Strategic Environmental Assessments (SEAs)

EASTERN CAPE PROVINCIAL GOVERNMENT CONSULTATION

Identification of Strategic Power Corridors

Eskom

DEDEAT HO, King Williams Town

13 May 2014

What is the Transmission Grid Network?

- The Transmission Grid Network is a system that is designed and constructed to deliver electrical power that is generated at one place to another place where it is consumed
- Voltage Level definitions/terminology in South Africa
  - Transmission is > 132kV
  - Distribution is <= 132kV
  - Reticulation is <= 22kV
- One Transmission licence in South Africa – Eskom
- Many Distribution licences

The Different Development Plans

Integrated Resource Plan

- The Department of Energy (Energy Planner) is accountable for the Country Energy Plan as per recently published regulations.
- The Country Plan is also termed the Integrated Resource Plan (IRP).
- The Integrated Resource Plan (IRP) is intended to drive all new generation capacity development.
- NERSA licences new generators according to this determination.

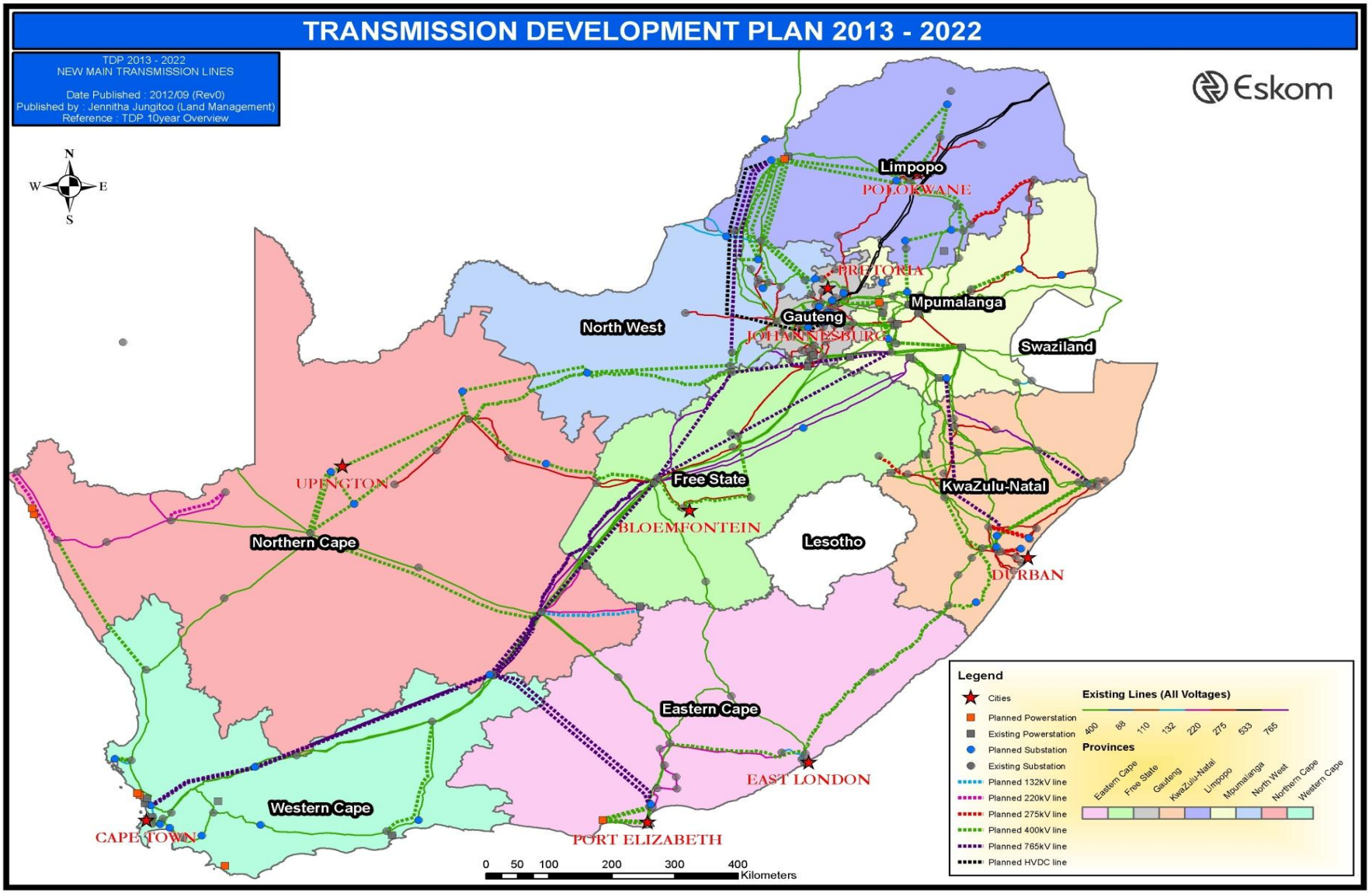
Strategic Grid Plan

- The Strategic Grid Plan formulates long term strategic transmission corridor requirements
- Plan is based on range of generation scenarios, and associated strategic network analysis
- Horizon date is 20 years
- Updated every 2-3 years

