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Governing electricity in South Africa: wind, coal and power struggles

Lucy Baker

University of East Anglia

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For further information on the Working Paper Series, please contact:

Jon Phillips
International Development,
University of East Anglia,
Norwich NR4 7TJ
E: jon.phillips@uea.ac.uk
W: www.clean-development.com

For further information on DEV and International Development UEA, please contact:

School of International Development
University of East Anglia
Norwich NR4 7TJ, UK
T: +44 (0) 1603 592807
F: +44 (0) 1603 451999
E: dev.general@uea.ac.uk
W: www.uea.ac.uk/dev

Governing electricity in South Africa: wind, coal and power struggles[1]

Lucy Baker

Abstract

South Africa's electricity policy is at a crossroads. Its historical dependence on cheap coal for approximately 90 per cent of its electricity generation is under threat from a variety of factors. This paper firstly examines how the governance of South Africa's electricity is inextricably bound up with the country's historical dependence on cheap coal for export-oriented industry and complex political and economic legacy which has shaped its minerals-energy complex (Fine and Rustomjee 1996). Secondly it finds that despite regulatory hold-ups and departmental tensions, power dynamics in the electricity sector are shifting with the potential introduction of private renewable energy generation into the energy mix. Of this, wind is set to form the largest component. Meanwhile Eskom's Medupi coal-fired power plant deemed as essential to the country's generation expansion has been redefined as a 'clean coal' power plant following a World Bank loan of $3 billion in April 2010. The paper concludes that while vested interests in the country's coal-based industrial trajectory are still very influential, they are simultaneously challenged with rising coal costs, imminent national electricity supply shortages and increasing tariffs, a funding crisis of the electricity utility, the demands of climate change mitigation and emerging stakeholders in renewable generation.

Key words: clean coal; electricity; Eskom; feed in tariff; governance; Medupi; minerals-energy complex; political economy; South Africa; wind power

About the author: Lucy Baker is a PhD Student in the School of International Development at the University of East Anglia (UEA). Lucy's doctoral research is supervised by Professors Peter Newell and Kate Brown and funded by the ESRC under the Governance of Clean Development Project at UEA. During fieldwork in South Africa Lucy was hosted as an academic fellow with the Institute for Security Studies in Cape Town, a respected national think tank on governance issues.

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Abbreviations and acronyms

AfDB	African Development Bank
ANC	African National Congress
CDM	Clean Development Mechanism
CER	Carbon Emission Reduction
CSP	Concentrated Solar Power
CPS	Country Partnership Strategy
DANCED	Danish Cooperation for Environment and Development
DBSA	Development Bank of South Africa
DoE	Department of Energy
DME	Department of Minerals and Energy
DPE	Department of Public Enterprises
ECA	Export Credit Agency
GTZ	Deutsche Gesellscahft für Technische Zusammenarbeit (German Technical Cooperation)
GWh	Gigawatt Hour
IBRD	International Bank for Reconstruction and Development
IEA	International Energy Agency
IPP	Independent Power Producer
IRP	Integrated Resource Plan
ISMO	the Independent Systems and Market Operator
LTMS	Long-Term Mitigation Scenarios
MEC	Minerals-Energy Complex
Mtoe	Mega Tonnes of Oil Equivalent
MW	Megawatt
NERSA	National Energy Regulator of South Africa
PPA	Power Purchase Agreement
PV	Photovoltaics
REFIT	Renewable Energy Feed-in Tariff
SAPP	Southern Africa Power Pool
TWh	Terra Watt Hour
UNEP	United Nations Environment Programme

1. Introduction[2]

South Africa's electricity policy is at a crossroads. Historically dependent on cheap coal for approximately 90 per cent of its electricity generation, at the Copenhagen climate change summit in December 2009 President Jacob Zuma pledged to reduce the country's greenhouse gas emissions by 34 per cent by 2020 and 42 per cent by 2025[3]. Meanwhile South Africa faces a crisis of generation which resulted in rolling blackouts and mine closures across the country in 2008. The country's monopolistic utility Eskom, which currently generates 95 per cent of the country's electricity, is struggling to build an additional 20,000 MW of generation capacity by 2025 (Eskom 2010)[4] whilst facing a funding crisis. The era of cheap electricity, of particular benefit to the country's large energy intensive users, is over. In April 2010 the national energy regulator (NERSA) approved three year on year tariff increases of 25 per cent. In the same month, the World Bank granted the country a $3 billion loan for Medupi, the largest coal-fired power plant on the continent. Though South Africa's 1998 energy white paper agreed to enable up to 30 per cent of the country's generation to come from independent power producers (IPPs), the appropriate legislation was never enacted and no private generation was incorporated. The renewable energy white paper published in 2003 allows for "10,000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013..." South Africa's renewable energy feed-in tariff to attract independent renewable generation was first announced in 2008. South Africa is the world's fifth largest producer of coal (World Bank 2010:12). Despite the absence of national expertise, South Africa also has a huge potential for a number of different renewable energy technologies including: wind, solar water heaters, concentrated solar power, solar photovoltaics and biomass.

The starting hypothesis of this research is that clean energy initiatives in South Africa are being slotted into an existing industrial infrastructure based on a high-carbon paradigm, which has limited benefits for the energy poor (Hallowes and Munnik 2007). It examines how the governance of energy in South Africa is inevitably bound up with the country's historical dependence on cheap coal for export-oriented industry and complex political and economic legacy which has shaped its minerals-energy complex (Fine and Rustomjee 1996). The objectives of the research are to:

- analyse the dynamics and tensions inherent in energy governance and renewable energy policy making in South Africa;
- explore the development of South Africa's minerals-energy complex within a low carbon paradigm; and
- examine 'clean energy' discourses and practise in South Africa in relation to the Medupi coal-fired power plant.

By examining a multiplicity of processes and activities and a constantly evolving national scenario, the research aims to expose and illuminate a complex and at times obscure reality. It presents a snap shot of the political economy of certain features of South Africa's electricity sector. Deeper answers to some of the questions tackled by the research may only emerge several years down the line and, it is hoped, will have implications for other renewable technologies that are likely gain ground in South Africa in the future, such as solar photovoltaics (PV) and concentrated solar power (CSP), just a few steps behind wind.

The overarching conceptual framework for this research takes a critical political economy approach (Fine and Rustomjee 1996, Büscher 2009). This is crucial for the analysis of existing power relations, structural change and the underlying interests of

dominant actors and beneficiaries of governance mechanisms (Söderbaum 2004). The paper will analyse governance factors and policy-making processes in relation to:

i) the potential, yet non-existent wind energy industry. This is being developed largely by independent power producers backed by private finance who are hoping to take advantage of the country's feed-in tariff. The South African wind lobby claims that affordable wind energy could provide up to 25 per cent of the country's electricity by 2025. However finalisation of the feed-in tariff is currently stalled by the development of an appropriate regulatory framework and agreement over: a 'bankable' power purchase agreement, grid connection licences, and who the buyer of electricity should be.

ii) Eskom's Medupi 4800 MW coal-fired power plant in Limpopo province. Referred to by the government as "Africa's first clean coal 'supercritical' power station", when complete it will emit approximately 30 million tonnes of CO2 per year. In April 2010, in the midst of intense environmental, economic and social debate World Bank funding for $3 billion was approved.

These two case studies are examined within the context of significant, yet at times conflicting policy developments taking place simultaneously at the national level. These include the renewable energy feed-in tariff, the integrated resource plan, the industrial policy action plan and the renewable energy white paper. By doing this, the research explores and illuminates key tensions between economic, political, industrial, environmental and social priorities in the governance of South Africa's energy sector[5]. The research defines governance in its broadest sense, spanning the continuum of public to private, and including the influence that many non-governmental stakeholders may have over national policy-making processes (Stoker 1998).

The analytical focus of this paper is fixed within the context of the national electricity grid to which the proposed wind projects and the Medupi coal-fired power plant will connect and the national policy in question applies. Electricity is South Africa's largest energy sub-sector supplying 29 per cent of South Africa's energy demand and approximately 50 per cent of its carbon emissions[6]. Ninety six per cent of the country's electricity is supplied by coal. In financial year 2009/2010 Eskom burned 123 million tonnes of coal (Creamer Media 2011:5).

