Financing the Coal Transition

Pragmatic Solutions to Accelerate an Equitable, Clean Energy Future

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About RMI

RMI is an independent nonprofit founded in 1982 that transforms global energy systems through market-driven solutions to align with a 1.5°C future and secure a clean, prosperous, zero-carbon future for all. We work in the world's most critical geographies and engage businesses, policymakers, communities, and NGOs to identify and scale energy system interventions that will cut greenhouse gas emissions at least 50 percent by 2030. RMI has offices in Basalt and Boulder, Colorado; New York City; Oakland, California; Washington, D.C.; and Beijing.

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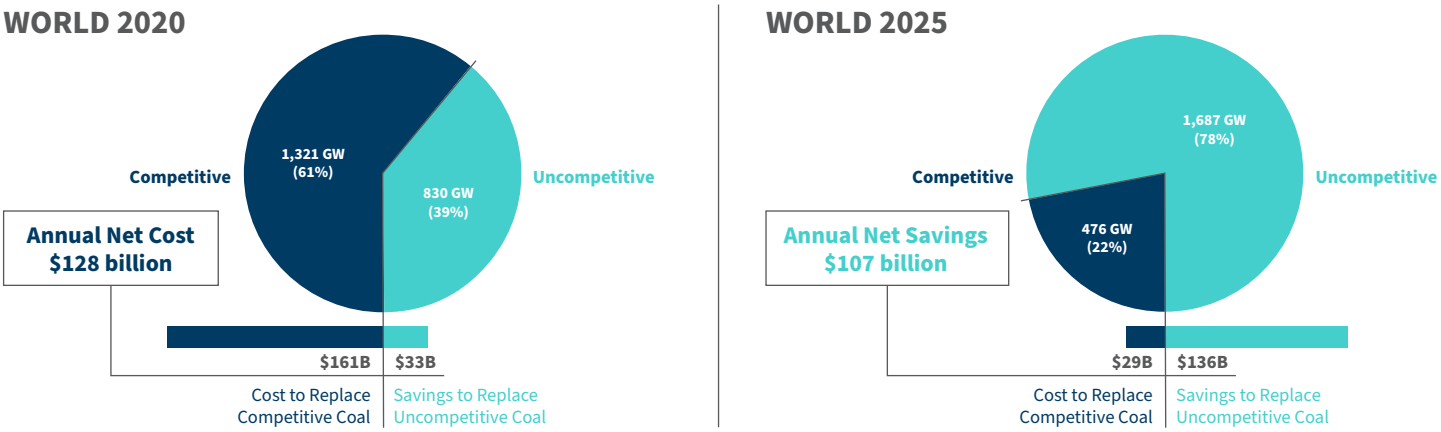
Executive Summary

The economics of power generation are shifting rapidly in favor of cheaper and cleaner sources. Already, two-thirds of the world's population live in a country where wind and solar photovoltaics (PV) are the cheapest sources of new generation, and by 2025, renewables plus energy storage will be able to cost-effectively replace 78% of *existing* coal power plants.[1, i] Renewables are already undercutting coal generation in many Organisation for Economic Co-operation and Development (OECD) countries and similar trends are emerging worldwide as the costs of clean energy continue to fall and the risks of coal rise.

Exhibit ES1 Cost competitiveness of existing coal vs. new renewables and storage



Source: RMI, *How to Retire Early: Making Accelerated Coal Phaseout Feasible and Just*, 2020

Meanwhile, governments, utilities, and financial institutions are making major commitments to end new coal power projects.[2] This momentum is only building, with 2021 alone witnessing some of the largest public funders and governments laying out stronger commitments against new coal. In June, G7 leaders issued a communiqué in which they committed to end public funding for unabated coal power and scale domestic efforts to accelerate the transition from coal to clean energy in line with climate goals.[3] More recently, President Xi Jinping announced that China—among the largest public lenders to international coal power projects, especially in the developing world—would no longer fund overseas coal power projects.[4]

i This figure assumes onshore wind or solar PV with four-hour battery storage sized to 50% of the renewable generation capacity replaces coal. Though this assumption is simplistic—and a mix of resources and longer-term storage are likely required to replace coal, particularly with higher shares of renewables—four hours of storage is a reasonable replacement for most existing coal plants.

Although halting the pipeline for *new* coal is a necessary step toward achieving climate goals, avoiding the worst impacts of climate change will require urgent and ambitious action to transition the *existing* coal fleet. To maintain a pathway to a 1.5°C future, the International Energy Agency's net-zero scenario states that advanced economies must phase out unabated coal by 2030, and the rest of the world must do the same by 2040.[5] Coal retirements are growing—with 180 GW retired since 2016—but coal still remains the largest single source of power generation worldwide.[6, ii] In many growing economies, coal is a critical element of long-term economic development and energy security planning norms, creating a complicated landscape of competing interests. Nowhere is this more apparent than in Asia, which currently accounts for 73% of the global coal fleet and 76% of global coal production. [7, iii]

Transitioning the existing global coal fleet faces significant national-, sectoral-, and asset-level barriers. The changing economics of clean energy compared with coal power are challenging coal's long history as a mainstay of economic development throughout the world. However, the privileged place coal has occupied in power generation for over a century has entrenched complex barriers—from the way that grids have been built to the incentive structures within electricity systems—that prevent markets from catching up to the very clear economic trends toward clean energy.

In the absence of solutions to address these barriers, the costs of uneconomic coal will fall largely on local communities—through direct costs, fallout from unplanned closures, and unpriced impacts on local health and the environment.[8] An estimated 93% of coal power capacity is insulated from market pressure, allowing the lion's share of coal plants to operate long after they cease to be economic.[9] These protections can take the form of long-term contracts, such as power purchase agreements (PPAs), regulated tariffs that allow cost recovery, and/or ongoing subsidies to help mitigate losses. All of these pass the obligation to pay for uneconomic coal on to consumers or taxpayers. At the same time, the coal transition also poses significant economic and social risks to communities and workers, which are vulnerable to the impacts of an unmanaged coal transition.

The global community needs new coal transition solutions to address the social and economic complexities of the transition while responding to the urgency of the climate challenge. Although we will need to leverage all available tools in this effort, this report focuses on the role of financial mechanisms in the global coal transition, with an emphasis on coal power plants. Over the past year, financial mechanisms have gained significant attention, as governments and financial institutions have initiated new financial approaches to support the transition. In this report, RMI helps make sense of these approaches, and outlines the case for *why* and more importantly *how* finance can be used to support the coal transition. Here we outline five key insights from this report, with the full analysis and supporting discussion included in the sections that follow.

1. **Financial mechanisms can be important complements to policy and regulation, helping overcome the barriers to coal phaseout to enable a more rapid, smooth, and just energy transition.** We refer to financial mechanisms as the instruments or paths through which institutions (utilities, businesses, governments, financial institutions, and/or programs) receive and deliver funding. These mechanisms include both private-sector instruments, such as securitization; public or blended finance vehicles; and more innovative approaches, such as carbon finance.

ii Retirements between 2016 and 2020 totaled 180 GW compared with 120 GW in the five years prior.

iii Includes Central, South, Southeast, and East Asia.

By shifting the costs, benefits, and risks of the coal transition across stakeholders, financial mechanisms can align incentives across governments and commercial, environmental, and community groups. In doing so, the right financial mechanisms can offer a targeted and pragmatic approach to addressing coal phaseout challenges, while mitigating impacts on the most vulnerable stakeholders. Importantly, financial mechanisms provide a means to address the contractual and structural market barriers to the coal transition (e.g., PPAs or regulated tariffs) in a way that both enables accelerated action and does not undermine a country's long-term energy transition.[iv] Their potential to generate wins for both the climate and local populations also provides a promising outlet for channeling climate or development finance to support the transition in developing countries, which face some of the largest needs—and risks—in a coal transition. Though not a silver bullet, the ability of financial mechanisms to generate consensus can enable progress on the coal transition *today*.

2. **Already, financial mechanisms are garnering interest from financial institutions and governments.** This report provides a landscape of the myriad approaches proposed to date, including refinancing, managed transition vehicles, compensation schemes, and broad just transition packages (see Exhibit ES2). Though differing in their design, most of the financial mechanisms we surveyed included similar core components: (1) refinancing the obligation of customers and taxpayers to continue to pay for uneconomic coal, with the aim to unlock value and enable the transition from coal to clean; (2) investment in low-carbon solutions; and (3) support for the just transition. While a few of these mechanisms are already being implemented, many are in the early stages of their conceptualization and design, having only been introduced in the past year.

3. **Although this momentum is exciting, financial mechanisms also carry risks and must be designed carefully to ensure they are aligned with identified economic, social, and climate goals.** Financial mechanisms must provide sufficient incentives for current coal plant owners to transition their asset. However, determining what is "sufficient" suffers from inherent challenges stemming from information asymmetries and the market and political power of coal asset owners, who may exploit these challenges to game financial mechanisms and extract excess profits in a transition. While allowing for a risk-adjusted return will be required for approaches to be feasible and, ultimately, scalable, financial mechanisms must put in place safeguards to ensure the public remains the primary beneficiary in the transition.

   This means designing financial mechanisms to: (1) ensure excess value is shared with customers, taxpayers, and communities as opposed to being pocketed by profit-seekers; (2) incentivize coal asset owners to transition away from coal, avoiding moral hazard risks; and (3) provide transparency about how the costs and benefits of the transition are distributed. To ensure that financial mechanisms hold true to transition goals, public finance institutions with clear climate and development mandates will likely need to take the lead in setting the guiderails and principles for mechanisms, even as profit-seeking private finance is eventually introduced to enable scale-up.

iv For example, breaking existing PPA contracts could undermine investor confidence in PPAs, hindering future investments in low-carbon energy.

Exhibit ES2 Landscape of existing financial mechanisms for the coal transition

Primary mechanism type:

Refinancing | Managed transition vehicle | Compensation | Broad transition support

Ratepayer-Backed Bond Securitization

Refinancing regulated utility coal-fired assets using bonds backed by surcharges on ratepayers' energy bills

Status: Implementation

German Coal Phaseout

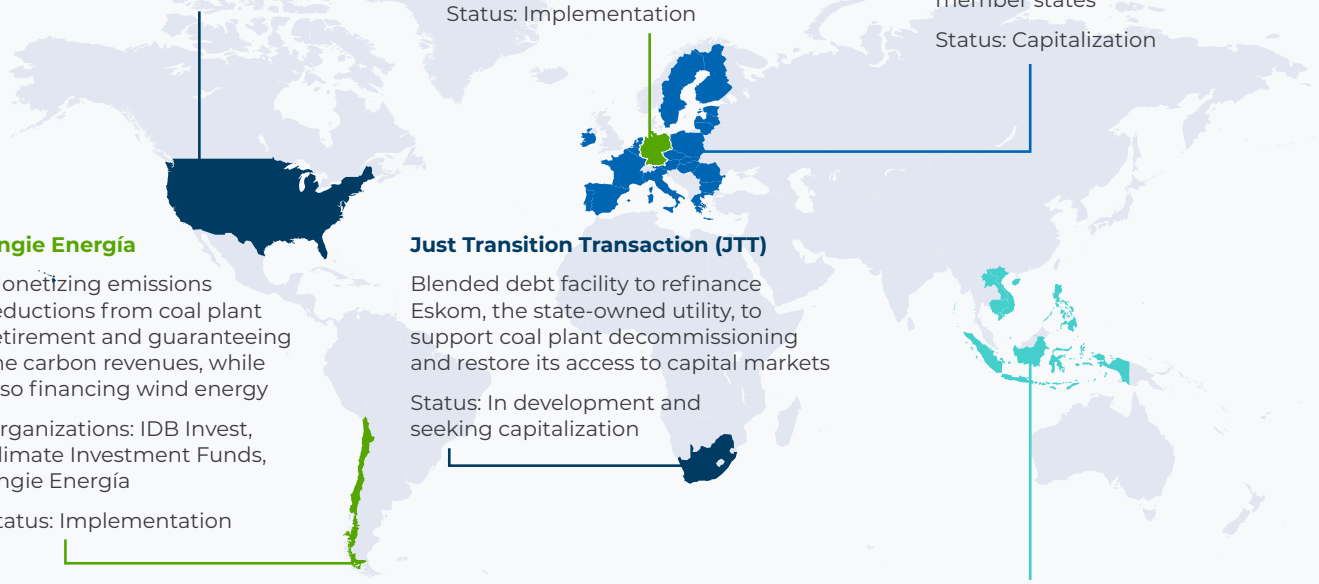
Competitive auctions to compensate coal plant owners for the early retirement of plants, implemented alongside policy and financial support for the just transition

Status: Implementation

EU Just Transition Mechanism (JTM)

Three-part fund that supports the just transition, including economic diversification, infrastructure assets, and repurposing of assets in EU member states

Status: Capitalization



Engie Energía

Monetizing emissions reductions from coal plant retirement and guaranteeing the carbon revenues, while also financing wind energy

Organizations: IDB Invest, Climate Investment Funds, Engie Energía

Status: Implementation

Just Transition Transaction (JTT)

Blended debt facility to refinance Eskom, the state-owned utility, to support coal plant decommissioning and restore its access to capital markets

Status: In development and seeking capitalization

Energy Transition Mechanism (ETM)

Blended finance facility to acquire coal power assets and retire them earlier than the plant's previously expected lifetime, while providing enough time to build up renewables and support a just transition. Coal plant operators use funds from their asset sale to invest in the transition, while a complementary clean energy facility would support renewable energy deployment.

Organization: Asian Development Bank

Status: Feasibility studies

Coal to Zero (C20)

Equity fund to acquire coal mines and retire them by 2040, with a portion of resources left in the ground, and some returns earmarked to support the just transition of workers

Organizations: Ausenco, Trafigura, Resource Capital Funds

Geography: TBD

Status: In development and seeking capitalization

Accelerating Coal Transition (ACT) Investment Program

Concessional financing to support reclaiming and repurposing of coal assets, the just transition, and the governance of the coal transition

Organization: Climate Investment Funds

Geography: Global

Status: To be launched

Exhibit ES3 **Five key principles to guide the design of financial mechanisms for the coal transition**

Just & Equitable
Fairly distribute the costs, risks, benefits, and upsides of the coal transition among key stakeholders

Additional
Support the transition of plants that otherwise would continue to operate in a manner inconsistent with climate and development goals

Managed
Prioritize, sequence, and accelerate the transition of coal plants in a way that maximizes societal benefits and minimizes harm

Transformational
Align with and support the enabling environments needed to achieve a low-carbon transition

Scalable
Be implementable at scale, enabling significant progress on 1.5°C efforts

4. **In this report, we propose five key principles to guide the design of credible financial mechanisms (see Exhibit ES3).** First, financial mechanisms should fairly distribute the costs, benefits, risks, and upsides of the coal transition to ensure **just and equitable** outcomes for key stakeholders—particularly the most vulnerable. Second, financial mechanisms should be **additional**, only supporting the transition of coal plants that otherwise would continue to operate in a manner inconsistent with climate or development goals. Third, financial mechanisms must support a **managed** transition, with careful consideration given to the speed, sequencing, and prioritization of coal phaseout. Fourth, financial mechanisms should foster **transformational** change, helping create the enabling environment needed to support the broader energy transition. At a minimum, this may require financial mechanisms to put in place redlines, for example, to ensure coal is not replaced by natural gas plants, which themselves may become stranded in the future. Finally, financial mechanisms should chart a pathway to **scalable** action, whether through private-sector scaling or by acting as an on-ramp to regulation.

5. **To help advance conversations about moving financial mechanisms from conceptual design to practice, we model the impacts of using different financial mechanisms to transition existing coal power plants.** Our analysis focuses on two example coal plants in an emerging market context with distinct ownership structures: a coal plant owned by a state-owned utility and a coal plant owned by an independent power producer (IPP) with a long-term PPA. Each faces unique barriers to the coal transition and has different costs of capital, both of which affect the outcomes of financial mechanisms. For each type of ownership structure, we explore a refinancing (or debt) mechanism and a managed transition vehicle.

   Our analysis, while high level, identifies several key design considerations and risks of implementing financial mechanisms.

   First, each of the financial mechanisms we assess results in benefits for nearly all public stakeholders compared with business-as-usual (BAU), in the form of subsidy savings to the government and taxpayers, emissions reductions, transition support for coal plant workers, and improved financial health of the utility. However, each mechanism entails different distributions of the costs and benefits

of replacing uneconomic coal with lower cost renewables. An understanding of these trade-offs, as well as the strategies to mitigate their risks, needs to be established at the outset of designing financial mechanisms.

Second, in our analysis, refinancing creates the greatest net benefits and will often be the first best option when considering financial support for the coal transition. However, refinancing may face practical constraints in transitioning both utility- and IPP-owned coal plants that would make a managed transition vehicle preferable. Specifically, in the case of the utility-owned coal plant, the utility may be unable to take on additional debt, and the near-term cash provided by a managed transition vehicle may provide greater benefit by supporting the utility's solvency—which will likely be central to the success of the energy transition in the country. In the case of the IPP-owned coal plant, the refinancing scenario we explore involves directly awarding a renewable PPA to the existing coal IPP. This direct awarding of contracts can undermine transparency and competitive processes for supporting renewable energy investment in the country.

> **Financial mechanisms can be a transformational tool in coal transition efforts—but only if implemented well.**

Third, the managed transition vehicle results in overall benefits compared with the BAU, particularly if the new ownership under the vehicle brings additional value through technical or financial capabilities that enable it to transition coal more effectively than the previous plant owner. In our analysis, simply using the vehicle to retire the coal plant early is challenging, creating either near-term spikes in the cost of generation or requiring a delay in the coal plant retirement compared with the refinancing case. However, different designs of the managed transition vehicle and its role—for example if it can take on greater risks, operate more efficiently, or deliver the same energy services as coal through clean generation—can make it an attractive option for supporting the transition of both utility- and IPP-owned coal plants.

This report aims to contribute to growing conversations about coal finance mechanisms, particularly as they move from concept to reality. RMI believes that financial mechanisms can be a transformational tool in coal transition efforts—but only if implemented well. Ultimately, the devil will be in the detail as to how financial mechanisms are designed and governed to meet the critical needs of all stakeholders and help deliver a rapid and smooth pathway to a climate-safe future.

