



## The Implications of South Africa's Nuclear Power Programme

### 1. Introduction

The demand for energy continually increases with South Africa's developing population and economy. Nuclear power has been touted as one of the solutions to meet this ever-increasing demand especially as, according to its proponents, it generates electricity in an environmentally responsible manner. South Africa's only nuclear power plant, Koeberg, situated 30km north of Cape Town, consists of two pressurized water reactors, better known as EPR units. According to the 2012 national budget review, South Africa plans to build three new nuclear power plants, comprising six reactors, which will provide 9 600MW of power by 2029. The proposed sites are, once again, Koeberg; Bantamsklip on the southern Cape coast about seven kilometres from Pearly Beach; and Thyspunt in the Eastern Cape, near Cape St Francis. Koeberg currently produces 1 800MW of electricity.<sup>1</sup>

### 2. Policy Development

The government's decision to pursue the nuclear option is based on the 2010 Integrated Resource Plan (IRP), which called for planning to identify the lowest-cost methods of meeting electricity demand by considering all resources, including energy efficiency measures. The IRP envisages 9600 MW of new nuclear capacity to be completed between 2023 and 2030.<sup>2</sup>

The revised demand projections indicated that no new nuclear base-load capacity would be required until after 2025 (and for lower demand not until at the earliest 2035) and that there are alternative options, such as regional hydro, that could meet the energy requirement before prematurely committing to a technology that may be redundant if the electricity demand expectations do not materialise. This shift in anticipated demand

would require a reduction in nuclear capacity from 11 400MW to 6 660MW (of which Koeberg would still contribute 1 800MW, implying only 4 860 MW of new nuclear capacity). The gas capacity increases to 3 550 MW; while concentrated solar power (CSP) increases substantially; the incorporation of new wind data into the model decreases the wind capacity; and solar photovoltaics (PV) increase slightly. After different energy requirement scenarios were tested, the total capacity required amounted to 8 182 MW less than that foreseen in the IRP 2010, which would have an impact on electricity prices over the next fifteen years.<sup>3</sup>

According to the Integrated Resource Plan, more nuclear energy plants will need to be commissioned from 2023/24. Although nuclear power does provide a low-carbon base-load alternative, South Africa needs a thorough investigation on the implications of nuclear energy, including its costs, financing options, institutional arrangements, safety, environmental costs and benefits, localisation and employment opportunities, and uranium enrichment and fuel fabrication possibilities. While some of these issues were investigated in the IRP, a potential fleet of nuclear power stations will involve a level of investment unprecedented in South Africa. An in-depth investigation into the financial viability of nuclear energy is thus mandatory.

In November 2011, the National Nuclear Energy Executive Coordinating Committee (NNEECC) was established by Cabinet. This body was tasked with providing oversight and decision-making on nuclear policy and the new build programme and, accordingly, was mandated to make a final decision on South Africa's nuclear future, especially after actual costs and financing options were revealed.<sup>4</sup> On 27 March 2015, President Zuma informed the nation that in June 2014, the NNEECC was converted into the Energy Security

Cabinet Subcommittee (ESCS), responsible for oversight, coordination and direction of activities for the entire energy sector. The committee comprised the following members:

- The Minister of Energy, Ms Tina Joemat-Pettersson;
- The Minister of Public Enterprise, Ms Lynne Brown;
- The Minister of International Relation and Cooperation, Ms Maite Nkoana-Mashabane;
- The Minister of State Security, Mr David Mahlobo;
- The Minister of Finance, Mr Nhlanhla Nene;
- The Minister of Trade and Industry, Dr Rob Davies;
- The Minister of Economic Development, Mr Ebrahim Patel;
- The Minister of Mineral Resource, Advocate Ngoako Ramatlhodi;
- The Minister of Environmental Affairs, Ms Edna Molewa;
- The Minister of Defence and Military Veterans, Ms Nosiviwe Mapisa-Nqakula.<sup>5</sup>

