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The impact of Private Sector Participation in the South African electricity supply industry

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i. Declaration

I declare "The impact of Private Sector Participation in the South African electricity supply industry" is my own work and all sources that I have used or quoted have been indicated and acknowledged by means of completing reference

Buang Vernon Gibbs

ii. Acknowledgement

I would like to thank the Almighty for giving me the opportunity and strength to be able to complete this thesis. All glory be to God.

This piece of work is dedicated to my late dad, Mr Victor Simon Gibbs, may his soul rest in peace.

My sincere gratitude goes to my supervisor, Dr O.D Daw for guidance during the course for this dissertation. May his expert guidance be available to many students in future

Furthermore, I would like to thank my mother, family, friends, colleagues and my partner who encouraged me when I was about to give up while doing this work. I also extend my appreciation to all those who helped in any way with the completion of this work, may the good Lord's grace and light always shine upon you.

iii. Abstract

The South African economy was hit hard by the electricity crisis of 2008 where increasing demand for electricity outstripped the available supply that led to load shedding. Many jobs were lost, industries could not keep up with international competition and as a result jobs were lost in the process affecting many households in the country.

This is the context within the debate around the introduction of private sector participation in the electricity industry to assist Eskom to meet the demand and stimulate economic growth. This dissertation examines the introduction of the Independent Power Producers and its impact on the industry. It has been found that to level the playing field in the industry, the horizontal structure of the electricity industry will have to disaggregate.

International experience has shown that this structure is perfect for meeting the increasing electricity demand and for economic growth.

Contents

Acronyms

IPP	Independent Power Producers
IRP	Integrated Resource Plan
ESI	Electricity Supply Industry
OCGT	Open Cycle Gas Turbine
NERSA	National Energy Regulator of South Africa
SADC	South African Development Community
MYPD	Multi Year Price Determination
EPP	Electricity Pricing Policy
REDs	Regional Electricity Distributors
DMP	Demand Market Participation
GNEEP	Government's National electricity emergency programmes
PCP	Power Conservation Programme
PPA	Power Purchase Agreement
DSM	Demand Side Management
NRS	National Regulator Standard
DPE	Department of Public Enterprise
ANC	African National Congress
ISMO	Independent System Marker Operator
SEB	State Electricity Board
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
CII	Confederation of Indian Industries
MW	Megawatts
DoE	Department of Energy
REFIT	Renewable Energy Feed-in Tariff
GWh	Gigawatts Hours

1. Chapter 1: Introduction

The South African electricity supply industry is dominated by a state-owned and vertically integrated company called Eskom. Eskom, which generates about 96% of the electricity in South Africa, transmits and distributes to either end users or the municipalities who buys in bulk (and to those with a few generating small amounts for sale in their areas of jurisdiction) then distribute to end users in their licensed area of supply.

South Africa is rich in mineral resources with an extensive mining industry. It is ranked first for platinum production, second for gold production and fifth for coal production in the world. In 2007 247,7 million tonnes of coal was mined and it was estimated that there are a further 31 billion tonnes of recoverable coal resources remaining. (GCIS, 2008). It is the abundance of coal that has resulted in the picture in South Africa shown in fig 1: below.

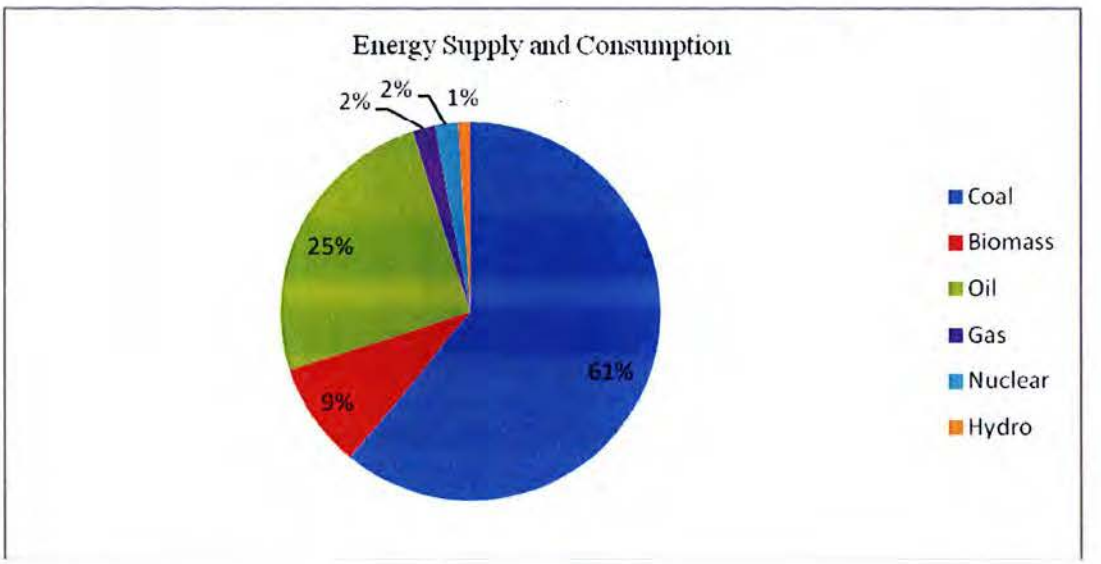

Fig 1: Energy Supply and Consumption

In South Africa, electricity is generated from coal; nuclear and hydro and emergency gas. South Africa sells electricity to neighbouring countries e.g. Botswana, Lesotho, Mozambique, Swaziland, Zimbabwe, etc. while on the other hand, contractually, South Africa is bound to take electricity from Mozambique's Cahorra Bassa hydro-

electric station on the station on the Zambezi. Eskom also imports some power from the Democratic Republic of Congo and from Zambia, mainly for peak load management.

In 2003, Cabinet approved private-sector participation in the electricity industry and decided that future power generation capacity will be divided between Eskom (70 %) and independent power producers, or IPPs (30 %). The Department of Minerals and Energy (the departments has now split into two separate departments, namely Department of Minerals and the other one is Department of Energy) was mandated with the responsibility of ensuring private-sector participation in power generation through a competitive bidding process and that diversified primary energy sources be developed within the electricity sector without hindrance.

A power generation investment plan was drawn up to take into account this 30 percent private-sector participation in power generation. The planning and development of transmission systems will be undertaken by the transmission company, subject to the government's policy guidelines.

Eskom, in 2003, implemented a revised business model to prepare for capacity requirements and the impending restructuring, by splitting its business into regulated and non-regulated divisions. Eskom's core business, its strategic support businesses, and target markets were reviewed and agreed on and the generation division will continue to be part of Eskom. The power stations in the division were paired together to form clusters to prepare the generation sector for flexibility to accommodate different options in a changing electricity supply industry (ESI). The transmission division takes responsibility for the electricity grid. Worldwide transmission is a natural monopoly.

In South Africa, an efficient regulatory body must be established that will grant all players access to the grid. For example, customers could buy from sources other than Eskom, such as the Southern African Development Community (SADC) electricity pool or IPPs, but still use the same transmission infrastructure to have power delivered to them.

1.1 Background Statement

In 2008, Eskom was faced with a situation of capacity shortage and this energy crisis has had devastating effect on South Africa. Besides destabilising the fluency of everyday life, the crisis has had drastic implications for growth, industry and employment. Most economic sectors have been affected including the mining sector as they were unable to benefit fully from the high gold prices amid Eskom's electricity rationing.

In response to unreliable supply, consumers would normally seek out an alternative service provider. However, in the South African electricity sector, Eskom still has the monopoly. The problem of capacity shortage is still in our midst and looming as Eskom has been unable to keep pace with the growing energy demand. As such, it is very critical for conditions that encourage private sector participation or involvement be created.

Problems encountered in the South African electricity market are not unique to what some other international countries have experienced. These countries have wrestled with these difficult issues and there is wealth of experience for South Africa to utilise in reforming our power industry to ensure that electricity permanently becomes available once again.

The problem of capacity shortage maybe related to the current structure of the industry in our country, where Eskom is a monopoly and owned by the state. In cases where competition exists, customers have a choice of suppliers and because of competition, efficiency will increase, better service will be offered and prices will be reduced.

According to the World-Bank, whenever the state own and operate infrastructure, four institutional problems appear repeatedly namely:

- Misallocation of resources - a tendency to become involved in large-scale projects that are not economically viable e.g. in the South African context is when Eskom was producing generating capacity that far exceeded potential demand as it did some years ago leading to "moth-balling" of high-cost generation plants that were redundant; or the state industry goes to the other extreme and fails to increase capacity to meet demand, causing huge disruption because there are no alternative suppliers, because of Eskom's monopoly
- Inadequate maintenance. An examination of the 'moth-balled' generation plants is likely to reveal that they were totally neglected, making reactivation impossible, while the records of existing plants most probably will reveal that earlier adequate maintenance would have avoided some of the current problems;
- Waste and Inefficiency in the operation of infrastructure. For example, port facilities in developing countries move cargo from ship to shore at only 40 per cent the speed of the world's most efficient ports; and

- The operation of much state-owned infrastructure is the lack of a sensible relationship between prices and costs. Prices are set politically, with the result that electric power prices of developing countries are set typically at half their cost, and the negative effects of over-usage are ignored. South Africa has for a long time, had a surplus at a cheap price – far cheaper than in other industrial nations. So it made sense for the giant investors, whose plants need massive amounts of electricity, to invest here.

1.2 Problem Statement

During the period November 2007 to January 2008, South Africa's electricity supply came under intense pressure with Eskom having to institute power supply interruption, popularly known as "Load shedding", as a result of inadequate electricity generation capacity to meet the country's demand. The electricity supply crisis hit its bottom low on the 24th January 2008 when Eskom declared a "force majeure". Depleted coal stockpiles, high levels of planned and unplanned maintenance in late 2007 and an inadequate reserve margin conspired to create a situation of inadequate electricity capacity available to meet the demand. Load shedding is a last resort measure to prevent a collapse of the national electricity supply system after taking a number of interventions to reduce the demand in a system emergency situation.

In 1998 the Energy White Paper recommended that the country's electricity generating capacity should be increased to facilitate South Africa's economic growth. This was based on the projected electricity demand at the time which forecasted that there will be excess demand if no decision is made on the supply-side investment.

Eskom has, for the past couple of months (in 2012), run campaigns that encourage consumers to save electricity due to a very tight system. These campaigns were

encouraging for a 10% saving. Power buy-option with large customers was also explored with big customers like BHP Billiton and Xstrata targeted for these reductions. This problem indicates that capacity shortage is still a serious threat to the economy as load shedding is still looming. Eskom has, on the other hand, explored other options to prevent the electricity crisis (load shedding of 2008) to repeat itself by running all its stations including Open Gas Cycle Turbines (OCGT's) which is an expensive source. With the current constraints, it is clear that Eskom does not have an immediate solution on its own but would need other role players, The Independent Power Producers to come in here to remedy the situation.

This study aims to assess the impact of independent power producers' participation in the South African electricity sector.

