Check for updates

AUTHOR:
Mike Muller[1]

AFFILIATION:
[1]School of Governance, University of the Witwatersrand, Johannesburg, South Africa

CORRESPONDENCE TO:
Mike Muller

EMAIL:
Mike.Muller@wits.ac.za

HOW TO CITE:
Muller M. Load shedding as a result of failures at the political-technological interface. S Afr J Sci. 2023;119(9/10), Art. #16595. https://doi.org/10.17159/sajs.2023/16595

ARTICLE INCLUDES:
☐ Peer review
☐ Supplementary material

KEYWORDS:
electricity supply, developmental state, technology policy, megaproject management

PUBLISHED:
31 August 2023

Load shedding as a result of failures at the political-technological interface

Significance:

In effective developmental states, technocrats are 'embedded' in the political system with sufficient autonomy to undertake their tasks. South Africa's current electricity crisis is attributed here, in part, to an initial mistrust between the country's new political leadership and its 'old-order' technocrats following the political transition of 1994. This trust deficit led to policy missteps in the development of new electricity generation. The impact of these missteps was compounded by the adoption of a risky, politically driven, project management strategy. The outcome was not just substantial cost increases but the project delays that resulted in the current 'load shedding'.

Electricity 'load shedding' is not new to South Africa. When demand exceeds supply, distributors have little choice but to restrict use. Limited ability to meet the rapid growth in demand from the gold mining industry after World War II saw supplies rationed.[1] Along with other users, the mining industry was again hit hard by rolling power cuts in early 2008. However, South Africa's current inability to generate sufficient electricity to meet the needs of its people and economy can be attributed to a set of poor decisions (and, indecisions) dating from the 1994 political transition.

This is not to say that the current load shedding is the consequence of the transition to non-racial democracy. The argument focuses rather on the nature of that transition. Specifically, it considers the relationship between an existing, inherently technological, public institution and the new political institutions which positioned themselves as the leaders of a developmental state.

In particular, there was a failure to coordinate the parallel transitions of the country's political institutions and of Eskom, its largest public enterprise. This experience also highlights future risks if a coherent national strategy for energy transition is not established.

Theoretical background – the role of trust in governance networks

Eskom's institutional challenges are common in contemporary democracies in which important, long-term, technical decisions require political support or sanction for their implementation. The problem is that the outlook of the political institutions on which they depend is inherently short term, defined by contested election cycles.

Political support may be provided formally or informally, through a wide range of institutional frameworks that allow the 'technological community' to present their proposals to the 'political community' for evaluation and decision. However, to overcome the 'timing' difference and achieve mutually acceptable outcomes, there must be effective communication and understanding of each other's concerns between the two communities. While formal institutional processes are necessary, they are often not sufficient to allow engagement to proceed to a successful conclusion. To achieve alignment across the diverse and complex domains of technology and politics, an understanding of each other's priorities and constraints underpinned by mutual trust is required.[2] In the related water sector, trust is explicitly identified, alongside efficiency and effectiveness, as a key pillar of successful sector governance.[3]

