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Decarbonizing the Energy Sector in Chile

CONVERGENCE
BLENDING GLOBAL FINANCE

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Executive Summary

Chile has long been reliant on coal for electricity generation. Industrialization and sustained economic growth throughout the latter half of the last century rapidly increased electricity demand and applied pressure to Chile's heavily hydro-based generation. Coal became a viable and economical supplementary fuel source, much of which was imported. While not a leading emitter of greenhouse gas emissions, today Chile stands in the top quartile of countries most vulnerable to climate change.

In 2018, in the face of mounting domestic climate pressures and global commitments to reduce reliance on coal power, the Government of Chile introduced a national energy strategy to completely phase out all coal-fired power plants in the country by 2040.

With a clear public and corporate commitment to phase out coal assets in place, IDB Invest, the private sector arm of the Inter-American Development Bank, saw the opportunity to pilot a new decarbonization instrument with global energy utility Engie, that would accelerate the closure of two coal power plants to achieve a greater reduction in emissions. The instrument applied blended finance in the form of a compensation scheme. Concessionality would be used to incentivize Engie to cease operating net profitable coal plants earlier, by creating an alternative revenue stream linked to a newly constructed renewable energy asset, the Calama wind farm. The increased emissions reduction from closing the coal plants earlier than initially planned would be monetized and applied to reduce Engie's borrowing costs for the construction of the Calama power plant. IDB Invest also sought to lay the groundwork for a new tradeable carbon credit class tied to the accelerated decommissioning of coal plants.

A suite of approaches to coal decommissioning in emerging markets exists. Yet, their use, standardization and replicability are impeded by an inadequate supply of concessional capital, insufficient political will to transition away from coal power, and inconsistent economic incentives for private coal owners to cease operations during the useful lives of their assets. The

SYNOPSIS

THEME	Just Energy Transition
DONOR CAPITAL POOL	Clean Technology Fund (CTF)
DONOR MANDATE	As one of the Trust Funds of the Climate Investment Funds (CIF), CTF is focused on providing concessional finance for climate mitigation activities in emerging markets.
UNDERLYING PROJECT	***New renewable energy asset:*** • Calama wind farm (151MW); Calama, Antofagasta, Chile ***Decommissioned coal assets:*** • Tocopilla coal unit 14 (136MW); Tocopilla, Antofagasta, Chile • Tocopilla coal unit 15 (132MW); Tocopilla, Antofagasta, Chile
PROJECT SPONSORS	***Coal asset and renewable energy owner:*** Engie Energia Chile, S.A., subsidiary of Engie S.A.
COUNTRY	Chile
CONSTRUCTION COSTS	**TOTAL COST OF CALAMA WIND FARM: $152.9 million** ***IDB Invest*** • $74 million senior loan ***Co-financing*** • $36 million senior loan ***CTF*** • $12 million senior loan with embedded outcome-based concessionality ***Sponsor equity*** • $27.9 million
OUTCOME-BASED METHODOLOGY	Emissions avoided from accelerated coal plant closure are monetized into a carbon mitigation credit. The carbon mitigation credit represents an interest payment discount applied at maturity of the CTF loan.

UNDERLYING PROJECT	• Realized emission avoided:
	  • 2022 – 132,256 tCo2eq
	  • 2023 – 333,700 tCo2eq
	  • 2024 - 161,467 tCO2eq
	• 267 impacted staff participating in re-skilling training
	• 14,000 cumulative hours of training conducted
	• 100% exit from coal power in the Tocopilla region by Engie

decarbonization pilot illustrates the array of political, economic and regulatory elements that must be in sync for blended finance to effectively contribute to the phase-out of coal power plants and shows how a compensation scheme structure, when implemented in an enabling environment, can help to maximize the emissions reduction efficiency of concessional dollars aimed at coal decarbonization.

Key insights from this case study include:

- A national transition away from coal requires more than blended finance alone; it hinges on strong policy commitment and industry buy-in.
- To incentivize and accelerate coal decommissioning in Emerging Markets and Developing Economies, availability of concessional finance is paramount.
- A dedicated and knowledgeable blended finance team is highly valuable in first-time, pilot transactions in new sectors.
- Piloting transactions in controlled environments with experienced counterparts helps to speed up the development of models for more complex applications.

Introduction

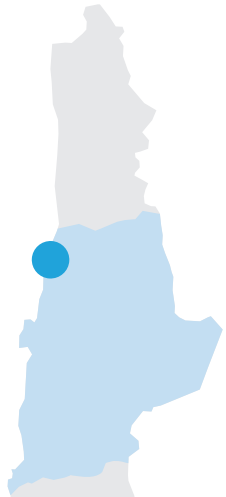
Coal remains the most relied upon yet most environmentally harmful energy source worldwide. According to the Intergovernmental Panel on Climate Change (IPCC), coal demand must decrease by 95% by 2050 from current levels if there is any realistic expectation of keeping global warming within the 1.5°C threshold set by the Paris Agreement. Concurrently, public and private investment into renewable energy assets must grow exponentially as coal fleets are retired. While not a leading emitter of greenhouse gases (GHGs), Chile is highly vulnerable to the impacts of climate change and has long been locked into coal for electricity generation[1]. In 2020, coal comprised the greatest share of the country's installed energy capacity (40%), making the electricity sector the leading contributor to the nation's overall emissions output. By contrast, all non-conventional renewable energy sources (i.e., excluding hydro) combined accounted for less than one-third of the energy matrix.

Framed by the twin imperatives of Paris Agreement compliance and the ever-growing threats of climate change, in 2018, the Government of Chile (GoC) through the Ministry of Energy (MoE), began to roll out a national energy strategy roadmap, Energy Route 2018-2022: Modernization with Citizen Seal, that was developed in collaboration with the main coal asset owning utilities in the country, including Engie Energia Chile (EECL, or "Engie"). The strategy established directives regarding the decarbonization of the electricity industry, chief among which was the commitment to phase out all coal-fired power plants in the country by 2040 and increase the share of renewable energy in Chile's energy matrix to at least 70% by 2050.

In the context of Chile's collective decarbonization commitment, IDB Invest, the private sector arm of the Inter-American Development Bank (IDB) Group, saw the opportunity to pilot a new financial instrument to:

- i accelerate the decommissioning of two EECL coal plants near Tocopilla by two years; and
- ii replace the lost generation capacity with the creation of the Calama wind power plant owned and operated by ECCL.

This case study explores how IDB Invest used blended finance to support energy sector decarbonization in Chile. IDB Invest aimed to accelerate the decommissioning of Unit (U)14 and U15 by providing financial incentives to Engie in the form of an outcome-based finance model. The model combined concessional funds from the Clean Technology Fund (CTF)[2] with commercial financing, to create an alternative source of income for Engie in place of the forfeited coal-based revenue streams from the expedited closure of the coal plants. It also explores the model's potential in accelerating private sector involvement in coal decommissioning by piloting a new, high-integrity carbon credit asset class tied to transition activities. The monetization of the enhanced emissions reduction provides Engie with an alternative cash flow option, that replaces the blended financing in the event a carbon market compliant with Article 6 of the Paris Agreement is established during the term of the decarbonization instrument. The success of the pilot hinged on a supportive regulatory environment, corporate commitment to decarbonization, and the availability of blended finance.



