loss) and environmental health burdens (e.g., pollution, associated health effects), tend to be disproportionately made up of minority and low-income populations. Figure 3 shows coal-fired power plant recent and planned retirements and operating plants with probable retirements after 2024 overlayed on the poverty rate in the associated regions.

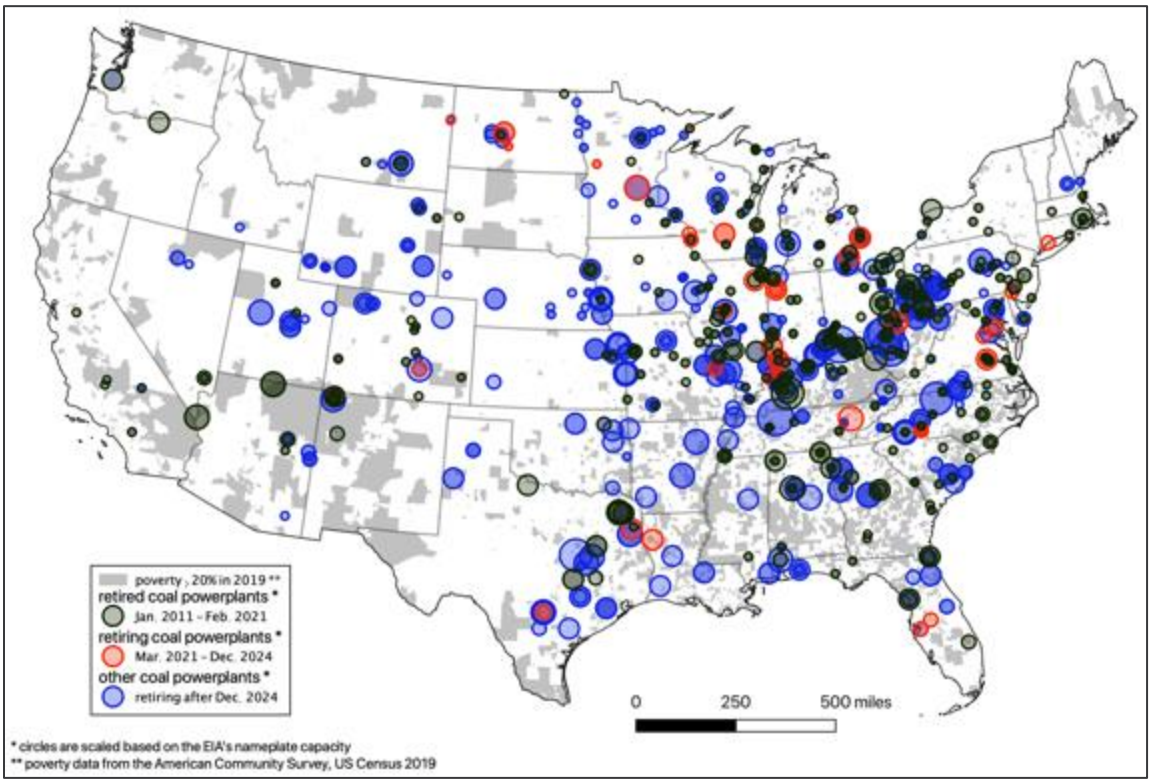

Figure 3. Status of coal-fired power plants. Recent and planned retirements (2011–2024), operating plants with probable retirement post 2024 overlayed on poverty rate in the region. (Data source: EIA, US Census; Analysis by: PNNL)

[1] A Community Benefits Agreement is a contract between a developer and community-based organizations representing residents' interests, which delineates the benefits the community will receive in return for supporting the developer's project.

Wilson et al. (2012) assessed the socioeconomic and demographic disparities for those living within 3 miles of a major U.S. coal-fired power plant using data from the 2000 Census. The authors reported that the six million fenceline communities had a lower average income of $18,400 compared to the national average of $21,587 and were more likely to be people of color at 39% compared to 36%. The focus of this report is not on the patterns of siting and racial and socioeconomic disparities, but to highlight the need for an inclusive approach to capture all community needs in the coal-fired power plant decommissioning process, especially for communities that have been historically neglected.

Despite the economic spillover effects that decommissioning will have on the surrounding community, residents often do not have a say on the decision to decommission a coal plant. After the decision has been made to decommission plants, they may be left idle to stand unremediated and undeveloped, repurposed with a fuel switch to another generation resource, redeveloped to serve other electric grid needs like load pockets or remote transmission, or redeveloped and repurposed with alternative commercial activities like shopping centers, museums, or logistics hubs. Which direction a retired plant may go depends on several factors, such as the economics of decommissioning and potential redevelopment of the retired plant. The needs of the community may also influence the outcomes of the decommissioning process; desired outcomes may include reparations for coal workers who have serious health effects from years of mining and waste disposal, workforce services and skills training for displaced workers, and more state-funded energy efficiency programs. State and local governments have various approaches to handling coal revenue; some governments stream revenue directly to county governments and local school districts, and others flow it through coal-funded state trust funds, for example.

3.0 Communities in Transition

Numerous U.S. communities are transitioning from coal dependency to the new energy economy. The following sections present the results of case studies conducted in four of these communities—Wise County, Muskegon, Anderson County, and Becker communities in a range of geographical settings—to help identify the best practices in coal plant decommissioning processes. For each study, plant and community backgrounds are described, followed by the motivations for plant retirements, the community's perspective on the plant decommissioning process, and associated best practices.

3.1 Case Study: The Virginia City Hybrid Energy Center, St. Paul, Virginia

3.1.1 Plant Background

The Virginia City Hybrid Energy Center (VCHEC; Figure 4) is a hybrid power station in southwest Virginia in the town of St. Paul that cost $1.8 billion to build (Boyd 2015). The power station was commissioned in 2012 and is owned by Dominion Energy (other investors include American Electric Power, Virginia Municipal Electric Association, and Blue Ridge Power). The plant is operated by Dominion's subsidiary Virginia Electric & Power Co and has a 668 MW nameplate capacity burning coal and coal waste (or gob), and up to 20% biomass. It currently burns 93% coal by energy input consuming about 537 thousand tons/year. The plant has had numerous air pollution violations, including surpassing its limits on carbon monoxide, particulate matter, hydrochloric acid, and sulfur dioxide emissions, although it was once deemed Virginia's

cleanest-burning power plant. There were intense protests and legal challenges by local and environmental groups prior to the plant construction. In just eight years after the plant commenced operation, the conversation is now about the potential decommissioning of the power plant in the next decade.

Figure 4. Virginia City Hybrid Energy Center. (Source: Google Earth 2021a)

3.1.2 Community Background

In 2019, Wise County had a population of about 38 thousand and St. Paul had about 1,000 residents. Most of the county residents are white (92.1%) followed by black or African American (5.5%). The median county household income was $38,888 (compared to the state's median household income of $74,222) and 22.1% of the population was below poverty level (U.S. Census 2019). Wise County has a low workforce participation rate and high unemployment. The labor force participation rate in the 2019 American Community Survey (ACS) 5-year[1] estimates was reported to be 45%, employment 40.7% and unemployment 9.4% (the unemployment national average is 5.3%, the Virginia average is 4.6%).

