

The Cost Benefits of Renewable Energy

SOUTH AFRICAN WIND ENERGY ASSOCIATION, 2019



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SAWEA's vision

A thriving commercial Wind power industry in South Africa, part of a growing domestic and international renewable power industry that is recognised as a major contributor to social, environmental and economic security.



Energy future of South Africa and the world

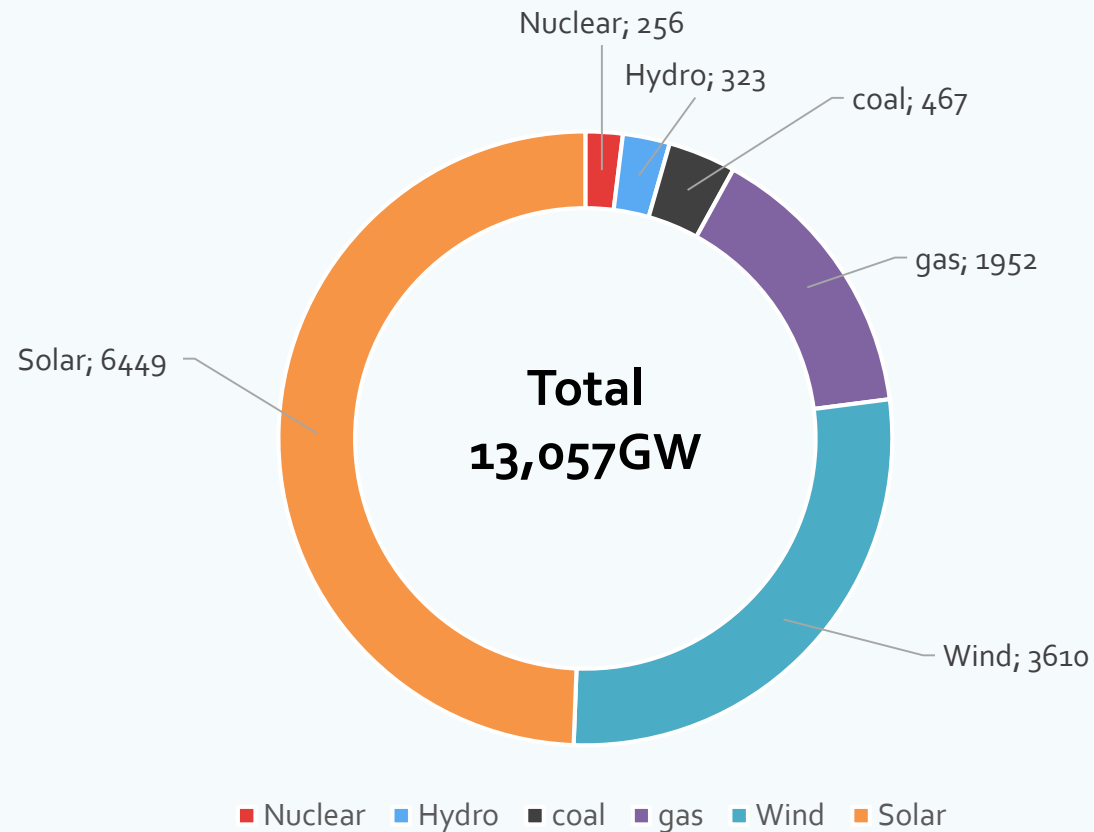


6 Reasons why Renewable Energy are awesome:

- ✦ RE are the cheapest electricity generation sources to install
 - ✦ RE is the cheapest electricity to sell to the customer
 - ✦ RE creates new jobs for the modern economy
- ✦ RE reduced CO₂ production, diesel, coal, gas and water consumption
 - ✦ RE reduces the risk of load shedding
 - ✦ RE contributes directly to the local community

This is what the world is moving towards according to Bloomberg NEF - Capacity addition by Technology, 2018 - 2050

How much capacity (GW) is added over the next 33 years?



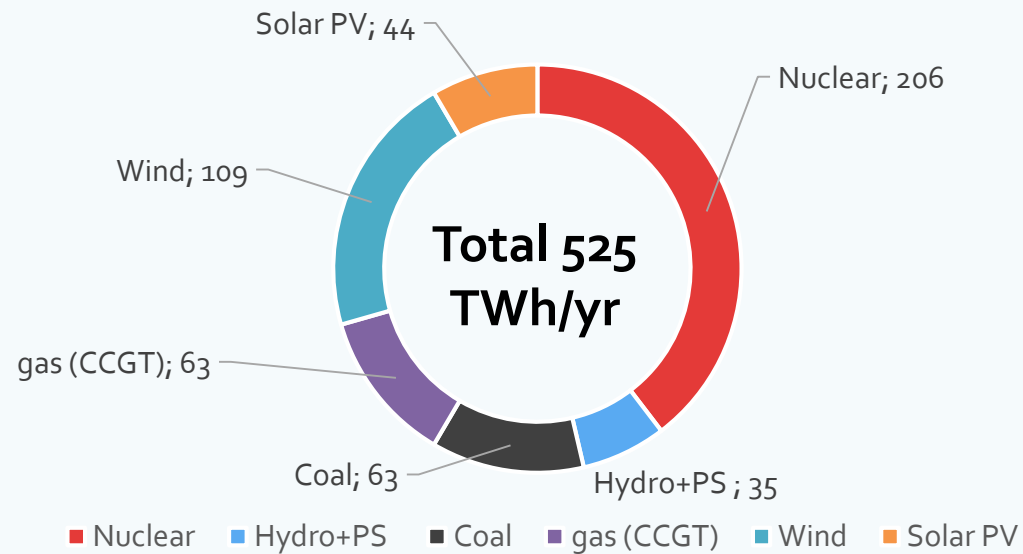
Source: Bloomberg New Energy Finance – New Energy Outlook 2018



