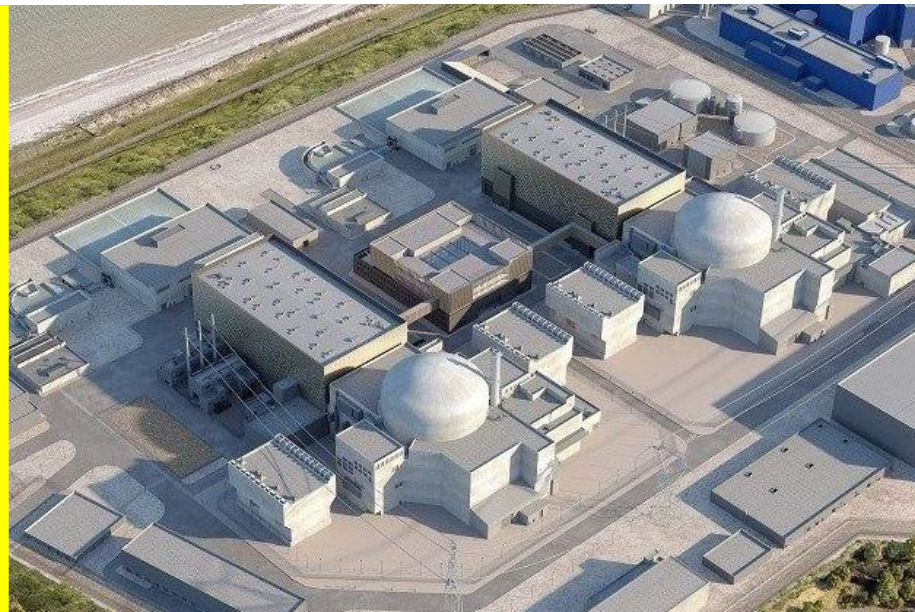


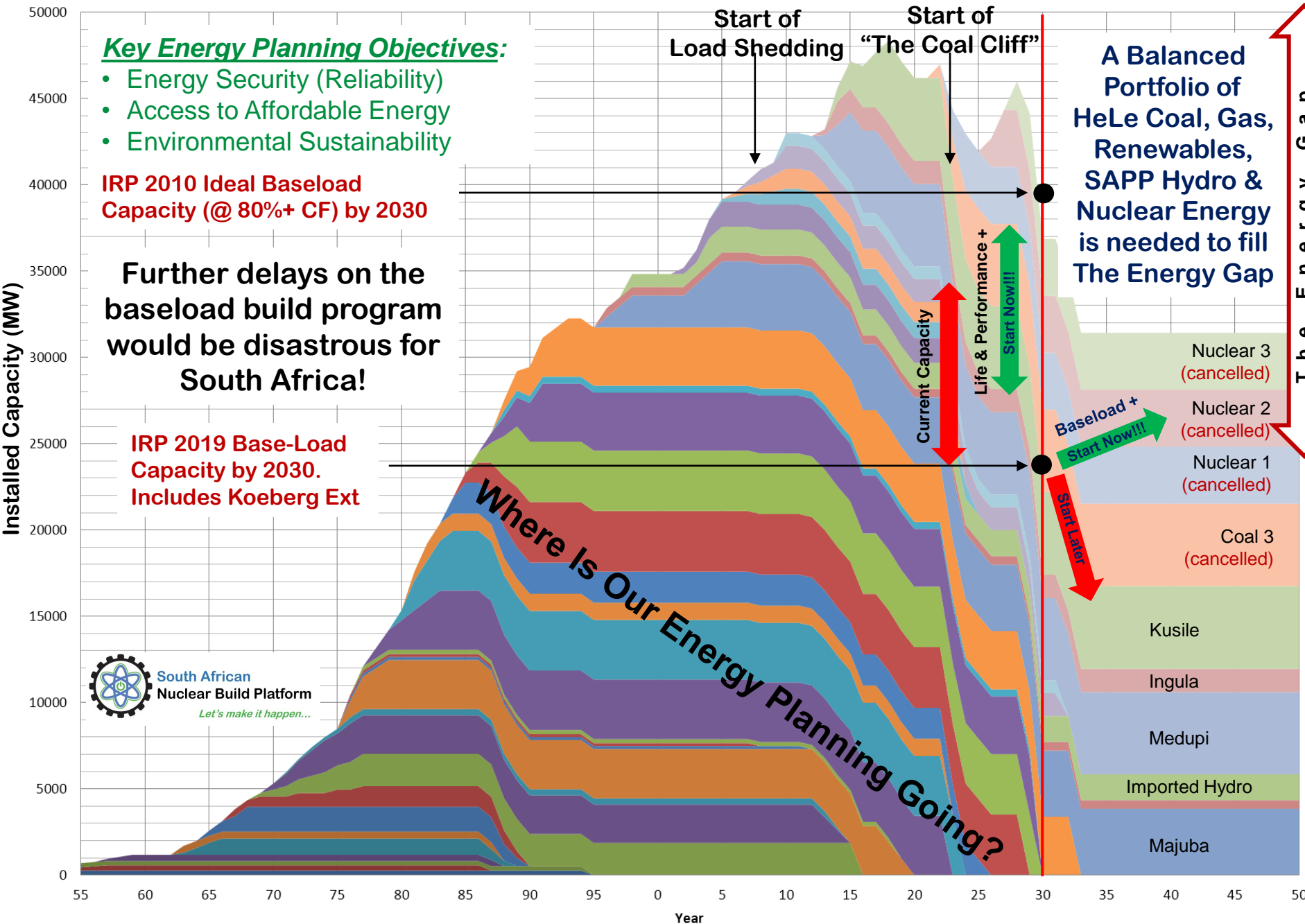


# Finding a Balanced and Sustainable Energy Mix for South Africa

*Presented by: Des Muller – Spokesperson for SANBP*



# IRP 2010 vs IRP 2019 Baseload Capacity Planning



## Key Energy Planning Objectives:

- Energy Security (Reliability)
- Access to Affordable Energy
- Environmental Sustainability

IRP 2010 Ideal Baseload Capacity (@ 80%+ CF) by 2030

Further delays on the baseload build program would be disastrous for South Africa!

IRP 2019 Base-Load Capacity by 2030. Includes Koeberg Ext



Where Is Our Energy Planning Going?

A Balanced Portfolio of HeLe Coal, Gas, Renewables, SAPP Hydro & Nuclear Energy is needed to fill The Energy Gap

## Assumptions:

For a developing and growing country, South Africa's electricity demand should double by 2050. EVs will significantly raise demand.

Base-Load capacity provides 3 to 4 times the electricity delivered by renewables

Base-Load power plants have an 8-to-10-year lead time.

Nuclear and Gas Power are classified as "green". (COP26)

> 1 GW per year "Coal Cliff" Retirement Program ahead

Gas Master Plan should be Implemented in 2022?

## Immediate Solutions:

- Raise performance of Eskom's coal fleet
- Delay coal power retirement program
- Start Gas & Nuclear Procurement Immediately!



# Reboot Eskom's Purpose

The Climate Agenda has Vilified Eskom

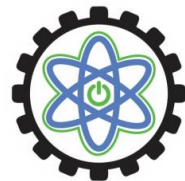
Improve Performance & Plant Life

Effective Leadership & Competence

Engage Environmental Management

Align with Global Best Practices

Restructure to Improve Service



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**Capacity: 60 TWh per Year (25%)**

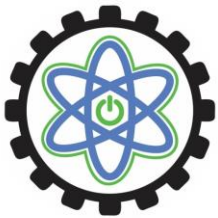
**Actual: ?**





# Experience has shown Worldwide, that Energy Security needs Stable Baseload and Flexible Energy to Support Weather- Dependent Technologies

