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IRP 2025: REFLECTIONS ON PROCESS AND OUTCOMES

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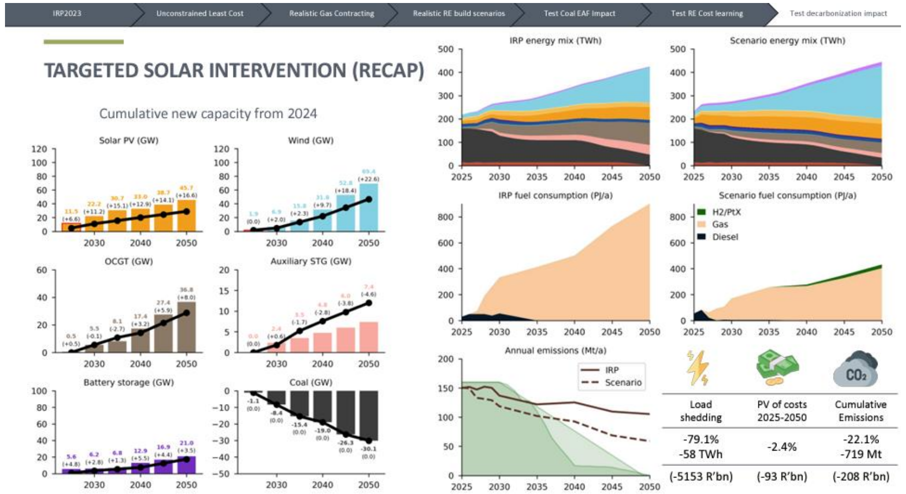
7 MAY 2025

OUR COMMENTS ARE BASED ON EXTENSIVE INVOLVEMENT IN THE IRP AND BROADER ENERGY POLICY PROCESSES

- We have engaged extensively with the IRP process, participating in all stakeholder engagements and conducting independent technical modelling, which we have published to support broader transparency and debate.
- https://meridianeconomics.co.za/publications/review-of-the-irp-2023/
- Our comments today:
  - Do not address the technical details at length; but
  - Focus on the essential aspects of the process for, and contents of the IRP proposals.



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01

ROLE OF THE IRP – WHY GETTING IT RIGHT IS IMPORTANT

WHAT IS THE IRP?

- The IRP is **defined in law** (ERA 2006, Section 1):

  'integrated resource plan' means an indicative, forward looking plan for electricity generation, which reflects national policy on electricity planning, which plan specifies the types of energy sources and technologies from which electricity may be generated and indicates the amount of electricity that is to be generated from each of such sources or technologies;

- Policy-making must satisfy the constitutional principle of legality, which includes a minimal rationality requirement. A policy can be invalidated if it is shown to be objectively irrational–that is, without any rational connection to its stated purpose.

WHY GETTING THE IRP RIGHT IS SO IMPORTANT

THE IRP IS CRITICAL FOR EFFICIENT PUBLIC PROCUREMENT AND PRIVATE INVESTMENT

- The IRP is required for the public procurement of electricity
  - Most flexible dispatchable generation likely to be publicly procured for the foreseeable future (e.g. gas & batteries).
  - Any new nuclear and pumped storage capacity will have to be publicly procured (nuclear not commercially viable for the foreseeable future).
  - (These costs will be imposed on electricity consumers)
  - Procurement governed by Section 34 ministerial determinations. The Minister–
  - (a) must have regard to the content of the integrated resource plan… - S34 (6)
- The IRP is also important for supporting private investment
  - Coherent, rational, predictable policy is critical for investor confidence in the sector and in the economy more widely.
- Over the last 17 years the economy has undergone a massive supply-side shock with load shedding AND a 280% real increase in Eskom tariffs, with undeniable negative impact on economic growth and employment.
  - Power sector efficiency is critical to contain further electricity cost increases
    - In the best-case modelled scenarios electricity tariffs will still need to increase further as old coal stations are retired.
  - Least cost power system planning therefore matters greatly

