Aligning South African energy and climate change mitigation policy

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Contents

Abstract iii

1. Research background 1

2. 'Policy': a working definition 1

3. South African climate mitigation policy 2
- 3.1 ANC's Polokwane resolution on climate change 2
- 3.2 The LTMS process and the Cabinet lekgotla's climate policy vision 2
  - 3.2.1 The March 2009 Climate Policy Summit discussion document 4
- 3.3 Defining South African energy mitigation policy direction 5
- 3.4 The impact of national and international developments on actualised climate mitigation policy 5

4. South African energy policy 6
- 4.1 Sector overview 6
- 4.2 Energy institutions 7
- 4.3 Energy policy paradigms 8
- 4.4 South Africa's historical energy policy, and the 1998 White Paper 8

5. Policy developments between 1998 and the present 9
- 5.1 Failure of energy planning, co-ordination and liberalisation 9
- 5.2 Slow and low levels of implementation of climate mitigation-aligned energy policy 10

6. Is current energy policy aligned with climate change policy? 13

7. Two thought experiments 14
- 7.1 Thought experiment 1: Achieving alignment for renewable energy 14
- 7.2 Thought experiment 2: Industrial energy efficiency 15

8. Indicative requirements for policy alignment 16

9. Conclusions and areas for further research 17

References 19

Abstract

This paper considers the alignment of energy policy in South Africa with the Cabinet's mitigation vision of a 'peak, plateau and decline' greenhouse gas emissions trajectory to 2050.

First, the term 'policy' is defined as having a number of components, ranging from the broad 'policy paradigm' which guides the approach to policy development in a particular area, to statements and intentions, written documents and institutional orientation and capacity. Following from this definition it is argued that, at the level of written and stated energy policy, the intention exists to move towards a more diverse, efficient and less carbon-intensive energy sector. A number of policy instruments are being developed which go some way towards achieving this. However, the targets set are too low, and all initiatives are hampered for institutional and financing reasons. On the other hand, however, the dominant energy policy paradigm and the orientation and capacity of the country's energy institutions are fundamentaly misaligned with climate mitigation policy. In particular, conflicts between these institutions constrain policy co-ordination and hence alignment.

The primary causes of misalignment are argued to be, firstly, existing and entrenched institutional orientation and capacity and, secondly, the lack of a single, overarching, co-ordinating energy policy institution which has sufficient power and influence to deal with the vested interests of the existing energy institutions.

The paper then explores, by means of thought experiments in the areas of renewable energy and energy efficiency, what would be required to align energy policy with Cabinet's mitigation vision. The establishment of a single, overarching, co-ordinating energy policy institution is identified as a pre-requisite to any chance of alignment. This institution would then establish and govern appropriately oriented institutional capacity, either by creating new institutions, or mandating existing institutions to deliver on low carbon initiatives. It is suggested that whilst new capacity would be optimal, it may be unrealistic to attain this level of sector transformation within the timeframes required by mitigation policy, given the strongly entrenched interests in maintaining the status quo.

The paper concludes that intervention at the highest political level is required to enforce energy institutional co-ordination and achieve actualisation of emissions mitigation aligned energy policies.

1. Research background

Funded by the European Commission DG for Environment, the Energy Research Centre (ERC) is undertaking a set of research activities on economic instruments for climate change mitigation policy in South Africa. This proposal is to produce a critical scoping paper to constitute one of these activities, focusing on mitigation policy and the energy sector.

The role of the energy sector in climate change mitigation in the country is key, with emissions to 2050 anticipated to continue to be dominated by energy sources which are increasing at a far more rapid rate than emissions from non-energy sectors (SBT, 2007). South Africa has recently undergone an electricity supply crisis and a potential liquid fuels crisis is looming, which have prompted urgent reassessment of many aspects of the energy sector, including energy institutions, regulation and policy. The policy environment is changing quickly, with a focus on energy security. The country has also recently undertaken a climate change mitigation scenario process, whereby a 'peak, plateau and decline' emissions trajectory following an aspirational target of between 30-40% emissions reduction off a 2003 baseline by 2050, has been adopted by Cabinet. However, there is currently no institutional or policy infrastructure in place to consider how this target is met, nor the roles of various sectors.

An important characteristic of the energy sector is the potential for 'lock-in' to specific emissions paths depending on how the sector responds to the current and potential future supply crises, and the nature of the energy and related policy currently under development. A scoping paper is therefore proposed to explore the alignment of existing and emerging energy and related policy areas with South Africa's climate change mitigation aspirations. Areas of synergy and conflict with the country's climate change mitigation objectives are explored, and the project considers how greater policy alignment could be achieved.

2. 'Policy': a working definition

There is no universally agreed definition of what constitutes 'policy'. Policy could encompass the set of decisions undertaken by government, but it could also include the influences which determine both the way in which these decisions are interpreted and which decisions end up being implemented. Further, it may include the context that determines the types of issues considered for decision initially. Policy is unlikely to be static, but rather continuously evolve as existing decisions are adapted and modified. A more detailed discussion of the definition of policy is beyond the scope of this paper. However, for present purposes, certain concepts are drawn from Marquard (2006) and expanded on by the author, for use as a working definition:

- At its broadest, policy is governed by the policy paradigm, defined as 'the system of ideas and standards that specify the goals of policy, the kinds of instruments that can be used to attain them, and the very nature of the problems they are meant to address' (Menahem in Marquard, 2006).
- Policy comprises formal decisions as well as informal decisions made during the policy development process. These are linked inter-temporally, as decisions result in further decisions, and structurally, as decisions are detailed and implemented.
- There are both administrative and political functions to policy development.
- Institutional capacity is an important determinant of policy direction, encouraging or constraining the elaboration of policy along particular paths.
- Policy development can be contested due to conflict of interests within the policy-making community. This could result in a lack of coherence between the various components of policy.
- A policy can be referred to as actualised if it is embedded in an institutional context, attracts resources on an ongoing basis for implementation, and results in further policy development in a similar direction.

Policy is therefore understood to comprise a range of written policy documents (white papers and regulation), statements by policymakers, intentions and directions as included in green papers and strategic documents, institutional capacity and orientation, and actualised policy. Policy is also continuously evolving, is often contested and incohesive, with the dominant policy paradigm driving policy focus and direction.

3. South African climate mitigation policy

South Africa is in the early stages of developing climate change mitigation policy, with only policy intentions and directions existing at this stage. The major building blocks of this policy direction include: the establishment of a National Committee on Climate Change in 1994 to advise the relevant minister on climate change-related issues (ERC, 2009), the 2005 South African Country Study on Climate Change, the 1994 and 2000 national greenhouse gas inventories, the First and Second National Communications to the United Nations Framework Convention on Climate Change (UNFCCC) in 2000 and 2009, the 2004 Climate Change Response Strategy, the 2005 Technology Needs Assessment which resulted in a Cabinet-endorsed prioritised list of environmentally sound technologies, the 2005 Climate Change Conference, the African National Congress (ANC)'s 2007 Polokwane resolution on climate change, the Long Term Mitigation Scenarios (LTMS) process and the 2008 Cabinet Response, the March 2009 Climate Policy Summit Discussion Document and international commitments made at the 2009 Copenhagen Conference of the Parties to the Kyoto Protocol. Whilst South Africa's climate change policy development is informed and supported by all of the above, this scoping paper will focus on the more recent developments which, for the purposes of this analysis, are taken as defining the country's current policy direction and intention.

3.1 ANC's Polokwane resolution on climate change

At the 2007 ANC National Conference at Polokwane, the governing party adopted a climate change resolution which states a strong intention to mitigation greenhouse gas emissions and to adopt a low carbon growth path. The resolution acknowledges the role of South Africa as a large developed country emitter, the impact of climate change on the poor, and the ANC's past and continuing commitment to a sustainable future. It affirms that the organisation will continue to play a leadership position on environmental issues internationally. The resolution resolves to set a greenhouse gas mitigation target for the country in the future, and to diversify the energy mix away from its current coal focus with a strong emphasis on renewable energy, particularly wind and solar. Setting a price on carbon emissions, ambitious renewable energy targets and a mandatory energy efficiency programme comprise the main pillars of the path to achieve greenhouse gas reductions in the resolution. It speaks to the context of the employment creation imperative, and mobilising all stakeholders to respond to the climate change challenge. The fast-tracking of appropriate institutional mechanisms to support mitigation is directly identified, including the establishment of a renewable energy feed-in tariff.

