Introduction

AT THE beginning of 2018, South Africa's national electricity provider, the Electricity Supply Commission of South Africa (Eskom) threatened to sink the fortunes of the South African government. Eskom was indebted to the tune of R450 billion (35 billion in USD), and most of this debt was backed by government guarantees. Eskom was then in the midst of a liquidity crunch, and in the event that it failed to meet its repayment obligations, the government would have to assume responsibility, a cost that the fiscus could scarce afford.[1] Eskom managed to regain its liquidity in subsequent months and lumbered on, still remaining a corporation of concern. The following year, at an event hosted by the investment firm Goldman Sachs, South African president Cyril Ramaphosa told a gathering of foreign investors that Eskom would not be privatized. Eskom was "just too big to fail," Ramaphosa said. "It holds the fortunes at an economic level and social level of our country in its hands."[2]

In a country where a celebrated culture of popular protest hastened the demise of the apartheid regime and continues to challenge the practices of the postapartheid government, Eskom—an essentially technological corporation—is an unexpected threat to the fortunes of the South African government. The intimacy of its relationship with the South African government was etched into the principles of its founding under the Electricity Act of 1922. Prime Minister Jan Smuts had encouraged the formation of Eskom, and then in 1928, amid general government enthusiasm for state corporations, the Pact government, under General J. B. M. Hertzog, oversaw

the creation of the steel manufacturing corporation Iscor. The two state corporations were organizationally and juridically distinct from each other and from the South African government, and because they were essentially technological corporations, engineers dominated their upper echelons. Eskom in particular developed a momentum of its own as the twentieth century wore on. It grew from strength to strength so that, according to an economist based at the University of Witwatersrand, Stuart Jones, the replacement value of its assets was an estimated R60,000 million ($3,200 million)[3] in August 1986, an amount that was larger than the market value of the country's gold mines, which stood at R51,000 million ($2,800 million).[4] In other words, Eskom was richer in investment than South Africa's most important activity of the twentieth century, one that had supplied the bulk of the tax revenue used to build the capacity of the state bureaucracy and for which electricity had first been generated.

Over time, Eskom surpassed any auxiliary role it might have initially played as subordinate to the electricity requirements of the gold mines, and it acted in close cooperation with the successive governments of the twentieth century. These governments were consumed with the project of white supremacy in various degrees of intensity before 1994, and, under apartheid, realized the most ambitious program of racial segregation in the world. While the state corporations were organizationally autonomous from the government, their activities appeared to follow the imperatives of the latter in an uncanny fashion.

This book is, firstly, concerned with understanding this seemingly contradictory relationship between the different South African governments of the twentieth century and the state corporations. The story told here begins in the 1960s, setting the scene for a period of heightened repression in South Africa that fits the mold of James Scott's authoritarian high modernism. But rather than viewing the technological state corporations as tools in the arsenal of authoritarian rulers, this book reveals their ambivalent relationship—one that can be characterized as both autonomous and immersive. Insights from the field of science and technology studies are particularly valuable in attempting to understand this relationship. Scholars working in this field have complicated the idea of intentionality, dwelling instead on the interstitial space between command and action. Scholars have also remarked on the promiscuity of technologies, whether in purpose or scope, and the variation in the user experience of already existing infrastructure.[5] This book shows that two of the largest technical systems in the world—South Africa's national electricity provider Eskom and its national

steel manufacturer Iscor—created infrastructures under the protection of an authoritarian government but generated contradictory politics internally and in the societies in which they operated. This ambivalence allowed Eskom to survive, with a singular tenacity, into the era of political and economic liberalization, since it could be repurposed to serve the ends of the democratic government.[6] In the late 2000s, Eskom attempted to resuscitate its construction network, but with limited success. Now, far from being a docile instrument of government command, it has drawn the government to the brink of bankruptcy.

Secondly, Eskom and Iscor are conceived here as writhing leviathans, made up of disparate elements that are both human and nonhuman, and with the ability to move through time and space in a coordinated fashion. Such a conceptualization complicates our existing understanding of the major political and economic transformation of the African continent during the second half of the twentieth century: a transformation that went from authoritarian governments committed to state-led development to neoliberalism and democracy. The oil crisis of 1973 is generally considered the beginning of the end of the state-led development project across the African continent and the start of the rise of the governmental austerity, which entailed the diminution in the size and capacity of the state bureaucracy, characteristic of the neoliberal era.[7] This book demonstrates that rather than destroying the South African state corporations, the oil crisis initiated a relative austerity with a distinct tenacity on the part of the state corporation engineers. This peculiar combination kept the engine of the developmental project running and led, ultimately, to the exploitation of the Waterberg coalfields. In the 1970s these coalfields were the last remaining coal frontier in South Africa. Despite the fact that Eskom, as a large-scale, monopolistic state corporation, did not comfortably align with neoliberal principles of competition, it escaped privatization in the 1980s and 1990s. And in 2007, Eskom was drawn into renewed government exuberance in spending on infrastructure projects when it began construction on the Medupi power station, a cornerstone of Eskom's resurgent commitment to expanding its electricity generation capacity.

Lastly, this book demonstrates that South Africa's transition from authoritarian rule to democracy meant for Eskom, in part, a transition from dogged certainty to one of interminable uncertainty. The engineers' tenacity in the face of the austerity of the 1970s rose out of their adherence to their long-term predictions of demand and supply. This adherence was, in turn, necessary to ensure the survival of White South Africa, and the defensive,

nation-building imperative endowed a certain cohesion to the relationship between the apartheid government and the state corporations. Democracy institutionalized contestation and offered up a splintered imaginary of the future. In the 1980s, Eskom's sure-footedness was already threatened by seemingly uncontrollable elements, such as trade unions and environmental activists. Eskom adapted to the changing imperatives of neoliberalism and of racial transformation in the early 1990s. And the Medupi power station, begun in 2007, became a construction project capacious enough to absorb the different imperatives of the democratic era.