Transmission Development Plan

- Transmission Development Plan (TDP) presents transmission corridor requirements
- Plan covers a 10 year window
- Updated annually
- Indicates financial commitments required over 10 year period

Transmission Development Plan (TDP) Overview



STRATEGIC GRID PLAN

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The 2010 Integrated Resource Plan

Table 3. Policy-Adjusted IRP

	Committed build											New build options										
	RTS Capacity (coal)	Medupi (coal)	Kusile (coal)	Ingula (pumped storage)	DOE OCGT IPP (diesel)	Co-generation, own build	Wind	CSP	Landfill, hydro	Sere (wind)	Decommissioning	Coal (PF, FBC, Imports)	Gas CCGT (natural gas)	OCGT (diesel)	Import Hydro	Wind	Solar PV	CSP	Nuclear	Total new build	Total system capacity	Peak demand (net sent-out) forecast	Demand Side Management
	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
2010	380	0	0	0	0	260	0	0	0	0	0	0	0	0	0	0	0	0	0	640	44535	38885	252
2011	679	0	0	0	0	130	0	0	0	0	0	0	0	0	0	0	0	0	0	809	45344	39956	494
2012	303	0	0	0	0	0	300	0	100	100	0	0	0	0	0	0	300	0	0	1103	46447	40995	809
2013	101	722	0	333	1020	0	400	0	25	0	0	0	0	0	0	0	300	0	0	2901	49348	42416	1310
2014	0	722	0	999	0	0	0	100	0	0	0	500	0	0	0	400	300	0	0	3021	52369	43436	1966
2015	0	1444	0	0	0	0	0	100	0	0	-180	500	0	0	0	400	300	0	0	2564	54933	44865	2594
2016	0	722	0	0	0	0	0	0	0	0	-90	0	0	0	0	400	300	100	0	1432	56365	45786	3007
2017	0	722	1446	0	0	0	0	0	0	0	0	0	0	0	0	400	300	100	0	2968	59333	47870	3420
2018	0	0	723	0	0	0	0	0	0	0	0	0	0	0	0	400	300	100	0	1523	60856	49516	3420
2019	0	0	1446	0	0	0	0	0	0	0	0	250	237	0	0	400	300	100	0	2733	63589	51233	3420
2020	0	0	723	0	0	0	0	0	0	0	0	250	237	0	0	400	300	100	0	2010	65599	52719	3420
2021	0	0	0	0	0	0	0	0	0	0	-75	250	237	0	0	400	300	100	0	1212	66811	54326	3420
2022	0	0	0	0	0	0	0	0	0	0	-1870	250	0	805	1143	400	300	100	0	1128	67939	55734	3420
2023	0	0	0	0	0	0	0	0	0	0	-2280	250	0	805	1183	400	300	100	1600	2358	70297	57097	3420
2024	0	0	0	0	0	0	0	0	0	0	-909	250	0	0	283	800	300	100	1600	2424	72721	58340	3420
2025	0	0	0	0	0	0	0	0	0	0	-1520	250	0	805	0	1600	1000	100	1600	3835	76556	60150	3420
2026	0	0	0	0	0	0	0	0	0	0	0	1000	0	0	0	400	500	0	1600	3500	80056	61770	3420
2027	0	0	0	0	0	0	0	0	0	0	0	250	0	0	0	1600	500	0	0	2350	82406	63404	3420
2028	0	0	0	0	0	0	0	0	0	0	-2850	1000	474	690	0	0	500	0	1600	1414	83820	64867	3420
2029	0	0	0	0	0	0	0	0	0	0	-1128	250	237	805	0	0	1000	0	1600	2764	86584	66460	3420
2030	0	0	0	0	0	0	0	0	0	0	0	1000	948	0	0	0	1000	0	0	2948	89532	67809	3420
TOTAL	1463	4332	4338	1332	1020	390	700	200	125	100	-10902	6250	2370	3910	2609	8400	8400	1000	9600	45637			