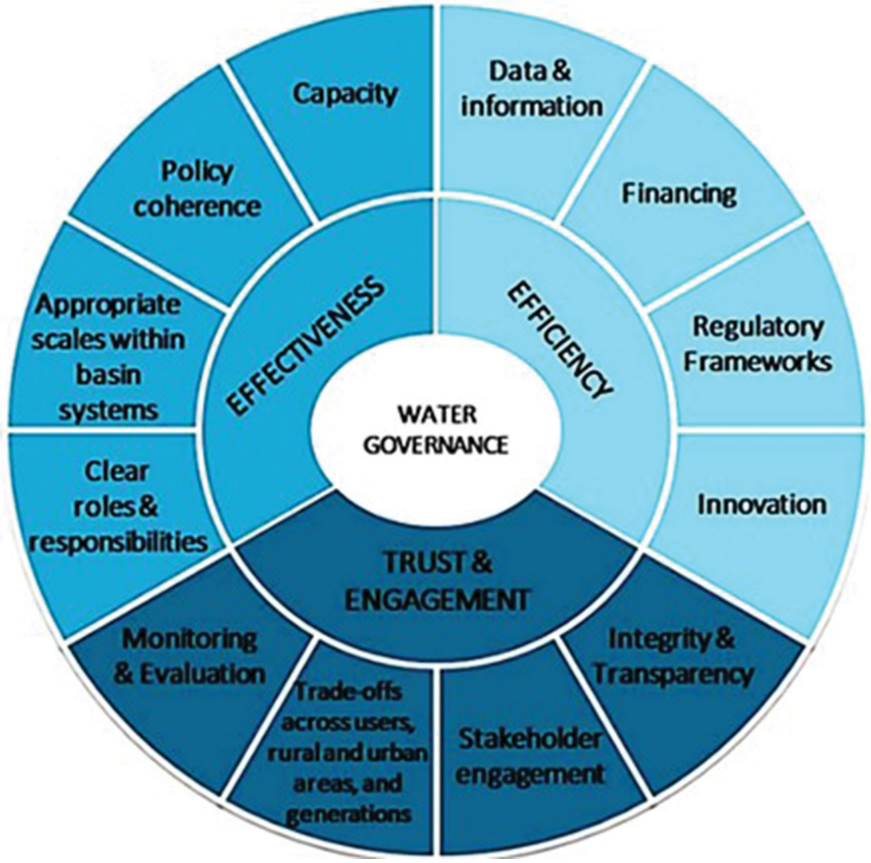
In successful 'developmental states' and similar contexts, trust relationships based on common histories and backgrounds, play an important role in 'greasing the wheels' of decision-making.[4] Trust between parties is particularly important in the governance of inherently complex operations such as the provision of electricity and water at a national scale. These activities require technical and institutional systems operating across diverse national geographies to supply a diverse community of users, ranging from the poorest individual households to industries of global scope and scale.

Building such systems requires decadal foresight; their financing requires access to large pools of exacting capital backed by credible commitments to pay for it; in operation, the disciplined cooperation of a large, dispersed skilled workforce is needed. But it also requires that the interests of politically powerful actors in the wider society are identified and addressed.

The institutional arrangements needed for Eskom to achieve the desired technical outcome of reliable and affordable electricity supplies had taken decades to establish. There had been substantial missteps, notably a period of substantial over-investment in the 1970s[5], compounded by subsequent economic and political developments. However, by 1994, the organisation was working well[6].

Political transition disrupted the equilibrium because electricity's long-run planning and operational priorities were secondary to the political priorities of the time. Some new political leaders believed that the priorities of the energy sector's leadership were antithetical to their own. And the nature of the transition from minority rule to democratic government was that the technocrats who sought to guide the policymakers had, in large measure, lost their seats at the primary policy tables. These conflicts were aggravated by an international discourse hostile to public enterprise, actively promoting private-sector approaches to the management of traditionally public utility functions.[7]

© 2023. The Author(s). Published under a Creative Commons Attribution Licence.



Source: OECD[3]

Figure 1: The role of trust in utility governance.

The initial evolution of the political-technical dialectic

The emergence and growth of Eskom as a public electricity supplier at national scale was integral to South Africa's economic development in the 20th century. The organisation was an early product of the long-running partnership between politics and science policy of Premiers Smuts and Hertzog and Hendrik van der Bijl, their scientific and industrial advisor[8], which has been characterised by some as an early example of developmental state policies[9].

From its creation in 1922, ESCOM (the Electricity Supply Commission as it was initially) expanded rapidly, displacing small municipal and private electricity providers and supplying the state-owned railways and harbours. In 1948, it became the dominant supplier, taking over the highly profitable operations of the Victoria Falls and Transvaal Power Company's coal-fired power stations. The use of a public enterprise to supply the country's electricity was in line with van der Bijl's and Smuts' vision of strategic state participation in the economy.[10] This 'nationalisation' was supported by the private gold mining industry as a non-profit public corporation would provide cheaper electricity.

The public utility was not immune to constraints on growth and suffered an early period of load shedding at the end of World War II in 1945, when electricity demand from gold mines grew rapidly as they went deeper. Unable to increase supply fast enough, due to post-war shortages, ESCOM had to ration supplies to avoid unplanned 'load shedding' interruptions.

Thereafter, ESCOM's generation capacity was increased rapidly, more than doubling by the end of the 1950s and continuing over the following decade, supported by an expanded transmission network. But demand grew erratically. In 1975, when reserve margins fell to just 11% (well below the 15% target), the response was to order new capacity. But, in 1982, with over 20 000 MW on order, demand began to slow and, by 1992, the reserve margin had risen to nearly 40%.

