



Editorial

Futures in Energy: Where South Africa's Transition Binds

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Guest Editors, CARES 2025 Energy Special Issue

Abstract

This editorial introduces the CARES 2025 Energy Special Issue of the Wits Business Review, four articles developed from the 2025 Conference for Academic Researchers in the Energy Sector (CARES), held under the theme 'Futures in Energy'. The articles examine how South Africa procures renewable electricity, where new generation will have to be built and, on whose land, how environmental law weighs the water and food consequences of energy projects, and what the European Union's Carbon Border Adjustment Mechanism will cost the country's carbon-intensive exporters. Read together, they make one argument. The transition is held back less by technology, resources or investor interest than by the points at which projects must connect to something they do not control: the grid, the land, the mandates of other public authorities and the rules of export markets. Throughout the issue, implementation challenges emerge as more significant than technological constraints, highlighting the importance of infrastructure readiness, institutional coordination, and regulatory coherence. We identify three findings that cut across the distributions: the role of binding constraints in shaping transition outcomes, the importance of legitimacy and governance in securing support for transition policies, and the growing cross-border reach of carbon process and climate-related measures. We also distinguish between what the evidence can and cannot yet support and propose an agenda of future research on grid access and procurement design, integrated resource governance, trade exposure and industrial decarbonisation, and the social and regional foundations of the opportunities and constraints shaping South Africa's energy future.

Keywords: *Just Energy Transition; South Africa; public-private partnerships; water-energy-food nexus; Carbon Border Adjustment Mechanism; renewable energy integration; customary land governance; grid access; energy governance*

1 Introduction

For much of the period from 2007 to 2023, South Africans experienced the energy crisis as load shedding (Modisane, this issue). Supply has since stabilised, but the harder questions remain. The country is still among the most coal-dependent economies in the world (Nel et al., 2023). Through the Just Energy Transition Investment Plan, it has committed to a transition that is fair as well as fast (The Presidency, 2022). And since January 2026, its steel and aluminium exporters have faced a carbon price at the European Union's border (European Commission, 2024). The Just Energy Transition (JET) framework asks that this shift be judged by who carries its costs and who shares its gains, and not only by the megawatts it adds (Abram et al., 2022; Presidential Climate Commission, 2022). Energy transitions are shaped by contested histories, unequal power and political struggle as much as by technology (Kalt et al., 2023). This issue takes up a practical question that follows from that view: where, concretely, does South Africa's transition get stuck, and what would free it?

This special issue emerges from the 2025 Conference for Academic Researchers in the Energy Sector (CARES), hosted by the African Energy Leadership Centre (AELC) at Wits Business School on 26 November 2025 under the theme 'Futures in Energy'. CARES brings together academics, early-career researchers and postgraduate students to examine energy system transformation through multiple disciplinary lenses. Selected papers from the conference were subsequently submitted to the Wits Business Review as a collection from the AELC and went through the journal's full review process. Five manuscripts entered review, all five were returned for major revision, one was withdrawn by its authors after the first round, and the four articles published here are those that came through.

The four articles approach that question from different disciplines: project finance and public procurement, constitutional and environmental law, input-output economics, and regional planning. Their evidence differs too, from expert interviews and court judgments to a social accounting matrix and scenario models. Yet they keep arriving at the same places. In each, a project or policy that makes sense on its own terms runs into something it does not control: a substation that has not been built, a port that cannot receive gas, a catchment already under strain, land held under customary authority, a carbon price set in Brussels. That convergence is the main reason to read them together, and Section 3 sets out what it adds up to.

