

Department of Energy  
Private Bag X 96  
Pretoria  
0001  
Attention: Mr Tshepo Madingoane  
email: Tshepo.Madingoane@energy.gov.za

7 February 2014

Dear Sir,

**Re: Invitation to comment on the Integrated Resource Plan Update 2013.**

We submit these comments in response to the invitation to the public to submit written comments on the Draft 2013 Integrated Resource Plan Update (IRP Update 2013).

1. The conclusions of the report that the nuclear decision can be delayed are generally supported. However as a decision making tool the IRP Update 2013 has a number of material deficiencies which must be addressed before it can form the basis of lawful decision making in compliance with section 217 of the Constitution<sup>1</sup> and the requirements of lawful administrative action as set out in section 6(2) of the Promotion of Administrative Justice Act, in regard to the procurement of new nuclear power stations.<sup>2</sup>
2. Our submissions to both the Integrated Energy Plan (IEP) and IRP Update 2013 state that Earthlife Africa opposes the continuation of the current procurement process for nuclear reactors by 2030. The reason for the opposition is that the process which has been adopted to date, in both the IEP and IRP is deficient in its analysis, and is unconstitutional. The procurement is at real risk of causing severe government cost, both financial and political. The conclusions of the IRP update, which are to inform this procurement process, will only contribute further to the deficiencies which have characterized the process to date unless substantially revised. We make recommendations at the end of this submission as to how this problem can be solved.
3. The Integrated Resource Plan 2010, promulgated in 2011 under the Electricity Regulation Act 4 of 2006<sup>3</sup> forms the policy basis for large scale energy procurement, laying out the proposed generation new build fleet for South Africa for the period 2010 to 2030.<sup>4</sup> It is the official government plan for new generation capacity until replaced by a full iteration. The IRP Update 2013 serves to provide insight into critical changes for consideration on key issues in the interim including the nuclear procurement program.<sup>5</sup> The IRP process is therefore a key component of future energy procurement decisions.
4. Section 217 of the Constitution requires that procurement be conducted by means of “a system which is fair, equitable, transparent, competitive and cost-effective.” The IRP process pertaining to the procurement of new nuclear energy power plants to date falls well short of this constitutional requirement. Should the deficiencies in the process not be remedied, the government will be liable to a constitutional challenge to future nuclear power procurement on several bases. These are set out in more detail in the paragraphs below.

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<sup>1</sup> Act 106 of 1996

<sup>2</sup> Act 3 of 2000

<sup>3</sup> GNR 400 of 6 May 2011 in Gazette Number 34263

<sup>4</sup> IRP 2010 page 6

<sup>5</sup> IRP 2010 Update 2013 page 10

5. A decision<sup>6</sup> based upon the IRP process to date will also be liable to challenge on administrative law grounds on the basis of a failure to comply with requirements for lawful administrative action.
6. The Promotion of Administrative Justice Act provides that any person affected by a government decision of this kind can challenge the decision in the courts. A complainant will succeed if any of the conditions in s 6 are fulfilled. That section relevantly states that:
- A court or tribunal has the power to judicially review an administrative action if-*
- ... b) a mandatory and material procedure or condition prescribed by an empowering provision was not complied with;*
  - ... e) the action was taken-*
    - iii) because irrelevant considerations were taken into account or relevant considerations were not considered;*
    - ...*
    - vi) arbitrarily or capriciously;*
  - f) the action itself-*
    - i) contravenes a law or is not authorised by the empowering provision; or*
    - ii) is not rationally connected to-*
      - aa) the purpose for which it was taken;*
      - bb) the purpose of the empowering provision;*
      - cc) the information before the administrator; or*
      - dd) the reasons given for it by the administrator;*
    - ...h) the exercise of the power or the performance of the function authorised by the empowering provision, in pursuance of which the administrative action was purportedly taken, is so unreasonable that no reasonable person could have so exercised the power or performed the function; or*
    - i) the action is otherwise unconstitutional or unlawful.*

## 7. **IRP and IEP**

The executive summary of the IRP update states that the IRP will be informed by the Integrated Energy Plan Report (Draft IEP) 2013. Our critique of the Draft IEP is therefore relevant and is summarized as follows. We referred to the National Energy Act 2008 which states that the government will comply with its provisions by fulfilling its purpose which is inter alia, to ensure that energy is made available ‘at affordable prices’. The Act also sets out the purpose of an Integrated Energy Plan. In particular, s 6(4)(d) states that such a Plan must take into account ‘economic viability’. The purpose of the Plan, in addition, is to ‘guide the selection of the appropriate technology’ (s 6(6)(c)). These requirements mirror in statutory form the Batho Pele Principles, especially principle 8 concerned with sound economic management.<sup>7</sup> We submitted that regarding future nuclear procurement, the IEP has failed to taken into account current and relevant information as it is required to do under the Promotion of Administrative Justice Act<sup>8</sup>, and that should it form the basis of a decision to procure nuclear power the decision may be challenged as it is based on inaccurate and misleading costing information. We submit that such decision would also be arbitrary,