Beyond Economics

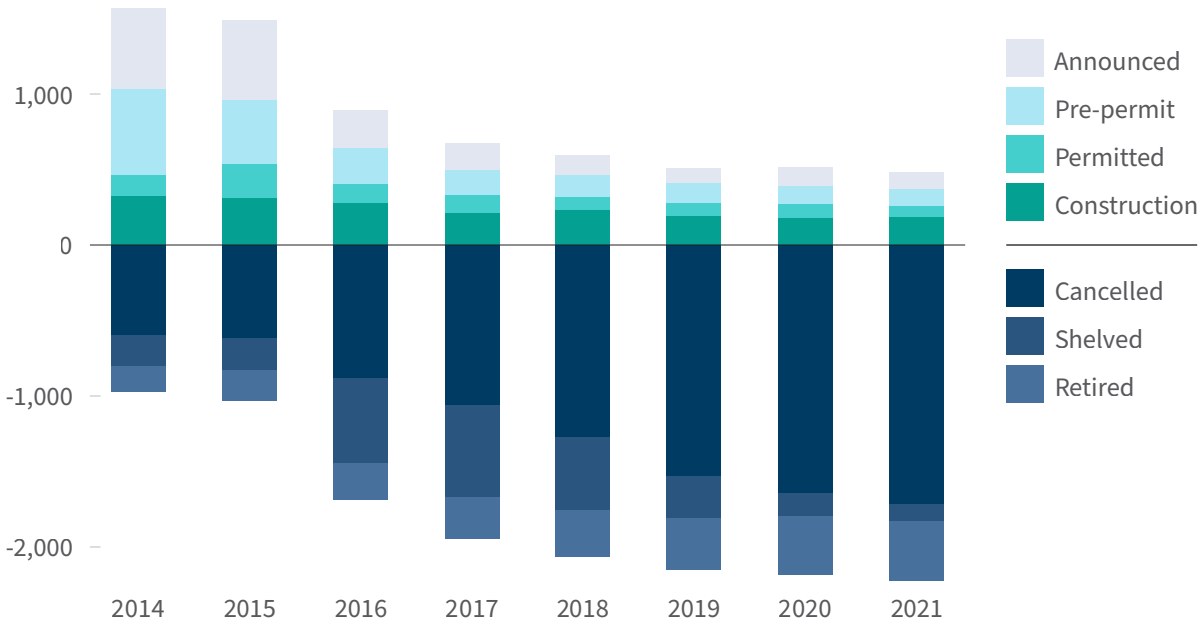
Why Coal Remains Resilient

The transition from coal to clean energy is gaining momentum, driven by economic, financial, and political forces. Coal demand peaked in 2013 in an environment of declining cost competitiveness compared with renewables and natural gas.[10] Facing both the falling economics of coal and rising shareholder pressure on climate issues, financial institutions have enacted investment and lending policies barring financial support for new coal projects. Meanwhile, power utilities and governments worldwide are increasingly committing to stop the construction of new coal power plants (see Exhibit 1), recognizing both their risks as well as the economic opportunities of a low-carbon future.[11] While these forces have helped slow the pipeline for new coal, achieving climate goals also requires the urgent transition of the *existing* coal fleet. In March 2021, the UN Secretary General cited coal phaseout as "the single most important step to get in line with the 1.5°C goal."[12, v]

Exhibit 1

Coal capacity by operating status: 2014–2021

Gigawatts (GW)

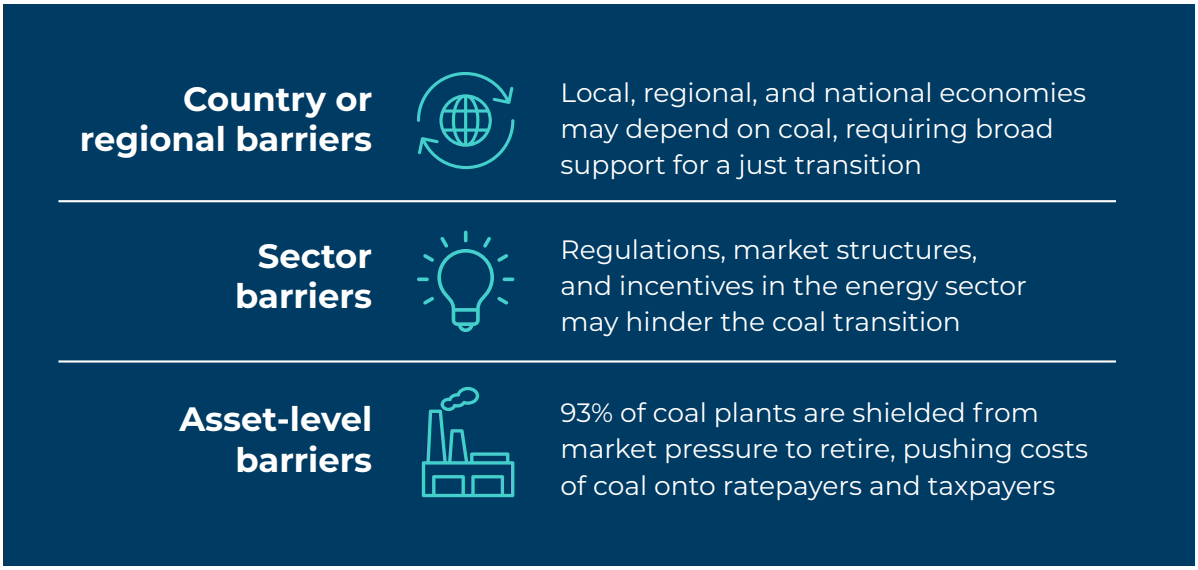


Source: Global Energy Monitor

v In order to avoid the worst impacts of climate change, we must limit average global temperature rise to 1.5°C compared with pre-industrial levels, which requires advanced economies to phase out coal by 2030 and the rest of the world to do so by 2040. In this report, coal phaseout refers to ending the use of unabated thermal coal for electricity generation.

Exhibit 2

Key barriers to the coal transition



Major barriers to coal phaseout mean that market forces alone will not achieve the transition at the pace required (see Exhibit 2).[13] These barriers include:

- **Country and regional barriers:** In some countries, coal is not only a source of energy, but also deeply entrenched within their political economy. Coal-producing countries may perceive coal as a core component of energy security, while their coal sectors may provide significant direct and indirect employment, sometimes supporting entire towns and cities. Coal may also contribute significantly to government revenues through taxation, royalties, or profits from state-owned coal mining or power companies, providing a means to reinvest in the economy or provide social safety nets. As a result, the coal transition can lead to far-reaching economic repercussions and deep impacts on concentrated populations, dampening political will for the coal transition. The lack of country-level coal transition commitments and plans in turn can hamper on-the-ground progress, even when solutions may be available.

- **Sector barriers:** Current energy sector technologies, regulations, and market structures may also hinder the transition to a low-carbon grid. From a technical standpoint, electricity systems may be poorly equipped to absorb high shares of variable renewable energy generation. Further, power market regulations and utility incentive structures may be outdated, creating disincentives for utilities to adapt to the changing technological and economic landscape. For example, vertically integrated monopoly utilities may block grid access to new renewables, whereas regulated electricity tariffs may stifle low-carbon innovations and investments. Governments may also subsidize coal as a strategic industry, distorting the cost competitiveness of cleaner alternatives while providing direct benefits to the coal industry.[14] All of these circumstances can create systemic sector-wide barriers to the energy transition.

- **Asset-level barriers:** An estimated 93% of coal plants operate in regulated or quasi-regulated energy markets, which shield them from competitive pressures that would lead to their retirement.[15]

In these non-liberalized markets, coal plants may be owned by a monopoly utility or, in some cases, an independent power producer (IPP).[vi] In the case of utility-owned plants, the utility may lack the financial means to decommission and replace its coal fleet or the technical expertise to develop new renewable generation—even if the coal transition would be more cost-effective for the utility in the long run.[16] The utility may also be able to (partially) pass through the costs of uneconomic coal to its customers, creating further inertia to the transition. In the case of IPP-owned coal plants, coal plant economics are protected by long-term PPAs that provide the owner guaranteed revenues. As a result, IPPs have no incentive to retire their plant before the end of their PPA contracts, which can have terms of 20 years or more. PPAs also carry financial penalties for the utility if terminated early, making it difficult for the utility to cancel PPA contracts whose terms are no longer attractive.

Due to these barriers, private-sector coal plant owners and their investors remain largely unaffected by changing economics, and instead pass on the cost of uneconomic coal to the public. In some regulated markets, utilities are allowed to build a predetermined return on investment into their electricity tariffs.[17] This gives utilities an incentive to ensure that plants operate to the end of their economic life, because the revenues utilities earn from electricity sales allow them to recover their initial investment and realize attractive financial returns. This cost-of-service regulation locks customers into paying for a coal plant even if it becomes cheaper to replace that plant with an alternative.[18] Even in markets where tariffs only allow utilities to recover their operating costs, the ability to pass costs on to customers eliminates any incentives to retire costly generation. As a result, electricity customers are often left footing the bill to keep uneconomic coal plants operational, to the detriment of the health of local communities and the climate.

In countries where electricity is subsidized, keeping uneconomic coal on utility balance sheets can worsen financial and technical challenges in the energy sector. In many markets with state-owned utilities, regulators set tariffs below the utility's full cost recovery.[vii] Although subsidizing electricity is intended to ensure electricity is affordable for households and to support domestic industry, it also strains the utility's financial health, often leading to underinvestment and poor quality of electricity supply.[19] Furthermore, the government, as the ultimate owner of the utility, may need to inject cash into the utility to keep it financially viable, creating an onus on government budgets and taxpayers.

In addition to bearing the burden of uneconomic coal today, the public also faces several risks if the coal transition is not managed effectively.[20] If a coal plant is forced to shutter unexpectedly, workers could be left vulnerable to loss of livelihoods, while local communities may face health and environmental impacts from sites that are not properly remediated. Unplanned closures can also result in defaults or bankruptcies of coal plant owners, and no opportunity for workers to claim support. At a macro level, widespread and unplanned closures in countries highly dependent on coal could not only pose energy security issues, but also cause major shocks to their financial sectors and investment climates, constraining their ability to mobilize the investments needed to support both economic stability and the long-term energy transition.[21]

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vi Many markets are partially liberalized, where a vertically integrated utility may act as a single buyer, procuring electricity from independent power producers alongside its own generation.

vii Cost recovery ranges from tariffs that fail to even cover a utility's operating costs (resulting in a loss-making entity) to full cost recovery. Full cost recovery entails recovery of both operating expenses and capital expenses for existing and future assets, allowing the utility to make the investments needed to ensure reliable electricity supply. In the absence of cost recovery, the government often must subsidize the utility to ensure it remains financially viable.

Financial Mechanisms

A Critical Part of the Coal Transition Toolkit

Over the past two decades, governments, citizens, and other organizations have developed a variety of measures to curtail investment in new coal and help utilities transition away from existing coal power. These measures include country-level commitments and plans to phase out coal, as well as regulations that internalize environmental costs and risks and require utilities to respond to the changing cost competitiveness of renewables.[22] More recently, legal actions requiring private corporations to meet climate goals and mitigate climate harm have started to shift risk in the fossil fuel industry.[23, viii] The development of financial mechanisms currently underway provides an additional opportunity to accelerate the transition in conjunction with effective policy and regulatory enforcement.

Financial mechanisms aim to align incentives of key stakeholders who stand to gain and lose from a coal transition. At their core, financial mechanisms unlock value trapped in coal—for example the value tied to contractual obligations to provide coal returns—retire these coal assets early, and distribute the unlocked value across public and private stakeholders, including workers, communities, governments, and coal plant owners, investors, and financiers. By creating sufficient incentives while mitigating costs and risks, financial mechanisms hold the potential to pragmatically build buy-in to accelerate the coal transition.

Though not a silver bullet, financial mechanisms can complement regulatory, legal, and advocacy efforts to achieve a faster, more ambitious, and just transition from coal. Here's how:

- **Financial mechanisms can kick start action today**. Regulatory solutions can lead to widespread impacts across a market. However, legislative processes take time and can face opposition from stakeholders who stand to lose from regulation.[24] Although financial mechanisms need country buy-in, they can lead to quicker action and progress in the near term because of their ability to *align* stakeholder interests. In turn, this progress can help drive political momentum for future regulatory action.[25]

- **Financial mechanisms can unlock greater clean energy ambition**. Financial mechanisms can create new sources of climate finance by ensuring that some of the value unlocked through the retirement of uneconomic coal is reinvested to support a just low-carbon transition. Financial mechanisms can also help maintain and even boost investor confidence in markets by targeting coal transition in a manner that does not undermine PPAs and financial obligations. These conditions will be key for deploying the solutions needed in the low-carbon transition.

- **Financial mechanisms can support a just transition**. While they must work in concert with policy and other just transition plans, financial mechanisms can mobilize private-sector and other previously untapped resources toward funding a just transition. For example, financial mechanisms can ensure sufficient capital has been allocated to support workers adversely affected by coal plant and mine

viii For example, a Dutch court recently ruled that oil major Shell must reduce its emissions as part of its responsibility to avoid dangerous climate change.

closures and to properly remediate closed sites. Such provisions may not occur if private investors are forced to shutter coal plants unexpectedly or if assets are simply sold to companies that lack the resources and incentives to manage a responsible closure.

However, financial mechanisms are not a replacement for effective policy. They must be coordinated with broader energy transition planning, particularly for enabling a just transition, and can even be used as an on-ramp to regulation. For example, Germany's coal phaseout policy offers hard coal plant owners the option of bidding in a reverse auction to receive compensation and realize (partial) capital recovery for early closure.[26] The competitive element of the auctions, which will operate for a limited number of years, helps keep closure costs low. Any hard coal plants still operational after the last auction will be forced to close without compensation under Germany's coal phaseout policy. Financial mechanisms can also be used to test potential modalities and approaches that can eventually be scaled or used to inform energy transition strategies in both developed and developing countries.

Finally—and most critically—financial mechanisms must be designed with proper safeguards in place to ensure they truly contribute to a just low-carbon transition. Financial mechanisms should not serve simply to buy out coal owners and their investors. They must address real barriers to the coal transition, ensure the ultimate closure of plants, and reduce risks to and provide benefits for populations and the climate. With financial mechanisms gaining attention, getting their design right will be critical to their credibility and contribution to the global coal transition.

Financial Mechanisms in Practice

Mounting interest in the potential of financial mechanisms to support the coal transition has led to a proliferation of initiatives and approaches. This section takes stock of these initiatives, drawing out their key principles and mechanics. This overview is based on information available as of September 2021. As many of these efforts are in early or conceptual stages, we expect these mechanisms to evolve as they mature.

The current landscape of financial mechanisms can be grouped into four types: refinancing, managed transition vehicles, compensation, and broad transition support (see Exhibit 3). Note that these are simplified mechanism types. In reality, financial mechanisms often include components of or hybridizations across multiple types.

Refinancing involves providing the owner of a coal asset with low-cost debt, which it can use to fund a variety of transition activities, such as decommissioning the coal plant, investing in clean energy or grid improvements, and supporting the just transition of workers. Although the coal plant owner must repay this debt over time, the debt's interest rate is lower than the owner's original cost of capital, freeing up value that can be shared across key stakeholders. The two most prevalent refinancing mechanisms for the coal transition are ratepayer-backed bond securitization (also referred to as securitization) and the proposed Just Transition Transaction.

- **Securitization** (Status: Implementation) supports the early retirement and replacement of coal plants in regulated US utility markets where utilities are allowed to build a fair return on investment into customers' electricity tariffs. (See "A deeper look: Designing ratepayer-backed bond securitization in the United States," page 25.) In a growing number of US states, regulators allow utilities to issue securitization bonds whose proceeds finance capital recovery for coal plants, enabling utilities to retire plants early and reinvest in cleaner and cheaper generation (see Exhibit 4).[ix] In doing so, securitization refinances the customers' obligation to provide the utility a "fair return" on its coal plant with an obligation to repay a much lower interest rate bond, resulting in overall savings for electricity customers. Securitization achieves a low interest rate due to the high certainty of repayment of the bond, as utilities can include a surcharge on customers' electricity bills to pay back the debt. Proceeds from securitization bonds can also be used to support a just transition for workers and communities. When structured effectively, securitization can reduce customers' electricity costs, compensate coal plant workers, and allow utilities to replace their coal returns with clean returns.

ix A securitization bond can also fund other obligations that may prevent a utility from retiring the plant. For example, a coal plant owner may need to buy out long-term coal supply agreements or repay asset-level debt.

Exhibit 3 **Landscape of existing financial mechanisms for the coal transition**

Primary mechanism type:

Refinancing | Managed transition vehicle | Compensation | Broad transition support

Ratepayer-Backed Bond Securitization

Refinancing regulated utility coal-fired assets using bonds backed by surcharges on ratepayers' energy bills

Status: Implementation

German Coal Phaseout

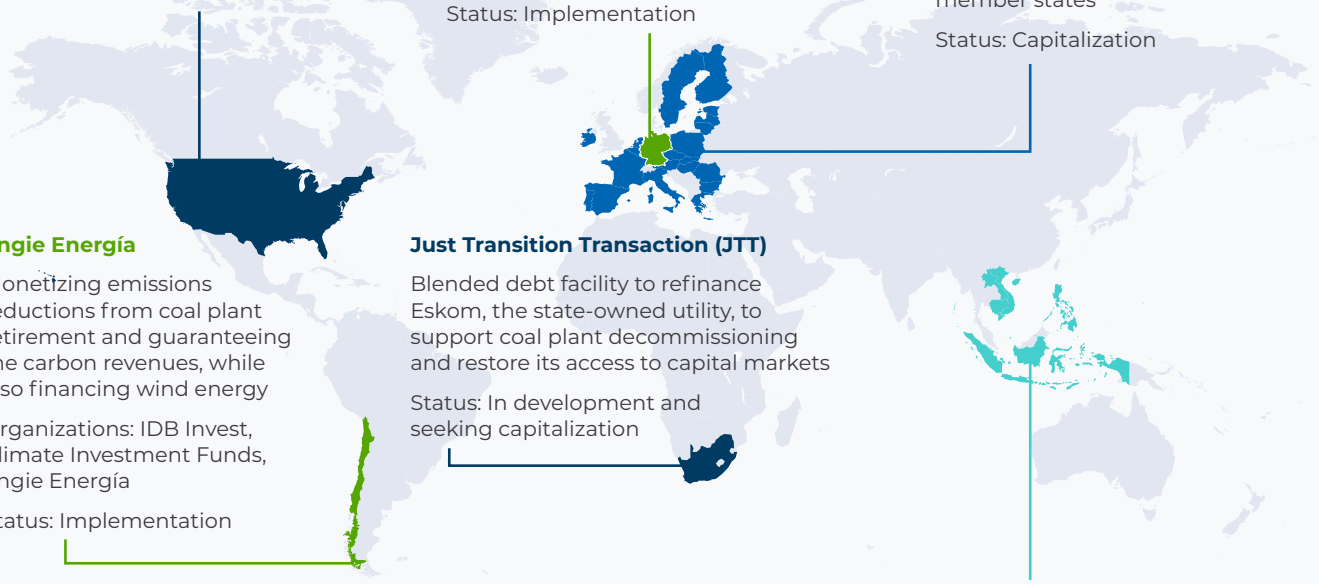
Competitive auctions to compensate coal plant owners for the early retirement of plants, implemented alongside policy and financial support for the just transition

Status: Implementation

EU Just Transition Mechanism (JTM)

Three-part fund that supports the just transition, including economic diversification, infrastructure assets, and repurposing of assets in EU member states

Status: Capitalization



Engie Energía

Monetizing emissions reductions from coal plant retirement and guaranteeing the carbon revenues, while also financing wind energy

Organizations: IDB Invest, Climate Investment Funds, Engie Energía

Status: Implementation

Just Transition Transaction (JTT)

Blended debt facility to refinance Eskom, the state-owned utility, to support coal plant decommissioning and restore its access to capital markets

Status: In development and seeking capitalization

Coal to Zero (C20)

Equity fund to acquire coal mines and retire them by 2040, with a portion of resources left in the ground, and some returns earmarked to support the just transition of workers

Organizations: Ausenco, Trafigura, Resource Capital Funds

Geography: TBD

Status: In development and seeking capitalization

Accelerating Coal Transition (ACT) Investment Program

Concessional financing to support reclaiming and repurposing of coal assets, the just transition, and the governance of the coal transition

Organization: Climate Investment Funds

Geography: Global

Status: To be launched

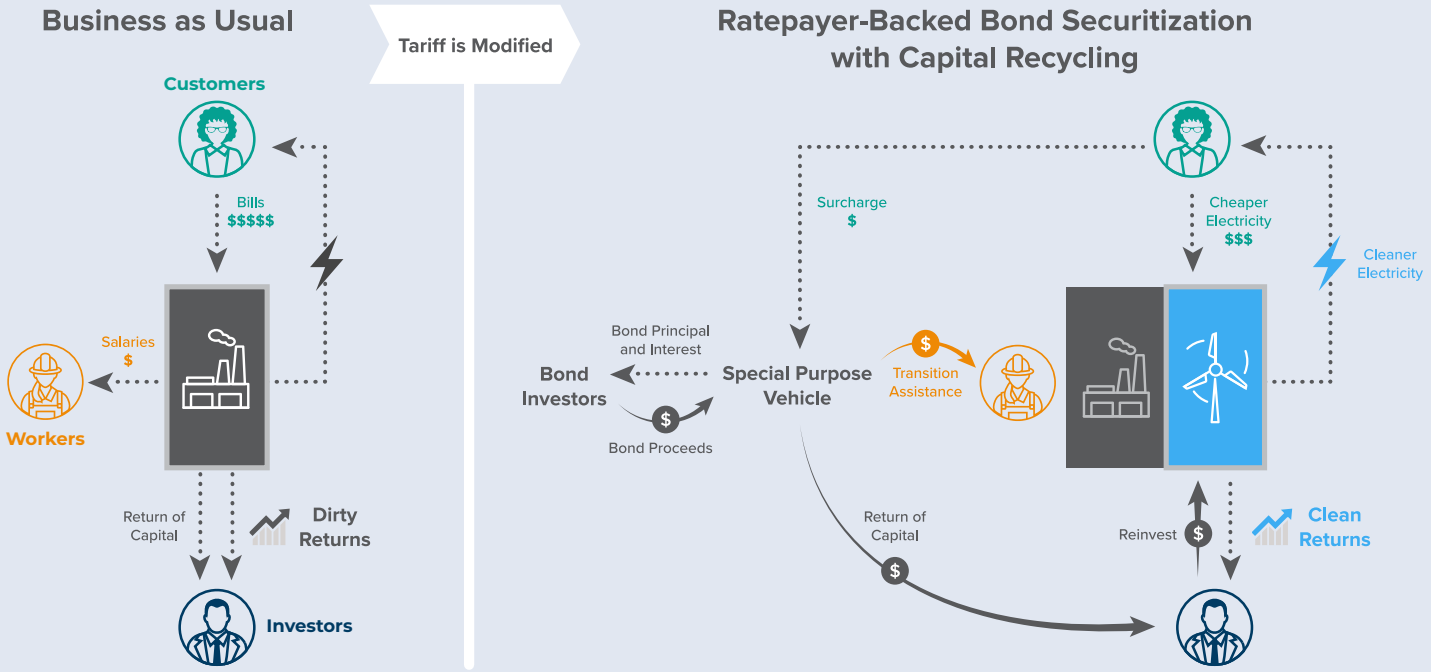
Energy Transition Mechanism (ETM)

Blended finance facility to acquire coal power assets and retire them earlier than the plant's previously expected lifetime, while providing enough time to build up renewables and support a just transition. Coal plant operators use funds from their asset sale to invest in the transition, while a complementary clean energy facility would support renewable energy deployment.

