SUBMISSION TO NERSA ON CONCURRENCE WITH THE SECTION 34 DETERMINATION FOR NUCLEAR PROCUREMENT

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CONTENTS

Additional attachments: Please see the memorandum in Appendix A which provides comprehensive overview of the legal context pertaining to the nature of NERSA's powers and the requirements attendant on the exercise of those powers. The memorandum was compiled by Webber Wentzel, as requested by Meridian Economics. Webber Wentzel act as a neutral party and do not adopt any position on the correctness or desirability of the draft section 34 determination for nuclear procurement.

POLICY AND LEGISLATIVE CONTEXT: SECTION 34 OF THE ERA (2006)

EMPOWERMENT OF THE MINISTER TO DETERMINE TYPES AND QUANTITY OF NEW GENERATION CAPACITY

- Section 34(1) of the Electricity Regulation Act (“ERA”) (2006) empowers the Minister to determine, in consultation with NERSA, that "new generation capacity is needed" and to make a determination regarding "the types of energy sources from which electricity must be generated, and the percentages of electricity that must be generated from such sources".
- For a determination by the Minister in terms of section 34(1) of the ERA to have force and practical effect, it must serve before and be concurred in by NERSA.

DETERMINATION UNDER SECTION 34(1) OF THE ELECTRICITY REGULATION ACT, 2006 (ACT NO. 4 OF 2006)

The Minister, in consultation with the National Energy Regulator of South Africa (“NERSA”), acting under section 34(1) of the Electricity Regulation Act, 2006 (Act No. 4 of 2006) (as amended) (the **ERA**) has determined as follows:

1. To commence the process to procure the new nuclear energy generation capacity of 2 500 MW as per decision 8 of the Integrated Resource Plan for Electricity 2019 - 2030 (published as GN 1360 of 18 October 2019 in *Government Gazette* No. 42784)("IRP 2019");
2. The generator of this electricity produced will be either Eskom Holdings (SOC) Limited, or any other organ of state, or in partnership with any other juristic person.
3. The buyer of the electricity will be Eskom Holdings (SOC) Limited or any entity determined through the Eskom's unbundling process as the future buyer of electricity.
4. The procurer of the nuclear new build programme will be the Department of Mineral Resources and Energy, or any other organ of state, or in partnership with any other juristic person.
5. The procurer designated above will be responsible for determining the procurement process which will be established through a tendering procedure which is fair, equitable, transparent, competitive and cost effective.

Government notice: draft section 34 determination to procure 2,500MW of nuclear power

POLICY AND LEGISLATIVE CONTEXT: NERA (2004)

NERSA'S LEGAL OBLIGATIONS IN EXERCISING ITS POWER OF CONCURRENCE

- NERSA's concurrence must comply with section 10(1) of the National Electricity Regulation Act ("NERA") (2004)
- **Section 10(1)(b) of the NERA mandates NERSA to *act in the public interest* in making its concurrence decision:**
  - Accordingly, where a proposed determination would be detrimental to the public, it cannot lawfully concur in that determination.
  - In assessing what is in the "public interest" South African courts have adjudged what is "reasonably necessary in the interest of the public" and engaged in a weighing-up of hardship and benefit to the public.
- **Section 10(1)(d)-(f) are indicative of the fact that the legislative intent is for NERSA *to play an active role in exercising its discretion to concur (or to refuse to do so)*.**
  - NERSA therefore cannot merely give an affirmative response to the Minister's request for concurrence – rather, NERSA is required to apply its mind afresh and independently to the content of the section 34 determination and its implications in order to come to a lawful decision.
  - The NERA further requires NERSA to prepare a written summary of the relevant facts, reasons, evidence, and the legal basis for its decision.

Decisions of Energy Regulator

10. (1) Every decision of the Energy Regulator must be in writing and be—
(a) consistent with the Constitution and all applicable laws;
(b) in the public interest;
(c) within the powers of the Energy Regulator, as set out in this Act, the Electricity Act, the Gas Act and the Petroleum Pipelines Act;
(d) taken within a procedurally fair process in which affected persons have the opportunity to submit their views and present relevant facts and evidence to the Energy Regulator;
(e) based on reasons, facts and evidence that must be summarised and recorded; and
(f) explained clearly as to its factual and legal basis and the reasons therefor.

Source: Section 10(1) of National Electricity Regulation Act (2004)

POLICY AND LEGISLATIVE CONTEXT: PAJA (2000)

BOTH THE SECTION 34 DETERMINATION, AND NERSA'S DECISION ON CONCURRENCE ARE SUBJECT TO THE PROMOTION OF ADMINISTRATIVE JUSTICE ACT ("PAJA") (2000)

- As administrative action, both the section 34 determination to procure new nuclear power, as well as the decision by NERSA to concur (or not to do so) must be in accordance with the procedural and substantive requirements in the PAJA (2000) which include, but are not limited to:

1. **That the decision should not be arbitrary** (Section 6(2)(e)(vi) of PAJA):
   - This makes clear that a decision-maker must do more than simply "rubber-stamp" a decision taken by another decision-maker (to do so would constitute an abdication of the discretionary power vested in the decision-maker, with the effect that a decision was not taken by that decision-maker at all)
   - NERSA is required to apply its mind, independently, to the determination proposed by the Minister.
2. **That the exercise of public power must be rationally connected to** (Section 6(2)(f)(ii) of PAJA):

   (i) the purpose for which it was taken;

   (ii) the purpose of the empowering provision;

   (iii) the information before the administrator;

   (iv) the reasons given for it by the administrator.

   - Where a step in the decision-making process does not bear a rational relation to the purpose for which the power was given to the decision-maker, the information before the decision-maker or the reasons given for the decision, the entire decision-making process may be rendered irrational.
3. **That the decision should be reasonable** (Section 6(2)(h) of PAJA):
   - Any adverse impact on a person occasioned by such exercise be proportional to the benefit sought to be gained through the exercise of such power.
   - Assessing reasonableness requires the consideration of a range of factors relevant to the decision, the nature of the competing interests involved and the impact of the decision on the lives and well-being of those affected.
   - E.g. in terms of the section 34 determination by the Minister, even if the decision that new generation capacity is required is unequivocally reasonable, the sub-decisions on the type of energy source or the percentage of electricity to be generated from that source may be unreasonable and therefore invalid.

SUMMARY OF KEY FINDINGS IN THIS SUBMISSION

- As outlined in PAJA (2000) Section 6(2)(f)(ii), in order for a decision to be rational, it must (among other provisions) be connected to the information before the administrator
  - The information on nuclear power provided in the IRP 2019, read in its factual context, does not offer adequate support for nuclear procurement. It is unclear what rational connection exists between the ministerial decision and the information that informed it.
  - The IRP 2019 reasons that nuclear is a 'no-regret' option, however, there are cheaper power generation technologies that perform better in respect of the 'no-regret' definition in the consultation document and hence this reasoning does not provide a rational basis for nuclear procurement. Therefore, there is no rational basis on which NERSA could concur with the decision to procure nuclear power.
- According to NERA (2004) Section 10(1)(b)(e), NERSA is legally obligated to act in the public interest and base its decisions on reasons, facts and evidence.
  - We demonstrate that the procurement of nuclear is not in the public interest because: the procurement of nuclear will raise electricity costs, increase financial risks, increase security of supply risks due to project delays, exacerbate Eskom's financial failure as it will be forced to purchase power above the cost of cheaper alternatives, and because nuclear has poor localisation and job creation potential when compared to other alternatives.
- The ministerial decision to procure nuclear power, and thereby the decision to concur, is unreasonable, as the procurement will likely have a negative impact on the lives and well-being of those impacted, one impact being increasing electricity tariffs. Alternative solutions would better serve the public, while still furthering energy objectives.
- NERSA must demonstrate that it has applied its independent mind to the decision to procure nuclear power. Absent additional information or cogent evidence from NERSA, that significantly supplements or contradicts the information provided to date and publicly available, there is no rational basis for NERSA to concur with the section 34 determination in question.

SUPPORTING EVIDENCE FOR KEY FINDINGS

The following three sections provide evidence for the findings in this submission, which substantiate that the procurement of nuclear power, and therefore the decision to concur, is irrational, is not in the public interest and is thereby unreasonable. In particular, we provide evidence and reasons to show that:

1. The decision to procure nuclear power is not supported by the (adjusted least-cost optimization) analysis presented in the IRP 2019, nor is it supported by similar studies of the South African power system available in the public domain.
2. Further arguments in the IRP 2019 and NERSA consultation paper in support of the decision to procure nuclear power are ill-founded and susceptible to challenge.
3. The decision to concur with the section 34 determination is not in the public interest.

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THE DECISION TO PROCURE NUCLEAR POWER IS NOT SUPPORTED BY THE (ADJUSTED LEAST-COST OPTIMIZATION) ANALYSIS PRESENTED IN THE IRP 2019, NOR IS IT SUPPORTED BY SIMILAR STUDIES OF THE SOUTH AFRICAN POWER SYSTEM AVAILABLE IN THE PUBLIC DOMAIN

THE IRP 2019 ALLOCATES NO NEW BUILD NUCLEAR CAPACITY

- The Integrated Resource Plan (IRP) is the process to establish the need for power generation capacity expansion in South Africa. The IRP is based on a least-cost optimisation process which is then 'adjusted' for policy implementation. (Wright and Calitz, 2020)
- Results of the least-cost optimisation modelling process and conclusions presented in the IRP 2019 do not provide any substantive information that can form a rational basis for the draft 34 determination to procure nuclear power.
- **In the capacity allocation Table 5 of the IRP 2019, no new build nuclear capacity* is allocated for the planning horizon of 2019-2030.**
- A decision to procure new nuclear power is not supported by findings presented in IRP 2019. In the absence of any other sound basis presented for the determination it is therefore irrational. A NERSA decision to concur with the draft section 34 determination would therefore also be rendered irrational.

	Coal	Coal (Decommissioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37 149		1 860	2 100	2 912	1 474	1 980	300	3 830	499
2019	2 155	-2373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1 433	-557				114	300			
2021	1 433	-1403				300	818			
2022	711	-844			513	400 1000	1600			
2023	750	-555				1000	1600			500
2024			1860				1600		1000	500
2025						1000	1600			500
2026		-1219					1600			500
2027	750	-847					1 600		2000	500
2028		-475				1000	1 600			500
2029		-1694			1575	1000	1 600			500
2030		-1050		2 500		1 000	1 600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33364		1860	4600	5000	8288	17742	600	6380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

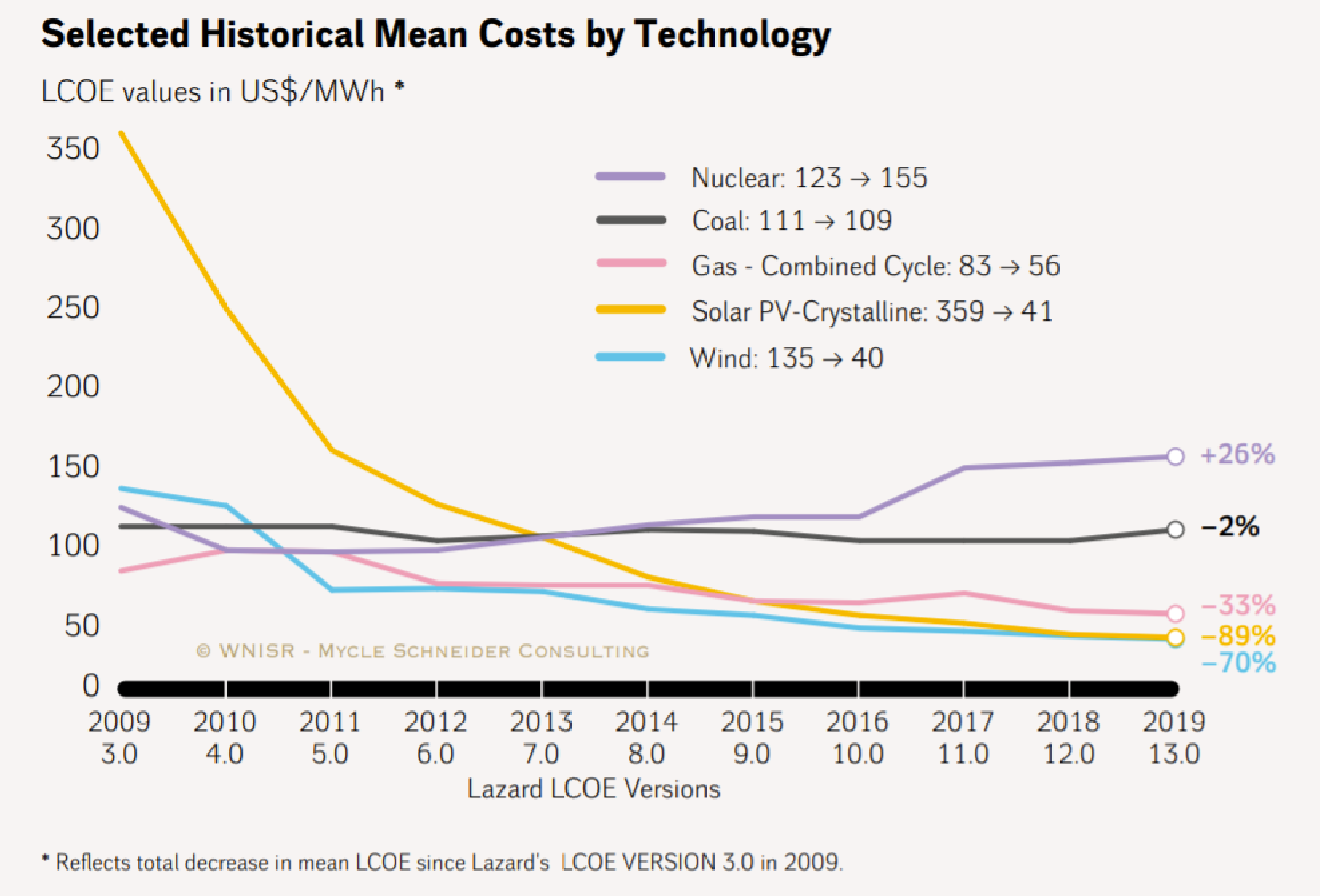
- Installed Capacity (grey)
- Committed / Already Contracted Capacity (yellow)
- Capacity Decommissioned (red)
- New Additional Capacity (green)
- Extension of Koeberg Plant Design Life (blue)
- Includes Distributed Generation Capacity for own use (orange)

