

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/233022375>


# Moroccan independent power producers – African pioneers

**Article** *in* The Journal of North African Studies · March 2008  
DOI: 10.1080/13629380701642662

CITATIONS  
8

READS  
1,023

3 authors, including:



**Anton Eberhard**  
University of Cape Town  
108 PUBLICATIONS 1,609 CITATIONS

SEE PROFILE

## **Moroccan Independent Power Producers – African Pioneers**

Isaac Malgas, Katharine Nawaal Gratwick and Anton Eberhard

16 February 2006

Management Programme in Infrastructure Reform and Regulation  
Graduate School of Business  
University of Cape Town  
Breakwater Campus  
Private Bag  
Rondebosch 7701  
Cape Town, South Africa  
  
**[www.gsb.uct.ac.az/mir](http://www.gsb.uct.ac.az/mir)**

The Management Programme in Infrastructure Reform and Regulation (MIR), based at the University of Cape Town's Graduate School of Business (GSB) is a leading centre of excellence and expertise in Africa and other emerging and developing economies. It is committed to making a major contribution to enhancing understanding and capacity to manage the reform and regulation of the electricity, gas and telecommunications, water and transport industries in support of sustainable development.

#### **About the Authors**

Isaac Malgas is a part-time post-graduate student at the Management Programme for Infrastructure Reform and Regulation at the University of Cape Town's Graduate School of Business. He currently works as a Senior Engineer at Eskom in the Generation Division and has been in the employment of the utility, in various posts, for more than 12 years. He holds an M.Tech(Eng) from the Witwatersrand Technikon and an MBA from the University of Stellenbosch Business School.

Katharine Nawaal Gratwick, a senior researcher with the Management Programme for Infrastructure Reform and Regulation at the University of Cape Town's Graduate School of Business, leads the Programme's survey of Independent Power Projects (IPPs) throughout Africa, including detailed case studies in Egypt, Kenya, Morocco, Nigeria, Tanzania and Tunisia. Ms. Gratwick obtained her M.A. in International Energy Management and Policy from Columbia University in New York.

Professor Anton Eberhard directs the Management Programme in Infrastructure Reform and Regulation at the University of Cape Town's Graduate School of Business. He is a former Board Member of the National Electricity Regulator of South Africa. His research and teaching focuses on the restructuring and regulation of the electricity sector and linkages to sustainable development issues such as widened access to services, and investments in renewable energy and energy efficiency. He has worked in the energy sector for more than 20 years and was the founding Director of the Energy and Development Research Centre. Anton has more than 70 publications to his credit and has undertaken numerous assignments (both locally and abroad) for governments, utilities, regulatory authorities, and donor and multi-lateral agencies. Professor Eberhard has a PhD from the University of Edinburgh.

<b>Table of Contents</b>	
About the Authors.....	2
Table of Contents.....	3
Acronyms .....	4
Acknowledgements.....	5
Abstract.....	6
1. Introduction.....	7
1.1 Country reforms & privatization.....	8
2. The Moroccan Electricity Supply Industry.....	8
2.1 Background .....	8
2.2 Transmission and Distribution.....	10
3. Independent Power Producers: advent of change .....	11
3.1 Jorf Lasfar Energy Company .....	12
3.1.1 Project Overview .....	12
3.1.2 Financing the giant.....	13
3.1.3 PPA: 30 years of charges, tapering off .....	13
3.1.4 Fuelling the giant: JLEC's coal supply .....	13
3.2 Compagnie Eolienne de Detroit (CED) .....	14
3.2.1 Project Overview .....	14
3.2.2 Localizing: fuel and payments .....	15
3.3. Energie Electrique de Tahaddart (EET).....	15
3.3.1 Project Overview .....	15
3.3.2 Financing.....	16
4. Analysis of outcomes: how the success story came about.....	16
5. Country purview: the elements that shaped the outcomes.....	18
5.1 Investment climate: African oasis.....	18
5.2 IPP policy, planning, regulatory frameworks and a lot of good will.....	19
5.2.1 Precursor to planning .....	19
5.2.2 Central station: the ease of few actors .....	19
5.2.3 Good demand and good management.....	19
6. Project purview: the elements that shaped the outcomes.....	20
6.1 Good relations and good track records .....	20
6.2 Comprehensive contracts .....	20
6.1 JLEC revisited: size, fuel and cleaner energy .....	22
6.2 CED revisited: good advisors and good local components .....	22
6.3 EET revisited: a local revolution .....	23
7. Conclusion & next steps .....	24
Bibliography .....	26
Appendix I : Future Plants and Regulation of the Sector .....	28

## Acronyms

ABB	Asea Brown Boveri
BCP	Banque Centrale Populaire
BMCE	Banque Marocaine pour le Commerce Extérieure
BTO	Build-Transfer-Operate
CDM	Clean Development Mechanism
CED	Compagnie Eolienne de Detroit
CDER	Centre de Development d’Energie Renouvelable
CNCA	Caisse Nationale de Crédit Agricole
COD	Commercial Operating Date
EDF	Electricité de France
EEM	Energie Electrique du Maroc
EET	Energie Electrique de Tahaddart
ENDESA	Empresa Nacional de Electricidad S.A.
EPC	Engineering, Procurement and Construction
ESI	Electricity Supply Industry
EU	European Union
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
GWh	Gigawatt hour
ICB	International Competitive Bid
IPP	Independent Power Project / Producer
JLEC	Jorf Lasfar Energy Company
KfW	Kreditanstalt für Wiederaufbau
kV	kilovolt
kW	kilowatt
m/s	meters per second
MAD	Moroccan dirham
MW	Megawatt
O&M	Operating and Maintenance
ONE	Office Nationale de l’Electricité
PERG	Programme d’Electrification Rurale Global
PPA	Power Purchase Agreement
RfP	Request for Proposal
ROE	Return on Equity
SPV	Special Purpose Vehicle
TERNA	Technical Expertise for Renewable Energy Application
US	United States
VAT	Value Added Tax

**Acknowledgements**

The authors acknowledge generous support from the Norwegian Agency for Development Cooperation (Norad). The authors thank Erik Woodhouse, David Victor and Thomas Heller, for insights into the research methodology. This paper would not have been possible without the help of all the stakeholder representatives from Office Nationale de l'Electricité, Jorf Lasfar Energy Company, Compagnie Eolienne de Detroit, La Compagnie du Vent and Energie Electrique de Tahaddart who participated in interviews during the information gathering phase as well as in subsequent reviews of the work. Our sincere gratitude and appreciation is expressed to them as partners in the culmination of this research. Finally, the authors wish to thank the University of Cape Town's Graduate School of Business. Any omissions or errors are the responsibility of the authors.

**Abstract**

This paper tells the story of Morocco's three independent power projects (IPPs), which were developed between 1994 and 2005. The three projects are very different in nature. Through the first project, the country placed nearly two thirds of Morocco's electricity production in the hands of private producers, the Jorf Lasfar Energy Company (JLEC)--presently Africa's largest IPP. The second project, Compagnie Eolienne de Detroit (CED), brought about further diversification of the electricity production mix by harnessing Morocco's wind energy potential; CED is also a record setter in that it represents the first wind farm in Africa that is entirely privately financed. Energie Electrique de Tahaddart (EET), the third IPP, served to introduce the first combined cycle gas plant to Morocco, which is fuelled from the pipeline that delivers Algerian gas to Spain. Another outstanding feature of EET is that the majority of project financing was sourced from local Moroccan banks. Among the key elements that explain project successes is that the Moroccan dirham (MAD) has remained relatively stable in a low inflation environment since the inception of the contracts, and, in the case of EET, charges are significantly shielded from foreign currency risks.

## 1. Introduction

Prior to structural reforms in the Kingdom of Morocco, the country financed infrastructure investments, including electricity, mainly through concessionary loans from multilateral institutions. This financing practice, together with a series of currency devaluations, led Morocco into a spiral of debt.<sup>1</sup> Under the guidance of the World Bank and the International Monetary Fund, Morocco turned to project finance, as part of a broader structural adjustment programme, to procure much needed new electric generation capacity.

Morocco's forays into independent power projects (IPP) followed a trend across developing countries, which peaked at approximately US\$1.8 billion in 1997 for Africa.<sup>2</sup> With the exception to 2000, neither Africa nor other developing regions have seen private participation in greenfield electricity projects continue at the same rate, with causes attributed to the following. On the one hand private sector firms faced tougher markets at home (for example, the Enron collapse and its after-shocks) and had to reduce their risk exposure in emerging and developing country markets. On the other hand, multilateral and bilateral donors were reconsidering their position of restricted infrastructure investment. As multilateral and bilateral concessionary funding became available again, many countries once again pursued publicly funded projects, rather than their private sector counterparts. Although the current trend is back to state-led projects, capital is limited and demand is high. Therefore, it is doubtful that publicly funded plants will be able to meet all demands going forward. An examination of Morocco's IPPs in this context is therefore particularly important as projects have been noted for their success and therefore may hold wider lessons for the development of future IPPs.

