

# IRP 2 Preliminary Comments

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IRP 2 1<sup>st</sup> Stakeholder Workshop

Pretoria, 7 June 2010



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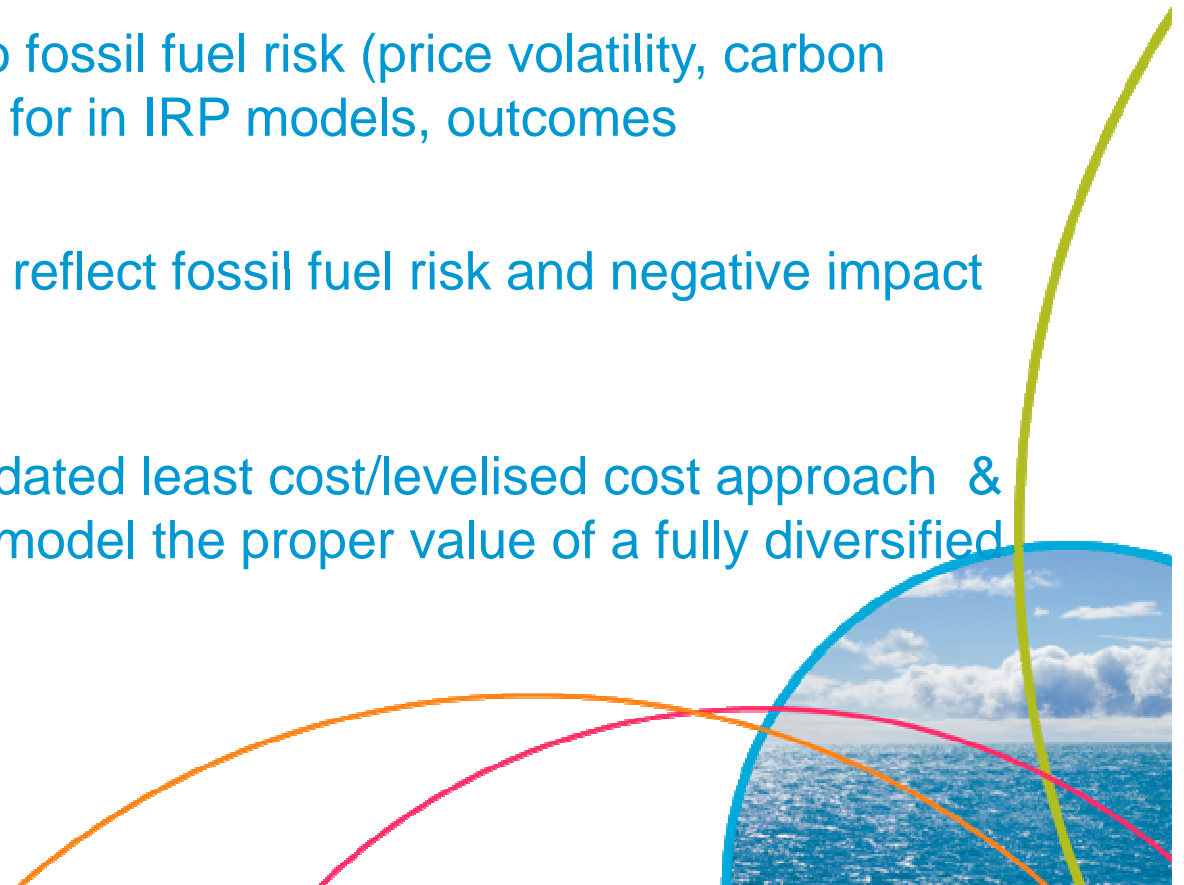
# General Principles and Comments

- IRP process
  - no significant inclusion of RE associations in the reference groups. Reflects bias in the IRP toward a ‘business as usual, carbon constrained’ generation mix
  - key parameters informed by myths around RE technologies & their benefits
- Significant exposure to fossil fuel risk (price volatility, carbon fines) – not accounted for in IRP models, outcomes
- IRP not able to model, reflect fossil fuel risk and negative impact on GDP
- Modeling relies on outdated least cost/levelised cost approach & not able to accurately model the proper value of a fully diversified supply side mix



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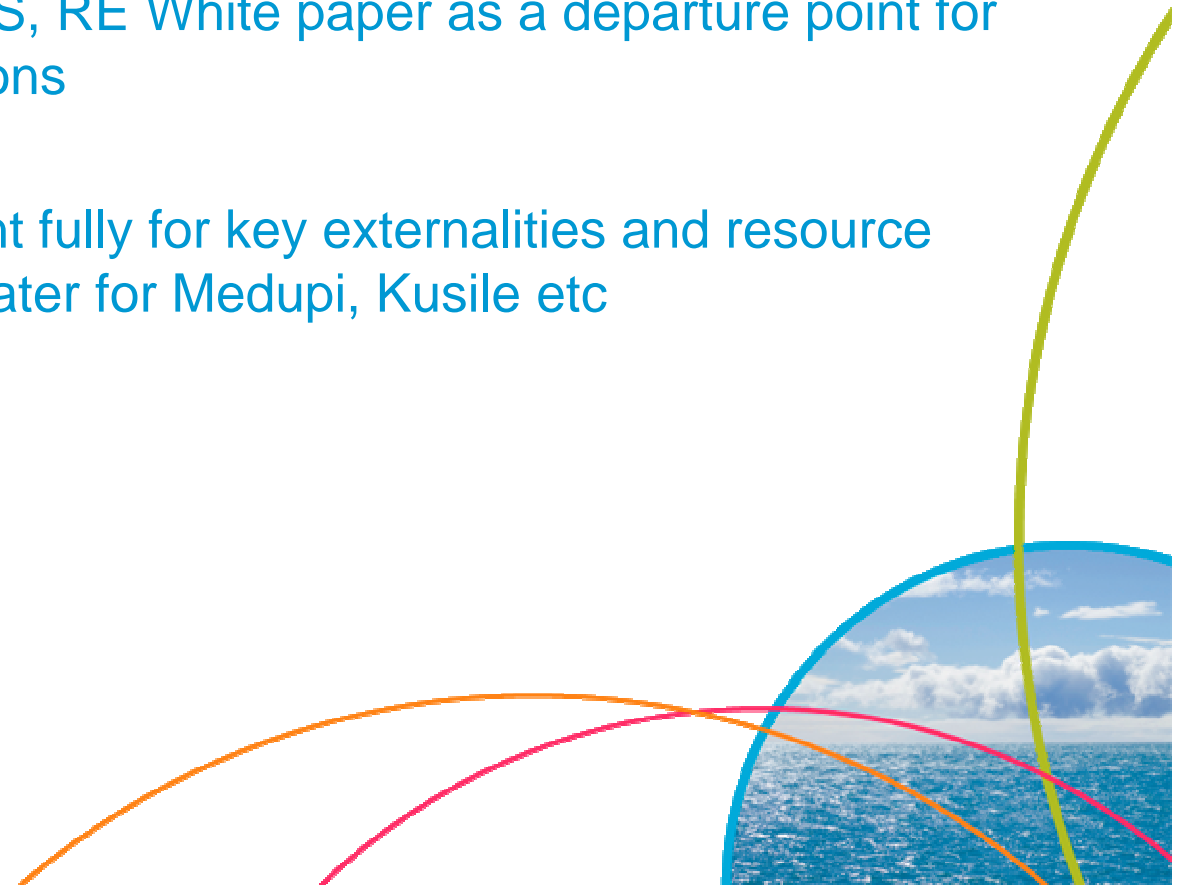
# General Principles and Comments (2)

