



SANEA Thinking Energy

31 August 2017, Johannesburg

“Requirements for a Resilient Future Electricity Grid”

In the future our electricity supply sector will have greater variety of generation technologies, more Independent Power Producers, more embedded generation in the distribution sector and more co-generation and self-generation from large and small consumers. This evolution will require new approaches to development, operation and maintenance of transmission and distribution networks, metering, tariffs and licencing. A new range of skill-sets will be required by suppliers, consumers and government organisations to take full advantage of these innovations.

This *Thinking Energy* Workshop will explore

- *Considering the change in energy mix and electricity providers, what are the current constraints and challenges with grid infrastructure at present?*
- *How has the world dealt with grid infrastructure constraints and challenges arising from the emerging trends we are currently experiencing?*
- *In the development of long term planning considerations, are our planning criteria extensive and encompassing enough to develop and ensure resilience of infrastructure in the future?*

1. Plenary Address

Setting the perspective in the Southern African grid and micro grids – a future development.

Thava Govender, Group Executive Transmission, Eskom Holdings SOC Ltd

- 1.1. Business is no longer just about profit and loss.
- 1.2. You need a business case for sustainable development.
- 1.3. Need to reduce uncertainty, but the world is increasing in uncertainty.
- 1.4. Problems with access to water, education and energy.
- 1.5. There is more knowledge but less intelligence.
- 1.6. Solutions need a long term focus.
- 1.7. Inequality and exclusivity abound.
- 1.8. 600 million people without access in Africa.
- 1.9. South Africa is one of the most unequal societies.
- 1.10. Access is still a problem in deep rural locations.
- 1.11. 3 million connections still required.
- 1.12. Micro grids are possible.
- 1.13. Modularity is important.
- 1.14. Can be lifted and re-deployed.
- 1.15. Community participation is critical.

2. Panel 1

Current experiences - Considering the change in energy mix and electricity providers, what are the current constraints and challenges with grid infrastructure?

Facilitator: Theo Sibiyi, A.T. Kearney

Panel:

- ***Louis Maleka, Eskom Holdings SOC Ltd***
- ***Pervelan Govender, IPP Office***
- ***Piet van Staden, EIUG***

- 2.1. There is a lack of vision and direction.
- 2.2. The issues are Policy, Regulation and Cost.
- 2.3. Need policy on the role of Eskom and the role of the Funders.
- 2.4. Distribution level is very fragmented in terms of Local Authorities
- 2.5. Funding and Tariffs need to be reconciled.
- 2.6. Need a robust price-path.
- 2.7. Need to know what the market appetite will be for the supply of such systems, especially across border.
- 2.8. It is a challenge for the private sector to go into Africa because the bilateral inter-government agreements don't enable access.
- 2.9. Pricing needs to be reviewed eg N Cape still paying a distance surcharge.
- 2.10. Northern Cape transmission corridor is constrained.
- 2.11. Northern Grid is congested.
- 2.12. Urban grids – where do you start – so much to do.
- 2.13. Need smart grid capability from the start.
- 2.14. Public-Private-Partnerships [PPP] may be important in the future.
- 2.15. Aging networks could be privately enhanced.
- 2.16. Regarding private sector participation:-
 - 2.16.1. Policy certainty needed.
 - 2.16.2. IPP experience should give some direction.
 - 2.16.3. Need liberalisation to create space for the private sector.
- 2.17. PPPs are important but the IPP programme is stalled which is killing investor confidence.
- 2.18. Coal will provide load for some time to come.
- 2.19. Need to accept it will be a long transition period.

- 2.20. Need to factor the old technology into the future design.
- 2.21. Need a balance of technologies.
- 2.22. Storage is a critical consideration.
- 2.23. Battery cost is important for micro grids.
- 2.24. Cost of renewables and storage is coming down in real terms.
- 2.25. Biomass is a form of storage.
- 2.26. Need to be aware of water constraints in the future.
- 2.27. Concern that economics will cause business to convert to self-generation and Eskom will become defunct.
- 2.28. Moving “off-grid” is not necessarily smart because you can’t sell back.
- 2.29. Consider it rather as diversifying of supply and risk.
- 2.30. Need renewables to be connected.
- 2.31. Many roof-top solar systems.
- 2.32. Is 24/7 supply still important relative to intermittence of renewables?
- 2.33. A utility is not only a provider of energy – For a prosumer it is also a battery and a reserve.
- 2.34. Eskom needs to re-think its business model to be agile for the future.
- 2.35. REIPPPP has stalled – stop selling it as a success.

3. Breakaway Feedback

Breakaway groups were formed and were asked to consider:

“What are the necessary attributes and enablers of the future Electricity Grid?”

Group 1

- 3.1. Grid must be an independent institution.
- 3.2. Should not be state owned because of political interference – Must be a business.
- 3.3. Open access and regionally interconnected.
- 3.4. Smart grid capability required.
- 3.5. Regulatory and policy framework needed.
- 3.6. Grid plan needed to support IRP.
- 3.7. Financially stable.
- 3.8. ISMO Bill contains essential principles.
- 3.9. Distribution needs the same principles as transmission.

