

GLOBAL POWER SECTOR REFORM AND THE CASE FOR REFORM IN SOUTH AFRICA

PRESENTATION TO THE ABSA
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THE ORIGINAL RATIONALE FOR POWER SECTOR REFORM

KEY PROBLEMS THAT ANY ELECTRICITY INSTITUTIONAL FRAMEWORK SHOULD SOLVE

- Ensure that supply and demand of energy is in balance in real time at the lowest cost (including environmental externalities).
 - Has implications for planning and decision making over the short, medium and long-term.
- Ensure efficient and adequate resourcing.
 - Resources must be efficiently procured and applied.
 - Often in the context of economies of scale.
- Service must be extended on a socio-economic viable basis.
- Avoid abuse of market power and monopoly.
 - Pricing.
 - Adequate service.



THE TRADITIONAL MODEL

- Historically these problems were typically solved by vertical integration, central control and monopoly, and often state ownership and/or regulation.
- By the 1980s concerns about the performance of vertically integrated monopolies were piling up.
 - Large problems with efficiencies and abuse of market power.
 - SOE or privatised monopolies typically prefer large coal, hydro or nuclear megaprojects.
 - Poor track record of delays and cost overruns.
 - No risk bearing.
 - Large information asymmetries.
 - Political and managerial moral hazard.



COMPETITIVE MARKETS PROVIDE A BETTER APPROACH

- At this time (the 1980s) it was realised that power generation and sales (supply) can be organised and regulated as a competitive market.
- Restructuring for competition holds the promise to resolve many of the problems of the traditional monopoly SOE model.
 - Improved allocation of risk to the providers of capital (equity and debt).
 - Reduction of information asymmetry problems.
 - All of which results in drastic changes in investment behaviour and resource allocation in order to mitigate exposure to risk and uncertainty.
 - private sector players in a competitive market have:
 - led the dash-for-gas revolution in the 1990s and;
 - are now the dominant players in the renewables revolution which is fundamentally disrupting the power sector.



BUT, ORGANISING MARKETS TO ACHIEVE EFFICIENT COMPETITION TAKES SPECIAL CARE

- Achieving sufficient competition and reducing or avoiding market power is not necessarily the “natural” outcome in the power sector.
- Effective competition is the result of careful policy, market, regulatory and institutional design.
 - See, for instance, the detailed design that goes into the REIPPP reverse auction programme in South Africa (a one sided market).
 - Or, the detailed rules applicable in any properly competitive power market globally.



DESIGNING COMPETITIVE MARKETS IN A SYSTEM WITH NATURAL MONOPOLY ELEMENTS

- The grid and system operations are natural monopolies but power generation is not.
- In order to facilitate effective competition in the demand and supply of electricity (generation or flexible demand) these function should be institutionally separated from the natural monopoly functions of the system.
- Competition occurs mostly before real time.
 - Most of the market can be cleared between willing buyers and sellers before real time (typically hourly or half hourly slots).
 - Supply and Demand side resources can and should participate.
 - Typically the system operator (centralised control) only has to address the remainder of the imbalance problem (forecast errors, etc.) for each time slot.
 - The resources required by the SO can also be procured competitively.



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**A NEW IMPERATIVE
FOR REFORM:
TECHNOLOGICAL
DISRUPTION**

THE FUTURE IS NOT WHAT IT USED TO BE: DISRUPTIVE TECHNOLOGICAL CHANGE

- Clean and low cost renewables
 - Utility scale renewables are rapidly becoming the cheapest source of energy in the economy.
 - Countries such as Mexico, Saudi Arabia, etc. are already realising prices below 30 ZARc/kWh.
 - Embedded generation has become cost competitive against retail tariffs.
- Digitisation of the power system
 - Smart meters
 - Prosumers
 - Community based owned peer-to-peer power trading - block chain technology, etc.
 - E.g. Bangladesh
- Energy storage
 - Storage costs are rapidly declining
 - Embedded and grid-scale levels
 - Electric Vehicles
 - SA: 2018 Nissan Leaf claims a range of 378 km!
 - At 10kWh/100km and falling prices EVs are rapidly becoming competitive against ICE vehicles.



LOW COST RENEWABLES ARE DISRUPTING COAL-BASED POWER MONOPOLIES BUT ALSO PRESENT A GAME CHANGING OPPORTUNITY FOR ESKOM AND SOUTH AFRICA

- The early REIPPP programme has been expensive.
 - E.g. BW4: 97 c/kWh (PV) and 77 c/kWh (Wind) in 2018 ZAR.
- Internationally auctions are now often pricing renewables around or below 20 \$/MWh
- This is 30 ZAR cents (15 ZAR/USD). Even with a 50% premium this is 45 c/kWh.

Coal cost (R/t)	350	400	450	500	550	600	650	700	750	800
Electricity (c/kWh)	43	45	48	51	54	56	59	62	64	67
Realistic new renewables price										
Average Eskom coal price										
Marginal Eskom coal price										
IRP assumed coal cost										

- By decommissioning coal plant, curtailing the construction of new coal capacity and by establishing a continuous build programme of competitively procured renewables the IRP will enable Eskom, as the single buyer, to capture the benefits of on-going price reductions (below the cost of coal power), which will assist with addressing its financial crisis.

