

Lessons from Power Sector Reforms

The Case of Morocco

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Abstract

Morocco charted its own distinctive path of power sector reform. It selectively introduced private sector participation for generation capacity expansion and electricity distribution, while retaining a strong, state-owned and vertically-integrated national power utility operating as a single buyer at the core of the sector. Until recently, the country eschewed an independent regulatory entity. The power sector has been guided by strong top-down policy mandates that have served to align the disparate actions of political parties and sector institutions. Ambitious targets for electricity access, liberalization, and renewable energy investments were conceived as an integrated approach to contribute to economic development by relieving fiscal pressures, reducing external dependence on fossil fuels, and positioning the country as a regional leader in renewable energy. The results have been impressive. Since 1990, Morocco has more than tripled its power supply, while

growing renewable energy to account for one-third of the total and relying on the private sector to supply just over half of the electricity generated. Rural electrification has accelerated rapidly from 18 percent in 1995 to virtually 100 percent in 2017. While operational efficiency has been broadly adequate, performance has fluctuated over time. Moreover, the sector's achievements through this selective approach to reform have come somewhat at the expense of the financial viability of the incumbent utility, the National Office for Electricity and Water (ONEE), which has suffered from lack of cost-reflective tariff-setting and an array of entrenched cross-subsidies. Other vulnerabilities include the continued but declining dependence on electricity imports, external price volatilities of imported fossil fuels, and a territorialized electricity distribution model that could be disrupted by grid integration of renewable energy.

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Lessons from Power Sector Reforms: The Case of Morocco¹

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Foreword

“Rethinking Power Sector Reform” is a multiyear global initiative of the Energy & Extractives Global Practice that provides an updated assessment of power sector reform experiences across the developing world. The initiative aims to revisit and refresh thinking on power sector reform approaches, in the light of accumulated evidence about the performance of countries undertaking different types of reforms. The goal is to reignite the policy debate around reform approaches by articulating a new vision that incorporates lessons learned over the past 25 years. It also reflects on how recent technological trends and business models that are disrupting the sector may call for a new thinking on reform strategies.

Since the 1990s, a standard set of policy prescriptions for power sector reform has been widely used. These include vertical and horizontal unbundling of power utilities; private sector participation; creation of an independent regulator; achievement of cost recovery pricing; and the introduction of competition in power generation. While this package of reforms was, at least partially, adopted by several developing countries, momentum and uptake slowed considerably in the 2000s. There is a need to revise approaches in the light of 25 years of experience, evidence, and technological disruptions to provide practitioners with a flexible frame of reference that can help identify the types of reforms needed to improve the power sector in different country contexts.

Supported by the World Bank’s [Energy Sector Management Assistance Program](#) (ESMAP) and the [Public – Private Infrastructure Advisory Facility](#) (PPIAF), the initiative works with different partners and experts across the World Bank Group (WBG) and beyond to generate evidence, analysis and insights on key themes of interest to power sector reform practitioners and decision makers globally: cost recovery, utility governance and restructuring, power markets, regulation, and political economy. Findings and recommendations on each of these themes will be included in a forthcoming Flagship Report.

The initiative is strongly evidence-based, grounding its research in an in-depth exploration of the 25-year power sector reform journey of 15 World Bank Group client countries that represent a wide diversity of geographies, income levels, and approaches to reform. The selected countries are Colombia, Dominican Republic, the Arab Republic of Egypt, India, Kenya, Morocco, Pakistan, Peru, the Philippines, Senegal, Tajikistan, Tanzania, Uganda, Ukraine, and Vietnam.

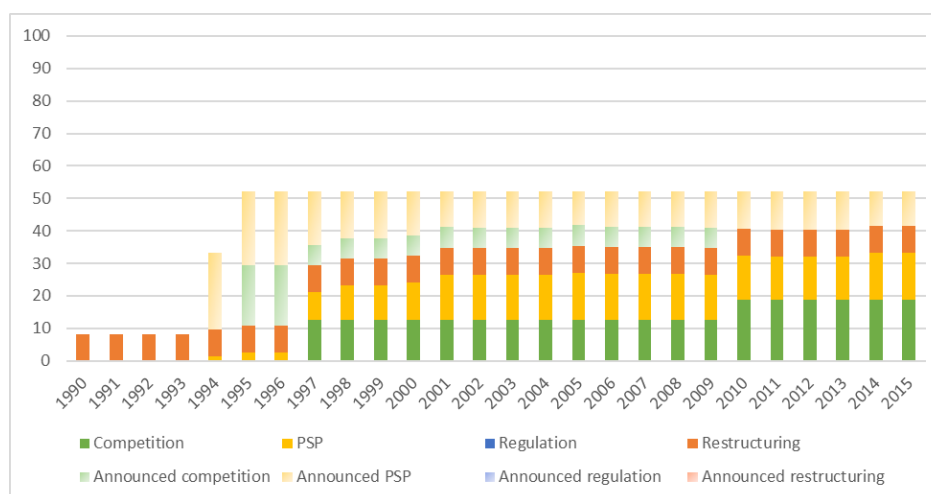
An important output of the project is a series of case studies – of which this is one – that provide a narrative of the reform dynamics in each country and evaluate the impact of reforms on key dimensions of sector performance including security of supply, operational efficiency, cost recovery and energy access. For a subset of countries that pursued deeper reforms – Colombia, India, Peru and the Philippines – the project also includes a series of free-standing case studies that evaluate the experience with wholesale power markets. The purpose of the case studies is to reflect upon the experiences of individual countries with a view to extracting lessons of broader interest to the global community. It is not the role of these papers to recommend any particular way forward for the countries in question.

These case studies, which constitute companions to the synthesis of the Flagship Report, are being published in the Policy Research Working Paper series of the World Bank. As such, the case studies represent the views of the authors alone and should not be attributed to the World Bank or to any other person or institution.

INTRODUCTION

Morocco's experience with power sector reforms presents an interesting case of achievement of outcomes within an institutional structure different from the prescribed 1990s model.³ There is significant private participation in the partially unbundled electricity generation and distribution segments. The share of power generation by the national utility, ONEE, has fallen dramatically from 90 percent in 1991 to about 30 percent in 2017 whereas private generation constitutes about 18,906 GWh (50.8 percent) of gross output. Competition for the market has been prevalent in Morocco, but until very recently there has been no competition in the market. Morocco has made impressive strides in broader energy sector objectives such as rural electrification. It achieved about 99.5 percent rural electricity access in 2017 for 2.1 million households, up from 18 percent in 1995. The country is also a leading performer in implementing a renewable energy strategy towards decarbonizing its energy system. Renewable energy – including hydro, solar and wind – constitutes almost 2,696MW (34 percent) of installed generation capacity, a rate higher than some OECD countries, and is on course to reach 3,769MW (42.7 percent) by 2020 as articulated in the country's renewable energy strategy.

Figure 1: Actual and announced reforms in Morocco, 1990-2015



Source: *Rethinking power sector reform project*
PSP: Private sector participation

However, Morocco has not fully conformed to the 1990s model of power sector reforms⁴ (Figure 1) in the pursuit of strategic sector objectives. The power sector is structured as a single buyer market with elements of third-party access to the transmission and distribution grid, at variance with the prescribed end-point of a fully competitive wholesale and retail power market. The national public utility ONEE has only been partially unbundled given its continued involvement in generation, transmission and distribution. Until very recently, ONEE had persistent financial difficulties, and recorded significant

³The 1990s model of power sector reforms is based on the “Washington Consensus” on improving economic efficiency and attracting private investment. These reforms are comprised of four distinct measures. These are unbundling/restructuring, regulation, private sector participation and competition (Foster, Witte, Banerjee, & Vega Moreno, 2017; Bacon, 2018).

⁴ A simple Power Sector Reform Index is constructed to aggregate the four dimensions of power sector reform considered in this study. The index gives each country a score on an interval of 0 to 100 on each dimension of power sector reform. The scores give equal weight to each step on each dimension of the reform continuum. The average of the four 0-100 scores is used to provide an overall summary of the extent of reform. For more on the index, see Table A.I. in the annex.

transmission and distribution losses of up to 13 percent in 2012. Regulation was carried out by government directly until the creation of an autonomous regulator, ANRE in 2016. Overall, the sector's institutional arrangements have shaped reform design and implementation. Thus, a selective and incremental approach to market reforms preserves the influence and market share of legacy actors, by restricting the scope of the private sector and new government agencies through the single buyer market structure and territorialized electricity distribution.

What explains Morocco's distinct power sector reform experience? How did the country attract private investment in electricity generation and distribution and achieve electrification without extensive textbook model reforms? Will Morocco's institutional arrangements in the power sector endure, adapt to or be disrupted by the country's energy transition? What lessons does Morocco's power sector reform experience provide for other developing countries?

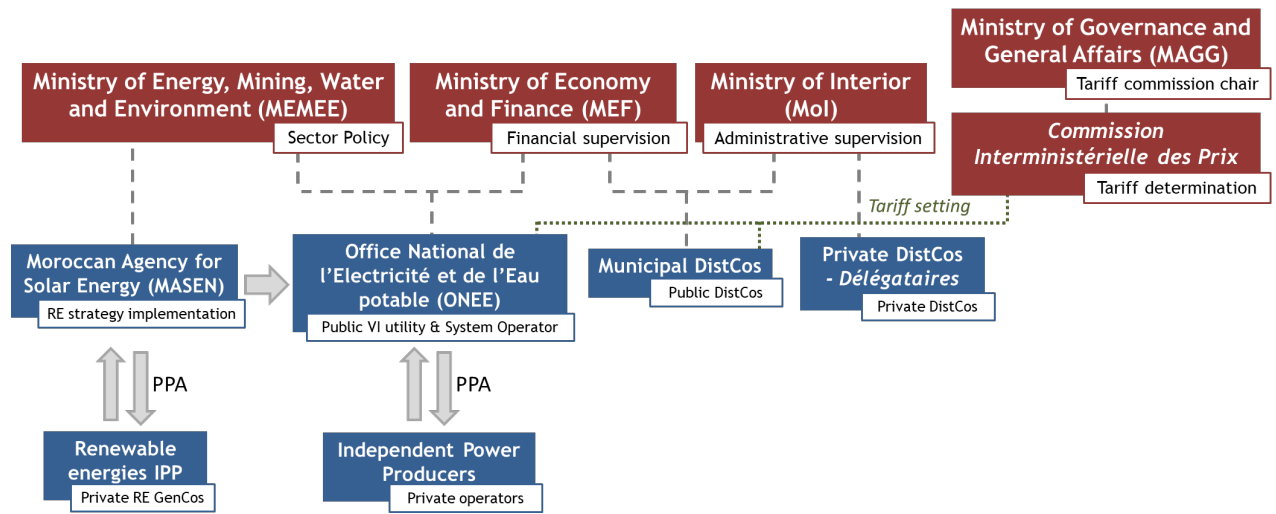
The analysis in this paper addresses these questions over the period 1990 to 2017. It draws on technical and financial data from Morocco's utilities and external databases, and from stakeholder interviews. Where necessary, these data are supplemented by published studies. The paper describes the chronological timeline of reform and examines the sector's performance along the security of supply, electricity access and affordability, utility efficiency and financial viability, and tariffs and cost-recovery. The paper is structured in two main parts: Part I is a chronological timeline of reform and Part II examines the sector's performance along key indicators as well as their underlying institutional arrangements. The rest of the 'Introduction' section presents the policy and institutional framework of Morocco's power sector.

The Policy and Institutional Framework of Morocco's Power Sector

The policy and institutional framework of Morocco's power sector is comprised of a national energy strategy, several public and private operators and a series of laws linking the core elements of this strategy with implementing agencies (Figure 2; Tables 1 and 2). Morocco unveiled a new National Energy Strategy in 2009 with clear objectives around five pillars. These are to: optimize the fuel mix in the electricity sector; accelerate the development of energy from renewable sources especially wind, solar and hydropower to help reduce import dependency and diversify the nation's industrial base; make energy efficiency a national priority; encourage more foreign investment in the energy sector including in oil and gas exploration; and promote integration into the regional electricity and gas grids.⁵ Implementation plans include the installation of a total of 2GW each of wind and solar power generation capacity by 2020 with the aim of bringing renewable energy capacity in power generation to above 40 percent of the total energy mix. Morocco's submission to the UNFCCC as part of its intended nationally determined contributions (INDCs) includes the objective to reach 52 percent of installed electricity generation capacity from renewable sources by 2030.

⁵ (IEA, 2014, p. 22)

Figure 2: Public and Private Entities in the Energy Sector



Source: Authors

Table 1: Key Power Sector Agencies and their Functions.

Agency	Function
Ministry of Energy, Mines, and Sustainable Development (MEMDD)	This is one of the most important government agencies supervising the sector. MEMDD is the main authority over energy policy. It ensures the functioning of the electricity market, security of energy supplies, and the safety of people and energy facilities, among others. It drafts and enforces laws and regulations.
Ministry of Interior (MoI)	MOI supervises the private electricity distribution companies, the cross-subsidies in the sub-sector, as well-as participation in electricity tariff design and implementation.
Ministry of Finance and Economy (MEF)	MEF financially supervises all energy state-owned enterprises, including ONEE, MASEN, AMEE and SIE.
Ministry of General Affairs and Governance (MAGG)	MAGG leads an inter-ministerial committee on prices for determining and implementing tariff adjustments. The task of regulation and tariff-setting will shift to the new regulator, <i>Autorité Nationale de Régulation du secteur de l'Electricité</i> (ANRE).
National Agency for Electricity and Water (ONEE)	ONEE is a national utility. It is in charge of most generation activity, is the owner and operator of the transmission grid, performs the task of system operator and power dispatching and is the largest distributor and supplier of electricity. It is also in charge of producing power generation and transmission master plans. ONEE is supervised technically by MEMDD and financially by MEF.
Moroccan Agency for Energy Efficiency (AMEE)	AMEE was set up in 2010 as a successor to the Centre for the Development of Renewable Energy promotes energy efficiency Its main role is the implementation and coordination of energy efficiency programs. It also proposes national, sectoral and regional plans for energy efficiency development.
Moroccan Agency for Sustainable Energy (MASEN)	MASEN was established in 2010 to lead and manage the deployment of renewable energy. It develops the projects, raises the funds to finance them, and acts as a one-stop-shop. It also conducts renewables resource

	assessment, and generation capacity planning in collaboration with ONEE. ⁶
Municipal distribution companies	There are 11 distribution companies comprising of seven public municipal utilities and four private concessions. ONEE is also in charge of electricity distribution for most of Morocco's cities and regions. Municipal distributors are under the financial supervision of the MEF but are monitored in practice by the MoI. The private concessions hold a contractual relationship with municipal authorities.

Source: Authors

Table 2: The Legal Framework of Morocco's Energy Sector

Year	Law
1963	Decree N°1-63-226. Creation of ONE
1994	Decree Law N° 2-94-503. Allows ONE to sign PPAs with IPPs. Amends Decree 1-63-226
1997	Decree N° 3-127-97. Allows for the privatization of electricity distribution utilities through transferred management.
2002	Law N° 28-01. Authorizes ONE's participation in private generation projects. Amends Decree 1-63-226 Decree N° 1548-02. Rural electricity tariffs
2006	Law N° 54-05. Allows for the delegated management of public services
2008	Law N° 16-08. Provides grid access to large renewable energy self-producers. Amends Decree 1-63-226
2010	Law N°13-09. Allows private power producers to use the transmission grid and enter into direct purchase agreements with end users Law N° 16-09. Creation of <i>Agence des Énergies Renouvelables et de l'Efficacité Energetique</i> Law N° 57-09. Creation of Moroccan Agency for Solar Energy (and amendments)
2011	Law N° 40-09. Merger of ONE (electricity) and ONEP (water) to create ONEE Law N° 47-09. Energy efficiency law
2014	Decree N° 2-13-1874. National building code for energy efficiency in residential, administrative and commercial buildings Decree N° 2451-14. Sets electricity tariffs
2015	Law N° 54-14. Provides transmission grid access to large self-producers, in excess of 300MW (amends Decree 1-63-226. Creation of ONEE) Decree N° 2-15-772. Provides distribution grid access to self-producers to supply medium voltage end-users
2016	Law N° 48-15. Creation of <i>Autorité Nationale de Régulation du secteur de l'Electricité</i> Law N° 58-15. Amends Law N° 13-09 Law N° 37-16. Amends Law N° 57-09 Law N° 38-16. Transfer of ONEE RE assets to MASEN. Amends Decree 1-63-226 Law N° 39-16. Creation of <i>Agence Marocaine de l'Efficacité Energetique</i> . Amends Law N° 16-09

Source: Authors

⁶ (IEA, 2019, p. 109)

1 MOROCCO'S POWER SECTOR REFORM STORY

This section describes Morocco's power sector reform experience through four distinct phases, from the country's independence in the 1960s to date. These are: the post-independence, partial liberalization, privatization of electricity distribution and the new energy strategy phases.

1.1 Post-Independence Power Sector and the Creation of ONE (1963-1993)

Shortly after independence, the *Office National de l'Electricité* (ONE)⁷ was created in 1963 to inherit *Energie Electrique du Maroc's* (EEM's) assets. This marked a transition from the colonial arrangement of privately-owned territorial monopolies in electricity distribution (EEM in rural towns and *Société Marocaine de Distribution* (SMD) in large and industrialized urban centers). The pre-independence power sector was not restructured but it was nationalized. Thus, ONE had a monopoly in generation and transmission but provided distribution with 12 other municipal entities as territorialized monopolies that were nationalized but autonomous.

ONE continued with EEM's planning strategy and investment program to meet rapidly increasing demand. Electricity tariffs were determined by an appointed Inter-Ministerial Commission. The responsibility of new connections was transferred from this commission to ONE and funded via a national tax on tariffs.⁸ Until the 1980s, ONE managed to meet the infrastructural expansion of demand without major difficulties. The MOI, through the department in charge of local authorities (DGCL), tried with limited success to meet the needs of a few off-grid small and remote towns using decentralized generation systems.

From 1990, the Moroccan power sector experienced serious power supply shortages due to the country's economic and financial legacy from the 1980s. A severe drought reduced the contribution of hydropower in total electricity generation, by more than 60 percent for five consecutive years. There was also poor performance of the newly commissioned Mohammedia coal-fired power plant.⁹ The dire state of public finances resulted in the cancellation of investment grants from the state.¹⁰ By 1983, debt had risen to 84 percent of GDP and 300 percent of export earnings, and Morocco's foreign reserves could only pay for a few weeks' worth of imports. Finally, the cost of fuels increased three-fold between 1980 and 1985 as a result of increased taxation at a time when the share of HFO (heavy fuel oil) in power generation was up to 54 percent of total electricity supply. Yet, electricity tariffs were frozen during the same period and the government postponed any decision to adjust tariffs after popular protests followed an attempt to raise food prices. This financial hardship and power supply shortages provided the impetus for the initial steps towards sector reforms with the introduction of IPPs.

⁷ The utility was known as ONE until 2011 when it was merged with a water division and renamed to ONEE.

⁸ « Décret n° 2-74-530 du 14 avril 1975 relatif à l'électrification rurale ou des petites centres » decree on rural electrification.

⁹ (World Bank, 1994, p. 1)

¹⁰ From 1981, the economic situation in Morocco significantly deteriorated as the result of both internal and external factors. By March 1983, the country was bankrupt and could no longer service its debt.

