

Initial thoughts on the IEP and IRP Drafts (2016)

Presentation to IRP public hearing sessions

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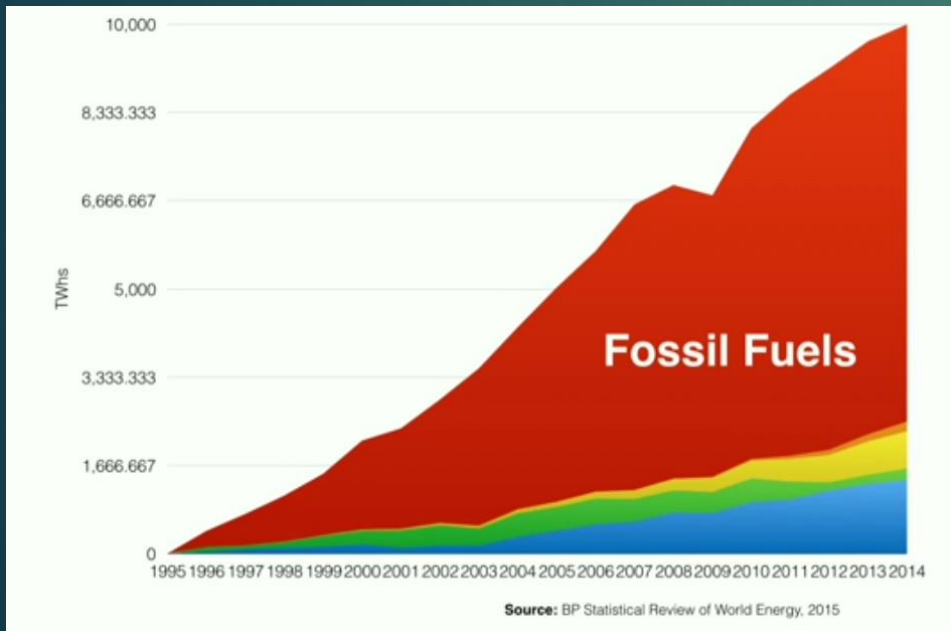
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Global Energy

Energy Planning Trilemma:

- **Energy Security** – Supply adequately meets demand.
- **Access to affordable energy by all** – Socio-economic growth.
- **Environmental sustainability** – Climate Change mitigation.

In spite of global initiatives to reduce CO₂ and toxic emission in the energy sector, we continue to increase our fossil fuel generation at an unprecedented rate. Today 60% of global power is derived from fossil fuels. (SA 80%). Actual energy generated from renewables remains insignificant in spite of massive capacity expansion programs.

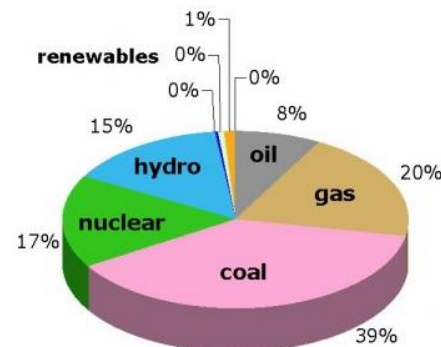


Global Generation Capacity (2011)
15'000 TWhrs/yr

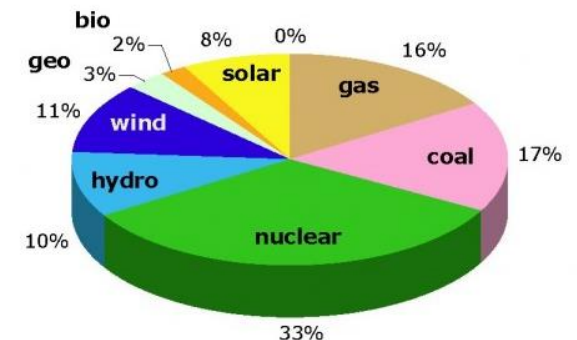
Quantity of Electricity Generated

Global Generation Capacity (2050)
30'000 TWhrs/yr

World (2011)
15 tkWhrs/yr
Present Energy Distribution (Power)



World (2040)
30 tkWhrs/yr
A Target Sustainable Energy Distribution by 2040 (Power)