The regional economy was once largely dependent on extraction-based activities—namely, coal mining; the pivot to coal-fired generation was an effort to financially revitalize the area following the decline of the mining industry. Based on Dominion's reporting (Table 4), the VCHEC power plant employs around 153 full-time employees and supports 300–400 additional jobs in the area. The plant provides approximately $8.5 million in annual property tax revenues for Wise County (15% of the County's budget). The local economic activity surrounding the plant raises an additional $40 million per year for the County (Cates et al. 2020). Additionally, local coal mines provide coal for the power plant, and are at risk of closure when the power plant closes, worsening the job impacts in surrounding counties.

[1] Wise County, Virginia employment status
https://data.census.gov/cedsci/table?q=wise%20county,%20VA%20unemployment&tid=ACSST5Y2019.S2301

Table 4. Virginia City Hybrid Energy Center operation benefits and decommissioning impacts.

VCHEC Operation Benefits	VCHEC Decommissioning Impacts
153 full-time jobs	Job losses
350–400 external jobs supported	Economic loss
$6 million-$8.5 million local tax revenue	Local tax revenue loss
$25 million–$40 million local economic activity	School budget cuts
	Environmental impacts
	Gob (accumulated spoil) piles cleanup
	Cultural losses

3.1.3 Motivations for Decommissioning

In April 2020, Governor Northam signed the Virginia Clean Economy Act (HB 1526, SB 851) requiring almost all coal power plants in Virginia to close down by 2024 (VA Governor 2020). The Act specifically requires Dominion Energy to provide 100% carbon-free energy to its retail customers by 2045, which also sets the decommissioning of VCHEC by that timeframe at the latest. However, community members fear that the plant closure could happen sooner than 2045 considering the plant has been running at low capacity in recent years and is operating at a financial loss. In 2013 and 2014, the plant ran at above 65% of its capacity. In the past few years, however, the plant's running capacity has been declining. In 2018 and 2019, the capacity fell to 54% and 22%, respectively. Dominion Energy anticipates the plant capacity factor to continue declining with an average capacity at less than 7.7% in the next decade and a projected capacity factor of 3.2% by 2035 (Cates et al. 2020). At the Integrated Resource Plan hearing at the State Corporation Commission, the financial and economic risk of operating the plant was highlighted—VCHEC was found to be uncompetitive in the market for about 94–97% of the time.

Although the plant closure is inevitable, no timeline has been determined aside from the 2045 deadline, and no deommissioning process has been required other than discussion by Dominon officials of possibly repurposing the site for renewable energy. In 2021, the Virginia General Assembly passed Senate Bill 1247/House Bill 1834 (VA LIS 2021). The bill is designed to ensure a transparent power plant decommissioning process in the state of Virginia. The bill was initiated by advocates primarily in Wise County and it includes three key provisions (Anderson 2021):

- A requirement for public notice and public hearing in the case of large carbon-emitting plant decommissioning.
- A requirement to maintain a website detailing decommissioning dates for large carbon-emitting power plants. The state Department of Mines, Minerals and Energy is tasked with this role.
- A requirement for investor-owned utilities to provide carbon-emitting power plant decommissioning studies as part of Integrated Resource Plans (IRPs) and to provide the information to affected communities.

Under the bill's requirements, Dominion Energy would be required to provide written notice of the public decision to decommission the plant to Wise County and surrounding communities, as well as to the state agencies that provide supportive services and programs. The requirement further asks for Dominion to provide information about the anticipated plant closure date, a list of permits for the facility, anticipated future uses of the site, workforce transition assistance

information, and complete decommissioning information. The bill requires the governing bodies (those in the facility location and the planning district commission) to hold a public hearing within 6 months of the formal announcement to decommission.

3.1.4 The Community's Perspective on Decommissioning

The VCHEC power plant was already a source of discord within the community. Environmental advocacy groups did not want a fossil-fuel power plant to be built, and other community advocates thought the plant was an unnecessary investment from an economic standpoint. Plant opponents responded to the plant's low utilization rates with "we told you so" sentiments. The plant that was highly celebrated will be planning for shutdown after only eight years of operation. Plant proponents, on the other hand, believed the plant would bring a significant benefit to the local economy through jobs and tax revenue, which it did. Wise County already faced the impact of the coal mining industry decline, and the power plant was seen as a means to help the community cope with the changing economic landscape. Both supporters and opponents of the plant now fear for the future of the community. They are worried about what would happen to the local economy, potential school budgets, business closures, and impacts on livelihoods as the plant closure is expected in the next 10 years.

The major impact anticipated by the community following the decommissioning of the plant is the expected loss in tax revenue for the County. For community members this translates into a significant impact on schools and other public services in the area. For a region with high unemployment and poverty rates, the job losses and decrease in economic activity due to the plant closure would be a critical threat. The issue of environmental cleanup is another huge concern among community members, especially the resources for cleaning up gob (accumulated spoil) piles, for which the only remediation solution currently is to burn the gob at the power plant. Table 5 offers a summary of the available funding resources to support in the decommissioning process. Losing a power plant and the transition away from fossil fuels will be a tough transition for communities that have been dependent on these resources and have been proud to be an energy production hub for the country in the past.

Table 5. Funding resources to support plant decommissioning and impacted communities.

Funding Type	Funding Source
Decommissioning and site cleanup funding	Department of Mines Minerals and Energy Funding for abandoned mine land reclamation that could be used to clean up gob piles
Economic development and community revitalization funding	GO Virginia Virginia Coalfield Economic Development Authority The Tobacco Region Revitalization Commission Department of Housing and Community Development Virginia Economic Development Partnership Department of Labor and Industry

3.1.5 Best Practices for Coal Plant Decommissioning for Wise County

The following list of best practices were identified by the residents of Wise County and the surrounding community:

1. Start early community engagement and continue throughout the plant decommissioning process.

a. Offer in-person, virtual, and written comment opportunities.
b. Conduct listening sessions to hear concerns and desires from affected communities.
c. Use a transparent process providing trusted information throughout.

2. Integrate the power plant decommissioning timeline in the state's climate and clean energy transition targets.
3. Conduct plant decommissioning impact assessments, communicate results to affected communities, and coordinate the appropriate remediation plans.
4. Identify funding resources to support decommissioning and the affected communities upfront.
5. Plan early for post-decommissioning projects to replace lost jobs, revenues, and economic activity.
   a. Gather community input for the post-decommissioning plans realizing economic development is not a one-size-fits-all proposition.
   b. Recognize the cultural, social, environmental, and long-term health impacts faced by communities.

