Overcoming Barriers to Utility-scale Solar Energy in Zambia

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Summary

Zambia's 2023/24 drought exposed its heavy dependence on hydropower, prompting an urgent push for alternatives, including utility-scale solar energy. This policy brief identifies the major barriers to utility-scale solar deployment and analyses their evolution within Zambia's dynamic energy and policy landscape. The findings reveal that the most visible financial constraints are rooted in deeper governance and political economy challenges. These barriers continue to evolve but have been intensified by the drought. This, in turn, has deepened market and financial instability, revealed grid bottlenecks, and triggered a surge in opaque, non-competitive procurement practices. In response, the brief provides evidence-based recommendations for policymakers to mobilise regulators, the state-owned utility (ZESCO), and financiers. These recommendations present an opportunity to place governance at the core alongside market reform and infrastructure development to unlock Zambia's solar potential.

Key Policy Recommendations

1. **Strengthen ZESCO's Financial Position and Reform the Market:** Restore ZESCO's financial health through sustained, cost-reflective tariffs, indexed to the US dollar via a Multi-Year Tariff Framework (MYTF) to protect revenue from currency volatility. Follow with ongoing market reform by operationalising the 2024 Electricity Open Access Framework and establishing an independent system operator (ISO) to ensure fair grid access and promote competition.
2. **Prioritise Strategic Grid Investment:** Address the outdated and underinvested grid as the next critical bottleneck to solar expansion. While immediate, large-scale upgrades remain economically challenging, prioritise financing for grid modernisation, reinforcement, and flexibility solutions, such as battery storage, to enable reliable integration of new solar capacity.

New solar panel roof installation in Zambia

3. **Establish Transparent and Competitive Procurement:** Replace the opaque and unsolicited Power Purchase Agreement (PPA) process with a competitive bidding framework. To manage the backlog, existing PPAs should undergo prioritisation by an independent technical committee using clear criteria, including project readiness, grid capacity, and tariff levels, to reduce political interference and boost investor confidence.

Introduction

The 2023/24 drought exposed Zambia's heavy reliance on climate-sensitive hydropower, which supplies 80–90% of its electricity capacity. This vulnerability has deepened with recurring droughts over the past decade, causing devastating environmental, social, and economic impacts. Resulting electricity shortages, marked by load shedding—scheduled and unscheduled power cuts—of up to 21 hours per day, have undermined energy security, affecting both quality of life and economic stability [1].

To address this challenge, utility-scale solar offers a promising solution. Defined here as grid-connected installations of 5 MW or more, typical of most solar tenders in sub-Saharan Africa [2], such projects can help alleviate drought-related power supply shortfalls and enhance grid reliability during daylight hours. Zambia's world-class solar resources, combined with falling costs, rapid deployment, climate resilience, and lower long-term environmental liabilities than fossil fuels, make solar particularly attractive.

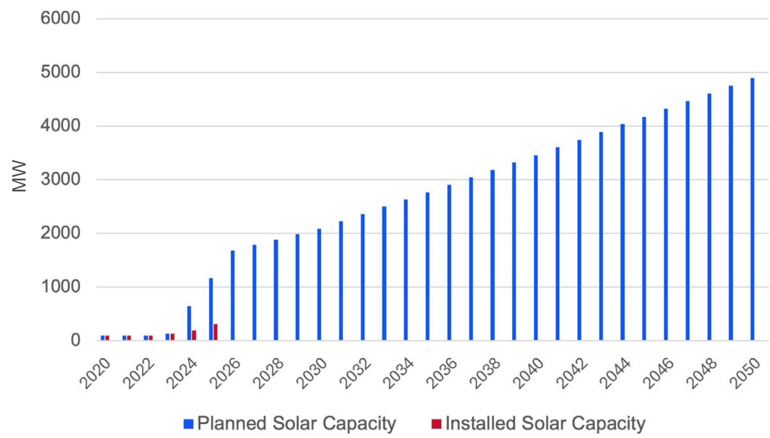
In recognition of the need for energy diversification, a presidential directive set a target of adding 1,000 MW of solar capacity by the end of 2025 [3], aiming to mitigate a 1,600 MW electricity deficit [4]. This short-term goal is supported by existing energy policies, including the Integrated Resource Plan (IRP), which targets approximately 5,000 MW of solar capacity by 2050 [5]. However, these initiatives have yet to translate into meaningful progress.

By mid-2025, installed solar capacity [6] stood at roughly 300 MW, including the 2025 commissioning of Chisamba Solar Phase 1 (100 MW) [7] and Mailo Solar Phase 1 (25 MW) [8], far below the power deficit and IRP projections (see **Figure 1**). Flagship international programmes, such as the World Bank Group's Scaling Solar, launched as early as 2015 to de-risk investment and accelerate development, have faced delays or cancellations, reflecting persistent political and economic barriers [9].