Organization: Asian Development Bank

Status: Feasibility studies

Exhibit 4 Ratepayer-backed bond securitization



Source: RMI, *How to Retire Early: Making Accelerated Coal Phaseout Feasible and Just*, 2020

- The **Just Transition Transaction (JTT)** (Status: In Development and Seeking Capitalization) is a proposed, long-term $12 billion blended debt facility to refinance Eskom, the state-owned utility in South Africa.[27,x] The JTT is a corporate-level debt facility that targets several challenges stemming from Eskom's financial situation. Eskom is increasingly unable to meet its debt obligations, affecting the company's ability to access capital and in turn maintain reliable electricity supply. Eskom's unsustainable debt also creates challenges for the Government of South Africa, which has provided substantial loan guarantees for Eskom.[28] The JTT would allow Eskom to accelerate retirement of its coal fleet—which includes several older and inefficient plants—by funding decommissioning costs as well as renewable replacement energy. In addition, it would keep Eskom solvent as it transitions, restoring its access to traditional capital markets and helping mitigate some of the risk associated with Eskom on the government's balance sheet. Providing the utility access to the finance it needs to invest in the transition (e.g., in renewables and grid improvements) contributes to Eskom's longer-term financial sustainability and supports South Africa's growing energy needs. Alongside the debt provided to Eskom, the JTT includes grants for the just transition of South Africa's main coal-producing region. President Cyril Ramaphosa announced the JTT in 2019, and its final design and structure are still under development.[29]

x Initiatives in development are those whose design is still being finalized. These initiatives may still be seeking capitalization even as the final design has not been established.

Managed transition vehicles involve the creation of an investment vehicle that purchases a coal asset with the explicit purpose of retiring it. Provided the investment vehicle has a lower cost of capital than the previous owner and/or can purchase the asset at a discount, it will be able to operate the coal asset for a specified time, realize the necessary returns to repay its investors, and retire the asset earlier than its original expected end of life. Managed transition vehicles also offer the potential benefit that a new owner possesses technical or financial capabilities that facilitate the coal transition. This could simply mean having the resources to decommission coal assets responsibly, or it could entail more complex capabilities. For example, in acquiring a coal asset and its PPA rights, a new owner could choose to deliver the same energy services under the PPA contract using cheaper and cleaner alternatives. Managed transition vehicles could also indirectly support the transition and financial health of the original coal asset owner by transferring coal-related risks off the original owner's balance sheet. Two proposed managed transition vehicles are Coal to Zero and the Energy Transition Mechanism.

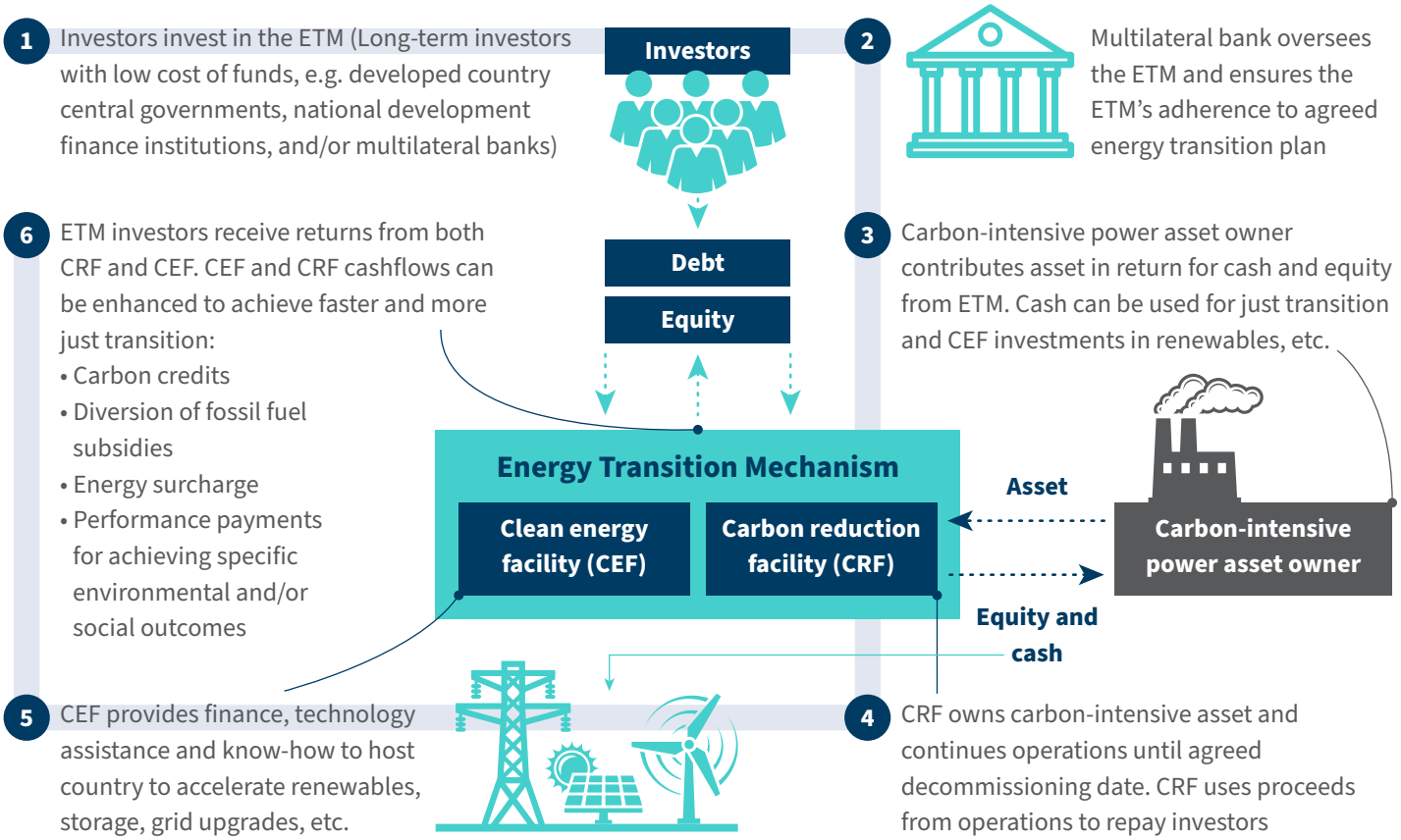
- **Coal to Zero (C20)** (Status: In Development and Seeking Capitalization) is a private-sector-led initiative proposed by Ausenco, Trafigura, and Resource Capital Funds that aims to purchase coal mines in safe mining jurisdictions.[30] C20 will operate these mines to provide returns to investors, with a promise to close the mines and properly remediate the sites by 2040—before the end of their mineable lives. While operating the coal mines for profit, C20 has pledged it will not reinvest in the mines to expand their production or extend their lifetimes. All returns will be provided to investors or earmarked to support a just transition, including coal miner transition assistance, creation of employment opportunities in affected regions, and replacement and repurposing of coal mining sites. C20 is distinct among the other initiatives surveyed here both because it is a purely private-sector initiative and because it targets coal mines rather than coal power plants. Although responsible closure of mines is critical to the coal transition, closing a coal mine does not always result in direct emissions reductions because other mines may replace the lost production.

- The **Energy Transition Mechanism (ETM)** (Status: Feasibility studies), proposed by Donald Kanak at Prudential plc, is a public–private finance vehicle that aims to achieve the dual objectives of significantly reducing carbon dioxide (CO_2) emissions through accelerated retirement of coal power plants in developing countries while simultaneously boosting the growth of renewable energy through an equitable, scalable, and market-based approach. At full scale, the ETM aims to materially reduce coal generation capacity in each target country (e.g., by 50%), consistent with the nationally determined contributions of the country under the Paris Agreement. The ETM would use blended finance sourced from governments, development financial institutions (DFIs), and the broader financial sector to support a developing country's coal transition and broader post-COVID green recovery (see Exhibit 5).

  One component of the ETM will be the creation of a Carbon Reduction Facility that will purchase coal power plants to operate and retire ahead of their original expected lifetime, according to a transition plan agreed upon with the host country. The ETM's lower cost of capital will allow it to utilize the plant's cash flows to repay debt and equity investors faster than an owner with a higher cost of capital, enabling the ETM to accelerate the plant's retirement.[31] The duration of the transition period will also be linked to the time needed to implement a just transition plan and build renewable energy sources in the country. The ETM also proposes the creation of a Clean Energy Facility to support investments in clean energy and storage, and to assist with technology transfer for transmission and distribution. The Asian Development Bank (ADB) has been exploring the feasibility of this mechanism, with a near-term focus on three Southeast Asian countries: Indonesia, the Philippines, and Vietnam.[32]

Exhibit 5 Energy Transition Mechanism conceptual diagram[33]

Based on agreements with national governments and energy authorities, consistent with Nationally Determined Contributions, an ETM is established for a given country, with a target of transitioning a large amount of carbon intensive power, e.g. ~50% of current coal-fired capacity by 2035



Source: Donald Kanak and Casey Ho, Prudential plc

Compensation schemes provide payments to coal plant owners to compensate them for revenues lost when their assets are retired early. This mechanism effectively reduces the tenor of returns to zero, paying out guaranteed up-front revenues. As a result, coal plants can likely be retired at a lower cost than if they had operated to the end of their useful life. Although compensation schemes could be financed domestically through taxpayer revenues or carbon markets, they could also be provided as part of developed countries' obligation to provide climate finance to developing countries to support their mitigation efforts. Germany's coal phaseout policy and Engie Energía in Chile have both utilized compensation to support their coal phaseout goals.[xi] In both cases, the mechanism transferred the cost of uneconomic coal from customers and coal plant owners to public funders.

xi Other jurisdictions, such as Alberta, Canada, or the Netherlands, have also provided compensation for early coal plant closure. However, we highlight Germany's hard coal transition and Engie in Chile to illustrate more innovative compensation approaches, namely competitive tendering and results-based finance.

- Germany's **Act to Reduce and End Coal-Fired Power Generation** (Status: Implementation) is the country's framework to realize its commitment to phase out coal power by 2038.[34] The policy is broad and includes support for the structural transformation of German mining regions as well as compensation payments to coal plant owners. While the German government will compensate and close lignite plants in line with contractual agreements negotiated with operators, hard coal plants will close under a reverse auction system. Hard coal plant owners can participate in voluntary auctions, where they submit bids for the compensation price required to retire their plant. The German government will reduce the maximum compensation amount in subsequent auction rounds to create incentives for earlier retirement. Any plants remaining after the last auction in 2027 will be mandated to close without compensation.

  Although the concept of compensation is not new, the German model is innovative in its use of competitive tendering. Competitive tendering with a reducing ladder of incentives encourages acceleration of coal plant closures and helps minimize the cost of coal plant closures to the German government and taxpayers. The first two auction rounds were both oversubscribed, contracting the closure of around 4.5 GW of coal capacity for well below the maximum compensation prices.[35] The third round, in July 2021, was undersubscribed, yet still awarded contracts for closing 2.1 GW of capacity and achieved an average price below the maximum.[36]

- **Engie Energía Chile** (Status: Implementation), together with IDB Invest and the Climate Investment Funds (CIF), is piloting a financial instrument that monetizes the emissions reductions achieved through the early closure of its coal plants.[37] Under the scheme, Engie receives compensation in the form of results-based public finance, or carbon finance, from the CIF's Clean Technology Fund (CTF). Currently, the CTF effectively provides Engie a minimum carbon price guarantee for its emissions reductions and builds this value in as a reduction in the interest rate of its loan to the utility, allowing Engie to retire its coal plants before their end of life.[38] If in the future Chile develops a carbon market, Engie could receive revenues from the market, rather than the CTF. As part of the financing package, IDB Invest also provided Engie a loan to develop a wind farm in northern Chile. The project was approved in May 2020 and is under implementation.

Finally, **broad transition support** packages place a greater focus on creating the structural changes and enabling conditions to support low-carbon transition. While these packages earmark funding to support coal asset retirement or repurposing, they also channel funding to broader activities, such as investment in low-carbon infrastructure, economic diversification, and the governance of the transition. Two multicountry initiatives offering such support are the EU Just Transition Mechanism and the CIF's Accelerating Coal Transition Investment Program.

- **The EU Just Transition Mechanism (JTM)** (Status: Capitalization) is a multipronged, €29 billion policy package to support the coal transition in EU coal regions.[39] Financed by EU member states but intended to mobilize additional sources of finance, the JTM includes three pillars. First, the Just Transition Fund provides mostly grant-based funding to support broad economic diversification in member states, for example supporting small- to medium-sized enterprises, R&D, and the upskilling and retraining of workers, and notably excludes financial support for natural gas. Second, a scheme under InvestEU aims to mobilize private-sector investment in low-carbon infrastructure and the just transition. Third, a public-sector loan facility provided by the European Investment Bank supports public-sector investments in both low-carbon and social infrastructure. The European Parliament and Council reached political agreement on the JTM's three pillars in spring 2021, with final approval slated for the second half of the year.[40]

- The CIF's **Accelerating Coal Transition (ACT) Investment Program** (Status: To Be Launched) is a global initiative to support the transition of major coal-producing and coal-consuming countries.[41] Alongside funding from partner multilateral development banks (MDBs), the CIF will provide grants, loans, guarantees, and other concessional finance for three areas. First, it will support countries to develop country-level strategies for implementing the coal transition, including engagement, communication, and creation of social and economic development plans. Second, it will provide transition support for people and communities directly (e.g., layoff support) and through programmatic approaches (e.g., retraining) and economic diversification. Finally, it will address land and infrastructure aspects of the coal transition through reclaiming and repurposing coal infrastructure. The CIF's committee endorsed the ACT investment program in March 2021 and the G7 endorsed the program in June 2021.[42]

Though differing in their approaches, financial mechanisms typically include three key activities: (1) refinancing the obligation of customers and taxpayers to continue to pay for uneconomic coal, with the aim to unlock value and enable the transition from coal to clean (see "The basics: How refinancing supports the coal transition," next page); (2) investing in low-carbon solutions;[xii] and (3) supporting the just transition of workers and communities. These activities can be targeted appropriately to address the unique country-, sector-, and asset-level barriers to the coal transition in a specific context.

xii This could include investing in replacement generation, other low-carbon or enabling infrastructure, or even supporting biodiversity through land reclamation after asset retirement.

The basics: How refinancing supports the coal transition

Many of the financial mechanisms we surveyed follow the same underlying principle: refinancing the obligation to provide returns to coal asset owners and investors to accelerate the coal transition. Here, we explain the basics of how refinancing supports the coal transition, recognizing that in reality, the mechanisms will be more complex.

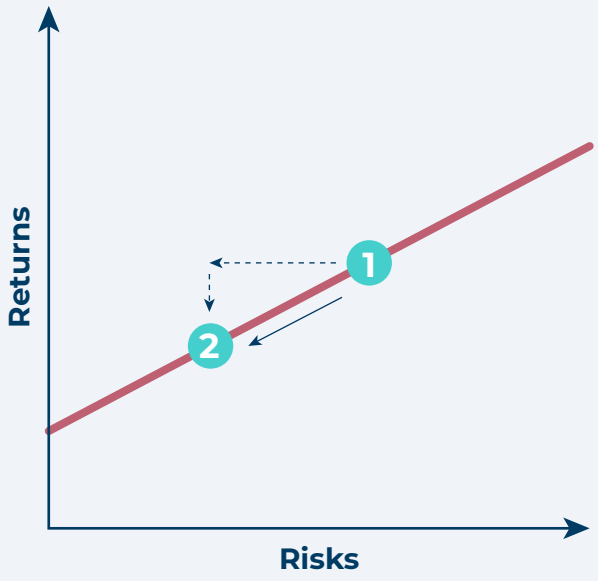
For an investment to be attractive, an investor will expect a certain level of returns given a certain level of risk (see Exhibit 6). In the case of many coal power plants, returns are provided by PPAs or regulated tariffs, or partially supported through government subsidies. In all three scenarios, the obligation to pay for uneconomic coal is ultimately passed on to customers and taxpayers. Financial mechanisms refinance this obligation, decreasing the total returns required over the coal plant's remaining life. This enables the early retirement of coal and creates overall savings for customers and taxpayers, who no longer need to pay for uneconomic coal. Refinancing also can free up capital for the utility, which can invest some of this unlocked value in low-carbon solutions and a just transition.

Several strategies support refinancing:

- Shortening the expected time period, or tenor, over which returns will be received helps reduce the risk associated with future uncertainties. This strategy is deployed in compensation schemes, for example, where the tenor is reduced to zero.
- Ringfencing revenues, or designating that certain cash flows will be used solely to repay investors, as is done with the customer surcharges in securitization.
- Portfolio effects, or pooling assets with different underlying risk drivers, can be an effective de-risking tool, much like investing in an index fund rather than a single stock. As an example, securitization provides de-risking by pooling payments across customers.
- De-risking instruments, such as loan guarantees or political risk insurance, can also reduce specific risks.
- Concessional finance from public finance institutions can reduce return requirements, as these institutions may expect a lower return for a given level of risk. This is the case in the ETM, for example.[xiii]

Exhibit 6

How refinancing can unlock value and enable early coal plant retirement



1 Decreasing risk by

- Reducing tenor
- Ringfencing revenues
- Portfolio effects
- Guarantees
- Concessional finance

2 Lowers required returns

- Enabling faster realization of necessary returns, leading to early retirement of coal
- Resulting in savings for stakeholders that would have provided the coal plant revenues (e.g., electricity customers)

xiii Concessional finance is offered below commercial rates and often has lower rates, longer tenors, and/or a more attractive grace period.

Financial mechanisms also carry several risks of their own, and therefore must be designed carefully. Most mechanisms involve providing sufficient incentives, or capital recovery, to coal plant owners, while distributing the costs and benefits of coal plant retirement to key stakeholders. However, defining what constitutes "sufficient incentives" suffers from inherent challenges stemming from information asymmetries and the political and market power of coal asset owners. There is a risk that coal asset owners will exploit these challenges to game financial mechanisms and extract excessive profits from the coal transition.

Consequently, each financial mechanism has potential moral hazard, efficiency, and equity risks. Moral hazard could pose an issue if financial mechanisms encourage continued investment in or operation of coal. To avoid moral hazard, financial mechanisms must create incentives for coal asset owners and countries to ultimately transition away from coal. Efficiency risks include aspects such as avoiding overpayment or overuse of public finance to plants that would otherwise have retired. While financial mechanisms should support a more rapid and just transition of coal assets, determining the business-as-usual (BAU) retirement date of a plant is often difficult, creating risks that financial mechanisms will support plants that would have retired regardless.

Finally, equity risks relate to how costs and benefits are shared across stakeholders and ensuring sufficient support for the most vulnerable groups. In particular, while providing a risk-adjusted return is necessary for the feasibility and scale-up of financial mechanisms, mechanisms should be designed to avoid excessive rents to coal asset owners and investors. Instead, they should build in safeguards to ensure upsides are shared with the public. Transparency about how such benefits are distributed will be a key element to ensure the credibility of mechanisms. We discuss these issues further when proposing core principles for financial mechanisms in *Core Principles to Guide the Design of Financial Mechanisms*.