AUTHORITARIAN HIGH MODERNISM

The story told here begins in the 1960s, a decade in which the apartheid government fully embraced the power of scientific planning to realize racial segregation. The first prime minister of the apartheid regime, D. F. Malan, was wary of the state corporations because British imperial sympathizer Jan Smuts was instrumental in their creation. But Hendrik Verwoerd, prime minister of South Africa from 1958 to 1966, more fully embraced scientific principles to realize racial segregation within his vision of "grand apartheid," and he enjoyed a close relationship with the leadership of the state corporations. The Sharpeville Massacre of 21 March 1960, which was widely reported in the foreign press, marked the start of international hostility to the apartheid regime and raised the very real threat that international sanctions would be imposed against South Africa. The government saw scientific planning as essential to the project of national industrialization. Industrial development and the growth of the manufacturing sector would ensure that South Africa reduced its dependence on imported goods in the likely event that sanctions were imposed.

The 1960s in South Africa thus marks the beginning of an extreme period of the authoritarian high modernism that James Scott describes in his seminal work on the brutal, state-driven interventions that occurred around the world in the nineteenth and twentieth centuries.[8] In Scott's formulation, authoritarian governments brutally intervened in societies within their ambit of control, ignoring the opinions of the local populace in favor of a modernization that rested on the authority of scientific expertise. In South Africa, this governmental praxis is clearly seen in the activities of the Group Areas Board (GAB), the official body responsible for racial segregation, which carried out forced removals of people in racially mixed neighborhoods that were labeled slums. Forced removals occurred in earnest during the second half of the twentieth century, affecting both commercial and residential

districts in large cities and in the tiniest of towns across South Africa.[9] The GAB instructed the people forcibly removed from their homes to reside in "townships" that it had developed as racially delimited mini-towns in close proximity to a major urban center that then became the preserve of Whites. These townships usually consisted of a small business district, a residential area, and bare fields that served as public parks and sports grounds. More generally, these instances of state-driven social engineering valorized scientific experts because of their ability to achieve social and economic modernization. In Scott's formulation, however, scientists and engineers appear as docile handmaidens of governments. The organizational and professional loyalties of the technical experts and planners under discussion are vague, and the state, scientists, and engineers appear as undifferentiated conspirators subsumed within the overarching vehicle of authoritarian high modernism.

Eskom and Iscor can be considered agents of authoritarian high modernism since Scott's analysis is not restricted to scientists and engineers within the government bureaucracy. Scott writes that at times the task of authoritarian high modernism fell to agencies with "quasi-governmental powers" and the ability to enact large-scale technological interventions.[10] Eskom has certainly been portrayed in a similar vein in the South African historiography, as having acted in concert with governments to further their authoritarian aims. Renfrew Christie, for example, argues that Eskom served only the interests of racial capitalism, which in turn strengthened the fiscus of successive colonial and apartheid governments.[11] Electricity from Eskom powered the machines that enabled the gold mines to reach ever-deeper levels and cast off their dependence on skilled African labor. This, in turn, created the conditions for the maintenance of the "color bar," whereby skilled White operatives managed a cheap, low-skilled African labor force. Similarly, Ben Fine and Zavareh Rustomjee argue that the minerals-energy complex, which derives its profits from the export of minerals, has been the dominant driver of the South African economy in the twentieth century.[12] For Fine and Rustomjee, Eskom served the interests of the mines—chiefly the gold mines—creating a "minerals-energy complex" that has prevented the prosperity of economic activity that occurred outside of it. This remains the most influential interpretation of twentieth-century South African economic (and institutional) history.

But Eskom (and Iscor) did not exist solely to serve the needs of the gold mines. Together with South African Railways and Harbours, they formed the foundation of industrialization by providing cheap electricity

and steel to both the mines and to the infant manufacturing sector. And while driven by the demands of the mines, both contained a developmental purpose from their origin, which was focused on improving the lot of the poor White population.[13] In the years preceding the creation of Eskom and Iscor, Jan Smuts had experienced the full might of the White working class during a series of insurrectionary strikes that he temporarily subdued in 1914. This created a "crisis of legitimacy"[14] for the government, and Smuts resolved to play a more interventionist role in industrial development to create employment for Whites. In this way, the state corporations contained a distinctive socioeconomic mission that was tied to the government's efforts to protect White workers, especially after 1922. Their developmental role would endure in various political forms for the rest of the twentieth century.

This dual role of Eskom and Iscor continued into the 1960s and fused with the apartheid government's defensive effort to promote industrialization. But industrialization also provided the basis for the beginning of worker solidarity and the bitterly contested development of African trade unions—especially the Metal and Allied Workers Union and its peers—from the 1970s onward. Worker protest and organization, in turn, played an important role in the protest culture of the late apartheid period and the eventual dismantling of the apartheid state.[15] This ambivalent role of the state corporations—one that supplied the steel and electricity for the apartheid regime while simultaneously planting the seeds for its challenge—is further explored in this book.

As the South African government embarked on the project of grand apartheid in the 1960s, elsewhere on the continent, newly independent countries rapidly descended into authoritarian rule, casting off the trappings of democracy that departing colonial powers had hastily introduced.[16] Postcolonial leaders took up the mantle of the developmental project that colonial governments had implemented toward the end of their rule to quell African unrest. Both colonial and postcolonial leaders hoped that electricity generated from new hydroelectric dams would simultaneously modernize mineral exploitation and kick-start national industrialization. For postcolonial leaders, electricity lay at the heart of their promise to deliver the fruits of modernization to the majority of the citizenry. Some of these dams were constructed during the colonial period, such as the Kariba Dam of the Central African Federation.[17] Others were built in countries still under colonial rule later than the general pattern across the continent, such as the Cahora Bassa Dam of Mozambique, completed in 1975, which entailed the forced

removals of indigenous peoples from the banks of the Lower Zambesi River before construction began.[18]

These large dams were expensive to build and a huge financial burden on the governments that commissioned them. For example, Mobutu Sese Seko, president of Zaire (present-day Democratic Republic of the Congo) from 1965 to 1997, hoped that the Inga-Shaba hydroelectric project in the Congo would provide the electricity to intensify copper mining in the copper-rich Shaba region. The resultant cost overruns and fatal delays of the Shaba Dam were major contributors to the financial collapse of the postcolonial Congolese state in the 1980s.[19] More successful examples of hydroelectric projects on the continent include President Kwame Nkrumah's Akosombo Dam in Ghana, which Nkrumah hoped would power a giant aluminum plant that processed naturally occurring bauxite. In each case, as in South Africa, electricity formed the basis of economic and social modernization, while frequently rooted in the need to service the mines for the export of minerals.

