Rethinking Eskom:

Lessons from electricity sector reform in India and Mexico

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Written by Anna Geddes, Richard Bridle, Mostafa Mostafa, Joachim Roth, Lourdes Sanchez, Vibhuti Garg, Louise Scholtz and Saliem Fakir

Executive Summary

South Africa is debating the reform of its heavily indebted state-owned electricity utility, Eskom. Statements promising reforms and other steps to improve the status quo have been announced amid concerns about possible job losses, issues around ownership of assets, a need for decarbonization, and likely electricity price hikes.

This paper explores two international examples of electricity sector reform in emerging economies with comparable characteristics—India and Mexico. It further considers the impact of reform on electricity prices, jobs, decarbonization, and electricity sector ownership, drawing lessons for the South African context. The "standard model" of electricity utility reform favoured by many economists is compared to the reforms implemented in the case study countries and those planned for South Africa in Table ES1.

Table ES1. Status of the "standard model" elements of electricity sector reform in India, Mexico, and South Africa.

Element	Standard Model	India	Mexico	South Africa – Pre-reform	South Africa – Post-reform
Regulation	Independent regulator	Yes, independent regulator	Yes, independent regulator	Yes, though some regulatory functions performed by utility and energy ministry.	Unchanged
Unbundling	Fully separated into generation, transmission, distribution, and retail functions.	Separated into generation, transmission, and distribution functions.	Separated into generation, transmission, and distribution functions.	No, Eskom remains a vertically integrated utility.	Separated into generation, transmission, and distribution functions.
Ownership	Privatization of all existing and future assets	Mix of public and private ownership	Mix of public and private ownership	Majority publicly owned	Unchanged – details not provided by roadmap
Competition	Creation of competitive markets in all areas	Partially	Partially	Partially	Unchanged – details not provided by roadmap
Cost recovery achieved (Yes/No)	Yes	No	No	No	Details not provided by roadmap
Electricity prices (un/regulated)	Unregulated, to reflect costs – let market decide	Remain regulated	Remain regulated	Regulated	Unchanged
Government financial assistance provided to sector actors (Yes/No)	Not specified	Yes	Yes	Yes	Yes

Element	Standard Model	India	Mexico	South Africa – Pre-reform	South Africa – Post-reform
De-carbonization	Not specified				
Share of coal generation before/after reform		68% (2003)/ 86% (2020)	11% (2013)/ 9% (2018)	88% (2017)	Reform impact unclear
Share of renewable energy generation before/ after reform		0.6% (2003)/ 8% (2017)	4% (2013)/ 7% (2018)	3.4% (2017)	Reform impact unclear IRP states 26% renewable energy target by 2030

Key Findings and Recommendations

- Instead of strictly adhering to the "standard model" of electricity utility reform favoured by many economists, India and Mexico have taken a more pragmatic approach, implementing reforms where they are expected to be effective and politically feasible and accepting the status quo in other areas. A more pragmatic approach to electricity sector reform might be a better fit for South Africa. Reforms should consider the South African context and impacts beyond economic efficiency and consider the need to keep prices affordable for the poor, vulnerable, and small, medium, and micro enterprises (SMMEs), provide decent jobs, reduce coal dependence, and acknowledge calls to retain forms of public and community ownership.
- Neither India nor Mexico has instituted market-based electricity tariffs for all end consumers, choosing instead to maintain regulated pricing below cost. As a result, most electricity prices are not at a cost-recovery level. This is one of the drivers for the financial problems seen in each country's electricity sector, and ongoing financial assistance has been necessary following reform. Unbundling alone, without pricing reform, is unlikely to have much of an impact on South Africa's electricity prices or Eskom's financial problems. Ongoing financial assistance from the government is likely needed while South Africa finds a way for Eskom and the electricity system as a whole to become financially sustainable.
- Another result of maintaining below-cost tariffs in both India and Mexico is that electricity consumer subsidies continue to feature in the system. Untargeted electricity subsidies can encourage wasteful consumption, disproportionately benefiting the rich (who tend to consume more energy) and lead to unsustainable costs to the public budget. Inefficient electricity subsidies should be removed, while well-designed targeted support should be provided to poor and vulnerable consumers to ensure access to reliable, affordable, and modern forms of electricity.
- Understanding the impact of electricity sector reform on jobs is a key issue for ensuring a just transition occurs in South Africa. Data remains limited regarding impacts on employment in both India and Mexico. A deeper investigation of job losses and gains across the energy sector that may have occurred as a result of reform in

India and Mexico and an exploration of patterns relating job shifts to private vs. public ownership would provide further valuable insights for South Africa.

- Reforms involving unbundling combined with the introduction of competition and private sector participation in generation (via auctions) in India and Mexico have allowed an acceleration of renewable energy deployment due to the increasing cost-competitiveness of renewable energy technologies. As a result, these renewable projects have been mostly privately developed and owned. The same trend is already observable in South Africa.
- Many stakeholders in South Africa are concerned about the various degrees of privatization of electricity sector assets. Both case study countries have sought to implement only partial privatization as part of their reforms. Because most renewable projects were privately developed and owned in India and Mexico after reform, opposition to private ownership may create additional barriers to decarbonization in South Africa. If public ownership and state-owned enterprises are to continue to play a strong role in the sector, there remain questions around how they can also support decarbonization and a just transition. Given the dual need to decarbonize and retain a form of public ownership in South Africa, future research and effort are needed to evaluate how public, municipal, or community ownership of infrastructure at different scales could integrate renewables in South Africa.

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1.0 Introduction

In response to the seventh presidential pronouncement on electricity sector reform in 2018, South Africa is debating the restructuring of its state-owned electricity utility, Eskom. Reform has been proposed in an effort to overcome Eskom's extensive financial problems and ongoing electricity sector performance issues (Department of Public Enterprises, 2019). Eskom's situation, described as a "crisis" by the government, has its roots in a history of policy and planning uncertainty, mismanagement, and governance issues (Baker & Phillips, 2019a; Department of Public Enterprises, 2019). The utility currently holds ZAR 450 billion (USD 34 billion) of debt it is unable to service, and its credit rating has been downgraded to "junk" by international credit rating agencies (Baker & Phillips, 2019b; Eskom, 2011; Merten, 2019). Its financial situation is unsustainable, with revenues remaining substantially lower than costs (Baker & Phillips, 2019b; Department of Public Enterprises, 2019; Eskom, 2019a). In addition, the electricity system is characterized by power shortages, inadequate maintenance, and delays in plant construction. As a result, Eskom had to implement severe load-shedding earlier in 2020. This impacts households and industry (Fin24, 2019).

The South African government laid out the first steps of reform in its "Roadmap for Eskom in a Reformed Electricity Supply Industry" in October 2019 (Department of Public Enterprises, 2019). It aims to split ("unbundle") Eskom into separate entities responsible for generation, transmission, and distribution, and discusses various strategies to ensure the new entities are financially sustainable and feature improved governance. These reforms have been announced amid the concerns of labour and civil society organizations about possible job losses and issues around ownership of assets, as well as concerns of consumers toward potential electricity price hikes.[1]

A "standard model" of electricity sector reform, aiming to maximize economic efficiency, is favoured by many economists (Sen et al., 2016). However, it is still a subject of debate whether this model is appropriate for developing countries and emerging economies, especially as the need to place social and environmental impacts alongside economic considerations has risen to greater prominence. Energy access, economic inequality, industrialization plans, and unemployment are among the main challenges in developing countries and emerging economies. South Africa, in its Nationally Determined Contribution (NDC) under the Paris climate agreement, has pledged to ensure a "just transition"[2] for workers (Burton et al., 2019; Government of South Africa, 2016). The Eskom roadmap also discusses the implementation of a "just transition," reflecting the importance of the social and environmental impacts of energy transition in the South African context (Department of Public Enterprises, 2019).

[1] In December 2019, IISD conducted a series of interviews with NGOs, academics and independent power producer (IPPs) that highlighted these stakeholder views.

[2] A just energy transition is "a negotiated vision and process centered on dialogue, supported by a set of guiding principles, to shift practices in energy production and consumption. It aims to minimize negative impacts on workers and communities with stakes in high-carbon sectors that will wind down, and to maximize positive opportunities for new decent jobs in the low-carbon growth sectors of the future. It strives to ensure that the costs and benefits of the transition are equitably shared." (Zinecker, Gass, et al., 2018, p. 2).

This paper explores international examples of electricity sector reform in comparable large emerging economies—India and Mexico. Both countries' electricity systems have faced financial distress. In India's case, the system is heavily dependent on coal, like in South Africa. Both countries have recently implemented reforms. These cases, therefore, offer a rich source of information to inform the debate in South Africa. This work goes beyond the evaluation of the success or failure of reforms purely on economic indicators and the requirements of the "standard model." It considers a broader range of indicators that are considered particularly relevant to the debate in South Africa, namely the impact of reform on:

- Electricity prices
- Electricity sector jobs
- Decarbonization
- Electricity sector ownership

This is necessary because policy-makers and the public they represent have a similarly broad range of interests and concerns. The remainder of this report is structured as follows. It first discusses the "standard model" of electricity sector reform and how India, Mexico, and South Africa compare against the elements of this model. It then outlines South Africa's electricity system and Eskom according to the broad range of indicators mentioned above, along with a summary of the proposed reforms. The report then presents India and Mexico's recent reforms (and their impacts), followed by a discussion of potential lessons for South Africa. The paper concludes with key findings and recommendations.

