2020

THE TOLL BEYOND COAL

Who Bears the Cost of Coal Plant Decommissioning and Coal Ash Disposal? A Case Study of the Municipal Energy Agency of Nebraska

This study was prepared by
Sustainable Development Strategies Group

By James Cody; Ellen Ross, Master in Environmental Management;
and Keriann Conroy, Master in Environmental Management,

with suggestions, support and advice from many colleagues and fellow researchers in numerous institutions.

Aerial Image of the Kingston Fossil Plant Coal Ash Spill on 12/23/2008

Sustainable Development Strategies Group
116 N. Taylor Street
Gunnison, CO 81230
970 641 4605

www.SDSG.org

About SDSG

Sustainable Development Strategies Group ("SDSG") is a Colorado-based nonprofit organization that uses research, practice, and teaching to provide guidance to communities, companies, and governments on law and policy frameworks that advance best practices for sustainable energy and natural resource development. Learn more about us at www.SDSG.org.

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LIST OF ABBREVIATIONS

ABBREVIATION	PHRASE/DEFINITION
"ARO"	Asset Retirement Obligation, a legal obligation associated with the retirement of a tangible long-lived asset in which the timing or method of settlement may be conditional on a future event, the occurrence of which may not be within the control of the entity burdened by the obligation
"CCR"	Coal Combustion Residuals, commonly known as coal ash, created when coal is burned by power plants.
"CCW"	Coal Combustion Waste, another term for coal ash,, including fly ash, bottom ash, boiler slag, and flue-gas desulfurization (FGD) or scrubber sludge from air emissions controls.
"DMEA"	Delta-Montrose Electric Association, a Western Slope, Colorado member-owned electric distribution cooperative
"EIA"	Environmental Impact Assessment, a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.
"EPA"	Environmental Protection Agency
"GGS"	Gerald Gentleman Station, 1,365 MW coal-fired power plant in Nebraska
"IRP"	Integrated Resource Plan, outlines an electric utility's resource needs in order to meet expected electricity demand over a long-term planning horizon
"KCEC"	Kit Carson Electric Cooperative, a member-owned electric distribution cooperative serving Northern New Mexico
"LGS"	Louisa Generating Station, 783 MW coal-fired power plant in Iowa
"LRS"	Laramie River Station, 1710 MW coal-fired power plant in Wyoming
"LTTRP"	Long-Term Total Requirements Participants, communities that have a long-term agreement with MEAN for bulk power
"MATS"	Mercury Air and Toxics Standards, standards for all hazardous air pollutants emitted by coal- and oil-fired electric generating units with a capacity of 25 megawatts or greater. These are national emission standards for hazardous air pollutants.
"MEAN"	Municipal Energy Agency of Nebraska
"MW"	Megawatts, a unit of power equal to 1,000 kilowatts
"NIPSCO"	Northern Indiana Public Service Company, electric utility in Northern Indiana
"NMPP"	Nebraska Municipal Power Pool, a coalition of four energy providers headquartered in Lincoln, NE
"NPPD"	Nebraska Public Power District, a large Nebraska publicly-owned electric utility

"NSU2"	Neil Simpson, Unit 2, 90 MW coal-fired power plant in Wyoming
"PPGA"	Public Power and Generation Agency, an interlocal agency established in Nebraska for the sole purpose of constructing and operating Whelan Energy Center Unit 2
"PUC"	Public Utilities Commission, serves the public interest by effectively regulating utilities and facilities so that the people of Colorado receive safe, reliable, and reasonably-priced services
"RCRA"	Resource Conservation and Recovery Act, gives EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste.
"RSA"	Rate Stabilization Account, a portion of the MEAN budget for operating expenses or debt service. It is meant to ensure stable, economic rates for participant communities.
"SWMP"	Solid Waste Management Plan, a guide to policy decisions regarding how a state handles solid waste reduction, reuse, recycling and disposal
"TVA"	Tennessee Valley Authority, a large power provider in the Eastern U.S.
"WAPA"	Western Area Power Administration, a federal entity that generates and sells wholesale hydro-electric power
"WEC2"	Whelan Energy Center, Unit 2, 220 MW coal-fired power plant in Nebraska
"WSEC4"	Walter Scott Energy Center, Unit 4, 818 MW coal-fired power plant in Iowa

PREFACE

Sustainable Development Strategies Group (SDSG) released *A Renewable Energy Future for Communities Served by the Municipal Energy Agency of Nebraska* in February 2019, identifying the opportunities for and barriers to increased renewable electricity supply to Colorado municipalities that are in contract with the Municipal Energy Agency of Nebraska ("MEAN"). That study, in two volumes, is available on the SDSG website at www.SDSG.org.[1]

There are now 14 Colorado municipalities that obtain their wholesale electricity from MEAN. Ten are member utilities, meaning they designate representatives that sit on the MEAN Board of Directors. These are Aspen, Delta, Fleming, Fort Morgan, Gunnison, Haxtun, Julesburg, Lyons, Oak Creek, and Yuma. There are four non-member utilities served by MEAN: Glenwood Springs, which has a Schedule K-1 Contract and Wray, Holyoke, and Center, which have Schedule J Contracts.[2] These non-member utilities do not have board representation because of their more unique relationships with MEAN.

Historically, many of these municipal utilities provided their own electricity through municipal power plants. As they grew, and looked for regional supplies, they generated much of their electricity from federal hydropower generated at dams operated by the United States Bureau of Reclamation and the Army Corps of Engineers, and marketed through the Western Area Power Administration ("WAPA.") Originally, outside suppliers like MEAN might have been seen as a supplement to self-generation and WAPA power. But as the region has grown, power supplied by providers such as MEAN became a greater part of the mix, and ultimately the principal source of supply.

MEAN contracts now limit the member municipalities to generating a maximum of 5% of their own energy, a minimal increase from the 2% cap on local generation from 2018. This increase was approved by the MEAN Board of Directors in November of 2019.[3] This means that MEAN controls a mandatory 95% of member communities' power supply.

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[1] Sustainable Development Strategies Group. (2019). A Renewable Energy Future for Colorado Communities Served by MEAN. SDSG. https://www.sdsg.org/mean-study

[2] Glenwood Springs has a Schedule K-1 contract for bulk power, but for a duration of 10 years, as opposed to 40 years for some Schedule M contract agreements. Schedule J contracts are for 5 years and provide supplemental power from MEAN, as they own their own generation and MEAN provides these communities with baseload, backup power.

[3] Power Supply Committee. (2019). 'Item 3: RENEWABLE DISTRIBUTED GENERATION POLICY CAP'. In *Minutes of Power Supply Committee meeting on 20 November 2019*. Municipal Energy Agency of Nebraska: Younes Conference Center – Kearney, Nebraska.

How that power supply is managed and to what extent communities may generate their own power was the impetus for the first MEAN study by SDSG.[4]

Our subsequent study was also motivated by the rapidly changing landscape of renewable energy development. Colorado is among the nation's leaders in setting renewable energy standards and transitioning from coal dependent electricity generation. Our previous study concluded by addressing key issues concerning the lack of regulation of municipal utilities and identified policies in need of reform at the system level, the state level, and the level of individual municipalities.[5]

Image 1. Colorado Solar Farm.[6]

Since our previous study, in two volumes, there have been changes in state regulation. Senate Bill 19-236 passed in 2019, requiring wholesale electric cooperatives like Tri-State Generation and Transmission to submit an integrated resource plan to the Colorado Public Utilities Commission (PUC). Tri State's future integrated resource plans must meet Colorado's Energy Policy Goals. This new oversight comes after several member co-ops filed complaints with the PUC about Tri-State's practices and expressed desire to receive energy generated from renewable resources. Some cooperative utilities have been trying to exit the Tri-State system, and two have now succeeded - New Mexico's Kit Carson Electric Cooperative (KCEC) in 2016 and Delta-Montrose Electric Association (DMEA) is poised to exit their contract in July 2020.

As a public power utility, MEAN is accountable to the communities it serves, through a board of directors on which each member community has a vote. As discussed in the previous SDSG study of MEAN, the agency has three distinct contract types, which give utilities different terms and rates.[7] The most common is the member contract,

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[4] The first study in two volumes may be found at https://www.sdsg.org/mean-study.

[5] The key issues addressed in the subsequent study were how despite customers' interest, MEAN's generation cap inhibits renewable energy generation at the local level, and an initial look at MEAN's overdependence on coal assets. The resulting policy recommendations were that MEAN develop a clear strategy to develop more renewable energy and enable an environment of local renewable energy generation.

[6] Bureau of Land Management. (n.d.). Solar Energy. [Photograph]. https://www.blm.gov/programs/energy-and-minerals/renewable-energy/solar-energy

[7] See Note 4 above.

Schedule M, which accounts for 89% of MEAN's revenue, as will be discussed later in this report. If MEAN is going to be accountable to member municipalities, and those towns are accountable to their voters, then citizens need to be as well informed as possible about what MEAN is doing, and what policies it is pursuing.

Municipal utilities in Colorado, whether they own local electrical generation or not, are governed locally and exempted from PUC oversight under the Colorado Constitution.[8] This gives a municipal government and the utilities managed by a municipal government more self-governing power and more responsibility. While the PUC may not have jurisdiction over the municipal power providers themselves, its potential authority over MEAN as a wholesale power supplier has not been tested legally and is an issue for further exploration as the Colorado communities it serves increasingly turn to a variety of actions to develop more renewable supplies. The renewable energy transition is underway.

Image 2. Governor Jared Polis Spring 2019, announces Colorado's new renewable energy plan.[9]

INTRODUCTION

This report is designed to inform Colorado communities served by the Municipal Energy Agency of Nebraska (MEAN) and advocates for the renewable energy transition about MEAN's coal assets and responsibilities. The information within this report will make dense financial documents clearer for Colorado legislators, local public servants, and the public. There are concluding policy recommendations for MEAN communities, local and regional policy makers, and for MEAN itself. These recommendations will be supported by the information detailed in this report and the growing desire from Colorado communities to be a part of the renewable energy transition and not bystanders.

As Colorado navigates carbon emissions mitigation in accordance with House Bill 1261, the "Climate Action Plan to Reduce Pollution", this work provides more detailed

[8] Colorado Constitution, Article V, Section 35 Retrieved from: http://leg.colorado.gov/sites/default/files/images/olls/crs2018-title-00.pdf

[9] Woodruff, C. (Photographer). (2019). [Digital Image]. WestWord. https://www.westword.com/news/colorado-has-some-very-specific-new-climate-energy-goals-11400794

information about the by-product of Colorado's coal-generated electricity, coal combustion residuals. This information will be of value to advocates who wish to see Colorado's transition to renewable energy conducted in a way that does not leave behind improperly closed coal facilities and the associated morass of environmental, social, and economic legacies. The fact that MEAN's emissions and power resources are not regulated by a Colorado authority, means the public's scrutiny of the information in this report is doubly important.[10]

The Municipal Energy Agency of Nebraska is a public, not-for-profit entity created under Nebraska law to provide wholesale electricity to municipal distribution utilities. Most of the utilities it serves are in Nebraska, but it also provides power to municipalities in Iowa, Wyoming, and Colorado. Currently, MEAN obtains most of its electrical power supply from coal-fired power plants in Wyoming, Nebraska, and Iowa. With 14 of the 54 communities MEAN serves being located in Colorado, Colorado represents approximately a quarter of MEAN's customer base.

SDSG's previous studies have looked at ways that municipal utilities can more aggressively transition to more renewable electricity. But in this transition from fossil fuel-based generation to renewables, there are costs that must be accounted. Among them is the significant expense of decommissioning coal plants and the proper disposal of coal ash. Rules governing the decommissioning of coal-fired power plants and the disposal of residuals from coal combustion have become considerably more stringent and costly to comply with in the decades since many of these power plants were built. Environmental laws and regulations tend to become more stringent over time. As a public entity, MEAN has an obligation to the public to act responsibly even where it is not specifically ordered by law to do so.

Whatever retiring a coal plant may cost, it is important to understand who pays for it.

Questions this report addresses include:

(1) What are the costs associated with decommissioning or retrofitting a coal-fired power plant?

[10] MEAN submits an Integrated Resource Plan to the Western Area Power Administration (WAPA) every five years, but this is not a regulatory body. The Federal Energy Regulatory Commission (FERC) oversees MEAN's transmission of electricity between states.

(2) Does MEAN have responsibility for these costs as a part owner of some of these plants, or as a wholesale power provider?

(3) If MEAN is responsible for some of the costs, what provisions is it implementing to pay for them?

(4) Do coal plants in MEAN's energy portfolio have estimated closure dates and plans? If so, what are the anticipated time frames and when will these costs become due?

NATIONAL TRENDS OF COAL FIRED POWER PLANT CLOSURES

The U.S. experienced record closures of coal power plants in 2015, 2017, and 2018, a trend that is expected to continue at least through 2024, despite the repeal of the Obama-era Clean Power Plan in 2019 and ongoing federal and state subsidies for coal-generated power.[11, 12]

Globally, renewable energy, such as wind and solar, continue to compete and increasingly outcompete against traditional sources of power, like coal, despite coal subsidies.[13] The closure of coal plants was initially relegated to older, smaller plants, but as the economics of renewable energy projects improve and natural gas prices decrease, large coal plants across the U.S. are being retired as well.[14]

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[11] Feaster, S. (2018.) Record Drop in U.S. Coal-Fired Capacity Likely in 2018: Utilities Are Accelerating Shutdown Dates, as Plants Grow Increasingly Uneconomic. Institute for Energy Economics and Financial Analysis. https://ieefa.org/wp-content/uploads/2018/10/Record-Drop-in-U.S.-Coal-Fired-Capacity-in-2018_October2018.pdf

[12] Ellsmoor, J. (2019, June 15). United States Spend Ten Times More On Fossil Fuel Subsidies Than Education. Forbes. https://www.forbes.com/sites/jamesellsmoor/2019/06/15/united-states-spend-ten-times-more-on-fossil-fuel-subsidies-than-education/

[13] "Energy subsidies are projected at US $5.3 trillion in 2015, or 6.5 percent of global GDP, according to a recent IMF study." IMF News, July 17, 2015. The great majority of these massive subsidies go to fossil fuels, and the majority of that to coal. "The largest subsidizers in 2015 were China ($1.4 trillion), the United States ($649 billion), [and] Russia ($551 billion) …" Coady et al., Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates, May 2, 2019. https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509

[14] Storrow, B. (2019, August 16). And Now the Really Big Coal Plants Begin to Close. Scientific American. https://www.scientificamerican.com/article/and-now-the-really-big-coal-plants-begin-to-close/

A series of factors are creating a crisis for coal-dependent utilities, including:

- **Environmental** – The realization that coal combustion residuals present a real and long-term environmental threat. In general, they cannot be disposed of properly in unlined ponds, though that is exactly where millions of tons of these wastes now sit.

- **Fiscal** – It now appears that proper disposal of coal combustion residuals will require that millions of tons of ash be dug up, and reburied in lined impoundments, at a very considerable cost.

- Many utilities have seriously underestimated these costs, from a combination of overly optimistic technical projections and the sense that power plant closure was so far in the future that investment in coal infrastructure would outpace the renewable energy transition. Many plants will close much sooner than originally projected, yet the financial reserves accumulated by utilities against these closure costs fall far short of what will be needed to pay to adequately close these facilities.

- **Regulatory** – Regulators have started to realize that past approaches to the disposal of coal combustion residuals are inadequate, and regulations have tightened notably in recent years. Utilities were not able to predict future environmental regulations, although we now have a more comprehensive understanding of environmental effects than at the time of some coal-power plants' construction.