3.2 The LTMS process and the Cabinet lekgotla's climate policy vision

Arising out of the 2005 Climate Change Conference (ERC, 2009), the LTMS process and research collaboration analysed South Africa's climate change mitigation challenge as a set of four distinct strategic options. The LTMS can be conceptually summarised in a set of graphs, depicting the baseline of business as usual emissions growth for South Africa from 2003 to 2050, *Growth without constraints* (GWC) against a *Required by science* (RBS) emissions trajectory, and a set of four strategic mitigation options which the country could take to take to respond to this challenge. These are depicted in Figure 1 and discussed below.

The LTMS process modelled the country's emissions trajectory as if all existing mitigation policy was implemented. This trajectory, called *Current development plans*, includes the Energy Efficiency Strategy to achieve a final energy demand reduction of 12% by 2015 (DME, 2003), and the target of 10000 GWh renewable energy contribution to final energy consumption by 2013 (DME, 2003). This trajectory brings GWC down slightly, but not significantly compared to RBS.

The RBS scenario, indicates that South Africa's fair contribution to global greenhouse gas reduction is a reduction of between 30-40% from 2003 levels by 2050 (SBT, 2007). In the four strategic

options: *Start now*, *Scale up, Use the market* and *Reach for the goal*, the main mitigation components which could get the country close to the RBS trajectory are identified, and packaged differently in each option. *Start now* includes accelerated energy and vehicle efficiency measures, passenger modal shift, and some nuclear and renewables for electricity generation. *Scale up* builds on *Start now*, incorporating extended renewables and nuclear for electricity generation, carbon capture and storage (CCS) technologies for synfuels, and electric vehicles. *Use the market* entails putting a price on carbon, together with subsidies for renewables, biofuels and solar water heaters. This option results in a carbon free electricity grid by 2050, with no new coal plants or coal-to-liquid (CTL) plants being built. But even under the *Use the market* option, which is modelled as resulting in the greatest reductions by 2050, emissions are still not brought down to the RBS level. The *Reach for the goal* scenario anticipates the use of new and as of yet unidentified technologies, and planning and behavioural change.

The LTMS process identified a number of technology wedges which could be employed to achieve lower mitigation trajectories, and these drive the strategic options. The most significant mitigation wedges required, in terms of volume of mitigation achieved, are: renewables, nuclear, industrial energy efficiency, vehicle efficiencies, electric cars and CCS.

These wedges come into effect at different times under the various scenarios. Some can be implemented immediately (largely energy efficiency), whilst others require signficant lead times and research and development investment. The *Reach for the goal* strategic option requires the emergence of a supporting context for substantial changes to the macro-economy and society, which will take time. What is evident from the strategic options is that it is highly likely that all the identified wedges will be required to achieve the RBS trajectory, and that an early start is important.

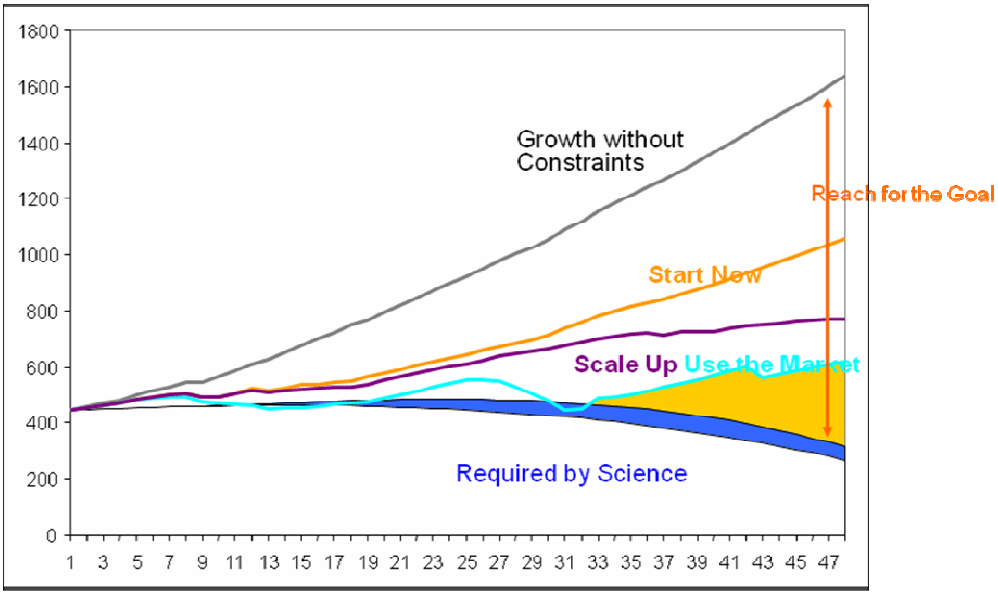

Figure 1: The LTMS scenarios and strategic options
Source: DEAT (2008)

The main (in terms of volume) wedges are all energy related. They are identified and grouped into energy sectors below, with the smaller LTMS energy wedges included to indicate the total effort required in each energy sub-sector.

Electricity supply side: Renewable energy and nuclear will comprise the majority of grid electricity generation. Cleaner coal technologies are prioritised, and CCS for coal-fired power plants is implemented.

Energy demand side: Industrial efficiency, commercial efficiency, residential efficiency, and a solar water heater subsidy.

Transport: Electric vehicles, vehicle efficiency, synfuels CCS, biofuel subsidy, hybrids, and passenger modal shift.

Against the LTMS outcome, the 2008 Cabinet Lekgotla responded, identifying a 'peak, plateau and decline' emissions trajectory for the country, and denoting a shift 'from an energy-intensive to a climate-friendly path as part of a pro-growth, pro-development and pro-jobs strategy' (Van Schalkwyk, 2008), and one which deviates substantially from the baseline. The peak will occur between 2020 and 2025, emissions will then plateau until 2035 and decline after this date until 2050. This 'mitigation vision' has informed the government's recent offer to restrict emissions to 34% below business as usual in 2020 and 42% by 2025 at the Copenhagen Conference of the Parties to the Kyoto Protocol. The peak plateau and decline trajectory of the Cabinet's mitigation vision is depicted in Figure 2, against the LTMS graphs.

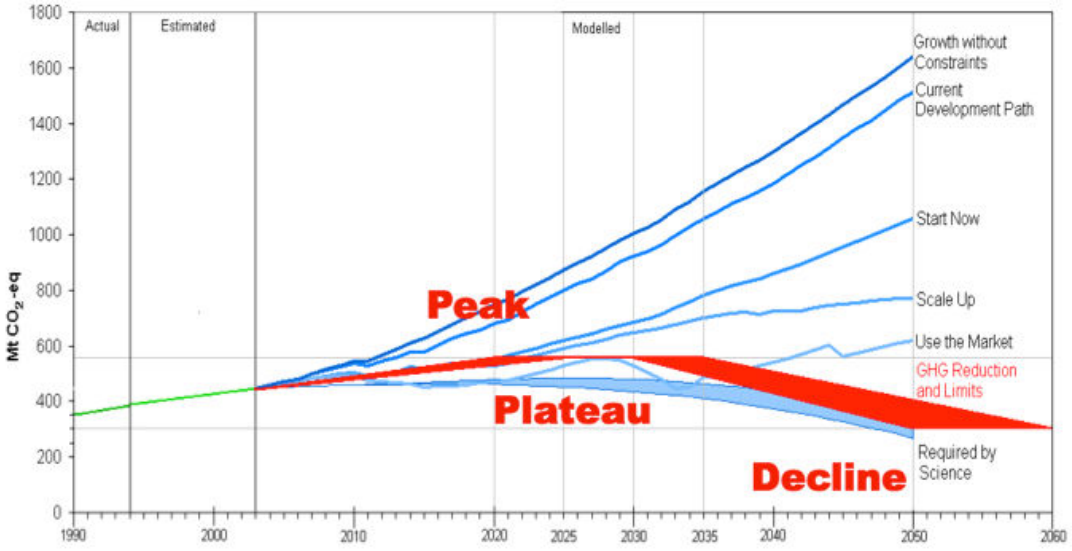

Figure 2: Cabinet's peak, plateau and decline trajectory

The mitigation vision elaborates on the peak, plateau and decline trajectory, based on the LTMS mitigation wedges. An immediate implementation of the *Start now* strategic option using the electricity crisis response as a basis is envisaged. The vision endorses the shift to nuclear and renewables in equal parts for the electricity supply sector, moving to a net zero carbon grid in the long term. Initial targets will be in place for the end of 2030, with feed-in tariffs to provide incentives. Remaining coal will move towards cleaner coal technologies. CCS will be mandatory for new coal fired power stations, and explored for existing power station and all CTL plants.