Source: South Africa's Integrated Resource Plan (2019)

**1,860MW of nuclear capacity in Table 5 indicates existing capacity at Koeberg plant, the licence of which is to be renewed.*

GLOBAL CONTEXT: NUCLEAR COSTS HAVE RISEN, WHILE THE COSTS OF LOW-CARBON ALTERNATIVES HAVE PLUMMETED

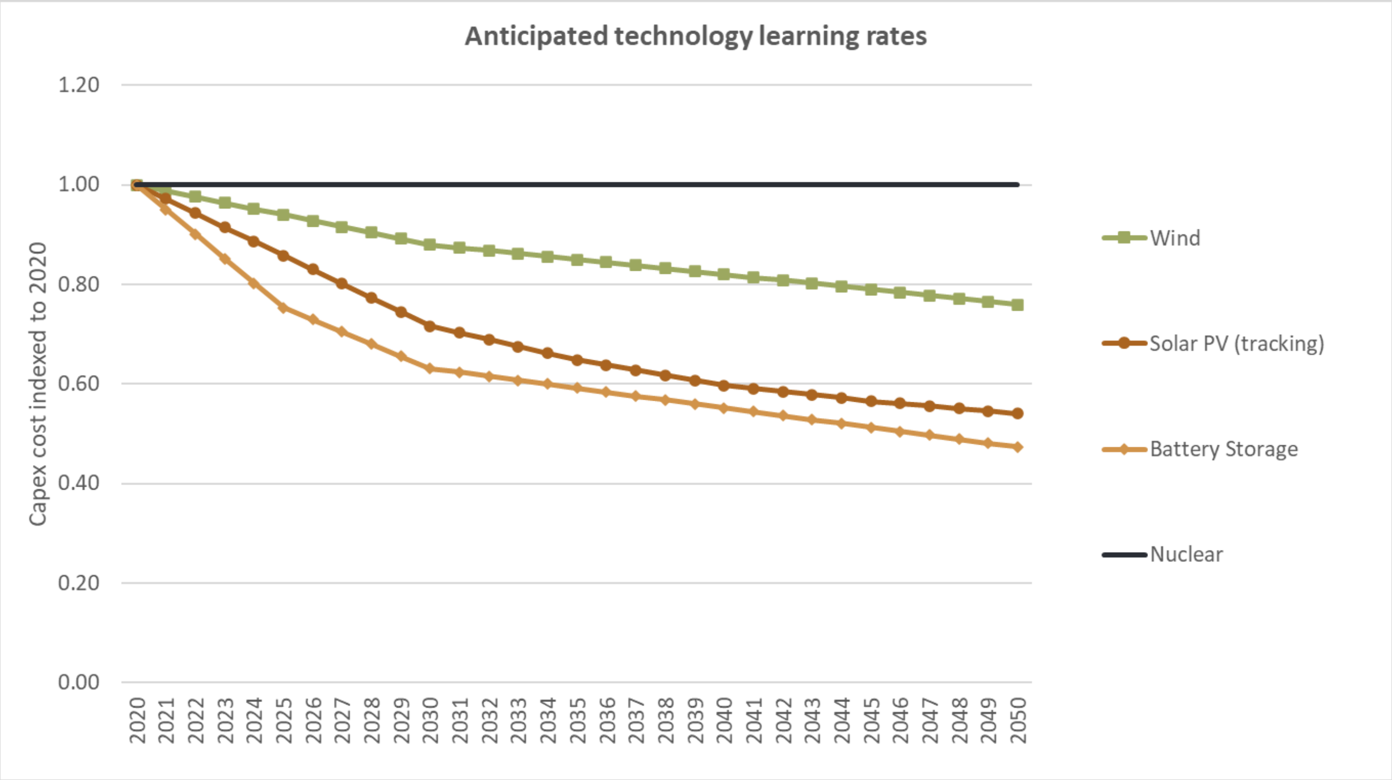
- The cost of new nuclear projects rose 26% between 2009 and 2019.
- In the same period, utility-scale solar costs fell 89%, and the cost of wind energy dropped 70%.
- "The declining costs of renewables globally contrast with nuclear costs that are at best constant, and more often, when numbers are available, are rising, often significantly." (World Nuclear Industry Status Report, 2020).
- New conventional nuclear units are indicating total costs of between $5,500/kW to $8,100/kW which would make the speculative cost of 2,500MW nuclear somewhere between R230-billion and R260-billion (Cohen, 2020).
- It is widely acknowledged based on realised costs that wind and solar PV technologies are now the cheapest energy generation sources in most countries, more so than nuclear and gas.



Source: World Nuclear Industry Status Report (2020)

DISRUPTIVE COST-DECLINES IN RENEWABLE ENERGY WILL CONTINUE FOR THE NEXT TWO DECADES

- The latest information on global nuclear costs presented on the previous slide corroborates with estimates in the IRP 2019.
- The IRP 2019 determines nuclear and gas to be 'mature technologies' and hence large cost declines are not anticipated.
- Meanwhile, disruptive cost-declines in renewable energy technologies are expected to continue for the next two decades.



Sources: Integrated Resource Plan (2019); EPRI (2017); NREL Annual Technology Baseline (2019); for more information regarding these assumptions see CSIR (2020) technical report.

SUMMARY: MERIDIAN-CSIR AMBITIONS POWER SYSTEM MODELLING STUDY

- Direct cost comparisons between technologies (like LCOE comparisons) are not always valuable as different technologies contribute different benefits to the power system, including different dispatchability (capacity) and energy profile characteristics.
- **Integrated power system modelling can overcome these limitations and is a useful exercise to determine the value of each technology at a national electricity system level**,
  - it considers the characteristics of each generation source in order to enable the system to deliver power reliably and optimally, while meeting electricity demand in the most cost-effective manner for a particular planning horizon.
- The Meridian Economics – CSIR (2020) Ambitions study explored the costs of different power system plans for the period of 2020-2050, with increasingly ambitious levels of carbon emission reductions.
- Plexos power system planning software was used in the study (the same software that is used in the IRP development process)
- **In all the power system plans investigated (including least-cost and SA 'climate obligation aligned'* plans), a combination of other power resources are selected over nuclear power** in order to meet demand at the required reliability.
- Therefore, at a power system level, **nuclear cannot be justified: on the basis of cost, on the requirement to meet demand reliably, or on the basis of the requirement to reduce emissions**.
- More detailed slides on the study findings follow:

**A power system plan that would likely enable South Africa's power system to align with national carbon emissions reduction commitments pledged under the UNFCCC Paris Agreement.*

MERIDIAN-CSIR STUDY: NEW-BUILD TECHNOLOGY ASSUMPTIONS

TECHNOLOGY ASSUMPTIONS MADE AVAILABLE TO THE OPTIMISATION MODEL WERE BASED ON THE IRP

- In the ME-CSIR (2020) power system modelling process, technology cost assumptions from the IRP2019 were used and updated with latest best public domain information if available (replacements indicated by ***bold italics***)
- Nuclear generation capacity costs are based on large-scale nuclear power as defined in the IRP2019 (based on EPRI 2015) and supporting studies (“Ingerop study”, commissioned by DMRE)
  - These indicate a total capital cost of ZAR [2019] 93,964/kW ~ USD [2019] 6,413/kW (at avg ZAR/USD exchange rate of 14,4)
  - **End of life decommissioning costs for nuclear are not included in the modelling framework**
  - All costs are expressed in Jan 2019 Rands

Technology	Overnight Capital Costs (OCC) [R/kW]	Fixed Operating Cost (FOM) [R/kW/year]	Variable Operating Cost (VOM) [R/MWh]	Capacity Factor (typical)	Build Period [years]	Economic Lifetime [years]	LCOE 2020 [c/kWh]	LCOE 2030 [c/kWh]	LCOE 2035 [c/kWh]
Wind	14 515	742	0	***36%***	4	20	70.6	62.1	60.0
Solar PV	10 140	328	0	***20%***	1	25	62.0	45.7	41.8
Solar CSP	110 576	1 236	1	***60%***	4	30	216.1	159.9	146.9
SSEG*	12 310	328	0	20%	1	25	100.0	72.0	66.0
Battery Storage	***13 175***	757	4	12%	1	***10***	235.4	175.3	168.8
Pumped Storage	24 680	222	0	33%	8	50	96.7	96.7	96.7
Hydro	50 156	484	0	67%	8	60	113.0	113.0	113.0
Biofuel	19 468	2 907	76	74%	1	30	79.6	79.6	79.6
Gas – OCGT/GE	10 015	196	3	8%	2	30	336.9	336.9	336.9
Gas – CCGT/GE	10 997	203	27	36%	3	30	153.1	153.1	153.1
Nuclear	75 728	1 187	45	90%	6	60	128.5	126.6	126.6
Coal (PF)	43 453	1 133	98	85%	9	30	116.7	116.7	116.7
Coal (FBC)	52 450	762	212	85%	4	30	120.2	120.2	120.2

* Small Scale Embedded Generation

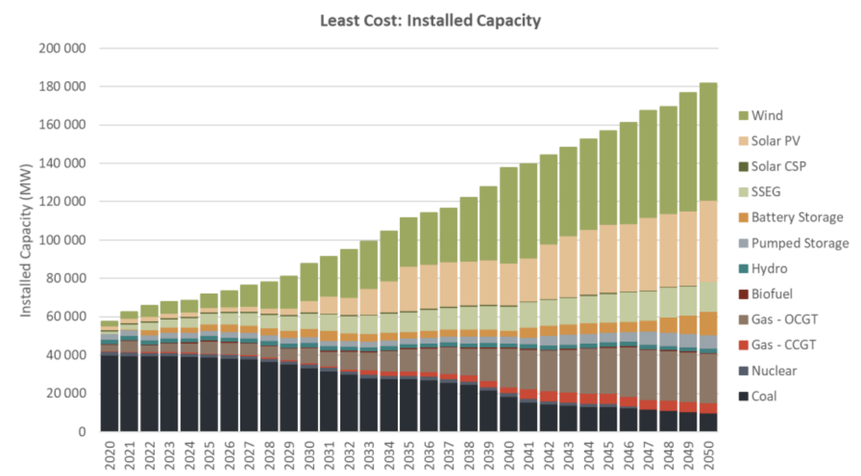
Sources: Integrated Resource Plan (2019); EPRI (2017); NREL Annual Technology Baseline (2019); Detailed technology assumptions can be found in CSIR, 2020 “Systems analysis to support increasingly ambitious CO_2 emissions scenarios in the South African electricity system,” Technical Report, July 2020.