In 2017, coal-fired power made up 61% percent of MEAN's generation portfolio. This power came from seven coal-fired generating stations located in Iowa, Nebraska, and Wyoming.[15]

MEAN's 2017 & 2030 Energy Resource Mix From IRP.[16]

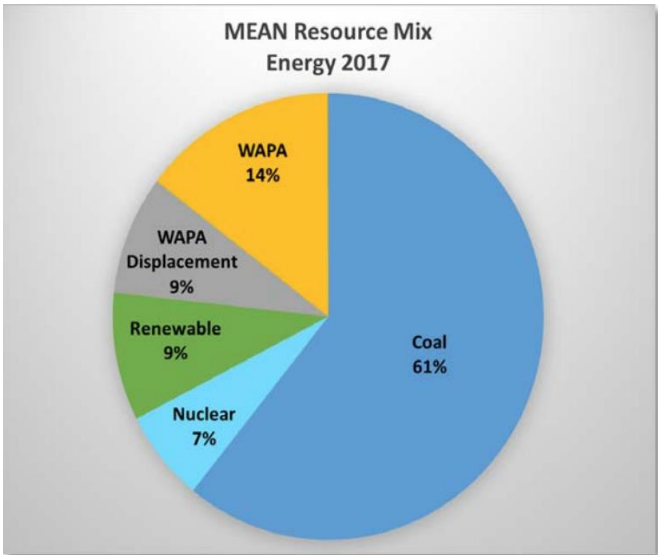

Figure 1. Graph from MEAN IRP 2017. MEAN 2017 energy resource supply mix.

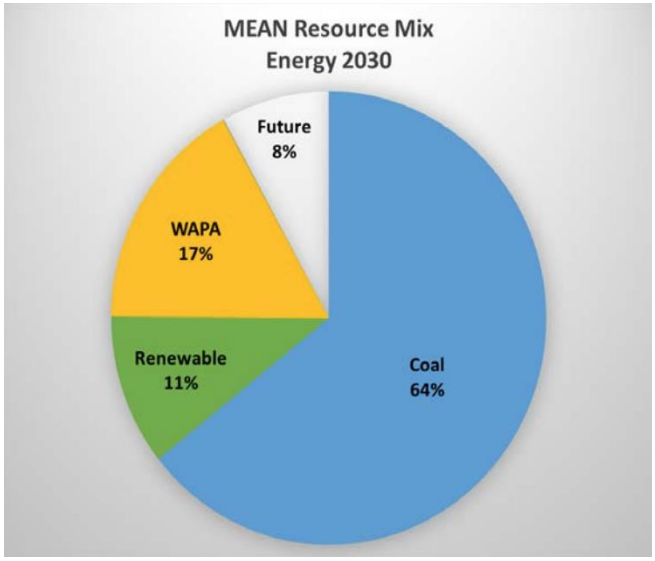

Figure 2. Graph from MEAN IRP 2017. MEAN projected 2030 energy resource supply mix.

[15] MEAN. (2017). 2017 Integrated Resource Plan. NMPP Energy. [Henceforth, referred to as "MEAN IRP. (2017)"]

[16] MEAN IRP. (2017).

Table 1. MEAN's coal energy resources.[17]

Plant	Laramie River Station(LRS)	Walter Scott Energy Center Unit 4 (WSEC4)	Whelan Energy Center Unit 2 (WEC)	Wygen Unit 1	Gerald Gentleman 1 & 2 (NPPD Multi-Unit Participation)	Wygen Unit 3 & Neil Simpson Unit 2	Louisa Generating Station
Location	Wheatland, WY	Council Bluffs, IA	Hastings, NE	Gillette, Wy	Sutherland, NE	Gillette, Wy	Muscatine, IA
Year of Operation	1980	2006	2011	2003	Unit 1: 1979/ Unit 2:1982	Wygen Unit 3: 2010/ Neil Simpson: 1995	1983
% of MEAN's Energy Profolio	7.7%	10.6%	14.4%	6.9%	13.1%	7%	1.7%
Contract Experation Dates	Life of Unit	Life of Unit	Life of Unit or all Debt Paid off	2043 (Potentail Contract Extentiosn)	2023	2028 (early termination possible in 2023)	2050

According to a study released in March 2019 by Vibrant Clean Energy and Energy Innovation Policy & Technology, LLC, the decline in the cost of wind and solar electric generation continues. Continued operation and maintenance of existing coal-fired generation is often more expensive than new renewable development. Specifically, the study found that if 74 percent of existing coal plants were replaced with new wind and solar today, electricity customers would see immediate savings.[18]

Colorado's largest privately owned electrical utility, Xcel Energy, recently cited $175 million in savings as the reason for retiring two coal-fired units at the Comanche Generating Station in Pueblo, Colorado and replacing them with renewables such as wind and solar.[19] A 2014 assessment of decommissioning costs from Burns & McDonnell Engineering Company, Inc. assessed the net closure costs of the Comanche Generating

[17] MEAN IRP. (2017).

[18] Gimon, E., O'Boyle, M., Clack, C., McKee, S. (2019). The Coal Cost Crossover: Economic Viability of Existing Coal Compared to New Local Wind and Solar Resources. Energy Innovation Policy & Technology, LLC. https://energyinnovation.org/wp-content/uploads/2019/03/Coal-Cost-Crossover_Energy-Innovation_VCE_FINAL.pdf

[19] Xcel Energy Inc. (2019). Colorado Energy Plan: Advancing Affordable Clean Energy: Information Sheet. https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Resource%20Plans/CO-Energy-Plan-Fact-Sheet.pdf

Station in Pueblo, Colorado at $66.4 million.[20] On June 26, 2020, the municipal utility, Colorado Springs Utility came to the decision to accelerate the closure timeline for its two coal plants.[21] A 2019 analysis by Strategen showed that closing both plants by 2023 would save rate payers $160 million.[22]

Tri-State Generation and Transmission, the entity that supplies most rural electric co-ops in the Colorado, Wyoming, New Mexico, and Nebraska region, in the past year has announced the closure of three coal plants, two with mines collocated at the power plant, which will signify the end of Tri-State's coal generation in Colorado and New Mexico by 2030.[23] Tri-State's role in supplying electricity to rural electric co-ops is in many ways analogous to MEAN's role in supplying municipal utilities.

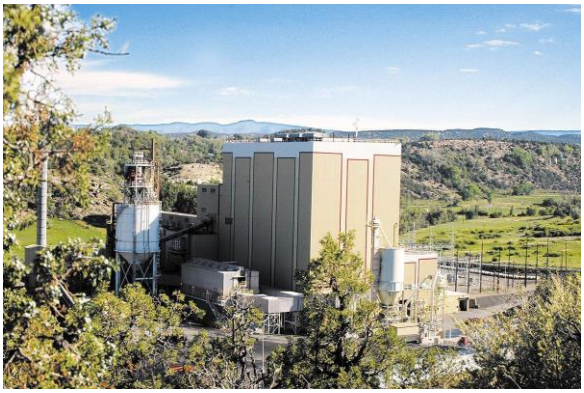

Image 3. Nucla Coal- Fired Power Plant.[24]

Presumably, the same technological developments and economic forces that are currently affecting Xcel and Tri-State will affect MEAN. Further, since MEAN owns a minority share of three coal plants, the decisions will be made by the majority owners. These plants will close not when MEAN chooses, but when the entities that own most of the shares decide to close them.

The success of the renewable energy sector in recent years has impacted the coal industry in lasting ways. Perhaps most relevant to this study is that the closure and

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[20] Before the Public Utilities Commission of The State of Colorado: RE: In The Matter Of Advice Letter No. 1672-Electric Filed By Public Service Company Of Colorado To Revise Its Colorado Puc No. 7-Electric Tariff To Implement A General Rate Schedule Adjustment And Other Rate Changes Effective. (Testimony of Jeffrey T. Kopp. (p. 128). Retrieved from https://www.xcelenergy.com/staticfiles/xe/Marketing/Files/CO-Regulatory-Direct-T-A-Kopp.pdf

[21] Shaikh, S. (2020, June 26). Colorado Springs Utilities Sets Early Closure Date for Coal Plants. Sierra Club. https://www.sierraclub.org/press-releases/2020/06/colorado-springs-utilities-sets-early-closure-date-for-coal-plants

[22] See Note 21 above.

[23] Tri-State Generation and Transmission Association. (2020). Tri-State announces retirement of all coal generation in Colorado and New Mexico. https://tristate.coop/tri-state-announces-retirement-all-coal-generation-colorado-and-new-mexico

[24] Staff Report. (2019, September 20). Tri-State officially closes Nucla coal-fired plant. Montrose Daily Press. https://www.montrosepress.com/news/tri-state-officially-closes-nucla-coal-fired-plant/article_ee246956-dc24-11e9-b986-d32aaac8cb04.html

decommissioning timelines of existing coal plants have accelerated.[25] Not only are new coal plants generally not being built, but existing plants are being retired ahead of what was once thought of as their retirement dates.[26]

Xcel's two coal plant closures in Colorado are both on schedule to be shut down more than a decade earlier than originally planned.[27] Likewise, Northern Indiana Public Service Company (NIPSCO), which announced in 2018 plans to close two of five coal-fired plants by 2023, however recently they updated their plans to close all five plants within the decade.[28] These examples, of many, mean that the costs of closure and decommissioning, which may once have been thought to be far in the future, are beginning to be incurred now.

The significant drop in the price of renewable energy is not the only reason coal-fired energy use is on the decline; current and future environmental regulations and laws will impose significant costs on the operation of coal plants, and the pressure to protect climate by reducing carbon emissions is of growing concern.

When an energy developer or utility wants to build a coal plant, it generally must pass through a process of Environmental Impact Assessment (EIA) to ascertain the potential consequences of a project. This process is designed to identify or mitigate negative impacts on the air, soil, and water. An EIA for a coal power plant looked very different for facilities built years ago. Today, such assessments increasingly involve consideration of a wider range of impacts, including social impacts and impacts on public health. As a more comprehensive understanding of environmental impacts has developed, updated regulations regarding how coal plants dispose of waste are further exacerbating the cost of operating coal plants.

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[25] Blunt, K. (2019). Utilities Speed Up Closure of Coal-Fired Power Plants: Wind, solar and natural gas become more cost-competitive, driving shift to new energy sources. The Wall Street Journal. https://www.wsj.com/articles/utilities-speed-up-closure-of-coal-fired-power-plants-11547035201

[26] Feaster, S. (2018.) Record Drop in U.S. Coal-Fired Capacity Likely in 2018: Utilities Are Accelerating Shutdown Dates, as Plants Grow Increasingly Uneconomic. Institute for Energy Economics and Financial Analysis. https://ieefa.org/wp-content/uploads/2018/10/Record-Drop-in-U.S.-Coal-Fired-Capacity-in-2018_October2018.pdf

[27] Kovaleski, J. (2019, October 15). Xcel Energy plans to close 2 of its coal fired plants in Pueblo to make way for a greener future. KMGH. https://www.thedenverchannel.com/news/360/xcel-energy-plans-to-close-2-of-its-coal-fired-plants-in-pueblo-to-make-way-for-a-greener-future

[28] See Note 27 above.

Many utilities are finding that closing plants consistent with environmental regulations is considerably more costly than previously supposed.[29] Closure of a coal plant is an expensive process, which requires the demolition of vacant buildings, capping of coal ash ponds, the remediation of on-site contamination, and often redevelopment of facilities.[30]

The environmental hazards associated with the residuals of coal combustion are now recognized as considerable; they include ground and drinking water contamination with toxic pollutants that can cause cancer, neurological damage and other health effects.[31] The old practice of disposing of coal wastes in unlined ponds is now in violation of the 2015 Coal Combustion Residual rule. Some significant incidents at such facilities, such as the groundwater contamination at Laramie River Station and the earthen dam collapse at the Tennessee Valley Authority's Kingston Fossil Plant have brought public and regulatory attention to the need for improved practices in disposal of what are termed coal combustion residuals (CCRs). [32, 33]

According to the Environmental Integrity Project, approximately 91 percent of coal plants have contaminated groundwater from coal ash ponds.[34, 35] Most coal plants are located near water sources because generating electricity from coal is a water intensive process.[36] The Laramie River Station is located upstream of Wheatland Creek, Uva Ditch, Chugwater Creek, the Laramie River, Grayrocks Reservoir and Cottonwood Draw.[37] Of the 19 groundwater monitoring wells at Laramie River Station, 16 have reported groundwater

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[29] Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future. https://www.rff.org/publications/reports/decommissioning-us-power-plants-decisions-costs-and-key-issues/

[30] Environmental Protection Agency. (2016). Coal Plant Decommissioning; Plant Decommissioning, Remediation and Redevelopment. https://www.epa.gov/sites/production/files/2016-06/documents/4783_plant_decommissioning_remediation_and_redevelopment_508.pdf

[31] Russ, A., Bernhardt, C., Evans, L. (2019). Coal's Poisonous Legacy: Groundwater Contaminated by Coal Ash Across the U.S. Environmental Integrity Project. http://www.environmentalintegrity.org/wp-content/uploads/2019/04/National-Coal-Ash-Report-4.30.2019.pdf

[32] Ashtracker.org. (2019, July 19). Ashtracker | Site → 472. Ashtracker. http://ashtracker.org

[33] Blunt, K. (2019). Utilities Speed Up Closure of Coal-Fired Power Plants.

[34] The Environmental Integrity Project is a non-profit group, nonpartisan group that investigates environmental polluters and holds them accountable.

[35] Environmental Integrity Project. (2019). Coal's Poisonous Legacy Groundwater Contaminated by Coal Ash Across the U.S. http://www.environmentalintegrity.org/wp-content/uploads/2019/03/National-Coal-Ash-Report.pdf, page 13

[36] Union of Concerned Scientists. (2014, August 7). How it Works: Water for Coal. https://www.ucsusa.org/resources/water-coal

[37] McKim, C. (2018, February 7). Power Plant Facing Potential Lawsuit Over Coal Ash Pond Failure Plans | Wyoming Public Media. Wyoming Public Media. https://www.wyomingpublicmedia.org/post/power-plant-facing-potential-lawsuit-over-coal-ash-pond-failure-plans

contamination of lithium, sulfate, molybdenum, beryllium, arsenic and selenium above advised levels.[38] These heavy metals are carcinogenic and increased exposure can lead to organ failure and cancer.[39]

Image 4. Tennessee Valley Authority, 2008 Kingston Power Plant Coal Ash Spill. Credit: TVA.

[40]In December 2008, the earthen retaining wall at Tennessee Valley Authority's Kingston Fossil Plant gave way and released the 5.4 million cubic yards of coal ash sludge poured into the Emory and Clinch Rivers and covering 300 acres.[41, 42] The owner of the power plant, Tennessee Valley Authority (TVA) had misreported that the unlined coal ash ponds only contained 2.6 million cubic yards. [43] After the catastrophic spill, a TVA spokesperson assured area residents that, "You're not going to be endangered by touching the ash material. You'd have to eat it. You have to get it in your body."[44] Ten years later,

[38] Ashtracker.org. (2019, July 19). Ashtracker | Site → 472. Ashtracker. http://ashtracker.org

[39] Tchounwou, P. B., Yedjou, C. G., Patlolla, A. K., & Sutton, D. J. (2012). Heavy Metals Toxicity and the Environment. EXS, 101, 133–164.

[40] Irwin, C. (2008). House nearby Kingston Fossil Plant after Coal Ash Spill [Digital Image].

[41] Dewan, S. (2008, December 26). Tennessee Ash Flood Larger Than Initial Estimate. The New York Times. https://www.nytimes.com/2008/12/27/us/27sludge.html

[42] Gaffney, A. (2018, December 17). Hundreds of Workers Who Cleaned Up the Country's Worst Coal Ash Spill Are Now Sick and Dying. NRDC. https://www.nrdc.org/stories/hundreds-workers-who-cleaned-countrys-worst-coal-ash-spill-are-now-sick-and-dying

[43] See Note 41 above.

