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Integrated Resource Plan (IRP) 2025 Analysis Report

An Industry Assessment of Wind Energy Targets, Delivery Constraints and the Pathway

Artemis
GROUP HOLDINGS

Integrated Resource Plan (IRP) 2025 Analysis Report: An Industry Assessment of Wind Energy Targets, Delivery Constraints and the Pathway

Developed by South African Wind Energy Association (SAWEA)

Suite 2, 2 Hood Avenue, Rosebank, 2196
+27 010 006 7088 | admin@sawea.co.za | www.sawea.co.za

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Executive Summary

This report provides an updated assessment of the implications of South Africa's electricity planning framework for the wind energy sector, building on the Phase I analysis of the Draft Integrated Resource Plan (IRP) 2024 and incorporating the key changes introduced by the gazetted IRP 2025. The original Phase I report assessed the Draft IRP 2024 as a major recalibration of South Africa's electricity strategy, particularly because it placed wind energy at the centre of the country's long-term generation expansion pathway. The gazetted IRP 2025 does not invalidate that analysis. Rather, it confirms many of its central findings while shifting the policy question from draft-stage ambition to implementation credibility.

The Draft IRP 2024 represented a significant improvement from the earlier Draft IRP 2023 process by assigning wind energy a much larger role in South Africa's future electricity mix. The gazetted IRP 2025 broadly retains this trajectory. The key point is that wind remains a central technology in the planned future electricity system, with approximately 44.7 GW of wind capacity reflected in the 2025–2042 Balanced Plan trajectory. However, the near-term allocation remains more modest than the long-term headline suggests. The 2025–2030 wind allocation remains 9,079 MW, which is 521 MW lower than the 9,600 MW allocated under IRP 2019 for the same period. This creates a sequencing challenge: the gazetted IRP 2025 confirms a large post-2030 wind build, but the sector must still maintain investment momentum, grid readiness, supply-chain capacity and skills development during the 2025–2030 period.

The major difference between the Draft IRP 2024 and the gazetted IRP 2025 is therefore not primarily a reduction or reversal of wind ambition. The deeper difference is that the gazetted IRP 2025 formalises the planning framework and gives stronger attention to the implementation architecture required to deliver the generation build. The final plan is more integrated in its treatment of generation planning, transmission planning, system operations, flexibility, committed public and private generation, storage and climate-policy alignment. This is a positive development for the wind sector because it recognises that new generation capacity is only useful if it can be connected, dispatched, financed and integrated into a reliable power system.

Nevertheless, the central risks identified in the Phase I report remain unresolved. South Africa's best wind resources are concentrated in regions where grid capacity is constrained, particularly the Western Cape, Eastern Cape and Northern Cape. Transmission expansion therefore remains the most important enabling condition for wind deployment. The gazetted IRP 2025's stronger treatment of grid planning reinforces, rather than weakens, the Phase I finding that wind ambition will remain aspirational unless it is matched by accelerated grid investment, transparent grid-access rules and effective coordination with the Transmission Development Plan (TDP) and the National Transmission Company South Africa (NTCSA).

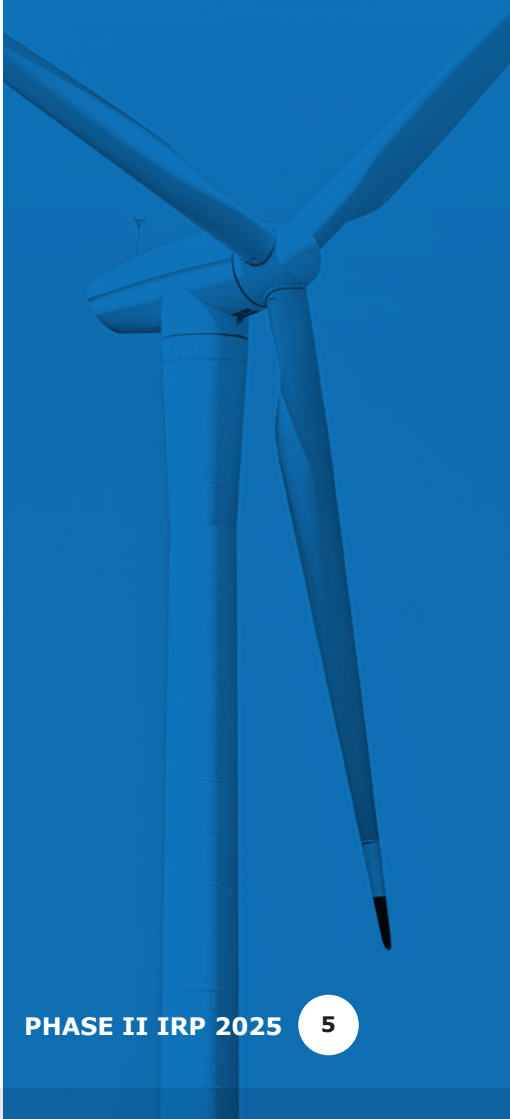
Procurement and route-to-market certainty also remain critical. The wind sector requires a stable and predictable procurement rhythm to support investor confidence, local manufacturing, project development and skills planning. The gazetted IRP 2025 creates a formal planning signal, but that signal must now be translated into bankable procurement schedules, private offtake opportunities, municipal procurement pathways and fair grid allocation processes. Without this, the risk remains that wind capacity will exist in the IRP as a planning allocation but not materialise as operational capacity.

The report also retains its concern with the Interim Grid Capacity Allocation Rules (IGCAR). Grid allocation mechanisms must be restructured to support fairness, non-discrimination and bankability across both public procurement and private power purchase agreements. The lessons from recent procurement rounds, particularly the underutilisation of wind potential due to grid constraints, show that grid access is now a central determinant of whether wind projects can reach financial close and commercial operation.

The gazetted IRP 2025 also strengthens the case for treating storage and flexibility as core components of wind deployment. A high-wind electricity system requires battery storage, pumped storage, demand response, ancillary services, forecasting, curtailment rules and grid-support capabilities. Wind variability should not be treated as a reason to slow wind deployment. Rather, it should be treated as a reason to procure flexibility alongside wind and to modernise system operations.

The Phase I report's industrial-policy findings also remain valid. A large long-term wind allocation can support localisation, supplier development and employment, but this will not happen automatically. Local manufacturing requires predictable annual demand, realistic local-content rules, working-capital support, port and logistics readiness, and a skills pipeline aligned with the expected wind build. The gazetted IRP 2025 therefore strengthens the need to align wind procurement with the South African Renewable Energy Masterplan (SAREM), supplier development instruments and targeted technical training programmes.

A high-wind electricity system requires battery storage, pumped storage, demand response, ancillary services, forecasting, curtailment rules and grid-support capabilities.



Accordingly, the report's original recommendations remain relevant, but they should now be framed as gazetted IRP 2025 implementation priorities rather than draft-stage recommendations. The updated recommendations are:

1. Embed a regular IRP review and implementation-monitoring cycle, aligned with SAWEM, SAREM, the JET-IP and the Transmission Development Plan, to ensure that the – gazetted IRP 2025 remains responsive to demand, technology costs, coal fleet performance, private generation and grid constraints. Department of Electricity and Energy (DEE) has already indicated regular IRP reviews starting in 2027 and the integration implementation monitoring data into the IRP reviews and updates.
2. Reform grid allocation rules, including IGCAR, to ensure that grid access supports public procurement, private offtake and municipal procurement through transparent, non-discriminatory and bankable criteria.
3. Accelerate transmission finance and delivery, including the proposed R60 billion blended-finance transmission facility, government-backed credit guarantees and mechanisms to crowd in private capital for grid expansion under the NTCSA framework.
4. Declare and upgrade strategic wind logistics corridors, including abnormal-load routes, port-handling capacity, bridge reinforcement and transport-permitting systems required for large turbine components.
5. Stabilise the wind build trajectory, using predictable annual or biennial procurement schedules to support local industrialisation, investor confidence and supply-chain development. This is particularly important because the 2025–2030 allocation remains lower than IRP 2019 despite the much larger post-2030 wind ambition.
6. Establish a Supplier Development Fund and targeted training incentives, linked to SAREM and JET skills programmes, to address local-content constraints and the projected shortage of wind technicians, engineers, grid-integration specialists and artisans.

In conclusion, the gazetted IRP 2025 confirms the strategic importance of wind energy in South Africa's electricity transition, but it does not remove the implementation risks identified in the Phase I report. The central challenge has shifted from securing recognition for wind in the draft planning process to ensuring delivery under the final gazetted plan. For SAWEA, the priority is now to ensure that the gazetted IRP 2025 is translated into grid capacity, procurement certainty, fair market access, system flexibility, local industrial capability and workforce readiness. South Africa's wind opportunity remains historic, but its realisation will depend on whether the country can close the gap between planning ambition and implementation delivery.

Key Terms and Definitions

Abnormal Load Corridor – Designated routes equipped to handle oversized or heavy equipment transport (e.g., turbine blades, transformers).

Blended Finance – A financing approach that mixes concessional/development funds with private capital to de-risk renewable and grid investments.

Build-Own-Transfer / Build-Transfer-Operate (PPP models) – Public–private partnership models where private firms finance, build, and temporarily operate grid or generation assets, then transfer them to government or Eskom/NTCSA.

Capital Expenditure (CAPEX) – Funds spent on acquiring, upgrading, or building assets (e.g., power plants, transmission lines).

Climate Change Act – South Africa's legal framework for coordinating the national response to climate change and supporting a low-carbon, climate-resilient economy. Relevant to Final IRP 2025 because the plan gives stronger attention to emissions pathways and NDC commitments.

Committed Private Generation – Private-sector electricity projects advanced enough to be treated as part of the expected supply pipeline, including private PPAs, wheeling projects, embedded generation and corporate offtake projects.

Community Benefit Agreement (CBA) – Legally binding agreements ensuring local communities share benefits (jobs, revenue, services) from renewable projects.

CPI-X – A tariff indexation formula where electricity prices adjust by inflation (CPI) minus an efficiency factor (X). Used in regulatory pricing to incentivize efficiency.

Curtailment – When renewable projects are forced to reduce output due to grid congestion or stability limits.

Dispatchable Technologies – Technologies (like gas, hydro, nuclear, or storage) that can be ramped up or down on demand to balance variable renewables.

Dual-apprenticeship pipelines – Training models combining classroom education and on-the-job learning to address skills gaps in renewable energy (e.g., turbine technicians).

Energy Availability Factor (EAF) – A measure of Eskom's coal fleet operational performance: the % of time generation units are available. In 2025, EAF hovers around 55–60%, well below the 65–68% assumed in IRP models.

Engineering, Procurement and Construction (EPC) – Turnkey contracting model where a contractor designs, procures, and builds a project to agreed specifications.

Eskom – The state-owned, vertically integrated utility that generates over 90% of South Africa's electricity and owns the 33 000 km transmission grid. Eskom relies heavily on aging coal plants, faces a structural shortfall of 4 000–6 000 MW, and procures some power from Independent Power Producers (IPPs) via REIPPPP.

Final IRP 2025 – The gazetted final version of South Africa's Integrated Resource Plan, published by the Department of Electricity and Energy in 2025. It replaces IRP 2019 as the current official electricity planning framework.

Grid Code – The technical and regulatory standards for connecting to and operating within the transmission network (e.g., turbine size certification, frequency support).

Grid Congestion – A condition where transmission capacity is insufficient to carry additional electricity from generation to demand centres.

Independent Power Producer (IPP) – Private-sector entities that generate electricity for the grid. In South Africa, IPPs sell power through PPAs with Eskom or private off takers.

Integrated Energy Plan (IEP) – A broader plan required annually under the National Energy Act (2004). Unlike the IRP (electricity-specific), the IEP covers the entire energy system (electricity, petroleum, gas, etc.), aligning energy supply with national development. South Africa has lagged in publishing IEPs, though compliance is expected to improve planning consistency.

Integrated Resource Plan (IRP) – South Africa's official electricity planning instrument, mandated under the Electricity Regulation Act. It sets long-term projections for electricity demand and outlines the least-cost and policy-adjusted energy mix (coal, gas, nuclear, renewables). The IRP 2024 includes a major scale-up of wind capacity and, for the first time, a dedicated transmission plan.

Interim Grid Capacity Allocation Rules (IGCAR) – Rules introduced to manage scarce grid connection capacity and allocate available capacity fairly among IPPs, given severe congestion in renewable corridors.

Just Energy Transition Implementation Plan (JET-IP) – The South African government's plan for rolling out Just Energy Transition investments, including financing, reskilling, and local economic development.

Just Energy Transition Partnership (JET-P) – An international climate-finance package (initially $8.5 billion pledged by partner countries in 2021) to support South Africa's coal-to-clean transition.

Levelized Cost of Electricity (LCOE) – The average lifetime cost per MWh of a power plant, including capital, operating, and financing costs. Used to compare technologies.

Load Shedding – Planned rolling blackouts implemented when supply cannot meet demand, to prevent grid collapse.

Local Content – The share of project inputs (turbines, towers, services) that are sourced domestically, often a REIPPPP requirement.

Merchant Projects/Private Offtake – Projects selling electricity directly to private buyers (mines, corporates) rather than through Eskom or REIPPPP.

National Transmission Company of South Africa (NTCSA) – The newly licensed, legally unbundled entity responsible for operating and expanding South Africa's transmission network. Its Transmission Development Plan (2025–34) calls for ~14 500 km of new high-voltage lines and R400 billion in investment.

Overnight Costs – The capital costs of building a power plant as if construction were instantaneous, excluding financing charges and delays.

PESTEL Analysis – A framework assessing Political, Economic, Social, Technological, Environmental, and Legal drivers of risk in project planning.

Power Purchase Agreements (PPAs) – Long-term contracts between IPPs and buyers (Eskom, municipalities, or corporates) that secure offtake, tariffs, and risk allocation.

Power-system Flexibility – The ability of the electricity system to respond to changes in supply and demand while maintaining reliability. Flexibility can come from storage, demand response, flexible generation, forecasting, curtailment management and ancillary services.

Proposed Balanced Plan – The preferred electricity build pathway in Final IRP 2025, balancing security of supply, cost, emissions, technology diversity, grid constraints and system flexibility.

Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) – South Africa's competitive renewable energy auction programme, launched in 2011. It has contracted over 6 GW of wind and solar and attracted ~$16 billion in private investment but has faced stop–start procurement cycles.

Renewable Energy Development Zone (REDZ) – Geographically defined areas earmarked for fast-tracked renewable project approvals (environmental and land-use), designed to reduce permitting delays.

Self-Propelled Modular Transporters (SPMT) – Specialized multi-axle vehicles used to transport heavy components (e.g., 80m+ turbine blades) across abnormal-load corridors.

South African Wind Energy Association (SAWEA) – The industry association representing wind developers, investors, and suppliers. It advocates for enabling policy and regulatory frameworks for wind energy.

South African Wholesale Electricity Market (SAWEM) – The emerging multi-buyer, competitive electricity market, formalized by the Electricity Regulation Amendment Act. It replaces Eskom's single-buyer dominance.

South African Renewable Energy Masterplan (SAREM) – An industrialisation roadmap to develop a local renewable-energy manufacturing sector and jobs, aligning with localisation and green growth goals.

Strategic Transmission Corridors – Designated priority routes for new high-voltage lines, often linked to renewable-rich provinces (e.g., Koruson–Kling corridor).

Sustainability-Linked Bond (SLB) – A bond whose coupon/interest rate is tied to sustainability performance targets (e.g., emissions reduction).

Transmission Development Fund (TDF) – A proposed blended-finance fund (≈R60 billion) to help finance NTCSA's transmission expansion.

Transmission Development Plan (TDP) – Eskom/NTCSA's 10-year roadmap for transmission projects, updated annually. It highlights grid reinforcements and expansion projects needed to connect renewable energy in provinces like the Western, Eastern, and Northern Cape.

01 Introduction

1.1 Purpose of the report

This analysis report provides a comprehensive review of the Draft Integrated Resource Plan (IRP) 2024, with a particular emphasis on the opportunities, challenges, and risks associated with scaling up wind energy deployment in South Africa. It critically examines structural constraints, policy misalignments, and implementation gaps, and presents a set of actionable recommendations to support the effective realisation of the plan's wind energy ambitions.

The primary objective of the report is to assist the South African Wind Energy Association (SAWEA) in developing a clear, evidence-based position on the gazetted IRP 2025. It is intended to inform SAWEA's advocacy strategy, stakeholder engagement efforts, and alignment initiatives to accelerate wind energy deployment in a coordinated, efficient, and sustainable manner. The analysis centres on the Draft IRP 2024, released in December 2024, and includes comparative insights from previous iterations, particularly IRP 2010 and IRP 2019, to contextualise policy evolution and identify lessons for improved planning and implementation going forward.

This updated version retains the approved Phase I structure but incorporates the gazetted IRP 2025 where it materially changes, confirms or clarifies the Draft IRP 2024 analysis. The purpose is therefore not to produce a new report, but to identify how the gazetted IRP 2025 affects the Phase I findings, particularly in relation to wind allocation, the Balanced Plan, grid planning, flexibility, private generation and implementation risks.

1.2 Problem statement

South Africa's electricity system remains trapped in a self-reinforcing cycle of declining coal-plant performance, chronic load-shedding, and policy-implementation failures. The system is still heavily dependent on ageing coal-based fleet, which is no longer capable of reliably meeting demand or complying with increasingly stringent environmental regulations. In response, successive government policy interventions have culminated in the IRP – the country's legally binding electricity planning framework – which sets procurement envelopes for all generation technologies. The current IRP revision cycle has become a pivotal arena for addressing, or potentially exacerbating, South Africa's ongoing power crisis.

The initial draft of the Draft IRP 2024 was met with strong opposition from the wind energy industry, led by SAWEA. Criticisms centred on the plan's reliance on opaque modelling, lack of clarity on implementation pathways, and the disproportionately low allocation to wind energy – despite its proven cost competitiveness and scalability. Following extensive stakeholder engagements, the Department of Mineral Resources and Energy (DMRE) issued a revised draft that significantly increased wind capacity allocations, positioning wind energy as a central pillar of South Africa's future electricity mix.

While this revision represents a welcome and necessary course correction, the inclusion of higher wind capacity targets alone is not sufficient. Realising these targets – and, by extension, meeting South Africa's decarbonisation and energy security objectives – will require the resolution of several entrenched structural challenges. The most critical of these include:

- Transmission infrastructure limitations, which restrict access to high-quality wind resources and complicate system integration;
- Financial constraints, driven by Eskom's deteriorating balance sheet and revenue uncertainty, which impair bankability for Independent Power Producers (IPPs);
- Irregular procurement cycles, which introduce volume risk and weaken investor confidence;
- Demand uncertainty due to several reasons including infrastructure readiness and Eskom's failure to adhere to the decommissioning of Coal fired power stations.
- Cumbersome permitting and land-use approval processes, involving multiple agencies and resulting in significant delays for shovel-ready projects; and
- Policy incoherence across energy, environmental, and industrial domains, which continues to blur lines of accountability and prolong critical decision-making.

1.3 Electricity system in South Africa

This section highlights the structural limitations of South Africa's legacy electricity system to underscore the urgency and system-wide imperative of integrating large-scale wind capacity, as envisaged in Draft IRP 2024. Electricity generation and supply in South Africa is predominantly managed by Eskom, a vertically integrated, state-owned utility responsible for more than 90% of the electricity delivered to the national grid. In addition to its generation role, Eskom also owns and operates the entire high-voltage transmission network, which extends over approximately 33 000 km[1]. While Eskom remains the principal supplier, it supplements national supply by procuring electricity from Independent Power Producers (IPP), primarily through initiatives such as the Renewable-Energy Independent Power Producer Procurement Programme (REIPPPP) – See Figure 1 for further detail.

1 Eskom (2024) *Generation plant mix: fact sheet* (GX 0001, Rev. 29, July 2024). Johannesburg: Eskom. Available at: http://www.eskom.co.za (Accessed 2 June 2025).

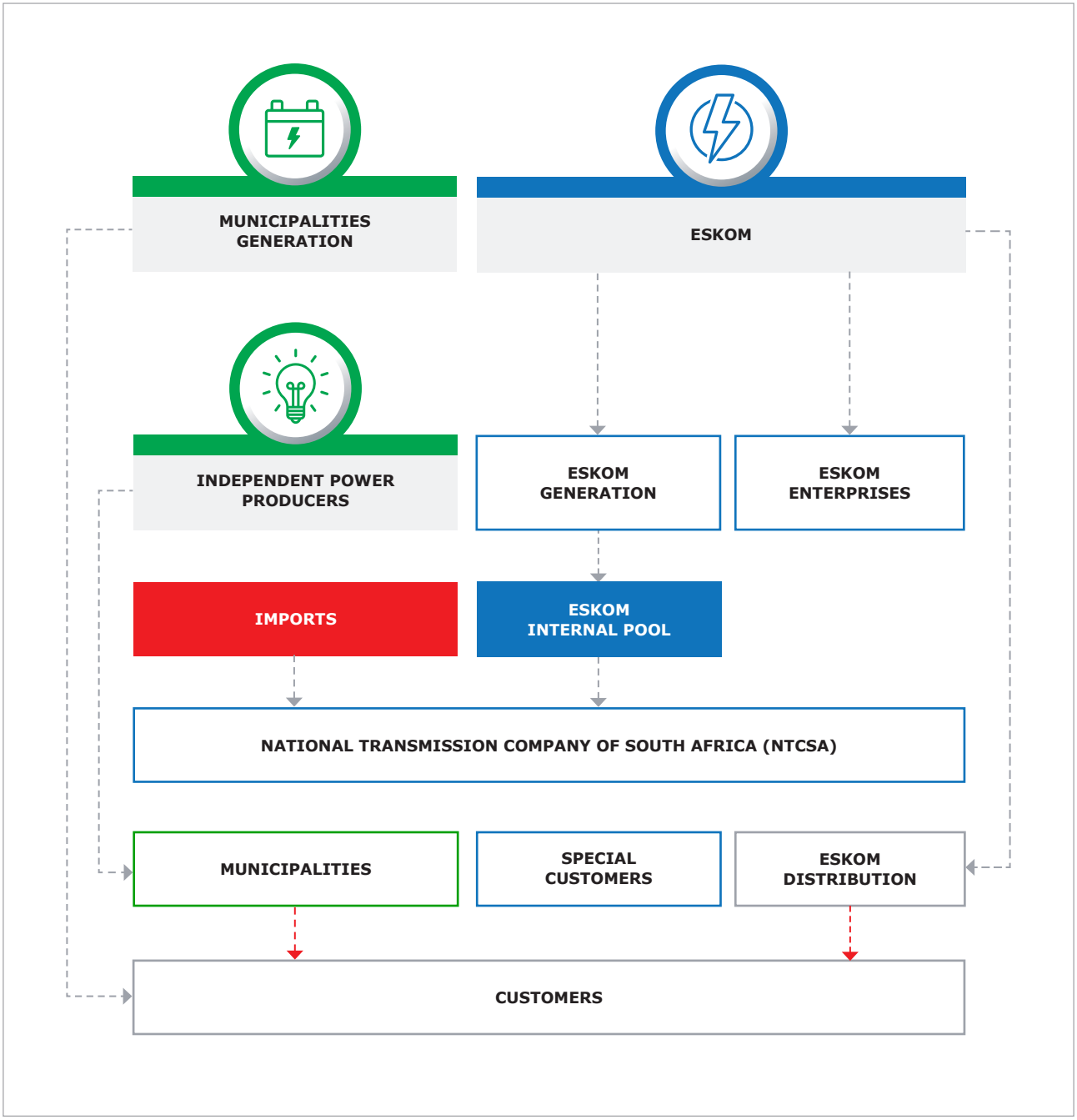


FIGURE 1 South Africa's electrical power industry structure[2]

As of December 2024, Eskom's installed generation capacity stood at approximately 55.4 GW, with coal-fired power stations accounting for the majority share. This continued dominance of coal in the generation profile reflects the structural legacy of South Africa's energy system and presents a significant constraint to achieving the country's decarbonisation commitments, energy diversification goals, and long-term climate policy targets. – see Figure 2 next.

2 Buraimoh, E., Adebiyi, A.A., Ayamolowo, O.J. and Davidson, I.E., 2020. South Africa electricity supply system: The past, present and the future. *2020 IEEE PES/IAS PowerAfrica*, pp.1-5.

The coal fleet, with an average operational age exceeding four decades, suffers from declining performance and increased maintenance requirements, resulting in reduced reliability and a persistent supply shortfall.

