OpenMinds

NextGen Coal-to-X Project

CenterPoint Energy

NextGen Coal-to-X transition team

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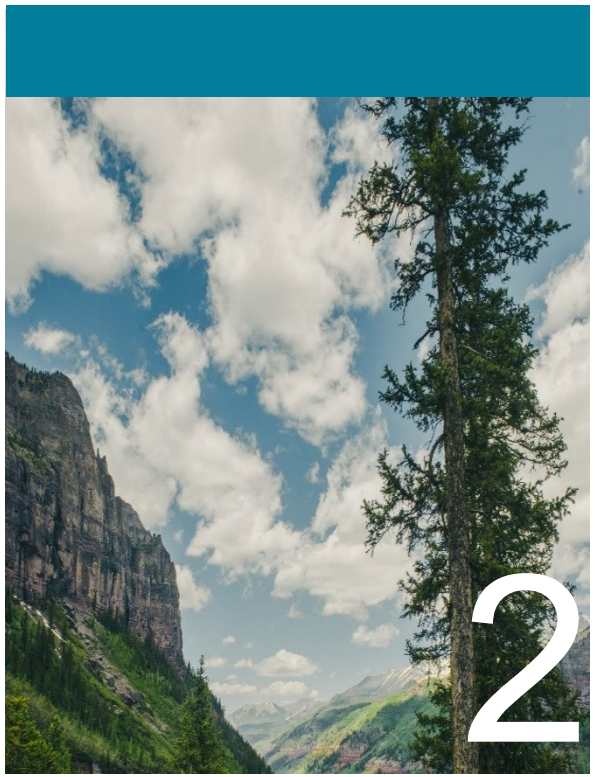
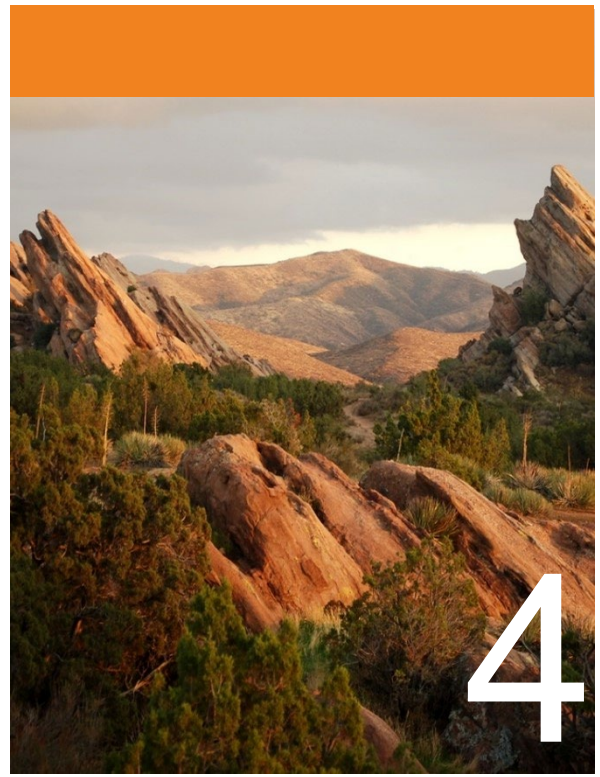
The Coal Dilemma



Framework for Action

Tipping the Scale



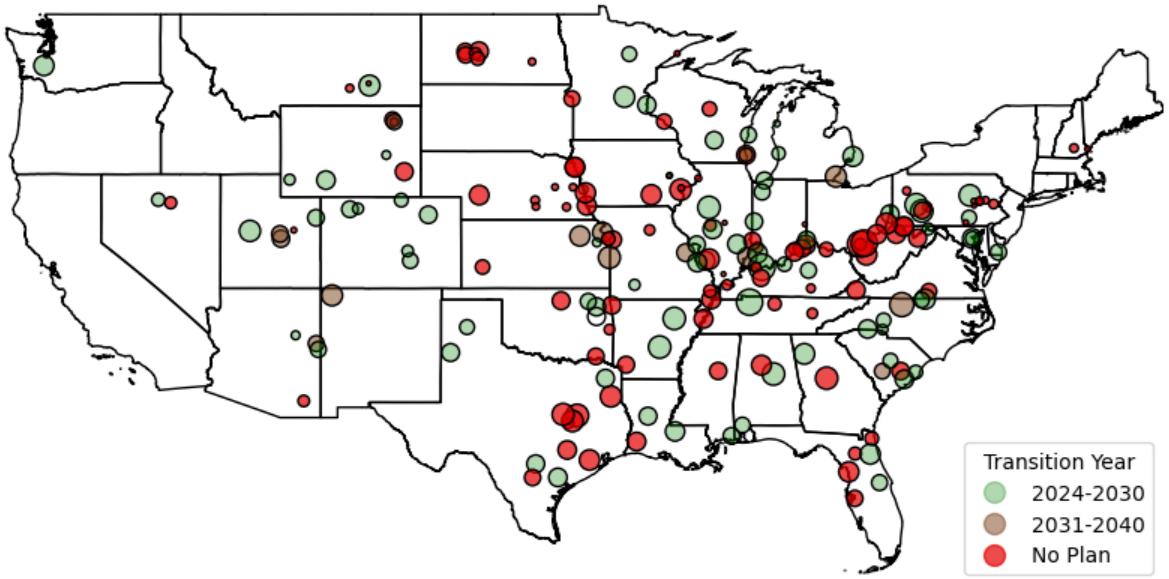
Sustaining Impacts

1

While we have transitioned many, 48GW of coal plants remain with no transition plan or significant risk of delay