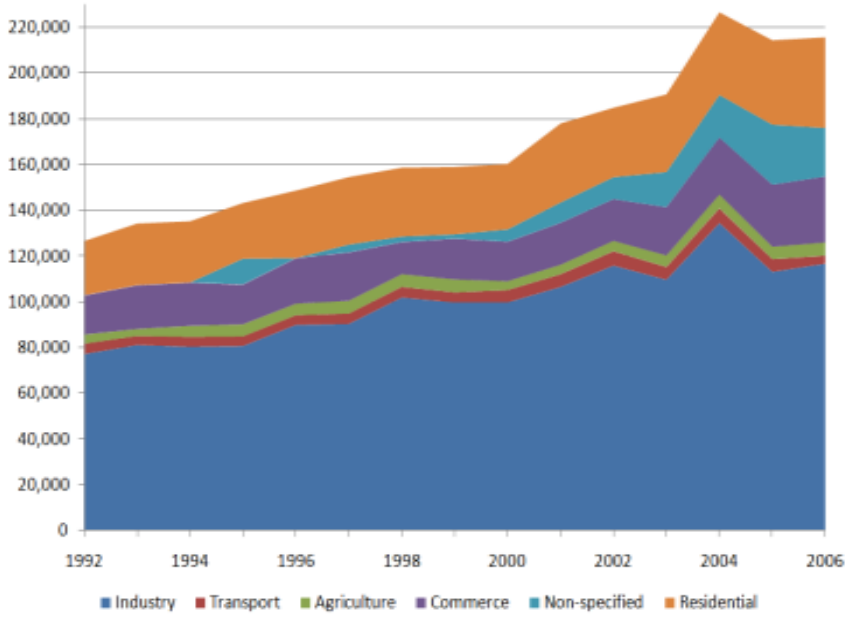
2. Minerals-energy complex

The minerals-energy complex (MEC) a concept initially coined and expanded by Ben Fine and Zavareh Rustomjee[7] lies at the "core of the South African economy, not only by virtue of its weight in economic activity but also through its determining role throughout the rest of the economy" (Fine and Rustomjee 1996:5). It encapsulates a set of national activities organised in and around the energy and mining sectors and associated sub-sectors of manufacturing. The MEC has been used as framework of analysis by a number of different scholars writing about South Africa's political economy (Freund 2010, Michie and Padayachee 1997, McDonald 2009a,b, Roberts 2008). To Freund (2010), it offers "a way of understanding power and key networks in South Africa's political economy". While the MEC is widely cited in literature on South Africa's energy policy and climate change strategies (Winkler 2009, IDASA 2010), conceptually it has not been explored in depth in relation to the introduction of renewable energy given the latter's recent emergence. Similarly, there is a paucity of thinking that links South Africa's industrial policy with climate change issues (Burton 2011).

Fine and Rustomjee identified an intrinsic link between the state and private capital and between "a core set of activities around mining and energy, straddling the public/private divide" (1996). Key activities of the MEC include coal, gold, diamond and other mining activities; non-metallic mineral products; iron and steel basic industries; and fertilisers, pesticides, synthesis resins, plastics, basic chemicals and petroleum. It is "uniquely dependent on electricity and uniquely electricity-intensive" (Fine and Rustomjee 1996:8). Cheap energy has been essential to this process and is still highly relevant (DME 1998, Winkler and Marquard 2007). The MEC's activities were largely established in the north east of the country following the discovery of gold, which resulted in the concentration of economic power and wealth in the hands of a small number of large state-owned corporations, notably Eskom and Sasol (Hallowes and Munnik 2007). Its activities are "vertically and horizontally integrated into a composite set of related industrial and manufacturing activities" as well as services, and finance in particular (McDonald 2009a:8). Figure 1 illustrates the relevance of the MEC showing that industry, of which mining and manufacturing form the bulk, consumes over 50 per cent of the country's electricity with residential consumers accounting for less than 20 per cent. These sectors continue to be incredibly influential over the state and direction of the economy but with "new features coming to the fore" (Fine 2008:2). This research perceives the role of IPPs and renewable energy as one of those features.

The MEC's dependence on cheap coal-fired electricity is no longer sustainable. Until the supply crises in 2008 the country had the cheapest electricity prices in the world at average R0.25 cents per kWh (Edkins et al 2010:14). In 2009 a 2 c/ kWh levy was introduced on electricity generated from non-renewable sources (Edkins et al 2010:14). Further to an approved year on year increase of approximately 25 per cent over three years between 2010 and 2013, it is expected that the utility will request further increases by 25 per cent in both 2013/14 and 2014/15. By 2020 they could be as high as an average of 110c/kWh (Creamer Media 2011:12).

Figure 1: Electricity consumption (Gwh) by sector (1992-2006)

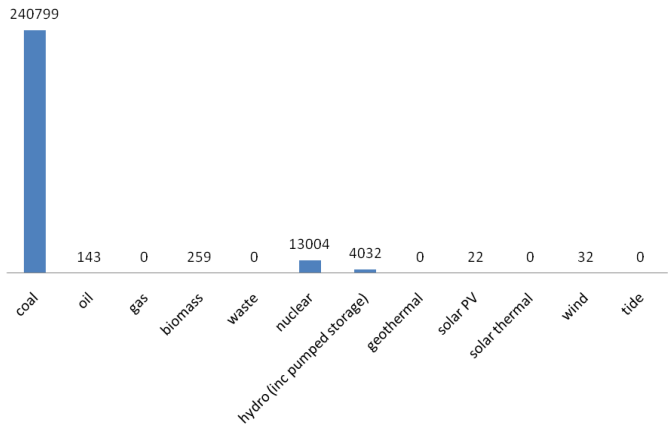


Source: World Bank 2010:10

2.1 Eskom: the monopoly parastatal

Central to the MEC is Eskom, South Africa's state-owned parastatal utility licensed to generate, transmit and distribute electricity. It is the sole transmitter of electricity via the country's high-voltage transmission grid, generates 96 per cent of national electricity and is responsible for 60 per cent of distribution directly to customers[8]. Eskom has 27 power plants in South Africa that make up 40.7 GW of the country's 43.9 GW capacity. Of this 34.7 GW comes from its 13 coal-fired power plants in the northeast, many immediately adjacent to privately owned coal mines. The remaining generation comes from pumped storage and imported hydro electricity, the Koeberg nuclear power station, four gas fuelled turbine stations, and one wind energy power station (see Figure 2). Eskom is Africa's largest and the world's fourth largest energy utility (Daniel and Lutchman 2006).

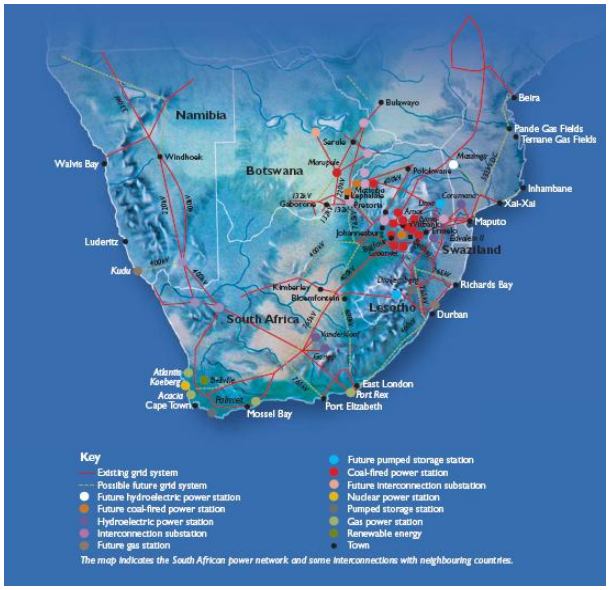
Figure 2: Electricity production in South Africa (GWh), 2008



Source: IEA energy statistics 2008[9]

The Southern Africa Power Pool (SAPP) is also heavily dependent on Eskom (see Figure 3)[10]. The utility accounts for nearly 85 per cent of its energy generation and is a net exporter to six of its twelve countries (World Bank 2010:13). However in light of supply shortages Eskom now imports more than it exports. Countries in the SAPP are experiencing increased energy shortages with Botswana and Namibia being particularly affected.