Antofagasta

Chile

Tocopilla coal unit 14 – 136MW
Tocopilla, Antofagasta

Tocopilla coal unit 15 – 132MW
Tocopilla, Antofagasta

Calama wind farm – 151MW
Calama, Antofagasta

1 Chile's share of global GHG emissions stands at just 0.10%.

2 The Clean Technology Fund (CTF) is one of the Trust Funds of the Climate Investment Funds (CIF), a multilateral climate fund focused on providing concessional finance for climate mitigation activities in emerging markets.

OPTION	DESCRIPTION	EMISSION REDUCTION POTENTIAL
Retrofit operations	Continue plant operations and co-fire with cleaner energy sources (e.g., biomass, hydrogen); continue plant operations and retrofit equipment with efficiency upgrades or carbon capture systems (CCSs); or continue plant operations at a lower output capacity.	Low emission reduction potential
Cease operations (keep intact)	Suspend plant operations for a period of time to cut back emissions; maintain plant as reserve capacity only, firing plant to meet grid needs; or deactivate but not completely retire the plant, a process known as **mothballing**[3].	Intermediate emissions reduction potential
Cease operations (dismantle)	Accelerate the full closure of the plant; replace the plant with a renewable energy alternative at a different site; or repurpose plant infrastructure for clean energy production.	High emissions reduction potential

Table 1. The three primary transition methods applicable to coal power plants Source: Boston University Global Development Policy Centre: Early Phase-Down of Coal Plants.

Background on coal decommissioning in emerging markets

In most emerging markets and developing economies (EMDEs), coal power plants have been a core enabler of social and economic development, creating tension with climate objectives. Additionally, with many plants owned and operated by state-owned enterprises (SOEs), coal generation has also historically represented a strong source of revenue for governments and expanded public budgets. Public subsidies have been introduced to protect these gains but, over time, have insulated coal power from market pressures, slowing competition from alternative energy technologies and allowing coal assets to operate well after they cease to be economically sound. RMI estimates that, by 2025, 78% of the global coal fleet will be economically uncompetitive in the absence of subsidies. Reducing and ultimately eliminating coal subsidies can save billions of dollars in electricity tariffs for end users, reduce state debt burdens and free up public balance sheets for other activities, including renewable energy asset development and transmission upgrades.

There are three key "transition methods" to reduce the emissions output of coal power plants, as outlined in Table 1 above.

Structurally, there are different ways to deliver financing to facilitate the above transition efforts in EMDEs. Table 2 below outlines five financial mechanisms currently under implementation which, wholly or in part, target the decarbonization of coal assets. They either utilize a blended finance approach (use of concessional funds to de-risk and incentivize private sector financing participation), are funded by public sector entities only, or are entirely financed through conventional commercial investment. Furthermore, transition efforts can target individual assets or take a market-wide approach in countries where coal is heavily integrated into the economy.

MECHANISM	DESCRIPTION	FINANCING SOURCES	STATUS OF IMPLEMENTATION TO-DATE
Compensation scheme (asset level financing)	• Aims to **accelerate** retirement timeline (already committed) of (a) particular coal asset(s) • Reimburses the coal power plant owner's lost profitability caused by early retirement through the monetization of the actual displacement of emissions • The plant owner receives payment replacing the existing coal revenue stream (tariffs from energy production). Acts as an incentive for early closure of the coal plant because the payout can be greater than the net present value of the future income stream.	**Blended finance** • Concessional financing from public sources (debt / equity) to compensate the coal asset owner for emissions reduction from accelerated closure • Commercial financing from public or private sources (debt / equity) can be used to finance construction of replacement asset (renewables)	• IDB Invest / Engie decarbonization instrument in Tocopilla, Chile

3 Mothballing is the deactivation and preservation of capital equipment of facilities for potential future use or eventual sale.

MECHANISM	DESCRIPTION	FINANCING SOURCES	STATUS OF IMPLEMENTATION TO-DATE
Energy Transition Mechanism (ETM)	• A project-level or country-level approach that acquires coal assets to retire them • Coal asset owners use sale proceeds to reinvest in renewable energy asset creation • Can integrate a compensation scheme approach	**Blended finance** through ETM Trust Fund • Commercial financing (debt / equity) to finance coal asset purchase • Concessional financing from public sources (debt / equity) to finance the difference between the value of the plant if operated for its full lifespan and its value with an abbreviated lifespan. • Compensation scheme integration - concessional and commercial financing structured as outlined above	• Manila, Philippines (planning) • Cirebon 1 coal plant, Indonesia (planning) • Vietnam (planning)
Eskom Just Energy Transition Project (EJETP)	• Refinancing of Komati coal plant in South Africa, owned by the country's state-owned electricity utility, Eskom, for its eventual **reconversion** to renewable energy sources and battery storage • Funds part of Eskom debt restructuring efforts that will help restore access to capital markets to maintain operations	**Public financing** • Concessional financing from public sources (debt / grant) to lower cost of capital • Commercial financing (debt) from public sources	• Komati coal plant, South Africa
Just Energy Transition Partnership (JETP)	• Country-level multilateral funding agreements between donor countries (the International Partners Group) and recipient EMDE governments that aim to accelerate the transition away from coal power generation • Tied to political commitments and processes for **country-wide coal decommissioning**	Potential for **asset level blended finance** • Concessional financing from public sources (debt / equity) to de-risk investment in the energy transition • Commercial financing from public and private sources (debt / equity) to acquire coal assets for retirement and/or finance renewable energy asset construction	• South Africa • Indonesia • Vietnam • Senegal
Rate-payer-backed securitization	• Refinances coal assets for their early retirement and replacement by renewable energy through bond issuance by utility company backed by tariff revenue. The bond issuance is backed by the new renewable energy PPA. • Bond proceeds are used to reduce end user electricity costs by replacing a portion of their fee payment (the return share for the utility). Bonds are issued at a lower rate (compared to fee rate for electricity users) because of the low probability of default enabled by the renewable energy tariff schedule.	**Commercial financing** • Commercial financing (debt) from private sources to acquire bond	• United States[4]

Table 2. Summary of ongoing coal transition financing mechanisms in EMDEs. Source: RMI – Financing the Coal Transition.

4 Rate-payer-backed securitization has only been implemented in the US to-date but is structurally applicable in EMDEs.

A series of common challenges affect the incentivization, efficiency, scalability and replicability of coal transition financing mechanisms.