The vision confirms that transport emissions will be targeted through the LTMS transport wedges, but does not elaborate on these. Cabinet indicates that both regulatory and economic instruments will be used, with new industrial policy incentivising non-energy intensive sectors. The country will start investing towards the Reach for the Goal option.

3.2.1 The March 2009 Climate Policy Summit discussion document

The process of developing policy to support Cabinet's mitigation vision was formally begun with the March 2009 Climate Change Policy Summit. A discussion document was circulated at the conference, and cited as an 'organising framework and starting point' (DEAT, 2009) for South African climate change mitigation policy going forward. The document uses the peak, plateau and decline trajectory as a basis, and elaborates that planned infrastructure projects (including coal-fired power stations and CTL plants) will be built. At the time of writing it is likely that these include the next two power stations in Eskom's fleet (Medupi and Kusile), and the planned Mafutha CTL plant. This position is not climate policy per se, but rather the need of the emerging climate policy to take account of existing political realities. It confirms that the required fiscal and economic framework will be in place to appropriately incentivise and support a low-carbon economy. The 2009 Summit document is aligned to the Cabinet's mitigation vision, but is less strong in its wording and commitment to the phasing out of fossil fuels. However, this document is still at a very early phase. Comments have been received on the document, and a green paper is expected to be released in April 2010.

3.3 Defining South African energy mitigation policy direction

From the above policy processes and building blocks, clarity on a number of energy related aspects of climate change policy direction emerges. The direction for some aspects differs in terms of strength, largely between the Polokwane Resolution and Cabinet vision on the one hand and the 2009 Policy Summit document on the other. Given the seniority of the ANC conference and Cabinet, the draft nature of the Summit document, and South Africa's recent international offer at Copenhagen, the stronger version is in all cases adhered to for the purposes of this analysis.

The only significant point of discrepancy between them is with regard to nuclear. The Polokwane Resolution does not identify nuclear as an important component of the country's mitigation approach. The Pebble Bed Modular Reactor (PMR) technology is also absent from the Technology Needs Assessment.[1] However, nuclear is a clear mitigation component in the LTMS, and Cabinet endorses this in its vision of a carbon zero electricity grid comprising renewables and nuclear in equal part. The Department of Energy has a nuclear policy which supports nuclear expansion. The more recent Cabinet vision is adhered to in this analysis given the influence of this institution in the country's policy processes.

Planned fossil fuel infrastructure projects such as the Medupi and Kusile power stations and the Mufatha coal to liquids plant are political realities which need to be accounted for when considering climate change policy in the country.

The current energy related climate change policy direction is identified as follows:

- Emissions will peak between 2020 – 2025, plateau until 2030 and then decline to 2050.
- Renewables and nuclear will contribute in equal measure to a long-term carbon-neutral grid, with interim targets by 2030. Feed-in tariffs will support renewable energy.
- CCS will be mandatory for new both coal-fired power generation and will be explored for existing coal plants and CTL.
- Energy efficiency measures will be immediately implemented, building on the electricity crisis response. A mandatory national efficiency programme will be introduced.
- Economic (carbon pricing), fiscal instruments and regulation will be employed to support a low carbon economy.
- In the transport sector, vehicle efficiencies will be pursued, as well as electric vehicles, R&D for hybrids and passengar modal shift.
- Institutional support for the above will be fast-tracked.

3.4 The impact of national and international developments on actualised climate mitigation policy

How closely the eventual actualised climate change mitigation policy adheres to the current policy direction identified above depends on a number of contextual and institutional factors. These are described for context, but are not considered further in this study.

Institutional location

Currently, the climate change policy process is being led by the Department of Environmental Affairs (DEA), which may not have the necessary institutional strength to drive a policy position entailing a substantial transformation of the way in which the economy currently operates, given significant vested influence in maintenance of the status quo. The issue of climate change is included as something which the proposed Planning Commission (Presidency, 2009) will tackle, and if this Commission is established with suffient high level political and stakeholder support, it could assist DEA in overcoming the challenges it is likely to face in policy development.

[1] Pressurised water reactors are also not considered by the TNA, however this is understandable in that only technologies which had not yet been commercialised in the country were addressed.

Political support and Alignment with the overarching policy paradigm
The climate change policy direction appears to have strong Cabinet and ANC support and commitment. However, should analysis of the choices required to implement this direction reveal trade-offs between climate mitigation and jobs, or another of the Zuma government's five priority areas, this support may not be sustained. Whilst there is the potential for alignment with the jobs and poverty alleviation focus of the new regime, these largely demand-side-led solutions were not explicitly modelled in the LTMS and therefore have yet to be tested.

International pressures
International support for a global economic transition to a low carbon future is still far from certain. The negotiations under the UNFCCC and Kyoto at Copenhagen and beyond will play a decisive role, as will the implementation of bilateral approaches such as border tax adjustments. Climate change physical impacts will inform the international policy process, as will other economic and political factors such as the path of the oil price.

4. South African energy policy

4.1 Sector overview

The South African energy sector is very simple in structure. There are only a small number of primary energy sources, with limited substitution between energy carriers, and an overwhelming reliance on coal. Coal-fired power generation provides over 80% (Imbewu, 2009) of the country's electricity supply, and through the Fischer Tropps process, Sasol's coal-to-liquids plants convert coal into a third of the country's liquid fuels supply (Sing, 2006, cited in Winkler, 2007). Oil imports, refined locally, provide the remaining liquid fuel, and some of the energy-intensive industries and mines use coal directly to generate power on site. South Africa has one nuclear power station, owned by Eskom. Poor quality fuels such as low-grade coal and parrafin are used by low-income households for cooking and heating.

The development of the sector has its roots in the mining industry, with the minerals-energy complex (Fine & Rustomjee, 1996) driving South Africa's industrialisation, which has been premised on the availability of cheap and secure energy supplies. The South African economy is therefore highly energy intensive and also energy inefficient. Promoting cheap energy as one of its main sources of competitive advantage, it has continued to attracted energy intensive investment up until the electricity supply crisis of 2008, where there was still talk of a 'developmental tariff' for foreign direct investment.

The apartheid state also strongly influenced the development of the energy sector, determining spatial patterns of energy supply (concentrated on 'white' areas), a culture of secrecy which has permeated energy institutions, and the development of coal-to-liquid technologies in response to sanctions (Marquard, 2006). A significant, and largely successful electrification drive led and subsidised Eskom at the turn of the century addressed some of this spatial legacy. Transformation in the sector has been prioritised since 1994, a challenge in an environment of skills scarcity.

Throughout its history, the sector has been dominated by centralised supply side approaches to energy service delivery, concentrated in the coal, liquid fuels, nuclear and electricity subsectors. A few large companies operate within the sector, which, apart from the coal **su**bsector, is highly regulated. A move towards liberalisation of electricity supply, transmission and distribution occurred at the turn of the century, but this was reversed in 2004 (Marquard et al, 2008).

Significant capital investment occurred in the 1970s (electricity, nuclear, oil-refining), which led to over-capacity in the energy sector during the recession of the 1980s and early 1990s. Strong subsequent economic growth with no additional capacity investment in the late 20th and early 21st centuries has led to the severe generation capacity constraints in the electricity sector and similar constraints looming in liquid fuels.