*This Science is also Settled...*



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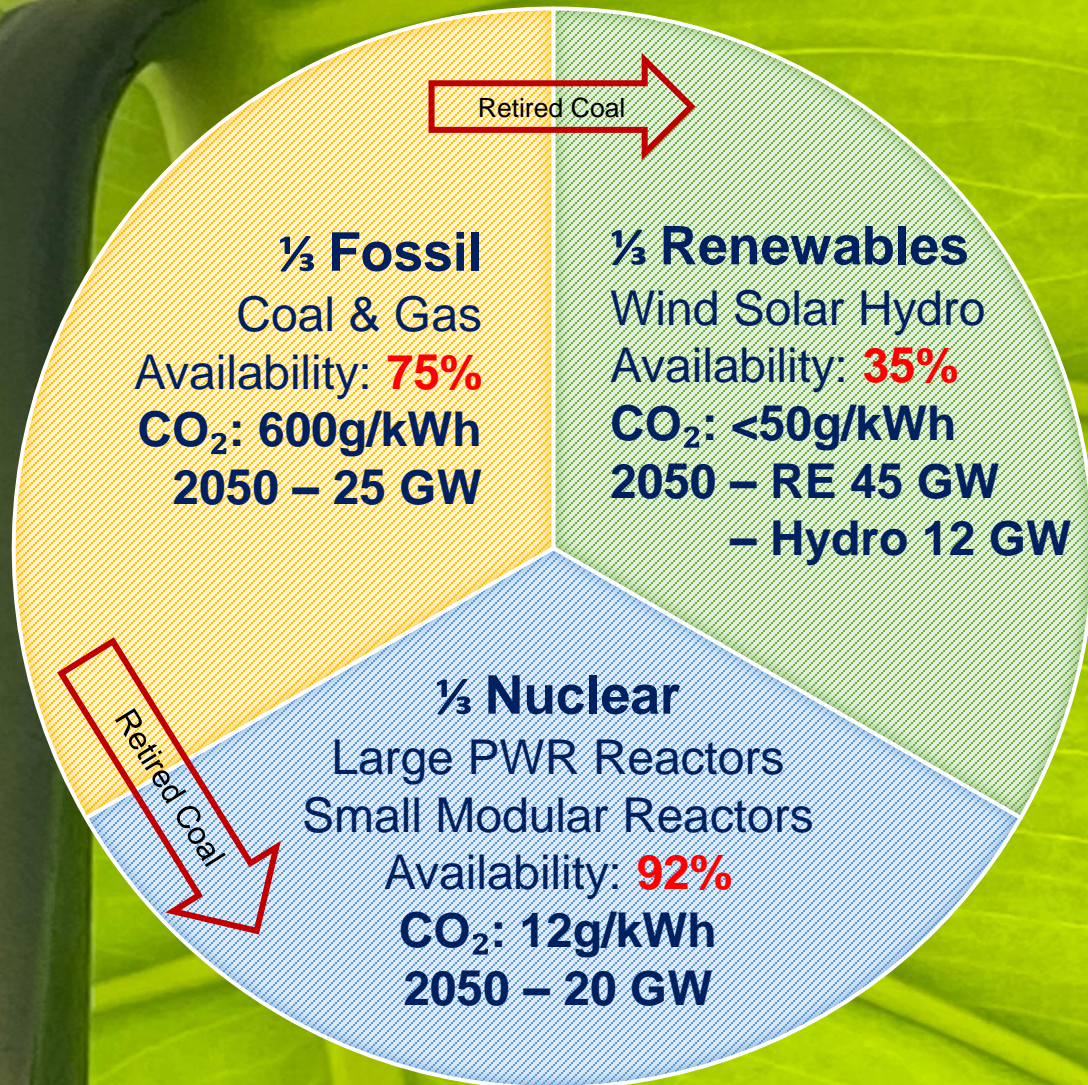
Renewables (20%)

Flexible Energy (20%)

Baseload (60%)



# SA Electricity Generation 2000 to 2050 200TWh to 400TWh



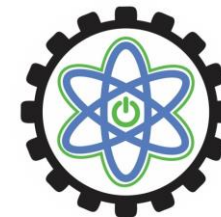
## South Africa needs a Just Energy Transition...

