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Research Report

Powering the future: China's role in Zambia's drive for energy security

ODI Global Report

Provided in Cooperation with:
ODI Global, London

Suggested Citation: Borodyna, Olena; Shieh, Shawn; Chen, Yunnan (2025) : Powering the future: China's role in Zambia's drive for energy security, ODI Global Report, ODI Global, London, https://odi.org/en/publications/powering-the-future-chinas-role-in-zambias-drive-for-energy-security/

This Version is available at:
https://hdl.handle.net/10419/334916

Report

Powering the future: China's role in Zambia's drive for energy security

Olena Borodyna, Shawn Shieh and Yunnan Chen

November 2025

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Online ISSN: 2052-7209

How to cite: Borodyna, O., Shieh, S. and Chen, Y. (2025) Powering the future: China's role in Zambia's drive for energy security. ODI Global Report. London: ODI Global (www.odi.org/en/publications/powering-the-future-chinas-role-in-zambias-drive-for-energy-security/)

Front cover image: Shutterstock ID: 2203459341

Acknowledgements

About this publication
This report benefited from the inputs of key informants from 18 institutions in Zambia between April and July 2025. The authors are also grateful to Flavia Russo for research assistance, Claire Bond (Project Manager at ODI Global) for project management support and Maegan Rodricks (Communications Officer) for communications support.

We also thank Dr. Kabwe Mubanga (Senior Lecturer at the University of Zambia and National Coordinator for Climate Compatible Growth – Zambia Network), Kudakwashe (Kuda) Ndhlukula (Executive Director of the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE)), Naa Adjekai Adjei (PhD Candidate at Power Futures Lab) and Dr Rebecca Nadin, Director, Global Risks and Resilience, for their review. Finally, we are grateful to the European Climate Foundation Pooled Fund on International Energy for their support of this work. The findings, interpretations and conclusions in the report are those of the authors.

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Abbreviations and acronyms

AfDB	African Development Bank
BRI	Belt and Road Initiative
CDB	China Development Bank
CEC	Copperbelt Energy Corporation
CRMs	Critical raw materials
DFI	Development Finance Institutions
DRC	Democratic Republic of Congo
EAPP	East African Power Pool
EMDEs	Emerging and developing economies
EPC	Engineering, procurement and construction
ERB	Energy Regulation Board
EU	European Union
EV	Electric vehicle
FDI	Foreign Direct Investment
FOCAC	Forum on China–Africa Cooperation
FYP	Five-year plan
GDP	Gross domestic product
GHG	Greenhouse gas
ICBC	Industrial and Commercial Bank of China
IDC	Industrial Development Corporation
IEA	International Energy Agency
IMF	International Monetary Fund
IPPs	Independent power producers
IRP	Integrated Resource Plan
KNBEPC	Kariba North Bank Extension Power Corporation
M&As	Mergers and acquisitions
MDB	Multilateral development bank
MoU	Memorandum of Understanding

PPAs	Power Purchase Agreements
PPP	Public–private partnership
PV	Photovoltaic
RE	Renewable energy
SADC	Southern African Development Community
SAPP	Southern Africa Power Pool
SEZ	Special Economic Zone
SOEs	State-owned enterprises
T&D	Transmission and distribution
VAT	Value Added Tax
ZESCO	Zambia Electricity Supply Corporation Limited

Executive summary

Zambia stands at a pivotal moment in its development trajectory. The government's Vision 2030 sets ambitious economic growth targets. Energy security is critical to meeting these goals – both to power the expansion of strategic sectors such as mining and agriculture, and to reach the millions of Zambians who remain off-grid or experience persistent load-shedding.

Chronic power crises have made energy diversification a national imperative. Tapping into the country's modern renewables potential, particularly solar, has emerged as a political and economic priority. The scale of investment required, however, far exceeds public resources. With fiscal space constrained and sovereign borrowing limited by ongoing debt restructuring, private capital will be essential.

As the world's leading clean-tech manufacturer and energy sector financier, China is well-positioned to participate in Zambia's modern renewable energy expansion. While China has scaled back large-scale infrastructure lending, commercial financing has become more prominent, and Chinese policy strongly encourages investment in green development in emerging markets, including across Africa.

China is already a major external partner for Zambia's energy sector. Chinese policy and commercial banks, including China Exim Bank, Industrial and Commercial Bank of China (ICBC) and Bank of China, have financed significant power generation and transmission projects. Meanwhile, Chinese companies such as PowerChina and TBEA delivered hydropower plants, coal facilities and grid infrastructure projects, including cross-border interconnections. China also maintains a significant presence in Zambia's mining sector, which is poised for further expansion, as well as in other industrial areas.

However, a financing model reliant on sovereign-backed guarantees has become increasingly constrained. Zambia's debt restructuring has limited the scope for new sovereign borrowing, just as China has shifted away from large-scale infrastructure lending towards more selective, commercially oriented investments. Although there have been co-financing arrangements with other lenders in the energy sector, such activities are now limited.

Chinese energy companies nonetheless maintain an active presence in Zambia as EPC contractors and equipment suppliers, and are increasingly exploring opportunities in modern renewables and low-carbon value chain investments. However, Chinese firms have so far played only a limited role as independent power producers, and Chinese financial institutions have yet to participate in the modern renewable energy sector. This suggests that their financing models have not sufficiently adapted to the specific requirements of renewable energy generation.

Despite bottlenecks and investment challenges, including institutional and financial risks and issues around project bankability, modern renewable energy developers are pursuing projects in Zambia. These include merchant solar plants of up to 100 MW with equity backing. These projects are being developed

independently of the national utility, ZESCO, and its power purchase agreements. Strong demand from the mining and industrial sectors is likely to drive further expansion. Together, these developments highlight emerging pathways for scaling up modern renewable energy, leveraging regional market connectivity and alternative financing arrangements better suited to these projects.

With a growing emphasis on commercially viable modern renewable energy investments, Zambia is emerging as a market to watch for new forms of Chinese engagement in the energy sector.

What to watch

As Zambia seeks to attract investment in scaling-up modern renewable energy projects and low-carbon value chains, including from China, our analysis highlights several 'what to watch' areas in the country's evolving energy sector policy, financing, and partnerships.

1. Policy and regulatory stability to facilitate private investor confidence

Zambia has made progress in liberalising grid access, encouraging independent power producers' participation and strengthening the foundations for private investment. Sustaining this momentum while maintaining regulatory predictability will be critical to reinforce investor confidence and accelerate the deployment of modern renewable energy.

What to watch:

- Will Zambia sustain progress in liberalising the energy sector while maintaining the policy and regulatory stability needed to strengthen investor confidence and accelerate the deployment of modern renewable energy?

2. Alternative offtake models and implications for investment

Diversifying offtake models offers a practical means of enabling projects that might otherwise struggle to secure financing. In the Chisamba Solar PV Project, for example, Africa GreenCo acted as the intermediary offtaker instead of ZESCO, enabling financial close without a sovereign guarantee. Broader use of such arrangements could stimulate capacity growth and attract investment.

What to watch:

- How might alternative offtake models influence the investment appetite of Chinese financial institutions, SOEs and private companies in Zambia's modern renewable energy projects?

3. Integration of modern renewable energy projects and energy efficiency in mining operations

Rising demand for low-carbon electricity from the mining sector presents an opportunity to expand modern renewable energy generation. Broader adoption of energy-efficiency measures could also deliver spillover climate and environmental benefits for surrounding communities.

What to watch:

- Will Zambia integrate modern renewables and energy-efficiency measures into mining projects to advance the greening of the sector and deliver environmental and socio-economic benefits to local communities?

4. Leveraging China's expertise to build a modern renewable energy ecosystem

Chinese companies such as Datang, LONGi, Huawei and PowerChina are exploring opportunities in Zambia's modern renewable energy market. Given their expertise in the modern renewables sector and China's strong policy signals to diversify export markets, these companies are well positioned to expand their engagement abroad. With Zambia's growing appetite for modern renewables, closer collaboration may emerge between these firms, China's broader low-carbon ecosystem, and Zambia's energy sector.

What to watch:

- How will Zambia leverage China's expertise in modern renewable energy to build a renewable energy ecosystem that strengthens domestic capacity and supports technology adoption, for example through technology transfer, training and capacity development?

5. Strategic engagement with Chinese mining and clean-tech firms for low-carbon value chain development

Zambia has significant untapped potential to localise low-carbon value chains by expanding refining capacity for copper and other minerals and production of clean tech. With plans to scale up in-country value addition, the country may seek to leverage China's appetite for its mineral resources and expertise in clean tech manufacturing to support value chain development.

What to watch:

- As Zambia scales up production of copper and other minerals, will cooperation with Chinese firms extend beyond mineral extraction into downstream value addition?
- How might other international partners with interests in Zambia's critical minerals value chains respond to China's growing role?

1 Introduction

Zambia's power sector is undergoing significant transformation as the country works to enhance energy security and reduce its dependence on hydropower as its primary source of electricity. A more resilient energy system is critical to sustaining economic growth, achieving the goals of its Vision 2030, and supporting debt sustainability, given the sector's pivotal role in the broader economy.. Expanding energy infrastructure will be costly, and with limited government borrowing capacity, attracting private sector investment has become increasingly important.

Since the mid-2000s, China has played a key role in financing and constructing Zambia's energy infrastructure. However, Zambia's recent debt crisis, combined with China's evolving approach to overseas policy lending, has constrained the flow of Chinese finance to the country.