Study Methodology – Design Philosophy

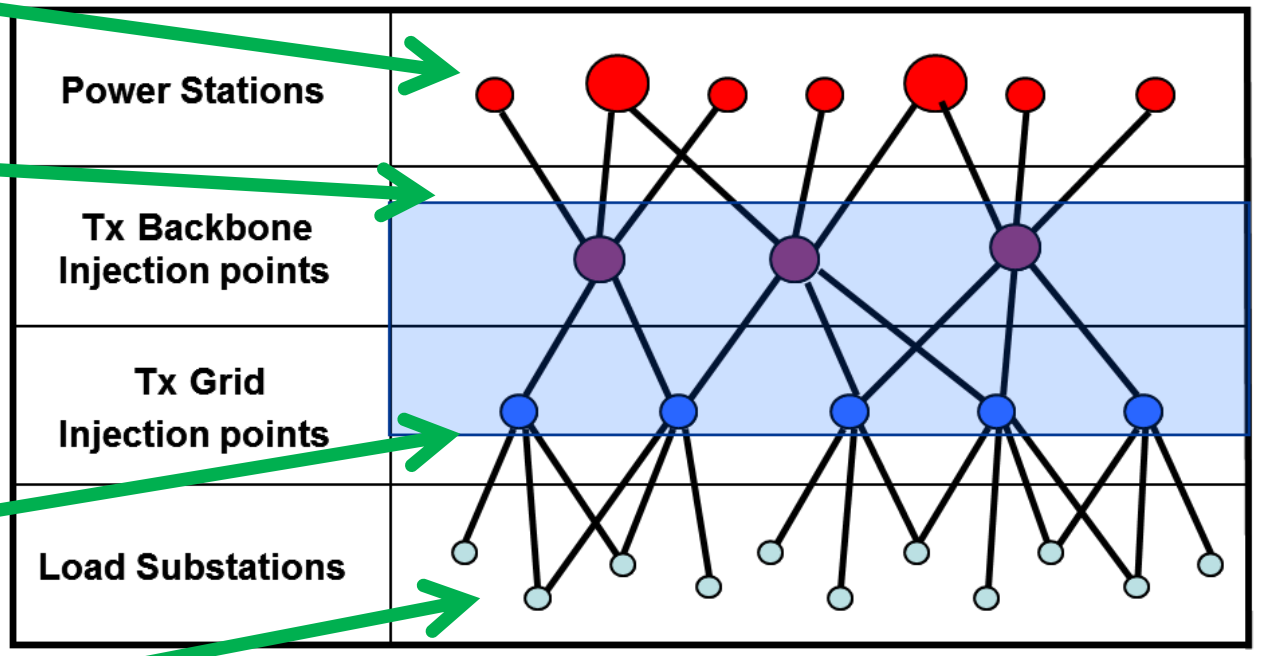
Layer model for substation requirements and network development

New power station sites not known

Identify Injection points in areas where power stations are likely

Identify Injection points in areas where new loads are likely to be

Exact sites of new loads not known



Main corridor configuration design

Designing Main Backbone grid to connect Injection Points provides flexibility & robustness to changing scenarios

2040 Network Study - Generation Scenarios

Eskom recently completed Strategic Transmission 2040 Network Study

Three generation scenarios were considered for the study:

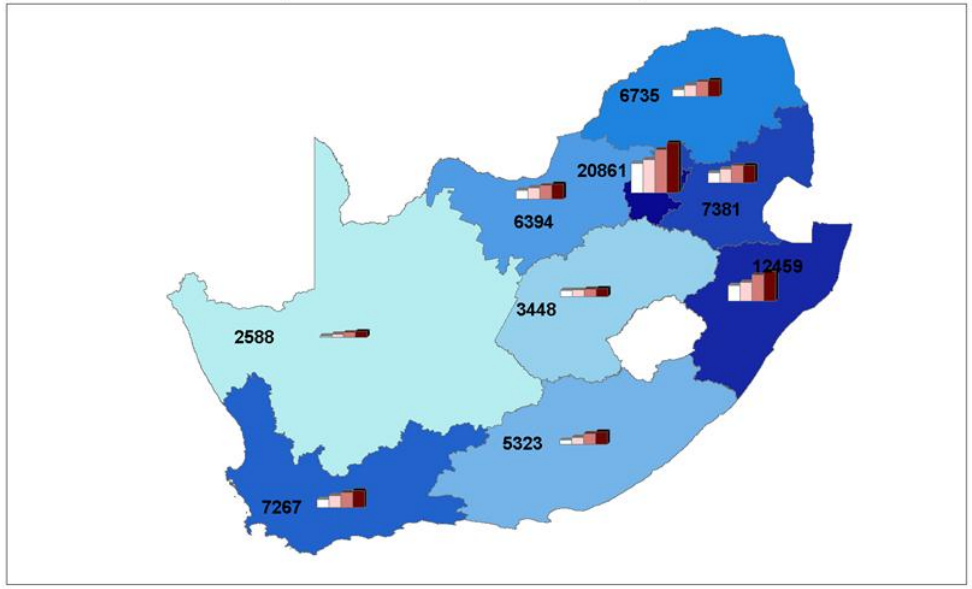
- **The IRP 2010 base Scenario (BASE IRP)**
  - IRP was extended to 2040
  - Coal was fixed at 2030 level
  - Balance in similar ratio to 2030 mix
- **Increased Renewables Scenario (GREEN)**
  - Replaced nuclear component with RE base generation equivalent
  - CSP (with storage)/ Wind with CCV of 30% / Natural Gas
- **Increased Imports Scenario (IMPORT)**
  - Doubled imported power by 2030
  - Reduced coal & nuclear