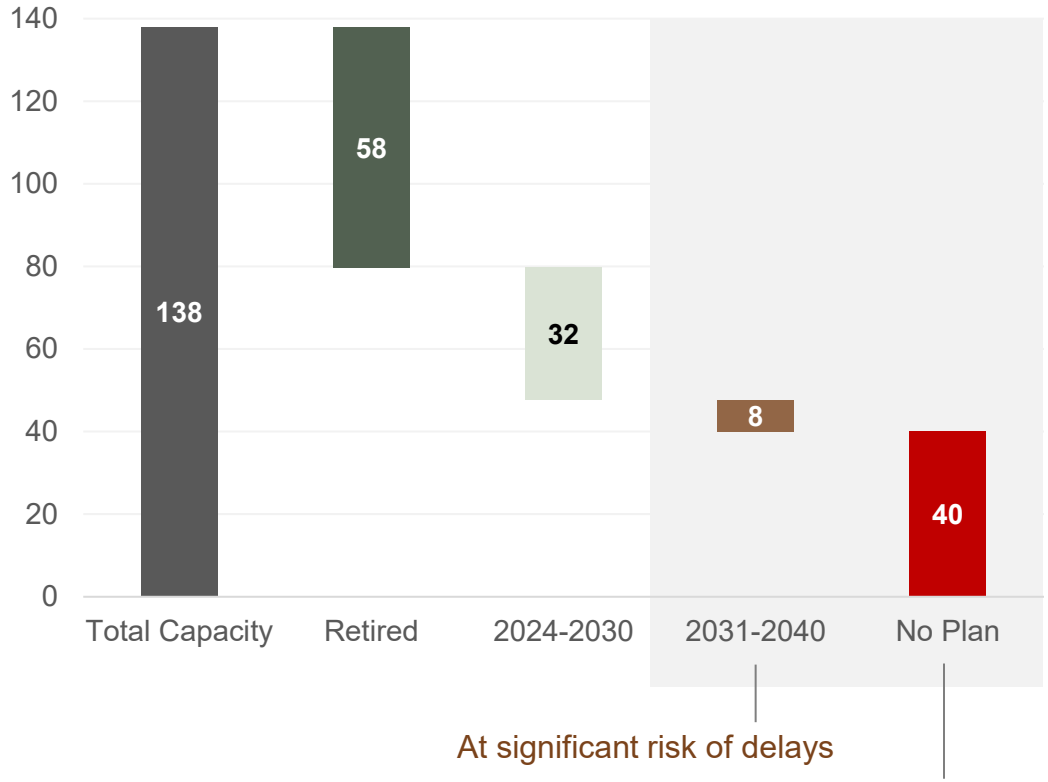
US coal plant locations, current operation

CO2 emission levels (million tons/year)



US coal plant transition progress

Installed capacity (GW)



Source: Global Energy Monitor Global Coal Plant Tracker (Jan 2024)

1

Sluggish coal transition despite decades of efforts can be attributed to three main barriers

Barriers

Coal-to-x transition is difficult because…

Policy & Regulations

> Under **regulatory turmoil** such as state public utilities commissions' negligence and blocked EPA rule requiring major carbon cuts from coal and gas plants, **utilities abandon its climate goals** and extend the operation of its coal plants.

Financial & Governance

> PE firms and independent power producers (IPPs) profit from coal plants despite declining demand, **leveraging market incentives and capacity payments** that keep coal plants viable even when uneconomical.

Grid & Market Operations

> Citing concerns over **grid reliability** and infeasibility to meet **transition deadlines** in affordable way, grid balancing authorities reject replacing coal plants with other technologies such as battery storages.