The paper is structured into three parts. The first section provides a brief description of the electricity supply industry in Morocco and the reforms that have taken place to liberalise certain sectors of the economy. The second section describes the three independent power projects that have been supplying power to the national grid since power sector reform started and the contractual agreements that have been reached by the various stakeholders. The last section discusses some of the key elements that affected project outcomes.

The main objective of the paper is to analyse the development and investment outcomes, namely the extent to which affordable, reliable power was delivered and investors achieved expected returns and increased their market share, as well as the elements that contributed to outcomes. Embedded in this analysis is a discussion of what determined the outcomes--what did the host country do or not do to impact on more or less positive outcomes. To what extent, for example, did the investment climate impact on the results? Was the state of electricity sector reform a major contributing element? What about actions taken by the investors in terms of the equity and debt arrangements and the fuel supply agreement? How did each of these elements impact, if at all, project outcomes?

To address these and other questions, the authors adopted an inductive research approach, initially conducting structured literature searches, followed by a country visit and detailed interviews with key stakeholders.<sup>3</sup> The result of these efforts is the present study, which, in addition to

---

<sup>1</sup> In the mid 1980s, external debt exceeded the country's annual GDP, and much of the country's revenue went toward servicing this debt.

<sup>2</sup> Figures are based on the World Bank's Private Participation in Infrastructure (PPI) database, which records the level of projects with private participation that reached financial closure in the stated year.

<sup>3</sup> Interviews including written queries were conducted with 7 stakeholders throughout 2006 in Morocco. Interviews were followed by email correspondence to clarify discussion points. Stakeholder interviews included representatives from the Office Nationale de l'Electricité (ONE), Jorf Lasfar Energy Company (JLEC), Compagnie Eolienne de Detroit (CED), La Compagnie du Vent (a company established to perform maintenance on CED plant) and Energie Electrique de Tahaddart (EET).



documenting and analyzing the Moroccan IPP experience, contributes to a wider body of work, which seeks to analyze outcomes of IPP projects across the developing world.<sup>4</sup>

### **1.1 Country reforms & privatization**

Like many other developing countries in the 1980s and early 1990s, Morocco embarked on a structural adjustment programme under the guidance of the International Monetary Fund and the World Bank. The goal was to reduce debt and increase overall economic growth, primarily by limiting the state's involvement in the economy. Privatisation of existing state-owned enterprises featured prominently on the reform agenda, together with liberalization of foreign trade and tariffs, opening the economy up to new foreign investment and overhauling the country's fiscal system. In 1989, the requisite legislation was passed (law no.39-89) to allow the transfer of public assets to the private sector, with the aim of raising money to pay off government loans, transferring skills and technology, and achieving efficiency gains.<sup>5</sup>

Private participation in the electricity supply industry therefore represented one component of this larger reform programme and included the following specific aims. Firstly, it was expected to free up government funds for other areas of social needs as well as aid in relieving the state's debt burden. The national utility could then focus on rolling out the necessary infrastructure to take power to rural areas where, as of 1994, only 17% of the population had access to electricity. Secondly, in conjunction with a broader liberalisation programme including tax reductions and efficiency improvements, it was anticipated that privatisation would decrease the cost of power thereby making the country as a whole more attractive to investors. This would in turn help facilitate the increasingly heavy investment programmes rolled out by government. Private participation in generation was seen as among the first steps in achieving these goals and hence independent power producers were introduced.<sup>6</sup>

## **2. The Moroccan Electricity Supply Industry**

### **2.1 Background**

Before Morocco's independence in March 1956 Energie Electrique du Maroc (EEM), a private limited liability company, maintained a monopoly over the country's electricity generation, transmission and distribution systems. After independence, the state took control of what was perceived to be a strategic economic sector and created, by decree 1-63-226 of 5 August 1963, the Office Nationale de l'Electricité (ONE). As of 2006, ONE is still a state-owned company, overseen by the Ministry of Energy and Mines, and until 1994, it was solely responsible for production, transmission and distribution of electricity in Morocco.<sup>7</sup>

At the time of Morocco's independence, there were ten hydroelectric plants (meeting roughly 90% of the country's demand), two coal-fired plants, and two oil-fired plants, which altogether

---

<sup>4</sup> The Program on Energy and Sustainable Development (PESD) at Stanford University has led a survey of IPPs across developing countries: <http://pesd.stanford.edu/ipps>. The Africa portion of the global study has been coordinated by the Management Programme for Infrastructure Reform and Regulation (MIR), based at the University of Cape Town's Graduate School of Business. Detailed case studies of IPP experiences in Egypt, Kenya, Morocco, Nigeria, Tanzania and Tunisia have been completed in 2005 and 2006, available at <http://www.gsb.uct.ac.za/gsbwebb/default.asp?intpagenr=309>. The Moroccan IPP evaluation forms part of this global study and was led by MIR researcher Isaac Malgas.

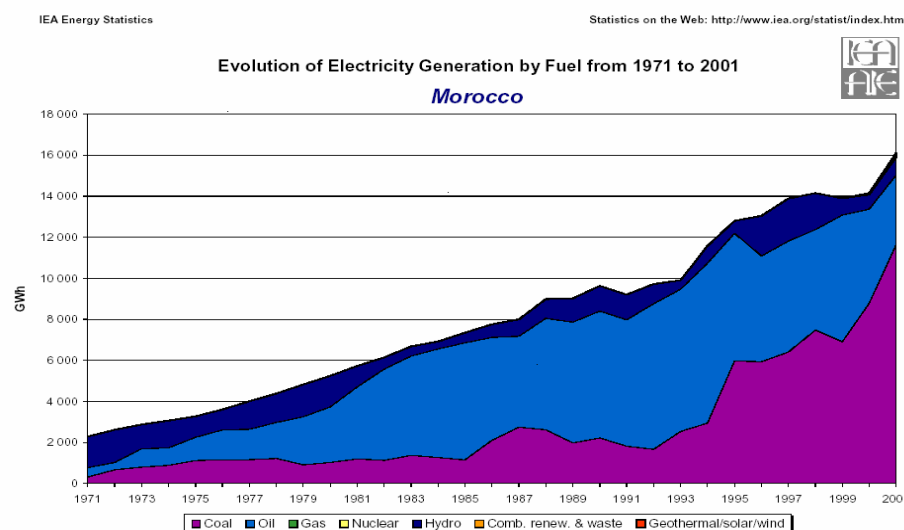
<sup>5</sup> Between 1993 and 2003, 66 of the 114 entities that were initially earmarked for privatisation were transferred to the private sector, which resulted in an additional MAD54 billion in income for the state [Ministry of Finance and Privatisation: 2004]. This translates into approximately US\$5.54billion based on an annualized averaged exchange rate using data from the World Bank African Development Indicators (2004, p.45).

<sup>6</sup> This information is based on interviews with various personnel at ONE.

<sup>7</sup> Private self-producers were allowed to generate provided their output remained below 300kW.

supplied approximately 90 GWh per year (ONE, 2003, p.23). With demand doubling approximately every ten years, these plants proved insufficient to meet the needs of industrial and domestic consumers. Additional plants were brought on line, however, with the country's hydro reserves largely exhausted, new capacity was thermal-based.<sup>8</sup> It should be noted that the country has virtually no indigenous coal, oil and gas reserves.<sup>9</sup>

Figure 1: Moroccan Electricity Generation by Fuel Source: 1971 to 2001.



Source: International Energy Agency

The Moroccan ESI functioned relatively well up until the early 1980s. At that time, droughts, an increase in demand and lack of financing began to strain the system. With a hydro-dominated system, the droughts of 1983-1985 and then again 1992-1993 required increased usage of thermal plants, this in turn led to an increase in incidences on these plants. In addition to outages, demand was growing at a rapid rate at the time, reaching around 8% growth in 1992 (Boutad, 2001, p.7). As a result, load shedding became common. With financing hard to come by, new power projects were delayed. Eventually, emergency gas turbines were ordered and installed for power generation, but not before the impact of the crisis had made a significant impact on the daily lives of most Moroccans.

The electricity crisis in the mid 1980s and early 1990s prompted policy makers to rethink Morocco's dependence on hydropower. Coal was considered among the best alternatives (at the time accounting for only 8% of production) to help diversify the production mix.<sup>10</sup>

<sup>8</sup> Although the 450MW Afourer pump storage scheme has been commissioned since, it has a net negative energy output.

<sup>9</sup> Although Morocco does possess oil and gas wells, generally speaking, the calorific value of the fuels or the quantities estimated are too low to make exploration economic. A number of foreign exploration companies (20+) have concessions and continue to search for oil and gas deposits both on and off shore. In 1998 Morocco's gas reserves were estimated at about 1.4 billion cubic meters (Bcm); proven oil reserves were recorded at approximately two million barrels, and, recoverable coal reserves were stated as six million tons (African Energy, 2005).

<sup>10</sup> Coal was sourced from the Jerada coal field in northeast Morocco, which was discovered in 1927 and put into production in 1932 by the local coal company Charbonnages du Maroc. High quality anthracite was mined from this 1,000m field, and in the early 1990s it was producing 600,000 tons per year. It was the

To facilitate efforts at diversification and meeting the increasing demand, a decree was introduced in 1994, which opened the door to private participation in the generation sector. With Moroccan law dictating that private firms may not own electricity infrastructure, however, arrangements were pre-specified as BTO (Build-Transfer-Operate). Furthermore, ONE was designated as the exclusive buyer of all power (above 10 MW).<sup>11</sup> Shortly thereafter bidding for the first IPP commenced, which together with the country's other two IPPs will be discussed in detail in the next section.

