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Electricity reforms: Experience and approach

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Introduction[2]

South Africa has been experiencing electricity shortages since 2008. Load shedding is taking place even at the moment, despite a large contraction in economic activity due to the Covid-19 crisis. Eskom is now a sovereign debt risk due to its failure to effectively address operational and financial challenges. The power utility's deterioration is a result of various factors, including long delays in the completion of the Medupi and Kusile coal-fired power plants, political interference, corrupt practices in the procurement process, poor maintenance and a large, well-paid labour force. In the authors' view, the problem underlying these factors is the structure and regulation of the electricity sector.

South Africa's vertically integrated and regulated electricity monopoly was the common global model until the 1990s. Since then, most countries have liberalised their electricity sectors and now only 6% of global electricity is supplied by vertically integrated electricity monopolies (IEA, 2016). South Africa is behind global best practice in managing and regulating its electricity sector.

This policy bulletin provides a brief history of electricity reforms and their impact, and outlines steps that South Africa should take to liberalise its electricity sector.

History of reforms in South Africa

South Africa has been trying to restructure its electricity sector since 1998. The 1998 Energy White Paper proposed reducing Eskom's share of electricity generation to 70% and establishing an independent system and market operator[3] as a separate state-owned enterprise.

In line with international best practice, the White Paper proposed unbundling vertically integrated electricity monopolies; introducing competition through new private players; ensuring non-discriminatory open access to the transmission network; and implementing independent regulation (Mondi, 2018). To ensure a level playing field, it proposed making policy-related processes the responsibility of the Department of Energy instead of Eskom. These processes

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[2] Many thanks to Shaun de Jager and Theo van Rensburg.

[3] The Independent system and market operator procures electricity from different generation companies, manages the transmission network and provides electricity to distributional companies.

include long-term planning, procuring power from private firms and developing protocols for load-shedding.

Government approved restructuring the electricity sector in 2001 as outlined in the 1998 White Paper. Eskom's power plants were to be established as clusters that would compete with each other, with independent power producers providing 30% of the generation capacity. The reform was expected to provide opportunities for foreign direct investment and black economic empowerment.

After the 2004 elections, government changed course and reforms were only partially implemented, with Eskom maintaining its monopoly over the electricity sector.

Reform pressure increased again in the post 2008 period as rising electricity prices and unreliable electricity supply highlighted the unsustainability of the current model. The National Development Plan recommended restructuring the electricity sector, including selling Eskom generation capacity (National Planning Commission, 2012).

Progress in transforming the sector has been slow. Independent power producers currently constitute 11% of the total generation capacity and Eskom remains a vertically integrated monopoly. Government announced in October 2019 that it would carry out plans to unbundle Eskom given its operational and financial problems. A chief restructuring officer has been appointed, but no new reform steps have been taken.

Empirical evidence of the impact of electricity reforms

The first steps in reforming the regulation of the electricity sector are to separate electricity generation and transmission, encourage competition in generation, and expand network access. The simplest form of private-sector access is to allow the entry of independent power producers, which mostly generate electricity with some technological restrictions[4] and sell the output to a local utility for a predetermined price.

More complex regulatory reform includes strengthening private participation in generation and distribution, and developing effective wholesale and retail markets. This includes forming electricity spot markets to determine electricity prices and trade, and ensure a choice of supplier. Among countries that have initiated reforms, some have liberalised their electricity supply industry, some have privatised segments of the industry, and others have pursued both liberalisation and privatisation (Steiner, 2000). Figure 1 presents the status of liberalisation globally.

