G:ENESIS

MYPD 3 assessment

An assessment of the Eskom Multi Year Price Determination application

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Contact Information

Genesis Analytics (Pty) Ltd

Office 3, 50 Sixth Road
Hyde Park, 2196, Johannesburg
South Africa

Post to: PO Box 413431, Craighall, 2024
Johannesburg, South Africa

Tel: +2711 994 7000
Fax: +2711 994 7099

www.genesis-analytics.com

Authors

Stephan Malherbe, Anthony Felet, Riaz Angamia, Thobile Mbatha and Andre Frauenknecht

Contact Person

Anthony Felet

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EXECUTIVE SUMMARY

In its tariff application Eskom proposes an average annual tariff increase of 16 percent over the a five-year MYPD period, far in excess of expected inflation, and resulting in a doubling of electricity prices. In this report we apply best practice regulatory accounting techniques to provide an independent expert assessment of Eskom's application proposed tariff path. We also discuss the economic impact of the proposed increases, likely to be felt most in the large export sectors of the economy which tend to be power-intensive.

Other than the economic impact (discussed in Chapter 5), there are four principal reasons meriting close scrutiny of Eskom's proposals:

- The proposal for real increases follow a period of large tariff increases during MYPD 1 and 2, during which nominal electricity tariffs tripled within five years.
- Other drivers of power costs such as the additional premiums charged by municipalities and the potential introduction of the carbon tax will add further upward pressure on power costs in South Africa.
- Absent effective incentive based regulation, a monopoly provider like Eskom face no pressure to reduce costs to competitive levels. This point is borne out by Eskom's poor record in achieving operating cost efficiencies over both the MYPD 1 and MYPD 2 periods.
- The record of the previous MYPD periods demonstrates that Eskom's applications are not always accurate predictors of what eventuates. It is important to ensure Eskom's revenue allowance – with its massive impact on cost structures in the economy -- does not include significant over-recoveries of the true economic costs of generating, transmitting and distributing electricity.

When we turn to a detailed assessment of Eskom's proposed tariffs, our principal finding is that the increases are unjustified. The proposed tariff increases are based in considerable part on unsubstantiated cost escalations significantly in excess of inflation, whilst efficiency gains are absent or small. We identify about R138 billion worth of savings from the costs estimates disclosed in Eskom's Application particularly with regards primary energy and operating costs. This reduces Eskom's MYPD 3 revenue allowance by about 13 per cent; from R1 088 billion to R949 billion. The major costs savings and the items they relate to are shown in the Table below.

R million	2013/14	2014/15	2015/16	2016/17	2017/18	MYPD 3
Eskom's applied revenue allowance	**153 378**	**179 605**	**212 760**	**248 333**	**293 501**	**1 087 578**
Less coal cost savings	-6 979	-9 825	-12 212	-14 819	-16 901	-60 736
Less water cost savings	-160	-205	-227	-224	-227	-1 043
Less environmental levy savings	-581	-725	-829	-876	-910	-3 921
Less renewable energy IPP cost savings	-1 428	-6 778	-2 373	317	329	-9 933
Less manpower cost savings	-371	-283	-488	-974	-1 324	-3 440
Less IDM cost savings	-4 288	-4 302	-2 939	-2 814	-4 302	-18 645
Less arrear debt provision savings	-287	-411	-575	-748	-871	-2 894
Less "other" cost savings	-6 345	-6 891	-8 619	-8 105	-7 713	-37 673
Revised revenue allowance	**132 939**	**150 185**	**184 496**	**220 090**	**261 583**	**949 293**

The identified savings largely stem from: *limiting the coal price escalation to the expected PPI index over MYPD 3*, *reducing water consumption per kWh in line with the targets contained in Eskom's 2012 Annual Report – from 1.34 to 1.20 litres per kWh*; *correcting the renewable energy volume assumptions for calculating environmental levy costs*; *removing the third round capacity additions from the renewable energy IPP programme for calculating IPP costs*; *limiting the escalation in cost per employee to the expected CPI index over the MYPD 3 period*; *removing the double counting of IDM costs*; *limiting remaining IDM costs to the avoided cost of supply for the expected energy saved by the programmes*; *setting arrear debt provision equal to the historical average in absolute terms*; and *reducing the escalation of "other costs" to the expected PPI index over the MYPD 3 period*.

The estimates of the savings available to Eskom are also likely to be conservative. For example, we have assumed Eskom's CPI and PPI projections despite Treasury's projections of inflation being lower. We have also allowed full PPI escalation of coal cost despite the downward trend in export coal prices over the last 12 months.

Importantly, we have made no adjustments to Eskom's Regulatory Asset Base or depreciation estimates even though there is a considerable risk of significant flaws in its asset valuation approach. We have also made no adjustments to Eskom's capital expenditure estimates to take account of potential over-estimation or regulatory gaming. We have taken this conservative approach not for lack of effort, but because of the lack of information provided by Eskom in its application. Eskom's Application does not contain any information on the assumptions used in the asset valuations or depreciation estimates, which makes it impossible for stakeholders to comment on the validity of the RAB and the depreciation estimates. Given the contribution these two elements make to the overall revenue allowance, the omission of this information is not consistent with an open and transparent consultation process. **We urge NERSA to require Eskom to provide sufficient disclosure on these factors, and for the information to be made available to third parties. Failing that, it is impossible to sign off on tariff increases with any confidence**.

Based solely on the adjustments for which sufficient information, we find that a fair assessment of Eskom's MYPD 3 application indicates that a tariff of 113.7 cents per kWh by 2017/18 is more appropriate than Eskom's proposal of 128 cents per kWh by 2017/18. There is no doubt scope for further reductions if certain cost items (for which little information was given in the application) were scrutinised far more closely. The Table below presents the details of our proposed tariff path.

The year-on-year percentage increases are not however uniform throughout the period, given the non-uniform timing of certain costs (e.g. renewable energy IPP costs). A more preferable tariff profile is therefore to equalise or "smooth" the increases over the MYPD 3 period. The benefits of this approach is that it provides for a more predicable tariff profile for consumers, and could potentially limit the adverse impacts from sudden supply-side price shocks for the economy. We carried out this calculation and have derived a smoothed tariff increase of 10.8 per cent per annum. This compares to Eskom's applied increase of 16 per cent per annum.

R million	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	MYPD 3
Revised revenue allowance		132 939	150 185	184 496	220 090	261 583	949 293
Less exports and special pricing agreements		-7 191	-8 107	-8 494	-6 982	-7 297	-38 071
Standard tariff revenues (Rm)		**125 748**	**142 078**	**176 002**	**213 108**	**254 286**	**911 222**
Volumes for standard tariff customers (GWh)		205 898	209 145	215 016	219 409	223 597	1 073 066
Nominal tariffs for standard customers (c/kWh)	61.0	61.1	67.9	81.9	97.1	113.7	
Nominal tariff increases		**0.1%**	**11.2%**	**20.5%**	**18.7%**	**17.1%**	

We further demonstrate that Eskom is able to generate sufficient cash flows from our modeled smoothed tariff path to meet its operating and capital expenditure obligations and still be in a position to retire a significant portion of its gross debt by 2017/18. We accept it is important that electricity tariffs are set such that Eskom's costs are sufficiently covered to therefore ensure South Africa is provided with the required electricity on a sustainable basis. However, it is critical that the required electricity supply is attained at the minimum cost to the economy.

This is highlighted when considering the negative impact the proposed increases electricity tariffs will have on the South African economy. The sectors most directly reliant on electricity as an input into their production process include the mining, metals, minerals, agriculture and chemical industries. Indications are that the tariff increases proposed in the MYPD 3 application would increase the share of operating cost accounted for by electricity of these electricity intensive sectors by up to as much as 60 per cent in real terms. These sectors are typically also highly trade-exposed, exporting often more than 50 per cent of local production, and as a result the substantial rise in electricity costs is likely to stifle their competitiveness to some degree. As these sectors are often price takers in international markets, firms would only have very limited ability to absorb the substantial increases in real electricity tariff foreseen. The proposed electricity tariff increases can be expected to adversely impact these sectors' output and investment decisions. This is likely to have have ripple effects throughout the economy due to the significance of these sectors.

Less electricity-intensive sectors may also be adversely impacted through the so called "second round" effects of the proposed electricity tariff hikes. These "second round" effects are primarily driven by falling disposable and government income which suppresses demand, as well as the pass-on of increased electricity costs to downstream firms in the form of intermediate inputs. These effects may be substantial as the proposed increases in electricity tariffs will cost consumers an additional R10 billion a year in real terms by 2017/2018. The current economic climate, additional price pressure from municipality mark-ups and carbon tax accentuate the vulnerability of firms to the proposed tariff increases.

Quantitative studies of electricity shocks suggest significant adverse economy wide impacts. In such studies, the impact on mining and certain manufacturing sectors is consistently found to be severe in both in the short and long-run. The models register the impact of reduced consumer and government expenditure on tertiary sectors such as healthcare and financial services. Surveys further suggest that SMEs may be particularly vulnerable to shocks in electricity prices.

1. INTRODUCTION

1. On 17 October 2012, Eskom published its MYPD 3 revenue application ("Eskom's Application")[1], outlining its proposed tariffs for the five period 01 April 2013 to 31 March 2018. In its application, Eskom proposed to extend the MYPD period from three to five years, and requested from NERSA an average annual tariff increase of 16 per cent (on a cents per KWh basis) for the duration of this five year period.

2. The University of Cape Town, through its Development Policy Research Unit (DPRU), and BUSA have retained Genesis to critically review Eskom's Application in order to determine whether the proposed tariffs are cost reflective and consistent with sound regulatory accounting principles. In addition, we were asked to assess the likely economic impacts of Eskom's proposed increases, and to detail the adverse impact from recent tariff increases.

3. It is important to note that the tariff increases proposed by Eskom for MYPD 3 follow two years of 25 per cent increases, in addition to the 16 per cent increase for 2012/13. In other words, over the three year MYPD 2 period, average tariffs rose from 33 cents per kWh to 61 cent per kWh, an increase of 82 per cent. These hikes have already caused significant adverse effects on the South African economy, in terms of higher inflation and weak economic and employment growth. Further tariff increases will only exacerbate these effects.

4. It is crucial that NERSA scrutinise all aspects of Eskom's revenue allowance calculation to ensure that it does not over-recover on prudently incurred costs. Regulatory gaming is a common feature in utility tariff setting regimes, and therefore, it is incumbent on NERSA to ensure that Eskom has not over-inflated its MYPD 3 cost estimates so as to derive revenue in excess of its expected requirements. Our detailed assessment of Eskom's Application is contained in Chapter 3 of our report.

5. It is right for Eskom to derive sufficient revenues to cover its prudently incurred primary energy and operating costs, and earn a reasonable return on its capital employed. Tariffs set at cost reflective levels are consistent with a sustainable electricity market and encourage private sector participation. However, tariffs that are above cost reflective levels place a significant burden on most, if not all sectors of the economy. The economic impacts of steep hikes in electricity tariffs are explained comprehensively in Chapter 5 of our report.

6. Our report is structured as follows:

    6.1. Chapter 2 outlines the key considerations for NERSA in assessing Eskom's Application. We highlight the magnitude of recent tariff increases, municipality pricing practices, the proposed carbon tax, renewable energy IPPs, Eskom's poor operating performance, and the existence of regulatory gaming.

    6.2. Chapter 3 provides a detailed assessment of Eskom's Application, which includes a critique of the cost estimates used by Eskom to justify its proposed tariff increases. It also details the savings that we have identified from Eskom's cost estimates.

[1] Eskom: Revenue Application Multi-Year Price Determination 2013/14 to 2017/18 (MYPD 3) – 17 October 2017

6.3. Chapter 4 outlines our alternative tariff calculations, which are based on the savings identified in Chapter 3, and sound regulatory accounting principles.

6.4. Chapter 5 details our high level economic impact assessment based on the CGE studies conducted by various economic institutions such as the HSRC, and the KZN Department of Economic Development. This chapter also summarises the findings of the Deloitte Economic Impact analysis (referred to by Eskom) and discusses the extent to which it provides a complete assessment of the impact of rising energy costs.

6.5. Chapter 6 concludes our report.

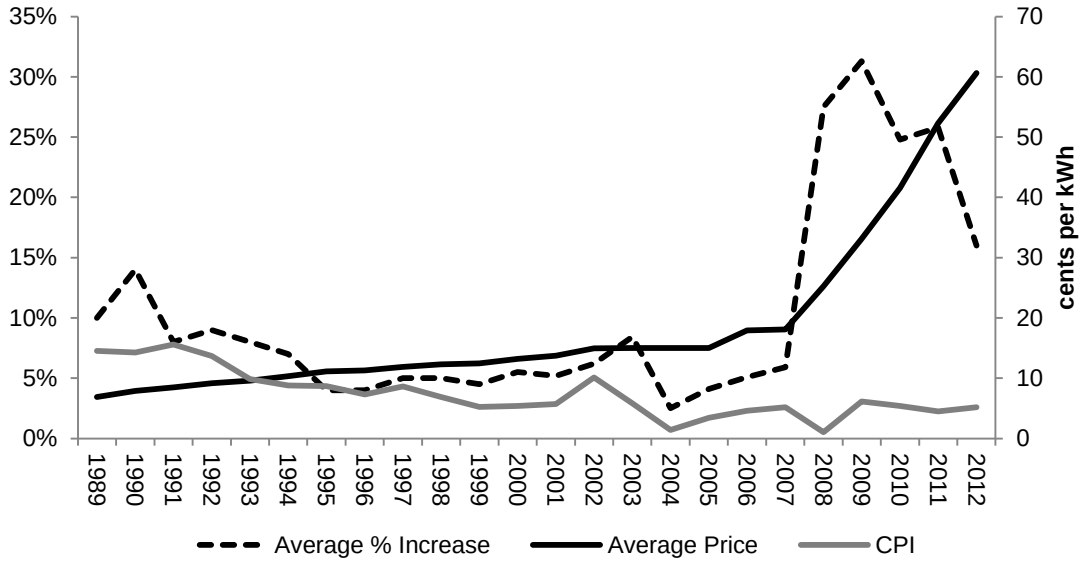
2. KEY CONSIDERATIONS FOR NERSA

7. There are a number of important issues that NERSA needs to consider carefully when it undertakes its MYPD 3 determination. For example, Eskom's Application fails to highlight the extent to which the tariff increases imposed during MYPD 1 and 2 have adversely impacted the local economy. It also fails to explain how municipality pricing practices are exacerbating these economic impacts with the excessive premiums they charge on top of Eskom's wholesale tariffs. These issues are discussed in more detail below. In addition we explain how increasing renewables in the energy mix and the proposed carbon tax are likely to affect future tariff levels.

2.1. RECENT TARIFF INCREASES

8. Over the twenty year period up to 2007, tariffs generally followed the rate of CPI inflation. However, since NERSA's first tariff determination (MYPD 1), tariffs have significantly exceeded CPI inflation, and in nominal terms, tripled over the last five years, as shown in Figure 1.

Figure 1: South African electricity prices 1989 to 2012



Source: Eskom website - tariff history

9. There are two major causes for this outcome. Firstly, Eskom has undertaken a significant capital expansion since 2008, and this has added considerably to primary energy and operating costs, and has required a greater profit return to Eskom's shareholders. Increases in the recovery of operating and capital costs have exceeded volume growth over the past five years, and therefore tariffs have increased markedly. Secondly, there was a change in Eskom's asset valuation methodology at the beginning of MYPD 2, which was prescribed in the Electricity Pricing Policy ("EPP"). More specifically, NERSA was required to move from an Indexed Historical Cost ("IHC") approach to a Depreciated Replacement Cost ("DRC") approach. The asset values used by NERSA were significantly higher than the values disclosed in Eskom's financial statements, which resulted in the returns and depreciation elements of the MYPD 2 revenue allowance being much higher than the levels assumed in MYPD 1. The tariffs approved by NERSA for both determinations are shown in Table 1.

Table 1: MYPD 1 and 2 tariff determinations

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
	MYPD 1			Interim	MYPD 2		
Approved tariff (c/kWh)	17.91	18.09	25.24	33.14	41.57	52.30	60.66
% increase	5.1%	5.9%	27.5%	31.3%	24.8%	25.8%	16.0%

Source: NERSA Record of Decisions for MYPD1,2 and Interim Decision of 2009/10

10. As we explain in chapter 5, these increases have already imposed significant burdens on the South African economy, in terms of higher inflation, loss of employment and lower exports. Additional 16 per cent per annum increases for MYPD 3 would mean that tariffs would have increased four-fold in the nine years from 2008/09 to 2017/18. Increases of this magnitude would have dire economic consequences, particularly for energy intensive industries in the country.

11. We understand the need for tariffs to be cost reflective. However, as we explain in chapter 4, we believe that the tariffs proposed by Eskom for MYPD 3 are well in excess of cost reflective levels.

2.2. MUNICIPALITY PRICING PRACTICES

12. There are currently about 187 licensed municipal distributors in the country and their tariff structures and levels vary considerably. For most municipalities, there is no ring-fencing of services related to electricity distribution, which means that some municipal services are being subsidised by electricity charges.

13. NERSA's regulation of municipal tariffs is limited to providing pricing guidelines to municipalities, based largely on increases granted in each MYPD determination. These guidelines include a price increase benchmark and further increases to cover expenditure on electricity infrastructure[2]. NERSA relies on information provided by municipalities on their electricity distribution and reticulation activities (via D Forms) when setting its tariff guidelines. It also relies on the municipal cost of supply studies, which were initiated by the EDIH[3], the administrative body responsible for designing the regional distribution framework. We understand that there are significant delays in the completion of the studies, and their future provision is unlikely after the disbanding of the EDIH in 2010. This indicates that NERSA faces significant information asymmetries with regards to setting municipal tariff guidelines.

14. Another concern is the limited information available on historical investments in municipal distribution networks. Lack of investment has had adverse implications on the reliability of supply, which has seriously deteriorated in some municipalities. Recent reports estimate that the backlog of outstanding distribution investment has risen to R35bn from the initial R25Bn[4] that was reported at the 2008 Electricity Distribution Summit[5]. This places further pressure on municipalities to increase tariffs beyond NERSA's pricing guidelines.

15. According to the IDC, roughly 20 per cent of municipalities had illegal tariff structures in 2009, meaning that many municipalities were using MYPD tariff increases to *"generate significant surpluses from electricity revenues that [were] used to contribute to the rates*

[2] Indicative Municipal Tariff guidelines and The Reasons for Decision for Municipal Tariff Application above guideline increase – for implementation 01 July 2012
[3]Electricity Distribution Industry Holdings

[5] http://www.infrastructurene.ws/2012/10/09/shocking-r35bn-electricity-maintenance-backlog/ accessed 06/11/2012

and general account of the municipality as a supplementary revenue source". For four municipalities, the surplus of municipality charges over the NERSA guidelines were in the order of 15 per cent, and for three municipalities, the surplus was close to or more than 25 per cent[6]. IDC also confirmed that many municipalities were submitting Distribution Information Forms to NERSA of such poor quality that NERSA were unable to make use of them.

16. It is evident that any significant wholesale tariff increase allowed by NERSA will have a disproportionate effect on downstream municipal pricing of electricity. The means that despite Eskom's claim of its tariffs being cost reflective, a significant over-recovery of costs will occur across the total electricity value chain.

2.3. RENEWABLE ENERGY IPPS

17. The urgency to invest in additional electricity generation capacity was accelerated by the shortages of available generation capacity and the erosion of the reserve margin during the 2008 power crisis. Eskom is struggling to deliver all of the country's power needs in the future in a timely and cost effective manner and, accordingly, Independent Power Producers (IPPs) are important for meeting the energy needs for the growth of the economy.

18. The Department of Energy has embarked on a three-round programme to procure a total of 3,725 MW of renewable energy from IPPs. We understand that the department has awarded two rounds of allocations and the final round is yet to be determined. Projects submitted under the first round of bidding must be capable of beginning commercial operation before the end of June 2014 or June 2015, depending on the type of generation technology. The maximum prices (in 2011 prices) that Eskom would pay IPPs for renewable energy under each type of technology are shown in Table 2.

Table 2: Renewable energy IPP price caps

Generation technology	MW	c/kWh
Onshore wind	1 850	115
Solar photovoltaic	1 450	285
Concentrated solar power	200	285
Biomass	13	107
Bogass	13	80
Landfill Gas	25	60
Small Hydro	75	103
Other small	100	115

Source: The Department of Energy tender document DOE/001/2011/2012

19. It is clear from the above prices that renewable energy generation is significantly more expensive than traditional coal powered generation. Eskom's current generation costs are about 50 cents per kWh[7]. Altering Eskom's generation mix to include the purchases from renewable energy IPPs will increase its primary energy costs significantly, and this is before Eskom adds any generation capacity of its own. Accordingly, tariffs will increase regardless of the movements in Eskom's own costs. This is confirmed by Eskom's Application which states that 3 per cent of the 16 per cent increase is attributable to the

[6] Industrial Development Corporation of South Africa Limited: Request for proposal for research into the impact and policy implications of escalated electricity prices and changing energy mix in South Africa, 2012.
[7] Calculated using primary energy costs and a portion of other operating and capital costs for 2011 divided by volumes (kWh).

introduction of renewable IPPs over the MYPD 3 period. This emphasises the importance of NERSA's scrutiny of Eskom's primary energy costs.

2.4. CARBON TAX

20. In his Budget Reveiw for 2012[8], the Finance Minister Pravin Gordhan announced that the carbon tax would be implemented in the next financial year (2013-2014). While the implementation of the tax appears to have since been postponed, the Budget Review decision suggests that Treasury is likely to implement the tax in the near future, i.e. during the MYPD 3 period. In its discussion document[9], the National Treasury proposed a carbon tax of approximately R100 per ton of CO_2 rising to R300 (in 2010 prices) per ton of CO_2. The subsequent Budget Review suggested a tax of R120 per ton of CO_2, with additional concessions for manufacturing emissions and trade-exposed sectors[10]. The impact of the carbon tax is further explained in Chapter 5 of this report.

2.5. ESKOM'S POOR OPERATING PERFORMANCE

21. In the absence of effective incentive based regulation, dominant utility companies face no pressure to reduce costs to levels that would be expected in a competitive market, and this is particularly true for Eskom. Eskom has a poor record in achieving operating cost efficiencies over the MYPD 1 and MYPD 2 period. In fact, on a per unit basis, Eskom's primary energy and operating costs have increased by 175 per cent in nominal terms in the period 2006/07 to 2011/12[11]. This equates to a CAGR in unit costs of 22 per cent. If one just considers operating costs under the control of Eskom (i.e. ignoring primary energy), the CAGR is 17 per cent.

22. Table 3 summarises the actual operating results of Eskom for the years 2006/07 to 2011/12, which covers MYPD 1, the interim period and most of MYPD 2.

Table 3: Eskom's actual operating results – 2006/07 to 2011/12

R million	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Revenue	40 427	44 679	54 177	71 209	91 447	114 760
Primary Energy	13 040	18 314	24 884	29 100	35 795	46 314
Operating Expenses	16 226	18 866	24 708	26 190	29 553	35 961
Depreciation	4 709	4 284	4 918	5 726	7 219	8 801
Operating Profit	**6 452**	**3 215**	**-333**	**10 193**	**18 880**	**23 684**
Volume produced (GWh)	232 445	239 109	228 994	232 812	237 430	237 291
Unit revenue (c/kWh)	17.4	18.7	23.7	30.6	38.5	48.4
Unit primary energy costs (c/kWh)	5.6	7.7	10.9	12.5	15.1	19.5
Unit operating expenses (c/kWh)	7.0	7.9	10.8	11.2	12.4	15.2

Source: Eskom's Historical Financial Statements

23. Eskom's revenues increased by 184 per cent over the period but volumes only rose by 2.1 per cent, reflecting the escalating tariffs granted by NERSA. On the cost side, its primary energy and operating costs per unit of volume produced (kWh) increased from 5.6 cents to 19.5 cents and 7.0 cents to 15.2 cents respectively. This provides strong evidence that Eskom's operating efficiency has deteriorated, and Eskom has relied on tariff increases to achieve profitability. Table 4 summarises the year on year percentage

[8] National Treasury: Budget Review 2012, 22 February 2012
[9] National Treasury: Reducing Greenhouse Gas Emissions: The Carbon Tax Option, December 2010
[10] Tax proposal Budget 2012, Indirect Taxes: Carbon Emissions tax pg8-11
[11] Equating to the movement in unit costs - calculated as primary energy plus operating cost divided by sales volumes (GWh).

increase (from 2007/08 through 2011/12) on a per unit of volume produced basis, in primary energy and operating costs.

Table 4: Percentage increases in Eskom's revenue and costs per unit of volume

per cent	2007/08	2008/09	2009/10	2010/11	2011/12	CAGR
Volume Produced	2.9	-4.2	1.7	2.0	-0.1	0.4
Unit revenue (c/kWh)	7.4	26.6	29.3	25.9	25.6	22.7
Unit primary energy costs (c/kWh)	36.5	41.9	15.0	20.6	29.5	28.3
Unit operating expenses (c/kWh)	13.0	36.8	4.3	10.6	21.8	16.8

Source: Eskom's Historical Financial Statements

24. The above tables reinforce the importance of robust scrutiny of Eskom's Application, particularly with regards to its cost assumptions. Given Eskom's poor historical cost performance, it is important to ensure that Eskom's revenue allowance does not allow significant over-recoveries of the true economic costs of generating, transmitting and distributing electricity.

25. We highlighted to NERSA in a previous submission[12] that a robust quantitative benchmarking approach for assessing Eskom's operating costs is preferable to the granting of inflationary increases, as per the practice in previous determinations. Benchmarking methods have been developed and employed by energy regulators in other countries for evaluating the efficiency of monopoly electricity providers. The main objective of these methods is to improve the efficiency of electricity providers by measuring their performance against a predetermined benchmark and rewarding performance accordingly.