With the addition of IPPs that have come on line since 2000,<sup>12</sup> as well as a number of upgrades to ONE's generation capacity, Morocco's installed generation capacity has been increased to 5237 MW, providing 19 508 GWh, as of 2005 (Boutaleb, 2005).<sup>13</sup> This represents an increase of 8.7% from the previous year [Ministry of Energy and Mines: 2006]. Of the installed capacity, thermal plants account for roughly 69%, hydro, 30% and the remainder is wind farms. Important to note, however, is that actual generation from hydro, in sharp contrast to 1956, has recently accounted for less than 10%.

One unintended effect of diversifying away from hydro is that Morocco has become more dependent on imports. As of 2005, Morocco imported 96% of its primary energy sources, and the country is expected to continue to rely on imports, for the foreseeable future. Actual imports of electricity generation (originating from Spain and Algeria) have, however, recently been minimal, accounting for only 3% of the total generation mix in 2005.<sup>14</sup>

## 2.2 Transmission and Distribution

The country's transmission grid was connected to the Algerian network at the 225kV level in 1988. The initial exchange capacity was restricted to 200 MW until a second line was installed in 1992. Trade with Algeria has been limited to mutual spot back-up to balance supply and demand (Morocco Electrical Energy Sector Report, 1998). To facilitate trade, an interconnection also exists with Spain via a 400kV connection commissioned in May 1998. The capacity of this connection is currently being doubled to carry 1 400 MW by the end of 2006.<sup>15</sup>

Expansion of the national transmission and distribution networks is mainly at the lower voltage levels and is currently driven by the goals of the Programme d'Electrification Rurale Global (PERG), which is expected to be completed by the end of 2007. The increase in low and medium voltage categories between 2003 and 2004, depicted in Table 1 below, illustrate that much effort has been focused on the electrification programme (with similar figures in the low and medium voltage categories reported from 2000 to 2003 as well). Although accounting for only a small percentage of installations, photovoltaic systems have been installed in areas deemed too far from the grid to justify network extensions. As of 2005, rural electrification rates were recorded at 81%, up from 72% in 2004.

---

only coal mine in the country until the main works finally closed in 2001/02 after many years of declining output.

<sup>11</sup> Decree no. 2-94-503 of 23 September 1994.

<sup>12</sup> By 2000, just before the first IPP was commissioned, the country's production fleet was made up of: 24 hydro plants, 5 thermal steam plants, 7 gas turbines, 1 wind farm, and several smaller diesel plants, totalling an installed capacity of 4 516 MW.

<sup>13</sup> Approximately 661 GWh of this was imported.

<sup>14</sup> This is down from 9% in 2004, with the change linked to the newly commissioned Tahaddart Combined Cycle Gas Power Station, Morocco's third IPP.

<sup>15</sup> The contract for the initial interconnection was signed by ONE and REE (Red Eléctrica de España) in July 1993 when Morocco was suffering from a severe energy crisis.

Table 1: Variation of transmission lines in kilometres between 2003 and 2004

Voltage	2003	2004	Variation
Very High Voltage	7503	7532	0.4%
High Voltage	9605	9655	0.5%
Medium Voltage	36956	40560	9.8%
Low Voltage	92130	112017	21.6%

Source: ONE Annual Report - 2004

At the end of 2004, ONE, the state-owned utility accounted for approximately 42% of the total distribution market.<sup>16</sup> Seven regional municipal distributors made up about 15%. The remainder or approximately half of the country's distribution market is controlled via long-term contracts by three private firms, under the supervision of the Ministry of the Interior and Urban Centres (Jerjini, 2002). Lydec is the largest of the three private distributors, holding the rights to provide electricity services for 30-years for Casablanca (since 1997) and representing almost a quarter of the country's total distribution market. Redal holds a 30-year contract for Rabat since 1999 and represents one tenth of the distribution market. Finally, since 2002, Amendis is active in Tangiers and Tetouan, and represents about 5% of the country's market, under 25-year contracts (ONE Annual Report, 2004, p.17).

### 3. Independent Power Producers: advent of change

As previously noted, IPPs have helped to change the face of Morocco's ESI, providing much needed generation after the troubled years of the mid-1980s and early 1990s. This section describes the three independent power projects that have come on line since the start of the reform programme. The projects are distinct in size, fuel source, and construction costs, as illustrated in Table 2 below. The first IPP, the Jorf Lasfar Energy Company (JLEC) uses coal and consisted of both a brownfield and greenfield transaction. The second IPP, Compagnie Eolienne de Detroit (CED), is a wind farm. The third plant, Energie Electrique de Tahaddart (EET) uses gas from neighbouring Algeria to run the country's first combined cycle gas plant.

Table 2: Summary of Moroccan IPPs

	JLEC (1 <sup>st</sup> IPP)	CED (2 <sup>nd</sup> IPP)	EET (3 <sup>rd</sup> IPP)
<b>Total Project Cost</b>	US\$ 1.5 billion	€45.7 million	€285 million <sup>17</sup>
<b>Nominal Capacity</b>	680 + 680 MW	50 MW	384 MW
<b>PPA Duration</b>	30 years	19 years	20 years
<b>Fuel Type</b>	Coal	Wind	Natural gas
<b>Debt</b>	Foreign	Foreign	Local
<b>Equity</b>	Foreign	Foreign	Local / Foreign

Although technologically varied, there were a standard set of investment incentives extended that helped attract and cement these projects, including: VAT and customs duty exemptions on all equipment that could not be sourced locally and five year holiday on property tax. In terms of corporate income tax, there was a slight variation among the three projects. For Jorf Lasfar, the first IPP, there was a full exemption granted for the first five years of operation, followed by a

<sup>16</sup> This excludes high voltage customers.

<sup>17</sup> In local currency, this amounts to roughly MAD 3013 million.

50% reduction from year-six to year-ten. For CED, the 2<sup>nd</sup> project, the firm received only a 50% exemption during the first five years, after which the normal tax rate of 35% applied. Finally, the fact that EET was located in one of the region's investment zones meant that it qualified for a 75% income tax exemption during the first five years.<sup>18</sup> From year six to ten, a 50% exemption is scheduled, similar to JLEC. All exemptions were scheduled to start from COD and thereby reduce overall financing charges. Important to note is the absence of sovereign guarantees, which were required by many IPP investors (including all those in Egypt) as well as what may be termed relatively light security packages, discussed in greater detail below.

### **3.1 Jorf Lasfar Energy Company**

#### **3.1.1 Project Overview**

Unlike most of the other projects in this study Morocco's first IPP, a 1360 MW coal-fired plant, was both a brownfield and greenfield development. Shortly after the first and second units, consisting of 330 MW each, came into service in October 1994, the government launched an international competitive bid (ICB) for additional capacity. The deal consisted of building two more units (as well as expanding the coal supply terminal) and operating the power plant (including units one and two) for a period of 30 years under a BTO agreement. The three bidders who responded were:

Asea Brown Boveri(ABB) and CMS – 1<sup>st</sup> consortium  
AES and General Electric (GE) – 2<sup>nd</sup> consortium  
Alstom – 3<sup>rd</sup> consortium<sup>19</sup>

The CMS/ABB consortium would ultimately be selected in 1995 among the three bidders, in part due to its proven track record in Engineering, Procurement and Construction (EPC) and Operations & Maintenance (O&M). ABB was a known leader in EPC, and CMS recognized for its expertise in O&M. The firms had partnered in a number of IPPs internationally. Thus, together the two companies were able to demonstrate that they could adequately share the technical and project management risks normally associated with projects of this nature.

Negotiations with the ABB/CMS consortium continued until April 1996, when agreement was reached on the draft Power Purchase Agreement (PPA). The PPA was finalized in September 1997 when negotiations for the O&M agreement, the EPC agreement and the financing arrangements were concluded. A performance bond of US\$50 million was posted by ABB/CMS as a guarantee that they could arrange the project financing and would then execute the PPA.

In January 1997, the Jorf Lasfar Energy Company (JLEC) was incorporated as a Moroccan company to start operating units one and two for which JLEC paid US\$263 million to ONE.<sup>20</sup> Many personnel for the operation of the plant were subsequently transferred from ONE to the new company and a series of new support functions for JLEC were established. For units three and four, work began in September of 1997, and was scheduled to be completed approximately three years later. With the project slightly ahead of schedule, COD for unit three was reached in June 2000 and for unit four in February 2001. Project arrangements are noted briefly in the next three sections. A short description of the financing arrangements is followed a summary of key terms featured in the PPA and the fuel agreement.

---

<sup>18</sup> The Tahaddart plant is located in a free trade zone in Tangiers which is used by both Moroccan and foreign companies. Those firms in the zone may import goods duty free and qualify for certain tax exemptions depending on the business concern.

<sup>19</sup> Alstom was actually the EPC contractor for the first two units of Jorf Lasfar and therefore had previous experience with the project.