WHY DOING OPTIMISER-BASED ANALYSIS AND DOING IT CORRECTLY IS SO IMPORTANT

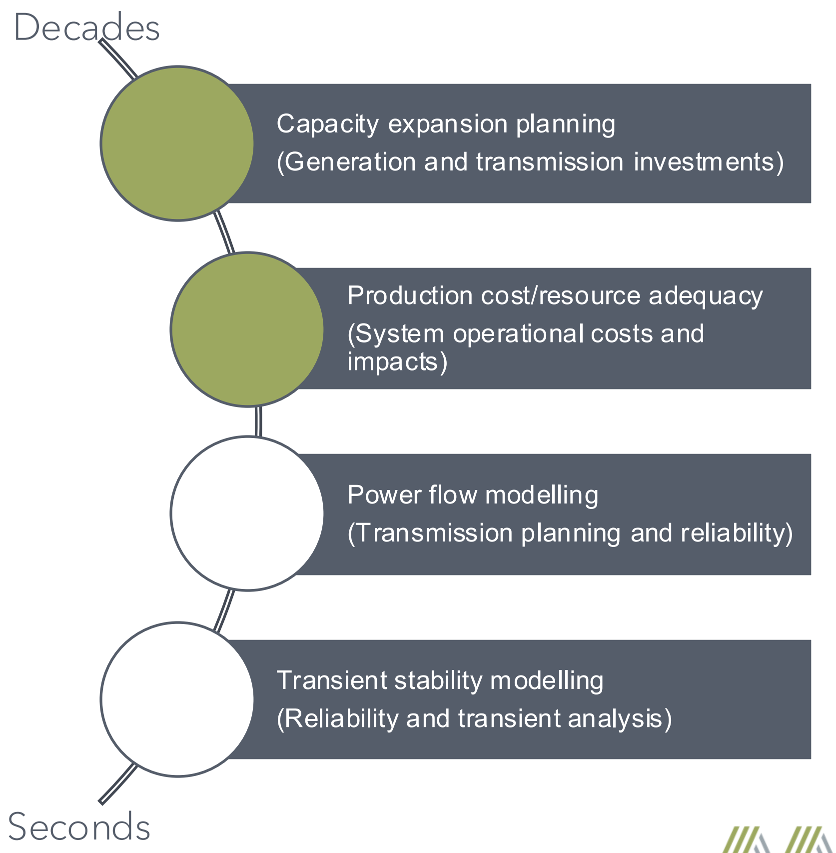
The stakes are incredibly high

- Securing a reliable electricity supply at the lowest possible economic and environmental cost is one of the most critical challenges in supporting long-term economic development.

Developing resilient investment plans is a complex endeavour

- Without rigorous analysis, there is no solid basis for decision-making
- Capacity expansion simulation models process millions of variables and constraints to determine the "optimal" technology investments for a given set of input assumptions and constraints.
- Effective scenario planning, underpinned by this modelling, is critical for engaging in uncertain environments and developing resilient energy plans.

Power system models use mathematical optimisation to simulate decisions under defined technical, economic and policy constraints



Modified from Mileva, Deshmukh. (2020) The GridPath Electricity Modelling Platform

02

A CREDIBLE IRP REQUIRES A CREDIBLE PROCESS

OUTCOMES MUST FOLLOW LOGICALLY FROM THE RESULTS OF PROPER ANALYSIS

Evidence-Based Outcomes

- Outcomes should be grounded in sound, transparent, and well-documented techno-economic analysis. Analytical decisions should be guided by objective energy system planning criteria rather than predetermined outcomes.
- The test is: will another energy planner making similar reasonable assumptions arrive at similar results: i.e. replicability.
- "Policy adjustments" are not a free "get out of jail" card for special interests.
  - Any adjustment or constraint that forces deviation from the optimised plan has a further cost.
  - Need to quantify whether the "policy adjustment" really brings greater benefits; and at what additional cost?
  - There is no free lunch – it only appears so when the costs are hidden or imposed on others.

Policy Alignment and Integration

- The IRP must be consistent with existing policy frameworks, including climate commitments, local air quality regulations, and socio-economic development goals.

A CREDIBLE PROCESS MUST INVOLVE MEANINGFUL CONSULTATION AND TECHNICAL REVIEW

Transparent Assumptions and Scenario Design

- Clearly document all assumptions–including fuel prices, technology costs, build constraints, and demand forecasts–along with a range of scenarios and sensitivities to reflect uncertainty. All input data and model outputs should be published in open, machine-readable formats to enable reproducibility and independent verification.

