

# PERSPECTIVES

Political analysis and commentary from Southern Africa

SPECIAL  
EDITION

## ENERGY CRISIS IN SOUTH AFRICA

### Dear Reader

January 2008 was marked by the most severe electricity blackouts to hit South Africa in years, even decades. Since then, South Africans have been exposed to a myriad of theories, accusations and speculation addressing both the causes and possible solutions to what has become known as “The Energy Crisis”.

Between January and April, a scheduled programme of electricity blackouts – euphemistically termed “load-shedding” – was implemented by South Africa’s national electricity utility ‘Eskom’, Africa’s largest power supplier. Candles, chaos on roads and intersections caused by malfunctioning traffic lights and darkened places of work became a way of life for most South Africans. In April, when load-shedding activity was suddenly terminated, public debate again abounded with theories and rumours about what it was that was going on in the national utility. Although this newly found public ritual has been halted for the time being, Eskom has regularly issued warnings that the era of power cuts is not yet over. The era of cheap electricity however, definitely is: Two hefty price increases in December 2007 and June 2008 resulted in a 27,5% average increase year-on-year.

Plenty of questions are being asked about how it is that South Africa – who in the 70s, 80s and 90s was the owner of an enviable reserve margin – has reached a state where electricity cuts have become a daily norm? More importantly, what are the implications?

With the country’s – and the region’s – energy future at stake, we utilise this issue of *Perspectives*

to explore the range of actions and circumstances that brought South Africa’s power house to its knees [Trusha Reddy]; to investigate the impact of power failures on ordinary lives [Sibusiso Mimi], the country’s power intensive economy [Dave Marrs] and public discourse on energy solutions [Saliem Fakir, Maya Aberman]. We hope that collectively, these contributions – a diverse range of opinions from experts and activists who work in the energy sector – begin to identify and point out paths that could lead out of darkness.

Particularly close to our hearts – as the green foundation – and central to this issue – is the question of renewable energy, and how it figures in the current energy scenario. As South Africa accelerates its development of nuclear power utilities, tossing aside its massive potential to yield power from renewable sources, we reflect on why it is that this crisis has not at the very least materialised as a significant opportunity to push renewables to the fore. Of all the dimensions of this crisis, there is no doubt that this is the most unfortunate. It is the lessons learned from the fleeting of this prospect that we hope civil society, decision makers and experts consider in mapping out the collective futures of South Africans.

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## Biography

### Trusha Reddy

Trusha is a political researcher in the Corruption & Governance Programme at the Institute for Security Studies, based in Cape Town. She has a MA degree in International Politics and a Bachelor of Journalism degree. She is deeply interested in issues of environmental and social justice and her jointly authored and edited book on anti-corruption & service delivery in SA will be launched in September 2008. She has published locally & internationally on carbon trading and is now specialising on the governance of climate change in Africa. Her report on carbon trading projects on the continent will be out later this year. She is also focusing on energy security and climate impacts in SA and the region.



# Powering a sustainable development plan out of South Africa's energy crisis

## *South African energy policy decision between past, present, and future*

*This contribution sheds some light on the historical perspective and highlights how energy policy decisions in the past (in particular during the 1990s) have contributed to the current South African energy crisis. The official South African position reads as: 'The government and Eskom have acknowledged their mistakes, and are working to bring South Africa's electricity supply and distribution system back into balance.' Is this really true?*

*This contribution extrapolates how policy decisions today will possibly impact on the future energy situation. In other words, the article looks at the decisions different stakeholders (Eskom leadership, politicians etc) took in the past and analyse whether and how decision makers have actually learned from the past mistakes.*

In January 2008 South Africa's nationwide power cuts made international headlines when about a quarter of national energy provider, Eskom's<sup>1</sup> existing plant was down and the national grid almost collapsed. The cost to the economy of energy not supplied in the period was estimated at R50billion (667GWh at R75 per kWh)<sup>2</sup> and a dramatic transformation of the country from a situation where there was cheap and reliable electricity, for those connected to the grid, to an uncertain future of power scarcity and rolling load

sheds. Eskom's latest predictions that the country should still be experiencing power shortages until at least 2012 or 2013 have raised more alarms bells for the potential impacts on the country hosting the 2010 Soccer World Cup.

The official justification for the energy crisis has been pegged on three key interrelated issues:

1. *Supply/demand nexus* – There has been significant levels of growth in electricity consumption and demand. For example, 4.31% more energy was consumed in 2007 than in 2006 and growth in peak demand rose 4.9% from 2006 to 2007.
2. *Low electricity price* – The current electricity price does not reflect the efficient cost of supply. SA has amongst the cheapest price for electricity in the world.

<sup>1</sup> Eskom is the accepted name for the "Electricity Supply Commission", shortened from Afrikaans name.

<sup>2</sup> Nersa. 28 May 2008. *Inquiry into the national electricity supply shortage and load shedding presented to the Parliamentary Portfolio Committee on Minerals and Energy.*

3. *Low reserve margin* – The robust economy and the associated demand for electricity has caused a decline in the historically enjoyed large reserve margin. This decline in reserve margin, with a targeted minimum of 15%, has resulted in limited opportunities for maintenance and necessitated that power stations are run harder.

In reality, Eskom states that the translated loss of 5000MW of power not available due to unplanned outages in the week of 14 January 2008 was because of:

- ❑ Boiler tube leaks/failure
- ❑ Various smaller equipment failure
- ❑ Generator output reductions (load losses) as a result of coal quality
- ❑ Problems with coal supply<sup>3</sup>

### So what has been done to address the crisis?

For starters, a National Emergency was declared on 24 January 2008. Money quickly poured in, significantly R60 billion support from the utility's single shareholder, Government. In reality, for citizens living amidst and through the power cuts, the feelings of redress have been varied. In the first few weeks we were inundated with conflicting, confusing reports from Eskom and government and we weren't really sure what the plan was. In the ensuing panic and mixed messages people rushed out to buy expensive solar water heaters for their houses and costly, environmentally-unfriendly generators to stave off repercussions of interrupted work hours. The mines also announced massive retrenchments of workers fearing expected losses with shutting down operations when only 80%-90% energy supply was guaranteed. Then suddenly, it was announced that load shedding would cease and that capacity was regained. And despite briefings to parliament from Eskom, government and the National Energy Regulator of SA (Nersa), of more concrete measures that are being putting in place, there is still much uncertainty hanging in the air.

This piece attempts to unpack many of the issues still plaguing public consciousness and fuelling negative public perceptions. These include understanding: Why did this problem really emerge? Has the situation been addressed satisfactorily? Have Eskom and government really learnt from the past mistakes? Are the plans put forward reasonable, adequate and embodying a sustainable vision for the future?

<sup>3</sup> Department of Minerals and Energy. January 2008. *Interventions to address electricity shortage*

### Echoes of the recent past

*"There is no crisis... We shouldn't frighten ourselves too much... We shouldn't be (sending out) threats to local and foreign investors that something disastrous is going to happen with regard to energy and therefore, they must be on their toes."*

– SA President Thabo Mbeki

This statement was made in 2006 during the first wave of power cuts in the Western Cape, dubbed the 'Koeberg crisis' after the nuclear plant from which the disaster manifested. Government brushed off the prescience of this warning with trite allusions to "human instrumentality" and "loose bolts". In fact, what actually happened was that the electrical load from Mpumalanga province couldn't be carried because of badly maintained transmission lines, which were found melted along the way in the hot and arid Karoo region. Critics argue that the under spending on maintenance went hand in hand with a trend of spending less so that profits and bonuses were increased. In hindsight, the demand side management strategy to deal with the problem based in part on retrofitting five million energy efficient light bulbs to mainly low-income households, and providing energy appliance subsidies, was paltry and misguided. The Koeberg Crisis is thus instructive not only because it echoes some of the tensions in the current energy crisis but also because it hints at multiplicity of policy failures that went into the making of the present situation.

### Eskom, government: Is there a difference?

The Eskom Act came into force during Apartheid 1987, making it possible for the energy provider – which generates 92% of electricity in the country and is the sole transmitter and distributor to many large households from sections of the largest municipalities, commercial farms and to 70% of SA's households<sup>4</sup> – to make a lot of money and pay no tax and dividends. The profits were arguably invested in infrastructure that ensured steady supply of electricity. When the new dispensation came in 1994 they enforced changes in the form of the Eskom Amendment Act in 1998.

<sup>4</sup> According to SA Census, an SA household can be considered as people residing in any of the following types of structures: house or brick structure on a separate stand or yard, traditional dwelling/hut/structure made of traditional materials, flat in a block of flats, town/cluster/semi-detached house, unit in retirement village, house/flat/room in backyard, informal dwelling/shack NOT in backyard eg in an informal/squatter settlement, room/flatlet not in backyard but on a shared property, caravan/tent. Online url: <http://www.statssa.gov.za/census01/Census96/HTML/CIB/Households.htm>

Essentially, they turned the utility into a company with one shareholder, the state to which it pays both dividends and taxes. This relationship has inspired a difficulty in distinguishing government from Eskom, in particular because there is no real clarity in the public's eye on how decisions are made, who makes them, and ultimately who to hold to account for 'mistakes' made. It has enabled a situation in which, at the height of the crisis, Eskom was able to distance itself from government, saying that it informed government years ago that investment in power infrastructure was needed.

In fact, warnings came in 1998 from both within the Department of Minerals and Energy energy review and the Energy Policy White Paper in which the message was couched. These stated that, at a projected growth rate of 4.2%, timely steps needed to be taken to ensure that demand does not exceed available supply capacity. In this scenario, generating capacity would reach its limit by 2007. It added that the next decision on supply-side investments would have to be taken by the end of 1999. The reaction was to ignore this message.<sup>5</sup>

Instead, a moratorium for Eskom on building new infrastructure was invoked from 2001-2004. Government's rationale was that imposing a deregulation of the environment, in line with its market-driven Growth Employment and Redistribution Strategy (GEAR), would encourage private investors to build the stations.<sup>6</sup> But this did not take into account the substantial barriers to entry for private investors into the system, including an extensive stifling bureaucracy. Moreover, electricity was already priced too low for private investors to get a good return on their investments. Thus no new power stations were built. Thus this highlights an unmanaged schizophrenia with opening up the economy on one the hand, and controlling manufacture and distribution of resources on the other hand.

### Differentiated consumption

The interplay between Eskom and government reveals a murkier issue about who's interest Eskom acts on behalf of and serves. Eskom may make a profit for the company and shareholders. But its single shareholder,

as government, is in turn meant to operate in the public interest, making electricity a public good and not a commodity. Therefore, it is argued that it should comply with the resolutions taken by the country and not solely by its own corporate mandate and ethos. However, Eskom deals with citizens as "customers". New Public Service Management recognises citizens as consumers anyway, but the messiness is in how it deals with this in a developmental state with one of the highest levels of inequality in the world, increasing levels of poverty and a high unemployment rate.

According to the White Paper on Energy of 1998 the objective of government's electricity policy is to create a sector that is capable of being the engine for growth, development and prosperity for South Africa. Specific objectives for the restructuring of the electricity sector are therefore to:

- Improve social equity by specifically addressing the energy requirements of the poor
- Enhance the efficiency and competitiveness of the South African economy by providing low-cost and high quality energy inputs to industrial, mining and other sectors
- Achieve environmental sustainability in both the short-term and long-term usage of natural resources<sup>7</sup>

So, amongst these defined "customers" are, in fact, citizens living in poor households whose social equity should be raised with the provision of electricity. But, before the power cuts, in November 2007, the National Energy Regulator of South Africa (Nersa) was already indulging Eskom's massive price hikes to poor households (defined by Nersa as domestic low users, 100kWh of usage), above those of high users. A price hike of 16.4% would cost low users 48.17c/kWh as opposed to high users at 45.5c/kWh. Other issues further complicate matters. Only 70% of households are electrified. Of the poor electrified many suffer disconnections. This numbered two million by 2002. Users of prepaid meters disconnect themselves because of lack of funds to feed the meters. Free basic allocation is widely regarded to be inadequate at 50kWh, which doesn't stretch that far between six to eight people.<sup>8</sup> Most rural inhabitants are cut off entirely from the grid relying on environmentally unsound sources of energy including

5 Admin. 2008. *Government chose guns over power stations – Zille*, in Energy Crisis.com. 25 January 2008. Online url: <http://energycrisis.co.za/?p=63>

6 Part of this was also envisioned in the Eskom Conversion Act 13 of 2001, which was meant to lead to the unbundling of Eskom's generation and transmission functions and licenses each entity separately. Under the Act it was intended to sell 30% of Eskom's generating assets by 2006, which may pave the way for new, independent power producers.