2 Overview of the Articles

We begin with procurement, because that is where most of South Africa's new generating capacity has come from. Modisane (this issue) asks why the country's reverse-auction public-private partnership programmes, whose early record is well documented (Eberhard & Naude, 2016), have lost their ability to turn Preferred Bidders into projects that reach Financial Close. The contrast is stark. Ninety-one of the ninety-two projects selected in the first four REIPPPP bid windows closed. In Bid Window 5 only eleven of twenty-five did, and twelve of the fourteen that failed belonged to a single consortium. Drawing on twenty-one interviews with developers, lenders, the Independent Power Producer Office, Eskom and government, the article builds a Success and Risk Factor Framework that holds thirty-two critical success factors, seven success criteria, four interlink factors and seventeen risk factors in one structure. Its central finding is that the decline is structural rather than political. Grid connection, raised by twenty of the twenty-one experts, is a risk that lenders can neither price nor allocate, so no tariff can carry a project past it. The article also shows how price-dominant evaluation of bids that are checked for compliance, but not for deliverability, rewards the bidder who has assumed most and

verified least. And it explains why the 2020 emergency round lost all four of its gas-based projects: the ports could not receive gas, and no party to the procurement had authority over the ports. In the author's words, that failure was neither commercial nor technical; it was jurisdictional.

Ngcobo, Mulaudzi and Phaho (this issue) take the analysis to a particular place: the proposed Eastern Seaboard Smart City, planned along some 600 kilometres of coast across the Eastern Cape and KwaZulu-Natal, with pilot sites in Ray Nkonyeni (Margate) and King Sabata Dalindyebo (Mthatha). Combining interviews with fourteen energy experts, electricity expenditure records from thirty-six small businesses and scenario modelling, they estimate that a 138 MW wind farm and a 54 MW solar plant could together generate about 546,000 MWh a year and avoid roughly 514,000 tonnes of CO₂e, with battery storage proposed to smooth their complementary profiles. These are indicative planning figures, valued at the municipal retail tariff and not net of capital, financing or grid costs, and the authors present them as such. The article's distinctive contribution lies elsewhere. Experts cited capital requirements most often (nine of fourteen), followed by grid capacity and missing infrastructure (six each), but they kept returning to the fact that much of the corridor is held under customary tenure. The authors conclude that, in such settings, the legitimacy of an energy project is co-produced by statutory and customary institutions, so that a technically sound project can still stall if traditional authorities and communities are engaged late or as a formality.

How the wider consequences of such projects are weighed before approval is the subject of Ngubevana and Ngubevana (this issue). Through a doctrinal analysis of constitutional, environmental and administrative law, they ask whether South Africa's project-level Environmental Impact Assessment (EIA) system can govern the interactions between water, energy and food systems (Hoff, 2011) that the Just Energy Transition will set in motion. Their answer is careful. NEMA and the EIA Regulations already require cumulative impacts to be assessed; the weakness is one of scale and strategic context, because an assessment built around a single application cannot see how many projects together press on one catchment or farming district. Rather than a new authorisation regime, they propose a proportionate one: a water-energy-food screening layer within the existing national web-based screening tool, with low, moderate and high risk tiers; nexus-sensitive scoping where risk is material; selective use of strategic environmental assessment, building on the experience of the Renewable Energy Development Zones; a written Nexus Opinion from the water, agriculture and energy authorities, which the decision-maker must address in its reasons but which gives no department a veto; and plain-language disclosure to affected communities. The Wild Coast seismic survey litigation, in which the Supreme Court of Appeal found that notices published in English and Afrikaans had not reached isiXhosa- and isiMpondo-speaking communities, anchors their argument that participation must be meaningful and not merely available. That litigation concerned part of the same coastline along which the Eastern Seaboard Smart City is planned.

Marema, Rakaibe, Swanepoel, Tlokolo, Nqoko and Dondofema (this issue) turn to the external pressure that gives all of this a deadline. Since January 2026, importers into the European Union have had to buy certificates for the carbon embedded in iron and steel, aluminium, cement, fertiliser and other covered goods (European Commission, 2024), and South Africa's exposure has been flagged since the mechanism was first proposed (Eicke et al., 2021). Using an input-output model built on the 2019 social accounting matrix, with export-loss rates for 2030 taken from earlier global modelling, the authors estimate that if the four exposed industries do not decarbonise, the mid-case cost is about R10.2 billion of GDP (0.21 per cent), some 18,100 full-time-equivalent jobs and R2.7 billion of government revenue. They then translate the revenue loss into public services: in the mid case, the equivalent of 26,251 grant beneficiaries, 599 educators and 126 hospital beds left unfunded. Iron and steel carries almost three-quarters of the GDP loss. The authors are clear that a fixed-coefficient model

cannot capture substitution, trade diversion or price adjustment, so these are upper-bound estimates. Their policy argument is that the response must run through decarbonising production, and through aligning the domestic carbon tax, now R308 per tonne of CO₂e, with border prices so that more of the revenue from pricing South African carbon is retained at home.