SCIENCE, TECHNOLOGY, AND AFRICAN STUDIES

Studies of African politics and the African state have neglected a concerted engagement with the technological facet of power. While highlighting the importance of technology and infrastructure, these studies have not taken into account the analytical implications of the vitality of technology. Notable among these is Jeffrey Herbst's study of the way that states project their authority from their location at the capital to the peripheral regions of the territory within the borders of the nation-state.[20] Herbst argues that this process in Africa differed from the centripetal forces at work in European nation-states, which had engaged in warfare with their neighbors for centuries. In African countries, roads were essential to overcoming geographical constraints and reaching far-flung communities, but the paucity of roads and other communication infrastructure deterred the effective transmission of state authority. The challenge that incumbent leaders face in extending state power throughout the national territory is a recurring theme in studies of African politics.

In his study of the 2009 construction of the Merowe Dam in Sudan under the presidency of Omar al-Bashir, Harry Verhoeven notes the essential "civilizing" mission that al-Bashir envisioned developmental projects performing, uniting a country historically riven by violent cleavages.[21] Al-Bashir hoped that the dam would strengthen the links between the capital and peripheral regions of the territory within the national borders, thus bolstering

the political fortunes of the military-Islamist al-Ingaz regime. Despite these efforts, South Sudan seceded in 2011, frustrating the government's efforts to maintain territorial integrity. Iginio Gagliardone has documented the role that information and control technologies have played in Ethiopia in transmitting political orders from the country's capital to the bureaucrats stationed in the various administrative districts. This transmission of governmental authority mirrored the regimental style of the ruling party, the Ethiopian People's Ruling Democratic Front, which had previously borne arms as the country's liberation party.[22]

Historians of South Africa have recently focused attention on the role of scientific institutions in the country's history, challenging the idea of a trajectory of political development driven by human action.[23] Keith Breckenridge has examined the importance of technological failure in Prime Minister Verwoerd's decision-making during his term in office. In an effort to resolve one of the most important challenges of racial segregation—controlling African mobility in the nominally White urban areas—Verwoerd ordered the creation of a national fingerprint database called the *bewysburo.*[24] The failure of this scheme, Breckenridge suggests, gave rise to government efforts to make the African homelands durable as the last remaining option for total segregation. In a recent book, *The Scientific Imagination in South Africa,* William Beinart and Saul Dubow have highlighted the autonomous role of scientific developments and institutions, separate from the governments of their time, as well as their role in maintaining group identities of belonging and exclusion.[25] While recognizing the dual, ambivalent role of science and technology, their work presents various instances of scientific ingenuity in South African history, and they do not concertedly examine the relationship between the South African governments and the scientists and engineers.

A small but significant body of scholarship has examined this relationship through the lens of "technopolitics." The term is best understood in its scholarly context, rather than as a generally applicable definition, and the books of three authors who thoroughly engage it are discussed here: Gabrielle Hecht, Timothy Mitchell, and Antina von Schnitzler. Historian of technology Thomas Hughes, writing in 1986, characterized the relationship between technology and society as a "seamless web," one in which humans and technology are mutually constituted and ultimately inseparable.[26] In studying nuclear development in France after the Second World War, Gabrielle Hecht expanded the bounds of the technological system to include the French nation-building project. Driven by state-linked corporations,

the Électricité de France and the Commissariat al'Energie Atomique, the development of nuclear power assisted with the reconstruction of national identity in a country devastated by war and shorn of its former imperial glory. By rhetorically separating the sphere of technology from the sphere of politics, engineers at the state-linked corporations cloaked their activities in an apolitical guise. At the same time, the particular properties of the technology delimited the options available to politicians and so, Hecht argues, "technology cannot be reduced to politics."[27]

In *Rule of Experts: Egypt, Techno-Politics, Modernity,* a book focused on colonial and postcolonial Egypt, Timothy Mitchell describes technopolitics as an "alloy" that is composed of both the human and the nonhuman, but organized so that human intention appears to overpower and drive the nonhuman.[28] Mitchell offers a model for gauging change over time by demonstrating the ultimately messy enactment of colonial experts' preconceived plans and their continued reformulation in the face of unpredictable, particularly material, elements.

Lastly, Antina von Schnitzler's *Democracy's Infrastructure: Techno-Politics and Protest after Apartheid* details the adoption of a small and seemingly mundane object in South Africa, the prepaid meter. Johannesburg city engineers installed prepaid meters in African townships in the 1980s to alleviate the crisis of nonpayment. The nonpayment was in turn a product of resident distrust of municipal authorities and recurrent unrest in the townships. Prepaid meters continue to be used in the postapartheid period and are a rallying object for protests against the lack of service delivery. Von Schnitzler argues that, rather than a "conduit for power," they constitute a "political terrain," one in which popular protest, the rights of the citizenry, and governmental intervention all play out.[29]

An important characteristic of a technopolitical intervention, as in the studies discussed above, is its open-endedness. This goes against the grain of positivist political theory, which presumes that the presence of certain conditions will give rise to predictable outcomes through the operation of discernible laws. By virtue of its technical complexity, technology holds the potential to entirely defy the will of the human operator and so scuttle the purpose of the latter, whether for better or worse. It is thus difficult to identify pure zones of political and technological action. Government bureaucracies are inextricably bound up with technologies and infrastructures that enable communications, record keeping, and security, to name a few. Politics is conceived here as composed of both human and nonhuman agents that are not restricted to the governmental sphere or to the machinations

of political parties. Rather, politics is composed of assemblages of relations between and within governments, political parties, corporations, nongovernmental organizations, municipal authorities, and the multiplicity of individuals and organizations that constitute everyday life.