8 Key Objectives for SA's Energy Planning (a Nuclear Energy Perspective)

1. Ensure Security of supply: (Nuclear energy has the highest capacity factor and can be distributed)
2. Minimise cost of energy: (Nuclear energy's total life-cycle cost per kWhr is second only to large hydro)
3. Promote job creation and localisation: (Highest concentration of long term jobs per kW. Knowledge Economy!)
4. Minimise environmental impact: (Biggest contributor to Climate Change mitigation waste management solution)
5. Minimise water consumption: (Coastal based power plants use sea water for cooling. Can desalinate water too.)
6. Diversify Supply Sources: (Nuclear energy is the greatest contender to diversifying SA from 80% coal power.)
7. Promote Energy Efficiency: (Coastal based power plants reduce 18% transmission losses using very little fuel. During off-peak periods, nuclear energy can desalinate water and power a clean electric transportation system.)
8. Promote energy access: (Good energy security and distributed nuclear energy can power regions that were previously deprived of energy.)

History

- ▶ The 2012 versions of the IEP and IRP Update both allocated some capacity to nuclear power. According to Government decision it would be 9.6 GW of new nuclear power plant capacity up till 2030.
- ▶ However this has been met with strong resistance from “civil society”.
- ▶ NIASA has reviewed the 2016 versions of the IEP and IRP and found several serious shortcomings, especially that externality costs were not taken into account.
- ▶ This was communicated to the Externalities sub-committee of the IEP Update process.
- ▶ **The 2016 IRP does factor in the decommissioning of the existing coal fleet which stresses the importance of a rapid base load build program to replace this capacity.**