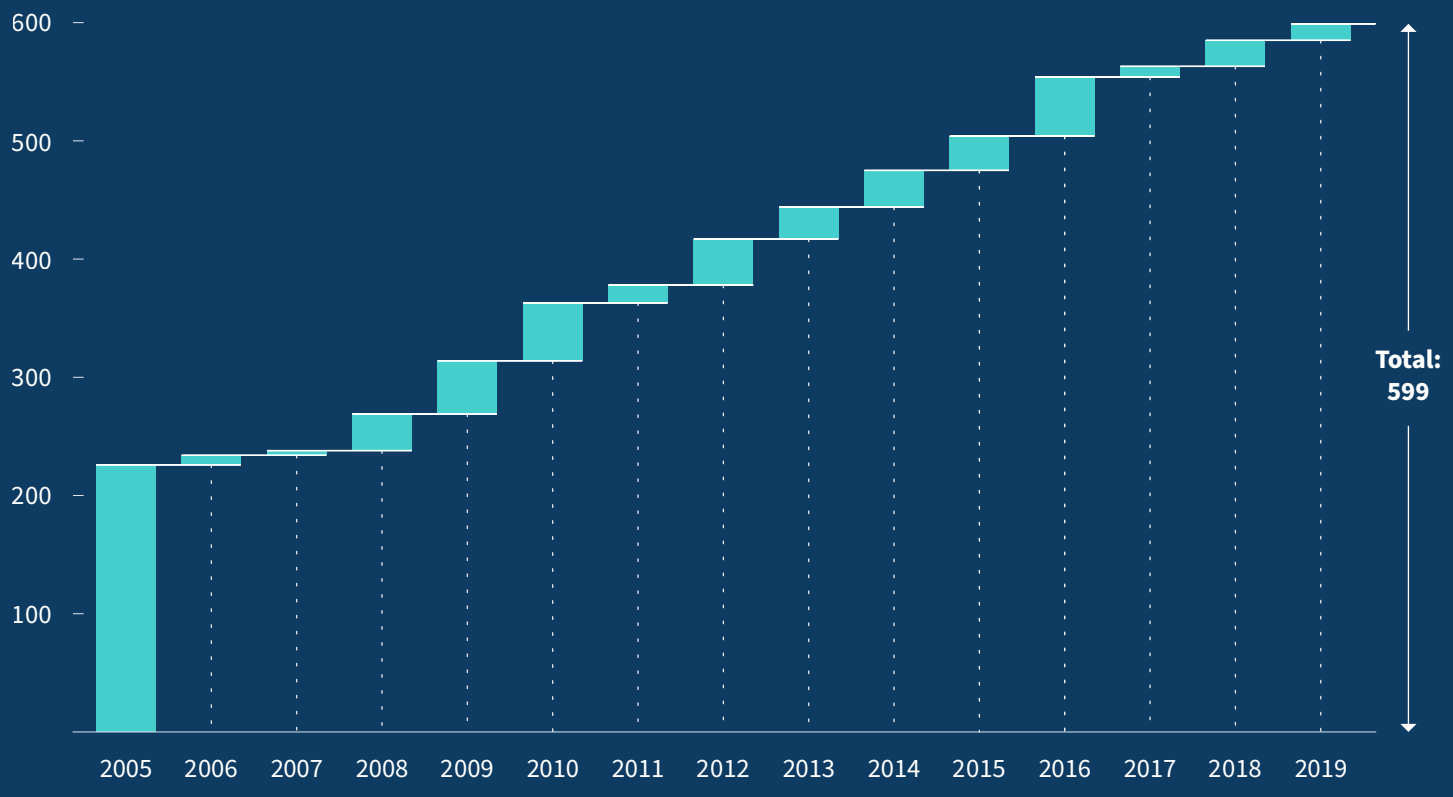
A deeper look: Designing ratepayer-backed bond securitization in the United States

In the United States, renewables and energy storage are quickly becoming the most cost-effective source of power generation. Today, 79% of existing coal plants in the United States are more expensive than renewables and battery storage, and this number will increase to 83% by 2025.[43] With coal economics falling, momentum behind the coal transition has been building, creating benefits for both the climate and energy customer. Since 2005, CO_2 emissions from US coal plants have nearly halved, while phasing out uneconomic coal can save customers over $9 billion per year.[44]

However, 61% of coal plants are owned by regulated utilities, which are shielded from competitive pressure.[45] Regulation in the United States allows these utilities to build a fair return on their investments into electricity tariffs. This cost-of-service regulation limits the utility's financial incentives to retire coal plants, even when they are no longer cost competitive. Although regulated utilities have made some progress in phasing out their coal fleets, stricter environmental regulations have often caused these utilities to sink greater investments into coal (e.g., in scrubbers)—passing on even higher costs to customers. From 2005 to 2019, regulated utilities increased the per watt value of steam assets on their balance sheets by over 150% (see Exhibit 7).[46, xiv]

Exhibit 7 **US utilities' net book value of steam assets: 2005–2019**

Million US$/Gigawatt (GW)



Source: The Utility Transition Hub

xiv Steam assets predominantly refer to coal power plants but include some coal plants that have been retrofitted into natural gas plants with steam turbines.

Customers and coal plant communities bear the largest costs and risks of uneconomic coal. Under BAU, customers must shoulder the costs of uneconomic coal plants. At the same time, customers and communities would face risks if the utility were forced to accelerate coal phaseout. Under traditional regulatory structures, the utility may simply accelerate cost recovery over a shorter period, creating near-term increases in electricity prices. While regulators could force utilities to shut down coal without cost recovery, the negative impact on utilities' credit ratings could increase customer costs in the long run. Coal plant communities are also vulnerable in a rapid, unmanaged transition, including through direct economic and fiscal impacts on plant owners, employees, and local financing, and indirect impacts on economic activities in affected regions.

Securitization has emerged as a promising financial tool to address these challenges, creating sufficient incentives and safeguards to accelerate coal phaseout. As explained earlier in this report, securitization refinances the customer obligation to provide the utility's expected return—typically around 7%—with a low-cost bond repaid through surcharges on customers' electricity bills.[47] The bond proceeds can be used by the utility to reinvest in renewable energy and to provide community transition assistance. In this way, securitization offers a win-win-win for utilities, customers, and communities. For utilities, securitization enables recovery of their initial coal investment while providing the opportunity to realize cleaner, and typically less risky, returns. For customers, securitization can lower electricity bills, mitigate the risk of rate shock, and provide cleaner sources of energy. Finally, for communities, securitization can provide transition assistance for affected workers.

Securitization is garnering attention as a critical tool in the US coal transition. To date, 13 states have authorized or passed legislation enabling the use of securitization for coal retirement, and over $1.5 billion in securitization transactions have been approved or issued. Here, we describe one specific securitization transaction in New Mexico, diving into both its mechanics and how it enables a more equitable and just coal transition.

An equitable coal transition for New Mexico: Securitization of the San Juan coal plant

Securitization is a core element of New Mexico's Energy Transition Act (ETA). The ETA, passed in 2019, created statewide renewable energy targets, authorized the use of securitization for coal phaseout, and stipulated the provision of transition support for affected communities.[48] Under this legislation, the Public Service Company of New Mexico (PNM), New Mexico's largest utility, was approved for a $361 million securitization bond to support the retirement and replacement of the San Juan coal plant with a portfolio of clean energy. The 924 MW coal plant will be replaced by 650 MW of solar, 300 MW of storage, and 24 MW of additional demand response.[49]

The securitization bond enables the plant to be retired 31 years before its expected end of life, which had been extended due to plant investments.[50] In addition to supporting coal plant decommissioning, the bond earmarks funding for the responsible reclamation of the coal mine that supplies the plant (see table, next page).[51]

The design of the securitization bond takes equity into consideration. In determining the bond tenor of 25 years, PNM notes that "the duration of the recovery period involves balancing factors of rate impact and intergenerational equity," given that longer tenors tend to lower costs for customers, but can raise equity questions as future generations are left to pay for the bond.[52] PNM also customized securitization surcharge rates for different customer classes, with customers who use less electricity—and tend to have lower household incomes—paying a lower surcharge.[53] Despite the additional surcharge to repay the bond, PNM estimates that securitization can result in net yearly customer savings of $80 million, with greater proportional savings for customers who use less electricity per month.[54]

Terms of securitization refinancing	
Approved amount	$361 million
Bond components	• Undepreciated investment: $283 million • Up-front financing costs: $8.7 million • Coal mine reclamation costs: $9.4 million • Plant decommissioning costs: $19.2 million • Severance and job training costs: $20 million • State administered energy transition funds: $19.8 million
Proposed bond tenor	25 years
Required bond rating	AAA rating or equivalent (currently yields are around 2.5% compared with PNM's regulated rate of return of 7.23%)
Expected issuance date	Shortly after July 1, 2022 (scheduled retirement date)
Estimated securitization surcharge	• $1.90 per month for residential customers using less than 900 kWh per month • $4.97 per month for residential customers using more than 900 kWh per month
Average estimated customer savings due to securitization	• $6.87 per month on a $73.25 monthly bill for residential customers using less than 600 kWh per month • $9.65 per month on a $129.03 monthly bill for residential customers using more than 1,000 kWh per month

The securitization bond also supports the just transition for communities, providing $19.8 million to three state energy transition funds, including $1.8 million for the Indian Affairs fund, $5.9 million for the Economic Development Assistance fund, and $12.1 million for the Displaced Worker Assistance fund. The funds will be administered by state departments, which will help create community advisory committees and engage with affected communities on the use of the funds.[55] The bond also allows PNM to provide a maximum of $20 million for severance and job training to employees affected by the retirement of the San Juan coal plant and mine, including around $10.4 million for severance and $1.3 million for job training for coal plant workers, and $7.4 million for severance and $1.5 million for job training for coal mine workers.

What can we learn from the US experience?

In some ways, securitization is tailored to the unique market and regulatory situation in the United States, especially its cost-of-service regulation. Securitization also requires enabling legislation to authorize the securitization surcharge on customer bills, and often is not viable in the absence of low-cost renewables enabled by the US renewable energy investment tax credit. As a result, securitization likely cannot be applied directly in other contexts, particularly in countries where local bond markets are underdeveloped and overseas bond markets are inaccessible.

However, the San Juan securitization does offer two insights. First, it illustrates the potential value that can be unlocked through refinancing and how this value can be redistributed to ensure all stakeholders benefit. Second, it underscores the importance of equity considerations in the design of financial mechanisms. Costs and benefits of the coal retirement and replacement should be borne equitably across affected stakeholders, while coal workers and communities should be appropriately supported in the coal transition.

The Global Coal Transition

A Critical Role for Public Finance

The coal transition has been accelerating in advanced economies, where competitive electricity markets are more common and coal phaseout solutions, like securitization, are already being used. However, nearly three-quarters of the global coal capacity sits in developing and emerging economies, where solutions are still in development.[56, xv] In these markets, financial mechanisms led by public institutions, such as the CIF's ACT Investment Program and the ETM, are likely to play an important role in financing and setting the terms for the coal transition. Here we examine the role of public finance institutions in international energy finance and the opportunities for these institutions to catalyze a more rapid and just coal transition.

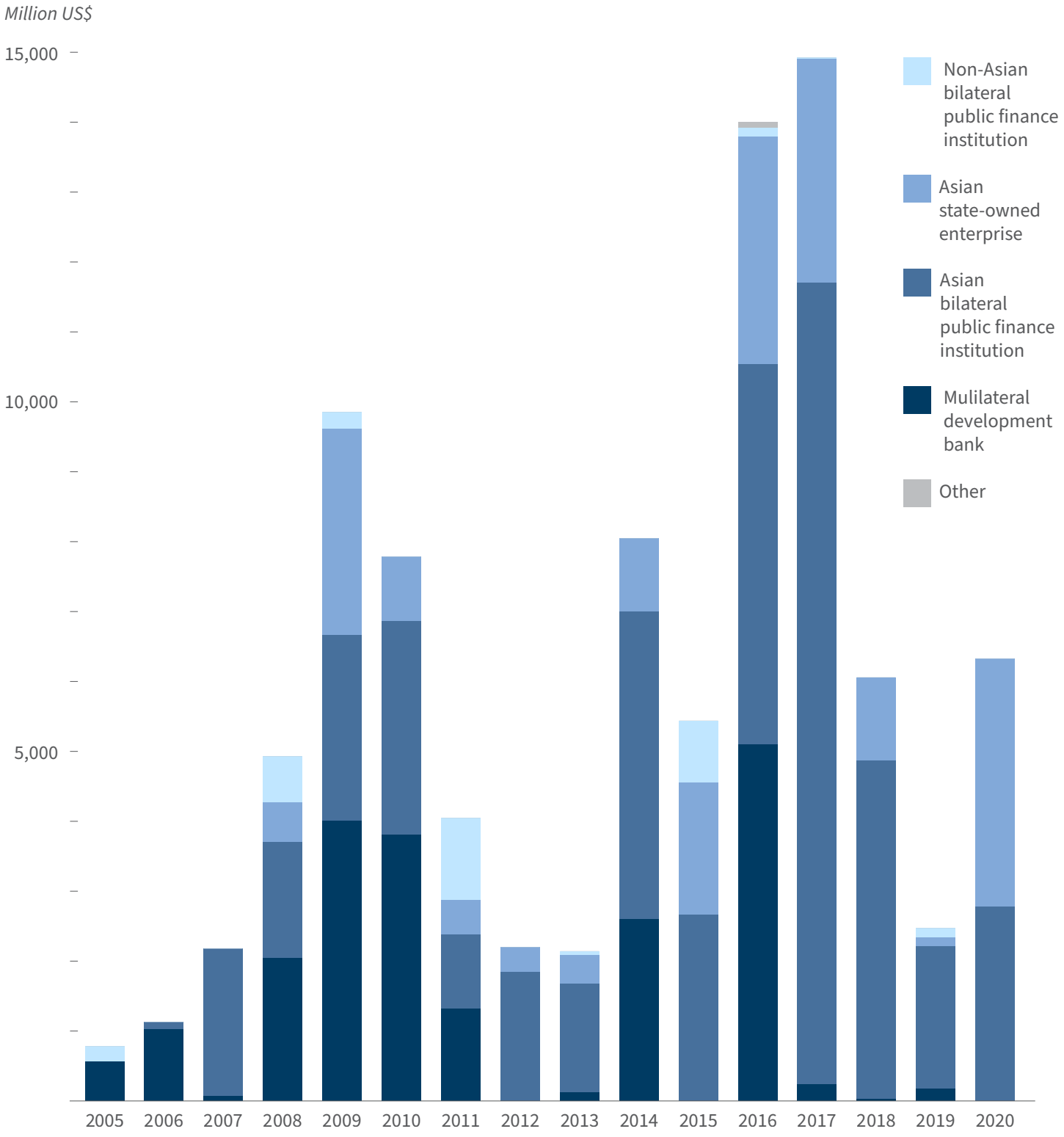
Historically, international public financial institutions, including MDBs, export credit agencies (ECAs), and other bilateral DFIs, have played a key role in expanding energy services in developing and emerging markets. Their ability to understand and mitigate risk and, for some, provide concessional finance can be critical to mobilizing investments in energy infrastructure in markets perceived as risky. Beyond their direct financing, these institutions can often work with governments and other stakeholders, through technical assistance or development policy lending, to help create an enabling environment for scaling private investment in energy projects.

Although in recent years these institutions have channeled significant investments to renewable energy, over their history, they have also provided billions in financing to coal power. Since 2005, public finance has provided over $283 billion in support for renewable generation in developing and emerging markets.[57] Yet, over the same period, these institutions also committed over $92 billion in international financing to coal power projects, helping enable around 9% of the coal capacity in the past 15 years (see Exhibit 8).[58] Prior to around 2012, MDBs were some of the largest public funders of coal power, and they remain the second largest funder of coal overall. In more recent years, however, Asian bilateral public finance institutions have provided the largest share of international public financing to coal power.[xvi]

xv Includes coal capacity in middle- and low-income countries

xvi The MDBs included in this figure are: the African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, Islamic Development Bank, Inter-American Development Bank, and The World Bank Group (IBRD, IDA, IFC, MIGA). Bilateral public finance institutions include both development banks and export credit agencies.

Exhibit 8 Committed international public finance for coal power: 2005–2020



Values are reported in real 2021 terms; Bilateral public finance institutions include bilateral development banks and export credit agencies

Source: IJGlobal

Although possibly the cheapest option for expanding electricity services at the time, many of the coal plants enabled by public finance will likely be uneconomic within the decade. As the economics of coal erode, public finance institutions—in particular MDBs and DFIs—should have an interest in supporting a managed phaseout of coal. From a development perspective, retiring and replacing uneconomic coal with cleaner alternatives brings health, financial, and environmental benefits to local communities, and can also mitigate fiscal risks on national governments.

Due to the prevalence of state-owned utilities in developing countries, the cost of uneconomic coal often ends up on public balance sheets.[59] In many cases, the need for government subsidies and guarantees to support the utility's solvency and operations only adds to this burden on public finances.[xvii] As the financial burden of coal on the state-owned utility worsens, it can begin to affect a country's fiscal health and ability to raise capital to provide essential public services. This dynamic—the increasing risks of coal and spiraling impact on public budgets—can be debilitating at a time when countries need to mobilize significant investments in both climate resiliency and mitigation efforts.

Given their role in energy finance, public finance institutions have an opportunity to demonstrate leadership in the global coal transition. Already, many of these institutions—including most of the major MDBs and, more recently, G7 and Chinese bilateral public finance institutions, including the major Asian ECAs—have committed to end *new* financing for unabated coal.[xviii] Yet these institutions can also play a catalytic role in supporting the phaseout of existing coal in developing and emerging markets, including through their obligations to provide climate finance to support the transition in these countries.

Public finance is not a cure-all and has experienced key challenges, but it can play a transformative role in setting the precedent for financial approaches to support the transition away from coal.[60] Public finance can, and should, work in partnership with private financial institutions. Indeed, private finance can bring much-needed financial and technical expertise to transactions as well as the ability to scale approaches. However, public finance institutions with clear development and climate mandates can help govern and oversee approaches, thereby setting the standard for the credibility of financial mechanisms and managing the risk they only serve to bail out coal asset owners. Achieving this means ensuring mechanisms adhere to core guiding principles and safeguarding their ability to deliver outcomes that benefit local populations and the climate over private-sector interests.

xvii For example, regulators may set electricity tariffs below a utility's cost recovery to make energy more affordable for consumers. As the utility operates at a loss, it requires subsidies from the government to remain solvent. Similarly, the government may provide guarantees to enable a utility to raise private capital or to mitigate the risk of nonpayment by the utility under power purchase agreements with the private sector.

xviii The Asian Development Bank, European Bank for Reconstruction and Development, European Investment Group, World Bank Group, and Inter-American Development Bank have exclusion policies against unabated thermal coal, and the African Development Bank Group's president has said the bank will not finance new coal. The G7 commitment would apply to bilateral public finance institutions in G7 countries, including Canada, France, Germany, Italy, Japan, the UK, US, and EU.

Core Principles to Guide the Design of Financial Mechanisms

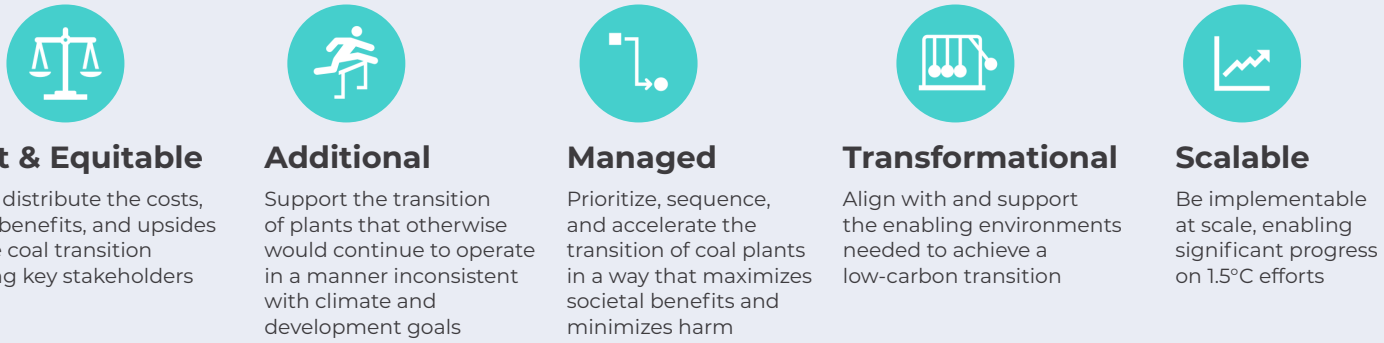
As financial institutions become changemakers in the coal transition, the primary question they will face is not whether finance has an important role to play, but rather how to design financial solutions to ensure beneficial and aligned outcomes.

The outcomes RMI believes should guide coal transition efforts are a **rapid and smooth transition** that results in **increased ambition aligned with 1.5°C climate goals** and that provides **support for the communities, power customers, coal workers, and taxpayers** most impacted by the transition. We arrived at these outcomes based on our analysis of existing and planned coal transition initiatives and consultation with a number of climate, energy, and finance experts. Although we did not undertake a formal stakeholder engagement process, we see strong consensus for these outcomes among a variety of institutions and experts.

Informed by these outcomes, RMI developed a set of core principles to guide the design of future financial mechanisms to support the coal transition (see Exhibit 9). There are many differing perspectives about how finance *can* be used to enable an accelerated coal transition. These principles aim to articulate how finance *should* credibly be used to achieve the stated outcomes underpinning the coal transition.

