Independent Power Producers Programme

PLANNING AND CAPITAL COSTS FOR IPP GRID CONNECTION

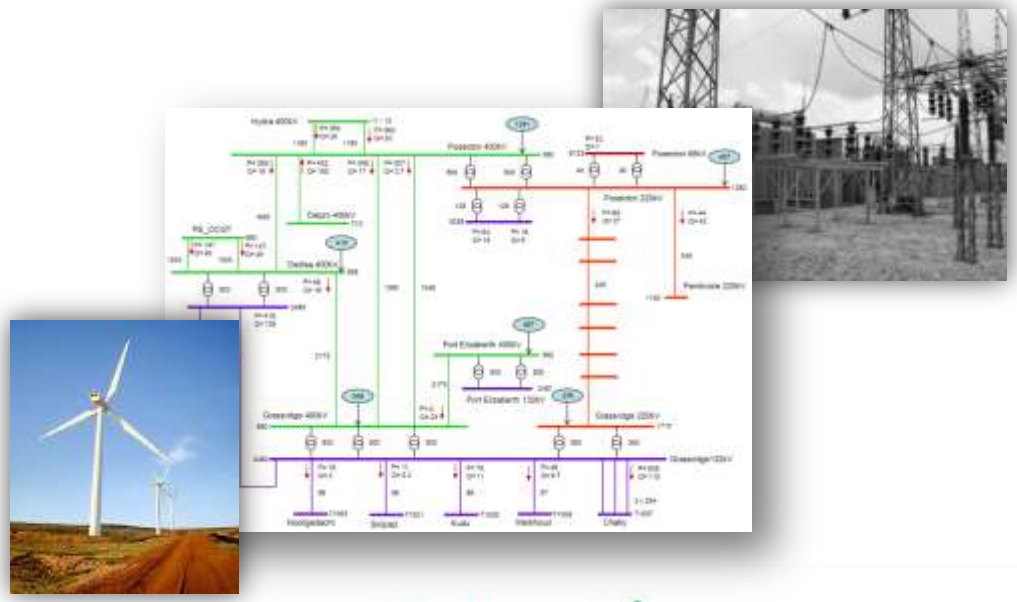
NRLN Presentation

5 August 2015

towards sustainable energy

Road Map

- Background: problem definition
- Spatial view of the IRP2010 generation forecast
- Incorporating a spatial generation forecast in Transmission and Distribution Development Plans
- Findings
- Conclusions



Background

- The IRP 2010 provides policy as regards the future generation mix. The change in the future generation mix has a significant impact on the planning of the transmission grid.

- The specific spatial location of the future generation is uncertain. Furthermore the introduction of renewable energy will result in the proliferation of many smaller sized power plant spread across the country.

- The REIPPPP BWs 1 to 4 have utilised much of the available grid capacity in areas of RE IPP interest. Network upgrades will be required if RE development is to continue in certain areas, as driven by the need to procure cost efficient electricity generation.

- Misalignment between project life cycle durations (a consequence of a reactive approach to grid upgrades):
  - Long Transmission lines: 6 - 8 years
  - Distributed IPP plants: 3 - 6 years (2-3 years post preferred bidder)

  Hence if an IPP is announced as a preferred bidder triggering a Transmission line, the likely COD would be 6-8 year post preferred bidder announcement.

Background (continued)

- Historical piecemeal approach to IPP grid connection. No broader grid connection plan. Inadequate funding of related infrastructure requires first mover to pay (severely constrains IPP connection). Some examples of IPPs capacitated via strategic grid investment e.g. Upington MTS

- The Renewable Energy Independent Power Producer (REIPPP) programme has promoted RE project development in areas with resources and development need. IPP determines the plant location and manages associated risks. Grid is becoming an increasing issue that requires proactive planning

- In order to maintain a competitive bidding environment (that continues to drive down electricity tariffs), sufficient grid capacity needs to be timeously available in sufficient areas with good resources (sun, wind, coal, gas etc.). Typically the grid costs are a small cost component (as compared to Gx costs) but significantly influence procurement due to grid connection capacity limitations and grid upgrade timeframes.

- Strategic grid upgrades need to be proactively planned, with equitable recovery of costs

Background (continued)