As a leading producer of copper, cobalt, and other strategically important minerals such as manganese, Zambia is seeking to expand its critical mineral value chains. Considering China's strategic interest in these minerals, a key question is the extent to which Chinese engagement will align with Zambia's ambitions to promote domestic value addition and strengthen participation in low-carbon value chains. These developments warrant close attention as both countries seek to balance commercial opportunity with sustainable energy transition objectives, in line with commitments made at the 2024 Forum on China-Africa Cooperation (FOCAC) summit.

This report examines the current landscape of Zambia's energy sector policy and financing, highlighting key reforms the country is undertaking to attract investment. It explores past and current areas of Chinese participation in the energy sector (power generation, including embedded), transmission and low-carbon value chains, and the challenges and barriers to Chinese and other international investment.

It addresses three key questions:

1. What role does Chinese investment play in Zambia's energy sector, and how is this evolving, particularly regarding China's interest in modern renewables such as solar and wind?
2. Where are the untapped opportunities for expansion and collaboration, such as co-financing and co-investment with Chinese stakeholders?
3. What are the bottlenecks and challenges to unlocking Chinese and other foreign investment in the energy sector?

Zambia already has extensive commercial engagement with China, including in the energy sector. Chinese clean-tech suppliers and contracting firms are showing growing interest in the country. However, institutional and financial risks continue to deter longer-term investment and equity participation in energy projects by China and other investors. Emerging approaches from other companies and financial institutions are starting to attract private investment, which may, in turn, encourage greater Chinese participation in the market.

1.1 The global energy transition and China's evolving role

Global renewable energy (RE) capacity is set to grow almost three-fold by 2030. Solar and wind energy projects will constitute the majority of 940GW in capacity additions annually by the end of the decade (IEA, 2024). Solar PV will account for 80% of this growth.

Across emerging and developing economies (EMDEs), energy transition is an opportunity to meet the demands of growing and diversifying economies (IEA, 2023). Key challenges to scaling up RE projects include high financing costs, weak and opaque auction systems, limited grid capacity and inconsistencies in the policy environment (IEA, 2023b).

Financing the energy transition to meet growing demand and aligning with the Paris Agreement in EMDEs will be costly. Annual public and private investment would need to increase from $770 billion in 2022 to $2.2–2.8 trillion by the 2030s, and remain at similar levels to 2050 (IEA, 2023b). Excluding China, this amounts to as much as a seven-fold rise in annual investment, from $260 billion to between $1.4–1.9 trillion for clean electrification, grid infrastructure and efficiency (IEA, 2023b). Attracting private investment remains an ongoing challenge.

China has established itself as a global leader in RE deployment and in the development and innovation of low-carbon supply chains. The country has 1,407GW of solar and wind capacity and is projected to account for 60% of global RE capacity additions by 2030 (Yin and Yep, 2025; IEA, 2023). It is home to four of the five top wind manufacturers and nine of the 12 top solar manufacturers (Wood Mackenzie, 2024a; 2024b). A favourable policy environment supports the capacity addition and manufacturing of modern RE technologies, batteries and emerging technologies such as hydrogen electrolysers.

China's appetite for overseas infrastructure financing has declined since 2016. State-owned policy banks (the China Development Bank and the Export-Import Bank of China) have traditionally financed large infrastructure projects at home and overseas. However, amid heightened concerns over debt sustainability and a more challenging global macroeconomic context, they have begun to recalibrate their lending strategies, with mitigating financial risks now a central priority (Nadin et al., 2023), alongside aligning investments with key policy areas such as green development. This has led to a shift towards more targeted, quality-focused lending and expanded commercial financing in Belt and Road Initiative (BRI) countries (Chen and Emery, 2025; Parks et al., 2023).

China has strongly encouraged its companies to participate in RE projects and low-carbon value chains, including across Africa. With the sector facing challenges domestically and growing calls for de-risking in key markets such as the European Union (EU), EMDEs are set to become even more important as a market for Chinese firms (Kiryakova et al., 2025). To advance this shift towards green development, the Chinese government has issued policy guidance on overseas investment through the Ministry of Ecology and Environment and the Ministry of Commerce, including the 2021 Guidelines for the Green Development of Foreign Investment and Cooperation.

1.2 What does this mean for Zambia?

The bilateral relationship between Zambia and China dates to the 1960s, anchored in landmark projects such as the Tanzania Zambia Railway Authority (Tazara) Railway connecting Zambia to Dar es Salaam in Tanzania. Over the decades, China has become a significant economic partner across multiple sectors, including agriculture, mining and energy. Zambia hosted two of the first 'Special Economic Zone' (SEZ)-style Economic and Trade Cooperation Zones announced at FOCAC in 2006.[1]

Zambia has been a significant recipient of Chinese finance, with total commitments amounting to around $14 billion, most of it in loans (AidData, 2023). A range of Chinese policy and commercial lenders and contractors have been involved, often competing for infrastructure contracts (Brautigam, 2021). This diversity of actors has contributed to coordination challenges in restructuring Chinese debt (Brautigam, 2021).

China's relationship with Zambia, and its financial commitments, has ebbed and flowed in line with shifts in Zambia's domestic political landscape (Parks et al., 2023). Under President Hakainde Hichilema, Zambia has pursued renewed engagement with Western partners alongside efforts to maintain its strategic relationship with China (Vandome, 2023). In 2023, the two countries elevated their bilateral ties to a comprehensive strategic partnership, signalling a new phase in the relationship (China Daily, 2024).

China's engagement in Zambia's energy sector dates back to the mid-2000s, when the country emerged as a significant recipient of financing from Chinese policy and commercial banks (see Figure 1). Chinese foreign direct investment (FDI) and official financial flows to Zambia peaked in the mid-2010s. The energy sector was among the leading recipients of Chinese lending, enabling firms such as PowerChina and TBEA to establish an early presence in the market. Zambia also began attracting Chinese financing to its mining sector as early as the late 1990s, and mining continues to account for a significant share of China's FDI portfolio in the country.

Zambia's energy sector remains underdeveloped, with significant gaps in both energy access and financing. The country is seeking to harness its modern RE potential to improve energy security while also refurbishing ageing infrastructure. Scaling up investment across power generation, transmission and distribution will require mobilising up to $12 billion in capital by 2030. Zambia has also set ambitious energy access targets through its Energy Compact under Mission 300 and related initiatives. The country's ambitions in critical raw material (CRM) supply chains present an additional opportunity to expand production of low-carbon, value-added products.

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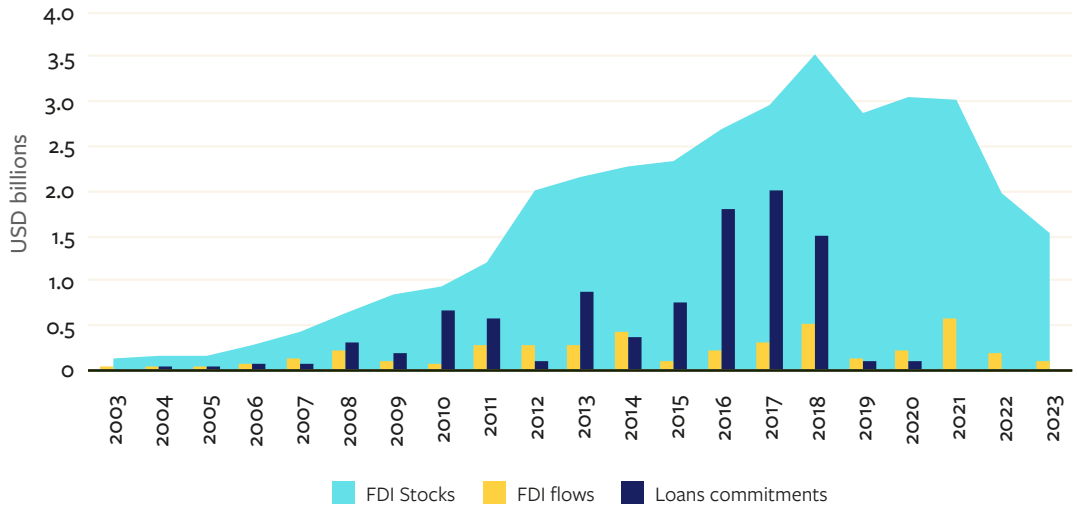
1 The Zambia–China Economic and Trade Cooperation Zone (ZCCZ), developed by China Nonferrous Metal Mining Group, consists of two industrial parks. The Chambishi Park, located in the central Copperbelt Province, began planning in 2003 and received official support in 2006. It focuses primarily on copper and copper-related industries. The Lusaka East Park, situated in the north-eastern part of the capital, is oriented towards garment manufacturing, food processing, appliances, tobacco and electronics (Brautigam et al., 2010).

China is likely to remain an important actor in shaping Zambia's energy and industrial landscape, given its expertise, financing capacity and manufacturing dominance in clean tech. These capabilities position Chinese firms to participate in Zambia's efforts to expand modern RE generation and strengthen value addition in CRM supply chains.

Prospects for further engagement are tempered by structural constraints, including the legacy of Zambia's debt crisis, which has reduced sovereign borrowing capacity and increased reliance on private rather than state-backed financing. China's broader strategic interest in securing access to critical minerals and embedding itself in global low-carbon supply chains provides a backdrop for potential involvement, but future cooperation will depend on how financing models evolve in line with Zambia's fiscal realities and debt sustainability priorities.