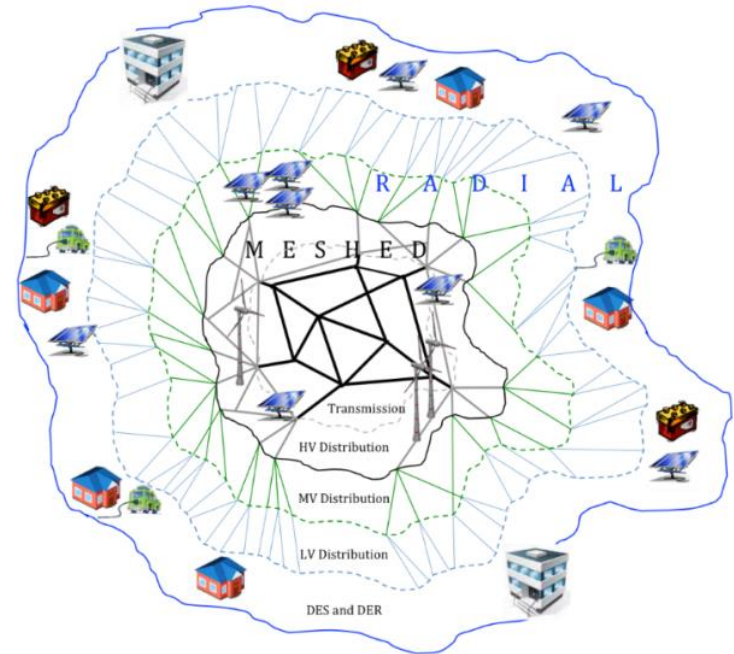
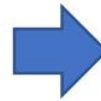
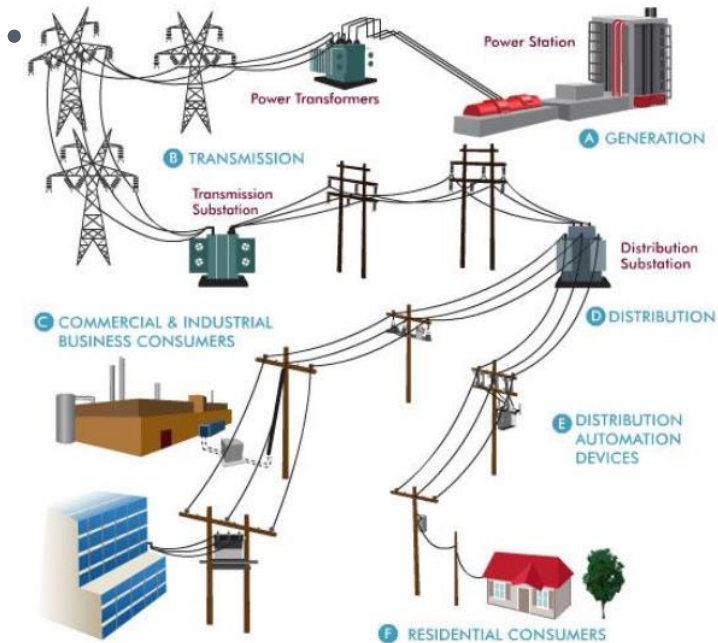


THESE CHANGES RESULT IN A NEW POWER SECTOR TECHNO-ECONOMIC PARADIGM

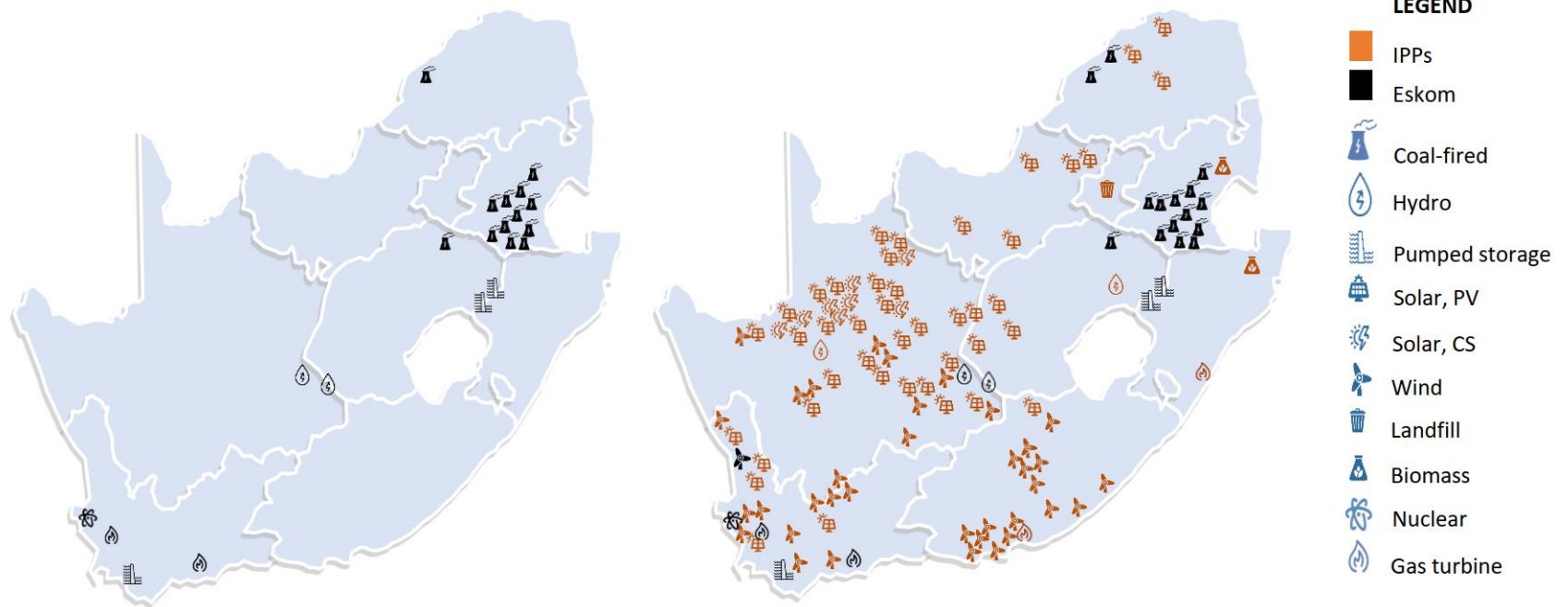
- Economies of scale are drastically reduced
 - A large turbine is now 7.5MW (wind) not 800MW (steam)
 - A large power project is now 140MW not 4800MW
- The cheapest sources of generation (renewables) will produce variable output
 - Complimentary dispatchable mid-merit resources will be valuable;
 - Inflexible base load resources will loose value;
- Decentralisation
 - Hundreds of utility scale projects will now be spread throughout the network
 - Embedded demand side resources (demand or generation based) will proliferate
- System balancing
 - Digitally based market and pricing based mechanisms will play a much bigger role in order to coordinate a multitude of resources;
 - The role of centralised command-and-control will reduce (but not disappear).
- In general the action will move from the centre to the periphery
 - Greater energy democracy