Some key barriers are as follows:

i FINANCIAL BARRIERS

- a Foregone profits for coal asset owners and power plant investors
- b High interest rates and highly leveraged balance sheets prevent coal owners from taking on new financing
- c Tariff-setting formulas for Independent Power Producers (IPPs) and some state-owned assets are designed to yield a predetermined return. Transition to more affordable renewable assets would trigger a tariff reset, removing any incentive to make the change.

ii POLITICAL BARRIERS

- a A lack of political will for early closure of coal assets due to continued revenue streams (state-owned assets) or royalties (privately owned assets)
- b Other key sectors are engaged in and rely on coal value chain activities
- c Coal subsidy schemes have created market distortion which prevents market entry for renewable energy alternatives
- d A lack of political will for early closure of coal assets due to development needs

iii LEGAL BARRIERS

- a Existing Power Purchase Agreements (PPAs) or coal supply agreements (with mines) must be renegotiated before coal assets can be phased out

iv SOCIAL BARRIERS

- a Highly coal-dependent jurisdictions face potential energy insecurity, stifled local economic development and significant job loss without adequate transition plans

v TECHNICAL AND INFRASTRUCTURE BARRIERS

- a Substantial public and private investment in transmission infrastructure that is compatible with renewable energy sources is required
- b Fewer centralized power stations requires long-term strategic spatial planning to link dispersed renewable energy power plants to end users

vi CORPORATE STRUCTURE BARRIERS

- a Coal owners that are vertically integrated across the value chain (mining, transportation, transmission) introduce greater economic and interface complexity to phase-out plans

Design and Fundraising

The implementation of IDB Invest's decarbonization instrument in Chile was facilitated by three pivotal developments that aligned national goals with corporate commitments and needs.

i. The GoC's commitment to phase-out all coal assets by 2040
ii. Engie's existing corporate commitment to decarbonize its power generation assets globally
iii. The creation of an alternative revenue stream for EECL using concessional finance that would replace existing income from coal power generation and incentivize an accelerated closure of indicated coal power plants

Each factor was necessary to create a scenario where an accelerated phase-out of two coal assets could be achieved.

Concept and legislative environment

With the introduction of the Energy Route 2018-2022 plan, Chile communicated to its energy industry that the future economic losses due to climate change outweighed the costs associated with early decarbonization[5]. As part of this strategy's formation, Chile's MoE convened a multistakeholder roundtable - the Plan for Phase-out and/or Reconversion of Coal Units – which included public, private, and philanthropic organizations, alongside coal asset owners AES Gener, Colbún, Enel, and Engie. At the time of the roundtable, these four energy producers held 5.53GW of installed coal capacity in Chile. The roundtable addressed the complexities of phasing out coal, considering factors like energy security, technology, and economic implications. The dialogue crystallized willful agreements between the GoC and coal operators, committing to the complete phase out of the country's coal fleet by 2040. The Energy Strategy laid out a coordinated timetable, targeting the closure of 28 coal plants, with 11 plants (1.7GW) to close by 2024 and 4 more (1.1GW) by 2025.

Through the roundtable and the advancement of the Energy Strategy, the Chilean government delivered clear messaging on the future of using coal as an energy source. The strategy created a regulatory environment that was no longer conducive to coal assets and offered a clear pathway to coal operators: integrate phase-out plans or risk having stranded assets.

The public sector arm of the IDB Group participated in the MoE's roundtable and contributed to the energy sector's regulatory reform process. Noting the relatively limited success to date implementing existing decarbonization financing models (see Background on coal decommissioning in emerging markets above), IDB Invest was looking for an opportunity to develop and prove a blended finance instrument that would incentivize coal asset owners to accelerate their decommissioning timelines and maximize the emissions reduction potential of shutting down coal power plants. **Specifically, IDB Invest wanted to design an instrument that would monetize the actual emissions reduction yielded by closing a coal power plant earlier than originally targeted and apply that monetized credit to reduce the borrowing costs associated with the construction of a renewable energy asset.**

Chile presented a unique opportunity for IDB Invest in this respect. First, the GoC's voluntary coal phase-out plan provided the necessary framework to push IPPs away from coal generation and pull them towards renewable energy asset development. Importantly, it established a clear phase-out timeline at an asset level that IDB Invest's decarbonization instrument intended to accelerate. IDB Invest's renewable energy portfolio demonstrated evidence of the coordinated private sector investment that is stimulated by positive regulatory reform. For example, the success of IDB Invest's work in developing the Uruguay solar sector is traced back to the bank's early-stage engagement with the national utility to reform tariff structures and design a competitive tendering auction to increase appetite from IPPs. A more coherent regulatory regime, which was more conducive to private sector investment, helped mitigate country risk and enhance project bankability.

Second, Chile's private coal owners all made voluntary pledges towards the early closure of their coal plants. Compared to other impact investment strategies, such as motivating greater investment into green or gender-lens assets, which reallocates a company's portfolio without intending to disrupt a net-profitable business line, coal asset decommissioning effectively eliminates a profit-generating activity. As such, corporate commitment to the

5 The strategy comprised seven axes of the energy sector: energy sector modernization, energy development, low-emission energy development, sustainable transport, energy efficiency, the social impact of energy transitions, and energy education campaigns.

phase-out is paramount. Additionally, like the GoC's coal mandate, the pledges by Chile's coal owners cemented actual target dates for asset phase-out to which IDB Invest's acceleration model could be applied.

Finally, Chile is one of few countries in the Latin America and the Caribbean region with significant coal power assets owned by private companies (others include the Dominican Republic, Brazil, and Mexico) and where IDB Invest had donor resources under management. The availability of scarce concessional capital would be vital to providing the necessary incentives to expedite the closure of a coal power plant.

Engie's decarbonization commitment

Under the Paris Agreement, multilateral development bank (MDB) support to private sector led decarbonization efforts is intended to motivate broad behavioural shifts among IPPs. Rather than use scarce MDB and concessional resources to decommission coal assets on a plant-by-plant basis, the Paris Agreement encourages MDBs to either support private entities in developing a robust and coherent corporate decarbonization timeline or prioritize working with those that already have a mandated strategy in place.

IDB Invest marketed its monetization decarbonization instrument to the coal owners in Chile. Among these, Engie stood out as a strong partner given their existing commitments to decarbonization. Prior to Chile's 2040 phase-out timetable, Engie adopted corporate social responsibility targets aligned with the Sustainable Development Goals (SDGs). Central to this framework was the decarbonization of its global power generation assets, underscored by a 2016 pledge to exit the coal industry globally by 2027 and by 2025 in Chile. To support this transition, Engie committed over $1 billion through its Chilean subsidiary, EECL, to decarbonize operations and fully shift energy production to renewable energy sources. Building on these foundations, Engie committed under Chile's Energy Strategy to phase out its four coal assets in the Tocopilla Province by the end of 2024. U12 and U13 (a combined 171MW capacity) were decommissioned in 2019, with U14 and U15 (268MW combined capacity) were scheduled to close by May 2024.

At the 2019 UN Climate Change Conference (COP26), IDB Invest and Engie formalized their partnership with a letter of intent to pilot the decarbonization instrument.

In addition to its sophisticated corporate decarbonization strategy, EECL represented a strong potential partner for IDB Invest due to its:

- (i) diversified infrastructure asset base
- (ii) stable financial standing as a BBB (Fitch) rated company and largest power producer in northern Chile
- (iii) strong industrial client base (mining companies) under long-term PPAs, with a share of the PPAs containing take-or-pay provisions[6]
- (iv) parent company's experience developing greenfield renewable energy projects, with 400MW under construction and 600MW in planning

As a pilot transaction, having a strong counterparty who i) was in strong financial standing; ii) had a balance sheet that could absorb potential structuring delays; and iii) had the human capital to meet the necessary due diligence and emissions monitoring required of the project was critical to IDB Invest.

As will be outlined below, these aspects were also vital to the successful implementation of IDB Invest's pioneering methodology to quantify the actual emissions avoided from accelerated coal power plant retirement that would allow EECL to participate in carbon markets through a new coal transition credit asset class. Moreover, EECL's sound balance sheet limited financial risk and allowed for improved efficiency in the design of the decarbonization credit mechanism without outsized concern for additional risk mitigation elements. Overall, EECL's acceptable investment risk and the sovereign creditworthiness of Chile provided IDB Invest with an investment grade exposure.

