



NATURAL JUSTICE

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TO: **PORTOFOLIO COMMITTEE ON MINERAL RESOURCES AND ENERGY**
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BY EMAIL: akotze@parliament.gov.za

RE: NATURAL JUSTICE COMMENTARY ON THE NATIONAL NUCLEAR REGULATOR
AMENDMENT BILL [B25-2023]

PART 1: INTRODUCTION

1. Natural Justice is a non-profit organization, registered in South Africa since 2007. Our vision is the conservation and sustainable use of biodiversity and resources through the self-determination of indigenous peoples and local communities. Our mission is to facilitate the full and effective participation of Indigenous peoples and local communities in the development and implementation of laws and policies that relate to the conservation and customary uses of biodiversity and the protection of associated cultural heritage. Natural Justice works at the local, national, regional, and international levels with a wide range of partners. We strive to ensure that community rights and responsibilities are represented and respected on a broader scale and that gains made in international fora are fully upheld at lower levels.
2. This submission is done in collaboration with the Just Energy Transition Africa (“**JETA**”) Initiative. JETA is an initiative of non-profit environmental, energy and climate justice lawyers aimed at supporting African communities and CSOs leading the advocacy for our clean energy future and assisting the growth of a legal community of practice across the continent. The JETA Initiative is coordinated by Natural Justice in partnership with Earthjustice and the African Environmental Justice Lawyers Collective.
3. This submission is set out in the following sections:
 - 3.1. Introduction
 - 3.2. General comments
 - 3.2.1. Nuclear energy will not create energy security and access
 - 3.2.2. Nuclear energy is expensive
 - 3.2.3. Few or no job opportunities for local communities
 - 3.2.4. Nuclear energy poses significant environmental and safety concerns
 - 3.2.5. Nuclear energy hinders renewable energy deployment
 - 3.2.6. Risks and concerns with unfettered powers and control of the Minister over nuclear energy
 - 3.2.7. South Africa’s history of rehabilitation

3.2.8. The Bill should not limit liability for harm from nuclear power

3.3. Conclusion and recommendations

PART 2: INTRODUCTION

4. We welcome the Minister for introducing the National Nuclear Regulator Amendment Bill (B25-2023) (“**the Bill**”) to amend the National Nuclear Regulator Act 47 of 1999 (“**the Nuclear Regulator Act**”), whose objects are to ‘*regulate nuclear activities, for its objects and functions, for the manner in which it is to be managed and for its staff matters; to provide for safety standards and regulatory practices for protection of persons, property and the environment against nuclear damage; and to provide for matters connected therewith.*’.
5. However, scientific evidence has shown that although rigorous and robust measures can be taken to regulate the use, possession, production, storage, enrichment, processing, reprocessing, or disposal of radioactive material, this can never be sufficiently regulated, or its contamination risks completely avoided through regulation.¹
6. This risk is increased if there is not proper decommissioning and/or weak regulatory structures and enforcement with disposal. In the instance of South Africa, there has been weak laws and enforcement in the instance of rehabilitation of mines which fall under the responsibility of the Department of Mineral Resources and Energy (“**DMRE**”). The National Nuclear Regulator Act is also the responsibility of the DMRE with the Minister of DRME having extensive powers over the Board of the National Nuclear Regulatory and its duties.
7. Because uranium is a carcinogen in humans, it is impossible to have any safe levels of exposure to a carcinogen for human beings; meaning that it is not only nuclear weapons which are dangerous, but nuclear energy itself poses significant, generational risks to humans. Additionally, in the event of natural disasters (such as earthquakes) or human error at nuclear facilities, the damage to public health and to the environment is catastrophic and irreversible. Scientific study has shown that nuclear energy is not a safe replacement for fossil fuels. For these reasons, any intention or action to procure any further nuclear energy in the energy mix of South Africa is opposed.

¹ Dean Kyne and Bob Boblin “Emerging environmental Justice Issues in Nuclear Power and Radioactive Contamination” 2016 *Int J Environ Res Public Health* 700 available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4962241/#B3-ijerph-13-00700> (accessed on 13 October 2023).

8. Further, nuclear energy is not a solution to the current energy crisis and will hamper South Africa having a just energy transition to clean, renewable energy. Opposition to nuclear energy being expanded in South Africa has been stated previously, notably by Organisation Undoing Tax Abuse (“OUTA”) with clear comment that there is no scenario in which South Africa could afford nuclear energy.²
9. We realise that the Bill does not equate to nuclear power being introduced into the energy mix. However, amending the Nuclear Regulator Act has the intention and effect of encouraging investment into this type of energy which takes away from the commitments to invest in clean, renewable energy like solar and wind as well as storage, which are more affordable, reliable, safer and will provide just energy access.

