

Power to the People

Towards a suitable restructuring modality for
Egypt's electricity sector reforms

Master Thesis - Ernst Stefan Schütte

August 2018



Cover image: The 4800 MW combined cycle gas plant build in Egypt's 'New Capital' by Siemens. After completion in late 2018, it will be the largest gas-fired combined cycle power plant in the world. Source: Siemens (2017)

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Towards a suitable restructuring modality for Egypt's electricity sector reforms

Master thesis submitted to the Delft University of Technology in partial fulfilment of the requirements for the degree of

Master of Science

in Complex Systems Engineering and Management

Faculty of Technology, Policy and Management

by

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To be defended in public on September 21, 2018

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Acknowledgements

Writing this thesis would not have been possible without the help and support of many people close to me. First and foremost I would like to thank my parents, Alexander and Stefanie, who always believed in me and supported me however they could. Despite spending a year on another continent, their love and involvedness made me feel they were just around the corner.

I am also very grateful for my colleagues and friends in Cairo. In particular, Gamal, Bregt, Nienke, Carole, Rita, Bernardo, Mariana, Joost, Tsjerd, Sally and Aziza; your support and friendship provided a perfect social environment in which I was able to enjoy my time in Egypt while writing my thesis.

Special thanks go to the interviewees from a variety of organizations. Without your valuable thoughts and insights I was not able to do this research.

I am also grateful for the work done by my friend Ronald and my parents; they took the effort to review my work. This was a significant task considering the number of pages of this thesis.

Last, but certainly not least, I would like to thank my committee; Rolf, Daniel & Thomas. In particular Daniel; it was great to have such a flexible and involved supervisor, especially considering doing my thesis abroad, combined with an almost full time job. In general I am very grateful for the staff and teachers at the faculty of TPM. In particular, Wim, Otto, Laurens, Martijn, Tineke, Marja en Haiko. I learned a lot from you and really appreciate all the help and support I received from you. Not only for this thesis, but throughout the past eight years at this faculty.

Preface

In March 2016, *The Economist* published an article about the privatization efforts of Nigeria's electricity sector, which sparked my interest in this topic. The current installed generation capacity (2800MW) in a country with almost 200 million people, equals the demand of the city of Edinburgh, Scotland. With half of the population not being connected to the grid, the government decided to improve the status quo by privatizing the state-owned power plants. These efforts did not work out as planned, to say the least. It struck me how many different factors contributed to this, most of them outside the scope of the theories and case studies we get taught at the faculty of TPM.

Striking staff of the power plants prevented investors to take a look at the plants, and after the deal had been closed, it became clear that they bought rundown assets with books that had been systematically cooked. Gas, that was needed to operate the plants, was unavailable due to artificially low gas prices (set by the government) so it was cheaper for producers to flare it off (when extracting oil). Also, gas pipes were often vandalized by criminals demanding money to protect them. Moreover, the produced electricity barely reached the customer because the state of the government owned transmission and distribution network was extremely poor. Maintenance or expansion of this grid was challenging because people do not pay for their electricity ('power theft') and even the Nigerian government itself owed the distribution companies hundreds of millions USD. On top of this, a falling currency and shortages of foreign exchange made the investment climate for the private sector extremely difficult (The Economist, 2016).

I was fascinated by these complexities that often had nothing to do with electricity sector liberalization itself; all these contextual factors made these reform efforts so challenging. Some of these factors were not new to me; I did my minor in Cameroon and my bachelor thesis in Kenya, and the conclusions from my research were similar; 'the content (the project, or intervention), should match the context'.

I decided to do my graduate elective courses at the International Institute of Social Studies (ISS) in the Hague; an institute part of Erasmus University focused on development studies. The gained combined knowledge of both the ISS and the faculty of TPM, created the perfect foundation to research electricity sector liberalization in a developing context.

This research focusses on Egypt, a country with less major challenges in its electricity sector as compared to Nigeria, but just as fascinating and also in the middle of a liberalization process. The reason for choosing Egypt was the combination of doing this research and a job in Cairo. This was a big advantage in terms of getting to know the 'context', but often challenging when it comes to time management. However, I believe the results of this report can help both the academic community and stakeholders in the Egyptian electricity sector.

The title of this thesis has both a literal meaning, and is a phrase that has a 'revolutionary' ring to it. With the latter referring to Egypt's turbulent political environment the last decade. Power to the People. To the people in Egypt, who I admire and respect deeply. Their resilience, persistence, friendliness and sense of humor made 'the context' for my research activities so incredibly nice. I hope you will enjoy reading this report.

Ernst Schütte

Cairo, August 12, 2018

Summary

Market-oriented electricity sector reforms have spread across the world in the last decades, with the aim to increase efficiency and stimulate investments. In many cases the outcomes of these reforms did not meet up with expectations in terms of among others pricing, social welfare and efficiency. An often mentioned reason for these undesired outcomes is that the ‘content’ (the reform, the intervention), did not match the ‘context’ (of a country in which the reforms take place). Egypt is a developing country which adopted in 2015 the New Electricity law, that laid the legal foundation to restructure its electricity sector into a competitive one. The aim of this research is to investigate what the most suitable restructuring modality is for an efficient and reliable electricity sector in Egypt, given the institutional and political-economic context in which these reforms have to take place. The research question for this research is as follows:

Which restructuring modality for Egypt’s market-oriented electricity sector reforms is the most suitable for an efficient and reliable electricity supply, considering the institutional and political-economic context?

The majority of the countries that reformed their electricity sectors followed the ‘standard model’ which provided a sequence and steps for implementing these reforms, and became a global trend during the 1990s. This model has been defined differently by multiple authors, but roughly follows the same steps: corporatization, commercialization, requisite legislation, an independent regulator, sector restructuring, IPPs, divestiture of generation assets, divestiture of distribution assets, and competition (wholesale and retail markets). However, after 25 years since this model has been advocated, it has not been fully realized anywhere in Africa. Instead, different varieties emerged, often referred to as ‘hybrid power markets’; a market structure somewhere between the pre-reform structure and retail competition. Several authors and organizations made an attempt to categorize these different structures. For this research, five types of restructuring are distinguished; a vertically integrated monopoly, a vertically integrated monopoly with IPPs, unbundling with IPPs, a wholesale market, and a wholesale market with retail competition. Each with different advantages, disadvantages and pre-conditions.

Many studies have been conducted on the reasons for the undesired outcomes of electricity sector reform in developing countries. Among others, it was not part of broader institutional reform, there was political instability, public opposition, or not enough regulatory capacity. Most reasons are contextual factors, which justifies the extensive contextual analysis of the case of Egypt. These reasons have been translated as criteria into a framework to assess which type of restructuring fits the best with a certain context. The earlier distinguished five restructuring modalities each have a different institutional set-up, role of the state and the private sector, and therefore pre-conditions to be met in order to successfully implement this particular structure. This framework can help practitioners to assess which of the five restructuring modalities fits the best in a certain country context. This framework has been developed with multiple assumptions since criteria are interrelated, not mutually exclusive or difficult to measure. A framework like this has not been made before, so there was no previous work to build on. The criteria have been operationalized and will for this research be applied on the case of Egypt.

Now that the framework to assess the case of Egypt has been developed, the technical and political-

economic context was assessed. The more technical contextual analysis provided an overview of Egypt's electricity sector (its institutional structure, the value chain and an elaboration on the proposed reforms). After this a Political Economic Analysis has been done. These two analysis combined, together with information out of interviews with experts and stakeholders, the framework with the defined criteria has been applied on the case of Egypt.

After the application of the framework on the case of Egypt, it became clear that crucial pre-conditions for a competitive wholesale market are not present in Egypt. These include among others, political commitment, regulatory independence, cost-reflective tariffs, public acceptance and a good investment climate. In the long run (>25 years), a wholesale market might be possible but for the short to medium term (as stipulated in the Electricity Law) this is too optimistic, due among others to the 'cultural' changes within the government that have to take place. Instead, the government should focus on improving the status quo; a legally unbundled and state dominated structure with IPPs, before 'moving on' to the next, more competitive, type of restructuring, being a wholesale market. Improving the status quo means in this case; continuation of the subsidy reform, and the IMF reform program in general, strengthening the independence and effectiveness of the regulator, and capacity building within the involved ministries and authorities. These measures, primarily focused on the second level of Williamson's four layer model, will take time. Longer than the timeline of the reforms as outlined in the Electricity Law.

This recommendation does not imply that a competitive wholesale market cannot work in Egypt. With 100 million customers and a population growth rate of 2% per year, there are ample opportunities for private parties to invest and operate in Egypt's electricity market. But to push now for a competitive market without the necessary pre-conditions and transparency, will delay the process (as is currently happening) and creates uncertainty among all the stakeholders that are needed to make such a market work. The literature provided multiple examples of countries where market-oriented reforms happened too fast, with undesired outcomes as a result.

Liberalization is not a goal in itself. It is merely a mean to achieve the overall goal of the Egyptian government: a reliable and efficient electricity supply. Strengthening the current structure with a focus on the pre-conditions needed for a competitive market, is for now, according to this research the mean to achieve this.

Discussion and suggestion for future research

The developed framework can be useful for policy makers and other practitioners in the field of electricity sector reform in developing countries, considering the large amount of vertically integrated utilities in Africa alone. This framework is however the first of its kind and open for improvement and especially extensive validation. Based on the results of the research suggestions for future research are:

1. The research done is from a qualitative nature. A quantitative/modelling approach to electricity sector reform in Egypt can be valuable as well.
2. Influence of intermittent sources and decentralized production on a suitable restructuring modality and the standard model. These issues were less urgent in the early 2000s when most literature about electricity sector in developing countries was written.
3. Development of an extensive sequencing and prioritization framework for Egypt's electricity

sector reforms.

4. A framework with weighted criteria to determine a suitable restructuring modality.
5. Operationalization of political commitment for electricity sector reform.

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List of Abbreviations

AfDB	African Development Bank
BOOT	Build, Own, Operate, Transfer
CAPMS	Central Agency for Public Mobilization and Statistics
CCGT	Combined Cycle Gas Turbine
EBRD	European Bank for Reconstruction and Development
EDI	Energy Delta Institute
EEA	Egyptian Electric Authority
EEHC	Egyptian Electricity Holding Company
EETC	Egyptian Electricity Transmission Company
EGP	Egyptian Pound
EgyptERA	Egyptian Electric Utility and Consumer Protection Regulatory Agency
EIU	Economist Intelligence Unit
FIT	Feed-in-Tariff
FMO	Financieringsmaatschappij voor Ontwikkelingslanden, Dutch Development Bank
GDP	Gross Domestic Product
GGNI	Global Gas Networks Initiative
IEA	International Energy Agency
IFC	International Finance Cooperation (Part of the World Bank Group)
IFI	International Financial Institution
IMF	International Monetary Fund
IPP	Independent Power Producer
ISO	Independent System Operator
ISS	International Institute of Social Studies (part of Erasmus University Rotterdam)
KfW	Kreditanstalt für Wiederaufbau, German Development Bank
MedReg	Mediterranean Energy Regulators
MENA	Middle-East & North Africa
MoERE	Ministry of Electricity and Renewable Energy
MoP	Ministry of Petroleum
NGO	Non-Governmental Organization
NREA	New and Renewable Energy Agency
OECD	Organization for Economic Cooperation and Development
PE	Political Economy
PEA	Political Economic Analysis
PPA	Power-Purchasing Agreement
PSP	Private Sector Participation
SOE	State Owned Enterprise
USD	United States Dollar
TSO	Transmission System Operator
WBG	World Bank Group

1. Introduction

Market-oriented electricity sector reforms have spread across the world in the last decades. These reforms were not limited to electricity sectors only; it was part of a broader reimagined role that the state should play in society and development, driven by progressive globalization of neoliberalism and the rapid development of private capital markets (Eberhard & Godinho, 2017). The aim of these reforms was among others increasing efficiency (less bureaucracy) and stimulate investments. In the late 1980s it became clear that the state-owned and -operated electricity sectors in developing countries performed poorly, and hence an institutional shift from the status-quo was needed. Transmission and distribution losses averaged around 20% (compared to the world average of 9%) which resulted in high supply costs, low debt coverage, and insufficient money for investments. Additionally, blackouts were frequent and electricity access rates were low, especially on the African continent (Gratwick & Eberhard, 2008). Market-oriented reforms were seen as a way to improve the generally poorly performing electricity sectors in developing countries. By means of introducing competition, efficiency could be induced, the surplus transferred to consumers in order to eventually maximize economic welfare (Sen et al., 2016).

These reforms or restructuring is commonly referred to as ‘liberalization’, which means that certain activities within the production and supply are exposed to competition, while the transportation and distribution activities maintain heavily regulated (Künneke, 2008). The majority of the countries that reformed their electricity sectors followed the ‘standard model’, which provided a sequence and steps for implementing these reforms and became a global trend during the 1990s (Jamasp et al., 2015).¹

Whilst the majority of the first electricity sector reforms started in developed countries, developing countries followed quickly. In 2006, about 70 out of 150 developing countries started with varying degrees of electricity sector reforms, also with varying degrees of success (Besant-Jones, 2006; Jamasp et al., 2015). In many cases the reform did not meet expectations in terms of, among others, pricing, social welfare and efficiency (Nagayama, 2007; Nepal & Jamasp, 2012). Electricity access rates for the poor remained low and the state (and its inefficiencies) remained overrepresented in the sector. Additionally, reforms failed to correct the chronic underinvestment in the electricity sector which was one of the main reasons to reform in the first place (Jamasp, 2015).²

Many reasons have been mentioned for these undesired outcomes (see also Appendix A). An often mentioned reason is a lack of taking into account contextual economic, institutional, political and cultural factors during the design and implementation phase of these reforms. Too often, a ‘one-size-fits-all approach’ has been used that did not fit with the context of the country in which the reforms took place (Jamasp et al., 2015; Sen et al., 2016; Gratwick & Eberhard, 2008). So despite the fact that the standard reform model has been promoted in developing countries by institutions like the World Bank and the IMF, during the 25 years in which this model has been advocated, it has not been fully realized anywhere in Africa (Kapika & Eberhard, 2013). Instead, different varieties emerged, often referred to as ‘hybrid power markets’; a market structure somewhere between the pre-reform structure (a vertically integrated utility)

¹ An elaboration on the standard model will be provided in chapter 4

² Jamasp (2015, p.8-10) provides an overview of several developing countries and their specific outcomes of sector reform.

and retail competition (Correljé & De Vries, 2008; Gratwick & Eberhard, 2008). Figure 1 shows that the most ‘far reaching’ market-oriented reforms (wholesale markets with retail competition) were realized primarily in developed countries, whilst electricity sectors in most countries in Africa, the Middle East and South-East Asia are still vertically integrated government monopolies.

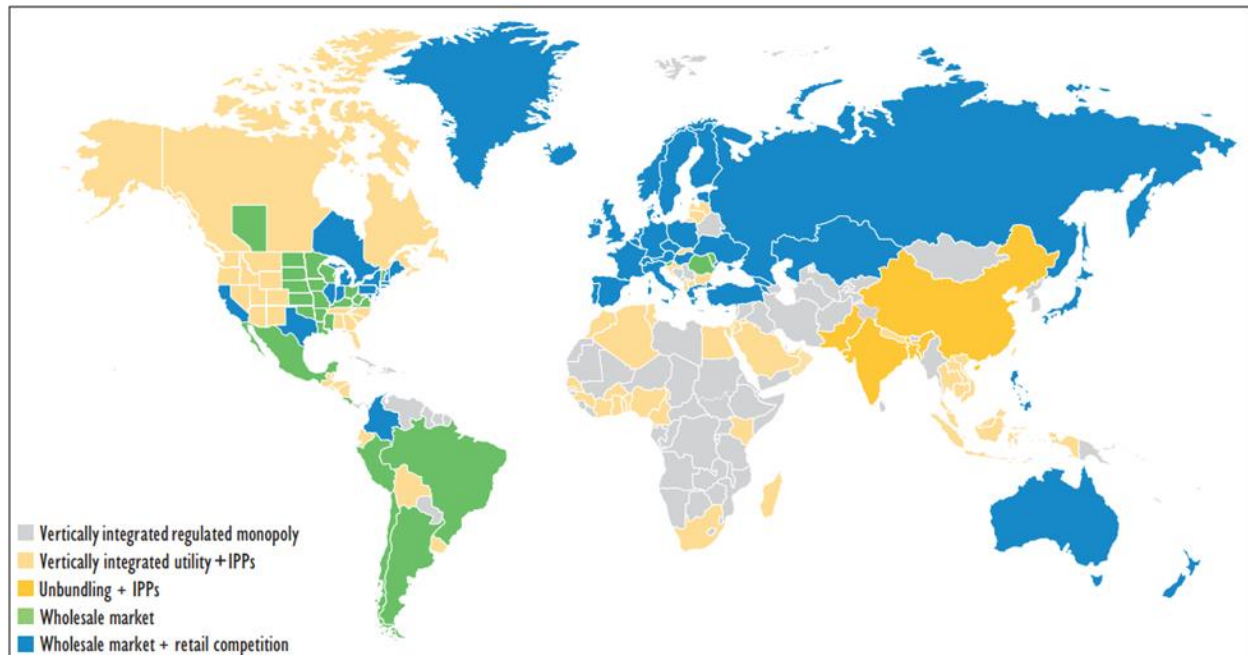


Figure 1: Overview of electricity reform progress worldwide. Source: IEA (2016, p.23).

One of these developing countries that embarked in recent years on the route towards a market-oriented electricity sector is Egypt.³ In 2015, the President and Parliament approved a new Electricity Law with the aim to vertically disintegrate the current monopoly by the government and to allow for competition in certain sections of the value chain. This will take place in various stages, with the aim to eventually create a fully competitive electricity market with retail completion (Arab Republic of Egypt, 2015). Even though the law that laid the legal foundation for this reform was enacted in 2015, three years later the status of the reforms is unclear and a variety of stakeholders doubt if the most far reaching type of reform (a wholesale market with retail competition) is feasible in the short and medium term for the Egyptian context (El-Salmawy, 2018; Anonymous 14, 2018).

1.1 Outline of the research

The objective of this thesis is to give a recommendation for the most suitable type of restructuring of the Egyptian electricity sector. This is done by using experiences from other developing countries, focusing on the institutional and political economic context, making an overview of Egypt’s electricity sector and holding interviews with experts and stakeholders.

First, the goal, objectives and the methodology for this research will be outlined. Secondly, the theoretical

³Egypt is a developing economy according to the International Monetary Fund's World Economic Outlook Report, April 2017

framework will be presented consisting of the history, drivers and outcomes of electricity sector reform in developing countries, as well as an overview of the standard reform model, and the different restructuring modalities. Based on this, the criteria to determine a suitable modality for the Egyptian context will be described followed by an overview of Egypt's electricity sector and the Political Economic Analysis. Finally, the formulated criteria will be applied on the case of Egypt which will result in a proposal for the most suitable type of restructuring for Egypt.

2. Research formulation

Egypt has the ambition to transform its state-owned dominated electricity sector into a fully unbundled retail market in the long run. This will be a challenging task since no developing country has yet realized this ultimate degree of market liberalization. Instead, as can be seen in Figure 1, liberalization of electricity markets in developing countries happened in varying degrees, meaning in this case the degree of liberalization or private sector participation. Scientific literature related to this topic shows that one of the most important reasons for undesired reform outcomes can be traced back to the fact that crucial contextual factors were not duly considered. Therefore, before any attempt can be done to (further) liberalize an electricity sector, a comprehensive and detailed understanding of structural, institutional, macroeconomic and political conditions is necessary (Eberhard & Godinho, 2017; Erdogdu, 2014). Similarly, William & Ghanadan's (2006) first recommendation after a study on electricity sector reform in developing countries, was that it should be 'reality based';

"The main policy challenge ahead is creating reforms that address the most important needs, are based on the actual conditions of the sector, and are consistent with the social and institutional capacities of the country. Standard-menu reforms have often been too ideological in their conception, too rigid in their execution, and too narrowly focused on finance to deal successfully with changing investment conditions, the political complexities of reform implementation, and the combined economic and public benefits functions that an electricity system must serve. Better reform begins with a locally-specific framing of problems and targeting of solutions, not the idealized image of a perfect market (p.836)"

This is in line with the findings of Matt Andrews (2013), a Harvard scholar who wrote extensively about institutional reform in developing countries in general. He asks why so many (externally financed) institutional reform efforts in the public sector fall short of expectations. A lack of considering the local context is one of the main reasons and he proposes the following approach needed for successful reform processes:

"[F]inding and fitting relevant reforms requires a process of 'purposive muddling' that (i) takes time and is incremental, (ii) requires a localized focus on problems and contextual realities, and (iii) involves broad scanning—externally and internally—and the formation, through bricolage, of hybrids." (Andrews, 2013, p.162)

These context-focused lines of reasoning will be the justification for the choice of analysis and research methodology, as outlined in this chapter.

2.1 Knowledge gaps

During the literature review it turned out that there was no literature written solely about Egypt's electricity sector reform (see Appendix A). The vast majority of literature written about electricity sector reforms in developing countries is focused on countries in sub-Saharan Africa, Latin-America and South-East Asia. Little has been published about reforms in North-Africa or the MENA region, with the exception of Dyllick-Brezinger & Finger (2013).⁴ One reason for the lack of literature about reforms in the MENA

⁴ However, these authors excluded Egypt because their focus was on large, oil- and gas exporting countries like Kuwait, Saudi Arabia and Algeria.

region is that because of the countries' abundant and cheap fossil energy resources, the pressure to introduce market-oriented reforms in this sector was relatively low. Despite this lack of perceived pressure, most of the countries in the MENA region made long term plans to restructure their electricity sector (Dyllick-Brezinger & Finger, 2013).

Research done by Eberhard & Godinho (2017) on the status, context and political economy of electricity sector reforms in developing countries, concluded that there is an untapped potential for country-to-country learning across and within developing regions. Regarding Egypt (and the MENA region in general), this type of research is currently lacking. Moreover, the majority of the literature written about electricity sector reform in developing countries are *ex post*, and focusses solely on the policy and institutional aspects of reform. Also, literature written about Egypt's energy sector is mostly related to energy security, the gas sector, and integration of renewables, and is written merely from a technical perspective.

There is not yet a comprehensive study that puts Egypt's electricity reform ambitions into the context of the institutional environment, while literature regarding this topic emphasized on the importance of doing so. Additionally, there is not yet academic literature that provides a critical scientific reflection on Egypt's future plan to implement retail competition.

Based on this, several knowledge gaps can be formulated:

1. Since the Egyptian government enacted its new Electricity Law in 2015, the way has been paved for the first comprehensive market-based electricity sector reforms in Egypt. Despite the significant impact this will have on the sector, there is no scientific literature yet dedicated to these reforms. The majority of literature written about Egypt's electricity sector focusses on the integration of renewable electricity sources, and primarily from a technical perspective.
2. The planned reforms have the long term aim to eventually create a wholesale market with retail competition for all customers. It is not yet clear if this type of restructuring is the most suitable for the Egyptian context.

2.2 Problem statement

Three years after the enactment of the new Electricity Law in 2015 that legally paved the way to implement a far reaching type of reform (a wholesale market with retail competition), the status of the reform process is unclear. Many doubt if these reforms are feasible in the short and medium term for the Egyptian context (El-Salmawy, 2018; Anonymous 14, 2018). Moreover, no country in Africa or the Middle-East has - up to the date of writing - successfully implemented a wholesale market with retail competition. Taking into account the earlier described knowledge gaps, the following problem statement can be formulated:

Although Egypt started with implementing its first significant market-oriented electricity sector reforms, it is not clear which restructuring modality in the medium- to long run will be the most suitable for the Egyptian context.

2.3 Research objective

As visualized in Figure 1, there are varying degrees of liberalization or reform possible, each with a

different role of the state and the private sector. Since the most suitable restructuring modality for Egypt's electricity sector is not yet defined nor researched, the objective of this will be as follows:

This research investigates the most suitable restructuring modality for an efficient and reliable electricity sector in Egypt, given the institutional and political-economic context in which these reforms have to take place.

2.4 Scientific & societal relevance

The earlier described knowledge gaps show that scientific research about this topic, specifically in Egypt is limited. Conclusions drawn from this research can be used to analyze reform efforts in other MENA countries as well. Additionally, standard reform models have been developed in the 1990s and early 2000s, and are still being applied in developing countries around the world. But currently, these countries face many new electricity sector challenges associated with climate change mitigation and the integration of renewables, technology change and regional integration (IEA, 2016). After this research, there will be a reflection on the standard reform model to see which aspects can be translated to the Egyptian context and which not.

The societal relevance lies mainly in recommendations for the Egyptian government stakeholders to effectively implement their reform efforts. Two of the main goals of Egypt's Ministry of Electricity and Renewable Energy (MoERE) are to provide an efficient and reliable electricity supply, and to restructure the electricity sector in the most optimal way to stimulate investments. This research can contribute to achieving these goals. In general, Egypt's economy needs an affordable and reliable electricity system to function properly. This is in line with the opinion of the Egyptian public, expressed in 2011 during the revolution: an important source of discontent came from the poor quality of state services, of which electricity provision was one (Lakhal, 2014).

2.5 Research questions

Based on the information above, the following main research question has been formulated:

Which restructuring modality for Egypt's market-oriented electricity sector reforms is the most suitable for an efficient and reliable electricity supply, considering the institutional and political-economic context?

To answer this question, 4 sub-questions are formulated:

1. *What type of electricity sector restructuring is possible and how can context-specificity be incorporated when determining a suitable modality for an electricity sector in a developing country?*
 - a. *What does liberalizing of an electricity sector entail?*
 - b. *Which types of electricity sector restructuring can be distinguished?*
 - c. *What can context-specificity tell us about the outcomes and lessons learned from liberalizing electricity sectors in developing countries?*

2. *How can these experiences in other developing countries be translated into general criteria to determine the most suitable restructuring modality?*
 - a. *Which criteria can be formulated to determine a suitable restructuring modality?*
 - b. *How can these criteria be operationalized?*
3. *How can the contextual analysis be used to determine the most suitable type of restructuring?*
 - a. *What does the institutional and technical structure of Egypt's electricity sector look like and what are the goals and policies of the government for market-oriented reform?*
 - b. *What does Egypt's political-economic context look like?*
 - c. *How can the formulated criteria be applied on Egypt by using the context analyses and stakeholder and expert interviews?*
4. *What restructuring modality is the most suitable for Egypt according to the contextual framework?*
 - a. *Based on the outcome of the application of the criteria, what are the implications for Egypt's reforms?*
 - b. *Based on the findings and conclusions, what aspects of the standard reform model could be applied on the Egyptian case and which not?*
 - c. *What are shortcomings of the proposed type of restructuring and recommendations for future research?*

3 Research methodology

The two main methods used for this thesis are desk research and interviews (see also Table 1). The desk research consist of studying (scientific) literature and reports (grey literature) related to this topic. The desk research is a mean to explore what has already been written about this topic and where this research can add to. Additionally, it is possible to build on the work or recommendations of other authors.

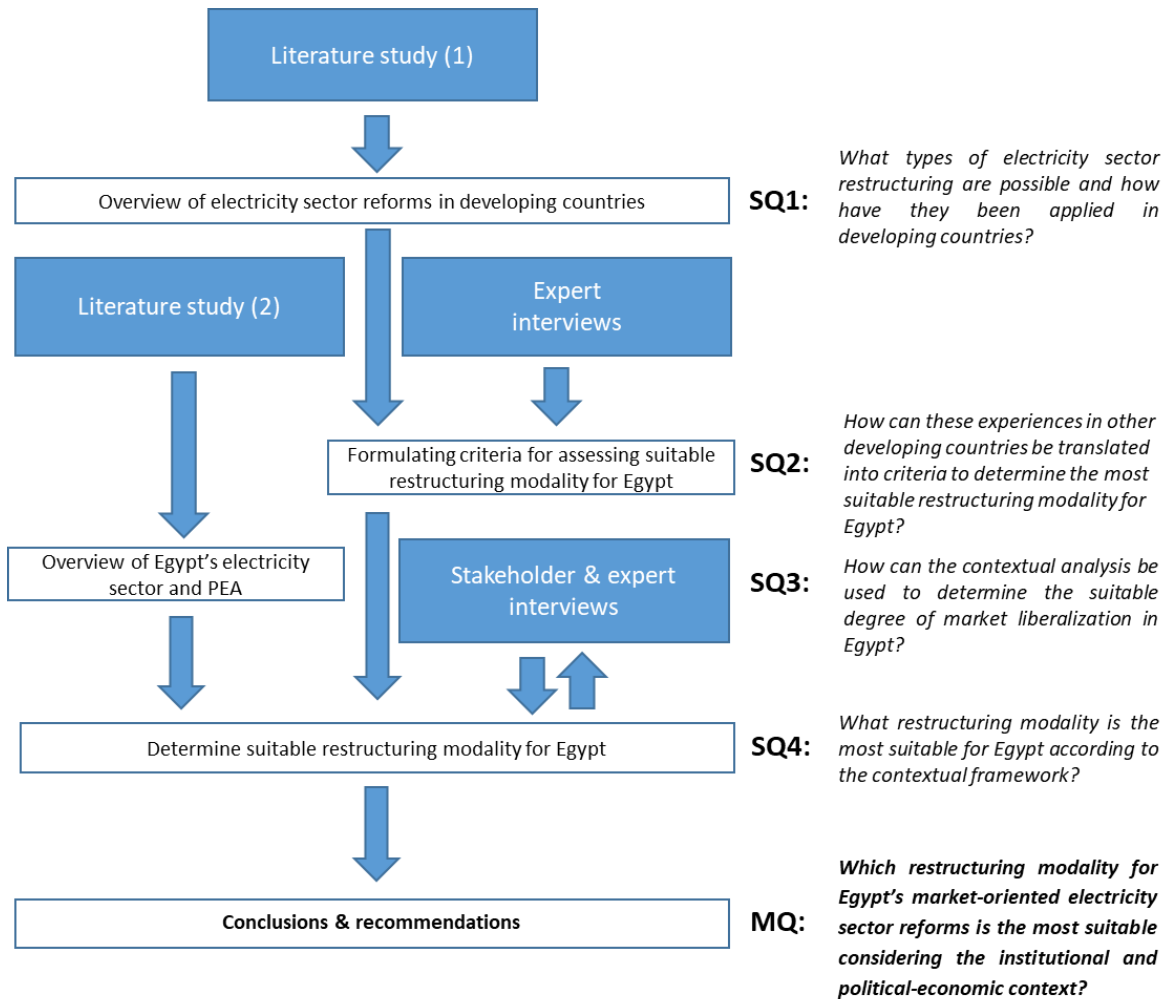


Figure 2: The research methodology framework

This research design has been chosen over a more quantitative one because collecting (reliable) quantitative data on Egypt's electricity sector is difficult. The IEA provides some basic KPIs for Egypt's electricity sector but this data is limited and outdated (last update in 2014) (IEA, 2018). A more qualitative approach is therefore favored, specifically by conducting interviews. Interviews with experts or stakeholders is a qualitative empirical research method for obtaining relevant information from these actors (Bogner et al., 2009).

3.1 Stakeholder and expert interviews

Interviews have been conducted with both experts and relevant stakeholders. The rationale is that experts and stakeholders have different perspectives, values and motivations which will lead to different forms of

information (Van Buuren, 2009). Both forms are relevant, if not crucial, for this research. An expert is in this case defined as someone who holds scientific knowledge based on scientific facts, models and methods. The knowledge of a stakeholder is based on his or her experiences related to this context (Egypt and/or its electricity sector) and provides local insights related to their activities (Reynaud et al., 2015).

The interviews have been conducted for two important reasons. Firstly, in a country like Egypt, actual and reliable data and information is scarce. Moreover, the Egyptian government is considered as not being transparent, especially when it comes to reforms (see Chapter 7). Interviews are an important source for information about Egypt's electricity sector. For example, what is the current status of the reform? The legal foundation for the reforms has been laid by the 2015 Electricity Law, however what happened between then and the time of writing is for many not clear. Also, the criteria that have been formulated to assess which restructuring modality should be chosen, will be applied on Egypt by means of the information gained from the interviews. Second, experts will be interviewed to validate the criteria formulated in chapter 5. Hence, both the validation and the application of the chosen criteria by the interviewees happened somewhat simultaneously. This was done because the distinction between a stakeholder and expert was not always fully clear. It was also an iterative process: after every interview the author was provided with new insights. It is therefore too time consuming for both the interviewee and interviewer to validate every new finding with an expert or stakeholder. With the exemption of Prof. Hafez El-Salmawy, only one interview has been conducted per expert or stakeholder.

The interviews were semi-structured. This means that only the outline of the question was formulated, which gave the researcher more flexibility. It also facilitated a 'two-way' communication (Yin, 2003). The guideline and the questions used can be found in Appendix B. Roughly two types of interviews guidelines and questions were prepared. The questions for the scientific experts focused more on electricity sector reform in general and for validation of the chosen criteria. The questions for the stakeholders were more aimed at Egypt as a case study.

At the start of every interview the research was introduced and the necessary background information was provided to the interviewees (depending on the knowledge this specific interviewee already had). Also, before the appointments were made, the author's position as researcher and graduate student had been underlined. A more detailed description of the interview protocol can be found in Appendix B.

3.2 Selection of interviewees

Since electricity sector reforms influences - and is influenced - by many types of stakeholders, a variety of people were interviewed with different backgrounds, expertise and interests. The type of stakeholder or expert has been classified as development, IFI, government, private, academic and diplomatic. The selection of the interviewees was made based on three criteria. The person needed to have knowledge about, or experience in:

1. Egypt's electricity sector reforms
2. Electricity sector reform or institutional reform in general
3. Egypt in general (its institutional, political or economic context)

Since Egypt is a developing country, development agencies and IFIs (International Financial Institutions)

play an important role in the liberalization process, as opposed to in Western Europe for example. Agencies and banks like the AfDB, EBRD, WBG and GIZ are involved in Egypt's electricity sector in general, and specifically with its liberalization. Moreover, the multiple authors mentioned the important, and sometimes controversial, role that development agencies and IFIs played in the liberalization of electricity sectors in developing countries (Wamukonya 2003; Williams & Ghanadan, 2006).

The government is obviously a key stakeholder as well. However, government officials have been deliberately excluded from interviews. The people that were classified as 'government' were either former high-ranking government officials, or were in a position not directly related to the electricity sector or not politically sensitive. The reasons for this decision was twofold. Firstly, as described earlier, the author was combining this research with a job with a potential conflict of interest. Making the distinction between this research and job was easy for the author. For an Egyptian government official this distinction might not be so clear. Secondly, electricity sector reforms are politically sensitive because they are linked to the decrease of electricity subsidies (the tariff reform). The current political environment does not allow for critical questions related to this topic, as was advised by many people (colleagues and friends) close to the author.⁵

This research aims has a significant scientific foundation, as will be described in chapter 4. Therefore scientific experts have been interviewed as well. These scientific experts provided the author with insights on electricity sector liberalization in general.

Additionally, since liberalization entails an important future role for private parties in a state-dominated status quo, several private actors have been interviewed as well. Actors classified as 'private' are both private companies in Egypt's electricity sector and investments banks investing in the private sector. The justification for this classification is that both types have a strong interest in a restructuring modality that is favorable for their projects or investments.

3.3 Data analysis and processing

11 out of the 15 interviews have been recorded, obviously with the consent of the interviewee. Simultaneously notes were made. Combined, notes of every interview had been produced of which a summary can be found in Appendix B. No specific interview processing software has been used. Instead, the type of questions are linked to a section in this thesis. Most of the information retrieved from the interviewees was used to apply the formulated criteria in chapter 5 on the case of Egypt. The answers of the interviewees per topic were highlighted, and translated into the general story line. Different interviewees with different backgrounds have been used to retrieve specific information on the different criteria. For example, the questions for an interviewee labeled as 'private sector' had more emphasis on the criteria related to the investment climate.