Some critics attributed this excess capacity to over-enthusiastic investment rather than economic stagnation due to political pressures on the apartheid government which promoted Eskom's privatisation.[11] But the critique also led to policy missteps by the new government.[12]

Seeking a common agenda: 1994–1998

Cheap, plentiful electricity had been a strategic priority for the authoritarian security state whose investment decisions were not accountable to democratic process. The 1994 political settlement changed that dynamic. For many actors in the new government, the electricity sector's strategic decisions were of secondary importance. Their priority was to assert political control over key national institutions. To this end, the *Eskom Amendment Act 1998* gave government formal control over Eskom as sole shareholder, including decision-making powers about future energy investments.

Significant ambiguity remained in government's attitudes. Conservative characterisations of Eskom as an unwieldy and inefficient enterprise that should be privatised[11] informed the Reconstruction and Development Programme's (RDP) call for the establishment of a

> *powerful, independent national electricity regulator … to enforce public policy, ensure long-term financial viability, assure environmental sustainability and act as an ombuds in the event of conflicts between consumers, government and the electricity industry.*[13]

The option of allowing greater private participation in the system also responded to global policy pressures for developing country governments to open their utility markets to private providers.[7]

The more pragmatic position was that while Eskom had been a pillar of the apartheid private-sector economy, its substantial capabilities could be redirected. In addition to accelerating the "electricity for all" programme, the RDP explicitly said: "the benefits of cheap electricity

presently enjoyed by large corporations must be extended to all parts of the economy." Electricity could "increase the level of mineral beneficiation ….. (and) employment and add more value to our natural resources before export".[12]

Eskom's technocratic leadership had anticipated the demands of the new democratic dispensation as well as some of the criticisms. The generation surplus was propitious, allowing Eskom to concentrate on expanding electrification to formerly unserved black areas. It enabled Eskom to support minerals beneficiation in energy-intensive industries such as aluminium and chrome smelting.[14] And, to further demonstrate its commitment to the new national interests, Eskom proposed to foster regional economic integration, initially selling cheap coal-fired electricity to southern African countries and later importing hydropower from them.

In retrospect, these initiatives reinforced the view that Eskom had no need for new generation capacity and could focus on expanding household services. Eskom's leadership failed to communicate effectively to the politicians that the inherited surplus capacity was a temporary windfall and that a long timeframe was required to plan and build new generation capacity. So, the political leadership failed to identify and address the critical interventions required to sustain a reliable supply of electricity.

1998–2004: Continued political distraction, growing technical concern

Alongside the legislative change to Eskom's mandate, government's 1998 Energy White Paper suggested that the conservative view had prevailed. It promised discussion about public sector investments but also asserted that competition in the sector would move the country towards a competitive electricity market.

Two major decisions were taken. The electricity distribution function would be shifted from Eskom and municipalities to six new regional electricity distributors (REDs). On the supply side, 30% of Eskom's generating capacity would be sold to private investors, a separate transmission company established, and an electricity market introduced to ensure competition between different electricity producers. These reforms were to begin in 2003.[15]

These proposals for liberalisation met predictable political opposition. Over the next decade, the establishment of regional electricity distributors was abandoned due to constitutional objections from both local and provincial governments, unhappy about the loss of functions, funds and influence. "The entire plan appears to be based on the assumption that municipalities can ultimately be compelled to transfer their electricity distribution to a RED" wrote one commentator.[16] Meanwhile, the proposed restructuring of Eskom was not helped by its association with increased private sector involvement and attempts to develop a new type of nuclear reactor.

These issues diverted attention from the growing challenge of ensuring adequate generation capacity. Belatedly, in the face of the new democracy's first major instance of load shedding, Minister of Public Enterprises Alec Erwin acknowledged that:

> *…. In 1998, energy supply was not a major issue, and government thought it was important to focus on energy distribution. Eskom should have at the time been asked to build a base load station, in order to avert the crisis…. The Ministry and Department acknowledge that they incorrectly predicted the short to medium term issues.*[17]

2004 – political funding and football aggravate the failures

The electricity policy environment was changed dramatically in May 2004 with South Africa's selection to host the football world cup in 2010. This put a spotlight onto the practical and reputational costs of electricity supply shortfalls, not least because the South African government had to report on its readiness to external agencies.