It is then important to consider the question of what makes the relationships within the assemblage durable. Bruno Latour and Michel Callon have provided a way of conceptualizing the relationship between these disparate elements. They use the term "Leviathan" to describe the irreversible alliances created by the entanglement of human and nonhuman agents:

> In the state of nature, no one is strong enough to hold out against every coalition. But if you transform the state of nature, replacing unsettled alliances as much as you can with walls and written contracts, the ranks with uniforms and tattoos and reversible friendships with names and signs, then you will obtain a Leviathan: "His scales are his pride, shut up together as with a close seal. One is so near to another that no air can come between them. They are joined one to another; they stick together that they cannot be sundered" (Job 41:15–17).[30]

While in a relationship of cooperation with each other, the different entities are concurrently immersed in other assemblages of relations.[31] Susan Leigh Star and James Griesemer's concept of the "boundary object" offers a useful conceptualization of the meeting of interests that enable cooperation.[32] The boundary object straddles multiple worlds and is so able to bring heterogeneous elements together in a cooperative relationship of negotiation and compromise. In Star and Griesemer's case study of the Museum of Vertebrate Zoology at the University of California, Berkeley, each individual or organization involved collected and preserved flora and fauna in the state of California for preservation at the museum according to their own interests. In so doing, they retained their separate, individual identities while still cooperating with the projects of the museum's first director, Joseph Grinnell.

In the case of Iscor and Eskom presented here, conflict and compromise characterized the relationship between the state corporations and the apartheid government. The way forward for the state corporations was not always smooth, and intransigent opposition from affected ministries often blocked the paths they intended to follow. Their shared need to ensure the economic and military survival of White South Africa in the face of threats to apartheid from both within and without ensured their cooperation. This

commitment to a defensive nationalism coincided with a faith in the efficacy of long-term planning. Eskom's and Iscor's long-term-demand forecasts of electricity and steel, respectively, determined the size of their ambitious expansion plans in the 1970s and 1980s, enabling their engineers' peculiar tenacity during this period. Brian Larkin has remarked on the evocative quality of infrastructure and its role in producing forms of fantasy and desire among those who interact with it that is independent of the "technical functioning" of an infrastructure.[33] As the story of Eskom and Iscor demonstrates, infrastructure can also evoke particular imaginaries of an ideal society and ensure cooperation and unity in the realization of this goal. These imaginaries could be recorded in government policy or exist outside of official government sanction. The existence of the Broederbond in twentieth-century South Africa is an example of the latter. The Broederbond was a shadowy organization responsible for the propagation of Afrikaner culture, education, and economic development, and it enjoyed a disproportionate amount of control over the National Party and the various leaders of the apartheid government.

FROM KEYNESIANISM TO NEOLIBERALISM

The apartheid government's tenacious commitment to building the infrastructure that would ensure its survival entailed significant government investment from the 1960s onward. This was in keeping with contemporaneous Keynesian global trends, where governments around the world hoped that public spending would invigorate ailing postwar economies. In addition to spending on infrastructure, by the 1980s the apartheid government was also spending large amounts of money on arms and artillery to repress ongoing protests in the townships and to prop up the treasuries of the homeland governments.[34] In 1985 South Africa officially entered a financial crisis, prompted by the refusal of the American-based Chase Manhattan Bank to extend further credit to the country. In response, the government turned its attention inward, and the state corporations swam into focus as targets for cost cutting. Thus began the serious consideration of privatizing the state corporations; a process that Ben Fine describes as "selling-off of the family silver in order to raise the funds to finance the apartheid regime."[35] President P. W. Botha instituted a committee to investigate the privatization and deregulation of state corporations, and the report that the committee released echoed neoliberal concerns about government overreach in the management of the economy and the importance of carving out a space for private sector involvement.[36]

This preoccupation with fiscal austerity and the privatization of state-owned corporations tailed similar developments elsewhere in the world and is generally indicative of the onset of neoliberalism. In European countries, neoliberalism had arrived slightly earlier. In the late 1960s, stagflation, or intolerably high inflation rates, stalled the Keynesian model of government spending to stimulate economic growth, and the proponents of neoliberalism, who had previously been sidelined, rushed to fill the now vacant space of economic orthodoxy. Neoliberals saw individual liberty as tied to market freedom and advocated the relaxation of the hold of governments in organizing the economy. On the African continent, neoliberalism is seen to have arrived with the structural adjustment policies (SAPs) imposed by the World Bank and International Monetary Fund on bankrupt governments as a part of loan conditionality. Because they advocated austerity, SAPs are thought to have destroyed governments' capacities to maintain the developmental projects introduced in the late colonial and postcolonial periods.[37] Nonetheless, as Nicolas van de Walle argues, it is difficult to establish the actual efficacy of SAPs, when measured in terms of their ability to realize their own objectives or in terms of the actual scale of the transformation they wrought.[38] South Africa, however, managed to escape adherence to the prescriptions of SAPs, though World Bank officials regularly advised both the government under apartheid and the government led by the African National Congress (ANC) on economic policy. The ANC inherited a decimated fiscus when it came into power in 1994 and implemented what is widely considered a neoliberal-inspired policy, Growth, Employment, and Redistribution.

While often presumed to be a foreign imposition on African governments, neoliberalism offered an opportunity to mend the fracturing apartheid project for government officials concerned with reform in the 1970s.[39] In South Africa, as elsewhere on the continent, the oil crisis of 1973 signaled the start of financial hardship, and African governments struggled thereafter to access the funding they previously could. In South Africa, the oil crisis was soon followed by the Soweto uprising of June 1976, which began persistent unrest in the townships and, as Deborah Posel writes, urged the apartheid government to adopt a "new language of legitimation."[40] Faced with the growing "ungovernability" of the townships, which was an avowed ANC resistance strategy, the National Party attempted to reform its strategy of racial segregation and subdue discord within its ranks. It failed, however, to prevent the eventual defection of a faction of the Afrikaner nationalist right in 1982 to form the Conservative Party.

Antina von Schnitzler writes that certain government economists found neoliberal precepts appealing and recommended that apartheid reform focus on molding the subjugated African in the image of the market consumer. Where it had previously eroded all forms of African capital ownership, in the 1980s, the apartheid government attempted to create an elite class of African entrepreneurs in the townships and the homelands in the hopes of alleviating popular protest.