1.3 Purpose of the study

The purpose of this paper is to assess the impact of the Independent Power Producers' participation in the electricity supply industry (ESI) in South Africa.

1.4 Objectives of the study

The objectives of this study are to do an assessment of the following:

- How Independent Power Producers (IPPs) can assist the country and Eskom to reduce the problem of electricity shortage in South Africa,
- Electricity sector reform in South Africa, and
- Facilitating greater private sector (IPPs) participation

1.5 Scope of work

The following tasks constitute the scope of work for this research project:

- The causes of the electricity crisis,
- Structural sector reform,
- Barriers to IPP's entry into the sector,

- Eskom's power purchase programmes, and
- Multi-site base-load IPP programme

1.6 Theoretical Framework

In the development of this report, a number of theories were considered and they are as follows:

- Eskom's Corporate plan: 2011 – 2016
- Department of Energy's Integrated Resource Plan (IRP) 2010
- Power System Economics, Designing Markets for electricity
- Power Systems Restructuring, Engineering and Economics
- Theories of Economic development
- Theories of demand and supply

On data collection, Eskom's national control systems reports which measures the frequency (50Hz) by balancing generation of electricity and its demand, was used to collect data that indicates the need for additional generation capacity from the IPPs due to demand exceeding supply. Eskom's annual reports were also considered for capacity generated per annum and sales thereof. Data regarding the IPPs introduction was collected from Department of Energy and National Energy Regulator of South Africa.

1.7 Report Structure/ Study Layout

The layout and the structure of the structure of the report are as follows:

- Chapter 1: Introduction
- Chapter 2: Electricity in South Africa and experiences of other countries
- Chapter 3: Focus area
- Chapter 4: Data Analysis, Interpretation and Discussion
- Chapter 5: Conclusion and Recommendations
- References

1.8 Scope of limitation

The study has a limitation and this was to keep the study within specific focus topics to realise or achieve the set objectives and achieve the aim of the study. This study is limited to the electricity supply industry (ESI) in the South African context. The international experience was studied to merely provide a background. Further, it was limited to the role of the Independent Power Producers in the electricity shortage to salvage the situation. Eskom as a state owned company holding monopolistic position in the ESI in South Africa and the role of government.

1.9 Conclusion

This chapter has highlighted the causes of the electricity shortage that led to the "load shedding". It has also concluded that the problem of electricity shortage is still looming in South Africa and this will have its negative impact on the country's economic growth. This is attributed to the growing demand for electricity in the country; while on the other hand, this increase was not catered for by expanding the electricity generation capacity. Several studies that were conducted indicated the economic growth is linked to adequate electricity availability.

2. Chapter 2: Electricity in South Africa and Experiences in other countries

2.1 Introduction and Background

The 2008 saw unprecedented levels of load shedding nationally, which was brought about by a shortage of generation supply capacity and is a last resort measure to prevent a collapse of the national electricity supply system. Load shedding is the last of a number of interventions taken to reduce demand in a system emergency situation. In 2012, the demand for electricity has been growing but the increase in the provision for supply is not growing. If no action is taken to ameliorate the situation, especially during times of planned high level maintenance, the risk of load shedding will remain high. Immediate interventions are needed to minimise the risk of load shedding until the new peaking plant and base-load electricity generating capacity being built, comes on line.

"Returning to Economics 101, and the demand-supply graphs, helps one to put the issue in context"

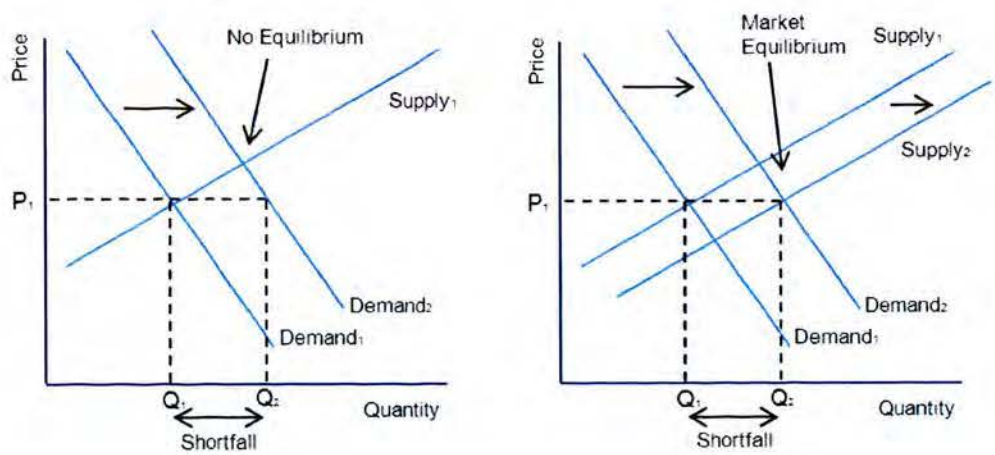

Fig 2: Demand and Supply Curves

The above graphs depicts movement of both the demand and the supply curve showing that in this particular case, since the price is regulated, focus is on the demand and supply of electricity and not the price. Demand growth has outstripped growth in supply, but because prices are regulated they cannot rise to 'clear the market' (no equilibrium). Rising prices would have dampened demand, and given correct signals to suppliers to build additional capacity. Theoretically this would have resulted in a market solution, with prices reflecting the true cost of producing electricity (optimal resource allocation). A supply shift (Eskom's capital expansion programme) can bring the system back in line.

Demand has been growing (D1 to D2) as the economy grew. Much investment in supply capacity has also occurred (S1 to S2) – increasing economies of scale. Prices have been regulated however, and thus the market has rarely cleared correctly. In the long-term prices have come down in real terms. Initially, at prevailing prices, there was massive excess supply (QS1 minus QD1). Excess supply would have been reduced as demand grew (D2) – but supply was increased (S2). Excess remained (QS2-QD2). By D4 equilibrium was reached, once prices had fallen (aided by large cheap contracts), and new stations had stopped being built (after S4 – there were no additions). Now, D5, there is shortage (QD5 – QS3) – and, at current prices, Eskom would optimally produce even less, at QS.

Eskom's business is one of supply and demand. Its customers demand power every time they switch on an electrical appliance or light a switch and Eskom supplies the power to meet that demand. For 24 hours every day of the year, Eskom's system controllers must supply the national grid with enough electricity to meet the demand. Power users, such as steel producers, aluminium smelters, mines, cities and

agriculture are all sources of load to the system controllers. On a typical weekday, load starts increasing from 02:00 am climbing steadily as people wake up; get ready for work and open shops, offices and factories.

Between 06:00 and 09:00 am, the system experiences its morning peak load when demand can get close to the available capacity. The load eases off until the afternoon peak which usually starts around 16:00 when people get home and entertainment centres come to life. In summer, air-conditioners and in winter electric heaters form a heavy load and all the time the ubiquitous geyser silently gobbles up electricity keeping its load of water hot unless it has an insulating blanket, the geyser uses more electricity in winter than in summer because it loses heat through its metal walls.

Winter is also the time when the morning and evening peaks get higher every year bringing the demand closer and closer to the supply. Usually the supply is adequate and the peak passes without incident. Occasionally, a huge turbo- generator in a power station develops a fault and "trips"- shuts down, no longer contributing to the supply. When this happens, load exceeds supply and the load has to be reduced to a point where the available capacity can handle it, otherwise the whole system could be affected. This is when the system controllers "shed some load" by switching off the supply to various customers for a short while.

Eskom has contracts with some large power users that allow it to do this. These customers can cope with being switched off as long as the interruption does not exceed specified periods say 30 or 60 minutes. That is usually enough time for total demand to ease a little and for the problem to pass. If not, Eskom must switch off other large user/s, including cities, and restore power to the first customer who was

load shed. Certain principles are followed when implementing this last resort resolution. It is done on a rotational basis limiting, it to two hours per area and where possible, Eskom tried to avoid load shedding in areas where there are critical and sensitive services like hospitals, economic hubs like shopping centres, strategic product areas and high security areas.

2.2 South Africa's electricity supply

2.2.1 South African Electricity Supply Value Chain

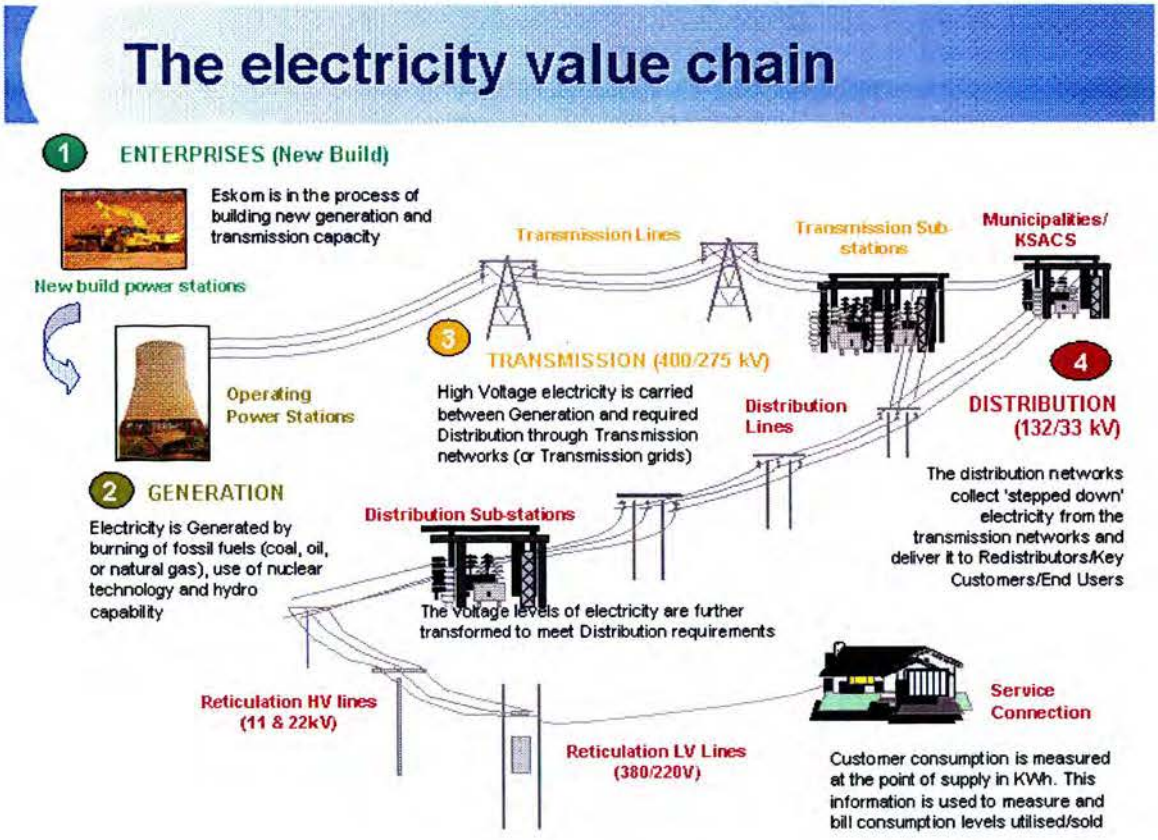

Figure 3

Source: Eskom's website

The above diagram depicts South African electricity value chain from the building of the power stations until it reaches the final users. It also depicts how the voltage levels are stepped down at different centres or business units from high to low voltage levels to accommodate different customer groupings.