South African options being considered

IRP 2016 Base Case

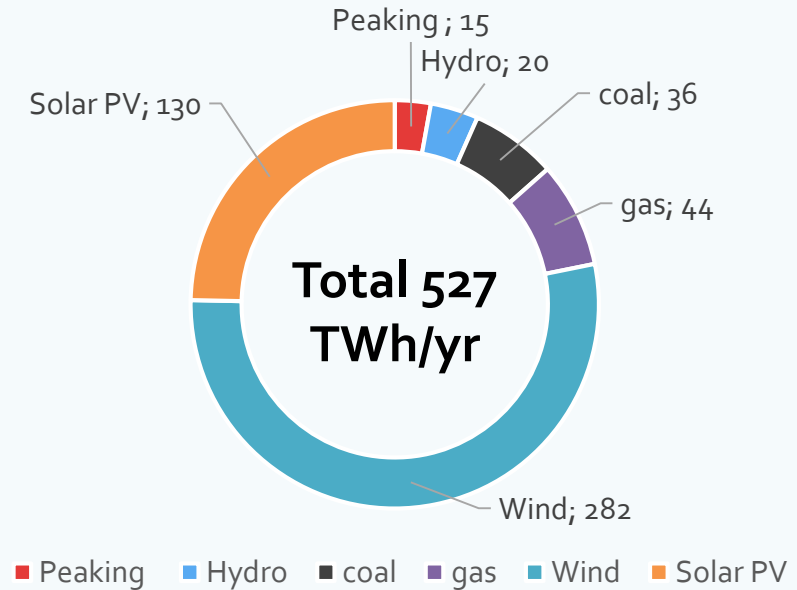
Total Electricity produces in TWh/yr



R1.34/kWh

Least Cost model

Total Electricity produces in TWh/yr



R1.2/kWh

Source: CSIR Comments on Draft IRP2016. CSIR, March 2017.



Least-cost Model Benefits



Least cost model advantages over IRP2016 Base Case (by 2050)



R73 billion per year cheaper



10-20% more jobs in the electricity sector



55% less CO₂ emitted



65% less fresh water consumed

Sources: CSIR Energy Centre analysis



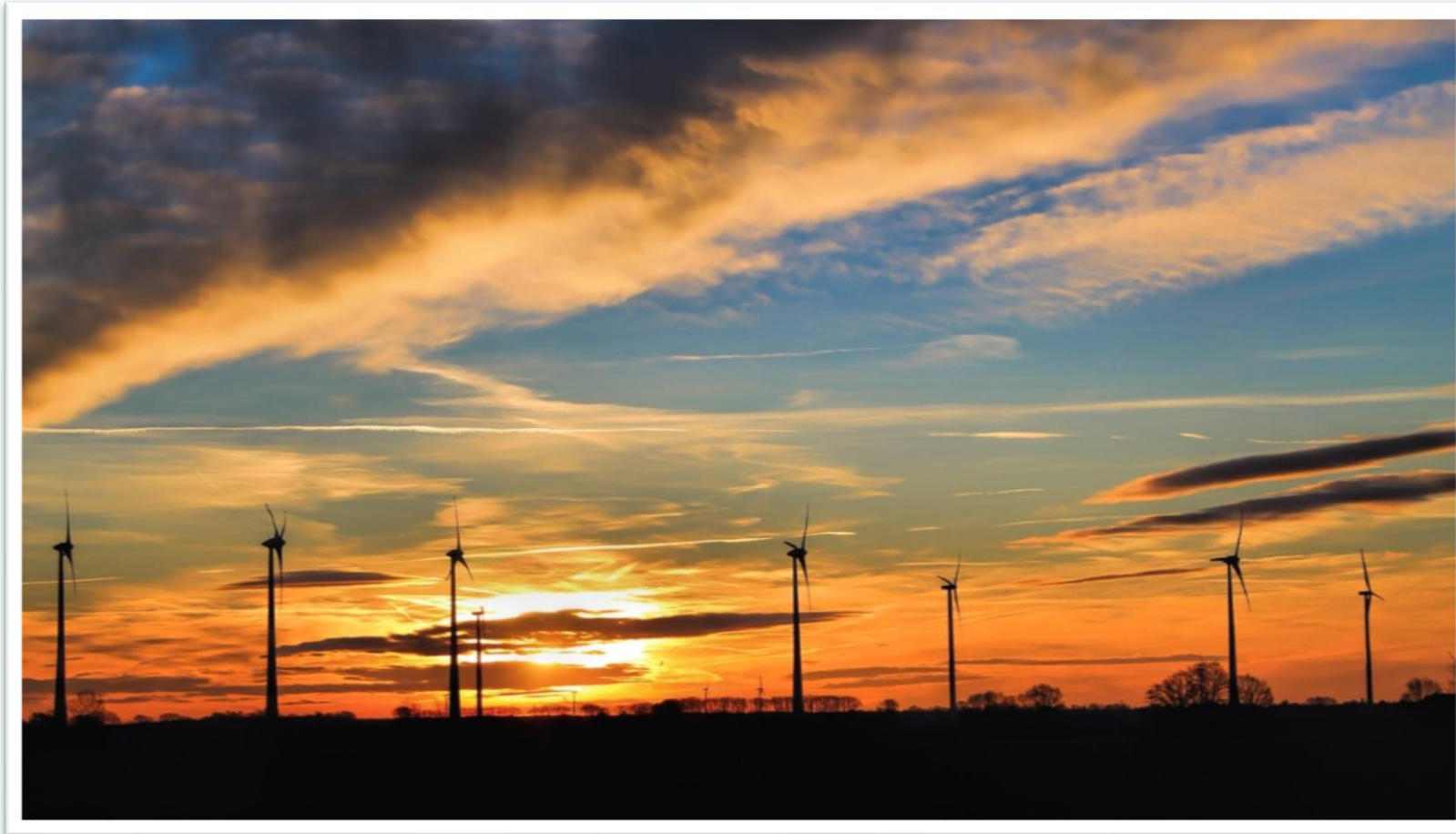
Least cost model advantages deployment



The achieved savings through cheaper RE power can be allocated towards training coal workers to transition to Renewable Energy Jobs