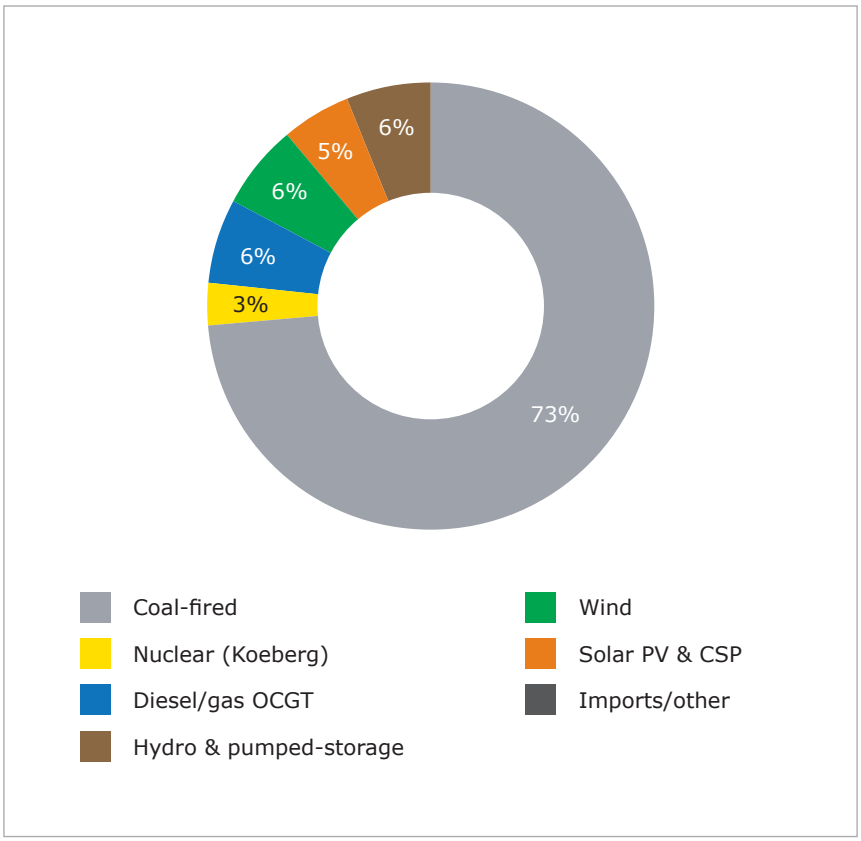


FIGURE 2 South Africa's nominal grid-connected capacity on 31 December 2024[3]

Figure 2 illustrates South Africa's nominal grid-connected capacity as of 31 December 2024. As shown, coal accounts for more than 70% of Eskom's total supply, reflecting the historical dependency on coal-fired generation. The coal fleet, with an average operational age exceeding four decades, suffers from declining performance and increased maintenance requirements, resulting in reduced reliability and a persistent supply shortfall[4]. The entrenched reliance on ageing coal infrastructure highlights the magnitude of the transition required to achieve a more diversified and resilient energy mix. Since the coal-fired power stations are primarily located within the coal belt in Mpumalanga, the transmission infrastructure-including lines and substations are concentrated in the eastern side of South Africa – see Figure 3.

3 Computed by author using data obtained from CSIR (2025)

4 Eskom System Operator (2023) *Medium-term system adequacy outlook 2024–2028: generation system adequacy for the Republic of South Africa* (MTSAO 2023, 30 October 2023). Johannesburg: Eskom. Available at: http://www.eskom.co.za (Accessed 2 June 2025).

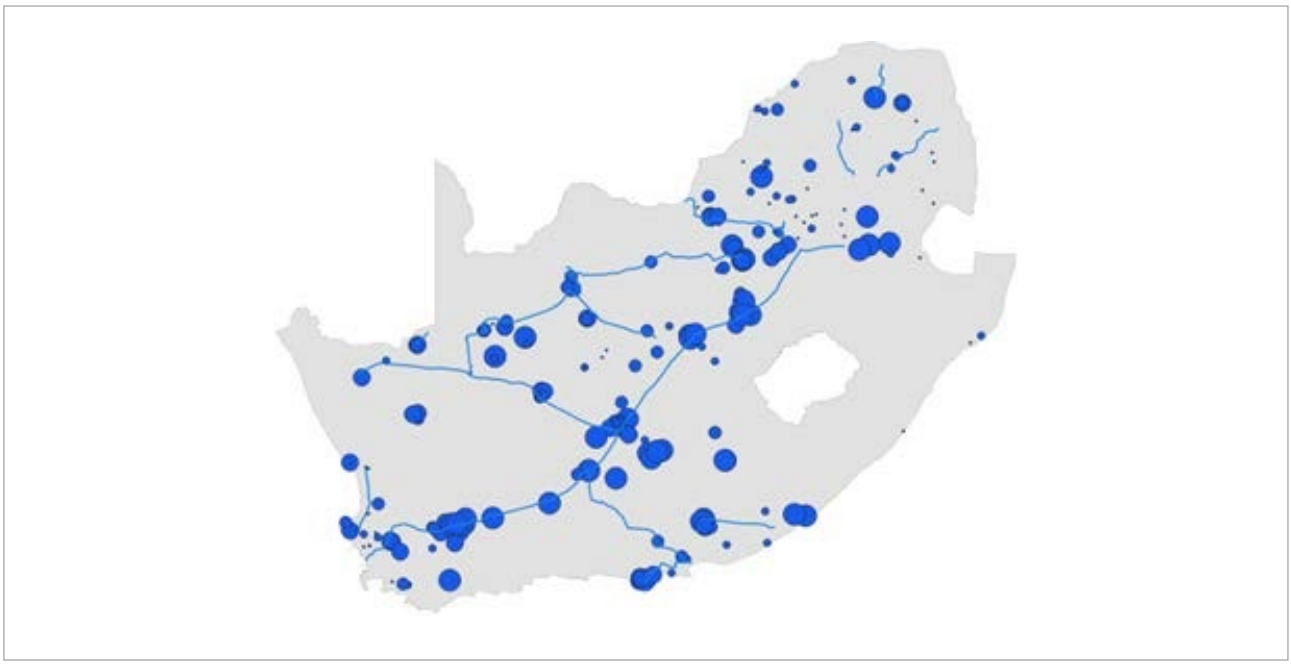


FIGURE 3 Existing grid infrastructure[5]

The concentration of generation capacity in aging coal infrastructure, particularly in Mpumalanga, has led to ongoing reliability challenges and a structural mismatch between supply and demand. In 2023 alone, South Africa endured 290 days of loadshedding, placing significant strain on the national economy. The economic impact of this loadshedding have been catastrophic. The Council for Scientific and Industrial Research (CSIR) estimates that in 2023, the South African economy experienced output losses approaching R2,900 billion due to persistent load shedding[6].

Eskom's continued dependence on ageing coal-fired infrastructure presents both reliability and environmental challenges. The fleet is significant in emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter emissions, placing Eskom among the world's highest emitters on a per-megawatt-hour basis, underscoring the need for accelerated energy diversification. This environmental burden, combined with deteriorating plant performance, has compromised Eskom's ability to provide secure, affordable electricity while also meeting South Africa's evolving climate commitments.

These systemic constraints underscore the critical importance of diversifying the country's generation mix. To achieve the objectives set out in the gazetted IRP 2025, it is essential to align implementation efforts with grid modernisation initiatives and increased private sector participation across the value chain.

5 https://www.ntcsa.co.za/wp-content/uploads/2024/11/TDP2024_Public_Forum_Presentation_30Oct2024_Final_Pack_Rev1.pdf

6 CSIR Energy Research Centre (2025) *Utility statistics report: utility-scale power generation statistics in South Africa, 1 January 2024–31 December 2024*. Pretoria: Council for Scientific and Industrial Research. Available at: http://www.csir.co.za (Accessed 2 June 2025).

1.4 Electricity policy evolution

South Africa's electricity policy began with the 1998 White Paper, which called for supply diversification, cost-reflective tariffs, and the unbundling of Eskom. The 2003 Renewable Energy White Paper introduced IPPs and set early targets, but implementation stalled due to legislative and institutional inertia. Momentum was regained through the 2011 REIPPPP, attracting over US$16 billion in private capital and delivering ~5 GW of wind and solar. However, delays, coal megaproject overruns, and policy inconsistencies eroded progress. Key reforms – such as the creation of Regional Electricity Distributors – remained unrealised, reinforcing institutional fragmentation. In response, the 2023 Energy Action Plan and Electricity Regulation Amendment Act enabled the legal unbundling of Eskom, licensed the NTCSA, and laid the groundwork for a competitive, investor-driven electricity market. See Figure 4 next for a depiction of the policy evolution.

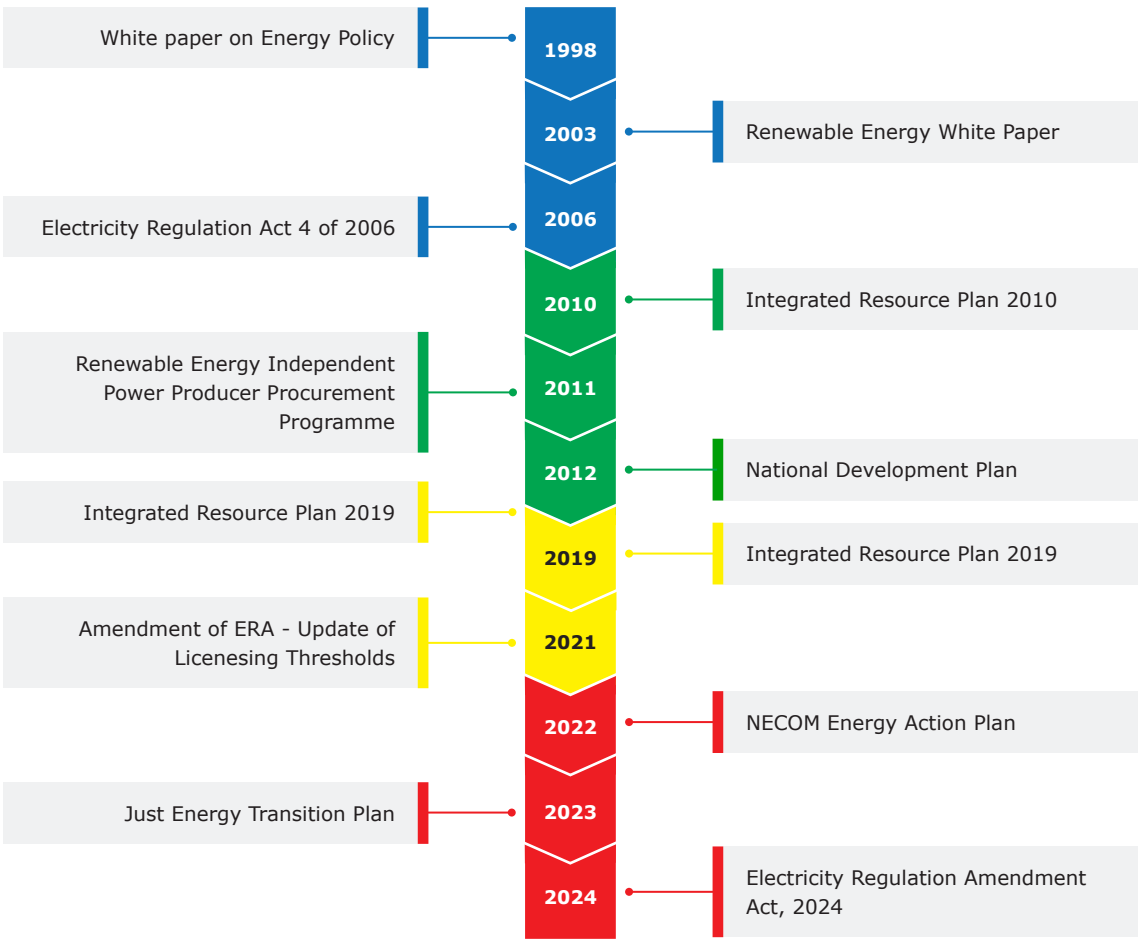


FIGURE 4 Depiction of energy policy evolution[7]

7 Generated by the author

1.5 IRP in context

To date, the IRP has undergone three iterations: IRP 2010 (gazetted in March 2011), IRP 2019, and the most recent gazetted IRP 2025. The inaugural Integrated Resource Plan (IRP 2010) came into effect in 2010 and was formally gazetted in March 2011. It employed a capacity-expansion model to generate a "policy-adjusted" build plan, which included approximately 17.8 GW of new renewable energy, 9.6 GW of nuclear, and a phased decommissioning of 8.9 GW of coal capacity. Critically, IRP 2010 enabled the launch of the REIPPPP, which between 2011 and 2015 attracted an estimated US$16 billion in private investment for approximately 5 GW of wind and solar capacity. This competitive procurement process drove down bid tariffs by 60% in the first four rounds, establishing South Africa as a global benchmark for auction-based renewable energy procurement.

At the time, IRP 2010 was widely regarded by academics and industry as a milestone in transparent, evidence-based energy planning. However, concerns soon emerged regarding the failure to adhere to its intended two-year revision cycle. The inability to finalise updated IRPs in 2013 and 2018 left policymakers and investors navigating an evolving energy landscape – characterised by fluctuating demand forecasts and rapidly falling technology costs – without current planning guidance. A second official plan was eventually gazetted on 18 October 2019.

IRP 2019 acknowledged the declining Energy Availability Factor (EAF) of Eskom's generation fleet and introduced annual build limits for wind and solar PV to stabilise procurement cycles. While it retained 1.5 GW for new coal and 2.5 GW for nuclear, these allocations conflicted with least-cost modelling scenarios that supported a more aggressive rollout of renewables. The plan also identified a 2–3 GW short-term capacity gap, to be addressed through emergency procurement and demand-side interventions. Importantly, IRP 2019 introduced utility-scale battery storage and, for the first time, acknowledged grid constraints as a limiting factor – an inclusion welcomed by system planners and industry stakeholders. However, the retention of ageing coal plants was widely criticised as misaligned with both cost-efficiency and decarbonisation imperatives.

In January 2023, a draft version of IRP 2023 was released, setting out two planning horizons: 2025–2030 and 2031–2050. The draft faced immediate and widespread criticism for its lack of transparency, unrealistic projections of coal usage beyond 2035, and the omission of key cost assumptions related to emerging technologies and grid expansion. Over 4,300 submissions were received during the public consultation process, with stakeholders citing serious deficiencies in the modelling approach and underlying data.

In response, government acknowledged the validity of stakeholder concerns. By November 2024, the South African National Energy Development Institute (SANEDI) confirmed that a revised plan – DRAFT IRP 2024 – would be submitted to Cabinet, reflecting substantial revisions and public input. The updated IRP, released for comment in late 2024, represented a marked increase in ambition. It raised the projected installed wind capacity to between 69 and 76 GW by 2050, up from 18 GW in IRP 2019 – a more than threefold increase.

Since the completion of the Phase I analysis report, the gazetted IRP 2025 has been published as the official electricity planning framework. The gazetted IRP 2025 does not fundamentally reverse the Draft IRP 2024's wind ambition. Instead, it formalises the planning framework and strengthens the treatment of grid planning, power-system operations, flexibility, committed public and private generation, and climate-policy alignment. The main shift is therefore from draft-stage advocacy to implementation monitoring.

Significantly, Draft IRP 2024 is the first version to include a dedicated Transmission Development Programme, recognising the need for approximately 14,000 km of new 400 kV transmission lines to be developed by the newly licensed National Transmission Company South Africa. This marks a strategic shift away from the previous generation-first planning paradigm and aligns transmission expansion with generation forecasting. Industry stakeholders have welcomed this development, particularly its implications for improving procurement sequencing, enabling private offtake, and facilitating access to climate finance.

Given that the IRP forms the statutory basis for Ministerial Determinations under the Electricity Regulation Act, its contents directly influence future procurement rounds, Eskom contracting, and the broader energy investment landscape. If implemented effectively, Draft IRP 2024, now read alongside the gazetted IRP 2025, has the potential to catalyse a structural transformation in South Africa's power sector by delivering enhanced reliability, reduced emissions, and expanded private sector participation.

While the IRP plays a central role in guiding electricity infrastructure development, it is important to note that it ideally operates as a sub-component of the broader Integrated Energy Plan (IEP). The Integrated Energy Plan is intended to provide a comprehensive, economy-wide framework for forecasting and balancing energy demand and supply across all fuel types, including electricity, liquid fuels, and gas, based on national development goals. In this context, the IRP should ideally follow the Integrated Energy Plan, ensuring alignment with broader policy objectives, least-cost energy transitions, and cross-sectoral synergies. The sequencing of these plans is crucial for coordinated investment decisions, long-term grid planning, and fiscal sustainability.

Although this misalignment has not been formally raised as a challenge at this point, it provides important context for understanding structural constraints in South Africa's energy planning architecture and will be examined further in the section on risks and challenges.

1.6 Brief background

Despite its name, the IRP functions not as a comprehensive energy plan but as a dedicated electricity sector plan. In conventional planning frameworks, an Integrated Energy Plan (IEP) serves as the overarching strategy, with sector-specific plans – including electricity, petroleum, and gas – cascading from it. South Africa, however, has deviated from this norm by prioritising the IRP in the absence of an operational IEP.

Although the National Energy Act (Act No. 40 of 2004) mandates the publication of an IEP on an annual basis, this requirement only came into legal effect in 2023 following litigation compelling its enforcement. As of June 2025, the first IEP under this provision has yet to be published. Once implemented, regular IEP updates are expected to trigger corresponding revisions to the IRP, improving coherence and responsiveness in energy planning. Such integration is essential for two reasons:

Rapid technological change and intensifying global climate commitments necessitate more agile and forward-looking planning mechanisms.

The emergence of a **competitive electricity market** in South Africa marks a transition from centralised planning to a market-based system, demanding greater alignment across financing, regulation, and system operations.

Historically, IRPs have often reflected political and strategic interventions that deviate from least-cost planning principles. Moreover, interpretations of IRP have varied. Earlier definitions, such as that of Hirst (1990), emphasised cost-effective electricity supply with limited concern for broader social or environmental impacts. In contrast, more evolved perspectives – such as that of Oak Ridge National Laboratory (1992) – advocate for inclusive planning that accounts for demand- and supply-side options, environmental and social externalities, public participation, and uncertainty analysis.

For South Africa to successfully navigate its energy transition, a shift toward truly integrated and transparent planning – anchored in a regularly updated IEP and informed by a market-oriented IRP – is essential. Considering the role of electricity in the socioeconomic development of South Africa, the IRP is a necessary framework to guide the development of a competitive electricity market in South Africa. Once the competitive electricity market in South Africa is matured and serving the developmental needs, a cost benefit analysis may be conducted on whether to continue using the IRP as the guiding framework.

02 Draft IRP 2024 detailed analysis and Final IRP 2025 update

2.1 IRP brief background

The Draft IRP 2024 represents the third iteration of South Africa's electricity planning framework, following IRP 2010 and IRP 2019. Released for public comment in early 2024, it outlines electricity demand projections, technology allocations, and generation capacity build plans to 2050. Compared to its predecessor, the Draft IRP 2024 significantly increases the projected role of wind and solar, targeting 44 GW and 86 GW respectively by 2050.

This report presents an independent analysis of the Draft IRP 2024 from the perspective of the wind energy sector. It draws on industry experience, policy benchmarks, and best-practice energy planning approaches from various sources to evaluate whether the Draft IRP adequately supports South Africa's decarbonisation, industrialisation, and energy security goals. Particular attention is paid to system enablers – such as **grid access**, **procurement design**, and **institutional coordination** – that will determine whether the plan's ambitions can be delivered in practice.

The Final IRP 2025 should therefore be read as the formalisation of the revised planning process that followed the contested Draft IRP 2023 and the subsequent Draft IRP 2024 stakeholder engagement process. For SAWEA, the key question is whether the gazetted IRP 2025 materially changes the Draft IRP 2024 wind trajectory or whether it mainly shifts the task from policy advocacy to implementation delivery.

2.2 IRP scope and intent

The Draft IRP 2024 positions itself as a "policy-adjusted least-cost" plan – an approach that combines cost-optimised system modelling with non-cost-based national priorities such as job creation, localisation, and emissions reduction. While this hybrid framework is widely used in energy planning globally, it requires a structured, transparent approach to remain credible and actionable.

The challenge arises when adjustments from the least-cost base are made without sufficient justification or disclosure. As highlighted in Meridian Economics' (Meridian Economics, 2023) analysis, several allocations shift in the Draft IRP 2023 appear misaligned with least-cost outcomes and are not supported by clear policy rationale or quantifiable metrics. For example, the Meridian Economics report states that:

> The resulting energy mix in the IRP 2023 reference scenario will see an expanding role for gas that exceeds results of previous studies. Previous studies of the South African Power system assumed a higher coal fleet availability than the IRP 2023. Most of these studies were published before 2022, when there was a significant increase in coal station outages.
>
> - By 2030, IRP 2023 envisages that gas energy will replace the energy that can no longer be generated from an underperforming coal fleet.
> - By 2040, the role of gas is further expanded in the IRP 2023. This gas usage is significantly higher than other studies, whilst renewable energy (particularly from wind), is much lower.
> - IRP 2023 does not provide any capacity factors for gas generation post 2030.
>
> **(Meridian Economics, 2023:12)**

This lack of transparency can erode stakeholder confidence and compromise investor certainty. Meridian Economics (2023) point out that:

> Transparency is key for enhancing the technical rigour of any capacity planning exercise:
>
> - Decisions made in the modelling approach can significantly change the result from the optimisation. Capacity expansion models are complex, and many trade-offs must be made to keep the models tractable.
> - At a minimum detailed input and output data should be provided that will allow other modelling teams to fully replicate the IRP results. Where any significant differences emerge for similar input assumptions, these can then be interrogated between stakeholders.
> - Further transparency includes opening the actual model itself, so that each technical modelling decision is visible. Commercial tools such as PLEXOS allow for an export of the modelling variables to Excel, which could be made public after removing confidential information.
>
> **(Meridian Economics, 2023:17)**

To maintain the integrity of the IRP as both a planning and investment signal, future iterations must adopt best-practice disclosure standards. These include publishing the base case model, clearly explaining and quantifying any policy deviations, disclosing system-level trade-offs, and releasing input assumptions and data files. By adopting these practices, the IRP process can better align long-term infrastructure investments with South Africa's broader economic and climate goals.

2.3 IRP and wind energy allocations

A comparative analysis of IRP 2010, IRP 2019, Draft IRP 2024 and gazetted IRP 2025 reveals a **sustained increase** in the planned role of wind energy in South Africa's electricity planning framework. This reflects the growing recognition of wind power as a cost-competitive technology and as a central component of the country's long-term decarbonisation, energy security and industrial development strategy. As shown in Table 1, wind energy's share of total planned capacity increased from 19.9% in IRP 2010 to 35.4% in IRP 2019, before rising further to 43.1% in Draft IRP 2024. The gazetted IRP 2025 broadly retains this wind trajectory, indicating that the final plan does not materially reverse the wind ambition introduced in the draft planning process.

TABLE A1 Wind capacity share of total IRP capacity (MW)[8]

IRP Version	Time Period	Wind Capacity (MW)	Total IRP Capacity (MW)	Wind Share (%)
IRP 2010	2012–2027	9,100	45,637	19.9%
IRP 2019	2019–2030	15,762	44,470	35.4%
Draft IRP 2024	2025–2042	44,779	103,951	43.1%
Gazetted IRP 2025	2025–2042	44,779	103,951*	43.1%*

Beyond total capacity, Draft IRP 2024 and gazetted IRP 2025 allocate a substantially greater long-term role to wind than previous plans. However, analysis of the capacity rollout still reveals significant year-on-year volatility, characterized by sudden increases and declines in wind buildout across the IRP iterations. This is shown in Figure 5.

8 For purposes of this report's comparative analysis, gazetted IRP 2025 is presented using the same Balanced Plan wind trajectory as Draft IRP 2024, since the final plan does not materially alter the wind pathway used here.