There are currently large challenges facing the energy sector. Energy security is a pressing concern. It has both capacity implications and implications for energy efficiency, demand-side management and conservation programmes. In the liquid fuels subsector, the volatility of the international oil price leaves South Africa vulnerable. The large-scale investment programmes required in the sector

imply financing, management and skills challenges, with governance becoming an increasing issue in the case of Eskom. These factors combined have led to calls for the resuming of the liberalisation programme in the electricity subsector. Electricity pricing is another issue which is caught up in the above, with Eskom recently proposing three consecutive annual price increases of 45% (NERSA, 2009). This extent of increase is anticipated to have a significant impact on the consumer, and implications for economic growth. Energy poverty remains an issue, with many households using dirty and dangerous fuels for heating and cooking. The coal sector faces transport infrastructure constraints to export, and co-ordination issues (Eberhard, 2009). Climate change mitigation is therefore one of a suite of critical challenges which the sector and government is facing.

4.2 Energy institutions

Large supply-side institutions dominate the sector. In electricity, Eskom is a partly state-owned monopolist of generation and transmission, generating 96% of the country's electricity (Goswami, 2009). Eskom's core activity has been defined by Marquard (2006) as being the generation of low-cost coal-fired power, and the ability to make autonomous decisions in this regard. Given its monopolistic position and concentration of energy sector skills and capacity, the institution has successfully defended this core activity over the past half century, including detouring into nuclear power and electrification programmes in order to do so. In recent years, Eskom has suffered from a deteriorating public image and is an increasing challenge for the Department of Public Enterprises (DPE) which oversees it. This is largely due to the electricity crisis of 2007 and its very recent governance crisis (Salgaldo, 2009)

Sasol, ex-parastatal and now a private company, supplies a third of the country's liquid fuels, the remainder coming from the oil refining sector which consists largely of major international companies. Its origins in the apartheid sanctions era, Sasol's Fischer-Tropps technology converts coal to liquid fuels at significant environmental cost. The liquid fuels companies' agenda is argued by Marquard (2006) to maintain their status as 'energy sector' companies, occupying a special place in the economy so as to avoid scrutiny by the Competition Commission.

The coal sector is dominated by five major mining companies, with its product largely for export, or domestic consumption by Eskom or Sasol.

South Africa's limited nuclear capacity (the Koeberg power station in the Cape) is owned and run by Eskom. A National Nuclear Regulator regulates the subsector, and the South African Nuclear Energy Corporation exists to research and promote nuclear development, and manage the materials side. A Pebble Bed Modular Reactor (PBMR) company, with joint government and nuclear industry shareholding is developing the PBMR technology as a strategic national project.

The Department of Energy (DoE), until recently the Department of Minerals and Energy (DME), has policy oversight over the sector. The DoE has two branches, the electricity and nuclear branch, and the hydrocarbons, energy planning and clean energy branch. Traditionally, DoE has its strongest policy capacity in the liquid fuel's section (Marquard, 2006) followed by electricity. The DoE has both a renewable energy and energy efficiency directorate, but these have consistently suffered from lack of capacity and resources. Marquard describes the Department as having an analytical culture, with policy making mostly happening outside the line functions, in the broader energy sector policy communities.

Other significant energy sector institutions and companies include the National Energy Regulator of South Africa (NERSA), the sector's youngest institution, established in 2004 to regulate the liquid fuels, gas and electricity sectors. The Central Energy Fund (CEF) has its origins in liquid fuels and petroleum regulation and promotion in the apartheid era, and has grown as a partial government funded entity reporting to DoE to operate the oil and gas assets of South Africa. CEF has also become involved in promoting energy research, renewable energy and energy efficiency. The South African Energy Research Institute (SANERI), tasked with the 'co-ordination and undertaking of public interest energy research, development and demonstration' (www.saneri.org.za, 15/12/09), and with the National Energy Efficiency Agency (NEEA) are both housed in CEF. The South African Energy Development Institute (SANEDI), mandated by the 2008 Energy Act, is expected to include both SANERI and the NEEA, and take on renewables promotion.

The National Electricity Response Team (NERT) is a public-private structure which was established to respond to the 2007 electricity crisis and to help manage the power system whilst supply was

constrained. NERT has all but ground to a halt due to funding issues and a lack of continuity during the restructuring of the DoE (Creamer, 2009).

Municipalities play a role as electricity distributers, and in many cases this function provides a valuable revenue stream to cash strapped local government. There are in the region of 250 large energy users (apart from municipalities) which are represented on the Energy Intensive User Group (EIUG), an industry body established to promote the interests of the companies in the sector, which plays an important role in the South African economy.

Each energy sector institution is driven by internal agendas and objectives, with a striking lack of co-ordination amongst them. For example, the liquid fuels companies, including Sasol, aim to manage government in order to retain their position as 'strategic energy companies', avoiding scrutiny by the Competition Commission (Marquard, 2006) and thereby maximising value for their shareholders. Eskom defends its core activity and automony which is supported by the industrial policy domain. The coal companies are focused on exports and transformation, the municipalities in retaining their electricity distribution function as a revenue generator.

4.3 Energy policy paradigms

Marquard constructs a set of four possible consecutive energy policy paradigms to assist in analysing the state of energy policy in South Africa in his 2006 doctoral thesis on South African energy policy (2006). The paradigms and analysis provide insights into the question of climate and energy policy alignment at its broadest level. The least sophisticated paradigm is termed 'Autarky' (0), where there is no co-ordination of the energy sector. This is followed by (1), 'Energy supply' where the policy objective is to ensure adequate energy supply to match a growing economy. Paradigm (2) 'Supply-demand' sees an awareness of energy demand as a factor in policy, and characterises many of the OECD energy systems today. Finally the hypothetical 'Structural-cultural' paradigm (3) includes cognisance of societal and behavioural factors as part of the energy system. Marquard proposes that the more sophisticated policy paradigms (2 and, particularly, 3) are better able to respond to policy challenges such as climate change given their expanded view of the energy system and its interactions with society as a whole.

A wider consideration of energy policy such as that envisaged under the Structural-cultural paradigm is strongly aligned with the Cabinet's mitigation vision; as the country progresses along the peak, plateau and decline trajectory an increasingly profound overhaul of the way the country currently uses and thinks about energy will be required. The LTMS *Reach for the goal* strategic option comprises as yet unidentified technologies and behavioural changes that are highly likely to require an energy policy paradigm (3) approach. Marquard's paradigms imply an increasing level of co-ordination and planning, both within the energy sector and between the energy sector and the rest of society. Importantly for the analysis in this paper, Marquard writes that the ability to shift paradigms is determined by institutional capacity, and the ability for institutional innovation within the sector.

4.4 South Africa's historical energy policy, and the 1998 White Paper

Prior to the 1994 political transition, energy policy was conducted separately within four main sub-sectors: electricity, coal, liquid fuels and nuclear. Policy was developed by different supply-side policy communities with differing agendas, in isolation of each other (Marquard, 2006). The investment decisions of Eskom, Sasol, mining and other energy-intensive sectors played a significant policy informing role. Policy was most developed for electricity and nuclear, with very little policy or strategy guiding coal and liquid fuels. In this era, the South African energy sector could be said to be operating within an 'energy supply' (1) policy paradigm (Marquard, 2006), with individual energy supply communities dominating the policy development and implementation process, and largely acting in silos.

The 1994 political transition opened a policy window as the political landscape was transformed, and the individual energy supply communities influence was relaxed (Marquard, 2006). Within this window, the 1998 Energy Policy White Paper was developed, to guide the energy sector for the following decade. The Paper identifies five policy objectives: increasing access to affordable energy services, improving energy governance, stimulating economic development, managing energy related environmental and health impacts and securing supply through diversity. These are significantly broader than the historical focus on securing energy supply, and extend to

environmental and societal concerns, particularly the issue of electrification. Energy demand is addressed explicitly, as is the need to reduce greenhouse gas emissions. Demand subsectors are even considered before the supply side is addressed in the paper. The White Paper itself follows an integrated energy planning structure, which 'recognises that energy is not an end-good in itself, but is rather consumed as a means to some end…. The role of policy is thus to facilitate the optimal consumption of energy resources to meet social needs' (DME, 1998: 19). As such it contains elements of a Supply-demand type of policy paradigm, and potentially even a Structural-cultural paradigm.