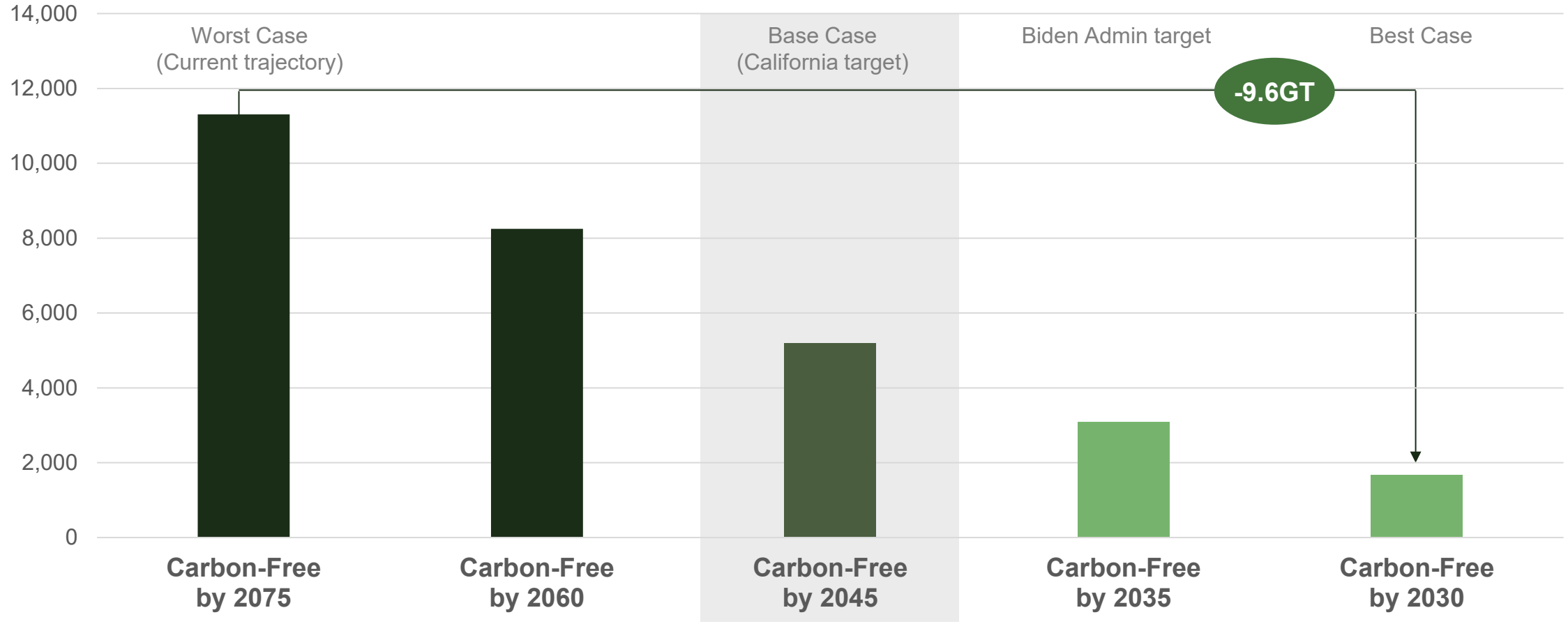
Source: Reuters, CBS, EnergyWire, Dallas News, Utility Dive

1

The US can avoid 9.6 GT CO2e from coal plants between the best-case and the worst-case coal transition scenarios

Comparative emission impact from coal plants

Cumulative CO2e (million metric ton)



Source: Global Energy Monitor Global Coal Plant Tracker (Jan 2024)

2 Capturing the emissions reduction potential from coal transition requires prioritizing based on feasibility and impact

Step	Criteria
1. Filter-out low impact plants	• **Transition before 2030:** retirement process likely ongoing, difficult to revert. • **Low capacity factor:** does not emit high CO2e on a per-MW basis, less climate threat.
2.1. Score feasibility of coal transition	• **Proximity to major gas lines:** conversion to gas plant most feasible for coal transition, therefore nearby gas infrastructure is necessary. • **Plant efficiency:** weak operational economics means higher chance of coal transition. • **State favorability:** existing clean energy policies are easier to keep, and enacting new ones are difficult in the current political environment. • **Criticality of load service:** high load growth forecast hampers coal transition plans. • **Ownership structure:** fewer owners easier to make coal transition decision.
2.2. Score climate impact/ benefits	• **Retirement year:** later retirement year leads to higher impact (avoided emissions). • **Annualized & unit emissions:** higher coal plant emissions means higher impact. • **Control equipment:** absence of pollutant control equipment means higher impact.

2 Assessment on feasibility of coal-transition and long-term climate impacts identified 25 utility-owned priority coal plants