2.0 Beyond the Standard Model

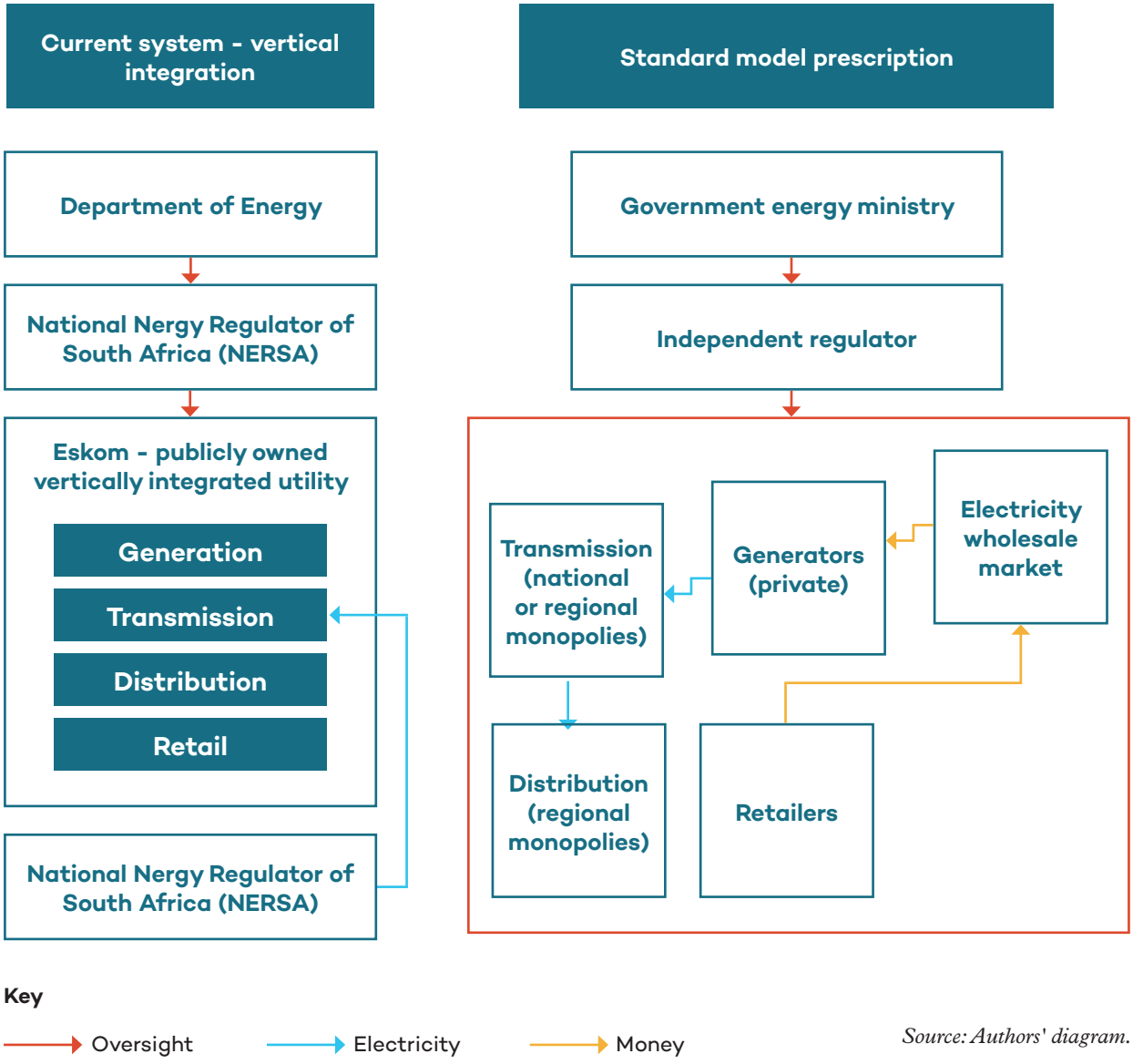
Since the 1990s, a "standard model" of electricity sector reform has been recommended by international organizations, including the World Bank and other international financial institutions. The main goal of the standard model of reform is to optimize economic efficiency (Foster et al., 2017; Sen et al., 2016). To achieve this goal, four main categories of reforms are proposed:

1. Create a system of independent regulation to remove conflicts of interest and help improve transparency.
2. Ensuring competition takes place throughout the sector, by creating markets, especially in the retail and wholesale generation parts of the system. Competition is encouraged throughout the sector, but in practice, transmission is a natural monopoly, and it is less likely that several transmission entities are created to compete. This can also be the case for parts of the distribution sector.
3. Restructure with the goal of fully vertically and horizontally unbundling the sector. Often, unreformed electricity sectors consist of a vertically or horizontally integrated (state-owned) monopoly utility—meaning that the utility is responsible for all or most of the functions of the electricity sector, i.e., the generation, transmission, distribution, and retail of electricity. In practice, unbundling means separating the sector into generation, transmission, distribution, and retail functions, and creating several independent, corporatized[3] entities to operate each of these functions.
4. Promote private sector participation by encouraging private sector investment in new assets and privatizing existing assets.

The standard model also includes other elements such as ensuring cost recovery (where revenues are higher than costs) are achieved for all entities and that electricity prices are cost-reflective (or are unregulated), meaning that governments no longer subsidize electricity for consumers. In cases where existing utilities are heavily indebted, reform can also include the provision of financial assistance in the form of financial bailouts from governments and debt restructuring processes.

[3] Corporatization refers to the process of operating business entities as if they were corporations, with independent management, production of operational and financial reports, following a rules-based system and demonstrating that decisions are taken according to economic logic (McDonald, 2015).

Figure 1. South Africa's current energy system model and standard model reform prescriptions



Source: Authors' diagram.

The standard model was first developed and deployed in OECD countries in the context of overcapacity, well-functioning markets, and established institutions. It is still a subject of debate whether this model is effective in developing and emerging economies, where the drivers for reform and the context conditions can be so different—such as heavily indebted utilities, electricity supply constraining growth, and the need for investment in new capacity (Sen et al., 2016).

A 2018 World Bank report summarized the impacts of energy sector reforms across 88 developing countries (Bacon, 2018). The report concluded that private sector participation was, in many cases, associated with economic efficiency improvements and that unbundling alone was not expected to have much of an effect on performance even though it is often considered a prerequisite for private sector participation (Bacon, 2018).

Despite being the default economic prescription for several decades, the standard model has not been widely implemented in its entirety. The World Bank reports that only 18% of developing countries had a fully unbundled electricity sector in 2015 (Foster et al., 2017). Since the development of the model, the need to place social and environmental impacts alongside economic considerations has risen to greater prominence. Some countries have embarked on reforms that have had unpopular outcomes, such as electricity price increases or reduced electricity sector employment. As a result, leaving the provision of grid connections, the energy mix, or energy prices to market forces has become less politically tenable.

In practice, many of the reforms have adapted the standard model for the national context. This has often meant retaining a greater level of public ownership than the standard model would recommend. This highlights the need for an electricity reform agenda that better reflects political realities and sustainable development priorities. That is why this report considers the impacts of reform on issues that are considered important to the debate in South Africa, using the examples of Mexico and India.

3.0 South Africa's Electricity Sector and Eskom

3.1 Proposed Reform and Its Drivers

Eskom's crisis is both financial and technical, characterized by capacity shortfalls, power shortages, inadequate maintenance, rising prices, rising debt, and governance issues (Baker & Phillips, 2018). The utility is unable to service its debt of ZAR 450 billion, as of July 2019 (USD 34 billion, July 2019), of which ZAR 350 billion (USD 26 billion, July 2019) is guaranteed by the government (Merten, 2019). Eskom has been declared "too systemic and critically important to the South African economy to be allowed to fail," so in the short term, the government has chosen to provide financial assistance to the utility while seeking to transition the electricity system to financial sustainability (Department of Public Enterprises, 2019, p. 14). The government approved a payment of ZAR 26 billion (USD 2 billion, July 2019) for the 2019–2020 financial year and another ZAR 33 billion (USD 2.5 billion, July 2019) for the 2020–2021 financial year (Ministry of Finance, 2019).

In its "Roadmap for Eskom in a Reformed Electricity Supply Industry," released in October 2019, the government has described some initial steps of reform for Eskom and the electricity sector. The utility is currently a state-owned, fully vertically integrated monopoly. That means it is responsible for most of the functions of South Africa's electricity sector, including generation, transmission, and distribution.[4] Under the roadmap, the government aims to split (i.e., unbundle) Eskom into separate entities responsible for generation, transmission, and distribution. These entities will be subsidiaries of an overarching holding company, Eskom Holdings SOC Limited. Therefore, while these subsidiaries will continue to be state-owned, they will not be totally separate, independent state-owned enterprises (Department of Public Enterprises, 2019).

