3.6.9 SOUTH AFRICA

Sector overview

Existing network

- As of March 2020, Eskom's transmission network comprised 33,027 km of high voltage transmission lines, and 153,135 MVA of transformer capacity ranging from 132 kV to 765 kV.
- The majority of South Africa's high voltage network is at 400 kV and is based on alternating current (AC) technology, with the exception of the 1,032-km-long, 533 kV high voltage direct current (HVDC) monopolar line that links the Cahora Bassa hydroelectric power plant (HPP) in Mozambique to Johannesburg.
- South Africa's electricity network is interconnected with the grids of Botswana, Mozambique, Namibia, Zimbabwe, Lesotho, Swaziland and Zambia.

TSO

- Eskom Holdings SOC Limited (Eskom), the state-owned vertically integrated power utility, is responsible for the generation, transmission, distribution and trade of electricity in South Africa.
- The company owns and operates 90% of the country's installed generation capacity and holds a monopoly over electricity transmission, distribution and trade.
- Further, Eskom is on track for unbundling its transmission arm and establishing a separate entity by December 2021. As per the restructuring roadmap presented in November 2019, the vertically-integrated utility plans to unbundle into three separate utilities each, for generation, transmission and distribution, by the end of 2022. The three power companies, post the unbundling, will remain under a state-owned Eskom holding.
- The South African government allocated the cash-strapped utility Eskom ZAR56 billion for 2020-21, of which ZAR6 billion of the equity allocations had been provided by September 30, 2020. In addition, the utility has been allocated ZAR31.7 billion for 2021-22 by the government. The funds will be utilised for stabilising the utility while the government restructures it into three separate entities.

Investment drivers

- Key investment drivers are:
  - Strengthening the transmission network to accommodate the growing electricity demand.
  - Evacuation of power from the upcoming generation projects in the country.
  - Transforming the grid to address the addition of renewable energy (RE) capacity, as the country over the next decade, plans to add around 30 GW of new generation capacity.
  - Refurbishment of the existing transmission network.
  - The country also plans to establish cross-border interconnections, for facilitating power trade.

Expected investment

- As per the Eskom's Transmission Development Plan (TDP) 2021–30, investment of around ZAR118 billion has been earmarked for the expansion and strengthening of the country's transmission network

Historical capital expenditure trends

Investment trends

- As per Eskom's previous TDPs, the power utility intended to spend around ZAR10 billion on average each year for the development of the country's transmission sector.
- However, over the past ten years, the utility has only been able to spend ZAR1.0–1.2 billion each year on the expansion of the transmission sector.
- The power utility has been facing a deep financial crisis for years, and hence the underinvestment in the sector. Further, due to a low cash reserve margin, Eskom is now finding it challenging to undertake high-level maintenance of its ailing infrastructure.
- Investments on transmission sector in South Africa have declined at a CAGR of 5.69% from ZAR1.5 billion in 2011 to ZAR887 million in 2020.

Investment focus

- Strengthening the domestic grid, renewable integration and setting up high voltage interconnections have been the key focus areas so far.
- Eskom's capacity expansion plan has been focused on expanding the country's generation to address the increasing electricity demand. This increase in generation capacity has been carried out in conjunction with expansion of the transmission grid.
- However, in the last few years, Eskom has been under severe financial constraint because of its huge capex commitments towards its large-scale generation projects. This has led to downsizing or postponement of transmission projects.

Key projects commissioned

- Key recently commissioned projects include:
  - Dwarsberg Strengthening: 132 kV Switching Station
  - Waterloo IPP Integration
  - Perdekraal East 110 MW Wind Farm Integration

Historical capital expenditure growth

Figure 1: Growth in South Africa's capital expenditure on transmission network (ZAR million)