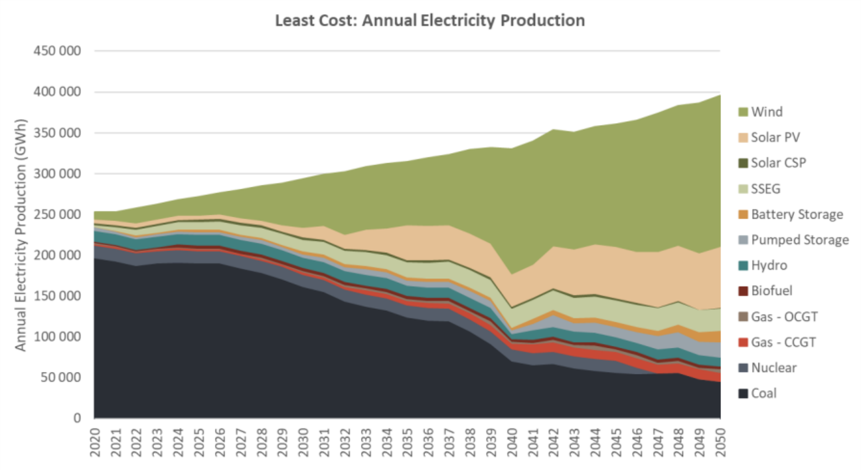
MERIDIAN-CSIR STUDY: SA'S LEAST COST POWER SYSTEM

NO NEW HYDRO AND *NO NEW NUCLEAR* ARE BUILT, NEW BUILD IS DOMINATED BY WIND, SOLAR AND STORAGE

- When running a 'least-cost' power system scenario in the optimisation model, no constraints are imposed on any technology (new capacity is built and old capacity is retired *purely based on minimising cost and meeting demand*).
- Recent power system modelling studies have repeatedly shown that no new nuclear, no new coal and no new hydro capacity is built in SA's least-cost power system pathway (McCall et al, 2019; CSIR, 2018).
- The ME-CSIR study (2020) supports this finding: **no new coal, nuclear or hydro is chosen by the optimiser**
  - these technologies will be **more costly for the power system** than the portfolio of alternatives
- Most new build capacity in South Africa's least-cost electricity system is wind and solar PV, with gas and storage to provide flexibility and reserve capacity as coal retires (dispatchable reserve capacity is required when the primary generation sources are not available).

Technology	Total new capacity built in the least cost scenario from 2020-2050 (GW)
Wind	76.8
Solar PV	42.3
Solar CSP	-
SSEG	17.4
Battery Storage	16.9
Pumped Storage	3.9
Hydro	-
Biofuel	0.3
Gas – OCGT/GE	28.2
Gas – CCGT/GE	4.7
Nuclear	-
Coal	-





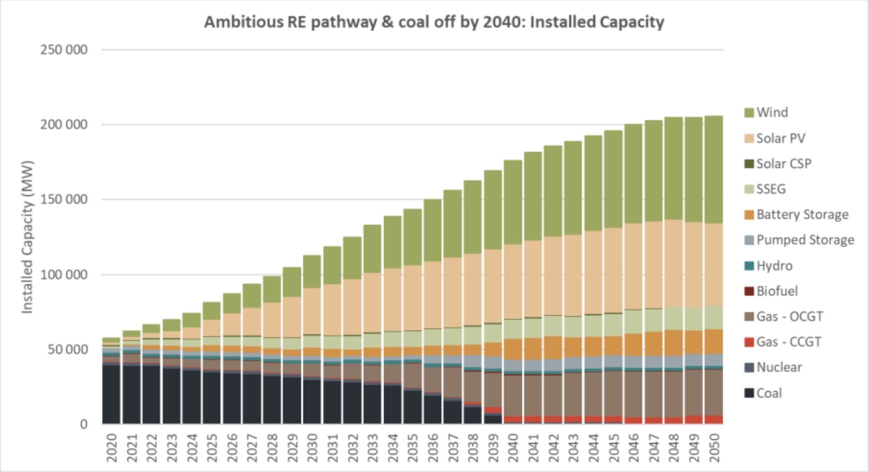
Source: ME-CSIR 'Ambitions' study (2020)

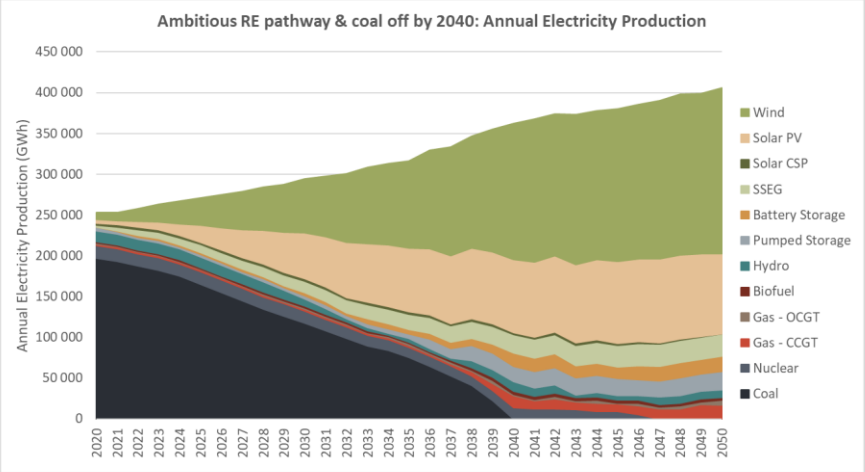
MERIDIAN-CSIR STUDY: ACHIEVING EMISSIONS REDUCTIONS

NUCLEAR POWER IS NOT A COST-OPTIMAL WAY OF REDUCING CARBON EMISSIONS IN SA, EITHER

- It is argued that nuclear power may have a role to play in the decarbonisation of energy systems, as it is a relatively low-carbon energy source.
- The ME-CSIR (2020) tested this theory, to see what technology mix was most cost-optimal, when constraining the optimisation model to only allow a certain amount of carbon emissions from the power sector.
- **However, even in the 'Ambitious RE pathway & coal off by 2040' scenario** – a power system plan which reduces up to 1.5 gigatonnes of emissions relative to those associated with our 'Current Policy Trajectory' (a power system plan based on the IRP) and forces all coal off the system by 2040* **- no nuclear or hydro (lower carbon sources) are chosen by the optimiser.**
- Therefore, in a cost-optimal, 'climate-compatible' electricity system, wind and solar PV form the bulk of new build, with gas and storage to provide flexibility and reserve capacity as coal retires.

Technology	Total new capacity built in the Ambitious RE pathway & coal off by 2040 (GW)
Wind	88.7
Solar PV	63.5
Solar CSP	-
SSEG	17.4
Battery Storage	32.9
Pumped Storage	5.0
Hydro	-
Biofuel	0.3
Gas – OCGT/GE	32.5
Gas – CCGT/GE	6.2
Nuclear	-
Coal	-





Source: ME-CSIR 'Ambitions' study (2020)
**This type of power system plan would likely enable South Africa's power system to align with national carbon reduction commitments pledged under the UNFCCC Paris Agreement.*

SUMMARY OF SYSTEM MODELLING FINDINGS

- The South African power system does not require nuclear power to meet demand;
- Demand can reliably be met for the next 30 years with alternative technologies at lower cost;
- Carbon emission mitigation can be achieved with alternative technologies at lower cost;
- There is therefore no cost basis supporting the case for new nuclear capacity;
- In these circumstances, including new nuclear capacity will simply increase the price of electricity above what it would have been if a rational, objective system planning process was followed.

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FURTHER MOTIVATIONS CONTAINED IN THE IRP AND NERSA CONSULTATION PAPER IN SUPPORT OF THE DECISION TO PROCURE NUCLEAR POWER ARE ILL-FOUNDED AND SUSCEPTIBLE TO CHALLENGE.

NUCLEAR IS NOT A ‘NO-REGRET’ OPTION

- The only reference to nuclear capacity in the IRP 2019 is:
  - Decision 8: “Commence preparation for a nuclear build programme to the extent of 2 500MW at a pace and scale that the country can afford because it is a no-regret option in the long term.”
  - Commencing preparations for nuclear build is justified based on the reason that it is a ‘no-regret’ option.
- A ‘no-regret’ option *is not defined in the IRP*, but the NERSA consultation paper defines ‘no-regret’ option as follows:
  - “Here it is assumed to mean those options that generate net social or economic benefits irrespective of whether or not climate change occurs, as well as across a range of possible climate futures. They build resilience to future climate shocks while also delivering near-term benefits.”
- The previous section demonstrates clearly that the procurement of nuclear will be at the expense of other, cheaper power generation technologies which can produce electricity and achieve emissions reductions to mitigate climate impacts at a lower cost.
- Far from being a ‘no-regret’ option, pursuing much more expensive nuclear procurement now, in the context of Eskom financial and South Africa’s fiscal crisis is therefore guaranteed to be a deeply regrettable strategy.
- The decision to procure nuclear is not logically connected to the reasoning that it is a ‘no-regret’ option, as the reasoning cannot be sustained. This renders the decision of nuclear procurement irrational, rendering a NERSA concurrence with the decision also irrational and therefore unable to sustain its legality.

NERSA CONSULTATION PAPER: THE NEED FOR ADDITIONAL "BASELOAD" CAPACITY

- In NERSA's consultation paper, NERSA motivates the need for additional "baseload" capacity (as coal power is decommissioned) as a reason for the procurement of nuclear power.
- It is important to note that this capacity is indicated to be required 'post-2030' (which is outside the planning horizon of the IRP).

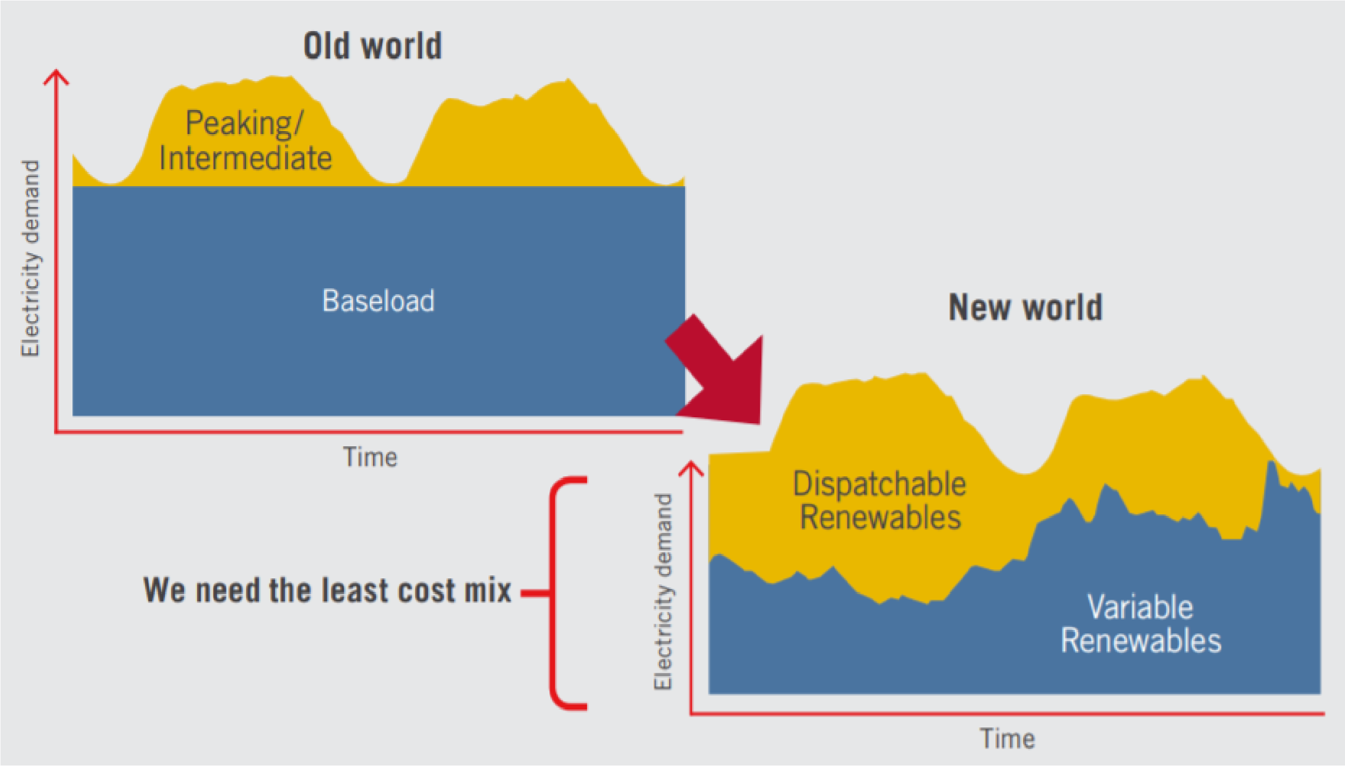
"Post 2030, the expected further decommissioning of 24 100MW of coal power stations supports the need for additional capacity from cleaner energy technologies, including nuclear. The impending loss of base load capacity will result in a base load gap in the energy mix beyond 2030, which has several unintended consequences from a system stability perspective e.g. loss of inertia in the system and need for more ancillary services. In light of the above-mentioned factors, the Department of Mineral Resources and Energy (DMRE) developed procurement of 2 500MW of nuclear within a diverse supply scenario, in order to maintain supply-demand balance in the future and improve energy security."

- **The following slides demonstrate that there is no "need for baseload power" and that it is *not* a sound reason for the procurement of nuclear power:**

SECURITY OF SUPPLY: THE OLD "BASELOAD" PARADIGM

A COMMON ARGUMENT MOTIVATING FOR NUCLEAR AND OR COAL POWER GENERATION IS THE 'NEED FOR BASELOAD' ELECTRICITY PRODUCTION

- Deflationary costs of low-carbon electricity generation sources and escalating commitments to reducing carbon emissions are driving electricity system transitions from:
  - **'old world' baseload coal and/or nuclear non-dispatchable generation** balanced by dispatchable open cycle gas turbines and hydro,
  - to **a 'new world' with increasing levels of variable renewable energy generation** balanced by dispatchable generators including battery storage, pumped hydro, and hydrogen storage.