### Not Just an Energy Transition

- Energy Security – Reliability
- Environmental Sustainability
- Access to Affordable Energy
- Industrial Expansion and Jobs
- Planned, Financed & Delivered
- Clean Hybrid Energy (H<sub>2</sub> & H<sub>2</sub>O)
- Strengthen Africa's Power Pools

*The Product of a Just Energy Transition is...*

*A Country with an Abundance of Clean,  
Reliable and Affordable Energy, Driving  
Economic Growth and Prosperity for all*



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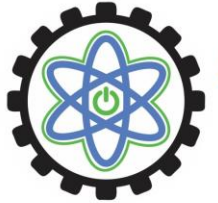
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**Sustainable 2050 Capacity Mix for SA**

**Southern Africa has  
a Wealth of Clean Power  
Generation Opportunities,  
...and it's Interconnected.  
Time to Start Solving the  
Energy Crisis as a Region**

**Complimented with DSM & Distributed Systems**



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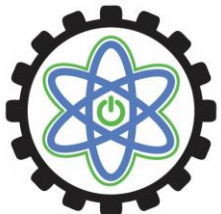
*Let's make it happen...*





# After Powering Western Cape for 38 years Koeberg's Spent Fuel can fit on Half a Tennis Court

- *All spent fuel secured in the pools inside the containment*
- *Ready to put into dry storage cask for interim storage*
- *Can be reprocessed into advanced nuclear fuels. GT-GW*
- *Decomm & Waste Management Costs covered in Tariff*



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Spent Fuel Pool



Renewable Waste Landfills



Comparing  s with  s....

Capacity Factor: >90%

Time and Costs involved in building the Capacity needed to deliver 10% of South Africa's annual electricity demand

... and the cost per kWh?

Reliance on... Fossil Fuels

Ramp Up Rates after First Power

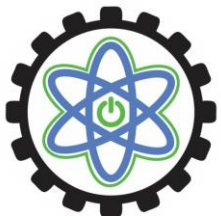


8.6 TWh/yr



2.2 TWh/yr

So, who costs too much and takes too long to build?



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Capacity Factor: RE ~25%

## Scalable Nuclear Energy

CO<sub>2</sub> : 12g/kWh



Electricity Production	<b>26 TWh/yr</b>	Generation Capacity	3300 MW	Cost	± \$16Bn
Construction Lead Time	10 years	Operating Life	75 years	Land Usage	2 Sq km

## Renewable Energy + BESS + Fossil

CO<sub>2</sub> : >200+g/kWh



**70% RMI4P (R1.70/kWh before gas hike!)**

Electricity Production	<b>26 TWh/yr</b>	Generation Capacity	15000 MW (repeat 3x) (BESS 7x)	Cost	± \$22Bn (x3)
Construction Lead Time	15 years (x3) @ 1 GW/yr	Operating Life	25 years (1/3) 10 yrs - BESS	Land Usage	600 Sq km



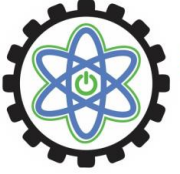


CO<sub>2</sub> <12g/kWh



# Nuclear Energy Delivers Effective Solutions to the Most Common Challenges Experienced in Power Generation...

... it also aligns with our SDGs



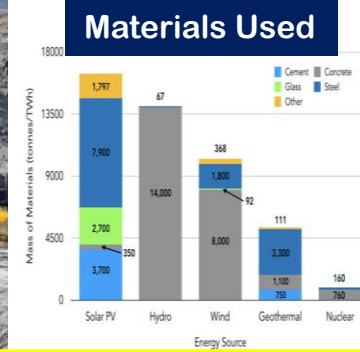
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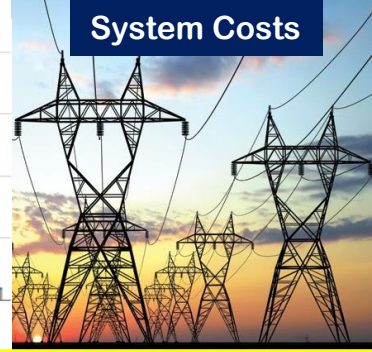
Toxic Waste Management