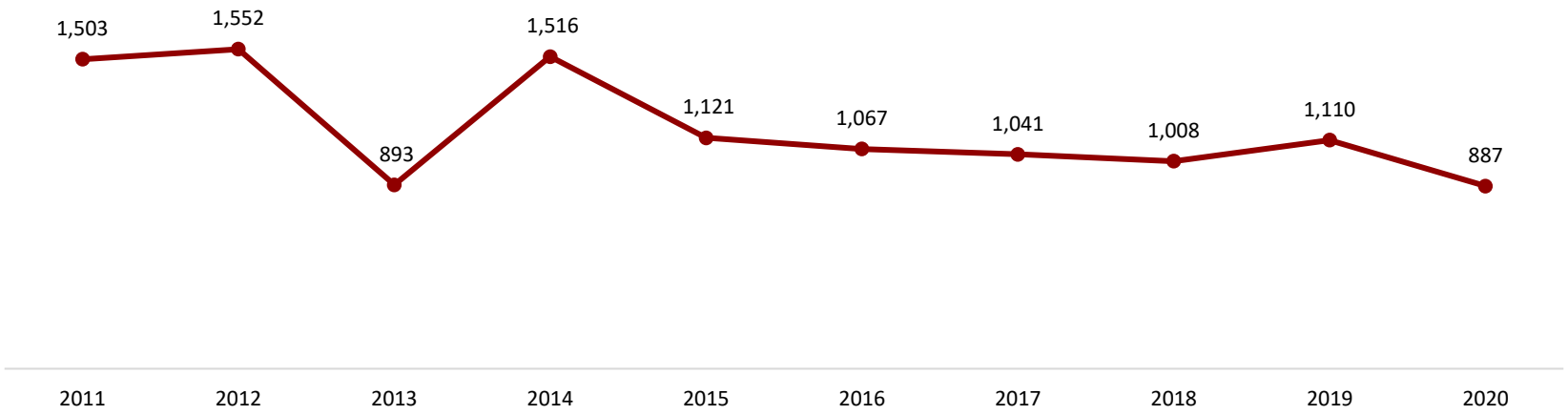


Table 1: South Africa's capital expenditure on transmission network for 2011–20 (ZAR million)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capital expenditure	1,503	1,552	893	1,516	1,121	1,067	1,041	1,008	1,110	887

Note: Data is as of March 31 for the mentioned year.
Capital expenditure for each year excludes the capitalised borrowing cost.
Source: Eskom Financial Reports; Global Transmission Research

Future capital investment

Investment drivers and focus

- South Africa requires significant new transmission infrastructure to integrate the upcoming new generation renewable capacity to the country's grid network and therefore needs to upgrade domestic grid to reduce load on the coal fleet. Hence, Eskom requires to accelerate the existing TDP projects, develop new transmission corridors and substations, and strengthen the existing substations.
- Due to limited financial resources, Eskom is focusing on refurbishing existing transmission infrastructure instead of building new infrastructure which is highly capital-intensive. The utility is looking to develop new substations and transmission corridors in close proximity to the RE generation facilities.
- In addition, focus is also on strengthening the network to integrate new loads in the transmission system by expanding the network to off-grid areas.
- The country has planned various cross-border interconnection projects, for initiating power trade with its neighboring countries.

Expected investment

- As per the Transmission Development Plan (TDP) 2021–30, Eskom has envisaged an investment of around ZAR118 billion over the next decade for the expansion of transmission network in the country.
- Of the planned ZAR118 billion, ZAR87 billion (74%) will be spent on capital expansion projects in all the provinces, ZAR19 billion will be invested in the refurbishment of existing infrastructure, ZAR674 million will be spent on production equipment, ZAR3.1 billion on environmental impact assessment (EIA) and servitude, ZAR4 billion on telecoms, and ZAR4.1 billion on strategic spares.
- Under the ZAR87 billion, 32% or ZAR27.3 billion will be spent on strengthening the infrastructure, while another 26% or ZAR22.7 billion is earmarked for integration of upcoming IPP plants into the grid network.