Many other parts of the reform and its impacts are not discussed in detail in the roadmap, which does not provide clear details on how Eskom's debt will be dealt with at this stage. For example, apart from the already announced financial assistance, it doesn't indicate how the debt will be apportioned between the entities or how the debt will be restructured.

There also remain questions around future decarbonization and ownership in all parts of the sector. President Cyril Ramaphosa's more recent 2020 State of the Nation Address announced intentions to enable additional solar and wind capacity and a greater role for municipalities, allowing them to source their own power from independent power producers (Government of South Africa, 2020).

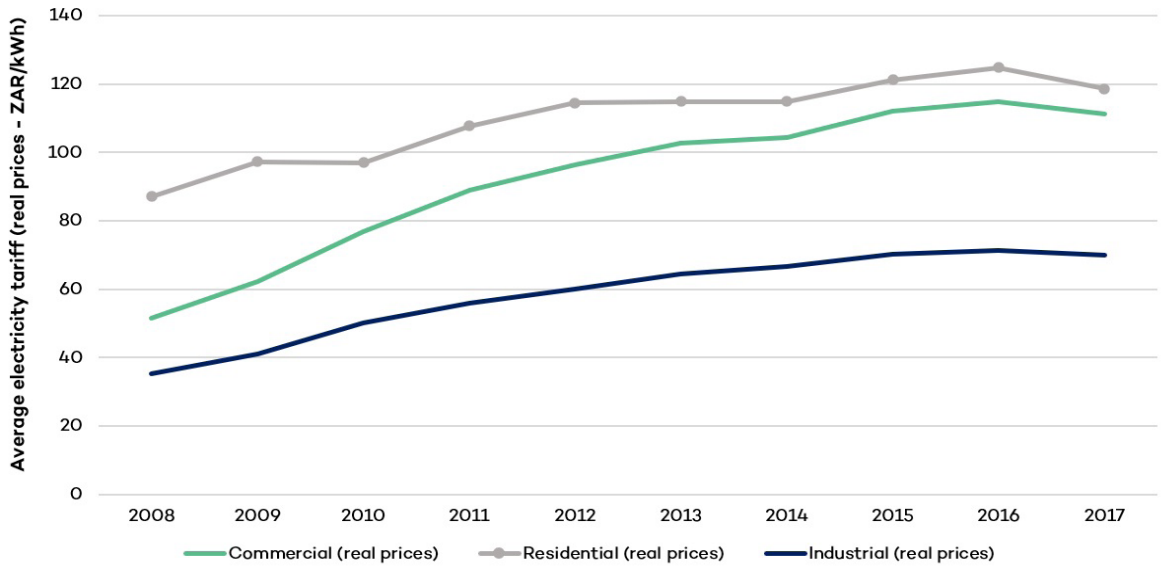
The roadmap also discusses the implementation of a just transition, touching on issues including impacts on workers, communities, and reducing emissions. Questions remain unanswered on how to balance the need to secure Eskom's financial position while protecting consumers, workers, and the environment.

[4] Currently it performs 40% of the distribution function whereas municipalities are responsible for the other 60% of distribution (Department of Public Enterprises, 2019).

3.2 Electricity Prices

In South Africa, electricity prices—which have risen significantly in recent years—are regulated by the National Energy Regulator of South Africa (NERSA). The roadmap reports nominal increases of 500% from 2007 to 2019 (Department of Public Enterprises, 2019). A summary of historical tariffs is shown in Figure 2 (in ZAR). When real prices, adjusted for inflation, are considered, it can be seen that to a significant extent the rising tariffs reflect high inflation rates. Regardless of the cause, price increases can push consumers into energy poverty.

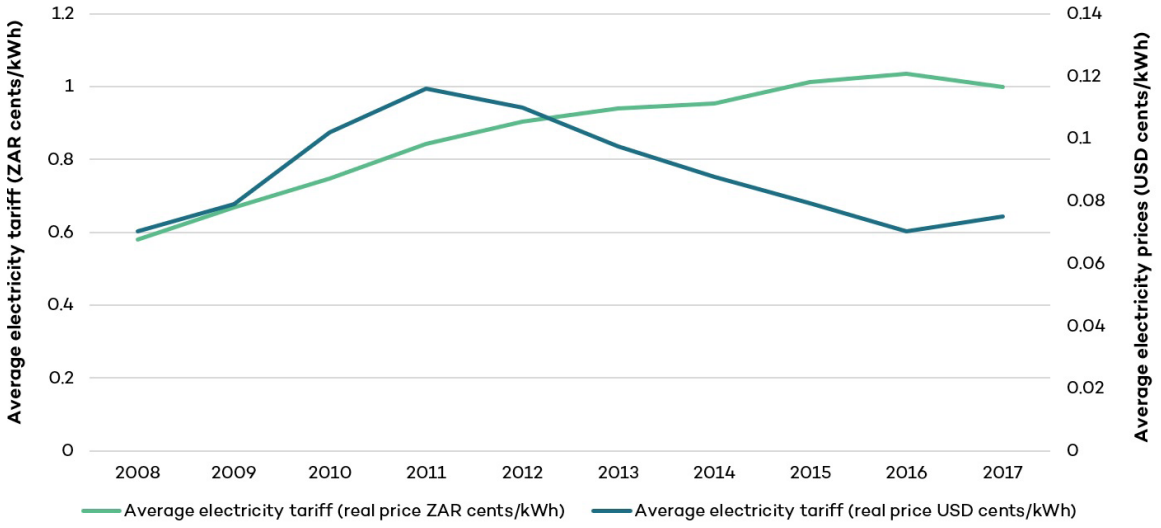
Figure 2. Historical tariffs adjusted to 2017 prices



Source: Eskom, 2020b.

The exchange rate has also played a role in the change in prices. Figure 3 shows average electricity tariffs in ZAR and USD (Eskom, 2020b). This graph shows that in real 2017 prices, in terms of the USD value of tariffs, prices have not increased significantly due to the devaluation of the ZAR in this period. This indicates that rising electricity prices can be partially attributed to South Africa's ongoing economic troubles.

Figure 3. Historical tariffs USD & ZAR comparison



Source: Eskom, 2020a.

The fact that price increases in USD-denominated prices have not risen significantly does not make them any less painful for South African consumers receiving an income in ZAR. Many consumers aren't able to afford electricity. Skyrocketing costs have worsened the situation, and many are concerned about potential future electricity price rises due to reform.

Impacts on electricity tariffs from the proposed reforms are unclear, with the roadmap mentioning only that the government wants to "ensure that Eskom can fully recover efficient costs" (Department of Public Enterprises, 2019, p. 28). If further price increases are part of the government's plan to achieve cost recovery, it is important to ensure that they do not threaten access to reliable, affordable, and modern forms of electricity. International experience shows that subsidies that cannot be removed for social reasons should be well targeted to avoid wasteful expenditure (Zinecker et al., 2018). The provision of "Free Basic Electricity" in South Africa, where a relatively small amount of electricity is provided free of charge to some South African households, is an example of such a subsidy aiming to ensure energy access.

3.3 Electricity Sector Jobs

A key area concern around electricity sector reform is the potential impact on jobs. There is currently no widely accepted method for measuring, monitoring, or projecting employment related to the electricity sector. Without a comprehensive understanding of employment trends in direct, indirect, and induced employment, it is difficult to draw any firm conclusions on the potential impact due to reform.

A review by Meridian Economics concluded that a common understanding of electricity sector employment remains elusive due to inconsistent and non-standardized data. It also found that such was the variation in available estimates that there was no agreement over whether job losses in the coal sector would be compensated by increases in the renewables sector. Furthermore, they concluded that the available data did address the meaningfulness or decency of work (Meridian Economics, 2018). Acknowledging the limitations of available data, the authors note that in 2017 coal mining employed some 87,500 people, and Eskom employed a further nearly 8,000 people in its coal-fired power station fleet. These figures are considerably larger than those currently employed in the renewable energy industry, estimated at approximately 32,500 person years (note the inconsistency of units) (Meridian Economics, 2018).

Other available sources also provide information on direct jobs in the sector. For example, Eskom reports that it had 46,665[5] employees in 2019 (Eskom, 2019b). The level of staffing at Eskom has been controversial. In 2016 a World Bank report claimed that staffing levels were 66% higher than an estimated "optimal" level (Trimble et al., 2016).

According to IRENA, renewable energy employment increased from 17,800 job-years[6] in 2014 to 36,500 by the middle of 2018 (IRENA, 2019a). Of these jobs, 85% were reported to be in construction and are therefore temporary, and the remainder were in operations (IRENA, 2019a). There is an ongoing debate in South Africa on whether a shift from coal-

[5] Includes full-time employees and fixed-term contractors (Eskom, 2019b).

[6] A job-year is defined as one year of work for one person.

fired power plants to renewable energy would replace the jobs that exist today in coal-related activities. The labour unions have a key mandate to protect the jobs of their members, and their position on this topic will influence prospects for electricity sector reform. Several unions have indicated their opposition to the unbundling of Eskom as they see it as a precursor to full privatization and major job losses (Business Day, 2019).