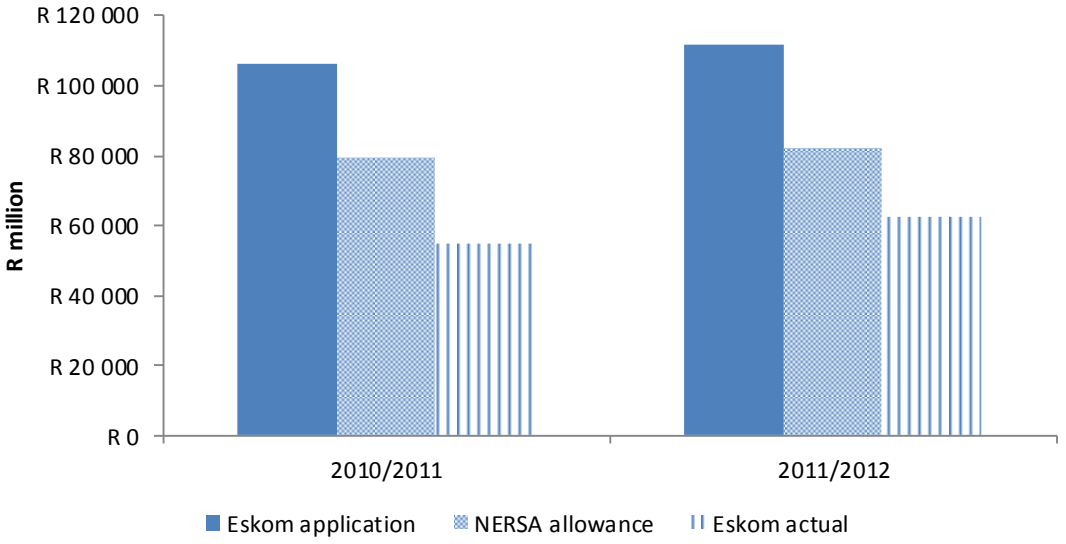
2.6. REGULATORY GAMING

26. In addition to its poor operating performance, there is also strong evidence that Eskom has over-inflated its revenue requirements in its application in order to allow for further underperformance for the MYPD 3 period. We detail this evidence in Chapter 3. This is also borne out by the target revenues disclosed in Eskom's 2012 Integrated Report. Appendix A of that report (labelled "Key Indicators") shows its target performance for the 2016/17 year under a number or performance metrics. More specifically, it shows that Eskom has a target unit revenue requirement of 97.5 cents per kWh for the 2016/17 year. This compares to Eskom's calculated tariff of 110 cents per kWh disclosed in its MYPD 3 Application for that year[13], meaning that Eskom is seeking to over-recover its true estimates of operating and capital costs by about 13 per cent. This is consistent with the regulatory gaming practices that are common in utility tariff applications.

27. To illustrate this point further, we compared Eskom's estimates of capex, primary energy costs and operating costs disclosed in its MYPD 2 application[14] (for the 2010/11 and 2011/12 years), and compared these to the cost allowances granted by NERSA and actual costs incurred for those years. As we are currently in the third year of MYPD 2, we are unable to obtain Eskom's actual results for 2012/13. Figure 3 provides a graphical illustration of this comparison.

[12] Genesis Analytics: A Report on the financial aspects of NERSA's MYPD Methodology document, May 2012
[13] See Table 3 of Eskom's Application
[14] Dated 30 November 2009

Figure 2: Comparison of Eskom MYPD 2 application, NERSA allowance and actual capex for 2010/11 and 2011/12

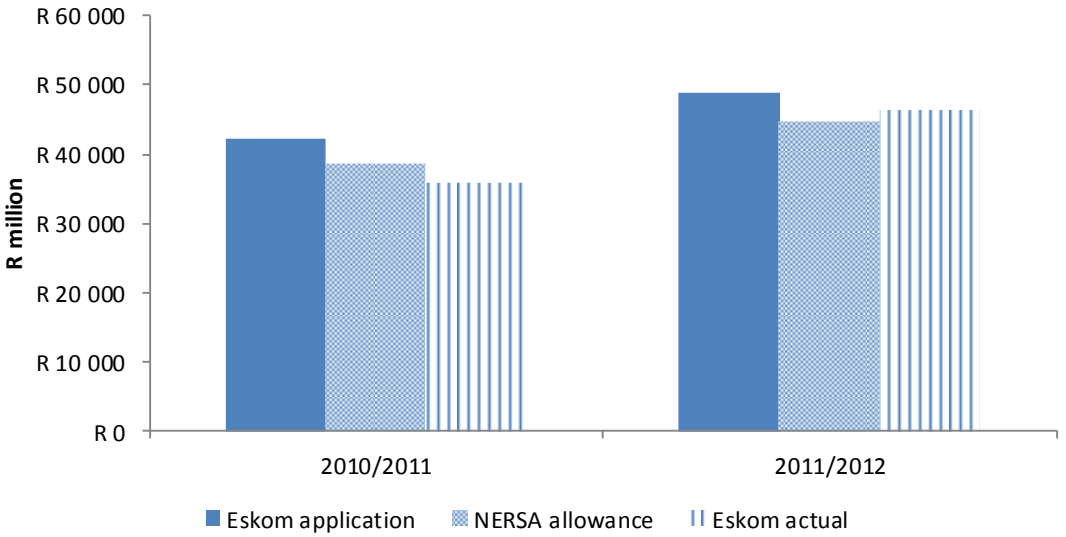


Source: Eskom's Annual Report 2012, 2011 and Eskom's MYPD 2 application

28. In its 2009 application, Eskom significantly over-estimated its capital expenditure requirements for MYPD 2 by R99.8 billion, and this is for the first two years only. Even NERSA's allowance overestimated capital expenditure by R43.7 billion, meaning that Eskom's RAB was markedly over-valued during these years. It is unclear how NERSA had corrected for this over-recovery during the MYPD 2 period, but in the absence of an appropriate claw-back, Eskom would have over-recovered some R3.6 billion in its revenue allowance, assuming a cost of capital of 8.1 per cent that was granted by NERSA in its determination.

29. Figure 4 shows the same comparison for primary energy costs.

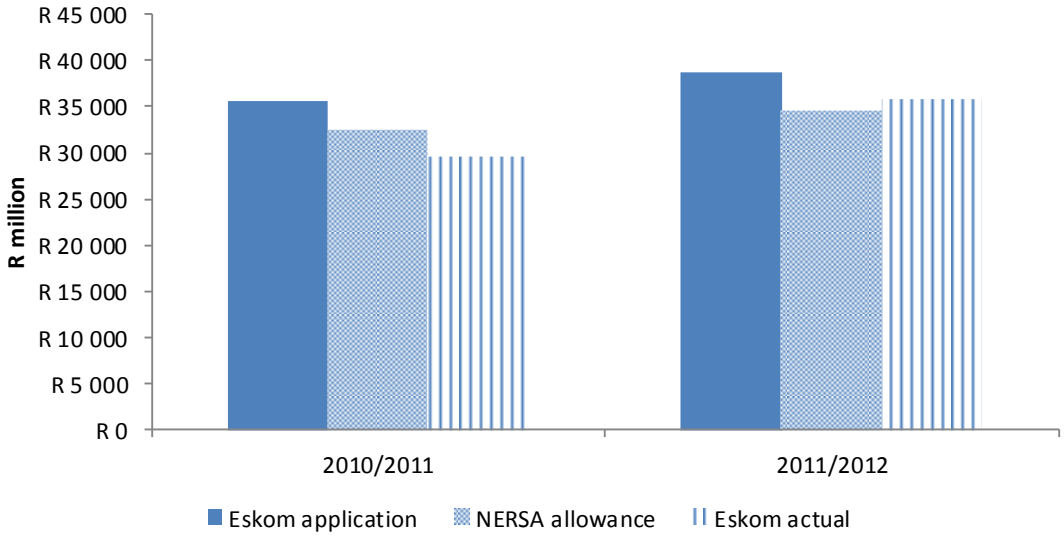
Figure 3: Comparison of Eskom MYPD 2 application, NERSA allowance and actual primary energy costs for 2010/11 and 2011/12



Source: Eskom's Annual Report 2012, 2011 and Eskom's MYPD 2 application

30. Eskom over-estimated its primary energy costs by R8.9 billion for the first two years of MYPD 2. Despite NERSA identifying savings in its determination, its allowance for MYPD 2 still exceeded actual cost by R1.4 billion. Figure 5 provides the same comparison for operating costs.

Figure 4: Comparison of Eskom MYPD 2 application, NERSA allowance and actual operating costs for 2010/11 and 2011/12



Source: Eskom's Annual Report 2012, 2011 and Eskom's MYPD 2 application

31. As per primary energy costs, Eskom over-estimated its operating cost by R7.0 billion for the first two years of MYPD 2. NERSA, after its adjustments, had also over-estimated operating costs by R1.8 billion.

32. Taking into account the extent of over-estimation in Eskom's MYPD 2 application, and the actual underspend on capital expenditure, primary energy and operating cost relative to NERSA's MYPD 2 allowance, it is eve\ident that Eskom engaged in systematic regulatory gaming in its previous application. If they were granted the revenues they applied for, they would have derived significant excess revenues and profits. Also, the under-spend still translated into massive escalations of unit costs described above. When assessing the increase in costs proposed in the MYPD 3 application, NERSA should assume some degree of over-estimation from Eskom and therefore be vigorous in its search for savings.

33. In summary, it is important that NERSA consider all of the issues outlined above in its determination of Eskom's revenue allowance. More specifically, Eskom's proposed above-inflation tariff increases for MYPD 3 must be considered in the context of:

    33.1. The significant increases that have already been granted in MYPD 1 and 2, which have had significant adverse impacts on the economy

    33.2. The municipality pricing practices which have the ability to amplify any increases granted by NERSA

    33.3. The potential impact of the carbon tax proposed by National Treasury, which will add significantly to Eskom's own cost base

    33.4. The additional requirements of Eskom to purchase renewable energy from IPPs during the MYPD 3, which is expected to add significantly to Eskom's primary energy costs

33.5. The rapid escalation of Eskom's unit operating costs over MYPD 1 and 2, which points to a deterioration of its operating performance

33.6. Evidence of regulatory gaming from Eskom

3. ASSESSMENT OF THE MYPD 3 APPLICATION

34. The standard building block approach to setting electricity tariffs, as outlined in NERSA's MYPD Methodology document[15], requires Eskom to estimate its cost of production (primary energy and operating costs), depreciation and a reasonable rate of return on its assets, valued at depreciated replacement cost. The chapter provides a detailed assessment of Eskom's Application which contains its estimates of these building blocks for the MYPD 3 period. We first explain how Eskom has derived its estimates, provide a critique of the same and then disclose our own estimates for the purposes of deriving alternative tariff calculation.

3.1. SUMMARY OF ESKOM'S APPLICATION

35. Eskom's Application covers the period of 01 April 2013 to 31 March 2018, which is an extension to the standard three year MYPD term. It is proposing average annual tariff increases (in nominal terms) of 16 per cent for each year of the five-year period, as shown in Table 5.

Table 5: Eskom's proposed tariffs MYPD 2

cents/kWh	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Average tariff (c/kWh) (nom)	61	71	82	95	110	128
Increase per annum		16%	16%	16%	16%	16%
Average tariff (c/kWh) (real, 2012/13)	61	67	73	80	88	96
Increase per annum		10%	9%	9%	9%	10%

Source: Eskom's Application

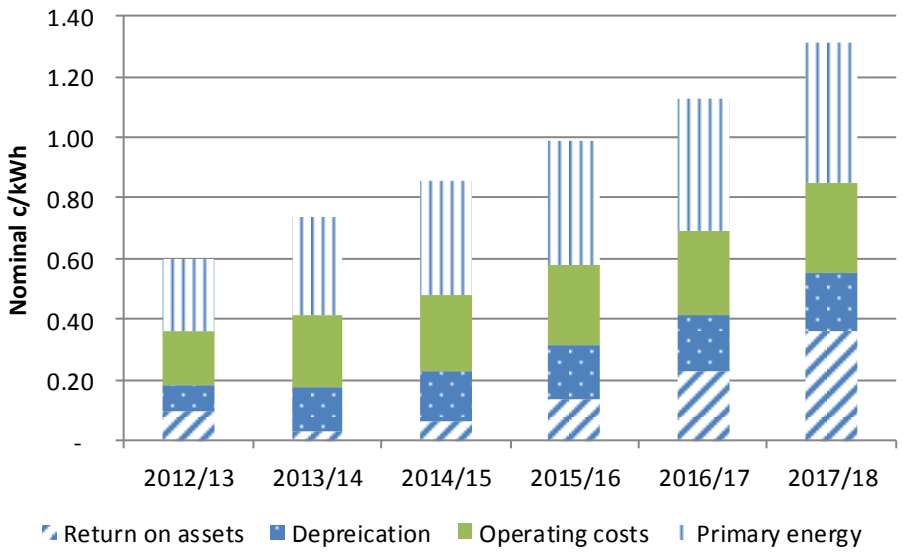
36. Current year average tariffs are 61 cents per kWh and Eskom proposes to increase this to 128 cents per kWh by 2017/18. Taking into account expected CPI inflation (as assumed by Eskom) tariffs would increase about 10 per cent per annum over the period. These above inflation increases result from Eskom's estimates for each of the revenue allowance categories, namely returns on assets, depreciation, primary energy costs and operating costs. The tariffs are calculated by dividing the projected revenue allowance for each year by the projected volumes, which for Eskom, is the amount of KWh sold in each year. As the revenue allowance is projected to increase much faster than volumes over the MYPD 3 period, the revenue yield (cents per KWh) will rise, and in the case of MYPD3, well in excess of inflation.

37. Primary energy makes up the largest component of Eskom's current revenue allowance, and this is expected to remain so throughout MYPD 3, i.e. about 40 per cent of the total revenue requirement. Operating cost, covering generation, transmission, distribution and corporate overheads, is the next largest component (26 per cent of the total), followed by returns on assets and depreciation (both accounting for 17 per cent of the total).

38. A graphical representation of the make-up of Eskom's proposed tariffs for the MYPD 3 period is contained in Figure 1. For comparability purposes, we include the last year of MYPD 2 (2012/13), as determined by NERSA in its revised determination in March 2012.

[15] NERSA consultation paper: Eskom Multi-Year Price Determination Methodology, October 2011

Figure 5: Eskom's estimate of building blocks for MYPD 3



Source: Eskom MYPD 3 application and Genesis calculations

39. The tariff increases in Eskom's Application are largely driven by the following:

    39.1. Assumed coal price increases (R per ton) of about 10 per cent per annum.

    39.2. Marked increases in expected power purchases from IPPs due to the Department of Energy's renewable energy IPP programme. IPP purchases are expected to increase from R4.8 billion in 2012/13 to R21.0 billion in 2017/18.

    39.3. Marked increases in maintenance costs, from R10.3 billion in 2012/13 to R16.9 billion in 2017/18, which Eskom argues is necessary due to the expanding generation capacity and transmission network.

    39.4. Marked increases in "other" costs, from R3.4 billion in 2011/12 to R13.7 billion in 2017/18. There is no explanation given in Eskom's Application for these increases.

    39.5. R340 billion of capital expenditure for the MYPD 3 period, largely accounted for by the completion of Medupi and Kusile power stations. This planned capex will be added to the Regulatory Asset Base (RAB) as incurred.

    39.6. Continued progression to a full return of assets based on a DRC valuation. Eskom assumes that real returns on its RAB (on a DRC basis) will increase from 0.9 per cent in 2013/14 to 7.8 per cent in 2017/18.

    39.7. Full depreciation recovery (also on a DRC basis) over the MYPD period

40. The above aspects will be the focus of our assessment of Eskom's Application as outlined in the remainder of this chapter. We will also deal with manpower costs and the cost of capital as these elements also have significant impacts on tariff estimates. We begin our assessment with Eskom's proposal to increase the MYPD period from three to five years.

3.2. PROPOSAL FOR FIVE YEAR PERIOD

41. Eskom essentially makes three arguments in support of a five-year regulatory period:

    41.1. Firstly, that the price path is more gradual, or smooth;

    41.2. Secondly, that the price path is more predictable; and

    41.3. Thirdly, that price increases are lower due to reaching cost-reflectivity over a longer period.

42. With regards to the first argument (smoother price paths), we note that price increases are usually constant for each year within a MYPD period. Accordingly, the longer the MYPD term, the longer the period where price increases are constant. However, it is not clear that the benefits of this approach would be material, particularly if the annual price increases are substantial (as per MYPD 2).

43. With regards to the second argument (more predictable prices), we agree that a longer time horizon would add certainty, which in turn, presumably, benefit investors and businesses with respect to planning purposes. However, price determinations for any MYPD period are never certain as earnings over-runs or under-runs may result in a reopener in any case[16]. Thus it is not clear that a move from a three-year to five-year regulatory period would mean that prices are any more predictable, at least not to any significant degree.

44. With regards to the third argument (lower price increases), we agree that reaching cost reflectivity over a longer period would invariably mean lower year-on-year increases. However, the point at which prices become cost-reflective is a decision which is independent of the regulatory period. Even with a three-year regulatory period, one could design a price path such that cost reflectivity is attained in the second year of the next three-year period (i.e. the fifth year). Also, this point is only valid if prices are not currently cost reflective.

45. There are potentially some additional benefits to a longer regulatory period not expressed by Eskom in its application:

    45.1. Firstly, a longer MYPD period provides Eskom with a greater incentive for cost savings[17]. This is because savings achieved by Eskom are enjoyed for a longer period before NERSA reclaims a lower cost base in the next MYPD determination. Accordingly, the potential level of savings due to efficiency gains are higher.

    45.2. Secondly, a longer regulatory period would mean a lower regulatory burden on NERSA, as well as a lower burden on Eskom. With less regulatory reviews, the costs of regulation would be reduced, although this may be mitigated to some extent where there are reopeners that would not otherwise have happened. However, there is also a trade-off between reducing the regulatory burden and

[16] This was also pointed out by the Treasury (See page 46 of Eskom's Application).
[17] See for instance: Joskow, P. L. (2006). Incentive regulation in theory and practice: Electricity distribution and transmission networks. Prepared for the National Bureau of Economic Research Conference on Economic Regulation, September 9-10, 2005, p. 17. (Available at: http://economics.mit.edu/files/1181)

effective public participation[18]. In effect, there would also be less public scrutiny of Eskom prices and costs.

45.3. Thirdly, Eskom has submitted in public hearings that a five-year period would give greater comfort to ratings agencies, as there is less scope for NERSA to change the "regulatory goal posts" for a given period. If it is indeed correct, this should result in a lower cost of capital for Eskom.

46. One potential issue with a five-year regulatory period is the additional uncertainty of predictions on key variables of the revenue allowance calculation, such as volumes and capex. The longer the regulatory period, the greater the likelihood of variances between actual and forecast levels of key variables. The Treasury points this out when it warns "*that a prolonged control period reduce(s) certainty regarding underlying assumptions"* [19]. This issue can be resolved by clear pass-through and tariff correction mechanisms in NERSA MYPD methodology document.

47. In summary, there are potential positive effects of a longer MYPD period in terms of improved cost efficiencies and lower regulatory costs. We believe that on balance, these benefits are likely to outweigh the detriments (less scrutiny of Eskom and less accurate revenue allowance calculations), particularly as these detriments can be mitigated from year-end correcting mechanisms to cater for uncontrollable variances in key variables within an MYPD period. It is also worth noting that Eskom's five year proposal is consistent with the tariff periods adopted by the UK's Ofgem for the price regulation of distribution and transmission companies.

3.3. PRIMARY ENERGY

48. Primary energy refers to the acquisition of coal, uranium, water, gas and diesel that are used by Eskom in the generation of electricity. The largest component of primary energy costs is the purchase of coal. Eskom's estimates of its coal costs are driven by three factors - a) energy produced b) coal burnt per unit of energy and c) coal cost per ton. The values of these factors and the derivation of Eskom's estimated coal costs are shown in Table 6.

Table 6: Eskom's Application coal cost estimates

Eskom's Application	2011/12 Actual	2012/13 Forecast	2013/14 MYPD 3	2014/15 MYPD 3	2015/16 MYPD 3	2016/17 MYPD 3	2017/18 MYPD 3
Energy produced by coal (GWh)			220 520	222 661	229 194	231 406	237 325
Coal burn (tons per MWh)			0.57	0.57	0.57	0.57	0.57
Coal burn (m tons)			126	127	131	132	135
Total coal costs (Rm)			37 010	41 966	47 282	52 351	57 703
Coal cost per ton	212	271	294	331	362	397	427
Increase per annum		27.6%	8.6%	12.3%	9.5%	9.7%	7.5%

Source: Eskom's Application and Genesis calculations

49. Eskom's Application provides estimates of total coal costs (in R million), energy produced by coal (in GWh) and the coal burn per GWh of energy produced (tons). From this information we are able to derive the coal cost per ton assumed for MYPD 3. As shown above, Eskom expects coal costs per ton to increase from R212 in 2011/12 to R427 by the end of MYPD 3, equating to a CAGR of 12.3 per cent. This is well above any reasonable inflationary forecast and contrary to the trend in market spot rates, i.e. South

[18] Church, J. and Ware, R. (2000). Industrial Organization: A Strategic Approach. Boston: McGraw-Hill, p. 861
[19] See page 46 of Eskom's Application.

African exports prices are currently at their lowest level for almost three years[20]. Eskom does not provide any reasoning in its application for the magnitude of the assumed coal cost increases. We note from NERSA Methodology document that a risk-sharing mechanism (PBR formula) for movements in coal costs will be implemented for MYPD 3. Under this mechanism, Eskom would only be allowed a partial pass through of coal cost increases beyond a pre-determined benchmark price. This would incentivise Eskom to overstate its ex-ante estimates of prices, which is evident in its assumed coal prices for MYPD 3.

50. We believe that an objective price escalation assumption for coal costs would be the forecast PPI over the MYPD 3 period, starting from the actual coal cost in 2011/12. This would result in unit coal costs increasing from R212 to R302 in 2017/18. This, more modest, level of escalation is more appropriate than Eskom's assumed escalation for the following reasons:

    50.1. According to its application, Eskom will be sourcing more coal under long-term mining contracts during MYPD 3, which it states will *"minimise overall costs, reduce supply risk and create price stability"*.[21]

    50.2. According to its application, Eskom is migrating a significant portion of its current coal-transport volume from road to rail, which it states *"is significantly more cost effective in the long term"*.[22]

    50.3. The new Medupi and Kusile generation plants, which come on line during MYPD 3, should operate at lower a coal burn rate than Eskom's existing plants, which should help constrain Eskom's overall coal costs.

    50.4. The Department of Energy's IRP 2010 – 2030 report has modeled its chosen Revised Balanced scenario at R200 per ton (in constant 2010 prices) throughout the twenty year period, which is consistent with our coal price estimates.

    50.5. The downward trend in coal prices over the last 12 months means that any future escalation should begin at a base lower than the one assumed in Eskom's Application.

51. Table 7 shows our estimates of Eskom's MYPD coal costs assuming coal prices escalating according to forecast PPI. We assume the same volumes as disclosed in Eskom's Application

Table 7: Genesis estimates of Eskom's coal costs for MYPD 3

Genesis adjustments	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Coal cost per ton (inc as per PPI)	212	225	239	253	268	285	302
Coal burn (m tons)			126	127	131	132	135
Total coal costs (Rm)			30 031	32 141	35 070	37 532	40 802
Savings (Rm)			6 979	9 825	12 212	14 819	16 901

Source: Genesis calculations

52. Our coal cost estimates produce savings (relative to Eskom's estimates) of R7 billion in 2013/14, rising to R16.9 billion in 2017/18. For all of MYPD 3, the savings total R60.7 billion.

[20] See http://www.bloomberg.com/news/2012-10-29/south-african-coal-export-prices-fall-to-lowest-in-three-years.html
[21] See page 57 of Eskom's Application
[22] See page 57 of Eskom's Application

53. As with coal costs, water costs are largely dependent on the amount of energy produced. Eskom's Application contains a provision of R12.8 billion to cover these costs over MYPD 3. On an annual basis, costs are expected to increase from R1.5 billion in 2012/13 to R 3.0 billion in 2017/18. This increase arises from Eskom's assumption that unit water costs will more than double during MYPD 3, due to the Department of Water Affair expanding infrastructure. We find no support for price increases of this magnitude in any of the multi-year strategic plans published by the Department.

54. Nonetheless we do anticipate significant infrastructure water investment during MYPD 3 and given the lack of guidance from the Department, it is difficult to determine an alternative price escalation estimate. However, we do have concerns about Eskom's water volume consumption assumptions, in that they assume a relatively constant level over the MYPD 3 period. This is contrary to the water volume consumption targets contained in Eskom's 2012 Annual Report, which shows that the number of litres consumed per kWh of energy produced is expected to fall from 1.34 in 2011/12 to 1.20 in 2016/17[23]. This is due to the new Medupi and Kusile power plants being dry cooled. Accordingly, we have applied this assumed reduction for the purposes of calculating alternative water costs for MYPD 3, which is shown in Table 8.

Table 8: Genesis estimates of Eskom's water costs for MYPD 3

Water costs	2013/14	2014/15	2015/16	2016/17	2017/18
Water consumption (L/Kwh)	1.34	1.31	1.27	1.24	1.20
Energy produced all sources (GWh)	239 896	243 639	249 542	252 930	259 281
Total water consumption (ML)	321 461	317 948	316 918	312 369	311 138
Water price (R/ML)	5 982	6 947	7 533	8 088	8 768
Water cost (Rm)	1 923	2 209	2 387	2 526	2 728
Savings (Rm)	160	205	227	224	227

Source Genesis calculations

55. Our estimates of Eskom's water costs produce savings (relative to Eskom's estimates) of about R200 million per annum over the MYPD period.