Key projects

- Some of the key planned domestic projects are – Greater EL Phase 4 Project; Southern Grid Strengthening Phase 3 Project; 400/132 kV Poseidon North substation; Sorata Substation Strengthening; Harrismith Strengthening Phase 1; Vaal Strengthening Phase 2 Project; Brenner Phase 2: Lesokwana Substation; and Second 400 kV Ariadne-Venus line and 765 kV KZN Strengthening-Empangeni Integration
- Key palnned interocnnection projects are 935-km-long, 400 kV Mozambique–Zimbabwe–South Africa (MOZISA) Transmission Project; Botswana–South Africa (BOSA) Interconnector

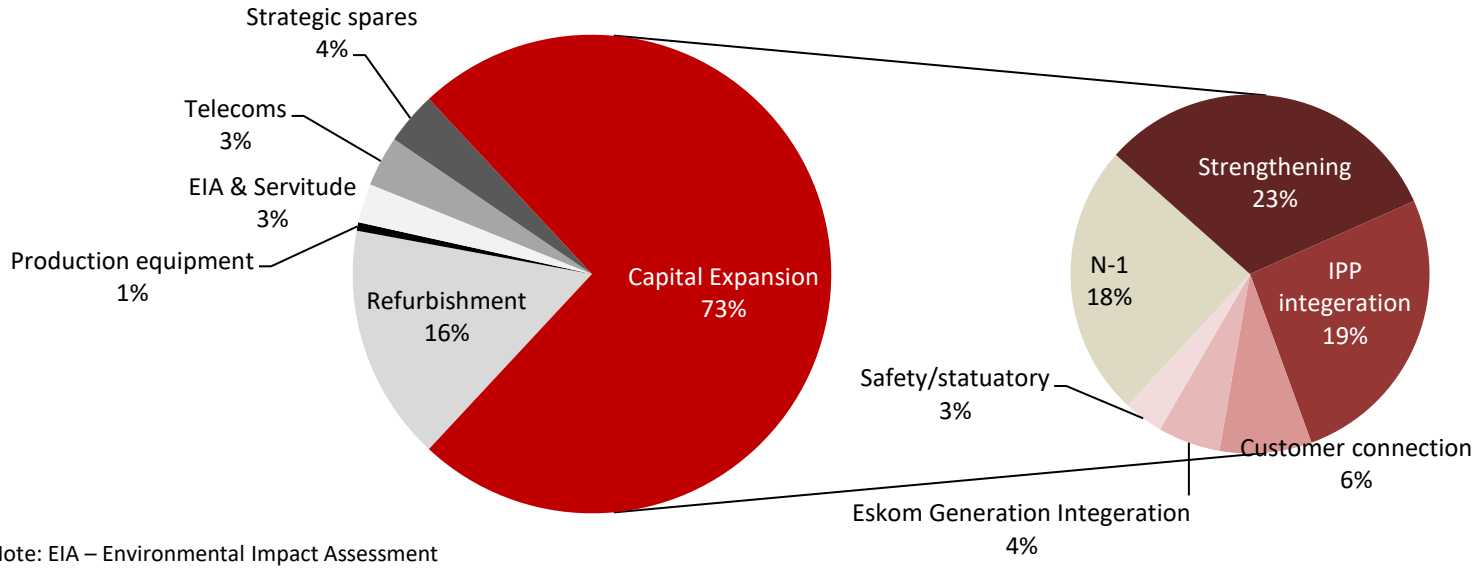
Eskom has formulated ambitious plans for expanding its infrastructure facilities. But the cash-strapped utility is facing several challenges that need to be addressed including way leave acquisition/right-of-way (RoW) acquisition, which leads to long delays in project execution. Eskom's inability to timely invest in grid infrastructure has also deteriorated its operational performance. Thus, the unbundling of Eskom becomes the most awaited step for revamping the South African power sector, as the move will create a more transparent and efficient power sector model in the country.