For EECL, partnering with IDB Invest on the decarbonization instrument pilot offered the potential to obtain a reduced interest rate on construction loans for the Calama wind project; and ii) provided the opportunity to further enhance the emissions reduction impact of its corporate decarbonization strategy and align the social and environmental outcomes of the closure of U14 and U15 with IFC Performance Standards. As one of the world's largest utility companies and given its corporate decommissioning plan, Engie was in a position to finance the construction of the new wind farm on an entirely commercial basis (either debt raised in the capital market or through own equity) and shut down U14 and U15 as planned strategy in 2024. However, like IDB Invest, EECL was motivated to participate in the pilot to demonstrate the impact case for accelerated

6 A take-or-pay provision ensures that a buyer will take a predetermined amount of energy from a producer or pay a set penalty fee if it does not.

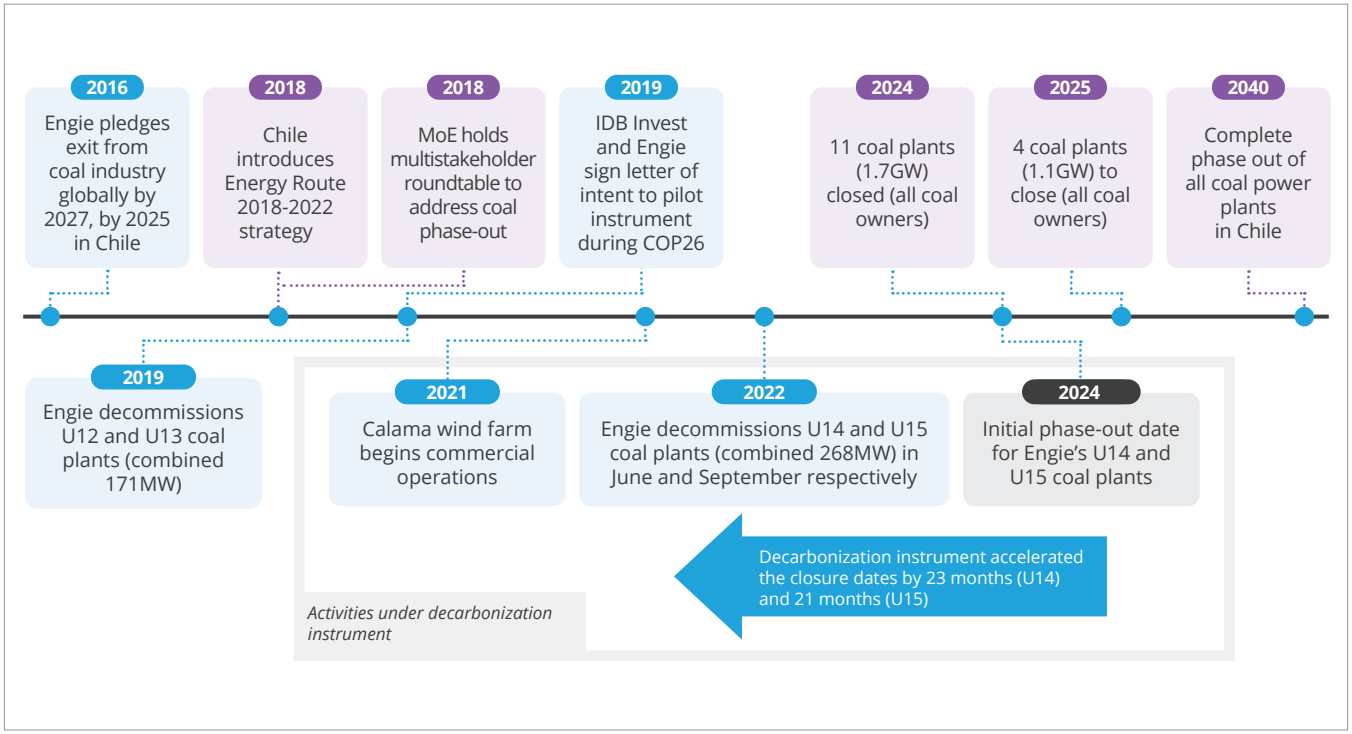


Figure 1. Timeline of Chile's coal decarbonization strategy and integration of IDB Invest's pilot decarbonization instrument

coal retirement, position itself at the forefront of a new carbon credit asset class, and underscore its commitment to reducing emissions from its power generation assets.

The accelerated closure of U14 and U15 using blended finance

In emerging markets, decarbonization mechanisms typically use concessional funds in three ways;

- provide concessional debt to lower the cost of decommissioning for the coal owner and pay out investors sooner;
- provide concessional equity through a Managed Transition Vehicle (MTV) which is used to purchase the coal asset from the owner and exit other investors with the intention to close the plant; and
- for a compensation scheme to create an additional source of income for the coal owner

Each approach uses concessional funding to help incentivize early plant phase-out by compensating coal owners upfront for future revenues, thereby decreasing total return required by the coal owner. However, the first two models require substantial concessional funding, which is often limited. Recognizing this, IDB Invest used its available donor resources to accelerate EECL's decommissioning through piloting a **compensation scheme embedded in a debt structure**. A compensation scheme involves the use of concessional capital to create an additional source of income for the coal owner, which offsets future revenues from coal generation. This model directly addresses the commercial paradox of the early closure of coal assets. That is, the approach embeds a temporary subsidy component to incentive coal owners to cease operating a net profitable business.

The decarbonization instrument would accelerate the respective closure dates of U14 and U15 by 29 months by providing EECL with a monetized emission reduction incentive, or carbon mitigation credit, based on the actual reduction in GHGs resulting from the earlier phase-out.

The carbon mitigation credit would either be:

- applied in the form of an interest rate reduction on the construction financing for the Calama wind farm – the renewable energy asset replacing generation capacity due to the closure of U14 and U15; or

- if a carbon market develops within the 12-year term of the loans, EECL is entitled to sell the carbon mitigation credit into the market, thereby establishing a new revenue line created by the decarbonization instrument.

As a first-of-its-kind transaction, IDB Invest was required to devise a novel methodology to quantify to the actual emissions avoided from the accelerated retirement. The development of the methodology was a complex and resource-intensive process. It was based on the United Nations Framework Convention on Climate Change (UNFCCC) Clean Development Mechanism (CDM), the initial framework designed by the UNFCCC that outlines the criteria against which emission reduction projects can earn certified carbon credits and apply them towards Kyoto Protocol targets.

The intention was to allow the methodology to have broad applicability beyond the pilot transaction. As such, IDB Invest partnered with an external consultant, WSP, and identified a series of criteria determining the methodology's transferability to other projects. These criteria are detailed in Table 3 below. The methodology is publicly available in English and Spanish.

For EECL, the emission reduction goals under the methodology were considered ambitious. The framework required detailed and consistent reporting from the company to determine the baseline emissions output of U14 and U15 and the generation output of the Calama wind farm. Additionally, due to various reasons, including weather, the coal plants were not fully dispatched[7] in the years leading up to the decommissioning date, which would impact the size of the credit earned. Despite these challenges, EECL remained committed to the pilot given its climate mitigation impact and market creation potential for a high-integrity asset class based on the carbon mitigation credit. The capacity and dedication of IDB Invest's blended finance team working on the deal were also important in this respect. They were instrumental in guiding EECL counterparts through the structuring and methodology development processes and effectively communicated what was required of EECL.