- Benefits of diversified mix not accounted for (economic; GDP impacts; jobs; rural development' industrial development)
- Does not use the LTMS, RE White paper as a departure point for the modeling and options
- IRP 2 does not account fully for key externalities and resource constraints - use of water for Medupi, Kusile etc



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# Initial Modeling parameters

- **Electricity Intensity-Short Term: IRP 2010 Input Parameter Data Sheet**

*While it is reasonable to assume that the existing electricity intensive base of the economy will take some time to adopt energy efficient technologies (because it is much harder and more expensive to retrofit existing production capacity) it would also be reasonable to assume that investment in future productive capacity will incorporate increasingly energy efficient technologies.'*

**Comment:** It should be noted that this will only happen when the electricity price increases to a level which warrants this investment.

- **Electricity Intensity-Long Term: IRP 2010 Input Parameter Data Sheet**

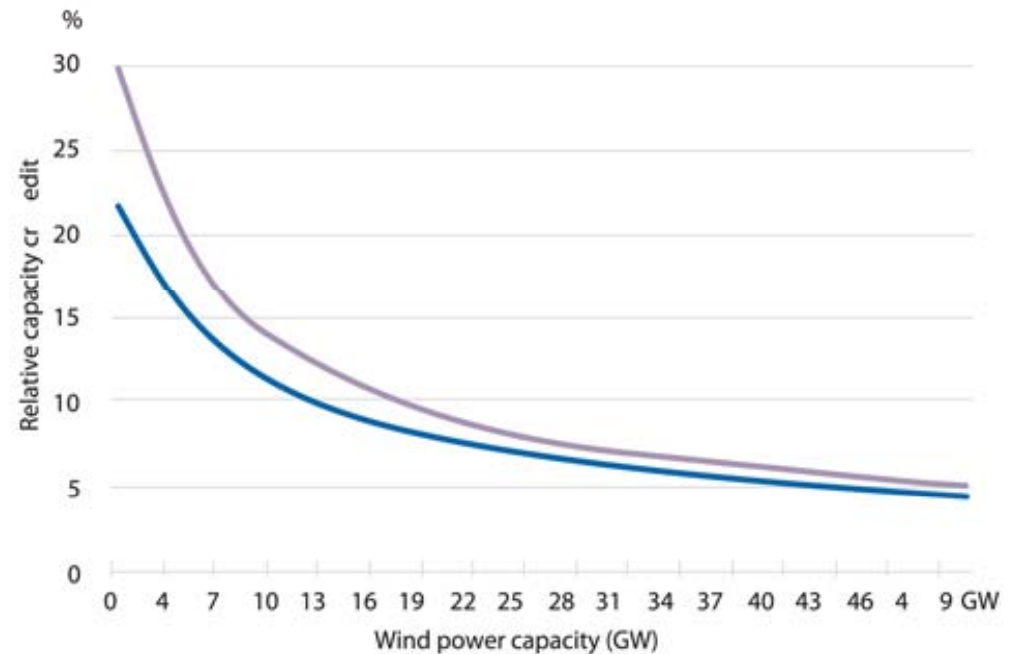
**Comment:** Did the calculation used to calculate the current intensity ratio of 3:2 include load shedding? If so it would make sense that the ratio would be higher.

- **Price Elasticity of Demand: IRP 2010 Input Parameter Data Sheet**

**Comment:** Different sectors/industries will react differently to price increases. Sensitivity for a range of sectors/industry to electricity price increases should be included in the final calculation.

# Reserve Margin: IRP 2010 Input Parameter Data Sheet

- The 5-25% Capacity credit for Wind Energy warrants revision
- Capacity credit needs to be fully understood and modelled with more accurate figures
- SAWEA IRP Response Papers - average power daily output of a portfolio of 30 GW of wind energy projects dispersed across South Africa, will not drop below 6 GW, or 20% of installed base.
- Capacity credit is not stated for Solar Photovoltaic which is the most proven and fastest growing form of solar power.



■ Wind power configuration 2003  
■ Wind power configuration 2020

DENA 2005

# Proportion of Renewable Energy (1)

- SAWEA's proposal is for 25% by 2025 and 30% by 2030. This equates to approx. 100 TWh by 2025
- Dispatchability
  - wind energy is a variable source of generation it is not intermittent
  - predict 24 to 72 hours in advance what power wind will be generating, allowing it to be dispatched on the system along with other forms of power generation to meet demand.
- Intermittent:
  - the results highlighted that the level of variability in wind power production in South Africa is comparable to that observed in international markets with existing high levels of wind penetration
  - the existing electricity generation plant and electricity system can absorb this without any negative consequences.
  - 30,000 MW national wind energy capacity would have an average daily minimum power output of 7,000 MW thus displacing the equivalent oil coal and nuclear baseload.

# Proportion of Renewable Energy (2)

- **Impact on Reserve Requirements:** The parameter sheet states that the ratio of dispatchable vs. Intermittent (variable) renewable generation has an impact on operating reserve requirements.
- International experience - national electricity systems can typically achieve up to 15% wind penetration without any notable grid upgrades or increase in reserve requirements.
  - level of variability in wind power production in South Africa comparable to that observed in international markets with existing high levels of wind penetration
  - existing electricity generation plant and electricity system can absorb this without any negative consequences.
  - PGWC, Eskom, GTZ study – 2800MW with no need for upgrade
  - 30,000 MW national wind energy capacity - average daily minimum power output of 7,000 MW thus displacing the equivalent oil coal and nuclear baseload.
  - existing electricity system - accommodate 6,600 MW
  - should represent a short-term (2015-2016) target

# Portion of Renewable Energy (3)

- **‘RE affects the affordability of the IRP in the short to medium term’.**
  - increase in renewable energy will narrow the price cone due to its fixed price nature over a 20-year period
  - Risk not priced and reflected
- **Funding for REFIT** - assessed by keeping in context the cost of ‘unserved energy in South Africa’ (75k Rand/MWh in this document), the cost of the power that it is displacing at the margin (oil-fuelled OCGT plants (2-3 Rand/kWh), water and emission savings, transmission losses avoided and the income and tax income generated.
- **Environmental Impact Assessments (EIA)** – these are to be completed for all plant, not just wind and solar. Ensure reflected for all technologies
- Regulatory delays and lack of appropriate policies and rules by the respective departments surrounding the REFIT should not affect the inclusion of adequate Renewable Energy Proportion allocation in the IRP.