<sup>20</sup> Exemption on corporate income tax, referenced above included income from the two brownfield units.

### 3.1.2 Financing the giant

The brownfield and the greenfield components of the deal were treated as one transaction. Equity, accounting for US\$500 million or approximately 33% of total financing, was made up of two tranches: US\$300 million provided initially as a shareholder loan and then converted into equity and US\$200 million from surplus cash flows from units 1 and 2. The project debt of US\$1 billion was made up of five sets of loans agreements (with interest rates varying between 5.7% and 10% depending on the loan facility).

The US Export Import Bank (US ExIm) is a senior lender with US\$200 million of loans issued at an interest rate of 7.2%. An additional US\$200 million credit facility was extended by the Overseas Private Investment Corporation (OPIC). The commercial bank loans are backed by political risk guarantees from the Italian Export Credit Agency, Servizi Assicurativi del Commercio Estero (SACE),<sup>21</sup> the Swiss Export Risk Guarantee (ERG)<sup>22</sup> and the World Bank. After syndication, the project started with 50 commercial banks. This number has since been reduced to less than 45 due to mergers and buyouts.

As security for these loans, the Government of Morocco issued JLEC a letter guaranteeing JLEC the right to operate the power station and that in the event of default, guaranteeing the ability of ONE to make the termination payments. This was very important to investors and lenders in the BTO context – the fact that transfer takes place before operations commence. JLEC also received a letter from the Ministry of Finance guaranteeing JLEC the right to purchase foreign exchange without obstacle or discrimination since the payments from ONE for electricity are made in local currency before being converted by JLEC. Finally, JLEC received a letter from the Office of Foreign Exchange allowing the company to hold foreign exchange accounts in Morocco and abroad.

### 3.1.3 PPA: 30 years of charges, tapering off

Although the above noted security arrangements helped to pad the deal, it was and continues to be the PPA that under girds the whole transaction. While no information on actual tariff amounts is publicly available, it has been disclosed that the PPA tariff schedule was front-end loaded with the tariff peaking in the fifth year and tapering off to year thirty. Furthermore, also publicly ascertainable are the following facts. Payments are based on the energy that JLEC makes available for dispatching, with the PPA stipulating that JLEC guarantee a minimum energy availability factor of 82%. As is standard for IPPs globally, these payments include a capacity charge, an O&M charge, and an energy charge that is based on the cost of the primary energy consumed and the prescribed heat rate curves for the plant hardware. At the end of the 30-year contract ONE will automatically take back the full installation with no financial payment. Thereafter, the decision to extend the period of plant operation will be up to ONE.

Included in the terms of the PPA was an Escrow facility equivalent to one month of invoicing. The agreement also contains a clause stating that if no payment dispute is entered into during the first four years of the contract, ONE could request a reduction to zero in this cash escrow account, which is what happened. As security against a payment default, the PPA requires ONE to establish and maintain a letter of credit in favour of JLEC equal to two months of invoicing.

### 3.1.4 Fuelling the giant: JLEC's coal supply

All four units use coal for which JLEC is reimbursed according to the following formula:

80% - the average cost of coal procured by JLEC

20% - the average cost of coal imported into the European Union

---

<sup>21</sup> SACE S.p.A. is an export credit agency, owned by the Italian Ministry of Economy and Finance.

<sup>22</sup> The Export Risk Guarantee (ERG) is a Swiss export credit agency.

This arrangement acts as an incentive for JLEC to procure the coal at a competitive rate. With Morocco having virtually no indigenous coal supply, as mentioned earlier, all of JLEC's coal supply is imported (mostly from South Africa). Thirty-five days of stockpiling is required in terms of the security agreement. The choice of coal as fuel was linked to three factors: the existing two units already used coal as the source of primary energy, the proximity of the Jorf Lasfar coal terminal, and the competitiveness of the fuel type.

### **3.2 Compagnie Eolienne de Detroit (CED)**

As the largest IPP in Africa, Jorf Lasfar towers over every other project, especially Compagnie Eolienne de Detroit (CED), Morocco's second IPP at only 50 MW (or less than 4% of JLEC's installed capacity). CED is, however, a record setter in its own right as Africa's first privately financed wind farm, and therefore is important to discuss in the context of both Morocco's and the continent's evolving power development.

#### **3.2.1 Project Overview**

Morocco's efforts at harnessing wind power date back to the 1980s when, in 1986, the Centre de Development d'Energie Renouvelable (CDER) in Marrakech published the first wind atlas for the country. Four years later, CDER launched a special wind measurement programme, supported by the German Development Agency's Technical Expertise for Renewable Energy Application (TERNA) program, to identify the most promising sites for wind energy utilisation.<sup>23</sup> The results of this programme, published in March 1995, indicated mean annual wind speeds of 11.5 m/s in the Tétouan region, near Tangiers in northern Morocco. Encouraged by these findings, which qualified the site as one of the best in the world, ONE subsequently created a programme for the development and promotion of wind energy. The goal of the programme was twofold: diversify Morocco's ESI and develop more sustainable energy alternatives.

The first wind project was a 3.5 MW demonstration wind farm at the Al Koudi Al Baïdi site.<sup>24</sup> To finance the project, the German Development Bank, Kreditanstalt für Wiederaufbau (KfW), provided a low interest loan of €4.35 million to ONE. Following what was deemed a successful demonstration and in keeping with the government's initiative to draw on private capital to finance infrastructure projects, ONE began discussions with Germa, the French wind energy consulting company, as a first step to developing a 50 MW wind project.

These discussions with Germa resulted in the wind consultancy being given the opportunity to share in the project's equity. To supply the equipment for the project, however, the government subsequently conducted an ICB hoping that the equipment supplier would take the remaining equity stake in the project. The ICB attracted bids from Nordex and Enercon, the German equipment suppliers, and Vestas, the Danish equipment supplier. Vestas, although providing the winning bid, indicated that its involvement would be limited to the construction of the plant, i.e. it had no interest in acquiring an equity stake. With Vestas' interest limited to that of equipment supplier, Germa entered into discussions with Electricité de France (EDF), and Paribas Merchant Bank since it needed equity partners for the project. The acquiescence of these partners resulted in all the equity for the project being of French origin.

Project equity, which accounted for 30% of total project costs, was therefore agreed to as follows: EDF 49%; Paribas 35.5% and Germa 15.5%. Thereafter, CED was established as a SPV to realize the project, with first priority given to arranging debt financing.

---

<sup>23</sup> Germany's Gesellschaft für Technische Zusammenarbeit (GTZ) sponsored TERN, which in turn helps countries assess and utilise their wind energy potential.

<sup>24</sup> This is in the province of Tétouan, 40 km east of Tangiers.

The European Investment Bank (EIB), senior lender to the project, provided a loan of €24.4 million for the €45.7 million project. Secondary lenders in the loan syndication were, among others, Credit Agricole (now Calyon) and Société de Promotion et la Participation pour la Coopération Economique (PROPACO), the French development agency.

### **3.2.2 Localizing: fuel and payments**

As with JLEC, ownership of the IPP ultimately resides with the state, and the 19-year PPA, which was finalized in 1997, specified a BTO arrangement. In a departure from thermal IPPs, however, a capacity charge alone, i.e. no energy charge, is detailed in the PPA. Initially this payment is made in the form of a 70:30 ratio of US\$:MAD. With project debt paid off in the first ten years of operation, this payment ratio will gradually change so that towards the end of the PPA period most of the payment is made in local currency.

Provision is made in the PPA for arbitration in Morocco in the case of any party failing to honour its commitments as stipulated in the agreement. Furthermore, according to the terms of the PPA, ONE has the right to take over the operation of the wind farm, but is obligated to pay CED an amount equal to the value of the assets and the calculated future cash flows from the operation for the remainder of the PPA duration.

### **3.3. Energie Electrique de Tahaddart (EET)**

Morocco's third IPP also maintains the status of a record setter, being the country's first plant using combined cycle gas turbine (CCGT) technology. Of perhaps greater significance, however, is the fact that Energie Electrique de Tahaddart (EET) is the first power plant in all of Africa where all the project debt is financed by local banks in local currency.

#### **3.3.1 Project Overview**

There were several factors that coalesced that led to the realization of EET. First, in terms of fuel, the Moroccan government has the right to 7% of the gas that passes through from Algeria to Spain. Prior to the inception of EET, royalties were paid to the government in cash. With increasing electricity demand and pressure to diversify the supply mix, a decision was made to accept the gas commodity as payment as apposed to cash. Government was also motivated by the fact that using gas would help reduce the country's foreign currency demands and (albeit to a much lesser degree) minimize foreign exchange exposure since the vast majority of Morocco's energy needs are purchased with foreign currency. Finally, the decommissioning of existing plant meant, quite simply, that new generation was needed.