As a result of the decarbonization instrument, EECL retired U14 and U15 approximately two years ahead of schedule in June 2022 and September 2022 respectively. The Calama wind farm became fully operational in the summer of 2021. IDB Invest is currently engaged in discussions with other governments and coal asset owners in the region to replicate the compensation scheme, most notably in the Dominican Republic. As such, a carbon credit market aligned with the Paris Agreement for this new asset class (coal transition credits) yielded by the instrument has yet to develop.

CRITERION	DESCRIPTION
Early Decommissioning	The project must involve the planned and accelerated closure of a thermal power plant (operational or stranded).
Renewable Energy Addition	A renewable energy project must be implemented to fully offset the reduction in energy production caused by the decommissioning.
Recent Operation	The coal plant targeted for decommissioning must have been actively operational within the last five years.
Shared Ownership	Both the coal plant and the renewable energy project must be owned or controlled by the same economic group or entity.
Integrated Energy System	Both facilities must provide energy to the same electricity grid or energy system.
Timeframe Coordination	The renewable energy facility must begin operations no later than two years after the coal plant is shut down.

Table 3. Criteria determining applicability of the IDB Invest-WSP methodology

7 The term "dispatched" refers to the extent to which a power plant is called upon to generate electricity to meet demand. When a plant is "dispatched," it is actively producing power; if it is "not fully dispatched," it operates below its capacity or remains idle for periods due to factors like lower demand, weather conditions, or grid management decisions.

Capital Structure

IDB Invest designed the pilot decarbonization instrument to achieve three key outcomes:

i. Accelerate the decommissioning of two coal power plants (U14 and U15) owned and operated by EECL in Tocopilla province, Chile;

ii. Finance the construction of a replacement renewable energy asset, the 151MW Calama wind farm near the city of Calama; and

iii. Establish a methodology and framework for the creation of a new synthetic asset class based on coal transition credits generated by the early closure of coal power plants.

The decarbonization instrument provides corporate finance for the construction, operation, and maintenance of the Calama wind farm. The structure includes an embedded concessional component that offers an interest rate reduction derived from the additional emissions avoided from the accelerated decommissioning of U14 and U15.

Total construction cost of the wind plant was $152.9 million. IDB Invest provided a 12-year, $74 million senior A loan for its own account and mobilized a *pari passu*, 12-year $36 million senior loan of co-financing. In addition, IDB Invest administered a 12-year, $15 million senior concessional loan on behalf of the Clean Technology Fund. The CTF loan features a 12-year bullet maturity, which allows EECL to defer principal repayments until maturity. Commercial pricing was determined using comparable Chilean Peso and USD denominated sovereign instruments and corporate transactions in the energy sector. Remaining project costs were funded from EECL's balance sheet.

The instrument also features an embedded real option in the event a carbon market compliant with Article 6 of the Paris Agreement is developed. As will be discussed below, EECL has the option to sell carbon mitigation credits derived from the enhanced emissions reduction into the carbon market during the 12-year duration of the CTF loan. Cash flows generated from the sale would replace the interest rate subsidization option.

SOURCE	**INVESTMENT SIZE** (USD millions)	**SHARE** (%)	**PRICING**	**TENOR** (years)
IDB Invest A loan (senior)	74	48	Market comparable	12
Co-financing (senior)	36	24	Market comparable	12
CTF Tranche (senior, concessional)	15	10	100 bps + (Additional Interest compound amount – Carbon Mitigation Credit)	12
Sponsor Equity	27.9	18	-	
Total project cost: USD 152.9 million				

Table 4. Capital structure of the decarbonization instrument

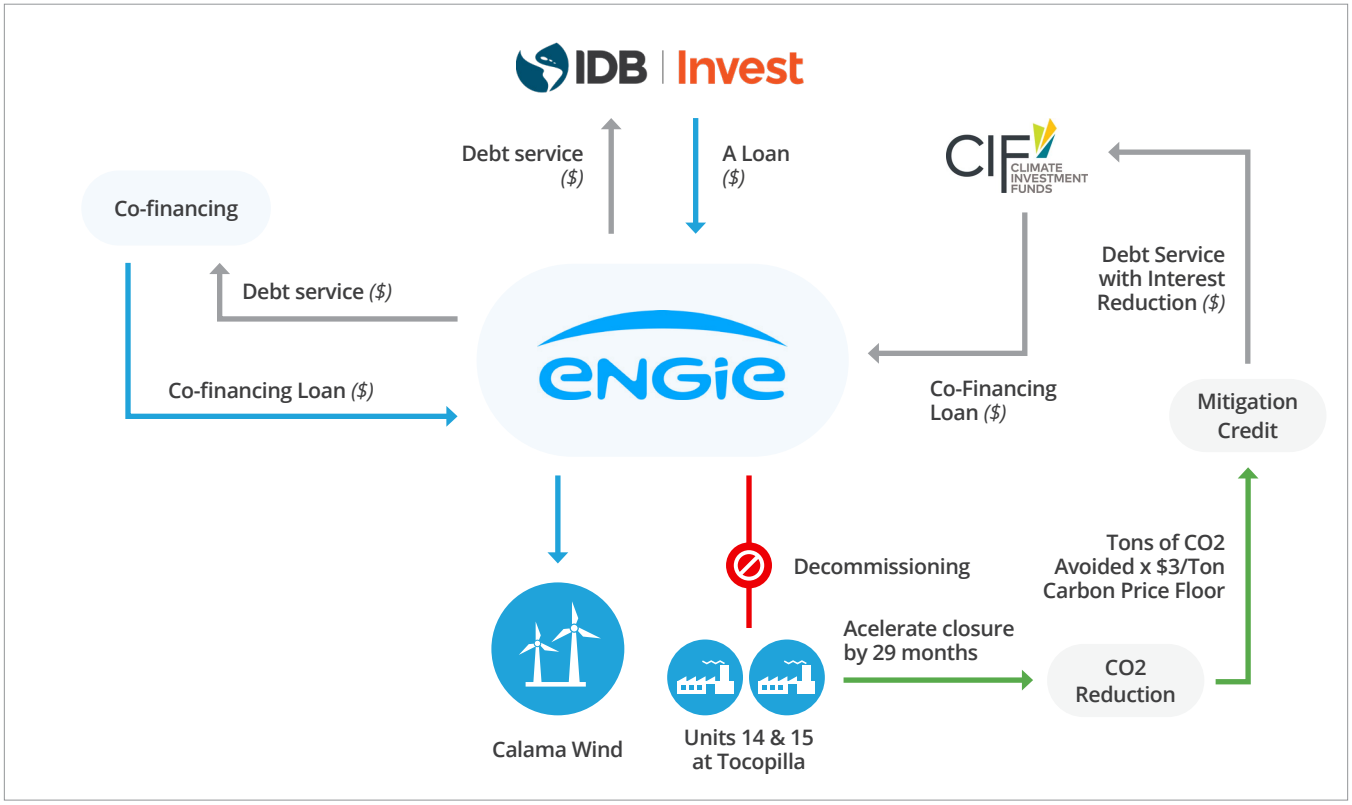


Figure 2. Financial structure of decarbonization instrument

The CTF loan features a two-tiered interest rate structure:

- i a fixed floor interest rate of 100 basis points; and
- ii a "Blended Finance Loan Additional Interest Rate."