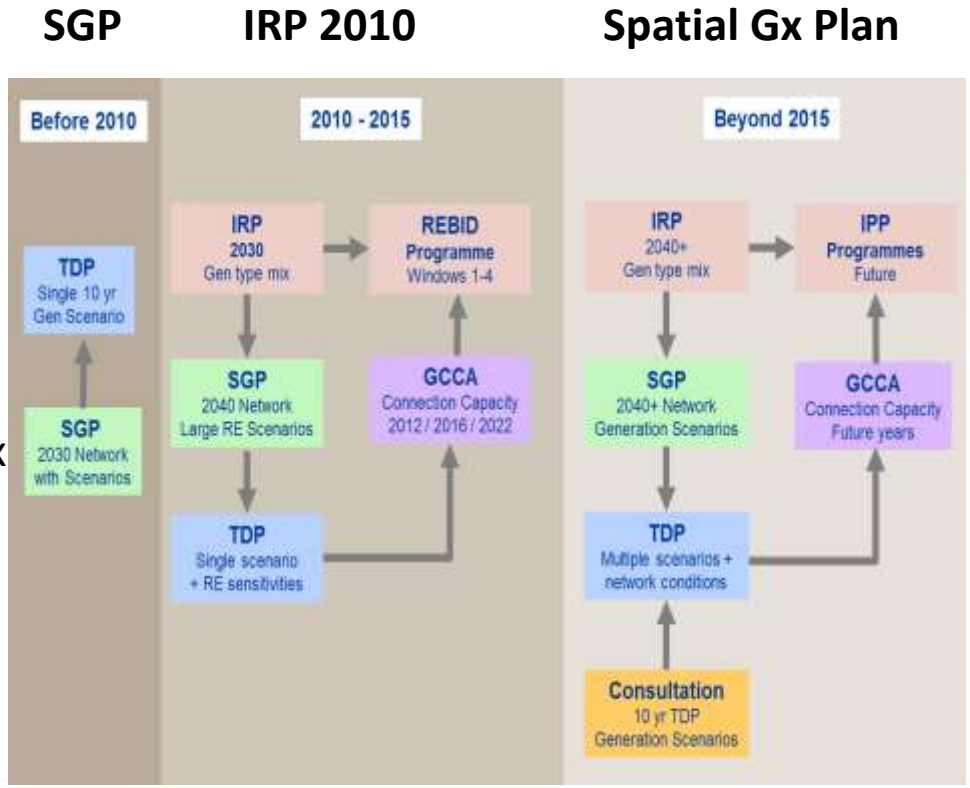
- The Transmission Development Plan (TDP) documents the expected expansion and strengthening of approved and proposed transmission grid projects over a 10 year period. This informs the basis of the capital funding requirements for Eskom Transmission.

- TDP Historically:
  - Developed in a regulated vertically integrated utility environment in alignment with the Grid Code.
  - Included the grid connection for committed generation (typically Eskom's own-build power stations with a known spatial location).
  - The TDP process and criteria have not evolved to accommodate IPPs with uncertain spatial location.
  - Eskom were required to develop a view of the future load and generation. Outcomes shared at a public presentation
  - No public consultation on the input assumptions that drive grid plans (load and generation forecasts and spatial locations of these developments)

Background (continued)

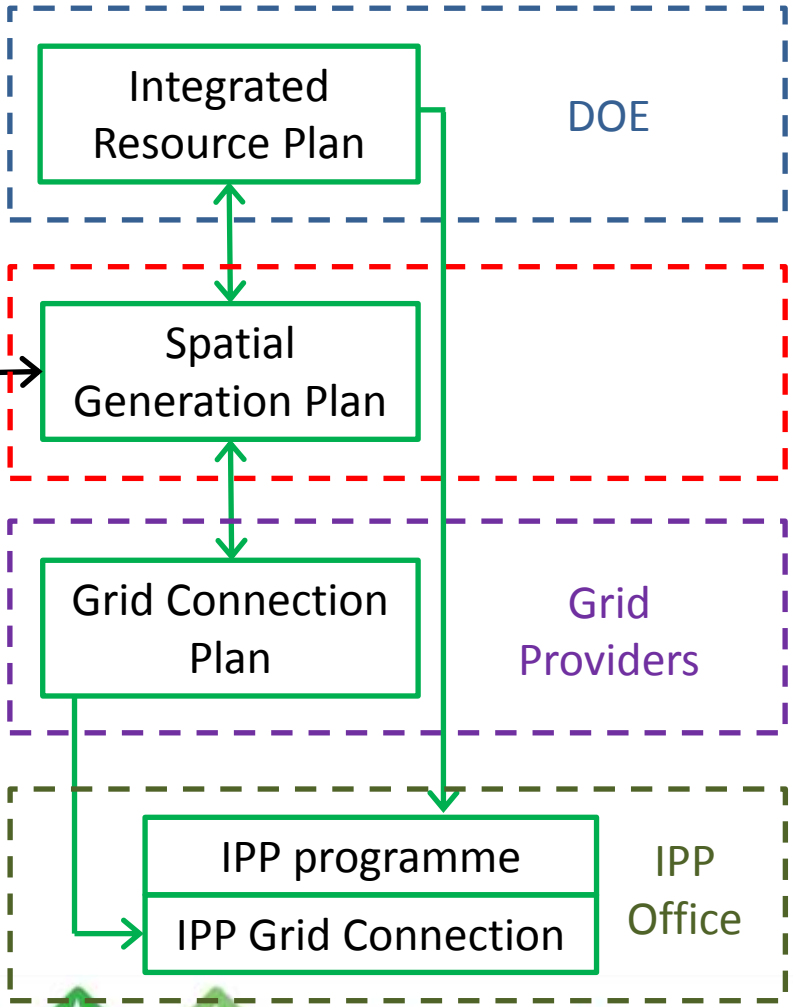
The IRP has had a major impact on the approach to transmission grid planning:

- Prior to 2010 the Eskom TDP and SGP made assumptions regarding the future generation.
- Post the IRP2010 and REIPPPP the TDP has attempted to make some allowance for IPP connection. An agreed view on the spatial location of Gx has not been created.
- Going forward grid planning needs to be informed by a generation spatial plan developed with broad industry and stakeholder consultation



The Planning Gap

- Grid costs
- Resources (water, coal, wind, solar, biomass)
- Economic development priority areas
- Environmental sensitivity
- Drivers (transport, terrain)



Minimise total cost of electricity while aligning with National Development Plan

Missing Link

Can't plan the grid to connect IPPs if there is no agreed view on where the Gx will be located. To be included into TDP and NDP then MYPD.

IPP procurement programme design needs to reflect the realities imposed by a constrained grid and lack of a Grid Connection Plan

Creation of a spatial Gx Plan (Base-line scenario)

The key considerations when creating a base-line spatial view of the IRP2010 were as follows:

- Committed generation such as the Eskom Ingula, Medupi and Kusile builds, and outcomes of the REIPPPP bid windows announced to date. These locations are known and fixed.

- The spatial location of future planned generation has been informed by a range of sources:
  - Spatial resource maps (wind, PV, coal)
  - Information from REIPPPP bid windows
  - Information from IPP Office RFIs
  - Eskom grid access applications
  - Renewable Energy Development Zones
  - EIA applications