For current efforts to succeed where past initiatives have faltered, it is essential to understand the barriers that have impeded progress and that need to be addressed. This policy brief provides timely insights into utility-scale solar development in Zambia to ensure future energy planning is grounded in implementation realities.

[1] Figure 1 illustrates the IRP's solar capacity targets, with linear interpolation used to estimate annual figures between key milestone years (2026, 2030, 2040, 2050) presented in the plan.

***Figure 1:** Rapid Solar Expansion Ambition vs. 300 MW Reality in mid-2025 (IRP data from Ministry of Energy, 2023 [5, p.14], with partial interpolation[1])*



Methods

This brief draws on a study conducted between June and August 2025 to inform the policy, planning, and implementation of utility-scale solar development in Zambia. The study comprised two phases: (i) a desk-based review of existing sources, including government publications, stakeholder reports and statistics, and recent media coverage; and (ii) eight semi-structured interviews with key stakeholders, summarised in **Table 1**. These experts represented a cross-section of Zambia's energy sector and offered grounded insights into the development of utility-scale solar. While the purposively selected interview sample is not statistically representative of all stakeholder views, it offers a rich and nuanced understanding of key barriers to utility-scale solar deployment by triangulating official energy plans with on-the-ground experiences.

***Table 1:** Interview Participants*

Code	Organisation Type	Key Responsibility
GOV-M	Government ministry	Energy policy formulation and oversight
GOV-R	Government regulatory agency	Energy sector regulation
SOE	State-owned utility	Electricity generation, transmission, and distribution
IPP	Independent power producer	Energy project development and power generation
TRD	Electricity trading firm	Renewable electricity trading and market facilitation
INV	Investment and advisory firm	Investment and project funding advisory
CON	Consulting firm	Energy system planning and policy advisory
MDB	Multilateral development bank	Project finance, technical, and policy support

Findings

Context:
Contested Landscape of Solar Development

❝ *Seeing the adverse effects of the [2024] drought and... the hydrological projections of where these droughts have now moved from ten years to every four years... that's what has led to more uptake in solar...* ❞ [GOV-M]. As this remark illustrates, the 2024 drought crisis has accelerated interest in utility-scale solar, a perspective which was shared among interviewees.

Several participants noted how the drought had spurred *'the government's policy reforms to actually expedite project implementation'* [GOV-M]. Notable developments include the new Energy Single Licensing System, which was designed to grant feasibility study rights for solar project applications within 48 hours—a dramatic reduction from six months [3; GOV-M]. While some interviewees viewed President Hichilema's 1,000 MW solar target for 2025 [3] as overly ambitious, many appreciated its bold signalling. Many participants also welcomed Zambia's transition toward power market liberalisation via the 2024 Electricity Open Access Framework [6]. By ensuring non-discriminatory access to transmission and distribution networks for third-party users, this reform is intended to *'facilitate and catalyse new investment'* [TRD]. The commissioning of the Chisamba project [7] was highlighted as evidence of an emerging commercial model for utility-scale solar. In this model, Africa GreenCo—a private trader—acts as a risk-mitigating intermediary to bypass ZESCO as an off-taker.

Conversely, other participants characterised this rapid rollout as *'a little bit chaotic'* [SOE], warning that political signalling may be outpacing actual delivery [CON]. They highlighted the absence of a structured procurement framework, with signed PPAs—that is, long-term contracts to sell electricity—totalling over 3,000–5,000 MW. This volume far exceeds the grid's current capacity to integrate Variable Renewable Energy (VRE), which remains below 1,000 MW [SOE]. Many PPAs are unsolicited *'bad contracts'* [CON], which lack competitive bidding and regulatory oversight, potentially imposing long-term financial liabilities on ZESCO. Although most PPAs have stalled due to insufficient financing, it was argued that cancelling them could discourage future investment by heightening regulatory uncertainty. This uncertainty is compounded by the fact that Open Access remains largely theoretical for most developers. Even the 'successful' Chisamba project was seen by several interviewees as an exception, enabled by a *'unique'* structure [MDB; SOE] in which an intermediary trader sells directly to a creditworthy mining off-taker. The model, which was underpinned by strong government backing and a state-owned developer [SOE], may not be easily replicable for independent power producers (IPPs) without similar support. This contested environment sets the stage for the subsequent barrier analysis.

Key Finding 1:
Interconnected System of Barriers

While interviewees consistently cited financial constraints as the primary impediment to utility-scale solar, the analysis reveals these are symptoms of deeper, interconnected challenges.