Exhibit 9

Five key principles to guide the design of financial mechanisms for the coal transition



We propose a set of design questions below for consideration by stakeholders engaging in coal retirement efforts to ensure that financial approaches are responsive to the issues captured in these core principles. This list is based on existing mechanisms, analysis of potential additional mechanisms, and consultation with experts.[61]

Principle	Design Questions
Just & Equitable	• What are the costs and benefits associated with the coal transition? • How are the costs and benefits distributed across public- and private-sector stakeholders? How can costs to public sector stakeholders be minimized (e.g., through auctions)? • What is the boundary to be considered for supporting just transition activities (e.g., immediate vicinity versus national level)? What is the impact on coal workers and communities within this boundary? What is the mix of welfare support and economic regeneration support to mitigate these impacts? • How can financial mechanisms support opportunities for economic growth and poverty alleviation?
Additional	• What are the barriers to the coal transition? • Which plants will continue to operate uneconomically because of these barriers (e.g., systems, structures, power dynamics)? How can financial mechanisms avoid supporting plants that would have retired regardless? • To overcome these barriers, what incentives do the mechanism need to create and for whom? • What safeguards should be built in to avoid moral hazard (e.g., making financing available only where moratoriums limit new coal development)?
Managed	• What criteria should be used to determine the prioritization, sequencing, and speed of the transition of assets under the financial mechanism? • Based on identified criteria, what is the transition plan (prioritization, sequencing, and speed of the asset retirement)? • How will the coal transition be governed to ensure adherence to this transition plan? • What are the implications of different retirement scenarios and what processes need to be put in place to effectively manage these implications?

Principle	Design Questions
Transformational	• What is the likely long-term impact of the mechanism on the capacity to transition to a resilient and just low-carbon energy system? • How can the financial mechanism ensure that value unlocked in the coal transition is not reinvested in technologies that will contribute to carbon lock-in? (e.g., should certain technologies, such as gas, be excluded?) • How can the financial mechanism ensure that it does not undermine the effectiveness of future climate policies, such as carbon markets?
Scalable	• What is the enabling regulatory, financial, and market environment required to implement the mechanism? • Can the mechanism be replicated or scaled within the market and to other contexts? How can the mechanism mobilize private sources of capital to enable scalability?

Assessing the Feasibility of Coal Finance Mechanisms

This section investigates the role of different financial mechanisms in supporting the transition of specific coal power plants in an emerging market context. We analyze two example coal plants in the same country to illustrate how financial mechanisms *could* work, their risks, and design considerations, with an objective to enrich discussions about the design of financial mechanisms in practice. We provide background on the operating, market, and regulatory environment of the plants, as well as the results of our analysis. The assumptions about and analysis of these coal plants are generalized from actual plants and plant-level data.

Background and barriers to the coal transition in the country

Coal plays an important but changing role in the country where the example plants are located. Coal currently provides well over half of the country's power generation, and coal mining is a key source of export revenues and employment, especially in a few concentrated coal mining regions. Though the country has a number of coal plants under construction and in its pipeline—which will increase its capacity by over 40% after they are constructed—it recently canceled several projects, as many have faced local resistance and struggled to complete legal, regulatory, and financial hurdles. The country has also announced that no new coal plants will be considered in the future. Such a commitment would likely be an important precondition for receiving support from a financing mechanism.[xix] In addition to a slowing coal power pipeline, the country's coal mining sector is also experiencing challenges due to increasing demand volatility caused by the current COVID situation and a declining outlook for long-term demand.

Despite slowing its coal pipeline, the country is still in the early stages of its low-carbon energy transition. The country has set renewable energy targets, but deployment has been slow, hindered in part by high local costs of renewables and challenges with the bankability of renewable PPAs. In most of the country, existing coal is still cheaper than new renewables; however, this dynamic is expected to change within next 5 to 10 years. Proactive investigation of coal transition solutions today can help ensure an accelerated transition when renewables do become cost competitive with coal.[xx]

The coal transition will require solutions for two distinct ownership models in the country: utility-owned and IPP-owned coal plants. The coal plants we analyze operate in a market with a vertically integrated, state-owned utility that acts as a single buyer of all electricity generated.[62, xxi] This means the utility owns several generation assets—including over half of the country's coal fleet—and has a de-facto monopoly on transmission and distribution. However, it also purchases some electricity from IPPs, with which it has contracted energy and capacity under long-term PPAs (see Exhibit 10).

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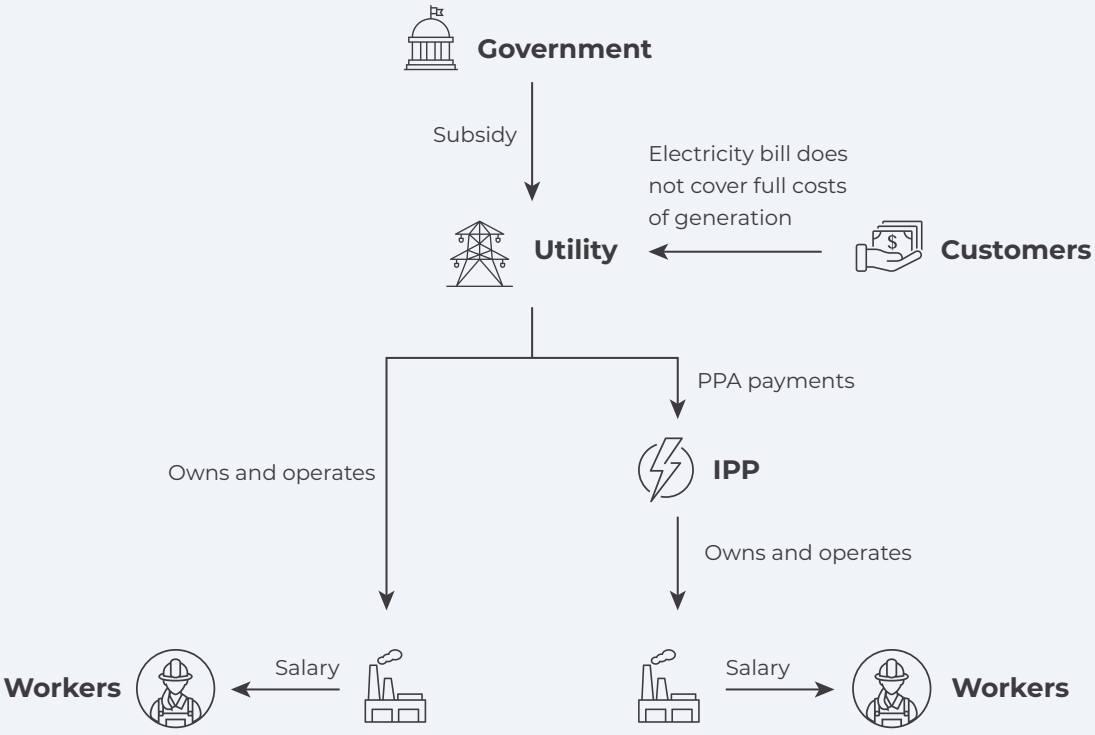
xix This commitment could help avoid moral hazard, or the risk that the utility or regulator will approve new coal projects that will end up stranded and in need of transition assistance.

xx It is important to note that in this country, as in all contexts, the transition is much more complicated than the simple cost competitiveness of renewables, and will also require significant grid investments and enabling regulatory and policy solutions to support the transition.

xxi This type of model is common in developing countries, where about half have adopted a single buyer model, with varying degrees of competition in generation.

Exhibit 10 **Financial flows for utility-owned and IPP-owned coal plants**



The utility faces significant financial challenges in the coal transition. Subsidized tariffs do not provide the utility full cost recovery, and the government subsidizes the utility's cash flow shortfalls through a cash injection to ensure it remains financially viable. This subsidy has allowed the utility to maintain a positive, but close to zero, return on equity over the past few years, but has meant that little capital has been available to reinvest in the electricity system. In addition, the utility's debt has increased substantially over the past five years, driven in part by its recent expansion of the coal fleet. The utility's financial situation has resulted in historical underinvestment in the grid, and may constrain its future ability to finance the capital-intensive investments needed in the energy transition.

The country's remaining coal capacity is owned by IPPs and secured under 25- to 30-year PPAs, which shield them from competitive pressure. These PPAs have two components that make them attractive to IPPs. First, fixed yearly capacity payments cover the IPPs' debt repayments, return on equity, and fixed operation and maintenance (O&M) costs. The IPPs receive these payments as long as they meet their contracted availability, regardless of whether the utility dispatches the coal plant. Second, energy payments act as a pass-through cost to the utility and cover the IPPs' variable O&M and fuel costs. The utility provides payment under PPAs and the government (currently rated as investment grade) guarantees these payments. Although IPPs face some risks due to the declining financial situation of the utility, they generally have little incentive to retire coal plants before the end of their PPA contracts.

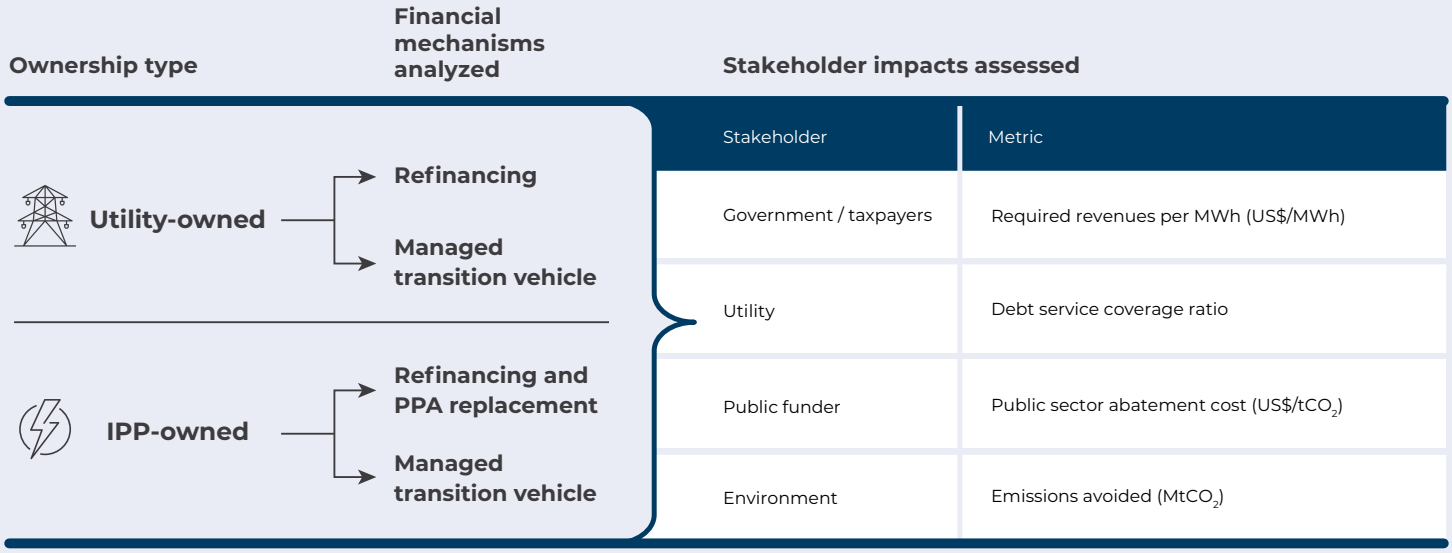
As a result of these barriers, the risks and burden of coal fall largely on the state-owned utility—and by extension the government, taxpayers, and general population. Uneconomic coal plants, whether owned by the utility or procured through IPPs, will only further weaken the utility's cash flows, perpetuate

the need for government subsidies, and put pressure on regulators to raise electricity tariffs for customers. If unaddressed, coal risks could ultimately undermine the country's energy transition by hindering the utility's ability to make the necessary investments and payments to provide affordable, reliable, and clean energy to the population.

Analytical approach

To explore how financial mechanisms could address barriers to the coal transition, we conduct separate analyses on a utility-owned coal plant and on an IPP-owned coal plant (see Exhibit 11). For each type of coal plant, we explore two categories of financial mechanisms—refinancing and a managed transition vehicle—and compare the outcomes of these mechanisms against a BAU scenario. Note that we do not assess a compensation scheme, as this mechanism depends primarily on determining the appropriate compensation value of the plant. This value would likely be determined through negotiations or, more efficiently, through price-finding mechanisms such as auctions, both of which are difficult to model. We also do not assess a broad just transition package. While such a package is likely necessary in the country, it will need to be designed in close collaboration with the government and local stakeholders in affected regions, making it inappropriate to analyze using a simple financial model.

Exhibit 11 **Approach to plant-level financial analysis**



The outcomes we assess intend to demonstrate the impact of the financial mechanisms on key stakeholders, including the government and taxpayers, the utility, public funders, and the climate. We do not explicitly calculate metrics to assess the impact of mechanisms on private finance or IPPs, as each of the financial mechanisms we explore provides a sufficient value proposition to be attractive to these stakeholders. Similarly, we do not explore the impact on customers, as we assume that the government will continue to regulate and subsidize electricity tariffs. Instead, the required revenues metric, which represents the per MWh revenues that would be required for the utility to recover its costs and provide a sufficient return to its government owner to enable it to service its treasury bonds, provides a

proxy for the cost burden of generation on the government and taxpayers that would need to subsidize the revenue shortfalls of the state-owned utility. We calculate revenue requirements both over a standardized 20-year period, as well as in 2022 to capture any near-term impacts.[xxii]

The utility-owned and IPP-owned coal plants we analyze are both subcritical, non-mine mouth plants with less than 10 years of operation (see Exhibit 12). The operational, economic, and financial characteristics of the example plants are based on two currently operating plants, and draw on data from several sources, including Global Energy Monitor, IJGlobal, Carbon Tracker, and country-specific resources for data such as capacity factors, coal prices and calorific values, typical PPA terms, taxation policies, and utility financial statements.[63] To understand coal costs and cash flows under a BAU scenario, we project the coal plants' current costs and operating profiles until the BAU retirement year.[xxiii] For the IPP, PPA revenues are assumed to include both a yearly capacity payment that covers its return on equity, fixed O&M, and debt repayment, and a pass-through energy payment that covers variable O&M and fuel costs.

Exhibit 12

Key coal plant parameters

	Utility-owned	IPP-owned
Size	700 MW	660 MW
Age	8 years	9 years
Assumed BAU retirement year	2053	2042
Capacity factor	55%	67%
Debt: Equity ratio	85:15	70:30
Cost of equity	6.9%	12.0%
Remaining asset-level debt	2 years on 13 year loan with 2.00% rate	2 years on 13 year loan with 2.25% rate
Long run marginal cost, 2021	$38.78/MWh	$38.23/MWh
Net book value, End of Year 2021	$446 million	$595 million
Emissions factor	0.97 tCO_2/MWhe	0.84 tCO_2/MWhe

Source: Global Energy Monitor, IJGlobal, Carbon Tracker, Calculations done by RMI

xxii Calculating revenue requirements over a fixed period is often a standard way for utilities to determine their necessary electricity rates to enable full cost recovery. In this case, though the utility does not achieve full cost recovery, the government must bear these costs from elsewhere in its budget. Note that for simplicity, all modeling is done in US$, which assumes the debt on the coal plants is owed in US$ and/or that exchange rates between local and hard currencies remain stable throughout the modeling period.

xxiii The BAU retirement year for the utility-owned coal plant is based on a 40-year technical lifetime, and for the IPP-owned coal plant based on the end of its 30-year PPA contract.

For each financial mechanism, we assume that the coal plant is retired only after it becomes cheaper to build new renewables than to continue operating the existing plant.[xxiv] For simplicity, we assume solar PV without storage replaces coal. At low share of renewables penetration, this assumption is reasonable. However, as the transition progresses, short- and long-term storage and clean firm power will likely be required to fully replace baseload coal generation. Further discussion on this topic is included later in this report.

To assess the cost competitiveness of solar PV with existing coal, we compare the levelized cost of energy of solar PV with the long-run marginal cost of the coal plant, which includes fuel costs and variable and fixed O&M costs. The capital cost of solar PV is based on 2020 costs for the country, subject to global and local learning rates for hardware (module and inverter) and balance of system costs.[64] O&M costs are assumed to be 2% of capital costs. We use the average solar capacity factor in the region under consideration and apply the accelerated depreciation and income tax incentive available to solar PV in the country.[65] As a standard across all scenarios, we assume that renewables are financed with concessional debt, with a 75:25 debt-to-equity ratio.

We build in provisions for the just transition of coal plant workers into all financial mechanisms we assess. We assume that all financial mechanisms will provide salary compensation at current rates for coal plant workers for 10 years.[xxv] We believe transition support for displaced coal plant workers is an important, but insufficient, element of financial mechanisms. Alongside the mechanisms we assess, the country will likely need additional funding to cover the full scope of actions required to support a just transition, which is not analyzed in this report.

Our analysis is a modeling exercise, designed to explore the potential feasibility and impacts of different financial mechanisms. It aims to provide insight into the broad ways such mechanisms may work and how they could distribute costs and benefits of the coal transition. It does not provide definitive conclusions about which types of mechanisms are "best," nor does it provide an exhaustive analysis of the potential mechanisms that could be deployed in practice. As seen in the following results, financial mechanisms often involve trade-offs and nuances, and therefore each one must ultimately be designed for the specific market, regulatory, political, and institutional context in which it will operate.

Financing the transition of a utility-owned coal plant

We explore two counter-factual or BAU scenarios for the utility-owned coal plant. The first BAU case captures the scenario in which the utility would operate the coal plant until the end of its 40-year technical life, earning revenues on the plant until it retires in 2053. This scenario is important to provide an understanding of how financial mechanisms may need to be structured to provide a similar value to the utility, its customers, and the government.

However, a fairer baseline for assessing the value-add of financial mechanisms is an early coal retirement scenario that does not use any financial mechanisms to smooth the transition. We therefore also assess a second BAU early retirement scenario in which the utility retires the coal plant in 2026 once it becomes cheaper to replace that generation with renewables. Because the utility retires the coal plant early—cutting

xxiv In reality, the timing of the transition will depend on a variety of factors, including grid stability and socio-economic implications of the transition.

xxv We have not built in support for coal miners. This support may be an important component of the just transition in practice, depending on how each coal plant sources its coal.

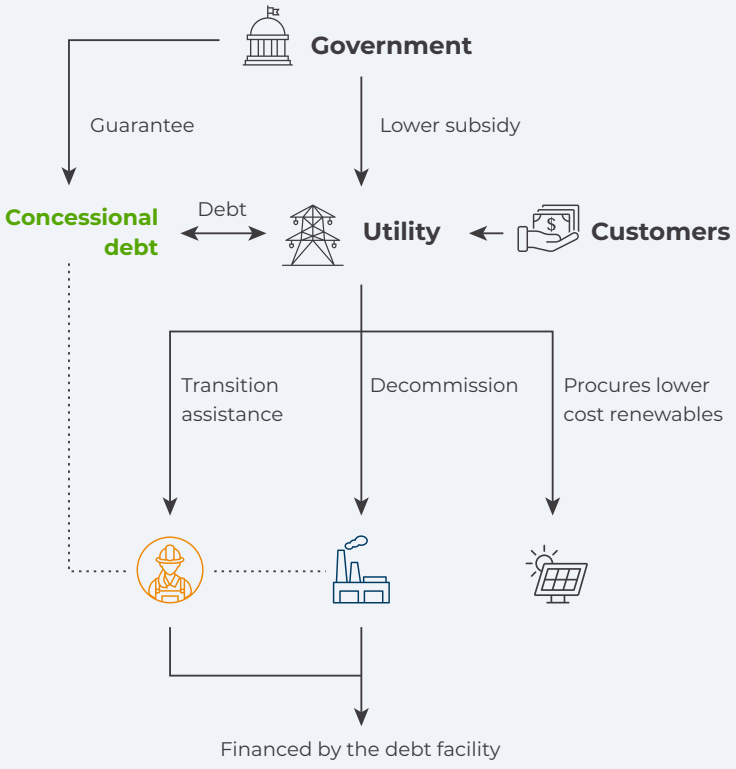
short its revenue-generating lifetime—it would need to recover its coal capital costs over a shorter period. This accelerated depreciation creates near-term increases in revenues required by the utility to achieve cost recovery (see Exhibit 14).

The first financial mechanism we assess against these BAU scenarios is a **refinancing mechanism.** Under this mechanism, once renewables become cheaper than the existing coal plant, a concessional debt facility funds: (1) transition support for displaced coal plant workers; (2) early decommissioning of the coal plant; and (3) the refinancing of the utility's unrecovered capital costs of its coal plant, enabling it to achieve capital recovery (see Exhibit 13). Although the utility must repay this concessional debt over time, it provides the utility the up-front liquidity it needs to decommission the plant and effectively replaces the utility's higher cost of equity with low-cost debt, reducing its required revenues (or required government subsidies to make up the utility's shortfall in revenues). After the utility retires the coal plant, we assume it procures renewables from an IPP. This mechanism is most similar in its underlying principles to securitization.