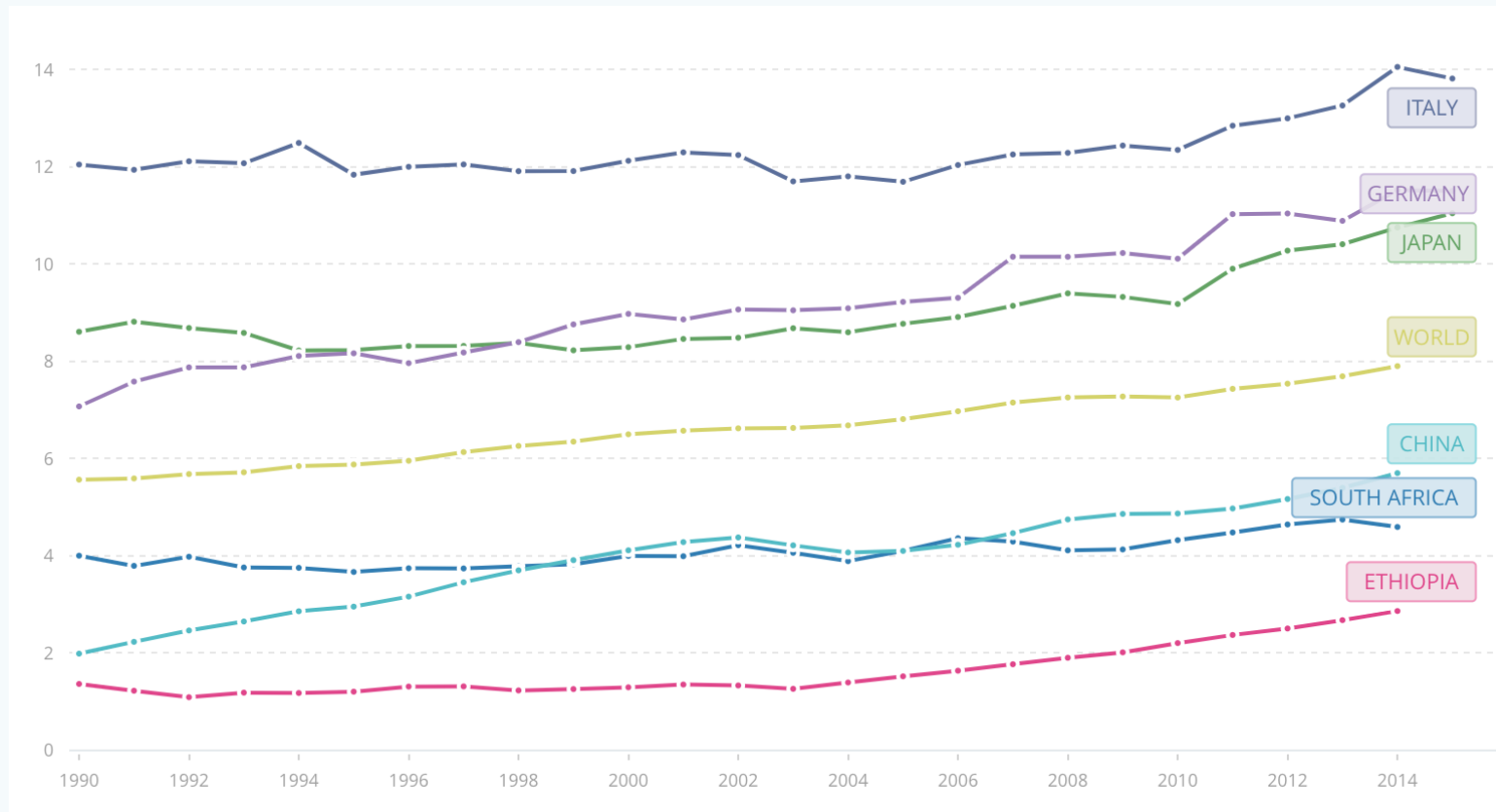


Energy and Carbon Intensity in SA



SA economy's energy efficiency is amongst the worst in the world

GDP per unit of energy use (constant 2011 PPP\$ per kg of oil equivalent.)



South Africa has amongst the worst GDP per unit of energy use in the world.

This ratio makes South Africa less competitive in the global market.

Source: IEA Statistics © OECD/IEA 2014



Least cost model is less carbon intensive



Energy that South Africa produces is amongst the most carbon intensive in the world