56. Another key cost category within primary energy is the environmental levy, payable at a rate of 3.5 cents per kWh of non-renewable energy produced (i.e. from coal, nuclear and gas). Eskom's calculations assume generation volumes that appear inconsistent with the gross generation volumes disclosed in Table 42 of its application. In addition although Eskom excludes hydro and pumped storage from its non-renewable volume estimates, it does not exclude wind, which is also not subject to the levy.

57. Our estimate of Eskom's environmental levy costs, using the non-renewable volume assumptions in Eskom's Application, is shown in Table 9.

[23] See 2012 Annual Report Appendix A "Key Indicators"

Table 9: Genesis estimates of Eskom's environmental levy costs for MYPD 3

Environmental levy costs	2013/14	2014/15	2015/16	2016/17	2017/18
Gross non-renewable energy (GWh)	236 043	237 488	242 693	246 136	252 440
Environmental levy rate (c/kWh)	3.5	3.5	3.5	3.5	3.5
Environmental levy costs (Rm)	8 261	8 312	8 494	8 615	8 835
Savings (Rm)	581	725	829	876	910

Source: Genesis calculations

58. IPP costs are the second largest cost category within primary energy, and these costs account for 3 of the 16 per cent tariff increases that Eskom is proposing. The reason for this impact is the start of the renewable energy IPP programme. As stated in Eskom's Application, the Department of Energy has embarked a three-round programme to procure a total of 3 725MW in renewable energy capacity from IPPs. Crucially, the Department has only awarded round 1 and 2 allocations, and the date of the third round is yet to be determined. Eskom has assumed all three rounds in its revenue allowance calculation, i.e. all 3 725MW of capacity additions. This has a significant impact on expected IPP costs, i.e. the provision for IPP costs increases from R1.4 billion in 2013/14 to R17.7 billion in 2017/18.

59. The main issue with Eskom's IPP cost estimates is that it includes all the capacity allocation (3,725 MW) of the renewable energy IPP programme even though only 2 459 MW of capacity has been awarded to bidders[24]. Given the delays in achieving financial close out for the preferred bidders under the first round[25] and the lead times required to achieve the commissioning of capacity, it is reasonable to include only the capacity additions of the <u>awarded</u> bidders in the calculation of IPP costs. NERSA's MYPD Methodology document allows a full pass through of all efficiently incurred IPP costs, so even in the unlikely event that the round 3 bidders produce the capacity by the end of the MYPD 3 period, Eskom should be able to claim back these extra IPP cost through the regulatory clearing account[26].

60. Eskom argues that Eskom's own generators will be expected to compensate any shortfall in the event of renewable energy IPP capacity not being completed on time. However, Eskom's capacity build in recent years have generally followed the capacity additions outlined under the IRP 2010 report, which assumed a 2.9 per cent per annum demand increase, well above Eskom's demand increase estimate of 1.9 per cent for the MYPD 3 period. Accordingly, there should be ample capacity even without the full completion of the renewable energy IPP programme. This view is support by the IRP 2010 report which states (of its demand forecasts):

> *"The forecast demand is at the higher end of the anticipated spectrum. The risk is thus that the actual demand turns out to be lower than forecast. In this case, the effect would be limited to over-investment in capacity. Security of supply is not jeopardized because of the conservative assumptions regarding energy efficiency and thus demand reducing measures."*[27]

[24] Refer to Eskom presentation titled "Renewable Energy Independent Power Producer (RE IPP) Procurement Programme – An Eskom perspective", 27 July 2012 (slide 14).
[25] Refer to the media briefing by the Minister of Energy Ms Dipuo Peters sated 29 October 2012, where the Minister stated that financial close out was delayed from June 2012 to the end of October 2012 due to approvals from various government institutions.
[26] See paragraph 10.2
[27] See paragraph 6.9.1

61. Our estimates of renewable energy IPP costs, which are based on awarded capacity only, are disclosed in Table 10, and assumed standard load factors for each type of technology[28], and the maximum bid prices outlined in the Department's tender documents[29]. We assume the capacity is added in accordance with the timing requirements, also contained in the Department's tender documents[30].

Table 10: Genesis estimates of Eskom's renewable energy IPP costs

IPPs - Renewable energy costs	R/Mwh (2011/12)	Load	1st Bid MW	2nd Bid MW	2013/14	2014/15	2015/16	2016/17	2017/18
Onshore wind	1 150	29%	634		-	2 209	2 342	2 482	2 631
Onshore wind	1 150	29%		562	-	-	2 077	2 202	2 334
Solar photovoltaic	2 850	27%	632		-	-	5 382	5 705	6 047
Solar photovoltaic	2 850	27%		417	-	-	-	3 768	3 994
Concentrated solar power	2 850	36%	150		-	-	1 704	1 807	1 915
Concentrated solar power	2 850	36%		50	-	-	-	602	638
Small Hydro	1 030	67%		14	-	-	-	-	123
Total Genesis estimate (Rm)			**1 416**	**1 044**	**-**	**2 209**	**11 505**	**16 566**	**17 682**
Eskom MYPD 3 application (Rm)					1 428	8 987	13 879	16 249	17 353
Savings (Rm)					1 428	6 778	2 373	-317	-329

Source: Genesis calculations, Eskom and Department of Energy

62. Our renewable energy IPP cost estimates produce savings (relative to Eskom's estimates) of R9.9 billion over the MYPD 3 period. Our calculated savings on IPP costs are validated by Eskom's own base case scenario (mentioned briefly in the application[31]), which states that if only first round bids are included, Eskom's proposed tariff increase would reduce from 16 per cent to 14.5 per cent over MYPD 3.

3.4. OPERATING COSTS

63. Operating costs comprise largely of human capital, maintenance and corporate overheads, and collectively these amount to some R270 billion of Eskom's revenue allowance over the MYPD 3 period. Eskom estimates that its' operating costs will be R45 billion in 2013/14 and will rise to R61 billion in 2017/18. These estimates are net of "efficiency targets" of R6 billion per annum. As with primary energy costs, we believe that these operating cost estimates are significantly over-stated. More specifically, we have identified savings that can be made in the following areas:

    63.1. Human capital

    63.2. Integrated demand management (IDM)

    63.3. Arrear costs

    63.4. Other costs

64. Our view of Eskom's over-stated operating cost estimates is supported by the unit cost targets disclosed in Eskom's 2012 Annual Report[32], which shows that Eskom is targeting to achieve unit operating cost of 71.4 cents per kWh in 2016/17, whereas its application implies that it will require unit operating costs (including primary energy and depreciation) of 82 cents per kWh.

[28] See Tables 28 and 29 of IRP 2010 report.
[29] See paragraph 5.1.4.5 of Part A document labelled "General Requirements, Rules and Provisions.
[30] See paragraph 5.1.1.4 of Part A document labelled "General Requirements, Rules and Provisions
[31] See page 43 of Eskom's Application
[32] See 2012 Annual Report Appendix A "Key Indicators"

65. In relation to the claimed savings of R6 billion per annum, these can only be credible savings if the base operating costs from which the savings are made are comparable to the operating costs in previous years. Table 11 shows a comparison of unit operating costs after deducting Eskom's claimed savings for the 2012/13 and 2013/14 years.

Table 11: Comparison of unit operating costs net of claimed savings

R million	2011/12 Actual	2012/13 Forecast	2013/14 MYPD 3
Operating costs	35 341	50 406	50 857
Claimed savings	-	-3 000	-6 000
Net operating costs	35 341	47 406	44 857
Total volumes (GWh)	237 291	236 414	239 896
Per unit operating costs (c/kWh)	14.89	20.05	18.70

Source: Eskom and Genesis calculations

66. Net of claimed savings, Eskom's estimates of operating costs for the current financial year and for the first year of MYPD 3 are still significantly higher than the actual operating costs for 2011/12. On a per unit basis, net costs are still expected to increase by 35 per cent per annum from 2011/12 to 2012/13. This shows that the claimed savings are merely a partial claw-back of the massive planned overspend for MYPD 3. Accordingly, they cannot be seen as credible.

67. The largest component of operating costs is manpower costs, and these are driven by two factors – employee numbers and cost per employee. Eskom argues that employment is set to increase during MYPD 3 as new generating facilities come online, as operations expand into rural areas and as Eskom strive to improve its technical and business performance. In its application, it has forecast for increases in both employee numbers and cost per employee, as shown in Table 12.

Table 12: Eskom's manpower cost assumptions for MYPD 3

Eskom's manpower cost estimates	2011/12 Actual	2012/13 Forecast	2013/14 MYPD 3	2014/15 MYPD 3	2015/16 MYPD 3	2016/17 MYPD 3	2017/18 MYPD 3
Employee numbers	43 473	43 450	44 280	44 833	45 187	45 601	45 601
Cost per employee (ZAR)	561 268	618 135	633 354	667 947	712 928	767 421	821 082
Increase in cost per employee		10.1%	2.5%	5.5%	6.7%	7.6%	7.0%

Source: Eskom

68. The above figures are gross employee and cost estimates, i.e. some of these costs will be capitalised on the RAB as they are incurred in the construction of facilities. Increases in employee numbers are in line with the expected capacity additions over MYPD 3. However, the cost per employee is forecast to increase substantially in the current year (2012/13) and then slightly above inflation for the MYPD 3 period. There is no justification for above inflation increases, particularly as employee salaries rose substantially above inflation over the MYPD 2 period. We have therefore assumed that costs per employee increase in line with the forecast CPI, consistent with the approach adopted by NERSA in its MYPD 2 determination[33]. This produces modest savings (R3.4 billion) over the MYPD 3 period as shown in Table 13.

[33] See paragraph 68 of NERSA's Reasons for Decision document for MYPD 2

Table 13: Genesis estimates of Eskom's manpower cost for MYPD 3

Genesis adjustments	2013/14	2014/15	2015/16	2016/17	2017/18
Cost per employee (ZAR)	622 929	660 305	699 923	741 918	786 433
Total manpower costs (Rm)	22 169	24 457	26 276	28 339	30 040
Savings (Rm)	371	283	488	974	1 324

Source: Genesis calculations

69. With regards to IDM costs, we note that Eskom's Application has included these costs twice; both as a stand-alone category of the revenue allowance (Table 1) and as part of the operating cost category (Table 21). This double counting has added R13.1 billion to the overall revenue allowance, and therefore must be removed. In addition, there is a strong argument that such costs should not be included at all as these programmes are not core to Eskom's business and should rather be implemented by agencies set up for this purpose. There have been significant demand adjustments arising from the MYPD 2 tariff increases, which will render some IDM cost incurred by Eskom unnecessary. This view is supported by National Treasury, which provided comments to Eskom's on its application, which states that:

> *"The National Treasury was of the view that energy efficiency and demand-side management should be funded through the fiscus via the electricity levy, and that Eskom and all other interested parties should apply to the revenue fund for these purposes."*[34]

70. Nevertheless, in the event that NERSA continues with its MYPD 2 practice of allowing such costs in Eskom's revenue allowance, we recommend that NERSA apply a cost effectiveness test to these costs. For example, it should compare the avoided cost of supply (based on the long run incremental cost of generation and network charges) to the costs of the programmes. This ensures that there is no impact on customer electricity bills or rates due to changes in utility revenues and operating costs caused by the programme.

71. We note from Eskom's IDM cost estimates that the expected costs of the programme on a per kWh saved basis exceeds the expected unit costs (primary energy, operating, depreciation and return on assets) of producing a kWh of energy over the MYPD 3 period. Accordingly, we reduced Eskom's estimate of IDM costs to equate to the avoided costs of all kWh expected to be saved under the programme. For simplicity, we assumed that the avoided cost of supply per kWh equates to the tariffs proposed by Eskom in its application (this is likely to overstate avoidable costs). All IDM costs in excess of this amount would be detrimental to tariff users and therefore should not be recoverable through the revenue allowance.

72. The savings arising from this calculation, as well the reversal of the double counting mentioned above is shown in Table 14.

[34] Refer to page 44.

Table 14: Genesis estimates of IDM costs for MYPD 3

IDM costs	2013/14	2014/15	2015/16	2016/17	2017/18
Avoided cost of supply (cents per kWh saved)	71	82	95	110	128
Programme cost at avoided cost of supply (Rm)	1 594	1 116	785	1 118	2 922
Savings (Rm)	1 347	1 593	1 077	848	690
Reversal of double counting (Rm)	2 941	2 709	1 862	1 966	3 612
Total savings (Rm)	4 288	4 302	2 939	2 814	4 302

Source: Genesis calculations

73. Another category within operating costs which give rise to concern is arrear debt provisions, which is the amount of bad debts that Eskom writes-off annually. Eskom estimates that these costs would total R6.1 billion for MYPD 3, or 0.6 per cent of revenues each year, which Eskom believe is an acceptable level. We understand from Eskom's Application that Eskom's outstanding debt is largely confined to residential customers in Soweto (75 per cent). Given the geographical confinement of this cost, there is no justification to assume a linear relationship between revenues and bad debt. Rather we believe these costs would be relatively fixed regardless of revenues. The actual impairments to Eskom's receivables, as shown in Table 15, support this view.

Table 15: Eskom's impairments of receivables 2007/08 to 2011/12

R million	2007/08	2008/09	2009/10	2010/11	2011/12
Impairments of receivables (Rm)	483	832	583	687	613
Revenues (Rm)	44 448	54 177	71 209	90 375	112 999
As a percentage of revenue (%)	1.09	1.54	0.82	0.76	0.54

Source: Eskom audited financial statements

74. Despite Eskom's revenues expanding substantially since 2007/08, Eskom's impairments of receivables, or arrear debt provisions, have remained relatively constant. In fact, as a percentage of revenue, they have fallen to below Eskom's 0.6 per cent MYPD 3 target in 2011/12. Even in absolute terms, these costs have fallen. Accordingly, we believe that a historical average of these costs is appropriate for MYPD 3, and will provide Eskom with the necessary discipline to control its debtor's risk. The savings arising from our estimate of arrear debt provisions are shown in Table 16, and amount to R2.9 billion for the MYPD 3 period.

Table 16: Genesis estimates of arrear debt provisions for MYPD 3

R million	2007/08	2008/09	2009/10	2010/11	2011/12
Historical average of Impairments (Rm)	640	640	640	640	640
Savings (Rm)	287	411	575	748	871

Source: Genesis calculations

75. The last remaining cost category within operating costs is labeled "other", and according to Eskom, this comprises of information management systems, consultant costs, research costs, telecommunications, audit fees, marketing fees, travel and accommodation, property rates vehicle and insurance. We believe that each of these support functions should not increase in response to revenues, particularly as future revenue growth will arise mainly from tariffs increases rather than volume increases. However Eskom's Application has assumed a significant escalation in the "other" costs category; from R3.4 billion in 2011/12 to R13.7 billion in 2017/18. This represents an annual compounded growth rate in these costs of 23 per cent. The only explanation provided by Eskom for this escalation is the extra insurance required for the expanded asset base. This is clearly insufficient justification, given that insurance makes up a relatively small portion of "other" costs. We have calculated an alternative estimate by taking the actual "other" costs for

2011/12, and uplift this value according to the expected PPI and expected capacity expansion[35] for the MYPD 3 period. Our estimates are shown in Table 17, and these equate to significant savings of R38 billion over the MYPD 3 period.

Table 17: Genesis estimates of "Other" costs for MYPD 3

R million	2013/14	2014/15	2015/16	2016/17	2017/18
Eskom's MYPD 3 estimates	10 271	11 336	13 576	13 534	13 651
Genesis estiamtes (increases as per PPI & capacity expansion)	3 926	4 445	4 957	5 429	5 938
Savings (Rm)	6 345	6 891	8 619	8 105	7 713

Source: Genesis calculations

3.5. REGULATORY ASSET BASE AND DEPRECIATION

76. The RAB represents the value of assets that Eskom is allowed to earn a return on, and in Eskom's Application, this return on assets element will account for about 5 per cent of Eskom's revenue allowance in the 20013/14 year, rising to 28 per cent as the phase-in of DRC values becomes complete. The RAB has a direct impact on the depreciation allowance, which itself accounts for 17 per cent of the revenue allowance for the whole MYPD 3 period.

77. In its MYPD 2 application, Eskom moved from an IHC to a DRC approach in line with the requirements of the EPP. Consequently, Eskom's RAB value increased more than two fold (from R198 billion to R659 billion) in the year 2009/10. For MYPD 3 Eskom's estimates that the average RAB value will be R779 billion in the 2013/14 year, rising to, R1,043 billion in 2017/18. Depreciation will rise from R28.4 billion to R41.7 billion over the same period. Eskom states that it engaged Ernst & Young to determine the MEA value of its RAB as at the end of the 2010/11 year. We assume that Eskom has rolled forward this value (which is not disclosed in its application) with actual capital expenditure and DRC depreciation for the years 2011/12 and 2012/13 to arrive at its opening MYPD 3 RAB of R709 billion

78. Our major concern with Eskom's RAB and depreciation estimates is that no information is provided in the application on how these estimates were calculated. Deriving DRC estimates involve valuing assets at the cost of a modern equivalent with similar service potential adjusted for the age, physical deterioration and all forms of obsolescence. This involves some degree of judgement as the valuation does not rely on historically verifiable cost data. Also, there should be optimisation considerations, which involve removing any surplus assets or excess capacity from the network configuration, given the required level of service and network capacity. Eskom's Application does not contain any information on the assumptions used in the asset valuations, which makes it impossible for stakeholders to comment on the validity of the RAB and depreciation estimates. Given the contribution these two elements make to the overall revenue allowance, the omission of this information is not consistent with an open and transparent consultation process.

79. Eskom's Application values all assets at DRC, despite some assets that are likely to have a lower realisable value. For example, certain assets may use outdated technology or sub-optimal capacity. We understand from discussions with Eskom that many of its generation assets were built 30 years ago when 200 MW units were the norm, whereas 800 MW units are now typically built. In addition, Eskom's Application includes R76 billion

[35] Total power station net maximum capacity (MW)

worth of maintenance expenditure, which suggests that many of the transmission and distribution assets are in poor condition. This view is supported by Eskom's Application which states that additional maintenance is required to sustain plant integrity[36]. The realisable value of some of Eskom's assets would therefore be significantly lower than their DRC.

80. The approach of valuating assets in the RAB at the lower of DRC and NRV finds support in the OFT's paper on profitability in competition analysis. The paper argues that in competition cases, asset valuations need to be consistent with the value-to-the-owner principle, that is, assets should be valued at NRV if this is less than the DRC[37]. The logic of this principle is that in a market where returns are high, entry or investment will take place at the lowest cost of entry. Potential entrants will either construct new assets or acquire existing ones, depending which is the lowest cost option. This approach also finds support in a paper dealing specifically with the DRC valuation of electricity assets in Australia, which stated that:

> *"The economic lower bound on RAB is thus NRV. Provided RAB is not less than NRV, existing productive assets will remain in current (presumably optimal) use. Apart from the fact that for specialised infrastructure assets, DORC is generally (much) greater than NRV, the economic objective of continued optimal allocation of existing assets affords no special significance to RAB = DORC."*[38]

81. One aspect of Eskom's RAB which also gives rise to concern is the likely inclusion of full capital expenditure incurred in the two years since the Ernst & Young valuation was undertaken in 2010/11. There is ample anecdotal evidence of cost overruns at both Medupi and Kusile power plants[39], meaning that inefficiently incurred capital expenditure is likely to have been included in Eskom's RAB estimate. This inclusion is contrary to the notion of cost reflectivity.

82. Another concern with Eskom's MEA values is that the primary energy and operating cost assumptions contained in Eskom's Application are not consistent with the type of assets assumed for the MEA values. In other words, it is incorrect to derive a return on relatively more valuable modern assets and also obtain full primary energy and operating cost recovery on older less efficient plants. Chapter 2 of our report clearly shows that Eskom has become less efficient (on a real unit cost basis) in recent years, and this view is supported by Eskom's 2012 Annual report[40], which shows its operating cost performance worsening in the four years to 2011/12. Accordingly, full cost recovery on relatively inefficient assets should not coincide with the adoption of MEA valuations.

83. Given the concerns we raise above, there is a real risk that Eskom's RAB estimates are significantly overvalued, and not consistent with true cost reflectivity. As we do not have access to the Ernst & Young MEA valuation report, or to Eskom's asset registers, we are unable to derive alternative estimates of Eskom's RAB. For the purposes of our MYPD 3 assessment, we are forced to adopt Eskom's estimates of its returns on RAB and

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[36] See page 107 of Eskom's Application.
[37] OFT Assessing profitability in competition policy analysis, Economic Discussion Paper 6, July 2003, paragraphs 4.12 to 4.13
[38] Jonstone, "Replacement Cost Asset Valuation", page 24
[39] For example, refer to http://www.engineeringnews.co.za/article/medupi-kusile-overruns-should-be-probed-npc-commissioner-asserts-2012-08-21
[40] Refer to Appendix A – Key Indicators, which shows that operating cost per kWh increasing from 18.56 to 41.28 in the four year to 2011/12. This implies a CAGR of 22 per cent.

therefore limit our adjustments to Eskom's revenue allowance to primary energy and operating costs items, as outlined above.

3.6. COST OF CAPITAL

84. Eskom's Application makes reference to a WACC estimate of 8.31 per cent, which is slightly above NERSA's estimate for the MYPD 2 period of 8.16 per cent. Eskom argue that based on its proposed revenue application and its own valuation of the RAB, its projected return on assets will not reach either NERSA's or Eskom's WACC estimates by the end of the MYPD 3 period. Eskom also argue that its projected returns are well below the returns any private sector investor would require. It is not clear from Eskom's application document what WACC parameters were used to derive its 8.31 per cent estimate.

85. Eskom's arguments with regards to its projected returns are reliant on their RAB valuations being robustly calculated, and that the primary energy and operating cost assumptions reflect efficiently incurred costs. As we outlined above, Eskom's Application contain significant over-estimates of primary energy and operating costs. In addition, there are considerable unresolved issues surrounding Eskom's RAB estimates, which mean that a lower RAB estimate could be justified if sound regulatory accounting principles are applied. Using robust estimates of primary energy and operating costs and fair valuations of the RAB could result in Eskom's proposed revenues producing returns that are above both Eskom's current and NERSA's MYPD 2 WACC estimates. In the event that NERSA chooses to revise down Eskom's estimates of costs and the RAB, it would need to apply a fair estimate of Eskom's WACC in its revenue allowance calculation so that cost reflectivity is achieved by the end of the MYPD 3 period. Our calculation of Eskom's WACC is described in more detail below.

86. The WACC is comprised of the cost of equity and debt. The cost of equity is calculated with reference to capital asset pricing model (CAPM), as outlined in NERSA's MYPD Methodology document. The CAPM requires robust calculations of the risk-free rate (RFR), market risk premium (MRP) and equity beta.

87. For calculating the RFR, NERSA Methodology document proposes to use the South African 10 year or longer R186 government bond as a proxy. It is unclear from this document whether NERSA will apply a historical average of the yields applicable on the government bonds or whether it will apply the spot rate applicable at the time of the MYPD assessment. All that is stated is that "the applicable rate will be determined at the time of the application". A RFR calculated with reference to a long-term historical average of South African government bond yields will be much higher than a RFR calculated using recent spot rates. According to data available from the South African Reserve Bank ("SARB"), yields on government bond loan stock have fallen significantly since the late 1990's, from around 15 per cent to around 8 per cent per annum, and this reflects a marked fall in inflation expectations by bond investors. Therefore, we believe a short-term estimate (e.g. the average yields form the five most recent years) is a reasonable expectation of the yields for MYPD 3 period. This would produce a nominal RFR estimate of about 8.3 per cent[41]. Using the average CPI for the same five year period (6.4 per cent) would produce a real risk free rate of 2.1 per cent.

[41] South African Reserve Bank

88. In calculating the MRP, NERSA's MYPD Methodology states that the proxy used to determine the market return will be the All Share Index of the Johannesburg Stock Exchange post 1994. This suggests that NERSA will assess South African equity returns over a period of about 20 years. We believe that for the purposes of calculating average long-term equity returns, even longer periods should be assessed. As Dimson et al. argue in their paper covering historical evidence on the MRP[42], to properly assess the MRP one should examine equity returns covering periods of 100 years or more. This is because a long time-series is more likely to incorporate both buoyant and turbulent periods, and this is particularly important in equity markets such as South Africa, which has derived highly varied equity returns over the past 100 years.

89. The volatility of equity returns is reflected in the South African MRP estimates provided by Credit Suisse in its annual investor yearbook[43], which uses historic equity and government bond data as far back as 1900. The average premium over the last 112 years was 5.3 per cent per annum, and this is what we have applied in our WACC estimate. This approach of using long-term averages is common practice in the financial community. For example, a PWC report (prepared on behalf of Ofgem) into the cost of capital for UK electricity distribution companies stated the following:

> *"[In] shorter-run periods, actual returns below or in excess of the EMRP can be experienced which is why practitioners who use the ex-post approach prefer a very long run data series such as that provided by DMS"*[44]

90. With regards to the equity beta NERSA's Methodology document states that the equity beta will be determined by an average of equity betas of similar listed utilities (proxy companies). More specifically, the equity betas of these companies will be un-levered to arrive at proxy asset betas. A weighted average of the proxy asset betas will then be derived and this average asset beta is then re-levered according to an assumed Eskom gearing of 60 per cent. This was the approach NERSA used for MYPD 2 and accordingly, we have used NERSA's beta estimate of 1 (extracted from the MYPD 2 Reasons for Decision) as the equity beta for the current MYPD 3. We note that the proxy companies used by NERSA were based in the US (which are less regulated than Eskom), and had significantly higher asset betas than those observed in the UK during the same period[45]. For example, a report prepared by economic consulting firm NERA to Ofgem on behalf of Distribution Network Operators (DNOs) disclosed asset beta estimates for DNOs of 0.33 to 0.45, whereas NERSA's asset beta estimate was about 0.88. Accordingly our estimate is likely to overstate the required returns for <u>regulated</u> electricity entities.