PART 2: GENERAL COMMENTS

- 9.1. Despite the increasing availability of cheaper and less polluting alternatives, both locally and internationally, South Africa has continued to rely on an aging fleet of coal-fired power stations and has continued to invest in fossil fuels to provide over 80 percent of its electricity.
- 9.2. In light of South Africa’s considerations to include nuclear energy in the energy mix of South Africa as indicated in the Integrated Resources Plan 2019 and the Bill we raise the following objections: nuclear energy will not create energy security and access; the economics of nuclear energy – not being economically viable and no job creation; environmental concerns including radioactivity, nuclear waste, water issues, why renewable energy (solar and wind predominantly) in comparison to nuclear energy is the only viable pathway to the future of South Africa’s electricity, the power of the Minister of the DMRE, poor track record with mining industry rehabilitation and why liability for nuclear or radioactive damage should not be limited.
- 9.3. Nuclear energy will not create energy security and access
 - 9.3.1. In the region of sub-Saharan Africa 600 million people, or approximately 53 per cent of the population, live without access to electricity with hundreds of millions

² OUTA “OUTA comments on the NERSA concurrence with the Ministerial Determination on the procurement of 2 500 MW new generation capacity from nuclear” available at <https://outa.co.za/web/content/171165> (accessed on 10 October 2023) 4.

more having only limited or unreliable electricity according to the United Nations Conference on Trade and Development report.³

9.3.2. Though South Africa has one of the highest rates of electricity access in sub-Saharan Africa it has been plagued by load shedding (controlled rolling black outs).⁴ The Electricity Regulation Act's objects include universal access to electricity.

9.3.3. Proponents may argue that nuclear is needed for energy access and to remove the threat of load shedding. Load shedding is caused by there being more demand than there is power supply. Load-shedding has resulted in localized power outages of up to six hours or more per day throughout the country. These planned electricity outages negatively impact private residences, businesses, municipal lighting, traffic lights, and hotels. Rolling blackouts can also impact water availability and safety, internet connectivity, cell phone network coverage, fuel pumps (and therefore fuel availability), residential security features, and the food supply. The results can be more dire with mortuaries unable to keep bodies refrigerated, small businesses unable to stay open, agriculture losing produce and food supply being jeopardised.⁵ At one point during 2023, load shedding was declared a state of disaster in February 2023. The state of disaster was revoked in April 2023 but with some emergency measures still being kept in place.⁶

9.3.4. However, planning to operation times (including site identification, procuring land, financing, insurance, licensing, building, connection to transmission) of

³ United Nations Conference on Trade and Development "Commodities at a Glance: Special issue on access to energy in sub-Saharan Africa" (17: 2023) available at https://unctad.org/system/files/official-document/ditcom2023d1_en.pdf (accessed on 13 October 2023).

⁴ Africa Energy Outlook "available at https://iea.blob.core.windows.net/assets/1d996108-18cc-41d7-9da3-55496cec6310/AEO2019_SOUTHAFRICA.pdf (accessed on 10 October 2023) 16.

⁵ Rebecca Trenner "Dead Chickens and Decomposing Bodies: Inside South Africa's Power Blackout 'Pandemic'" CNN (31 January 2023) available at <https://www.cnn.com/2023/01/31/africa/south-africa-power-blackouts-intl-cmd/index.html> (accessed on 13 October 2023); Crystal Orderson, "In South Africa, 'Load Shedding' Takes a Toll on Small Businesses" ALJAZEERA (9 February 2023) available at <https://www.aljazeera.com/features/2023/2/9/in-south-africa-load-shedding-takes-a-toll-on-small-businesses> (accessed on 13 October 2023).

⁶ U.S Embassy and Consulates in South Africa "Security Alert: State of Disaster Declared over Ongoing Energy Crisis" (15 February, 2023) available at <https://za.usembassy.gov/security-alert-u-s-embassy-state-of-disaster-declared-over-ongoing-energy-crisis-of-load-shedding-controlled-electricity-outages/> (accessed on 11 October 2023); Reuters "South Africa revokes 'state of disaster' declared over power crisis" (6 April 2023) available at <https://www.reuters.com/business/energy/south-africa-revokes-state-disaster-declared-over-power-crisis-2023-04-05/> (accessed on 10 October 2023).

nuclear plants are between 10 to 19 years or more.⁷ These estimates of duration have increased around the world due to increasing stringent safety regulations.⁸ Therefore, making nuclear a solution to the energy crisis faced by South Africa will not work due to these long periods of time that will be required to build and establish working nuclear facilities.