7 Malzbender, D. 2005. *Domestic electricity provision in the democratic South Africa*. University of Pretoria.

8 Taylor, T. 2007. *Eskom's war on the poor*, in Environment.co.za Online url: [http://www.environment.co.za/topic.asp?TOPIC\\_ID=1880](http://www.environment.co.za/topic.asp?TOPIC_ID=1880)

wood, paraffin oil and coal that also pose serious health hazards.

Poor consumption is starkly compared with major customers, who consist of 25 companies, and account for 40% of energy consumption by sales. They are termed 'contestable customers' and receive electricity directly from Eskom, often at lower prices.

### Generation: Power, deals & transparency

The supply contracts between Eskom and its 'contestable customers' are seen as state secrets and not open to public scrutiny. These contracts are often fixed for decades, have penalty clauses if Eskom turns the power off (that is, Eskom pays these companies if it shuts down power for a period longer than what is defined in the contract), and includes tariffs much lower than domestic or municipal tariffs. Tristan Taylor of Earthlife Africa contends:

*The economic model of cheap energy for wealthy corporations was locked in by new policies where in December 2006 Eskom and government signed a raft of deals with the Canadian aluminium smelter, Alcan under the Development Electricity Pricing Programme (DEPP). The DEPP, which was never sent to Parliament, provides a special tariff for foreign corporations that want to build high electricity usage, industrial plants in South Africa. The DEPP ensures that tariff will be cheaper than anywhere else in the world (or, at least, on par with the next cheapest supplier of electricity) and will be low enough to guarantee the corporation a profitable internal rate of return. Contracts signed under the DEPP are subject to confidentiality clauses, meaning that the exact tariff will not be subject to public scrutiny. What we do know is that the electricity contract to Alcan's proposed aluminum smelter at Coega will be for the next 25 years and is for 1350MW of electricity, enough to power a medium city. The tariff could be as low as 12c/kWh. The indirect financial subsidies (building of transmission lines and externalized costs of generation) to Alcan top over R12 billion. This was at a time when Eskom was short of generating capacity, raising domestic tariffs, and is embarking on R150 billion capital expansion plan, 50% financed through debt. This R150 billion will have to be recovered through revenue; that means you, me, and millions of other South Africans will pay for the cheap and dirty electricity that will generate obscene profits for local and foreign corporations.<sup>9</sup>*

<sup>9</sup> *ibid*

Thus the core components of policy are beset by anti-social and anti-ecological practices encapsulated by the minerals-energy complex, which had its roots during the Apartheid era and is being perpetuated in the current one. Centrality of cheap, dirty energy from large stocks of coal stem from power needs of mines and heavy industry and has been responsible for rapid accumulation in the 1980s. Moreover, coal-fire has devastated our climate record, being ranked as one of world's 20 biggest emitters of greenhouse gases. Cheap electricity also places great stress on the environment because it requires large amounts of coolant water.

### Big profits, big salaries: Where was the oversight & regulation?

As early as 2006 opposition parties called for the Moseneke Commission<sup>10</sup>, an independent commission determining reasonable salary scales for all public office bearers in the country on an annual basis, to investigate the remunerations given at Eskom. Eskom's profit for 2006/2007 was R6.454 billion, up from R4.641 billion in 2005/2006 after the national press revealed that Eskom's executive directors earned R73m in 2005, making them the highest paid executives in the country. According to a Mail & Guardian report, Eskom's nearest peer state utility equivalent, Transnet, paid its executive team a relatively 'modest' R28.9m during its last annual reporting period. Eskom's CEO Thulani Gcabashe earned R13m last year, five times more than Transnet CEO Maria Ramos's R2.6m. The two parastatals are similarly sized in terms of revenue, their respective sales being R46bn for Transnet and R42bn for Eskom.<sup>11</sup>

The utility's audacious salaries were premised on a strategy taken in 1997 to inflate salaries in order to retain skills and ensure they would be transferred to less skilful staff. There was a group of 200 or so employees who were one grade below those on the executive committee. Special contracts were dished out to these 'high flyers', which would also allow

<sup>10</sup> So coined because it was under chairmanship of deputy chief justice Dikgang Moseneke

<sup>11</sup> Investigate Eskom salaries – According to Mail & Guardian, the R6.9m average for the eight divisional executives is extremely generous when compared to high-profile CEOs in the private sector such as Harmony's Bernard Swanepoel (R2.1m), Mittal Steel's Davinder Chugh (R2.6m), Kumba's Con Fauconnier (R4.5m), Caxton's Terry Moolman (R1.98m), Imperial's Bill Lynch (R4.2m), Angloplats's Ralph Havenstein (R5.3m), Discovery's Adrian Gore (R2.3m) and Sasol's Pieter Cox (R5m).  
Online url: [http://www.fin24.com/articles/default/display\\_article.aspx?Nav=ns&ArticleID=1518-24\\_1904220](http://www.fin24.com/articles/default/display_article.aspx?Nav=ns&ArticleID=1518-24_1904220)

Eskom to get creative on tax. Of this, 57 contracts signed amounted to R60 billion. As far as meeting the objective of the strategy was concerned, however, it appeared a failure as little skill was retained or transferred.<sup>12</sup> Yet, the skills crunch is also being used to justify bonuses and poor decisions including subsequently hiring the former CEO who was fired as a consultant. Others were hired as consultants too. The review process of the salaries and profits and the attention it has received in local media is particularly important in the context of a developing country with scarce resources and high margins of inequality. Moreover, what is striking is that the big profits did not translate into a greater productivity of management and the ability to be able to circumvent a looming crisis.

The Chairperson at a recent parliamentary discussion on the crisis said that media was investigating that bonuses were inflated using funds from Asset Maintenance Fund, so that world creditors would see Eskom as making a profit. However, current CEO Jacob Maroga rejected the claim that books were crooked, stating that over past three years Eskom spent R13 billion, over and above what was budgeted on the purchase of coal. But then this does little to explain the low stockpiles of coal that Eskom complains contributes to the power cuts.

Eskom is now also blaming poor regulation for not being able to meet mass electricity needs. But the subtext reveals that instead of Nersa being independent as a regulator ought to be, in the past it used to be largely dependent on licence levies from Eskom – the only significant licenced electricity generator in the country. Furthermore, there appears to be a revolving door of relationships with big corporations. Xolani Mkhwanazi (Nersa) subsequently became CEO for BHPO Billiton Aluminium Southern Africa. The pricing of electricity for the poor has also brought into question whose interests Nersa has at heart.

Nersa, in turn accuses Eskom of not being clear about whether the R60 billion given by Treasury to the utility is to be used as a loan or equity. Eskom contends that it is still deliberating on the how and in what time frame the money is to be dispersed. It is perplexing though that Eskom had been given permission to expand operations four years ago but were only being referred to Treasury now. The parastatal's weak defence in this regard is that they

only began understanding the task ahead, in terms of such items as procurement processes, policy and regulatory environment, after 2004 when the moratorium on building infrastructure ended so as not to "misdiagnose" the problem. So we may presume that it took four years for them to understand until crisis prompted instantaneous revelation, which throws up serious corporate governance inadequacies. Finally, both Nersa and Eskom complain about unexpected growth of the country that made it impossible to prepare for. Yet Eskom stopped meetings they used to have with the Reserve Bank on medium and long-term growth forecasts for the country in early 1980s.

### Poor, costly decisions

There are a host of poor decisions taken by Eskom that have cost the parastatal dearly. Eskom has said part of the problem was due to wet coal. However, an anonymous source used by South African news magazine *Noseweek*, claimed that it wasn't wet coal but a lack of coal. In the past, Eskom used its own collieries or it received coal from large companies like BHPO Billiton. But then it decided to start using small Black Economic Empowerment (BEE) compliant collieries out in Mpumalanga Province. When these companies realised that Eskom wasn't exercising quality control anymore, according to the *Noseweek*, they started sending low quality coal apparently including significant portions of rocks, which caused problems to their equipment (e.g. tube leaks) and meant that boilers had to be stopped<sup>13</sup>. When this was discovered, the scapegoat Eskom wanted to use, threatened that he would sue if he was fired and charges were thus dropped. Three other managers who could possibly have had the blame pinned on them resigned because of tender irregularities ironically involving coal.

To further complicate matters, Minerals and Energy Minister Buyelwa Sonjica stated that because part of the problem related to poor quality coal, as one of the solutions to the crisis, SA could switch from low grade coal to high grade power generation. But local power stations, which the government wants to use because they are BEE compliant are designed to burn low quality coal. If high quality coal is supplied the power stations would need to be reshaped to handle that type of coal. The stations are also situated far from coal mines, thus causing delivery delays perhaps also

<sup>12</sup> *Noseweek*. Eskom whistles in the dark. May 2008

<sup>13</sup> The allegations have never been denied by Eskom.

explaining the low stockpile levels of coal.<sup>14</sup>

But local university professor Eberhard<sup>15</sup> believes that much of this discussion is about proximate, and not ultimate, causes. The latter involves a greater understanding of a generation power plant that was old with some units built 40 years ago. Because of the old reserve margin, these old units were being run flat out. In other words, the Achilles Heel comes back to dodging on maintenance costs, as we are aware with Koeberg.<sup>16</sup> Once again, the political manifesto of the newly incumbent government in 1994 to electrify one million homes provides a backdrop to the confusion around why Eskom did not add new plants in order to ensure sufficient capacity to meet this requirement.

### Looking ahead & learning from mistakes

*“The scale of our response to the challenge of growth is unprecedented.”*

– Chairman, Eskom

There are numerous exhortations in all communication to living in “extraordinary times” that require “extraordinary measures” to be adopted. Eskom CEO, Jacob Maroga, insists that amongst ALL options, load shedding would be the last mechanism used to manage the system under any scenario. Eskom CEO, Jacob Maroga, insists that amongst those options listed, load shedding would be the last mechanism used to manage the system under any scenario.<sup>17</sup> The discussion that follows attempts to highlight and evaluate the nature and scope of the strategy and extrapolate how these decisions taken today will impact on energy provision in the future. Auguring growth of the economy through energy is one thing, but to what extent is climate change factored in? Indeed, is our future a sustainably developed one?

### Immediate Action

Demand side interventions: These are aimed at releasing some capacity within the system to allow more time for maintenance and to reduce the levels of stress at which power plant is being operated. Amongst these is a power conservation programme

with the following quotas for a few of the sectors being: industrial (10%); general commercial (15%); residential (10%); hotels, resorts, shopping malls and conference centres (20%); and agriculture (5%)<sup>18</sup>. A cursory analysis reveals that the figures of residential to industrial are somewhat absurd since if industry uses more electricity, and the problem lies in Eskom’s capacity to provide electricity, it goes to reason the demand side programme ought to focus more on targeting the biggest users rather than the smallest ones. Behavioural change programmes, like the rollout of efficient lighting, restriction of incandescents, solar water heating programme and national housing specifications are also in the offing. It is interesting to note that City’s like Cape Town investigated these possibilities some while ago but the support from national government has been meagre. Fast tracking of the medium-long term initiatives with smart metering for residential fuel switching, solar powered (with battery back up) traffic lights and public lighting & hospitality industry are also among alternatives on the table. No doubt, this holistic approach to energy conservation is to be lauded and as it inspires a mindset of fundamental lifestyle changes which are desperately needed in the context detrimental climate change.

