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ESKOM TRANSFORMED

ACHIEVING A JUST ENERGY TRANSITION FOR SOUTH AFRICA

FRIEDRICH EBERT STIFTUNG

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AIDC Alternative Information & Development Centre

TRADE UNIONS FOR ENERGY DEMOCRACY

tni transnationalinstitute

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ABBREVIATIONS AND ACRONYMS

AIDC	Alternative Information and Development Centre
AMI	Advanced Metering Infrastructure
ARV	Antiretroviral
BEE	Black Economic Empowerment
BESS	Battery Energy Storage Systems
BNEF	Bloomberg New Energy Finance
BW	Bid Window
CADTM	Committee for the Abolition of Illegitimate Debt
CCGT	Combined Cycle Gas Turbine
CODELCO	National Copper Corporation of Chile
COP	Conference of the Parties
CPI	Climate Policy Initiative
CSIR	Council for Scientific and Industrial Research
CSP	Concentrated Solar Power
DMR	Department of Mineral Resources and Energy
DPE	Department of Public Enterprises
DSR	Demand Side Response
ECB	Electricity Control Board
EIA	Energy Information Administration
ERA	Electricity Regulation Act
ERC	Energy Research Centre
ESCOM	Electricity Supply Commission
FDI	Foreign Direct Investment
FiT	Feed in Tariff
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GEPF	Government Employees Pension Fund
GHG	Greenhouse Gas
GW	Giga watt
IBRD	International Bank for Reconstruction and Development
ICE	Costa Rican Electricity Institute
IEA	International Energy Agency
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
IPR	Intellectual Property Right
IRENA	International Renewable Energy Agency
ISMO	Independent System and Market Operator
JSE	Johannesburg Stock Exchange
LCOE	Levelised Cost of Energy
LCR	Local Content Requirement
MEC	Minerals Energy Complex
MTBPS	Medium Term Budget Policy Statement
MW	Megawatt
NREL	National Renewable Energy Laboratory

NUM	National Union of Mineworkers
NUMSA	National Union of Metalworkers of South Africa
OECD	Organisation for Economic Cooperation and Development
PHES	Pumped Hydro Energy Storage
PHSS	Pumped hydro storage systems
PIC	Public Investment Corporation
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PRASA	Passenger Rail Agency of South Africa
PUP	Public-Public Partnership
PV	Photovoltaics
RDP	Reconstruction and Development Plan
RE	Renewable Energy
RED	Regional Electricity Distributor
REI4P	Renewable Energy Independent Power Producer Procurement Programme
RPS	Renewable Portfolio Standards
SAA	South African Airways
SALGA	South African Local Government Association
SEC	Securities and Exchange Commission
SOE	State-Owned Enterprise
TDP	Transmission Development Plan
TNI	Transnational Institute
TUED	Trade Unions for Energy Democracy
TWh	Terawatt-hour
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UTE	National Administration of Electrical Power (Uruguay)
VRE	Variable Renewable Energy
WACC	Weighted Average Cost of Capital
WTO	World Trade Organisation

1

INTRODUCTION

This report presents the case for a modern national power utility - a *New Eskom*. Unfortunately, in the public discourse around energy in South Africa, the word 'Eskom' has become an expletive. To suggest that a reformed publicly utility can and must play a new and perhaps expanded role in shaping the country's energy future as it transitions away from coal sounds ludicrous. But this is exactly what the situation demands, and this report explains why.

The contents of the report reflect the work of three research organisations – the Alternative Information and Development Centre (AIDC) in Cape Town, Trade Unions for Energy Democracy (TUED) in New York and the Transnational Institute (TNI) in Amsterdam. These research organisations have worked closely with the trade unions involved in organising workers at Eskom – the National Union of Mineworkers (NUM) and the National Union of Metalworkers of South Africa (NUMSA).

Before Covid-19 replaced Eskom's crisis as the central issue facing the country, it was only unions and their very close allies that held a consistent line both against the proposed 'unbundling' of the utility and against the incursions of the independent power producers (IPPs). Many believe that this opposition merely reflects the desire on the part of trade unions to protect coal sector jobs, and to do so in a way that is oblivious to the economic, social and ecological problems that come from the continued use of coal. Similarly, union opposition to the IPP system – including the Renewable Energy IPP program known as 'REI4P' – has in some quarters been seen as an opposition to renewable energy itself and economy-wide decarbonisation more generally.

This report should put the record straight. As will become clear, the position of the unions participating in the development of this report is not simply about protecting jobs in coal, or about preserving Eskom as it currently operates. These unions support a move towards both clean energy and economy-wide decarbonisation. But the current *unbundling + IPPs* approach (read *privatisation*) will achieve neither. In the pages that follow, we show why this is the case, and why this approach threatens to seriously compromise the country's energy sovereignty by making it dependent on technologies and supply chains that are almost invariably situated in Asia and Europe.

The report was written before both the onset of Covid-19 and the economic contraction that will surely take place as a result of the lockdown. But Covid-19 gives us an opportunity to look at both South Africa's energy crisis and its impending transition in an entirely new light. This, we will argue, is not a time to further undermine and sell off vital public services. Private sector interest in South Africa's energy system was already limited before Covid-19, and if it were not for the introduction of lucrative power purchase agreements (PPAs), private companies would have no interest at all. With a major contraction in energy demand, the only way forward is a public one. Notwithstanding the profit-maximising market, people need electricity, as does the economy. Now is the time to engage

in a robust process of detailed reflection regarding our country's economic and social priorities and how energy can be generated and used to meet them.

Even before Covid-19, it had become clear, at least to those who were prepared to take a long and hard look at the facts, that neoliberal formulas based on undermining public energy and promoting private sector interests were not working, and a shift towards a 'public goods' approach to energy transition was long overdue.

The report also shows how the current discourse on energy transition in South Africa has, for some years, become distorted by a number of damaging misconceptions. Three misconceptions stand out and, in the pages that follow, they are confronted head on.

The first misconception concerns the cause of Eskom's crisis. This is attributed to corruption, mismanagement and poor decisions.

The report shows that most of Eskom's problems are in fact a direct consequence of the 'electricity for profit' paradigm promoted by the World Bank and other neoliberal institutions. We also show how the debate on energy transition in South Africa often loses track of the fact that Eskom's crisis is in many respects a synthetic one. Eskom's so-called *death spiral* is in many ways typical of the 'death spiral' of other national public utilities in other parts of the world.

Contrary to the beliefs expressed by some environmental groups, Eskom's 'death spiral' does not spell the end of coal, and its continuation will not accelerate the deployment of renewable energy. The specific problems associated with Medupi and Kusile have made Eskom's situation far worse from a financial standpoint, but the utility's position had been systematically undermined by government policy long before these ill-fated projects broke ground.

The report offers no 'quick fix' solution to the financial crisis of the utility. This is intentional. Not only has there been a lot of debate on this already, but many contributors to this debate appear to be unaware of the origins of Eskom's woes. We argue that, until the current obsession with the World Bank's 'full cost recovery' policy is confronted and displaced, the financial crisis of Eskom will simply get worse. We do offer a short-term solution to Eskom's debt, but the long-term one is dependent on addressing the financial crisis of which debt is a manifestation.

The second misconception is that the transition to renewable energy is driven by economics, specifically by the falling costs of renewable energy. This has led to the mistaken idea that renewables are the 'least cost option', both domestically and globally.

Drawing on the international experience, the report shows how the global growth of for-profit renewables by way of the IPP system, which is the World Bank's only option for driving renewables, is a policy train wreck, not just in South Africa, but also internationally.

Many progressive voices and environmental groups seem to believe that market forces explain the rise in renewable energy, and that these same

forces, expressed in falling bid prices for renewable energy, explain the current plight of Eskom and other 'tired and inflexible' public energy systems.

This report shows how the reality is quite different. The rise of renewable energy is, instead, a story of public money being used to make profitable what would not otherwise be profitable. This is not 'the market' performing its mythical magic; rather, it is a story of public funds being used to drive a 'reform' agenda that adds up to slow motion privatisation of public energy systems.

The third misconception is that there are no major technical hurdles standing in the way of South Africa's energy transition. This is based on studies that suggest that the country's abundance of wind and sunshine means that its transition to 100 percent renewable energy will be relatively painless, as long as there are enough solar arrays and wind turbines to compensate for the problems of variable generation.[1]

No one will contest the idea that South Africa, with its year-round sunshine and abundant wind potential, is better placed than, say, most of Europe in terms of being able tackle the problems posed by windless and sunless days. But the 'painless decarbonisation' perspective does not take into account the system costs that could accompany high levels of renewable energy coming into the system. And, according to some estimates, a 'deep decarbonisation strategy' for South Africa will also require a threefold rise (100 GWs of additional capacity) in order to counter the impact of changing weather patterns on the energy system.[2] Identifying some of the major technical challenges associated with large-scale renewable energy deployment is not the same as saying that the energy transition should be abandoned or is somehow not critically important. It merely draws attention to the need for careful planning and a facts-based approach.

There will be no energy transition, no decarbonisation, based on the 'energy for profit' model. Another path – a public path – is possible.

In drawing attention to these three misconceptions, this report opens the door to a fresh assessment of South Africa's energy crisis and the longer-term challenges of transition. We show how public energy and a transformed national utility provide the means to deal with the current crisis and transition-related challenges, both technical and economic, in ways that are effective and equitable.

The report identifies a 'to do list' for progressive forces in South Africa that are committed to a *Just Transition* and to a more sustainable and equitable energy system, one that is publicly owned and controlled. It identifies some of the challenges that will surely confront a *New Eskom* as it

[1] Wright, J.G., Bischof-Niemz, T., Calitz, J., Mushwana, C., van Heerden R. and Senatla, M. (4 April 2017) *Formal comments on the Integrated Resource Plan (IRP) Update Assumptions, Base Case and Observations 2016*. Pretoria: CSIR.

[2] Greenstone, M. and Nath, I. (9 May 2019) 'Do Renewable Portfolio Standards Deliver? 'Working Paper No 2019-62. University of Chicago: Becker Friedman Institute for Economics.

navigates the difficult and uncharted territory that leads us away from coal towards a more sustainable and equitable energy system.

The report recommends the demarketisation of Eskom and the dismantling of the IPP system. Again, these proposals should not be interpreted as a statement of opposition to decarbonisation. Quite the contrary. Our concern is that there will be no energy transition, no decarbonisation, based on the 'energy for profit' model. Another path – a public path – is possible.

The report urges progressive forces in South Africa to join with unions in bringing about a shift in the orientation of multilateral institutions that operate at the global level. A global public goods approach is today necessary to deal with the economic devastation caused by Covid-19. It is also needed to expedite an energy transition that can address rising levels of pollution, water stress, resource depletion, and climate instability.

Our proposals for a restructured Eskom are constructed around three core commitments:

1. Build a *New Eskom*, fully public and serving the people
2. Secure a democratic and just energy transition
3. Work towards socially owned renewable energy

We offer this publication to encourage an in-depth discussion on energy transition options and an energy mix that moves the country towards a low carbon future.

2

BACKGROUND AND CONTEXT

THE POLITICAL ECONOMY

The Eskom crisis takes place within the context of a stagnating and deindustrialising economy, made even worse now by the Covid-19 pandemic. A wider context also includes the climate crisis and its impact on, and consequences for, the electricity and energy sectors, as issues of climate change begin to affect and impose themselves on energy policy and the public utilities responsible for electricity generation

Eskom (then *Escom*) was established in 1923 to ensure delivery of cheap electricity to the railways and mines, and has served as a critical institution of the minerals-energy complex MEC that has shaped SA's political economy. So, it is important to contextualise the Eskom crisis within the MEC's unravelling. Eskom is both a contributing factor to that unravelling and a victim of it, as well as of the wider economic crisis being experienced in South Africa.

INEQUALITY, POVERTY AND UNEMPLOYMENT

Within the current crisis of South Africa's political economy, Eskom plays a critical role. Its financial crisis, with a debt burden of over R450 billion, weighs heavily on South Africa's financial position and is one of the factors behind the credit rating agencies' downgrade of South Africa's sovereign debt. Economic growth was hovering at recessionary levels even before the Coronavirus pandemic hit.

Several factors account for this. Some are structural: the impact of the slowdown in the world economy, capital's refusal to invest without reasonably assurance of sufficient profit, and large capital outflows. But the Eskom crisis itself is a major factor. Load shedding and increased electricity prices have led to disinvestment from the mining and minerals beneficiation sectors. In short, the crisis of Eskom is a key factor in what has been termed the premature deindustrialisation of the South African economy.

The key feature of this economic crisis is *not* the anaemic growth levels, which most mainstream commentators and economic analysts focus on. Rather, it is the extreme, inequality, poverty and unemployment levels that mark South Africa's post-apartheid political economy and act as the major constraint on, and obstacle to, development and wellbeing.

When we take into account the more than 5 million discouraged work-seekers and homemakers not included as part of the work force, over 11 million people were without work and regular income, even before the pandemic. This has significantly contributed to the official statistic that almost 50 percent of the population live in poverty. These high levels of unemployment and worsening poverty have led to South Africa becoming more unequal than ever before. Measured by the GINI co-efficient, and in spite of a range of anti-poverty measures, South Africa is

considered to be the most unequal country in the world – the GINI coefficient ranges from 0.66 to 0.7.

Ten percent of the population earn around 60 percent of all income, compared to only 20-35 percent in the advanced economies – further evidence of inequality. But while the top income share is high in its own right, it pales into insignificance compared with the figures for wealth – real estate, pension funds and shares of listed companies, etc. New tax and survey data suggest that 10 percent of the South African population owns at least 90 percent of all assets.[3] According to a new study, just 3,500 people (0.01 percent of the adult population) own 15 percent of total wealth in South Africa.[4]

ALTERNATIVE POLICIES NEEDED

The export-oriented direction of the economy, not to mention the tendency towards over-accumulation crises, flows from these unequal foundations and imbalances on which the economy is structured. Wealth redistribution is essential, not least higher wages, extensive land and agrarian reform, comprehensive social security, a progressive system of taxation, an extensive investment programme to overcome spatial apartheid, and the remoulding of the built environment. Without such redistribution, the economies of scale necessary to withstand the pressures of a globalised and financialised world economy cannot be achieved. A different set of economic (fiscal, monetary, industrial and trade) policies would be required to overcome South Africa's economic, social and political crises.

In short, the crisis of Eskom is a key factor in what has been termed the 'premature deindustrialisation' of the South African economy.

However, inflation targeting, tight monetary policies structured around high interest rates, and financial and trade liberalisation have eroded the productive base of the economy and encouraged investment in the speculative financial sectors. This has coincided with the big corporations, which have traditionally dominated the South African economy, reinventing themselves as global corporations. They have used their dominant positions, and their resources in the South African economy, as platforms to expand into global markets and value chains. This reorientation of the largest South African corporations and reallocation of capital have led to large-scale corporate restructuring. With the growing influence of the shareholder value movement, this has increased deindustrialisation and hindered diversification into downstream manufacturing sectors.

At the same time, the large growth in Foreign Direct Investment (FDI) that the government's pro market policies banked on has not materialised. This has made the economy more dependent on hot money portfolio inflows. These inflows are necessary to match the large outflows occurring as a result of financial liberalisation, but they have fuelled increased levels of

[3] Orthofer, A. (2016) *Wealth inequality in South Africa: Evidence from survey and tax data*. REDI3x3 Working Paper 15. Cape Town: SALDRU.
[4] Stent, J. (10 March 2020) 'Fifteen percent of SA's wealth is in the hands of just 3,500 people, study finds'. *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2020-03-10-fifteen-percent-of-sas-wealth-is-in-the-hands-of-just-3500-people-study-finds (retrie-ved 22 June 2020).

debt-driven consumption and higher levels of imports for this consumption. Reduced downstream manufacturing capacity has led to high levels of capital flight and speculation in securities and real estate markets. The low levels of domestic investment and the domestic absorption of short-term foreign capital flows have been accompanied by unsustainable increases in the rate of GDP growth that has been driven by consumption and speculation. The severe impact of the 2008 global financial crisis on the South African economy put an end to this unsustainable growth model.

MEC IN DECLINE

Since the 2007/8 global recession, the South African economy has been in a stagnating and job-shedding cycle, as the MEC has reached its probable limits and begun to erode. Between October 2008 and March 2010, 1.2 million jobs were lost, many in key sectors such as mining and manufacturing. The opening up of the economy, particularly the liberalisation of trade and finance, has left South Africa largely defenceless in relation to the contagion resulting from the global financial crisis.

This has taken a heavy toll on mining and other key sectors of the MEC. Not only has economic growth in general been low, but mining and downstream heavy industries have been in recessionary mode. Between 2016 and 2019, mining has experienced eight quarters of negative growth.[5]

Because of the depressed nature of the economy, the relative fall in commodity prices, uncertainty regarding the greatly enhanced *Black Economic Empowerment* (BEE) ownership targets being advanced by the Department of Mineral Resources and Energy [DMRE] for the new Mining Charter), and the legacy of state capture, investment has been subdued and several major mining companies have announced their intention to withdraw from South Africa.

Former South African giant corporations restructured their South African components to focus on their core businesses and at the same time increased their investments abroad. Since 2000, conglomerates have restructured and internationalised themselves, with their share of control over the market capitalisation of the JSE having declined.

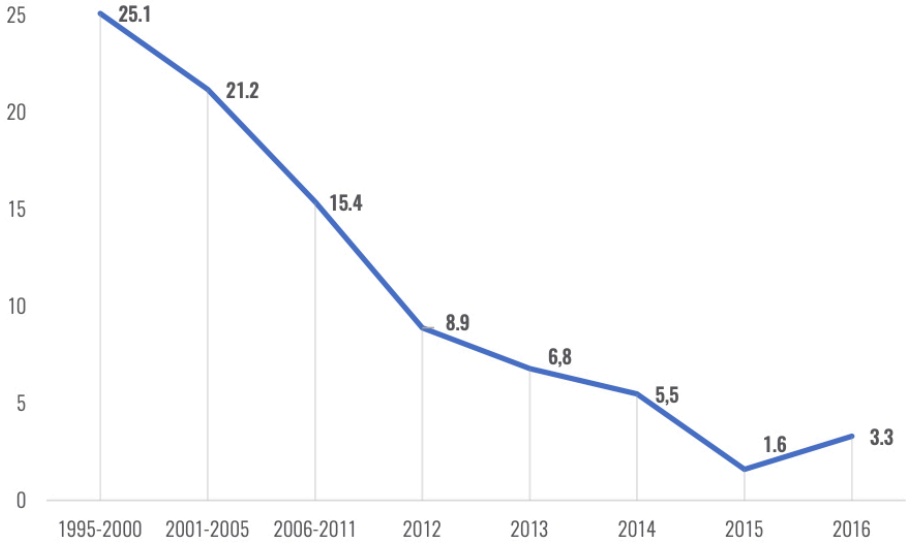
Consider the situation of Anglo American, once the preeminent South African conglomerate, which at its height represented 54 percent of the capital of the JSE. Its share of the JSE has declined dramatically to 3.3 percent, as figure 1 shows.

In the same vein, AngloGold Ashanti has announced its withdrawal from South Africa and expects to sell off its remaining South African mines by the end of 2020. The reason it offers is instructive: withdrawal from South Africa would result in an upward rerating of its shares because "regulatory uncertainty [mainly BEE related], Eskom electricity

[5] Statistics South Africa (2019) *Gross Domestic Product (GDP), 4th Quarter 2019, P0441*. Pretoria: Stats SA.

price increases and constraints, labour unrest, and rising and untenable levels of debt in state-owned companies that threaten the economy" are all making South Africa a risky investment for miners.

Figure 1: Anglo American's share of JSE market capitalisation, 1980 to 2016



Source: Mohamed, S. (2019) *The Political Economy of Accumulation in South Africa: Resource Extraction, Financialisation, and Capital Flight as Barriers to Investment and Employment Growth*. Doctoral Dissertation. Amherst: University of Massachusetts Amherst. Available at: https://scholarworks.umass.edu/dissertations_2/1533.

A POLITICAL EXPLANATION

The ending of the era of cheap electricity is significant and has contributed to the weakening of South Africa's industrial base. Over a period of 10 years, Eskom's electricity prices have increased by about 356 percent, whilst inflation over the same period was only 74 percent. Until recently, intensive energy users, such as smelters and steel producers, were able to mitigate against these electricity price rises through long term contracts with Eskom. However, while the investments in upstream production of basic metals have been supported by cheap energy agreements made in the 1990s (some of which must be ending soon, influencing investment decisions), downstream industries are generally purchasing electricity from municipalities at costs estimated (for foundries) to be 19-29 percent higher than if they were supplied direct by Eskom.

Part of the explanation for the decay of the MEC also lies in the political side of political economy, namely in the struggle between an emerging black capitalist class dependent on the state for accumulation and the internationalised corporations that have traditionally dominated the South African economy. This struggle took on a more combative phase after the transition of the ANC presidency from Thabo Mbeki to Jacob Zuma in Polokwane in 2007, and the subsequent recall of Mbeki as South African President in 2008. Frustration had grown with the slow pace of so-called economic transformation - more accurately, the economic transfer of wealth and positions exclusively to those who Mbeki called the *black bourgeoisie*.

Under the guise of a 'radical economic transformation' and a more radical version of African nationalism, several factions and patronage networks united to drive a more aggressive programme to gain greater control of the economy for black capital. Their focus was on the government's R800 billion procurement budget, as well as the expenditure of state-owned enterprises (SOEs), especially the more significant ones such as Eskom, Transnet, Prasa and SAA, and the big capital-spending departments, such as the Department of Water Affairs. This drive was led by Zuma and his allies for control of key state institutions, including Treasury, the revenue services and key security and intelligence services.

This is what became known as *state capture*. Their reliance on the state as an accumulation strategy predisposed them to cronyism and corruption, especially in the form of manipulating the tender process and directing these to favoured corporations, from which kickbacks could be extracted. But the result of this struggle for greater levels of black ownership and control over state procurement was to factionalise the state, divide key agencies, demoralise public servants and leave a trail of paralysis and dysfunctionality at most SOEs, government departments and institutions. The economic costs were and are not small. Estimates range between R500 billion and R1 trillion. Of course, it is nearly impossible to put a cost on the lost opportunities that cronyism has imposed on the South African economy, especially in relation to what could have been a more sustainable development path had we had an effective state able to coordinate economic and industrial strategies with social priorities of job creation, poverty eradication and reduction in inequality.

AUSTERITY

And the political transition to the era of the *New Dawn* is likely to only worsen things. This is because there is every indication that Ramaphosa's government is seeking to address South Africa's political economic and social crises through relying on attracting foreign investment and appeasing the credit rating agencies. Both investors and the credit rating agencies have made clear what they require from government:

- **Austerity** to deal with what they consider to be South Africa's unsustainable debt levels (projected, during Covid-19, to rise to over 85% of GDP by 2021[6]), and further pressure on the fiscus as the result of bailing out of SOEs (the R59 billion Eskom bailout being a case in point);
- **Privatisation**, or at the very least public private partnerships, and the opening up of key markets such as electricity, as a way to deal with crisis-ridden SOEs;
- **Labour Market flexibility**: "streamlining the settlement of labour lawsuits and limiting compensation for dismissals".[7] The obvious intention

[6] https://businesstech.co.za/news/finance/402569/south-africa-faces-historic-covid-19-economic-shock/. Accessed 8 July 2020.
[7] International Monetary Fund (IMF) (2018) 'South Africa: 2018 Article IV Consultation-Press Release, Staff Report and Statement by the Executive Director for South Africa'. Washington DC: IMF.

is to reduce wages and further weaken the bargaining position of the trade unions;

- **Reduction in the cost of doing business**: this entails reducing costs of administered prices such as electricity, water, broadband etc. and easing congestion in transporting goods.

Already the Minister of Finance, Tito Mboweni, in his 2019 *Medium Term Budget Policy Statement* (MTBPS), has signalled government's intention to adopt most, if not all, of these reforms. When delivering the MTBPS, in what was a clear statement of intent to reform SOEs, he noted "I am pleased to learn that there are conversations involving SAA and potential equity partners which would liberate the fiscus from this SAA sword of Damocles".

The supplementary 'emergency' budget delivered in June 2020 by Mboweni reinforced the main budget's intention to deal with government's supposed 'debt crisis'. That makes dealing with Eskom a priority. The Budget Review sets out how government links reform of Eskom and the debt, "Government envisions a package of economic reforms that will improve productivity, lower costs and reduce demands of state-owned companies on the public purse. These measures include finalising electricity determinations, unbundling Eskom and taking other steps to open up energy markets".[8]

ESKOM'S DEBT CRISIS

A substantial part of South Africa's rising indebtedness is clearly related to the debt of SA's state owned enterprises, especially Eskom. As of March 2020, Eskom's unsustainable debt would be over R500 billion assuming its current rate of growth.

THE ORIGINS OF ESKOM'S UNSUSTAINABLE DEBT

There are four key elements in creating Eskom's unstainable debt:

1. **Commercialisation**: this led to what should have been broad societal costs being loaded onto Eskom alone.
2. **Corruption and wasteful expenditure**: as we know, looting has been rife, not least the skyrocketing costs for Medupi and Kusile, which have been financed with new loans at higher and higher interest rates.
3. **Independent Power Producers**: early highly priced contracts created expensive renewable energy.
4. **Increase in the price of coal since 2008-2010**: BEE and market competition from India and China have created a huge increase in the price of the low grade coal that Eskom uses.

The neoliberal shibboleth of full-cost recovery inside the user-pays principal made electricity unaffordable to most people. This not only created

[8] Department of National Treasury (2020) *Supplementary Budget Review 2020.* Pretoria: Department of National Treasury.

Eskom's large and growing number of individual debtors, but those debtors in turn have helped to swell the size of the municipal debt owed to Eskom.

Commercialisation

When Eskom was formed in 1923 (as Escom), it was a public service, not-for-profit entity. As such, it played a central role in the development of the South African capitalist economy, and made possible cheap power for the growing mining, transport and manufacturing sectors. Escom was required by law to sell electricity at cost and it was exempt from paying taxes.

Commercialisation began in 1987 when, whilst remaining a parastatal entity, its not-for-profit status was removed and it was required to raise capital commercially.[9] The ANC government continued on this trajectory when, in 1998, under the Eskom Amendment Act, Eskom was required to become a limited liability company with share capital; the state was the sole shareholder. Much of its tax-exempt status was repealed.

So, it was as a commercial entity, if not yet a corporation, that Eskom took on the task of mass electrification to deliver on its public mandate of ensuring access to electricity for all. Between 1994 and 2000 it succeeded in adding 2.5 million households to the grid, with more being connected by local government. At the end of 1993, just 36 percent of the population had access to grid electricity, and only 12 percent of rural dwellers. By 1999, Eskom and local authorities had together increased overall electrification to around 66 percent. Private markets could never have accomplished this level of electrification.

Electricity for all should be the responsibility of the whole of society.

Electrification on its own, however, could not overcome the impacts of extreme poverty. The poorest 50 percent of South Africans continue to receive only 3.3 percent of the national income and, according to the 2014/2015 *Living Conditions Survey*, 49.2 percent are living in poverty.[10] Poorer urban homes in South Africa spend between 12 and 20 percent of household income on energy.

In terms of Eskom's finances, these levels of poverty meant that only a fraction of the costs of electrification (roughly R9 billion in total) was recovered through electricity payments by users. Introducing pre-paid meters did not significantly raise payment levels and was obviously regressive.[11]

As Eskom sought to close the gap between revenues and costs, tariffs have been raised by more than 400 percent in real terms in just a decade. Any commitment to full electrification will need to acknowledge that this will incur further costs. These costs, however, will need to be distributed

[9] Gentle, L. (2008) 'Escom to Eskom: from racial Keynesian capitalism to neoliberalism (1910 to 1994)', in McDonald, D.A., *Electric capitalism: recolonising Africa on the power grid*. Pretoria: HSRC.

[10] Stats SA (4 April 2019) 'Five facts about poverty in South Africa'. http://www.statssa.gov.za/?p=12075 (retrieved 16 May 2020).

[11] Department Minerals and Energy (DME) (November 2001) *National Electrification Programme (NEP) 1994-1999, Summary Evaluation Report*. Pretoria: DME. Available at: http://www.energy.gov.za/files/media/explained/statistics_eletrification_2001.pdf (retrieved 20 June 2020).

across the entire system of government finances. They should not be purely the responsibility of Eskom. Electricity for all should be the responsibility of the whole of society.

While the poor are struggling to pay their electricity bill, large energy consumers have not been required to pay their fair share of the total cost of providing a universal public electricity service. The mining and industrial sectors together consume 60 percent of Eskom's generation, whereas residential users consume just under 20 percent. Eight corporations that make up the Energy Intensive Users Group (EIUG) consume over 40 percent of Eskom's power, but contribute disproportionally less to revenue. According to Eskom, the result is that wealth is effectively being transferred to large consumers of electricity, which is neither equitable nor desirable.[12]

Eskom is also subsidising municipal authorities. Struggling to provide or sustain basic services, many municipalities sell electricity at a price considerably higher than Eskom's. Many of these same municipalities then fail to pay their bills to Eskom. This also contributes to Eskom's financial woes. Soweto on its own owes Eskom R15 billion in unpaid electricity bills; another 60 municipalities combined owe another R15 billion.[13]

This leads to what is known as the 'death spiral'. It goes like this: the amount of electricity that Eskom is able to sell declines – this happens for a range of reasons including higher tariffs and increased use of renewable energy; as revenue and profits continue to fall, the electricity infrastructure decays and the situation worsens.

In the section on renewable energy below, we explore the notion of the death spiral further and argue that, despite what many people propose, it will not improve the prospects for renewables, but will rather impede the transition to a new and more sustainable energy system.

Corruption

There is a marked difference between the independent audits of Eskom's finances in 2018 and 2019 and those of earlier years. Recent audit reports are more critical and numbers more alarming. This has of course to do with the unravelling of *state capture* and the hearings of the Zondo Commission.

For the 2017 financial year, the auditor says that it is uncertain if all irregular expenditure has been accounted for, but he gives no numbers. The 2018 and 2019 audits go further and say that it isn't possible to know if the numbers given for "irregular expenditure" and "fruitless and wasteful expenditure" are true. The 2018 Director Report states: "The amount of irregular expenditure reported has increased significantly as a result of the cleaning up exercise". The 2019 independent audit still lists seven pages of irregularities,

[12] Eskom (17 October 2012) *Eskom Revenue Application: Multi-year price determination 2013/2014 to 2017/18 (MYPD 3), Part 1*, 16. Available at: http://www.eskom.co.za/CustomerCare/MYPD3/Documents/1MYPD3PartOne19102012Website.pdf (retrieved 22 June 2020). See also Energy Intensive Users Group (EIUG). https://eiug.org.za.

[13] Eskom (2019) *Eskom Annual Financial Statements*, 8: 'The total gross overdue debt was R35.7 billion of which municipalities represented 56 percent and Soweto 37 percent. The total gross municipal overdue debt increased by R6.3 billion to R19.9 billion of which the Free State owed 44 percent, Mpumalanga 27 percent and Gauteng 8 percent. The total gross overdue debt for Soweto increased by R1.2 billion to R13.3 billion'.

reporting new transgressions and law breaking, despite the fact that the inquiry had started.

In February 2020, investigative journalists also revealed that the looting of Eskom's separate R140 billion pension fund probably is not only about the unlawful R30 million pension package given to Brian Molefe, after his brief employment as CEO in 2015-2016. As many as 138 other managers might be implicated in a milking scandal, which will affect the future pension levels of Eskom workers.[14]

How such a top management culture impacts in general on Eskom's finances is best illustrated by the extreme cost overruns and delays during the building of Kusile and Medupi.

Independent Power Producers (IPPS)

Much has been said about the cost of buying energy from Independent Power Producers (IPPs). Indeed, Eskom's 2019 Annual Report comments: "It remains a concern that IPP purchases were 4.8 percent of total generating production, while their cost represented 25 percent of the total primary energy cost".[15]

Whilst it is true that the newer IPP contracts are considerably less expensive, the many contracts agreed in earlier 'bid windows' were very costly, and they are still in place and will remain so for 20 years at fixed prices. Those prices reflect a de facto out of the market subsidy to private renewable energy businesses. Subsequently, the increased competition among IPPs, together with the abandoning of subsidies and 'encouragement' of private for-profit renewable energy, has reduced the prices. But the previous guaranteed prices give a high total price, and it is this total that is reflected in Eskom's comment.

The sharp increase in the prices of low-grade coal

It appears that regulation of the price of coal to Eskom, or forced renegotiation of coal contracts, must be a part of Eskom's financial rescue operation. It was in December 2019 that Public Enterprises Minister Pravin Gordhan started to object in public to Eskom's expensive coal contracts. Fin24 commented: "According to data from Eskom, nine suppliers are estimated to earn margins between 30% and 49%, while four suppliers earn margins between 50% and 100%. Seven suppliers have been identified as earning 100% margins on their contracts. Gordhan said these are excessive profits".[16]

[14] Jooste, B. (6 February 2020) 'Brian Molefe's Eskom Retirement Fund saga is just the Tip of an Iceberg'. *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2020-02-06-brian-molefes-eskom-retirement-fund-saga-is-just-the-tip-of-an-iceberg (retrieved 22 June 2020).

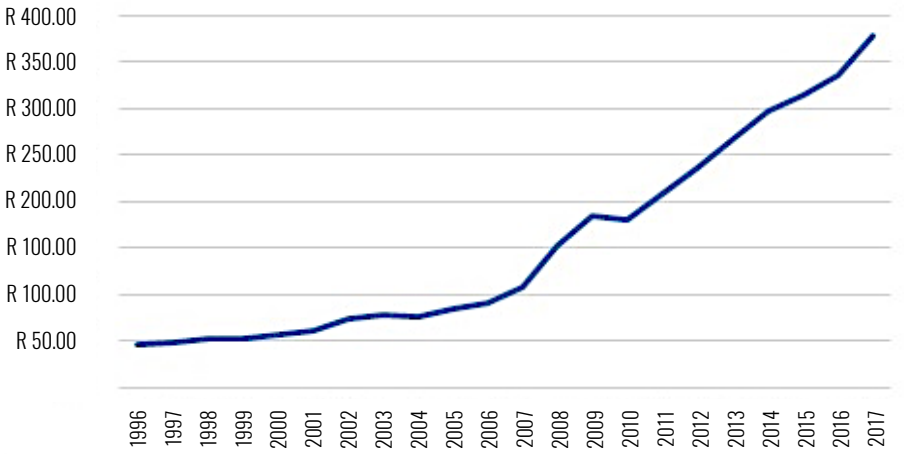
[15] Eskom (2019) *Eskom Annual Financial Statements*, 6.

[16] Omarjee, L. (3 December 2019) 'Gordhan: Govt won't scrap costly renewables contracts, but will renegotiate them'. *Fin24*. Available at: https://www.fin24.com/Economy/Eskom/gordhan-govt-wont-scrap-costly-renewable-producer-contracts-but-will-renegotiate-them-20191203 (retrieved 22 June 2020).

And the destination of these super profits is clear. Statistics South Africa publishes detailed data on the *wage share of value* added in coal mining.[17] Between 2007 and 2017, the wage share dropped from 42 percent to 25 percent. Over the same period, the production volumes remained constant. Yet the prices that Eskom paid for the low-grade coal that Eskom uses skyrocketed (the high grade coal is always exported in South Africa's free market environment).

The 2016 and 2017 annual reports show prices paid by Eskom that exceed the prices in Figure 2 by R30-R50 per ton. The golden years for coal mining companies in South Africa started in 2010, when Eskom adopted a policy of supporting new BEE entrants, giving them very good deals in this political process.

Figure 2: Low grade coal average prices, 1996-2017 (R per ton)



Source: DMR (2018) *Minerals Statistical Tables 1996-2017. Bulletin B1/2018.* Pretoria: Department of Mineral Resources, Republic of South Africa (DMR).

But according to Martin Kohler, former deputy head of DMR Statistics, it is not as simple as that. He argues that the coal producer-friendly decisions at Eskom from 2010 onwards undoubtedly played a role. But something that impacted heavily on Eskom's ability to negotiate reasonable prices was the entry of China, and especially India, into the market for buying South African coal. Traditional buyers of South African export coal only bought premium quality. But China and India started to buy the same low-grade coal that Eskom uses, and they offered better prices than Eskom. This resulted in a shortage of low-grade coal, and Eskom was forced to pay more in order to compete with the Chinese and Indian buyers.[18]

In other words, the policy of free cross border competition again proved to be a problem for a developing country like South Africa, just as it did for

[17] That is the part of the value added by the industry every year that goes to wages; the rest goes to profit before tax.
[18] Martin Kohler, email conversation with AIDC's Dick Forslund, 11 December 2019.

our textile and steel industries. And Eskom is a key organisation in our economy which produces almost all the electricity in the country. Electricity is a condition for modernity itself.

THE STRUCTURE OF THE DEBT

Much more could be said about the need for an audit of coal contracts as well as of Eskom's debt, including the infamous World Bank loan to Medupi. But there are two bottom lines:

- Eskom can no longer service its debt without support, and
- Eskom cannot be allowed to fail.

In 2017, Eskom's total debt stood at R358 billion and in 2018 at R392 billion. On 31 March 2019, it amounted to R445 billion.[19] The debt is increasing as is the rate of its growth. Eskom is taking new loans to pay back old loans and the interest on those old loans. In 2019, Eskom paid R69.5 billion in debt repayments and finance costs compared to R43.6 billion in 2018. Without a solution, this is what will lead to a crash.

In addition, more than a quarter of Eskom's debt mountain is owed to other public entities. In March 2019, that debt amounted to R119.8 billion, costing R31.8 billion in finance costs. R7.8 billion (24.5 percent) of those costs was paid to public entities, that is to other organs of the state.[20]

Eskom's debt to public entities in 2017, 2018 and 2019 remained steady at around R120 billion. This shows that it did not make any net debt repayment to its public sector friends during the period.[21] It also shows a fixed commitment from other state institutions that have accumulated surplus funds to invest, even when faced with Eskom's escalating financial crisis.

Meanwhile, a larger and larger proportion of Eskom's debt is owned by the private finance industry. The opposite should have been the case. The politics of regulating terms, conditions and interest rates for intra-governmental lending are always easier to handle than debt and claims between the public and the private sector. The charged debate about prescribed assets has shown this. The finance industry establishment has met the suggestion with an outcry.

Only about 10 percent of government debt is to foreign investors; government prides itself on this. But over 50 percent of Eskom and other state-owned enterprise (SOE) loans were given by foreigners in 2019.[22] This adds an exchange rate problem to many of those loans: a loan in dollars is serviced in dollars. So the cost of a loan in foreign currency also depends on the value of the rand, and not only on the interest rate.

Despite this, there is no obvious political support for a strategy of maximising the delinking of Eskom's finances from the private finance

[19] Eskom (2019) *Eskom Annual Financial Statements*, 89.
[20] *Ibid*, 103 and 98.
[21] We say 'net repayments' as old loans can be replaced by new ones.
[22] National Treasury (20 February 2019) *Budget Review 2019*, 92. Pretoria: National Treasury.

industry. The R7.8 billion in 2019 finance costs to public entities for R119.8 billion of debt indicates an annual return on public entity investments in Eskom of about 6.4 percent.[23] This reflects an 'arm's length' policy of demand for market related returns. The 2020 Budget Review reports that "the government's average borrowing cost is 6.9 per cent".[24]

But the interest rates and repayment terms of all intra-governmental loans could be established differently. They could be informed by the return the public entities really need to fulfil their roles, and they could take Eskom's crisis into account when setting the terms, so as to give space to address Eskom's fundamental problems. In those circumstances, the fact that a quarter of the company's debt is intra-governmental would of course be a big advantage.

The GEPF is Eskom's (and the government's) biggest creditor

In March 2018, R87.6 billion of Eskom's debt was owed to the Government Employee Pension Fund (GEPF)[25] and R9 billion to the Unemployment Insurance Fund (UIF).[26] GEPF is Eskom's biggest creditor, whether public or private. Over 20 percent of Eskom's debt was held by GEPF in March 2018. Still, this comprises less than 5 percent of GEPF's more than R1.8 trillion in financial assets and we will argue that GEPF's commitment should increase to at least R250 billion. This is the number often given by observers as the part of Eskom's debt that is unsustainable and should be transferred to off its books.

GEPF is also a big direct creditor of the government (or the Treasury). In the 2017/18 fiscal year, the government paid an estimated R23-25 billion in interest on its R359bn debt to GEPF. GEPF in fact owned 14 percent of the entire gross loan debt of the government (which was over R2.5 trillion that fiscal year). GEPF is without doubt the biggest creditor of both Eskom and the Treasury. In fact, over 40 percent of GEPF's cash investment returns of R72 billion in the 2017/18 financial year came from the Treasury (the R23-25 billion) and from Eskom (close to R6 billion).[27]

Ever since 1996, the GEPF has been running a huge surplus each year after pensions and benefits have been paid. Up until 2013, it did not even have to use the cash returns from investments. They were simply reinvested, as contributions from the public sector employee wage bill always exceeded benefits paid. After a radical change of the rules in 2012, some of GEPF's cash investment returns had to be used, but the remaining annual cash surplus was still growing. In 2017/18 the cash surplus to be reinvested, after paying all pensions and benefits, was R47.5 billion. In 2018/19 it increased again to

[23] Numbers are rounded to billions and one decimal for ease for reading.

[24] National Treasury (20 February 2019) *Budget Review 2019*, 93.