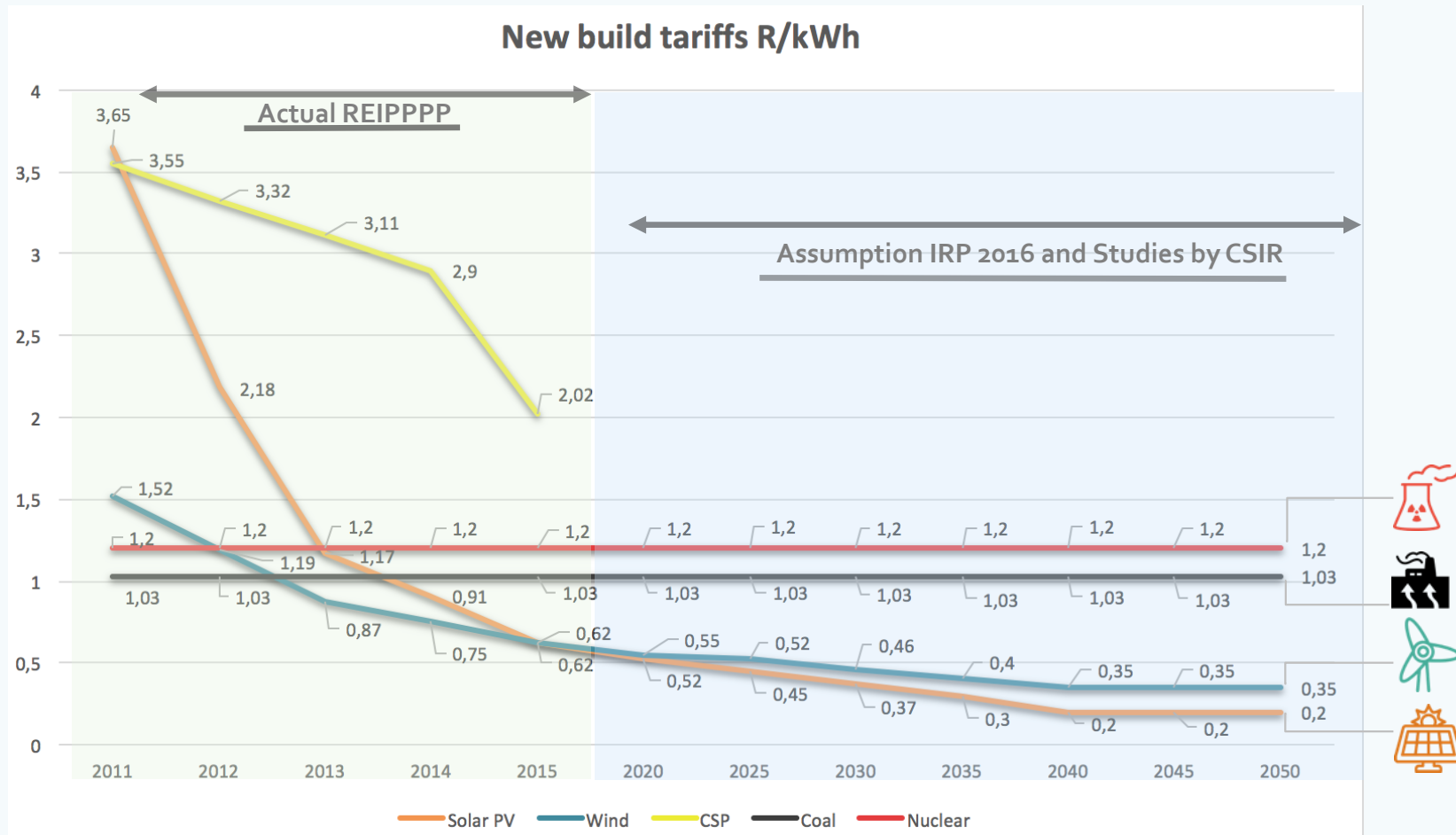
This makes future products produced in South Africa undesirable as the rest of the world is moving towards a carbon natural economies.



The cost of RE vs old technology



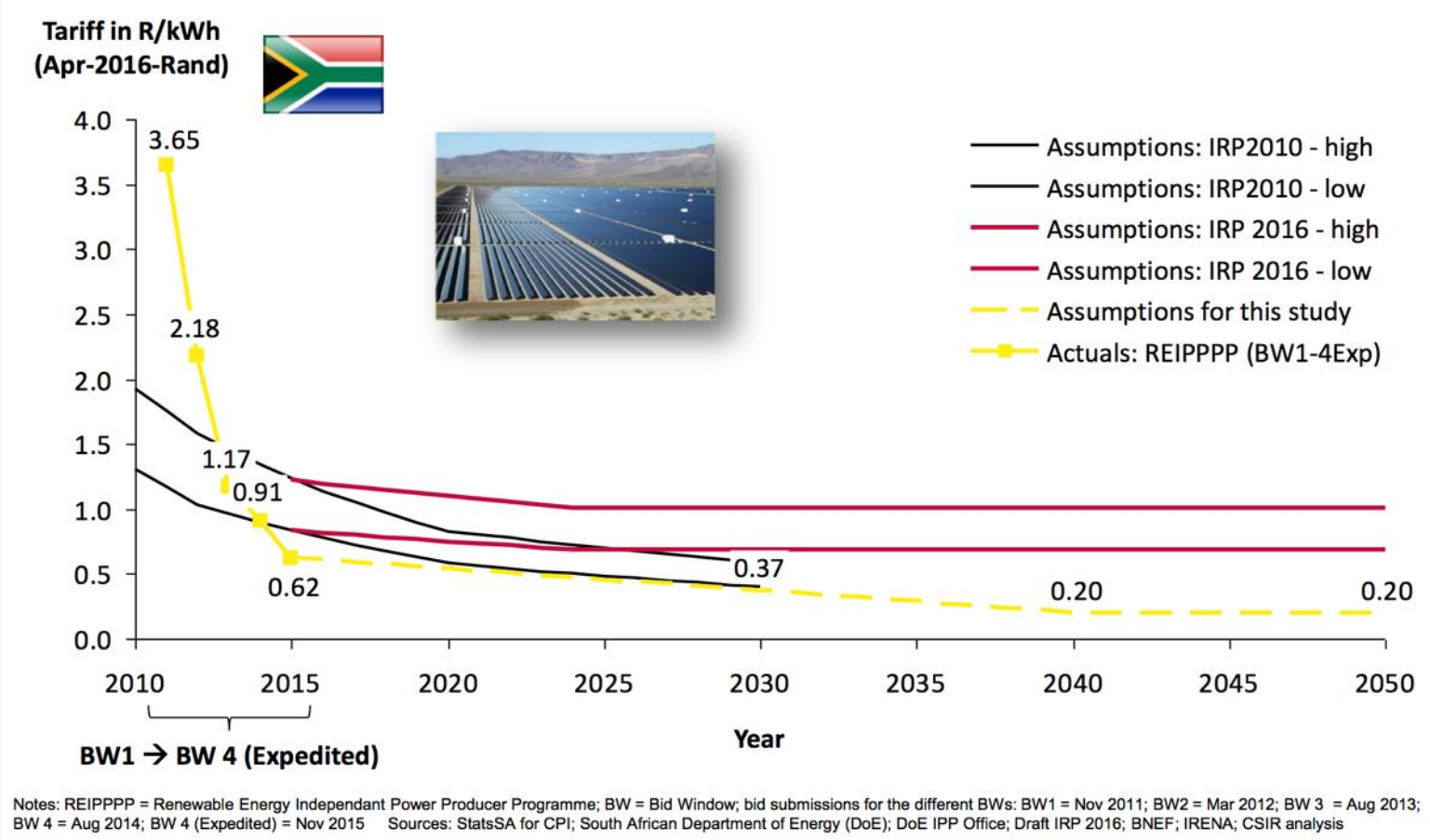
RE already cheapest form of new build electricity, price gap will continue to grow