Source: Australian Renewable Energy Agency (2018)

"BASELOAD" IS NO LONGER A SOUND ECONOMIC STRATEGY

THERE WAS NEVER AN INHERENT TECHNICAL REQUIREMENT FOR "BASELOAD" POWER TO PROVIDE SECURITY OF SUPPLY IN SOUTH AFRICA

- Historically, the cheapest form of electricity generation in South Africa was achieved through coal-fired power based on the country's mineral resource and technological endowments.
- Historically South Africa constructed a large fleet of coal-fired power stations which maximised inflexible coal base generation *to provide least-cost power into the system*.
- South Africa also constructed an inflexible base generation nuclear plant (Koeberg) within this technological paradigm.
- The 'old world' least cost power system strategy was to run these coal and nuclear generators flat-out, maximizing economies of scale, (they are also technically inflexible) and supply as much least-cost energy into the system at a constant rate.
- However, baseload generators cannot meet electricity demand as it fluctuates on an hourly, daily, weekly, and seasonal basis. To fill the electricity demand gaps that (historically least-cost) coal power and nuclear power could not meet, flexible, dispatchable peaking power generation was used (in the form of open cycle gas turbines and pumped storage).
- There was never an inherent technical requirement for "baseload" power to provide security of supply in. It was simply an *economic strategy* to minimise total system cost under a given historic technological and resource endowment. New variable technologies are now the cheapest source for the bulk of our power requirements and there is therefore no need for "baseload" power anymore.

NOW, CHEAPER TECHNOLOGIES CAN ENSURE SECURITY OF SUPPLY

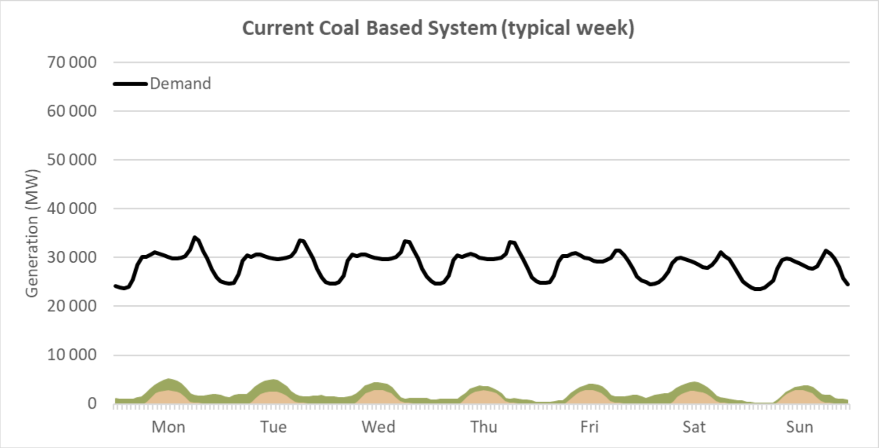
SOUTH AFRICA IS ENDOWED WITH ONE OF THE BEST RENEWABLE ENERGY RESOURCE POTENTIALS IN THE WORLD, WHICH WHEN COMBINED WITH FLEXIBLE, DISPATCHABLE ENERGY SOURCES, CAN MEET DEMAND RELIABLY AND COST-EFFECTIVELY

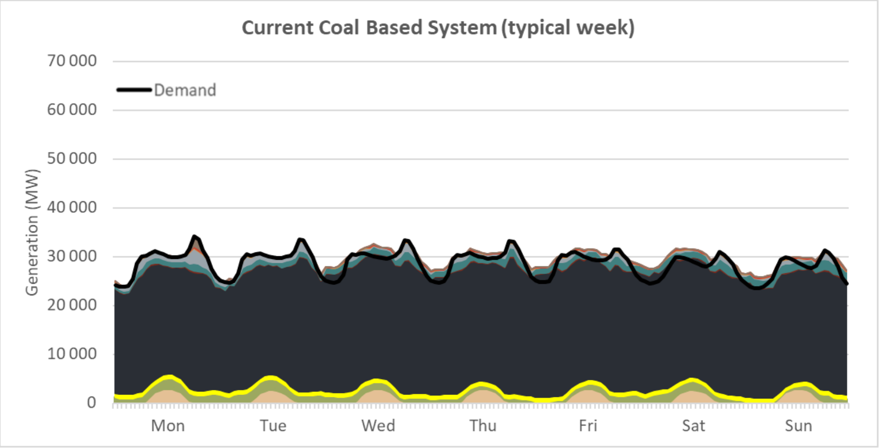
- The falling costs of solar PV and wind energy generation sources have disrupted South Africa's 'old world' technological paradigm as it has done across the world.
- Solar PV and wind now provide energy at lower cost than other "baseload" options such as nuclear and coal.
- South Africa's 'new world' economic strategy should thus be to *minimise* the total power system cost by *maximising* least-cost variable renewable energy generation and continuing to fill in the demand gaps with the cheapest dispatchable, flexible resources available – sources that one can 'switch' on and off when "the wind doesn't blow and the sun doesn't shine", like batteries, pumped storage, open cycle turbines or hydrogen storage.

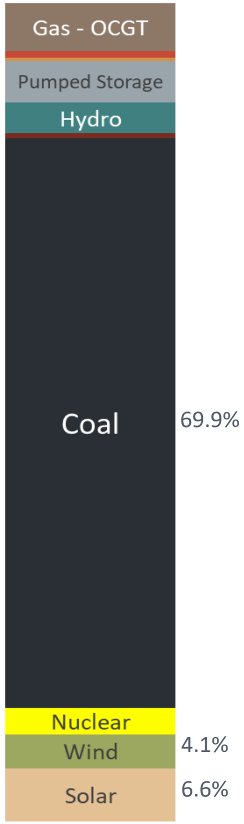
- **The next two slides demonstrate what a 'new world' energy system can look like, and how it can reliably meet demand even in adverse weather conditions:**

AFRAID OF THE DARK? SUFFERING FROM DUNKELFLAUTE?*

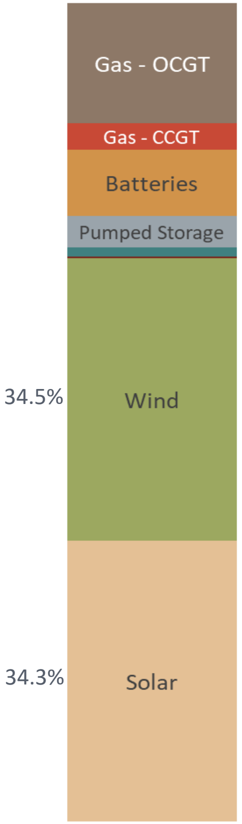
FILLING THE GAP BETWEEN DEMAND AND RENEWABLE ENERGY GENERATION IN A TYPICAL WEEK



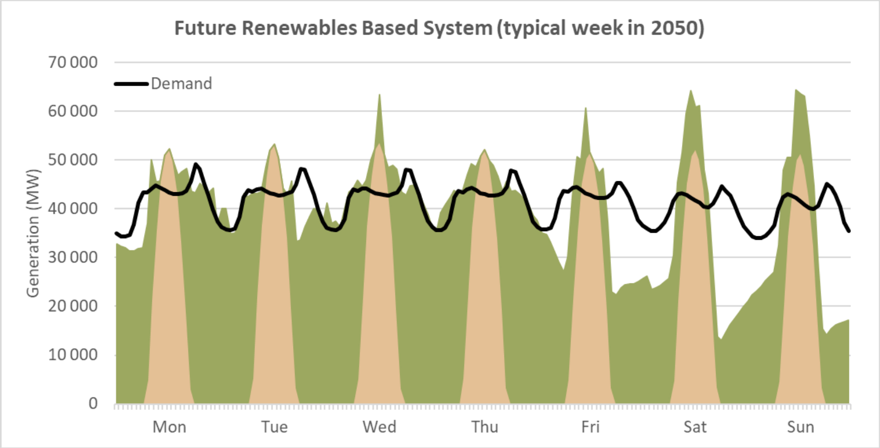


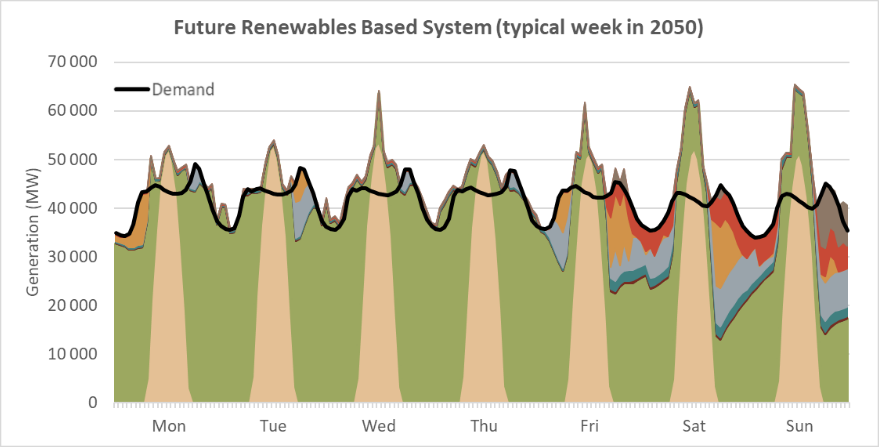


2020
Coal-based
capacity mix



2050
RE-based
capacity mix



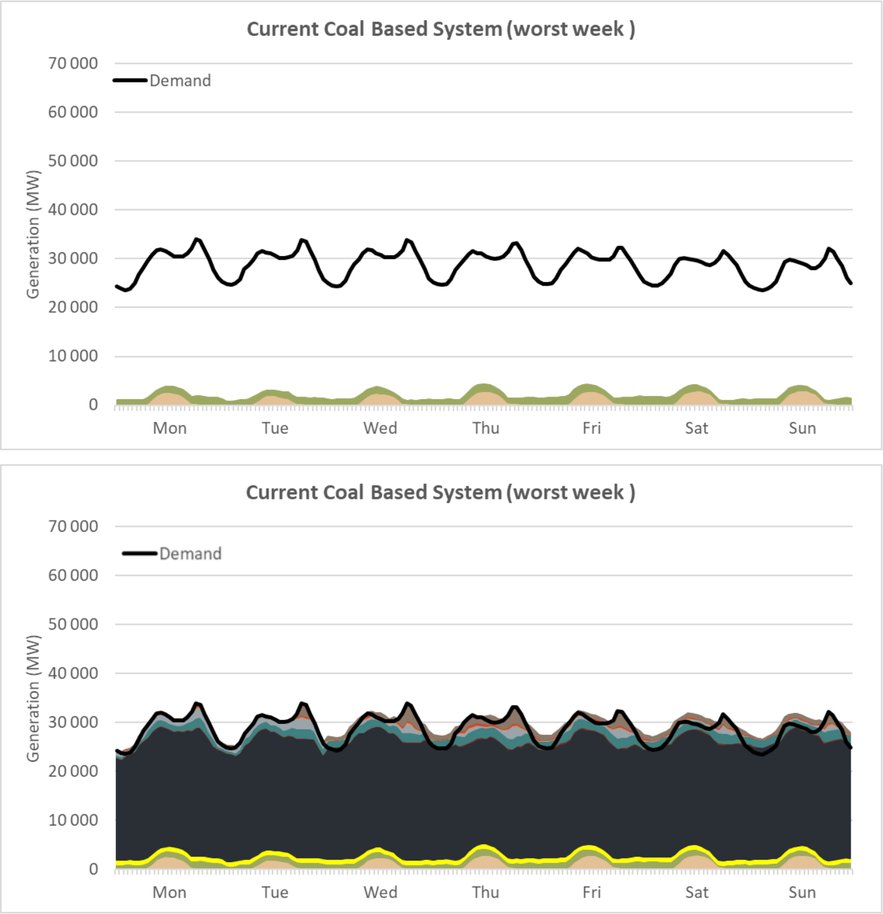


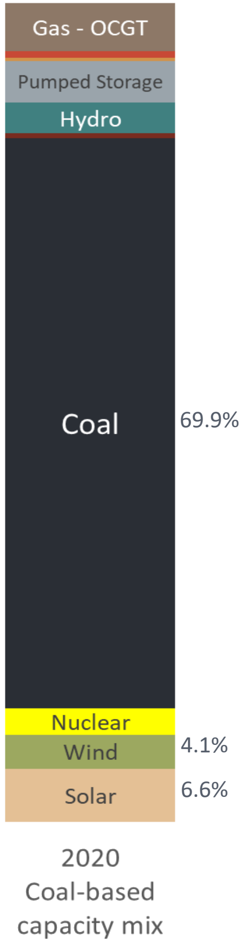
*In the German language, dunkelflaute is a word that refers to the fear of having inadequate sunshine or wind to maintain a viable supply of renewable energy.

