SUSTAINABLE ENERGY AFRICA

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Comments towards the concurrence with the Ministerial Determination on the procurement of 2 500mw generation capacity from nuclear: NERSA consultation paper published 23rd November 2020

Organisational Background:
Sustainable Energy Africa (SEA) is a Section 21 (not for profit) organisation and has been supporting local government in South Africa for 20 years, with a focus on electricity distribution, renewable energy and environmental sustainability. SEA 's objectives are to promote equitable, low carbon, clean energy development in urban South Africa and Africa, through the reduction of carbon-emitting fossil fuels by increasing efficiency in energy consumption, in an equitable and affordable fashion. SEA works closely with the metros and municipalities, SALGA, the SA Cities Network, the AMEU and convenes the Urban Energy Network. Further information on SEA can be obtained from our website: www.sustainable.org.za, or www.cityenergy.org.za.

Overarching Comment:
SEA believes that there are various economic, environmental and socio-economic reasons why the extension of the Koeberg nuclear plant to procure 2500MW of nuclear in the short term, should not be considered. SEA's position is that Nuclear energy will not contribute to South Africa's electricity deficit crippling our economy. Better, cheaper alternatives exist. We substantiate our reasoning below.

There is more to be gained from renewables to mitigate capacity shortfalls in the national energy grid than from nuclear:

Globally, new capacity has been dominated by renewable energy sources. According to the IRENA annual Renewable Energy Capacity Statistics, 2020 report, renewables added 176 GW in generation capacity globally in 2019, accounting for 72% of all new capacity in 2019 and bringing the total global installed capacity to 2,5 Terrawatts. The International Energy Agency (2020) predict that renewables are set to account for 95% of the net increase in global power capacity by 2025. The same report indicates that in 2019, 5.5 GW of additional nuclear capacity were connected to the grid and 9.4 GW were permanently shut down, bringing global capacity to 443 GW. **It is the continued cost reductions in renewable energy that are driving and changing the investment landscape (IEA, 2020).**

The South African picture also shows the enormous growth in renewable energy commissioning and the ability of the sector to deliver at scale in short time frames: by 2017, 6 422 MW of electricity had been procured from 112 Renewable Energy Independent Power Producers (IPPs) using the competitive bidding process. Out of this total, 3 162 MW of electricity generation capacity from 57 IPP projects was connected to the national electricity

grid by end of June 2017[1]. This has also been coupled with the increased uptake of solar PV at local government level, with an estimated total of 282.1 MW generated from small scale embedded generation by 2020[2].

In the current context of capacity shortage it is key to note that consumers typically wait 10 to 19 years for nuclear to come online or be refurbished, relative to 2 to 5 years for wind or solar[3].

Baseload versus intermittent/variable power: Nuclear is often proposed as an important part of the energy mix due to its contribution to baseload. We would like to note the study by the CSIR Energy Centre (2016: Least-Cost Electricity Mix for South Africa by 2040) that has explored deeply the technical and cost issues related to a future energy mix. The report indicates the potential for a renewable future. **It is well accepted that renewable energy at scale can provide base load. In addition, it can provide flexibility and power on demand.**

Technology costs and project financing

The costs associated with generating nuclear are high. The current costs of producing electricity through nuclear energy generation appear substantially more expensive compared with renewable energy sources, such as wind, or solar thermal. Nuclear energy has additional costs to it that are often not factored into the pricing methodology. Additional costs are typically in the over run on commissioning (capital costs), as well as decommissioning and the costs of waste disposal[4].

Costs required to generate nuclear power are heavily influenced by capital cost, which accounts for at least 60% of the total levelized cost of electricity, largely subsidised by the government. Additional costs associated with commissioning nuclear power plants include, operating costs and external costs (fuel costs, other input costs, and regulatory costs). These are higher in comparison to renewable energy-based technologies[5]. Operation and maintenance (O&M) costs account for about 66% of the total operating cost and decommissioning costs are about 9-15% of the initial capital cost of a nuclear power plant[6].

Given the above, the funding for the extension of the Koeberg nuclear plant has not been clearly stated in the NERSA consultation paper. Previous plans to commission additional nuclear energy had to be halted due to affordability challenges experienced by the national utility during the year 2008. The financial status of ESKOM has not improved to date and any other committed plans with external suppliers that were made between the year 2008 and 2017 have since fallen away due to the limited funding availability in the country.[7] **An honest and upfront account of costs and how the financing will be achieved is required.**

In contrast, renewable energy production costs have decreased over time and are beginning to stabilize, in part due to the technology learning curve and very low input costs (notably zero fuel costs)[8]. In addition, funding mechanisms for renewable energy can be localized and spread across various smaller, medium and larger investors. The source to finance renewable energy does not solely lie on the national capex nor does it rely on the economic viability of the national utility. Existing models of renewable energy generation in the country have revealed that a decentralized generation mechanism can contribute towards reducing the burden on the government to commission renewables.