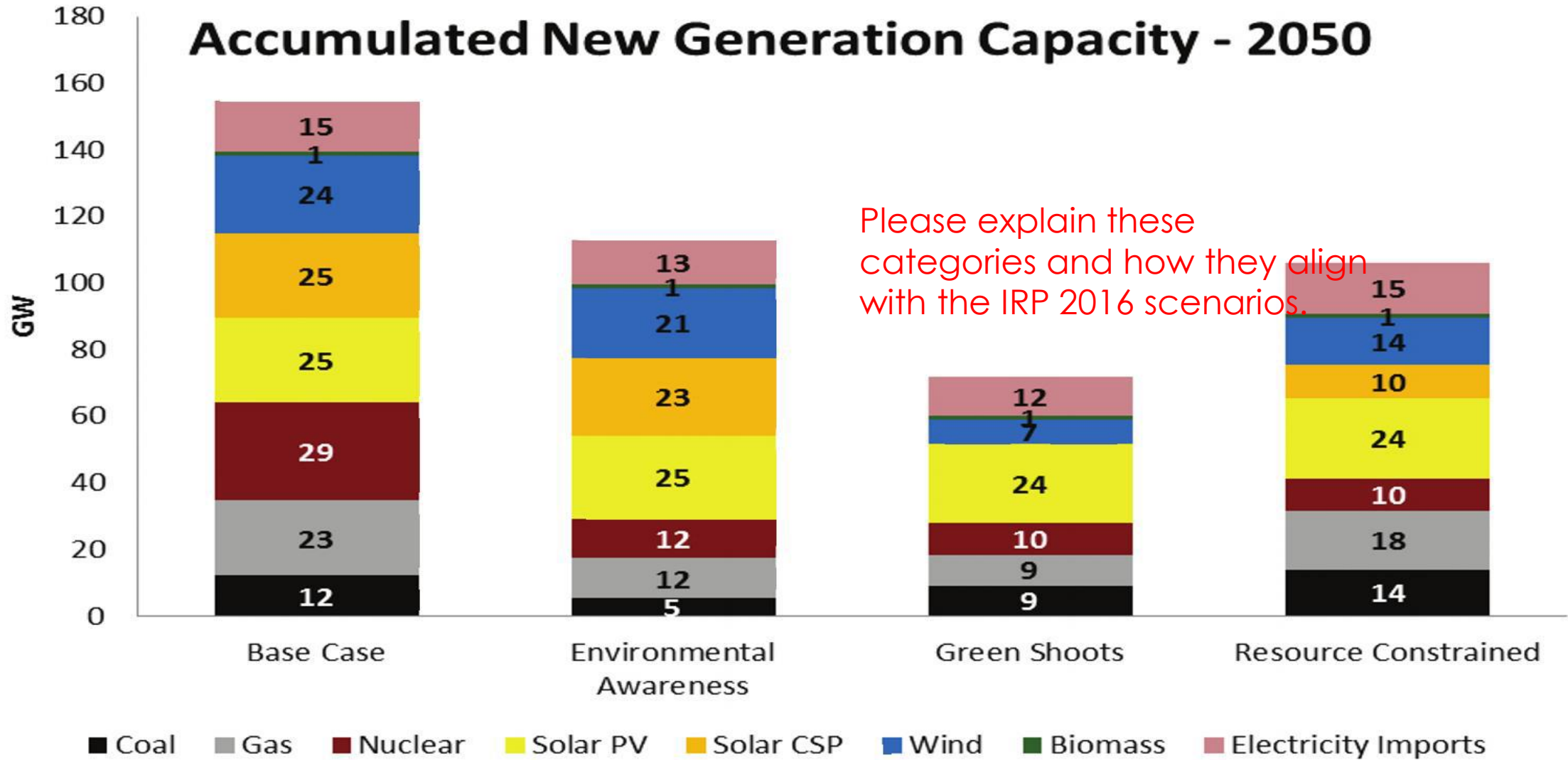
History

- ▶ Several well-known academics and institutions recently claimed that it will be more profitable for South Africa (SA) to replace the said new nuclear capacity with a mixture of PV-solar panels, wind turbines and gas turbines. **The actual cost analysis of this solution was not pursued.**
- ▶ However, Eskom claimed that the wind and PV-solar power that DOE forces Eskom to buy through the REIPPP is largely useless, as it arrives at the wrong time of day.
- ▶ **According to Eskom, although the power installed under the REIPP saved R3Bn in lost revenue during peak demand periods, it cost Eskom R12Bn, resulting in a R9Bn shortfall.**

IRP (2016)

- ▶ The new IEP takes Externality Costs much more seriously:
 - ▶ Climate change cost of CO₂ emissions up from R150/ton to R270/ton!
 - ▶ With 947.3 g CO₂ released/kWh **for Coal Fired power.**
= R0.26/kWh CO₂ damage cost.
 - ▶ Therefore Coal is squeezed out and nuclear and renewables are in:
Nuclear = 10 to 29 GW by 2050, depending on the scenario selected.

IEP (2016) Scenarios



IRP (2016)

- ▶ Different from the IEP, the IRP Update uses a zero carbon cost, but rather applies a maximum annual limit to CO₂ emissions.
- ▶ Coal is thus not penalised for CO₂, until the limit is reached in a decade or two!
- ▶ Therefore Coal cost is only = R0.89/kWh
- ▶ Cheaper than Nuclear = R0.97/kWh.
- ▶ Therefore nuclear squeezed out to 2037 **with little impact on our CO₂ reductions.**

IRP (2016)

- ▶ However, this is unfair as Coal CO₂ is not penalised, until the limit is reached!
- ▶ Therefore, if we rightly add the R0.26/kWh CO₂ damage cost, coal's true cost moves up to = R1.15, which is much more expensive than the competing options.
Health associated costs from toxic emissions are not considered.
- ▶ Coal would then be replaced by nuclear at = R0.97/kWh.
- ▶ Therefore nuclear should then come in well before 2037.

IRP (2016)

- ▶ IRP estimated PV and wind costs are at about R0.85/kWh, which is much higher than the minimum of R0.60 in REIPPP(4) (?)
- ▶ Yearly capacity additions restricted to 1000 MW PV and 1600 MW wind, due to the problems that their intermittency causes on the grid. **(this is cryptic??? explain)**
- ▶ This means that even if wind and PV were to become much cheaper than the competing options, they will only be deployed in limited quantities, which creates scope for nuclear.