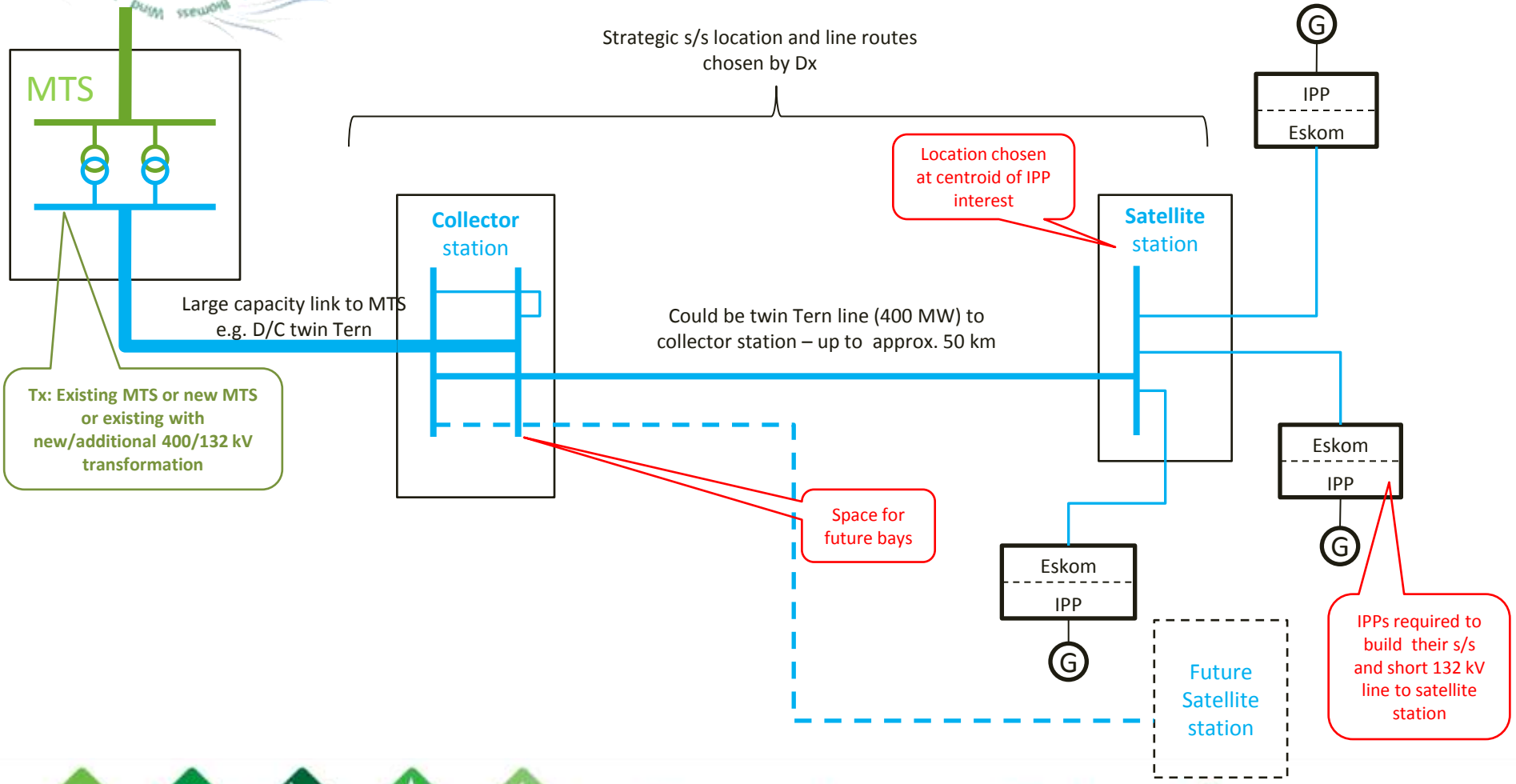
Outcome of the Gx spatial forecast

- Base-line forecast with scenarios reflecting the uncertainty in the likely location of planned generation in the IRP2010
- Jointly developed by IPP Office and Eskom
- Documented in a report
- Provides an IPP Office supported view as regards where grid capacity should be created to support sustained Gx procurement (IPP or other)
- Covers all generation technologies (procuring agent is not important)

Implementation of the Gx spatial forecast in the TDP

- Eskom have committed to include the generation base-line forecast and scenarios as the generation assumptions for the 2015 TDP update
- Tx Projects, Development costs and relevant Capital costs to connect IPPs in alignment with the Gx spatial plan should be an outcome of the TDP
- There has been no public or industry consultation on the Gx spatial forecast assumptions (due to constrained timelines). The various spatial scenarios extensively cover areas of IPP interest
- The 2016 TDP update process and timeframes should be revised to allow adequate public input and consultation in the development of the TDP assumptions, including the generation spatial forecasts

Basic graphical representation of IPP Cluster concept



Findings

- It is critical that the shared network upgrades required for IPP connection are proactively identified and developed, with appropriate linkages to the MYPD.
- Approvals and funding should capacitate an approach whereby shared network EIAs, servitudes and consents are proactively obtained to reduce project delivery timeframes, and integrate with IPP procurement timelines.
- Grid expansion projects facilitating IPP connection need to be categorised into “must do” and “might do” projects, with triggers for project execution.
- Given the considerable uncertainty in the spatial location of IPPs, the generation forecast used in grid planning needs to consider a range of credible spatial scenarios.
- TDPs and NDPs need to identify all of the grid upgrades required to support the spatial generation forecasts (base-line and scenarios)
- Increased stakeholder participation is required in the creation and approval of input assumptions to the TDP, including the generation spatial forecast.

Findings (continued)

- The consideration of the spatial generation forecast may significantly increase the grid infrastructure requirements in the 2015 TDP update
- There is concern regarding the present levels of grid infrastructure asset creation, as links to MYPD, capital budgets and the actual spending of revenue allocations
- The capital requirements for the grid required to facilitate IPP connection are significant (but relatively small as compared to Gx costs)
- A lack of grid capacity in optimal areas will increase total cost. Such considerations need to be factored into the IRP process
- Requires better integration between the generation plan (IRP) and grid plans (TDP and Distributor NDPs)
- Requires a framework whereby funds required to be spent on the grid must be spent on the grid
- The grid plans should provide guidance as to what should be done
- The relatively small spend on project development costs should provide optionality
- Need to consider alternative funding approaches to grid asset creation

Conclusions

- A spatial generation plan (aligned with the IRP 2010) has been drafted as an input into Grid planning (Tx and Sub-Tx)
- Eskom were a key partner in developing the spatial generation plan, which has been formally documented by the IPP Office and provided to Eskom
- Eskom Tx have committed to include the Generation forecast Baseline and Scenarios in the 2015 TDP update
- The 2015 TDP update should provide a holistic view of the 10 year Tx grid upgrades required to support Gx connection, as aligned to the spatial Gx forecast. Costs are expected to be substantial
- The IPP Office is collaborating with Eskom to create sub-tx IPP grid master plans in RE clusters. The outcomes will feed into the TDP and Distributor NDPs
- These planning activities will provide a holistic understanding of the Tx and sub-tx grid upgrades and costs to support new generation, and the prioritisation thereof
- The funding and execution of the grid project development work needs to be addressed with extreme urgency
- The IRP and/or TDP processes need to be expanded to include the creation of a generation spatial plan for the country, transparently developed in consultation with key stakeholders
- How can NERSA's assist in capacitating and enforcing the above?