# Generation Life Cycle Cost: IRP 2010

## Input Parameter Data Sheet

- “Levelised Cost of Electricity” - does not take into account the risk profile attached to each technology, the significant long-term exposure to fuel price volatility and the economic and societal impact of each form of technology.
  - resulted in national generation portfolios that are highly exposed to volatile external costs (i.e. fuel, capital costs, operating costs, delays, emissions)
  - An unpredictable escalation in external fuel or emission prices, as has happened in recent years, can have very negative implications for most economies
- No accounting for unpredictable externalities
- Risk profiling of SA mix not evident
  - economy’s tolerance to risk and the acceptable and realistic cost of electricity for each type of generation
  - Uncertainties long-term fuel costs, the emissions costs, the capital costs and the operational costs
  - risk and cost profile of the national generation portfolio.
- More diversity there is in a generation portfolio, especially if there is limited correlation between the chosen options, the lower the portfolio risk.

# Generation Life Cycle Cost: IRP 2010 Input Parameter Data Sheet (2)

## Summary

- **The current Generation Life Cycle Cost (GLCC) as a standalone parameter is inadequate**
  - does not take into account the risk profile attached to each technology,
  - the significant long-term exposure to fuel price volatility and
  - the economic and societal impact of each form of technology.

**This parameter needs to be extended to a more comprehensive Generation Portfolio assessment, taking into account the risks and cost of each form of power generation.**



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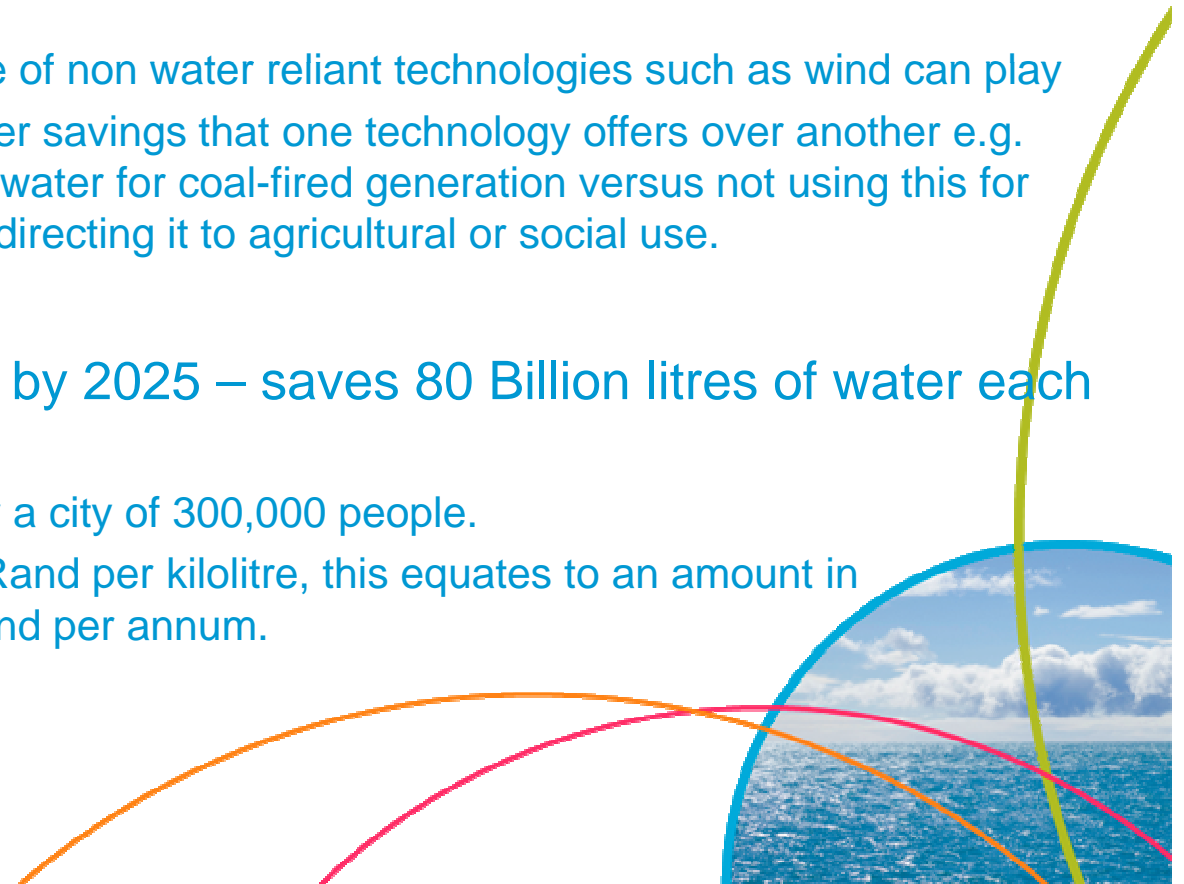
# Water: IRP 2010 Input Parameter Data Sheet

- Water Parameter acknowledges that SA is an arid country and that availability of water could be a severe constraint on choice of generation technology and plant location Compare with estimated demand profile 2025
- **Does not**
  - refer to the role the value of non water reliant technologies such as wind can play
  - quantify the value of water savings that one technology offers over another e.g. what is the cost of using water for coal-fired generation versus not using this for power generation and redirecting it to agricultural or social use.
- SAWEA 25% RE target by 2025 – saves 80 Billion litres of water each year
  - annual water required by a city of 300,000 people.
  - with a cost of at least 3 Rand per kilolitre, this equates to an amount in excess of 300 Million Rand per annum.