9.3.5. Further energy access in rural areas will not be elevated due to nuclear energy being centralized and requiring a reliable grid with capacity.⁹ In rural areas there is a lack of electricity infrastructure and connection to the grid.¹⁰ Across sub-Saharan Africa, only 28% of rural inhabitants have access to electricity.¹¹

9.3.6. Renewable energy especially solar is a solution for rural areas with no or limited grid access as it can provide decentralized solutions including mini-grids which are expanding in East and West Africa.¹² These mini grids can also be a means to community ownership of energy systems. Moreover, the installation of solar panels can substitute or delay the need for new electric grid infrastructure, making solar energy a cost-effective and sustainable solution for these remote regions.

9.3.7. There has been mention made of small modular reactors being used in South Africa. According to Engineering News in September 2023, it has been reported that the South African Nuclear Energy Corporation has requested the Minister of Energy Minister Gwede Mantashe to allow it to become in generation of electricity

⁷ Marc Z. Jacobson “7 Reasons Why Nuclear Energy is Not the Answer to Solve Climate Change” ONE EARTH (16 June 2023) available at <https://www.oneearth.org/the-7-reasons-why-nuclear-energy-is-not-the-answer-to-solve-climate-change/> (accessed on 10 October 2023).

⁸ Mycle Schneider Consulting Project “The World Nuclear Industry Status Report” (Sept. 2021) available at <https://www.worldnuclearreport.org/IMG/pdf/wnisr2021-lr.pdf> (accessed on 10 October 2023) 53.

⁹ International Atomic Energy Agency “Interfacing Nuclear Power Plants with the Electric Grid: The Need for Reliability amid Complexity” available at https://www.iaea.org/sites/default/files/gc/gc53inf-3-att5_en.pdf (accessed on 10 October 2023) 1.

¹⁰ United Nations “Improving Energy Access Key to Meeting Development Goals in Africa” United Nations Conference on Trade and Development (21 March 2023) available at <https://unctad.org/news/improving-energy-access-key-meeting-development-goals-africa#:~:text=Low%20levels%20of%20access%20to,unstable%20and%20lack%20customer%20connections> (accessed on 10 October 2023).

¹¹ Vaclav Smil “Africa’s Electricity-Access Problem Is Worse Than You Think” IEEE Spectrum (24 February, 2022) available at <https://spectrum.ieee.org/electrification> (accessed on 10 October 2023).

¹² Jac Corfee-Morlot et al., “Achieving Clean Energy Access in Sub-Saharan Africa” Organisation for Economic Cooperation and Development . (31 January, 2019) 5-6 available at <https://www.oecd.org/environment/cc/climate-futures/case-study-achieving-clean-energy-access-in-sub-saharan-africa.pdf> (accessed on 10 October 2023).

from nuclear energy, specifically referring to small modular reactors and micro-reactors.¹³

9.3.8. However according to a research report done by Stanford and British Columbia¹⁴ this may not be the case, with small modular reactors potentially creating more waste with more management and disposal being required. This in turn will increase the costs. The conclusion of the study being that conventional reactors are better in the aspects of radioactive waste generation, management requirements and disposal options.¹⁵

9.3.9. The current IRP 2019 advocates for small modular reactors. However, from the above it would not be economically viable or environmentally feasible and thus not a viable solution. Further large nuclear power plants will take over ten years to provide power which is desperately required now.

9.3.10. From the above, solar energy is more viable solution to energy access and quickly addressing issues of load shedding in South Africa compared to nuclear energy.

9.4. Nuclear energy is expensive

9.4.1. In terms of the Electricity Regulation Act, the objects relating to economically viability are: *“(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 Republic; (c) facilitate investment in the electricity supply industry; (f) promote competitiveness and customer and end user choice”*.

¹³ Rebecca Campbell “Nesca wants to get involved with small modular reactors” Engineering News available at <https://www.engineeringnews.co.za/article/necsa-wants-to-get-involved-with-small-modular-reactors-2023-09-20> (accessed on 13 October 2023).

¹⁴ Linsay M. Krail et al “Nuclear waste from small modular reactors” PNAS (31 May 2022) available at <https://www.pnas.org/doi/full/10.1073/pnas.2111833119> (accessed on 13 October 2023).

¹⁵ Mark Shwartz “Stanford-led research finds small modulator reactors will exacerbate challenges of highly radioactive nuclear waste” Stanford News (May 30, 2022) available at <https://news.stanford.edu/2022/05/30/small-modular-reactors-produce-high-levels-nuclear-waste/#:~:text=The%20study%20concludes%20that%2C%20overall,radiation%20from%20spent%20nuclear%20fuel> (accessed on 9 October 2023).