[44] See Note 41 above.

the cleanup crews hired for the multi-year coal ash cleanup from Kingston Fossil Plant, are experiencing health problems from exposure to the toxic sludge.[45]

Image 5. House nearby Kingston Fossil Plant after Coal Ash Spill

RULES AND REGULATIONS FOR CLOSURE AND DECOMMISSIONING

When a coal-fired power plant is at the end of its life, there are many variables that affect what the operator may decide to do with the plant. There are two main paths at the end of life of a plant: closure or decommissioning. The terms "closure" and "decommissioning" are often seemingly interchangeable. This comes from the nuance that closure is one option on the spectrum of decommissioning a coal-fired power plant. The spectrum being the extent to which a plant is dismantled and environmentally remediated in the overall process of decommissioning. The most extreme, or most thorough decommissioning on that spectrum being the complete dismantling of a facility and selling-off of capital assets from the facility.[46]

[45] See Note 42 above.

[46] Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

Although the paths of closure and decommissioning are similar, there exists a major difference in the cost of decommissioning versus closure. In deciding whether to close or to decommission a plant, location of the plant seems to be the largest variable in the decision-making process. Specifically, plants located in rural areas, or anywhere that land has less resale value, have less financial incentive and regulatory pressure to fully decommission and remediate a site.[47]

Image 6. Coal Plant during decommissioning.[48]

Site operators have the choice of maintaining the plant for "standby" use to help supply hypothetical loads in the future or they go "cold and dark". The latter means that the site is shut down and only partially decommissioned, usually leaving infrastructure behind.

Once a closure path is chosen for a plant there are four major phases: site assessment, project planning, project implementation, and project closure.[49] Decommissioning of a coal plant begins with the announcement of a scheduled shutdown. Decommissioning does not end until all operations at the plant have completely ceased. All electric generating units must be shut down and operating permits terminated. Unused coal, equipment and hazardous materials must be removed, in addition to partial or total building demolition, depending on future use of the site. Finally, onsite coal ash ponds and off-site solid waste landfills are required to follow federal and state regulatory requirements for closure of the facility.[50] Management of the coal ash ponds and landfills is in most cases the most expensive element.

Some power plants are "mine mouth" plants, located at coal sources, and often operate as the mine's lone customer. When these plants close, it requires the closure of the coal mine as well as any transportation infrastructure. It appears that some companies try to avoid these costs or postpone them indefinitely by asserting the mine is only in

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[47] Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

[48] Burns & McDonnell. https://www.powermag.com/well-planned-retirement-keys-to-successful-coal-plant-decommissioning

[49] See Note 48 above.

[50] Malley, E. (2016). Coal Power Plant Post-Retirement Options. Power Magazine. https://www.powermag.com/coal-power-plant-post-retirement-options/

"temporary cessation" of activities.[51] According to the Center for Public Integrity, there are about 150 coal mines in this status that have sat idle for years and are likely to never produce again.[52] The management of these idle mines is important, but this issue is outside the scope of this study.

The closure costs of mining operations, processing and generation facilities are often referred to as Asset Retirement Obligations (ARO). Power providers, like MEAN often have numerous power assets in their resource portfolio, so a line item labeled "ARO" in financial statements may include numerous plants and power projects. It is difficult to estimate these costs due to changes in laws and regulations, plan revisions, inflation and changes in the amount and timing of the expected work. Furthermore, since power providers have multiple power assets, ARO estimates are not plant-specific, inhibiting detailed analysis, and historically leading to underestimated closure costs.[53] Despite the many difficulties of calculating total costs, utilities must be planning for coal-plant retirement options and how they will cover the respective costs. Indeed, as stated in the previous section, many utilities are doing just that.

[51] Olalde, M., Yerardi, J. (2019). While 'zombie" mines idle, cleanup and workers Suffer in Limbo. High Country News. https://www.hcn.org/issues/51.20/mining-while-zombie-mines-idle-cleanup-and-workers-suffer-in-limbo

[52] See Note 52 above.

[53] Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

Table 2.

COST OF RECENT CCR IMPOUNDMENT CLOSURES			
Plant	**Power Plant Owner**	**Size**	**Cost of Closure**
Bremo Power Station east ash impoundment[54]	Dominion Energy	1,800,000 Cubic Yards	$20.1 million
Clover Power Station CCR impoundments[55]	Dominion Energy, Virginia Electric and Power Company	38,000 Cubic Yards	$8.5 million
Mayo Steam Electric Plant CCR impoundments[56]	Duke Energy	5,500,000 Cubic Yards	$249 million (+$95 million for post-closure monitoring)

Electric utility suppliers operate in either regulated or unregulated markets that vary state to state; there are regulated (Cost-of-Service) utilities and deregulated utilities. Regulated utilities prepare cost estimates and recover the future cost of decommissioning plants with rates charged to customers; these costs are reviewed by public utility commissions to ensure that they are equitable and may then be incorporated into the rate base. If it is evident that the costs will at some point be incurred, responsible regulators will exert some pressure to ensure that some kind of financial reserve is being accumulated to pay them.

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[54] Golder Associates. (2018). Bremo Power Station CCR Surface Impoundment: East Ash Pond. https://www.dominionenergy.com/library/domcom/media/community/environment/reports-performance/ccr-rule-compliance-data-and-information/bremo/bremo-east-closure-plan.pdf?la=en&modified=20180921191321

[55] Nilsson, R. K., & Addison, N. W. (2016). Closure Plan for CCR Surface Impoundments Clover Power Station Clover, Virginia (p. 14). https://www.dominionenergy.com/library/domcom/media/community/environment/reports-performance/ccr-rule-compliance-data-and-information/clover/sed-basins-closure-plan.pdf?la=en&modified=20180824170602

[56] AECOM, & Duke Energy. (2019). DUKE ENERGY MAYO STEAM ELECTRIC PLANT COAL COMBUSTION RESIDUALS SURFACE IMPOUNDMENT CLOSURE PLAN. https://files.nc.gov/ncdeq/Coal%20Ash/2020-closure/Mayo-CBE---Closure-Plan.pdf

Deregulated utilities prepare cost-estimates at their own discretion and with little oversight.[57] A deregulated utility may underestimate closure costs as a way to keep rates low for their customers.[58] This disconnect between artificially low cost projections and the true costs of closure may not actually be discovered for a long time, if plants are scheduled to close 30 years or more into the future.

If events cause that closure date to become more immediate, the gap between actual costs and "optimistic" projections of costs is going to become evident. Utilities and their customers may suddenly find themselves obligated to large unanticipated expenses.

Or, as in the case of Kentucky municipalities, retroactively responsible for decommissioning costs not previously made transparent. In 2016 Kentucky municipalities received unexpected expenses related to decommissioning costs of CCR's at closed coal power plants owned by Kentucky Utilities Company.[59] With the establishment of the EPA CCR rule, Kentucky Utilities Company was required by law to decommission CCR impoundments and looked to recover these costs from its municipal customers.[60] Although the plants had already been closed, Kentucky Utilities Company argued that the municipalities had benefited from the energy produced from the closed plants and therefore should pay their share of the decommissioning costs.[61] Municipalities argued that the costs did not meet the requirements to be asset retirement obligations when the plants had already been closed and did not believe they should be held responsible for the costs. In the end the Federal Energy Regulatory Commission sided with Kentucky Utilities Company affirming that the municipalities misunderstood what constituted an ARO and allowed for the revised rate structure to retroactively cover the costs of the CCR impoundment decommissioning.[62]

MEAN and its member municipal utilities operate in a largely unregulated environment. Nebraska, where MEAN is established and maintains its headquarters and operations is unique among U.S. states when it comes to utility energy regulation.

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[57] Deregulated electricity markets emerged in the early 1990s to allow more market competition to drive energy prices down. However, there have been misgivings about deregulated markets falling prey to market manipulation. Most states benefit from having a combination of the two markets.

[58] Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

[59] Keisling, J. (2016). Filing of Recovery of Asset Retirement Obligations Docket No. ER17-____-000 (Legal Filing No. ER17-234). FERC.

[60] Bruggers, J. (2016, August 8). LG&E/KU to pass cleanup costs to customers. https://www.courier-journal.com/story/tech/science/environment/2016/08/08/lgeku-pass-cleanup-costs-customers/88407408/

[61] United States of America Federal Energy Regulatory Commission, (2016). Kentucky Utilities Company Docket No. ER 17-234-000. https://www.ferc.gov/CalendarFiles/20161230152133-ER17-234-000.pdf

[62] See Note 60 above.

> "In the United States, there is one state, and only one state, where every single resident and business receives electricity from a community-owned institution rather than a for-profit corporation."[63]

That one state is Nebraska. Because Nebraska does not have any investor-owned utilities to regulate, it has not developed the robust public utility regulatory system that is typical of other states. It has a Power Review Board, but the authority of this entity is quite limited and does not extend to the kind of detailed review of underlying economics that is typical of other states.[64]

Further, the many Colorado municipal utilities that buy power from MEAN are largely unregulated. The Colorado PUC was granted control over private energy utility providers operating within the state to regulate rates and approve Resource Portfolios that meet state standards. However, there is little or no state oversight of municipalities that serve less than 40,000 meters.

MEAN prepares an Integrated Resource Plan for the federal Western Area Power Administration (WAPA) every five years but does not submit any kind of plan to the Colorado PUC for approval.

Many of Colorado's municipal utilities that are part of the MEAN system are small and have limited policy and research capacity. These communities are not in an ideal position to be researching and understanding the implications of how these aging coal assets, plans for closure, and the costs involved will affect electricity rates for member communities. Although MEAN serves a small proportion of customers in Colorado compared to some of the other regional players, such as Xcel Energy (1.5 million customers), Tri-State (397,863 customers), or Black Hills (262,000 customers), the member communities in Colorado they serve could be significantly impacted by any unplanned closure costs.

In the absence of regulatory oversight, there is a possibility that municipal utilities and the customers they serve may not fully understand the issues, including cost issues, they may face in closing these coal plants. The only real checks and balances here are informed citizens. The consequences of overlooking these issues in an environment where

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[63] Hanna, T. (2015). Community-Owned Energy: How Nebraska Became the Only State to Bring Everyone Power From a Public Grid. Yes Magazine. https://www.yesmagazine.org/economy/2015/01/30/nebraskas-community-owned-energy/

[64] Nebraska Power Review Board. (n.d.). Retrieved July 17, 2020, from https://powerreview.nebraska.gov/

coal plants are closing ahead of schedule could be very costly. Given the potential importance of this issue to MEAN members, MEAN needs to identify the range of potential costs and share them publicly.

COAL COMBUSTION RESIDUALS RULE

In recent years, decommissioning has extended beyond mere dismantlement of the plant to include environmental remediation and restoration of the property.[65] These additional requirements make for increased costs, but without proper data it can be difficult to estimate total costs for coal plant operators regarding closures. Four key federal regulations have contributed to coal plant retirement and the increased costs associated with coal plant decommissioning. These are:

i. Clean Water Act Section 316 (b),
ii. Mercury Air and Toxics Standards ("MATS"), and
iii. Coal Combustion Residuals Rule ("CCR").[66]
iv. Clean Air Act, Regional Haze Rule[67]

This Study will focus on the effects of the CCR rule as it has been identified as a variable that could significantly increase closure costs.

Image 6. Coal Combustion Residual Pond and Plant.[68]

[65] Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

[66] Malley, E. (2016). Coal Power Plant Post-Retirement Options. *Power Magazine.*

[67] EELP Staff. (2018, April 24). Regional Haze Rule—Environmental & Energy Law Program. Harvard Law School. https://eelp.law.harvard.edu/2018/04/regional-haze-rule/

[68] CNN video screen shot. https://www.cnn.com/2019/03/04/health/coal-ash-groundwater-contamination/index.html

While there are a variety of costs associated with coal-plant closures, this section takes a deeper look at one of the more costly aspects of decommissioning: coal ash pond closure. In 2015, the Environmental Protection Agency (EPA) established national requirements for the disposal of CCR from electric utilities.[69] Coal combustion residuals are the by-products of burning coal to generate electricity and are often referred to as coal ash. These rules apply to the owners and operators of coal plants, and subtitle D of the Resource Conservation and Recovery Act (RCRA), is the primary federal law for regulating solid waste from coal plants.

The need for proper disposal of coal ash comes from its many environmental risks. These by-products contain arsenic, boron, cadmium, cobalt, lead, lithium, mercury, radium, selenium, and thallium, and other contaminants.[70] The release of CCRs has the potential to leak toxic contaminants into groundwater, or release contaminants into the air, causing a variety of health and environmental threats and concerns. At present, CCRs are stored in on-site or off-site landfills, surface impoundments, or sometimes used as mine backfill. They are either kept dry or mixed with water to form a holding pond, known as "wet" storage. In some cases, CCRs are transported from the power plant sites to distant landfills.[71] It had been assumed that landfills would reduce risk of groundwater contamination of CCRs compared to impoundments. But it has been discovered that 76% of CCR landfills have one or more leaks.[72]

One option for managing CCR waste is by using it as coal mine backfill to help with mine reclamation efforts. This technique of CCR use for mine backfill is employed at some of MEAN's power resources: Wygen units 1 & 3 and the Neil Simpson plants, which are collocated with the coal mines that feed them. The Current CCR rule does not apply to backfilling mines.[73] Using this technique may reduce the costs associated with using landfills or impoundments and attempts to put CCRs to beneficial use. This method is not

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[69] Environmental Protection Agency. (2018). Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Amendments to the National Facilities—Basin Electric Power Cooperative. (n.d.). Retrieved May 13, 2020, from https://www.basinelectric.com/facilities

[70] Russ, A., Bernhardt, C., Evans, L. (2019). Coal's Poisonous Legacy: Groundwater Contaminated by Coal Ash Across the U.S. Environmental Integrity Project.

[71] EPA. (2019). Frequent Questions about Definitions and Implementing the Final Rule Regulating the Disposal of CCR. US Environmental Protection Agency. https://www.epa.gov/coalash/list-frequent-questions-about-implementing-final-rule-regulating-disposal-coal-combustion

[72] See Note 69 above.

[73] EPA. (2018). Frequent Questions about the 2015 Coal Ash Disposal Rule | Coal Ash (Coal Combustion Residuals, or CCR) | US EPA. https://www.epa.gov/coalash/frequent-questions-about-2015-coal-ash-disposal-rule#20

widely used because it creates concerns about contamination of regional groundwater.[74] There is a lack of research on the potential long-term environmental effects of using CCRs as mine backfill.[75]

Table 3. MEAN's coal-fired power resources' groundwater contamination[76]

Plant	Pollutants Exceeding Safe Levels
Laramie River Station	Lithium, sulfate, molybdenum
Walter Scott Energy Center unit 4	Arsenic, Lithium, Molybdenum, Selenium
Whelan Energy Center	Molybdenum
Wygen Unit 1	No Impoundments
Gerald Gentleman 1 & 2 (NPPD Multi-Unit Participation)	Lead
Wygen unit 3 & Neil Simpson unit 2	No Impoundments
Louisa Generating Station	Molybdenum

Subtitle D of RCRA is a self-implementing rule with no direct federal oversight but includes the retrofitting of liners for CCR disposal ponds, as many are unlined and thus unable to prevent leaching.[77] A nuance of this "self-implementing" rule is that these

[74] Clean Water Fund. (2013). Coal Ash: Colorado's Toxic Trash Exposed. Clean Water fund. https://www.cleanwateraction.org/files/publications/Toxic%20Trash%20Exposed%20-%20Coal%20Ash%20in%20Colorado.pdf

[75] National Research Council. (2006). Managing Coal Combustion Residues in Mines. Washington, DC: The National Academies Press. Chapter 4: Pages 81-104.

[76] Russ, A., Bernhardt, C., Evans, L. (2019). Coal's Poisonous Legacy: Groundwater Contaminated by Coal Ash Across the U.S.