The Paper therefore holds considerable promise in laying the policy basis for a sector well equipped to respond to the challenges of climate change mitigation. From a paradigm perspective, it can be seen to be progressing the existing energy policy paradigm (1) towards (2) or even (3). On a written policy level, it sets out objectives relating specifically to energy efficiency, renewables, energy diversification and sector level planning, all of which are essential for climate mitigation.

Whilst the 1998 White Paper also held significant promise of increasing alignment of energy policy with climate mitigation initiatives, the subsequent decade has shown substantial backtracking on this promise, less so in written policy than in the institutional policy environment, and the sustaining of an 'energy supply' (1)-type policy paradigm and the interests of cheap coal and high energy consumption.

5. Policy developments between 1998 and the present

The period 1998–2009 has been dominated from a South African energy perspective by electricity: the electrification programme, the reversal of electricity sector liberalisation and the 2007 electricity supply crisis. On the sidelines there have been the financing difficulties of the PBMR, the transport infrastructure bottlenecks in the coal subsector, and hints of a pending supply crisis in the liquid fuels subsector. There has been a noticeable lack of sector co-ordination and guidance.

5.1 Failure of energy planning, co-ordination and liberalisation

The Energy Policy White Paper made provision for both integrated energy planning (IEP) and national integrated resource planning (NIRP) in the electricity sector, acknowledging that capacity and data limitations in South Africa made this difficult. The DME conducted a first IEP in 2003, but the second has not progressed past draft status. NERSA was identified to undertake NIRP in conjunction with Eskom, and successfully managed the first two NIRPs. The third NIRP has been transferred solely to Eskom, with limited public consultation. Electricity and liquid fuels masterplans have been undertaken by DME in 2007, the liquid fuels plan promotes a central planning approach to ensuring liquid fuels security, and cites climate change as an important consideration for the industry. It is not clear the status these documents have in the sector.

Whilst the exercise has been undertaken on paper to some extent, it is unlikely that the opportunity to embed a national process of energy planning and co-ordination will be realised. At an overall sectoral level, the stalling of the IEP process is symptomatic of the lack of capacity highlighted by the White Paper (the Paper cautioned that the level of planning envisioned requires data which was not at the country's disposal at the time), and therefore no cohesive policy guidance is being developed on an ongoing basis to realise the paradigm 2 (Supply-demand)-type ambitions of the White Paper. In the electricity sector, the planning process has largely reverted to Eskom's internal investment planning process, the Integrated strategic electricity plan (ISEP) (Winkler, 2009), despite it being allocated to NERSA, which contains the largest source of skills in the electricity sector outside Eskom. A potential paradigm 2 policy tool therefore has been subverted to a that of a paradigm 1 (Energy supply) tool, focused solely on an individual energy supply sub-sector in isolation of substantive consultation with the broader energy community or society at large. This reduces the electricity sector's ability to respond to climate mitigation challenges to that of the utility, whose objectives are not necessarily aligned with national objectives. The Liquid fuels masterplan identifies the need for a co-ordinated approach within the sub-sector, but it is not clear where this planning capacity will be located. The National nuclear energy policy of 2008 identifies planning capacity for the industry in the Executive, although how this will interact with the remaining energy sub-sectors or be financed is not yet apparent.

The 1998 White Paper spoke to the need to address the lack of data and transparency of information in the energy sector for the purposes of planning and co-ordination. However, apart from the establishment of NERSA, a significant effort in 2004, there does not appear to have been much progress made in this regard. Skills and capacity are still largely concentrated in the dominant supply side institutions, informing the incumbent energy policy paradigm, and perpetuating the status quo. Bill versions of the 2008 Energy Act considered the establishment of a data collection and processing function (the National Energy Modelling and Information Agency), but this was not included in the final version of the Act. The data function has been incorporated under SANEDI's functions, but at the time of writing SANEDI still has not received the resources or institutional backing to function.

On the objective of securing energy supply through diversification and liberalisation as envisaged in the White Paper, the situation has, if anything, regressed since 1998. Attempts were made at liberalisation early on in the decade, such as the establishment of the Regional electricity distributors (REDs), but the lack of direction on new generation capacity, resistance by municipalities and the electricity supply crisis has sharply reversed this with Eskom being confirmed as the sole purchaser of generated power by Cabinet in 2007. Little proactive appears to have been done to prevent or manage the 2007 electricity crisis, nor the pending liquid fuels supply crisis. This lack of co-ordination and prioritisation is demonstrated in the experience of NERT, which was tasked with driving all inititiatives relating to the electricity crisis (Rossouw, 2009). Despite its important energy security mandate, it is being rendered impotent due to a lack of financing and a lack of staffing continuity since the DME was split into Energy and Minerals (Creamer, 2009).

Eskom has been working on the inclusion of nuclear in their future fleet of power generators, but these plans have been put on hold for the coming decade due to the cost being prohibitive in the current funding climate (Derby & Lourens, 2008). The PBMR also looks to be in limbo, despite significant investment in development by government.

Governance in the sector has been improved with the establishment of NERSA, but co-ordination between government departments and policies has not been improved, neither has government capacity been strengthened.

The failure of planning, co-ordination and liberalisation has meant that the status quo of a centralised supply side oriented oligopolistic energy sector based on coal has been maintained. This structure is vulnerable to climate change mitigation challenges, which ideally require an energy service approach (Structural-cultural paradigm 3) to efficiently and resourcefully reduce the country's reliance on fossil fuels. However, the reasons for this failure persist despite the heightened urgency of the electricity supply crisis and looming liquid fuels crisis: there is no single, overarching, skilled and powerful institution to drive a national energy policy.

The recently proposed National Planning Commission within the presidency (Presidency, 2007) will focus on the development of medium- and long-term plans for South Africa, which are likely to include energy and climate change considerations. Depending on the prioritisation of energy and climate amongst other policy priorities, this may provide a driver for energy policy co-ordination in the demonstrated absence of capacity for this at the level of the energy sector itself. Given that the Planning Commission is based within the Presidency, and assuming therefore that it operates with the highest authority, it may have sufficient weight to override the various vested interests which are entrenched within the sector. However, currently the Planning Commission remains in early stages of conceptualisation and development, and the proposal has faced some political opposition. It may therefore be some time before it is able to fulfill this role.

5.2 Slow and low levels of implementation of climate mitigation-aligned energy policy

Progress on managing greenhouse gas emissions in the energy sector has been slow since the White Paper established the management of energy-related environmental impacts as an objective in 1998, although a foothold has been established. White papers, strategies and masterplans refer consistently to the need to diversify the energy mix, and to support renewable and nuclear energy, and energy efficiency. Targets are identified, and whilst these are consistently much lower than what is required to implement the peak, plateau and decline trajectory, they are in place, and the mechanisms to realise these are slowly being added.

The objective of increasing access to affordable energy services was tackled largely through the electrification campaign. However very little was done around the use of energy efficient and off-grid renewable interventions for the poor. The low-income subsidised housing sector is still comprised of highly energy-inefficient dwellings with residents using dirty fuels with a correspondingly high incidence of poor health. The electrification campaign extended the country's reliance on centralised coal-generated grid electricity.

The Electricity Regulation Act of 2007 promotes the use of diverse energy sources and energy efficiency, and the 2008 Energy Act gives the Minister powers to set mandatory targets for both renewable energy and energy efficiency. The 2003 IEP considers renewable energy in one of its four scenarios, but only as 5% of electricity generation by 2020 (Marquard et al, 2008).

The 2003 Renewable Energy White Paper commits the country to 10 000 GWh contribution of renewable energy to final energy demand by 2013. NERSA is developing a Renewable energy feed-in tariff (REFIT), which pays a subsidy to renewable energy generators. This is expected to provide a long awaited kick-start to the renewables sector in the country, and enable South Africa to meet its renewable energy target. The cost of the subsidy will be passed through to electricity consumers, with Eskom mandated to pay the premium as sole purchaser of generated electricity in the country. Whilst the pricing structure has been agreed, with the DoE providing the regulatory framework in the regulations on new generation capacity (5 August 2009), Eskom is reportedly still to sign off on the power purchase agreements which would give effect to the first renewable energy generation under the REFIT.