- 9.4.2. The White Paper on Energy Policy 1998 enforces this with a key objective of affordable energy services.
- 9.4.3. This means that electricity needs to be accessible and affordable whatever the source is. Below it can be shown that nuclear energy will not be affordable or accessible to all.
- 9.4.4. Nuclear energy will not achieve the objects of the Electricity Regulation Act in the form of affordable electricity as was realized in the United States of America where it was found that nuclear energy was not the cheapest energy option to consumers.¹⁶ The high cost of nuclear power was realized in Britain in the case of costs for a European Pressurized Water Reactor increasing from £2bn in 2008 to £8bn in 2013. In comparison with inflation, the costs would have only increased to £2.3bn.¹⁷
- 9.4.5. In the report by Professor Thomas it is clearly advised that there is no logic in pursuing nuclear energy, especially with costs fluctuating by over 40% in a short period of time and results in nuclear power being a high risk.¹⁸ The high risk taking the form of high capital costs, sensitivity to interest rates, construction, competition from other electricity sources and political risks.¹⁹
- 9.4.6. The IRP2019 published by the Department of Mineral Resources and Energy (DMRE) recognizes that the cheapest supply of energy will be from large amounts of renewable energy.²⁰ Allowing new nuclear energy builds will lessen investment in renewable energy and the costs of energy post 2030 would be higher with nuclear.²¹

¹⁶ Professor Steve Thomas “The South African government’s Integrated Resource Plan for the electricity industry” available at https://earthlife.org.za/wp-content/uploads/2020/06/2014-02-06-Thomas_Planning_Investment_in_Electricity_Supply1.pdf (accessed on 10 October 2023) 3.

¹⁷ Ibid 6

¹⁸ Ibid 4.

¹⁹ International Atomic Energy Agency “Financing Nuclear Power in Evolving Electricity Markets” (April 2018) available at <https://www.iaea.org/sites/default/files/18/07/financing-np-0418.pdf> (accessed on 10 October 2023) 1.

²⁰ OUTA “OUTA comments on the NERSA concurrence with the Ministerial Determination on the procurement of 2 500 MW new generation capacity from nuclear” available at <https://outa.co.za/web/content/171165> (accessed on 10 October 2023) 5.

²¹ Ibid 5.

- 9.4.7. Historically South Africa has pursued nuclear energy but abandoned plans due to economic reasons. In December 2008 Eskom abandoned a tender associated with nuclear energy, due to the magnitude of investment being too much.²² Further it seems unlikely Eskom will be able to finance nuclear energy.²³ South Africa historically has had unrealistic expectations for nuclear power with attempts for Pebble Bed Modular Reactors being abandoned after a decade of trying to commercialise, huge inflation costs over short periods of time for costing of kW with a cost of \$8000 per a kilowatt estimated for the Hinkley Point in November 2013.²⁴
- 9.4.8. Even once a nuclear power plant is started, the operating costs and competition from cheaper gas and renewable energy sources, result in nuclear plants being unprofitable. In general, the levelized cost of nuclear power (the cost of building, financing and fueling a new power plant while removing all the subsidies) is relatively high compared to other energy sources: the minimum cost per megawatt hour for nuclear is \$97, compared to \$58 for utility-scale solar, \$52 for combined cycle gas, and \$31 for wind. Many of the world’s new plants in China, India and Russia, are heavily subsidized in their nuclear industries.²⁵ Subsidies are the only way nuclear energy becomes economically viable.
- 9.4.9. These high operating costs are a result of the funds required to cover nuclear waste disposal. In Forbes it was stated that “[N]o country has allotted enough funds to cover nuclear waste disposal. In France and the US, according to the recently published *World Nuclear Waste Report*, the funding allocation only covers a third of the estimated costs.”²⁶

²² See note 16 5.

²³ See note 16 5.

²⁴ See note 16 5.

²⁵ Climate Nexus “Which Way for Nuclear Energy?” (27 February 2017) available at <https://climatenexus.org/climate-issues/energy/which-way-for-nuclear-energy/> (accessed on 10 October 2023).

²⁶ Christine Ro “The Staggering Timescales of Nuclear Waste Disposal” Forbes (26 November 2019) available at <https://www.forbes.com/sites/christinero/2019/11/26/the-staggering-timescales-of-nuclear-waste-disposal/?sh=5732a07c29cf> (accessed on 13 October 2023).