1.2 Partial Liberalization of Generation Enables Electrification Drive (1994-1996)

From the mid-1990s, the government initiated a series of reforms to allow for market entry in electricity generation and distribution, expand the regional integration of the power system, and initiate a vast rural electrification program. In 1994, Morocco adopted Law N° 2-94-503 which allowed the national power monopoly ONE to enter into power purchase agreements with independent power producers (IPPs). This partial liberalization was a response to the recurring problems of the power system's financial sustainability. It was also an attempt to improve the performance of generation facilities and offer electricity to consumers at competitive prices. Subsequently, in 1996, ONE awarded CMS Energy and ABB Energy a 30-year concession agreement to construct and operate the Jorf Lasfar Energy Company (JLEC) power station, a 1,356 MW coal-fired power project on the Atlantic Coast. The concession was a Build-Transfer-Operation (BTO) arrangement. The project was Morocco's first IPP and was considered successful, prompting the country to replicate the model to increase private sector participation in power generation.

The choice of a BTO instead of a Build-Own-Operate-Transfer (BOOT) model was the result of strong resistance from decision makers to private ownership of large generation plants. It was deemed risky to allow a private and foreign investor to own the strategic facilities responsible for producing more than 50 percent of the country's total electricity demand. An ad-hoc tax arrangement was introduced by fiscal authorities to avoid transaction costs of the BTO structure. After ONE failed to obtain a new tax waiver from the Ministry of Finance in 2010, the BTO was replaced with the BOOT for all subsequent IPPs.

The BOOT model marked a turning point for private sector participation in electricity generation and enabled an improvement in ONE's financial health. The private finance in generation released ONE from a significant portion of its debt, thereby restoring its capacity to invest. The BOOT also introduced "transparent" pricing where a portion of tariffs is indexed to the international market price for coal. The 'take-or-pay' clause of the underlying PPAs with IPPs reinforced the role of ONE as the system operator in charge of ensuring the balance between supply and demand. The utility made improvements in debt collection and reducing generation costs. A part of the subsequent windfall was shared with consumers through tariff reductions, a political decision by some policy makers.¹¹ The inconsistency of these adjustments in which medium voltage (MV) tariffs were lower than high voltage (HV) ones, were regarded as the basis of ONE's deteriorating financial health, starting from 2006.¹²

This phase in Morocco's Power Sector Reform history marked an important step towards regional integration with the inauguration of the Maghreb-Europe gas pipeline in December 1996. The pipeline allowed for the introduction of natural gas into the supply mix. The first Combined Cycle Gas Turbine (CCGT) power plant, which was a joint venture between ONE, Siemens and Endesa, was commissioned in 2006. There was a 30-fold increase in supply of natural gas to Morocco, from 30 million cubic meters (m³) to more than 900 million m³ per year. Gas imports created an energy security issue of dependence on

¹¹ Interviews with power sector experts in Morocco, 2017.

¹² Ibid (2017)

Algeria. Electricity imports also increased at this time. Until 1997, regional power interconnections were limited to a 225-kV single connection to Algeria. More connections were developed but the main interconnection is through the Morocco-Spain network which consists of two lines: a 400-kV line commissioned in August 1997; and another 400-kV line commissioned in June 2006.

In 1996, Morocco's rural electrification program, the '*Programme d'Électrification Rurale Généralisé*' (PERG), began. Over the course of 20 years, the grid was extended to cover most areas of the country thereby reaching 99.5 percent electrification by 2017. The program was implemented by ONE, using a blend of domestic and international financing (discussed further in Part II of the paper). ONE also combined grid and off-grid renewable energy systems to bring electricity to some remote rural communities.

1.3 The Privatization of Distribution Falls Short of Comprehensive Sector Reforms (1997-2007)

In electricity distribution, a decentralized approach to market reforms was taken, involving municipalities. Privatization took the form of concessions called delegated management or '*gestion déléguée*'.¹³ In 1997, the French *Lyonnaise des Eaux* (LYDEC) signed a 30-year concession agreement with the Casablanca municipality.¹⁴ The contract was for the management and maintenance of the electricity, water and sewerage assets in Casablanca.¹⁵ In addition to Casablanca, Rabat (REDAL), Tangier and Tetouan (AMENDIS) elected to outsource power and water distribution to the private sector.

However, these 'delegated management' practices were introduced without a legal framework. This allowed private actors to exploit the legal vacuum. Thus, the government introduced the Law 54-05 for delegation of public services, the Public – Private Partnership (PPP) Law and 17-08 Law to amend the communal charter.¹⁶ Nevertheless, the electricity distribution service is still governed by a 55-year old institutional framework which defines the various supervisory roles according to the area involved. The Technical and regulatory aspects of the eleven municipal distributors are supervised by the MOI, while ONE is supervised by the MEMEE. The financial aspects are supervised by the Department for Monitoring State Owned Entities (DEPP) of the MEF. Proposals for tariff adjustments are generally made by ONE and discussed and approved by an inter-ministerial commission on tariffs.

Since 2002, no concessions have been awarded in the distribution sector via delegated management. This was largely due to the lack of unanimous political agreement on the

¹³ It is instructive that Moroccan decision-makers opted for an approach to privatization that concedes minimal control. Other approaches to private participation that could be considered include: 'full divestiture', that transfers 100 percent of assets to private hands for an indefinite period; 'partial divestiture', that transfers 51 percent (but less than 100 percent) of assets to private hands for an indefinite period and 'lease contract' with state ownership of infrastructure assets, joint ownership of operating assets, and private ownership of operating rights for a limited period and 'management contract' that is similar to a 'lease contract' except that the state owns the operating assets (Gassner, Popov, & Pushak, 2009).

¹⁴ RAD or 'Régie Autonome de Distribution'.

¹⁵ (Hatem, 2007, p. 9)

¹⁶ The Communal Charter provides the legal framework for local governance, administration and management of communal public services. It clarifies the role of each entity, responsibilities of the municipal staff and defines governance rules.

most appropriate institutional arrangement for private sector participation considering the perceived hegemony of private distribution utilities and information asymmetry.¹⁷ Furthermore, a substantial improvement of operational performance and financial viability of the distribution utilities rendered the transfer of their activities to the private sector unnecessary.¹⁸ This strong performance improvement was due to strong actions by the MOI to ensure utility financial discipline. This was reinforced by the newly amended municipal charter of 2002 which extended the role of local government, to include decisions selecting their preferred model for public service provision.

Broadly, the reforms of the 1990s did not result in comprehensive sector-wide application of the standard model of power sector liberalization. An ambitious draft legislation to unbundle the sector and introduce competition in generation was prepared by the government in the early 2000s. ONE even floated an unfruitful tender for developing generation capacity with no guarantees as to purchasing the power produced. Policy makers rather focused on directing private investments to expensive generation assets (Coal-fired and CCGT plants), and on electricity distribution activities. In an illustrative decision taken in 2002, ONE awarded a 25-year 380 MW IPP while both Tangier and Tetouan municipalities signed concession agreements with the French company, Veolia. However, neither ONE nor municipal distributors were comfortable with introducing full competition and market-orientation in the sector.

Between 2000 and 2004, ONE and MEF suspended the elaborate plans for sector-wide reforms including privatization for reasons revolving around tariffs. It was difficult to design a tariff system which could achieve various countervailing goals, i.e. guarantee subsidized tariffs for low-income households, low tariffs for a struggling manufacturing sector, allow municipal distributors to make sufficient electricity sales to subsidize their other loss-making activities, and still provide the necessary revenues for ONE to expand the transmission grid and implement rural electrification.

The MOI resisted full liberalization and municipal distributors argued that a sizeable excess of revenues from their electricity sales is necessary to balance loss-making sales of water and investments in wastewater treatment and sanitation infrastructure. Therefore, it was deemed that the long-run price uncertainty of electricity tariffs in a market-based model would damage the whole model of municipal distribution without a profound overhaul of other municipal services including water, and sanitation. Other reasons given for suspending comprehensive reforms were that the limited size of the generation market and the improved performance of public distribution utilities that made sector-wide reforms unnecessary.¹⁹ Policy makers also felt that full privatization at the time carried high risks and uncertainties that could disrupt the continuity of a reliable and affordable supply of electricity to fuel the country's economic and social development.²⁰ Policy makers regard the collapse of SAMIR, Morocco's only refining company, after its privatization in 1997, as

¹⁷ "Rapport sur la gestion déléguée des services publics", Court of Auditors, October 2014 ; "Rapport sur la gestion déléguée", CESE, April 2015 and (El Yaakoubi, 2015) on 2015 protests in Tangier against the local private utility.

¹⁸ Interviews with Moroccan power sector stakeholders, 27 January 2017.

¹⁹ Interviews with Moroccan power sector policy makers, 3 February 2017

²⁰ Interviews with Moroccan policy makers, 3 February 2017.

a validation of their view on the risks of premature and poorly designed privatization. The new municipal charter also empowered local authorities to resist market reforms.

1.4 A New Energy Strategy Aims to Bypass the Power Sector's Legacy Issues (2008-Date)

From 2008, there were several important developments including further liberalization, the announcement of a national energy strategy and the establishment of implementing agencies. In 2008, the power generation market was further opened to private investors. Large power consumers could own and operate plants with capacities not exceeding 50MW and were granted access to the grid to transport electricity produced from local fuel resources, including renewables, to centers of consumption.

In 2009, Morocco announced ambitious targets of increasing renewable energy (RE) capacity in power generation to more than 40 percent by 2020 as part of a national energy strategy. To achieve these objectives, the government created two dedicated agencies: Moroccan Agency for Solar Energy (MASEN), in charge of implementing the Moroccan Solar Plan, and ADEREE (now AMEE) to promote energy efficiency. The new renewable energy strategy was a stark shift from the 2008 energy plan for 2030, which asserted the preference for coal and gas in power generation and did not envisage a major role for solar energy before 2020.²¹ Since the RE strategy was crafted while the price of oil and coal was relatively low, it was no doubt, a strategic decision taken by the highest Moroccan political authority. This decision was driven by security of supply concerns, long term economic development goals and a vision for the country's geopolitical ambitions within the region.²²

In 2010, the RE Law13-09 was announced. The law made it possible for private power producers to use the transmission grid and enter into direct purchase agreements with end-users to sell the electricity produced from renewable resources. It also opened a new market segment in which certain industrial customers could choose their electricity suppliers. However, the framework, did not live up to the expectations of its advocates and private energy developers. It was criticized to be in favor of ONE with notable concerns including the size of the potential bulk customers considered too small. However, with prospects of declining revenue the MOI and municipal distributors were not on-board with early attempts to include medium voltage customers in the category of eligible consumers who could choose their suppliers.

In 2011, ONE was merged with ONEP (the state-owned water utility). The new legal entity resulting from the merger became the *Office National de l'Electricité et de l'Eau potable* (ONEE). Changes induced by the merger were limited to creating the new legal entity and did not entail any modifications in the organizational structures of both the electricity and water utilities. Financial accounts are still separated operationally but merged for state reporting purposes. The merger was meant to support desalination projects and enable a potential reorganization of the power and water distribution sectors.²³ One option still being considered is the creation of regional distributors to replace the prevailing hybrid

²¹ MEMDD opposed ONE's attempts in 2008 to gradually increase solar and wind contribution in power generation.

²² Interviews with Moroccan policy makers, 8 February 2017.

²³ Interviews with Moroccan policy makers, 3 January 2017.

model where 11 urban centers are covered by municipal utilities and the rest of the country by ONEE.

A 2011 Energy Efficiency Law (Law 47-09) introduced appliance labeling, mandatory energy audits in industry, energy norms for new buildings, and mandatory impact studies for large energy projects. In 2014, the Moroccan government adopted a decree on energy efficiency in the building sector allowing for thermal regulation.

In early 2014, the government decided to withdraw subsidies for most petroleum products except for those used by ONEE for electricity generation as well as butane.²⁴ In May 2014, to alleviate the long-running poor state of finances of ONEE while simultaneously pushing the utility to improve its operational performances, the government approved a Financial Restructuring Plan. The plan allowed for crucial tariff adjustment series from 2014 to 2017 which significantly improved the financial situation of ONEE. However, it stopped short of deeper structural sector reforms because of the complex negotiations involved and the urgency for short-term measures.

In 2015, restrictions on self-generation were further relaxed. The power self-generation legal framework suspended restrictions on capacity, type and site of generation, provided that the total installed capacity is above 300MW. The new legal amendment recognized the importance of providing more flexibility to large industrial consumers such as the mining sector. Nonetheless, this new regulatory development is somewhat odd. The only non-power industrial company in Morocco with more than 300MW of installed generation capacity is the Office Chérifien des Phosphates (OCP), the world's largest phosphates and fertilizer producer, and no other industrial company comes close to the threshold of 50MW. Thus, the new amendment appears to favor industrials like OCP by attempting to address their grievances against ONE's conditions for buying back excess electricity from their cogeneration facilities.²⁵ From ONEE's perspective, it bears significant costs to supply a reliable service at a fixed tariff regardless of generation costs.

In 2015, the scope of the renewable energy law was further widened to distribution grids through Decree N° 2-15-772. Private renewable energy developers could connect their projects to the medium voltage grid and directly access, albeit under some restrictions, the end users. However, the pool of consumers eligible to enter into purchase agreements with private producers is very limited and provisions are included in the law to cover any resulting losses for private distributors. Distribution companies pushed back against any attempts to share their core and captive customers with competition, while ONEE weighed the risk of a shrinking pool of consumers and the impact on its capacity to honor its long-term PPAs. Discussions with legacy utilities showed that they will resist a fast rollout of this decree unless they are assured that future prospects for their business activities will not be jeopardized.

In 2016, Morocco adopted Law 48-15 to introduce an energy regulator, the National Energy Regulatory Agency (ANRE). The new authority's functions will include regulating access to

²⁴ Butane gas, largely used by households and agriculture, remains heavily subsidized (IEA, 2019).

²⁵ ONE values electricity produced by its customers at 40 percent of the tariffs used for its electricity sales.

networks, setting the tariffs for the utilization of transmission and medium-voltage grid and ensuring the efficient functioning of the market.²⁶ As ANRE's mandate covers the 'free market', the Ministry of General Affairs will remain responsible for tariff setting in the regulated segment of the electricity market. A director-general was appointed in 2018 but the agency is yet to begin operations. Implementation of the legislation is underway and should enable ANRE to manage conflicts between operators and network users.²⁷ ONEE's transmission network will be administered independently of energy production to avoid discrimination against new producers.

In 2016 still, MASEN's scope was expanded to include the development and operation of all types of renewable energy facilities. The agency was renamed the Moroccan Agency for Sustainable Energy and ONEE was required by law to transfer all its renewable energy assets to the new entity. This measure emphasized the role of renewables in the energy sector's future development and to fast-track the realization of the country's RE targets in power generation. The low cost of wind and hydroelectricity should allow MASEN to balance the high cost of solar CSP.²⁸ Much remains to be established regarding the institutional relationship between ONEE and MASEN, and the latter's role in energy planning and policy making. ONEE is wary of any arrangement that could lead to inheriting what they view as MASEN's liabilities for the solar CSP incremental cost and other operational costs, without adequate compensation.

2 MOROCCO'S POWER SECTOR PERFORMANCE

Having examined Morocco's experience with power sector reforms, this section analyzes the implications for the sector's performance and institutional development. This evidence-based analysis aims to first establish whether Morocco's power sector performance improved over the period 1990-2017 along four dimensions. These are security of energy supply; electricity access and affordability; efficiency and financial viability of utilities and; tariffs and cost recovery. Then we evaluate the extent to which specific institutional arrangements explain this performance.

2.1 Security of Supply

2.1.1 Performance

Since the 1990s, Morocco has taken steps to increase its generation capacity, diversify its energy mix, and secure its energy supplies. This is within a context of high dependence on imported energy supplies – coal, oil and oil products; gas from Algeria; electricity from Spain – and significant greenhouse gas emissions.²⁹ The result is that the structure of Moroccan power generation is changing. From a configuration where, oil-fired generation alone constituted 70 percent in 1993 to the situation in 2017 where coal (55 percent), oil (10.5 percent) and natural gas (18.8 percent) account for over 80 percent of all production and renewables (hydro, wind and solar) account for 15 percent. Renewable power plants

²⁶ (IEA, 2019, p. 21)

²⁷ (International Trade Administration, 2017)

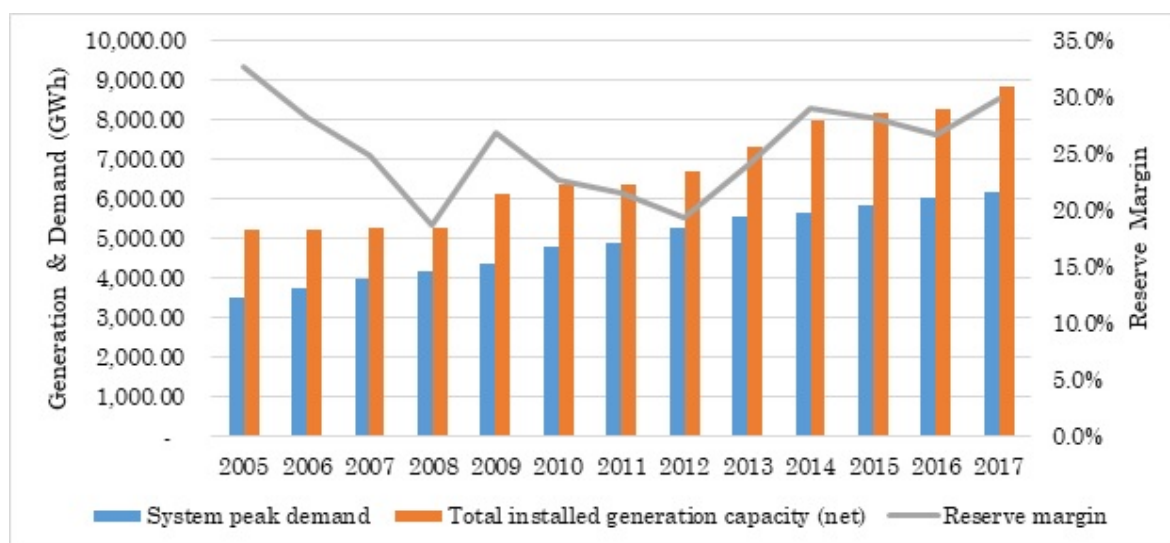
²⁸ Interviews with Moroccan policy makers, 3 January 2017.

²⁹ (IEA, 2014)

constitute 33.66 percent of installed generation capacity. The performance indicators assessed here are installed generation capacity, diversification of fuel sources and suppliers and grid reliability.

Morocco's system-wide power generation indicators point to stable and improving performance. Power generation capacity is growing alongside a steady increase in peak demand and actual output (figures 3 and 4). In 2017, total generation capacity stood at 8,820 MW compared to 5,233MW in 2005, peak demand is at 6,180MW compared to 3,520MW in 2005, and capacity utilization of 48.2 percent compared to 42.8 percent in 2005. The reserve margin³⁰ is at 29.9 percent in 2017 down from 32.7 percent MW in 2005, but steady. Net generation more than doubled to 37TWh in 2017 from 17TWh in 2005 and from under 10TWh in 1990. Actual production, excluding electricity imports in 2017 is 31.8TWh. Over the last 12 years, growth in average peak demand at 4.8 percent has been slightly faster than generation capacity, at 4.5 percent. The high growth in demand is linked to higher access to electricity rates within this period as well as GDP growth, population increase and improvements in the standard of living. Electricity demand growth is projected to continue at 5 percent per annum until 2021³¹ with demand reaching 45 TWh in 2020 and 80 TWh by 2030. To continue to meet this rising demand, there must be massive capacity additions, averaging close to 1,000 MW per year, if Morocco does not want to increase its electricity imports.