The latter represents the difference between the commercial benchmark rate and the fixed floor interest rate. The difference is deferred, compounded and repaid alongside the principal at maturity. This additional interest rate is linked to a carbon monetization mechanism, which provides results-based payments from the reduction of GHG emissions achieved through the accelerated retirement of EECL's U14 and U15 coal assets by approximately two years. The methodology for the calculation of this credit is outlined below.

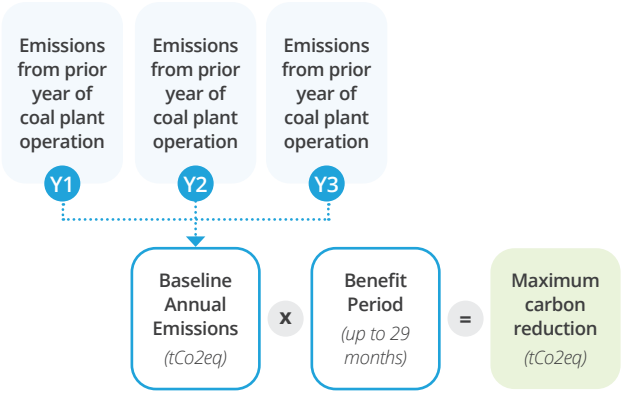
Monetization Methodology

Given the absence of an established domestic carbon market in Chile, IDB Invest devised a novel methodology to calculate the monetized value of the emissions avoided, known as the "carbon mitigation credit". The value of the carbon mitigation credit would be discounted from the CTF loan rate at maturity and acts as the incentive for EECL to accelerate the phase-out timelines for U14 and U15. The model is an example of "pay-for-success" blended finance, with concessionality effectively earned after the fact, based on achievement of desired impact. The key objectives of the methodology were to:

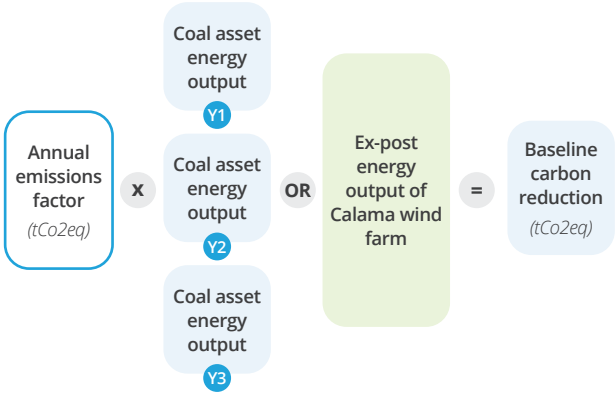
- i Devise a way to calculate actual emissions produced in a business as usual (BAU) scenario where the coal power plant continued to operate;
- ii Use the BAU emissions scenario as a benchmark against which the renewable energy replacement scenario could be compared and with which the value of the carbon credit could be calculated;
- iii Use blended finance as a means to reimburse EECL for the accelerated phase-out of the two coal plants; and
- iv Design the methodology in such a way that it could be transferable to other decommissioning projects and influence the creation of a new commercialized market where the credits could be traded.

The reduction in emissions resulting from EECL's accelerated phase-out is determined over the period between the original phase-out date and the earlier, voluntary phase-out date identified by the decarbonization instrument – known as the "benefit period". EECL's initial date for decommissioning was May 31, 2024, and the voluntary closure target date was January 1, 2022, making the benefit period effectively up to 29 months.

Next, the methodology would establish the BAU scenario for the calculation of the "maximum carbon reduction". The maximum amount of emissions (in tons Co2 equivalent, tCo2eq) is the largest amount of tCo2eq that could be avoided during the benefit period (i.e., the amount of emissions that are avoided due to accelerated phase-out). It is calculated using the average emissions data of the coal power plants from the prior three years (also known as the "annual emissions factor").



Next, the methodology calculates the ex-ante amount of carbon (tCo2eq) reduced during the benefit period resulting from accelerated phase-out and replacement of coal energy output with renewable energy output. There are two terms in this calculation. The first is the annual emissions factor as presented above. The other represents "displaced energy" and is the lower of either: i) the ex-post energy output of the renewable energy asset (Calama wind farm) during the benefit period; and ii) the baseline energy output of the coal plants (both in megawatt/hours, MWhs). This term adjusts the average annual emissions factor by the actual amount of energy produced during the benefit period following the coal plants' closure. In this case, the Calama wind farm output is used as determined by IDB Invest and EECL. The product of the annual emissions factor and the Calama wind farm average annual output is known as the "baseline carbon reduction".



The baseline carbon reduction amount is then multiplied by a carbon floor price ($X/tCo2eq), to get the size of the carbon mitigation credit. The lack of an established domestic carbon market required IDB Invest and EECL to engage in a price discovery process that led to a carbon floor price of $3/tCo2eq.

The carbon mitigation credit amount is applied to the CTF loan interest rate by subtracting the carbon mitigation credit amount ($) from the interest payment amount due at maturity using the CTF loan's original commercially priced interest rate. The interest due at maturity is adjusted based on the size of the carbon mitigation credit. In other words, the carbon mitigation credit cannot reduce the CTF loan rate below the 1% floor price (assuming the maximum carbon credit is achieved) and the interest paid at maturity cannot exceed what is determined by the commercial benchmark rate (assuming a carbon mitigation credit of $0).

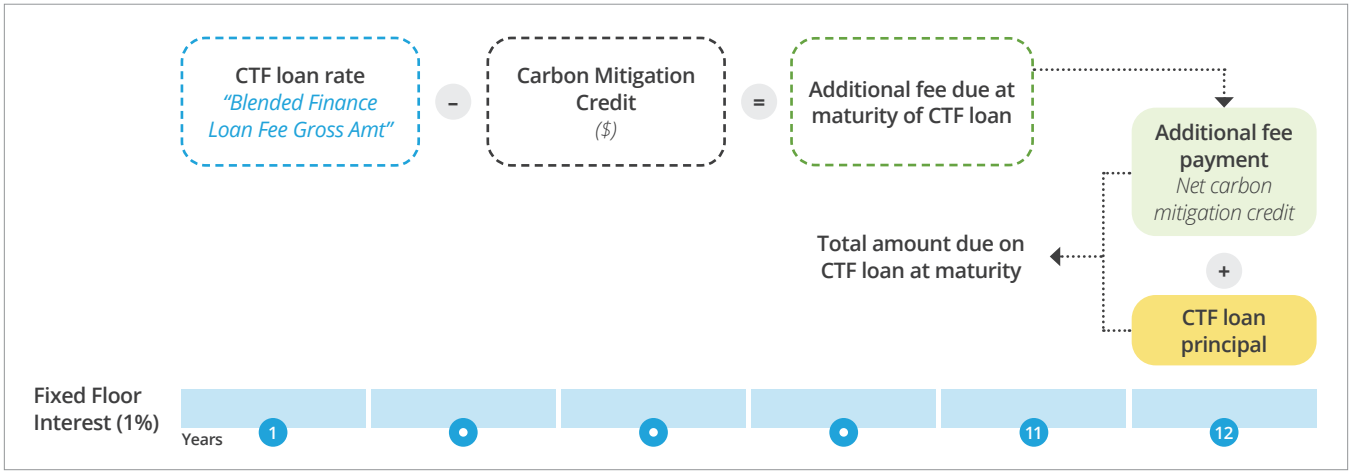


Figure 3. CTF blended finance loan structure

In the event a domestic or international carbon credit market is established during the term of the CTF loan and the credit is sold into the market, the model can be adapted to take advantage of a dynamic carbon market price. Sale of the credit is at the sole discretion of EECL. The methodology proceeds in the same way apart from the final determination of the value of the carbon mitigation credit. If the market price per tCo2eq exceeds the $3 floor price, IDB Invest cancels part of the interest rate reduction (carbon mitigation credit) to recoup the $3 floor price.