⁵ What played a role in this advice was the torturing and death of an Italian graduate student in 2016, who did research in Cairo. What precisely happened is not yet fully clear. According to an Italian prosecutor, the student, Giulio Regeni, had been in the cross hairs of Egyptian security services until the day of his disappearance, and was murdered over research he had been carrying out into Egypt's independent labor unions. The event caused a diplomatic crisis between Egypt and Italy (Walsh, 2017; Povoledo, 2018).

Table 1: Overview of interviewees

Personal Information			Knowledge about/ experience in			Type of interviewee/sector					
Number + Name	Organization	Position	Egypt's elec. Sec. (reforms)	Elec. Sec. Reform in general	Egyptian context	Govern-ment	Develop-ment	IFI	Private	Academic	Diplomati
1. Anonymous			X		X		X	X			
2. Prof. Dr. Hafez El-Salmawy	World Bank/ EgyptERA/ Zigazag Univ.	Advisor/ Former Chairman/ Professor	X	X	X	X	X	X		X	
3. Michel Scheepens	FMO	Senior Investment Officer Energy	X	X	X		X	X			
4. Anonymous			X	X	X		X	X			
5. Dr. Laurens de Vries	TU Delft	Associate Professor		X						X	
6. Anonymous			X	X	X	X	X	X			
7. Dr. Sunil Tankha	ISS	Associate Professor		X						X	
8. Anonymous			X		X				X		
9. Prof. Dr. Mohamed El-Sobki	EgyptERA/ NREA/ Cairo University	Former Director/ Former Chairman/ Professor	X	X	X	X				X	
10. Anonymous					X						X
11. Anonymous					X						X
12. Anonymous			X	X	X				X		
13. Dr. Volko de Jong	GGNI/EDI	Managing Partner		X	X				X	X	
14. Anonymous			X	X	X		X	X			
15. Anonymous			X	X	X		X				

In total, 15 people have been interviewed (see table 1 on page 20) ranging from former government executives and diplomats, to academic experts, development actors and private sector stakeholders. The complete list of interviewees can be found in Appendix B, together with a summary of the interviews. The findings and outcomes of the interviews have been translated into the general story line.

Figure 3Fout! Verwijzingsbron niet gevonden. provides an overview of the research methodology framework which shows at what point of the research which particular research question will be answered (SQ' stands for sub-questions and 'MQ' for main question). Table 1 below gives an overview of the linkages between the research methods, activities and the research question to be answered.

Table 1: Research questions and related research activities and methods.

Sub research question	Research activity	Research method
1. What types of electricity sector restructuring are possible and how have they been applied in developing countries?	<ul style="list-style-type: none"> • Empirical research on different types of electricity sector structures • Make an overview of electricity sector experiences in developing countries 	Literature study
2. How can these experiences in other developing countries be translated into general criteria to determine the most suitable restructuring modality?	<ul style="list-style-type: none"> • Translate the findings into criteria to assess as part of a framework for assessing a suitable restructuring modality 	Literature study Expert interviews
3. How can the contextual analysis be used to determine the suitable degree of market liberalization in Egypt?	<ul style="list-style-type: none"> • Apply criteria on the case of Egypt 	Stakeholder interviews Expert interviews
4. What restructuring modality is the most suitable for the Egyptian context considering the institutional and political-economic environment?	<ul style="list-style-type: none"> • Concluding research findings • Reflecting on the standard reform model 	

3.4 Confidentiality

For reasons outlined above, some names of interviewees have been kept confidential. Moreover, honest and un-biased answers by interviewees can conflict with the official stand- and viewpoints towards Egypt of the organizations they represent. Most of them therefore requested if their names could be kept confidential. The names of all the interviewees are known to the thesis committee by means of a confidential appendix. The list as presented in table 1 gives the number of every interviewee. If a reference is made to a statement of anonymous interviewee number 1 for example, it is cited as: "(Anonymous 1, 2018)."

4. Theoretical framework

SQ 1: What types of electricity sector restructuring are possible and how can context specificity be incorporated when determining a suitable modality for an electricity sector in a developing country?

- a) What does liberalizing of an electricity sector entail?
- b) Which types of electricity sector restructuring can be distinguished?
- c) What can context specificity tell us about the outcomes and lessons learned from liberalizing electricity sectors in developing countries?

This chapter describes the theoretical framework which is an integral part of this research. In this chapter, liberalization literature on the one hand, and the institutional environment and political economic literature on the other are brought together. The first focuses on liberalization in light of performance criteria such as efficiency and reliability. The last truly helps us to look closer at the political-institutional environment, the context within which liberalization occurs. These two components will be brought together in the framework in chapter 5.

First, the history and status of electricity sector reforms in developing countries is described, together with the drivers behind these reforms. Second, the concept of the standard reform model will be explained followed by an overview of the restructuring modalities that materialized after these reforms. After this, the outcomes and lessons learned from reforms will be described which will lead to the introduction and the justification of the use of the Political Economic Analysis (PEA).

4.1 The level of analysis

Since the scope of this research is broad, clarification will be provided regarding the level of analysis. The four-layer model of Williamson (1998) adapted by Scholten & Künneke (2016) for energy infrastructures, can be used to distinguish levels of institutional analysis and to clarify how these layers interrelate. As visualized in Figure 2, the model consists of four layers, with the downward arrows representing the constraints that a higher level imposes on the level directly below it, and the upwards arrow representing feedback.⁶ The aim of this research will be to assist individual actors in Egypt's electricity sector, which are active in the 4th level. But this will not be the level of analysis. The focus will be on layer 2a (formal institutions) and 2b (governance). The recommendations on which type of restructuring is the most suitable for the Egyptian context will prescribe which institutional and governance arrangements have to be made (layer 2) in order to restructure the elements in layer 3 (degree of unbundling, type of contracts etc.).

⁶ The dotted arrows (upwards) versus the solid arrows (downward) represent the importance of the market design (on a higher level) on the lower levels (Scholten & Künneke, 2016).

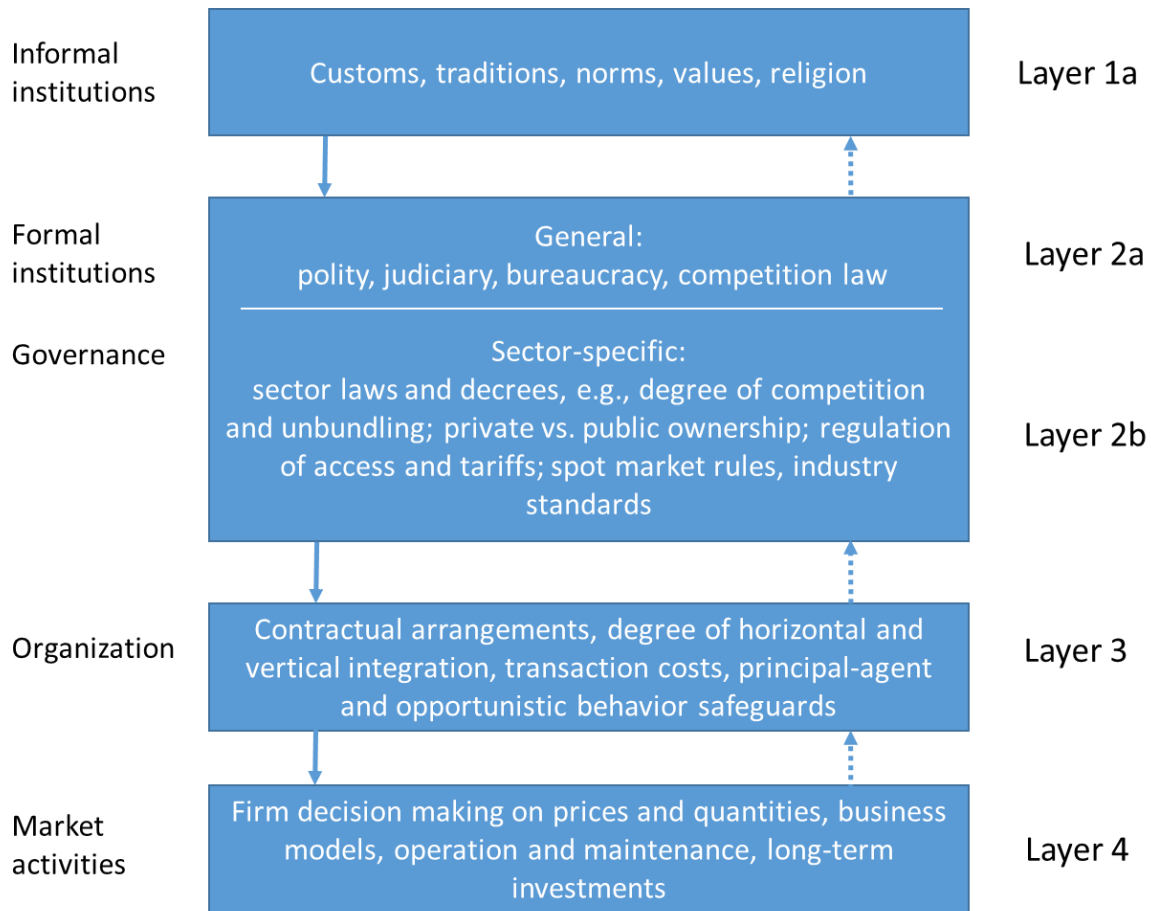


Figure 3: The four layer model by Williamson (1998) adapted by Scholten & Künneke (2016, p.12) to determine the level of analysis.

This framework will help, next to pinpointing the level of analysis, to define the type of interventions that are needed for the case of Egypt (based on the analysis and the recommendations). This will be done in chapter 8. Since the different layers of Williamson's model each have different frequencies of change, this will provide insights into the implications for Egypt, time-wise.

4.2 Liberalization of electricity sectors

4.2.1 History and status of reforms

It was on September 4, 1882 when in New York City the world's first centralized power plant opened, designed by Thomas Edison and fully privately financed by Wall Street investors. After that, private electricity systems multiplied rapidly; in 1902, around 75% of the power systems in the United States operated privately (Brennan et al., 1996). Similarly, in Egypt the first electricity systems in 1893 were privately owned and operated. This system consisted of several small diesel engines installed in Cairo and Alexandria to supply electricity to some streets and houses (Ibrahim et al., 2004). Private sector participation in Egypt's electricity sector remained until 1962, when all companies were nationalized. (Osman, 2014). Similarly, the development of other utility industries (water, telecommunication, transport and gas) around the globe in the early 20th century, happened within free market conditions by

private investments (Kessides, 2004). This continued until the 1940s and 1950s when all over the world consolidation and nationalization of the previously fragmented municipally and privately owned electricity systems occurred. After these consolidation and nationalization processes, the public owned and operated vertically integrated structure emerged ('pre-reform structure'). Thus, although we primarily speak of increased private sector participation when talking nowadays about electricity sector reform, private sector participation already happened in the early stages of its development in the beginning of the 20th century.

There were several justifications for this pre-reform structure that rested on four grounds (Besant-Jones, 2006, p. 10; Gratwick & Eberhard, 2008, p. 3948; Künneke, 2008, p.234):

1. This structure minimized the coordination (or transaction) costs between the functions (generation, distribution and transmission) in the supply chain and the costs of financing the development of electricity systems.
2. The state as financer was favored because of the high fixed costs and the increased economies of scale when increasingly large power plants were being build.
3. The network of the electricity sector was classified as natural monopoly which meant that state stewardship was favored in order to enhance consumer welfare.
4. The electricity sector was seen as a strategic asset, critical to national economic security and needed for social distributional objectives.

This pre-reform structure, dominated by the state, was encouraged among developing countries by the Cold War superpowers and development agencies (like the World Bank) alike (Williams & Ghanadan, 2006).

It was in the 1980s and 1990s when electricity sectors worldwide started with introducing market-oriented reforms. These reforms or this restructuring is commonly referred to as 'liberalization'. Liberalization in economic sense means the reduction of the involvement of the state in the economy. And generally speaking as a result, allowing for (more) private sector participation in sectors of the economy that were previously dominated by the state. In the case of the electricity sector, it meant that certain activities within the production and supply are exposed to competition, while the transportation and distribution activities maintained heavily regulated (Künneke, 2008). The aim of liberalization is to increase efficiency, lower consumer costs and stimulate investments. Figure 4 provides a visual representation by Künneke & Fens (2007) of the electricity value chain before and after liberalization in which the light shaded elements represent a natural monopolistic function and the dark shaded market-based commercial ones. The upper part represents the earlier described vertically integrated monopoly in which every part of the chain is operated by the government. The lower part shows the value chain after liberalization.⁷

⁷ In this case the most far-reaching form of liberalization namely retail completion. In chapter 4 the different types of liberalization, or restructuring, will be described extensively.

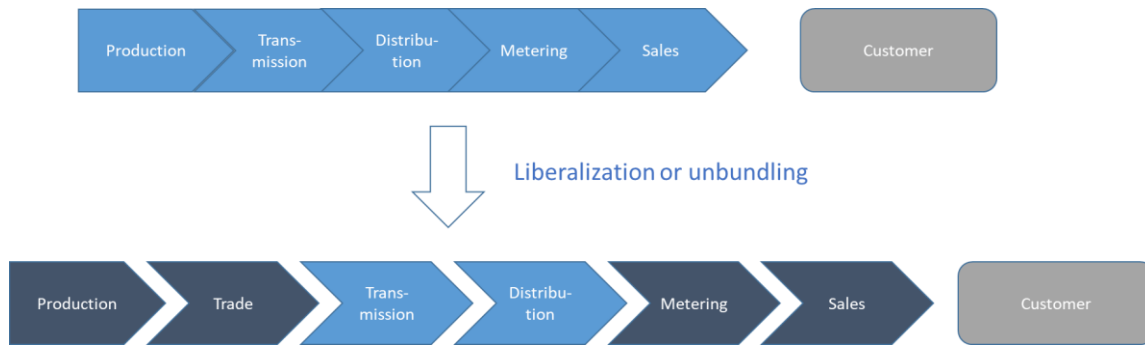


Figure 2: Electricity value chain before and after liberalization. Adapted from Künneke & Fens (2007).

The majority of the countries that reformed their electricity sectors followed the ‘standard model’ which provided a sequence and steps for implementing these reforms and became a global trend during the 1990s (Jamاسب et al., 2015).⁸ The first country that applied the standard model was Chile in 1982 and was followed quickly by the United States, England, Wales and Norway. These countries all reformed in a slightly different way. And even though these reforms were experimental in the sense that it was based largely on an untested theory, they were later brought to bear on countries throughout the developing world (Gratwick & Eberhard, 2008; Bacon & Besant-Jones, 2002). Nowadays, a large number of both developed and developing countries reformed their electricity sectors, in various degrees, or are in the progress of doing so (see Figure 3).⁹ The most ‘far-reaching’ reforms (development of wholesale markets and retail competition) are however implemented mostly in developed/OECD countries.

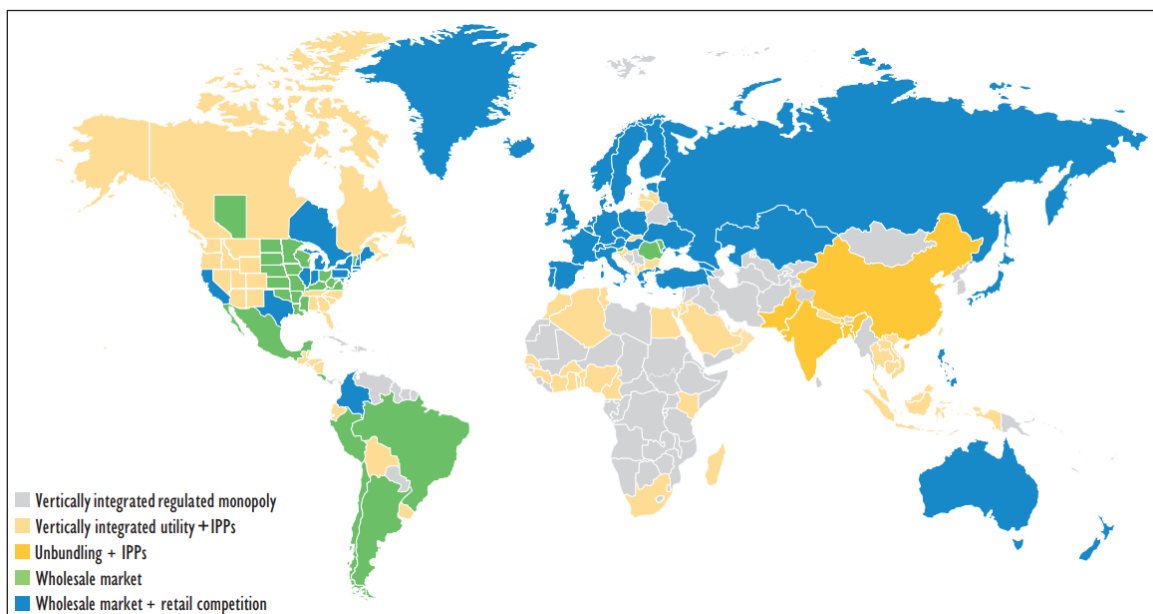


Figure 3: Overview of electricity reform progress worldwide. Source: IEA (2016, p.23).

⁹ See also the ‘Electricity Market Closeness Index’ by Erdogdu (2014), a visual overview of reform progress in certain regions by Eberhard & Godinho (2017), and a table created by Jamاسب (2015, p.8-12) showing the status of reforms for a variety of countries.

4.2.2 Drivers

The main reason for the reform or liberalization of electricity sectors was to improve economic efficiency. According to Kessides (2012), in developed countries the pressure to reform grew with increasing excess capacity and disillusionment with capital-intensive generation projects, influenced by the 1970 oil crisis. This in combination with the rapid global expansion of neoliberalism which reimagined the role of the state in society and development (Eberhard & Godinho, 2017). Another, sometimes overlooked, driver for reform came from the technological sphere. In the end of the 1970s, new technologies made it possible to produce electricity more efficient, at lower scales of production (Künneke, 2008). For example, the development of Combined Cycle Gas Turbines (CCGTs) lowered the costs on the generation side. But also advancements in information technology (IT) reduced the costs for metering and grid control, and therefore creating the pre-conditions for decentralization of supply (IEA, 1999, p.23).

Performance of the electricity sector (meaning financial performance, supply side efficiency and demand-side efficiency) was especially a pressing issue in developing countries (World Bank, 1994).¹⁰ Besant-Jones (2006) described several drivers behind reform in developing countries specifically¹¹:

- State-run electricity systems turned out to be performing poorly. There were high operating costs, a poor connection rate and for those who are connected, the electricity supply was unreliable.
- State sectors were unable to finance much needed investments and maintenance due to, among others, endemic corruption, political interference, theft of power and lack of a long-term vision.
- There was a need to reduce the fiscal stress on running the electricity system; funds were needed for other pressing public needs. It was also a mean to generate revenue by selling the state-owned assets. Some developing countries (Brazil and Argentina for example) did this to deal with the high debt load of operating the electricity system.

Jamasb (2015, p.6) provided an overview of the drivers, divided in the external ones and the ones within the electricity sector (for both developed and developing countries), see the table 3 below.

¹⁰ This was also the case for the Egyptian electricity sector, see chapter 6.

¹¹ Eastern European countries had an 'external'/additional incentive to implement reforms since this was required under the 1996 EU's Electricity Directive.

Table 2: Overview of drivers for electricity sector reforms in both developed and developing countries. Adapted from Jamasb (2015, p.6).

Electricity sector drivers	External drivers
<p>Developed countries: excess capacity, use of costly generation technologies, economic inefficiency, growing consumer demands for cheap energy</p> <p>Developing countries: lack of public sector financial resources to meet growing demand, institutional inefficiency, burden of energy subsidies, low service quality, high energy losses, poor service coverage, capacity shortage and energy sector investment constraints</p>	<p>a) Political and economic ideology: faith on the forces of market, competition and privatization</p> <p>b) Technological innovation: such as the development of CCGTs</p> <p>c) Macroeconomic events: such as the post-Soviet economic transition (1989), Latin American debt crisis (1980s), Asian financial crisis (1997-1998)</p> <p>d) Capital raising options: privatization of state owned energy assets</p> <p>e) OECD energy deregulation: creating of new energy multinationals looking for new investment opportunities</p> <p>f) Lending policies of donors: such as those of the World Bank and IMF with strings attached</p> <p>g) National economic reform context: as a result of economic crisis and structural adjustment programs</p>

It can be concluded that despite the different economic and institutional environments, both developed and developing countries started with reform for the sake of economic efficiency. It also fitted in a wider, global trend of liberalization and market thinking. This resulted in donor- and development agencies and governments alike shifting away from favoring state planning and state ownership, and focusing more on

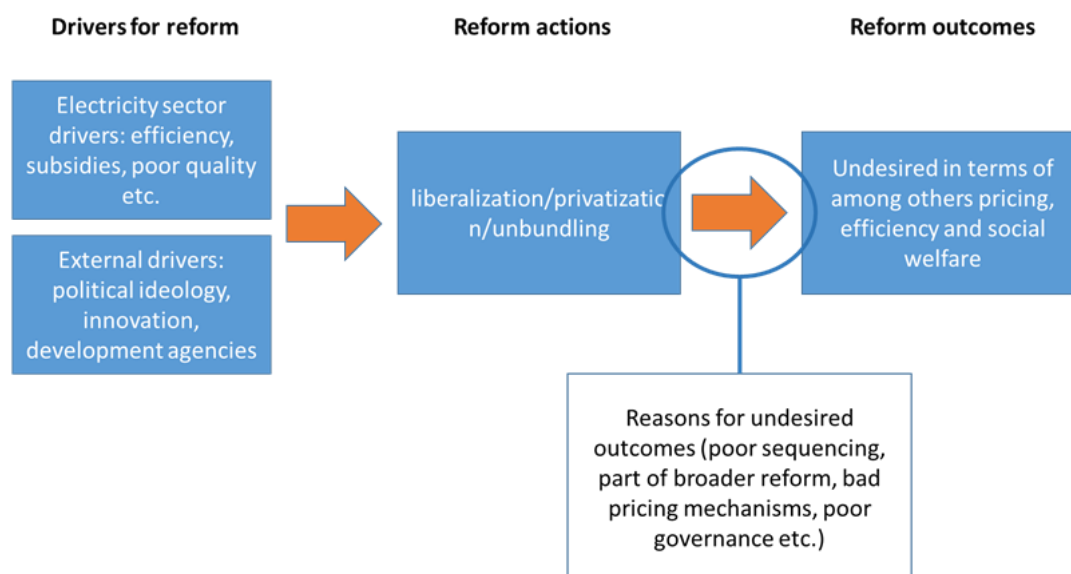


Figure 4: Overview of the drivers, actions and outcomes of electricity sector reforms in developing countries.

the role that the private sector can play in development (Parker & Kirkpatrick, 2005). In other words, a more neoliberal economic approach on electricity delivery was favored over the public status quo.

4.2.3 Results

Despite the fact that electricity sector reform has been applied widely in developing countries, in many cases it did not lead to a desired outcome in terms of among others pricing, social welfare and efficiency (Nagayama, 2007; Nepal & Jamasb, 2012).¹² Wamukonya (2003) goes as far by saying that:

“[Electricity sector reforms] not fulfilled many of its goals and the prevailing recipes are likely to leave developing countries socially and economically worse off than in the pre-reform period.” (p.1273).

Bensch et al. (2016) did an extensive quantitative review of the effects of market oriented electricity sector reforms on electricity prices and did not find robust evidence that these reforms had the desired outcome. Additionally, reforms failed to correct the chronic underinvestment in the electricity sector which was one of the main reasons to reform in the first place (Jamasp, 2015).¹³ Figure 6 visualizes the reform drivers, actions and outcomes of the reforms.

However, in some developing countries the quality of supply improved, primarily in South America (Jamasp, 2015; Besant-Jones, 2006). In most sub-Saharan African countries where reforms have been implemented (mostly corporatization and commercialization of state-owned utilities and establishment of independent regulators), quality of supply remains poor and prices remain higher than most other parts of the world (Eberhard, 2013). The standard model has not been implemented anywhere in Africa, but instead hybrid electricity markets emerged; markets that are often regulated independently but where state-owned utilities still dominate (Gratwick & Eberhard, 2008). Or formulated by De Vries & Correljé (2008, p.65), hybrid electricity markets *“[...] are somewhere in between their former pre-liberalized state and retail competition.”*

It can be concluded that despite the similarity of drivers for reforms in developing countries, the outcomes differ, both in terms of performance and market structure (as shown in Figure 1). And that, in the case of the African continent, even though the standard model for reform has been propagated by governments and development agencies alike, it hasn't been fully implemented anywhere.

4.3 The standard reform model

The majority of the countries that reformed their electricity sectors followed the 'standard model' which provided a sequence and steps for implementing these reforms, and became a global trend during the 1990s (Jamasp et al., 2015). The World Bank defined in 1993 five recommendations for market-oriented electricity sector reform in developing countries, and is considered as one of the first to do so. These recommendations are therefore also seen as the foundation on which the 'standard model' is based (Gratwick & Eberhard, 2008). These recommendations can be grouped under five principles: transparent regulatory processes, importation of services (especially for the least developed countries),

¹² See Appendix A for an overview of literature about electricity sector reform in developing countries and the conclusions/outcomes.

¹³ Jamasp (2015, p.8-10) provides an overview of several developing countries and their specific outcomes of sector reform.

commercialization and corporatization of entities within the electricity sector, commitment lending (the World Bank would only lend to countries that implemented these recommendations), and encouraging of private investment (by providing investment guarantees for example) (World Bank, 1993). As electricity sector reform progressed around the world, these measures or key steps were further identified and defined by a variety of authors;

- ‘The standard prescription’ by Hunt (2002)
- ‘The standard model’ or ‘textbook model’ by Littlechild (2006)
- ‘The textbook architecture’ by Joskow (2008)

Roughly, these steps defined by the different authors are similar. Gratwick & Eberhard (2008) formulated the key steps, compiled of work of several authors. These steps will be used in this research and referred to as the standard reform model. Summarized, this model consists of the following elements (Gratwick & Eberhard, 2008, p.3952):

Table 3: The key steps of the standard reform model. Adapted from (Gratwick & Eberhard, 2008; Kapika & Eberhard, 2013).

Milestone	Description
1. Corporatization	Transforming the state owned utility into a separate legal entity (apart from the ministry/government)
2. Commercialization	Cost recovery in terms of pricing, improvements in metering, billing and collection, and optionally adopting internationally recognized accounting practices
3. Requisite legislation	Pass a legal mandate for restructuring, as well as a legal framework to allow private sector participation
4. Independent regulator	The establishment of a regulatory body that aims to introduce efficiency, transparency and fairness in the management of the sector
5. Sector restructuring	Unbundling of the vertically integrated state owned utility (horizontally and/or vertically) into separate generation, distribution and transmission companies in order to prepare for privatization
6. Independent power producers (IPPs)	Securing new private investment in generation, anchored by long-term PPAs
7. Divestiture of generation assets	Divesting state ownership of generations assets to the private sector
8. Divestiture of distribution assets	Divesting state ownership of distribution assets to the private sector
7. Competition	Introduction of wholesale and retail markets.

Bacon (1999) placed emphasis on the sequencing of the steps outlined above. First the state owned utility needs to be corporatized and commercialized after which legislation should be passed allowing for private sector participation. After that, regulation must be implemented followed by the vertical and horizontally unbundling of state owned enterprises. Finally, privatization of the existing assets can take place (Bacon, 1999, p.3). Zhang et al. (2005) studied six years later the effect of the sequencing of electricity sector reforms in developing countries. They concluded that the establishment of an independent regulator and

the introduction of competition (unbundling in this case) before privatization, is correlated with more generation capacity and higher capital utilization.

Over time as the reforms spread out globally, minor variations of the standard reform model have been formulated, by Joskow (2008) for example. These variations focused on the last four steps of the model as outlined in Table 3 and primarily on the creation of wholesale and retail markets (Gratwick & Eberhard, 2008).

The arguments laid out for the standard model have been primarily economic.¹⁴ These arguments have their foundations in standard microeconomic theory which says that restructuring towards more competition will lead to higher efficiency. The resulting surplus can be transferred to consumers and therefore maximize economic welfare (Sen et al., 2016). In practice this has not always been the case, even in developed countries which pioneered the standard model, as will be described further on in this chapter. The standard model was promoted in developing countries by institutions like the World Bank, IFC and the IMF. However, after 25 years since this model has been advocated, it has not been fully realized anywhere in Africa (Kapika & Eberhard, 2013). Instead, different varieties emerged, often referred to as 'hybrid power markets'; a market structure somewhere between the pre-reform structure and retail competition (Correljé & De Vries, 2008; Gratwick & Eberhard, 2008).¹⁵

4.4 Types of restructuring

Several authors and organizations made an attempt to categorize these different varieties that emerged after global efforts to reform electricity sectors. Some classifications are more quantitative (like the EBRD), whilst others are more qualitative (Besant-Jones, 2006; Eberhard & Godinho, 2017; IEA, 2016). It needs to be noted however that precise classification is difficult due to a large number of reform varieties that are possible; the distinction between integration and unbundling is not clear cut in practice (Besant-Jones, 2007). For example:

- Vertical unbundling is possible without horizontal unbundling (but not vice-versa). Horizontal unbundling means the separation of elements in the same level of the value chain. For example, splitting up the national genco or disco, into multiple geographically different gencos or discos (as Egypt did for example, see figure 17). Vertical unbundling therefore means separation of elements in different sections of the value chain. For example, splitting up the vertically integrated utility into separate generation, transmission and distribution entities.
- There can be partially vertical unbundling. For example, privatized generation but full government ownership of the distribution and transmission, or vice versa.
- Vertical unbundling can happen in less 'radical' forms than ownership. For example, legal, management or accounting unbundling. In this case, different state owned organizations operate along the value chain (as is the case in Egypt).

¹⁴ According to Williams & Ghanadan (2006), societal concerns like access, service, social pricing and the environment were not among the priorities for policy makers when implementing the standard reform model.

¹⁵ One could argue that retail competition is also a hybrid power market since in this system private and public ownership co-exist as well. It rarely occurred that there was a complete transfer of the entire value chain to the private sector as happened in the United Kingdom for example (Zhang et al, 2007).

- There can be unbundling of retail supply from distribution, but at the same time re-integration of generation and retail supply for risk management purposes (Besant-Jones, 2007).

Empirical examples of these various restructuring variants can be found in Appendix C. Evaluating every existing or possible restructuring modality is outside the scope of this research. The classification that will be used for this research will be based on the one by Besant-Jones (2006), the IEA (2016) and Eberhard & Godinho (2017). Five different types of restructuring are distinguished and are displayed below in Figure 7.

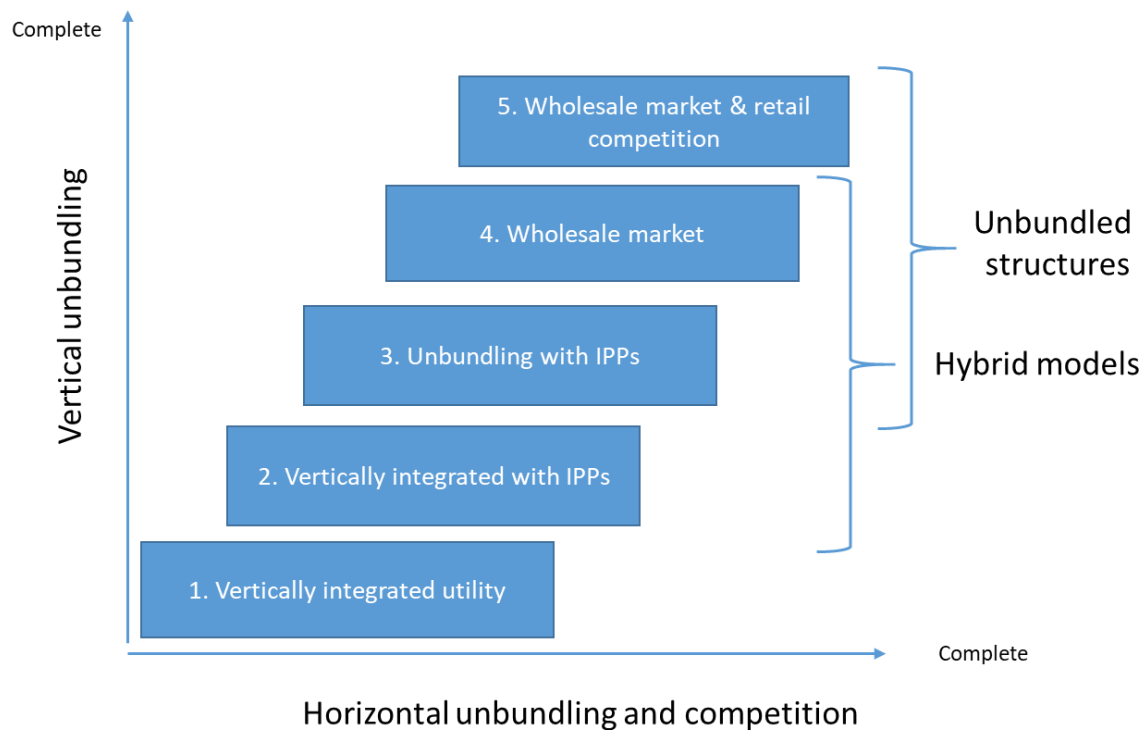


Figure 5: A visualization of the various stages of unbundling. Adapted from Besant-Jones (2007).

4.4.1 Vertically integrated utility

When the utility is vertically integrated, the government owns and operates the entire chain: generation, transmission and distribution. This means that there is no unbundling in any way (accounting, legal or management¹⁶) and that there is no private sector participation in the entire electricity system. Inherently, no consumer has a choice of supplier and often a regulatory agency is non-existent. This structure is also referred to as the 'pre-reform' structure. The initial justifications for having a vertically integrated utility were the high fixed costs and economies of scale involved with electricity production, minimized coordination costs along the value chain, and because electricity was seen as a strategic asset. The disadvantages of this structure, as outlined earlier in this chapter, are inefficiencies, lack of capital for investments in capacity, and a lack of innovation. The vertical integrated utility does not exist anymore in

¹⁶ See paragraph 4.3.3 for an explanation of the types of unbundling.

developed countries but is still present in developing countries (Besant-Jones, 2006, p. 10; Gratwick & Eberhard, 2008, p. 3948; Künneke, 2008, p.234). Benin, Eritrea, Liberia, Malawi and the Gambia are African examples of a fully integrated utility (see Appendix C).

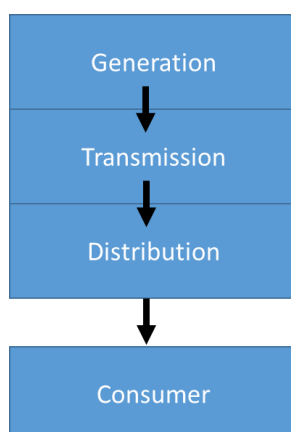


Figure 6: The vertical integrated monopoly without any form of unbundling.

Table 5: Advantages and disadvantages of the vertically integrated utility.

Advantages	Disadvantages
Economies of scale	Inefficiencies
Low coordination costs	Lack of innovation
Means to pursue national economic and social objective	Lack of capital for investments
Natural monopoly can enhance social welfare	

4.4.2 Vertically integrated utility with IPPs

The first step in liberalization can be seen as the introduction of private participation on the generation side (Hunt, 2002). In this case, the government still owns the entire chain but private parties operate on the generation side by means of long-term power purchase agreements (PPAs) with the government. These contracts include 'take-or-pay' quotas or fixed capacity charges in order to protect private investors from possible market or currency risks (Lovei, 2000). This type of restructuring means that independent generators are only allowed to sell to the existing utility (which functions as a 'single-buyer') which on its turn has the monopoly on selling it to the end customers.