Figure 3: Generation Capacity, Peak Demand and Reserve Margin



Source: Authors based on data from ONEE

The power grid's reliability as measured by outages appears to be high. A snapshot shows that there were only 0.6 outages per month in 2013 with an average duration per outage of 1.7 hours. The heat rate has increased slightly from 36 percent in the year 2000 to 38 percent in 2014. There were high emissions of around 850 gCO₂/kWh until 2002, which has

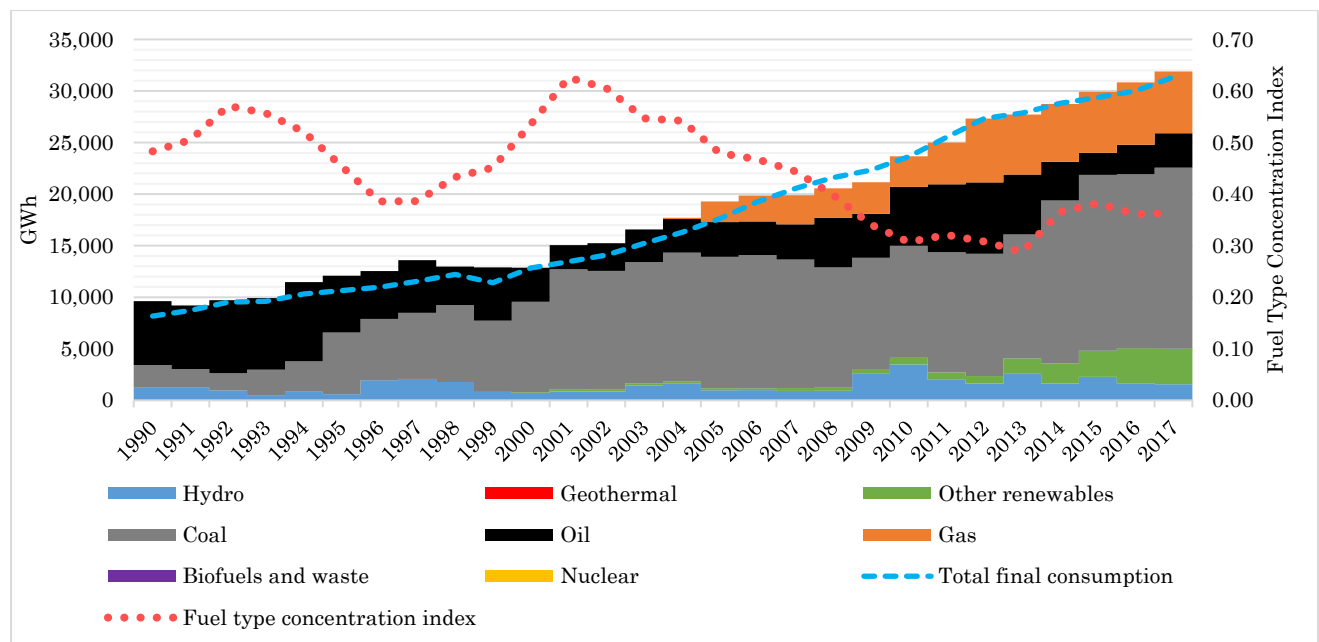
³⁰ Reserve margin is the amount of unused available capability of an electric power system (at peak load for a utility system) as a percentage of total capability.

³¹ (IEA, 2019, p. 12)

now dropped to 700 gCO₂/kWh. However, the heat rate of JLEC, outperforms ONEE's older coal plants, such as Jerada, which requires almost twice the quantity of coal to produce the same amount of power. While JLEC has a heat rate of 2,195 kilocalories per kilowatt-hour, the values for ONEE's Jerada and Mohammedia coal plants, commissioned over three decades ago, are 3,850 and 2,534, respectively.³²

These stable system-wide indicators are underpinned by a growth and diversification of Morocco's electricity generation mix in at least three ways. First, there are more energy sources today than there were in 1990. The fuel-type concentration index has declined steadily over the years (Figure 4) from 0.48 in 1990 to 0.36 in 2017. In the 1990s, there were three main fuel sources, oil, hydro and coal. Therefore, the fuel-type concentration index reached a peak of 0.57 in 1992 when oil constituted 73 percent of generation (7,087 GWh) and coal contributed about 17 percent (1,668 GWh). The concentration index dipped to 0.39 from 1997 when hydro-electric generation more than tripled to an all-time high of 2,083 GWh. There was another shift in the 2000s, when the generation mix became more concentrated, at 0.63 in 2000. At this time, hydro-electric output collapsed to 718 GWh and coal-fired generation began an upward trend to 8,783 GWh that continued for the next decade. This was in part, due to the drought between 1997 and the year 2000. Over the next decade, other energy resources were added to the mix, including gas, wind, and solar. Gas for instance, contributed 126 GWh in 2004 and 2,003 GWh in 2005 due to imports through regional interconnections with Algeria.³³ In 2014, for the first time, wind-generated electricity surpassed hydroelectric power as the biggest contributor to renewable energy generation (Figure 5).

Figure 4: Electricity Generation in GWh (1990-2017)

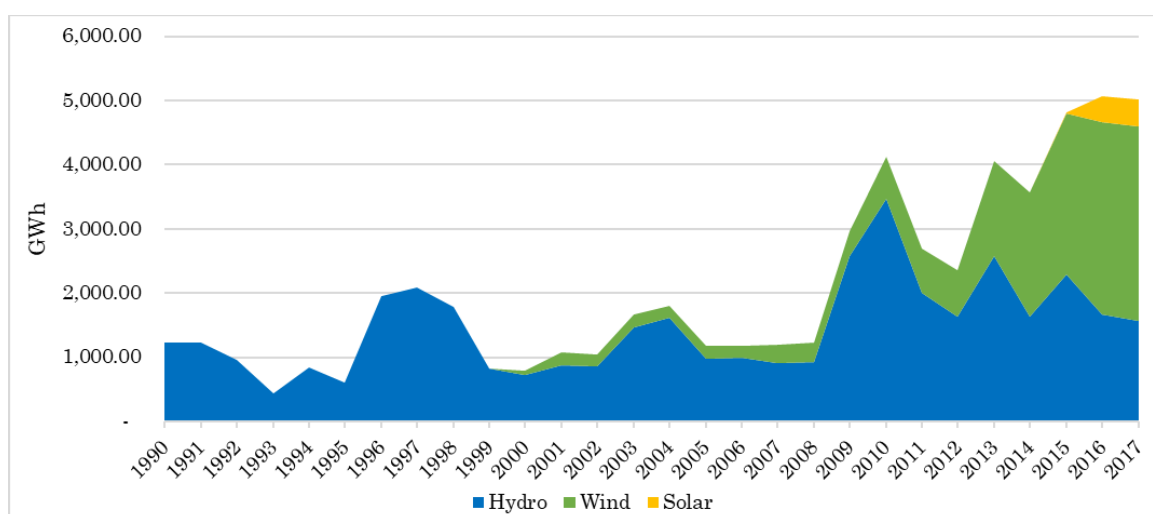


Source: Authors based on data from ONEE

³² (Camos, Bacon, Estache, & Hamid, 2018)

³³ Morocco plans to expand the share of natural gas in the longer term. Several new gas supply routes are being discussed, including imports of natural gas from Nigeria, and the construction of an LNG terminal, which can provide access to contract and source flexibility (IEA, 2019, p. 12).

Figure 5: Renewable electricity production in GWh (1991 -2017)



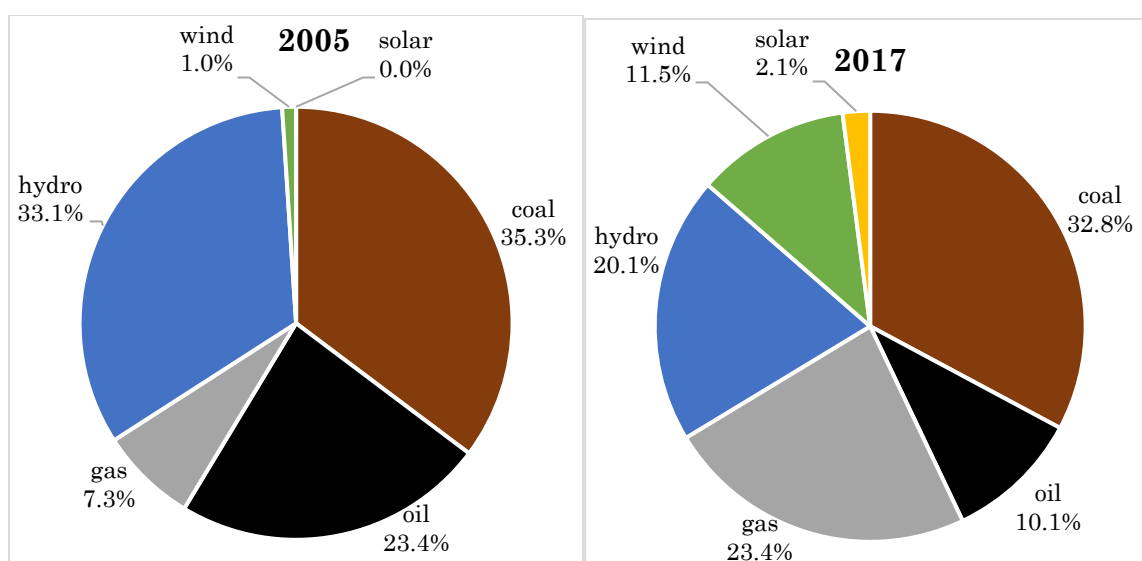
Source: Authors based on data from ONEE

Secondly, Morocco's power systems are characterized by a rising share of cleaner energy, including renewables, although still heavily reliant on fossil fuels and thermal generation. Renewables, including hydro, wind and solar, constitute 2,696MW (33.7 percent) of installed capacity and 5,015 GWh (15 percent) of electricity output. Between 1990 and 2004, oil and coal dominated the energy mix, while hydro fluctuated, rising and declining steeply. The capacity for hydro-electric generation has remained constant since 2005, reaching 1,770MW. However, the more dramatic growth in capacity additions are in an 18-fold (1,885 percent) increase in wind, from 54MW in 2005 to 1,018MW in 2017; and a five-fold (543 percent) in gas generation,³⁴ from 380MW in 2005 to 2064MW in 2017.

There is also an increasing share of renewables other than hydropower in Morocco's electricity generation portfolio. The country is on track to achieve its 42 percent renewable energy target by 2020. In 2014, electricity generated from wind reached 1,924 GWh surpassing hydroelectric power at 1,637 GWh. As of April 2019, Morocco had the largest wind generation capacity in the Middle East and North Africa (MENA) region. For solar, 161MW capacity was added in 2015, with plans for another 600 to 800MW by 2020 from hybrid PV concentrated solar power (CSP) plants in the Noor-Midelt Solar Power project. The completion of this project will effectively push the share of renewables in the generation capacity to 42.7 percent at 3,769MW, beyond the 40 percent target set in Morocco's RE strategy. Concurrently, the generation capacity for fossil fuel plants is expanding. The capacity of coal and oil-fired plants increased from 3,069MW in 2005 to 4,577MW in 2015. Collectively, thermal plants constitute about 66 percent of installed generation capacity (Figure 6).

³⁴ This figure includes both the gas plants and the combined cycle turbine plants of Energie Electricque de Tahaddart and Ain Beni Mathar.

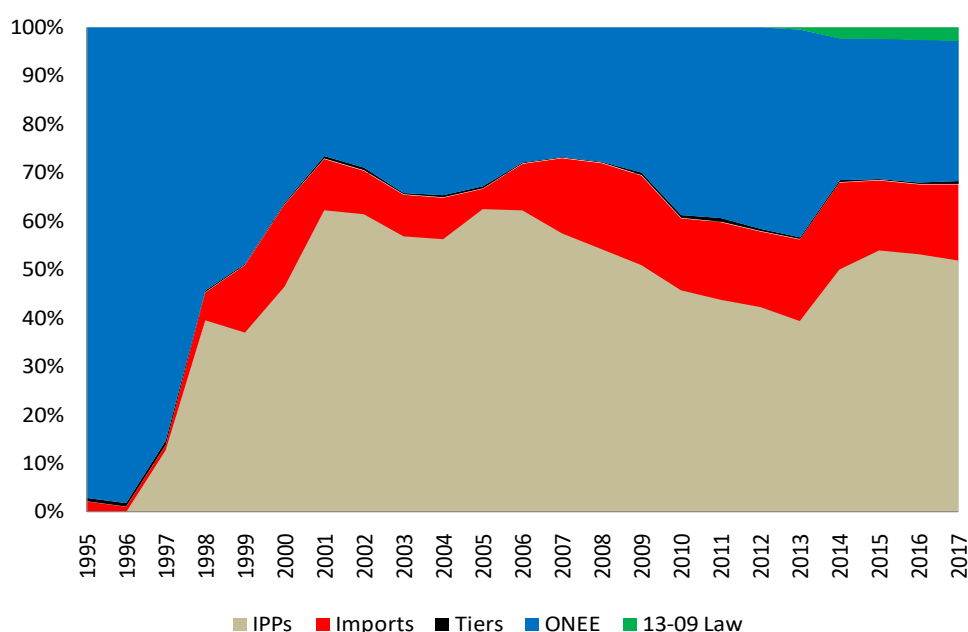
Figure 6: Electricity generation capacity (percent) by Fuel Type 2005 & 2017



Source: Authors based on data from ONEE

Thirdly, ONEE's share of generation has declined greatly over the years. From 92 percent in 1991 and a peak of over 98 percent in 1996, ONEE's total share of generation is at 30 percent in 2017 (Figure 7). The share of private power generation, through IPPs from 1994 has grown rapidly to 18,906 GWh (50.8 percent) in 2017.³⁵ However, electricity imports have also grown consistently during the same period, reaching 5,955GWh (16 percent) in 2017.

Figure 7: Power generation by status of producer (1991 – 2017)



Source: Authors based on data from ONEE

³⁵ (ONEE, 2017, p. 5)

Note: IPPs refer to private power plants; 'Imports' are electricity imports, 'Tiers' refer to autonomous production, 'ONEE' refers to its own plants and '13-09 Law' refer to renewable generation from state-owned and private plants.

Overall, Morocco's electricity sector has featured a growth in generation capacity, output and demand, as well as a diversification of the energy supply mix. There is still high dependency on fossil-fuel based power generation which constitutes over 66 percent of total installed capacity of which all fuels, i.e. coal, oil and gas are imported. The energy system has become more resilient to climatic shocks however, compared to the past when droughts were extremely destabilizing. While hydro constitutes a fifth (about 20 percent) of generation capacity, it is only about 4.2 percent of actual output. Energy security supply concerns also persist, given the reliance on electricity imports, although they are projected to decline in the coming years with additional capacity. Electricity generation is diverse in terms of the fuel and technology type but is heavily reliant on imports of electricity and fossil fuels.

2.1.2 Institutions

The growth in generation capacity and output, and diversification of Morocco's supply mix can be attributed to the strong national aspiration to achieve energy security and the political will to attract private investment, unveil a renewable energy strategy and pursue regional integration. There is a clear objective of reducing energy imports given its impact on balance of payments and, alongside subsidies on some energy supplies such as butane, on fiscal space.³⁶ There are also strong geopolitical motivations for Morocco to assume a leadership role in the region through energy exports to Europe.³⁷ Combining market liberalization with regional grid integration through the Maghreb Electricity Committee [COMEEC], and with counterparts in the European Union is an important thrust of Morocco's energy policy.³⁸ The government hopes that Morocco will be able to provide renewable energy exports to the European market and regional neighbors in Africa through the West African Power Pool.³⁹ The realization of this vision however, has been shaped by the sector's institutional architecture, especially the role of legacy actors like ONEE, and the Ministries of Energy, Finance and Interior, thereby creating vulnerabilities, such as exposures to external price volatilities, as is explained below.

Strategic economic policy decisions are usually made at the highest levels of political authority in Morocco. In undertaking such strategic long-term plans, the King of Morocco provides moral leadership to generate consensus among the otherwise disparate and short-term objectives of political parties and implementing agencies. Politicians and some bureaucrats had previously dismissed the viability of renewables as a serious option for power generation. However, the strong political commitment established consensus that unraveled the bureaucratic inertia in RE promotion and development. This leadership facilitated RE incorporation into the national energy strategy⁴⁰ and the mobilization of the financial resources and expertise necessary to realize set targets. The RE target was

³⁶ (IEA, 2014)

³⁷ Interview with Moroccan power sector policy makers, 2 February 2017.

³⁸ (IEA, 2014, pp. 9-10)

³⁹ The roadmap for sustainable electricity trade between Morocco and the European internal energy market was signed between Morocco and Germany, France, Spain and Portugal on 19 December 2018 in Brussels (IEA, 2019, p. 12).

⁴⁰ The strategy was developed by MEMDD, with input from ONEE's experts. Interviews with Moroccan policy makers, 2017.

initially set at 42 percent of installed generating capacity in 2020 and then increased to 52 percent by 2030 in Morocco's INDCs, putting the country at the forefront of the MENA region in clean energy ambitions. This shift to RE stems from a holistic vision that combines long term economic development goals with the imperative of securing energy supplies, reducing the country's dependency on imported fossil fuels and lowering the economy's energy intensity.

A gradual and selective approach shaped by the power sector's institutional architecture and legacy actors like ONEE characterized the implementation of these strategic plans. ONEE is Morocco's state-owned utility that covers parts of electricity generation, all of transmission and parts of distribution. Its conflicting roles as the sole buyer and supplier of electricity to distributors and as responsible for producing power sector master plans have shaped the selective and incremental approach to market entry that has resulted in both progress towards the diversification of the generation mix as well as increasing dependence on external fuels and electricity imports. The three notable aspects of this approach to liberalization are: the substance of laws enabling market entry, single buyer generation market structure due to partial unbundling and ONEE's focus on short-term sector planning.

First, since 1994, a series of laws have incrementally enabled private participation while allowing ONEE to retain control of aspects of generation and transmission. As discussed in the previous sections, Decree Law N° 2-94-503 allowed ONEE to enter into power purchase agreements with IPPs thereby partially unbundling ONEE. Then, Law N°28-01 of 2002 allowed the utility to take equity participation in private power generation firms. Law N° 16-08 of 2008 allowed for self-production for RE capacity not exceeding 50 MW and to sell the excess to ONEE. Law N°13-09 (2010), Decree N° 2-15-772 (2015) and Law N° 54-14 (2015) made it theoretically possible for private power producers to use the transmission grid and enter into direct purchase agreements with end users.

