SOUTH AFRICA'S ENERGY TRANSITION: A STORY UNFOLDING

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ERC

ENERGY RESEARCH CENTRE

University of Cape Town

WIDER Development Conference

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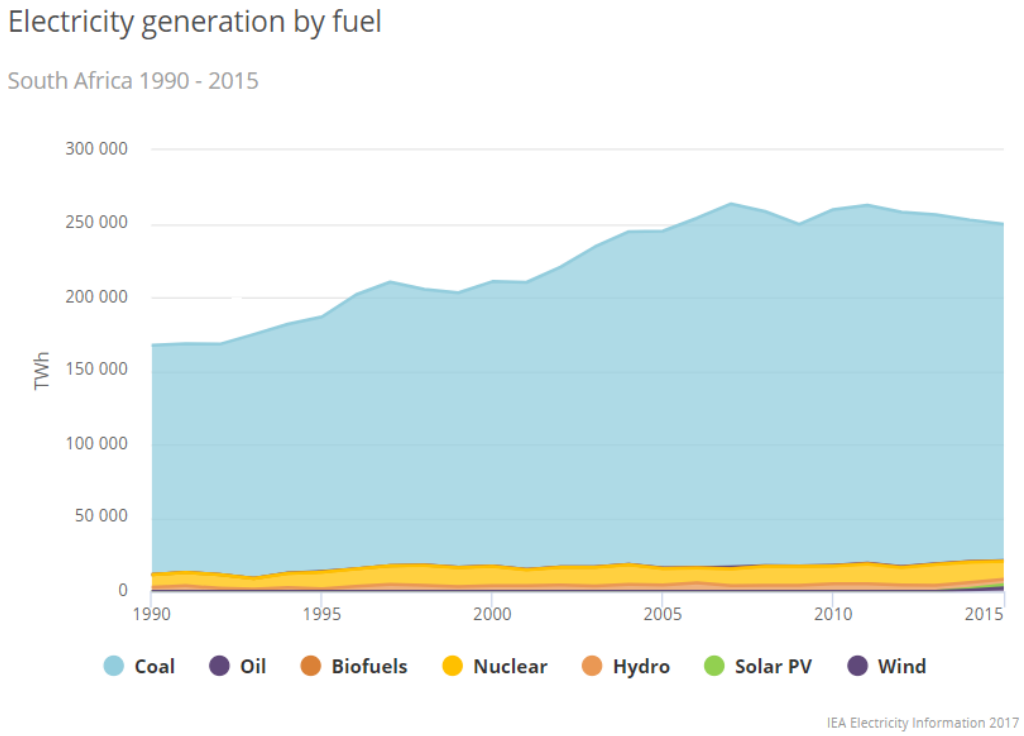
Helsinki, Finland

ENERGY HISTORICALLY COAL BASED

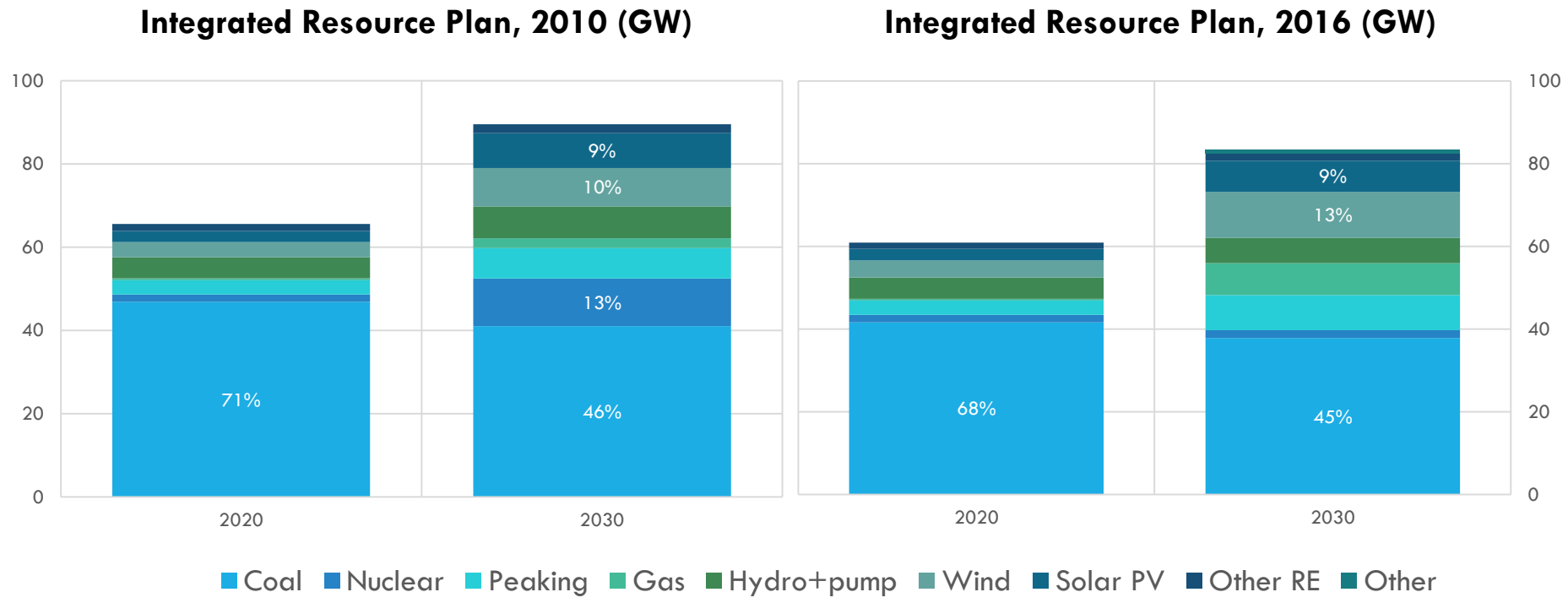


Coal accounts for 73% of primary energy usage in South Africa

Coal power stations account for 74% of total electricity capacity and 82% of total generation