Extra slides

Variations from Base-line

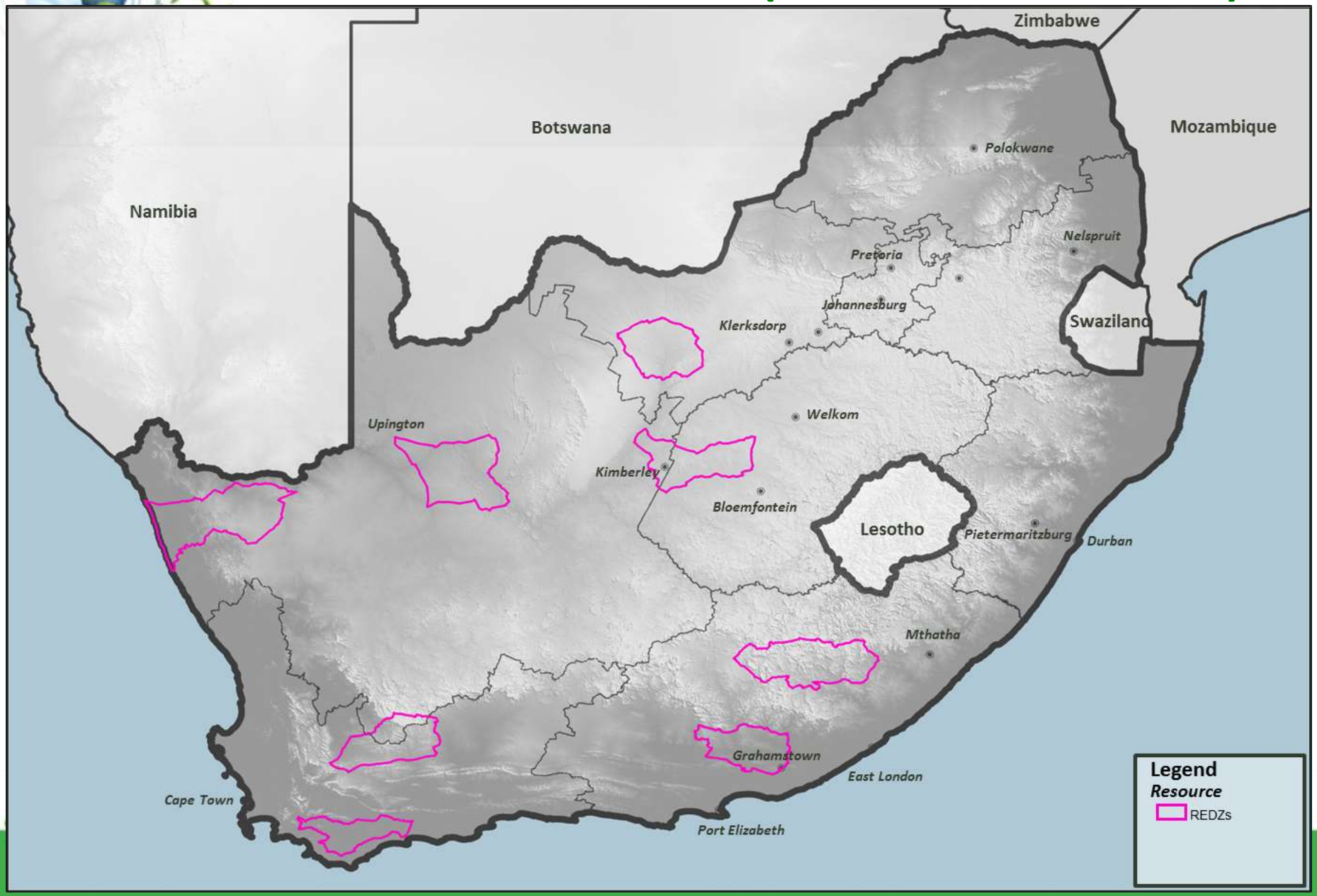
The variations from the base-line forecast are indicated as the spatial relocation of the generation sources in relation to the base-line, namely:

- Solar: A portion of the allocated Solar PV is moved from the mainly Northern Cape to Limpopo,
- Wind: A portion of the allocated Wind is moved to the Northern and Western Cape,
- Coal: Coal is relocated from the Waterberg area (Limpopo) to Mpumalanga and Kwa-Zulu Natal,
- Gas (LNG): Gas is moved between the three identified ports (Richards Bay, Coega and Saldanha Bay),
- Nuclear: Nuclear is moved between the Thyspunt (Port Elizabeth) and Duynefontain (Cape Town) sites.

