



WWF RE Vision 2030

Quantifying the capital requirement: 19% RE by 2030

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WWF Renewable Energy Vision 2030

Articulating the Capital Requirement

Overview

- Government plans for investment in renewable energy are not ambitious by international standards
- Renewable energy is the right choice for SA: it is affordable, promotes energy security and a sustainable future
- Achieving a meaningful renewable energy share will require creative problem solving: public/private capital and the grid



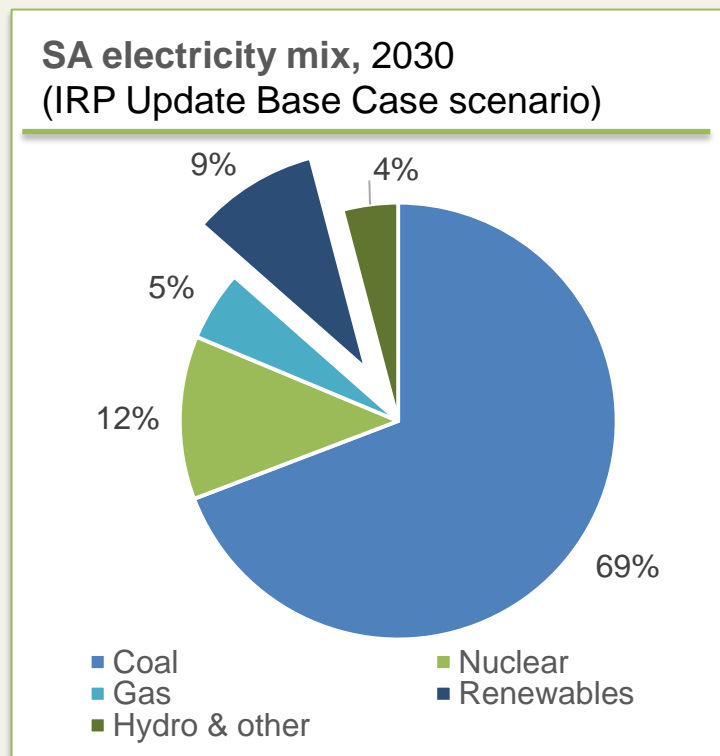
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The IRP2010-2030 Update allows for a 9% share of renewable energy by 2030



By 2030, 9% of SA's energy requirement will be supplied by 17 GW renewable energy (RE) capacity. More than two thirds electricity will still come from coal, including 2.5 GW new capacity.

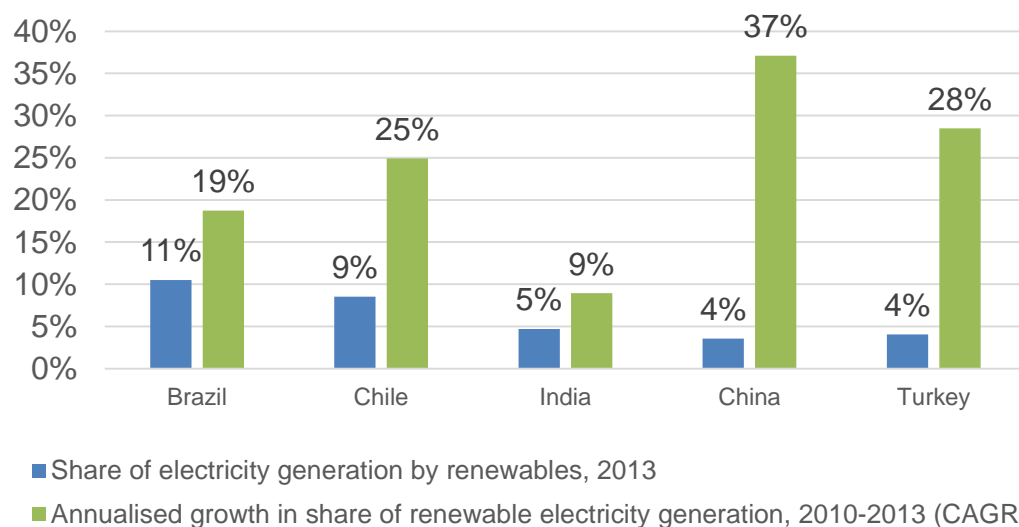
Coal emissions alone will exceed the DEA's PPD GHG emissions implicit electricity sector target, despite remaining within the DOE's IRP target.

