Electricity Sector Reforms in Namibia and Mozambique

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During the two last decades the electricity sectors of both developed and developing countries have been going through a process of reforms and restructuring. Evidence from various countries has led to some main agreements of the main steps of reforms and generalized models for the reform process have been worked out. The purpose of this thesis is to discuss the electricity sector reforms of Namibia and Mozambique and analyze how successful the reforms have been from the viewpoint of the extended generic reform model. The electricity sector reforms are founded on the view of generation as potentially competitive activities and distribution and transmission as having natural monopoly characteristics and thus a need to be regulated. The model is a generalized model based on evidence from reforming countries and it has been extended to include the impact of institutional framework and social aspects. Both the Namibian and Mozambican reforms have more or less followed the main steps in the extended generic reform model even though they have taken somewhat different approaches. The countries have considered the social aspects in their reform processes and it is probably the case that the institutional situations in both countries have influenced and slowed down the reforms.
SAMMANFATTNING

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<tr>
<td>ANEEL</td>
<td>Electricity Regulatory Agency, Brazil</td>
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<td>CNELEC</td>
<td>National Electricity Council, Mozambique</td>
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<td>DNE</td>
<td>National Directorate of Energy, Mozambique</td>
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<td>ECB</td>
<td>Electricity Control Board, Namibia</td>
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<td>EDI</td>
<td>Electricity Distribution Industry</td>
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<td>EDM</td>
<td>Electricidade de Moçambique, Mozambican national power utility</td>
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<td>EGAT</td>
<td>Electricity Generating Authority of Thailand</td>
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<td>ENDE</td>
<td>Empresa Nacional de Electricidad, Bolivian national power utility</td>
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<td>ERA</td>
<td>Electricity regulatory Authority, Uganda</td>
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<td>ERAP</td>
<td>Energy reform and Access Program, Mozambique</td>
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<td>ESKOM</td>
<td>Electricity Supply Commission, South African national power utility</td>
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<td>FUNAE</td>
<td>National Electrification Fund, Mozambique</td>
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<td>HCB</td>
<td>Hidroeletricidade de Cahora Basa</td>
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<td>IMF</td>
<td>International Monetary Fund</td>
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<td>IPP</td>
<td>Independent Power Producer</td>
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<td>ME</td>
<td>Ministry of Energy, Mozambique(^1)</td>
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<td>MEA</td>
<td>Metropolitan Electricity Authority, Thailand</td>
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<td>MIREME</td>
<td>Ministry of Mines and Energy, Mozambique</td>
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<td>MME</td>
<td>Ministry of Energy, Namibia</td>
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<tr>
<td>MoTraCO</td>
<td>Mozambique Transmission Company</td>
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<td>MOZAL</td>
<td>Mozambique Aluminum Smelter</td>
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<td>MRLGH</td>
<td>Ministry of Regional and Local Government and Housing, Namibia</td>
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<td>NamPower</td>
<td>Namibian national power utility(^2)</td>
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<td>PEA</td>
<td>Provincial Electricity Authority, Thailand</td>
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<tr>
<td>RED</td>
<td>Regional Electricity Distributor</td>
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<td>SAPP</td>
<td>South African Power Pool</td>
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<td>SWAWEK</td>
<td>South West African Water and Electricity Corporation</td>
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\(^1\) Formerly MIREME
\(^2\) Formerly SWAWEK
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<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>UEB</td>
<td>Uganda Electricity Board</td>
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<td>UEDCL</td>
<td>Uganda Electricity Distribution Company</td>
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<td>UEGCL</td>
<td>Uganda Electricity Generation Company</td>
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<tr>
<td>UETCL</td>
<td>Uganda Electricity Transmission Company</td>
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<td>ZESA</td>
<td>Zimbabwe National Electricity Power Utility</td>
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Chapter 1
INTRODUCTION

1.1 Background
Electricity is a fundamental factor for development; it is needed in agriculture, industries and most other areas in a modern society. The Swedish International Development Authority (Sida) (2005) claims electricity as one of the most important factors for an economy to grow and decrease poverty. The supply of electricity creates conditions for improved living conditions through the increased economic activity and employment that electricity facilitates. Electricity can also increase the supply of health services and education, as well as increase safety. Continued investment on rural infrastructure in form of electrification will consequently constitute one important component in development of the rural areas (UD, 2001).

During the two last decades the electricity sector of both developed and developing countries in many parts of the world have been going through a process of reforms and restructuring. The reforms have shifted centralized organization and state ownership of the power utilities to vertical unbundling, private ownership, public regulation and market competition. Although the reforms have varied from country to country the main objective has been to improve the economic efficiency of the sector through introduction of private capital, liberalised markets and independent regulatory bodies. Improved economic performance is the expected benefits from the reforms with privatisation, competition and more effective state regulation of monopoly activities. The success of the reforms is however dependent upon the institutional situation in the reforming country as well as an appropriate design and implementation of the reforms (Zhang et al, 2002). Evidence from various countries has led to some main agreements of the main steps of reforms and generalized models for reforms have been worked out. Jamasb (2006) generic reform model based on Newbery (2002) are one generalized model of reform.

Mozambique is one of the poorest countries in the world. The country has however shown an increasing growth during the 1990s and has been used as an example to show that the
distressing progress in Africa is possible to change (Sida, 2005). The country gained independence from Portugal as one of the last countries in Africa in 1975. The decolonization in the Portuguese colonies was to a large extent the result of long civil war and the transition to democracy in Portugal. During the 1980s new civil wars between the government party and the resistant movement were a fact and it was first in 1992 a peace agreement was signed (Chabal, 2002). The economic development has been positive since the 1990’s and prognoses for future economic growth are optimistic (UD, 2005). Namibia gained independence in 1990 as the last African colony. The influence of the South African occupation and the apartheid is still evident. Although the standard of living has increased are the differences between rich and poor large in the country and the poverty is widespread. The attempts to stimulate the Namibian economy have been hampered by the South African dominance in the export market and it has been hard to diversify the industry (Sida, 2005). In economic terms Namibia is comparatively stable although the economy is small, open and dependent on natural resources (UD, 2005).

Namibia and Mozambique are relatively young economies that were two of the last colonies in Africa. The two countries have both reformed their respective electricity sectors during the 1990s. This thesis will describe and analyze how successfully the electricity reforms in Namibia and Mozambique have been designed and implemented in respective country compared to an extended generic reform model.

1.2 Purpose

The purpose of this thesis is to assess and compare the success of the electricity sector reforms of Namibia and Mozambique.

1.3 Scope

The study will only consider the electricity sector reforms in Namibia and Mozambique. The two countries have been chosen because they both are relatively young economies and therefore see if they have followed the generalized model or taken different paths to reform their respective electricity sector. The study will only include the aspects of reforms included in the extended generic model described in chapter 3.7. With social aspects are meant the access and services to the population.
1.4 Methodological Framework

This thesis is a case study of the Namibian and Mozambican electricity sector reforms and is based on a generic reform model. In order to conduct the analysis, data and information have been collected and interviews and visits at companies and authorities have been carried out in Mozambique. The idea of electricity reforms is based on the changed view at the electricity sector as a natural monopoly. The transmission and distribution side of the industry is still considered to have natural monopoly characteristics with a need of regulation, while the generation side is viewed upon as potentially competitive activities. The generic model used in the thesis is a generalized model of the main steps and implementation sequence in the reforming process which is based on evidence from reforming countries. The generic model has been extended to include institutional and social aspects as well since this are important aspects for the outcome of reforms. With the point of departure in the extended generic reform model the reforms in the both countries have been analyzed to see if they follow the model and what differences and similarities the two countries have made in their reform processes.

1.5 Previous Research

Several studies have been made on the restructuring and reform process in various countries which shows various degrees of success. Many of the studies that cover developing countries state the need to look at the reform process in the light of institutional framework and actual conditions in the country in question. Jamasb (2006) argues that contextual factors like system size, institution endowment and international organizations might affect the outcome of the reforms and that there is a need for many countries to adopt simpler reform models and that full withdraw of the state is to reconsider in many cases. Williams & Ghanadan (2006) concludes that realistic assessments and actual national needs and capabilities must be the base of reforms and that they need to have a broader set of objectives.

The article Electricity market reform in Argentina: assessing the impact for the poor in Buenos Aires by Haselip et al (2005) discusses the possibilities to establish a link between liberation in the electricity sector and low-income groups. The study finds that the economic benefit from reforms are larger for the rich population and that the result is dependent upon in which way the reforms are carried out. Perkins (2005) examines the environmental benefits of the Indian restructuring. He concludes that the evidence from India does not support that
environmental gains can generate from opening up the grid in developing countries and is dependent on the legal, institutional and regulatory framework.

1.6 Outline of the Thesis

This thesis is structured as follows. In chapter 2 the electricity reform of a selected number of developing countries are briefly described to give a background to possible approaches and outcomes of reforms in different countries. A brief background to the Namibian and Mozambican electricity sector reforms is also provided. Chapter 3 explains the theory behind electricity reforms and the extended generic reform model is described. In chapter 4 a description and analyze of the electricity reforms of Namibia and Mozambique are provided. The thesis ends in chapter 5 where some concluding remarks are drawn from the main findings of the study.
Many developing and transition economies have in the two past decades carried out reforms of their electricity sectors. These reforms have been undertaken in various structural, economic and political contexts (Jamasb, 2006). In Figure 2.1 the electricity generation for Africa, Latin America, Asia and China are compared.

![Figure 2.1: Net Electricity Generation by Region, 1980-2003](source: EIA (2003)).

In Africa production grew at an annual average rate of 6.4 percent between 1980 and 2003, Latin America with 7.3, Asia with 9.1 and China with 22.9 per cent annually. The trends for all regions have been positive although the development in Asia far exceeds the other regions in increased generation. The trends in per capita consumption between 1981 and 2003 for Africa, Latin America, Asia and China are shown in Figure 2.2.
The average per capita electricity consumption in Africa in 2003 was only 512 kWh compared to 1752 kWh in Latin America, 1124 kWh in Asia (excluding China) and 1281 kWh in China. Also the trend per capita is positive for all regions although it is obvious that the development in Africa is much slower compared to the other regions. It is important to remember that the numbers for sub-regions and countries within the continent can vary widely. For example, almost 50 percent of the electricity produced in Africa is consumed in South Africa while the corresponding share in East Africa is only 2 percent (EIA, 2003). In the following sections drivers for reform and a few examples of electricity reforms in the different regions are reviewed to show different approaches and outcomes of reforms. A background presentation of the Namibian and Mozambican electricity sector and their reforms is also provided.

### 2.1 Macroeconomic Drivers of Electricity Sector Reforms

Many developing countries were by the early 1980s burdened by inflation, foreign debt and budget shortfalls, and the macroeconomic and fiscal crises made governments introduce structural adjustment programs. The intention of the programs was to reduce public spending and increase private capital flows into the economy. Many reforms around 1990 focused on liberalizing the energy, technology and infrastructure sectors (Williams & Ghanadan, 2006). Much of the financial problem at the state owned companies were caused by weak performance and improper pricing caused by unqualified and inexperienced personnel.
Governments were also interfering in the operation of the companies concerning employment policies which lead to low labor productivity and over-employment (Kessides, 2004). Numerous governments had concerns about how to finance the power sector since the public owned utilities had constant deficits and were observed as an unsustainable burden on state budget. A driving main concern was to find alternative financing solutions for the sector and cost recovery and private investment appeared as the central principle (Jhirad, 1990).