[77] Because the CCR Rule is self-implementing, when and how operators report groundwater contamination and CCR Rule compliance may be difficult to access. The EPA has a list of publicly accessible sites hosting compliance data for CCR compliance at https://www.epa.gov/coalash/list-publicly-accessible-internet-sites-hosting-compliance-data-and-information-required, but Earth Justice has a more comprehensive map at https://earthjustice.org/features/map-coal-ash-contaminated-sites.

regulations give each state discretion as to how to apply them, leading to every state having its own rules under its Solid Waste Management Plan (SWMP). Under RCRA, some states mandate the closure and monitoring of these ponds, which can have substantial costs, with one estimate of up to $200 million for the closure and monitoring of surface impoundments at the Tennessee Valley Authority's 350 acre-site.[78]

Recently, Duke Energy settled a long running dispute over its coal ash repositories. Duke had resisted regulatory cleanup orders

> "…[Duke complained that] the order would cost an additional $4-5 billion on top of an estimated $5.6 billion plan. Duke says the current settlement will reduce costs by $1.5 billion, to a projected total of $8-9 billion, by allowing approximately 4 million tons to sit below a landfill and another almost 30 million tons to remain capped and in place."[79]

Coal ash repositories are generally classified as either "wet" or "dry." "Wet" coal ash refers to a process where the operators wash out the coal ash with water, creating a slurry and then storing it in manufactured impoundments, typically onsite.[80] "Dry" coal ash is more expensive upfront. Operators use vacuums to suck out the ash and then recycle it for beneficial uses, store it in structures, or bury it in landfills.[81, 82]

There are two ways to properly close CCR "wet" landfills. One is to drain the water and dry the contents, then cap the pond. If an operator chooses this method, they must also install a composite liner in the pond. The second option consists of draining the water and transporting the CCRs to a regulated landfill. The second option is far more expensive than closing a pond on-site.

In 2009, the Federal Office of Management and Budget released a study finding that proper closure of all 155 coal ash ponds in the U.S. would cost roughly $39 billion

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[78] Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

[79] Morehouse, C. (2020). Duke agrees to largest coal ash cleanup in US after years of fighting with environmentalists.

[80] See Note 78 above.

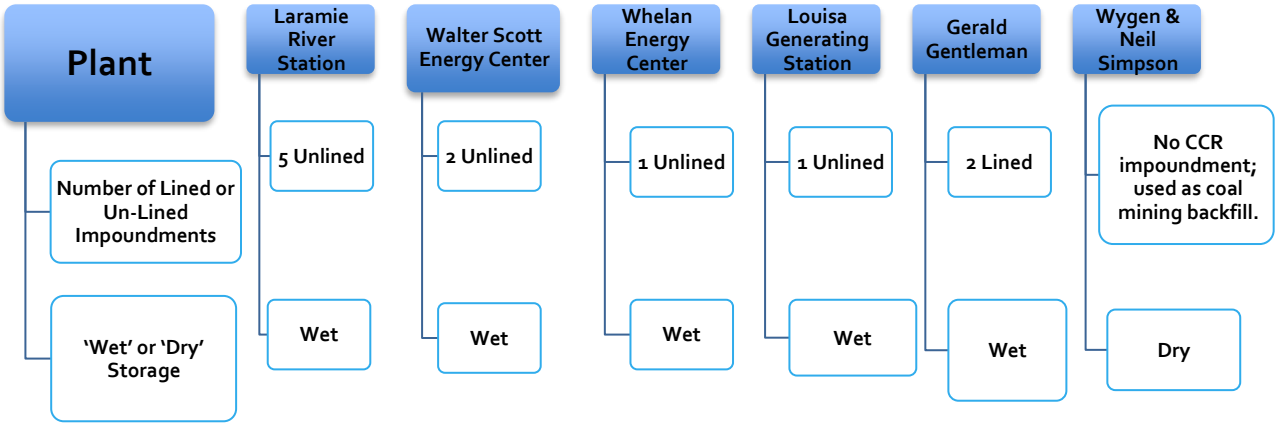
[81] See Note 78 above.

[82] "Dry" coal ash has more expensive upfront costs, but costs may be recouped through beneficial reuse. Some common forms of coal ash beneficial reuse are as a concrete or cement additive, wallboard, road base, roofing material, or in bricks. These reuse options are non-toxic to humans and the environment. While coal combustion products is an under-supplied market, meaning manufacturers want more coal ash than is readily available, a consistent supply of coal ash requires an increased investment in technology and logistics.

dollars.[83] When looking more closely at pond size and relative cost, estimates showed that closing a 22-acre pond would cost about $3.5 million, while closing a 350-acre pond was estimated at $200 million.[84] If CCRs are required to be removed and transported off-site, the cost of closure increases between 270 and 2,200 percent.[85]

Utility operators and owners tend to underestimate the cost of Asset Retirement Obligations (ARO). Any resulting unexpected increases in the cost of AROs are usually reflected in higher future rates.[86] As one example of how costs can be grossly underestimated, in 2013 the nation's largest electric power utility, Duke Energy did not report *any* AROs exclusively for CCR impoundment closure and remediation.[87] In 2016, Duke Energy reported ARO estimates of $1.6 million/acre in their financial statements, although they have not publicly stated how much the closures of all their wet and dry CCR impoundments will cost.[88]

Table 4. MEAN's coal-fired plant CCR impoundment number and status as lined or unlined impoundments.[89], [90] "Lined," in this context, means in accordance with the EPA's statute 40 CFR § 257.71, liner design criteria.



[83] Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

[84] See Note 82 above.

[85] See Note 82 above.

[86] Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

[87] See Note 85 above.

[88] See Note 85 above.

[89] Details of the type, number, and whether the plant has lined, or unlined ponds was retrieved from individual plant operators' websites and can be found cited in the bibliography.

[90] Earth Justice. (2019, March 4). Mapping the Coal Ash Contamination. Earthjustice. https://earthjustice.org/features/map-coal-ash-contaminated-sites

Stalling and Delay

While the 2015 CCR rule set strict timelines for closures and retrofitting of unlined impoundments, compliance has been low and coupled with litigation, stalling and delay. Since 2015, 265 of the 427 total coal plants have reported groundwater monitoring data, albeit in abstruse forms.[91, 92, 93]

The CCR rule has been in litigation in the D.C. Circuit Court of Appeals for the past four years. This litigation leads to unclear closure requirements and timelines. This further complicates already complex cost estimates until the court makes a decision. MEAN's financial statements say:

> "Until the EPA reissues the Rule, Basin [Electric][94] and PPGA[95] are unable to estimate the cost or the extent of any potential corrective action required".[96]

Many plant operators, including some of clear relevance to MEAN customers, have been using the pending litigation as a rationale for failing to come to grips with these issues or to start taking action.

> "... due to the level of regulatory and legal uncertainty related to MEAN's facilities, it is impractical to quantify any specific financial impacts at this time".[97]

In November 2019 the EPA made its final decision on the CCR rule with an updated August 1, 2020 closure timeline for CCR impoundments. However, the new rules come with some loopholes that include provisions that allow facilities more time to develop

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[91] Environmental Integrity Project. (2019). Coal's Poisonous Legacy Groundwater Contaminated by Coal Ash Across the U.S. http://www.environmentalintegrity.org/wp-content/uploads/2019/03/National-Coal-Ash-Report.pdf

[92] Any plants that closed coal ash dumps before the Coal Ash Rule took effect in 2015 do not have to report groundwater monitoring data, but based on the fact that 91% of those who have reported data show groundwater contamination, there is a high likelihood that those plants that have skirted the Coal Ash Rule have caused groundwater contamination as well. Plants closed prior to 2015 have no obligation under Federal law to retrofit those impoundments.

[93] As of 2018, the number of U.S. coal plants had decreased from 427 in 2015 to 336, and more are shuttered yearly.

[94] Basin Electric is the operator of the Laramie River Station, of which MEAN owns a minority share

[95] Public Power and Generation Agency, a coal power supplier of MEAN

[96] MEAN 2019 Financial Audit, page 11.

[97] MEAN 2019 Financial Audit, page 35.

alternative ways of managing waste and include increased use of CCRs for beneficial use.[98] Beneficial use of coal ash is regulated by state environmental agencies and is defined as "reduced use of virgin resources, lower greenhouse gas emissions, reduced cost of coal ash disposal, and improved strength and durability of materials".[99] An example of coal ash reuse would be "fly ash used in "concrete/concrete products/grout" to increase strength[100] or, employing coal ash as mine back fill.

The utilization of coal ash in mine closure and remediation may reduce acid mine drainage and mine fires. Mine backfilling with coal ash has not been significantly proven to be environmentally sound, especially on a large scale.[101] Utilizing coal ash as mine back fill runs the risk of contaminating groundwater and soil with heavy metals. This could conceivably be a larger issue resulting in costs incurred in the future as the potential environmental harms become better understood and appropriately regulated. It seems like a prelude banally similar to the current amended regulation required for appropriate retrofit and closure of coal ash ponds.

Since the announcement of the proposed coal CCR rules environmental groups are already speaking up and getting ready to challenge the new rules stating that they would drastically weaken public health and safety protections from coal-fired power plants.[102, 103]

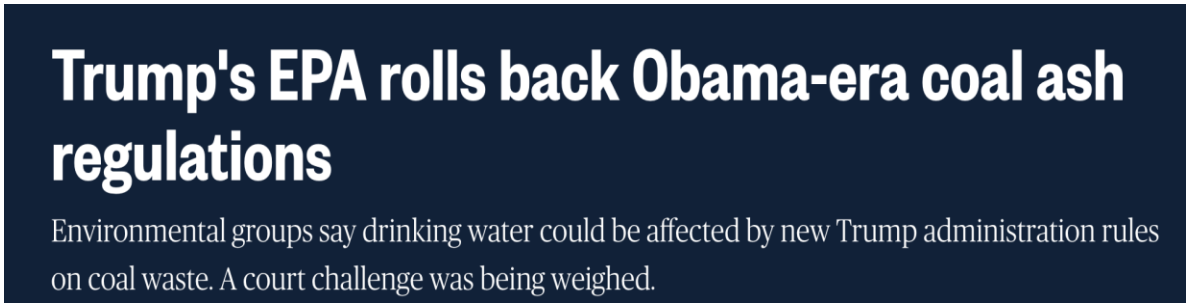

Image 7. NBC News Article on new CCR rule.[104]

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[98] Environmental Protection Agency. (2019). Proposed Revisions to the Coal Combustion Residuals Rule.

[99] EPA (2014, December 11). Coal Ash Reuse [Other Policies and Guidance]. US EPA. https://www.epa.gov/coalash/coal-ash-reuse

[100] EPA (2014, December 11). Coal Ash Reuse [Other Policies and Guidance]. US EPA. https://www.epa.gov/coalash/coal-ash-reuse

[101] Park, J. H., Edraki, M., Mulligan, D., & Jang, H. S. (2014). The application of coal combustion by-products in mine site rehabilitation. Journal of Cleaner Production, 84, 761–772.

[102] Money, J. (2019) Environmentalists describe proposed coal ash rule changes as "dangerous." The Oklahoman. https://oklahoman.com/article/5646100/environmentalists-describe-proposed-coal-ash-rule-changes-as-dangerous

[103] Essentially, the extension that the coal industry has been given results in 18 more months of potential groundwater contamination.

[104] Romero, Dennis. (2018, July 18). Trump's EPA rolls back Obama-era coal ash regulations. https://www.nbcnews.com/news/us-news/trump-s-epa-rolls-back-obama-era-coal-ash-regulations-n892586

Impacts of COVID-19

In March 2020, many states and counties in the U.S. initiated a stay-at-home order in response to the growing concerns over the spread of a new respiratory virus, COVID-19. The U.S. is one of many nations touched by this international pandemic. On March 26, 2020, in response to this pandemic, the EPA relaxed air and water environmental regulations for coal and natural gas energy generation facilities.[105] This "temporary enforcement discretion policy" allows the coal industry leniency in routine monitoring and reporting, however the EPA "does not expect to seek penalties for violations" of compliance during this pandemic.[106] Most power plant operators and cooperative electric utilities have not admitted to needing the relaxed regulations nor exploiting the enforcement discretion policy.[107]

With the majority of CCR impoundments across the U.S. being unlined, the potential of toxic chemicals leaching into groundwater could increase during this time. Two of the plants in which MEAN owns shares have wet, unlined coal ash disposal ponds and three of the plants in which they have entitlement shares have wet, unlined ponds.[108]

MEAN'S OWNERSHIP AND RESPONSIBILITY

MEAN receives coal-fired power from seven stations, the Laramie River Station (LRS), Walter Scott Energy Center Unit 4 (WSCU4), Wygen Units 1 & 3, Whelan Energy Center Units 1 & 2 (WEC2), Gerald Gentleman Station Units 1 & 2 (GGS), Neil Simpson Unit 2 (NSU2), and Louisa Generating Station (LGS).

MEAN has three different business relationships with the plants from which it receives energy. MEAN is in some cases a partial plant owner, in others it is a participant in a larger power generating agency or has a power purchase agreement with the power producer. MEAN holds minority ownership interest in the Laramie River Station, Walter Scott Energy Center and Wygen Unit 1, in which MEAN is proportionately responsible for

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[105] Morehouse, C. 2020. "EPA gives power plants, regulated entities pollution compliance flexibility, citing COVID-19 concerns". *Utility Dive. https://www.utilitydive.com/news/epa-gives-power-plants-regulated-entities-pollution-compliance-flexibility/575103/*

[106] EPA. (2020, March 26). EPA Announces Enforcement Discretion Policy for COVID-19 Pandemic [Speeches, Testimony and Transcripts]. US EPA. https://www.epa.gov/newsreleases/epa-announces-enforcement-discretion-policy-covid-19-pandemic

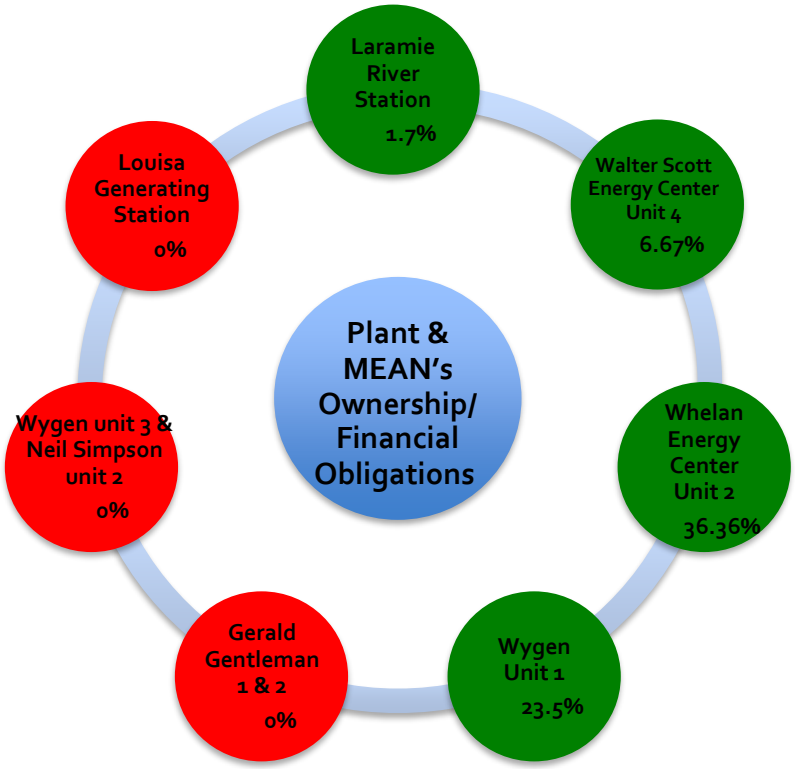
[107] See note 105 above.