In the low economic growth scenario, RE falls to a share of just 6% SA's electricity.

Source: Own calculations based on DOE (2013)

This is not ambitious by international standards

Renewable energy generation share and share growth in emerging markets, 2013



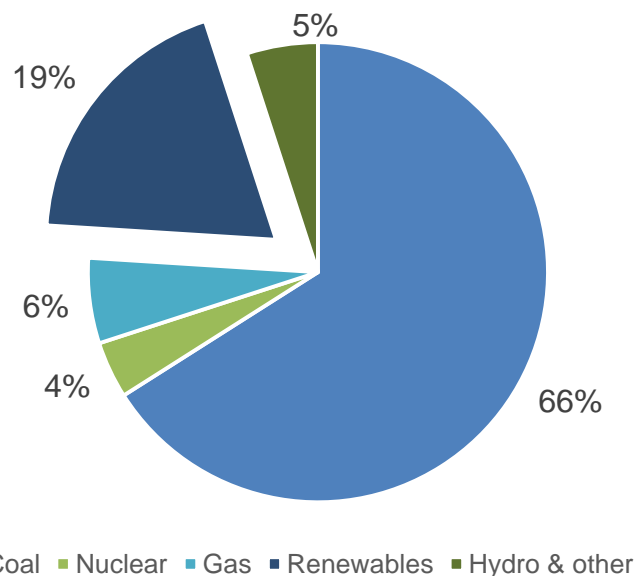
Brazil and Chile have already met or exceeded South Africa's targeted RE share for 2030.

China and Turkey will reach 9% within the next 3 years if current RE share growth rates continue.

Source: BP (2014); own calculations.

The WWF calls for a 19% share of renewable energy by 2030

SA electricity mix, 2030
(WWF high growth scenario)



No further investment in coal or nuclear is supported. When possible, old coal-fired power stations should be decommissioned to lower emissions. Gas is acceptable as a bridge fuel: high ramp rates, lower emissions.

Should low economic growth materialise, the proposed RE share falls to 9%.

High RE penetration rate: 20%+. Global studies show a 20% wind share and 7.5-10% solar PV peak supply share are already feasible (Citi). 26% Germany's electricity comes from RE.

Source: Own calculations



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This will cost SA 1-2% GDP p.a.
but with likely multiplier effects

	<u>Capacity (MW)</u>	<u>Generation (TWh)</u>	<u>Fiscal cost : 2015-2030 (Rand)</u>
High economic growth (5.4% p.a.) scenario	Add 2 200 MW p.a. Total: 35 000 MW <ul style="list-style-type: none">Solar*: 19 000 MWWind: 16 000 MW	Annual: 78TWh+	Annual: R78 billion Total: R1.1 trillion
Low economic growth (2.9% p.a.) scenario	Add up to 2 200 MW p.a. (min 1 100 MW) Total: 17 500 MW <ul style="list-style-type: none">Solar*: 9 000 MWWind: 8 000 MW	Annual: 39TWh+	Annual: R40-R78 billion p.a. Total: R480 billion

Recent US infrastructure study shows 2x GDP multiplier effect for up to 10 years after investment

* Solar mix (PV and CSP) determined dynamically according to developments in pricing, storage and the need for dispatchable power