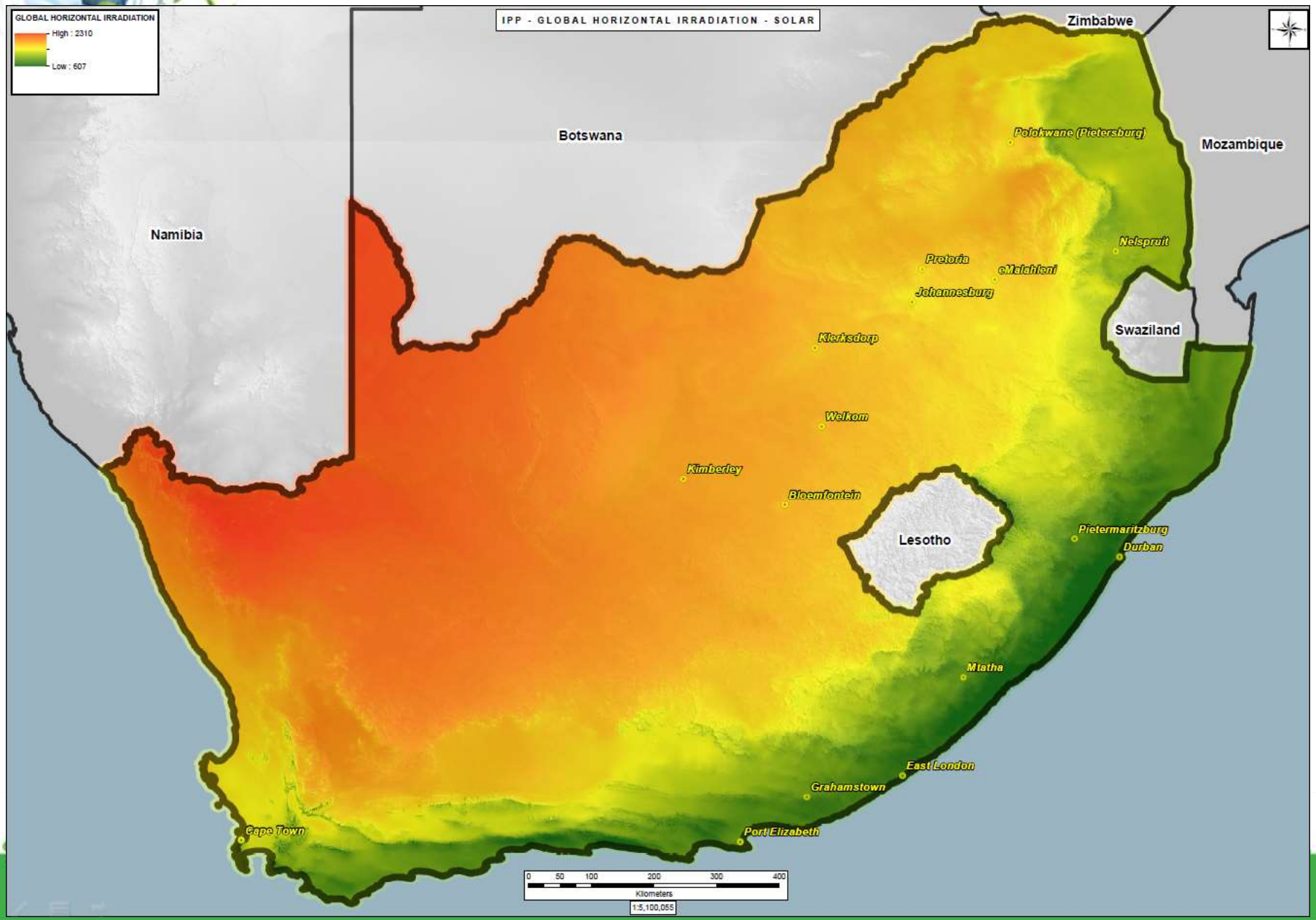
Resource Location

- The following sections slides context regarding the potential spatial location of power generation, as is