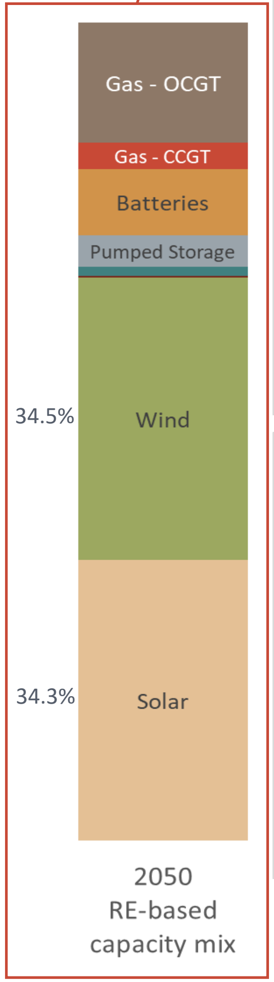
DON'T BE AFRAID

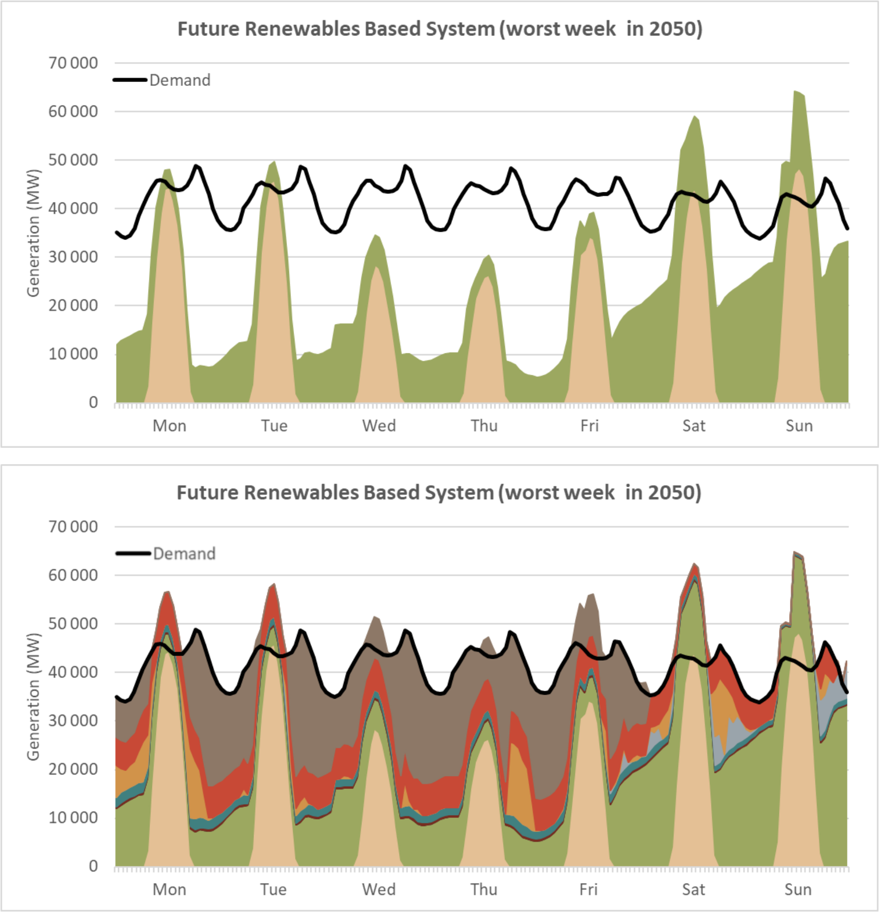
No nuclear "baseload" is needed to meet national electricity demand, even during adverse weather (when the sun doesn't shine and wind doesn't blow)

FLEXIBLE CAPACITY (DESIGNED TO STAND IDLE MOST OF THE TIME) FILLS THE GAP DURING ADVERSE WEATHER









SUMMARY OF IMPACT ON SECURITY OF SUPPLY

- **Investing in nuclear capacity increases reliance on single points of failure** (single large power plants which, if they are not built on time or fail, may have large consequences for security of supply - e.g. Medupi or Kusile. This is a **threat** to security of supply.
- A less risky (and less costly) strategy and one in the best interest of the South African public would be to **diversify** and invest in geographically dispersed, smaller projects which if they fail will not result in a large system impact.
- A further threat to security of supply associated with a large nuclear build (small modular reactor technology is immature and carries exceptionally high economic risk) is that of **time overrun.**
  - Nuclear projects as we discuss in the following slides are prone to lengthy implementation delays, resulting in many years during which the planned capacity is not available and financing costs compound.
  - Because the delayed capacity is large, the impact on available capacity is profound.
  - This same issue is currently being experienced in South Africa with delays to the Medupi and Kusile mega projects resulting in the worst load shedding in recorded history.

03

THE DECISION TO CONCUR WITH THE SECTION 34 DETERMINATION IS NOT IN THE PUBLIC INTEREST.

NUCLEAR PROCUREMENT WOULD NOT BE IN THE 'PUBLIC INTEREST'

- Section 10(1)(b) of the NERA mandates NERSA to act in the public interest in making its concurrence decision. Accordingly, if a proposed determination would be detrimental to the public interest, it cannot lawfully concur in that determination.
- We argue that nuclear procurement is not in the public interest based on the following reasons:

1. Nuclear power is not a cost-optimal technology choice and will merely raise electricity costs for the South African public (as demonstrated above)
2. Nuclear will exacerbate Eskom's financial failure as Eskom will be forced to purchase power above cost of cheaper alternatives forcing consumers off the grid, contributing to utility death spiral and burdening the taxpayer with bailout.
3. Nuclear has large associated financial risks: cost overruns, delays (therefore contributing to security of supply issues), and stranding risks.
4. Nuclear has poor localisation potential and hence there are no net public benefits in terms of industrialisation and job creation compared to better options.

Points (3) and (4) are elaborated on the following slides:

NUCLEAR PROJECT DELAYS AND COST OVERRUNS

LARGE UPFRONT CAPITAL COSTS AND FREQUENT CONSTRUCTION DELAYS INCREASE FINANCIAL RISK

- Nuclear reactors (compared to all other electricity projects) have been determined **the riskiest technology in terms of mean cost escalation as a percentage of budget and frequency** (Sovacool et al, 2014).
- Eash-Gates et al (2020) MIT study: examines OCC of 107 nuclear plants in US, finding a **learning rate of –115%** for the industry – implying that **plant costs doubled with each doubling of cumulative US capacity** (note that these were 4 different types of large reactor designs – exceeding 8GW per plant). Eash-Gates (2020) argue that **technological learning has been consistently overestimated**. They do acknowledge that SMRs may stimulate future technological 'on-site' learning due to the construction of multiple, smaller units, benefits of standardisation and factory fabrication.
- Eash-Gates et al (2020) and Portugal-Pereira et al (2018) examine the reasons for nuclear reactor costs exceeding estimates in engineering models, including:
  - –Lower than expected labour productivity resulting in longer construction periods;
  - –Underestimating the impact of safety regulations and other soft-costs;
  - –Difficulties in gaining environmental licences and public acceptance causing construction delays.
- Portugal-Pereira et al (2018) find that 76% of their sample of conventional light water reactors (380 plants, constructed between 1955 and 2016 includes some from 'new racers' China, India, Pakistan, UAE and Iran) experienced significant construction delays, **with the cost of delay representing on average more than 18% of the total cost of the project**. "This suggests a discontinuity of the learning curve for both OCC [overnight capital cost] and lead-time, which threatens the market and financial sustainability of current and future nuclear energy projects."

WHO WILL TAKE THE RISK OF FUNDING NUCLEAR?

SOUTH AFRICA HAS A POOR TRACK RECORD IN TERMS OF MANAGING LARGE INFRASTRUCTURE PROJECTS

Recent international experience demonstrates the large risks associated with nuclear investment:

1. In 2017, two AP1000 reactor projects at the 'Summer' nuclear site in Georgia U.S (having commenced construction in 2013) were cancelled after years of delays and billions of cost overruns. Westinghouse, the primary construction contractor for these projects filed for bankruptcy protection (Reuters, 2017).
2. The Finnish Olkiluoto 3 power reactor is now delayed by 12 years due to slow progress in system testing, originally planned to come online in 2009 it will now only come online in 2021, with many lawsuits and cost overruns (Yle, 2019).
3. EDF energy has already announced that the UK Hinkley Point C reactor (started construction in 2018) will be delayed by 15months beyond the 2025 completion deadline and cost 15% or 2.9 billion pounds more than originally budgeted (WNN, 2020).

- South Africa has a poor record in terms of the management of large power infrastructure projects:
  - Medupi – initially planned to be completed in 2015, the last generation unit is yet to be commissioned. The approved cost to completion has risen from R79 Billion in 2007 to R145 Billion at the end of 2019, which excludes a large amount of interest during construction.
  - Kusile – similarly, all six generation units were set to be commissioned in 2014; however, four units are yet to completed. The approved cost to completion has risen from R69 Billion in 2007 to R161 Billion at the end of 2019, which excludes interest during construction (Eskom, 2020; Tshidavhu and Khatleli, 2020)
  - In the current, dire economic context, there is limited fiscal space to for public investment in large suboptimal infrastructure projects – the economics and financial risk of nuclear will not be able to compete with those of other low-carbon energy technologies.
- Furthermore, forcing Eskom to purchase expensive nuclear power when lower cost alternatives are available to its customers will run a high risk of stranding that asset (the asset becomes uneconomical in the face of alternatives) and South African tax-payers will have to pick up the tab.