The Eskom roadmap claims that the transition away from an economy based on coal-fired power to one based on new and low-carbon technologies will provide 'better' and more jobs. There are, however, no details on what this expected impact will be at a granular level, either at Eskom or in the wider economy. As part of implementing a just transition, Eskom is considering creating a fund for retraining workers for the renewable energy sector.[7]

3.4 Decarbonization

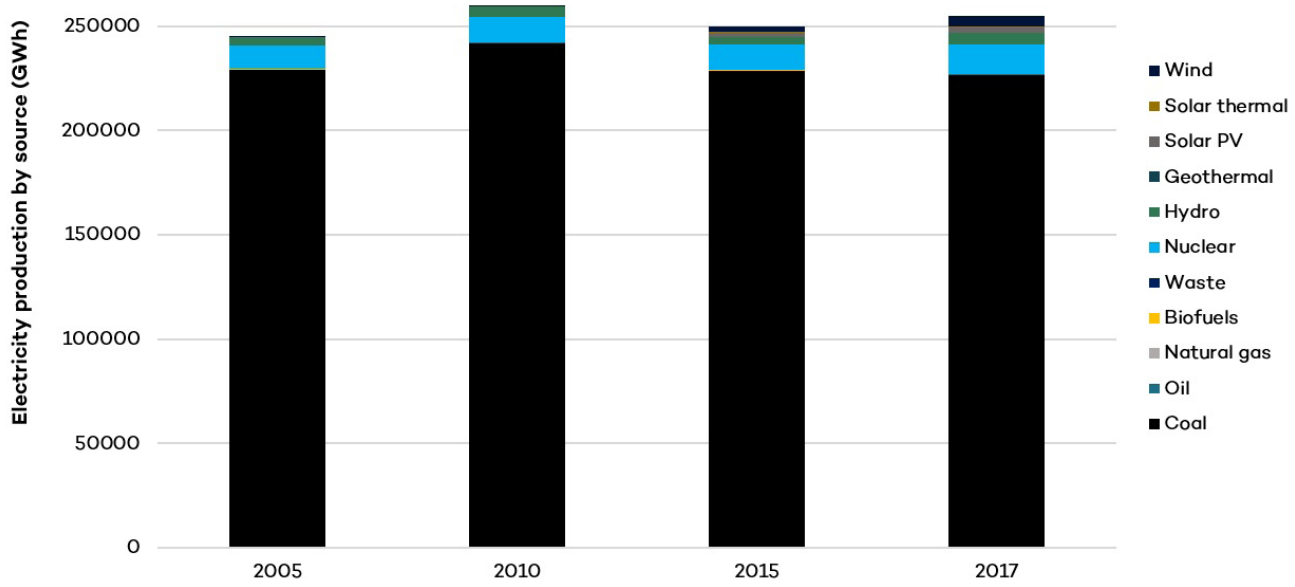
The Eskom roadmap is unclear about the extent to which the reform will enable the decarbonization of South Africa's electricity system. It also is unclear whether the new entity created from unbundling responsible for generation, Eskom Generation, will develop its own low-carbon generation assets or whether it will be left to private IPPs.

South Africa has one of the most coal-dominated energy systems in the world. Coal accounted for 76% of total primary energy in 2017, compared to a global average of 27%. In the electricity sector, 89% of electricity generation came from coal (Figure 4) (International Energy Agency [IEA], 2019a). Renewable energy has recently started to see some growth, with installed capacity of renewable energy increasing from 0.3 MW in 2011 to 5.3 MW in 2018 (IRENA, 2019b). In 2017, wind and solar accounted for 2% and 1% of total generation, respectively (IEA, 2019a). The increase in wind and solar generation was due to a series of independent power producer (IPP) procurement rounds launched in 2011 under the Renewable Energy Independent Power Producers' Procurement Programme (REIPPPP). These energy auctions enabled private sector investment in the electricity sector through long-term power purchase agreements (PPAs). As of March 2019, 112 projects have been procured, and ZAR 209.7 billion (USD 14 billion) has been invested (Department of Energy, 2019).

Renewable energy PPA prices in the most recent round of procurement are reported to be lower than the cost of electricity procured from new coal generators, with solar at ZAR 0.96 (USD 0.07, August 2019) per kWh and wind at ZAR 0.76 (USD 0.06) per kWh in the latest round of PPAs, compared to a cost per unit of ZAR 1.15 (USD 0.08) per kWh from South Africa's Medupi coal project (Paton, 2019; Yelland, 2016).

[7] While evidence remains limited on the impacts of Eskom's reform on jobs, a first model of mitigating labour losses in South Africa's energy transition using just transition strategies estimates the costs at ZAR 6 bn (USD 0.5 bn) (Cruywagen et al., 2019).

Figure 4. South Africa electricity production by energy



Source: IEA, 2019c.

3.5 Electricity Sector Ownership

The roadmap does not explicitly address questions around public, private, or community ownership of generation, transmission, and distribution. It mentions the eventual creation of an open and competitive generation market, which implies greater private sector participation in the generation sector.

More than 90% of South Africa's electricity generation capacity, along with all the transmission and distribution systems, are publicly owned (Department of Public Enterprises, 2019). Eskom owns 90% of generation capacity and 100% of transmission but only 40% of the distribution system, with municipalities accounting for the remaining 60% (Department of Public Enterprises, 2019). The REIPPPPs allowed the introduction of some private sector investment and ownership into generation, as described above.

The introduction of private ownership under the REIPPPP has highlighted two challenges in the current structure of the electricity sector. Firstly, there is currently a potential conflict of interest for Eskom. Eskom develops and owns 90% of the generation capacity and is at the same time the entity responsible for procuring power from IPPs. This conflict was brought into focus as Eskom blocked IPP PPAs in 2017, reportedly due to concerns over the impact on its own financial position and political support for plans to develop a fleet of nuclear power stations in-house (African Energy, 2016). It is not clear if the unbundling of Eskom will overcome this conflict of interest, as the Eskom entities will not be fully independent and will still be owned by the same holding company.

Secondly, the labour unions have indicated their opposition to private ownership of the electricity sector. South Africa has seen mixed results regarding the privatization of state-

owned enterprises (SOEs) (Ncopo, 2018), and unions are particularly concerned that privatization will allow private companies to perform mass layoffs in the electricity sector (Mkentane, 2019).

The National Union of Metalworkers of South Africa (NUMSA), launched a high court challenge against the signing of 27 PPAs with private renewable energy developers in March 2018 (Cloete, 2018b). In a statement, Karl Cloete, the Deputy General Secretary of NUMSA, argued that they supported a transition to renewable energy but only on the condition that renewable energy projects are owned by community groups or the public (Cloete, 2018a, 2018b). Most recently, the Congress of South African Trade Unions (COSATU) declared its support for allowing Eskom to access funds from the state-owned asset management firm, the Public Investment Corporation (PIC), to help pay off part of its debt. Key conditions for doing so include that Eskom remains state-owned, future renewable energy development is state-owned, and a just transition will be implemented with no jobs lost (Bloom, 2020; COSATU, 2020). Similar concerns over the need for public ownership have been raised by the National Union of Mineworkers (NUM) and the South African Federation of Trade Unions (Saftu) (Malope & Brown, 2019). The labour unions see the unbundling of Eskom as a precursor to privatization and potential job losses and hence have voiced their opposition to the reforms.

Other key stakeholders are also part of the electricity sector ownership debate. Civil society organizations (such as 90by2030) have expressed an interest in increased community ownership of electricity sector assets (Overy, 2018). As more households install rooftop solar photovoltaic (PV) devices to generate their own power, some municipalities that are responsible for distributing electricity and electricity sales are facing reduced revenues (Scholtz & Kritzinger, 2019). This threatens their ability to provide "Free Basic Electricity" to low-income households (which in turn threatens energy access) and to invest in the distribution infrastructure (Scholtz & Kritzinger, 2019). Municipalities are hence also pushing for a more active role in the electricity sector. The City of Cape Town has taken the Minister of Energy and NERSA to court to seek permission to procure electricity generation directly from IPPs rather than solely from Eskom (Knight, 2019).

4.0 India's Reform

In the last two and a half decades, the Indian electricity sector[8] has struggled with low-quality power supply, lack of sufficient investment in infrastructure, energy access issues, and rising debt. Until the early 1990s, each Indian state had its own State Electricity Board (SEB), which were vertically integrated, state-owned monopoly utilities. SEBs made a first step toward reform in 1991 by allowing private sector investment in generation, and in the early 2000s, Odisha and Delhi became the first states to privatize their distribution sectors (CRISIL, 2019). However, the sector continued to face ongoing performance and financial issues, and so further reforms were introduced.

4.1 Reform and Its Drivers

The introduction of the Electricity Act in 2003 set the framework for reform that aimed to improve the technical performance of the system,[9] increase electricity access,[10] improve transparency and governance of SEB utilities, and increase competition and private sector participation. Overall, the reforms aimed to create a more accountable and commercial performance-driven culture (CRISIL, 2019).

The SEB utilities were unbundled into generation, transmission, and distribution functions. Each state created several companies for these functions (e.g., distribution companies—referred to as DISCOMs—and generation companies). In generation,[11] private sector participation has increased, whereas transmission, a natural monopoly, has remained mostly publicly owned and operated.