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# Thank you for your time

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# IRP 2 Preliminary Comments Supporting Presentation - Wind Energy Portfolio Studies

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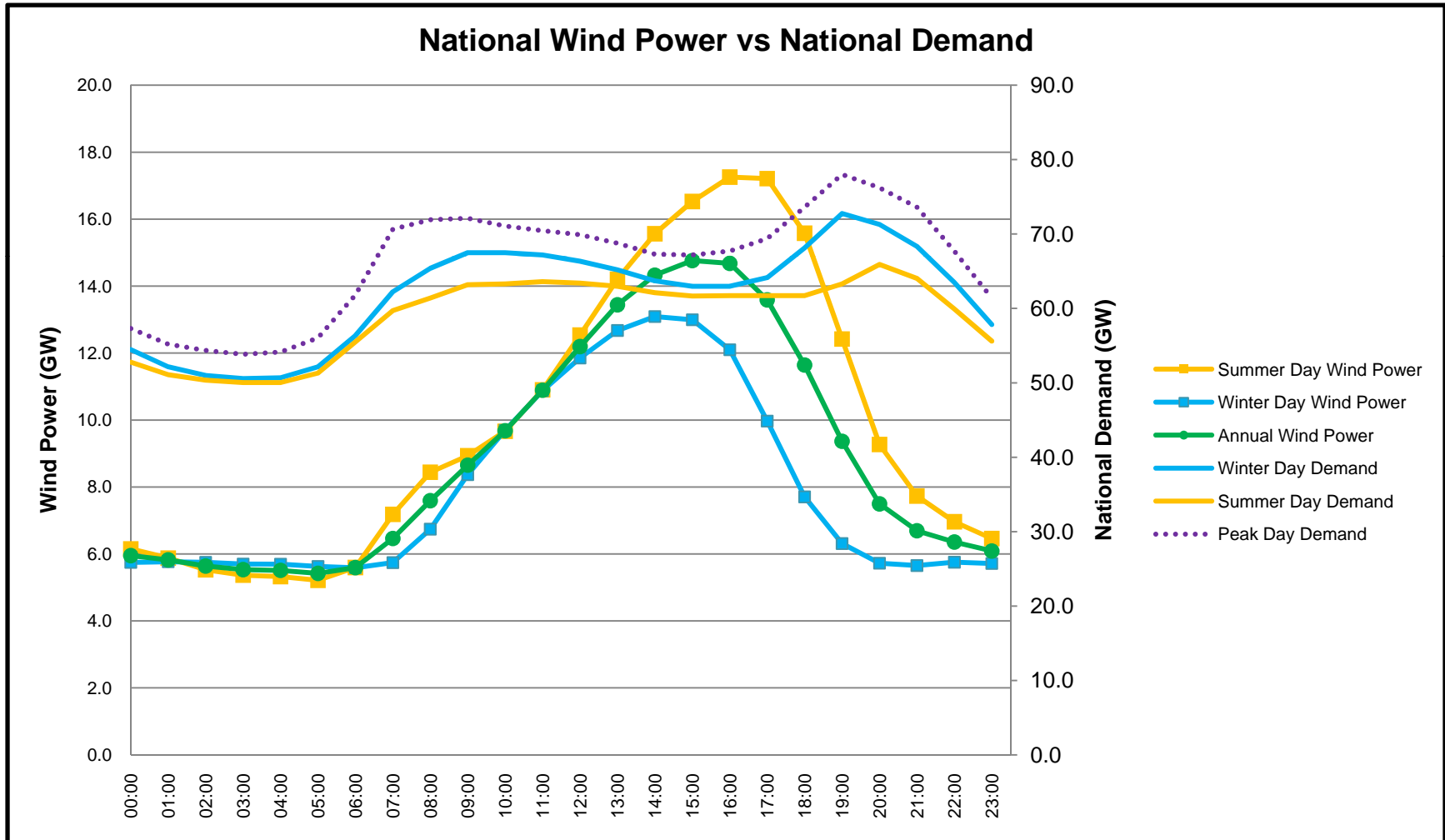