These legislations have gradually allowed for market entry in electricity generation in a way that has not undermined ONEE's control in generation and transmission, and the revenues of municipal utilities in electricity distribution. As a policy maker explained, the government has "always emphasized on a step-by-step approach for introducing important reforms in the energy sector". Law 13-09 in its first version, deliberately had a narrow scope as it did not cover installations connected to distribution grids and did not fix a clear framework for the relationship between project developers and ONEE. They add that "the idea was to introduce amendments..." gradually "...and get the legacy utilities more comfortable with the impact of the law."⁴¹

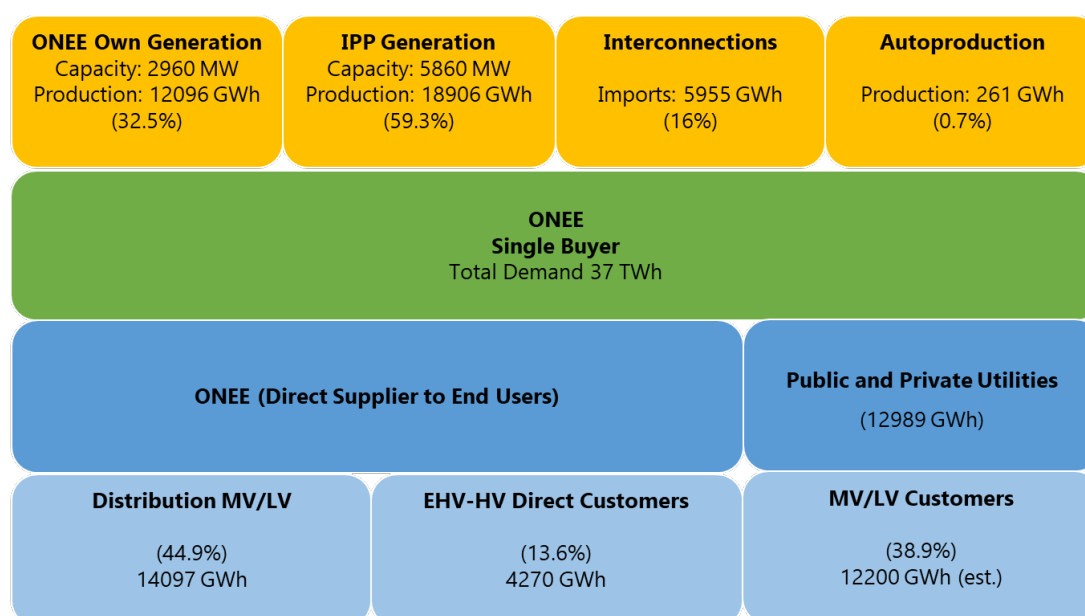
A second aspect of the selective approach to liberalization is the partial unbundling of ONEE such that the generation market is structured as a single-buyer model.⁴² In this configuration, the utility acts as the sole buyer and supplier of power. Thus, ONEE's transmission grid is supplied with power from its own generation plants, or purchased from IPPs and international interconnections, which is then sold to other distribution utilities and large industrial clients. In this single buyer market structure, ONEE retains a

⁴¹ Interview with Moroccan policy makers, 7 February 2017.

⁴² The various approaches to unbundling are a spectrum, from vertically-integrated monopolist, to single buyer, IPPs, third-party access and to the ideal end-point of a power market (Bacon, 2018, p. 12; Vagliasindi & Besant-Jones, 2013, p. 23).

powerful role despite the existence of private operators in generation (Figure 8). Market entry in generation has been enabled by PPAs between the utility and IPPs (Box 1). These PPAs allow the company to take on the construction and operational risks, and in the case of renewables, the resource risks. ONEE and the government of Morocco shoulder most of the other risks, including currency, coal/gas price and political risks. For instance, JLEC, Morocco's first IPP, signed a PPA in 1997. In renewable energy as well, MASEN has PPAs with RE producers, which it then resells to ONEE. Thus, the IPP model with ONEE as the sole buyer is still the preferred vehicle to adding generation capacity even with the expansion of private investment in solar and the gas-to-power projects. Consequently, ONEE remains at the core of generation activity even if its actual share of electricity production is declining. Crucially, the financial burden of the risks shouldered by ONEE from the generous PPAs make the utility reluctant to lose its share of the electricity distribution market if RE producers were to have unfettered access to the distribution grid.⁴³

Figure 8: An illustration of the single buyer market structure in Morocco's power sector, 2017



Source: Authors' calculations from ONEE data and adapted from Amegroud (2015)

Note: the bottom tier of the figure represents electricity sold to end users. The figures do not add up to 100 percent due to distribution losses

Box 1: The IPP Model in Private Electricity Generation in Morocco

Since the announcement of Law N° 2-94-503 of 1994 to open power generation to the private sector, several IPPs have come online contributing 50.8 percent of production in 2017. The projects are distinct in size, fuel source, construction costs, shareholder structure, origin of debt financing, and contractual arrangements. The first IPP, the Jorf Lasfar Energy Company (JLEC), signed in 1996, uses coal and included transfer of ownership of two newly constructed units (2x340MW) and construction of two additional units (2x350MW). Due to nationalistic sensitivities to yielding the plant to foreign ownership,

⁴³ Interview with Moroccan policy makers, 7 February 2017.

since the single IPP constituted more than 50 percent of total power generation at the time, the transaction was structured as a BTO. The project was backed by political risk guaranties from the World Bank and export credit agencies. The IPP shouldered the construction and operational risks, while ONEE and the government of Morocco supported the other risks, including currency and coal price risk. The second IPP in 2000, *Compagnie Eolienne du Detroit* (CED), was a wind farm, the first in Africa and one of the world's largest. The third IPP, *Energie Electrique de Tahaddart* (EET), used the gas from the Maghreb pipeline linking Algerian gas fields to Spain. The transaction for EET had local currency financing for 100 percent of project debt and ONEE (the off-taker) as a majority shareholder. The government provided necessary comfort letters to secure debt for these projects and all subsequent IPPs, such that political risks guarantees from international financial institutions (IFIs) were not sought after. Since 2010, twelve additional independent power projects (1,380MW coal, 1,300MW wind and 660MW solar) are at different stages of development. With the announced plans for more private investment in solar and gas-to-power projects, this IPP model with ONEE as sole buyer continues to be favored by the policy makers to add generation capacity and meet rising energy demand. Notable features of the Moroccan IPP experience are in the generous terms provided by the government in the PPAs with the private sector. Construction and operational risks are borne the private sector. Coal procurement, in the case of coal-fired plants, is a pass through and the market price rests mainly with ONEE, the sole buyer. In the case of renewables, the PPA is with MASEN which guarantees purchase of the electricity that it then sells to ONEE, while the IPP bears the resource risk (wind or solar). Currency risk (energy payments are indexed on the project finance currencies), political risk, siting and some permitting risks are all assumed by ONEE. Substantial financial guarantees are provided by the government. These include political risk guarantee, escrow accounts, comfort letters to guarantee energy payments/debt and recently providing up to 100 percent of government-backed debt for some renewable projects. While the first three IPPs, pre-2002, were structured as BTO, subsequent projects were structured as BOOT. Fiscal costs associated with transfers and a new more relaxed attitude towards private ownership of generation assets prompted the new policy.

The third aspect of Morocco's approach to liberalization is that ONEE's responsibility for power sector planning reinforces its centrality to the sector and affects coordination of various projects. As table 3 below shows, Morocco scores 43 percent in generation planning and 50 percent for transmission. These scores are lower than the regional comparator, the Arab Republic of Egypt's 82 percent for generation and 75 percent for transmission planning, and the other 14 countries being analyzed in this study. ONEE's DSP (Directorate for Planning and Strategy) produces master plans for generation and transmission every three to five years. It employs competent engineers and uses adequate planning tools and processes in electricity generation and high-voltage (HV) transmission including more recently, capturing the intermittency of certain renewables. It produces independent assessments, often with external consultancy services. These masterplans are usually submitted for discussion and approval during the annual meeting of ONEE's board of administrators, inclusive of the head of the government and other ministers. The generation plans combine a long-term energy strategy outlined by the government – on

shale oil and nuclear in the 1980s, coal and natural gas from the 1990s until 2009, and now renewable energy – and proposals from ONEE to address short term concerns and avoid power shortage. These generation and transmission plans are however, not mandatory, the process for developing them is not transparent and participatory, and they do not generally lead to timely initiation of procurement (see annex). While there is a procurement framework for new generation plants, inclusive of public auctions, there is no procurement framework for transmission lines although it is subject to competitive tenders.

Table 3: Institutional arrangements for power sector planning and procurement in Pakistan and comparators, 2015

	Egypt	India	Morocco	Pakistan	International benchmark
Planning and Procurement	82%	78%	61%	63%	71%
Generation Planning	71%	57%	43%	29%	56%
Procurement of Generation	100%	95%	100%	100%	85%
Transmission Planning	75%	75%	50%	25%	74%
Transmission Procurement	83%	83%	50%	100%	68%

Source: Rethinking power sector reform project, 2015

For the more detailed planning and procurement index, see Table A2 and A3 in the annex.

ONEE's mandate over short-term considerations often overwhelm its coordination of various projects but does not undermine its implementation of the sector's longer-term strategic objectives. ONEE's 20 to 30-year master plans are used for annual reporting, rather than informing decisions on generation and transmission. These nominal plans are not very impactful since they are based on assumptions beyond the utility's sphere of influence. Schedules for the installation of additional capacity can often be overoptimistic. The forecasting of demand, a key input during the planning process, is not always satisfactory because realistic estimates of disaggregated demand require high quality granular data that are not always available.⁴⁴ With respect to the RE strategy, it was the strong political commitment that placed it on the agenda, rather than an outcome of technical forecasts and planning by key government agencies.⁴⁵ Multiple goals are pursued in a seemingly conflicting manner. For instance, Laws N°13-09 and N° 2-15-772 allow private renewable energy producers access to electricity end-users while the largest share of projects developments is assigned to the state-owned ONEE and MASEN; new PPAs are announced in gas, coal and fossil-fuel plants while clean energy technologies are simultaneously promoted, and the tariff structure remains rigid.

Nevertheless, ambitious reforms are still pursued within this institutional configuration of powerful legacy stakeholders wedded to the status quo. There is a tendency to create new agencies entrusted with implementing specific projects, bypassing legacy state-owned companies, which are then allowed to retain their influence and market share.⁴⁶ Thus, the decision to assign the implementation of the solar plan to MASEN was largely to ensure

⁴⁴ A recent World Bank investment project, the "Clean and Efficient Energy Project" aims to build capacity on demand planning.

⁴⁵ Interviews with Moroccan power sector policy makers, 8 February 2017.

⁴⁶ Interviews with Moroccan policy makers, 2 February 2017.

that RE goals could be pursued with minimal inter-agency disruption and conflict. The IPP model of liberalization has sustained ONEE's influence but has allowed the outsourcing of investments in generation to the private sector giving the utility the fiscal space to pursue important long-term initiatives. These include rural electrification, the rapid extension of the 400kV transmission grid (more than 2,600km in less than 20 years) and the interconnection with Spain and the European power grid.

2.1.3 Summary

Morocco's system-wide energy supply indicators point to stable and improving performance. Generation capacity and output are growing alongside a steady increase in peak demand and the power grid's reliability. The country's electricity generation is more diverse with substantial private participation and a growing share of renewables. In fact, Morocco is on track to achieve its 2020 target of having 42 percent of installed generation capacity from renewables. Concurrently, there is a dependence on electricity imports and fossil fuels. The energy system is vulnerable to commodity price volatilities, but it has become more resilient to droughts. This performance can be attributed to the strong national aspiration to achieve energy security. Flagship projects such as RE are defined at the apex of political authority thereby establishing strong consensus to overcome bureaucratic inertia and the disparate objectives of governing political parties. The realization of this vision, however, has been shaped by the sector's institutional architecture in a selective and incremental approach to liberalization that affects the sector's performance. ONEE and other legacy actors possess the technical and managerial skills to oversee the implementation of these national projects in the sector. Yet they have shaped market entry in a way that minimizes disruptions to their influence in the sector, through the single buyer market structure, and by carving out distinct areas for new agencies to supervise. Consequently, there is both growth and diversification of electricity generation as well as significant vulnerabilities such as exposures to external price volatilities and dependence on electricity imports.

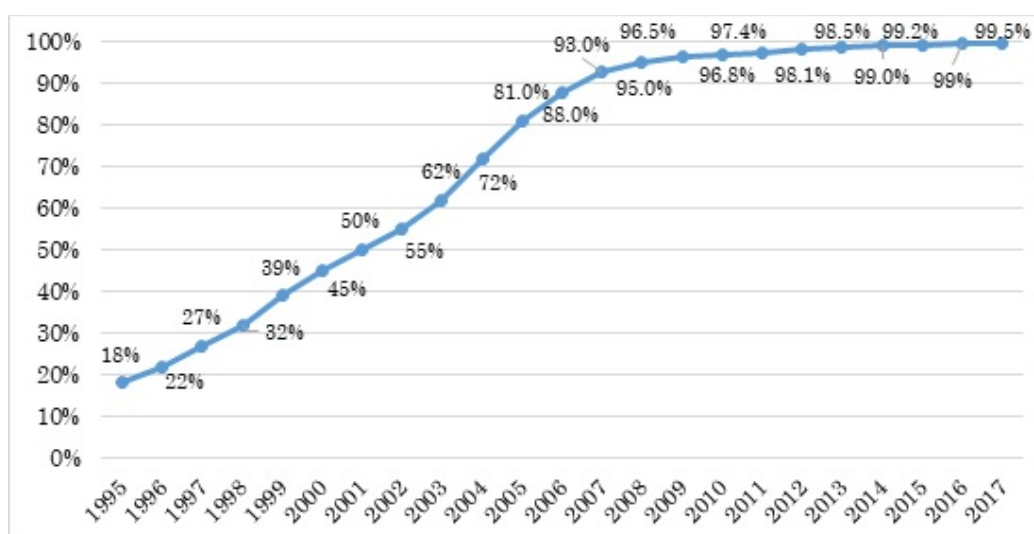
2.2 Electricity Access and Affordability

2.2.1 Performance

Morocco has been a success story on the achievement of near universal access to electricity. Its rural electricity access moved from 18 percent in 1995 to about 99.5 percent by 2017 (Figure 9). In 1996, the government launched the rural electrification program, PERG. The program led to the provision of over 42,000 rural villages and 2.1 million households (about 13 million people) with electricity connections.⁴⁷ Driven by economic considerations, ONEE introduced off-grid renewable energy systems to bring electricity to some remote rural communities.

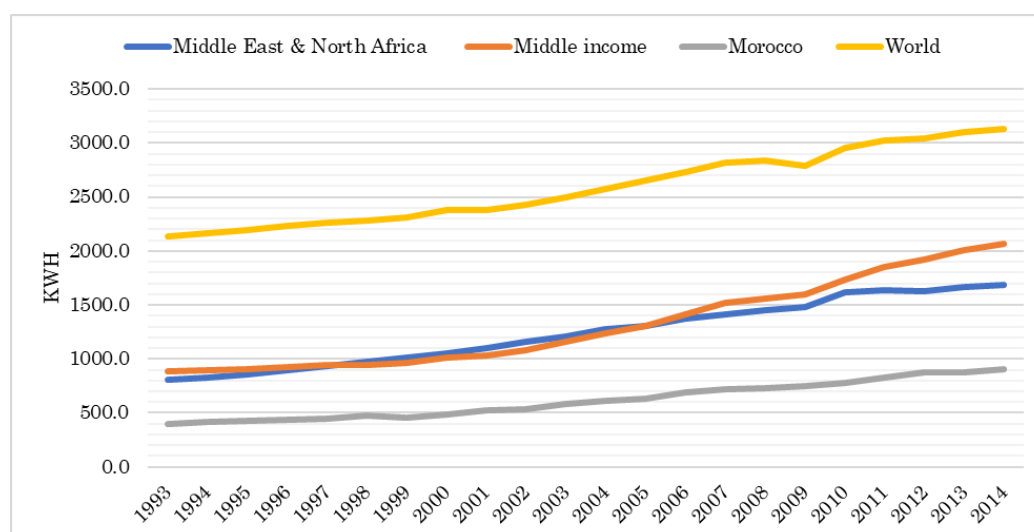
⁴⁷ (ONEE, 2017)

Figure 9: Rural Electrification (1995 to 2017)



Source: ONEE Data

Figure 10: Electric Power Consumption (kWh) Per Capita (1993-2014)



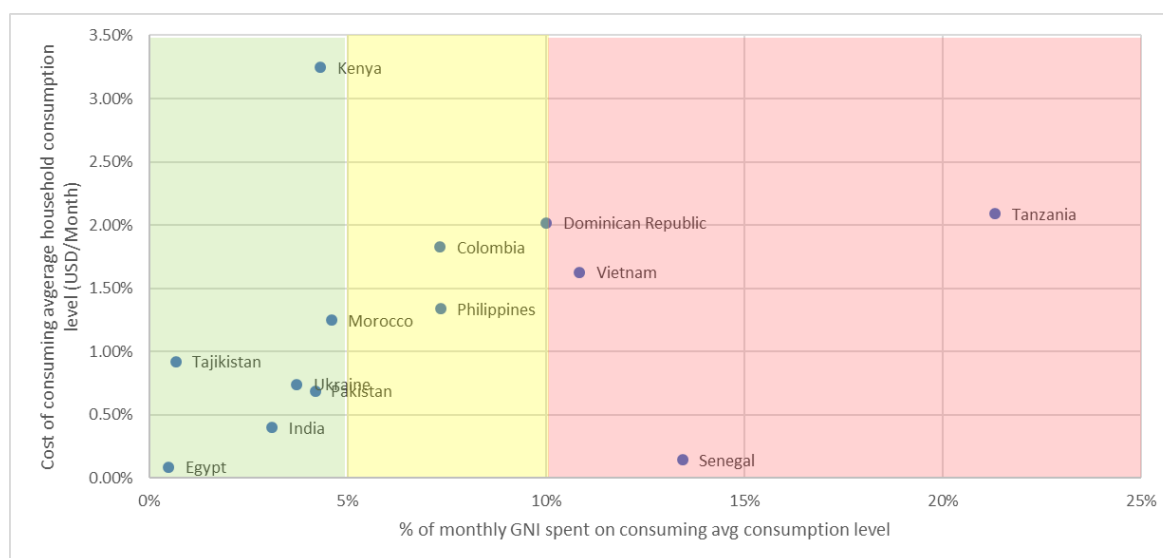
Source: World Bank's World Development Indicators

In the last two decades, electricity consumption increased rapidly, reaching 900 kWh per capita presently, although still below the world average. In 1993, electricity consumption was at 400 kWh per capita. Subsequently, consumption grew rapidly, at an average of 4.6 percent per annum alongside a strong increase in demand of 4.8 percent p.a. Yet, Morocco's consumption is much lower than the global average of 3,127.4 kWh per capita and for the MENA region, 1,687kWh (Figure 10). This reflects the relatively low value added of the industrial sector and a low level of household equipment. The only consumer category whose electricity consumption declined between 2012 (5,174.2GWh) and 2015 (4,119.1GWh) is the large-end users. The increase in electricity access has contributed to a

consistent economic growth rate of between 4 percent and 5 percent per year, as well as a strong increase in electricity demand.

In terms of affordability, defined as the share of monthly household income that is spent on utility services,⁴⁸ the poorest households in Morocco can afford electricity. Using a metric of affordability defined by the share of the income of the bottom 40 percent of the population expended towards consuming electricity in the country, electricity is not out of reach for most households. To consume the lifeline amount of 30kWh, the bottom 40 percent of households by GNI need to spend 1 percent of their monthly income. To consume the average household level, they will need to spend 4.6 percent of their monthly income.

Figure 11. Affordability of average consumption in Morocco, 2016



Source: RISE 2018

2.2.2 Institutions

Morocco's success in achieving universal electricity access can be explained by several factors including strong political will, a multi-stakeholder business model, and a competent implementing agency.⁴⁹ These very factors, in some ways, may have sowed the seeds of present and future risks in the distribution system.