Early and Inclusive Stakeholder Engagement

- Engage stakeholders about assumptions early (before modelling) and continuously throughout the IRP process to strengthen analytical quality and foster broad-based support. Government, Eskom, IPPs, Large power users, civil society, academia and industry experts.

Independent Review and Oversight

- Commission independent technical review of modelling methods and assumptions by local or international experts. The findings should be published in full to build credibility.

Regular and Predictable IRP Updates

- IRPs should be updated on a regular and predictable schedule, every 2 to 3 years, to reflect changing technology costs, system needs, and policy developments.
- Major technical changes to the modelling should be thoroughly reviewed before implementation into the planning process (e.g moving from single to multi-nodal modelling).

03

KEY ASPECTS OF THE IRP ANALYSIS

KEY ASPECTS OF THE IRP ANALYSIS FOR THE PURPOSE OF OUR COMMENTS

- Modelled an optimised Reference Case
  - which includes existing committed public procurement and private sector plans, including 6GW of gas-to-power procurement - i.e. 6GW of CCGT is "forced in" and not modelled by the optimiser.
  - Results:
    - "The emerging technology mix from the analysis shows that wind, solar PV, gas and storage are preferred options. This is in line with the expectation based on the cost production basis resulting from the screening curves."
    - "In the initial period between 2031 and 2035, mid-merit gas is not required due to the already committed 6 GW gas capacity."
    - "No new nuclear, coal and pumped storage options are built in this case." **The nuclear finding is consistent with other published modelling studies of the SA power system**
- Optimised "Gas at Risk" scenario
  - Same as Reference Case, but gas-to-power is NOT forced into the optimiser
  - Results: Optimiser chooses only 3.5 GW of CCGT in the period between 2031 and 2035 and the build rate up to 2040 is more aggressive than in the Reference case.
- Nuclear Scenario
  - The only way a nuclear scenario could be constructed was if the model was so constrained that it had no other choice than to build nuclear. The Nuclear scenario arbitrarily removes the option to build any dispatchable gas/liquid fuel capacity between 2030-2050 (without any justification).
  - The Case for Nuclear is thus not the outcome of the model's optimisation, but a forced-in scenario

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04

CRITICAL FLAWS IN THE CURRENT IRP THAT UNDERMINE ITS CREDIBILITY

THE IRP DOCUMENT DOES NOT CONTAIN SUFFICIENT INFORMATION TO ENABLE MEANINGFUL CONSULTATION

Comparing the costs and emissions of the "Proposed Balanced Plan" to the previously modelled scenarios is not currently possible.

- It is astonishing that the current IRP document does not show data on the technology capacity, energy mix, costs or emissions for the modelled scenarios or the Proposed Balanced Plan. (Technically this mean that it does not qualify as an IRP in terms of the legal definition.)
  - Whilst some high-level information was shared in the November 2024 presentation, It remains unclear if there has been any subsequent changes to the modelling.
  - Critically no modelling outputs have been presented for the Proposed Balanced Plan, which clearly runs the risk of imposing excessive electricity costs on consumers and the productive economy.

Despite welcome improvements in the (February 2023) technology costs assumptions, overall, the input assumptions remain opaque and poorly documented.

- Updated EPRI cost and performance data report has not been publicly released.
- The move to spatially disaggregated modelling has not been accompanied by any spatially disaggregated input or output data.