[25] In March 2019, Eskom's debt to GEPF had fallen to about R83 billion, according to the Annual Report, indicating decreasing commitment by the GEPF managers.

[26] Unemployment Insurance Fund (UIF) (2018) *UIF Annual Report, 2017/18.* Pretoria: UIF.

[27] We are making a cautious assumption of a 6.4 percent interest rate and notes that GEPF's R87.6 billion claim on Eskom comprises 73 percent of the whole 'public entities' claim of R119.5 billion, translating this share of the claim into a 73 percent share of Eskom's financial costs paid to government organs, which from their point of view are financial incomes from investments. The numbers in the paragraph are found in the 2019 Budget Review and in Eskom's 2018 and 2019 Annual Reports. It will be detailed below.

R55 billion. GEPF's investment in the debt of the central state is a part of the financial environment around Eskom's acute debt crisis that is not officially acknowledged. It is a part of this financial environment because of the growing loan guarantees from the Treasury to Eskom (and other SOEs) and because Eskom is increasingly capitalised from the national budget, something that has prompted the Treasury to harsh and dangerous fiscal austerity.

The World Bank loan to Medupi

Then there is the $3.75 billion credit facility from the World Bank to Eskom, mainly for the building of Medupi coal-fired power station. It was approved in April 2010.

This loan works like a kind of credit card. Eskom has continued to use this facility for ten years; by June 2020 it had used about $3.076 billion of the credit. Eskom's 2019 Annual Report shows that the public company increased its debt to the World Bank by $20 million in the 2019 financial year.[28] Another $20 million has been used since then, according to the World Bank's website.

In June 2020, there is therefore $673.85 million left to draw from this credit, should Eskom choose to do so.[29] It can continue to use it until 30 June 2021 (the "closing date" of the facility).

As we have already pointed out, the cost in rand for servicing this loan increases when the rand falls in value in relation to the dollar. When Eskom opened the credit line to the World Bank in April 2010, the rand stood at R7.33 to the dollar. By 31 March 2019, when $3.056 billion of this credit had been used, the exchange rate was R14.48. The value of the rand to the dollar had almost halved, and $3.056 in debt to the World Bank corresponded to about R44.3 billion, or 10 percent of Eskom's total R445 billion debt.[30]

At the time of finalising this report in June 2020, the rand is hovering around R17.20 to the dollar, but the currency is extremely volatile. In May, on average, it was at R18.29 to the dollar. That same month, Eskom made $45.4 million in repayments on the loan. It also paid $78.7 million in interest and charges. These payments of $124.1 million cost Eskom R2.27 billion. Back in April 2010, they would have cost R0.9 billion. The amount payable in rand has more than doubled; South Africa has paid an extra R1.4 billion.

In the ten years since 2010, Eskom has paid the World Bank $1.5 billion at a steadily worsening exchange rate. Only 25 percent of the amount, $392 million, has counted as repayments. The rest, $1.2 billion, has been payments of interest, fees and charges. At this rate, the World Bank loan will only be repaid by the turn of the century!

[28] Eskom (2019) *Eskom Annual Financial Statements*, 61.
[29] An account for the use of the facility since April 2010 is found on the World Bank website: https://projects.worldbank.org/en/projects-operations/project-detail/P116410?lang=en (retrieved 17 June 2020).
[30] Eskom (2019) *Eskom Annual Report*, 2018/19, 88.

To sum up this situation: developing countries have been hit by huge outflows of foreign currency since the start of 2020. This has escalated during the Covid-19 lockdown crisis. The rand has dropped more than 20 percent in value to the dollar since the beginning of January 2020. In a year's time, the rand might be at R20, R21 or R22 to the dollar. Nobody knows. The World Bank loan might be even more burdensome to Eskom in the future.

THE GOVERNMENT'S WRONG APPROACH TO THE DEBT CRISIS

The Treasury has already chosen to capitalise Eskom from the national budget; it did so when the 2019 Budget was adopted. In the October 2019 *Mid Term Budget Policy Statement*, the Treasury insisted on its long-term plan to support Eskom's debt service from the National Revenue Fund. A large chunk of tax revenue, supposed to fund all kinds of service delivery or public investment projects, will be used to pay interest on Eskom's debts and to pay back Eskom's loans when they expire. So the 2020 Budget Review announced: "Over the next three years, government will transfer R112 billion to Eskom to enable the utility to meet its short-term financial obligations".[31]

The result of this is the austerity policy we explored earlier. It will aggravate the social crisis and the futile battles that working class communities launch every day against local governments, protesting against lack of service delivery. Shrinking public sector economic demand for goods and services (by buying less or reducing the wages paid to public employees) can also trigger an outright economic downturn - the dreaded recession. This also means retrenchments in the private sector and even higher mass unemployment. The reason for this is that government spending comprises about 30 percent of economic demand in the country. By the end of 2019, this fact was sinking in even among those not regarded as 'radicals' or 'lefties'.[32]

R23 billion was set aside to service Eskom's debt in the 2019/20 budget year. This R23 billion was set to continue every year for ten years. In addition, Parliament in November 2019 adopted the *Special Appropriation Bill*. This decision added another R26 billion to Eskom's debt service in 2019/20 and R33 billion in the 2020/21 budget year. In the 2021/22 budget year, the Mid Term Budget again added R10 billion to the R23 billion already announced in the 2019 Budget Review.

In sum, the *Mid Term Budget Policy Statement*[33] revealed a plan to take R161 billion rand from the national budget over four years. The R49 billion in the 2019/20 budget year, which has already been decided, will be followed by R56 billion, R33 billion and R23 billion in the following three years.

Obviously shaken by the extent of the opposition to new cuts in spending that would hit education, housing programmes, public health (with its estimated 37,000 vacancies[34] and with the National Health Insurance reform

[31] National Treasury (26 February 2020) *Budget Review 2020*, 25. Pretoria: National Treasury.

[32] Buckham, D. (22 November 2019) 'Privatisation of SOEs is not a silver bullet for South Africa', *Daily Maverick*. Available at: https://www.dailymaverick.co.za/opinionista/2019-11-22-privatisation-of-soes-is-not-a-silver-bullet-for-south-africa (retrieved 22 June 2020).

[33] National Treasury (2019) *Medium Term Budget Policy Statement (MTBPS)*, Table D.1., 65.

[34] This number of vacancies in the public health sector was given at the government's October 2018 Public Health Presidential Summit.

again disappearing into the fog), Finance Minister Tito Mboweni told the media in October that, with the *Mid Term Budget Policy Statement*, he had only "opened up a debate" before the 2020 Budget in February.[35]

The 2020 Budget, however, became a strict austerity budget as expected. The so called *contingency reserve*, which is there to take care of events like Covid-19, was cut: it went from R13 Billion in the 2019 budget, to R6 Billion in the Mid Term budget, to R5 Billion in the 2020 budget. Public health expenditure was to be cut in real terms (after inflation) by 1.2 percent. All other departments were to follow: Education 1.2 percent, Policing 2.8 percent and so on. In per person terms, because the population is growing every year, expenditure on education is budgeted to reduce by about 3.4 percent and health care by 2.7 percent.[36] All kinds of government programmes are cut to the tune of R101 billion over three years, starting with a R28 billion cut in the current year.

A number of civil society organisations in the C19 Coalition, organised to fight the Covid-19 pandemic, have demanded that the 2020 Budget be withdrawn. That is now scheduled to take place towards the end of June. A demand for increasing the Child Support Grant by R500 for six months to fight starvation among poor and working class households, eventually partially agreed to, was opposed by the Treasury, indicating that the austerity budget is still in place.[37]

[35] Hogg, A. (30 October 2019) 'In Full: SA Finance Minister Tito Mboweni's 2019 MTBPS'. *BizNews*. Available at: https://www.biznews.com/budget/2019/10/30/finance-minister-tito-mboweni-2019-mtbps (retrieved 22 November 2019).

[36] According to Neva Makgetla at Trade and Industry Policy Strategies (TIPS).

[37] Heywood, M. (9 April 2020) 'Who is blocking emergency relief for the poorest households?' *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2020-04-09-who-is-blocking-emergency-relief-for-the-poorest-households/ (retrieved 13 April 2020).

3

RENEWABLE ENERGY CHALLENGES

The problems of the government's current approach to renewable energy are too serious to ignore. Already visible in South Africa, the problems have triggered a full-blown energy sector crisis in other countries and regions. The pandemic has led to an economic contraction that will merely worsen the crisis that was already evident. Therefore, the continuation of the IPP approach risks throwing South Africa into a policy quagmire that will make Eskom's current load shedding and financial difficulties seem trivial by comparison. This is explained in considerable detail below.

This part of the report is divided into four sections:

- The first section looks at the current limitations to growth globally in renewables.
- The second section analyses the global reduction in renewable energy prices and the effect on investment.
- The third section explains how real costs are borne by the incumbent public utility companies and the danger that they become zombie companies.
- The fourth section identifies the implications of this scenario for renewables in South Africa.

The failures of the current model of liberalised power systems, including 'marketised' public utilities like Eskom, have been well documented.[35] These failures include underinvestment, job losses, deteriorating service, and rising energy poverty. The need to correct these failures is by itself sufficient reason to reclaim public energy systems so that they can serve the public good.

However, the main goal here is to show how the current IPP-based approach does not provide a pathway to a transformed energy system in South Africa. Most of the data presented below therefore concerns the crisis of the current for-profit IPP system and its impact on energy provision more broadly. This impact is currently more advanced, and thus more visible, outside of South Africa than it is here at home.

This data reveals a clear need for unions and progressive forces to commit to the task of providing a detailed roadmap that can help South Africa develop a mature socially owned renewables sector in the next five to ten years. Such a sector is both possible and necessary. Needless to say, turning wind and sunshine potential into electricity requires technologies and skills that South Africa, and most of the developing world, do not currently have. But this is also true of many developed countries. The production of wind turbines is currently dominated by a handful countries, and more than half of the world's solar photovoltaics (solar PV) are produced in China. It is worth considering the case of the South Korean steel industry:

[35] Weghmann, V. (2019) *Going Public: A Decarbonised, Affordable and Democratic Energy System*. London: Public Services International Research Unit (PSIRU) at the University of Greenwich.

In the 1960s the Korean steel industry was starting from nothing: it lacked technology, resources, and expertise. However, by the mid-1990s it had become the world's sixth-largest steel producing country and has maintained this status ever since. It established a state-owned company and provided focused government support.[36]

This is a 'selection and concentration' strategy. In fact, this strategy is seemingly the only choice for a country lacking the resources, technologies, or capital for nurturing key industries.

GLOBAL RENEWABLE ENERGY GROWTH

Before the Covid-19 pandemic, the prevailing neoliberal approach to energy transition and climate protection was facing a major crisis. The world was not, and is not, *moving away from fossil fuels*, as many have claimed and many more believe. Despite the headlines touting progress in renewable energy, both fossil fuel use and greenhouse gas emissions were, until early 2020, on an upward trajectory. Those who try to reassure us that the transition to a sustainable, low-carbon future is, once 'normality' is restored, 'inevitable' or 'unstoppable' need to face this reality. And the idea that we can sit back and watch Eskom's demise in the belief it will speed up the displacement of coal by renewable energy is badly mistaken!

It is not possible here to explain all of the features of the crisis of neoliberal policy. They include: the failure to introduce an effective price for greenhouse emissions; the appalling waste of public money in the form of subsidies for private renewable energy companies; the almost complete lack of progress in terms of controlling, let alone reducing, energy demand. The list of failures is long, and the overall impact is likely to be devastating.

In the power sector in particular, two inconvenient truths must be confronted:

1. Modern renewable power (mostly wind and solar) is only inching forward as a proportion of energy generated and used. It remains marginal to overall global energy use, which means it has barely affected transport systems, industrial processes, or heating and cooling in buildings. If the current approach is allowed to continue, power sector emissions and pollution will continue to rise.
2. The limited progress that has been made in bringing renewable energy into the global power sector has been almost entirely due to public subsidies of various kinds. Subsidies are being used to make profitable what would not otherwise be profitable.

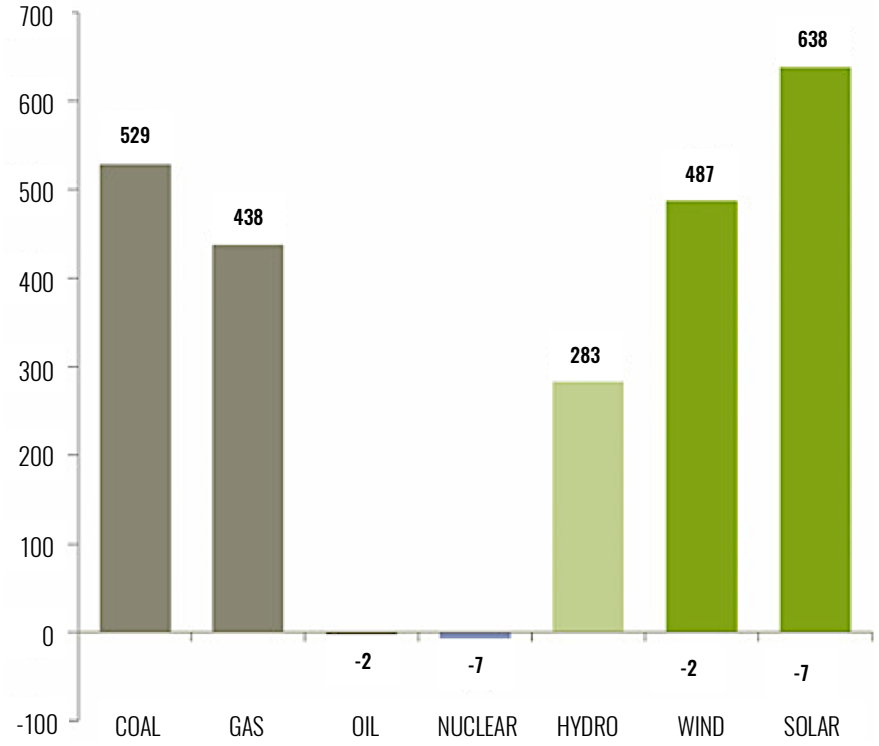
It is important to be clear about the general trends in the global energy system that were visible before the pandemic and its economic impact. There are those who will tell us that the transition to renewable energy was well under way, and that neoliberal policy was producing positive results.

[36] Chung, C.H. and Dong, C.S. (2017) 'The Korean Steel Industry in retrospect: perspectives for developing countries', *Asian Steel Watch* 80, Available at: https://www.slideshare.net/POSCO_Research_Institute/the-korean-steel-industry-in-retrospect-lessons-for-developing-coun-tries dongcheol-sa-cheolho-chung (retrieved 16 June 2020).

This not only misrepresents the truth; it is an attempt to resume 'policy as usual' once the global economy 'recovers'.

When these capacity factors are compared, then it becomes clear that in terms of electricity generated, new wind and solar is still quite a long way behind new fossil-based power generation.

Figure 3: Net capacity added in main generation technologies 2009-2019 (GW)



Source: Frankfurt School-UNEP Centre/BNEF (2019) *Global Trends in Renewable Energy Investment 2019*. Frankfurt: Frankfurt School-UNEP Centre/BNEF.[37]

First of all, during the past decade renewables have been on an upward trajectory. In 2018, a record-breaking 167GW in new renewables-based generating capacity was installed around the world.[38] Net wind and solar capacity additions have outstripped net capacity additions for coal and gas. From 2009 to 2019, solar added 638GW of capacity, while wind added 487GW. Coal added 529GW, and gas 436GW over the same 10-year period.[39]

At first glance, these figures suggest that renewable power is well on its way to displacing fossil-based power. But this conclusion is false, for two reasons. First, the overall demand for electricity was, until early 2020 and the onset of the pandemic and its effects, rising at such a rate that

[37] Figures are estimates based on actual data to 2018, and forecasts for 2019. Oil and nuclear saw capacity closed more than offset new capacity commissioned.

[38] Frankfurt School-UNEP Centre/BNEF (2019) *Global Trends in Renewable Energy Investment 2019*. Frankfurt: Frankfurt School-UNEP Centre/BNEF. See also IRENA, *Renewable Energy Capacity Statistics 2017*. Available at: http://www.irena.org/newsroom/pressreleases/2017/Mar/2016-a-Record-Year-for-Renewables-Latest-IRENA-Data-Reveals

[39] Frankfurt School-UNEP Centre/BNEF (2019) *Global Trends in Renewable Energy Investment 2019*.

renewable energy additions have not been *displacing* fossil-based power. Rather, renewables have been growing *alongside* new coal- and gas-fired capacity. Second, any comparison of installed capacity needs to take into account the 'capacity factors' associated with different technologies.

Box 1: Energy poverty in Africa

South Africa's potential to generate wind, solar photovoltaics (PV) and concentrated solar power (CSP) has been well documented. The wind potential alone is several times the country's anticipated electricity consumption of 40,000 GW for 2025. Furthermore, the potential gains from regional connectivity are even greater.[40] Many NGOs have argued that, because of these abundant resources, South Africa is well positioned for a 'painless' transition away from coal.

But if the deployment of renewable energy simply depended on the availability of wind and sunshine, then the entire continent would probably have gained access to a reliable and affordable supply of electricity by now. And yet, in 2017, 573 million people in sub-Saharan Africa lacked access to electricity.[41] For every 10 people in the world without electricity, seven live in sub-Saharan Africa. Electrification levels have, since 2015, started to grow faster than the growth in population, but currently there are more people without electricity in sub-Saharan Africa than there were in 1990.

The 48 sub-Saharan African countries (with a combined population of roughly 800 million people) generate roughly the same electrical power as Spain (with 45 million people). Power consumption, at 124 kilowatt-hours per capita annually and falling, is only 10 percent of that found elsewhere in the developing world, barely enough to power one 100 watt lightbulb per person for three hours a day.[42] The levels of installed wind and solar capacity barely register. In 2019, Spain had installed more wind and solar capacity than 48 sub-Saharan African countries combined.

When viewed against the appallingly low levels of deployment throughout most of the sub-continent, it is perhaps not surprising that the REI4P program has been hailed as a success story, one that other countries in sub-Saharan Africa should emulate. But the total amount of wind and solar power installed in South Africa from 2013 to 2019 is 3.9 gigawatts (GW) – that generates just 3-4 percent of the country's electricity.

Rising demand: energy expansion, not energy transition

The scale of the energy expansion poses a major challenge to the effort to control and eventually reduce emissions. In 2016, global installed power capacity reached 6,473GW. At that time, capacity additions were growing at 4.1 percent annually, or by roughly 300GW. In other words, the overall global energy system has been *expanding*, and electricity generation capacity in late 2019 was more than 7,000GW.

[40] Bischof-Niemz, T. and Creamer, T. (2018) *South Africa's Energy Transition, A Roadmap to a Decarbonised, Low-cost and Job-rich Future*. London: Routledge.

[41] World Bank. (May 22 2019) 'Energy Progress Report 2019'. Available at: https://www.worldbank.org/en/news/press-release/2019/05/22/tracking-sdg7-the-energy-progress-report-2019 (retrieved 22 June 2020).

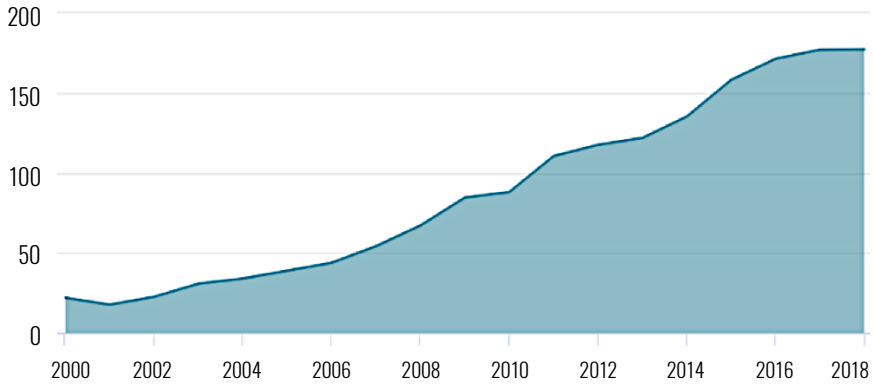
[42] Foster, V. and Briceño-Garmendia, C. (eds.) (2010) *Africa's Infrastructure: A Time for Transformation*. Washington DC: World Bank, 5.

Had this expansion not been interrupted by the pandemic, by 2025 roughly 430GW of net new capacity would need to have been added annually.

Whatever the pace of economic recovery, renewable energy will need to grow a lot faster than the current rate of 167GW per year in order to simply *maintain* its current share in the global power mix.

Meanwhile, the rate of growth in renewable energy has in recent years stalled. New capacity additions have for three consecutive years stood at 160-167GW.[43] This is much higher than it was a decade ago, but the fact that annual deployment rates have levelled off should be a cause for concern. The factors behind this noticeable and worrying pre-Covid flatlining of annual deployment levels are explained below. But even if annual levels of renewable energy deployment were to pick up again, this would not be enough to displace fossil-based power more than incrementally. And in the context of rising energy use, any incremental shift in the proportion of renewables to fossil-generated power is, from a climate perspective, largely irrelevant. Emissions will continue to rise, albeit a little less quickly than if there had been no renewables deployed at all.

Figure 4: Global renewable net capacity additions, 2000 to 2018

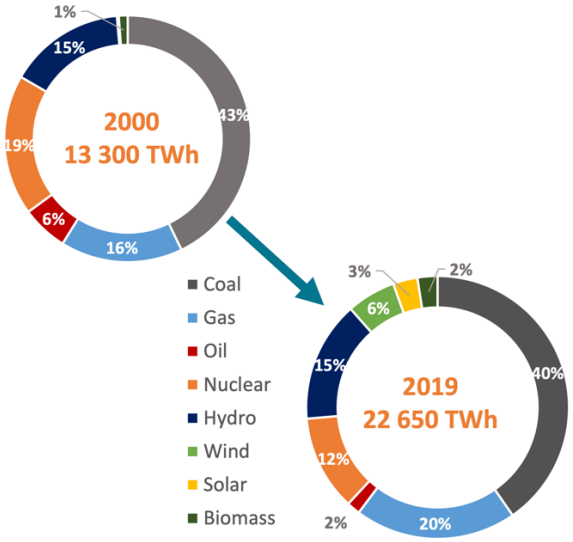


Source: IEA (2018) *Energy Outlook 2018*. Paris: International Energy Agency (IEA).

But if, during the past decade, net wind and solar capacity additions have outstripped net coal and gas additions, then surely renewable energy is well on the way to displacing fossil-based electricity? If this is indeed the case, then perhaps there is no pressing need to change the current policy framework, beyond measures that might speed things along? Unfortunately, the available data shows that in the G20 countries (including South Africa) shows that there has hardly been any progress , as figure 5 shows.

[43] REN21 (2019) *Global Status Report 2019*. Paris: REN21, available at: https://www.ren21.net/gsr-2019; International Energy Agency (IEA). (2018) *World Energy Outlook 2018: Summary*, available at: https://webstore.iea.org/download/summary/190?fileName=English-WEO-2018-ES.pdf (all retrieved 23 June 2020).

Figure 5: Global renewable net capacity additions, 2000-2018



Source: Enerdata (2020) *Global Energy Trends 2020*. Grenoble: Enerdata. Available at https://www.enerdata.net/publications/reports-presentations/world-energy-trends.html.

No decisive shift to renewables in Europe

In Europe, 'out of market' protections for private renewable power companies have caused significant changes to electrical systems, but they have not produced a *transition* from fossil fuels to renewables. The share of fossil fuel generation (lignite, coal, gas and oil) has decreased from 54 percent in 2008 to 49 percent in 2017. During the same period, the share of renewables (including wind, solar, hydro and biomass) has increased from 17 percent to 24 percent.[44] For many, these numbers suggest that the decision to protect renewables from market competition was correct, because it led to an expansion of renewable power not seen elsewhere. The relatively fast growth of renewables in electricity generation therefore helped establish Europe as the world leader in renewable energy. In 2012, Germany could boast around one-third of all the world's installed solar capacity.[45] The EU was also the first region to develop offshore wind, with over 90 percent of global installations in 2015.[46] By 2014 EU countries had invested approximately €1.1 trillion in renewables.

As of 2018, wind and solar together still provided only around 16 percent of the European Union's electrical power.

But as of 2018, as figure 6 shows, wind and solar together still provided only around 16 percent of the region's electrical power. And while this was

[44] Eurostat (June 2019) 'Electricity production, consumption and market overview'. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Electricity_production,_consumption_and_market_overview#Electricity_generation (retrieved 22 June 2020).

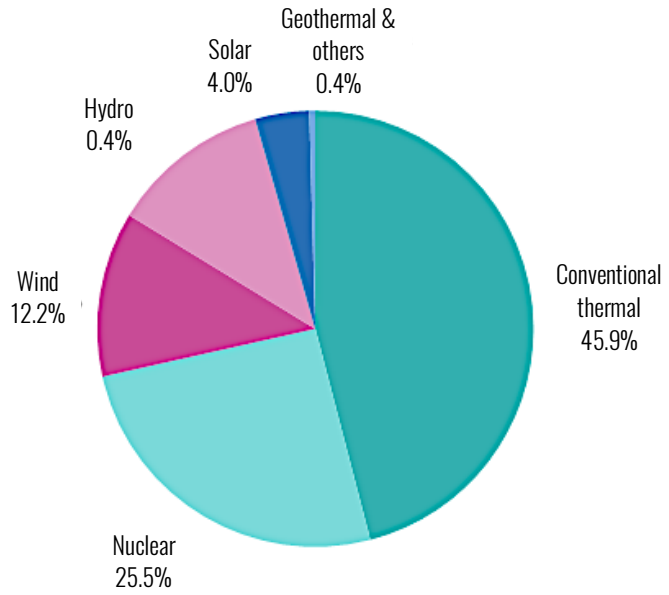
[45] REN21 (2015) *Renewables 2015 Global Status Report*. Available at: https://www.ren21.net/wp-content/uploads/2019/05/GSR2015_FullReport_English.pdf (retrieved 22 June 2020).

[46] European Environment Agency (7 November 2017) *Trends and Projections in Europe 2016: Progress of the European Union and its Member States towards 2020 climate and energy targets*. Available at: https://www.eea.europa.eu/themes/climate/trends-and-projections-in-europe/executive-summary-1 (retrieved 22 June 2020).

well above world regional averages for modern renewables, Europe's power system is currently still largely dependent on coal, gas and nuclear. Taken together, as we have noted, these sources supply roughly 75 percent of the region's electricity. Public hydroelectric systems contribute almost 12 percent. These systems fall into the category of 'renewables' but they were, in most instances, built decades ago.

Aside from the fairly limited decarbonisation of the power system, there were several additional outcomes that policy makers did not fully anticipate. The combined effect of these outcomes has turned the 'success story' of Europe's energy transition into a policy train wreck. And the damage has been made worse by the ideological insistence on the part of the European Commission to further liberalise the power sector, as evidenced by the EU's *Clean Energy Package*.

Figure 6: Electricity production by source in the European Union, 2018



Source: Eurostat (2018). Available at: https://ec.europa.eu/eurostat/statistics-explained/images/d/d6/Electricity_production_by_source percent2C_EU-28 percent2C_2018_ percent28 percent25 percent29.png

Capacity factors for different energy technologies

Wind and solar were, until the beginning of 2020 at least, clearly 'winning the race' against coal and gas in terms of 'net new capacity additions'. The maximum generation capacity of an electricity-producing installation (i.e. what it is capable of producing under ideal conditions) is called 'nameplate capacity' or 'nameplate power'.

When measured in this way, over the last decade renewables were ahead of fossil-based power by a considerable margin (roughly 158 GW). But how much electricity is actually generated by the different technologies? Any serious effort to answer this question can only lead to one conclusion: in terms of actual generation, newly installed wind and solar is still trailing behind the power generated by newly installed coal and gas. This is because, over the course of a year, power stations using coal, gas,

and nuclear energy generally produce far more electricity per GW of installed capacity than is typically produced by renewable sources. Coal, gas, and nuclear energy are not dependent on the weather. They can generate electricity around the clock, 365 days a year (sometimes referred to as *24/365 power*.)[47]

But different sources of electrical power have varying 'capacity factors'. This concept refers to the percentage of nameplate electricity that might actually be produced over the course of a year (or some other time period) for a specific technology in a specific location. For example, a 5 MW wind turbine situated in a wind corridor off the coast of Denmark might produce at 40 percent of its 'nameplate' capacity. If the wind blew hard and constantly for '24/365' the capacity factor would be close to 100 percent. But because wind is highly variable, the capacity factor is going to be less than the 100 percent maximum. The same is true in the case of solar. Solar panels generate no electricity at night, limited electricity on cloudy days, and more on long sunny days in summertime.

The combined effect of these outcomes has turned the 'success story' of Europe's energy transition into a policy train wreck.

It must be emphasised that capacity factors vary significantly and in general they vary much more substantially for renewable technologies than for fossil fuel-based generation. This is because the amounts of wind and solar available for capture and conversion to electricity vary by location, whereas differences in fossil fuel types (for example, due to the thermal quality of different grades of coal) are not linked in the same way to the location of the generation assets.

Globally, the 'capacity factor' of solar PV is in the 11-35 percent range, with South Africa being towards the higher end of that range (at 20-25 percent), reflecting the high availability of sunlight. The capacity factor for wind power is usually 20-40 percent, although some offshore wind installations in the North Sea have an annual capacity factor above 40 percent for the newer and larger turbines.[48]

Again, wind turbines in South Africa can sustain a 35 percent capacity factor, significantly above the global average.[49] However, the capacity factor for a new coal-fired power station can be as high as 80 percent, although even new coal plants are seldom utilised at this level. The capacity factor for gas-fired power is normally 50-60 percent, and nuclear at around 80 percent.

Based on crude averages, 1GW of new coal capacity (assuming a capacity factor of 60 percent, which is on the low end of the global average for coal-fired power) will out-produce 1GW of wind (with a 30 percent capacity factor) at a 2:1 ratio over the course of a year. And 1GW of new gas capacity (at

[47] RE CF @ 30 percent = 337.5 GW equivalent; FF CF @70 percent = 677 GW equivalent. For global variations and other data on capacity factors, see https://www.eia.gov/todayinenergy/detail.php?id=22832 (retrieved 22 June 2020).

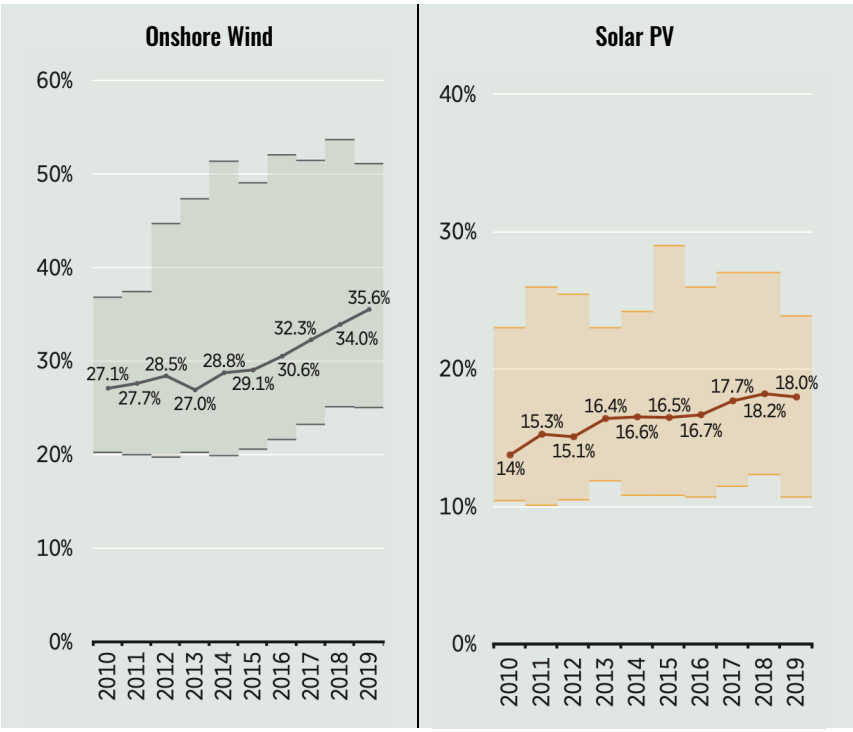
[48] Energy Numbers (13 January 2020) 'UK offshore wind capacity factors'. Available at: http://energynumbers.info/uk-offshore-wind-capacity-factors (retrieved 23 June 2020).

[49] Data cited by Bischof-Niemz, T. and Creamer, T. (2018) *South Africa's Energy Transition, A Roadmap to a Decarbonised, Low-cost and Job-rich Future*, London: Routledge.

a 50 percent capacity factor) will generate more power than 1GW of new solar (at a 25 percent capacity factor) by a similar ratio.[50]

Capacity factors for both wind and solar *are* improving, so the next generation of solar and wind installations could be accompanied by considerably higher capacity factors. But these improvements are likely to be incremental (at current rates of improvement, roughly 1 percent annually for wind, and 0.5 percent annually for solar PV). So the point is this: as a general rule, in order to generate comparable amounts of electricity in a given time period, far higher amounts of wind and solar capacity must be installed than might be the case for coal or gas.

Figure 7: Capacity factor onshore wind and solar PV (2010-2019)



Source: IRENA (2020) *Renewable Power Generation Costs in 2019*. Abu Dhabi: International Renewable Energy Agency (IRENA). Available at: https://www.irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019

In addition, new coal and gas power stations will potentially be generating electricity for up to 40 years, whereas new wind and solar installations will need to be replaced after just 20 years or so. When both rising demand and capacity factors are taken into account, the growth of renewable energy that occurred over the past ten years is not as impressive as it might first appear. And certainly not at the level which would displace fossil fuels and mitigate climate change.

[50] Capacity factor for baseload thermal generators can be around 85 percent – 90 percent. Wind turbines typically achieve capacity factors of 20 percent – 40 percent, depending on location, design characteristics and weather conditions in a particular year. The term 'load factor' is typically used interchangeably with capacity factor and that is the usage adopted in this report. See: Heptonstall, P., Gross, R. and Steiner, F. (February 2017) 'The costs and impacts of intermittency – 2016 update'. London: UK Energy Research Centre (UKERC). Available at: https://ukerc.ac.uk/publications/the-costs-and-impacts-of-intermittency-2016-update/ (retrieved 26 June 2020).

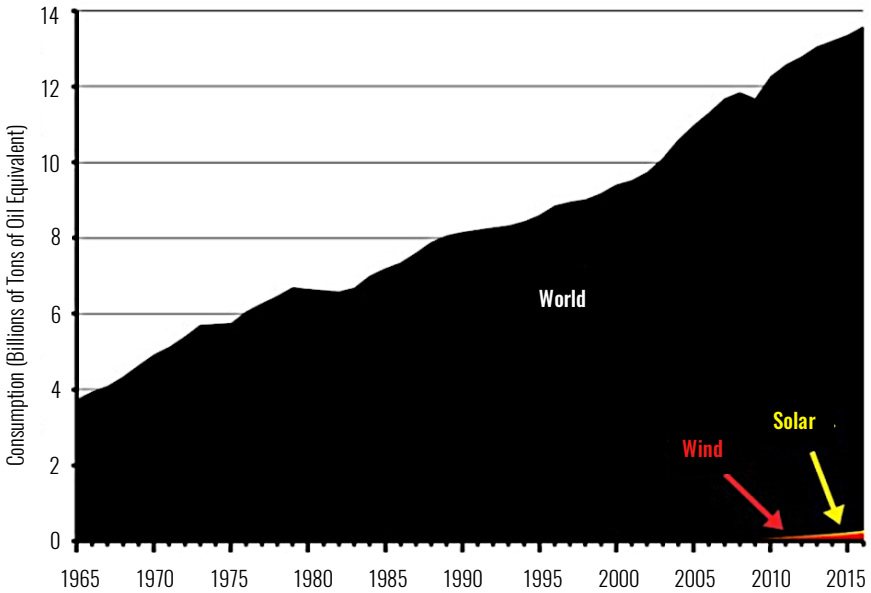
Incremental renewables' growth

In 2018, modern renewables reached almost 13 percent of global power generation, up from around 6 percent a decade earlier. According to the United Nations Environment Programme (UNEP) and Bloomberg New Energy Finance (BNEF), 'Even though there was a lot of solar and wind capacity installed in the latest decade, its impact on the electricity mix has been gradual, not dramatic'.[51]

Reviewing the trends in electricity generation, BP's group chief economist, Spencer Dale, recently stated that, 'despite the extraordinary growth in renewables…there has been almost no improvement in the power sector fuel mix over the past 20 years… I had no idea that so little progress had been made until I looked at these data'.[52]

It is therefore important to remember that, just because renewable energy was 'breaking records' does not mean that we were witnessing a *transition to a renewables-based system*. If 'normal' levels of growth at some stage resume, the only result will be that fossil fuels and renewables will continue to grow alongside each other, as a result of rising energy demand. [53] Power sector emissions will also resume their upward course.[54]

Figure 8: Global world, wind and solar energy consumption, 1965-2016



Source: Based on data from BP (2019) *Statistical Review of World Energy 2019*. London: BP. Available at: https://www.bp.com/en/global/corporate/energy-economics/energy-outlook.html.

[51] Frankfurt School-UNEP Centre/BNEF (2019) *Global Trends in Renewable Energy Investment 2019*. Available at: http://www.fs-unep-centre.org (retrieved 26 June 2020)

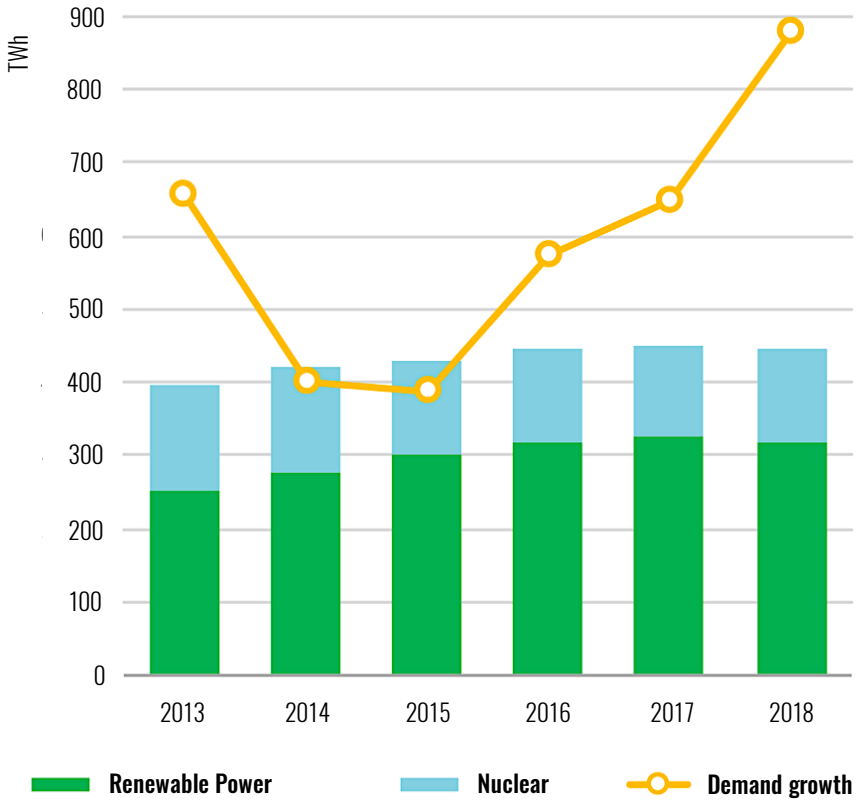
[52] Dale, S. (13 June 2018) 'Energy in 2017: two steps forward, one step back'. British Petroleum. Available at: https://www.bp.com/en/global/corporate/news-and-insights/speeches/spencer-dale-energy-in-2017.html (retrieved 22 June 2020).

[53] IEA (2017) *World Energy Outlook 2017*. Paris: International Energy Agency (IEA).

[54] IPCC (2018) 'Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments'. Available at: https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments (retrieved 23 June 2020).

By now it should be clear that the world has not been undergoing a major energy transition. It is better described as an energy expansion where, in the power sector, renewables have been growing alongside energy demand. The growth of renewables has been impressive and, over the longer term, it is likely to continue. But growth alone does not mean the current investor-focused policies are working successfully (displacing fossil fuel energy and thereby reducing greenhouse gases) and all that is needed is 'more of the same'. Quite the contrary. The policy is failing on multiple levels. Emissions from the power sector continue to rise, and across other key sectors, such as transport, buildings and industry, emissions are rising even faster.

Figure 9: Expected generation from low-carbon power investments and annual investment needs by scenario



Source: IEA (2019) *World Energy Investment 2019*. Paris: International Energy Agency (IEA). Available at: https://www.iea.org/reports/world-energy-investment-2019.

According to an IEA's recent assessment, 'There are few signs of the major shift of capital towards efficiency, renewables and innovative technologies that is needed to turn emissions around…Investment and financing decisions are shaped by policies: today's frameworks are not yet equipped to avoid multiple risks for the future'.[55]

[55] IEA (14 May 2019) 'World Energy Investment 2019'. Webinar. Available at: https://youtu.be/ZulVjHW7n5k (retrieved 23 June 2020).