The rural electrification program, PERG was both home-grown and supported by IFIs. Investment financing was distributed across major stakeholder groups, with their share and responsibilities evolving over the years.⁵⁰ Between 1996 and 2009, the cumulative investment of the PERG was an estimated €1.8 billion. Approximately 50 percent (US\$ 1 billion) financing was syndicated across major international financiers. These include, *Agence Française de Développement* (24 percent), European Investment Bank (18 percent), Islamic Development (15 percent), African Development Bank (12 percent), Japan Bank for International Cooperation (11.5 percent), European Bank for Reconstruction and Development (6 percent), Arab Fund for Economic and Social Development (5 percent), Kuwait Fund (4 percent), Oil for Development (4 percent), and KfW Development Bank (0.5

⁴⁸ (Fankhauser & Tepic, 2005)

⁴⁹ (IsDB - Islamic Development Bank, 2013)

⁵⁰ (Independent Evaluation Group, 2016, p. 31)

percent). There was no World Bank Group engagement during this scale-up program. ONEE's share of total investment financing was split approximately fifty-fifty with government borrowings, grants, and equity. These funds were raised in four tranches over the 15-year period, from 1996 to 2009. By 2009, consumers had provided about 25 percent of total investment, municipalities and communities provided about 20 percent (enabled by earmarked allocations sourced from value-added tax receipts and municipal development fund allocations), and ONEE provided 55 percent.⁵¹ It is worth noting that the advent of IPPs gave ONEE the space to reallocate its financial resources to implement the vast rural electrification initiative.⁵²

Another reason for PERG's success is that it was systematically and effectively managed by a single competent implementation agency, ONEE. The coherence of PERG in terms of having one plan and one implementer compares to earlier experiences of peer countries such as Tunisia, Thailand, Vietnam and the Lao People's Democratic Republic.⁵³ Under ONEE's competent leadership, PERG had a clear vision –global electrification of rural households – fully aligned with the government's own developmental priorities.⁵⁴ This contrasted with previous unsuccessful attempts in the 1980s by MOI and local authorities. PERG at the outset was an analytically sound and comprehensive plan prepared by ONEE in a least-cost spatially optimized manner that was technologically neutral and that incorporated grid extensions for the most part, but also included mini-grids, Solar Household Systems (SHSs),⁵⁵ wind plants and micro power stations. ONEE performed optimal engineering design based on detailed surveys and developed an internal GIS database that captured almost all rural communities and villages in the country. This information assisted the utility and the government in opting for appropriate solutions to achieve assigned targets. PERG was flexible enough to integrate a broad range of technical approaches, enabling it to implement whichever solution was most appropriate to local demographics and geographical conditions.⁵⁶ For instance, several thousand families have been provided with off-grid photovoltaic kits, 51,559 households between 1998 and 2009, and another 19,438 between 2016 and 2017.⁵⁷

In several instances, sociopolitical and equity considerations—coupled with aspirations of communities for grid service—resulted in grid extensions not identified as part of the least-cost plan.⁵⁸ Typically, ONEE covered 55 percent of the cost of a connection, the local commune 20 percent and the household 25 percent. Actual installation was performed by 230 different subcontractors competing for tenders, an approach that succeeded in reducing the average cost of a connection by over 30 percent compared to the pre-program benchmark. ONEE reviewed the subcontractors and supervised all construction work.⁵⁹

ONEE's approach in the initial design of the rural electrification program of minimal consultations with other stakeholders may have created risks in the electricity distribution

⁵¹ (IsDB - Islamic Development Bank, 2013; Nygaard & Dafrallah, 2015).

⁵² Interviews with Moroccan power sector policy makers, 8 February 2017.

⁵³ (Independent Evaluation Group, 2016, p. 31)

⁵⁴ (IsDB - Islamic Development Bank, 2013)

⁵⁵ (Independent Evaluation Group, 2016, pp. 31-32)

⁵⁶ (IsDB - Islamic Development Bank, 2013)

⁵⁷ (ONEE, 2016, p. 10; ONEE, 2017, p. 10)

⁵⁸ (Independent Evaluation Group, 2016)

⁵⁹ (IsDB - Islamic Development Bank, 2013)

system. Municipalities and beneficiaries were not initially involved in surveys and village programming until 2002 when local commissions were created. Neither were there consultations with municipal distributors, thus exacerbating the issues regarding limits of service and boundaries of intervention areas. From ONEE's perspective, the electrification effort achieved its goals precisely because it was not slowed-down by excessive consultations and discussions. The MOI and municipal distributors regard ONEE as overreaching in expanding its electricity distribution activity further jeopardizing the municipal distribution model. There is a legal ambiguity surrounding electricity distribution: considered as a public service, it falls within the competence of local government, but ONEE is also involved in distribution in certain municipalities.

2.2.3 Summary

Morocco's success in expanding rural electrification through PERG is largely due to the critical role played by ONEE. PERG was underpinned by a clear vision and political commitment to follow the plan that was set out, a business model inclusive of domestic and international financing, and an effective institutional framework that draws on ONEE's strengths while leveraging other national and international stakeholders. PERG was based on a least-cost spatially optimized plan that was technologically neutral, choosing the approach suited to meet local demand and using an internal GIS database that captured almost all rural communities in the country. Equally important in achieving these results is that at the outset, Morocco's high level of urban electrification may have allowed cross-subsidization from urban to rural consumers.⁶⁰ By comparison in sub-Saharan Africa, one study finds that demand-side challenges are a greater obstacle to electrification due to low uptake and low household income translating into very low electricity consumption that affects the financial viability of utilities.⁶¹ ONEE's expertise provided the country with necessary technical and managerial skills to oversee an important expansion of the power infrastructure and achieve universal access to electricity. Importantly, the liberalization of generation gave ONEE the fiscal space to invest and focus on rural electrification.

2.3 Utility Efficiency and Financial Viability

2.3.1 Performance

The analysis of Morocco's utilities here is based on, where available, time series data for technical and financial indicators on transmission and distribution losses and profitability. Given data limitations, we draw on data snapshots of ONEE and the 11 electricity distribution utilities. Since ONEE is also engaged in electricity distribution and provides water and sanitation services, these are combined in its consolidated financial reports. Though utilities are required to report technical and financial data, these are often aggregated and not publicly available.

Transmission and distribution losses⁶² have generally increased alongside rising output over the years. In 2012, total losses stood at 13 percent, a three-point increase from 10 percent in 1990 (Figure 12). The efficiency of thermal generation plants has improved from

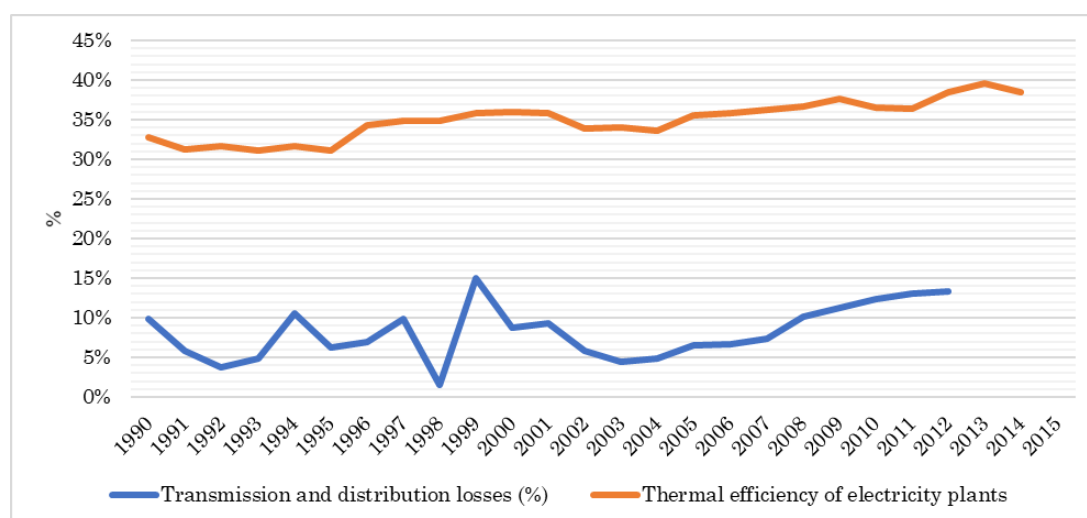
⁶⁰ (Nygaard & Dafrallah, 2015)

⁶¹ (Blimpo & Cosgrove-Davies, 2019)

⁶² These losses can be defined as the difference between total electricity output (total gross generation + imports) and the total billed to and paid by end consumers (and exports).

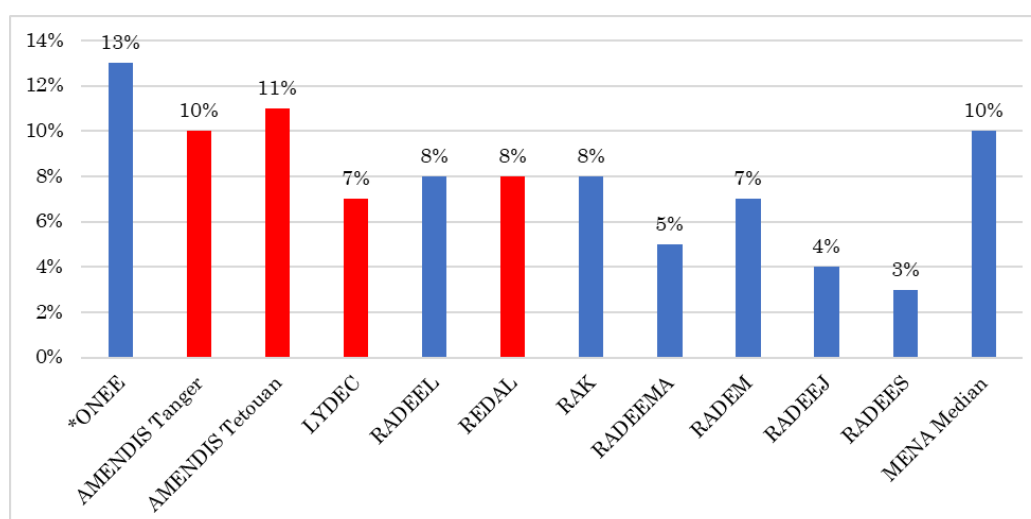
33 percent in 1990 to 36 percent in 2000 and 38 percent in 2014. With regards to distribution losses, there is no publicly accessible collection rate data for ONEE. However, the utility's distribution losses have shown a clearly increasing trend and consequently, rising levels of lost revenues. Drawing on a snapshot of utilities performance in 2013, distribution losses among municipal utilities in Morocco are lower than or equal to the MENA median of 10 percent. AMENDIS Tetouan records the highest losses of 11 percent, and RADIS, the lowest at 3 percent. They all perform higher than ONEE (Figure 13). ONEE's performance needs to be put in proper context of its expansive scope, covering Morocco's rural areas and lagging regions compared to the medium to large-city distributors.

Figure 12: Some Measures of Technical Efficiency in Morocco (1990 to 2015)



Source: Authors based on data from ONEE

Figure 13: Utilities' Distribution Losses (2013)



**ONEE's figures are derived from 2012 data.*

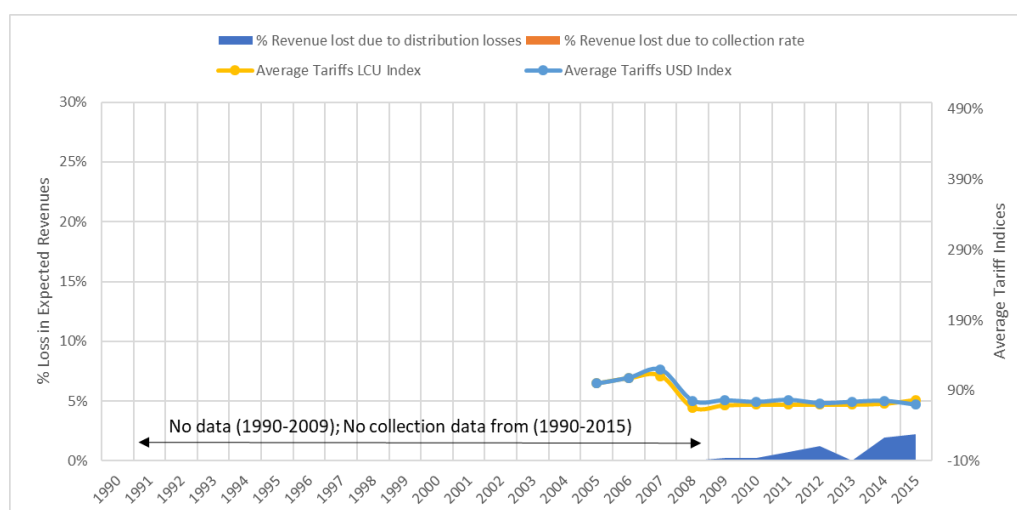
There is no data point for RADEEF

The bars in blue represent public utilities, and those in red represent private concessionaires.

Source: Authors based on data from (Camos, Bacon, Estache, & Hamid, 2018, p. 135&137)

A more detailed look at ONEE's operational performance is achieved by looking at the distribution losses of the utility in monetary terms. The losses are more than what is considered efficient for comparable utilities (10 percent) and are expressed as a percentage of utility revenues. Since ONEE's losses are only marginally above the 10 percent mark, the inefficiencies remain under 3 percent of the utility revenues. Unfortunately, the absence of collection data for ONEE restricts us from carrying out similar analysis for any inefficiencies due to under collection.

Figure 14. Evolution of ONEE operational inefficiencies and average tariff, 2010-2015



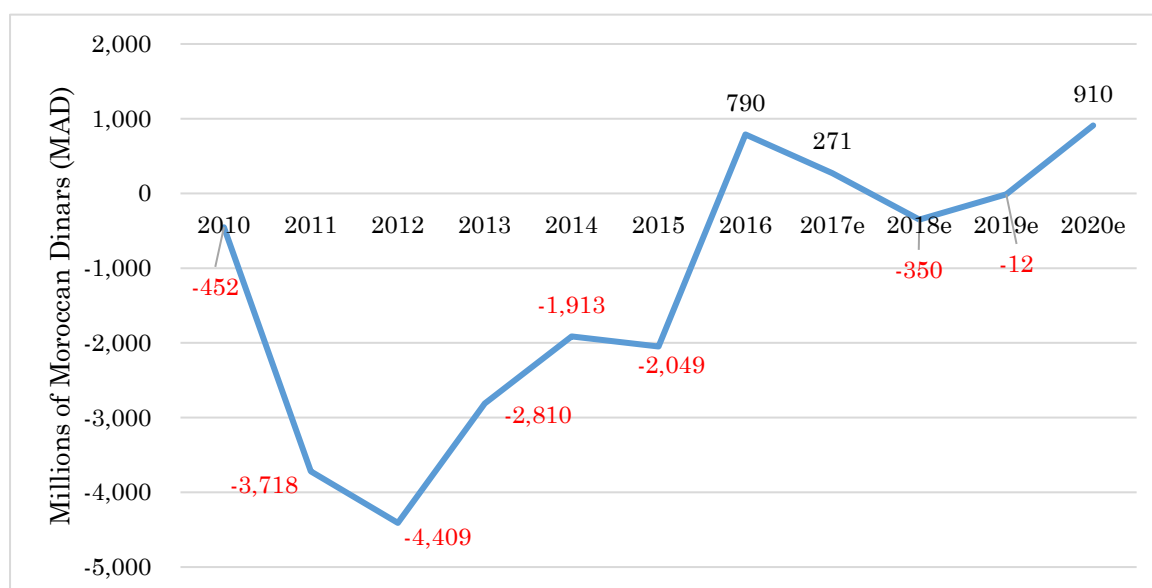
Source: Rethinking power sector reform project

The financial performance of utilities is assessed based on their profitability.⁶³ The data are however patchy. ONEE's performance is difficult to assess given the difficulty in accessing data on its overall costs and sales. This is further complicated by cross-subsidies between different types of clients and a complex tariff structure. There is also scarce debt information available. For years, the utility made consistent losses but its performance improved after 2015 (figure 15) due to the government's '*contrat programme*' or financial restructuring plan from 2014 to 2017.⁶⁴ From a net loss of over MAD 2 billion in 2015, the utility turned around a profit of MAD 790 million in 2016 and an estimated MAD 271 million in 2017.

⁶³ The analysis of financial performance is largely drawn from (Camos, Bacon, Estache, & Hamid, 2018, pp. 135-139).

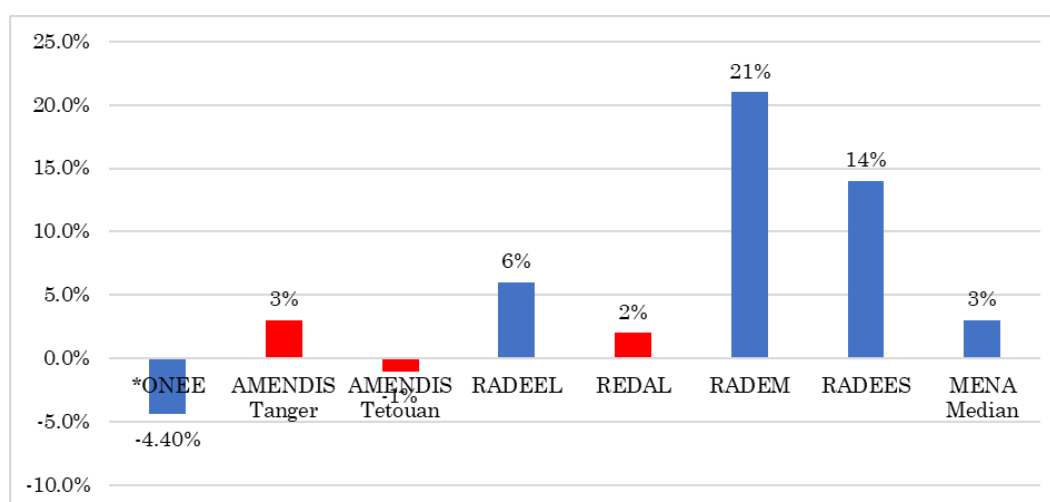
⁶⁴ The *contrat programme* is examined in more detail in the 'institutions' discussion in the next section.

Figure 15: ONEE's Net Profit and Loss



Source: Authors based on data from ONEE

Figure 16: Return on assets (percent), 2013



Source: Camos, D., Bacon, R., Estache, A., & Hamid, M. M. (2018:135&137)

*ONEE's figures are derived from 2012 data.

There is no data point for LYDEC, RAK, RADEEMA, RADEEJ and RADEEF

The bars in blue represent public utilities, and those in red represent private concessionaires.

An analysis of profitability indicators such as return on assets (ROA) for the distribution utilities also provides useful insights. Using a snapshot of 2013 figures, all utilities showed low positive values except one. ONEE had a negative return on assets in 2013 (-4.40 percent) (Figure 16). Apart from ONEE, the second lowest value is with AMENDIS Tetouan (-1 percent) and the highest, RADEM (21 percent). The only clear pattern in these ROA figures even among public and private utilities is that they perform better than ONEE, which has negative values. Not all of them, however, perform higher than the MENA median, at 3 percent.

2.3.2 Institutions

At least two aspects of the sector's institutional arrangements underpin the technical and financial performance of Morocco's power utilities. These are: the nature of utility governance and the socio-economic and socio-political considerations underlying the liberalization of generation and distribution.

The governance of ONEE is one illustrative explanation for the performance of utilities. Across a range of governance indicators, ONEE's performance ranks lower than the comparators from the rethinking power sector reform project observatory (Table 4). On both accountability and autonomy, ONEE scores below the international benchmark as well as most of the comparators. Notably, members of ONEE's board are not necessarily selected through a competitive process, they can be removed at the sole discretion of the appointing authority and are not required to declare conflicts of interest. The board itself does not have the explicit responsibility of deciding and implementing tariff adjustments and to approve human resource hiring and firing decisions. However, the board has the responsibility for defining corporate strategy, has an audit committee and publishes an annual report.