- 9.4.10. In Roche's report²⁷ estimates are given for the costs of nuclear waste management for various countries:
- 9.4.10.1. "France: According to the Court of Auditors, in 2013, the total gross costs for long-term waste management were €32 billion, which does not include costs of spent fuel management which was estimated at €16 billion by EDF on 31 December 2013.
- 9.4.10.2. Belgium: estimated at €3 billion in 2011, now stand at €8 or even €10 billion.
- 9.4.10.3. Sweden: in 2017 the Swedish Nuclear Fuel and Waste Management Co (SKB) estimated total future costs ... to be €9.5 billion, of which €3 billion is for managing spent fuel.
- 9.4.10.4. Japan: the cost of waste disposal was estimated by the Ministry of Economy Trade and Industry (METI) in 2011 as €29 billion (likely to be a vast underestimate because of inevitable delays)
- 9.4.10.5. United States: in 2008, the Department of Energy (DOE) issued a revised life-cycle cost estimate totaling €100 billion for the disposal of 70,000 metric tons of commercial power reactor spent fuel at the Yucca Mountain site – but with more than 112,000 tons of spent fuel projected as reactors continue to operate these costs will also significantly increase.
- 9.4.10.6. UK: current cost models of the planned Geological Disposal Facility (GDF) €12.6 billion as of 2008 but exclude spent fuel from new nuclear reactors."²⁸
- 9.4.11. The costs of decommissioning are also extremely expensive, and in the case of South Africa's Koeberg Nuclear Plant, have been estimated at R42 billion to R64

²⁷ Peter Roche et al. "The Global Crisis of Nuclear Waste" Greenpeace Finance (January 2019) available at https://cdn.greenpeace.fr/site/uploads/2019/01/REPORT_NUCLEAR_WASTE_CRISIS_ENG_BD-2.pdf?_ga=2.4138613.494648163.1695930588-1256065049.1695930587 (accessed on 10 October 2023) 7.

²⁸ Ibid 9.

billion. Though South Africa has only estimated the costs at R8 billion and has failed to set aside for decommissioning.²⁹

9.5. Few or no job opportunities for local communities

9.5.1. Nuclear energy is not only expensive to build and maintain throughout its lifecycle, but in comparison with renewable energy, it also does not give in the form of employment. Firstly, nuclear energy does not require a big labour force. Overall, nuclear energy creates fewer jobs than jobs in other renewable energy sectors. For example, solar creates far more jobs than nuclear.³⁰ Secondly, in the nuclear energy sector, the vast majority of the jobs created are temporary construction jobs.³¹ Localisation of manufacturing is not prevalent with equipment, technology and expertise needing to be imported and are not locally produced, which further leaves little economic improvement to local communities.³²

9.5.2. Lastly, many indigenous and local communities situated near nuclear plant facilities will not have the required academic requirements, expertise and experience to acquire jobs to handle the imported equipment and technology associated with running and maintaining nuclear facilities.

9.6. Nuclear Energy poses significant environmental and safety concerns

9.6.1. Nuclear accidents can be catastrophic and there is no guarantee that reactors will be designed, built, and operated correctly.³³

²⁹ Chris Yelland “South Africa taxpayers exposed to high-level nuclear waste disposal and decommissioning liabilities” Daily Maverick (21 February 2021) available at <https://www.dailymaverick.co.za/article/2021-02-21-south-african-taxpayers-exposed-to-high-level-nuclear-waste-disposal-and-decommissioning-liabilities/> (assessed on 13 October 2023).

³⁰ Bryan Jacob “Solar Creates More Jobs than Nuclear” Southern Alliance for Clean Energy (21 February 2020) available at <https://www.cleanenergy.org/blog/solar-creates-more-jobs-than-nuclear/> (accessed on 10 October 2023).

³¹ Elliott Negin “Renewable Energy Would Create More Jobs Than Nuclear Power” GTM (29 July 2010) available at <https://www.greentechmedia.com/articles/read/renewable-energy-would-create-more-jobs-than-nuclear-power> (accessed on 10 October 2023).

³² NICE Future “Nuclear Energy: Providing Power, Building Economies” Nuclear Innovation: Clean Energy Future (April 2022) available at <https://www.nrel.gov/docs/fy22osti/82419.pdf> (accessed on 10 October 2023) 2.

³³ Piera, M., “Sustainability issues in the development of nuclear fission energy” 2010 *Energy Conversion and Management* 51 938–946, Penner, S.S., Seiser, R., Schultz, K.R., “Steps toward passively safe, proliferation resistant nuclear power” 2008 *Progress in Energy and Combustion Science* 34 275–287.; Feiveson, H.A., “A skeptics view of nuclear energy” 2009 *Daedalus* 60–70.