Smaller shares are used by industry and the liquid fuels sector

EXPECTATIONS FOR ENERGY TO REMAIN FOSSIL FUEL INTENSIVE

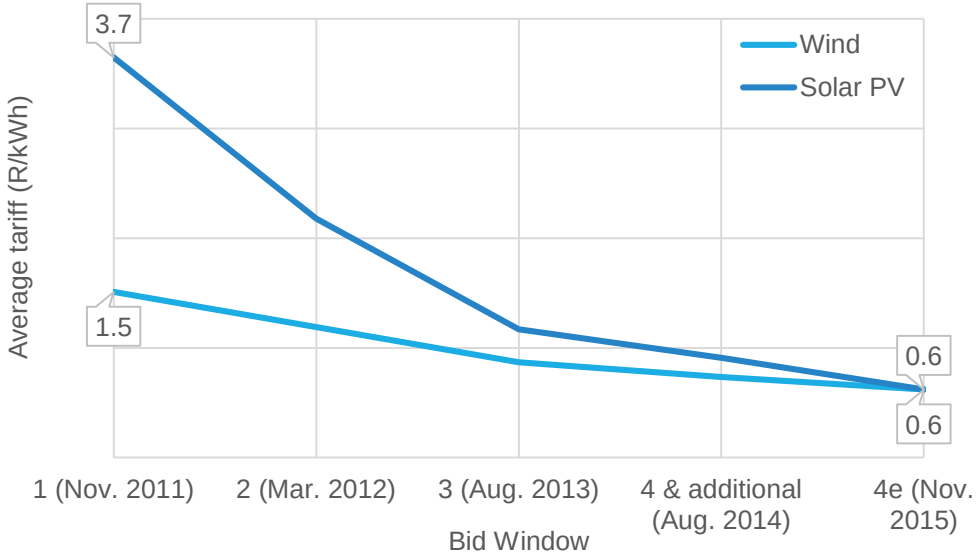


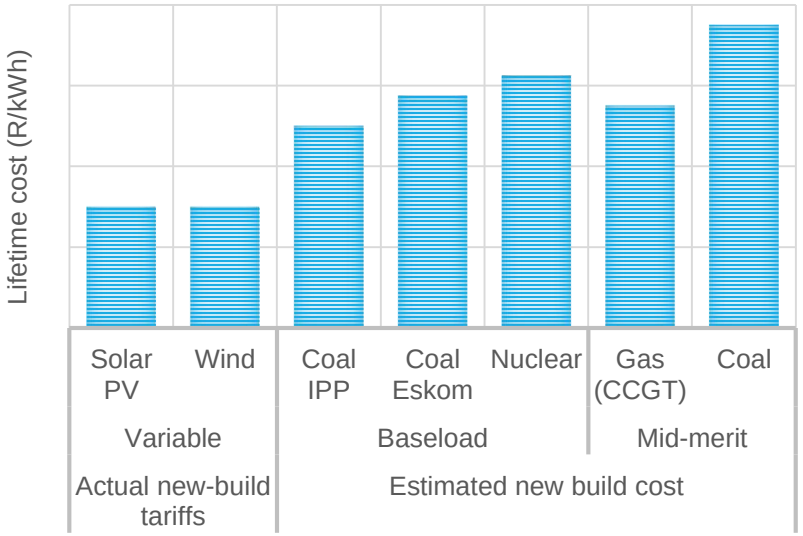
Source: Department of Energy, South Africa

South Africa has sufficient capacity to meet demand to 2025 – electricity demand expected to increase by ~2.7% pa

LIMITED INCLUSION OF VRE, PRICE DECLINES HAVE BEEN LARGE

- REIPPPP programme to ensure inclusion of RE → YTD 6 bid windows = 6.8GW (3.8 operational)
  - solar PV: 2.3; wind: 3.3
- Inclusion of RE however capped (solar PV: 1GWpa; wind: 1.8GWpa)
- Despite limited inclusion prices have decreased >50%
- Local manufacturing industry stimulated through local requirements