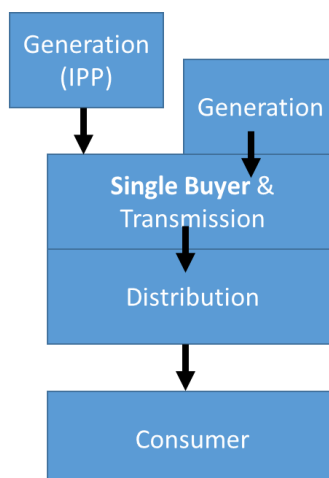


Figure 7: The integrated utility with IPPs, who sell to the utility (single-buyer) by means of bilateral contracts.

The prices in the PPA are regulated, and often determined by an auction: the generator that can offer the lowest price will get the long term contract, usually after approval of the regulator. These negotiated prices are subsequently passed on to the consumer. This structure means that the risks involved with electricity production (technology risks, market risks, currency risks, etc.) are transferred from the generator to the utility and therefore eventually the customer. Breaches of contract occur rarely, so this structure is relatively safe from an investors point of view (Hunt, 2002; De Vries, 2018). Also from a government point of view this structure has its advantages. For example, the flow of electricity follows the laws of physics with no regard for contractual arrangements. This is often problematic in markets with multiple buyers and sellers. Organizing this third-party access can be complex and demanding from a regulatory point of view (Lovei, 2000). In other words, because of these low transaction costs as compared to a wholesale market for example, this model can be useful in countries with insufficient institutional capacity, i.e. developing countries.

However, the features of an integrated utility with IPPs also has its disadvantages. It is, especially in a developing context, susceptible for corruption (or lobbying from interest groups) since the government sets the price and sometimes does not have the knowledge to set the right one (De Vries, 2018; Hunt, 2002). Additionally, these government officials do not have to bear the financial consequences of their decisions. Hungary, Indonesia and Thailand are examples of countries where officials found the lobbying of interest groups hard to resist, i.e. there was an upward bias towards IPPs since these investors found government assurances attractive (Lovei, 2000). This is defined by Spiller (2013) as 'third party opportunism'. Another downside of the Single Buyer system from the government's perspective, is that the state (and eventually the consumer) bears all the risk for potential oil prices increases or currency devaluation. This happened in 2002 in Egypt when devaluation of the pound occurred and the government just started with an IPP program by means of PPAs. Because of the devaluation of the Egyptian Pound and the long term contracts the government signed with IPPs in dollars (on the backdrop of already a lack of foreign currency), the Egyptian government decided to alter the IPP program which made it unattractive for new private generators (El-Salmawy, 2017). After that, the IPP program stalled.

Table 6: Selection of the advantages, disadvantages and pre-conditions for a vertically integrated monopoly with IPPs.

Advantages	Disadvantages	Pre-conditions
No third party access so less coordination costs	Prone to corruption, especially in developing countries	Basic favorable investment climate
A key role for the Ministry in decisions on investments in capacity, and for the state owned electricity company as well. Is therefore favored by these actors.	Investment decisions are made by government officials with a lack of knowledge and do not have to bear financial consequences of decisions	Competent and integer government officials within the power purchasing authority
Shields investors from investment risks (if PPA contracts are honored)	The state bears all the risks for higher fuel prices or local currency devaluation	

4.4.3 Unbundling with IPPs

In this third structure, unbundling means the disintegration of the vertically integrated utility. Unbundling can happen in several ways. The EU distinguishes four main types of unbundling (Van Koten & Ortmann, 2007):

1. Accounting unbundling: the least drastic form which means that separate accounts must be kept for generation and transmission/distribution activities to prevent cross-subsidies.
2. Management unbundling: next to separate accounts there needs to be a separation between the operational and management for the transmission and generation activities.
3. Legal unbundling: the transmission and generation activities must be put in separate legal entities. This is the current state of unbundling in Egypt; there is government ownership along the entire value chain (with the exception of some generation units), but they function as separate organizations since the enactment of Law 168 in 2000.
4. Ownership unbundling: the most drastic form of unbundling which means that generation, transmission and distribution activities are done by independent entities who are not allowed to hold shares in each other activities. This type can only work with a wholesale market and is therefore not applicable on this specific restructuring modality. The 2015 Electricity Law in Egypt paved the way to eventually realize ownership unbundling.

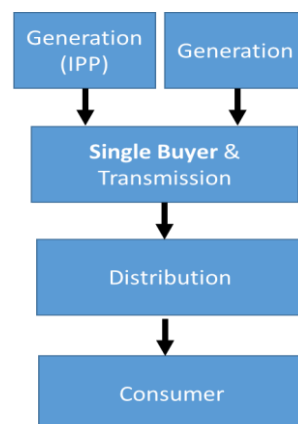


Figure 8: The unbundled situation with IPPs. The entire value chain is still owned by the government but unbundled by means of accounting, management or legally.

The types 1,2 and 3 are done by the government with the aim to eventually turn over the distribution and transmission activities to the private sector (while often keeping the strategically important transmission activities in state hands) (Lovei, 2000). In these cases, the transmission company is still the single buyer until decided to create a wholesale market. As can be seen in Appendix C, the first three types of unbundling, or vertical disintegration, can happen in various ways. For example, in Ethiopia and Sierra Leone generation and transmission are still part of the utility, while distribution is a separate legal entity but still government owned. In Lesotho, the generation part is legally unbundled while transmission and distribution are still integrated (Eberhard & Godinho, 2016).

Accounting, management, or legal unbundling has several advantages. First it decreases the conflict of interest between different parts of the value chain. If properly regulated, it is easier to improve the different parts by means of regulatory benchmarking. It can also increase the transparency in (operating) costs which is needed for the earlier mentioned operating improvements, as well for potential private investors in the future.¹⁷ Additionally, there is no need for an overriding business and management model for 4 fundamentally different activities (generation, transmission, distribution) within one integrated company (Besant-Jones, 2007). Disadvantages of this model is that the shortcomings mentioned in the previous discussed models related to full government ownership remains. Also, there are costs involved in achieving this. Mulder (2000) mentions three types; one-off transaction costs directly related to the implementation. Second, costs of changing legislation by the public authorities. And third, there is a loss of economies of scope as activities within the different parts of the value chains are closely linked to each other.

Table 7: Selection of the advantages, disadvantages and pre-conditions for unbundling with IPPs.

Advantages	Disadvantages	Pre-conditions
Can increase transparency in costs and therefore easier to improve by regulatory benchmarking	Still incentives to hinder third party access (as is the case with Egypt)	Basic regulatory oversight
No need for an overriding business and management model for 4 fundamentally different activities (generation, transmission, distribution) within one integrated company.	Still almost a full government ownership of the value chain (similar arguments as the integrated monopoly)	
Easier and cheaper to realize as compared to full ownership unbundling	Increased coordination/transaction costs for the governments (loss of economies of scale).	

4.4.4 Wholesale market

The fourth liberalization step distinguished in this research is the creation of a wholesale market. In this structure the generation side is fully competitive. Distribution companies and the large eligible customers purchase the produced electricity from the generators via the wholesale market. On this market, private generations can compete against each other by means of selling power through a power exchange. In this exchange, private generators bid the quantity of electricity they want to sell for a certain price at a pre-

¹⁷ Regulatory capabilities is needed to achieve this. See the example mentioned in the Preface where books of state-owned generators had been cooked, which investors found out after they bought them.

determined dispatch interval. A merit order is created which is an order in price from the lowest to the highest. The market-clearing price (for a certain area) becomes the price of the most expensive dispatched generator.

In this structure there is competition on the generation side, where according to Hunt (2002) the most benefits are; it has many buyers and it avoids transactions costs involved with providing retail access for all customers (consumer-oriented billing, settlement, information infrastructure, etc.). This model, where large customers can buy directly from generators but small/franchise customers still buy from the distribution company, was the first step of the electricity sector restructuring in the United Kingdom in 1990 (Hunt, 2002).

The wholesale market also has its disadvantages which lay mainly in the added complexity. In contrast to the vertically integrated monopoly, there is no control by the government on the generation units. An independent system operator (ISO or TSO) is needed who has the full overview of generation and consumption and can therefore manage the security of the electricity system in a sense that there are no supply interruptions or frequency fluctuations. This is a complex task and can only be attained by establishing an extensive set of rules and regulations regarding how generators, traders and consumers interact within the electricity sector (IEA, 2005).¹⁸ Also its independence is crucial; it should for example not favor state owned plants over private owned ones. The European Market Directive calls this regulated third party access.

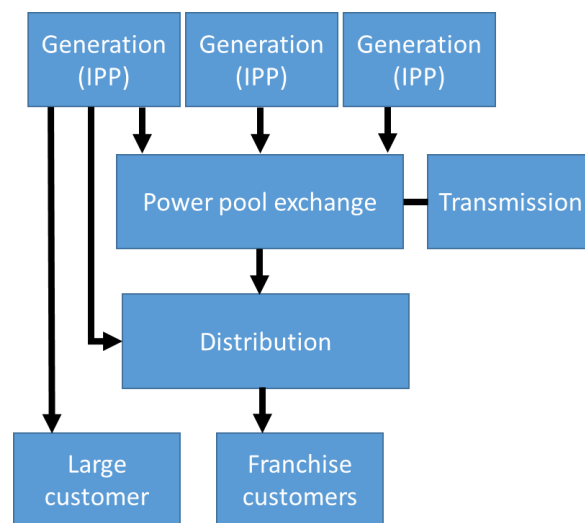


Figure 9: The wholesale market model. A fully competitive generation side sells on the wholesale market (power pool exchange) and distribution companies deliver to the customers on which they have a monopoly. Some large consumers are eligible for bilateral contracts with an IPP directly.

The major problem according to Hunt (2002) with the wholesale competition model are the contracting arrangements with the distribution companies ('Discos'). The discos buy directly from the generators and have a monopoly on the final customers. It could sell the power directly to the customers for the same price it was bought on the wholesale market, but this is not optimal since prices can fluctuate and small

¹⁸ These rules and regulations should also be applied and enforced; often a challenge in developing countries.

customers do not have the freedom to choose another supplier. Additionally, complex regulatory arrangements are needed to make sure that the distributor has the incentive to purchase electricity at the lowest possible costs. Again, the Disco is not a final customer but buys on behalf of the end consumer (with the exception of large consumers who have bilateral contracts with generators). These difficulties can be an argument to go to the second (and empirically last) step of liberalization; retail competition. Because in this model, the final customer gets to decide from which provider it will purchase electricity, not the distribution company. Distribution companies do not have to provide tariff services so complex regulations about how the contracting should look like is not needed (Hunt, 2002).

Table 8: Selection of the advantages, disadvantages and pre-conditions for a wholesale market.

Advantages	Disadvantages	Pre-conditions
Competition on the generation side where the most benefits are	High transaction and regulatory costs	A good investment climate that can facilitate the many investor and producers needed for a competitive market
Less prone to corruption as compared to the single-buyer model	Complex contractual arrangements needed for discos	Strong regulatory capacity
	Discos still have a monopoly over consumers	Development of spot-market
	Developing spot market is complex and expensive (even in developed countries)	Sufficient capacity on transmission network
		Cost reflective tariffs

4.4.5 Wholesale market with retail competition

In the fifth model, customers can choose their own supplier (usually a retailer) or generator. Retail competition can be seen as the most extensive variation of liberalization and has up till today not been implemented in developing countries. Just like in the previous model, private generators sell their produced electricity on the wholesale market, but the discos do not have a monopoly on selling it to the end users, instead customers can choose their own supplier. This model with many buyers and sellers puts pressure on the generators to produce for the lowest price and on retailers to come up with innovative contracts. Just as in the previous model there is a competitive wholesale market, but in this case it also requires additional physical (meter reading, billing, information transfer) and non-physical (no switching barriers, a transparent spot price) additions. It also requires according to Hunt (2002) the education of millions of customers about what a retail market entails.

A retail market can only be competitive if there are clear and enforceable rules, regulations and procedures. For example, when spot prices are high, it might be more profitable for a retail company to sell the purchased power back to the market, instead of delivering it to the customer. Contractual arrangements need to be made that protect the consumer from such practices. Likewise, the transmission and distribution companies should provide equal access (same quality of delivery services) regardless of the customer's choice of supplier, it should not use its monopoly position to subsidize its competitive activities and not provide information about customers to its retailing subsidiary which can give it an unfair competitive advantage (Hunt, 2002).

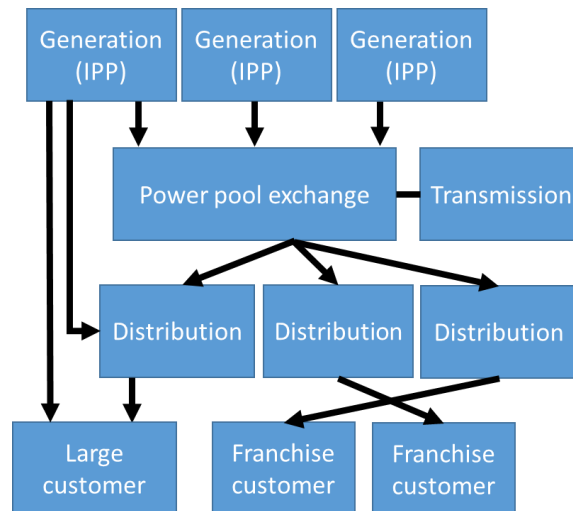


Figure 10: The wholesale market with retail competition. The model in which both types of consumers can choose their supplier.

Concluding it can be said that retail competition can in theory be a solution to all the disadvantages of the earlier described models. However, complex regulatory, institutional and infrastructural arrangements have to be made to facilitate the implementation of retail competition. Additionally, there should be many producers and consumers in order to create a competitive market. The question then remains if these pre-conditions can be met in countries with a weak institutional environment and a lack of private sector participation.

Table 9: Selection of the advantages, disadvantages and pre-conditions for a wholesale market with retail competition.

Advantages	Disadvantages	Pre-conditions
Many retailers and discos pressures generators for low prices	Complex regulatory and infrastructural arrangements	Educating customers (demand side response)
Risk does not solely lie at the government or consumer side.	Risks of 'gaming' of the system (as happened during the California electricity crisis)	A good investment climate that can facilitate the many investor and producers needed for a competitive market
		No or limited switching barriers
		Metering equipment and timely billing

4.4.6 Considerations for determining a suitable type of restructuring

After assessing the 5 types of restructuring modalities it can be concluded that every type has its

advantages, disadvantages and also its pre-conditions. Regarding the pre-conditions, literature about different restructuring modalities mention those implicitly. There is however not an overview that shows what type of pre-conditions are needed for which type of restructuring (De Vries, 2018). An attempt has been made to make one, which resulted in a flow chart as can be seen in figure 13. This 'restructuring

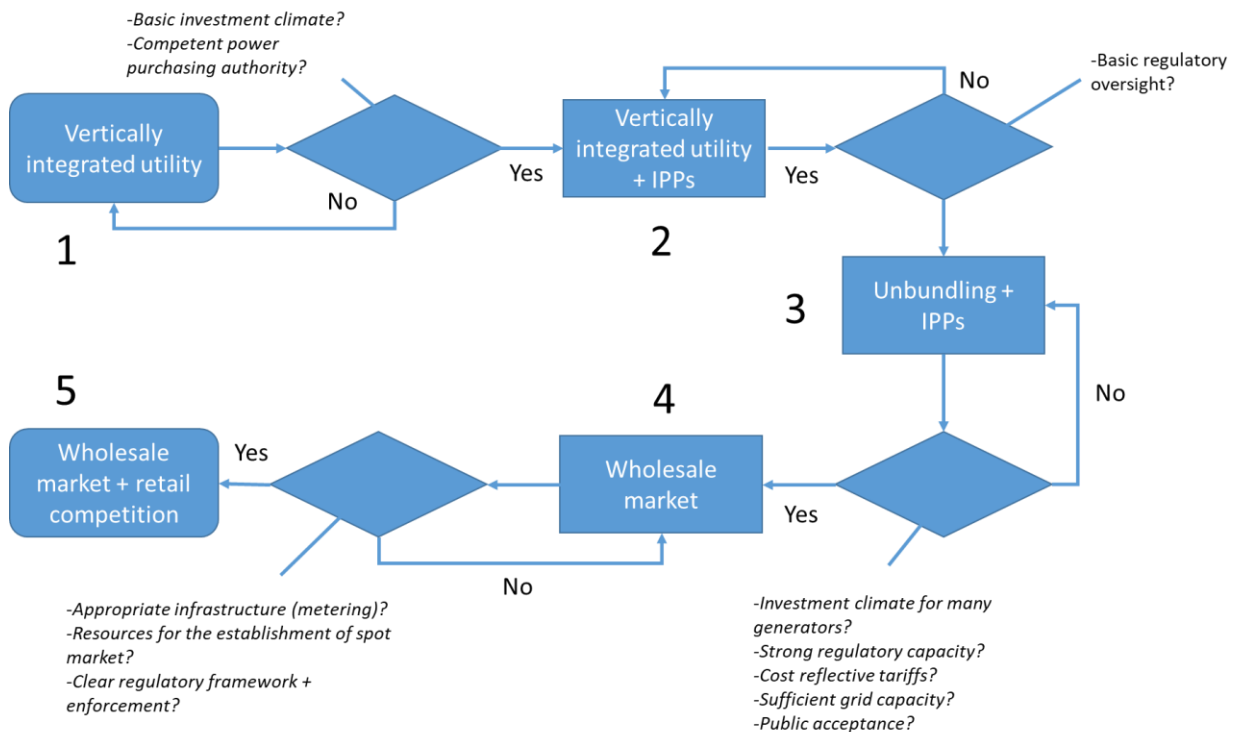


Figure 11: The 'restructuring flow chart'

flow chart' can help in determining quickly which modality is suited when. Obviously, as a 'rule of thumb'; this flow chart remains very generalized. As described earlier, there are many different modalities possible and delineating every technical or institutional pre-condition is almost impossible. Additionally, you can argue that strong regulatory capabilities is needed in every structure. The assumption however has been made that strong regulator capacity is needed in a competitive market with many (private) players. The literature emphasizes on this capacity strongly when talking about a wholesale market (with retail competition).

Regarding the advantages and disadvantages, assume that there is a 'competition spectrum', as shown in

Figure 12: The 'competition spectrum'

14. One side has the least degree of competition, namely the vertically integrated utility. The other side has (empirically) the highest degree of competition, the wholesale market with retail competition. Or in other words, the pre-reform structure versus the fully implemented standard reform model.

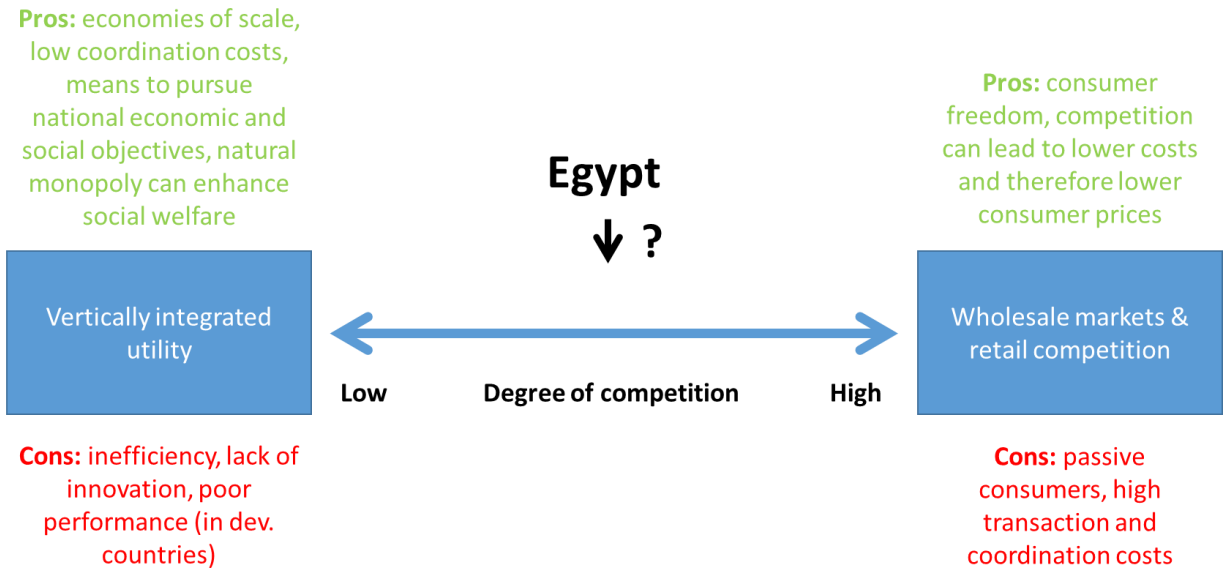


Figure 12: The 'competition spectrum'

The question then remains what the optimal balance is between state and private sector involvement since apparently both ends of this spectrum have its shortcomings and its advantages. The status quo in most developing countries, the vertically integrated utility, is not performing optimally which was the reason for countries around the world to start restructuring in the first place. The other side of the spectrum has its theoretical benefits, but only if certain institutional pre-conditions are met. The IEA states the following:

Active legislation, regulation and market design, established collaboratively by governments, independent regulators and independent system operators, play critical roles in the development of liberalized and competitive markets. Liberalization requires the necessary legal framework and a targeted process, launched by active government decisions. The intentions of government, as expressed in the legislation, then need to be implemented in a way that stakeholders can both predict and challenge. This requires a regulatory body that is independent of government (IEA, 2005, p.57-58)

Most of these by the IEA mentioned pre-conditions for the successful development of a competitive electricity market, are not present in developing countries. Table 10 below shows this clearly. This implies that difficult trade-offs and considerations have to be made before determining a suitable restructuring modality. Part of these considerations are learning from liberalization outcomes around the world (paragraph 4.4) and a focus on the context in which the restructuring has to take place (paragraph 4.5).

Table 10: The difference in institutional settings between developed and developing countries. Source: Parker & Kirkpatrick (2005, p.527)

Commonly found features of:

Developed countries	Developing countries
Competitive product markets	Imperfect competitive and incomplete markets
Organized and competitive labor markets	Regionalized and sometimes ethnically distinct labor markets, with appointments through connections
Competitive capital markets	Underdeveloped capital markets
Competitive managerial labor markets; institutionalized management training	Management weaknesses and patronage in appointments
Protected and well-defined private property rights; understood standards of business conduct	Poorly protected private property rights; underdeveloped business codes of behavior
Usually relatively high standards of probity in public administration	Relatively low standards of probity in public administration in a number of countries, including cronyism and corruption.

4.5 Outcomes and lessons learned

Up to this point, liberalization has been addressed as in a ‘theoretical vacuum’. From now on we will look at the institutional environment within liberalization takes place which influences it. The emergence of different restructuring modalities around the world, although roughly following the same (‘standard’) model, implies that the outcomes were not straight forward. Especially in developing countries. A wide selection of scientific literature has been used to grasp the outcomes and lessons learned of electricity sector reform in developing countries.

4.5.1 Selection of literature

Several electronic databases (Scopus, Science Direct, Francis-Taylor, IEEE Xplore) have been used to get the literature relevant for this research. Since a general framework will be created to assess a suitable restructuring modality for electricity sector reforms in developing countries, the following search string has been created to search for relevant articles in Scopus:

Keywords: ((electricity OR power OR energy) AND (institutional OR institutions OR governance OR policy) AND (reform OR privatization OR unbundling) AND (developing countries OR non-OECD countries))

For this part of the research, specific case studies were excluded. The selected articles describe the reforms from a broad, aggregated perspective and do not focus on one specific country or aspect (regulation, technology, politics etc.). The articles often describe reforms in developing countries in general, in various regions around the world. Also, the results have been filtered on the year of writing. ‘Reform’ is a broad term and can entail many institutional changes in an electricity sector; both minor and major ones. Significant reforms, i.e. liberalization, occurred in developing countries in the late 1990s. Literature has been chosen that wrote about those market-oriented reforms. An overview of the selected articles can be seen in table 11.

4.5.2 Outcomes and lessons learned: what the literature says

Since the early 2000s, a variety of literature has been published regarding this topic and several reasons have been provided for the undesired outcome of electricity sector reforms in developing countries (see table 5 for an overview of a selection of articles). A non-exhaustive selection of the major reasons for these undesired outcomes:

- Kessides (2012) concluded that the standard reform model that consists of privatization, vertical and horizontal unbundling, and the introduction of performance-based regulatory mechanisms, can have a positive outcome on the performance of an electricity system. However, it is emphasized that *“There is a logical sequence of reforms, and it is costly to undertake reforms in the wrong order-ideally, the reforming country should first raise prices to cost-recovering levels, then create regulatory institutions and restructure the sector, and only after that privatize (p.87).* Similarly, Grindle (2007) argues for a prioritization and sequencing of policy interventions in general; not all government/institutional reforms can be addressed and implemented at the same time.
- Stern (2001) researched unbundling of utility industries in developing countries (mainly in Latin America) and concluded that the success was very much depended on the presence of effective autonomous regulatory agencies.¹⁹ In other words, electricity sector reforms should take place in wider institutional reforms in order to be effective. Similarly, Parker & Kirkpatrick (2005) concluded that privatization (or unbundling in this case) can only improve performance over the longer term if it is complemented by policies that promote competition and regulatory capacity.
- Wamukonya (2003) and Tankha (2009) concluded similar to the earlier mentioned studies that donor organizations failed in appropriately executing electricity sector reform by focusing too much and too soon on privatization, although there was not yet enough regulatory capacity in the public sector.
- Nepal & Jamasb (2012, p. 1675) mentioned that *“the success of power sector reforms in developing countries largely depend on the extent to which they synchronize inter-sector reforms in the economy.”* In other words, electricity sector reform policies alone are not enough to establish the desired outcome of a liberalized electricity sector.
- Perhaps one of the most mentioned reasons for undesired reform outcomes is that a failed ‘one-size fits all’ approach of the standard model has been applied. There is now a broad consensus in the literature that reform efforts can only be successful if national economic, political, social and cultural contextualities are duly considered (Eberhard & Godinho, 2017).

Table 5 provides a non-exhaustive and non-mutually exclusive list of reasons for undesired outcomes, as stipulated by a variety of authors. These reasons are labeled as either ‘political’, ‘institutional’, ‘economic’, ‘financial’ and ‘social’. This classification will be used for the criteria in chapter 5. Information out of the literature will be combined with insights gained out of the expert interviews to get a comprehensive set of criteria that will be used to assess the case of Egypt.

¹⁹ In developing countries, many regulatory bodies face significant human resource constraints which has a negative effect on the effectiveness of electricity sector reform policies (Pollitt & stern, 2001).

Table 11: Overview of reasons for undesired outcomes of electricity sector reforms in developing countries.

Reasons for undesired outcomes:	Author(s):	Classification:
Needs to be part of broader institutional reform	Nepal & Jamasb (2012), Kessides (2012), Stern (2001), Jamasb (2006), Williams & Ghanadan (2006), Wamukonya (2003), Karekezi & Kimani (2002), Nagayama (2007), Bhattacharyya (2007)	Institutional
Failed one-size-fits-all approach	Nepal & Jamasb (2012), Williams & Ghanadan (2006), Tankha (2009)	Institutional
Poor sequencing of policy/reform interventions	Kessides (2012), Jamasb (2006), Tankha (2009), Nagayama (2007)	Institutional/ Political
Public opposition	Kessides (2012), Jamasb (2006), Williams & Ghanadan (2006)	Social
No focus on long term prosperity/low access rates among the poorest	Kessides (2012), Wamukonya (2003), Tankha (2009), Karekezi & Kimani (2002), Nagayama (2007)	Social
No regulatory capacity/lack of skilled human resources	Kessides (2012), Stern (2001), Jamasb (2006), Williams & Ghanadan (2006), Wamukonya (2003),	Institutional
Bad pricing mechanisms	Jamasb (2006), Williams & Ghanadan (2006), Tankha (2009), Nagayama (2007), Sen (2014)	Economic/ Financial
Pressure from external donors/agencies	Wamukonya (2003), Williams & Ghanadan (2006)	Political
Political instability	Bhattacharyya (2007)	Political

This selection of reasons confirms what has been a ‘leitmotif’ in this research so far; contextual factors determine the outcome, and therefore success, of any electricity sector reform effort.

4.6 Reforms & context specificity: the use of a Political Economic Analysis

In order to grasp the context in which Egypt's electricity sector are taking place, a Political Economic Analysis will be conducted.²⁰ Political Economy (PE) combines two disciplines; political science and economics, and specifically the interactions between these two.²¹ Where political science primary deals with the distribution of power, economics deals with the distribution of resources.²² There is no common agreed upon conceptual framework or definition for a PE approach. But the UK's Department for International Development (DFID) stated in an often cited article that PE is the understanding of (DFID, 2009, p.4);

- The interests and incentives facing different groups in society (and in particular political elites), and how these groups generate policy outcomes
- The role that formal institutions (rule of law, elections, etc.) and informal social, political and cultural norms play in shaping human interaction and political and economic competition
- The impact of values and ideas, including political ideologies, religion and cultural beliefs, on political behavior and public policy.

This particular conceptualization of Political Economy is closely linked with the upper two layers of Williamson's four layer model in which both the formal and informal institutions are described, as well as the governance.

Within the development and donor community, there has been a focus on PE since the 1990s. Before that (1970s and 1980s), development and donor agencies tried to sidestep politics as much as possible because it was a) entangled with international relations (during the height of the Cold War) and b) politics of recipient countries were seen as incompatible with the needs of the public (Fritz et al., 2014). Additionally, neoclassic economics at that time was seen as a constraint on political decision making by for example independent regulation and "getting the price right". This approach has its merits but often it turned out that technical constraints on politics was not sufficient (Fritz et al., 2014).

The World Bank is one of the major development agencies that incorporated a PE approach, especially for policy reform operations:

²⁰ Poole (2011, p.10) stated the a recent 'wave' of Political Economic Analysis (PEA) points to an evolution in thinking about context.

²¹ The term political economy is derived from the Greek word *polis* ("city" or "state") and *oikonomis* ("one who manages a household or estate"). PE can therefore be seen as the study of how a state is managed, from both an economic and political perspective (Encyclopedia Britannica, n.d.)

²² Although the academic discipline is relatively new, the concept of combining a political and economic approach can be traced back to Plato and Aristotle and some argue that the first work providing a comprehensive PE system was the famous work of Adam Smith in 1776: *An Inquiry into the Nature and Causes of the Wealth of Nations*. This holistic approach on studying societal phenomena was continued by among others Karl Marx and Friedrich List until the beginning of the 20th century when there became more focus on the two individual disciplines (economics on the one hand, and political science/international relations on the other). Since the second half of the 20th century until today, there became a renewed interest in the PE approach since it was perceived that complex national and international problems required a broader approach (Encyclopedia Britannica, n.d.). Electricity sector reform in Egypt qualifies in the author's opinion as such a 'complex national' challenge.

“A political economy lens can help us to better understand the dynamics of policy reform processes. Stakeholders’ interests and the power relations between social actors obviously influence their support or opposition to the reform. The sequencing and timing of actions associated with policy reforms can also determine the level of tension and conflict, the duration, and ultimately the success or failure of reforms.” (World Bank, 2009, p.2).

There is also considerable research literature that started to think about the PE of electricity sector reform and development in low- and middle- income countries (Barnett, 2014). Recent examples are the earlier mentioned research done by Eberhard & Godinho (2017) and Erdogdu (2014) who analyzed the PE of electricity market liberalization.

The concept of PE is not narrowly defined; there are plenty of components ranging from history to geopolitics, and from natural resources to legislative system that can be justified to include in a PEA. It is possible to write a book about the PE of Egypt, which has also been done by several authors. It is outside the scope however of this research to research every aspect of Egypt’s PE in depth. Instead, a selection is made of components relevant for this research. Eberhard & Godinho (2017, p.29-30) proposed, based on work by Edelman (2009) and Hudson & Leftwich (2014), the following components of a PEA for analyzing electricity sector reform:

- National structural characteristics (i.a. state formation, history, macro-economic structure)
- Political and economic institutions (i.a. regime, distribution of power and resources, capacity and capability)
- Sector analysis (i.a. historical evolution of the sector, relevant institutions & policies, stakeholder analysis)
- Policy/reform process (policy making and implementation processes, incentive and capacities of actors, past policy process timelines and experiences)
- Situational/temporary factors (i.a. ‘focusing events’ like crises or regime transition, external actors/donor agencies, stability/volatility across the PE system).

The first two components will be incorporated in the PEA directly. The sector analysis will be done separately in chapter 6.1 which also includes the reform process. Situational factors (including the IMF reform program and the revolutions in 2011 and 2013) are mentioned throughout the PEA and where needed elaborated on in the application of the criteria.

4.7 Intermediate conclusion

The standard reform model for electricity sector reform, with a wholesale market and retail competition as end goal, has been advocated by IFIs and development agencies in developing countries, but after 25 years has not been fully realized anywhere in Africa. Instead, hybrid structures emerged, as outlined in paragraph 4.3. Each with its advantages, disadvantages and pre-conditions. Since the literature emphasizes on the lack of considering contextualities when implementing reforms, an extensive contextual analysis will be done for the case of Egypt. A PEA is an appropriate way to analyze this context, which will function as input for the recommendation for a suitable restructuring modality for Egypt.

5. Formulation of criteria

SQ2: How can these experiences in other developing countries be translated into general criteria to determine the most suitable restructuring modality?

- a) Which criteria can be formulated to determine a suitable restructuring modality?
- b) How can these criteria be operationalized?

Despite the vast amount of literature that has been written about electricity sector reform in both developed and developing countries, there is not yet an overview of criteria or pre-conditions that are required for which type of restructuring modality. Since the aim of this research is to define the most suitable modality for Egypt's electricity sector with a strong focus on the context, such an overview can be useful. Therefore an attempt has been made to define criteria for the successful functioning of one of the five earlier mentioned types of restructuring. The list of criteria has been composed by using liberalization theories and literature as used in paragraph 4.1 t/m 4.2, literature on the outcomes (the application of liberalization) of electricity sector reforms in developing countries as used in paragraph 4.4), combined insights out of the interviews with experts and stakeholders (see Appendix B).

These criteria can be divided into institutional, economic & financial, political, technical and social categories. It needs to be noted that not all these criteria and categories are mutually exclusive; one can argue that politics is part of an institutional setting, and several criteria could be placed under different categories.²³ The literature that has been written on electricity sector reforms in developing countries however, often mentions these criteria explicitly and separately, as is also shown in table 12 below. Still, in order to provide a clear overview, several choices had to be made which resulted in the classification as seen below in Figure 15.

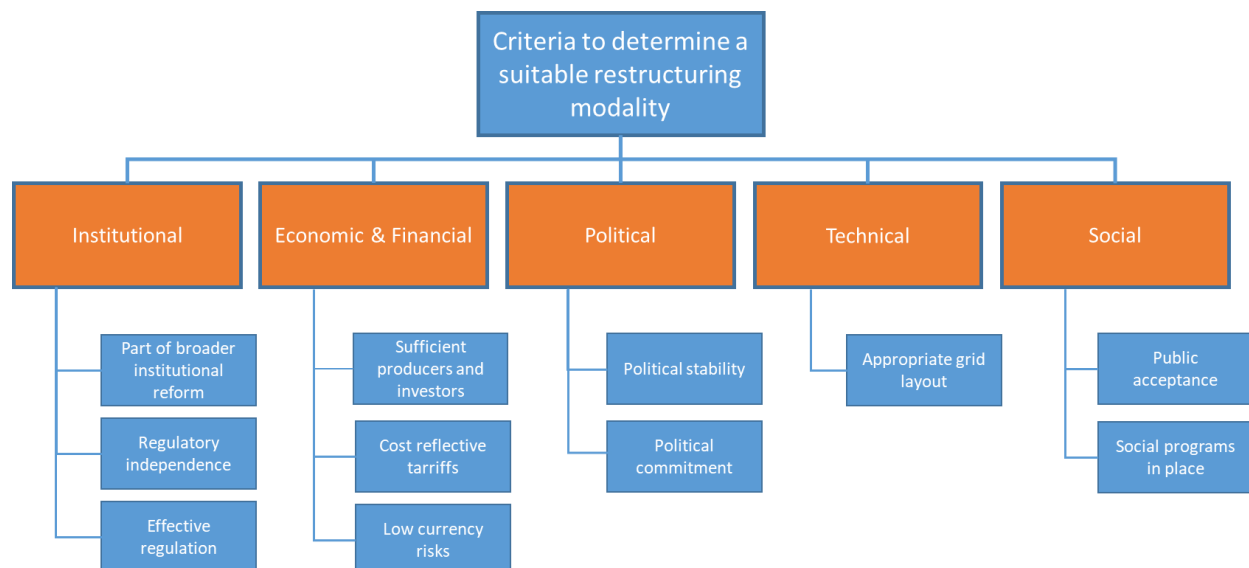


Figure 13: Schematic overview of the chosen criteria, divided under five different categories.