91. Eskom's cost of debt is directly observable and can be estimated with some degree of confidence from its latest statutory accounts[46]. We observed Eskom's debt instruments outstanding as at 31 March 2012, and the interest rate applicable for each instrument excluding Eskom bonds that have been guaranteed by the South African Government. The Eskom bonds have been excluded as we believe it will deflate the rate as it will not provide a fair rate at which Eskom would be able to borrow at on the open market. Our estimate of Eskom's local denominated weighted average cost of debt is 10.9% in nominal terms. Eskom's MYPD 3 application document assumes a latest CPI of about

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[42] Dimson, Marsh and Staunton (2002, p. 2)
[43] Credit Suisse Global Investment Returns Yearbook 2012.
[44] PWC (2009, p. 54)
[45] NERA: "Distribution Network Operators (DNOs) Cost of Capital for DPCR5, A Report for the DNOs" (July 2009) - Table 4.3
[46] Year ended 31 March 2012

5.2%, which suggests a real pre-tax cost of debt of about 5.42%, which we have used in our WACC calculation.

92. As stated earlier NERSA proposes to use a gearing ratio of 60 per cent for the weighing of debt and equity, which is consistent with Eskom's own gearing levels, which have increased significantly over the past four years, from 40 per cent in 2008 to 61 per cent in 2012.

93. Taking into account our estimates of each of the WACC variables outlined above, our overall WACC estimate, and its underlying calculation for MYPD 3 is shown in Table 18.

Table 18: Genesis estimate of Eskom's WACC for MYPD 3

WACC variable	Estimate
Risk free rate	2.1%
Equity risk premium	5.3%
Equity beta	1.00
Cost of equity - post-tax	7.4%
Cost of equity - pre-tax	10.3%
Cost of debt - pre-tax	5.42%
Tax rate	28.0%
Gearing	60.0%
WACC - post-tax	7.36%

Source: Genesis Workings

94. Table 32 of Eskom's Application suggests that returns will only reach 7.8 per cent in the final year of MYPD 3, that is, for the first four years returns will be below our WACC estimate. However, given the concerns we have with Eskom's RAB estimates as outlined in paragraphs 78 to 82 above, it is likely that true returns on assets over the MYPD 3 period will significantly exceed those claimed by Eskom. As stated above, we have no way of deriving alternative RAB estimates given the lack information provided in the application. Accordingly, we have not adjusted Eskom's returns on assets estimates, and we assume that they are more than sufficient for the purposes of achieving cost reflectivity.

4. OUR ALTERNATIVE TARIFF CALCULATION

96. This chapter summarises our assessment on Eskom's Application and the adjustments made to the MYPD 3 revenue allowance. We also provide an alternative tariff increase that is smoothed over the MYPD 3 period. Our general view is that Eskom's application is replete with unsubstantiated cost escalations far in excess of inflation and is largely absent of material efficiency gains. Our view is supported by the large variances that have occurred between Eskom's MYPD 2 cost estimates and the actual out-turn costs incurred during that period. In the absence of significant downward revisions to the cost estimates contained in its current application, Eskom will significantly over-recover on the true economic costs of electricity production in South Africa. Acceptance by NERSA of our proposed adjustments detailed in the previous chapter will go some way to ensuring that Eskom's tariffs in MYPD 3 will be truly cost reflective.

97. Our assessment has been hampered by the lack of detailed information, particularly in relation to asset values and depreciation. These two elements are two key drivers of Eskom's proposed 16 per cent tariff increases. Accordingly, our assessment falls short of identifying all the potential misstatements in Eskom's revenue allowance calculation.

4.1. ADJUSTMENTS TO ESKOM'S REVENUE ALLOWANCE

98. In chapter 3 we identified about R138 billion worth of savings from the costs estimates disclosed in Eskom's Application, particularly with regards primary energy and operating costs. This reduces Eskom's MYPD 3 revenue allowance by about 13 per cent; from R1 088 billion to R949 billion. These adjustments are shown in Table 19.

Table 19: Adjustments to Eskom's revenue allowance

R million	2013/14	2014/15	2015/16	2016/17	2017/18	MYPD 3
Eskom's applied revenue allowance	**153 378**	**179 605**	**212 760**	**248 333**	**293 501**	**1 087 578**
Less coal cost savings	-6 979	-9 825	-12 212	-14 819	-16 901	-60 736
Less water cost savings	-160	-205	-227	-224	-227	-1 043
Less environmental levy savings	-581	-725	-829	-876	-910	-3 921
Less renewable energy IPP cost savings	-1 428	-6 778	-2 373	317	329	-9 933
Less manpower cost savings	-371	-283	-488	-974	-1 324	-3 440
Less IDM cost savings	-4 288	-4 302	-2 939	-2 814	-4 302	-18 645
Less arrear debt provision savings	-287	-411	-575	-748	-871	-2 894
Less "other" cost savings	-6 345	-6 891	-8 619	-8 105	-7 713	-37 673
Revised revenue allowance	**132 939**	**150 185**	**184 496**	**220 090**	**261 583**	**949 293**

Source: Genesis calculations

99. The identified savings can be summarised as follows:

    99.1. Limiting the coal price escalation to the expected PPI index over MYPD 3

    99.2. Reducing water consumption per kWh in line with the targets contained in Eskom's 2012 Annual Report – from 1.34 to 1.20 litres per kWh

    99.3. Correcting the renewable energy volume assumptions for calculating environmental levy costs

    99.4. Removing the third round capacity additions from the renewable energy IPP programme for calculating IPP costs

99.5. Limiting the escalation in cost per employee to the expected CPI index over the MYPD 3

99.6. Removing the double counting of IDM costs, and limiting remaining IDM costs to the avoided cost of supply for the expected energy saved by the programmes

99.7. Setting arrear debt provision equal to the historical average in absolute terms

99.8. Reducing the escalation of "other costs" to the expected PPI index over the MYPD 3 period and expected capacity additions.

100. The above adjustments are by no means an exhaustive list of potential savings available, as there are several elements of Eskom's revenue allowance calculation that we unable to assess given the lack of available information. Also, Table 19 is likely to be a conservative estimate of the savings available for the following reasons:

100.1. We have assumed Eskom's CPI and PPI projections despite Treasury's projections of inflation being lower[47]. Assuming Treasury's estimate would result in lower escalations in coal, manpower and "other" costs.

100.2. We allowed full PPI escalation of coal cost despite the downward trend in export coal prices over the last 12 months.

100.3. .We assumed no real efficiency savings from the 2012/13 base year cost level, despite Eskom's operating cost performance (on a kWh basis) deteriorating since 2006/07. Our approach of allowing inflationary increases is significantly more generous than the practice of regulators in other countries. Utility regulators in the UK have been successful in lowering unit costs in real terms by forcing improved efficiencies during tariff determinations.

100.4. We have made no adjustments to Eskom's RAB or depreciation estimates even though there are significant flaws in its asset valuation approach, which we outlined in chapter 3.

100.5. We have made no adjustments to Eskom's capital expenditure estimates to take account of potential over-estimation or regulatory gaming. As we stated in chapter 2, Eskom has significantly under-spent on NERSA's capital expenditure allowance during MYPD 2, and more considerably against their own MYPD 2 forecasts.

100.6. We assumed maximum bid prices for the renewable energy IPP programme when calculating IPP costs, even though actual contracted prices are likely to be lower.

100.7. We escalated "other" costs in line with both inflation and projected capacity additions even though a large portion of these costs are incurred independently of capacity or volumes and are likely to stay fixed in real terms over the MYPD 3 period.

101. In making the above generous assumptions, we have erred against calculating an under-estimate of the revenue allowance. We strongly suggest to NERSA that it scrutinize the information not available to stakeholders (e.g. the Ernst & Young asset valuation report) in order to identify further savings.

[47] Refer to page 47 of Eskom's Application

4.2. OUR CALCULATED TARIFF PATH

102. To calculate an alternative tariff path for MYPD 3, we divide our calculated revenue allowance (post our adjustments outlined above) by the expected volumes (kWh sold). Our revenue allowance deducts the revenue expected to be derived from export customers and those on special pricing arrangements (SPAs), to arrive at the net revenue to be collected from standard tariff customers. According to Eskom, these export and SPA sales are expected to be between R7 billion to R8 billion per annum over the MYPD 3 period. No disclosure is given in the application on how these sales are priced, but Eskom's tariff calculation suggests that these customers receive electricity at much lower prices than standard tariff customers, i.e. around 37 cents per kWh compared to the average standard tariffs of 97 cent per kWh for the MYPD 3 period.

103. Table 20 shows our standard tariff calculations for the MYPD 3 period, and the nominal increases implied by these tariff estimates. We assumed the standard tariff volume estimates as disclosed in Eskom's application.

Table 20: Genesis tariff estimates for MYPD 3

R million	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	MYPD 3
Revised revenue allowance		132 939	150 185	184 496	220 090	261 583	949 293
Less exports and special pricing agreements		-7 191	-8 107	-8 494	-6 982	-7 297	-38 071
Standard tariff revenues (Rm)		**125 748**	**142 078**	**176 002**	**213 108**	**254 286**	**911 222**
Volumes for standard tariff customers (GWh)		205 898	209 145	215 016	219 409	223 597	1 073 066
Nominal tariffs for standard customers (c/kWh)	61.0	61.1	67.9	81.9	97.1	113.7	
Nominal tariff increases		**0.1%**	**11.2%**	**20.5%**	**18.7%**	**17.1%**	

Source: Genesis calculations

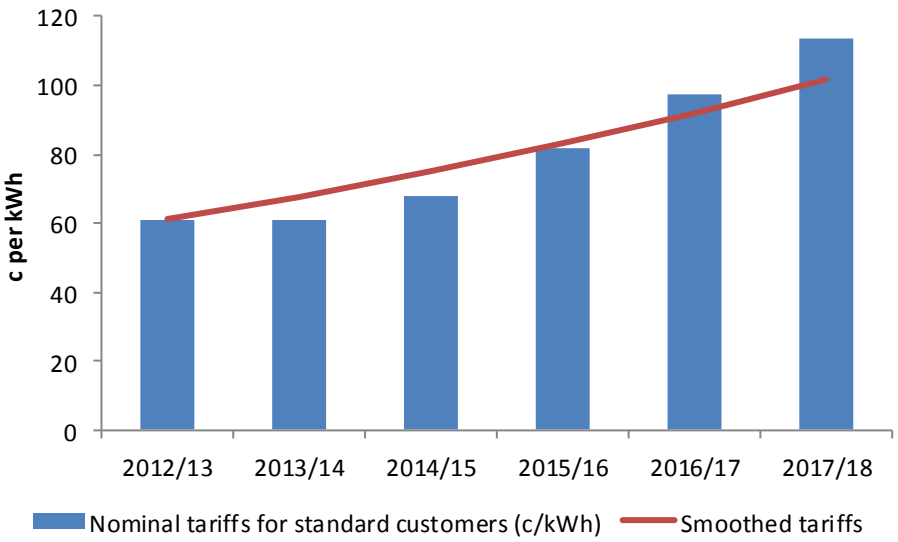
104. On a per kWh basis, our calculations show that tariffs would increase from the current level of 61 cents to 113.7 cents by the end of MYPD 3.

105. The year-on-year percentage increases are not uniform throughout the period, given the non-uniform timing of certain costs (e.g. renewable energy IPP costs). Tariffs would only increase by 0.1 per cent in 2013/14 but by 20.5 per cent in 2015/16. The asymmetrical nature of these tariff increases would allow Eskom to recover our estimates of its operating and capital costs as they fall due.

106. An alternative and more preferable tariff profile would be to equalise or "smooth" the increases over the MYPD 3 period, i.e. a constant percentage increases year-on year. The benefits of this approach is that it provides for a more predicable tariff profile for consumers, and could potentially limit the adverse impacts from sudden supply-side price shocks for the economy. As the year-on-year increases shown in Table 20 are weighted towards the end of the MYPD 3 period, smoothing the tariff increases involves bringing forward some of the revenue allowance to the early years, and therefore sacrificing some of the revenue allowance in the later years. The process of shifting revenues is done on NPV neutral basis, i.e. the constant percentage increase should be set at the level that makes the present value of revenues derived from the smoothed tariffs equate to the present value of revenues derived from the non-smoothed tariffs. We carried out this calculation and have derived a smoothed tariff increase of 10.8 per cent per annum over the MYPD 3 period. This compares to Eskom's applied increase of 16 per cent per annum.

107. Figure 7 shows a comparison of our smoothed v non-smoothed tariff increases for the MYPD period, with a base year tariff of 61 cents per kWh for 2012/13.

Figure 6: Comparison of smoothed v non-smoothed tariffs for MYPD 3



Source: Genesis calculations

108. Under the smoothed option, consumers pay more than the cost reflective levels in years 2013/14 and 2014/15, but are compensated by lower tariffs (i.e. revenue claw-backs) in the later years. Tariffs increase to 101.7 cents per kWh in 2017/18 instead of the 113.7 cents under the non-smoothed option. Importantly, a 10.8 per cent per annum increase is sufficient for Eskom to achieve full cost reflectivity over MYPD 3.

109. Despite limiting most of the primary energy and operating cost escalations to inflation in our revenue allowance calculation, our derived tariffs still exceed expected inflation over the MYPD 3 period. In real terms, our smoothed option produces increases of about 4.5 per cent per annum. The reasons for this are three-fold:

    109.1. Despite being linked to expected inflation, our nominal primary energy and operating cost estimates rise much faster than expected tariff volumes over the MYPD 3 period.

    109.2. The renewable energy IPP programme will add significantly to primary energy costs due to the prices paid per kWh for renewable energy being greater than the blended unit costs of Eskom's own generation.

    109.3. We assume Eskom's estimates of depreciation, which are expected to increase substantially from MYPD 2 levels due to the full adoption of the MEA values.

110. Table 21 provides a reconciliation of our calculated 10.8 per cent increase to Eskom's proposed 16 per cent increase.

Figure 7: Reconciliation of Eskom's and Genesis' tariff increase

per cent	MYPD 3
Eskom's Application	**16.0**
Less coal cost savings	-2.2
Less water cost savings	-0.1
Less environmental levy savings	-0.1
Less renewable energy IPP cost savings	-0.4
Less manpower cost savings	-0.1
Less IDM cost savings	-0.7
Less arrear debt provision savings	-0.1
Less "other" cost savings	-1.4
Genesis estimates	**10.8**

Source: Genesis calculations

111. The reductions in Eskom's proposed tariffs could be even greater if certain underlying assumptions were adjusted. For example, a lower CPI and PPI forecast and greater assumed tariff volumes would mean that Eskom would require a lower revenue yield to achieve cost reflectivity. This emphasis the need for NERSA to scrutinize all aspects of Eskom's Application.

4.3. FINANCIAL PROJECTIONS

112. It is important that tariffs be set at a level that allows Eskom to meet its financial obligations. In other words, revenues derived from tariffs should cover all cash operating and financing costs, and in addition help accumulate reserves for future funding requirements. Table 21 shows projections of cash flow that arise from adopting our tariff estimates.

Table 21: Cash flow and funding projections for MYPD 3

R million	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	MYPD3
Revenue	129 199	153 379	179 605	212 760	248 332	293 501	**1 087 577**
Arrear debts	(763)	(927)	(1 051)	(1 215)	(1 388)	(1 511)	**(6 092)**
Primary Energy	(63 920)	(60 537)	(68 845)	(75 487)	(80 656)	(86 407)	**(371 932)**
Amortisation (included in Primary Energy)	365	1 171	1 961	2 580	3 146	3 146	**12 004**
Working capital changes	3 305	976	(1 143)	299	744	744	**1 620**
Employee benefit	(21 166)	(22 540)	(24 740)	(26 765)	(29 313)	(31 364)	**(134 721)**
Other opex	(26 240)	(22 317)	(24 213)	(28 171)	(30 034)	(30 114)	**(134 850)**
Cash from operations	**20 780**	**49 204**	**61 574**	**84 001**	**110 832**	**147 995**	**453 607**
Capital expenditure	(65 044)	(72 107)	(68 016)	(64 934)	(67 098)	(65 000)	**(337 155)**
Net borrowing requirement	**(44 264)**	**(22 902)**	**(6 441)**	**19 066**	**43 735**	**82 995**	**116 452**
Net debt raised	31 173	34 471	16 148	(5 147)	(21 183)	(64 815)	
FFO/Gross debt (target > 20%)	8.9%	17.1%	18.6%	23.6%	30.2%	44.4%	
Gross debt/EBITDA (target <3)	11.2	5.9	5.4	4.2	3.3	2.3	
Gearing (target 60%)	32.7%	37.0%	38.8%	38.7%	37.4%	31.9%	

Source: Eskom and Genesis Application

113. Our cash flow projections assume the adoption of our smoothed tariff option, i.e. some revenue advancement for the first two years of MYPD 3. We anticipate that under our tariff proposals, Eskom's will derive over R49 billion in surplus operating cash in 2013/14, rising to R148 billion in 2017/18. The net debt raised estimates provided by Eskom show the amount of debt that Eskom is able to obtain from funders for each year. In all years of the MYPD period, the combination of tariff revenues and net debt is sufficient to cover all

of Eskom's capital expenditure requirements. In fact, for the last three years, Eskom's escalating cash flows are large enough to cover all of Eskom's planned capital expenditure and retire over R90 billion of debt. In addition, Eskom will be able to achieve its key financial ratio targets by the end of the MYPD 3 period. These include the ratio of funds from operations (FFO) to gross debt (target of 20 per cent) and the ratio of gross debt to EBITDA (target of 3). We note that the under Eskom's proposed tariffs, the achievement of these ratios also only occurs at the end of the MYPD 3 period.

114. Projected gearing (the percentage of the RAB funded by debt) levels increase marginally in the years to 2015/16, and then begin to fall in the last two years of MYPD 3 to 32 per cent. This is well below NERSA's target ratio of 60 per cent, which it assumes for its WACC calculation.

115. In summary, our projections show that Eskom is able to generate sufficient cash flows from our modelled smoothed tariff path to meet its operating and capital expenditure obligations and still be in a position to retire a significant portion of its gross debt by 2017/18.

5. ECONOMIC IMPACT ASSESSMENT

117. Eskom's proposed electricity tariff increases of 16 per cent per year for the next five years are more than double the expected inflation rate and thus reflect substantial increases in the real cost of electricity. There is a broad consensus that such substantial real increases in electricity tariffs will have negative effects on the South African economy. For example, some of these negative economic impacts are recognised in Eskom's MYPD 3 application where it is stated:

> *"Eskom is acutely sensitive to the fact that its proposed price increases will have some negative effects on the economy, particularly on more vulnerable economic sectors and poorer households"* [48]*. . . "Electricity price increases will also have a pronounced knock-on effect on inflation. Businesses that can pass on price increases to customers will do so, resulting in "second-round" effects that could well be more severe than the direct impact."*[49]

118. Despite this acknowledgement, Eskom seeks to justify the inevitable adverse economic effects of the tariff increases primarily on two grounds[50]:

118.1. First, Eskom's MYPD 3 proposal and the Deloitte impact assessment report (which was commissioned by Eskom)[51], both appear to try and underplay these negative impacts to some degree. For example:

118.1.1. In the MYPD 3 application it is suggested that *"studies commissioned by Eskom indicated that the overall impact on the economic growth rate will be relatively muted, though some sectors will be affected more than others."*[52]

118.1.2. In a similar vein the Deloitte report seems to imply those industries which are electricity intensive (and likely to be directly negatively impacted by substantial electricity tariff increases) are relatively small contributors to the South African economy.[53]

118.2. Second, Eskom justifies any negative effects from the tariff increases on the basis that the only alternative is an inadequate electricity supply for the country. On these grounds, and using this counterfactual, Eskom suggests that the proposed tariff increases will only result in short-run negative economic impacts.

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[48] See page 82 of Eskom's Application
[49] See page 84 of Eskom's Application
[50] In addition, Eskom also suggests that the price increase will allow it to increase its investment and employment.
[51] Deloitte, (2012),"The Economic Impact of Electricity Price Increases on Various Sectors of the South African Economy – A Consolidated View Based on Various Sectors of the South African Economy" A report prepared for Eskom
[52] See page 18 of Eskom's Application
[53] See Deloitte, (2012),"The Economic Impact of Electricity Price Increases on Various Sectors of the South African Economy – A Consolidated View Based on Various Sectors of the South African Economy" A report prepared for Eskom p 9. Here it is suggested that electricity intensive sectors like gold mining and non-ferrous metal are small contributors to economy by way of reference to these sectors direct contributions to GDP. However, this fails to account for the indirect contribution of these and other electricity intensive sectors to employment and GDP as well their contributions to exports, FDI and corporate tax.

"The choice then is stark. The negative effects of electricity price increases in the short term must be weighed against the benefits of having an adequate, reliable electricity supply to enable the economy to expand in the long term."[54]

. . . "Economic growth will, in the short term, almost certainly be stifled. However, as electricity supply becomes less constrained and electricity price increases level out, the country's expanded production ability will reinvigorate the economy, stimulating consumption, inviting investment and creating jobs" [55]

119. In our view, any suggestion that the proposed tariff increases will have a relatively insignificant and short-lived impact on the economy is incorrect and would seem to be based on only a partial understanding of the dynamics at play. To the contrary, we find in this section – based on a comprehensive assessment of the structure of the economy and review of available impact studies – that Eskom's proposed tariff increases are likely to impose a significant and long-term cost on the economy.

120. We accept it is important that electricity tariffs are set such that Eskom's costs are sufficiently covered to therefore ensure South Africa is provided with the required electricity on a sustainable basis. However, the fact that electricity tariffs have such a significant impact across the economy means that it is critical that the required electricity supply is attained at the minimum cost to the economy. For this reason it is critical for NERSA to ensure that the tariff path granted to Eskom is not above that required for a sustainable supply of electricity. This is particularly pertinent given we show earlier in this report that substantial savings are available from the cost assessment of Eskom's MYPD 3 application. <u>This suggests that much of the negative economic impact associated with the prices proposed in the MYPD 3 application can be averted *without* compromising the supply of electricity supply.</u>

121. This chapter proceeds by firstly presenting a high level assessment of which sectors of the economy are likely to be impacted by significant increases in electricity tariffs. We then present a number of factors which further enhance the vulnerability of the South Africa economy to any additional significant tariff increases. Section 5.2 presents a summary of existing formal studies on the macroeconomic and sector level impact of electricity tariff increases. Section 5.3 concludes. In performing this assessment we also point out a number of areas where the analysis of the Eskom and Deloitte paint an incomplete picture of the vulnerability of the South African economy to further significant real electricity tariff increases.

5.1. UNDERSTANDING HOW THE ELECTRICITY TARIFF INCREASES WILL IMPACT THE ECONOMY

122. In the sections that follow we examine the mechanisms by which the proposed electricity tariff hikes are likely to impact the South African economy and the extent to which such impact is likely to be significant.

[54] See page 82 of Eskom's Application
[55] See page 88 of Eskom's Application

5.1.1. Electricity intensive sectors will be most directly impacted

123. Sectors of the economy which rely heavily on electricity as an input into their operations are amongst those likely to be most directly impacted by the proposed electricity hikes. This logic is relatively uncontroversial as it is these sectors which will see the most significant rise in cost base as a direct result of the proposed electricity tariff increases. [56] In this section we identify these electricity-intensive sectors and examine their role within the South African economy. We also consider further the impact that the proposed rise in electricity tariffs would be likely to have on these sectors. This can negatively impact their businesses in two ways:

    123.1. *First*, this increase in costs will lower their competitiveness when competitors do not experience a similar negative impact on their cost base. For example, this would relate to firms that compete against international suppliers either in the form of imports coming into the country or in terms of exports leaving the country, or maybe where competitors use a different energy source apart from electricity.

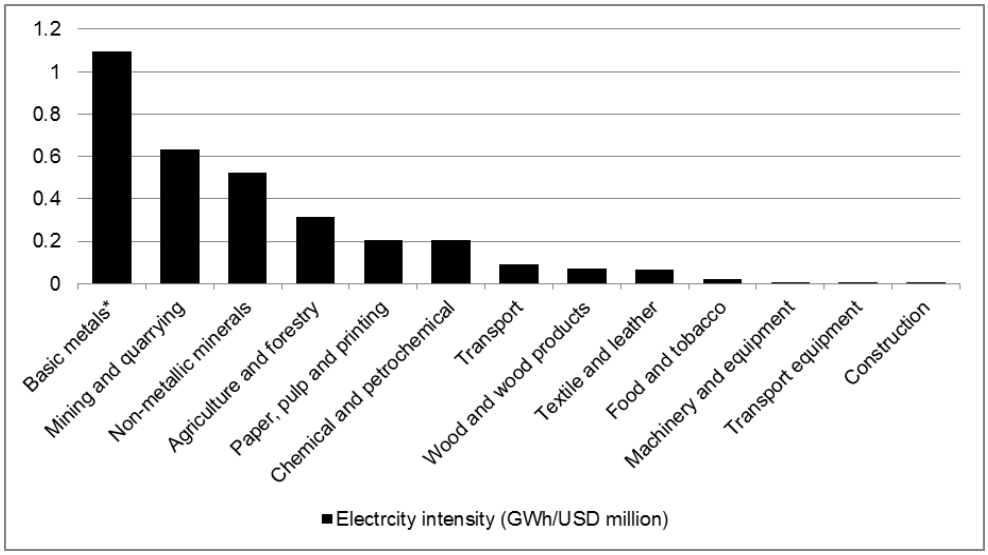
    123.2. *Second*, even if competitiveness is not directly negatively impacted, these firms are still constrained by the demand function these firms face. This implies that even if some pass on is possible, output is still likely to fall either by way of reduced demand or reductions in supply to maintain a given price.

