



Comments on Nuclear determination

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groundWork's comment on the Minister's determination on the procurement of 2 500 MW generation capacity from nuclear

Introduction

The Minister has issued a determination to commence the process to procure the new nuclear energy generation capacity of 2 500 MW as per decision 8 of the Integrated Resource Plan (IRP) 2019.

The IRP 2019 is a deeply flawed document for four main reasons:

- The build limits imposed on renewables;
- The inclusion of fossil fuels despite the evident intensification of the climate crisis;
- The fantasy of clean coal as per decision 6;
- The nuclear folly in decision 8.

A folly is not only a piece of foolishness, it is also an extravagance built for appearance or status.

We oppose it for the following main reasons:

1. Environmental damage done in the mining and processing of uranium. At present, radioactive dust blows from the mine dumps on the Rand and particularly the West Rand. The nuclear regulator has no plan, and apparently no will, to deal with it. It may be that South Africa will procure fuel from France or somewhere else. This merely displaces the problem – the uranium mining areas of Mali are heavily contaminated.
2. Following mining, fuel fabrication is energy intensive and polluting.
3. The lack of any feasible plan to deal with high level nuclear waste. At present, high level waste from Koeberg is stored under water on site while low level waste is dumped at Vaalputs. Given the very long half life of uranium, a high level nuclear dump site must be safe, and monitored and managed for several hundred thousand years. The assumption that the present civilisation will last that long is presumptuous. In the short term, the potential for waste spills increases with the quantity of waste.
4. Cost. The DMRE regularly repeats the phrase ‘at a pace and scale that the country can afford’, as if repetition will make it affordable. And it periodically pretends to have information on costs which it cannot divulge for reasons of security or confidentiality. Outside of the nuclear lobby, nobody believes it. Eskom CEO Andre de Ruyter recently gave a ball park figure of R1.80 / kWh for nuclear against 60c or 70c/kWh for renewables.¹
5. That is before cost and time overruns. In 2009, we predicted that the construction of Medupi and Kusile would end in tears with cost and time overruns. Various politicians then implied that we lacked patriotism. Their ‘patriotism’, however, now constitutes the most significant threat to national stability. New nuclear builds are notoriously prone to cost and time overruns and corruption.

¹ Terence Creamer, *De Ruyter calls for upscaling of power procurement plans as he questions whether coal IPP will proceed*, Engineering News, 24 November 2020.

6. They are also prone to corruption at the top level of the states involved in any nuclear deal – as it was with the aborted Russian deal. The corruption then, is not merely about money, but also about geo-political leverage over the ‘recipient’ country. This is profoundly anti-democratic.
7. Nuclear power also promotes anti-democratic tendencies within the structures of state and industry. By its nature the fuel requires high levels of security, both because it is radioactive and because of its potential for use in weapons. Hence, nuclear technologies tend to promote state security agencies which thrive on secrecy. Moreover, when those security agencies are corruptly involved in manipulating politics and or taking money, as South Africa’s SSA has, they can be expected to act in ways that are hostile to democracy. Security agencies are also linked to the relevant divisions of energy, minerals and trade departments as well as to private transnational or national corporations, as well as transnational state owned corporations such as EDF or Rosatom. The result is a tightly networked group with a common interest in evading scrutiny and accountability.
8. Nuclear power stations cost as much to decommission as to build – and are similarly subject to time and budget overruns and likely also to corruption. And there is no future income to pay for it. It is of concern that Eskom does not appear to have put aside the money to decommission Koeberg (or any other of its power stations) and we surmise that the extension to its design life has to do with this as well as with Eskom’s capacity shortfall.

In the context of nuclear power, it is of particular concern that the Minister’s determination allows that the generator, the buyer and the procurer of nuclear power may be just about anyone and, moreover, that the procurer then decides the procurement process. The contrast with the earlier determinations, where generator, buyer and procurer are predefined, is marked.

Nersa’s questions

Nersa has posed its questions in relation to each paragraph in the minister’s proposed determination. Below, we follow Nersa’s headings and numbering but leave out questions that

assume nuclear power will be built. The lettered paragraphs in bold are from the minister's determination.

Capacity allocation

A. To commence the process to procure the new nuclear energy generation capacity of 2 500MW as per decision 8 of the Integrated Resource Plan for Electricity 2019 – 2030.

A.1 As noted, we think decision 8 is misguided. The IRP 2019 is supposed to be revised through regular updates. We suggest that a revision is due before the DMRE starts any procurement process for nuclear power. Such revision needs to be accompanied by open information on the costs of each technology, including assumptions on fuel supply, and decommissioning.