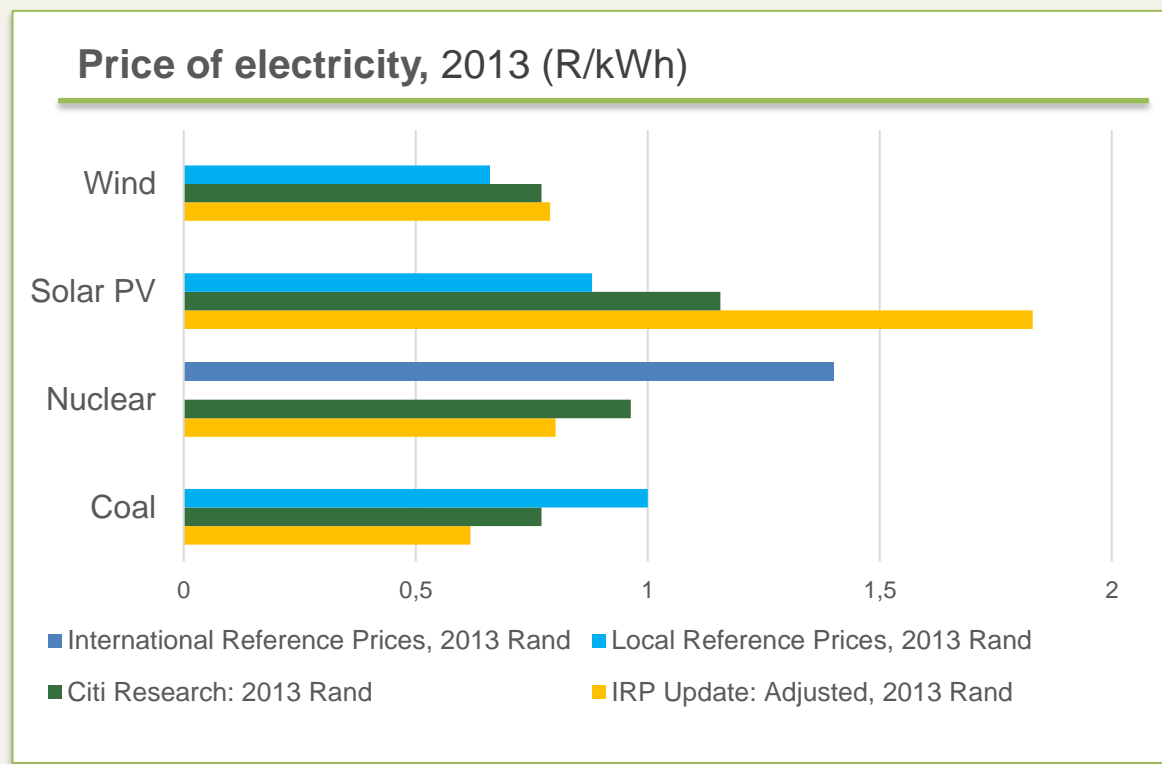
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RE technologies compete favourably with conventional technologies on price



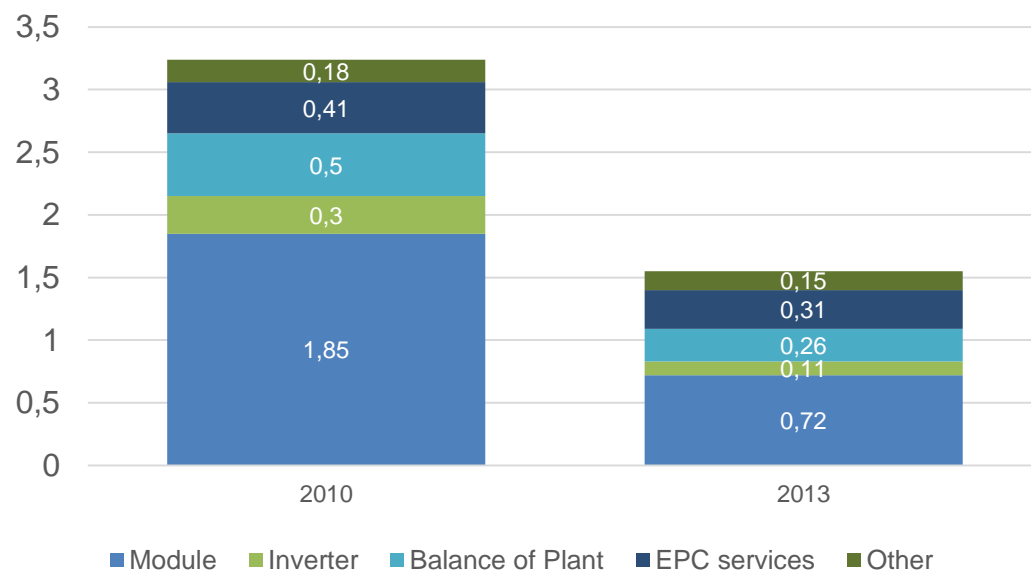
In the IRP Update, coal and nuclear are very cheap internationally speaking. PV expensive.

Nuclear is likely to cost much more, while PV averaged R0.88/kWh in REIPPPP Round 3.

Sources: DOE (2013); Citi Research (2013); Papapetrou (2014); Own analysis

The recent rapid drop in PV prices is not an anomaly

Best-in-class global utility-scale solar PV costs, 2010-2013 (USD/W)



The dollar price of utility-scale solar PV has halved in the last 3 years.