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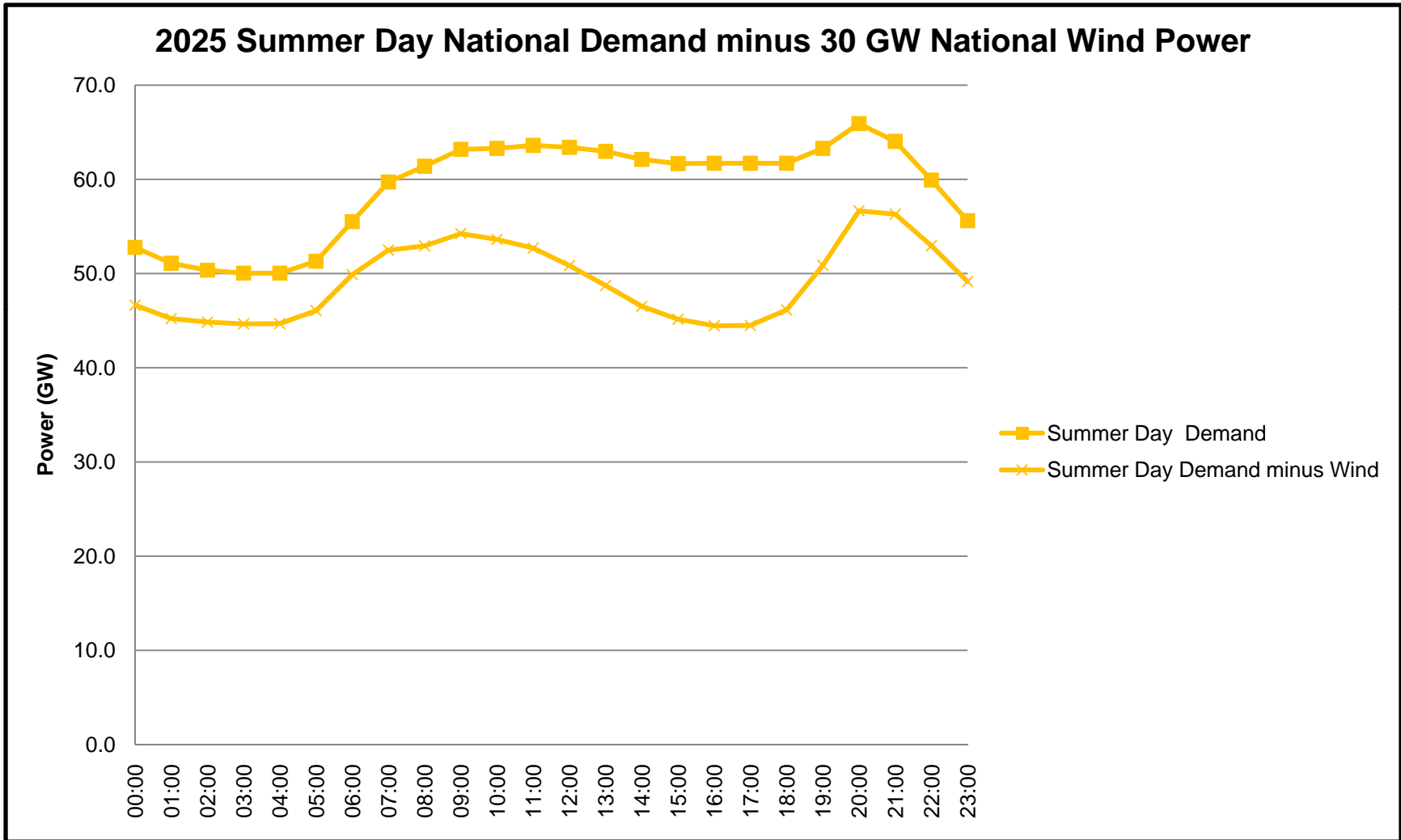
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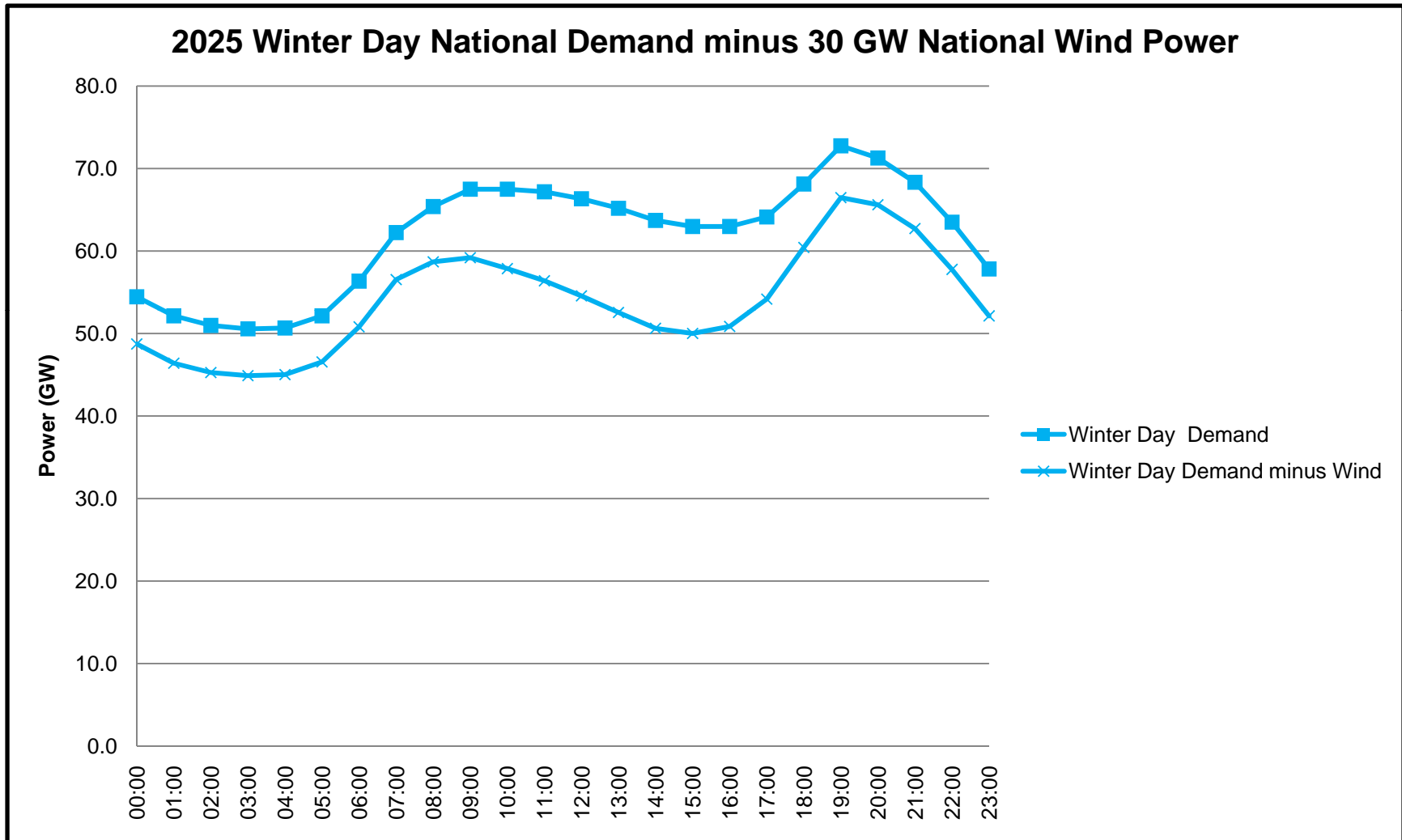
# Portfolio Power and Estimated 2025 National Demand