2.2.2 Eskom's summary of capital expansion programme

While the cost of electricity in South Africa is among the world's lowest, the country's strong economic growth, rapid industrialisation and a mass electrification programme by early 2008 led to demand for power outstripping supply. As a result, Eskom has embarked on a massive programme to upgrade and expand the country's electricity infrastructure. These plans include spending a projected R343 billion over five years to fund a new generation of power stations with the first due to come on stream in 2013. Eskom has started work on two coal-fired power stations and on a new conventional nuclear power station as well as previously mothballed stations (Eberhard, 2008a).

Over and above the billions mentioned above, there are various problems associated with Eskom's contingency plan. The coal powered stations takes several years to build and, in addition, the costs of the installation and running of the power station will amount of billions of rand. Furthermore, for coal-fired stations, adequate supplies of coal must be secured. However, by the time these power plants are operational, the population and energy usage would have increased leaving Eskom continually behind in terms of energy provision.

The open cycle gas fired turbines (OCGT's), which takes much shorter period to install, are extremely expensive to operate and they are operating at their limit as

well as limitations by the NERSA rules (NERSA rule changes document) which states that OCGT's will only be operated at peak or in cases of emergency. Eskom has to provide reports on their usage on a quarterly basis which must prove that they were indeed needed and the costs associated with each usage. As such, OCGT's cannot fully solve the current energy crisis as they are supposed to run during peak demand periods and not supply energy throughout the day. (Eberhard, 2008a)

Table 1: The generation capacity and reserve margin outlook according to EE Publishers

Year	Forecast demand (MW)	New Plant (MW/yr.)	Year-end capacity (MW)	Reserve Margin (%)	Ideal capacity (15% margin) (MW)	Shortfall (MW)
2011	43238	181	44536	3.00%	49724	5188
2012	44665	1003	45539	2.00%	51365	5826
2013	46430	2422	47961	3.30%	53395	5433
2014	48624	2363	50324	3.50%	55918	5594

Source: EE News

According to EE Publishers (in the table above), if one projects a fixed demand increase of 4% per annum going forward, plus the planned generation capacity build to 2014, one gets the figures in the table. Furthermore, EE Publishers states that despite everything that Eskom can do, it will not be able to generate enough electricity to meet South Africa's needs. By 2014, the reserve margin will be significantly lower than it currently is despite Eskom's massive capital expenditure programme. The above table emphasises that a permanent solution is urgently needed and decisions on other role players needs to be taken urgently.

Table 2: Eskom's aspirational plan

Year	MYPD Moderate Demand (Energy Sent out)MW	Total System Capacity (MW)	Reserve Margin %
2011	40231	47310	17.60%
2012	41355	48332	16.87%
2013	42832	50459	17.81%
2014	44776	55332	19.09%
2015	47139	55348	17.41%

Source: MYPD 2 Price application

During the Multi-Year Price Determination (MYPD) 2 revenue requirement application, Eskom submitted the above table to NERSA as its aspiration to meet the country's electricity demand. The "Total System Capacity" assumes total generation capacity by Eskom. This table further indicates the increase in the reserve margin by Eskom showing that the quantum of the reserve margin is increasing and that it is above the 15% margin as opposed to what EE Publishers has published.

2.3 The South African Electricity Sector objectives

The White Paper of 1998 spelt out the South African electricity sector objectives and in drafting of the Electricity Pricing Policy (EPP), Department of Energy, was guided by these objectives. The set objectives (as per the White Paper on 1998) are as follows:

- Improved social equity, by addressing the requirements of the low income;
- Enhanced efficiency and competitiveness to provide low-cost and high quality inputs to all sectors;
- Environmentally sustainable short and long-term usage of our natural resources;
- The right of choice of electricity supplier;
- Competition in especially the generation sector;

- Open non-discriminatory access to the transmission system; and
- Private sector participation in the industry.
- Ensuring that electrification targets are met;
- The provision of low-cost electricity; better price equality; financial viability;
- Improved quality of service and supply (including security of supply);
- Proper co-ordination of operation and investments and the attraction and the retention of a competent work force.

Regional Electricity Distributors (REDs) were established with the intention that separate entities for generation and transmission would be formed. These REDs were approved but only RED 1 (which formed part of Cape Town Eskom's Distribution business and Municipalities) was established, though it never really functioned as planned until these REDs were disbanded in 2011.

2.4 Government's objectives through the Electricity Supply Industry

The Electricity Supply Industry (ESI) helped government deliver in some of key social and economic domains e. g the Reconstruction and Development Programme (RDP)'s goals of achieving 2.5 million homes have been met and exceeded. Also, ESI has delivered low prices, which assisted the competitiveness of our industry, particularly in the energy-intensive sectors. With the need to move towards cost reflective tariffs as spelt out by section 2.3 of the Electricity Pricing Policy which states that "All tariffs should become cost-reflective subject to specific cross-subsidies", this favourable position is likely to turn around as higher increases are now needed due to revenue requirements by Eskom to meet the need for capital expansion programme.

National Government is a custodian of huge assets in the all sectors of the economy which are an important instrument in pursuing future social and economic goals such as:

- Achieving universal access to electricity;
- Promoting integrated rural development with the aid of appropriate electricity provision;
- Promoting industrial development through competitive electricity prices;

- Reducing government debt and meeting other public purpose objectives through unlocking value in state assets;
- Widening the participation and ownership of black South Africans in the economy through well-designed economic empowerment initiatives around state assets;
- Attracting foreign direct investment and
- Ensuring security of supply

The Electricity Supply Industry has a role to play in assisting government to achieve these objectives, but the question that arises is: Is the current ESI structure suitable to meet these objectives? The "*universal access to electricity and rural development*" objectives could be arguable in any electricity supply industry structure as electrification is essentially a question of funding and distribution and not the generation side of the business. It can be argued that an efficient ESI for a sustainable electrification effort and options to unlock economic values from the industry to fund electrification, can be explored.

The security of supply objective can be a little complex. Monopoly planned investments often lead to over-investment and this has been the case with Eskom in the past. Market driven investments should lead to optimal investment efficiencies. However, the ability of commodity markets tend to exhibit investment cycles of over and under investment, which are evident in commodity price cycles. In the case of electricity, the situation could even be worse because it cannot be stored or stockpiled. Under-investment would result in price volatility as well as the risk of brown or black-outs in extreme cases. The Integrated Resource Plan (IRP) 2010 was approved by the South African Cabinet. It should provide early warning signals to government about the risks of under-investment and government can then intervene in the market to ensure capacity enhancements.

2.5 Electricity Supply Performance

Eskom has, in the beginning of 2012, escalated its campaigns encouraging electricity users to save by emphasising that the system is very tight and that it is fast approaching the period of load shedding if adequate capacity is not saved. The 2008 history has not repeated itself by 2012 as Eskom has been able to balance supply

and demand, though it has been a challenge due to serious constraints. South Africa's power system will continue to be very tight in the next few years but 2013 and 2014 are the most critical years.

Most of Eskom's power stations are in their mid-life and require increased maintenance; however, this maintenance has been constantly shifted in order to ensure that demand is met. When maintenance is undertaken, there is a need for a planned outage by switching off certain units but due to the tight system, this has not happened. This is the strategy that Eskom has adopted but shifting maintenance outages can no longer be sustained.

Summer is Eskom's season of maintenance. The system is being run at higher risk levels of to tackle backlogs and keep up with maintenance while at the same time meeting demand. Eskom is in the media a lot these days, this is clearly an indication that the problem of capacity shortage is still looming in South Africa. Supply is also constrained by the unreliability of some power stations and power imports. When this happens, Eskom's merit order goes on until the use of OCGT's and this has been the case so as to balance demand and supply.

2.6 NERSA's Enquiry on capacity shortage

On 30 January 2008, the National Energy Regulator of South Africa (NERSA), prompted by the national electricity supply shortage and the subsequent load shedding, decided to commission an inquiry in terms of the Electricity Regulation Act of 2006. The scope of the inquiry covered the period from 01 November 2007 to 31 January 2008.

The purpose of the inquiry was to inform the Energy Regulator of the reasons for the electricity supply shortage resulting in the national load shedding and recommend measures to be adopted in mitigation against the electricity supply shortage and to reduce the adverse impact thereof.

2.6.1 The following are the main findings and conclusions of the report:

- High unplanned maintenance and load losses combined with the usual high planned maintenance of generating units during the period resulted in reduced generating capacity being available from 1 November 2007 to 31

January 2008. Poor coal quality, wet coal and low stockpile levels contributed to the unplanned generation plant outages and load losses in the period.

- In previous load forecasts, Eskom had anticipated the current growth rate. However, the implementation of measures to provide for the growth has been inadequate and slow. In particular, there have been delays in returning the mothballed generation plant to service and the implementation of energy efficiency and demand management initiatives remain behind target. Eskom's new build programme is experiencing delays.

- Inadequate primary energy procurement and power station production planning impacted on coal stockpile levels in the period. Coal stockpiles were allowed to decline to unacceptably low levels and there was a reluctance to obtain supplementary coal due to its high cost and its impact on Eskom's financial position.

- Eskom was correct in declaring a force majeure on 24 January 2008. Prior to load shedding, Eskom did use other emergency options such as demand market participation (DMP) and interruptible loads extensively prior to load shedding.

2.6.2 The Energy Regulator made the following key policy recommendations:

- The Government's national electricity emergency programme (GNEEP), including the power conservation programme (PCP), should be coordinated and led by a centralised high-level government unit with authority to take action.

- The procurement of new private generation capacity, independent power producers (IPPs) and co-generation should be managed and coordinated centrally by a professional entity independent from Eskom.

- There is a need for a national strategy by Government for the acquisition and management of coal to ensure security of supply.

- National Government should consider formulating a policy that will balance Eskom's commercial decisions and the national security of electricity supply in order to avoid national crises.
- The role of Eskom in the Government's national electricity emergency programme should be clarified, considering that Eskom has to focus, among others, on returning the system to normality and on its new generation build programme.

2.6.3 The Energy Regulator recommended further investigation in the following areas:

- Primary energy management and in particular coal management in Eskom
- The availability, adequacy and optimum utilisation of Eskom's generation plants in emergency and in view of the mid-life of these plants.

2.7 Recovery from Load Shedding days

Earlier in this report, it was mentioned that history of 2008 has never repeated itself until 2012, due to efforts by Eskom to "keep the lights on" by avoiding load shedding. The graph below indicates how this was realised:

Table 3: Eskom's recovery from 2008

Source: Eskom state of the system update- May presentation to NERSA

The table above puts into perspective the actions taken from 2008 load shedding recovery to improving the system capabilities. On the supply side, new capacity has been added on line and new PPA's has been signed by Eskom with the Municipal generators as well as the IPPs. On Primary Energy sources, especially on coal, stockpile days have increased from 12 days to just over 40 days and an improvement on diesel storage facility. Demand Side Management (DSM) activities have been improved and verified savings have been realised of about 1634 MW since 2008.