More and more governments viewed foreign direct investments as a way to solve the investment needs and this was strongly encouraged by international forces like the World Bank and the International Monetary Fund (IMF), which embraced the neoliberal principle of the Washington consensus in their structural adjustment lending policies. The new World Bank power sector loans made in 1993 were highly dependent on government commitments to initiate private participation. The pressure on different countries from the World Bank differed depending on the specific options for raising capital, and how well the intentions of the country matched the more and more standardized reform model. In some countries the lending policy forced national policy makers to implement reforms under limited experience, high risk and uncertain benefits. In other countries electricity reforms came from national efforts which had achieved public support by guaranteeing improved economic and service conditions (Williams & Ghanadan, 2006).

Power sector reforms in most developing countries were seldom restricted to the sector, but intimately tied to transformation all over the national economy and often took place within poorly defined or problematic legal and institutional contexts. The fundamental objective was to improve the weakening finances and the performance that sometimes included losses and uncontrolled power theft in the industry rather than to optimal efficiency. The success of the reforms depended mostly on how well the new electricity markets themselves functioned and the governments had only limited control over the success of the reform since it depended largely on attracting capital from outside the country (Ibid.). Another driver for the reform was the necessity to incorporate national electricity markets into regional power pools where countries could benefit from joint project development, increased supply security and low production costs. Finding an alternative source of sector finance thus became the driving priority of power sector policy. Equity issues have also contributed to shape reforms (Haayika, 2005).
2.2 Electricity Sector Reform in Bolivia

Latin America was in the middle of the debt crisis when Bolivia’s electricity reforms took place. The government was in the second economic reform and focused on reducing government borrowing, increasing foreign direct investment, and developing natural gas exports. A part of this strategy was the electricity reform. The generation and distribution was somewhat unbundled already before the electricity reform and had state, private, municipal, and cooperative ownership. The main actor in the sector was, however, the state utility Empresa Nacional de Electricidad (ENDE). ENDE was vertically integrated, operated the grid and controlled 80% of generation. At the time for reforming ENDE was a profitable utility with tariffs above cost recovery levels. The government privatized the energy sector through capitalization and got political acceptance among industry, labor unions, and citizen groups that were against sale of national resources to foreigners. That way could the government also prevent political opposition through gradually reduced cross-subsidies to poor residential households, by using savings in generation to make the increase slower. The Electricity Law from 1994 fully unbundled the sector and a new regulator for public utilities was established outside the energy ministry. ENDE was split up in a private transmission company and three private generation companies and by 1998 privatization was basically complete and has resulted in major investment. Public tolerance was achieved through gradual tariff reform and a considerable pension-fund payoff in 1997. Bolivia’s electricity reforms are seen as a success by the World Bank considering sector finance and operations, and the government’s fiscal goals. The success have been left out when it comes to improving rural service and access and the access level remains at 25 percent for the rural population. The fact that the energy pension payouts have not matched the early promises or public expectations is even more serious. Since the electricity reform is currently seen in a larger reform context it might in the future be seen as a technical success at the same time as a political failure (Williams & Ghanadan, 2006).

2.3 Electricity Sector Reform in Thailand

In Thailand an electricity reform was first proposed in the early 1980s when the country got a structural adjustment loan from the World Bank. The reform was not carried out until the early 1990s because of severe opposition from labor unions. By then the shortage of electricity supply and the substantial governmental debt burdens set the idea with privatization participation in motion again. The parliament authorized the introduction of independent power producers (IPPs) and partial privatization of the thermal generation of
Electricity Generating Authority of Thailand (EGAT) in 1992. Thailand’s electricity sector consisted of three utilities owned by the state. The EGAT owned all grid, generation and transmission and supplied the two distribution utilities, Metropolitan Electricity Authority (MEA) and Provincial Electricity Authority (PEA), with power. About 90 percent of all villages were electrified and the losses of transmission and distribution were low, the system had in general pleasing service and the finances of the utilities were good. At the time Thailand’s economy was one of the fastest growing in the world and the electricity sector expanded quickly. Since the utilities’ expansion was depending primarily on state-guaranteed foreign debt for finance, it became a significant strain on the government. Both foreign and domestic investors showed strong interest in the reforms and the government wanted to take the reforms further. The utilities resisted but the Asian financial crisis in combination with IMF conditions for loan resulted in a Privatization Master Plan that included the energy sector, and it was approved in 1998. The master plan included introduction of competition in wholesale and retail, establishment of a power pool and utility privatization. The cabinet authorized a draft Electricity Act in 2000 which would offer the legal basis for reform and establish an independent regulator. However, the Parliament never approved it and the new government from 2001 was more skeptical about reform. The reforms have since 2001 changed direction from competition to focusing on making EGAT to a “National Champion”. This includes that 30 percent of the utility are to be sold on the stock market to raise capital, for the monopoly to stand a better chance against international competitors at the regional market. The EGAT labor unions resistance stays strong and the reforms of the electricity seem stalled (Ibid.).

2.4 Electricity Sector Reform in Uganda

Uganda Electricity Board (UEB) is the only power utility in the country and it is state owned and vertically integrated. The autonomy of the UEB is minimal and the government interferes in tariff setting and operational matters. A policy promoting privatization has been introduced by the government but does not include the UEB. The utility will continue to be owned by the state although the sector has been opened up for IPPs to attract private sector investment (Bhagavan, 1999). The need to attract investment was the main driver for the reform and in 1999 a new Electricity Act was enacted which eliminated the monopoly of UEB and opened up for private participation and restructuring. The Electricity Regulatory Authority (ERA) was also established by the Act in 1999 and one of their first actions was to reform the tariffs. In 2001 the UEB was divided into three separate companies; Uganda Electricity Generation
Company (UEGCL), Uganda Electricity Transmission Company (UETCL) and Uganda Electricity Distribution Company (UEGCL), from earlier being the only utility in generation, transmission and distribution. The privatization of UEGCL and UEDCL are about to take place and the sector reforms have led to new entries in generation and distribution. Of Uganda’s population only 6 percent have access to electricity. In 2003 a Rural Electrification Agency and a Rural Electrification fund were established and the rate of access has increased remarkably (ESMAP, 2005).

2.5 The Electricity Sector in Namibia

In harmony with the policy to enhance the efficiency in the sector, the Ministry of Energy (MME) commenced a detailed restructuring study that began in 1998. The study lasted for two years and during that time extensive stakeholder consultations took place (ECB, 2006). The Namibian Cabinet approved the proposals of the energy supply industry restructuring study in November 2000. The recommendations had extensive implication for industry reform, the core recommendations were:

- As a first liberalization step, to establish a single buyer market structure;
- Rationalize electricity distribution and improve financial viability, enhance efficiency and customer service through implementation of Regional Electricity Distributors (REDs);
- Formalize rural electrification arrangements and responsibilities; and
- Improve the regulatory framework to contain the necessities of the new sector structure. (NVE, 2004).

While the reform was put into practice, more determined and extensive objectives were introduced. Social uplift, effective governance, economic competitiveness and efficiency, security of supply, and sustainability were some of the goals, and the three foremost initiatives implemented to accomplish these aims were:

- Restructuring of the distribution, including outsourcing planning and the rural electrification program to the private sector
- Establishment of an Electricity Control Board (ECB)
- Restructuring of NamPower and the structure for the single-buyer market (ESMAP, 2005).
NamPower is the main electricity utility in Namibia and at the moment Namibia gets all its electricity through NamPower, apart from some big consumers that have direct contracts with the South African Electricity Supply Commission, (ESKOM). The Namibian electricity generation requirements are met primarily by the Ruacana hydropower facility. The Ruacana hydroelectric power station consists of an old coal fired plant, a number of diesel generators and imports mainly from South Africa. Out of the Namibian electricity consumption, more than fifty percent is supplied by the South African electricity supply company ESKOM. The electricity consumption per capita in Namibia is 1259 kWh. Figure 2.3 shows the Namibian generation by source and it is evident that hydropower is dominant (IEA, 2003).

Figure 2.3: Namibian Generation by Source, (GWh)


The dependence on foreign electricity resources as one of the drivers for the reforms has so far not led to any real changes. Since the initiation of the reform process and up till now, no new generating facilities have been developed. In the meantime, plans for possible independent power producer plants have been drawn up. A combined cycle gas turbine plant supplied by the Kudu offshore gas field, the Epupa hydro plant, and a wind farm in Luderitz and a hydro facility on the Okavango River are included in the plans. Of these projects the Kudu project face numerous severe difficulties and the Epupa investment appear doubtful (ESMAP, 2005). The aspiration is that Namibia in the future will be self sufficient, and generation will comprise the unused resources of hydropower of the Kavango and Kunene rivers and the development of Kudu Gas (Namibian Economist, 2001).
2.6 The Electricity Sector in Mozambique

In 1997 until 1998 a study on reform and regulation of the electricity sector was carried out. The study included recommendations of:

- Establishment of a single-buyer model with wholesale competition;
- EDM restructuring through vertical separation into generation, transmission and distribution businesses, together with horizontal separation of distribution through concessions; and
- Strengthening private sector participation through independent power producers and leases/concessions contracts for distribution. After considering the recommendations the government decided to consult the stakeholders further (NVE, 2004).

In recent years the Mozambican government has taken considerable steps in the direction of implementing a policy and legislative framework to reform the energy industry. The National Energy Strategy was approved in 2000 and gave the base for more reforms and competitive private sector participation. In 2000 regulations to permit private sector participation in all stages of the electricity business were realized. The government is in support of the National Energy Strategy and with support from the World Bank, organizing the Energy Reform and Access Program (ERAP), an eight year project. The program objectives is to accelerate the use of electricity for economic growth and improved quality of life in rural and peri-urban areas, and to strengthen Mozambican capacity to expand the energy sector for both domestic and export markets, in a commercially viable way. One component of the ERAP project is the power sector reforms. The other components are grid electrification, renewable energy promotion, institutional strengthening and capacity building. Ministry of Energy (ME) have the general responsibility for the project and electrification investments by different agencies will be put into practice as individual sub projects in both the public and private sectors (Impacto, 2003).

In Mozambique Electricidade de Moçambique (EDM) is in charge of generation, transmission and distribution, although there are some other actors that produce and distribute electricity. Hidroelectrica de Cahora Bassa (HCB), a company jointly owned by Portugal and Mozambique is the major one and the largest hydroelectric scheme in Southern Africa (MBendi, 2006). EDM only has a few small generator facilities and does not have any considerable capacity for generation of power of its own. The generators are both diesel powered generators as well as hydropower stations and are interconnected (Sida, 2001).
Southern Africa, Mozambique is one of the largest electricity producers and there is a large potential for producing low priced electricity, mainly through the development of hydropower. Other important sources that can be used for energy generation is for instance, the exploitation of Mozambique’s immense natural gas deposits or to develop the inefficient use of already established utilities (MBendi, 2006).

The generating capacity in Mozambique is under utilized and therefore the power output is planned to expand with additional generating plants. The HCB northern expansion, the Moatize thermal power station, and the Mepanda Uncuna hydropower station are taken in account for the increase. In the future hydroelectric power will maintain the main electrical power source in Mozambique, however, wind power from the sea breeze and solar radiation are other potential energy sources (Ibid.). The electricity consumption per capita is 343 kWh in the country. The generation mixture is shown by source in Figure 2.4 and shows that hydropower is the main source of energy. Petroleum products constitute 27 GWh and gas 6 GWh while hydropower stands for 10569 GWh (IEA, 2003).

![Figure 2.4: Mozambican Generation by Source, (GWh)](source: IEA (2003).

Mozambique stands out both as a large electricity producer and exporter and also because of the low electricity consumption numbers. The HCB power plant is the largest hydro power plant in Southern Africa, but Mozambique and the state owned electricity utility EDM has until recently only been permitted ten percent of the power produced in HCB. This share has barely been a sufficient amount to cover the current demand peak in Mozambique. Since the
level has been raised from 2004 and is expected to increase even more, the instant need for capacity is thus covered for the first few years (EDM, 2004). The Mozambican transmission system is fundamentally made up of three lines; the north and central lines are both fed from HCB and the southern line that is fed via South Africa.