Football catalysed a national infrastructure programme involving major transport and stadium investments. Secure electricity supply was, however, a prerequisite and it was suddenly recognised that reserve margins were declining rapidly.

Although government had "prohibited Eskom from adding new generation capacity in the expectation that the private sector would do so," Eskom had continued to prepare "Project Alpha" (later Medupi). It was thus able to respond when, by 2004, "it became apparent that the anticipated private sector response was not forthcoming and power deficits would occur around 2007"[18].

A more immediate political priority was that the ruling party needed funds to contest the 2006 local government elections. It is well documented[19] that, shortly after Mohamed Valli Moosa, a member of the ANC's National Executive and finance committees, was appointed as Eskom chairman in August 2005, the Japanese firm Hitachi won the largest contract in Eskom's history to supply boilers for Medupi. Controversially, Chancellor House, an investment arm of the governing ANC, partnered with Hitachi and benefitted from this contract.

A Public Protector's investigation found that there "was a conflict between the personal interest of Mr Moosa in the ANC and his duty towards Eskom" when it awarded the contract to the Hitachi Consortium, in which the ANC had an interest and that "Mr Moosa failed to manage his said conflict of interests …. and therefore acted improperly" but that the award was "not in any way affected by Mr Moosa's improper conduct"[19].

However, there were serious consequences for Eskom and the security of South Africa's electricity supply. Although Eskom had not built a power station for 20 years, it took direct responsibility for managing the project rather than giving 'turnkey' responsibility to a single EPC (engineering, procurement and construction) contractor to deliver the project on time and on budget. This sub-contracting strategy, which allowed the ANC associated company to share the profits in return for political connections, was found by the US Securities and Exchange Commission to be a corrupt practice for which Hitachi paid a USD19 million settlement.[20]

The cost to Eskom (and South Africa) was much higher. Eskom awarded and supervised a multiplicity of separate sub-contracts and was liable for cost increases when, for instance, a change in equipment specifications delayed other contractors. Poor coordination, a 5-year delay and a series of defects more than doubled the costs. But it also reduced Eskom's performance because maintenance of other stations was delayed. Energy availability declined from 81.9% in 2011/2012 to a 2022/2023 low of 58%.[21]

Post hoc: A case of the megaproject challenge?

It has been suggested that the decision to build Medupi and Kusile was an expensive error and that renewables would have been a better solution.[22] This proposition is ahistorical. In 2005, it was expected that some coal-fired generation would continue for another 40 years. Introduction of new, more efficient generators (in terms of CO_2 emission per MWh) would allow closure of older, dirtier generators, making an immediate contribution to CO_2 mitigation by enabling more electricity to be generated without increasing emissions.[23] Meanwhile, cost comparisons between renewables and coal often failed to take account of the pace at which renewables could be integrated into the national grid.[24]

In 2014, this long-term perspective still guided global strategies. On the sidelines of a global meeting, Chinese and US climate negotiators argued amicably about "whose coal-fired power stations were most efficient and who was going to reduce their emissions by how much and how quickly"[25]. The Chinese delegate acknowledged that China had planned on reaching 'peak coal' in 2035 but was considering bringing it forward to 2030.[25] South Africa's own peak-plateau–decline strategy, as presented in both the National Climate Change Response Policy (2011) and the National Development Plan (2012), envisaged that emissions would only start to decline in 2035.[26] The choice of supercritical technology for Medupi and Kusile was thus consistent with agreed national policy.

With hindsight, should the risks of completion delays and cost overruns typical of large infrastructure projects[27] have been recognised and addressed? There are project management methodologies to mitigate these challenges, notably the appointment of an overarching EPC contractor. The evidence is that this more robust contracting methodology was not adopted because it would have conflicted with the parallel objective of channelling a portion of the project proceeds to the ruling political party.

The counterfactual suggestion that a *programme* to build renewable generators would have been more reliable and less risky than two large capital projects may also be misleading.[28] While the *project* challenges of procurement and on-site coordination may be addressed by such an alternative, coordination of the different elements of a huge *multi-project programme* between the various loci of decision and control poses similar risks.