<sup>6</sup> As defined in s 1, Promotion of Administrative Justice Act, 2000 (Act No. 3 of 2000)

<sup>7</sup> These principles concern all public service activities. They are set out in short form here: [www.info.gov.za/aboutgovt/publicadmin/bathopele.htm](http://www.info.gov.za/aboutgovt/publicadmin/bathopele.htm).

<sup>8</sup> Section 6(2)(e)(iii) of Act 3 of 2000

capricious and in bad faith apart from not being based on the consideration of sufficient relevant information and relevant considerations to constitute lawful administrative action. As the IRP is informed by the IEP the deficiencies in the IEP must be addressed before the IRP update can be finalized.

8. The IRP update 2013 is premised on the same inaccurate or inadequate costing information for nuclear power as the IEP. The IRP was gazette in terms of the Electricity Regulation Act 4 of 2006. The objects of this Act are to-

- (a) achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa;*
- (b) ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met, having regard to the governance, efficiency, effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in the*
- (c) facilitate investment in the electricity supply industry;*
- (d) facilitate universal access to electricity;*
- (e) promote the use of diverse energy sources and energy efficiency;*
- (f) promote competitiveness and customer and end user choice; and*
- (g) facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public.*

9. The IRP as a planning and decision making tool is therefore required in terms of the Electricity Regulation Act to promote competitiveness in the electricity supply industry and to facilitate a balance between consumers and investors in the power supply. It is submitted that this cannot take place without accurate information as to the cost of nuclear power. In this submission we will set out on the basis of an expert report the conclusion that the IRP fails to give estimates of the future costs of power which are credible and based on accurate information and sound costing principles. As such the IRP update cannot form the basis of lawful administrative decision making which complies with the objectives of the regulatory scheme for energy, and the Constitution.

#### **10. Summary of deficiencies in the IRP Update 2013.**

The process that the government has undertaken thus far is deficient in the following respects:<sup>9</sup>

- a. The cost estimates upon which analysis by the government has been completed to date bear no relationship with known costs of analogous nuclear reactor procurements elsewhere. For example, the construction cost of a nuclear reactor in the UK was more than 40% above that estimated by the South African government in its most recent report.
- b. The procurement analysis fails to take into account socio-economic impacts of the nuclear program in terms of electricity prices, job creation and poverty alleviation. This risks loss of community confidence in government budget management.
- c. The estimates do not take into account the increased safety expenses (for example increased insurance costs) of operating such facilities in the wake of the 2011 Fukushima nuclear reactor disaster.
- d. The report fails to take into account that none of the proposals that have been considered to date have an operating record against which to assess performance and cost. Reactors from Korea, China and Russia are not proven to be compliant with

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<sup>9</sup> We draw these summary conclusions based on detailed analysis and consideration by Stephen Thomas, a professor from Greenwich University, UK and an expert in nuclear energy costing and economics annexed to this submission.

- western safety standards and would not comply with constitutional requirements in South Africa
- e. The estimates for the cost of capital and load factor are unrealistically low and do not conform to international or local experience.
  - f. Cost estimates for construction and decommissioning are not distinguished making estimates untransparent.
  - g. Applying cost assumptions in line with international experience could more than double the estimated costs of new nuclear power plants
  - h. South Africa has a history of underestimating nuclear costs and shows lack of expertise in public tender documentation.
  - i. Future nuclear costing should be based on an independent, transparent and credible process based on best science and economics in order to ensure decision making is compliant with constitutional and administrative law imperatives.

### **11. Detailed analysis of deficiencies in the costing of the nuclear program**

We annex in support of these submissions the expert report of Professor Steve Thomas, Business School, University of Greenwich entitled “South African government’s Integrated Resource Plan for the electricity industry” together with an annexure entitled “Annex: Terms of Reference for Appointment of a Service Provider for Advisory Services on Financing Options Models and Solutions for New Build Nuclear Fleet.” Professor Thomas is an expert on nuclear energy costing and economics.<sup>10</sup>

Professor Thomas’s report (the Thomas report) is an analysis of the conclusions of the Integrated Resource Plan and IRP Update 2013. On the basis of this report we submit that its recommendations on future nuclear procurement are misleading and based on inaccurate information and cannot form the basis of lawful administrative action, for the procurement of new nuclear plants. Since the IRP update 2013 does not provide a credible costing of future nuclear power the state will not be able to discharge its obligations in terms of section 217 of the Constitution when making procurements on the basis of this report.