Figure 1 Chinese investment (FDI and lending) to Zambia 2003–2023



1.3 About this report

This report draws on primary and secondary research, including semi-structured field interviews with stakeholders from 18 institutions representing a range of sectors. These interviews were conducted in Lusaka, Zambia, and via virtual calls between April and July 2025. Participants included government representatives covering energy, finance and green economy portfolios; commercial banks; power traders and producers; renewable energy associations; multilateral development banks (MDBs) and development partners.

The interviews explored the role and involvement of Chinese investors in the energy sector, particularly in the context of Zambia's macroeconomic challenges and investment priorities. They examined the evolution of Chinese investments over time and identified opportunities and barriers related to investment, co-investment and co-financing, both for Chinese investors and for other stakeholders.

The paper is structured as follows: Section 2 outlines the landscape of Zambia's energy sector, key policy and institutional developments, and

the challenges associated with securing external financing. Section 3 examines China's role in Zambia's energy sector and how this has evolved, with a focus on power generation, transmission and low-carbon value chains. Section 4 highlights key bottlenecks and challenges facing investment in modern renewables and the power sector, including for Chinese investors. Section 5 concludes with 'what to watch' areas in Zambia's evolving energy sector policy, financing and partnerships landscape.

2 Zambia's energy sector priorities

Zambia's energy sector is at a critical juncture. The recent power crisis has once again exposed the vulnerabilities of the country's hydro-dependent energy system, prompting renewed efforts to diversify the energy mix. Zambia aims to expand energy provision to increase access and meet growing demand, with the broader goal of supporting economic growth, employment creation and managing its debt obligations.

However, financing the sector remains a significant challenge. The debt crisis and ongoing restructuring negotiations continue to constrain public sector borrowing, accelerating Zambia's efforts to reform the energy sector and mobilise greater private investment, with development partner and MDB financing helping to meet some of its most critical needs.

This section examines Zambia's energy sector priorities, identifying key infrastructure gaps and policy imperatives, and situating the sector within the country's broader economic goals. It highlights recent efforts to expand electricity generation, transmission and distribution (T&D) infrastructure, and mobilise finance to meet rising demand and achieve universal access by 2030.

2.1 Overview of the energy sector

Zambia has made progress in improving electricity access. However, with 54% access in 2023, the country remains significantly behind its 2030 universal access targets. Significant disparities in access between urban and rural areas persist (Ministry of Energy et al., 2024). While around 80% of urban residents have access to electricity, this falls to just 34% in rural areas, where more than 80% of the population lives (Ministry of Energy et al., 2024). There are also substantial disparities across provinces. Lusaka leads with an electrification rate of 84.8%, followed by the Copperbelt province (81.7%), but access is much lower in other parts of the country – 33% and 25% respectively in Northern and Western provinces (Ministry of Energy et al., 2024).

Zambia's energy mix is predominantly hydropower-based. In 2023, hydropower accounted for over 80% of electricity generation, with an installed capacity of 3,153MW out of a total generation capacity of 3,705MW (Ministry of Energy, 2023b). Other energy sources include modern renewables – 123MW of solar photovoltaic (PV) generation, and 435MW of coal-fired generation from the Maamba coal plant (Ministry of Energy, 2023b). Major hydropower storage dams include Kariba, with total installed capacity of 1,080MW, and Kafue Gorge, at 990MW (Ministry of Energy, 2023a). Electricity demand is driven primarily by the mining sector (between 45–52% in 2023 and 2024), followed by residential, commercial and industrial activities.

Zambia holds significant untapped modern RE potential. It is classified as a high-potential country for solar PV generation (World Bank, 2019). Eastern and Muchinga Provinces show high wind potential, with moderate wind resources present in Central and Lusaka Provinces. The country may also have up to 1,100MW of geothermal generation potential

(Ministry of Energy, 2023b), though its resources are yet to be tapped for industrial or energy provision and require further elaboration and quantification. Zambia has removed tariffs on solar panels and lithium-ion batteries to encourage solar adoption and is revising policies to support RE development. However, it remains unclear how far these measures have affected consumer prices or RE uptake.

The country is both an exporter and importer of electricity and is a member of the Southern African Power Pool (SAPP). In 2023 its electricity exports were directed primarily to Namibia, the Democratic Republic of Congo (DRC), Botswana and Tanzania. Imports come primarily from Mozambique (OEC, 2024). Existing contractual obligations, coupled with the need to secure foreign currency, have continued to drive electricity exports even as the country faces domestic power shortages.

Zambia's reliance on hydropower presents major climate-related risks. Zambia, like much of Southern Africa, is increasingly vulnerable to the impacts of climate variability and droughts. Over 70% of the region's hydropower generation is concentrated in the Zambezi River Basin, a figure projected to rise to nearly 90% by 2030. This basin is already experiencing greater rainfall variability, prolonged dry periods and increased drought frequency (Conway et al., 2015; 2017; Hamududu and Killingtveit, 2016).

Drought conditions in 2015/16, 2018/19 and 2023/24 significantly disrupted electricity supply. In August 2024, the country's public energy utility, ZESCO was operating at less than half of its generation capacity, with power deficits reaching 1,095MW, curtailing power for up to 20 hours a day across much of the country (World Bank, 2025). This was not the first time droughts led to power deficits, with disruption in 2016 leading to load shedding up to 12 hours daily. The recent prolonged shortages have intensified the search for alternative energy sources, with broader implications for economic activity, including reduced manufacturing output (World Bank, 2025).

2.2 Overview of Zambia's energy sector policy

2.2.1 Energy sector goals

Energy access and security are central to Zambia's Vision 2030, which aims to transform the country into a resilient and self-sustaining middle-income economy by 2030 (Ministry of Finance and National Planning, 2006). The Eighth National Development Plan (2022–2026) targets four key growth sectors: agriculture, mining, manufacturing and tourism (Ministry of Finance and National Planning, 2022). Scaling up growth across these areas requires significant improvements to the country's energy infrastructure.

Zambia's National Energy Compact outlines key targets for the sector to 2030. These include achieving universal electricity access through both on-grid and off-grid solutions; increasing installed generation capacity to 10,000MW; raising the share of non-hydro renewables in the generation mix from 3% to 33%; and mobilising $11.9 billion in investment, of which $9.5 billion is expected to come from the private sector (Mission 300, 2025).

2.2.2 Energy sector planning

Energy sector policy and planning in Zambia are led by the Ministry of Energy, alongside several other government bodies, with public and private utilities playing key roles. The Energy Regulation Board (ERB) is the statutory body overseeing the sector's regulation and performance. The Zambia Electricity Supply Corporation (ZESCO) is the dominant public utility, responsible for most of the country's electricity generation, transmission, distribution and supply.

Copperbelt Energy Corporation (CEC) supplies around one-fifth of Zambia's electricity and participates in power exchanges through the SAPP. CEC primarily supplies the mining sector, both within Zambia and across the border in the DRC. Companies such as Africa GreenCo also play a growing role as renewable energy traders and offtakers.

Zambia has several independent power producers (IPPs), including solar projects. These include Ngonye Power Company Limited (34MW) and Bangweulu Power Company (50MW), each holding 25-year power purchase agreements (PPAs) with ZESCO. Both projects are majority-owned by European and American private developers, with minority stakes held by Zambia's Industrial Development Corporation (IDC), and were financed through blended concessional and commercial sources to help de-risk investment.

Approved in 2023, the Ministry of Energy's Integrated Resource Plan (IRP) provides the strategic framework for expanding power generation and T&D networks over a 30-year horizon. The Plan outlines a roadmap for a gradual transition from hydropower dependence to a more diversified energy mix.[2] Under the IRP, modern renewables, including solar and wind, are expected to contribute 33% of installed capacity by 2030 and 45% by 2050, up from just 3% in 2023. By 2026, the plan recommends adding 1,555MW of solar and 400MW of wind capacity, reflecting their shorter financing and construction timelines. The Renewable Energy Strategy and Action Plan (2022) details how Zambia intends to achieve its ambitions for scaling up RE.

By 2030, grid-connected generation capacity will need to increase by 165% to meet the projected rise in electricity demand – from 3,705MW in 2023 to 10,013MW. Demand growth will be driven primarily by rising electricity consumption in the agriculture and mining sectors (see Table 1).

To meet the demands of a growing economy, Zambia's transmission network will also need to expand by 82% by 2050. The IRP identifies new transmission projects across all voltage levels and prioritises interconnector development with neighbouring countries to strengthen regional power trade and position Zambia as a regional hub within the SAPP, as well as through interconnection with the Eastern African Power Pool (EAPP) via Tanzania.

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2 New hydropower development will prioritise the northern region, part of the Congo River basin, which is less vulnerable to climate variability than the Zambezi catchment area.