GLOBAL RENEWABLE ENERGY COSTS AND THE EFFECT ON INVESTMENT

Falling renewable energy costs and 'tipping points'

But what about the falling costs of renewables? There is no denying that the 'levelised cost of electricity' (LCOE)[56] for renewables has fallen dramatically in recent years. Globally, the average cost of power generated by solar photovoltaics (PV) has dropped 88 percent since 2009, while wind has fallen 69 percent.[57]

In the energy debates in South Africa, it is often claimed that renewables have reached, or may soon reach, a 'tipping point' in terms of their competitiveness with fossil fuels, and renewables are now the 'least cost option'.

Table 1: Different ways of measuring methods of electricity generation

Levelised cost of electricity (LCOE)	The sum of the costs of electricity generated over the lifetime of an electricity-producing installation, divided by the sum of the electrical energy produced over that lifetime.
Nameplate capacity	The maximum generation capacity of an electricity-producing installation (i.e. what it is capable of producing under ideal conditions).
Capacity factor	The percentage of nameplate electricity that might actually be produced over the course of a year by an electricity-producing installation.

Many believe that renewables will soon enjoy an explosive and qualitative growth as a result of the falling LCOE for wind and solar. In South Africa, supporters of renewable energy frequently refer to the fact that wind and solar PV are now cheaper than *new coal*, if measured on a LCOE or kilowatt-hour basis.[58]

The International Renewable Energy Agency (IRENA) also believes that the falling prices of renewables amount to a global game-changer, because now renewables can produce electricity cheaper than established coal-fired power stations such as those that make up the majority of Eskom's fleet. According to IRENA, 'New solar PV and onshore wind are expected to increasingly cost less than the marginal operating cost of *existing* coal fired power plants [emphasis added]. In 2020, the weighted average PPA or auction price for solar PV from projects in the IRENA database – USD 0.048 per kilowatt-hour (kWh) – is expected to be less than the marginal operating costs for around 700GW of operational coal-fired capacity'.

At the same time, IRENA expects onshore wind – currently at USD 0.045/kWh – 'to fall below the marginal operating costs of almost 900 GW of

[56] The LCOE is a measure of the average net present cost of electricity generation for a generating plant over its lifetime. The LCOE is calculated as the ratio between all the discounted costs over the lifetime of an electricity generating plant divided by a discounted sum of the actual energy amounts delivered.

[57] IRENA (2019) *Renewable Power Generation Costs in 2018*. Abu Dhabi: International Renewable Energy Agency.

[58] Bischof-Niemz, T. and Creamer, T. (2018) *South Africa's Energy Transition, A Roadmap to a Decarbonised, Low-cost and Job-rich Future*. London: Routledge.

coal capacity potentially online in 2020'.[59] Based on these calculations, IRENA estimates that up to 40 percent of the world's existing coal-fired generation, totalling around 2,100 GW, could soon be outcompeted on a kW/hr basis by new renewable deployment.

There are, however, several problems with the 'tipping point' or 'least cost option' argument that need to be both examined and understood. First, the LCOE does not reflect all of the costs associated with renewable energy. Second, falling prices may not necessarily lead to a 'tipping point' that opens the door for the large-scale deployment of renewables. Rather, it could lead to a meltdown in the entire 'renewables for profit' system, as profit margins shrink and investors lose interest.

The only way to prevent the meltdown and at the same time preserve the 'renewables for profit' framework is for PPA prices to stay at levels that can guarantee satisfactory returns on investment.

But any effort to arrest the global investment deficit in renewable energy by making PPAs more profitable to private interests would then expose renewable energy to considerable political risk. Governments would need to pass on the additional PPA costs to end-users while sustaining the myth of 'competitive' electricity markets. The 'tipping point' argument is based on falling LCOE costs for wind and solar, but falling costs seriously reduce levels of profit and investors look elsewhere. And if costs are allowed to rise through PPAs in order to guarantee satisfactory returns for private investors, then renewables may lose their 'least cost option' status. This is a 'no win' situation for private renewable energy companies, and it lies at the heart of the current global crisis of neoliberal policy for the power sector.

By now it should be clear that the world has not been undergoing a major energy transition. It is better described as an energy expansion where, in the power sector, renewables have been growing alongside energy demand.

Why are renewable energy costs falling?

In South Africa and elsewhere, discussions on the costs of renewable energy do not usually concern themselves with the reasons why renewable energy costs have fallen so precipitously in recent years. Industry voices tend to take the lion's share of the credit for falling costs, pointing to their own capacity to advance efficiencies and innovation. Economists refer to the 'maturing market' for renewables. And while both of these factors have made a significant contribution, this is hardly the whole story. Historically low interest rates; concessionary financing from publicly owned development banks; overpricing in the early bidding rounds that gave the impression that the actual costs were falling precipitously (which is not unique to South Africa); a global surplus in productive capacity due to the slowdown in renewable energy deployment in Europe and China. These factors and several more have contributed to falling renewable energy costs.[60]

[59] IRENA. (2019) *Renewable Power Generation Costs in 2018*. Abu Dhabi: International Renewable Energy Agency.

[60] Keay, M. and Robinson, D. (2019) *Limits of Auctions: reflections on the role of central purchaser auctions for long-term commitments in electricity systems*. Oxford: Oxford Institute for Energy Studies (OIES).

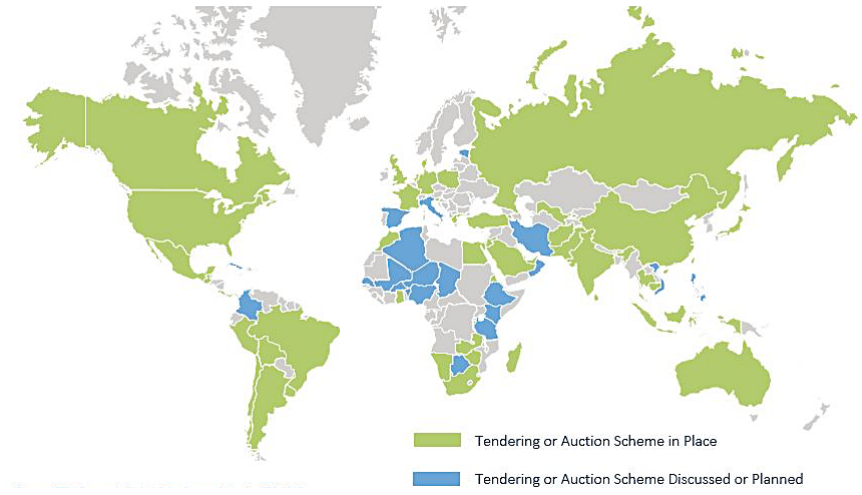
However, while the falling costs helped private renewable energy concerns promote wind and solar as the 'least cost option', falling technology and borrowing costs led policymakers to conclude that renewables had been 'oversubsidised'. This eventually triggered an important change in government policy. The shift in policy began in Europe, which was until recently the world leader in renewable energy deployment. Before 2012, modern renewables had been heavily subsidised through a system known as the Feed-in tariff (FiT). This was a 'come one, come all' subsidy that guaranteed any producer of solar or wind power, small or large, an above market price per kilowatt hour (kW/h). However, in Europe the cost of the FiT was passed on to *all* consumers, and the more renewables came into the system as a result of the FiT, the higher electricity bills steadily became.

Beginning around 2013, the EU began to turn away from FiT schemes towards competitive bidding or auctions. Under this system, renewable energy companies are required to bid for any new capacity that governments consider necessary in order to meet decarbonisation targets or to replace coal and nuclear power capacity that might be scheduled for retirement.

Global investment in renewables falling

The goal of competitive bidding is to reduce the costs of the subsidies, bringing bid prices closer to the actual costs incurred by companies and developers. But, as a result of falling bid prices, investors see falling profit margins, and investment levels have also fallen accordingly. To simplify matters, this can be referred to as the 'three fall effect'. Falling prices lead to falling profits and these leads to falling levels of investment.

Figure 10: Energy markets with tendering or auction schemes in place, under discussion, or in planning stages, Q2 2017



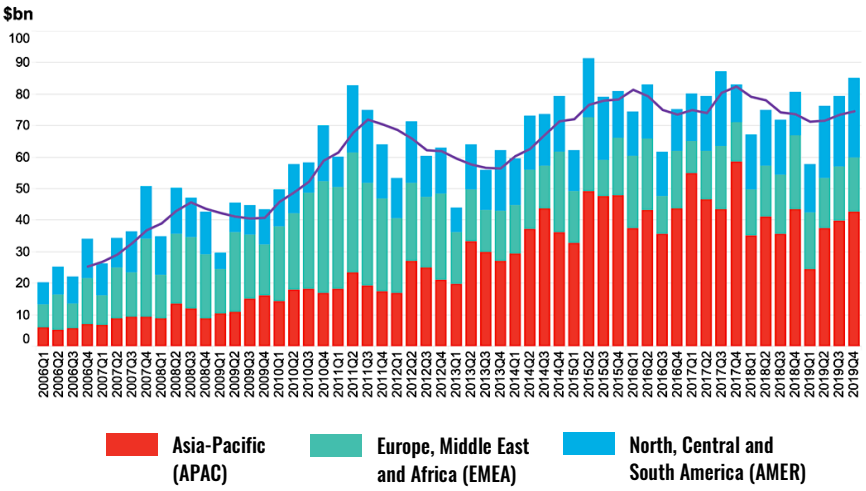
Source: GTM Research (2017) *Global Solar Demand Monitor Q2 2017*, quoted by Hill, J.S. (2017) 'Global Solar Demand Will Exceed 80 GW In 2017; 9.6 GW Awarded In Q3 Alone', *Clean Technica*. Available at: https://cleantechnica.com/2017/07/19/global-solar-demand-will-exceed-80-gw-2017-9-6-gw-awarded-q3-alone/

Concerns about falling profit rates for renewables were increasing during the pre-pandemic years. As one analyst puts it: 'A look at the renewable energy sector fundamentals analysis shows that the total rating of all listed

renewable energy companies' fundamentals is just 3.9 out of 10, a rating that signals the renewable energy sector has very poor fundamentals'. Another analyst noted that solar stocks are currently 'getting pummelled', and remarked: 'Low solar panel prices will obviously squeeze margins and make it tough to report a profit at all this year.... Everyone in the value chain is ultimately going to be impacted by falling solar panel prices'.[61]

Annual deployment levels for renewable energy rose dramatically from the mid 2000s until 2016 or so, but deployment levels have essentially plateaued since then. The recent zero or negligible annual levels of growth in renewable generation capacity mean that investment, in real dollars, is actually falling.

Figure 11: New investment in clean energy in China and in other regions of the world



Source: Bloomberg NEF (2020) *CleanEnergy InvestmentTrends 2019*. New York: Bloomberg New Energy Finance (BNEF). Available at: https://data.bloomberglp.com/professional/sites/24/ BloombergNEF-Clean-Energy-Investment-Trends-2019.pdf.

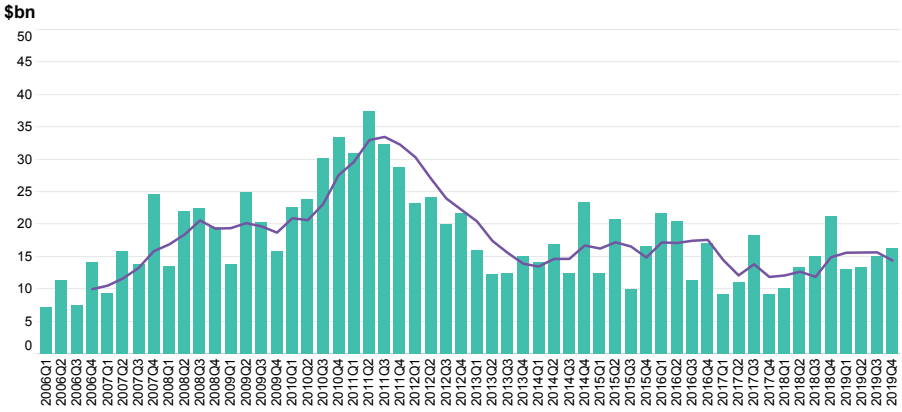
In fact, BNEF reported in mid-2018 that investment in renewables had fallen to a four-year low.[62] A year later, in mid 2019, UNEP and BNEF reported that investment in renewables had fallen 11 percent in 2018, to $188.3 billion.[63] According to the Climate Policy Initiative's (CPI) most recent assessment of climate financing, current levels of investment are nowhere near the levels needed from now until 2050 ($1.6 trillion to $3.8 trillion annually) for supply-side energy system investments.

In Europe, the move from Feed-in Tariffs to competitive bidding led to a precipitous fall in investment levels from 2012 to 2017. And although

[61] Hoium, T. (15 April 2019) 'Why Solar Stocks Are Getting Pummeled', *The Motley Fool*. Available at: https://www.fool.com/investing/2019/03/26/why-solar-stocks-are-getting-pummeled.aspx (retrieved 22 June 2020).
[62] Stubbe, R. (12 July 2018) 'Global Clean-Energy Investments Have Slowed in 2018'. *Bloomberg Businessweek*. Available at: https://www.bloomberg.com/news/articles/2018-07-12/global-clean-energy-investments-have-slowed-in-2018 (retrieved 23 June 2020).
[63] Frankfurt School-UNEP Centre/BNEF. (2019). *Global Trends in Renewable Energy Investment 2019*.

Europe's investment levels bounced back in 2018 they are still far lower than they were in the 2008-2012 period.

Figure 12: New investment in clean energy: Europe (2006-2019)



Source: Bloomberg NEF (2020) *CleanEnergy InvestmentTrends 2019*. New York: Bloomberg New Energy Finance (BNEF). Available at: https://data.bloomberglp.com/professional/sites/24/ BloombergNEF-Clean-Energy-Investment-Trends-2019.pdf.

CPI stated that 'there is a need for a tectonic shift beyond 'climate finance as usual'. Annual investment must increase many times over, and rapidly, to achieve globally agreed climate goals and initiate a truly systemic transition across global, regional, and national economies'.[64] According to data systematised by BNEF, if China's investment in renewables (included within the broader Asia-Pacific region) is taken out of the picture, it becomes clear that investment for the rest of the world has remained stagnant or been actually falling.

China's robust investment in renewable energy has, until recently, to some extent obscured the underlying downward slide in investment globally. But this may soon change. Following the lead of Europe and other countries, China has taken steps to reduce FiT support and its overall investment in renewables has fallen dramatically in the past two years, as figure 13 shows.

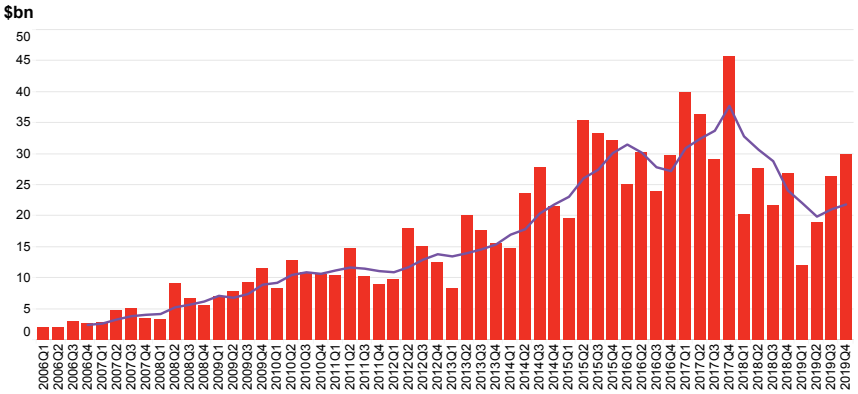
A similar process is visible in India. During the 2015 Paris talks, India's government stated it would install 175GW of renewable energy by 2022. However, India is not expected to reach more than 69GW by 2022, and renewable energy capacity additions fell to just 8GW during the 2018-2019 financial year.[65] It is worth remembering that in early 2017 India made headlines when an auction for renewable energy attracted a successful bid for around 4 cents per kilowatt-hour.Bids to produce wind power were also low, at around 6 cents per kilowatt-hour. (In Dubai and Chile, successful auction

[64] Buchner, B., Clark A., Falconer, A., Macquarie, R., Meattle, C., Wetherbee, C. and Tolentino, R. (2019) 'Global Landscape of Climate Finance 2019'. *San Francisco: Climate Policy Initiative.*

[65] Seetharaman, G. (3 November 2019) 'Why India may not achieve its 2022 clean energy target', *The Economic Times*, India. Available at: https://economictimes.indiatimes.com/industry/energy/power/why-india-may-not-achieve-its-2022-clean-energy-target/articleshow/71869684.cms (retrieved 23 June 2020).

bids have been even lower.[66]) According to the Indian government, 'by introducing competitive bidding, the government has ensured that renewable energy is affordable and attractive for consumers'.[67]

Figure 13: New investment in clean energy: China (2006-2019)



Source: Bloomberg NEF (2020) *CleanEnergy InvestmentTrends 2019*. New York: Bloomberg New Energy Finance (BNEF). Available at: https://data.bloomberglp.com/professional/sites/24/ BloombergNEF-Clean-Energy-Investment-Trends-2019.pdf.

All over the world, renewable energy advocates greeted the news with enthusiasm, as did major institutions like the World Bank.[68] With renewable energy cheaper than coal for the first time, it was claimed that India's ambitious commitment to install 175 GW of renewable energy by 2022 now looked even more feasible. In 2016-17, net capacity additions of renewable energy were higher than for fossil fuels, at around 9 GW for each year, although still very far below the 22 GW per year needed to reach the government's target of 175 GW by 2022.[69]

The inadequate levels of investment in renewables looks more serious when viewed in the light of the fact that each MW of renewable energy capacity normally costs more to install than a MW of coal or gas. A MW of onshore wind capacity today costs roughly €800,000 (with a capacity factor of 30 percent). Offshore wind costs are roughly €2.5 to €3 million per MW (capacity factor of 50 percent).[70]

[66] Aiyar, S.S.A. (10 May 2017) 'Roll out the sun, but gently', *Swaminomics*. Available at: https://swaminomics.org/roll-out-the-sun-but-gently/ (retrieved 23 June 2020).

[67] Dutta, A. (12 June 2017) 'Coal India will set up 1,000 Megawatt solar power generation capacity: Piyush Goyal', *The Economic Times*, India. Available at: http://energy.economictimes.indiatimes.com/news/coal/coal-india-will-set-up-1000-megawatt-solar-power-generation-capacity-piyush-goyal/59109226 (retrieved 23 June 2020).

[68] Jha, L.K. (21 April 2017) 'India shows the path for cheaper solar energy: World Bank', *The Economic Times*, India. Available at: http://energy.economictimes.indiatimes.com/news/renewable/india-shows-path-for-cheaper-solar-energy-world-bank/58291824 (retrieved 23 June 2020).

[69] In 2015, India's primary energy consumption rose by 5.2 percent; its share in global coal consumption exceeded 10 percent for the first time ever, and India had its largest increase in oil consumption. Also in 2015, India registered an increase in CO^2 emissions of 5.3 percent, higher than any other country. So the commitment to 175 GW of renewable energy – of which 100 GW will be from solar – needs to be seen in this context. Read more at: http://www.ecologise.in/2016/06/13/the-largest-increase-in-global-co2-emissions-from-energy-use-in-2015-came-from-india/# (retrieved 23 June 2020).

[70] Parr, M. (5 April 2019) 'Diverting fossil fuel investments to renewables is not enough', *Euractiv*. Available at: https://www.euractiv.com/section/energy-environment/opinion/diverting-fossil-fuel-investments-to-renewables-is-not-enough/ (retrieved 23 June 2020).

Meanwhile, the capital investment required for a Combined Cycle Gas Turbine (CCGT) are about €780,000 per MW, but the capacity factor is much higher than it is for wind power, and higher still when compared to solar. According to one source, 'This means that the difference in upfront capital costs between renewables and fossil generation ranges from 3.5 to 7 times. And these multiples do not take into account storage[71] requirements. In the case of utility-scale solar PV, the picture is more extreme'.[72]

The general anxiety of investors was recently summed up in an article entitled *The dangers of subsidy-free renewable energy*.[73] The article pointed to the implications of 'greater levels of merchant price exposure'. It states:

> *We are not the only ones seeing a looming crash in renewables investment if the current trend of pushing renewables towards merchant price risk continues. While it's accurate to say renewables have become much cheaper over the last few years and no longer require outright subsidy, the idea of a pure market for electricity is a mix of ignorance and wilful fallacy. Pushing renewable energy to compete with fossil fuels in wholesale electricity market may, in fact, undo much of the progress made over the last decade in developing investment-ready climate policies.*

To the extent that the falling costs lead to increasing levels of 'merchant price exposure' (no ´out of market´ subsidies or protections) then increased risk will, at some point, lead to a commensurate increase in the cost of borrowing money for renewable energy projects. Therefore, 'merchant risk will push renewables back into the domain of private equity firms – who may be willing to take that risk but at returns of 15 per cent or more'.

Shifting the debate in South Africa

The data presented above should have set off alarm bells in South Africa, but the 'three fall effect' passed mostly unnoticed. Discussions on energy transition and climate policy have thus far been dominated by the cheerleaders of *unbundling* and the purported achievements of the REI4P program. This story is anchored in wildly distorted perceptions of what is happening globally.

If the facts presented above were more widely known, they would draw attention to dangers facing South Africa should it persist with the current policy framework, a framework that comes straight out of the neoliberal handbook. This framework is currently undergoing a process of slow motion collapse in a number of key countries and regions.

At the global level, the policy shift from FiTs to competitive bidding has drawn attention to the fact that, as project prices for renewables get closer

[71] Storage batteries absorb excess power production at times of excess supply of variable renewables and release it back to the grid at times of higher demand.

[72] €1m/MW 10 to 14 percent capacity factor – the multiple is more than 10. See: https://www.euractiv.com/section/energy-environment/opinion/diverting-fossil-fuel-investments-to-renewables-is-not-enough/ (retrieved 23 June 2020).

[73] Stukalkina, A. and Donovan C. (30 October 2018) 'The dangers of subsidy-free renewable energy', Imperial College Business School. Available at: https://www.imperial.ac.uk/business-school/knowledge/finance/dangers-subsidy-free-renewable-energy/ (retrieved 23 June 2020).

to actual costs, the for-profit approach to renewables hits a brick wall. All of this shows that it is not easy to make money from renewables without subsidies in the form of FiTs or, more recently, of PPAs. This is not a reason, as some on the political right have argued, to abandon renewables. Rather, the fact that there is 'no profit in renewables' merely opens the door to social ownership of renewable energy, because a system anchored in social ownership will be liberated from the imperatives of 'satisfactory returns on investment' for private developers and investors. For privately owned renewable energy companies, 'cheap' is bad. For publicly owned renewables, the prospect of abundant clean energy for all becomes an achievable reality.

IPPS AND THE 'DEATH SPIRAL'

At this point, it is necessary to consider the implications of these policy outcomes for the future of South Africa's energy system and the prospects of achieving a just transition away from coal and towards modern renewable energy. South Africa's energy policy has been informed by the kind of investor-focused neoliberal framework that developed in Europe and internationally. It is therefore reasonable to expect that what has transpired elsewhere as a result of these policies could well happen in South Africa.

In the public debate on the crisis of Eskom, the term *death spiral* is used to describe the deepening financial crisis of the national utility, and how this crisis has led, among other things, to load-shedding and a series of technical failures. The utility's debt and interest burden, which is largely due to decisions taken around the Medupi and Kusile coal plants, are the death spiral's 'Exhibit A'.[74]

But in the world of energy policy, the 'death spiral' refers to something quite different. It describes the situation facing large utilities in many parts of the world, especially where:

- firstly, energy demand is either flat or falling (such as Europe, the United States, and Japan, as well as South Africa), and
- secondly, where renewable energy has made subsidy-enabled inroads in terms of gaining market share.

The debate in South Africa has tended to blur the distinction between the specific crisis triggered by Medupi and Kusile and the general and more drawn out crisis of Eskom, a crisis that is the direct consequence of neoliberal policy. It is not a crisis of 'being public', or of being 'too large', or of being trapped in an outdated model of energy provision. It is a *synthetic* crisis, one created as a result of policy design.

[74] Yelland, C. (7 July 2016) 'Medupi, Kusile, and the massive cost/time overrun', *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2016-07-07-medupi-kusile-and-the-massive-costtime-overrun/ (retrieved 23 June 2020) - Donnelly, L., (15 Feb 2019) 'Medupi and Kusile: Costly and faulty', *Mail and Guardian*. Available at: https://mg.co.za/article/2019-02-15-00-medupi-and-kusile-costly-and-faulty (retrie-ved 23 June 2020).

The IPP system is partially responsible for Eskom's 'death spiral'. Consistent with neoliberal policy, the REI4P approach guarantees returns on investment for private companies ('risk mitigation') through the purchase of electricity at an agreed price through PPAs. Power is purchased regardless of whether or not the electricity is needed. This is a good deal for private companies.

Armed with a PPA, private developers are in a strong position to negotiate financing arrangements with lenders. Both the developer and the lender will operate on the basis that 'satisfactory returns' are all but guaranteed.

It is unfortunate that in South Africa today many liberal policy groups believe that, both globally and domestically, the transition away from coal is being driven by market forces as a result of the falling costs of renewable energy. The idea that renewables are the 'least cost option' goes largely unchallenged in the South African context. As a result, the REI4P is considered to have thus far been an outstanding success. Those who might be otherwise sympathetic to public ownership of key services like energy feel they cannot argue with the results produced by the REI4P, and they contrast these results with the 'mess' that Eskom currently finds itself in.

Power is purchased regardless of whether or not the electricity is needed. This is a good deal for private companies.

It follows that there is broad agreement that unbundling Eskom will further open the door to purportedly competitive low-cost renewable energy, and this will accelerate the transition away from coal. Many liberals and progressives therefore welcome the 'death spiral' of Eskom because they believe the bigger Eskom's troubles are, the better it will be for renewables. These groups believe that the subsidies to renewables have done their job, and market forces will do the rest. With rare exceptions, this is where the analysis stops.

All of these claims are deeply problematic, both empirically and politically. They are based on a story about the rise of renewable energy that has been told by market-driven voices, one that ignores crucial facts and contradictions and trivialises the danger that Eskom's 'death spiral' will have for the energy transition itself.

The idea that 'the energy transition is going according to plan' and is 'unstoppable' has been cultivated globally by *green growth* theorists, renewable energy industry groups and lobbyists, as well as influential North-based NGOs that have for many years taken a 'renewables by any means necessary' stance.

REI4P good, Eskom bad' ignores hidden costs

From this flows an unwillingness to acknowledge that the REI4P programme is contributing to Eskom's crisis, or that unbundling Eskom might actually end up backfiring on renewables. Those who make these claims tend to over-emphasise the importance of falling renewable energy prices, operating in the belief that the LCOE is in some way decisive

(the 'tipping point' argument) in terms of shaping energy options and decisions.

But there are system balancing and other grid issues that come with RE. These are normally not the responsibility of the IPPs in South Africa or anywhere else in the world for that matter. Currently in South Africa, system and grid issues are Eskom's responsibility, and will remain so if Eskom is unbundled, since these are functions that have proven around the world not to be as suitable for generating profits. So, many transmission and distribution systems remain in public ownership. Similarly, the deployment of storage technologies to accommodate variable generation from wind and solar PV will fall to Eskom, since these are crucial for keeping the entire system operating reliably.

South Africa is blessed with a lot of wind and sunshine, but, just because more electricity is generated by renewables, all of the problems associated with variable renewable energy will not miraculously disappear. As more renewable energy comes online, the technical complications and financial burdens increase. The LCOE, which shows renewables becoming increasingly competitive, ignores the costs either of backing up renewables' supply with reserve capacity (to cope with the sometimes dramatic and sudden changes in output from wind and solar facilities), and of integrating renewables into the system.

Substantial demand for baseload

There is also a tendency to downplay the technical challenges that a renewables-based system will need to navigate. For example, according to energy writers Bischof-Niemz and Creamer, South Africa has no need to worry about the impact of variable power supply, because the models they refer to show that South Africa's solar and wind resources are such that providing back up power will not pose too much of a problem. And, in any case, 'utilities in the US and Europe have had at least a decade of experience in operating grids with declining shares of baseload power relative to renewable energy, and doing so comfortably'.[75] These writers might have also pointed out that the record level of renewable power generation Europe-wide on any given day has never exceeded 30.1 percent (on July 30, 2017). That means that on that record day for renewable power generation, baseload power (including large hydro) provided almost 70 percent of the region's power. Three weeks later, during the evening of August 25, 2017, renewables (excluding hydro) provided only 5.5 percent of the region's power.[76] Baseload shares may be declining, but baseload power is still dominant in Europe and even more dominant in the United States.

None of this means that renewables should be abandoned or that the technical obstacles impeding deployment on a larger scale are too formi-

[75] Bischof-Niemz, T. and Creamer, T. (2018) *South Africa's Energy Transition, A Roadmap to a Decarbonised, Low-cost and Job-rich Future*. London: Routledge.

[76] Lajoie, B. (8 June 2018) 'Europe's interconnected electricity system: an in-depth analysis', *electricityMap*. Available at: https://medium.com/electricitymap/what-does-it-take-to-decarbonize-europe-d94cbed80878 (retrieved 23 June 2020).

dable to tackle. It simply means that the discussion on South Africa's energy future needs to be fact-based, rigorous, and free of wishful thinking about the purported successes of the 'renewables for profit' policy regime.[77] Meanwhile, Eskom's death spiral risks *slowing down* the transition to a renewables-based system, because any intensification of the 'energy war' between Eskom and the IPPs will probably lead to system-wide problems that will require state interventions. These interventions will inflict additional costs (through 'capacity payments') and complexities that could be avoided if the entire system remains public and the transition can proceed in a planned and orderly way.

Neoliberal policy: public money ensures private profit

The current policy failure has its roots in neoliberal priorities and their contradictions. Launched in the 1980s, the neoliberal policy made privatisation and liberalisation of power systems a top policy priority. The policy demanded that existing 'incumbent' monopoly utilities be part of a competitive market, one that governments would help set up. Vertically integrated and often publicly owned systems were broken up and 'marketised'. The argument was that introducing competition would improve efficiency and reduce costs to consumers. Of course, this would also create profit-making opportunities for investors, although this was less emphasised in the public-facing rhetoric.

Climate policy was not merely captured but also instrumentalised as a vehicle to further legitimise and consolidate neoliberal restructuring of the power sector.

In many countries, the push towards privatisation and liberalisation *predates* the development of climate policies and the adoption of renewable energy targets. Power sector privatisation was therefore not designed to drive an energy transition towards a renewables-based system; rather, it was designed to reduce the role of the state and to corrode the idea of energy as a public service. With the rise of concern over climate change and increasing urgency for policy action to address it, attention turned towards the need to pivot away from fossil fuels. Given the balance of class forces during the period in question, it was perhaps inevitable that climate policy would be captured by the forces for privatisation. In fact, climate policy was not merely captured but also instrumentalised as a vehicle to further legitimise and consolidate neoliberal restructuring of the power sector.

This is a process that continues to this day, often in the guise of 'subsidy reform' that purportedly targets fossil fuel interests, when the real target is government regulation of energy prices for consumers.[78] According to this

[77] According to Greenpeace's European Unit, capacity payments means that European policy is: 'Propping up coal, gas and nuclear is also slowing down the transition towards 100 percent renewable energy, which is crucial to avert the climate chaos Europeans are beginning to experience in their everyday lives. European governments must end this dirty practice'. The Unit maintains that these payments are a waste of money because Europe already has more generation capacity than it has energy demand. This understates the problem of variability or the economic impact of the reduced market share of the incumbent companies. But the issue is not the capacity payments; these are a symptom of a larger problem, namely the 'death spiral' and the need to maintain 'zombie utilities' in order to secure adequate supply. See: https://storage.googleapis.com/planet4-eu-unit-stateless/2018/09/d8de00df-capacity_mechanisms-media_briefing-greenpeace_20180913.pdf (retrieved 23 June 2020).

[78] Sweeney, S. (2020) 'Weaponizing the Numbers: The Hidden Agenda Behind Fossil-Fuel Subsidy Reform', *New Labor Forum*, 29(1), 87–92.

narrative, in order to reach climate targets, liberalisation and privatisation of the power sector are crucial prerequisites. State-run, -owned or -regulated monopolies should therefore be 'unbundled' in order to make space for 'new actors', namely for-profit renewable energy companies and a host of 'green tech' interests that politically partner with them.

But renewable energy companies were at that time simply not in a position to compete in an open market with energy generated from coal, gas and nuclear. The result was that public money was used to build a renewable energy sector by guaranteeing profit for private investors. Subsidies would make profitable what would otherwise not be profitable. This policy was pioneered in Europe beginning in the early 2000s, but it became widely adopted across the developed and developing world by the end of the decade. In 2011, this same approach led to the launch of the REI4P program.

Who paid for the subsidies?

One important feature of the partial decarbonisation of Europe's electricity systems has been its socially regressive nature. The costs of the subsidies were passed on to consumers, and retail prices rose accordingly. As once source notes, these higher retail prices 'reflect taxes and the cost of a number of public policies; these include financing out-of-market payments subsidies [essentially power purchase agreements, or PPAs] to renewables'.[79]

The upward direction of retail prices is especially striking, and politically toxic, when juxtaposed to the widely celebrated falling costs of renewable power. This is because the wholesale prices do not include the 'system costs' incurred as a result of integrating renewables. The incumbent utilities have attempted to recover these costs from retail prices – the utility raises retail prices (essentially, electricity bills or tariffs) in order to compensate for declining wholesale market revenues.

As a general rule, the deeper the penetration of renewables, the higher the retail price for electricity. The European Commission calculated that FiT payments added €40 billion to electricity bills in 2012 alone.[80]

In 2016, German consumers saw €23 billion added, and the average household electricity price in Germany was 25 percent higher than it would have been without the subsidies.[81] In Italy, the FiT stimulated an impressive 16.4 GW of new renewable capacity, but 85 percent of the incentives went to large producers. And according to one trade union source 'the capital behind those investments overwhelmingly originated

[79] Robinson, D. (August 2015) *The Scissors Effect: How structural trends and government intervention are damaging major European electricity companies and affecting consumers*. OIES, EL 14, 6.

[80] Cambridge Econometrics, Directorate-General for Energy (European Commission), Enerdata, Ludwig Bölkow SystemTechnik (LBST) and Trinomics B.V. (November 2018) *Study on energy prices, costs and subsidies and their impact on industry and households*. Luxembourg: EU publications.

[81] Ball, J. (14 March 2017) 'Germany's High-Priced Energy Revolution', *Fortune*. Available at: http://fortune.com/2017/03/14/germany-renewable-clean-energy-solar/. 'The rise in that surcharge is the single biggest reason that the amount the average German household spent on electricity rose to 1,060 euros in 2016, up 50 percent from 2007'. However, in Germany's case, renewables contributed 32 percent of the country's electricity consumption during the same year.

outside Italy, while the bill was paid by 29 million Italian consumers'.[82] Alongside renewable energy companies, businesses, farmers and property owners all benefited from the FiT, but the lion's share of the costs fell on the shoulders of those who had no obvious stake in the transition to renewables, such as those in rented accommodation.

Prices and true costs diverge

According to the EU's own data, in 2017 LCOE costs represented on average just 33 percent of the final electricity price, while the remaining 67 percent reflected network costs, taxes and levies.[83] So 'levelised' costs for renewables may indeed be falling. But there are costs involved in incorporating renewable generation into the system. These are not typically charged to the providers, nor reflected in the LCOE. But they must be covered in some other way. So they will typically show up in retail prices.

It is important to emphasise that this 'cost shifting' is not confined to Europe. A study on the impact of 20 years of market restructuring in the US concluded: 'The low wholesale prices that have resulted from expansion of subsidised renewables are not sufficient to cover the total cost of renewable or conventional sources, so the prominence of extra-market sources of revenue …is likely to continue to grow'.[84] The same study shows how the financial gains made by the consumer by both using electricity generated on site (mostly through rooftop solar PV) and through selling surplus electricity into the grid at a fixed price amounts to a cost shifting exercise from the consumer to the utility. However, it is the utility that is expected to sustain the entire grid so that all consumers have access to electricity.[85]

System-wide investment is falling

Another serious outcome of neoliberal energy policy has been the *system wide* decline in investment. The dramatic slowdown in investment in renewable power in Europe has already been noted, but it has not been limited to renewables. The EU's policy has created an investment crisis that has hit both renewables *and* incumbent energy companies.

By protecting renewables through 'out-of-market' measures like FiTs and PPAs via capacity auctions, which were designed to guarantee profit for private players, current policy has created a crisis of profitability among the utilities using coal, gas and nuclear. This has led to a sharp fall in their market value as investors have moved their capital away from the energy sector.[86]

[82] Rondinella, T. and Grimaccia, E. (2015) 'How austerity put a brake on the energy transformation in Italy', in Galgóczi, B. (ed.), *Europe's energy transformation in the austerity trap*. Brussels: European Trade Union Institute (ETUI).

[83] Eurelectric. (Undated) *Power Barometer.* Available at: https://cdn.eurelectric.org/media/4005/power-barometer-final-lr-h-3A4C4DC9.pdf (retrieved 23 June 2020) - European Commission (2019) *Report from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions: Energy prices and costs in Europe.* Brussels: European Commission.

[84] Borenstein, S. and Bushnell, J. (2015) 'The US Electricity Industry After 20 Years of Restructuring', Working paper 21113. Cambridge, MA: National Bureau of Economic Research.

[85] *Ibid*.

[86] Economist. (15 October 2013) 'How to lose half a trillion euros'. Available at: http://www.economist.com/news/briefing/21587782-europes-electricity-providers-face-existential-threat-how-lose-half-trillion-euros (retrieved 23 June 2020). For the US, see http://www.mckinsey.

Between 2008 and 2017, average wholesale electricity prices in Europe steadily declined. The increasing amount of renewable capacity brings short-term wholesale prices to very low levels, and occasionally results in zero or negative prices. According to the industry group Eurelectric, 'There is currently an increased risk of very low, zero or even negative prices at times of high renewables output. In order to recover their fixed costs, generators will have to rely more and more on price spikes, which are, as of today, extremely rare'. This, Eurelectric points out, 'is insufficient to ensure the needed investments, in particular in flexibility, but also in firm and reliable capacities, to reach the decarbonisation objectives'.[87]

It is worth remembering that one of the main arguments for privatisation was based on the need for 'the market' to prevent the development of unneeded generation capacity. Liberalisation was supposed to reduce 'capacity margins' (essentially the distance between available electricity supply and demand) by opening up the market to more competition. On this reasoning, if electricity was produced for profit, then private sector players would not produce in excess of what was needed by 'the market', for fear of incurring financial losses.

But the 'problem' of excess capacity has in recent years given way to the opposite: inadequate investment in future supply. In Western Europe, a total of 40GW of coal and 20GW of nuclear are set to be taken offline by 2025. According to Eurelectric:

> *This opens a significant capacity gap for the region as the foreseen capacity additions that will result from renewables over the same period will only make a limited contribution to security of supply… Overall, the outlook on power system adequacy for the whole of Europe is concerning.*[88]

While some might be tempted to celebrate this as 'disruption' of an outdated system inextricably linked to fossil fuel interests, this is an extremely short-sighted perspective. Any serious capacity shortfalls in power generation will either be filled with carbon-intensive backup generation (typically natural gas), or they will lead to power outages and the attendant additional wear-and-tear on system infrastructure, making a real transition to reliable, sustainable future power even more difficult and costly.

Meanwhile, the seriousness of the 'death spiral' has been reflected in a precipitous collapse of the European utilities' balance sheets. In 2013 alone, this amounted to a €32 billion decline. Importantly, capacity closures have accelerated since 2010, with 71 GW having closed in just five years (2010-2014), and analysts expect additional closures, totalling 50

com/business-functions/sustainability-and-resource-productivity/our-insights/the-disruptive-potential-of-solar-power (retrieved 23 June 2020)

[87] Eurelectric. (Undated) *Power Barometer.* Available at: https://cdn.eurelectric.org/media/4005/power-barometer-final-lr-h-3A4C4DC9.pdf (retrieved 23 June 2020).

[88] *Ibid*.

GW or more, of coal- and gas-fired generation, within the next several years.[89]

But however poor the current market position of the incumbent companies using coal, gas and nuclear generation may be, it does not alter the fact that wind and solar provide only 14 percent of the EU's electricity on an annual basis. And because wind and solar power generation are weather-dependent, they are *variable*, which means that coal, gas and nuclear generation are still needed in large quantities as back up on a '24/7' basis.

It remains the case that neoliberal policy has left the power sector saturated in risk. This means that investors will not commit money without cast-iron commitments on the part of governments to ensure returns on investment. All energy providers will require 'certainties' in order to acquire financing, and the technical challenges involved in moving to a renewables-based system will remain unresolved. The unbundling of Eskom will not alter this fundamental reality. And if system costs are not accounted for in negotiations with the IPPs, then the costs will shift towards customers and/or the state.