**Supply side focus** – This is focused on managing the coal supply and handling. It is interesting to note that Nersa has recommended investigations on “changes required to shareholder compact to prioritise security of supply above commercial decisions in order to avoid national crises, primary energy procurement and management and in particular coal management in Eskom” and on “Obligations to maintain coal stockpiles and reporting to Nersa.” It appears thus that embedded in the latter recommendation is an admission of poor regulation by Nersa, which holds some promise for redress.

**Stakeholder inclusion & coordination** – A multi-sector task team has been put together to co-ordinate implementation of all activities including the DME, Department of Public Enterprises (DPE), Eskom, South African Local Government Agency (Salga). This may be able to partly address the problem of the DME, Nersa and Eskom having different power plans. Separate task teams are also to be established with key industrial customers and the top 11 municipalities to assess demand reductions and work in activities to accelerate energy savings. Civil

14 SABC-TV News, 2008. *Eskom’s black economic empowerment policies contributing to power crisis*. 29 January 2008. Online url: <http://www.sabcnews.co.za/economy/business/0.2172.163318.00.html>

15 Eberhard, A. 2008. *Moving beyond blame: what is required to shore up Eskom?* Online url: [www.gsb.uct.ac.za/gsbwebb/mir/documents/MovingBeyondBlame](http://www.gsb.uct.ac.za/gsbwebb/mir/documents/MovingBeyondBlame)

16 Ibid.

17 PMG. 2008. *Electricity Crisis and Pricing: Briefing by Eskom and Nersa*

18 Department of Minerals & Energy (DME). 2008. *Interventions to address electricity shortages*. January 2008. Pg 11.

society does not appear on any of these teams. Nor does an independent commission of enquiry feature. These issues are particularly salient for a host of reasons as outlined in the above discussion, but also especially given that there are no rational, transparent or published criteria for allocating new build opportunities between Eskom and private sector. Furthermore, the Single Buyer Model, where Eskom might purchase power from private producers, meant to contribute 30% of entire energy supply, has still not been fully designed or implemented.

**Justifying a price hike** – In the wake of the crisis, the utility announced a dramatic 53% hike in electricity prices supposedly so as a means of adjusting the tariff regime to reflect the actual cost of providing electricity. In a briefing to the Portfolio Committee on Minerals and Energy on 28 May 2008, Eskom also claimed to be facing “significant financial challenges for 2008/9 and beyond”.<sup>19</sup> These challenges include:

- ❑ An extraordinary increase in fuel costs placing a burden on cash flow
- ❑ Massive expense of the capital expansion programme
- ❑ Loss of R7.9 billion for 2008/2009 financial year if 14.2% price increase currently allowed is in place
- ❑ Negative credit rating because agencies have put the utility on credit watch

The proposed increase caused a furore amongst all sectors (including government) because it was seen as a way for Eskom to externalise the costs of their mistakes. It also raises trust issues with Eskom as their previous strategic plan states that the utility will absorb new capacity expenses and not the public. That same plan also stated that the hike would be phased in over five years. Given that Eskom blames the regulatory environment for the contributing to the inadequacies in governance that led to the crisis, they propose Nersa provides an even-handed mechanism where customers would gain if the costs of fuel and inflation decrease. As a response, Nersa agreed to a hike of 27.5% for residents on 18 June 2008. Thus Nersa approved a 13,3% average electricity price increase, in addition to the 14,2% already approved in December last year, resulting in a 27,5% average increase year-on-year.<sup>20</sup> The hike for the poor will

remain at 14.4%. The ‘compromise’ was widely lauded within government circles. However, it is difficult to imagine that the public will thank Nersa for the decision considering the devastating impact faced from price hikes on fuel and food in recent months.

**Bonuses** – A focus of discussions at parliament has been on the hefty bonuses Eskom receives in spite of the poor performance of managers. In a parliamentary debate, Eskom CEO Maroga thus maintained that staff has not received bonuses for the last financial year as they were not calculated as yet. Maroga stressed that the Eskom Board had authority over bonuses and would not only look at technical calculation but would also note what needed to be done about bonuses in current context as it would not be seen as proper to “profit from a national emergency”. Because the crisis was the biggest crisis in the country the utility would need to attract and retain best and brightest. These high flyers again would need to feel valued through incentives. Thus the bonuses would be rephrased to be called “incentives” which reveals more a semantic change than a real reflection and redress instituted.

**Taking care of the poor** – Talk has completely abated on increasing the free basic allocation to 100kWh per person per month to alleviate the cost stress on the poor. Furthermore, no discussion has come to the fore on scrapping the DEPP and making the heaviest users (industrial and commercial) pay their fair share. The Apartheid culture of secrecy that has loomed in the current era is also lurking impediment to real resolutions to the crisis.<sup>21</sup>

## Envisioning the energy future

**Build plan:** The current capital expenditure plan is valued at R343 billion over the next five years and is set to increase by more than R1.3trillion in the long term.<sup>22</sup> But this is still very much in the order of business as usual with massive increase in capacity of fossil fuel plants (coal-fired power). Three new coal-fired power stations to be built, including bringing back decommissioned ones into use. The first plant to be built is Medupi in Lephalale, Limpopo Province, at cost of R78 billion. It has also been mired by scandal because ANC front company, Chancellor House secured a tender worth R20 billion through boiler company Hitachi power, in which it has a 25% stake. Tender process was also flawed because Hitachi

19 Eskom. 28 May 2008. *Briefing on the Current Electricity Crisis and Pricing to the Portfolio Committee on Minerals and Energy*.

20 Anon. 2008. *Nersa announces price increase*, in Mail & Guardian, 8 July 2008, Online url: <http://www.mg.co.za/article/2008-07-08-nersa-announces-price-increase>

21 Some of these ideas are from Taylor, op cit

22 Maroga, J. 29 May 2008. Mail & Guardian business breakfast: Mr. Jacob Maroga, Chief Executive- Eskom Holdings Limited.

wasn't cheap nor was the product superior to another bidder, Alstom. In accordance with BEE requirements government has already stated that procurement work on boilers and turbines tenders would involve questioning how each company would localise their manufacturing, utilise local partnerships and build local skills.

**Measuring up to the progressive scenario of co-generation & renewables** – Potential power that could be sold to Eskom by other businesses is about 5 000MW – almost equivalent to two Koeberg-sized power stations. But the utility is only prepared to half of what it charges for electricity to these IPP's. Investors also say there is no certainty that if they build capacity at a relatively high cost only to find that Eskom refuses to buy their power when the crisis eases. Alternative sources are also likely to be kinder to the environment than coal-fired power. They are also relatively quick in constructing the necessary infrastructure, unlike the 10 years it takes to build a large power station. Much of the power generated is also already being produced as part of the industrial processes as diverse as sewage processing, sugar refining and paper making. But the argument once again is that it is being held up by red tape, price disputes and reluctance to sign on to new providers.<sup>23</sup> For its part, Eskom states that it is working with govt on streamlining these onerous decision making processes.

There is also scope for small scale renewable energy projects to contribute to the grid. In other countries internationally, there is a special feed-in tariff paid to suppliers of green energy to encourage the development of new, cleaner forms of energy. Government says that it is looking into this option, but there are signs that provision may be controlled and monopolised by Eskom. Legally, electricity producers may only sell to Eskom or to municipalities distributing electricity. This again points to problems of conflicts of interest between the regulator and Eskom. Nersa indicates that they are considering a proposal from Eskom where 50% of renewable energy comes from them and 50% from other sources. Currently the plan is that SA would need to source 10 000 gigawatt hours of electricity from renewable sources by 2013.<sup>24</sup> Renewable energy would need to provide 13% of energy by 2020 and 70% by 2050. In general, for example, in terms of residential use 35%-40% of electricity is used for heating water instead of using solar water heating which would ease peak capacity constraints.

Vast amounts of money is still being spent on the new

nuclear technology including the Pebble Bed Modular Reactor, even though the design is still not finalised. Spending on this is almost half of the projected spending to achieve universal access. It also involves high risks and unpredictably high costs with the prospect of limited returns.

**Relations with SA's neighbours** – Eskom itself has embarked on certain strategic initiatives aimed at making its energy and related services a business institution in Africa, and is now involved in 39 other African countries. Plans to get energy from controversial sources like Inga dam in the Democratic Republic of Congo (DRC) and Cahorra Bassa dam in Mozambique have also caused tensions within those countries as well as to the image of SA as bullying regional hegemon.

### Factoring in Climate change

As stated above, Eskom attests that it is "exploring" renewable energy options. The Plan has 100MW of wind energy and a solar power plant of 100MW being considered. Comprehensive plans will be submitted to cabinet during first half of 2008.<sup>25</sup> In a climate change adjusted scenario, renewable energy would completely replace fossil fuels by 2050. For this to become viable, investments in supply will have to be large, strain on energy consumption through economic development must be reasonable and energy efficiency must be promoted at all levels.<sup>26</sup> This would also mean having to pry apart minerals and energy so that development is locked into dirty processes of generating it. The current trajectory does not fall into this paradigm of thinking, although it is somewhat premature to come to any definitive conclusions about the way forward suggested. It is clear that vigilant sustained monitoring by all sectors would need to take place, regulation tightened, and policy changed. The hopeful irony of an energy crisis in a time of climate change is that the country can now begin to walk the tightrope that navigates between proper corporate governance, individual environmentalism and policy that leads to a low-carbon future of universal access.

23 Newmarch, J. and Davie. K. 2008. *Energy crisis: What energy crisis?*, in Mail & Guardian, 25 January 2008.

24 *ibid*

25 *ibid*

26 Gedye, L. 2008. *Energy policy needs to be overhauled*, in Mail & Guardian, 6 March 2008.

## Biography

### Sibusiso Mimi

Sibusiso is a Parliamentary Researcher for the National Union of Mineworkers in South Africa. Over the years his work involved community development, youth development, and social and environmental justice issues. Key elements in his work included policy lobbying and advocacy, environmental campaigning and developing structured communication and PR strategies – environmental programmes management, research and facilitation also form key aspects of his work.



# The effects of electricity load shedding on the poor

During the power failures in Koeberg Nuclear Power Station, President Thabo Mbeki assured the National Assembly in March 2006 that there was “no energy crisis in South Africa”. Prior to the President making that statement, the Minister of Public Enterprises Alec Erwin alleged that the problem with one of the reactors at Koeberg that resulted to plunging the Cape into darkness was “sabotage”.

Two years later, President Mbeki apologised to South Africans about the energy crisis in the country. He acknowledged that Eskom was right about investing in expanding the generation capacity and that government should have listened to warnings about the dwindling generation capacity.

A reflection of both government’s and Eskom’s lack of long-term planning and carrying the mandate bestowed upon them by the South African citizenry. The government and Eskom’s lack of long-term planning and oversight tantamount to a complete disregard of the constitutional right to adequate basic services, including energy services.

As the electricity crisis continues to haunt South Africans, very little is said about the effects the whole situation has on the poor – particularly township communities who continue to suffer silently. Since electricity services were introduced to

poor communities, during the period of democratic transition in South Africa – early 90s, townships have experienced constant unscheduled power cuts due to a number of reasons including the fact that many South Africans could not afford electricity then and still are unable to meet the expense of electricity today.