The preoccupation with the commercial reform of the state corporations in the 1980s also reflected the South African government's suspicion that Eskom had too much free rein. By the end of the 1980s it became apparent that Eskom had built too much electricity generation capacity, and the concern with privatization coincided with the view among government officials and commentators in the press that public funds had been wasted on the new power stations. While Eskom escaped privatization in the 1980s, it came to the realization that its long-term planning of supply and demand had been misleading, inadvertently confirming the neoliberal argument that the market is best placed to determine levels of demand and supply. Eskom's demand projections proved erroneous because of the unexpected drop in gold prices in the 1980s, and this transformed the century-old alliance between energy in South Africa and the gold mines. At the same time, global and domestic forces agitating for the unbanning of political parties such as the ANC and for the implementation of democratic systems wore away the resolve of the apartheid regime.

While the neoliberal transition looms large in the history of the African continent, its implications and defining features have proven elusive. So significant is its apparent vacuity that Rajesh Venugopal has suggested we retain neoliberalism only as a "broad indicator of the historical turn in macro-political economy."[41] The difficulty in definition is due, in part, to the fact that its actual manifestation assumed unrecognizable forms. While attributed to the musings of members of the Mont Pelerin Society, who began to meet at a Swiss mountain resort in 1947, neoliberalism was always and everywhere grafted onto preexisting social fabrics, and this was part of its appeal for apartheid reformers.[42] For this reason, the preexisting institutional structures, nongovernmental organizations, political parties, infrastructure, and technological corporations shaped the adoption of neoliberalism around the world.

Scholars of neoliberalism have pointed to its ultimate role in exacerbating wealth inequality, while it paradoxically continues to rely on the regulatory authority of the state. Pierre Bourdieu has highlighted the

paradoxical role of neoliberalism, which criticizes "collective structures" that oppose its valorizing of the individual, while these older structures remain responsible for curbing the social chaos that neoliberalism would unleash if left to its own devices.[43] David Harvey describes the "neoliberal state" as one that is committed to the accumulation of wealth for a multinational business elite.[44] Efforts to suppress the economic mobility for the poorest of society follow, such as the erosion of welfare and the relaxation of laws that protect labor. Scholars have also considered the continued provision of government welfare through the use of neoliberal techniques, such as in James Ferguson's study of direct cash transfers in the rollout of South Africa's Basic Income Grant.[45] Similarly, Stephen Collier reveals that state corporations continued to assume responsibility for the provision of heating in post-Soviet Russia, all the while utilizing elements of the neoliberal toolkit, such as privatizing parts of themselves, an exercise known as "unbundling."[46]

Neoliberalism is also considered to have a splintering effect on the large-scale, networked infrastructure, much like the large technical systems that Hughes has described, common under a state-centered model of development.[47] Privatization and the effort to encourage competition entailed the breaking up of these behemoths at both the national and local level, leading, in cities, to what Stephen Graham and Simon Marvin have termed "splintering urbanism."[48] Where new technologies have been adopted, these often take the form of "micrological" devices, such as the water and electricity prepaid meter that Von Schnitzler has described, in line with devolved, individualized techniques of neoliberal governmentality.[49] But the tendency toward the splintering of infrastructure has existed side by side with an impetus toward centralization. The persistence of large, networked infrastructures in a nominally democratic South Africa with a competitive market economy is best explained by the continued advocacy—typically by trade unions in official forums—of "democratic socialism." Eskom and the South African government repeatedly toyed with the idea of the privatization of Eskom in the 1990s, but it remained a potent state corporation with the ability to build enormous plants such as the 4800 MW Medupi power station. While not disputing its splintering effect, the implementation of neoliberalism is viewed here as a contested process. In South Africa, the governmental preoccupation with privatization and fiscal austerity, activities associated with a neoliberal orthodoxy, has ebbed and flowed in a cyclical fashion since the 1980s. Trade unions in particular have been strong proponents of "democratic

socialism" and have acted as a countervailing force to the imposition of neoliberal-inspired policies. They have done this from a position of power as a part of the ruling "tricameral alliance" that is composed of the Congress of South African Trade Unions, the South African Communist Party, and the ANC.

DEMOCRATIZATION

Across the African continent in the early 1990s, democratization followed on the heels of economic liberalization.[50] Frustrated at the slow pace of economic reform, international monetary bodies urged the implementation of multiparty elections in the belief that authoritarian governments were stifling economic growth. Democratization, culminating in South Africa's multiparty elections of 1994, institutionalized party contestation. Multiparty elections, while holding the promise of freedom and liberation from authoritarian rule, also brought new forms of insecurity and uncertainty. This was the case in Rwanda, where genocide began in the same month as South Africa's democratic elections.[51] The contestation formalized in the democratic process also meant the splintering of the imaginary that had previously animated the relationship between the government and the state corporations. As a crucible of politics in postapartheid South Africa, an infrastructure project such as Medupi became capacious enough to hold multiple contested assemblages, composed of both the human and the nonhuman. The infrastructure project absorbed a multiplicity of expectations and imaginaries of the future by virtue of its complexity and its extended time duration.[52]

The Medupi power station promised to end load shedding, periods of forced electricity outages that have afflicted South Africa since 2007. But the construction of the power station was ultimately uncontrollable. Its technological ambitions proved expensive and extremely difficult, and its continued contribution to climate change became indefensible. Medupi originated within the milieu of a resurgent focus on government spending on infrastructure to encourage a Keynesian-like stimulus of economic growth. Increased government spending was a common response around the world to the depression wrought by the financial crisis of 2007–8.[53] In South Africa, this coincided with the new presidency of Jacob Zuma, who was elected at the end of 2008. Zuma rapidly dissolved any pretense at austerity, and government funds lined the pockets of politicians and businesspeople as much as they went toward the construction of infrastructure. But this period did not exactly mirror the events that occurred during the

period of Keynesian-inspired government spending from the Second World War to about 1980. In particular, the animating logic of the ruling party had changed. The National Party had focused on constructing the infrastructure of racial segregation as well as the cultural and economic promotion of Afrikaans and of Afrikaner unity encapsulated in its idea of the *volkseenheid.* But for the ANC-led government, the need for party funding underpinned its corruption scandals (as well as those of opposition parties) in the context of a party with a history of militant struggle that lacked inroads into the country's higher economic echelons before it came into power.