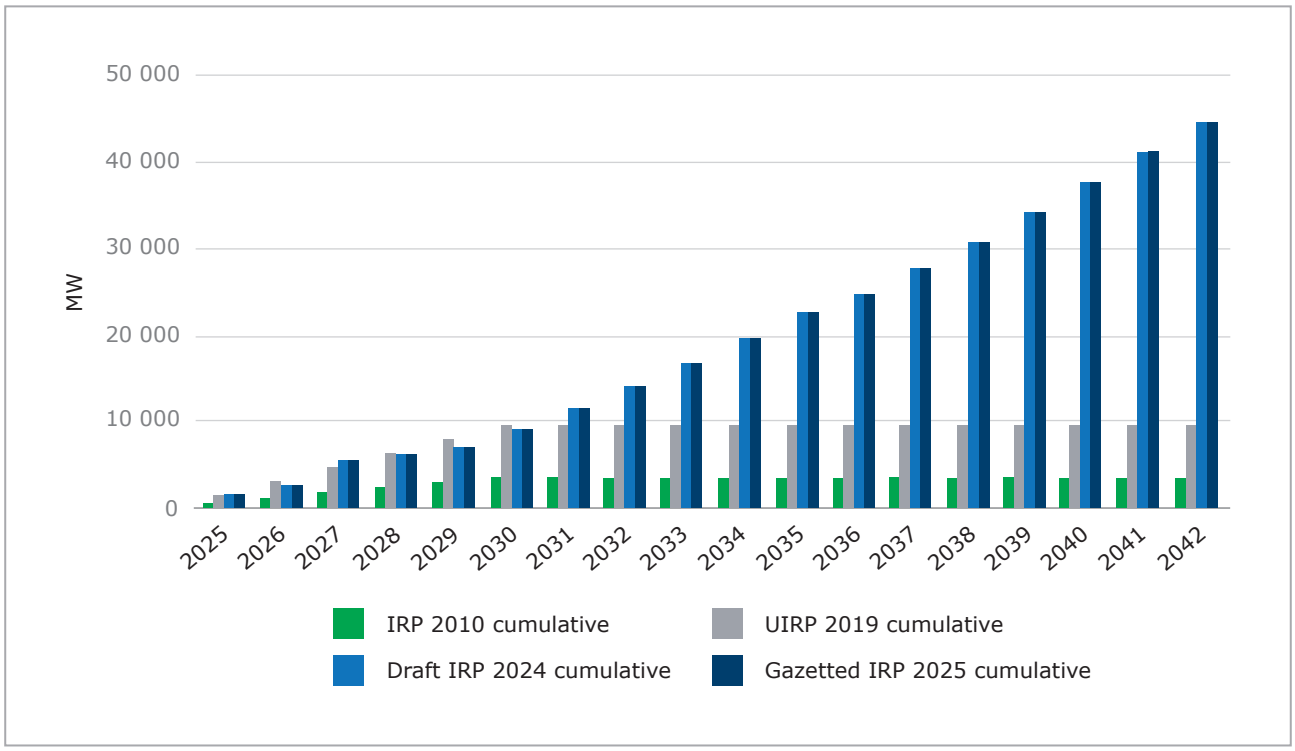


FIGURE 5 Cumulative wind allocations under IRP 2010, IRP 2019, Draft IRP 2024 and gazetted IRP 2025

Such volatility undermines the development of a stable local value chain for wind power. Sharp fluctuations in annual allocations create unpredictability in demand for equipment, labour, skills, logistics and project-development capacity. This weakens localisation potential and increases reliance on imported components and foreign expertise. A smoother and more predictable buildout trajectory would be more conducive to local manufacturing, supplier development and workforce planning.

Additionally, the observed volatility does not appear to correlate neatly with expected trends in national electricity demand, suggesting that other modelling or policy factors, such as technology allocation constraints, balancing assumptions or policy-adjusted decisions, may be influencing capacity distributions. For example, in 2036, Draft IRP 2024 increased gas and nuclear capacity by 1,250 MW each, while wind capacity is reduced by 1,000 MW. This suggests that wind may be serving as a balancing or residual variable in the modelling process, adjusted to accommodate other policy or technology decisions rather than **consistently treated as a primary strategic technology**.

Table 2 provides the gazetted IRP 2025 capacity allocations under the Balanced Plan. The key point is that the gazetted IRP 2025 broadly confirms the Draft IRP 2024 wind pathway rather than replacing it with a materially different allocation. Both plans show approximately 44,779 MW of wind allocation to 2042. The 43,041 MW in Table 2 does not include the include the year 2025, hence it is lower than the 44,779 MW by 1,738 MW, which is considered to have been in construction in 2025.

TABLE A2 Proposed Balanced Plan (New Generation Capacity in MW)[9]

Period/ Year	Coal	Gas – IPP Programme	Gas – Eskom	Nuclear	Hydro	Pumped Storage	CSP	Solar PV	Wind	Hybrid IPP Programme	Distributed Generation	Energy Storage	BESS – Eskom	Other private projects (Includes Diesel, Bioenergy etc.)
Current Base (MW) (End 2025)	40,960	1,005	2,825	1,860	1,600	2,732	600	3,646	5,344	428	7,065	513	199	104
2026								3,553	964		900	144	35	
2027								2,886	2,847		900	150	332	
2028								1,760	770		900	615		
2029		3,000						1,314	760		900	2,615		
2030			3,000					800	2,000		900	200		
Total (2026–2030)	**–**	**3,000**	**3,000**	**–**	**–**	**–**	**–**	**10,313**	**7,341**	**–**	**4,500**	**3,723**	**367**	**–**
2031								1,000	2,500		900	200		
2032		1,250						1,200	2,600		900	200		
2033		1,250						1,400	2,600		900	200		
2034		1,250						1,600	3,000		900	200		
2035		1,000						2,000	3,000		900	200		
2036		1,250		1,250				1,600	2,000			500		
2037		1,500		1,250		1,332		1,600	3,000			500		
2038		1,250		1,350				1,600	3,000			500		
2039		1,250		1,350				1,600	3,500			500		
2040		1,250						1,600	3,500			500		
2041		500						1,600	3,500			500		
2042		500						1,600	3,500			500		
Total (2031–2042)	**–**	**12,250**	**–**	**5,200**	**–**	**1,332**	**–**	**18,400**	**35,700**	**–**	**4,500**	**4,500**	**–**	**–**
Grand Total New Capacity	**–**	**15,250**	**3,000**	**5,200**	**–**	**1,332**	**–**	**28,713**	**43,041**	**–**	**9,000**	**8,223**	**367**	**–**

9 Based on Table 1 in the gazetted IRP 2025

A closer look at the 2025–2030 planning window highlights the most important finding of this update. While Draft IRP 2024 and gazetted IRP 2025 retain a stronger long-term wind trajectory than earlier plans, the near-term wind allocation remains below IRP 2019. Figure 6 shows annual wind capacity allocations across the 2025–2030 period.

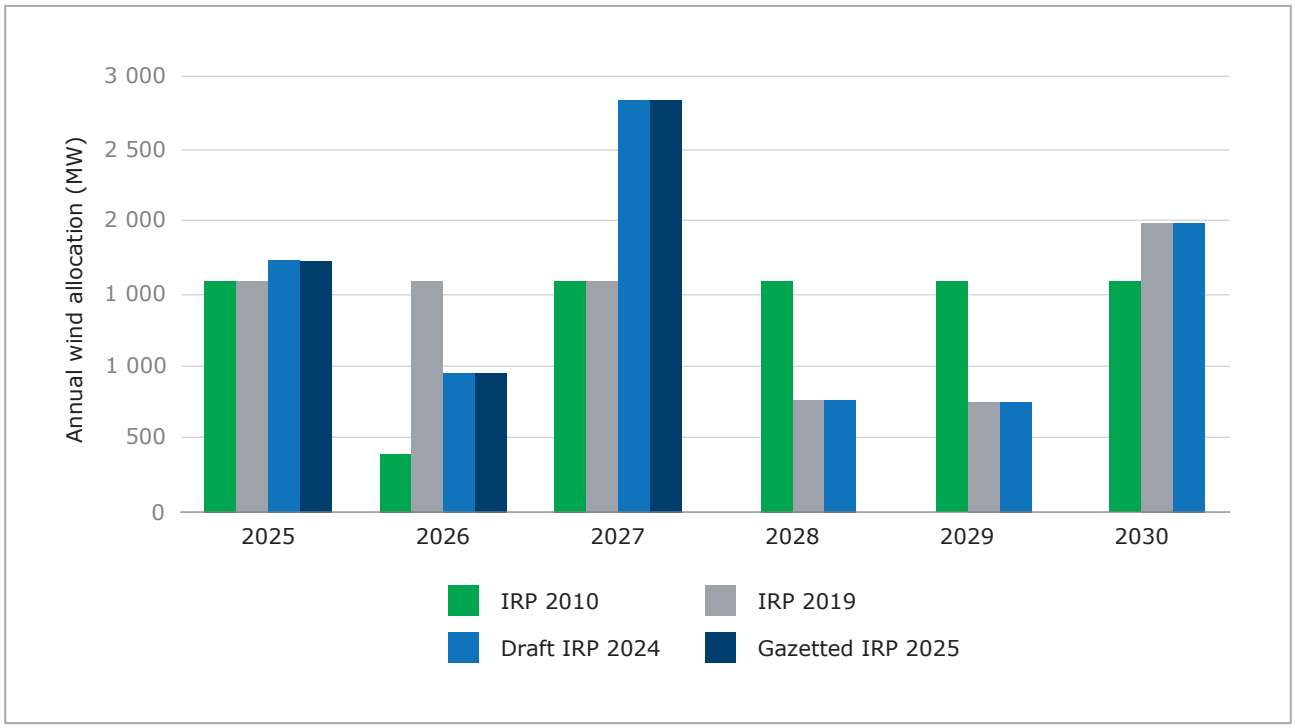


FIGURE 6 Wind capacity allocations, 2025–2030

As shown in Table 3, IRP 2019 allocated 9,600 MW of wind between 2025 and 2030, compared with 9,079 MW under both Draft IRP 2024 and Final IRP 2025. This means that the 2025–2030 allocation remains 521 MW lower than the allocation contained in IRP 2019.

TABLE A3 Wind allocation in IRPs

Period	IRP 2010	IRP 2019	Draft IRP 2024	Gazetted IRP 2025
Wind allocation, 2025–2030	3,600 MW	9,600 MW	9,079 MW	9,079 MW
Change vs previous	–	+6,000 MW	−521 MW	No material changes from Draft IRP 2024

This finding is significant because it shows that the gazetted IRP 2025 broadly retains the Draft IRP 2024 wind trajectory. Both plans show approximately 44,779 MW of wind allocation to 2042. The more important issue, however, is that the 2025–2030 allocation remains unchanged at 9,079 MW, which is still 521 MW lower than the 9,600 MW allocated under IRP 2019. Therefore, while the long-term wind pathway has strengthened, the near-term build programme remains less ambitious than the previous planning framework.

For SAWEA, this shifts the central question from draft-stage advocacy to implementation delivery. The issue is no longer only whether wind is recognised in the official planning framework, but whether procurement design, grid access, permitting, system flexibility, private generation and institutional coordination will be sufficient to deliver the confirmed wind trajectory in practice. Despite these near-term constraints, the post-2033 trajectory in both Draft IRP 2024 and gazetted IRP 2025 still proposes a substantial acceleration in wind deployment, far exceeding the trajectories set in earlier plans. While this marks a positive shift in long-term ambition, it raises concerns about the **sector's ability to ramp up** at such a pace given structural barriers in permitting, grid availability, transmission expansion and supply-chain readiness.

To ensure that wind energy can meet its expanded role under gazetted IRP 2025, a stable procurement rhythm, long-term grid planning and targeted localisation policies will be critical. Without these, headline targets risk being undermined by implementation delays and missed industrial development opportunities.

2.4 Scenarios and modelling results

2.4.1 Scenarios overview

Draft IRP 2024 contains a curious mixture of scenarios and recommendations. The recommended capacities for the various technologies are set out in the Balanced Plan. It also reports five scenarios:

i. Reference Case
ii. Reference Case with No Committed Gas Build Plan Aggressive BESS
iii. Nuclear Scenario Build Plan
iv. Optimistic Battery Learning Build Plan
v. Delayed Shutdown Build Plan.

The recommended "Balanced Plan" covers the years 2024 to 2042. The scenarios from which the Balanced Plan was derived cover the years 2031–2050. This begs the question, how were the capacity plans for the years 2024 to 2031 arrived at? It is also not clear why the Balanced Plan stops at 2042 and does not go all the way to 2050 as the five scenarios do. It does not disclose the data on the technology capacity, energy mix, costs or emissions for the 'Proposed Balanced Plan'. Dr Grové Steyn of Meridian Economics has been quoted as saying "Technically this means that it does not qualify as an IRP in terms of the legal definition…"[10].

In Figure 7 next, the total capacity allocations in the Balanced Plan and the Reference Case Scenario are compared.

10 https://www.engineeringnews.co.za/article/concern-lingers-over-both-content-of-updated-irp-and-lack-of-consultation-2025-05-08

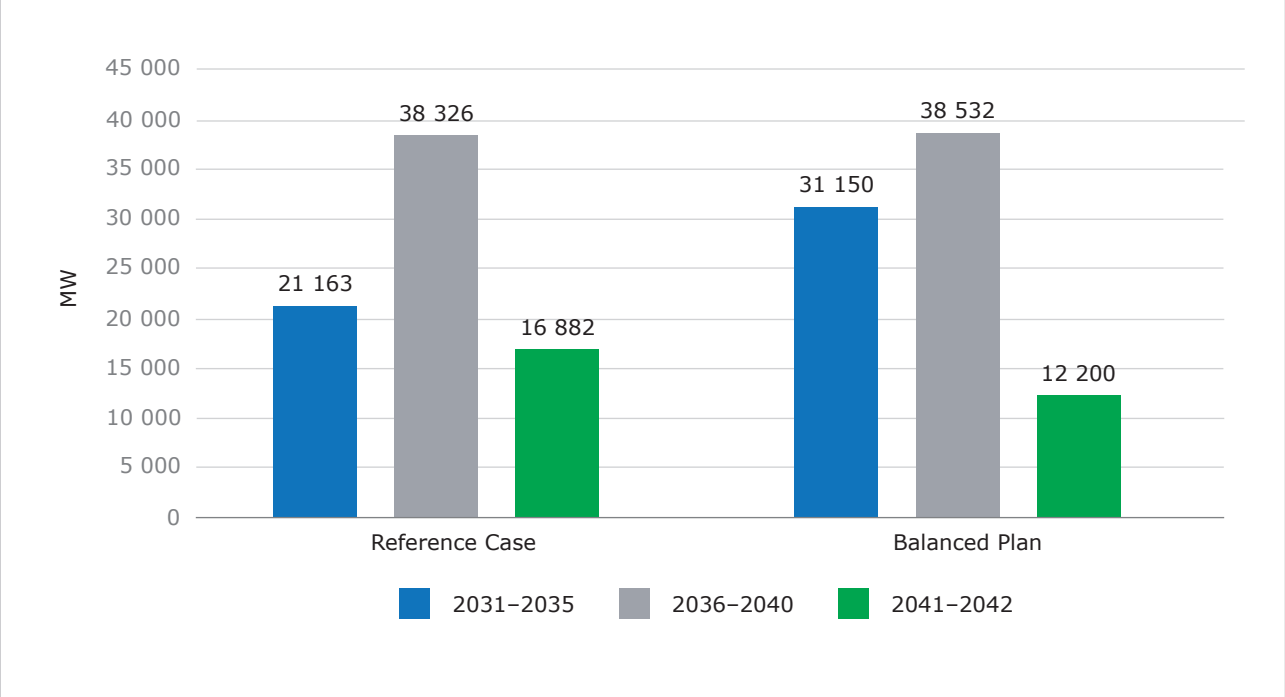


FIGURE 7 Capacity Allocations Draft IRP 2024 All Technologies MW[11]

The Balanced Plan has approximately one third more capacity for the 2031–2035 period despite the same electricity demand growth forecast averaging 2.3% per annum. The comparative information for just wind is given in Figure 8.

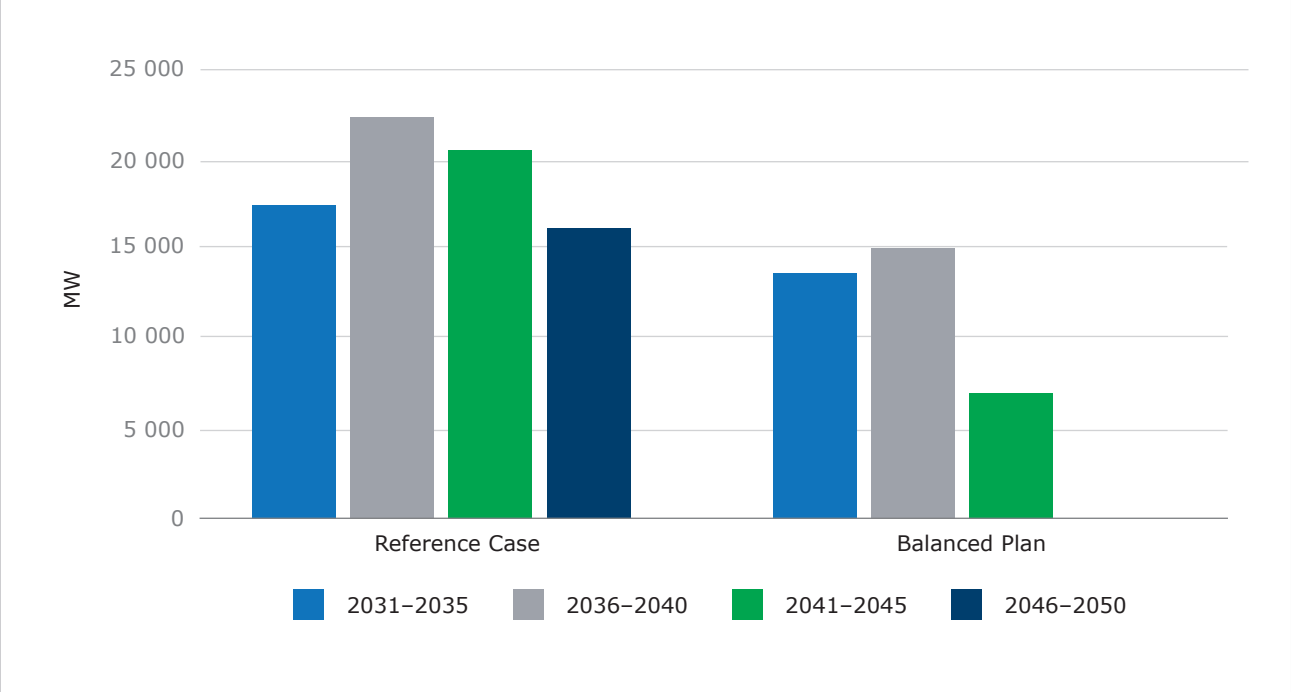


FIGURE 8 Capacity Allocations Draft IRP 2024 Wind (MW)

11 The Reference Case for 2041 to 2045 has been reduced to two fifths of the 2041 to 2045 allocation to match the 2041 to 2042 data provided in the Balanced Plan

To compound matters, South Africa follows the "cart before the horse" approach to energy planning, further elevating the importance of an IRP.

Overall, the Balanced Plan allocates less wind over the three periods of up to the year 2045, which is not favourable for the wind sector. Considering that the Balanced Plan does not include the 2046–2050 period, this could imply a much more aggressive wind allocation during this period.

2.4.2 Methodology and modelling tools

At the outset, the seriousness of the consequences of the methodology and assumptions used in integrated resource planning in South Africa must be recognized. IRPs become law in South Africa. To compound matters, South Africa follows the "cart before the horse" approach to energy planning, further elevating the importance of an IRP. The planning tools used in Draft IRP 2024 are well known and have been used in many applications. The key to any modelling tools is the assumptions used. As the old saying goes, "garbage in, garbage out".

The Draft IRP 2024 exercise has assumed that the Base case forecast for Eskom's EAF will prevail and that Eskom's EAF will be between 65% and 68% in the 2025 to 2030 period, in all the scenarios tested! This is a very risky assumption (as is discussed elsewhere in this report) to incorporate into an IRP methodology. The Draft IPR 2024 document tells readers that its "assumptions [are] arranged in a credible manner" and that they are used to test specific government policy objectives including:

1. security of supply by diversifying the energy mix,
2. promoting localization and industrialization,
3. job creation,
4. beneficiation of minerals,
5. technology transfer,
6. skills development,
7. reduction of emissions,
8. reduction of usage of scarce resources such as water and
9. non-dependence on non-indigenous resources

The formal government policy documents from which these policy objectives were drawn are not disclosed. This is important because policy documents are sometimes lengthy documents that can provide clarity on their particular policy objectives. For example, the first one in the list above is drawn from the White Paper on Energy Policy (1998), but that document is 102 pages long.

Unfortunately, the reader is not told how these policy objectives influenced the modelling and what weightings were accorded with them. In addition, the Reference Case is based on "existing and planned policies"! The reader is not told what these planned policies are nor who is planning them. This statement opens the door to possible non-transparent political intervention in the IRP process. It is entirely wrong for a government department to incorporate undisclosed planned policies into its activities.

2.4.3 Input assumptions

The Draft IRP 2024 data assumptions were based on Lazard (June 2024), NREL ATB.

i. **Energy and Demand Forecast:** The GDP growth assumption used as a baseline for the Draft IRP 2024, was a steady growth of 1.5% to 2% in the long term. This may be a bit optimistic in the light of recent developments, (SA's GDP remained subdued, averaging growth of around 1% per annum over the past several years). Against this backdrop, projections of 1.5% to 2% annual GDP growth appear overly optimistic.

ii. **Shutdown Plan of Coal-Fired Stations:** It is not clear whether Eskom's decision to try and extend the life of several of its coal-fired power stations is included in the Draft IRP 2024. The stations in question are: Hendrina, Grootvlei, Arnot, Camden and Kriel. What is remarkable is that there has been very little, if any, public questioning of this Eskom decision and its prospects of implementation. Eskom has provided no evidence to show that its planned life extensions are the cheapest and quickest ways to bring additional capacity onto the grid. Similarly, Eskom's assumptions about parts availability for 50-year-old power plants have not been questioned. Eskom's estimates for refurbishment time have also not been questioned. As there is 4100 MW at stake and given that Eskom is being funded by taxpayer bailouts, this warrants much more careful consideration. (*Between 2013/14 and 2022/23*[12]*, Eskom received bailouts totaling R242 billion. The Eskom Debt Relief Act (Act No. 7 of 2023) provides for an additional R254 billion for additional support. Furthermore, Eskom benefits from a R350 billion government guarantee facility, which effectively subsidises its cost of debt. Without these guarantees, Eskom would be unable to access borrowing. For a detailed list of development finance loans see Mokgonyana, 2025*[13]).

iii. **Shutdown Plan of Diesel-Fired Stations:** The Avon and Dedisa stations were procured under a 15-year contract and are due to expire between 2030 and 2031. They are assumed to terminate output in 2031; however, it is quite possible that they could continue to operate beyond that date.

iv. **Gas-fired Generating Capacity:** The Draft IRP 2024 assumes that 3 GW will be available on the grid by 2030. This is an optimistic assumption. Perhaps for this reason the Draft IRP 2024 includes a scenario where the gas capacity does not materialise.

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12 https://dailyinvestor.com/energy/17488/eskom-received-r242-billion-in-bailouts-but-cannot-keep-the-lights-on/

13 https://www.businesslive.co.za/bd/opinion/2025-07-23-karabo-mokgonyana-eskoms-addiction-to-loans-signals-decay-of-developmental-state/

v. **Distributed Generation (PV):** The Draft IRP 2024 assumes a forecasted growth of 0.9 GW per year up to 2035. This is a particularly difficult assumption to critique, not least because growth in this sector is partially driven by Eskom loadshedding which has proved difficult to predict. In the period May 2025 to May 2026, South Africa did not experience loadshedding due Eskom's improvement through the Generation Recovery Plan. Equally, there are emerging concerns at the municipal level relating to accounting for distributed generation through private rooftop PV and the impact to demand forecasting assumptions.

vi. **Coal-Fired Stations and Eskom's EAF:** The assumptions concerning Eskom's EAF is also a difficult assumption to critique because there are so many variables at play, not least of which are softer issues such as improvements to the institutional culture and Eskom employee attitudes to work. The Draft IRP 2024 assumes the "Base" assumption shown in Figure 9.

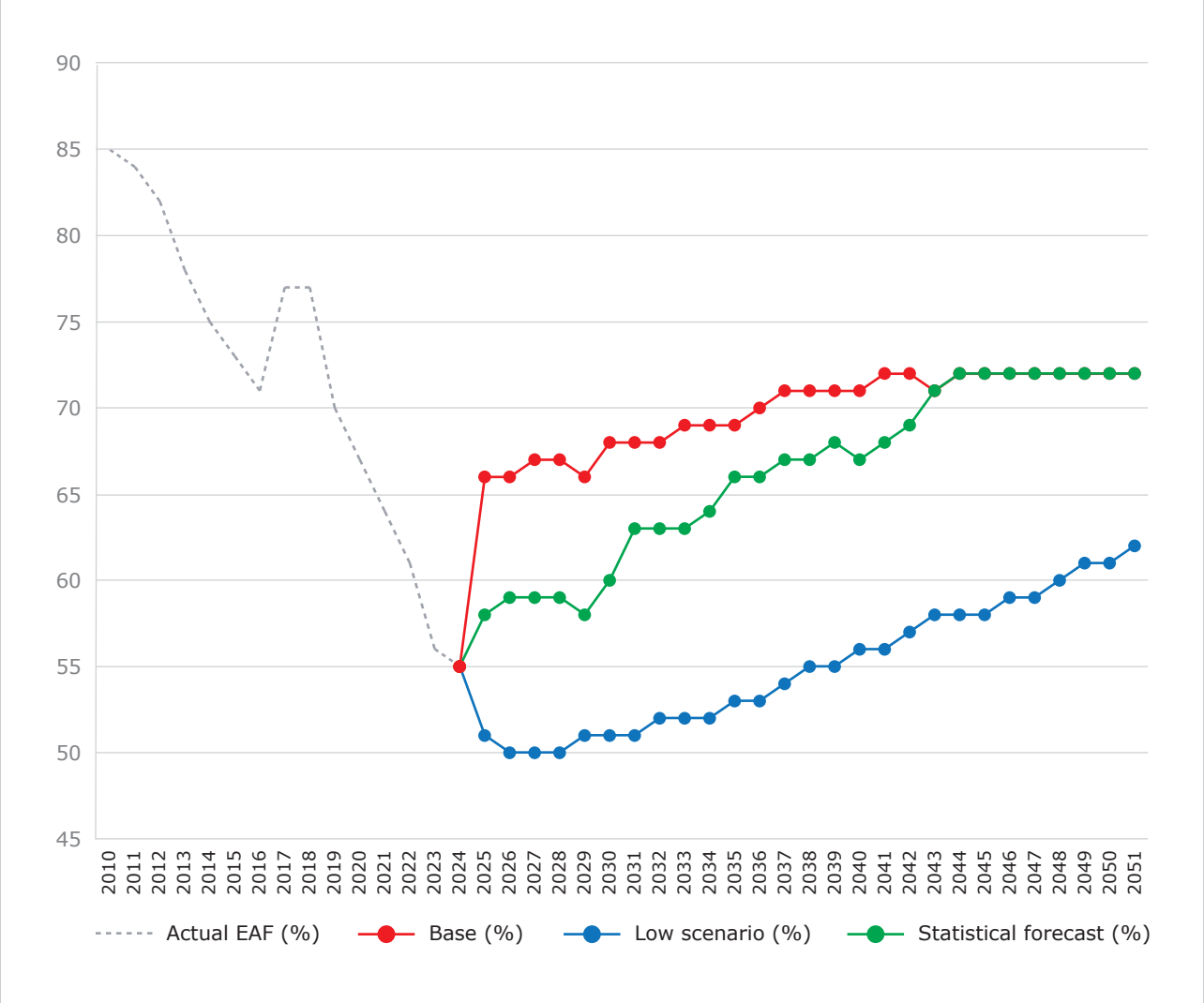


FIGURE 9 EAF assumptions (%)

In the light of Eskom's recent EAF, opting for the "Base" scenario seems over optimistic. The "Statistical Forecast" assumption seems more reasonable – see Figure 10 next.