In the beginning of the new Millennium residents of the South Western Townships (SOWETO) in Johannesburg, organised themselves into a group to resist the power cuts in their communities which were introduced by Eskom as a ‘costs recovery’ campaign. The resistance started as protests and public mobilisation, but as Eskom intensified its campaign against the community, the SOWETO Electricity Crisis Committee (SECC) combined the protest actions with unauthorised reconnections. Within six months the SECC had reconnected more than 3000 households in SOWETO. During this time, Eskom disconnected electricity indiscriminately cutting off whole areas including those who paid and those who did not pay their bills – businesses in the areas that were targeted for electricity cut offs were immensely affected including public services such as clinics, police stations, shops and schools.

SOWETO was not the only township affected by basic services cut offs, particularly electricity. Cape Town was also affected, mainly in the areas of

Khayelitsha, Delft and Mitchell's Plain. Water and electricity cut offs were experienced in a number of communities, while some families were forcibly evicted for defaulting in paying for services. The communities quickly followed the SOWETO mode of resistance – protests were organised and reconnection of water and electricity undertaken as well as reinstating families in their homes.

With that background, South African townships are no stranger to inequitable treatment from Eskom. To townships the term load shedding has a different meaning including longer periods without any source of energy for cooking, space heating, lighting, refrigeration etc. Desperate measures are usually taken including the use of unsafe sources of energy such as paraffin, candles and coal stoves. These effects of load shedding are not as extensively documented as they should – leading to a myth that Eskom's load shedding does not affect the energy needs of the poor.

It is important for us to always remind the world that townships operate slightly different from the 'normal world'. This is where the poor live and energy forms a critical aspect of survival. These are stressed communities that are affected by high rates of unemployment, crime, HIV/AIDS epidemic, poverty, teenage pregnancies and all other ills working against functional communities. For example, a family of workers and school goers come back to rotten food due to load shedding – a whole month of food supply destroyed and placing additional strain on already stressed family relationships. The working class families buy food supplies on a monthly basis and if anything happens to that supply it means hunger – unnecessary hunger that could have been prevented if government and Eskom had worked together in ensuring that new generation capacity was online and ready.

In working class societies it is mostly women who have the task of ensuring that a household has the required energy sources, for example, a woman has to cook – she has to pick an energy source to cook, she should ensure that there's light, hot water and that all that needs to be refrigerated is done so. Load shedding therefore places additional burdens on these women's shoulders to ensure that energy is available.

South African households have been conditioned to think that there is an abundance of electricity that will never run out – at the switch you get all that you need. It is taking some adjusting to now have to live without electricity or find other means should you not have electricity. In emulating the living standard of the more affluent societies, township households often

fall into the trap of purchasing appliances that are intensive energy users thus impacting on the budget of most families – perhaps a signal to energy efficient appliances producers to consider appealing to the low-income markets as well.

Load shedding has also left many workers stranded in train stations and some on the way to work inside trains. This is costly to workers as they lose pay for that day and some face unsympathetic reprimands from their bosses. This results in stress for workers having to ensure that they have enough for alternative transport. Transport remains an extremely expensive service for the poor.

Apart from hurting the financial situation of the poor, unscheduled load shedding also contributes to increasing crime rates as dark hours are more opportune for criminals roaming townships. Safety emerges as a critical issue – in the early hours of the morning when some workers are leaving for work, they fall victims to criminals as the results of darkness.

More critical and of utmost importance, Eskom needs to rework its communication strategy with a focus on the poor. Their communication strategy should include Eskom going into communities not only to cut-off their electricity but to share information and establish effective ways of communication with the poor. Eskom should endeavour to use all modes of communication in reaching out to townships in an effort to raise awareness on the current situation and options for the future.

## Biography

### David Marrs

David is Cape Editor of South African financial daily newspaper Business Day, and editor of its trade supplement, The South African Exporter. He has been working as a journalist and commentator on the South African political economy for more than 20 years.



# Perfect storm

It has been described as the “Perfect Storm”, a reference to the 2000 movie of the same name starring George Clooney, in which a range of normally benign weather events coincided to form a uniquely destructive force.

That may be a gross exaggeration of the dark cloud looming over South Africa’s economy in the middle of 2008, which appears to be growing ominously, but it remains useful as a reminder that growth occurs in cycles. What goes up must eventually come down, at least partially, especially when the growth was boosted by a serendipitous combination of favourable factors that could be regarded as the mirror image of a Perfect Storm.

There can be no disputing that the ending of Apartheid benefited South Africa greatly by removing some of the biggest impediments to growth, such as international sanctions, and releasing the full potential of the country’s population for the first time. It is also true that the new African National Congress (ANC) government under President Nelson Mandela contributed significantly to the positive economic outlook during the late 1990s and early 2000s by refraining from implementing the socialist policies the organisation had espoused as a liberation movement, instead opting for a mixed economy in which the market was allowed to hold sway. This led to significant foreign direct investment and a surge in international trade.

However, South Africa’s annual economic growth rate of over 5%, reached in recent years, was also a result of enabling factors that were well beyond the government’s control and with hindsight may have led to a potentially destructive complacency. These included

the global liquidity glut that resulted from the United States’ attempts to counter the economic effects of the September 11 2001 terror attacks, and the prolonged commodities boom, which came as a welcome windfall to resource-rich countries like South Africa.

Now that the former has been rudely reversed through the subprime crisis that is currently ravaging the US economy and reverberating throughout the world, and the latter has resulted in a crude oil price shock, the South African economy is coming down to earth with a bang. Add to that the contagion from the implosion of neighbouring Zimbabwe, a stubbornly high crime rate, soaring interest rates and rocketing administered prices, and it is hard to find a silver lining to the proverbial storm cloud.

Fundamental errors of governance that could be glossed over when the economy was booming, money was cheap and energy apparently abundant have been exposed to the glare of public opinion. Already there has been an uprising within the ruling ANC that led to the ousting of President Thabo Mbeki as president of the organisation and his replacement by the leftward leaning and populist-inclined Jacob Zuma.

There are legitimate fears that this, and the recent spate of xenophobic attacks on African immigrants, could be but the start of social unrest arising from the ruling party’s real and perceived failings, and especially its failure to ensure that the good times made an appreciable difference to the lives of the poor majority.

The electricity supply crisis is a prime example. It is now clear that the generation capacity constraints experienced by state-owned power utility Eskom, which plunged large parts of the country into darkness and forced the mining industry to shut down for five days in

January, wiping 10% off the value of the Johannesburg Stock Exchange's Top 20 Resources Index, were largely the result of government miscalculations.

It has emerged that when key government officials and energy sector regulators met in 2000 and again in 2001 to conduct a routine forward planning exercise, Eskom was blocked from building the new power stations its advisers said would be needed to avoid the generation capacity shortfall that was predicted to occur by 2007 if the economy grew at the projected rate.

The restraint placed on Eskom was motivated by the government's aim at the time to open the power generation industry to private sector involvement. However, because electricity prices had been kept artificially low due to a glut of generation capacity stemming from the Apartheid era, private power producers were not falling over themselves to enter the market and the privatisation policy was subsequently abandoned. By then it was too late for Eskom to avoid a supply shortfall.

The government's stumble was not the only cause of January's blackouts. Eskom's maintenance programme fell well short of required standards, as did its management of coal stocks to feed the large base load stations in the north of the country.

Part of the reason for this was the utility's overenthusiastic application of national laws intended to correct racial imbalances caused by the Apartheid system.

Eskom's so-called employment-equity programme was pursued at the expense of hiring the best available skills, to the extent that in 2006 a ban was placed on hiring white males, and then all males, to meet the targeted proportion of black female employees.

At the same time, the utility was losing scarce skills to emigration, an international phenomenon that was worsened in SA by perceptions that experienced white employees would be discriminated against in terms of the state's affirmative action policy. In 2006, Public Enterprises Minister Alec Erwin acknowledged that the utility had lost 15% of its most skilled and experienced staff since 1994, but this did not prevent Eskom from sticking to its controversial employment policy.

A spokesman said at the time filling available posts would require hiring two new people every working day. And, to remain in line with employment equity targets, one of them would have to be a black woman. It subsequently became clear that a shortage of experience and skills was a major cause of management's errors of judgment.

The blame game aside, it is indisputable that deep

level gold and platinum mines were especially hard hit by the blackouts because they use the bulk of their power for basic services such as water pumping and ventilation. The mines are currently getting at least 90% of their previous power allocation, but this remains a significant constraint on production and a number of expansion plans have had to be put on hold indefinitely.

Stats SA reported that mining production dropped 8,3% in the March quarter compared with December after seasonal adjustment, with a 10% drop in gold production and an 8% fall in other minerals. Year on year, the fall in March quarterly mining production was 11,4%.

Financial daily Business Day reported that platinum producer Lonmin lost about 15 000oz of saleable platinum worth about \$24m in the first quarter because of the power cuts. Gold miner Harmony said it lost 800kg of gold worth about R180m, and DRDGold some 3000oz worth \$2,8m.

The latest gross domestic product (GDP) data show that mining output dropped by a fifth in the first quarter despite historically high world prices for precious metals, slamming the brakes on economic growth. This plummeted from more than 5% last year to a little over 2% in the first quarter of this year.

Economists have sounded the alarm, pointing out that mining is the foundation of the South African economy, and if power supplies are not restored to their previous level soon the damage will become irreversible.

The trouble with restoring full power to the mines is that other sectors will have to take up the burden until new generation capacity can be built, which will take years. Energy-intensive enterprises such as smelters and steel makers make up a large part of the industrial economy, making it difficult to spread the burden fairly, while expecting domestic consumers to bear the brunt risks reversing progress made in electrifying poor communities. As it is, households are being expected to cut consumption by 10% on average to avoid punitive tariffs and scheduled blackouts euphemistically termed "load-shedding", which are intended to prevent overloading that might crash the entire grid.

Already the aluminium smelter proposed by Alcan for Coega in the Eastern Cape has been put on ice, and the question of power availability hangs over any proposed property development, whether commercial, industrial or residential. The supply of new industrial property stock in Gauteng is widely expected to dry up within the coming 18 months

because of the electricity supply crisis.

However, talk of a moratorium on new industrial projects has been shouted down by the government, which fears it could cause predictions of a recession to become self-fulfilling. Yet a self-imposed moratorium already exists since Eskom cannot guarantee that greenfields projects will get power.

Swingeing electricity price increases approved by the National Energy Regulator of SA (Nersa) in June will add significantly to costs and push up inflation. The price of power will increase by at least 27,5% this year, and Nersa chairman Collin Matjila has said tariff increases of between 20% and 25% a year can be expected over the next three years, depending on Eskom's capital expenditure programme, the current economic climate, and how much the state is prepared to contribute from the fiscus.

Eskom's capital expenditure plan to address the power crisis includes emergency gas and diesel peaking plants, two new coal-fired power stations that are already under construction, and as many as five nuclear power stations, the first to be ready by 2015. Although less environmentally damaging than their coal-fired counterparts in terms of greenhouse gases, the nuclear generators are significantly more expensive – the first is now expected to cost as much as R180bn due to escalating global demand for nuclear power.

In addition to hobbling economic growth, the five-day blackout in January combined with a soaring crude oil import bill to widen South Africa's current account deficit to 9% of GDP at the end of the first quarter, its worst level since 1982. This has raised fears that the rand will come under severe pressure in the coming months, especially if the foreign capital inflows required to finance the deficit start to dry up as the global economy slows.

Net dividend outflows from SA have risen rapidly due to increased foreign ownership of local shares and bonds. From about R10bn in the first quarter of 2000, the amount leaving the country rose to R76,5bn in the first quarter of this year, even as new portfolio investment was drying up due to a general increase in global risk aversion. Financial Mail magazine reported recently that portfolio inflows had fallen by R19bn in the first quarter.