²³ See also the discussion and reflection in chapter 9.

Table 12: Overview of the criteria, the way of operationalization and measurement.

Classification	Criterion	Mentioned by a.o.:	Operationalization	Measurement
Institutional	Part of broader reform	Nepal & Jamasb (2012), Kessides (2012), Stern (2001), Jamasb (2006), Williams & Ghanadan (2006), Wamukonya (2003), Karekezi & Kimani (2002), Nagayama (2007), Bhattacharyya (2007)	Other institutional reforms present?	Yes/no
	Regulatory independence	Kessides (2012), Stern (2001), Jamasb (2006), Williams & Ghanadan (2006), Wamukonya (2003), Kapika & Eberhard (2013)	Decision making independence?	Yes/partly/no
			Financial independence?	Yes/partly/no
	Effective regulation		Transparency?	Yes/partly/no
	Accountability?		Yes/partly/no	
	Predictable and proportional?		Yes/partly/no	
Economic & Financial	Sufficient producers and investors	Sen et al. (2016), Erdogdu (2014)	Investment climate?	Poor/medium/good
	Cost reflective pricing	Jamasb (2006), Williams & Ghanadan (2006), Tankha (2009), Nagayama (2007), Sen (2014)	Cost reflective pricing?	Yes/no
	Low currency risks	Tankha (2018), Scheepens (2018)	Currency Risk	Low/medium/high
Political	Political stability	Bhattacharyya (2007)	Political stability	Stable/semi-stable/unstable
	Political commitment	Tankha (2018), Andrews (2013), GSDRC (2015)	Political commitment?	Yes/partly/no
Technical	Appropriate grid layout	Anonymous 14 (2018), Anonymous 8 (2018), Scheepens (2018)	Sufficiently widespread grid layout?	Yes/semi/no
			Capacity and quality of transmission and distribution grid?	Poor/medium/good
Social	Public acceptance	Kessides (2012), Jamasb (2006), Williams & Ghanadan (2006)	Public perception towards reform?	Positive/neutral/negative
	Social programs in place	Besant-Jones (2006), De Vries (2018)	Social programs in place?	Yes/partly/no

Operationalization and validation

These criteria are all qualitative, which means it is not straight forward to attach a certain numerical value to it. Political commitment is a criterion that is difficult to measure as compared to, for example, the amount of installed generation capacity in Megawatts. Hence, several assumptions had to be made regarding the operationalization of the criteria. These assumptions are based on literature but also on insights retrieved out of the interviews with stakeholders. They are also up for discussion, as will be done in chapter 9. Often the way of measurement will be by validating the operationalization of a certain criterion with 'yes', 'partly' or 'semi', or 'no'. Due to the qualitative nature of this research and therefore also the data (in the form of interviews) it is not possible to rate certain criteria on a scale (e.g. from 1 to 10). This would imply a degree of detailed, quantifiable measurement which is in this research not the case. The set of criteria have been validated by the following experts (see also the list of interviewees in table 12 and appendix B):

- Dr. ir. Laurens de Vries (Delft University of Technology)
- Dr. Sunil Tankha (International Institute of Social Studies)
- Prof. Dr. Hafez El-Salmawy (Zigazag University)
- Dr. Khaled Anonymous 14 (African Development Bank)

Some of the chosen criteria (for example the appropriate grid layout) were not explicitly mentioned in the literature about electricity sector reform in developing countries. However, some of the above academic experts, as well as stakeholders, mentioned this a barrier for private investments and therefore liberalization. Table 12 above gives an overview of the criteria with their way of operationalization and measurement.

5.1 Institutional

5.1.1 Part of broader institutional reform

Several authors emphasized on the necessity of broader institutional reform when one wants to achieve successful electricity sector reforms in developing countries. In other words, liberalizing of an electricity alone is not sufficient for a desired outcome. Nepal & Jamasb (2012) concluded:

"[...]the message from our study is that only those countries that have been able to harmonize reforms across sectors (i.e. harmonizing power reforms with other institutional reforms) or are in the process of doing so have gained significantly in terms of power sector and broader macroeconomic reform outcomes."(p.1682).

Institutional reform entails a broad range of activities and sectors. Nepal & Jamasb's conclusion makes sense considering how interlinked the electricity sector is with other sectors and institutions. Similarly, Parker & Kirkpatrick (2005) concluded that privatization (or unbundling in this case) in developing countries can only improve performance over the longer term if it is complemented by policies that promote competition and regulatory capacity. The authors who mentioned this, did not specify which type of additional reform programs are needed, except for other pre-conditions (like regulatory capacity and competition as Parker & Kirkpatrick did) that will be included as well in the list of criteria.

5.1.1.1 Operationalization

This criterion will be operationalized by analyzing the presence of other institutional reform programs that are not directly related to, but do have an influence on the reform of the electricity sector. Additionally, the more quantitative EBRD 'transition indicators' will be used to assess the reform progress in Egypt in other sectors. The indicators reflect the judgement of the office of the EBRD's Chief Economist Office on how a country is progressing in different types of reform. Progress is measured against the standards of industrialized market economies, while recognizing that there is neither a "pure" market economy nor a unique end-point for transition (EBRD, 2018). Progress is measured by using a scale from 1 to 4+. A one represent no or little change from a rigid centrally planned economy and 4+ represents the standards of an industrialized market economy (EBRD, 2018). The transition indicators are classified as follows:

1. Large scale privatization
2. Small scale privatization
3. Governance and enterprise restructuring
4. Price liberalization
5. Trade and foreign exchange system
6. Competition policy

For this research, the criterion 'broader reforms present?' is operationalized booleanly for two reasons. First, the literature is not specific enough on how to measure this. Second, the effectiveness of this potential broader reform program is also relevant but difficult to assess and predict.

Measurement: [Broader reforms present? yes/partly/no]

5.1.2 Regulatory independence

Regulatory independence is crucial for a well-functioning liberalized electricity sector as several case studies concluded (Jamasp et al., 2015). The Mediterranean Energy regulators (MedReg) considers full independence of the regulator from political and industrial interests the most important regulatory principle;

"Independence from national and regional government and from the industry guarantees regulatory stability and neutrality and avoids situations in which the decisions of the regulator are constantly modified or taken under influence" (MedReg, 2014, p.4).

In order to ensure regulatory independence, among others fixed term limits should be established for members of the regulatory agencies, there should be financial and management independence, and a regulator should have the autonomy to determine remuneration levels (Kapika & Eberhard, 2013). In other words, there should be a minimum of political influence. Spiller (2013, p.234) formulated this as 'governmental opportunism'; the government's ability to change the rules of the game in their own interest by using the standard ways of governmental powers. This can happen by 'hard' laws or decrees, but also in a more subtle way via administrative processes (Spiller, 2013).

In the case of Argentina's electricity reforms, the regulator was subjected to political influence. In particular during the approval process of transmission upgrades, which unnecessarily increased the

uncertainty of the regulated revenue of network companies (Pollitt, 2008). Additionally, in many African countries, the pressure felt by authorities to increase capacity (mostly with support from the public), puts pressure on regulators and are therefore often left with no option but to ‘rubber-stamp’ any project (Kapika & Eberhard, 2013). These examples show that there are ample ways to limit or even prevent regulatory independence by governmental opportunism. It can be concluded that plenty of authors stressed the importance of regulatory independence. However, the establishment of a regulator itself, even though it is not fully independent from the executive power, has a positive influence on good governance practices, as concluded by Abrardi et al. (2016) after taking the MENA region as case study.

5.1.2.1 Operationalization

Regulatory independence will be operationalized by using a regulatory governance framework by Kapika & Eberhard, 2013) (see figure 16). Both decision-making independence and financial and management independence are needed for effective regulation. One might argue that effective regulation is part of independent regulatory independence. However, a not independent regulator can still be effective in a way, and an independent regulatory can be ineffective. For this reason these two aspects are taken separately.

Decision-making independence means that the regulator’s applied autonomy in its day-to-day regulatory activities (Medreg, 2014). There must be no governmental opportunism and independency in hiring their own staff (preferably with term limits).

Measurement: [independent decision making? Yes/semi/no]

Financial independence means that the regulatory organization is not dependent on funding from for example the Ministry of Electricity but instead is funded by electricity levies, paid for by consumers (who are the intended beneficiaries of regulation).

Measurement: [financial independence? Yes/semi/no]

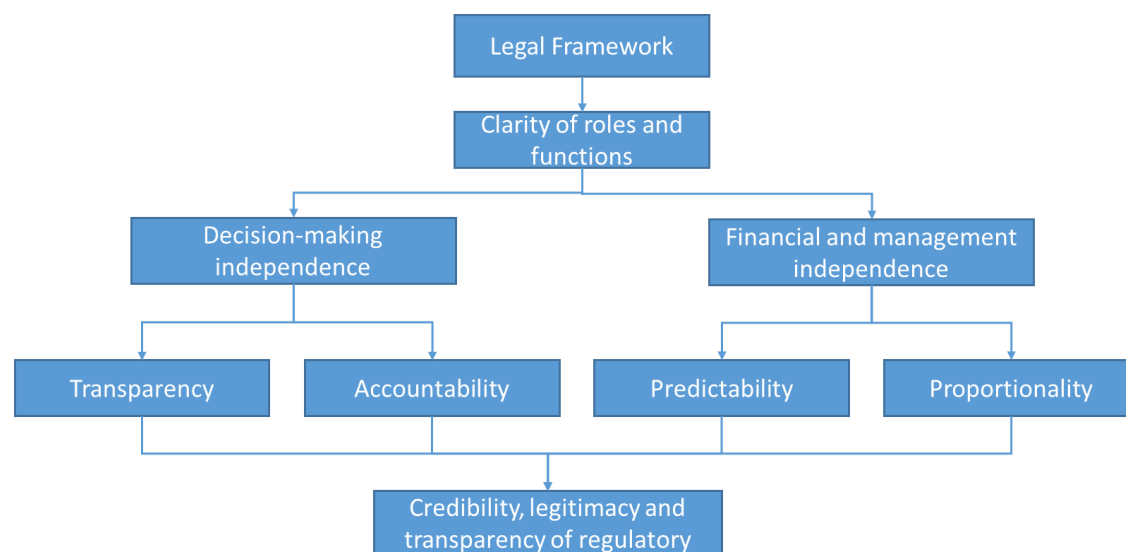


Figure 14: Regulatory governance hierarchy. Adapted from Kapika & Eberhard (2013).

5.1.3 Effective regulation

Next to independent, a regulator needs to be effective. Williams & Ghanadan (2006) stated:

“Despite the formation of regulatory bodies in many non-OECD countries, examples of effective power sector regulation are scarce, as indicated by the prevalence of IPP scandals, insider privatization schemes, and tariff regimes that range from inadequate to draconian. A key lesson of this experience is that laws and frameworks alone do not guarantee success.” (p.838).

This means that a regulator needs to have a next to a clear mandate or legal framework, the ability to make transparent, predictable and proportional decisions (in the eyes of the supply industry, potential investors and consumers) as well as being accountable (Kapika & Eberhard, 2013; MedReg, 2014). An important case, especially in the case of an integrated market structure with IPPs, is that contracts can be enforced (USAID, 2000). Effective regulation also entails the availability of qualified personnel within a regulatory agency. This seems straightforward but research done by Pollitt & Stern (2011) showed that human resources constraints significantly limited the effectiveness of electricity regulators in developing countries. Additionally, regulators and the public administration in general should be ‘up-to-date’ with new innovations and technologies in primarily ICT, which is reshaping the electricity market (Glachant, 2012).

5.1.3.1 Operationalization

Effective regulation will be operationalized using the framework as shown in Figure 16. This means that for this research, an effective regulator is transparent, accountable, predictable and proportional.

A transparent regulator means it communicates its decisions and mandate with the wider public. Regulators cannot be viewed as credible and legitimate if the wider public does not know how for example prices or subsidies are determined (Kapika & Eberhard, 2013).

Measurement: [transparency? Communication with wider public yes/semi/no]

Accountability means in this case that the regulator takes on the responsibility and is able to demonstrate outcomes and results from its activities (MedReg, 2014). This can be done by annual reports or releasing data or other forms of information sharing or knowledge exchange.

Measurement: [accountable? Regulator takes responsibility for its actions yes/semi/no]

Predictability and proportionality means respectively that it makes its regulatory decisions in a similar nature as earlier ones and that regulation should not be excessive and only be exercised in the pursuit of ‘efficiency and fairness’ (Kapika & Eberhard, 2013).

Measurement: [predictable and proportional? Yes/semi/no]

5.2 Economic & Financial

5.2.1 Sufficient producers and investors

For any competitive market to operate successfully, there should be sufficient private parties (producers/generators and investors) in order to guarantee competition. The IEA formulated it as follows:

“A competitive market needs many sellers. In a perfectly competitive market, with many, many sellers, every seller is a price taker, and cannot affect the market price. If they try to charge more, customers will go elsewhere. By contrast, a monopoly (a single seller) has the ability to drive up the price without fear that other sellers would undercut his price; he will produce less than a perfectly competitive market will produce, and at a higher price that is well above costs, and make more profits. By restricting output, the monopolist diverts resources from their highest value use and the high prices transfer money to the monopolist at the expense of the consumers” (IEA, 2005, p.89).

A lack of sellers can eventually lead to a few parties having too much market power. Liberalization in that case will face difficulties if powerful incumbents hold up the process and governing bodies that favor a small welfare state, accelerate it (Erdogdu, 2014). The regulator plays an important role in ensuring a level-playing field for third-party/private sector access in a liberalized electricity sector. Thailand’s electricity sector reforms in the 1990s with the aim to create a wholesale and retail market, had limited success. Public companies operated geographically segregated oligopolies and had majority shares in the private generation companies. As a result, open access had limited success in stimulating competition (Sen et al., 2016).

Often sector reform in developing countries happens during an economic or financial crisis, pushed by IFIs like the IMF or World Bank. This is precisely the time that (foreign) private sector companies are not willing to invest in, in this case, an electricity sector (Barnett, 2014; Tankha, 2018). Having sufficient producers or sellers can in that case be difficult. In general, the investment climate in country must be favorable for private sector participation, otherwise competition will not happen in the first place.

5.2.1.1 Operationalization

Competition will happen with sufficient producers and investors, which will happen if the investment climate for the private sector is suitable. There are two, often used and annually updated, indexes that can be used for operationalizing the investment climate in a country:

- The World Bank’s ‘Ease of Doing Business’ Index. This index uses surveys and questionnaires, to measure business regulations and their enforcement across 189 countries in the world. The topics that are surveyed include the easiness of starting a business, dealing with construction permits, getting electricity; registering property etc.
- The Global Competitiveness Index by the World Economic Forum (WEF). This dataset combines executive opinion survey results with quantitative data to measure the competitiveness of a certain country. The by the WEF defined pillars to measure this competitiveness include infrastructure, education, macroeconomic environment, labor market efficiency, financial market development and innovation.

The ranking of and information about Egypt in these indexes will be combined with conclusions from the PEA and the insights from the interviews, in order to measure the investment climate for potential electricity sector investors.

Measurement: [investment climate for the electricity sector: poor/medium/good]

5.2.2 Cost reflective pricing

Prices that reflect the costs of producing are necessary to maintain a financially sustainable electricity

supply. Jamasb & Nepal (2015) argue that the issue of cost-reflective pricing remains at the heart of the success or failure of electricity sector reforms. This is also an important role of a regulator; it needs to ensure a transition to cost-reflective power pricing and mitigate negative impacts of price increases. Jamasb & Nepal (2015) therefore argue that:

“[...]electricity price adjustments should be undertaken before privatization rather than after privatization to minimize the tension between economic efficiency and equity if privatization of the energy companies is considered as an option for reform in developing countries” (p.39).

Similarly, Kessides (2012) states that electricity prices should first be raised to cost-recovering levels before privatization takes place. This is in line with Scheepens (2018) who mentioned that cost reflective pricing is one of the most important criteria for FMO (the Dutch Development Bank) to decide if they will invest in power projects or not.

Often developing countries use cross subsidization in their electricity sector. This means that high consumption (and often rich) users are charged more (often above marginal costs) in order to pay for low consumption (and often poor) users. Cross subsidies negative influence the productivity of the industry (high consumption users) if they decide to shift to own production which means the state owned utilities are deprived with even less funds (Irwin, 1997). Cross subsidies can work in a vertically integrated monopoly with IPPs, but not in a competitive market; new firms will undercut high-priced electricity provision, denying the former state owned electricity supplier the revenue to fund low-priced electricity provision for the poor (Irwin, 1997).

5.2.2.1 Operationalization

This criterion will be operationalized by determining if there are any forms of electricity subsidy schemes present in order to find out if there are cost reflective tariffs present or not.

Measurement: [cost reflective pricing?: yes/no]

5.2.3 Low currency risks

A volatile currency creates more risks for investors and is therefore an important criteria that those investors consider before deciding to invest in a power project (Scheepens, 2018; Tankha, 2018). For example, in the case of an IPP, the payments might be in local currency yet a large share of the costs for an IPP (fuel-, equipment & repair-, capital costs) might be in US Dollars (USAID, 2000). Also, often local banks do not have dollars or euros as hard reserve but can only pay in local currency because that is the only currency they can get (Scheepens, 2018).

In general, an important aim of market-based sector reform is increased private sector participation and therefore attracting (foreign) investors. Brazil started in the late 1990s with market-based reforms in its electricity sector. In 1999 however the country was forced into a large devaluation of its currency (the Real). During that time, the government finished privatization of the distribution companies and was about to start the privatization of the generation companies. But the more the Real weakened, the less private parties were interested to invest in Brazil's electricity sector. They demanded that the regulator should set higher rates to compensate for the losses (due to the foreign exchange debt) but it refused to do so because of fear for political and public opposition (Tankha, 2008). Similarly Argentine's electricity

sector reforms in the late 1990s and early 2000s were very successful until the Argentine Peso collapsed in 2002. The government had to abandon the peso parity with the dollar (floated the currency) and as a result it decreased 30% in value overnight (Pollitt, 2008). Combined with a political crisis that followed suit, made Argentina one of the lowest rated countries in the world for prospects for electricity investment (Lamech & Saeed, 2003).

5.2.3.1 Operationalization

For this research, the presence of a currency risks will be operationalized by looking at the most recent risk analysis of the Economist Intelligence Unit (EIU). Specifically, the currency risk, which measures:

“[...]the risk of maxi-devaluation against the reference currency (usually the US dollar, sometimes the euro) over the next 12-month period.” (EIU, n.d., p.1).

The EIU uses a rating band from AAA to D, as can be seen in table 13. Obviously, investors are looking further than 12 months when investing in a country. A long term currency prediction is difficult since it is dependent on a lot of (external) factors.

This criterion will be operationalized by a low, medium, or high currency risk.

Table 13: Sovereign rating band with the characteristics. Adapted from EIU (n.d.).

AAA	Capacity and commitment to honour obligations not in question under any foreseeable circumstances.
AA	Capacity and commitment to honour obligations not in question.
A	Capacity and commitment to honour obligations strong.
BBB	Capacity and commitment to honour obligations currently but somewhat susceptible to changes in economic climate.
BB	Capacity and commitment to honour obligations currently but susceptible to changes in economic climate.
B	Capacity and commitment to honour obligations currently but very susceptible to changes in economic climate.
CCC	Questionable capacity and commitment to honour obligations. Patchy payment record.
CC	Somewhat weak capacity and commitment to honour obligations. Patchy payment record. Likely to be in default on some obligations.
C	Weak capacity and commitment to honour obligations. Patchy payment record. Likely to be in default on significant amount of obligations.
D	Very weak capacity and commitment to honour obligations. Poor payment record. Currently in default on significant amount of obligations

Measurement: [Currency Risk: Low/Medium/High]

5.3 Political

5.3.1 Political stability

Sector reform is essentially a political process; government stakeholders with support from the public have to make the legal changes that facilitate electricity sector reform. Political stability is therefore crucial. However, political stability is not a clear cut term and it can be interpreted and measured in various ways. For example, many people would agree that Somalia or Syria currently are politically unstable. However, are military dictatorships like in Korea or Eritrea stable? You could argue that is the case since there hasn't been major civil unrest in decade and it doesn't look like the type of regime will change anytime soon. Is the Netherlands on the other hand politically stable when we have regular elections with different cabinets and often cabinets that do not finish their term? One could say so. But perhaps the political environment in Netherlands is more resilient; a protest against the government would probably not lead to a full blown civil war or coup, while this might be the case in North Korea or Eritrea when protest suddenly emerge. The United States Peace Institute (USPI) defines 'stable governance' as:

"Ability of the people to share, access, or compete for power through nonviolent political processes and to enjoy the collective benefits and services of the state" (USPI, 2009)

Radu (2015) used in a research on the link between sustainable growth and political stability in Romania the following definition, based on work by Alesina et al. (1996):

"In our study, political stability is defined as the measure of the perceptions regarding the probability that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism." (Radu, 2015, p.753).

Hence, it is clear that the term is interpreted and defined in various ways by various authors. Margolis (2010) concluded that academic and policy analyses have clustered around five different definitions of political stability as can be seen in Table . The first three are more in line with the definition as used by Radu (2015), while number 4 is more in line with the definition of 'stable governance' by the USIP (2009).

Table 14: Overview of different definitions of political stability. Adapted from Margolis (2010, p.327).

Title	Definition: "political stability is..."
1. Absence of violence	...the absence of violence within a polity
2. Absence of structural change	...the absence of change threatening an object's 'core' traits
3. Absence of control	...cast in relief; instability is a state's inability to control its polity
4. State functionality	...the degree of which a state meets its political responsibilities
5. Indicators and correlates	...uncertain, but probabilistically tied to structural correlates
6. Pattern of political behavior	...the degree of regularity in the political behavior of a polity

For this research, the definition as formulated by Radu will be used because it reflects the findings of Bhattacharyya (2007), as described in the previous chapter. He studied the slow and limited progress of electricity sector reform in South Asia and concluded that political instability (i.e.; change of governments, military coups, constitutional crises etc.) in among others Pakistan, Bangladesh, Nepal and India

contributed to this.

5.3.1.1 Operationalization

Political stability is a complex term and it is concluded it can be interpreted in various ways. For this research, the 'political stability and absence of violence index' by the World Bank will be used to operationalize this criteria. This index measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. The estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5. (World Bank, 2017a). This numerical value will be combined with insights gained from the interviews and the PEA which will eventually lead to the classification stable, semi-stable or unstable.

Measurement: [Political stability: stable/semi-stable/unstable]

5.3.2 Political commitment

Lack of political commitment was not explicitly mentioned in the literature about electricity sector reform in developing countries as a reasons for undesired outcomes. However, it was mentioned by several interviewees and also in the literature a common explanation for undesired outcomes of institutional reforms in general (Tankha, 2018; Joshi & Carter, 2015; Andrews, 2013). A lack of political commitment can be linked to factors such as reform fatigue, patronage networks and a lack of financial incentives, as well as aims such as staying in power and satisfying elite supporters (Scott, 2011). A cross-study conducted by Fritz (2012) on public financial management reform in post-conflict countries that a lack of commitment and incentives to implement reforms was the biggest bottleneck, more than a lack of capacity or resources (Joshi & Carter, 2015).

Specifically for the electricity sector, Correljé & De Vries (2008) argue that some governments who initiated reforms are not able to overcome resistance to change by vested interests. Similarly, one of Besant-Jones' (2006) main conclusions after an extensive and often quoted study on the lessons learned from electricity sector reforms in developing countries was related to political commitment:

"Maintaining momentum for reform involves political costs and thus requires political commitment through successive phases of the reform process over one or more electoral cycles" (p.2)

Country specific empirical evidence for this statement comes from Kwako (1997); the strong belief by the Chilean President in the power of the market provided political pressure that resulted in Chile being one of the first countries in the world to liberalize its electricity sector.

5.3.2.1 Operationalization

Brinkerhoff (2007) constructed a framework to assess political commitment of reforms. It consist of several elements of which the first one is whether of drive for reform is external or internal. This is especially relevant for electricity sector reforms since several authors mentioned pressure from donor agencies and development banks as a factor that contributed to undesired outcomes of electricity sector reforms in developing countries. Another element in Brinkerhoff's framework is consultation with stakeholders. Up to what extend is the government coordinating its reform efforts with other stakeholders in the sector? These two elements together with the results from the interviews will lead to a measurement of the political commitment of the Egyptian government to pursue its far reaching

electricity sector reforms.

Measurement: [political commitment committed/partly committed/not committed].

5.4 Technical

5.4.1 Appropriate grid layout

Literature about electricity sector reform in developing countries did not explicitly mention the grid (transmission and distribution) layout as an important pre-condition for liberalization, or as a reason for undesired reform outcomes. It became however clear during the interviews that several stakeholders mentioned this as a barrier for private investment and a competitive market. According to Anonymous 14 (2018), transmission capacity needs to be sufficient to support a competitive market.²⁴ Taking Egypt as an example, selling electricity from a generator in Cairo to Alexandria cannot happen if the grid is not there or has insufficient capacity. Another (more expansive) generator nearby Alexandria is in that case the alternative. In other words, congestion counteracts a competitive market (Anonymous 14, 2018).

Also from an investment perspective, the capacity of a grid is important before an investment decision can be made (Scheepens, 2018; Anonymous 8, 2018). This is especially relevant with investments in renewable energy projects, in the case of Egypt often far off the main grid. An example where the grid capacity limited private sector investments is Kenya. In June 2017, the biggest wind farm in sub-Saharan Africa was installed in the northern part of Kenya, the largest single private investment in the country and closely watched by other private investors in Africa's electricity sector. The wind farm was ready to produce but the transmission line to the main grid had yet to be built by the state owned transmission company (Jacobsen, 2017). Up till the date of writing the transmission cable is not completed.

5.4.1.1 Operationalization

This criterion will be operationalized by assessing if the existing transmission and distribution grid in Egypt is both widespread enough to cover the areas for new investments, and also by assessing the capacity and quality. This will partly be done by the assessment of Egypt's electricity sector in chapter 6 and the insights gained out of the stakeholder interviews.

Measurement: Sufficiently widespread grid layout [yes/semi/no]

Measurement: Capacity and quality of transmission and distribution grid [poor/medium/good]

²⁴ Also, interconnectors are important for two main reasons. First, interconnectors facilitate trade and therefore an increase in overall welfare. In the EU for example when the Internal Electricity Market was created, the European Commission promoted investment in new cross-border interconnections (Jacottet, 2012). In North-Africa there is no such internal market (yet), but increased competition among private generators in the region will not only increase the security of supply and facilitate deployment of electricity produced from intermittent sources, it will also enhance competition. Although this is the case, the choice has been made not to include this in the list of criteria. Both the literature and the interviewees did not mention this as a pre-criteria for a liberalized electricity market.

5.5 Social

5.5.1 Public acceptance

For electricity sector reforms to be successful it requires public acceptance or social legitimacy (Jamab & Nepal, 2015; Williams & Ghanadan, 2006; Wamukonya, 2003). The public measure of acceptance rests on among others perceptions of costs and benefits and if reform promises have been kept or broken. There are many developing countries in which authorities responsible for the execution or implementation of reforms failed the 'social legitimacy test':

- Increases in tariffs and payment enforcements outpaced consumer service and public benefits
- Reform goals are outweighed by corruption and non-transparent dealings happening under the radar screen of formal policy
- Sometimes electricity sector reform in developing succeeded in terms of policy, but failed politically because the public saw it as a part of a larger package of broken economic development promises (Williams & Ghanadan, 2006).

A lack of public acceptance can result in non-commercial losses (electricity theft) and non-payment of electricity bills (Jamab & Nepal, 2015). But eventually also to protests resulting in the ousting of a government responsible for the reforms (Williams & Ghanadan, 2006).

5.5.1.1 Operationalization

Surveys among the public regarding politically sensitive topics like this (considering the subsidy reform involved) are not allowed in Egypt and it is therefore hard to find reliable data on this. Instead, information out of the interviews will be used to get a grasp of the public perception towards electricity sector reform.

Measurement: [Public perception towards reform: positive/neutral/negative]

5.5.2 Social programs in place

Related to the public acceptance criteria is the pre-condition that social programs should be in place to mitigate for the poorest in society that may not directly benefit from a liberalized electricity sector (De Vries, 2018). Often, not every segment of society reaped the benefits from market-oriented reforms. The efficiency gains from reformed electricity sectors mainly benefitted power producers, service providers, high-income users and commercial businesses, but have not reached the poor. Some argue that these distributional issues should be at the heart of designing the reforms (Besant-Jones, 2006).

One might argue that poorer segments of society also benefit from a more reliable electricity provision, but for some people it becomes unaffordable and therefore prefer the pre-reform situation where the service quality was poor, but at least cheap or even free. Reform therefore should be focused on socio-economic improvements, and not on reforming alone (reform is a mean, not an end in itself) (Parker & Kirkpatrick, 2005).

Examples of social mitigation measures are social safety nets, cash transfers, or subsidies directly from the tax budget (instead of cross-subsidies).

5.5.2.1 Operationalization

This criterion will be operationalized by looking at the countries plans and commitment to implement mitigation measures for the poor segments in society that might not (directly) profit from market-oriented

electricity sector reforms.

Measurement: [Social programs in place? Yes/partly/no]

5.6 Overview of restructuring modality per criteria

Based on the liberalization and restructuring literature described in chapter 4, and the elaboration on and operationalization of the criteria in this chapter, a framework has been created. This framework, see table 15, can determine which criterion is an important, or less important, pre-condition per restructuring modality. This framework will eventually after the contextual analysis and application of the criteria on the case of Egypt, determine which a suitable restructuring modality.

Multiple assumptions have been made, based on the gained insights from the previous chapters. Most criteria (part of broader institutional reform, regulatory independence, political commitment, cost-reflective pricing, appropriate grid layout, public acceptance and social programs) become relevant with the establishment of a competitive, wholesale market. This requires the biggest institutional transition from a state-owned sector, to a competitive one with private sector participation. In the other three structures the state remains the dominant player. An independent regulator is needed to provide a level playing field and provide third party access. Political commitment is needed because it requires a complete overhaul of the status quo, at the cost of SOEs who might not be too keen on this. Cost-reflective prices are needed in order for the private sector to invest and an appropriate grid layout is required so private generators can compete with each other, via the transmission network, on a wholesale market. Because with this modality power theft will be enforced and tariffs will be raised to cost-reflective lessons, it requires public acceptance which is directly related to the social programs that are in place for the poor.

Effective regulation becomes already more important in the third structure: legal/management/account unbundling with IPPs. This type of unbundling is usually done to prepare for full privatization (so structure 4 & 5). The unbundled SOEs have to operate efficiently, cost-reflective and transparent in order to prepare for a handover to the private sector. Effective regulation is therefore an important pre-condition.

Political stability and currency risks are important pre-conditions for any type of private sector participation, so in this case IPPs. Investors are not eager to invest in political unstable countries or countries with large currency risks (even if the PPAs are in dollars, there is a chance that with a steep devaluation the government cannot honor its contracts anymore or that fast rising electricity prices will lead to social unrest).

Table 15: Framework to determine which criterion is an important, or less important, pre-condition per restructuring modality.

<i>Restructuring modality:</i>	1. Vertically integrated utility	2. Vertically integrated utility with IPPs	3. Unbundling with IPPs	4. Wholesale market	5. Wholesale market + retail competition	
<i>Criteria:</i>						
Institutional						
Part of broader inst. reform	Less important pre-condition			Important pre-condition		
Regulatory independence	Less important pre-condition					
Effective regulation	Less important pre-condition		Important pre-condition			
Political						
Political stability	Less imp. Pre-cond.	Important pre-condition				
Political commitment	Less important pre-condition					
Economic & Financial						
Cost-reflective pricing	Less important pre-condition			Important pre-condition		
Currency risks	Less imp. Pre-cond.	Important pre-condition				
Technical						
Appropriate grid layout	Less important pre-condition			Important pre-condition		
Social						
Public acceptance	Less important pre-condition			Important pre-condition		
Social programs in place	Less important pre-condition					

6. The reform context in Egypt

SQ3: How can the contextual analysis be used to determine the most suitable type of restructuring?

- a) What does the institutional and technical structure of Egypt's electricity sector look like and what are the goals and policies of the government for market-oriented reform?
- b) What does Egypt's political-economic context look like?
- c) *How can the formulated criteria be applied on Egypt by using the context analyses and stakeholder and expert interviews? [Chapter 7]*

Now that the criteria to assess the case of Egypt has been defined, the technical and political-economic context will be assessed. The outcome of this contextual analysis will function, among others, as input for the application of the formulated criteria in the previous chapter. First, the more 'technical' context will be described by providing an overview of Egypt's electricity sector (its institutional structure, the value chain and an elaboration on the proposed reforms). This will be followed by the political-economic analysis.

6.1 Egypt's electricity sector

Egypt's electricity sector is subject to rapid and significant changes. These changes take place in both the technological/engineering- and institutional/economic sphere. For example, large scale centralized solar parks in the southern part²⁵ of Egypt are being developed, a nuclear power plant will be built in the north, Siemens is currently constructing the world's biggest gas fired power plant east of Cairo, and an interconnector between Egypt and Saudi Arabia is almost ready for operation (Reuters, 2015; Egypt Today, 2017; El Wardany, 2018; Egypt Today, 2018). Parallel to these 'physical' projects, different types of policies, laws and regulations have been created and implemented. Examples are the new 2015 electricity law that paved the way for unbundling, a feed-in-tariff (FIT) scheme and the political sensitive reform of electricity subsidies (Electricity Law, 2015; Bloomberg, 2018; Eibl, 2017).

In this paragraph an overview will be given for Egypt's electricity sector. The institutional set up will be described together with the 'physical' characteristics, followed by Egypt's reform plans.

6.1.1 Institutional structure

Egypt's electricity sector is unbundled but almost fully owned and operated by the government. Its former vertically integrated Electricity Company is since 2000 legally separated into 16 state-owned electricity companies (of which 6 generating companies, 1 transmission company and 9 distribution companies), as can be seen in Figure 15. Since 1996, private sector parties are allowed on the generation side in a single-buyer model by means of BOOT (Build, Own, Operate, Transfer) contracts, but only contribute 9% of the capacity (Arab Republic of Egypt, 2015; EEHC, 2016).

²⁵ The south of Egypt is often referred to as 'Upper Egypt'. It is called this way because the Nile runs from South to North.