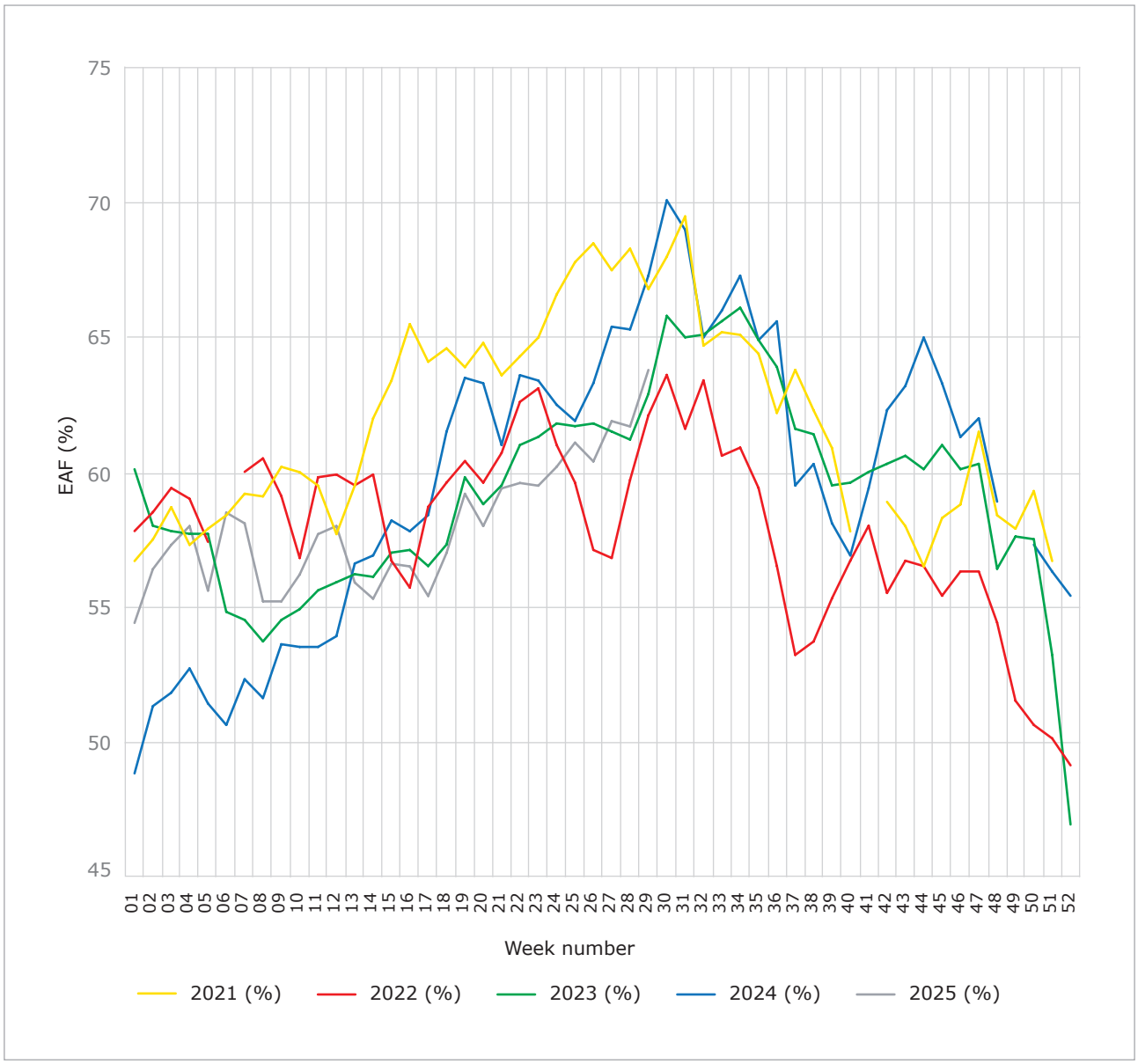


FIGURE 10 Eskom Energy Availability Factor from week, 2021, to 2025

Figure 10 shows that despite recent improvements, Eskom's EAF has during the first few weeks of 2025 hovered in the region of 55% to 58%. It was expected to improve over the winter months when planned maintenance was usually reduced, with the result being in the order of the 58% estimated in the "Statistical Forecast" scenario. It is of course risky to base longer term forecasts on such a short-term data set. However, Eskom's EAF history suggests that it would be prudent to make conversative estimates about its prospects.

Eskom's recent improved EAF performance is partly attributable to a government bailout of R254 billion which allowed it to order long lead time parts and equipment. However, that bailout as already been whittled down by Eskom's failure to comply with certain of the conditions imposed by the Minister of Finance and partly by a reduction of R20 billion in the 2025 national Budget. This may negatively affect Eskom's EAF recovery as well as the planned coal station life extensions.

While there is a risk of being overly optimistic in the short term, not targeting benchmark levels in the long term and calling for a Generation Recovery Plan to match poses significant long term system risks.

The IRP's assumed EAF trajectory – from 68% by 2030 to 72% by 2050 – remains conservative and misaligned with Eskom's publicly stated ambition and historical EAF benchmark targets exceeding 80%. Without incorporating a high-EAF (80%) policy-driven scenario, the IRP risks underestimating available supply, increasing system cost, distorting capacity additions, and delaying procurement of renewables, storage, and grid infrastructure.

On new technologies, several of the cost assumptions used in the Draft IRP 2024 are based on the EPRI 2021 study (EPRI 2021) where all costs are reported in January 2021 South African Rands. Whilst EPRI is a reputable institution, using assumptions that will be about five years out of date at the time of the gazetted IRP 2025 is finalized is risky, especially during rapid technological change. As EPRI (2021) points out "The factors underlying the data in this report can change quickly and markedly both on worldwide and local market conditions" (EPRI 2021:viii).

These EPRI costs were not used for all the technologies. The nuclear costs were based on a request for information (RFI) following a study commissioned by the department and are not disclosed in the report. Elsewhere the Draft IRP 2024 states that "All costs are estimated to be in January 2024 rand terms". It is unclear how the EPRI 2021 assumptions were adjusted to 2024 Rand terms, or if that was done at all.

2.4.4 Scenarios

At a high level it is reasonable for modelers to test the kinds of options that were explored, that is a Nuclear scenario, an Aggressive Battery Learning scenario and a Delayed Shutdown of coal-fired stations. The latter is currently being implemented by Eskom. However, the Draft IRP 2024 is confusing about the period of the life extensions for these stations. It refers to an additional 10 years beyond their assumed 50-year useful life. But it goes on to refer to "a further 10-year operation" (DMRE 2024:25). It is not clear if this is a 10-year or a 20-year life extension that is envisaged. Figure 11shows a comparison of the capacity allocated to the various scenarios in the Draft IRP 2024.

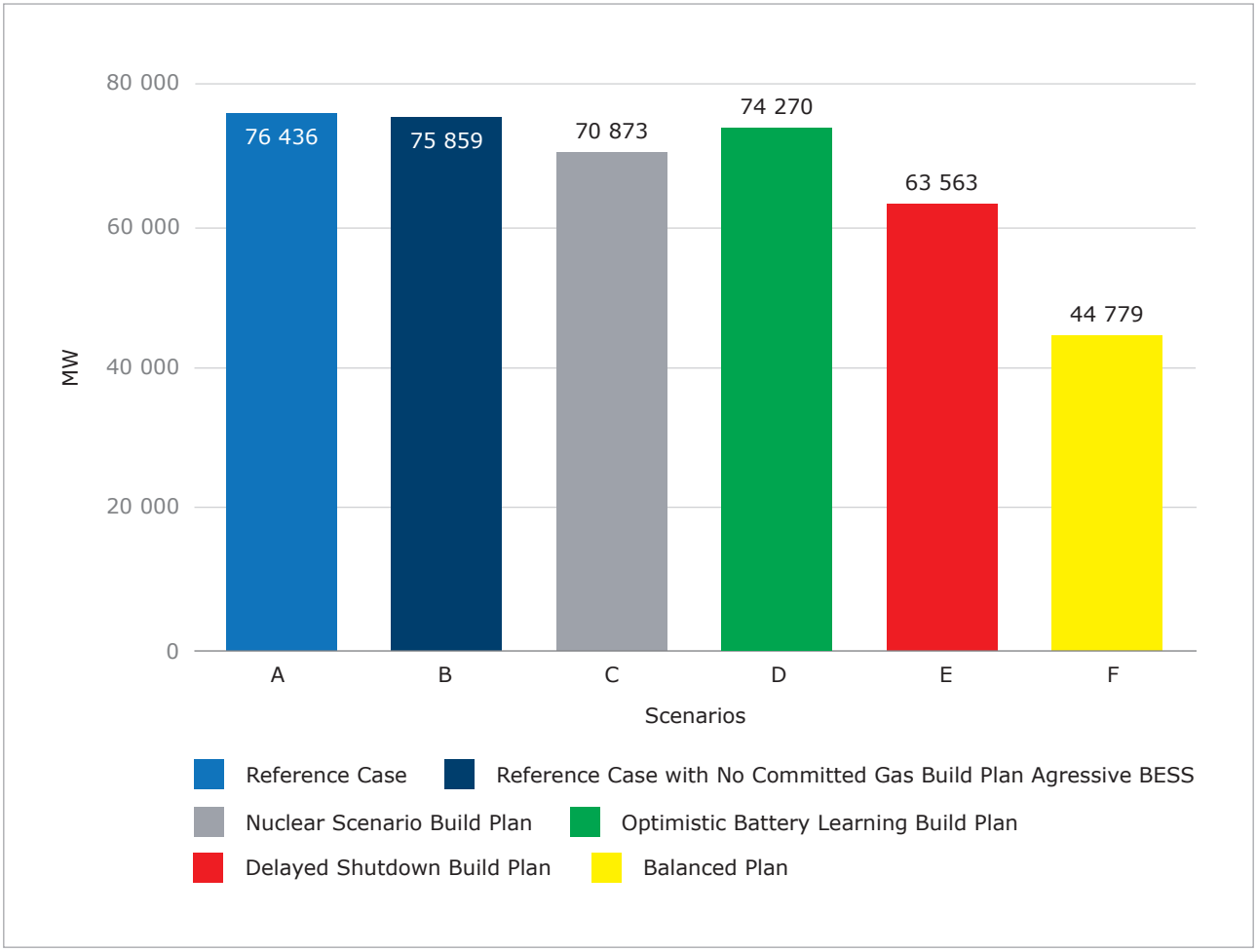


FIGURE 11 Total Wind Capacity by Scenarios Draft IRP 2024

TABLE A4 Scenarios and associated period for Figure 11

Key	Scenario	Period
A	Reference Case	2031–2050
B	Reference Case with No Committed Gas Build Plan Aggressive Bess	2031–2050
C	Nuclear Scenario Build Plan	2031–2050
D	Optimistic Battery Learning Build Plan	2031–2050
E	Delayed Shutdown Build Plan	2031–2050
F	Balanced Plan	2025–2042

Figure 11 shows that four of the scenarios yield similar outcomes for wind capacity and allocate higher capacity to wind. The Delayed Shutdown Build Plan results in a lower wind capacity in the 2036 to 2040 period. Eskom has announced that it intends to extend the lives of several power stations beyond their 50-year useful lives. Consequently, the Delayed Shutdown Build Plan may be the scenario most likely to materialize in practice. The same four scenarios and the Balanced Plan yield declining wind capacity after 2040.

If the total wind capacities are compared, the Draft IRP 2024 Balanced Plan yields the least wind capacity. Even if it is adjusted upwards to compensate for it being two years shorter than the other scenarios, it still yields the least wind capacity, less than 50 000 MW – See Figure 12.

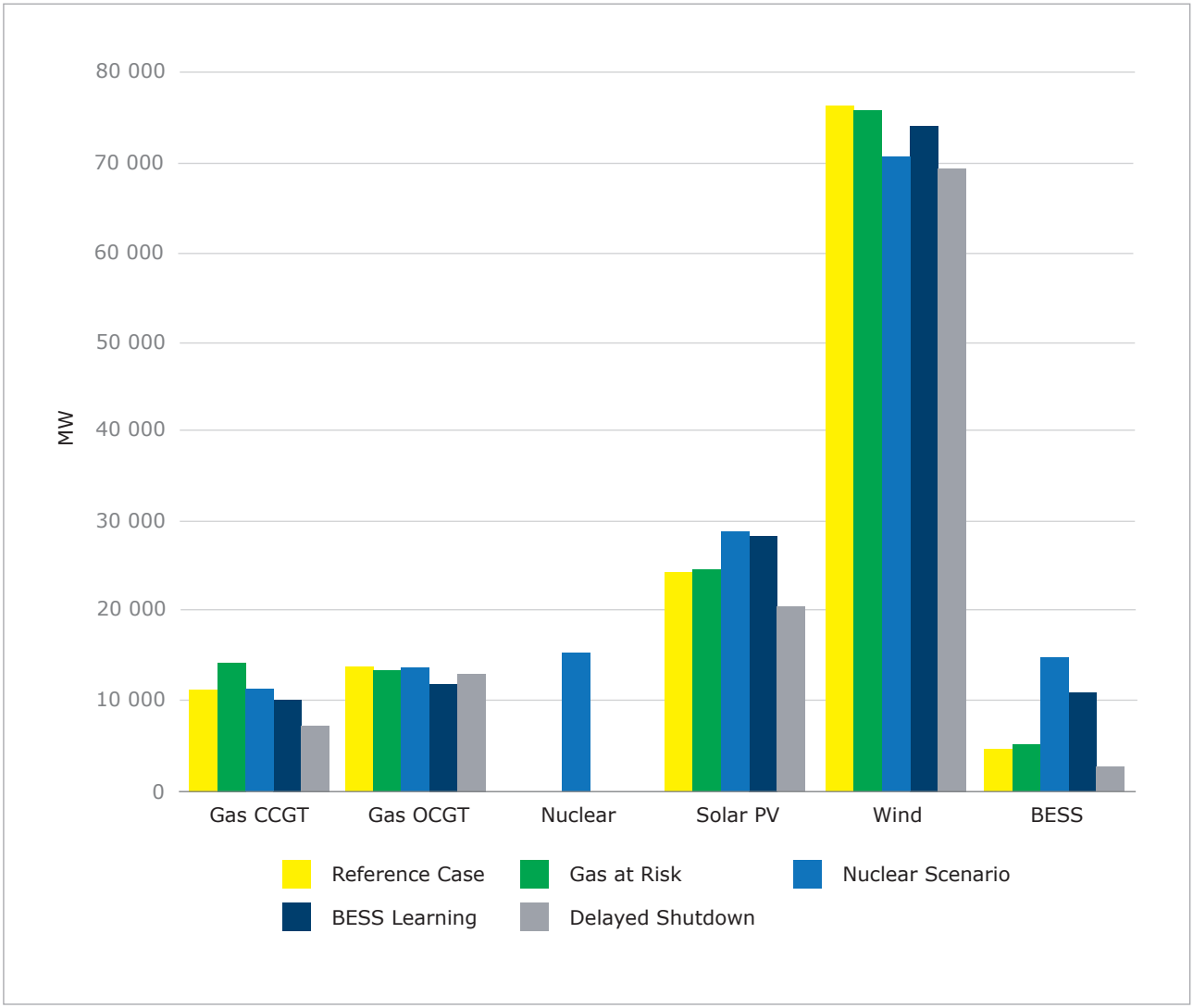


FIGURE 12 2050 Outlook – Draft IRP 2024[14]

The Reference Case scenario yields the largest wind capacity possibly because it is the least "adulterated" scenario, and closest to lowest cost even though it has 6 GW of gas CCGT included. This gas capacity is probably included because at the time that the modelling was done Section 34 Ministerial "Determinations concurred to by NERSA including 6000 MW gas CCGT" (DMRE 2024:9) had already been made. The detailed capacities allocated to wind in each of the scenarios are presented in Annexure A.

14 DMRE – Draft IRP Consultation Workshop November 2024

2.4.5 Input data

There are several key parameters that influence the outcomes of integrated resource planning, and they include:

i. Electricity Demand Forecast
ii. ZAR/USD exchange rates
iii. Overnight costs for the various technologies
iv. EAF of Eskom fleet of power stations
v. Fuel costs

The Draft IRP 2024 modelling exercise considered 5 forecasts based on assumptions on factors such as GDP change, population growth, behind-the-meter investment in power generation, sectoral shifts in demand, penetration of electric vehicles, demand-side management initiatives and energy efficiency. Compiling such forecasts is large and complex undertaking, see for example Merven (2023).

The Draft IRP 2024 states that "The Draft IRP 2024 electricity forecasting methodology is detailed in full in a report accompanying this publication". We have been unable to locate this report. The Draft IRP 2024 used a demand growth forecast averaging 2.3% per annum (page 23). This seems optimistic compared to the Eskom Transmission Development plan for 2025–2034 which assumes a GDP growth forecast of 1.6% p.a. (page 3) for the first 10 years.

The Draft IRP 2024 assumes an exchange rate an exchange rate of R18.35 to the US dollar. This is in line with other estimates and the actual for 2024:

- Exchange Rates.Org: R18.332[15]
- South African Reserve Bank: R18.32552[16] (actual)

In this context, 'overnight costs' refer to the estimated capital cost of constructing a power generation facility as if it were completed instantaneously excluding financing charges, cost escalation, and inflation during the construction period. This measure reflects the baseline capital expenditure required to bring a facility into commercial operation and is typically expressed per unit of installed capacity, such as R/kW or $/MW.

Overnight costs are particularly relevant in integrated resource planning as they enable consistent, technology-neutral comparisons of upfront capital requirements. For wind energy, this metric helps assess the relative affordability of scaling capacity compared to other generation options, especially in a constrained fiscal environment. A rough comparison of the wind capacity overnight costs estimated by various sources is provided in Figure 13 next.

15 https://www.exchange-rates.org/exchange-rate-history/usd-zar-2024
16 https://www.resbank.co.za/en/home/what-we-do/statistics/key-statistics/selected-historical-rates

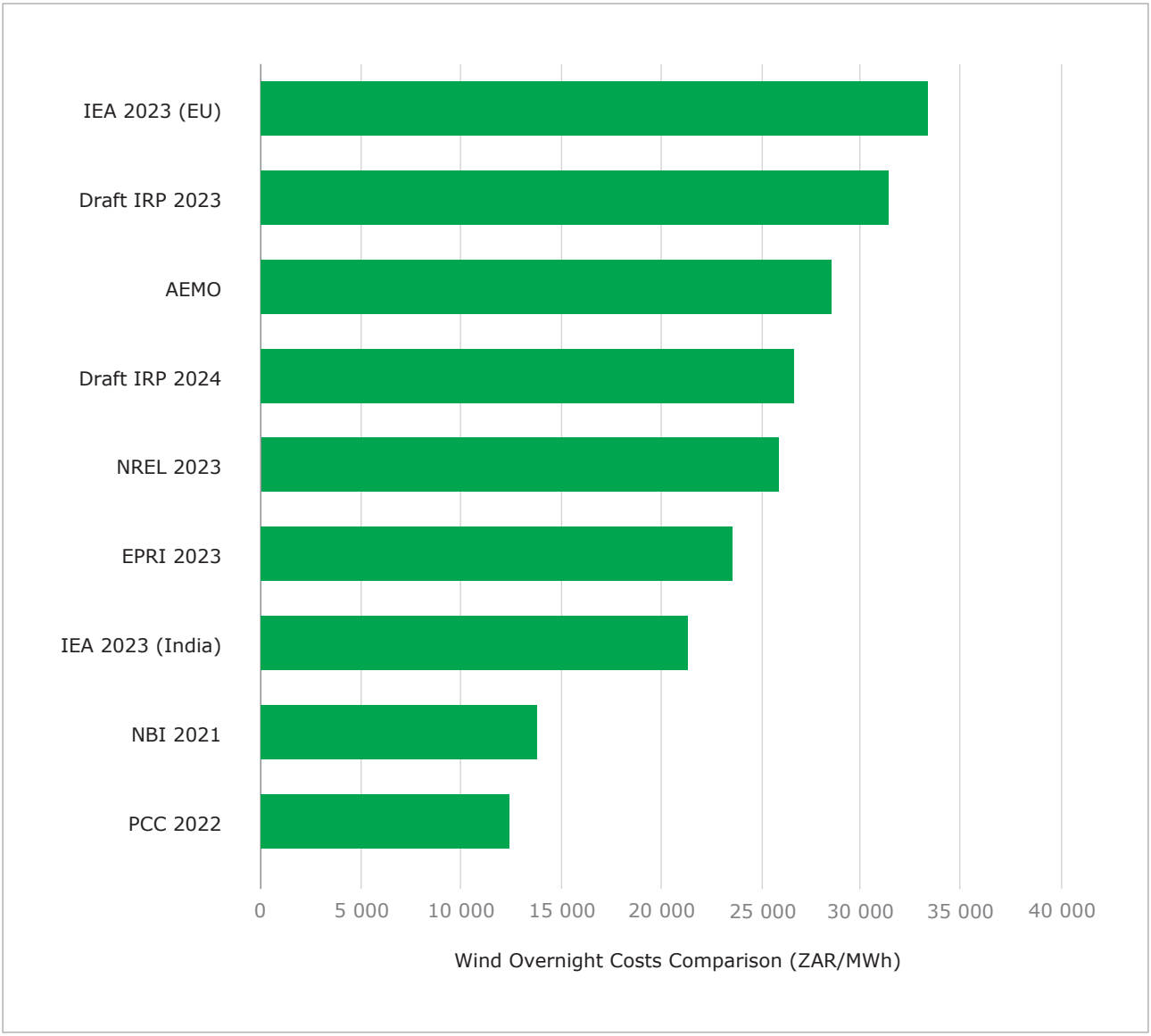


FIGURE 13 Onshore Wind Overnight Costs Comparison (ZAR/MWh)[17]

Not all the data in Figure 13 is strictly comparable but it does provide an indication of where the Draft IRP 2024 assumption sits in relation to other estimates and shows it to be roughly in the middle of the other estimates and therefore not unreasonable.

EAF of Eskom fleet of power stations is discussed in section 2.5.3 of this report. The natural gas price assumption used is reviewed as gas-to-power is a competitor to wind power generation because both enjoy comparatively quick construction periods. The Draft IPR 2024 uses a natural gas price of $15/Gj. In 2024 the U.S. Henry Hub Average. Price reached a record low $2.33/Gj but other forecasts are higher – see Table 5 next.

17 Meridian, 2024

TABLE A5 Gas Price Forecasts

Year	NYMEX Henry Hub $/Gj	NYMEX Henry Hub delivered to SA Aurthor's estimate $/Gj	UK NBP $/Gj	Dutch TTF $/Gj	UK NBP $/Gj
2025	3.41	10.91	–	14.07	13.91
2026	4.04	11.54	–	12.23	12.08
2027	4.36	11.54	–	10.55	10.40
2028	4.46	11.96	–	10.76	10.61
2029	4.57	12.07	–	10.97	10.82
2030	4.62	12.12	11.025	11.18	11.03
2031	–	–	–	11.39	–
2032	–	–	–	11.66	–

Source: Capital.Com[18]

Delivering LNG to South Africa also involves the additional costs associated with local costs in USA such as pipeline tariffs, liquefaction, shipping, and regasification. Once landed on the South Africa coast there will be additional costs to transport the gas through the transmission and distribution pipelines to the customer which are not included in Table 4. In this light the Draft IRP 2024 gas price of $15/Gj seems reasonable.

