Redeveloping Coal Power Plants: Data Centers

Grid electricity demand is forecast to grow due to data centers, new manufacturing, and electrification of transportation and buildings. Data centers are expected to drive near-term load growth that may be challenging to meet with existing resources, a situation made more complex by coal power plant retirements. At the same time, retired and retiring coal power plants offer an opportunity for redevelopment: they often have electrical, transportation, and water infrastructure and a nearby workforce that can support a range of new uses as the energy system transitions. Retired and retiring coal power plants are an opportunity for connecting new, clean generation to the grid to meet the growing demand of data centers. Retired coal sites could also accommodate new loads like data centers, which could procure renewable energy elsewhere on the grid. A retired coal site could even be redeveloped to combine a data center and new clean energy on the same site.

Repurposing former coal plants can bring economic revitalization to hard-hit energy communities. A redevelopment project is a multi-stakeholder process requiring the input of developers, communities, local governments, nonprofits, and utilities. These groups can work together to maximize existing equipment, infrastructure, and permits to create new uses and value streams. This pamphlet summarizes key considerations and approaches to support these entities in repurposing coal power plants to help meet data center load growth with clean energy.

What are key considerations for coal to data centers and/or clean energy redevelopment?

Coal power plant redevelopment projects raise many considerations. A detailed site assessment will help shape the options for a given site.

Considerations include:

- **Affordable, reliable bulk power:** Data centers require significant electrical power and generally seek sites with access to low-cost power [1] and very high electrical reliability [2]. This might involve having multiple sources of power or multiple connections to the grid. Retired and retiring coal power plants often have this kind of electrical infrastructure in place.
- **Electrical point of interconnection:** A retired or retiring coal power plant leaves behind a point of interconnection with the grid that consists of physical infrastructure and the rights to use it. Connecting a new load or generation resource at an existing point of interconnection may require an interconnection study and potentially some equipment upgrades, but is expected to be faster and cheaper than trying to construct and connect to a new point of interconnection [3]. New large loads like data centers can face multi-year delays in accessing the grid [4]. New generators can also face delays and be required to pay significant transmission upgrades. Some grid operators have accelerated interconnection processes for replacement generation at retiring facilities, which is a pathway that could be compatible with coal redevelopment to clean energy [5].

- **Siting and permitting:** Efficient and effective permitting has been identified as key for overcoming delays in new infrastructure development to meet load growth from data centers [4]. Brownfield sites, like retired coal power plant sites, may have favorable zoning for new industrial uses and may be an avenue to faster local permitting. Brownfield sites located in federal Opportunity Zones or similar state-designated areas may also be eligible for financial incentives to support redevelopment [6].
- **Fiber network connectivity:** The robustness of fiber lines, which determines latency (or the time it takes for signal to travel), is critical for data center site selection [2]. Fiber lines often run along major transportation corridors, which may overlap with locations of brownfield sites such as retired coal plants [2, 7].
- **Cooling potential:** About 40% of a data center's energy consumption goes to cooling [8] and data centers can consume significant amounts of water to provide this cooling. Coal power plant sites may have cooling water permits and infrastructure that could be re-purposed.
- **Community benefits:** Data centers and clean energy development can provide economic diversification, which can be especially important in coal communities experiencing declines during the energy transition. Potential economic benefits include job creation, local tax revenues, and direct investment from data center companies. State economic development agencies may offer economic incentives, such as property or sales tax abatements or exemptions, to secure these benefits. Data center development may also provide the added local benefit of improved broadband connectivity, which may be especially valuable in rural, low-income areas with high-cost internet services [2].

Available financial resources supporting redevelopment

There is currently significant federal financial support for redeveloping coal power plants and developing clean energy. Data centers could benefit directly from some of these resources by incorporating clean energy onsite, or they could benefit indirectly by procuring clean energy that benefits from these financial resources.