3.2 Case Study: The Bull Run Fossil Plant, Anderson County, Tennessee

3.2.1 Plant Background

The Bull Run Fossil Plant (BRFP) is located on 750 acres of land in Anderson County, Tennessee (Figure 5), along the north bank of Bull Run Creek and on the east bank of the Clinch River (GEM 2021a). The plant consists of a single coal-fired generator that has a winter net-generating capacity of 881 MW and a summer net capacity of 863 MW (TVA 2019). Constructed between 1962 and 1966 by the Tennessee Valley Authority (TVA), the BRFP officially commenced operation in 1967 and is slated to cease operation in 2023. Over the course of its lifetime, the site has reportedly grown to store more than 10 million cubic yards of coal ash, or approximately 172 acres of coal combustion residuals. The plant consumes more than 2.66 million tons of coal a year and releases millions of tons of harmful emissions annually as well (GEM 2021a). In fact, the BRFP was responsible for roughly 60% of the greater Knoxville area's pollutant emissions in 2002. Despite upgrading the facility with SO_2 emissions-reducing scrubbers in 2008, fine particle pollution from the plant—consisting of SO_2, NO_X, soot, and other heavy metals—was linked to the deaths of 21 individuals in just one year alone (GEM 2021a). Much like the VCHEC, the BRFP has been linked to multiple Clean Air Act violations. Although it has been reportedly described as the "most-efficient coal-fired plant in the nation" (and was awarded this title 13 times), the TVA approved the retirement of the BRFP by December 2023, listing the rising economic cost of maintaining its ever-declining and environmentally taxing performance as one of the primary motivators (TVA 2012).

Figure 5. Bull Run Fossil Plant. (Source: Google Earth 2021b)

3.2.2 Community Background

Anderson County has a population of about 75,000 people, and the county seat of Anderson—the city of Clinton—has roughly 9,800 residents. The median county household and per capita incomes ($50,392 and $28,455, respectively) are slightly lower than the nation's ($63,843 and $34,103, respectively) (U.S. Census 2021a). In Anderson County, 15.3% of people live below the poverty line which is higher than the national poverty rate of 10.5% in 2019 (U.S. Census 2020a). In Clinton, the median household income is slightly lower than the county level, at $45,000. At both the city and county scale, the majority of residents are white (93.9% in Clinton and 89.3% in Anderson County), followed by black or African American residents (2.79% and 3.26%, respectively), and people of multiracial backgrounds (1.75% and 2.54%, respectively).

Anderson County's economic history is rich—the area has found prosperity through many different modes of industry over the course of its existence, including coal mining (in the mid-to-late 19th century). Before it became economically tied to coal-fired generation, the County also found relative prosperity through a different TVA-led endeavor: the construction of the enterprise's first major dam. The TVA project, now the Norris Reservoir, brought thousands of jobs to the area during the Depression era. Ironically, the change in water temperature below the dam killed the local freshwater mussel population and resulted in the demise of the fishing and recreation industry in the city of Clinton, thereby stunting the local economy (Anderson 2021). Now, the scheduled closure of the TVA's Bull Run Fossil Plant may also spell economic trouble for the city of Clinton and the surrounding areas (Table 6), because it provides an annual $450,000 payment (in lieu of taxes) to the county area, much of which goes to the Claxton Elementary School. The plant also employs 125 workers, all of whom are regional, and one-fifth of whom are local people from Anderson County.

Beyond the local economy, the BRFP has also had a historied environmental and visual footprint on the local landscape. Anderson County is home to an abundance of natural resources and recreational facilities, including the 780-acre Haw Ridge Park, located in the

southeastern corner of the city of Oak Ridge, across from the BRFP. The city is also home to the Oak Ridge Rowing Association and a number of rowing venues (also directly across from the BRFP), which have sparked growth in the local tourism industry and garnered the area a reputation for its recreational offerings.

Table 6. Bull Run Fossil Plant operation benefits and decommissioning impacts.

BRFP Operation Benefits	BRFP Decommissioning Impacts
125 full-time jobs (~100 regional, ~25 local)	Job losses
$450,000 annual payments	Economic loss
	Loss of funding stream for school districts
	Property value impacts (if site goes unmaintained)

3.2.3 Motivations for Retirement

The motivation behind the retirement of the BRFP was largely economic. Analysis of the TVA's BRFP and Kentucky-based Paradise coal plant found that the two units no longer operate reliably and that retiring the generators would result in an estimated $320 million in net present savings, amounting to $1.3 billion in avoided capital costs (Gheorghiu 2019). The analysis, which evaluated load forecast, historical and projected natural gas prices, the potential of a carbon tax, and the capital investment risks associated with both plants, also found that the two coal-fired generators would not be economically competitive *even if* power demand increases and the price of natural gas—a market competitor for coal—more than doubles. The only scenario in which the plants could be dispatched efficiently within the fleet is if TVA's baseload power demand doubles, but as stated by former TVA CEO Bill Johnson, "…load is likely to continue to decline" (Wamsted and Schlissel 2019). Johnson also revealed that the units can be retired without any impact on the reliability or resiliency of the TVA system. In fact, the TVA has enough capacity to meet loads without the Paradise and Bull Run Fossil plants. Given that the generators have outlived their design lives, face rising competition from renewables and natural gas, and are expected to rack up higher operating and environmental compliance costs over their lifetimes as performance continues to decline, virtually no profitability remains in keeping the units online. In February 2019, the TVA board of directors voted to retire the BRFP, with a deadline date of December 2023.

Although the TVA is a state-owned enterprise, meaning its shares are owned by the federal government, it acts like a private corporation. As such, the retirement decision came down to the nine-member board of directors, each nominated by the President and confirmed by the Senate. Based on the utility's environmental assessment committee recommendations, the board voted to close the plant, despite the Trump administration efforts to save the plant with proposed subsidies (Gardner 2019). Since the TVA announced its retirement decision in 2019, the decision-making process for post-retirement site plans has largely evaded local community input. The TVA has indicated that their preferred alternative for the future involves full demolition of the plant to keep the site open for reuse (TVA Virtual Open House 2020), but a formal negotiation process that assesses community needs for site alternatives is still lacking.

3.2.4 The Community's Perspective on Decommissioning

The decision to retire the BRFP stirred mixed emotions throughout the region. In response to the BRFP's draft environmental assessment published by the TVA (TVA 2019), local figures

such as Senator Ken Yager and Oak Ridge Mayor Warren Gooch commented in support of keeping the BRFP online, arguing that it provides critical fuel diversity during extreme weather and flexible, economic baseload power (if maintained with prudence). In contrast, some local residents and community advocates commented in favor of the retirement, listing factors such as climate change, environmental and human health, and cost-competitive renewables as key drivers for shuttering the plant (TVA 2019).

The TVA also received substantive comments about ideas for alternative site uses, with some suggesting site redevelopment for grid-scale energy storage or renewables, and others commenting on potential economic development opportunities due to the site's size, location, and proximity to rail, road, and water networks. A few respondents voiced interest in converting the site into data centers or housing a new supercomputer for the nearby Oak Ridge National Laboratory, while others responded with less specific requests, simply advocating for environmental protection of the area (TVA 2019). In more recent discussions, there were suggestions to use the site for a new museum, library, conference center, glass recycling center, health clinic, or a wind or solar farm (Pounds 2021); a proposal to include park facilities, such as picnic areas, biking trails, and hiking paths, complementary to the nearby Haw Ridge Park and rowing venues was also mentioned. TVA has also pitched its own ideas for the future of the site, such as park areas, bike trails, and a "development area" for future industrial activity with solar "blankets" above the current coal ash storage to generate power (Pounds 2021).