2.7 Concluding Comments
It is obvious that power reforms can take many different approaches and lead to various outcomes. This chapter has given some examples of electricity sector reforms and their outcome. A brief background for the electricity sector and the reforms in Namibia and Mozambique has been provided. Experience from electricity reform in both industrialized and developed countries has led to some main agreements concerning the key ingredients for reform. In the following chapter a theory for energy reform is described, based on the generic electricity reform model. In the remainder of the essay this model is applied to compare the electricity reforms in Namibia and Mozambique respectively. The two countries have been chosen since they are relatively new and immature economies and have started the reform of their electricity sectors during the 1990s.
Chapter 3  
THEORETICAL FRAMEWORK ON ELECTRICITY SECTOR REFORMS

This chapter will present the theoretical framework for the rest of the thesis. The chapter deals with the question whether the electricity is a natural monopoly or not and different solutions with regulation and private participation in the electricity sector. Theory about a generic reform model is reviewed and the institutional and non economic aspects of reforms are discussed. Finally an extended generic reform model is presented, which the rest of the thesis and the analysis of the Namibian and Mozambican electricity reform will be based on.

3.1 Natural Monopolies and Competitive Elements
Electricity is a product that involves three basic procedures; generation, transmission and distribution, before it can reach and be used by the end customers. The physical and engineering characteristics and the specific economic and social qualities of the electricity sector have led to the view of it as a natural monopoly. This means that only with one supplier in the sector, or with one supplier that can accomplish lower unit costs than numerous suppliers in the industry, can the lowest possible production cost be attained (Yi-chong, 2004). The generation part of the industry is not viewed as a vertically integrated natural monopoly functions any more, while transmission and distribution activities have natural monopoly characteristics. The latter can be subject to incentive-based regulation while the supply industry is looked upon as “a set of separate but inter-related activities with distinctive economic characteristics” and is viewed as potentially competitive activities (Jamasb, 2006).

Newbery (1999) cites Farrer’s (1902) catalog of typical characteristics of natural monopolies:
1. Economies of scale
2. Capital-intensity
3. Non-storability with fluctuating demand
4. Locational specificity generating location rents
5. Producing necessities or essentials for the community
6. Involving direct connections to customers
According to Newbery networks are capital-intensive, durable, long-lived and immovable. The network utilities are also noteworthy in both function and size and compose a substantial part of the productive capital in an economy. The network suppliers present one of the most apparent examples of natural monopolies. Since transmission and distribution of electricity functions have the characteristics of a natural monopoly there is however a need to have social control over them (Gilbert, 1996). In figure 3.1 the effect of a natural monopoly is shown.

![Figure 3.1 Natural Monopoly](source: Schotter (1994)).

In a natural monopoly the long run marginal cost curve (LRMC) is horizontal while the long run average cost curve (LRAC) is sloping downwards. In a perfect competition situation the price and quantity is set were the LRMC intercept with the demand curve (D) in point b. With a natural monopoly the decreasing average cost is higher than the marginal cost. Consequently a price equal the marginal cost will lead to a loss since the natural monopoly cannot cover its total costs. A profit maximizing monopolist would produce in point c where the marginal revenue (MR) is equal to the MC which leaves space for a competitor to enter the market without making a loss. The equilibrium price and quantity for a natural monopoly will be in point a where the LRAC is equal to D. The sustainable price in a natural monopoly will be higher than in a competitive market and lower than an monopoly while the sustainable quantity will be lower than in a competitive situation and higher than in a monopoly (Schotter, 1994).
The changed view on electricity sectors as a natural monopoly has led to a wave of electricity reforms over the world, both in developed and developing countries. Some main steps agreements based on electricity reforms in different countries is regulation, restructuring and where achievable privatization. Agreements on key elements in electricity reforms can give generalized models that can serve as broad reference framework for future reforms. Later in this chapter a generic reform model based on Newberry (2002) and Jamasb (2006) is presented, and shows the main steps and implementation sequence of a generic reform model. The model is then extended with consideration to institutional and social aspects of reforms, and it is this extended model the electricity sector reforms in Namibia and Mozambique will be compared with.

3.2 Different Regulatory Solutions and Private Participation

By looking at different countries’ electricity history, there appear different solutions for balancing the amount of control and free markets, balancing the governments and consumers interests and at the same time facilitating efficient investments. The solutions can be divided into three main categories based on their ownership structure; entirely publicly owned, entirely private or mixed system. In a solution where the electricity industry is entirely publicly owned it is directly subject to political control and access to funds. The private system is regulated either implicitly or explicitly and in the mixed system the private sector is controlled implicitly by the potential of the remaining publicly owned system to take over its function (Gilbert, 1996).

Studies of ownership structure concerning distribution utilities show that it is important that they are big enough to obtain economies of scale and can be the subject of benchmark regulation if possible. In addition the organization of transmission and the form of their supply responsibility can influence the distribution utilities role and ownership (Ibid.). The degree of competitive weight on the utility is shown to be the most essential efficient determinant in studies by Pollitt (1995). The degree of competitive pressure is in order dependent on the characteristics of the regulation and the degree to which the utility needs to compete for its market. Private ownership appears however to offer some extra improvement. Competitive markets make private owned companies perform better, especially when innovation is central, costs must be strictly controlled, least-cost solutions call for cautious and informed decisions and where costs need to be thoroughly controlled. The generation and supply is well suited for private ownership, particularly if in combination with open access on
transmission. By combining the two elements it is possible to improve the competitive structure of the bulk electricity market and allow private establishments with their own generation to put the surplus power up for sale (Gilbert, 1996).

There is no conclusive theory or empirical proof on the advantages of private ownership and privatization as a part of market oriented power sector reforms. Nevertheless, most of the electricity reform models have been market oriented and participation of private actors has been central. There can be considerable economic and social costs as a result of lack of electricity access and electricity shortages. Reforms with private involvement as an alternative way of financing necessary investments in the industry, has consequently been an interesting alternative for countries with raising pressure of funding expansion of public owned electricity arrangement (Jamasb, 2006). Cost efficiency, reduced losses, improved revenue collection and lower prices are anticipated outcomes of private ownership combined with competition and incentive regulation of networks (Newbery, 1999). Privatization of existing publicly owned assets also present a scenario of considerable income for governments that are short of money from foreign debts. Consequently, the success of reforms based on private participation is greatly determined by the private sector’s willingness to participate and perform as anticipated (Jamasb, 2006).

Distribution networks account for about 30-40 percent of total supply costs and can be significantly higher in developing countries as well as show considerable potential for efficiency improvements. Because of its characteristics as a natural monopoly the network calls for continued regulation. The regulatory framework can though be in need of changes and the costs of failure to implement an effective regulatory framework for distribution utilities can exceed the efficiency enhancement achieved from the competitive actions (Ibid.). Liberalized generation activities in numerous countries have undertaken regulatory reform of the distribution utilities by implementing incentive regulation. Incentive base regulation models penalize or rewards the companies depending on their performance comparative to other companies or specific performance standards, while traditional rate of return regulation is funded on cost of service and a guaranteed return on capital (Jamasb, 2006; Pollitt, 1995).

The form of public ownership of the electricity sector can be both national publicly owned companies or municipally owned and can be a corporation or a part of the government structure. Infrastructure development decisions that depend on the preferences of the main
political actors, legal and political institutions and the running government affect the form of ownership. The ownership form is also influenced by public goods and the roles played by private companies (Yi-chong, 2004). The public sector in the electricity industry is expected to remain a key player in the future (Jamasb, 2006).

3.3 The Generic Reform Model

Evidence of reforms in various countries have given some agreements with regard to the main steps for reform design, where regulation, restructuring and where possible privatization should be a part. Generalized models can provide an extensive reference framework when designing or evaluating reform options. In this thesis the generalized model for reforms used are the generic reform model described by Jamasb (2006) based on framework suggested by Newbery (2002).3

The power sector reforms are supported by market theories and electricity is treated as a good instead of an integrated service. By handling the electricity sector according to market dynamics it is possible to obtain more efficient production. The reforms usually include structural changes, which in general imply vertical and horizontal unbundling, and/or privatization. Since electricity is no longer treated as a social service the private and commercialized utilities will strive to maximize profit (Haanyika, 2005). The World Bank published a well known ‘score card’ in 1999 and this show the prescriptive character of the electricity reforms recommended for developing countries. There were standardized objective and processes, privatization and competition were seen as the ultimate goals despite the different initial conditions of the countries. There were other World Bank analyses that drew attention to locally modified reforms but they were frequently lost on the energy ministries, business interests or foreign advisors involved in the reform legislation (ESMAP, 1999). The focus was clearly financial and although issues like access, service, social pricing and environment were a part of the legislative discussion they were not among the priorities in the actual design of the reforms. They were rather dealt with as secondary issues that could be considered after the reforms were completed (Dubash, 2003).

3 There are other generalized models of which most have the same main features as the generic model described in this chapter; one example is “the open competitive model”. In this essay the generic reform based on Newbery (2002) and Jamasb (2006) has been chosen because of its simplicity and its clarity of the main steps.
The support from electricity reforms in different countries has resulted in some agreements considering what the main steps and their sequence should be when designing reforms. Regulation, restructuring and where it is achievable privatization are the main fundamentals of a reform. Generalized models can provide an extensive reference framework when designing or evaluating reform options, although it is widely recognized that reform design should consider specific characteristics of the industry like availability of resources, system size and institutional features. Jamasb (2006) summarizes a generic electricity reform model based on Newbery (1999) as follows:

![Figure 3.2: Main Steps in the Generic Reform Model](source: Jamasb (2006)).

### 3.3.1 Electricity Law and Regulator

In Figure 3.2 it is shown that the first step in the reforming process should be the legislative and regulatory basis. A clear legal basis is essential for electricity reforms and it is often necessary with a new legislation concerning restructuring, private participation and establishment and role of regulatory body, generally in the form of an electricity law or act. The legal basis furthermore ease uncertainties linked with property rights and procedures to resolve conflicts and indicate countries’ commitment to implement the reforms (Ibid.).

### 3.3.2 Restructuring the Sector

The majority of reforms call for restructuring of the industry to some extent and the intention is to separate potentially competitive activities from the natural monopoly part, consequently separating generation and supply from transmission and distribution. The initial restructuring should be cautiously considered since the introduction of any new structure likely generate vested interests that might obstruct or oppose change of structure. Separation of distribution business from generation and transmission is where the unbundling should start according to Figure 3.2 (Ibid.).
3.3.3 Separating and regulating Distribution

Regulation should involve distribution activities and evidence has showed that incentive regulation can give substantial efficiency improvements. Pricing that is cost reflecting can be introduced in this phase through a rebalancing of the tariff and reduce subsidies. Government subsidies for specific users and cross subsidies for residential customer groups are contents of the tariffs and they are likely to create vested interests among the receivers. Since it is hard to design efficient subsidy schemes, they can get costly by benefiting other customer groups than targeted, or not reaching the intended groups. Tariff restructuring ought to be cautiously planned in advance of the reform process and explicitly incorporated in the reform realization strategy to achieve vital support from the providers of subsidies. To get the best results from the tariff adjustments in developing countries they should also be introduced gradually. Terms of disconnection and incentives for decreased non collection should be established and energy losses and revenue collection can be enhanced by privatization. This question requires political support and is sensitive since rate increases and disconnections for non payment have social consequences. In case of privatization distribution must however be separate from and cannot replace governmental liability for those issues, and they should preferably be dealt with previous to deciding the form of ownership for distribution. At this stage rules for access to network and proper charges should be set. Generally regulated third party access is ideal and the central concern is to avoid discrimination when it comes to network access and charges among the users, reduce uncertainty for new entries, and define the framework for future system expansion (Ibid.).