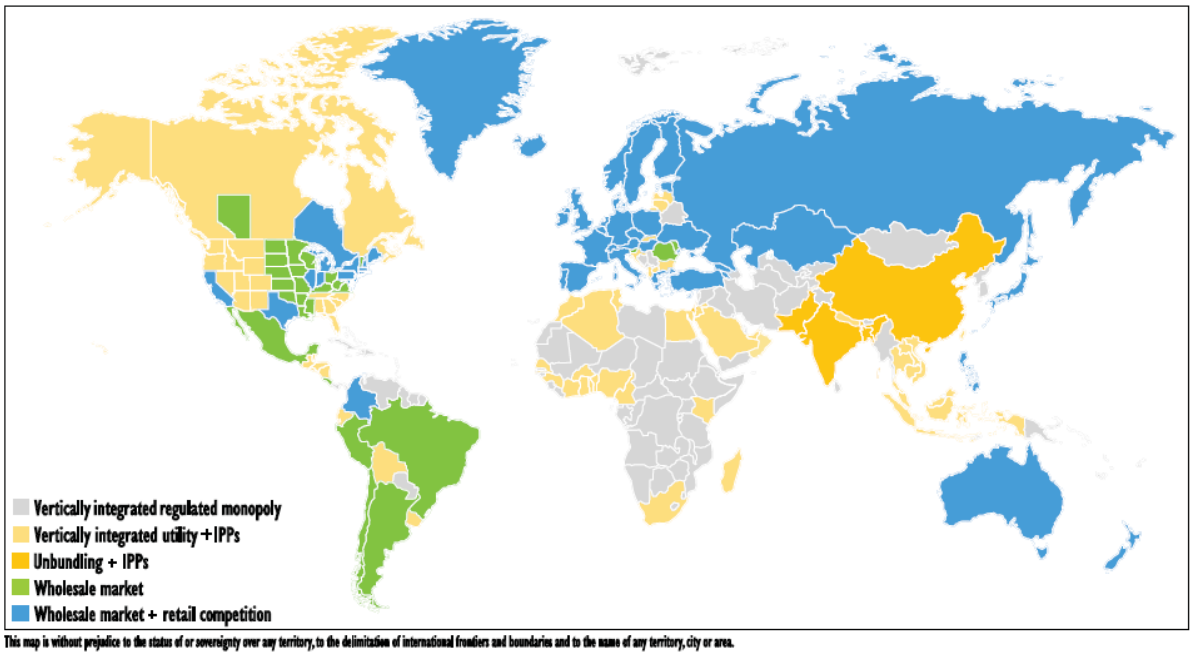
Electricity reforms generally have a positive impact on energy prices, efficiency and production. For example, Zhang et al. (2008) found that introducing competition in the generation and transmission sectors increases productivity and improves efficiency.[5,6] In addition, distribution

[4] The restrictions are imposed based on some government objective such as to reduce greenhouse emissions.

[5] Steiner (2000) used data from 19 Organisation for Economic Co-operation and Development (OECD) countries and concluded that privatised competitive generation lowers prices and increases efficiency. Cubbin and Stern (2006) studied 28 developing countries from 1980 to 2001 and found that the regulatory framework is critical to achieve electricity efficiency and increased generation. Bortolotti et al. (1998) also found positive outcomes in 38 countries between 1977 and 1997. The performance indicators used in empirical analysis are often only proxies for efficiency and prices. An appropriate indicator for quality is often unavailable; therefore, empirical investigations are mostly applied only to the price and efficiency dimensions of performance. Case studies are therefore an important methodological instrument to better understand electricity reform outcomes (Kessides (2012). The general conclusion from these case studies is that liberalising the electricity sector has improved efficiency.

concerns resulting from electricity privatisation and market liberalisation tend to be misplaced, as higher prices in some cases are offset by increased access for poor consumers, enhanced service quality, and positive changes in public finances, which benefit the poor (McKenzie et al. 2003).

Figure 1: Map of the status of electricity liberalisation



Sources: IEA and *Renewable Energy and Energy Efficiency Partnership (REEEP) Policy Database 2012-2013.*

The gains, however, depend more on the form of regulation than on ownership (Newbery, 1995). Private-sector participation is only beneficial when there is an independent regulator. Independent regulation without privatisation (in effect, regulation of state-owned utilities), on the other hand, seems to be ineffective in improving the performance of electricity monopolies (Zhang et al., 2008).

In addition to effective regulation, the reform process needs to focus on cost recovery and financial considerations, as well as service provision and public benefits (Williams and Ghanadan, 2006). Granting long-term rights to independent power producers to supply at predetermined prices can reduce competition and, consequently, the positive outcomes from the reform process (Kessides, 2012).

The standard model

While the benefits of electricity reforms can be extensive, the potential cost can also be significant if the reforms are implemented incompletely or incorrectly (Joskow, 2008).