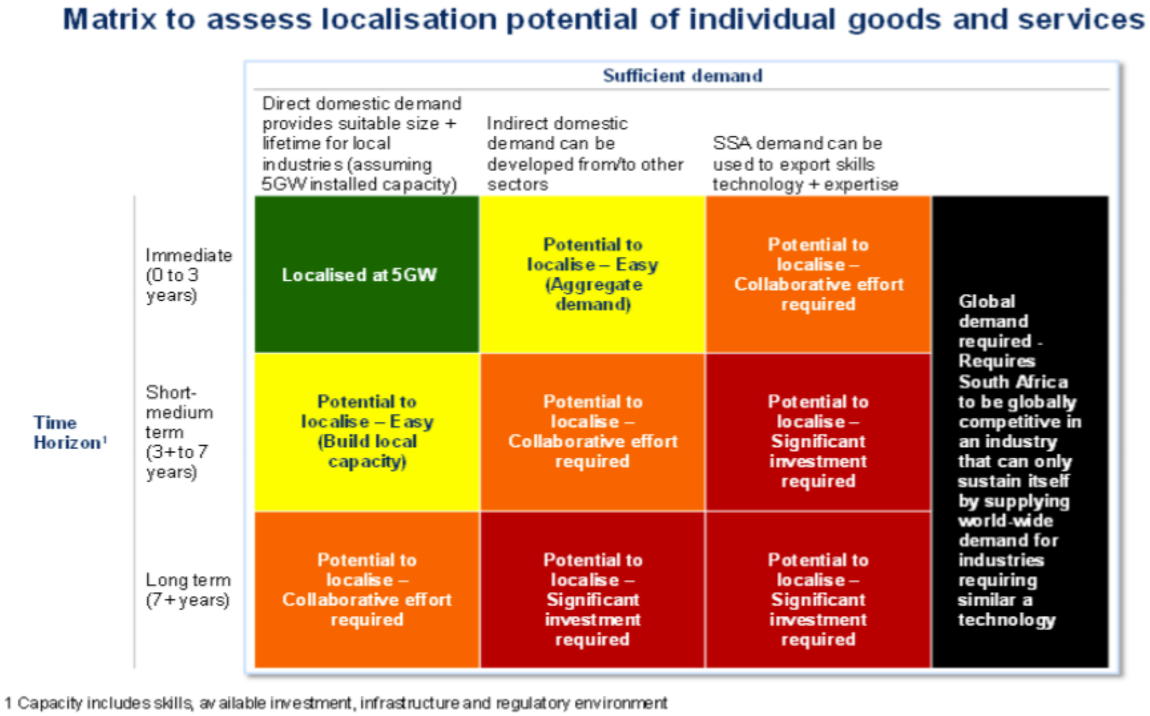
‘SMALL MODULAR REACTORS” ARE STILL A THEORETICAL CONCEPT

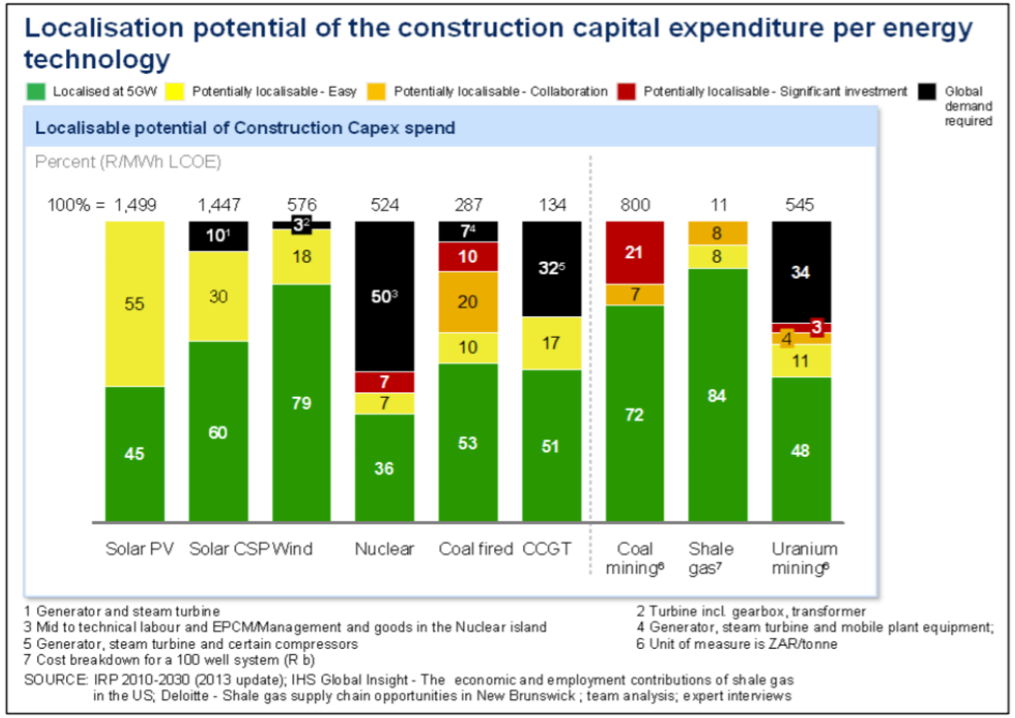
COST-ESTIMATES ARE INCREDIBLY VARIABLE, AND THE FIRST SMR IS YET TO BE BUILT

- In the IRP2019, there is specific emphasis that any nuclear programme should be implemented at an ‘affordable pace and modular scale’ (potentially aiming to quell fear associated with financial risks as discussed in the previous slides).
- This has given rise to the concept of “small modular reactors” or “SMRs” in the South African energy discourse. SMRs are generally described as *reactors that are smaller than 300 megawatts* (MW) (IAEA, 2020).
- The June 2020 RFI encouraged the submission of SMR technology proposals, in addition to conventional commercially available larger reactors, on the basis that “preliminary costing has shown that there can be a business case for modular and smaller power plants.” However**, there are no publicly available cost-applications to the South African context** (Wright and Calitz, 2020).
- SMRs are still currently in the prototype, experimental, or demonstration plant phase. There are about 50 SMR designs and concepts globally – some are claimed as being near-term deployable – but the first one is yet to be built (IAEA, 2020).
- Cost-estimates for SMRs remain very wide and subject to a multitude of factors including size, construction time, extent to which plants are co-sited and whether the deployment is done at a programme-level or individual plant-level (Mignacia and Locatelli, 2020).
- Abdulla et al (2020) show that **there is large uncertainty related to the actual cost of SMRs,** with median capital cost estimates for 45MW SMRs range from USD $4,000 to $16,300 per kilowatt (kW) and from $3,200 to $7,100 per kW for 225MW SMRs.
- US company NuScale has expressed interest in developing SMR tech in SA (Creamer, 2020), NuScale’s first SMR ‘module’ is expected to be operational by late 2026 and the entire 12-module reactor by the end of 2027. “NuScale has estimated its first plant will cost just under $3 billion to build, giving an overnight capital cost of $5,078/kWe.” (Forbes, 2020)
- Boarin and Ricotti (2013) study suggests that SMRs may not in fact be economically competitive with large reactors, but may show more robustness to construction schedule uncertainty. Mignacia and Locatelli (2020) argue that economic and financial reasons are still strongly hindering SMR development.

NUCLEAR CAPACITY HAS POOR LOCALIZATION POTENTIAL IN SA

- It is explicitly stated in South Africa's Integrated Energy Plan (IEP) assessment of localization potential for different technologies that: "nuclear plants due to high complexity and not enough volumes being built from either a country or regional perspective **cannot be economically localized**" (DoE, 2016).
- For nuclear technology to be economically localized in South Africa, it would require SA to be **globally competitive** in the nuclear industry and be supplying components for similar technologies, world-wide.

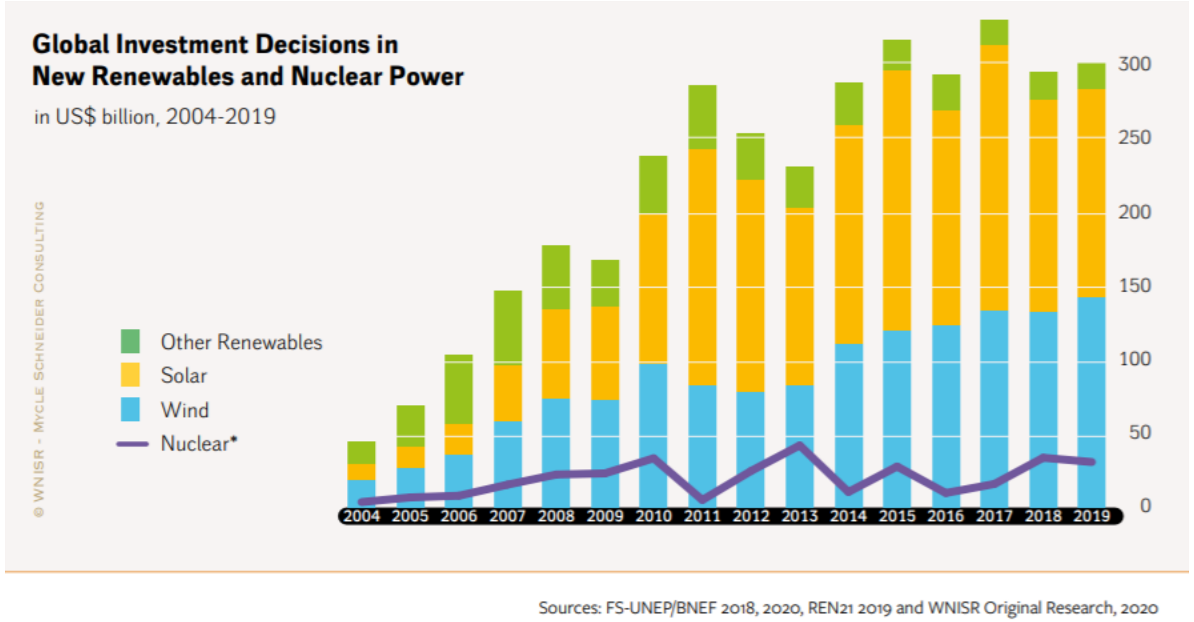




Source: DoE, 2016. Integrated Energy Plan (IEP) Macroeconomic Assumptions

GLOBAL NUCLEAR INVESTMENT HAS REMAINED STAGNANT

- It is unlikely that South Africa will ever become a global exporter of nuclear components, given the **declining popularity of nuclear technology** particularly in countries like Europe and the U.S, and because South Africa is already far behind other countries in terms of nuclear research and development.
- **Global investment in nuclear has stagnated**, whilst investment in other renewable technologies has risen dramatically, suggesting that there are better opportunities for industrialization elsewhere.
- According to the IEP assessment (previous slide), most of the capital expenditure for South Africa's least-cost new build options (solar PV and wind) are far more easily localizable, which would likely translate into better job opportunities.



Source: World Nuclear Industry Status Report (2020)

WEIGHING UP PUBLIC COSTS AND BENEFITS

- **The alleged advantages of nuclear**, being that it is an effective technology for reducing emissions and provides base load capacity to the system, do not hold water and **are not justifiable when compared with other, cheaper low carbon alternatives**.
- In fact, the **alleged advantages are far outweighed by the disadvantages** associated with the procurement of nuclear power:
  - Nuclear power is not a cost-optimal technology choice and will merely raise electricity costs for the South African public
  - Nuclear will exacerbate Eskom's financial failure as Eskom will be forced to purchase power above the cost of cheaper alternatives forcing consumers off the grid, contributing to utility death spiral and burdening the taxpayer with bailout.
  - Nuclear has large associated financial risks: cost overruns, delays (therefore contributing to security of supply issues and stranding risks.
  - Nuclear has poor localisation potential and hence there are no net public benefits in terms of industrialisation and job creation.
- The ministerial decision to procure nuclear power, and thereby the decision to concur, is unreasonable, as the procurement will likely have a negative impact on the lives and well-being of those impacted, through increasing tariffs and burdens on the taxpayer, lower economic growth and fewer employment opportunities. Alternative solutions would better serve the public, while still furthering energy objectives.

CONCLUSION

In this submission we have demonstrated:

- The adjusted least-cost optimisation process reflected in the IRP, and similar studies of the South African power system in the public domain, do not support the decision to procure nuclear power.
- The evidence shows that further motivations in support of the decision to procure nuclear power contained in the IRP and NERSA consultation paper are ill-founded and susceptible to challenge.

Therefore, in line with PAJA (2000) and based on the evidence provided, we conclude that the draft section 34 determination to procure nuclear power is an irrational decision, and hence that a decision by NERSA to concur with such a decision would also be irrational.

Furthermore, we have also demonstrated that:

- NERSA concurrence with the section 34 determination would not be in the public interest.

Therefore, in line with NERA Section 10(1), we conclude that a NERSA concurrence with the section 34 determination would be unreasonable and therefore not be a lawful decision.

NERSA CONSULTATION PAPER QUESTIONS

- ***Q1. Is this 2 500MW of nuclear capacity section 34 determination compliant with the IRP 2019 as gazetted by the Minister of Mineral Resources and Energy?***
  - As demonstrated in this submission, a decision to procure nuclear power is not supported by the information presented in the IRP2019.
  - Additionally, it has been alleged that should the Inga hydro project of 2,500MW as specified in the IRP2019 not materialize, preparations should be in place for nuclear to be procured instead (Paton, 2020). However, cost-optimal power system modelling shows that there are cheaper, low carbon alternatives that could replace the 2,500MW of hydro power more cost-effectively than nuclear power can.

- ***Q2. In light of the decommissioning of a significant amount of base load capacity by 2030, and South Africa's reliance on natural resources extraction and beneficiation as significant drivers of economic development, should this baseload capacity be added post 2030 and why? Is this an important consideration in the broader integrated industrial policy and why?***
  - No, supporting evidence in this submission demonstrates that the argument for the need of "base load" nuclear capacity is invalid. It is possible for least-cost variable renewable energy generation, combined with the cheapest dispatchable, flexible resources available to reliably meet demand even in adverse weather conditions.

NERSA CONSULTATION PAPER QUESTIONS

- ***Q4. Comment on the type of technology in line with the following:***
  - ***i.*** ***Energy security considering both security of supply and security of demand***
  - ***iii.*** ***The interest of present and future electricity customers is safeguarded against, inter alia, stranded assets, environmental impact and energy security.***
  - ***iv.*** ***Use of diverse energy sources and energy efficiency.***
  - ***v.*** ***International best practices.***
  - ***vi.*** ***Mitigation of climate change by the reduction of greenhouse gasses and other environmental imperatives.***
  - As demonstrated in this submission, investing in nuclear capacity promotes reliance on single points of failure and poses large risks of time overrun, which threaten security of supply. A less risky (and less costly) strategy and one in the best interest of the South African public would be to diversify and invest in geographically dispersed, smaller projects which if they fail will not result in a large system impact.
  - As demonstrated in this submission, and in terms of mitigating climate change, low carbon alternatives such as wind, solar PV combined with battery storage and peaking capacity, which present a cheaper way to reduce greenhouse gas emissions in the South African power system than nuclear power.

NERSA CONSULTATION PAPER QUESTIONS

- ***Q5. Provide what you consider to be the risks and challenges associated with the allocated capacity in terms of the objects of the Electricity Regulation Act mentioned above.***
  - Investing in nuclear capacity increases reliance on single points of failure, which is a threat to security of supply.
  - Time overruns due to large nuclear builds also pose a threat to security of supply and increase financial and stranding risk.
  - Nuclear reactor projects, when compared to other electricity projects, have been determined the riskiest technology in terms of mean cost escalation as a percentage of budget and frequency. As demonstrated in this submission, there are many examples of international projects that have experienced long delays and cost escalations.
  - There is no fiscal space to fund large suboptimal infrastructure projects in South Africa.

NERSA CONSULTATION PAPER QUESTIONS

- ***Q7. What would the advantages brought about by SMRs, and is it possible for these to complement intermittent technologies such as renewables?***
  - SMRs are still currently in the prototype, experimental, or demonstration plant phase. The first SMR is yet to be built and global cost-estimates remain incredibly wide. There is no substantial evidence that SMRs will (based on the same unit of capacity) be cheaper than large conventional reactors. There are no publicly available cost-applications to the South African context. Therefore, it is not possible to comment on whether advantages may be brought about for South Africa by SMRs.