- **Clean energy tax credits:** New clean energy, such as solar photovoltaic and battery energy storage, can benefit from an investment tax credit that can generally cover 6-30% of eligible capital costs. A 10 percentage-point bonus can be added for using domestic content. Another 10 percentage-point bonus credit can be obtained for siting a qualifying project in a defined energy community. Energy communities include areas with recently retired coal-fired generating units, meaning coal redevelopment projects are expected to trigger this bonus for clean energy on the site and in the surrounding area. From 2025, clean electricity technologies and storage are expected to be eligible under a technology-neutral investment tax credit, where qualification is based on having zero or negative greenhouse gas emissions. A similar production tax credit, which is based on the amount of clean energy a project produces, is also expected to be available from 2025.
- **Elective pay mechanism:** Elective pay is a new mechanism that makes certain clean energy tax credits directly available to applicable entities such as rural electric cooperatives and local governments. This could help these entities with transitioning coal-fired generating units to clean energy.
- **Energy Infrastructure Reinvestment (EIR) financing:** EIR financing from the Department of Energy can support redevelopment of coal power plants to certain new energy-related uses, including clean energy. EIR can support site remediation associated with redevelopment and is therefore uniquely positioned for coal redevelopment projects.
- **Brownfields Grants:** Brownfields Grants are available from the Environmental Protection Agency to certain entities for assessing and cleaning up sites with potential or actual contamination. Many states also offer voluntary cleanup programs with flexible cleanup standards to expedite site remediation for brownfield purchasers, as well as state-designated opportunity zones for brownfield redevelopments or other state incentives or tax abatements [9].
- **Other resources:** There are numerous other federal and local resources for brownfield redevelopment, clean energy development, and economic development, including specific incentives for data centers. At least 31 states offer some form of a property, sales, and/or use

tax incentive for data center development (as of January 2024) [10]. Some states' sales tax exemptions extend to electricity, energy sources, and related electrical equipment.

For more data and information, visit: energycommunities.gov/

Resources to support data center energy efficiency

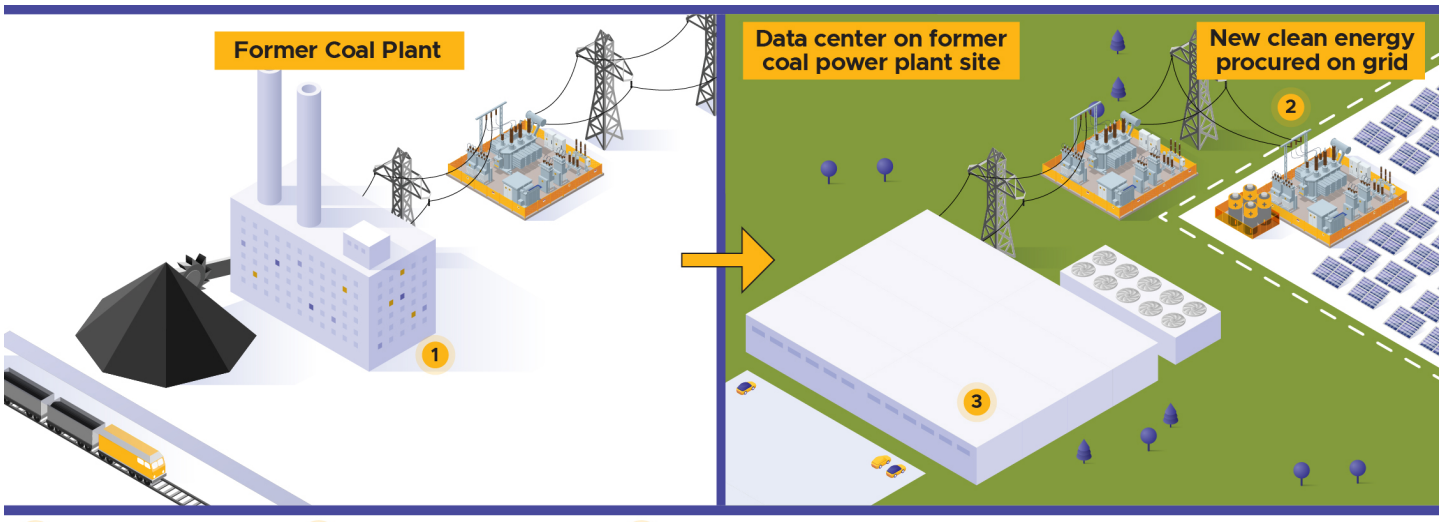
Energy efficiency in data centers can be a critical lever for reducing energy demand on the grid and reducing costs for data center operators. The Department of Energy (DOE) offers multiple tools and guides to drive energy and financial savings in data centers through energy-efficient measures and technologies [11].