Source: CSIR Statistics of utility-scale solar PV, wind and CSP in South Africa in 2016. CSIR, April 2017. Nuclear and coal assumptions as per IRP 2016

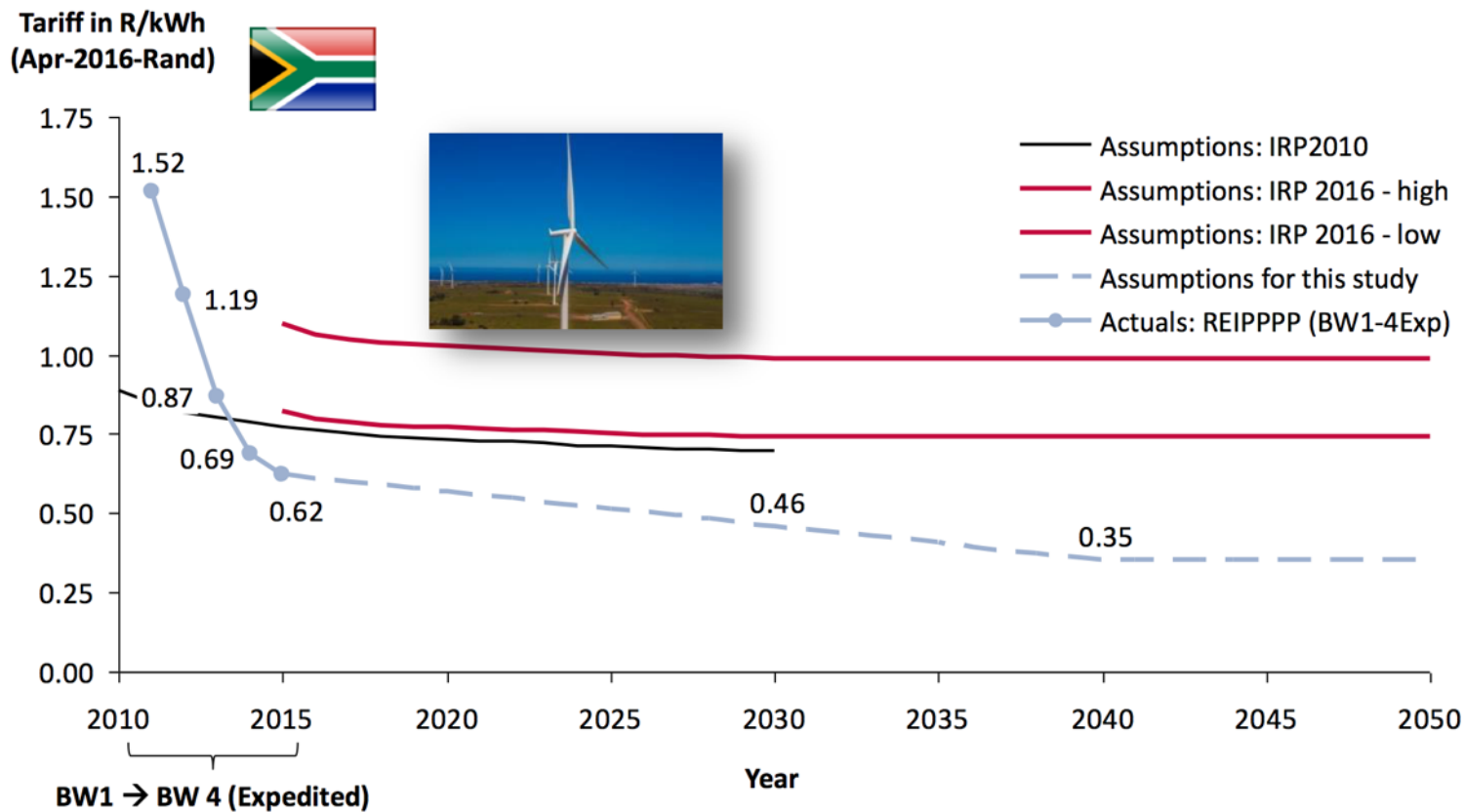


Solar PV and wind power cheaper than any other new supply options



Source: The case for Renewable Energy to provide base load energy in South Africa, CSIR, June 2017