Mapping the Demand and Generation

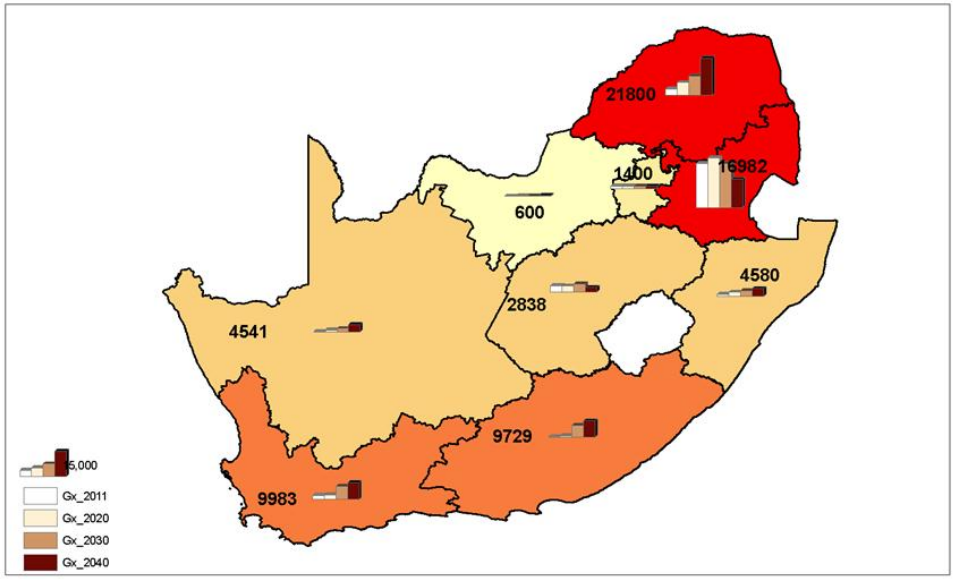
- First the Demand is allocated to each Municipal Area and then summated by province to get the total Load Demand for each province
- The Bars represent the relative Demand for 2011, 2020, 2030 and 2040 with the 2040 figure shown

- Secondly the Generation is allocated to each Municipal Area and then summated by province to get the total Generation for each province for each Generation Scenario
- The Bars represent the relative Generation for 2011, 2020, 2030 and 2040 with the 2040 figure shown

LOAD GROWTH BY 2040 PER PROVINCE
(Maximum Demand in MW)