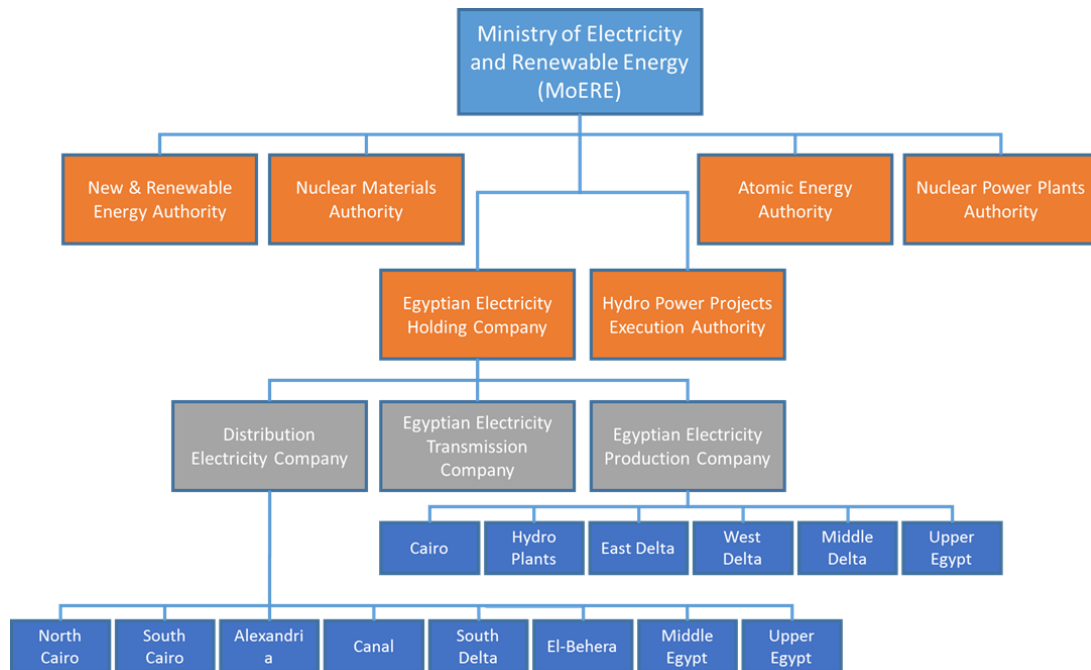


Figure 15: Organizational structure of the Ministry of Electricity and Renewable Energy. Adapted from (Ministry of Electricity and Renewable Energy, n.d.).

There are several key-actors in this sector, each with their own tasks and levels of responsibilities:

- Strategic level: Supreme Council of Energy, consisting of Ministers from 11 ministries, headed by the Prime Minister (Sherif Ismail). Strategic, long term policies on energy are being made within this council and covers both the electricity and the oil and gas sector.
- Policy level: Ministry of Electricity and Renewable Energy (MoERE). The MoERE task is to implement these policies and plans in the field of electricity generation, transmission and distribution.
- Service providers level: Generation companies ('gencos'), transmission company ('transco') and, distribution companies (discos), all owned by the Egyptian Electricity Holding Company (EEHC).
- Regulatory level: Egypt ERA, the utility and consumer protection regulatory agency, established in 2001.

The MoERE formulated several goals for itself, of which the most relevant for this research are (Ministry of Electricity and Renewable Energy, n.d.):

- Provide electricity with the most suitable price and best quality
- Restructuring (i.e., reforming) of the electricity sector to optimize investments and improve electrical services

The EEHC is responsible for the implementation of power projects (in the three main parts of the supply chain; generation, transmission and distribution). EEHC is part of the MoERE and owns 95% of the generation, 100% of the transmission and over 99% of distribution. As can be seen in Figure 15, the gencos and discos are geographically separated, but eventually all under the EEHC (and therefore also the MoERE)

umbrella.

The regulatory agency (EgyptERA), established in 2001, has the task to oversee and regulate all the activities related to electricity production, transmission and distribution. More specific, they are among others responsible for tariff setting, setting the Feed-in-Tariff (FIT) for renewables, determine transmission fees and set the electricity grid and network codes. EgyptERA is often referred to by the Egyptian government as the *independent* regulator. However, this independence classification can be questioned. For example:

- Funding for EgyptERA comes directly from the companies it regulates
- The board consists of representatives from all the public stakeholders in Egypt's electricity sector.
- The board of directors is headed by the Minister for Electricity and Renewable Energy
- EgyptERA does not own a private location; they rent office floors in a building that is also used and owned by the EEHC (MedReg, 2014)

Additionally, EgyptERA cannot decide fully on its own internal organization; this has to be done in accordance with the legislative body, in this case the parliamentary Supreme Council of Energy (Abrardi et al., 2016). Apart from the independency aspect, EgyptERA faces additional challenges regarding its effectiveness. EgyptERA makes annually a benchmarking report of all the companies it regulates. However, no action is being taken by the Ministry or by the companies itself for the companies that are reported by EgyptERA to perform badly (MedReg, 2014).

Currently, the market operates as a single buyer. EETC buys electricity from all the generation companies which it then sells to the 9 distribution companies (serving around 22 million customers), Industrial (High Voltage) users, and to several private distribution companies who own less than 1% of the market (Arab Republic of Egypt, 2015). Additionally, it exchanges a small amount of electricity by means of interconnectors with Jordan and Libya.

Figure 16 provides a schematic overview of the electric value chain in Egypt. This chain (from generation to distribution) will be described in the following paragraphs.

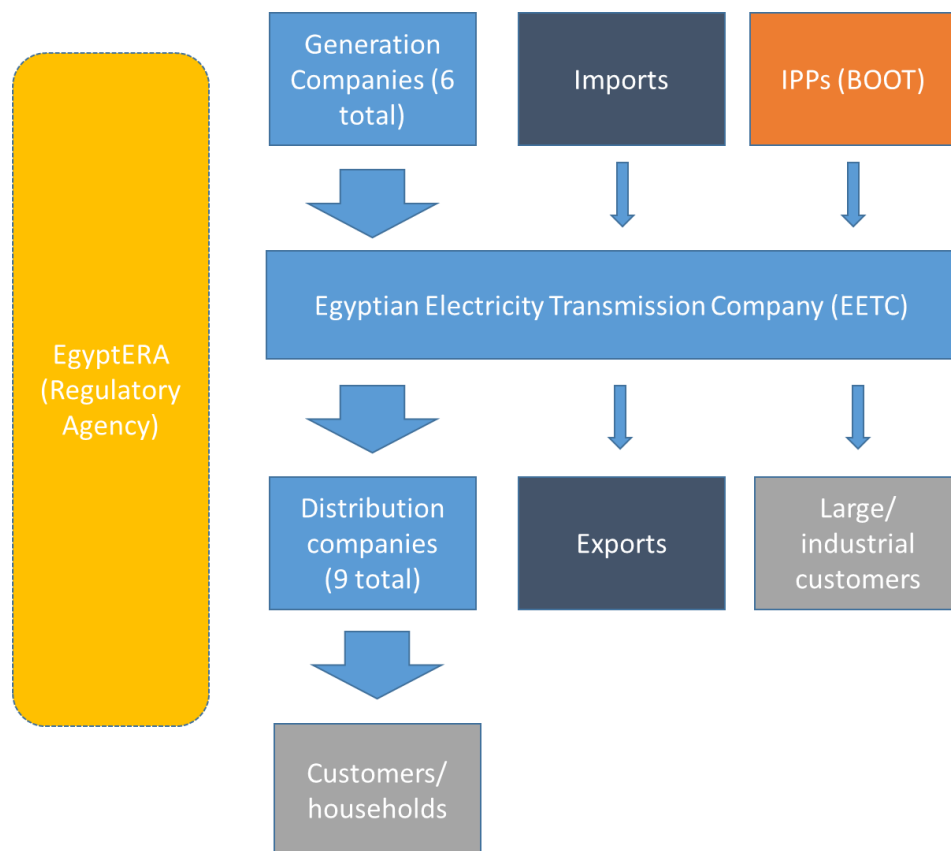


Figure 16: Schematic overview of Egypt's electricity value chain.

6.1.2 Generation

Egypt's electricity infrastructure is relatively well developed; 99,8% of its citizens has access to electricity, as compared to the average of 37,4 % in its sub-Saharan African counterparts (World Bank, 2018a). Also, with a fast growing population, the Egyptian government added a lot of capacity over the last decades. Between the period 2011/2012 and 2015/2016, the total installed capacity increased from 29075 MW to 38857 MW, with an average annual growth rate of 7.5% (EEHC, 2016). However, the total installed capacity cannot be utilized fully because of the aging of several generation units, intermittency of wind and solar, the amount of water that is allocated by the Ministry of Irrigation and Water sources for hydropower generation, quality of the used fuel and the negative impact of high summer temperatures on the efficiency of thermal generation units (EEHC, 2016). The amount of generated electricity has increased as well; between the period 2011/2012 and 2015/2016, the gross generated energy increased from 157406 GWh to 186320 GWh, with an average annual growth rate of 4.3% (EEHC, 2016).

Table provides an overview of the total installed capacity, the peak load, total power generated and exchange of electricity by means of interconnectors for the period 2015/2016. The majority of the generated (around 90%) electricity is fossil (in this case natural gas) based, while 3% is generated by renewable (wind and solar) sources. 7% is generated by hydro power of which the vast majority by the Aswan High Dam in the south of Egypt.

Table 16: Installed capacity in Egypt. Source: EEHC (2016).

Description	Unit	Value
Total installed capacity	MW	38857
Peak load	GWh	29200
Total power generated	GWh	186320
-Hydro	GWh	13545
-Thermal	GWh	157056
-Renewables	GWh	2225
-Energy Purchased from IPPs	GWh	42
-Generated by private sector (BOOT)	GWh	13307
-Generated from isolated plants	GWh	144
Net. Electricity exchange with interconnected countries	GWh	713

Egypt has several isolated power plants and reserve units who mainly provide electricity to remote and touristic areas. The total installed capacity is 266 MW.

Since both Egypt's population and economy is forecasted to grow steadily in the upcoming years, the electricity demand will rise accordingly. For this reason, the Egyptian government is expanding capacity rapidly (Egypt Today, 2018).

6.1.3 Transmission and distribution

Egypt's transmission network is operated, managed and maintained by the earlier mentioned EETC, via its National Dispatch Center and several Regional Control Centers. EETC purchases bulk power produced by the gencos, and sells it in bulk to the discos and High-Voltage/industrial customers. It is also the responsible body for interconnectors; currently two between Egypt and Libya and Jordan, both in operation since 1998. Figure 17 provides a schematic overview of Egypt's transmission network.²⁶ This map shows clearly the areas where Egypt's population is concentrated, namely along the Nile river and the Nile Delta in the North. The total length of transmission lines and cables is close to 45.000 km, and is slowly expanding with an annual growth rate of around 1% (EEHC, 2016).

Part of Egypt's 2035 Integrated Sustainable Energy Strategy, is to improve the performance of the transmission system and also make the necessary expansions and adjustments to facilitate the integration of renewables. Currently, the EETC is developing an 'Transmission Expansion Plan', which includes strategies to make the centralized status quo a more decentralized one that facilitates distributed renewable sources and smart micro grids. It will also consist of a plan to increase interconnection with neighboring countries and improvements of 'the weak points' in the system (Arab Republic of Egypt, 2015).

²⁶ It is worth mentioning that Israel and the Palestinian territories are not shown on this map, created by the EEHC. Instead, the entire area is labeled as 'Palestine'. This shows the still tenuous relations between the Egyptian and Israeli government. It is therefore not likely that any interconnectors will be constructed between these two economically significant countries in the region anytime soon.

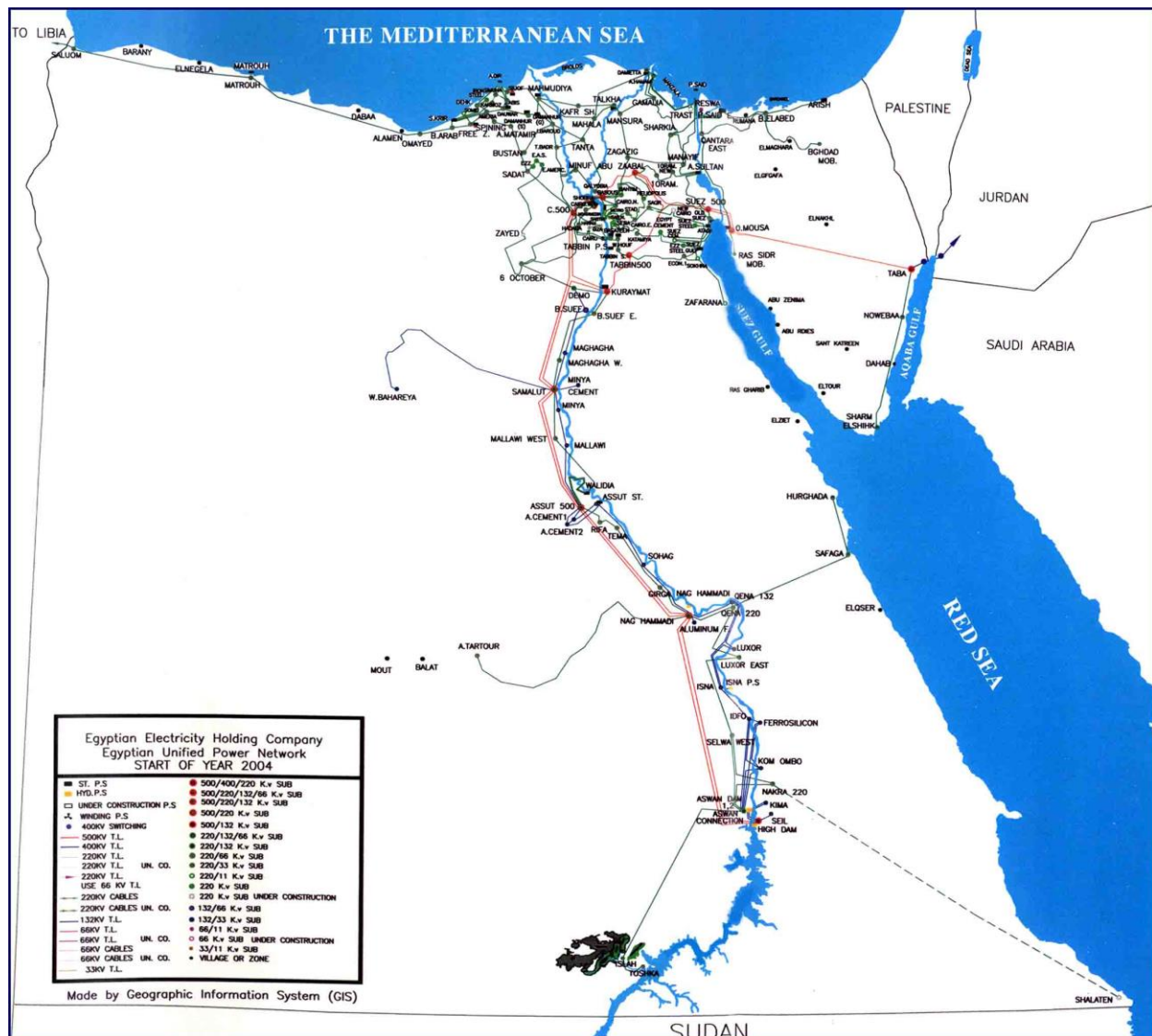


Figure 17: Schematic overview of Egypt's transmission network. Source: GENI (2004).

The government owned distribution companies are responsible for delivering and selling the generated electricity to medium and low voltage customers, bought from the EETC. In June 2016, the distribution companies delivered electricity to 32.4 million customers throughout Egypt, of which the majority (72%) is residential (EEHC, 2016). The total length of the medium voltage lines and cables is about 185.000 kilometers, the low voltage ones around 275.000.

Also the distribution part of Egypt's electricity sector will be subjected to performance improvements, based on the Distribution Expansion Plan. This plan will also include the transition towards a decentralized system, installation of smart grids and micro grids, and improvements in those areas where the most technical failures (i.e., black-outs) occur (Arab Republic of Egypt, 2015). Additionally, the distribution companies are currently implementing a comprehensive customer service improvement program which (among others) supports renovating service centers, automating meter readings and payments, and dealing with customer inquiries via WhatsApp (EEHC, 2016).

6.1.4 Tariffs

Energy in Egypt has always been heavily subsidized; in 2014, the amount of subsidies equaled 7% of Egypt's GDP, or 22% of the national budget (El-Markabi, 2015). Aside from draining the government's annual budget, it also negatively influences energy efficiency and organizations like the EETC cannot adequately recover their costs (World Bank, 2014).²⁷

Table 47: Electricity tariffs in Egypt, and its yearly increase in percentages. Source: American Chamber of Commerce (2016) & Egypt Today (2017a).

Consumption bracket (kWh/month)	2015/2016 (piasters/kWh) ²⁸	2016/2017 (piasters/kWh)	2017/2018 (piasters/kWh)	2017/2018 (piasters/kWh)
0-50	7,5	11,0 (+47%)	13,0 (+18%)	22,0 (+69%)
51-100	14,5	19,0 (+31%)	22,0 (+15%)	30,0 (+36%)
101-200	16,0	21,5 (+34%)	27,0 (+26%)	36,0 (+33%)
201-350	30,5	42,0 (+38%)	55,0 (+31%)	70,0 (+27%)
351-650	40,5	55,0 (+36%)	75,0 (+36%)	90,0 (+20%)
651-1000	71,0	95,0 (+34%)	125 (+32%)	135,0 (+8%)

Since these subsidies weigh heavy on Egypt's annual budget, Egypt recently started with gradually phasing out subsidies. This subsidy reform is part of a three-year international Monetary Fund (IMF) structural reform program which started in 2016. Table 4 provides an overview of the electricity prices in Egypt and shows that these prices are gradually increasing. Consumer electricity prices depends on the consumption bracket; lower, and therefore mostly poorer consumers, pay less as compared to high using consumers. The aim of the Egyptian government is to completely phase out electricity subsidies by the end of 2021/2022.

The current tariff system is seen by the Minister of Electricity & Renewable Energy (Mohamed Shaker El-Markabi) as a challenge for the financial sustainability of the sector (El-Markabi, 2015). Apart from the fiscal burden, a significant share of the subsidies does not reach the target group (low-income consumers). Additionally, the EEHC is in a poor financial shape due to delayed subsidy payments by the Ministry of Finance and due to other public entities that do not pay for electricity. These, and other non-financial reasons resulted eventually in plans to reform Egypt's electricity sector.

6.1.5 Egypt's reform plans

When the energy crisis during the revolution in 2011 happened, it turned out that the first reform step (the single-buyer model) was not sufficient to meet Egypt's electricity needs (Ismail, 2014; Lakhal, 2014). Although the situation has somewhat improved, Egypt still experiences frequent electricity blackouts

²⁷ Subsidies are not limited to the energy sector; other utilities and basic foodstuffs are evenly heavily subsidized..

²⁸ On March 27th, 2018, 1 piaster (a hundredth of an Egyptian Pound) equaled 0,00046 euro.

because of rising demand, natural gas supply shortages, aging infrastructure, and inadequate generation and transmission capacity. Additionally, because of the continuing social and political unrest, Egypt's ambition to increase the generation capacity has been slowed down.

These challenges led ultimately in 2015 to a new electricity law, which went into effect in May 2016 when the executive regulations had been approved. This law ended the previous single buyer system and allows private generation companies to sell electricity to certain 'high voltage' end users by means of bilateral contracts (see Figure 18). The medium- to low voltage end users will pay a regulated tariff to the distribution companies whom are supplied by a public trader (Arab Republic of Egypt, 2015a). This can be seen as a first step; according to the regulator (EgyptERA), the ultimate objective is to *"establish a fully competitive electricity market, where electricity generation, transmission and distribution activities are fully unbundled"* (Osman, 2014, p.25). Additionally, the Egyptian government stated in its 2035 Integrated Sustainable Energy Strategy that *"the regulated market would gradually contract and customers would transfer to the competitive market over time"* (Arab Republic of Egypt, 2015, p.21).

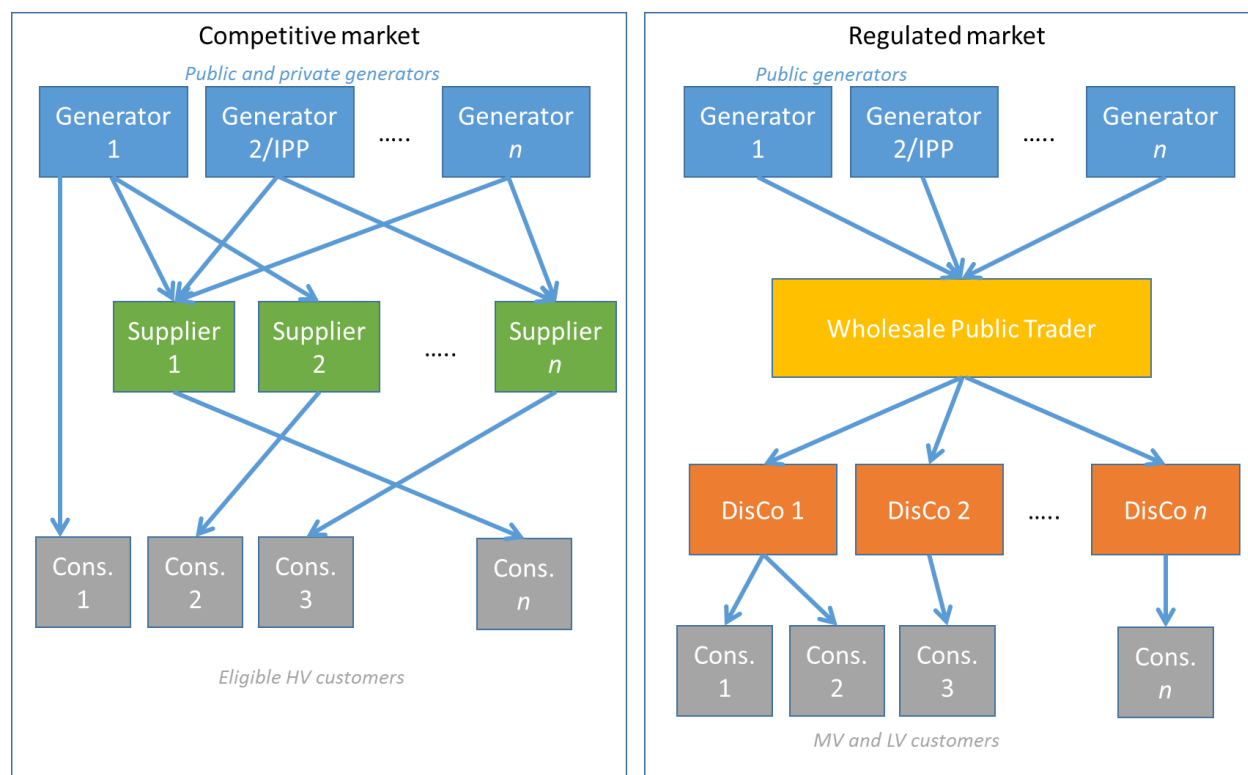


Figure 18: Egypt's new electricity market structure. The first tier of the market will be competitive and will supply high voltage customers (HV), who will freely choose their suppliers based on a bilateral contract and negotiated electricity prices. The second tier of the market will pay a regulated tariff and will purchase electricity from the distribution companies who will be supplied by a single Wholesale Public Trader.

The planning of the reform process, as set out in the Electricity Law is as follows:

1. Eight years (so until 2023) for the EEHC and its subsidiary gencos and discos to implement the restructuring, as stated in the law.
2. Three years (so until 2018) for the EETC and EEHC to make the necessary grid capacity and expansion studies;

3. Three years (so until 2018) for the restructuring of the EETC to comply with its duties to become a TSO, as stated in the law (Sharkawy & Sarhan Law Firm, 2015).

Even though these reform ambitions have been formulated and the legal mandate for these reforms went into effect, the precise status of the reforms is unclear (Anonymous 1, 2018; El-Salmawy, 2018, El-Sobki, 2018). It is however clear that the reforms have been stalled for mainly two reasons. First, the reform of the electricity tariffs or subsidies goes slower than expected, mainly because they are so politically sensitive (Anonymous 6, 2018). Second, within the government there is no commitment for the reforms and rivalry among public entities that will have new role in a liberalized system, as will elaborated on in chapter 7.

In addition to the goals of electricity sector liberalization, the Egyptian government stated broader energy targets, which include increasing the share of renewables in the energy mix (37% by 2035), ensuring energy security, increased private sector participation, reducing energy consumption, and reducing emissions and pollutants (Arab Republic of Egypt, 2015).

6.2 The Political Economy of Egypt

After the sector specific analysis, Egypt's political economic situation is described. As discussed in the theoretical framework, a PEA can entail a variety of topics. For this research, the decision is made to focus on Egypt's national structural characteristics, it's macro-economic situation and political institutions. These aspects are based on the delineation made by Eberhard & Godhino (2017).

6.2.1 National Structural Characteristics.

Egypt is located in the Middle-East and North Africa and shares borders with Libya in the west, Israel and the Palestinian territories in the northeast, and Sudan in the south. With an estimated 100 million inhabitants it's the most populous country in the Arab world, and the third in Africa (after Nigeria and Ethiopia). Demographically, the country consists of a Muslim majority (90%) and Coptic minority (10%)(CIA Factbook, 2018).



Figure 19: Map of Egypt. Source: CIA Factbook (2018).

6.2.1.1 Egypt's recent history

Egypt's became an important player on the world stage since the completion of the Suez Canal in 1869. In addition to being a crucial global transportation hub, the canal also generated a considerable amount of revenue for the Egyptian state. For this reason, the United Kingdom seized control over the Egyptian government, until Egypt's independence in 1952 (CIA Factbook, 2018). After independence, Gamal Abdel Nasser took power in 1954 and remained president until 1970, followed by Anwar Sadat (from 1970 to 1981). In this time period, Egypt became a socialist country, described by Nasser himself as "Arab Socialism".²⁹ Significant historical events since that time include the Suez Crisis, the Six Day- and the October 1973 War (both with Israel) and the assassination of President Sadat in 1981. One month later, Hosni Mubarak (Vice-President under Sadat) took over.

During the last decade Egypt went through turbulent political times as well. Inspired by the revolution in Tunisia in 2010, known as the 'Arab Spring', violent protests erupted in 2011 in Egypt as well, leading to Mubarak's ouster. The Egyptian Armed Forces took control until 2012 when presidential elections were held, won by Mohamed Morsi, a leading figure in the Muslim Brotherhood. In 2013, again, violent protests erupted against Morsi and the Muslim Brotherhood, resulting in a coup where the Egyptian Armed Forces seizing control and removing him from power. In May 2014, and two revolutions later, the Egyptian people voted former Armed Forces General Abdel Fattah El-Sisi into power, together with a new constitution.³⁰

²⁹ Socialist laws and policies made in that era under Nasser, shaped Egypt's economy for good. The outcomes (i.e., the government being the biggest employer, heavy subsidized utilities and certain types of food, underdeveloped private sector) are still visible today, as will be described further on. (Ibrahim, 2003).

³⁰ Whether these coups by the Armed Forces were justified or not, it dims the prospect of long term stability. Collier (2007) defined several so called 'traps', of which a 'coup trap' is one; "once a country has had a coup it is much more likely to have further coups" (p.36). The two biggest risk factors for a coup are according to Collier (2007) low income and low growth, one of the main reasons for the discontent that started the revolution in 2011.

In March 2018, President Sisi was re-elected, although without any serious opponents (CIA Factbook, 2018; Michaelson, 2018).

6.2.2 (Macro-)economic situation

With a GDP of 306 billion USD and 3.400 USD per capita (nominal), Egypt is a developing economy and a middle-income country.³¹ 27,8% of its citizens live below the national poverty line.³² The Egyptian economy is bigger than most of its counterparts in the Middle East, but throughout the last decades, until today, it has been characterized by an oversized bureaucratic apparatus, corruption, inefficiencies and a high foreign debt. These are among others the reasons mentioned in the World Bank's Ease of Doing Business index of 2017, to justify Egypt's ranking being 128 among 190 countries (World Bank, 2017). Egypt's macro-economic situation worsened after the two earlier described revolutions. Foreign investors leaving the country, slowed economy growth, a high public debt, a growing current account deficit and declining foreign exchange reserves resulted in 2016 to Egypt being subjected to a 3 years IMF-reform program. Up to the date of the writing of this thesis, the IMF reported progress in decreasing foreign exchange reserves and a decrease of budget and current account deficits. However, structural reforms of the Egyptian economy (corruption, size of the government, subsidy schemes) remain slow because of 'vested interests' in the status quo (IMF, 2017). This current state of Egypt's economy will be explained by a brief explanation of Egypt's economic history and the classification of Egypt as a rentier state in the following paragraphs.

6.2.2.1 Economic History

When Nasser came to power in 1952, the Egyptian economy was state-controlled as a result of his socialist national policy. The current 'top-heavy' economy can be traced back to the belief at that time that strengthening of the public sector is the main way to develop a planned economy. Companies were nationalized (including the Suez Canal in 1956), the state spent heavily on social services and introduced land reform. In 1961, State Owned Enterprises (SOEs) monopolized the banking and manufacturing sector, foreign trade and almost the entire transportation sector. An important milestone was the National Charter of 1962, which officially institutionalized the control of the state in Egypt's economy. For example, the government guaranteed employment for those with a secondary school diploma, and subsidies were provided for utilities (including electricity) and food (Alissa, 2007; Ibrahim, 2003).

A socialistic economic policy remained the status quo until, led by President Anwar al-Sadat, the economy opened for foreign investment and private sector participation was promoted. This was needed since the growth of the Egyptian economy stagnated under Nasser; the annual GDP growth declined from an average of 7.52% between 1959 and 1965, to 2.85% between 1965 and 1973 (Alissa, 2007). Sadat's new economic policies aided to increase annual GDP growth rates (8% on average between 1974 and 1985). This growth, however, was not sustainable in the long term; a large part of this growth was consisted of 'windfall rents' as will be described further on in this paragraph. These revenue rents were distributed among the lower class citizens by means of subsidies, and the upper class was rewarded by favorable import conditions. An overvalued exchange rate and declined domestic demand (and therefore

³¹ See appendix D for an overview of a variety of socio-economic indicators.

³² 5,787.9 EGP annually and 482 EGP monthly, in 2016.

production) combined with financing at very high interests rates resulted in a foreign debt of more than 100% of the gross national product in 1981. Eventually, in under pressure from the IMF, the Egyptian government proposed to reduce subsidies, but because of heavy riots and protests from citizens as a result, this plan was stopped (Alissa, 2007). This phase is particularly telling because similar events happened during following decades; an underdeveloped private sector, lack of foreign currency, high debts and an oversized government which lead to partially successful reform efforts (Alissa, 2007; Beblawi, 2008). As a consequence of the continued poor shape of the Egyptian economy, Egypt is since 2015 subjected to a fiscal consolidation program by the IMF. This shows that structural factors must lay behind this economic performance.

6.2.2.2 Role of the army in the economy

An often mentioned structural factor is the important role the army plays in Egypt's economy, which is seen by many as one of the biggest constraints for developing an inclusive economy with a space for the private sector (European Parliament, 2018; Marshall, 2015; Anonymous 1, 2018; Anonymous 11, 2018; Reuters, 2018; Boukhari, 2017). The army fulfilled this role already since the sixties, but since 2011 it has deepened its involvement in the economy. Marshall (2015) states:

The Egyptian military has gained unprecedented power since overseeing the ouster of two Egyptian presidents, Hosni Mubarak in 2011 and Mohamed Morsi in 2013. With its major political rivals sidelined, more than \$20 billion in Gulf aid, and widespread domestic support for General-Turned-President Abdel Fattah el-Sisi, the Egyptian Armed Forces (EAF) has restarted its defunct industrial operations, secured control over massive infrastructure projects, and inserted generals at virtually all levels of government (p.1).

A precise overview of the size of the army's activities is hard to provide because no publicly accessible reliable data or information exists. But according to Reuters (2018) and Boukhari (2017) its activities are diverse and include cement production, infrastructural projects, fish farms, supermarkets, hotels and clothing manufacturing. The army has in the sectors it operates a competitive advantage; it is exempted from taxes, import and export duties, has free labor in the form of conscripts, and exempted from tendering procedures or construction permits (European Parliament, 2018; Boukhari, 2017; Reuters, 2018).

6.2.2.3 Egypt as rentier state

The macroeconomic performance of a state can obviously be explained by a variety of factors, which will be outside the scope of this research. However, the rentier state theory can explain some of these structural factors, and is especially applicable on countries in the Middle-East (Beblawi, 1987). Several authors classified Egypt as a (semi-) rentier economy (Beblawi, 2008; Richter & Steiner, 2008; Fuinhas & Marques, 2013). Rentierism (an 'unearned' stream of income) is defined by Beblawi (1987) as indicated four general characteristics of a rentier economy:

- The rent is a relatively important source of income
- The rent has an external source
- The rent is generated by a limited number of people
- The rent is predominantly channeled the government

What rents separates from profit is that it is not reinvested to promote production. This is especially the case in Middle-Eastern countries that traditionally have an economy that is heavily dependent on the export of oil and gas, combined with authoritarian regimes.³³ Boussaid (2017) added several other characteristics of a rentier state which include among others a repressive state, lack of competition, an expanding bureaucracy and an underdeveloped civil society.

Figure 20 shows a visual representation of the fiscal sociology of a 'normal' tax state; interdependencies and feedback loops can be seen between the government, citizenry and the private sector (Hertog, 2013).

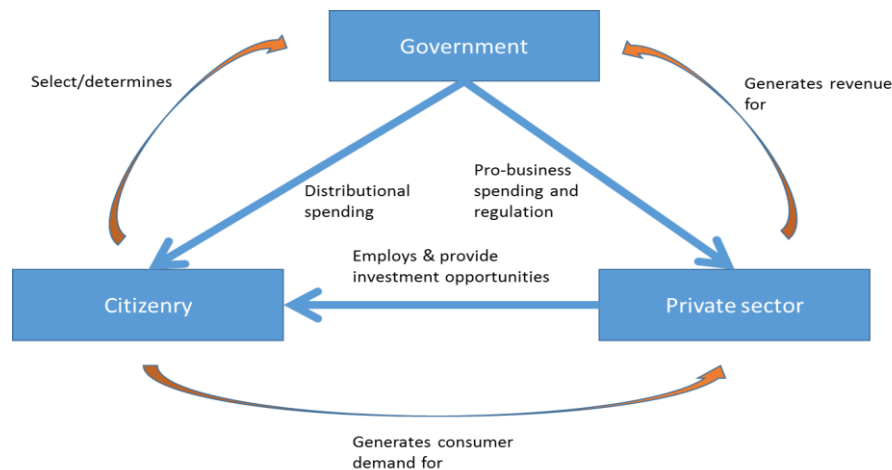


Figure 20: Visualization of a 'normal' tax state. Adapted from Hertog (2013).

Figure 21 displays the fiscal sociology of an authoritarian rentier state and is generally applicable on Egypt. Several feedback loops do not exist in this case; there are no free elections, the private sector is underdeveloped and the majority of Egyptians are either employed by the government or work in the formal sector. The government in this case functions as arbiter (Boussaid, 2017).

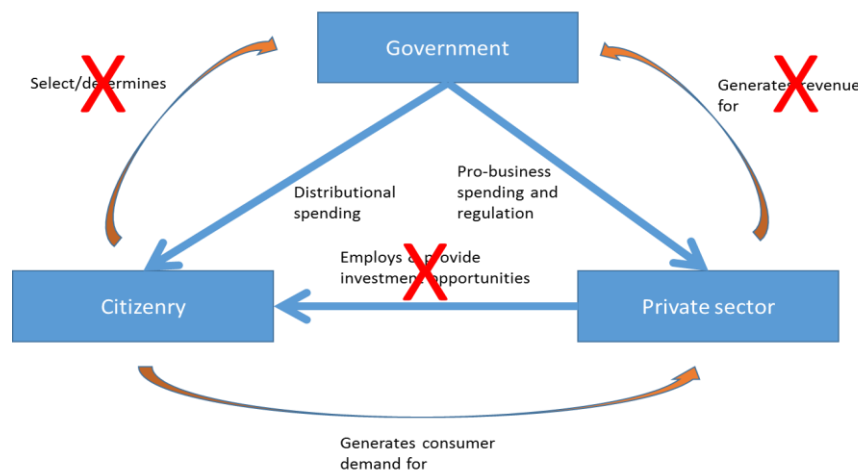


Figure 21: Visualization of a rentier state. Adapted from Hertog (2013).