Table 4: Governance and management practices in Morocco and comparators, 2015⁶⁵

	Egypt	India, Odisha		India, AP		India, Raj		Pakistan		Morocco	International
	EEHC (Discos)	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	ONEE	benchmark
Overall Utility Governance	55%	68%	26%	52%	52%	63%	63%	52%	90%	53%	63%
Corporate Governance	49%	86%	13%	47%	47%	67%	67%	56%	94%	35%	62%
<i>Accountability</i>	42%	83%	25%	50%	50%	67%	67%	67%	100%	25%	60%
<i>Autonomy</i>	56%	89%	0%	44%	44%	67%	67%	44%	89%	44%	63%
Utility Management	61%	50%	40%	56%	56%	60%	60%	48%	86%	70%	64%
<i>Financial Discipline</i>	53%	43%	36%	53%	53%	64%	64%	50%	79%	57%	59%
<i>Human Resource</i>	71%	70%	40%	43%	43%	36%	36%	43%	86%	79%	62%
<i>Information and Technology</i>	60%	36%	43%	73%	73%	80%	79%	50%	93%	73%	71%

Source: Rethinking power sector reform project

Unlike its performance on corporate governance, ONEE performs much better than most of its comparators when it comes to good management practices for financial discipline, human resources and information and technology. In fact, its overall utility management score is better than the international benchmark.

ONEE's performance on financial discipline and accounting practices compares favorably to the regional and international comparators. Its financial practices (64 percent) rank higher than the international benchmark (59 percent) (Table 4). As an SoE, the utility does not have a credit rating, is not at liberty to issue new equity. However, it issues bonds and is required to meet financial performance targets by its shareholders. It produces annual financial accounts, and these are audited by an external auditor and are produced in compliance with national accounting standards, but they are not made public, presenting a big challenge in evaluating the utility's financial performance.

On human resource practices, the utility performs quite well (79 percent) scoring much above the international average (62 percent). Apart from giving managers the autonomy to hire or fire employees and implement investment projects, ONEE follows all HR good practices on the index. These include, carrying out annual staff performance reviews,

⁶⁵ For more detailed governance and management indices, refer to Tables A.5. to A.8. in the annex.

performance related bonuses, transparency in recruitment process and not linking wages to government pay scales despite being an SOE.

Finally, ONEE also performs better (73 percent) than most of its comparators when it comes to using information and technology solutions for system management and consumer interactions. ONEE's IT systems support recording and resolving incidents and interruptions, distribution management and energy management. It also uses GIS and has an accurate customer database. However, it does not have Advanced Metering Infrastructure (AMI),⁶⁶ does not allow for submission and follow-up of customer complaints on its website and does not regularly monitor customer satisfaction. Although in practice, customer satisfaction is undertaken through surveys, carried out by utilities every few years.

Overall, ONEE's performance on utility management clearly indicates that the utility follows most good practices when it comes to financial discipline, human resources and information and technology. However, when it comes to good practices pertaining to the autonomy and accountability of the Board, ONEE still lacks some of the good practices measured in the index (something seen widely among state owned utilities).

Another aspect of utility governance is that broad stakeholder engagement in policies and decision-making is limited. Unions are seldom involved in the process of reform design. Although the power sector is heavily unionized, the corporatist nature of the relationship between the unions and legacy utilities has resulted in the former's acquiescence to partial reform efforts. In the mid-1990s, when initial efforts were made to liberalize generation and privatize electricity distribution, unions were offered attractive terms to keep them at bay.

LYDEC for instance, maintained the attractive terms of employment of existing employees including pensions and benefits that are among the best in the public-sector. The unions negotiated an even better bargain from JLEC. Employees who transferred from ONEE's generation units to JLEC were offered better working conditions and had the option of returning to ONEE after a fixed period if not satisfied with their new working environment. These arrangements were made possible because of the dominant role of *Union Marocaine des Travailleurs* (UMT) in representing workers in the sector. UMT suppressed dissenting voices with discreet support by ONEE's management and politicians.

Lately, the unions have not been as accommodating of further reforms. A plan to transfer ONEE's distribution activity in the suburbs of Casablanca to LYDEC, announced in 2014 is yet to be implemented because of a strong opposition from UMT with tacit support from ONEE's management. There is also some opposition to transferring some of ONEE's assets to MASEN. UMT may have realized that the sequence of these individual reforms may in the long run threaten the very corporate existence of ONEE as currently constituted, and thus their plight as a union.

⁶⁶ The World Bank's Clean and Efficient Energy Project aims to help build advanced metering infrastructure (AMI) in Morocco.

The second factor shaping utilities' financial model and thus their performance is the socio-economic and political considerations underpinning liberalization. ONEE's perennial financial crisis is partially attributable to the single buyer model and the use of PPAs with private generators. These PPAs have enabled private investments in generation and the impressive technical performance of IPPs like JLEC, in terms of high capacity and availability factors.⁶⁷ The upside to these government-backed financial and power purchase guarantees is that in passing market and institutional risks to ONEE, they allow JLEC and other private operators to invest sufficiently in their operations.

The downside is that these socio-economic considerations contribute to ONEE's weak financial health and to its insufficient investments in maintenance. The utility's electricity sales alone are not sufficient to cover total costs; its energy sales covered only 87 percent of total costs in 2013. Within that year, ONEE received US\$624 million in fuel oil subsidies for its generation activities, representing 23 percent of total petroleum product subsidies. Thus, in May 2014, to alleviate the poor state of finances of ONEE and simultaneously improve its operational performances, the government approved a Financial Restructuring Plan. The plan involved an immediate public financial contribution (capital increase, assistance to recover debts with public entities and distributors, etc.), cost reductions as well as a major multiyear tariff increase over the period 2014-2017. The plan also included a lump-sum payment to ONEE as a one-off flat subsidy for fuel oil used in electricity production to allow for a complete phase-out of all oil subsidies.

The restructuring scheme improved ONEE's liquidity, but it was a missed opportunity to sustain the improved financials through deeper structural reforms. The inability to push for structural reforms was partly due to the complex negotiations involved and the urgency for short-term actions. Since the government is the sole owner of ONEE and seven distribution utilities, their financial performance impacts the government's budget. For instance, a significant part of the loans taken by the power sector utilities has been provided with government guarantees.

Another socio-economic characteristic of utilities' business model is the cross-subsidization of water and sanitation services by electricity distribution companies. A sizeable excess of revenues from the electricity sales of distribution utilities is necessary to balance their loss-making sales of water and finance future investments in wastewater treatment and sanitation infrastructure. Therefore, the long-run price uncertainty of tariffs in a market system could undermine the territorialized model of electricity distribution. The distribution companies' ambivalence towards liberalization can turn to opposition if they perceive reforms to threaten their revenues from electricity sales. They are skeptical of the grid integration of RE and its potential to reduce up to 10 percent of their total medium voltage sales unless there's a guarantee that such losses will be compensated by large increases in electricity sales or lower costs of power purchases. This territorialized electricity distribution model is not sustainable and is a major reason for the difficulty of introducing cost-based tariffs and comprehensive regulation. Some stakeholders believe that ONEE must withdraw from distribution, and others argue that the cross-subsidies between different municipal public services, championed by MOI, is no longer viable.

⁶⁷ In 2013 for instance, JLEC's capacity factor and availability factor was 75 percent and 91 percent respectively, compared to ONEE's 31 percent and 75-80 percent respectively (Camos, Bacon, Estache, & Hamid, 2018, p. 135).

2.3.3 Summary

ONEE's technical performance is lower than the municipal utilities' and the MENA median. Financially, it has posted annual losses since 2004, with frequent difficulties, necessitating bailouts. There is considerable variation among the public and private municipal utilities and they hardly publish financial information on their distribution activity. One reason for this varying performance is utility governance. ONEE's governance is good on some measures such as in using modern accounting practices and IT systems; however, some best practices pertaining to autonomy and accountability are not followed. This quality of utility governance allows for the opacity and paucity in financial, accounting and corporate reporting. Broad stakeholder engagement in decision-making is minimal as unions and the private sector are seldom involved in the process of reform design. A second reason is the socio-economic and political considerations underlining electricity generation and distribution. Generous power purchase and financial guarantees allow IPPs to invest in their operations resulting in their high capacity and availability factors. These generous PPAs undermine ONEE's financial buoyancy and its capacity to sufficiently invest in maintenance⁶⁸ since its energy sales are insufficient to cover its total costs. Similarly, revenue from electricity sales are used to cross-subsidize municipal water and sanitation services. Concurrently, an increasing RE grid integration and the direct access to end users that RE producers now have, could disrupt the business models of fossil fuel generators and distributors in the long run. It is possible that unions could abandon their hitherto passive engagement with reforms as they realize that RE grid access could ultimately undermine their own existence.

2.4 Tariffs and Cost Recovery

2.4.1 Performance

Any analysis of tariffs involves an assessment of the cost-recovery of utilities. This is challenging to do for Morocco's power sector as ONEE does not provide commercial and financial data on its distribution business. For the Rethinking Power Sector Reform project, detailed cost recovery analysis was carried out for all observatory economies except Morocco due to unavailability of data. The cost-recovery data for distribution utilities like LYDEC, RADEEMA and RADEEJ, is insufficient for this exercise, since ONEE is also involved in both generation and distribution. All together, these data limitations do not allow for a comprehensive assessment of tariffs and cost recovery in the sector.

Morocco's tariff structure is complex, and adjustments are infrequent and decided by an inter-ministerial committee on prices. As part of a review process between 2014 and 2017, new tariffs were implemented through Minister's Order N° 2451-14. This Order set the tariffs to be charged by ONEE to distribution companies, as well as those applied by distribution companies to final consumers. The tariff adjustment that followed this review is shown in Table 5, for low voltage domestic usage (with monthly consumption between

⁶⁸ (Camos, Bacon, Estache, & Hamid, 2018)

100 and 200 kWh) and for medium voltage consumers (medium size industrials, large hospitals, universities etc.).

Table 5: Tariff adjustment history

Date	Domestic Usage	%	MV (daylight hours tariff)	%	Comments
03/2009	0.969	0	0.805	5	Requested by ONE after a “difficult” year in 2008
08/2014	0.969	0	0.868	8	Requested by ONEE as part of a rescue package to overcome a difficult financial situation
01/2015	1.002	3	0.927	7	
01/2016	1.037	3	0.968	4	
01/2017	1.073	3	1.010	4	

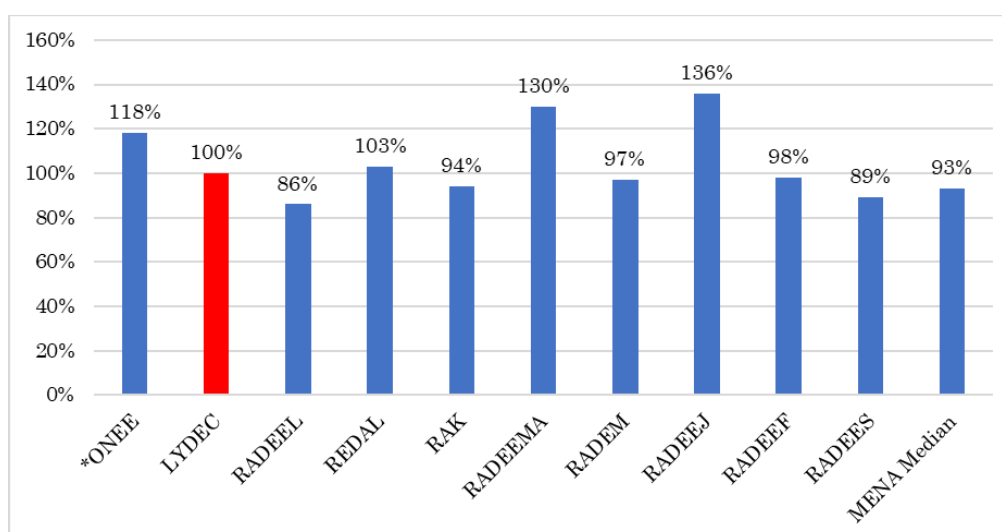
In terms of the general structure, tariffs to distribution companies are differentiated by time of use (peak, shoulder, and off-peak) and by voltage level (extra high, high, and medium voltage). Tariffs to medium, high and extra high-voltage final consumers of distribution companies are also time differentiated and consist of a fixed (power-related) and a variable (electricity consumption-related) charge. For these clients there are different tariff options available. For distribution companies i.e. those operating low voltage lines, tariffs consist of variable charges and are differentiated by type of customer. The tariff schedule for domestic consumers consists of an increasing block tariff (IBT) structure for monthly consumption less than 150 kWh ‘*tarification progressive*.’⁶⁹ For consumption over that amount, a single unit electricity tariff is applied for all period of consumption, with the unit charge varying according to the amount consumed (*tarification sélective*).⁷⁰ If these clients’ monthly consumption exceeds 500 kWh, then a TOU tariff is to be applied. For commercial customer categories, *éclairage patenté* and *force motrice*, there is also an IBT applying the 500kWh limit for TOU tariffs application in the case of *force motrice*. For customers in the administrative buildings and public lighting categories, there is a fixed per kWh tariff, regardless of consumption level. Finally, there are specific tariffs for rural customers that are under a prepaid scheme. These are fixed per kWh tariffs that may depend on power, in the case of domestic and commercial clients, but not for administrative buildings and public lighting.

The cost recovery of distribution utilities here is assessed based on limited data that provide a snapshot of their financial performance, drawing on two indicators related to energy sales. In 2013, ONEE, LYDEC, REDAL, RADEEMA, and RADEEJ positively recovered their operating expenditure from energy sales, whereas the other utilities show values below 100 percent (Figures 17 and 18). Only RADEEJ fully covered its costs from energy sales. ONEE’s performance improved significantly with the financial restructuring plan of 2014-2017 as discussed in the previous section but we do not have the data to conduct a detailed cost-recovery analysis.

⁶⁹ Comprising two blocks, the first is up to 100 kWh/month, and the second is from 101 to 150 kWh/month.

⁷⁰ That is, there is a given tariff for all kWh consumed if monthly consumption is between 151 and 200 kWh, another different and higher - tariff if monthly consumption is between 201 and 300 kWh, and so on.

Figure 17: Energy sales as a share of OPEX, 2013



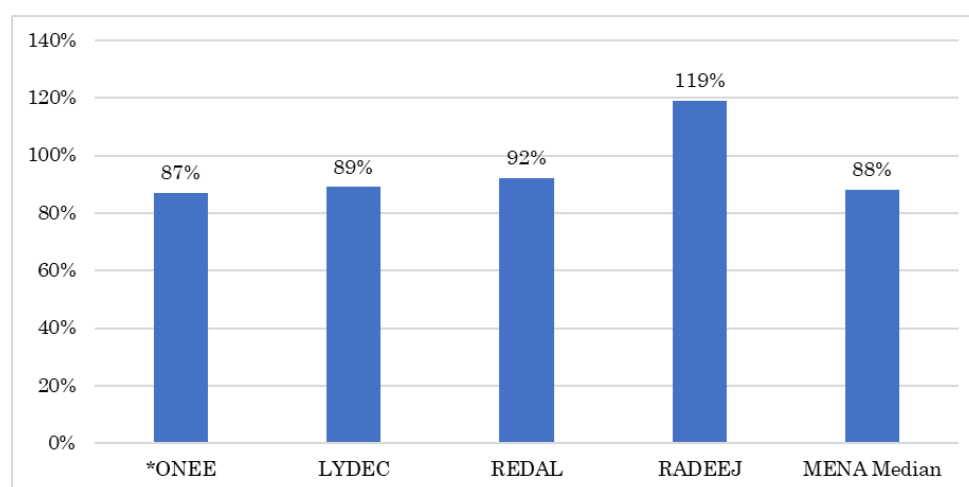
Source: Camos, D., Bacon, R., Estache, A., & Hamid, M. M. (2018:135&137)

*ONEE's figures are derived from 2012 data.

There is no data point for AMENDIS Tangier and AMENIS Tetouan

Bars in blue represent public utilities, and red represents private concessionaires.

Figure 18: Energy sales as a share of total costs



Source: Camos, D., Bacon, R., Estache, A., & Hamid, M. M. (2018:135&137)

*ONEE's figures are derived from 2012 data.

There is no data point for AMENDIS Tangier, AMENIS Tetouan, RADEEL, RAK, RADEEMA, RADEM, RADEEF and RADEES

Bars in blue represent public utilities, and red represents private concessionaires.

The discrepancies between Moroccan power distribution utilities on these cost-recovery measures mainly reflect specific features of each utility.⁷¹ The first feature is the type of customers. An important share of medium-voltage customers tends to push the load factor and cost-recovery ratios higher, while keeping employment needs low (RADEEJ). The level of economic activity is a second factor. A thriving economy represented by relatively high standards of living tends to have a positive impact on recovery and profitability indicators.

⁷¹ (Camos, Bacon, Estache, & Hamid, 2018)

Tariffs charged to households with high electricity consumption are generally more profitable (in the case of LYDEC and REDAL). A third factor is geography. Operational costs and investments are generally higher for utilities operating in extended geographical areas, covering scattered clients. Local climate is a fourth important characteristic. Utilities operating in regions in the central part of the country are generally faced with higher operating and investment costs (RADEEMA, RADEEF).

2.4.2 Institutions

The difficulty of conducting a detailed assessment of Morocco's tariff structure and cost-recovery ratios of distribution utilities is largely shaped by the absence of a regulator. For a long time, Morocco did not have a regulator until Law N° 48-15 of 2016 established ANRE. It is yet to commence operations and its scope will largely be around the RE law and market, with some oversight over the transmission and distribution grid operators.

At the time of data collection for the Rethinking Project (2015), Morocco had not set up a legal regulatory framework for ANRE. ANRE was eventually set up in 2016 and its head was appointed in December 2018, but it is yet to start shaping the sector's functioning. Before ANRE, tariffs were still set, quality was monitored, and market entry regulation was carried out considering the significant increase in private sector participation in the sector. Thus, for evaluation purposes here, the regulatory practices are identified and scored. This essentially means that in terms of governance of the regulatory entity, Morocco has no scores for regulatory principles, but does for the substance of regulation as they are carried out in the country. This evaluation is of course based on the system in 2015. Given that the regulator started some operations in 2019, there are bound to be many changes to how regulation is carried out as the new entity creates a formal framework.

The evaluation of the regulatory framework is done from two standpoints. First, the rules and regulations that make the existing framework (as of 2015) in principle. Second, the rules and regulations that the sector's experts and practitioners believe are implemented in practice.

For a long time, there have been no clear requirements on government entities, especially ONEE to publicly report financial data and meet explicit quality of service requirements. The prolonged absence of a regulator also affected the process of tariff adjustments. Nevertheless, utilities are obligated to connect new customers and these connections are charged. Morocco therefore performs poorly on various indicators for regulatory governance and substance (Figure 19). Compared to an average of 15 countries, there are no scores for Morocco on accountability and autonomy of public operators, the two indicators for regulatory governance.