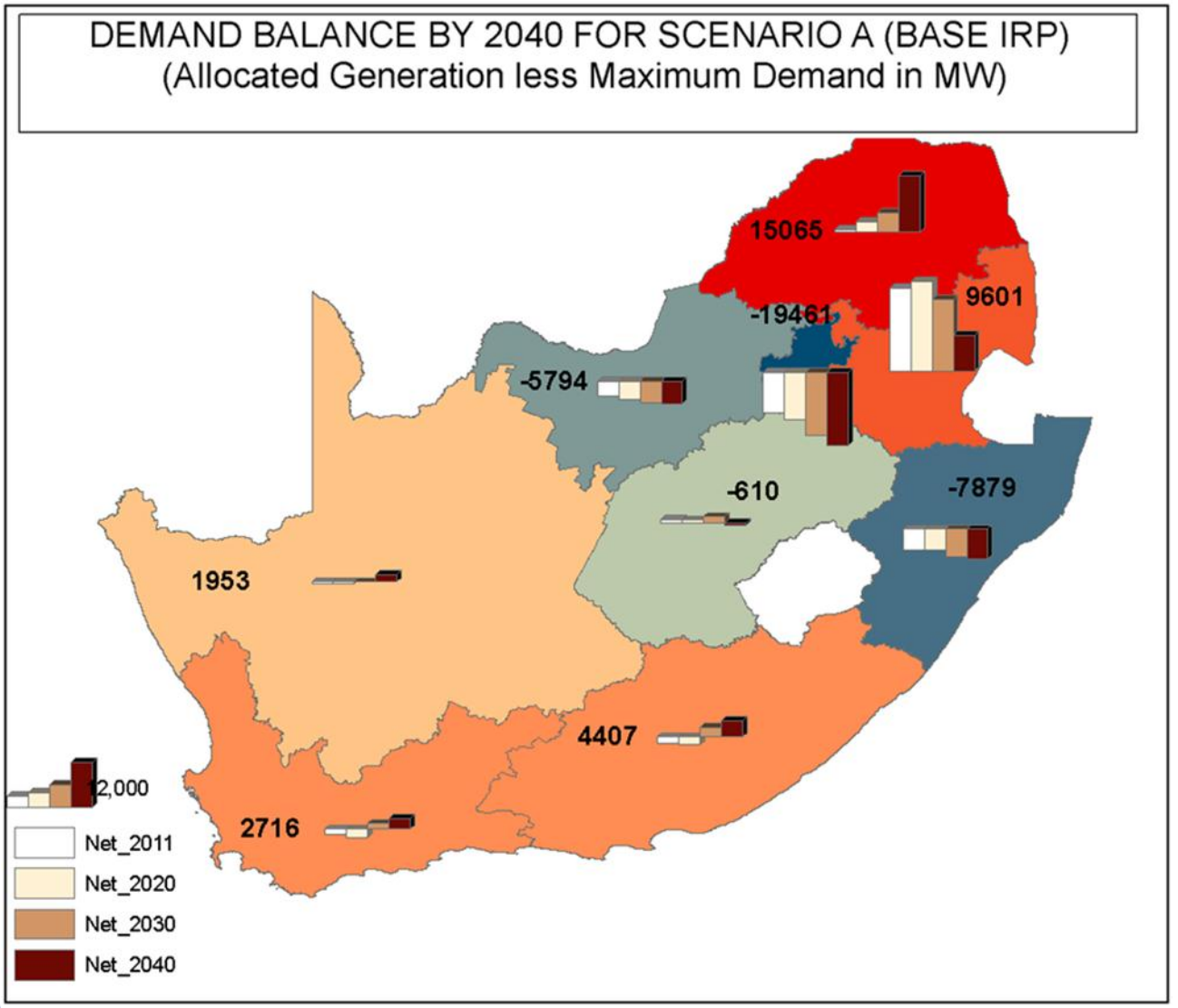


GENERATION DEVELOPMENT FOR SCENARIO A (BASE IRP)
(Maximum Demand in MW)