The rand has already weakened considerably this year against the basket of currencies of its major trading partners, which should help ease the pressure on the current account in the longer term as exports are boosted and imports of luxury goods become too expensive for local tastes. However, a weaker rand also

imports inflation through higher rand oil prices and is a significant factor behind the recent series of interest rate hikes.

The so-called CPIX inflation rate, which the South African Reserve Bank endeavours to keep within a range of 3%-6% in terms of its inflation-targeting mandate, reached 10,9% year-on-year in May and is widely expected to increase still further before reaching a peak.

The target has now been breached for 14 months in a row, and analysts' best guess is that it may only get back within the target range some time in 2011.

With a limited arsenal available to it to attack inflation, the Bank has had little option but to increase interest rates, even though this does nothing to influence externally-driven factors such as soaring oil and food prices. However, dearer money will help suppress the secondary inflation effects, which are starting to be felt in the form of higher wage demands and surging core inflation figures.

There have already been 10 interest rate increases in a row, taking the key repo rate to 12%. If the rate rises by a further half percentage point at the next meeting of the Bank's monetary policy committee in August, as expected, this will bring the cumulative increase in the past two years to 5,5 percentage points.

The concern is that the newly indebted black middle class will be severely affected by higher rates, which could have political ramifications. Reserve Bank governor Tito Mboweni is nominally independent of government, but as a former cabinet minister and long-time member of the ruling party, he is already being demonised in the popular media and is showing signs of feeling beleaguered.

Statistics SA reported in June employment growth slowed to 0,1% in the second quarter of the year, from 0,8% in the first quarter, a change it attributed to interest rate increases and Eskom's failure to supply power for new construction projects. The construction sector shed 2 000 jobs over the 12 months to March and the mines reported no new hiring in the first quarter despite the ongoing resources boom, also as a direct result of the power shortages.

Trade union federation Cosatu, which is allied with the faction of the ruling party that ousted Mbeki as party leader at the end of last year, has threatened to call a national strike if interest rates are increased further. There have also been calls for the government to cut fuel taxes as a means of taking some of the pressure off the poor, but this has been rejected by the National Treasury as a blunt instrument that would benefit the

wealthy and encourage fuel wastage.

However, the minerals and energy department has proposed other means to help township residents, many of whom are dependent on paraffin as a cooking and heating fuel. The government has been wanting to phase out paraffin, mainly because it is a major cause of shack fires and kills several children each year through accidental ingestion.

Liquid petroleum gas is the alternative fuel of choice from the government's perspective, but South Africa does not produce enough for it to replace paraffin, and prices have soared along with those of other fossil fuels. In a recent presentation to Parliament, the department revealed plans to not only regulate LPG distribution, with the aim of more than halving retail prices, but facilitate the construction of an import terminal to cater for an expected ten-fold increase in gas consumption.

Natural gas has the potential to contribute significantly to South Africa's energy requirements in the coming decades, both as a feedstock for existing and planned synthetic fuel plants operated by Sasol and PetroSA, but also for domestic use. Parts of Johannesburg already have access to natural gas piped from fields off the coast of Mozambique, and hopes remain that fields discovered more than a decade ago off the west coast of South Africa will prove commercially viable.

However, South Africa's black economic empowerment requirements, which demand that black-owned companies have a stake in new production projects, have proved a disincentive for international exploration and production companies. A global shortage of exploration vessels and drilling rigs has also delayed bids to prove promising gas discoveries.

Namibia has started producing electricity from a gas-fired power station fed by the Kudu field a few hundred kilometres to the north, and it is likely that some of this will find its way to South Africa via the regional power grid to help fill the generation capacity gap while new plants are being built.

South Africa is lagging behind the rest of the world in terms of investment in renewable energy, and Eskom has made it clear that its priority is to increase its generation capacity as quickly and cost-effectively as possible, which means coal and nuclear fired stations will absorb the lion's share of new investment.

The nuclear option is attractive to the government because, although more expensive than coal-fired plants, reactors can be located close to where the

energy is needed rather than where the fuel source is located, saving on transmission costs. South Africa is also one of the world's leading producers of uranium.

The goal is for about half of the 40 000 MW the utility intends adding to the grid by 2025 to come from nuclear energy, and Eskom remains committed to commercialising the pebble bed modular reactor (PBMR) technology that was conceived, and subsequently abandoned, by German scientists.

Environmental groups such as Earthlife Africa have campaigned vigorously against the PBMR project, and especially plans to set up a demonstration module on the site of SA's sole existing nuclear power plant at Koeberg in the Western Cape.

However, the government is convinced that the modular concept is not only viable and safe, but has the potential to bring in substantial export revenue in the long term, and the global energy crisis has given the project a new lease on life. US-based Westinghouse Electric was reported recently to be interested in taking up a stake in the PBMR, as was Japan's Mitsubishi Heavy Industries.

The electricity blackouts have also given the solar water heating industry a significant boost, and Eskom has sponsored a subsidisation programme to encourage householders to use solar to cut electricity consumption. Meaningful power generation by means of photovoltaic technologies remains some way off. However, Eskom has committed R2,2bn for a planned 100MW solar plant near Upington in the Northern Cape, a site that gets among the highest amounts of solar radiation in the world.

SA's first renewable energy project to actually feed electricity into the grid, a 5MW wind farm funded by the private sector and a grant from the Danish government, started operating at Darling in the Western Cape in May. Eskom has had a pilot windmill project on the go in the province for several years, and is undertaking a feasibility study for a 100MW farm.

The production of biofuels was identified as a priority project under government's Accelerated and Shared Growth Initiative for SA (AsgiSA) in 2006, with the expectation that they would contribute at least 5% of SA's fuel needs by 2013 and create 55000 jobs. However, with biofuel production in the US being blamed for global food price inflation, the plan has been quietly shelved.

## Biography

### Saliem Fakir

Saliem is senior lecturer at the Department of Public Administration and Planning at the University of Stellenbosch where he teaches a course on renewable energy policy and financing of renewable energy projects. He is also the Associate Director of the Centre for Renewable and Sustainable Energy Studies – a newly established center at the University of Stellenbosch.

Saliem previously worked for Lereko Energy (Pty) Ltd an investment company focusing on project development and financial arrangements for renewable energy, biofuels, waste and water sectors. He also served as Director of the World Conservation Union South Africa (IUCN-SA) office for 8 years. Saliem's qualifications are: B.Sc Honours molecular biology (WITS), Masters' in Environmental Science, Wye College London, and he did a senior executive management course at Harvard University in 2000.



# Renewable energy Just lip service?

## Introduction

There is only one word for the electricity situation in South Africa at the moment – chaos!

The electricity crisis is one of the biggest crises our young democracy has faced – when darkness hits all of a sudden all hope too fades in the ability of government to manage the situation.

There is more at stake here than just electricity: it is the ability to provide clear leadership and guidance in the time of crisis. At present the indecision simply does not instil any confidence.

Not being able to resolve the large energy crisis also has consequences for the renewable energy (RE) sector. Before the electricity crisis made big news, South Africa's renewable energy market itself was fledgling, struggling to break through the numerous barriers – there was a glimmer of hope in the last two years but the energy crisis and indecisions around key supporting policies for the RE sector is placing a damper on future prospects for RE.

As a result South Africa, which is most suitably endowed with large quantities of biomass, boasts one of the highest UV radiation ratios in the world, and has sufficient wind resources to accommodate at least

3 000-4 000 MW of wind power, has hardly made a dent on its innate potential. It lags far behind other emerging economies.

There are number of reasons for this as this paper will show.

## The context

South Africa's economic growth rate has exceeded original expectations. On the basis of sound macro-economic policy and fiscal austerity measures, as well as a higher rate of tax compliance and collection following the post 1994 era economic growth has been averaging 3-4% of GDP per annum.

The 2007 first quarter indicators showed growth already at 5% of GDP. On the back of the growth significant infrastructure investments are envisaged – more than 50% of the funds are allocated primarily in the power sector.

The effect of growth has been that power generation capacity has not kept abreast of demand and power shortages have occurred recurrently in the last 3 years. South Africa is the largest user of fossil based fuels in the SADC region as a result of the size of its economy.

About 90% of our energy is derived from low-cost coal and the transport sector is dependent on imported oil. About 60% of our oil is imported and the rest is generated from coal-to-liquid technologies by SASOL.

The dependence on fossil fuels, especially coal, is influenced by cost factors and their abundant availability in South Africa. As a result electricity prices in South Africa have been one of the cheapest in the world. But as some commentators have argued these prices are not a reflection of real cost which should include environmental and social costs; rather South Africa's electricity prices are deliberately underpriced.

Things are changing. South Africa has run out of power. It needs to generate another 40 000 MW of power to support an economic growth rate at between 4-6%. Decisions have already been made to go with conventional power – a mix of nuclear and coal fired power stations, with nuclear contributing half of the new power needed at a cost of about R600 billion (roughly the size of the government's yearly budget).

The overall contribution of renewables pales in comparison.

In South Africa energy diversification seems to be the key driver underlying the Renewable Energy White Paper's policy position, with environmental concerns being secondary. The White Paper sets a 4% target for RE or 10 000 GWh to be reached by 2013 and includes biofuels. If, capacity is doubled by 2025 on the conventional power generation side RE's contribution will be diluted to 2%.

Of the 10 000 GWh that forms the final energy consumption target a portion of it will also come from non-electric technologies such as solar water geysers and biofuels. About 50% of this target is expected to be met through biofuels production.

This has caused a stir in some quarters as it leads to doubt as to whether this reflects a true commitment to the establishment of an RE market in South Africa. Biofuels should perhaps be treated separately and not form part of the White Paper's RE target as some experts argue that other RE technologies should be given more support and be promoted to meet the 4% target.

Another way in which the target is meant to be achieved, partly, is through the allocation of demand side management funds (DSM) for the mass roll-out of solar water heating systems.

The DSM is critical for implementing the targeted installation of 1m solar water geysers.

About R2 billion has already been set aside for the implementation of solar water heaters as part of a R10 billion demand side management programme. (Business Report, October 2, 2007)

Since solar systems are expensive a subsidy of 20-30% is being envisaged to encourage uptake in the market. The potential savings from the implementation of this programme is estimated to be about 650MW – at least saving the building of one coal-fired power station.

Even the effects of climate change have come to have little bearing on the push for RE – ironically it has already been hi-jacked to back the policy push for more nuclear power and the Stern Review Report can be fingered as the main culprit in helping South African policy makers make the case that nuclear is good for the environment. South Africa's carbon footprint nonetheless is significant – we are the 13th largest producer of carbon emissions in the world.

### The opportunities for RE

The outlook for renewable energy over the long-term seems positive if you were to take price factor as the sole basis and indicator of good market conditions.

1. The huge loan-book that Eskom is carrying for its new capital intensive projects has entailed that Eskom cannot see itself get through the capital cost of these loans without a price hike. As a result, in 2007 Eskom requested the National Electricity Regulator<sup>1</sup> to consider an 18% tariff hike. Eskom was recently granted the right to increase tariffs by 14.5% instead of the 18% it requested. It subsequently applied for a 53% hike but this has not been accepted by cabinet and other stakeholders because of inflationary pressures and a general outcry that the South African public must bear the cost for Eskom's incompetence. At a recent energy summit there was a general agreement that electricity tariffs should increase gradually so as to be in a better position to combat inflation – the wholesale price is predicted to be 46ckW compared to the current price of 20ckW.
2. The White Paper on Energy Policy (1998) is an overarching document which sets out the government's official policy on the supply and consumption of energy for the decade following

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<sup>1</sup> NERSA is the electricity regulating body that is meant to oversee that the electricity market. It ultimately determines what tariffs can be charged and is also key to the success of the renewable energy market – for instance NERSA would be the authority that finally approves the feed-in tariff once there is consensus on the policy.

its release. One of the main goals of the White Paper is to create energy security by diversifying the energy supply and energy carriers. The other key feature of the White Paper is the recognition that not all of South Africa's power needs should and can be met by a single operator. The White Paper argues for 30% of power to be generated by Independent Power Producers (IPP). It therefore recommends the liberalisation of the energy market. Renewable energy would be a share of the IPP network. The dominant energy player for electricity is the state owned enterprise Eskom. Eskom produces 90% of all of South Africa's power. However, for IPPs to succeed there needs to be more than just be reliant on Eskom to make goodwill – Eskom should be forced to buy electricity from RE producers through a feed-in tariff like it is done in other countries. A feed-in policy process is currently being deliberated and there is big hope it should be in place within the next year.