# Average Summer Demand

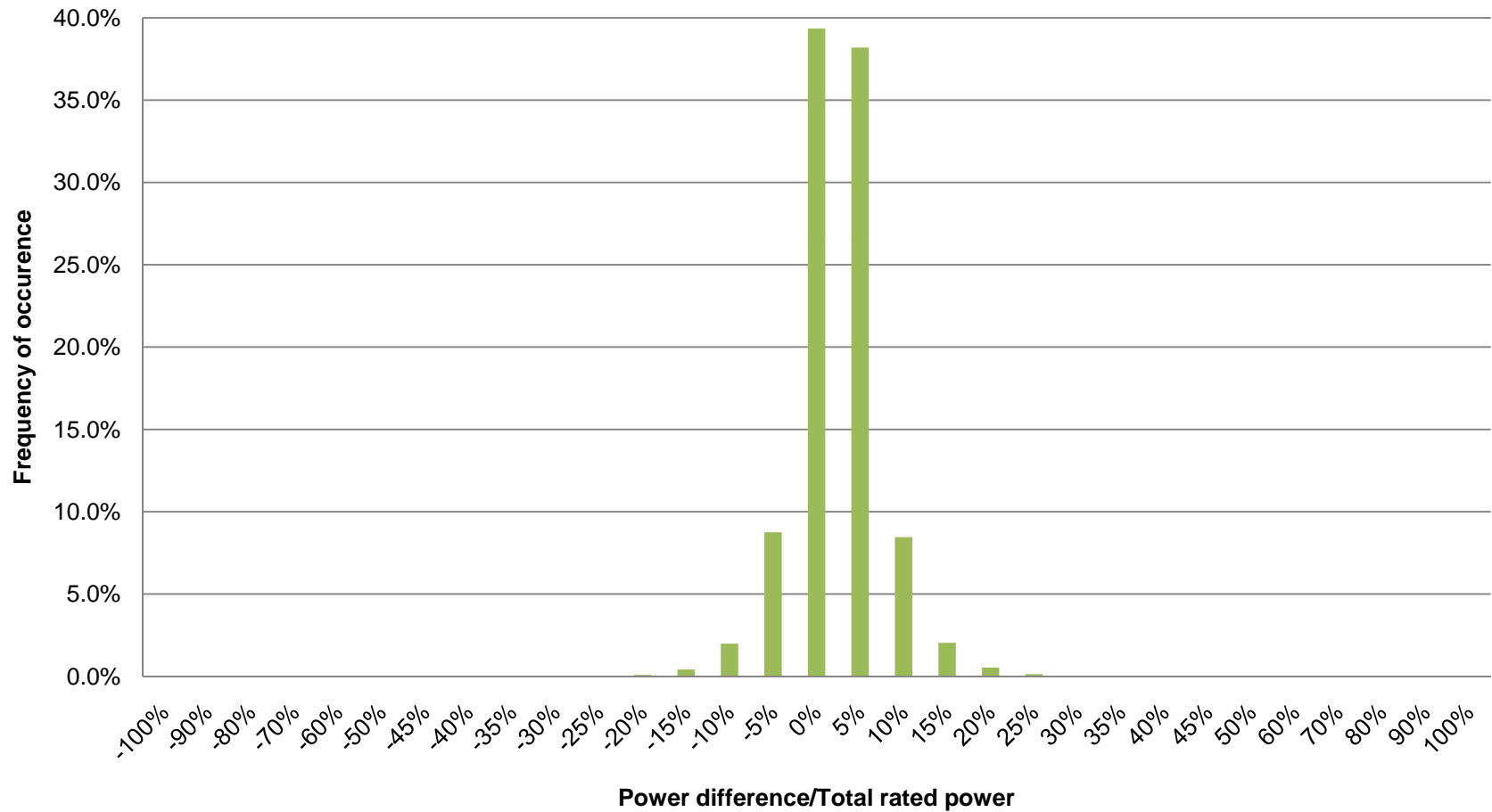


# Average Winter Demand

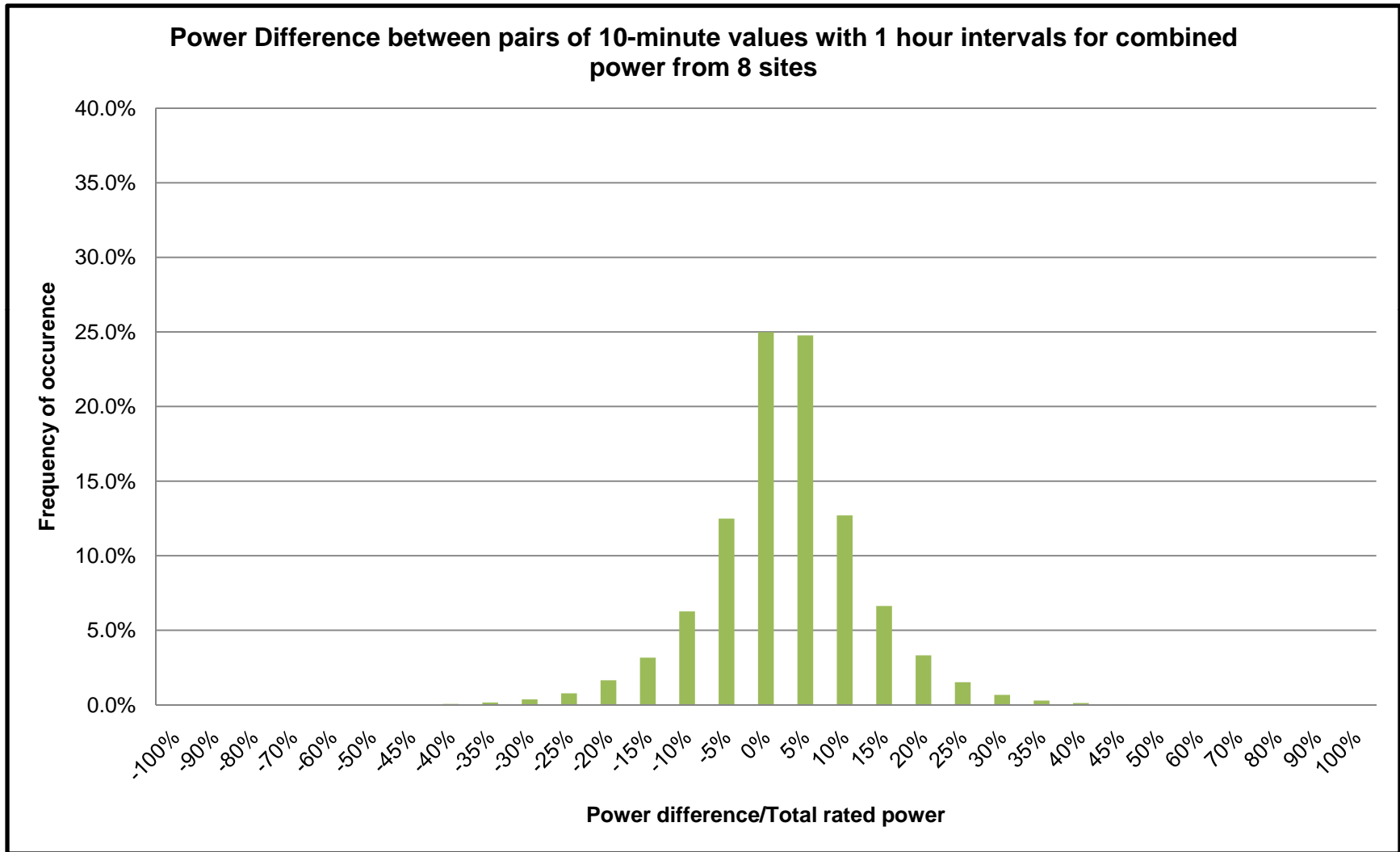


# 10 Minute Power Difference

Power Difference between pairs of 10-minute values with 10 minute intervals for combined power from 8 sites



# 1 Hour Power Difference



# RE Cost Allocations

## National Power Generation:

- Power Generation in South Africa (approx.): 270,000 GWh
- Approx. Income (@ R 0.45/kWh approx.): 121 Bn Rand

## Wind Power Generation:

- 4,000 MWs of wind energy (approx.) 10,000 GWh
- Equates to 1.25 R/kWh x 10<sup>6</sup> x 10,000: 12.5 Bn Rand.