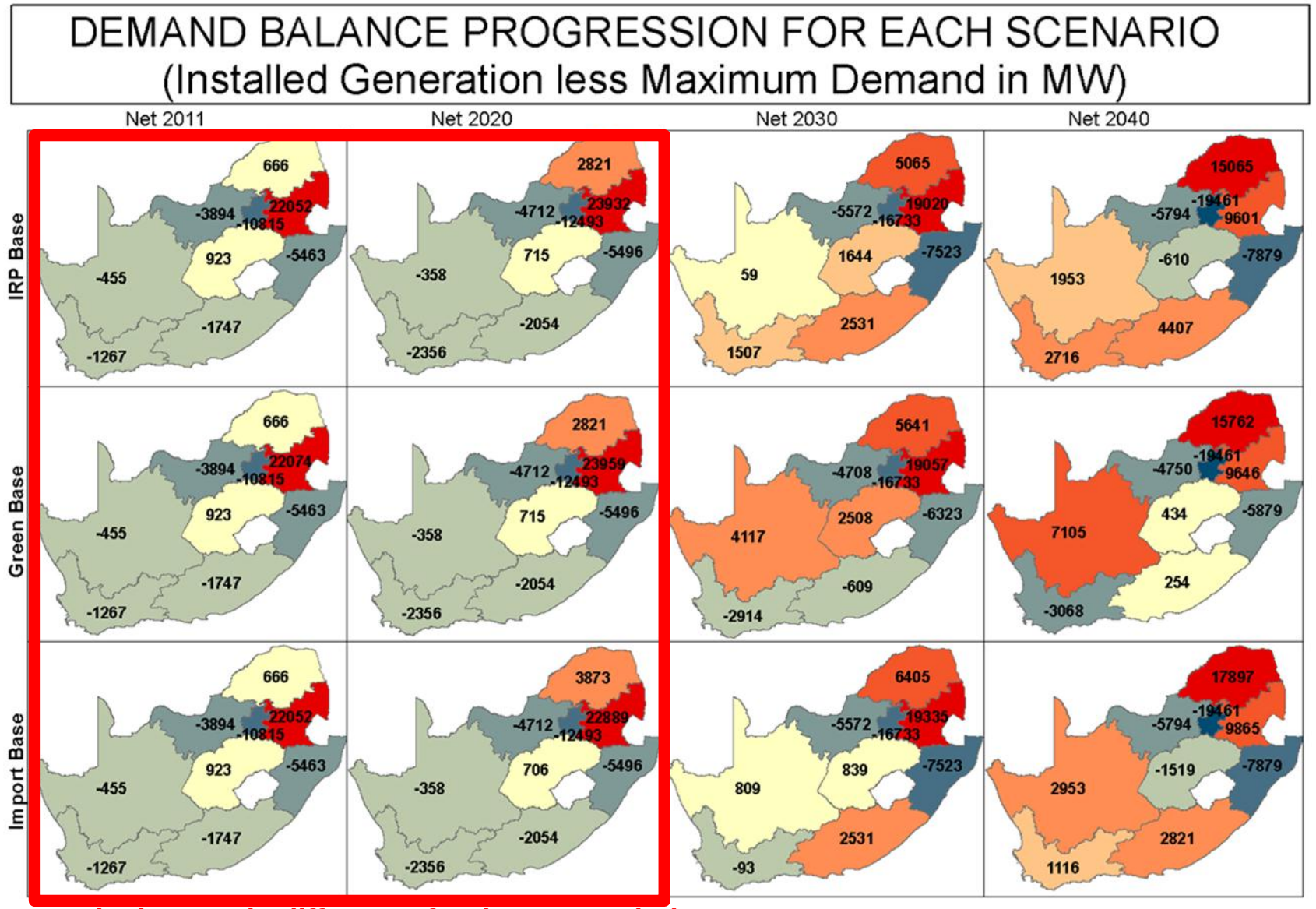


Mapping the Demand Balance up to 2040

- The Supply and Demand Balance value is then calculated for each Generation Scenario for each year to 2040 to determine the change over this period
- The 2011, 2020, 2030 and 2040 scenarios are presented in the report to illustrate the change over each decade
- The Bars represent the relative Demand Balance for 2011, 2020, 2030 and 2040 with the 2040 figure shown for Scenario A in this case
- All three Generation Scenarios can be mapped and compared to show the differences between the scenarios over time



Comparing Demand Balances for each Generation Scenario



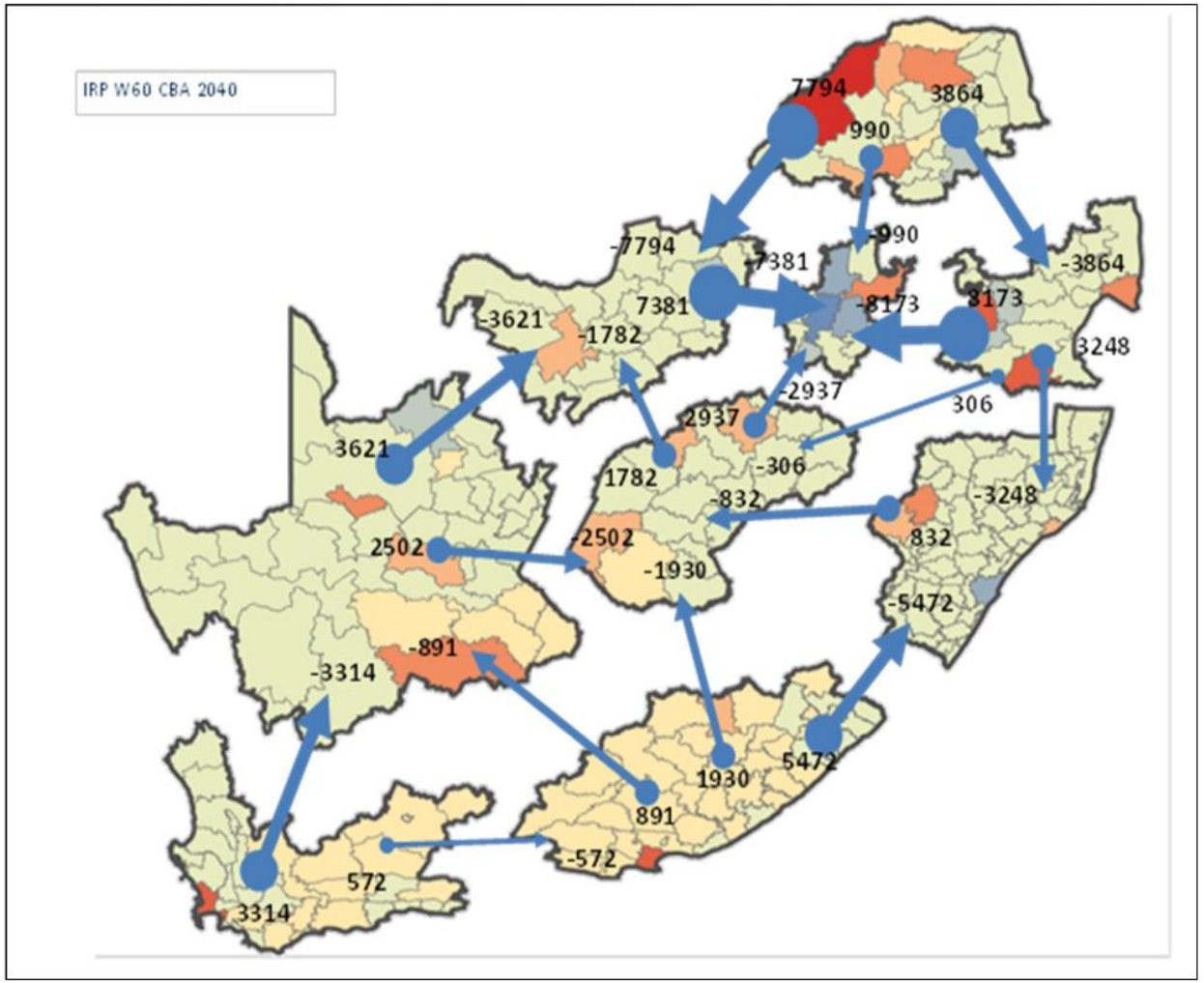
Marginal scenario difference for the TDP period