- Energy efficient commercial buildings tax deduction (Internal Revenue Code [IRC] 179D): Commercial building owners may be able to claim a tax deduction for installing qualifying energy efficient systems. Qualifying equipment must be part of the interior lighting systems, the building envelope, or the heating, cooling, ventilation, and hot water systems. The deduction value depends on the energy savings achieved and can be increased by meeting prevailing wage and apprenticeship requirements [12].
- Other resources: There are additional resources from the DOE that provide technical assistance (e.g., Better Plants Initiative) [13], guidance and best practices (e.g., Data Center Accelerator Toolkit) [14], and trainings to certify practitioners as energy efficiency experts (e.g., Data Center Energy Practitioner) [15].

Pathways for incorporating clean energy and data centers in coal power plant redevelopment

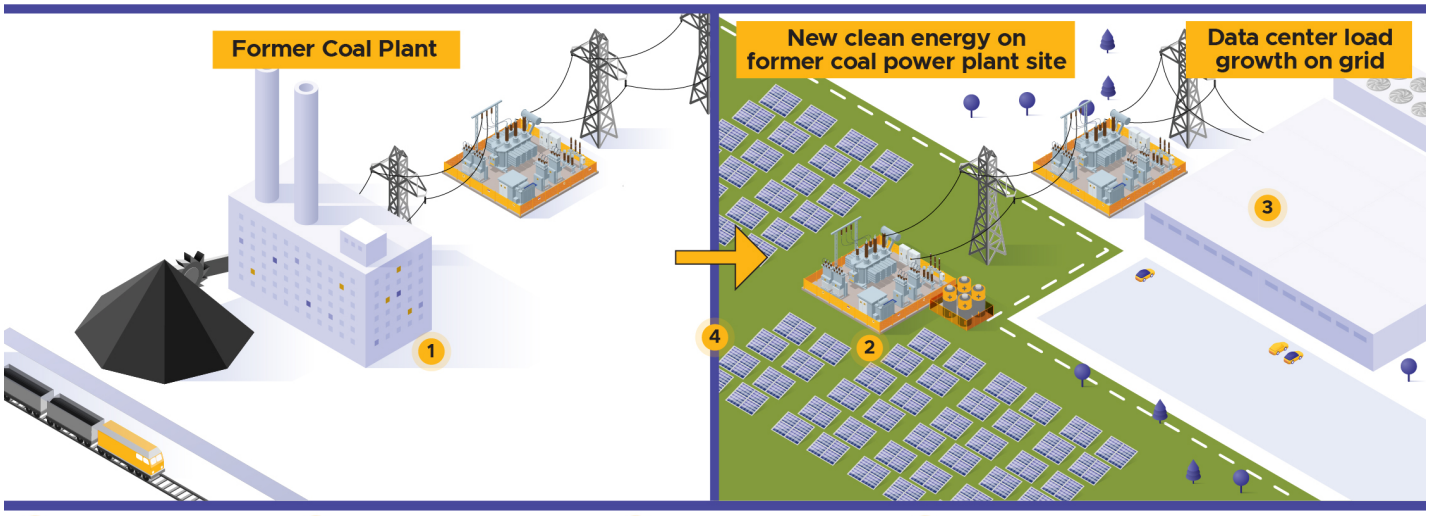
This pamphlet contemplates three pathways for redeveloping retired or retiring coal power plants to support data center load growth with clean energy.

Pathway #1: coal power plant to data center + new clean energy procurement. A data center is installed on the brownfield site of a retired coal power plant. The data center re-uses the electrical point of interconnection to draw power from the grid. The data center procures new clean energy, e.g., through a corporate power purchase agreement, located elsewhere on the same grid system.