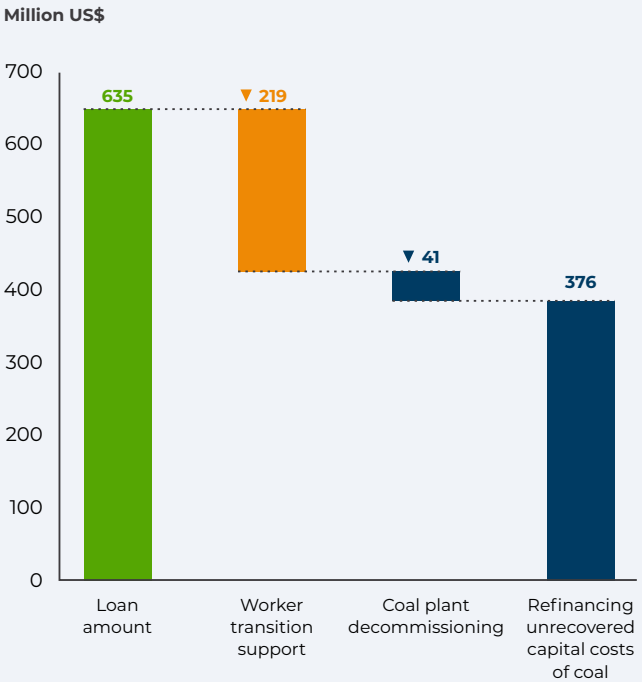
In our analysis, we assume this concessional debt would take the form of a sovereign loan on-lent to the utility from an international DFI, as is common with MDB financing. However, this could also be structured as a blended debt facility with other domestic and commercial sources.

Exhibit 13 Refinancing to enable the transition of the utility-owned coal plant

Refinancing mechanism



Funding allocation of the concessional debt facility



Refinancing results in significant emissions savings, provides benefits to the government and taxpayers in the form of subsidies avoided, and supports the just transition coal plant workers through salary payments. These benefits are achieved at a relatively low cost to public funders of US$3.40 per ton of CO_2 avoided. Although refinancing only marginally decreases the utility's revenues (or subsidies) required compared with the 40-year coal plant operation BAU case, it allows the coal plant to be retired 27 years earlier than BAU (see Exhibit 14). As a result, refinancing can support emissions savings of 88 Mt CO_2 with effectively no impact on the subsidies required to the utility from the government and taxpayers. In contrast, retiring the coal plant early without refinancing (i.e., the BAU early retirement case) would have resulted in significantly higher subsidies being required—particularly in the near term—demonstrating the potential value of financial mechanisms in helping smooth the transition. Refinancing also enables the utility to improve its longer-term (2030) debt service coverage ratio (DSCR) compared with BAU (see Exhibit 15). Despite taking on additional debt, which includes a substantial amount of funding earmarked for the just transition, refinancing enables significant cash flow improvements, which offset the utility's additional debt repayment burden.

Exhibit 14 Change in required revenues compared with the 40-year BAU scenario for the utility-owned coal plant analysis

US$/MWh

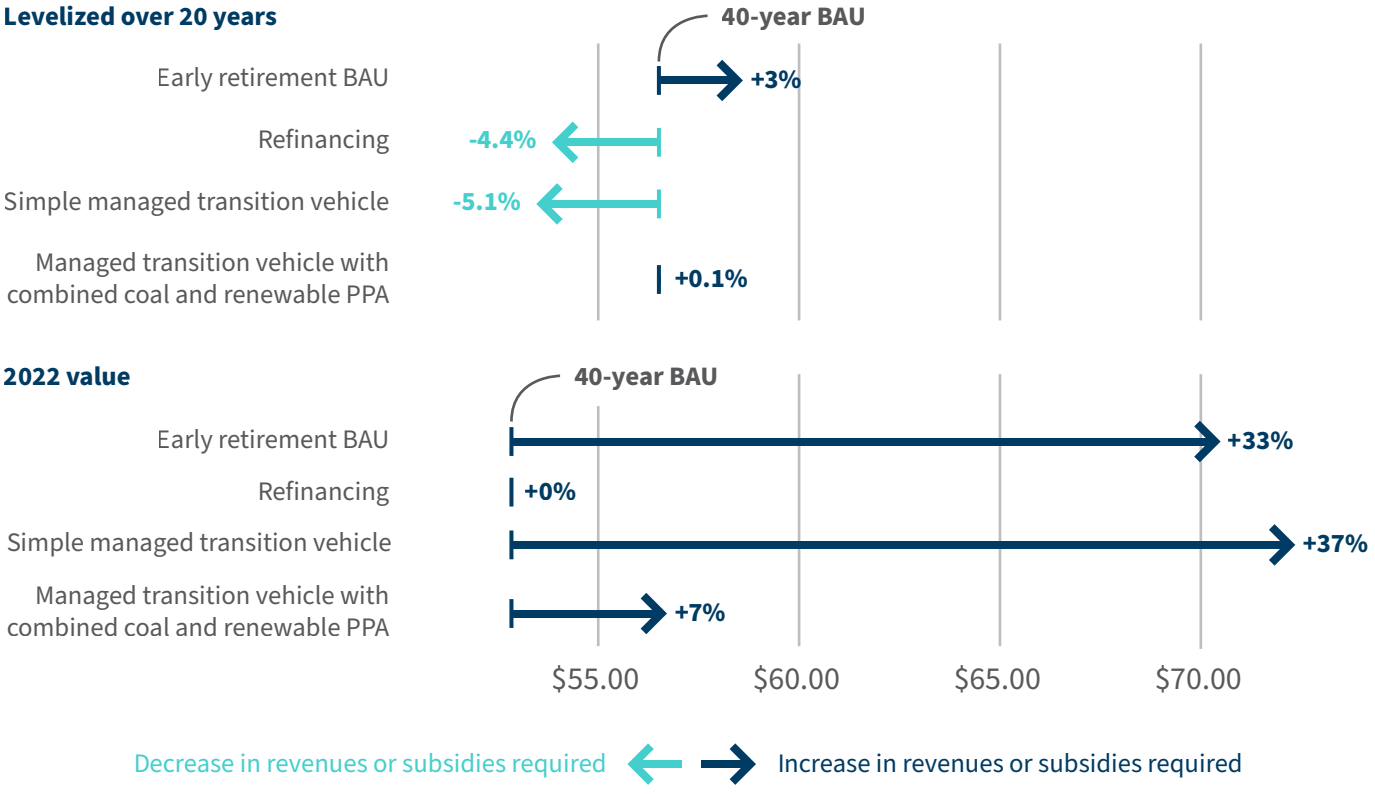
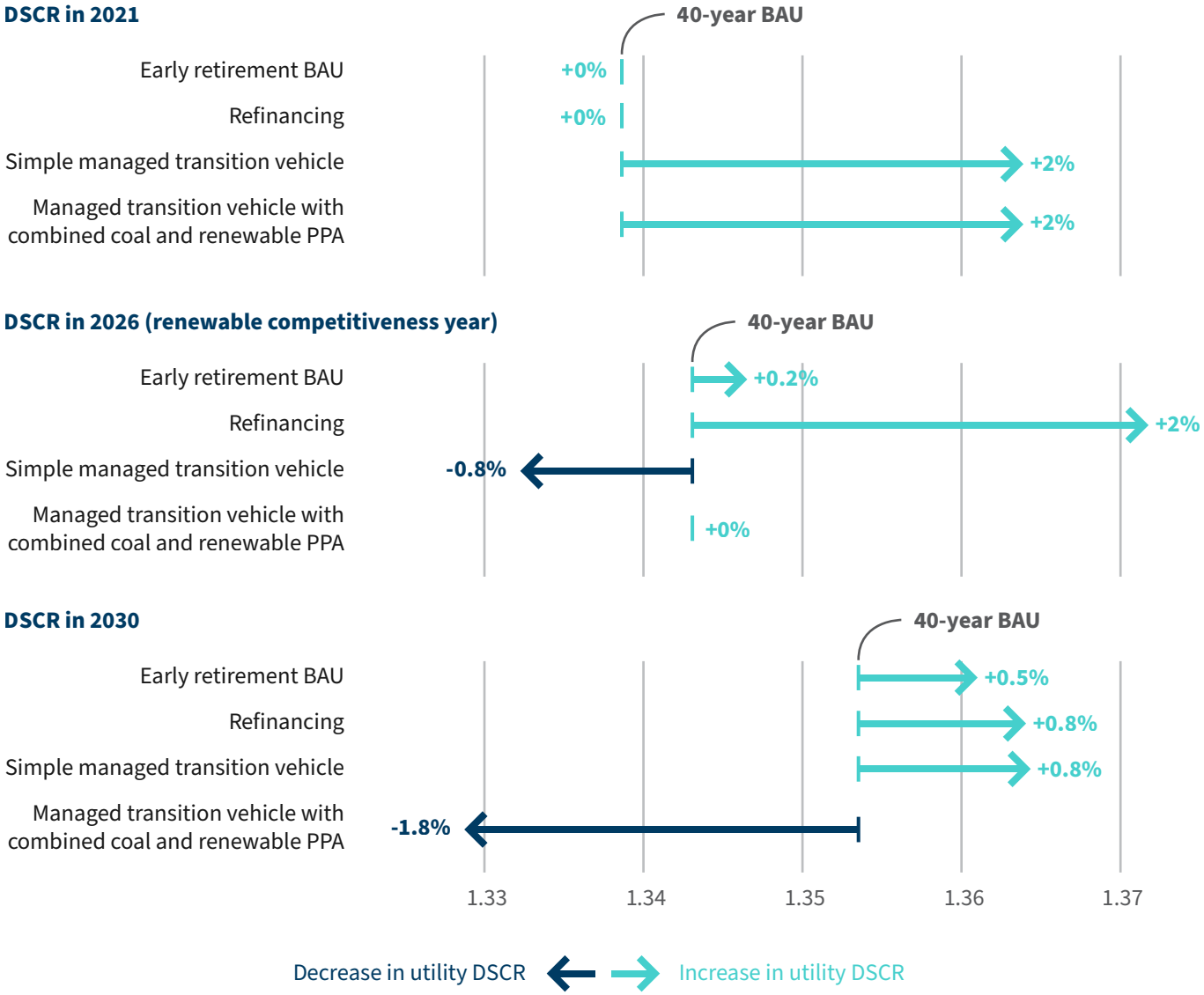


Exhibit 15 Change in the utility's DSCR compared with the 40-year BAU scenario for the utility-owned coal plant analysis



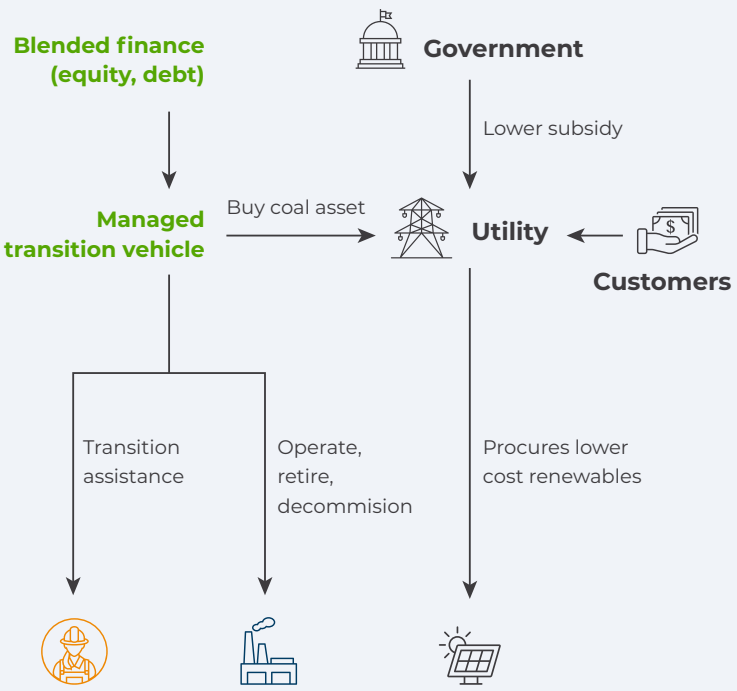
However, refinancing also carries key risks for the utility. Despite improving the utility's long-term DSCR, refinancing would increase the utility's overall debt, which may not be viable if the utility is already significantly leveraged.[xxvi] At a larger scale, taking on this additional debt could also negatively impact other stakeholders, such as the government and taxpayers, and may not be feasible if there are limitations on sovereign debt or contingent liabilities held by the government. To mitigate this impact, a public funder could consider providing the utility with results-based carbon finance for the emissions reductions achieved through the early retirement of the plant. This carbon finance would serve as equity for the utility, decrease the size of the loan required to finance its transition, and reduce the potential impact of the transaction on its leverage ratio. Such carbon finance would, however, require well-defined guardrails to ensure the robustness of carbon pricing approaches.

xxvi The DSCR figures we present are the values with the government cash injection. Without government support, the utility's DSCR is less than 1.

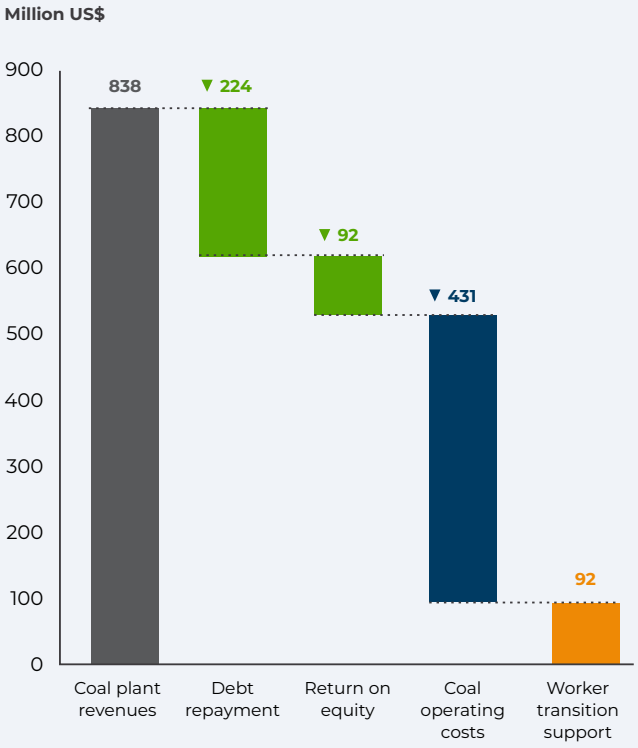
A managed transition vehicle, the second type of financial mechanism we assess, could also help address this credit challenge. Under a **simple managed transition vehicle**, we assume that a combination of equity (20%) and concessional debt (80%) capitalize an investment vehicle (see Exhibit 16). The investment vehicle purchases the coal plant from the utility for its remaining book value, enters into a PPA contract with the utility, and operates the plant until it has realized sufficient returns to repay equity and debt investors and provide salary transition support for coal plant workers.[xxvii] After the managed transition vehicle retires the coal plant, we assume the utility can procure cheaper renewable generation. Due to the additional equity under the vehicle, it can achieve similar emissions reductions as the refinancing case for a lower public abatement cost of US$2.73 per tCO_2.

Exhibit 16 The simple managed transition vehicle for a utility-owned coal power plant

Simple managed transition vehicle



Allocation of coal plant revenues



The managed transition vehicle helps address the debt challenges facing the utility and overall reduces required subsidies over a 20-year period, as the utility can replace coal generation with cheaper renewables (see Exhibit 15)**.** The up-front equity the utility receives when it sells its coal plant provides an immediate benefit to its financial health, as seen in its 2021 DSCR. This cash can be used by the

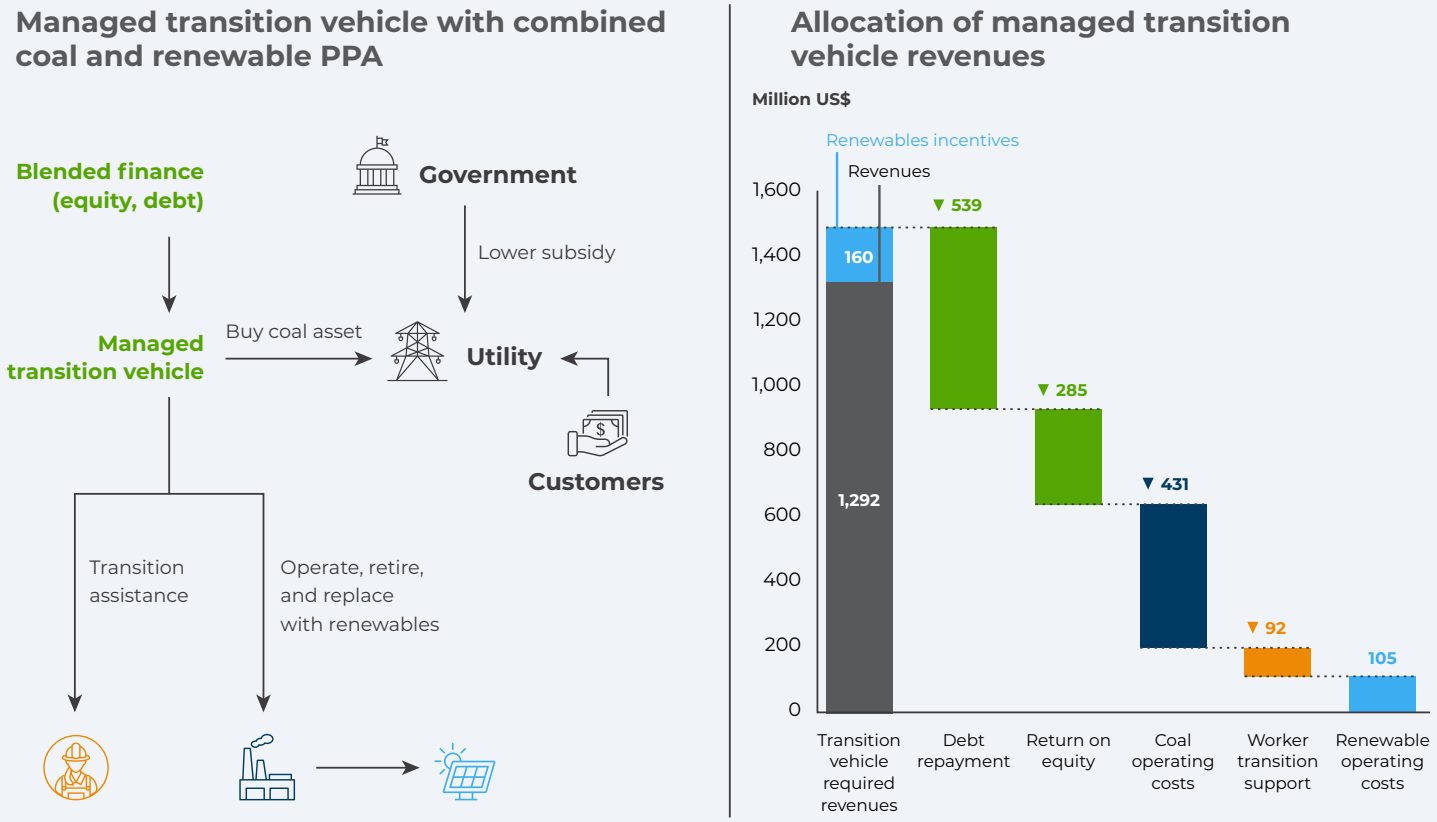
xxvii Worker transition support is provided for 10 years at current rates in both the refinancing and managed transition vehicle scenarios. The main differences in their net present values are due to the different discount rates between the utility and the managed transition vehicle, as well as the year in which values have been discounted. For the refinancing case shown in Exhibit 13, values have been discounted to the refinancing year (2026), whereas for the managed transition case shown in Exhibit 15, values have been discounted to the year the transition vehicle acquires the coal asset (2021).

utility flexibly, whether to reduce its existing debt or invest in other energy infrastructure (e.g., renewables, transmission, or distribution). The managed transition vehicle model also requires no additional debt to be taken on by the utility, improving its 2030 DSCR.

However, in the near term, the managed transition vehicle would require significantly higher revenues than both the 40-year BAU and retirement scenarios and negatively impact the utility's DSCR. In our model, we assume the managed transition vehicle enters into an energy PPA with the utility, or receives payment proportional to the amount of energy it produces. As a result, the managed transition vehicle's necessary revenues must be realized through the sale of a relatively low volume of energy, creating a spike in generation costs to the utility as long as the managed transition vehicle is operating the coal plant. This increase in revenues required could be mitigated if the managed transition vehicle operated the plant longer, delaying the retirement date, or potentially through more innovative PPA configurations and designs.