3.3.4 Separating and regulating Transmission

Transmission and generation should be separated and transmission established as a separate unit. This separation is required for effective competition in the generation sector. Vertical integration between distribution and generation can result in discrimination of other generators, harm competition and hinder new entry. Access to the grid requires clear regulations and preferably should an independent system operator manage the transmission and grid operation. Transmission should like distribution be based on incentive regulation. The erection of incentives for investments in expanding network as well as measures for managing and pricing of congestion is the central concern when regulating transmission. Small grid can hamper competition and result in high generation prices. Since the economic cost of underdeveloped transmission systems are high, over dimensioning of the grid is possible at the early stages of the reform (Ibid.).
3.3.5 Splitting Generation
Part of the generic reform model is that a wholesale electricity market should be established
and the existing generation capacity should be split into numerous units. It is important that
the number of firms is efficient for a competitive market as well as to avoid dominant
incumbents since that can lead to the exertion of market power and discourage new entry
(Ibid.).

3.3.6 Privatizing
Finally the figure describing the generic reform process suggests that where it is desirable and
feasible with privatization it should be carried out. The privatization should if possible start
with the distribution networks. Privatization of the generation part of the industry should take
place after structure, regulation and ownership of distribution utilities is satisfied. Privatization is not a crucial part of the reform and privatization of transmission grid is not urgent and can be introduced at the same time or after effective network congestion and system extension arrangements are operating (Ibid.).

3.4 Institutional Framework and the Social Aspects of Reforms
There are diverse ways of reforming the electricity sector and timing, sequence, means and
eventual outcomes of the reforms are guarded by the present political and economic
organization of the country (Yi-Chong, 2004). It is well known that other than financial
aspects of reform are needed to be considered. It is necessary to take into account the specific
characteristics of the industry and evidence from reforming countries imply that the
importance of this argument goes further than the systematic characteristics like size, resource
mix and structure. Power sector reforms occur within institutional scenery that is
characterized by unstable political systems, interventionist governments, unclear legislation
on property rights, lack of judicial independence and credibility, and corruption in many
developing countries. Policy makers need to make realistic supposition regarding the political
and institutional endowment and regulatory framework need to be in line with the institutional
endowment (Jamasb, 2006).

Reforms in developing countries have often been based on policy recommendations and
theoretical analysis of developed countries like Europe and US. The aim of these analyses has
been to reduce government’s role and maximize economic efficiency and consequently to
create competitive markets in electricity systems that are already functioning well (Williams
Development banks and consultants integrated those procedures and the underlying assumptions into reform policies and what the World Bank called the generic approach and passed them on to the developing countries with diverse political and economic systems. To countries whose electrical industry is less developed, without any consideration of the outlook and ability of the country in question for reform (Bates, 1997; Yi-Chong, 2004).

By giving consideration to institutional performance in form of historical and political conditions the comparison across countries put forward that economic institutions have an inertia and strength that endure the inevitable dispute on public policy. By focusing on the direct policy matters there is a risk of overlooking the larger and long running forces that shape the sector (Gilbert, 1996). Even with exceptional ideological consistency of market competition, substantial resources and multilateral financial institutions to promote competition, it is necessary to modify the reform models to fit the local economic and political situation and the different political, legal, economic and social-cultural contexts (Yi-Chong, 2004). North (1990) defines institutions as:

*the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction*

Extensive rethinking of electricity sector policy and the primary assumption from the World Bank scorecard has developed from the present status of power reform in developing countries. Competition is not seen as a first priority until legal foundations, regulation, and the private sector are improved and sound management and distribution is competing with supply expansion in importance. More than anything, the idea of a uniform prescription itself has lost credibility. Study results during the last decade have shown that it is possible to recognize some general features to improve the reform approach. Williams & Ghanadan (2006) states that the main policy challenge further on is to make reforms that are based on actual conditions in the sector, address the most important needs and are consistent with the social and institutional capacities of the country. The focus must not be the idealized image of a perfect market but to identify the most important problems and best solutions based on real circumstances (Ibid.).
Reform has often been concentrated on economic reasons and can work against public benefits like access, social pricing and the protection of the environment, which are seldom included in the reforms. In debates about reforms it is often stated that the reduced governmental expenses are relocated but it is not apparent if this is the case. Emphasis on service has been one of the core weaknesses of electricity reforms and in many countries service improvement has not corresponded to cost recovery. Consumers have often only seen reforms in appearance of tariff increases and payment enforcement and sometimes this has been caused by expecting lower long term tariffs and greater benefits to consumers as a result from reform. In other cases due to loss of public support because of a financial focus that has overlooked customer concerns. There is a need to reestablish service provision that balances cost recovery with measurable development in reliability, quality and access as the foundation of commercial operation. One way to do this is to include incentive based policies intended to increase new connections and reduce outages, customer complaints and installation lead times into private management contracts and regulated performance criteria for utilities (Ibid).

Reforms in electricity are both an economic, social and political process and requires public acceptance to be successful. The success therefore depends on the public perception of promises kept and broken, cost and benefits and basic fairness and honesty. Many reforms throughout the world risk failing in the social legitimacy on one or more counts and the lack thereof can take different expressions. Power theft, vandalism, protest movements and electoral politics are examples of consequences from lack of social legitimacy. By using reforms based on reality, emphasis on service, effective regulation and involving the public in the reform process can increase the social legitimacy and the outcome of the reform can be more successful (Ibid.).

3.5 Extending the Generic Reform Model
The generic model described earlier lack the consideration of institutional and non economic aspects that can be crucial for electricity reforms. Since electricity reforms are both an economic, social and political process there is a need to take all sides in consideration when designing and implementing reforms. In Figure 3.2 the generic reform model described in chapter 3.5 are extended to include the institutional framework in the reforming country as well as considering non economic aspects of the reform.
The main steps of the reform are the same in the extended generic model as described before, only now the important institutional and non-economic aspects of reforms are included in the model. The analysis of the Namibian and Mozambican electricity sector reforms in the following chapters will be performed with the starting point in the extended generic model. The reform in the two countries will be compared with the extended generic model as well with each other to see what similarities and differences the both countries have made in their respective reforming process.

3.6 Concluding Comments
In this chapter the theory behind electricity sector reforms have been presented. The generalized generic model have been described and extended to include institutional and social aspects of reforms. In the following chapter the description and analysis of the Namibian and Mozambican electricity sector reforms will have its point of departure in the extended generic reform model.
Chapter 4
THE ELECTRICITY SECTOR REFORMS IN NAMIBIA AND MOZAMBIQUE
FROM THE VIEWPOINT OF THE EXTENDED GENERIC REFORM MODEL

In this chapter the electricity sector reforms of Namibia and Mozambique are presented and analyzed. The presentation will follow the extended generic reform model and will include the legal and regulatory basis, the unbundling and reforming of distribution, transmission and generation and privatization. Each reform step will be described, discussed and compared for respective country. Finally the institutional and social aspects and their influence on reform are described and discussed.

The electricity sector reform in Namibia have been undertaken in four steps: the first part was to a large extent driven by the state and concentrated on the program for rural electrification, the second part focused on the restructuring of the distribution sector and private sector participation thereof, the third part concentrated on improvement of the regulatory process. Finally the fourth part concerns the legal and institutional reform in progress and attempt to develop the settings for private sector investment in generation (ESMAP, 2005).

Part of the electricity sector reform in Mozambique has been the transformation of the former state body EDM into a public enterprise in 1995 and the introduction of the electricity law in 1997. The electricity market is opened up for competition by the electricity law on both the generation, transmission and distribution sides (Sida, 2001). The reforms in Mozambique will further consist of three parts: EDM will be separated into several business units; private sector participation will be introduced in the distribution and supply business of EDM; and separate corporate public entity to provide transmission will be created, with a potential interim role as single buyer (World Bank, 2003).
4.1 Legal and Regulatory Basis

4.1.1 How Has the Legal and Regulatory Basis Changed in Namibia?

During the time Namibia was a South African colony the Namibian electricity sector was integrated with the South African market. There existed no specific electricity law for Namibia and the South African law prevailed (Sundqvist, 1998). Even after Namibia was independent the South West African Water and Electricity Corporation (SWAWEK), (today NamPower) was basically functioning as a self regulated public utility in the beginning of the 1990s. No apparent legal framework governing the way in which tariff, investment and other critical decisions were reached was in place. The nominal regulator was Ministry of Mines and Energy (MME) and the relationship between SWAWEK and MME appeared to be mostly informal consultation concerning particular matters as they occurred (ESMAP, 1993). The electricity legislation in Namibia was long influenced by the inheritance from the time before independence and the legal framework was more or less unchanged and was run in accordance with pre-independence regulations. The change was slow, mostly due to the reconciliation policy adopted by the government and the aversion to change among the remaining economic and political organizations from pre-independence. Since the legislation was not in accordance with the new administration and objectives, the new Electricity Act was developed, which was introduced in 2000 (Sundqvist, 1998).

The objective of the Namibian Electricity Act introduced in 2000 was to implement control over the electricity supply sector to be rationally executed for the benefit of society and to provide for related issues (Namibian Electricity Act, 2000). The law describes the legal and regulatory framework for reform of the sector and the ECB is established as an independent regulator of the sector appointed by the MME. ECB is also the licensing authority and local, regional and municipal authorities are subject to ECB. The law defines the application and granting of license should be carried out concerning generation, supply and distribution (Econ One Research, 2002). The ECB is also responsible for managing disputes and taking care of customers’ complaints in case of conflict. Although ECB has the regulatory responsibility in all aspects of electricity supply in Namibia, in reality they only have an advisory role in most areas. The ultimate decisions are taken by the MME. The establishment of the ECB has in any case smoothed the progress of many reforms. Even though the MME maintains the overall policy authority the ECB has assisted the MME with implementation and monitoring of
reform initiatives in the electricity supply industry along with ring-fencing of NamPower and the establishment of the market for single buyers. The ECB has in addition been in charge for administering a new licensing system, where licensees need to motivate tariff levels and to stipulate transparency and cost-reflective prices (ESMAP, 2005).

4.1.2 How Has the Legal and Regulatory Basis Changed in Mozambique?
In Mozambique EDM had solitary responsibility for generation, transmission and distribution of electricity in the country, established by the Law Decree no. 38/77 of August 1977. Several existing electricity services at both national level and in different districts and municipalities were under the decree taken over by EDM. The Law no. 2/81 on State Enterprises influenced the functioning and organization of EDM. The law had although no affect on the objective and the monopoly position of EDM and no significant change in the way of operating. The Law on Public Enterprises no. 17/91 did however call for further adjustments in the status and the organizational principles of the enterprise. The Electricity Law no. 21/97 was introduced in Mozambique in 1997. To open up for private participation in the electricity industry activities under a concession system, at the same time as keeping a special position and responsibility for EDM was the primary driver of the law (Sida, 1996). The law was supplemented with the Decree no. 8/2000 from 2000 which further specifies procedures concerning concession for generation, transmission, distribution and sale of electricity.

The law established a governmental consultative body, National Electricity Council (CNELEC), which works as a regulatory instrument concerning generation, transmission and sale of electricity. The role of the state and authorities is described in the law. The Council of Ministers is the authority that takes decisions for the sector and that has the power to approve new projects and defines the authorities and powers to the authorization of supply of electricity at different levels. The law explains the role of the CNELEC which is supposed to serve as a medium for consultation and hearing of public opinion as well as the defense of public interests. The functions of CNELEC include conciliation, mediation and arbitration functions in possible disputes. In the articles about concession of generation, transmission and distribution and sale it is defined to include both public and private individuals and corporate entities and open for competition (Mozambique Electricity Law 21/97, 1997; Mozambique Decree 8/2000, 2000). The CNELEC will in turn be instructed by the Council of Ministers (Sida, 1996). CNELEC was established by the Electricity Law from 1997 but its board
members were appointed first in 2001. They were only operationalized in 2003 and still today no regulatory institutions have been implemented as a forum for protection and consultation of the public interests. The development of CNELEC into a completely developed regulatory agency is one of the main aspects of the government’s reform agenda for the electricity supply industry. The slow implementation of the operation of CNELEC is due of the lack of various resources. Scarcity of sufficient trained personnel in DNE, has led to a heavily reliance on that advisors provided by bilateral donors for the institution. As a result of shortage of graduate staff to understudy the advisors the transfer of knowledge has not been effective (World Bank, 2003).