³³ The type of regime in Egypt will be discussed in the next paragraph.

In Egypt, there are several types of resources for these rents. Rents from raw materials like oil and gas, location rents generated by the Suez Canal and the SUMED pipeline, strategic or political rents generated by grants and soft loans directly given to Egypt for military and budgetary aid, workers' remittances and tourism revenues (Richter & Steiner, 2008). A large share of the government's income earned by rents are spend on subsidies (visualized Figure 20 and 21 by the 'distributional spending' arrow) and provision of jobs within the government. As described earlier, these subsidy schemes are deeply rooted in Egypt's fiscal policies, already since the 50s under President Nasser. Alissa (2007, p.12) stated the following:

"The Egyptian state is caught in a quandary. On the one hand, it wants to pursue reform efforts because its current economic conditions and external pressure from international financial institutions do not permit it to pursue expansionary measures and policies of granting subsidies. On the other hand, the social and political price of abandoning this role and public spending programs has been greater than what could be borne by the Egyptian state; it has been faced with resistance from people who are negatively affected by these measures[...]".

This quandary and Egypt's rentier state characteristics in general, can be problematic for sector reforms that have the aim to increase private sector participation. This is the case for Egypt's electricity sector reforms that includes a long term plan to create a fully competitive wholesale market with retail competition. How the outcomes of the PEA will influence the choice for a suitable type of restructuring for the Egyptian context, will be explained in chapter 5

6.2.3 Political institutions

Egypt is a presidential republic, currently headed by President El-Sisi who, at the time of writing, has been recently re-elected for his next four-year term. The current system of government has been established after the revolution of 2011, and the resignation of former President Hosni Mubarak. The parliament is unicameral and can be dissolved by the President. Being the legislative branch of the government, the parliament enacts laws, approves general policies and plans as well as the general budget.

Egypt is *de jure* a democracy but is widely considered as authoritarian.³⁴ Amr Hamzawy summarized in a Carnegie Endowment for International Peace report in 2017 the current state of Egypt's political institutions as followed:³⁵

Egypt's new authoritarian regime is rapidly closing the public space—cracking down on autonomous civil society and independent political parties, asphyxiating the practice of pluralist politics, and thwarting citizens' peaceful and active engagement in public affairs. The government's primary strategy is to institute wide-scale repression through lawmaking and justify its behavior through conspiratorial and populist narratives. With unprecedented resolve, it has passed new protest and terrorism laws, introduced legal amendments targeting nongovernmental organizations, and extended the military court's

³⁴ In The Economist Intelligence Unit's Democracy Index, Egypt scores a 3,36 which makes it an authoritarian regime.

³⁵ Hamzawy's observations might seem too negative or biased/unbalanced. The author of this thesis witnessed the 2018 presidential elections and the process towards it from up close (and the political situation in general), and can verify Hamzawy's conclusions.

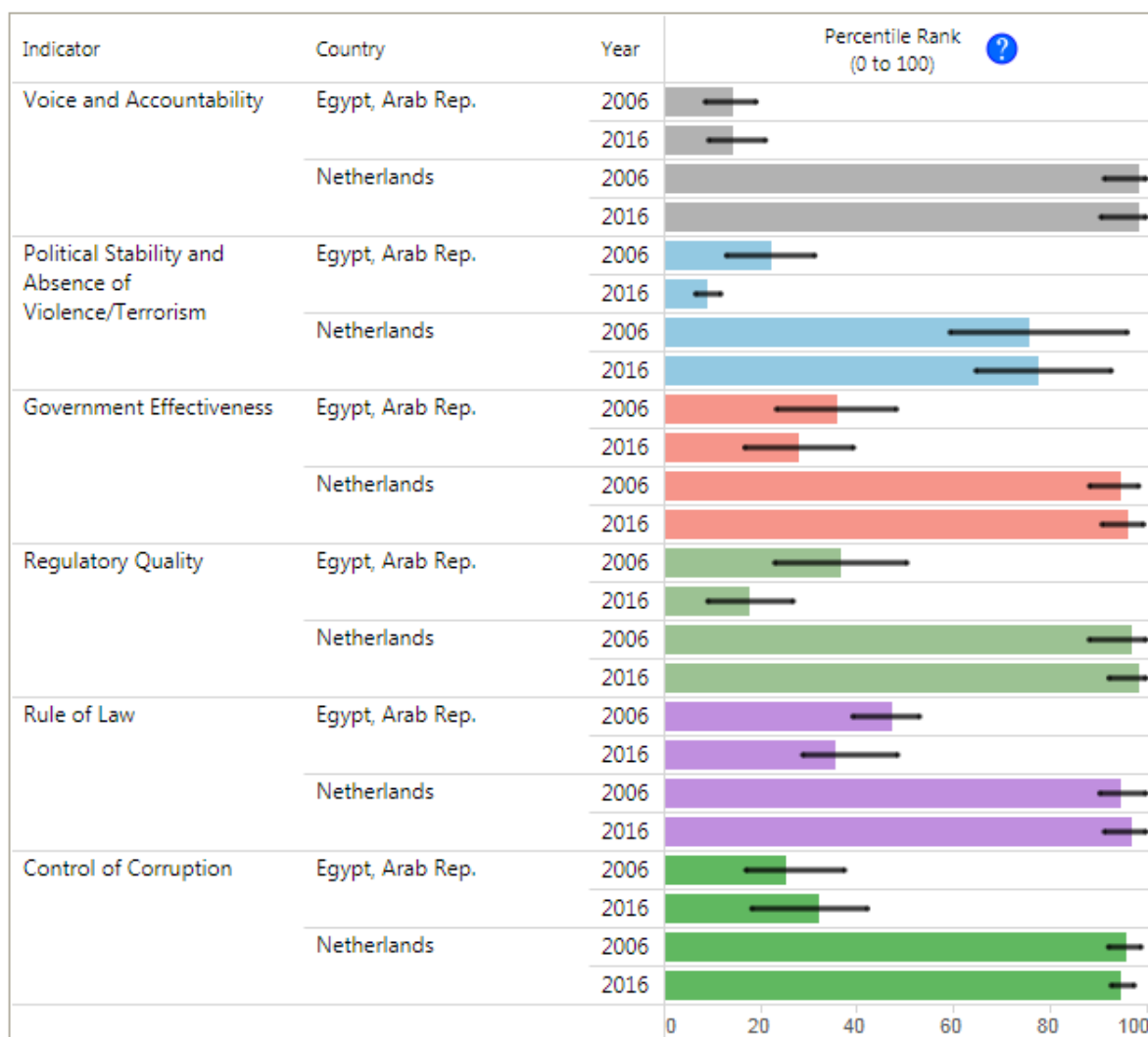
jurisdiction. Essentially, the regime is adapting lawmaking for its own purposes (Hamzawy, 2017, p.1).

Some hoped that after the Arabic spring Egyptian politics would transform slowly to a more democratic system with ‘good governance’. However, a variety of authors concluded that this has not happened and that *de facto* democratic governance in Egypt is unlikely in the short run (Ahmed & Capoccia, 2014; Bhuiyan, 2015; Tadros, 2014).

Governance indicators

The World Bank publishes annually the World Wide Governance Indicators for six dimensions (see Table 5). Each indicator is ranked from 0 to 100. In the case of Egypt, a general negative trend can be seen when comparing the indicators between 2006 and 2016.

Table 5: World Wide Governance Indicators for Egypt and the Netherlands. Source: World Bank (2018).



An authoritarian regime (as currently is the case in Egypt) does not necessarily mean that a government is ineffective. For example, China and Saudi-Arabia who both score 7 on the ‘Voice and Accountability’ indicator, score respectively 68 and 63 on ‘Government Effectiveness’ (World Bank, 2018). However, in

Egypt's case these are both relatively low. The same goes for 'Regulatory Quality' that has dropped sharply since 2011 in Egypt. This is line with the earlier described findings by MedReg (Mediterranean Energy Regulators) that Egypt's regulatory agency (EgyptERA) lacks independency and (therefore) a clear mandate. Since the literature study showed that regulatory capacity is key for a successful reform of an electricity sector (and other types of infrastructures/utilities) in general, this low score should be duly considered when proposing a suitable restructuring modality.

7. Towards a suitable restructuring modality

SQ3: How can the contextual analysis be used to determine the most suitable type of restructuring?

- d) *What does the institutional and technical structure of Egypt's electricity sector look like and what are the goals and policies of the government for market-oriented reform?* [Chapter 6]
- e) *What does Egypt's political-economic context look like?* [Chapter 6]
- f) **How can the formulated criteria be applied on Egypt by using the context analyses and stakeholder and expert interviews?**

In this chapter the criteria as outlined in chapter 5 will be applied on Egypt.

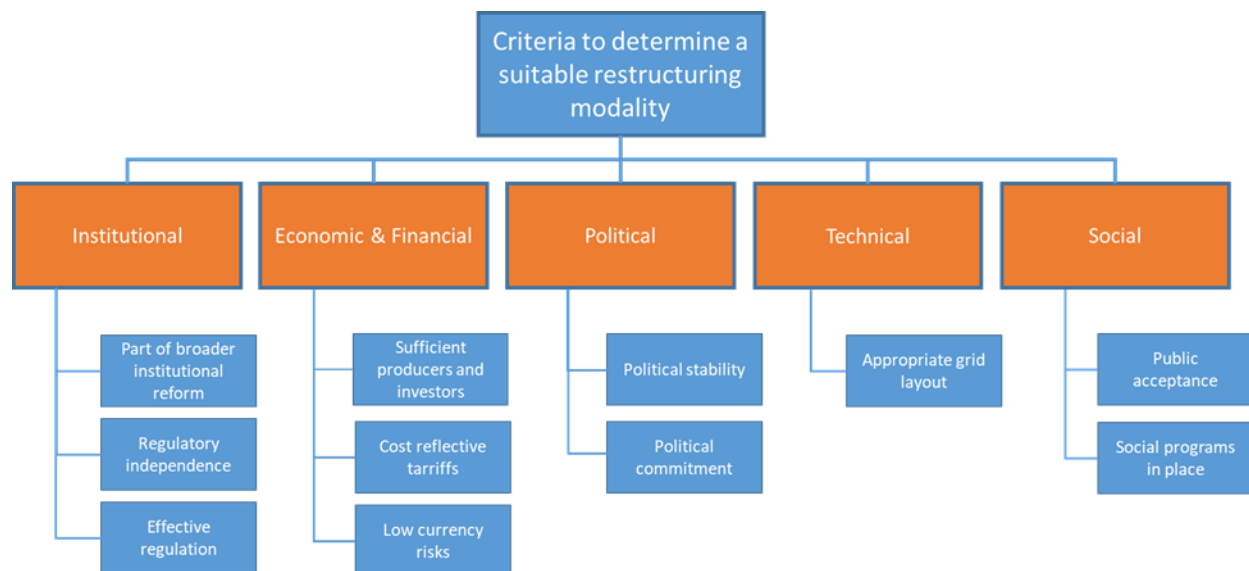


Figure 22: Overview of the criteria defined in chapter 5.

7.1 Institutional

7.1.1 Part of broader institutional reform

Since 2015 Egypt is subject to a comprehensive fiscal reform program by the IMF (Extended Fund Facility). Because of decades of financial and economic mismanagement, combined with an acute lack of foreign currency due to investors fleeing the country after two revolutions, reform was needed to prevent the Egyptian economy from collapsing. Since then, bold reforms have been implemented to improve the investment climate and Egypt's fiscal situation (a more elaborate description of Egypt's investment climate will be given in paragraph 7.2). For example, the floatation of the exchange rate, the introduction of a Value Added Tax (VAT), a Civil service Reform Law and a new Investment Law was passed in 2016, and energy subsidies are being phased out. This reform program is widely endorsed and complemented by the major development stakeholders and IFIs in Egypt (The World Bank, EBRD and AfDB) (World Bank, 2018c).

The precise scope of this program is however difficult to define. The IMF is focusing on macroeconomic policies and tends to stay out of politics. It is involved in governance aspects, but only those that are the

most closely related to transparency of government accounts, the effectiveness of public resource management, and the transparency of the regulatory environment for the private sector (IMF, 1997). These aspects obviously have an influence on the electricity sector. An improved investment climate induced by these reforms will attract private (foreign) investors, a crucial pre-condition for a liberalized and competitive electricity sector. In that case you can argue that indeed the electricity sector reforms are part of broader institutional reform. However, it became clear after the PEA that by looking at the past decades, reform programs like this are not new to Egypt. It already happened multiple times; an underdeveloped private sector, lack of foreign currency, high debts and an oversized government that leads to partially successful reform efforts (Alissa, 2007; Beblawi, 2008). So apparently there are 'structural' factors outside the direct fiscal or macro-economic scope that prevent successful, long term reform.

6.1.1.1 Reform effectiveness

Despite the wide accreditation from among others the IMF for Egypt's implementation of the above described reforms, many stakeholders and experts are concerned that structural challenges remain preventing long term economic stability (EIU, 2018; Anonymous 11, 2018, Momani, 2018; Anonymous 1, 2018). These challenges include the big role the army has in the economy, the size of the government, income inequality, and increasing political oppression and a shrinking space for the civil society (Momani, 2018; EIU, 2018). Even the IMF raised its concerns in a report about the progress so far:

"The risks to the program mainly arise from the difficulties inherent in implementing a strong and wide-ranging reform program. [...] Structural reforms are vulnerable to opposition by vested interests." (IMF, 2017, p2).

Successfully liberalizing an electricity sector will take years, sometimes even decades. This is also the case in developed countries. In the UK for example, it was in 1990 when the reform progress started but only in 1998 there was full competition on the generation side (Wamukonya, 2003). So if broader institutional reform is in place but is not fully implemented, there is a risk that Egypt again ends up in a macro-economic and fiscal condition as was the case before the IMF reform program, just after the two revolutions. This will without any doubt negatively influence the liberalization process.

6.1.2 transition indicators

The EBRD most recent measurement of Egypt's transition indicators was done in 2014, so before the IMF reform program started. Table 19, provides an overview of the progress so far in 6 types of reform, as classified by the EBRD.

Table 19: EBRD's transition indicators for Egypt. Adapted from EBRD (2018).

Transition indicator	Rating (1-4+) 2014	Corresponds with
Large scale privatization	3,0	More than 25 per cent of large-scale enterprise assets in private hands or in the process of being privatized (with the process having reached a stage at which the state has effectively ceded its ownership rights), but possibly with major unresolved issues regarding corporate governance
Small scale privatization	3,7	Almost complete privatization of small companies with tradable ownership rights.

Governance and enterprise restructuring	2,0	Moderately tight credit and subsidy policy, but weak enforcement of bankruptcy legislation and little action taken to strengthen competition and corporate governance
Price liberalization	3,3	Significant progress on price liberalization, but state procurement at non-market prices remains substantial
Trade & Forex system	4,0	Removal of all quantitative and administrative import and export restrictions (apart from agriculture) and all significant export tariffs; insignificant direct involvement in exports and imports by ministries and state-owned trading companies; no major non-uniformity of customs duties for non-agricultural goods and services; full and current account convertibility
Competition Policy	1,7	Competition policy legislation and institutions set up; some reduction of entry restrictions or enforcement action on dominant firms.

This measurement shows that reforms are implemented, with a different rates of progress. For this research however, the criterion is operationalized booleanly; are there broader reforms present or not? The answer is yes, its long term effect has yet to be seen.

7.1.2 Regulatory Independence

Egypt's regulatory agency, EgyptERA, is not independent (El-Salmawy, 2018; El-Salmawy, 2017; MedReg, 2014; Abrardi et al., 2016; El-Sobki, 2018; Anonymous 14, 2018). The main reasons being that it is still directly connected to MoERE; the Minister of Electricity is the head of the Board of Directors. Additionally, the board of the regulator consists of representatives from all the public stakeholders in Egypt's electricity sector, the majority of which being stakeholders EgyptERA has to regulate. Also the funding for EgyptERA comes directly from the companies it regulates, and not from levies paid by the consumers. Its independence is even stipulated by the fact that EgyptERA does not own its own office space; it is renting floor in a building owned by the EEHC; the holding company it has to regulate in a liberalized market (MedReg, 2014). Finally, EgyptERA cannot decide fully on its own internal organization; this has to be done in accordance with the legislative body, in this case the parliamentary Supreme Council of Energy (Abrardi et al., 2016).

This criteria has been operationalized by assessing its decision making independence, as well as its funding. The highest decision making body of the agency is the board of directors consisting of all public electricity sector stakeholders and chaired by the Minister of Electricity. Its funding comes directly from the companies it regulates so in both aspects EgyptERA is not independent.³⁶

7.1.3 Effective regulation

An often mentioned shortcoming of Egypt's regulatory agency is transparency and communication with the public (El-Salmawy, 2018; Anonymous 1, 2018). The previous head of the regulator, Hafez El-Salmawy goes as far by saying there is *'almost zero communication and mutual understanding between the citizens*

³⁶ Anonymous 14 (2018) mentioned, not in line with the literature, that having a regulator that is still connected to the government is desirable because it makes decision making easier. This will be elaborated on in the discussion and recommendation. According to him, there is a tendency within the Egyptian government to not trust entities outside the government, or at least cooperating with them is problematic. Right now, the communication lines with the government are short, and as long as the right decisions or proposals are being made, this counter-intuitive institutional set-up can benefit the reform process.

and the regulator' (El-Salmawy, 2018). Since EgyptERA is also involved in the setting of the tariffs, communication with the public is needed considering the big social and political impact it has. EgyptERA is making an effort to communicate with civil society, but the Egyptian government is obviously not in favor of that (El-Salmawy, 2018).

Regarding the accountability, predictability and proportionality, EgyptERA is publishing annual reports, tariff information and newsletters on its website³⁷ and makes annual plans and performs audits on the regulated companies. These results of this audits/benchmarking reports are presented to the board of directors and a detailed report is shared with the regulated company it involves. However, there is no action taken for any company with a bad performance (MedReg, 2014).

A transparent auditing mechanism of EgyptERA's financial operations is put in place by the regulator itself and is being done by an independent party. Its financial accounts are submitted to the Accountability State Authority (ASA) and both results are published on EgyptERA's website.

EgyptERA is a well-functioning regulator on paper. MedReg (2017) published a report with a complete overview on how electricity sectors in the Mediterranean region are governed and each regulator is analyzed according to several dimensions (such as independence, organization, transparency and accountability). Based on their finding it can be concluded that all these dimensions or pre-conditions are in place. The reality however is different as became clear after consultations with experts and stakeholders. In the author's opinion this is caused by the government giving the regulator not enough leeway to operate, and not primarily by a lack of commitment or knowledge by the regulator itself.

7.2 Economic & Financial

7.2.1 Sufficient producers and investors

7.2.1.1 General investment climate

It became clear after the PEA that Egypt's general investment climate is far from optimal which can be traced back to the economic policies pursued by Gamal Abdel Nasser in the sixties. Heavily subsidized goods ranging from electricity to bread, an oversized government that believes that strengthening the public sector is the main way to develop the economy, a heavily dependency on 'rents', and a large economic role for the army (see paragraph 7.2), are among the main factors that prevent the Egyptian economy from developing and creating a fertile investment climate for the private sector.

Anonymous 11 (2018) confirms this. Even after the implementation of the IMF reform program and the new investment law, foreign direct investment (FDI) is not picking up (except for the oil and gas sector). The general investment climate remains poor, mainly because of endemic corruption and bureaucracy in every level of the government, a lack of rule of law, and the increasing large role army plays in the economy (Anonymous 11, 2018; Anonymous 1, 2018; Momani, 2018).³⁸ These are also, among others, the reasons mentioned in the World Bank's Ease of Doing Business index of 2017, to justify Egypt's ranking being 128 among 190 countries (World Bank, 2017). Similarly, in the WEF's Global Competitiveness Index, Egypt ranks 100 out of the 137 countries included in the index. Based on these indexes, the PEA, and the interviews with stakeholders, Egypt's general investment climate can be labeled as poor.

³⁷ However, the author visited this website and found it very user unfriendly and outdated.

³⁸ These are the structural factors as discussed in paragraph 7.1.1

7.2.1.2 Investment climate for the electricity sector

Currently the electricity sector is still dominated by the government. There is competition on the generation side but this is only between 2 and 5%.³⁹ EEHC therefore owns the vast majority of the market and is according to Anonymous 14 (2018) not willing to give up this majority share. Additionally, only 1% of the distribution capacity is privately owned.

A big concern regarding existing agreements between the government and private investors (PPAs), is the worry that disputes with the Egyptian government will not be treated fairly and impartial (Anonymous 6, 2018; Momani, 2018). In 2017 it was decided that the president has the authority to appoint heads of judicial bodies. Whatever confidence there was in Egypt's judicial bodies, has as a result mostly left. Subsequently, a number of foreign investors who entered PPAs left the country (Momani, 2018).

Private investors would like to have sovereign guarantees (Scheepens, 2018), but the Egyptian government is currently hesitant to give those and therefore has no track record in guaranteeing investments (El-Salmawy, 2017; El-Salmawy, 2018). Finally, Anonymous 14 (2018) mentioned that when the Siemens plants will come operational, there will be a huge overcapacity in the market. The question then remains if there is still a sufficient demand for private sector generation.

Concluding can be said that attracting sufficient producers and investors in order to operate a competitive market is difficult in Egypt, because of its general challenging investment climate, the reluctance of SOEs to give up its majority share, worries related to the legal settlement of investment disputes, lack of sovereign guarantees, and an overcapacity in the near future.

Despite the big potential (100 million customers) of the Egyptian electricity market, the current investment conditions are not sufficient enough to attract the investors and producers needed for a competitive market in the short run.

7.2.2 Cost-reflective tariffs

Energy in Egypt has always been heavily subsidized; in 2014, the amount of subsidies equaled 7% of Egypt's GDP, or 22% of the national budget (El-Markabi, 2015). This has not only a big impact on the government's annual budget, but it also negatively influences energy efficiency and organizations like the EETC and the Discos cannot adequately recover their costs (World Bank, 2014).

As part of the IMF reform program, the government has started with the gradual phase-out of the subsidies. Table 20 below shows the electricity prices for every consumption bracket over the past years, together with the percentage increase.

³⁹ The author heard and read different percentages, but they were all in this range. This is another example of the difficulties in getting reliable information when doing research in Egypt.

Table 20: Overview of the household electricity tariffs from 2015/2016 until 2017/2018

Consumption bracket (kWh/month)	2015/2016 (piasters/kWh) ⁴⁰	2016/2017 (piasters/kWh)	2017/2018 (piasters/kWh)	2017/2018 (piasters/kWh)
0-50	7,5	11,0 (+47%)	13,0 (+18%)	22,0 (+69%)
51-100	14,5	19,0 (+31%)	22,0 (+15%)	30,0 (+36%)
101-200	16,0	21,5 (+34%)	27,0 (+26%)	36,0 (+33%)
201-350	30,5	42,0 (+38%)	55,0 (+31%)	70,0 (+27%)
351-650	40,5	55,0 (+36%)	75,0 (+36%)	90,0 (+20%)
651-1000	71,0	95,0 (+34%)	125 (+32%)	135,0 (+8%)

But despite the recent decrease in subsidies and therefore increase in electricity prices, electricity remains heavily (cross-)subsidized; on average consumers pay around 20% of the actual production costs. The production costs of 1 kWh costs approximately 1 EGP, or 100 piasters (Egypt Independent, 2018). If compared with the tariffs charged for the different consumer types, it can be seen clearly that the consumers in the highest consumption bracket cross-subsidize in the lower ones. This table only shows the prices for households. The commercial and industrial tariffs are higher. Using the same scale as in table 20, users in the 101-200 kWh/month consumption bracket pay 1 EGP per 100 kWh, so that is where in the case of commercial and industrial tariffs the cross-subsidizing starts.

The original plan was to phase out electricity subsidies completely in 2018/2019, but this has been postponed until 2021/2022. Because of the floatation of the pound (also part of the IMF program) and the rise in gas prices (in USD), the projections for the government to phase out the subsidies have been delayed. Another often mentioned reason is the political sensitivity of the topic. The government is dealing with this issue in a lot of secrecy because they are aware of the public discontent (Anonymous 6, 2018). Because of this, some see the risk of the government not completing the tariff reform program (Anonymous 1, 2018; Anonymous 11, 2018). This has happened before in the last decades as the PEA showed; in 1981, an overvalued exchange rate and declined domestic demand combined with financing at very high interests rates resulted in a foreign debt more than 100%. Eventually, under pressure from the IMF, the Egyptian government proposed to reduce subsidies, but because of heavy riots and protests from citizens as a result, this plan was stopped (Alissa, 2007).

Concluding can be said that despite reform efforts, cost-reflective tariffs are still in place, at least until 2022. The process to phase-out the subsidies have been delayed and there is a chance that the government delays again or even stops with the reforms entirely, as happened earlier in Egypt's recent history. Anonymous 14 (2018) believes that without cost-reflective tariffs, private investors will not come to Egypt.

⁴⁰ On March 27th, 2018, 1 piaster (a hundredth of an Egyptian Pound) equaled 0,00046 euro.

7.2.3 Low currency risks

The most recent EIU's risk analysis (August 2018) for Egypt can be seen in the table below.

Table 21: EIU's risk analysis for Egypt, August 2018. Source: EIU (2018)

Sovereign risk	Currency risk	Banking sector risk	Political risk	Economic structure risk	Country risk
B	BB	BB	CCC	CCC	B

A currency risk of BB corresponds with capacity and commitment to honor obligations currently but susceptible to changes in economic climate. This is an improvement from the month July (B rating) and part of a downward trend since the floatation of the pound in February 2017. However, the total country risk (derived by taking a simple average of the scores for sovereign risk, currency risk, and banking sector risk) remains B (EIU, 2018). These findings correspond with medium currency risks.

7.3 Political

7.3.1 Political stability

When operationalizing this criteria it became clear that there are many views on the precise definition of political stability. This became also clear during this research. When using the definition of political stability by Radu (2015) the risk of a violent overthrow by the current government is not high on the short term. In the most recent report of the Economist Intelligence Unit is stated:

"[...]the kind of instability that prevailed in the period between the toppling of the former president, Hosni Mubarak, in 2011 and the election of Mr Sisi three years later will not be repeated. This is because Mr Sisi exercises strong control over the military and the internal security apparatus, both of which are sufficient to ensure regime survival during the forecast period. Given the low risk of regime change, the pro-business policy direction under Mr Sisi will be maintained and reinforced, minimizing the uncertainties facing companies during Egypt's ongoing political and economic transition." (EIU, 2018, p.4)

This is confirmed by Anonymous 11 (2018), who also emphasizes that it remains to be seen how the current population accepts the rising costs of living because of the subsidy reform.

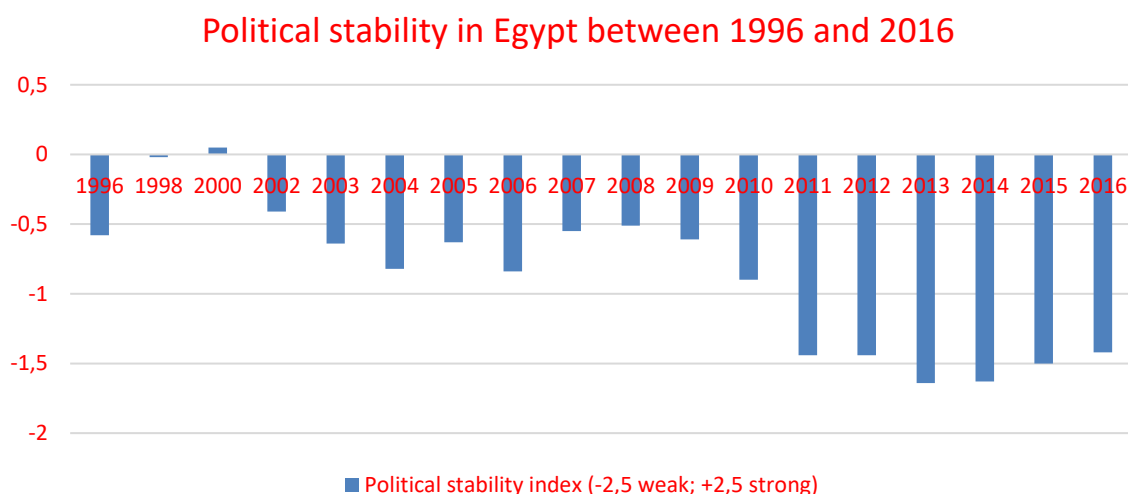


Figure 23: An overview of the political stability in Egypt between 1996 and 2016. Source: World Bank (2017).

The 'Political Stability Index' of the World Bank has data for Egypt between 1996 and 2016. During that time, the average was -0.86, and a minimum of -1.64 during the second revolution when Morsi was overthrown (World Bank, 2017). When looking at this data it can be concluded that based on the World Bank's data, Egypt can be labeled as unstable. However, this rate is declining and several interviewees mentioned that political change in the short run is unlikely, consistent with the finding of the EIU. Egypt can therefore be labeled as semi-stable. It needs to be mentioned however that operationalization of this multi-interpretable and measurable term is difficult and subject to a lot of discussion (as will be elaborated on in the reflection in chapter 8).

7.3.2 Political commitment

Most of the interviewees mentioned a lack of commitment within both the government and the political system to pursue the liberalization of the electricity sector as outlined in the 2015 Electricity Law (Anonymous 6, 2018; Anonymous 14, 2018; Anonymous 15, 2018; Anonymous 1, 2018; El-Salmawy, 2018; El-Sobki, 2018; Anonymous 12, 2018). However, they mentioned as well that there is a mismatched between:

- The highest and middle management (Anonymous 14, 2018)
- The younger and older generation (Anonymous 15, 2018)
- A limited number of visionaries and the rest of the government (Anonymous 6, 2018).

In all three cases the first being in favor of liberalization, and the latter against it. Many of the interviewees mentioned as well that this is one of the major reasons why the reforms are stalled and why it will take longer than planned to fully implement these reforms. For example, the EETC has an important future role as TSO (who should provide equal third party access), but according to El-Sboki (2018): *"The EETC is not convinced of becoming a TSO, or at least, that is what their activities are currently reflecting"*.

According to El-Salmawy (2017;2018) and El-Sboki (2018) there is also a lack of commitment within the highest levels of the government. Currently, the President and the Parliament are mainly concerned with two things; security of supply and the tariff reform. Although both aspects are needed for well-functioning electricity sector, liberalization is not among the priorities.

Several reasons have been mentioned for this lack of commitment:

- There is a general distrust within the government towards the private sector (Anonymous 6, 2018).
- SOEs are convinced that a state owned/vertically integrated model is not bad, as long as it respects the market rules (however, they are reluctant to accept benchmarking and performance valuation from EgyptERA). Anonymous 14 (2018)
- There is often not enough capacity and knowledge to implement the reforms. Government officials are not trained or educated on liberalization which also results in a lack of commitment (Anonymous 6, 2018).
- SOEs are looking at the reforms as a reduction of their power and are therefore reluctant to implement them (El-Salmawy, 2017).

- The law that laid the legal foundation for the reforms was passed in 2015, after years of political turmoil (two revolutions) and high oil (and therefore gas) prices. This resulted in a lack of capacity, high debts within the SOEs and frequent power blackouts. Liberalization was seen as a way to improve this. Currently, in 2018, there is relative political stability, low oil prices and an overcapacity and (therefore) way less frequent blackouts. This results in a less sense of urgency within the government to continue with liberalization (Anonymous 14, 2018).
- IFIs and donor agencies promoted liberalization, especially the World Bank. This was mentioned by several interviewees as a reasons for a lack of commitment. Others on the other hand argued the influence of IFIs and donors was limited.

Concluding can be said that political commitment is low, which is a major barrier for the implementation of the reforms, specifically for the liberalization.

7.4 Technical

7.4.1 Appropriate grid layout

Even though Egypt's electricity access rate is 99,8%, both its transmission and distribution network is not yet widespread enough, and of a sufficient quality and capacity to facilitate a competitive market (Anonymous 14, 2018; Anonymous 4, 2018; Ghazala & El-Shennawy, 2012). Despite the high access rate, in remote areas the capacity is often not sufficient for commercial or industrial purposes.

Detailed information on Egypt's transmission and distribution grid is hard to get since it is considered as a strategic asset.⁴¹ The existing grid has aging components and is not ready to accommodate new technologies (like new ways of metering) that are needed in a competitive electricity market (El-Shennawy, 2012). Additionally, a lot of new investments in renewables are done in the sparsely populated Ben Ban region, in the south of Egypt. Many doubt if the grid is sufficient to transport the produced electricity towards Cairo and the Delta Region (Anonymous 8, 2018).

The government recognizes this problem and is currently investing significant amounts to upgrade the transmission and distribution network, since it is also closely related with security of supply (see previous paragraph)(Daily News Egypt, 2018; El-Sobki, 2018). Currently, as discussed in paragraph 6.1, the EETC is developing an 'Transmission Expansion Plan', which includes strategies to make the centralized status quo a more decentralized one that facilitates distributed renewable sources and smart micro grids. It will also consist of a plan to increase interconnection with neighboring countries and improvements in 'the weak points' of the system (Arab Republic of Egypt, 2015). Also the distribution part of Egypt's electricity sector will be subjected to performance improvements, based on the Distribution Expansion Plan.

Egypt's transmission and distribution grid serves 99,8% of the population which is a high number if compared to its African counterparts. But, it has aging components and many doubt if the grid is sufficient to facilitate a competitive electricity market. The government recognizes this and is currently

⁴¹ This lack of transparency is sometimes problematic for private parties on the generation side that do not know where grid access point are, and what the capacity is of those points. This makes it often hard to make investment decisions (Anonymous 8, 2018).

investing significantly to upgrade the electricity grid, in terms of quality and lay-out. Both sub-criteria ('sufficient widespread grid layout' and 'capacity and quality of transmission and distribution grid') are therefore classified as semi and medium respectively.

7.5 Social

7.5.1 Public acceptance

Surveys among the population of Egypt to measure their acceptance towards the reforms have not been executed. And to conduct one, requires permission from the government which is unlikely to approve it. Measuring the public acceptance is therefore difficult, but multiple interviewees mentioned that the perception of the public towards the reforms is negative because it is related to the tariff reform and therefore increase in electricity prices. (El-Sboki, 2018; El-Salmawy, 2018; Anonymous 6, 2018; Anonymous 14, 2018). El-Sobki (2018) adds that the people are more price driven, than quality driven. For them, the affordability of electricity is the most important, even if it is coupled with an unreliable supply. As became clear during the PEA, attempts by the government to decrease subsidies have been initiated before, but were reversed because of large public discontent. This discontent is also present today (see also paragraph 7.2.2). Additionally, Anonymous 14 (2018) mentioned that the public is used to the government being the provider of electricity and utilities in general. There is a distrust towards the private sector; for many the 'private sector is a bad word'. What also adds to the discontent according to El-Salmawy (2017, p.22) is that:

"[The public] suffers from uncertainty since there is no clear horizon regarding the prices at which the balance will be achieved. The government has not respected what has been announced before in 2014 for the five-year plan."

The lack of transparency that has been stipulated by the private sector, is therefore also present among the public.

A competitive electricity market will eventually imply cost-reflective tariffs, enforcement of power theft and in the case of retail competition, private sector parties competing for consumers. The public acceptance for these elements is currently lacking, the perception towards the reforms are therefore generally negative. What can mitigate for these negative effects, are social programs as will be described in the next paragraph.