The variability challenge

Regarding the technical challenges associated with the need to integrate increasing volumes of renewable energy, the experience of the past 20 years has been very informative. Today, the accepted wisdom is that modern grids can accommodate some degree of variable renewable supply, but above 10 percent or so the technical challenges build up. The IEA identifies four phases of 'variable renewable energy' (VRE) capacity. South Africa is currently in Phase One, which means renewables constitute just a few percent of available capacity.[90]

The IEA places countries like China and India in Phase Two, which includes countries with up to 15 percent VRE. According to the IEA, Phase Three, where the VRE penetration ranges from 15 percent to 25 percent in annual generation, is where countries begin to encounter 'the first really significant integration challenges, as the impact of variability is felt both in terms of overall system operation, and by other power plants'.[91] The IEA places countries such Italy, the United Kingdom, Spain, Germany, Portugal, Greece and Uruguay in the Phase 3 category. As the IEA notes, Phases 2 and 3 require a simultaneous increase in 'system flexibility' (grid reinforcement and interconnections, storage, demand-side response, etc.), without which the effort to decarbonise power generation in these countries with renewables 'will confront serious technical roadblocks'.[92]

Finally, a few countries have reached Phase Four, in which even greater challenges emerge. According to the IEA, Phase Four challenges relate to the *stability* of the power system. The stability of a power system is its resilience

[89] Robinson, D. (August 2015) *The Scissors Effect: How structural trends and government intervention are damaging major European electricity companies and affecting consumers*. OIES, EL 14, 6.
[90] International Energy Agency (IEA) (2017) *Getting Wind and Sun onto the Grid: A Manual for Policy Makers*. Technical report. Paris: IEA.
[91] *Ibid*.
[92] IEA (4 October 2017) *Renewables 2017*. Available at: https://www.iea.org/publications/renewables2017/ (retrieved 23 June 2020).

in the face of events that might disturb its normal operation on very short timescales (a few seconds and less). Countries that are seeing challenges primarily related to this phase include Ireland and Denmark, with an annual VRE share of around 25 percent to 50 percent in annual generation.

According to IRP 2019, South Africa will, by 2030, be in Phase 3 territory. If the current IPP-based policy continues, these technical challenges and the costs associated with them will fall on the shoulders of a still-public Eskom transmission company.

Zombie utilities: economically 'unviable', but still essential

As noted above, neoliberal policy created the 'death spiral' of the utilities, a term that is now routinely used to describe Eskom's deep crisis. However, as sources of electricity, the incumbents are still essential providers that cannot be replaced. They are, in a sense, 'zombie utilities', because the 'death spiral' cannot be allowed to end in death, if death in this instance means that the power these utilities are able to generate is no longer available

Meanwhile, EU and US policy has tried to deal with the fallout of the 'death spiral', including concerns about security of supply, system instability, and insufficient investment. EU member states (and several US states like New York and New Jersey) have intervened to help ensure that incumbents generate enough revenue to cover costs. The main mechanism used is called 'capacity payments'. These payments allow generators that operate in times of peak demand to recover their fixed costs and deliver returns to shareholders.[93] According to one energy analyst commenting on India, 'Huge costs are involved in keeping thermal plants idle when the sun shines. Such costs can be absorbed by central government-owned plants that get paid for available capacity even when they don't generate power'.[94]

If system costs are not accounted for in negotiations with the IPPs, then the costs will shift towards customers and/or the state.

Capacity payments have led to a large transfer of funds to coal, gas and nuclear interests. It has today reached a point that, without guaranteed capacity payments, there will be no investment in 'base load' power.

In the words of one source, in recent years 'little or no investment in conventional plant has taken place, except where it had support via some form of capacity remuneration system'.[95] Capacity payments are needed in order to 'ensure sufficient reliable capacity is available by providing

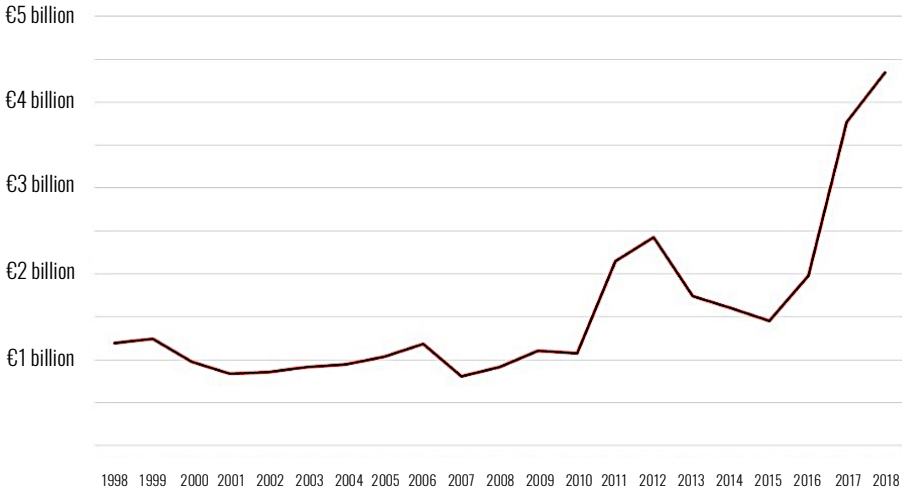
[93] The UK government calculated that £100 billion of capital investment would be needed over a 10-year period to replace aging generation capacity and to meet the UK's carbon targets. According to the national regulator, OFGEM, increased risk across the power sector was a barrier to mobilising investment at such high levels. See: https://www.ofgem.gov.uk/ofgem-publications/76371/ofgem-discovery-phase-ii-draft-v15.pdf (retrieved 23 June 2020) See also: https://www.gov.uk/government/publications/2010-to-2015-government-policy-uk-energy-security/2010-to-2015-government-policy-uk-energy-security#appendix-5-electricity-market-reform-emr (retrieved 23 June 2020).

[94] Aiyar, S.S.A. (10 May 2017) 'Roll out the sun, but gently', *Swaminomics*. Available at: https://swaminomics.org/roll-out-the-sun-but-gently/ (retrieved 23 June 2020).

[95] Keay, M. and Robinson, D. (2019) *Limits of Auctions: reflections on the role of central purchaser auctions for long-term commitments in electricity systems*. Oxford: Oxford Institute for Energy Studies (OIES).

payments to encourage investment in new capacity or for existing capacity to remain open'.[96]

Figure 14: Evolution of capacity mechanism payments, 1998-2018



Source: Greenpeace (2018) '€58 billion in hidden subsidies for coal, gas and nuclear'. Available at https://www.greenpeace.org/eu-unit/issues/climate-energy/1508/media-briefing-e58-billion-in-hidden-subsidies-for-coal-gas-and-nuclear/.

Environmental groups in Europe have been severely critical of capacity payments for coal, gas and nuclear because such payments appear to be sustaining dirty, dangerous, and 'uneconomical' energy. According to Greenpeace's European Unit: 'From 1998 to 2018, these subsidies to old, unprofitable and polluting power stations have cost consumers €32.6 billion. But what, then, is the alternative to capacity payments? And how will investment levels be increased to the levels required? According to the European Commission's *Energy Roadmap 2050:*

> *Massive investments are needed in infrastructures... The public sector might have a role as a facilitator for investment in the energy revolution. The current uncertainty in the market increases the cost of capital for low-carbon investment. The EU needs to move today and start improving the conditions for financing in the energy sector.*[97]

A number of European governments have already committed to a further €25.7 billion until 2040, with Belgium and Poland allocating the largest sums to date'.[98] For those willing to see it, this is both an admission of defeat and a declaration of surrender. Privatisation and liberalisation have scared private investors away from the energy sector, depriving it of the investment

[96] EMR Settlement Limited (Undated) 'Capacity Market'. Available at: https://www.emrsettlement.co.uk/about-emr/capacity-market/ (retrieved 23 June 2020).
[97] European Commission (15 December 2011) *Energy Roadmap, 2050*, 16. Luxembourg: European Union.
[98] Greenpeace (2018) 'EXPOSED: €58 billion in hidden subsidies for coal, gas and nuclear', Greenpeace EU media briefing. Available at: https://storage.googleapis.com/planet4-eu-unit-stateless/2018/09/d8de00df-capacity_mechanisms-media_briefing-greenpeace_20180913.pdf (retrieved 23 June 2020).

capital it desperately needs to ensure future supply and to upgrade the grid. The solution, which runs counter to neoliberal ideology, is for the public sector to be 'a facilitator for investment'.

This is a thinly veiled way of saying that, in the absence of sufficient investment from the private sector, public money will need to be packaged in a way that private interests can make returns. In other words, the power sector is treated as 'too big to fail', but the bailout is being offered *before* the possibility of failure is even allowed to rear its head: a bail out *ex ante*. This is already happening now, and more of the same is being proposed.

Neoliberal policy has thus degenerated into a 'subsidies for all' situation. The unplanned, *ad hoc* and ultimately irrational nature of this policy has wreaked havoc on the entire system. Addressing these challenges will require a planned approach in which the grid technologies and demand management innovations develop *in tandem* with the deployment of renewables. The approach embodied in REI4P is to press forward with renewables without factoring in their impact on the entire system. It is like putting the renewables horse before a cart without wheels. This is a direct consequence of the irrational liberalisation and a policy fixation with 'competitive electricity markets' and IPPs.

As the German Association of Local Utilities (VkU) notes, 'Relevant amounts of renewables were not present when the current (neoliberal) market design was established. Therefore, the design that has evolved is not suitable for the necessary transformation of the system unless changes are made'.[99]

LESSONS FOR SOUTH AFRICA

What do these policy outcomes, intended as well as unanticipated, mean for South Africa? And what political lessons can be drawn from the global experience? Several points need to be emphasised:

- First, the REI4P program is contributing to Eskom's 'death spiral', and if the programme is expanded as proposed then the impact on Eskom will become increasingly negative. The falling auction prices do not add up to a 'tipping point' for renewables and therefore 'the market' is, contrary to what many believe, not serving the cause of decarbonisation.
- Second, the financial as well as technical implications of a REI4P expansion will impose an increasingly heavy burden on the entire energy system, and this must be avoided at all costs.
- Third, social ownership of renewables presents a better option than the IPP system.

The REI4P story

[99] Enervis/BET (2013) *A Sustainable Energy Market Design for Germany* (Condensed Version). Berlin: VKU/Enervis/BET.

The question of the REI4P's contribution (or otherwise) to Eskom's current crisis has been hotly debated. Following the path established in Europe, the REI4P was announced at the end of March 2011.[100] Successful bidders received 20-year PPAs. There were 28 eligible bids for the first Bid Window (BW), totalling 1,416 MW of new capacity.

Solar PV projects procured in 2011 were awarded 20-year PPAs at a high tariff level of R3.65/kWh (at 2016 prices), while the wind projects came in at R1.51/kWh. PPA contracts were finalised and signed in November 2012, with a total investment approaching US$6 billion. The second round (BW2) sought bids for just 1,275 MW of capacity, in the hope of encouraging greater competition. Bids for wind fell by roughly 20 percent on average compared to BW1, and for solar PV by 40 percent. By the second bid window, solar PV tariffs had fallen to R2.18/ kWh, while those for onshore wind declined to R1.19/kWh. The declines continued into the next two bid windows: for BW3, R1.17/kWh for solar PV and R0.87/kWh for wind, and for BW4, R0.87/kWh for solar PV and R0.69/kWh for wind.[101]

The falling tariffs for wind and solar have been offered as evidence of the programme's success. So any initial questions and concerns about the REI4P program's role in South Africa's energy transition, at least from the perspective of costs, have largely disappeared from the debate. Estimates place the LCOE for Medupi and Kusile at R1.05/kWh and R1.16/kWh respectively, considerably higher than the average 0.62 kWh for renewables in BW4.[102] Price decreases to date have led to claims of 'new renewable capacity being competitive on a Levelised Cost of Energy (LCOE) basis with new coal in many countries, including South Africa' and that 'new renewable capacity is furthermore expected to be competitive with existing coal, nearly globally, by 2030'.[103]

But these same numbers can be presented quite differently. It would be equally accurate to say that BW4 produced prices that are not low enough to compete with power generated from Eskom's existing coal fleet but that *are* low enough to compete with power that will be generated by Medupi and Kusile, due in large part to cost overruns and debt financing costs.

[100] The REI4P replaced the country's 'Renewable Energy Feed-in Tariff' (REFIT) program. The earlier REFIT program, introduced in 2009, had been announced with tariff rates among the most generous in the world. These were eventually revised downward, before any contracts were finalised, with NERSA citing exchange rate and capital cost considerations. However, after receiving further legal advice that the program was in fact not consistent with the country's public finance and procurement laws, the Department of Energy announced that REFIT would be replaced by a competitive auction system. Ultimately, no contracts were finalised under REFIT during the program's two-year existence

See: Anton Eberhard. (April 2013) 'Feed-In Tariffs or Auctions? Procuring Renewable Energy Supply in South Africa', World Bank, Viewpoint, Note 338.

[101] Bischof-Niemz, T. and Creamer, T. (2018) *South Africa's Energy Transition, A Roadmap to a Decarbonised, Low-cost and Job-rich Future, 7.*

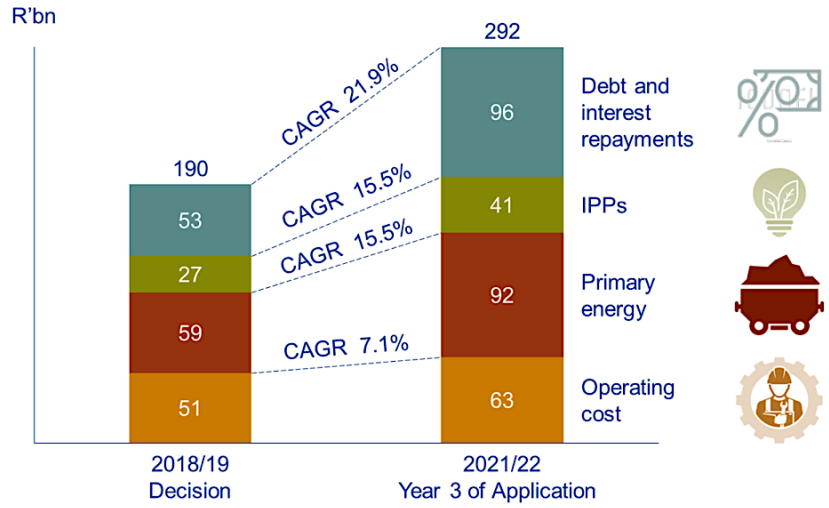
[102] ERC, CSIR and IFPRI (2017) *The developing energy landscape in South Africa: Technical Report.* Cape Town: ERC.

[103] *Ibid*.

'Pass Back': the impact of REI4P programme PPAs on Eskom's finances

Based on the prices per kW/hr of the existing coal fleet, the evidence suggests that Eskom's financial problems are significantly worsened as a result of the PPAs under the REI4P program.

Figure 15: Key contributors to increase in allowed revenue



Source: Eskom (2018) 'Eskom Revenue Application Multi-Year Price Determination (MYPD 4) FY2019/20 - 2021/22'. Available at https://www.nersa.org.za/Admin/Document/Editor/file/Consultations/Electricity/Notices/Eskom%20Summary%20MYPD4.pdf.

As shown in Figure 15, Eskom's largest cost component is finance – debt and interest payments; these are largely due to the Medupi and Kusile coal plants, both of which have seen massive cost overruns.[104] Primary energy costs follow, then operating costs, but the costs of the IPP program, which includes the REI4Ps, have contributed more than 14 percent to the overall increase in Eskom's revenue requirement.[105] These IPP costs are expected to increase more than 15 percent from now (2019) to the 2021-2022 financial year. This 15 percent increase matches the rise in primary energy costs and is more than double the increase in Eskom's operating costs from now until 2022.

The contract prices for the REI4P's BW4 are much lower than those that emerged from BW1. But contracts from the earlier bidding rounds are still in force. When combined with the rising total number of PPAs, this means that the overall cost to Eskom will increase until the BW contracts begin to expire (see Figure 18 below).[106] It seems certain that this projected peak in costs associated with the REI4P programme is behind the South African government's efforts, beginning in early 2019, to renegotiate the IPP contracts for both coal and renewables.[107]

[104] Yelland, C. (7 July 2016) 'Medupi, Kusile, and the massive cost/time overrun', *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2016-07-07-medupi-kusile-and-the-massive-costtime-overrun/ (retrieved 23 June 2020) - Donnelly, L. (15 Feb 2019) 'Medupi and Kusile: Costly and faulty', *Mail and Guardian*. Available at: https://mg.co.za/article/2019-02-15-00-medupi-and-kusile-costly-and-faulty (retrieved 23 June 2020).

[105] Eskom (September 2018) 'Revenue Application, Multi-Year Price Determination (MYPD 4) FY2019/20 – 2021/22, 14'.

[106] Eskom. (September 2018) *Revenue Application, Multi-Year Price Determination (MYPD 4) FY2019/20 – 2021/22*, 68.

[107] Creamer, T. (13 September 2019) 'Govt to seek to renegotiate coal, IPP contracts', *Engineering News*. Available at: http://www.engineeringnews.co.za/article/govt-to-seek-to-renegotiate-coal-ipp-contracts-2019-09-13/rep_id:4136 (retrieved 23 June 2020).

Eskom's *existing* fleet currently produces power that is cheaper than the REI4P average. The costs of building the power stations were recovered (amortised) long ago and therefore when costs for fuel, operations and maintenance, and labour are added together Eskom's coal-generated power is still cheaper per kW/hr than renewables from the IPPs, by some distance. For example, the IPPs were granted R15 billion in the fiscal years 2016 and 2017, compared to the R3 billion it would have cost Eskom to produce the same amount of electricity.

And given that the existing fleet generates 90 percent of South Africa's electricity, and the renewable projects procured as a result of BW4 will not come on line for 2-3 years, it is the LCOE from the existing coal fleet that is a more meaningful basis for comparing South Africa's coal generation to that from renewables. In terms of *new* capacity, renewables may indeed be competitive with power from new coal, but in South Africa the new capacity for coal is, or for the most part will be, generated by Medupi and Kusile and the price of power generated by these two facilities is, in any case, extraordinarily high due to cost overruns and debt commitments.[108]

Undermining Eskom

Eskom has attempted to obstruct the IPPs at every turn. It has delayed signing contracts and dragged its feet when connecting IPP power to the grid. It claims that the 20-year PPAs agreed during the various REI4P bid windows have made a significant contribution to its current financial difficulties. The government has rejected this claim, arguing that Eskom incurs no costs from the REI4P program because the costs associated with the power purchased under the program are a 'pass through'.

Of course, this ignores the limit that NERSA places on Eskom's price increases, which in turn limits its ability to pass additional costs on to the consumer. In other words, according to the government's account, it is end users, not Eskom, who pay for the REI4P costs through the tariffs. According to Energy Minister Jeff Radebe:

> *The renewable energy IPPs are cost neutral to Eskom as the cost is passed on to the consumer. The assertion therefore that Eskom incurs losses as a result of the Independent Power Producer programme is without foundation, misleading and false. Since 2013, Eskom has not incurred a cent in buying electricity from the Independent Power Producers which they have not been able to recover through the tariff allowance.*[109]

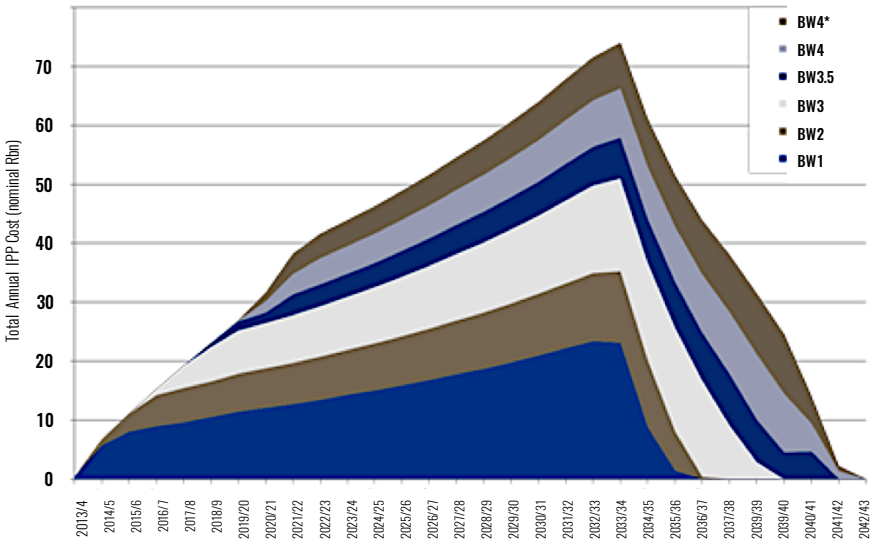
But the *Roadmap for Eskom* from the Department of Public Enterprises (DPE), which lays out what the 'unbundling' process will mean, acknowledges that the IPP system has hurt the utility: 'Discussions have already commenced with coal producers and participants in the renewables programme

[108] The assumption in the IRP is that all new coal to power capacity beyond the already procured 900 MW will be in the form of clean coal technology, which is still generally financed. As proposed in the draft IRP update, work to enable implementation and investments in flexible HELE will be undertaken following finalisation of the IRP.

[109] Radebe, Minister J. (24 February 2019) 'Statement re Independent Power Producers'. Available at: http://www.energy.gov.za/files/media/pr/2019/MediaConference-Statement-by-Minister-on-RE-IPP-24February2019.pdf (retrieved 23 June 2020).

to reduce the burden on Eskom. This is the time for all parties to make sacrifices as a contribution to a sustainable energy future'.[110]

Figure 16: Summary of RIP4P costs over life of contracts



Source: Eskom (2018) 'Eskom Revenue Application Multi-Year Price Determination (MYPD 4) FY2019/20 - 2021/22'. Available at https://www.nersa.org.za/Admin/Document/Editor/file/Consultations/Electricity/Notices/Eskom%20Summary%20MYPD4.pdf.

It is not clear what the DPE means by 'sacrifices' in this context. But the statements appear to validate Eskom's concerns about the impact of the REI4P programme on its finances. Set against the background of falling demand for electricity, rising fuel costs, and non-payment by many municipalities, the guaranteed payment of above-market prices for electricity generated by the private wind and solar operations is, in effect, not a 'pass through' but a guaranteed profit-yielding 'pass back' of Eskom revenue to the IPPs, while the remaining revenues generated by electricity sales that are available to the utility in order to cover other costs grow appreciably smaller.[111] Furthermore, the 'pass back' obligation incurred as a result of just the bid windows to date will, according to Eskom, exceed R70 billion annually at its peak in 2032, and payments to the IPPs for the current contracts will extend into the mid 2030s, when those contracts finally expire. Of course, any new contracts agreed on comparable terms will extend the utility's obligations – and these corrosive dynamics – further into the future.

It should be clear, then, that the costs associated with the PPAs make a significant contribution to Eskom's current financial difficulties. And if the IRP 2019 is any guide, the REI4P programme is set to be greatly expanded, particularly after 2025. This will intensify the effects of the utility's 'death spiral'. According to IRP 2019, Eskom-provided coal-powered electricity will still provide 60 percent of the country's electricity in 2030,

[110] DPE, RSA (2019) *Roadmap for Eskom in a Reformed Electricity Supply Industry*. Pretoria: Department of Public Enterprise, 4.

[111] City Press (25 March 2019) 'More trouble for Eskom as defaulting municipalities gain new powers to not pay', *City Press*. Available at: https://city-press.news24.com/Business/more-trouble-for-eskom-as-defaulting-municipalities-gain-new-powers-to-not-pay-20190325 (retrieved 23 June 2020).

but its share of the market will have declined very significantly (down from roughly 90 percent today).

An important political point emerges from this brief assessment of the impact of the REI4P program on Eskom's crisis: the case for renewables cannot live or die based on price, and particularly the LCOE. The same can be said for the phase out of coal-fired power. This phase out – in South Africa and globally – must be driven by social and ecological concerns, and these concerns must be paramount. The future of South Africa's energy system, and the health of its people, cannot be held hostage by cost per kW/hr to generate electricity. Furthermore, if the case for an energy transition rests disproportionately on price, it pulls attention away from the many other reasons that make decarbonisation both positive and necessary. And, when arguments about 'least cost options' and 'competitive renewables' do not fit comfortably with the facts, the facts get twisted, distorted and 'repackaged' to fit the arguments.

The IPPs were granted R15 billion in the fiscal years 2016 and 2017, compared to the R3 billion it would have cost Eskom to produce the same amount of electricity.

Losing sovereignty, deepening debt

At this point it is important to consider what might be the effect of the expansion of the REI4P programme on South Africa's energy system. Under the programme, South Africa will add just 2.5GW until the end of 2024 and will have installed a total of just 6GW of renewable energy capacity (excluding pumped storage). Renewables will at that point still be less than 10 percent of South Africa's generation capacity. However, under IRP 2019, 6,000 MW of new solar PV capacity and 14,400 MW of new wind power capacity will be commissioned by 2030, most of it coming online after 2025. Reaching these targets would increase the amount of installed wind and solar capacity by around 700 percent from current levels. IRP 2019 states that renewable energy, most of it variable wind and solar, will provide 40 percent of the country's electricity by 2030. But if this massive increase in renewable energy deployment is pursued by way of an expanded REI4P, then a number of negative outcomes appear very likely.

First, South Africa will lose its energy sovereignty. According to IRP 2019, by 2030 more than half of South Africa's generating capacity, and virtually all of its renewables capacity, will be operating under long term PPAs with companies that are not based in South Africa and which source technologies mostly from Europe or China. With up to 12GW of coal-fired generation expected to be decommissioned in the next 15 years, South Africa will be vulnerable to price blackmail by multinational companies which also export profits and dividends, causing additional Balance of Payment problems. Absent some radical shift in the way supply chains are currently configured, South Africa will not have access to the technologies needed to generate its own electricity.

Second, REI4P expansion exposes South Africa to the uncertain economics of the IPP system. If auction prices continue to fall, the evidence suggests

that profit-seeking investors will increasingly look elsewhere. According to energy expert David Newbery, the current auction-based IPP system is unsustainable: 'Long-term capacity auctions by themselves are either not credible or not sufficient as a mechanism to secure adequate investment in network capacity, particularly where this capacity is critical for the efficient and secure operation of the system'.[112] In other words, PPAs may be able to turn a profit for renewable energy developers and their overseas suppliers, but this does not cover system-wide investment needs that might span decades. But because the IPP model is based on guaranteeing returns on investment, then it seems very likely that bid prices will stay at current levels and may even rise, especially if the borrowing costs of project developers increase due to increased project risk or rising interest rates. In other words, what looks like cheap renewable energy today may be considerably more expensive several years from now, especially if there is less coal, gas or nuclear with which to 'compete' and South Africa becomes dependent on renewable energy to ensure its energy security.

Box 2: Non-dispatchable (variable) power

Non-dispatchable power cannot be turned on or off in order to meet society's fluctuating electricity needs. It is the opposite of dispatchable sources of electricity which are very flexible, being able to change their output fairly quickly in order to meet electricity demands. Non-dispatchable electricity sources are often highly intermittent, which means that they are not continuously available due to factors that cannot be controlled (for example the weather). There are many different types of non-dispatchable sources such as tidal power and wave power, but two main types that contribute noticeably to the electrical grid: solar power and wind power.[113]

Third, Eskom's 'death spiral' will intensify. System costs (sometimes called 'non LCOE costs') not reflected in the PPAs will either be passed on to end users or will show up as red ink on Eskom's balance sheet. And yet, according to IRP 2019, by 2030 still 60 percent of South Africa's electricity will be generated by burning coal. By 2030, renewables are expected to contribute 32.8 percent of electricity in South Africa, comprising 26.6 percent from solar, wind, and CSP (Concentrated Solar Power), and 6.2 percent from hydro. According to the IRP, 'Eskom's existing generation plant will still dominate the South African electricity installed capacity for the foreseeable future.

The current and future performance of these Eskom plants is critical for security of supply and heavily influences the capacity planned to be introduced under the IRP'.[114] But if all of the wind and solar supplying the

[112] Keay, M. and Robinson, D. (2019) *Limits of Auctions: reflections on the role of central purchaser auctions for long-term commitments in electricity systems*. Oxford: Oxford Institute for Energy Studies (OIES).

[113] Energy Education. (Undated) 'Non-dispatchable source of electricity'. Available at: https://energyeducation.ca/encyclopedia/Non-dispatchable_source_of_electricity. (retrieved 16 May 2020)

[114] Department of Energy (DOE) (October 2019) *Integrated Resource Plan* (IRP 2019), 34. Pretoria: Department of Energy.

system operates within the current IPP system with PPAs, Eskom will be an economic basket case as a result of having to purchase large volumes of variable wind and solar energy while at the same time having to upgrade the grid in order to manage the effects of a large increase in non-dispatchable (variable) power.

Given that Eskom's power will still be needed, if the utility is unbundled, and its coal fleet is expected to compete with IPPs in renewables enjoying 'out of market' protections in the form of 20 year PPAs, then Eskom's generation operations will probably require 'capacity payments' in order to avoid bankruptcy. These payments will need to be in place in order to provide security of supply up to 2030 and perhaps far beyond. South Africa will then be stuck in a 'subsidies for all' situation that today reflects what is going on in the EU's electricity sector. This will *slow down* the transition to a renewables-based system because of the 'signals' these capacity payments will send to renewable energy developers, suppliers, and investors.

If Eskom's transmission system becomes a separate entity, it will shoulder all the 'system costs' associated with rising wind and solar generation. These costs may include balancing costs (adjustments of dispatchable power plants that respond to short-term variability), collector stations and other grid costs (that can include additional transmission) and costs related to any back-up capacity that may be required. These 'costs of integration' are highly location-specific – they depend on available power system resources as well as on the characteristics and penetration levels of the specific variable renewables being used. So they become difficult to estimate in monetary terms.[115] We will return to this issue below.

The future of South Africa's energy system, and the health of its people, cannot be held hostage by cost per kW/hr to generate electricity

But the evidence suggests that if renewable energy is expected to produce 32 percent of South Africa's electricity by 2030, then these costs are likely to be considerable. And they will not be invoiced to the IPPs; they will, instead, become the responsibility of Eskom Transmission Entity (Eskom TE). The still-public transmission entity will then quickly become economically unviable, and it will need to be bailed out by public funds.

The DPE's *Roadmap for Eskom* makes light of these costs and the other challenges that will face the proposed Eskom TE. It notes that South Africa's transmission system is already in a state of decline, with much of its 33,000 kms of transmission lines between 30 and 40 years old and a third of lines more than 40 years old.[116] New investment is therefore needed. According to the DPE, forming a separate Eskom TE will 'boost investor confidence' because Eskom TE will, as an independent entity, be able to 'foster accountability within the remainder of Eskom'. Increased investor confidence 'will enable security of supply through increased investment'.[117] But it is not clear

[115] Ueckerdt, F., Hirth, L., Luderer, G. and Edenhofer, O. (15 December 2013) 'System LCOE: What are the costs of variable renewables?' *Energy*, vol. 63: 61–75. Available at: http://www.sciencedirect.com/science/article/pii/S0360544213009390 (retrieved 23 June 2020).
[116] DPE. *Roadmap for Eskom in a Reformed Electricity Supply Industry*.
[117] *Ibid*.

how 'investor confidence' will be enhanced by the knowledge that transmission upgrades will incur costs just to sustain the system *as is*, and that these costs will need to be recovered at a level that is above the cost of the upgrades in order to secure returns on investment.

Fourth, in addition to monetary costs, there is likely to be no viable plan to deal with the technical challenges of variable power, an issue addressed in more detail below. According to Eskom, the REI4P system already poses problems of managing and balancing the grid. Eskom currently has to deal with this intermittent and 'non-dispatchable' power supply. And while REI4P-generated power only amounts to around 4 percent of South Africa's electricity generation, its impact is nonetheless disruptive. This supply, says Eskom:

> *had to be purchased ahead of other, potentially cheaper sources. South Africa has started to see the impact of the intermittency of the renewable plant on the system…[this] has not been problematic from a system perspective. However, the ever-increasing contribution from Solar PV and the large growth in rooftop PV foreseen will require a change to the mix of plant available to improve flexibility in the system and ensure the future reliability of the grid.*[118]

Fifth, the current investment crisis in the power sector will grow more severe. It is well known that considerable investments in networks will be needed to accommodate challenges such as the integration of more decentralised resources, digitalisation, smart metering, charging infrastructure for electric vehicles, etc. And if wealthy Europe is facing investment headaches, then South Africa will suffer a paralysing migraine by comparison. According to the European Commission, €30 billion was invested in the EU's distribution networks in 2018 (i.e. 85.7 percent of the total EU grid spending) and €3.5 billion in transmission networks. But the average investment needed for the EU's power grids in the 2021-2030 horizon has been estimated to be between €60 and €110 billion per year.[119] In addition, in South Africa there will be decommissioning costs associated with coal that have, as yet, not been fully quantified.

Sixth, the intensification of the 'death spiral' (and the accompanying disintegration of infrastructure) will likely lead to more businesses and residents going off grid. IRP 2019 notes this growing trend (but without estimates or quantifications). Globally, one of the growth areas for renewables has been so-called 'corporate PPAs where, as the term implies, corporations enter into PPA contracts with renewable energy developers.[120] However, these same companies will fall back on the grid as needed, but the contribution to the grid by way of electricity tariffs will

[118] Eskom (July 2018) *Draft Revenue Application FY2019/20 - 2021/22. For consultation with SALGA and National Treasury*, 107.
[119] Data cited by Eurelectric, see: https://cdn.eurelectric.org/media/4005/power-barometer-final-lr-h-3A4C4DC9.pdf (retrieved 23 June 2020).
[120] Frankfurt School-UNEP Centre/BNEF. (2019). *Global Trends in Renewable Energy Investment 2019*. http://www.fs-unep-centre.org (retrieved 26 June 2020).

have nevertheless been reduced. Of course, companies and wealthy residential users may have the 'off grid' option, but poor and working class families and many small enterprises will not.

The public pathway

There is, of course, an alternative. Many of the policy contradictions and *cul-de-sacs* outlined above could be resolved if the neoliberal 'energy for profit' policy framework was consigned to history. This is where it most certainly belongs. Neoliberal energy policy does not become a 'success story' simply because trillions of dollars in public money have so far been used to develop a renewable energy sector. That sector is today facing a deep crisis. The fact that the incumbent companies were privatised and thrown into a 'death spiral' and are themselves increasingly subsidised in order to keep the lights on is hardly the hallmark of a policy accomplishment. In the light of this massive policy failure – one that many prefer not to acknowledge – the case for social ownership of renewables emerges as the only viable option for energy transition in South Africa.

4

OUR PROPOSALS

AN ALTERNATIVE SOLUTION TO THE DEBT CRISIS

The Government Employees Pension Fund is required by law to be fully funded. That means that at any one moment it has to have sufficient accumulated funds to pay out pensions to all its beneficiaries simultaneously. Since this is never going to happen, it has large amounts of unused capital. The Unemployment Insurance Fund (UIF) has accumulated a substantial surplus. These two funds are managed by the Public Investment Corporation (PIC), which is the largest government fund in Africa, with over R2.1 trillion in assets under management.[89] R1.8 trillion (87 percent) of these funds belonged to GEPF in March 2018 and R156 billion or 8 percent to UIF.

USE GEPF TO FUND ESKOM

Ever since the start of the GEPF in 1996, there has been no need for it to 'maximise its returns'. To secure benefits and pensions to government employees is GEPF's main objective, giving reasonable increases every year.

As for coping with the problem of inflation hollowing out the buying power of money, the law says that the pensions each year must increase by at least 75 percent of the inflation rate. Pensions and benefits have on average increased by more than inflation since 1996. This is in line with a widely accepted rule: pensions in general should not fall behind the real growth rate of the economy. A 'maximising returns' goal is of course not stated in the Government Employee Pension Law of 1996.

A January 2018 media release, containing the GEPF Board's reaction to the suspension and investigation of PIC managers for patronage and corruption, said that 5 percent of its funds are invested in unlisted companies 'to drive transformation' (i.e. the formation of a black business class) but that GEPF is 'still aiming to realise its main objective of maximising returns'.[90]

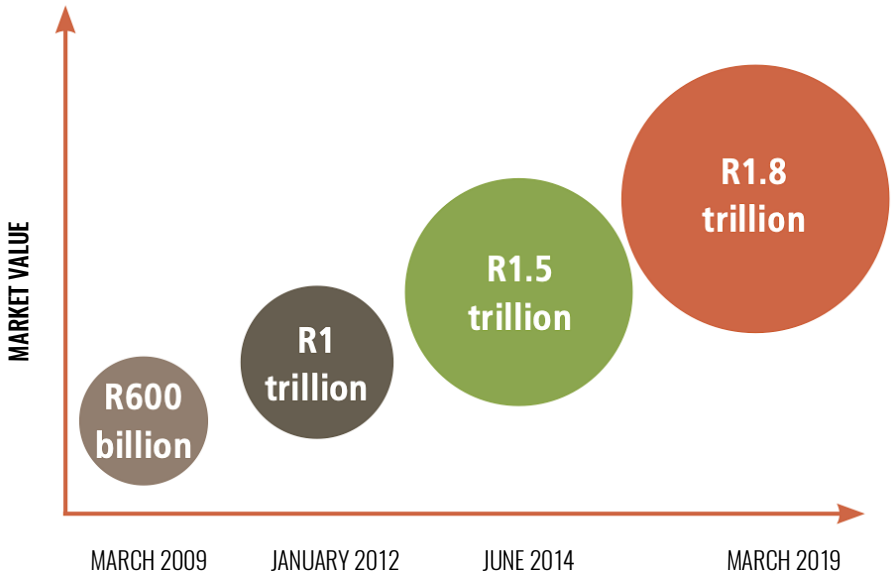
In 2012, there was a rule change in the GEPF's pension scheme which allowed an employee to withdraw all their actuarially calculated pension claim if they left their job before the normal retirement date. This change demonstrated the healthy state of the fund. And it remained healthy even when it drastically increased pension benefits. They doubled between 2012/13 and 2014/15 before stabilising at that much higher level. The GEPF's cash income surplus continued. In the 2018 fiscal year it was still R47.5-billion.

[89] PIC (2019) *PIC Integrated Annual Report 2019*. Pretoria: Public Investment Corporation (2019).

[90] Government Employees Pension Fund (GEPF) (22 November 2019) 'Statement by the Government Employees Pension Fund on the suspension of PIC Officials', Press Release. Available at: https://www.gepf.gov.za/statement-by-the-government-employees-pension-fund-on-the-suspension-of-pic-officials-2/ (retrieved 29 June 2020).

In 2019, the surplus after paying all benefits reached close to R55 billion. There were no additional payments from the government to deal with the earlier shock. The contribution rates have not increased, but the market value of GEPF's total financial assets has continued to grow (see figure below).

Figure 17: GEPF's market value, 2009-2019



Source: GEPF (2019). *GEPF Annual Report 2018/2019*. Pretoria: Government Employees Pension Fund (GEPF).

The alternative to the GEPF's 'fully funded model' is another pension fund model called *Pay-as-you-go*.[91] In this scheme, the current contributions from working members, plus the scheme's current investment incomes, should be enough to cover all benefits paid to retired members 'as you go along'. This has been common for large public funds. The manager does not strive to have assets to pay what the scheme owes to all its beneficiaries at once, as if they are working at or retired from a private corporation. The need for private corporations to do this derives from the possibility that one day they might be liquidated. A 'fully-funded' scheme takes that theoretical possibility into account. From the 2017 Budget Review, the Treasury started to report on the financial health of this pension scheme as if it was a Pay-as-you-go scheme. This is a prudent way of looking at how such a large pension fund is doing. From this perspective, the GEPF is completely bloated. At the same time, Eskom is close to bankruptcy.

The investment income in Table 2 above represents the real payments to PIC coming from the financial assets belonging to GEPF: mainly dividends from shareholding and interest on bonds. From a cash flow (or Pay-as you-go) perspective, over the last 10 years the cash return from bonds has been more advantageous to GEPF than the annual cash returns from dividends:

[91] This perspective is described in an AIDC study about PIC/GEPF: AIDC (2020) *The Public Investment Corporation and Financing a Just Transition.* Cape Town: Alternative Information & Development Centre.

on average over 7 percent in cash returns on bond holding value, compared to about 3.3 percent in dividends paid out on the total value of shares under management at PIC. Over two thirds of the 'Investment income' in Table 2 above comes from interest on bonds (tradable loans).

Table 2: GEPF cash account 2010/11 to 2018/19 (billions of Rand)

Financial year	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Contributions	40	44,2	47,9	52,2	56,4	60,3	65,5	70,4	**75**
Invest. cash income	40,6	44,5	49,9	54	68,5	69	69,5	72	**82,8**
Contrib. & income	80,6	88,7	97,8	106,2	129,3	129,3	135	142,4	**157,8**
Benefits paid	29,9	37,2	43,2	57,9	83,1	83,1	88,3	94,9	**103**
Surpluses to reinvest	50,7	51,5	54,6	48,3	46,2	46,2	46,7	47,5	**54,8**

Cash account for GEPF's finances. Source: Treasure's Budget Reviews 2017-19, GEPFs' annual reports, and own calculations.

GEPF's risky investment policy

Out of the more than R1.8 trillion in assets GEPF held in March 2019, the market value of its shares was R1.034 trillion or over 55 percent of all its assets. This comprises some 7-8 percent of the combined value of all shares traded on JSE. GEPF effectively cannot order its manager, PIC, to sell off large chunks of its shareholding at once, as speculators always do during a market crash. It would cause panic and exacerbate the total price fall. This observation is relevant for the discussion of how GEPF should be used when we have to deal with Eskom's debt crisis.

With over 50 percent invested in company shares and only about 30 percent invested in safer bonds (lending money at interest to Eskom, the Treasury, municipalities and also companies) the GEPF is taking on too much financial risk. Its investment policy can be compared to UIF's. UIF holds about 25 percent of its financial assets in shares.[92]

From 2016 to 2018, the auditor increased the goal for the GEPF's 'solvency fund' from R302bn to R402 billion There was no explanation for the 33 percent increase in this safety requirement, but it reflects the fact that the risk of investment losses was regarded as having increased. A solvency fund protects pension payments against sudden losses from risky investments and stock market crashes. A riskier investment policy – more investment in shares – demands a larger solvency fund.