4.1.3 Comparing the Namibian and Mozambican Legal and Regulatory Basis

By introducing a legal basis for the electricity sector the consumers and private sector participants in the sector got confidence in the reforms and the sector will function under an agreed and transparent set of procedures and rules. Both Namibia and Mozambique have by establishing the Electricity Act from 2000 and the Electricity law from 1997 respectively shown their commitment to the reforms. The laws were introduced relatively early in both countries which is important for the continuing work of reform. In Namibia the Northern Electric experiments were introduced in 1996 and the Act was enacted first in 2000. Even though, because the actual reforms started first in 2000 with the introduction of REDs, the Act can be said to have been introduced early in the process and supposed to have had a positive affect on the reform process. In Mozambique the law was introduced relatively early in the reforming process which assumingly has affected the reform in a positive way. It is also important to continue to improve the legislation when needed.

Although the ECB was established as a juristic person by the Electricity Act, Namibia still seems to lack a well functioning regulatory institution. The regulatory function of ECB to some extent seems to be without real authority since all decisions ultimately are taken by the Ministry of Energy (ME). The regulatory body in Mozambique, CNELEC, was established by the Electricity Law in 1997. The fact that the regulatory institutions of CNELEC are not put in practice yet is unfortunate since an independent regulator preferably should be established before most of the other reforming steps. In Mozambique the law has a tendency to structure procedures and actions more than define responsibilities and this is a weak side of the law. The explanation of essential network actions and responsibilities of the grid operator is
thorough at the same time as the law falls short when it comes to outlining the required responsibilities for decision making. The electricity environment is changing and hence the market needs continuous guiding. The law is extensive concerning the protection of the costumers from possible misuse by monopolies of market power. When it comes to the rights of the investors the law says less, and the requirement of a fair investment return for market investors. The “rights of the investors” should be as clear as possible when trying to raise capital to expand the market on an international capital market (EDM, 2004).

4.2 Restructuring of the Electricity Sector

4.2.1 Have the Namibian Electricity Sector Been Restructured?
Traditionally NamPower has been in charge of the generation, transmission and distribution of electricity as a bulk supplier. Both political and economic global transformations in the power sector have resulted in changes that underline technological progress as well as financial imperatives. The need for NamPower to reposition itself to face up to the competition has been further required by the introduction of the Energy Act in 2000 (ESI, 2002). The current structure of the Power sector in Namibia is shown in Figure 4.1.

![Figure 4.1: Structure of the Power Sector in Namibia](Source: ESMAP (2005)).
The vertically integrated company must give other groups of actors in the electricity sector a chance to enter the market and create competition and price competitiveness to the benefit of the end-consumer by ring-fencing the activities of its core business. NamPower has become a commercially stronger, technically and technologically more innovative, and customer-oriented company by the transformation period. As part of the new structure, NamPower will consist of regulated and non-regulated business units. The power utility will be separated in four regulated business units, generation, transmission, distribution and single buyer (ESI, 2002). The non-regulated business includes the support services essential in driving the company forward. NamPower Investment will be another commercial division with the purpose of strengthening the assets of the company through energy related industries and activities beyond Namibia’s borders. NamPower board of directors has elected Premier Electric as the distribution entity, with focus on the maintenance and operation of the distribution (Namibian Economist, 2001).

4.2.2 Have the Mozambican Electricity Sector Been Restructured?

The sector has been characterized by centrally planned, state owned and operated monopolies but in 1995 EDM was transformed from a state body into a public enterprise. The introduction of the electricity law has opened the electricity market to competition both on the generation, transmission and distribution. EDM still remains a quasi-monopolist in both transmission and distribution even though some new actors have entered the sector. The transformation of EDM into Public enterprise has required the company to concentrate more on its financial performance which in 1998 resulted in an operating surplus for the first time (Sida, 2001). The structure of the Mozambican power sector is shown in Figure 4.2.

Vertical unbundling of EDM’s generation, transmission and distribution businesses and concession of EDM’s distribution operations to the private sector is one reform steps that are a part of ERAP (NVE, 2004). EDM is at the moment in the process of forming autonomous business centers. The different business units will have responsibility for their own operations and economic results and their performance will be evaluated through special Key Performance Indicators that compare the outcome to the budgets. Generation, transmission, distribution and customer administration/commercialization is the central business activities included in an electricity utility. Another part of increasing importance in a market in transition and increase regional trading is the market operator who works as a single buyer of
energy for resell to commercialization. Regulations or laws separate these different industry entities into separate legal units in a restructured market (EDM, 2004).

Figure 4.2: Structure of the Power Sector in Mozambique


4.2.3 Comparing the Namibian and Mozambican Restructuring of the Electricity Sector
Both Namibia and Mozambique have commenced the restructuring of the electricity sector and NamPower and EDM and are separating the generation from transmission and distribution and unbundling of the vertically integrated utility. It can be assumed that both NamPower and EDM and maybe other actors as well might have had vested interested against the restructuring since the companies have been the dominant actors in the respective country. It is not clear if the unbundling have started in the distribution business in Mozambique have started in the distribution side. In Namibia the restructuring seem to have concentrated on the reorganization of the distribution part of the electricity sector. Distribution is, however, in both Namibia and Mozambique becoming separated business units.

4.3 Separating and Regulating the Electricity Distribution

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4 ZESA – Zimbabwe Electricity Supply Authority, Zimbabwean electricity supply company. ESKOM - Electricity Supply Commission, South African electricity supply company. SAPP-Southern African Power Pool. MoTraCO – Mozambique Transmission Company, joint venture between EDM, ESKOM and SEB (Electricity Board of Swaziland), owns and manages the transmission system for the MOZAL aluminium smelter.
4.3.1 What Changes Have Been Made in the Distribution Side in Namibia?

The reforms in Namibia have primarily focused on the reorganization of the distribution sector, which has been short of both resources and capacity to deliver and extend satisfactory service levels. NamPower, the national public utility, has the main responsibility for electricity generation, transmission, import, export, and directly supplies large customers. Until lately the Ministry of Regional and Local Government and Housing (MRLGH) were in charge for distribution to rural villages. The local authorities were in general in charge of distribution in the capital city and towns. The distribution is since the implementation of the government's decentralization policy being relocated to the regional councils and in progress to be run by REDs. Because of poor progress with electrification program of the MRLGH and unsustainable financial losses, the government invited the private sector to operate the existing distribution systems under an interim period in the central northern regions (ESMAP, 2005).

The distribution restructuring project began in 1996. Northern Electricity, a private company, was contracted to operate the existing distribution infrastructure in the north of the country. The company was responsible for all other costs and revenues associated with the business but did not own any of the assets. Northern Electricity conducted a complete meter audit and signed new supply contracts with all customers. The contracts documented the parties' rights and obligations, all meters were sealed and consequently payment rates of 99 percent were achieved. With funding assistance from the government Northern Electricity tried to improve the power system reliability and strengthened and upgraded the major urban networks. To ensure system reliability a five year network development plan and a preventive maintenance program was implemented. The company’s limited contractual obligation for electrification consisted mainly of extending existing networks and connecting new customers and the company was also responsible for facilitating the rural electrification program. The experiment with the Northern Electricity ended in spite of obvious success in 2002. This was a consequence of pressure from NamPower, the MRLGH, and local authorities in their try to extend their influence over a more and more profitable and productive activity. The goal of the government was in addition to ring-fencing the municipal electricity business to establish REDs. NORED took over from Northern Electricity as the first RED and was a company formed by NamPower and northern local authorities and regional councils (Ibid.).
The main recommendation from the Namibian Electricity Supply Industry restructuring study was the establishment of REDs. With a RED means an asset-based company, which within a large geographic area, is directly responsible for distribution and supply of electricity to customers. All the previous individual distributors are shareholders and the shareholding is decided by the average amount of unit sales and the depreciated replacement asset value. There are five planned REDs in Namibia, namely Northern Regional Electricity Distribution Company (NORED), Central Northern Regional Distribution Company (CENORED), Erongo RED, Central RED & Southern RED (ECB, 2006). Although the REDs policy promotes the commercialization of electricity supply utilities, the government expects the new entities to be public rather than private within the current political framework. The private sector will rather than through equity capital, participate through outsourcing (ESMAP, 2005).

Premier Electric will serve as the distribution entity of NamPower, giving better efficiency and focus in the distribution industry and the operation and maintenance thereof. NamPower will not have a dominant part in the distribution business but will through teamwork and support of government and REDs help the Premier Electric’s development of the industry (ESI, 2002) NamPower is entirely supportive of the idea of REDs. As a major partner with the MME and ECB in the implementation, the company is prepared to eventually shift the focus of Premier Electric if required for the establishment of the RED's (NamPower, 2006). The NORED, CENORED and Erongo RED are established and operational while establishment and operationalization of the Central and Southern RED are planned to be completed by July 2006. The management of the establishment and operationalization of the REDs was in 2004 outsourced by the MME to the ECB (ECB, 2006).

There were earlier no regulatory system in place that controlled the electricity tariffs in Namibia. Large price differences were a result as every municipality was allowed to set its own tariffs and some municipalities made surplus revenues from supply of electricity to the end consumers. Since the national grid is not connected to several rural areas small centers and institutions, like schools and clinics are supplied by the government with diesel generators for electricity. The price of diesel generated electricity has been subsidized as it is substantially more expensive than electricity from the grid. Not to discriminate between consumers from different areas has been the reason for this subsidy (Van der Linden, 1993).
SWAWEK was to a large extent functioning as a self-regulated public utility and consultations between SWAWEK and its nominal regulator the MME took place on an informal basis. Changes in tariff were proposed by SWAWEK to meet its perceived financial requirements and the proposals seem to have been approved with little or no alteration in most cases. This was due to the fact that there appeared to be no publicly accepted criteria for tariffs and the technical capability of MME was limited. The level of tariffs has been quite low and was neither related to criteria of long run marginal costs nor return on revalued assets. The tariffs for end consumers were considerably higher and generally included a monthly charge as well as a unit charge per kWh. Because of managerial and technical inefficiencies in the distribution, and the fact that some distributors regarded electricity as a revenue source for supporting other activities of their responsibility, the consumer tariffs were significantly above bulk prices (ESMAP, 1993).

The existing retail tariffs vary across distributors although ECB has established a standard methodology for setting tariffs (ESMAP, 2005). The tariff for bulk sales and final consumers do not reflect the structure of Namibia's hydro-thermal power supply costs. Both consumers and suppliers are for that reason not accommodating their supply and consumption decisions to real economic costs, which mean the use of resources are sub-optimal. The cost of connection was built in to the retail tariff and the pre-payment meter also helps consumers to avoid using more electricity than they can afford. By visually showing the pace that they are using what they paid for also help them economize on electricity costs. For distributors does the prepaid meters mean the advantage of eliminating unpaid bills, meter reading, billing and collection costs (ESMAP, 1993).