3. The size of the RE market is dependent on how RE technologies compete with what is called the Long Run Marginal Cost (LRMC) of coal fired power stations. One should also add the cost of nuclear power here in order to determine a more fairer comparison.

However, the Department of Minerals and Energy (DME) which commissioned a study in 2004 and based RE market projections on the LRMC costs for coal-fired power stations.

The marginal cost of producing an extra kWh of electricity from coal is estimated to be about R0.2526 per kWh which was compared to current generation prices for conventional energy, estimated to be about R0.10 per kWh.

If, one were to add the social cost of coal fired power stations this is estimated to be about R0.05 per kWh, bringing the cost of coal fired power at about R0.30 per kWh with which the price of electricity generation from RE must compete with. It has to be either below or at the same price.

4. Environmental externalities have not been included in the study – and should have a much larger price effect. They have proved difficult to model in the DME study because of the availability of accurate data.  
Some form of carbon tax is essential to ensure that this externality is incorporated in future

calculations of the price of electricity. There will be a 2c per kW charge on top of the normal electricity price that will be passed onto the consumer. The extra surcharge is regarded by the Treasury as a carbon tax and is meant to bring in an extra R4 billion. The Treasury has given the public and stakeholders the assurance that it will be used to fund RE projects. However, detailed plans of how that will work have not been tabled as of yet.

5. However, the price of electricity from conventional power is likely to be far more higher than the cost predicted in the DME study in 2004. There are a number of reasons for this, 1) cost of material like cement, steel and other material have gone up, 2) the cost of labour will be high because of the shortage of engineers, project managers and other skilled workers; 3) the cost of coal has doubled in the last two years and Eskom is battling to secure long-term contracts; and finally there are always cost overruns with new large power plants which are hard to predict.

Some indicators of cost have been made mention of in the media. Most recently, it was pointed out that currently installed capacity generates power at a cost of US\$100/kW and future installed capacity will come nothing under \$1500/kW. (FM, 21 September, 2007)

Demonstrating major cost shifts in conventional power generation – all helpful for the RE market provided RE technologies can generate power at competitive prices and major stumbling blocks in a range of areas are dealt with.

6. The main barriers relate to the fact that RE is still a new market in which the sponsors are individual entrepreneurs who have a genuine interest, great zeal but suffer from all the other elements which include insufficient capital, little to no prior business experience in the energy sector and often their commercial models are not tried and tested. They have to contend with a tough market in which the transaction costs are high, mostly related to the costs associated with project identification, determining viability and financial closure. The barriers to the development of the RE sector in South Africa are no different to what has been experienced elsewhere in the world. In South Africa obtaining approvals and licenses are cited by developers as being the biggest hurdle and most time consuming project activity. Even if

the price of electricity increases it does not imply that a favourable market for RE will exist – there are often non-market barriers that affect the implementation of RE projects.

The Darling Wind Farm and the Bethlehem hydro-projects took several years to get off the ground. These drive up development cost and delays also add to the cost of finance if the cost of capital increases due to inflationary reasons. Construction cost can also be affected because both labour and material cost go up the longer the project takes to get approval. Some of the delays are a result of inefficiency in approvals, lack of experience in dealing with RE technologies in government agencies or unclarity regarding who should be giving approvals.

7. Certain projects that are owned or located on municipal property, like landfill sites or sewage plants come foul of the Municipal Finance Management Act (MFMA). Here legal restrictions have forfeited many opportunities for entrepreneurs. These legal issues involve entering public-private partnerships or laws regarding the proper disposal of state assets. Municipalities are also not allowed to enter into contracts that extend beyond three years because of the financial risk associated with long-term contracts. There are as a result onerous approval processes that municipal managers have to undergo before they can enter into partnership with the private sector, dispose of assets or sign power purchase agreements that are longer than three years. Since, this is new turf for both project developers and the municipalities it is natural that there would be difficulties around how best to proceed and enter into agreements without contravening the MFMA. For example many landfill-to-gas projects have failed to get off the ground because municipal managers have to follow very strict guidelines and rules if they want to enter into partnerships with the private sector. Landfill-to-gas (LFG) projects offer tremendous opportunity and profitable prospects for small firms willing to take the risk. They are also ideal for Certified Emissions Reductions (CERs)<sup>2</sup> because methane is being off-set earning the project potentially large revenue as reducing

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2 When a project under the Kyoto Protocol registers itself for carbon emission reductions through what is called the clean development mechanism and proves that it has generated lower or no emissions it gets what is called a certified emission reduction.

methane emissions earn a higher number of credits than reducing carbon dioxide.

### What about the non-grid sector and micro-generation

Non grid options are generally thought of as being conducive for very remote areas where grid electrification is far more costly to implement. Non-grid systems are best optimised when they integrate generation capacity with energy efficiency through good building design and reduction of consumption at the demand end. Non-grid options can either be electrified or non-electricity based.

However, the suitability of non-grid options for urban areas increases when there are shortages of power. Non-grid or off-grid systems in urban areas can be envisaged as having two models: 1) autonomous buildings, factories or offices are entirely off the grid; 2) semi-autonomous in which off-peak supply comes from the grid and peak supply is derived from the establishment's own infrastructure.

The Renewable Energy White Paper does discuss non-grid or mini-grid options as being essential in the government's vision. However, the issue is not tackled in depth in the White Paper as other grid based renewables. The policy is biased towards non-grid options for rural areas and completely ignores non-grid models for urban settings.

The reason for this is that the RDP<sup>3</sup> itself envisaged massive electrification for poor households in rural and urban areas and it was always thought that most areas would have grid connections – therefore the policy was only to concentrate in areas deemed exceptional because of their geographic location and cost associated with establishing transmission lines.

Eskom in fact did achieve an impressive programme of national grid based electrification over the last 14 years. However, the consequences are that there has been little development in non-grid options. Both the provision of free basic electricity (50kWh/month)<sup>4</sup> and the mass electrification programme has been a disincentive to look at non-grid options. Because these were cheaper and for free people did not seek alternatives as power was promised by the state through the central grid. This of course is changing as centralised supply is constrained by the shortage of generation

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3 The RDP stands for the Reconstruction and Development Programme. The RDP was document produced by the ANC before it got into power. It was a manifesto to the people of South Africa of the ANC's blueprint for social, economic and political change in concrete terms.

4 50kWh is enough power to basic lighting, small black and white TV, small radio, basic ironing and water heating through an electric kettle.

capacity and users are desperate for more localised solutions.

Before the Eskom electrification programme was rolled out about 65% of households in 1994 did not have electricity. The Eskom plan was to electrify 2.5 million households by the year 2000 – all of that has been achieved and more. By 2005 about 52% of rural households were electrified from a low base of 12% in 1994 and for the whole country about 72% of households were electrified in the same period.

With the electricity crisis there is an opportunity to relook at the issue considering that there are many constituencies like farmers, businesses, residents, industry and others looking for non-grid options – this has become more than just a option for rural areas but non-grid electrification and use of non-electric renewables are increasingly being viewed as ways to ensure energy security at the local or household level.

Further reasons for consideration of non-grid options come from taking a holistic view of electricity supply – evaluating capacity not only from the point of view of supply but also transmission and distribution. In the future even if generation capacity comes on-line problems are being envisaged in the areas of transmission and distribution where there is a significant back-log of investment in infrastructure, upgrading and maintenance.

The expectation is that considerable new innovative approaches to non-grid electrification or energy supply through renewables are most likely to emerge from the energy crisis. The cost of not doing something and being totally reliant on centralised supply is far more punitive and users are looking for autonomous systems as a backup without totally removing themselves from the existing grid system. All they want is more autonomy, security and flexibility.

## Conclusions

All of these questions about energy alternatives raise a much broader policy issue – the nature of energy policy as a whole and the nature of our energy mix. There are two ways of looking at the energy mix: the conventional way driven by assumptions of energy security as the sole premise, or a second approach that defines the energy mix equation as shifting from a high carbon and energy intensive system towards a low-energy carbon and more energy efficient system.

Rarely, if at all, is the energy equation dealt with from a sustainability point of view. This raises questions about how carbon intense the energy solutions should be vs a shift to more sustainable outcomes. Energy

consumption is the single biggest factor in a modern economy and the more carbon intense the economy is the greater its environmental impact or footprint.

Energy sustainability should be the overarching and holistic concept governing the question of our energy future. Energy sustainability should address questions of durability of the energy system and the process in which the source is secured must not have negative consequences or disrupt human and ecological systems. Jaccard an expert in this field writes:

*“Our energy system is not sustainable if it exhausts irreplaceable energy inputs: for example if we use up oil stocks and have no ready substitute. It is also unsustainable if its material and energy wastes exceed the assimilative capacity of the biogeosphere, degrading some of the services it provides such as clean air, biodiversity and fresh water. If our energy system’s CO2 emissions exceed the earth’s assimilative capacity – leading to rising atmospheric concentrations of GHGs (greenhouse gases), climate change and reduced biodiversity – again the system is unacceptable from an environmental sustainability perspective”.*

(p.37) (See Mark Jaccard, Sustainable Fossil Fuels, Cambridge University Press, UK: 2005)

Jaccard’s model is to propose a framework of shifting the debate away from energy security to energy sustainability. His proposal is pragmatic as it allows a range of energy options to be part of the equation in so far as they are a build-up to more sustainable options.

Jaccard’s approach steers us away from looking at power output per source but rather carbon dioxide emissions per source and then choosing the mix of energy sources that lead us towards more sustainable approaches.

In Jaccard’s proposal coal and nuclear power can be part of the energy mix, only in so far as the final trajectory of the energy plan is towards more sustainable solutions. In other-words he proposes a gradual, rather than radical transition from a high carbon based economy to a low-carbon based economy.

His approach at least gives wider policy space for RE rather than closing the debate off, as at present the debate is very divisive between proponents of RE and those for conventional power. The reality is that we cannot do without both, but we must at least start thinking about the future along sustainability criteria.

Jaccard’s proposal is aimed at encouraging the framing of energy policy by shifting the frame of mind and looking more closely at those factors that contribute

towards a more energy intense economy. Factors that affect the energy intensity of the economy are:

- ❑ Lifestyle choices
- ❑ Whether there are energy efficiency measures
- ❑ Change in technology – from high energy demand to low energy demand
- ❑ Heavy industry vs service industries
- ❑ Gini co-efficient (The larger the number of people that are middle class the more energy is consumed).

Energy intensity is a variable of the factors mentioned above, but does not necessarily tell us about the source of the energy. Jaccard's approach provides an interesting way of thinking about the energy issue by introducing the criteria of energy sustainability and using carbon intensity as a key measure. The proposition dwells on the fact that you can have a mix of energy

options so long as they meet the sustainability criteria.

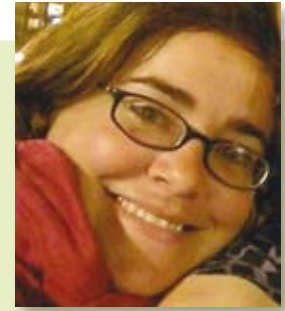
Therefore the RE debate in South Africa should not be about RE vs nuclear or coal, but RE as part of a strategy towards sustainability – in that way the RE target can either be increased or is simply not part of South Africa's energy equation. RE's contribution can be much larger than it presently is – it can be increased up to 10-15%. And, that would be a more serious commitment for the government than the current 4%.