1. Filter-out low impact plants

80 GW
Current coal fleet in the US

32 GW
Transitioning before 2030

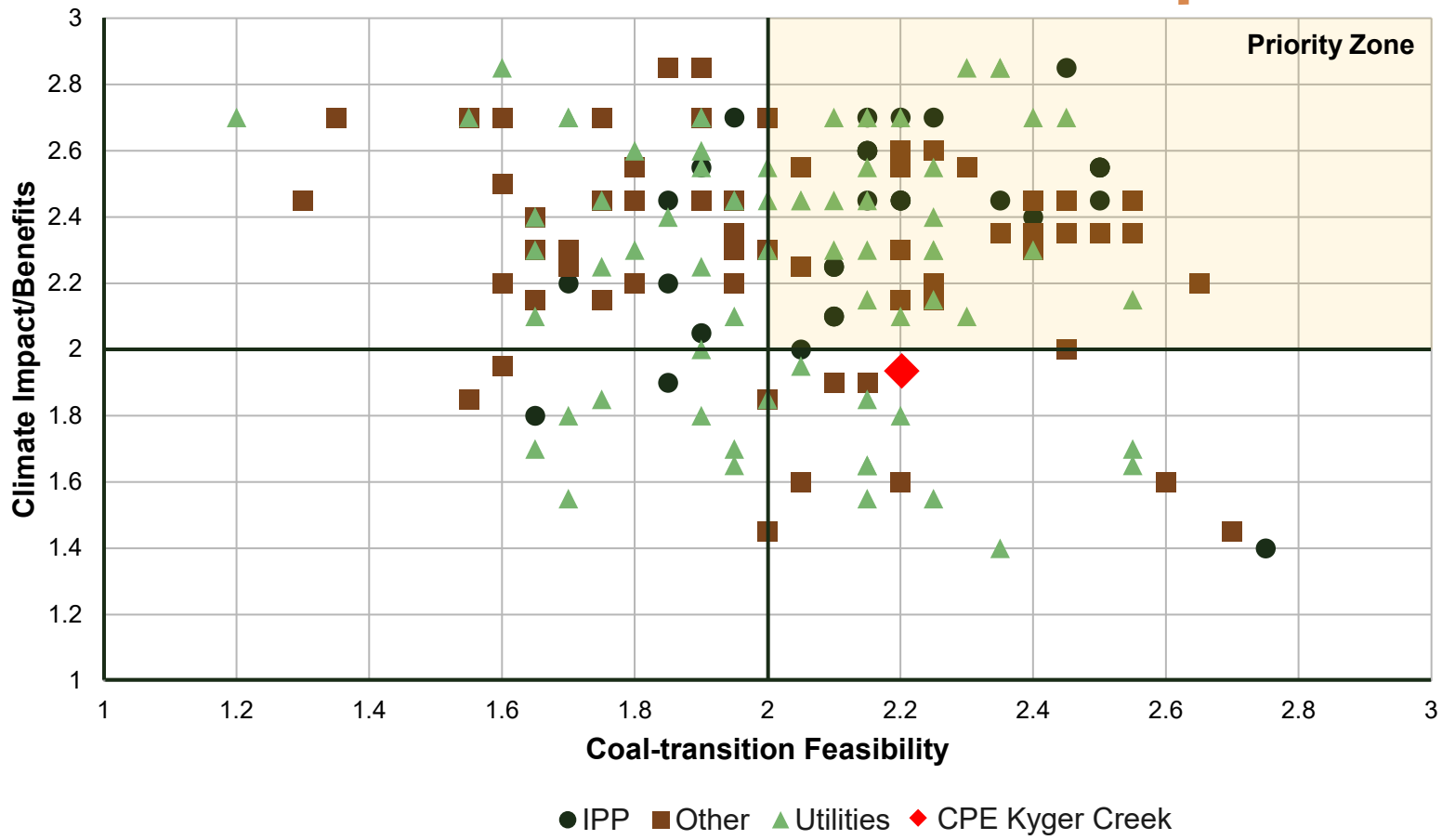
10 GW
Utilized less than 10% of time

38 GW
Target coal fleet for accelerated transition

2. Priority US coal plant identification framework

Coal-transition feasibility vs. climate impact/benefits

See next page for details

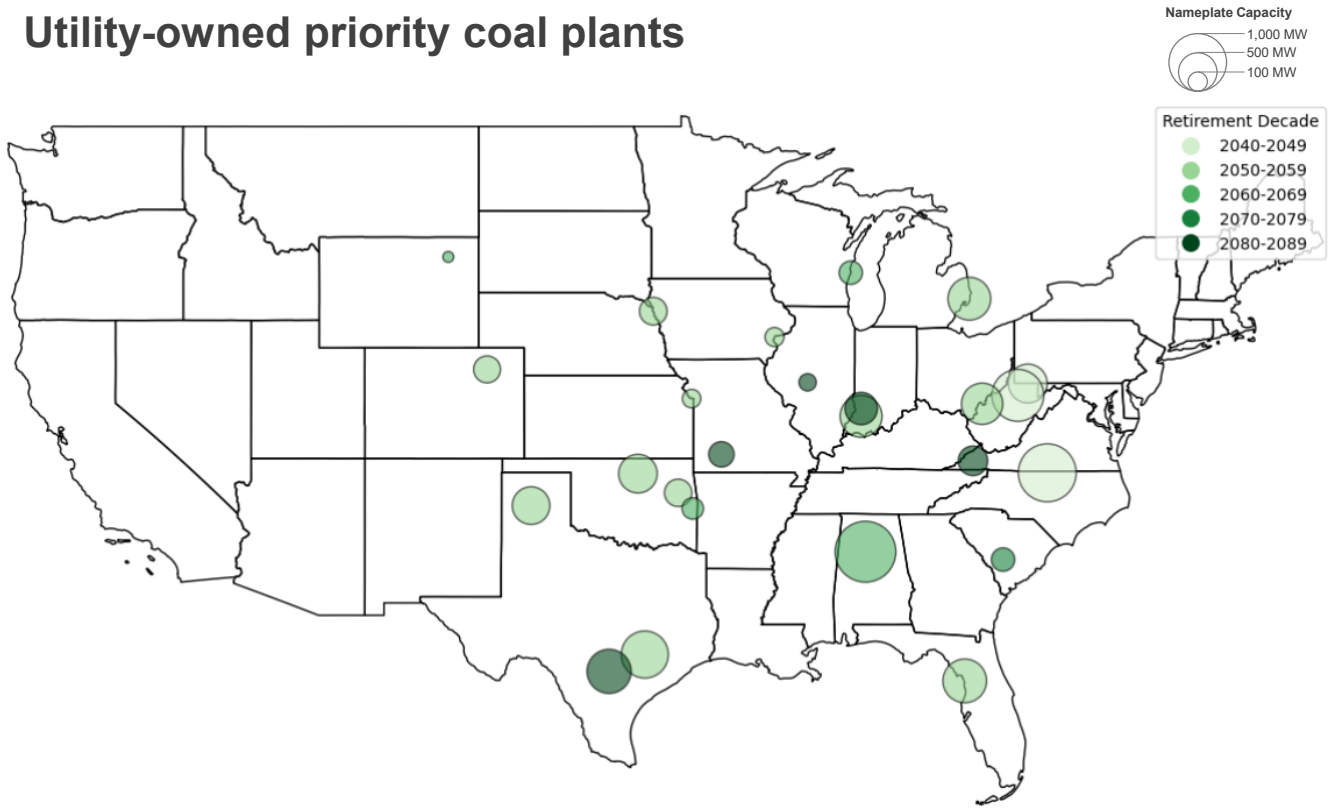


Source: US EIA, Hitachi Velocity Suite, Global Energy Monitor Global Coal Plant Tracker

2 Among the priority coal plants, 25 utility-owned projects are further down-selected for action plan development

Focus on utility-owned coal plants is because they are less driven by market economics, making them harder to transition, yet their retirement has a greater impact on emissions and grid transformation.