A. 2 & 3: We consider baseload to be a red herring. The issue is whether the system has sufficient flexibility to follow the demand load. This requires a flexible grid to equalise variable generation across geographic space, and ample storage. Such storage should include renewable biogas off municipal sewerage and composting plants, but not fossil gas plants. It should also include gravity storage along with pumped storage, batteries and fuel cells etc.

Biogas is a preferred option because it does double duty as municipal energy and treatment plant, the gas is used at source to minimise leaks, and it can be used flexibly at peak times. Gravity storage is preferred because it can be used at different scales (from deep mineshaft to urban high rise), occupies minimal space as compared with pumped storage, and is not polluting and has no polluting supply chain.

A.4 We do not believe that planning for nuclear energy contributes to energy security because it is, in effect, a speculative investment which will divert resources from where they are needed now. The cost of nuclear will add to the energy insecurity of the majority of the people.

As noted above, environmental impacts will be felt by 'electricity customers' all along the fuel supply chain and the (unresolved) waste disposal chain. Impacts at the plant include the

infrastructure relating to cooling (usually using sea water) and the return of heated water to marine environments. In the long term, however, at decommissioning the site may well be left contaminated by radioactivity – particularly if:

- inadequate provision is made for decommissioning,
- the requisite technical capacities are lost or were never developed,
- the plant is stranded before decommissioning for economic reasons, or
- the site has to be abandoned because of a catastrophic accident or event.

In respect of the last point, we note that nuclear plants are not insurable because, while catastrophic events are rare, the costs are potentially limitless. For this reason, risk is assigned to the state. It should be noted that, while catastrophic incidents such as Windscale, Three Mile Island, Chernobyl or Fukushima are infrequent, lesser incidents are not. What is common, is that the authorities and the utilities invariably cover up incidents big and small as far as they can and deny the extent of impact when they can't. This is an element of our concern around secrecy.

Climate: While nuclear power is carbon free at the point of generation, the fuel supply chain is energy intensive. Carbon emissions are more or less proportionate to the ore grade – as the uranium content in ore declines, so the energy used to extract it increases. This suggests that energy intensity must rise over time as higher grade ores are developed first. The waste chain is also energy intensive and adds to life-cycle emissions.

The impact of climate change on nuclear power stations over a 50 year design life are potentially large. They include flooding, air and sea temperature rise, sea level rise and increased earthquake activity as the earth's crust responds to the loss of ice mass at the poles.

A.5 See question 3 above. Baseload does not equate to energy security.

A.6 Nersa's question suggests a 10 year lead time for nuclear power. We think this very optimistic. That said, we do not think any time is a good time to start preparing to build nuclear power plants. Nor do we think it is a 'no-regret' option. To the contrary, and irrespective of climate change, it will come at high social, economic and environmental costs.

A.7 The IRP does not specify *small* modular reactors (SMR) (see below). In general, nuclear power is inflexible in operation and does not compliment variable renewables. As baseload, it will be excessively expensive. If combined with hot salt to create storage and hence the potential for load following, it will be excruciatingly expensive.

A.8 Nuclear power will drive up the tariff. If this is blended into a single grid tariff, it will drive customers who can afford the capital investments to off-grid energy sources – just as the escalation of tariffs to pay for Medupi and Kusile is doing. This will leave those who can't afford it paying excessive tariffs and being cut off when they cannot pay – as happens now (whether by pre- or post-paid billing systems). In short, nuclear power plants will be stranded unless they are provided with captive customers. The most likely captives are poorer municipalities (i.e. most of them) and the poor within those municipalities. These municipalities will then be left with slum grids providing intermittent power to those who can't afford it. This will increase already widespread piracy and so reduce revenues to the municipal grid and so on. The utility death spiral is not only about Eskom. But failing municipalities are already drawing Eskom further into the vortex.

Technology costs

B. The IRP proposes that the nuclear power programme must be implemented at an affordable pace and modular scale (as opposed to a fleet approach) and taking into account technological developments in the nuclear space

B.9 We anticipate that the levelised cost of energy (LCOE) will start at around R1.80/kWh, excluding the costs of insuring against major incidents. As observed:

- i. Investment in nuclear depends on risk as well as costs being imposed on the public;
- ii. It does not contribute to universal access but, to the contrary, it will shrink access both in the number of people with access and the number of days they can afford power – just as Medupi and Kusile have done;
- iii. Nuclear power will require captive customers to avoid stranding.

B.10 As noted, the IRP does not specify SMRs. A modular approach is contrasted with a fleet option but the size of each module is not limited.

