JUST ENERGY TRANSITION PARLIAMENT WEBINAR

28 October 2021

Presented by
Dr Stanley Semelane

CSIR
Touching lives through innovation

Outline

1. Factors driving the energy transition
2. A transition to an accelerated renewable energy technologies roll-out
3. Implications of a coal phase-out in South Africa
4. The role of a just energy transition in addressing energy challenges in South Africa
5. The potential to optimise renewable energy benefits
6. Just energy transition bottlenecks and enablers

Four drivers require a global energy transition: Natural resources are finite, CO_2 emissions need to be capped and energy poverty has to be resolved

Needs to be considered in our local context and the National Development Plan

75 YEAR ANNIVERSARY

Resources are finite

Coal

(140 to 300 yrs)

Gas

(60-100 yrs)

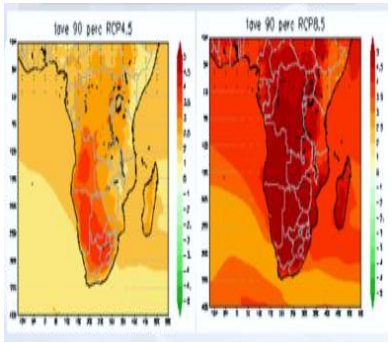
Oil

(40 – 60 yrs)

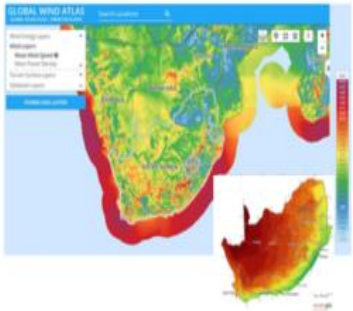
Reserves

Resources

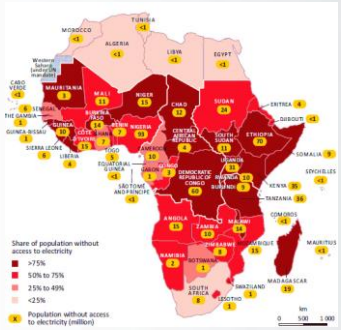
CO_2 emissions reduction



Wind and solar resource



Energy poverty



300 yrs

Price pressure — **Today** — **Regulatory/policy pressure**

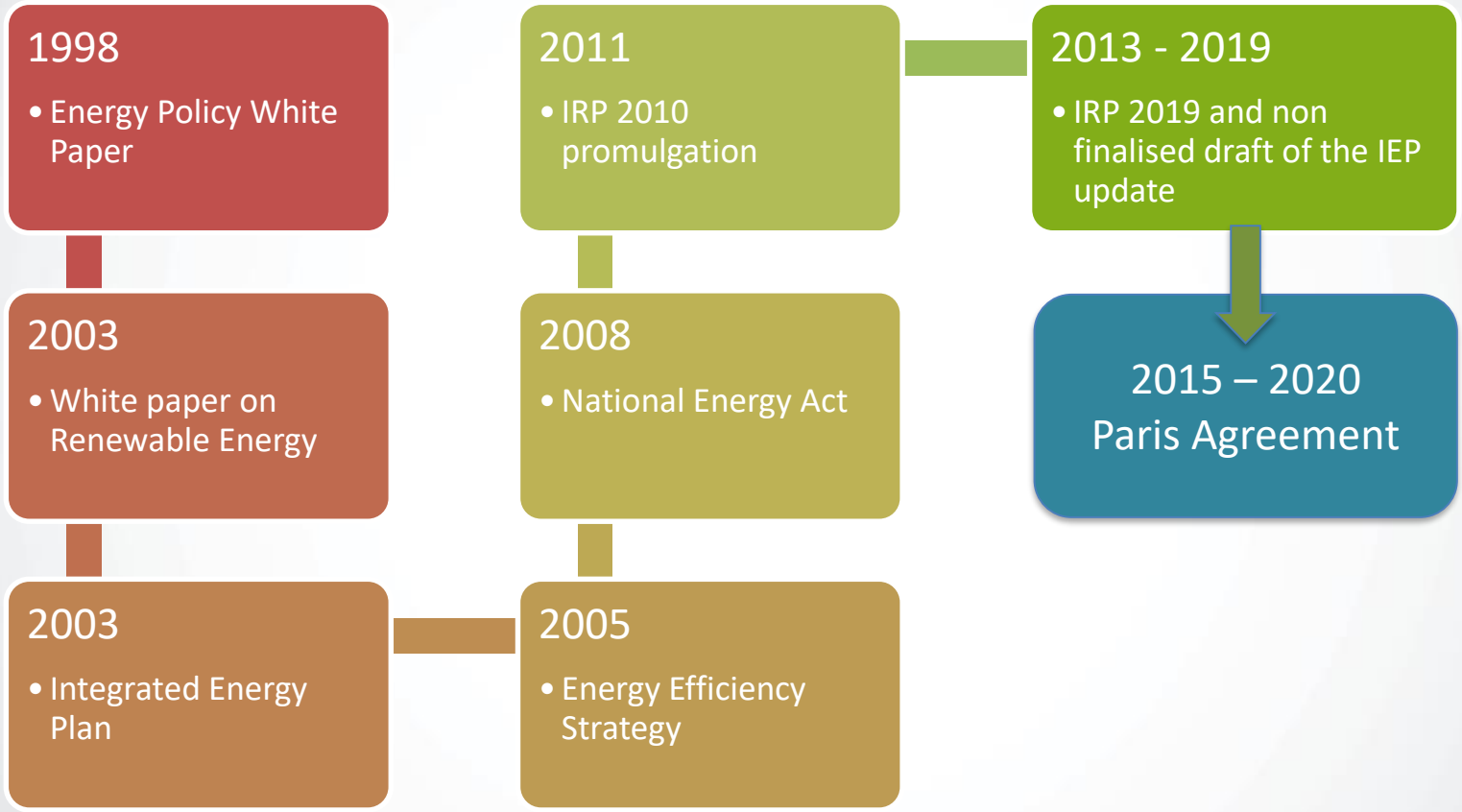
NDP Vision 2030

- Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change
- Social Equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households
- Reliable and efficient energy service at competitive rates, while supporting economic growth through job creation