The Load Management protocol, National Regulator Standard (NRS) 048, has been approved and stakeholder engagement by means of communication has also been stepped up. Power alert campaigns were increased and, in conjunction with the Department of Public Enterprise (DPE), a campaign called 49million was launched. The name 49m is equated to South African population which translates into: "*that the entire South African population has a role to play*" in reducing the demand

2.8 Eskom's Generation Performance

Eskom's Generation Division forms the first link in the electricity supply chain. The Division currently maintains and operates 26 power stations throughout South Africa with an installed capacity of 43 037 MW and they are 13 coal-fired power stations; 4 gas/liquid fuel turbine stations; 6 hydro-electric stations; 2 pumped-storage stations and 1 wind energy station. Its purpose is: "*To provide sustainable electricity solutions to grow the economy and improve the quality of life of people in South Africa and in the region*" (Eskom Generation MYPD 2 application script)

Due to the delayed start to the capacity expansion programme and the resulting inadequate reserve margin, Eskom's ageing plants are currently operated at high load factors. This has some consequences, such as increased stress on the plant and accelerated wear and tear, which increase the risk of unreliability. In addition, given the limited ability of the linked mines to provide sufficient coal to operate the power stations at these high load factors, it requires that supplementary coal from a

variety of smaller mines be transported by road to the power stations. The varying quality of the supplemental coal further increases wear and tear of the plant.

In order to mitigate these effects, maintenance programmes have been adapted commensurately. This however results in cost increases, in addition to the steep global increases in the price of power plant components and maintenance activities which have been experienced over the last couple of years. Where feasible, delivered coal quality is being improved through procurement and through processes of beneficiation or screening-out of below-standard material, which similarly results in cost increases. In addition, due to both operational as well as mineral resource considerations, the linked mines are finding that they cannot sustain coal production at levels in excess of the contractual volumes, which they have been doing as the power station load factors have been increasing.

Reduced coal production from these mines has had to be replaced by increasing the procurement from the smaller mines at significantly higher cost at source, further increased by the requirement for road transport from these sources. Existing linked mines have furthermore experienced significant input cost increases due to global increases in the prices of mining equipment and other input costs. This does not only result in increased cost per tonne on the "cost-plus" contracts but due to indexation formulas cost increases is also experienced on the "fixed base, indexed" contracts.

2.9 Introduction of Independent Power Producers

Excess capacity is long-past, and South Africa's current electricity generation environment has an extremely tight supply-demand balance. The return-to-service projects form just one element of a massive investment programme, valued in the region of R500-billion, being undertaken by Eskom to meet rising demand. As far back as the 1998 Energy White Paper, government demonstrated an awareness of the need to bring additional electricity generation capacity on stream. However, the required investment in new capacity was slow in getting off the ground and this, together with several other factors, contributed, in 2008, to the unfolding of an electricity supply emergency that saw widespread blackouts and load-shedding.

The immediate threat of the crisis has since been alleviated – in part owing to measures put in place by Eskom and partly as a result of the global economic slowdown that saw demand for electricity in South Africa moderating during 2009. However, the security of electricity supply in South Africa remains tenuous, and some of the issues that contributed to the crisis in 2008 have not been resolved. In particular the ultimate cause of the 2008 crisis – policy uncertainty and planning confusion – remains clearly evident in the electricity sector today. Government vacillated for years over the introduction of independent power producers (IPPs) to the South African market, considering options ranging from the sale of a portion of Eskom's generation assets to a private operator through to requiring IPPs to participate in the introduction of new generation capacity. For a period during government's uncertainty, Eskom was prohibited from building new generation capacity and valuable time was lost in securing the country's electricity supply.

While government has since decided on a model for IPP participation and has authorised Eskom to proceed with its investment plans, uncertainty and confusion remain. Various programmes have been initiated to introduce IPP power to the grid, but significant IPP power has yet to become available, owing to a failure to finalise a standard power purchase agreement (PPA) and as a result of on-going questions regarding access to the grid.

Nevertheless, the vision for the generation sector is one in which Eskom will remain dominant, although its pre-eminence will be somewhat moderated through a long-term objective of having 30% of the country's power produced by independent operators. In the near term, the target is to have 10% of the country's power generated by IPPs within three years. It is expected that South Africa will need to add over 50 000 MW of new generation capacity to the supply system by 2025, based on an economic growth trajectory of 4,5% a year. In an attempt to streamline and clarify the planning for this new capacity, government has produced an integrated resource plan (IRP).

The inaugural version of the plan, known as IRP1, was approved by Cabinet in late 2009, while a draft second version of the plan, known as IRP2010, was released in October 2010, offering a 20-year outline of the new generation capacity to be

brought on stream. Within the draft IRP2010 document, various scenarios and options are presented, with government's preferred option being the so-called 'Balanced Revised Scenario', which will require an investment of R860-billion over the 20-year period.

Following the release of the draft IRP2010, a public participation process (through invitation to submit written comments and public hearings processes) was followed allowing all stakeholders to submit their concerns or support for the proposal. Following this public participation process, IRP 2010 was approved and from the plan is it clear that it is tied to a medium-term risk mitigation (MTRM) strategy aimed at dealing with the tight reserve margin period that will prevail until 2016. It takes cognisance of a major infrastructure investment programme currently being undertaken by Eskom as well as the potential for future developments. This is in line with Department of Energy's objectives and in support of ensuring security of supply"

2.10 IPP Participation in the South African ESI

The 2009 elections manifesto of the African National Congress directed that we should work towards an equitable, sustainable and inclusive growth path that brings decent work and sustainable livelihoods, education, health safe and secure communities and rural development to all corners of this land. This remains the vision and the context within which the government seeks to bring about fundamental social change.

In the main, ANC led government, and the Department of Energy in particular, responds to the injunction from the ruling party, the ANC to "Ensure security of supply of energy resources, and pursue an energy mix that includes clean and renewable sources to meet the demands of our fast growing economy, without compromising our commitment to sustainable development" (2012 Budget Vote Speech, Ms Dipuo Peters, MP, Minister of Energy)

In 2009, Ms. Dipuo Peters, Minister of Energy, under section 35(4) of the Electricity Regulation Act, 2006 (Act No 4 of 2006), introduced the Electricity Regulations on New Generation Capacity (Government No. R.721 Notice No. 32378). The objectives of the regulations are as follows:

- the regulation of entry by a buyer and an IPP into a power purchase agreement;
- the facilitation of fair treatment and the non-discrimination between IPP generators and the buyer;
- the facilitation of the full recovery by the buyer of all costs incurred by it under or in connection with the power purchase agreement and an appropriate return based on the risks assumed by the buyer thereunder and, for this purpose, to ensure the transparency and cost reflectivity in the determination of electricity tariffs;
- the establishment of rules and guidelines that are applicable in the undertaking of an IPP bid programme and the procurement of an IPP for purposes of new generation capacity;
- the provision of a framework for the reimbursement by the regulator, of costs incurred by the buyer and the system operator in the power purchase agreement; and
- The regulation of the framework of approving the IPP bid programme, the procurement process, the REFIT programme, and the relevant agreements to be concluded.

Furthermore, Section 8 of these regulations pronounced that The Regulator shall prepare and pass rules for purposes of cost recovery by the system operator and the buyer. The regulations were followed by the NERSA's approval of the Regulatory Rules on Power Purchase Cost Recovery normally referred to as ***"Cost Recovery Mechanism"***. These rules started to create "appetite" amongst IPPs. Previously, the IPPs saw a lack of regulatory mechanisms that ensured recovery of costs as a barrier to entry and the approval of these rules somehow gave comfort and confidence to the IPPs.

During the NERSA's public participation process (public hearings held on the 22 January 2010 at Gallagher Estate, Midrand, Johannesburg) on Eskom's MYPD 2 applications, Mr Doug Kuni – Managing Director of South African Independent Power Producers Association (SAIPPA) made a presentation to the Energy Regulator and with regards to the IPPs and he raised the following points:

- "IPPs saw opportunities and have been queuing to get into SA market.
- Low tariffs (unrealistic) and regulatory environment have kept them out.
- Eskom control of the market has dampened appetite & frustrated IPPs.
- If structure does not change, IPPs will be cautious to engage SA" (SAIPPA) presentation on Eskom's Multi Year Price Determination (MYPD) 2 NERSA Public Hearings, Fri 22 Jan 2010)

The questions that comes up at this stage are (i) does the structure of the ESI allow for IPPs to take part in the sector; and (ii) Are the prices at the levels that can allow for entrants.

2.11 Barriers to IPPs entrance

It is clear that with a shortage of capacity (electricity) in South Africa to meet the demand, an immediate feasible solution is the introduction of the IPPs to come with the shortfall. However, from Mr Doug Kuni's comments at the NERSA public hearings, there are still barriers preventing the entrants.

2.12 Policy Barriers

Department of Energy has flexed its muscle on issues of policy to promote entrance of the IPPs in the sector. In August 2009, it issued regulations on new generation capacity that aims to provide a regulatory framework for the purchase of power from IPPs by a buyer. Further policy developments followed, the Integrated Resource Plan (IRP) 1 which was the inaugural integrated plan with an aim to serve as a capital project blue-print for the country. This was followed by an improved IRP 2010 which is now a guiding document for the additional generation capacity. This IRP made provision for the establishment of the Independent System Market Operator (ISMO) which translates into the restructuring of Eskom.

It can be interpreted that Government's aim of the ISMO is to ensure a stable critical step towards ensuring a stable and effective electricity supply system for the country. The load shedding incidents of 2008, demonstrates how critical the performance of the electricity sector is for the country's economic health. This performance depends on the long term processes which facilitate investment on new generation capacity.

Power sector investments are massive investment by anyone's scale. The World Bank's Africa Infrastructure Country Diagnostic report concluded that sub-Saharan African needs to spend US$42.6 billion a year on capital improvement, operations and maintenance for all infrastructure sectors, including ICT, irrigation, transport, water and sanitation. (World Bank. September 2008)

2.13 Economic Barriers

One critical aspect / issue that must be considered with regard to IPP provision of electricity is the tariff price in terms of a Power Purchase Agreement (PPA) to recover its full costs of operations and a fair margin of return. The Electricity Regulations Act (ERA) makes provision for this recovery of costs but clearly states that "An efficient licensee will recover its full costs of operations plus a fair margin of return". However, the ERA does not define efficient and this can be a challenge. NERSA, in its Regulatory Rules for Power Purchase Cost Recovery or Cost Recovery Mechanism, states that prudency tests will be conducted but as to how this prudency is conducted, the mechanism is quite about it.

2.14 Institutional Barriers

The current electricity structure, which is a monopoly, suggests that Eskom is reluctant to share the economic benefits of power generation with the IPPs. This has been the case with other role players accusing Eskom of closing the entrants and it has been accused of intimidation so that the introduction of IPPs will increase the price burden on consumers.