### Less

- Benefits of Wind (10,000 x 10<sup>3</sup> x 1212) 12.12 Bn Rand

### Add back 'complex' issues:

- Capacity Payments (10,000 x 200 x 10<sup>3</sup>) 2.0 Bn Rand
- Carbon Credits (10,000 x 142 x 10<sup>3</sup>) 1.4 Bn Rand

Annual Cost to Eskom to run REFIT 3.8 Bn Rand

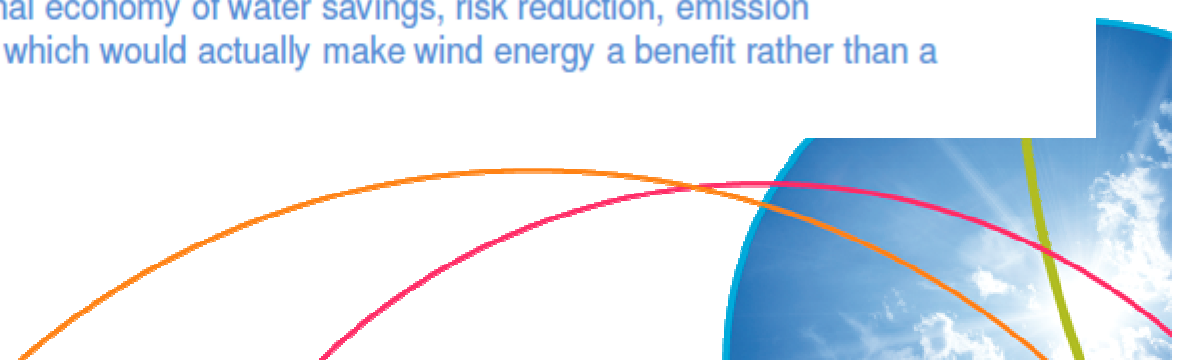
Or 3% of their gross wholesale electricity income

This ignores the benefits to the national economy of water savings, risk reduction, emission reductions and capacity benefits which would actually make wind energy a benefit rather than a cost to the national economy.



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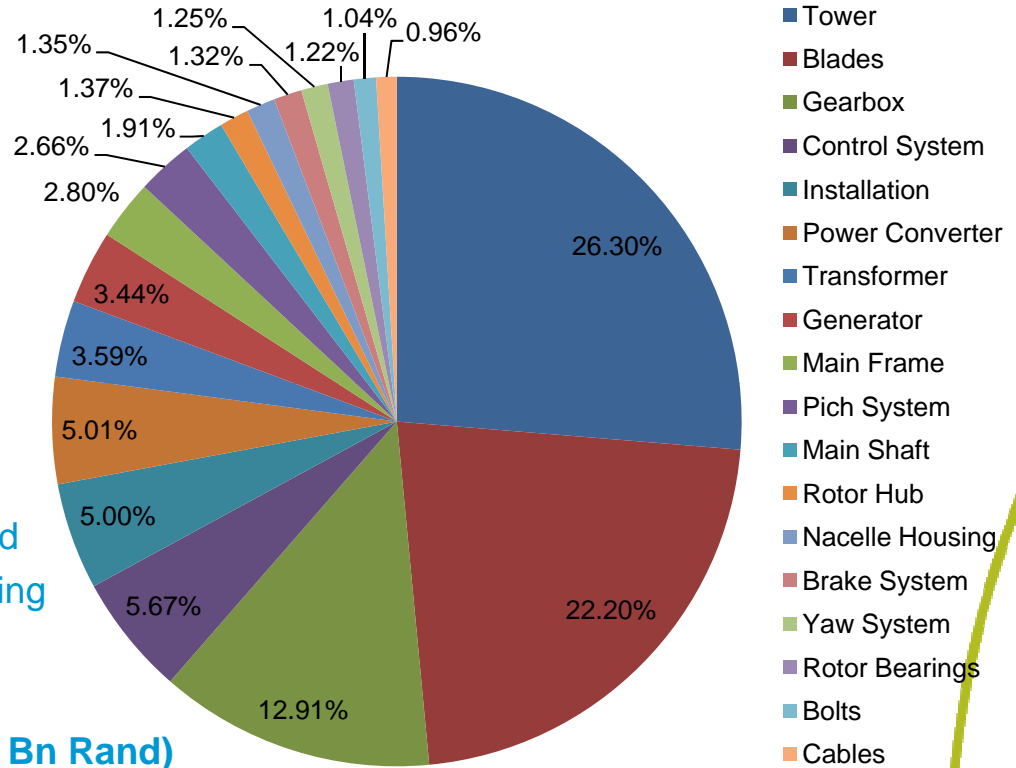
# Delivering on LED and Jobs

- Breakdown of Wind Farm costs

- 70% wind turbine contract (see pie chart)
- 30% site costs (civil, electrical etc)

- Of the 70% wind turbine element, the domestic market could produce:

- Towers 26.3%
- Blades 22.2%
- Transformer 3.59%
- Main Frame 2.8%
- Nacelle Housing 1.35%
- Bolts 1.04%
- Cables 0.96%