CSIR Touching lives through innovation

Sources: WEC; BCG; CSIR analysis, National Development Plan

Foundational policy landscape informing energy sector transition



Sources: WEC; BCG; CSIR analysis, National Development Plan

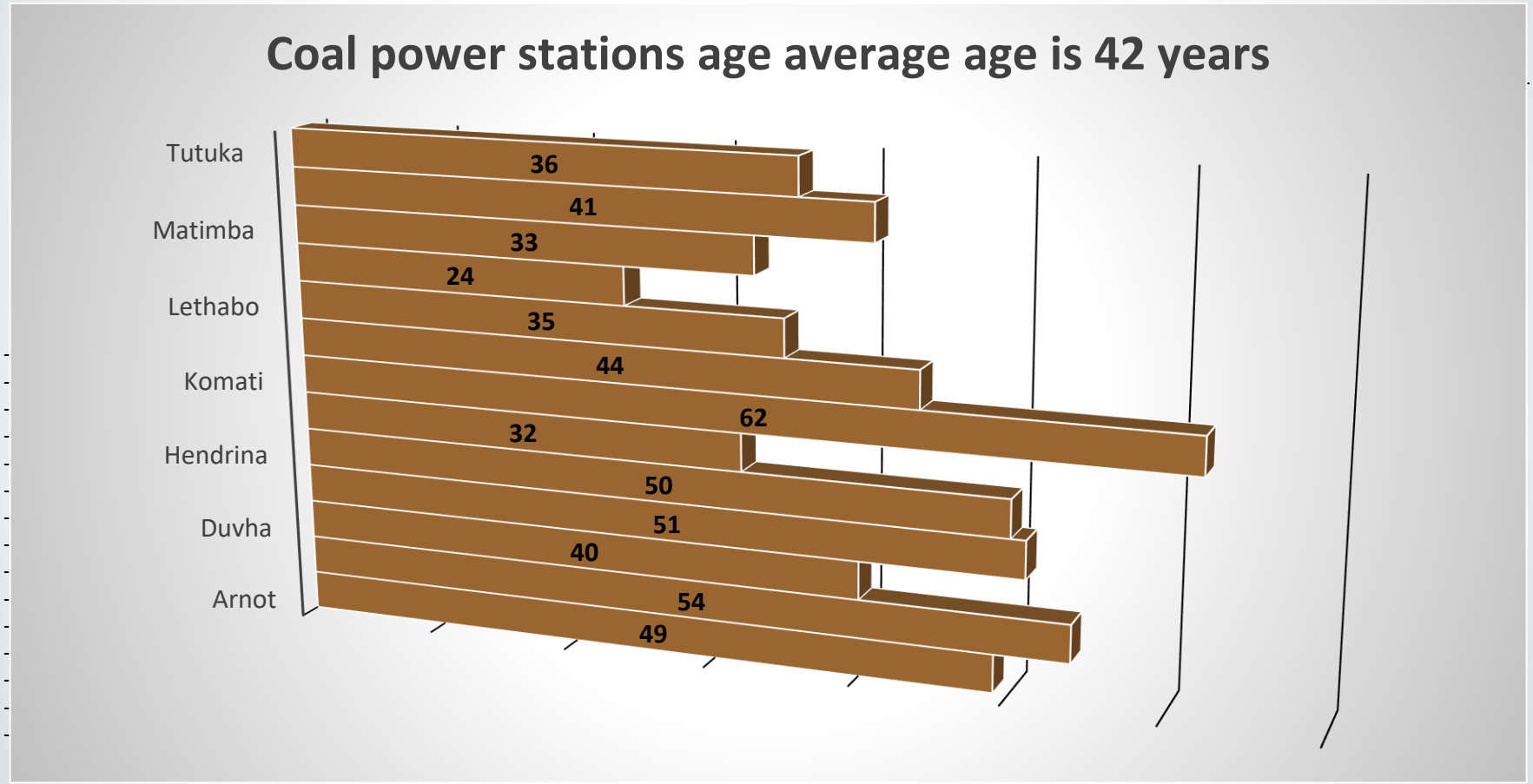
Energy transition implementation plan

	Coal	Coal Decommissioning	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas &diesel	Other (Distributed Generation, CoGen, Biomass, Landfill
Current Base	37149		1860	2100	2912	1474	1980	300	3830	499
2019	2155	-2373					244	300		Allocation to the extent of the short term capacity and energy gap
2020	1433	-557				114	300			
2021	1433	-1403				300	818			
2022	711	-844			513	400 1000	1600			
2023	750	-555				1000	1600			500
2024			1860				1600		1000	500
2025						1000	1600			500
2026		-1219					1600			500
2027	750	-847					1600		1000	500
2028		-475				1000	1600			500
2029		-1694			1575	1000	1600			500
2030		-1050		2500		1000	1600			500
TOTAL INSTALLED CAPACITY by 2030	33364		1860	4600	5000	8288	17742	600	6380	
% Total installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
%Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