Specifically, the carbon mitigation credit would be reduced by multiplying the $3 floor price by the total amount of carbon avoided. This adjustment results in a smaller interest rate reduction for EECL because the company would benefit from selling carbon credits at higher market prices. In this scenario, EECL recovers lost coal revenues by selling carbon credits at market rates (amount of carbon sold multiplied by the carbon price) rather than receiving the blended finance subsidy. CTF is also entitled to 50% of the mitigation credit proceeds above the $3 floor price in this scenario.

Legal Structure and Governance

Engie Energía Chile S.A. is an energy utility company operating in Chile and subsidiary of the French multinational power utility company Engie S.A., rated A- (S&P). EECL manages a diverse asset base with a total installed capacity of 2.2 GW, that includes electricity generation plants, 2,300 km of transmission lines, 2 seaport facilities, and gas transportation infrastructure. It is the largest power producer in northern Chile, the fourth largest electricity generation company in Chile, and the third largest transmission company. The company holds an international credit rating of BBB from both S&P and Fitch.

As a power producer, Engie sells electricity into two markets:

- i The primary market, characterized by PPAs between generators and distribution companies (DISCOs) or large consumers regulated by the National Energy Commission (CNE) and the Electricity Coordinator (CEN)
- ii The secondary market, a spot market for short-term supply and demand balancing.

The two markets are interconnected, with primary market contracts establishing a baseline for energy supply and the secondary market enabling real-time adjustments to fluctuating demand.

EECL primarily generates revenue through electricity sales via medium and long-term contracts with customers in the primary market. Its main clients include large mining and industrial companies in the Norte Grande Region and DISCOs that supply electricity to residential and commercial consumers.

The Calama wind farm is 100% owned by Engie S.A. and operated by EECL. Global Energy Services (GES) Chile was awarded the engineering, procurement and construction (EPC) contract Balance of Plant and Siemens Gamesa was awarded the EPC for the turbines. Electricity from the wind farm is provided to the national grid, the Sistema Eléctrico Nacional (SEN).

Operations and Impact

YEAR	ACTUAL EMISSIONS AVOIDED
2022	132,256 tCo2eq
2023	333,700 tCo2eq
2024	161,467 tCO2eq

Table 5. Actual emissions avoided due to accelerated decommissioning of U14 and U15

The Calama wind farm began commercial operations in November 2021, with an installed capacity of 151.2MW. The U14 and U15 coal assets, with a combined thermal energy capacity of 268MW, were disconnected from the national grid on June 30, 2022 and September 30, 2022 respectively. The complete phase out of the two coal plants came 20 months earlier than the original committed phase-out date. Accounting for the associated emission reductions commenced following the disconnection of U14 in June 2022, with the benefit period concluding May 2024.

One of the core elements of the MoE's coal phase-out roundtable was the creation of a national Just Transition Plan. The establishment of the 2040 phase-out deadline allows for sufficient time for public agencies and private coal owners to create the necessary just transition plans related to:

- assessing the job profiles of affected workers;
- surveying the new job opportunities created by new investment;
- understanding the type and degree of training needed for the retraining of workers based on existing competencies; and
- developing coordination strategies between public and private jobs programs.

The MoE looked to existing transition examples during the formulation of its Just Transition Plan. For example, the phase-out of coal plants in certain states in the United States relied heavily on early-stage public campaigns that notified affected populations well in advance of the phase-out and outlined the employment plans for workers at coal plants and mines.

EECL began the transition dialogue with workers' unions in the Tocopilla region in 2018, followed by engagement with local government officials. EECL's own Just Transition Plan includes three axes;

i. employment and skills;
ii. territorial development; and
iii. environmental management and dismantling.

The plan is summarized below in table 6.

Prior to the decommissioning of the coal plants, EECL established an Energy Transition Working Committee to oversee the transition for the 90 employees at U14 and U15. Approximately one-third of the coal plant employees participated in training programs aimed at equipping them with new skills for emerging job opportunities. The training covered topics including water treatment plant operations,

FOCUS AREA	OBJECTIVE	ACTIVITES
Employment and Skills Development	• Promote job opportunities, upskilling and employee retention • Additional measures to support those impacted by decarbonization	• Training • Retraining • New job creation
Regional Development	• Create economic value for regions and communities, including support to restructuring local economy as needed	• Value chain development • Local development • Local diversification
Environmental Management and Dismantling of Coal Asset	• Ensure no net negative impacts on environment	• Supervision during dismantling • Circular economy approach to waste management • Transition to renewable energy

Table 6. Engie Just Transition Plan for the Tocopilla coal transition.

assembly and maintenance of photovoltaic panels, wind turbine maintenance, and entrepreneurship. The remaining workforce had options that aligned with their individual circumstances: about one-third opted for early retirement, while others chose voluntary resignation under a special plan. To support regional industry diversification, EECL also established a permanent working group that included port employees and fishermen, focusing on their needs and promoting artisan and sustainable fishing initiatives. Additionally, EECL allocates annual subsidies to humanitarian organizations and micro-enterprises in Tocopilla to support local development initiatives. Figure 4 below highlights some key impact metrics achieved under EECL's just transition plan during the full phase-out of its Tocopilla coal assets, including those financed through the IDB program as well as the decommissioning of U12 and U13.

100% exit from coal in Tocopilla

4 Units fully dismantled (including U12 and U13)

267 Participants in work training courses

1,400 Hours of instruction in training courses

34 Competitive funds awarded in Tocopilla in 2022

$300M New investment in Tocopilla

Figure 4. Key results of Engie's Coal Transition Plan in Tocopilla.

Replication in the Dominican Republic

Following the success of the decarbonization instrument pilot in Chile, IDB Invest is currently in the process of expanding that model into the Dominican Republic's coal transition. The Dominican Republic has become increasingly locked into coal as an energy source over the last two decades. It is the fourth highest user of coal in the Latin America and Caribbean region and highest among Caribbean nations, with coal-fired energy accounting for nearly 30% its total energy supply. The country's entire coal supply is imported.