18 https://capital.com/en-int/analysis/natural-gas-prices-forecast-2030–2050

2.4.6 Impact on wind energy capacity allocation

The investment forecast for wind in the Draft IRP 2024 Balanced Plan scenario assumes that the overnight cost is R26 647 per MW. The capital outlay required to achieve the Balanced Plan scenario is shown in Table 6.

TABLE A6 Draft IRP 2024 Balanced Plan Wind Overnight Costs Capex ZAR mil

Year	Capacity MW	Overnight Capital Cost 2024 ZAR mil
2025	1 738	46 312 486
2026	964	25 687 708
2027	2 847	75 864 009
2028	770	20 518 190
2029	760	20 251 720
2030	2 000	53 294 000
2031	2 500	66 617 500
2032	2 600	69 282 200
2033	2 600	69 282 200
2034	3 000	79 941 000
2035	3 000	79 941 000
2036	2 000	53 294 000
2037	3 000	79 941 000
2038	3 000	79 941 000
2039	3 500	93 264 500
2040	3 500	93 264 500
2041	3 500	93 264 500
2042	3 500	93 264 500
TOTALS	**44 779**	**1 193 226 013**

The data in Table 6 is represented in graph format next in Figure 14 for improved visualization.

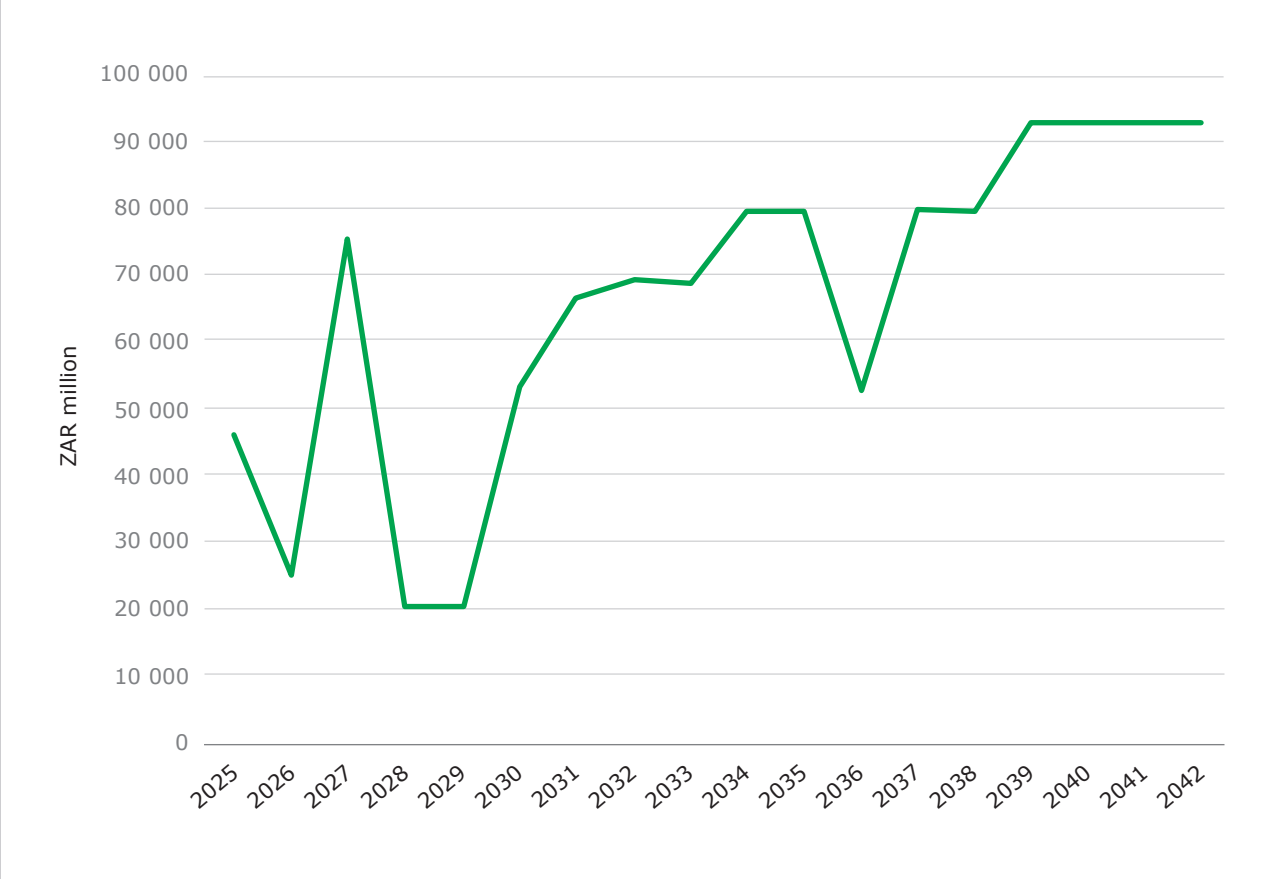


FIGURE 14 Draft IRP 2024 Balanced Plan Wind Overnight Costs Capex ZAR mil

Overnight costs alone are not a reliable basis for comparing the actual costs of different technologies, as they exclude operating expenses and debt servicing. This creates a distortion in relative competitiveness: technologies with high upfront capital costs but low operating and fuel costs (such as wind and solar) appear disadvantaged, while those with lower capital costs but higher operating and fuel expenses (such as gas and coal) appear advantaged.

For this reason, the electricity literature prefers to use the Levelized Cost of Electricity (LOCE) which includes the operating and other costs over the life of the assets. This is a better way to compare the economic efficiency of different electricity generation technologies. Unfortunately, that data is not provided in the Draft IRP 2024 and we must make do with the Overnight Cost metric as that is all that is available.

The capital outlays for wind associated with these five scenarios are provided in Figure 15 next.

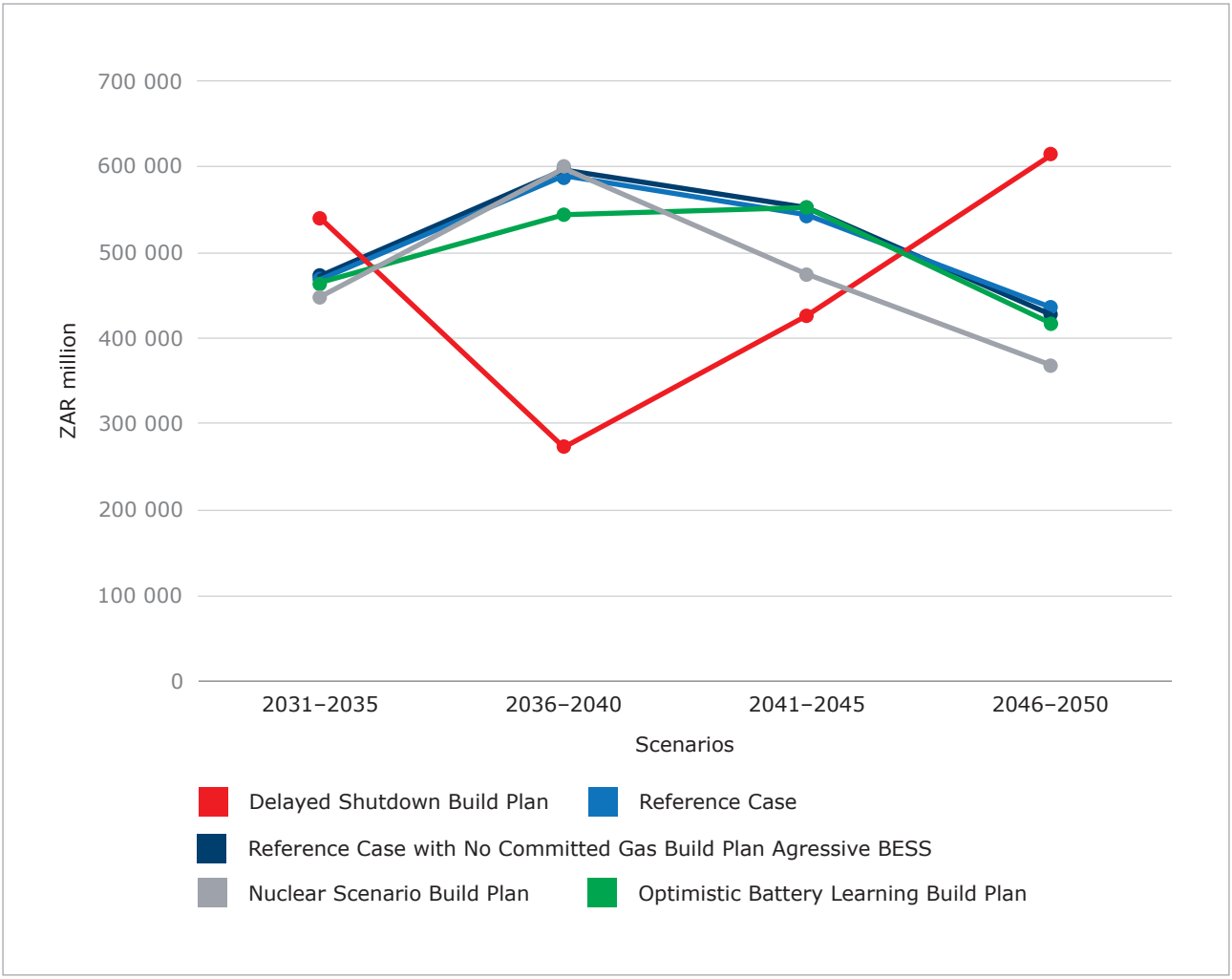


FIGURE 15 Wind Capital Required for Wind per Draft IRP 2024 Scenario (Overnight costs)

It is clear from Figure 16 that the Delayed Shutdown Build Plan Scenario of coal-fired stations has the largest negative impact on capital expenditure on wind capacity particularly in the 2036–2040 period. All the other four scenarios see a significant decline in wind investment from 2040 to 2050. Table 7 next shows total wind CAPEX in all scenarios.

TABLE A7 Total Wind Capex in Draft IRP 2024 Scenarios

Scenario	Total (ZAR mil)
A – Reference Case	R2 036 790
B – Reference Case with No Committed Gas Build Plan Aggressive BESS	R2 021 415
C – Nuclear Scenario Build Plan	R1 888 553
D – Optimistic Battery Learning Build Plan	R1 979 073
E – Delayed Shutdown Build Plan	R1 853 645

The reference case leads to the largest investment in wind capacity.

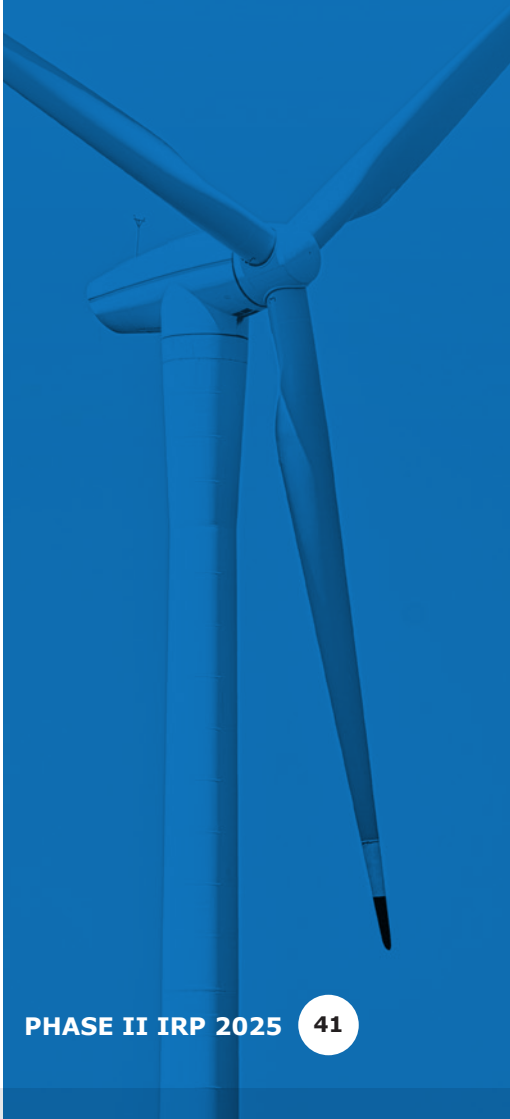
2.4.7 Gazetted IRP 2025 scenario update

The gazetted IRP 2025 improves the presentation of South Africa's electricity planning framework by placing the Proposed Balanced Plan within a more integrated structure. Unlike the Draft IRP 2024, the final plan more clearly links scenario assessment to broader implementation considerations, including grid planning, system flexibility, power-system operations, committed public and private generation, and alignment with South Africa's Nationally Determined Contribution. This gives the Final IRP 2025 a more coherent planning architecture and provides a stronger basis for assessing the operational requirements needed to deliver the preferred electricity pathway.

The scenario structure is also clearer in the gazetted IRP 2025. The plan focuses on a more defined set of scenarios, including the Reference Case, Gas at Risk, Nuclear, Aggressive Battery Learning and Delayed Shutdown. These scenarios are useful because they test the sensitivity of the electricity system to major uncertainties that are directly relevant to wind energy deployment. These include the availability and cost of gas, the timing and scale of nuclear capacity, the pace of battery cost reductions, and the effect of extending coal-fired generation beyond scheduled shutdown dates.

However, the clearer presentation of scenarios does not remove the underlying concern that wind allocations remain sensitive to assumptions about other technologies and system constraints. In particular, assumptions about gas availability, nuclear build decisions, battery learning rates and delayed coal shutdown can materially affect the scale and timing of wind deployment. Where gas or nuclear capacity is prioritised, or where coal shutdown is delayed, wind capacity may be displaced or postponed. Conversely, faster battery cost reductions and stronger flexibility planning can improve the system's ability to absorb higher levels of wind generation.

The gazetted IRP 2025 improves the presentation of South Africa's electricity planning framework by placing the Proposed Balanced Plan within a more integrated structure.



© Nuno Marques via Unsplash

For the wind sector, the gazetted IRP 2025 therefore confirms the importance of monitoring not only the headline wind allocation, but also the assumptions and implementation choices that shape whether this allocation is delivered in practice. The key issue is whether the planning framework is translated into a credible procurement pipeline, timely grid expansion, adequate flexibility resources, efficient power-system operations, and transparent coordination between public procurement and private generation. Without these enabling conditions, the wind trajectory in the gazetted IRP 2025 may remain vulnerable to delays, displacement by other technologies, or uneven year-on-year rollout.

2.5 Balanced plan capacity allocation

2.5.1 Wind energy capacity allocation

Wind energy capacity allocation under the Balanced Plan has already been discussed in Section 2.3. The gazetted IRP 2025 broadly retains the Draft IRP 2024 Balanced Plan wind trajectory. This means that the earlier conclusion remains valid: wind receives a historically significant allocation relative to earlier IRPs and is positioned as one of the central technologies in South Africa's future electricity mix.

However, the concern is not only the total allocation, but also the sequencing of the build. Although the long-term wind allocation is substantially higher than in IRP 2010 and IRP 2019, the largest expansion occurs after 2030. This creates an implementation risk because the wind sector requires a predictable near-term procurement pipeline to support investment certainty, grid planning, localisation, skills development and supply-chain readiness. Therefore, the key issue under gazetted IRP 2025 is not simply whether wind receives a large allocation, but whether the planned capacity can be delivered in a timely, sequenced and bankable manner.

2.5.2 Wind energy capacity in relation to other technologies

Wind energy is known to be variable due to the natural variability of wind. The wind farm capacity factor is determined by the availability of wind and the swept area of the turbine as well as the size of the generator. The global average capacity factor for wind energy is between 25% and 45%. Therefore, it is well accepted that wind energy capacity factor can thus vary depending on wind conditions and location e.g. local topography (surface roughness of the terrain).

South Africa's best 20% of windiest areas have good mean windspeeds at 100m of between 7 and 9 m/s according to the Global Wind Atlas[19] see Figure 16.

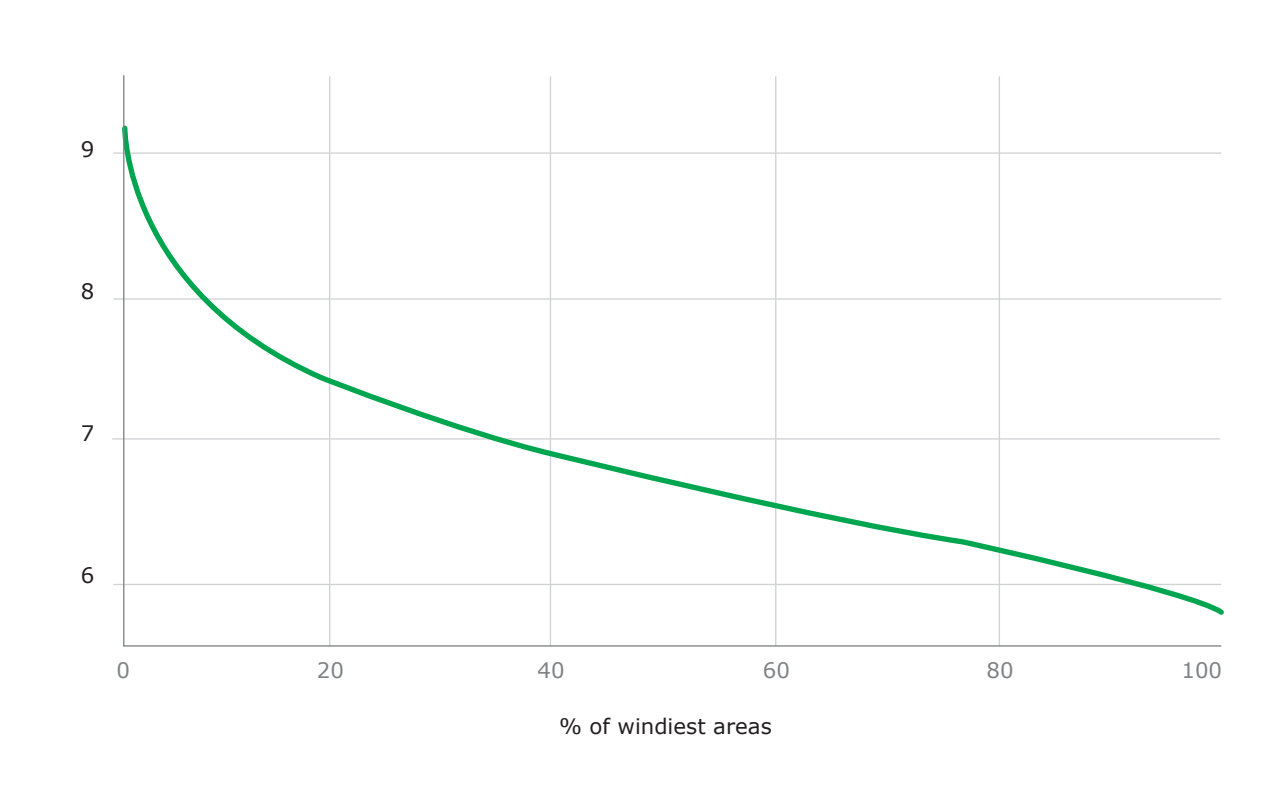


FIGURE 16 South Africa Mean Wind Speed m/s @Height 100m[20]

In 2022, the average annual capacity factor for operational wind stations was 34% between 2013 and 2022 (CSIR Energy Centre, 2023).

Figure 17 shows the global wind power generation in 2024.

19 https://globalwindatlas.info/en/area/South%20Africa

20 Global Wind Atlas

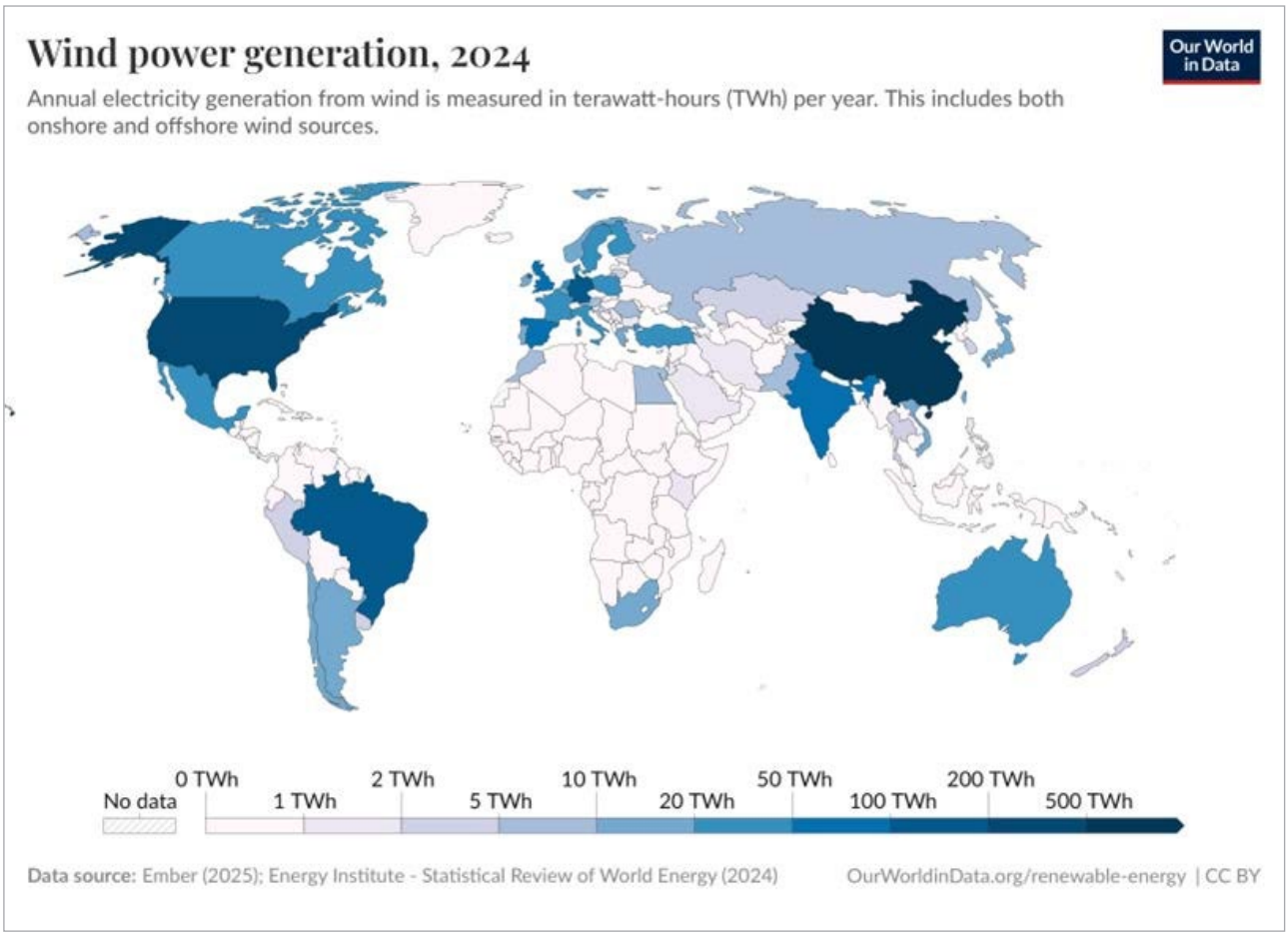


FIGURE 17 Global Wind power generation as of 2024[21]

Since the establishment of the REIPPPP, there has been a concerted effort in integrating renewable energy into South Africa's electricity mix. Through thirty-four (34) wind energy projects, the REIPPPP programme has contracted approximately 3.4 GW of wind energy capacity in South Africa which is currently generating less than 11.1 TWh of electricity from the wind energy as shown in Figure 13 (Statistical Review of World Energy, 2024).

Wind energy is the second largest electricity generating source after coal in South Africa which has a contribution of 24% of power generated in 2024 (CSIR Utility-scale power generation statistics in South Africa Report, 2025). There is a growing potential for wind energy projects with a pipeline of twenty-one (21) wind energy projects, comprising both public and private representing 2.5 GW of capacity. This has a potential to result in approximately 6 GW of current wind energy allocated to the grid.

The capacity factor of wind energy in relation to other renewable energy sources was at 36.8% as of the year 2024 – See Figure 18 next.