In a certain respect, the transition from apartheid to democracy with regards to infrastructure has meant a transition from engineers' tenacious conviction in the rectitude of their activities to contestation and irresolution. Scholars writing on the way in which questions of science and infrastructure are imbricated in democratic politics have highlighted the importance, and desirability even, of controversies.[54] Technological controversy benefits the practice of democracy because it allows ordinary citizens and consumers to inform the direction of technological change, removing decision-making from being the sole province of scientific and technical experts. This creates new forums for democratic action and consultation and ensures the participation of affected parties, through which the natural and social orders are "coproduced."[55] In this way, uncertainty enables participation by people who would otherwise be marginalized in decision-making about the direction of technological change.

The case under discussion here offers a layer of complexity to current understandings of the implications of democracy for technology and infrastructure. In principle, the ANC was elected into power as the representative of the electorate, but its leaders are also responsible for ensuring the survival of the party (which is the representative of the people). The party has profited off its control of the levers of the government, and since this behavior is largely illicit, the line between corruption for the party and for individual politicians is easily crossed. In the case of Medupi, uncertainty over the technical diagnosis of its problems acted as a cover for competent and well-meaning leaders in Eskom to be removed in favor of those who sought to siphon funds for individual enrichment. As a result, uncertainty was not resolved in a manner that enabled a consensus among affected parties and was instead used as an instrument to enable looting to continue unabated. A complex megaproject such as Medupi is the site of multiple, overlapping, and changing alliances, which made it difficult to identify a single entity or individual that is responsible for the project's

failures. The long-standing nature of the construction and the fact that costs were escalated in a seemingly unlimited manner meant that a construction project such as Medupi was suitable terrain to absorb the pressures of democratic politics in South Africa.

<div align="center">METHODOLOGY</div>

This book uses primary sources from various archives. These include the National Archives of South Africa, which houses much of Iscor's archive from the 1970s. I also utilized Eskom's own archival documents. These were obtained with special permission which specified that Eskom had the right to read the chapters written for my dissertation (on which this book is based) that mention the information contained within its archival records. I duly submitted chapters 3, 4, and 5 of the dissertation for their perusal, and Eskom requested no change apart from changing the reference to its earlier name of "Escom" to "Eskom." I obtained some archival material from certain interviewees who belonged to trade unions at the Matimba power station. These interviewees had kept the minutes of meetings between management and trade union representatives held at the power station in the 1990s and were helpful in reconstructing the narrative of negotiations that occurred during this period. I also utilized government publications to gauge the official parliamentary view of pertinent historical events. These include the records of parliamentary debates (Hansard), various white papers, and the reports of commissions of enquiry set up by the government.

When I began research on Medupi in 2013, Eskom had announced the first postponement of Medupi's completion date, which was initially the end of 2013. I approached Medupi with the intent to locate the points at which the autonomy of Eskom and its engineers had been eroded, rendering Eskom subject to political interference that sacrificed technical efficiency. But the story turned out to be more complicated. I decided that it would be unwise to interview engineers or staff members at the power station because of interviewees' likely guarded responses. In addition, the fact that Medupi was an ongoing construction project meant that it would have been difficult to gain a sense of developments there from any isolated section of interviewees. Casual conversations revealed that there were as many different points of view for the reasons for Medupi's failures as people I spoke to. For this reason, I have relied chiefly on documents in the public domain—news articles and reports of various Commissions of Inquiry—to establish the nature of events at the power station. Evidence given to the Commission of Inquiry into Allegations of State Capture (established in 2018

and also known as the state capture commission) is discussed in relation to the travails of the Medupi power station, though it is important to note that these witness testimonies are delimited by the parameters of the inquiry. I conducted interviews, chiefly as life histories, for the earlier period of the book because I believed that the passage of time would render the relation of past events less controversial. A few long-standing residents of the Lephalale and of Marapong were helpful and happy to share their memories. I also conducted interviews with engineers who had worked at Iscor and Eskom during the 1970s, 1980s and 1990s. Efforts were made to cross-check their information with archival documents as much as possible.

The archival documents I consulted for Iscor and Eskom were chiefly the minutes of board meetings that were held roughly each month in the 1970s and 1980s. Iscor was privatized in the late 1980s, and its company archives before privatization have been deposited in the National Archives of South Africa and are freely accessible to the public. The documents for the relevant years related to Eskom's activity are housed in Eskom's internal archives. The minutes of the board meetings for both Iscor and Eskom revealed the decision-making process that led to them entering the Waterberg in the mid-1970s. Since these were official records, they relay the impression of an eminently rational decision-making process, one in which the costs and benefits of all possibilities were considered in order to reach the best possible solution. This apparently rational process was itself an artifice since it depended on the reduction of complex economic, social, and political factors into factors that could be manipulated in a cost-benefit model. For example, the records contain no mention of the international and domestic hostility toward the apartheid regime during this period. The record of Eskom board meetings refers to the threat of the underground struggle launched from ANC bases in other African countries only as "defense" considerations. The tale relayed in this book relies on these documents, while euphemistic in the extreme, to understand the relationship between Iscor, Eskom, and the government as well as their official motivations for entering the Waterberg.

Unlike Iscor, Eskom was not privatized and remains a state-owned corporation at the time of writing. Many of the engineers who rose through its ranks in the 1970s and 1980s were still employed at the corporation during the course of my research. By the mid-2010s, allegations of government interference in tendering processes had become clear, raising concomitant fears that this would threaten the technical efficiency of existing and newly commissioned power stations. As the years wore on, the scale of the penetration

of state capture operatives became more evident and engineers who held management positions at Eskom testified at the state capture commission. These engineers revealed a sense of incomprehensibility about the governmental interventions, which had manifested in sudden dismissals of personnel for reasons that were unconvincing. While Eskom's engineers did not launch overt protests, there was a sense of frustration at the government's interference in internal decision-making processes. There was also a sense that events were occurring that were outside of the control of Eskom's engineers. The controversies surrounding the state capture scandal touched on events at Medupi, and the ANC had been implicated in the improper award of the tender for the boilers early in the construction of the power station. While an investigation by the public protector of South Africa in 2008 laid to rest claims of ANC interference in the award of the tender, there remained a veil of suspicion around how corruption at Medupi was influencing the continuous delay in completion of the power station.