Utility-owned priority coal plants



Plant	Holding company	State
James H Miller Jr	Southern Co	AL
Pawnee	Xcel Energy Inc	CO
Crystal River	Duke Energy Corp	FL
Dallman	Springfield Water Light & Power	IL
AES Petersburg (IN)	AES Corp (The)	IN
Edwardsport	Duke Energy Corp	IN
George Neal North	Alliant Energy Corp	IA
Muscatine	Muscatine Power & Water	IA
Nearman Creek	Kansas City Board Pub Utilities	KS
Belle River	DTE Energy Co	MI
John Twitty Energy Center	Springfield MO (City of)	MO
Roxboro	Duke Energy Corp	NC
AES Shady Point Inc	OGE Energy Corp	OK
Muskogee	OGE Energy Corp	OK
Sooner	OGE Energy Corp	OK
Cope	Dominion Energy Inc	SC
Fayette Power Project	Austin Energy	TX
J K Spruce	CPS Energy	TX
Harrington	Xcel Energy Inc	TX
Virginia City Hybrid Energy Center	Dominion Energy Inc	VA
Fort Martin	FirstEnergy Corp	WV
Harrison (WV)	FirstEnergy Corp	WV
Mountaineer	American Electric Power Co Inc	WV
Edgewater (WI)	Alliant Energy Corp	WI
Neil Simpson II	Black Hills Corp	WY

3

Multi-faceted barriers to utilities' coal transition call for fit-for-purpose incentives design

Objective

Design incentives to accelerate coal-to-x transition for the utilities-owned coal plants that are most feasible with highest impact

Regulation-Based Incentive

Mandate or impose policies accelerating coal plant retirements & gas conversions through **emissions limits**, deadlines, **tax** mechanisms, and streamlined **permitting**.

Cost Recovery-Based Incentive

Recover stranded coal plant costs by issuing **low-interest, ratepayer-backed bond**, thereby lowering financing costs and freeing up capital for clean energy investments.

Performance-Based Incentive

Market mechanisms or independent system operators administer **financial rewards and penalties** (e.g. tradeable carbon credits) based on operations-related emissions.

3

Tailored incentives, each with unique benefits, challenges, and applicability, address coal plants' transition barriers

	1 Regulation-Based Incentive	2 Cost Recovery–Based Incentive	3 Performance-Based Incentive
Benefits	• Creates **most certain/clear** regulatory signals and deadlines for retirement. • Accelerates large-scale deployment of renewables. • **Can be paired** with local economic development efforts.	• **Lowers financing costs** vs. utility WACC; eases affordability. • Frees balance sheet for **utility to make cleaner investments**. • Direct and structured path to retiring coal units.	• Directly ties financial incentives to **desired policy outcomes** (lower emissions, reduced coal). • Encourages ongoing **operational improvements** vs. one-time closures.
Challenges	• Top-down mandates can face resistance in **current political environment**. • May **impose high compliance costs** if new capacity is rushed. • Doesn't address stranded costs unless paired with cost recovery.	• Often **requires legislative or regulatory approval** for securitization. • Accelerated depreciation may still cause near-term rate increases.	• Requires **robust tracking & verification** of emissions / performance. • **Political pushback** if carbon pricing/trading is included. • Doesn't fully address stranded costs if retirement is needed.
Applicability	Coal plants in regions **already with strict environmental mandates**, early closure policies, or strong clean energy incentives.	**Newer coal plants with high remaining book value**, in states with securitization statutes or open to accelerated depreciation.	Coal plants in areas pursuing emissions cuts or phased retirement, with **utilities open to financial incentives**.

3

Case 1: Regulation-based incentives at Fort Martin coal plant could accelerate coal-transition by additional 8 years

Identify target plant

Fort Martin

Location: Maidsville, WV

Owner: FirstEnergy

Capacity: 1,152 MW

Capacity factor: 45%

Fuel: Bituminous coal (primary), oil (secondary)

Online year: 1968 (57 y.o.)

Est. retirement year: 2043

Design incentive & transition strategy

- **What:** Policies that mandate or encourage coal plant closures or gas conversions via deadlines, permitting reforms, RPS, or tax credits to make coal less viable.
- **Why**: Establish clear transition timelines, attract clean energy investments, and accelerate compliance via streamlined permitting and fewer bureaucratic hurdles.
- **How**: Legislative or regulatory action (e.g., retirement targets, emissions limits), fast-tracked agency reviews, and pre-conversion consultations.
- **So what**: Utilities integrate mandates, face penalties for delays, and fast-track approvals by unifying applications, exempting low-impact retrofits from full reviews, and using technical guidance early.

Draft action plan and execute

- **Establish a conversion liaison at VA PSC** by drafting legislation to fast-track coal-to-gas approvals.
- **Create a unified permitting roadmap** using research & best practices for streamlined regulatory adoption.
- **Launch a Pilot at Fort Martin** with OpenMinds' support to accelerate coal-to-gas transition.
- **Expand statewide** by lobbying for policies that replicate the streamlined process across West Virginia.