According to the Electricity Act from 2000 the charge must be in accordance with the tariffs specified in the license. The electricity prices have been low by both international and South African standards, especially for large mining and industrial users, and the financial viability of the distribution industry has not been clear. Distribution of electricity to rural areas is to a large extent not financially viable because of low consumption levels, high operating cost and insufficient management capacity. The fact that prices are not reflecting cost has a negative effect on the efficiency of the sector and economic resource allocation. The absence of a national pricing framework is an obstacle to improved efficiency and prices for final customers vary widely, both between rural and urban areas and between and throughout the
country. Significant subsidies and cross-subsidies exist and the price levels and structures have not been consistent with the supply cost for different areas and customer groups. Future tariffs also need to deal with the conflict between strictly economic costs and the need for cross subsidies for access of electricity to low income customers. The fact that prices are not market related and that future tariff are uncertain hold back social and economic development and needed investments in the electricity sector (MME, 1998). According to the draft energy policy should the future tariffs be based on the long-run marginal cost:

*Electricity tariff structures and prices will be based on sound economic principles, generally reflecting the long-run marginal cost of electricity consumers*

A ‘National Electricity Tariffs Study’ with the intention of developing a transparent and cost effective electricity tariff methodology has been commissioned by the ECB. Harmonization of tariffs charged by distributors for final users from various regions of the country has been the focus of the study. The recommendations of the tariff study was that distributors should be regulated based on their requirements of revenue, including a return on assets used in supply and distribution. The ECB should annually set the revenue requirements and determine the tariff level (Namibian Economist, 2001).

The large numbers of distributors used to lead to several numbers of tariffs which were often not cost-reflective. This led to efficiency losses as well as large variations in quality of supply and service. A RED feasibility study from 2003 showed that current electricity prices need to be raised to cost reflective levels in real terms. The ECB which regulates electricity prices will permit gradual tariff increases over the next years since the situation is not sustainable. This will slow but sure move in the direction of cost-reflective price levels. It is inevitable to let Namibian electricity prices increase more than inflation over the next years for the sector to be commercially viable in the long run. The establishment of REDs should not be blamed for future increases in electricity price; the REDs will in fact contribute significantly towards minimizing future price increases (ECB, 2006).

### 4.3.2 What Changes Have Been Made in the Distribution Side in Mozambique?

The dominant electricity distributor in Mozambique is EDM which is also owned by the State of Mozambique. While the electricity law has opened up for competition in the electricity
market also in the distribution side, EDM still remains a quasi-monopolist in distribution (Sida, 2001). Isolated distribution systems are only in really special cases an option to the distribution of EDM. Distribution of electricity is more or less completely performed by EDM. The area around Maputo is dominating in electricity distribution although other regions are closing in with the growth of the system. Even though EDM has recently set up a functional organization, the distribution industry is in fact in general organized as one and connected to the local technical resources that manage and operate stations and power lines, this especially outside Maputo. The geographically developed organization rather than a functional one is rather expected when considering the enormous distances, the relatively low electrification level and the wish of EDM for local presence. This is also emphasized by the variation in size between the regions. The electricity that is distributed in the Maputo area is more than three times bigger than in the Central area and the central area is in its turn twice as big as the one of the North & Tete area. The government aims to enhance the chances for economic development by supplying electricity to as many people as possible. This means in reality that of those that get connected many will not consume much energy. The electricity distribution cost of electricity is extremely sensitive to the scale aspect and the distribution to a larger customer can be significantly cheaper per kWh than the distribution of just a few kWh (EDM, 2004).

The power sector reforms will include guidance on transaction of EDM Distribution public-private partnership. In accordance with a consultancy report of restructuring of EDM and private participation, an internal task force made up of several stakeholders has advised private sector participation for the energy distribution and supply business of EDM. This recommendation was based on different factors. First, the present legislation, which does not permit private sector participation in the present vertically integrated utility but however in its subsidiary businesses. Second the reality that independent ownership and management already exist in generation and transmission, and third because the distribution holds the most important concerns responsible for poor performance in the industry (World Bank, 2003).

The initial assignment of CNELEC will be to deal with the difficult matter of tariffs and customer complaints associated with it. By letting a professional entity, rather than politicians, address the issues of tariff should give consumers and investors confidence. Any regulatory agency should have confidence building and trust as the prime center of attention. The combination of focus on revenue collection and setting of retail tariffs should make
possible for actors to achieve the electrification targets set by the government (ESI, 2005). The Mozambican electricity law from 1997 specifies fair and reasonable tariffs as:

\[
\text{fixed in accordance with the following cumulative criteria:}\n\]
\[
a) \text{ensure the minimum possible cost to consumers and which is consistent with the quality of the service provided;}
\]
\[
b) \text{amortize over time the capital and operating costs; and provide an adequate return on the capital invested in the installation in question}
\]

In numerous small towns and rural centers participation is involvement in the electricity sector at present unattractive for the private sector. This unattractiveness is basically a result of low number of consumers and low demand, high cost per customer of service provision and low revenues from sale. Private sector participation is documented be more commercially attractive through:

- reducing the cost per customer connected by applying more appropriate, lower cost construction and management methods;
- increasing revenue through the use of cost-based and site or area specific tariffs;
- providing suppliers with performance-based capital subsidies; and
- employing "light" regulation;

The government will invite private participation in Greenfield operations, both national grid-based and isolated. Realizing that rural access expansion cannot be achieved without subsidies, the mechanism for providing transparent capital subsidies rural as well as peri-urban projects, which would otherwise not be commercially viable. By using cost based, regionally differentiated tariffs and offer up-front capital subsidies the main grid investment can be made commercially attractive. That way main grid electricity supply can be possible for selected areas. Only if electrification is found economically viable will the areas with lower population areas, outside rural centers be supplied. Such projects will for the most part be executed by EDM in the peri-urban areas and in the rural centers by the private sector. One part of the electrification strategy is to use competitive output-based subsidy award mechanisms for individual solar household systems. The outputs will be equivalent to the number of customers connected, which will be decided when given the concession and/or qualified installation. Financial analyses of the isolated grid schemes have shown that fully
commercial rural electrification is not realistic. The question of affordability can though be
dealt with by only subsidizing the capital cost and the results also implied that the capital subsidies must be above 50 percent for most of the schemes. The implementation of competitive output-based subsidy mechanisms will guarantee the subsidy awards transparency and involve the private sector more intensely in the selection and design of projects (World Bank, 2003).

There are a contradicting pressure between attaining commercially viability as soon as possible and development of the electricity sector. For example should connection fee be fully charged as a pre-condition to be hooked up from a commercial point of view, since all connection costs are largely at that time. At the same time can it be hard for households to be able to pay the whole connection cost at once. To be able to pay the connection charges for example over a year would make the payment easier to handle and consequently expand the household consumer market. One resolution for EDM could be to extend a loan to the households through the option to pay the connection charge as a part of the general bill over a year, with a market-based interest rate added on. A practical condition for this is of course that EDM’s billing and account system can handle the additional service at reasonable cost. A related matter is that EDM when disconnecting a customer does not charge a re-connection fee when the outstanding bill is paid. This way there is no penalty for non-payment and external consultants has repeatedly suggested that the real re-connecting cost and an additional penalty fee should be charged. This would probably however have a limiting effect on the household market (Sida, 2001). Pre paid services, which is advantageous to the sector’s development, is available at some places and the World Bank is on the way of financing a project to install a significant base of prepayment or fixed rate meters. The best choice for a small customer base may be the fixed rate meters since the considerable and costly support equipment for prepaid meters are avoided. A fixed rate meter works as a load limiter, with important difference that it is possible for the consumer to save energy for use in the future (ESI, 2005).

In order to make sure a viable operation it is important that tariff planning allow cost recovery for the investors and that actions for adjustment do not involve a complicated approval process. Although numerous studies have been done on tariffs there is still need for in-depth analysis as the sector is being vertically unbundled (World Bank, 2003). When applying a
cost reflective tariff policy it is not recommended to choose a uniform tariff system throughout the country in order to ensure increased public access to electricity and fast expansion of geographical coverage. Accordingly, transmission tariffs will be based on the real supply cost at the point of transfer will be established and a practice of non-discriminatory transit tariffs will be used to facilitate transactions between producers and distributors of energy. A transparent tariff system that reflects the cost of putting energy in place and a transparent system of cross subsidies will be established. The latter in without encouraging inefficiency and accordance with consumers rights (Mozambique Energy Strategy, 2000).

4.3.3 Comparing the Namibian and Mozambican Changes in the Distribution Side

Namibia has had the focus on the distribution in their restructuring of the sector. The distribution used to be the responsibility of the MRLGH and the local authorities but is now organized through a solution where the REDs are handling the distribution. Even though the idea with RED is to let private interest take part in the distribution through commercialization will the new entities that are on the way be public rather than private. The private sector will possibly be able to participate through outsourcing rather than through equity capital.

The private company Northern Electricity showed an example of a public-private partnership that was favorable to both the government and end-users. The Northern Electric improved the troubles with the non-collection and disconnection and at the same time improved reliability and access. The ending of the company however shows the political influences on sector policy works. There was pressure from NamPower, the MRLGH and the local authorities as a try for them to extend their influence on the more productive and profitable activity (ESMAP, 2005). The establishment of REDs will lead to advantages and the main ones can be summarized as follows:

- Lower electricity prices to the electricity consumer from economies of scale.
- Reductions in cost from the pooling of human, operational and capital resources.
- Better focus to meet the current, significant distribution challenges from specializing in only electricity distribution (ECB, 2006).

Because of these advantages the public-private partnerships of REDs will have a better situation than the earlier fragmented EDI players to deal with the problems in the distribution
industry. In the long term the REDs have better possibilities to bring quality, uniformity, viability and sustainability to the electricity distribution industry. One challenge the establishment of the REDs is facing is to make sure that the Local Authorities does not lose revenue streams that they had earlier from using electricity sales to subsidize other commercially non-viable services. There is a need for special legal and contractual arrangements to prevent this and such arrangements are being prepared. Another challenge for the establishment of the REDs is that considerable capitalization funds are necessary to make sure effective operations of the RED. In March 2005 the ECB held a successful workshop that investigated funding sources for the capitalization of the REDs. Because of legal obstacles to the establishment of REDs there is a need for the Electricity Act, the Local Authorities Act and the Regional Councils Act to solve this problem and improve the legislation to guarantee the legality of REDs (Ibid.). There might be a risk with the fact that Premier Electric is an entity of NamPower. The future will show if the regulation and legal basis is good enough for preventing discrimination in the distribution sector. The NamPower have although shown support of the REDs solution and their willingness to change focus of the Premier Electric if needed for the establishment of REDs.

In Mozambique the development in distribution has been more modest. The Electricity law has opened up for competition although the distribution is however still a quasi-monopoly and mainly performed by EDM. The reform will include a public-private partnership between EDM and a private actor. The public-private partnership recommendations can however be hard to realize since the potential to find a private-public partnership solution for distribution are dark. To ring-fence the operation and to set aside the bulk of the cash flow to the operation business and to find a separate donor support for the larger part of the investments for some specific projects seems like the only realistic resolution (EDM, 2004). The different structure in the distribution side before reform can to some extent explain the different solutions the two countries have chosen for the restructuring of distribution. Namibia had fragmented structure where the distribution was run by local authorities while in Mozambique the distribution was the responsibility of EDM.

Both the Namibian and Mozambican governments is working in the direction for developing more cost reflective tariffs and consequently improve the viability of the activities in the sector. The gradual tariff increase has started and tariffs are becoming more cost reflective in
Namibia, the tariffs will however also in the future be set by ECB. Mozambique has made numerous studies about the tariffs but has not yet decided a methodology for how to set tariffs in the future as the sector is unbundled. The aim is to have a cost reflective tariff policy. The government is using subsidies as a way to get the rural electrification to be commercially viable. Weimann and Bunn (2004) mentions that countries that are rich on energy resources often have a higher level of subsidies. This might be the case in Mozambique and the risk is that this will slow down the reform pace. The balance between introducing cost reflective prices and subsidizing for social reasons are difficult, the need for improved access is large and will mean a larger customer base in the long run. The subsidies can hamper the reform process at the same time as it is needed for rural development. Non-collection is to some extent decreased with the installation of pre-paid meters and there have been recommendations of distribute the connection fee over time and introduce re-connection charges.