[108] Earth Justice. (2019, March 4). Mapping the Coal Ash Contamination. Earthjustice. https://earthjustice.org/features/map-coal-ash-contaminated-sites

costs such as operation, retrofit, maintenance and termination.[109] MEAN has an entitlement share, or participation share of the Whelan Energy Center Unit 2 that makes MEAN responsible for a corresponding ownership percentage of total debt and operating expenses.[110, 111] Finally, MEAN engages in power purchase agreements in which it purchases electricity from facilities, but is not responsible for any operating costs.[112]

Key questions for the purposes of this study are the extent to which MEAN has liabilities for closure costs at each of these facilities, and to what extent MEAN must pay these costs or will pass them on to MEAN customers?

Table 5. MEAN's ownership and financial obligations to coal-fired power plants in energy supply; red indicates that MEAN has no debt obligation, while green is reported as a liability in MEAN's "Power Supply System Refunding Revenue Bonds 2016 Series A"[113]



[109] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, Page 30 & 31.

[110] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 29 & 30.

[111] MEAN has entitlement shares in other coal power resources, which are not directly referenced in "Power Supply System Refunding Revenue Bonds 2016 Series A" because they do not have debt obligations under those participation agreements.

[112] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 29 & 30.

[113] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 29 & 30.

To better understand the financial relationships between MEAN and its coal-fired power sources, the following financial obligation information was gathered from MEAN's Power Supply System Refunding Revenue Bonds 2016 Series A and MEAN's annual audited financial statements made available to the public.[114] These documents are designed to communicate MEAN's financial condition to the investor community. To the extent there are any other agreements that modify or add to our conclusions, we hope that MEAN will prove ready to share them.[115]

MEAN has three facilities where its minority ownership obligations include costs associated with maintenance, operation, retrofit, and termination. These are the Laramie River Station (LRS), Walter Scott Energy Center Unit 4 (WSEC4), and Wygen Unit 1. The ownership percentage is 1.74%, 6.67%, and 23.5% respectively.[116] MEAN's 36.36% entitlement share in the Whelan Energy Center Unit 2 (WEC2), requires MEAN to be responsible for a corresponding percentage of ownership to debt responsibility of the facility. As of 2016 the total bond debt remaining on WEC2 was 637.1 million dollars.[117] The agreement to purchase power from WEC2 expires when that debt is paid or the plant is decommissioned, whichever comes later. However, trends suggest that the plant will be decommissioned long before the debt is paid.

At three of the coal-fired power plants: Gerald Gentleman Station, operating units 1 and 2 (also called NPPD Multi-Unit Production), Louisa Generating Station (LGS), and Wygen Unit 1, MEAN has Power Purchase Agreements.[118] These agreements are only for purchase of power. MEAN affirms that it does not have any ownership of the plants, nor responsibility for costs associated with operation, termination, or outstanding bond

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[114] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A.

[115] As a Nebraska public agency, MEAN must respond to public records requests. On August 23, 2019, SDSG sent MEAN a public document request regarding any studies the power provider had undertaken to assess the decommissioning costs at their coal-fired plants or associated waste disposal facilities and the costs therewith; to which MEAN responded on October 19, 2019, "MEAN as a power purchaser, a non-operator and only a minority interest holder has not commissioned studies and does not have decision-making power in any of the coal-fired power plants from which MEAN currently purchases power." MEAN required a $500 deposit for this information, because the request exceeded 4 hours of their time to fulfill. The appropriate information was ascertained by MEAN from an Annual Meeting document from October 25, 2016. To the agencies' credit they have now made these board meetings and minutes available to the public on their website at no charge: http://www.nmppenergy.org/board/MEAN. SDSG also requested notices of noncompliance, notices of violation, complaints in lawsuits, or regulatory actions concerning environmental issues at MEAN's coal-fired generating assets. Which would have required a $1000 deposit for the public records, which SDSG, as a small, non-profit could not provide to this large public agency.

[116] MEAN 2019 Audited Financial Statements, page 33.

[117] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 29.

[118] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 35 & 36.

debts.[119] Nebraska Public Power District states that MEAN has no liability for closure costs at the Sheldon Station, another plant from which MEAN only purchases power.[120] These power purchase agreements represent a small fraction of the MEAN power supply. With contracts set to expire within the next five years, MEAN has the opportunity to replace them with renewable energy.

MEAN pays the costs incurred related to their ownership stake in coal-fired power plants, with revenues that are generated by electrical sales to participating municipal utilities in Colorado, Nebraska, Wyoming and Iowa.[121] A large portion of MEAN's total operating revenue comes from power sales to member communities with Long-Term Total Requirement Participants (LTTRP) contracts.[122] These LTTRP contracts have a fixed expiration date that covers the maturity of all bond debt that in 2016 extended to at least 2041.[123] As coal-fired energy generation becomes more **expensive**, the increased costs MEAN experiences will be reflected in member community rates.

In 2016, member communities with Schedule M contracts accounted for 89% of participant revenue.[124] Under these Schedule M contracts, MEAN conducts an annual review of rate charges and possesses the ability to adjust them as needed to meet all financial costs and along with other revenues to pay debt obligations.[125] The revenue from power sales, including revenues from the implementation in 2015 of a flat rate charge and a fixed cost recovery charge added to Schedule M Contracts, allows MEAN to meet its yearly financial obligation.[126]

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[119] MEAN 2015 & 2016 Audited Financial Statements, page 33. This states which plants MEAN has production costs for and does not include Gerald Gentleman 1 & 2, Louisa Generating Station, Neil Simpson & Wygen Unit 1.

[120] October 25, 2019 response to public information request by SDSG.

[121] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 48.

[122] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 44.

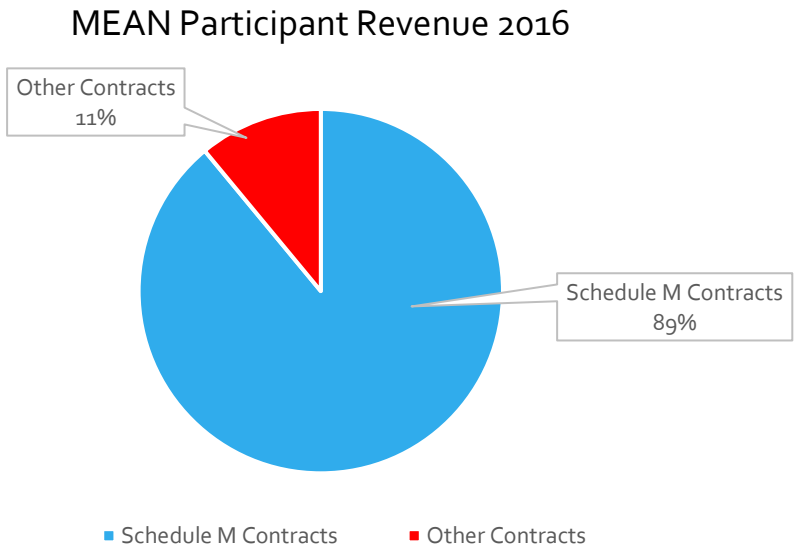
[123] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 48 & 49.

[124] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 51.

[125] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 41 & 48.

[126] The Fixed Cost Recovery Charge, which our earlier study found to be a major impediment to local renewable energy development for MEAN communities, is a means of ensuring that municipalities whose citizens adopt solar energy share the costs of retiring MEAN's bonded debt. Access the previous SDSG studies of MEAN at https://www.sdsg.org/mean-study.

Figure 4. Schedule M contract revenues, taken from the MEAN 2016 bond statement.[127]



The flat rate energy charge helps cover variable costs associated with the costs of purchased power, production, and transmission of power.[128] The fixed cost recovery charge was added to help cover costs related to administrative costs, debt and interest from power generating assets as well as contracted power sources, and capital costs.[129]

Regarding costs that may be associated with increased environmental regulation, financial statements should quantify and describe these liabilities. MEAN's financial statements state:

> "Future changes in environmental regulations could result in MEAN incurring significant costs for additional capital and operating expenditures, reduced operating levels or the complete shutdown of individual units not in compliance. However, due to the level of regulatory and legal uncertainty related to MEAN's facilities, it is impractical to quantify any specific financial impacts at this time."[130]

It is understood that calculating future costs associated with changes in regulation and laws is difficult due to a wide range of uncertainties. However, this does not make it proper to ignore the likely increased costs of future regulatory changes. Now that it

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[127] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 51.
[128] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 49.
[129] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 49.
[130] MEAN 2019 Audited Financial Statements, page 35.

appears that the coal ash litigation has resulted in a new EPA rule, presumably MEAN's future financial statements can and will become clearer regarding related anticipated future costs.[131]

The costs of closure are linked to environmental impact assessment, environmental management planning, and contingent retrofits at a plant. Plants where there are groundwater contamination problems or other issues may be more costly and difficult to close. The full cost of closure will only be known once (1) there is some clarity regarding when the plant is actually going to close; (2) the regulatory requirements that will apply are known; and (3) a closure plan is developed to a level of engineering detail that allows adequate calculation of costs.

There are several issues that complicate getting to the point of clear and reliable cost calculations. One of these is that many – maybe most – utilities have been consistently underestimating closure costs.[132] In many cases this is due to failing to recognize groundwater contamination where it exists or to plan for its remediation.

> "A Duke University study of coal ash ponds near 21 power plants in five Southeastern U.S. states has found evidence that nearby surface waters and groundwater are consistently and lastingly contaminated by the unlined ponds. ... "In all the investigated sites, we saw evidence of leaking," said Avner Vengosh, a professor of geochemistry and water quality in Duke University's Nicholas School of the Environment. "Some of the impacted water had high levels of contaminants."[133]

As stated above, to the best of our knowledge, MEAN is only responsible for maintenance, operation, retrofit, and termination at plants in which MEAN has an ownership entitlement share. Ostensibly, MEAN will recoup any unforeseen costs through the rates charged to their customer base through long-term contracts. The total bill for these closure costs, we predict, exceeds best case scenarios, especially as the environmental impacts at these plants is better understood.

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131 EPA. (2014, December 11). Disposal of Coal Combustion Residuals from Electric Utilities Rulemakings [Other Policies and Guidance]. US EPA. https://www.epa.gov/coalash/coal-ash-rule

132 Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

133 Duke University. (2016, June 10). Coal ash ponds found to leak toxic materials. https://phys.org/news/2016-06-coal-ash-ponds-leak-toxic.html

Recent MEAN Renewable Energy Generation Announcements

On December 30, 2019 MEAN announced that it would increase the current 2% local renewable energy generation cap to 5% for member communities.[134]

> "The policy allows for the integration of smaller, local renewable projects for MEAN long-term total requirement participants while still fulfilling obligations under MEAN's total requirements power supply contracts."[135]

The cap increase is not the only recent development as MEAN followed up in January of 2020 with the announcement of a vision to be carbon neutral by 2050, after the maturity of its current bond debts in 2041.

> "MEAN will have opportunities in the coming years to transition toward carbon neutrality as power purchase agreement contracts expire and capital debt is paid on its shared ownership of power resources with other utilities."[136]

By all indications, these announcements are a sign that MEAN is starting to understand the threat the thermal coal industry is facing because of cheaper alternatives and customer desire for cleaner forms of energy. More time will have to pass before we can fully understand the impacts from these announcements; however it is a positive sign to see MEAN beginning to respond to participant communities' concerns about MEAN's current coal-heavy energy portfolio.

IMPLICATIONS FOR THE MEMBER UTILITIES

So, what does this all mean for member utilities? Member utilities will end up paying some of the costs, through rate charges, to operate, retrofit or decommission these coal energy generation facilities, along with related obligations on bonds and debts. The decision-making on closure is likely to be very complicated when some of these plants have multiple fractional owners. See for example the ownership structure for the Laramie

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[134] MEAN. (December 30, 2019) MEAN EXECUTIVE COMMITTEE APPROVES INCREASING CAP IN DISTRIBUTED GENERATION POLICY. [Press Release] https://www.nmppenergy.org/mean/news/detail/204-mean-executive-committee-approves-increasing-cap-in-distributed-generation-policy

[135] See Note 133 above.

[136] MEAN. (January 28, 2020) MEAN BOARD APPROVES RESOLUTION ON VISION FOR CARBON NEUTRALITY BY 2050. [Press Release] https://www.nmppenergy.org/mean/news/detail/210-mean-board-approves-resolution-on-vision-for-carbon-neutrality-by-2050

River Station.[137] In such cases, noting that MEAN owns only 1.74% of Laramie River Station, MEAN is unlikely to be a key decision maker. If the majority of owners want to close, the plant will probably close. If they want to stay open, the plant will likely stay open.[138] We note that Laramie River Station is 36% owned by Tri-State Generation and Transmission, which has announced closure of all its coal plants in Colorado and New Mexico.[139]

Laramie River Station (LRS) has roughly a maximum CCR holding capacity of 4,728,000 cubic yards at the five impoundments located on site.[140] With the knowledge that MEAN owns 1.74% of LRS, we can attempt to make an estimate of MEAN's share of the cost to decommission the CCR impoundments. The LRS maximum CCR impoundment capacity is 79% the size of Duke Energy's Mayo Steam Electric Plant, which had 5,500,000 cubic yards of CCR ash and has the projected cost of $249,000,000. Assuming the cost based on CCR cubic yardage, the total cost for decommissioning LRS's CCR impoundments would be roughly $196,710,000. Therefore, MEAN's 1.74% ownership responsibility of LRS would result in MEAN owing $3,422,754 for the decommissioning of the LRS CCR impoundments. The Mayo Steam Electric Plant had wet and dry coal ash storage, whereas LRS has wet coal ash storage, which is more expensive to dispose of.

While MEAN has strategically diversified its portfolio by investing in multiple coal facilities so that no more than 15% of MEAN's capacity comes from a single generating facility, this tactic may have unforeseen consequences.[141] With the recent news of coal industry giant Murray Energy filing for bankruptcy this past November, there are truly no coal companies, large or small, that are not susceptible to the changing energy market.[142]

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[137] The Basin Electric website, which owns the Laramie River Station, states the five primary owners as: Basin Electric Power Cooperative, Tri-State Generation and Transmission Association, The Western Minnesota Municipal Power Agency, The Lincoln Electric System, and The Wyoming Municipal Power Agency.

[138] Randazzo, R. (2017). Owners to vote on fate of Navajo coal plant. AZ Central. https://www.azcentral.com/story/money/business/energy/2017/02/07/arizona-navajo-generating-station-coal-plant-fate/97608058/

[139] Tri-State Generation and Transmission Association. (January 9, 2020). Tri-State announces retirement of all coal generation in Colorado and New Mexico. [Press Release] https://tristate.coop/tri-state-announces-retirement-all-coal-generation-colorado-and-new-mexico

[140] Basin Electric Power Cooperative. (2016). Coal Combustion Residual, Surface Impoundment Liner Documentation, page 7. https://www.basinelectric.com/environment/coal-combustion-residuals-ccr-rule-compliance-data-and-information/bottom-ash-surface

[141] MEAN IRP. (2017), page 78.

[142] Krauss, C. (2019, October 29). Murray Energy Is 8th Coal Company in a Year to Seek Bankruptcy. The New York Times. https://www.nytimes.com/2019/10/29/business/energy-environment/murray-energy-bankruptcy.html

Coal giant, and Colorado's own, Westmoreland Coal filed for bankruptcy in 2019, following in the fated footsteps of coal behemoths Peabody Energy Corp and Arch Coal.[143]

> *"Coal's forecast share of electricity generation will fall from 24% in 2019 to 21% in both 2020 and 2021."*[144, 145]

Whatever MEAN's share of closure costs turns out to be based on historical revenue from MEAN's power sales, it appears that cities with Schedule M contracts will bear the weight of the cost in future years; in 2016, towns with Schedule M contracts accounted for 89% of participant revenue.[146] Other contract types tend to be short term with stated rates, and do not involve ownership rights or liabilities.