SEVERAL CRITICAL FLAWS PERSIST IN THE TECHNICAL MODELLING UNDERPINNING THE IRP

- Scenarios are not effectively defined to capture a reasonable breadth of plausible futures and explore associated uncertainties
  - The way the scenarios are defined is not internally consistent and provides only limited insight into key risks and opportunities
    - Critical uncertainties around demand, coal plant EAF, and gas pricing are not investigated.
    - These are to be tested AFTER the IRP is approved. Why are uncertainties not taken into consideration when developing the plan?
- Fundamental changes to the modelling were made mid process
  - The move to a more complex multi-nodal model significantly increases computational complexity, yet no inputs/outputs are presented with a spatial disaggregation. This makes it difficult to ascertain if the additional complexity adds value to the process.
- Nuclear technology
  - Nuclear costs in general remain overly optimistic.
  - Small modular reactors are not fully commercialised, yet they are included in the analysis. It is stated in the IRP that a share of the proposed Nuclear capacity will be from SMRs.
- No liquid fuelled generators considered
  - Only gas fired OCGT/CCGT capacity is considered. Liquid fuels could continue to play a role in peaking support given the ease of storage and might therefore be part of the optimal solution.
- SA's Low Emission Development Strategy sets an economy-wide goal of net zero emissions by 2050, but no scenarios are tested to achieve this. Local air quality and MES compliance is not adequately considered.

THE PROPOSED BALANCED PLAN IS NOT LOGICALLY DERIVED FROM THE UNDERLYING ANALYSIS.

Table 1: Proposed Balanced Pan

	Coal	Gas – IPP Programme	Gas - Eskom	Nuclear	Hydro	Pumped Storage	CSP	Solar PV	Wind	Hybrid IPP Programme	Distributed Generation	BESS – IPP Programme	BESS - Eskom	Other private projects (Includes Diesel, Bioenergy etc.)	Unserved Energy (GWh)
Current Base (MW)	39 520	1 005	2 825	1 860	1 600	2732	500	2 287	3 443	-	6 165	-	219	104	
2024	720									150	900				
2025	720						100	960*	1738*	476	900	712			0,14
2026								3553**	964**		900		144	35	0,28
2027								2 886***	2847***		900		150	332	0,03
2028									770****		900	615			0,2
2029			3 000					24****	760*****		900	2 615			0,4
2030		3 000						800	2 000		900	200			0
2031								1 000	2 500		900	200			
2032		1 250						1 200	2 600		900	200			
2033		1 250						1 400	2 600		900	200			
2034		1 250						1 600	3 000		900	200			
2035		1 000						2 000	3 000		900	200			
2036		1 250		1 250				1 600	2 000			500			
2037		1 500		1 250		1 332		1 600	3 000			500			
2038		1 250		1 350				1 600	3 000			500			
2039		1 250		1 350				1 600	3 500			500			
2040		1 250						1 600	3 500			500			
2041		500						1 600	3 500			500			
2042		500						1 600	3 500			500			
2043															
2044															
2045															

Installed Capacity
Capacity under construction
Capacity procured
New Capacity
Distributed Generation Capacity for own use
Unserved Energy, preferred as low as possible

OCGT capacity is grouped with CCGT capacity. Section 6.1 refers to capacity in plan as all CCGT.

Nuclear is only introduced when future gas build disallowed. But then final plan includes both big gas and nuclear.

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2031								1 000	2 500		900	200			
2032		1 250						1 200	2 600		900	200			
2033		1 250						1 400	2 600		900	200			
2034		1 250						1 600	3 000		900	200			
2035		1 000						2 000	3 000		900	200			
2036		1 250		1 250				1 600	2 000			500			
2037		1 500		1 250		1 332		1 600	3 000			500			
2038		1 250		1 350				1 600	3 000			500			
2039		1 250		1 350				1 600	3 500			500			
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2041		500						1 600	3 500			500			
2042		500						1 600	3 500			500			
2043															
2044															
2045															

Gas build out programme

- The scale of Gas-to-Power is dependent on the installed capacity AND utilization. Without capacity factor results the outcome is ambiguous and open to abuse.
- The modelled scenarios consist of a mix of OCGT and CCGT capacity. These are grouped together into one programme in the plan, despite having fundamentally different supply profiles (and then treated as CCGT).

Nuclear build out programme

- Merely defining a scenario in which Nuclear is built does not create an investment case for Nuclear.
  - The Nuclear Scenario was created by excluding new gas power as an option after 2030
- However, The Balanced Plan combines Nuclear with an ongoing big gas build. This is:
  - Logically inconsistent with the IRP's own analysis;
  - Will be very expensive; and
  - Will displace cheaper renewables-based options.