### **3. Roundtable Discussion**

The CPLO was driven to organise a roundtable discussion on the Implications of a South African Nuclear Build on 22 May 2015 in order to explore the pending procurement. The speakers at the occasion were Mr Shane Pereira from Lesedi Nuclear Services; Mr Andrew Kenny, an independent energy consultant; Ms Liz McDaid from the Southern African Faith Communities' Environment Institute (SAFCEI); and Mr Saliem Fakir from the World Wildlife Fund (WWF). Mr Pereira examined the construction implications of such an infrastructural endeavor; Ms McDaid focused on the socio-economic implications, exploring the legacy of nuclear energy in South Africa as well as in other countries worldwide; Mr Kenny looked at the positive results of having nuclear as our main source of energy; and Mr Fakir

spoke about other energy options we could adopt instead of going the nuclear route.

A big disadvantage of the nuclear option is the large capital investment required. Vital as energy security is, spending approximately R1trillion on an energy venture may bring about problems of constitutionality. The subject of base-load power was a recurring issue in the discussion, as nuclear proponents consider it as the perfect replacement for coal; and they doubt whether renewable sources of energy can deliver reliably. On the other hand, civil society has to ensure that the procurement deals do not indemnify the nuclear vendors from liability claims in the event of any radiation accidents.

The fact is that coal and nuclear offer relatively long-term solutions, while South Africa faces an immediate power crisis. This is where renewable energy does play a role, as it has much shorter lead-in times to become operational. For example, wind farms can be built when required, and comparatively cheaply. It was pointed out that nuclear energy means highly centralised stations, unlike renewables, which can be spread out more in alignment with the country's natural resources. The incremental commodification of nature was queried: who bears the burden and who gets the benefit? One poignant remark was that the rich will go off the grid, using private renewable sources of energy, while the poor will suffer and bear the brunt of the rising electricity costs. There was no unanimity on what the implications of a South African nuclear build would be, but the discussion did clearly outline worries about corruption and management, and the transparency of any deal that is brokered.

### **4. Nuclear Developments**

#### ***4.1. Project implementation***

South Africa's energy plan lists Eskom as the owner and operator of the 9 600 megawatts of nuclear-powered generating units that are to be built by 2030. However, on 2 June 2015, Zizamele Mbambo, Deputy Director-General of Nuclear at the Department of Energy, confirmed that Eskom had approached government and said that in its present situation it cannot handle the nuclear build program. Thus, it seems that the Department of Energy will be the implementing agency instead, which alters government's current policy. A dedicated management team is being set up to run the process; they will consult with Eskom, the

South African Nuclear Energy Corporation (Necsa) & the National Nuclear Regulator (NNR) in this regard.<sup>6</sup>

#### **4.2. Governance**

The NNR's preparedness for a nuclear build is assessed in terms of regulatory readiness, human resource and skills readiness, international relations and cooperation, and its preparedness to dealing with challenges. A self-assessment was carried out in 2010 with the assistance of the International Atomic Energy Agency (IAEA) tools, where a number of gaps were identified in the regulatory framework. Subsequently an action plan was developed to address the gaps, while new regulations were developed and finalized in 2014; these were submitted to the Minister of Energy for further processing and promulgation. A draft amended NNR Act has been submitted to the Minister of Energy in 2014 and will be in effect by mid-2017, subject to legislative and other processes.<sup>7</sup> Financial viability and sustainability was one of the specific areas of concern that required keen monitoring, as NNR faced insufficient funding due to the diminishing state allocation, coupled with delays in the approval and gazetting of authorisation fees, difficulties in economic conditions, and non-payment of authorisation fees by some authorisation holders. A revised financial model should assist in alleviating this risk once it is approved by the executive authority.<sup>8</sup>