Table 1 Analysis of sectoral demand between 2020–2050 (MW), outlined in IRP (2023)

Maximum demand (MW) by Sector	2020	2030	2050	Increase by 2030 (%)	Increase by 2050 (%)	Factors driving demand increase
Mining	886	1,552	2,052	75%	132%	• Copper production rising to 3 million tonnes per annum by 2040 • Increased mining of other minerals e.g. manganese
Residential	769	1,079	1923	40%	150%	• New connections increase from 60,000 per annum to 120,000 per annum
Commercial and industrial	257	337	984	31%	283%	• Industrialisation of economy • Electric vehicle battery manufacturing facility in Ndola
Agriculture	48	1,200	3,625	2,400%	7,500%	• Increase in wheat maize and soya production and irrigation and processing support
Transport	0	67	153	-	-	• Inter-city and urban electric rail networks
Exports	138	500	1,000	262%	625%	• Key export markets include DRC and Namibia
Technical losses	358	687	1,294	92%	261%	• Losses are mainly a function of network size and topology
Total demand including losses	2,456	5,422	11,031	121%	349%	

Source: Authors' compilation based on Ministry of Energy (2023b)

2.2.3 Powering Zambia's ambitions in mining and low-carbon value chains

Global demand for transition minerals is accelerating, and Zambia is seeking to expand mineral extraction while pursuing value addition through low-carbon value chains (see Box 1). Mining has historically been the main recipient of FDI in the country. It accounts for 44% of government revenues and 70% of export revenues (World Bank, 2025). However, the industry has struggled to generate widespread employment or create significant value addition (World Bank, 2025; Barron et al., 2024). The sector's political and socioeconomic importance was underscored during the recent power crisis, when electricity supply to the mining industry was prioritised even as other sectors faced curtailments.[3]

3 Source: stakeholder consultation with development partner (1).

Under the Eighth National Development Plan, Zambia aims to build a more industrialised and diversified economy by promoting increased mineral production, value addition and manufacturing. This includes raising annual copper output to 3 million tonnes, expanding production of other key minerals, promoting processing and downstream manufacturing, and encouraging greater participation by local firms in the mining industry (Ministry of Finance and National Planning, 2022). While some value addition already takes place, such as the production of copper cathodes and preliminary refining, these activities remain limited, and expanding them is a priority (Barron et al., 2024).

Scaling up the energy sector is critical to Zambia's ambitions in transition mineral mining and industry. The relationship between the two sectors is complex: energy underpins the country's mining and industrialisation plans, while the energy transition itself creates new opportunities through low-carbon value chains. The experience of neighbouring DRC illustrates this dynamic – rapid growth in copper production there has sharply increased energy demand, creating opportunities for Zambian companies such as CEC to supply electricity across the border.[4] At the same time, DRC, often in partnership with Zambia, is seeking to position itself in battery manufacturing and other downstream activities linked to the global clean energy transition.

Box 1 Zambia's critical minerals sector: priorities, challenges and strategic partnerships

Zambia is a long-standing minerals producer, historically focused on the production of copper and its by-product cobalt, alongside manganese and nickel. In 2023, raw and refined copper exports were valued at nearly $10 billion. While the sector has contributed significantly to national GDP and export earnings, dependence on a few commodities has exposed the economy to volatile global prices and communities to negative environmental and social externalities (Shieh et al., 2021). The dominance of large, foreign-owned companies with long-term off-take agreements has further constrained opportunities for domestic value addition.

Recognising the growing global demand for critical minerals, the government has developed a National Critical Minerals Strategy (2024). The strategy prioritises the sustainable development of 11 strategic minerals with applications in the energy transition and other sectors: lithium, graphite, nickel, cobalt, tin, copper, manganese, sugilite, uranium and rare earth elements. It is intended to ensure their sustainable exploitation and value addition, contributing reliably to the global supply chain while enhancing the socio-economic well-being of Zambians (Ministry of Mines and Minerals Development, 2024).

4 Source: stakeholder consultation with development partner (1).

The strategy outlines measures to address barriers to scaling up the sector. These include creating a Special Purpose Vehicle to invest in the critical minerals sub-sector and securing a minimum 30% state share in production-sharing agreements and new projects. It also proposes developing regional and national value chains and introducing local content requirements mandating that at least 35% of sector procurement be sourced domestically. Policy measures include restricting exports of unprocessed critical minerals, offering fiscal and non-fiscal incentives for local beneficiation, promoting circular economy approaches, and investing in skills and institutional capacity for value-added industries (Ministry of Mines and Minerals Development, 2024).

Zambia's mineral potential is attracting a diverse range of partners. The EU has signed a memorandum of understanding (MoU) with Zambia and the DRC to develop value chains and has identified the Kobaloni Energy cobalt sulphate refinery as one of 13 strategic CRM projects outside the bloc (European Commission, 2023: European Commission, 2025).. Once completed, the refinery, backed by Vision Blue and $100 million from Africa Finance Corporation, will be Africa's first such facility, and one of the few outside China capable of producing this lithium-ion battery component (Hill, 2024). The United States has signed its own MoU with the DRC and Zambia, aiming to expand access to the Lobito Corridor with financing from the US Development Finance Corporation (US Department of State. 2023; US Development Finance Corporation, 2024). The UAE is increasing its footprint in the sector through the purchase of shares in the Mopani mine (Mfula, 2023).

Efforts are under way to deepen regional cooperation, with Zambia and the DRC planning to jointly establish battery precursor manufacturing; while the status of these initiatives remains uncertain, they signal an important shift towards regional industrial integration (Olan'g and Scurfield, 2023).

2.3 Financing the energy sector

2.3.1 Financing needs and ecosystem

Scaling up power generation (on- and off-grid) and T&D infrastructure in Zambia will be costly. Financing needs reach up to $12 billion to 2030 and $31 billion by 2050. By 2030, over 60% of the costs will go towards building out on-grid capacity, 19% to off-grid connections and the rest towards enhancing the transmission and distribution network (Ministry of Energy, 2023b).

Zambia's energy financing landscape is diverse and evolving. The country receives support from multilateral partners such as the World Bank and the African Development Bank (AfDB), alongside bilateral grants from the EU and the UK. Notable projects include the Zambia–Tanzania Interconnector (2024–2027), financed with $245 million from IDA and $50 million from other sources, including the EU and the UK's Foreign and Commonwealth Development Office; and the rehabilitation and expansion of the Chishimba Falls hydroelectric power station (2025–2027), supported by €41.5 million in grant funding from Kreditanstalt für Wiederaufbau (German Development Bank) (Mission 300, 2025).

Table 2 Summary of electricity sector investment outlined in IRP (2023)

IRP investment summary	Incremental Investments ($m)				Cumulative investments ($m)			
Year	**2023–2026**	**2027–2030**	**2031–2040**	**2041–2050**	**2026**	**2030**	**2040**	**Total (2050)**
Generation ($m)	2,943	4,281	7,801	7,805	2,953	7,224	15,026	22,830
Transmission ($m) including 66kV	953	457	745	231	953	1,410	2,156	2,386
Investment in distribution – 33kV network ($m)	247	259	364	107	247	506	870	976
Investment in on-grid access ($m)	143	166	235	309	143	308	544	853
Investment in off-grid access ($m)	698	1,488	749	991	698	2,185	2,935	3,926
Total IRP planned investment ($m)	4,983	6,650	9,895	9,442	4,983	11,634	21,529	30,971

Source: Authors' compilation based on Ministry of Energy (2023b)

Domestic institutions also play a key role, particularly ZESCO, which has accumulated significant debt to finance energy infrastructure expansion. Domestic firms have limited access to capital, relying mainly on bank lending or credit, as local capital markets remain shallow. In contrast, international investors typically obtain financing from overseas sources, especially in mining and other export-oriented sectors.

The energy sector is one of several in which the government participates through wholly owned parastatals managed under the IDC portfolio. ZESCO, in particular, exerts significant influence over the energy market. The IDC manages former state-owned enterprises, including ZESCO; holds equity in CEC through ZCCM Investments Holdings Plc; invests in priority sectors such as energy and mining; and is mandated to establish a sovereign wealth fund to channel mineral revenues into national development priorities. Acting as a catalytic investor, the IDC often serves as the main partner for energy project development, collaborating with IPPs to identify and secure sites, facilitate development and arrange financing. The IDC and the government generally seek minority equity stakes to share risk and align incentives. Current initiatives include three solar projects in partnership with Solar Century, alongside other renewable ventures in ZESCO's portfolio.

Commercial banks such as Stanbic are becoming more active in the sector but continue to focus mainly on debt financing rather than equity participation, with high local financing costs remaining a key constraint.

2.3.2 Ongoing impact of debt crisis limits sovereign borrowing capacity

Financing energy sector investment through public financing is a challenge due to borrowing constraints. Zambia defaulted on its external bonded debt in 2020 and spent the next four years in debt restructuring negotiations with official and commercial creditors under the G20 (see Box 2). As a result, the country has faced serious constraints in its ability to raise external financing from capital markets or international development finance institutions.

While the successful conclusion of Zambia's debt restructuring in 2024 has helped restore market confidence, negotiations with non-bonded commercial creditors, including the China Development Bank (CDB) and other Chinese state-owned commercial banks, have not concluded. Zambia may continue to face challenges in securing financing or guarantees from Chinese financial institutions, and its capacity to take on non-concessional lending from IFIs will remain limited.

As a sovereign-linked offtaker, ZESCO faces debt financing constraints due to creditworthiness concerns, though it is working to strengthen its financial position (International Monetary Fund African Dept, 2024). Although ZESCO's debt is not fully consolidated within central government accounts, its liabilities and cash flow performance are closely monitored under the Debt Sustainability Assessment. As part of broader institutional reforms, the government has launched a financial turnaround plan for ZESCO. Key measures include a five-year electricity tariff schedule and emergency tariff adjustment implemented. These actions aim to restore ZESCO's financial viability, reduce dependence on government support, and attract private investment in new generation capacity.

Given its historical contribution to liabilities and fiscal pressures, ZESCO remains a strategic actor in Zambia's broader fiscal and structural reform agenda. The World Bank has provided a $100 million grant (2024–2026) to support improvements in ZESCO's financial performance and operational reliability (World Bank, 2024).