Not every state implemented reforms in the same way or to the same extent—especially in terms of distribution. The number of DISCOMs established in each state varies, and different states adopted different distribution business models depending on the extent of private sector ownership and participation desired by the state (Swain, 2016). For example, while Odisha fully privatized its distribution sector, some other states have adopted a distribution franchisee model where different distribution functions are contracted to private franchisees (Swain, 2016). These functions range from billing and collection through to power procurement (e.g., negotiating PPAs with generators) and maintenance of the distribution network. Sometimes the overall aim is to improve the operation of the function before taking it back under the control of the state-run DISCOM. State DISCOM employees are often seconded to the franchisee for knowledge-sharing purposes. The DISCOM franchise model was very successful in Bhiwandi, Maharashtra, where aggregate technical and commercial losses declined substantially; however, results have been mixed elsewhere (Pmanifold, 2014; Swain, 2016).

[8] Both the state and central governments play a role in the administration of the Indian electricity sector with distribution and power supply to rural and urban consumers resting with the states (Ministry of Power, n.d.).

[9] The central government instituted certain operational reforms to reduce technical losses, separate agriculture feeders, improve rural electrification etc. through schemes like the Restructured Accelerated Power Development and Reforms Programme (R-APDRP), the Integrated Power Development Scheme (IPDS), the Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) and Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY).

[10] Although not the focus of this study, India's reforms have allowed great improvements in the country's energy access rate.

[11] Along with opening generation to private sector participation, two national level power exchanges for generation were created in 2008: Indian Energy Exchange Ltd (IEX) and Power Exchange India Ltd (PXIL). These exchanges accounted for 4.3% of India's total procured generation in 2018–2019 (CERC, 2019). In contrast, 88% of generation was procured through long-term PPAs and short-term intra-state transactions with state DISCOMs (CERC, 2019).

Many of India's DISCOMs have continued to face financial problems. In order to help DISCOMs reduce their losses, financial assistance in the form of bail-out packages was provided in 2002 and 2012 to reduce their compounding debt burden. In 2015, the government introduced another financial restructuring package, Ujwal DISCOM Assurance Yojana (UDAY), to improve the operational and financial performance of DISCOMs and reduce losses (Worrall et al., 2019). Despite government efforts, DISCOMs continue to be in financial distress and are estimated to be carrying billions of dollars of debt (Worrall et al., 2018, 2019).

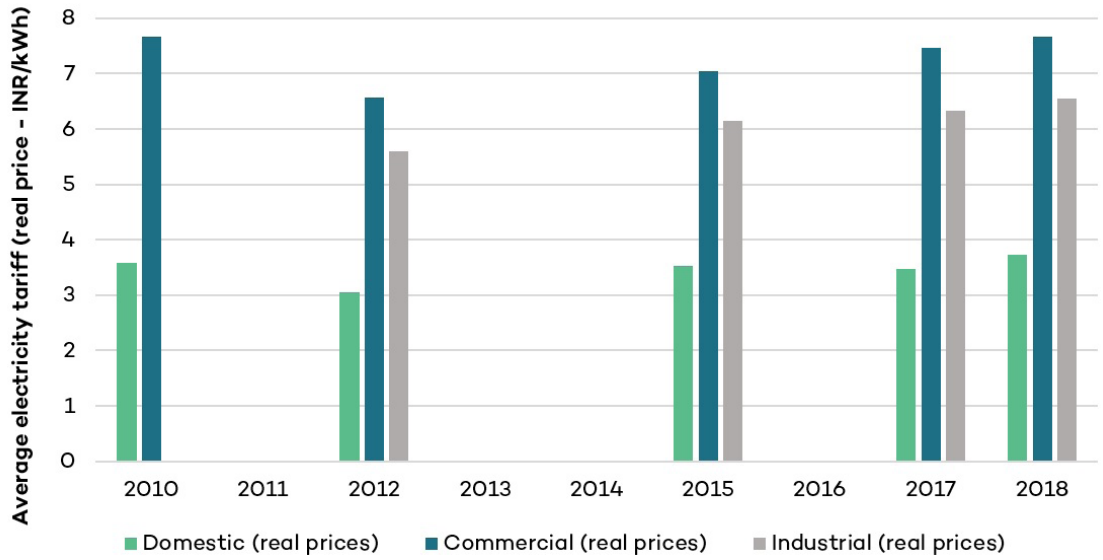
4.2 Reform Outcomes

4.2.1 Electricity Prices

Electricity prices continue to be regulated for end consumers in all Indian states. A summary of historical tariffs in India is shown in Figure 5 (in INR). Each state regulator decides the tariff, and hence electricity tariffs vary in India from state to state; they also vary based on voltage level and consumer type. There is no aggregate national level tariff.

Low tariffs are provided at below cost-recovery levels to many consumers, and subsidies (including cross subsidies between different categories of consumers) continue to feature in the system (Swain, 2016). The cost of selling electricity at below-market prices, mostly to residential and agricultural users, was the single largest source of energy subsidy expenditure in FY2017 at INR 74,925 crore (USD 11.5 billion), or 49% of all quantified energy subsidies in India (Soman et al., 2018).

Figure 5. Historical Tariffs[12] adjusted to 2017 prices



Source: Central Electricity Authority, 2010, 2011, 2013, 2015, 2018a, 2019.

[12] The average electricity price was calculated based on three different categories: Domestic 1kW, Commercial 30 kW and Industrial 11kW. The average rates of these three categories was chosen to present a simplification of India's energy prices. This should not be used to indicate average electricity prices in India but is solely to be used as a comparison with electricity price averages in Mexico and South Africa. Data for all years was not available.

Heavily subsidized electricity prices that don't allow DISCOMs to recover costs have been a key driver of their financial distress (Worrall et al., 2018). There is a need to remove inefficient consumer subsidies so that DISCOMs can cover their costs while also providing targeted support to poor and vulnerable consumers. To better target its electricity subsidies, India has announced its plan to include power sector consumer subsidies under its Direct Benefits Transfer (DBT) scheme as of March 2019 (Bhaskar, 2017). This reform aims to allow for market-based, cost-reflective electricity pricing while simultaneously ensuring better targeting of subsidies for the poor and vulnerable to maintain energy access.

4.2.2 Electricity Sector Jobs

Very little data exists on the impacts of the reforms on electricity sector jobs in India, apart from estimates of the creation of jobs due to the growth of renewables. According to IRENA's report *Renewable Energy and Jobs: Annual Review 2019*, the renewable energy sector in India created 372,000 jobs in 2018 (IRENA, 2019a) with around 12.4 GW of mostly on-grid capacity (IRENA, 2019c). In terms of decentralized renewable energy, Power for All reports that the off-grid sector accounted for 95,000 direct, formal jobs and 210,000 informal jobs in 2017–2018 (Power for All, 2019). The renewable energy sector has significant further potential for job creation in India. It is estimated that if India achieves its target of 175 GW of renewable energy by 2022, it could result in the creation of 1 million job opportunities (short and long-term) between 2017 and 2022, or full-time-equivalent employment for 331,000 workers (Aggarwal & Dutt, 2018).

4.2.3 Decarbonization

Like South Africa, coal has historically dominated India's installed capacity mix mainly because of its significant reserves. At the time reforms were introduced in 2003, 67% of its electricity was generated from coal (IEA, 2019a). However, the installed capacity of renewable energy in India's electricity mix increased by 22% from 7.7 GW in 2002 (Das et al., 2017) to 86 GW in 2019 (Central Electricity Authority, 2020). The share of generation from renewables has increased from 0.5% in 2003 to 8% in 2017 (IEA, 2019a). Renewable energy generation costs have plummeted over the past few years, dropping to between INR 2.7 to INR 2.73 per kWh (USD 0.039 to USD 0.04 per kWh) for utility-scale solar PV in 2018 (Shah, 2019).

Investment in renewables doubled between 2013 and 2018 and reached nearly USD 20 billion in 2018, exceeding that for fossil fuel power investments (Dutt et al., 2019; IEA, 2019b). Reform has led to greater private sector investment in generation, and renewable energy is attracting more private capital compared to fossil fuels. A recent Centre for Financial Accountability report analyzed 54 energy projects comprising both coal-fired power stations and renewable energy projects in India that reached financial close[13] in 2018, and found that 80% of the total lending of INR 30,534 crore (USD 4.5 billion) was attributed to renewable energy projects (CFA, 2019). In contrast, coal-fired power projects received only 20% of total lending, with finance to coal power shrinking by 93% compared to 2017 values

[13] Financial close occurs for a project when all financial and project contracts have been signed and any associated conditions have been met. At this stage the relevant project party (often the developer) can start drawing down finance and develop the project.

(CFA, 2019). The same report found that, in 2018, most coal-fired project loans came from majority government and government-owned financial institutions. Majority privately owned commercial banks contributed 75%of all finance toward renewable energy projects (CFA, 2019).

Over the long term, the share of coal-based generation is expected to decline, and the share of installed renewables to increase to 44% (275 GW) by 2027 as India is increasingly exploiting the potential of lower-cost renewable energy (Central Electricity Authority, 2018b).