Sources: IRP 2019 CSIR analysis,

CSIR
Touching lives through innovation

Substantial coal-fired capacity is planned to be decommissioned in the IRP2019



Sources: IRP 2019 CSIR analysis,

CSIR
Touching lives through innovation

A just energy transition is critically important

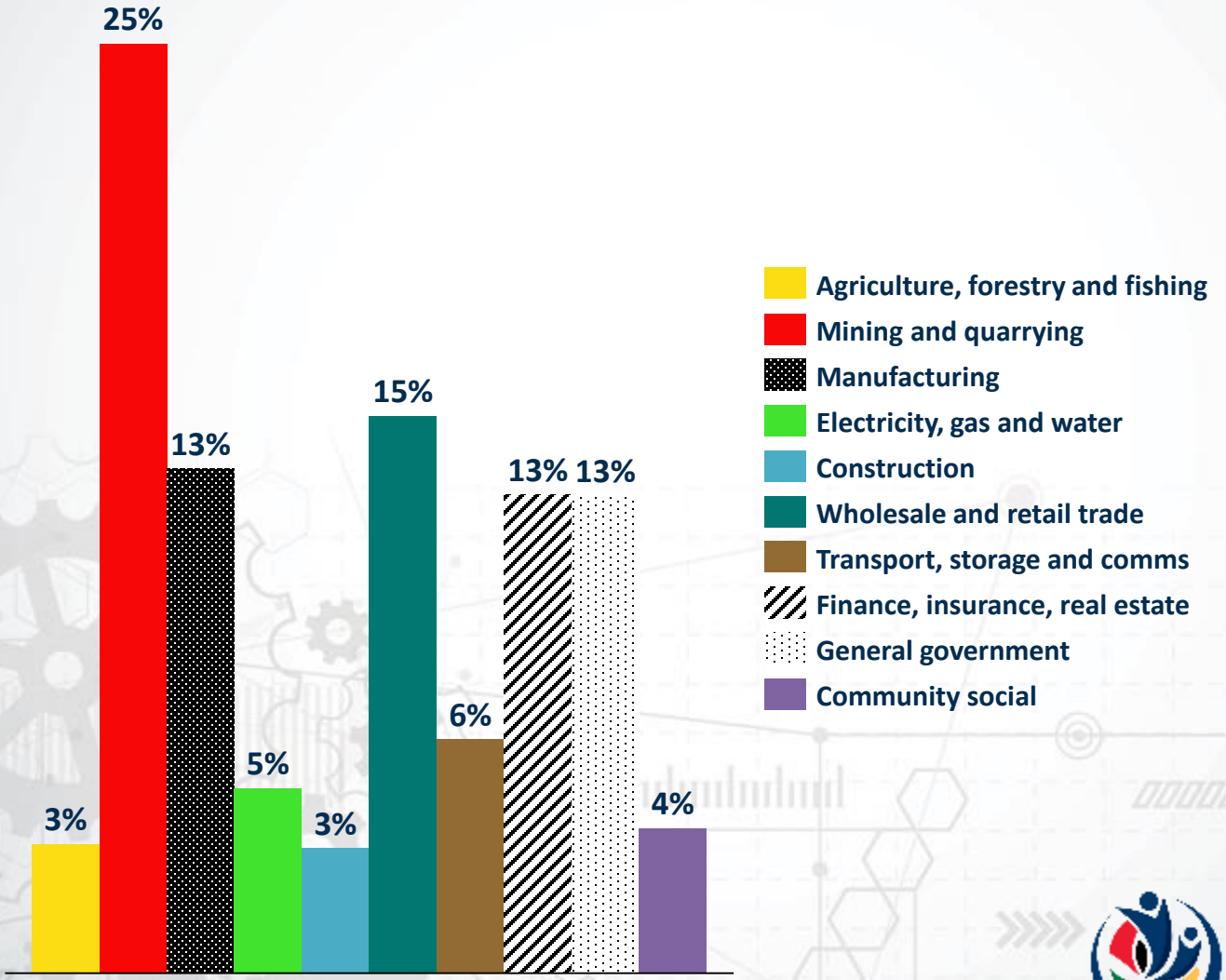
Key considerations for South Africa

- The coal sector is the largest mining contributor to gross domestic product (GDP) and the third-largest employer when compared with other domestic mining activities (Mining Review Africa, 2018);
- The country's coal sector has about 92 000 direct employees with earnings of approximately R22 billion (Minerals Council South Africa, 2020) and approximately R129 billion (Mining Review Africa, 2018) in sales in 2017 (28% of the country's total mineral sales);
- 170 000 indirect jobs are created by the coal sector (Mining Review Africa, 2018);
- South Africa has an unemployment rate of 34.4% (Stats SA, 2021), therefore, it is important that the South African just energy transition be considered within this context.

Sources: Bloomberg, 2021, MCSA, 2020

Project background - Mpumalanga will be directly impacted due to the current economic structure

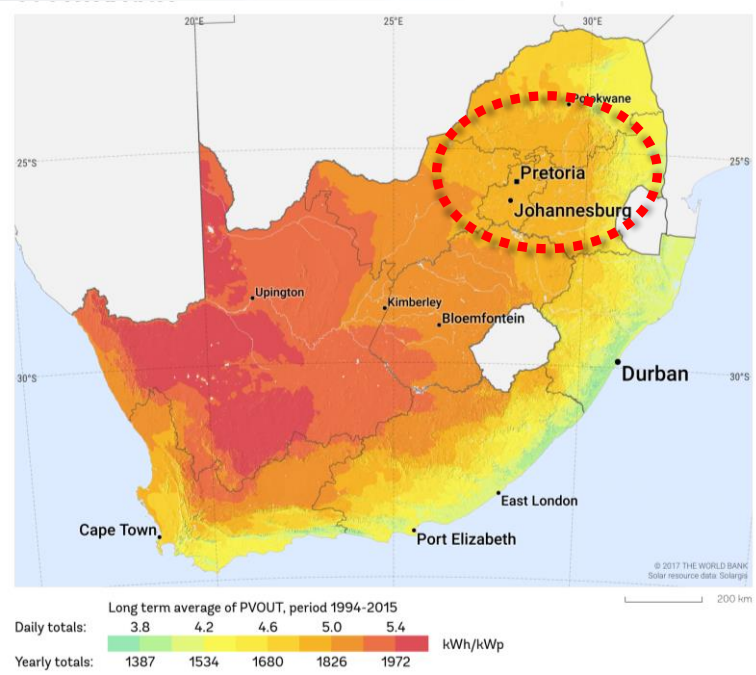
The coal mining sector is a major contributor to the local economy



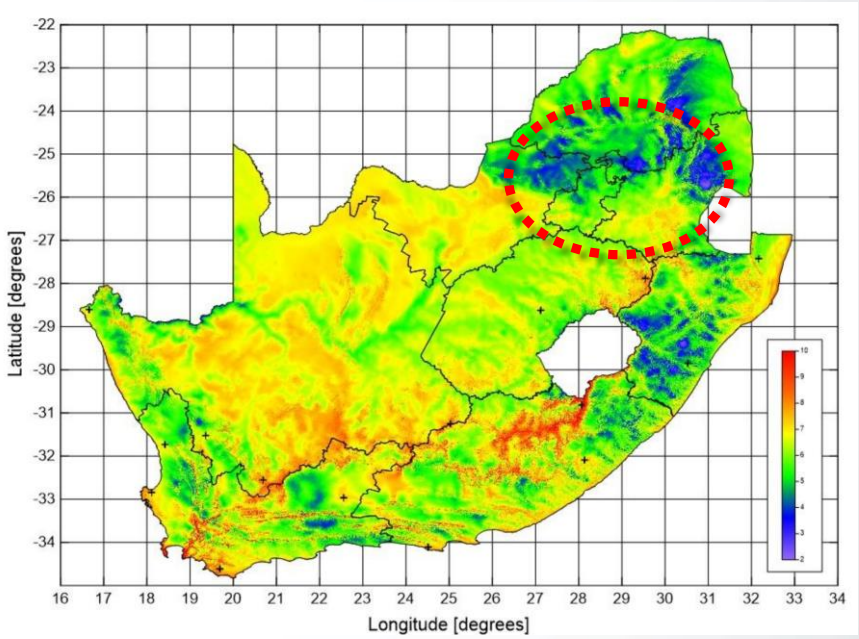
Sources: Stats SA, Quantec

The wind and solar resource is best in particular locations but economic across most areas of South Africa