- ***Q8. Comment on the impact of nuclear on the electricity tariff and how this may affect demand for electricity in the long term, and how this may affect future investment decisions and how long the investment cycle is, where applicable.***
  - As demonstrated in the supporting evidence above, there is no cost basis supporting the case for new nuclear capacity. In these circumstances, including new nuclear capacity will simply increase the price of electricity above what it would have been if a rational, objective system planning process was followed.
  - Furthermore, forcing Eskom to purchase expensive nuclear power when lower cost alternatives are available to its customers will run a high risk of stranding that asset (the asset becomes uneconomical in the face of alternatives) and South African tax-payers will have to pick up the tab.

NERSA CONSULTATION PAPER QUESTIONS

- **Q9. Comment on the costs of mature and commercially available nuclear power generation technologies. Provide your comments in line with a mandate to ensure that:**
  - ***i. Investment in the electricity supply industry is facilitated;***
  - ***ii. universal access to electricity is facilitated; and***
  - ***iii. competitiveness, customer and end-user choice are promoted.***

  Comments on costs should incorporate overall cost of the technology and must not be limited to overnight cost.

  The South African power system does not require nuclear power to meet demand, demand can reliably be met for the next 30 years with alternative technologies at lower cost. Furthermore, carbon emissions mitigation can be achieved with alternative technologies at lower cost. There is therefore no cost basis supporting the case for new nuclear capacity. In these circumstances, including new nuclear capacity will simply increase the price of electricity above what it would have been if a rational, objective system planning process was followed.

NERSA CONSULTATION PAPER QUESTIONS

- **Q13. Comment on the procurement of this capacity now for build beyond 2030**
  - It is not based on government policy. Government policy pertaining to the electricity sector is the IRP, which has a 10-year capacity expansion planning horizon, from 2019 to 2030. The current IRP 2019 does not include procurement planning after 2030; therefore, the procurement of new nuclear capacity is beyond its scope.

- ***Q32. Comment on the socio-economic impact of nuclear new build programme on South Africa (e.g. job opportunities and localisation)***
  - As demonstrated in this submission, nuclear plants due to high complexity and not enough volumes being built from either a country or regional perspective cannot be economically localized. This means that any nuclear development would have potentially large associated foreign expenditure.

- ***Q33. Do you agree with the determination as provided by the Minister?***
  - No. Based on the evidence set out in this submission, we believe that the determination to procure nuclear power is irrational, not in the public interest and is thereby unreasonable.

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IRP 2019 (EPRI 2015) COMMERCIAL NUCLEAR TECH COSTS

- EPRI 2015 results used for nuclear costs in IRP 2019
- EPRI 2015 focused on two Generation III/III+ reactors: Areva's evolutionary pressurized reactor (EPR) and Westinghouse's AP1000
- LCOE summary: page. x – xiv (EPRI, 2015)

Table 2
Nuclear Technologies

Technology Type	Rated Capacity, MWe (net)	Assumed Location
Nuclear (with seawater cooling) (2)		
AP1000	1, 2, 4, 6 x 1,115 MW	Coastal, near Port Elizabeth or north of Cape Town
Areva EPR	1, 2, 4, 6 x 1,600 MW	Coastal, near Port Elizabeth or north of Cape Town

(2) Multiple units are sequentially built

Table 13
Nuclear Areva EPR Levelized Cost of Electricity

Technology	1 Unit	2 Units	4 Units	6 Units
Rated Capacity, MW net	1,600	3,200	6,400	9,600
Capacity Factor, %	90	90	90	90
Fuel Cost (ZAR/MWh)	218.4	218.4	218.4	218.4
O&M (ZAR/MWh)	138.1	121.9	113.8	109.1
Capital (ZAR/MWh)	1,603.0	1,583.4	1,543.2	1,505.7
LCOE (ZAR/MWh)	**1,959.6**	**1,923.7**	**1,875.4**	**1,833.2**

*Multiple units are sequentially built, with construction and startup of each subsequent unit occurring every 2 years

Table 14
Nuclear AP1000 Levelized Cost of Electricity

Technology	1 Unit	2 Units	4 Units	6 Units
Rated Capacity, MW net	1,117	2,234	4,468	6,702
Fuel Cost (ZAR/MWh)	231.8	231.8	231.8	231.8
O&M (ZAR/MWh)	154.1	130.9	119.2	112.6
Capital (ZAR/MWh)	1,231.0	1,215.8	1,185.7	1,155.3
LCOE (ZAR/MWh)	**1,616.9**	**1,578.4**	**1,536.7**	**1,499.8**

*Multiple units are sequentially built, with construction and startup of each subsequent unit occurring every 2 years

Table 15
Levelized Cost of Electricity for Multiple Nuclear Units with the Same Commercial Service Date

Technology	6x1600 MW, Areva	8x1115 MW, AP1000
Rated Capacity, MW net	9,600	8,936
Fuel Cost (ZAR/MWh)	218.4	231.8
O&M (ZAR/MWh)	109.1	95.6
Capital (ZAR/MWh)	1,716.1	1,284.7
LCOE (ZAR/MWh)	**2,043.7**	**1,612.1**

Nuclear technology costs used in IRP2019 (Source: EPRI, 2015)

Table 8-1
Nuclear Areva EPR Technology Performance and Cost Summary

Technology	1 Unit	2 Units	4 Units	6 Units
Rated Capacity, MW net	1,600	3,200	6,400	9,600
Plant Cost Estimates (January 2015)				
TPC, Overnight, ZAR/kW	79,432	78,461	76,474	74,612
Lead Times and Project Schedule, years	6	8	12	16
Single Unit Expense Schedule, % of TPC per year	15%, 15%, 25%, 25%, 10%, 10%	15%, 15%, 25%, 25%, 10%, 10%	15%, 15%, 25%, 25%, 10%, 10%	15%, 15%, 25%, 25%, 10%, 10%
Full Project Expense Schedule, % of TPC per year (* indicates commissioning year of first unit)	15%, 15%, 25%, 25%, 10%, 10%	7%, 7%, 20%, 20%, 18%, 18%*, 5%, 5%	4%, 4%, 10%, 10%, 13%, 13%*, 12%, 12%, 9%, 9%, 2%, 2%	3%, 3%, 7%, 7%, 8%, 8%*, 8%, 8%, 8%, 8%, 8%, 8%, 6%, 6%, 2%, 2%
Fuel Cost Estimates				
First Year, ZAR/GJ	7.35	7.35	7.35	7.35
Expected Escalation (beyond inflation)	0%	0%	0%	0%
Fuel Energy Content, GJ/kg	1,299	1,299	1,299	1,299
O&M Cost Estimates				
Fixed O&M, ZAR/kW-yr	755	627	562	527
Variable O&M, ZAR/MWh	42.4	42.4	42.4	42.4
Availability Estimates				
Equivalent Availability	92.1	92.1	92.1	92.1
Maintenance	2.5	2.5	2.5	2.5
Unplanned Outages	5.5	5.5	5.5	5.5
Performance Estimates				
Economic Life, years	60	60	60	60
Heat Rate, kJ/kWh	10,340	10,340	10,340	10,340
Net Plant Efficiency, %	34.8	34.8	34.8	34.8
Water Usage				
Cooling (once-through sea water), L/MWh	6,814	6,814	6,814	6,814
Boiler Makeup, L/MWh	Negligible	Negligible	Negligible	Negligible

Table 8-2
Nuclear AP1000 Technology Performance and Cost Summary

Technology	1 Unit	2 Units	4 Units	6 Units
Rated Capacity, MW net	1,117	2,234	4,468	6,702
Plant Cost Estimates (January 2015)				
TPC, Overnight, ZAR/kW	60,960	60,218	58,732	57,233
Lead Times and Project Schedule, years	6	8	12	16
Single Unit Expense Schedule, % of TPC per year	15%, 15%, 25%, 25%, 10%, 10%	15%, 15%, 25%, 25%, 10%, 10%	15%, 15%, 25%, 25%, 10%, 10%	15%, 15%, 25%, 25%, 10%, 10%
Full Project Expense Schedule, % of TPC per year (* indicates commissioning year of first unit)	15%, 15%, 25%, 25%, 10%, 10%	7%, 7%, 20%, 20%, 18%, 18%*, 5%, 5%	4%, 4%, 10%, 10%, 13%, 13%*, 12%, 12%, 9%, 9%, 2%, 2%	3%, 3%, 7%, 7%, 8%, 8%*, 8%, 8%, 8%, 8%, 8%, 8%, 6%, 6%, 2%, 2%
Fuel Cost Estimates				
First Year, ZAR/GJ	7.35	7.35	7.35	7.35
Expected Escalation (beyond inflation)	0%	0%	0%	0%
Fuel Energy Content, GJ/kg	1,299	1,299	1,299	1,299
O&M Cost Estimates				
Fixed O&M, ZAR/kW-yr	1,015	832	740	688
Variable O&M, ZAR/MWh	25.3	25.3	25.3	25.3
Availability Estimates				
Equivalent Availability	92.1	92.1	92.1	92.1
Maintenance	2.5	2.5	2.5	2.5
Unplanned Outages	5.5	5.5	5.5	5.5
Performance Estimates				
Economic Life, years	60	60	60	60
Heat Rate, kJ/kWh	10,973	10,973	10,973	10,973
Net Plant Efficiency, %	32.8	32.8	32.8	32.8
Water Usage				
Cooling (once-through sea water), L/MWh	6,814	6,814	6,814	6,814
Boiler Makeup, L/MWh	Negligible	Negligible	Negligible	Negligible

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To:

Adam Roff, Meridian Economics
Suite EB04, Tannery Park
Rondebosch
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MEMORANDUM

From:

Mzukisi Kota, Webber Wentzel

Your reference	Our reference	Date
NERSA: concurrence powers	Mzukisi Kota / Alexandra Rees / 3045934	5 February 2021

Dear Adam

Legal context: powers of concurrence by the National Energy Regulator of South Africa (NERSA) with a ministerial determination made in terms of section 34 of the Electricity Regulation Act, 2006

1. Introduction

1.1 On 23 November 2020, the National Energy Regulator of South Africa ("**NERSA**") called for written comments regarding its possible concurrence in the determination proposed by the Minister of Mineral Resources and Energy ("**Minister**") in terms of section 34 of the Electricity Regulation Act, 2006 ("**ERA**").[1]

1.2 We understand that Meridian Economics ("**Meridian**") intends to make submissions in response to this call for comments. To this end, Meridian have requested that we provide a high-level overview of the source and scope of NERSA's powers of concurrence and the legal principles that govern the exercise of those powers. We set out a brief exposition of relevant considerations below.

[1] Published under Government Notice 1244 in *Government Gazette* 43926 of 23 November 2020.

2. **Relevant legislative context**

2.1 *Electricity Regulation Act, 2006*

2.1.1 The ERA is the primary legislative instrument regulating electricity supply industry in South Africa. To this end, ERA provides for the licensing and registration of, among other things, electricity generation, transmission, distribution, reticulation, trading and the importing and exporting of electricity.

2.1.2 The stated objectives of ERA are set out in section 2 of the Act. They include: (i) achieving the "*efficient, effective, sustainable and orderly*" development and operation of electricity supply infrastructure; (ii) promoting energy supply that is certain and secure for current and future user needs, having regard to the efficiency and long-term sustainability of the electricity supply industry; (iii) creating a regulatory environment that facilitates investment in energy infrastructure; (iv) promoting competition and competitiveness within the energy industry; (v) promoting accessible and affordable energy for all citizens and (vi) balancing the interests of customers, end users, licensees and investors in the electricity supply industry. The ERA also establishes the powers and duties of the national authority responsible for the regulation of electricity.[2] As discussed below, this function is fulfilled by NERSA.

2.1.3 Section 34(1) of the ERA empowers the Minister to determine, in consultation with NERSA, that "new generation capacity is needed"[3] and to make a determination regarding "the types of energy sources from which electricity must be generated, and the percentages of electricity that must be generated from such sources".[4]

2.2 *National Energy Regulator Act, 2004*

2.2.1 The National Energy Regulator Act, 2004 ("**NERA**") establishes NERSA,[5] the regulatory authority that acts as "*the custodian and enforcer*" of the regulatory

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[2] Section 4 of the ERA

[3] Section 34(1)(a) of the ERA.

[4] Section 34(1)(b) of the ERA.

[5] Section 3 of the NERA.

framework provided for in the ERA.[6] The powers and duties of NERSA are stipulated by the NERA to include those listed in section 4 of the ERA: these include the consideration of license applications and the issuance of licenses, the regulation of prices and tariffs, and the performance of any other act incidental to NERSA's functions. The NERA also sets out the duties of the members of NERSA[7] and, importantly, establishes requirements that every decision taken by NERSA must satisfy.