12. The IRP 2013 update fails to refer to up to date information on nuclear costing.

The IRP 2010 Update 2013<sup>11</sup> states that based on a number of expert studies it has concluded that, outside of Asia costs for new nuclear capacity reach the nuclear cost value included in the final scenarios of the IRP 2010 adjusted for inflation from 2010. This equates to an overnight cost of \$5800 per kilowatt hour (in 2012 dollars). This figure is taken as the generic cost of nuclear capacity for purposes of the Update. The Thomas report describes this figure as a hopelessly unrealistic estimate when compared to current information relating to the construction of new nuclear plants globally.<sup>12</sup> His analysis describes the three most recent estimates of construction costs of nuclear power plants - Olkiluoto, Flamanville and Hinkley Point. Olkiluoto and Flamanville are currently under construction and although both were initially estimated to cost less than \$ 3000/kW, they are now estimated to cost \$7000/kW. In the case of the proposed Hinkley Point plant in the UK, the price is \$8000/kW.

12. It is submitted that should these three plants be distinguishable from the proposed South African case, these differences should be explained in the IRP 2010 Update 2013. Conclusions regarding competitiveness of generating power from new nuclear reactors should be evaluated in the light of the cost of these plants. This has not been

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<sup>10</sup> Professor Thomas’ profile is available on [www2.gre.ac.uk/about/schools/business/about/departments/ibe/staff/steve-thomas](http://www2.gre.ac.uk/about/schools/business/about/departments/ibe/staff/steve-thomas)

<sup>11</sup> Parag 3.3

<sup>12</sup> Thomas report page page 9 parag 4.2

done. The IRP update is therefore deficient. We also refer in support of this conclusion to the submissions of the Thomas report in regard to Eskom's 2008 call for tenders for new nuclear capacity where it was reported that the bids were for around \$6000.<sup>13</sup> Updated based on inflation of 3% this would bring this figure closer to \$6750 in 2012.<sup>14</sup>

13. The IRP update recommendations on future nuclear procurement fail to make reference to the impact of increased safety costs arising as a consequence of the Fukushima nuclear disaster and the impact thereof on energy planning in South Africa. The report also does not include a socio economic impact assessment of the nuclear program which was acknowledged as a deficiency in the IRP 2010.
14. The load factor of 92 percent given in the IRP 2010 is hopelessly unrealistic. The Thomas report highlights the fact that globally this figure has improved from around 60% in 1980 to around 80%. For a South African example, Koeberg's two reactors both have a life time load factor over their 20 year life of 69%.<sup>15</sup>
15. The cost of capital is unreasonably low. The IRP Update 2013 has not investigated the cost of capital (covered by the use of the term "discount rate"), contrary to the recommendations of the final IRP which stated that the possibility of different discount rates for technology to factor in different risk profiles for the technologies should also be investigated. The Thomas report highlights the fact that discount rate is determined to a large extent by how risky the project is perceived to be and in the case of the nuclear power "the record of nuclear power plants seldom if ever being built to time and costs, of operating significantly less reliably than expected and of real cost escalation in all aspects of the product life cycle from construction costs, through operating costs to decommissioning and waste disposal makes nuclear power by far the riskiest commercial generation option."<sup>16</sup>
16. The cost estimates are not transparent. The estimate is stated to include waste management and decommissioning costs.<sup>17</sup> These amounts are not indicated separately. Hence it is not possible to determine whether the costs of either of these components are reasonable estimates, apart from the considerations stated above. Based on cost estimates given for Koeberg<sup>18</sup> which are unreasonably low according to the expert opinion of the Thomas report, it can be inferred that the figures for future nuclear power provided for in the IRP 2010 Update 2013 are also unreasonably low.<sup>19</sup> Worldwide there is no experience of siting a high level waste disposal site, much less actually building and operating one and therefore the costs given must be seen as extremely speculative.<sup>20</sup> A cost estimate for a substantial expenditure (such as the decommissioning and management of waste of a nuclear reactor) that fails to identify the gaps in knowledge and predictive assumptions cannot form the basis of a procurement decision which is transparent, and cost effective as required by section 217 of the Constitution.
17. Applying cost assumptions in line with international experience could more than double the estimated costs of new nuclear build.  
The impact of applying assumptions as to cost, load factors and cost of capital which are in line with credible international estimates would easily increase the cost estimates