5.1.1.1. Identification of electricity-intensive sectors

124. Figure 8 below presents a high level overview of the most electricity intensive sectors (similiar data is also highlighted in Eskom's MYPD 3 application[57] and the Deloitte report[58]). Here we find that generally speaking, mining and certain manufacturing activities, such as those related to iron, steel and non-ferrous metals, are likely to experience the most severe costs impacts, followed by the agriculture sector which is also relatively electricity intensive. It would also seem that some sub-sectors within the "paper, pulp and printing" and "chemical and petrochemical" sectors are relatively electricity intensive.

[56] This point is accepted in the Deloitte report; see Chapter 3 of the Deloitte report and Eskom's MYPD 3 application p 90
[57] See page 90 of Eskom's Application
[58] See the Deloitte report p 62

Figure 8: Relative vulnerability of economic sectors based on electricity intensity: 2006



Source: R.Inglesi-Lotz & J.Blignaut (2011) "Electricity intensities of the OECD & South Africa: A comparison".

125. A number of other sources confirms these sectors as these being some of the most electricity intensive:

125.1. The Deloitte also report identifies mining and quarrying, metal manufactures and ferrochrome producers as being particularly vulnerable to rising electricity tariffs, given the reliance of these sectors on electricity.[59] It is also mentioned in the Deloitte report that chemical, paper and cement manufactures appear to be relatively vulnerable as well.[60]

125.2. A study by the Development and Policy Research Unit (2008) at UCT also found that non-ferrous metals, gold and other mining and the petroleum sub sectors featured in the top 10 sectors ranked by shares in electricity purchases.[61]

125.3. A study by Devarajan *et al* (2009)[62] also presented a list of the most energy intensive sectors in South Africa. The relative importance of energy in each production activity was characterised through its energy expenditure as a percent of the corresponding net output or value added. Sectors with a high ratio of energy expenditures relative to value added again included: refined petroleum products (79.27 percent), basic non-ferrous metals (57.02 percent), basic iron and steel (53.86 percent) and basic chemicals (42.93 percent).

126. It should be noted that there may be some variation in relation to the degree of electricity intensity of sub-sectors within some of the broad sector categories.[63] However, the sectors identified as electricity-intensive will in general experience the most significant direct impact on their costs base as a result of Eskom's proposed electricity tariff increases.

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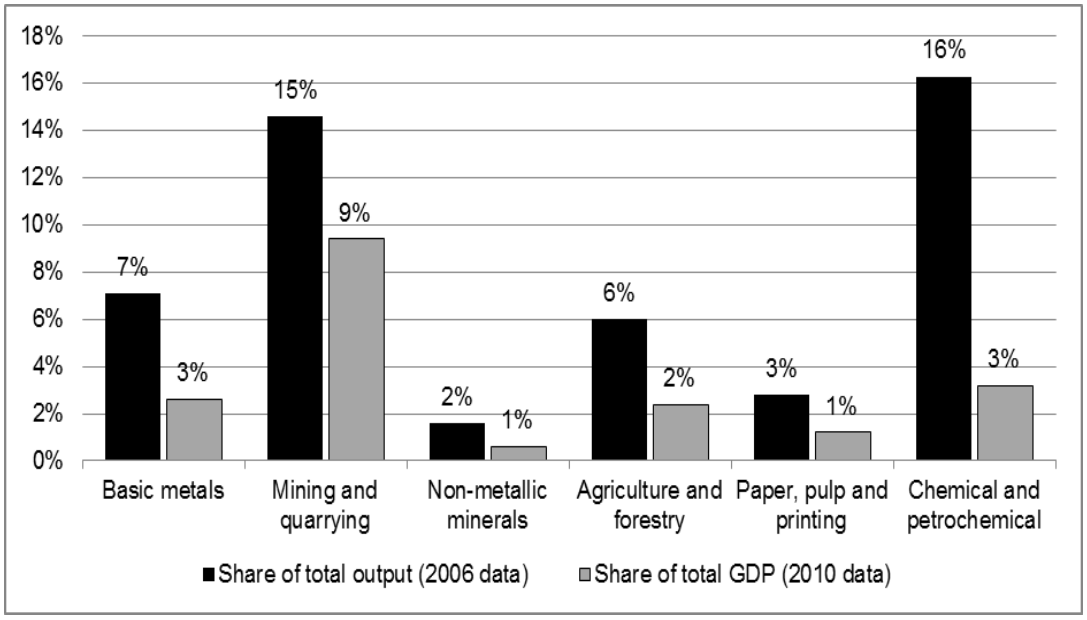
[59] See the Deloitte report p13, p58, p59 and p 62
[60] See the Deloitte report p 14
[61] See R. Davies (2008) "Electricity Shortages and the South African Economy: Reflections Based on an Economy-Wide Analysis" DPRU Conference 2008
[62] S. Devarajan, D. S. Go, S. Robinson and K. Thierfelder (2009) "Tax Policy to Reduce Carbon Emissions In South Africa"
[63] From example with the mining sector we understand that coal-mining is relatively less electricity intensive say for example relative to gold mining.

5.1.1.2. Role of electricity-intensive sectors

127. These electricity intensive sectors have historically been a core component of the South African economy, and will continue to be so going forward. The significance of these electricity intensive sectors can be seen with respect to their contribution to a number of key economic indicators.

127.1. *Contributions to output*. Figure 9 below presents the contributions of the electricity intensive sectors to total output and value add. The **top three** most electricity intensive sectors accounted for roughly **13 percent of total value add**[64] and more than **20 per cent of total output**.[65] If one were to focus only on the primary sector the **mining sector alone** accounts for **more than 70% of the value-add**. In addition, indirect and induced contributions to the economy play a significant role and should not be overlooked. These indirect contributions relate to stimulating the activities of upstream suppliers to these industries, including contractors and other companies providing inputs.[66] There are also induced contributions to the economy, which relates to the impact of spending payrolls earned from activities in these electricity intensive industries. Taking the **mining and quarrying** sector as an example, a recent estimate suggests the mining sector accounts for roughly **18 per cent of total GDP** (8% direct and 10% indirect and induced).[67] Importantly, these "2nd round" indirect and induced contributions to the economy would not occur but for the operations of firms in these affected electricity intensive sectors.

Figure 9: Estimates of contributions to output and value-add



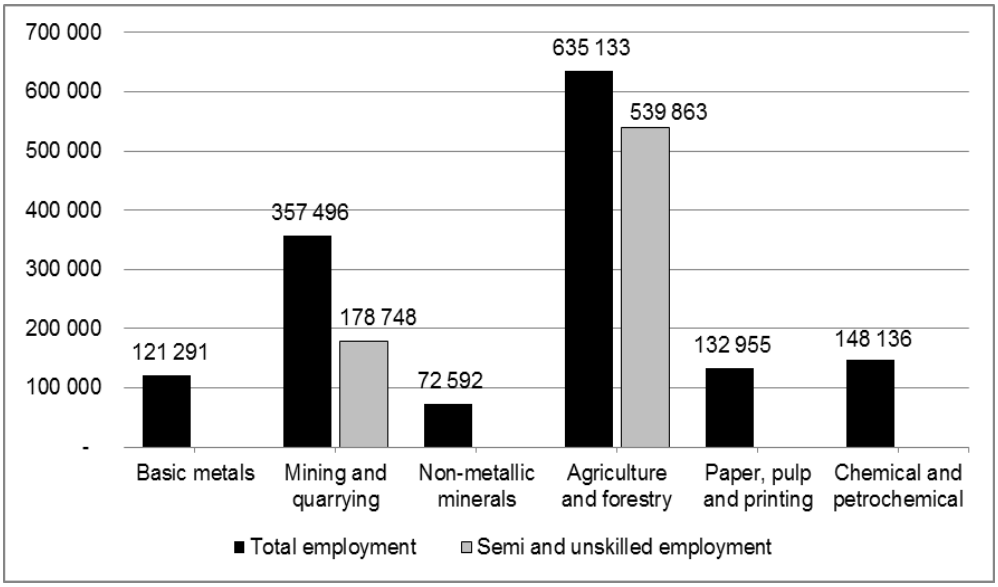
Source: Value add figure from Stats SA Statistical release P0441. Gross domestic product Annual estimates 2002- 2010.Regional Estimates 2002-2010.Third quarter 2011. Share of total output is from R.Inglesi-Lotz & J.Blignaut (2011) "Electricity intensities of the OECD & South Africa: A comparison".

[64] Note that total value-add and GDP includes the service and government sectors' contributions to the economy and therefore these broad measures may underplay the role of these sectors in relation to total output.
[65] If the agricultural sector was included, this would be just under 30 per cent of total output.
[66] In addition, indirect contributions also include the activity of suppliers to these other upstream companies.
[67] See R. Baxter (2011). "The Vision Towards Competitive Growth and Meaningful Transformation of South Africa's Mining Sector", Presentation to the "South Africa's Mining Industry Day", Chamber of Mines of South Africa

Notes: The contributions to value add for paper, pulp and printing includes wood products and while the contribution of chemical and petrochemicals includes rubber and plastic and therefore these may be slightly overestimated.

127.2. *Contributions to employment*. Figure 10 below presents the electricity intensive sectors contribution to employment. Where possible we have applied the percentage breakdown of unskilled and semi-skilled labour to these sectors as highlighted in the Deloitte report.[68] Here the **top three** most electricity intensive sectors **employ over half a million workers**. Furthermore, the mining sector directly employs a significant number of unskilled and semi-skilled workers. The agriculture sector, which is still relatively electricity intensive, is also a major contributor to unskilled and semi-skilled employment. Furthermore, these employment figures only account for the direct contribution of these sectors to employment. Taking into account the indirect and induced contributions accentuates the role of the electricity intensive sectors even further. For example, taking the mining sector again, a recent estimate suggests **an additional half a million jobs are created due to the indirect and induced contributions of the mining sector**.[69]

Figure 10: Estimates of contributions to employment

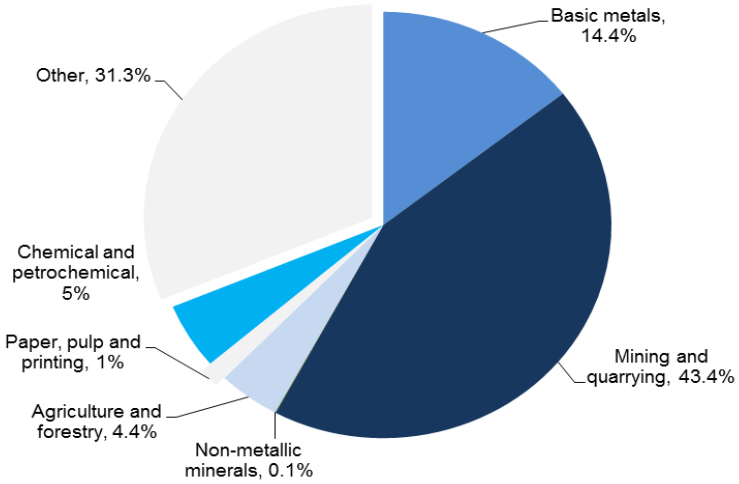


Source: Labour Force Survey 2012- Quarter 2: Individuals. Obtained from Eighty 20

127.3. *Contributions to exports*. The contribution of these electricity intensive sectors to exports further highlights their crucial position in the South African economy. The pie chart below presents the contribution of the electricity intensive sectors to total exports by value in 2011. Here we find the **two most energy intensive sectors alone**, namely mining and basic metals **accounted for close to 60 per cent of South Africa's exports in 2011**. These electricity intensive sectors therefore make a significant contribution to South Africa's, foreign exchange, balance of payments and international competiveness.

[68] See the Deloitte report p 23
[69] See R. Baxter (2011). "The Vision Towards Competitive Growth and Meaningful Transformation of South Africa's Mining Sector", Presentation to the "South Africa's Mining Industry Day", Chamber of Mines of South Africa

Figure 11: Contribution of electricity intensive sectors to exports



Source: DTI

127.4. *Contributions to government expenditure*. These electricity intensive sectors contribute significantly to corporate income tax (CIT) as well. CIT is critical for government spending in the economy. Government spending is an important component of aggregate demand, while it also plays a key role in development. **The mining sector alone contributed 13.7% to all CIT collections in 2011/2012**. And based on the direct contribution of the basic metals sector to total output it is likely that this electricity intensive sector also makes a significant contribution to CIT.[70] Therefore any significant falls in the output and profitability of these electricity intensive sectors, would be likely to result in a significant reduction in CIT.

127.5. *Foreign and local investment contributions*. Some of these electricity intensive sectors also make significant contributions to foreign and national investment. Mining in particular makes a significant contribution to national investment. A recent estimate by the chamber of mines suggests the **mining sector accounts for 18% of investment (9% direct and 11% indirect)**.[71] This is also in line with the recent estimates of the mining sector's direct contribution to gross capital formulation. According to the national accounts the **mining sector contributed 12% to gross capital formulation in 2011**.[72] With respect to FDI a recent report stated that the mining and quarrying sector received the most foreign direct investment of all sectors in South Africa in 2009. **FDI in the mining and quarrying sector as a proportion of total FDI stock - as opposed to flow - increased from 5.7 per cent in 1989 to 33.4 per cent in 2009**.[73]

128. Therefore in addition to the direct contributions to output and employment, the indirect impacts on employment and output, as well as the contribution to exports, government revenue and investment suggests these electricity intensive sectors matter a great deal in

[70] See South African Revenue Service Annual report 2011-2012 p 26
[71] See R. Baxter (2011). "The Vision Towards Competitive Growth and Meaningful Transformation of South Africa's Mining Sector", Presentation to the "South Africa's Mining Industry Day", Chamber of Mines of South Africa
[72] See the statistical tables to the National Accounts 2011, p S-114
[73] See http://www.iol.co.za/business/business-news/fdi-favoured-mining-sector-1.1213399, last accessed 21 November 2012.

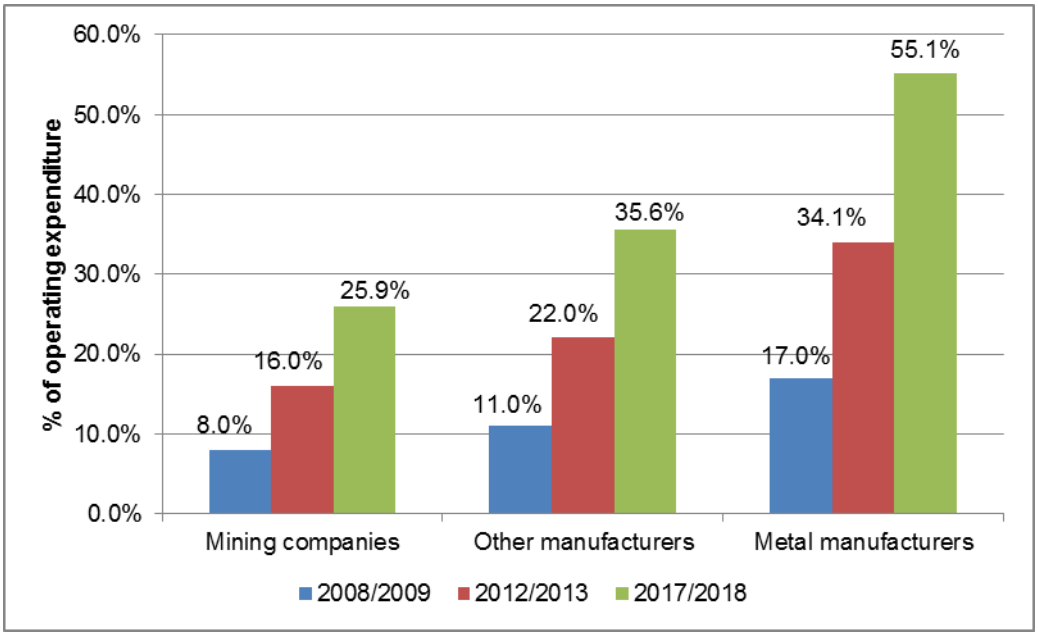
the South African economy. Accordingly, any potential adverse economy wide impacts in these electricity intensive sectors warrants real concern.

5.1.1.3. Impact on energy intensive sectors

Eskom's recent MYPD 3 application will result in substantial costs increases for these electricity intensive sectors

129. Figure 12 presents a survey that was conducted on 31 of Eskom's Key Industrial Customers in 2009, measuring the share of total operating expenditure accounted by electricity costs for three groups of firms – mining companies, metal manufactures and other manufactures. In 2009, the contribution of electricity costs to total operating costs was 8 per cent for mining companies, 11 per cent for other manufactures and 17 per cent for metal manufactures. If the historical tariff increases and Eskom's MYPD 3 proposed increases are applied from 2009 up until 2018, electricity costs would make up 26 per cent for mining companies, 37 per cent for other manufactures and up to 55 per cent for metal manufactures total operating expenditure in real terms.[74] Overall these operating costs increases represents more than a doubling of the cost share accounted for by electricity in these sectors. In addition, isolating the impact Eskom's MYPD 3 application alone – i.e. the impact of the proposed tariff increases on these businesses' current costs - suggests that the contribution of electricity costs to total operating costs for each of these three groups will increase by roughly 60 per cent on average by 2018 (in real terms).

Figure 12: The impact of MYPD 2 and 3 on the electricity cost as a percentage of total operational costs for Eskom's key industrial customers



Source: Adapted from (Deloitte report) and Genesis calculations

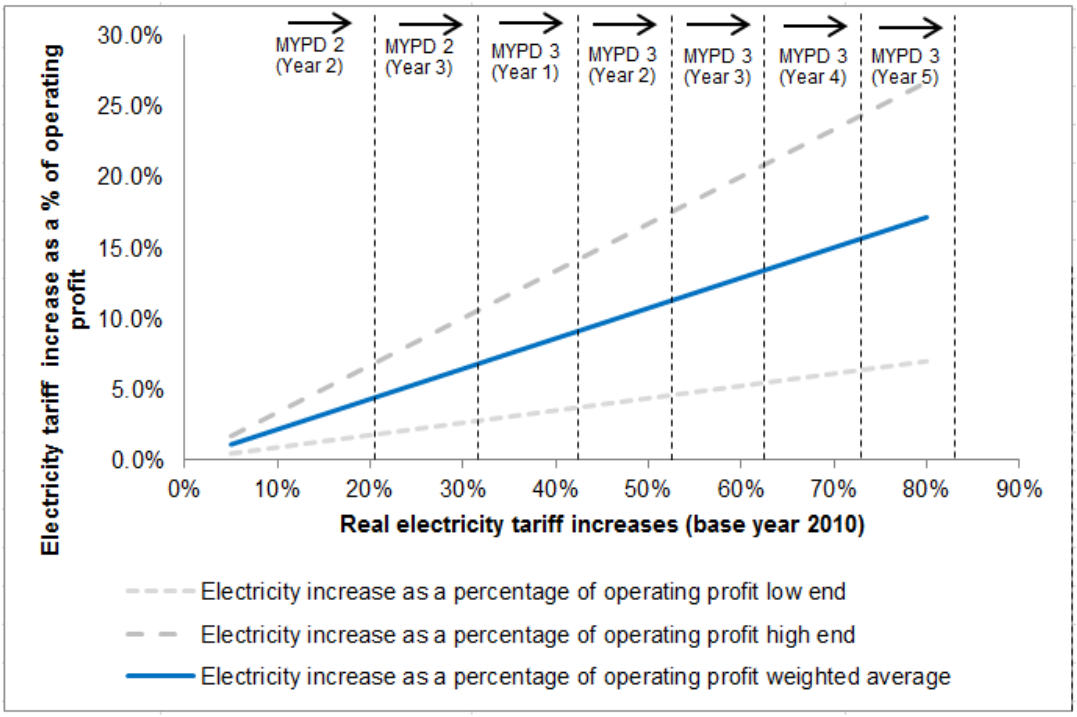
[74]This cost impact is also likely to be far more pronounced in the gold mining sub-sector. For example, South Africa's largest gold-mining company, Gold Fields, indicted that, owing to the recent tariff increases associated with MYPD 2 alone, electricity as a share of the company's total operating costs was likely to increase from 12 per cent to 20 per cent. Therefore the additional increases associated with Eskom's MYPD 3 application is likely to result in electricity as a share of the company's total operating costs being in excess of 30 per cent. See O'Donnel M, 'Power tariff increases will see electricity share of Gold Fields' operating costs soar to 20 per cent', Mining Weekly, 26 March 2010.

These substantial increases in costs are likely to eliminate a significant portion of profits

130. This potential negative impact of these substantial cost increases become evident when considering: (i) how these cost increases may erode operating profits and (ii) the extent to which large electricity intensive sectors are highly exposed to international competition.

131. *The potential impact on operating profits*. We understand from our experiences that the electricity cost increases shown in Figure 12 can make up a significant portion of operating profit for many electricity intensive firms. Based on the information provided by four large mining houses we estimate the extent to which the MYPD 2 and 3 (as applied for by Eskom) tariff increase would erode operating profit. Figure 3 presents the high end, low end and weighted average impacts on profitability, by examining the impact of various real increases in electricity tariffs on the average operating profits of these firms. The initial cost and profit data estimates were based on FY 2010 data. Here we find that if Eskom's MYPD 3 application did in fact apply then, electricity tariffs would experience a real increase in excess of 80% over this seven year period.[75] This real increase in electricity costs significantly erodes the operating profits of the firms analysed by some 16 per cent on average but as high as 25% in some cases. The high end of this impact on operating profits would most likely apply to those mining firms, which are either more electricity intensive or earn relatively tighter profit margins. Just the current MYPD 3 tariff application would appear to erode the operating profits of the firms by just under 10% (in real terms over the 5 year period).

Figure 13: Potential impact of electricity price increases on the operating profit of the mining sector



Source: Genesis calculations

131.1. *Many of the electricity intensive sectors are highly tradable*. Many of the electricity intensive sectors are also among the most trade exposed in the economy, often

[75] This includes the increases in 2011and 2012 of 25.8 per cent and 16 per cent respectively that was associated with MYPD 2

exporting over half of their total production. As such the proposed tariff increase will significantly reduce their competiveness and it also means that it is unlikely they will be able to pass these significant increases in costs to customers. Table 22 below displays South African imports and exports as a percentage of supply and demand, by sector. The import-domestic demand ratio is equal to the total imports divided by the total domestic demand times one hundred. The export-output ratio is equal to the total exports divided by the total output of an economy times one hundred. Table 22: Export – output ratio / Import – domestic demand ratio reveals that the most trade intensive sectors also correspond with those sectors that are most electricity intensive. For example the top five most export intensive sectors all correspond with those electricity intensive sectors identified in Figure 8 above. Therefore a significant portion of these sectors revenue is determined in global markets (for example, gold price is set in global markets), and so they cannot easily respond to significant cost increases by simply passing them through as final price increases.

Table 22: Export – output ratio / Import – domestic demand ratio

Sector/Year	Import – domestic demand ratio				Export – output ratio			
	1991	1995	1999	2003	1991	1995	1999	2003
Gold and uranium ore mining [23]	0	0	0	0	99.5	99.5	99.5	99.5
Other transport equipment [384-387]	39.26	53.82	87.04	94.7	9.98	24.61	73.09	80.46
Other mining [22/24/25/29]	49.31	52.65	53.97	68.45	63.01	61.49	66.41	72.96
Basic iron and steel [351]	8.21	11.89	14.95	18.02	37.81	46.15	55.28	65.17
Basic chemicals [334]	33.77	49.36	45.71	54.73	26.82	44.69	46.02	58.17
Coal mining [21]	2.9	2.93	5.23	6.63	62.01	60.97	62.8	57.86
Basic non-ferrous metals [352]	16.03	21.71	21.65	24.58	52.29	38.21	36.84	44.99
Other manufacturing [392-393]	21.16	19.82	29.29	29.3	25.36	24.43	29.85	32.73
Wood and wood products [321-322]	8.42	11.35	11.7	14.77	10.51	13.55	19.91	26.89
Paper and paper products [323]	10.11	15.35	14.95	9	16.26	26.07	24.16	23.76
Metal products excluding machinery [353-355]	8.83	11.77	16.72	18.28	8.5	12.9	18.3	21.92
Glass and glass products [341]	15.1	19.26	26.9	31.86	8.92	7.74	15.42	21.74

Source: Source: Trade and Industrial Policy (2005)

The impact on electricity intensive firms' profitability will have a marked impact on output, employment and how firms make investment and operational decisions

132. The negative impact of increasing costs on profitability is likely to impact the output decisions of these electricity intensive firms as certain existing tranches of output no longer become feasible. This particularly true for the mining industry where segments of mineral resources often have quite different costs to mine. Following these reductions in output there is likely to be negative knock-on effect on employment. Business Unity South Africa (BUSA) demonstrates how the knock-on effects from rising electricity costs may unfold in the gold mining sector in their preliminary response to Eskom's MYPD 2 application. Here it is noted that as mines become unprofitable to operate due to a significant increase in their cost base, they may be forced to cut back on production or close entirely and this will have a concomitant decrease in employment.[76]

[76] BUSA (2009) Preliminary response to the Eskom Revenue Application for the Multi Year Price Determination for the period 2010/11 to 2012/13 (MYPD 2)

133. Furthermore, the decision to invest, particularly in the exploitation of new mines depends on whether the ore body can be profitably mined or not. Such an assessment involves a comparison of the current price for the commodity to the anticipated capital and operating costs associated with extracting the ore and refining it into the final pure product. A large increase in a significant cost item such as electricity will raise the expected operating costs of any potential new investment and is likely to be a swing factor in whether investment takes place or not. It is therefore likely that the higher electricity costs would accelerate the closure of marginal mines and reduce projected capital expenditure. Even the existing capital stock may be at risk of not being maintained following these significant tariff increases. Electricity intensive sectors such as mining have large aging capital stocks and if they are not maintained may be eroded over time.

