Endangered Wildlife Trust

Perspective on the Development and Use of Nuclear Energy in South Africa

The Endangered Wildlife Trust's (EWT) Mission is to conserve threatened species and ecosystems in southern Africa to the benefit of all people.

The EWT recognises that South Africa is currently heavily dependent on energy from fossil fuel resources, notably coal, and that this contributes to global carbon dioxide emissions, which the EWT believes should be drastically reduced. We therefore support the shift to a more diverse energy mix in South Africa, provided this leads to a decrease in the consumption of fossil fuels in the long term, a reduction in the unsustainable extraction of resources, and does not result in new or additional forms of environmental degradation and risk.

Several countries are still investing in nuclear power as part of their bid to meet their energy needs, whilst reducing carbon dioxide emissions and meeting climate change and emission targets. France, for example, generates around 75% of its electricity from nuclear energy, while Belgium, Czech Republic, Finland, Hungary, Slovakia, Sweden, Switzerland, Slovenia and Ukraine all generate at least 33% of their respective demand from nuclear sources.

The expansion of South Africa's nuclear energy programme is currently under consideration. In this context, the EWT recognises the following principle advantages of nuclear power:

- The fission process[1] used in nuclear power generation does not contribute to carbon emissions, and this is a major driver in shifting from fossil fuel-based energy.
- A nuclear power plant has a small footprint relative to its output, and once constructed it can operate for 40-60 years at relatively low costs.
- As nuclear reactors only need refuelling once every few years, transport costs are reduced.

[1] splitting the nucleus of an atom to generate heat, see Appendix 1

- Nuclear energy operates irrespective of weather conditions (a principle advantage over renewable energy technology).

However, we also recognise the following limitations of nuclear power generation:

- The energy source for nuclear energy is uranium, and while the scarcity of this mineral is debatable, the global supply is finite. Consequently, uranium cannot be considered a sustainable resource.

- Considering the entire nuclear process – including power station construction, and the processing, transport and mining of uranium – nuclear energy production remains relatively carbon intensive and the risk of environmental pollution during these processes is high.

- The waste produced during the fission process is radioactive and cannot be disposed of, or recycled. Instead, this waste is treated and stored on site, bringing into question the long-term viability of the process. The half-life of radioactive waste from nuclear fission is approximately 25,000 years, and the potential long-term consequences of waste storage and its impact on future generations remain completely unknown.

- Decommissioning of nuclear power stations is both costly and time consuming, and will leave an unwanted and considerable environmental legacy for future generations in the form of contaminated components and radioactive waste.

- Nuclear reactors need large volumes of water to cool them. The warm water this produces is typically discharged into the ocean, leading to thermal pollution. This impacts unnaturally on species and ecosystem processes in the marine environment. Increases in water temperature reduce dissolved oxygen, which affects fish and a wide variety of other aquatic organisms. Thermal pollution also affects the metabolic rate of aquatic organisms, causing them to consume more food and as such influences ecosystem function negatively.

- Nuclear accidents, however small the risk, have significant consequences for the environment and human populations over vast areas. The 1986 Chernobyl disaster – the worst nuclear accident in history – resulted in radiation fallout stretching across the (former) western Soviet Union and Europe. Thirty-one people died and some 220,000 people were re-homed. More recently in 2011, damage to the Fukushima Dai-ichi

nuclear power plant in Japan led to the mass evacuation of over 300,000 people. Although no immediate fatalities were recorded during this later incident, an estimated 1,600 people later died due to evacuation conditions. The most significant reported environmental impact during and after the incident was groundwater seepage into damaged reactor buildings and the mixing of this water with the highly radioactive water inside.

- Nuclear power plants represent a security threat if targeted by extremists. Reactor damage could lead to a nuclear fallout over vast areas, with far-reaching financial, social and environmental consequences.

In addition, nuclear power stations are expensive to construct. The cost of attaining the 9,600 MW nuclear target in South Africa's Integrated Resource Plan is estimated to be approximately USD50-billion, excluding interest on loans. We believe this investment should be channelled to the improvement and roll out of renewable energy technologies, as new build nuclear energy will cost an estimated R1.30 per kWh compared to approximately R0.70 per kWh for new wind energy and R0.90 per kWh for new solar energy respectively.

Given the considerable limitations of nuclear energy generation, as well as the significant risks, the EWT believes that the large financial costs associated with nuclear energy should partly be used to develop more decentralised energy systems. The public and industry should be offered subsidies to generate electricity on a small scale, for example installing rooftop solar, to reduce the demand and consumption of electricity in South Africa.

The per-megawatt cost of wind and solar energy is already lower than coal-powered energy, and the energy contributions of these renewable sources must be increased. In addition, a variety of renewable energy technologies such as ocean current, landfill gas, biogas and ocean wave energy still need to be developed and improved. We strongly argue that South Africa's focus and investments should be around these technologies, to significantly reduce overall environmental impacts, rather than shifting the environmental impact from fossil fuel to nuclear energy. If the South African government invests in local research and development of renewable technology, this is likely to create sustainable jobs and boost the economy as opposed to the considerable financial resources paid to international construction companies.

The EWT does not support any decision that serves to promote nuclear energy at the expense, or delayed implementation, of renewable energy.

In addition, a number of factors specific to South Africa still need to be addressed satisfactorily before the case for nuclear energy can be considered:

a) The impacts of uranium mining on the environment and on human health in South Africa, and how these will be meaningfully mitigated. Currently, proposed mining applications have not adequately addressed this.
b) Clarity on the scale and proposed location of reactors envisaged for nuclear development planned for South Africa.
c) Transparency and clarity on the cost of the planned nuclear programme and evaluation of the energy opportunity costs incurred should the nuclear build programme proceed. The impact of nuclear investments on renewable energy and the commensurate impact must be weighed against the same investment into renewable energy alternatives.

The EWT is also of the opinion that for nuclear energy to be considered, a number of prerequisites need to be objectively met:

a) A competent, stable, well governed and solvent energy utility.
b) An independent and accountable regulator.
c) A transparent and effective public participation system that promotes social justice and people's right to participate in decision-making.

Nuclear energy has some advantages over some other current forms of industrial energy production but there are also considerable drawbacks that cannot be ignored due to their complexities and the environmental burden these create for both present and future generations.

The EWT takes the position that a global shift away from both fossil fuel and nuclear energy towards renewable energy is achievable and must be the main focus of any major government

spend and technology advancement, in order to minimise impact on our environment and benefit current and future generations.

The EWT bases its perspectives on the best available information and data available at the time. Our positions and opinions may change as more information and data become available.

Appendix 1

- Nuclear power plants produce electricity by boiling water into steam. This steam then turns turbines to produce electricity.
- Heat required for steam is produced during a process called fission, which is the splitting of uranium atoms in a nuclear reactor. Uranium fuel consists of small, hard ceramic pellets that are packaged into long, vertical tubes. Bundles of this fuel are inserted into the reactor.
- Rods inserted among the tubes holding the uranium fuel control the nuclear reaction. Control rods, inserted or withdrawn to varying degrees, slow or accelerate the reaction.
- The nucleus of a uranium atom is unstable. As the nuclei break up, they release neutrons. When the neutrons hit other uranium atoms, those atoms split, releasing additional neutrons along with heat. One fission triggers others, and the process continues to form a chain reaction. When that happens, fission becomes self-sustaining.
- Water separates fuel tubes in the reactor. The heat produced by fission turns the water into steam.
- The steam is applied to a turbine, which spins a generator to create electricity.