21 Statistical Review of World Energy (2024)

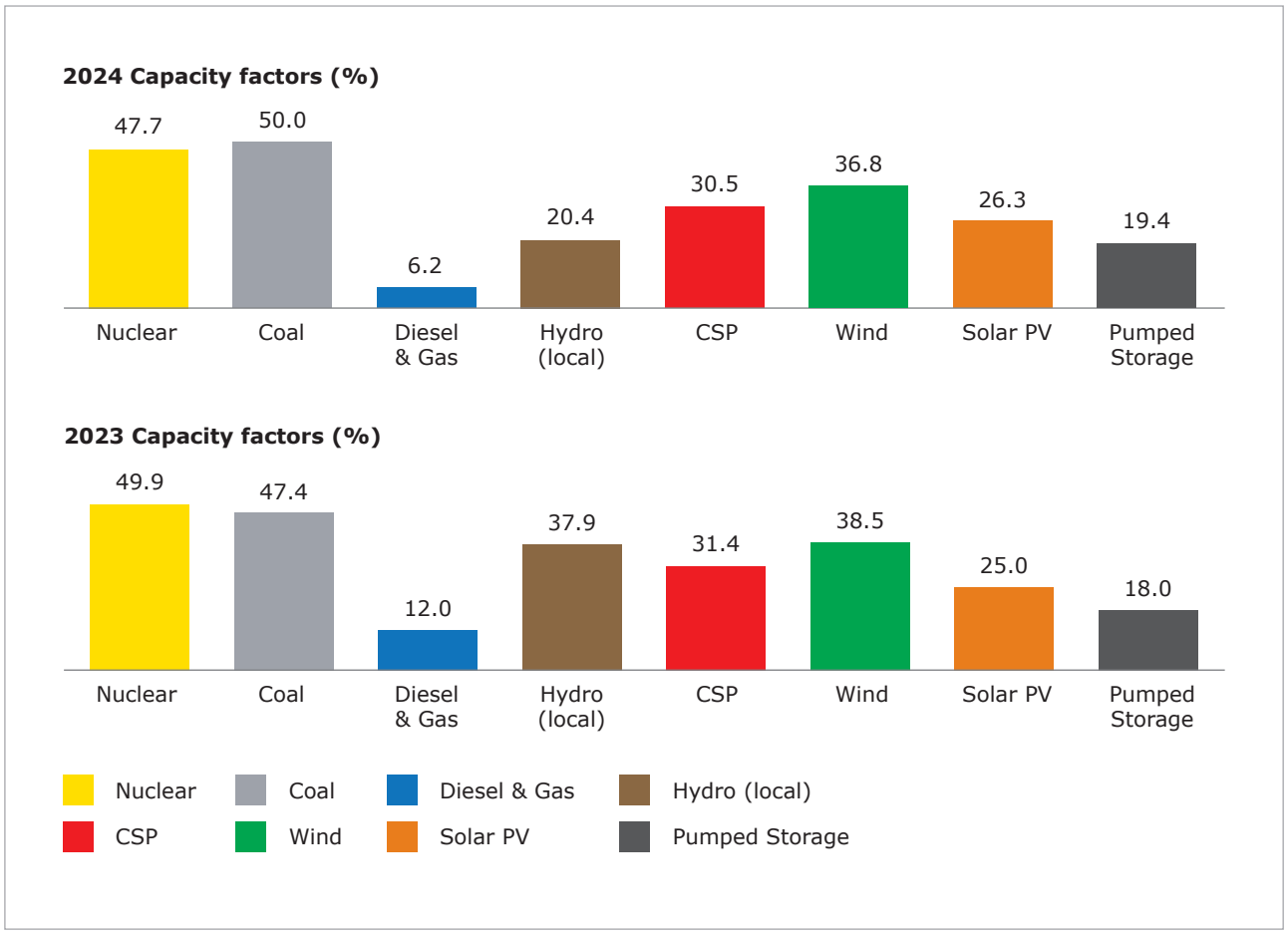


FIGURE 18 The capacity factor of energy sources as of the year 2024[22]

Wind had the third highest capacity factor amongst other energy sources of the country. This further proves that wind energy has a great potential in the country's just energy transition.

2.6 IRP provisions and implications for wind energy market

2.6.1 Short term

A total of 9,079 MW of wind capacity is reflected for the 2025–2030 period when capacity under construction is included in the wind trajectory. Of this, 1,738 MW is classified as capacity under construction, while the remaining allocation forms part of the new build pathway. This distinction is important because excluding capacity under construction produces a lower figure of 7,341 MW, but for purposes of comparing the Draft IRP 2024 and gazetted IRP 2025 wind trajectory, the broader 9,079 MW figure should be retained.

22 CSIR Energy Research Centre 2025

Although the 2025–2030 allocation signals continued policy support for wind energy, it should not be interpreted as automatically executable.

This short-term allocation excludes the existing operational wind capacity already connected to the grid. A substantial portion of the newly planned wind capacity is expected to come from independent power producers. This creates an important opportunity for new investment in the wind energy industry, particularly through public procurement, private offtake arrangements and corporate power purchase agreements. However, the realisation of this opportunity remains dependent on the extent to which existing implementation risks are addressed, including grid access constraints, delays in procurement, permitting bottlenecks, transmission expansion, and uncertainty around the sequencing of new capacity.

Although the 2025–2030 allocation signals continued policy support for wind energy, it should not be interpreted as automatically executable. The short-term pathway remains ambitious given the current state of the transmission network and the time required to connect new generation capacity. Some of the major enabling investments, particularly transmission expansion in high-wind resource areas, are only expected to enter more advanced implementation phases during the second half of the decade. This creates a potential mismatch between the timing of planned wind capacity and the readiness of the grid to absorb that capacity.

The market implication is that gazetted IRP 2025 does not materially change the Draft IRP 2024 wind trajectory for the short-term period. Instead, it confirms that the main challenge is implementation. For the wind sector, the priority is therefore to ensure that the 9,079 MW reflected for 2025–2030 is supported by a credible procurement schedule, accelerated grid investment, clear rules for private generation, and improved coordination between Eskom, the National Transmission Company South Africa, government departments, regulators and independent power producers.

2.6.2 Medium term to Long-term

A total of 35,700 MW of planned wind energy projects from 2031 to 2042 is anticipated to contribute towards the medium- to long-term scenario of the country's energy mix. Renewable energy will continue to be one of the key complementary sources of electricity supply in South Africa. This places the wind industry in an advantageous position, since there is potential for continued growth from the short-term period into the medium- and long-term planning horizon.

From 2031 onwards, it can be expected that some of the current challenges facing the wind energy sector may have been mitigated, particularly if transmission expansion, procurement reform, permitting improvements and system flexibility investments are implemented effectively. Under this scenario, the wind sector would be better positioned to deliver the larger post-2030 allocations contained in the Draft IRP 2024 and broadly retained in gazetted IRP 2025.

However, the medium- to long-term wind trajectory should still be treated with caution. The allocation of wind energy remains highly dependent on the viability, cost and timing of other technologies, including gas, nuclear, battery storage and coal life-extension decisions. If grid constraints, procurement delays or system-balancing limitations remain unresolved, it is possible that only a portion of the planned 35,700 MW could be connected to the transmission network by 2042.

It should also be noted that other technologies face their own implementation challenges, including cost uncertainty, long lead times, financing constraints, fuel availability, environmental approvals and institutional delays. The combined effect of these challenges can extend project timelines and increase uncertainty across the energy planning system. This makes regular IRP review and transparent implementation monitoring essential.

For the wind energy market, the key implication is that Final IRP 2025 confirms a substantial long-term role for wind, but the scale of the opportunity depends on delivery conditions. The sector will need to work closely with government, the regulator, the National Transmission Company South Africa and other stakeholders to ensure continued implementation of the national energy mix plans. This will require stronger advocacy around grid readiness, predictable procurement, private generation integration, localisation, and the creation of a stable investment environment for wind energy projects.

03 Implementation risks and challenges

3.1 Policy and regulatory context and alignment

South Africa's energy planning landscape is characterised by institutional and regulatory fragmentation. While the Integrated Resource Plan (IRP) functions as the country's legally binding electricity planning instrument under the Electricity Regulation Act, the broader Integrated Energy Plan (IEP) – mandated under the National Energy Act (Act No. 34 of 2008) – remains unpublished, with the legal requirement for its development only brought into force in 2023 following litigation. This 'cart-before-the-horse' approach to energy planning has contributed to inconsistencies between long-term infrastructure planning and actual electricity system development.

Notably, South Africa departs from international norms in that its IRPs are not indicative or advisory but rather carry the force of law as Ministerial regulations. At the time of writing, both Acts fall under the jurisdiction of a single Minister of Electricity and Energy, offering a potential opportunity for greater policy coherence going forward.

The gazetted IRP 2025 strengthens this policy-alignment agenda by more clearly linking electricity planning to the evolving regulatory and climate-policy environment. It reinforces the need for alignment between the Electricity Regulation Amendment Act, the Climate Change Act, grid planning, system flexibility, private generation and South Africa's Nationally Determined Contribution. This is important for wind energy because the successful delivery of the planned build pathway depends not only on generation allocations, but also on the regulatory rules, grid investment framework, market design and climate-policy commitments that shape project bankability and implementation certainty.

In this context, Draft IRP 2024 acknowledges the cost-effectiveness and industrial potential of renewable energy technologies, including wind. However, it also highlights operational challenges linked to their variability and insufficient system support. Specifically, Draft IRP 2024 notes:

> "The rollout of the [renewable] technology provides an opportunity for localisation and industrialisation of the manufacturing sector. However, their variability requires the support of other technologies of a dispatchable nature… [and] the technologies lack sufficient grid support and ancillary services, creating a challenge for power system operability with high penetration of these resources."
>
> **(Draft IRP 2024:4)**

One of the most critical constraints to scaling wind energy in South Africa remains inadequate transmission infrastructure, particularly in regions with high wind potential. To address this, the alignment between Draft IRP 2024 and key infrastructure strategies – notably the Infrastructure Plan 2050 and Eskom's Transmission Development Plan (TDP) 2025–2034 – is essential.

The Infrastructure Plan 2050 provides South Africa's overarching framework for long-term infrastructure investment. It places strong emphasis on grid expansion, explicitly stating that network development must be synchronised with supply-demand forecasts based on the IRP.

Eskom's TDP 2025–2034, which is primarily based on the draft IRP 2023, outlines system reinforcements required to accommodate new generation capacity over the next decade. It places particular focus on the Western Cape, Eastern Cape, and Northern Cape – provinces identified as critical for unlocking renewable energy potential.

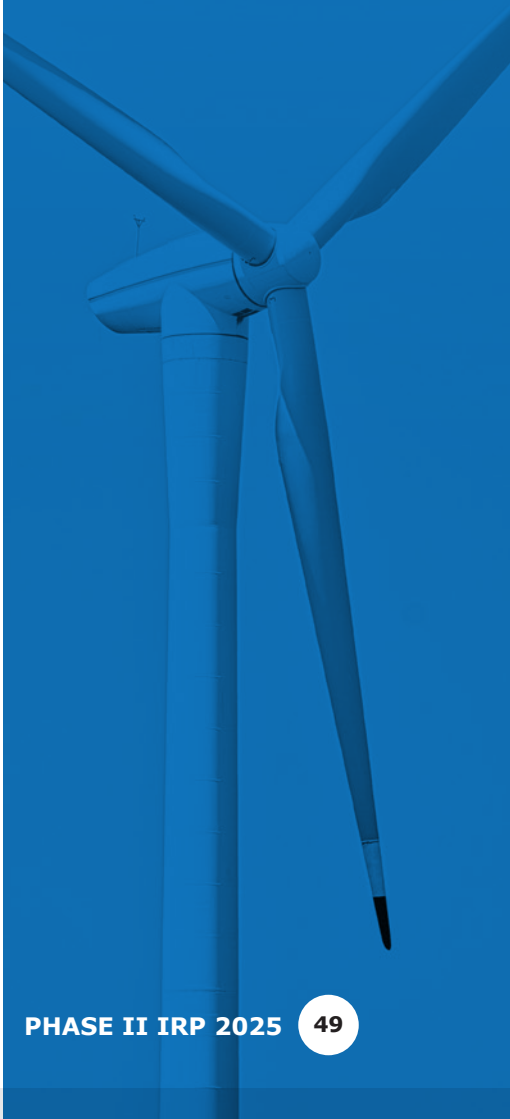
In terms of wind capacity:

- The Western Cape is projected to become a hub for wind development, with approximately 7,100 MW of new capacity expected by 2035, compared to 1,165 MW currently installed. A further 1,867 MW is anticipated to be wheeled through the grid.
- The Northern Cape expects to generate 6,558 MW of wind capacity by 2034.
- The Eastern Cape has not yet finalised future wind targets, although network upgrades are planned to enable integration.

The transmission buildout to support wind energy is scheduled in two phases:

- New transmission lines (2027–2033) for greenfield development; and
- Extension and refurbishment of existing infrastructure (starting 2025).

The Western Cape is projected to become a hub for wind development, with approximately 7,100 MW of new capacity expected by 2035.



The TDP forecasts less than 20,000 MW of additional transmission-enabled wind capacity through 2034, which aligns closely with the 19,779 MW allocation in Draft IRP 2024/25 for that period.

Looking ahead, the TDP 2024's moderate-to-high growth scenario is considered the most likely, with projected peak demand rising from 43 GW in 2034 to 52 GW by 2050. Total generation capacity is expected to increase from 66 GW in 2024 to 107 GW by 2034, driven by rapid uptake of wind, solar, and Battery Energy Storage Systems (BESS). Of the estimated 41 GW of new generation expected from variable renewable energy and storage, approximately 14.77 GW is projected to come from wind, based on its current share (36%) of renewable energy in the generation mix.

3.2 Identification framework

The risk identification framework took three tightly choreographed steps. Step one was a value-chain scan greenfield siting → procurement → construction → operation → de-commissioning. To map out pinch-points on the same critical-path timetable that developers need to perform to get the 69–76 GW of wind capacity planned into the new draft IRP 2024 and so to provide recommended fixes exactly where they are needed the most.

Secondly, all stages were stress tested with an overlay of Policy, Economic/financial, Social, Technological, Legal, Environmental (PESTLE). This is to ensure that economy-wide bottlenecks such as the R350 billion transmission funding gap identified in Eskom's Transmission Development Plan 2025–34 and market commentary in recent times are accommodated even when outside the control of one project – see Figure 19 next.

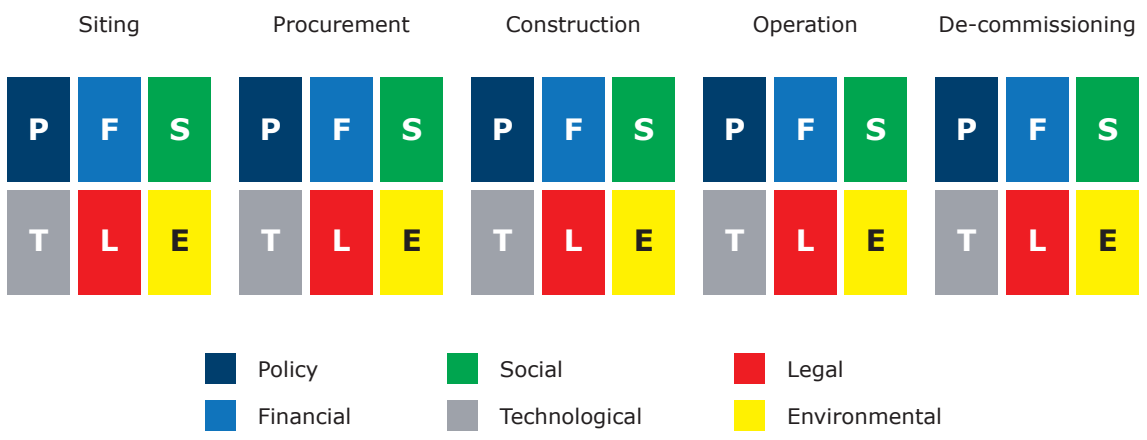


FIGURE 19 Wind Project Value-Chain with PESTLE value tags[23]

23 Generated by the author

Third, each risk is assigned High/Medium/Low based on four public sources of evidence, namely the IRP draft report, Eskom TDP 2025–34 figures, REIPPPP performance reports up to Q4 2023/24, and recent industry or media briefs. This is to ensure that scoring is transparent and can be audited without the use of closed-room stakeholder "votes" or uninterpretable heat-maps.

3.3 Risks and challenges

The outcome of the risk management framework shows that risks range from high, high-medium and medium – refer to Annexture B for more details. Along the risk areas, the risk profile is as follows:

i. **High:** Policy & regulatory misalignment; Financing & investment risk; Procurement & route-to-market uncertainty; and Transmission grid access & integration.
ii. **High – Medium:** Permitting & project implementation; and Supply-chain & logistics bottlenecks.
iii. **Medium:** Localization & industrial-policy tension; and Skills-development gap.

The PESTEL mapping shows that risks cut across the 6 PESTEL themes – see table in Annexture B.

3.4 Risks and challenges contextualization

This section summaries risks and challenges along the 8 themes and provides actional recommendations, the detailed study of risks and challenges can be found in Annexture C.

3.4.1 Policy and regulation

Key risks and challenges in policy and regulation are:

i. Infrastructure growth is ahead of regulation
ii. Regulation lagging technological progress – i.6 MW certification while 8–10 MW turbines are already in the market.
iii. Regulatory uncertainty causing price increase.
iv. Approvals through regulatory authorities are double those in OECD countries.

3.5 Risks and challenges contextualization

A reliable solution to South Africa's policy-and-regulatory misalignment must do two things at the same time: hard-wire accountability down the chain of permitting and pin the technical ruleset to a predictable, time-boxed update cycle. To begin with, Cabinet should create a Presidential Energy Delivery Unit (EDU) that reports to the National Energy Crisis Committee (NECOM) and is legislatively required to issue binding timelines for all permits or licenses issued by DMRE, DFFE, NERSA and Eskom/NTCSA.

The idea is already highlighted in the UK-supported Just Energy Transition Partnership (JET-P) leaders' report and in the 2023–27 Presidency's JET-IP, both of which demand a single delivery authority and digital "one-stop" portal to reduce red tape. The enabling Act must contain a "deemed-approved" provision – if an agency fails to meet a deadline; the application automatically advances – along with quarterly public scorecards, so delays are immediately apparent to investors.

Secondly, the technical codes must keep pace with ever larger turbines and a liberalizing market. NERSA must gazette the new Grid Code for ≥ 6 MW machines in Q1 2026 and introduce an 18-month compulsory review cycle in the Draft Market Code released for comment in April 2026. Time-bound periodic updates cut the "regulatory fog" premium that panel studies by global researchers assign a 0.3–0.6-percentage-point drag on renewable-capacity expansion each year. To anticipate future bottlenecks, the code must also automatically recognize IEC-certified turbine types and route minor parameter tweaks to a standing technical committee, rather than ministerial approval.

What SAWEA can do:
Regularly report the impact of policy-and-regulatory misalignment, and advocate for accountability.

3.5.1 Financing and investment

Key risks and challenges in financing and investment are:

i. High cost of capital of 11–13% is double that of European markets[24].
ii. Currency risk dominates due to rand volatility.
iii. Development finance institutions funds are too low finance the projected wind build.

24 Clean Air Task Force (2024) *Evaluating the Weighted Average Cost of Capital in the Power Sector of African Countries*.

Freeing the ≈ ZAR 500 billion[25] of debt a 69–76 GW wind fleet will ultimately require depends on two complementary steps: widening the domestic green-bond pipeline and overlaying it with specially designed blended finance backstops. South Africa's labelled-bond market has demonstrated investor appetite – cumulative issues had reached ZAR 20 billion by 2024, even if average ticket sizes have reduced as balance-sheet headroom at local institutions has contracted.

National Treasury's newly released Sustainability-Linked Bond (SLB) framework, released together with the 2025 Budget, offers IPPs a ready-made disclosure template, but will only mobilize volumes if followed by incentives to broaden the buyer base. Two key mechanisms can be used: (i) facilitating project enterprises and yield-co issuers to issue securities under the Sustainable Linked Bond (SLB) mechanism, and (ii) modifying the Income Tax Act to exempt withholding tax on interest to foreign climate-bond investors who hold the instruments for a minimum of five years – replicating exemptions for royalties.

ASISA market association modelling suggests that these changes – combined with clearer IRP-linked use-of-proceeds language that is less uncertain – could increase yearly green-bond issuance to ≈ ZAR 100 billion by 2030, which is enough to finance about 8 GW of new wind at prevailing capex ratios. But a larger bond pool by itself will not necessarily reduce the risk premiums associated with exchange rate exposure and Eskom's sub-investment-grade rating. That requires a blended-finance facility that can sit below commercial lenders and absorb first-loss risk in rand. Government can seed a R 15 billion platform by channel-partnering the World Bank's US$1 billion Development-Policy Loan for the power sector (approved October 2023) and the African Development Bank's Sustainable Energy Fund for Africa (SEFA), which already has catalytic equity and debt windows for renewables.

If a third of that pool is retained as subordinated, local-currency tranches, senior lenders' risk would be adequately buffered to lower the weighted average cost of capital by 200–300 basis points – a spread reduction scholars and DFIs identify as conclusive to crowding in private capital to emerging-market clean-energy projects. At present turbine prices, a 250 bp means ≈ R 12/MWh off the levelized cost of energy, retaining wind's tariff edge even in a weak rand.

What SAWEA can do:

Facilitate secondment of technical personnel from SAWEA members to the World Bank-Treasury steering committee to ensure the blended-finance platform term-sheet aligns with cash-flow realities of projects (e.g., 18-month construction drawdowns and stepped-down coverage during operations). The objective is to help bridge the information and knowledge asymmetry among key stakeholders.

25 National Presidency 2023, *Just Energy Transition Implementation Plan 2023–27, p. 38,* https://justenergytransition.co.za/wp-content/uploads/2024/10/JET-Implementation-Plan-2023-2027-1.pdf

Bottlenecks in procurement are, at their root, information and risk-allocation failure.

3.5.2 Procurement and route-to-market

Key risks and challenges in procurement and route to market are:

i. Grid capacity holding back wind energy deployment. i.e BW6/7 reallocation to solar.
ii. Investor confidence significantly reduced for future wind energy projects.
iii. Irregularly timed tender schedule delaying localization advances.
iv. Momentum lost could only add to further delays

Bottlenecks in procurement are, at their root, information and risk-allocation failure – problems that can be fixed only by restoring a transparent, rules-based pipe and insulating bidders from exogenous cost shocks. Publish a rolling five-year REIPPPP timetable: Brazil's renewables regulator auctions at least three times a year on a rolling multiyear basis, providing OEMs and lenders with clear demand visibility and allowing local factories to amortize re-tooling costs. DMRE needs to move by gazetting, every January, the subsequent five bid windows (capacity tranche, technology split, bid-submission date, and financial-close deadline). There would be a standing "variations log" where slippage would be noted, thereby making schedule risk transparent and hence bankable.

Hedge construction-period inflation using CPI-X indexation: The 2022–24 commodity boom shredded wind margins as REIPPPP tariffs are fixed from the time a bid is awarded to commercial operation. Chile solved the same problem by incorporating a CPI-minus-X escalator in its price-stabilization law for auction contracts; thus bids are not affected by steel or freight price spikes. Back-testing by researchers proves the mechanism cut bid withdrawals by 40%. South Africa needs to replicate the formula – cap increases at headline CPI minus an efficiency factor (X) and apply it on autopilot until the project hits the PPA start date.

Ring-fence grid capacity and make it available along with every RFP: Bid Window 6 failed for wind because Eskom's Cape corridors were oversubscribed, and capacity rights were auctioned on a first-come first-served basis. The NTCSA ought to hold back a preestablished megawatt tranche of reliable grid capacity per auction and release a reconstituted Generation Connection Capacity Assessment concurrently with the posting of its RFP. Projects that drop out during this timeframe would lose their place in the queue, deterring speculative "land grabs" and coordinating grid access with procurement schedules.

What SAWEA can do:
Undertake benchmarking and advocacy, effectively serving as a watchdog on behalf of members and South Africans to ensure compliance on planned allocation.

3.5.3 Transmission

Key risks and challenges in transmission are:

i. Transmission access is a bottleneck. i.e. Northern and Western Cape "green corridors" are fully saturated
ii. Transmission build is expensive and must happen quickly
iii. Eskom does not have the balance sheet for transmission build capital requirements
iv. TDP 2025–2034 and IRP 2024 are misaligned on capacity projections timing.

The Final IRP 2025 strengthens the planning treatment of transmission by including grid planning as a dedicated component of the electricity planning framework. This confirms this report's finding that wind deployment is no longer only a generation-capacity issue. It is fundamentally a grid-delivery issue. For wind energy, the availability, location and timing of transmission infrastructure will determine whether planned capacity can be connected, procured and financed within the required timeframes.

Granting access to the grid at the scale and speed the IRP demands will not be met if all risk and finance is retained on Eskom's strained balance-sheet; South Africa must crowd in private capital and multilateral concessional finance.

Legislate a bankable PPP path: Here the priority is to complete the legal unbundling of the National Transmission Company of South Africa (NTCSA) and amend the Electricity Regulation Act to enable NTCSA to sign 20- to 25-year "build–own–transfer" or "build–transfer–operate" agreements with private consortia. Kenya's 400 kV transmission transactions, Loiyangalani–Suswa and the newer Lessos–Loosuk lines, demonstrate that a government-supported, long-tenor PPP can finance pan-African money like Africa 50 and overseas sponsors like Adani to develop and operate grid backbones with ownership remaining with the public off-taker at end-of-term.