3

Case 2: Cost recovery-based incentives at Pawnee coal plant could accelerate coal-transition by 11 years

Identify target plant

Pawnee Station

Location: Brush, CO

Owner: Xcel Energy

Capacity: 552 MW

Capacity factor: 62%

Fuel: Sub-bituminous coal (primary), gas (secondary)

Online year: 1981 (44 y.o.)

Est. retirement year: 2056

Design incentive & transition strategy

- **What**: Securitization allows utilities to issue low-interest, ratepayer-backed bonds to recover undepreciated costs of retiring coal plants, replacing higher-cost utility debt and ensuring repayment through a dedicated charge on customer bills.
- **Why:** It lowers financing costs compared to standard utility debt, spreads plant closure costs to reduce near-term rate impacts, and frees up utility balance sheets for clean energy investments..
- **How:** Requires legislative or regulatory authorization, along with a dedicated ratepayer surcharge to secure bonds and ensure predictable repayment.
- **So what:** Utilities remove stranded costs from their balance sheets, reducing shareholder risk, aligning with energy transition goals, and facilitating investments in clean energy.

Draft action plan and execute

- **Coordinate in-person briefings with lawmakers and the PUC,** presenting a detailed securitization white paper to secure fast-track authorization for low-interest bonds.
- **Organize a bond consortium** to finalize the ratepayer surcharge structure and engage with rating agencies to lock in the lowest-cost financing.
- **Help establish decommissioning milestones in a binding MOU** with utility leadership; incorporate penalties or incentives for timeline adherence.

3

Case 3: Performance-based incentives at Shady Point coal plant could accelerate coal-transition by 20 years

Identify target plant

AES Shady Point

Location: Leflore, OK

Owner: Oklahoma G&E

Capacity: 350 MW

Operating Costs: $52/kW-yr

Fuel: Bituminous coal

Online year: 1990 (34 y.o.)

Est. retirement year: 2065

Design incentive & transition strategy

- **What:** Financial incentives and penalties linked to emissions reduction, efficiency gains, and early transition timelines via operating restrictions, emission caps, and carbon pricing.
- **Why**: Drives utilities to optimize operations, accelerates the transition, and phases out high-emission, high-cost plants.
- **How**: Regulatory approval for financial rewards/penalties tied to emissions and efficiency, with compliance monitoring and participation in carbon trading or cap-and-trade programs.
- **So what**: High-emission, costly plants face stricter penalties or retirement, while efficient ones earn tax credits, lower fees, or payments for co-firing with gas, hydrogen, or biomass.

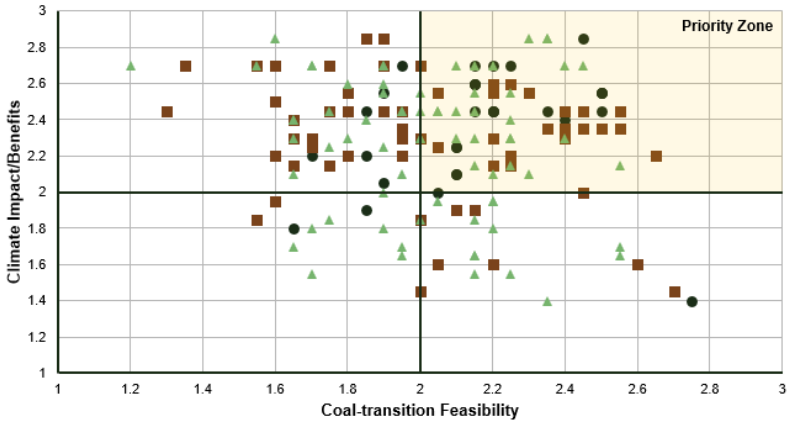
Draft action plan and execute

- **Help establish baseline operational metrics** and financial incentives/ penalties that link the two.
- **Engage OK policymakers and PUD to showcase data-driven policy brief** demonstrating the economic benefits of performance-based incentives.
- **Broker utility and regulatory buy-in** and contractual agreements, while ensuring a phased transition without grid instability.

4

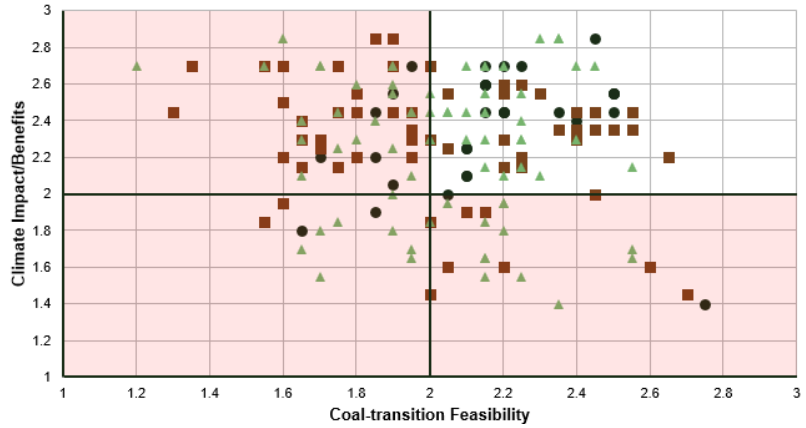
Accelerating Priority plant transitions cuts up to 200 MtCO2e/yr and unlock a flywheel for deeper clean energy transition

Accelerating transition by 1 year for the Priority coal plants can save up to 200 Mt CO2e annually



- Priority coal plants represent 40% of the total 38GW population of target plants identified
- We must focus on the Priority plants, especially those owned by utilities, to create success stories
- Note, the concentrated effort on transitioning utility-owned coal plants does not mean we can overlook those owned by IPPs and others.