Box 2 Zambia's debt renegotiations and implications for borrowing

In 2020, Zambia's economy deteriorated sharply amid structural deficits, declining copper revenues and disruption from the Covid-19 pandemic. Zambia was the first African country to default during Covid-19 after failing to meet a bond payment on a $42.5 million Eurobond in November 2020. In 2021 the government formally requested debt treatment under the G20 Common Framework. While Zambia was a beneficiary of the HIPC (heavily indebted poor countries) initiative in 2005, over the subsequent decade it built up substantial international borrowing, primarily via commercial Eurobond issuances, and infrastructure lending from Chinese banks (see Figure 2).

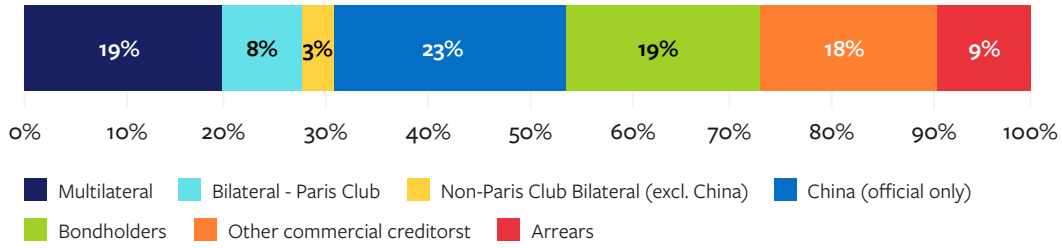
Debt restructuring was a lengthy process under the G20 Common Framework, taking four years to conclude a bond exchange on its Eurobond debt. Zambia faced a challenging creditor composition, comprising $3 billion of commercial bondholder debt as well as diverse Chinese creditors. While China and France co-chaired the official creditor committee, encompassing Paris Club creditors and official Chinese lending from China Eximbank, there was resistance to classifying borrowing from CDB and Sinosure-guaranteed debt as commercial, in opposition to Paris Club norms. The official creditor committee rejected a bondholder agreement

in 2023 (Maret and Setser, 2024). Negotiations with bondholders were finally concluded in early 2024 for a bond exchange that included a value recovery instrument if economic conditions improve,[5] but negotiations with commercial creditors (including ICBC and CDB) are ongoing.

Zambia's public debt is assessed as sustainable but the country remains at high risk of overall and external debt distress. Zambia's International Monetary Fund (IMF) programme concludes at the end of 2025 but the country is requesting a one-year extension (Orijuide-Ndibe, 2025). Access to international capital markets has resumed following the bond exchange, but the country's ability to raise external funding from bond markets or from commercial creditors is likely to remain constrained (International Monetary Fund African Dept, 2024).

In line with the IMF and World Bank policy requirements, the Zambian government will not undertake any non-concessional borrowing unless specifically approved. To ensure continued financing while maintaining debt sustainability, Zambia relies heavily on concessional external financing from multilateral partners, including in the energy sector. Between 2022 and 2025, the external financing mix includes $1.7 billion from the IMF, $2.5 billion from the World Bank (including grant components), and $250 million from the AfDB. Additionally, $1.8 billion is expected to be disbursed from already-contracted priority project loans.

Figure 2 Zambia's external debt composition (2022)



Source: Authors' compilation; IMF (2023) ECF Second Review

2.3.3 Reforming the energy sector to unlock private sector financing

Limited access to public finance, coupled with the time required to restore ZESCO's financial viability, has made liberalising the energy sector and attracting private capital increasingly important. To this end, Zambia has sought to broaden private participation through public–private partnerships (PPPs) and the engagement of IPPs, signalling a gradual shift towards more diversified investment models.

5 Zambia's use of a state-contingent debt instrument or value recovery instrument allows for a switch in the debt repayment profile of its external bondholder debts in an 'upside' case where economic performance exceeds an IMF-determined projection from 2026–2028. See Chen and Hart (2025).

To advance these objectives, the government has introduced policy and regulatory reforms aimed at improving financial sustainability and encouraging private investment. The Electricity Act of 2019, for example, enables private participation in project ownership through IPPs and allows private offtake arrangements, while transmission and distribution services remain under licensed network operators (see Table 3 for examples of recent reforms in the energy sector).

Private sector interest in Zambia's energy sector is growing. Companies such as CEC Renewables and other solar developers are exploring opportunities to build projects with equity backing from parent companies, including several merchant solar plants that operate without bank financing or PPAs with ZESCO. CEC Renewables, a subsidiary of the CEC, operates two solar PV plants – Itimpi (60MW) and Riverside (33MW) – and plans to expand its renewable portfolio to 300MW by 2027 (CEC, n.d.). To support this expansion, CEC has launched a green bond to raise additional financing (CEC, 2024).

Other RE companies are pursuing similar models, developing merchant plants backed by equity rather than debt or PPAs with ZESCO. Several are planning large-scale solar projects of up to 100MW, capitalising on opportunities in solar generation and the advantages of regional power market connectivity.[6]

With ZESCO facing challenges in concluding PPAs that progress to financial closure and construction, power traders have become an increasingly important part of the energy ecosystem. These companies offer bankable offtake agreements of up to 25 years and help attract new renewable capacity, with policy reforms introduced between 2019 and 2020 marking a key step towards unlocking greater private sector participation.[7]

Table 3 Policy and regulatory reforms in the energy sector since 2023

Framework	Year	Purpose
Multi-Year Tariff Framework	2023	Promotes cost-reflective and predictable tariffs.
Electricity Open Access Framework	2024	Enables IPPs and large consumers to trade electricity directly without relying solely on ZESCO. ZESCO retains a strong gatekeeper role, since IPPs rely on its transmission infrastructure and pay wheeling charges. There are opportunities to streamline access protocols for IPPs to unlock their full potential in using the grid.
Net Metering Framework	2024	Allows consumers to both purchase electricity from the grid and sell their excess generation back to it.
Energy Single Licensing System	2025	Provides a streamlined 'one-stop shop' to reduce administrative barriers for IPPs.

Source: Authors' compilation based on Mission 300 (2025)

6 Source: stakeholder consultation with renewable energy company (1).
7 Source: stakeholder consultation with renewable energy company (2).

3 China's evolving role in Zambia's energy sector

Since the early 2000s, China has actively engaged in Zambia's energy sector through financing and construction of energy projects. Its participation in the sector has evolved with recent debt renegotiations and China's shifting risk appetite curtailing both policy and commercial bank lending. Nevertheless, China's dominant position in global clean tech supply chains has sustained its interest in Zambia's energy sector, from project construction to participation in low-carbon value chains.

This section examines China's role in Zambia's energy sector, focusing on power generation, transmission and distribution in the context of Zambia's recent efforts to enhance energy security. It also considers how China's engagement in Zambia's mining sector and in the production of low-carbon value-chain products creates opportunities to expand modern renewable energy and scale up of low-carbon value chains.

3.1 Power generation

China has played a significant and growing role in Zambia's power generation sector since the early 2000s.[8] This reflects its broader push for overseas engagement in the energy industry. Since 2008, Chinese policy and commercial banks, including China Exim Bank, Bank of China and CDB, have extended around $4 billion in official loans to support Zambia's energy infrastructure development (AidData, 2023). At the time, projects such as Kafue Gorge Lower Hydropower construction were framed as addressing the country's energy security challenges. Similar to its approach in other countries, China has favoured bilateral engagement, and it does not participate in donor or MDB coordination meetings.[9]

Historically Chinese financing for Zambia's power generation has primarily focused on hydropower and coal projects. Major examples of Chinese-backed projects include the Kafue Gorge Lower Hydropower Plant, Kariba North Bank Hydropower Expansion and Maamba Coal Power Plant (see Table 4).

Although China previously financed the Maamba coal plant, it is currently not funding coal power plant developments, in line with the approach being taken by development banks and other international financiers. Maamba Collieries, operator of the Maamba Power Plant, plans to add 300MW of coal capacity, doubling the plant's output to 600MW. The company has secured a 20-year PPA with ZESCO but has reportedly only raised $50 million of the $400 million required, through commercial banks and other lenders (Africa Legal, 2024).

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8 Source: stakeholder consultation with MDB representative (1); stakeholder consultation with government representative in energy sector

9 Source: stakeholder consultation with MDB representative (1)

Table 4 Examples of Chinese-financed power generation projects in Zambia

Project	Year	Loan amount	Chinese lender	Contractor	Details
Kariba North Bank Hydropower Expansion	2008	$315m loan	China Exim Bank	Sinohydro	Collateralised against receivables from Copperbelt Energy Corporation and Chambeshi Mining Company Co-financing from the Development Bank of South Africa
Kafue Gorge Lower Hydropower Plant	2017	$1.53bn syndicated loan	China Exim Bank and ICBC	Sinohydro	Originally proposed in 2010, project faced major delays due to ongoing financing woes
Maamba Coal Power Plant Phase I	2015	$182.5m	Bank of China and ICBC	Shandong Electric Power Construction Corp.	Part of consortium of banks which offered a syndicated loan, co-financiers include Standard Chartered Bank

Source: Authors' compilation based on AidData (2023)

Chinese state-owned policy and commercial banks have been key financiers for these projects, often providing syndicated loans combined with credit insurance and sovereign guarantees to support large-scale infrastructure developments. Chinese companies have worked closely with government-linked entities, particularly ZESCO, rather than through purely commercial project finance. With Zambia undergoing debt restructuring with Chinese creditors, discussions about future financing have been limited.