Solar PV



Onshore Wind

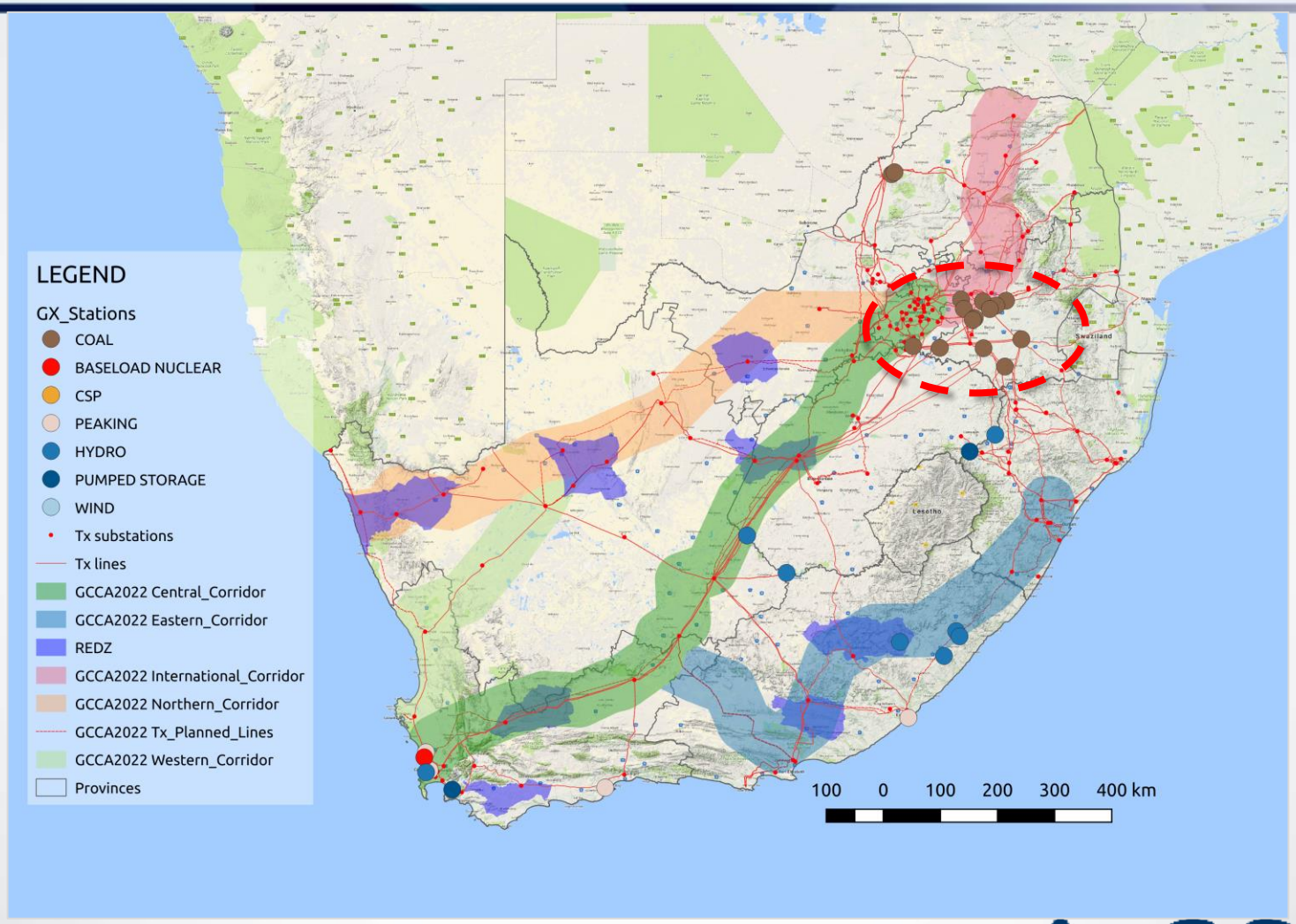


How much of the new technology build can/should be done in Mpumalanga?

Sources: World Bank; SANEDI; CSIR

In 2013 the majority of the power stations are located in the coal regions dominated by Mpumalanga