Once we achieve flywheel effect, we can target non-Priority plants for another 350 Mt CO2e annually



- Continued coal transition can also trigger secondary climate impacts and positive feedback loops:
- More coal transition lowers energy prices, making remaining coal plants less competitive; this in turn reduces electricity costs for end consumers.
- Lower coal demand cuts transport and mining, reducing air pollution and water use.

4

With its deep coal transition experience, CenterPoint can lead by example and influence other utilities to take action

All of CenterPoint's coal plants, apart from Kyger Creek, are set to transition by 2030

Plant	Unit	Capacity (MW)	Unit age	Transition strategy	Status	Transition year
AB Brown	Unit 1	245	44	Convert to gas plant	Complete	2023
	Unit 2	240	37	Convert to gas plant	Complete	2023
Warrick	Unit 4	150[1]	53	Exit joint ops with Alcoa	Complete	2023
FB Culley	Unit 2	90	57	Convert to gas plant	In Progress	2025
	Unit 3	270	50	Convert to gas plant	In Progress	2027
Kyger Creek	Units 1-5	32[2]	68	Divesture from joint ownership	No Plan	N/A

[1] Represents 50% of the CenterPoint's share in the joint ownership with Alcoa
[2] Represents 1.5% of the CenterPoint's share in the joint ownership of Ohio Valley Electric Corp.
Source: CenterPoint Energy 2023 Integrated Resource Plan

CenterPoint can continue to lead the pack among the US utilities by taking bold actions

Divest from Kyger Creek and go fully coal-free

- Option 1: Ring-fence the 1.5% stake into a subsidiary, then use a securitization model to convert stranded costs into a bond-like instrument for buy-out.
- Option 2: Broker OVEC with a potential asset sale to brown-to-green funds or corporate offtakers while navigating complex governance structure.

Influence other utilities for broader coal transition

- Form industry alliance with other utilities that have successfully transitioned; educate other utilities through technical studies and community engagement know-hows, and voice financial/strategic benefits.
- Pursue strategic advocacy by proactively engaging regulatory and financial institutions to help develop coal transition-focused policy and financing instruments.

4

As we wrap the NextGen project here, we call the broader OpenMinds community to continue and accelerate the effort

Recap: **The Coal Dilemma**	• 48GW of coal plants remain with no transition plan or significant risk of delay • Regulatory, financial, and operational barriers slow coal transition • The stake is high at 9.6 GT CO2e of potentially avoidable emission from coal plants

We leave this project with some takeaways that we learned about the coal-to-x transition…

- Transitioning coal is more complex than what's observed on the surface, as it requires alignment across policy, finance, and market operations that are often at conflicting ends.
- However, the gigaton-scale impact is too consequential for inaction and demands our coordinated, prompt efforts.
- Surgical incentive design is crucial, as each remaining and operational coal plant faces unique circumstances that hinder transition.

… and with some next steps for OpenMinds to continue our efforts on the coal-to-x transition

- **Launch a dedicated task force** with utilities, policy experts, and financiers to facilitate dialogue and draft incentive-specific policy recommendations for a specific sub-set of target government agencies, regulators, and investors.
- **Facilitate recurring open forum** for utilities to discuss current barriers to coal transition, share solutions, track progress, and form alliance to voice opinions to government agencies and regulators.

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Appendix

Prioritization framework details (1/2)

Filter Criteria		
Factor	**Thresholds**	**Background/Reasoning**
Nameplate Capacity	< 10 MW	Plants with low nameplate capacity do not emit large amount of CO2
Capacity factor	< 10%	Plants with low capacity factor do not run as frequently / long enough, thus do not emit large amount of CO2
Retirement Year	< 2030	Plants with planned retirement year in 2020s are likely already in process of retirement / decommissioning

Feasibility Criteria			
Factor	**Thresholds**	**Background/Reasoning**	**Weight**
Retirement Year	2050<=YR: 3, 2040<=YR<2050: 2, 2030<=YR<2040: 1	Plants with late retirement year will emit CO2e for longer, and are also at risk of further delays in retirement due to uncertain future supply & demand situations.	45%
Unit Emissionality (MT CO2/MW)	>=0.0045 MT CO2/MW: 3, >=0.003 MT CO2/MW: 2, Else: 1	Higher unit emissionality at coal plants mean the more impact that can be created by retiring/transitioning or less frequently operating the coal plants.	15%
Annual emissions (MT CO2)	>3 MT CO2: 3, >0.2 MT CO2: 2, Else: 1	Higher annual emissions at coal plants mean the more impact that can be created by retiring/transitioning or less frequently operating the coal plants.	25%
Control equipment	<2 "Y": 3, <3: 2 "Y", Else 1	Fewer "Yes" on the presence of pollutant control equipment (e.g. CO2, NOx, SOx) at coal plant means the more impact that can be created by retiring/transitioning the coal plants.	15%

Prioritization framework details (2/2)