4.4 Separating and Regulating the Electricity Transmission

4.4.1 What Changes Have Been Made in the Transmission Side in Namibia?

Namibia is currently getting all its electricity through the national power utility NamPower. In addition a few big consumers have direct contracts with the South African electricity supply company Eskom. The electricity from Eskom to these big consumers is still relying on the infrastructure of NamPower and their transmission of the electricity to the customers who require it. The planed implementation of the single buyer structure in the electricity sector in Namibia will encourage competition in the generation while NamPower will continue to carry out the transmission of the electricity and distribution will be the responsibility of the five REDs (Namibian Economist, 2001). The Electricity Act from 2000 states that everyone with a license to perform electricity activities should have access to the electricity transmission net. The main principles for transmission prices are that the owner of the transmission system should get a regulated return on the provision of the transmission services. By this it is made sure that other users are not cross-subsidizing the use of the system. The transmission charge should also include the capacity component of the price structure; the risk of surplus capacity during periods of low demand should be taken into account in the price (SAD-ELEC, 2000).
4.4.2 What Changes Have Been Made in the Transmission Side in Mozambique?
The Mozambican main electricity authority EDM is responsible for transmission in Mozambique, and currently owns and manages the national transmission system. The electricity market was opened up for competition with the electricity law regarding the transmission side as well, and EDM is obligated by the law to offer access to the national grid. Even though a few new actors have entered the industry, in transmission EDM is still a quasi-monopolist (Sida, 2001). The power sector reform will, among other things, contain transaction assistance in the establishment of a publicly owned separate transmission corporate entity, which will provide transmission assets and perform system operation. The separation of the transmission activities from other engineering functions has already begun by the government. A proper legal and operational establishment of a completely efficient public owned body has commenced and will possibly have an interim function as single buyer (World Bank, 2003).

In reality independent ownership/management is already involved in the transmission of electricity in Mozambique, free market actors in point of fact exist. These actors have been granted access to the transmission lines according to the principle of negotiated third party access. From a market terminological point of view, Mozambique has actually accepted third party access as a principle in transmission. This third party access is however done as a case by case rule and not as a general rule; the solution established is negotiated third party access. After a negotiation of the terms for transmission of the electricity, a small number of Mega producers or Mega consumers have been given the permission to transmit power over their own power lines or power lines owned by EDM. This confirms the first steps of the transition to a liberalized market when considering the matter from an institutional point of view. In addition the electricity law that regulates the conditions for private actors applying for concession rights for power lines, power stations or an area, further enforces this statement (EDM, 2004).

4.4.3 Comparing the Namibian and Mozambican Changes in the Transmission Side
The reform has not concerned the transmission in a large extent and there has not been much done in the transmission side in neither Namibia nor Mozambique. NamPower is and will in the near future continue to be the company responsible for transmission of the electricity without any competition. The access to the grid is clearly stated and NamPower are obligated
to allow access to the grid. In Mozambique the transmission is open for competition and EDM are obligated to offer access to grid by the law from 1997 although EDM still works as a quasi-monopolist. The electricity law from 1997 is clearly stating the rules for access to network and that proper charges should be established upon concession. Even though the transmission side is not fully unbundled, the offering of access to the grid can help prevent discrimination and hindrance of new entries in generation. As a part of the restructuring will the transmission activity of NamPower and EDM be part of the regulated business units of the power utilities. There do not seem to be any over dimensioning of the transmission grid in either of the two countries. Since the cost of underdeveloped transmission systems is high the importance of extending the grid seems to be high.

4.5 Separating and Regulating the Electricity Generation

4.5.1 What Changes Have Been Made in the Generation Side in Namibia?

Namibia’s dependence on foreign resources of electricity has been one of the drivers for the energy reforms. To attract independent power producers, parts of the reform in Namibia have concentrated on the establishment of a single buyer market. Consequently, the government has tried to produce an industry model that will contribute to attract new investment into the generation side and a single buyer model has been approved by the cabinet with the intention to give a ground for new investors (ESMAP, 2005). The MME has proposed the opening of the sector for competition to take place in three stages. The first stage would apply the single buyer structure for the sector, which will promote competition through purchasing all generated electricity and thereby encourage competition at the generation level. The second stage is supposed to make big customers buy electricity in bulk through a wholesale market structure, directly from the generators. The third and final stage means the creation of a retail market structure through which only market forces will be at play (Namibian Economist, 2001).

By a cabinet resolution in 2001 NamPower was given the single buyer role for an intermediary phase intended to lead to complete market development. A market framework founded on clear rules, planning codes and electricity generation is developing through the single buyer market structure. Particular concern is set to regulate the buying power of future IPPs as well as NamPower's pricing for internal transfer (ESMAP, 2005).
4.5.2 What Changes Have Been Made in the Generation Side in Mozambique?
Investments in generation throughout the last years have been constrained and most investments have gone to the transmission and distribution side. Since the financial pressure on investments in distribution is huge, the EDM investments in generation are recommended to be avoided or at least very selective. When considering the requests for an enhanced rate of electrification it is apparent that the financial limitation makes it impossible for EDM to take on new investments in generation. The Mozambican government wants to make use of the generation capacity in the country to the benefit of further electrification and economic development. A problem to achieve this is the constrained domestic financial resources and foreign investors are encouraged to take part in the generation side. For Greenfield generation projects, and in particular for larger projects, financing is dependent on private actors and commercial loans. First and foremost the development in the generation side could be made through various types of private partnership. Concession based financing might be a possibility in particular for small and medium scale plants with a need for rehabilitation. Some alternatives for generation to, through concessionary contracts, engage private partners seem to be a realistic alternative and can thereby be an option to get financial resources to the electrification. The Mozambican government is considering a single buyer model with whole competition but has yet not taken any considerable steps in that direction (EDM, 2004).

4.5.3 Comparing Namibian and Mozambican Changes in the Generation Side
Namibia is focusing a large part of the reform on establishing a whole sale market for electricity. As a first step to attract IPPs has the Namibian government started with establishing a single buyer market. A possible conflict of interest was created by placing the single buyer function within NamPower. Since the corporation is one of the power generators, it could potentially take advantage of its monopoly position for that reason. In the absence of other actors with sufficiently strong balance sheet to underwrite single buyer contractual agreements, it was decided that the best possible alternative was offered by NamPower (ESMAP, 2005). Mozambique is also considering a wholesale market through a single buyer model although no decision is taken so far. To avoid an incumbent with dominant position in the generation side seem to be hard considering HCB strong position in Mozambique. Considering the generation situation in Mozambique, an essential part of the energy sector can consequently be characterized as one of the most deregulated in the region.
This is by far dominant if measured by installed capacity and investment capital (EDM, 2004).

4.6 Privatization in the Electricity Sector
The Namibian government has so far chosen not to privatize the distribution and transmission side of the electricity sector. Privatization is not an indispensable part of the reform and Namibia’s reform process can continue without any further privatization. The generation side is however opened up for private actors through the wholesale market with the intention to attract IPPs. Mozambique has allowed private participation in all parts of the sector by the Electricity Law. In reality, however, are the private participation very limited and the EDM are still more or less working as a monopolist. The private participants are given third part access through concessions and this is decided on a case to case basis.

4.7 Institutions and Social Aspects

4.7.1 What Part Have Institutions and Social Aspects Had in the Namibian Electricity Reform?
The time before independence was the electricity sector institutions in Namibia assumingly structured in accordance with South African interests, for the oppressor to easier exploit the countries resources. The apartheid system influenced the sector and was consequently integrated in the society. External factors like pressure from other countries led to the independence; in the end was the transaction cost for continued occupation seen as higher than the benefits of maintaining the situation by the South African administration. The political structure and the supervising authority was changed by the independence and lead to new objectives founded on democratic principles. However was not interest groups changed as quickly and the new situation was apparently influenced and also hampered by the inheritance from the former South African oppression. The sector was still run by pre-independence legislation for the sector the first years of independence and there most likely existed groups that attempted to hinder the process of change (Sundqvist, 1998).

At independence the democratic principles were stated in the constitution of independence and a new government was established in harmony with the democratic principles. A new MME was formed in the electricity sector with focus on optimizing, regulating and facilitating generation, transmission and distribution throughout the country. MME should
also examine and promote the use of alternative energy sources. The new strategy was to reduce dependence on external sources of energy and to stimulate the development of a domestic electricity structure. The electricity utility NamPower, or SWAWEK as it was named then, was still working as the previous administration in many ways. It was a residue element from the apartheid administration, principally intended to serve the white population, the South African authorities and the mining companies. The transition was gradual and finally resulted in a “new” NamPower, which was a company with a new profile that took active part in rural electrification whenever economically justifiable. The MME is the normative institution in the Namibian electricity sector. At independence were MME’s possibilities to govern the energy sector hindered by the difficulties to get experienced staff, and one important subject has been to improve the competence of the MME. The slow change in the sector can somewhat be explained by the shortage of competence at the MME. The strengthening of competence was also important in order to get more influence in the policy making process which has been dominated by NamPower (Ibid.).

Under the South African administration the rural electrification and better service was not found economical but it is now an important part of the government’s policy. The aim is to extend the electricity grid into the rural areas, which are populated by the vast majority of Namibia’s population and fairly much has been done with expanding the electricity grid. The rural electrification is a vital part in the new institutional structure and will reduce past economic imbalances, improve citizen’s socio-economic conditions and create incentives for economic development in regions of the country where it is most needed. Rural centers that were previously supplied by isolated diesel generators has been the main aim for the electrification and government facilities such as schools and hospitals has been given priority (Ibid.). The extension of the grid to more remote areas is an essential part in the government's policy to restore the long neglect of those regions under the previous administration and directly assisting Namibia’s rural poor. The direct social benefits are probable going to be limited. Since electricity is already supplied to the government facilities there will be no change in their functioning, but they will benefit from more reliable supply and substantial cost savings. Although there is a high connection rate in the electrified areas the number of domestic connection is likely to be low. The number of supplied households will unavoidably be small in proportion to the total population of the region (ESMAP, 1993).
The urban access level is 75 percent and all of the country’s 17 municipalities and 19 towns are connected to the grid. The access level for rural areas are however much lower at 12 percent and the national aggregate electrification level is about 34 percent. Targets for 2010 have been set by the government at 25 percent for rural areas and 95 percent for the urban areas. Today’s access levels are mainly the result of state-led efforts, the National Rural Electrification Program was launched shortly after independence in 1991. The largest of all efforts has been the rural electrification program, which is supported by the MME. Electrification funding came at the beginning primarily from donors, with the balance being made up by government subsidies. Today is the program nearly completely funded by allocations from the government, with a 100 percent capital subsidy provided to cover transmission infrastructure, substations, supply feeders, distribution networks, and customer connections. A pre fabricated panel that allows lightning and use of electrical device without house wiring are also provided to poor customers. Pre-paid meters have also improved the services (ESMAP, 2005).

Most of the public investment in rural electrification has been in grid extension and just a small part has been invested in other technologies. The government does expect that off-grid technologies like solar home systems will constitute a larger part in electrification as population densities decrease further, settlements become even smaller, and distance to the existing grid increase. Until 2000 when the Rural Electricity Distribution Master Plan (REDMP) proposed a more systematic approach the electrification planning was rather ad hoc. The master plan make possible the objective prioritization of electrification projects on the basis of cost and social benefit, and it integrates both grid and off-grid electrification options, instead of just a technocratic analysis. During the reform period has the access increased and particularly in the rural areas where the majority of the population lives have the rates increased. Between 1997 and 2000 did the access for rural households increase from 8-9 percent to 12 percent. The access rate for urban areas has been steadier at 75 percent but because of a fast growth of urban populations, there has been considerable electrification activity there as well (Ibid.).