## Biography

### Maya Aberman

Maya is a Bachelor of Science graduate from the University of Cape Town and worked as campaign coordinator of the Nuclear Energy Costs the Earth Campaign (NECTEC) of Earthlife Africa in Cape Town. Earthlife Africa is one of the leading voices on environmental issues in South Africa. NECTEC is committed to the total eradication of the nuclear energy industry in Southern Africa, opposing all aspects of nuclear power generation and the consequent lack of safety for people and our environment.

Maya is a founding member and was elected to the advisory board of the African Youth Initiative on Climate Change. She was invited to the board of the South African Climate Action Network and elected to the Executive Committee of the Coalition for Environmental Justice. Most recently a member of the Provincial Development Council in the Western Cape, Maya will shortly depart for Mozambique where she will be working in the field of sustainable and community development.



# Implications of nuclear energy expansion for energy supply and deepening democracy in South Africa

*In late December 2005, a loose bolt in the generator of one of the nuclear reactors at the Western Cape's Koeberg Nuclear Power Station caused several power outages over the next months, eventually resulting in almost 2 weeks of rolling blackouts across the province in February. This was the beginning of what has now become two and a half years of power shortages across the country, known as the South African energy crisis. Electricity demand outstrips supply and is likely to do so for several years more as new capacity is installed. Our energy crisis is occurring against an equally undesirable global energy context; record high oil prices, the crops for fuel or food competition and the doom of climate change. Politically, South Africa is equally challenged. Thabo Mbeki, South Africa's president, will complete his second presidential term in 2009. The contest for the future presidency and any associated changes in policy and leadership style has divided the ruling African National Congress (ANC) and its allies. One of the key issues of contention in this political debate is the centralisation of power that has characterised the Presidency.*

*This piece will explore the South African energy picture, and examine the case for nuclear energy as an expanded portion of the energy mix. It will seek to understand the implications of expanding nuclear energy capacity in South Africa for energy supply and for democracy.*

### The South African Energy Picture

Under the Apartheid government, South Africa's energy picture was dominated by centralized production of coal-fired electricity sold for cheap prices. Driving this paradigm were; the energy security concerns of the Apartheid government, its failure to consider health and environmental consequences of energy derived from coal-fired power stations, and the focus on supplying resources

to mining and other industrial heavy users. Due to an excess of electricity supply in the 1980s and 1990s, electricity intensive industries were 'encouraged in order to 'mop up' the excess'.<sup>1</sup> Subsequent work by the new democratic government from 1994 has unfortunately yielded little change in practical terms.

<sup>1</sup> Ward, S. *The New Energy Book for Urban Development in South Africa*, Sustainable Energy Africa, 2008

The Department of Minerals and Energy (DME) did begin progressive processes to consider basic needs of citizens and environmental and health consequences of energy choices post-1994. However, the entrenched energy intensive economic base and current electricity supply concerns has meant that the DME has put its consultative, integrated energy planning process on hold and is forging ahead with bringing mothballed power stations on line and pursuing nuclear power plans.<sup>2</sup> One of the failures of the new dispensation was to sufficiently encourage diversification of energy supply and energy efficiency while still maintaining existing infrastructure and increasing supply to match increasing consumption. The result of these failures has been the current energy crisis.

Meeting the goal of eradicating poverty will involve providing employment and access to the basic services that continue to elude a significant portion of South African citizens. Energy, as a key component of life and a driving force for growth and development will play an integral part in meeting these goals. This places South Africa at a crossroads with respect to energy choices. There are a variety of energy generation and conservation technologies at our disposal. As with all choices, each of these technologies has consequences- advantages and disadvantages. It is important that we prioritise health and safety, job creation, affordability and access when we make these choices. In addition, the threat of climate change looms large and finding cleaner energy sources is a big challenge. It is evident that South Africa needs to move away from coal-fired power, but the Government's move towards nuclear power as an alternative has sparked controversy.

South Africa currently has one operating nuclear power station situated just outside Cape Town in the Western Cape. It contributes between four and six percent of the total South African production and is operated by Eskom, South Africa's sole electricity utility, responsible for over ninety percent of electricity production in South Africa. Additional research and storage takes place at Pelindaba in the Gauteng Province – the site of the Nuclear Energy Corporation of South Africa (NECSA). Waste from both these sites is deposited at a facility in the Northern Cape Province called Vaalputs. The South African Government has made known its intention to embark on a radical expansion of nuclear energy activities in South Africa. Among the plans are the

2 Ibid

Pebble Bed Modular Reactor (PBMR) demonstration model, ten new Pressurised Water Reactors (PWRs), uranium mining and enrichment, and fuel fabrication.

### Economic Realities

Nuclear power is expensive electricity. Nuclear energy is on average between 2 and 4 times more expensive than electricity from fossil fuels. States in the USA with nuclear power charge, on average, 25% more for their electricity.<sup>3</sup> The costs of nuclear power do not stop once plant construction is completed. Nuclear plants need to be decommissioned after their (approximate) 40-year life span. The radioactive spent fuel produced by nuclear reactors needs to be stored safely for thousands of years before it loses potency, which has enormous cost, health, environmental and social implications.

Nuclear power projects have a variety of negative systemic impacts, including: the need for inefficient large grid systems; the need for expensive state regulatory and disaster management institutions and infrastructure; blocking of innovation in the supply and demand sectors, as well as in the development of efficient small-scale plants.<sup>4</sup>

A recent report, prepared for Greenpeace International, *The Economics of Nuclear Energy*, highlights some interesting facts in this regard. Currently, there are only 22 reactors under construction in the world. Construction on five of these began over 20 years ago. Of the remaining 17, construction of 14 is currently suspended. In India, the country with the most recent and current construction experience, completion costs of the last 10 reactors have averaged at least 300% over budget.<sup>5</sup> The widely lauded nuclear renaissance may be in actuality little more than hype.

In South Africa, there has been a remarkable escalation of projected costs for the Pebble Bed Modular Reactor project since the announcement of the government involvement in the project in 1998. The PBMR is a version of a group of reactors termed high temperature gas-cooled reactors (HTGCR), a so-called and unproven 'fourth generation' nuclear technology abandoned by Germany.<sup>6</sup> Despite an as yet unfinalised design or Environmental Impact

3 Lakhani, M. *Nuclear Energy: the Counter Debate*, The Enviropaedia, 2004

4 R. Sherman & R. Worthington, *Pretenders & Providers: Why Nuclear Power doesn't make Climate Sense*, Sustainable Energy & Climate Change Partnership (SECCP), 2001

5 Thomas, S., Froggatt, A., Bradford, P., Millborrow, D., *The Economics of Nuclear Power*, Greenpeace International, December 2007

6 Hallowes, D. & Munnik, V., *Peak Poison, The elite energy crisis and environmental justice*, groundWork, November 2007

Assessment and lack of any construction, costs have escalated drastically from R2 billion in 1999 to R16 billion in 2007. This could increase to as much as R25 billion if decommissioning costs are included.<sup>7</sup> As a result of lapsed shareholding contracts, ownership of PBMR Pty (Ltd) has reverted to the South African Government. The cost of electricity can only be brought down to competitive levels once 32 reactors have been built, a very unlikely scenario, given that not a single order has been placed to date.<sup>8</sup>

The average construction time for nuclear plants has increased from 66 months in the mid 1970's to 116 months (nearly 10 years) for completions between 1995 and 2000.<sup>9</sup> The PBMR project is being developed according to several different phases – feasibility, demonstration and commercialisation. The commercialisation phase is the last phase of the project, when it is supposed that PBMR units will be sold to power producers. The expected date of the commercialisation phase has continued to slip since inception of the project, from 2007 in 1999 to 2015 in 2006.

With respect to costs for the renewable energy technologies, nuclear energy is the same cost as or less expensive than other, different technologies. However, the main difference to note is that while the costs of nuclear energy are constantly rising, the market for, as well as the rate of technological innovation in, the energy efficient and renewable energy sectors are growing rapidly, leading to decreasing costs for renewables. 'You get six times the reduction in carbon dioxide by investing in energy saving rather than nuclear power.'<sup>10</sup> It is essential to acknowledge that, with or without climate change, nuclear power is simply not economic.

### Uranium Supply and Climate Change

Much is made of the recent resurgence of interest in uranium as a valuable resource. The South African government has displayed enthusiasm about South Africa's uranium reserves and the potential to exploit these to supply our own nuclear industry and also as an export product. In that context perhaps a focus on some of the lesser publicized facts about uranium is wise.

Current supplies of uranium ore are insufficient to

fuel current demand for nuclear energy.<sup>11</sup> The excess demand, of approximately 37%, is met by stockpiles accumulated before 1980. These stockpiles are derived in part from the conversion of old nuclear weapons. Within ten years these stockpiles will be exhausted. According to information presented in Parliament by Professor Eugene Cairncross of the Cape Peninsula University of Technology, if current demand (assuming no significant increase in nuclear power capacity) is to be met, new production will have to be increased by about 50%.

Carbon dioxide is produced by every step in the nuclear fuel cycle except the actual fission in the reactor. Fossil fuels are involved in the mining, milling and enrichment of the ore; in the fuel-can preparation; in the construction of the station and in its decommissioning; in the handling of the spent waste and its re-processing; and in digging the hole in the rock for its deposition. Uranium enrichment, in particular, is incredibly energy intensive. If nuclear energy generation is to expand, demand for uranium will increase and lower and lower grades of this ore will be used. This will result in an increase in carbon emissions. As more and more marginal deposits or uranium ore are exploited, it is not simply the energy demand of mining that climbs, but also the energy demand for fuel fabrication, including uranium enrichment, which increases. This reality casts further aspersions on the false claim by the nuclear lobby that it offers us a climate change saviour. In comparison to renewable energy, nuclear power releases 3-4 times more CO<sub>2</sub> per unit of energy produced taking account of the whole fuel cycle.<sup>12</sup>

It is likely that in the recent future (to 2020), given long lead times and problems experienced with new uranium mining capacity, coupled with the existing shortfall, it will be difficult to meet even current demand for uranium. Large parts of the presently quoted reserves (about half) are marginal already. This is the case in Namibia, South Africa, Kazakhstan and with the Olympic Dam mine in Australia.<sup>13</sup> It thus seems almost impossible that we will be able to fuel the hypothesized massive nuclear expansion programme planned by our cabinet and corporations around the world. Jan Willem Storm van Leeuwen, an independent nuclear analyst writing for the Oxford

7 Thomas, Steve. *The Economic Impact of the Proposed Demonstration Plant for the Pebble Bed Modular Reactor Design*, University of Greenwich, UK, 2005

8 Earthlife Africa, *PBMR Update*, Earthlife Africa, January 2008

9 Thomas, S., Frogatt, A., Bradford, P., Millborrow, D., *The Economics of Nuclear Power*, Greenpeace International, December 2007

10 Meyer, N. in Ward, S., *The New Energy Book for Urban Development in South Africa*, Sustainable Energy Africa, 2008

11 Van Leeuwen, J.W.S., *Energy Security & Uranium Reserves*, Oxford Research Group, July 2006

12 Friends of the Earth International (FoEI), *Special Briefing, Nuclear Power and Climate Change*, FoEI, November 2000

13 Van Leeuwen, J.W.S., *Energy Security & Uranium Reserves*, Oxford Research Group, July 2006

Research Group, has concluded that if global nuclear energy production is maintained at 2005 levels, by 2016 the mean grade of uranium ore would have fallen significantly from today's levels and even more so after 2034. In 60 years "the world nuclear power system will fall off the 'Energy Cliff' – meaning that the nuclear system will consume as much energy as can be generated from the uranium fuel."