There is a renewable energy subsidy office (REFSO) within DoE, established in 2005, which administers a subsidy for assisting in the capital financing of both grid and non-grid renewable energy projects. By 2009 only six projects, with a total installed capacity of 24MW had been subsidised, to a value of R15 million (DoE, 2009).

The World Bank has funded a Renewable energy market transformation (REMT) project of the DoE, which is hosted by the Development Bank of Southern Africa. This project aims to remove the barriers and reduce the implementation costs of renewable energy technologies in the country, with a focus on power generation and solar water heating. This project is driving work on a national solar water heater strategy, and renewables workshops. The project aims to assist the country meet its 2013 renewable energy target through supporting DoE develop a regulatory and policy framework for renewable energy, and developing institutional and financing support within the economy for renewable energy uptake. The DoE is responsible for the project's implementation (WWF, nd).

Treasury has levied a 2c/kwh charge on electricity generated from non-renewable sources, implemented in July 2009. Eskom, as sole purchaser of electricity for the national grid, faces this charge, and whilst it can be passed on to consumers, the utility has to absorb the charge within its tariff schedule. This is essentially the country's first 'carbon tax', and whilst it pales into insignificance against the 45% increases requested by Eskom, the tax is now established and can be escalated in future.

The 2005 Energy efficiency strategy stipulates a national energy efficiency target of 12% by 2015, which is restated in the 2008 draft review of the strategy. This target is disaggregated to include sectoral targets. The electricity crisis resulted in immediate mandatory electricity rationing for the country's large power users, which have now been transformed into targets under the Power conservation programme (PCP) of an average of 10% reduction from a baseline consumption. This programme, identified as a key part of the crisis response is a government initiative aimed at increasing the level of energy efficiency within the country. It is identified as a medium-term solution, with a suggested timeframe of 2008–13 (NERSA, 2008). It consists of three components, the Energy conservation scheme (ECS), which envisages the inclusion of pricing interventions to encourage energy efficiency, the Energy growth management component, which aims to allocate power to new connections efficiently, and the trading Rights to consume scheme, which enables electricity consumers to trade energy efficiency rights in order to cost efficiently meet their targets under the ECS. NERSA published a draft consultation paper on the PCP rules in December 2008, and the programme has been reverted to NERT to commission a review and make recommendations for Cabinet (Rossouw, 2009). As discussed, NERT is currently unable to function due to institutional issues. Potentially one of the strongest instruments for aligning climate mitigation and energy policy has therefore been derailed through a lack of policy prioritisation and institutional focus.

NERSA has regulated that a component of electricity tariffs are allocated to Demand Side Management (DSM) activities, which are managed and undertaken by Eskom. Eskom has itself implement an Accelerated Energy Efficiency Plan (AEEP) which focuses on reducing electricity demand by 3000MW by 2012, and a further 5 000MW by 2025 (www.eskomdsm.co.za accessed 16 December 2009). However, given that Eskom generates its primary source of revenues from electricity sales, the AEEP does not appear to be aligned to the utility's business model.

The 1998 White Paper specified the establishment of institutional capacity to enable energy efficiency targets to be met. NEEA was established in 2006 by the DME, and located within CEF. It has been agreed that part of the funds raised through the DSM levy will be allocated to energy efficiency initiatives, although these funds appear still to be largely under the control of Eskom. The intention exists for a NEEA governance body to oversee the use of the funds (www.cef.org.za). However, the NEEA still lacks the mandate and resources to function effectively.

SANEDI, established by the 2008 Energy Act, may provide the institutional capacity required to drive both renewables and energy efficiency. It is intended as the institution which is mandated to increase energy efficiency throughout the economy, reducing energy intensity and optimising the use of finaite energy resources (*Government Gazette,* 2008). It also has functions in energy research and development in all fields of energy other than nuclear (*Government Gazette*, 2008). SANEDI is currently hosted by CEF to avoid the costs of a new entity to the country, but remains without resources and with a number of institutional issues still to be resolved before it can function effectively.

A Biofuels industrial strategy of 2007 has been developed, with a target of 2% penetration of biofuels in the national fuel supply by 2013. Integrated rapid transit (IRT) systems are being developed for eight South African cities prior to the 2010 Soccer World Cup, and some rural networks. IRT systems encourage modal shifts away from private vehicles towards public transport, with corresponding increased efficiency of fuel use. The implementation of these systems is a result of co-operation between national, provincial and local government, initiated by the transport departments. It appears that this initiative is happening without involvement of the energy sector, which remains restricted to a supply-side approach of providing liquid fuels.

The country has established a CCS centre, in March 2009. Under CEF, it aims to have a pilots CCS plant in place by 2020 for coal and liquid fuels, capturing 40 million tonnes per year (SANERI, 2009).

The National Nuclear Energy Policy of 2008 envisions a fleet of nuclear generators in the country, with Eskom identified as the operator of this fleet. However, both the PBMR company and Eskom are delaying further progress on nuclear due to a lack of financing.

Early targets and instruments are established by written energy policy which, if implemented and ramped up significantly over the next few years, could become aligned to the Cabinet's mitigation vision. However, progress on implementation is both typically slow and often resisted by the dominant energy institutions, or is stalled due to lack of co-ordination and prioritisation between institutions. The above discussion demonstrates too that there are a number of different institutions operating in the same space, with no clarity on which one is driving an initiative. For example, the NEEA is tasked with ensuring energy efficiency is promoted throughout the economy. SANEDI has a similar function, and the most promising energy efficiency initiative in terms of its alignment with Eskom's capacity and influence, and seriousness of targets is being undertaken by NERT as the PCP. All three institutions and initiatives are in limbo due to a lack of resources, mandate and institutional strength.

The overriding reason why the energy sector has underperformed on the implementation of climate mitigation aligned policies is argued therefore to be the continuing orientation of the well-resourced energy institutions towards a centralised, fossil-based supply approach. There is limited institutional capacity to support energy efficiency, renewable energy or planning responses to climate change mitigation, and where these are attempted they are thwarted by lack of co-ordination, or more sinisterly, by well established institutions with vested interests in maintaining the status quo.

The building of institutional capacity and influence is a long and slow process, particularly when skills are scarce and vested interests and cultures are entrenched. SANEDI may well represent the beginnings of the institutional counterweight required to elevate the critical climate mitigation options of planning, energy efficiency and renewable energy, and enable the implementation of

written policy. However, no change has yet been proposed to the policy context within which SANEDI will be required to operate; there has been no progress on systematic energy sector co-ordination or planning, and DoE has not proven itself has having sufficient capacity and influence to effectively manage the contested interests of the existing institutions to enable SANEDI to function effectively.

6. Is current energy policy aligned with climate change policy?

The current status of energy policy alignment can therefore be summarised as being strong on a high-level written policy level (ie the 1998 White Paper), but weak in its realisation in regulation, targets and implementation. Where there is alignment, it is still emerging, with targets and ambitions which are orders of magnitude lower than what is required by the climate change policy direction currently being pursued.

Whilst the objectives and intentions of the 1998 White Paper which could have brought energy policy closer into alignment with the Cabinet's mitigation vision have been taken forward to some degree in written policy in the last decade, implementation is lacking, and a transition to an energy policy Paradigm 2 (Supply-demand) or even 3 (Structural-cultural) has been severely constrained. The primary causes of this are identified as:

1. existing and entrenched institutional orientation and capacity; and
2. the lack of a single, overarching, co-ordinating energy policy institution which has sufficient power and influence to deal with the vested interests of the existing energy institutions

The recent context of severe domestic energy capacity constraints, dysfunctional governance in the parastatals and a slowly growing indication that a low-carbon future is inevitable for the international economy implemented either unilaterally through trade barriers or more ideally through a multilateral climate policy agreement, has strengthened the government's statements of intent to diversify the electricity sector, bringing in renewables and nuclear. Less has been said in the areas of liquid fuels and coal.

Under President Zuma's leadership, the DoE has been decoupled from the Department of Minerals, which although largely symbolic at this stage, does provide for the consideration of energy policy as separate from minerals policy, perhaps signifying a move away from the historical interdependence of the two and the emphasis on cheap, coal-generated power.