utilised in the creation of the base-line generation forecast and alternative generation forecast scenarios

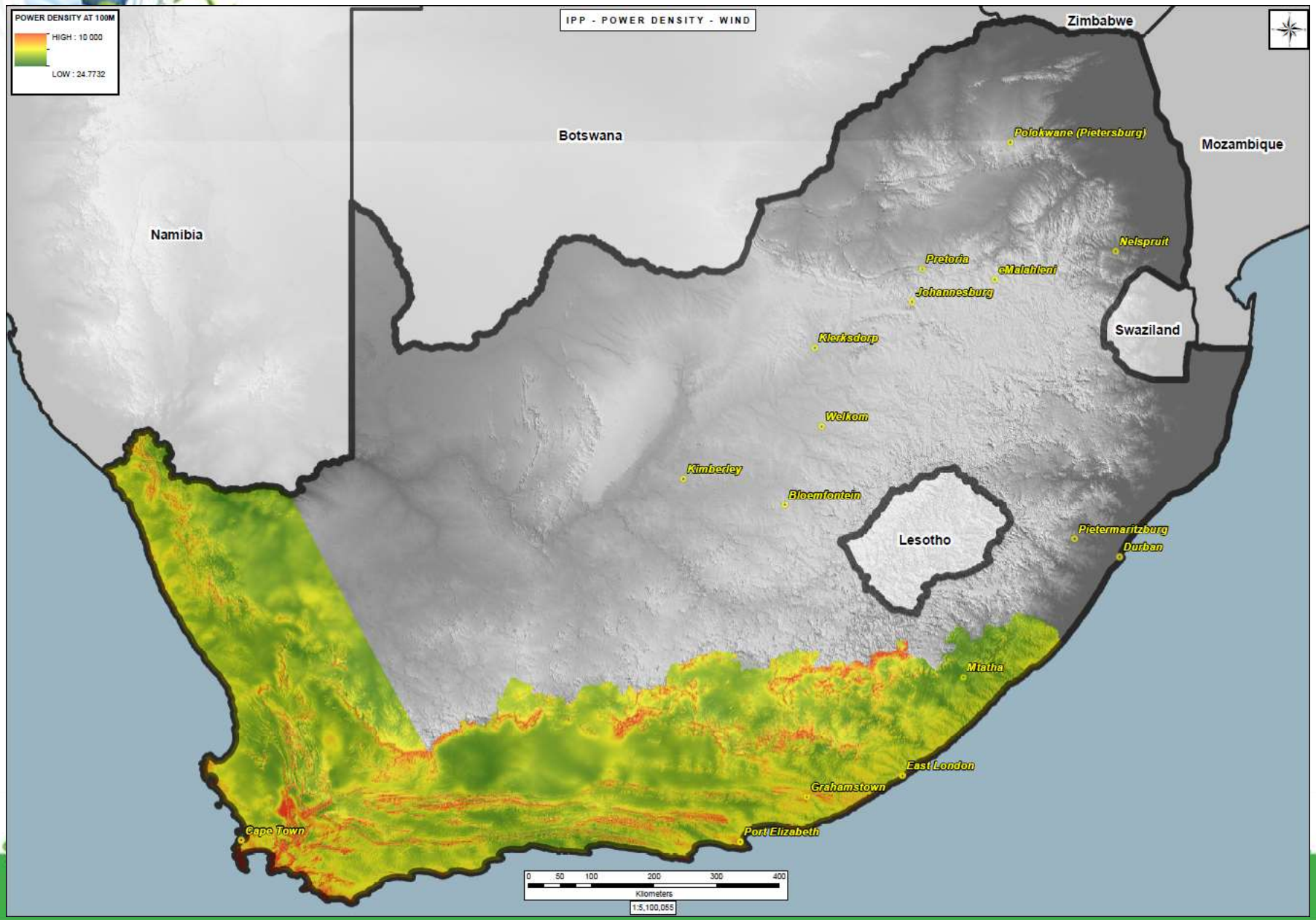
REDZ (Wind & Solar)