With more than half of the country's electricity generation output produced by IPPs, ONE made a strategic decision to limit its retreat from the generation sector and become a shareholding partner in EET. Initially ONE engaged in talks with EDF and Empresa Nacional de Electricidad S.A. (ENDESA), however, EDF's interest was limited and short-lived and the firm soon opted out. These discussions, like those conducted in the early days of CED, were meant to prepare the terrain for the ICB by helping ONE to find partners who could assist in facilitating the tender and ultimately in carrying part of the project equity. In 1999, assisted by ENDESA, ONE issued a Request for Proposal for an EPC contract and an O&M contract. It was agreed by ONE and ENDESA that the successful bidder would take a 20% equity stake. GE, ABB and Siemens pre-qualified, with Siemens ultimately chosen for both the construction and O&M contracts. The equity split was therefore as follows: ONE 48%, ENDESA 32% and Siemens 20%.<sup>25</sup> In addition to the other record setting aspects noted above, EET thus became the first shareholding partnership between ONE and private companies in Morocco's ESI.

---

<sup>25</sup> Initially, ONE would only take a 20% stake in the project, EDF a 30% stake and ENDESA a 30% stake. This changed when EDF left the negotiations (Morocco Electrical Energy Sector Report, 1998).



Construction started in February 2003 and COD occurred approximately two years later on March 25<sup>th</sup> 2005. A 20-year PPA, under BTO terms, specifies that ONE is the sole off-taker, as with both JLEC and CED, and that EET must guarantee minimum availability of 89%. It is important to note that there is no back-up fuel for the plant, other than that sourced from the Algerian pipeline, and the plant is not designed to use an alternate fuel.

### 3.3.2 Financing

The project cost, amounting to €285 million, was made up by 25% equity and 75% debt, which represents a larger debt component than in any of the previous IPPs (with 67% for JLEC and 70% for CED). Debt was provided by suite of Moroccan banks: Banque Centrale Populaire (BCP) provided MAD1300 million in loans; and a consortium of banks, which included BCP as the lead lender, the Banque Marocaine pour le Commerce Extérieure (BMCE) and Crédit Agricole (CNCA), provided an additional MAD960m in loans.<sup>26</sup> Part of the debt is tied to a fixed interest rate at 7.6%, and part varies with the prime interest rate (5.87% for February 2006). Although the debt is payable within the first 12 years of operation, a grace period of three years has been negotiated.<sup>27</sup> Apart from a letter of credit issued by a local bank equal to one month's payment, there are no Escrow facility requirements or any other security arrangements. In the case of default, however, the PPA does make provision for international arbitration at the ICCA in Geneva, Switzerland.

## 4. Analysis of outcomes: how the success story came about

In sharp contrast to other countries, Morocco's IPP experience appears to be a resounding success story. No losers emerge, only winners. This section and subsequent sections go one step further and attempt to unearth the main lessons for next round of power sector development as well as for replication of such success stories outside of Morocco. Our framework for evaluating results of the IPP experience is based on determining investment and development outcomes, as noted in the introduction. To reiterate, positive development outcomes are defined as reliable, affordable power provided to consumers; positive investment outcomes are where debt is serviced, equity rewarded as expected and there is a potential to increase investments. It is the premise of this study that in order for projects to be sustainable, development and investment outcomes must be roughly in balance. It should be noted that few projects have resulted in outright failures. Instead, what experience shows is that an imbalance in outcomes is unsustainable and hence a project is generally renegotiated on more equitable terms (although the extent of 'more equitable terms' may be an area of debate).

One disclaimer should be made at the outset of this analysis. Wholesale tariff data for JLEC, CED and EET is not publicly available, which means the authors are unable to conduct a detailed cost-basis analysis other than as it relates to the final investment cost of each plant. Stakeholders have, however, indicated general responses to tariff related questions, which will be highlighted below, together with other plant performance data.

Within this success story, development outcomes appear to be favorable across the three plants. In terms of Jorf Lasfar, ONE has turned to this base load facility, day and night, and in the year after commissioning, JLEC was dispatched at full capacity. For CED, the plant's capacity factor has averaged 46% thus far, which compares well with similar wind plants globally. According to the German Ministry for Economic Cooperation and Development (2002), the generation price for CED was calculated at MAD 0.40 to 0.60 per kWh (3.9 to 5.9 €cents per kWh), placing it in the range of the average production costs of conventional plants in Morocco and comparing

<sup>26</sup> Average exchange rate for the Moroccan dirham in 2003, the year that construction started, was 10.95MAD=1.00EUR (Interbank Rate).

<sup>27</sup> This flexibility gives ONE the option of extending its payment schedule from 12 to 15 years in the event that its financial situation changes to an extent where it has to restructure its repayments.

favourably with green energy prices elsewhere in the Mediterranean region. Stakeholders interviewed on behalf of ONE and the investors describe the wind farm project as largely positive. Finally, EET receives high marks as well. When EET came on line, it represented approximately 11% of the country’s installed capacity and roughly 17% of total generation output. IPPs do not appear to have caused price increases in local currency in Morocco, unlike elsewhere in Africa (namely in Egypt and Tanzania).<sup>28</sup>

Instead, during the period that IPPs have been developed, ONE has made progress in reducing electricity tariffs. Table 3 shows the reductions in the various voltage categories recorded in nominal terms, with real term reductions for medium and high voltage categories measuring 44.4% and 36.4%, respectively, for the same period. These reductions have helped to, among other things, attract business to Morocco.

Table 3: Tariffs in MAD cents per kWh.

Tariff Category	1997	2004	% Reduction
High Voltage	81.7	61	25%
Medium Voltage	101.8	69.9	31%
Low Voltage	93.2	86.4	7%
Residential	78.79	73.9	6%

Source: ONE Annual Report (2004, .p21)

Assigning part of the responsibility of electricity production to private producers also made it easier for ONE to focus on the rural electrification programme. PERG<sup>29</sup> succeeded in increasing the rural electrification rate from 18% (at the inception of the programme in 1995) to 81% (in 2005)—among the highest rates for African countries. The increase in rural electrification rates has helped counter the rapid urban migration, which was prompted in part by the droughts during the mid-1980s and early 1990s. PERG also has contributed to the economic, social and educational development that resulted from electrifying remote settlements. Furthermore, the programme provided work directly to more than 300 companies and indirectly to more than 6000 workers through installations (ONE, 2003, p.44). Finally, in terms of overall development outcomes, private investment has helped to overcome financial shortages in the state-owned ONE as was originally intended.

All the investors interviewed in the three projects are generally satisfied with their investments, and all contracts have been honoured; however in the case of CED sponsors indicated that the true value of green energy is higher than what they are being paid for their product, as will be discussed in greater detail below. Furthermore, the investors indicate that they would replicate the experience if given the opportunity to do so, describing the experience as positive.<sup>30</sup> There has even been interest shown by local investors expressing interest to get involved in future IPPs.

A general tilt toward investment outcomes at the expense of development outcomes has been the findings throughout the Sub-Saharan African IPPs evaluated in a larger African study, to which

<sup>28</sup> CED stakeholders, as most ‘green’ developers, contend that the price of fossil fuel generated power is, however, actually under-priced and does not fairly represent all the negative externalities.  
<sup>29</sup> The installation cost in the rural electrification programme is funded by municipalities, end-consumers and ONE.  
<sup>30</sup> Although this was the sentiment of the stakeholders interviewed, in the case of ABB/CMS and EDF, their respective organisations have retreated from IPPs in developing countries as an overall strategy and additional investments are therefore unlikely.

the Moroccan report is linked.<sup>31</sup> Thus the outcomes of Moroccan projects point to a new direction, namely that investors have fared relatively well but not at the expense of the public.<sup>32</sup> What is, however, perhaps more interesting, is what determined these outcomes; what were the contributing elements to success? And to what extent did the host country shape these outcomes versus the investor, i.e. who should be credited with the success?

## **5. Country purview: the elements that shaped the outcomes**

A series of elements shaped the outcomes of the IPPs, including a favourable investment climate, clear policy frameworks and planning, coupled with competitive bidding practices.

### **5.1 Investment climate: African oasis**

The investment climate in Morocco, at the time of all three IPP contract negotiations, was perceived to be positive. One of the clearest signs was a steady stream of FDI, largely prompted by the country's privatisation programme. External debt as a percentage of GDP also had decreased to almost 60% in 1996 (from more than 110% during the mid 1980s). Furthermore, on-going free trade agreement talks with the US and the EU meant that the country was potentially positioned to attract further investment resulting in economic growth. Country risks were perceived as minimal and the political situation was relatively stable. This favourable climate helped engage investors, who were already keen to enter Morocco, and was a key factor in the non-recourse tags attached to the IPPs.

The Moroccan dirham is pegged to a basket of currencies dominated by the Euro and this has had a stabilising effect on repayments due to the exchange rate remaining relatively stable since the first IPP had been developed<sup>33</sup>

Currency devaluations, which across developing regions were among the most significant elements to impact on IPPs,<sup>34</sup> were therefore not a factor in the Moroccan case with the dirham trading within a narrow band with respect to the US dollar and supported by inflows from its privatisation programme. As a result, capacity, fuel and O&M payments therefore remained relatively stable in a low inflation environment and the investment climate thus far had a positive impact on the three deals.