Figure 3: Southern Africa grid map



Source: Eskom (2008)

Eskom has gone from a period of electricity surplus in the 1980s with the lowest electricity prices in the world as a result of over-planning and the construction of excess generation capacity[11] to capacity restraints, resulting in load-shedding in 2008 (Eberhard 2011). In the post-apartheid era South Africa carried out a remarkable and rapid national electrification programme which saw the connection rate rise from 30 to 70 per cent of the country's population (Bekker et al 2008). Sadly this progress is now backsliding as disconnection rates have risen in recent years (IDASA 2010). No new capacity has been built in South Africa since 1980s. The 1998 Energy White Paper allowed for 30 per cent of electricity generation to come from private developers, including renewable energy (DME 1998) and in 2001 cabinet ruled that Eskom no longer be allowed to build new generation. However between 1998 and 2003 no new generation was built which Eberhard (2011) attributes in part to union resistance, inadequate political buy-in and tacit resistance from Eskom. Added to this it was not clear to whom IPPs would sell their electricity (Lakmeerharan 2010) and with national electricity tariffs well below cost, no IPP could compete with Eskom prices. Faced with falling reserve margins[12] and an imminent energy crisis, government re-allowed Eskom to construct more power plants, whilst keeping the possibility of private players providing up to 30 per cent of generation.

In 2005 Eskom initiated its expansion programme which includes the construction of Medupi and Kusile, the return to service of mothballed coal fired power stations and energy efficiency investments. Its renewable component consists only of the 100 MW Sere wind farm now funded by the World Bank (see section 6) and the 1,352 MW Ingula pumped storage programme (1300 MW) (Eskom 2010). Costs of this expansion are constantly increasing and currently estimated to cost R500 billion by 2017 (Creamer Media 2011:10).

3. Power struggles over policy

Demystifying the complexities of South Africa's energy policy in a context of constantly moving goal posts and a multitude of processes is an enormous challenge. Despite intense interest in the past few years from renewable energy independent power producers waiting to construct and connect their projects to the country's electric grid, numerous policy uncertainties and delays remain. Not one renewable energy power purchase agreement (PPA) had been licensed at the time of writing. Greater clarity has now been provided by the imminent approval of the country's long-awaited Integrated Resource Plan (IRP 2010) which is to shape the country's energy mix for the next 20 years. While this is likely to see renewable energy accounting for 26 per cent of the country's energy mix by 2030, coal will also increase significantly in real terms by 13,000 MW. However further uncertainty has now been created by the National Energy Regulator's (NERSA) Renewable Energy Feed-in Tariff (REFIT) consultation paper of March 2011 which proposes to reduce tariffs to replace those approved in 2009.

Since the start of 2010 alone South Africa's energy policy has witnessed a bewildering sequence, preceded in December 2009 by President Jacob Zuma's commitment as part of the Copenhagen Accords that the country would reduce its carbon dioxide emissions by 34 per cent below business as usual by 2020 and 42 per cent by 2025. On 31 December 2009 the Department of Energy (DoE) published its first Integrated Resource Plan (IRP1), a mere three pages. In February and March 2010 NERSA sought public comments on REFIT selection criteria for which the final version, more than a year later, is still pending. On 24 February 2010 NERSA announced an increase in electricity tariffs of approximately 25 per cent per year for the next three years starting on 1 April 2010. This was swiftly followed by public outcry over special purchasing agreements for energy intensive users such as BHP Billiton, Anglo American and Xstrata (Carnie 2010, Earthlife 2010b) some of which had been agreed during the apartheid era (Creamer 2010).

Amidst great national and international controversy on 8 April the World Bank's board approved a $3 billion loan for Eskom's Medupi coal-fired power plant and $260 million for the Sere Wind Farm and Upington Solar Power Plant. This in the wake of a public outcry over a conflict of interest involving the ANC's investment arm's 25 per cent stake in Hitachi Power Africa, a member of the consortium which won the boiler supply contract for the Medupi coal-fired power station (Mail and Guardian 2010). The first draft of the long-awaited IRP 2010 was released for public comment in May 2010, followed by public hearings in June, a second draft in October, another set of hearings at the end of the year and a nearly final version in March 2011. In September the DoE announced that it was starting its procurement process for REFIT and released a 'request for information' for potential private developers of renewable energy projects intending to apply (Aphane 2010). Various lines of credit were extended by government for Eskom's capital expansion programme and to alleviate the utility's funding crisis.

The Green Paper on the National Climate Change Response was gazetted for public comment on 25 November 2010 by the Department of Environmental Affairs, followed by a discussion document released for comment by Treasury on the introduction of a national carbon tax. The revision of the country's renewable energy white paper was scheduled for completion in March 2011 but there was no sign of it at the time of writing. South Africa's director-general for electricity, nuclear and clean energy Ompi Aphane admitted in March 2011 that delays to REFIT were likely to result in South Africa failing to meet its renewable energy white paper target of 10,000 GWh of renewable energy consumption by 2013 (Creamer 2011a).

3.1 Who is responsible?

While the activities of the electricity sector are mainly governed by the 2006 Electricity Regulation Act it is not always clear how and where policy is being made. This research has found that while the DoE is responsible for setting energy policy and planning, in reality formal and informal influence over many decisions made in the DoE's name is exerted by national entities such as Eskom, Treasury, Department of Public Enterprises, metropolitan and municipal governments, and the Inter-Ministerial Committee on energy. Less publicly, other stakeholders such as the Energy Intensive User's Group which consumes around 40 per cent of the electricity sold in South Africa (IDASA 2010:12) and Eskom's coal-suppliers appear to be incredibly influential (Yelland 2010). The DoE often delegates to Eskom on matters of planning, as it did with the IRP 2010. The Department of Public Enterprises meanwhile has oversight responsibility for Eskom, while NERSA though unable to make decisions outside of the IRP, determines electricity tariffs, sets the conditions under which electricity may be sold in the country, approves licenses for generation, distribution and transmission, and oversees the import, export and trading of electricity. The way in which renewable electricity policy has been negotiated and implemented to date illustrates some of the tensions and dynamics that exist between these entities. There have been a number of twists and turns, including NERSA acting beyond its mandate by promulgating REFIT in the first instance, a seizure of the procurement process from Eskom and NERSA by the DoE with the amended Electricity Regulations on New Generation Capacity in November 2010[13], and a sudden downward revision of REFIT tariffs by NERSA in March 2011 (NERSA 2011).

Weak institutional capacity has also affected policy making (Newbery and Eberhard 2008). McDaid (2009:2) explains that, "decision makers are unfamiliar with the technology and international best practice regulatory and policy systems that could promote renewable energy". Another analyst stated that "officials are learning about issues as they implement policy"[14]. IDASA (2010:4) also highlights "a systemic lack of clarity concerning roles and responsibilities in the electricity sector, with an associated extended period of policy opaqueness and uncertainty" and finds that "a lack of policy coordination has contributed to chronic under-capacitation, compounding the complex and profound social and environmental challenges that confront the country".

