Cost of new power generators in South Africa

Comparative analysis based on recent IPP announcements

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Background

The Integrated Resource Plan 2010 (IRP 2010) plans the South African power-system expansion for the period 2010-2030

The South African Department of Energy (DoE) has started several procurement processes to implement the IRP 2010

- Determinations for procurement of 29 GW of new capacity from Independent Power Producers (IPPs) have been made
  - … of which 17.3 GW for renewables
    - 13.2 GW under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)
    - 2.6 GW for regional/imported hydro
    - 1.5 GW for solar parks
  - … of which 11.5 GW for non-renewables
    - 1 GW for peaking power plants
    - 5 GW for coal-fired power plants (2.5 GW domestic and 2.5 GW regional/imported)
    - 3.7 GW for gas-fired power plants
    - 1.8 GW for co-generation power plants

First IPPs have been procured since 2011 and many GW are already operational

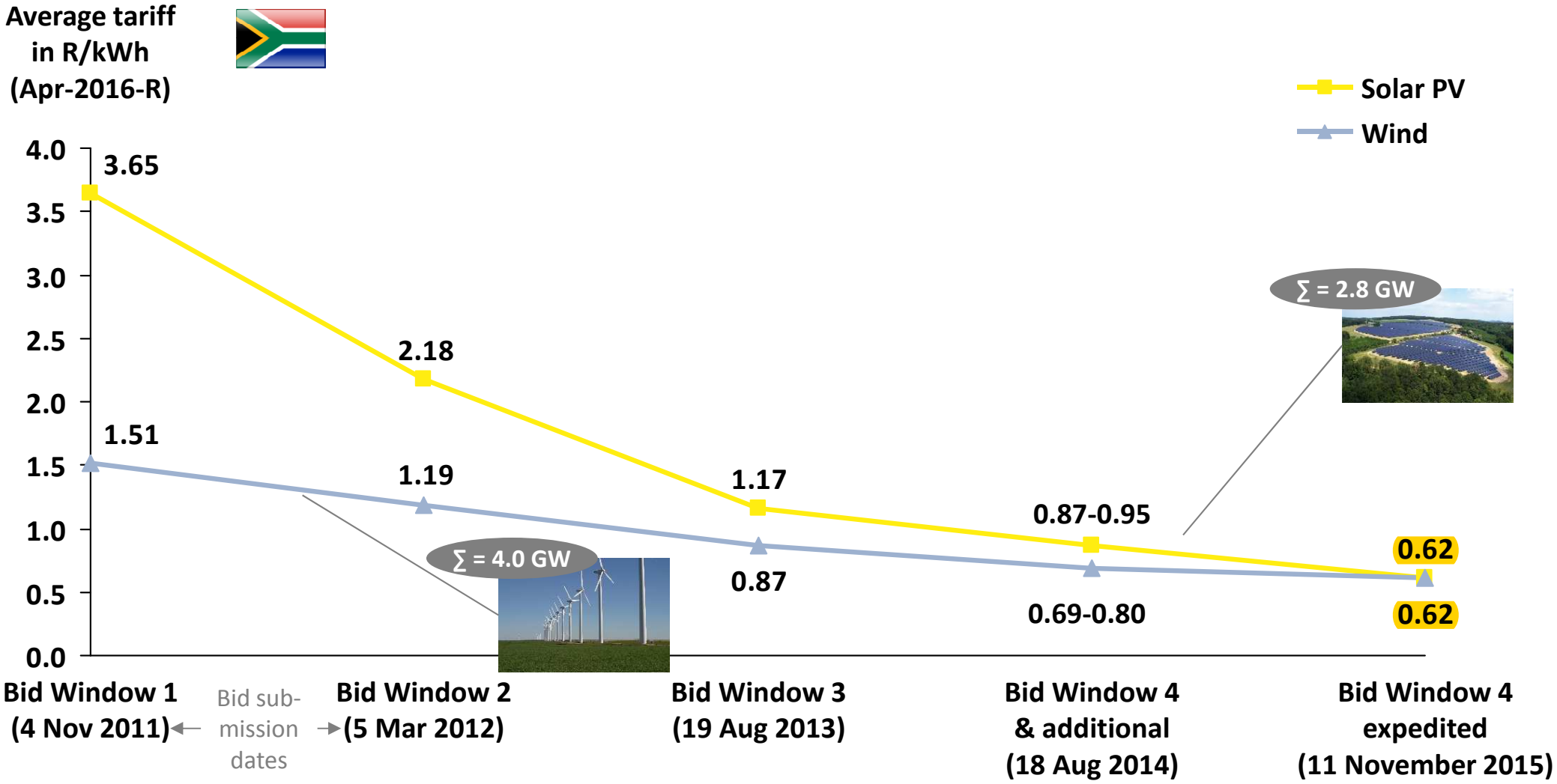
- In a number of Bid Windows, renewables have been procured and 2.5 GW are operational
- Almost 900 MW of coal-fired power stations have achieved preferred bidder status