134. In fact there have already been closures and curtailing of projects as a result of higher electricity costs in these electricity intensive sectors. For example, as a direct result of increasing electricity costs Aquarius Platinum has recently closed two mines, Royal Bafokeng Platinum has curtailed three projects and the Xstrata-Merafe joint venture chrome smelters is currently only able to operate at half-capacity.[77]

5.1.2. Other sectors will also be indirectly impacted

135. Considering the implications of the proposed electricity tariff increases only through the lens of the direct impact on electricity intensive industries provides an incomplete assessment of the true economy-wide impact. Rather, it is important to take account of the so called "second round" or indirect impacts of rising electricity tariffs on the economy. Although, Eskom and its advisors acknowledge some of these additional "second round" impacts exist, these indirect impacts are not sufficiently incorporated in their respective analyses. The focus of the impact assessment in Eskom's MYPD application and the Deloitte report is almost entirely on the electricity intensive industries.[78]

136. The importance of the "second round" effects is borne out of the economic studies which formally model the impact of electricity prices increases across the economy (these studies are summarised in Chapter 4 of the Deloitte report and are also discussed later in this Chapter. For example, sectors such as community social and personal services and wholesale retail and trade, which are relatively less electricity reliant, are found to experience similar adverse effects on output and employment relative to those sectors with much higher electricity reliance.[79] These service sectors contribute significantly to the economy as well, with for example, community social and personal services contributing more than a fifth to South African total employment.[80]

137. We proceed to discuss the additional channels of transmissions by which these "second round" effects occur and their significance.

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[77] See http://www.miningne.ws/pg/mining/news/102264/alarm-over-eskoms-latest-tariff-increase-plans-to-affect-mining, last accessed 7 November 2012.

[78] For example in the Deloitte report, Chapter 3 which describes which sectors are vulnerable mostly focuses on electricity reliance as a key indicator of vulnerability. In addition, Eskom's MYPD 3 application also mostly focuses on electricity intensive sectors as the sectors that will be impacted by the tariff increases, for example on p 90 it is emphasised that the vulnerability of sectors to electricity tariff increases can be measured by the relative electricity intensity of the sectors.

[79] See Pan African Investment and Research Services Pty (Ltd) (2012) "The Impact of Electricity Price Increases and Eskom's Six Year Capital Investment Programme on the South African Economy", Table D1.3 p 149

[80] Statistical release P0211 Quarterly Labour Force Survey Quarter 2, 2012 p vii.

5.1.2.1. Reductions in consumption expenditure

138. An important channel of transmission is the impact of rising electricity tariffs have on consumer and government spending.

Reductions in consumers' expenditure will have a negative impact on most industries

139. We estimate that the proposed increases in electricity tariffs will roughly **cost consumers an additional R10 billion rand** a year in electricity consumption in real terms by 2017/2018.[81] This may explain why some less electricity intensive industries are impacted more adversely than one would expect based on electricity intensity alone.[82] The following impacts on consumer spending are noteworthy:

140. *Higher electricity tariffs will reduce disposable (discretionary) income*. The proposed tariff increases will a negative impact on consumers' disposable income and spending power. All else equal, this impact of higher electricity tariffs on disposable income will be larger, the less elastic the demand for electricity.[83] A study by Niemeyer (2001)[84] summaries various elasticity estimates from a number of research papers. This suggests that the own price elasticity of demand for electricity by residential customers is relatively inelastic, particularly in the short-run.[85] [86] The impact on consumers' spending power can be demonstrated when assessing the impact of Eskom's historical and recent proposed real tariff increases on average household expenditure. Using the most recent data from the 2008/09 Living Conditions Survey from Stats SA, the South African household average share of electricity expenditure was 3.32 per cent in 2008/2009. In Figure 14 we apply the real electricity tariff increases associated with MYPD 2 as well Eskom's MYPD 3 application. The results are presented in Figure below. We find that the real increases associated with MYPD 2 alone is likely to (on average) double the proportion of total expenditure spent on electricity, taking this share from 3.16 per cent in 2008/09 to 6.3 per cent on average in 2012/13. Furthermore, **when applying the real increases as proposed in Eskom's MYPD 3 application, the average expenditure on electricity as share of total expenditure is likely to be just over 10 per cent in 2017/18**. Relative to 20012/13 this represents a **60 per cent <u>real increase</u>** in terms of average household electricity expenditure as share of total expenditure.

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[81] This is calculated by multiplying the annual average electricity spend from the 2008/09 (R1 600) as from living conditions survey by stat, by the number of households connected to electricity from the community survey 2007 (10 000 487). This total annual spend of R16 280 793 161 is then escalated by Eskom proposed tariff increases which are also adjusted for CPI. This is likely to be a conservative estimate given we do not include any of the MYPD 2 escalations.

[82] On p 82 of the Deloitte report, brief reference is made to the impact of tariff increases on the disposable income of consumers as second round effects. Deloitte refers to as these second round effects as a possible explanation for the "puzzling" outcome of certain service sectors experiencing a significant negative impact on output and employment despite a low degree of electricity reliance.

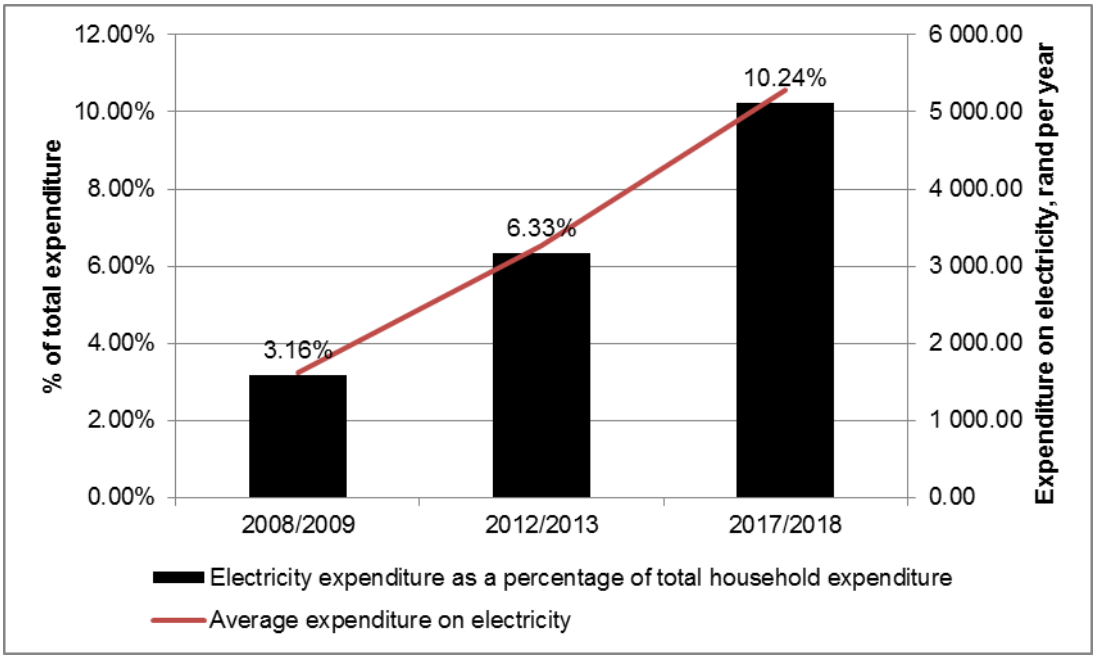
[83] However, even with perfectly inelastic electricity demand the magnitude of the effect of a unit change in energy prices is bounded by the electricity cost share of discretionary income.

[84] Niemeyer, V (2001), "Customer Response to Electricity Prices. Electricity Research Institute (ERPI)

[85] These were found to range from -0.05 -0.4 in the short-run and -0.3 to -1.2 in the long-run.

[86] Changing electricity prices may create uncertainty about the future path of the price of electricity, causing consumers to postpone purchases of bulky and durable products. Unlike the impact on disposable effecting demand for most types of goods and services, this uncertainty effect is limited to consumer durables. In particular, the consumption of goods that are complementary in use with electricity (in that their operation requires significant electricity usage) will tend to decline even more, as households delay or forego purchases of electricity-intensive Furthermore, any uncertainty in relation to the economic climate will further exacerbate this impact.

Figure 14: Impact of real tariff increases on real average household expenditure on electricity in South Africa as a percentage of total expenditure

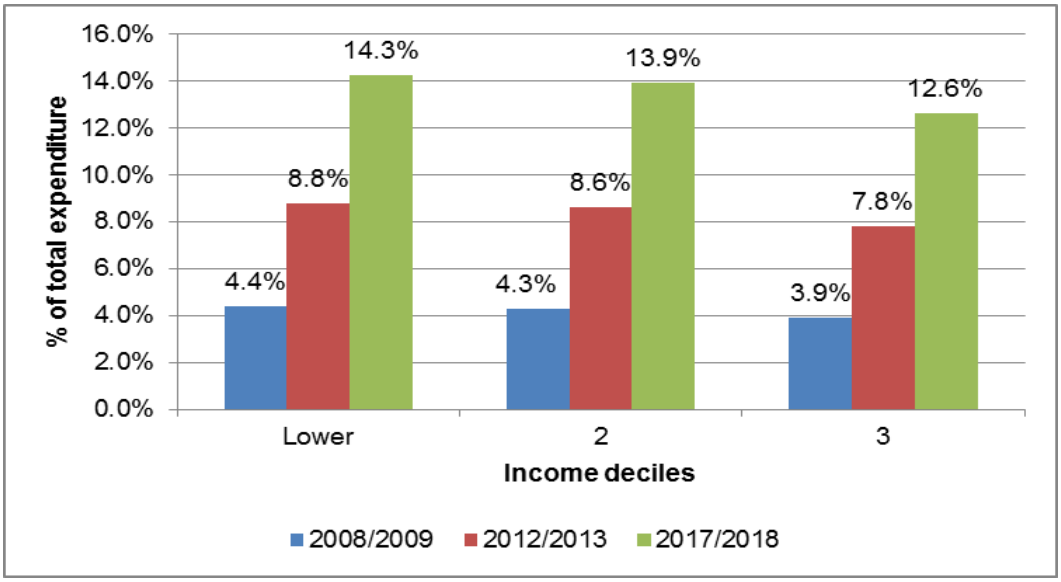


Source: Data from Stats SA

141. *The impact on the lower income households will be even more severe*. Figure 15 shows the impact of these real tariff increases on the three lowest income groups as defined in the 2008/09 Living Conditions Survey. The real increases associated with MYPD 2 alone are found to increase the electricity share of total expenditure from roughly 4 per cent in 2008/09 to just around 8 per cent in 2012/13 for the lowest income groups. When applying the additional real increases as proposed in Eskom's MYPD 3 application, **the average expenditure on electricity as share of total expenditure is likely to be rise to between 12.6 and 14.3 percent for the lowest income groups in 2017/18**. This reveals that the poorest households are the most exposed to significant increases in electricity tariffs as these increases will have significant knock-on effect on the buying power of these lower income groups. We note that Eskom's MYPD 3 application also acknowledges that the poor are particularly vulnerable to the impact of the proposed tariff increases.[87]

[87] See page 82 and 92 of Eskom's Application

Figure 15: Impact of real tariff increases on real household expenditure on electricity in South Africa as a percentage of total expenditure for the lower income groups



Source: Data from Stats SA

142. Falling disposable income is likely to translate into reduced demand for other goods and services. It follows that as the share of income spent on electricity increases demand for other goods and services is likely to fall.

143. As pointed out in Eskom's MYPD 3 application these electricity price increases will also have a pronounced knock-on effect on inflation and businesses that can pass on price increases to customers will do so, resulting in "second-round" effects that could well be more severe than the direct impact.[88] This inflationary pressure as result of the proposed electricity tariff increases will put further pressure on consumers and accentuate the negative impact on disposable income and aggregate demand.

Contraction in government spending

144. We have shown above that tariff shocks are likely to result in falling output, firm profitability, consumer spending and employment. A reduction in these variables will all result in decreased tax collections. Therefore the government will have less revenue to spend on the economy and this will reinforce the negative implications of falling consumer demand. Alternatively, the government can increase the deficit or taxes to maintain spending levels but these two options will also result in significant costs on the economy.

145. These negative effects on consumer and government spending imply a reduction in aggregate demand in response to a series of electricity tariff increases. Therefore it is not surprising that certain industries despite their low reliance on electricity can experience significant negative impacts as a result of higher electricity tariffs.

5.1.2.2. Indirect cost impacts

146. The proposed electricity tariff increases will not only impact the costs of those sectors which directly rely on electricity as a key input into their business. The indirect impact on

[88] See page 82 of Eskom's Application

the cost of key inputs and intermediate goods is another mechanism by which the electricity prices increases will be transmitted through the economy.

147. These inputs may increase in price, because their own production is electricity intensive, and so industries that are not necessarily directly electricity intensive may still experience significant increases in input costs as a result of electricity tariff shocks impacting industries upstream.[89] These potential increases in indirect costs are also likely to be a key contributor to overall inflation and this accepted in Eskom's MYPD 3 application.[90] Overall, these rising costs could therefore impact the vulnerability and competiveness of downstream sectors.

148. The extent of the impact on costs from these indirect impacts will however depend on a number of factors including: (i) The extent of electricity intensity associated with the upstream firm producing the input, (ii) the ability of the upstream firm to pass the cost increases on and (iii) the significance of the intermediate good in terms of the overall costs of the downstream firm. For example, the production of cement is recognised to be quite heavily electricity reliant and the ability of cement producers to pass on costs increases is regarded as relatively strong as well.[91] Therefore although the construction sector is among those sectors least reliant on electricity, rising cement prices due electricity shocks may eventually have a significant negative impact on the construction industry.

149. This indirect cost pressure on the economy will ultimately come from those sectors which are able to "pass on" electricity price increases to their downstream customers. Therefore, although this ability to pass on electricity tariff increases may insulate the firm in question it results in rising costs for other sectors of the economy. In Table 7 of the Deloitte report[92], the chemicals and petro chemicals, cement, ferrochrome and utilities (electricity, gas and water) sectors, are indicated to be among the top industries in terms of the ability to pass on cost increases. Therefore it can be expected that these industries, many of which are highly electricity intensive, will be the key source of indirect cost increases to the downstream economy.[93] Therefore although this indirect effect on costs is hard to measure it cannot be ignored.

5.1.3. Other factors enhance the vulnerability of the South African economy

150. There also exist a number of key factors that enhance the overall vulnerability of the South African economy to further significant tariff increases. These factors include:

150.1. The current hostile economic climate both in South Africa and globally.

150.2. Limited scope for substantial electricity efficiency gains and use of alternative energy sources.

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[89] These indirect cost impacts were also acknowledged in the Deloitte report, but seemingly dismissed largely on the basis that they are difficult to measure. See the Deloitte report p 62. This is also recognised in Eskom's MYPD 3 application where it noted that businesses that can pass on price increases to customers will do so, resulting in "second-round" effects that could well be more severe than the direct impact, see p 82.
[90] See page 82 of Eskom's Application
[91] See Deloitte report p 72.
[92] See the Deloitte report p 78.
[93] It is also worth noting that cost-push inflation may also develop from higher electricity tariffs even in relation to those industries that cannot pass on the cost increase. In this instance, the higher costs of production may result in a reduction of aggregate supply (the amount of total production) in the economy. Thus because there are now fewer goods being produced (supply weakens) and assuming demand for these goods remains relatively stable, the prices of finished goods may increase thus having an additional inflationary effect.

150.3. Additional premiums charged by certain municipalities on electricity purchases.

150.4. The likelihood of further electricity price increases associated with the implementation of a carbon tax.

151. These factors would not seem to have been fully appreciated in the MYPD application (nor the Deloitte Report). We proceed to consider these factors in more detail as this provides a fuller understanding of the overall vulnerability of the South African economy to the proposed increases in electricity tariffs.

5.1.3.1. A hostile local and global economic climate

152. The significant increases in electricity tariffs proposed to take place over the next five years will put additional pressure on an already vulnerable local economic climate.

153. *Global economic climate.* Eskom's MYPD 3 application to NERSA occurs in the midst of a prolonged global economic crisis, which has mostly resulted from the US subprime housing market collapse in 2007, and the more recent debt crises in the euro area where recession is again taking hold. According to the recent OECD interim global economic outlook[94] the forward-looking indicators suggest that the loss of momentum at the G7 level may persist through the latter half of this year, with the recession in the euro area and associated trade and confidence headwinds enduring. The average annualised quarter-on-quarter growth, in per cent for the G7 countries in 2012 was predicted to be only 1.4 per cent with the three largest EU countries (Germany, France and Italy) recording a negative average growth rate of -0.2 per cent in 2012. This implies a continued pressure on the demand of some of South Africa's major trading partners and further losses in consumer and business confidence.[95]

154. *South African economic climate*. The average annualised quarter-on-quarter GDP growth rate in South Africa is currently a moderate 3 per cent. The South African economy has also had to endure the recent global recession which has slowed growth as the rescission in the EU and to a lesser extent the US has resulted in tempered export demand and stagnant investment inflows. In addition, Jill Marcus the governor of the Reserve Bank has recently announced that the recent series of wage disputes, particularly in the mining sector, will place significant pressure on growth prospects in the short to mid-term.[96]

155. Inflation is currently in the target band prescribed by the South African Reserve bank, but nevertheless is on the upper bound of the range at 5.5 per cent at the time of writing.[97] Therefore there is significant risk that inflation will rise above the target in the near term, given the massive influx of higher wage settlements, increases in administered prices and the impact of Eskom's tariffs on the economy

156. These factors all point to the South African economy being particularly vulnerable to any additional negative economic shocks. Yet the additional increases in electricity tariffs as

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[94] OECD (September 2012) "What is the near-term global economic outlook? An interim assessment"

[95] The United States is an exception with comparatively stronger growth reflecting inter alia progress in balance-sheet adjustment and improving housing market conditions, yet growth is still moderate. In addition, the growth of emerging economies overall are expected to remain in positive territory and offer some positive prospects

[96] See http://www.businessweek.com/news/2012-11-01/marcus-says-investors-can-t-assume-more-south-africa-rate-cuts, last accessed 7 November 2012. Here it was stated *"The growth outlook has deteriorated since then as the worst labor unrest in almost two decades slashed mining exports while fuel prices and a weaker rand threaten to push inflation outside of the bank's 3 percent to 6 percent target band."*

[97] See http://www.resbank.co.za/Pages/default.aspx, last accessed 7 November 2012

proposed by Eskom are likely to have further ominous consequences on growth prospects, particularly in light of the current economic climate.

5.1.3.2. Mitigating factors relating electricity efficiency and alternative energy sources are unlikely to be significant

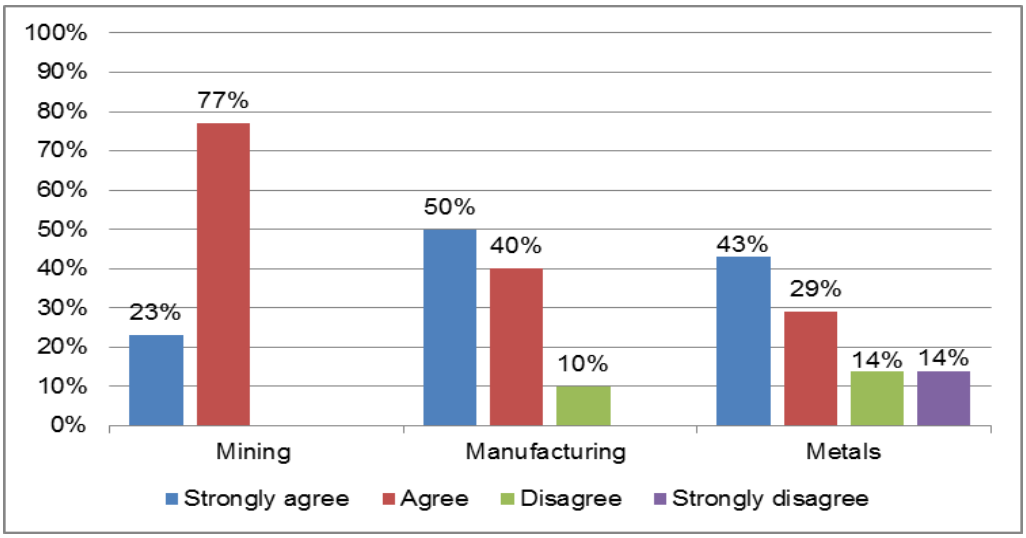
157. The Deloitte report suggests that firms may be able to mitigate against electricity price increases to the extent that there is: (i) scope for electricity efficiency gains and (ii) potential to use alternative cheaper energy sources.[98] However, in our view there would seem to be very little basis to believe these factors could substantially mitigate the negative impact of the proposed tariff increases.

Scope for electricity efficiency gains

158. Two pieces of analysis are sighted by the Deloitte report in support for efficiency gains as a potentially relevant mitigating factor.

158.1. *First*, the results from a survey in 2009 of Eskom's key industrial customers are presented. Here representatives from 31 mining, metal manufacturing and "other" manufacturing firms where asked to what extent their firm managed to realise gains in electricity efficiency. The results of this 2009 survey are replicated in Figure 16.

Figure 16: Has your firm been able to realize gains in efficiency?



Source: Deloitte and Eskom 2009

158.2. *Second*, a study by Inglesi-Lotz and Blignaut (2011)[99] is cited, which shows that in 2006 South Africa's electricity intensity by industry, is significantly higher when compared with other OECD countries. From this comparison it is inferred that there is significant scope for electricity efficiency gains in the South African economy.

[98] The Deloitte report also suggests that the ability of firms to "pass on" the cost increases may also serve as a mitigating factor. We have already discussed in the previous section why "pass on" is not a viable mitigating factor for many impacted firms, and indeed why such a factor does not necessarily insulate the overall economy as it results in indirect cost increases downstream.

[99] R.Inglesi-Lotz & J.Blignaut (2011), "Electricity intensities of the OECD & South Africa: A comparison".

159. We do not find these two pieces of analyses are convincing in relation to the significance of the role efficiency gains can play in the short to mid-term and this is for the following reasons.

159.1. *Many of the gains in efficiency that could have been achieved in 2006 and 2009 are likely to have already been achieved by now*. The results above related to the 2009 survey and 2006 electricity intensity comparison is fairly outdated. Therefore it can be expected that following the dramatic electricity tariff increases during MYPD 1 and 2, firms and industry may have moved closer to exhausting their options in terms of efficiency gains. This notion is also supported in study by DNA economics[100] where it is suggested that the number of energy efficiency options implemented for the first time is expected to decline in 2011- 2015 relative to 2008-2010.[101] This implies this option is likely to become less feasible in the face of future tariff increases as proposed in Eskom's MYPD 3 application.

159.2. *The results from the Eskom survey do not necessarily indicate further efficiency gains are achievable.* The Eskom survey above only asks if firms had been able to achieve efficiency savings as per 2009. The ability to achieve such savings in the past is not a reliable indicator of a continued ability to achieve further efficiencies. Rather, as discussed above, this would seem to more strongly indicate that much of the possible efficiency savings had already been exhausted by 2009.

159.3. *The electricity intensity comparison by industry is not a like for like comparison*. A high level comparison of electricity intensity across sectors in different countries may mask significant underlying differences in the characteristics of industries across countries that may make them less or more electricity intensive.[102] This shortcoming was also recognised in the Deloitte report and therefore we would caution on too much being read into this comparison in terms of the scope for additional efficiency gains.[103] However, what is highlighted by this comparison is the particular vulnerability of the South African economy to electricity tariff increases.

159.4. *Adjusting to more efficient technology is costly and takes time implement*. A further consideration is that in order for electricity intensive sectors to realise significant gains from electricity efficiency in the future – significant investments need to be made in new technologies. The problem is these investments come with their own set of associated costs and risks and also take time to implement successfully. It thus follows that at least in the short-run the impact of any additional tariff increases will not be easily ameliorated via these new investments.

159.5. *Eskom own MYPD 3 application gives little weight to the role of efficiency gains*. In its MYPD 3 application, Eskom also seems to suggest that based on the existing

[100] DNA Economics (2011), "Ability of Firms to Adjust to Higher Energy Costs", Non-confidential Executive Summary, p ii.
[101] This is also recognised in study by Inglesi-Lotz and Blignaut (2011) where it is mentioned that the HRC study where it is noted that given the sharp increase in electricity tariffs since 2006, it is likely that some efficiency gains will already have been realised
[102] For example Deloitte provides the example that the construction industry in South Africa is far more labour intensive than the construction industry of other OECD countries thus explaining the naturally lower electricity intensity.
[103] See the Deloitte report p 66.

evidence there is only limited potential for additional gains in electricity efficiency across industry.[104]

Potential to substitute electricity with alternative energy sources

160. The Deloitte report provides very limited insight as to how feasible and significant switching to alternative energy sources may be in the face of additional electricity tariff increases. Only a brief reference is made to a study by DNA Economics indicating some very limited switching in several sectors to alternative energy sources. In this regard, we do not dispute the importance of developing cost effective energy alternatives but it seems that a least in the foreseeable future these alternatives are limited, costly and take time to implement.[105] [106]

5.1.3.3. Municipalities electricity premiums creates additional concerns

161. Many consumers and small to medium enterprises do not buy electricity directly from Eskom but source electricity from the nearest metropolitan municipality. This is evident from the fact that roughly 40% of all electricity distribution is undertaken by about 185 local municipalities.[107] There are strong indications that municipalities at times charge an additional premium on top of the Eskom tariff.

    161.1. This point is acknowledged in Eskom's MYPD 3 application where reference is made to an Eskom study of the six metropolitan areas it supplies.[108] This study found that average tariffs charged to end users by municipalities were between 40 per cent and 110 per cent higher than the tariffs Eskom charged its direct customers.