Figure 2: Official Exchange Rate

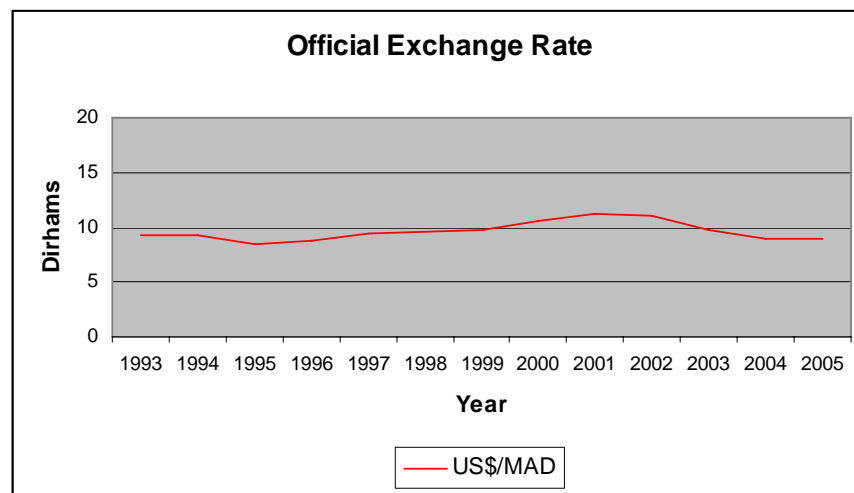
---

<sup>31</sup> See Gratwick, K and Eberhard, A (2006).

<sup>32</sup> Similar findings have been reached in Tunisia.

<sup>33</sup> On another policy front, policy makers have come under criticism that the stability and even appreciation of the real effective exchange rate has hindered Morocco's competitiveness and have been urged to move toward a more flexible exchange rate regime, in particular to match changing trends in international trade. This evolution would enhance competitiveness of exports and provide some degree of uniform protection to local producers facing tariff reductions in the context of free trade agreements. The decrease in inflation, from 6% in 1992 to an estimated 1% in 1999, has been accompanied by an 18% real appreciation of the dirham in the 1990s. This problem has been exacerbated by the fact that the real exchange rates of a number of Morocco's competitors have depreciated faster than the dirham over the last few years (World Bank, 1999).

<sup>34</sup> See Woodhouse (2005).



## 5.2 IPP policy, planning, regulatory frameworks and a lot of good will

### 5.2.1 Precursor to planning

As with the investment climate, the general policy framework together with planning and regulatory frameworks appear to have impacted favourably on projects. At the time that IPPs were first considered in 1994, as previously discussed, Morocco had just experienced nearly a decade of electricity-related shocks, due largely to persistent droughts, over-dependence on hydro-power and insufficient planning.<sup>35</sup> It should be reiterated in this context that between the 1950s and early 1980s, hydro had managed to meet the lion's share of the country's demands and policy makers had come to take weather reliability for granted. Although ONE's thermal capacity was on the increase in the 1980s and 1990s, new builds did not keep pace with demand, which, compounded with the drought, resulted in significant load shedding. This unprecedented load shedding was a wake up call to the country and to policy makers and ushered in a new awareness toward planning and diversification of fuel resources as well as a call for private financing.

### 5.2.2 Central station: the ease of few actors

Policy, planning and regulation is and has been since well before the inception of the first IPP centralized under the Ministry of Mines and Energy (although the Ministry of Finance is also involved in the setting of retail tariffs). One might charge that there is little to no independent oversight (which may have contributed to the system failures of the 1980s and early 1990s), however, there is also less room for lack of coordination and fewer policy hurdles for private investors.

It should be noted in this context that all stakeholders interviewed involved in the development of the projects describe the processes followed as fair and transparent and the absence of an independent regulator in the market does not appear to have favoured the interests of any one stakeholder over another. It is also not clear whether the presence of an independent regulator would have further reduced the price or the conditions of purchase of the energy provided by the IPPs, which won their bids through competitive tenders.

### 5.2.3 Good demand and good management

In addition to the centralized nature of the sector and the effectiveness of the bidding process, despite lack of an independent regulator, there was a healthy demand profile and assurance that

<sup>35</sup> The early 1980s marked the first time that fossil fuels accounted for more than renewable or hydro facilities for electricity supply in Morocco (ONE, 2003, p.89).

there would be a market for competitively price power due to a number of factors. First, the country's hydro stations were compromised by recurring drought; second, Morocco was decommissioning existing plants; and although available, imported power from Spain was considered comparatively very costly.

The sector had taken further steps in making itself more efficient, which helped attract investors and has also contributed directly to positive development outcomes, including lowering the price of electricity, since IPPs were developed. These steps have included: decreasing fuel levies by more than 50% (Loula, 2004); implementing programmes to increase plant and organisational efficiency at ONE; cost saving exercises, optimisation of maintenance practices and a plan to better guide technology choices and capacity expansions for optimal prices all contributed to lowering the price of electricity – an example is the development of the 450MW Afourer pump-storage transfer scheme, which has assisted in a more efficient energy management strategy in the supply system. The issuance of distribution concessions has improved collection rates and in turn has improved ONE's creditworthiness. Service levels were also ameliorated through more developed maintenance techniques in the live-line arena; better material condition monitoring and maintenance, as well as metering.<sup>36</sup> An additional move toward efficiency was incorporating time-of-use tariffs. This practice, which was not present during the electricity crisis in the 1980s and early 1990s, encouraged consumers to adjust their behaviour and thereby helped optimise load profiles.

Finally, although the abovementioned policies and practices appear to have gone along way in influencing favourable outcomes, investors attribute the successes of the projects to the will of *all* the actors to see the projects succeed. Thus, within the sector, there was a general commitment to the successful development of IPPs—a less tangible element, but ultimately critical in the recipe for success.

## **6. Project purview: the elements that shaped the outcomes**

A suite of factors helped pave the wave to success. In this and subsequent sections, the authors present first general trends across the project spectrum related to stakeholder relationships, experience, technology and PPAs and then adopt a project-by-project approach to analysis.

### **6.1 Good relations and good track records**

Much time was invested up-front clarifying the roles and responsibilities, expectations and commitments of all the stakeholders. This was cited as the biggest success factor by investor representatives noting the support received from all project actors, as mentioned above. The Jorf Lasfar company even enjoyed the support from the local government, which helped to screen many of the employees during JLEC's recruitment campaign for additional staff for units 3 and 4.

Furthermore, the technologies chosen for the Jorf Lasfar, CED and Tahaddart power stations are well known and minimal risks were associated with the choice. With ABB/CMS, Vestas and Siemens being experienced at these kinds of projects, most of the issues (such as potential delays and budget overruns) that may have become problems were settled and resolved in advance. The Jorf Lasfar and Tahaddart plants went on-line on schedule, partly due to the manner in which the projects were managed and risks minimised.

### **6.2 Comprehensive contracts**

The PPAs are all in accordance with a BTO (build- transfer-operate) formula since private institutions are not allowed to own electricity infrastructure according to Moroccan law. The PPAs all have stipulated procedures that can be followed in case of disagreement between the

---

<sup>36</sup> Overall transmission availability increased by 7.2% between 2001 and 2002 (ibid) and by 22% on medium voltage lines between 2003 and 2004 (ONE, 2004, p.33).

parties and to date there has been no default in any of the PPAs negotiated. Table 4 below gives a brief description how risks are typically shared in the agreements.

Table 4: IPP Risk Matrix

Nature of Risk	Assumed by ONE	Assumed by Developer	Notes
Market	Fixed tariff in PPA		ONE is exclusive buyer of electricity
Gas Availability	Included in PPA tariff structure		Government is the gas supplier
Change of law	Associated costs and delays		
Force Majeure – political	Associated costs and delays		
Force Majeure – natural	Delays in returning plant to service	Associated costs	
Technical performance		Heat rates specified in agreement as well as availability (JLEC and EET)	
Construction Delays		Penalties provided for in agreement	Experienced project developer used.
Currency	Charges		Payments indexed to a basket of currencies (JLEC and CED); Mainly local currency (EET)
Permits		Environmental	Complies with WB guidelines (JLEC) and Moroccan law

Compared to PPAs in other African countries studied (Egypt, Kenya and Tanzania), all the Moroccan PPAs are lightly loaded in terms of security arrangements (Escrow facilities and Letters of Credit), depicting the more favourable investment climate and the perceived credit-worthiness of the off-taker.

One element that is common to all the PPAs is that charges are heavily loaded in the early years of the contract and reduced later on. Charges paid to JLEC peak in year-five and slowly taper off to the end of the PPA period. In the case of CED, although the PPA duration is 19 years, the project debt is scheduled to be paid within the first 10 years of operation. Similarly with Tahaddart’s 20 year PPA, the debt is scheduled to be paid within the first 12 years, with a debt rescheduling buffer option consisting of an additional 3 years.

Although this type of arrangement can potentially have a negative effect on cash flows during the early years, it reduces interest charges with lenders and decreases the currency risks associated with future or long-term payment schedules, while not impacting too severely on the average price per kWh generated.

Finally, a major factor contributing to both successful development and investment outcomes was the economies of scale brought by larger plant size of JLEC and EET as well as the good plant availability, cited above.