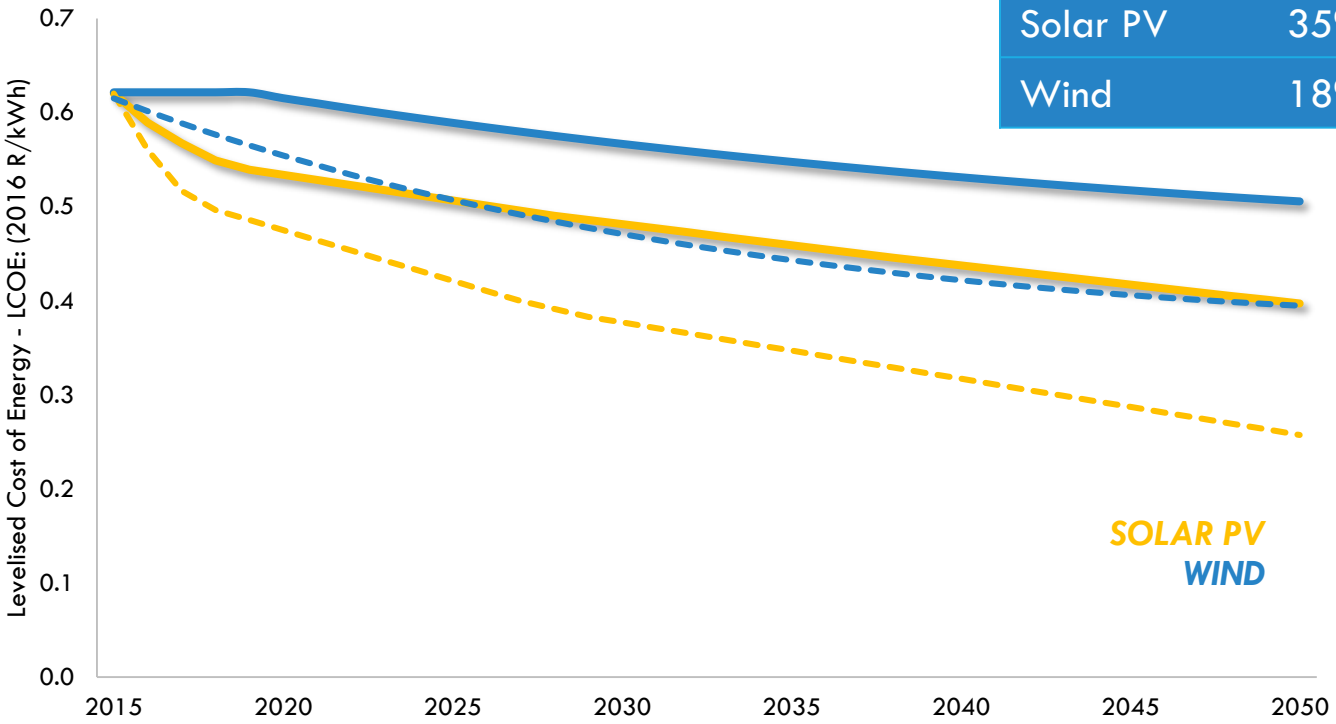


Source: Arndt et al. 2018

AND WILL CONTINUE TO FALL

Price declines to 2050

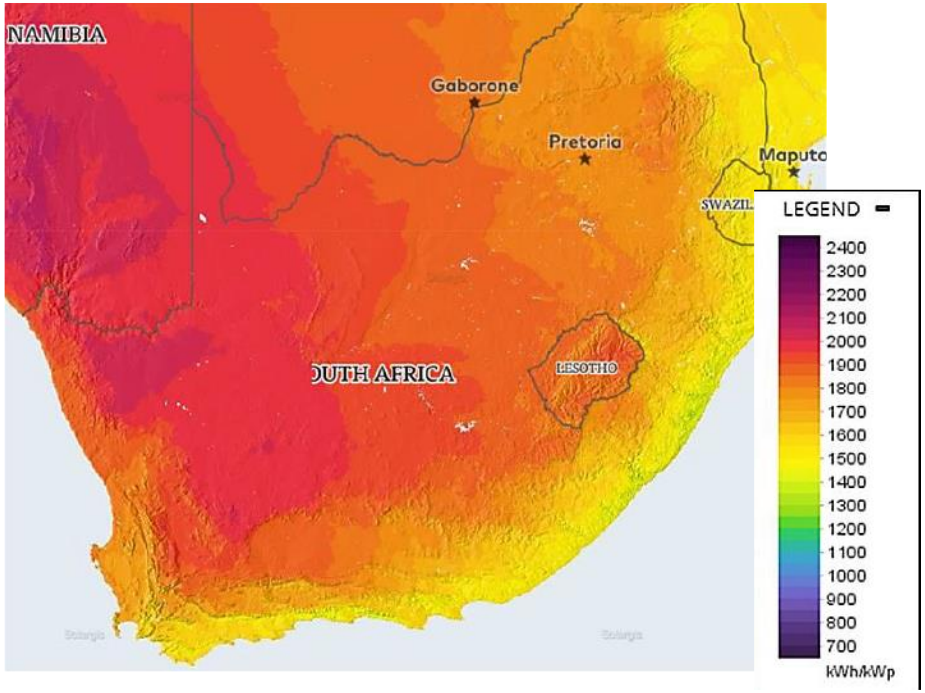
	Conservative	Optimistic
Solar PV	35%	58%
Wind	18%	37%