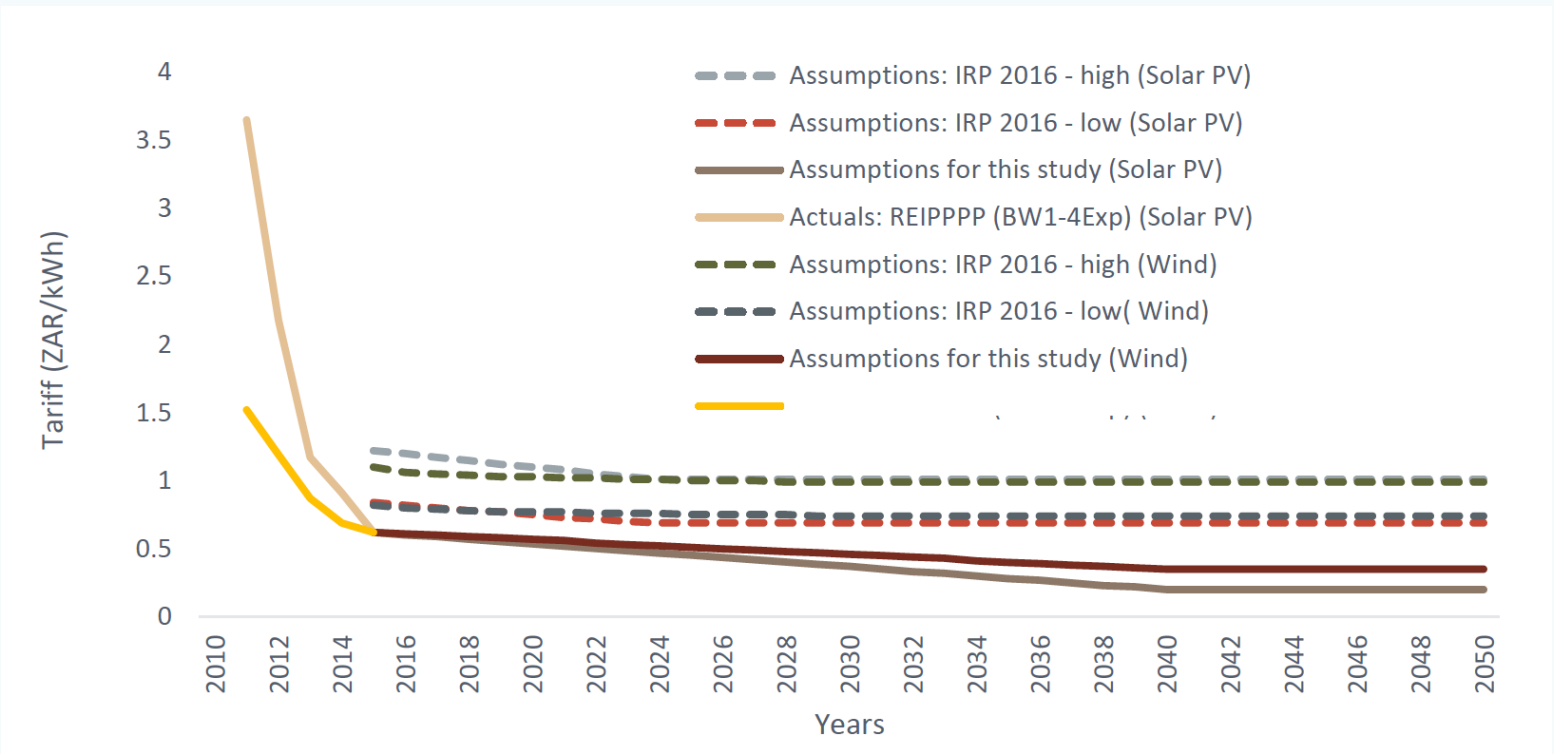
Solar PV and wind power cheaper than any other new supply options



Notes: REIPPPP = Renewable Energy Independent Power Producer Programme; BW = Bid Window; bid submissions for the different BWs: BW1 = Nov 2011; BW2 = Mar 2012; BW 3 = Aug 2013; BW 4 = Aug 2014; BW 4 (Expedited) = Nov 2015 Sources: StatsSA for CPI; IRP 2010; South African Department of Energy (DoE); DoE IPP Office; CSIR analysis



Solar PV and wind power cheaper than any other new supply options

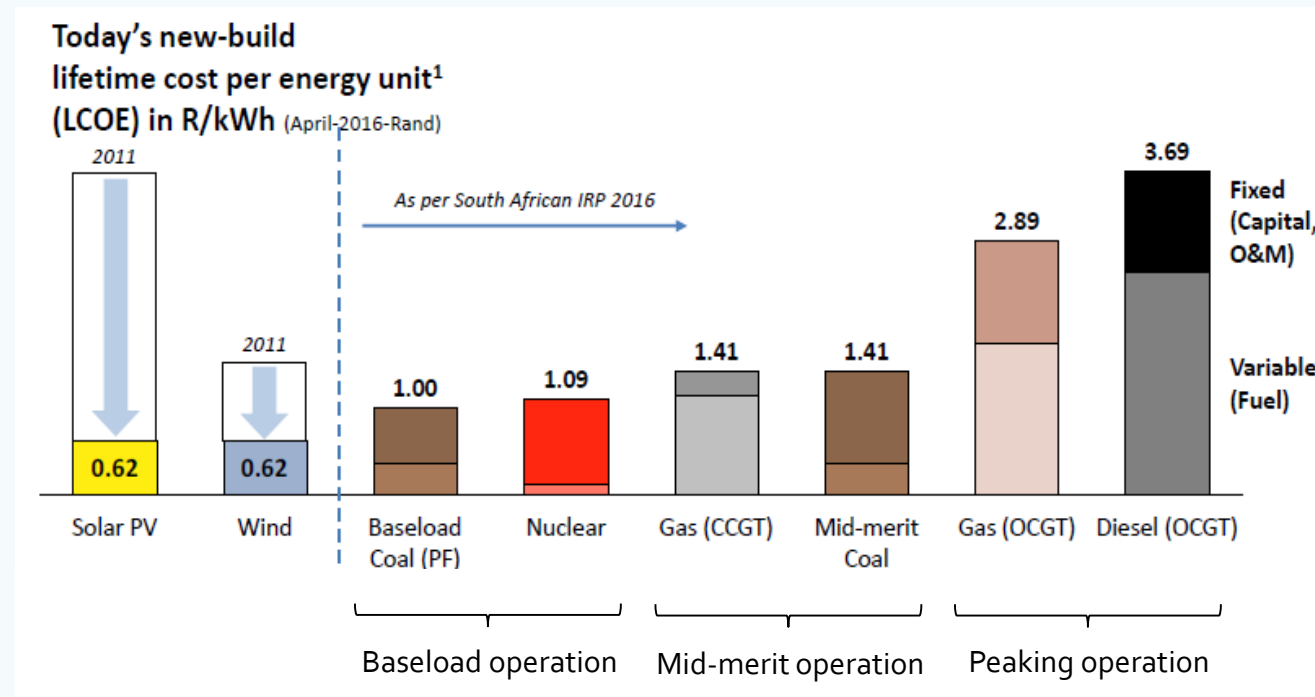


Source: Meridan Economics., Eskom's financial crises and the viability of coal-fired power in South Africa



Solar PV and wind power cheaper than any other new supply options

The 2016 tariff for PV and Wind power almost 40% cheaper than for new coal.