Feasibility Criteria			
Factor	**Thresholds**	**Background/Reasoning**	**Weight**
State favorability	Strong support for coal phase-out: 3, Neutral/limited support: 2, Active opposition: 1	States with strong policies for coal phase outs make transitions smoother and more cost-effective. Neutral or limited support indicates potential hurdles, while active opposition makes projects less feasible.	25%
Fixed O & M Cost ($/kW-yr)	>50: 3, >=30: 2, Else: 1	Higher fixed O&M costs indicate older or less efficient equipment, making these plants more suitable for conversion as they are closer to end-of-life.	5%
Variable O & M Costs ($/MWh)	>5: 3, >=2: 2, Else: 1	Higher variable O&M costs reflect inefficient operations or higher expenses per unit of electricity produced, making these plants less economical to run and better candidates for conversion.	5%
Heat Rate (Btu/kWh)	>14000: 3, >=11500: 2, Else: 1	Higher heat rates (lower efficiency) mean the plant consumes more fuel per unit of energy produced, making it a prime target for conversion to a more efficient fuel source like natural gas.	5%
Primary Fuel Source	Lignite Coal/Coal - generic: 3, Subbituminous/Refined Coal: 2, Else: 1	Lower-quality fuel types (e.g., lignite, generic coal) are less efficient and produce more emissions, making these plants ideal for conversion. Higher-quality fuels (e.g., bituminous coal) are less urgent targets.	5%
Criticality of Load Service	YoY load growth (MW) > 1,000 MW or YoY load growth (%) > 3%: 3, YoY load growth (MW) > 500 MW or YoY load growth (%) > 1.5%: 2, Else: 1	Balancing authority areas with hIgh load growth, defined by their large load addition (in MW terms) or by YoY load growth (in % terms), are likely to keep the coal plants stay on to serve the load and maintain system reliability.	15%
Ownership	<2: 3, <3: 2, Else: 1	The more owners of the plant, the more difficult to align interest on coal transition.	10%
Max Distance to Gas Infrastructure (miles)	<=3: 3, <=20: 2, Else: 1	Plants closer to natural gas infrastructure reduce the costs and complexity of conversion, making them more favorable candidates.	30%

Priority coal plant list – details

Plant	Holding Company	State	Balancing Authority	Nameplate Capacity	Capacity Factor	Heat Rate (Btu/kWh)	Coal Type	Online Year	(Est) Retirement Year
James H Miller Jr	Southern Co	AL	Southern Co	2,822	66%	10,115	Subbituminous	1991	2066
Pawnee	Xcel Energy Inc	CO	Pub Serv Co of CO	552	62%	11,241	Subbituminous	1981	2056
Crystal River	Duke Energy Corp	FL	Duke Florida	1,458	30%	9,548	Bituminous	1984	2059
Dallman	Springfield Water Light & Power	IL	MISO	230	32%	9,589	Bituminous	2009	2084
AES Petersburg (IN)	AES Corp (The)	IN	MISO	1,342	50%	9,628	Bituminous	1977	2052
Edwardsport	Duke Energy Corp	IN	MISO	805	65%	7,000	Coal - generic	2013	2088
George Neal North	Alliant Energy Corp	IA	MISO	584	28%	10,042	Subbituminous	1975	2050
Muscatine	Muscatine Power & Water	IA	MISO	276	22%	12,499	Subbituminous	1983	2058
Nearman Creek	Kansas City Board Pub Utilities	KS	SPP	261	21%	10,568	Subbituminous	1981	2056
Belle River	DTE Energy Co	MI	MISO	1,395	53%	10,074	Subbituminous	1984	2059
John Twitty Energy Center	Springfield MO (City of)	MO	SPP	494	35%	9,923	Subbituminous	2011	2086
Roxboro	Duke Energy Corp	NC	Duke Progress East	2,558	19%	9,530	Bituminous	1968	2043
AES Shady Point Inc	OGE Energy Corp	OK	SPP	350	20%	10,000	Bituminous	1990	2065
Muskogee	OGE Energy Corp	OK	SPP	572	44%	10,953	Subbituminous	1984	2059
Sooner	OGE Energy Corp	OK	SPP	1,138	11%	10,432	Subbituminous	1980	2055
Cope	Dominion Energy Inc	SC	Dominion SC	417	38%	10,525	Bituminous	1996	2071
Fayette Power Project	Austin Energy	TX	ERCOT	1,690	52%	10,919	Subbituminous	1979	2054
J K Spruce	CPS Energy	TX	ERCOT	1,489	39%	10,929	Subbituminous	2010	2085
Harrington	Xcel Energy Inc	TX	SPP	1,080	36%	10,516	Subbituminous	1976	2051
Virginia City Hybrid Energy Center	Dominion Energy Inc	VA	PJM	668	14%	9,000	Bituminous	2012	2087
Fort Martin	FirstEnergy Corp	WV	PJM	1,152	45%	9,442	Bituminous	1968	2043
Harrison (WV)	FirstEnergy Corp	WV	PJM	2,052	64%	9,547	Bituminous	1974	2049
Mountaineer	American Electric Power Co Inc	WV	PJM	1,300	43%	9,537	Bituminous	1980	2055
Edgewater (WI)	Alliant Energy Corp	WI	MISO	414	54%	10,546	Subbituminous	1985	2060
Neil Simpson II	Black Hills Corp	WY	WAPA Rocky	90	87%	12,377	Subbituminous	1995	2060