AS CONSUMERS BECOME ALSO PRODUCERS OF ELECTRICITY NETWORKS WILL LOOK VERY DIFFERENT IN THE FUTURE



SOUTH AFRICA'S POWER SYSTEM LANDSCAPE IS CHANGING



NEW INSTITUTIONAL MODELS ARE REQUIRED

- The monopoly SOE model is a machine designed to produce mega projects and that is what it will continue doing (coal and nuclear) – the old paradigm.
- The new techno-economic paradigm makes it easy to achieve effective market competition.
- This opens the way for beneficial entry by a multitude of private sector players.
 - The investment, socio-economic and price reduction benefits achieved by South Africa's REIPPP provides incontrovertible evidence of the superior benefits of this approach.
- It is widely agreed that structural separation of the potentially competitive activities (power generation, customer service, etc.) from natural monopoly activities (networks) is required (OECD, 2016).
- Network owners, including local government South Africa, will play a critical role in achieving this transition.



MANY COUNTRIES ARE NOW BEGINNING TO ANTICIPATE THE CHANGES THESE DISRUPTIVE TECHNOLOGIES WILL BRING TO POWER MARKETS



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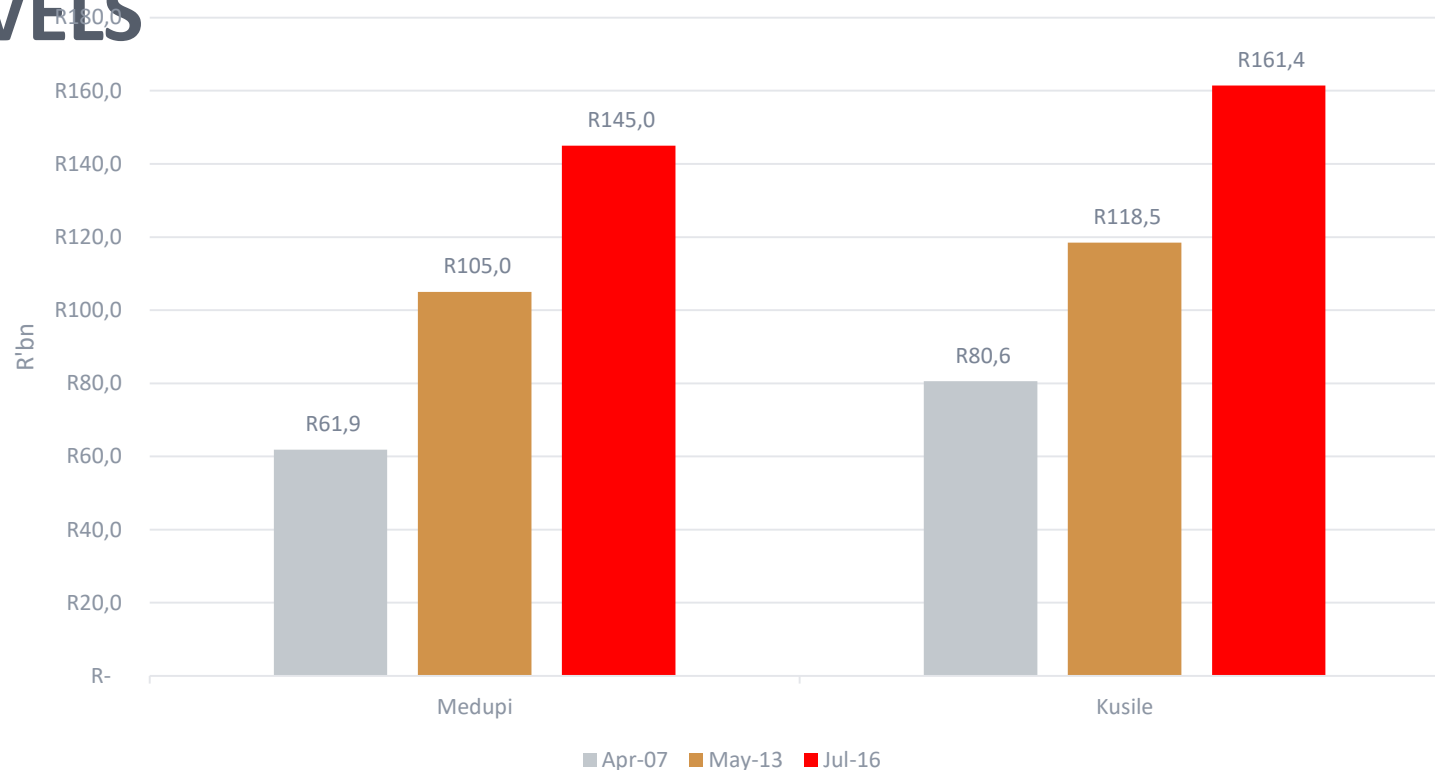
THE NEED FOR POWER SECTOR REFORM IN SOUTH AFRICA