Figures 5 and 6 show the portion of revenue Schedule M contracts provided in 2006 & 2016.

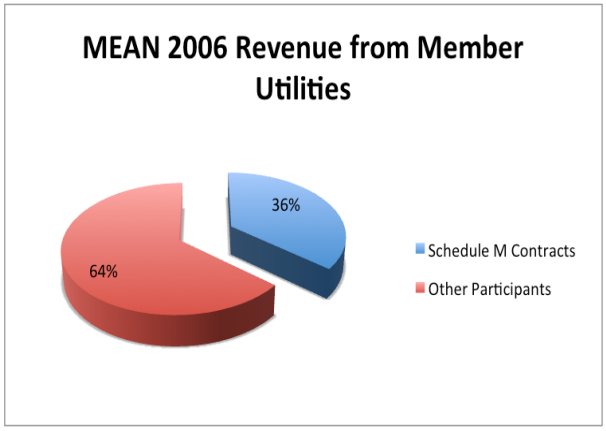

Figure 5.

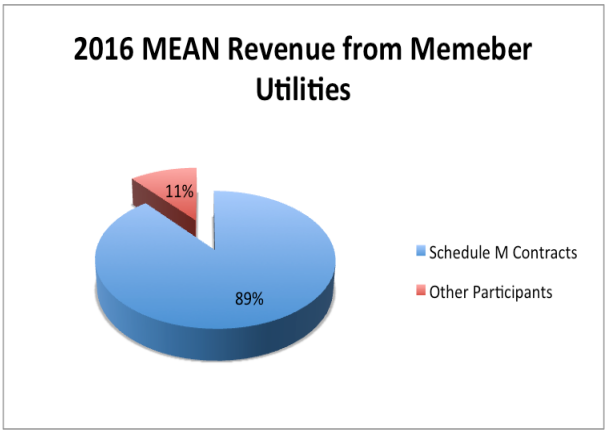

Figure 6.

Source: MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, Page 51.

MEAN reassures bondholders and prospective bond purchasers that it has the legal right to review rates each year and adjust them to be sufficient to pay

> "operation and maintenance relating to power supply projects, costs related to ownership obligations including termination, the cost of electric

[143] The Associated Press. (2019, March 5). Colorado's Westmoreland Coal To Leave Bankruptcy. Colorado Public Radio. https://www.cpr.org/2019/03/05/colorados-westmoreland-coal-to-leave-bankruptcy/

[144] EIA. (2020). Short-Term Energy Outlook. U.S. Energy Information Administration (EIA). https://www.eia.gov/outlooks/steo/report/coal.php

[145] Due to the COVID-19 pandemic, the U.S. Energy Information Administration forecasts that coal consumption will decrease by 19% in 2020.

[146] MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 51.

> power purchased, debt service on bond and other obligation, [and] amounts necessary to meet any rate covenant of MEAN."[147]

Bondholders are also assured these rates are not regulated by any local, state utilities commission (CO, WY, NB, IA) or by any federal laws.[148]

MEAN is aware that "environmental concerns are preeminent in Colorado", however MEAN also makes note that "no retail rate competition legislation has been advanced in the General Assembly or proposed at the Colorado Public Utility Commission".[149] Additionally, MEAN asserts that legislators in Colorado are not ready for competitive retail electric systems.[150]

If we refer to the previously mentioned flat rate charge and fixed recovery costs additions to Schedule M contract in 2015, we can highlight what these rate hikes could look like in the future. In 2017, for example, Schedule M participant Gunnison, Colorado paid $889,658 in fixed-cost recovery fees, justified by the need to pay off MEAN's debts associated with coal-fired assets.[151] Furthermore, for fiscal year 2017 the "fixed rate recovery charge and flat energy rate are equal to approximately 44% and 53% respectively, of MEAN's targeted revenue requirements".[152, 153]

Reserves Against Closure Costs

MEAN's annual financial audit includes a statement of "debt service reserve fund" for "restricted long-term investments" that as of 2019 had a balance of $13,228,048.[154]

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147 MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 49 & 50.

148 MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 36.

149 MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 38.

150 MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 38.

151 MEAN Fixed Rate Recovery Charge. https://static1.squarespace.com/static/5bb24d3c9b8fe8421e87bbb6/t/5c5897b7eb393160be1e2928/1549309880781/MEAN+FCRC+Chart.pdf

152 MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 49.

153 It is valuable to note that each year the MEAN Board of Directors, representatives from each of the Schedule M communities, votes on approval of the allocation of the net revenue from the Fixed Cost Recovery Charge and the Energy Charge back to the participant communities. This amounted to $11.6 million and $1.6 million from the Energy Charge and Fixed Cost Recovery Charge, respectively, which was refunded to participant communities. http://cms5.revize.com/revize/gunnisonco/Public%20Woeks/MEAN.Agendas/20190523MinutesApprovedBoard.pdf, page 6.

154 MEAN 2019 Audited Financial Statements, page 23.

> "The Debt Service Reserve Requirement for the Bonds is equal to the lesser of (i) 10% of the aggregate original principal proceeds of all series of Bonds then outstanding."[155]

This debt reserve fund has been set up to make sure there is enough money available to pay off existing debts.[156]

Additionally, MEAN has a Rate Stabilization Account (RSA) within the General Reserve Fund that is utilized to "provide services at stable and economic rates for its participant communities".[157] The RSA helps to manage energy risks and may be used to pay operating expenses, debt service, or other purposes that would enable MEAN to stabilize electricity rates.[158] The RSA is divided to support both short and long-term investments and as of 2019 had a balance of $20,983,007.[159] However, this fund does not appear to cover the cost of decommissioning, as MEAN has elected to defer some costs of investments in the Walter Scott Energy Center Unit 4, Wygen Unit 1, and Laramie River Station.[160] These costs are associated with depreciation and bond issues and are to be charged in future years; presumably the money from the RSA has been ear-marked to cover these costs.[161]

Finally, MEAN does acknowledge both a Reserve and Contingency fund and a special account for decommissioning reserves.[162] However, these funds or accounts are not clearly presented in MEAN's financial statements, unlike both the debt reserve fund and RSA that have clearly stated line items.[163] While it appears that such funds or accounts do not exist, it is at least possible they are buried somewhere in other line items in the financial statement. We have reached out to MEAN for clarification and have not received a response.

Although MEAN has established a debt service reserve fund and an RSA, these funds are not specifically committed to covering future costs of asset decommissioning. It appears that MEAN is not fully prepared, without rate increases, to cover unexpected

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155 MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 13
156 MEAN 2019 Financial Audit, page 17.
157 MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 16.
158 MEAN 2019 Financial Audit, page, 11.
159 MEAN 2019 Financial Audit, page 12 & 23.
160 MEAN 2019 Financial Audit, page 11.
161 MEAN 2019 Financial Audit. page 11.
162 MEAN Power Supply System Refunding Revenue Bonds 2016 Series A, page 16.
163 MEAN 2019 Financial Audit, page 23.

costs they may encounter due to changes in regulations and laws related to coal-fired power plant decommissioning.

DISCUSSION

This final section of this report provides a summary of responses to the questions posed at the beginning of the report:

1) **What are the costs associated with decommissioning or retrofitting a coal-fired power plant?**

There are several categories of cost associated with the closure, decommissioning, or retrofitting of coal-fired power plants. The greatest of these costs is generally the cost associated with adequate long-term disposal of coal combustion residuals. The cost, of course, varies from plant to plant, based on the size of the plant, the objectives of closure, and the care with which operations have been conducted in the past, among other factors. Rough estimates at individual plants vary from tens of millions to hundreds of millions in cost. There is a history of AROs being grossly underestimated at other decommissioning sites.[164] Future changes to environmental rules and regulations pose a considerable risk of increasing costs associated with coal-fired power plants.

2) **Does MEAN have responsibility for these costs as a part owner of some of these plants, or as a wholesale power provider?**

MEAN is responsible for its fractional share of the cost of operation, maintenance, termination, and decommissioning of Laramie River Station, Walter Scott Energy Center Unit 4, and Wygen Unit 1. Furthermore, MEAN is financially obligated for debts related to a corresponding proportion of its ownership in Whelan Energy Center unit 2.

3) **If MEAN is responsible for some of the costs, what mechanisms is it implementing to pay for them?**

MEAN pays for its financial obligations through the revenue it generates through its sale of wholesale electricity. There is no local, state, or federal authority that regulates MEAN's rate charges, and thus no real oversight of MEAN's financial decision making except perhaps by its bondholders. MEAN's rates are subject to review every year and can be adjusted for increased costs. If there are any big cost increases, there is a potential for big rate increases, unless there are funds held in reserve available to cover those costs. Long-Term Revenue Participants with Schedule M contracts, accounting for 89% of

[164] Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

revenue will certainly bear the weight of increases in costs related to retirement of coal-fired energy generation.

4) **Do coal plants in MEAN's energy portfolio have estimated closure dates and plans? If so, what are the anticipated time frames and when will these costs become due?**

Most of the coal-fired power plants for which MEAN has financial ownership obligations do not have defined timelines for closure and most state a 40 to 50-year life expectancy. This is questionable, in light of the economic realities facing coal plants in the region.

While many plants do have logistical plans for closure, they do not have expedient timelines. Timelines for closure and decommissioning are largely unknown, and largely out of MEAN's control since it is a minority interest holder in these plants. The decisions will be made by the majority owners, and if there is money due to retire the assets, MEAN will be responsible for associated costs. MEAN does not have control of decision making regarding when or how these plants are to be closed or decommissioned.

The level of cost of closure at these plants is dependent on uncertainties regarding environmental laws and regulations. It appears that some plant owners and operators are suing, lobbying, and employing all the means available to them to stall adoption and implementation of environmental regulations. Such regulations are made to protect the health and safety of humans, land, air, and water, but will require preparedness from plant owners and operators. MEAN is owned by public entities. Responsible public representatives are required to ensure that MEAN is doing their due diligence where required.

In January 2020 MEAN announced plans to transition its energy sources to carbon-neutral by 2050. More will be known when MEAN releases their next Integrated Resource Portfolio in 2022, but due to contract obligations MEAN will not officially pay off its current coal debts until 2041.

In conclusion, it is very hard to give precise answers, at least in part because uncertainties have led plant operators to avoid dealing with the difficult realities of estimating costs for dismantling a coal-fired power plant. Emphasizing, or even helping to create uncertainties has become an excuse for ignoring financial preparation for future responsibilities.

Key factors for future consideration include:

1. It does not seem likely that most of the coal plants in MEAN's portfolio will actually operate for decades into the future. But realistic analysis of how long these plants may operate is very hard to find in the public domain.

2. Since MEAN is a minority owner in the plants of which they are invested, the decisions as to when and how to close and decommission are not MEAN's to make. The other owners can decide to close when they want to; MEAN has no effective control over when closure occurs and how much it will cost.

3. The decisions regarding how long these plants will continue to operate, and thus when the bills will come due for closure costs, are in the hands of other owners and operators and not in the hands of MEAN. The bills could become due quickly and with little warning.

4. MEAN has no published estimates of the costs that will be associated with the closure of these plants, though there is reason to believe that closure will be costly.

5. It is not clear whether MEAN has created any adequate reserve for decommissioning costs, so if they are incurred earlier than anticipated, MEAN could be faced with large unexpected costs.

RECOMMENDATIONS

Recommendations for MEAN member communities:

- Demand that MEAN be more transparent about costs of coal-fired power plant closures. Require an analysis of the financial risks posed by early coal plant closure.

- Ask for MEAN to commit that it is not supporting litigation or lobbying to weaken environmental standards.

- Emphasize to MEAN that the state of Colorado and its communities are committed to transitioning to renewable energy and that the current Integrated Resource Plan does not reflect that goal.

- Work to inform community members about the unique electric utility system that is currently in place.

Recommendations for MEAN:

- Work to identify potential cost of coal plant closures, instead of using pending litigation as an excuse for failing to confront this issue.

- MEAN has power purchase agreements with coal facilities that are set to expire within the next decade (NPPD's Gerald Gentleman Station, Neil Simpson Unit 2, and Wygen Unit 3). MEAN should look to invest in renewable energy sources rather than extend existing contracts.

- MEAN and Tri-State Generation and Transmission operate in similar Colorado territories, Tri-State has recently announced renewable energy commitments, and must now add to their renewable energy portfolio. There is a potential partnership opportunity for Colorado communities, MEAN and Tri-State to work together to tap into Colorado's renewable resources and create a more localized grid for rural communities.

- The State of Colorado has recognized the financial burden facing energy providers in closing coal-fired power plants and has recently created a fund to help with costs for facilities' closures within the state. If MEAN were proactive in addressing this issue, the state government could be a potential ally in helping MEAN transition away from coal energy.

- In 2019, Colorado passed House Bill 19-1261, a Climate Action Plan which is aggressively seeking to mitigate carbon emissions for the state. Under Colorado's Revised Statute Section§ 25-7-105, the Colorado Air Quality Control Commission may seek support for statewide greenhouse gas abatement from outside jurisdictions.[165] This shows Colorado's readiness to work with an external entity, like MEAN to responsibly transition coal-fired assets to renewable infrastructure.

Recommendations for Local and State Policy Makers:

- As Colorado continues its transition to renewable energy, it is important to restate that while some municipal utilities are exempt from current regulation, their preparation for coal-fired power plant closures should not be overlooked in the renewable energy transition.

- The majority of communities served by MEAN face challenges of limited capacity to handle the complexities of transitioning to renewable energy. While increased regulation would be met with push back, there is a need for state administration to work with municipal utilities to ensure that they are doing their part to mitigate greenhouse gas emissions by transitioning to renewable energy in a manageable way.

- MEAN serves reliable energy at inexpensive rates to 14 Colorado communities. Some of these communities are home to less than 3,000 residents. Do not allow the attendant costs of MEAN's additional financial planning be a cost incurred by these Colorado communities.

[165] C.R.S. § 25-7-105(1)(e)(V). https://leg.colorado.gov/sites/default/files/images/olls/crs2017-title-25.pdf

MEAN OWNERSHIP PLANT PROFILES

Laramie River Station

MAJORITY OWNER/OPERATOR: Missouri Basin Power Project/Basin Electric Power Cooperative
LOCATION: Wheatland, Wyoming
START DATE: Unit 1 began operating in 1980; Unit 2 began operating in 1981; Unit 3 began operating in 1982
OUTPUT: 1710 MW
MEAN OWNERSHIP: 1.67%

Image 8. Laramie River Station.[166]

The Laramie River Station is one of the largest consumer-operated, regional, joint power supply ventures in the United States. The power plant serves two separate electrical grids, with Unit 1 connected to the Eastern Interconnection, while Unit 2 and Unit 3 are connected to the Western Interconnection. Missouri Basin Municipal Power Agency, Tri-State Generation & Transmission and Lincoln Electric System are among the owners of the station, responsible for 49%, 36% and 31% respectively. MEAN has a total interest of 1.67% in LRS and receives 28 MW of energy capacity from the facility.[167]

The Laramie River Station has three surface impoundments, one landfill, and two emergency holding ponds. In total the coal combustion residual holding facility at Laramie River Station has an approximate footprint of 336.61 surface acres.[168]

In 2018, the Sierra Club filed a lawsuit against the Laramie River Station (LRS) over its failure to follow federal guidelines in its emergency plans in the event of coal ash pond spills. The West Emergency Holding Pond has been listed for significant contamination

[166] Burns & McDonnell. https://www.burnsmcd.com/projects/laramie-river-station-overfire-air
[167] MEAN IRP. (2017), page 85.
[168] Basin Electric Power Cooperative CCR Rule Compliance Data and Information. Landfill, surface impoundments, and emergency holding closure plans. 2016.

under the federal coal ash rule compliance standards, and *remains unlined*, meaning future remediation efforts will, under any responsible scenario, require very significant decommissioning funds.