But in fact only about one third of the 2018 solvency requirement was met[93]: There was only R137.5bn of financial assets left in the GEPF to meet the R402bn safety requirement demanded by the independent auditor.[94] 60 percent of the required safety funding was missing.

We wrote the warnings in this section of the report in August 2019, long before the more than 30 percent crash of share prices on the JSE,

[92] As at March 2018.

[93] This figure is correct even when setting to zero and disregarding the other political contingency fund requirements that were added since 2006.

[94] GEPF (2018) *GEPF Statutory actuarial valuation as at 31 March 2018.* Available at: https://www.gepf.gov.za/wp-content/uploads/ 2019/08/ GEPF_Statutory_Actuarial_Valution_31_March_2018.pdf (retrieved 23 June 2020).

triggered by Covid-19. Now we are finalising this text in the middle of April 2020, and the JSE has recovered by some 10 percentage points. It is however still down 17 percent since March 2019, and there are no guarantees there won't be a second, even deeper crash. The pandemic is very far from over, especially in Africa.

As a result of the March crash, the 2020 annual report will value the GEPF's investments in equities at some R250-R300 billion less than the approximately R964 billion 'fair market value' reported on 31 March 2019. It follows from the 'fully funded' rules that the 2020 audit will recommend a cut in pensions and benefits.

From a cash flow and PayGo perspective, however, there is no need to change the pension benefits. Even if the GEPF takes a 'hair cut' on its claims on Eskom, and moderates its claims on the South African government, and even if the market value of its total funds has fallen from R1.8 trillion in March 2019 to around R1.5 trillion in March 2020, the scheme will still run a surplus.

GEPF assets also include around R900 billion in investments other than on the JSE, including South African government and other African government bonds, South African state-owned companies, and South African municipality and corporate bonds of all kinds.

With the economic crisis triggered by Covid-19, and the vast numbers of people requiring massive support, as well as the additional funds required for public health, it is even more urgent not to overfund the GEPF and invest its funds in risky assets. It should adopt a policy of assistance to Eskom as well as to the government at large.

All that's needed is a change of policy

What if the GEPFs investment policy on shares and bonds was reversed? Instead of 50 percent in local equity and 32 percent in local bonds, put the 50 percent into bonds and leave 32 percent for equity. That extra 18 percent could offer the government and indebted SOEs, specifically Eskom, up to R450bn more in credit from a creditor that the government itself controls. The terms of intra-governmental loans can be decided outside the markets, bringing down the interest rates without endangering pension guarantees.

As soon as we acknowledge that the debt crisis of Eskom must be solved outside the national budget, there are many options. For example, in times of debt crisis for governments, private creditors have often been offered a so-called 'haircut' in exchange for the risk of losing all their claims. A 'haircut' can mean a lower interest rate on a loan. In this case the government would be negotiating with a state organ. Alternatives could range from simply writing off the debt to delaying the capital repayment.

GEPF could take a haircut on its R84 billion bond claim on Eskom[95] with no risk for the guaranteed pension payments: the minimums are defined in

[95] As at March 2019.

the GEP Law of 1996. It can forfeit some R6 billion in interest income from its Eskom bonds, converting these claims to an interest free loan.

But what about the R573bn 'long-term funding shortfall', reported in the press after the March 2018 independent audit? This was a theoretical demand on GEPF's funding from the auditor who was making an actuarial audit from a 'fully funded' perspective[96]. The majority of this theoretical shortfall of funds was the drastically increased demand for the solvency fund. If the GEPF and the Finance Minister comply with the audit demand and switch its policy from risky shareholding to more secure bonds (and Treasury bonds are the safest), the size of the solvency fund would diminish drastically, and with it the theoretical 'shortfall'.

That this is the right thing to do, not only because of Eskom, should be evident. There is no basis in the real economic world of South Africa for the GEPF to own R573bn more in financial assets than it requires. It is *imali yomoya* (imaginary money).

Excessive contributions to GEPF

And then there are the contributions. A steady 13 percent of the public sector wage bill every year comprises the excessive contributions from tax revenue to the GEPF.[97] The contributions will amount to about R80 billion in the 2020 financial year. Meanwhile the GEPF will run with a cash surplus of R50 billion, at the same time that Eskom is experiencing a debt crisis.

Given the available resources at hand to deal with Eskom's debt crisis, it is almost incomprehensible to see GEPF managers apparently struggling to motivate why the state pension fund must act to stop electricity from being cut off. Motivating an emergency loan to Eskom in the beginning of 2018 the Annual Report reads:

> *It was never an elephant [sic], but it's best mentioned [sic] that the PIC, as GEPF's asset manager, advanced a R5 billion bridging facility to Eskom for one month, February to March 2018. Eskom repaid the loan, with interest, as agreed. We believe that the investment was in the best interest of the Fund and South Africa and its economy, seeing that failure of Eskom to service its debt would have resulted in a cross-default, with catastrophic consequences. While the GEPF pursues good risk-adjusted investment returns for the benefit of its members and pensioners, it also recognises its role in the economic development of South Africa, Africa and the world.*[98]

The independent 2018 audit shows, however, that the investment policy isn't 'risk-adjusted'. By their own cherished standards, the Finance Minister and the GEPF board cannot defend the present investment policy of the pension scheme. To change the terms of Eskom's debt to GEPF

[96] This is closely examined in: AIDC (2020) *The Public Investment Corporation and Financing a Just Transition*. Cape Town: Alternative Information & Development Centre.

[97] The contribution rates are higher, but not all remuneration is pensionable.

[98] GEPF. (2018) *2018 Annual Report*, 13. Pretoria: Government Employees Pension Fund.

is not to destroy financial wealth. It is to move money from a place where 'maximised returns on investments' are not needed, not required by the GEP Law and not rational from the point of view of the vast majority of citizens.

Eskom is too big to fail, but the Treasury must stop supporting Eskom via the national budget, borrowing more money for this purpose at market rates and irrationally increasing its debt service costs. The budgeted R112 billion transfer to Eskom over the coming three years must be stopped. The political agenda must change. Austerity must be reversed; the Eskom debt crisis must not be used to sharpen it. While we wait for prosecutions and the scrapping of Eskom's corrupt sales contracts, there is an obvious solution at hand.

DEALING WITH ODIOUS DEBT

An additional way to reduce and restructure Eskom's debt is to repudiate odious debt.

In April 2010, the World Bank Group's International Bank for Reconstruction and Development (IBRD) approved a US$3.75 billion loan to Eskom as a major part of the funding for the Eskom Investment Support Project, justified under the guise of promoting renewable and clean energy. Despite this rhetoric, $3.05 billion of the loan was dedicated to completion of the Medupi coal-fired power station in Limpopo. This power station, if completed, will be the largest coal-fired power plant on Earth, emitting more carbon dioxide than the 143 least-emitting entire countries.[99]

Despite significant and wide ranging concern about the fate of Eskom, the World Bank has recently expressed its *full confidence* in its ability to complete Medupi and ensure national electricity provision. The Bank's vote of confidence in the struggling entity is a product of the Ramaphosa government's courting of international investors and financial institutions at the expense of ordinary South Africans.

Given the overwhelming evidence of corruption and environmental degradation fostered through this loan, the grounds for repudiating the debt are ripe. Instead of accepting the World Bank's vote of confidence in the struggling power utility, the public should use the moment of Eskom's crisis to express a lack of confidence in the World Bank, an expression that must be accompanied by the repudiation of the debt incurred in 2010. The odious nature of the debt is clear, and it is only a lack of political will that prevents the state from standing up to the Bank.

The doctrine of odious debt, long recognised in international law, rests on two pillars:

1. That the debt was incurred against the best interests of the population of the borrower state, and

[99] $260 million was also dedicated to building the Sere Wind Farm and the Upington Concentrated-Solar Project. A further $450 million was meant for 'low carbon efficiency components,' which mainly translated into a railway for transporting coal.

2. That this condition was known, or ought to have been known, by both borrower and lender.

The Committee for the Abolition of Illegitimate Debt (CADTM by its French acronym) is an international network of finance and debt specialists, with extensive experience of studying odious debt dating back to 1980. CADTM defines *odious debt* as follows:

> *Debt, which the lender knew or ought to have known, was incurred in violation of democratic principles (including consent, participation, transparency and accountability), and used against the best interests of the population of the borrower State, or is unconscionable and whose effect is to deny people their fundamental civil, political, economic, social and cultural rights.*[100]

The obscene climate degradation, local pollution, and blatant corruption surrounding the 2010 loan clearly signify that it was against the best interests of South Africans and denies South Africans their rights. The debt is manifestly odious.

The 2010 World Bank loan was also mired in severe corruption. Hitachi Power Africa, the sub-Saharan African subsidiary of transnational corporation Hitachi, was contracted to build the boilers at the Medupi power station. Chancellor House Holdings, an ANC investment arm, owned 25 percent of Hitachi Power Africa. The ANC itself is said to have been enriched by up to R1 billion through Chancellor House's dealings with Hitachi, earning roughly a 5,000 percent return on investment.

The links between Chancellor House and the upper echelons of the ANC have long been known and were reported on in South African media before the 2010 loan. In November 2006, the Institute for Security Studies published an exposé revealing that Chancellor House was an arm of the ANC, and Kgalema Motlanthe later confirmed the connection. Hitachi Power Africa was formed at the end of 2005, with Chancellor House Holdings a stakeholder. In 2007 Hitachi won R38.5 billion in contracts to build boilers for Eskom, including Medupi's boilers.

In 2015 the United States Securities and Exchange Commission (SEC) ordered Hitachi to pay a fine of $19 million, due to its breach of the US Foreign Corrupt Practices Act. The SEC investigation found that Hitachi gave Chancellor House millions of US dollars in 'success fees' in instances in which Hitachi was granted contracts 'substantially as a result' of Chancellor House's direct connection to ANC decision makers. This ensured that it was profitable for the ANC to contract Hitachi. The investigation found that Hitachi was explicitly aware of the ANC-Chancellor House connection and intentionally used this connection to win contracts. By loaning Eskom billions of US dollars, the World Bank was fostering and condoning such corruption.

[100] The Truth Committee on the Greek Public Debt (21 May 2015) 'Definition of illegitimate, illegal, odious and unsustainable debts', The Committee for the Abolition of Illegitimate Debt' (CADTM). Available at: https://www.cadtm.org/ spip.php?page=imprimer&id_article=11662 (retrieved 16 June 2020).

Following the SEC settlement, the Democratic Alliance requested that the World Bank carry out its own investigation. Suspiciously, the stunted probe, which concluded that a full investigation was not warranted, was approved by the Bank's then Vice-President for Integrity, Leonard McCarthy. Besides McCarthy's clear conflict of interest in this probe, given his political and social proximity to the ANC as former head of the Directorate for Special Operations (Scorpions), McCarthy is perhaps best known for using the Scorpions as a political tool for influencing internal ANC leadership struggles in favour of Thabo Mbeki. This puts into question McCarthy's own integrity and the earnestness of the Bank's investigation.

Even the current head of the World Bank, David Malpass, has been critical of the corrupt dealings of the Bank. As Bear Stearns chief economist, Malpass urged the public not to panic about the credit market, just months before Bear Stearns collapsed from exposure to subprime mortgages, indicative of the calibre of economic leadership the World Bank encourages. In a rare moment of honesty at a US House hearing in 2017, Malpass accused the Bank of regular corruption when dealing in developing countries, explicitly mentioning South Africa. This serves as yet another example of the understanding at the highest levels that the World Bank's loans are not in the public interest.

In the face of the current government's constant appeasing of international financial institutions, South Africans must demand accountability to the public. Repudiation of Eskom's debt to the World Bank is a simple, yet effective demand. The clearly illegitimate nature of the debt burden could be used to rally popular mobilisation, allowing the public to hold the South African government and the World Bank responsible for the massively adverse effects of the 2010 loan to Eskom.

In summary, politicians, civil society, organised labour, and numerous other stakeholders recognise that there is an urgent need to address the Eskom situation in some manner. Rather than the common suggestion of 'unbundling' of Eskom, a more appropriate measure would be to make credit available from the GEPF and cancel the odious Eskom debt.

TOWARDS SOCIALLY OWNED RENEWABLE ENERGY IN SOUTH AFRICA

Earlier in this report we pointed to the need for fresh assessment of South Africa's energy crisis and the longer-term challenges of transition. We have explained how the debate on energy transition has been distorted by important misconceptions with regard to the source of Eskom's crisis, the 'success story' of renewable energy and various 'least cost option' and 'tipping point' arguments.

We also analysed the tendency to seriously understate some of the technical challenges associated with a 'deep decarbonisation' strategy based on a the large-scale deployment of renewable energy. We have shown that any expansion of the REI4P program will backfire on the energy transition process – it will intensify the 'death spiral' of Eskom in a period when a good portion of Eskom's generation will still be needed.

We believe we have shown how public energy and a transformed national utility can provide the means to deal with the current crisis and transition-related challenges, both technical and economic, in ways that are effective and equitable.

HOW SOCIAL OWNERSHIP CAN WORK FOR SOUTH AFRICA

Social ownership of renewable energy will not work if it is constructed as a 'rival' sector that competes with Eskom. The deployment of renewables at scale and over a significant period of time is only possible in the context of a comprehensive public reclaiming of the entire power sector.[101] This is the best means to avoid the kind of chaotic and regressive outcomes that currently plague countries and regions that have kept faith with the 'energy for profit' neoliberal model. Put differently, the development of a socially owned renewables sector and the creation of a modern national utility are a single, but distinctly two-sided, proposition.

The case for public ownership also has a large technical dimension. Earlier we discussed the 'death spiral' phenomenon and its destructive impact on energy systems. Because renewable sources of power will remain variable for the foreseeable future, back-up power is essential. This means the old and the new must coexist for what could span several decades, but in a state of transition not in a state of *stasis.* According to the Fraunhofer Institute for Solar Energy Systems:

PV and wind power may currently be capable of *reducing* the use of fossil fuels…but until considerable storage capacities for electricity or hydroelectric storage facilities are available in the grid, they are not capable of replacing capacities. Calm, dull winter days, when power consumption is at a maximum and no solar or wind power is available, present the most critical test.[102]

This section therefore touches on a number of issues that are technical in nature. However, it is important to acknowledge at the outset that public ownership is not *a solution* to the technical problems, but it will provide the best possible platform for dealing with them. Nevertheless, a modern public system will probably end up being a fully integrated system that is managed on a public goods basis.

This section also shows how taking profit out of energy opens up a 'public pathway' for South Africa's decarbonisation process. The current 'energy for profit' model provides a different pathway, one that will likely

101 Sweeney, S., Treat J. and HongPing Shen, I. (March 2020) 'The Rise and Fall of 'Community Energy' in Europe', *TUED Working Paper #13*. Available at: http://unionsforenergydemocracy.org/resources/tued-publications/tued-working-paper-13/ (retrieved 23 June 2020).
[102] Wirth, H. (7 January 2020) *Recent Facts about Photovoltaics in Germany*. Fraunhofer ISE.

lead into a policy quagmire and a protracted period of uncertainty and crisis.

But can a socially owned system deliver the kind of energy transition South Africa, its people, and its climate clearly need? The answer to this question is yes. Not only is social ownership the best option in terms of energy self-determination and job creation, it also provides a needs-based framework whereby technical challenges can be addressed without having to address investor concerns. In addition, it offers the most feasible option for the decarbonising of the energy system, which is important for several reasons, including dealing with climate change as well as industrial and economic development.

SOUTH AFRICA'S SUN AND WIND RESOURCES

Before we examine more closely the key tasks involved in the struggle for social ownership, it is worth reminding ourselves that South Africa has abundant sun and wind potential. Studies have suggested that the country has up to 300 GW of solar potential alone, of which approximately 73 GW could be generated from rooftops.[103] This amounts to around 550 TWh of yearly electricity generation.

Many NGOs have argued that, because of these abundant resources, South Africa is well positioned to 'painlessly' transition away from coal towards renewable sources of energy.

If the deployment of renewable energy simply depended on the availability of wind and sunshine, then the entire continent would have gained access to a reliable and affordable supply of electricity by now. But in 2017, 573 million people in sub-Saharan Africa lacked access to electricity.[104] For every ten people without electricity globally, seven live in sub-Saharan Africa.[105] In 2018, there were 71 million more people without electricity in sub-Saharan Africa than was the case in year 2000.[106]

South Africa's wind and sun resources are nevertheless an important factor in determining what kind of decarbonisation is possible and how it might be accomplished. In the case of solar irradiation, there are far less seasonal fluctuations in South Africa than there are in many other parts of the world, and wind conditions are similarly quite consistent all year round. Together, these factors mean that South Africa could have a steady supply of energy without the need for *seasonal* storage. At first glance, this removes a major technical hurdle given that, aside from pumped hydropower, it is not commercially available anyway. But, as is explained below, there are other challenges that also need to be addressed.

[103] Knorr, K., Zimmermann, B., Bofinger, S., Gerlach, A-K., , Bischof-Niemz, T. and Mushwana, C. (November 2016) *Wind and Solar PV Resource Aggregation Study for South Africa, Final Report*. CSIR, Fraunhofer IWES, Sanedi, Eskom.

[104] IEA, IRENA, UNSD, WB, WHO (2019) *Tracking SDG 7: The Energy Progress Report 2019*, Washington DC. See also: World Bank (2019) 'More People Have Access to Electricity Than Ever Before, but World Is Falling Short of Sustainable Energy Goals', World Bank, Media release. Available at: https://www.worldbank.org/en/news/press-release/2019/05/22/tracking-sdg7-the-energy-progress-report-2019 (retrieved 23 June 2020).

[105] IEA, IRENA, UNSD, WB, WHO. (2019) *Tracking SDG 7: The Energy Progress Report 2019*. Washington DC: IEA, IRENA, UNSD, WB, WHO.

[106] Tracking Sustainable Development Goal 7: World Energy Report [World Bank et. al.] https://trackingsdg7.esmap.org/data/files/download-documents/02-sdg7-chapter1-accesstoelectricty_0.pdf, 23 (reviewed 26 June 2020).

FIVE SPECIFIC TASKS

This section proposes five specific but interlocking tasks around which the struggle for social ownership might be conducted. These tasks will span both the short and medium terms, and they are discussed in more detail below.

Task 1 is to stop the 'unbundling' of Eskom with an eye on *reversing the process of privatisation* and marketisation that began roughly two decades ago. With the current crisis in neoliberal climate policy becoming every day more obvious, unions and their allies can show that a modern, integrated utility is necessary for the energy transition to be achieved.

Task 2 will involve waging an aggressive campaign at the global level that targets the (now politically frayed and fragile) network of international trade law, including its restrictions on intellectual property. In 1997 South Africa government was a world leader in the global effort to allow for the provision of antiretroviral medications (ARVs) based on need. South Africa could champion a new multilateral approach to energy transition, one that opens the door to skills and technology transfers as well as 'public-public partnerships' (PUPs).

Task 3 is to halt the REI4P program and to begin to lay plans for *insourcing* the skills and technologies to develop a viable domestic renewables industry in South Africa. The REI4P is not helping to advance renewable energy deployment; it is adding cost and complexity and it will need to be brought to an end. Just as the feed-in tariff approach was eventually abandoned, capacity auctions are eradicating profit and discouraging investors.[107] With social ownership another decarbonisation is possible.

Task 4 involves a fresh examination of the various options for energy transition. This task is particularly important and it therefore receives a lot of detailed attention here. Such attention seems warranted given that there are diverging assessments of the best way to pursue a high renewables strategy, given the uncertainties around the various technologies. A fresh examination must consider *all* decarbonisation options. As the Energy Research Centre (ERC) points out, 'decisions made now on technology choices will have a long-term effect on the structure of the electricity system, the associated level of emissions and the costs of any future transition'. Therefore 'Choosing pathways that avoid long-term technological 'lock-in' whilst prioritising socio-economic wellbeing and transparent and democratic policy processes is crucial to the realisation of decarbonisation'.[108]

Task 5 concerns proposing ways to finance the energy transition, and to assess the capacity of government to commit or generate funds for what will surely be a 30 year move away from coal-fired power to a new,

[107] 'Governments should not therefore see the success of auctions to date as an indication that they represent the optimum long-term solution for the sustainable low-carbon market of the future'. See: Keay, M. and Robinson, D. (2019) *Limits of Auctions: reflections on the role of central purchaser auctions for long-term commitments in electricity systems*. Oxford: Oxford Institute for Energy Studies (OIES).

[108] Energy Research Centre (ERC) (November 2015) *The political economy of decarbonisation:Exploring the dynamics of South Africa's electricity sector*. Cape Town: ERC.

low carbon, and more sustainable energy portfolio that ensures South Africa's energy sovereignty and security. But first we need to establish *what* we hope to finance, and for what purpose. As a guiding principle, government debt financing is a less expensive way to produce public goods infrastructure and capacity than the far more expensive 'public-private partnerships' approach that includes PPAs.

TASK ONE: STOP UNBUNDLING - SLOW MOTION PRIVATISATION CAN BE REVERSED

Clearly, the immediate task facing those who defend public ownership of energy and who see the need for a modern national utility is to stop the unbundling of Eskom.

There is no reason to believe that Eskom cannot be radically reformed. Institutions have the capacity to change, and they can change fundamentally. It bears repeating that Eskom's CEO-level corruption, mismanagement, etc. are not intrinsic to publicly owned electricity systems. In Eskom's case, many of these problems are, either directly or indirectly, the result of marketisation of the utility, although a good number of otherwise progressive voices have concluded that the failure of the process of neoliberal reform has contributed to Eskom's current crisis.[109] We deal with the issue of governance in more detail in the last section of this document.

It is often stated that Eskom is 'soaked in coal culture' and is therefore hardly suited to the task of integrating different forms of energy, particularly wind and solar power.

But once the coal is burned, turbines take over, as do the transmission and distribution systems that bring power to end-users. On the one hand, we can't ignore the mutual dependence between Eskom and the coal industry within the Minerals Energy Complex. On the other hand, whilst coal is the fuel that is used to generate the power, generation is only one part of Eskom's current set of functions and responsibilities.

There is simply no reason to believe that privatisation of Eskom cannot be stopped and reversed. It is worth remembering that more than two decades have passed since the South African government, in its 1998 *White Paper on the Energy Policy of the Republic of South Africa,* indicated its intention to introduce 'cost-reflective tariffs', diversity of supply, and competition and trading in the electricity sector, including the unbundling of Eskom.[110] The *White Paper* provided for the introduction of IPPs into the generation market, but it took 13 years to get the REI4P program off the ground. In the seven years since the REI4P was launched, the total amount of wind and solar power installed in South Africa is just 3.9 gigawatts (GW); that's a mere 3 - 4 percent of the country's electricity. So today, Eskom remains responsible for nearly all generation and transmission of South Africa's electricity.

[109] Energy Research Centre (ERC) (November 2015) *The political economy of decarbonisation:Exploring the dynamics of South Africa's electricity sector.* Cape Town: ERC.
[110] Department of Minerals and Energy (DMW). (1998) *White Paper on the Energy Policy of the Republic of South Africa.* Pretoria: DME.

In April 2001, the Cabinet took a formal decision to restructure the electricity supply industry by unbundling Eskom. It planned to sell 30 percent of Eskom's generation capacity and to ensure that all new generation capacity was built by the private sector. Eskom was converted into a public company in July 2002, but it was only in 2006 that the framework for private sector participation in electricity generation was created with the enactment of the Electricity Regulation Act (ERA).

An important piece of the neoliberal architecture of privatisation is the presence of an Independent System and Market Operator (ISMO). An ISMO is responsible for the procurement function and acts as the buyer of electricity generated, thus preventing Eskom from continuing in its role as both buyer and generator on 'conflict of interest' grounds. According to neoliberal logic, the fact that Eskom is a public system built up over decades, and much of the infrastructure costs have been fully paid for, amounts to an 'unfair advantage'. Therefore, the ISMO's job is to 'level the playing field' by giving IPPs preferential treatment and guaranteed access to the grid. Clearly, this is not introducing competition. It amounts, instead, to the suspension of competition in the service of private interests and profit-making.

The Department of Minerals and Energy's *Energy Security Master Plan: Electricity 2007-2025* concluded that the case for full competition on a 'merchant' basis was weak, and that any private participation in the electricity industry will need to happen via the IPP mechanism, with power purchase agreements with Eskom - the so-called 'single buyer model'.[111] This decision was a major blow to those who advocated for the kind of competitive wholesale market that had been established in Europe. The IPP mechanism would ensure that private investors would enjoy 'out of market' protections. Had there been a competitive market for electricity, Eskom's prices for coal would have prevailed for years into the future.

The DPE's October 2019 proposals to restructure Eskom (the *Roadmap for Eskom in a Reformed Electricity Supply Industry*[112]) provide for Eskom's transmission business to be 'fully functionally separated into a newly formed subsidiary of Eskom Holdings SOC Limited by 31 December 2021 and for the legal separation of the utility into three companies – generation, transmission and distribution – by 30 December 2022'.[113]

Will there be a buyer for Eskom?

The slow pace of privatisation has been attributed to the ideological differences among different government departments and officials regarding 'market reform'. Even today there remains a reluctance to use the word 'privatisation', even though it has been government policy since the late 1990s.

[111] See, Steyn, E. (2013) 'Dawn of a competitive electricity sector for South Africa', *De Jure*, 23.
[112] DPE. *Roadmap for Eskom in a Reformed Electricity Supply Industry*, 8.
[113] *Ibid*. 8.

But this is not the only reason for the government's contradictory policy. The policy reflects a realisation that, if Eskom were put up for sale, there would be no interest from private sector buyers, for reasons that should now be obvious. But the power Eskom generates, transmits, and distributes is still needed and will be needed for years to come. This is the reality that should shape policy.

And the fact that privatisation has not progressed very far provides a political opportunity to offer a different trajectory for decarbonisation. As the ERC notes, 'Organised labour in particular is opposed to any privatisation of Eskom, since they see electricity as a public good'.[114] It would be helpful if the liberal policy community were to share this commitment and to work alongside the labour movement in supporting a reform agenda that is clearly pro public. This would require seeing the REI4P program for what it is: marginal, expensive, divisive, and economically and socially regressive.

World Bank re-thinks energy reform and unbundling

South Africa is not, as is sometimes suggested, a laggard in terms of the pace at which privatisation is unfolding. A 2020 recent World Bank report has concluded that, after almost three decades, only about a dozen developing countries have been able to implement the full privatisation model, 'Many of those who have adopted the (neoliberal) reforms have done so selectively, leading to a situation where elements of market orientation coexist with a strong state presence, something the designers of the 1990s model did not anticipate'.[115]

Importantly, the report states that 'unbundling' has no intrinsic value, other than being a prerequisite to a more far-reaching reform (i.e. privatisation) agenda.

In keeping with the Bank's neoliberal 'standard model' of privatisation, a key objective was for public systems to recover all of the costs associated with providing a universal service whilst generating capital for future investments, and, increasingly, to ensure returns on investment for renewable energy IPPs. But the World Bank report notes, 'Full cost recovery has been a challenge for power utilities'.

In other words, Eskom is not unique and in many respects is typical of other national utilities. Whatever bad decisions can be laid at the feet of Eskom, what the World Bank calls 'financial fragility' is more or less the norm for public systems that aspire to provide or maintain a universal service. 'Full cost recovery' (essentially, breaking even) is unusual. This is partially due to the fact that the full costs of the universal provision of electricity are not easily recovered when large segments of the population are in poverty or otherwise on the margins. And the nation building and human development objectives of countries during the postcolonial period were such that electricity was in any case seen as a vital service, the benefits of which

[114] ERC. (November 2015) *The political economy of decarbonisation*.
[115] Foster, V. and Rana, A. (2020). *Rethinking Power Sector Reform in the Developing World*. Washington, DC: World Bank.

would express themselves across the spectrum of social and economic activity in the form of better life indicators, higher levels of productivity, and so on.

The case for privatisation is therefore based on the creation of a *synthetic* crisis: the World Bank policy insists on 'full cost recovery'. National utilities fall short of this politically unachievable goal. Then the World Bank starts to talk about the 'financial fragility' of the utility, and urges reforms to 'engage the private sector', 'deregulate prices', 'promote efficiencies' etc.

Importantly, the World Bank review of the 30-year record of this policy notes that 70 percent of developing countries have introduced private sector participation in power generation, but still 60 percent of the investment needed to provide new generation capacity is coming from public funds. This is itself revealing. It reflects the fact that either public systems do not want to be cash cows for private developers, or the private developers are not satisfied with the terms of engagement.

Furthermore, private sector involvement in transmission and distribution is the exception and certainly not the rule. This draws attention to the fact that these governments see no compelling reason to turn a well-maintained natural monopoly into a profit-making venture. Indeed, as the report progresses it becomes clear that governments mostly regard full privatisation to be incompatible with any commitment to provide electricity as a vital service. It notes:

> *Extending access to electricity to the peri-urban and rural periphery often leads a utility into diminishing and even negative marginal returns on investment, particularly if the power consumption of poor households remains very low. Thus, universal electrification cannot be achieved purely by allowing a utility to pursue commercial incentives.* [116]

Whether intended or not, the World Bank report is making the social case for resisting the 'unbundling' of national utilities like Eskom. It points to an irreconcilable tension between what is the neoliberal, for-profit model of electricity provision and the universal public service model.[117]

Eskom and the 'hybrid model'

It has been argued that Eskom can retain control of transmission and distribution and let the market operate both 'upstream', at the level of power generation, and (eventually) perhaps 'downstream', at the retail level, where different companies can harvest customers and then negotiate with those who generate, transmit or distribute energy.

[116] Foster and Rana. (2020). *Rethinking Power Sector Reform in the Developing World*.

[117] According to the ERC, 'Such a model [of privatisation] has since lost traction in light of repeated failings in low- and middle-income countries…incumbent utilities remain the dominant player while IPPs generate alongside them'. Gratwick, K.N. and Eberhard, A. (2008) 'Demise of the standard model for power sector reform and the emergence of hybrid power markets'. *Energy Policy* 36: 3948- 3960.

Elements of market orientation would coexist with a strong state presence. In terms of 'upstream' liberalisation, the idea that IPPs in coal, gas or renewables are going to install new capacity without assurances that the power will be purchased at a price that can deliver a satisfactory return on investment is not consistent with the international experience. Renewables require lots of upfront capital, but, once installed, wind and solar are very inexpensive to operate and incur no fuels costs.

Renewable energy projects must therefore be 'bankable'. As we have seen, lenders will not support projects without 'risk mitigation'. Under the REI4P auction system, developers compete against each other in order to win the contract to supply a pre-agreed amount of capacity bid and the winner secures what is normally a 20-year PPA where revenues and returns are guaranteed. Under the current REI4P program rules, Eskom will be legally bound to purchase the power generated by the IPPs. At that point, any competition ends. This applies to IPP-generated nuclear or coal-fired electricity as much as it currently does to smaller wind farm or solar array. So the bid-winning IPPs will be part of the private sector, enjoying profits secured by Eskom's legal obligation to purchase IPP-generated power.

Utilising the auction system, governments plan capacity additions based on what they think is required to meet projected demand and achieve the desired energy mix. Governments frequently make mistakes in estimating demand - it is almost impossible to predict the impact of economic boom and bust cycles on energy needs, or to respond quickly to shifting demand trends. Then the social and economic costs of the misjudgement (or of going beyond reasonable 'capacity margins') must be absorbed by the public Treasury, passed on to end users, or some combination of the two. The IPPs are therefore not exposed to the same kind of risk as a national utility like Eskom.

In short, full privatisation is implausible and the 'hybrid model' is unsustainable because an expanded role for IPPs will further erode Eskom's revenues. This will mean maintenance and upgrades will fall short of what is required.

A modern public utility, techno-myths and the 'consumer-centred' revolution

Eskom's power will be needed for years to come, and that means that it should not continue to be undermined by World Bank policy that has failed on multiple levels. Nevertheless, there is a clear sense that fully integrated power systems of the Eskom type are no longer fit for purpose. Based on this view, Eskom is a dinosaur that has already been around too long. This is false, and it is an idea that needs to be confronted head on.

Top government officials continue to promote this 'dinosaur' view of Eskom. According to DPE, 'Demand patterns are changing with the availa-

bility of more affordable self-generation, energy efficiency and storage technologies…Large, unwieldy and rigid institutions such as Eskom struggle to adapt to conditions in a dynamically changing market'.[118]

This view maintains that centralised generation is antiquated and will soon be replaced by a new decentralised system. This new system will be characterised by 'disruptive' technologies such as smart grids and digitalised sensors, predictive analytics algorithms, and the widespread use of storage batteries, electric heat pumps, etc. These and similar technologies will, we are told, transform the energy system, making it not only decentralised but also far more efficient.[119] According to this view, centralised generation, synonymous with the idea of a national utility, is not compatible with a new system based on decentralised generation. Clearly, the idea that a modern utility can play a role in shifting to a more decentralised or 'horizontal' system is rejected out of hand. This conclusion is baseless and is simply the product of neoliberal ideology.

Meanwhile, this Silicon Valley 'innovation model' vision of the energy revolution has been used to reinforce the argument that Eskom should be 'unbundled' in order to create space for the new system to emerge and thrive. Importantly, this vision is almost invariably tied to the idea that the 'consumer' or the 'prosumer' (both a producer and a consumer of energy) will be at the centre of the new system. The consumer is empowered, expresses choice, navigates around the established monopolies, takes control, and of course, makes some money along the way as a 'market player'.[120]

It is not possible here to fully interrogate either the technical dimensions or the social implications of this vision. It is fixated with 'smart consumers' looking after their own interests. According to one source, 'A fully transactive grid of the future could empower prosumers to trade electricity at the edges of the grid, recording their transactions on the blockchain. In this way, a gradual evolution could culminate in a full-blown revolution'.[121]

This consumer-centred view has shaped policy at the highest levels. The EU's recently adopted *Clean Energy Package* formally recognises the right of 'active customers' and 'citizens energy communities' to own and operate renewable energy sources as well as storage devices. But these same rights are also extended to private interests of all shapes and sizes, and this has legitimised the idea of private companies (such as Google or Amazon) entering into PPAs with renewable energy companies.

At the social level, the idea of the individual (or individual corporation) acting on the basis of self-interest is not compatible with the idea

[118] DPE. *Roadmap for Eskom in a Reformed Electricity Supply Industry*, 8.

[119] International Energy Agency. (November 2017) *Digitalization and Energy*. Paris: OEC/IEA.
Sivaram, V. (ed.) (June 2018) *Digital Decarbonization: Promoting Digital Innovations to Advance Clean Energy Systems*. New York City: Council on Foreign Relations.

[120] Sekaric, L. (June 2018) 'A Survey of Digital Innovations for a Decentralized and Transactive Electric Power System', in Sivaram, V. (ed.) *Digital Decarbonization*. New York: Council on Foreign Relations.

[121] *Ibid*.

that electricity should be a universal service that raises the quality of life of *all* people. This 'public goods' approach, which was once 'common sense', requires no further elaboration. In addition, the consumer-centred vision is not compatible with the pressing need to reach climate targets. As the Intergovernmental Panel on Climate Change (IPCC) itself has noted, 'Effective (climate change) mitigation will not be achieved if individual agents advance their own interests independently' and cooperation 'can play a constructive role in the development, diffusion and transfer of knowledge, and environmentally sound technologies'.[12.2]

A 'Dynamic Market'? Not really

But it is not just the consumer-focused and highly individualistic social vision that is problematic. The assumption that centralised power systems are being, or soon will be, rendered obsolete by innovative and 'disruptive' technologies in the hands of consumers is false. In fact, the market for these same technologies has been and remains dependent on government subsidies of one form or another. Because the wind and solar industries have thus far been almost completely *protected* from competition, renewables have been able to grow quite impressively, particularly in the OECD countries and in China. This, in turn, has created a market for technologies that can mitigate the problems of variable renewable energy. A range of knowledge-based products or services has therefore emerged, and these appear to have the potential to significantly improve operational performance, productivity or efficiency, while reducing costs, inputs, and energy consumption.

In the OECD, where energy demand was mostly flat or falling before the Covid pandemic, a mixture of renewable energy and gas-fired generation was gradually replacing old coal-fired and nuclear capacity. This is expected to continue, although the further pandemic-related reduction of energy demand means that the entire sector is facing a range of new challenges and uncertainties. Either way, the future growth of renewables in these regions will be accompanied by a need to find ways to deal with weather-related supply fluctuations. It is therefore reasonable to expect that there will be a market for technologies, such as storage batteries, that have been designed to address this challenge.

But these technologies do not, as the DPE and many others suggest, constitute a 'dynamic market' in the sense that the technologies are disrupting the existing centralised system on the strength of the value they create for those who deploy them. Rather, they are the by-product of a *politically constructed* and protected market, namely the market for modern renewables, which is, in the case of the OECD, also being sustained by the fact that many coal and nuclear power stations are at the point of retirement, or soon will be. This is not the case in many other regions, where thermal and nuclear power stations are much newer, and many more are under construction.

[12.2] IPCC. (2014) *AR5 Climate Change 2014: Mitigation of Climate Change*. Geneva: IPCC.

Investor risk is slowing down technological change

Contrary to the 'dynamic market' idea, we can see that the deployment of 'smart' technologies is today being *held back* because decisions to utilise them are based on the cost-benefit calculations of consumers, businesses, and investors. The deployment of these technologies is not due to their social or ecological value. If those criteria were paramount, then the deployment levels of at least some of these technologies would probably grow much faster, perhaps even exponentially.

As the IEA itself notes, 'Future projections reveal that *under existing policies*, the vast majority of economically viable energy efficiency investments will remain unrealised'.[123] (Emphasis added)

Indeed, investment levels in the flexibility-yielding 'disruptive' technologies have actually fallen in recent years. In the case of battery storage systems, one US-based trade source recently warned, 'We expect the proliferation of new battery storage systems to quickly overwhelm relatively finite ancillary service demand in both regulated and deregulated markets across North America'.[124] Of course, the shale gas boom, brought about by hydraulic fracturing ('fracking'), has lowered electricity prices and this has, as it were, disrupted the 'disruption'.

According to a Brookings Institute study of the 'cleantech' sector in the US, investment is dominated by venture capital looking for high returns. Beginning around 2011, the US shale boom (fracking for oil and gas) produced 'cheap' energy, and investor interest in cleantech innovation dramatically declined [125] . The study warns, 'If the trend continues, breakthrough and game-changing technologies will be underfunded, and the ability of the U.S. economy to break free from the domination of fossil fuels in the next 25-50 years will be reduced'.[126]

The deployment of these technologies is not due to their social or ecological value. If those criteria were paramount, then the deployment levels of at least some of these technologies would probably grow much faster, perhaps even exponentially.

In the words of another source, 'An innovation model that relies on quick scaling into monopoly will not take fundamental risks in energy

[123] IEA (2015) *Capturing the Multiple Benefits of Energy Efficiency*. Paris: IEA.

[124] Sackler, D. (14 November 2019) 'New battery storage on shaky ground in ancillary service markets', *Utility Dive*. Available on: https://www.utilitydive.com/news/new-battery-storage-on-shaky-ground-in-ancillary-service-markets/567303/ (retrieved 23 June 2020).

[125] Since this was written, the depression caused by the Coronavirus has slashed oil prices, which has devastated the shale gas industry.

[126] Saha, D. and Muro, M. (16 May 2017) 'Cleantech venture capital: Continued declines and narrow geography limit prospects', *Brookings*. Available at: https://www.brookings.edu/research/cleantech-venture-capital-continued-declines-and-narrow-geography-limit-prospects/ (retrieved 23 June 2020).
See also: Fehrenbacher, F. (26 May 2017) 'Venture Capital Funding for Cleantech Still Looks Pretty Grim', *Greentech Media*. Available at: http://greentechmedia.com/articles/read/venture-capital-funding-for-cleantech-still-looks-pretty-grim#gs.Od9w99w (retrieved 23 June 2020).

systems'.[127] It is, therefore, 'prudent to wait and see whether this new digital wave of clean energy investment in fact bears fruit'.[128] Once again this highlights the important role of the state and public funding if the advantages of these technologies are to be realised.

How can large industrial and commercial consumers shift demand?

Despite all of this, the idea that the needs of consumers-*cum*-energy entrepreneurs 'playing the market' will anchor a decentralised and flexible system has gained considerable traction. According to IRENA:

> *Consumers can contribute to system flexibility by shifting demand to times of low prices. This requires, firstly, the adaptation of regulations (to expose consumers to the hourly fluctuations of market prices) and, secondly, the deployment of infrastructure (e.g. smart meters and appliances) for consumers to be able to react to such signals.*[129]

But where do the large energy consumers fit into this proposed new system? In South Africa, residential use is around 20 percent of the economy-wide total of electricity consumed, and energy-intensive industries today account for around 60 percent. This mix is not unusual. According to the US Energy Information Administration (EIA), only a fraction of energy use can be categorised as 'residential', and commercial and industrial electricity use in non-OECD countries, which is already dominant, is expected to increase by an average of 2.8 percent per year from 2018 to 2050, compared with 1.1 percent per year in OECD countries.[130]

On this view, dealing with variability and intermittency 'relies on reshaping energy demand to become extremely flexible such that demand can be made to conform to the variable output of renewable energy; rather than energy supplies being shaped to match patterns of demand'. But serious questions have been raised about the practical limits of such a reshaping of demand.[131] Programming a washing machine to begin a wash cycle at 3 a.m. in order to take advantage of cheap wind energy is, of course, entirely plausible. But will factories, offices and other commercial spaces change their entire mode of operation simply to save money on electricity? And in a growing economy with rising *per capita* GDP, any increase in electricity charges can be built into the price of end products and services, although the same is also likely to be true in low growth economies.