4.2.4 Electricity Sector Ownership

After the introduction of the EA in 2003, private companies started to provide a similar share of electricity generation as state-owned companies. The private sector accounts for 46%, state government-owned companies for 29%, and central government-owned companies for the remaining 25% of the total installed capacity of 360 GW, as of August 31, 2019 (Central Electricity Authority, 2019; National Power Portal, 2020). While power generation attracted major investments from the private sector, transmission, and distribution companies (i.e., DISCOMs) continue to be predominantly owned by central and state government utilities. As for transmission, 55% of the transmission system is owned by state transmission utilities, 38% is owned by the Power Grid Corporation Of India Limited (PGCIL, a publicly owned utility), and 7% by private operators as of March 31, 2018 (CRISIL, 2019).

Although reform has enabled greater private sector participation in generation—which has allowed an increase in the installed renewables—it has not prevented Indian SOEs from also developing and owning renewable energy projects. The Indian Oil Corporation (IOC), India's state-owned oil and gas company, has converted many of its power stations to run on solar power and now owns 222 MW of wind and solar (Casey, 2019). Coal India Limited (CIL), India's largest state-owned coal producer, is diversifying its operations toward renewable energy sources and has announced plans to set up 20,000 MW of solar capacity over the next 10 years with investments of INR 100,000 crore (USD 14.6 billion) (Narayan, 2018).

5.0 Mexico's Reform

Prior to 2013, Mexico's state-owned electricity company, Comisión Federal de Electricidad (CFE), remained a vertically integrated monopoly and continued to be responsible for the majority of generation (and all the transmission and distribution) of electricity in the sector (Valdez et al., 2019). In 2012, CFE reported annual distribution losses of 16%, nearly three times that of the OECD average, representing more than USD 3 billion (MXN 39 billion) in lost revenue (Vietor & Sheldahl-Thomason, 2017). At the end of 2013, CFE was operating at a loss, with a negative net income of almost MXN 40 billion (USD 3 billion) and a total debt of MXN 345 billion (USD 27 billion) (CFE, 2014; SENER, 2018a). Mexico's energy mix was heavily dependent on natural gas (56% of generation) as the main source for electricity (IEA, 2019a). The sector also faced a lack of investment in its transmission and distribution networks.

5.1 Reform and Its Drivers

Mexico began reforming its electricity sector in 2013 as part of the "Reforma Energetica," a broad set of policy changes and new laws that transformed the electricity and the oil and gas sectors, seeking to promote private participation, competition, and economic growth (Lajous, 2014). These reforms were driven by a need to lower generation costs, increase the share of renewables, and reduce transmission and distribution (T&D) losses (Chanona Robles, 2016). The reform further sought to strengthen the energy regulatory agency, increase transparency, and reduce corruption within the energy sector, which for CFE reportedly involved at least 40 officials and fines of up to USD 80 million over the last 15 years (Guerrero, 2016). With peak demand for electricity growing by 27% from 2004 to 2013, there was also a need to upgrade and invest more in generation and transmission along with distribution infrastructure (Nance, 2018; SENER, 2018c).

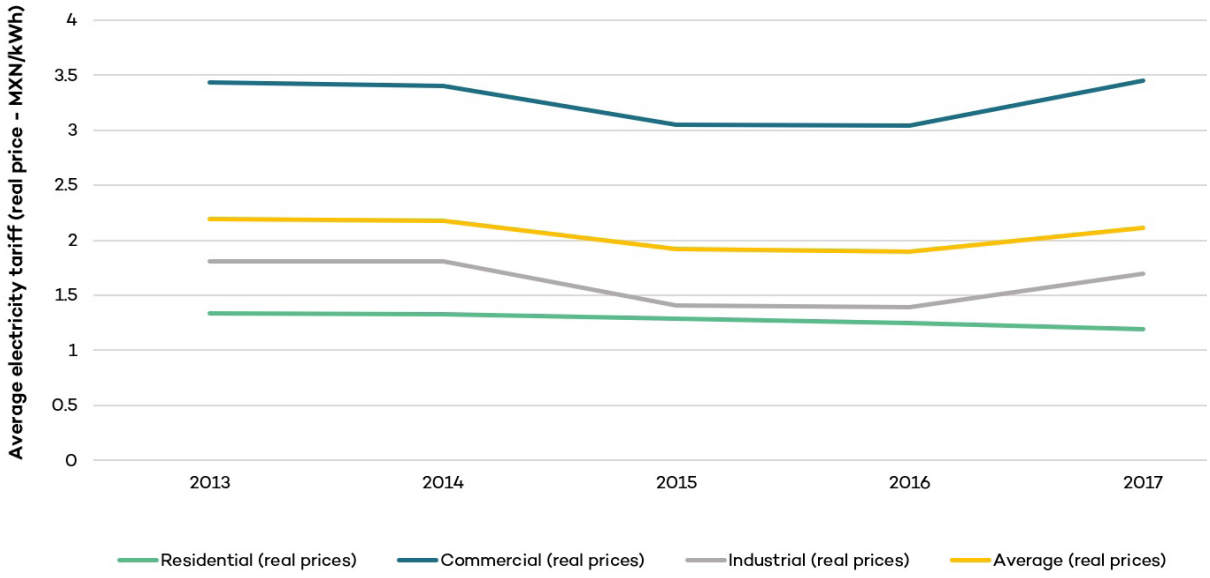
As a result of the reform, the former national electricity company, CFE, was transformed into a holding company, and new, independent members were added to its board (BMWi & SENER, 2018). The original CFE was unbundled into generation, transmission, and distribution functions and divided into 13 subsidiaries that sit under the new CFE holding company (Vietor & Sheldahl-Thomason, 2017). The reform also partially removed barriers to private sector participation and investment in the different areas of the sector. Transmission and distribution remained regulated and state-owned in the corresponding CFE subsidiaries. However, the reform allowed the possibility of entering into public–private partnership (PPP) contracts with private companies to build new T&D infrastructure. In the generation part of the sector, competition was increased via the creation of a wholesale electricity market (WEM), and long-term auctions were adopted. Electricity could be generated either by CFE subsidiaries or private generators (IPPs). In addition, to address CFE's financial problems and limit its rising debt, the government allowed CFE to defer taxes and assisted with reducing CFE's pension obligations (OECD, 2019; SENER, 2018a).

5.2 Reform Outcomes

5.2.1 Electricity Prices

Electricity prices continue to be regulated in Mexico for most consumer categories.[14] A summary of historical tariffs from 2013 to 2017 in constant 2017 prices is shown in Figure 6 (in MXN per kWh).

Figure 6. Average electricity price (MXN per kWh) (constant 2017 prices)



Source: SENER, 2018a.

Commercial and services tariffs increased in the years following the reform, reaching the cost-recovery level and even exceeding it. However, electricity subsidies continue to feature in Mexico's system. Residential and agricultural tariffs continued to be subsidized with the commercial and services sectors cross-subsidizing the former (Sanchez et al., 2018). The Secretariat of Energy (SENER) reports that subsidies to industrial and residential consumers increased from MXN 109.6 billion (USD 8.6 billion) in 2013 to MXN 116 billion (USD 6.2 billion) in 2016 (nominal values) (SENER, 2016, 2017). There is a need to remove inefficient consumer subsidies while also providing targeted support to poor and vulnerable consumers (Sanchez et al., 2018).

5.2.2 Electricity Sector Jobs

The size of CFE's workforce was affected by the reform. The total number of direct CFE employees (which represents around 95%n of CFE's total workforce) decreased by 6% (from 91,219 to 85,343) between 2013 and 2017, whereas the number of contractors[15] (around 5% of total CFE workers) increased by 6% (from 4,375 to 4,657) in the same period (CFE, 2014,

[14] While prices remain regulated for most consumers, market-based pricing exists in the generation sector, and large consumers can procure electricity from the market.

[15] Contractors are defined as those employed on short-term assignments e.g., certain supervisory activities or the construction of a particular gas pipeline. Usually contractors are employed for functions outside of CFE's area of expertise, but they do not receive the pension or other social benefits that full- or part-time employees do (CFE, 2014, 2015, 2017).

2015, 2017). The number of normal planned retirements increased 23% over the same period, accounting for a large share of the overall decrease of CFE employees (CFE, 2014, 2015, 2017).

Mexico's Strategic Human Resources Education Program for the Energy Sector predicted that the reforms could create at least 135,000 direct jobs in the electricity sector, with each direct job supporting another three indirect jobs (O'Connor & Viscidi, 2015). Another study by the Centro de Estudios del Sector Privado para el Desarrollo Sustentable (CESPEDES) focused on the impacts of reform on renewable industry-related jobs. It shows that the renewable industry could create up to 180,000 local jobs in the next 10 years based on current policies (Chanona Robles, 2016).

5.2.3 Decarbonization

Mexico's electricity system has historically been dominated by fossil fuels. At the time reforms were introduced in 2013, 55% of Mexico's electricity was generated from natural gas, 16% from oil and 11% from coal (IEA, 2019a). Since the introduction of reforms, the installed capacity of renewables in Mexico's electricity mix increased from 3.5 GW in 2013 to 9.5 GW in 2018 (IRENA, 2019c; SENER, 2018b), and its share of generation has increased from 4% in 2013 to 7% in 2018 (IEA, 2019a). Under its competitive long-term generation auctions, Mexico has seen renewable generation prices drop to USD 0.0179/kWh (MXN 0.344/kWh) for solar and USD 0.0177/kWh (MXN 0.341/kWh) for wind (BMWi and SENER, 2018; Viscidi, 2018). Mexico was one of the 10 countries with the highest investment in renewable energy in 2015 (Climatescope, 2017). The share of total investment in clean energy increased by 226% from 2013 to 2017 to USD 6.2 billion (MXN 117 billion) in 2017 (Bloomberg New Energy Finance, 2018).