WE HAVE SEEN THAT THE ABSENCE OF COMPETITION IN ELECTRICITY

- Encourages large inefficiencies in
 - Capital expenditure
 - Project and technology selection
 - Procurement and project execution
 - Fuel and operating costs
- Constrains access to transmission grid by competitors
- Suppresses energy sector entrepreneurship and innovation
- Results in information asymmetries and managerial moral hazard
- Allows inappropriate political interference, rent-seeking and large-scale corruption
- Inefficient costs are simply passed to consumers or the fiscus.
 - huge costs to economy
 - threat to the financial stability of national finances and economy



COST OVERRUNS AT MEDUPI AND KUSILE ARE THE MAIN REASON FOR ESKOM'S HIGH DEBT LEVELS

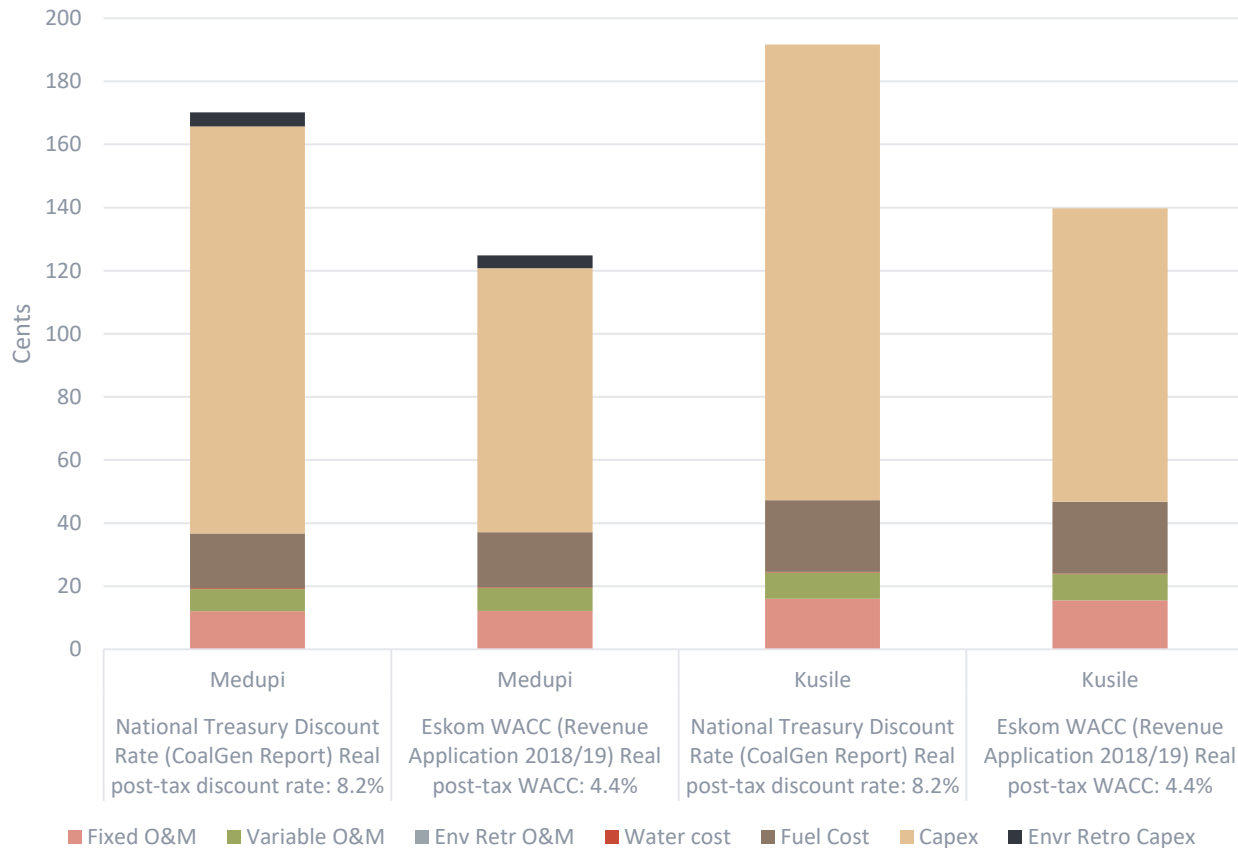


Medupi: Current budget is R145bn (R83bn more than in 2007)

Kusile: Current budget is R161.4bn (R80bn more than in 2007)