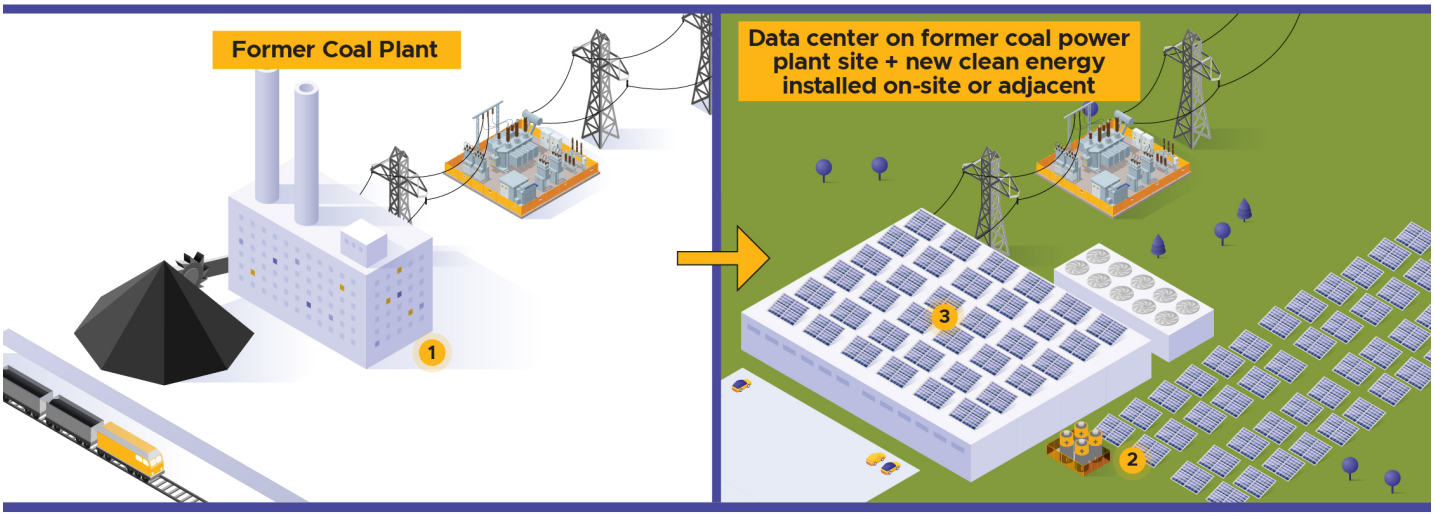
1 EPA Brownfields Grants 2 IRA clean energy tax credits 3 Potential local incentives

Pathway #2: coal power plant to new clean energy. New clean energy is installed on the brownfield site of a retired coal power plant. The new clean energy installation re-uses the electrical point of interconnection with the grid, saving capital cost and time. The new clean energy helps meet demand growth, including from data centers, elsewhere on the same grid system.



1 EPA Brownfields Grants 2 IRA clean energy tax credits 3 Potential local incentives 4 Energy Infrastructure Reinvestment financing

Pathway #3: coal power plant to data center + on-site clean energy. A data center is installed on the brownfield site of a retired coal power plant. The data center reuses the electrical point of interconnection to draw power from the grid. New clean energy is also constructed on the site (or adjacent to the site) and helps meet the energy demand from the data center, reducing the net load on the grid and likely reducing the need for new transmission and generation infrastructure.