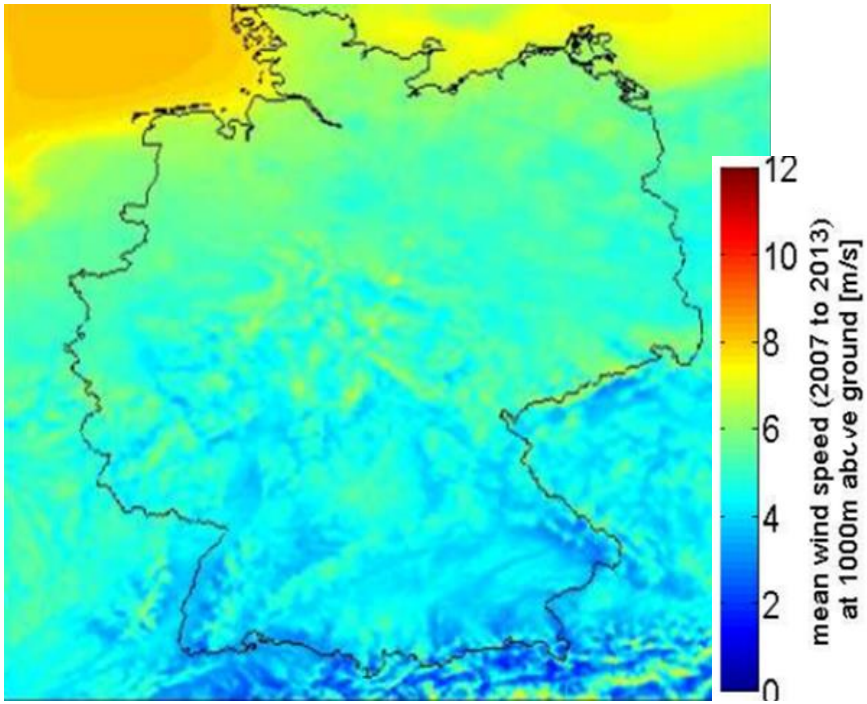
Source: Ireland and Burton, 2018

LARGE, COMPLEMENTARY, RESOURCES

SOLAR

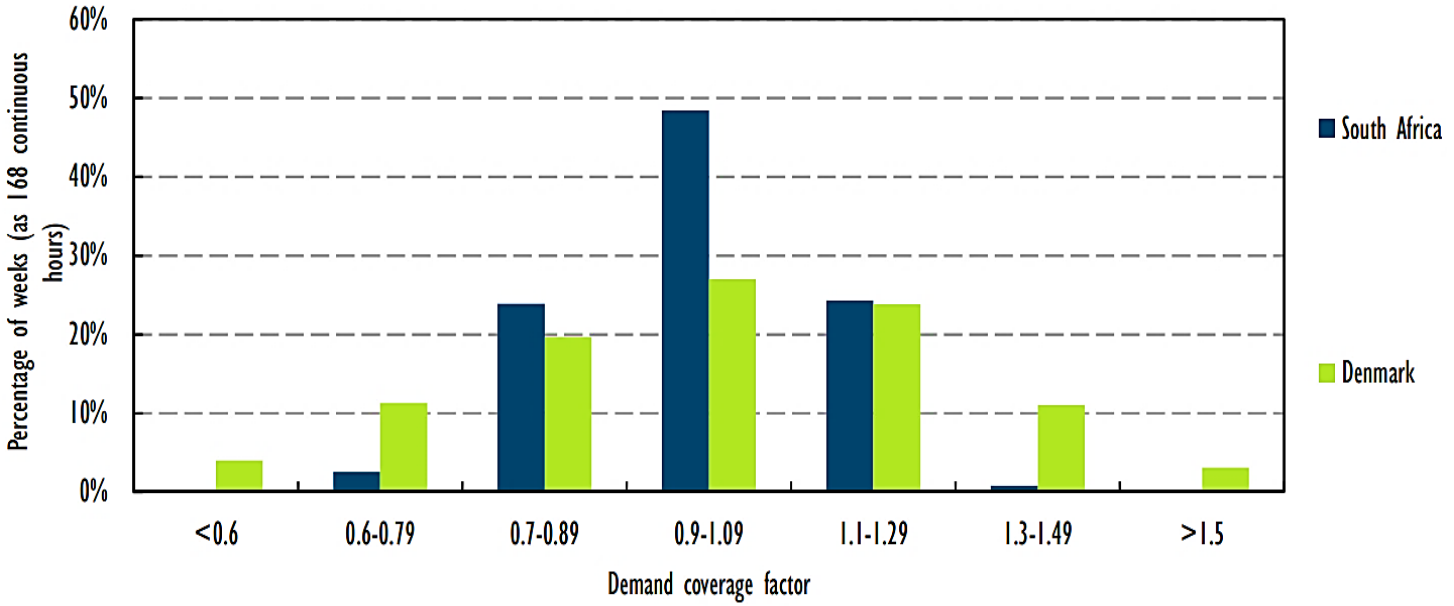


WIND



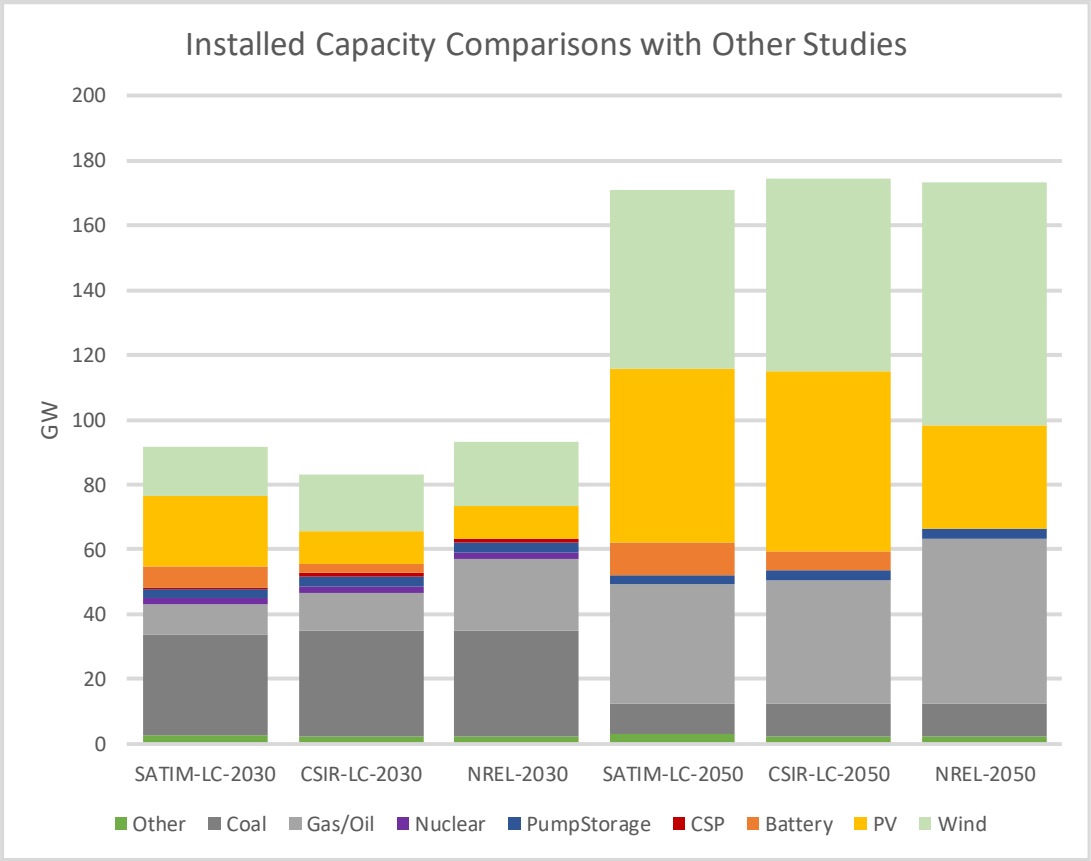
Source: Solar GIS, 2017; CSIR & Fraunhofer, 2016

LARGE, COMPLEMENTARY, RESOURCES



Source: IEA, 2016

LEAST COST PLANNING - LARGER ROLE FOR VRE



Source: Merven et al., 2018

Recent least cost studies

- Wright et al. (2017)
- Merven et al. (2018)
- Reber et al. (2018)

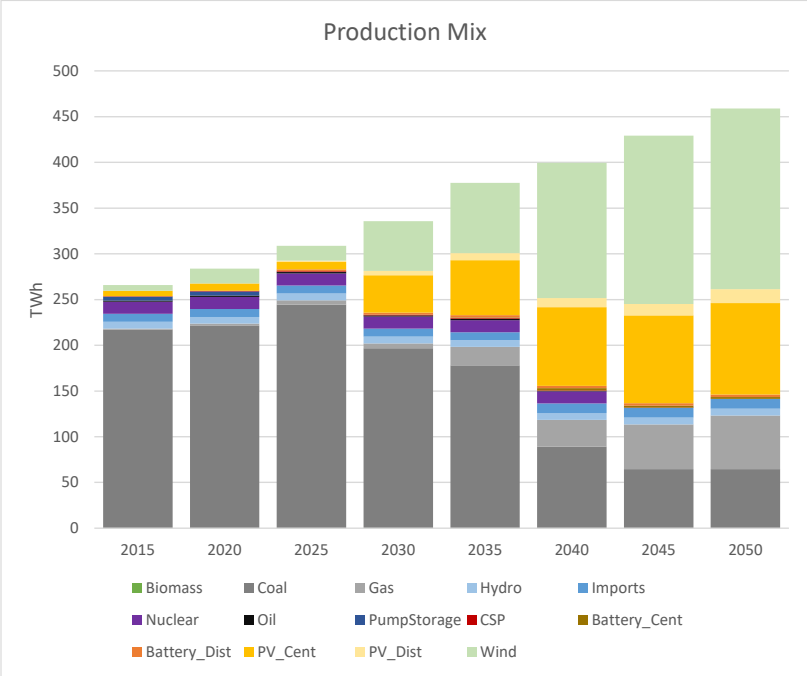
Wright/Reber: extensive adequacy testing at very high temporal resolution, only electricity;
Merven: full energy system