2013

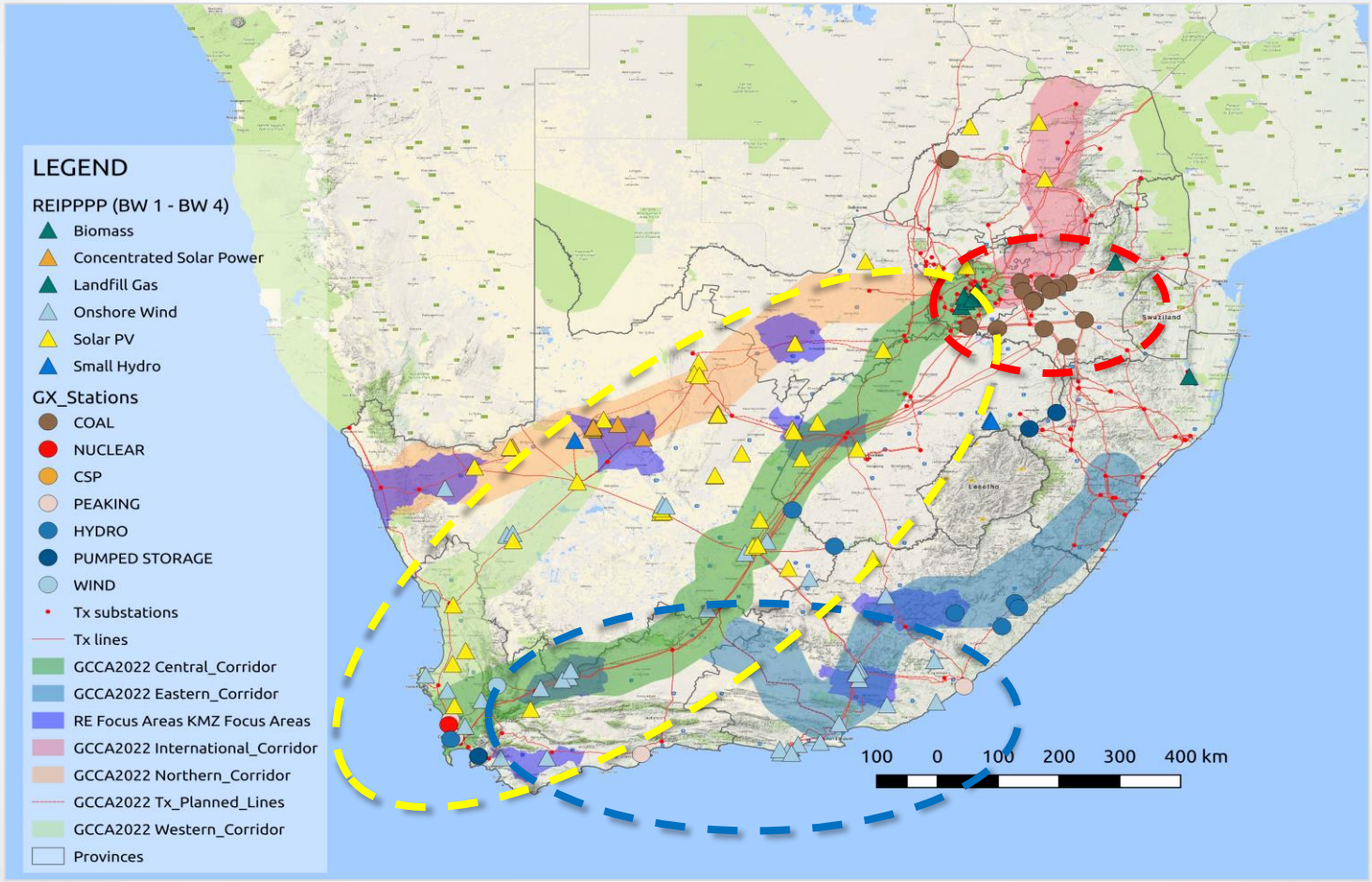


Sources: Eskom; CSIR

CSIR
Touching lives through innovation

By 2018 substantial geographic shifts are visible due to spatial deployment of new renewable energy plants

2018



Sources: Eskom; CSIR

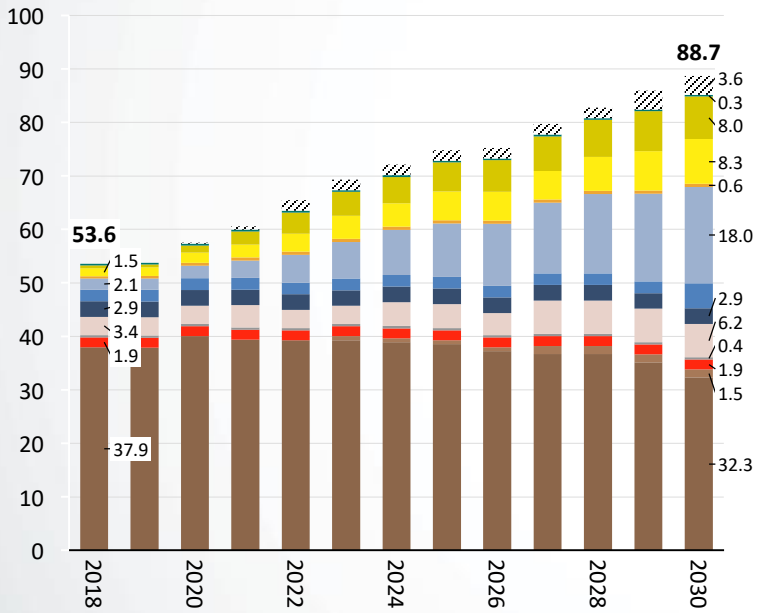
CSIR
Touching lives through innovation

Existing policy indicates an increasingly diversified energy mix away from coal predominantly towards solar PV, wind and flexibility

IRP 2019 (DMRE)

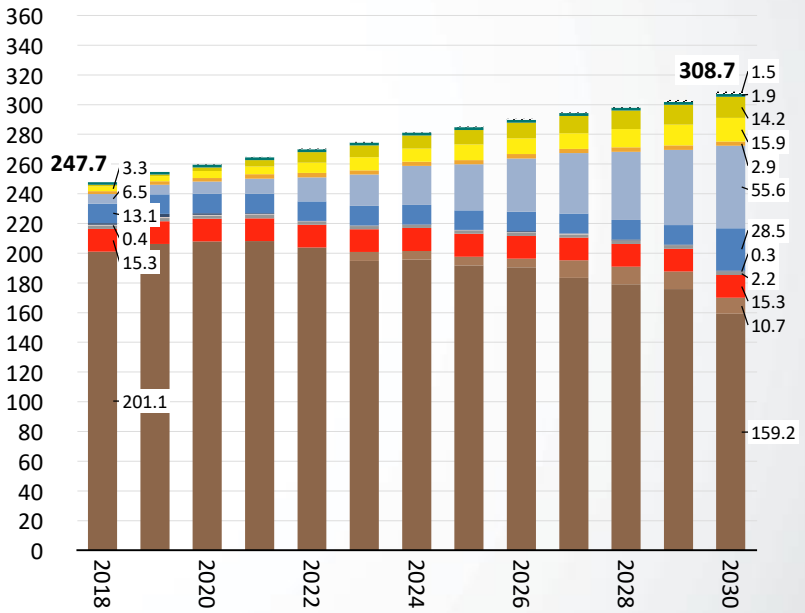
Installed capacity

Total installed capacity (net) [GW]



Energy mix

Electricity production [TWh/yr]



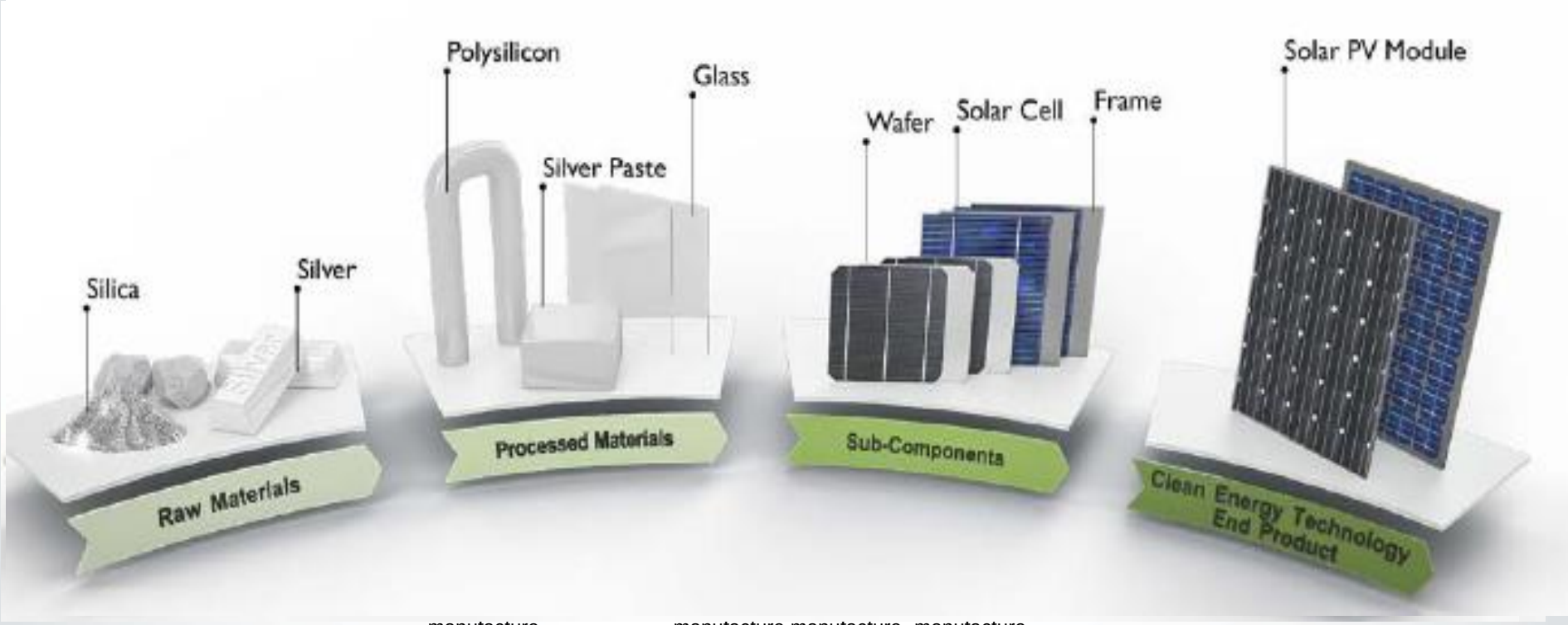
Other Storage | DG | CSP | Hydro | Peaking | Nuclear (new) | Coal (New)
Biomass/-gas | Solar PV | Wind | PS | Gas | Nuclear | Coal