In fact, economy-wide efficiency gains have for the past few decades been incremental at best. At around 1 percent per year, these efficiency gains

[127] Sivaram. *Digital Decarbonization*.
[128] *Ibid*.
[129] IRENA. (February 2018) *Renewable Energy Prospects for the European Union*. Paris: IRENA and Brussels: EC.
[130] EIA. (September 2019) *International Energy Outlook 2019*. Washington DC: US Energy Information Administration, US Department of Energy.
[131] Clack, C.T.M., Qvist, S.A., Apt, J., Bazilian, M., Brandt, A., Caldeira, K., Diakov, V., Handschy, M., Hines, P., Jaramillo P. et al. (8 May 2017) 'Supporting Information for the paper 'Evaluation of a proposal for reliable low-cost grid power with 100 percent wind, water, and solar". *PNAS*, vol. XXX, no. XX, 1-13. Available at: https://www.pnas.org/content/pnas/suppl/2017/06/16/1610381114.DCSupplemental/pnas.1610381114.sapp.pdf (retrieved 23 June 2020).

(sometimes labelled 'reduced energy intensity') lag behind GDP growth by some distance.

Technology and a modern national utility

Because so much attention has been directed towards consumers becoming market players, the fact that utilities can also take advantage of technological innovations is often overlooked, perhaps because it does not fit in with the 'unwieldy and rigid' depiction of entities like Eskom. But the data shows that utilities can also invest in technologies that can make networks more flexible and resilient, and thus the utility can play an important and perhaps crucial role in the energy transition.

For example, Advanced Metering Infrastructure (AMI) technologies allow for calculation, display, storage and communication with a central server. Data recordings are made every hour (or more frequently) and the data is sent to the utility company for constant monitoring and billing. This two-way communication between the meter and the central system run by the service provider is done via cellular telecommunication technologies and makes remote reporting and problem solving easier.

Using this kind of information, utilities can then deploy battery and other energy storage resources to meet customer needs during times of high instantaneous demand. Utilities can ensure that internet-connected electrical devices can be set to shift grid energy consumption to hours of the day with lower demand, reducing the peaks in the network's demand profile. Software tools allow for a much more precise analysis of power supply and demand interactions, and having real-time grid operational information, both technical and economic, would help a utility reduce electricity consumption, at least in non-industrial, residential, and small commercial settings.[132]

But whatever the potential of these and other technologies to advance efficiencies, profit (and 'market share') considerations are, once again, standing in the way of their development and deployment. Why should utilities invest in upgrades when such investments will *reduce* the amount of electricity sold and thus decrease sales revenue? In the case of Eskom, cost recovery proposals for investments of this nature would need to be approved by NERSA, which is a highly political process, the results of which have not always been favourable for the utility. [133]

[132] Sivaram. *Digital Decarbonization*.

[133] ERC. (November 2015) *The political economy of decarbonisation*. As the report notes, NERSA 'continues to limit Eskom's requests for tariff increases in the face of increasing financial and operational costs. Tariffs are now, and continue to be, below full cost-reflectivity but have also increased sharply in response to the revaluing of Eskom's asset base and increasing costs'. Eskom's revenue is 'significantly lower than applied for, leading Eskom to refer to a 'hole' in its financing of approximately R250 billion in 2013'.

TASK TWO: BUILD A GLOBAL CAMPAIGN FOR A 'GLOBAL PUBLIC GOODS' APPROACH TO ENERGY TRANSITION

There is a pressing need for a new multilateral approach to energy transition as a means to address the climate emergency, the health impacts of rising fossil fuel use, and the huge toll inflicted mostly on poor people as a result of 'extractivism'. South Africa can and should wage an aggressive campaign at the global level that targets the (now politically frayed and fragile) network of international trade law, including its restrictions on intellectual property. This legal architecture is holding back the energy transition and compromising energy self-determination and sovereignty:

Deindustrialisation, the declining influence of organised labour, dependence on the Global North, and environmental degradation through fossil fuels and extractive industries are institutionally mandated as South Africa's developmental future through the trade, investment, and finance liberalisation paradigm. There are a number of WTO provisions and other trade or investment agreements that have the potential to hinder the radical, urgently needed transition to a low-carbon economy. What is needed is collective action that allows states and civil society to exercise their Right to Say No to trade and investment agreements that privilege TNCs over human rights, climate change, development, and job creation.[134]

The need for such a campaign is as timely as it is pressing. First and foremost, turning South Africa's wind and sunshine potential into electricity requires technologies and skills that the country, and most of the developing world, do not currently have. But this is also true of many of the developed countries. The production of wind turbines is currently dominated by a handful of countries. For PV, in 2017 China accounted for 73 percent module production, followed by Rest of Asia-Pacific & Central Asia (ROAP/CA) with 14.8 percent. Europe contributed with a share of 3.1 percent (compared to 4 percent in 2016); USA/CAN contributed 3.7 percent.[135]

But any serious globally endorsed effort to decarbonise electricity in order to reach climate targets must quickly acknowledge that the scale of renewable energy production required is physically beyond the capacity of the handful of countries that currently dominate the renewables market. When viewed in this light, it is clear that there is a massive shortage of production capacity in renewables and other low carbon options.

In the case of wind energy, global installed capacity reached roughly 460GW in 2019.[136] For onshore wind, this amounts to a 400 percent growth in just ten years. Offshore wind capacity is over 15 times larger than it was a decade ago, and in 2019 it reached 29GW. But, according to one source, in order to reach the Paris climate goals for 2050, wind energy output will at

[134] Cannard J. (26 June 2020) *The impediments trade agreements pose to a South African Renewable Energy Industry*. Cape Town: AIDC. http://aidc.org.za/the-impediments-trade-agreements-pose-to-a-south-african-renewable-energy-industry/ (retrieved 27 June 2020).
[135] Fraunhofer Institute for Solar Energy Systems, ISE. (17 June 2020) *Photovoltaics Report, 5*. Fraunhofer Institute for Solar Energy Systems, ISE with support of PSE Projects GmbH.
[136] Frankfurt School-UNEP Centre/BNEF. *Global Trends in Renewable Energy Investment 2019*. Frankfurt: Frankfurt School-UNEP Centre; BNEF.

that point need to be as high as 4000GW per year.[137] Currently 'there is a massive shortfall in current industrial capacity to meet an output of this scale'.[138]

Furthermore, it has taken Europe almost 30 years, and a lot of public money, to fully develop its wind industry. The development of onshore wind helped pave the way for offshore development, although the move to offshore presented a number of new and formidable engineering challenges that onshore wind was able to avoid. Because of the specialised nature of these industries, it is not surprising that roughly 90 percent of the world's offshore wind capacity is today located in Europe, where just two countries, Germany and Denmark, dominate the market. South Africa would have the advantage of an engineering capacity developed in deep level mining.

China is trying to develop its offshore wind capacity. Of course, it receives no help from Europe in this endeavour. Meanwhile, China's progress is currently being hampered by the fact that its wind energy supply chain is mainly organised around *onshore* wind. As one technical paper notes, for wind energy in general, 'key bottlenecks exist, predominantly in logistics'. But there are, 'specific areas of the supply chain where international collaboration and knowledge transfer may speed up deployment'.[139] The same paper notes that:

> *Europe has learned that all operations offshore are much more expensive than similar operations carried out onshore. Therefore, some of the basic challenges with the offshore wind turbine generator technology could advantageously be sorted out with support from European firms and academia before China executes a revolutionarily paced push of onshore technology into the offshore sphere.*[140]

De-marketisation and the need for Public-Public Partnerships (PUPs)

In a world not driven by 'return on investment' concerns (profit) and 'market share', such a suggestion would be common sense, and cooperation between countries would be pursued as a matter of course. But if the Paris targets are to be reached, then the drip-drip diffusion of these technologies must be replaced by a torrent of cooperation.

Deployment levels can then be stepped up exponentially, intellectual property restrictions would be lifted, and a 'global public goods' approach would be a guiding principle. Once again, we see how the for-profit approach obstructs decarbonisation and addressing climate change.

The leading developer and operator of offshore wind farms globally, as measured in already installed capacity and projects under develop-

[137] Greenpeace/Global Wind Energy Council (GWEC). (2014) *Global wind energy outlook 2014*. Amsterdam: Greenpeace; Brussels: GWEC.
[138] Poulsen, T. and Lema, R. (June 2017) 'Is the supply chain ready for the green transformation? The case of offshore wind logistics', *Renewable and Sustainable Energy Reviews*, 73, 758–77. Available at: https://doi.org/10.1016/j.rser.2017.01.181
[139] *Ibid.*
[140] *Ibid.*

ment, is the Danish state-owned company Dong Energy, recently renamed Orsted.[141]Meanwhile, most of the Chinese companies moving into offshore wind are also formally state owned. These include Guodian, China General Nuclear, Huaneng, Three Gorges, and the China Communication Construction Company. Of course, if these 'marketised' companies were able to succeed in the offshore wind market then they, too, will seek to expand market share and make profit. The same is true of the large South Korean companies such as the 51 percent state owned Korea Electric Power Corporation (KEPCO), Hyundai, and Doosan. These are in the process of getting into the offshore wind business.[142] [143]

The presence of public or quasi-public companies in the renewable energy industry raises the distinct possibility of 'public-public partnerships' (PUPs) whereby public entities assist one another in order to meet social and ecological objectives. There are many historical precedents for this type of co-operation, but not in the renewables sector. However, this type of cooperation will be contingent on the 'demarketisation' of public renewable energy companies.

Of course, many of the largest coal, oil and gas companies are also formally state owned or state majority owned. As a result of neoliberal reforms, the overriding goal of many public coal, oil and gas companies is to sell energy for profit. For many countries in the global South, selling fossil fuels is an important source of revenue, paid in hard currencies. Because the transition away from fossil-based energy will require careful planning and rigorous consultation with communities, municipalities, and regional governments, these companies will also need to be reclaimed and demarketised.

Rebuilding skills and competencies

There is also a need to address the skills and competencies deficit in what remains of the state-owned utilities like Eskom. After thirty years of political attacks on public energy institutions (and public sector institutions more broadly), the skills deficit has become a major problem. Attending to this deficit is a long term process, but an international campaign to promote public goods could at least help bring the attacks on publicly owned systems to a halt, and thus create the space to rebuild a new set of skills and competencies, as well as a reinvigorated public service culture anchored in commitments to ecological health as well as real human development.

[141] European Wind Energy Association (EWEA). (February 2016) *The European offshore wind industry key trends and statistics 2015*. Brussels: EWEA. - Navigant Research. (2015) *World wind energy market update 2015: International wind energy development: 2015–2019*. Chicago: BTM Consult, Navigant Research.

[142] Rodrigues, S., Restrepo, C., Kontos, E., Teixeira, Pinto R. and Bauer, P. (2015) 'Trends of offshore wind projects', *Renewable & Sustainable Energy Reviews*, 49: 1114–35 - Zhang, S., Wang, W., Wang, L. and Zhao X. (2015) 'Review of China's wind power firms internationalization: status quo, determinants, prospects and policy implications', *Renewable & Sustainable Energy Reviews*, 43: 1333–42.

[143] Poulsen and Lema. (2017) 'Is the supply chain ready for the green transformation?' It follows that because offshore wind is not yet competitive in its own right compared to other electricity generation (e.g. levelised cost of energy of nuclear or coal generated energy) none of the supply chain lead firms seem willing to enter into the necessary and binding long-term agreements with the shipping and logistics industry firms that would enable these firms to invest in the necessary infrastructure, assets, and personnel necessary to support the planned diffusion in the 'home market' of Europe. To alleviate this challenge, our recommendation is that the EU considers implementing binding legislative offshore wind energy targets by member country up to 2030.

In the case of Eskom, during the period from 1991 to 2005 there was an excess supply of electricity and little was invested in new electricity generation. This resulted in a gradual loss of skills, knowledge and know-how from both Eskom and South Africa.[144] A shift in global policy from its current anti-public thrust towards support for a public goods approach could begin to address shortages of skills and competencies within the context of overseas development aid, climate financing, and collaboration between schools of engineering and design. PUPs, too, can provide a crucial platform for skills transfer and the exchange of knowledge.

Decarbonisation in one country? Challenging the current neoliberal trade and investment regimes

The fight for social ownership of renewable energy is therefore one that must be waged on both the domestic and international stage. An important dimension of this international struggle is the need to resist the restrictions imposed by bodies like the WTO on the ability of governments to develop their own renewable energy capacities. Current trade laws and intellectual property regimes are neoliberal constructs, purportedly designed to promote competition and growth, but they have served to undermine the public good. It is increasingly acknowledged that this 'architecture' is clearly not in alignment with the Paris Agreement and the need to limit warming to either 'well below 2 degrees Celsius' or the more ambitious Paris target of 1.5 degrees Celsius.[145]

It is interesting that the WTO has not taken action against the local content requirements tied to the REI4P, as the WTO did against the use of such requirements in an FiT program sponsored by Canada's Ontario province. However, REI4P would likely be declared a public procurement scheme, which is governed only by a single article in the General Agreement on Tariffs and Trade (GATT), and is unlikely to be applied by the WTO in cases of renewable energy.[146]

Resistance to the dominant global trade paradigm must engage other allies. South Africa must therefore create coalitions with other states, based on the stark reality that humanity is facing a climate emergency, the current policies have not delivered, and responding to the emergency requires a public goods approach. This could create a platform for more critical assessment of the idea that each country can pursue its own decarbonisation pathway. For South Africa to fully embrace decarbonisation, its people must be confident that the right kind of policies are in place at the global level. If South Africa were to pivot away from coal, it

[144] Eskom. (16 May 2012) 'Presentation to the Portfolio Committee on Energy 'Eskom's Comments on the ISMO Bill".

[145] IPCC. (2014). *AR5 Climate Change 2014*. Geneva: IPCC.

[146] Kuntze, J-C. and Moerenhout, T. (12 September 2012) 'Local Content Requirements and the Renewable Energy Industry – A Good Match?' *SSRN Electronic Journal*. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2188607 (retrieved 22 June 2020).
See also: Eberhard, A., Kolker, J. and Leigland, J. (2014). *South Africa's Renewable Energy IPP Procurement Program: Success Factors and Lessons*. World Bank Group.

would bring many advantages, but it would also create problems. The neoliberal approach to climate protection is not equipped to foster the kinds of international solidarity that the crisis demands. This must change.

In the short term, provisions and exceptions in existing trade laws can also be exploited as a means of challenging the current regime. For example, Article XX of GATT 1994 provides exceptions for measures 'necessary to protect human, animal or plant life or health', and for measures 'relating to the conservation of exhaustible natural resources'.[147] According to the current law, such measures cannot be a 'disguised restriction on international trade'. But a global public goods approach would enhance cooperation. The goals and motives of this increased level of economic activity will be quite different from the ones that were designed to drive capital accumulation, consumption and profit.

Antiretrovirals and renewables

In 1997 the South African government introduced legislation to allow for less expensive provision of antiretroviral (ARV) medications. Brazil also began to domestically produce generic ARVs.[148] These actions saved the lives of millions who had been living with HIV and AIDS. Yet they were strongly condemned for being an attack on intellectual property rights (IPRs). Pharmaceutical companies and rich country governments such as the US argued that strong IPRs were needed to promote 'innovation' and drive economic growth. These are the same arguments that renewable energy companies use today to secure public subsidies to expand market share.

But just as Brazil and South Africa did not ask permission of the WTO to produce generic low-cost medications for HIV infection and AIDs, South Africa should be willing to challenge laws that were designed to prevent the development of a domestic renewables sector. As with medication for HIV and AIDs, countries like South Africa have a moral right and a political responsibility to challenge, subvert and openly disobey laws and protocols that impede the global effort to address climate instability and other threats to the world's ecosystems, and to take steps that allow for job creation, worker protections, and that advance social and racial justice.

Cracks in the rules-based trade regime

Voices from the Global South have long proclaimed that the WTO's approach to IPRs is not compatible with either sustainable development or climate targets. South Africa can be an aggressive advocate for a radically different approach to the faltering and fruitless one currently being pursued by the WTO, the IMF and the World Bank. South Africa can partner with other key

[147] World Trade Organisation (WTO). (Undated) *WTO rules and environmental policies: GATT exceptions*. Available at: https://www.wto.org/english/tratop_e/envir_e/envt_rules_exceptions_e.htm (retrieved 23 June 2020).

[148] Halbert, D. (2002) 'Moralized Discourses: South Africa's Intellectual Property Fight for Access to AIDS Drugs', *Seattle Journal for Social Justice* 1 (2): 271.

allies to promote a global public goods approach to renewable energy deployment and a 'just transition' to a low carbon future. This could be the catalyst that could accelerate the demise of the neoliberal legal architecture.

Such a collapse is far from unimaginable. The WTO's appellate body has been under attack by the political right in US for years, and it is already largely dysfunctional. The US objects to the fact that the 'special and differential treatment' given by the WTO to developing countries allows them to take longer to remove tariff and non-tariff barriers. The Trump administration's trashing of supposedly 'unfair' trade rules has seriously damaged the notion of a rules-based global trade regime. By doing so, he has significantly weakened the ability of the world's major powers to invoke international law when countries seek to exercise their formally recognised sovereignty.

South Africa can champion a new approach, one that is anchored in a global public goods narrative. Such an approach is simple, but it is morally compelling. It enormously strengthens the case for a domestic South African renewable energy industry, one created through an ambitious state-led renewable energy programme, implemented by Eskom.

TASK THREE: CANCEL THE REI4P AND BUILD LOCAL RE PRODUCTION CAPACITY

We have already described how the REI4P program has contributed to Eskom's death spiral, ensured that renewable energy deployment has been expensive and brought little in terms of either social gains or decarbonisation.

The program should be brought to a halt via a moratorium on new bidding rounds. Existing contracts for projects now in operation should be renegotiated. BW 4 contracts should be reviewed. However, the closing down of REI4P must be accompanied by the development of plans for *insourcing* the skills and technologies to develop a viable domestic renewables industry in South Africa.

REI4P jobs and local content

The REI4P programme was supposed to create jobs in South Africa, facilitate skills transfer, and help small and medium sized companies at home.[149] It certainly served as a magnet for engineering, procurement, and construction contractors, nearly all of them based outside South Africa. According to a World Bank Group report, 49 such contractors were involved in the 64 projects during the first three REI4P bidding rounds. The 49 included Vestas (Denmark), Acciona (Spain), Consolidated Power Projects (South Africa), Group Five Construction (South Africa), Juwi Renewable Energies (Germany), Murray and Roberts (South Africa),

[149] Kuntze, J-C. and Moerenhout, T. (12 September 2012) 'Local Content Requirements and the Renewable Energy Industry – A Good Match?' See also: Eberhard et al. (2014) *South Africa's Renewable Energy IPP Procurement Program*.

Abengoa (Spain), ACS Cobra (Spain), Iberdrola Engineering and Construction (Spain), Nordex Energy (Germany), Scatec (Norway), Suzlon (India), and Temi Energia (Italy).

Wind turbine suppliers have included Vestas, Siemens, Nordex, ABB, Guodian, and Suzlon - mainly European companies alongside one each from China and India. The main PV suppliers have been Siemens, SMA Solar Tech, BYD Shanghai, Hanwha Solar, 3 Sun, AEG and ABB, exclusively European, Chinese, and Korean manufacturers.[150]

The predominance of foreign owned companies has triggered concerns that small and medium enterprises remain on the periphery of the renewables sector, and financial returns are more likely to leave the country rather than being invested at home.[151]

Although difficult to quantify, the transfer of skills, as with other local content requirements (LCRs), has reportedly produced only modest results. Government efforts to increase LCRs led to the kind of dilemmas most developing countries confront when trying to deal with multinational corporations: 'the government needs foreign companies for technology transfer, and it also needs to take into account the risk of high short-term power price escalation as a result of high LCRs'.[152]

The current policy simply does not fit into the business model of these overseas-based companies, and if the REI4P is expanded as planned under IRP 2019, then job creation, technology transfers, and financial returns to domestic companies will fail to materialise, beyond a few exceptions. According to a World Bank study of the REI4P, building a local manufacturing base was 'particularly risky for competing firms. First, globally, manufacturing of components for both wind and solar PV involve relatively mature, existing technologies and well-established industries'. In other words, local companies and workers were not really needed very much at all. Importantly, even before the Covid-19 pandemic, the global slowdown in renewables deployment meant that renewable energy multinationals were 'experiencing global over-capacity and intense competition that is resulting in very thin profit margins, if any profits are generated at all'.[153] Therefore, why build capacity in South Africa when there was already excess capacity in the 'home' countries?

Meanwhile, the wind and solar PV industries are becoming more technologically complex, and thus more knowledge-intensive.[154] Renewable energy companies have simply brought their own skilled workers to South Africa to perform what are mostly installation-related tasks. Once installed, operation and maintenance work in both wind and solar is relatively minimal. As the ERC noted in a 2015 report, 'These factors will evidently challenge the extent to which the South African government will be able to set up a local

[150] The list of companies is to be found in: Eberhard et al. (2014) *South Africa's Renewable Energy IPP Procurement Program*.

[151] Baker, L. and Wlokas, H. (2015) *South Africa's renewable energy procurement: A new frontier?* Cape Town: ERC.

[152] Kuntze, J-C. and Moerenhout T. (12 September 2012) 'Local Content Requirements and the Renewable Energy Industry – A Good Match?' See also: Eberhard et al. (2014) *South Africa's Renewable Energy IPP Procurement Program*.

[153] *Ibid*.

[154] ERC (November 2015) *The political economy of decarbonisation*, 31.

manufacturing industry and develop innovative capabilities, despite its commitments to localisation and the green economy'.[155]

Can we build it here? The potential for insourcing

South Africa is currently faced with three options:

1. Abandon renewables and stick to coal for as long as possible. The problems with this are: the current physical state and age of Eskom's fleet; the declining quality of coal sold domestically (export coal is better quality and privately owned); and the health and climate impacts of more coal use. Pursuing such an option would have serious consequences.
2. Continue down the REI4P path, with more renewables coming online. The downsides here are that the country will not benefit a great deal from the expansion of the renewables sector,[156] while it progressively loses its energy sovereignty as for-profit renewables companies, developers and lenders based outside of the country reap the benefits.
3. Insource skills, capacities and technologies to develop and deploy low carbon energy.

The third option is the only acceptable one, but it is, of course, extremely difficult to implement. The renewable energy industry is currently made up of globalised networks of developers; engineering, procurement and construction (EPC) companies; technology suppliers, etc. There is no way that Eskom, as a modern utility driving the energy transition, would be able to enter the renewables market as a competitor in open capitalist competition. But there are alternatives:

The role of a state-owned bank like the Development Bank of Southern Africa is to do what private banks hesitate or don't want to do.[157] There are many options if the primary motive isn't to satisfy shareholders with high returns, but to keep public utilities afloat so that the climate crisis is addressed. Repayments of friendly loans given by state owned development banks could be tied to a share of the revenue generated, and not interest payments, just as an example.

Technology producers (probably from the public sphere in PUPs) could supply and install the technology at cost:[158]

- South Africa could negotiate for large renewable companies (especially publicly owned companies, in PUPs) to deliver and install technologies *at cost.* Eskom could then sell the power generated and, over time, re-pay the technology supplier.

[155] *Ibid*, 31.

[156] Eberhard et al.. (2014) *South Africa's Renewable Energy IPP Procurement Program.*

[157] Gumede, W., Govender, M., and Motshidi, K. (2011) *The role of South Africa's state-owned development finance institutions in building a democratic developmental state.* Development Bank of Southern Africa (DBSA), Development Planning Division Working Paper 29. Midrand: DBSA.

[158] Electric Power Research Institute (EPRI). (2017) *Power Generation Technology Data for Integrated Resource Plan of South Africa*, 77. Palo Alto, CA: EPRI.

- International development banks could purchase the technologies with hard currency, and the revenues from electricity sales be returned to them over a 20-30 year time frame, at a fixed exchange rate.

As soon as we open up a non-market approach, the options multiply. Private RE producers have been and still are protected by non-market agreements and subsidies, in order to encourage them to start to invest. Their private funders have proved unreliable and their investments have been stagnating. To solve the climate crisis, to provide certainty, we need a reformed public utility that doesn't adhere to the underlying logic of shareholders finally getting a return on their RE investments and therefore requiring returns that compete with or beat alternatives.

We propose short term non-market solutions via the gigantic state pension fund GEPF to release Eskom from its unproductive debt burden. We propose non-market financing strategies to start publicly owned RE investment programs and the winding down of coal power.

South Africa could win support for such an approach from countries of the global South which find themselves similarly constrained by the current 'electricity for profit' calculations of renewable energy interests. A public goods approach could make such an approach feasible. It is the only way a country like South Africa can decarbonise its power sector. And the benefits will be far-reaching.

TASK FOUR: RE-EXAMINE AND EVALUATE ENERGY TRANSITION OPTIONS

The fourth task involves a fresh examination of the various options for energy transition and their respective costs. There are different views on the best way to pursue decarbonisation, given the uncertainties around the various technologies, among them battery storage and digital systems. A fresh examination must therefore consider *all* decarbonisation options. Most of the debates in South Africa have simply focused on the means to pivot towards renewables (a 'deep renewables strategy'). However, in the global-level debates, it is widely accepted that the power sector will need to 'lead the way' towards an economy-wide decarbonisation, involving transport, buildings, food and agriculture, and so on.

Decoupling market and technical challenges

In the debates on South Africa's energy future, technical considerations have perhaps not got the attention they deserve. But an electricity system based on 40 GW of coal-fired capacity (in 2017) cannot be transformed in just a few years. And the transition process cannot be accomplished simply by bringing more and more renewable energy into a system. Quite obviously, the level of planning required will need the direction of the state. Therefore it is necessary to pay serious attention to the technical challenges of integration of renewables (and their 'variable' nature) and to separate that discussion from assumptions created by an investor-focused 'market' approach. Neoliberal policy has been attempting to address both types of challenge simultaneously. The end result is failure on both fronts.

One of the clear advantages of the social ownership alternative lies in its ability to begin to address some of the formidable technical challenges of the energy transition. In fact, as we will see, these challenges may require a serious recalibration or refocusing of the decarbonisation project, not just in South Africa but internationally.

In 2015, a report from the UK-based Centre for Policy Studies – a Thatcherite think tank – concluded that the effort to deal with both sets of challenges had led to a complete breakdown in policy coherence, captured in the intentionally ironic phrase 'central planning with market features'. The report concluded: 'You can have renewables. Or you can have the market. You cannot have both.... If renewables are a must-have, then nationalisation is the answer'.[159]

The technical challenges

The technical challenges to integrating variable renewable energy – sometimes called 'non-dispatchable' power – into existing grids is today the subject of intense and often polarised political debate. Some leading advocates of renewable energy tend to make light of the challenges, and are inclined to point to technological breakthroughs and falling prices for storage batteries, digitalisation, etc. as if to suggest that the problems are being addressed and, helped along by the 'dynamic market', are well on their way to being resolved. Others have perhaps overstated the problems of integrating renewables, seeing the proposals as either economically implausible and/or beyond the reach of existing technologies. Even among scientists and engineers there appears to be a wide range of opinions on the capacities of different methods and technologies and the respective roles these may (or may not) play in the future of electrical power provision and management.[160]

It is not possible here to do justice to these debates. What follows is a fairly cursory assessment of the main technical challenges facing the transition to a renewables-based system. Its goal is to draw attention to two issues:

- first, how profit considerations make 'the market' incapable of developing technologies that might be suitable for the task, and
- second, how there are still many unanswered questions about 'deep decarbonisation' strategy.

These are issues that have opened up deep divisions in the scientific community. We highlight them not because we stand opposed to this transition; far from it. We draw attention to them so that we put in place the correct strategies. For those engaged in the energy debates in South

[159] Darwall, R. (2015) *Central Planning with Market Features: how renewable subsidies destroyed the UK electricity market.* London: Centre for Policy Studies.

[160] Jacobson, M.Z. et al. (2015) '100 percent clean and renewable wind, water, and sunlight (WWS) all-sector energy roadmaps for the 50 United States', *Energy & Environmental Science*, 8, 2093. Available at: http://web.stanford.edu/group/efmh/jacobson/Articles/I/USStates WWS.pdf (retrieved 23 June 2020).

Africa, an awareness of these differences and their implications is essential.[161] However, it is difficult to avoid the conclusion that achieving power sector decarbonisation will require levels of planning and cooperation that only a modern utility, backed by a supportive government, can provide. Current policy renders this level of planning and cooperation, which must include international support for a public goods approach, virtually impossible.

The global experience of renewable energy integration

When dealing with ever larger inputs of variable renewable power, the overall goal is to achieve system flexibility and reliability.[162] Where renewables have gained a significant foothold in power systems, such as in Europe, the US and China, policy makers have identified and promoted three distinct and complementary responses.

The first is to establish a more far reaching transmission system with more interconnectors so that electricity can be moved over long distances. In Europe, where renewable energy has reached 30 percent of total capacity, this increasingly involves moving power across regional and national borders, in a continent-wide grid.

The second, to deal with variability, is to find ways to store energy generated by the sun and the wind so that it can be used at times when it is actually needed, such as in early evening hours, during periods of peak demand. So far, storage has not featured greatly in most countries which have already reached above 20 percent share of renewable energy, although wind dominates in most of these cases, and the cost effectiveness of electricity storage is usually higher for solar PV than for wind.[163]

The third response is to promote 'flexible demand management' or a 'demand side response' (DSR) whereby consumers use renewable energy at times when it is abundant (and thus less expensive). Meanwhile, as discussed above, these same consumers would be encouraged, perhaps by way of smart meters and digital systems, to avoid using electricity when the system becomes more dependent on base-load capacity which supplies power from coal, gas, nuclear and large hydro systems.

These proposed options are not mutually exclusive, and it is conceivable, even likely, that various combinations of storage, grid expansions, and flexible demand management will emerge in future. However, each of these responses to variability present a distinct set of challenges. These challenges are summarised briefly below, although these summaries cannot do justice

[161] According to Child et al., even advocates of an aggressive deployment of renewables are divided in terms of their respective visions of a renewables-based system. 'On the one hand, EUROSOLAR advocates decentralisation of energy and the disempowerment of the actors and structures that have produced an unsustainable and undemocratic energy system [9]. On the other hand, DESERTEC envisions a highly and wind power throughout Europe [10]. However, a third option may be possible. Battaglini et al. [11] advocate an approach for Europe that combines the decentralised Smartgrid with the centralised Supergrid to produce a SuperSmart Grid vision, arguing that 'the two concepts are complementary and can and must coexist in order to guarantee a transition to a decarbonised economy". From: Child et al. (August 2019), 'Flexible electricity generation, grid exchange and storage for the transition to a 100 percent renewable energy system in Europe', *Renewable Energy*, Volume 139, 80-101.

[162] IEA. (2017) *Getting Wind and Sun onto the Grid.*

[163] *Ibid.*

either to the complexities involved or even begin to capture the intensity of the debates that currently surround these issues.

The challenge of renewable energy storage

It is claimed that storage technologies allow electricity from renewable energy resources such as wind and solar to be generated at times of peak sun and wind and then stored for later use. It is widely believed that, as these energy sources grow both absolutely and proportionately, more of the energy generated will need to be stored for later use, and renewables, without well-developed storage capabilities or extensive back-up systems, cannot provide 100 percent reliability.

Storage is expected to allow grid operators and utilities to reduce peak electricity demand on baseload generation, thus reducing the need for additional non-renewable resources and new transmission lines. Finally, storage reduces the need for grid operators to ask wind and solar companies to reduce or halt the production of electricity (known as 'curtailment') in order not to 'congest' the grid. Batteries can store excess energy for later use.[164]

There are a number of different types of storage technologies, including pumped hydro energy storage ('PHES'), power-to-gas, power-to-heat, liquid air, batteries, supercapacitors, and flywheels. They can operate as 'grid storage' or as 'behind the meter' systems (grid storage can be embedded in transmission and distribution networks, whereas 'behind the meter' systems are normally located in homes and businesses).[165] The most significant storage technologies today are large- and small-scale batteries (battery energy storage systems, or BESS) and pumped storage hydropower.

In global terms, pumped hydro storage systems (PHSS) represents almost 99 percent of current worldwide storage capacity.[166] Water is pumped up to a reservoir when demand for power is low and then allowed to flow back down through turbines when demand is high. It avoids the problems that battery storage often confronts. But pumped hydro storage is restricted by geography - it requires access to areas where hydropower is generated.

Two types of storage will be needed for a renewables-based system to function effectively. The first is *diurnal* storage - technologies that can release solar energy generated during the day past sundown and into the night. Four-hour batteries are today the most common, but six-hour and eight-hour batteries are being developed, although the costs of the latter

[164] Klass, A.B. (6 September 2017) 'Expanding the U.S. Electric Transmission and Distribution Grid to Meet Deep Decarbonization Goals', in M.B. Gerrard and J. Dernbach (eds.), *Legal Pathways to Deep Decarbonization in the United States* (2018 from ELI) Forthcoming; *Environmental Law Reporter*, Vol. 47, 2017. Available at http://dx.doi.org/10.2139/ssrn.3033829.

[165] Geder, J. (August 2019) 'Bankable and insurable energy storage: a necessary next step for renewable energy', *Energy Storage*. Available at: https://www.energy-storage.news/resources/download/bankable-and-insurable-energy-storage-a-necessary-next-step-for-renewable-e (retrieved 23 June 2020).

[166] European Commission (Undated) *The future role and challenges of Energy Storage*, Directorate-General for Energy, European Commission. Available at: https://ec.europa.eu/energy/sites/ener/files/energy_storage.pdf (retrieved 23 June 2020).

two are currently much higher. The second type of storage is *seasonal* storage - technologies that can use power, generated during the summer, in winter months when the sun is not shining and the wind may not always be blowing.

Many voices in the energy debates regard the viability and availability of energy storage to be a crucial factor in further growth of renewable energy generation.[167] But, as we will see, scientists and engineers don't agree about the need (or lack of need) for large amounts of storage, or about how much storage might be needed once renewables go beyond 30 percent or 40 percent of total supply, let alone to 60 percent or 70 percent. This is already part of the debate in South Africa, but it is not always visible given the short-term challenges of load shedding and Eskom's financial crisis.

Whatever the potential of storage technologies to tackle the challenge of variable or intermittent generation, there are a number of formidable obstacles that will need to be negotiated if they are to play a much larger role. As with wind and solar technologies, we can again identify both technical challenges and 'market' challenges.

On the technical challenges, the difficulties of seasonal storage are particularly formidable. Battery technologies are not yet sufficiently developed to store such large amounts of electricity so that it can be used perhaps for days or even weeks at a time. In the US, it has been estimated that the optimal mix of wind and solar capacity to supply 100 percent of US electricity would require storage capacity for 15-30 percent of U.S. annual electricity demand - between 8 and 16 weeks of usage.[168] The US currently has storage capacity that amounts to 43 minutes of usage, and most of that capacity is in the form of pumped hydropower. According to the US-based National Renewable Energy Laboratory (NREL), just 10 percent of solar PV penetration (in the US context) could require up to 50GW of storage potential. That is the equivalent of roughly 65 coal-fired power stations.[169] Energy scholars Jesse Jenkins and Samuel Thernstrom have therefore concluded that, 'Battery storage is infeasible for such long duration seasonal storage'. A '100 percent renewables scenario' would, they argue, mean the total storage capacity 'is equivalent to 37.8 billion Tesla Power Wall 2.0 home energy storage systems - 320 Power Walls per US household'.[170] Similarly, another paper has concluded that, in the US at least, 'wind and solar output exhibit seasonal episodes of both sustained oversupply and undersupply that overwhelm any conceivable storage strategy'.[171]

[167] European Commission. (Undated) 'Energy storage'. Available at: https://ec.europa.eu/energy/en/topics/technology-and-innovation/energy-storage (retrieved 23 June 2020).

[168] Jenkins, J. and Thernstrom, S. (March 2017) *Deep Decarbonization of the Electric Power Sector: Insights from Recent Literature.* Arlington, VA: Energy Innovation Reform Project (EIRP).

[169] Denholm, P., Nunemaker, J., Gagnon, P. and Cole, W. (June 2019) *The Potential for Battery Energy Storage to Provide Peaking Capacity in the United States*, Technical Report, NREL/TP-6A20-74184. Golden, Colo: National Renewable Energy Laboratory (NREL).

[170] Jenkins, J. and Thernstrom, S. (March 2017) *Deep Decarbonization of the Electric Power Sector*.

[171] Brick, S., and Thernstrom, S. (2016) 'Renewables and Decarbonization: Studies of California, Wisconsin and Germany', *The Electricity Journal*, 29 (3): 6–12.

Some studies suggest that South Africa will not face the same problems because there is more than enough wind and sun on a year-round basis to 'smooth out' both short-term and seasonal variations in supply. But not everyone agrees. An independent study conducted by the California-based Electric Power Research Institute concluded:

The bottom line is that today's power distribution system has not been designed for distribution-connected PV or other high penetration of distributed generation. In the past this was not an issue, but today, with larger amounts of PV connecting to the electric system, we can expect new challenges in how distributed and variable generation can be safely and reliably interconnected. [172]

Problems with 'Storage for Profit'

The 'market' challenges facing the further development of storage are similar to those facing the future deployment of renewables. Because storage is being developed within the 'energy for profit' framework, the challenges again revolve around issues of investor risk and the need to establish a 'storage for profit' environment for those who invest in or deploy storage technologies.

Storage companies therefore speak with one voice on the need for 'risk negation'. For example, the industry groups note how the EU's *Clean Energy Package* 'does not address all of the issues that are holding back storage deployment', principally the need for 'investment certainty in the form of long-term contracts for storage services'.[173] In other words, storage companies are seeking PPA-like contracts in order to guarantee returns on investment. But current EU policy on storage 'means that there are ever fewer longer-term revenue streams on which storage operators - and investors - can rely'. The European Commission concurs, 'Above all, the main challenge for energy storage development is economic… Today, development is very slow due to the poor economic/business case and related uncertainties'.[174] In December 2019, the European Commission approved a €3.2 billion plan to create a 'pan-European' battery ecosystem via a coordinated research effort involving storage companies.[175]

Clearly, the 'dynamic market' needs a significant infusion of public money in order to become, well, a bit more dynamic. But addressing the technical challenges, while important, will not solve the problems of the current market structure for storage, where the incentive to invest is tied to making money based on electricity price fluctuations, so that a battery owner can be a 'market player'. If the fluctuations are not significant

[172] Electric Power Research Institute (EPRI) (2017) *Power Generation Technology Data for Integrated Resource Plan of South Africa*, 11-6. Palo Alto, CA: EPRI, prepared for DOE, South Africa.

[173] Delgado, A. (13 February 2019) 'The reform of the European electricity market is imperative for the PV revolution', *pv magazine*. Available at: https://www.pv-magazine.com/2019/02/13/the-reform-of-the-european-electricity-market-is-imperative-for-the-pv-revolution/

[174] European Commission (Undated) *The future role and challenges of Energy Storage*.

[175] Martin, J.R. (10 December 2019) 'Europe approves US$3.5bn for R&D in major push to create sustainable battery manufacturing ecosystem', *Energy Storage News*. Available at: https://www.energy-storage.news/news/europe-wages-multi-billion-crusade-to-nurture-battery-ecosystem (retrieved 23 June 2020).

enough to make money, then there will be no investment. According to one study, 'Investing in storage is first profitable when large differences in the electricity price frequently occur, either on the electricity exchange market or at the consumer level. Currently investments in storage, specifically pumped storage, are even being deferred because cost-effective operation is not possible'.[176]

A 2017 New York University report (perhaps unintentionally) shines a light on system-level problems of 'storage for profit'. It states, 'energy storage systems cannot earn multiple revenue streams for various benefits they provide at different levels of the grid, so their current earnings do not accurately reflect their true value'. Hence the need to create 'appropriate market signals to incentivise the building of storage capacity'.[177] Put differently, in order to make sure that everyone investing in or deploying storage makes money, 'A framework should be developed that allows for services to be paid for by different grid actors, at different rates, using different methods of rate calculation'. But the report notes that such a convoluted system, which is to provide remuneration to individuals, companies and investors for 'storage services', could be disruptive to careful and coordinated grid management, which is itself essential in order to deal with the challenges of variable renewable energy coming into the system. Not surprisingly then, 'Unless this fundamental coordination problem can be resolved, neither the level of energy storage deployment, nor the composition of the types of energy storage systems that are deployed will be efficient'. [178]

Indeed, according to *Energy Storage News*, the sheer scale of the storage capacity needed will require careful energy planning and coordination across the entire system:

> *The reality of bi-directional energy flows to and from battery systems requires careful dimensioning with regards to expected load profiles on both the charge and discharge sides. Energy storage systems therefore need to be planned to operate with regards to generation and consumption characteristics of the grid. This includes accounting for future upgrades based on the grid's needs*'.[179]

From the above we can safely conclude that 'storage for profit' means that the development and deployment of storage technologies is currently dependent on removing risk to private investors in order to guarantee returns. But removing such risk will, it is claimed, open the door to 'different grid actors', all motivated by self-interest rather than 'system interest'.

Clearly, this is not the policy direction South Africa should pursue, unless it wants to be sucked into the kind of quagmire that the EU currently finds itself in, perhaps soon to be joined by the US and China, as each goes beyond the 10 percent renewable energy threshold.