South Africa's renewables programme requires the engagement and coherence of approach of many different parties. These include generation project developers, transmission grid managers, system operators responsible for storage and technical regulation as well as payment arrangements together with economic regulators, financiers and spatial planning authorities. Current experience with the rollout of renewables[29] is that these pose equally difficult problems of coordination and impose similar delays and costs.

Conclusion

While subsequent corruption contributed to Eskom's declining performance, earlier failures of governance and management at the interface between political and technical spheres played a major role. Periods of load shedding due to inadequate generation capacity had occurred both before and after 1994, but their extent is now more persistent and systemic. The 'root causes' include the initial failure of contemporary political leaders to respond timeously to technical advice to expand generating capacity.

Interventions to avoid electricity shortages before and during the 2010 football world cup, accelerated the performance decline, reducing Eskom's planned maintenance and causing a vicious cycle of higher demands on working plants and more unplanned maintenance. Delays in the completion of major new generation projects and their subsequent poor performance compounded pressures on the system. These project management failures were, in part, the consequence of the earlier decision that Eskom would manage the projects directly rather than appointing a 'turnkey' contractor to ensure coordination.

The subsequent deterioration in management control together with personal and political corruption further undermined Eskom's performance. The resulting organisational climate is not conducive to remedial action which has, at times, been actively subverted.

This evidence suggests that the early failure of political and technical leadership to develop a coherent common understanding of South Africa's electricity challenges contributed substantially to the current crisis. In the early years of South Africa's democracy, the leaderships of old technical institutions and new political institutions came from social and political communities with different cultures and values and a history of conflict, resulting in failures of communication at that interface.

Complex technical systems like electricity require competent and empowered technical leadership to achieve effective performance and trust and active cooperation between technical and political leadership is essential where political decisions supervene. The load shedding experience thus highlights broader challenges and opportunities. Effective relationships between technical and political spheres help to manage tensions between the political short-term and longer-term technical priorities and to negotiate and implement policy when there are contests over strategy between different societal interest groups.

Debilitating conflicts are aggravating the electricity sector's current dysfunction as it grapples with the long-term challenges inherent in the energy transition. Urgent interventions are blocked by sectoral interest group 'lawfare' and countervailing political action, increasing the likelihood of supply curtailment and failure.[30] While the 'old' load shedding resulted from political mistrust between historically opposed forces, the 'new' load shedding may be the result of leaderships' failures to develop and embrace a robust, collective strategy for South Africa's energy transition.

Competing interests

I have no competing interests to declare.

References

1. Steyn G. Governance, finance and investment: Decision making and risk in the electric power sector [doctoral dissertation]. Brighton: University of Sussex; 2001.
2. Klijn EH, Edelenbos J, Steijn B. Trust in governance networks: Its impacts on outcomes. Admin Soc. 2010;42(2):193–221. https://doi.org/10.1177/0095399710362716
3. Organisation for Economic Co-operation and Development (OECD). OECD principles on water governance [webpage on the Internet]. c2015 [cited 2023 Apr 14]. Available from: www.oecd.org/governance/oecd-principles-on-water-governance.htm
4. Muller M. Decolonising engineering in South Africa – Experience to date and some emerging challenges. S Afr J Sci. 2018;114(5/6), Art. #a0270. https://doi.org/10.17159/sajs.2018/a0270
5. Eberhard A. The political economy of power sector reform in South Africa. In: Victor D, Heller T, editors. The political economy of power sector reform: The experiences of five major developing countries. Cambridge: Cambridge University Press; 2007. p. 215–253. https://doi.org/10.1017/CBO9780511493287.007
6. Kessides I, Bogetic Z, Maurer L. Current and forthcoming issues in the South African electricity sector. World Bank Policy Research Working Paper No. 4197. SSRN. 2007 April 1. Available from: https://ssrn.com/abstract=979669
7. Muller M. The regulation of network infrastructure beyond the Washington consensus. Dev South Africa. 2013;30(4–5):674–686. https://doi.org/10.1080/0376835X.2013.830558
8. Schonland BFJ. Hendrik Johannes van Der Bijl: 1887–1948. Obituary notices of Fellows of the Royal Society. 1950;7(19):27–34. https://doi.org/10.1098/rsbm.1950.0003
9. Freund B. A ghost from the past: The South African developmental state of the 1940s. Transformation: Critical Perspectives on Southern Africa. 2013;81:86–114. https://doi.org/10.1353/trn.2013.0007
10. Christie R. Electricity, industry and class in South Africa. London: Palgrave Macmillan; 1984. https://doi.org/10.1007/978-1-349-07030-5
11. De Villers WJ. Report of the commission of inquiry into the supply of electricity in the Republic of South Africa. Pretoria: Government Printer; 1984.
12. Horwitz RB. The uneasy relation between political and economic reform in South Africa: The case of telecommunications. Afr Aff. 1994;93(372):361–386. https://doi.org/10.1093/oxfordjournals.afraf.a098725
13. African National Congress (ANC). Reconstruction and Development Programme. Johannesburg: ANC; 1993.
14. Kessides JK. The decline and fall of Eskom: A South African tragedy. Report 45. London: The Global Warming Policy Foundation; 2020.
15. National Treasury. Intergovernmental fiscal review. Republic of South Africa; 2003.
16. Johnson V. Electricity restructuring short circuiting municipalities. Local Government Bulletin volume 4 number 2. Cape Town: Dullah Omar Institute; 2002.
17. Parliamentary Monitoring Group. Power outages: Parliamentary briefing by minister and Eskom [webpage on the Internet]. c2008 [cited 2023 Apr 14]. Available from: https://pmg.org.za/committee-meeting/8809/
18. World Bank. Eskom investment support project – Implementation completion and results report. Washington DC: World Bank; 2022.
19. Public Protector. Report on an investigation into an allegation of improper conduct by the former chairperson of the board of directors of Eskom. Report no: 30 of 2008/9. Pretoria; 2008.