Solar Corridor

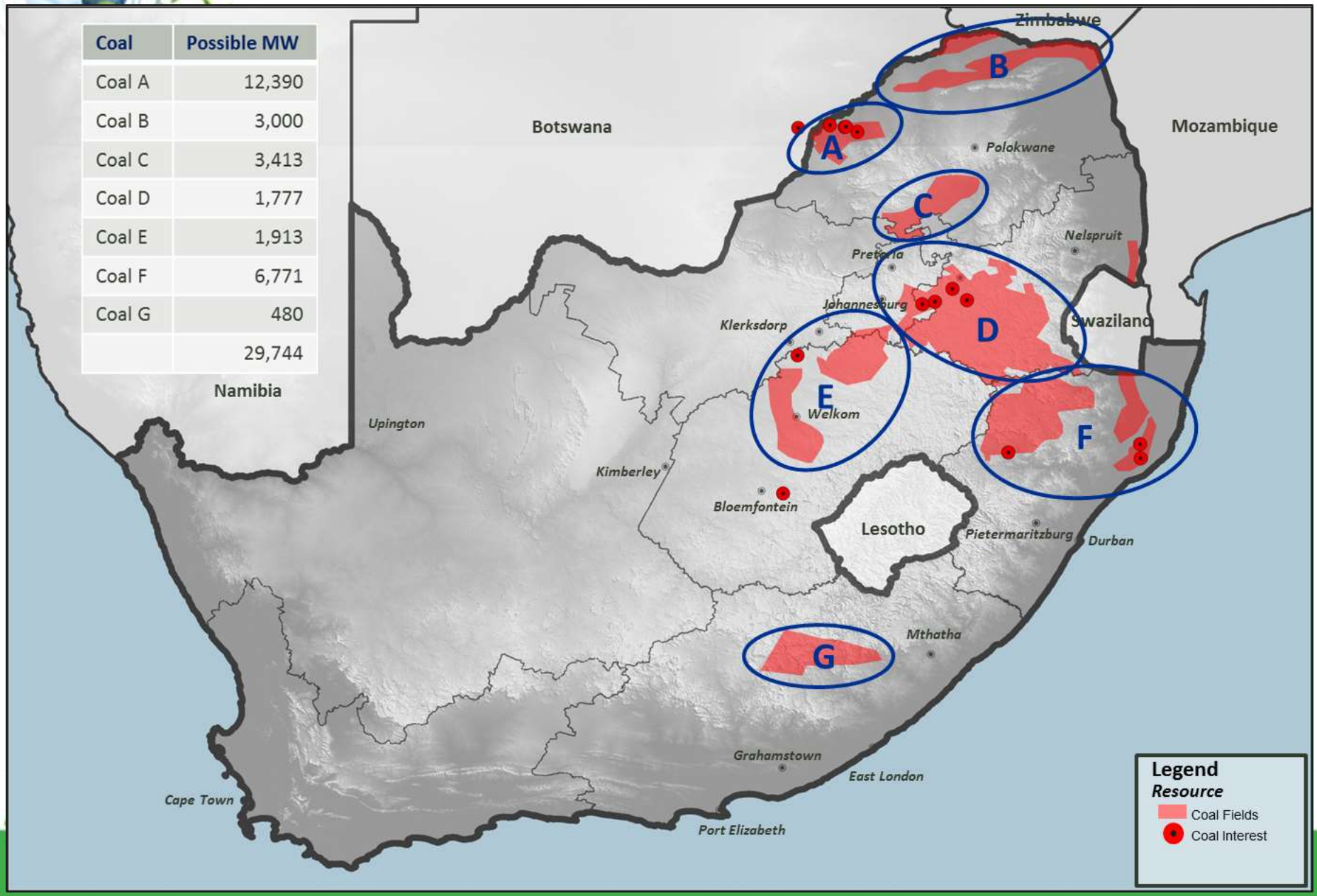


Wind Location

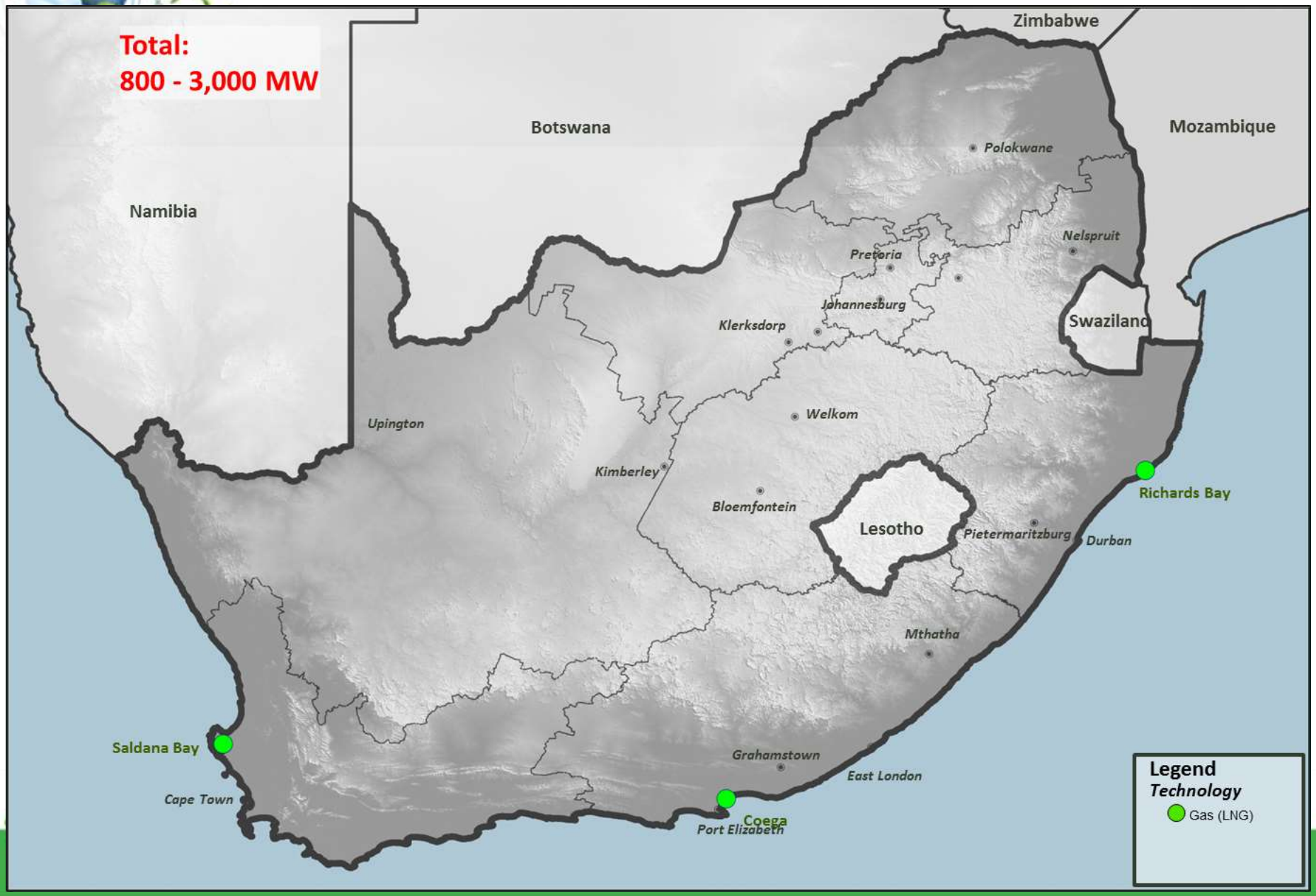


Coal Location

Coal	Possible MW
Coal A	12,390
Coal B	3,000
Coal C	3,413
Coal D	1,777
Coal E	1,913
Coal F	6,771
Coal G	480
	29,744



LNG Gas Location



Nuclear Plant Location