3 Reading the Articles Together

The four articles share a starting conviction, that South Africa's transition turns on institutions, investment and legitimacy as much as on technology (Presidential Climate Commission, 2022; The Presidency, 2022; Department of Electricity and Energy, 2025). What they add, read side by side, is precision about where the transition binds. Three findings stand out.

First, the binding constraints are physical and jurisdictional, and they sit at the points of connection. Resources and investor interest are not what is scarce. In Bid Window 6, developers offered 4,116 MW of onshore wind against an allocation of 3,200 MW, and none was selected because the grid in the Eastern and Western Cape could not take it (Modisane, this issue). What is scarce is the connection: to the grid, to a gas supply, to a substation, to the authority that controls a port or a water licence. The same pattern of fragmented mandates recurs across the issue. In the procurement programmes, no party to the auction could act on the ports (Modisane, this issue). On the Eastern Seaboard, experts describe municipalities, Eskom, regulators and national departments working in silos (Ngcobo et al., this issue). In environmental law, the water, agriculture and energy authorities each hold part of the picture and none is required to assemble it (Ngubevana & Ngubevana, this issue). It follows that most of the remedies the authors propose are about connection rather than new money: readiness tests before bids are awarded, a single point for permits, and a Nexus Opinion that places the views of several departments on one decision record.

Second, legitimacy is an input to delivery, not a by-product of it. Sixteen of Modisane's twenty-one experts named community buy-in as a success factor, and they asked that social impact be measured by outcomes rather than by money spent; one called unmeasured spending 'fiscal dumping'. Ngcobo and colleagues find that on customary land, consent and access run through traditional authorities whose standing no permit can confer on a developer. Ngubevana and Ngubevana show the courts treating consultation that does not reach people in their own language as falling short of what the law requires. Together these papers suggest that the procedural and distributive commitments of a just transition (Abram et al., 2022) are not costs added to otherwise bankable projects. They are among the conditions that make projects bankable in the first place.

Third, carbon is now priced across borders, and the price reaches deep into the domestic economy. The European border price falls first on steel and aluminium, but through inter-industry linkages it reaches household incomes and the public budget (Marema et al., this issue). The exporters' main route to protection is cleaner electricity, and that route runs through the same procurement and grid system whose failures Modisane documents. In that sense a delay in connecting renewable generation is also a trade cost. The CBAM study raises a further question that the issue leaves open: if South Africa's own carbon price remains far below the European one, a share of the revenue from pricing South African carbon will accrue to European treasuries rather than to the just transition at home.

A geographical thread runs through all of this. Modisane's respondents expect grid constraints in the Cape to push new projects towards Mpumalanga, KwaZulu-Natal and Limpopo, closer to load and to people, and they expect the risk of extortion by so-called construction mafias to rise as a result. That eastward movement brings the transition onto the terrain of the other articles: the Eastern Cape

and KwaZulu-Natal corridor of the Eastern Seaboard study, the Wild Coast of the seismic survey litigation, and Mpumalanga, where coal dependence and water stress already overlap (Nel et al., 2023). The next phase of the transition is likely to be built on land that is more densely settled, more often held under customary tenure and more contested than the remote sites of the early bid windows. Each article, in its own way, describes what that will demand.

A word on the standing of this evidence is in order, because the authors are careful about it and readers should be too. Modisane's framework ranks factors by how often experts raised them, which is salience rather than causal weight. The CBAM estimates are upper bounds from a model that holds prices and technologies fixed. The Eastern Seaboard scenarios are indicative and are not net of system costs. The water-energy-food framework is a legal proposal that has yet to be tested in practice. None of this weakens the issue. It does mean that its strongest claims are diagnostic: they show where to look and what to measure, and they prepare the ground for the empirical work set out below.

4 Future Directions

Beyond their individual findings, the articles point to a research and policy agenda that remains open.