One of the alternative PPA structures we explore is a combined coal and renewable PPA, which would require the **managed transition vehicle to bring additional capabilities** such as structuring, risk management, and operating capabilities to the transaction. Under this scenario, we assume that the managed transition vehicle can sign an extended fixed price energy PPA, under which it can deliver energy using coal while it is cost competitive before switching to renewable generation (see Exhibit 17).

Exhibit 17 Managed transition vehicle with a combined coal and renewable PPA for an IPP-owned coal plant



Such a PPA contract would not only mean the managed transition vehicle takes on additional operating risks during the coal plant's operation (e.g., fuel price risks), but would also properly incentivize the owners under the managed transition vehicle to switch to cheaper renewable energy generation once it becomes economic to do so. While this scenario still results in a slight increase in the 2022 cost of generation compared with the 40-year coal plant operation BAU scenario, it significantly smooths the near-term impact on revenues required compared with the simple managed transition vehicle (see Exhibit 14). However, these benefits must be carefully weighed against the added complexity under such a PPA and the PPA's impacts on the cost of procured renewables—as combining coal and renewable generation under a single PPA is greater than if renewables were procured under a standalone contract. The benefits would be contingent on the ability and appetite of owners under the managed transition vehicle to take on such a PPA contract.

In summary, both refinancing and a managed transition vehicle can result in net benefits to taxpayers and the climate, while providing just transition support to coal plant workers. Refinancing is likely a first-best solution from a taxpayer or subsidy savings perspective, resulting in both overall subsidy savings and no short-term increases in required subsidies. However, refinancing may prove challenging for utilities that are already significantly leveraged and unable to take on additional debt. As an alternative, a managed transition vehicle can effectively support the transition of coal, particularly if it can bring additional financial, risk-taking, or technical capabilities to the transaction. Such a transaction would need to be designed carefully to balance the impacts on key stakeholders and the risk appetite of the managed transition vehicle investors.

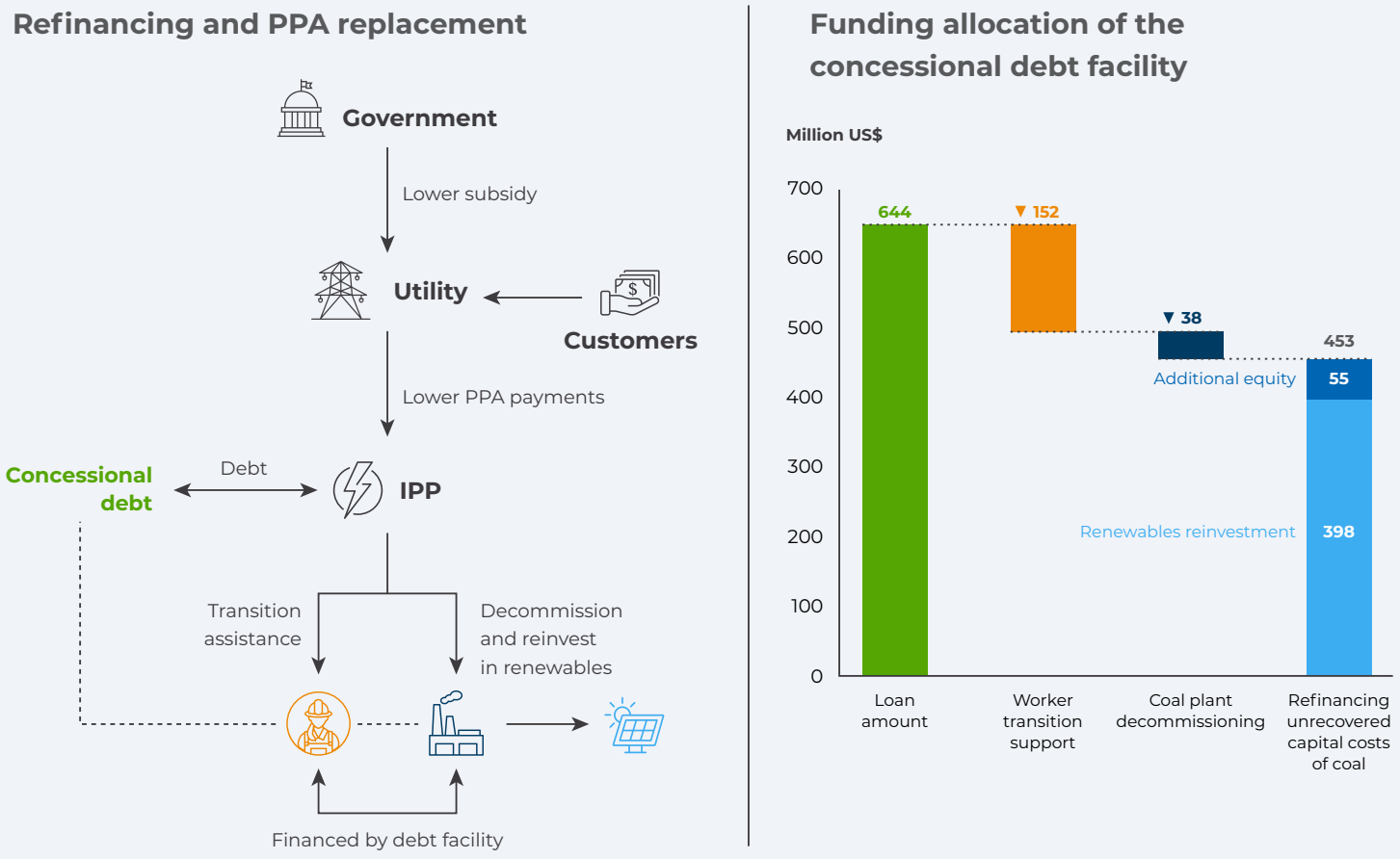
Finally, governance is critical to successful implementation of either mechanism. Both mechanisms require safeguards to ensure achievement of desired outcomes. Under refinancing, this could be achieved through a disbursal schedule, where funds would not be disbursed until after the utility decommissions the coal plant or achieves other milestones. Under the managed transition vehicle, governance of the plant's transition may be easier as it would be under direct control of the facility. However, the presence of climate- and development-oriented investors in the vehicle would likely be critical to ensure it is committed to achieving societal outcomes.

Financing the transition of an IPP-owned coal plant

We explore two financial mechanisms to support the transition of an IPP-owned coal plant: refinancing the obligation under the original coal PPA and replacing it with a renewable energy PPA, and a managed transition vehicle.

In the **refinancing and PPA replacement** scenario, the coal PPA is canceled and the IPP signs a new PPA for renewable energy generation (see Exhibit 18). To incentivize the IPP to cancel its coal PPA, we assume that it needs to be made whole by providing the necessary capital to recover the remaining value of its initial coal investment.[xxviii] This amount is financed using concessional debt provided to the IPP, effectively refinancing the utility's obligation to pay the IPP its full return on equity with a low-cost loan (similar to securitization). Though the IPP would need to service this debt, it realizes overall value from the transaction as it can deploy additional equity—and realize returns on this equity—under a renewable PPA. We also assume the concessional loan provided to the IPP provides worker transition support for 10 years after the coal plant is retired.

Exhibit 18 **Refinancing and replacement of the coal PPA with a renewable PPA**

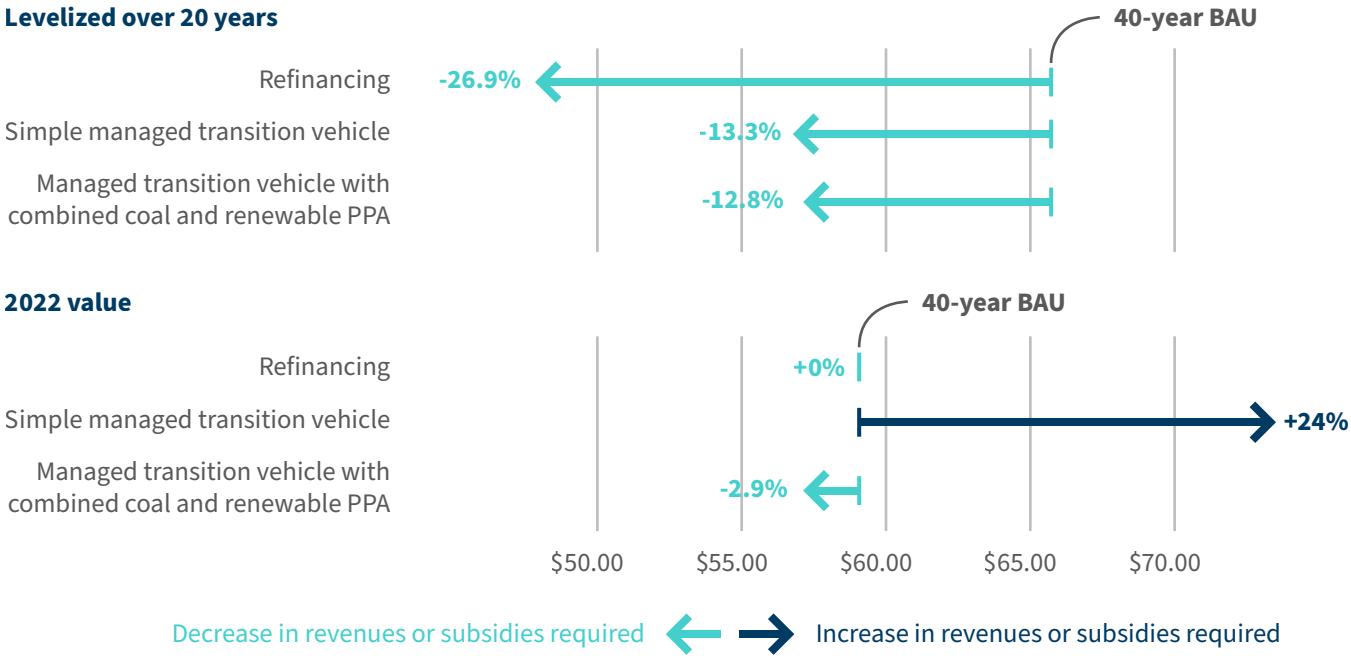


xxviii In reality, the buyout price would be negotiated or determined through a competitive process. In our model, the per MW compensation price of the IPP-owned asset is higher than the per MW price of the utility-owned asset. This difference is largely driven by different per MW investment costs of each plant and the different plant lifetimes used to determine net book value.

The refinancing and PPA replacement scenario results in substantial benefits for all stakeholders (see Exhibit 19)**.** It creates the greatest subsidy savings and an emissions savings of 52 Mt CO_2, resulting in a public finance abatement cost of US$6.44 per tCO_2. However, this scenario means that a renewable PPA would be awarded directly to an IPP, rather than competitively. While this ensures that funds are used to support a transition (rather than the IPP potentially investing in projects with higher climate risks, such as natural gas generation) and may be politically advantageous to foster the buy-in of IPPs, it also creates a risk that the utility must procure renewable generation that is more expensive than it would have been if contracts were awarded competitively. Direct awarding of a renewable PPA could also undermine renewable energy policies in the country based on competitive tendering, such as renewable energy auctions.

Exhibit 19 Change in required revenues compared with the 40-year BAU scenario for the IPP-owned coal plant analysis

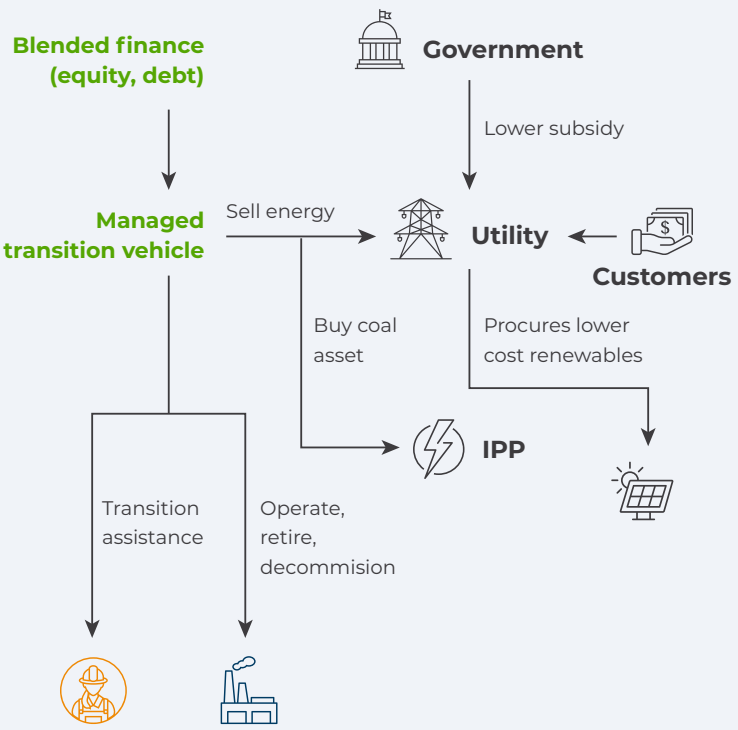
US$/MWh



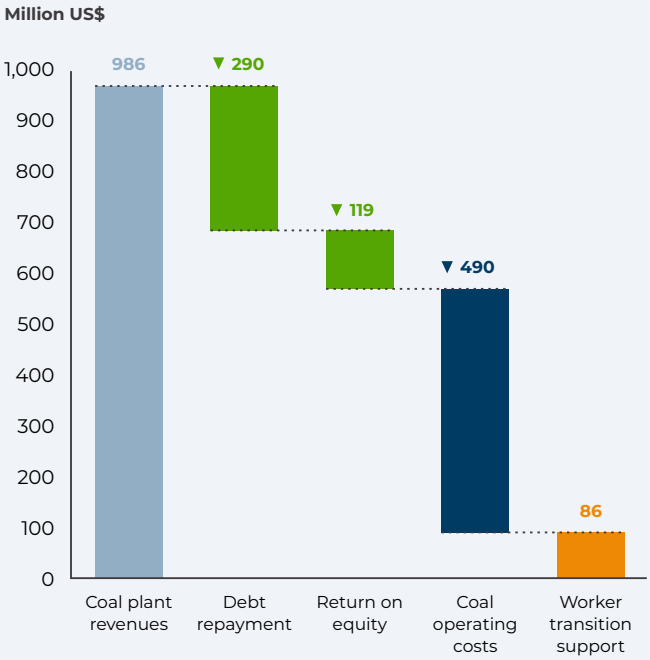
To instead support more competitive processes, or a scenario in which the current coal IPP would not invest in renewable generation, **a managed transition vehicle** could be used to transition the IPP-owned coal plant.[xxix] Similar to the utility case, we explore two variations of a managed transition vehicle. In the first, a managed transition vehicle capitalized with 20% equity and 80% concessional debt purchases the IPP's coal asset and PPA contract with an aim to retire the plant early. It operates the coal plant until it has repaid investors and has capital earmarked for the just transition, receiving energy payments for the generation it sells to the utility (see Exhibit 20).

Exhibit 20 The simple managed transition vehicle for the IPP-owned coal power plant

Simple managed transition vehicle



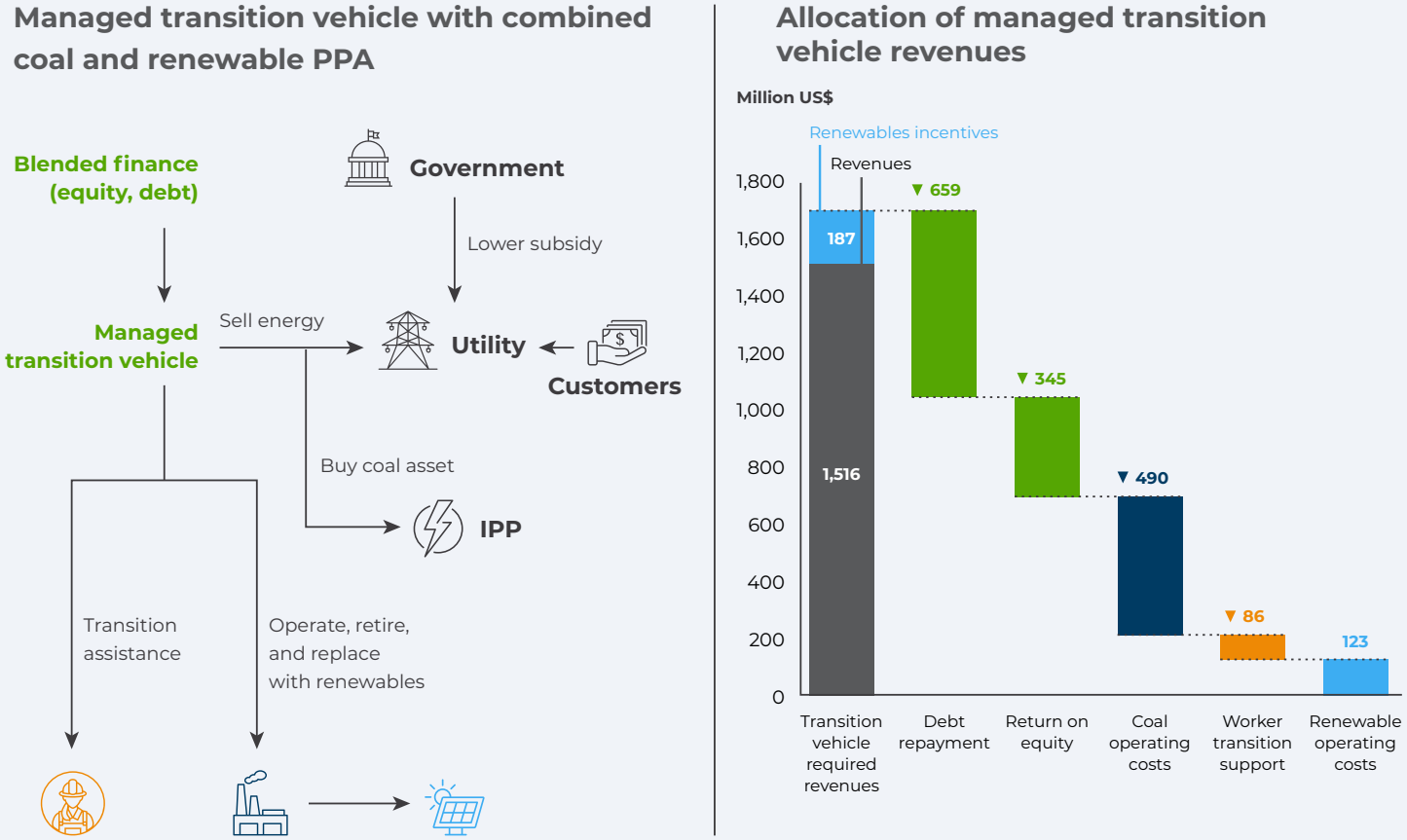
Allocation of coal plant revenues



xxix The coal IPP may not possess the technical capabilities to develop renewables or may be uninterested in making renewables part of its business model.

In the second case, we again assume that the managed transition vehicle can sign an extended fixed-price energy PPA, under which it can deliver energy using coal or renewable generation (see Exhibit 21). When renewables become cheaper than coal, we assume the IPP would transition its coal asset. In both managed transition vehicle scenarios, again, the additional equity under the vehicle lowers the public abatement cost to US$5.54 per tCO_2 compared with the refinancing case.

Exhibit 21 The managed transition vehicle with a combined coal and renewable PPA for the IPP-owned coal power plant



Similar to the utility case, the managed transition vehicle presents key trade-offs in its design. The simple managed transition vehicle again creates a near-term increase in revenues required, despite decreasing overall revenue requirements over a 20-year period. This impact could be mitigated by either operating the coal plant longer or by more innovative PPA designs. For example, in the case where the managed transition vehicle can take on the risk and complexity of a combined coal and renewable PPA, both near-term and overall subsidy requirements are reduced compared with BAU.

In summary, both types of financial mechanisms can provide substantial value to supporting the transition of IPP-owned plants. The higher cost of equity and debt underlying IPP-owned plants often means that financial mechanisms can provide greater savings to the utility and, by extension, the government and taxpayers that need to subsidize its operations. As both refinancing and the managed transition vehicle provide benefits to all stakeholders compared with BAU, the choice and ultimate design of the mechanism will likely depend on contextual factors and country preferences, such as how a country awards and structures its PPA contracts.

Designing financial mechanisms in practice

Our analysis demonstrates how various financial mechanisms could work in theory. In practice, the exact design and implementation of these mechanisms will be strongly dictated by the country context, and will have a significant impact on their outcomes. Below, we highlight several considerations to ensure mechanisms adhere to the core principles we propose in *Core Principles to Guide the Design of Financial Mechanisms*.

Just & Equitable

As seen in the analysis, each mechanism has different impacts on key stakeholders, as well as options for redistributing or mitigating those impacts. Financial mechanisms are not a one-size-fits-all approach, and stakeholder engagement will be a critical part of their design process.