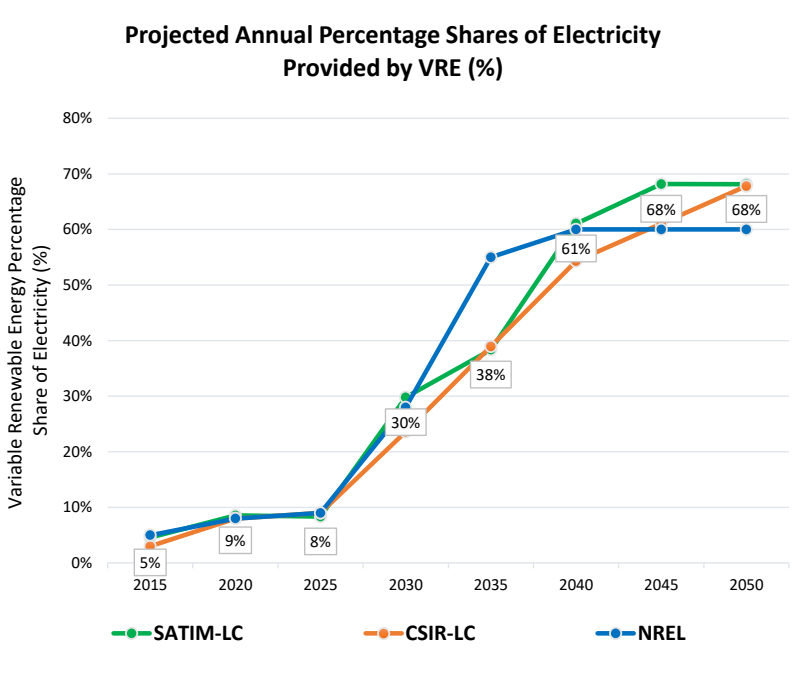
No new capacity needed over medium term

Capacity thereafter → 4GW wind; 3GW solar pa to 2040

Solar PV and wind capacity reaches 20% and 16% of total capacity in 2030
(IRP 2016: 9%;13%)