2.15 India's Electricity Market Context

India is one of the largest consumers of energy, relying on coal as the primary energy source for over half of its total energy needs. Thermal power plants produce more than three quarters of India's electricity taking advantage of India's position as the third largest producer of coal in the world. The electricity sector has experienced capacity shortfalls, poor reliability and quality of electricity for example, voltage fluctuation, and frequent blackouts. Industry cited electricity supply as a major impediment to economic growth. Despite reforms introducing private sector

participation, India's electricity sector has remained dominated by the state since India independence in 1947.

The Electricity Supply Act of 1948 integrated smaller fragmented utilities into 19 State Electricity Boards (SEB). The SEBs remained dominant institutions within India's electricity industry controlling over half of the electricity supply and the major role in distribution. The SEBs falls under the jurisdiction of individual state governments.

This country's federal system creates an institutional environment of shared authority over power projects. The political, institutional and economic context for private investors varies substantially across states which allows for partially controlled conclusions when comparing outcomes. As a result of not being able to address the country-wide shortage of electricity supply through state and federal deficit, federal state reforms aim at minimizing the role of cash-strapped and inefficient SEBs and empowering regulators in the country. States were given latitude to pursue their own reform plans. Some states privatized distribution, other unbundled their SEBs and a few opted against structural reform keeping the SEBs intact and reforming internally.

The regulatory commissions have primary responsibility for setting retail electricity tariffs and approving tariffs between IPPs and the SEBs. The Indian Constitution lists electricity as a concurrent responsibility of state and federal governments, meaning that the state legislature's authority overlaps with the central government. In the event of a conflict between overlapping state and federal authority, the federal parliament in New Dehli can exercise pre-emptive power. The concurrent listing of electricity in the Constitution has opened the door, but delays the implementation of statutory economic reforms when disagreements occur between the central government and state parliaments[1].

India is regarded as the second largest developing country market and features an evolving legal and regulatory regime created in the early 1990's specifically to promote investment in green-field independent power projects. India's experience with a diverse range of green-field IPPs have produced dramatic variation in investor

[1] Rahul Tongia, Standford- CMU Indian Power Sector Reform Studies (February 2003)

strategies and outcomes ranging from the Dabhol Power Project in Maharanshtra to the modestly successful GVK project in Andhra Pradesh and Paguthan in Gujarat.

Given the political dynamics of the Indian power sector, politicians and state off-takers displayed truly lasting enthusiasm about IPP development, officials have openly and regularly criticised IPPs. To a certain extent, state politicians, off-takers and regulators have attempted to gain and have often achieved further concessions from IPPs in response to perceptions of biased or unsustainable original deals. The problems with IPPs most often cited by central and state government officials and off-takers are relatively high construction costs, poor fuel linkage choices, unjustifiably high rates of return and the resultant high wholesale electricity tariffs borne by already cash-strapped state electricity boards.

2.16 India's Macroeconomic Context

India entered the twenty-first century with per-capita income around half that of China and Indonesia, countries that in 1970 were at comparable stages of development with India.[2] This has led many development economists to question the relative success of India's economic growth over several decades. Reform measures adopted since 1991, have improved India's economic picture as legislations has created a variety of openings in specific sectors of the Indian economy. India's economy, however, is still largely closed by international standards. Foreign firms disappointed from the past dealings with India's difficult bureaucracy and high taxes and tariffs have become cautious about entering the market.

Total foreign direct investment (FDI) into India has ranged from $3 to $5 billion over the past several years but this compares to $40-$50 billion per year of FDI in China.[3] One of the important reasons for the low level of foreign direct investment in India (FDI accounted for less than 1 percent of India's gross domestic product in 2002, compared to 4 percent for China is the fear of regulatory capture in important sectors of India's economy. Although India's economy has benefited from trade liberalization, relatively low inflation, increased levels of international trade and foreign investment

[2] World Bank. 2003. India: Sustaining Reform, Reducing Poverty. World Bank Development Policy Review. New Delhi. Oxford University Press

[3] U.S. Department of Energy, Energy Information Agency, India Country Analysis Brief (October 2004)

and an improvement in foreign reserves, the economy also continues to face the challenge of a high budget deficit and poor infrastructure. The World Bank continues to express concern about India's perennially high public sector budget deficit running at approximately 10% of GDP.[4]

Because of its high literacy rate, the economic growth pattern of India is led by the information technology sector. Electricity is one of the two (including telecommunications) key infrastructure inputs for economic growth. Unpredictable state electricity supply, however, has led these growth industries to rely increasingly on captive power generation, thereby obviating the risks associated with the uncertain supply from the state electricity grid. Technology entrepreneurs complain of having to pay large deposits to the local electricity board for uninterrupted power supply for their start-ups.[5]

2.17 Macroeconomic Growth

Economists have expressed on-going concern about its sustainability most vocally during India's fiscal balance of payments crisis in 1991 and again after 1997-1998 when fiscal deficits returned to around 10 percent of Gross Domestic Product (GDP) range and government debt mushroomed. [6] With IPPs presence in the India, the economy experienced real GDP growth ranging from 4% to 8%.[7] . Inflation at the same period was above 8% on average with a peak at over 16 % in 1991 when the balance of payments crisis led to sharp depreciation of the rupee and upward pressure on the price of industrial outputs[8]. While government debt ballooned during the Ninth Plan from 1997-98 to 2001-02, inflation and interest rates began to converge with global trends toward 4% by the end of the period, despite a rise in the

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[4] In 2003-2004, the overall deficit of the general government exceeded 10% of GDP, the primary deficit is 4.25% of GDP and government debt is over 83% of GDP. The overall deficit and debt of the general government in India are greater than during the run up to India's balance of payments crisis in 1991 when the overall deficit was 9.5% and the government debt constituted 62% of GDP. *See* Roubin and Hemming, A balance Sheet Crisis in India (2004)

[5] Writing on the development of the IT sector in India,Nirvikar Singh writes that "of the various infrastructure constraints probably that of electric power is the most fundamental and the most difficult one to tackle." Nirvikar Singh, Information Technology and India's Economic Development (April 2002); Rafiq Dossani and Martin Kenney, Went for Cost, Stayed for Quality?: Moving the back office to India (December 2003)

[6] See Brian Pinto and Farah Zahir, India: Why Fiscal Adjustment Now?, Economic and Political Weekly (2003)

[7] U.S Department of Energy, Energy Information Agency, India Country Analysis Brief (2004)

[8] Tim Callen and Dongkoo Chang, Modelling and Forecasting Inflation in India, IMF Working Paper (September 1999)

fiscal deficit and a significant increase in energy prices. This was due to in large part to the Reserve Bank of India building up and sterilizing reserves designed to guard against exogenous macroeconomic shocks and control inflation[9]

2.18 The Social and Political Context

India has endured a great deal of political volatility at the federal, state and local level and a calculation of political risk must factor into any large-scale foreign investment. The presence of numerous factors in some projects has heightened the political risk normally associated with emerging market infrastructure development. One particular aspect of India's IPP programme that received a great deal of attention is the fast track procedure. There were eleven fast tracked projects at the time, but of these only three successfully achieved commercial operations. IPPs under India's fast track programme were not subject to competitive tender, which often led to charges of public corruption and malfeasance levied by political leaders, NGO's and the vocal Indian press.

A lack of transparency i.e. some IPPs, documents including the PPA's were never made public and the apparent alacrity of the decision making process fuelled further speculation of bribery and corruption.

2.19 Political Forces

Two deeply divisive issues confronted the Indian politics during the era of IPP investment; secularism and the economic crisis. The two major parties attempted, through shifts in their ideology, organization, social base and leadership, to address these issues and thereby prevent instability. The period that saw the opening of the generation sector was one of political instability following the breakdown of the Congress party and Nehruvian consensus which had previously survived in one form or another since India's independence. The 1990s was a decade of confrontation between the major national parties as each struggled to mobilize a social base to gain majority and form a government alone.

[9] Brian Pinto and Farah Zahir, India: Why Fiscal Adjustment Now?, Economic and Political weekly 2003

In this politicised environment, the parties avowed strong positions on economic issues and marshalled their forces along the fault lines, resulting in fragmentation and conflict within the electorate. The second half of the 1990s was a period of greater moderation, which saw the dominant parties attempting to moderate their ideology, broaden their social base and form more stable coalitions. Increasing regionalisation of national politics in India has prevented any one national party from ruling without their support. On the other hand, regional party politicians, despite demanding a share in central governance, must still focus primarily on the regional political arena in order to strengthen their home base[10]. This push and pull between regional political and national energy policy forms an important backdrop to international investment in IPPs

2.20 Entry, Exit and Contract Enforcement

Investors in IPPs preferred to have the ability to enter or exit new or existing projects with a minimum of transaction costs. Business organisations such as the Confederation of Indian Industries (CII) have also argued that excessive regulation of entry and exit forms a key barrier to private investment. Liberalization of merger and acquisition was a hotly debated issue in India, which would effectively remove exit barriers for foreign investors. The Planning Commission Report proposed the elimination of almost all exit barriers and among significant barriers, the commission only recommended against removing the prohibition of local borrowing by foreign investors to fund share purchases.

Another important factor for IPP investors (particularly for foreigners) is contract enforcement. Contract enforcement has proved to be one of the foremost problems cited by foreign investors when IPPs have soured. Moreover, Indian debt recovery and bankruptcy proceedings are viewed as long and drawn-out. The slow pace towards resolution of debt recovery and bankruptcy claims partially explains the failure of stakeholders to reach a settlement. The CII asserts that it is normal for debt recovery proceeding to take more than two years and enforcement can reportedly take over a decade in some cases. Given these inadequacies in the legal regime, it

[10] Sudha Pai, Parties and Political Stability in India: Problems and Prospects, Centre for Political Studies, JNU, New Delhi (2000)

becomes more important for foreign investors and smaller players to use an Indian company with the necessary political clout to achieve results outside of court.

2.21 India's IPP Experience and National Strategy

Shortfalls in India's electricity supply have caused severe constraints in India's economic growth, despite a rapid expansion of power generation from 1300 MW in 1947 to 113 506 MW in 2004[11]. Since 1991, India has turned to private sector participation to address the supply gap. Indian policymakers cited two primary justifications for relying on the private sector to address electricity supply shortages. First, India's power shortage had placed serious constraints on the overall growth of India's economy. When the Indian government began to explore an IPP strategy, industry and transportation accounted for 70% of India's power consumption and officials feared the repercussions of continued power shortages for India's development programme [12].

Secondly, a move away from the state utility model was believed to be necessary to reduce state expenditure, and enormous budget deficits in the energy sector. The ever-increasing demand for electricity had outpaced the growth in public funds required to finance capacity expansion. Indian policymakers have long viewed the poor quality and inefficient pricing of electricity through a cross-subsidy tariff structure as the single greatest deterrent to India's economic growth and development. As a result, Indian legislators at the central and state level made the electricity sector a focal point of economic policy and regulatory reform.