- 9.6.2. In South Africa, the Constitution protects the right to a health environment and protection of the environment for present and future generations (section 24). This right is further reinstated in the National Environmental Management Act 107 of 1998³⁴.
- 9.6.3. Uranium spent reactor fuel and other radioactive waste, which is used to generate nuclear energy, must be disposed of safely. It can take thousands of years to break down and will remain dangerous and radioactive to human health.³⁵ This raises issues about the technical and long-term cost.³⁶
- 9.6.4. Nuclear waste is produced at all stages of nuclear energy production. Waste is created from the mining of uranium to the reactor, the spent fuel from the reactor and its storage/reprocessing.³⁷ The International Atomic Energy Agency (IAEA) estimates that around 370,000 metric tons of heavy metal (MTHM) of spent fuel has been produced to date.
- 9.6.5. Before storing of spent fuel, it must be cooled and stored in designed pools of water which act as a radiation shield.³⁸ The importance of cooling is essential to safety as evident in the Fukushima accident of March 2011 where a tsunami disabled the power supply and cooling of reactors, leading to a mass evacuation.³⁹
- 9.6.6. The time needed to safely store spent fuel is up to millions of years. The processes being used currently to store spent fuel are short-term with deep geological

³⁴ The National Environmental Management Act 107 of 1998 (NEMA) stems from Section 24 of the Constitution and its function is to legislate the right to a healthy environment for all. NEMA defines sustainable development as the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.

³⁵ U.S. Energy Information Administration “Nuclear Explained: Nuclear Power and the Environment” (7 November 2022) available at <https://www.eia.gov/energyexplained/nuclear/nuclear-power-and-the-environment.php#:~:text=These%20materials%20can%20remain%20radioactive,human%20health%20and%20the%20environment> (accessed on 10 October 2023).

³⁶ United States Nuclear Regulatory Commission “Backgrounder on Radioactive Waste” (23 July 2019) available at <https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html> (accessed on 13 October 2023).

³⁷ See note 27.

³⁸ See note 35.

³⁹ World Nuclear Association “Fukushima Daiichi Accident” (August 2023) available at <https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/fukushima-daiichi-accident.aspx> (accessed on 10 October 2023).

disposing being the best option.⁴⁰ The United States does not currently have a permanent disposal facility for high-level nuclear waste.⁴¹

9.6.7. Nuclear energy is not carbon neutral and produces 9 – 25 times more carbon emissions than wind energy.⁴²

9.6.8. Nuclear energy requires a lot of water use. “The Nuclear Energy Institute estimates that, per megawatt-hour, a nuclear power reactor consumes between 1,514 and 2,725 litres of water. This is compared to coal with figures of 1,220 to 2,270 litres per MWh, and 700 to 1,200 litres per MWh for gas. It’s clear to see, just from these brief statistics, that the nuclear energy industry relies much more heavily on water than other sectors. A large nuclear power plant may use up to 1 billion gallons of water a day and, for this reason, they are often built next to rivers, lakes or oceans to utilise the bodies of water. The water is drawn from these sources and heated to create steam to power the turbine.”⁴³ This water consumption is more than what is required for coal-fired power plants by 20 – 83% with renewable energy being negligible.⁴⁴

9.7. Nuclear generation's inflexibility does not complement but excludes wind and solar, nuclear should not be part of the new design of electricity systems.

9.7.1. Nuclear energy is inflexible in that it runs all the time rather than being ramped up or down in response to the electricity system’s needs. This means it can only serve a set base load and needs to supply power all the time, except for planned maintenance.⁴⁵ For a nuclear power plant to be economical and operational it needs

⁴⁰ See note 26.

⁴¹ See note 35.

⁴² Lenzen, M., “Life cycle energy and greenhouse gas emissions of nuclear energy: a review” 2008 *Energy Conversion & Management* 2178–2199; Sovacool, B.K., “Valuing the greenhouse gas emissions from nuclear power: a critical survey” *Energy Policy* (36; 2008) 2940–2953.

⁴³

Kate Green “Nuclear Power and its Water Consumption Secrets” Monarch Partnership (30 January 2019) available at <https://monarchpartnership.co.uk/nuclear-power-water-consumption/#:~:text=A%20large%20nuclear%20power%20plant,steam%20to%20power%20the%20turbine> (accessed on 10 October 2023).

⁴⁴ Jim Green “Water, Uranium and Nuclear Power: Short Summary” Friends of the Earth Australia (2007) available at <https://www.foe.org.au/anti-nuclear/issues/oz/water-nuclear/short> (accessed on 10 October 2023).