[176] Wirth, H. (7 January 2020) *Recent Facts about Photovoltaics in Germany*. Freiburg: Fraunhofer ISE.
[177] Condon, M., Revesz, R.L. and Unel, B. (April 2018) *Managing the Future of Energy Storage.* New York: Institute for Policy Integrity, New York University School of Law.
[178] Condon, M., Revesz, R.L. and Unel, B. (April 2018) *Managing the Future of Energy Storage*.
[179] Geder, J. (August 2019) 'Bankable and insurable energy storage'.

The big grid approach

Another proposed option for dealing with variable power generated from wind and solar is to expand and improve the grid so that power can be moved long distances between areas that are sunny and windy to areas where the sun is not shining and/or the wind is not blowing. On this thinking, if wind and solar farms are built in enough places, they should all be able to back each other up: when it is cloudy in one place, it will be windy in another. In principle, this 'aggregated' or 'big grid' approach could dramatically reduce the need for storage. Indeed, research into this approach as a response to variable power has in part been motivated by a sense that the challenges facing storage are simply too formidable, and therefore attention should shift towards 'smoothing out' supply and shaping patterns of demand.

However, one of the technical challenges to turning the aggregated 'big grid' idea into reality is the need for a lot more transmission infrastructure stretching over long distances. So most high-renewable scenarios include plans for much greater long-distance transmission capacity.[180] The IEA notes how 'fluctuations are reduced when VRE capacity is installed over a wide area, and interconnection among adjacent countries/power systems can make this area very wide indeed'. [181]

In the US, the NREL is in the midst of serious research exploring how to connect regional grids in order to allow for variable renewable energy to be directed to where it is needed. The three major grids, covering the Eastern seaboard, the West coast, and Texas, have until now operated more or less separately.

In a 2012 study, the NREL concluded that 'renewable electricity generation from technologies that are commercially available today, in combination with a more flexible electric system, is more than adequate to supply 80 percent of total U.S. electricity generation in 2050 while meeting electricity demand on an hourly basis in every region of the United States'.[182] But the study did not pay particular attention to challenges associated with expanding long-distance transmission capacity, except to say that for renewable energy to supply 90 percent of U.S. electricity would require a doubling of existing installed capacity, from 150-200 million MW miles of transmission to around 400 million MW miles.[183]

A more recent study (April 2017) conducted by Climate Policy Initiative similarly concluded that the US is not unique in terms of what is possible in the integration of large volumes of renewables, suggesting that 'There is no technical barrier to the deployment of variable renewables in the power sector and flexibility options will become available at increasingly lower cost in most geographies'. However, according to the study,

[180] Jenkins, J. and Thernstrom, S. (March 2017) *Deep Decarbonization of the Electric Power Sector*.

[181] IEA. (2017) *Getting Wind and Sun onto the Grid*.

[182] National Renewable Energy Laboratory (NREL). (2012) *Renewable Electricity Futures Study* (NREL/TP-6A20-52409). Golden, Colo: NREL. Available at: https://www.nrel.gov/docs/fy12osti/52409-1.pdf (retrieved 23 June 2020) - Technical report. https://www.nrel.gov/analysis/re-futures.html (retrieved 23 June 2020) - Also, https://www.nrel.gov/docs/fy13osti/52409-ES.pdf (retrieved 23 June 2020).

[183] National Renewable Energy Laboratory (NREL). (2012) *Renewable Electricity Futures Study*.

'flexibility costs' are expected to bump up the estimated cost of power by 2030 from $40 per MW/hr to $70 per MW/hr. [184] The additional $30 per MW/hr would be needed to cover the cost of transmission additions and upgrades, as well as storage capacity needed. [185]

In the EU the debate between either prioritising storage or expanding the capacity of transmission interconnections has become more urgent in the light of the EU's recently adopted 'net zero' Greenhouse Gas (GHG) target, which must be achieved 'as early as possible'.[186] Most EU member states, along with the European Commission, have interpreted this to mean 100 percent renewable energy by 2050. Advocating for a 'storage' approach to reaching this goal, one study has calculated that 'the capacity of transmission interconnection would need to grow approximately fourfold, from the current level of 63 GW to 262 GW in 2050. Furthermore, much of this transmission line length would need to be installed before 2025'.[187]

The prospect of a massive build out of new transmission infrastructure again raises the question of who will pay for such additions, and on what terms will the capital be released in order to get the job fully underway. A 2009 study conducted by the US Department of Energy concluded that new transmission infrastructure, 'could address the general increase seen in grid congestion and support the future integration of renewable resources; however, the relationship between this general economic benefit and the private return to companies paying for new transmission is often insufficient or too uncertain to spur investment'.[188]

Not surprisingly, one analyst concluded, 'The power industry has been reluctant to make capital-intensive upgrades because it is becoming unclear who will pay for the grid. New firms and policies aimed at promoting disruption have also disrupted the business models and policy credibility needed for long-term investment'.[189]

Commenting on Europe's challenges, a policy group representing system operators concluded, 'the gap between market outcomes and the physical reality of the grid is widening'.[190] Thus we see how the 'energy for profit' approach, and its preoccupation with 'mobilising the private sector' stands in the way of potential social and ecological benefits of transmission additions and upgrades, just as 'storage for profit' stands in the way of releasing the potential of these technologies.

[184] Pierpont, B., Nelson, D., Posner, D., and Goggins, A. (April 2017) *Flexibility: the path to low-carbon, low-cost electricity grids.* San Francisco: Climate Policy Initiative.

[185] National Renewable Energy Laboratory (NREL). (2012) *Renewable Electricity Futures Study*.

[186] European Commission (EC). (2018) *A Clean Planet for All: A European Strategic Long- Term Vision for a Prosperous, Modern, Competitive and Climate Neutral Economy*. Brussels: EC.

[187] See also: Pleßmann, G. and Blechinger, P. (March 2017) 'How to Meet EU GHG Emission Reduction Targets? A Model Based Decarbonization Pathway for Europe's Electricity Supply System until 2050', *Energy Strategy Reviews*, 15: 19–32.

[188] US Department of Energy (DOE). (2009) '2009 National Electric Transmission Congestion Study'. Washington DC: DOE. Available at: http://congestion09.anl.gov/documents/docs/Congestion_Study_2009.pdf (retrieved 31 May 2012) Cited in: https://www.nrel.gov/docs/fy12osti/52409-4.pdf

[189] Sivaram, V. (ed.) (June 2018) *Digital Decarbonization*.

[190] ENTSO-E. (October 2019) *Ten Years Network Development Plan* (TYNDP). Brussels: ENTSO-E.

In mainstream policy circles, it is therefore slowly beginning to sink in that the current neoliberal 'power market design' is not helpful in terms of delivering either the investment or the planning processes needed to make the best possible decisions about technologies. According to the CPI, 'Most of the prevailing market structures were designed for circumstances that no longer pertain'. Hourly pricing models have:

> *become decreasingly relevant in systems with growing shares of renewable or nuclear power generation. Indeed, as these shares rise, hourly pricing models become ultimately unworkable, since hourly competition between generators with close to zero marginal cost will result in such low average wholesale prices that no new investment will be forthcoming.*[191]

Painless decarbonisation? Technical challenges in the South African context

This albeit cursory assessment of the main technical challenges facing the transition to a renewables-based system raises important issues for those engaged in the energy debates in South Africa.

In South Africa, research conducted by liberal policy groups have tended to support the idea that South Africa and renewable energy can forge a perfect marriage. For example, the Council for Scientific and Industrial Research (CSIR) states that, 'There is no technical limitation to solar PV and wind penetration over the planning horizon until 2050'.[192] At least 70 percent of renewables generation nationally by 2050 'is cost optimal, replacing all plants that decommission over time and meeting new demand with the new optimal mix. South Africa has the unique opportunity to decarbonise its electricity sector without pain'.[193]

Backing up this argument, Chris Yellin notes that:

> *International experience and scientific and technical research now shows that, to 2050 and beyond, there is indeed no economic, technical or other reason why the significant majority of South Africa's new generation capacity requirements should not be wind and solar PV, backed up by flexible generation capacity in the form of gas-to-power, hydro, pumped water storage and other emerging energy storage technologies.*[194]

Similarly, in a report released in February 2019, the ERC proposed two scenarios for the large-scale deployment of renewable energy, namely 'the least cost option' scenario and a more aggressive 'least cost climate mitigation' scenario. Both scenarios see the potential for wind and solar energy to make up, respectively, 38 percent and 57 percent of electricity supply by 2030 and, again respectively, 88 percent and 96 percent by 2050. Clearly, both the CSIR and ERC studies imagine a rapid rate of

[191] Pierpont, et al. (April 2017) *Flexibility: the path to low-carbon, low-cost electricity grids.*
[192] Wright, et al. (4 April 2017) *Formal comments on the Integrated Resource Plan (IRP)*, i.
[193] *Ibid*, i.
[194] Yelland, C. (2 August 2017) 'SA needs to ditch 'baseloadism' for flexible power generation', Fin24. Available at: https://www.fin24.com/Companies/Industrial/the-end-for-baseloadism-in-sa-and-the-need-for-flexible-power-generation-20170802 (retrieved 23 June 2020).

power sector decarbonisation without any serious technical difficulties.[195]

As with other aspects of these debates, technical matters have become the subject of political disagreements rooted in contrasting assessments of what is possible. The 'yes we can, no we can't' tensions in these debates therefore reflect or replicate the kinds of debates happening elsewhere. There are those who see the technical challenges posed by renewable energy as a reason to fundamentally question, and perhaps reject, the idea that South Africa should (or even can) transition to a renewables-based system. But there are also many voices that feel that these technical challenges have been exaggerated; they serve to perpetuate the myth of 'baseloadism' (that thermal and nuclear power will always be necessary to provide back-up power), and these arguments are little more than a futile attempt to impede the ever-forward march of low-cost renewables.

A report commissioned by Eskom and conducted by Germany-based consultants Moeller & Poeller Engineering similarly concluded, 'The South African power system will be sufficiently flexible to handle very large amounts of wind and PV generation'.[196] The study asserted that, in 2030, the system could accommodate 38.5 GW of variable wind and solar fairly easily, as long as it was backed up by 7.3GW of new gas-fired power generation using Combined Cycle Gas Turbine (CCGT) technologies.

Another study concluded that South Africa could meet all of its energy needs from wind and solar for many decades to come, simply by situating wind turbines and solar PV throughout the rural regions of the entire country.[197] Released in November 2016, this detailed 'wind and solar aggregation' study carried out by Fraunhofer IWES in collaboration with CSIR, Eskom and others, concluded that the wider the spatial distribution of the technologies, the less significant the fluctuations in supply. South Africa could therefore pursue a radical renewables-based decarbonisation agenda and avoid many of the problems associated with variable supply that are today being faced by power systems in, for example, Europe.

Realising Potential Requires Planning

These technical studies are extremely helpful in that they draw attention to South Africa's potential to develop an energy system based on modern renewables, while attempting to come up with feasible and viable solutions to the technical challenges posed by their integration.

But they also reveal, perhaps unintentionally, how difficult it will be to pursue such a transition based on the current 'energy for profit' framework.

[195] McCall, B., Burton, J., Marquard, A., Hartley, F., Ahjum, F., Ireland, G. and Merven, B. (February 2019) *Least-cost integrated resource planning and cost optimal climate change mitigation policy: Alternatives for the South African electricity system*, Cape Town: Energy Research Centre.
[196] Obert, M. and Pöller, M. (September 2017). *Assessing the impact of increasing shares of variable generation on system operations in South Africa*. GIZ for Department of Energy and Eskom.
[197] Knorr, K., Zimmermann, B., Bofinger, S., Gerlach, A-K., (Fraunhofer IWES), Bischof-Niemz, T. and Mushwana, C. (CSIR). (November 2016) *Wind and Solar PV Resource Aggregation Study for South Africa, Final Report*. CSIR, Fraunhofer IWES, Sanedi, Eskom.

Without careful planning and a facts-based approach, an energy transition that is anything other than chaotic is inconceivable.[198]

To substantiate this point, it is worth noting that the various technical studies more or less agree on one thing: South Africa should aspire to build a power system where renewables provide between 70 percent and 95 percent of the country's electricity supply by 2050.

But while there is agreement in terms of the final destination, the studies propose sharply diverging pathways in order to get there. Taking a 'big grid' approach, CSIR estimates that 16GW of stationary batteries and 5GW of pumped hydro storage will be needed by 2050. For the ERC, deep decarbonisation will require a lot more battery storage - 53GW in total. To view these numbers in context, less than 1GW of battery storage is currently operational in the US.

It is not possible here to adequately examine or explain why some studies consider large amounts of storage to be essential (and therefore a policy priority) while others conclude that a 'big grid' aggregated approach will help to overcome the storage challenge. But from the perspective of energy transition planning, the implications of choosing one path or the other are monumental. That these conclusions are so wildly different from each other in this and other important respects merely emphasises the need for the most meticulous interrogation of the available data. An expanded IPP system is simply not set up to deliver the kinds of planning and coordination needed to address the technical challenges associated with power sector decarbonisation.[199]

South Africa should aspire to build a power system where renewables provide between 70 percent and 95 percent of the country's electricity supply by 2050.

Regarding the costs associated with these different scenarios, there are clear signs that some studies have underestimated the potential costs associated with a deep renewables strategy. There is certainly a tendency for those who take a 'yes we can' position to refer to just a few indicators - the falling LCOE for renewables, and, as if to reinforce the point, the recent fall in costs for battery storage, and the low cost of transmission extensions and upgrades when compared to the total costs of the system.[200]

[198] For a sense of the complexities and scale of the grid changes needed, see Marais, R. (2015). *Transmission Strategic Grid Study 2040*. Midrand: Eskom. Presented at the Transmission Development Plan (TDP) 2015-2024 Public Forum, 10 October. Available at: http://www.eskom.co.za/Whatweredoing/TransmissionDevelopmentPlan/Documents/2015-2024TDP_SGP_Presentation20141010.pdf (retrieved 23 June 2020).

[199] For a sense of the complexities and scale of the grid changes needed, see Marais, R. (2015). *Transmission Strategic Grid Study 2040*.

[200] Heard, B.P., Brook, B.W., Wigley, T.M.L. and Bradshaw, C.J.A. (2017) 'Burden of proof: A comprehensive review of the feasibility of 100 percent renewable-electricity systems', *Renewable and Sustainable Energy Reviews*, 76, 1122–1133. See also: Ueckerdt et al. (15 December 2013) 'System LCOE: What are the costs of variable renewables?' and Hirth, L., Ueckerdt F. and Edenhofer O. (2015;) 'Integration costs revisited - An economic framework for wind and solar variability', *Renew Energy* 74:925–39. On the other side of the argument, the 'painless decarbonisation' school notes that system costs need to be viewed alongside all of the other energy-related costs. For example, the EU expects the cost of network expansions to reach €80 billion in the decade to 2030. However, Europe pays around €300–400 billion for its electricity annually. Therefore network expansion costs are trivial—just 2 percent of annual spending on electricity—when compared to the costs of the entire system.

We have already discussed why the LCOE is not a sound methodology to compare the relative costs of different sources of power, because it does not account for the additional costs necessary to supply electricity when winds subside and the sun goes down. And battery storage technologies are neither as inexpensive nor as ready for mass deployment as many apparently believe. By focusing on the LCOE, these studies not only divert attention away from all of these other costs, they infer that market forces will ensure that the transition will follow 'the least cost option' trajectory. If it is cheaper, then it will surely come.

But there is an even bigger problem here. Hypothetically, the LCOE estimates for the aggregated 'big grid' approach might be lower than the LCOE costs for renewables plus large amounts of (still prohibitively expensive) battery storage. And, of course, the opposite could also be true. If LCOE levels and 'least cost option' arguments more broadly were allowed to become the sole criterion for hugely important decisions about South Africa's energy transition, then the results could be more or less right in terms of cost considerations, but disastrously wrong from a technical standpoint. Put differently, the best decarbonisation technologies from a social and ecological perspective may not turn out to be the least expensive.[201]

Solar panels and windmills everywhere?

Two other considerations underscore the immense problems for energy planning that may pass unnoticed as a result of a narrow focus on LCOE levels. These are, first, the tendency to overlook the implications of installing levels of renewables (measured in 'nameplate' capacity) that are required in order to decarbonise the power system and, second, the size and significance of 'system costs' (sometimes referred to as 'network costs') associated with these levels of deployment.

In South Africa, the level of future capacity additions for renewables or any form of energy will be tied in some way to both the pace of decommissioning of coal-fired power stations and to the changing levels of energy demand. According to the government's IRP 2019, the country's 'peak demand' for electricity is expected to grow roughly 50 percent between 2020 and 2050, from 40 GW to 61 GW. Calculated in TWh, the country's need for power will expand from roughly 270 TWh per year in 2020 to roughly 400 TWh in 2050, which is also roughly 50 percent above 2020 levels. The IRP 2019 projects that solar and wind will together contribute 62 percent of supply by 2050. But to reach this 62 percent, the levels of total installed capacity (from all energy sources) will need to grow from 48GW to 148GW.

It is important to point out that 148GW would *triple* the country's currently installed capacity in the 30 years from 2020 to 2050. However, in terms of additional electricity supply, the additional 100GW above current

[201] According to the NGO Climate Action Tracker (CAT), 'The transition toward a predominantly renewables-based electricity supply requires advanced long-term planning of transmission, grid connection, and grid management infrastructure. Such forward-looking planning comprises adjustments during the early stage, the medium stage planning on introducing market design concepts and enhancing the system infrastructure's flexibility and stability, as well as the advanced stage (or stabilisation) planning such as storage and sector coupling'. See: Climate Action Tracker. (November 2018) *Scaling Up: South Africa*.

levels produces just 50 percent more electricity above current levels.[202] In other words, a 200 percent increase in capacity will not produce a similar increase in generation—far from it. This is due almost entirely to the fact that 'capacity factors' for wind and solar are considerably lower than they are for coal, gas and nuclear generation, an issue discussed in Part One of this section. The implications of this capacity 'redundancy' is not always given the attention it perhaps deserves.

Again, Europe's experience is revealing. For example, Germany had installed 42GW of PV and 56GW of wind power at the end of 2017, thus a total of 98GW. But 'rarely more than 45 GW of power was connected to the grid…only 3 percent of the electricity production was above a capacity of 30 GW'.[203] Statistics such as these suggest that in order to secure adequate and consistent supply, a lot of redundant wind and solar capacity will need to be in place, at least when compared to conventional sources of thermal, nuclear, and large hydro systems.

This 200 percent increase or tripling of the country's capacity is based on the IRP 2019 projections but, as noted above, CSIR's 'big grid' aggregation approach estimates that, reaching 88 percent of total supply by 2050 will require 157GW of renewable energy. The ERC's 'least cost option' scenario estimates that 161 GW of wind and solar would be needed, complemented by as much as 53GW of battery storage.[204] Based on today's technologies, these levels of renewables would presumably further increase capacity redundancy.

System costs are real, even in South Africa

Additional renewable energy capacity in the region of 100GW above current levels by 2050 will also incur a range of 'system costs' or 'network costs'. These are costs associated with intermittency, transmission, and, when it occurs, the earlier than necessary displacement of existing capacity infrastructure (primarily coal).[205]According to the Energy Policy Research Institute's 2015 technical study for the IRP process:

Depending on the location and the relative size of renewable output, absorbing variable generation ultimately leads to increased cost[s] related to the impacts of intermittency, ramping, fluctuating output, lack of control, and remote location on transmission scheduling, system dispatch, network stability, load following, and load balancing.[206]

In recent years there has been an increase in the levels of research into the extent and implications of these costs, particularly in countries that have seen a significant rise in renewable energy. One warned against 'extrapolating declines in the direct generation cost of renewable energy to

[202] DOE. (October 2019) *IRP 2019*, 91.
[203] Wirth, H. (7 January 2020) *Recent Facts about Photovoltaics in Germany*.
[204] McCall et al. (February 2019) *Least-cost integrated resource planning and cost optimal climate change mitigation policy*. (see also Footnote 245)
[205] Greenstone, M., and Nath, I. (9 May 2019) 'Do Renewable Portfolio Standards Deliver?'
[206] Electric Power Research Institute (EPRI). (2017) *Power Generation Technology Data for Integrated Resource Plan of South Africa*, 11-7. Cape Town: EPRI.

its overall impact on electricity prices'.[207] A US study on the cost and emissions-related impacts of mandating utilities to reach renewable energy targets (known as 'renewable portfolio standards' or RPS') concluded that 'system costs' constituted an 'important barrier to substantially increasing renewable energy's share of generation and meaningfully decreasing carbon dioxide emissions'.[208]

The discussions around 'system costs' have provoked sharp disagreements among those with specialised knowledge of the power sector and energy technologies.[209] For some, system costs are trivial; for others, they are very substantial. According to the IEA, 'costs vary widely…a useful rule of thumb holds that grid infrastructure is a factor of ten cheaper than generation capacity'. But overall system costs can be as high as 15 percent above the cost of new capacity.[210] Another study noted:

> *These system changes and technology upgrades represent an extensive investment on the part of electric utilities, rate payers, and equipment manufacturers, and a huge change in the way the power system is operated and designed. These changes will not come overnight and will require many decades to implement as well as considerable engineering planning and development to determine the balance of features and capabilities needed against cost and complexity of implementation. Nonetheless, these are the approaches needed to move to high-penetration PV, and the industry needs to begin work now on research and development so that the technologies, tools, and approaches will be available in a timely manner.*[211]

And another: 'The share of transmission requirements for renewables relative to their share of generation highlights the importance of accounting for the associated costs as part of the total cost of renewable energy'.[212]

Countries with high levels of renewable energy due to a 'favourable regulatory environment' are experiencing 'rapidly increasing expenditures and technical inefficiencies (losses for instance)'.[213]Indeed, the introduction of a modest amount of renewables by way of the REI4PP has, according to one study, 'posed a serious challenge for Eskom and required the utility to invest in grid expansion and strengthening in response to the introduction of IPPs'.[214] Eskom invested R2.4 billion in grid development to connect REI4P projects from Bid Windows 1 to 3. This involved expanding the number of transmission substations and transformer capacity enhancement projects

[207] Greenstone, M., and Nath, I. (9 May 2019) 'Do Renewable Portfolio Standards Deliver?'
[208] *Ibid*.
[209] Heard, et al. (2017) 'Burden of proof: A comprehensive review of the feasibility of 100 percent renewable-electricity systems'.
[210] IEA. (2017) *Getting Wind and Sun onto the Grid*.
[211] Electric Power Research Institute (EPRI). (2017) *Power Generation Technology Data for Integrated Resource Plan of South Africa*, 293. Palo Alto, CA: EPRI.
[212] Greenstone, M., and Nath, I. (9 May 2019) 'Do Renewable Portfolio Standards Deliver?'
[213] Corbier, D., Gonand, F. and Bessec, M. (2015). 'Impacts of decentralised power generation on distribution networks: a statistical typology of European countries', Working Paper 1509, Chaire Economie du climat. Available at: http://www.chaireeconomieduclimat.org/RePEc/cec/wpaper/15-10-Cahier-R-2015-09-Corbier-et-al.pdf (retrieved 24 June 2020).
[214] ERC. (November 2015) *The political economy of decarbonisation*, 40.

in order to accommodate 67 REI4PP projects totalling, by July 2019, 4,041MW.[215] The same source notes how:

The existing grid may have little or no capacity to accommodate additional generation. Grid constraints are becoming more prevalent as the REI4P progresses, and the limited spare capacity, especially in areas with good resources, is depleted…[Therefore] proactive plans are required to procure grid capacity in alignment with the spatial generation plans of the country.[216] Eskom's own *Transmission Development Plan* (TDP) reports that more than 5,500 km of power lines were added in 2018, but the utility anticipates needing to add 12,000 km per year by 2028.[217] Eskom's Transmission Capital Plan amounts to R109 billion over the TDP period 2019 – 2028.

We have already noted that much of Eskom's 33,000 km of transmission lines are between 30 and 40 years old, and a third of the lines are at least 40 years old.[218] The DPE notes that new investment, is needed simply to sustain the existing system, and for the DPE 'unbundling' provides the best means to attract private sector investment. According to this argument, forming a separate Eskom transmission company (Eskom TE) 'will boost investor confidence' because an independent Eskom TE will be able to 'foster accountability within the remainder of Eskom'. Increased investor confidence 'will enable security of supply through increased investment'. [219]

But if the current policy framework is extended into the future and unbundling proceeds as the DPE has proposed, Eskom TE will be caught in its own custom-made death spiral. It will be expected to be the 'single buyer' of energy generated by a large number of IPP projects; it will have the responsibility of installing a historically unprecedented amount of battery storage; and it will have to put in place power cables and other technologies needed to accommodate a minimum of 100GW of renewables, enough to triple the country's current generation capacity.

It is hard to imagine how expecting Eskom TE to carry these multiple burdens will inspire 'investor confidence', especially when NERSA will continue to have the power to approve or deny requests for tariff increases that might help Eskom cover these costs. In presenting its 10-year transmission plan, Eskom warned, 'The liquidity position of Eskom may impact the execution of the Transmission Development Plan. The location of future IPPs may also impact the roll-out of new network reinforcements. The execution ability to accomplish the plan remains a challenge'.[220]

[215] ESI Africa. (1 November 2019) 'Eskom shares its updated Transmission Development Plan through 2029'. Available at: https://www.esi-africa.com/industry-sectors/transmission-and-distribution/eskom-shares-its-updated-transmission-development-plan-through-2029/ (retrieved 24 June 2020).

[216] ERC. (November 2015) *The political economy of decarbonisation*, 40.

[217] Eskom. (25 October 2018) *The Eskom Transmission Development Plan, 2019-2028*.

[218] DPE. *Roadmap for Eskom in a Reformed Electricity Supply Industry*.

[219] DPE. *Roadmap for Eskom in a Reformed Electricity Supply Industry*, 48.

[220] ESI Africa. (1 November 2019) 'Eskom shares its updated Transmission Development Plan through 2029'.

In March 2019, NERSA announced its fourth Multi-Year Price Determination (MYPD4), which gave the green light for Eskom to increase tariffs by 9.41 percent, 8.1 percent and 5.22 percent for the period 2020-2022. The decision left Eskom with a shortfall of approximately R102 billion compared to what the utility said was needed to cover costs and investments, such as those in new transmission upgrades and connections. The ERA requires NERSA to set tariffs which would be reflective of prudent and efficient costs and allow a reasonable return on capital. Eskom's reaction involved pointing out that the MYPD4 decision had exacerbated the utility's financial crisis, and that NERSA was not fulfilling its mandate that 'requires considering the balance between the impact on consumers with Eskom's sustainability when making revenue decisions'.[221] / [222]

An expanded IPP system is simply not set up to deliver the kinds of planning and coordination needed to address the technical challenges associated with power sector decarbonisation.

It would appear from the above that South Africa's decarbonisation will probably not be 'painless' after all. Rather, the process will bring many challenges no matter what pathway is pursued. The CSIR study suggests that, although geographically dispersed, most of the new wind and solar can be located relatively close to existing substations, thereby reducing the technical as well as financial burdens of transmission.[223] This could reduce the costs of storage, but not erase those costs entirely. The ERC's 'high storage' scenario has led it to recommend that, beginning in 2026, 'a large-scale procurement program for battery technology to provide storage capabilities for variable renewable energy should be pursued in South Africa'. But it does not say who will be writing the cheques. If the current policy approach is allowed to continue, one can only assume that an unbundled Eskom TE will be expected to cover costs within a 'storage for profit' system build around incentives and 'storage PPAs'.

But even if we consider the government's less ambitious approach to deploying renewables contained in the IRP 2019, the renewables sector will still dominate South Africa's power supply by 2050, producing an estimated 62 percent of the country's electricity. It is therefore necessary to be as clear as possible with regard to both the technical challenges involved and the likely costs that might be incurred in trying to deal with them.

The technical dimensions of the energy transition are complex and even the most careful and transparent process will not be error free. But decisions of this nature must be liberated from the need to secure 'returns on investment' for every additional MW of IPP-installed wind, solar, and storage capacity. Continuing with the IPP approach will inflate the costs of the new system considerably, and on current policy, the new system will not be

[221] ESI Africa. (11 October 2019) 'Eskom questions the reasons behind the MYPD4 decision', *ESI Africa.* Available at: https://www.esi-africa.com/industry-sectors/generation/eskom-questions-the-reasons-behind-mypd4-decision/ (retrieved 24 June 2020).

[222] For a sense of the complexities and scale of the grid changes needed, see Marais, R. (2014). *Transmission Strategic Grid Study 2040.* Eskom. Available at: http://www.eskom.co.za/Whatweredoing/TransmissionDevelopmentPlan/Documents/2015-2024TDP_SGP_Presentation2014 1010. pdf (retrieved 24 June 2020).

[223] Knorr et al. (CSIR). (November 2016) *Wind and Solar PV Resource Aggregation Study for South Africa, Final Report.*

owned, constructed and perhaps not even operated or maintained by South Africans. It will take the form of a sprawling web of 'public private partnerships' where private returns will be secured through the proliferation of market-protected PPAs. As it stands now, the costs of making the entire system capable of integrating large amounts of variable power will first fall at the feet of Eskom TE, and then be passed on to consumers via NERSA or, failing that, to the state.[224] According to IRP 2019, Eskom's coal fleet will still be needed to provide more than 60 percent of South Africa's power in 2030, between 27 percent and 44 percent by 2040, and a minimum of 20 percent by 2050. Eskom's 'zombie' status will therefore stretch out for another thirty years unless, of course, Eskom's existing fleet of power stations is sold to one or more private companies.

The progressive policy community must acknowledge that such a scenario threatens any hopes of a relatively orderly energy transition in South Africa. And if the falling LCOE for renewables is sending any signal at all to investors, it is to recommend they stay away from what has become a market that yields low returns and is saturated in risk. The prerogatives of profit are therefore currently preventing efforts to address the technical challenges associated with the deployment of large-scale renewable power, principal among them being the challenge of variable renewable energy. These challenges are real. In South Africa, this is a problem that is still on the 10-year horizon. As noted above, in other regions, including Europe, China and India, the problem has already arrived.[225]

Among other things, social ownership will allow for the *decoupling* of what are currently understood as market problems (securing returns on investment for private interests) from the very real technical challenges posed by the need to transition to a truly sustainable energy system.

TASK FIVE: FINANCING THE ENERGY TRANSITION

The fifth task for supporters of social ownership is to provide an alternative to the current neoliberal model of investment and financing of the energy transition. When it comes to renewables, the job of governments has been to make profitable what would otherwise not be profitable through PPA-type contracts that mitigate or remove investor risk. Internationally, it is a policy that has led to the 'death spiral' of utilities like Eskom, falling levels of investment, a lack of long-term planning, and a failure to meet emissions reduction targets.

The investor-focused 'energy for profit' approach has failed and there is no basis on which to believe it can succeed in future. In 2016, the IEA reported that, globally, 'Market-based, unsubsidised low-carbon investments have been negligible'.[226] Private renewable energy interests and

[224] €1m/MW 10 to 14 percent capacity factor – the multiple is more than 10. See: Parr, M. (5 April 2019) 'Diverting fossil fuel investments to renewables is not enough'.

[225] As wind and solar floods into the system at any given moment, wholesale prices have typically collapsed. This means profits are compromised. When the sun is not shining and wind is not blowing, the grid relies on coal, gas, nuclear and large hydro. That is why governments often pay to keep these supplies available, even though they are not profitable.

[226] IEA (2016) *Repowering markets.* Paris: International Energy Agency.

their policy allies have claimed that renewables are, or soon will be, competitive with new coal, gas and nuclear energy. We have seen that this ignores 'system costs' as well as the need for storage and/or major transmission upgrades and extensions to deal with the challenges of variable supply.

From this we can safely assert that the IPP system based on PPAs will not produce the kind of energy transition that South Africa needs. A truly *just transition* from fossil fuels to renewable energy must be part of a project to modernise the economy in ways that can create employment alternatives for those who will lose their jobs, as well as create employment opportunities for those who either do not have steady work or whose work is in every respect precarious. But how can a new public system, structured around a reformed Eskom, find the kind of money needed to build the new low carbon capacity that South Africa will need in the next one to three decades?

What follows are some common-sense arguments for public financing of the energy transition. Of course, there are still unanswered questions and there are many difficult problems that will need to be solved. As we prepare to grapple with this challenge, it is useful to be mindful of two things. First, this does not boil down to a choice between a public pathway and a private one. There is no private pathway, certainly not one that can arrive at a destination that is socially acceptable and ecologically necessary. 'Energy for profit' is not a way forward. Second, if it were not for publicly owned electricity systems, most of the world would today still be in darkness. And publicly owned systems can provide the platform for a planned decarbonisation, one that is liberated from the prerogative of private profit.

Their decarbonisation and ours

In South Africa, decarbonisation of the power sector, if done right, is likely to bring many benefits and could create desperately needed jobs, performing socially and environmentally necessary work on a 'public goods' basis. The potential to generate jobs has been explored in detail in another AIDC booklet, *One Million Climate Jobs*[227]. But unless there is a radical policy shift at the global level, there is no climate-related reason whatsoever for South Africa to pursue an aggressive decarbonisation strategy, if this means hitching national policy to a neoliberal wagon that is full of useless policy 'sticks' and 'carrots'.

In terms of climate change, rich countries are responsible for 70 percent of carbon in the atmosphere that is currently warming the planet (so-called 'cumulative CO2').[228] They have promised climate finance to offset this 'ecological debt' to the global South, but they have failed to produce anything meaningful. If South Africa's decarbonisation fails to get off the ground, it will be the combined responsibility of the rich of the global North, advanced capitalist countries and their class allies in South Africa, historically and more recently, both old and new.

[227] Ashley, B., Forslund, D., Majali, T., Winkler, L., Neale, J. (ed.), Rudin, J. and van Niekerk, S. (2016) *One Million Climate Jobs: moving South Africa forward on a low-carbon, wage-led and sustainable path*, Cape Town: AIDC.

[228] Sweeney, S. (2020) 'Weaponizing the Numbers: The Hidden Agenda Behind Fossil-Fuel Subsidy Reform', *New Labor Forum*, 29(1). See also: https://www.wri.org/blog/2014/11/6-graphs-explain-world-s-top-10-emitters (retrieved 28 June 2020)

But, as the Climate Policy Initiative, an independent, not-for-profit organisation, notes, 'There could be a role for mission-driven international capital if there were a commitment by Eskom to accelerate emissions reduction'.[229] A reformed Eskom could make such a commitment, but should at the same time press radical reform of the current global trade investment framework. As noted above, South Africa can spearhead an international campaign around a public goods approach that could demand turning the ecological debt of the North into direct, no-strings-attached investment capital for the energy transition in energy-intensive developing countries.

Forget 'Full Cost Recovery' and 'Hybrid Models'

We have seen that neoliberal energy policymakers have, after 30 years, finally given up on the so-called 'standard model' of full power sector privatisation. They are now even beginning to question the reforms that were in many instances put in place, such as so-called competitive wholesale markets for electricity. But settling for a 'hybrid model', which is where ANC policy currently stands, will not solve the 'death spiral' of Eskom, as long as the push to privatise generation through the IPP system continues.

Socially owned renewables, embedded in a modern national utility, would provide official closure to both the full-cost recovery and 'hybrid' models. Whatever South Africa's energy mix will be in the decades ahead, it will involve investing in large amounts of new capacity, enough to handle any increases in energy demand. Other countries are in the same boat, but most have a GDP paddle that's a lot bigger than South Africa's. This means that the capital investment needed to replace retired capacity will, in per capita terms, be higher for South Africa than it is for many other countries with aging energy infrastructure. Like South Africa, Poland is dependent on old coal-fired power stations for its electricity, but it has a GDP per capita that is twice the level of South Africa's.

Paying for new capacity and system costs

If it were not for government interventions that were explicitly designed to make profitable what would not otherwise be profitable, there would be no modern renewable energy industry to speak of in most, if not all, areas of the world. 'Out of market' protections like Feed-in Tariffs and PPAs, underwritten by governments, put wind and solar on the global map.

Governments, including the South African government, also gave wind and solar 'priority of dispatch' to grid systems that were built as a result of public investments, in much the same way as the motor vehicle industry has been sustained by national highway systems. Publicly

[229] *Huxham, M., Anwar, M. and Nelson, D. (March 2019)* Understanding the impact of a low carbon transition on South Africa. *San Francisco: Climate Policy Initiative (CPI).*

owned development banks have also made a major contribution to financing renewables at favourable rates of interest. It is one of the ironies of the current debates on energy transition that these basic truths about public financing of renewables have been turned into a celebration of the private sector and its 'leadership'.

We have seen that IRP 2019 proposes a near tripling of the country's currently installed capacity in the 30 years from 2020 to 2050.[230]

Any attempt to calculate how much this additional capacity might cost (generation as well as storage or transmission) is of course extremely difficult. The Fraunhofer Institute for Solar Energy Systems calculated that in 2018 the CAPEX costs for onshore wind were between $1.6 and $2.2 million dollars per MW of capacity.[231] For utility-sized solar PV installations (larger than 2MW) the cost per MW was between $660,000 and $890,000, with small rooftop solar systems costing $1.3 million or more for each MW of capacity. In 2019, the wind multinational Vestas stated that the current CAPEX for onshore wind was $892,000 per MW (with a capacity factor of 30 percent).[232]

Given these estimates we can, for the sake of argument, use $1.25 million (in current dollar value) as the basis for a rough calculation of the costs of an additional MW of renewable energy capacity.[233] Based on IRP 2019, the total cost of the wind and solar contribution will be in the region of $25.5 billion by 2030 alone for 20.4GW of added renewables capacity. But this does not include storage or transmission extensions and upgrades. The updated IRP 2019 anticipates renewable energy reaching as high as 62 percent of power supplied by 2050; it also offered post-2030 scenarios where nuclear provides between 14 percent and 19 percent of supply, thus reducing the contribution of wind and solar.[234] But no matter what eventually unfolds in terms of energy technologies, it will involve serious levels of investment.

Through the roof

Regarding the installation of solar PV, the Fraunhofer IWES study assumes 'that 70 percent of the installed capacity will be 'distributed' solar PV installations. The other 30 percent will be large, 'utility-scale' installations'.[235] If rooftops are expected to provide as much as 73GW of capacity, which is approaching double the capacity of Eskom's current fleet of coal-fired power stations, then it seems reasonable to ask whether or not compensation to

[230] DOE. (October 2019) *IRP 2019*. 'The South African power system consists of the generation options, which are 38 GW installed capacity from coal, 1.8 GW from nuclear, 2.7 GW from pumped storage, 1.7 GW from hydro, 3.8 GW from diesel and 3.7 GW from renewable energy', 91.

[231] Fraunhofer Institute for Solar Energy Sytems (ISE). (March 2018) *Levelized Cost of Electricity Renewable Energy Technologies.* Available at: https://www.ise.fraunhofer.de/content/dam/ise/en/documents/publications/studies/EN2018_FraunhoferISE_LCOE_Renewable_Energy_Technologies.pdf (retrieved 26 June 2020)

[232] Parr, M. (5 April 2019) 'Diverting fossil fuel investments to renewables is not enough', *Euractiv*.

[233] DOE. (October 2019) *IRP 2019*. Additional capacity to the energy mix as contained in the IRP 2019 for the period up to 2030 is as follows: 1 500 MW of generation from Coal, 2 500 MW from Hydro, 6 000 MW from Photovoltaic, 14 400 MW from Wind, 2 088 MW from Storage and 3 000 MW from Gas.

[234] DOE. (October 2019) *IRP 2019*, 91.

[235] Knorr, et al. (November 2016) *Wind and Solar PV Resource Aggregation Study for South Africa, Final Report*, CSIR.

property owners, either through a Feed-in Tariff or some other form of remuneration, features in the cost calculations.[236] The owners of rooftop systems will of course be expected to use the power generated to meet some of their own electricity needs, which would reduce the amount of kWh these owners would buy from Eskom. But local use will not decrease the cost of integrating 73GW of rooftop solar into the grid.

Energy specialists in the EU have been grappling with this issue. According to one account, 'some effort must be made to account for the existence of decentralised prosumers'.[237] This is because prosumers:

> *motivated by the low cost of solar PV and batteries, can generate significant amounts of their own electricity that will reduce the need for large, centralised grids. Studies that do not take the latest cost trends for these technologies in relation to the retail price of electricity in different regions into account may exaggerate dependence on central grids to some extent and show higher grid-related costs.*[238]

According to the EU's 2016 *The State of Renewable Energies in Europe*, 'Public authorities have found it very difficult to establish the balance between the interests of the grid users and the prosumers.[239] The absence of Europe-wide regulatory uniformity and common vision on this issue does nothing to promote the deployment of this market'.[240]

But the problem here is 'the market' which pitted 'prosumers' and 'grid users' against each other in the first place.