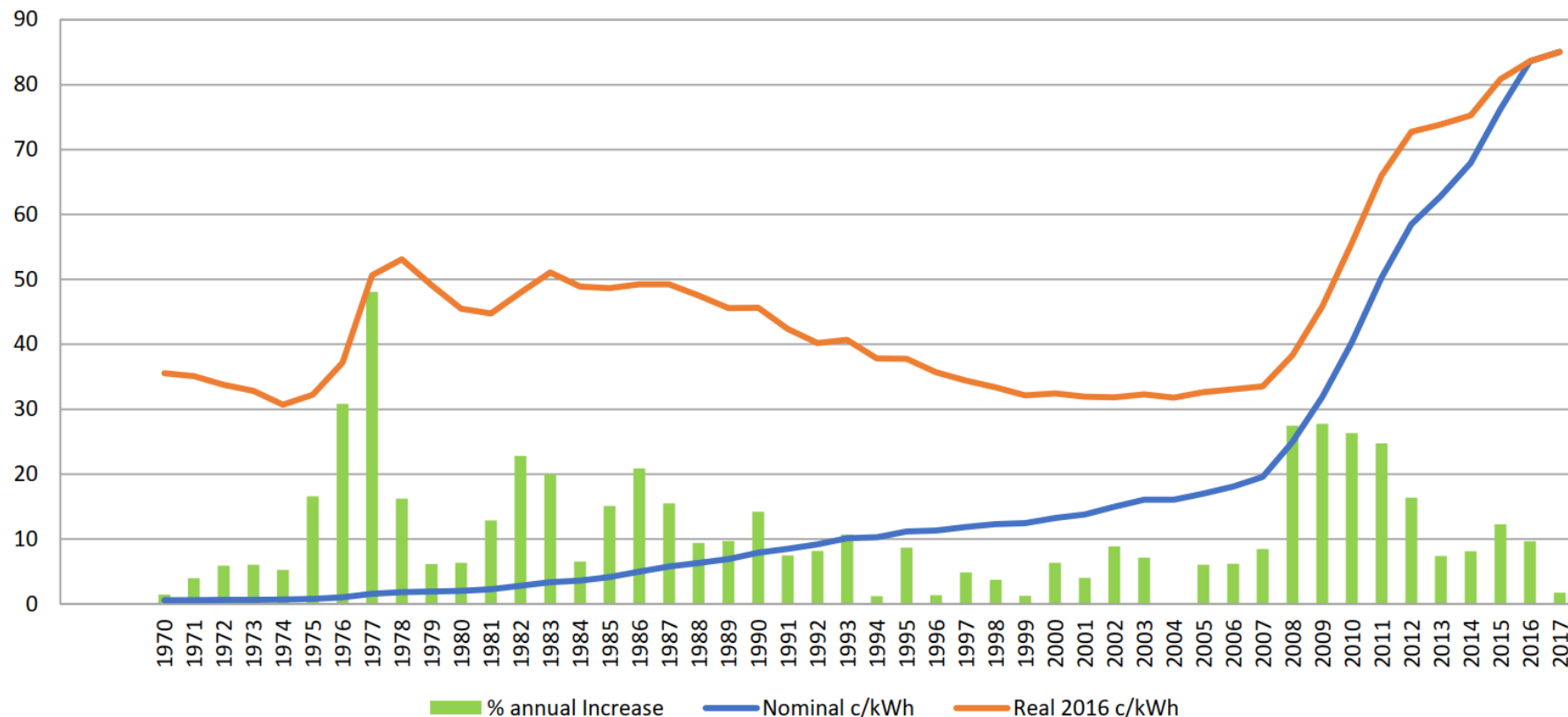
MEDUPI AND KUSILE COSTS PER KWH



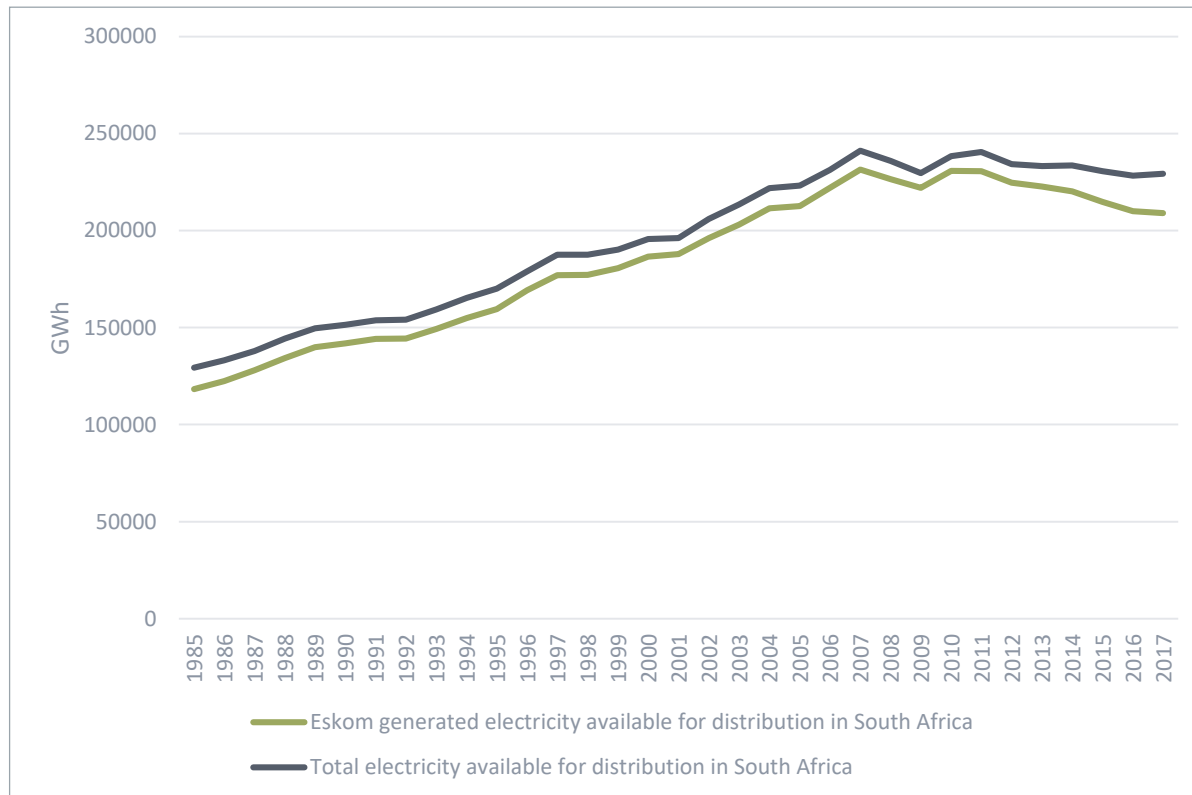
Source: Meridian Economics, 2017