In so far as SMRs are an option, we note that the country has already been scalded by the pebble bed modular reactor (PBMR) programme – with nothing to show for billions spent. Globally, there are several competing SMR designs none of which are in production and most of which also require new fuel designs which are also still in development. The presumed advantage of SMRs is that components can be mass produced to bring down costs. In other words, the developers need to sell lots of SMRs – as was assumed with the PBMR – to make it remotely competitive. Assuming that everything goes smoothly, SMR production lines are still decades away. But there is no reason to believe that everything will go smoothly. Hence, the entire enterprise is speculative and, no doubt, driven by sales hype from competing corporate design teams – backed by diplomatic pressure.

The disadvantage of SMRs is that they are inherently less efficient than big nuclear plants. Assuming, however, that the IRP's 'module' is a large unit, there is no reason to believe that adding one unit at a time will make it any more affordable.

B.11 See A.3 above.

B.12 & 13 See A.6 above: Now is the best time to let go of nuclear dreams.

The generator

C. The generator of this electricity produced [sic] will be either Eskom Holdings (SOC) Limited, or any other organ of state, or in partnership with any other juristic person.

C.14 We do not see Eskom, in any future scenario (bundled or unbundled), having capacity for new nuclear. We do think that Eskom can and should develop capacity for new renewables – Sere wind farm was the only Eskom new build project that came in on budget and on time. New

nuclear would suck in resources and likely end in failure. It is a distraction to the job that is needed.

C.15 Taking on a partner does not change the answer above. To the contrary, a private partner will likely to use Eskom to absorb risk as is typically the case with public-private partnerships.

C.16 There is no other state owned utility ready to build new nuclear. The only other conceivable candidate is the Nuclear Energy Corporation (Necsa) which is itself mired in debt – including on its electricity bill to Eskom – and in ‘governance’ issues. It should stick to radioisotopes. Or rather, its subsidiary NTP Radioisotopes should be freed of the burden of its parent.

As to privatised nuclear IPPs, we think this would be a compound folly. We can think of no justification for putting this technology in private hands. Nor do we think that any prospective nuclear IPP would build a power station without ‘derisking’ it, that is passing the risk to government, including the risks of incidents, of technical development (i.e. of things that don’t work, like at Medupi & Kusile), or of stranding.

The buyer

D. The buyer of the electricity will be Eskom Holdings (SOC) Limited or any entity determined through the Eskom’s unbundling process as the future buyer of electricity.

We don’t think this power should be produced. Hence, we don’t think it should be bought.

Procurement process

E. The procurer of the nuclear new build programme will be the Department of Mineral Resources and Energy, or any other organ of state, or in partnership with any other juristic person.

As before, we don't think new nuclear power should be procured. We are nevertheless alarmed at the apparently open ended identity of potential procurers. What other organs of state does the DMRE have in mind?

And who are the potential partners in procurement? Since they are not other organs of the South African state, we presume that they must be multilateral institutions, organs of another state or private corporations – and most likely transnational corporations given that there are no private groups with nuclear experience in South Africa. Whoever they are, there would be little point in them joining the procurement if they did not also have an interest in the outcome. They would seek deals transferring costs and risks to the South African public via the government partner and they would carry their own geo-strategic calculations. As an example, the World Bank would want to rig the rules in favour of investors (state or private).

F. The procurer designated above will be responsible for determining the procurement process, which will be established through a tendering procedure that is fair, equitable, transparent, competitive and cost effective.

Assuming a partnership with an 'other juristic person', this seems designed to let them put their thumb on the scale. Why else would they be part of it? This would appear to hand considerable power to an entity that is bound to put other interests before the public interest. It is, of course, a sad reflection of the times that the same can be said of the DMRE.

The IPPPP was regarded as transparent to the bidders, at least until the determination for short term risk mitigation capacity. It has never been transparent to the public and the phrasing above gives no indication that public transparency is even considered. As noted above, the nuclear industry is notoriously secretive. We do not believe this procurement will be compatible with democratic decision making. Hence, we do not believe it should proceed.

Socio-economic impact

G. The IRP 2019 highlights that ‘Taking into account the existing human resource capacity, skills, technology and the economic potential that nuclear holds, consideration must be given to preparatory work commencing on the development of a road map for future expansion programme’.

G.32 The job opportunities in nuclear power are limited and mostly restricted to higher skills levels. It fits with an enclave model of development but does little for those outside the fence. Localisation is unlikely given the complexity and precision of engineering and the effect of intellectual property rights. This is already evident in the refurbishment of Koeberg.

Localisation is also unlikely in the case of SMRs with scaled up manufacture of ready made components. This is because the actual number of new plants will be limited and OEMs will need to focus production to get the advantage of scale.

G.33 We do not agree with this determination. We do not agree that ‘decision 8’ in the IRP was ever justified.