This document aims to consolidate the achieved tariffs for electricity from IPPs

Sources: http://www.necsa.co.za/Portals/1/Documents/IndustryNews/IPP-Presentation-PCE_23Aug2016.pdf

Competitive tender outcome: new wind/solar PV projects very cheap

First four Bid Windows' results of Department of Energy's RE IPP Procurement Programme (REIPPPP)



Sources: South African Department of Energy IPP Office's publications on results of first four bidding windows http://www.energy.gov.za/IPP/List-of-IPP-Preferred-Bidders-Window-three-04Nov2013.pdf; http://www.energy.gov.za/IPP/Renewables_IPP_ProcurementProgram_WindowTwoAnnouncement_21May2012.pptx; http://www.ipprenewables.co.za/gong/widget/file/download/id/279; IPP Office on Bid Window 4 expedited; StatsSA on CPI; CSIR analysis

The average coal IPP tariff is 1.03 R/kWh in April-2016-Rand

On 10 October 2016, the Department of Energy announced the results of Coal IPP Bid Window 1

- 1 Qualification Tariff per project and 1 Evaluation Tariff per project
- These tariffs are quoted in April-2014-Rand

The announced tariffs cover a different scope than the typical Renewables IPP tariff

- The qualification tariff does not include the so-called shallow grid connection costs, the evaluation tariff includes them, but in addition the evaluation tariff also includes the cost of CO2 emissions (@ 120 R/t)
- The coal cost component of the tariff will be escalated with a basket index that is currently CPI + 1%-point, all other components of the tariff will be escalated with CPI
- Renewables IPP projects include the shallow grid connections costs and the tariffs are inflated with CPI

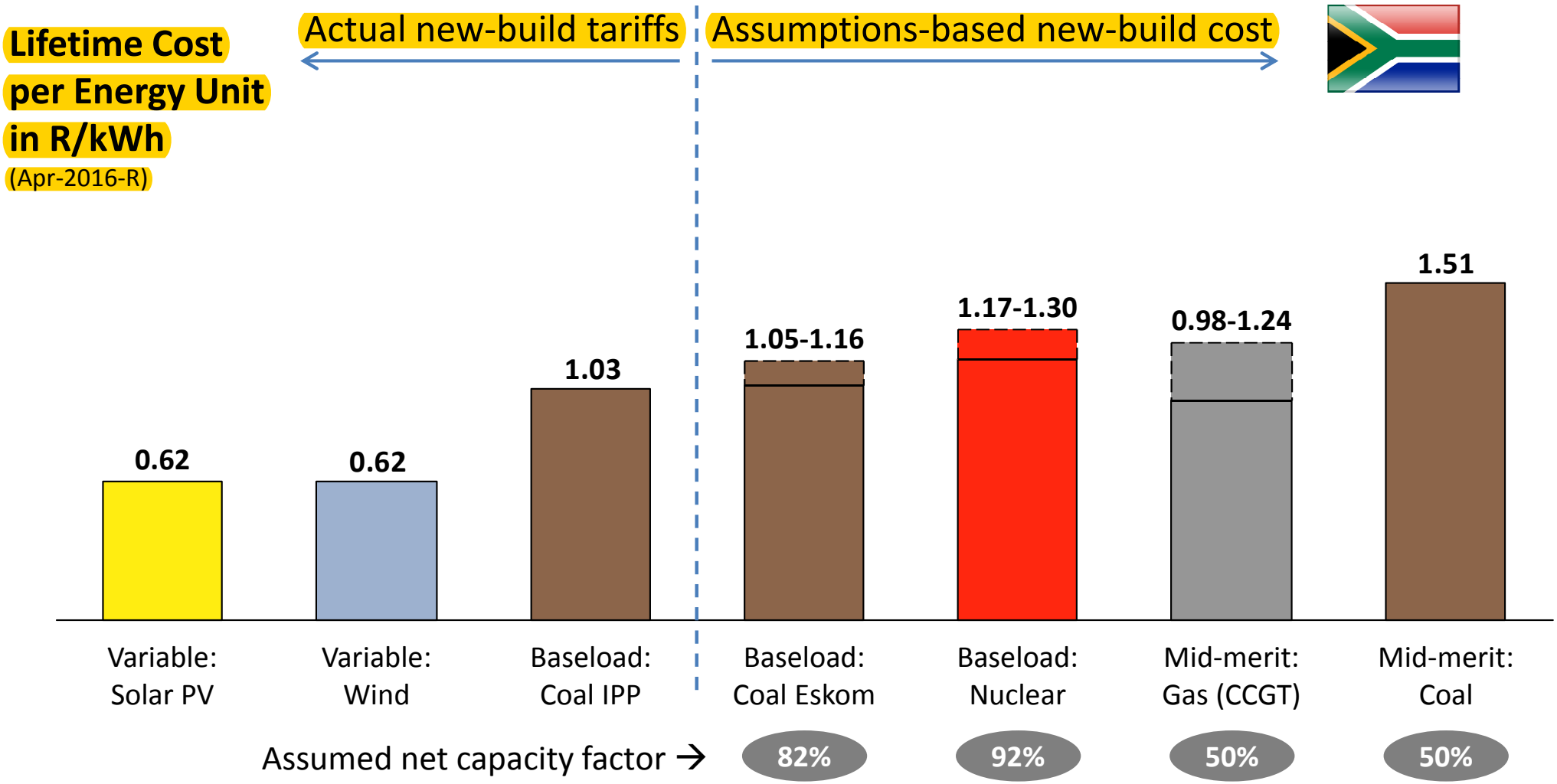
Hence, the announced coal evaluation tariff can be made comparable to Renewables IPP tariffs by