20. US Securities and Exchange Commission (SEC). SEC charges Hitachi with FCPA violations [media release on the Internet]. c2015 [cited 2023 Apr 14]. Available from: https://www.sec.gov/news/press-release/2015-212#

21. Mathe ZT. Focus on improving the energy availability factor as a quick win to stop load-shedding. Mail & Guardian. 2023 January 16. Available from: https://mg.co.za/opinion/2023-01-16-focus-on-improving-the-energy-availability-factor-as-a-quick-win-to-stop-load-shedding/

22. Blignaut J. Climate change: The opportunity cost of Medupi and Kusile power stations. J Energy South Afr. 2012;23(4):67–75. https://doi.org/10.17159/2413-3051/2012/v23i4a3179

23. Fouilloux J, Otto M. Medupi and Kusile: Supercritical giants of South Africa. Modern Power Systems. 2009 April 01. Available from: https://www.modernpowersystems.com/features/featuremedupi-and-kusile-supercritical-giants-of-south-africa/

24. Bohlmann J, Bohlmann H, Inglesi-Lotz R, Van Heerden J. An economy-wide evaluation of new power generation in South Africa: The case of Medupi and Kusile. Energy Policy. 2016;97:450–460. https://doi.org/10.1016/j.enpol.2016.07.020

25. Muller M. SA needs to make decisions on energy and act on them. Business Day. 2014 November 25. Available from: https://www.businesslive.co.za/archive/2014-11-25-sa-needs-to-make-decisions-on-energy-and-act-on-them/

26. DFFE. South Africa's low emission development strategy 2050. c2020 [cited 2023 Apr 14]. Available from: https://www.dffe.gov.za/sites/default/files/docs/2020lowemission_developmentstrategy.pdf

27. Flyvbjerg B. What you should know about megaprojects and why: An overview. Proj Manag J. 2014;45(2):6–19. https://doi.org/10.1002/pmj.21409

28. Gregory J. Governance, scale, scope: A review of six South African electricity generation infrastructure megaprojects. Utilities Policy. 2020;66:101103. https://doi.org/10.1016/j.jup.2020.101103

29. Parker D. Delays, inconsistency and lack of clarity blocking South African renewables rollout. Engineering News. 2022 February 11. Available from: https://www.engineeringnews.co.za/article/delays-inconsistency-and-lack-of-clarity-blocking-south-african-renewables-rollout-2022-02-11

30. Muller M. Fracking lawfare may obstruct the just transition. Business Day. 2022 August 25. Available from: https://www.businesslive.co.za/bd/opinion/2022-08-25-mike-muller-fracking-lawfare-may-obstruct-the-just-transition/