These realities about uranium imply not only that we are rapidly approaching uranium peak, but also that nuclear plant life-cycles are shorter than we may have imagined and that the fuel cost for this energy generation technology is likely to be higher than Uranium vendors ever dreamed of.

Committing South Africa to investment in a recently estimated R400 billion<sup>14</sup> nuclear energy expansion programme seems foolhardy. Founding energy generation in South Africa on a fuel that will be prohibitively expensive, in terms of both absolute and energy cost, in 70 years seems nonsensical. Apart from the obvious, what we also risk is the opportunity cost. Putting at least 10-20% of our eggs into the renewable energy basket now, rather than sighing over the broken eggs in the nuclear basket in ten years time, seems the sensible option.

### Health & Environmental Impacts

There is no such thing as a safe dose of radiation. There is no debate as to whether radiation kills, maims, causes mutations, is cumulative, causes leukaemia, cancers, respiratory illnesses and attacks the immune system (with children, pregnant women and the elderly most vulnerable) because we already know it does.<sup>15</sup> The only disagreement is about what is legally considered an allowable dose.

Uranium mining is responsible for the greatest proportion of the health-related damages of the nuclear power industry. Nuclear energy has also been proven to carry the grave risk of accidental explosions resulting in the release of large quantities of radiation causing grave illness and death in tens of thousands of people.

There is no responsible way to "dispose" of radioactive waste and it can remain dangerous for hundreds of thousands of years, equivalent to 10 000 generations. There is no plan in place for the long-term storage of, or any final disposal site for, radioactive waste anywhere in the world. Low-level

nuclear waste storage sites are built in rural areas far way from densely populated areas. Is it fair to expose people to such risks simply because they live in rural areas that are generally not well represented and without political influence? Nuclear waste is a responsibility for hundreds of thousands of years and it will be future generations that will bear the much of the health, environmental and financial costs. The best solution would be not to produce any radioactive wastes in the first place; the next best is to stop producing more now.

### Public Institutions & Nuclear Energy

Nuclear energy has emerged in South Africa and globally from governments and regimes where military secrecy and security were fundamental principles of governance. Nuclear energy requires, as a result of its very nature, secrecy and high levels of security. In the year following the start of the electricity shortages, the National Energy Regulator of South Africa (NERSA) undertook an investigation into events at Koeberg Nuclear Power Station. NERSA indicated in its report that problems at Koeberg commencing in November 2005 could be attributed to negligence and inadequate corrective action on the part of personnel. It was alleged that Eskom has failed to respond to warnings and has failed to test vital equipment for years. 'It is shocking that such information should have been withheld from the public. It is essential that the public be reminded that Eskom and its operations are a people's resource and should be governed according to the will of the people. Such institutions must ensure compliance with the law, among which is the constitutional right to a healthy, safe and clean environment as well as the information that can help us to achieve a health, safe and clean environment,' says Earthlife Africa in a statement following the release of the NERSA report, 'Even more alarming is that it has taken NERSA and not the National Nuclear Regulator (NNR)<sup>16</sup> to make these discoveries.

These are neither the first nor the only problems to be noted with the ability of the NNR to regulate the nuclear industry. The NNR is also severely lacking in capacity. From an administrative point of

14 Approx. 33,000,000,000 (33 billion) Euro as per July 2008.

15 Bertell, R., *Health and Safety Implications of Nuclear Development: The International Experience, in The Nuclear Debate: Proceedings of the Conference on Nuclear Policy for a Democratic South Africa*, 1994

16 The National Nuclear Regulator is a South African national institution under the authority of the Minister of Minerals and Energy. The NNR was established "provide an effective and efficient national regulatory framework for the protection of persons, property and environment against nuclear damage" (NNR Mission Statement). It is charged with independently assessing the nuclear industry.

view, it is very difficult for civil society to engage with the regulator. This is because telephone and written correspondence are not responded to; it is difficult to access documentation and to arrange meetings. Furthermore, the NNR has admitted that it lacks capacity in its regulatory role. It will need to engage foreign assistance in order to license the PBMR. Further it has admitted to lacking capacity to independently evaluate medical reports.

### Energy Governance & Nuclear Energy

Problems with the independence of the NNR are serious and yet are only the beginning of a chain of systemic problems with energy governance in South Africa. The NNR sits within the Department of Minerals and Energy, a department which is actively promoting the expansion of nuclear energy in South Africa. The Minister of Minerals and Energy is responsible for the appointment of the board of the National Nuclear Regulator. The constitution of the board – numbers of representatives from different sectors etc – is also determined by the Minister. The former licensing officer of the PBMR Pty Ltd is current Chief Executive Officer of the NNR. This is a clear conflict of interest, where the Minister and the Department of Minerals and Energy play the roles of both coach and referee. The SA White Paper on Energy (1998) states, “Government will ensure that decisions to construct new nuclear power stations are taken within the context of an integrated energy policy planning process with due consideration given to all relevant legislation, and the process subject to structured participation and consultation with all stakeholders.” Such a process has never been completed.

In the year 2000, the South African government commissioned a panel of international experts to investigate the feasibility of the PBMR from a variety of different angles – safety, economics etc. This report has never seen the light of day, despite repeated requests from civil society bodies for access to the information contained in the report. Environmental justice organisation Earthlife Africa (ELA) has been engaged for several years in an access to information court case against Eskom for access to Eskom board minutes pertaining to the PBMR. ELA is represented in this matter by the Open Democracy Advice Centre (ODAC). ELA had this to say about the PBMR feasibility report and Eskom board minutes; ‘It is remarkable to Earthlife Africa that information crucial to making an informed

decision about the wisdom of investing public money in PBMR developments is being withheld. In any corporate setting, investors must be provided with all the facts before justifying any capital outlay. So too, in ELA’s opinion, do the tax-payers of South Africa have a right to information before R16 billion of public money is spent on PBMR developments. The National Environmental Management Act (NEMA) requires that an Environmental Impact Assessment (EIA) take full account of any environmental and socio-economic impacts. This type of assessment is surely, in ELA’s view, not comprehensive while in certain aspects of the project are kept secret.’

Eskom is a state-owned institution and is also responsible for almost all of electricity generation in South Africa. The South African government therefore has a vested interest in the sale of electricity. Such strong ties between these two institutions are very problematic from a transparency and accountability perspective.

Imagine a South Africa with ten conventional nuclear power stations, ten PBMR’s, uranium mining and enrichment, nuclear fuel fabrication and all of the associated infrastructure. These are the plans for which the South African government has already put policy in place. Consider the security apparatus that will be required to protect the public from exposure to accidental or wilful exposure to radiation when nuclear energy proliferates around South Africa. Between 1993 and 2004, the International Atomic Energy Agency (IAEA) confirmed 662 incidents involving illicit trafficking of radiological materials.<sup>17</sup> Consider the heightened institutional secrecy that will be necessary to safeguard the dangerous nuclear material being used to generate our electricity. It begs the question; does this not make a return to the security state of the Apartheid era almost inevitable? ‘At workshop after workshop people stated as their highest priority their need for energy information and for energy capacity at the local level.’<sup>18</sup> What hope can the fledgling South African democracy have in the face of such challenges to its transparency and accountability?

### Energy for Sustainable Development

Despite the obvious flaws of nuclear energy, South Africa does need to make more energy available. The first and lowest hanging fruit is to maximise

<sup>17</sup> <http://www.iaea.org/NewsCenter/Features/RadSources/PDF/chart2>.

<sup>18</sup> Ward, S., *The New Energy Book for Urban Development in South Africa, Sustainable Energy Africa*, 2008

energy efficiency. South Africa is among the world's least efficient economies.<sup>19</sup> Industry in South Africa consumes approximately 40% of our energy production, while transport and the commercial sector make up an additional 40%. The residential sector is responsible for less than 20% of consumption. Nevertheless, it is our country's citizens, many of them poor, who pay the highest price per unit of electricity. Full-cost accounting for energy generation, where social and economic consequences of energy generation are factored into the price, needs to be implemented. Becoming an energy efficient economy would make additional energy available for growth and development and at the lowest cost. During the period that one of Koeberg's units was out of operation, causing severe electricity shortages in the Western Cape, an electricity savings target of approximately 350MW was identified and achieved. Says Earthlife Africa; 'The Western Cape was able to achieve electricity savings of 350 MW by spending only R400 million. Given that one PBMR will only produce 165 MW at a cost of R16 billion, can there be any doubt about which is a better option?'

In the medium term it is possible to supply all of the world's energy needs through renewable sources based on current technology (i.e. not including the further developments to be made in the future).<sup>20</sup> This scenario has been depicted in three separate studies, compiled by The Union of Concerned Scientists in the USA (1978); The International Institute for Applied Systems Analysis for Europe (1981); Enquete Commission of the German Bundestag (2002). Whilst none of these studies have ever been seriously refuted, they have all been largely ignored by conventional experts (Scheer, 2004).<sup>21</sup> South Africa is rich in wind, solar and ocean RE resources. A mix of these technologies could provide all of South Africa's energy requirements. Studies have shown clear evidence that there are sufficient RE resources in South Africa to provide for 13% of the electricity demand by 2020, and easily 70% or more by 2050.<sup>22</sup>

Nuclear power projects require highly specialised international expertise and technology and thus always involve net job loss in energy provision.<sup>23</sup> Nuclear

energy is capital intensive and most often requires medium to highly skilled employees. An AGAMA Energy study commissioned by the Sustainable Energy & Climate Change Project in 2003 showed that while nuclear energy would create approximately 0.1 jobs per GWh, renewables far exceed this. For example, wind energy will create 12.6 jobs per GWh and solar panels will create 62 jobs per GWh.

## Conclusion

The South African energy crisis has arisen as a result of the Apartheid regime's commitment to energy for security and industry. It has persisted as a result of the current ANC Government's commitment to the centralisation of power and its failure to adequately diversify energy supply. This paper has illustrated that nuclear energy is both economically unwise and a threat to human and environmental health. Our public institutions and leaders have shown themselves to be unable to govern with transparency and accountability when it comes to nuclear energy. A massive expansion of the nuclear energy programme, as is planned by current South African Government policy, would further undermine our democracy.

We are uniquely poised in South Africa to embark on a sustainable development path that will be beneficial for our citizens in terms of meeting basic needs, creating employment and eradicating poverty. We have the opportunity to leapfrog the unfortunate nuclear choices of developed nations and invest wisely in sustainable energy choices and technologies. These technologies will not be only materially beneficial but beneficial to us in contributing towards deepening our democracy by creating a universal franchise of access to energy and information. Sarah Ward's words serve as the best counsel for our next steps; 'The next frontier is galvanizing the potential that cities have to change the South African energy picture from a focus on fossil fuels and centralized control to one where energy sources are diverse, control and ownership is more decentralized and sustainability is a priority.'<sup>24</sup>

19 Ibid.

20 R. Sherman & R. Worthington, *Pretenders & Providers: Why Nuclear Power doesn't make Climate Sense*, SECCP, 2001

21 WISE Nuclear Monitor, *Nuclear energy as a solution for climate change?*, WISE Nuclear Monitor, February 2005

22 SECCP, *Sustainable Energy Briefing 5: The potential contribution of renewable energy in South Africa*, SECCP, May 2005

23 R. Sherman & R. Worthington, *Pretenders & Providers: Why Nuclear Power doesn't make Climate Sense*, SECCP, 2001

24 Ward, S. *The New Energy Book for Urban Development in South Africa*, Sustainable Energy Africa, 2008

*Perspectives* is published by the HBS Southern Africa Office in Cape Town.

The views expressed in this publication are those of the authors and do not necessarily reflect the views of the HBS.

Hard copies of *Perspectives* are available from our Cape Town office, and electronic versions at [www.boell.org.za](http://www.boell.org.za)

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