Group 2

- 3.10. Must build on what we have.
- 3.11. Already have links to the region – must use them.
- 3.12. Need strong energy transfer over the region
- 3.13. Combination of urban grids with micro-grids.
- 3.14. Electricity is a right? Question of ownership.
- 3.15. Governance model needs adaptation.
- 3.16. Donor models? Franchising?
- 3.17. Not enough planning for the economy of the zone.
- 3.18. Selling Energy? Or economic development?
- 3.19. Link to other services [water info, education, health etc] – selling economic development.
- 3.20. Central vs decentralised Planning.
- 3.21. Do those without access have any choice?

Group 3

- 3.22. Policy and ownership are the issues
- 3.23. Reliable, affordable, and continuous supply
- 3.24. Flexibility
- 3.25. Let the Grid be a natural monopoly – regulated
- 3.26. Stand alone with open access
- 3.27. Must be controllable
- 3.28. Resource sharing across the grid e.g. standard voltage

4. Panel 2

How to address current challenges and future planning criteria

Facilitator: Erica Johnson, Independent Energy Analyst

Panel:

- ***Dr Rod Crompton, Crompton Consulting***
- ***Bernard Magoro, Eskom Holdings SOC Ltd***
- ***Adv Omar Vajeth, Southern African Power Pool***
- ***Marco Rahner, Siemens Limited***

- 4.1. RSA will only survive if all Africa is electrified.
- 4.2. RSA should lead regional development.
- 4.3. Why do Utilities and Munics feel so reluctant to move?
- 4.4. Leaders must be less risk averse.
- 4.5. Problem with credit-worthiness of off-takers.
- 4.6. Debts of Eskom and Munics are a massive problem.
- 4.7. If Eskom falls over then RSA collapses financially.
- 4.8. Increasing tariffs to support Eskom encourages grid defections which exacerbates the problem – Debt [death] spiral.
- 4.9. Regulation Act only deals with growing asset base – nothing about shrinking asset requirements.
- 4.10. How do we deal with stranded assets?
- 4.11. IPPs appear to have been project financed but in reality they were backed by some form of Govt. support. The guarantees ultimately affect the sovereign credit rating.
- 4.12. Demand is becoming less predictable and is declining.
- 4.13. Renewables self-dispatch unpredictably.
- 4.14. Renewables can be 2500MW midday and only 50MW for evening peak.
- 4.15. Midday is showing a demand dip because of PV.
- 4.16. Have seen a 13000MW delta between peak and minimum. – Uncertain future.
- 4.17. Need real-time planning and response capability.
- 4.18. Mix is still controllable.
- 4.19. Technically the regional plan is well defined with feasibility studies in place.
- 4.20. Technical solutions are in place – Financial and legal solutions are the problem.
- 4.21. New technologies are very customer focussed.
- 4.22. Eskom is an out-dated model which is typical of state owned enterprises.

- 4.23. CSIR alternative model will cost a fortune in grid enhancements to achieve grid stability.
- 4.24. Tariffs need to become cost reflective. e.g. EIUG want the true tariff which will remove the cross-subsidy of residential consumers.
- 4.25. Need Integrated ENERGY planning.
- 4.26. Need to merge Grid Planning and Energy Planning.
- 4.27. Need to plan towards a future where the marginal cost of energy is zero because of renewables.
- 4.28. Computer capability is growing faster than the complexity of the world – therefore decision making tools are available.
- 4.29. Big Data gives us the capability to do real time forecasting.
- 4.30. Take small steps to be flexible and agile enough to track the trends.
- 4.31. The consistency of input data and the planning horizon are both getting much tighter.
- 4.32. Short term predictions are difficult and longer term is impossible.
- 4.33. Not doing frequent enough iterations of plans.
- 4.34. Distribution sector should be doing day ahead planning.

5. CONCLUDING PANEL

Reflections on the discussions of the day

Facilitator: Kiren Maharaj, Director: SANEA

Panel:

- ***Bernard Magoro, Eskom Holdings SOC Ltd***
- ***Elekanyani Ndlovu, SA Institute of Electrical Engineers***
- ***Brian Statham, Chairman, SANEA***

5.1. Grid is a natural monopoly:-

5.1.1. Open access

5.1.2. Regulated

5.1.3. Affordable

5.1.4. Reliable

5.1.5. Flexible

5.1.6. Standardised

5.1.7. Controllable

5.2. Lack of clear vision [nationally and regionally].

5.3. Must think regionally to allow resource sharing.

5.4. Planning must happen at regional, national, provincial and local levels.

5.5. Need to re-think the business models because business is no longer just about profit and loss – need to reflect the economic sustainability objective.

5.6. Political aspiration is in conflict with business objectives.

5.7. Current tariff structures impede private funding.

5.8. Build from what we have.

5.9. Asset Inertia – will take time.

5.10. Future is here so do we have time to react?

5.11. We require certainty in an increasingly uncertain world.

5.12. Uncertainty of data has a multiplier effect.

5.13. Human factor – choices are unpredictable

5.14. Ownership is a problem.

5.15. Distribution sector is very fragmented.

5.16. RSA businesses want to go into Africa but this may conflict with other countries localisation efforts.