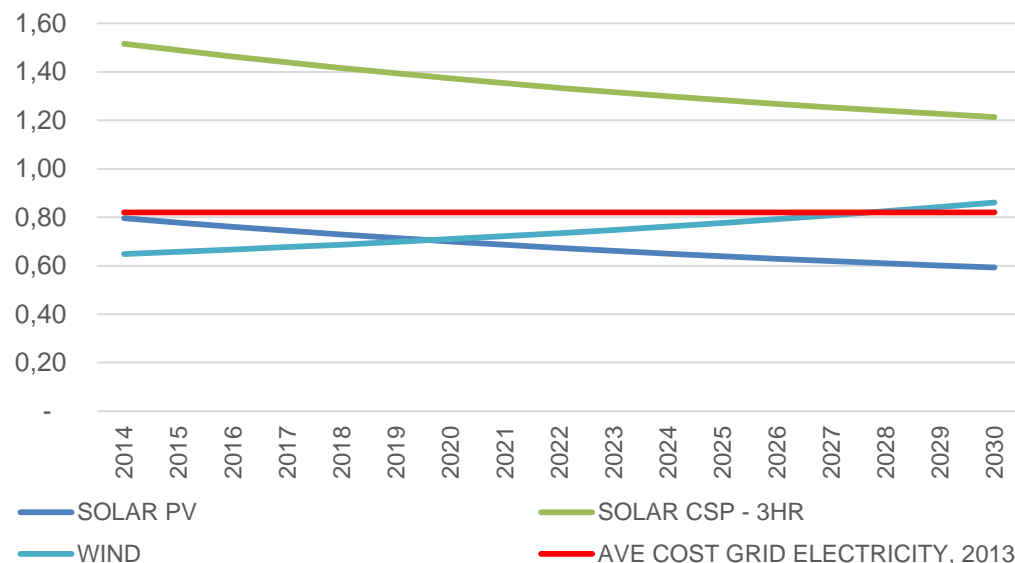
Drivers:

- Shift to China
- Low commodity prices
- Weak global economy

In US PPAs are being signed for \$60/MWh.

Indeed market forces will support long term grid parity for wind and PV

Projected tariff trajectory, 2014-2030 (2014 Rand)



The average price of grid electricity to Eskom was R0.82/kWh in 2013. Wind is already cheaper.

PV will be the cheapest RE source by 2020. CSP is an alternative to nuclear.

A weakening Rand may increase the wind price.

Source: Own analysis; Donnelly (2014)