### **6.1 JLEC revisited: size, fuel and cleaner energy**

JLEC is written largely as a success story, with the economies of scale cited as among the contributing element of success for this 1360 MW plant that in 2002 accounted for 66% of national production (ONE Annual Report, 2002, p.10), and until 2005 has always represented more than 50%. The technology was proven as noted above, but, as, if not more importantly, the technical performance has also been superior. While JLEC guarantees a minimum energy availability of 82%, as mentioned previously, the plant has always been able to maintain availability above 90%. The plant has not, however, been free of all controversy. Local analysts have charged that the plant's monthly payments have weighed heavily on ONE's balance sheet. This section attempts to unpack these charges as well as identify some of key contributing elements that shaped outcomes.

JLEC was an unprecedented development for Morocco. Although an ICB was conducted, only three consortia responded to the RfP, which is much lower than average for IPP requests in the North African region, and meant that there may have been less pressure to drive down prices. This low response rate may also signal that investors were cautious to invest in a project that was the first of its kind in its size and finance requirements, amidst the uncertainty of the country's future reform efforts. In addition, the fact that the syndication started out with 50 commercial banks may point to the novelty of the transaction, with no single entity wanting to assume too much risk. Although there is room for speculation about each of these issues, the final indicator is that ONE's prices have declined, not risen since JLEC (accounting for more than half of the utility's generation production) came online. As discussed in 5.2.3, the utility has been engaged in a host of activities to improve efficiency, which must be considered in a final evaluation of outcomes, hence it is not JLEC alone that has led to the price reductions, but JLEC is a large part of the equation.

Another factor to consider is the fact the JLEC contributed to more than just its own fuel supply. For Jorf Lasfar, coal was a natural choice since units 3 and 4 were an extension of the first two units, which used coal as fuel source. To accommodate the increased demand, an upgrade to the existing coal terminal was required. Part of the terminal expansion plans included accommodating supply for the Mohamedia plant, the largest coal-fired power station in the country after JLEC, which is operated by ONE. Although this expansion has put upward pressure on the tariff charged to ONE by JLEC, the benefits of having one large terminal has been indicated by stakeholders as ultimately outweighing these costs.

In addition, one of the ways for JLEC to attain or exceed expected ROE is for the firm to procure coal at a less costly rate than coal imported into the European Union. Although ONE, as the off-taker, has control neither of the fuel supplier nor of the international coal price, the utility has created an incentive for JLEC to keep primary energy costs down, exerting downward pressure on the cost of a kWh.

A final aspect to note relates to the environmental impact, which has made a significant impact to the overall development outcomes. Until 1997, when ABB/CMS took over the operation of units 1 and 2 and began construction on units 3 and 4, the fly ash generated by the plant was pumped into the ocean. Since 1997, at the initiation of the IPP sponsors, all of the ash has been deposited in a lined storage area, and in November 1999 JLEC developed a long-term ash disposal site. This site, which is located close to the plant, is designed to accommodate the waste for the duration of the plant's operating life (Power Technology, 2000). Furthermore, the company has been selling more than half of the fly ash generated to cement companies since July 1999.

### **6.2 CED revisited: good advisors and good local components**

There is some overlap with Jorf Lasfar in terms of the elements that contributed to CED's outcomes, however, there is also considerable difference. To recap, since COD in August 2000,

the plant's capacity factor has been averaging 46%, which compares well with similar wind plants globally. The availability factor of the installation since COD has been in the order of 98.5% (2005). Thus, as with Jorf Lasfar, good technical performance has had a positive role to play. CED's tariffs are considered to compare favourably with green energy prices elsewhere in the Mediterranean region, signalling positive development outcomes.<sup>37</sup> Further insights into the investment outcomes include the firm's indication of its possible interest in installing bigger machines to harness Morocco's abundance of wind energy for a rate similar to that of CED.<sup>38</sup>

The ICB may have played a role in the competitive pricing of the plant; however, it is the role of Germa, the internationally renowned wind energy consultant, working together with the Ministry throughout the duration of the bidding process that is cited as assisting in balancing development and investment outcomes. This carefully managed transaction, like JLEC, was unprecedented, and ultimately served to prove that green energy that reduces rather than increases carbon emissions may be installed economically, through a BTO arrangement—thus setting the stage for additional developments.

Also of significance in balancing outcomes and related to that mentioned above is how the capacity charges are paid. As there is no primary energy charge, ONE was able to negotiate up to 30% of the capacity charge to be denominated in local currency at the onset of the agreement, thereby lessening foreign exchange exposure.

An additional boon particularly with regard to development outcomes includes skills transfer. The wind farm is operated by Moroccan nationals, which also helps to lay the foundation for further similar projects.

### **6.3 EET revisited: a local revolution**

EET, like its IPP predecessors, has been performing well—constituting approximately 11% of the country's installed capacity and roughly 17% of total generation output. EET's availability for its first year was 94%, exceeding the 89% guaranteed in the PPA for the first six months of operation.<sup>39</sup> This performance data goes a long way in pointing to positive outcomes for a plant that since the time of its financial closure has been changing the face of private power in Africa.

Largely due to local currency financing, EET may ultimately prove to achieve among the most balanced outcomes of any project on the continent. As has been previously discussed, all the debt for the project was locally sourced, and in local currency. How did this local currency revolution come about? The lead lenders for the debt were local banks, which still had a significant degree of state involvement at the time the financing arrangements were negotiated. It is therefore doubtful whether similar local debt financing would have been realised with historically private banks alone and without the influence of the state. Nevertheless, the arrangement has significantly aided in doing away with the currency risks, which have plagued similar projects in other emerging countries.<sup>40</sup>

The following facts related to EET are also contributing to positive outcomes. Firstly, the project provided 450 000 man-days labour and since COD it has created 40 permanent jobs directly and 50 permanent jobs indirectly, all for Moroccans. In addition to the new employment opportunities, by using gas that was previously traded for cash, the country has seen a reduction in the price of electricity.

---

<sup>37</sup> Tariffs have been confirmed to be within the band estimated by the German Ministry for Economic Cooperation and Development (2002).

<sup>38</sup> It should be noted that CED was signed before the introduction of CDM credits and thus did not qualify.

<sup>39</sup> The average availability guaranteed for the duration of the PPA is 92%.

<sup>40</sup> In particular Asian and Latin American IPPs – see PESD report (Woodhouse, 2005).



## 7. Conclusion & next steps

Morocco's private power innovations register successful development and investment outcomes. Reliable, largely affordable power is being supplied, and investors appear to be achieving expected returns, with some signalling interest in further investments. Further boons appear to be job creation, environmental benefits and technology transfer, not to mention the ability of the state to focus limited resources on rural electrification and debt reduction.

At the country-level, much has been done to help diversify Morocco's electricity supply in the aftermath of the droughts. Although having no significant resources of its own, Morocco has established itself as the energy link between Europe and Africa through the 400kV interconnection with Spain and the gas pipeline. Through both these means, Morocco has been able to satisfy its energy demand simply through its proximity to Europe and its neighbour's abundance of energy resources. This enabled Morocco to increase its diversification not only in the constitution of its primary energy through EET and the gas pipeline, but also adding to it electricity as a final product, through the links that Morocco has with Algeria and with Spain. Furthermore, there has been a concerted effort to work with investors and create an environment that is conducive to business, including creating a more efficient ESI and improving ONE's creditworthiness.

ICBs had a role in introducing transparency for each of the projects as well as competitive pressures, particularly with the absence of an independent regulator, however, key project partners, such as Germa in CED, may have proven equally if not more influential in contributing to balanced outcomes. In fact, across the board, stakeholders cited the will of *all* the actors to see the projects succeed, as being a major contributing element of success.

Also noteworthy are the economies of scale employed in both JLEC and EET plants, which helped keep tariffs competitive, and in the case of JLEC may have even offset the terminal expansion, which has ultimately benefited ONE's Mohamedia plant.

Arguably one of the most important elements of Morocco's IPPs has been local currency financing as well as capacity charges denominated in local currency, which applies to most of EET's charges and part of CED's. Projects have been sheltered from foreign exchange exposure, which bodes well for the short-term and long-term sustainability of the investments. Local currency financing was facilitated in part by the state, which as originally intended, remains heavily involved in the sector.

With full privatization ruled out, state involvement appears to be here to stay. Nonetheless, Morocco presently represents among the most reformed ESIs on the continent.<sup>41</sup> Furthermore, the country's hybrid market<sup>42</sup> is helping to keep both private actors and state owned companies in check in terms of productivity - as was seen in 2004 in the distribution sector when it was commented that ONE was more competitive than the privately owned Moroccan distributor Lydec.<sup>43</sup>

---

<sup>41</sup> Apart from reforms resulting in two-thirds of electricity generation output being provided by IPPs, at the distribution level large centres have private companies manage the business through long-term concessions. Plans for the introduction of a hybrid market where large customers will no longer be captive to ONE also puts the market a step ahead of most electricity markets not only in the North African region, but on the African continent as well (African Energy, 2004).

<sup>42</sup> A hybrid market is one where state-owned operators generate and supply the same grid as private producers – in the Moroccan case, it is intended that ONE generators will be able to sell directly to customers whereas IPPs will continue to sell power exclusively to ONE in accordance with their PPAs.