After reviewing the operator's 2019 financial report, Basin Electric has established a fund for asset retirement, for all 12 fossil fuel burning assets and three renewable assets, that currently has $35,454,000 allocated to Asset Retirement Obligations.[169], [170] While the formation of a fund for asset retirement shows the operator is preparing for future plant closures, current cost estimates could be underestimated due to future developments in requirements for plant closures. The reports also noted that Basin Electric has had to reduce the workforce at LRS and was facing challenges to adequately operate the technical environmental equipment on site.

Basin Electric currently has closure plans but no published, planned closure date for the LRS.[171, 172]

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[169] Facilities—Basin Electric Power Cooperative. (n.d.). Retrieved May 13, 2020, from https://www.basinelectric.com/facilities

[170] Dockendorf, J., & Krasnoff, A. (2019). Annual Report—Basin Electric Power Cooperative. Deloitte and Touche. https://www.basinelectric.com/news-center/publications/annual-report; page 37

[171] Basin Electric Power Cooperative CCR Rule Compliance Data and Information (2016). Landfill, surface impoundments, and emergency holding closure plans.

[172] Earth Justice reports that the population of low-income residents within three miles of the Laramie River station is above Wyoming's state average. Meaning, the air and water pollution from the LRS is being felt by Wyoming's lower income residents as a matter of environmental injustice. It is not unusual for a power plant to be located in lower income areas and have an above average number of People of Color living nearby.

Walter Scott Energy Center Unit 4

MAJORITY OWNER/OPERATOR: MidAmerican Energy Company
LOCATION: Council Bluffs, Iowa
START DATE: 2007
OUTPUT: 818 MW
MEAN OWNERSHIP: 6.92%

MEAN entered into a Joint Ownership Agreement with MidAmerican Energy Company and other entities to construct, own, and operate the Walter Scott Energy Center unit 4. This plant is fueled by low sulfur coal and MEAN receives 56 MW of power from the facility.[173]

Image 9. Walter Scott Energy Center.[174]

Unit 4 of the Walter Scott Energy Center doubled plant capacity, and in 2007 won Power Magazine's Plant of the Year award because of its supercritical coal-firing technology, increasing efficiency and lowering CO_2 emissions. That same year, MidAmerican Energy paid $27,500 in fines after the attorney general's office filed a lawsuit claiming the company was operating the plant without proper permits from the Iowa Department of Natural Resources. In 2009, Sue Sturgis of the Institute of Southern Studies published a list of the 100 most polluting coal plants in the United States based on coal combusting waste (CCW), stored in surface impoundments. Walter Scott Energy Center was ranked 35th.

The Walter Scott Energy Center has three CCR holding areas, one landfill and two surface impoundments. Both surface impoundments are currently in the closure process and should be completed by 2024.[175] The Landfill does not have a planned date of closure, and totals approximately 198 acres.[176]

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[173] MEAN IRP. (2017), page 84.

[174] Corn Belt Power Cooperative. http://www.cbpower.coop/aspx/News.aspx?NewsID=1626

[175] Burns & McDonnell Engineering Company, Inc. (2020). Closure Plan for the North & South CCR Surface Impoundments. https://www.brkenergy.com/ccr/assets/pdf/mec/WSEC/North_surface_impoundment/Closure_post-closure_care/ClosurePlan/Closure%20Plan_WSEC.

[176] See Note 174 above.

Whelan Energy Center Unit 2

MAJORITY OWNER/OPERATOR: Public Power Generation Agency
LOCATION: Hastings, Nebraska
START DATE: 2011
OUTPUT: 220 MW
MEAN OWNERSHIP: 36.36%

MEAN is a participant in the Public Power Generation Agency, a Nebraska corporation of local communities created for the purpose of owning, financing, acquiring, constructing and operating the Whelan Energy Center Unit 2. The unit became operational in 2011 and was built with pollution control equipment and water treatment facilities.[177]

Image 10. Whelan Energy Center.[178]

MEAN owns a 36.36% Entitlement Share of the Whelan Energy Center Unit 2 and receives 80mw of output. MEAN's participant agreement with PPGA makes them responsible for a corresponding percentage of costs of owning and operating WEC2, including outstanding debts. MEAN is responsible for these debts whether the facility is running or not.

The WEC2 Temporary Ash Disposal Area is approximately 23.2 surface acres and has been reported for significant groundwater contamination under the federal coal ash rule compliance standards. As a temporary and unlined disposal area, the coal ash is transported off-site for "beneficial use" and the plan is to have no CCR remaining on site.[179]

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[177] MEAN IRP. (2017), page 83.

[178] Miron Construction. [Digital Image]. https://miron-construction.com/project/whelan-energy-center-unit-2-superstructures/

[179] Calub, L. (2016). Closure Plan: WEC Temporary Ash Disposal Area. https://hut.ideabankweb.com/assets/site/utl/documents/WEC%20Temporary%20Ash%20Disposal%20Area_Closure%20Plan2016_Amended11-3-2016.pdf

Wygen Unit 1

MAJORITY OWNER/OPERATOR: Black Hills Corporation
LOCATION: Gillette, Wy
START DATE: Unit 1: 2003
OUTPUT: Unit 1: 85 MW
MEAN OWNERSHIP: 23.5%

Mean acquired a 23.5% interest in Wygen Unit 1 in 2009 for approximately 20 MW of energy.[180] Wygen Unit 1 is located in Gillette, WY and is operated by Black Hills Corporation. The Wygen unit is collocated with a coal mine and is therefore known as a "mine mouth plant". The mine is operated by Black Hills and supplies the power plant with coal.

Image 11. Wygen Power Plant.[181]

The Wygen facilities do not have any CCR impoundments and instead backfill the coal mine with its CCR waste. This is a process that is not frequently approved and therefore should be subject to strict technical scrutiny, especially in an atmosphere where the Governor of Wyoming is exerting maximum political pressure to keep coal mines open.[182] Black Hills says it has acquired the proper permits to use CCR waste as mine backfill.

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[180] MEAN IRP. (2017), page 85.

[181] Black Hills Energy Corp. 2010. [Digital Image] https://www.blackhillscorp.com/learn-about-energy/electricity/generation-production

[182] Erickson, C. (2020, July 8). Wyoming governor pushes lawsuit against Washington over coal terminal. Casper Star-Tribune Online. https://trib.com/business/energy/wyoming-governor-pushes-lawsuit-against-washington-over-coal-terminal/article_7dbfa249-5711-5d13-bd68-4f23d69564a8.html

Neil Simpson Generating Station and Wygen Unit 3

MAJORITY OWNER/OPERATOR: Black Hill Corporation
LOCATION: Gillette, WY
START DATE: 1995
OUTPUT: 80 MW
MEAN OWNERSHIP: 0%

MEAN entered into a Power Purchase Agreement with Black Hills Power in 2010. MEAN's agreement with Black Hills supplies MEAN with 15 MW of energy capacity as of 2020.

Image 12. Neil Simpson Generating Station[184]

The agreement lasts through 2023 and will see decreased supply to MEAN of 12 MW from 2020-2022 and 10 MW from 2022-2023 when the contract reaches maturity.[183] This agreement has been revised to last until 5/31/2028, with an early termination option in 2023.[185]

The Neil Simpson Generating Station and Wygen Unit 3 are owned and operated by the Black Hills Corporation and located at facilities adjacent to the Wygen Units. CCR waste is backfilled into the coal mine that is located on site.

[183] MEAN IRP. (2017), page 86.
[184] MEAN IRP. (2017), page 86.
[185] MEAN Long-term Power Supply Resources as of March 31, 2019.

Louisa Generating Station

MAJORITY OWNER/OPERATOR: MidAmerican Energy
LOCATION: Muscatine, Iowa
START DATE: 1983
OUTPUT: 738 MW
MEAN OWNERSHIP: 0%

MidAmerican Energy, which is a subsidiary of Berkshire Hathaway, owns the Louisa Generating Station. CCR waste is held onsite in impoundments and it should be noted that in 2009 the Institute of Southern Studies ranked the 100 most polluting coal-fired power plants and the Louisa Generating Station was ranked 71.

Image 13. Louisa Generating Station

Louisa Generating Station has one unlined CCR surface impoundment and two landfills, one of which they operate and the other operated by a third party.[186] In total, CCR holdings are approximately 95.5 surface acres.[187] In the 2016 surface impoundment closure plan it was noted it might be closed sooner than expected due to the fact of changing regulation regarding unlined impoundments.[188]

[186] Burns & McDonnell Engineering Company, Inc. (2016). Closure Plan Louisa Generating Station CCR Monofill. https://www.brkenergy.com/ccr/assets/pdf/mec/LGS/West_Landfill/Closure_and_post-closure_care/Closure_plan/LGS_Monofill_Closure%20Plan_Final.pdf
[187] See Note 185 above.
[188] See Note 185 above.

Gerald Gentleman Station 1 & 2

MAJORITY OWNER/OPERATOR: Nebraska Public Power District
LOCATION: Sutherland, Nebraska
START DATE: Unit 1: 1979; Unit 2: 1982
OUTPUT: Unit 1: 681 MW; Unit 2:681 MW
MEAN OWNERSHIP: 0%

MEAN entered into a Multi-Unit Participation Agreement with NPPD in 2011 to receive 50 MW of energy from the facilities. 24 MW are received from coal fired power plants while the remaining 26 MW are received from the Cooper Nuclear Station. This agreement is effective through 2023 at which time MEAN can terminate its contract. [189]

Image 14. Gerald Gentleman Station

The Gerald Gentleman Station has four coal ash landfills and one, closed bottom ash storage area. The historic liner design varies across the landfills. The CCR closure plan estimates that the maximum size of closure needed will be approximately 33 surface acres. The same report estimates the life of the facility as of 2014 is 72 years, with expected closure in 2086.[190]

[189] MEAN IRP. (2017), page 84

[190] Golder Associates Inc. (2016). CLOSURE AND POST-CLOSURE PLAN FOR GERALD GENTLEMAN STATION. https://assets.website-files.com/5a26c42ac0c9b00001479372/5bbe14b79a09dc937119c241_GGSClosurePlan.pdf

BIBLIOGRAPHY

AECOM, & Duke Energy. (2019). DUKE ENERGY MAYO STEAM ELECTRIC PLANT COAL COMBUSTION RESIDUALS SURFACE IMPOUNDMENT CLOSURE PLAN. https://files.nc.gov/ncdeq/Coal%20Ash/2020-closure/Mayo-CBE---Closure-Plan.pdf

Ashtracker.org. (2019, July 19). Ashtracker | Site ⟶ 472. Ashtracker. http://ashtracker.org

Basin Electric Power Cooperative. (2016). Coal Combustion Residual, Surface Impoundment Liner Documentation. https://www.basinelectric.com/environment/coal-combustion-residuals-ccr-rule-compliance-data-and-information/bottom-ash-surface

Before the Public Utilities Commission of The State of Colorado: RE: In The Matter Of Advice Letter No. 1672-Electric Filed By Public Service Company Of Colorado To Revise Its Colorado Puc No. 7-Electric Tariff To Implement A General Rate Schedule Adjustment And Other Rate Changes Effective. (Testimony of Jeffrey T. Kopp. (p. 128). Retrieved from https://www.xcelenergy.com/staticfiles/xe/Marketing/Files/CO-Regulatory-Direct-T-A-Kopp.pdf

Black Hills Corporation. (2018, April 23). Environmental Responsibility. Black Hills Corporation. https://www.blackhillscorp.com/about-black-hills-corporation/corporate-responsibility-report/environmental-responsibility

Blunt, K. (2019). Utilities Speed Up Closure of Coal-Fired Power Plants: Wind, solar and natural gas become more cost-competitive, driving shift to new energy sources. The Wall Street Journal. https://www.wsj.com/articles/utilities-speed-up-closure-of-coal-fired-power-plants-11547035201

Bruggers, J. (2016, August 8). LG&E/KU to pass cleanup costs to customers. https://www.courier-journal.com/story/tech/science/environment/2016/08/08/lgeku-pass-cleanup-costs-customers/88407408/

Bureau of Land Management. (n.d.). Solar Energy. [Photograph]. https://www.blm.gov/programs/energy-and-minerals/renewable-energy/solar-energy

Burns & McDonnell Engineering Company, Inc. (2016a). Closure Plan Louisa Generating Station CCR Monofill.

https://www.brkenergy.com/ccr/assets/pdf/mec/LGS/West_Landfill/Closure_and_post-closure_care/Closure_plan/LGS_Monofill_Closure%20Plan_Final.pdf

Burns & McDonnell Engineering Company, Inc. (2016b). Summary of Liner Construction for the Louisa Generating Station CCR Impoundment. https://www.brkenergy.com/ccr/assets/pdf/mec/LGS/Surface_Impoundment/Design_criteria/Documentation_of_liner_type/LGS_Impoundment_Liner%20Construction_Final.pdf

Burns & McDonnell Engineering Company, Inc. (2016c). Summary of Liner Construction for Walter Scott, Jr. Energy Center South CCR Impoundment. https://www.brkenergy.com/ccr/assets/pdf/mec/WSEC/South_surface_impoundment/Design_criteria/Documentation_of_liner_type/WSEC_SSI_Liner%20Construction.pdf

Burns & McDonnell Engineering Company, Inc. (2018). Summary of Liner Construction for Walter Scott, Jr. Energy Center North CCR Impoundment. https://www.brkenergy.com/ccr/assets/pdf/mec/WSEC/North_surface_impoundment/Design_Criteria/Doc_Of_LinerType/LinerConstruction_WSEC.pdf

Burns & McDonnell Engineering Company, Inc. (2020). Closure Plan for the North & South CCR Surface Impoundments. https://www.brkenergy.com/ccr/assets/pdf/mec/WSEC/North_surface_impoundment/Closure_post-closure_care/ClosurePlan/Closure%20Plan_WSEC.pdf

Bursch, F., Jarosh, V., Danielson, L., Edberg, H., & Calvano, V. (2019). A RENEWABLE ENERGY FUTURE FOR COLORADO COMMUNITIES SERVED BY THE MUNICIPAL ENERGY AGENCY OF NEBRASKA, Vol. 1. Sustainable Development Strategies Group. https://static1.squarespace.com/static/5bb24d3c9b8fe8421e87bbb6/t/5c58ec1c652deafb6bd84559/1549331496906/19+02+04+Final+Report+VOL+1.pdf

Bursch, F., Jarosh, V., Danielson, L., Edberg, H., & Calvano, V. (2019). A RENEWABLE ENERGY FUTURE FOR COLORADO COMMUNITIES SERVED BY THE MUNICIPAL ENERGY AGENCY OF NEBRASK, Vol. 2. Sustainable Development Strategies Group. https://static1.squarespace.com/static/5bb24d3c9b8fe8421e87bbb6/t/5c9011f04e17b6661a2aa0ec/1552945657666/19+03+18+Volume+II.pdf

Calub, L. (2016). Closure Plan: WEC Temporary Ash Disposal Area. https://hut.ideabankweb.com/assets/site/utl/documents/WEC%20Temporary%20Ash%20Disposal%20Area_Closure%20Plan2016_Amended11-3-2016.pdf

Clean Water Fund. (2013). Coal Ash: Colorado's Toxic Trash Exposed. Clean Water fund. https://www.cleanwateraction.org/files/publications/Toxic%20Trash%20Exposed%20-%20Coal%20Ash%20in%20Colorado.pdf

Coady, D., Parry, I., Le, N.P., Shang, B. (2019). Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates. International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509

Colorado Constitution, Article V, Section 35 Retrieved from: http://leg.colorado.gov/sites/default/files/images/olls/crs2018-title-00.pdf

Colorado Constitution Amendment 37. (2004). Colorado Renewable Energy Requirement. https://www.colorado.gov/pacific/sites/default/files/04%20Amendment37fiscalimpact,0_1.pdf