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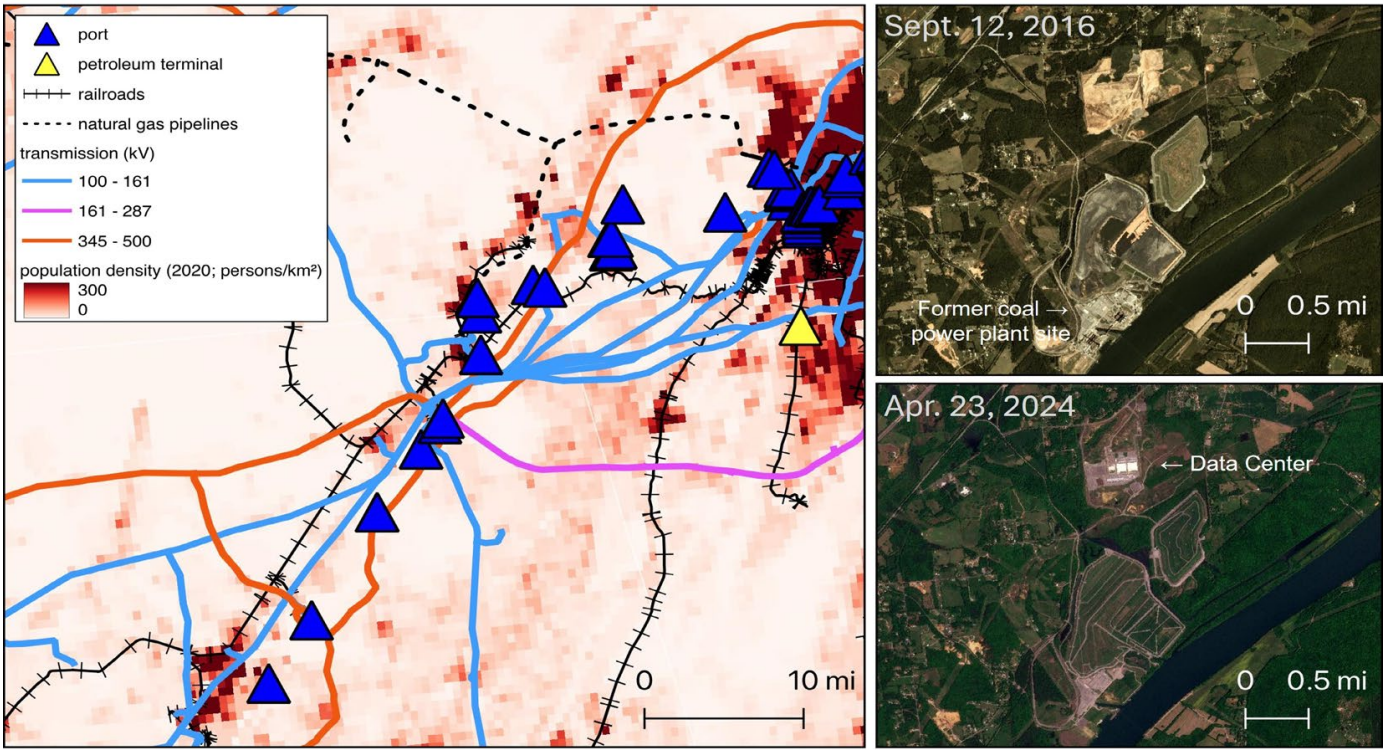
These three pathways are illustrative and non-exhaustive—additional pathways likely exist. One such pathway could involve constructing new data centers adjacent to operational coal power plants, where the data center would serve as a dedicated customer, providing the power plant with a limited period of revenue certainty while committing the plant to a clean energy redevelopment over a defined timeline. This pathway would allow a data center's demand for energy to be met immediately with an existing resource while still contributing to decarbonization goals in the longer term. The defined transition timeline could also be helpful for the local workforce.

Case study: Widows Creek coal power plant to data center + new clean energy procurement