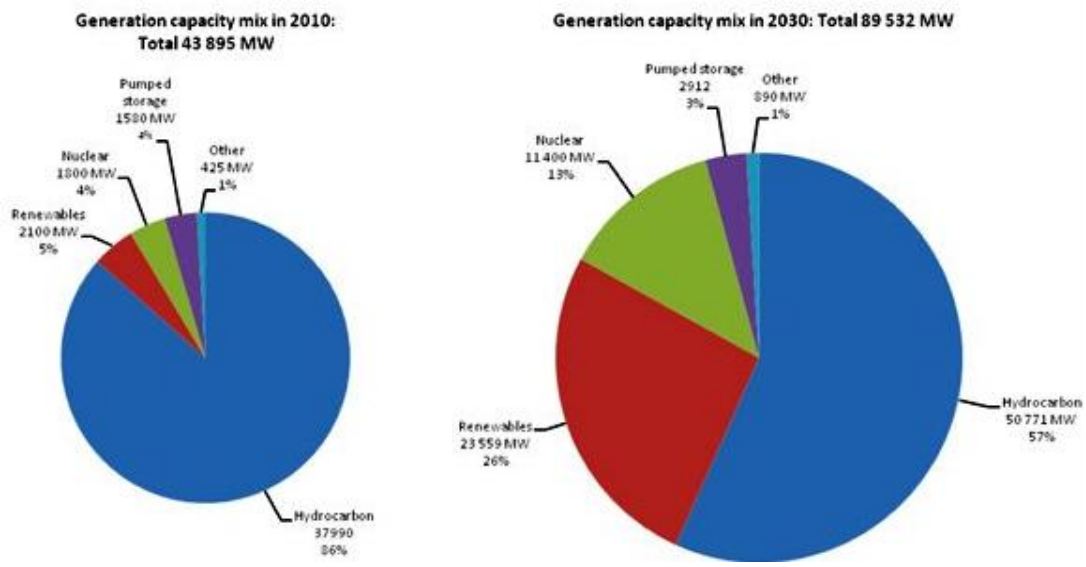
Finance and technical assistance from foreign donors, in particular the Danish and German Embassies have engaged heavily with government and business, and played a considerable role in shaping policy, directing relevant research and project development[15]. To a lesser extent technical assistance has also been provided by the World Bank, often via the Development Bank of South Africa and other development finance institutions (DFIs)[16]. Investors and wind industry IPPs keen to benefit from REFIT's tariffs, now recently revised, also seem to have been influential.

3.2 Integrated Resource Plan 2010

IRP 2010 which at the time of writing was approved by cabinet but yet to be approved by parliament and signed off by the president is an electricity master plan covering the total requirement for electricity generation from 2010 to 2030. Figure 4 illustrates the current and envisaged generation capacity mix by 2030 and national plans to more than double capacity from 42,895 MW to 89,532 MW by 2030.While renewable energy will account for about 40 per cent of South Africa's *new* generation capacity over the next 20 years with a final contribution of 23,559 MW[17], hydrocarbons[18] will account for 50,771 MW. While the proportion of hydrocarbons decreases from 86 to 57 per cent, in real terms it will increase dramatically by 13,000 MW. IRP 2010 comes after consultations in 2010 with industry, financial stakeholders, academics and civil society which saw

government heavily criticised by all sides who questioned the plan's costs, energy mix, timelines, impacts on the poor and feasibility (McDaid et al 2010). A technical advisory group providing inputs into the modelling of electricity scenarios was heavily criticised for consisting largely of representatives from government, Eskom and the energy intensive users group. Though the DoE insists they were operating in an informal capacity, no representative from the renewable energy sector was included in this group (Yelland 2010). The majority of projects are likely to be privately funded with the exception of nuclear and Eskom's committed capacity expansion.

Figure 4. Generation capacity mix in 2010 and 2030

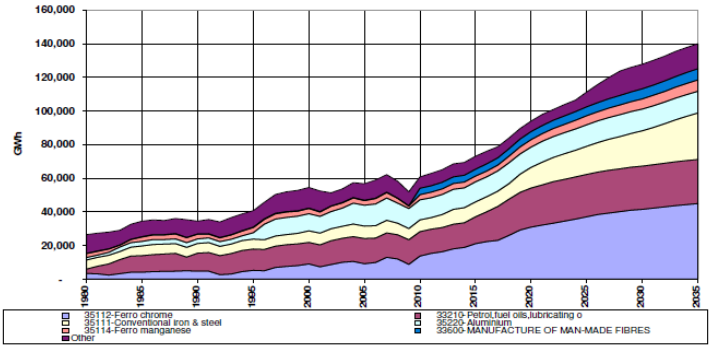


Source: Yelland 2011

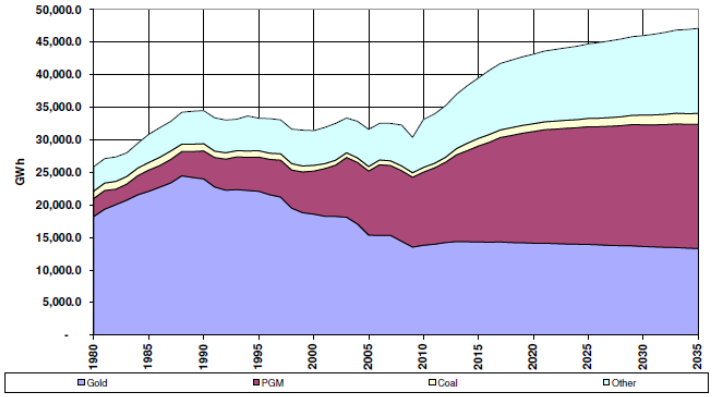
It must also be noted that despite proposed changes to the generation mix, consumption is set to increase almost two fold by 2030, from 260 TWh in 2010 to 454 TWh in 2030 as illustrated in Figure 5. There are questions over the viability of such a growth path. Winkler (2011) explains that "the growth in electricity demand outweighs the reduction in the CO2 intensity of electricity" and that the IRP would therefore result in "GHG emissions from electricity generation increasing from 237 million tons of CO2 in 2010 to 272 million tons in 2030". A further finding is that "electricity prices are projected to increase by at least 250 per cent in real terms from their current level by 2020 and by a much higher rate with inflation factored in" (Winkler 2011).More bluntly, a representative of the City of Cape Town's climate and energy branch at the IRP 2010 hearings in December 2010 referred to it as "business as usual on steroids" (Donnelly 2010). This points to bigger questions over the disconnect between the creation of a lower carbon energy mix from matters of industrial demand at the national and international level and from what and where this demand is driven.

Figure 5. IRP 2010 electricity demand forecast

(a) Eskom sales to industrial sector, moderate forecast



(b) Eskom sales to mining sector, moderate forecast



Source: Eskom Systems Operation and Planning Department (2010)

3.3 Renewable Energy Feed-in Tariff (REFIT)

NERSA (2008) states that "the basic economic principle underpinning the FITs is the establishment of a tariff (price) that covers the cost of generation plus a "reasonable profit" to induce developers to invest"(2008:1). The increased cost is to be borne by electricity consumers. The push for REFIT came in 2006/7 from within NERSA despite internal opposition[19] and from the DoE. Despite some continuing national resistance to renewable energy, perceived political and financial risks and hold ups in REFIT's procurement process, the DoE, National Treasury, and some departments of Eskom now appear resigned to REFIT and are working towards its realisation. The research found that once the process had become high profile and appeared irreversible, the DoE supported by National Treasury took over the process, removing it as much as possible from the jurisdiction of NERSA and Eskom. As one energy specialist observed, "Thembani Bukula, NERSA's director, brought the world's wind developers to South Africa to beat a path to the DoE's door"[20]. An analysis of public statements throughout 2010 also suggests a change in the DoE's rhetoric which has become more sympathetic towards renewable energy.

REFIT applies to: landfill gas, small hydro (less than 10 MW), wind and concentrated solar power (CSP) with and without storage, solid biomass, biogas, photovoltaic systems, concentrated photovoltaic and concentrated solar power (central tower). Currently the greatest interest in South Africa's REFIT comes from the wind industry, with solar CSP and PV likely to become bigger players in the near future. REFIT's first allocation will amount to 1025 MW and is set to run until end 2013 in keeping with the target in the renewable energy white paper. To the dismay of the country's IPPs in waiting, a NERSA consultation paper in March 2011 proposed dramatic downwards revision to the tariffs approved in 2009, in the case of wind from R1.25 to R0.94 per kWh. Following public hearings into the tariff review held at start May, NERSA has said it will announce its final decision in mid-June 2011.