The standard model for restructuring, regulatory reform and developing competitive markets for power includes the following steps:

Corporatise and commercialise state-owned utilities

This first step aims to reduce inefficiency in the utility stemming from many objectives and requests for spending while under political control. Public requests, like a service obligation, are

[6] Egert (2018) analysed the economic impact of product market reforms on economic activity for OECD and non-OECD countries. Reforms in non-OECD countries were found to have a much larger effect. Arnold and Wörgötter (2011) found that further reforms in old and new European Union member countries' network regulations could boost productivity by up to 10% over 10 years.

more likely to be handled transparently and cost-effectively when negotiated between government and an independent commercial entity. Usually, the checks and balances in commercial law ensure a cost-effective and innovation-friendly environment for a company and reduce political interference. It also supports greater private-sector participation. If privatisation is not feasible, governance should be the responsibility of a central authority instead of a line ministry (OECD, 2015).

Enact statutory legislation to ensure a legal mandate for restructuring and creating (independent) regulatory agencies with adequate information, capacity and statutory authority

Even after privatisation, some parts of the electricity market will remain public and require regulation. Clear and transparent procedures are needed to deal with legal disputes between regulators and private electricity firms.

Restructure the sector to facilitate competition by separating generation and retail activities from transmission and distribution

This intervention improves incentives for controlling construction and operating costs of generation facilities; encourages innovation in power supply technologies; makes network operators responsible for service quality; and shifts the risks of technology choice, construction cost and operational negligence (such as delayed maintenance) away from consumers to suppliers.

Restructuring benefits consumers by allowing more retail competition from which to choose. It also benefits the environment by allowing the entry of less carbon-intensive generation technologies.

Change the regulatory regime to promote efficient access to the transmission network and optimise the location of generation facilities

Introducing wholesale and retail competition requires reforms to traditional regulatory arrangements governing distribution and transmission networks (Joskow, 2008). Regulators need a wide range of competencies to incentivise electricity firms to maintain and develop efficient operations, while satisfying broader policy objectives such as reducing carbon emissions, broadening market access and encouraging increased spending on innovation. The regulatory design must take into account these broader policy objectives as well as the more complex interactions between the various role players that are no longer part of the same company (IEA, 2016).

To reduce costs and improve service quality, the privatisation of distribution and transmission companies should be complemented with the implementation of performance-based regulation[7] that imposes budget constraints on regulated network firms (Beesley and Littlechild, 1989; Joskow, 2014; and Jamasb and Pollitt, 2007).

Designate an independent system operator

Unbundling requires an independent system operator to manage coordination in the place of the

[7] Performance-based regulation is based on a set of performance metrics and not only on the cost of service. For a detailed discussion of performance-based regulation see https://www.brookings.edu/blog/planetpolicy/2015/12/03/why-performance-based-regulation-is-important-for-the-electric-utility-transformation/

integrated monopolist (Pickering 2010).

Separate the costs of retail supply from the costs of transmission and distribution

Unbundling retail tariffs, along with introducing time-varying pricing, ensures that prices reflect the underlying cost level and structure. This will encourage consumers to invest in energy-efficiency measures and use less carbon-intensive technologies. For example, Spain's recent tariff reform exposes final customers to intra-day wholesale price variations (IEA, 2016). Tariffs should be calculated using a simple and transparent methodology.

Create markets and trading arrangements for household energy provision and ancillary services

Digitalisation provides new opportunities to optimise demand and supply in electricity markets. Households can select greener technologies as their preferred source of electricity. Smart meters contribute to lowering expensive peak loads, while treating demand as a generation source enhances the flexibility of supply networks (IEA, 2016).

Conclusion

Based on international comparison, comprehensive reform of South Africa's electricity sector is long overdue. Reforms will improve efficiency and eliminate the current supply shortages, helping to raise the growth potential of the economy. They will also improve price certainty, which is important for investment, inflation expectations and monetary policy.

The South African case of stopping short after commercialisation highlights the risks of incomplete reforms. Implementing the best-practice reforms outlined here will promote competition and cost efficiency while eliminating supply shortages, reducing the carbon intensity of the sector and improving service quality. Reduced barriers to entry will also provide greater opportunities for black-owned companies to participate in the sector.