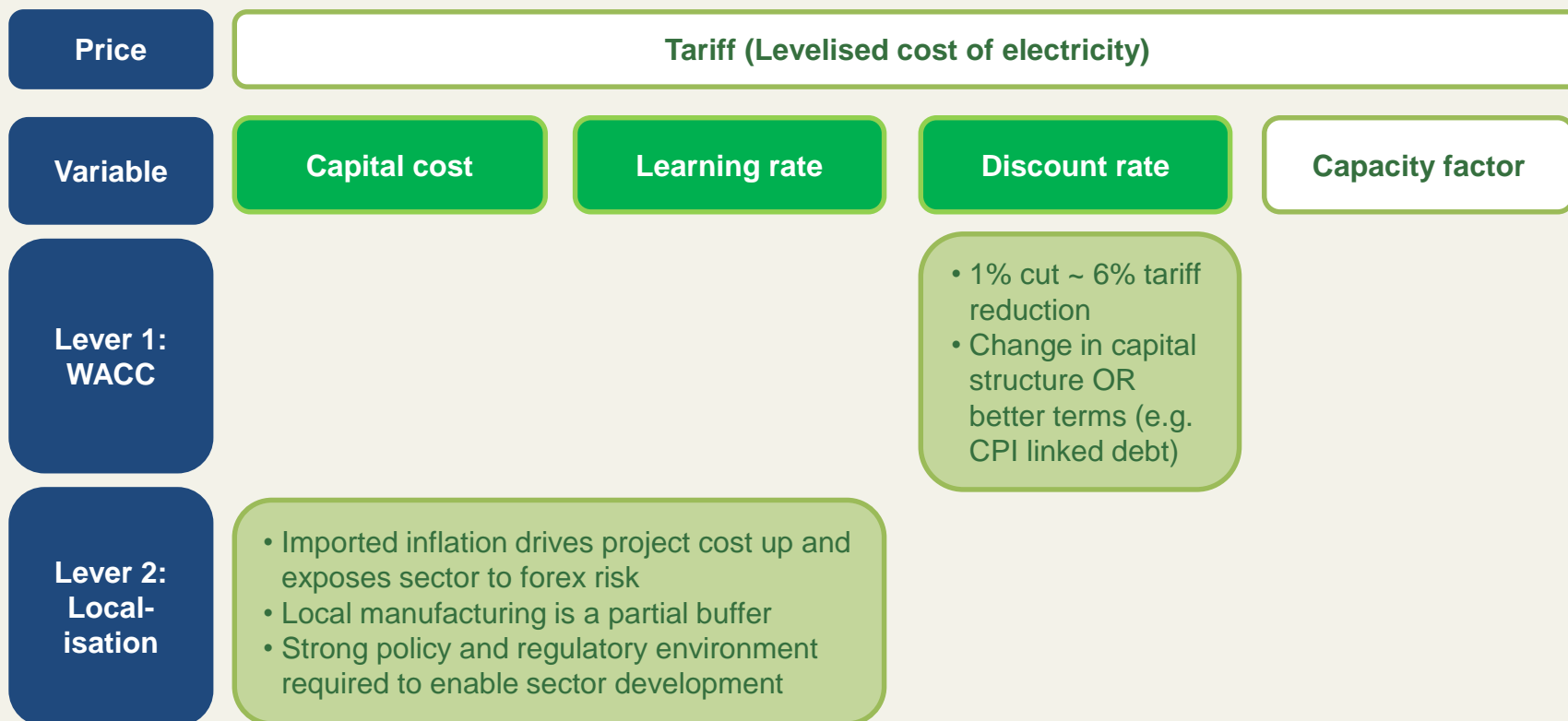
Notes: CSP estimate refers to CSP with 3 hours storage



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Local factors may drive further price advantage





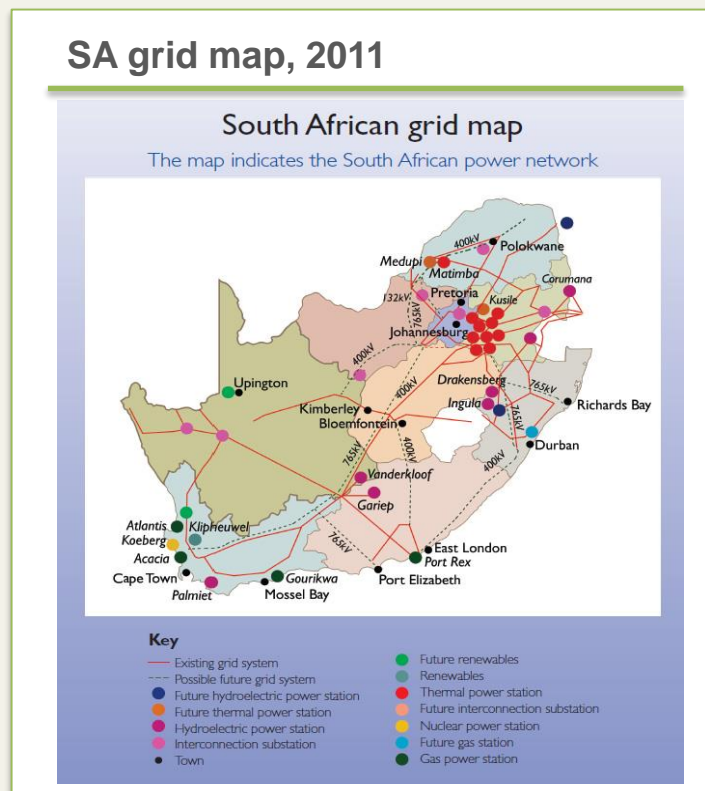
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The first challenge to consider is grid integration



Source: www.eskom.co.za

Transmission and distribution infrastructure is inadequate. The Cape* region will be worst affected: grid stability limit = 15GW.

Extensive upgrades will be costly and these have longer time horizons than RE plant construction... Uncertainty about plant location hinders investment.

Solutions:

- Incentivise central procurement where capacity exists
- Perform 'robustly required' transmission system upgrades (e.g. NC-GP line)
- Promote distributed generation near point of load demand.