Chinese energy sector financing has typically been tied to construction contracts for Chinese contractors carried out under the EPC model. This has been a common approach for Chinese-financed projects both before and after the launch of the BRI. Major construction companies, such as Sinohydro, a subsidiary of the central SOE Power Construction Corporation of China (PowerChina), have been prominent in these projects. Some projects have faced delays and cost concerns. In 2024, Zambia and Zimbabwe withdrew from a $5 billion Batoka Gorge Hydropower Project agreement with GE and PowerChina, citing cost issues (Marawanyika, 2024).

China's role in financing and co-financing modern renewable energy in Zambia has been limited, with most foreign interest coming from European and American companies.[10] While interest from Chinese developers is reportedly growing, including for projects financed by IFIs such as the Scaling Solar Initiative, project discussions with China and other developers appear to have stalled, likely due to challenges with project financing and the country's limited borrowing capacity (see Section 4). For example, in 2020 ZESCO and PowerChina signed a $548 million agreement to develop three solar plants totalling 600MW (Reuters, 2020), but the projects do not appear to have progressed.

10 Source: stakeholder consultation with government representative in energy sector; stakeholder consultation with finance sector representative (2).

In September 2024, China's Datang Overseas Investment signed an MoU with ZESCO to develop 220MW of new solar PV energy capacity, including 100MW at Itezhi Tezhi, 50MW at Choma and 70MW at Kasama (Chandak, 2024). According to Zambia's Ministry of Energy, LONGi Green Energy, a leading Chinese solar panel manufacturer, plans to develop a 10MW solar plant by the end of 2025, with an ambition to expand to 200MW (Ministry of Energy, 2025). This aligns with LONGi's regional growth strategy, including opening an office in South Africa in 2024.

Chinese companies are seeking to play a role as EPC contractors for modern renewable projects in Zambia. PowerChina is among the most active Chinese firms in the energy sector, including modern renewables. It has recently acted as EPC contractor for several renewable projects, including CEC's green bond-financed developments and the Chisamba solar power project. During FOCAC 2024, PowerChina hosted a forum attended by President Hichilema to underscore its commitment to cooperating with Zambia in scaling up power infrastructure (PowerChina, 2024). Chinese companies have also approached developers of IPP projects in Zambia and other countries in the region to bid for EPC contracts. While African EPC contractors were ultimately engaged, Chinese equipment has been used for solar projects.[11]

Chinese companies have also shown interest in battery storage projects. Both private and state-owned firms are exploring opportunities to own and operate such facilities over their lifetime, signalling a potential interest in longer-term IPP roles.[12]

Several interviewees highlighted China's role as a major exporter of clean tech, particularly solar panels. However, there is little evidence of Chinese financing for large-scale rural energy access initiatives, an area where development partners and MDBs such as the EU and AfDB have been more active. Instead, the focus appears to be on the commercial opportunities associated with these projects. Huawei supplies residential, utility-scale and microgrid solar PV systems and works with African countries including Ghana and Mozambique, and has participated in 'smart village' projects in Zambia featuring mini-grid installations. It is unclear whether these involve Chinese financing (Huawei, 2025).

3.2 Transmission and distribution infrastructure

Similar to its role in power generation, China has been active in financing and construction of Zambia's T&D infrastructure, with many projects directly linked to large-scale energy generation developments. Financing has been provided primarily by Chinese policy and commercial banks, including China Exim Bank and ICBC. These loans have typically been accompanied by EPC contracts implemented by Chinese firms such as TBEA and Sinohydro (a subsidiary of PowerChina) (AidData, 2023).

Chinese financing for T&D infrastructure has supported both national grid expansion and regional interconnection. Some projects have been tied to Zambia's industrial zones, highlighting the integration of power infrastructure into broader Chinese trade and investment strategies.

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11 Source: stakeholder consultation with renewable energy company (1).
12 Source: stakeholder consultation with renewable energy company (2) and authors.

Table 5 Examples of Chinese-financed T&D projects in Zambia

Project	Year	Loan amount	Chinese lender	Contractor	Notes
Chambishi Park Transmission Line	2009	$11.1m	CNMC Industrial Zone Development (a subsidiary of state-owned China Nonferrous Metal Mining (Group) Co., Ltd)	Not specified	Covers 40% of total project costs; supplies the Zambia-China Economic & Trade Cooperation Zone (ZCCZ) in Copperbelt Province, a flagship Chinese SEZ in Africa
Pensulo–Msoro–Chipata West 330kV & Pensulo–Kasama 330kV Transmission Lines	2011	$285m	ICBC	TBEA	This project is part of larger project called the Zambia–Tanzania–Kenya (ZTK) Transmission Interconnector, which sought to link the power grids of all three countries.
33kV Kariba North Bank–Kafue West Transmission Line Project	2014	$45.0m	China Exim Bank	Sinohydro	Used to construct transmission line between the China Eximbank-financed Kariba North Bank Hydropower Plant and Kafue West substation.
Mpika Power Supply Improvement Project (330/66kV substation upgrade)	2016	$29.6m	ICBC	TBEA	Upgrade of Mpika district's power supply
330kV Kabwe–Pensulo Second Transmission Line Project	2017	$114.1m	China Exim Bank	China Jiangxi Corporation for International Economic and Technical Cooperation (CJIC)	In 2018, China Jiangxi Corporation for International Economic and Technical Cooperation (CJIC) provided a $17 million bridge loan (supplier's credit) to ZESCO – a state-owned power company in Zambia – for the 330kV Kabwe-Pensulo Second Transmission Line Project

Source: Authors' compilation based on AidData (2023)

As with power generation, Chinese T&D projects have relied heavily on EPC delivery models and policy and commercial bank financing, in some cases alongside wider Chinese investment in mining, industrial zones and regional trade corridors. A mix of central SOEs, such as PowerChina, and privately owned companies such as TBEA have been engaged as EPC contractors. TBEA has been extensively involved in high-profile transmission contracts financed by Chinese banks across BRI countries, as well as winning bids for projects financed through other modalities. PowerChina has played a major role in both power generation and transmission and distribution, delivering 50 major projects including over 1,100km of T&D lines and 1,500GW in power capacity (PowerChina, 2024).

Zambia requires substantial investment in T&D infrastructure for power generation and regional interconnectivity (see Section 2.3.1). While Chinese financing for such projects is likely to remain limited, as with power generation Chinese companies active in the T&D sector across sub-Saharan Africa, often on MDB and DFI-financed contracts, may seek to participate in T&D infrastructure contracts given their extensive experience in regional energy projects.

Although China's financing for new T&D infrastructure is limited, a new trend is emerging: Chinese companies like PowerChina, which are engaged in EPC construction of solar projects, are also building the transmission lines to connect this infrastructure to the grid. For example, the Chisamba power station, constructed by PowerChina, includes a 2.7km double-circuit 132kV transmission line and the expansion of the existing substation (PowerChina, 2025).

3.3 Low-carbon value chain investments

China's role in Zambia's mining sector, as well as its position as a leading producer of low-carbon technologies for which it sources Zambian minerals, presents a dual opportunity. First, there is an opportunity to better integrate green development into the mining process by incorporating modern RE offtake and expanding capacity in existing and future mining operations. Second, Zambia can leverage China's expertise in low-carbon value chains and its interest in the country's minerals to more effectively integrate Zambia into manufacturing value chains.

Zambia has long been a producer of copper and cobalt, but the country now seeks to strengthen links between mining and downstream value chains (see Section 2.2). In recent years, Chinese mining companies have been looking to expand their already substantial presence in Zambia's mining sector. The Chinese Mining Enterprises Association in Zambia, established in 2024, has announced plans to invest $5 billion over the next five years to expand the mining sector (Xinhua, 2024). Sinomine Resource Group plans to commence copper production in September 2026 at its Kitumba Copper Mine in Central Province with an investment of $560 million (Reuters, 2025).

While some mining companies in Zambia are beginning to integrate modern renewable energy solutions, the depth of commitment across the sector, and the degree to which the government intends to encourage or coordinate such efforts, remains uncertain. For example, US-based Terra Metals, which is recommissioning a copper and cobalt acid-leach plant, will develop two 200MW solar plants (400MW total), one in Northern Province and another near its operations in North-Western Province (GlobalNewswire, 2025). First Quantum Minerals, in which China's Jiangxi Copper is the second-largest shareholder, has recently signed offtake agreements with renewable power trader Africa GreenCo from the Chisamba project (see Box 3). As part of its drive to reduce carbon footprint by 30% in 2025, First Quantum is investing $500 million in a 430MW RE project to power its Kansashi and Sentinel mines in Zambia. The project will include a 230MW solar plant and a 200MW wind farm, developed with Total Eren and Chariot.

The extent to which Chinese companies are pursuing similar strategies is uncertain. There are signs of innovative practices being introduced on a small scale. China has reportedly shipped 31 electric mining trucks to Africa for deployment at a Zambian copper mine, marking the first such use in the country on a Chinese copper-mining project (Africanews, 2025). The expansion of modern renewables such as solar by companies like CEC marks a significant step in capitalising on the country's potential for solar power and diversifying its energy supply. As CEC supplies electricity to several majority Chinese-owned mines, including Chambishi Copper Mines and CNMC Luanshya Copper Mines, and extends its operations into the DRC, these efforts could generate positive spillover effects for Chinese enterprises operating across both markets. Chinese companies can also advance this transition by pursuing power offtake agreements and implementing energy efficiency measures, in line with China's policy push to green overseas investment and Zambia's efforts to scale up renewable energy integration.