Although community consensus about the direction of the decommissioning process has not been reached, most local residents agree that a major concern surrounding the future of the BRFP is the coal ash impacts (Figure 6). TVA stores millions of tons of coal ash in the working-class neighborhood of Claxton, almost all of which is sited atop groundwater and along public water sources (Satterfield 2021). Four of the eight coal ash pits at the site are known to be unlined and leaking, and several well monitoring tests have confirmed that pollutants have surpassed their exceedance levels. Some locals have claimed that the emissions from the plant, fine particulate agents known to be carcinogenic, caused their cancer. This is not unlikely, because pollution from the BRFP has already been linked to multiple illnesses and diseases, including 340 asthma attacks, 31 heart attacks, and 13 cases of chronic bronchitis (GEM 2021a). Locals have also experienced random events of what they suspect to be "fugitive dust" during which ash from the plant settles upon cars and around the community during operation hours (Appalachian Voices 2019).

Community opinions about whether the coal ash should be moved offsite or kept in its current location at the BRFP facility are mixed. The decision is a difficult one, because the community will be faced with environmental ramifications and public health consequences if the ash pile is kept onsite, but will also encounter significant impacts if the coal ash is removed. In more recent years, the TVA attempted to use land it purchased through eminent domain—a process that displaced many families with generational ties to their land—to establish a coal ash landfill for the existing ash at the facility. Fearful that the landfill would leach potentially toxic material into the nearby Bull Run Creek, local residents worked together to strike down the proposal, causing TVA to withdraw the permit application (Flessner 2020). Community trust in TVA is exceptionally low, not only because of the utility's eminent domain schemes and lack of accountability for coal ash contamination, but also because of the ongoing legacy of the 2008 Kingston coal ash spill.[1]

[1] After more than 1.5 million tons of coal ash broke out of an unlined containment pond at TVA's Kingston facility, hundreds of workers who tirelessly labored to clean up the spill are now sick and dying. The event provided a number of lessons in worker safety for coal ash handling, and although cleanup efforts have since concluded, the consequences of worker neglect are ongoing—many of the cleanup workers, two of whom live relatively close to the BRFP, have fallen ill from exposure to TVA's toxic coal ash.

Figure 6. The BRFP facility's dry fly ash stack, located next to children's playground in Anderson County.

TVA's noncommittal attitude toward engaging the community in the decommissioning process has strained their relationship with the community and constituted a large barrier in setting the stage for a just transition process. The community wants more direct input in the retirement planning process, and more specifically, a formal negotiation agreement to be signed by the TVA, especially to ensure that the community has some influence on the landfill permitting issue. Since 2018, the TVA has hosted or planned a total of 13 sessions for information dissemination/public involvement in the BRFP retirement process, 3 of which did not provide opportunities for formal public comments.

The major impact anticipated by the community following the decommissioning of the plant is the expected loss of tax revenues for the County. For community members, this translates to a significant impact on school districts in the area (Claxton Elementary School, in particular). The decrease in economic activity due to the plant closure could be a critical threat to the community and the issue of environmental cleanup is another huge concern among community members, especially the resources for cleaning up coal ash piles. The available funding resources to support during the decommissioning process are compiled in Table 7.

Table 7. Funding resources to support plant decommissioning and impacted communities.

Funding Type	Funding Source
Decommissioning and site cleanup funding	Tennessee Department of Environment & Conservation Brownfields Redevelopment Program • Provides grant assistance and technical oversight. • Oversees the Voluntary Oversight, Cleanup, and Assistance Program.
Economic development and community revitalization funding	Tennessee Department of Community and Economic Development • Provides grant assistance through Community Development Block Grants and FastTrack Grants (for public infrastructure improvements, workforce training, offsetting investment costs for expanding businesses). ThreeStar Program • Provides asset-based planning to help communities maximize their local assets to drive economic development.

3.2.5 Best Practices for Coal Plant Decommissioning for Anderson County

The following list of best practices were identified by the residents of Anderson County and the surrounding community:

1. Start early community engagement and continue throughout the plant decommissioning process.
    a. Offer in-person, virtual, and written comment opportunities.
    b. Conduct listening sessions to hear concerns from affected communities.
    c. Have a transparent process and provide trusted information throughout. Build trust within the community.
    d. Provide updates on the decision-making process as requested by the community.
2. Ensure effective community engagement throughout the National Environmental Policy Act[1] process.[2] Uplift community voices in the evaluation of site alternatives.
3. Integrate community support resource opportunities into the decision-making process, such as the technical expertise available at the nearby Oak Ridge National Laboratory.
4. Conduct plant decommissioning impact assessments and communicate results to affected communities.
    a. Perform environmental assessments and release monitoring reports regularly to keep the community informed of potential environmental hazards.
5. Identify funding resources to support decommissioning and the affected communities upfront.
6. Plan early for post-decommissioning projects to replace lost jobs, revenues, and economic activity.
    a. Gather community input for the post-decommissioning plans realizing economic development is not a one-size-fits-all proposition.
    b. Mitigate the risks and long-term health impacts from on-site contamination.
    c. Recognize the cultural, social, and environmental attributes of the site and local community.
    d. Identify resources and methods for decision making regarding the post-decommissioning site use (see Table 7).

3.3 Case Study: The Cobb Generating Plant, Muskegon, Michigan

3.3.1 Plant Background

For nearly seven decades, Muskegon County was home to the 320 MW B.C. Cobb Generating Plant (referred to here as the Cobb Plant; Figure 7). Located on 300 acres of land just a mile away from Lake Michigan, the Cobb Plant was first built in 1948, retired in 2016, and finally

[1] The National Environmental Policy Act (NEPA) establishes a national policy for the environment, and it is the first major environmental law in the U.S. https://ceq.doe.gov/
[2] The National Environmental Policy Act (NEPA) process is a set of activities performed to gather and analyze information on potential environmental effects of projects https://www.epa.gov/nepa/national-environmental-policy-act-review-process

demolished in 2020 (Moore 2021). It was considered a local landmark of sorts; as the former tallest structure in Muskegon County—standing 650 feet above ground, 345 feet taller than the Statue of Liberty—it was visible to travelers on both land and water (Bissell 2019). Owned by Consumers Energy, it was the last of the seven coal-fired power plants in Consumer Energy's parent company (CMS Energy) fleet to be retired.

At the time of its construction, the plant cost $26 million to build, approximately $318 million in current prices (according to 2016 inflation) (Bissell 2016). The facility originally consisted of three 60 MW coal-fired units that were retired in 1990, then was repowered using natural gas in 2000, and permanently decommissioned in 2008. Units 4 and 5, capable of generating 160 MW of electricity each, were brought online in the mid-1950s and were retired in 2016. These two units consumed approximately 1 million tons of coal per year and released millions of tons of emissions annually—in fact, the deaths of at least 34 individuals and hundreds of cases of respiratory illness and disease were attributed to the fine particle pollution from the Cobb Plant (GEM 2021b).