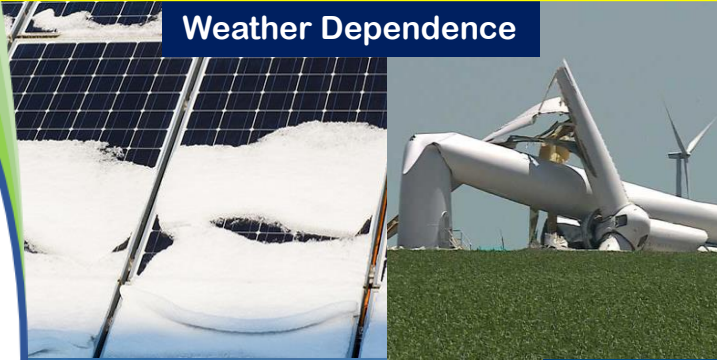
Materials Used



System Costs



Weather Dependence



Fuel Security



Cooling



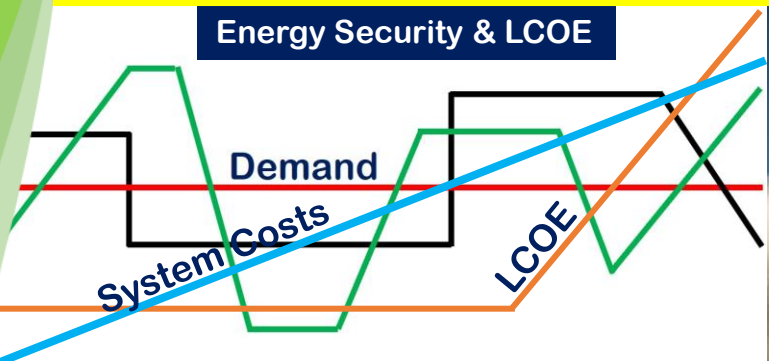
Construction



Energy & Land Density



Energy Security & LCOE



Safety & Environment



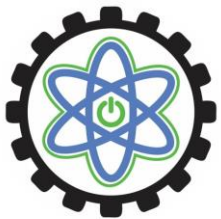
Local Jobs



# Small Modular Reactors are an Effective Replacement for our Retired Coal Power Plants

- Jobs During Construction + 60yr O&M
- Increased Power Output (TWh) CF 90%
- 98% Reduction in CO<sub>2</sub> Emissions
- Existing Workforce Upskilled & Retained
- Affordable Green H<sub>2</sub>, H<sub>2</sub>O and Heat
- Perfect Synergy with Gas Power Plants
- Delivers to Eskom's ESG Objectives

*Now that's a Just Energy Transition...*



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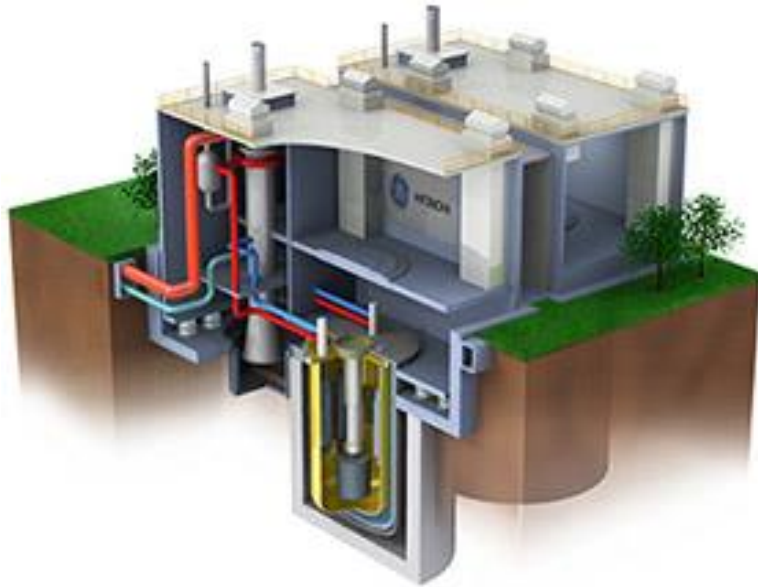
*Let's make it happen...*

[www.sanuclearbuildplatform.co.za](http://www.sanuclearbuildplatform.co.za)