Upfront costs

The cost of electricity typically consists of three components: the cost of borrowing money, the operations and maintenance cost (O&M cost) and the fuel cost. The deployment of renewable energy involves more upfront costs than is the case with fossil fuel generation. According to one source, 'the difference in upfront capital costs between renewables and fossil generation ranges from 3.5 to 7 times. And these multiples do not take into account storage requirements. In the case of utility-scale solar PV, the picture is more extreme'.[241]

It is the high up-front cost of renewables that has convinced governments that the IPP system is an attractive alternative. The value of the PPA does not show up as public debt, because the costs are passed on to consumers over a 20-year period. Problem solved. But the PPA contract is a transfer of public money to private interests. By protecting the private investor from market competition, the costs of the protection

[236] *Ibid*.
[237] Child et al. (August 2019) 'Flexible electricity generation, grid exchange and storage for the transition to a 100 percent renewable energy system in Europe'.
[238] *Ibid*.
[239] 'Prosumer' is short for a household, farm, or commercial entity that both produces and consumes electrical power, usually by way of a solar PV or wind installation.
[240] Frankfurt School of Finance and Management (DE), Fraunhofer ISI (DE) and Statistics Netherlands (NL). (2016) *The state of renewable energies in Europe, 2016, 16th EurObserv'ER Report*'.
[241] Parr, M. (5 April 2019) 'Diverting fossil fuel investments to renewables is not enough', *Euractiv*.

through an 'out of market' price turned into a 20-year contract is paid by Eskom, the state (in cash infusions to 'bail out' Eskom), or by consumers.

Those who defend the current IPP model often point out that, globally, most renewable energy projects are supported by 'on-balance-sheet' funding by developers or other investors. But the financing has occurred as a result of these same 'out of market' protections. According to BNEF:

> *Key to whether renewable energy projects get beyond the drawing board, or the permitting process, is what is known in the sector as 'bankability'. All the green power technologies involve heavy upfront capital expenditure [and] the expense of keeping installations going once built is modest… But the money to cover upfront capital expenditure needs to be raised… [Getting that funding] will depend on whether those involved have a high level of confidence that the project will make adequate returns…so almost all non-hydro renewable energy projects built have gone ahead thanks to some sort of contract securing the electricity selling price that their owners would receive.*[242]

Proper public ownership would lower the cost of capital

If South Africa is to follow either the decarbonisation path laid out in IRP 2019, or the more ambitious scenarios laid out in the CSIR and ERC studies, then who will pay for the new capacity, and how?

Of course, an energy transition involving projects that could generate revenue for several decades means that debt financing is an obvious option. And since the wind, solar and hydroelectric technologies are capital cost intensive (there are no fuel costs), the cost of borrowing money is critically important. The smallest fluctuations in the discount rate can have a considerable impact on the projected cost of capital.[243]

As the Fraunhofer Institute notes, 'The influence of the capital costs for investment (WACC) on the LCOE is not to be underestimated'.[244]

The IPCC's baseline discount rate for calculating the cost from wind and solar investments is 8 percent.[245] The National Renewable Energy Laboratory (NREL) estimates the after-tax inflation-adjusted US discount rate at 6.5 percent for on-shore wind,[246] while the International Renewable Energy Agency (IRENA) estimates a span between 5.5 percent and 12.6 percent, with a baseline of 10 percent.[247] But as one study points out, 'Low-risk firms such as well-managed regulated electric utilities have debt costs similar to [these] numbers…Higher risk firms, such as those that populate the residential solar market, have much higher rates'.[248]

[242] UN Environment, BloombergNEF. (2019) *Global trends in renewable energy investment.* Available at: https://www.fs-unep-centre.org/wp-content/uploads/2020/06/GTR_2020.pdf (retrieved 24 June 2020).

[243] Clack et al. (8 May 2017) 'Supporting Information for the paper 'Evaluation of a proposal for reliable low-cost grid power with 100 percent wind, water, and solar".

[244] Kost, C., Shammugam, S., Jülch, V., Nguyen, H.T. and Schlegl, T. (March 2018) *Levelized Cost of Electricity Renewable Energy Technologies*, 16.

[245] Working Group III. (2014) *Climate Change 2014, Mitigation of Climate Change: Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.

[246] Moné, C., Smith, A., Maples, B. and Hand, M. (2015) *2013 Cost of Wind Energy Review*. Golden, Colo: National Renewable Energy Laboratory.

[247] International Renewable Energy Agency (IRENA). (2012) 'Renewable energy technologies: cost analysis series: Wind power', *IRENA Working paper*, Vol. 1, Issue 5/5. Abu Dabhi: IRENA.

[248] Clack, et al. (8 May 2017) 'Supporting Information for the paper 'Evaluation of a proposal for reliable low-cost grid power with 100 percent wind, water, and solar".

In the section 'Eskom's debt crisis', we argued that the overfunded Government Employee Pension Fund should be used to 'decorporatise' Eskom's debt crisis. Eskom's unsustainable R200-250 billion debt should be treated as a debt within the family of the state, not as an investment that maximises the creditors' private profit irrespective of the consequences. Public organisations should not operate as if they are private finance institutions. There is likely also to be borrowing from the market, but much of Eskom's financing should come with the intervention of public institutions like the GEPF. Make such a rational intervention, with huge surplus funds in the public sector, to solve the acute crisis. Combine it with prosecution of managers who have defrauded the public utility of billions, audits of impugned transactions and coal contracts, and litigation of local and foreign companies that have participated in the looting. All of these together could return Eskom's credit rating, and the interest rates it pays on its private borrowing, to normal.

Indeed, as a rule, public utilities qualify as low-risk borrowers, so 'money can be borrowed at relatively low rates because the risk of default is low. On the other hand, the cost of money would be much higher for a private utility which is exposed to the uncertainties of the market'. Therefore 'investments may not take place at the socially optimal level'.[249] This truth has been compromised by the extreme developments at Eskom.

But in general, the public sector can raise long-term, cheap finance at lower interest rates and over far longer time periods than could any private company, by using tax revenues, or user charges, as security to raise loans, or by issuing bonds to be repaid out of future income.

Government policy can decide on the balance between user charges and taxes to finance a service, and it can vary this balance over time according to changing circumstances. It can also choose to finance investment directly out of current revenues or taxes. The benefit of low borrowing costs can be gained by local as well as central and federal governments.[250]

According to the Public Services International Research Unit:

> *the overwhelming majority of renewable energy has been developed by public sector or non-profit organisations, not by private companies…Moving to public ownership therefore makes it easier to develop renewable energy systems, rather than using public money to offer financial 'incentives' for private companies to choose investments in renewables sold through a dysfunctional market system*.[251]

According to the Thatcher-inspired Centre for Policy Studies:

[249] Iyer, G.C., Clarke, L.E., Edmonds, J.A., Flannery, B.P., Hultman, N.E., McJeon, H.C. and Victor, D.G. (2015) *Improved representation of investment decisions in assessments of CO_2 mitigation.* Nature Climate Change. MacMillan Publishers Ltd.
[250] Hall, D. (2014) *Why Public-Private Partnerships Don't Work.* Greenwich: PSIRU.
[251] See PSIRU, http://www.psiru.org/reports/public-ownership-uk-energy-system- percente2 percent80 percent93-benefits-costs-and-processes.html (retrieved 24 June 2020).

At no stage has there been any published analysis demonstrating that the use of private capital delivers better value for money than a public sector comparator. By subsidising the provision of capacity, the Government is taking control of electricity generation, but not taking ownership of it. The logical solution is for the public sector to finance and own investment in such assets.[252]

The simple economics of public energy

The economics of a public sector approach are therefore quite simple. User fees can cover some percentage of the costs of building new capacity. The main variable of this model is not the quantity of electricity sold in a given time period, but the overall costs of generating the power and protecting and upgrading the system on an ongoing basis.

The current PPA system incurs the borrowing costs of private interests as well as profit, and almost certainly higher legal, accounting and other costs involved in the complex and lengthy processes involved in participating in REI4P applications and bidding. To ensure that these costs are covered and 'balance sheet' revenues are set aside for future investments, public entities must be able to control the price of electricity and, if necessary, use revenues from other sources (such as a dedicated tax on carbon) to make up any shortfalls in the short- to medium-term. Within a framework of public ownership, shifting budgetary priorities and creating purpose-specific revenue streams are important options available to governments.

Low cost public energy

As we have seen, private sector, for-profit renewables companies are currently being put under pressure on two fronts. First, there is pressure to reduce costs and prices. Second, there is the 'bankability' pressure from investors seeking to secure satisfactory returns. Private renewable energy interests are therefore caught in their own potential 'death spiral'. They must show that the LCOE from wind and solar is competitive with 'new' coal, 'new' gas, or 'new' nuclear, while dodging the fact that renewables are not competing against 'new' anything. The costs of the older power plants, which still produce over 80 percent of the country's electricity, have already been paid for ('amortised') and continue to produce electricity at very low operating costs.[253]

In South Africa, a new public system would not squander the price advantage of the existing system by creating a 'death spiral' at a time when large amounts of new capacity will need to be added in the next two or three decades. From the perspective of public investment, falling prices for renewable energy would unquestionably be a good thing. Along with the impact of maturing technologies and economies of scale, falling renewables' costs reflect the fact that the fuel sources (the wind and the sun) are effectively unlimited in supply terms, and require no payment.

[252] Darwall, R. (2015) *Central Planning with Market Features: how renewable subsidies destroyed the UK electricity market.*
[253] Kost, et al. (March 2018) *Levelized Cost of Electricity Renewable Energy Technologies.*

TACKLING THE GOVERNANCE CRISIS

Eskom's crisis regularly makes headlines in the South African and international press as a tangible example of state capture, incompetence and corruption. The causes and components of such a crisis, already analysed in other parts of this report, are long-standing and complex, deriving from decades of mismanagement. The constant load-shedding outages that have plagued the country since 2006, paired with Eskom's unsustainably high levels of debt, clearly have an impact on how the majority of the population perceive public ownership and management of energy services, but the company can certainly be reformed towards greater accountability and improved efficiency while remaining entirely public.

We take into account both our research in South Africa, and ongoing debates and policy proposals being developed in other parts of the world, to set out below some key features of what a reformed national electricity company would look like. First, we present an overview of the current resurgence of public ownership observed around the world. Second, drawing from international experiences in the provision of electricity and other basic services, we outline the core principles that would constitute the basis for an ideal 'New Eskom'.

THE RESURGENCE OF PUBLIC OWNERSHIP

Current South African debates and policy moves towards unbundling (and eventually privatising) Eskom clearly run directly counter to the international trend towards strengthening, modernising and democratising state-owned enterprises. Several studies published in recent years demonstrate that public ownership is making a strong comeback both in northern and southern countries, as it is perceived as the best way to secure the provision of essential services.[254]

Research specifically focused on the energy system has also demonstrated that the public option might be the only alternative for decarbonising the power sector. The market-driven approaches that were hegemonic throughout the world between the 1970s and the 1990s have failed, and therefore no longer seem fit to address the challenges posed by growing economic and social inequalities and the global climate emergency. There is a growing international consensus that new forms of public ownership and management are required to secure the long-term and crucial investments needed to supply accessible and affordable public services.

[254] Cumbers, A. (2012) *Reclaiming Public Ownership: Making Space for Economic Democracy*. London: Zed Books. Bernier, L. (ed.) (2015) *Public Enterprises Today: Missions, Performance and Governance*. Bern: Peter Lang. McDonald, D.A. (ed.) (2016), *Making Public in a Privatized World: The Struggle for Essential Services*. London: Zed Books. Hanna, T.M. (2018), *Our Common Wealth: The Return of Public Ownership in the United States*. Manchester University Press.

Around the world, social activists, trade unionists, progressive researchers and policymakers from diverse institutional and ideological backgrounds are demanding a more equitable, democratic and sustainable economic system, with public ownership as the cornerstone of the transition. Ranging from social mobilisations for remunicipalisation and renationalisation to multisectoral alliances and innovative policy proposals around a 'Green New Deal', there is a revival of public ownership as an essential tool to address the social, economic and environmental challenges of this era. Specifically in the sector within which Eskom operates, in many and diverse countries and under the banner of 'energy democracy', social movements and progressive governments are demanding a transition towards genuinely renewable forms of generation, challenging large corporate interests and reclaiming state and social ownership.[255]

In the last decade, state-owned enterprises have regained a strategic position in the world economy. Despite the many attempts to weaken or privatise state companies, a significant number of them survived, and in recent years – in particular in Latin America and Europe – many enterprises that had been privatised have been renationalised or remunicipalised. This trend is evident even in countries often showcased as the world's most liberalised economies, like Chile. Enterprises that survived the wave of privatisation of the 1970s and 1980s have mostly been managed under the logic of corporatisation at the core of the 'corporate governance' approach promoted by the Organisation for Economic Cooperation and Development (OECD). However, enterprises as important as CODELCO (National Copper Corporation of Chile), one of the world's largest state-owned companies in the mining sector, have recently been 'decorporatised' and turned into fully 'public' enterprises, once the government became aware of their strategic importance and contribution to the national economy.[256]

A recent investigation found 835 cases of 'deprivatisation' of public goods and services in 45 countries around the world.[257] These processes have been aimed at reclaiming state ownership and public management in order to tackle the problems of inefficiency of privatised companies and insufficient private investment in extending services or improving their quality. Deprivatisation, in this context, has meant:

- bringing previously privatised companies or services back into public ownership; or
- creating new national, regional or municipal public enterprises to replace or compete with private operators.

[255] Burke, M.J. and Stephens, J.C. (2017) 'Energy Democracy: Goals and policy instruments for sociotechnical transitions', *Energy Research & Social Science*, 33, 35–48.
[256] Castañeda, F., Barría, D. and Astorga, G. (2018) 'Is the OECD Model Suitable for Strategic Public Enterprises in Terms of National Development? Reflections from CODELCO Case, Chile', *CIRIEC* Working paper No 2015/18.
[257] Kishimoto, S. and Petitjean, O. (eds). (2017) *Reclaiming Public Services: How Cities and Citizens are Turning Back Privatization*. Amsterdam: Transnational Institute.

In Germany, for example, 72 new non-profit and publicly owned local energy supply companies were created between 2007 and 2012, as many German municipalities resorted to regaining control of previously privatised utilities, while in other parts of the country local citizen coalitions have mobilised to deprivatise the energy supply by promoting referendums and other civil society initiatives.[258]

The undeniable threats posed by climate change and the urgency of decarbonisation have also reinforced the importance of public ownership.[259] According to a growing mass of research, the world needs a complete restructuring of the energy system. Public ownership is perceived to be the best (and in many countries the only) option for guaranteeing both security of supply and the decarbonisation of the electricity system. From this perspective, a transition that is fair for both users and workers, that enables viable solutions to energy poverty, and that preserves and/or creates jobs would be possible only by moving towards a fully public and horizontally integrated system that combines various forms and levels of ownership.

The public ownership of the energy system has also become an essential component of national political discussions in Europe and the United States. In the United Kingdom, reversing privatisation would help improve services and lower electricity rates by dismantling the biased market system that has allowed the oligopoly of private energy companies, known as 'The Big Six', to make excessive profits. The Labour Party's manifesto for the recent election included an explicit commitment to 'bring key utilities back into public ownership to deliver lower prices, more accountability and a more sustainable economy'.[260] In the United States, two of the Democratic Party candidates for the presidential nomination also declared their commitment to public ownership: Bernie Sanders' *Climate Plan* explicitly stated that 'the renewable energy generated by the Green New Deal will be publicly owned',[261] and Elizabeth Warren's *Environmental Justice Plan* included public ownership as an alternative to the lack of renewable energy investment.[262]

The rediscovery of the potential of public ownership, however, does not imply a blind defence of the type of ownership and management that still prevails in South Africa and in many other countries of the world. Instead of defending or replicating what are too often opaque, top-down, unaccountable and corruption-prone public enterprises, there is a need for new forms of ownership and management that take away power from

[258] Angel, J. (2016) 'Towards an Energy Politics In-Against-and-Beyond the State: Berlin's Struggle for Energy Democracy'. *Antipode*, 49 (3), 557–576.

[259] Sweeney, J. and Treat, J. (2017) *Preparing a Public Pathway: Confronting the Investment Crisis in Renewable Energy*. New York: Trade Unions for Energy Democracy (TUED).

[260] The Labour Party. (2017) *For the Many Not the Few. The Labour Party Manifesto*. London: The Labour Party.

[261] Sanders, B. (2020) 'The Green New Deal. Available at: https://berniesanders.com/issues/green-new-deal (retrieved 24 June 2020).

[262] Warren, E. (2020) 'Fighting for Justice as We Combat the Climate Crisis'. Available at: https://elizabethwarren.com/plans/environmental-justice (retrieved 24 June 2020).

the elite groups who have contributed to the current state of decay of many state-owned companies.

Moreover, public ownership is not a magic fix for all the problems of the energy system. As one researcher based in the United States argues:

> *Shifting the gears in this machine will take steady campaigning and activism, seeking to (re)democratise public utilities and hold those institutions accountable. But public ownership offers far more recourse and potential levers of control to actualise that shift than a private model based on profit maximisation for absentee investors.*[263]

Building a 'New Eskom', therefore, implies an effort to develop a more democratic approach that prevents the mistakes of the past. The current crisis of Eskom, in fact, represents a great opportunity, that should not be missed, to advance new forms of governance, organisation and service provision that strengthen the public ethos, promote workers' and citizens' participation, and increase transparency and accountability in the management of the public enterprise.

IMAGINING A 'NEW ESKOM': BASIC PRINCIPLES

The principles listed below are based on recent research, policy recommendations and ongoing debates around the significance of public ownership and management in diverse parts of the world.[264] They are grounded in real experiences, which show how state-owned enterprises such as Eskom could be democratised and become more efficient and effective in the delivery of electricity and other essential public services.

Access, affordability and equity

The national electrification programme enabled by the RDP programme greatly expanded the domestic connection rate, and as result of the expansion of generation capacity and the implementation of new tariffs, by the year 2012 almost 90 per cent of households were connected to the grid.[265] Nevertheless, many households still cannot afford to use the power to which they are connected; the provision of a basic allocation of free electricity is insufficient for basic household needs, in particular in the context of decaying infrastructure and service standards. Millions of users are forced to burn paraffin, wood and coal instead of using electricity, which negatively impacts on air quality, health and public safety.[266]

The 'New Eskom' will ensure the availability of energy services to all users, eliminating current socio-spatial differences in access. It will also have

[263] Bozuwa, J. (15 October 2019) 'Pulling the Plug on PG&E', *The Nation*.

[264] These principles have been largely adapted from studies produced by the Municipal Services Project – MSP, an international research network focused on progressive alternatives for the provision of water, electricity and health services. See <https://www.municipalservicesproject.org> and a white paper published by two academic researchers: Cumber, A. and Hanna, T.M. (2019) 'Constructing the Democratic Public Enterprise', Glasgow: Democracy Collaborative and University of Glasgow.

[265] Sustainable Energy Africa. (2015) *State of Energy in South African Cities*. Cape Town: Sustainable Energy Africa.

[266] McDonald, D.A. (ed). (2008) *Electric Capitalism: Recolonising Africa on the Grid*. Cape Town: HSRC Press. Tait, L. (2016) *Targeting Informal Households: Diversifying Energy Supply for the Poor in Cape Town*. Cape Town: Energy Research Centre.

a tariff structure that secures access for all South Africans, regardless of their economic or social status. This means reversing the current situation in which poorer households are disproportionately burdened, and establishing new schemes for cross-subsidy pricing. Moreover, it will imply moving beyond the present inconsistency of tariffs between different municipal distributors and Eskom, with a more straightforward and transparent approach for tariff setting within and between Eskom and the municipalities.

Quality and efficiency

The current dissatisfaction with the quality of services delivered by Eskom is not inherently derived from its nature as a public enterprise. A report published in 2005 highlighted the fact that 'Eskom was, and continues to be, a relatively well-functioning public utility'.[267] The same report argued that 'unlike many other developing countries, which suffer from serious operational inefficiencies, Eskom delivers reasonably reliable and quality power at low prices, and is financially viable', and concluded that 'largely due to Eskom, South Africa has not experienced capacity shortfalls'.

A reformed Eskom could regain its previous efficiency and capacity to deliver quality services. It is clear that in recent years the management of the company was neither efficient nor accountable and that poor financial decisions were made, with massive impacts on the national economy and on the quality of delivery. However, international empirical evidence shows that public enterprises are indeed able to be restructured as very efficient companies.

Uruguay and Costa Rica are world leaders in clean, public and democratically accountable energy, and their success is directly linked to the existence of very efficient and vertically-integrated state-owned power companies.[268]

Since its foundation in 1949, the Costa Rican Electricity Institute (ICE), a company active in the fields of energy and telecommunications, has evolved as one of the pillar institutions of a welfare state that ranks today among the world's most advanced in terms of social development. In Uruguay, the National Administration of Electrical Power (UTE) has been the key player in the transition to wind power, positioning the country as the world's most advanced in generation of renewable energy. UTE remains a highly efficient company in both the reliability of its services and its financial stability. In fact, it is one of the main sources of financing – at zero cost – for the Uruguayan state, as a big portion of the company's annual revenues feed the state's coffers. International credit agencies have awarded UTE the highest investment grade AAA, noting that

[267] Eberhard, A. (2005) 'From State to Market and Back Again: South Africa's Power Sector Reforms', in *Economic and Political Weekly* (50), 5309-5317.

[268] Chavez, D. (2018) 'Energy democracy and public ownership: What can Britain learn from Latin America?', in *Renewal: A Journal of Social Democracy*, (26)4, 34-44.

historically the company has maintained an adequate level of indebtedness that guarantees easy access to the banking and financial market.

The recovery of Eskom from its current decay will entail securing financial, social and political sustainability for the company. This means (a) finding a viable solution to the debt crisis and safeguarding enough public funding to ensure the continuity of the service in terms of operations and future long-term investments in the infrastructure needed to meet the social goals of the service; (b) recovering social support, reversing the current animosity towards the company; and (c) the government making a strong commitment to keep the company as a fully public and vertically integrated enterprise. The 'New Eskom' will then be able to provide reliable and satisfactory energy services for all its users, beginning with visibly decreased service interruptions in the form of unplanned and planned outages (load-shedding).

The current crisis of Eskom represents a great opportunity, that should not be missed, to advance new forms of governance, organisation and service provision that strengthen the public ethos, promote workers' and citizens' participation, and increase transparency and accountability.

Moreover, the 'New Eskom' will be managed by senior staff with proven experience, skills, knowledge and competences relevant for the energy sector. The company's management structure will be insulated from day-to-day interference from political factions and corporate lobbies, and its operations will rely on long-term strategic plans, clear goals and appropriate performance metrics.

Environmental sustainability

In South Africa, the transition to an affordable, equitable and low-carbon energy system will require facing major political and economic challenges that are rooted in the country's history of socio-economic and racial inequalities, as well as in its heavy dependence on coal-fired power. Currently, the electricity sector is structured around Eskom, a largely coal dependent utility that owns the transmission grid and is responsible for 95 per cent of generation and 60 per cent of distribution. As we have seen, historically the South African electricity sector has relied on the abundant supply of low-cost and low-grade coal, which has been at the service of the MEC.[269]

As a way to facilitate the transition towards greater environmental sustainability of the power sector, some South African analysts have proposed the expansion of generation of renewable energy by independent power producers (IPPs). Relying on for-profit companies, however, is not a viable option for the transition, as has been explained in the previous section of this report. Moreover, other countries, again using the examples of Costa Rica and Uruguay, have become showcases for the energy transition that the

[269] Fine, B. and Rustomjee, Z. (1996) *The Political Economy of South Africa: From Minerals-Energy Complex to Industrialisation*. New York: Routledge. Baker, L. (2016) 'Sustainability transitions and the politics of electricity planning in South Africa', in Brauch, H.G., Oswald Spring, U., Grin, J. and Scheffran, J., (eds) *Handbook on Sustainability Transition and Sustainable Peace*. London: Springer.

world needs, while defying the conventional wisdom that says public ownership damages the economy and hinders social development. In their successes – and limitations – the public energy systems of Latin America provide important political lessons for South Africa.

A closer analysis of the energy transition in Latin America and other regions of the world demonstrates that attention must be paid to the 'stealth privatisation' that can be brought about through the proliferation of private independent power producers and other profit-driven schemes active in renewable power generation. In the long run, opening the door to IPPs always turns out to be a wrong financial decision. The experience of UTE in Uruguay demonstrates that countries such as South Africa should not introduce artificial debt caps that may prevent the public utility from investing in the transition to clean energy.

The 'New Eskom' will expand its ability to meet its service mandates without compromising national and international commitments to reverse climate change or undermining environmental norms. This means a planned and greater public investment in renewable energy, shifting away from dirty coal and ending the load-shedding that has being choking the South African economy. Renewable energy investments by Eskom could be rapidly deployed and scaled up – as the Latin American experiences demonstrate – and become the solution to the current energy crisis.

Public ethos

Among researchers and activists focusing on alternatives to privatisation, there is an implicit assumption that state-owned enterprises have a greater degree of 'publicness' and 'public ethos' than their privately-owned counterparts. 'Public ethos', however, is a rather ambiguous concept, although it has been related to commitment to 'societal objectives, including democracy, environmental sustainability and human security'[270] instead of pursuit of profit or purely financial aims.

In the case of Eskom and other highly corporatised public utilities, their public nature and mission are not always easy to discern. 'Corporatisation' generally refers to public enterprises that are owned and managed by the state (local or national) but which function at arm's length from government, with diverse degrees of administrative, operational and financial autonomy. Quite often, it implies placing market-based operating mechanisms at the heart of the governance of state-owned companies, pushing managers to use market-oriented signals such as revenues and other financial indicators as primary factors for decision making, to the detriment of the societal objectives mentioned above.

The role of Eskom in extending electricity services in South Africa should not be undervalued, but despite being one of the world's largest

[270] Balanyá, B., Brennan, B., Hoedeman, O., Kishimoto, S. and Terhorst, P. (2005) 'Empowering public water – Ways forward', in Balanyá, B., Brennan, B., Hoedeman, O., Kishimoto, S. and Terhorst, P. (eds), *Reclaiming public water: Achievements, struggles and visions from around the world*. Amsterdam: Transnational Institute and Corporate Europe Observatory.

electricity companies – ranked eleventh in the world for installed capacity and the sixth largest African company across all sectors – it has not been able to fulfil its social mission and continues to be a target of strong criticism from a wide range of social and environmental organisations.[271]

Costa Rica's national power company, ICE, is a great alternative example. It is a state-owned enterprise that has been able to extend its energy services across the country. It scores extremely well on a wide range of performance measures such as quality, affordability and environmental sustainability, due to its strong public ethos. ICE's management has relied since its foundation in 1949 on an awareness of the importance of the energy company as one of the main pillars of the *modelo solidario* (solidarity model) that has made Costa Rica a leading country in social development. Costa Rican citizens are very much aware of the state company's contributions to national development, which has propelled them to resist several attempts to privatise the public enterprise in the past decades.[272]

Recovering the public ethos that Eskom and other South African corporatised state-owned companies might have lost implies revaluing the societal mission of the public enterprise beyond purely financial or commercial goals. In other words, all the actors involved in the management and the operations of the company should recognise their broader global responsibilities in the promotion of a more democratic and sustainable South Africa, securing the common good against sectoral or private vested interests.

The reference to the 'common good' relates to the importance of 'participation', discussed below. The 'New Eskom' will commit to democratic processes and institutions aimed at counterbalancing the concentration of decision-making power in a few hands.

An obvious starting point in agreeing what is a 'common good' would be the 17 sustainable development goals agreed by the 193 countries of the United Nations. This international agreement commits the South African state to addressing climate change, tackling poverty and inequality, and upholding sustainable production and consumption, among other aims.[273] The efficiency and effectiveness of the 'New Eskom' (among all the other state-owned and state-managed enterprises, agencies and bodies) will be measured according to how well it fares delivering in these areas.

Participation

When discussing participation, it is firstly necessary to ask the question: participation in what? If the priority of the entity is established as selling as much electricity as possible in order to generate revenue, then democratic participation will simply serve this purpose. But if the mission of the entity is 'demarketisation', and it is re-constituted as a modern public service, then democratic participation takes on a qualitatively different character

[271] Jaglin, J. and Dubresson, A. (2016) *Eskom: electricity and technopolitics in South Africa*. Cape Town: UCT Press.
[272] Chavez, D. (2014) 'An Exceptional Electricity Company in an Atypical Social Democracy: Costa Rica's ICE', in McDonald, D.A. (ed.) *Re-thinking Corporatization and Public Services in the Global South*. London: Zed Books.
[273] Statistics South Africa. (2019) *Sustainable Development Goals (SDGs): Country report 2019*. Pretoria: Statistics South Africa.

Having said that, the effective participation of citizens ('users' or 'consumers') and employees in decision-making and/or the implementation of services has been extensively recommended by the literature published in recent years in the field of public policy and administration. Ideally, all social groups involved in, or affected by, the provision of services should have some form of democratic participation in the governance structures of state-owned companies. Public enterprises impact on many social groups, including the users or consumers of electricity and other public services, local communities, and the workers in other industries and supply chains, among others. These constituencies should have the right to have a say in decisions that affect them.

Democratic representation in large public enterprises, such as Eskom, presents a number of challenges, but these can be overcome. In 2010, the City of Paris reversed the privatisation of water services to create a new municipal public water utility – Eau de Paris – which included a multi-stakeholder board composed of city councillors, representatives of the employees and civil society representatives (involving environmental and consumer groups).[274]

Participation also means involvement in democratic planning, allowing different stakeholders to provide active inputs into the goals and practices of public enterprises. This implies setting up a deliberative process led by a representative body that holds the company's management to account and designs broader strategies and priorities on behalf of the public. In this sense, participation contributes to overturning, or at least diminishing, the narrow capture of an enterprise's strategic purpose and mission by vested interests, and ensuring that the strategies and operations of the company are driven by a sense of the common good.

The Paris water utility launched a *Paris Water Observatory* as a space for citizen oversight and information, to make the elected representatives of the municipal government, its administration and the employees of the company accountable to citizens. The Observatory elects a member to serve on the board of the company, so it is 'not just another so-called citizen's committee that only rubberstamps decisions already made'.[275] The case of Eau de Paris as a large utility that integrated the representation of its staff, users and civic associations on the management board, with full voting rights and with open access to all the company's information, could be a good example to start a discussion on how to democratise the governance of Eskom and other South African public enterprises.

A key social actor to be considered are the employees of public enterprises. In the 'New Eskom', workers will be effectively involved in running of the company. As the political theorist, Robert Dahl, famously

[274] FuturePolicy.org. (2019) 'The Remunicipalisation of Water Services in Paris, France'. Available at: https://www.futurepolicy.org/food-and-water/remunicipalisation-of-water-services-paris (retrieved 24 June 2020).

[275] Petitjean, O. (2015). 'Taking Stock of Remunicipalisation in Paris: A Conversation with Anne Le Strat', in Kishimoto, S. (ed.) *Our Public Water Future: The Global Experience with Remunicipalisation*. Amsterdam: Transnational Institute.

wrote, 'If democracy is justified in governing the state, then it must also be justified in governing economic enterprises'.[276] In this sense, diverse modalities to ensure the participation of workers in the governance and management of state-owned enterprises have been developed in different parts of the world. In several European countries, trade unions have become fundamental players in 'codetermination' schemes, through which employees are represented on the boards, with varying degrees and forms of engagement dependent on a range of factors, such as the size or sector of each company. A variation on this approach is the participation of workers in works councils or assemblies that enable employees to participate in the management of both state-owned and privately owned enterprises.

Another example of workers' involvement is the substantial influence granted to the employees of public enterprises in China. Within state-owned enterprises there are elected employee congresses, with decision-making power on a variety of social issues, including welfare and housing, wages and bonuses. These bodies are also consulted by the governing board of each enterprise around major strategic decisions and the nomination of senior managers.[277]

The 'New Eskom' will democratise its governance structure, with greater and more influential engagement of civil society and labour representatives in decision-making processes. Restructuring the current national power utility will require setting up a procedure for deliberation, with the presence of representatives of the South African government, members of parliament, the Eskom trade unions, users' organisations and environmental groups. Based on the general principles outlined here, such a deliberative process will propose a more detailed reform path and a governance model for the company.

Transparency and accountability

Requests for more transparency and accountability of state-owned companies are common among the promoters of the corporatisation and eventual privatisation of public enterprises. Preserving and strengthening the public nature of this type of company, on the other hand, implies moving beyond the simple demands for better oversight and reporting standards based on the procedures and logic of private businesses. As experts in public policy reforms have warned:

While democratisation and mainstream market-based reforms share a concern over political interference in the day-to-day running of public enterprises, the latter often suggests that the solution is isolating it from self-seeking politicians and the democratic process, while the former proposes to embed democracy within the enterprise rather than retreat from it.[278]

[276] Dahl, R. (1985) *A Preface to Economic Democracy*. Berkeley, CA: University of California Press.
[277] Xiaoyang, Z. and Chan, A. (2005) 'Staff and Workers' Representative Congress: An Institutionalized Channel for Expression of Employees' Interests?', *Chinese Sociology and Anthropology*, 37 (4), 6-33.
[278] Cumbers, et al. (2012) *Reclaiming Public Ownership*.

In line with a democratising perspective, the 'New Eskom' will 'extend citizen engagement by holding elected politicians more accountable and putting in place greater public participation and deliberation rather than relying too much on representational forms of democracy'.[279]

[279] *Ibid.*

5

CONCLUSION

This research was mainly carried out before the Covid-19 pandemic hit the world. However, rather than making the research outdated or irrelevant, the pandemic has served to emphasise how important the public sector approach is, not just to health, but to all services that are vital to ensuring a decent life for all, including electricity. As we have seen with the Covid-19 pandemic, when health services are privatised and governments cut funding to public health, the result is an underprepared and ill-equipped public health sector, and a private health sector that completely fails to meet the needs of the vast majority who cannot afford to pay. In this research we have argued that a transition to renewable energy that is driven through the market and IPPs will not only fail to deliver sufficient electricity to those most in need - the poor and working class - but will also hold back the transition to renewables happening at the speed and scale that we need, to meet sufficiently ambitious greenhouse gas emission reduction targets.

The pandemic has been a major disruptive force, which has moved along existing divisions, inequalities and injustices, emphasising and deepening them. The challenge facing trade unions, community organisations and civil society is to work collectively to agitate for changes, so that we don't go back to the way things were before the pandemic, but rather make fundamental shifts which never again leaves our societies so vulnerable to devastating crises.

This is particularly relevant with respect to the climate crisis. The new economic and development path must begin to meet some of the basic needs of the millions of hungry, poor, unemployed South Africans who do not have access to basic services such as electricity, water, and sanitation. Now, more than ever, is the time for us to interrogate existing systems of service delivery, identify social and economic priorities, and work to transform vital public entities like Eskom.

The first key plank of our argument is the impact that corporatisation has had on Eskom. This is a process that started in 1987, culminating in the Act of 2001. The process pushed Eskom from being a world class public utility focused on meeting a public need, to one required to make a profit, pay dividends and taxes and act like a private company. It is this process of moving Eskom from a public utility to a corporatised one that has opened the door to many of the subsequent problems that beset it, such as its overwhelming debt, mismanagement, corruption, and so on. We are not saying, in a simplistic way, that corporatisation explains all these problems, but we are saying that corporatisation created the conditions for these problems to flourish. And the problems cannot be solved without removing the underlying cause and transforming Eskom into an accountable, fully public electricity utility.

The second plank relates to the need to transition away from coal to renewable energy in order to cut South Africa's greenhouse gas emissions. Our argument is that this transition will not happen fast enough, or with enough ambition, unless it is done through the public sector. A

popular argument is that, as the price of RE drops, the transition is inevitable, with government the only hindrance to this process. In fact, as we have shown, without public money, the Renewable Energy industry would not be as profitable as it is. It is public money that has funded the research into technologies, and public money that subsidises the generation of Renewable Energy through the PPAs that give private companies guaranteed payments from Eskom for the electricity they generate. We emphasise in particular the 'three fall' effect, where investors lose interest in investing in renewables because it does not make sufficient returns. This tendency has strengthened with the fallout from the pandemic. In the words of the IEA, 'Renewables generally do not offer opportunities that investors are looking for in terms of market capitalisation, dividends or overall liquidity…Market and policy signals were not leading to a large-scale reallocation of capital to support clean energy transitions'.[279]

The third plank of our argument is that it is only a strong public sector driving renewable energy that can ensure a coherent, national, and planned transition taking into account the technical challenges of shifting systematically to 100 percent renewables, that can ensure fair mechanisms for the transition, and that will protect both workers and communities most affected by the transition. Most importantly, it is only a transition to renewable energy that is driven by the public sector that can then drive the process of decarbonising the entire economy, including transport, manufacturing, and construction, in a way that overcomes the 'premature deindustrialisation of the South African economy'.

What we are proposing focuses on the following three elements:

- Build a 'New Eskom', fully public and serving the people
- Secure a democratic and just energy transition
- Work towards socially owned renewable energy

Eskom, as it currently is, is not the public sector utility we envisage. But without a public sector utility leading the way in a just transition to a low carbon economy, the goals of ensuring electricity access for all in a just, equitable and fair way, and reducing greenhouse gas emissions to deal with climate change, will not happen. As the Minerals Energy Complex unravels in South Africa – an unravelling speeded up now by the coronavirus pandemic – we need to envisage a different Eskom that can play an integral role in building a decarbonised, reindustrialised economy.

There is urgent work to be done in transforming Eskom. A transformed Eskom is an essential part of a transformed economy. We want a just transition which is not just about greening market relations and greening profit making; it must be about creating a society where the needs of all are met, workers are treated decently, and the environment is respected.

[279] IEA. (2020) *World Energy Investment 2020*.Paris: International Energy Agency (IEA). Available at: https://www.iea.org/reports/world-energy-investment-2020 (retrieved 24 June 2020).

This report is a call to action. Covid-19 has deepened the economic devastation in the country. We are seeing rocketing unemployment, desperate levels of poverty and vast inequalities. We cannot afford to allow electricity to become a profit-making enterprise for the private sector, or a service that is largely designed to meet the needs of big business. A transformed and public Eskom can play a key role in building a more just and equitable society.

We have focused on three specific areas. Firstly, we deal with the Eskom debt crisis; secondly, we move to a socially owned renewable energy sector of which Eskom is a vital and driving part; and thirdly, we identify the basic principles that should be driving governance. In each of these three areas we have made specific proposals in dealing with the particular crisis.

We are proposing the following:

- **Conduct a forensic audit of Eskom's debt**. Some of that debt is **odious** and must be declared so and repudiated. For the remainder, the Eskom debt must be restructured in such a way that billions of rands are not used from the fiscus to bail out Eskom, but surpluses in government institutions like the UIF and GEPF (whose funds are managed by PIC) are invested in Eskom, subject to the utility's fundamental transformation along lines of democratic accountability and the transition to renewable energy.
- **Halt any plans to unbundle Eskom**. Government has chosen to adopt a process of unbundling and deepening corporatisation, rather than explore viable public options. Unbundling will cause job losses and drive electricity as a profit-making enterprise rather than a fundamental public service.

At a meeting of the public enterprises parliamentary committee in early June 2020, Eskom announced that it was moving the timetable for starting the process of unbundling. For instance, the divisionalisation of the Transmission entity is now pushed to March 2022.[280]

This is the perfect opportunity to use the space opened up to investigate more thoroughly and more rigorously the role that a unified public entity like Eskom could play in driving the electricity sector to rebuild South Africa's economy along the lines of a low-carbon reindustrialisation process.

- **Build global cooperation (rather than competition) around the use of renewable energy technologies in the interests of stopping runaway climate change and the health of our people**.

[280] Paton, C. (4 June 2020) 'Eskom unbundling horizon shifts by at least two years', Business Day. Available at: https://www.businesslive.co.za/bd/national/2020-06-04-eskom-unbundling--horizon-shifts-by-at-least-two-years/ (retrieved 24 June 2020).

This will mean loosening the stranglehold of international trade law, with its intellectual property restrictions, and allowing for greater deployment of the technology, facilitated, in many cases, by Public-Public partnerships.

- **End the REI4P programme and focus instead on building/rebuilding skills, competencies and technologies** internally to take on the rollout of renewable energy.
- **Develop a planned approach to the shift to a low-carbon economy**. A transformed Eskom must lead the way to a decarbonised economy, involving all elements including transport, buildings, food and agriculture. The planning process must also take into account an honest appraisal of the technical challenges, such as storage, that will be faced in the shift to renewables, and develop strategies to deal with these.
- **Use public financing to build a public system,** not subsidise a for-profit system. There are many possibilities to explore in looking for public finance options. But it involves, first and foremost, rejecting both the full cost recovery model, so loved by neoliberal policy makers, and the hybrid model.
- **Build a future Eskom according to key public ethos principles**. These include ensuring affordable access for all; providing quality and efficiency, as well as environmental sustainability; subjecting all decision making and operational running decisions to public ethos criteria; expanding participation in Eskom decision-making processes; and ensuring transparency and accountability in the running of Eskom.

We need to use the space opened up by the pushing back of the unbundling process to build support for a restructured, fully public Eskom that leads, in partnership with local government and community organisations, the transition towards a low carbon economy.

There seems to be some acceptance from government that Eskom should be playing a larger role in renewable energy. In June 2019, the Minister of Trade & Industry, Ebrahim Patel, said, 'We're all looking at Eskom's model having to embrace and include renewable energy'.[281] However, there has been little other evidence that government is serious about this approach. We need to make sure that this is the direction that Eskom moves in.

What we are calling for is not an easy solution. Rather than breaking down and dividing up, we are calling for a thorough restructuring and reorganisation, along different principles:

- cooperation rather than competition;
- meeting public need rather than financial profit lines;
- accountability and transparency rather than opaqueness and obfuscation; and
- open public funding rather than private sector subsidisation.

[281] Takeo, Y. (29 June 2019) 'South Africa moving Eskom toward renewable energy – Minister says', Bloomberg. Available at: https://www.bloomberg.com/news/articles/2019-06-29/south-africa-moving-eskom-toward-renewable-energy-minister-says (retrieved 24 June 2020).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