Source: The case for Renewable Energy to provide base load energy in South Africa, CSIR, June 2017

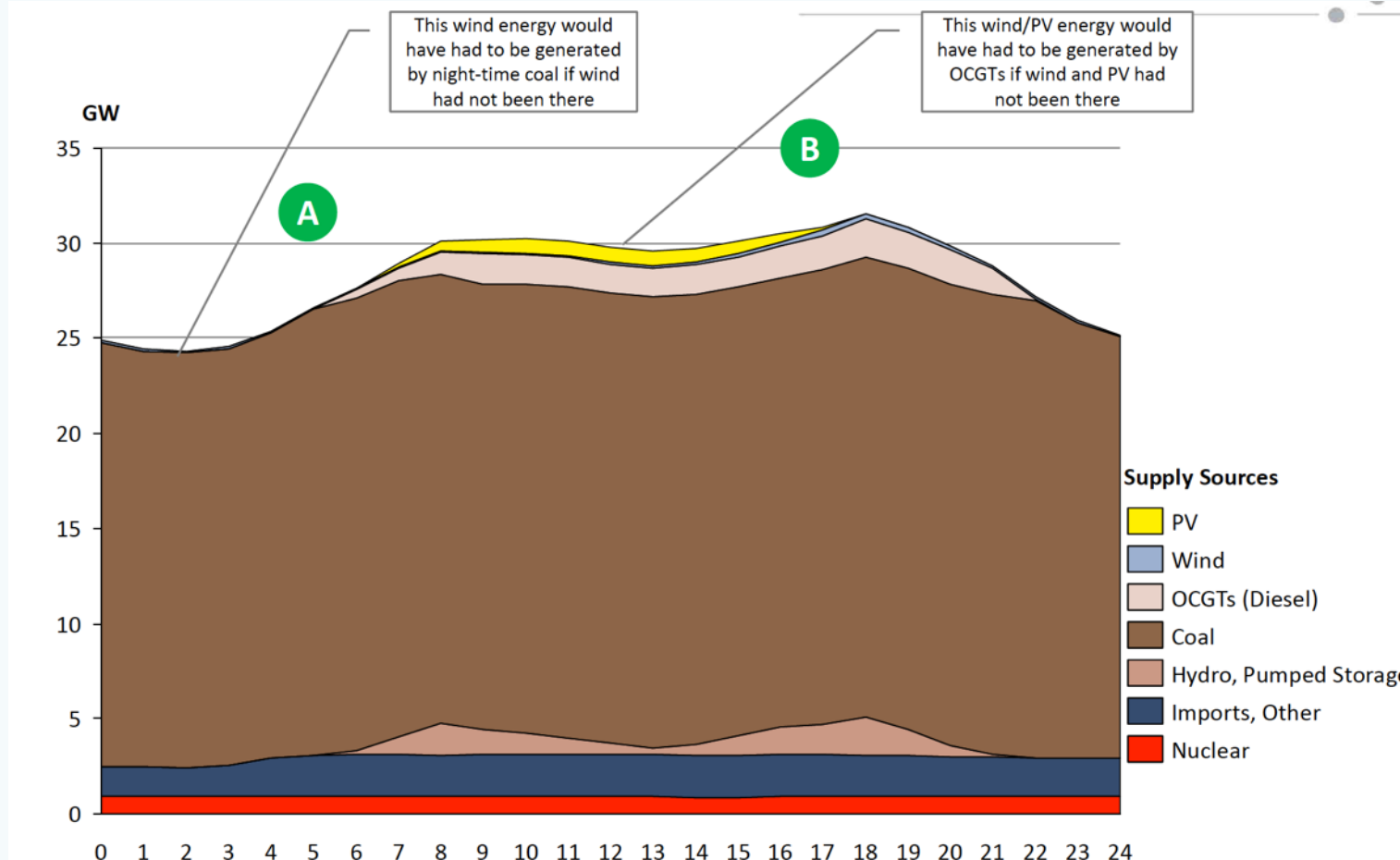


RE has reduced diesel spend and avoided load shedding



On a constrained day, both wind and PV replace mainly diesel fuel

Actual South African supply structure for a autumn day, 9 April 2015 (Thursday)



Source: Eskom; CSIR Energy Centre analysis



RE has saved SA economy billions of Rand by avoided diesel and load shedding.



Open Cycle Gas Turbines burn diesel to assist the South African grid when its under strain. This costs:

≈R3 per kWh

RE has saved SA economy billions of Rand by avoided diesel and load shedding.