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[1] Department of Minerals and Energy, 2020, Renewable energy overview, available from: Renewables | Department: Energy | REPUBLIC OF SOUTH AFRICA

[2] South African Local Government Association,2020, Status of Small Scale Embedded Generation (SSEG) In South African Municipalities, available from: Status of Small Scale Embedded Generation (SSEG) In South African Municipalities - SSEG Municipal Resource Portal

[3] Mark ,Z. Jacobson, 2019, The 7 reasons why Nuclear energy I not the answer to solve climate change, Leornardo Dicaprio Foundation

4 Cilliers, A, 2020, Identifying advantages, disadvantages and associated risks of nuclear energy, published by ESI Africa,

[5] International Energy Agency,2020, Projected Cost of Generating Energy, available from: https://www.iea.org/reports/projected-costs-of-generating-electricity-2020

[6] World Nuclear Association, 2020, Economics of Nuclear Power, available from: Nuclear Power Economics | Nuclear Energy Costs - World Nuclear Association (world-nuclear.org)

[7] Dr Anthony Cilliers , 2019, Update: History of nuclear in South Africa, available from: History of nuclear in South Africa | ESI-Africa.com (esi-africa.com)

8. Green Cape ,2020, Utility Scale Renewable Energy: Market intelligence Report, Green Cape, available from: https://www.greenpeace.org/static/planet4-africa-stateless/2018/10/66fc5759-66fc5759-the-true-cost-of-nuclear-power-in-sa-screen.pdf

Economic and environmental risks

Nuclear energy does not offer the most effective route to mitigate climate change. Nuclear energy is presumed to have low emissions at its operation level. However, this excludes emissions from other activities that are part of its value chain. This form of electricity generation cannot take place without the mining of uranium and the establishment of a storage facility. As nuclear takes so long to come online, the emissions accumulated during this waiting period (mentioned above – far longer than bringing renewable energy on line) should also be factored.

According to the Oko-Institute, 34 grams of carbon dioxide are emitted per nuclear generated kWh in Germany. Other international studies estimate up to 60 grams per kWh. While this is less than coal, it is a lot more than renewable energy technologies. Uranium mining and enrichment, required for fuel production, is extremely energy intensive. If uranium use were to significantly increase, use of lower grade ores would require more processing and therefore an increase of carbon dioxide emissions per unit of energy. Using current ore grades, when the entire cycle of production is considered, nuclear energy produces three to four times more carbon dioxide per unit energy than renewable energy sources. Though there may be other less carbon-intensive alternative forms to mine uranium, the whole nuclear energy value chain contributes to more emissions and has higher input and operational costs[9].

Nuclear Energy poses significant safety risks. The most radioactive waste generated by nuclear reactors remains radioactive for up to a million years; waste storage sites plan for 10 – 100 00 years. Nuclear power plants require additional infrastructure in order to reduce the safety risk to the surrounding populations, and there is currently no long-term storage solution as most of the waste is stored temporarily, on above-ground facilities. There is no safe dose of radiation[10]. The scale and longevity of the environmental harm that occurs in the event of accidents at nuclear power plants is incomparable to that of alternative electricity generating options. The retirement process for nuclear power plants involves the disposing off of nuclear waste, decontaminating equipment and facilities to reduce residual radioactivity, making it much more expensive and time consuming than retiring other power plants[11].

Other concerns that are associated with nuclear power:

The decommissioning process of a nuclear plant includes complex activities, technological equipment and technological procedures, huge financial implications and typically long project duration (about 20 years). The outcomes of the IAEA's IRRS Mission Report for South Africa indicated that Government has not yet developed a national decommissioning policy and strategy[12].

In addition, security concerns surrounding nuclear matters tend to reduce public accountability and reduce democratic governance in electricity and other state matters[13].

Overall Conclusion:

SEA is convinced that nuclear energy would not provide a lasting solution to the current or future electricity challenges. **Proven alternative solutions exist**. The country has committed to the 2015 Paris agreement to reduce carbon emissions and has made policy developments towards transforming the power sector to a less carbon intensive one. Coupled with this, the Integrated Resource Plan 2019 has committed towards upscaling renewables into the energy mix. This shows commitment to move towards cleaner and more sustainable sources of energy and these efforts should be supported.

[9] IAEA, 2020, Climate Change And Nuclear Power, available from: https://www.iea.org/reports/projected-costs-of-generating-electricity-2020

10 Green America, 2020, Nuclear Energy is Not a Climate Solution, available from: https://www.greenamerica.org/nuclear-power-not-climate-solution

11 Marta M. Gospodarczyk, Jacob Kincer, 2017, Decommissioning nuclear reactors is a long-term and costly process, EIA, available from: https://www.eia.gov/todayinenergy/detail.php?id=33792#

12 Department of Minerals and Energy,2020, Discussion Paper on National Decommissioning Policy for Nuclear Facilities, available from: http://www.energy.gov.za/nuclear/Discussion-Paper-on-National-Decommissioning-Policy.pdf

13 Damon Moglen, Nuclear Development Against Democracy in the Nuclear Debate (proceedings of the Conference on Nuclear Policy for a Democratic South Africa) 2004. (Joint publication of the Environmental Monitoring Group and the Western Cape ANC Science and Technology group).

SEA believes that concerted action by all South Africans, inspired leadership and true statesmanship may still ensure that we take the right path to protect our country and all that live in it.