In 1991, the Indian government also issued its mega power project guidelines which provided incentives for qualifying thermal power plants with capacity in excess of 1000MW or hydroelectric power plants with at least 500MW capacity. In addition, the plants had to supply power to more than one state. Under the guidelines, mega power projects were exempt from customs and countervailing duties among other lesser investment incentives.

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[11] OECD India Investment Roundtable, Opportunities and Challenges for Investment in India: Background Paper (October 19, 2004)

[12] Harvard Business School, Enron Development Corporation: The Dhabhol Power Project in Maharashtra, India (A) (HBS Case no. 9-596-099, Mar. 25, 1997

The regulatory arrangements applied to IPPs have also differed considerably, particularly when comparing eight projects approved under the "fast track" programme and the remaining projects pursued according to terms and procedures somewhat less favourable to foreign investors. This included both cost-bid and tariff-bid projects which surprisingly led to considerably lower construction costs compared to projects developed without competitive bidding. Although early reforms focussed on IPPs, private sector power was only a small percentage (roughly 5%) of the total capacity in India. The main supplier of new electricity through the 1990s was the state-owned thermal power company which amassed enough capacity to make it the sixth largest generating company in the world. Despite India's series of reforms and policy intentions, the electricity sector remained heavily dominated by the state.

2.22 Specific Effects of Electricity Capacity Shortage

Electricity shortage of 2008 had its own impact on the industries, employment, relative pricing signals and on household income. Eskom commissioned a study[13] as a result of the amount R343 billion it required fund its capital expansion programme to assess the impact and the following were:

2.23 Industry Specific Effects

- Some industries are more impacted than the others specifically the mining, non-ferrous metal and electricity sector itself;
- Different sectors impact different macro variables like mining and non-ferrous metals impact trade balance and the strength of the Rand. Agriculture affects inflation and has many knock-on effects;
- Services sectors are very integrated with the rest of the economy and have the biggest overall impact on GDP/employment; and
- Non-Ferrous metals has a much smaller impact on the economy than is sometimes suggested

[13] Eskom's study "Summary Economic Impact of R343 billion on the economy"

2.24 What are the impacts on employment for different sectors?

- The impacts are the biggest for the mining and the metals sectors depending on the ability of the service sector to be adaptable, the impact on the largest employing sectors might be far more muted; and
- Some impacts are muted. Some sectors are able to shift to more labour-intensive production techniques whilst the negative impact on certain industries actually benefits other industries like import-competing sectors.

2.25 Which Industries are impacted the most?

- Those industries that cannot shift around production times are affected the most like certain types of manufacturing, mining, chemical and non-ferrous metals sectors; and
- These sectors are also the most energy intensive and the least likely to gain from reducing wastage or non-essential electricity consumption in their production processes.

2.26 What is the relative pricing impact?

- The case in which there is a market solution, yields the least damaging impact from power reduction; that is, prices can rise and firms that use electricity efficiently (profit or value add per megawatt) will pay the higher price, those who don't will reduce consumption; and
- Electricity consumption is price inelastic. Consumers still use electricity irrespective of the quantum of the price increases. This can be attributed to the fact that it is a need rather than a want and considered a major input resource in the economy.

2.27 What is the first choice option?

- Demand Side Management and Efficiency gains needs to kick in at an increased rate. There is a need to conserve electricity and see savings on the customers' bills;

- Large amounts of savings can be derived from the sector, until supply side options start coming on line;
- The country has to adopt the strong and more efficient use of electricity in production which has strong long term benefits to the economy;
- Correct price signals are also necessary for incentives for the customers and in turn the economy

2.28 What household/income categories will be impacted most?

- All income groups are affected by the need for the funding in different forms. The study commissioned by Eskom indicates that the richest are affected mainly through loss of dividends or profits and the poorest through lost employment in specific sectors. One can conclude that because electricity is a major input cost, the middle class would be affected by increases in prices of goods and services and this affects their purchasing power, looking at their net income.

2.29 Conclusion

It is clear that capacity shortage has its consequences on the economy and certainly South Africa had its own fair share of the impact in 2008 during the electricity crises. The problem still continues as there is no enough generation capacity and the system remains very tight. Energy efficiency and demand managements measures to reduce demand are continuing to avoid black-outs. All stakeholders need to put hands together to come up with solutions to the problem, measures needs to be put into place to ensure that enough capacity is available at all times at affordable prices to meet the demand and attract both domestic and foreign investment.

International experience shows that opening the market to other participants to enter the market can proof to be a solution provided that legislation, policies and regulations allows for such entry.

3. Chapter 3: Data Collection

3.1 Introduction

This chapter outlines the methodology undertaken in the project. The data used is from the Integrated Resource Plan (IRP) 2010 issued by the Department of Energy (DoE), phase 1 and 2 of the bidding window for "Potential developers of renewable energy projects under the REFIT programme in South Africa (on- shore wind, solar, biomass, biogas, small hydropower and landfill gas) and potential developers of co-generation projects.

3.2 Legal Background

In 2009, as given powers by the Electricity Regulation Act No. 4 of 2006 (the ACT), the Minister of Energy, under section 35(5) announced new regulations. These regulations are referred to as "Electricity Regulations on New Generation Capacity". These regulations apply to procurement by organs of state in the national sphere of government of all new generation capacity including new generation capacity derived from renewable energy sources; base load, mid-merit and cross border projects.

These regulations give the Minister of Energy the powers to determine the need for new generation capacity as the Minister is responsible for the security of supply. The determination shall include whether the new generation capacity shall be established by Eskom, another state organ or an IPP. If the determination requires that the capacity be established by an IPP, the Minister shall also determine whether an IPP bid programme or a REFIT bid programme shall be followed as well as the identity of the buyer.

3.3 Bid Programme

South Africa has a high level of renewable energy potential, with the target of 10 000 Gigawatt hours (GWh) of renewable energy in 2013. To contribute towards achieving this target and towards the socio-economic and environmentally friendly sustainable growth, a need to stimulate the renewable energy in South African was identified and in 2009, NERSA announced the South African Renewable Energy Feed-in-Tariffs (REFIT) programme phase 1 and 2. It further published Regulatory Guidelines, a draft Power Purchase Agreement (PPA) and Rules on selection criteria for renewable energy projects under REFIT programme.

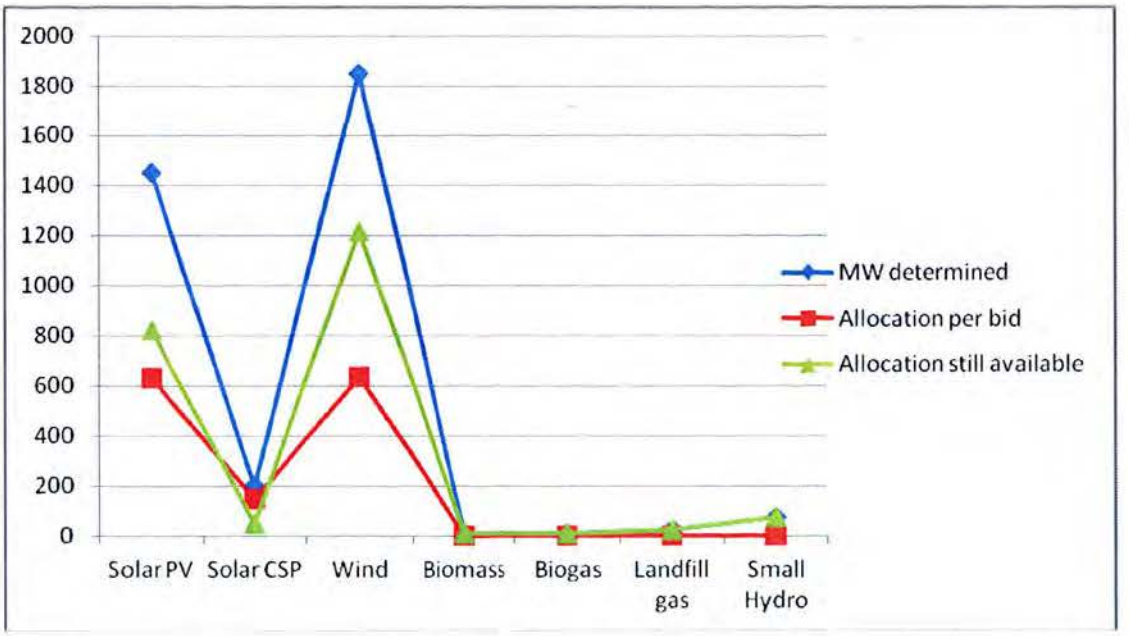
The Minister of Energy, in consultation with NERSA, identified the need for new generation capacity. The determination provided for the procurement of 3 725 Megawatt hours (MW) from independent producers.

On the 3rd August 2011, the procurement documents were released for phase 1 and phase 2 of the bidding window. In phase 1, the total capacity bids received amounted to 2 127.66 MW and from the received number of bids, only 28 bids passed as per the set requirements by DoE.

Outcome of phase 1:

The outcome of the procurement process by DoE, for phase 1 on the all the preferred projects, recommended the following:

Fig: 4: Outcome of DoE bidding window 1



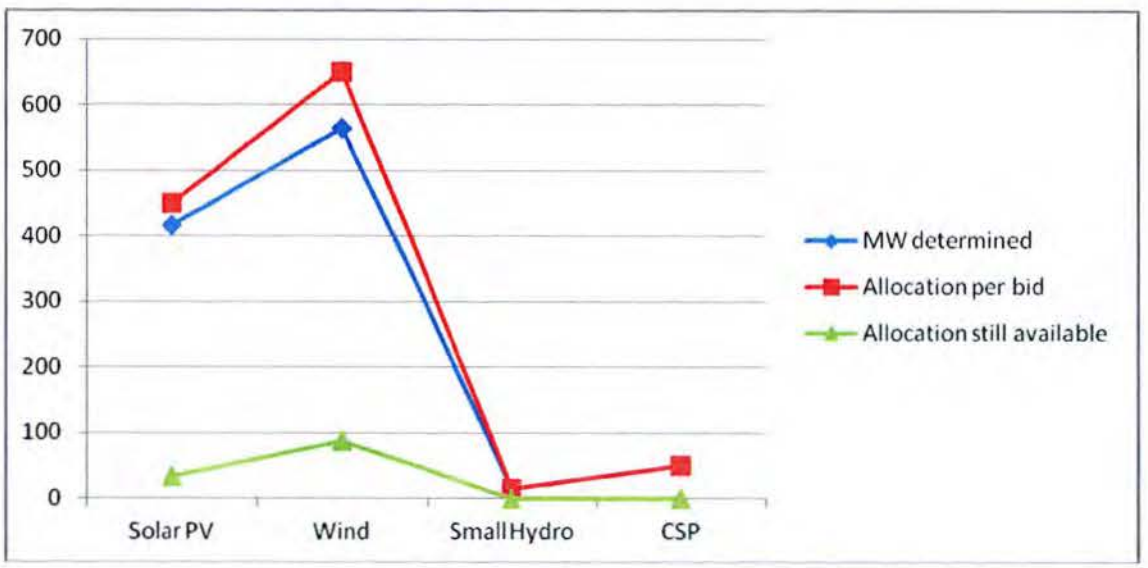
The outcome of phase 1 of the bid process, shows that not all the projects were selected namely Biomass, Biogas, Landfill gas and Small Hydro as a result of not meeting the set requirements. From the selected bids, the required capacity could not be realised and this is shown in the above diagram. The expectation was now to

get the remaining capacity in the next round of the bids. This phase only saw 43.55% (631.53) of the allocated Solar Photovoltaic's {PV's} (1 450 MW); 75% (150) of CSP's (200MW) and 34.3 % (633.99) of allocated wind (1850MW) total allocation of the required capacity being committed or preferred.