3.4 Key concerns

Draft selection criteria were published by NERSA in February 2010. Still to be finalised these are based on ten key requirements: compliance with IRP 2010; acceptance of the PPA; project location that contributes to grid stabilisation; location and technology that contributes to local economic development; compliance with legislation in respect of the advancement of historically disadvantaged individuals; projects with viable network integration requirements; projects with advanced environmental impact approvals; projects demonstrating the ability to raise finance; a preference for small distributed generators over centralised generators[21]; and projects that can be commissioned in the shortest time (NERSA 2010). IPPs are frustrated at the absence of clear selection criteria as many state they are risking large amounts of capital without knowing how their projects may be selected.

The initial PPA for REFIT drawn up in July 2009 by NERSA was criticised by developers and investors for allocating too much risk to renewable energy IPPs as compared to Eskom (Waller 2010:47). Banks are insisting that in order for the PPA to be 'bankable', it must be underwritten by government, particularly if Eskom is the counter party given its financial instability. Risk and the inability of different stakeholders to agree over its apportionment have been cited as one reason for the continued stalling of the PPA in its final version, now being drawn up by the Treasury with Danish assistance.

IPPs state that the utility's position as 'player and referee' (both the generator and buyer of power) poses a serious conflict of interest and that a neutral power purchasing agency is needed. Steps to establish a single buyer and unbundle the transmission system away from Eskom also continue. In the 2011 State of the Nation address, President Jacob Zuma reiterated his 2010 commitment to establish an Independent Systems and Market Operator (ISMO) separate from Eskom, with whom IPPs will sign the PPAs. Currently the DoE is proposing an interim ISMO, a ring-fenced entity within Eskom's systems operations and planning division, at least for the first phase of REFIT (Creamer 2011a).

4. Governance of South Africa's nascent wind industry

Wind is the largest contributor to new installed power generation capacity globally (Szewczuk et al 2010). It is cheaper than concentrated solar power and solar PV, has more operational experience than other renewable technologies and can be competitive with conventional sources of energy generation. A recent report by Heinrich Böll Foundation states "wind farms offer the largest immediate potential for input into the national electricity grid, and for significantly alleviating South Africa's power supply shortage" (Trollip and Marquard 2010:2). Reflecting these trends, the majority of interest in South Africa's feed-in tariff to date comes from wind energy developers. It is

anticipated that 700 MW of the 1025 MW of the first stage of REFIT will come from wind. While IRP 2010 has increased the allocation for wind to 8,400 MW (not including REFIT) this is not set to start until 2014. South Africa has only two grid connected wind farms, both in the Western Cape: the 5 MW Darling wind farm[22] and the 3.16 MW Klipheuwel wind farm[23]. A stand alone turbine was erected at Coega in 2010 with a generating capacity of 1.8 MW[24].

An exact figure for potential wind energy development in South Africa does not exist, being heavily determined by a complex mix of political, economic and technical factors including technological limitations, land agreements, affordability, human capital, technological learning rates, transmission grid capacity, road infrastructure, the overall energy mix and political will[25]. According to analysis by the South African Wind Energy Association "wind energy can provide 20 per cent of the country's energy demand by 2025, equivalent to 80 TWh, through the funding, installing and operating of 30,000 MW by the private sector". This would amount to "an average daily minimum power output of 7000 MW, displacing up to 6000 MW of conventional base load" (SAWEA 2010:3). Estimations of South Africa's wind capacity have increased progressively on the basis of a series of wind map studies[26]. Projects are mostly planned for the Western and Eastern Cape, with a smaller number in the Northern Cape and the Karoo.

Since the introduction of REFIT South Africa has seen a 'wind rush' of aspiring developers some of whom have no or limited experience[27]. Indeed a number of national stakeholders involved in renewable energy project development such as representatives of national banks, law firms and Eskom have explained that it has been hard to decipher the more credible players amongst them.

Many of South Africa's potential IPPs consist of a local company backed by a foreign partner and private finance. The most credible and visible of these include: Irish company Mainstream Renewable Power in joint venture with South African Genesis Eco Energy; South African Clean Energy Developments, jointly owned by Australian-listed Macquarie Capital and Old Mutual Investment Group of South Africa; Swiss energy development firm Genesys Wind in partnership with South African engineering company Thuthuka Group Limited; RES Southern Africa, part of the UK-registered international RES group; InnoWind Pty (Ltd) set up by French sister company InnoVent; Moyeng Energy (Pty) Ltd, a partnership of GDF Suez and Investec. There are limited details of the majority of these stakeholders and how they are involved available in the public domain[28]. The nascent industry has been criticised in the press for consisting largely of white men (Salgado 2010) which is reflected in the make up of the board of its industry lobby group SAWEA[29]. One civil society representative interviewed referred to the industry as consisting largely of "white wind capitalists". Two unusual examples that have been identified amongst South Africa's potential IPPs include Watt Energy, supported by South Africa's second largest coal producer Exxaro and Just Energy, which has a core commitment to poverty alleviation (see Box 1).

South Africa's wind industry will inevitably be shaped by trends of the international wind market (Lewis and Wiser 2007). There are three wind turbine manufacturers with small offices in South Africa. Vestas has had a representative in the country for about a decade and opened a small office in Johannesburg in June 2010. Suzlon Energy Ltd, India's largest wind turbine manufacturer followed suit in late 2010, appointing Silas Zimu, former managing director of Johannesburg's municipal electricity distributor, City Power as its in-country CEO. The company has since signed a memorandum of understanding with African Clean Energy Developments (ACED) for 76 turbines for its proposed Cookhouse project, in the Eastern Cape (Creamer 2011c). Chinese company Goldwind Africa, whose Chinese parent company Xinjiang Goldwind Science &

Technology Co. Ltd is one of the largest turbine manufacturers in China and one of the top five in the world, was launched in Cape Town in March 2011.

Other global power and engineering companies who have been mainstream suppliers of energy and electricity equipment for some time in the country are also likely contenders. Siemens, which has been involved in South Africa's electricity sector since 1860 has decided to make South Africa its wind power hub for Africa and the Middle East and says it is building domestic capacity to support project developers, "including the Mainstream consortium, with various local manufacturing options under consideration" (Creamer 2001b). The company announced it would invest €200-million in Africa by 2012 of which half in South Africa including in renewable energy. General Electric which is a leading wind turbine supplier elsewhere has had a presence in South Africa for nearly a century. French company Alstom better known for its supply of key equipment to coal-fired power plants in South Africa including Medupi and Kusile, recently announced its intention to supply equipment for wind power (Alstom 2008). In July 2009 Alstom Switchgear introduced a medium-voltage ring main unit for use in distributing power generated by wind turbines (Engineering News 2009). German company Nordex also has designs on the South African market and in 2010 offered a traineeship in wind farm development in Paris for a South African engineer[30].

South African banks as potential providers of debt financing include NedBank, Standard Bank, ABSA Capital and Investec. It is believed that equity investors are likely to include development finance institutions and large international energy companies. Legal advisors also play a key role for instance in negotiating over off-take agreements with the buyer of power. In addition to the requirements of project finance set by debt providers and equity investors, a number of domestic factors have also been influential in shaping the industry's development. For instance South Africa's environmental impact assessment (EIA) process has been criticized for slowing down the process. Until March 2011 it appeared that only three projects had reached final EIA approval from the Department of Environmental Affairs (DEA), though since then another four have been approved[31]. In February 2011 there were rumours in the press that the DEA had called a moratorium on future EIA approvals for wind farms (Cape Times 2011) though this was not substantiated officially. In April 2011 the DEA reportedly had changed its compliance criteria for wind farms and had received a total of 67 EIA applications from wind farm developers (Salgado 2011). Securing land rights for renewable energy development can also be complex and time consuming given that agricultural land, upon which most wind farms are planned, can not be subdivided without the consent of the Minister of Agriculture (Deneys Reitz Attorneys 2010).

Findings thus far indicate that the larger players in the industry[32] are more likely to reap the financial benefits of the emerging industry which is still waiting for the regulatory framework to accommodate their development. For smaller players waiting is an expensive business and risks financial ruin. Though the draft REFIT selection criteria insists on local content and Broad Based Black Economic Empowerment, the extent to which wind development will benefit local communities is in the majority of cases currently unclear[33].