⁴⁵ Tony Dutzik “Do We Really Need Nuclear Power for “Baseload” Electricity?” Frontier Group (29 March 2011) available at <https://frontiergroup.org/articles/do-we-really-need-nuclear-power-baseload-electricity/> (accessed on 10 October 2023). Nuclear Energy Agency “Technical and Economic Aspects of Load Following with Nuclear Power

to be a base load source of electricity. This makes nuclear the least flexible power source on grids.⁴⁶

9.8. Due to this inflexibility, should there be an abundance of renewable energy, it cannot be used as nuclear energy needs to be used consistently and all the time. This makes nuclear energy incompatible with renewables.⁴⁷ Nuclear energy will push out the use of cheaper and more competitive forms of energy like wind and solar, which is evidenced with France being behind in its renewable energy development due to its use of nuclear energy.⁴⁸

9.9. A fully reliable and deeply decarbonized electricity system must include technologies that complement and buttress wind and solar energy capabilities. Due to high costs of nuclear energy and the low costs of wind and solar energy⁴⁹ across the world the most cost-effective new energy is renewables which should be done through the Renewable Energy Independent Power Producer Procurement Programme (which does not include nuclear).

10. Risks and concerns with unfettered powers and control of the Minister over nuclear energy

10.1. In terms of the Bill, the Minister of DMRE has extensive powers in making decisions on issues of nuclear energy. The Nuclear Energy Act 46 of 1999 makes the Minister of the DMRE the regulatory authority over nuclear security and safeguards. The National Nuclear Regulatory exercises safety regulation oversight over the nuclear security and safeguard aspects.

10.2. The National Nuclear Regulatory Act in some sections allowed the Minister to act after consultation with the board of the National Nuclear Reactor. This has been amended “with recommendation” from the Board as in Section 2(c), 2(f), 11(a) and 11(b). Other sections are after consultation presently. This amendment is welcomed as it grants the Board more power.

Plants” NUCLEAR ENERGY AGENCY (14 February 2022) available at https://oecd-nea.org/jcms/pl_62445/technical-and-economic-aspects-of-load-following-with-nuclear-power-plants (accessed on 10 October 2023).

⁴⁶ Paul Jockenos “Why Nuclear Power and Renewables Don’t Mix” Energy Transition (24 November 2022) available at <https://energytransition.org/2022/11/why-nuclear-power-and-renewables-dont-mix/> (accessed on 10 October 2023).

⁴⁷ University of Sussex “Two’s a crowd: Nuclear and renewables don’t mix” Science Daily (5 October 2020) available at <https://www.sciencedaily.com/releases/2020/10/201005112141.html> (accessed on 10 October 2023).

⁴⁸ See note 46.

⁴⁹ World Economic Forum “Wind and solar PV will take the lead” August 2020 available at https://www3.weforum.org/docs/WEF_Wind_and_Solar_2030.pdf (accessed on 10 October 2023).

- 10.3. However, amendments to section 49 of the National Nuclear Regulatory Act are to provide for when there is a disagreement between the Board and Minister of the DMRE. This amendment means that even after a recommendation is given, should the Board and Minister not agree, the Minister makes the final decision. Therefore, it is irrelevant whether a recommendation is given, or the Board is consulted with, as the Minister has the final decision-making power.
- 10.4. This ultimate power results in the Minister of the DMRE being the decision maker. In light of the below section, this raises serious questions about whether financial security will be implemented, especially for financial provisions for nuclear damage and decommissioning.
- 10.5. South Africa's history of rehabilitation
- 10.5.1. Nuclear energy requires precise and proper waste management. As stated above, the issues of nuclear damage, nuclear waste disposal and decommissioning will finally rest with the Minister of the DMRE.
- 10.5.2. The financing for decommissioning and waste management of nuclear projects falls under the "polluter pays" principle. The polluter pays principle as well as financial provisions for rehabilitation are similar within the mining sector of South Africa and also under the responsibility of the DMRE.
- 10.5.3. In the case of the mining industry, the Auditor-General undertook a follow up performance audit on the rehabilitation of abandoned mines. The outcomes can be summarized as follows:
- 10.5.3.1. Rehabilitation needs to take place at a faster rate as abandoned mines are a serious health, safety and environmental hazard for nearby communities.
- 10.5.3.2. From 2009 to 2023 approximately 2 322 high-risk commodity mines have not been rehabilitated.
- 10.5.3.3. There has only been a slight improvement in the rehabilitation programme from 1,67 mines in 2009 to 2,25 mines in 2021.