1. Inflating it into today's money (from Apr-2014-Rand → Apr-2016-Rand)
2. Calculating the present-value-equivalent of a fully CPI-indexed coal-cost component to CPI+1%-point
3. Subtracting the cost of CO2 emissions (@ 120 R/t) from the evaluation tariff

With these adjustments, the average coal IPP tariff (incl. grid, excl. CO2) is 1.03 R/kWh (in Apr-2016-Rand)

Sources: http://www.energy.gov.za/files/media/pr/2016/Coal-IPP-factsheet.pdf; CSIR analysis

Consequence of renewables' cost reduction for South Africa: Solar PV and wind are 40% cheaper than new baseload coal today



Note: Changing full-load hours for conventional new-build options drastically changes the fixed cost components per kWh (lower full-load hours → higher capital costs and fixed O&M costs per kWh); Assumptions: Average efficiency for CCGT = 55%, OCGT = 35%; nuclear = 33%; IRP costs from Jan-2012 escalated to Apr-2016 with CPI; assumed EPC CAPEX inflated by 10% to convert EPC/LCOE into tariff; Sources: IRP 2013 Update; DoE IPP Office; StatsSA for CPI; Eskom financial reports for coal/diesel fuel cost; EE Publishers for Medupi, Kusile & nuclear cost; CSIR analysis

Consequence of renewables' cost reduction for South Africa:

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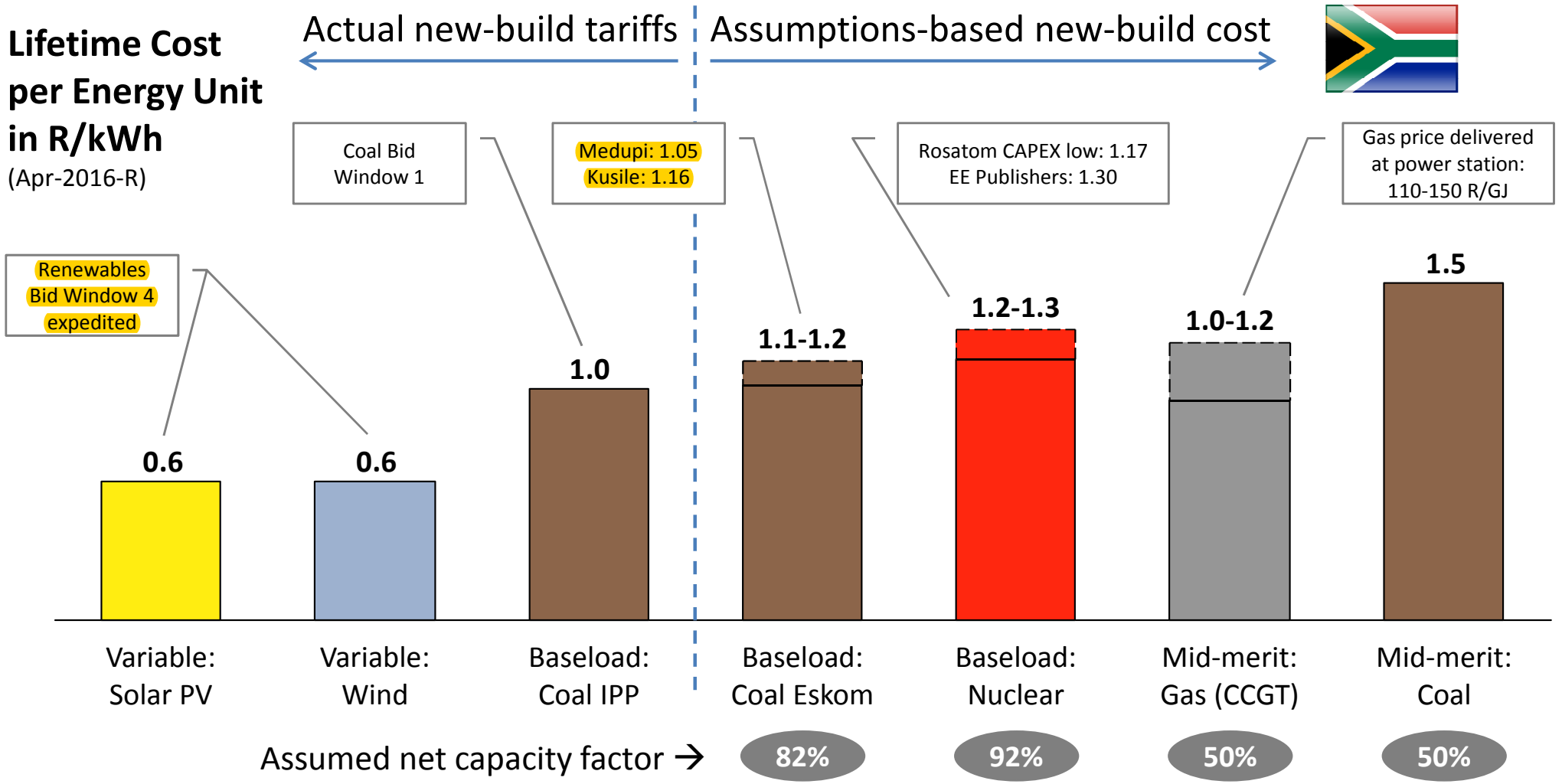

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In summary:
Results of the Department of Energy's IPP Procurement Programme

All tariffs in R/kWh	Base Month / Year	REIPPPP BW 1	REIPPPP BW 2	REIPPPP BW 3	REIPPPP BW 4	REIPPPP BW 4 additional	Coal IPP BW 1	REIPPPP BW 4 expedited
Bid submission		*4 Nov 2011*	*5 Mar 2012*	*19 Aug 2013*	*18 Aug 2014*	*18 Aug 2014*	*2 Nov 2015*	*11 Nov 2015*
Financial close		*5 Nov 2012*	*9 Mar 2013*	*11 Dec 2014*				
Solar PV		632 MW	417 MW	435 MW	415 MW	398 MW		520 MW
	April 2014	3.29	1.96	1.05	0.79	0.85		0.56
	April 2015	3.44	2.05	1.10	0.82	0.89		0.58
	April 2016	3.65	2.18	1.17	0.87	0.95		0.62
Wind		634 MW	563 MW	787 MW	676 MW	686 MW		650 MW
	April 2014	1.36	1.07	0.78	0.62	0.72		0.56
	April 2015	1.42	1.12	0.82	0.65	0.75		0.58
	April 2016	1.51	1.19	0.87	0.69	0.80		0.62
Coal							863 MW	
	April 2014						0.93	
	April 2015						0.97	
	April 2016						1.03	

Sources: South African Department of Energy IPP Office; StatsSA for CPI (http://beta2.statssa.gov.za/publications/P0141/CPIHistory.pdf); CSIR analysis

Sources

Solar PV and wind tariffs for Bid Window 4 Expedited

- IPP Office

Coal IPP Bid Window 1

- http://www.energy.gov.za/files/media/pr/2016/Coal-IPP-factsheet.pdf, with CSIR analysis

Medupi & Kusile

- http://www.ee.co.za/article/understanding-cost-electricity-medupi-kusile-ipps.html

New Nuclear

- CSIR analysis, based on IRP 2013 and Rosatom-announced CAPEX
- http://www.ee.co.za/article/cost-electricity-new-nuclear-build-sa-various-assumptions.html

Mid-merit Gas (CCGT)

- CSIR analysis, based on IRP 2013 with fuel-cost updates

Mid-merit Coal

- CSIR analysis, derived from coal IPP baseload tariff

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Re a leboha

Ha Khensa

Enkosi

Siyathokoza

Thank you

Re a leboga

Ro livhuha

Dankie

Siyabonga