A significant stride in this direction was taken in February 2025. The Clean Technology Fund Trust Fund Committee approved an innovative investment plan to diversify the Dominican Republic's energy system and accelerate the transition away from coal presented by the Ministry of Energy and Mines of the Dominican Republic. Developed in collaboration with IDB Invest, IFC, IDB and the World Bank, the plan will deliver $85 million in concessional financing to mobilize $1.2 billion in co-financing for the closure of three privately owned coal power plants over the next 5-10 years; Itabo 1, Itabo 2 and Barahona Carbón. The financing is part of the Accelerating Coal Transition (ACT) investment program, a multilateral initiative pioneering the transition away from fossil fuels. As in the case of Chile, the concessional financing will focus on monetizing the reduced Co2eq from the early retirement of coal power plants and their replacement with renewable energy assets. The investment plan is expected to accelerate the retirement of 312MW of coal power early, facilitate around 10 million tCo2eq in emission reductions, and create more than 2,000 jobs in the energy sector.

The Dominican Republic applies the three pillars of success from the Chile experience. One, a public sector commitment to prevent the construction of new coal power plants and gradually move away from the existing coal fleet. Two, corporate buy-in to shift energy generation activities from coal to renewable energy. Three, the availability of blended finance to accelerate the transition. The bank's experience in the Dominican Republic to-date has underscored how vital each of these elements is to achieving portfolio level phase-out of coal assets. For example, a clear phase-out commitment from coal owning companies in the country has yet to materialize. Coal plants in the country remain relatively young, which reduces the incentive for owners to close them before the end of their useful life as they remain financially productive. This also illustrates the differing corporate cultures that exist across the region and the impact these attitudes have on corporate ESG integration and the setting of long-term strategies in the energy transition. In this case, IDB Invest finds that establishing the other two pillars is pivotal to influencing a mindset shift among the IPPs. MDBs can support the public sector in creating a legal environment that persuades IPPs to commit to coal phase-out and shift their energy generation assets to renewable sources. This also ensures stability of energy supply. Likewise, MDBs can draw on donor-funded concessional capital pools to expedite the creation of replacement revenue streams for coal owners through the development of renewable energy assets.

The pilot in Chile demonstrates how carbon markets can be incorporated into decarbonization efforts led by private energy companies, as well as companies in other high-emitting industries like transportation. Furthermore, the pilot provides a transferable methodology for the ex-ante calculation of actual mitigation outcomes and carbon pricing aligned with Article 6 of the Paris Agreement[8]. The implementation of a compensation scheme in the Dominican Republic would mark another step toward the creation of a market for the coal transition credit asset class. As replication of the model expands, a wholly functional carbon credit market would unlock larger sources of commercial capital for these accelerated phase-out projects that exceed the quantum of concessional capital available.

8 Article 6 outlines how parties to the Paris Agreement can pursue voluntary cooperation to meet climate targets, including the transfer of carbon credits between countries and private entities.

Key Insights

1 A national transition away from coal requires more than blended finance alone; it hinges on strong policy commitment and industry buy-in.

IDB Invest chose to pilot its decarbonization instrument in Chile for two core reasons:

i the government undertook strategic reform; and

ii Engie and other coal owners adopted corporate mandates to phase out their coal assets.

In this sense, the order of operations to successfully implement a decarbonization plan mattered and allowed IDB Invest to introduce its blended finance model to accelerate the closure of ECCL's U14 and U15 plants. The robustness of the Energy Strategy and Engie's decarbonization strategy, lent clarity to the potential additionality of the decarbonization instrument as well. First, the GoC's 2040 coal phase-out mandate made renewable energy a more attractive investment opportunity compared to coal. At the time of the transaction, new renewable energy PPAs were cheaper than those for coal, creating the right conditions for generators and customers to renegotiate contracts and shift to cleaner energy. Second, understanding the shifting policy environment and the risk of stranded assets, coal owners formulated and acted on coal transition plans. Chile's national phase-out directive and each IPP's phase-out plan were produced in collaboration, creating clear timelines for the closure of coal power plants that were attentive to baseload energy supply and the corporate objectives of the coal owners. With clear phase-out schedules in place and clear commitment from the public sector and the coal companies, the groundwork was established for IDB Invest to use blended finance to accelerate the early closure of U14 and 15 by creating a replacement income stream for EECL. Meanwhile, EECL's existing Just Transition Plan anticipated the social implications of the project and established a plan to address them within the committed phase-out timeline. IDB Invest is looking to replicate this enabling environment as it seeks to launch a decarbonization instrument in the Dominican Republic. Exporting this model across the region will similarly require proactively identifying regulatory, corporate, and legislative barriers that obstruct the enabling environment.

2 To incentivize and accelerate coal decommissioning in EMDEs, availability of concessional finance is paramount.

Each coal transition financing mechanism currently under implementation in EMDEs (excludes rate-payer-backed securitization) draws on concessional capital to motivate the early closure of coal-fired power plants. ETMs use low-cost capital to incentivize coal owners to retire assets early. IDB Invest's compensation scheme uses a pay-for-success model to establish an alternative revenue stream for coal operators, with the same goal: to encourage a quicker retirement timeline. Concessional funds are vital because coal decarbonization requires returns-seeking companies (i.e., IPPs) to shut down net profitable activities and shift to cleaner energy, which conflicts with their fiduciary duties unless structured properly. While progress has been made to increase the supply of concessional funds earmarked for decarbonization projects – for example, the aforementioned ACT program– it remains insufficient to support the retirement of the more than 1,500 GW of coal energy in EMDEs today. As shown by the Chile decarbonization instrument, concessional capital introduced via blended finance structures is not a long-term solution to coal decommissioning, nor should it be used repeatedly for project-specific risks. Rather, its use should drive standardized commercial participation in the sector. The market building effect of the mitigation credit use in the Chile model demonstrates this point. Blended finance was used to create a new synthetic asset class, which has the potential to accelerate coal decommissioning timelines on a wholly commercial basis in the future.

3 A dedicated and knowledgeable blended finance team is highly valuable in first-time transactions in new sectors.

Never before had a pay-for-success blended finance model been applied to the accelerated decommissioning of coal assets. The decarbonization pilot in Chile benefitted from a core blended finance team within IDB Invest that was well-versed in the regional context,

had technical blended finance knowledge and worked in partnership with government agencies and large corporate clients. Having a core group of blended finance champions on a transaction provides a strong base for the investment process, meaning deals do not start from scratch. Importantly, this makes the design, structuring and investment process more efficient particularly for pilot transactions, which have little to no transaction precedent to draw on.

4 Piloting transactions in controlled environments with experienced counterparts helps to speed up the development of models for more complex applications.

Chile's economic and political stability enabled the government to set clear, ambitious coal decommissioning targets. This created favourable conditions for gaining IPP buy-in and ultimately made it possible for IDB Invest to implement the decarbonization instrument. Likewise, Engie's strong financial standing, industry track record, and decarbonization pledge helped mitigate additional investment risk associated with the deal, reducing the complexity of its design. A less well-established counterpart, particularly one without a corporate decarbonization mandate, would have potentially necessitated a more subsidized incentive structure. Given the complexity of the emissions methodology and reporting requirements, it was also critical from IDB Invest's perspective that the partner had the internal systems to meet the demands and gave IDB Invest the opportunity to fine-tune the model alongside Engie without adding new operational risk. These combined factors ultimately boosted the instrument's success rate and increases the likelihood of application in less favourable conditions. In countries less far along in their decarbonization journey and/or with companies less committed to transition investing, blended finance incentives are much more valuable.

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