To support their industrial operations in other sectors across the country, some investors are reportedly exploring alternative sources of fuel. The Wonderful Group of Companies, a Chinese-owned industrial group, plans to construct a fertiliser plant in Lusaka Province in partnership with China Wuhuan Engineering Co., Ltd., a Chinese engineering contractor (People's Daily, 2025; Mitimingi and Hill, 2024). The group, which had previously proposed building a larger coal-fired power plant (Mitimingi and Hill, 2024), will reportedly utilise an 85 MW coal power plant to supply energy to the fertiliser facility. Details regarding the project's financing arrangements remain unclear.

When it comes to value addition, China's Chambishi Park in the Copperbelt Province focuses on copper and cobalt processing and related industries. The park is co-located with the Chambishi copper mine, though the extent of local value addition remains limited. While some copper cathode processing takes place in Zambia, overall value addition appears modest. Recent environmental incidents, such as the tailings dam leakage at the Chambishi mine in early 2025, highlight that efforts to expand mineral value chains need to go hand in hand with stronger enforcement of environmental regulations.

Chinese clean tech companies are exploring opportunities in Zambia's low-carbon value chains. Zamtrans Electrical Limited, located in the Jiangxi Co-operation Economic Zone in Chibombo, manufactures, supplies and repairs distribution transformers (Zamtrans Electrical Limited, n.d.). Better Technology Group Limited has announced plans for a lithium-battery manufacturing plant in Southern Province, expected to create 3,000 jobs and produce over three million batteries annually (ZNBC Today, 2024). The government has been courting Chinese electric vehicle manufacturers, including BYD, to establish battery manufacturing operations in the country (Ministry of Foreign Affairs and International Cooperation, 2024; Agbetiloye, 2025). However, it remains unclear whether BYD, which is looking to expand its presence in the local EV market, is exploring these projects.

4 Bottlenecks and key investment challenges

Zambia has both ambitious goals and pressing needs for modern renewable energy, and there is strong demand for private investment in the sector; however, significant challenges to attracting such investment remain. This section highlights the key financing obstacles facing Zambia's energy sector, particularly those that hinder the expansion of Chinese and other international investment.

4.1 Policy and regulatory barriers

Zambia has sought to strengthen its policy environment through more robust energy sector planning and reforms (see Section 2.2). Interviewees broadly agreed that, while challenges remain, the government has taken notable steps to liberalise access to the energy market, including the promotion of open access to power for IPPs.[13] This policy shift is largely driven by the urgent need to diversify the energy mix in light of recent power shortages which exposed the risk of its hydropower dependency.[14] Although the country has faced power shortages before, the present crisis has underscored the need for accelerated action. Liberalising access to the grid and reducing the monopoly of the public utility were repeatedly cited as crucial steps in the right direction, with the government also seeking to fast-track approvals for solar power projects.[15]

Despite these positive steps, stakeholders identified several ongoing barriers. Chief among these is financing, alongside the need to identify and secure additional viable sites for renewable energy development.[16] There is currently no dedicated procurement policy for modern RE projects, though Zambia working to establish a structured framework to support project procurement (Mission 300, 2025). This could strengthen the competitive bidding process, improve transparency and signal a stable policy environment. At present, the government of Zambia receives a high volume of unsolicited bids from a range of players with various tariffs reportedly being offered.[17] Stakeholders noted that the introduction of an auction or request-for-proposals system, where pre-developed sites are released in competitive procurement rounds, could help attract credible partners, improve financing opportunities and facilitate energy market development.[18]

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13 Source: stakeholder consultation with development partner (1), government representative in energy sector, energy sector association and stakeholder consultation with renewable energy company (2).
14 Source: stakeholder consultation with development partner (1) and stakeholder consultation with renewable energy company (1).
15 Source: stakeholder consultation with development partner (1); stakeholder consultation with government representative in energy sector.
16 Source: stakeholder consultation with finance sector representative (2).
17 Source: stakeholder consultation with finance sector representative (2); stakeholder consultation with mining sector expert.
18 Source: stakeholder consultation with finance sector representative (2).

4.2 Institutional risks

Offtaker risk is a major impediment to advancing energy projects in Zambia. This reflects a broader challenge across Africa where 80% of infrastructure projects fail to progress beyond the feasibility or business-plan stage (Lakmeeharan et al., 2020). The inability to secure offtake agreements underpinned by sovereign guarantees is a key constraint, with many African governments, including Zambia, unable to offer such assurances due to weak balance sheets and restricted public borrowing capacity (Lakmeeharan et al., 2020). Zambia's sovereign credit is currently rated as Restricted Default (Fitch Ratings). This limits its ability to issue sovereign guarantees, even as it seeks to attract private investment.[19] Multilateral lenders such as the World Bank are also restricted in their provision of guarantee instruments, limiting the options available to de-risk projects for private investors.[20]

This structural challenge is evident in the problems Zambia faces in financing the expansion of modern renewables. Multiple stakeholders noted that, while the government of Zambia has engaged numerous prospective partners and reached MoU agreements, few projects have reached financial close or moved to the construction stage. The primary concern is the creditworthiness of the offtaker. ZESCO, the national utility and principal offtaker, remains in a fragile financial position.[21] Although steps are being taken to improve its balance sheet, financing against a ZESCO PPA remains challenging without substantial guarantees.[22]

Recognising these constraints, alternative project financing mechanisms that do not rely on sovereign guarantees are emerging.[23] A recent example is the Chisamba Solar PV Project, where ZESCO had initially been expected to act as offtaker but last-minute settlement issues prevented the arrangement from proceeding.[24] Africa GreenCo assumed the role of intermediate offtaker, enabling the project to reach financial close and facilitating the onward supply of energy to First Quantum Minerals under a separate PPA (see Box 3). This model, where a creditworthy intermediary sits between generator and end-user, illustrates a potential pathway for de-risking future renewable investments in Zambia, while avoiding reliance on sovereign guarantees. Given ZESCO's ongoing financial woes, this model may become more common.

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19 Source: stakeholder consultation with MDB representative (2).
20 Source: stakeholder consultation with MDB representative (2).
21 Source: Stakeholder consultation with MDB representative (2).
22 Source: stakeholder consultation with finance sector representative (1).
23 Source: stakeholder consultation with finance sector representative (1) and (2); stakeholder consultation with MDB representative (2).
24 Source: stakeholder consultation with renewable energy company (1).

Box 3 Chisamba Solar PV Project

The 100MW Chisamba Solar PV Project, now the largest grid-connected solar installation in Zambia and the largest of its kind in sub-Saharan Africa, has achieved financial close with $71.5 million in commercial debt provided by Stanbic Bank Zambia, a subsidiary of Standard Bank Group. The project is being developed by Kariba North Bank Extension Power Corporation (KNBEPC), a wholly owned arm of ZESCO, and is supported by a 13-year PPA with GreenCo Power Services. GreenCo will in turn deliver the electricity to First Quantum Minerals, the country's largest mining investor, under a separate Power Supply Agreement that blends solar generation into the grid, freeing up capacity for ZESCO to supply other customers with the electricity that would have otherwise been supplied to the mine.

This financing structure, which has been assembled without sovereign guarantees, government backing or recourse to ZESCO, illustrates how private offtake arrangements can mobilise substantial investment in renewable generation. The arrangement allows KNBEPC to secure purely commercial financing while maintaining operational autonomy, provides ZESCO with additional transmission revenues and spare capacity for other customers, and ensures FQM receives dependable renewable energy. Upon completion of the PPA term and repayment of all debt, the full output of the plant will be transferred to ZESCO. By delivering competitive tariffs within a shorter debt tenor, this transaction moves away from conventional government-backed procurement and sets a new precedent for clean energy project financing in Zambia.

Source: Adapted from Africa GreenCo Press Release (2025)

4.3 Financial risks

High financing costs were highlighted by stakeholders as a significant impediment to the advancement of modern RE projects in Zambia. Domestic interest rates remain high, limiting the affordability of long-term project finance.[25] Blended finance structures, combining commercial loans with concessional or development finance, were viewed as a viable solution to reduce the overall cost of capital, particularly for large-scale renewable projects.

However, the capacity of domestic commercial banks such as Stanbic Bank Zambia to participate in such deals is constrained by limited capital, making it difficult for them to support the scale of investment required.[26] Given that Chinese commercial lenders have limited experience with project finance structures, it is unclear to what extent they can fill this gap.

Stakeholders also emphasised that, beyond financing challenges, managing currency risk is critical. Some renewable energy developers

25 Source: stakeholder consultation with finance sector representative (2).
26 Source: stakeholder consultation with energy sector association.

address this by targeting customers such as mining companies, which can pay for delivery in dollars, and by 'dollarising' their value chains to ensure they can meet PPA obligations.[27] Stakeholders further highlighted economies of scale as essential, underscoring the importance of developing a more integrated regional energy market to expand demand, reduce costs and improve project viability.[28]

Blended finance and co-financing models are already being deployed in Zambia, with grant-equity-debt structures cited as the most attractive approach by stakeholders representing the energy sector.[29] Interviewees were optimistic that more co-financed projects will emerge in the coming years, but noted that unlocking this potential will require lowering financing costs, mobilising greater regional investment and continuing to strengthen the policy and regulatory environment for private sector participation.

In South Africa, where the renewable energy market is more developed than in Zambia and financial links with Chinese institutions are well-established, Chinese stakeholders view credit and currency risks as key barriers to longer-term investment (Chen et al., 2025). South Africa's relatively poor credit rating and Rand depreciation limit the value of returns for investors operating in US dollars or euros, including Chinese firms. The long-term nature of investments in IPPs is seen as risky and insufficient to cover potential currency losses. By contrast, shorter-term EPC contracts (typically 2–5 years) are better able to manage currency risks (Chen et al., 2025).