However, this progress should be considered in the light of both the past decade and the more distant past. Dominance of a supply-side, centralised, coal-focused approach has been sustained and entrenched through the institutional establishment. Despite various 'policy windows' (Marquard, 2006) having opened up during the past decade, moments where there is an opportunity for deep policy change, all have closed without serious challenge to the (1)-type energy supply policy paradigm. After 1994, the political transition provided a shake up of the routes to power of those with vested interests in maintaining the status quo, enabling the 1998 White Paper which contained paradigm (2)- and (3)-type elements. However, before the policy changes could be supported by corresponding insitutional capacity and co-ordination, the paradigm (1)-type institutions reasserted their dominance, and there has been little follow-through on the White Paper's promise subsequently. The 2007 electricity supply crisis also presented a window of opportunity for energy efficiency, liberalisation and diversification, but this too seems to have passed the sector by, with NERT rendered impotent and SANEDI still struggling for resources. The REFIT is promising, but is being held back by Eskom's reluctance to sign the PPAs.

Given this entrenched misalignment, this paper now undertakes some initial exploration into what types of change would be required in order for energy policy to align with climate change mitigation policy. Given the complexity of this question, this will be tackled by means of two thought experiments. One for the LTMS renewables wedge, and the other for industrial energy efficiency. From these, some initial conclusions and areas for further research can be inferred.

7. Two thought experiments

7.1 Thought experiment 1: Achieving alignment for renewable energy

The Cabinet's vision identifies that the energy mix will be diversified away from coal towards nuclear and renewables equally with the timeframe for initial targets being the end of 2030. In the long term, the electricity sector will be net zero carbon (Van Schalkwyk, 2008). To adhere to this vision, it is likely that only the Medupi and Kusile coal-fired power plants will be able to be built, resulting in a decline in Eskom's coal consumption (and therefore emissions) from around 2022.

For South African emissions to peak by 2020/25, the renewable energy and nuclear targets will have to be sizeable, and considerably greater than the current renewable energy target of 10 000 GWh by 2013 (DME, 2003). Currently, it is not clear that even the 10 000 GWh target will be met. The mechanisms in place to achieve this are the renewable energy capital subsidy disbursed by REFSO, the REMT DoE project housed in the Development Bank of South Africa, and most recently, the REFIT. REFIT alone is hoped to enable the target to be met. However, at the time of writing (December 2009) no REFIT PPA has yet been concluded, with Eskom as sole purchaser citing affordability reasons as to why they are unable to sign off the PPAs.

In order for the REFIT mechanism to work, the financing issue has to be resolved, and any reluctance on Eskom's part in supporting the REFIT overcome. If the REFIT is to be extended to enable a greater proportion of renewables to meet the country's power requirements, there is expected to be a greater financing requirement. In the current REFIT guidelines, the power purchaser is able to fully recover the cost of the REFIT. However, this is limited to the extent that Eskom's tariff increases are approved. Eskom's initial request of a 45% tariff increase this year excluded the 2c/kWh carbon tax, let alone the REFIT premiums. Given Eskom's current financial challenges, it is likely that additional financial support for the REFIT will be required.

A World Wildlife Fund (WWF) paper explored the feasibility of a 15% renewables target for South Africa by 2020 (Marquard et al, 2008). This level of target is more likely to be in line with that required by the Cabinet's mitigation vision than the existing renewables target. The study found that achieving a 15% target was just slightly more costly than a business as usual approach, and cost effective if partnered with a rigorous energy efficiency programme. The most viable technologies for achieving the target are identified as solar thermal and wind. Optimal implementation of the programme would be achieved if partner programmes in research and development, infrastructural development, energy efficiency and industrial strategy were simultaneously implemented. The study admits to the timeframe for implementation being 'extremely tight', with programme planning needing to be concluded by 2010 in order to meet the target. The 2030 target date identified by climate policy does provide some flexibility, but the need for urgent action is likely to remain the same.

The paper considers institutional and policy conditions for achievement of the target, and identifies two possible institutional arrangements within which the programme would need to be implemented. The first is the continued monopolisation of the sector by Eskom, with little private sector involvement. The second is an 'open access system, in which Eskom still plays a dominant role, but there are well-defined rules for private sector involvement and a significant number of IPPs. Eskom maintains control of the system operator, and plays a central role both in planning and in promoting socio-economic and technology development in the electricity system' (Marquard et al, 2008: 34). The study finds the first option inadequate for achieving the target.

Whilst the second arrangement may appear from written and stated policy to be the direction in which the electricity sub-sector is moving, the preceding analysis in this paper suggests differently, given the extent of misalignment of the dominant energy policy paradigm and institutional orientation. The problems associated with the approval of the PPAs bear testimony to this.

The institutional and financing issues need to be addressed as a matter of urgency in order to meet the timeframes suggested by the Cabinet's mitigation vision. In order to unblock the institutional logjam, an overarching policy institution as identified in section 6 has to intervene to force the necessary degree of co-ordination and institutional alignment within the timeframe required. The National Planning Commission may provide the platform for such intervention, but the political legitimacy of this institution and its priorities still need to be established.

Alternatively, the first institutional arrangement identified in the WWF paper (that of Eskom continuing to play a monopoly role) may need to be revisited. Given that timeframes for renewables development and implementation to meet the Cabinet's trajectory are tight, it may be worth considering how best to persuade Eskom to adopt an aggressive renewables development programme in the short term. This approach would require careful consideration of the culture, agenda and role of Eskom in the political economy to ensure uptake at the intended scale, and that the renewables programme would not be sidelined by the utility in the future. This type of arrangement and unintended consequence is not without precedent. In the 1970's Eskom was persuaded to undertake a nuclear programme under threat to its power generation autonomy by government. However, the utility sidelined the technology by only building one power station, and then reverting its focus to coal (Marquard, 2006). More positively, Eskom responded to the social dimension of the 1998 White Paper by undertaking the electrification programme, outside its agenda, and at signficant cost to the utility. This may have been out of necessity to align the organisation with the new political elite.

From a financing perspective, WWF's modelling indicates that the cost of a 15% target is not substantially greater than business as usual. This would mean the re-allocation of funding from planned coal fired generation to renewables. Again, intervention from an overarching policy institution would be necessary to overcome the resistance that this is anticipated to meet from Eskom. It may be that WWF's first institutional arrangement, that of Eskom continuing to play a monopoly role, may be more conducive to such a funding re-allocation than if it were transferred outside the utility to a growing IPP sector.

The South African delegation to the 2009 Conference of the Parties to the Kyoto Protocol (COP 15), has requested substantial financing and technology assistance in order to meet the peak, plateau and decline trajectory. Should this be forthcoming, additional financial resources may be available to ease the transition. Another alternative is for the international assistance to come through the technology route, and may have ownership implications for the renewable energy power generation assets.

The WWF paper identifies that full commitment by the key stakeholders in the electricity sector would be critical for the achievement of the 15% target: DoE, Eskom, the Department of Public Enterprises, NERSA, and both the proposed South African National Energy Development Institute (SANEDI) and the Department of Science and Technology in technology research and development support roles, as well as the Department of Trade and Industry, to integrate the implementation of the programme into national industrial strategies.' (Marquard et al, 2008: 33). An overarching policy institution would need to ensure and co-ordinate this involvement.

7.2 Thought experiment 2: Industrial energy efficiency

Immediate uptake of energy efficiency as envisaged under the *Start now* LTMS strategic option is required for the alignment of energy policy with climate mitigation policy. Industrial energy efficiency is identified as being a cost saving mitigation option, actually saving the economy money, rather than costing it. However, South Africa's culture of energy inefficiency is so pervasive that despite the cost benefits and energy security issues there is still little uptake of these measures currently.

The 2007 electricity crisis provided the perfect incentive for a large scale uptake of industrial energy efficiency measures, especially amongst the 250 largest electricity users in the country. During the height of the crisis a mandatory 10% increase in efficiency was imposed by Eskom across the large users in order to stabilise the system. However, as the short-term crisis subsided and the economic downturn set in, this focus has lessened.