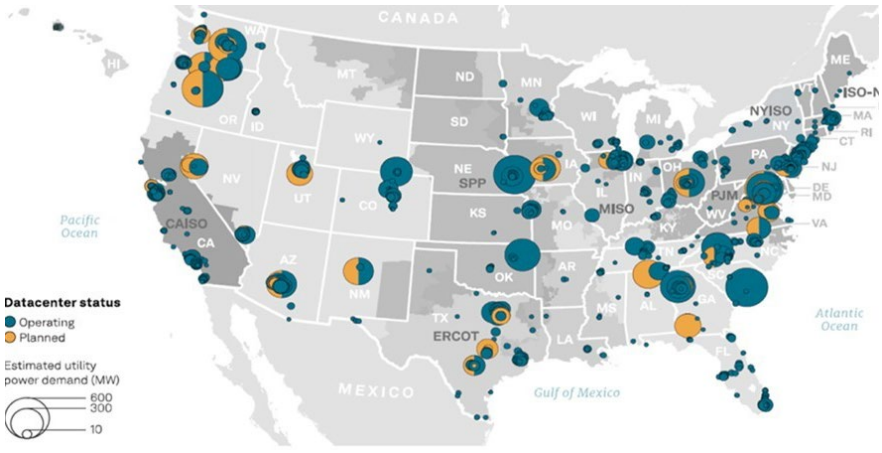
The Widows Creek coal power plant in Stevenson, AL followed Pathway #1 above. The coal power plant retired in 2015 and in the same year Google selected the site for a new data center. The data center was constructed on land owned by the utility and adjacent to the retired coal power plant, reusing the power plant's point of interconnection with the grid. Google procured solar energy resources nearby to help meet the energy needs of the data center. The data center represents a capital investment of $980 million and has created over 100 onsite jobs [16].



Relevant data and information

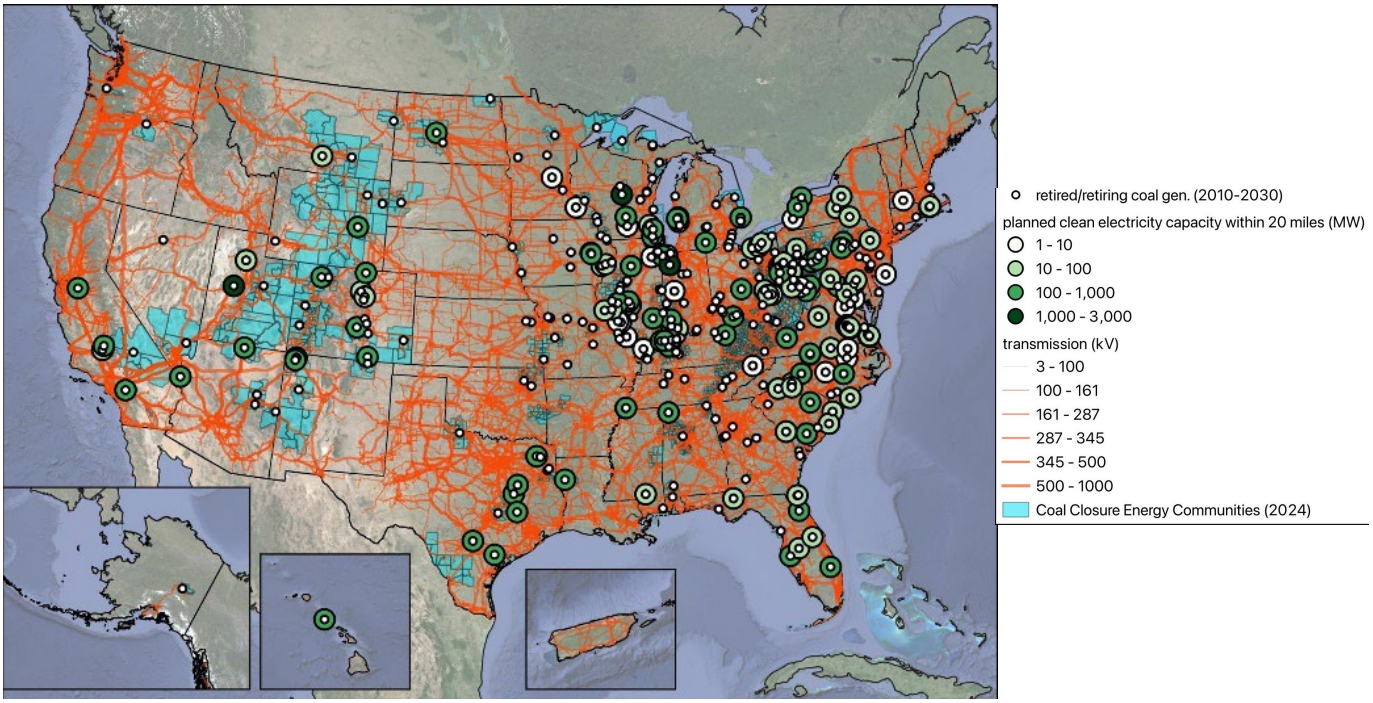
National datasets can help stakeholders identify and navigate options for coal power plant redevelopment and data center development. Based on the high-level considerations identified above, informative data might include:

- Retired/retiring coal power plant locations
- Electrical transmission infrastructure locations and voltage ratings
- Energy community tax credit bonus areas
- Planned clean energy developments in proximity to retired/retiring coal power plant sites



Operating and planned data centers in the US.

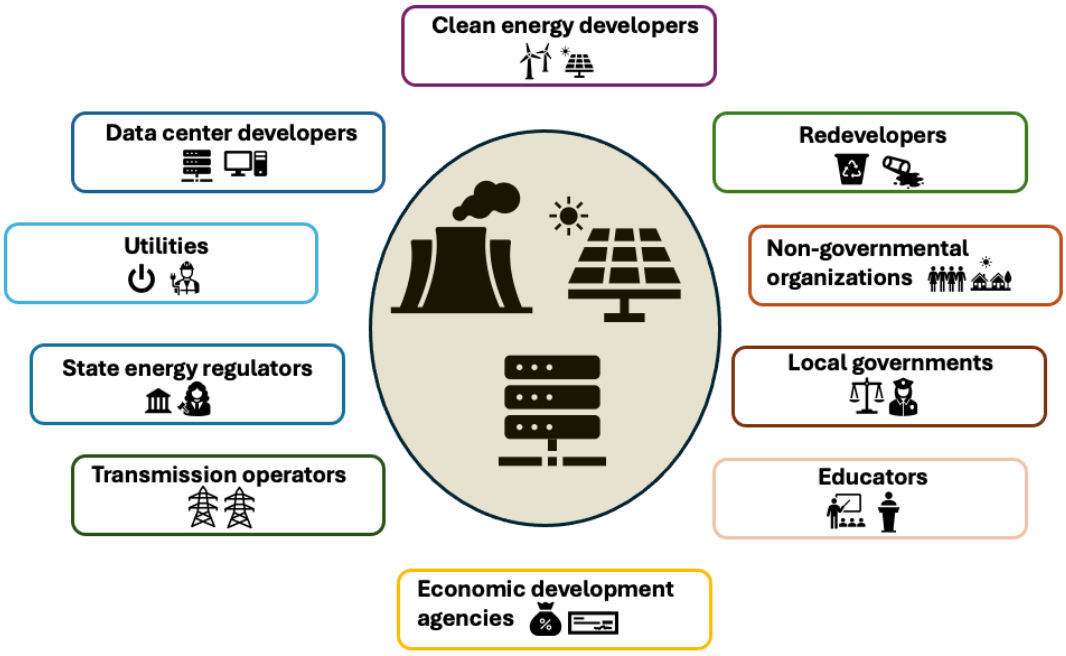
Source: adopted from S&P Global Market Intelligence; 451 Research; S&P Global Commodity Insights [17]



Planned clean electricity capacity within 20 miles of a retired or retiring (2010-2030) coal power plant. Clean electricity includes: Batteries, Conventional Hydroelectric, Geothermal, Hydroelectric Pumped Storage, Offshore Wind Turbine, Onshore Wind Turbine, Solar Photovoltaic, Solar Thermal without Energy Storage, Wood/Wood Waste Biomass.

The stakeholders and their roles in redevelopment

Redeveloping a coal power plant involves multiple stakeholders. Introducing data centers in this process adds additional stakeholders and considerations. Coordination among the various stakeholders has been identified as key for meeting the scale and pace of expected near-term electricity load growth with clean energy development [4]. The stakeholders below may simultaneously be handling the retirement of coal power plants and an uptick in load growth all against the backdrop of a transition to clean energy that requires new ways of planning resources and operating the grid. Understanding the roles of other stakeholders in the process may help a given stakeholder achieve its goals and contribute to positive outcomes.