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<sup>13</sup> id page 5

<sup>14</sup> id page 5

<sup>15</sup> id page 12

<sup>16</sup> id page 12

<sup>17</sup> IRP 2010 page states that the costs were increased by 40% to take into account inter alia waste and decommissioning costs

<sup>18</sup> Eskom "Status of decommissioning strategy and plans for Koeberg nuclear power station." Eskom 331-440

<sup>19</sup> Thomas report parag 4.7 at page 15

<sup>20</sup> id page 23

of the IRP update by a factor of 130% if not more.<sup>21</sup> These assumptions are far from worst case scenarios. The system of procurement must be fair, equitable, transparent and cost effective for compliance with section 217 of the Constitution. It will not be possible to achieve these objectives based on assumptions and calculations that are so vastly divergent from established international experience of the cost of nuclear power.

18. The cost estimates do not reflect global trends. The chosen or preferred technology is the Gen III or III+.<sup>22</sup> But the IRP update 2013 fails to reflect that the five options<sup>23</sup> mooted do not have operating reactors in service yet. Reactors from China and Korea and Russia have been described as cheaper but have not proven to comply with western safety standards. Such reactors are therefore not acceptable in South Africa which has a constitutional right to an environment that is not harmful to health and well-being of its citizens.<sup>24</sup>

As stated in the Thomas report:<sup>25</sup>

*“There has been a lot of ill-informed discussion of the technology options available to South Africa since the failed tenders of 2008. It seemed that the conclusion of the government and Eskom was that the reason the bids were so high was that the tender had been done wrongly so that the bids were higher than they should have been and that other suppliers, not included in that process would offer much cheaper prices. Five options have been mooted: Areva’s EPR; Toshiba-Westinghouse’s AP1000; a Korean design AP1400; Chinese-supplied reactors; and Russian-supplied reactors. None of these options is proven in the sense of having operating reactors in service yet.*

*The EPR is the design with the most experience but most of this is appallingly bad. Reactors in Finland and France are running 4-6 years late and at least double the expected cost. There are still major unresolved regulatory issues with the design that were identified at least three years ago.*

*The AP1000, which has never underbid the EPR in a tender has less experience of construction with no experience outside China, but does have regulatory approval in the USA. Like the EPR, in the previous tender, it proved unfinanceable and it is highly unlikely the price bid in a new tender will be anything other than higher than in 2008.*

*China is seen as an attractive assumption on the basis of the large number of reactors ordered there in recent years and on the tacit assumption, with no evidence to support it, that because it is Chinese, a reactor would be cheap and of good quality. In practice, the reactors that made up most of the recent burst of orders could not be exported because of license restrictions and would probably be of too early a design generation to meet current safety standards. It has advanced reactor designs under development but these are still some way from being orderable and they have not undergone a comprehensive safety review so are not a realistic option.*

*Russia has also emerged on the reactor market in the past five years with orders for its home market using a new design that it claims meets current Western standards. These claims have not been tested and no Western regulatory body has undertaken a thorough review of the design.”*

19. Other concerns regarding inadequate costing of the nuclear program.
- The South African government has shown a history of underestimating the cost of nuclear power which must be corrected in light of the vast sums of money which are at

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<sup>21</sup> id parag 4.6

<sup>22</sup> id parag 3 page 15

<sup>23</sup> id. Areva’s EPR; Toshiba-Westinghouse’s AP1000; a Korean design AP1400; Chinese-supplied reactors; and Russian-supplied reactors. None of these options is proven in the sense of having operating reactors in service yet.

<sup>24</sup> Constitution of the Republic of South Africa section 24

<sup>25</sup> Id page 19

stake. Its unrealistic expectations on nuclear power predate the IRP with a decade wasted trying to commercialise the Pebble Bed Modular Reactor, at an estimated cost of R10 billion.

- The bids in the previous tender of 2008 (updated for inflation to 2012 prices to \$6750/kW) were about 16 per cent higher than the cost assumed in the updated IRP and about 50 per cent higher than the level originally assumed in the IRP2010. It is incomprehensible why the South African government went to international consultants to get an estimate of the cost of a nuclear power plant when it had recent experience likely to be a much more reliable estimate of costs, the results of its earlier tender, than a consultant's cost estimate<sup>26</sup>
- The issue of finance is not considered as an uncertainty in the IRP. Only four years ago in 2008, a programme of two reactors proved to be unfinanceable yet it is not even questioned that a programme of six reactors might not be financeable.<sup>27</sup>
- The lack of expertise on nuclear power is apparent in the material produced by the South African Department of Energy and these concerns are ventilated in more detail in the annexure to the Thomas report entitled "Annex 3: terms of reference for appointment of a service provider for advisory services on financing options models and solutions for new build nuclear fleet" which we annex to this submission.