First new-builds:

Wind (2022)	*1.6 GW*
PV (2022)	*1.0 GW*
Storage (2022)	*0.5 GW*
Coal (2023)	*0.75 GW*
Gas (2024)	*1.0 GW*

DG = Distributed Generation; PS = Pumped Storage
NOTE: Energy share is a best estimate based on available data)
Sources: IRP 2019. CSIR Energy Centre analysis

Possible solution: The localisation of renewable energy technologies and value chains - an important part of a just transition



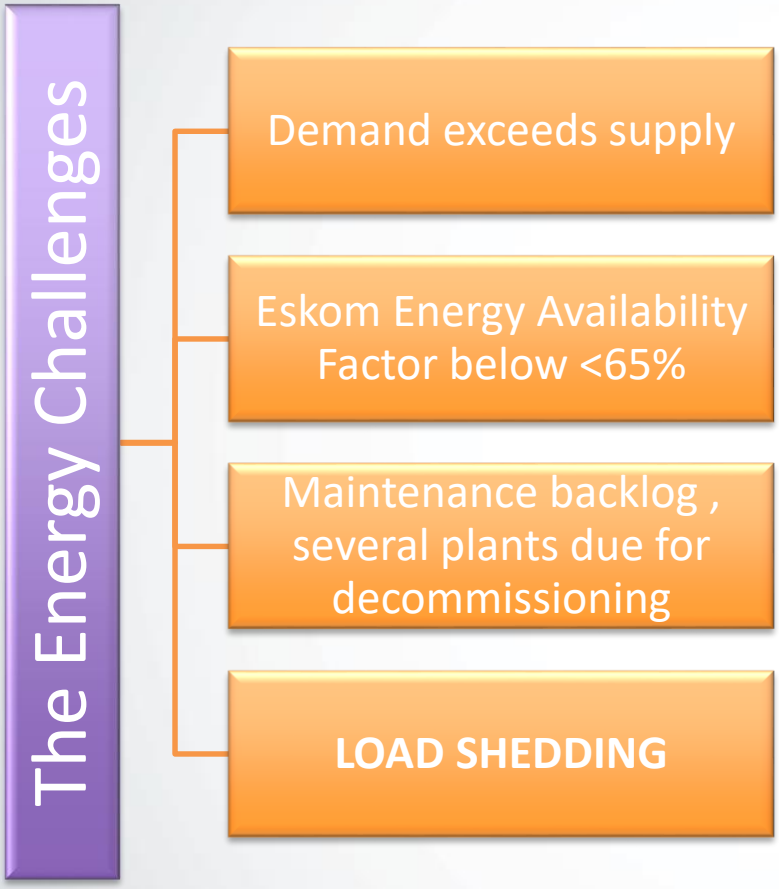
manufacture manufacture manufacture manufacture