However, several issues have led to delays in developing renewable projects awarded through long-term generation auctions. These issues relate to land availability, local community opposition and higher end costs. In addition, the record low prices quoted for the long-term auctions both for wind and solar have raised concerns that projects will not be financially viable and may not be developed (BMWi & SENER, 2018; Viscidi, 2018).

5.2.4 Electricity Sector Ownership

Reform has led to greater private sector investment in generation, mostly into renewable energy projects. As of 2017, 77% of installed generation capacity remained publicly owned by CFE, and private sector ownership accounted for 33% of installed generation capacity (Nance, 2018; SENER, 2018c). So, while new generation developed after the reforms is owned by the private sector, CFE has maintained public ownership of its existing generation assets. CFE has also maintained (public) ownership of T&D but enters into public–private–partnership (PPP) contracts with the private sector for specific projects in order to upgrade T&D infrastructure (Chanona Robles, 2016).

6.0 Lessons for South Africa and the Way Forward

The debate around Eskom's reform and the experiences of other countries show the limitations of applying the "standard model" approach to electricity sector reform. Instead, many countries have taken a pragmatic approach, implementing reforms where they are expected to be effective and politically feasible and accepting the status quo in other areas. It is recommended that South Africa be pragmatic about its reform as well. There is a need to consider other impacts of reforms beyond economic efficiency. Reforms that ignore the need to keep prices low, provide decent jobs, reduce coal dependence—as well as calls to retain forms of public ownership—are not tackling South Africa's most pressing problems. The reform approach will have to be able to demonstrate that its impacts will be in line with social and environmental priorities, not just economic considerations.

Table 1 lists the key "standard model" elements and the current status of each of these elements in India, Mexico, and South Africa (both currently and according to the Eskom reform roadmap). The table shows that in all the countries the model has only been partially deployed, particularly in terms of privatization and competition. Under its latest roadmap for Eskom, South Africa will also only partially deploy the "standard model."

Table 1. Status of the "standard model" elements of electricity sector reform in India, Mexico, and South Africa.

Element	Standard Model	India	Mexico	South Africa - Pre-reform	South Africa - Roadmap
Regulation	Independent regulator	Yes, independent regulator	Yes, independent regulator	Yes, though some regulatory functions performed by utility and energy ministry.	Unchanged
Unbundling	Fully separated into generation, transmission, distribution, and retail functions, with independent entities responsible for these separate functions.	State electricity boards separated into several generation, transmission, and distribution companies.	CFE separated into generation, transmission, and distribution, and divided into 13 subsidiaries. Entities remain under an overarching holding company - not fully separate and independent.	No, Eskom remains a vertically integrated utility.	Eskom will be separated into generation, transmission, and distribution, but entities will remain under an overarching Eskom Holding company - entities will not be fully separate and independent.

Element	Standard Model	India	Mexico	South Africa - Pre-reform	South Africa - Roadmap
Ownership	Privatization of all existing and future assets in generation, transmission, and distribution.	Approximately 46% of generation privately owned. Transmission and distribution continue to be predominantly publicly owned. 7% of transmission is privately operated.	Approximately 33% of generation is privately owned. Transmission and distribution predominantly publicly owned.	More than 90% publicly owned generation. Publicly owned transmission and distribution (Eskom responsible for 40% distribution, municipalities 60%).	Unchanged—details not provided by roadmap.
Competition	Creation of competitive markets in all areas to allow new investment. Acknowledges that transmission is a natural monopoly.	Partially: Generation mainly procured through auctions. Transmission auctions have begun.	Partially: Mix of public and private generation procurement.	Partially: Mix of generation auctions and public procurement.	Unchanged details not provided by roadmap.
Cost recovery achieved (Yes/No)	Yes	No—many actors remain heavily indebted.	No—but improvements made.	No—Eskom heavily indebted.	Details not provided by roadmap.
Electricity prices (un/regulated)	Unregulated, to reflect costs—let market decide	Remain regulated	Remain regulated	Regulated	Unchanged
Financial assistance provided (Yes/No)	Not specified	Yes—financial assistance to distribution companies in financial distress.	Yes—deferred tax and reduction of pension burdens.	Yes—financial assistance historically provided.	Yes—financial assistance announced for future.
De-carbonization	Unregulated				
Share of coal generation before & after reform		68% (2003)/ 86% (2020)	11% (2013)/ 9% (2018)*	88% (2017)	Reform impact unclear
Share of RE generation before & after reform		0.6% (2003)/ 8% (2017)	4% (2013)/ 7% (2018)	3.4% (2017)	Reform impact unclear

Sources: Central Electricity Authority, 2019, 2020; Chanona Robles, 2016; CRISIL, 2019; Department of Public Enterprises, 2019b; IEA, 2019a; National Power Portal, 2020.

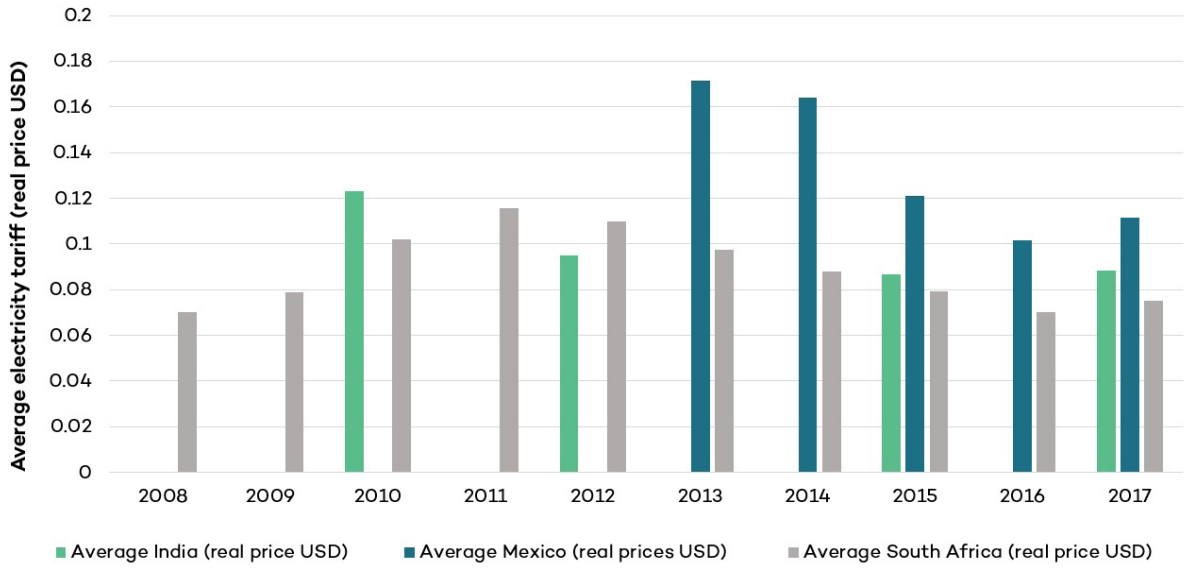
6.1 Electricity Prices

There is no obvious relationship between electricity prices and structural reform that is generalizable across contexts.

The standard model recommendation of letting markets decide prices has proven socially and politically unacceptable in many developing countries. To ensure that access to electricity is affordable, it is often seen as the role of government to decide what tariffs should be charged for electricity. Correspondingly, neither India nor Mexico has instituted market-based electricity pricing systems for all consumers, choosing instead to maintain regulated pricing. The case studies also show that unbundling on its own doesn't necessarily have a significant impact on electricity prices. Unbundling alone, as planned for South Africa, is, therefore, unlikely to have a major impact on South Africa's electricity prices over the medium term.

Figure 7 compares electricity prices in India, Mexico, and South Africa in real USD per kWh. The graph shows that South Africa's electricity prices are relatively in line with India and Mexico's.

Figure 7. Average Electricity Tariffs in India[16], Mexico, and South Africa



Sources: Central Electricity Authority, 2010, 2011, 2013, 2015, 2018a, 2019; Eskom, 2020b; SENER, 2018a.

Maintaining electricity prices below cost recovery levels is one of the drivers for the ongoing financial problems seen in in both India and Mexico's electricity sector. Indian DISCOMs still cannot recover their costs and both Mexico and India have not yet created financially sustainable sectors.

[16] The average electricity price for India was calculated based on three different categories across all states: Domestic 1kW, Commercial 30 kW and Industrial 11kW. The average rates of these three categories was chosen to present a simplification of India's energy prices. This should not be used to indicate average electricity prices in India but is solely to be used as a comparison with electricity price averages in Mexico and South Africa. Data was not available for all years.