Expected capital investment by type

Table 2: South Africa's planned capital expenditure on transmission network for 2021–30 (ZAR million)

Category	2021–30
Capital expansion	**86,979**
– N-1	21,425
– Strengthening	27,637
– IPP integeration	22,695
– Customer connection	7,217
– Eskom Generation Integeration	4,899
– Safety/statuatory	3,106
Refurbishment	**18,803**
Production equipment/other	**674**
EIA and Servitudes	**3,107**
Telecoms	**4,015**
Strategic Spares	**4,173**
Total	**1,17,751**

Figure 3: South Africa's planned transmission capex by type for 2021–30 (ZAR million)



Note: EIA – Environmental Impact Assessment
Source: Eskom's Transmission Development Plan 2021–30

Key programmes and initiatives

Table 3: South Africa's key programmes and initiatives

Name	Scope of work	Investment	Planned completion
Eskom's Transmission Development Plan (TDP) 2021–30	• Under the plan, Eskom plans to add 5,650 km of transmission lines, 41,595 MVA of transformer capacity and 83 transformers at the 275 kV, 400 kV and 765 kV voltage levels. Of the total planned line length, 84% or 4,741 km will be at 400 kV, 15% or 838 km at 765 kV and the remaining 1% at 275 kV. • Over the 10-year span (2021–30), 52% of the line length (2,937-km), 64% of the transformer capacity (26,585 MVA) and 63% of the transformers (52 transformers) will be added to the country's grid network during the second half of the plan (2026–30).	ZAR118 billion	2028
Unbundling of Eskom	• In October 2019, the South African government published a roadmap to restructure Eskom into separate subsidiaries (under Eskom Holdings) aimed at improving efficiency, creating greater transparency around performance, providing greater protection against corruption and providing confidence to capital providers, resulting in greater investment comfort. • The first step under the new model is to establish a transmission entity (TE), which will act as an unbiased electricity market broker to promote capital investment within the industry, and further conduce energy efficiency and cost sustainability. Eskom is committed to establishing the TE by December 2021. • Under the generation segment, a separate subsidiary will be formed for generation, comprising mainly the current power plant base, which will be separated into several feasible smaller generation units. • Lastly, a separate distribution entity will also be formed, which will be authorised to buy from the TE, licenced municipal generators and embedded generation (small-scale residential and business generators). There are speculations, however, that due to lengthy legal processes, Eskom might not be able to meet its unbundling timetable, which is scheduled to be completed by the end of 2022.	NA	NA

Note: NA; not available
Source: Global Transmission Research

Key programmes and initiatives

Table 3: South Africa's key programmes and initiatives

Name	Scope of work	Investment	Planned completion
Smart Grid 2030 Vision	• South Africa's electricity infrastructure is aged and requires renovation and expansion in order to meet its growing electricity demands. Hence, to respond to increasing energy demand in an efficient manner, the South African National Energy Development Institute (SANEDI) drafted the Smart Grid Vision 2030 as part of the South African Smart Grid Initiative (SASGI) in 2013. • The objective of the Vision is to bring together all parties involved in the smart grid industry in order to build a focused, integrated, optimal smart grid network across the country. Hence, it is crucial for Eskom to meet its target under the TDP 2021-30 as the ambitious smart grid plan must be backed by an efficient and reliable transmission system.	NA	2030
Battery Energy Storage System (BESS)	• BESS can become a key component of meeting South Africa's long-term RE goals. It can be linked to solar and wind energy generation plants, so that energy generated during periods of low generation costs and demand can be stored for distribution during periods of high costs and demand. This will improve the cost-effectiveness of RE generation. • To this end, in August 2020, Eskom invited bids for the design, engineering, supply, construction, erection, testing and commissioning of a BESS, with a minimum of 80 MW/320 MWh usable capacity, at the Skaapvlei substation in the Western Cape province of the country. • The contract is being financially supported by the World Bank, African Development Bank (AfDB) and New Development Bank, under the Eskom Investment Support Project (EISP) and Eskom Renewables Support Project (ERSP). EISP aims to enhance Eskom's power supply and energy security so as to support economic growth objectives. ERSP aims to facilitate accelerated development of large-scale RE capacity in the country. Both projects share a common goal of supporting the long-term carbon mitigation strategy of South Africa.	NA	NA

Note: NA; not available
Source: Global Transmission Research