7.5.2 Social programs in place

The pre-reform tariff design set by EgyptERA, takes into consideration the consumers' affordability. The affordability criteria has been set as that the annual expenditure on electricity should be around 4% of the annual customer expenditure. Regarding the expenditure, EgyptERA relies on the bi-annual report issued by CAPMS (Central Agency for Public Mobilization and Statistics) regarding income and expenditure. According to the CAPMS, 26% of the Egyptian population lives below the poverty line. The CAPMS found a correlation between the usage and income, and therefore the consumers using 0-200 kWh receive electricity that is heavily subsidized. This has been paid for by cross subsidies (see also paragraph 7.2.2) (El-Salmawy, 2018).

Currently the subsidies are decreasing and in a competitive market, the cross-subsidies will disappear as

well. There are future plans to introduce a Value-Added-Tax on electricity, which will replace the cross-subsidies (El-Salmawy, 2018). This will improve as well the tariff transparency (Irwin, 1999). However, these are plans that have yet to be implemented. In general, according to a World Bank study on electricity subsidy reform in Egypt, social programs are not yet sufficient to mitigate for the impact on the poor:

“Egypt needs to strengthen and consolidate its social safety net system, in particular, the targeting, communication, and roll out of smart cards. The existing programs have had many weaknesses, including fragmentation and poor coordination; low coverage of the poor; poor targeting performance; and low poverty impact. Egypt’s non-subsidy social safety net system has also been among the least generous in the world, amounting to only about 10% of the poorest quintile’s consumption expenditure (prior to the increase in 2013)” (World Bank, 2017b, p.3).

Concluding can be said that there are currently subsidies in place for the poor segments of society. However, these subsidies are paid for by cross subsidies which will disappear in the future. The current status of new social programs is unclear. It is however clear that the social safety nets in Egypt in general have many weaknesses and need to be improved as well. The answer on the question “are there social in place” is therefore ‘partly’.

7.6 Outcomes & implications

SQ4: What restructuring modality is the most suitable for Egypt according to the contextual framework?

- a) Based on the outcome of the application of the criteria, what are the implications of Egypt's reforms?
- b) Based on the findings and conclusions, what aspects of the standard reform model can be applied on the Egyptian case and which not? [Chapter 9]
- c) What are shortcomings of the proposed type of restructuring and recommendations for future research? [Chapter 9]

7.6.1 Outcome of the analysis

The outcomes of the application of the criteria, as presented below in table 22, make several things clear. The major challenges will be described in this chapter, as well as the implications of the proposed reforms and a recommendation for a suitable restructuring modality.

Table 22: Outcome of the application of the criteria on Egypt

Classification	Criterion	Operationalization	Measurement
Institutional	Part of broader reform	Broader institutional reforms present?	Yes/no
	Regulatory independence	Decision making independence?	Yes/partly/no
		Financial independence?	Yes/partly/no
	Effective regulation	Transparency?	Yes/partly/no
		Accountability?	Yes/partly/no
		Predictable and proportional?	Yes/partly/no
Economic & Financial	Sufficient producers and investors	Investment climate?	Poor/medium/good
	Cost reflective pricing	Cost reflective pricing?	Yes/no
	Low currency risks	Currency Risk	Low/medium/high
Political	Political stability	Political stability	Stable/semi-stable/unstable
	Political commitment	Political commitment?	Yes/partly/no
Technical	Appropriate grid layout	Sufficiently widespread grid layout?	Yes/semi/no
		Capacity and quality of transmission and distribution grid	Poor/medium/good
Social	Public acceptance	Public perception towards reform?	Positive/neutral/negative
	Social programs in place	Social programs in place?	Yes/partly/no

There are several major challenges to overcome before successful implementation of the market-oriented reforms can happen. One of the most important ones, which also influences and is influenced by, the other criteria, is the absence of political commitment. This political commitment is currently lacking at almost all levels of the government. At the level of the president and the parliament, the main priority related to the electricity sector is not liberalization. Their first priority is the phase-out of the subsidies (although part of the reform) and security of supply. Within the Ministry of Electricity itself, there are (according to the interviewed stakeholders) some dedicated officials, or visionaries, who are convinced of the reforms. The lower level officials generally are not. This is obviously problematic for the implementation. Even if the Minister itself is willing to implement reforms but doesn't get the political support at the highest levels, combined with civil servants who are not convinced of the reforms in the first place, the implementation process will get delayed, as is already happening.

There are roughly three reasons for this lack of commitment. First, the Electricity Law in 2015 was approved by the parliament, just when Egypt faced a big energy crisis. Because of the two revolutions, the poor condition of the state owned electricity plants, and high oil and gas prices, there was a shortage of capacity and blackouts happened on a daily basis. Pushed by donor agencies, the belief was that a liberalized electricity sector in Egypt would attract the necessary investments it needed. At the time of writing, three years later, there is an overcapacity in the market. Among others, Siemens secured a contract to install CCTGs with a total capacity of 14 GW which currently results in an overcapacity. Some stakeholders argue that this lack of overcapacity was the reason to push for reforms in the first place, and knowing this issue has been resolved, for now, the priority of the government lays somewhere else.

Second, reforms are now a sensitive topic because it is linked with the phase out of the electricity and fuel subsidies. These subsidies, in place since the 1960s, are deeply rooted in the Egyptian political-economy and an integral part of the social contract⁴² between the government and the people. There is a big discontent among the population with the phase out of the subsidies, especially since they do not see it coupled with a rise in living standards. The government knows this and therefore deals with this topic with a lot of secrecy; the precise status of the reforms is not clear and subsidy reforms/tariff changes are announced at the last minute. It is this lack of transparency that bothers private parties that are investing, or willing to invest, in Egypt's electricity sector.

Third, according to the interviewed stakeholders, there is a lack of trust between the government and the private sector. There is a tendency within the government to think that the state is the one that should provide services for its citizens, not the private sector. This mindset is not strange considering that the Egyptian government is since the reign of Nasser the provider of all the (heavily subsidized) utilities, but also goods like fuel and bread. Such an attitude makes it very unlikely for, for example, the EEHC to give up its majority share on the generation side, which is needed for a liberalized market as laid out in the new Electricity Law.

Finally, the coordination and corporation among the different government entities is problematic and

⁴² An actual or hypothetical agreement among the members of an organized society or between a community and its ruler that defines and limits the rights and duties of each (Merriam-Webster, 2018). For example, sacrificing individual rights and freedom for state protection.

mentioned by the interviewed stakeholders as one of the reasons why the reforms have been stalled. As an example it is mentioned that the EETC having to become an TSO, which requires responsibilities that are currently under the EEHC. The EEHC is not willing to hand these over. Even outside the MoERE there is friction among different entities. An example that was mentioned is the different view on tariff reforms between the MoERE and the Ministry of Finance.

Without a committed government, it is unlikely that the proposed reforms will be executed according to plan. The vagueness surrounding the reforms will not benefit the investment climate for the private sector. Bureaucracy, corruption, a lack of rule of law, and an increasing role of the army in the economy makes the investment climate not favorable in the first place. Or formulated by Sutherland (2018);

“Historically, weak governmental and regulatory infrastructure, as well as reluctance by mid- and even senior-level management to make decisions have led to project delays and investor frustration. This needs to change and should be addressed in line with ongoing reforms” (p.70-71).

7.6.2 Implications for the proposed reforms

In the new Electricity Law it is stated that the current structure of Egypt’s electricity sector (a legally unbundled, state owned structure with a small share of IPPs) will change towards a fully competitive market with retail competition. In other words, the standard reform model will be implemented. Table 23 below shows the different elements of the standard model as defined by Gratwick & Eberhard (2018), applied on the case of Egypt.

It becomes clear that generally the required legislation is in place, but several other pre-conditions such as cost reflective tariffs (‘commercialization’) and a willingness from the state owned Gencos to divest (‘divestiture of generation assets’) are not yet met. Also, an independent regulator is lacking which is mentioned in almost all literature about electricity sector reform in developing countries as one of the most important pre-conditions for successful reform. Many stakeholders therefore believe that the original ‘deadline’ (8 years for implementation as of the effective date of the Electricity Law in 2015, as outlined in paragraph 6.1.5) will not be met. Considering the fact that it also took the United Kingdom, a country with less ‘institutional challenges’, eight years to restructure their electricity sector into a competitive one, this planning for the case of Egypt was ambitious in the first place.

A long implementation time is needed. Most interviewed stakeholders mentioned that a ‘cultural shift’ has to take place within the government. Anonymous 6 (2018) mentioned a lot of ‘shiny’ plans and strategies, but no desire or capacity to implement them. Or, as De Jong (2018) stated: *“Culture eats strategy for lunch”*. In other words, these are not merely technical issues, but cultural and organizational ones that can take decades to solve (De Jong, 2018). This is in line with the upper levels of Williamson’s (1998) Four-Layer Model, and the corresponding frequency of change.

This is not problematic in itself. On the contrary, it is mentioned in both the literature on institutional reform and the stakeholders and experts consulted for this research.

Table 23: The standard reform model applied on the case of Egypt

Milestone	Description	The case of Egypt
1. Corporatization	Transforming the state owned utility into a separate legal entity (apart from the ministry/government)	This happened initially in 1993, but was reversed in 1998.
2. Commercialization	Cost recovery in terms of pricing, improvements in metering, billing and collection, and optionally adopting internationally recognized accounting practices	No, still no cost-reflective tariffs (although progress has been made), and a large amount of power theft.
3. Requisite legislation	Pass a legal mandate for restructuring, as well as a legal framework to allow private sector participation	2015 electricity law, still some aspects in the law are not clear, as well as the status of the reform.
4. Independent regulator	The establishment of a regulatory body that aims to introduce efficiency, transparency and fairness in the management of the sector	EgyptERA was established in 2001 under Presidential decree 339, but is not fully independent.
5. Sector restructuring	Unbundling of the vertically integrated state owned utility (horizontally and/or vertically) into separate generation, distribution and transmission companies in order to prepare for privatization	This has happened in 2000 by Law 168. EEHC was established and vertical and horizontal unbundling (separate generation , transmission and distribution) took place.
6. Independent power producers (IPPs)	Securing new private investment in generation, anchored by long-term PPAs	Yes, although a low share of IPPs (3-5%). This is not expected to increase soon.
7. Divestiture of generation assets	Divesting state ownership of generations assets to the private sector	Possible on paper but EEHC is reluctant to 'give away' generation to the private sector.
8. Divestiture of distribution assets	Divesting state ownership of distribution assets to the private sector	Not the case. There are some small independent disco's (1%) but they were created independently and not as a result of divesting state ownership
7. Competition	Introduction of wholesale and retail markets.	Not present. This is however the long term aim of the government.

The research formulation in chapter 2 started with two quotes by Williams & Ghanadan (2006) who stated that electricity sector reforms were often 'too ridged in their execution' and Andrews (2013) emphasized on the requirement of 'purposive muddling'. It becomes problematic if a certain timeframe has been set that is unrealistic, combined with a lack of transparency and communication on the exact status of the implementation. This creates uncertainties which are a barrier for the private sector, a crucial player in a competitive market. Additionally, the complete lack of communication and consultation with civil society can reinforce the already skeptical attitude of the public towards the reforms.

7.6.3 A suitable restructuring modality

When combining the framework (Table 15) in paragraph 5.6 with the outcomes of the analysis as presented above in Table 23, it can be concluded that crucial pre-conditions for a competitive wholesale market are not present in Egypt (as shown below in table 24). These include political commitment, regulatory independence, cost-reflective tariffs, public acceptance and a good investment climate. In the long run (>25 years) this might be possible but for the short to medium term (as stipulated in the Electricity Law) this is too optimistic, due among others to the 'cultural' changes that have to take place as outlined in the previous paragraph.

Instead, the government should focus on improving the status quo; a legally unbundled and state dominated structure with IPPs, before 'moving on' to the next, more competitive, type of restructuring being a wholesale market. How this should be done will be discussed in chapter 8.2.

8. Conclusions and recommendations

RQ: Which restructuring modality for Egypt's market-oriented electricity sector reforms is the most suitable for an efficient and reliable electricity supply, considering the institutional and political-economic context?

8.1 Answering the research question

Market-oriented electricity sector reforms have spread across the world in the last decades, with the aim to increase efficiency (less bureaucracy) and stimulate investments. In many cases the outcomes of these reforms did not meet up with expectations in terms of among others pricing, social welfare and efficiency. An often mentioned reason for these undesired outcomes is that the 'content' (the reform, the intervention), did not match the 'context' (of a country in which the reforms take place). Egypt is a developing country which adopted in 2015 the New Electricity law that laid the legal foundation to restructure its electricity sector into a competitive one. The aim of this research is to investigate what the most suitable restructuring modality is for an efficient and reliable electricity sector in Egypt, given the institutional and political-economic context in which these reforms have to take place. The conclusions of this research will be given by answering the main question:

Which restructuring modality for Egypt's market-oriented electricity sector reforms is the most suitable for an efficient and reliable electricity supply, considering the institutional and political-economic context?

Which on its turn will be answered by the four sub-questions.

1. What types of electricity sector restructuring are possible and how can context specificity be incorporated when determining a suitable modality for an electricity sector in a developing country?

The majority of the countries that reformed their electricity sectors followed the 'standard model' which provided a sequence and steps for implementing these reforms, and became a global trend during the 1990s. This model has been defined differently by multiple authors, but roughly follow the same steps: corporatization, commercialization, requisite legislation, an independent regulator, sector restructuring, IPPs, divestiture of generation assets, divestiture of distribution assets, and competition (wholesale and retail markets). However, after 25 years since this model has been advocated, it has not been fully realized anywhere in Africa. Instead, different varieties emerged, often referred to as 'hybrid power markets'; a market structure somewhere between the pre-reform structure and retail competition. Several authors and organizations made an attempt to categorize these different structures. For this research, five types of restructuring are distinguished; a vertically integrated monopoly, a vertically integrated monopoly with IPPs, unbundling with IPPs, a wholesale market, and a wholesale market with retail competition. Each with different advantages, disadvantages and pre-conditions, as outlined in chapter 5.

Many studies have been conducted on the reasons for the undesired outcomes of electricity sector reform in developing countries. Among others, it was not part of broader institutional reform, there was political instability, public opposition, or not enough regulatory capacity. Most reasons are contextual factors, which justifies the extensive contextual analysis of case of Egypt.

2. How can these experiences in other developing countries be translated into general criteria to determine the most suitable restructuring modality?

These reasons have been translated as criteria into a framework to assess which type of restructuring fits the best with a certain context (see table 12). The five different restructuring modalities each have a different institutional set-up, role of the state and the private sector, and therefore pre-conditions to be met in order to successfully implement this particular structure. This framework can help practitioners to assess which of the five restructuring modalities fits the best in a certain country context. This framework has been developed with multiple assumptions since criterions are interrelated, not mutually exclusive or difficult to measure. A framework like this has not been made before, so there was no previous work to build on. The criteria have been operationalized and will for this research be applied on the case of Egypt.

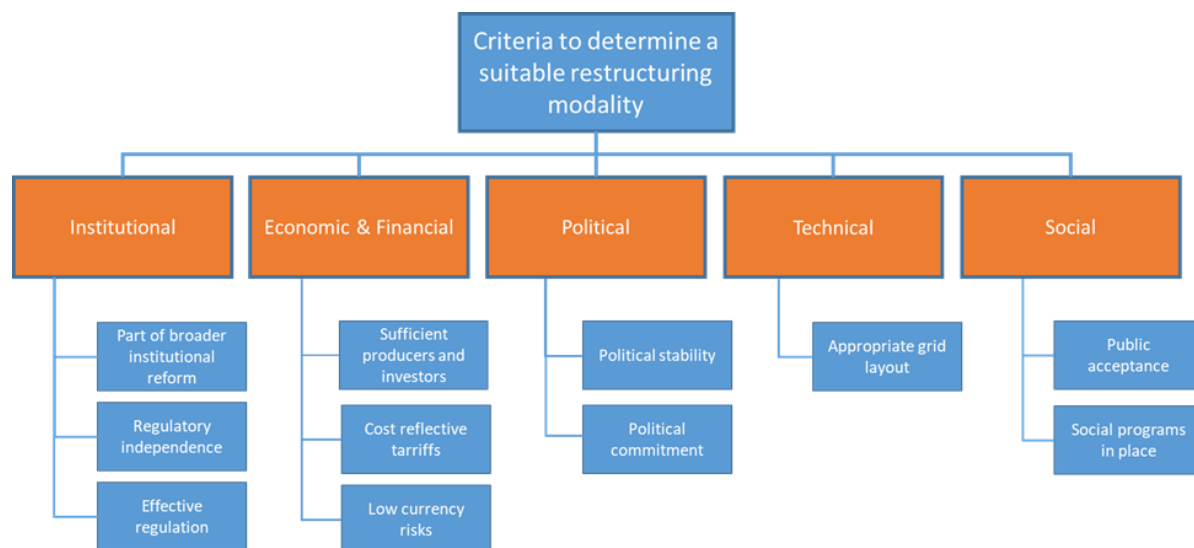


Figure 24: Schematic overview of the chosen criteria, divided under five different categories

3. How can the contextual analysis be used to determine the most suitable type of restructuring?

Now that the framework to assess the case of Egypt has been developed, the technical and political-economic context was assessed. The more technical contextual analysis provided an overview of Egypt's electricity sector (its institutional structure, the value chain and an elaboration on the proposed reforms). After this a Political Economic Analysis has been done. These two analysis combined, together with information out of interviews with experts and stakeholders, the framework with the defined criteria has been applied on the case of Egypt with the result as can be seen in the table below.

Table 22: Outcome of the application of the criteria on Egypt

Classification	Criterion	Operationalization	Measurement
Institutional	Part of broader institutional reform	Broader institutional reforms present?	Yes/no
	Regulatory independence	Decision making independence?	Yes/partly/no
		Financial independence?	Yes/partly/no
	Effective regulation	Transparency?	Yes/partly/no
		Accountability?	Yes/partly/no
		Predictable and proportional?	Yes/partly/no
Economic & Financial	Sufficient producers and investors	Investment climate?	Poor/medium/good
	Cost reflective pricing	Cost reflective pricing?	Yes/no
	Low currency risks	Currency Risk	Low/medium/high
Political	Political stability	Political stability	Stable/semi-stable/unstable
	Political commitment	Political commitment?	Yes/partly/no
Technical	Appropriate grid layout	Sufficiently widespread grid layout?	Yes/semi/no
		Capacity and quality of transmission and distribution grid	Poor/medium/good
Social	Public acceptance	Public perception towards reform?	Positive/neutral/negative
	Social programs in place	Social programs in place?	Yes/partly/no

4. What restructuring modality is the most suitable for Egypt according to the contextual framework?

After the application of the framework on the case of Egypt, it became clear that crucial pre-conditions for a competitive wholesale market are not present in Egypt, as shown in the table above. These include among others, political commitment, regulatory independence, cost-reflective tariffs, public acceptance and a good investment climate. In the long run (>25 years), a wholesale market might be possible but for the short to medium term (as stipulated in the Electricity Law) this is too optimistic, due among others to the ‘cultural’ changes within the government that have to take place.

8.2 Policy recommendations for Egypt

As was concluded at the end of chapter 7, to focus as Egyptian Government on implementing a competitive wholesale market is not appropriate considering the outcomes of the application of the framework; too many pre-conditions are not met. Instead, the government should focus on improving the status quo; a legally unbundled and state dominated structure with IPPs, before ‘moving on’ to the next,

more competitive, type of restructuring being a wholesale market. Several policy recommendations are derived from the analysis, outcomes and implications.

Improving the above mentioned status quo means in this case:

- Continuation of the subsidy reform. This will obviously take time since it is politically sensitive and failed multiple times in the past. However, without the abolishment of cross-subsidies and cost-reflective tariffs, a competitive market will not work. Subsidies for the poor segments in society should come directly from the state budget. In general, social safety nets should be strengthened to compensate for Egypt's poorest, that will face the negative consequences of a competitive electricity market.
- Related to this is the continuation of the broader IMF reform program, among other measures, to improve the investment climate. An important pre-requisite for creating a competitive electricity market with many private players.
- Strengthening the independence and effectiveness of EgyptERA. This should start with providing a legal mandate for EgyptERA to become detached from the Ministry. This will enhance the regulator's credibility, necessary for attracting private investment. This regulator is also needed to enhance the performance of the state-owned gencos, before they can be auctioned to the private sector.
- Capacity building within the involved ministries and authorities, to sensitize and educate the officials about the benefits of a competitive market and on what their role will be. This is where donor agencies can play an important role.

These measures, primarily focused on the second level of Williamson's (1998) four layer model, will take time. Longer than the timeline of the reforms as outlined in the Electricity Law.

This recommendation does not imply that a competitive wholesale market cannot work in Egypt. With 100 million customers and a population growth rate of 2% per year, there are ample opportunities for private parties to invest and operate in Egypt's electricity market. But to push now for a competitive market without the necessary pre-conditions and transparency, will delay the process (as is currently happening) and create uncertainty among all the stakeholders that are needed to make such a market work. The literature provided multiple examples of countries where market-oriented reforms happened too fast, with undesired outcomes as a result.

Liberalization is not a goal in itself. It is merely a mean to achieve the overall goal of the Egyptian government: a reliable and efficient electricity supply. Strengthening the current structure with a focus on the pre-conditions needed for a competitive market, is for now the way to achieve this.

Table 24: Egypt's scores on the criteria, combined with the framework to determine a suitable modality.

<i>Restructuring modality:</i>	1. Vertically integrated utility	2. Vertically integrated utility with IPPs	3. Unbundling with IPPs	4. Wholesale market	5. Wholesale market + retail competition	
<i>Criteria:</i>						
Institutional						
Part of broader inst. reform	Less important pre-condition			Important pre-condition		
Regulatory independence	Less important pre-condition					
Effective regulation	Less important pre-condition		Important pre-condition			
Political						
Political stability	Less imp. Pre-cond.	Important pre-condition				
Political commitment	Less important pre-condition					
				Important pre-condition		
Economic & Financial						
Cost-reflective pricing	Less important pre-condition			Important pre-condition		
Currency risks	Less imp. Pre-cond.	Important pre-condition				
Technical						
Appropriate grid layout	Less important pre-condition			Important pre-condition		
Social						
Public acceptance	Less important pre-condition			Important pre-condition		
Social programs in place	Less important pre-condition					

8.3 Recommendations for future research

Based on the results of this thesis, as well as the discussion and reflection, several suggestions are made for further research.

1. A quantitative/modelling approach to electricity sector reform in Egypt
2. Influence of intermittent sources and decentralized production on a suitable restructuring modality
3. Development of a sequencing framework
4. A framework with weighted criteria
5. Operationalization of political commitment for electricity sector reform

At first, this research is rather qualitative. By analyzing literature and semi-structured interviews the contextual situation has been analyzed in which the proposed reforms have to take place. A topic like this is also suitable for a Systems Dynamics model in which also factors like population growth, oil & gas price, installed capacity and demand can be included. Several important parameters have already been operationalized in this research. A proposed research questions: *What contextual factors influence the implementation of Egypt's electricity sector reforms?* After this, recommendations can be made for a suitable restructuring modality.

Second, most literature written about restructuring modalities (in developing countries) has been written in the early 2000s. Between then and now, significant developments occurred in terms of intermittent sources and decentralized electricity production. Switching from a centralized, fossil electricity system towards a decentralized, renewable one has implications for the most suitable market design (IEA, 2016). A proposed research question: *How does renewable and decentralized electricity production influence the type of restructuring that is the most suitable for the Egyptian context?*

Third, a recommendation has been made in this research regarding the most suitable restructuring modality. However, there is no detailed sequencing and priority framework yet for all the interventions necessary to implement the reforms. A proposed research question: *What sequencing and prioritization of reform interventions are needed to successfully restructure Egypt's electricity sector?*

Fourth, the criteria in the designed framework are not weighted in terms of relevance/importance. By consulting multiple stakeholders, and perhaps organizing a workshop, this could be developed. A proposed research question: *Which criteria have the biggest influence on the choice for a suitable restructuring modality for electricity sector reforms in developing countries?*

Finally, one of the most important conclusions of this research is that political commitment is needed for successful reform. This is currently lacking in the case of Egypt. However, there is no research yet on how political commitment for electricity sector liberalization can be operationalized and therefore measured. Some authors tried to do this for AIDS/HIV reduction and food security (Gore et al., 2013; Fox et al., 2015). However, such kind of operationalization for political commitment of electricity sector reforms is not yet available. A proposed research question: *How can political commitment for electricity sector reforms in developing countries be operationalized?*

9. Discussion and reflection

SQ4: What restructuring modality is the most suitable for Egypt according to the contextual framework?

- a) *Based on the outcome of the application of the criteria, what are the implications for Egypt's reforms?* [Chapter 7]
- b) **Based on the findings and conclusions, what aspects of the standard reform model could be applied on the Egyptian case and which not?**
- c) **What are shortcomings of the proposed type of restructuring and recommendations for future research?**

In this chapter the implications of this research for the standard model will be explained, followed by the limitations of the research, as well as its scientific and societal relevance. This chapter will end with a reflection of the author on this research.

9.1 Implications for the standard reform model

There is a methodological and theoretical paradox in this research. In the theoretical framework it is argued, based on the findings of other authors, that the standard model is nowhere fully implemented in developing countries. The model's 'content' (independent regulator, unbundling, a competitive market etc.) is not compatible with the context of most of these countries. Instead, so called hybrid-markets have emerged that are somewhere between the pre-reform structure and a full competitive market. Despite these findings, the standard model has been used to develop a framework for assessing the status of the reforms (table 23) and to develop recommendations for Egypt to meet the pre-conditions needed for a competitive market.

This is because the standard model in itself has crucial elements that can make an electricity sector more reliable and efficient (the pre-reform structure is a worse alternative which is the reason developing countries started with reforms in the first place). The first steps in the standard model are relatively feasible to implement; although no developing country has implemented the standard model fully, steps have been made to unbundle (legally, or management or accounting unbundling), introduce competition at the generation side, create a (independent) regulator, or work towards cost-reflective tariffs. Stakeholders in the Egyptian electricity sector often underlined the importance of these elements. However, the full standard model cannot be 'copy-pasted' in its full extend for the Egyptian context, and perhaps any other developing country context.

Firstly, this is because some elements, like retail competition, are not feasible in the short to medium term since crucial requirements for this structure will not be met in the coming 10 years (i.e., an investment climate that facilitates multiple private operators, a fully independent and effective regulator, full divestment of the government on the generation and distribution side, or the (technical) facilitation of switching of consumers). But also a cultural change from the status quo within the government has to take place, as stipulated by most of the interviewees. In other words; changes have to occur in the higher layers of Williamson's (1998) Four-Layer Model, that will take longer than the timelines used by the government to implement these reforms. Additionally, more fundamental, it is not clear if retail competition in developed countries yielded any significant benefits in the first place (Defeuilley, 2009; Morey & Kirsch, 2016) and should therefore be a 'point at the horizon' for developing countries to work

towards.

Second, the prescribed steps in the standard model imply a sequence that in the case of Egypt is not necessarily applicable. In Egypt, several steps like commercialization, corporatization and restructuring happen somewhat simultaneously. Anonymous 14 (2018) argues even that for the time being, an independent regulator is not necessary (see Appendix B). According to him, there is a benefit in having a regulator which is part of the 'system'; it makes dialogue between the government and the regulator much easier. This is in line with the findings out of the PEA and the interviews that the Egyptian government is hesitant in interacting with non-public actors.

Deviating from the standard model, is not problematic in itself, or even desirable. But this needs to happen transparently. Gratwick & Eberhard (2008) conclude:

"It has been demonstrated that the standard model no longer serves a descriptive or prescriptive role. What now needs to be developed is how to efficiently manage a hybrid market, taking into account the wide array of considerations of stakeholders." (p.3951-3952)

This is true.⁴³ The mentioned wide array of considerations of stakeholders are indeed crucial to take into account. But this needs to be combined with transparency towards, and communication with these stakeholders. In the case of Egypt, the vast majority of the stakeholders interviewed, emphasized on the lack of transparency and communication as one of the biggest barriers for reform. Deviating from the standard model can be desirable in itself, but sub-optimal outcomes or significant delays will occur if the stakeholders involved have no clue about the status or planning. Private sector parties, necessary for a competitive electricity sector, are hesitant to invest if there is no transparency and communication from the side of the government.

Concluding can be said, based on the case of Egypt, that the standard model can function as a useful guideline for developing countries that wish to reform their electricity sector towards a competitive one. But which steps, and the sequence of these steps, are applicable on a specific country, depends fully on the context in which these reforms have to take place. Additionally, deviating from the standard model is therefore desirable, if clearly communicated with the involved stakeholders.

9.2 Limitations of the research

This research had several limitations which will be reflected upon in this chapter.

9.2.1 The development of the framework

Focus of the research

Even though the developed framework became the 'core' of this research, this was initially not the intention. When this research commenced, it was focused more practically; how to come up with a suitable restructuring modality for Egypt's electricity sector? As the research progressed, it became clear that a more structured way of approaching this case was needed since reform efforts in other countries often did not had the desired outcomes. Since many scientific authors agreed on the reasons for these outcomes lays in a country's institutional context but a structural overview of this context was not yet created, this research attempted to create one. In hindsight, at the start of this research a clear choice

⁴³ However, in the case of Egypt it is not only about managing the status quo, but also about improving it.

should have been made; the development of this framework after which it can be applied on Egypt is a case study, or solely make practical recommendations for the case of Egypt. Considering the limited amount of time that was available for this research (half a year), it is hard to excel in both. This choice has not been made which resulted in still a valuable research, but not one with a specific focus and therefore unique scientific contribution.

Assumptions

The development of this framework came with a broad range of choices and assumptions. First, since such a framework did not yet exist, the criteria had to be retrieved from literature written about this topic, and had to be grouped under the 5 (institutional, economic & financial, political, technical and social) criteria. The formulated criteria are not mutually exclusive; delineation is difficult. They are all interrelated or criteria A could be a sub-component of criteria B. For example, regulatory independence can be placed under political commitment since it is, at least in the case of Egypt, a political decision to not detach the regulator from the MoERE. Also, the operationalization came with multiple assumptions since criteria like 'political commitment' or 'an appropriate grid layout' are not measurable quantitatively. And also after the operationalization, giving a score to the criteria came with assumptions as well. In this case, often the information retrieved from the interviews helped.

Second, the criteria are not weighted. In this research, each criteria was displayed as equally important, but this might not reflect the reality. The existence of social programs might be less important than political commitment. It requires a more extensive research on these criteria in consultation with experts and stakeholders to prioritize or weigh them. Third, choices also had to be made to distinguish the five different restructuring modalities. As discussed in chapter 4, there are multiple classifications possible (see also Appendix C).

Fourth, assumptions have been made when deciding which criteria is applicable on what restructuring modality. For example, in this research 'political stability' starts to become relevant when introducing IPPs (so it is not applicable for a vertically integrated utility). One can also argue that political stability is needed for successful operation of a vertically integrated utility. Similarly for regulatory independence. This becomes in the framework necessary when introducing a wholesale market, but is also needed in a legally unbundled structure. In this case, this assumption has been made since the literature stresses the independence of a regulator when a competitive market is created. Summarized, some criteria are 'contextual factors' than can be applied in any case.

Finally, the framework has not been extensively validated. The set of criteria and the classification of restructuring modalities have been discussed with experts, but it requires more extensive validation from multiple experts (by means of a workshop for example) to further improve this framework.

Concluding can be said that multiple, debatable, assumptions have been made to come up with this framework. This was necessary considering the broad scope, but also the fact that a framework like this is not yet existent.

Application

The way each criteria scores is measured ('yes'/'no' or 'low'/'medium'/'high') and applied, is debatable. Qualitative data (for example, the commitment within the Egyptian government to implement the reforms) has been translated into a score either being 'yes', 'partly' or 'no'. This translation cannot be done in a clear cut, objective manner and is therefore debatable. Even some quantitative data for

example, the score of Egypt on the World Bank's Political Stability Index, with a value ranging from -2,5 to +2,5, is hard to translate into a score in the framework designed in this research. An alternative would be to, next to an extensive expert validation on the way of measurement (as discussed in the previous paragraph), measure the criteria on a scale from 1 to 5, and to perform a survey among experts or stakeholders in which they're asked to rate each criteria (for a specific country) on that scale. The average score can be calculated which results in a less subjective rating by the user of the framework only.

Role of technology

In the framework, technology plays a minor role. Only the grid layout has been considered as criterion. The reason being that used literature on electricity sector reform in developing countries did not mention technology or infrastructure as an important pre-condition or a reasons for undesired reform outcomes. The same goes for the interviewees, except for underlining the importance of a sufficient spread-out grid layout and transmission capacity. However, for the general institutional set-up of an electricity sector, technology plays in important role. For example, the amount and location of interconnectors influences electricity trade and capacity mechanisms. Also the type of plants (hydro, nuclear, solar, wind, etc.) and their share in the total energy mix influences the institutional set-up around it. This applies as well on a centralized or more decentralized electricity system. The IEA (2016) formulates it as follows:

"The old regulatory paradigm designed to deliver kilowatt hours from a centralized system in a unidirectional fashion with meters read only once a year is unlikely to unleash the real-time flexibility that new technologies promise and that the new low-carbon power system will require. If regulatory regimes, market design and system operation end up lagging behind technology deployment, the result may undermine electricity security and, ultimately, the low-carbon transition itself." (p.3).

Most of the literature on electricity sector reform in developing countries was written in the early 2000s, a time when renewables and decentralized production did not play a significant role as it does today. This is a shortcoming of the framework and therefore also mentioned in paragraph 8.3 as a suggestion for future research.

9.2.2 Methodology

Semi-structured interviews

The interviews were a crucial source of information to conduct this research, and provided the author often with more information than hoped for; this is an advantage of the semi-structured type of interview. There were nevertheless shortcomings with respect to these interviews which are partly the case with any type of semi-structured interviews, and partly special for this specific research.

First, government stakeholders have not been interviewed, for reasons outlined in chapter 3. This is a shortcoming, but it was highly unlikely that any information would have been retrieved that deviated from the official government positions and statements. To mitigate for this shortcomings several high level ex-government officials have been interviewed. Secondly, 'only' 15 persons have been interviewed. These people provided the author with a lot of information, but considering a sector with an incredible high amount of actors and entities, more interviewees with different backgrounds would contribute to a more comprehensive understanding of this topic. In other words, the 'external validity' is therefore limited (Verschuren & Doorewaard, 2010). Third, there might have been a bias towards the author 'with two hats': the hat of the profession of the author during his time in Egypt, and a researcher hat. Even though the author made the separation between those two explicitly clear before the interview, a bias in answers

might still have been present. Finally, sometimes the author prepared a set of topics and questions but they could not be fully answered because a) some interviewees kept on talking so some topics were not discussed. The author found it impolite to interrupt them continuously, especially if it was a high ranking official. And b) it happened sometimes that the interviewee did not know all the details about the electricity sector reforms in Egypt, but questions had been prepared for that topic. In that case the author had to adapt quickly in order to come up with other questions that were still relevant for this research.

Political Economic Analysis

The PEA was a crucial part of this research which provided important insights into the context in which the reforms had to take. For example, the fact that subsidies have been embedded in Egypt's PE since the reign of Nasser, and that reducing these subsidies in the past have resulted in social unrest, was an important conclusion out of the PEA. This was concluded after a research into Egypt's recent history, political institutions and macro-economic situation and is very relevant for the electricity sector reforms of today. There were however also some shortcomings.

First, a PEA is very suitable for a problem analysis and exploration of the context, but it is hard to 'distillate' any tangible implications and design decisions out of this analysis. How relevant every political-economic aspect is for the application of the framework, is debatable and not clear cut. Related to this, a PEA is fuzzy, not narrowly defined, as political-economy is a broad topic. Therefore assumptions had to be made and it was up to the author to define the boundaries. For example, the history of a country should be included as well. But how far do you want to deep into history, and with what detail? No PEA methodology guide can give a clear answer on this which makes sense. Fortunately Eberhard & Godinho (2017) applied a PEA on electricity sector reforms in developing countries which provided some guidance, but still many choices and assumptions had to be made regarding the components of the PEA. Fritz et al. (2009) developed a PEA 'good practice framework' for the World Bank and concluded that a PEA is most useful when it is motivated to understand a specific issue or challenge (is 'problem-driven'). This was the case in this research, namely electricity sector reforms. By knowing beforehand how this PEA would fit into the research, the analysis could be focused more on the components relevant for this topic.