Renewable energy resources can be a complement for electrification of rural areas since grid electrification can not reach regions of the large and sparsely populated country. Conventional electrification can sometimes become too expensive and impractical and renewable sources of
energy, particularly solar power, can be an option in rural electrification (Sundqvist, 1998). A UNDP-GEF initiative projects the installation of about 6,800 solar home systems over a five-year period, which would increase the percentage of electrified rural households with another 3.3 percent (ESMAP, 2005). The renewable energy sector in Namibia seems to have extraordinarily strong position and both photovoltaic and wind are well developed. The private sector is competent and active and should go on to playing the major role in renewable energy development, but at the same time facilitated by government support (ESMAP, 1993).

4.7.2 What Part Have Institutions and Social Aspects Had in the Mozambican Electricity Reform?
Mozambique was a Portuguese colony until 1975 and the electricity sector was till then mostly concentrated around Maputo and the other regions that were strategic for the Portuguese regime. The time before independence was characterized with civil war for independence and a few years after independence started the civil war between the government party and the resistance movement that lasted until 1992. During the civil war a lot of infrastructure was destroyed and no actual development of the electricity sector was possible (UD, 2001).

The government agency DNE was, as apart of The Ministry of Industry and Commerce, established in 1976. In 1985 it was re-established in the Ministry of Industry and Energy. After the first free elections in 1994 was the responsibility for the electricity sector transferred to the Ministry of Mineral Resources and Energy (MIREME) which was already responsible for coal and hydrocarbons (Sida, 1996). From 2005 the MIREME was divided into the Ministry of Mineral resources and the ME (Bacela, 2005). DNE is the institution for overall coordination as well as evaluation and monitoring. It is in charge for matter like policy formulation and implementation, project definition and promotion, initiation and formulation of regulations and energy planning, management and conservation (Sida, 2001).

Because of low level of investment after independence and sabotage of existing installations, the geographical coverage was extremely limited after the civil war. The reliability was low and the distribution system was seriously overloaded and the access in urban households was only about 23 percent (Foley, 1993). The national electricity utility EDM was established in 1977 to take over a range of electric power utilities that were existing. EDM has had a monopoly role and more or less still has although the Electricity Law from 1997 opens up the
sector for competition under licensing (Sida, 1996). EDM has been responsible for the electricity supply at a national level and was also responsible for rural electrification. Many areas were supplied by off-grid diesel generators at independence but difficulties with spare parts, fuel supplies led to increasingly unreliable supply, often restricted to a few hours per day. As a result has priority been given to the search for alternatives to supply these remote areas (Foley, 1993).

As a result of the Electricity Law National Electricity Fund (FUNAE) was established as an administrative and autonomous institution with the mission to assist in rural electrification to low-income groups to low-cost energy. FUNAE should also promote conservation and a rational and sustainable management of energy sources and will be financed through fees, licenses and concessions (Sida, 2001). To strengthen the institutions under the Ministry there are intentions to further define their responsibilities and suitable coordination mechanisms (World Bank, 2003). New and renewable energy sources are promoted by the government and in particularly solar and wind power since these are most economically viable in rural areas. They are well suited for the scattered pattern of population distribution at the same time as they have a positive environmental impact and help reduce dependency on imported energy products. Private sector and civil society in general are encouraged to get involved in spreading renewable energy solutions (Mozambique Energy Policy).

The total electricity access rate in Mozambique is 6 percent and half of them live in the capital Maputo with surrounding areas. In the rural areas is the access minimal and there has more or less not been any increase in the last 25 years. All the provincial capitals and most of the other 20 or so municipalities are connected to the national grid or isolated diesel-based grids. Of the around 120 “district capitals” are over 50 of them lacking any form of public electricity supply or have sporadic supplies from small diesel-fueled generating sets. Even in these areas the reliability of supply is low and the access rate is only 15-20 percent. The implicit cross-subsidies are grave and the pace of access expansion of main grid is slow. Between 1996 and 2000 only 30 000 new customers were connected (World Bank, 2003). The access rate is actually foreseen to decrease since the population increase faster than the number of electricity connections (World Bank, 2005). The main reasons for the slow pace are the high electrification cost and lack of periodic tariff adjustments in combination with the national utility EDM’s inadequate performance and difficulties to raise the funds required to
connection. The government plan on combining the traditional grid expansion with technical and institutional changes that lower the costs of service, enhance affordability, employ performance-oriented subsidies, and bring in competitive participation by the private sector in order to expand electricity access and improve the quality of supply. A rural electrification plan has been designed to enable several district capitals to be supplied from the national grid. Financial support is provided by various funding agencies and the work will include both systems expansion and reinforcement (World Bank, 2003).

4.7.3 Comparing Institutional and Social Aspects of Reforms in Namibia and Mozambique
The Namibian history with a large influence from South Africa can to a large extent have affected the reform of the electricity sector. The lack of experienced personnel has probably slowed down the restructuring. The sector has also been dominated by a big electricity utility that can be assumed to have some interests against the reforms. In Mozambique, the war between the government and the resistant party can have caused political disagreements even after the peace agreement. The network was non-existing or in bad shape in many parts of the country because the Portuguese had seen only to their own interests when electrifying, there was few investments after independence and because the civil war destroyed existing installations. EDM can to some extent be assumed to have had interests against the restructuring since they have been the dominant firm Mozambican electricity sector.

The pace of the electrification in Namibia has been slow and as a result a rural development plan has been developed. The electrification has increased especially in rural areas and the aspiration is that the electrification will improve faster. Renewable sources for electricity are supported by the government as especially solar energy might be a good complement in the rural electrification with low population. Grid electrification can become too expensive and therefore not reach some regions. There have also been measures to improve the non-collection and disconnection and a step in that direction is the installments of pre-paid meters. FUNAE is the rural electrification authority in Mozambique and is meant to assist in the electrification of rural areas. The electricity access in Mozambique is very low and has more or less been at the same level for the 25 last years. A rural development plan has been designed and aims to supply several district capitals with electricity from the grid.
The future development in electricity sector of Namibia and Mozambique will to a large extent depend on the effectiveness of administration and policy-making. There is amongst others a need to rationalize the institutional structure, strengthen policy analysis and decision making capabilities. The ideal situation is that institutions should be independent and transparent and have expertise, accountability and credibility. Both countries have lacked experienced personnel which have probably slowed down the restructuring. Even though Mozambique’s legislation has gone far in some aspects the implementation and concrete results has although been relatively moderate due to limited institutional and human resource capacity. Consequently, both countries have a need to further capacity building.

Namibia seems to have gone further in its reforming process and the results are more obvious. In both countries consideration is given to the social aspects of the reforms and rural electrification and improved services seem to be a large part of their respective policy for the future. The social benefits of the improvements are anyhow most likely going to be limited. It is hard to say whether account has been taken to the actual situation in the country when considering the reforms. Both governments seem to be aware of the shortages that exist in their sectors and the need to change for better functioning electricity sectors in the future. The impacts of the reforms are both short and long term and they are long processes. It is important to see the reforms in a long time perspective since the steps taken today can give results in the future.
Chapter 5
CONCLUSION

Namibia and Mozambique have both more or less followed the main steps in the extended generic reform model at the same time as the two countries have had different ways of reform. Both countries have today new legislation for the electricity sectors and regulatory bodies are established. The regulators could however be improved since they do not have authority and do not function well enough to work as independent regulators. By introducing the new legislation Namibia and Mozambique have shown their commitment to implementing the reforms. It is however important that the legislation is renewed and improved when the need occurs as the reforms continue and the environment in the electricity sector changes continuously. The legislation was in both countries introduced relatively early as suggested in the generic reform model. The early introduction can be assumed to have had a positive affect on the reform processes.

Both Namibia and Mozambique are on the way to restructure and vertically unbundled their respective electricity sector to separate the generation from the transmission and distribution side. The generic reform model recommends that the restructuring should start in the distribution side which seems to be the case in Namibia that has been focusing on the restructuring of the distribution side. In Mozambique it is however unclear whether the restructuring has commences in the distribution side. Vested interests can be assumed to have occurred in both counties as NamPower and EDM have been the main actors in the electricity sector.

Namibia and Mozambique have both restructured the distribution side although they have chosen different reform solutions. Namibia has chosen to establish REDs that are responsible for the distribution while Mozambique have chosen to involve private participation through third party access based on concession. The different solution for restructuring in the distribution side can somewhat be explained by the different structure before reform. Namibia had a fragmented distribution where local authorities were responsible for distribution while in Mozambique distribution was run by EDM. Not much private participation in the
distribution side exists in neither of the countries. In Namibia the REDs will be public rather than private and in Mozambique EDM is still working as a monopolist although the law has opened up for competition. A public-private partnership is considered but it seems hard to find a way to realize these plans. Both countries are striving towards using methodology with cost reflecting tariffs to improve the viability in the sector. Namibia seems to have come further in this work while Mozambique has yet not decided a methodology for tariff setting. As the generic model advice for getting the best results, the tariff adjustments in Namibia have been introduced gradually. Both countries have subsidies even though Mozambique seems to have it to a larger extent. This might be explained by the country is rich on energy resources which often result in higher level of subsidies. The use of subsidies might slow down the pace of the reform process at the same time as improved access is necessary for a larger customer base in the long run. The balance between cost reflective prices and subsidies for social reasons is consequently not easy. Namibia and Mozambique are both trying to improve the non-collection and the installation of pre-paid meters is one part of this ambition.

Transmission activities are still the responsibility of the NamPower and EDM although the transmission is becoming a separated entity in both countries. The operators of the grid in both countries are obligated by law to offer access to the grid. This can prevent discrimination, harming of the competition and entry in generation since the integration between the generation and transmission part is not fully unbundled as of today. Over dimensioning in the electricity grid do not seem to be a fact in neither Namibia nor Mozambique. On the opposite the transmission system seems to be underdeveloped and the need to extend the grid is high and this is an important issue for further improvement in the access of electricity.

In both countries a wholesale market is considered in the generation side. Namibia have also here gone further in the development of the wholesale market than Mozambique that are still in the planning stadium. In Namibia the single buyer function is run by NamPower. Even though this can give a possible conflict of interests since NamPower is one of the electricity producers this was decided to be the best alternative in the absence of other suitable actors. Since HCB have an extraordinary strong position in Mozambique the issue with avoiding an incumbent seems hard to avoid.
Privatization is yet not a part of the reforms in neither of the countries. Namibia has opened up for competition in the generation side through the wholesale market and Mozambique has allowed private participation in all parts of the sector but is in reality still working as a monopolist. Since privatization is not a crucial part of the reform process this is not an issue for the outcome of the reforms.

The institutional situation in both countries can be assumed to have affected the reform process. The South African inheritance is still evident in Namibia and the Portuguese oppression and the civil war in Mozambique have affected the countries electricity reform processes in a negative way and have probably slowed it down. Namibia’s and Mozambique’s electricity sectors have also been dominated by a big electricity utility that can be assumed to have had some interests against the restructuring. The lack of experienced personnel after the independence was huge in both countries and the need for further capacity building is still evident. The effectiveness in administration and policy-making is important issues for the future development in the sector. Both governments seem to be aware of the shortages and the need of change for better functioning electricity sectors in the future.

Both Namibia and Mozambique have taken the social aspects in consideration in their reforms and improved access and services are an important part of their reforms. The pace of electrification has been slow in both countries and they both have developed plans to increase the electrification in rural areas. In rural areas renewable electricity sources are encouraged since it is a good alternative in areas with low population where grid electrification is too expensive.

The results of the reform process are more obvious in Namibia and the country seems to have come a bit further in the reform process than Mozambique. For the future it is important for both countries that the reforms are implemented with considerations taken to the actual situation in the country in question. It is also important to remember that reforms are a longtime process and it is hard to say what direction and outcome the reforms will take in the future.
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