Box 1: Wind industry IPPs: two unlikely suspects

Exxaro: coal giant builds wind

Exxaro is the second largest coal producer in South Africa. Its carbon footprint makes up one per cent of South Africa's emissions. The sole supplier of coal to the Medupi coal-fired power plant, Exxaro is now developing a small renewable energy portfolio of approximately 200 MW. It explains that it is driven by the need to "thrive in a low-carbon economy" (Exxaro 2011) and concerned about rising costs and increasing scarcity of electricity, it saw how it could benefit from generating its own electricity.
Does the company's embrace of renewables represent a shift away from its role as a stakeholder in the country's minerals-energy complex or is it using the opportunity to mitigate its core activities? One mining industry expert explained "Exxaro has worn two hats. It is lobbying for the cheapest possible electricity which comes from coal but is also preparing to get involved in a new energy future. I think it is hedging its bets"[34].

Exxaro is the biggest black owned company listed on the Johannesburg Stock Exchange. A 'proudly South African'[35] company it has considerable political reach which could present a strong comparative advantage for its renewable energy activities. One energy analyst stated, "they have access to decision-makers that new [renewable energy] developers do not and influencing access within the ruling party, all departments, and at all different levels as well as many personal relationships. Exxaro are making an effort to collaborate with the government on sustainability and have a different approach than the average capitalist"[36].

Exxaro is part of the Tsitsikamma Community Wind Farm consortium which plans to generate 40 MW of wind power by 2013 from a R1-billion wind energy project in the Eastern Cape. Exxaro together with the IPP Watt Energy and the Tsitsikamma Development Trust which operates on behalf of the landowning community hold a 46 per cent stake. The rest is held by the Danish Industrialisation Fund for Developing countries and Danish IPP European Energy. Other partners include: the Eastern Cape Community Wind Energy Development Association; Vestas who will supply the technology; the Danish Export Credit Fund, which would provide debt credits; the Danish energy utility Dong Energy, which will buy the project's CDM credits; and Danish wind laboratory Risø, which carried out the wind measurements and mapping (Watt Energy 2011).

Watt Energy is a black-owned 'renewable energy project management and facilitation company' based in Port Elizabeth, with a stated commitment to "community empowerment; quality job creation; poverty alleviation and rural development through renewable energy". Mike Msizi its CEO spent time in exile in Denmark during apartheid, where he states, "I was quickly introduced to their biggest passion, drinking beer, followed by their second passion, the wind industry… It was not until the blackouts in 2006 and the introduction of Independent Power Producers into the vocabulary of ordinary South Africans that I remember what I had learned from the people of Denmark" (Msizi 2010). In November 2009, Watt Energy formalised its relationship with Exxaro as its equity partner.

Just Energy: a model for sustainability?

According to research findings, the IPP Just Energy is unique in that its core commitment to poverty alleviation is structured into its project finance model. Oxfam is

Box 1 continued...

a founding member, has a seat on it board, and currently funds the developer's operational and core costs. Just Energy works to connect low-income communities that have land and a wind resource with partner organisations that have financial resources and technical expertise. Its ultimate aim is to pass as much ownership as possible to the local community. A not-for-profit organisation, after it has paid off its debt and covered its operational costs project revenues will be returned to the communities. While Just Energy's projects will use local skills it is anticipated that the main economic benefit will come from retaining the income generated by the project within the communities which can then be invested in revenue generating activities. The organisation's plans began before the inception of REFIT and it is now faced with stiff competition for grid access which wasn't there at the outset.

Just Energy has three projects of a total combined capacity of about 111 MW at a 'mature' stage meaning that EIAs are in the process, wind masts have been erected and the pre-feasibility study completed. The most advanced of these is a 65 MW project in the Eastern Cape. The project is unique in that the land is owned entirely by small holder farmers with the first phase involving eleven different portions of land. The project is located in the former Ciskei, where land titles have never been transferred from one generation to another and until recently had no formal process for doing so. The title may sit with someone from three or four generations back meaning that they, their children and even their grandchildren will be dead. Project Manager Neil Townsend explains that getting the title transferred to the current generation can be problematic and complex particularly in the general absence of wills or death certificates. Before the Minister of Agriculture will approve a long-term lease, the land's title must be transferred to the new owners. In the face of such legal challenges the IPP still needs to come up with something that banks will be willing to lend against. Just Energy is currently seeking debt funding and equity investment for its projects but having the community as a shareholder is considered a 'risk' under project finance norms, especially if the community is to take consensus-based decisions. While development finance institutions such as the Development Bank of South Africa (DBSA) are willing to take a higher degree of risk its rates tend to be unfavourable compared to commercial debt providers (Townsend 2010).

5. "Clean coal": the Medupi coal-fired power plant

The Medupi coal-fired power plant in Limpopo Province will be the largest coal-fired power plant on the continent and the first to use supercritical coal technology. With a total installed capacity of 4,800 MW it will be the first base load coal-fired power plant to be built in over 20 years in South Africa. It is the World Bank's largest ever investment in the country following a formal request for assistance from the government in February 2009. Government permission for its construction and the decision to use supercritical technology was granted in 2009 (World Bank 2010:36). To have been completed in 2012, the project is now said to be two years behind schedule (Kumwenda 2010). It is estimated that on completion, the plant will emit 29.9 million tonnes of CO2 per year. It is claimed that Medupi's supercritical technology will result in CO2 emissions 20 per cent lower than if the project had been built with subcritical technology. Coal miner Exxaro will supply 14.6 million tonnes of coal per year for 40 years and is currently increasing the capacity of its open cast Grootgeluk mine in order to do this at a cost of R9 billion (Creamer 2009). The total cost of project construction

was set at $12.047 billion (World Bank 2010:29) but this has since risen to $17.87 (Creamer Media 2011)[37].

The project's outcomes, listed as "increased reliable power generation; increased renewable energy supply; and reduction in carbon intensity" (World Bank 2010:28) reflect the balance of emphasis in the World Bank's report. As part of Bank conditions for the loan, Eskom must have a programme in place to install flue-gas desulphurisation (FGD) equipment in each of the six units. This will be retrofitted as it was not included in the project's original design. The first unit must be in operation by 2018 and all six by end 2021 (World Bank 2011:iv), though a World Bank representative in Pretoria interviewed clarified that "it was later decided that the condition for installation would be only the availability of a sufficient amount of water"[38]. Though Medupi will be the largest dry-cooled power station in the world, a key consideration in water scarce South Africa, the operation of its six units will still need six million cubic metres of water per year and additional investments in the Mokolo River system from where the water will be sourced (World Bank 2010:38). The introduction of flue gas desulphurisation (FGD) will increase the annual water requirement to 12 million cubic metres.

5.1 Clean lending

The $3.75 billion loan from the World Bank's International Bank for Reconstruction and Development (IBRD) to Eskom Holdings for the Eskom Investment Support Project consisted of three components.

- $3,040 million for the financing of the Medupi coal-fired power plant using supercritical technology, including construction contracts and associated transmission lines' This is co-financed with an the African Development Bank of loan about $2.63 billion and European ECAs;
- $260 million for the Sere Wind Farm and Upington CSP plant (to be co-financed with CTF and other DFI financing);
- $440 million for "low carbon energy efficiency components" including the Majuba Rail Project (financed by IBRD alone) (World Bank 2010).

The construction of the plant and the World Bank loan met with intense opposition from national and international civil society. Reasons included: concerns over the impact of coal-fired development on local communities and their environment such as air pollution and acid mine drainage; how economic impacts of repaying the loan will contribute to raised electricity tariffs; doubts over claims that the project will increase employment; and corruption issues relating to the ANC's investment arm's involvement in a boiler contract (Hallowes 2009, Africa Action 2010, Earthlife 2010a). There was also internal opposition from within the World Bank demonstrated by abstentions from the board's vote on the loan by the US, UK, Netherlands and Italy (Njobeni 2010)[39]. While the South African government also emphasised Medupi's contribution to energy security and economic growth (Hogan 2010, Gordhan 2010), the Bank has detailed how its involvement will help South Africa develop a low carbon strategy as enshrined in its LTMS endorsed by Cabinet in 2008. In addition to assisting South Africa's low carbon development strategy, the World Bank also justifies its role as 'lender of last resort' (World Bank 2010:22) on the grounds that the project will reduce unemployment, tackle poverty, deepen regional integration, increase energy access and prevent civil unrest and social inequalities.