NOTES ON TERMINOLOGY

I have chosen to use the names of places that are contemporaneous with the period under discussion. For example, the name of the town of Ellisras was changed to Lephalale in 2002, but when discussing the history of the town during the 1970s, the name Ellisras is used in accordance with the terms of the discussion in archival records. The exception to this is the name "Eskom," which was known as "Escom" before 1987.

Since racial segregation is an important component of South Africa's history, the use of racial categories is unavoidable in a study such as this. During the antiapartheid struggle, the term "Black" came to encompass the so-called racial groups that bore the brunt of apartheid's discriminatory laws. These groups included the apartheid-created racial categories of "Black," "Indian," and "Coloured." With the absence of the racial solidarity occasioned by the antiapartheid struggle, in the postapartheid period it is difficult to ascribe the same cohesion of racial categories to the term "Black." I have used the term "African" to refer to indigenous South African peoples, whom the apartheid government classified as "Black." The term "Black" is used in the book to denote the racial groups that the apartheid government classified as "Black," "Indian," and "Coloured," as described above.

THE INTERNAL ARCHITECTURE OF THE BOOK

Chapter 1 details Iscor's arrival in the Waterberg. Located far from the infrastructure of coal exploitation, the Waterberg was an unlikely site of state

corporation activity. During the 1960s, the apartheid government worked closely with Iscor and Eskom to realize its project of national industrialization and racial segregation. As a frontier-like border region without a substantial White settler population, and surrounded by fragments of the self-governing Lebowa homeland, the Waterberg was not of any particular importance to the government. Iscor drove the exploitation of the Waterberg coalfields to meet the coking coal requirements of its expansion plan, which was in turn determined by its demand forecasts. Despite the threat posed by the global scarcity of funds after the oil crisis of 1973, Iscor proceeded tenaciously with the development of the Grootegeluk coal mine in the Waterberg. Iscor and the government came together to enable the unlikely exploitation of the Waterberg coalfields, united by a shared nation-building project in a relationship characterized by conflict and compromise.

Chapter 2 focuses on the development of the small town of Ellisras and the mediated way in which it was subject to the government's regulatory authority. As a vast expanse of bushveld, the Waterberg was too far from the government capital, in Pretoria, to feel the full might of governmental control. It was only with Iscor's arrival in the mid-1970s that the government turned its eye to regulating urban development and racial segregation in the incipient town of Ellisras. Iscor's arrival, with its promise of large-scale capital investment and urban growth, coincided with the forced removals of Africans from White-owned farmlands in the district in accordance with the Group Areas Act. This enactment of forced removals, a characteristic feature of authoritarian high modernism, was not directly a product of governmental decree. While the Group Areas Act was one of the pillars of apartheid, the government lacked the will or the wherewithal to commence with forced removals everywhere in the country. Iscor provided the infrastructural muscle to ensure the development of a "modern" town, and in line with government prescriptions, a modern town was also one that was racially segregated. The forced removals of African communities from the vicinity of the town to the nearby homeland was enabled by a confluence of concerns from Iscor and various layers of government, including labor scarcity, public health, town planning, and racial segregation.

Chapter 3 details Eskom's arrival in the Waterberg in the 1980s as the apartheid regime increased its military capacity in defiance of its impending end. The Matimba power station, built near Iscor's coal mine in the Waterberg, was a part of Eskom's major power station construction spree in the 1980s. A power station in the Waterberg required significant technological innovation to cope with the arid climate, and its construction is a testament

to Eskom's tenacious commitment to its own capacity expansion plan. At the end of the 1980s, however, Eskom's erstwhile foundation of certainty began to crumble. In the end, it had created too much electricity generation capacity. The collapse in the price of gold meant that demand from the gold mines did not increase as much as Eskom had predicted, belying the accuracy of long-term planning. Eskom also encountered rare opposition to its plans in the form of the country's air pollution officer, who forced the corporation to situate one of its power stations outside of its traditional stronghold of Mpumalanga, which had become saturated with sulfur dioxide emissions.

Chapter 4 details the beginning of the neoliberal era in the 1970s. Following the Soweto uprising, apartheid underwent a process of reform that saw the political triumph of the *verligte* faction, a group that advocated an embrace of commercial principles even if this meant the relaxation of racial segregation. The rising tide of neoliberal orthodoxy offered a means of commercial salvation, and when the government entered a financial crisis in the late 1980s, government officials explored the option of privatizing state corporations to gain liquidity. This chapter demonstrates the selective and partial incorporation of neoliberalism as a top-down attempt at reform. The privatization of Eskom ultimately appeared too inconvenient. The corporation had proven its role in diplomacy in the southern African region under apartheid, and for the incoming ANC-led government, it promised to deliver universal electrification and the fruits of modernity to the previously disenfranchised citizenry. In this way, Eskom resisted privatization and total divorce from the levers of the government while still committing to commercial reform.

Chapter 5 details the arrival of African trade unions at the Matimba power station and their incorporation into official labor bargaining forums. Labor organization at the Matimba power station and at the nearby Grootegeluk coal mine followed a coal mine and power station trajectory of union organization that occurred elsewhere in the country, particularly in the Gauteng-based industrial hub of the Vaal Triangle. Because of the proximity of power stations to coal mines across the countryside, the National Union of Mineworkers and the National Union of Metalworkers of South Africa were naturally inclined to organize in a similar way in the Waterberg. Trade unions negotiated the transition from paternalism to the idea of workers as nominally autonomous individuals, highlighting the complexity of the transition in a context of deep dispossession. With the award of South African citizenship rights for Africans in the town of Ellisras after 1994, the

power station became an important site for the promotion of autochthony, as workers across racial lines agitated for residents of the region to be prioritized for employment and promotion opportunities.