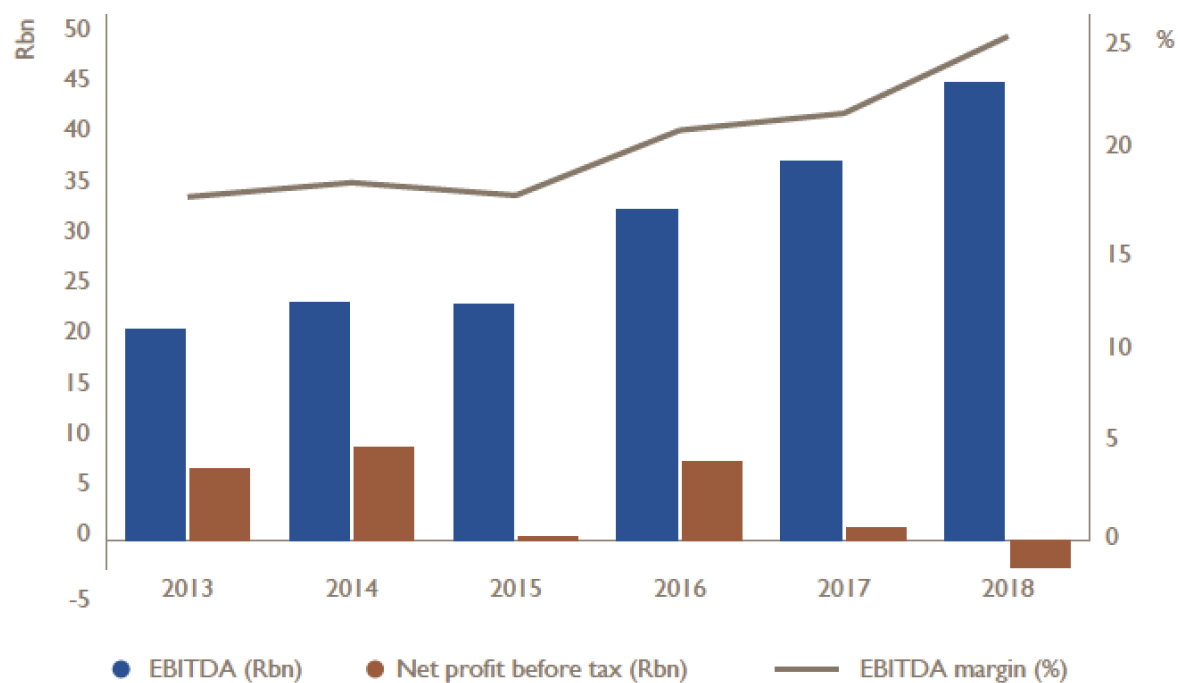
ESKOM TARIFFS IN 10 YEARS HAVE RISEN MORE THAN 4X (NOMINAL) AND NEARLY 3X (REAL)