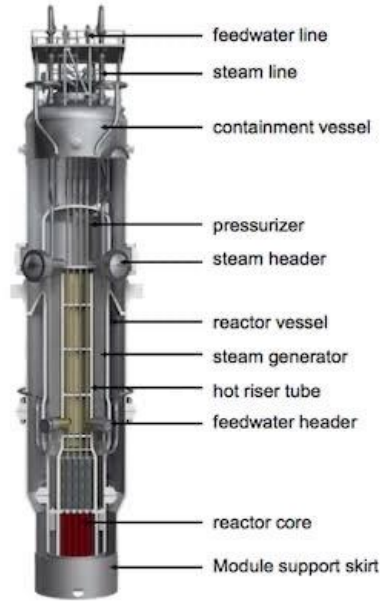




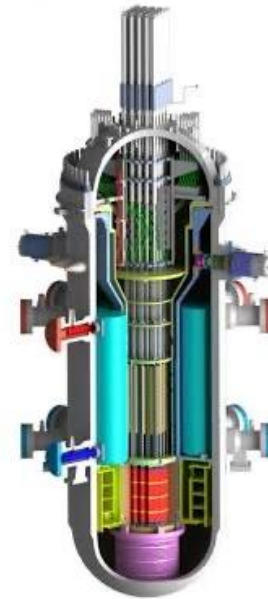
# Generation 4 Small Modular Reactors (SMR) (40 to 400MW - Hybrids)



**GE-Hitachi**



**NuScale**



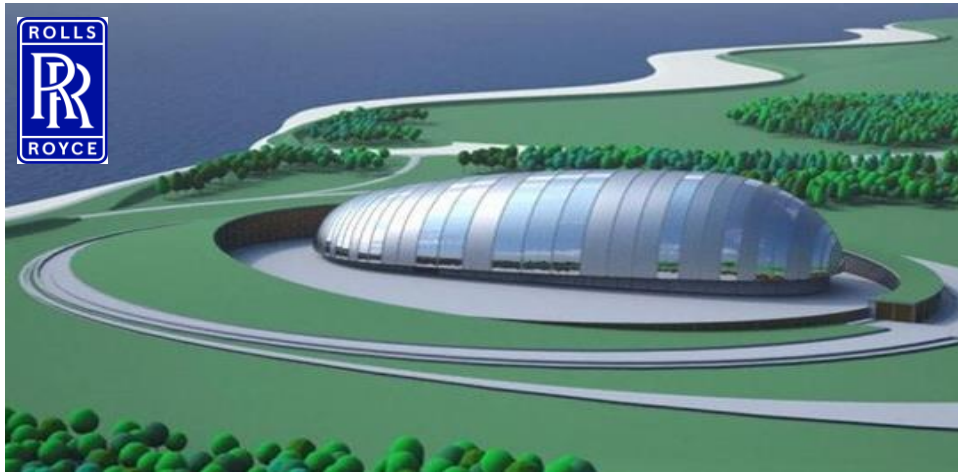
**KAERI - SMART**



**EDF - Nuward**



**Rosatom**



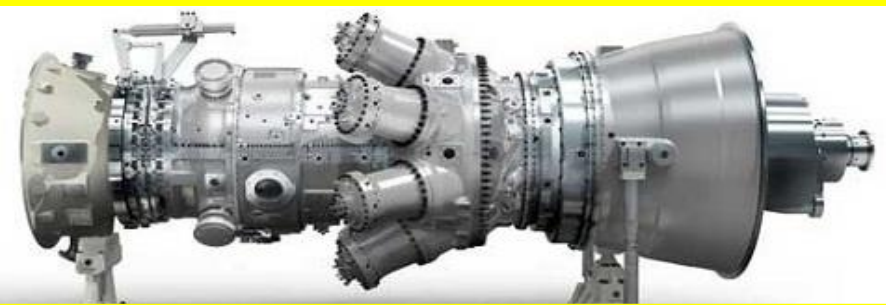
Commercial Operation Jan 2022



**Westinghouse**

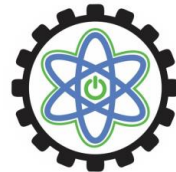
*Intensive Energy Users should consider SMRs for Embedded Generation, or Invest Equity in Large NPP for Long-Term Clean Off-take Agreements*





# Conclusion:

- Effective Solutions at the Right Magnitude.
- Sweating the Small Stuff will Drown You.
- Eskom to Seize Full Control of its Power Plants.
- Extend Life and Improve Performance of all Eskom's Power Plants, including Koeberg.
- Get Professional Help and Support to do that.
- Start New Baseload Procurement & Construction
- Integrate Renewables and DSM Sensibly and not as a Substitute for New Baseload Power.



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*Let's Get South Africans Back to Work!*



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