Chapter 6 details the development of the Medupi power station, demonstrating that the power station functioned as an entity capacious enough to absorb shifting alliances and imaginaries in the democratic era. South Africa adopted a resurgent infrastructural drive toward the end of the first decade of the twenty-first century, one that shared features with the Keynesian economic stimulus after the Second World War. Despite the best political will—given the public discontent at the frequency of electricity outages and its importance to the ANC's electoral prospects—Medupi consistently defied estimates of the dates of completion of construction. Eskom promised at the outset to install pollutant reducing technology, called flue gas desulfurization, at Medupi, though it has delayed doing so. Medupi is an air polluter and a contributor to the ever-worsening climate change crisis. Over time, state capture operatives, or those who sought to illicitly profit from the power station construction, manipulated the facts behind its delay as an excuse to remove competent engineers from Eskom when, in reality, no single individual could be held responsible for its lack of completion. In time, irresolution and uncertainty over the power station's failures were used as a cover for continued looting. This allowed state capture operatives to plant pliable officials in the managerial ranks of Eskom—these officials assisted in the project of looting and were not particularly concerned with the maintenance of infrastructure. Medupi and Eskom have ultimately drawn the government into a position of indebtedness from which it cannot easily escape. Eskom now stands out as a globally critical contributor to the climate crisis and a major threat to the government's fiscal well-being. Whether Eskom remains a state corporation or is wholly privatized, it is not likely to construct another coal-fired power station of a similar scale in the near future.

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This book sets out to illuminate the infrastructural, technological, and material dimension of politics in South Africa and on the African continent more generally. Politics in South Africa is generally considered to be people-centered—its trajectory dependent on the machinations of political parties, influential politicians, and citizens at the voting booth. The corpus of science and technology studies, with its focus on the vitality of the material, has complicated the notion of intentionality, highlighting the intermediate elements between command and action. During the 1960s and early

1970s, the period of apartheid rule that closely approximates James Scott's notion of authoritarian high modernism, the institutional autonomy of the technological state corporations, the complexity of the technology, and the geography of the country's mineral deposits, to name a few, complicated the apartheid government's ability to enact its will. The technological projects of the Waterberg originated in this foundational period of government-driven infrastructural development, and an examination of their evolution reveals the contingent, inadvertent nature of authoritarian high modernism.

This contingency extended to the project of extending the authority of the government to peripheral regions of the country, which affected the apartheid government's ability to effectively control the people and things within the territory of the nation-state. An important theme in studies of the African state is that of its difficulty in gaining legitimacy in the eyes of its populace and effective control over the territory within its borders. But infrastructure and technology were not passive transmitters of government power, and their intermediary role means that the transmission of government power was the product of an assemblage of factors composed of various layers of government officials, engineers, local elites, labor, and materials. This challenges the presumption of concerted action contained within the notion of the "African state."

The institutional autonomy of the state corporations, Eskom and Iscor, meant that they did not perfectly align with any presumed role that politicians envisioned for them to play. In this way they played an ambivalent role—or contradictory roles simultaneously—in South Africa's historical development. For example, analysts of South African political economy consider Eskom to have played a key role in sustaining the particular set of capitalist relations contained within the minerals-energy complex. But at the same time, Eskom was also important to the government's developmental project—focused on the improvement of the living conditions of Whites—for most of the twentieth century. Iscor and Eskom merged with the imperatives of successive governments of the twentieth and twenty-first centuries and so passed through different technopolitical regimes. This includes the austerity of the neoliberal era and later the renewed infrastructural emphasis of the ANC-led government. While a part of these regimes, they were also transformed during the course of their passage, incorporating new elements and retaining traces of their past activities.

The major transition of South Africa's history—from the oppressive rule of apartheid to the freedom of democracy—is complicated by the ambivalent presence of large technological systems in the Waterberg, and more

generally by the networked infrastructure in the form of Eskom, its country-wide network of power stations, and its extensive network of transmission lines. The technological systems in the Waterberg, which were created in the midst of apartheid, set the stage for the formation of African worker solidarity in the region. In the postapartheid era, the construction of the Medupi power station in the region has provided hope for the end of the country's electricity shortage crisis and for the delivery of the fruits of modernization to the majority of the populace. At the same time, the delayed completion of Medupi has frustrated efforts to realize the material benefits of democratic freedom, for which access to electricity is crucial. The technological systems in the Waterberg have come to signify both freedom and unfreedom from their origins in the apartheid period and in their continued activity in the postapartheid era.

In understandings of the political economy of the transition from authoritarian to democratic rule in Africa, neoliberalism immediately preceded the democratic turn. The oil crisis of 1973 was a crucial moment in ending the overbearing presence of African governments in the economy. But the relationship between the global funding scarcity, signaled by the oil crisis, and the end of the government-led developmental project is a complicated one. The development of the technological systems in the Waterberg continued into the 1980s despite the funding scarcity. In accordance with the argument made by scholars such as Stephen Collier, the neoliberal era did not automatically mean the privatization of state-owned corporations such as Eskom. This book further develops this point, demonstrating that the imposition of neoliberalism was a contested process. Trade union organization in the Waterberg in the 1980s closely followed the organizational experience among the coal mine and power station nexus of the Vaal Triangle, in what is today part of the Gauteng province. In this way, the trade unions negotiated and contested the imposition of principles associated with neoliberalism in a context where Africans had been steadily dispossessed of capital over the course of the twentieth century. Neoliberalism was thus imperfectly adopted and the shape it assumed was a product of preexisting material and organizational configurations such as those set by the coal mine and power station nexus of the Waterberg.

South Africa's infrastructure networks have stealthily gained visibility in the postapartheid era due to innumerable instances of failure, in line with Paul Edwards's contention that infrastructure is largely invisible until breakdown. Electricity provision in particular has come to be a crucial measure of the health of the country's democracy and of the satisfaction of the general populace with the rule of the ANC-led government. Much like other state

corporations, Eskom has fallen prey to corruption, which has resulted in the widespread hollowing out of infrastructure and the organizations that sustain them. The construction of the Medupi power station has proceeded through three different presidential regimes, and it has proven too complex to relay a single diagnosis that could determine an appropriate remedy. Repair and correction have occurred during the course of construction in a feedback loop of sorts, leading to the continual delay in completion. Medupi and the technological systems in the Waterberg are both subject to, and immersed in, the economic, financial, technological, and political milieu of democratic South Africa. In this way, they have proven crucial to the country's prosperity.