- 10.5.3.4. The management of 6 100 abandoned mines and 1 170 mine openings has been ineffective and has not addressed environmental, social and health impacts.
- 10.5.3.5. The databases on abandoned mines contain errors and data which is inaccurate, outdated and incomplete.
- 10.5.3.6. The DMRE was not well organized with lack of processes and procedures.^[50]
- 10.5.4. Auditor General Tsakani Maluleke stated in the media release for the report that “Citizens have a constitutional right to a safe, healthy environment that promotes conservation. The department’s slow progress in dealing with these D & O mines and mine openings leaves unrehabilitated mining sites that often change the natural environment. The resultant degradation takes the form of air pollution from dust or toxic gases, infertile soil and severely graded water resources that are often devoid of life”.⁵⁰
- 10.5.5. The nonperformance of the DMRE of abandoned and rehabilitated mines has not only resulted in harm to health and environment but has resulted in an increase of illegal mining which is scourged with violence, criminality, and illegal trading of minerals. There are also artisanal miners who are fighting to be able to make a living from the abandoned mines and at the same time be a solution for rehabilitation of these areas. A policy for formalizing artisanal miners has been published,^[50] but the DMRE has left it there with no laws or concrete actions to formalize the sector.
- 10.5.6. The DMRE will be the same department who will have a final say on the financial provisions, disposal of nuclear waste, management of nuclear damage and decommissioning of nuclear activities. From the track record of rehabilitation of mines, the DMRE’s prior performance is lacking. With this in mind, the results of poor management of radioactive and nuclear waste could be disastrous. Therefore,

⁵⁰ Auditor General South Africa “Auditor-General calls for stricter management in rehabilitating abandoned mines and mine openings” (31 March 2022) available at [https://www.agsa.co.za/Portals/0/Reports/Special%20Reports/2021/2022%20%20MEDIA%20STATEMENT%20\(Derelict%20and%20Ownerless%20Mines%20Performance%20Report\)%20FINAL%20\(002\).pdf?ver=2022-03-31-102059-447×tamp=1648714873244](https://www.agsa.co.za/Portals/0/Reports/Special%20Reports/2021/2022%20%20MEDIA%20STATEMENT%20(Derelict%20and%20Ownerless%20Mines%20Performance%20Report)%20FINAL%20(002).pdf?ver=2022-03-31-102059-447×tamp=1648714873244) (accessed on 11 October 2023).

nuclear power should not be considered until the DMRE shows a commitment to proper management of rehabilitation and financial provisions in the mining sector.

10.5.7. When looking at the example of the only commercial nuclear power plant in South Africa, Koeberg there has been allegations of no financial provisions being available to decommission. [OBJ]

10.6. The Bill should not limit liability for harms from nuclear power

10.6.1. With the dangers of nuclear damage being so extensive and for such long period of time (thousands of years), it is not appropriate for the liability from harm to be limited as is done in the redefining of the period of responsibility in the Bill and the amendments in section 27 of the Bill for strict liability.

10.6.2. Liability cannot be transferred to the next license holder as the polluter pay principle must be strictly enforced. Therefore, there cannot be any limiting of liability.

10.6.3. In the mining industry of South Africa, liability for damage to the environment has been circumvented by constant changing hands of rights/licenses for mining areas and the damage being carried over to a new entity who continues to create more liability. When payment for rehabilitation is finally due, entities have liquidated/disappeared with the DMRE having to take responsibility. This has resulted in a lack of rehabilitation with people and the environment paying the price.

PART 3: CONCLUSION AND RECOMMENDATIONS

11. It is very clear from the above reasons that nuclear is not a viable solution for energy access and load shedding issues in South Africa.

12. Nuclear energy will only be available in a decade or more and will create a legacy of radioactive and nuclear waste. It will also create risks and potential harm to people's health and the environment.

13. There will be no benefits to the development of the economy with subsidies being required, high costs of waste disposal and decommissioning and a small number of jobs and economic opportunities being created.
14. The White Paper on the Renewable Energy Policy 2003 states that there is a long-term vision of sustainable, completely non-subsidised alternatives to fossil fuels. It promotes and advocates for the use of biomass, wind, solar and small-scale hydro energy. This vision should guide the energy sources in South Africa.
15. Therefore, we urge the DMRE to not consider nuclear energy in the energy mix of South Africa in the future.
16. Whilst expanding nuclear energy may have disastrous consequences for present and future generations, adopting a pathway towards embracing renewable energy solutions works with nature instead of against it and will help create solutions that work for the present and for the future. Further, indigenous and local communities have more opportunities to meaningfully participate and move up the value chain, if renewable energy initiatives are thoughtfully planned and implemented, which can improve their livelihoods, increase their resilience, and abilities to adapt in the face of increasing impacts of climate change.
17. Finally public participation and access to information, as well as been able to test the decisions of government and its ministers should always be protected through the Constitutional rights to public participation. These rights are the right to equality (section 9), the right to dignity (section 10), the right to language and culture (section 30); the right to cultural, religious and linguistic communities (section 31); the right to access to information (section 32) and right to just administrative action (section 33).
18. In any planning for electricity access, the above rights should be promoted and enforced.