sanedi

South African National Energy Development Institute

Overview of current and future prospects of nuclear in South Africa

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Content Outline

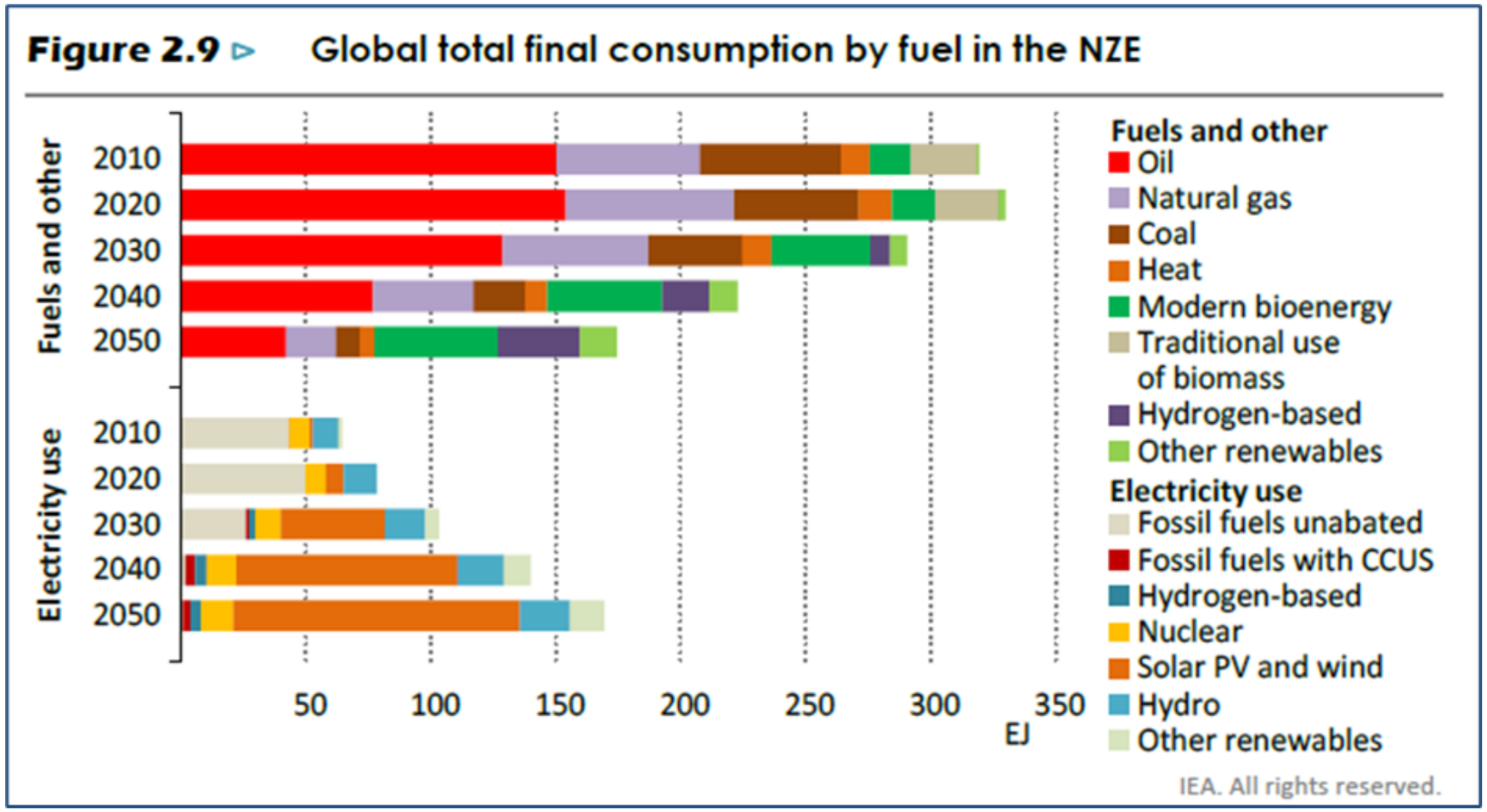
- Global context of Nuclear Energy
  - COP 28 Outcomes
  - NET ZERO EMISSIONS
- Nuclear Energy in South Africa context
- Coal Plant Repurposing
- SMRs and Advanced Nuclear