Figure 19: Morocco's performance on regulatory governance and substance

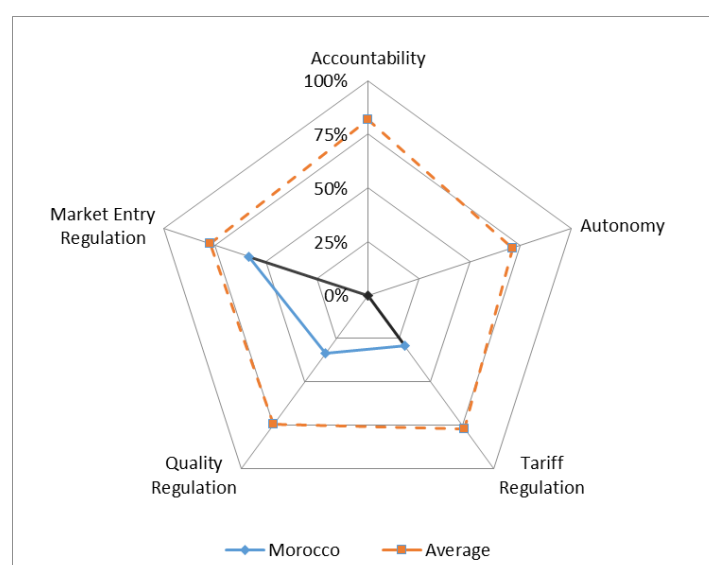


Table 6: Formal regulatory substance in Morocco and comparators, 2015

	Egypt	India, AP	India, Odisha	India, Raj	Morocco	Pakistan	International benchmark
Regulatory Substance	78%	76%	76%	79%	40%	83%	76%
Tariff Regulation	75%	75%	75%	75%	29%	83%	77%
Regulatory Framework for Tariffs	100%	100%	100%	100%	33%	100%	90%
Determination of Tariffs	50%	50%	50%	50%	25%	67%	64%
Quality Regulation	83%	83%	83%	92%	33%	100%	75%
Quality of Service Standards	100%	100%	100%	100%	50%	100%	82%
Quality of Service Enforcement	67%	67%	67%	83%	17%	100%	68%
Market Entry Regulation	75%	71%	71%	71%	58%	67%	77%
Permitting New Entrants	100%	75%	75%	75%	50%	100%	90%
PPA Approvals	50%	67%	67%	67%	67%	33%	57%

Source: Data collected for the rethinking power sector reform project

On tariff regulation, Morocco's overall performance (29 percent) is far lower than the regional i.e. Egypt (75 percent) and international (77 percent) comparators (Table 6). In terms of the regulatory framework for tariffs, the country has an explicit policy that lays the objectives to be pursued in determination of power tariffs, and there is an entity, an inter-ministerial committee on prices, that has authority over the tariff level. However, there are neither clearly articulated principles for setting end-user tariffs, nor a clearly specified regulatory framework. In terms of the actual practice of tariffs determination, end-users in Morocco bear the costs of incentive mechanisms for renewable energy generation as is the case in Egypt. However, there is no written formula prescribing how to set end-user tariff levels, and all costs are fully passed through to the customers. Furthermore, utilities previously did not need to submit financial information according to regulatory accounting standards, but this has now been made mandatory by ANRE in 2019. It is not uncommon for utilities to receive government subsidies to cover capital investment

or even operating deficits. Even though transfers are not paid regularly, utilities are bailed out from time to time, thereby reducing incentives to improve efficiency.

Morocco's performance on quality regulation (33 percent) is far lower than the regional (83 percent) and international (75 percent) comparators. Utilities in Morocco are legally required to meet quality of service standards and these are formally written and publicly available for product, service and customer service quality. However, utility performance on quality of service standards is not public and there are no fines for failing to meet them. In practice, regulated entities are required to report technical data on a periodic basis, as in Egypt. However, Morocco's newly established regulator is yet to specify how to collect technical performance data and does not review or validate technical performance data. In addition, measurements of the quality or reliability of power supply are not made public and there are no financial incentives to meet customer service standards or increase customer satisfaction.

On market entry regulation, Morocco scores 58 percent. There is no independent entity that monitors compliance with terms of license/permit, but there are provisions to force companies to relinquish licenses for contractual violation. On PPA approvals (67 percent), there is an entity legally required to approve all power sales contracts either directly or indirectly. This entity has authority over the process by which utilities can select or procure power from IPPs. However, there is no legally specified period by which this entity must approve or refuse a proposed PPA. To contextualize these regulation scores, in the absence of a regulator, tariff adjustments are decided by the inter-ministerial committee on prices led by MAGG. This committee decides on tariffs and prices beyond the power sector, including petroleum subsidies. This committee includes representatives of the MOI, MEMDD, MEF, the Ministry of Trade and Industry and the Ministry of Agriculture and Fisheries. Typically, ONEE makes the request for tariff adjustments, and supervises an independent study that makes various proposals under different scenarios, based on which the committee decides. This committee has authority over the tariff level and structure, as well as the frequency of tariff revisions.

The process of initiating a tariff study, completing it and approving can take up to four years, and broad stakeholder input is limited. The absence of clear guidelines on how to carry out tariff revisions leaves the process open to political interference. One of the complexities of the revision process results from conflicting interests and divergent views among stakeholders. For instance, ONEE pushes for high tariffs to cover generation and transmission costs, while municipal distributors prefer a regime in which higher tariffs will not affect electricity demand from consumers and their sales and revenues.⁷² There is often limited input to tariff revisions by other stakeholders, especially IPPs and the private sector.⁷³ Tariff revisions are generally not decided until it is clear that ONEE is on the brink of financial collapse and there is a serious impact on continuity of service. For instance, during the period of high fossil fuels prices between 2006 and 2014, ONEE struggled to meet its take-or-pay commitments and its contractors experienced extended payment

⁷² Interviews with Moroccan stakeholders in the power sector, 27 January 2017.

⁷³ Ibid.

delays.⁷⁴ The decision to adjust tariffs was only made upon the realization that there was no other alternative and there was a serious risk looming for the entire sector.

The last tariff adjustment took place in 2017. As examined in previous sections, in July 2014, the government approved a financial restructuring plan for ONEE to address its financial situation, improve the economic sustainability of the power sector and enable continued investment in generation infrastructure and grid expansion. Among other things, it involved a multiyear tariff increase. The result was a 20 percent increase in energy sales revenues to ONEE. The first tariff increase took place in August 2014 and the last one in January 2017. The new introduced selective pricing (*tarification sélective*) structure did not affect the lowest income households with monthly electricity consumption below 100 kWh. An element of cross-subsidization was thus built in because the rates were below the real average costs of production and distribution.⁷⁵ While the new tariffs helped improve ONEE's financial situation, they resulted in a negative impact on the electricity sales for distribution companies, because the combination of higher levels and selective tariff structure pushed customers to reduce their electricity usage.

Table 7 summarizes Morocco's regulatory performance *de jure* – it describes what is stated in the rules and regulations that are to be implemented in principle. It then compares these numbers to what is perceived by the sector experts as the actual implementation of these rules and regulations.

The overall scores for *de jure* and perceived indices do not diverge significantly from each other. However, there are differences on the sub-indices. The perceived scores on tariff regulation and quality are both lower than their *de jure* counterparts. Interestingly the perceived score for market entry indicators is higher than the *de jure* aspect. This indicates that some good practices that are not part of the formal rules are nonetheless being followed by the institutions in the sector. While surprising, this result is borne out by Morocco's successful attempts at attracting new private investment in generation despite the existence of ONEE as a legacy vertically integrated utility in the sector.

⁷⁴ Interviews with Moroccan power sector policy makers, 2017.

⁷⁵ (IEA, 2014, p. 55)

Table 7. Overall *de jure* and perceived scores for regulation

Indicators	De Jure	Perceived
Overall Regulation	NAP	N/A
Regulatory Governance	NAP	N/A
Accountability	NAP	N/A
<i>Regulatory Oversight</i>	NAP	N/A
<i>Legal Appeals</i>	NAP	N/A
<i>Transparency</i>	NAP	N/A
Autonomy	NAP	N/A
<i>Decision-Making Autonomy</i>	NAP	N/A
<i>Budgetary Autonomy</i>	NAP	N/A
<i>Leadership Autonomy</i>	NAP	N/A
<i>Managerial Autonomy</i>	NAP	N/A
Regulatory Substance	40%	38%
Tariff Regulation	29%	21%
<i>Regulatory Framework for Tariffs</i>	33%	17%
<i>Determination of Tariffs</i>	25%	25%
Quality Regulation	33%	25%
<i>Quality of Service Standards</i>	50%	50%
<i>Quality of Service Enforcement</i>	17%	0%
Market Entry Regulation	58%	67%
<i>Permitting New Entrants</i>	50%	67%
<i>PPA Approvals</i>	67%	67%

2.4.3 Summary

The complexity of Morocco's tariff regime and cost-reflective pricing is underlined by the common thread of inconsistent financial accounting and data reporting practices. These are directly linked to the absence of an independent regulator because until 2016, when ANRE was announced, the substance of regulation was carried out by the government. The prolonged absence of an independent regulator has three implications. First, important aspects of regulatory governance are not articulated even if certain aspects of regulation are implemented in practice. Therefore, best practice rules around accountability and autonomy of decision-making do not exist, and thus affect the quality of tariff regulation and quality of service, and the culture of reporting and publishing data is also not prioritized. In practice however, Morocco does regulate certain aspects of market entry, for instance. Second, it compounds the problem of lack of public data reporting which exists due to ONEE's horizontal integration with a water services division even though the financial accounts for these two services are separated. Third, a rigid tariff regime results from the ingrained practice of cross-subsidization – of low-income households, various consumer categories, and of water and sanitation activities by both ONEE and distribution companies. This tariff regime is managed by the inter-ministerial committee on prices whose decisions are shaped by various socio-political considerations. Evidently, an independent regulator would help ensure the effective separation of activities within the electricity division of ONEE, guarantee the transparency and impartiality of the

transmission grid operator, and boost market openness and competition.⁷⁶ ANRE is in the initial stages of setting up its regulations and policies. Even when it begins operations fully, ANRE's scope will be defined by the power generation regime under the RE law with limited oversight of the transmission and distribution grids. Besides, as research shows, without a pre-requisite step of fully unbundling ONEE, the establishment of a regulator could end up not having the expected effect on the performance of the utilities.⁷⁷

3 CONCLUSION

This paper analyzed Morocco's experience with power sector reforms from 1990 to 2017. It draws on technical and financial data, stakeholder interviews and published studies. It described the chronological timeline of reform and examined the sector's performance along the security of supply, electricity access and affordability, utility efficiency and financial viability, and tariffs and cost-recovery.

Morocco charted its own distinctive path of power sector reform. It selectively introduced private sector participation for generation capacity expansion and electricity distribution in certain cities, while retaining a strong, state-owned and vertically-integrated national power utility operating as a single buyer at the core of the sector. Until recently, the country eschewed an independent regulatory entity. The power sector has been guided by strong top-down policy mandates that have served to align the disparate actions of political parties and sector institutions. Ambitious targets for electricity access, liberalization, and renewable energy investments were conceived as an integrated approach to contribute to economic development by relieving fiscal pressures, reducing external dependence on fossil fuels, and positioning the country as a leader in renewable energy. The results have been impressive. Since 1990, Morocco has more than tripled its power supply, while growing renewable energy to account for one-third of the total and relying on the private sector to supply just over half of the electricity generated. Rural electrification has accelerated rapidly from 18 percent in 1995 to virtually 100 percent in 2017. While operational efficiency has been broadly adequate, performance has fluctuated over time. Moreover, the sector's achievements through this selective approach to reform have come somewhat at the expense of the financial viability of the incumbent utility, the National Office for Electricity and Water (ONEE), which has suffered from lack of cost-reflective tariff-setting and an array of entrenched cross-subsidies. Other vulnerabilities include the continued but declining dependence on electricity imports, external price volatilities of imported fossil fuels, and a territorialized electricity distribution model that could be disrupted by grid integration of renewable energy.

Morocco's performance along the four key dimensions established in this paper is briefly stated here and summarized in Table 8.

On security of supply, Morocco has made important progress. Power generation has grown from under 10TWh in 1990 to 32TWh in 2017 and capacity has grown from 5,233MW in

⁷⁶ (IEA, 2014, p. 56)

⁷⁷ In the literature, regulation makes sense when there has been unbundling and some private sector entry into the sector (Bacon, 2018, p. 15).

2005 and 8,820MW in 2017. Electricity generation is also more diversified, with private power plants accounting for 50.8 percent of output, and renewables for 33.8 percent of installed capacity (and projected to reach 42.7 percent by 2020). The energy system is more resilient to droughts compared to the 1990s but increasingly dependent on electricity imports and still vulnerable to price volatilities of imported fossil fuels. While ONEE is responsible for producing masterplans, its focus on short term priorities affects its coordination of various longer-term projects in the sector. These flagship projects are the ones oriented towards delivering on the political commitment to energy security, often through IPPs. Despite significant private sector presence in generation, ONEE and other legacy actors have shaped liberalization to minimize disruptions to their spheres of influence and market share, by retaining tight control through the single buyer market structure.

On access and affordability, Morocco has achieved near universal access to affordable electricity. The country's ambitious rural electrification plan, PERG, guided exceptionally rapid growth in rural access from 18 percent in 1995 to 99.5 percent by 2017. Since PERG was launched in 1996, over 42,000 rural villages and 2.1 million households (about 13 million people), have been provided with electricity access. At the same time, annual household electricity consumption more than doubled from 400 kilowatt-hours in 1993 to 900 kilowatt-hours in 2014. Moreover, electricity remains highly affordable, as the bottom 40 percent spend only 1 percent of their monthly income to consume a lifeline consumption of 30 kilowatt-hours. PERG was underpinned by a strong political commitment, a business model comprised of domestic and international financing, and an effective institutional framework that relied primarily on ONEE's technical and managerial expertise while leveraging other national and international stakeholders. The liberalization of generation relieved ONEE of some financial pressures, allowing it to reallocate resources towards rural electrification. Furthermore, Morocco's relatively high income per capita and urbanization rates provided a solid basis for cross-subsidization from urban to rural areas.

On utility efficiency and financial viability, the story is mixed. Operational performance was always reasonably good but has fluctuated over time. Transmission and distribution losses increased from 10 percent in 1990 to 13 percent in 2012 yet reportedly improved in recent times, while the thermal efficiency of electricity plants increased significantly – from 33 percent in 1990 to 38 percent in 2014. While utility management practices are relatively good with regard to financial discipline, human resources and Information Technology, performance on board governance is quite weak. Financial performance has been chronically weak. Following a prolonged period of recording net losses and a negative return on assets that necessitated bailouts, ONEE's financial indicators began to improve from 2016. The performance of the 11 municipal distribution utilities varies, although it is generally better than ONEE. Political economy considerations including generous PPA terms with IPPs and cross-subsidization of municipal services with revenue from electricity sales, and non-cost reflective tariffs explain ONEE's historical financial underperformance.

Table 8: Summary of Morocco's power sector reform experience from 1990 to 2017

Measure	Performance	Institutions
Security of Supply	<ul style="list-style-type: none"> Power generation grew from <10TWh in 1990 to 32TWh in 2017 Generation capacity grew from 5.2 GW in 2005 to 8.8 GW in 2017. Private sector accounts for 50.8 percent of generation output. Renewables account for 33.8 percent of installed capacity (42.7 percent by 2020). 	<ul style="list-style-type: none"> ONEE produces power system masterplans, but focuses on short term priorities Policy objectives are pursued primarily through specialized agencies and IPPs.
Electricity Access and Affordability	<ul style="list-style-type: none"> Rural electrification rates moved from 18 percent in 1995 to 99.5 percent by 2017. Since 1996, electricity reached >42,000 villages, >2mn. Households, and 13mn. people. Household electricity consumption rose from 400 kWh/yr in 1993 to 900kWh/yr in 2014. Bottom 40 percent spend only 1 percent of their monthly income for 30kWh/month. 	<ul style="list-style-type: none"> Clear rural electrification plan, PERG. Capable implementing entity able to focus on rural electrification agenda, ONEE. Adequate financing provided by national and international sources. Relatively high income and urbanization rates created solid basis for cross-subsidy.
Utility Efficiency and Financial Viability	<ul style="list-style-type: none"> T&D losses increased from 10 percent in 1990 to 13 percent in 2012, later improving. Thermal efficiency of plants rose from 33 percent in 1990 to 38 percent in 2014. ONEE's financial performance began to improve from 2016 after a chronic period of loss-making. 	<ul style="list-style-type: none"> Utility governance is good on modern accounting practices and IT systems, but weaker on-board management. Numerous factors undermine financial viability including generous PPA terms, cross-subsidization from electricity to water, non-cost reflective tariffs and other socio-economic objectives.
Regulation of Tariffs and Cost Recovery	<ul style="list-style-type: none"> ONEE and four other distribution utilities recover operating expenditure but not capital costs. 	<ul style="list-style-type: none"> Absence of a power sector regulator with tariff-setting mandate until 2016. Ingrained practice of cross-subsidization complicates achievement of cost recovery.

On tariff regulation and cost recovery, performance has been poor but has begun to improve. Morocco has long functioned without a regulatory entity, leading to poor regulatory governance and limited application of best practice methodologies for tariff regulation. Between 2014 and 2017, new tariffs were implemented as part of a financial restructuring process and a new regulator, ANRE, was created in 2016. ONEE and four other distribution utilities now appear to be recovering their operating expenditure from energy sales but not necessarily their capital costs. The challenge of tariff regulation is compounded by the lack of transparent accounting data for the electricity service due to its integration with a water services division, as well as the ingrained practice of cross-subsidization.

There are at least four lessons for developing countries from Morocco's experience.

First, an incremental approach can be pursued in an environment where legacy entities can obstruct sudden, radical and 'big-bang' reforms. Morocco's policy makers were selective in the aspects of the power sector market reforms they adopted. There was a clear sense of direction in the sector and capable institutional arrangements. Policy makers explicitly refused to fully privatize state agencies in the early 2000s. They, rather, opted for gradual liberalization through a series of laws that introduced IPPs in a process they could manage and control. They were also selective in their approach to privatizing electricity distribution, through concessions to AMENDIS, LYDEC and REDAL, that reinforced existing territorial monopolies, rather than full or partial divestiture of these municipal utilities. This gradualism also characterizes the development of renewable energy. Grid access was slowly granted to renewable energy producers to minimize disrupting the influence and market share of stakeholders like ONEE, certain ministries and the distribution companies. MASEN's influence as a stakeholder could also be affected by further liberalization of renewables.

Second, institutional arrangements in Morocco are different from those prescribed by the 1990s power sector reform model, but nonetheless perform the necessary functions in practice. In introducing private participation in generation for instance, Morocco's institutional arrangements provided credible commitments to investors through the instrument of PPAs and other risk guarantees. Similarly, in expanding electricity access, ONEE played a coordination role for domestic and international stakeholders for PERG. This aligns with recent research that the functions that institutions perform should be given more weight rather than the form they take.⁷⁸ Despite not conforming to the textbook model, Morocco's power sector institutional arrangements performed the necessary commitment, coordination and cooperation functions to achieve energy sector objectives of attracting private investments to boost installed generation capacity and output.

Third, the ability to pursue socio-economic objectives in the power sector is contingent on having a strong and growing economy. Morocco's power sector is characterized by significant cross-subsidies between electricity and water services at the municipal level, between urban and rural customers, and between different urban customer groups. This has been possible due to the country's strong economic performance averaging 4.2 percent over the past two decades, and the existence of a relatively large population of electricity consumers with the ability to pay. Nevertheless, these socio-economic considerations have taken their chronic toll on the financial health of ONEE, which has nonetheless proved capable of balancing these conflicting considerations.

Finally, the implementation of the renewable energy strategy and diversification of energy supply within the prevailing institutional configuration has created parallel tracks in the sector. The first track is comprised of the legacy institutions operating a hybrid market model, with relatively little transparency and until recently without an autonomous regulator, but capable of delivering specific sector goals. The second track has developed to implement the country's renewable energy strategy through private sector participation,

⁷⁸ According to the World Bank's World Development Report 2017, what drives policy effectiveness is not how institutions look or seem, but the functions they perform in terms of providing commitment, enabling coordination and facilitating cooperation (World Bank, 2017, p. 5).

and the associated specialized government agencies, increasingly with direct access to consumers. These parallel tracks are converging as further grid integration of renewable energy disrupts the entire sector in fundamental ways: by shrinking the pool of customers for ONEE and municipal distributors, reducing their revenue from electricity sales, unravelling the basis for entrenched cross-subsidies, and thus affecting ONEE's capacity to provide power purchase and other risk guarantees to investors in electricity generation.