2.3 *Promotion of Administrative Justice Act, 2000*

2.3.1 Our courts have found that both a section 34(1) determination and a decision by NERSA to concur in such a determination constitute administrative action.[8] As such, a concurrence decision must be taken in accordance with the prescripts of the Promotion of Administrative Justice Act, 2000 ("**PAJA**"). The right to just administrative action derives from section 33 of the Constitution,[9] which provides that every person has the right to "*administrative action that is lawful, reasonable and procedurally fair*" and to obtain reasons for administrative action. PAJA is the national legislation implemented to give effect to the right.

2.3.2 As explained below, PAJA establishes a relatively stringent list of procedural and substantive requirements applicable to administrative decisions. The requirements provided for in PAJA impose a higher standard on administrative decision-makers than the standards applicable where a decision involves the exercise of public power that is not administrative action. Where a decision-maker (in this instance, NERSA) is found to have failed to comply with the substantive requirements established by PAJA, the relevant decision may be set aside on judicial review. Section 10(3) of the NERA affirms the above and expressly provides for judicial review of administrative action by NERSA.

[6] Section 3 of the ERA.

[7] Section 9 of the NERA.

[8] *Earthlife Africa Johannesburg and Another v Minister of Energy and Others* 2017 (5) SA 227 (WCC) at paras 37 and 40.

[9] Constitution of the Republic of South Africa, 1996.

3. Nature of NERSA's power of concurrence and the requirements for its lawful exercise

3.1 *Nature of NERSA's power of concurrence*

3.1.1 Important for present purposes is that, in order for a determination by the Minister in terms of section 34(1) of the ERA to have force and practical effect, it must serve before and be concurred in by NERSA. That this is the case is made evident from the wording of the sub-section, which provides that the ministerial determination must be taken "*in consultation with [NERSA]*". Our courts have made clear on numerous occasions that the correct legislative interpretation of the phrase "*in consultation with*" is that agreement must be reached between the consulting parties (this is distinct from the phrase "*after consultation with*", which requires only a discussion, and not agreement from the party being consulted).[10]

3.1.2 The correct interpretation of the phrase "*in consultation with [NERSA]*" in section 34(1) is therefore that the Minister is, together with NERSA, empowered to make the relevant determination. The section does not merely require the Minister to consult with NERSA. NERSA must concur in the making of the determination. Accordingly, absent concurrence by NERSA, the determination made by the Minister remains inchoate and will be of no force and effect. This means that no procurement processes or other steps may be taken by the Department of Mineral Resources and Energy in furtherance of the section 34(1) ministerial determination. It follows that the requirement that concurrence be obtained from NERSA acts as a vital constraint on the Minister's power and that Parliament, in crafting the legislation, sought to compel NERSA to apply its mind to a section 34(1) determination and to empower it, where necessary, to withhold its concurrence and thereby halt the implementation of the determination. By parity of reasoning, where reasons are provided for the decision by NERSA not to concur, these would inform the preparation of a revised determination by the Minister. In the light of the fact that NERSA's power of concurrence is not narrowly prescribed in the legislation (save for the

[10] *Premier Western Cape v President of the Republic of South Africa and Another 1999 (3) SA 657at fn 94; at para 17; McDonald et al v Minister of Minerals and Energy et al 2007(5) SA 642 (C) at paras 17-8; Tloumama et al v Speaker of The National Assembly et al 2016(1) SA 534 (WCC) at 569-570.*

requirements listed in paragraph 3.2.1 immediately below), it is submitted that NERSA enjoys a wide discretion in relation to the content of its determination. Our law envisions that, where a power is ancillary to, or flows as a necessary or reasonable consequence of the express powers in a legislative provision, it should not be fettered.[11] It is submitted that this doctrine of implied powers suggests that it would be open to NERSA to decide, for example, to conditionally concur in the ministerial determination.

3.2 *Scope of NERSA's power of concurrence*

3.2.1 A decision to concur (or a decision to refuse to concur) with a section 34(1) ministerial determination, must comply, first, with section 10(1) of the NERA. This section requires that the concurrence decision must be:

3.2.1.1 consistent with the Constitution and applicable laws;[12]

3.2.1.2 in the public interest;[13]

3.2.1.3 within the powers of NERSA;[14]

3.2.1.4 taken within a procedurally fair process in which affected persons have the opportunity to submit their views and to present relevant facts and evidence;[15]

3.2.1.5 based on reasons, facts and evidence that must be summarised and recorded;[16] and

3.2.1.6 explained clearly as to its factual and legal basis and the reasons therefor.[17]

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[11] *Road Accident Appeal Tribunal and Others v Gouws and Another* 2018 (3) SA 413 (SCA) at para 27.

[12] Section 10(1)(a) of NERA.

[13] Section 10(1)(b) of NERA.

[14] Section 10(1)(c) of NERA.

[15] Section 10(1)(d) of NERA.

[16] Section 10(1)(e) of NERA.

[17] section 10(1)(f) of NERA.

3.2.2 It is apposite to note that the second requirement mandates NERSA to act in the public interest in making its concurrence decision. Accordingly, where NERSA discerns that a proposed determination would be detrimental to the public, it cannot lawfully concur in that determination. In assessing what is in the "public interest", our courts have adjudged what is "*reasonably necessary in the interest of the public*" and engaged in a weighing-up of hardship and benefit to the public.[18] Our courts have also utilised the litmus test, albeit in the context of liquor license approvals, of "*whether the public would be better served if the applicant were granted the license*" than if the existing state of affairs were to continue.[19]

3.2.3 The latter three requirements, in particular, are indicative of the fact that the legislative intent is for NERSA to play an active role in exercising its discretion to concur (or to refuse to do so). It is submitted that NERSA therefore cannot merely give an affirmative response to the Minister's request for concurrence – rather, the NERA requires it to prepare a written summary of the relevant facts, reasons, evidence, and the legal basis for its decision. This essentially requires NERSA to apply its independent mind to the content of the section 34 determination prepared by the Minister. Moreover, the NERA mandates that, in doing so, NERSA must solicit submissions from affected persons. The requirement for a "procedurally fair" process necessarily suggests that the submissions made by affected persons must be meaningful: that is, they must be considered by the decision-maker with the possible consequence of affecting the outcome of the decision.[20]

3.2.4 Secondly, as administrative action, a decision by NERSA must be in accordance with the procedural and substantive requirements in PAJA. These include, but are not limited to, the requirement that the decision: (i) be

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[18] *Clinical Centre v Holdgates Motors Co* 1948 (4) 480 (W) at 489-90.

[19] *Maharaj v Chairman, Liquor Board* 1997 (1) SA 273 (N) at 281.

[20] *Masethla v President of the Republic of South Africa* 2008 (1) SA 566 (CC) at para 75.

procedurally fair;[21] (ii) consider all relevant considerations;[22] (iii) not take into account irrelevant considerations;[23] not be arbitrary;[24] and (iv) must be both rational[25] and reasonable.[26] While the first three requirements imposed by PAJA are relatively self-explanatory, the requirements of non-arbitrariness, rationality and reasonableness are the subjects of frequent judicial engagement and, in the light of their relevance in the present instance, warrant further explanation.

3.2.5 *Non-arbitrariness*

3.2.5.1 The requirement that a decision not be arbitrary makes clear that a decision-maker must do more than simply "rubber-stamp" a decision taken by another decision-maker. To do so would constitute an abdication of the discretionary power vested in the decision-maker, with the effect that a decision was not taken by that decision-maker at all.[27] Moreover, section 34(1) expressly envisions a joint determination process and empowers NERSA to exercise its discretion: the section does not permit of a reading that does not require independent consideration by NERSA. This would constitute an impermissible fettering of NERSA's statutory powers.

3.2.5.2 This express requirement makes clear that, in deciding whether or not to concur with the ministerial determination made in terms of section 34(1) of the ERA, NERSA is required to apply its mind, independently, to the determination proposed by the Minister.

[21] Section 3(1) of PAJA. The content of this requirement is expanded on in section 3(2)(b), which requires a decision-maker to provide adequate notice of the nature and purpose of the proposed action, a reasonable opportunity to make representations, a clear statement of the proposed action, adequate notice of the right of review where applicable and adequate notice of the right to request reasons.

[22] Section 6(2)(e)(iii) of PAJA.

[23] Section 6(2)(e)(iv) of PAJA.

[24] Section 6(e)(vi) of PAJA.

[25] Section 6(2)(f)(ii) of PAJA.

[26] Section 6(2)(h) of PAJA.

[27] *Minister of Environmental Affairs v Scenematic Fourteen (Pty) Ltd* 2005 (6) 182 (SCA) at para 20.

3.2.6 *Rationality*

3.2.6.1 It is an established principle of our law that the exercise of public power must be rationally connected to the purpose for which the power is exercised. Section 6(2)(f)(ii) of PAJA accordingly gives a court the power to review administrative action which is not rationally connected to: (i) the purpose for which it was taken; (ii) the purpose of the empowering provision; (iii) the information before the administrator; or (iv) the reasons given for it by the administrator.[28]

3.2.6.2 The rationality threshold will generally be satisfied if a decision-maker can show a direct connection between the action it has taken, the power it has been given and the purpose it was seeking to achieve. However, in certain instances, rationality also requires that the process followed by the decision-maker in making the decision must also be rational. Where a step in the decision-making process does not bear a rational relation to the purpose for which the power was given to the decision-maker, the entire decision-making process may be rendered irrational.[29] By way of example, our apex Court has recently made clear, in setting aside a decision by NERSA to approve maximum gas price and transmission tariff applications by Sasol Gas Limited ("**Sasol**"), that the process leading to a determination by NERSA must be rationally related to the objective sought to be achieved. In that matter, the stated purpose of NERSA's decision to approve the applications was to remedy Sasol's monopoly in the gas market. The Court emphasised that, because NERSA had failed to consider a mandatory factor (Sasol's marginal costs) in reaching its decision, its decision could not hope to cure Sasol's market monopoly. The decision, which had the effect of significantly raising cost to the customer, was rendered irrational by NERSA's approach.

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[28] Section 6(2)(f)(ii)(aa)-(dd).

[29] *Democratic Alliance v president of South Africa and Others* 2013 (1) SA 248 (CC) at paras 37-9; PG Group at para 50.

3.2.7 *Reasonableness*

3.2.8 In any event, a concurrence decision by NERSA is not subject only to the lower bar of rationality, but to the higher bar of reasonableness.[30] Notably, an aspect of the requirement that administrative decisions be reasonable is that any adverse impact on a person occasioned by such exercise be proportional to the benefit sought to be gained through the exercise of such power. The role of proportionality in the assessment of the reasonableness of an exercise of public power is explained in the following extract from the Constitutional Court's decision in *Bato Star Fishing (Pty) Ltd v Minister of Environmental Affairs and Tourism and Others*:

> "*[w]hat will constitute a reasonable decision will depend on the circumstances of each case, much as what will constitute a fair procedure will depend on the circumstances of each case. Factors relevant to determining whether a decision is reasonable or not will include the nature of the decision, the identity and expertise of the decision-maker, the range of factors relevant to the decision, the reasons given for the decision, the nature of the competing interests involved and the impact of the decision on the lives and well-being of those affected.*" [31]

3.2.9 What is apparent from the quoted passage is that reasonableness contains within it various elements of proportionality, in particular, the need to consider the range of factors relevant to the decision, the nature of the competing interests involved and the impact of the decision on the lives and well-being of those affected. Under the rubric of reasonableness, where a means is available that will serve the objective, but will limit the rights of affected persons less, this is the means that a decision-maker is required to adopt. It is also apposite to note that, where an administrative decision is multifaceted, or involves a number of aspects, each may be independently tested against the reasonableness standard. In the present instance, for example, section 34(1) of the ERA envisions a determination by the Minister, in consultation with NERSA, that "new

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[30] Section 6(2)(h) of PAJA stipulates that an exercise of administrative power will found a ground of review where:

"*the exercise of the power or the performance of the function authorised by the empowering provision, in pursuance of which the administrative action was purportedly taken, is so unreasonable that no reasonable person could have so exercised the power or performed the function*".

[31] 2004 (4) SA 490 (CC) at para 45.

generation capacity is needed",[32] as well as a determination regarding "the types of energy sources from which electricity must be generated, and the percentages of electricity that must be generated from such sources". Both these sub-decisions are subject to scrutiny: even if the decision that new generation capacity is required is unequivocally reasonable, the decision on the type of energy source or the percentage of electricity to be generated from that source may be unreasonable and therefore invalid.

4. Conclusion

4.1 To summarise, in deciding whether to concur with a proposed ministerial determination under section 34(1) of the ERA, NERSA is required to exercise an independent discretion and apply its mind to the decision, as opposed to merely acquiescing to the proposal made by the Minister. In reaching its decision, NERSA's exercise of its decision-making powers is subject to the applicable statutory constraints and ordinary principles of administrative law.

Please contact us if you have any questions or comments in relation to any aspect of this memorandum.

WEBBER WENTZEL **5 FEBRUARY 2020**

[32] Section 34(1)(a) of the ERA.