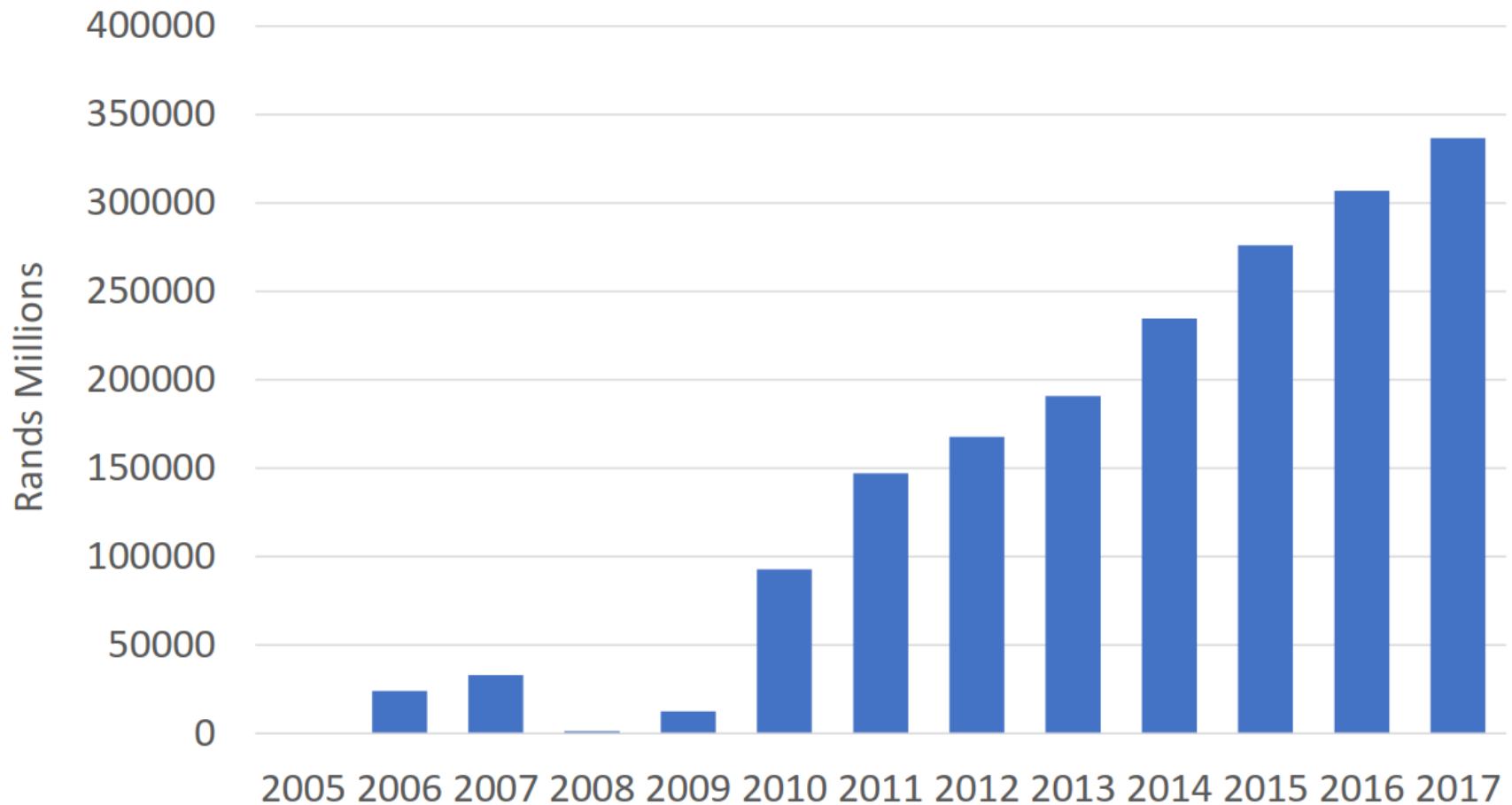
ELECTRICITY DEMAND IN SOUTH AFRICA CONTINUES TO DECLINE



ESKOM LOSSES ARE LIKELY TO INCREASE



GROWTH IN ESKOM DEBT IS UNSUSTAINABLE



FINANCIAL RATIOS ARE DETERIORATING

Measure and unit	2017/18	2016/17	2015/16
Finance¹			
Electricity revenue per kWh (including environmental levy), c/kWh	85.06	83.60	76.24
Electricity operating costs, R/MWh	634.69	662.98	628.00
EBITDA margin, %	24.81^{RA}	20.55	19.13
EBITDA, R million	43 428	35 989	30 932
Cash interest cover, ratio	1.18^{RA}	1.73	1.64
Debt service cover, ratio	0.84	1.37	1.09
Working capital ratio	1.06	0.86	0.86
Gross debt/EBITDA, ratio	10.22	11.39	11.71
Debt/equity (including long-term provisions), ratio	2.70^{RA}	2.22 ^{RA}	1.71
Gearing, %	73	69	63
Free funds from operations, R million	39 064	46 336	37 954
Free funds from operations after net interest paid, R million	8 017	19 776	16 260
Free funds from operations as % of gross debt, %	8.80^{RA}	11.30 ^{RA}	10.48 ^{RA}
Free funds from operations as % of total capex, %	76.68^{RA}	74.46	64.13



ESKOM FACES THE LARGEST FINANCIAL CRISIS OF ITS EXISTENCE. BASED ON SCENARIOS OF FUTURE CASH FLOWS BALANCE SHEET ASSET VALUES ARE OVERSTATED AND A LARGE PORTION OF ITS DEBT IS STRANDED.

Impact of likely R300bn asset write-down (conservative median value)

Eskom			
Statement of financial position (Balance sheet) - Rbn			
			31-Mar-18
Non-current assets		658	
Current assets		72	
Non-current assets held for sale		9	
			739
Consisting of:			
Generation	72%	532	
Transmission	14%	106	
Distribution	14%	101	
TOTAL ASSETS			R739bn
Equity			170
Liabilities			569
Non-current liabilities		474	
Debt securities issued*	348		
Other	126		
Current liabilities		93	
Debt securities issued*	41		
Other	52		
Non-current liabilities held for sale		2	
TOTAL EQUITY AND LIABILITIES			R739bn
*Total debt	389		

Eskom			
Statement of financial position (Balance sheet) - Rbn			
			31-Mar-18
Non-current assets		358	
Current assets		72	
Non-current assets held for sale		9	
			439
Consisting of:			
Generation	53%	232	
Transmission	24%	106	
Distribution	23%	101	
TOTAL ASSETS			R439bn
Equity			0
Liabilities			439
Non-current liabilities		345	
Debt securities issued*	218		
Other	126		
Current liabilities		93	
Debt securities issued*	41		
Other	52		
Non-current liabilities held for sale		2	
TOTAL EQUITY AND LIABILITIES			R439bn
*Total debt	259		

Reduction in equity value

Distressed debt

Order of magnitude estimate. This analysis isolates the balance sheet impact on Generation assets by showing the median impact on future Generation revenues of a wide range of scenarios. Includes commitment to complete Medupi and Kusile and business as usual. In effect this assumes Eskom consists of G, T & D, and that T & D are able to recover cost reflective tariffs. Zero return on equity assumed in discount rate.



THE ESKOM MONOPOLY HAS NOW RESULTED IN A NEAR DISASTROUS OUTCOME.