20. Recommendations regarding the costing of future nuclear build.

Given the magnitude of these costs and their potential impact on the future of our economy it is imperative that an **independent, transparent and credible process based on best science and economics be undertaken** to determine the cost of new nuclear power stations before any decision can be taken on the strength of the IRP process and its updates.

In support of this recommendation we refer to the National Development Plan Vision for 2030.<sup>28</sup> The IRP 2010 Update 2013 states that the recommendations of the National Development Plan were taken into account in the update. The NPC report recommends:

*"thorough investigation on the implications of nuclear energy including its costs, safety, environmental benefits, localization and employment opportunities, uranium enrichment, fuel fabrication and the dangers of weapons proliferation.... South Africa will face major challenges in financing the capital costs of a nuclear fleet. Nuclear plants involve massive, lumpy investments. It will also be extremely challenging to build the institutional and skills base for running new generation nuclear plants. All possible alternatives need to be explored....a maximum of one year remains to agree on a decision making process for new nuclear investments."<sup>29</sup>*

Should this proper appraisal of costs not take place there is the potential for underestimation of final costs and for the actual costs to be properly acknowledged only when the bids are actually placed. By this time it may be very difficult or at least politically embarrassing to abandon the pro nuclear policy even though it may no longer make economic sense.<sup>30</sup> As stated in the Thomas report:<sup>31</sup>

*Overall, there is a risk that South Africa will commit itself to order a large number of reactors that will impose huge additional costs on consumers. However, the more likely risk is that, as in 2008, the nuclear programme will prove impossible. Since*

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<sup>26</sup> Thomas report Page 5

<sup>27</sup> id

<sup>28</sup> Published by the National Planning Commission 11 November 2011 ISBN 978-0-621-40475-3

<sup>29</sup> NPC report page 147

<sup>30</sup> Thomas Report page 22

<sup>31</sup> Id page 20

*1998, when the Pebble Bed Modular Reactor programme was launched, the South African government has operated on the assumption that nuclear power plants would make up a significant proportion of generation. The result has been that other options, that could have met South Africa's electricity demand needs reliably and cost effectively have been neglected – South Africa, like any other country, has limited resources and cannot pursue all options. If the nuclear programme is not abandoned now, the risk is that efforts to make it happen will continue for several more years, wasting government time and money and leading to more neglect of alternatives, before the government again, as it did with the PBMR and the failed tender of 2008, has to admit defeat.*

## **Conclusions**

### 21. Non compliance with section 217 of the Constitution.

Based on the expert report discussed above we submit that the IRP Update 2013 does not present procurement decision makers with current, transparent, credible and reliable information as to the cost of future nuclear power. This deficiency in the IRP 2010 update is startling given that it pertains to the largest procurement cost that is foreseeable in the next two decades in South Africa. The costs associated with pursuing the procurement of the fleet of nuclear reactors will exceed those in 2011-2 in defence and also in education.<sup>32</sup> Such spending is of concern to all South Africans and makes the issue of nuclear costing in the IRP a matter of grave national concern. As matters stand the state will not be able to make fair, equitable and cost effective procurement decisions for nuclear power based on the information in the IRP Update 2013 and will therefore not be able to discharge its duties to do so in terms of section 217 of the Constitution when making any procurement based on it.

New nuclear procurement decisions based on the IRP Update 2013 also stand to be challenged as being non compliant with requirements for lawful administrative action in terms of the Promotion of Administrative Justice Act. The IRP Update simply fails to put sufficient accurate and up to date information before decision makers on nuclear costing. Hence procurement decisions based on it will be challengeable on the basis of failure to comply with section 6(2)(e)(iii) of this Act. Challenges of this nature will also delay the process of coming to a reasonable appraisal of the costs of new power so that reasonable, sustainable and cost effective energy planning decisions in line with the constitution can be taken.

We trust that you will take these recommendations into consideration and design a new process for the estimation of the cost of new nuclear power that addresses them.

### 22. Ends

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<sup>32</sup> Estimated costs of nuclear program: In 2011, the Minister of Energy estimated the cost of the purchase of a fleet of nuclear reactors at R1 trillion. This is approximately equal to the cost of the entire 2012/2013 national budget. Dwarfing the arms deal which was worth a mere R70 billion, the program could account for 20% of the world's total nuclear spending over the next two decades. See C Reed and Staff Reporter "SA nuclear power could be worth at least R1-trillion." *Mail and Guardian*, 19 October 2011.