Accelerating a corresponding model for South Africa would allow NTCSA to auction discrete corridors (e.g., Koruson–Kling, Upington–Weedbank) without clogging its own borrowing capacity. The board and licences of NTCSA are in position; the only missing link is statutory powers to carry out PPPs for durations extending beyond the present three-year period and to allow lenders step-in rights. Capitalize a R60 billion Transmission Development Fund (TDF): NTCSA's Transmission Development Plan 2025–34 needs about 14 500 km of new 400 kV lines and ≈ R400 billion of capex – five times last decade's line-build. A specialized TDF – seeded with a minimum of R60 billions of first-loss capital from the Just Energy Transition Partnership (JET-P) and South Africa's new sovereign green-bond programme – can crowd in senior commercial debt on more favourable terms.

The update of the JET-P leaders already envisages concessional support for transmission unbundling; the Treasury should allocate part of that envelope to the TDF and permit NTCSA to raise project-based green bonds against it. Global experience indicates the leverage dividend: California's 2024 grid package will invest US$6.1 billion to unlock 38 GW of new solar and offshore wind – about 6 GW per US$1 billion expended – and IEA statistics demonstrate that backlogs of over 3 000 GW are queued up worldwide for access to transmission. With that ratio, a fully funded TDF would allow 15–20 GW of South African renewables and preserve the IRP wind schedule in its entirety.

What SAWEA can do:
Advocate for strict adherence to the TDP schedule and the allocation of capacity for planned wind projects of the 69–76 GW.

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3.5.4 Permitting

Key risks and challenges in permitting are:

i. Long permitting process through multiple stakeholders. i.e. Can take 18–24 months.
ii. High cost of EIA. i.e. As much as R6 million for utility scale project.
iii. Permitting delays are priced as risk, adding to overall project cost.
iv. Misalignment between REIPPP and National Biodiversity Offset Guideline

Permitting delays will keep on stretching out project timelines until South Africa changes today's ad-hoc fast-track patchwork into an up-front community-consent-baked and zone-based system that is predictable. South Africa already has the legislative mechanisms: the Renewable-Energy Development Zones proclaimed in terms of section 24(2) of NEMA and the associated "Strategic Transmission Corridors". Projects that are wholly contained within the polygons could be founded on a Basic Assessment rather than a full EIA, cutting down paperwork to ≈ 60 days and omitting most specialist studies.

In 2024, 214 renewable-energy EIAs were accelerated by the Department of Forestry, Fisheries & the Environment (DFFE) under this model, which demonstrates that the model is feasible. Yet only three of the nine high wind resource provinces have REDZ coverage, and the transmission-corridor notice that would cover the Northern Cape spine has been in draft for more than a year. It is recommended for DFFE to do the following:

i. Gazette a third-round REDZ map covering the entire Cape/Namakwa wind belt and issue the long-awaited corridor notice prior to Q4 2025. Concurrent amendments to the Environmental Management Instrument Regulations can provide that any project within a gazetted REDZ automatically triggers the 60-day basic assessment. Speed alone will not terminate appeals; social agreement needs to be locked in early. Comparative research on wind developments in Europe and Australia indicates that projects with formal benefit-sharing or equity-participation arrangements experience approximately 35–40% fewer permit appeals compared to projects that provide statutory mitigation payments only.
ii. Develop a Community-Benefit Agreement (CBA) – defining either a royalty, a community-trust equity stake or an annual dividend – as a prerequisite for the basic-assessment route. Standardized CBA templates, published alongside the REDZ map, will enable developers to conclude negotiations before they make their environmental application, thereby de-risking litigation.

What SAWEA can do:

Undertake research and advocacy aimed at reducing permitting timelines. This may include convening workshops with key stakeholders and producing policy briefs to inform and educate the broader public.

3.5.5 Supply chain and logistics

Key risks and challenges in supply chain and logistics are:

i. Transport and port infrastructure not designed for 6-plus MW turbines.
ii. The need to speciality transport to move from port to wind farm.
iii. Demurrage and storage costs currently contributing 3–4% to engineering-procurement-construction (EPC) costs.
iv. Developers lengthen construction timelines to hedge against the risk of road closure.
v. The poor state of logistics and supply chain frictions have implications for OEMs to localize.

Oversized equipment is already straining South Africa's transport backbone, so the route-to-site must be reinforced as meticulously as the grid itself. South Africa's next-generation turbines are equipped with 80- to 82 m blades and 70-plus-ton nacelles; one Nordex cluster alone being moved from Ngqura to the Northern Cape requires 550 abnormal-load movements spanning 550 km, with all of them being escorted overnight because the N10/N12 bridge clearances and turning radii were planned for 40 m blades. Every convoy that inches down Cradock or De Aar roads nowadays takes up police escorts, holds up traffic in both directions and inflates project budgets by 3–4% through demurrage, diversions and specialist trailer hire, Green Cape's 2025 market-intelligence survey of EPC contractors' states. Yet Transnet's port-modernization initiative continues to spend most of the capital on container-handling cranes and leaves heavy-lift quaysides – where nacelles and blades must roll directly onto SPMTs – chronically short of bearing capacity.

Barring a special upgrade, Port of Ngqura and Saldanha will hit their project-cargo limits years before the IRP wind curve crests. The following recommendations are suggested:

i. Ring-fence R6 billion in Transnet's port-modernization programme for heavy-lift quaysides at Ngqura and Saldanha. Transnet's own "Reinvent for Growth" capital plan already recognizes "project-cargo berths" as shovel-ready; providing them with a dedicated capex line and performance metric will enable the Treasury to track spend and release multilateral co-finance earmarked to energy-transition logistics. The addition of 1 000 t/m² load-bearing aprons and rail-mounted 600-t cranes would decrease berth times for turbine vessels by 30–40%, abolish demurrage and give OEMs the confidence to pre-position stocks.
ii. Instruct SANRAL to bypass or expand the five bottleneck bridges on the N10/N12 abnormal-load corridor by 2027. These spans have already been pinpointed by the agency in its 2024 Bridges & Interchanges audit; assigning some of the Strategic Infrastructure Programme budget to grade-separate the most constraining turns and raise parapets will enable 90-m blade trailer vehicles to move in daylight convoys, halving escort expenses and local disruption.

iii. Offer a sector-specific localization incentive for 80 m-plus blades. Green Cape's 2025 Large-Scale Renewable-Energy Market Intelligence Report proposes a 15% refund on import duties on blade-moulds and root-studs to any OEM that makes a commitment to an ocean-side factory with a capacity of >250 blades / year. In combination with the upgraded quaysides, the refund would save approximately R7 million on each set of moulds and place South Africa into competitive landed-cost parity of Brazilian or Turkish factories.

What SAWEA can do:
Conduct research and advocacy to inform infrastructure investment and upgrades necessary to support wind energy projects pipeline.

3.5.6 Localization and industrial policy

Key risks and challenges in localization and industrial policy are:

i. Local capacity remains narrow and geographically imbalanced.
ii. Mismatch between local manufacturing capacity and projects requirements.
iii. Rising local content requirements not supported by local capacity and will only add to cost schedule overruns.
iv. Local capacity development requires stable and predictable pipeline of projects.

Local content rules must change from being extremely basic to becoming an advanced industrial tool. The draft chapters of SAREM lay out the 70% level of local procurement for main turbine components and 90% for balance-of-plant expenditure as annual construction capacity grows from 3 GW as it stands today to 5 GW by 2030. But REIPPPP tower, nacelle and blade thresholds are already at 40% and have increased with each bid window without improving pipeline visibility; on-the-ground research during Bid Window 4 saw developers achieving the tower target via GRI's Atlantis factory but still importing the majority of blades and generators owing to low volumes and thin working-capital buffers rendering local production uncompetitive. Driving demand ahead of secured demand threatens to repeat the stop-start cycle that SAWEA contends "severely damaged meaningful momentum" in 2015–20.

DMRE and the dtic need to publish a joint schedule that only raises local-content floors when Masterplan capacity milestones are contractually secured.

The following recommendations are suggested:

i. Phase thresholds in lockstep with SAREM's build curve. DMRE and the dtic need to publish a joint schedule that only raises local-content floors when Masterplan capacity milestones are contractually secured: e.g., hold the 40% floor until Bid Windows 7–8, then rise to 50% once the program has awarded a cumulative 10 GW, then to 60% after 15 GW. This is consistent with motor policy: the Automotive Production & Development Program (APDP) postponed more advanced bands of localization until OEMs could see through to sustained volumes – a staged process which doubled domestic value addition over 2013 to 2021.

ii. Capitalize a R3 billion Supplier-Development Fund. Using surplus Industrial Development Corporation (IDC) liquidity and DTIC's Competitiveness Enhancement budget, the state can create a fund that provides working-capital guarantees and technical-assistance grants to Tier-2 and Tier-3 fabricators (flanges, bolt cages, resins). The model replicates the APDP's component rebate scheme, which facilitated tooling finance and catalysed a four-fold expansion of local component manufacturing. A R3 bn first-loss pool would cause commercial banks to crowd in an additional ±R10 bn of supplier credit – more than enough to cover two blade-mould lines, a single nacelle assembly hall and some bolt-on part shops, closing the gap that otherwise requires imports.

What can SAWEA do:

Conduct research and advocacy to support the development of local component manufacturing or assembly, including recommendations on policy instrument and incentives for successful localization.

3.5.7 Skills development

Key risks and challenges in skills development are:

i. High unemployment is characterized by shortage of certain speciality skills.
ii. 3,500 qualified turbine technicians and grid-integration engineers will be required by 2030 to adhere to the IRP construction trajectory.
iii. Businesses typically invest six months of earnings operating at a loss as they attempt to employ or transport experts from Europe and Asia.
iv. Operation and maintenance contracts at a premium price of 15–20% above the European average to compensate for expatriate premiums and standby losses.

The Final IRP 2025's confirmation of the post-2030 wind build makes skills development more urgent, not less. A larger long-term wind allocation will require a sustained pipeline of turbine technicians, grid-integration engineers, project managers, environmental specialists, logistics coordinators and operations-and-maintenance workers. If skills development is delayed until procurement accelerates, the sector may face shortages precisely when the build programme needs to scale most rapidly. Skills planning should therefore be treated as an implementation enabler for the Final IRP 2025 wind trajectory, rather than as a secondary labour-market issue.

Shutting South Africa's future wind-skills deficit needs a three-pronged push: scale JET-SEP from pilot to industrial, inject dual apprenticeships into turbine OEMs/TVET colleges, and tilt the tax code so it is cheaper for companies to train locals than import skills. The National Business Initiative's "Powering Futures" baseline suggests the IRP build-out will need ≈3 500 additional qualified turbine technicians and grid-integration engineers by 2030 – over eight times the existing annual graduate stream.

Yet the Just Energy Transition – Skills for Employment Program (JET-SEP) is still in Phase 1, with curriculum design for <200 students and just three pilot colleges. The longer ramp-up period is already affecting bottom-line performance: a Reuters survey of African renewable energy companies reveals that developers stand to lose as much as six months' revenue recruiting or importing experts from overseas. This warning is replicated in the International Energy Agency's 2023 World Energy Employment report, which pronounces "severe technician bottlenecks" an increasingly costly determinant of clean technology projects worldwide. The following recommendations are suggested:

i. **Action 1:** Expand JET-SEP nationwide. Ring-fence R1 billion worth of JET-P technical-assistance funds and Skills Levy receipts to enable 3 500 apprenticeships (NQF 4–5) throughout all nine provinces by 2030. The money must flow on a per-learner, per-placement basis – following the German Energiewende Ausbildung model, where state vouchers supplemented by OEM wage top-ups cut wind-technician shortages by half within four years.

ii. **Action 2:** Introduce compulsory dual apprenticeship programs. Amend the REIPPPP economic development scorecard to require every successful IPP and EPC contractor to place at least one dual-system apprentice per 10 MW of contracted capacity, trained by an accredited TVET college in partnership with an OEM service hub. The German dual VET system is the template: companies alternate students between classroom and workplace, accelerating certification and enhancing retention. Clean Energy Wire analysis determines this system increases completion rates and slashes vacancy backlogs by >40%.

iii. **Action 3:** Implement a 200% training-tax deduction. Reintroduce the Section 12H learnership incentive – extended to 2024 in SARS guidance – but enlarge it for the energy transition: offer IPPs and EPCs double deduction (200%) on all accredited wind-O&M spend, up to R150 000 per learner. The same deduction for PV installers during 2016–20 raised the sector's accredited workforce threefold, industry tax-compliance data and SARS' solar-training rebate programme reveal.

What SAWEA can do:

Facilitate apprenticeship MOUs between OEMs and TVETs colleges to strengthen the skills base required for the wind energy projects pipeline. Leverage these agreements to engage National Treasury for the Section 12H "green-skills boost", supported by a cost–benefit report demonstrating that the tax deduction is offset by VAT and PAYE revenues from local employment

04 Key findings and interventions

4.1 Key findings for the wind energy sector

The gazetted IRP 2025 broadly confirms the Draft IRP 2024 wind trajectory, with wind remaining central to South Africa's future electricity mix. The key change is not a reduction in ambition, but the formalisation of the plan and the shift from draft-stage advocacy to implementation accountability. Wind therefore remains one of the most important technologies in South Africa's future electricity planning framework, but the strategic challenge is now whether the planned capacity can be delivered through credible procurement, grid expansion, financing, permitting and skills development.

The 2025–2030 wind allocation remains below IRP 2019, despite the much larger long-term allocation. This makes procurement continuity and early grid preparation essential. While the long-term wind pathway points to a historically significant expansion, the near-term build programme remains weaker than the previous planning framework. This creates a risk that the sector may face a delayed ramp-up, where too much capacity is pushed into the post-2030 period without sufficient early preparation of the grid, supply chain, localisation base and workforce.

The IRPs confirms that wind energy is no longer constrained mainly by technology availability or resource quality. South Africa has strong wind resources, especially across the coastal and interior wind corridors, and the technology is mature, scalable and increasingly cost competitive. The more binding constraint is the ability of the electricity system to absorb, transmit and balance large volumes of wind power. In this context, grid access, transmission expansion, system flexibility and power-system operations have become decisive implementation issues.

Transmission remains the central bottleneck for wind deployment. The planned wind build cannot be achieved unless new transmission infrastructure is delivered at the required pace and in the right locations. This is particularly important in high-resource wind provinces such as the Western Cape, Eastern Cape and Northern Cape, where available connection capacity is already constrained. Without accelerated grid investment, the wind allocation in the Final IRP 2025 risks remaining a planning commitment rather than an executable investment pipeline.

Supply-chain and logistics constraints are becoming more important as turbine technology scales up.

Financing is achievable, but the cost of capital remains a major barrier. South Africa's relatively high weighted average cost of capital for utility-scale renewables weakens the tariff advantage of wind, even where technology costs continue to fall. Rand volatility, Eskom-related credit risk, policy uncertainty and shallow domestic project-finance markets increase investor risk premiums. This means that wind deployment will require stronger financial de-risking instruments, blended finance, green bonds, currency-risk mitigation and more predictable procurement schedules.

Stop-start procurement has weakened investor confidence and disrupted the development of a stable project pipeline. Bid Window 6 demonstrated that wind procurement cannot be separated from grid availability and queue management. Future procurement rounds must therefore be linked to confirmed grid capacity, transparent connection rules and a rolling auction timetable. Procurement continuity is also essential for localisation, because local manufacturing investment depends on predictable demand over several years.

Permitting and environmental approvals remain a significant source of delay. Although the One Environmental System and renewable-energy development zones provide a basis for faster approvals, projects still face delays linked to appeals, biodiversity requirements, land-use approvals and sequential permitting processes. These delays can push projects beyond bid-validity periods and raise project costs. Faster, better-coordinated permitting will therefore be essential if the wind build pathway is to be delivered on time.

Supply-chain and logistics constraints are becoming more important as turbine technology scales up. Larger turbines, longer blades and heavier nacelles require specialised port, road, bridge and abnormal-load infrastructure. Existing constraints at ports such as Ngqura and Saldanha, together with road-transport bottlenecks, can add costs and delays to wind projects. This means that wind implementation requires not only energy-sector planning but also coordinated investment in logistics infrastructure.

Local-content requirements must be aligned with real manufacturing capacity. South Africa's current wind manufacturing base remains narrow, with limited domestic production of key components such as blades, nacelles and specialised electrical equipment. If localisation requirements rise faster than domestic capacity, they may increase project costs and delay implementation. A more effective approach would link local-content thresholds to a stable procurement pipeline, supplier-development finance and targeted industrial-policy support.

Skills development is an urgent implementation requirement. The confirmed post-2030 wind build in the gazetted IRP 2025 will require a significantly larger pool of turbine technicians, grid-integration engineers, project managers, environmental specialists, logistics coordinators and operations-and-maintenance workers. If the skills pipeline is not expanded early, shortages may emerge precisely when the wind programme needs to scale most rapidly. The just-transition benefits of wind energy will also be weakened if local workers are not trained in time to participate meaningfully in the sector.

Taken together, these findings show that the central issue is no longer whether wind has a role in South Africa's electricity future. The gazetted IRP 2025 confirms that it does. The real test is whether megawatts on paper can be converted into projects on the ground through grid steel, bankable auctions, de-risked capital, coordinated permitting, capable institutions and a sufficiently skilled workforce.

4.2 Proposed key interventions

To overcome these disparities, an integrated effort across eight key levers is required, with each lever carefully aligned with the constraints identified above and with the respective actions discussed in Section 3.5. The publication of the gazetted IRP 2025 does not change the substance of these interventions. Rather, it makes them more urgent, because implementation now needs to shift from planning commitments to delivery of the wind build pathway.

Policy and regulation – gazetted IRP 2025 implementation require policy certainty, stronger institutional coordination and a more predictable regulatory framework. Within the next 18 months, a Presidential Energy Delivery Unit should be established with the power to issue binding timelines, apply "deemed-approved" provisions for delayed licences and permits, and publish the ≥6 MW Grid Code update on a rolling 18-month revision timetable. The biennial IRP review cycle should also be restored and applied to gazetted IRP 2025 implementation so that technology costs, demand assumptions, grid availability, Eskom's EAF, private generation and climate-policy commitments are regularly updated. In the medium term, contradictory land-use and energy-planning rules should be consolidated into a single clean-energy planning framework to improve planning certainty. The TDP should also be reviewed to ensure alignment with the Final IRP 2025 wind trajectory.

Financing and investment – gazetted IRP 2025 implementation require a financing framework capable of supporting large-scale wind and transmission investment. The removal of withholding tax on green-bond coupons for foreign investors should be prioritised to deepen the investor base. In addition, the proposed R60 billion blended-finance Transmission Development Fund should be seeded with first-loss capital to crowd in commercial lenders and reduce the pressure on Eskom and the NTCSA balance sheet. As the grid balance sheet becomes more stable, the fund could be refinanced into a self-financing yield-co structure able to access long-term capital from local pension funds and institutional investors.

Procurement rhythm – A rolling five-year REIPPPP schedule should be released, with clearly defined capacity tranches, bid-submission dates, financial-close deadlines and ring-fenced grid-connection time slots. PPAs should also include a CPI-X inflation hedge to protect real tariffs during the construction period. A stable 5 GW per year wind build should be pursued as a corrective to the uneven Final IRP 2025 build path, since predictable procurement is essential for investor confidence, localisation, supply-chain planning and skills development. In the late 2020s, capacity auctions can then be gradually transferred into the emerging day-ahead market on the back of the NTCSA.

Transmission build-out – Transmission expansion must be treated as the central delivery condition for gazetted IRP 2025 implementation. Public-private partnerships should be expedited for strategic 400 kV corridors, including Koruson–Kling and Upington–Weedbank. The legal unbundling of the NTCSA should be completed in a manner that enables long-term build-own-transfer or build-transfer-operate agreements with private consortia. Future offshore-wind corridors should also be incorporated into TDP-2040. Without this transmission build-out, the wind allocation in Final IRP 2025 risks remaining a planning target rather than an executable investment pipeline.

Facilitating efficiency – Renewable Energy Development Zones should be scaled up so that initial evaluations for qualifying projects are completed within 60 days. This should be supported by a national e-permitting portal with real-time dashboards showing application status, responsible agencies and outstanding approvals. Reforming IGCAR should remain a priority so that grid connection, environmental authorisation, water-use approvals and land-use permissions are better coordinated. In the medium term, a biodiversity-banking system should be introduced to allow credible net-gain offsets while reducing project-by-project delays.

Supply chain and logistics – The N10/N12 routes should be declared Strategic Abnormal Corridors, with dedicated funding for lay-bys, bridge modifications, road widening and abnormal-load management. Ports must also be upgraded to support larger wind components. Ngqura and Saldanha should each receive at least 20 hectares of additional lay-down space, together with heavy-lift quay capacity and specialised handling infrastructure. An IDC-supported long-term leasing programme can help localise heavy-lift cranes and self-propelled modular-transporter fleets, reducing logistics costs and improving the bankability of wind projects.

Localisation and industrial policy – Local-content requirements should be phased according to South African Renewable Energy Masterplan milestones rather than imposed ahead of genuine manufacturing depth. For example, thresholds should increase from 40% to 50% only after at least 10 GW of cumulative capacity has been awarded and there is evidence of sufficient supplier capability. The proposed R3 billion Supplier Development Fund should be retained to support tooling finance, working-capital guarantees and technical assistance for local component producers. Regional component hubs should also be developed, including Western Cape blades, Northern Cape towers and Eastern Cape nacelles.

Training opportunities – JET-SEP should be expanded to support 3,500 apprentices through dual OEM-TVET placements, with at least one apprentice per 10 MW mandated in future bid windows. A 200% training-tax allowance should be applied for participating IPPs, EPC contractors and OEMs to make local training more attractive than importing scarce skills. A National Wind Centre of Excellence should also be established by 2030 to coordinate O&M research, technician certification and curriculum development.

Sequencing matters. Policy certainty and grid finance at the outset unlock investment; timely auctions provide orders to factories and logistics corridors in good time; and only then will skills programmes and localisation targets deliver their full economic and social returns. Final IRP 2025 therefore requires more than a confirmed wind allocation. It requires an implementation system capable of converting planned megawatts into grid-connected projects, local industrial capacity and decent jobs.

05 Concluding remarks and further research

The gazetted IRP 2025 does not invalidate the Phase I report. Instead, it confirms many of its core findings. The central shift is that wind-sector advocacy must now move from influencing a draft planning document to ensuring delivery of a final planning framework. The key question is no longer only whether wind energy is recognized in the IRP, but whether the institutional, financial, grid, procurement and skills systems can convert the plan's wind allocation into grid-connected projects.

The major difference between Draft IRP 2024 and gazetted IRP 2025 is not simply that one was a draft and the other is final and gazetted. The deeper difference is that Draft IRP 2024 was largely a scenario-testing and consultation document, while gazetted IRP 2025 provides a more formal and integrated electricity planning framework. It strengthens the treatment of grid planning, flexibility, power-system operations, committed public and private generation, and alignment with South Africa's Nationally Determined Contribution. In this sense, gazetted IRP 2025 gives stronger planning coherence to the electricity transition.

However, the main implementation risks identified in this report remain unresolved. Transmission constraints continue to be the central bottleneck for wind deployment, especially in high-resource wind corridors. Procurement uncertainty, grid-access rules, permitting delays, financing costs, logistics bottlenecks, localisation constraints and skills shortages remain serious risks to the timely delivery of the wind build pathway. Gazetted IRP 2025 therefore confirms that the challenge is not only about planning ambition, but about implementation capability.

The report has proposed an eight-point action plan to address these risks across policy and regulation, financing and investment, procurement and route-to-market, transmission, permitting, supply chain and logistics, localisation and industrial policy, and skills development. These interventions remain relevant under gazetted IRP 2025, but their framing must now shift from improving the draft plan to support implementation of the final plan.

Further research should validate the proposed eight-point action plan through consultation with key stakeholders in the wind energy sector, including SAWEA members, IPPs, OEMs, financiers, NTCSA, Eskom, DMRE, NERSA, DFFE, logistics actors, skills institutions and local manufacturers. The outcome of this further work could take the form of a SAWEA position paper focused on implementation accountability, with clear recommendations on procurement sequencing, grid delivery, investment mobilisation, localisation, and skills development under gazetted IRP 2025.

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07 Annexures

ANNEXURE A – Total Capacity Allocations by Scenario in Draft IRP 2024

	Reference Case	Reference Case with No Committed Gas Build Plan Aggressive BESS	Nuclear Scenario Build Plan	Optimistic Battery Learning Build Plan	Delayed Shutdown Build Plan	Balanced Plan
	A	B	C	D	E	F
2025–2030						9 079
2031–2035	17 479	16 888	16 718	17 435	20 263	13 700
2036–2040	22 281	22 128	22 471	20 453	10 264	15 000
2041–2045	20 535	20 502	17 826	20 682	15 983	7 000
2046–2050	16 141	16 341	13 858	15 700	23 053	
Totals	**76 436**	**75 859**	**70 873**	**74 270**	**69 563**	**44 779**

ANNEXURE B – Risks and Challenges

Reading any column tells the following:

i. What could go wrong from policy volatility to grid constraints,

ii. Why it happens, and

iii. How not resolving it would postpone or raise the price of the build program.