The Bank states that its project is in line with its 'Development and Climate Change, A Strategic Framework for the World Bank Group' (DCCSF) (World Bank 2010:24). An expert panel in February 2010 concluded that the project was consistent with DCCSF

criteria and that as a "transition strategy" it was essential and must be coupled to "a longer-term strategic shift to an economy based upon a low-carbon energy supply" supported by the Bank. The loan document also stated that all future coal-fired power plants in South Africa be made CCS ready and that significantly without Medupi, "South Africa would not be able to embark on the aggressive implementation of its low carbon initiatives". Finance from the IBRD and Clean Technology Fund (CTF) for the 100 MW Upington Concentrated Solar Power plant and 100 MW Sere Wind Farm are also reasons for how the loan will assist South Africa in realising its mitigation scenario endorsed by Cabinet in 2008. These two projects are presented as catalysts to South Africa's potential renewable energy sector and demonstration sites for large scale private renewable energy generation on the continent. Both projects will apply for CDM credits.

The construction of the Majuba Rail Project is also put forward as a low carbon element of the loan in that the infrastructure which will replace road transportation of coal to the Majuba power station and replace road transportation of coal which will reduce damage to roads caused by coal trucks and reduce "annual CO2 emissions by approximately 250,000 tons" (World Bank 2010:32).

Lastly Eskom is considering applying for CDM credits for Medupi on the basis of emission reductions from its supercritical technology and FGD (Friedman 2010). In 2010, the UNFCCC's CDM Executive Board published "consolidated baseline and monitoring methodology for new grid connected fossil fuel fired power plants using a less GHG intensive technology" (UNFCCC 2010). Under this the methodology for calculating CDM credits from supercritical (and/or ultra supercritical) coal plants is approved. Two power plants using similar technology to that of Medupi have been successful, run by the Adani group in Gujarat, India (Vidal 2010).

6. Conclusion: key findings to date

It is evident that there is a shift in South Africa's coal-based trajectory on which the country's industrial policy and minerals-energy complex has been predicated to date. However though the energy mix is being diversified, coal is still set to play a dominant role as illustrated in the IRP 2010 and the Medupi coal-fired power plant. Moreover the fact that the electricity demand forecast for the industrial sector is set to increase almost two fold by 2030 illustrates the continued dominance and priorities of key beneficiaries and stakeholders of the minerals-energy complex.

The study has also shown that emerging actors in private renewable energy generation pose a challenge to the entrenched interests of the minerals-energy complex, a structure already under threat from rising coal costs, electricity supply issue, rising tariffs and a utility struggling to hold onto its monopoly. Despite misalignment and delays at the level of policy, these actors have had some success in pushing for a certain level of change. In some cases they are acting for diverse interests, Exxaro being a case in point. How South Africa's nascent wind industry and other renewable energy sectors configure themselves will be central to its success in the long term. For instance it is clear that there has been limited unity of vision and purpose in formulating and implementing renewable energy policy at the national level. Despite great efforts of those involved in the country's potential wind industry, there is no one national champion of renewable energy to forge a path but rather a number of different entities acting at times in competition with each other. Furthermore these disparate strands have to compete with entrenched vested interests such as the energy intensive users group who as demonstrated by the IRP 2010 have more access to and influence over decision makers in government (Paul 2011).

While the allocation of renewables in the IRP 2010 has been increased from earlier versions, this research finds that renewable energy has been a niche policy intervention which to date has not been adequately backed up by industrial policy or sufficiently protected from the priorities and interests of current power structures. Key concerns lie not only in policy confusion and the absence of an efficient process, but also that the annual limits on wind development in the IRP 2010 and its delayed start may fail to jump start a sustainable national industry. Similarly REFIT in its current form is likely to benefit a small number of IPPs backed by private financial capital rather than encouraging the development of a critical industrial mass. The small amount of MWs available under REFIT has also been too limited to encourage too much information sharing amongst those IPPs applying who are forced to compete with one another. Commitment to 'localisation' of the wind industry which is a key national concern in light of high unemployment rates and the strong influencing role of organised labour, has been largely limited to government rhetoric and not supported by policy. Therefore there are fears that the way the wind industry is emerging may not encourage the development of national small and medium enterprises, facilitate a local industry and supply chain and national skills development.

What is also significant is that Medupi's supercritical technology, FGD and the smaller renewable energy and energy efficiency projects funded alongside it appear to be central to its national and international legitimacy. Given that there is no internationally agreed standard or accepted definition of what 'low carbon' should mean, it is a relative rather than absolute concept. In South Africa it is simultaneously used by the coal, nuclear, gas, hydro-electric and renewables industry. With this in mind it can be argued that in order to maintain legitimacy in the face of renewable energy development and the concerns over climate change, coal-generated interests have created a discourse which presents coal as clean.

Finally as South Africa grapples with its commitment to a low carbon energy future and the demands of its own government, industry, IPPs, banks and civil society it confronts a delicate balancing act of social, economic, political and environmental concerns. When the country plays host to the UNFCCC CoP 17 in Durban at the end of this year its actions in the field of renewable energy will come under particular scrutiny. Will it be able to unblock its policy chaos in time to mobilise an industry that places sustainable development, energy poverty and climate change at its core?

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[1] This paper constitutes a summary of work in progress for the author's PhD on 'the governance of clean energy in South Africa: concept, policy and practice" due for submission in early 2012. An earlier version was submitted as a conference paper for the 10th Nordic Environmental Social Science Conference run by Stockholm University, the Stockholm Resilience Centre and the Stockholm Environment Institute in June 2011 to be presented in the workshop entitled "the Power of Power: fossil, nuclear and renewable energy in the social and political terrain".

[2] The research has included two fieldwork visits to South Africa in 2010, from February to June and September to December. While in South Africa the author carried out approximately 60 semi-structured interviews in Cape Town, Johannesburg and Pretoria with representatives of government, industry, academia, civil society, Eskom, the legal profession, trade unions, journalists, banks and donors. The research also uses evidence from participant observation at: meetings of investors, renewable energy project developers, parliamentarians, civil society and trade unions; public hearings for the country's Integrated Resource Plan; and the national civil society energy caucus. The research also includes textual analysis of national policy documents, legislation, industry specific publications, and data on energy consumption and production.

[3] Consistent with South Africa's Long Term Mitigation Scenario endorsed by Cabinet in 2008.

[4] See Eskom's fact sheet for further information http://www.eskom.co.za/annreport10/fact_sheets/build_programme.htm

[5] Despite its at times critical approach, this research does not underestimate the immense challenges of the entrenched and highly inequitable and racist legacy in the energy sector inherited by the post-apartheid government in 1994 (McDonald 2009a), or the struggle and dedication of many individuals and institutions who have worked to overcome this.

[6] Eskom (2010: 54) reports that SA's carbon emissions from electricity were 224.7 million metric tonnes. According to the US Energy Information Administration, SA's total emissions for 2009 were 451.22 million metric tonnes http://www.eia.doe.gov/countries/country-data.cfm?fips=SF

[7] Ben Fine is professor of economics at the School of Oriental and African Studies, University of London. Zavareh Rustomjee is former director general of the South African Trade and Industry Ministry and faculty member of the Witwatersrand University, Johannesburg

[8] The balance of the remaining distribution is mostly carried out by the three largest metropolitan electricity distributers (see Bekker et al 2008)

[9] Available at: http://www.iea.org/stats/electricitydata.asp?COUNTRY_CODE=ZA, accessed 12 May 2011

[10] Of the twelve countries in SAPP, South Africa is a major provider to Botswana, Congo, Lesotho, Mozambique, Namibia, Swaziland and Zimbabwe through a wide transmission system

[11] 'Surplus capacity' is a technical term and does not reflect the fact that until 1993, only one third of the population had access to electricity. For more on domestic electricity connections and energy poverty see Eberhard (2007)

[12] The appropriate reserve margin is considered to be about 15 per cent by Eskom. In 2008 it was at 6 per cent (IBRD 2010:11)

[13] These regulations, finalised in August 2009 by the DoE were revised in November 2010 with assistance from Danish consultants, altering the roles and responsibilities outlined in August 2009 and in effect transferring powers from NERSA and Eskom to the Department of Energy and National Treasury. For example under the August 2009 Regulations, Eskom's System Operator was to have been responsible for selecting REFIT participants. The November 2010 version stipulates that the entity responsible for this selection must be designated by the DoE and obtain National Treasury approval. NERSA's ability to draw up the power purchase agreement and selection criteria has also been removed. When interviewed, a DoE representative stated "the New Generation Regulations now enable government to control the procurement process. The market indicated to us that in light of Eskom's financial position, they were not willing to enter into a PPA arrangement with Eskom unless they had a government guarantee".