Data center developers may approach utilities about opportunities to be served electric power. Data center developers may compare siting opportunities based on the availability, reliability, and cost of electric service. Their main interest may be in minimizing the time it takes to connect to the grid and receive electricity. They may also be strongly interested in meeting their energy demand with clean energy. They may value potential advantages that come with a retired coal power plant site, like access to the electric transmission system. At the same time, developing at one of these sites could involve extra time and costs, for example, if site remediation is required.

Utilities generate plans for meeting electric load with an array of resources, including generation resources, energy efficiency, and demand response. Many utilities are experiencing coal power plant retirements that mean that new energy resources must be procured. The uptick in demand from data centers, manufacturing, and electrification may mean that utilities are under additional pressure to quickly procure the necessary means to meet new load. The resource planning process, which generally involves an energy regulator, can take several years. Developing a new resource, which includes permitting, construction, and connection to the electric grid, can also take several years. Planning replacement resources as a redevelopment for a retired or retiring coal power plant could be a way to streamline this process.

State energy regulators generally have a role in coordinating the planning of electricity- generating resources and in ensuring that electricity rates are fair to the utilities and their customers. Regulators should check that utilities are considering new federal financial resources available for clean energy and energy infrastructure redevelopment. Energy regulators can shape decisions around coal power plant retirement, for example, by setting retirement deadlines that are consistent with state policy. When examining decisions around coal power plant retirement, regulators may also help shape the redevelopment options and their timing.

Transmission operators run the grid that carries electricity over longer distances from large-scale generating resources to load centers. In some regions, utilities are the transmission operators. In other regions, this role is filled by an independent system operator (ISO) or regional transmission organization (RTO) that runs both the transmission system and a competitive regional wholesale energy market. Transmission operators will be involved in decisions about interconnecting new loads or resources to their grid. This process takes time because, in addition to the infrastructure required, the effects on grid reliability must first be studied. There is often a queue for connecting to the grid, and utilities and transmission operators in many parts of the country currently have wait times of several years. This may be one advantage of redeveloping retired coal power plant sites, where the interconnection infrastructure is generally already in place and the necessary grid studies may be simplified.

Transmission operators may also be involved in contracts with data centers for transporting power across the grid; a data center at one location could procure energy from a resource at another location on the grid. This model is expected to be promising for data center developers to procure new clean energy, which may not always be co-located with the data center. When it is possible to co-locate, this could reduce the considerations for the transmission operator and help reduce the need for additional infrastructure elsewhere on the grid.

Clean energy developers may be approached by utilities or directly by data center developers. They may also respond to competitive requests for proposals identifying project specifications and asking for bids. Clean energy developers will generally navigate the grid interconnection process, the site control (obtaining ownership or lease, if necessary), permitting, and the construction of the resource.

Redevelopers are specialized companies that acquire brownfield sites like retired coal power plants and make them ready for new uses. This may involve site preparation such as demolition and legally

required treatment of environmental liabilities. Redevelopers may market a site to more than one developer. This would be a way to combine a data center and a new clean energy resource on the same retired coal power plant site. Knowing the end uses at the time of site preparation could reduce time and costs by allowing the remediation process to be tailored.

The public and non-governmental organizations can influence several of the decisions in this process. Public engagement is generally a feature of utility resource planning, state energy regulatory proceedings, and local permitting processes. Several past coal power plant retirements and redevelopments have been shaped by the involvement of organized community groups.

Local governments such as counties and municipalities often have local permitting processes that could affect development of new clean energy and data centers. Local governments may also offer tax incentives to these developments.

Economic development agencies can be local, state, or non-profit entities with an interest in economic development. They may help attract and coordinate various developers. They may pay particular attention to developments that can bring jobs or economic diversity to a local area.

Educators, such as community colleges and apprenticeship programs, can identify future workforce needs and tailor curricula to help meet these needs.

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Visit the Coal Redevelopment project website for additional resources.

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