Dewan, S. (2008, December 26). Tennessee Ash Flood Larger Than Initial Estimate. The New York Times. https://www.nytimes.com/2008/12/27/us/27sludge.html

Dockendorf, J., & Krasnoff, A. (2019). Annual Report—Basin Electric Power Cooperative. Deloitte and Touche. https://www.basinelectric.com/news-center/publications/annual-report

Duke University. (2016, June 10). Coal ash ponds found to leak toxic materials. https://phys.org/news/2016-06-coal-ash-ponds-leak-toxic.html

Earth Justice. (2019, March 4). Mapping the Coal Ash Contamination. Earthjustice. https://earthjustice.org/features/map-coal-ash-contaminated-sites

EELP Staff. (2018, April 24). Regional Haze Rule—Environmental & Energy Law Program. Harvard Law School. https://eelp.law.harvard.edu/2018/04/regional-haze-rule/

Ellsmoor, J. (2019, June 15). United States Spend Ten Times More On Fossil Fuel Subsidies Than Education. Forbes. https://www.forbes.com/sites/jamesellsmoor/2019/06/15/united-states-spend-ten-times-more-on-fossil-fuel-subsidies-than-education/

EIA. (2020). Short-Term Energy Outlook. U.S. Energy Information Administration (EIA). https://www.eia.gov/outlooks/steo/report/coal.php

Environmental Integrity Project. (2019). Coal's Poisonous Legacy Groundwater Contaminated by Coal Ash Across the U.S. http://www.environmentalintegrity.org/wp-content/uploads/2019/03/National-Coal-Ash-Report.pdf

Environmental Protection Agency. (2016). Coal Plant Decommissioning; Plant Decommissioning, Remediation and Redevelopment. https://www.epa.gov/sites/production/files/2016-06/documents/4783_plant_decommissioning_remediation_and_redevelopment_508.pdf

Environmental Protection Agency. (2018). Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Amendments to the National Facilities—Basin Electric Power Cooperative. (n.d.). Retrieved May 13, 2020, from https://www.basinelectric.com/facilities

Environmental Protection Agency. (2019). Proposed Revisions to the Coal Combustion Residuals Rule. Office of Land & Emergency Management. https://www.epa.gov/sites/production/files/2019-11/documents/ccr_one_pager_11.04.19.pdf

EPA (2014, December 11). Coal Ash Reuse [Other Policies and Guidance]. US EPA. https://www.epa.gov/coalash/coal-ash-reuse

EPA. (2014, December 11). Disposal of Coal Combustion Residuals from Electric Utilities Rulemakings [Other Policies and Guidance]. US EPA. https://www.epa.gov/coalash/coal-ash-rule

EPA. (2020, March 26). EPA Announces Enforcement Discretion Policy for COVID-19 Pandemic [Speeches, Testimony and Transcripts]. US EPA. https://www.epa.gov/newsreleases/epa-announces-enforcement-discretion-policy-covid-19-pandemic

EPA. (2019). Frequent Questions about Definitions and Implementing the Final Rule Regulating the Disposal of CCR. US Environmental Protection Agency. https://www.epa.gov/coalash/list-frequent-questions-about-implementing-final-rule-regulating-disposal-coal-combustion

EPA. (2018). Frequent Questions about the 2015 Coal Ash Disposal Rule | Coal Ash (Coal Combustion Residuals, or CCR) | US EPA. https://www.epa.gov/coalash/frequent-questions-about-2015-coal-ash-disposal-rule#20

Feaster, S. (2018.) Record Drop in U.S. Coal-Fired Capacity Likely in 2018: Utilities Are Accelerating Shutdown Dates, as Plants Grow Increasingly Uneconomic. Institute for Energy Economics and Financial Analysis. https://ieefa.org/wp-content/uploads/2018/10/Record-Drop-in-U.S.-Coal-Fired-Capacity-in-2018_October2018.pdf

Gaffney, A. (2018, December 17). Hundreds of Workers Who Cleaned Up the Country's Worst Coal Ash Spill Are Now Sick and Dying. NRDC. https://www.nrdc.org/stories/hundreds-workers-who-cleaned-countrys-worst-coal-ash-spill-are-now-sick-and-dying

Gimon, E., O'Boyle, M., Clack, C., McKee, S. (2019). The Coal Cost Crossover: Economic Viability of Existing Coal Compared to New Local Wind and Solar Resources. Energy Innovation Policy & Technology, LLC. https://energyinnovation.org/wp-content/uploads/2019/03/Coal-Cost-Crossover_Energy-Innovation_VCE_FINAL.pdf

Godby, R., Coupal, R. (2019) Potential Impacts to Wyoming of the Coal Transition (PowerPoint). Center for Energy Economics and Public Policy. . http://www.wyia.org/wp-content/uploads/2019/04/Godby_WIA-Spring-Meeting-3-28-2019.pdf

Golder Associates Inc. (2018). 2019 Annual Inspection Report Gerald Gentleman Station Ash Disposal Facility. https://docs.nppd.com/2019GGSAnnualInspectionReport.pdf

Golder Associates Inc. (2018). Bremo Power Station CCR Surface Impoundment: East Ash Pond. https://www.dominionenergy.com/library/domcom/media/community/environment/reports-performance/ccr-rule-compliance-data-and-information/bremo/bremo-east-closure-plan.pdf?la=en&modified=20180921191321

Golder Associates Inc. (2016). CLOSURE AND POST-CLOSURE PLAN FOR GERALD GENTLEMAN STATION. https://assets.website-files.com/5a26c42ac0c9b00001479372/5bbe14b79a09dc937119c241_GGSClosurePlan.pdf

Hanna, T. (2015). Community-Owned Energy: How Nebraska Became the Only State to Bring Everyone Power From a Public Grid. Yes Magazine. https://www.yesmagazine.org/economy/2015/01/30/nebraskas-community-owned-energy/

HDR, Inc. (2018, May 1). Notification of Assessment Monitoring Program per CCR Rule 257.94(e)(3) WEC Temporary Ash Disposal Area. https://www.cityofhastings.org/assets/site/coh/documents/doccentral/CCR-Assessment-Monitoring-Notification1525273723.pdf

Keisling, J. (2016). Filing of Recovery of Asset Retirement Obligations Docket No. ER17-____-000 (Legal Filing No. ER17-234). FERC.

Kovaleski, J. (2019, October 15). Xcel Energy plans to close 2 of its coal fired plants in Pueblo to make way for a greener future. KMGH. https://www.thedenverchannel.com/news/360/xcel-energy-plans-to-close-2-of-its-coal-fired-plants-in-pueblo-to-make-way-for-a-greener-future

Krauss, C. (2019, October 29). Murray Energy Is 8th Coal Company in a Year to Seek Bankruptcy. The New York Times. https://www.nytimes.com/2019/10/29/business/energy-environment/murray-energy-bankruptcy.html

Malley, E. (2016). Coal Power Plant Post-Retirement Options. Power Magazine. https://www.powermag.com/coal-power-plant-post-retirement-options/

McKim, C. (2018, February 7). Power Plant Facing Potential Lawsuit Over Coal Ash Pond Failure Plans | Wyoming Public Media. Wyoming Public Media. https://www.wyomingpublicmedia.org/post/power-plant-facing-potential-lawsuit-over-coal-ash-pond-failure-plans

MEAN. (2017). 2017 Integrated Resource Plan. NMPP Energy.

MEAN. (January 28, 2020) MEAN BOARD APPROVES RESOLUTION ON VISION FOR CARBON NEUTRALITY BY 2050. [Press Release] https://www.nmppenergy.org/mean/news/detail/210-mean-board-approves-resolution-on-vision-for-carbon-neutrality-by-2050

MEAN. (December 30, 2019) MEAN EXECUTIVE COMMITTEE APPROVES INCREASING CAP IN DISTRIBUTED GENERATION POLICY. [Press Release] https://www.nmppenergy.org/mean/news/detail/204-mean-executive-committee-approves-increasing-cap-in-distributed-generation-policy

Minimum Criteria (Phase One, Part One). https://www.federalregister.gov/documents/2018/07/30/2018-16262/hazardous-and-solid-waste-management-system-disposal-of-coal-combustion-residuals-from-electric

Money, J. (2019) Environmentalists describe proposed coal ash rule changes as "dangerous." The Oklahoman. https://oklahoman.com/article/5646100/environmentalists-describe-proposed-coal-ash-rule-changes-as-dangerous

Morehouse, C. (2020). Duke agrees to largest coal ash cleanup in US after years of fighting with environmentalists. Utility Dive. https://www.utilitydive.com/news/duke-agrees-to-largest-coal-ash-clean-up-in-us-after-years-of-fighting-with/569699/

Morehouse, C. (2020). "EPA gives power plants, regulated entities pollution compliance flexibility, citing COVID-19 concerns". Utility Drive. https://www.utilitydive.com/news/epa-gives-power-plants-regulated-entities-pollution-compliance-flexibility/575103/

Morford, S. (2009). EPA Study Finds Dangers in Coal Ash Ponds Nationwide. Inside Climate News. website: http://insideclimatenews.org/blog/20090901/epa-study-finds-dangers-coal-ash-ponds-nationwide

Municipal Energy Agency of Nebraska. (2019) 2018 & 2019 Independent Auditor's Report and Financial Statements. https://d1xqi1ehexn61z.cloudfront.net/23ce-01957567-MEAN%20Audited%20Financials%202019.PDF?versionId=GH2gflUML0v7RavfitItQfx6FQ1erllh

Municipal Energy Agency of Nebraska. (2016). Power Supply System Refunding Revenue Bonds 2016 Series A. https://drbgoik4mgcaw.cloudfront.net/0834-34965757-MEAN%202016A%20OS%20as%20posted%200n%20MuniOS.pdf?versionId=V19umyfp3HLN5pjjJRT.DBgicWWsQqIf

National Research Council. 2006. Managing Coal Combustion Residues in Mines. Washington, DC: The National Academies Press. https://doi.org/10.17226/11592.

Nilsson, R. K., & Addison, N. W. (2016). Closure Plan for CCR Surface Impoundments Clover Power Station Clover, Virginia (p. 14). https://www.dominionenergy.com/library/domcom/media/community/environment/reports-performance/ccr-rule-compliance-data-and-information/clover/sed-basins-closure-plan.pdf?la=en&modified=20180824170602

NMPP Energy. Municipal Energy Agency Of Nebraska: 2017 Integrated Resource Plan. (2017). https://www.wapa.gov/EnergyServices/Documents/MEAN2017.pdf

O'Boyle, M. (2019). Utilities Running Uneconomic Coal Plants Cost Consumers $3.5 Billion From 2015-2017. Forbes. https://www.forbes.com/sites/energyinnovation/2019/12/03/utilities-running-uneconomic-coal-plants-cost-consumers-35-billion-from-2015-2017/#61efa237342d

Olalde, M., Yerardi, J. (2019). While 'zombie" mines idle, cleanup and workers Suffer in Limbo. High Country News. https://www.hcn.org/issues/51.20/mining-while-zombie-mines-idle-cleanup-and-workers-suffer-in-limbo

Park, J. H., Edraki, M., Mulligan, D., & Jang, H. S. (2014). The application of coal combustion by-products in mine site rehabilitation. Journal of Cleaner Production, 84, 761–772.

Power Supply Committee. (2019). 'Item 3: RENEWABLE DISTRIBUTED GENERATION POLICY CAP'. In Minutes of Power Supply Committee meeting on 20 November 2019. Municipal Energy Agency of Nebraska: Younes Conference Center – Kearney, Nebraska.

Raimi, D. (2017). Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future. https://www.rff.org/publications/reports/decommissioning-us-power-plants-decisions-costs-and-key-issues/

Randazzo, R. (2017). Owners to vote on fate of Navajo coal plant. AZ Central. https://www.azcentral.com/story/money/business/energy/2017/02/07/arizona-navajo-generating-station-coal-plant-fate/97608058/

Richardson, H. (2019, April 29). Wyoming governor criticizes consideration of coal plant closures in state | Energy Journal | trib.com. Casper Star Tribune. https://trib.com/business/energy/wyoming-governor-criticizes-consideration-of-coal-plant-closures-in-state/article_e6a736f0-2e58-5d41-95ff-e0d20d4ed953.html

Romero, Dennis. (2018, July 18). Trump's EPA rolls back Obama-era coal ash regulations. https://www.nbcnews.com/news/us-news/trump-s-epa-rolls-back-obama-era-coal-ash-regulations-n892586

Russ, A., Bernhardt, C., Evans, L. (2019). Coal's Poisonous Legacy: Groundwater Contaminated by Coal Ash Across the U.S. Environmental Integrity Project. http://www.environmentalintegrity.org/wp-content/uploads/2019/04/National-Coal-Ash-Report-4.30.2019.pdf

Seidler, M., & Malloy, K. (2020). A COMPREHENSIVE SURVEY OF COAL ASH LAW AND COMMERCIALIZATION: Its Environmental Risks, Disposal Regulation, and Beneficial Use Markets. National Association of Regulatory Utility Commissioners. https://pubs.naruc.org/pub/A6923B2D-155D-0A36-31AA-045B741819EC

Shaikh, S. (2020, June 26). Colorado Springs Utilities Sets Early Closure Date for Coal Plants. Sierra Club. https://www.sierraclub.org/press-releases/2020/06/colorado-springs-utilities-sets-early-closure-date-for-coal-plants

Shu, C. 2020. "EPA relaxes enforcement of environmental law during the Covid-19 outbreak". Tech Church. https://techcrunch.com/2020/03/26/epa-relaxes-enforcement-of-environmental-laws-during-the-covid-19-outbreak/

Surface Mining Control and Reclamation Act of 1977. Public Law 95-87. https://www.osmre.gov/lrg/docs/SMCRA.pdf

Staff Report. (2019, September 20). Tri-State officially closes Nucla coal-fired plant. Montrose Daily Press. https://www.montrosepress.com/news/tri-state-officially-closes-nucla-coal-fired-plant/article_ee246956-dc24-11e9-b986-d32aaac8cb04.html

Storrow, B. (2019, August 16). And Now the Really Big Coal Plants Begin to Close. Scientific American. https://www.scientificamerican.com/article/and-now-the-really-big-coal-plants-begin-to-close/

Sustainable Development Strategies Group. (2019). A Renewable Energy Future for Colorado Communities Served by MEAN. SDSG. https://www.sdsg.org/mean-study

Tchounwou, P. B., Yedjou, C. G., Patlolla, A. K., & Sutton, D. J. (2012). Heavy Metals Toxicity and the Environment. EXS, 101, 133–164.

Tri-State Generation and Transmission. (2020, July 8). Craig Station Unit 2 owners announce retirement date of Sept. 30, 2028 | Tri-State Generation and Transmission Association, Inc. [Press Release] https://tristate.coop/craig-station-unit-2-owners-announce-retirement-date-sept-30-2028

Tri-State Generation and Transmission Association. (January 9, 2020). Tri-State announces retirement of all coal generation in Colorado and New Mexico. [Press Release] https://tristate.coop/tri-state-announces-retirement-all-coal-generation-colorado-and-new-mexico

Union of Concerned Scientists. (2014, August 7). How it Works: Water for Coal. https://www.ucsusa.org/resources/water-coal

Woodruff, C. (Photographer). (2019). [Digital Image]. WestWord. https://www.westword.com/news/colorado-has-some-very-specific-new-climate-energy-goals-11400794

Wyoming Governor Mark Gordon Criticizes Consideration of Coal Plant Closures in State, Mining Connection (Apr. 30, 2019); https://miningconnection.com/longwall/news/article/wyoming_governor_mark_gordon_criticizes_consideration_of_coal_plant_closure/

Xcel Energy Inc. (2019). Colorado Energy Plan: Advancing Affordable Clean Energy: Information Sheet. https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Resource%20Plans/CO-Energy-Plan-Fact-Sheet.pdf