Figure 7. B.C. Cobb Generating Plant. (Source: Google Earth 2021c)

The Cobb Plant has been the subject of many protests over the course of its lifetime. Grassroots environmental groups in particular have challenged the facility's environmental footprint, such as in 1981, when Greenpeace activists attempted to climb the 650-foot-tall smokestack and unfurl a banner protesting acid rain (Bissell 2016). Although the decision to retire the Cobb Plant was largely motivated by economic reasons, CMS Energy's pledge to sustainability—outlined in the company's 2019 Integrated Resource Plan (CMS IRP 2019)—also played a sizeable role. In the IRP, CMS Energy committed to reducing carbon emissions

from its electric-generating fleet by over 90% by 2040. In 2020, the company announced an even more progressive goal to achieve net-zero carbon emissions by 2040 (Consumers Energy 2021). The retirement of CMS Energy's "Classic Seven" coal plants, capable of generating nearly 1,000 MW of electricity, is vital to this goal; shutting down these seven plants reduces the company's carbon footprint by 25%, air emissions by 40%, and water usage by 40% as well (PR Newswire 2016).

3.3.2 Community Background

The city of Muskegon, which holds the seat of Muskegon County, is located on the west side of Michigan, approximately 115 miles north of the Indiana/Michigan state line, on the eastern shore of Lake Michigan. In 2019, the city population was approximately 36,565 and the county population was around 173,000 (U.S. Census 2021b). Muskegon has been characterized by high poverty rates—in 2019, almost 28% of the city population lived below the poverty line, compared to the national rate of 10.5% for the same year. At the county level, the poverty rate is significantly lower at 13.5%. The median household and per capita incomes are higher at the county level ($50,854 and $25,435, respectively) than in the city of Muskegon ($32,433 and $17,495), but the region generally fares worse than the rest of the nation (at $63,843 and $34,103) (U.S. Census 2021c). At both the city and county scale, the majority of residents are white (58.8% in the city and 81.2% in the county), followed by black or African American residents (32% and 14%, respectively), and people of American Indian or Alaskan Native descent (0.8% and 1%, respectively).

Over its years of operation, the Cobb Plant employed thousands of residents from the surrounding communities (Table 8). At its peak, when the facility was capable of providing power to more than 200,000 customers, it took roughly 200 employees to keep the plant running (Lofton 2019). Most of the employees lived in the city of Muskegon or in immediately adjacent communities. During the height of its operation, the plant also contributed roughly $70 million in annual tax revenue to the City and affiliated jurisdictions and upwards of $4 million in property tax revenue. However, in the years prior to the plant closure, Consumers Energy disputed a number of property tax assessments, arguing that Units 1, 2, and 3—which were retired in 2008—did not have taxable value (Delta Institute 2017). The settlement was approved in favor of the utility by the Michigan Tax Tribunal and ultimately reduced the value of the plant by more than 55% over the four disputed tax years from 2009 to 2012 (Alexander 2012). The taxing units—the city of Muskegon and local school districts—were forced to repay the utility more than $4.5 million in property tax overpayment per the settlement stipulations. Although the County did anticipate this potential loss in the budget, the area nevertheless weathered a large financial hit as a result.

The property tax dispute also involved a negotiated agreement between the City of Muskegon and Consumers Energy, in which the former agreed to drop the cash value of the plant property to $24 million in 2014, $20 million in 2015, and $11 million in 2016, and the latter agreed to make payments of $100,000 for "local essential services" to the City each year between 2014 and 2016 (Taylor and Benton, 2017). Unfortunately, the financial burdens imposed on the City and its residents did not end there. When the plant closed, property owners paying the local school district millage (based on the taxable value of the land) saw the debt levy nearly double to cover the loss of valuation.

The Cobb Plant was the single largest taxpayer in the county area and represented approximately 17% of the county seat's tax base in 2011 (Taylor and Benton 2017). The loss of the largest tax source in the area created and exacerbated a number of economic spillover

effects, which Consumers Energy tried to alleviate as best as possible. After plant closure, all 160 on-site personnel (65 local to the county area) were offered work at other Consumer Energy facilities within commuting distance (PR Newswire 2016). To mitigate potential economic fallout from the retirement decision, CMS Energy provided funding for a number of community improvement projects, including $250,000 for streetscaping near the plant and LED street light conversion projects around the community. Although CMS Energy did try to offset some of the economic burdens resulting from the plant closure, the cultural losses affecting the community were hardly quantified, let alone compensated for. The plant was a well-accepted feature of the community; its well-lit stack was used for navigation by boaters on Lake Michigan trying to find their way into the harbor. More than 300 people attended a final public tour of the facility, which evoked feelings of nostalgia for many local residents (Delta Institute 2017). The smokestack could be seen on the horizon from miles away and became, in a way, a monument of the Muskegon landscape. Although gone, the legacy of the plant remains in its environmental footprint—in the 60 acres of closed coal ash ponds located across the street from the former plant.

Table 8. Cobb Generating Plant operation benefits and decommissioning impacts.

Cobb Plant Operation Benefits	Cobb Plant Decommissioning Impacts
More than 100 full-time jobs	Economic loss
Thousands of local workers employed	Local tax revenue loss
Upwards of $70 million in local tax revenue	School budget cuts
Upwards of $4 million in property tax revenue	Environmental impacts
School district funding	Cultural losses

3.3.3 Motivations for Retirement

The move to retire the Cobb Plant was part of a larger effort to eliminate coal from CMS Energy's fuel mix. The intention behind changing the company's fuel portfolio was to take advantage of increasingly cost-competitive natural gas and renewable energy sources, which also aligned with the utility's goal of decreasing greenhouse gas emissions across its electric-generating fleet. The surplus of generating capacity in the Upper Midwest, combined with lower natural gas prices linked to expanded shale gas supplies, make investments in new and existing coal-fired plants economically unsound (Alexander 2012). The Cobb Plant had outlived its projected 50-year life span after Consumers Energy pumped millions of dollars into retrofitting the plant over the past two decades—investing more money to keep the less-efficient, environmentally taxing Cobb Plant running was simply unviable, according to company officials (Alexander 2012). The cost of upgrading the units to comply with the U.S. Environmental Protection Agency's Mercury and Air Toxics Standard rule that took effect in April 2016 was also far too expensive to merit continued operations for the old Cobb Plant generators (Cassell 2015). The cost of installing regulation-approved pollution controls, on top of the fact that Units 4 and 5 could not be repowered for natural gas generation like the plant's predecessor Units 1, 2, and 3, strengthened the retirement proposal. The decision to retire not just Cobb, but also the remaining six coal-fired facilities in CMS Energy's fleet, was also based on reduced demand for electricity in Michigan. By retiring the "classic seven" and making environmental improvements to its remaining generating units, the utility anticipates a reduction of power plant emissions by 90%, a key step in paving the way to the clean energy transition, as delineated in CMS Energy's 2019 IRP.

3.3.4 The Community's Perspective on Decommissioning

Upon hearing the news of the plant's proposed retirement, the Muskegon community did not fight to save the facility, recognizing that its old age, declining performance, and ever-growing environmental footprint would impose larger economic consequences on the community if not decommissioned. Ultimately, there was not much room for negotiation on the community's side—the decision to retire was quick and final. However, CMS Energy prepared the community for this type of news years in advance—as early as 2012—and offered to transition Cobb Plant employees to other Consumers Energy-owned facilities. Because the decommissioning process itself was largely nonnegotiable, community members focused their efforts on determining the best long-term reuse plan for the site. Residents agreed that they did not want the land to remain a brownfield or the building to sit on the property for years after retirement, which was (and is) common on other industrial sites in Michigan.