Given that EPC+Finance structures and Sinosure insurance do not fully hedge exchange rate risks, it is reasonable to assume that similar dynamics affect the appetite of Chinese companies for investments in Zambia. Respondents from South African commercial banks noted that they can offer highly competitive terms to developers over longer tenors than Chinese banks or financiers typically provide. For standard Chinese Export Credit Agency (ECA) finance (Exim Bank loans backed by Sinosure insurance), the typical maximum tenor of 15 years does not cover the full 20-year term of a PPA (Chen et al., 2025). Similar challenges are likely to shape Chinese investment considerations in the Zambian market.

4.4 Project bankability

Project bankability remains a core challenge for EMDEs seeking to mobilise greater private sector finance in the power sector. In Zambia, historically low electricity tariffs have constrained cost recovery, although recent reforms have introduced more cost-reflective and open pricing.[30] The increased autonomy of the national energy regulator is seen as a positive development, providing independence from utility influence and bolstering investor confidence.[31] Political interference has previously hindered tariff increases, and energy sector

27 Source: stakeholder consultation with renewable energy company (2).
28 Source: stakeholder consultation with energy sector association.
29 Source: stakeholder consultation with energy sector association.
30 Source: stakeholder consultation with development partner (1) and renewable energy company (2).
31 Source: stakeholder consultation with MDB representative (1).

stakeholders are likely to watch closely whether the government upholds its commitment to strengthening the regulator's autonomy.

Improving regional integration was highlighted as an important factor in enhancing project bankability. Stronger links to the SAPP can expand market access for modern RE project developers, reduce reliance on a single offtaker and provide access to Tier 1 buyers such as South Africa's energy market. Such arrangements can help mitigate offtaker risk and attract a wider pool of financing partners, including local commercial banks. Stakeholders noted that a variety of project modalities and contractual structures are being explored to leverage these regional opportunities and strengthen the investment case for renewable energy development.[32] Given the growing role of the mining sector and Zambia's position as a power supplier to the broader region through interconnectors, as well as direct supply to countries such as the DRC, this approach is likely to gain momentum, offering strong offtake options through multiple channels.

It remains to be seen how Chinese investors' and project developers' engagement in Zambia will evolve. As noted in Chen et al. (2025), Chinese investors have limited experience with project finance compared with European and other international investors and often prefer to negotiate price and payment based on a corporate facility. As one source observed, 'project finance is definitely new to the Chinese investor'.

More bespoke arrangements that do not involve ZESCO as the offtaker, and where project finance structures and tariffs are more viable, could attract greater interest from Chinese project developers and financiers. However, it remains unclear how such arrangements would be managed and regulated, and whether they would be offered on terms attractive to these investors.

4.5 Technical challenges

Stakeholders highlight significant technological constraints linked to the national grid's ability to absorb and balance a growing share of variable renewable energy sources.[33] Current transmission capacity limits mean the grid can accommodate only around 1.5GW of additional power, creating a bottleneck for large-scale capacity addition.[34] While Zambia is seeking to expand its grid capacity, including through new interconnectors, and is supported through a range of MDB and bilateral donor-financed projects, such investments are capital-intensive and will take time to deliver. Decentralised solutions such as mini-grids were identified as viable options for areas with constrained transmission and distribution capacity, but their effect on supply costs and the risk of increasing them requires closer assessment.

Grid reinforcement and the expansion of storage capacity are critical as Zambia moves to scale up modern renewable energy sources. Strengthening the transmission network will also be essential to support the country's ambitions for increased participation in regional energy trade through the SAPP and

32 Source: stakeholder consultation with renewable energy company (1) and (2), finance sector representative.
33 Source: stakeholder consultation with development partner (1); stakeholder consultation with energy sector association; stakeholder consultation with MDB representative (2).
34 Source: stakeholder consultation with development partner (1).

EAPP. Without such upgrades, both domestic renewable integration and cross-border power exchange will remain constrained, limiting the pace of Zambia's energy scale up and its ambitions as a regional power trader.

Chinese stakeholders view grid infrastructure as a critical enabler for the energy sector, even though it may not be classified as a climate investment under all taxonomies (Chen et al., 2025). Given broader constraints on sector financing, significant Chinese official lending for T&D infrastructure in Zambia appears unlikely, particularly considering the country's borrowing constraints. However, Chinese companies may show interest in bidding for EPC contracts on T&D projects financed by DFIs and other multilateral or bilateral institutions.

As Chinese firms expand in Zambia's mining sector and alternative offtake models develop, increased engagement from Chinese commercial lenders and construction companies in the T&D sector may follow.

5 Conclusion and what to watch

China's historical engagement in Zambia's energy sector mirrors trends across sub-Saharan Africa and other BRI countries, where projects were backed by substantial debt financing and EPC models. China's policy and commercial banks, including China Exim Bank, ICBC and Bank of China, played in financing the energy sector, while contractors like PowerChina (and their subsidiaries) participated in the expansion of the country's hydropower and coal infrastructure and T&D contracts.

In Zambia, this approach has been curtailed by debt renegotiations that have significantly reduced the country's sovereign borrowing capacity while also reflecting China's broader shift away from financing large-scale infrastructure projects. With negotiations still ongoing and China's policy lending becoming more conservative, this is unlikely to change in the near term. Whilst there have been examples of Chinese co-financing with other lenders such as the Development Bank of South Africa, there appears to be limited activity at present.

Stakeholder interviews suggest that beyond seeking to participate as EPC contractors and equipment manufacturers, Chinese companies are showing a growing interest in developing modern renewable projects. However, despite the significant participation of Chinese contractors in the country's energy sector historically, they have so far played a limited role as IPPs and financiers for modern renewable projects.

While Chinese financial institutions have long financed major energy projects in Zambia, their participation in modern renewable investments appears limited so far. Even as policy banks like CDB and China Exim Bank have been given the mandate and allocated capital of $48 billion each for smaller, more market-focused projects, including in the energy sector (Nyabiage, 2023). Zambia would struggle to access that funding. This partly reflects ongoing debt negotiations and the broader macroeconomic environment in Zambia. At the same time, despite strong policy signals encouraging overseas investment in clean power and low-carbon supply chains, China's financing model has struggled to adapt to the needs of project finance.

As Chinese companies seek to deepen their presence in Zambia's minerals sector, new opportunities are emerging to integrate renewable energy and energy-efficiency solutions into mining development. At the same time, Chinese cleantech companies are expressing interest in low-carbon value chain addition, which, if realised, would support Zambia's strategic priorities to move up the value chain, enhance domestic value addition, and foster a more sustainable minerals sector.

What to watch

As Zambia seeks to attract investment in scaling-up modern renewable energy projects and low-carbon value chains, including from China, our analysis highlights several 'what to watch' areas in the country's evolving energy sector policy, financing, and partnerships.

1. Policy and regulatory stability to facilitate private investor confidence

Zambia has made progress in improving the policy and regulatory framework for the energy sector, including liberalising grid access and encouraging IPP participation. These measures are vital for diversifying the energy mix, particularly given recurring droughts that have exposed vulnerabilities in the country's hydropower-dependent system. However, challenges remain in securing finance, identifying viable renewable sites and establishing a structured procurement policy for renewables.

What to watch:

- Will Zambia sustain progress in liberalising the energy sector while maintaining the policy and regulatory stability needed to strengthen investor confidence and accelerate the deployment of modern renewable energy?

2. Alternative offtake models and implications for investment

Diversifying offtake models offers a practical means of enabling projects that might otherwise struggle to secure financing. In the Chisamba Solar PV Project, for example, Africa GreenCo acted as the intermediary offtaker instead of ZESCO, enabling financial close without a sovereign guarantee. Broader use of such arrangements could stimulate capacity growth and attract investment.

What to watch:

- How might alternative offtake models influence the investment appetite of Chinese financial institutions, SOEs and private companies in Zambia's modern RE projects?

3. Integration of modern RE and energy efficiency in mining operations

Rising demand for low-carbon electricity from the mining sector presents an opportunity to expand modern renewable energy generation. Broader adoption of energy-efficiency measures could also deliver spillover climate and environmental benefits for surrounding communities.

What to watch:

- Will Zambia integrate modern renewables and energy-efficiency measures into mining projects to advance the greening of the sector and deliver environmental and socio-economic benefits to local communities?

4. Leveraging China's expertise to build a modern RE ecosystem

Chinese companies such as Datang, LONGi, Huawei and PowerChina are exploring opportunities in Zambia's modern renewable energy market. Given their expertise in the modern renewables sector and China's strong policy signals to diversify export markets, these companies are well positioned to expand their engagement abroad. With Zambia's growing appetite for modern renewables, closer collaboration may emerge between these firms, China's broader low-carbon ecosystem, and Zambia's energy sector.

What to watch:

- How will Zambia leverage China's expertise to build a modern renewables ecosystem that strengthens domestic capability and supports technology adoption, for example through technology transfer, training and capacity development?

5. Strategic engagement with Chinese mining and clean-tech firms for low-carbon value chain development

Zambia has significant untapped potential to localise low-carbon value chains by expanding refining capacity for copper and other minerals and production of clean tech. With plans to scale up in-country value addition, the country may seek to leverage China's appetite for its mineral resources and expertise in clean tech manufacturing to support value chain development.

What to watch:

- As Zambia scales up production of copper and other minerals, will cooperation with Chinese firms extend beyond mineral extraction into downstream value addition?
- How might other international partners with interests in Zambia's critical minerals value chains respond to China's growing role?

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