    161.2. Business Day has also reported evidence that Nelson Mandela Bay Metropolitan Municipality was charging a further 548 per cent mark-up on the Eskom price in 2011/2012. It was also suggested that this resulted in upwards of 300 companies closing in the Eastern Cape.[109]

162. The impact on municipal customers following electricity tariff increases is therefore likely to be greater than the effect on non-municipal customers. Eskom also acknowledges that any assessment of the impact of the proposed tariff increases on manufacturing and commercial enterprises, and on small business, must be aware of municipal tariff structures.[110]

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[104] See page 91 of Eskom's Application, where is stated: *"According to a 2011 survey of 32 firms across 17 economic subsectors, conducted by DNA Economics on behalf of the National Treasury, energy efficiency levels in South Africa compare favourably with international norms. This suggests there is not much opportunity for further efficiency gains*."

[105] See the DNA report (2011) Non-confidential Executive Summary p v. For example, with respect to renewable energy among the important short-run barriers mentioned in the survey used in the DNA report was the lack of knowledge or availability of suitable technologies and the fact that renewable energy is still relatively expensive. In addition, a number of firms indicated that the inability of renewable energy to provide base-load power was a serious drawback.

[106] See the DNA report (2011) Non-confidential Executive Summary p vi – vii. The case study indicated that most firms have few fuel switching options available to them

[107] See D. Newbery and A. Eberhard (2007) "South African Infrastructure Review" p 13

[108] See page 91 of Eskom's Application

[109] See http://www.iol.co.za/business/business-news/electricity-hikes-will-damage-industry-1.1415289 "Electricity hikes will damage industry", accessed 1 November 2012

[110] *ibid*.

5.1.3.4. The carbon tax will result in even further increases in electricity tariffs

163. As noted in Chapter 2 above, in its discussion document[111] the National Treasury proposed a carbon tax of approximately R100 per ton of CO2 rising to R300 (in 2010 prices) per ton of CO2. The subsequent Budget Review suggested a tax of R120 per ton of CO2. Eskom is the largest GHG emitter in South Africa, and thus the carbon tax would increase its operating costs significantly. In 2010 Eskom emitted 225 megatons of CO2 equivalent and its emissions are forecast to increase to over 300 megatons by 2020.[112] This implies that the cost of electricity is likely to rise even further following the implementation of the carbon tax. Furthermore, firms and industries that are highly electricity reliant and produce significant carbon emissions will experience a "double impact" on their cost base as a result of the implementation of the carbon tax.

164. Using operating and construction cost data obtained from Electric Power Research Institute (EPRI)[113], and assuming the capacity additions contained the Department of Energy's IRP 2010 report, we estimated the likely future tariff yield levels for the period up to 2030, starting with NERSA's and Eskom's calculated tariffs for the MYPD 2 and MYPD 3 periods respectively.[114] The high level assumptions we applied in our tariff calculations are summarised as follows:

    164.1. Starting regulatory asset base (RAB) values were obtained from NERSA's MYPD 2 determination.

    164.2. A real rate of return of 8.16 per cent was applied to each year's RAB, which is the rate used by NERSA in its MYPD 2 determination.

    164.3. Capital expenditure for new build assets were calculated using the construction costs estimates from EPRI.[115]

    164.4. All operating costs for existing assets were escalated using a long-term inflation estimate of six per cent per annum after 2018.

    164.5. Operating expenditure for new build assets were also obtained from the EPRI report, which categorises costs under both fixed and variable operating/maintenance costs and primary energy (fuel) costs.

    164.6. The carbon tax is introduced towards the end of the MYPD 3 period around 2017/2018.

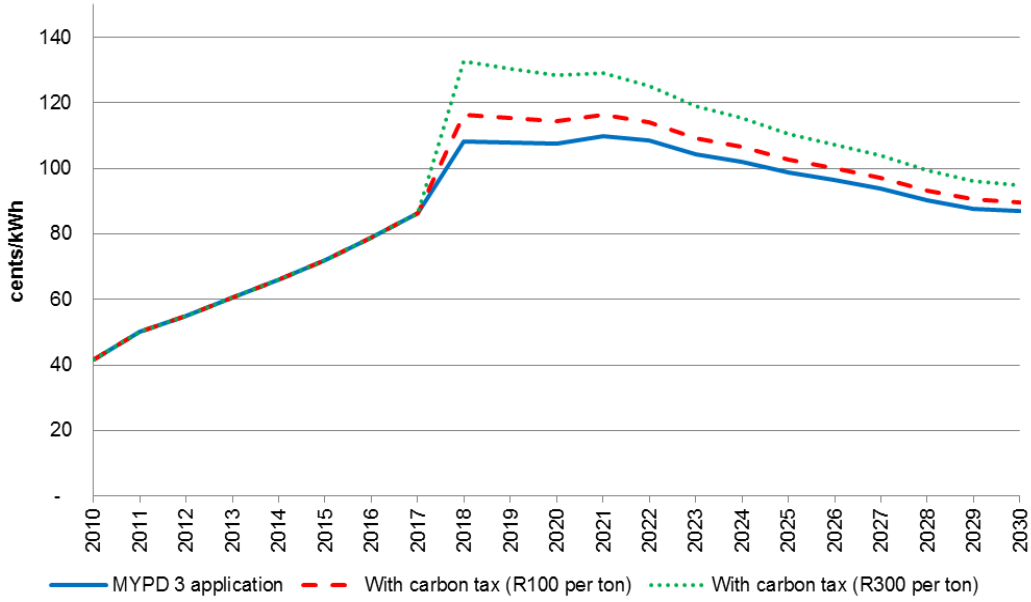
165. Our base case tariff estimates were then adjusted to take account of the additional costs that would be incurred by Eskom from the carbon tax. Given its current emissions, the tax would add R26 billion to Eskom's current primary energy costs at R100 per ton, or R78 billion at R300 per ton. Eskom's total primary energy and operating costs for the year ended March 2013 would be R112 billion, which means that a R300 per ton carbon tax would increase its primary energy costs by 70 per cent. As Eskom is allowed a full pass

[111] National Treasury: Reducing Greenhouse Gas Emissions: The Carbon Tax Option, December 2010
[112] Refer to the Department of Energy's IRP 2010 report, Table 17.
[113] From the report "Power Generation Technology Data for Integrated Resource Plan of South Africa", July 2010
[114] We used calendar year (as per IRP) as a basis of estimating tariffs rather than Eskom's financial year. Accordingly, we converted the financial year cost estimates (e.g. March 2012) to calendar year estimates (i.e. Dec 2011).
[115] From the report "Power Generation Technology Data for Integrated Resource Plan of South Africa", July 2010

through of all efficiently incurred primary fuel costs[116], the carbon tax would be included in Eskom's revenue allowance and passed onto consumers via higher electricity tariffs.

166. A comparison of our estimated long term electricity tariffs with (at both R100 and R300 per ton) and without the carbon tax is outlined in the Figure below, which expresses tariffs in constant 2010 prices.

Figure 17: Carbon tax impact on electricity tariffs (constant 2010 prices)



Source: Genesis calculations

167. With the carbon tax included, electricity tariffs (in 2010 prices) are expected to increase to R1.15 per KWh under the R100 per ton scenario or R1.28 per KWh under the R300 per ton scenario by 2020. This would result in an increase in electricity tariffs of 130 per cent and 155 per cent respectively under the two carbon tax scenarios, in real terms, by 2020. Note these significant real increases may come into effect even sooner, if the carbon tax is implemented earlier than 2017/2018. These real increases in the cost of electricity represent potentially dire cost increases for firms and industries, thus making them likely to be even more vulnerable in the face of the current electricity tariff increases proposed by Eskom.

5.1.4. Conclusion

168. A number of key sectors in the South African economy – such as mining, minerals, and chemicals – are heavily reliant on electricity as an input into their production processes. These sectors often are highly trade-exposed and would seem to have limited ability to absorb the substantial increases in real electricity tariff. As a result, the proposed electricity tariff increases can be expected to adversely impact these sectors' output and investment decisions. This will have ripple effects throughout the economy due to the significance of these sectors. Other less electricity-intensive sectors can also be expected to be adversely impacted through the so called "second round" effects of the proposed

[116] NERSA's document titled "Multi – Year Price Determination Methodology" states that variances between MYPD allowed and actual primary energy costs can be credited or debited to the Regulatory Clearing Account

electricity tariff hikes due reduced consumption and pass-on of increased electricity costs. The current economic climate, apparent lack of mitigating options and additional price pressure from municipality mark-ups and carbon tax all serve to accentuate the vulnerability of firms to the prosed tariff increases. Therefore, it would appear that the tariff increases proposed by Eskom threaten to significantly impact the South African economy in an adverse manner. This view would also seem to be consistent with the sentiment of Garth Strachan, the acting deputy director general of the Department of Trade Industry, who recently announced that given electricity costs have increased by over 170 per cent over the last five years, Eskom's MYPD 3 application is going to cause significant output and job losses.[117]

169. While Eskom's capacity expansion plan may result in additional investment and employment opportunities, there would not appear to be any basis to believe these would outweigh the potentially very significant adverse effects across the broader economy associated with the proposed tariff increases.

170. In the section that follows we consider the results from a number of formal economic studies which have sought to model the effects of significant electricity price increases across the economy. These studies are largely consistent with the above findings in terms of the sectors most likely to be impacted and the significance of this impact across the economy.

5.2. QUANTIFICATION OF ECONOMIC IMPACT

171. This section presents a summary of key findings relating to the impact that rising electricity tariffs can have on economy wide-output, employment and prices. In doing so we primarily draw from formal quantitative studies which endeavor to isolate the impact of electricity tariff increases on various macroeconomic variables.[118] In reviewing these quantitative studies, we also find that there are numerous and complex linkages to account for, and at times the findings provide a divergent range of results. Nevertheless, in synthesising the results we find there are a few consistent and robust conclusions that can be drawn. We also report on certain survey findings relating particularly to the impact that the electricity tariff increases will have on small to medium enterprises (SMEs).

5.2.1. Formal quantitative studies

172. We have identified four empirical studies that have isolated and modeled the economic impact of electricity tariff increases on the South African economy. This includes two empirical models by Pan African Investments & Research Services (2011)[119] (which the Deloitte report also referred to). We also briefly present two earlier studies including a

[117] This view expressed by Mr Strachan on the 31st of October 2012 was seemingly based on the logic that if you keep increasing input prices way beyond what industry can afford; the economy would be "strangled" resulting in job losses and firm closure. (See http://www.iol.co.za/business/business-news/electricity-hikes-will-damage-industry-1.1415289, last accessed 7 November 2012)

[118] We note there are other studies that implicitly assume a funding model must exist in the counterfactual when measuring the impact of tariff increases. For example, this counterfactual may include increases in income tax or vat instead of higher tariffs for consumers. See Eqoquant (2010) "The Macroeconomic Impact of Eskom Tariff Increases and Additional Funding Measures on the South African Economy" for such a study. These tend to suggest that when performing these types of comparisons, increasing consumer prices seems to result in the least harmful funding model for the economy, These studies are however less useful as they only look at impact in *relative* terms between funding models. The analysis presented here is focused squarely on the impact associated with the increase of electricity prices. Other funding models may indeed yield more adverse effects but the critical question at hand is still to understand the impact the prices proposed in MYPD 3 will have on the economy.

[119] Pan African Investment and Research Services Pty (Ltd) (2012) "The Impact of Electricity Price Increases and Eskom's Six Year Capital Investment Programme on the South African Economy".

study undertaken by staff at the KZN Department of Economic Development (2008)[120] and a study by the Human Sciences Research Council (HRSC 2008)[121]. All of these studies model the economic impact related to the recent wave of significant tariff increases experienced over the past 4 years. As such, it should be noted that although these studies provide insight into how significant electricity tariff increases may impact the economy, they are not modeled explicitly on the proposed tariff increases set out in the Eskom's MYPD 3 application.[122] Therefore these studies can only be treated as indicative of the macroeconomic effects that may be associated with Eskom's MYPD 3 application. Two further factors should be noted with regards to these studies:

172.1. First, these studies do not necessarily account for all the vulnerability enhancing factors raised earlier in this Chapter which would likely compound the negative economic impacts they suggest.

172.2. Second, since these studies were modeled largely around the impact of the price increases associated with MYPD 2, some of the negative impacts predicted in these studies may already have taken effect in the economy. Therefore a five year period of additional electricity tariff increases well in excess of inflation will likely compound the historical negative impacts on employment and output even further.

5.2.1.1. Pan African Investments & Research Services

173. This study makes use of two different types of economic models: a Time-Series Macro-Econometric (TSME) model and; a Computable General Equilibrium (CGE) model. Each model is subject to certain limitations; the CGE model is static in nature and therefore cannot measure the dynamic impacts over time, while the TSME model can capture some of the dynamic impacts over time, but cannot provide much insight in relation to the impact of tariff increases on subsectors of the economy. The CGE model however is more appropriate for more detailed sectoral analysis.

174. In both the CGE model TSME models, the impacts of electricity tariff increases on various macroeconomic variables are modeled under different tariff increase scenarios.

175. In the TSME model electricity prices are exogenously increased by 24.8 per cent over a three year period (Scenario 1), 15 per cent over a five year period (Scenario 2), 10 per cent over a seven year period (Scenario 3), 8 per cent over a ten year period (Scenario 4) and a combined effect of 24.8 per cent over a two year period and six per cent over a four year period (Scenario 5). The first four of these scenarios are also applied to the CGE model but due to the static nature of the model, only a once-off effect can be detected. The primary focus of their analysis was however scenario 1 which modeled a 24.8 per cent change in price.

176. All the results are reported as percentage changes from the baseline scenario. In other words, the results are not forecasts of various economic variables, but rather deviations from its short and long-run path due to increases in the price of electricity. Below we

[120] "The Impact of Electricity Pricing Shock On the South African Economy: A CGE Analysis", Jean Luc Erero, January 2010
[121] HRSC (2008). "The Impact Of Electricity Price Increases and Rationing On The South African Economy"
[122] Therefore when considering the impact of Eskom's MYPD 3 application, it is worth noting that significant electricity tariff increases have already transpired and that some of the predicted negative impacts may have already begun to take effect.

present some of the key findings from these two models applied by Pan African Investments & Research Services.[123]

Results of the TSME model

177. The TSME model predicts that there will be adverse economy wide impacts in the long-run for the scenarios where the electricity tariffs were substantially above inflation. We show the economy– wide results for three pricing scenarios in Table 23.

177.1. *Pricing scenario 1* (24.8 per cent for a three year period): Under this scenario the impact on inflation was moderate with about a 2 per cent deviation from its long-run path. Domestic investment and employment fell by about 0.9 per cent and 0.12 per cent, respectively and the combined effect resulted into output falling by about 1.1 per cent. Household consumption expenditure and real wages are also found to fall in the long-run by about 1.7 per cent and 0.7 per cent, respectively due to falling output and real interest rates.[124] These predicted falls in output and consumer expenditure implies a setback for the growth prospects of the economy as well as future employment.

177.2. *Pricing scenario 2* (15 per cent for a five year period): Eskom has attempted to dismiss to some extent the projections under the first pricing scenario on the basis that the assumed price increases in scenario 1 well exceed the tariff increases proposed in the MYPD 3 application.[125] However, this pricing scenario (i.e. 15 per cent over a five year period) bares close resemblance to Eskom's MYPD 3 application, and in fact is even slightly less in magnitude. Even this scenario predicted significant adverse effects for the economy. This scenario predicts that in the long-run output would decrease by -0.8 per cent (relative to -1.1 per cent for the three years of 24.8 per cent increases) and employment would decrease by -0.10 per cent (relative to -0.12 per cent for the three years of 24.8 per cent increases).

177.3. *Pricing scenario 3* (10 per cent for a seven year period): Interestingly, this model predicts that in the long-run output would increase by 0.25 per cent and employment would increase by 0.04 per cent. There is clearly a dramatic difference in impact between the scenario 2 and scenario 3 price paths. This resembles the different price paths proposed by Eskom and our own estimates of a cost reflective tariff. This stark contrast in economic impact emphasises the fact that any electricity tariffs in excess of the minimum requirement for sustainable electricity supply is likely to come at a significant cost to the economy.

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[123] Both models present short and long-run macro-economic impacts. However, the short-run implications of the price hikes in the dynamic TSME model are found not to be very robust due to the slow adjustment processes that are embedded in the economy. However, in the static CGE system robust short-run implications are captured. We only focus on the long-run impacts in both models as these are the most useful in terms of considering the impact on the economy.

[124] It is also predicted that the exchange rate will depreciate in the long-run by about 3.3 per cent and this is found to have a negative impact on domestic investment decreasing by about 1 per cent from its long-run path. The impact on exports is expected to be mild potentially because it is cushioned by the moderate inflation differentials but the output effect on imports will come to the fore in the long-run with a 2.5 per cent decline.

[125] See Eskom's MYPD 3 application p 89.

Table 23: Long run economy-wide impacts of an increase in electricity prices

	Employment	Output	Investment	Consumption	Real Wages	Exports	Imports	Inflation
Scenario 1	-0.12%	-1.10%	-0.90%	-1.70%	-0.70%	-0.10%	-2.50%	2%
Scenario 2	-0.10%	-0.80%	-1.30%	-1.15%	-0.50%	-0.05%	-1.50%	1.25%
Scenario 3	0.04%	0.25%	0.35%	0.37%	0.17%	0.01%	0.41%	-0.11%

Source: Pan-African investment and research services (2011)

178. In terms of the impact at a sector level, data was available for eight sectors of the economy and the sectoral impacts are presented in the Table 24. The results are ranked by the largest predicted falls in output.[126]

[126] The sectorial models developed in this study assume that both households and firms face the same final prices and a disaggregated sectorial model was adopted. Therefore, the response of major sectorial variables to any shock in the system will depend on the relative share of inputs (labour & capital) used in the production process. These inputs, however, have captured implicitly the energy intensity in production.

Table 24: Long run sector specific impacts of an increase in electricity prices

		Employment	Output	Investment	Real Wages	Exports	Imports
Mining	Scenario 1	-1.60%	-3.80%	-3.80%	-4.10%	-0.25%	-4.30%
	Scenario 2	-0.90%	-2.10%	-2.20%	-2.40%	-0.20%	-2.50%
	Scenario 3	0.36%	0.80%	0.43%	1%	-0.09%	0.90%
Transport & Communication	Scenario 1	-0.70%	-2.60%	-3.10%	-1.90%	-0.30%	-0.50%
	Scenario 2	-0.40%	-1.50%	-1.90%	-1.17%	-0.16%	-0.34%
	Scenario 3	0.21%	0.50%	-0.38%	0.42%	0.03%	0.20%
Manufacturing	Scenario 1	-0.20%	-1.90%	-2.50%	-1.90%	-0.05%	-2.20%
	Scenario 2	-0.13%	-1.20%	-1.60%	-1.20%	-0.02%	-1.40%
	Scenario 3	0.02%	0.20%	0.40%	0.17%	0.03%	0.27%
Agriculture	Scenario 1	-0.06%	-1.50%	-2.20%	-1.30%	-0.34%	-4.70%
	Scenario 2	-0.03%	-0.99%	-1.35%	-1.28%	-0.19%	-2.80%
	Scenario 3	-0.01%	0.27%	0.06%	0.25%	-0.05%	1.20%
Wholesale & Retail	Scenario 1	-0.54%	-1.20%	-1.70%	-1.20%	0.07%	-0.76%
	Scenario 2	-0.36%	-0.80%	-0.14%	-0.76%	-0.07%	-0.50%
	Scenario 3	0.11%	0.24%	0.27%	0.24%	-0.07%	0.14%
Construction	Scenario 1	-0.20%	-0.70%	-0.08%	-0.53%	NA	NA
	Scenario 2	-0.05%	-0.44%	-0.02%	-0.31%	NA	NA
	Scenario 3	0.12%	0.35%	0.17%	0.25%	NA	NA
Finance	Scenario 1	-0.23%	-0.62%	-1.10%	-0.70%	0.52%	-1.45%
	Scenario 2	-0.10%	-0.40%	-0.70%	-0.47%	0.30%	-0.90%
	Scenario 3	0.12%	0.09%	0.13%	0.11%	0.30%	0.32%
Electricity, gas & water	Scenario 1	9.60%	11.50%	9.50%	9.70%	-2%	9.8
	Scenario 2	-0.20%	-0.24%	-3%	-0.20%	-1.20%	0.30%
	Scenario 3	0.90%	1.10%	1.80%	1%	0.90%	-0.69%

Source: Pan-African Investment & Research Services (May 2011)

179. The sectors that experienced the largest declines in output for scenario 3 were mining (-3.8 per cent), transport and communication (-2.6 per cent) and manufacturing (-1.9 per cent). Mining and transport and communication also experienced the largest falls in employment for scenario 3. Again we find these sectors still experience significant negative impacts on output and employment in scenario 2 (the series of 15 per cent increases) but no negative impacts in relation to scenario 3 (the series of 10 per cent increases). The outcomes of TSME model are highly dependent on the energy intensity in production and hence these results are unsurprising given the high reliance of these sectors on electricity as a factor input.

180. The main shortcoming of this model is that the available level of sector disaggregation, masks significant variation in terms of the impact at the sub sector level. Therefore, we also present the CGE model result's which predicts the economic impact at a more detailed level of sector disaggregation.

Results of the CGE model

181. In considering the results of the CGE model we focus on the pricing scenario of a once off increase of 24.8 per cent. The MYPD 3 application relates to annual increases of 16 per cent for the next 5 years. Whilst spreading increases more gradually over a number of years may lead to a less severe impact, the accumulative price increase of the MYPD 3 application would be significantly higher than the once off increase considered in this scenario.

182. Table 25 below demonstrates the economy wide long-run impacts from a once-off increase of 24.8 per cent. We have highlighted in bold the long-run impact on output (-1.03 per cent), consumption (-2.37 per cent), unskilled labour (-1.32 per cent) and capital stock (-1.82 per cent). Here the long-run impact on employment is limited to unskilled labour as it assumed that skilled and semi-skilled workers would be able to find alternative employment in the long-run.

Table 25: Economy-Wide Impacts of an Increase in Electricity Prices

Macro-variable	Long-run outcome
Real devaluation	0.76%
Terms of trade	-0.14%
Gross operating surplus	-2.33%
Real household consumption	**-2.37%**
Aggregate capital stock	**-1.82%**
Real GDP	**-1.03%**
Average real wage	-2.12%
Unskilled employment	**-1.32%**

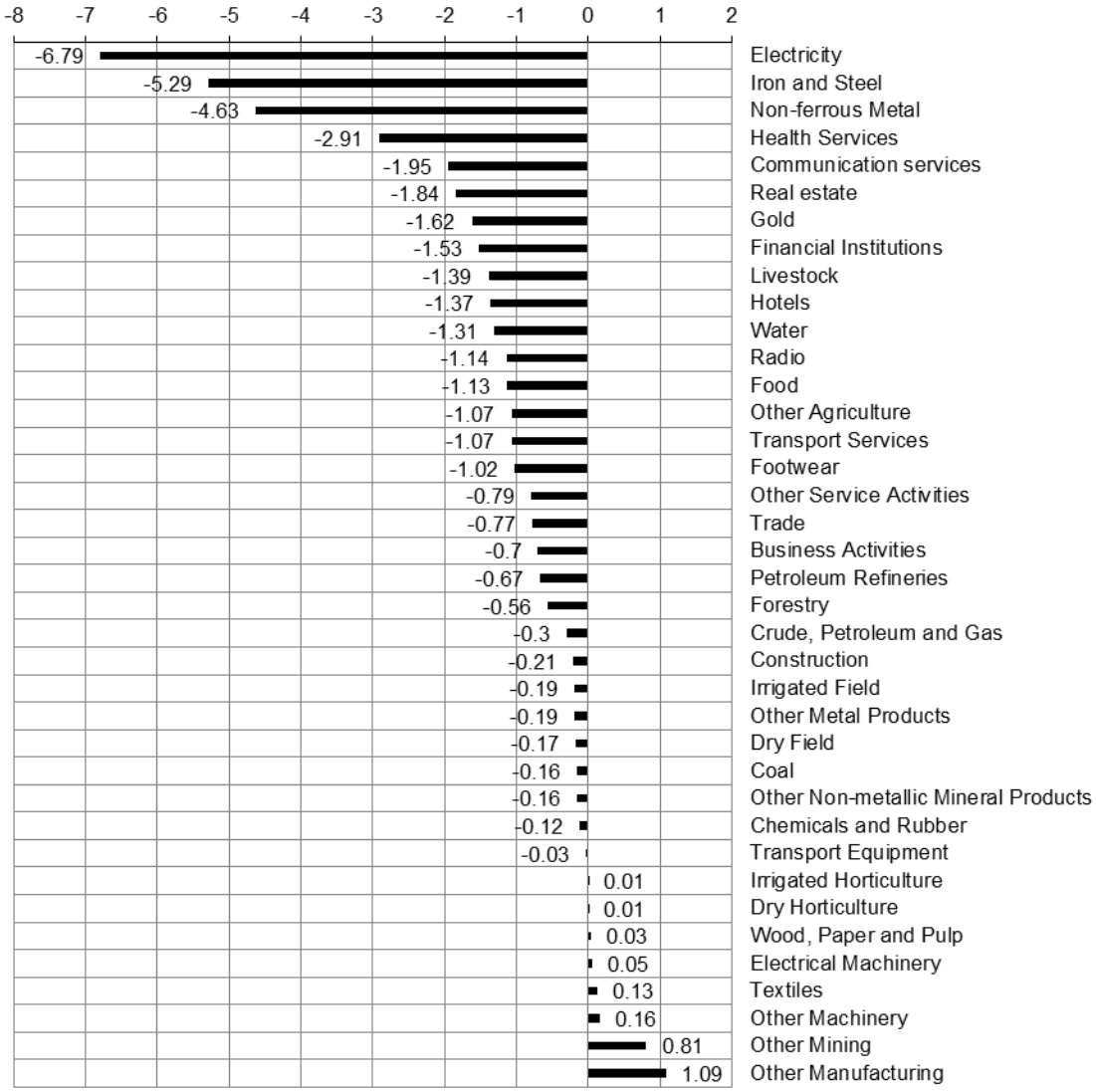
Source: Pan-African Investment & Research Services (May 2011)

183. The falls in the long-run path of output and consumption are similar to the findings of TSME model, with the drop in consumption slightly more pronounced in the CGE model, although direct comparisons across the models may not be that meaningful. It should be emphasised that these results are only due to a once-off increase of 24.8 per cent. Therefore the net impact on the economy from the subsequent increases including the possibility of five years of 16 per cent increases would likely result in worse outcomes due to the likely compounding effects.