PROCESS - VENEER OF STAKEHOLDER ENGAGEMENT

17 months

Jan 2024 Draft IRP 2023 published for comment

- 5 years after IRP2019 promulgated. No public stakeholder engagement over this period when developing the plan ✗

Feb 2024 3 online workshops

March 2024 Closure of comments

- Very limited opportunity for meaningful technical engagement. ✗
- Very limited input data shared in an Excel format ✗

(Between March 2024 and Nov 2024)

- Technology cost assumptions for RE and storage improved in modelling update. ✓
- Flawed scenarios not addressed. ✗
- Modelling completely changed to multi-node model. ✗

Nov 2024 Modelling update presentation

- Very rushed stakeholder workshop with little notice. Content only shared on the day of the workshop, with limited opportunity to probe the technical content. ✗
- SANEDI facilitated engagements with modelling experts ✓
- Initially promising engagement, but no further data was shared, expert requests to share energy mixes not fulfilled. ✗

March 2025 Leaked IRP document from NEDLAC process

- Official document has not yet been released

  Only engagement is around a leaked copy from NEDLAC. ✗

WHAT IS GOING ON HERE?

- We have an IRP that:
  - Neither went through a meaningful public consultation process; nor benefitted from review by independent experts;
  - Contains lots of technical descriptions about power system modeling, but
    - does not adequately investigate the most critical uncertainties affecting future outcomes;
  - Presents recommendations that do not follow logically from the analysis, are not otherwise substantiated, and for which the technical and cost implications are not presented; and in effect
  - creates an illusion that the recommendations are based on sound techno-economic principles when they clearly are not.
    - If the IRP is not based on, or tested by, the modelling conducted the question arises: why is the modelling done at all, and presented as an important part of the process?
- What is going on here? Why is this happening? How do we make sense of this? What are the risks for South Africa?
- The technologies that are uneconomically "forced" into the plan (esp. gas and nuclear) will rely on public procurement with limited competition where risk and costs will be socialised;
  - South Africa's recent empirical experience with these types of projects provides stark warnings about their enormous risk for cost overruns and opportunities for rent-seeking and even corruption.
    - e.g. Medupi, Kusile and Ingula megaprojects; the failed 9.6GW nuclear procurement process; and the highly concerning Karpowership RMIPPPP experience.

THE IRP OPPORTUNITY

- The energy transition presents South Africa with its best economic opportunity to unlock sustainable economic growth and development, and create 100 000s of net new jobs.
  - The IRP can and should be the policy statement that provides this vision and galvanises all stakeholders and investors to contribute to this process.
  - This outcome is within reach and is certainly what South Africans deserve after load shedding, Covid, and years of economic stagnation.
- The sector is undergoing fundamental changes with the market reforms introducing competition and the need to accelerate economic growth and decarbonisation.
- The time is ripe for a redesign of the IRP process to ensure that it becomes the authoritative policy vision for the sector.
  - Rather than being an arena for endless contestation and wasted energy, it can become a policy process that stakeholders can "get behind" and support.

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Extra slides

TOWARDS BETTER POLICY AND PLANNING - HOW COULD THE IRP BE IMPROVED?

A PLANNED, PREDICTABLE, TRANSPARENT PROCESS

DEVELOPMENT OF THE IRP IS AN ONGOING AND NOT A ONCE-OFF ENDEAVOR

- Plan a stakeholder engagement program with pre-established milestones throughout the process
  - Engage stakeholders during the process, not just at the end
- Conduct separate engagements in determining reasonable input assumptions, methodology and result sharing
  - Input assumptions
    - Technology cost and performance parameters are changing rapidly. Modelling should not commence prior to updating an established, reviewed set of cost and technology performance assumptions
  - Methodology
    - A clear, transparent, published, reviewed methodology should be subject to robust engagement by stakeholders before modelling commences. All analysis conducted should implement the latest, published methodology
  - Results sharing
    - Results should be made available in electronic format and include at minimum the annual capacity, energy production, capital and operating costs for each technology
    - Disclosure should be sufficient for stakeholders to easily replicate the analysis and obtain the same results

EXAMPLE OF AUSTRALIAN PROCESS WITH A CLEARLY DEFINED TIMELINE FOR A REGULAR 2YR CYCLE IRP, WITH COMPREHENSIVE STAKEHOLDER ENGAGEMENT

Stakeholder engagement on input assumptions and scenarios before modelling