CMS Energy contributed partial funding for alternative site use studies. It was ultimately determined that the best (and most economic) use for the site would be to take advantage of the port facility on Muskegon Lake, an economic hub for the local construction and shipping industries. From a taxable value standpoint, the deep water port does not come close to matching the revenue generated by the former Cobb Plant, but it was nevertheless recognized by the city and community as the best solution for the site.

Although the community was largely uninvolved in the direction and pace of the plant retirement process, CMS Energy did their best to be direct, open, and truthful about their proposed plans. The plant was fully decommissioned by CMS Energy and eventually sold to a third-party holding company, Forsite. Consumers Energy spent approximately $22 million to shut down the plant and another $1 million for Forsite to take ownership of the property (Delta Institute 2017). The sale, which was approved by the Michigan Public Service Commission, allowed Forsite to demolish the plant and sell the parcel of land to Verplank, a shipping company that has a well-established presence in the area. Throughout the process, the City worked on behalf of the community to ensure that residents' needs were being met; for example, City officials were able to move up the plant demolition timeline in exchange for approving permits for oversized backfill rocks on the site. The City also worked to ensure the coal ash ponds near the Cobb facility were completely removed; although community members contend that more could have been done to force the issue, CMS Energy agreed to close the fly ash ponds and remove the waste, but only after the City agreed to let the company leave ash pilings at the deep water port.

Although the decision-making process was neither equitable, nor entirely transparent, CMS Energy did give the community some leeway in assessing the best future use for the site. CMS Energy recommended alternative uses for the site, including an expanded deep water port, an agribusiness center, and a sustainable manufacturing center, but ultimately provided funding for the community to conduct studies to better understand their options. Now that the Cobb Plant has been decommissioned and demolished, and the community has had time to reflect on the process, there are a number of key lessons to be learned from the Muskegon case study.

3.3.5 Best Practices for Coal Plant Decommissioning for Muskegon County

The following list of best practices were identified for Muskegon County:

1. Inform community members of the potential retirement in advance.

a. Gather community feedback on the proposed retirement. Take the time to understand the community's needs and concerns. In the Muskegon County case study, community members were not afforded the opportunity or time to negotiate the retirement decision.

2. Start early community engagement and continue throughout the plant decommissioning process.
   a. Offer in-person, virtual, and written comment opportunities.
   b. Provide community engagement resources and public education forums.
   c. Have a transparent process providing trusted information throughout.
3. Plan early for post-decommissioning projects to replace lost jobs, revenues, and economic activity.
   a. Budget time to coordinate a workforce transition plan.
   b. Gather community input for the post-decommissioning plans realizing economic development is not a one-size-fits-all proposition.
   c. Recognize the cultural, social, environmental, and long-term health impacts faced by communities.
   d. Give communities a chance to commemorate the site if cultural sentiment is strong. In the Muskegon County case study, CMS Energy provided tours of the facility for locals to survey the site one last time, allowing them to physically see how the facility had changed over time.
4. Encourage communities to survey their options for alternative site uses. Provide technical assistance, expertise, and/or funding for communities to determine the best fit and most economic redevelopment plan for the site.
5. Encourage statewide reform of property taxes and regulations.

3.4 Case Study: The Sherburne County Generating Station, Becker, Minnesota

3.4.1 Plant Background

The Sherburne County Generating Station (known as Sherco; Figure 8) is a three-unit coal-fired facility; Units 1 and 2 are owned by the Northern States Power Company and Unit 3 is jointly owned by the Northern States Power Company and the Southern Minnesota Municipal Power Agency. Xcel Energy operates and maintains the units on behalf of both owners. Located near Becker, Minnesota, on the banks of Mississippi, the plant's three units have a combined capacity of 2,400 MW, making it the largest power plant in the state of Minnesota (City of Becker 2021). The Sherco plant burns approximately 30,000 tons of coal every day, the equivalent of three trainloads, and more than 9 million tons annually. In 2006, 4.7 million pounds of coal combustion waste were released to surface impoundments and Sherco was designated as the second most polluting plant in the United States.

Figure 8. The Sherburne County Generating Station. (Source: Google Earth 2021d)

3.4.2 Community Background

The city of Becker has a population of around 5 thousand people and Sherburne County has 95 thousand. The Sherco plant employs close to 300 people with an average annual employee income of $88,556. Twenty percent of the plant workers reside in Becker and 31% reside in Sherburne County. The plant provides a significant portion of the City's revenue, 75% of Becker's tax base, and 54% of the school districts' tax base. The power plant also supports indirect economic activity in the city and induces spending in the area (Table 9). Becker is a small town and, thus, the Sherco plant has a huge footprint and connection to the fabric of the community.

Table 9. Sherburne County Generating Station operation benefits and decommissioning impacts.

Sherco Plant Operation Benefits	Sherco Plant Decommissioning Impacts
300 full-time jobs	Job losses
14% of County tax base supported	Economic loss
75% of Becker's tax base	Local tax revenue loss
54% of school district's tax base	School budget cuts
	Environmental impacts
	Cultural losses

3.4.3 Motivations for Decommissioning

In 2007, the state of Minnesota set its carbon-reduction goals of 15% by 2015, 30% by 2025, and 80% by 2050. Xcel Energy had already started planning its own carbon-reduction goals 2 years prior to the State's targets. This was the first time the City of Becker started looking at what this would mean for their local plant and the City Council was engaged on conversations about the next steps between 2008 – 2010. Complying with the environmental law changes at both the state and federal levels, Xcel Energy's 2016–2030 IRP proposed the shutdown of Units 1 and 2 in 2026 and 2023, respectively, which was approved by the Minnesota Public Utilities Commission (MPUC) (City of Becker 2021). Prior to this filing, Xcel planned to reduce its CO_2 emissions across the Midwest by 40% by 2030, but the retirement of these two units will allow the utility to reach a new goal of 60% reduction by the same deadline. The fate of Unit 3 is currently being decided by the MPUC, although the generator was slated for retirement by 2030 in Xcel Energy's SEC 1-k filing for 2020 (GEM 2021a).

3.4.4 The Community's Perspective on Decommissioning

The Becker and broader Sherburne County communities were initially in denial about the plant's fate and thought Sherco might be saved because it powered a quarter of the Twin Cities. However, the Becker City Administrator strategically shifted the conversation from the need to save the power plant to developing plans for the anticipated power plant decommissioning. There were years where Sherco supported up to 98% of Becker's tax base and dealing with the anticipated decommissioning of the plant was a significant undertaking for the community.