Manufacturing capabilities

Sources: NREL, 2018, United Nations, 2017

CSIR
Touching lives through innovation

How does the South African decarbonisation agenda address the energy challenges

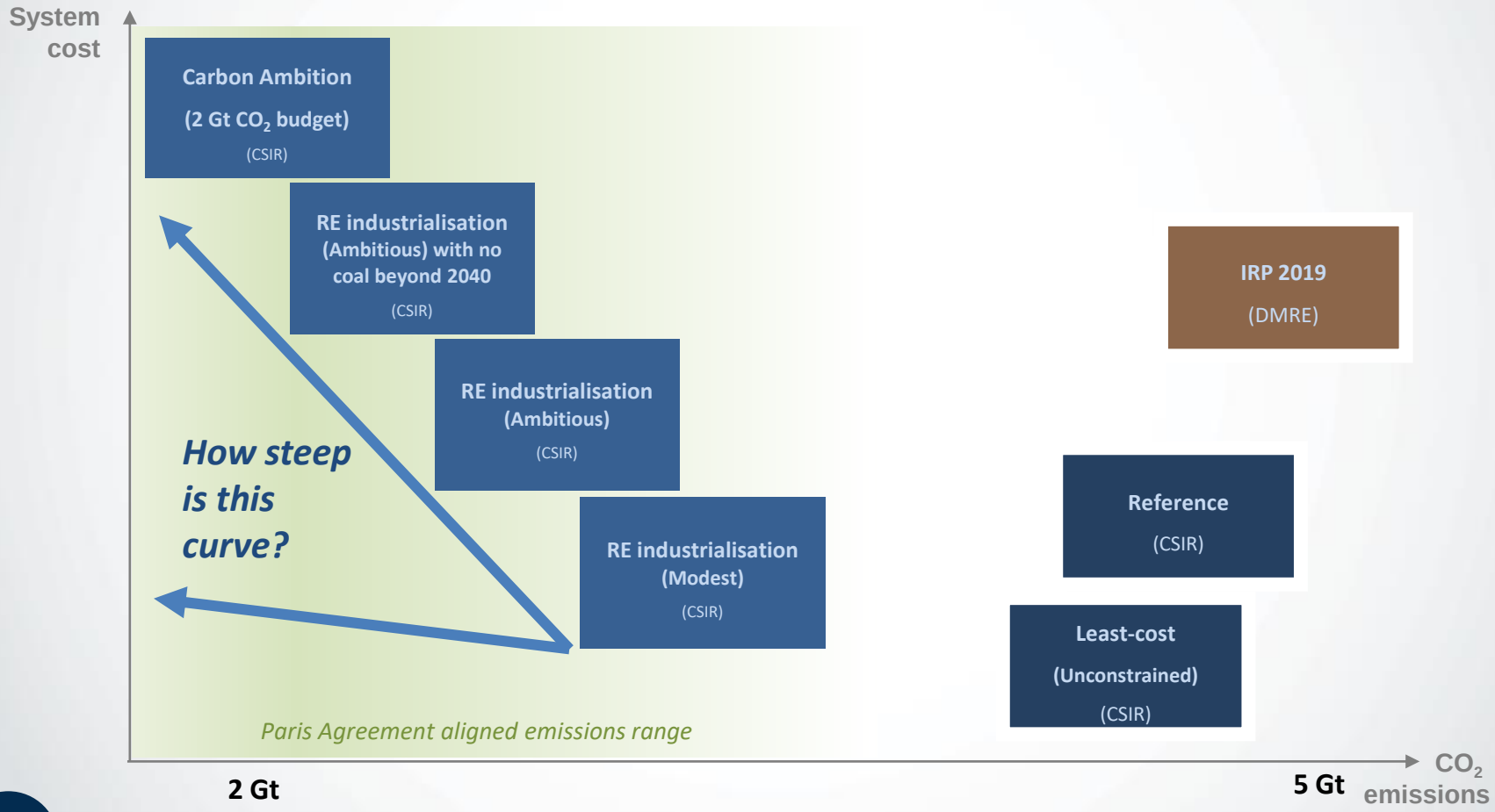


Government Commitments to Resolve Energy Challenges

- Issuing of Section 34 Determination to enable procurement of new generation capacity
- procurement of emergency power and round 5 underway in 2021
- Fast-tracking of Small Scale Embedded Generation applications by the Regulator
- Opening of bid window 5 of the renewable energy Independent Power Producers (IPPs) Procurement Programme
- Can supplementary power purchase agreements to acquired as additional capacity from existing wind and solar plants
- Put in place measures to enable municipalities in good financial standing to procure their own power from IPPs
- Fast-tracking of l applications by commercial and industrial users to produce electricity for own use above 1MW
- accelerating the completion of bid window 5 RE projects
- 100 MW License exemption now allowed

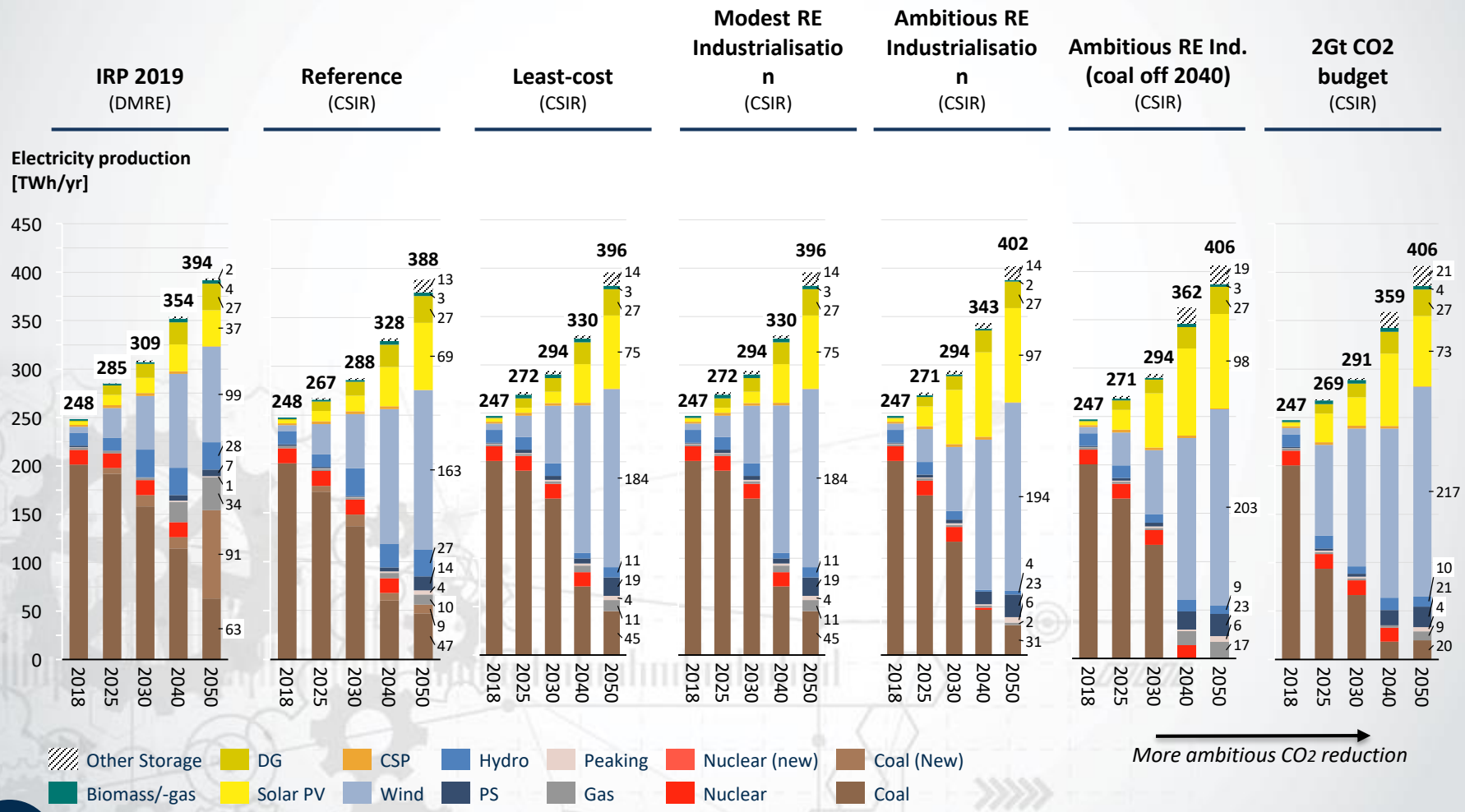
CSIR
Touching lives through innovation

Case study example – A long-term view, how expensive would it be to decarbonise beyond least-cost?