From the Solar PV's projects, 18 of the preferred bids, the capacity per individual project ranged from 5.00MW to 75.00 MW in sizes, while on Wind projects, 8 of the preferred bids the minimum capacity (or the range) preferred is 26.19 MW to a maximum of 135.00MW and for Solar CSP only two projects were selected with the minimum being 50MW and the maximum of 100MW. NERSA's Regulatory Rules for Power Purchase Cost Recovery allows for a minimum of 5.00 MW to be considered in the bidding process.

Second phase of the bidding window was subsequently announced, in this round, 19 preferred bidders were announced from the 79 received. The projects have the potential to produce 1 044MW. These projects will assist Eskom to meet the increasing demand of electricity as well as meet government's target of 3 725MW of power procured from the IPPs.

Fid 5: Outcome of DoE bidding window 2



The Second window of the bidding process saw only four types of projects been selected leaving a gap or creating an opportunity for the third window so the set

target can be achieved. The total of selected projects from the two windows amounted to 2 459.52MW

3.4 Localisation of the projects

During the bidding windows, prices and other elements such as empowerment and local content (South African content) played a crucial part in the determination of bid selection. In some of the technologies, the local content target was at around 60 % while on others it was at 40%. Such a certainty in requirements should encourage project developers to relocate their manufacturing capacities to South Africa so that the country can realise the additional objective of growing local employment opportunities and up-scaling skills.

The level of commitment on economic development in window two improved compared to window one. More communities were expected to benefit through employment or shareholding in the projects. Also, some of the preferred bidders would establish trusts that the Department of Energy would monitor very closely.

3.5 Project Specific Contribution and Impact

Table: 4: Solar Photovoltaic Projects

Component	Bid Window 1	Bid Window 2
Price: Fully Indexed (Ave Rand/MWh)	R1 645	R2 758
Total Project Cost (R'million)	R12 048	R21 937
Local Content (R'million)	R5 727	R6 261
Local Content %	47.5%	28.5%
Job Creation: during construction (Headcount)	4 577	10 386
Job Creation: during operations (headcount)	194	221

Table 5: Wind Projects

Component	Bid Window 1	Bid Window 2
Price: Fully Indexed (Ave Rand per MWh)	R897	R1 143
Total Project Cost (R'million)	R10 897	R12 724
Local Content Value (R'million)	R4 001	R2 766
Local Content (%)	36.7%	21.7%
Job Creation: during construction (headcount)	1 579	1 869
Job Creation: during operations	65	128

Table 6: Small Hydro Projects

Component	Bid Window 1	Bid Window 2
Price: Fully Indexed (Ave Rand per MWh)	R1 030	N/A
Total Project Cost (R'million)	R631	N/A
Local Content Value (R'million)	R421	N/A
Local Content (%)	66.7%	N/A
Job Creation: during construction (headcount)	261	N/A
Job Creation: during operations	7	N/A

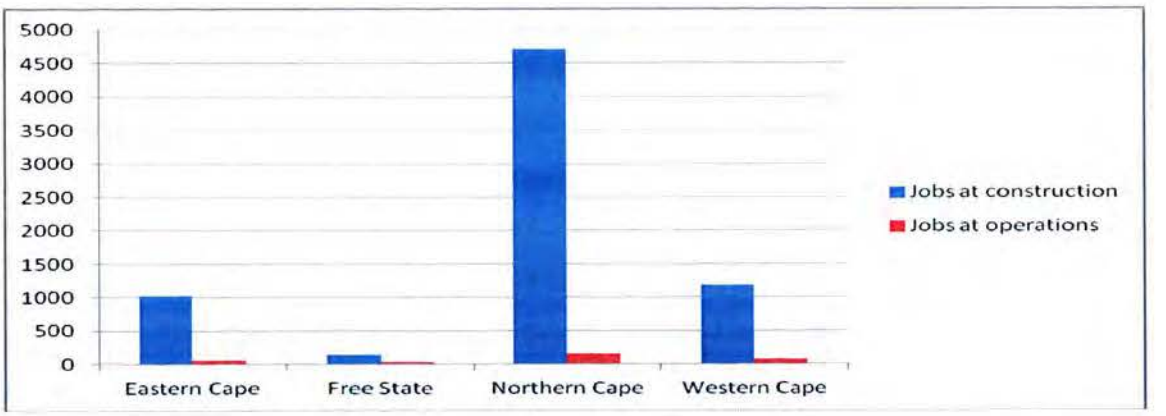
Table 7: Concentrated Solar Power

Component	Bid Window 1	Bid Window 2
Price: Fully Indexed (Ave Rand per MWh)	R2 512	R2 686
Total Project Cost (R'million)	R4 483	R11 365
Local Content Value (R'million)	R1 638	R2 391
Local Content (%)	36.5%	21.0%
Job Creation: during construction (headcount)	662	1 165
Job Creation: during operations	50	70

3.6 Contribution per Province from Preferred Bidders

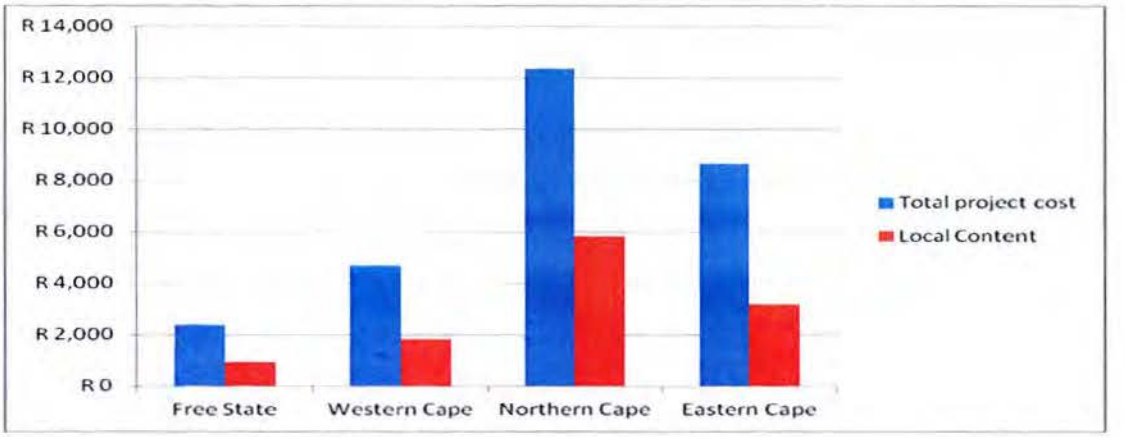
From the nine South African provinces, projects in only four provinces were preferred. These respective provinces will benefit from these projects in terms of job creation, both temporary (during the construction) and permanent as well an injection to the provincial economy by means of investments in these provinces.

Fig 6: Job Creation pre province



During the construction phase of the projects, in the 4 provinces, 7 059 jobs will be created with more of these (at 4 709 jobs) being in the Northern Cape , followed by Western Cape (at 1 184), Eastern Cape at 1 026. The lowest is Free State province at 140. Permanent (at operations) jobs, Northern Cape still leading in job creation with 151 jobs, followed by Western Cape at 81 jobs, Eastern Cape at 64 then Free State at 32 jobs

Fig 7: Investment per province



The above graph depicts local content as part of the total project costs. Local content (which is the revenue that remains in the South African economy) is at average of 42% of the total project costs from the four provinces. Free State province's local content of the total project cost is at 40%, while Western Cape is at 39%, Northern Cape at 47% and lastly Eastern Cape at 37%. The total project costs amount to R28 059 million while the local content is R R11 787 million.

3.7 Conclusion

Department of Energy's mandate is to ensure secured and sustainable provision of energy for socio- economic development. It is also the custodian of the IRP meaning that if there is power crisis, the Minister of Energy will account and give answers. In its attempt to resolve the matter, the department issued two rounds of IPP bid windows inviting the private sector also to take part. This shows government support of private sector participation in the industry at generation level (at this stage).

These projects have a direct impact on the economy as they create jobs as well pump electricity into the grid. The costs associated with the projects are quite high

but their prudency will be tested by the Energy Regulator in its prudency tests when PPA conclusions to minimise price shocks but still maintain the balance between all parties involved.

4. Chapter 4: Data Analysis, Interpretation and Discussion

4.1 Introduction

This chapter focuses on the data analysed and its interpretation. It focuses on the impact the introduction of the IPPs will have on the electricity supply industry and the possible results of this introduction.

4.2 Data Interpretation

Independent Power Producers, as stipulated in the previous chapters, will assist Eskom to meet the country's increasing demand for electricity. However, these are private businesses, unlike Eskom and they are not regulated, but to sell power they will have to enter into Power Purchase Agreements with Eskom. The structure of the industry only allows these IPPs to sell to Eskom or for own use.

The IPPs, as private sector, sets high rate of returns on their assets and as a result that will push electricity prices up. NERSA has set out the rate of return on assets for Eskom at 8.16% during the MYPD 2 determination and some stakeholders have criticised this saying Eskom is a state owned company and it is not exposed to risks, therefore this should be lower to minimise the impact of high prices on the economy and the consumers, while other stakeholders concurs with the Regulator saying the rate is appropriate to stimulate growth.

In its application for the third round of the Multi-Year Price Determination (MYPD 3), Eskom applied for an average of 16% to NERSA for five years starting 01 April 2013 until 31 March 2018 . This average was broken down into 13% for Eskom's revenue requirement and the 3% to accommodate the introduction of the Independent Power Producers. This would see the average of electricity prices increase from 61c/kWh in 2012/13 to 84c/kWh in real terms by 2017/18 for Eskom's needs only. With the introduction of the IPPs, this will increase to 96c/kWh.

The introduction of the IPPs, though it increases the price of electricity significantly, provides the necessary infrastructure to grow the economy by creating jobs (during construction and operations), skills and stimulating the development of the local supplier content. 7 059 jobs will be created as a result of the introduction of the IPPs in the industry and this addresses one of the three economic problems which is

"unemployment". The investments into the economy from the four provinces will in turn improve the lives of the communities in the respective provinces; demand for electricity will be met, creating a bigger appetite from both local and foreign direct investment into the South African economy.

An exercise which this project didn't cover, is the assessment of the impact on the economy as the result of the introduction of the IPPs at the rates at which they are coming versus the impact of not having the IPPs and Eskom not being able to meet the demand for electricity.