Inter-Province Power Transfers for the Scenarios

From the three main scenarios a number of variations of each scenario were identified and compared to account for the potential variation in wind generation output and patterns.

From the Demand Balance calculations it was possible to determine the power transfers that would occur between the provinces for each scenario across the study period as shown in this map for one scenario

Analysis of all the scenario results enabled the identification of the man power corridors that would be ***required under all scenarios*** to facilitate the transfer of power around the country.



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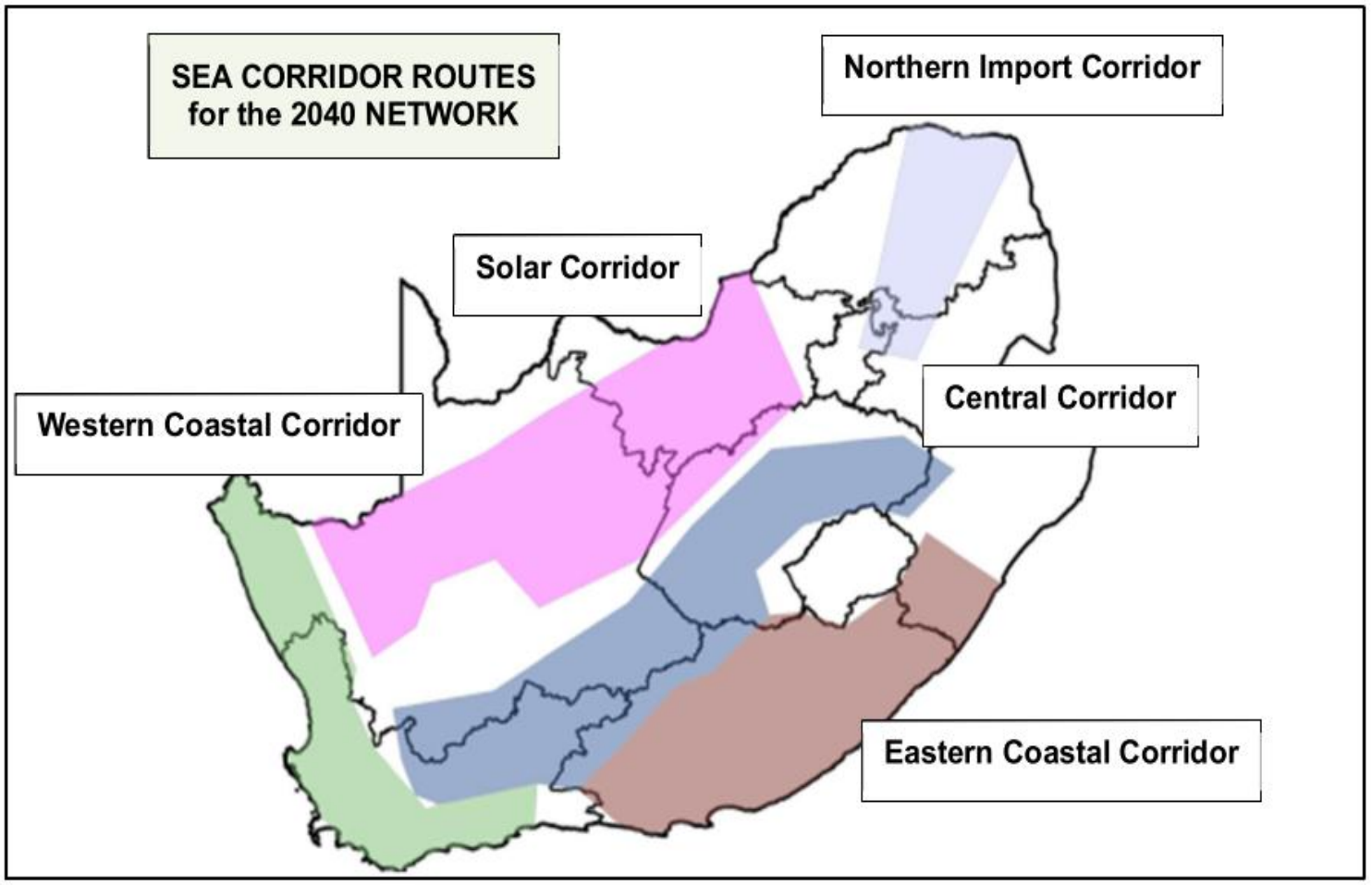
2040 Strategic Grid Planning – SEA Corridors