VRE = 68% OF GENERATION BY 2050



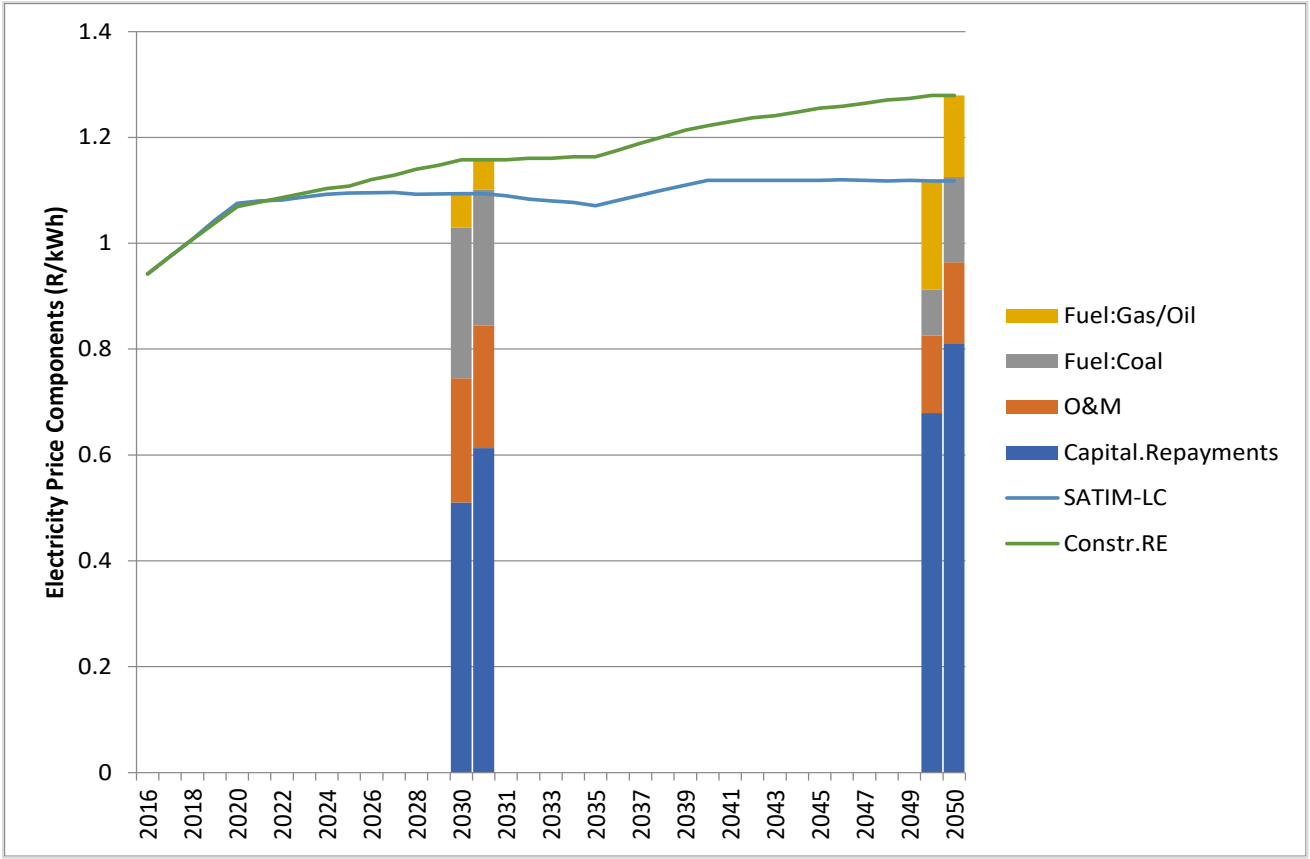


Source: Merven et al., 2018

BUT COULD BE AS HIGH AS 80%

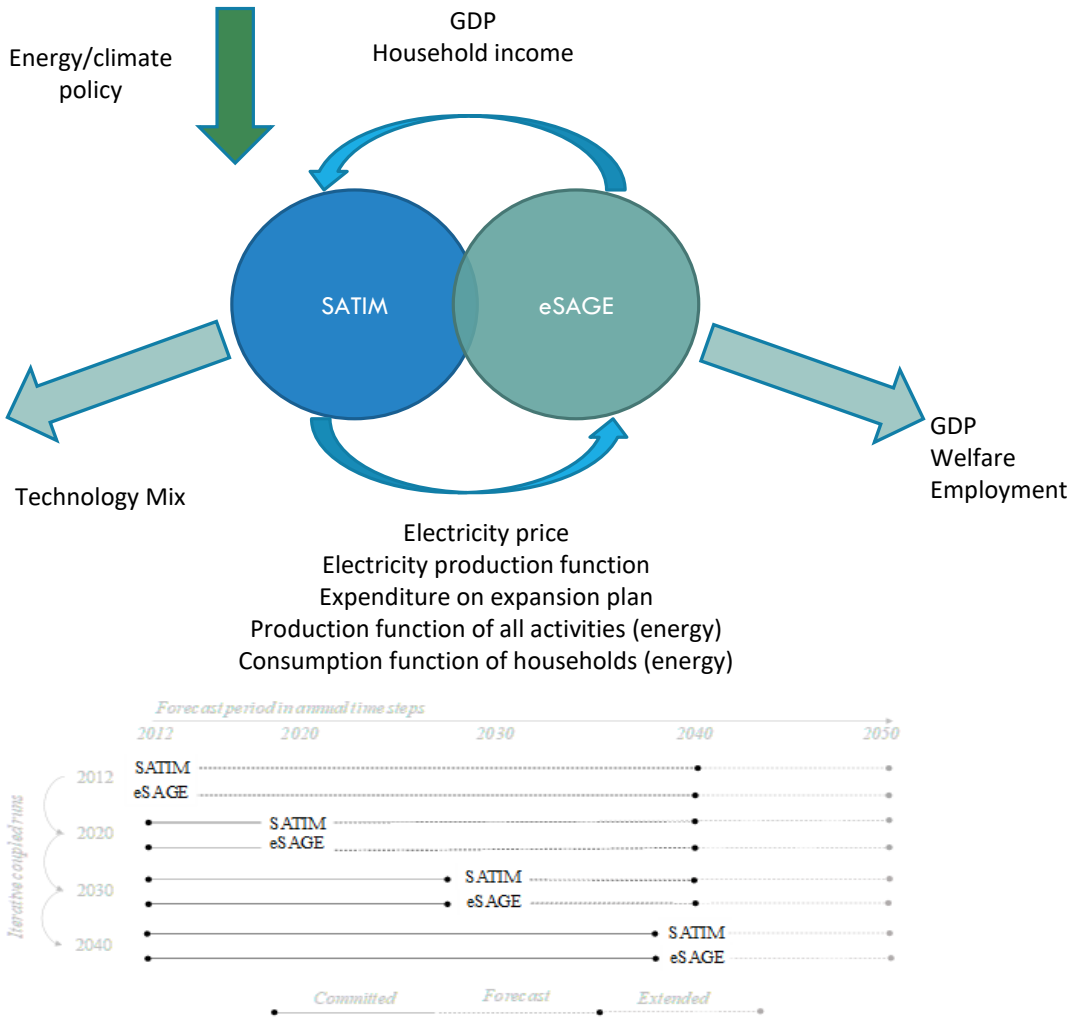
(lower costs, endogenous plant retirement)

LOWER LONG-TERM ELECTRICITY PRICES



Source: Merven et al., 2018

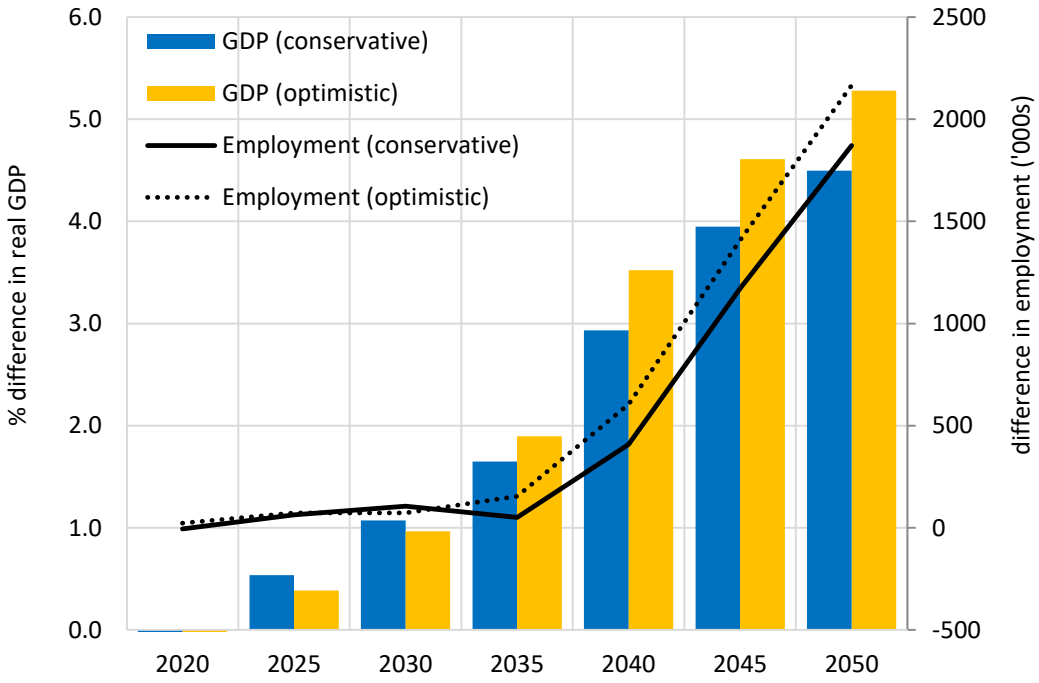
LINKED ENERGY-ECONOMIC MODEL



- Developed by ERC, UNU-WIDER and RSA National Treasury
- Combines ERC's bottom-up SATIM model (full energy model) with RSA National Treasury's eSAGE model (dynamic CGE)
- Combined model addresses the limitations of each model in energy analysis while maintaining its strengths
- Allows for a consistent framework for assessing the economic implications of changes in energy systems and energy usage in South Africa
- Useful for emissions analysis