#### **4.3. Procurement**

During the 2014 State of the Nation Address (SONA), President Zuma announced that nuclear energy would eventually provide more than 9 Giga Watts (9 600MW) of electricity in the energy mix. In the same year the Department of Energy signed inter-governmental agreements (IGAs) with Russia, France and China. Since then, further agreements have been signed with the USA and South Korea, and negotiations are underway to conclude IGAs with Canada and Japan. These IGAs lay the foundation for cooperation, trade and exchange of nuclear technology, as well as procurement. The IGAs described broad areas of nuclear cooperation, but they differ in emphasis based on the unique package offered by each country. The vendors made presentations on their offerings for the full nuclear value chain, including areas such as the technology, uranium mining, conversion, enrichment, fuel fabrication, localisation and industrialisation, power generation, safety and licensing, job creation,

research and development, skills transfer, and development. The conclusion of this vendor parade marks a significant milestone in the pre-procurement phase for the roll-out of the nuclear new build programme. Going forward, government will design and launch a formal procurement process.<sup>9</sup>

Deputy Director-General Mbambo, claims that the Nuclear Build Programme will create approximately 30 000 to 180 000 direct and indirect job during the 10 year construction phase; and in the range of 12 000 and 30 000 direct and indirect jobs during the operational period of 50 years. Nuclear energy, the government argues, will provide low cost, reliable base-load electricity. The main challenge with the nuclear programme, however, is around funding for capacity building and training for the programme. The Department of Energy is engaging with National Treasury on this matter.<sup>10</sup>

### **5. Concerns**

In the forefront of the procurement process, it must be noted that the Constitution of South Africa specifically regulates public procurement. Section 217 of the Constitution provides as follows:

- (1) "When an organ of state in the national, provincial or local sphere of government, or any other institution identified in national legislation, contracts for goods or services, it must do so in accordance with a system which is fair, equitable, transparent, competitive and cost effective".<sup>11</sup>

#### **5.1. An opaque process**

At this early stage of the process, warnings have already been given that the procurement is not happening in a transparent manner. Both the energy minister and various officials have declined to provide details of agreements, or to indicate which the preferred partner country(ies) are. Suggestions by Russian officials that their bid is the one most favourably considered by the SA government have not been convincingly rebutted. All this also calls into question the fairness and equitability of the process.

#### **5.2. Unaffordability**

Over and above the procurement process itself, many activists and experts are troubled by the

magnitude of the envisaged expenditure. The figure of R1 trillion (roughly equivalent to SA's total annual budget) has been widely mentioned, and no-one in government has suggested that this is unrealistically high. However, past experience with 'mega projects' such as the Gautrain and the World Cup stadiums suggests that the final cost is likely to be significantly higher than that first envisioned. The Medupi power station, for example, was initially forecast to cost R35 billion. Government now admits that its final price tag will be at least R105 billion, while private sector experts suggest anything from R150 to R300 billion (bearing in mind that Medupi is not scheduled to be completed for another six years at least).<sup>12</sup> If something similar were to occur with the nuclear power stations – and there is no reason to assume that it won't – the final cost could well be between R2 and R4 trillion. Given that Eskom's current credit-rating (which determines its ability to borrow money internationally) is at 'junk' status, and given that the government's budget deficit is already on an upward path, it is something of a mystery to know where R1 trillion, let alone R2 or R3 trillion, are going to be found.

### **5.3. An obsolete idea?**

But perhaps the most worrying aspect of the nuclear build programme is that it is taking place at a time when investment in alternative energy sources is surging ahead, and when the unit cost of sustainable electricity is coming down. Two recent studies quoted in *Business Day* indicate that wind and solar energy, along with coal (to which we are already deeply committed) are considerably cheaper per unit than nuclear; only diesel and gas turbines are more expensive.<sup>13</sup>

There is no doubt that alternative energy is going to grow in South Africa. We have among the world's greatest solar energy potentials, and we are making enormous strides in wind energy as well. In 2012, South Africa was among the world's top ten investors in renewable energy, surpassing much bigger economies such as Brazil and France<sup>14</sup>, and the pace of investment has, if anything, picked up since then. To give credit where it is due, Eskom, along with numerous private sector partners, has been in the forefront of this process.