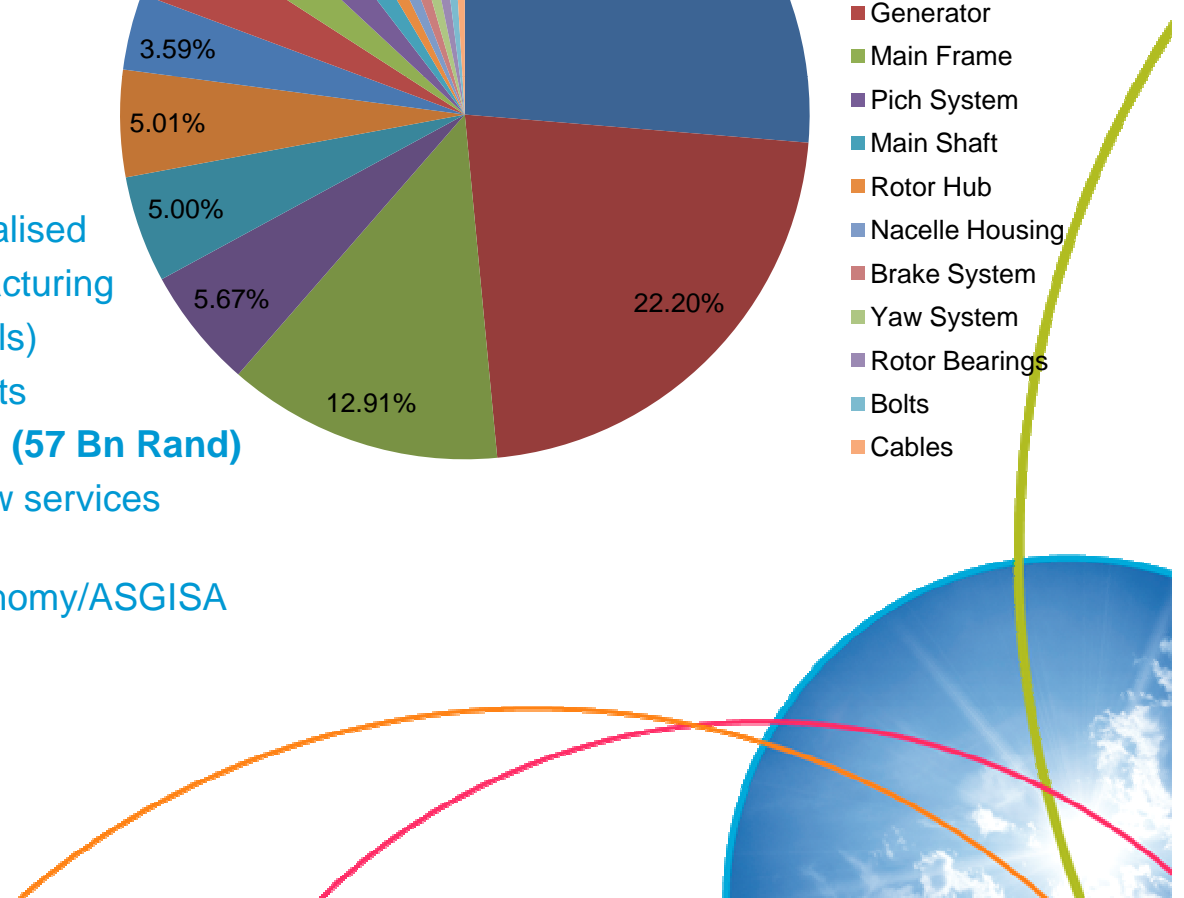


- 58.24% of the turbine costs can be localised
- Equates to **EUR 1.83 Bn** Local Manufacturing
- All site costs are local (Civils, Electricals)
- Equates to **EUR 2.7 Bn** Local Site Costs
- **Total Domestic Benefit = EUR 4.5 Bn (57 Bn Rand)**
- This **excludes** export potential and new services industries
- Significant to boost to the national economy/ASGISA goals



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# Total Economic Value

	SA Rand/MWh
Cost of Marginal Power Displaced (BNE):	900
Carbon Credits:	142
10% Decrease in Portfolio Generation Cost:	40
Decrease in Fuel Price:	30
Capacity Payment	200
<b>Total Value of Wind (Rand/MWh)</b>	<b>1212</b>

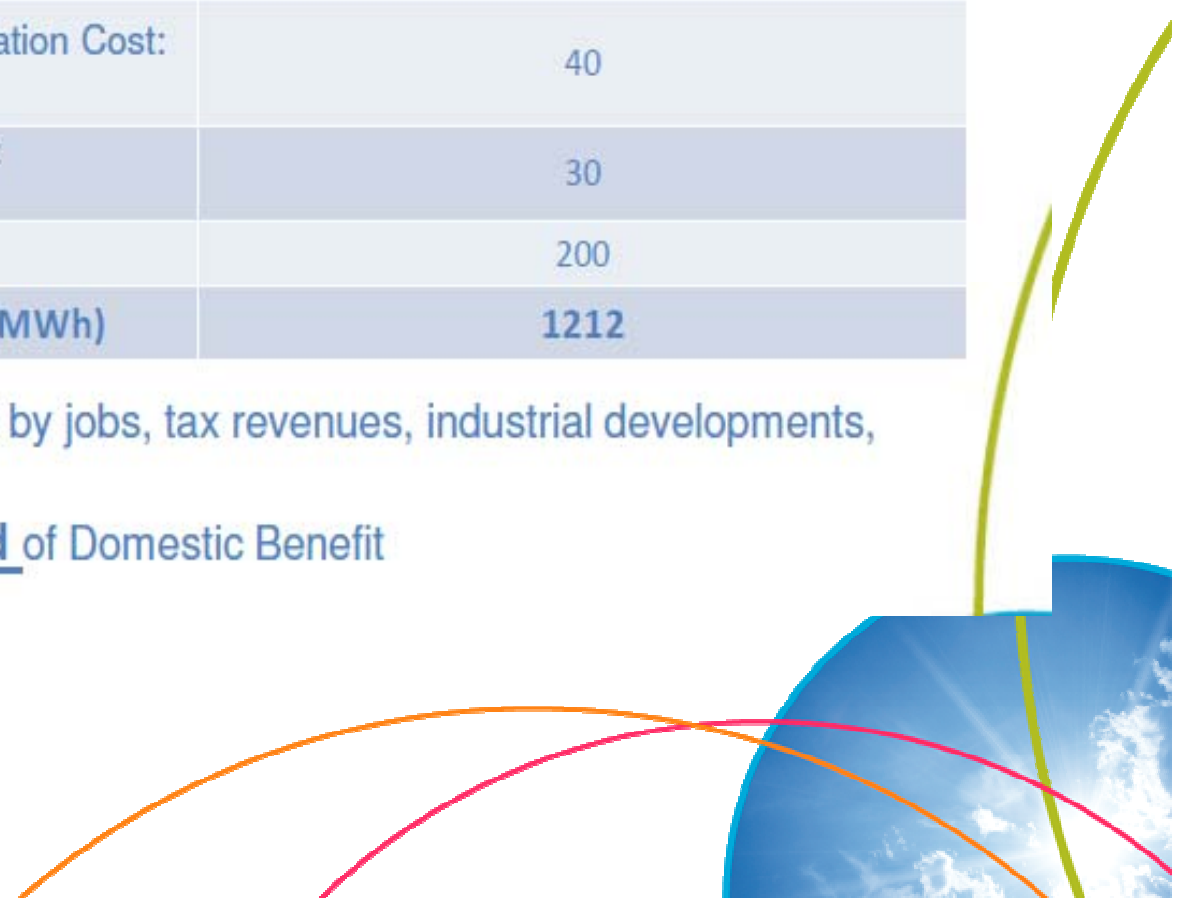
This **excludes** value created by jobs, tax revenues, industrial developments, exports, ASGISA

Estimated to be **4.5BN Rand** of Domestic Benefit



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## The Value of Wind

- A portfolio of geographically dispersed Wind Power Generation (30GW installed) in South Africa:
  - Can deliver on average 6 GW **base load**
  - Generally follows load pattern
  - Rarely differs more than 15% at 10 minute intervals
- Wind power **does not** have to be backed up with coal or nuclear or pumped storage
- Wind power makes its biggest contribution during the day when the demand for electricity is most valuable
- Wind energy costing R1.25 per unit replaces gas fired electricity at R3 to R4 per unit

# The Value of Wind: Summary

Wind is:

- the cheapest solution for electricity generation in South Africa, and certainly in other African countries
- the quickest plant to deploy – and the longest lasting
- a significant driver of local economic development
- a significant driver of rural development and poverty alleviation
- A local fuel source that will never run out

# The IRP Challenge – Our Energy Future

- Sustainable Energy future - to design our Energy Portfolio around
  - Transition to a sustainable future
  - Resources used optimally and not constrained
  - Security of Supply, lower cost, lower risk and increase GDP
  - Meet development objectives and unlock new opportunities
  - Meet our CO2 Objectives
- Drive the creation of an environment to **Deliver the Shared Vision**
  - Challenge leadership – bold energy vision (do we have one??)
  - **20% Renewables by 2025**
  - Chart a new energy path and push leaders to do the right thing
- Change the game and grasp the opportunities



# Thank you for your time

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