Energy efficiency is currently being driven by the NEEA, SANEDI, the PCP under NERT and Eskom's internal AEEP. The former three institutions are currently neither resourced nor operating within a clear institutional framework, and are therefore unable to effectively plan or implement energy efficiency targets or initiatives. The inherent conflict of a utility running an energy efficiency programme has been mentioned, and therefore it is concluded that the AEEP initiative is unlikely to drive the level of savings required.

The PCP includes mandatory energy efficiency targets for sectors, together with a trading mechanism to assist flexibility and efficiency, and as such presents a plausible policy instrument in

advanced stages of development to achieve climate mitigation aligned energy policy. However, the current institutional and financial impasse has to be overcome. In addition, as the PCP is a joint government and Eskom initiative, it is important that it is not restricted by any conflict of interests.

In order for the PCP to be implemented, it requires the highest level of policy backing and resources. Similar to the renewable energy thought experiment, it would appear that an overarching policy institution is required to enable NERT to resume its work, and to fast-track a proposal on the PCP to Cabinet for sign off. It is clear that such an intervention would require the co-operation of many of the existing energy institutions, together with Eskom, NERSA, the Department of Science and Technology and the Departement of Trade and Investment to ensure alignment with industrial policy[2]. There would also have to be policy commitment that it would continue into the long term, beyond a resolution of the current electricity capacity constraints.

However, the challenge of establishing institutional capacity to implement, monitor and enforce the PCP remains. The institutional arrangements of the PCP could be well informed by considering how the utility's conflict of interests in energy efficiency initiatives has been resolved internationally. An institutional of suitable weight would need to champion the PCP. Currently, no such institution exists. It would either have to be created, with all the corresponding challenges of cost and skills availability, or the PCP would need to be managed by an appropriate existing institution, ensuring that its agenda is sufficiently aligned to ensure success.

8. Indicative requirements for policy alignment

The two thought experiments above have explored how climate mitigation aligned policy could be potentially be achieved, given the current status quo pertaining to two of the main areas for mitigation; renewable energy and energy efficiency. Based on these experiments, two clear requirements for aligning energy and climate mitigation policy emerge. These are consistent with the barriers identified in section 6.

Firstly, the intervention of an overaching policy institution with sufficient power to override the vested interests which may be resisting progress in these areas currently, and with the ability to enforce co-ordination between both existing energy sector institutions and associated non-energy institutions, is essential.

Secondly, institutional capacity of appropriate weight and oriented towards low-carbon energy sector interventions is required. The creation of this capacity is both a slow process and very costly. In South Africa, the challenge of skills scarcity compounds the issue. Institutional change takes time, and the capacity and orientation of institutions determines the ability of a country to shift energy policy paradigms (Marquard, 2006).

The first requirement is non-negotiable. It requires a determined intervention, with the highest possible political support and clarification of the lines of responsibility and reporting within the energy sector currently, especially the roles of the Departments of Public Enterprises, Energy, and Science and Technology. An intervention of this nature would require tremendous political will. There is the potential that this may be possible under the proposed National Planning Commission.

The second requirement of institutional capacity can be achieved in two ways. Optimally, new capacity with sufficient weight to counteract the existing capacity which is oriented towards traditional coal based supply approaches could be established. At best, this is the path of energy planning and liberalisation, and will enable a Supply-demand policy paradigm 2 or Structural-cultural paradigm 3 to be achieved. The IEP would be revived and institutionalised, and it would be contextualised within a national plan to align economic and social development within the peak, plateau and decline trajectory. The dominance of the energy supply communities in policy making

2 In its current form the Department of Trade and Industry's industrial policy is aligned with a transition to a low-carbon economy. Its objective is to facilitate a transition of the economy away from its current reliance on energy- and capital-intensive upstream resource based manufacturing, towards non-traditional tradable goods and services in the medium-to-long term, many of which could be in the clean technology, renewable energy or carbon consulting and analytical services space.

would have to be dismantled, together with the long-standing cultures of secrecy and non-transparency within these institutions. Such an energy system will place the country in an optimal position to both respond to mitigation pressure from the international community, and take advantage of the opportunities which a low-carbon future offers.

However, this is a substantial and possibly overwhelming task, and one which may be beyond the capacity and priorities of the government and ruling party at this time, and particularly given the timeframes within which early mitigation investments need to be achieved. Certainly, substantial international support in terms of funding and specialist skills is likely to be required.

The second way of achieving the prerequisite institutional capacity is to accept the entrenched nature of the current energy policy paradigm and institutions, and to seek climate mitigation alignment within these constraints in the short to medium term. So for example, in the renewables area, Eskom would be mandated to achieve the 15% target itself. For industrial energy efficiency, ways would have to found of combining the institutional weight of existing parties such as Eskom, SANEDI, NERSA, the EIUG, industry and the DoE with a high level of co-ordination and policy direction from the overarching policy institution.

This second way would require a thorough and experienced understanding of the nature of the status quo, and the levers which could be accessed in order to align the agendas of the current institutions with those of Cabinet's mitigation vision. This is likely to constitute a highly strategic, sensitive and negotiated process, which may result in Eskom driving renewables and nuclear, Sasol and the refineries maintaining their special 'energy company' status, but assisting in a centrally driven transport emissions mitigation solution, and a mandatory energy efficiency programme being overseen by a number of institutions carefully co-ordinated and aligned by the overarching policy institution. Given that this centralised way is unlikely to be optimally aligned to the deeper mitigation objectives contained in the *Reach for the goal* trajectory post-2030, a plan to transition to this type of energy sector environment and Structural-cultural policy paradigm (3) in the medium-to-long term is likely to prove necessary.

Timing, particularly in the case of renewables, is critical. In order to reach specific mitigation targets by 2020 / 2025, planning must begin immediately. It is anticipated that many of the other main wedges will have similar timing requirements. Challenging the existing order of vested interests which date back for decades is likely to take time. This may necessitate the second way in the shorter term.

9. Conclusions and areas for further research

This scoping paper has argued that overall, energy and climate change policy in South Africa are not currently aligned. Whilst written and stated energy policy is to some extent aligned with a low-carbon future, both the dominant energy policy paradigm and the orientation and capacity of the country's energy institutions are fundamentally misaligned. In particular, conflicts between these institutions constrain policy co-ordination and hence alignment. However, on the level of policy mechanisms, a basis exists on which to build alignment in future. This includes mechanisms such as the renewable energy and energy efficiency targets, the PCP, the REFIT and the attempts at energy sector level planning.

The primary causes for the misalignment are:

1. existing and entrenched institutional orientation and capacity; and
2. the lack of a single, overarching, co-ordinating energy policy institution which has sufficient power and influence to deal with the vested interests of the existing energy institutions.

In line with this, the establishment of such an overarching, co-ordinating energy policy institution is a prerequisite for any progress to be made towards aligning energy policy with climate policy. On the institutional capacity and orientation front, two alternatives are proposed. Optimally, there should be a dismantling of the current energy institutional structure and its vested interests, and new climate mitigation oriented institutional capacity developed. However, South Africa is a developing country, with scarce resources, particularly energy sector skills. As such, and particularly considering the timeframe for adopting some of the main mitigation interventions, this approach may well not be possible. The thought experiment in renewables in particular suggests that timing is a

critical dimension to the issue of policy alignment: however it happens, it must happen extremely quickly.

The second alternative is that policymakers and energy sector participants consider how best to deliver mitigation within the constraints of the existing institutional structures.

The indicative policy alignment requirements arising from the thought experiments requires further testing and exploration, in particular through expanding it to the other climate mitigation wedges identified under the LTMS. A quantitative and modelled approach would substantially deepen the analysis. In addition, further research on how the second best institutional alternative could be constructed in each energy sub-sector and for each mitigation wedge will be informative. To this end, research into the energy institution's corporate culture, and how this could be transformed, would give useful insights. The weakening of the Cabinet's mitigation vision has not been considered in this analysis, but the implications of this for energy policy would be useful to understand, particularly if the high-level intervention option is attempted. Finally, this paper has not dwelt on the implications of and for industrial policy of a significant energy policy paradigm and institutional shift, which is expected to be a valuable addition.

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