<sup>43</sup> See observation by Mr Mohammed BOUTALEB, Minister of Mines and Energy in African Energy 74, May 2004. There is however a very widely held perception that private service providers offer a superior

Although state involvement may be here to stay, ONE has not made a categorical decision about overall participation in generation or about future projects;<sup>44</sup> instead the utility plans to evaluate plants on a case-by-case basis. It should be noted that with external debt levels having come down, (from more than 110% of GDP during the mid 1980s to around 30% in 2005), the pressure for private financing is considerably less, giving ONE ultimately more flexibility in its strategy.

However, at a time when the country had very few options to contract additional power, the assumed risks were well contemplated and managed, especially currency risks which has been the Achilles heel of independent power projects in developing countries globally. Currency risks can be minimised in a number of ways; by assuming local debt and equity; by indexing loans to multiple currencies; by allowing for loan repayment grace periods and making provision for contingency loan restructuring clauses in contracts; by using local skill, local equipment suppliers and developing local technical capacity to service plants, thereby enabling payments in local currency; and by using local or cheaper fuel.

Morocco has used these risk optimisation mechanisms to minimise its currency risk in its three independent power projects. International experience has shown that exchange rate risk has precipitated as the most common cause of arbitration and/or contract negotiation. Morocco has demonstrated that the management of these risks are not beyond the reach of some developing countries.

---

service to that of ONE at a fraction of the cost more at a distribution level, and for the better service, consumers are willing to pay more. From the comparison that was conducted it is also not clear what criteria were measured and how this done.

<sup>44</sup> Further detail on future projects and changes to the regulation of the sector are contained in Appendix 1.

## Bibliography

African Energy (2004) *Electrification Restructuring Moroccan Priorities*, Edition 74, May 2004.

African Energy (2005) *Morocco Energy Resources*, Volume 1 No.3, 2005.

Bencheqroun, A, n.d. *Situation Energétique du Maroc: Des Défis et des Opportunités*, Secretary General, Ministry of Mines and Energy, accessed at <http://www.industrie.gouv.fr/energie/conf/pdf/sem-maroc-bencheqroun.pdf>. in March 2006.

Boutad, B(2001) *Privatisation du Secteur de l'Electricité au Maroc: Evaluation à l'Aide de l'Approche du Vote Majoritaire*. Papier présenté au Colloque International du Réseau MONDER, Paris, 10-13 June 2001.

Boutaleb, M (2005) *Energy Policy in Morocco: Some Perspectives*. Presentation by the Minister of Mines and Energy at the MBA Association of Morocco, Casablanca, 7 December 2005.

Eberhard, A, Gratwick K, (2005) *The Experience of Independent Power Producers Across Africa* MIR working paper, Graduate School of Business, University of Cape Town, August 2005.

European Commission Memoranda of Understanding and Declaration of Intent ; *Protocole d'Accord pour l'Intégration Progressive des Marchés d'Electricité de l'Algérie, du Maroc et de la Tunisie dans le Marché Intérieure de l'Union Européenne*, Rome 2 December 2003.

German Ministry for Economic Cooperation and Development Report, accessed at [http://www.gtz.de/wind/files/terna\\_2002\\_en\\_morocco.pdf](http://www.gtz.de/wind/files/terna_2002_en_morocco.pdf) in March 2006.

Gestionnaire du Réseau de Transport d'Electricité (2006) *Le Secteur Electrique Méditerranéen*, 27 April 2006.

Jerjini, R (2002) *ONE Prepares for Liberalisation of Morocco's Electricity Sector*; Article by the Director of Audit and Organisation and Head of Communication – ONE in ESI Africa Volume 3, 2002. [http://www.esi-africa.com/last/ESI\\_3\\_2002/ESI32002\\_014\\_1.htm](http://www.esi-africa.com/last/ESI_3_2002/ESI32002_014_1.htm) accessed in March 2006.

Louali, H (2004) *Regulation of the Electricity Sector*, Ministry of Finances and Privatisation: Directorate of General Economic Policy;; Working Document No. 98, May 2004.

Ministère de l'Energie et des Mines (2006) *Electricité et Energies Renouvelables au Maro*, Journées d'Etudes sur la Coopération Espagnole dans le domaine de l'Energie Electrique, Marrakech, 16-17 March 2006.

Ministère des Finances et la Privatisation (2004) *Privatisation: Bilan et Perspectives*, Direction des Entreprises Publique et de la Privatisation, Morocco, June 2004.

Morocco Electrical Energy Sector Report (1998); *The Electrical Energy Sector in Morocco* accessed in December 2005 at <http://www.indiaelectricmarket.com/cgi-bin/iemfinancedata/country%20profile/morocco/countryprofile.asp>.

ONE Annual Report, 2002.

ONE (2003), *Quarante Ans d'ONE: l'Energie d'un Pays en Mouvement*, ONE Publication, 2003.

ONE Annual Report, 2004.

Power Technology (2000) *Jorf Lasfar Coal-fired Power Plant Expansion, Morocco*, Accessed at [http://www.power-technology.com/projects/jorf\\_lasfar/](http://www.power-technology.com/projects/jorf_lasfar/) in March 2006.

Woodhouse E, J (2005) *The Experience of IPPs in Developing Countries*; Working Paper, PESD Publications, Stanford University, 2005.

World Bank (1999) *Kingdom of Morocco Private Sector Assessment Update – Fulfilling the Promise of Private Sector-led Growth*, No. 19975-MOR; 15 December 1999.

### **Interviews**

Selected interviews with personnel from the Office Nationale de l'Electricité, February 2006.

Selected interviews with personnel from Jorf Lasfar Energy Company, February 2006.

Selected interviews with personnel from Compagnie Eolienne de Detroit, February 2006.

Selected interviews with personnel from La Compagnie du Vent, February 2006.

Selected interviews with personnel from Energie Electrique de Tahaddart, February 2006.

## Appendix I : Future Plants and Regulation of the Sector

A second combined cycle plant unit is planned to come on stream at Tahaddart in 2010 (Boutaleb, 2005). This will further optimise the use of the Maghreb-Europe pipeline traversing Morocco and the royalties paid by Algeria and further diversify its primary energy mix for power generation. At this stage however it is uncertain whether this will be an IPP.

Morocco has plans to develop more wind farms, having launched an RfP for the next project, a 140 MW plant. A 60 MW wind farm is also being planned for development in Essaouira. Neither of these, however, will be IPPs. ONE has also invited expressions of interest to develop a 1320 MW IPP in Cap Ghir using coal as fuel.

With the aim to further improve the operation and competitiveness of the electricity supply industry, the government planned to institute a regulatory system in 2005/2006 to govern the remaining liberalisation of the sector. After having studied the regulatory systems in a number of occident countries, with special attention given to the UK, California, Norway, Sweden, France and Germany, a regulatory framework has been tabled for introduction into the sector. Although 2006 has come and gone, virtually nothing has been done with respect to the implementation of this new plan. In accordance with the new framework, the sector is to be progressively opened to competition. Large users of electricity particularly in the high voltage categories will be able to select their supplier of choice, with prices determined by the market. The criteria of distinction between these two customer classes is expected to evolve with time. Customers eligible to choose their supplier will compete in an open market either through the electricity exchange or through bilateral contracts. Non eligible (smaller) customers will remain in a regulated market with ONE as the exclusive supplier. The regulated market is intended to supply customers, for whom electricity constitutes a basic service which must be guaranteed by the state, at the low voltage level. For this reason, this market is to be supplied mainly by the power stations realised in the framework of a purchase guarantee. All three IPPs in Morocco are therefore expected to operate in this regulated market (Jerjini, 2002). Tariffs for the sale of electricity to distributors and end users are to be regulated and defined by decree by the office of the prime minister, taking into consideration existing electricity generation and distribution contracts.

Although the new regulatory system was planned to be introduced (in 2005/2006), it is not clear at this stage whether the regulatory processes and functions will be shared between ONE and the Ministry of Mines and Energy or if an independent institution will be formed to fulfil this function. The integration and creation of a Mediterranean-Maghreb power market by 2010 and the on-going liberalisation of the sector will certainly may necessitate the creation of a more independent institution. (Gestionnaire du Réseau de Transport d'Electricité, 2006)<sup>45</sup>

Still conscious of its vulnerability in terms of energy dependence, efforts to further diversify its energy sources have commenced with studies to investigate the feasibility of generating electricity from commercial nuclear reactors<sup>46</sup>. It is not foreseen that these units will become part of the ONE fleet in the near to medium future due to the size of commercial units available and the relative small size of the Moroccan transmission network. Although the option of medium sized reactors is being considered, such reactors would only be economically viable if a programme of successive units were to come on line (Bencheqroun, 2005).

---

<sup>45</sup> See also *Protocole d'Accord pour l'Intégration Progressive des Marchés d'Electricité de l'Algérie, du Maroc et de la Tunisie dans le Marché Intérieure de l'Union Européenne*, Rome 2 December 2003.

<sup>46</sup> An agreement signed with the French in the early 1980s has facilitated the initiation of these studies. The Sidi Boulbra site between Safi and Essaouira has already been identified as the best option for the plant. Morocco already has a 2 MW experimental nuclear plant in Maamora [African Energy Volume 1 No.3, 2005].