The City of Becker and Sherburne County sent a focus group to Colorado to attend a workshop, Coal-Reliant Communities Innovative Challenge, sponsored by the National Association of Counties, National Association of Development Organizations, United States Economic Development Association. The Innovative Challenge was a training ground designed to share knowledge among communities that had gone through similar transitions and communities that are planning a transition and create a high-level strategy for Becker's transition. Through these partnerships, the City analyzed its current position, timeframe for decommissioning, and its options in ensuring a better future. The City did an inventory of assets that they could leverage in the transition such as the thousands of acres of buffer property owned by the power plant, an abundance of underground and surface water including the Mississippi River, a main railway line and two additional local spur tracks, and the city's location within a robust transportation corridor. There was also plenty of access to power from a nuclear plant across the river and existing transmission lines at the plant. After 3 years of conversations about plant replacement strategies, the City has had success building a large scale metals recycling plant, expanded two existing trucking companies, and has plans to locate a data center to induce new business activity and to support new jobs and create sustainable growth.

3.4.5 Best Practices for Coal Plant Decommissioning for Sherburne County

The following list of best practices were identified for the Becker and Sherburne County communities:

1. Communication and community engagement are essential.
    a. Continued communication through trusted sources is key in allowing communities to understand the facts and realities of the decommissioning process.
    b. Allow time for questions and comments from community members.

2. Create broader partnership and communication with local and state legislators and plant owners to bring them into the conversation and to build trust and open lines of communication.
3. Build trust and relationships between plant owners and communities.
    a. Plant owners or utilities should be candid about the direction in which they are going relative to the context of carbon emissions and decommissioning.
    b. Include communities as stakeholders and bring them into the conversation.
4. Design decommissioning and replacement plans.
    a. Becker developed a land use plan, a parks and trail plan, a transportation plan, and a rail impact study.
    b. The City also made planning a priority by carving out some of its own budget to support the activity.
5. Provide government support in plant replacement planning efforts.
    a. Provide technical assistance for planning: financial, engineering, grant-writing, financial modeling, and more.

4.0 Decommissioning Best Practices to Ensure Equitable Community Outcomes

The following section offers a synthesis of the community experiences and the key takeaways from the identified decommissioning best practices. This section of the report also outlines the potential roles for strategic partners and stakeholders and the areas for their engagement to support and revitalize coal-dependent communities.

4.1 Key Takeaways

The four case studies from the transitioning coal-dependent communities are alike in many ways—most notably by the lack of meaningful community involvement in the retirement decision itself—but they also diverge in the sense that community needs, and the practices required to meet them, are unique to each locality. The information gathered about the community experiences in the decommissioning process highlights a number of key takeaways about the best methods for engaging communities throughout the decommissioning process and identifying and supporting community needs and post-retirement plans best suited to the local community's environment and economic profile.

Where decommissioning processes do not effectively engage communities, the community may respond with policy levers. In Wise County, local activists successfully advocated for new legislation benefitting other Virginia communities also facing power plant closures. The bill, enacted into law in 2021 (VA Governor 2022), affords these communities new rights for information disclosure:

- a public notice and hearing requirement for plant closure,
- detailed retirement dates for the plants anticipating closure, and
- utility-provided retirement studies, to be disclosed to the affected communities.

In all of the surveyed communities, residents reported economic, environmental, health, and sociocultural concerns associated with the coal plant retirements and the toxic waste legacies

left behind. Beyond the economic concerns of job losses, tax revenue losses, and the costs of environmental remediation, communities also grappled with unquantifiable losses—those of cultural nostalgia and a sense of community pride for the power plants. It was community workers who supported these plants at the peak of their production, who were indirectly responsible for powering hundreds of thousands of homes across the nation. This sense of pride was expressed by residents in Wise County, and Muskegon County where residents also considered the large smokestack to be a city monument of sorts. How a plant closure may disrupt the social fabric of a community is difficult to quantify, but it is an important community concern that must nevertheless be accounted for during the decommissioning process. Early and continued community engagement throughout the decision-making process can help address these concerns. Understanding community perspectives early in the process also affords more thoughtful consideration of the post-decommissioning projects needed to replace jobs, revenue, and economic activity, as well as manage long-term environmental and health impacts.

The decision-making involved in the decommissioning process is a large undertaking for communities. As there are no federal guidelines in place to facilitate the plant closure transition, or any precise procedures for regulating the coal plant decommissioning process, the role that communities play in the decision-making process is often unclear. Moreover, many communities do not know what the decommissioning process should even look like—when it will begin, who pays for it, how long it will take, and what happens to the site afterwards are standard unknowns. In the Muskegon County, Wise County, and Sherburne County cases, locals identified the importance of community education about decommissioning—having the owners and key stakeholders explain what it means, what it entails, and why it can be a complex multi-year process was a much needed step in not only forging the path for more equitable conversations (by ensuring that everyone is on the same page), but also in building trust.

Because the decision-making process about the site future is a large undertaking, it is difficult for communities to manage without additional resources or strategic partnerships and technical engagement. A large area of concern identified in the Wise County case study was the need for cleanup resources and assistance to remove the gob piles left behind from decades of coal mining, for which the current method for clean-up is burning the gob in the power plant. The community has to grapple with not only the astronomical costs of removing decades of gob pile accumulation, but also the spillover costs of environmental and ecological degradation (caused by leaching, runoff, spontaneous combustion, etc.) and the resulting human health hazards. Going forward, the identification of partnerships or funding resources that can assist communities with their unique circumstances will be necessary. A more successful example of integrating partnerships and financial resources to help the community make the transition from coal power is the Sherburne County case study. Becker City officials carved out some of the City's own budget for site redevelopment; pursued state, federal, and private matches for redevelopment funding; and engaged the Sherco owner, as well as local and state legislators, to make the decommissioning process as efficient and cost-effective for the community as possible.

Providing trusted information and expertise is necessary not just at the beginning, when the plant is retired, but throughout the decommissioning process and into the discussion about potential alternative uses for the site. In all the case studies identified, communities stressed the need to understand their options for site redevelopment. From the beginning, in each of these areas, there was never clear community consensus on the desired outcome for the future of the site—it took time, technical expertise, and open communication for the redevelopment plans to be finalized. In Muskegon County, for example, the utility partially funded alternative use studies

for the community to decide on the redevelopment plan best suited to the local environment and economy. In Sherburne, City officials were strategic about coordinating partnerships to engage all community stakeholders, including residents, in making the decision about future site use. In the future, as more communities are affected by the energy transition, ensuring access to the technical and financial resources needed to adequately assess options and tradeoffs will be key to create a more equitable decision-making process.

4.2 Stakeholder Roles and Timeline for Engagement

It is important to recognize that many of the community needs and best practices identified in these case studies may require cross-sector collaboration for successful implementation and outcomes. The roles that stakeholders (e.g., local governments, non-profit and non-governmental organizations, government entities, affected communities etc.) can play in assisting these communities during the transition process may vary case-by-case, and may be limited, but have the power to be impactful in these three key areas: technical assistance, cross-partnership engagement and collaboration, and financial assistance.

4.2.1 Technical Assistance

Some communities may not know what a retirement decision means for them: how it will impact the local economy, environment, and future of the plant site. Moreover, the decommissioning process itself can be unclear: the timeline for site remediation and redevelopment and the responsibility for leading those processes can be large unknowns for communities. Strategic partners and technical support resources can play a major role in walking these transitioning coal-communities through the information asymmetry they face.