Financial mechanisms also need to ensure that public stakeholders are the ultimate beneficiaries of the coal transition, and should build in just transition provisions from the outset. Our analysis assumed certain revenue streams and costs, which in reality will be subject to uncertainty (e.g., due to changes in coal prices). Financial mechanisms must build in measures and governance structures to ensure the public is protected from risks—for example that a managed transition vehicle does not continue operating a coal plant past an agreed upon date if it cannot repay investors and financiers. They should also ensure the public (not the private sector) is the primary beneficiary of any upsides—for example an even earlier retirement if returns are realized faster than projected.

Additional

Additionality refers not only to whether financial mechanisms are needed to support the coal transition, but also to whether finance is used efficiently. The compensation price needed for the utility or IPP to retire its plant can have a significant impact on the mechanism's cost and outcomes. In our analysis, we made assumptions about this price due to the lack of information. In practice, competitive price discovery processes, such as through auctions, can be an effective way to correct information asymmetries and minimize retirement costs.

Managed

While a full coal fleet analysis was beyond the scope of this report, we'd like to highlight a few important considerations related to the prioritization and sequencing of coal phaseout. First, country-level buy-in and a strategy for the coal transition are crucial to underpin the use of financial mechanisms to support coal phaseout. Second, for simplicity we assumed that renewables would replace coal when they become cheaper than the existing plant. In reality, the timing of the transition should take into account other enabling or readiness factors, such as planning and progress on the just transition or sufficient investment in grid stability. Finally, although we have only explored coal plant retirement and renewable replacement in this report, we recognize there are other pathways in the transition—for example repurposing coal assets in countries with domestic coal to provide flexibility in a transitioning grid or even simply retiring coal plants in grids with excess capacity.

Strong governance structures for financial mechanisms will also help ensure a managed transition. These include frameworks for monitoring progress and outcomes, a means to coordinate with the government's energy transition planning, and clear processes for arbitration and recourse. Involvement of public stakeholders, such as public financial institutions, as well as a more centralized governance structure for the mechanisms, may be more conducive to effective governance.

Transformational

In our analysis, we stipulated that coal would be replaced with solar PV, which does not necessarily chart the most effective path to a net-zero energy system. Financial mechanisms must be paired with a solid technical analysis to understand the range of options (e.g., storage, flexible resources, clean firm power, grid investments) to support the coal transition.

For the managed transition vehicle, it's important to highlight that under our assumptions the original coal plant owner is not required to reinvest its equity in any specific technology. While this flexibility could be more efficient, for example allowing the utility to invest in the grid or pay down debt that could be more transformational in the long run, it also presents potential moral hazard challenges. As a result, financial mechanisms may need to include negative lists that would restrict reinvestments in detrimental technologies, as well as the incentives, legal, and monitoring frameworks to ensure compliance.

Scalable

As outlined in this analysis, a variety of context-specific design questions and issues need to be addressed at both the utility and asset levels. However, it is also clear that to achieve the amount of capital likely needed to support the scale of the coal transition, a degree of standardization will be necessary. Balancing between solutions that meet the specific needs of plants, communities, and countries, and solutions that can scale is a critical consideration in designing financial mechanisms.

Conclusion

Many of the financial mechanisms currently being proposed will serve as a test case for the role finance can play in the coal transition. As these initiatives are rolled out in both developed and emerging markets, several actions will be critical to their success and credibility. First, finance providers, policymakers, and community and environmental groups need to align on key principles for where and how finance should be used to accelerate the coal transition. Although we propose some core principles in this report, broader agreement on principles will help safeguard the integrity and credibility of financial approaches. Achieving the necessary scale and interest to support meaningful action will be possible only if financial mechanisms prove to be credible drivers of change, not simply a bailout of coal.

Achieving the necessary scale and interest to support meaningful action will be possible only if financial mechanisms prove to be credible drivers of change, not simply a bailout of coal.

Second, countries, utilities, and financial institutions will need to undertake dedicated technical, financial, political economic, and market analyses to inform a fit-for-purpose strategy to manage the coal transition in specific geographies.

Third, although this report focuses on financial approaches for the coal transition, rather than on addressing its social costs, the just transition must be at the heart of approaches. Realism and honesty about how financial mechanisms do (and do not) address the needs of workers and communities are essential, as are strategies to ensure any gaps are addressed.

Finally, the devil is in the detail when it comes to how financial mechanisms are implemented in practice. The governance of the transition, including engagement and communication with communities and other stakeholders, transparency and reporting on outcomes, and ensuring that financial mechanisms actually achieve what they set out to do, will be just as—if not more—important than the design of the mechanisms themselves.

The aim of this report was to begin to probe into the design of financial mechanisms for the transition of coal power plants. As we shift from ambition and ideas to on-the-ground implementation over the next year, we look forward to the ongoing and evolving progress in this space, and the inevitable learnings that will be gleaned as the first pilots are put into motion.

Endnotes

1 Paul Bodnar et al., *How to Retire Early: Making Accelerated Coal Phaseout Feasible and Just,* RMI, 2020, **https://rmi.org/insight/how-to-retire-early**; Tifenn Brandily, *1H 2021 LCOE Update,* BloombergNEF, June 23, 2021, **https://www.bnef.com/insights/26555/view**.

2 "Most countries are making progress on phasing out thermal coal—but not fast enough to offset China's expansion," Centre for Research on Energy and Clean Air, accessed August 17, 2021, **https://energyandcleanair.org/most-countries-are-making-progress-on-phasing-out-coal/**; "Coal policy tool," Reclaim Finance, accessed August 17, 2021, https://coalpolicytool.org/.

3 "G7 final communique: Nations promise coal phase-out and $100bn climate finance," June 13, 2021, **https://www.edie.net/news/11/G7-final-communique--Nations-promise-coal-phase-out-and--100bn-climate-finance/**.

4 Valerie Volcovici et al., "In climate pledge, Xi says China will not build new coal-fired power projects abroad," *Reuters,* September 21, 2021, **https://www.reuters.com/world/china/xi-says-china-aims-provide-2-bln-vaccine-doses-by-year-end-2021-09-21/**; Xinyue Ma and Kevin P. Gallagher, *Who Funds Overseas Coal Plants? The Need for Transparency and Accountability,* Boston University Global Development Policy Center, Global China Initiative, July 2021, **https://www.bu.edu/gdp/files/2021/07/GCI_PB_008_FIN.pdf**.

5 IEA, *Net Zero by 2050,* 2021, **https://www.iea.org/reports/net-zero-by-2050**.

6 "Global Coal Plant Tracker," Global Energy Monitor, accessed August 26, 2021, **https://globalenergymonitor.org/projects/global-coal-plant-tracker/dashboard/**; *Statistical Review of World Energy,* BP, 2021.

7 "January 2021 Global Coal Plant Tracker," *Global Energy Monitor,* **https://globalenergymonitor.org/projects/global-coal-plant-tracker/**; "Global Energy Statistical Yearbook 2021," *Enerdata,* accessed September 10, 2021, **https://yearbook.enerdata.net/coal-lignite/coal-production-data.html**.

8 IEA, *Net Zero by 2050,* 2021, **https://www.iea.org/reports/net-zero-by-2050**.

9 Paul Bodnar et al., *How to Retire Early: Making Accelerated Coal Phaseout Feasible and Just,* RMI, 2020, **https://rmi.org/insight/how-to-retire-early**.

10 IEA, *Global Energy Review,* April 2020, **https://www.iea.org/reports/global-energy-review-2020**.

11 "Global Coal Plant Tracker," Global Energy Monitor, accessed August 26, 2021, **https://globalenergymonitor.org/projects/global-coal-plant-tracker/dashboard/**.

12 "UN Chief Calls for Immediate Global Action to Phase Out Coal," *UNFCCC*, March 2, 2021, **https://unfccc.int/news/un-chief-calls-for-immediate-global-action-to-phase-out-coal**.

13 P. Yanguas Parra et al., *Global and regional coal phase-out requirements of the Paris Agreement: Insights from the IPCC Special Report on 1.5°C,* Climate Analytics, September 2018.

14 Robert Bridle and Lucy Kitson, *The Impact of Fossil Fuel Subsidies on Renewable Electricity Generation,* International Institute for Sustainable Development Global Subsidies Initiative, December 2014, **https://www.iisd.org/system/files/publications/impact-fossil-fuel-subsidies-renewable-electricity-generation.pdf**.

15 Paul Bodnar et al., *How to Retire Early: Making Accelerated Coal Phaseout Feasible and Just,* RMI, 2020, **https://rmi.org/insight/how-to-retire-early**.

16 H. Winkler, S. Keen, and A. Marquard, *Climate finance to transform energy infrastructure as part of a just transition in South Africa,* Research report for SNAPFI project, University of Cape Town, 2020.

17 David Coady et al., *How Large Are Global Energy Subsidies?* IMF Working Paper, 2015, **https://www.imf.org/external/pubs/ft/wp/2015/wp15105.pdf**.

18 Uday Varadarajan, David Posner, and Jeremy Fisher, *Harnessing Financial Tools to Transform the Electric Sector*, Sierra Club, 2018, **https://www.sierraclub.org/sites/www.sierraclub.org/files/sierra-club-harnessing-financial-tools-electric-sector.pdf**.

19 Joern Huenteler et al., *Cost Recovery and Financial Viability of the Power Sector in Developing Countries: A Literature Review,* World Bank Policy Research Working Paper 8287, December 2017.

20 Claudia Strambo, Jesse Burton, and Aaron Atteridge, *The end of coal? Planning a "just transition" in South Africa,* Stockholm Environmental Institute, February 2019, **https://cdn.sei.org/wp-content/uploads/2019/02/planning-a-just-transition-in-south-africa.pdf**.

21 Matthew Huxham, Muhammed Anwar, and David Nelson, *Understanding the impact of a low carbon transition on South Africa,* Climate Policy Initiative, March 26, 2019, **https://www.climatepolicyinitiative.org/publication/understanding-the-impact-of-a-low-carbon-transition-on-south-africa**/.

22 Annie Benn et al., *Managing the Coal Capital Transition: Collaborative opportunities for asset owners, policymakers, and environmental advocates,* RMI, 2018.

23 Diederik Baazil, Hugo Miller, and Laura Hurst, "Shell Loses Climate Case That May Set Precedent for Big Oil," *Bloomberg Green,* May 26, 2021.

24 E. Moe, "Energy, industry, and politics: Energy, vested interests, and long-term economic growth and development," *Energy* vol. 35, no. 4 (2010): 1730-1740.

25 Jonas Meckling et al., "Winning coalitions for climate policy," *Science* vol. 349, no. 6253 (2015): 1170-1171, DOI: **10.1126/science.aab1336**.

26 "Ending coal-generated power," Bundesregierung, accessed August 27, 2021, **https://www.bundesregierung.de/breg-en/issues/sustainability/kohleausstiegsgesetz-1717014**.

27 Meridian Economics, "The Role of Transition Finance for Climate Mitigation: A Just Climate Transaction for South Africa," December 2020, **https://meridianeconomics.co.za/wp-content/uploads/2020/09/2020-09-21-SA-Just-Transition-Transaction-proof-of-concept-updated.pdf**.

28 H. Winkler, S. Keen, and A. Marquard, *Climate finance to transform energy infrastructure as part of a just transition in South Africa,* Research report for SNAPFI project, University of Cape Town, 2020.

29 "Statement by H.E. President Cyril Ramaphosa of South Africa to the United Nations Secretary-General's Climate Summit," *Department of International Relations and Cooperation, Republic of South Africa,* September 23, 2019, **http://www.dirco.gov.za/docs/speeches/2019/cram0923.htm**.

30 Thomas Biesheuvel and Jack Farchy, "Citi and Trafigura Are Pitching 'Coal to Zero' Mining Vehicle," *Bloomberg Green,* May 6, 2021.

31 Donald Kanak, "How to accelerate the energy transition in developing economies," *World Economic Forum,* January 25, 2021, **https://www.weforum.org/agenda/2021/01/how-to-accelerate-the-energy-transition-in-developing-economies**.

32 Clara Denina and Melanie Burton, "ADB, Citi, HSBC, Prudential hatch plan for Asian coal-fired closures – sources," *Reuters*, August 3, 2021, **https://www.reuters.com/world/uk/exclusive-citi-hsbc-prudential-hatch-plan-asian-coal-fired-closures-sources-2021-08-03/**.

33 Donald Kanak, "How to accelerate the energy transition in developing economies," *World Economic Forum,* January 25, 2021, **https://www.weforum.org/agenda/2021/01/how-to-accelerate-the-energy-transition-in-developing-economies**.

34 "Ending coal-generated power," Bundesregierung, accessed August 27, 2021, **https://www.bundesregierung.de/breg-en/issues/sustainability/kohleausstiegsgesetz-1717014**; Murielle Gagnebin, "What's the timeline for Germany's coal phase out?" *Agora Energiewende,* July 16, 2020, **https://www.agora-energiewende.de/en/blog/whats-the-timeline-for-germanys-coal-phase-out/**.

35 Yannick Rack, "First German coal closure auction oversubscribed as utilities look to exit uneconomic sector," *IEEFA*, December 1, 2020, **https://ieefa.org/first-german-coal-closure-auction-oversubscribed-as-utilities-look-to-exit-uneconomic-sector/**; Vera Eckert, "Germany awards second round of permits to close hard coal plants," *Reuters*, April 1, 2021, **https://www.reuters.com/business/energy/germany-awards-second-round-permits-close-hard-coal-plants-2021-04-01**/.

36 Sören Amelang, "German coal exit on track despite weak third phaseout tender – grid agency," *Clean Energy Wire*, July 14, 2021, **https://www.cleanenergywire.org/news/german-coal-exit-track-despite-weak-third-phaseout-tender-grid-agency**.

37 "IDB Invest and ENGI Chile debut the world's first pilot project to monetize the cost of decarbonization," *IDB Invest*, February 3, 2021, **https://idbinvest.org/en/news-media/idb-invest-and-engie-chile-debut-worlds-first-pilot-project-monetize-cost-decarbonization**.

38 "BID Invest y Engie cierran financiamiento del primer piloto en el mundo para monetizer costos de la decarbonización," *Engie Energía Chile,* February 3, 2021, **https://engie-energia.cl/bid-y-engie-cierran-financiamiento-del-primer-piloto-en-el-mundo-para-monetizar-costos-de-la-descarbonizacion/**.

39 "The Just Transition Mechanism: making sure no one is left behind," European Commission, accessed August 28, 2021, **https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en**.

40 "Commission welcomes the political agreement on the proposal for a Public Sector Loan Facility of the Just Transition Mechanism," *European Commission,* April 26, 2021, **https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1935**.

41 "Accelerating Coal Transition (ACT) Investment Program," *Climate Investment Funds*, Joint Meeting of the CTF and SCF Trust Fund Committees, Washington D.C., November 17, 2021.

42 "CIF's bold program for accelerating coal transition receives committee endorsement," *Climate Investment Funds,* March 29, 2021, **https://www.climateinvestmentfunds.org/news/cif%E2%80%99s-bold-program-accelerating-coal-transition-receives-committee-endorsement**; G7, *Carbis Bay G7 Summit Communiqué: Our Shared Agenda for Global Action to Build Back Better,* G7 Cornwall UK 2021 Summit, **https://www.g7uk.org/wp-content/uploads/2021/06/Carbis-Bay-G7-Summit-Communique-PDF-430KB-25-pages-1-1.pdf**.

43 Paul Bodnar et al., *How to Retire Early: Making accelerated coal phaseout feasible and just,* RMI, June 2020, **https://rmi.org/how-to-retire-early-making-accelerated-coal-phaseout-feasible-and-just/**.

44 "Utility Transition Hub," RMI, accessed September 2, 2021, **https://utilitytransitionhub.rmi.org/portal/**; Paul Bodnar et al., *How to Retire Early: Making accelerated coal phaseout feasible and just,* RMI, June 2020, **https://rmi.org/how-to-retire-early-making-accelerated-coal-phaseout-feasible-and-just/**.

45 Paul Bodnar et al., *How to Retire Early: Making accelerated coal phaseout feasible and just,* RMI, June 2020, **https://rmi.org/how-to-retire-early-making-accelerated-coal-phaseout-feasible-and-just/**.

46 "Utility Transition Hub," RMI, accessed September 2, 2021, **https://utilitytransitionhub.rmi.org/portal/**.

47 "Rate Case History," S&P Capital IQ, accessed September 2, 2021, **snl.com**.

48 New Mexico, SB0489, Energy Transition Act, signed 3/22/2019.

49 New Mexico PRC, Case No. 19-00195-UT, Order on Recommended Decision on Replacement Resources - Part II, filed 7/29/2020.

50 New Mexico PRC, Case No. 19-00195-UT, Order on Recommended Decision on Replacement Resources - Part II, filed 7/29/2020.

51 New Mexico PRC, Case No. 19-00018-UT, Recommended Decision on PNM's Request for Issuance of a Financing Order, filed 2/21/2020; "Rate Case History," S&P Capital IQ, accessed September 2, 2021, **snl.com**.

52 New Mexico PRC, Case No. 19-00018-UT, Rebuttal Testimony of Ronald N. Darnell, filed 11/15/2019.

53 New Mexico PRC, Case No. 19-00018-UT, Transcript of Proceedings 12-12-2019 Public Hearing Exhibits of ABCWUA 2-3, NEE 11-14, NM AREA 1 & PNM 16-22, filed 12/17/2019.

54 New Mexico PRC, Case No. 19-00018-UT, Recommended Decision on PNM's Request for Issuance of a Financing Order, filed 2/21/2020.

55 New Mexico, SB0489, Energy Transition Act, signed 3/22/2019.

56 "Global Coal Plant Tracker," Global Energy Monitor, accessed August 26, 2021, **https://globalenergymonitor.org/projects/global-coal-plant-tracker/dashboard/**

57 "Public Investment Trends in Renewables," IRENA, accessed August 17, 2021, **https://www.irena.org/financeinvestment/Sources-of-Investment**.

58 IJGlobal, *Project Finance & Infrastructure Journal,* accessed July 28, 2021, ijglobal.com; Global Energy Monitor, *Global coal plant tracker,* accessed September 8, 2021, **https://globalenergymonitor.org/projects/global-coal-plant-tracker/**.

59 IMF, *State-owned Enterprises: The Other Government,* April 2020.

60 Joseph Stiglitz, *Globalization and Its Discontents,* W.W. Norton & Company, 2003.

61 Justin Guay, "5 rules to make sure coal-plant buyouts benefit the public, not the big banks," Canary Media, September 7, 2021, **https://www.canarymedia.com/articles/climate-crisis/five-rules-to-make-sure-coal-plant-buyouts-benefit-the-public-not-the-big-banks**; Donald Kanak, "How to accelerate the energy transition in developing economies," *World Economic Forum,* January 25, 2021, **https://www.weforum.org/agenda/2021/01/how-to-accelerate-the-energy-transition-in-developing-economies**; Melissa Brown, *ADB Back Coal Power Retirement in Southeast Asia: New program targets the right issues, but more solutions may be needed,* IEEFA, September 2021, **http://ieefa.org/wp-content/uploads/2021/09/ADB-Backs-Coal-Power-Retirement-In-Southeast-Asia-September-2021.pdf**.

62 Vivien Foster and Anshul Rana, *Rethinking Power Sector Reform in the Developing World,* The World Bank, December 2019.

63 "January 2021 Global Coal Plant Tracker," *Global Energy Monitor,* **https://globalenergymonitor.org/projects/global-coal-plant-tracker/***;* IJGlobal Project Finance & Infrastructure Journal, **https://ijglobal.com/data/search-transactions**; *Global Coal Power Economics Model Methodology,* Carbon Tracker, March 2020, **https://carbontracker.org/wp-content/uploads/2020/03/Global_Coal_Methodology_Vwebsite2.pdf**.

64 *Renewable power generation costs in 2020*, IRENA, June 2021, **https://www.irena.org/publications/2021/Jun/Renewable-Power-Costs-in-2020**; A. Elshurafa et al., "Estimating the learning curve of solar PV balance-of-system for over 20 countries: Implications and policy recommendations," *Journal of Cleaner Production* vol. 196 (2018): 122-134; *New Energy Outlook 2021,* BloombergNEF, July 2021, **https://about.bnef.com/new-energy-outlook/**.

65 "Global Solar Atlas 2.0," Solargis s.r.o. on behalf of the World Bank Group and ESMAP, accessed August 2, 2021, **https://globalsolaratlas.info/support/terms-of-use**.

Koben Calhoun, Pintian Chen, Mathias Einberger, Rachit Kansal, Tyeler Matsuo, Uday Varadarajan, and Udetanshu, *Financing the Coal Transition: Pragmatic Solutions to Accelerate an Equitable, Clean Energy Future*, RMI, 2021, **https://rmi.org/**

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