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5 Annex

The standard package of reforms prescribed by international donors in the 1990s included four principal components: restructuring (vertical and horizontal unbundling of power utilities); private sector participation; creation of an independent regulator; and competition in power generation.

In order to aggregate across the four dimensions of power sector reform considered in this study, a simple Power Sector Reform Index is constructed. The index gives each country a score on an interval of 0 to 100 on each dimension of power sector reform. The scores are based on giving equal weight to each step on each dimension of the reform continuum (see tabulation below). The average of the four 0-100 scores is used to provide an overall summary of the extent of reform.

Table A.1. The 'Rethinking Project's' Power Sector Reform Index

Regulation	No regulator = 0		Regulator = 100		
Restructuring	Vertically integrated = 0	Partial vertical unbundling = 33	Full vertical unbundling = 67	Vertical & horizontal unbundling = 100	
Competition	Monopoly = 0	IPPs = 25	Single Buyer Model = 50	Bilateral Contracts = 75	Competitive market = 100
Private Sector Participation	$0.5 * (\text{Percentage of generation capacity with private sector participation}) + 0.5 * (\text{Percentage of distribution utilities with private sector participation})$				

Table A.2. Generation and transmission planning index for Morocco and comparators, 2015

	Egypt	India	Morocco	Pakistan	International benchmark
Planning and Procurement	82%	78%	61%	63%	70%
Generation Planning	71%	57%	43%	29%	56%
Country has a generation master plan	○	○	○	○	94%
Country has an overall energy plan	○	●	○	●	65%
Competent entity is responsible for producing the plan	○	○	○	○	88%
Inter-governmental committee oversees the planning unit	○	●	●	●	29%
Power generation system plan is mandatory	○	●	●	●	19%
Plan leads to timely initiation of procurement	●	○	●	●	38%
Planning process is transparent and participatory	●	○	●	●	59%
Transmission Planning	75%	75%	50%	25%	72%
Competent entity is responsible for producing the plan	○	○	○	○	100%
Explicitly linked to power generation plans	○	○	○	●	88%
Plan is mandatory	○	●	●	●	29%
Planning process is transparent and participatory	●	○	●	●	71%

Table A.3: Generation and transmission procurement index for Morocco and comparators, 2015

	Egypt	India	Morocco	Pakistan	International benchmark
Procurement of Generation	100%	95%	100%	100%	85%
There is a framework for procurement	○	○	○	○	82%
Country allows International competitive bidding or public auction	○	○	○	○	94%
Types of procurement methods allowed					
Unsolicited bids	●	●	●	●	29%
Direct negotiation	●	●	○	○	47%
International competitive tendering	○	○	○	○	88%
Public auctions	●	○	●	●	41%
Stand-alone capacity market	●	●	●	●	0%
Auction design score	NAP	0.86	NAP	NAP	80%
Country uses public auctions for procurement	●	○	●	●	41%
Clear and comprehensive established rules	NAP	○	NAP	NAP	100%
Credible penalties for violating the rules	NAP	○	NAP	NAP	86%
Guarantees and penalties to ensure timely completion	NAP	○	NAP	NAP	86%
Standard, non-negotiable contracts	NAP	○	NAP	NAP	86%
Standard financing terms or risk mitigation instruments	NAP	○	NAP	NAP	86%
No concerns regarding the transparency and fairness of the auction	NAP	●	NAP	NAP	14%
Efforts to inform and attract bidders to the auction	NAP	○	NAP	NAP	100%
Transmission Procurement	83%	83%	50%	100%	68%
There is a framework for procurement of new transmission lines	○	○	●	○	59%
Methods used to procure new transmission-	○	○	○	○	71%
Competitive tender	○	○	○	○	71%
Direct negotiation	●	●	●	●	29%
All projects are awarded to the incumbent transmission company	○	○	●	●	47%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

Table A.4. Corporate governance- accountability index for Morocco and comparators, 2015

Corporate governance	Egypt	India, Odisha		India, AP		India, Raj		Pakistan		Morocco	International benchmark
	EEHC(Discos)	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	ONEE	
Accountability	42%	83%	25%	50%	50%	67%	67%	67%	100%	25%	60%
Private or public shareholders appoint board	●	○	●	●	●	●	●	●	○	●	36%
Transparent process exists for Board selection	●	●	●	○	○	○	○	●	○	●	36%
Board members cannot be removed at will	●	●	●	●	●	●	●	●	○	●	29%
Chairperson & CEO are separate positions	●	○	○	●	●	○	○	○	○	●	75%
Function of Company Secretary exists	●	○	○	○	○	○	○	○	○	●	82%
Board Sub-Committees for different issues	○	○	●	○	○	○	○	○	○	○	68%
Audit committee of the Board	●	○	●	○	○	○	○	○	○	○	71%
Board Code of Conduct exists	○	○	●	○	○	○	○	●	○	●	64%
Requirement to declare conflicts of interest	○	○	●	●	●	○	○	○	○	●	75%
Utility has carried out any third party transactions in last five yrs	○	○	●	●	●	●	●	○	○	●	46%
Minority shareholders' rights are protected	●	○	●	●	●	●	●	○	○	●	39%
Utility publishes an Annual Report	○	○	○	○	○	○	○	○	○	○	93%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

Table A.5. Corporate governance- autonomy index for Morocco and comparators, 2015

Corporate governance	Egypt	India, Odisha		India, AP		India, Raj		Pakistan		Morocco	International benchmark
	EEHC(Discos)	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	ONEE	
Autonomy (SOEs)	56%	89%	0%	44%	44%	67%	67%	44%	89%	44%	63%
Board is the final body to take decision on-											
<i>Defining corporate strategy</i>	○	○	NAP	○	○	○	○	○	○	○	96%
<i>Approving business plans</i>	○	○	NAP	○	○	○	○	○	○	○	96%
<i>Setting and monitoring performing objectives</i>	○	○	NAP	○	○	○	○	●	○	●	92%
<i>Selecting, appointing and overseeing the CEO</i>	●	○	NAP	●	●	●	●	○	○	○	56%
<i>Raising capital from debt</i>	●	○	NAP	●	●	○	○	●	○	●	68%
<i>Raising capital from equity</i>	●	○	NAP	●	●	●	●	●	○	●	48%
<i>Major capital expenditures</i>	○	○	NAP	○	○	○	○	●	○	○	88%
<i>Deciding and implementing tariff adjustments</i>	●	●	NAP	●	●	●	●	●	●	●	24%
<i>Human resource hiring and firing decisions</i>	○	○	NAP	●	●	○	○	○	○	●	72%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

Table A.6. Utility management- financial discipline index for Morocco and comparators, 2015

Utility management	Egypt	India, Odisha		India, AP		India, Raj		Pakistan		Morocco	International benchmark
	EEHC(Discos)	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	ONEE	
Financial Discipline	53%	43%	36%	53%	53%	64%	64%	50%	79%	64%	59%
Utility has a credit rating	●	●	●	○	○	○	○	●	○	●	36%
Utility can issue new bonds	●	●	●	●	●	○	○	●	○	○	36%
Utility can issue new equity	●	●	●	●	●	●	●	●	○	●	26%
Utility pays dividends to shareholders	●	●	●	●	●	●	●	●	●	●	29%
Public service obligations are explicitly defined	○	●	●	○	○	●	●	●	●	●	46%
PSO is publicly disclosed	○	NAP	NAP	●	●	NAP	NAP	NAP	NAP	NAP	38%
PSOs are costed	●	NAP	NAP	●	●	NAP	NAP	NAP	NAP	NAP	0%
PSOs are compensated by government	●	NAP	NAP	●	●	NAP	NAP	NAP	NAP	NAP	0%
Utility required to meet financial performance targets	○	●	●	●	●	○	○	●	○	○	52%
System of internal financial controls exists	○	○	○	○	○	○	○	○	○	○	96%
Internal audit function exists	○	○	○	○	○	○	○	○	○	○	93%
Utility is subject to state auditing procedures	○	○	●	○	○	●	●	○	●	○	71%
Financial accounts are produced	○	○	○	○	○	○	○	○	○	○	96%
Financial accounts are audited by external auditors	○	○	○	○	○	○	○	○	○	○	93%
Financial accounts are publicly disclosed	●	●	●	○	○	○	○	○	○	●	79%
Financial accounts meet national standards	○	○	○	○	○	○	○	●	○	○	82%
Financial accounts meet international standards	●	●	●	●	●	●	●	○	○	●	57%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

Table A.7. Utility management- human resources index for Morocco and comparators, 2015

Utility management	Egypt	India, Odisha		India, AP		India, Raj		Pakistan		Morocco	International benchmark
	EEHC(Discos)	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	ONEE	
Human Resource	71%	70%	40%	43%	43%	36%	36%	43%	86%	79%	62%
Annual staff performance reviews exist	○	○	○	○	○	○	○	○	○	○	93%
Employees receive performance related bonuses	○	○	●	●	●	●	●	●	○	○	70%
Employees can be fired for poor performance	●	●	●	○	○	●	●	○	○	○	79%
Government employment regulation don't apply	●	●	●	●	●	●	●	●	○	○	26%
Wages not based on government pay scales	○	●	●	●	●	●	●	●	○	○	48%
Staff training policy exists	○	○	○	○	○	●	●	●	○	○	86%
Managers are free to hire employees	●	NAV	NAV	●	●	●	●	●	●	●	12%
Managers are free to fire employees	●	NAV	NAV	●	●	●	●	●	●	●	24%
Managers can execute budget	○	NAV	NAV	●	●	●	●	○	○	○	60%
Managers can implement investment projects	○	NAV	NAV	●	●	○	○	●	○	●	44%
Recruitment involves advertisement of positions	○	○	○	○	○	○	○	○	○	○	71%
Recruitment involves short-listing candidates	○	○	○	○	○	○	○	○	○	○	89%
Recruitment involves interviewing candidates	○	○	●	○	○	●	●	○	○	○	82%
Recruitment involves reference checks	○	○	●	●	●	○	○	●	○	○	75%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

Table A.8. Utility management- information & technology index for Morocco and comparator, 2015

Utility management	Egypt	India, Odisha		AP, India		Raj, India		Pakistan		Morocco	International benchmark
	EEHC(Discos)	WESCO	CESU	APSPDCL	APEPDCL	JVVNL	JDDVNL	LESCO	KE	ONEE	
Information and Technology	60%	36%	43%	73%	73%	80%	79%	50%	93%	73%	71%
SCADA system	○	●	○	○	○	○	○	●	○	○	93%
IT system to support incidence resolution	●	●	●	○	○	○	○	●	○	○	75%
IT system to support distribution management	●	●	●	○	○	○	○	○	○	○	79%
IT system to support energy management	●	●	●	○	○	○	○	○	○	○	64%
Geographic Information System (GIS)	○	●	●	○	○	○	○	○	○	○	78%
KPIs are used to monitor quality of supply	○	○	○	○	○	○	○	○	○	○	100%
Advanced Metering Infrastructure (AMI)	●	●	●	○	○	●	●	●	○	●	52%
Accurate customer database	○	○	○	○	○	○	○	○	○	○	96%
Call center for dealing with customer complaints	○	○	○	○	○	○	NAV	●	○	○	96%
Website for submission of customer complaints	○	○	○	○	○	○	○	○	○	●	85%
Customer satisfaction regularly monitored	○	●	●	●	●	○	○	●	○	●	59%
Commercial management system (CMS)	●	●	●	●	●	●	●	●	○	○	41%
Resource Management System (RMS)	●	●	●	●	●	●	●	●	●	○	35%
KPIs are used to monitor commercial cycle	○	○	○	○	○	○	○	○	○	○	86%
KPIs are used to monitor corporate resource manag	○	NAP	NAP	●	●	○	○	NAP	NAP	●	54%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

Table A.9. Regulatory governance- accountability index for Morocco and comparators, 2015⁷⁹

		Egypt	India	Morocco	Pakistan	International benchmark
Accountability		87%	91%	NAP	79%	83%
Regulatory Oversight		100%	100%	NAP	67%	81%
Regulator's objectives formally stated in law		○	○	NAP	○	100%
Regulator required to report on its activities		○	○	NAP	○	88%
Independent third party evaluations of regulator have taken place		○	○	NAP	●	56%
Legal Appeals		100%	100%	NAP	100%	100%
Legally established process to		○	○	NAP	○	100%
Transparency		62%	73%	NAP	70%	67%
Publicly available annual reports		○	○	NAP	○	94%
Recommendations are required to be made		●	NAP	NAP	○	33%
Government body receiving recommendations required to respond publicly		○	NAP	NAP	○	33%
Regulator is required to publish its decisions on-	End-user tariffs	○	○	NAP	○	100%
	Licensing generation or supply	○	○	NAP	○	100%
	Wholesale or PPA prices and contract terms	○	○	NAP	○	100%
	Market design	○	○	NAP	NAP	100%
	Oversight of regulated utilities	○	○	NAP	○	85%
Regulatory decision-making process legally requires the participation of non-government stakeholders in case of-	End-user tariffs	●	○	NAP	●	69%
	Licensing generation or supply	○	○	NAP	●	69%
	Wholesale or PPA prices and contract terms	●	●	NAP	●	38%
	Market design	●	●	NAP	NAP	30%
	Oversight of regulated utilities	●	●	NAP	NAV	38%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

⁷⁹ The three Indian states follow similar regulatory structures and thus have similar scores. They are presented here as a single entity.

Table A.10. Regulatory governance- autonomy index for Morocco and comparators, 2015

Regulatory governance		Egypt	India	Morocco	Pakistan	International Benchmark
Autonomy		89%	75%	NAP	92%	71%
Decision-Making Autonomy		86%	100%	NAP	92%	79%
Areas where entity has a mandate to regulate-	End-user tariffs	○	○	NAP	○	100%
	Quality of supply and service	○	○	NAP	○	100%
	Electrification or increased access to energy	○	○	NAP	●	53%
Decision of the regulatory entity are legally binding in the area of-	End-user tariffs	○	○	NAP	○	88%
	Grid access charges	○	○	NAP	○	87%
	PPA/wholesale prices	○	○	NAP	○	92%
	Quality of supply/service	○	○	NAP	○	87%
	Market design	●	○	NAP	NAP	50%
	Licensing	○	○	NAP	○	85%
	Utility oversight	○	○	NAP	○	71%
Government body rejecting or modifying regulatory decisions needs to		●	NAP	NAP	○	17%
Law precribes decision making process for-	End-user tariffs	○	○	NAP	○	94%
	Grid access charges	○	○	NAP	○	81%
	Quality of supply/service	○	○	NAP	○	87%
Budgetary Autonomy		94%	50%	NAP	100%	80%
Funding for regulator established by law		○	○	NAP	○	100%
Percentage of regulator's budget that comes from levies or taxes		0.88	0	NAP	1	59%
Leadership Autonomy		75%	50%	NAP	75%	66%
Legal basis for existence is primary legislation		○	○	NAP	○	100%
Power to determine own organizational structure and rules		○	●	NAP	○	50%
Power to determine the allocation and use of budget		○	●	NAP	○	44%
Legal requirements or restrictions regarding professional profile leadership		○	○	NAP	○	94%
There is a fixed term for the leadership of the regulatory entity		○	○	NAP	○	88%
Legal provisions under which leadership an be removed from office		●	○	NAP	○	75%
Current leadership of entity connected to government or utilities		●	●	NAP	●	25%
Over 60% of employees are in technical positions		○	●	NAP	●	57%
Managerial Autonomy		100%	100%	NAP	100%	59%
Pay scale not linked to govt pay scale or is 90% of utility pay scale		○	○	NAP	○	53%
Not required to follow govt employment regulations		○	○	NAP	○	63%

○ Satisfactory result

● Unsatisfactory result

NAP Not applicable

NAV Not available

Table A.11. Regulatory substance- tariff regulation index for Morocco and comparators, 2015

	Egypt	India	Morocco	Pakistan	International Benchmark
Tariff Regulation	75%	75%	29%	83%	77%
Regulatory Framework for Tariffs	100%	100%	33%	100%	90%
Objectives in determining tariffs mentioned explicitly in policy or legal mandate	○	○	○	○	100%
Principles of tariff-setting clearly articulated	○	○	●	○	88%
Authority over the tariff level	○	○	○	○	94%
Clear definition of “cost recovery”	○	○	●	○	88%
Legitimacy of costs is used as a basis for tariff calculations	○	○	●	○	88%
Tariff-setting based on a clearly specified regulatory framework	○	○	●	○	88%
Frequency and schedule of revisions determined by law or regulation	NAP	NAP	NAP	NAP	75%
Determination of Tariffs	50%	50%	25%	67%	64%
Publicly available written formula is to be used for tariff setting and utilities are legally required to adhere to it	○	○	●	○	88%
Avoid passing-through inefficient costs to customers	●	○	●	○	76%
Requirement to submit financial information according to set standards	○	●	●	○	53%
Users bear the costs of incentive mechanisms for renewable energy generation	○	○	○	○	75%
Regulatory mechanisms to compensate generators for the provision of firm capacity or ancillary services	●	●	NAP	●	58%
Utilities are compensated for the costs of stranded assets	●	●	NAP	●	25%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

Table A.12. Regulatory substance- Quality regulation index for Morocco and comparators, 2015

	Egypt	India	Morocco	Pakistan	International benchmark
Quality Regulation	83%	83%	33%	100%	75%
Quality of Service Standards	100%	100%	50%	100%	82%
Requirement to meet quality of service standards	○	○	○	○	100%
Specific quality of service standards are formally written and publicly available for- quality of the product, quality of the service and customer	○	○	○	○	97%
Performance on quality of service standards is public	○	○	●	○	71%
Fines for failing to meet quality of service standards	○	○	●	○	59%
Quality of Service Enforcement	67%	67%	17%	100%	68%
Requirement to report technical data on a periodic basis	○	○	○	○	100%
Regulator specifies how to collect technical performance data	○	●	●	○	71%
Regulator reviews or validates technical performance data	○	●	●	○	47%
Automated information management systems are required to measure the quality or reliability of the power supply	●	○	●	○	71%
Measurements of the quality or reliability of power supply are made public	○	○	●	○	65%
Financial incentives to meet customer service standards or increase customer satisfaction	●	○	●	○	53%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available

Table A.13. Regulatory substance- Market entry index for Morocco and comparators, 2015

	Egypt	India	Morocco	Pakistan	International benchmark
Market Entry Regulation	75%	71%	58%	67%	77%
Permitting New Entrants	100%	75%	50%	100%	90%
Responsible for monitoring compliance with the terms of the license or permit	○	○	●	○	88%
Authority to impose penalties for violating license or permit terms	○	○	NAP	○	100%
Penalties are formally written and publicly available	○	●	NAP	○	80%
Provisions to force companies to relinquish licenses or permits for violation	○	○	○	○	100%
PPA Approvals	50%	67%	67%	33%	57%
Legally required to approve all power sales contracts either directly or indirectly	●	○	○	○	59%
Approve or refuse a proposed PPA in a legally specified period of time	NAP	○	●	●	60%
Authority over the process by which utilities can select or procure power from IPPs	○	●	○	●	50%

○	Satisfactory result
●	Unsatisfactory result
NAP	Not applicable
NAV	Not available