* This comprises the Western, Northern and Eastern Cape

Grid balancing is required to ensure smooth power supply

Ankerlig OCGT station, Atlantis



RE has **limited predictability and dispatchability**: challenging for system operator which needs to balance the electricity system.

Solutions:

- Dispatchability issue solved with storage (energy and thermal): substantial for CSP and emerging for PV (1 MW battery already available)
- Intermittency countered with flexible power supply such as gas turbines and pumped storage. Mid-merit combined cycle gas turbines running off natural gas are 1 option (e.g. Ankerlig conversion).

Source: www.eskom.co.za

The second challenge is Eskom as only offtaker

5 MW PV plant, India



There is limited fiscal space to invest further in utility scale RE. SA is close to the public debt ceiling of 60% GDP. Current obligations reach 56.9% GDP, excluding REIPPPP guarantees.

Eskom already benefits from a R350bn guarantee (+10% GDP) for the new build programme. With a revenue shortfall of R225bn, sustainability is questioned.

Solution:

Liberalise electricity market to enable private and municipal utilities to connect to grid or go off-grid, directly contracting with customers on micro grids.

The third challenge is policy coordination and certainty

Union Buildings



There is a perceived lack of strategic and planning alignment between the various public sector entities: DOE, DEA, DTI, DPE, NERSA and Eskom.

One example is multiplicity of emissions targets (DOE vs DTI). More immediate issue: DTI's desire for localisation vs DOE's lack of commitment to future RE procurement (e.g. State of Nation address) and NERSA's lack of electricity sector reform.

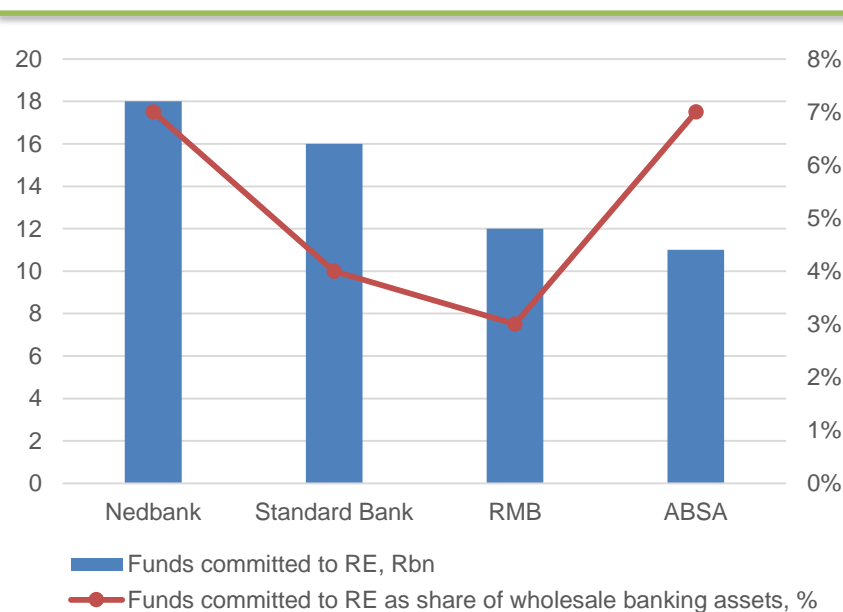
Solution:

One coordinated policy position which enables RE industry growth via commitment to RE procurement and sector reform.

Source: Wikipedia

Finally, wider private investor participation is required

Commercial bank exposure to RE, 2013



Source: FirstRand (2013); Standard Bank (2014); Nedbank (2014); ABSA (2014); Creamer 2013(b).

Local bank balance sheets cannot carry all of the project debt associated with the WWF vision. Further, fully financed BEE partners are said to be scarce.

Est. R400bn additional project debt will be required to scale up the RE sector from 2015-2030. At R57bn, committed funds are already 3-7% wholesale banking assets.

Solution:

Retirement funds (R3 trillion assets) can assist in primary or secondary debt markets for project and empowerment financing.



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As financiers and stakeholders in the SA RE sector,
you are a vital part of the solution

“

Someone's sitting in the shade
today because someone planted a
tree a long time ago

*Warren Buffett, CEO Berkshire
Hathaway (\$15bn RE investor)*



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Thank you

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