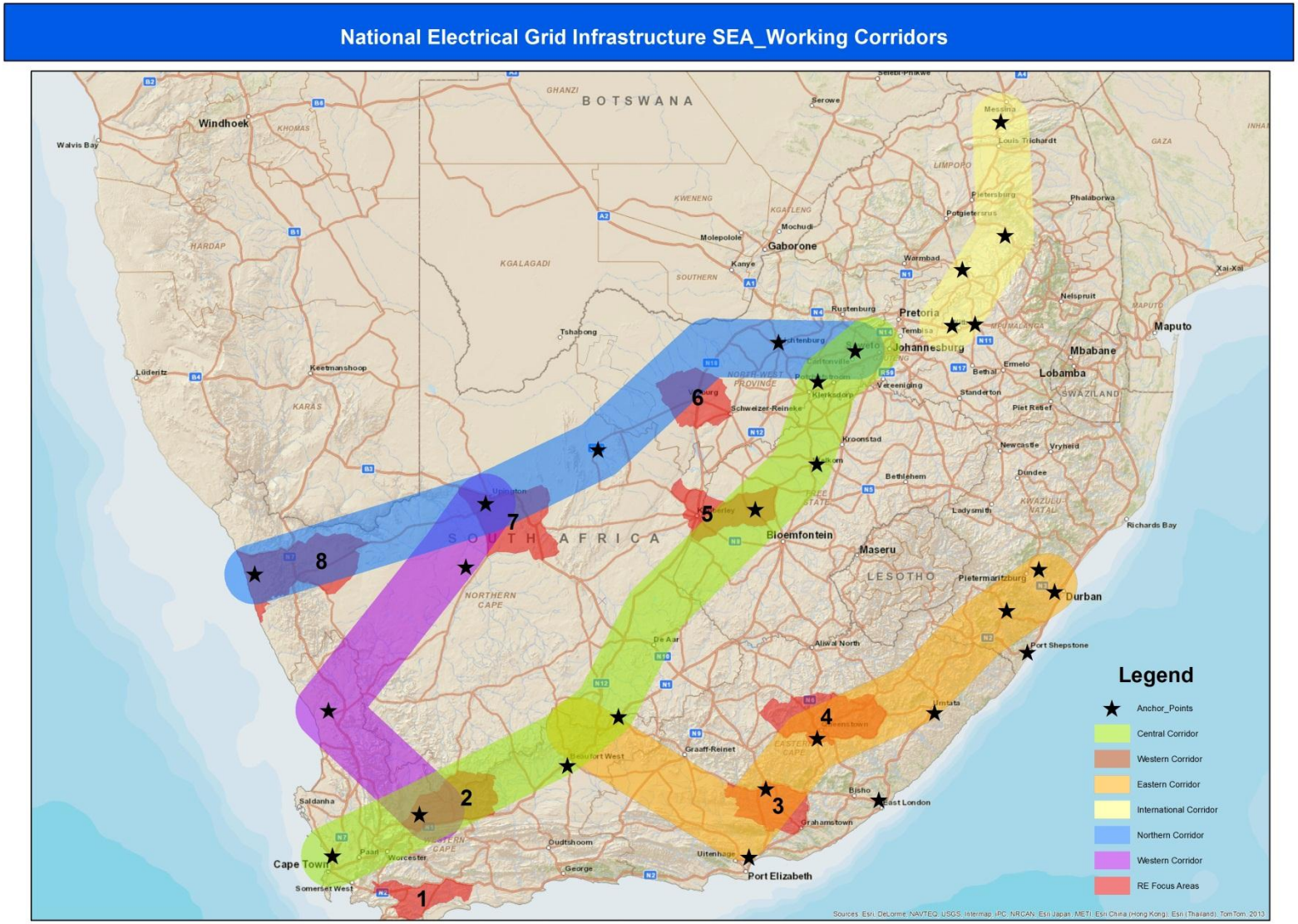
Five main corridors "areas" were identified that would be required to be further developed into the future to provide the necessary export and import of power between the provinces.

These five corridors areas are indicated on the map.

These corridors were used as input for the Sip 10 Power Corridor SEA study.



2040 Strategic Grid Planning – Final SEA Corridors



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