183.1. *Long-run impact on output by sector*. Figure 18 presents the more detailed sub-sector output impacts. In the long-run, output in 31 of the 39 industries would be expected to decrease. The reliance on electricity as a factor input mostly explains the significant impacts in the output of the sub sectors associated with iron and steel (-5.29 per cent), non-ferrous metal (-4.63 per cent) and gold (-1.62 per

cent).[127] This model also captures the negative impact of falling household expenditure and the impact of slower economic growth on government expenditure. This explains for the most part, the falls in health services (-2.91 per cent), real estate (-1.84 per cent) and financial institutions (-1.53 per cent). The marginal gains in long-run output predicted in some sectors (e.g. other mining and other manufacturing), is most likely to be the result of factors of production shifting to less energy intensive sub-sectors. Importantly, the overall net impact on output is remains negative

Figure 18: Long-run impact on output by sub-industry



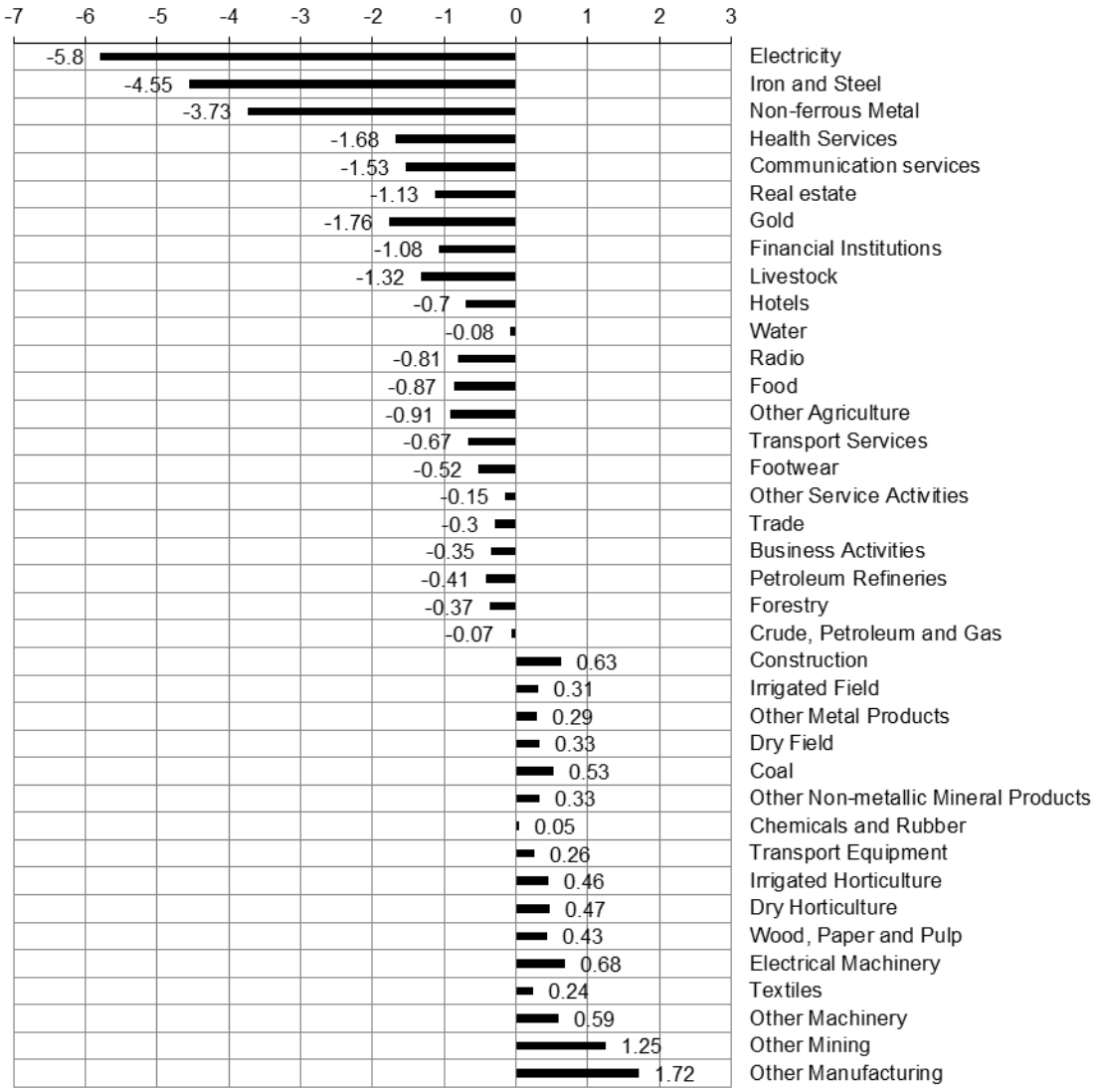
Source: Pan-African Investment & Research Services (May 2011)

183.2. *Long-run impact on unskilled labour by sector*. The sub-industry results relating to the impact on unskilled labour is shown in Figure 19. In 30 of the 39 sub-industries employment is predicted to fall. For the most part changes in unskilled employment will follow changes in output, for example, with the industries releasing the highest

[127] A slight oddity of this model is that it predicts the opposite effect in relation to the impact on the electricity, gas and water sector relative to TSME model. In the CGE model, a significant negative impact on the output of the electricity sector is predicted as the model implicitly assumes that an increase in the price of electricity leads to a fall in demand for electricity. However, we note the magnitude of this effect in reality is likely to be more muted, given the accompanying investments in the electricity sector and the fact the demand for electricity is relatively inelastic.

percentages of unskilled workers (other than electricity) being iron and steel (4.55 per cent) and non-ferrous metals (3.73 per cent). However, there are some labour intensive industries, which despite experiencing a relatively smaller impact on output, still experience a relatively large impact on unskilled employment. This is due to the labour intensive nature of these industries and hence, even a small impact on certain industries can have significant impacts on employment.[128] Furthermore, it could be expected that certain industries, will to some extent, substitute electricity intensive capital for labour in the long-run and this may explain some of the gains in unskilled employment in some of the sub-sectors such as the textiles industry. Nevertheless, despite some industries realising a positive increase in unskilled employment the net impact on unskilled labour is still an overall decrease 1.32 per cent as result of a once-off increase of 24.8 per cent.

Figure 19: Long-run impact on unskilled employment by sub-industry



Source: Pan-African Investment & Research Services (May 2011)

[128] For example the labour intensive industries that would reduce unskilled employment in the long-run by more than 0.5 per cent under a 24.8 per cent electricity price increase are Livestock (-1.32 per cent), Other Agriculture (-0.91 per cent), Footwear (-0.52 per cent), and Real Estate (-1.13 per cent).

5.2.1.2. KZN Department of Economic Development

184. A study undertaken by staff at the KZN Department of Economic Development[129] also attempted to assess the macroeconomic effects of a shock in electricity tariffs. However, in this study the emphasis was on the short-run implications of such a shock. In this instance a 35 per cent tariff increase was modeled using of a computable general equilibrium (CGE) model. This model therefore related to the proposed tariff hike in the beginning of MYPD 2 process.

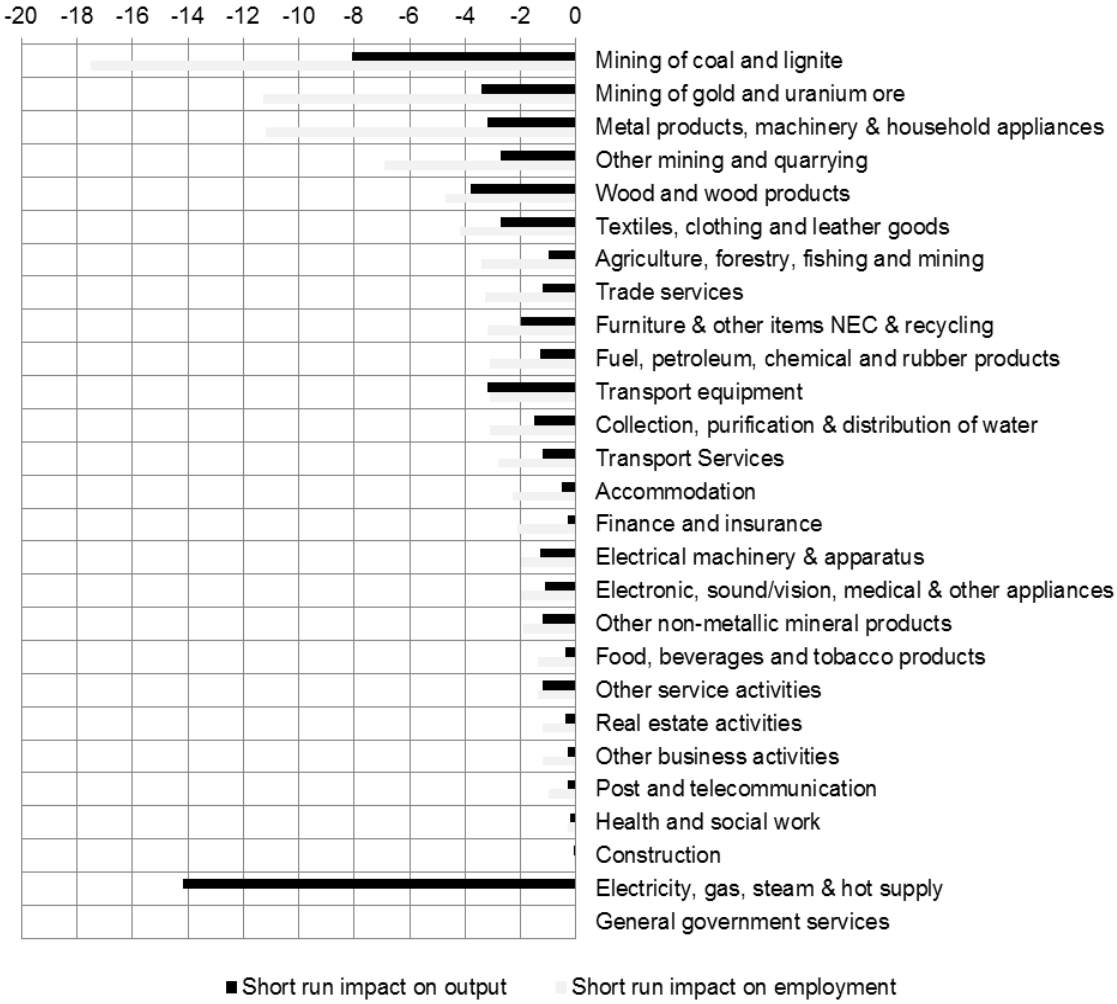
185. Their modeling found that in the short-run a 35 per cent increase in electricity tariffs would decrease GDP by 1.53 per cent relative to the baseline scenario and employment would fall even further, by 2.99 per cent. Importantly, the KZN study suggests that these outcomes arise mainly from the anticipated 4.88 per cent decrease in export volumes.[130]

186. With respect to the sector specific outcomes, the short-run changes in employment and output are presented in Figure 20. These impacts seem more severe than those predicted by the Pan African empirical models (possibly due to the larger price increase). However, what is generally consistent across the various studies is the sub-sectors that experience the most severe impacts, including mining and manufacturing sub-sectors. But perhaps the most concerning outcome of the KZN study is the overall negative economic impact of this electricity tariff shock on all sub-sectors in the short-run. This may however be the result of the inability of labour and capital to shift between sectors in the short-run which is a result of one of the assumptions of this model.

[129] "The Impact of Electricity Pricing Shock On the South African Economy: A CGE Analysis", Jean Luc Erero, January 2010

[130] The modeling also produces a CPI increase of 4.12 per cent but is not clear from the study whether this CPI estimate is the final outcome or an increase on top of a baseline CPI. These findings are based on a fairly stringent set of assumptions which also exclude any allowances for investment in the electricity sector or changes in behavior relating to efficiency adjustments. Furthermore the short-run implications for the economy are likely to be different for a series of 16 per cent increases relative to a once off increase of 35 per cent. Nevertheless, this study emphasises the impact of a previous increase in electricity tariffs on the overall competiveness of the economy by way of a significant fall exports.

Figure 20: Sectoral results short-run impact output and employment resulting from 35 per cent increase in tariffs



Source: DTIGEM simulation calculations

5.2.1.3. HRSC study

187. The HSRC's study analysed the potential economic impact of electricity tariff increases versus electricity rationing in South Africa. HSRC adopted a number of methodologies including economy wide modeling, financial modeling and interaction with energy experts from various industries. The report concluded that all things being equal (i.e. no improvements in energy efficiency) electricity price increases are more preferable to electricity rationing as a means of reducing electricity demand as the macroeconomic effects would be less marked.

188. However, notable negative macroeconomic impacts were still shown to result from significant tariff increases. Their modeling showed that reducing electricity demand by 10 per cent would require a real tariff increase of 71.3 per cent, which is very close to what was proposed by Eskom during MYPD 2. A tariff increase of this magnitude would result in GDP falling by 0.9 per cent in real terms, employment falling by 1.2 per cent and the CPI increasing by 2.5 per cent. It is not clear whether these are short-run or long-run impacts.

189. Under separate modeling, HSRC found that a tariff increase of 35 per cent (which is what Eskom applied for in November 2009) would reduce GDP by 0.1 per cent and increase the CPI by 1.3 per cent.

5.2.1.4. Consolidating learnings from the formal impact studies

190. We have reviewed a number of studies that focus on the impact of rising electricity tariffs on key macro-economic variables such as output, prices and employment. Although these studies are very detailed and have somewhat divergent approaches and results, a number of overall lessons can be drawn:

    190.1. *First*, when considering previous electricity tariff hikes, all of the studies modeling price increases significantly above inflation predicted the same adverse directional impact on economy wide output, prices and employment. Furthermore, these impacts were generally predicted to be significant. Therefore, although none of these studies were intended to model the tariff increases set out in the current MYPD 3 application, their outcomes are indicative that the these tariff increases will too have significant adverse economic effects. This finding is consistent with the analysis earlier in this chapter, and acknowledged to some degree by Eskom in the MYPD 3 application.[131]

    190.2. *Second*, although there is some variation in the sectoral outcomes, the impact from increasing electricity tariffs in mining and certain manufacturing sectors is found to be consistently severe in both in the short and long-run. These sectors are vital for to the economy as described earlier in this Chapter.

    190.3. *Third*, these models reveal the significance that reduced consumer and government expenditure can have on decreasing output and employment in those sectors that are relatively less reliant on electricity. Therefore many firms in the less electricity intensive sectors are likely to also be adversely impacted by Eskom proposed tariff increases. This too is consistent with analysis provided earlier in this Chapter.

    190.4. *Fourth*, in the long-run unskilled workers may suffer disproportionally and this will further hinder South Africa's structural unemployment problem. Therefore absent any policy interventions, Eskom's proposed tariff increases will have a regressive impact on the population.

    190.5. *Fifth*, despite Eskom's resistance in relation to there being any long-run impacts from the proposed increases, these studies found significant negative long-run implications for the economy associated with the modeled price increases.

191. Three further factors should be noted when considering the results of these studies:

    191.1. These studies, however, do not necessarily account for all the vulnerability enhancing factors raised earlier in this Chapter which would likely compound the negative economic impacts they suggest.

    191.2. Since these studies were modeled largely around the impact of the price increases associated with MYPD 2, some of the negative impacts predicted in these studies may already have taken effect in the economy. Therefore a five year period of

[131] See pages 82 and 95 in Eskom's application

additional electricity tariff increases well in excess of inflation may also compoundthe historical negative impacts on employment and output even further.

191.3. These empirical results account for the positive economic impact that will flow from Eskom's build program. However, as noted earlier, it is unlikely that these would be sufficient to counterbalance the substantial and economy wide negative effects predicted from the modeled price increases. Furthermore, if a sustainable and sufficient electricity supply could still be achieved through lower price increases – as we are suggesting in this report – then the additional benefits associated with this investment will only be enhanced.

5.2.2. Other studies and surveys

5.2.2.1. Survey of impact on SMEs

192. Small and medium enterprises (SMEs) are regarded as particularly important to South Africa at its current stage of development according to the South African Government's Accelerated and Shared Growth Initiative for South Africa (AsgiSA) (South Africa, 2006). An earlier study in 2008[132] surveyed 250 SMEs in Cape Town and primarily assessed the impact of the electricity crises on their consumption behaviour. This study found that SMEs are particularly vulnerable to shocks in their external environment mostly due to a general lack of resources necessary to invest in alternative sources of energy as well as a general lack of in-house capabilities for sound asset management. The survey results also suggested that the prevailing policy methods of changing electricity consumption behavior: information campaigns, increasing prices, and providing rebates for energy savings, have had limited results and were unsustainable when applied to SMEs. This study therefore further emphasizes the difficulties SMEs will face following further tariff shocks.

193. Furthermore, the potentially damaging impact on a variety of firms as result of additional tariff increases is also highlighted by a survey conducted by Pan African Investment research services (May 2011). Here two separate surveys were conducted to assess the impact of electricity price increases on a range of South African firms. The results of these surveys do not however include the anticipated impact of Eskom's MYPD 3 application and only relates to the recent electricity tariff increases.[133]

193.1. The first survey focused on small retailers in middle income communities and assessed the impact of municipal electricity tariff increases. It found that 64 per cent of the retail merchant owners surveyed anticipated that increasing electricity price hikes would materially affect their bottom line.

193.2. The second survey was a national survey and assessed the economic impact of rising electricity prices on 80 companies and included firms that participated in a range of industries. This survey found 73 per cent of the senior staff surveyed reported that rising prices had a noticeable impact on their profitability.

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[132] A. Von Ketelhodt and A. Wöcke (2008). "The impact of electricity crises on the consumption behaviour of small and medium enterprises"

[133] We have not gained direct access to these studies and thus refer to the summary of negative results as presented in the Deloitte report.

5.2.2.2. Other estimates of impact on employment

194. Although we have no knowledge of the underlying models used we note that various other stakeholders have also estimated the impact that shocks to electricity tariffs will have on employment levels.

    194.1. Following NERSA's announcement approving the tariff increases associated with MYPD 2, the South African Chamber of Commerce and Industry (SACCI) reported that the approved tariff increases of 25 per cent per annum for three years would result in the loss of 250 000 jobs.[134]

    194.2. Standard Bank also estimated that potential employment creation losses and found that employment opportunities could be cut by as much as 295 000 jobs as a result of MYPD 2 price increase.[135]

5.3. CONCLUSION ON ECONOMIC IMPACT

195. The sectors most directly reliant on electricity as an input into their production process include the mining, metals, minerals, agriculture and chemical industries. Indications are that the tariff increases proposed in the MYPD 3 application would increase the share of operating cost accounted for by electricity of these electricity intensive sectors by up to as much as 60 per cent in real terms. These sectors are typically also highly trade-exposed exporting often more than 50 per cent of local production, and as a result the substantial rise in electricity costs is likely to stifle their competitiveness to some degree. We also find that there are indications that these sectors would only have limited ability to absorb the substantial increases in real electricity tariff currently being applied for by Eskom. Therefore, the proposed electricity tariff increases can be expected to adversely impact these sectors' output and investment decisions. This will have ripple effects throughout the economy due to the significance of these sectors. For example, the mining sector alone accounts for more than 70% of the value-add in the primary sector, over 40% of exports, 12% of gross capital formulation and 13% of corporate income tax.

196. Other less electricity-intensive sectors can also be expected to be adversely impacted through the so called "second round" effects of the proposed electricity tariff hikes. These "second round" effects are primarily driven by falling disposable and government income which suppresses demand, as well as the pass-on of increased electricity costs to down-stream firms in the form of intermediate inputs. These effects "second round" effects can be expected to be substantial with the proposed increases in electricity tariffs estimated to cost consumers an additional R10 billion rand a year in electricity consumption in real terms by 2017/2018. This will increase the portion of average expenditure spent on electricity from 6.3 per cent to 10.3 per cent. The current economic climate, apparent lack of mitigating options and additional price pressure from municipality mark-ups and carbon tax all serve to accentuate the vulnerability of firms to the proposed tariff increases.

197. Formal quantitative studies which have modeled the impact of electricity shocks on the South African economy would also suggest that the negative impact of the proposed tariff increases will be significant. Although these studies are somewhat divergent in their approach and outcomes a few lessons can be learnt. First, the modeling of similar levels

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[134] South African Chamber of Commerce and Industry, Media Statement, 24 February 2010.
[135] Botha J & van Dyk D, 'Balancing the cost of electricity with the benefit of additional power supply', Standard Bank: South Africa Insight, 15 March 2010.

of price increases in 2011 suggests significant adverse economy wide impacts. For example such as decrease in long run GDP of around 1 per cent. Second, although there is some variation in the sectoral outcomes, the impact from increasing electricity tariffs in mining and certain manufacturing sectors is found to be consistently severe in both in the short and long-run. Third, these models reveal the significance that reduced consumer and government expenditure can have on decreasing output and employment in those sectors that are relatively less reliant on electricity such as healthcare and financial services. Therefore many firms in the less electricity intensive sectors are likely to also be adversely impacted by Eskom proposed tariff increases. Fourth, previously conducted surveys also suggest that SMEs may be particularly vulnerable to shocks in electricity prices.

198. Therefore, this analysis would suggest that the tariff increases contained in Eskom' MYPD 3 application will have significant negative long term implications for households, industries and the economy at large. This makes NERSA's scrutiny of the MYPD 3 cost estimates all the more crucial especially given we show in Chapter 3 that significant savings are available when performing a detailed cost assessment of Eskom's MYPD 3 application. This suggests that much of the negative economic impact associated with the prices proposed in the MYPD 3 application can be averted *without* compromising the supply of electricity supply.

6. CONCLUSIONS

199. The 16 per cent per annum tariff increases proposed by Eskom are based on flawed cost assumptions and rely largely on asset valuations that stakeholders are unable to verify. A fair assessment of Eskom's Application using sound regulatory accounting techniques indicates that a tariff of about 102 cents per kWh by the last year of MYPD 3 is more credible that Eskom's estimate of 128 cents per kWh. We have identified a number of adjustments to primary energy and operating costs that account for our lower tariff estimates, and there is no doubt that scope for further reductions is achievable if certain aspects of the application (for which limited information was disclosed by Eskom) are scrutinised more closely. NERSA has access to this information and it is incumbent on it to ensure that Eskom has not over-inflated its MYPD 3 cost estimates so as to derive revenue in excess of its requirements.

200. Our tariffs (reflecting better cost reflectivity) can be implemented by either a relatively low increase in 2013/14 followed by a higher increases for the remainder of MYPD 3, or alternatively a smoothed tariff increase of 10.8 per cent per annum over the period. The first option has the benefit of allowing consumers time to achieve energy efficiency gains in advance of the marked increases in the latter years. However, a smoothed tariff profile promotes predictability and allows Eskom extra funding up-front for its current capital expenditure requirements. The tariff profile of these two options, along with Eskom's tariff proposals are summarised in Table 22.

Table 26: Summary of Eskom and Genesis estimates of nominal tariffs for MYPD 3

Nominal tariffs cents/kWh	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Eskom's Application	61.0	71.0	82.1	95.0	110.0	128.0
% increase		16.4%	15.6%	15.8%	15.8%	16.4%
Genesis estimates	61.0	61.1	67.9	81.9	97.1	113.7
% increase		0.1%	11.2%	20.5%	18.7%	17.1%
Genesis estimates (smoothed)	61.0	67.6	74.9	82.9	91.9	101.7
% increase		10.8%	10.8%	10.8%	10.8%	10.8%

Source: Eskom and Genesis calculations

201. Regardless of the approach taken, it is crucial that NERSA consider all the savings identified in this report, particularly with regards to coal costs, renewable energy IPP costs, IDM costs and "other" costs, which account for the majority of savings. NERSA should also consider other relevant factors in its assessment of Eskom's Application, including the adverse economic impacts arising from the MYPD 1 and MYPD 2 tariff increases, the carbon tax proposals from National Treasury, the deterioration of Eskom's operating performance in recent years and the significant variations between Eskom's forecast and actual costs during MYPD 2. These factors should play a role in assessing the appropriateness of Eskom's proposals for MYPD 3.

202. Specifically in relation to the economic impacts of recent tariff increases, we find based on a comprehensive assessment of the structure of the economy and review of available impact studies – that Eskom's proposed tariff increases are likely to impose a significant and long-term cost on the economy. The sectors most directly reliant on electricity as an input into their production process include the mining, metals, minerals, agriculture and chemical industries will be most significantly impacted. However, other less electricity-intensive sectors can also be expected to be adversely impacted through the so called "second round" effects of the proposed electricity tariff hikes. These "second round"

effects are primarily driven by falling disposable and government income which suppresses demand, as well as the pass-on of increased electricity costs to down-stream firms in the form of intermediate inputs.

203. Furthermore, the current economic climate, apparent lack of mitigating options and additional price pressure from municipality mark-ups and carbon tax all serve to accentuate the vulnerability of firms to the proposed tariff increases.

204. Therefore, this analysis would suggest that the tariff increases contained in Eskom' MYPD 3 application will have significant negative long term implications for households, industries and the economy at large. This makes NERSA's scrutiny of the MYPD 3 cost estimates all the more crucial especially given we show in Chapter 3 that significant savings are available when performing a detailed cost assessment of Eskom's MYPD 3 application. This suggests that much of the negative economic impact associated with the prices proposed in the MYPD 3 application can be averted *without* compromising the supply of electricity supply