Some stakeholders may be able to leverage their technical resources to ensure that the needs of communities are met throughout the decommissioning process, and especially during the site redevelopment planning phase. In particular, these technical partners can lend their expertise to assess the feasibility of alternative site uses for communities and improve their future economic outlooks. Especially where communities are considering alternative energy infrastructures for their former plant sites, such as renewables and/or storage, these partners can provide strategic assistance and help them determine their path forward and guide their energy transition. This technical expertise can also support communities that are looking to repurpose the physical assets already present at the site, such as transmission pocket, for future industrial or commercial activity. Additionally, these partners can assist communities in optimizing the resources available at the local level to benefit both remediation and redevelopment efforts. For example, technical assistance can be utilized to survey how environmental clean-up needs (such as coal ash and gob pile removal) can also be leveraged to support a community's economic development post-retirement (e.g., through local job creation). For some communities, the value of natural resources at or near the site (e.g., rivers, forests, etc.) may outweigh the benefits of repurposing already existing physical assets. In this regard, technical expertise can also be used to help communities re-envision these sites for natural/recreational purposes, such as parks or eco-tourist facilities, if that is the community's desired direction of redevelopment.

4.2.2 Cross-partnership Engagement and Collaboration

Given that the decision-making process can be a large and often unguided and costly venture for communities, stakeholders and other strategic partners can play a role in connecting them

with the resources and partnerships[1] they may need for successful implementation of desired outcomes in the decommissioning process. Communities often lack the financial resources and access to experts needed to survey potential redevelopment options and identify the solution(s) best suited to their local environment and economy. For example, in Wise County, one significant community concern was the lack of strategic partnerships and funding sources for environmental remediation; the questions about the best methods for gob pile cleanup (e.g., how to do it, when, and where to relocate the waste) and financial resources to help offset the large cost burden for that removal and remediation are potential gaps these stakeholders can help fill for communities.

There is a need for a national hub for facilitating the knowledge-sharing of "lessons learned" from coal-communities already impacted by the energy transition. A network model for coal-dependent communities could connect communities with the organizations, resources, and expertise they need to implement community-driven solutions for site redevelopment, create a framework for newly-transitioning communities to use in planning the future of the site, and build a network for communities to share lessons learned about the decommissioning process with their cohort of community partners. For example, the Coal-Reliant Communities Innovative Challenge workshop was key for helping the Becker community plan their energy transition. Such a network could similarly design a "training ground" for communities that have transitioned from coal-dependent economies to share their stories with newly-transitioning communities.

4.2.3 Financial Assistance

There are a number of grant and loan programs that may be of use to coal communities facing the transition process.[2] Expansion of funding sources to assist communities from the start to end phases of the decommissioning process—from negotiation of community needs at the beginning of the retirement decision, to technical and financial assessment of redevelopment options—could be critical to ensuring more equitable outcomes for coal communities. Moreover, funding for assistance with job creation, or projects that directly support job creation in communities affected by the clean energy transition, is another vein of financial aid that could bolster economic security and resilience for hard-hit coal communities. Other areas of financial assistance could include funding for environmental cleanup efforts, such as those identified in Wise County, or for community improvement projects, such as those undertaken in Muskegon County. Because these coal communities principally bear the brunt of the health and environmental ramifications from coal generation that once sustained the nation at large, an equitable transition process must consider how to meaningfully address these long-lasting legacies. For many of these transitioning coal communities, funding gaps currently exist at three levels: 1) for community redevelopment, there is a need to identify the financial mechanisms needed to kickstart the local economy and enhance local job creation, 2) for environmental remediation, there is a need to determine the financial resources available for mobilizing costly clean-up efforts and performing relevant environmental assessments, and 3) for site redevelopment, there is a monetary need to support the survey of potential redevelopment

[1] The Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) initiative is a multi-agency effort that supports communities and workers affected by the decline of coal https://www.eda.gov/archives/2016/power/. The Assistance to Coal Communities (ACC) initiative assisted communities impacted by the declining use of coal https://www.eda.gov/coal/.

[2] In 2021, DOE announced $109.5 million in funding for projects in communities affected by the energy transition (https://www.energy.gov/articles/doe-announces-1095-million-support-jobs-and-economic-growth-coal-and-power-plant).
Existing federal programs with funding totaling approximately $38 billion also could support energy communities (https://netl.doe.gov/IWGInitialReport).

options. The Department of Energy and other agencies may play a role in ensuring that sustainable and equitable outcomes are delivered to these coal communities, many of which have been historically overlooked in the environmental decision-making process.

Figure 9 presents potential stakeholder roles/areas and timeline of engagement in the process of coal plant decommissioning, from the initial retirement decision through site redevelopment.

Figure 9. Timeline for engagement.

5.0 Conclusion

Since 2010, more than 102 GW of coal-fired generating capacity has been retired, and this will reach a total of nearly 120 GW by 2025. The effects of a steep decline have undoubtedly affected the communities that have historically relied on this industry for employment and economic stability. In the Wise, Muskegon, Anderson, and Becker communities, where coal-fired power plants were not just a source of economic activity, but also a source of pride, even a sense of reputation, the retirement process has ushered in a number of financial, environmental, and social challenges. These communities, all in varying stages of the decommissioning process, have identified similar concerns during the transition away from coal power, but each has followed different trajectories in the decision-making process, not only in terms of timing, but also in terms of the pace and planning of future site uses. The case studies reported in Section 3 offer valuable insights into best practices for the coal plant decommissioning process, but they also offer lessons on how to make these processes more equitable and inclusive. Therefore, they highlight areas in which communities can be better supported and uplifted to ensure sustainable outcomes for everyone.

Based on the information provided by these coal communities, the best practices in the coal plant decommissioning process include the following:

- early and continued engagement throughout, with a number of mediums for communication and feedback (e.g., in-person sessions, virtual meetings, written comment opportunities);
- early planning of post-decommissioning projects to replace lost jobs, revenue, and economic activity;
- recognition (and mitigation, if possible) of social impacts on the community due to plant closure;

- transparency throughout the process, with trusted information being provided about the decommissioning process and timeline; potential impacts on the workforce, economy, and environment; and the feasibility of alternative site uses;
- identification of funding sources, technical experts, and/or strategic partnerships to support decommissioning and the affected communities upfront; and
- acknowledgment of communities as stakeholders who have a role in the conversation and right to determine their futures.

Most importantly, however, is the recognition that the decision-making process must be community-based to be equitable: community input is key to the transition away from coal power, because there is no one-size -fits-all development plan. Each community is unique, so the decommissioning process must also be distinctive and specific to the needs of the community.

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https://earth.google.com/web/search/TVA+Bull+Run+Fossil+Plant,+Edgemoor+Road,+Clinton,+TN/@36.01910167,-84.15640516,248.77553758a,2148.08229369d,35y,0.00000001h,0t,0r/data=CigiJgokCWzgFkRiekJAEdClN_xldEJAGfMonTlRklTAIXXfamoUllTA

Google Earth 2021c
https://earth.google.com/web/search/BC+Cobb+steam+plant/@43.25468949,-86.24243486,181.42549032a,1624.7647342d,35y,146.01841873h,0t,0r/data=CigiJgokCX-B1KEAeEJAEWt4LgZ2dEJAGcuM-UoglVTAIWEIfa57l1TA

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