[14] Interview with energy analyst, December 2010, anonymous

[15] Danish DANIDA set up and funded the Capacity Building Project in Energy Efficiency and Renewable Energy (CaBEERE) 2001 until 2005 with 27 million Danish Kroner (approx $5.2 million). Amongst other activities it led to the publication of the 2003 Renewable Energy White paper and a base line study on wind energy in South Africa which documented that the country had enough wind for commercial application and recommended using a feed-in tariff as the way to implement this. Since then the Danish Embassy has played a strong role in renewable energy policy, pilot projects and capacity building in South Africa including the South African Wind Energy Programme (SAWEP), set up to encourage national on-grid wind development and the Darling Wind Farm. German GTZ's involvement has included technical assistance and funding for a 2009 study on "Grid integration of wind energy in the Western Cape" which found that up to 2800 MW of wind power could be integrated into the Western Cape grid without the need for additional transmission lines or problems of grid stability and a 2010 capacity credit study for wind together with Eskom, the DoE and South African company Windlab. Both countries have hosted study tours on wind energy and feed-in tariffs for South African government representatives.

[16] The Renewable Energy Market Transformation programme (REMT) began in 2008, five years after its inception. It has received $6 million from the Global Environment Facility via the World

Bank and is being implemented by the DBSA. Some of this is being spent on renewing the renewable energy white paper and the development of REFIT.

[17] Of which 16.3 per cent wind, 14.0 per cent PV and 2.1 per cent CSP, see ibid

[18] Of which 45.9 per cent is coal, 8.2 per cent open cycle gas turbines and 2.6 per cent closed cycle gas turbines. See Department of Energy, "Integrated resource plan for electricity 2010-2030, Revision 2, Final report, In promulgation process," 25 March 2011 at p. 14

[19] Interview with NERSA official, November 2010

[20] Interview with energy analyst, October 2010, anonymous

[21]Distributed generation means that the electricity is generated near where it is used, which reduces losses in transmission and the need to construct additional power lines. The preferred minimum size of a wind facility to qualify for REFIT is greater than 20 MW. No maximum size has been specified.

[22] The Darling wind farm, 70 km north of Cape Town was a R75 million national pilot project funded by the Danish government through DANIDA, the Global Environment Facility, South Africa's Department of Minerals and Energy, the Development Bank of Southern Africa and the Darling Independent Power Producing Company. Initiated in 2001, due to technical and governance issues the project only began generating in May 2008.

[23] The Klipheuwel Wind Farm approximately 50 km east of Cape Town was built in 2002/3 by Eskom as a demonstration site rather than a wind production facility. According to the DoE the wind farm has a total capacity of 3.2MW.

[24] A 1.8 MW Vestas V90 turbine was installed by Belgian company Electrawinds and the Coega Development Corporation (CDC) in the Coega Industrial Development Zone and connected to the grid in end May 2010. The energy generated from this turbine was used to power the Port Elizabeth football stadium in Nelson Mandela Bay in Eastern Cape Province during the 2010 World Cup.

[25] For a discussion of the different types of renewable energy potentials in relation to South Africa (theoretical, technical, realisable, mid-term and economic) see Edkins et al 2010.

[26] Studies on South Africa's wind capacity began in 1995 with the Roseanne Diab Wind Atlas which concluded that wind could provide 7.9 TWh/year, around 2.5 per cent of the country's electricity. A second wind atlas produced in 2001 by Eskom, CSIR and Danida as part of Eskom's South African Bulk Renewable Energy Generation Project (SABRE-Gen) upped the estimations of wind generation potential to approximately 26 TWh/ year. Killian Hagemann of the Climate Systems Analysis Group University of Cape Town now director of G7 Renewable Energies, created a Mesoscale Wind Atlas in 2008 estimating that wind could provide around 35 per cent of current consumption, or about 26 GW of wind power capacity which equates to 80 TWh/ year.

[27] In interviews with a number of different representatives of the utility, Eskom has expressed the need to weed out non-eligible players.

[28] In addition to interviews with wind energy IPPs, the bulk of information on wind IPPs has been compiled using: (1) information from environmental impact assessment documents available publicly at the time of writing from EIA companies: Savannah Environmental (http://www.savannahsa.com/projects/index.php), Arcus Gibb (http://projects.gibb.co.za/), CSIR (http://www.csir.co.za/eia/) and CESNET (http://www.cesnet.co.za);

(2) South Africa's CDM project portfolio up to 28 January 2011 available on the DNA's website http://www.energy.gov.za/files/esources/kyoto/CDM%20Projects%20Portfolio%2029%20March%202011.pdf;

(3) the 'Prior Consideration of the CDM' database accessed on UNFCCC's website http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html; and (4) articles that have appeared in the national and international press over the last three years.

[29] For a list of SAWEA's board see: http://www.sawea.org.za/index.php?option=com_content&view=article&id=1&Itemid=6 (last accessed on 10 June 2011)

[30] Department of Mechanical and Mechatronic Engineering, University of Stellenbosch "South African engineer for traineeship in wind farm development in France," February 2010, available online at: http://www.mecheng.sun.ac.za/Jobs/Trainee%20Nordex%20South%20Africa.pdf, (last accessed on 20 February 2011)

[31] These are Africa Clean Energy Developments, Eskom's Sere wind farm, Mainstream/Eco-genesis, Umoya, Grahamstown, Moyeng and Dorper. Sources listed at *supra* note 25

[32] Such as Mainstream Renewable Power which has a total of 3000 MW of wind and solar projects at various stages of development and has now set up a consortium consisting of the Thebe Investment Corporation, AsgiSA-EC, Enzani Technologies and Usizo Engineering. The consortium is supported by Siemens Energy Africa as the technology provider and Absa Capital as the exclusive financial adviser and debt arranger (Creamer 2011b)

[33] Unlike Germany, Denmark and the Netherlands, wind development in South Africa is not associated with local cooperative movements and farmers. For a discussion on policy and governance systems on wind power policy and implementation outcomes Toke (2006)

[34] Interview with mining industry expert, anonymous, November 2010

[35] This term is inspired by a 'buy local' campaign launched in 2001 by government, organised business, organised labour and community organisations to boost job creation and pride in South African companies and national products and services. Further information is available at: http://www.proudlysa.co.za/Index.aspx, accessed 16 May 2011

[36] Interview with South Africa energy analyst, anonymous, May 2010

[37] According to Creamer Media (2011:10) the cost of the plant has increased since it was first proposed, from R80 billion to R125 billion. R125 billion converts to $17.87 at 1 ZAR=$0.143, 17 May 2011

[38] Interview with Reynold Duncan, Lead Energy Specialist, World Bank, Africa Region, 7 October 2010

[39] The study is aware that coal has played a heavy role in the industrial history of the countries who abstained. Though this study focuses specifically on South Africa, it does not ignore the urgent need for rich countries to act on their own green house responsibilities under the Kyoto Protocol. For example see "New Oxfam report says that rich countries have a 'double duty' to act on climate change". Available at http://www.oxfam.org/en/pressroom/pressrelease/2009-06-11/new-oxfam-report-says-rich-countries-have-double-duty.

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