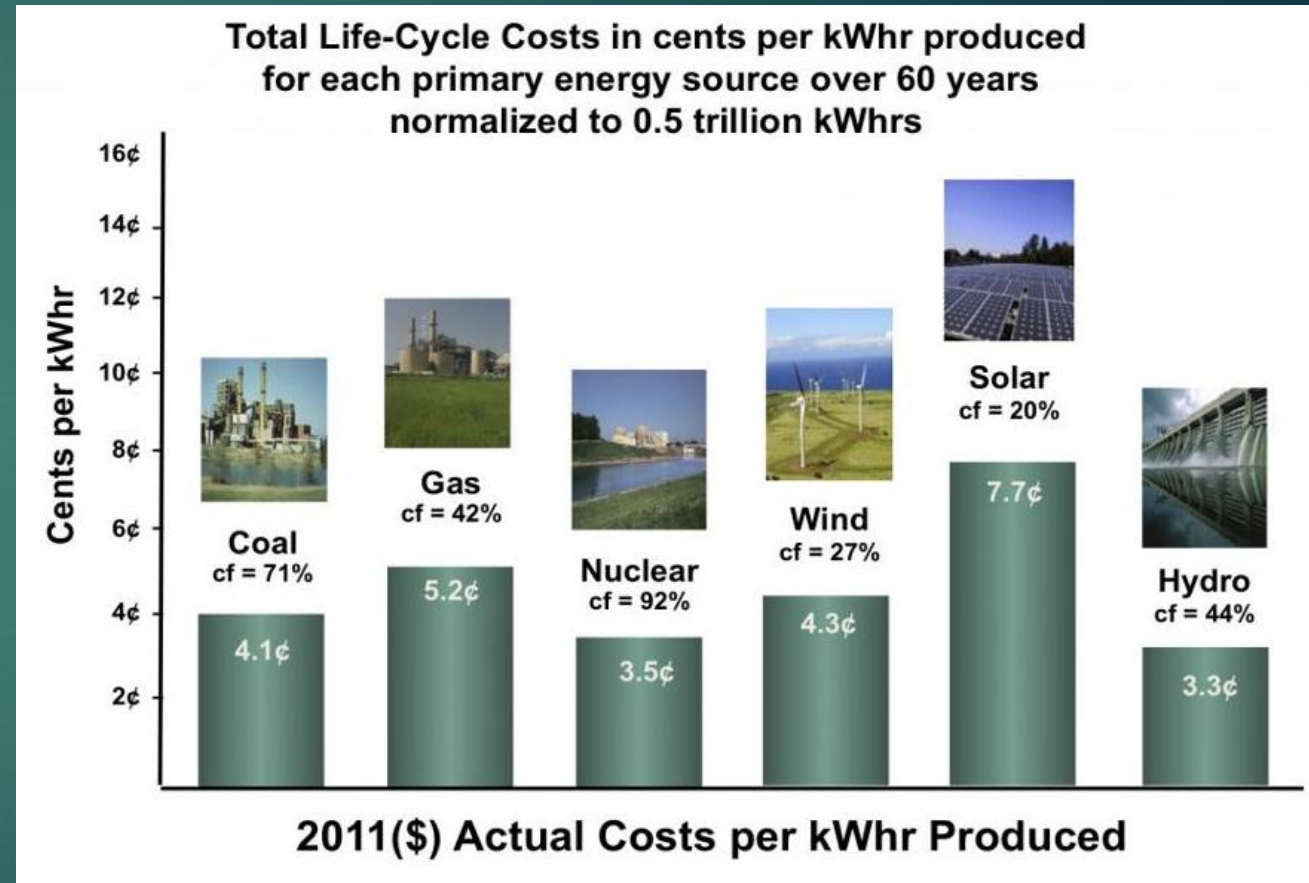
The Relevance of Total Life Cycle Costs

Included in Total Life-Cycle Costs of Electricity:

- Manufacturing and Construction costs and lead times
- Cost of Capital to finance the project.
- Operating and Maintenance costs (incl. fuel)
- Capacity Factor – Quality of energy produced
- Life expectancy of the power plant. (ranging 15 to 60 yrs)

Often Excluded from Total Life-Cycle Costs: (Externalities)

- CO₂, Pollution and Health Care Taxes.
- Buffering of intermittent power generation (RE)
- Transmission and Grid Stabilisation Costs
- Socio-economic benefits from Sustainable Energy.



Conclusions

- ▶ Externality costs are reasonably well allocated in IEP, except for methane discharges of imported LNG and strategic risks of imported hydro power.
- ▶ Externality costs are badly allocated in the IRP, which skewed the process in favor of coal and in favor of imported LNG to support the intermittency of renewables.
- ▶ This should urgently be corrected, otherwise society will suffer.
- ▶ **Only once actual costs are known, can better long term planning can be done and some levelizing factors be wisely shaped to affect a more desirable energy mix for an all-encompassing energy solution for South Africa.**