Debt restructuring, tax deferrals and regular bailouts have followed reform in the case study countries. This assistance will also likely be needed in South Africa while it finds a way for Eskom and the electricity system to become financially sustainable.

In both India and Mexico, electricity consumer subsidies continue to feature in the system. Untargeted electricity subsidies can encourage wasteful consumption, disproportionately benefit the rich who tend to consume more energy, and lead to unsustainable costs to the public budget (Zinecker, Sanchez, et al., 2018). Research from IISD/GSI on the targeting of subsidies recommends that inefficient electricity subsidies should be removed while ensuring well-designed targeted support aimed at energy access is provided to poor and vulnerable consumers (Zinecker, Sanchez, et al., 2018).

6.2 Electricity Sector Jobs

The issue of jobs in South Africa is complicated by the fact that there is no clarity on how to measure jobs in a manner that is credible across sectors and for different audiences.

The impact of electricity sector reform on employment is a key area of concern for many stakeholders in South Africa. Some assume that reform—and particularly reform that leads to privatization—may lead to job losses in the electricity sector (Confidential, personal communication, 2019; Malope & Brown, 2019).[17] Understanding the impact of electricity sector reform on jobs is a key issue for ensuring a just transition in South Africa. There is little data available on the impacts of reforms on employment in either India or Mexico. This opens up a range of questions that need to be explored to help inform the South African case.

In Mexico, unbundling was reported to lead to some job losses in the publicly owned utility CFE and its subsidiaries. However, little is known about the types of jobs that were lost, what sort of packages or retraining support they were offered (if any), and, ultimately, where these people ended up (retired, unemployed, employed elsewhere in the electricity sector, or in another sector entirely etc.). There is also little information on job losses due to the extensive reforms in India's state electricity utilities.

It is reported, however, that in India, jobs were created thanks to the increase in renewable development as a result of the reforms. In India, it was estimated the renewable energy sector created 372,000 jobs in 2018 (IRENA, 2019a) with around 12.4 GW of mostly on-grid capacity (IRENA, 2019c). While there are indications that an expansion of the renewable energy industry can create jobs, questions remain as to whether these gains are enough to offset job losses elsewhere, and whether workers in job-losing sectors can be retrained to move to sectors seeing job growth. In addition, many of the jobs in the renewable energy sector are project- or contract-based, rather than permanent, as they are mainly based in the construction phase. This creates a risk of replacing long-term secure jobs with less-secure and more-transitory jobs.

While this work looked at the impacts of reform on jobs in the utility itself and in the electricity sector as a whole, it did not examine secondary impacts on jobs in related sectors,

[17] In December 2019 IISD conducted a series of interviews with NGOs, academics and IPPs. This finding reflects these stakeholder views.

such as the coal mining sector. If reform was accompanied by a significant transition away from coal, further impacts on jobs in coal mining and generation, as well as in auxiliary industries such as road and rail transport, could be significant in South Africa.

A deeper investigation of any job losses or increases that may have occurred as a result of reform in India and Mexico (and an exploration of patterns relating to private vs public ownership) would provide valuable insights for the South African case. Findings can inform debate on how to mitigate the impact of job losses and to promote the creation of quality jobs in the energy sector. This research will be an important part of ensuring a just transition for workers and communities in South Africa.

6.3 Decarbonization

Reforms in India and Mexico have allowed an acceleration of renewable energy deployment. Unbundling and the introduction of competition and private sector participation in the generation sector via competitive auctions enabled the procurement of lowest-cost generation from IPPs. Increasingly, lowest-cost generation has been achieved by renewable energy projects. By 2017, India had reached 8%, and by 2018 Mexico had reached 7% of generation from renewable energy. In 2018, South Africa generated around 5% of its electricity from renewable sources including hydro (IEA, 2019a).

Because reforms have enabled the procurement of generation from IPPs, the renewable energy deployed has been mostly privately owned in these case countries. In South Africa's own auctions, wind, and solar prices have fallen below estimated costs for new coal. However, there is ongoing debate about how much private renewables should be in the energy mix. This relates to many stakeholders' desire to retain public ownership of energy infrastructure and to protect jobs in Eskom and the mining sector. It may be that this conflict creates a barrier to decarbonization.

6.4 Electricity Sector Ownership

In terms of ownership of the electricity sector, under the standard model all existing and new power sector assets in generation, transmission, and distribution should be privatized. However, this approach is seen as controversial in many countries including India, Mexico, and South Africa. Both case study countries have sought to implement partial privatization as part of their reforms. In practice, this has meant that increases in new generation capacity have tended to come from new private generators while existing publicly owned generators continue to operate, and T&D remains largely publicly owned. India has 46% of generation privately owned, and Mexico has 33%, compared to less than 10% in South Africa (Central Electricity Authority, 2019; Chanona Robles, 2016; Department of Public Enterprises, 2019).

In South Africa, many stakeholders have voiced a desire to retain public ownership of energy infrastructure. This stems from (among other issues) fears that privatization will lead to job losses in the sector and will not improve performance. In addition, given that much of the privately owned new capacity built after reform in India and Mexico is in renewable projects, opposition to private ownership may create a barrier to decarbonization.

However, there are examples of retained public ownership of assets in response to political considerations. For example, Mexico has used public–private–partnership (PPP) contracts in the transmission sector. Many of India's distribution companies remain state-owned while making use of private sector participation via franchisee models, and Indian SOEs have begun to diversify away from coal and develop (and own) renewable energy projects.

Policies that address the specific concerns in South Africa could be developed to mitigate some of these concerns. For example, regulations that compel local content and community or public ownership of renewable generators could be needed to deliver a politically viable plan. Given the political opposition in South Africa to the privatization of the electricity sector, exploring policies that could retain a level of public or community and local ownership could be a nationally appropriate solution.

Further research is needed to evaluate what models of public, municipal, or community ownership could be feasible in the South African context. In addition, if public ownership and state-owned enterprises are to continue to play a strong role in the sector, there are questions around how they can also support decarbonization and a just transition. Future directions would include investigating reforms where state ownership persists while ensuring financial sustainability and/or decarbonization occurs. This could include investigating the establishment of a public green infrastructure bank or fund (or greening existing institutions), to finance projects that meet both environmental and social priorities around ownership; opportunities for communities to buy or be allocated a share of project ownership; and reforms to allow municipalities to procure or develop their own renewable energy projects. This research could start by drawing on experiences from Denmark or Germany, where community or public ownership is commonplace.

7.0 Conclusions

This report highlights how electricity utility reform experiences are driven by a rich range of factors with examples from India and Mexico. It encourages policymakers in South Africa to consider how the reform process might be shaped. The key findings and recommendations from this work are summarized below.

Key Findings and Recommendations

- Instead of strictly adhering to the "standard model" of electricity utility reform favoured by many economists, many countries have taken a pragmatic approach, implementing reforms where they are expected to be effective and politically feasible and accepting the status quo in other areas. South Africa should also be pragmatic about electricity sector reform. Reforms should consider the South African context and impacts beyond economic efficiency while considering the need to keep prices affordable for the poor and vulnerable, providing decent jobs, reducing coal dependence, and acknowledging calls to retain forms of public and community ownership.
- Neither India nor Mexico has instituted market-based electricity tariffs for all end consumers, choosing instead to maintain regulated pricing below cost. As a result, most electricity prices are not at a cost-recovery level. This is one of the drivers for the financial problems seen in each country's electricity sector, and ongoing financial assistance has been necessary following reform. Without pricing reform, unbundling alone is unlikely to have much of an impact on South Africa's electricity prices or on Eskom's financial problems. Ongoing financial assistance from the government is likely necessary, while South Africa finds a way for Eskom and the electricity system to become financially sustainable.
- Another result of maintaining below-cost tariffs in both India and Mexico is that electricity consumer subsidies continue to feature in the system. Untargeted electricity subsidies can encourage wasteful consumption, disproportionately benefit the rich (who tend to consume more energy), and lead to unsustainable costs to the public budget. Inefficient electricity subsidies should be removed, and well-designed targeted support should be provided to poor and vulnerable consumers to ensure access to reliable, affordable, and modern forms of electricity.
- Understanding the impact of electricity sector reform on jobs is a key issue for ensuring a just transition occurs in South Africa. Data remains limited regarding impacts on employment in both India and Mexico. A deeper investigation of job losses and gains that may have occurred as a result of reform in India and Mexico and an exploration of patterns relating job shifts to private vs. public ownership would provide further valuable insights for South Africa.
- Reforms that combined unbundling with the introduction of competition and private sector participation in generation (via auctions) in India and Mexico have allowed an acceleration of renewable energy deployment due to the higher competitiveness of

renewable energy technologies. As a result, these renewable projects have been mostly privately developed and owned.

- Many stakeholders in South Africa are concerned about the privatization of electricity sector assets, and both case study countries have sought to implement only partial privatization as part of their reforms. However, because most renewable projects were privately developed and owned in India and Mexico following reform, opposition to private ownership may create a barrier to decarbonization. If public ownership and state-owned enterprises are to continue to play a strong role in the sector, there remain questions around how they can also support decarbonization and a just transition. Given the dual need to decarbonize and retain a form of public ownership in South Africa, future research is needed to evaluate how public, municipal, or community ownership could integrate renewables in South Africa.

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