First, grid infrastructure emerges as a binding constraint across the issue. Both the procurement study and the Eastern Seaboard study find that grid capacity, rather than resource availability or investor appetite, limits delivery; in the procurement study it is the dominant constraint, named by twenty of twenty-one experts. As the Electricity Regulation Amendment Act 38 of 2024 opens the way for an independent transmission system operator and a competitive wholesale market (Republic of South Africa, 2024), research is needed on how transmission expansion and grid capacity allocation can be sequenced and financed, and on whether procurement that rewards readiness and deliverability alongside price improves conversion to Financial Close (Kruger & Eberhard, 2023; Modisane, this issue). Weighting the Success and Risk Factor Framework against project-level outcome data across bid windows would move this work from expert perception towards predictive evidence. That work depends on access to project-level data on bids, grid quotes and closing timelines, and the Independent Power Producer Office could do the field a considerable service by releasing such data in anonymised form.

Second, governing interdependence requires practical tools. The case for embedding water-energy-food nexus considerations in environmental assessment now needs to be translated into standardised yet context-sensitive screening tools, monitoring and evaluation frameworks, and estimates of the administrative and distributive costs of reform. Empirical research on how cooperative governance between energy and environmental authorities operates in practice would complement the legal analysis, particularly in water-scarce and coal-dependent regions where renewable energy, green hydrogen and mining developments compete for the same land and water (Nel et al., 2023; Ngubevana & Ngubevana, this issue).

Third, the trade dimension of the transition is widening. With the European Union (EU) CBAM fully operational since January 2026 and comparable border carbon measures gaining traction elsewhere (Marema et al., this issue), the upper-bound estimates in this issue should be complemented by dynamic and general equilibrium models built on updated social accounting matrices. Research is also needed on the cost and feasibility of decarbonisation pathways for exposed sectors such as iron and steel and aluminium, on aligning domestic carbon pricing with border measures so that carbon revenue is retained in South Africa, and on how concessional finance under the Just Energy Transition Investment Plan can de-risk these investments (The Presidency, 2022) without reproducing extractive

patterns of development (Kalt et al., 2023).

Fourth, the social, institutional and regional foundations of the transition deserve greater attention. The Eastern Seaboard study shows that customary land governance and community acceptance shape project feasibility as much as technical factors do (Ngcobo et al., this issue). Future work should examine models of land access, benefit sharing and community ownership, and should assess, through longitudinal and mixed-methods designs, whether projects deliver the employment, energy access and local economic gains anticipated at the planning stage, giving empirical content to the distributive, procedural and restorative dimensions of a just transition (Abram et al., 2022).

Fifth, interdisciplinary research that brings together law, economics, engineering and management, and that extends the analysis to the Southern African Development Community (SADC), where power pooling, critical minerals and emerging green hydrogen value chains link national transitions, would situate South Africa's experience within the regional context that will increasingly shape it.

South Africa's first renewable energy auctions showed that private capital would come, and at prices few had expected (Eberhard & Naude, 2016). The task now extends beyond financing renewable energy projects to addressing the institutional, infrastructural, and market conditions that determine their success. This includes securing grid access, navigating land governance arrangements, accounting for impacts across water and food systems, and responding to the growing influence of carbon-related regulations in international trade. The articles in this issue do not settle how that is to be done. They do show, with unusual clarity, where the work lies, and we commend them to researchers, policymakers and practitioners in South Africa and across the region.

Acknowledgements

The guest editors thank the authors for their contributions and their responsiveness during the revision process, and the reviewers for their careful and constructive assessments. We are grateful to Professor Imhotep Alagidede (Editor-in-Chief of the *Wits Business Review*) and Professor Jones Odei-Mensah (Editor of the *Wits Business Review*) for their support of this special issue. We owe particular thanks to Professor David Phaho, Director of the African Energy Leadership Centre, for his leadership and administrative guidance throughout CARES 2025 and the preparation of this issue. We also thank Adams Amadu Diiwu, Design and Production Editor, and the team at Porthologos Press for the design and production editing of this issue. Finally, we acknowledge Absa and the Upstream Training Trust for their support of CARES 2025 and the African Energy Leadership Centre.

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