TABLE A8 Risks and challenges

Risk / challenge area	Severity*	Principal root causes	Likely implication for IRP-2024 roll-out if unresolved
Policy & regulatory misalignment	**High**	• Fragmented legislation and intersecting mandates of DMRE, DFFE, NERSA and Eskom give rise to conflicting approval paths. • Grid-code revision for ≥ 6 MW turbines remain in draft, delaying type certification. • Concurrent land-use, heritage, and biodiversity laws pull projects into multiple permitting streams.	• Developers build policy-risk premia into tariff bids, inflating prices. • Longer, more uncertain permitting chains push projects beyond bid-validity windows, jeopardizing financial close.
Financing & investment risk	**High**	• The South African green-bond market is thin and illiquid; issuances are short-dated in nature. • Eskom's tainted balance-sheet limits sovereign guarantees, pushing long-tenor project debt off balance-sheet. • Rand volatility and perceived political-economy risk add to lenders' margins.	• Higher cost of capital lengthens payback periods and lowers IRR, causing many IPPs to defer or cancel bids. • MW additions fall short of the 69–76 GW target, pushing decarbonization milestones beyond 2030.
Procurement & route-to-market uncertainty	**High**	• Stop-start REIPPPP cadence; Bid Window 6 cleared no wind because Cape grid caps were hit. • Bid schedules change with every IRP revision, making OEM production planning more complex. • Tariff indexation formulae lag recent inflation peaks, distorting bid economics.	• Developers postpone bid preparation; OEMs freeze localization investments. • Pipeline visibility collapses, making it impossible to contract balance-of-plant suppliers at scale.
Transmission grid access & integration	**High**	• There is only ±3 GW of spare capacity in the coastal renewable corridors. • Eskom TDP 2025–34 is for ~14 500 km of new 400 kV lines and ~R 400 bn capex, but no money is budgeted. • Long lead-times for environmental and way-leave consents and fresh servitudes.	• Shovel-ready projects cannot connect; curtailment risk rises above bankable thresholds. • The IRP build schedule slips, forcing DMRE to procure costly emergency capacity.

Risk / challenge area	Severity*	Principal root causes	Likely implication for IRP-2024 roll-out if unresolved
Permitting & project implementation	**Medium-High**	• Environmental Impact Assessments still take on average 18–24 months notwithstanding the "One Environmental System.". • Wind-rich areas overlap with high-biodiversity "no-go" zones; court challenges by environmental organizations are common. • Local community resistance arises where benefit-sharing mechanisms are unclear.	• Approval timelines extend beyond bid-validity periods; lenders add contingency margins to cover delay risk. • Escalating interest during construction raises the level of cost of energy (LCOE).
Supply-chain & logistics bottlenecks	**Medium-High**	• Rotor-blade lengths now exceed 80m, straining port lay-down areas and abnormal-load corridors (N10, N12). • Limited availability of heavy-lift cranes and self-propelled modular transporters (SPMTs). • Port congestion and rail inefficiencies delay inbound components.	• Delivery windows slip, triggering demurrage and idle-crew costs that inflate EPC budgets. • Schedule overruns erode developers liquidated-damages buffers, deterring further bids.
Localization & industrial-policy tension	**Medium**	• Compulsory thresholds for local content increase more than supplier capability in windy provinces. • Small component manufacturers are limited by low levels and working-capital deficiencies. • Incongruence between DTIC localization policy and DMRE procurement rules.	• Imports continue to dominate nacelles, blades and towers, limiting industrial spillovers. • Projects risk non-compliance penalties or delays while chasing scarce local inputs.
Skills-development gap	**Medium**	• Shortage of qualified turbine technicians, high-voltage jointers, and grid-integration engineers. • Just Energy Transition Skills for Employment Program (JET-SEP) is currently in pilot phase. • Brain-drain offshore to blow winds overseas (e.g., Europe) worsens domestic shortages.	• Higher O&M costs and longer outage durations than global benchmarks. • Local content and job-creation targets under the IRP are missed, weakening public support for renewables.

ANNEXURE C – PESTEL Drivers and Severity Ranking of Key Implementation Risks

For each headline threat, it identifies in one sentence per column the precise Political, Economic/Financial, Social, Technological, Legal/Regulatory and Environmental (PESTLE) forces that generate or drive that threat. Where a cell is empty, the corresponding PESTLE dimension was determined to have minimal impact on that specific peril, indicating to the reader where mitigation effort can be directed elsewhere.

TABLE A9 PESTLE Drivers and Severity Ranking of Key Implementation Risks

Risk / challenge area	Policy & regulatory misalignment	Financing & investment risk	Procurement & route-to-market uncertainty	Transmission grid access & integration	Permitting & project implementation	Supply-chain & logistics bottlenecks	Localization & industrial-policy tension	Skills-development gap
P – Political	Overlapping mandates for DMRE, DFFE, NERSA and Eskom stall decisions.	Sovereign downgrades restrict Treasury guarantees.	Stop-start REIPPPP windows reflect shifting ministerial priorities.	–	–	–	Rising local content floors outpace supplier capacity.	–
E – Economic / Financial	Policy-risk premia inflate WACC and tariff bids.	Thin, short-dated green-bond market plus rand volatility lift spreads.	Mis-indexed tariffs and inflation shocks erode project margins.	R 400 bn funding gap in Eskom TDP blocks new lines.	Delay risk adds 50–75 bps to debt spreads.	Port congestion and demurrage add 3–4% to EPC cost.	Working-capital gaps hobble small manufacturers.	Scarce turbine technicians inflate O&M premiums by 15–20%.
S – Social	–	–	–	–	Community push-back where benefit-sharing is unclear prolongs EIAs.	–	Job promises raise community expectations of local sourcing.	High unemployment but misaligned training delays job creation.
T – Technological	Grid code is still capped at ≤6 MW for turbines, lagging global norms.	–	OEMs lack demand visibility to plan localization.	Coastal corridors saturated; ±14 500 km of 400 kV lines still needed.	–	80 m+ blades exceed road bridge clearances; crane scarcity delays lifts.	–	Dual-apprenticeship model not yet scaled; JET-SEP still pilot phase.
L – Legal / Regulatory	Sequential permits across four departments stretch timelines.	Complex cross-border FX controls deter offshore lenders.	–	Wayleave and servitude rules slow corridor acquisition.	18–24-month EIA plus appeals exceed bid-validity windows.	Abnormal-load permits require multiple authorities and escorts.	DTIC localization rules clash with DMRE's bid scorecard weightings.	–
En – Environmental	–	–	–	New lines must cross sensitive biomes, triggering extra offsets.	Biodiversity offsets under 2023 guideline raise cost & complexity.	Heavy-haul routes cross protected habitats, limiting convoy windows.	–	–
Overall risk rank	High	High	High	High	Med-High	Med-High	Medium	Medium

ANNEXURE D – Risks and challenges detailed study

1. Policy and regulation

South African wind energy infrastructure growth is outstripping the regulations meant to manage it. The Grid Connection Code for Renewable Power Plants draft continues to impose a limit on type-certification processes to 6 MW per turbine even though turbines with 8–10 MW capacity are now the international standard[26]. Through April 2024, the sole update available was an "initial draft for comment," and no release date had been established. Until that revision is enacted, developers can't obtain the bankable certificates commercial lenders and export-credit agencies require, must carry the turbine-technology risk on their own books, and delay financial close. Those delays are passed directly through tariffs[27].

Industry modelling made available to bidders in the REIPPPP Bid Window 6 demonstrates that a 100 basis points rise in the weighted-average cost of capital – driven in large part by regulatory uncertainty – translates to an approximate rise of R12/MWh in the first-year tariff of a 140 MW Karoo-scale project. The policy risk of grid-related policy is already being priced in. Engineering News has cautioned that transmission capacity constraints and uncertain curtailment policy will impose a "renewables price premium" in forthcoming auctions[28].

Allowing piecemeal across these authorities exacerbates the situation. A single wind farm must still seek sequential approvals from the Department of Mineral Resources and Energy (generation license), NERSA (grid-code compliance and tariff approval), the Department of Forestry, Fisheries and the Environment (environmental impact assessment), and the municipal planning authorities (land-use, heritage and biodiversity). According to Green Cape's 2024 Market Intelligence Report, the average duration in negotiating this process currently exceeds two years, which is double the standard in comparable OECD markets[29].

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26 National Energy Regulator of South Africa (NERSA) (2024a) *Draft Grid Connection Code for Renewable Power Plants (Initial draft for comment)*. Pretoria: NERSA.

27 National Energy Regulator of South Africa (NERSA) 2022, *Grid Connection Code for Renewable Power Plants (RPPs) connected to the Electricity Transmission System (TS) or the Distribution System (DS) in South Africa*, Version 3.1, NERSA, Pretoria.

28 Creamer Media 2024, *Engineering News & Mining Weekly*, vol. 44, no. 46, 29 Nov–5 Dec, Creamer Media, Johannesburg.

29 GreenCape 2024, *Large-scale Renewable Energy Market Intelligence Report 2024,* GreenCape, Cape Town.

Additionally, as of April 2024, only two of the twenty-three preferred-bidder projects under Bid Window 6 had signed project agreements, primarily because they did not have the permits that were necessary. The macro environment is no longer benign. A recent multicounty panel study estimates that a one-standard-deviation rise in South Africa's economic-policy-uncertainty index reduces long-run renewable-energy deployment by as much as 0.5 percentage points; investors view successive, unsynchronized IRP revisions as proof of an unsteady playing field and either reduce loan tenors or increase credit spreads[30].

In short, essential market reforms are unfinished. While the National Transmission Company of South Africa (NTCSA) obtained its three licenses from NERSA in November 2024, it lacks legal ring-fencing, which hinders the establishment of binding and transparent rules for queue management and congestion curtailment. In the absence of an independent system operator, the extensive transmission network outlined in the 2025–34 Transmission Development Plan – especially the needed 400 kV backbone for coastal wind power evacuation – is in danger of falling behind the planned delivery of turbines[31].

Short of South Africa aligning its regulatory machinery with Draft IRP 2024's megawatt promises – by expediting the >6 MW Grid Code amendment, enacting a one-stop permitting window, and concluding Eskom's legal unbundling – the headline target of 69–76 GW of new wind will remain aspirational. The price of delay is measurable: higher consumer tariffs, foregone localization opportunity, and a widening credibility gap that will dog every future infrastructure tender.

2. Financing and investment

Financing risk poses the most immediate brakes on South Africa's 69–76 GW wind aspiration. The capital stack that financed previous REIPPPP rounds is no longer sufficiently deep – or sufficiently cheap – to accommodate the scale and rhythm suggested by Draft IRP 2024. South Africa's labelled-bond market captures the bottleneck: cumulative green-bond issuance totalled approximately ZAR 20 billion through early-2025. But the average ticket size has contracted from USD 176 million in the 2013–18 cohort to just USD 113 million for transactions priced between 2019 and 2024, mirroring thinner domestic investor books and increasing risk aversion.

30 Ozkan, C. & Okay, N. 2024, 'Renewable energy, economic policy uncertainty and climate policy uncertainty: new evidence for Environmental Kuznets Curve from emerging and developed countries', *Sustainability*, vol. 16, article 6049, MDPI, Basel

31 Eskom Transmission 2019, *Transmission Development Plan 2020–2029*, Eskom Holdings SOC Ltd, Johannesburg, South Africa.

While Eskom's balance-sheet – despite relief from the Treasury, still bears R400 billions of legacy debt – limits the sovereign's scope for offering construction-period guarantees or low-cost take-or-pay back-stops[32]. Commercial lenders therefore treat the South African IPPs as full merchant-risk propositions and demand longer-tenor, rand-hedged loans; each further layer of hedging adds spread. Forward-looking term-sheets for wind projects that have been viewed by industry experts indicate that wind projects are now facing an after-tax weighted average cost of capital that ranges from 11–13%, roughly double the 4–7% level that recent IEA levelized-cost analysis assumes for European on-shore wind, and well above the continental average that the Clean Air Task Force approximates at something like 15%[33].

Most of that deficit is currency risk: thirty years of rand volatility prompt swap markets to quote a structural 300–400 basis-point premium, and a Financial Times editorial opines that even multilateral attempts at constructing cheaper hedging platforms have yet to move the needle meaningfully[34]. Financial Times The effects transmit through the IRP timeline. Increased WACC increases levelized tariffs by approximately R10–R15/MWh for a standard 20-year PPA, eroding the cost advantage the IRP assigns to wind over new coal or gas; equity investors respond by reducing their bid pipeline or waiting for more merchant-price upside, the same response observed when average bid capacity in Round 6 fell.

In the meantime, the development-finance institutions are trying to fill the gap – witness the EIB and DBSA's new €200 million loan window opened in September 2024 – but such concessional funds are an order of magnitude too small to refinance the R300-plus-billion of debt the whole wind build would have accumulated by 2030. Until policymakers deepen local-currency debt markets (e.g. by allowing pension funds greater freedom to hold infrastructure-related bonds) and operationalize genuine blended-finance structures that socialize currency and offtake risk, most standalone power producers will simply bid off. Each delayed gigawatt takes South Africa's emissions-reduction, jobs and grid-stability ambitions further out of reach – shrinking a headline-grabbing 76 GW aspiration to a paper commitment.

3. Procurement and route-to-market

The well-known REIPPPP of South Africa has seen its steady beat of previously established investor confidence disturbed. After five bid windows with stable capacity allocations, Bid Window 6 (BW6) in 2022 brought a surprise: although 23 applications for onshore wind power with a combined 4.1 GW capacity were submitted, none qualified as preferred bidders when the grid-connection quota in the "Cape Corridor" of the Eastern and Western Cape was exhausted.

32 News24 (2023) 'Budget 2023's big news: Eskom debt, solar tax bonanza and tough choices'.

33 Clean Air Task Force (2024) *Evaluating the Weighted Average Cost of Capital in the Power Sector of African Countries.*

34 Financial Times (2024) 'Time to trim the hedge costs'. *FT View, 4 August.*

All six of the awards were to solar PV instead, leaving the 3 200 MW wind allocation up in the air and sending a clear message that grid risk now trumps price in the evaluation matrix. The zero-wind outcome overlapped with a steep post-Covid surge in global turbine, steel and logistics costs, yet the REIPPPP tariff-indexation formula – still pegged to pre-pandemic 4.5% CPI basis – was unchanged. Industry advisers note that BW6 bidders were no longer required to offer a "full-CPI" escalation provision, creating a margin squeeze that, along with grid uncertainty, pushed weighted-average winning tariffs 8% higher than BW5 levels amid more aggressive competition.

SAWEA cautioned that the irregular operational cadence, along with ill-timed price increases "risks investor confidence" and raises the likelihood that developers will postpone their involvement until a more favourable climate exists. Broken procurement cadence also sabotages the industrial-policy objectives woven into REIPPPP's economic-development scorecard. Turbine manufacturers and balance-of-plant suppliers locate factories only when they can see a clear multi-year volume pipeline; instead, BW6's wind lull forces original-equipment manufacturers to "site-hop" to more predictable markets such as Egypt or Brazil at the cost of depriving South Africa of localization dividends and associated jobs just as the Just Energy Transition Investment Plan targets green-manufacturing growth halls.

Research within the engineering sector attributes the irregularly timed tender schedule to a delay in localization advances, cautioning that each two-year procurement hiatus effectively restarts business-case timelines for suppliers. Barring a reinsertion of predictability in the next rounds – by ring-fencing grid capacity for wind, rebalancing tariff indexation to current inflation and publishing a rolling, capacity-related schedule – the flagship program risks derailing from international best practice to a textbook case of momentum lost, with repercussions that will reverberate through investment flows, local content goals and, ultimately, South Africa's prospects for meeting the 69–76 GW wind target in Draft IRP 2024.

4. Transmission

Transmission access, not turbine technology, is currently the South African binding limit on its 69–76 GW build-out of wind. Eskom Generation Connection Capacity Assessment 2024 maps the Northern and Western Cape "green corridors" as well and fully saturated. The national grid able to take on just 3 GW of incremental firm generation before stability limits are exceeded – one year less than the draft IRP's wind roll-out rate.

To clear the jam, the recently-licensed National Transmission Company of South Africa (NTCSA) has to bring a once-in-a-generation growth. Its Transmission Development Plan 2025–34 requires ≈14 500 km of new 400 kV lines, 133 000 MVA of transformers and approximately R400 billion (≈ USD 21 billion) in capital expenditure – five times the line-build done in the last ten years. That engineering task collides with a funding wall. NTCSA's holding company has a debt book over R 400 billion. While a Treasury relief initiative reduces interest costs, it is not enough to generate capacity on Eskom's balance sheet to support significant increases to transmission or to make the credit-enhanced offtake guarantees that wind developers require.

Investors spoken to for recent Money Web and News24 analyses describe the grid plan as "finance-or-fail": without new capital – either through concessional climate-finance windows, private wire charges or a sovereign-backed surcharge tariff – the upgrade will stall. The on-the-ground implication is grid-queue limbo and increasing curtailment risk. Shovel-ready wind projects that are allocated future REIPPPP rounds will be pushed to non-firm connection offers or forced to wait years for backbone lines such as the 400 kV Koruson–Kling corridor and Upington–Weedbank spine.

Each year of delay lowers equity internal rates of return, raises bid prices and increases the gap between IRP timetables and reality. Should South Africa fail to allocate the R400 billion designated for transmission expenditures – and simultaneously establish clear, viable queue-management regulations – the most economically advantageous renewable energy pipeline outlined in the strategy will be left unutilized, thereby jeopardizing the overall wind energy target of 69–76 GW significantly.

5. Permitting

Permitting has also been the silent saboteur of South Africa's wind roll-out. Ten years since the "One Environmental System" reforms aimed to harmonize approvals under NEMA, Water and Heritage legislation. A utility-scale wind project still takes 18–24 months and as much as R6 million shepherding its Environmental Impact Assessment (EIA) to signature – the very timeframe highlighted in Green Cape's market analysis of the renewable-energy sector and replicated in developers' financial projections.

Time is lost not merely to the EIA technical reports but also to appeals and negotiations over biodiversity. Ridges and plains with high wind power frequently overlap critically endangered vegetation units, and authorizations accordingly come with attached offset requirements or are contested, as the Kareekloof file and other WEF files illustrate. Even when developers triumph – witness the Supreme Court's May 2025 ruling validating three Cookhouse – area wind EIAs after a two-year court fight, the triumph merely resets the clock; grid slots and turbine orders secured early in the bid can already have expired. New regulations add more drag.

The National Biodiversity Offset Guideline (2023) incorporates no-net-loss conditions in EIAs for projects in biologically sensitive biomes, compelling wind sponsors to fund and assume ownership of long-term habitat banks beyond their original business plans. Meanwhile, REIPPPP's request-for-proposals continues to require preferred bidders to commit to commercial close within a narrowly prescribed 365-day bid-validity period; if an EIA runs over, the entire bid can lapse, reverting the project to square one and tacking months of "interest during construction" onto already thin margins.

Pricing encompasses folding that delay risk, adding 50–75 basis points to debt spreads and increasing levelized energy costs by ≈ R5–8/MWh, according to banker term-sheets seen during Bid Window 6. Overall, then, although permitting obstacles do not yet equal the existential risk of grid saturation, they nonetheless warrant a medium-to-high risk assessment: if unresolved, slow and contentious EIAs will strand shovel-ready capacity, drive up tariffs and burst the IRP's delivery schedule, even when turbines and transmission lines are on hand on time.

6. Supply chain and logistics

Logistics has been a stealthy medium–high risk throttle on the wind build-out because transport and port infrastructure in South Africa was never designed to accommodate the oversized hardware now ubiquitous in 6-plus MW turbines. A single Nordex project arriving at the Port of Ngqura from September 2024 illustrates the scale of the mismatch. It takes 550 abnormal-load movements, each limited to narrow scripted daylight time windows, police escorts and rolling road closures to get 81 m blades, 73-ton nacelles and 118-m tower sections to the Northern Cape because the N10/N12 bridge clearances and turning radii are designed with a decade-old 40-m blades in mind.

Specialty transport companies like Vanguard now use 95-meter rotor-blade transporter trains and self-propelled modular transporters to navigate mountain highways; however, every diversion, lane closure request, and required escorts translate to increased costs and decreased scheduling certainty. During their record-breaking transport of an 82.5-meter blade, wide sections of the highway were shut down for durations exceeding one hour at a time.

The pinch begins even earlier, at the quayside. Ngqura, Saldanha and Cape Town can berth heavy-lift vessels, yet lay-down space sufficient to pre-assemble blade sets or stage 120-ton tower cans is in chronically short supply, and positions for heavy-lift cranes must be booked months ahead. Where berths or cranes are unavailable, equipment sits on board; sector surveys contained in Green Cape's 2023 market-intelligence report estimated demurrage and storage costs currently contributing 3–4% to engineering-procurement-construction (EPC) costs, eating away a quarter of the contingency margin envisioned in typical REIPPPP finance models.

Congestion in ports necessitates the diversion of part of the cargo to Richards Bay or East London, which involves several hundred kilometres on the road and contributes to the general abnormal-load congestion being experienced by residents along the corridor. These blockages have severe strategic implications. Because OEMs can't rely on low-friction, predictable logistics, they won't localize blade or tower factories – even though the IRP's economic-development scorecard assumes those factories will be built. At the project level, developers must lengthen construction timelines to hedge against the risk of road closure, and lenders price in that uncertainty: term-sheet reviews after Bid Window 6 show logistics contingencies adding 30–50 basis points to debt spreads.

Until South Africa speeds up high-capacity corridor upgrades, increases port lay-down acreage and releases a clear, multi-year convoy-permit calendar, supply-chain friction will systematically undermine the IRP's cost and timing assumptions – transforming the physical transport of a single blade over one bridge into a systemic risk to a 76 GW aspiration.

7. Localization and industrial policy

Local-content policy has turned from catalyst to bottleneck as REIPPPP increasingly tightens localization barriers for towers, nacelles and blades while the local supply base is narrow and geographically imbalanced. Beyond the Western Cape – where GRI Wind Steel's Atlantis plant has the capacity to manufacture some 150 steel towers a year and is still South Africa's only operational turbine-tower plant – there are yet no major suppliers, following DCD Wind Towers' demise and putting on hold several blade-mould proposals. A field study by IEOM of Bid Window 4 wind farms confirmed the bottleneck: most projects met tower targets by utilizing GRI but still imported generators and blades, attributing cash-flow constraints, small production runs and long lead times that undermine economies of scale.

As policy bar keeps rising – Bid Windows 5 and 6 sustained a 40% floor, and initial rules for BW 7 considered an explicit step-up for key sub-components – pipeline visibility has decreased as successive bid rounds slipped, and grid quotas were complete. The result is a widening mismatch: financiers warn that tight thresholds without assured multi-year order books push projects to the edge of cost overruns, or even bid exclusion, because introducing a single non-conforming nacelle can negate the entire local-content scorecard.

The new South African Renewable-Energy Masterplan (SAREM), signed off by Cabinet in March 2025, prescribes supplier-development grants and concessional working-capital lines but will not address the volume gap until procurement schedules are less unpredictable. Unless industrial-policy objectives are teamed with a credible, long-lead project pipeline – and paired with regionally dispersed supplier hubs – localization mandates risk backfiring: developers will either price the penalty into more expensive tariffs or postpone involvement altogether, retarding the very build-out that industrial policy attempts to leverage.

8. Skills development

South Africa is simultaneously a nation of 32% unemployment and looming shortage of exactly those specialists whose expertise will keep a 69–76 GW wind fleet turning. A foundation research report released in 2024 by the National Business Initiative (NBI) estimates that an additional 3,500 qualified turbine technicians and grid-integration engineers will be required by 2030 to adhere to the IRP construction trajectory. It is, nevertheless, stated that currently fewer than 400 new technicians graduate annually from the three public colleges that provide courses endorsed by the Global Wind Organization.

Both government and the business community have high expectations of the Just Energy Transition Skills for Employment Program (JET-SEP), but the program is in its pilot phase, with a concentration on curriculum development and financing for fewer than 200 students and a full national launch provisionally set for 2026–27. The result is a bidding market for technical specialists that discriminates against the local market. A recent Reuters poll of African renewable energy companies has shown that these businesses typically invest six months of earnings operating at a loss as they attempt to employ or transport experts from Europe and Asia.

This delay significantly adds to the costs of O&M, making them exceed global standards. The economic effect is direct and substantial. The financial models for Bid Window 6 for the project already include operation and maintenance contracts at a premium price of 15–20% above the European average to compensate for expatriate premiums and standby losses. This premium increases the levelized cost of energy by R4-6 per megawatt-hour, effectively decreasing tariff flexibility that had made wind energy the most affordable option initially.

Meanwhile, the promised "just-transition dividend" in terms of community jobs is postponed: every one of the foreign technicians brought in replaces two or three national jobs that were supposed to be developed through dual-training and apprenticeship programs. Unless industry embraces multi-year training contracts that grant demand certainty to colleges, and JET-SEP is accelerated to ramp up scale from pilot, the skills gap will yawn ever wider as fleet size increases – morphing today's medium- high operational risk into a structural cost penalty that echoes through each future round of bids.

Contact us

Suite 2, 2 Hood Avenue, Rosebank, 2196
+27 010 006 7088 | admin@sawea.co.za

SAWEA
South African Wind Energy Association