STAGE 4

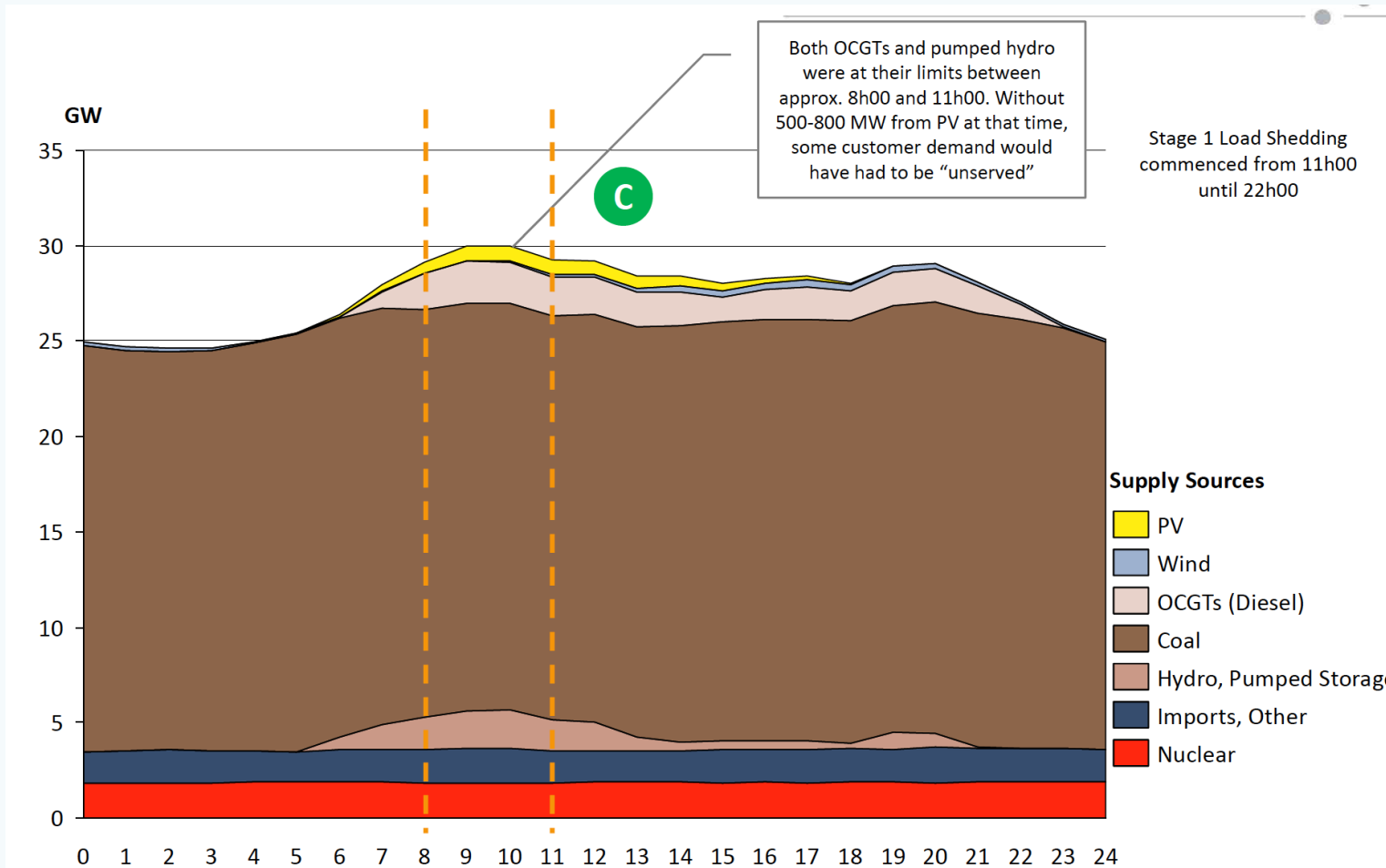


Load shedding cost the South African Economy R90 per kWh

Notes: Individual values are rounded and might not add up to the total values. Cost of Unserved Energy assumed as 90 R/kWh
Sources: CSIR Energy Centre analysis .:

On certain days, PV even averted unserved energy between 8h-11h00

Actual South African supply structure for a summer day, 9 April 2015 (Friday)





Source: Eskom; CSIR Energy Centre analysis



Wind and PV generated benefits of R8,3 billion from Jan-Jun 2015

Fuel savings in million Rand in 2015 due to electricity generated from wind and PV (all in April 2015-Rand)

Results for Jan-Jun 2015 from multiplying energy values with financial values for coal/diesel and COUE

<i>in million Rand</i>	A ... money spent on coal	B ... money spent on diesel	Subtotal (fuel savings)	C Value of avoiding “unserved energy” (@ 90 R/kWh)	Total (@ 90 R/kWh)
 Wind saved...	77	1 446	1 523	1 500	3 023
 PV saved...	58	2 042	2 101	3 134	5 235
Total	135	3 488	3 624	4 635	8 258

Notes: Individual values indicated in million Rand are rounded and might not add up to the total values. Cost of Unserved Energy assumed as 90 R/kWh. Source: CSIR Energy Centre analysis, 2016.



This translates into fuel saving per wind/PV energy unit of R1.85/kWh



Per energy unit, wind saved fuel to the value of
1.65 R per kWh of wind energy



Per energy unit, PV saved fuel to the value of
1.98 R per kWh of PV energy



Weighted average of
1.82 R per kWh of renewable energy (Apr-2015-Rand) A + B

Sources: CSIR Energy Centre analysis



In addition to the fuel-saving value, wind and PV generated value of up to 2,33 R/kWh from having avoided unserved energy for the economy



Per energy unit, wind avoided unserved energy to the value of **1.62 R per kWh of wind energy**



Per energy unit, PV avoided unserved energy to the value of **2.95 R per kWh of PV energy**



Weighted average of
2.33 R per kWh of renewable energy (Apr-2015-Rand)



(2.20 R/kWh @ COUE = 85 R/kWh)
(0.62 R/kWh @ COUE = 24 R/kWh)

Sources: CSIR Energy Centre analysis



Foreign investments



Wind, solar PV and solar CSP have attracted the most significant share of the investment in RE.

For the phases up to and including bidding window 4

Technology Type	Total investment costs (Rand million)	Average investment (Rand million/MW)	Capacity procured (MW)
Wind	74 700	22	3 367
Solar PV	64 700	27	2 366
CSP	58 400	97	600
Small Hydro	1 000	51	14.3
Biomass	2 800	55	78
Landfill	300	21	18

In 2015, 85% of ALL SA Foreign Direct Investment came from RE

Source: IPPPP Overview, December 2016. Department of Energy SA, Development Bank SA, National Treasury SA.

Source: <http://www.energy.org.za/> accessed August 2017.



Thank you.



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