GLOBAL CONTEXT OF NUCLEAR ENERGY

- A number of countries participated in the **COP 28 in Dubai**, where the Declaration recognizing the key role of nuclear energy in achieving global net-zero greenhouse gas emissions by 2050 and keeping the 1.5-degree goal within reach was agreed by several Member States.
- Core elements of the declaration include working together to advance a **goal of tripling nuclear energy capacity globally by 2050** and inviting shareholders of international financial institutions to encourage the inclusion of nuclear energy in energy lending policies.
- Pursuant to the Dubai Conference of the Parties the next step was to organise the **Nuclear Energy Summit**, the first of its kind which was hosted in **Brussels, Belgium 21st of March 2024**.
- The International Energy Agency (IEA) projects that **global** nuclear capacity will grow from **416 gigawatts (GWe) in 2023 to 647 GWe in 2050**. This is based on existing energy policies.

NET ZERO EMISSIONS

- Over 44 countries have committed to NET ZERO EMISSIONS by 2050
- Key to this is the recognition that nuclear power will have to play in achieving this.
- ~17GWe of nuclear annually



NUCLEAR ENERGY SOUTH AFRICAN CONTEXT

❑**1998 White Paper on Energy Policy**: diversity in the energy mix acknowledges the need to gradually transition to a low carbon economy.

- **Objective 4** *“managing energy-related environmental impacts”*
- **Objective 5** *“securing supply through diversity” in integrated resource planning methodologies.”*

❑**Nuclear Energy Policy of 2008**: vision to exploit nuclear for peaceful purposes

- through the development of an extensive nuclear energy programme with ***long-term goal of being self-sufficient in the nuclear fuel cycle value chain***.
- ***Nuclear Energy*** *shall form part of* ***South Africa‘s strategy to mitigate climate change***

❑**Integrated Resource Plan (IRP) approved in October 2019**

- The retiring of baseload coal **(24 100MW)** fleet post 2030 - and replacement thereof with Clean energy technologies

❖**Decision 2:** *“Koeberg power plant design life must be extended by another 20 years by undertaking the necessary technical and regulatory work”*

COAL POWER STATIONS REPURPOSING

- Several studies have shown that retrofitting existing fossil fuel plants is both economically and financially viable and competitive.

- A case study in Poland, which has a similar dependency on coal power plants as South Africa, illustrate a 28-35% reduction in capital costs, and 9-20% reduction in levelized cost as compared to a greenfield installation.

- This will also address the Just Transition challenges faced with moving the current electricity production from the coal power plants to other regions of the country, as well as the challenges associated with installing new grid and power evacuation infrastructure.

- SMRs viable technology option for SA repurposing of decommissioned coal fired plants

- Russia and China are leading with SMRs. There are more than 80 modular reactor designs under development in 19 countries including USA, Denmark, India, Japan etc

NUCLEAR AS PART OF THE ENERGY MIX

- Extensive nuclear technology experience locally (**Koeberg NPP**) and globally **(~443 NPPs operating in 30 countries**) as well as established global supply chains
- Nuclear as a **baseload energy source** to ensure security of supply
- Nuclear has **very low GHG emissions** over the entire lifecycle, comparable to hydro and renewables
- Nuclear has the **flexibility and versatility** to integrate with renewable energy sources to provide grid stability;
- Nuclear provides security of supply, however the **high upfront capital cost**; however, **competitive** with other technologies
- Viable, economic option due to **long operational lifetime** (60+ years with plant life extension) and **low operating costs**.
- Lower **system costs** for nuclear power than for intermittent renewables.

SMRs and ADVANCED NUCLEAR REACTORS

- Small Modular Reactors and Advanced Reactors
  - low capital cost and
  - high flexibility (load following, site location, modular size, and product output)

- Gamechanger and necessary solution option to provide energy (electricity or process heat) in future zero carbon energy systems.

- Investors globally are turning to nuclear, including Elon Musk and Bill Gates

- Increased global interest in small modular reactor (SMR) development favours South Africa's revival of the Pebble Bed Modular Reactor Technology(PBMR).

- The advancement in SMR technology and desired deployment thereof positions South Africa to further develop pebble fuel technology for potential global export

- Transfer of PBMR from Eskom to NECSA for further development

- Cabinet decision required to lift PBMR from Care and Maintenance

Thank You