References

- Alvarez, J. and F. Valencia. 2016. "Made in Mexico: Energy reform and manufacturing growth", *Energy Economics*, 55: 253-65.
- Arnold, J.M. and A. Wörgötter. 2011. "Structural reforms and the benefits of the enlarged EU internal market: still much to be gained," *Applied Economics Letters*, Taylor & Francis Journals, vol. 18(13), 1231-1235.
- Beesley, M. and S. Littlechild. 1989. "The Regulation of Privatized Monopolies in the United Kingdom," *Rand Journal of Economics*, 20:3 454-472.
- Bortolotti, B., M. Fantini and D. Siniscalco. 1998. "Regulation and privatisation: The case of electricity", *Nota di Lavoro*, No. 70.1998, Fondazione Eni Enrico Mattei (FEEM), Milano.
- Cubbin, J. and J. Stern. 2006. "The Impact of Regulatory Governance and Privatization on Electricity Industry Generation Capacity in Developing Economies", *The World Bank Economic Review*, 20(1): 115–141. https://doi.org/10.1093/wber/lhj004.
- DOE. 2018. Independent Power Producers Procurement Programme: An Overview, Pretoria.
- Égert, B. 2018. "The quantification of structural reforms," OECD Economics Department Working Papers 1482, OECD Publishing.
- IEA. 2016. Re-powering Markets Market: Design and regulation during the transition to low-carbon power systems. IEA, Paris.
- Jamasb, T. and M. Pollitt. 2007. "Incentive Regulation of Electricity Distribution Networks," June. http://www.electricitypolicy.org.uk/pubs/wp/eprg0701.pdf.
- Joskow, P. 2008. Lessons Learned from Electricity Market Liberalization, *Energy Journal*. Special Issue No. 2: 9–42.
- Joskow, P.L. 2014. "Incentive Regulation in Theory and Practice: Electric Transmission and

Distribution," in Nancy Rose, ed., *Economic Regulation and Its Reform: What Have We Learned*, University of Chicago Press, Chicago.
- Kessides, I.N. 2004. Reforming Infrastructure: Privatization, Regulation, and Competition, Washington, DC: Oxford University Press, World Bank, 2004.
- Kessides, I.N. 2012. 'The Impacts of Electricity Sector Reforms in Developing Countries', *The Electricity Journal*, 25: 79-88.
- McKenzie, D., D. Mookherjee, G. Castañeda and J. Saavedra. 2003. "The Distributive Impact of Privatization in Latin America: Evidence from Four Countries [with Comments]." *Economía*, vol. 3, no. 2: 161–233. JSTOR, www.jstor.org/stable/20065443.
- Mondi, L. 2018. "State, Market and Competition: Can Eskom Be Rescued?", Viewpoint, No. 3.
- Nagayama, H. 2007. Effects of Regulatory Reforms in the Electricity Supply Industry on Electricity Prices in Developing Countries, *Energy Policy*, 35 (6): 3440–3462.
- Newbery, D. 1995. A Template for Power Reform, Public Policy for the Private Sector Note 54, Washington, DC: World Bank.
- National Planning Commission. 2018. "Energy", NPC Economy Series.
- OECD. 2005. OECD Reviews of Regulatory Reform: Russia. Building Rules for the Market, OECD Publishing.
- OECD. 2015. OECD Guidelines on Corporate Governance of State-Owned Enterprises, 2015 Edition, OECD Publishing, Paris, https://doi.org/10.1787/9789264244160-en.
- Pickering, M. 2010. Towards an independent system operator for South Africa. Meridian Economics.
- Sioshansi F.P. (ed.). 2013. Evolution of Global Electricity Markets, Elsevier.
- Steiner, F. 2000. Regulation, Industry Structure, and Performance in the Electricity Supply Industry (March 2000). Available at SSRN: https://ssrn.com/abstract=223648 or http://dx.doi.org/10.2139/ssrn.223648, published in OECD Economic Studies, OECD Publishing, vol. 2001(1), pages 143-182.
- Tompson, W. 2004. "Restructuring Russia's Electricity Sector: Towards Effective Competition or Faux Liberalisation?," OECD Economics Department Working Papers 403, OECD Publishing.
- Williams, J.H. and R. Ghanadan. 2006. "Electricity reform in developing and transition countries: A reappraisal," *Energy*, Elsevier, vol. 31(6), pages 815-844.
- Zhang, Y., D. Parker and C. Kirkpatrick. 2008. "Electricity sector reform in developing countries: an econometric assessment of the effects of privatization, competition and regulation," *Journal of Regulatory Economics*, Springer, vol. 33(2), pages 159-178, April.