Notes: All scenarios include immediate customer response at scale (mostly embedded/distributed solar PV, storage) and other short-term risk mitigation capacity to ensure adequacy gap is met (portfolio of technologies/options). RE – Renewable CSIR Energy Centre analysis; Meridian Economics energy; IRP – Integrated Resource Plan. Graph not to scale, illustration purposes only.
Sources: CSIR Energy Centre analysis; Meridian Economics

Case study – What would an accelerated renewables roll-out mean for CO2 emissions and cost?



DG = Distributed Generation; PS = Pumped Storage
Sources: CSIR Energy Centre analysis

Identified bottlenecks in the South Africa Just Transition

- Over 90% of renewable energy jobs are temporal – Value chain different from coal
- Localisation of energy technologies also means that the cost of electricity would increase;
- The South African electricity sector is not big enough to justify economies of scale (i.e., approximately about 40 GW)
- Climate science models show that there need to reduce carbon emissions is more urgent as the global air temperatures may rise by more than 1.5°C in 20 years.
- Limited funded to supported an accelerated decarbonation agenda.

Key enabler for a just energy transition

What needs to be done to achieve a just energy transition?

1. Mapping the just energy transition planning framework for South Africa's power sector –It will not be automatic

2. Establish partnerships and social dialogue between government, local municipalities, enterprises and labour unions to guarantee a just energy transition

3. Developing Social Protection Plans that will secure salaries, pension rights, healthcare benefits, cash transfers for early retirement packages for coal sector employees and sustain economic activities in coal phase-out regions

4. Investment in infrastructure, skills and reskilling for the affected workforce as well as the formation of alternative industries that will mitigate the impacts of coal phase-out

5. Technology transfer – Localise renewable energy technologies and implement procurement models that drive and support local ownership and manufacturing

6. Understand the trade-offs of the energy transition as well as the implication of coal consumption and production change on the GDP

7. **Green investment should adopt a shared value principle** – adopting a shared value principle in green investment would create value for communities. This means that the communities located where renewable energy investment would take place would need to co-own investments in their communities. This will allow communities to raise capital and develop their low-carbon projects in the future as they gain more capacity throughout the project development value chain; and

8. A **just energy transition fund needs to be established** to deal with all the socioeconomic impacts that might arise from the energy transition. Moreover, potential losers in the energy transition (i.e., coal sector workers) need to be protected, and this fund can contribute to social protection plans.

Source: Just energy transition CSIR analysis,

Questions and discussions

- Thank you for your attention

Dr Stanley Semelane

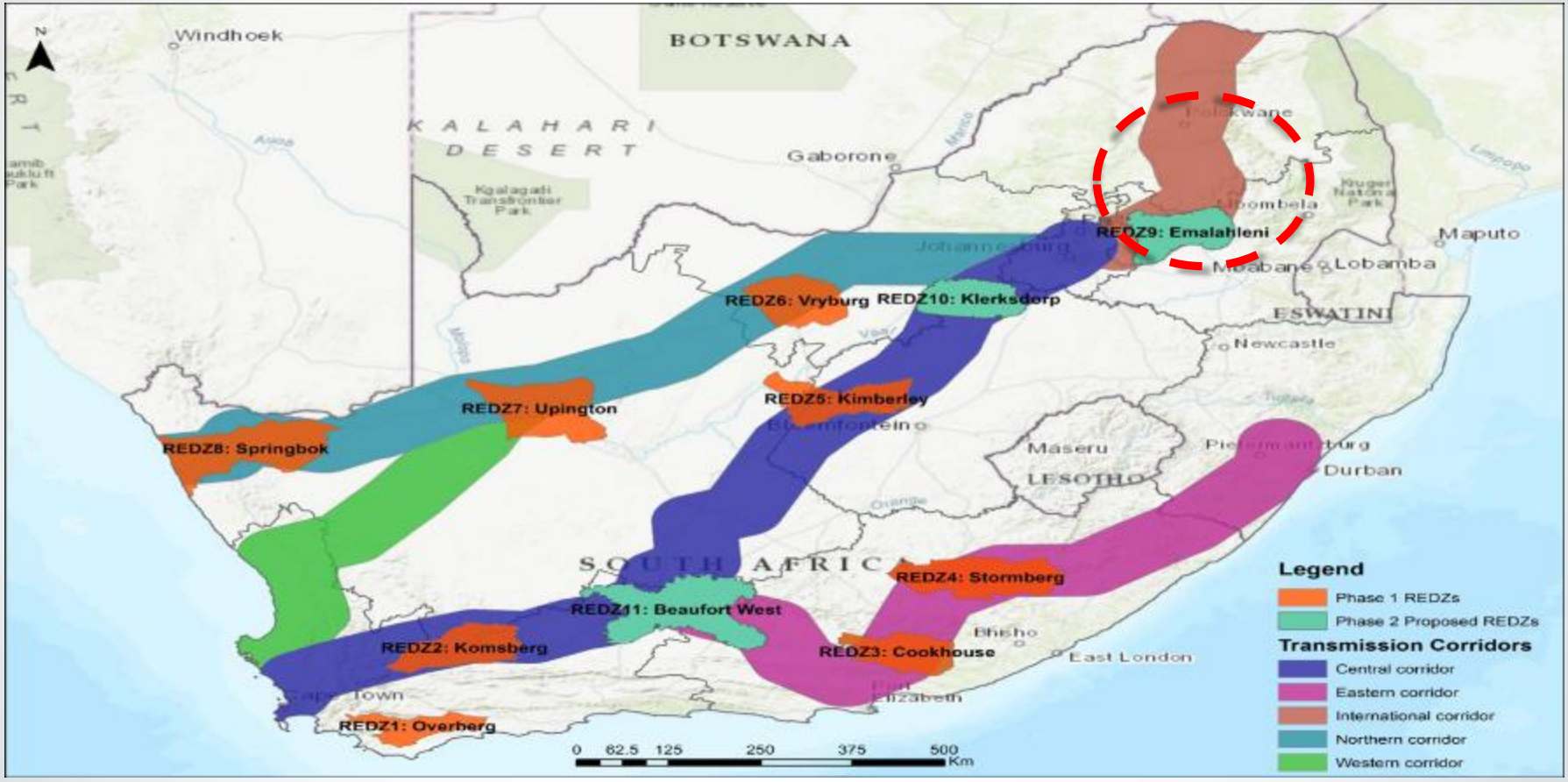
SSemelane@csir.co.za

065 856 3373

CSIR

Touching lives through innovation

Back-up: Renewable Energy Development Zones (REDZ)



Source: CSIR, 2018

CSIR
Touching lives through innovation