Source: Arndt et al., 2016

INCREASED VRE CAN LEAD TO HIGHER GROWTH AND EMPLOYMENT



Lower electricity investment and electricity price

Positive impacts extend across economy

- electricity and services experience the largest gains

Coal mining declines

- Losses likely regardless due to changes in global demand, prices and domestic capacity constraints

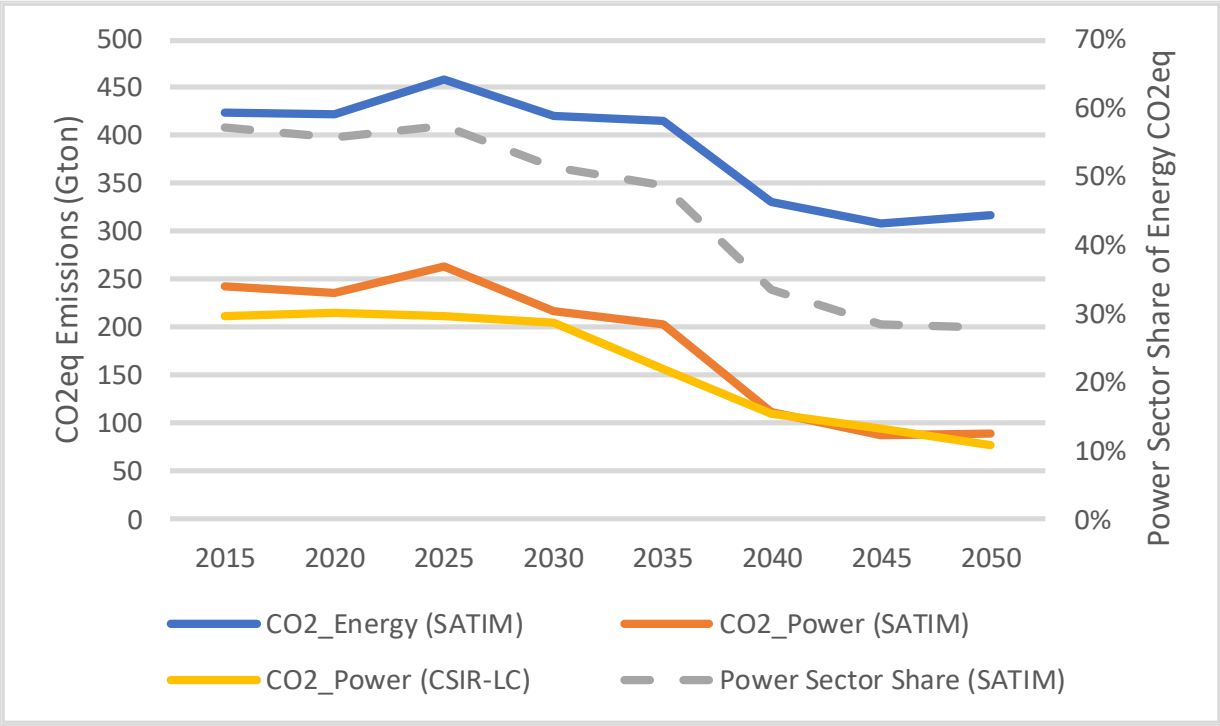
Higher overall welfare

- Similar gains experienced in poor and non-poor households

Impacts are however dependent on the availability of labour resources, primarily grade 12 and above