- Eskom's financial and managerial crisis runs deep
 - Threatens the viability of the national finances
 - Reliability of power supply is under permanent threat
 - Price rises continue unabated
 - The economic impact is large and ongoing
- In its current form, Eskom is too big to govern and manage effectively, and inappropriately structured to exploit the large opportunities currently unfolding.
- Eskom's financial problems are mainly in its generation business. These need to be ring-fenced, contained.
 - Requires a debt-restructuring / bail-out deal without infecting the entire system
- The heart of the power system (the grid and the transmission system) needs to be protected and placed in a separate entity.
- Eskom's conflict of interest as both a generator and single-buyer of power from IPPs needs to be removed.



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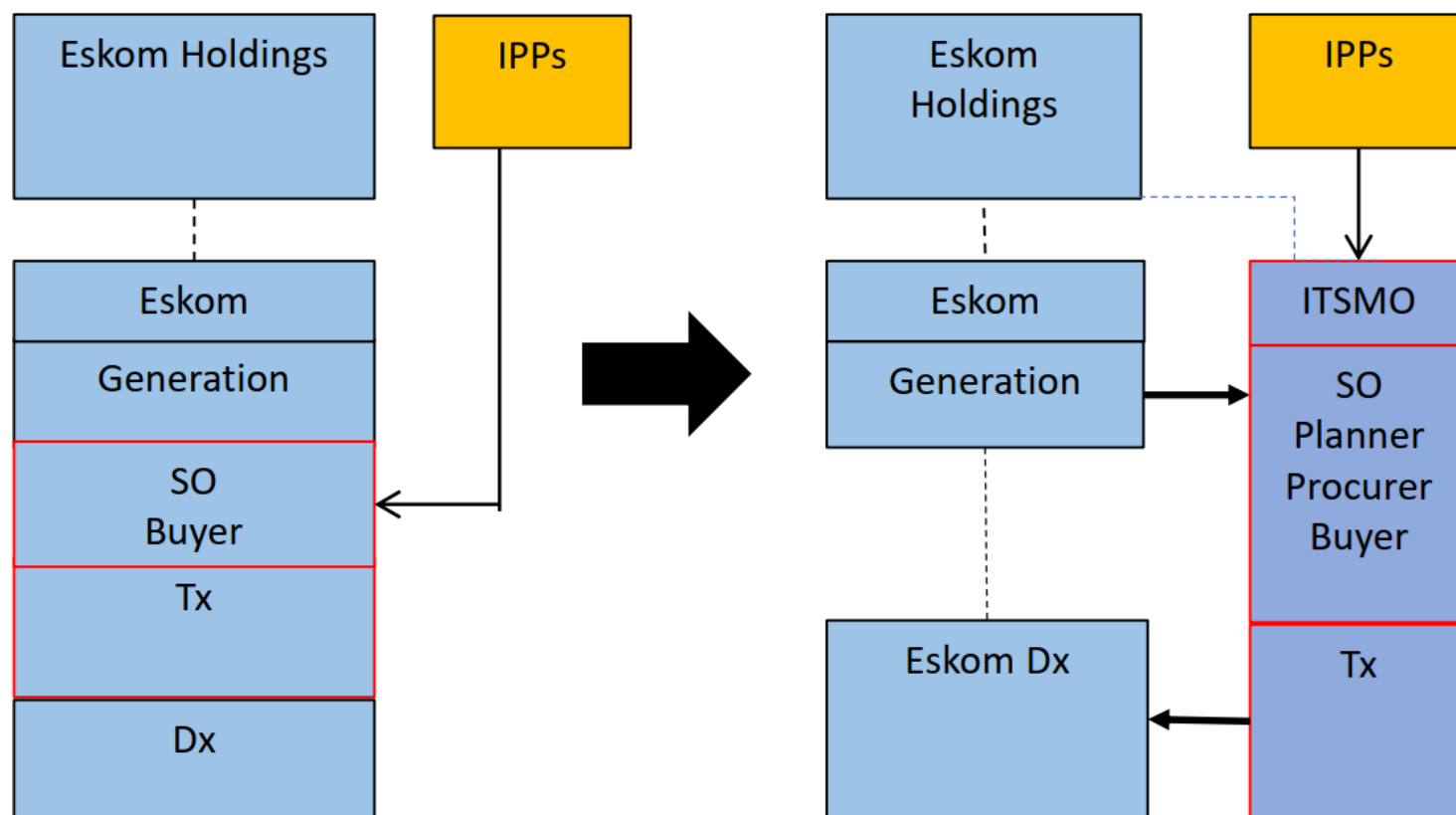
THE PATH FOR REFORMING THE POWER SECTOR IN SOUTH AFRICA

POWER SECTOR REFORM SHOULD BE APPROACHED IN TERMS OF IMPLEMENTING KEY PRINCIPLES, NOT MASTER PLANS

- Vertical separation.
- Minimise potential conflicts of interest
- Allow for a multitude of players.
- Customers should be able to choose their energy suppliers.
- Open network access should be guaranteed and practically enforceable.
- Flexibility and resilience in the face of uncertain changes already underway
- Facilitate emergence of a efficient portfolio of both utility scale and embedded / decentralised energy resources.



1ST STEP: ESKOM GENERATION AND TRANSMISSION NEED TO BE UNBUNDLED, CREATING AN INDEPENDENT GRID /SO



PRACTICALITIES

- Don't need new policy. Unbundling of Eskom generation and transmission is in the Energy Policy White Paper and mentioned in latest ANC policy documents.
- Don't need new legislation, initially. Can start as a corporate restructuring. Use Eskom Holdings structure to put ITSMO into a subsidiary company with its own externally appointed board. Later it could be spun-off into a separate state-owned company.
- Some debt-covenants will need to be re-negotiated and debt split between Generation and Transmission.
- A social plan is needed to mitigate the costs of the energy transition for employees of old coal power stations and mines and surrounding communities



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