It is all the more curious, therefore, that the authorities should be planning to spend so much money on extremely expensive technology, that is ultimately reliant on the support of international partners whose loyalty cannot be taken for granted; and which allows for no sharing of the cost by the private sector. The whole burden is going to fall on the shoulders of South African taxpayers and consumers. The situation is very different with renewable energy, where relatively small amounts – in the tens or hundreds of millions of Rands – can be readily supplied by entrepreneurs who build wind-farms or solar energy plants and add their output to the national grid.

## **6. Conclusion**

It is undeniable that South Africa is in the throes of an energy crisis that could have further economic and other adverse repercussions. The country simultaneously faces a host of major development challenges, exacerbated by the legacy and structures of apartheid. These include a dramatic gap between rich and poor, lack of infrastructure, high levels of urbanisation and unemployment, extreme inequality and poverty, and huge backlogs in service delivery to the majority of South Africans. Nuclear energy proponents consider it to be the solution to our energy woes, and it is clear that government has riskily chosen to pursue the nuclear build in the face of financial and infrastructural limitations. South Africa needs a substitute plan, a 'Plan B', should nuclear energy prove too expensive, sufficient financing be unavailable, or timelines too tight. As stated in the National Development Plan, all possible alternatives need to be explored because the implications of the proposed nuclear build are extensive and far reaching indeed. South Africa's governance track record needs to be looked at realistically; and an active citizenry must make sure that it does not end up paying for an ill-advised and needlessly expensive 'mega-project'.

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<sup>1</sup> Dzebu, S and Siphuma, P. 'South Africa's Impending Nuclear Plans'. *South African Catholic Bishops Conference Parliamentary Liaison Office Briefing Paper 290* – May 2013.

<sup>2</sup> Integrated Resource Plan 2010.

<sup>3</sup> IRP 2010-2030 UPDATE REPORT – November 2013.

<sup>4</sup> National Development Plan 2030.

<sup>5</sup> President Jacob Zuma's Written Reply to Questions in the National Assembly – 23 March 2015.

<sup>6</sup> South African Nuclear Programme: briefing by Department of Energy, South African Nuclear Energy Corporation and National Nuclear Regulator- 02 June 2015.

<sup>7</sup> South African Nuclear Programme: briefing by Department of Energy, South African Nuclear Energy Corporation and National Nuclear Regulator- 02 June 2015.

<sup>8</sup> STRATEGIC PLAN OF THE NATIONAL NUCLEAR REGULATOR 2012 – 2017. <http://www.nnr.co.za/wp-content/uploads/2015/strategic-plans/NNR-Strategic-Plan-2012-2017.pdf>

<sup>9</sup><http://www.energy.gov.za/files/media/pr/2014/MediaRelease-Government-concludes-round-two-of-the-Nuclear-Vendor-Parade-Workshops-26-Nov-2014.pdf> - 26 November 2014 Media Statement Department of Energy.

<sup>10</sup> South African Nuclear Programme: briefing by Department of Energy, South African Nuclear Energy Corporation and National Nuclear Regulator- 02 June 2015. <http://www.sanews.gov.za/south-africa/energy-department-ready-procure-nuclear-energy>

<sup>11</sup> The Constitution of Republic of South Africa, 1996.

<sup>12</sup> <http://www.news24.com/SouthAfrica/News/Medupi-will-cost-R105bn-to-complete-for-now-20150703>

<sup>13</sup> <http://www.bdlive.co.za/business/energy/2015/07/29/revealed-real-price-of-nuclear-energy>

<sup>14</sup> <http://www.moneyweb.co.za/archive/sa-now-in-the-top-ten-for-renewable-energy-investm/>