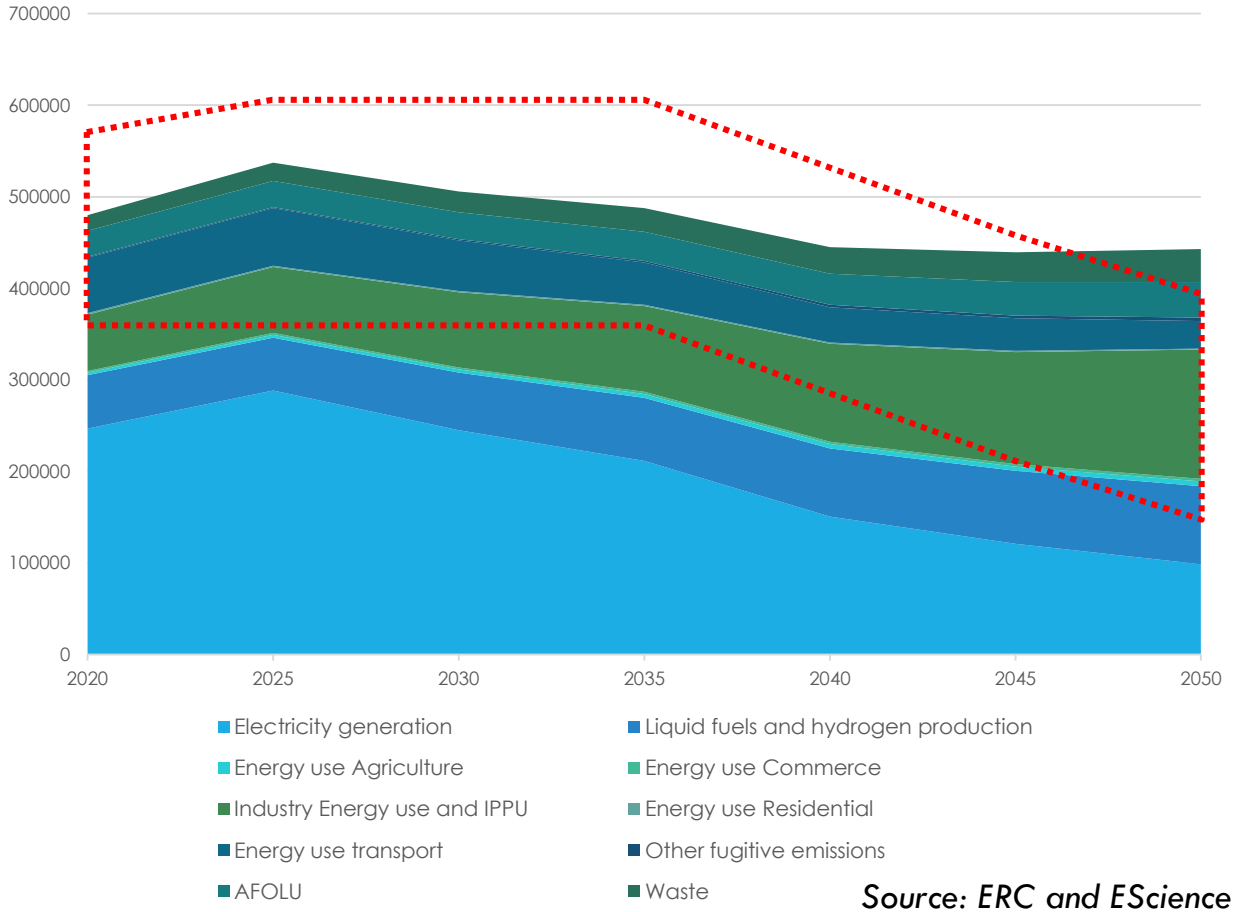
Source: Hartley et al., 2018

POWER SECTOR EMISSIONS DECLINE



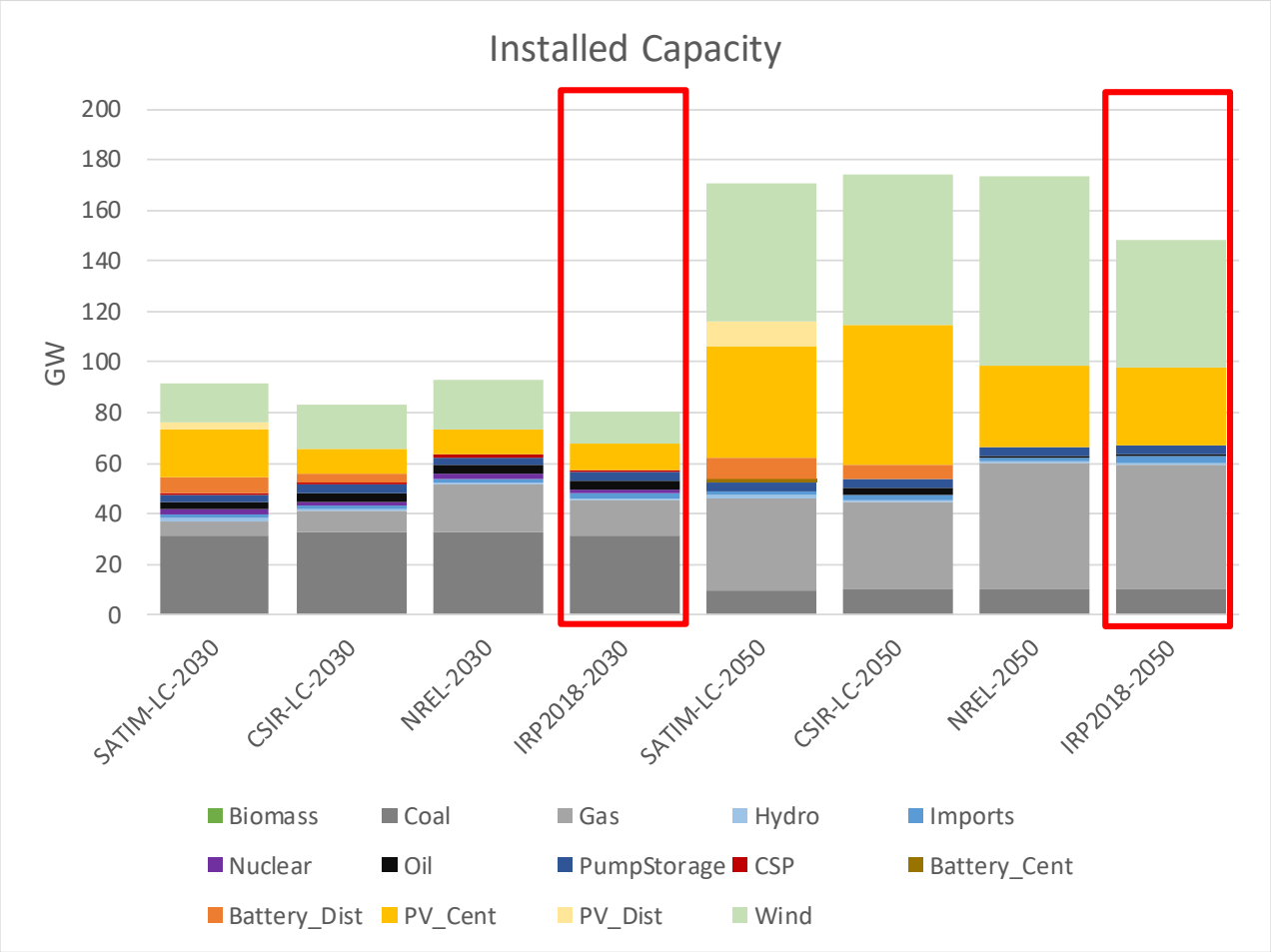
Source: Merven et al., 2018

ASSIST IN MEETING GLOBAL COMMITMENTS



Source: ERC and EScience Associates, 2018

2018 INTEGRATED RESOURCE PLAN



KEY MESSAGES

Large amounts of renewable energy can be included in the South African electricity generation mix, decreasing emissions, without negatively affecting overall economic growth and employment.

Coal mining communities however will be negatively impacted by the decline in coal demand and a transition plan is needed to mitigate the impact on these communities.

While the 2018 Integrated Resource Plan continues to constrain annual build limits in solar PV and wind to 2030 it acknowledges the importance of renewable energy in electricity mix and the potential role it could play in reducing electricity investments and prices.

Thank you

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