4.3 IPP Participation

The South African Government is working towards making the regulatory regime more conducive to increases in private sector participation in the ESI. New power plants were last commissioned many years ago (about 20-30 years ago) and in the early 1990's, the country experienced high reserve margins (higher than 30%) and over a long period of time; it was therefore not necessary to build new power stations for a certain period. From those years to late 2007, early 2008, the reserve margins have declined to unacceptable levels and the capital investment programme as espoused by the IRP will only provide necessary relief after the commissioning of Medupi power station.

This brings up the necessity for IPPs to complement Eskom as mentioned earlier in the discussion. Also, IPP introduction is necessary for a number of reasons which includes the opportunity to benchmark Eskom's performance in the development of new generation capacity, the leveraging of private capital to extend the ability to build more power stations and the transfer of technology, construction and financing risk to the private sector. In addition to the IPPs contributing to security of supply, there is a need to acknowledge that the renewable energy has the potential to contribute immensely to energy supply.

There's a need to leverage the available technologies for solar PV's, wind, biomass and biogas that would contribute significantly in scaling up access to energy for South Africa's people and businesses, while on the flip side of the coin, simultaneously putting the continent on a green and low- carbon development path.

4.4 Is the structure of the industry appropriate?

Earlier on in the discussion, a point regarding "opportunity to benchmark Eskom's performance in the development of new generation capacity" was mentioned. The question is benchmarking Eskom's performance against what? The immediate answer would be benchmarking Eskom's generation performance against IPP renewable's generation performance. Further to this, another question that might arise is, how can one conduct a clear benchmark study if the IPPs will be selling to Eskom?

With the current structure of the ESI, where Eskom is a monopoly, benchmarking on its performance can't necessarily be measured to the "fine point". The IPPs are required to enter into PPAs with Eskom that will see them generating power as determined by the Minister of Energy, then sell that energy to Eskom. Though the procurement programme and the requirements are set out by DoE in consultation with NERSA, there's nothing that forces Eskom to enter into a PPA with these IPPs and this is open to manipulation or Eskom deciding which IPPs to consider or not.

The 3725 MW of IPPs were included in Eskom's MYPD 3 application but this doesn't guarantee that all these will be brought on line in terms of signed PPAs. The MYPD methodology (which is a NERSA document on rules of treatment of Eskom's costs), has an IPP Control Account which captures all the IPP transactions between Eskom and the IPPs. It operates as a "T-account" where revenue allowed by the Energy Regulator is captured, then, as and when purchases are done, they are subtracted from this allowed revenue. At the end of the financial year, the account is closed and the balance is transferred to the Regulatory Clearing Account (RCA) where all cost items by Eskom are recorded and the claw-back rule will apply. If there were no purchases from IPPs, the full amount will be transferred to the RCA. This creates a loop-hole as a result, because Eskom can choose not to sign the PPA knowing that the revenues unspent will be clawed-back to the consumers in the coming years.

The value chain of the industry as depicted in chapter 1 states that Eskom is the monopoly in the industry from Generation to Distribution at the households. Looking

at this value chain, one can conclude that the structure doesn't allow for IPP participation, but there are ways in which a playing field can be levelled by opening up the structure so there can be competition that might reduce the impact on the prices to consumers.

4.5 ESI Structural Change Approach

The Energy Paper of 1998 proposed that the transmission sector would become a separate state-owned entity. In 2001 the South African cabinet instructed government to implement this policy. The objectives of the policy are to increase access to affordable energy services, improve governance, stimulate economic development, manage energy-related environmental impacts and secure energy supplies through diversity.

On the 16th March 2011, the Independent System Market Operator (ISMO) bill was approved by Cabinet for publication for comments by all interested stakeholders. Comments were received and considered and this led to the revised bill being published in August 2011. The purpose of this bill is to provide for the establishment of an Independent System and Market Operator as a state-owned entity which will provide an independent system operation to ensure safe, secure and efficient operation of the integrated power system, trading of electricity at wholesale level.

What the bill attempts to achieve is to disaggregate the current electricity supply industry, pulling out transmission of the electricity from the Eskom, to be operated by ISMO. The idea is to create competition at generation and sell to transmission and then distribution will buy from transmission for sales to final consumers. Countries like United State of America (USA), Norway and United Kingdom (UK), China, Turkey, Thailand and Brazil have the similar model.

The unbundling of the structure at generation level will create competition among the different generators and it will allow for bilateral agreements between the generators. At Transmission and System Operation, the transmission is independent from generation and distribution and this will open access to the transmission lines. It will allow for separation between the network cost and the energy cost and the owner of the transmission line will be one. At distribution, the network will be privately owned by distributors but these distributors will not be allowed to sell electricity. The sales of

electricity will be done by the retailers purchasing electricity from the market and selling it to end users but they do not own the distribution network.

The current market structure, where Eskom dominates generation capacity, and is also a single-buyer, dispatcher and reseller of electricity purchased from other generators, is unsatisfactory. History shows that Eskom has not been able to provide for all of South Africa's power needs, yet at the same time it has not been pro-active enough in contracting power from independent power producers (IPPs) who complain that the playing field is not level: Eskom favours its own generation and has inhibited investment in IPPs.

South Africa can no longer afford this situation. The demand for power now exceeds the ability of Eskom to supply reliably. The growth of the country's economy needs additional investment in power generation. It is already government policy that IPPs should be allowed to enter the market and contribute to supply security through greater diversification in power generation sources.

In order to create a level playing field for Eskom and IPPs, the electricity buying or market function needs to be separated from Eskom. There are a number of associated functions which are closely linked to that of buying or market operation: they include planning (short, medium and long term) for power generation capacity, the procurement of new generation capacity, the contracting and purchase of electricity from generations, system operation including dispatch of electricity and ancillary services (such as back-up and voltage support), and finally the sale of electricity to customers. These are the main motivations for establishing the ISMO. However, the Bill focuses mainly on system operation and on market operation (buying and selling of electricity).

However, there are challenges that will be faced due to the industry restructuring and they are as follows:

- *Financial Sustainability*- Once ISMO is required to enter into long-term PPAs with Eskom generators and IPPs as an independent entity, if it has a limited balance sheet and is not properly capitalised, there will be a requirement for long-term state guarantees to ensure the credibility and viability of the

procurement process from the independent generators. Similarly, Eskom's long term credit rating would depend on solid support for its generator sales to ISMO. The state would need to provide liquidity support to the ISMO in the eventuality of a payment default by a customer.

Furthermore, loss of key customers and large municipalities will cause a significant revenue loss and change in money flows for Eskom's balance sheet, which must be assessed as part of the comprehensive due-diligence prior to the transfer of such customers, as it will affect Eskom's credit ratings. For any re-organisation of Eskom, a detailed implementation plan will have to be presented to Eskom's current creditors for consent before implementation. This may be managed by necessary transfer provisions encapsulated in the legislation, as was done in the Eskom Conversion Act, 13 of 2001;

- *Asset Values*: Transmission has assets that forms part of Eskom's balance sheet. The issue of asset values is very critical in the perspective of lenders and credit agencies and it will require serious scrutiny before the decision is taken;
- *Transfer of employees:* The effect of formation of the ISMO will result in the automatic application of section 197 of the Labour Relations Act of 1995. This transition will need to be managed carefully and after intense consultation with organised labour movements as well affected employees. This process might be very costly and might take too long to conclude;
- *Governance:* In the establishment of ISMO, the issues of governance, more specific to the Public Finance Management Act (1999) and Companies Act (2008), should be adhered to and closely monitored in terms of compliance;

4.6 Conclusion

Independent Power Producers are necessary to ensure that electricity generated is adequate to meet the demand. Though the impact of not having IPP's and Eskom not been able to meet the demand vice versa the rates that the IPP's are coming with was not conducted, their participation will come handy for the industry and the economy given the growing demand and to limited extend the delays on Eskom's construction program. The industry's structural change needs to be tested and all

stakeholders should be involved to ensure that proper exercise is carried out which will consider all avenues that will be affected by the change.

This will be a huge task so in performing this exercise a clear project plan with milestones needs to be developed with regular meetings of all stakeholders to provide feedback on the progress of their milestones. Appropriate recommendation (signed by all partied) should then be presented to the relevant Minister for consideration.

5. Chapter 5: Conclusion and Recommendations

5.1 Introduction

This chapter is the last one and it outlines the conclusion of the study and the recommendations emanating from the research conducted and the discussions.

5.2 Conclusion

Acknowledging the challenges in the previous chapter, there's a question of meeting the electricity demand and establishment of ISMO is a critical step towards ensuring a stable and effective electricity supply system for the country. The load shedding incidents of recent years clearly demonstrated how critical the performance of the electricity sector is for the health of the country's economy. This performance depends on how the well the sector is governed and in particular on the long-term processes which will facilitate the investment in the new generation capacity.

For Eskom to be able to meet the increasing demand for electricity, it is clear that prior to Medupi coming on line, it will be suicidal to the economy of South Africa the if the IPPs are not introduced into the South African electricity industry. Eskom's forecasting shows that should there be no additional capacity, the country will go back to the 2008 load shedding days in 2020.

5.3 Recommendations

It is therefore recommended that with the introduction of the IPPs in the electricity industry, the structure of the supply industry be unbundled and the ISMO be established as a state-owned company to address the country's power sector challenges. The transmission function, its assets as well as employees should be allocated to ISMO to:

- *Ensure access to the grid-* A generation project is only viable if it has access to the grid. The national grid is a natural monopoly. IPPs have no option but to deal with the entity that owns and operates this infrastructure. Eskom's inherent conflict of interest will always compromise its ability to respond to IPP interests; therefore ISMO should take the responsibility of planning, ownership and operation of the transmission system. This will ensure that the one body has integrated responsibility for planning and for delivering the transmission

infrastructure necessary to execute the national generation capacity expansion plan;

- *Strengthen the ISMO balance sheet:* ISMO will enter into PPAs with Eskom and IPPs. The credit worthiness of the ISMO will therefore be a critical factor to lenders who stand behind both Eskom and IPPs. Government guarantees can be provided, but in the long run ISMO will be able to stand on its own. Adding of transmission to ISMO's functions would substantially increase its asset base, thereby improving its credit ratings and reducing its drag on government's balance sheet;
- *Balance approach to supply and demand side solutions:* ISMO as an independent player with no commercial interest in either supply or demand-side solutions, is less likely to demonstrate its bias and more likely to facilitate innovation on the demand side. Transmission system operators and independent system operators, the world over are increasingly realizing the value of demand-side initiatives to achieve security of supply rather than focusing on investment in inflexible and expensive supply side solutions.
- Transparent criteria needs to be developed for allocation of new construction opportunities between the IPPs and Eskom;
- Large customers need to be able to build or contract their own generation capacity, including wheeling across the grid, irrespective of whether it's in the plan or not. They need to notify the ISMO and NERSA of their intentions so that the overall impacts on the grid and system operation can be factored in.

With reference to the international practice, transmission should be transferred to ISMO, so that the frustration that can be caused by Eskom with regards to access to the grid by IPPs or failure to manage the network congestion in a way that is fair to all, can be avoided.

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