One participant explained: ❝ *Every solar project has a political aspect to it, like showing that there's something that is being done... the PPAs are being signed, how it's being announced, the information that is out there is not as clean as one would wish* ❞ [CON]. This sentiment reflects complex political dynamics in Zambia, where tensions persist between official reform narratives and market realities. Although the Energy Single Licensing System [3] was praised for speeding up approvals, some observed that the barrier has simply shifted, from slow bureaucracy to rapid, politically-driven permitting, often with limited due diligence.

These dynamics place strain on a vertically integrated electricity model where ZESCO dominates as both system operator and high-risk off-taker. Its financial position is undermined by non-cost-reflective tariffs [10], driven by political promises to maintain low prices, especially during election years [CON]. This forces ZESCO to buy power from IPPs at high rates (eg US$0.11/kWh) while selling it to consumers at a loss (eg US$0.07/kWh), resulting in chronic cashflow deficits [10]. This structural entanglement hinders the operationalisation of broader Open Access reforms because, without a neutral intermediary to manage the grid, the market remains tied to ZESCO's financial instability. Paradoxically, despite alternative off-takers emerging, most IPPs still favour ZESCO. Interviewees cited the utility's higher procurement tariffs [IPP] and longer contract tenures [MDB] which offer more security than nascent private off-takers can match. To break this deadlock, establishing an ISO is seen as critical. As one stakeholder argued: ❝ *If we have an independent system operator... it will then push up the conversation around... tariff setting because everyone will... be able to clearly articulate how the current price affects their investments* ❞ [CON].

Limited institutional capacities and market instability translate into financial barriers. IPPs face difficulty securing finance, as ZESCO's poor creditworthiness and debt history make its PPAs unbankable without sovereign guarantees [IPP]. As one participant noted, ❝ *The moment ZESCO becomes a viable institution, you'd see how much investors will flow in* ❞ [MDB]. This risk is compounded by a structural currency mismatch, which places additional pressure on ZESCO's cashflow, as projects are financed in US dollars but earn revenue in volatile Zambian Kwacha [2]. While some interviewees viewed the Multi-Year Tariff Framework (MYTF)—a regulatory mechanism adopted in 2023 that allows for predictable, incremental tariff adjustments over five years—as a step toward cost-reflectivity [6], they also highlighted that the MYTF does not account for currency fluctuations. Kwacha depreciation against the US dollar can rapidly erode revenue, especially given the prohibitive cost and limited availability of financial risk management instruments, such as hedging, within Zambia [INV].

Finally, this chronic lack of investment starves the physical network, creating technical and infrastructural barriers. As one participant observed, ❝ *The grid is very weak because in certain areas of the country, the grid that was installed in the 1960s...is still there today* ❞ [IPP]. The outdated grid suffers from high power losses and lacks modern control systems, limiting its VRE hosting capacity to under 1,000 MW, or roughly 27–30% of total installed generation [11; SOE]. One participant [SOE] warned that the government's rapid solar push risks breaching this ceiling without immediate, massive infrastructure upgrades, which are unlikely in the short term. Meanwhile, many interviewees stressed that essential grid reinforcement and battery storage remain economically unviable. One participant added: ❝ *It is necessary, but again, you have to look at bankability and the tariff framework for batteries... currently, Zambia lacks a proper framework to guide charging for battery storage* ❞ [SOE]. These limitations constrain revenue generation from new projects, perpetuating the cycle of financial challenges.

Key Finding 2:

Evolving Nature of the Challenge

The nature of these barriers has evolved in response to the 2023/24 crisis in three distinct ways. First, core structural issues remain, and there is no clear roadmap to separate ZESCO's generation, transmission, and distribution roles. Private investment continues to be deterred by ZESCO's financial instability, politically sensitive tariffs, and currency mismatches. **Strengthening ZESCO and operationalising ongoing market reform remain foundational priorities (Recommendation 1)**. Second, as bureaucratic hurdles have reduced, long-standing grid limitations have been unmasked as a key bottleneck. Zambia's ageing and underinvested grid now poses a physical obstacle to scaling VRE, **making strategic grid investment an urgent priority (Recommendation 2)**. Third, the challenge has shifted from procedural inefficiencies to procurement transparency. The recent surge in project activity has led to a proliferation of opaque, unsolicited PPAs, rather than slow bureaucratic approvals. **This necessitates reforms to establish transparent and competitive procurement (Recommendation 3)**.

Outlook

This brief has shown that the most visible financial barriers are symptoms of deeper challenges which continue to evolve in response to the 2023/24 drought crisis. Future energy planning in Zambia should tackle underlying investment risks through systemic reform: restore utility financial viability as the top priority; invest to ease grid bottlenecks; and replace opaque procurement with transparent, competitive processes. Success now hinges on translating current political will into these reforms to unlock Zambia's sustainable and resilient energy future.

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