9.3 Scientific and societal relevance

9.3.1 Research on Egypt's electricity sector reform

In the research formulation it was already discussed that there is lack of scientific literature available on Egypt's electricity sector reforms. Most literature about Egypt's electricity sector is related to the integration of renewables, and written from a rather technical point of view. Research on Egypt's electricity sector from a 'broad' or 'holistic' point of view has not yet been written. In general, information about this topic is limited; the Egyptian government is not transparent and finding reliable publicly accessible data or information is difficult in general. In a country like the Netherlands, reliable data and information is extremely easy accessible. Statistical organizations like the CBS (the Dutch Central Statistical Agency) and independent think tanks make for good sources for any research, and their results and findings are easily accessible online. Also, the Dutch government is more transparent in its viewpoints and actions, as opposed to Egypt. Thanks to the unique situation that the author worked on energy topics in Cairo, it was relatively easy to schedule interviews with Egypt's biggest experts and important stakeholders. Even the ones closely involved in the reforms did for example often not know precisely what the status is of the reforms. For these reasons alone, this research is scientifically relevant.

9.3.2 Development of framework

Moreover, despite the amount of literature that has been written about electricity sector reforms in developing countries, there is not yet a framework which can be used to assess which type of restructuring is suitable for a certain country context. This research made an attempt to create one, as the first to do so. Considering the large amount of vertically integrated utilities in Africa alone (see Appendix C), it can benefit both policy makers and academics involved in (future) market-oriented reform efforts in those countries.

Several shortcomings and limitations of the framework have already been discussed and are primarily related to the amount of assumptions, the limited role of technology and the lack of validation. However, its scientific potential is considerable. The framework can be used for researching countries that have more ‘institutional challenges’ as compared to developed/OECD countries. Table 10 on page 32 provided a clear overview the difference in institutional settings between developed and developing countries. These settings in developing countries are incorporated in the developed framework, and is therefore applicable on any country in the world that is classified as ‘developing’ and has the ambition to reform its electricity sector.

9.3.3 Societal contribution

A properly functioning electricity sector is not only important from an economic point of view, but also for the general wellbeing of people. Egypt’s reforms plans were made as result of frequent blackouts, inefficiency and a lack of capacity, especially after the two revolutions. This was also one of the sources of public discontent. The societal contributions lays primarily in a better, more realistic execution of this reforms which will hopefully lead to a better functioning electricity system in Egypt.

9.4 Personal reflection

I have always been broadly interested. This has been the reason I decided after high school to enroll for the bachelor ‘Technische Bestuurskunde’, followed by the master’s program CoSEM. And even within this broad academic field, I was eager to explore the fields outside of it. Especially the fields outside the borders of the Netherlands, and preferably in a development context. I genuinely believe that combining the knowledge taught at the faculty of TPM, with knowledge about development studies, institutional reform, and political science/international relations, can be extremely valuable to address the challenges in third world countries. At our faculty the scope of topics is broad, but mostly focused on the Netherlands and the developed world in general. While topics taught at institutes like the ISS focus solely on developing countries but often lack the ‘in-depth’ knowledge on for example, energy systems or systems engineering in general. My aim was to use the best of both worlds in this thesis. This broad interest unfortunately also had its shortcomings.

I was so fascinated by this topic that I read through dozens of books, reports and articles about topics ranging from electricity market design and the political history of Egypt, to rentier-state theory and regulatory governance (this explains the 12 pages of references). This is of course not a bad thing in itself, but it made it hard to convert all this gained knowledge into a clear storyline. It also took me a lot of time and effort to scope my research and to resist the temptation to become an expert in all of these separate topics. Combined with the fact that I was not fully familiar with some of these topics before I commenced, made planning difficult. Nevertheless, as a broadly interested CoSEM student it was amazing to dive into theories about political stability or finance that were new to me. What also helped was to have a first supervisor that is also familiar with, and passionate about these topics.

Another difficulty was combining this research with almost a full time job. It helped me on the one hand to become familiar with the 'context' and to arrange interviews relatively easily with some of the most relevant stakeholders in Egypt's electricity sector. On the other hand, it resulted in a lack of time to relax, especially the last months. The last two months I spend all my non-working days and weekends at the office to work on my thesis. I love my job and this research as well, but a complete lack of free time made it often stressful and difficult to enjoy both. If I could do this again, I would stop working at least two months before my 'green light'-meeting. Being abroad while writing this thesis also had it disadvantages. What I like about the faculty of TPM is that you can often knock on the door of our teachers and professors for urgent questions or feedback. This was obviously not possible in my case because of geographical reasons. Fortunately, my first supervisor was always willing for feedback sessions via Mail, Skype or telephone, as well as the rest of my committee (and my parents). In hindsight, I would have asked for feedback more often to prevent myself from drifting off to theories, frameworks and topics that are probably not that relevant. But also to make planning easier, which would have resulted in less stressful moments.

I can look back at an intense, but amazing half a year of research. I learned a lot that will without any doubt benefit me in my future career. Just like electricity sector reform itself, it was a time consuming and a complex undertaking. And also in the case of this research, necessary pre-conditions need to be in place for successful outcomes. These include; an interesting topic, and knowledgeable and involved supervisors, parents and friends. This made it possible to overcome these complexities and a research where, at least, I can be proud of.

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Appendix A: Schematic overview of scientific literature about electricity sector reform in developing countries

Study	Title	Objective	Country/Area	Main conclusions
Jamasb et al. (2015)	A Quarter Century Effort Yet to Come of Age, A Survey of Power Sector Reforms in Developing Countries	Comprehensive review of empirical and theoretical literature on linkages between power sector reforms, economic and technical efficiency, and poverty reduction	Global	Extent of power sector reforms has varied across developing countries. Generally efficiency and productivity improved, but these gains not always reached end consumers.
Tankha (2009)	Lost in Translation; Interpreting the Failure of Privatization in the Brazilian Electric Power Industry	Examines the causal chain assumed by large-scale privatization policies, part of reform and adjustment programs, taking Brazil as case study	Brazil	Many privatization policies and the economic stabilization programs within which they were embedded were not mutually reinforcing in the way that policymakers had expected.
Yousefi et al. (2017)	Electricity industry restructuring in Iran	Investigate the process of Iran's electricity sector reforms.	Iran	Despite privatization efforts, the government still has a monopoly over transmission and distribution.
Eberhard & Godinho (2017)	A review and exploration of the status, context and political economy of power sector reforms in sub-Saharan Africa, South Asia and Latin America	Overview of power sector reforms in three developing regions from a political economic perspective	Sub-Saharan Africa, South Asia, Latin America	PEA can be a good tool to analyze and design power sector reforms
Wamukonya (2003)	Power sector reform in developing countries: mismatched agendas	Examine the impacts of reform using the promised outcomes as a basis for analysis	Global	Reforms has had some achievements if conventional performance indicators are used but also questions the validity of some of these indicators. Reform has however not fulfilled many of its goals and the prevailing recipes are likely to leave developing countries socially and economically worse off than in the pre-reform period.
Kessides (2012)	The impact of electricity sector reforms in developing countries	Examine the impact of reforms in developing countries in general, given the application of the standard reform model.	Global	If the standard reform model is implemented correctly, it can lead to significant improvements in several dimensions of operating performance.
Meyer et al. (2018)	Uganda's power sector reform: The and back again?	To assess the experience of Uganda's IPPs and consider what might help accelerate private investment in the	Uganda	Progress has been made by Uganda government in increasing capacity. However, ultimately shortfalls in far-sighted and informed policy planning and implementation

		country's electricity sector		phasing are currently jeopardizing the future financial and economic sustainability of Uganda's electricity sector.
Jamasb (2006)	Between the state and the market: Electricity sector reform in developing countries	Review of private participation and key reform steps such as restructuring, competition and regulation. As well as, the role of contextual factors such as system size, institutional endowment and international organizations	Global	There is a need for redefining the role of the state rather than a full withdrawal from the sector and that many countries should adopt simpler reform models and gradual implementation.
Williams & Ghanadan (2006)	Electricity reform in developing and transition countries: a reappraisal	Examine common features of non-OECD electricity reform and reappraises reform policies and underlying assumptions.	Global (Bolivia, Ghana, India, Poland, Thailand)	Improving reform will require emphasizing a broader set of objectives, including service provision, public benefits, effective regulation, and social/political legitimacy. Above all, reforms must be based on realistic assessments of national needs and capabilities.
Nepal & Jamasb (2012)	Reforming the power sector in transition: Do institutions matter?	Investigate the often poorly explored link between power sector reforms and wider institutional reforms in the economy across different groups of transition countries	Central and Eastern Europe, Former Soviet Union countries	The success of power sector reforms in developing countries largely depend on the extent to which they synchronize inter-sector reforms in the economy.
Pollitt (2008)	Electricity reform in Argentina: lessons for developing countries	Describing reforms in Argentina in order to find the lessons learned.	Argentina	1) comprehensive electricity reform can work in a developing country. 2) well organized markets and effective network regulation are undermined if there is undue political interference in the pricing of electricity.
Bhattacharyya (2007)	Power sector reform in South Asia: Why slow and limited so far?	Provide a brief overview of power sector reform efforts in South Asia, and by using an institutional economics framework identifying factors shaping the success of these reforms.	South Asia	The paper finds that political instability has affected the power sector reform of the region, making hard decisions difficult to take. Slow progress of reform has also affected the sector viability, as signs of adverse effects on the power sector investment and performance are already visible.
Karekezi & Kimani (2002)	Status of power sector reform in Africa: Impact on the poor	Review of the status, challenges and prospects of ongoing and planned power sector reform in eastern and southern Africa with special emphasis on the implications for the poor.	Sub-Saharan Africa	Reforms have improved generation capacity as well as financial performance in certain utilities. However, there are several challenges that reforms are yet to address. These challenges include poor performance at the transmission and distribution end; increased electrification of the poor; and; increased local

participation in the power sector.

Appendix B: Semi-structured interviews

See below for a list of the interviewed experts and/or stakeholders used to retrieve information about Egypt's electricity sector (reforms), their opinions about the status and outcomes, and for the validation of the defined set of criteria and conclusions.

B1: Interview protocol

The author of this report worked at the time in Egypt, primarily in the energy sector. The interviewees were therefore contacted personally (using the author's private email, to emphasize on the distinction between his profession and this research). The fact that the interviewees were part of the author's network explains the high response rate: of the 18 people contacted, 15 agreed on an interview.

The author tried to have most of the interviews face-to-face. Sometimes this was not possible so the interviews were done via the telephone (see table 27 below for an overview). As can be seen in B2, every interview started with a personal introduction and asking for permission to record the interview. Also the fact that the author's profession at the time and this research were completely unrelated, was emphasized again. Subsequently, the questions as displayed below were asked in a semi-structured fashion.

After the interviews, the interviewee was thanked deeply for his or her help, and a transcript was made and sent to the interviewees for approval. Most of the interviewees in Egypt requested for confidentiality for the reasons outlined in chapter 3. This request is honored.

B2: Questions

The interviews were semi-structured and two types of interviews questions can be distinguished: one for key stakeholders in the Egyptian electricity sector, and one for academic experts. In two cases, the interviewees were both.

B2.1 Introduction questions (for both types of interviews)

Goal:

- Status update on Egypt's electricity sector reforms + Identification of the main bottlenecks
- Interviewee's vision on pre-conditions for a successful liberalized electricity market (cross-check with own formulated criteria)
- Interviewee's vision on the most suitable market structure for Egypt

Beginning of interview:

- Personal introduction
- Explanation of the goal of the interview
- Explain how information will be dealt with
- Ask permission for recording and use of quotes.

Information interviewee

Name

Position

Organization

(How) involved in reform process?

Position towards reforms

(support/neutral/oppose)

Background information for interviewee

- With the 2015 electricity law, Egypt has the ambition to in the long run fully liberalize and unbundle its electricity sector
- Liberalization of electricity sectors in developing countries were generally not successful because:
 - lack of regulatory framework
 - Wrong order of reforms
 - Not part of broader institutional reforms
 - Public opposition
 - No focus on long term prosperity
 - Political instability
 - Controversial role of development banks/agencies
- Different market structures emerged/exists (ranging from vertically integrated, to retail competition)
- Aim of this research is to define the most suitable market structure for Egypt
- As well as formulating a set of criteria per type of market structure.

B2.2 Questions stakeholder interviews

Own experience (5 min)

- How is your organization involved in Egypt's electricity sector reforms?
- Have you worked in other developing countries in the energy/electricity sectors?

Electricity reforms in developing countries (15 min)

- Is in your opinion liberalizing electricity sectors in developing countries a suitable way to achieve reliability, efficiency and affordability? If so, why (not)?
- Can you think of any examples?
- What are reasons for these (un)desired outcomes?
- What pre-conditions have to be met in order to successfully liberalize an electricity sector in a developing country?

The case of Egypt (35 min)

- Publicly accessible information on the status of the reforms are hard to get. How far is it in your opinion?
- According to some people, the reforms have stalled. What is in your opinion the reason for that?
- What are in general the main challenges for Egypt to reform its electricity sector?
 - Are the involved stakeholders working on these challenges?
 - Can these challenges be overcome?
- What are the roles of the different stakeholders and its attitudes:
 - Government
 - President
 - Parliament
 - Ministries/authorities (if different roles/attitudes per ministry, please elaborate)
 - Regulator
 - Private sector (is the private sector willing to invest in a liberalized market?/does the Govt have enough resources to invest itself?/which part of the value chain would you foresee the most private sector participation?)

- Consumers
 - Development agencies
 - Media?
- What pre-conditions have to be met in order to successfully liberalize Egypt's electricity sector in a developing country? Can you mention any technical criteria?
- What type of market structure is for the middle to long term suitable for the Egyptian context and why?

Closing (5 min)

- Is there anything you would like to add?
- Do you know other people I can interview?
- As employee of the Dutch Ministry of Foreign Affairs, would you advise me to interview government stakeholders?

B2.3 Questions expert interviews

- What is your very general opinion about liberalization of electricity sectors in developing countries? Have they succeeded in your opinion? If not, why?

[explanation of research]

- what are in your opinion institutional pre-conditions to take into account when liberalizing an electricity sector in a context like Egypt?

[show formulated criteria]

- Would you consider this as a comprehensive list of criteria to assess which competition modality is the most suitable for the Egyptian context?
 - Cross subsidies: how to mitigate for the negative effects?
- What role did development agencies/banks played in dev. countries with respect to electricity sector reform?
- Would you say that the standard reform model is not suitable for developing countries? If so, why?

[explaining status quo of Egypt's reforms]

- Finally, based on this (limited) information, what would you advise the Egyptian government regarding their reform plans to establish a full competitive retail market for electricity?

B3: Interviews

Table 23: Overview interviewees with setting and interview dates

Number & Name	Organization	Position	Stakeholder type	Setting	Date of interview
1. Anonymous			Development/IFI	Face-to-Face	22-07-2018
2. Hafez El-Salmawy	Zigazag University	Professor Electrical Engineering	Academic	Face-to-Face	14-05-2018
	World Bank	Consultant/energy expert	Development/IFI		
	EgyptERA (Egyptian Electricity Regulatory Agency)	Former Chairman	Government		
3. Michel Scheepens	FMO (Dutch Development Bank)	Senior Investment Officer Energy MENA & Africa	Development/Private	Face-to-Face	19-07-2018
4. Anonymous			Development/IFI	Telephone	08-08-2018
5. Laurens de Vries	Delft University of Technology	Assistant Professor	Academic	Face-to-Face	12-03-2018 & 20-07-2018
6. Anonymous			Development/IFI	Face-to-Face	25-07-2018
7. Sunil Tankha	Erasmus University Rotterdam (ISS)	Assistant Professor	Academic	Face-to-Face	27-07-2018
8. Anonymous			Private	Face-to-Face	25-07-2018
9. Mohamed Salah El-Sobki	Cairo University	Professor of Energy Planning	Academic	Telephone	24-07-2018
	NREA (New and Renewable Energy Agency)	Former Executive Chairman	Government		
	EgyptERA (Egyptian Electricity Regulatory Agency)	Former Founding Managing Director	Government		
10. Anonymous			Diplomacy	Face-to-Face	30-06-2018
11. Anonymous			Diplomacy/Development	Face-to-Face	30-06-2018
12. Anonymous			Private	Face-to-Face	25-07-2018
13. Volko de Jong	GGNI (Global Gas Networks Initiative)	Managing Partner	Private	Telephone	26-07-2018
	Energy Delta Institute	Vice President & Co-founder	Academic		
14. Anonymous			Development/IFI	Face-to-Face	12-07-2018
15. Anonymous			Development	Face-to-Face	07-08-2018

B.3.1 Anonymous

Interview summary

Status of Reforms

Nobody knows exactly what the current status is of the proposed reforms. Information about it is limited and the government does not communicate it clearly.

Risks and challenges when investing in Egypt

There is a saying in Germany: “a fish rots from the head down”. This means that at the top, the proper framework conditions need to be in place before the private sector wants to invest. This is currently not the case in Egypt. Several reasons/examples:

- Even though arbitration takes place in Paris, it can take up to 10 years before a decision has been made. The first FiT scheme was not successful because the Egyptian Government decided to do the arbitration in Cairo, with Egyptian Judges.
- Organizing the logistical chain is extremely difficult and slow. There is a horizontal delegation of responsibility to so nobody dares to take a decision. It is hard to work with this kind of bureaucracy.
- The role of the army in the economy is significant and makes it hard for the private sector to develop. For example, Siemens decided to make blades for wind turbines in Egypt. Simultaneously the army decided to do this as well.

We are considering at the moment the following risks when investing in Egypt:

- If Egypt goes off from its reform part, that would be a big thing. For us this is a big risk.
- Even though Egypt’s credit rating is a little up, it is still not good.
- We look at ‘external shocks’ like the oil and wheat price.
- There are investments risks. If a contract is signed with the government, is it sticking to its promises? In the oil & gas sector for example it took years before foreign companies got paid

Barriers for reforms

National pride is very big in this country; lots of decisions here are not made from a rational point of view. For example, the plan to develop the first nuclear power plant in Egypt doesn’t make any sense considering its costs (30 billion USD for 4.8 MW, while the 14MW of gas plants by Siemens costs only 6 billion USD). The government has a limited understanding of the energy sector. For example, with current PPAs they pay too much since they have difficulties estimating an appropriate price and are vulnerable for opportunistic behavior.

Another barrier is the extremely low percentage of people pay their energy bill. There is a large amount of power theft in this country. Distribution companies should therefore focus on metering; get the money. Also the amount of subsidies is worrying. Process wise there is lot to improve since the government barely communicates with its people. More mutual understanding would benefit the subsidy reform a lot.

Opportunities

We see a continuing commitment from the government to invest in renewables. But it should also be

coupled with investing in energy efficiency. Also, there is big market; 100 million people. Finally, there is a lot of money available within the IFI community to initiate projects.

B3.2 Hafez El-Salmawy (Zigazag University & World Bank)

Prof. Dr. Hafez El-Salmawy is seen by many as *the* electricity sector expert in Egypt. Hafez used to be the Chairman of the electricity regulator (EgyptERA) and is currently among others Professor in Electrical Engineering on Zigazag University and does a variety of consulting assignments on energy topics for the World Bank. Hafez provided the author with all the details regarding the regulatory environment specifically, but also knew a lot about the institutional environment in general, as well as technical aspects of Egypt's electricity system.

Interview summary

The new electricity law

The new electricity law dictates that full ownership unbundling should happen (generation companies cannot have shares in the TSO for example). The law is however not clear about if the EEHC can have private shareholders. The mandate of the transmission company (EETC) will become bigger; it will switch from an asset manager to an TSO. It will take around 10 years before the full competitive market will be realized.

Status of the reforms

The reforms have been stalled for several reasons. In 2017 we had the devaluation/floatation of the pound. So the debt value of the electricity company was almost doubled, since fuel supply was in dollars. Therefore, reforms stalled. Also, the cooperation between EETC and EEHC is not optimal. The first will need to get more responsibility that are now part of the latter. The EEHC is not very willing to hand over these responsibilities. EgyptERA and MoERE should present a market design document to government. Government needs to approve, 2020 is the date that it will happen (delayed because of the reasons mentioned earlier).

In many countries (primarily in the Gulf), it is hard to reform because there are many long term PPAs negotiated. It is difficult to renegotiate those contracts. This is not the case in Egypt, in 2022-2023 most PPA contracts end, and only 5% of the power generated in Egypt comes from IPPs, in contrast to almost 100% in gulf countries. So that is good for us, but a barrier for reform for them .

Challenges to overcome

EgyptERA is semi-independent. Investors pressure for an independent regulator, but current amount of investors is not that big, so pressure is limited. But it is a learning curve. The regulator has a parallel plan to communicate with civil society. Currently there is almost zero communication and mutual understanding between the regulator and the consumers/citizens. This needs to be improved, but the government obviously does not like this. Also, the president not interest in reform, it is not his first priority. Security of supply and tariff reform are. This can be applied on the parliament as well; they have a lot of power, but no interest in reforms. Second challenge is coordination among public entities. They have different plans. Government sometimes want to give subsidies to certain companies, but competition authority does not like that.

There is also inconsistency among IFIs. For example, World Bank said to Kenya, you should privatize. But JICA (Japanese Development Agency) said, we will not work with you if you privatize. So also in the development community there are mixed signals. This is undesirable, there needs to be coherence. Also in Egypt, the World Bank said in 1993 not to provide loans for state owned electricity projects, but changed it in 2002. Financiers are looking for a clear plan, a transparent process, commitment of the government for reforms, and a track record. There is track record with IPPs, but not with a competitive market obviously. Also, investors in private generation projects want sovereign guarantees. The government is hesitant to provide those.

Opportunities

There is willingness from private investors: market is growing, and it is substantial (100 million people). 6th largest grid in the Mediterranean. Track record with IPPs is good; contracts have always been fully respected. Also Egypt is a centrally located country with a lot of potential for interconnectors. Finally, the new investment law helps to make foreign direct investment easier, and we also see a renewed appetite from IFIs to give loans to Egypt.

B3.3 Michel Scheepens (FMO)

FMO (*Financieringsmaatschappij voor Ontwikkelingslanden*), the Dutch Development Bank, provides long-term financing for private businesses and projects in developing countries worldwide. FMO has an annual commitment of more than €9 billion (2017) of which €2,5 billion in energy projects. Michel Scheepens is as Senior Investment Officer Energy involved in a variety of renewable and non-renewable energy projects in the MENA region and on the African continent (including Egypt). Before he joined FMO in 2016, he worked among others 11 years for ING as Director Structured Finance for utilities, Power & Renewables. In 1996 he did his master thesis on Islamic banking and spent a year in Cairo for research at the Netherlands-Flemish Institute in Cairo (NVIC). Michel provided the author with valuable information about investment risks vis-à-vis the institutional set-up of an electricity sector. This is in particular relevant since one of the most important aims of liberalizing an utility is to attract (foreign) private sector investments.

Interview summary

FMO provides long term loans, for project financing in developing countries for projects that are not bankable for commercial banks (FMO can get money very cheaply, via among others the Dutch Central Bank).

Investment criteria

First thing we look at is if there are cost reflective tariffs; we make an estimation of what the end users pay, versus the production costs. We also look at the collection rate. If you look at Nigeria for example, SMEs refuse to pay their electricity bill, which is problematic. We also look at the overall liquidity and look at where we can scale in a project into the merit order. So if you look at those four elements (cost reflectiveness, collection rates, overall liquidity and the place in the merit order), you'll get a good sense of with what priority the government is going to support your project (with sovereign guarantees or put call termination).

Investment risks

We are looking at PPAs and see if there is a tail-end risk. We also look at technology risks; for example the guarantees on wind turbines and solar panels. In Egypt this is especially relevant because we have to make sure that the wind turbines are desert proof.

We also look if the generations costs will go down. For example, if our PPA tariff is 10cent/kWh and the FiT is 4 cents, we will never get the project approved. We try to cover our risks by also involving IFIs like the IFC, WBG or EBRD. They have a big 'political cloud', this political leverage is very important in a country like Egypt.

We also take into account currency risks consisting of 3 elements:

1. Foreign Exchange Risk (currency devaluation). This has to be made 'hard' in the contracts otherwise there is a very big risks for us.
2. Convertibility risk: the exchange between local currency and dollars/euros need to be made. In Nigeria for example this was not possible because there was not enough hard currency in the country. In Egypt we get 85% of the PPA tariff indexed (dollars), 15% in local currency (EGP).
3. Transferability risk. Can we repatriate our profits? Can we make actual payments?

We also look at the structure of the market. Basically we look at how the sector works and what kind of risks we deal with. In every contract there are risks and the question remains who is going to carry that risks. For example, if we need a transmission or distribution line, this can be problematic in Egypt. What type of risk is that?

We invest in a lot of African and Middle-Eastern countries, but avoid countries with conflict (Sudan for example).

Risks specific for Egypt

After the first FiT round, the arbitration (settlement of investment disputes) was in Egypt. No international arbitration is not working for us. Also for the IFIs this didn't work. So there were no guarantees and therefore the projects are not bankable. Additionally, the plots were too small (under 25MW), for us projects are bankable above 50MW. The Egyptian government received this message and the second FiT was changed for the better. Other issues we had to deal with in Egypt:

- The logistics, primarily in the construction phase. All the equipment needs to be transported via Alexandria. There were a lot of delays and it costs the builder around 2-3 million EUR. There are no ports close to the BenBan area (where all the large solar plants are being developed) so everything has to go via Alexandria which is problematic. Also, the rail connection is not good enough. This means that during the implementation of a project we expect delays.
- The capacity and the quality of the grid. Both from a technical point of view, but also from a social perspective: are there any land issues involved?

Electricity sector reform in developing countries

Liberalization in developing countries can work. The first priority is that people need to pay for the electricity they use. To take the example of Nigeria again. Because people don't pay for the electricity, investors like the IFC want a cover from the MIGA (Multilateral Investment Guarantee Agency), part of the World Bank. The WBG doesn't want to do that because the sector is not working. Therefore, nothing will change.

This can change by installing meters and to have (private) distribution companies who are able to collect electricity levies. Public discos are hesitant to do that, they do not want to disconnect for example schools or army barracks when they don't pay their bills. Example of Ukraine; distribution networks became privatized, AES an American company bought it. They had the guts to do this so it worked eventually.

I think eventually the same market model as we have in Europe (wholesale market and retail competition) can work in Egypt as well, if the government is committed to do so.

B3.4 Anonymous

Interview summary

The reason why Egypt started with liberalizing its electricity sector is that it didn't had the financial capacity to invest in additional generation capacity. Private equity can in that case be a solution. This can be done with sovereign guarantees by the government, but currently they are limited. This is an important shortcoming since a level playing field for investors is needed; they have to feel comfortable/protected enough to invest, you have to provide them with assurances.

Currently there is no competition within Egypt's electricity sector. Four steps have to be taken to achieve this. 1) Accounts of the gencos should be separated. This happened on paper, but is not done by international standards. 2) There should be an independent regulator. For example, will the government owned EETC develop connections to private sector plants? 3). Public capacity statements have to be made for performance improvements 4). Investment plants have to be made. After that, auctions can be held to sell the state owned generators to the private sector (as happened in France, and is currently happening in Greece). Timeline for liberalizing utilities in developing countries are often too optimistic. This is not only caused by the authorities, but also by international donors/agencies.

Generation and development in transmissions/distribution are not happening parallel. This is extremely important and is currently not happening in Egypt.

B3.5. Laurens de Vries (Delft University of Technology, faculty of Technology, Policy & Management)

Laurens de Vries is Associate Professor at the Faculty of Technology, Policy and Management of the Delft University of Technology. He performs research and teaches in the field of electricity market design, analyzing the mutual relationships between the physical infrastructure and its (economic) organization and regulation (TU Delft, n.d.). Laurens' infinite knowledge of electricity markets turned out to be extremely valuable for this thesis, even though his research activities are not primarily focused on developing countries. Laurens also validated the chosen criteria to assess the suitable restructuring modality for the Egyptian context.

Interview summary

Reforms in developing countries

It depends on the level of development and access to foreign capital if liberalization can be a mean to achieve efficiency and reliability in a developing country. You have to look at the value chain and see which sections can be opened for competition. I believe that a wholesale market can work if there is too much corruption and inefficiencies with the single-buyer. In the case of a wholesale market you have distribution companies who will look for the cheapest generator (unless they are also corrupt).

If you decide to introduce a wholesale market but there are still long term PPAs, you have to find a way to not breach the contract and reimburse the IPP according to the initial negotiated price. If you don't do that, and breach a contract, you can forget investments in your country for the next 10-20 years. This happened in Indonesia and the Philippines in the 1990s, when their local currency plummeted while the PPAs were in dollars. They could not honor their contract anymore.

I am skeptical towards introducing wholesale competition in countries with a steep growing demand (unless they are very politically and economically stable, but that is often not the case). If you add yearly a lot of extra capacity, it means that there needs to be a lot of return on investment in order to pay for that. Imagine there is a political crisis or a valuate crisis, all the sources of income suddenly disappear. It is an enormous risk to do these investments based on short term prices.

Always ask yourself the question? What problem do you wish to solve with retail competition? Market is not always more efficient.

Types of unbundling

I distinguish four types of unbundling, the vertically integrated monopoly, the IPPs, a wholesale market, and retail competition. A fifth one can be added in the middle; unbundling with IPPs. IPPs have disadvantages; prone to corruption and dispatch inefficiencies. But the advantage is that you can make fairly transparent and easy CO2 emission agreements in a PPA.

Personally I don't think retail competition is such an important goal. If you have a good single-buyer, it can work fine. Unless they are inefficient or corrupt (perhaps that is the case in Egypt?) that would be a good reason to switch to a wholesale market.

Validation of criteria

This looks like an excellent set of criteria. I would add poverty policy under 'social'. This is key. How do you want to deal with the poorer segments of society? Cross-subsidies or other subsidies? This was a big issue in India. For poor farmers they made electricity almost free for irrigation because they want to guarantee food production.

The case of Egypt

There is apparently an overcapacity. That is a perfect moment for introducing competition. If you have a shortage, the market prices will go through the roof which means you have no social acceptance. In the case of overcapacity, price are low. The only problem is that you don't have enough interest from investors.

B3.6 Anonymous

Interview summary

Status of the reform

The precise status of the reform is unclear; the government deals with this topic with a lot of secrecy. The most transparent decision was the 5 years plan announced by the Minister of Electricity. But the original projections have changed because of inflation and oil price increase. But also there is a lot of public discontent with the reform of the tariffs. This pushes them to become more secret. MoP never announced any kind of projections, It is always the day before. Even when you talk to them on official basis, they says it is the responsibility of the MoERE.

Why reforms then in the first place?

Typical decision making in Egypt, it is top down. Vision of the Minister, is sometimes more progressive compared to the rest of the Ministry. Also donor influences play a role, especially from the World Bank (dealing with budget management, a large portion from the budget deficit comes from energy subsidies). There is a gap between visionary people (like the Minister), and the officials who have to implement the reforms on the ground. They are used to doing things in a certain way for many years. So if you launch something new as a senior, it is hard to implement it with the lower level officials. The public officials are not so keen on private sector. They see it as just profiting from the people. It is a big cultural shift.

There is a fast pace of reform, pushed for by donors, especially the IMF. Often, the expectations of donors do not match with the reality on the ground.

Challenges for reform

For successful reform, you need a comprehensive approach. For example, do the institutions in place already have the capacity to implement the reforms? For example the FiT. If we take rooftop solar, as a household I want to sell my solar electricity to the distribution companies. Do the people in the 19 discos have the capacity and payment mechanism to compensate me? Does the personnel there understand how it works? Often this is not the case. So you launched the FiT, while the capacity is not yet in place.

Another issue with the government is that they make 'shiny' high level strategies but not coupled with transparent action plans. Another problem is that there is poor energy planning within the government. Currently it is often 'firefighting' instead of long term thinking.

Investment climate

Technical and business wise the private sector would be interested, Egypt is a very big market! But the playing field made by the government is not suitable. If the government gives sovereign guarantees, is the legal system for disputes fast enough and fair? All these pre-requisites should be in place. Summarized, it is a high risk business. You also see that the dialogue between the government and the private sector is not working. This creates more distrust and risks for (potential) investors.

Suitable restructuring modality for Egypt

I am not for a full state monopoly in the electricity system. There are a lot of inefficiencies. We have a long history of public companies, so socially we are not ready for 100% private sector. I don't see that changing in the short term. So gradually get the private sector involved

B3.7 Sunil Tankha (International Institute of Social Studies)

Sunil Tankha is Assistant Professor of States, Societies and World Development at the International Institute of Social Studies (ISS) of Erasmus University Rotterdam. He is specialized in development policies and governance in the field of electricity, water and infrastructures in general. He has research and consultancy experience in this sector in Brazil, the Netherlands, the US, Georgia, India, and a variety of other African and Southeast Asian countries. In Brazil, he has studied intensively the electricity sector reforms. The author of this thesis followed one of his courses at the ISS. Sunil did not know the specifics of the case of Egypt, but has a lot of knowledge about electricity sector- and institutional reform in general, especially in a developing context. His general insights on public sector reform was therefore extremely valuable for this research.

Interview summary

Pre-conditions for reform

KAPIRE; Knowledge, Attitude, Protocol, Incentives, Resources, Environment:

- Knowledge: You need to have local knowledge. Don't only import consultants. What kind of knowledge do they need?
- Attitude: Towards their own economy and citizens but also foreign investments
- Protocol: How are decisions made? In NL there are very clear steps. In Egypt what are decision making protocols? Are they in place or do people have to figure it out themselves. If they are in place, lower level employees can make the decisions otherwise it goes up to the higher levels. That is a bottleneck!
- Incentives: are their incentives strong enough?
- Resources: institutional transformation is expensive. You want to do it quickly. What are resources for staffing regulatory agencies?
- Environment: what is the level of initiative you can use?

Subsidy reform

This is a tricky subject since subsidies are often part of the social contract between the citizens and the government, but a phase out of subsidies is needed for the introduction of competition. It all depends on your capacity to provide social security support. In NL you know exactly what people earn. In Egypt you don't have that kind of thing. If you say we do cost reflective tariffs; how do you compensate the lower consumers? If you don't do it via the tax system (as in Holland). You need to have a good information management system and be transparent. But this is one of the last parts of the puzzle. The first one is, what is the most optimal structure? From a supply perspective, which risks can be reduced? You need to look at each of the models [i.e. restructuring modalities]. How many different supply chain actors are there? Where do they come in? For each of these actors are the relevant risks, where do they come from? That will make the supply part as efficient as possible. The other part of the puzzle is, how do you get cost recovery tariffs etc.

Types of risks

The key to any kind of infrastructure reform is to minimize the points where risks are introduced. You can do it by intelligent structures like PPPs. If you are an investor and selling electricity in EGP, currency risks are important. If investment is not international, then it is not relevant so it depends on the contract. Companies use the CAPM (Capital Assets Pricing Model): commercial risk (based on other countries) + market risk + political risk + currency risk. The higher the risk, the higher rate of return you have to take into account. Fundamental question: is competition creating efficiencies or only more risks?

Standard model in developing countries

There are several reasons why developing countries cannot implement the standard model. Standard model is based on experience in US and Europe. Biggest difference is that market demand is falling in these regions (or stagnant). There is a surplus in the system. In developing countries they need more investments. The standard model is therefore not suitable for three reasons:

1. Money goes into buying assets that are already build, so no new structures. Is the money they receive actually used for upgrading the electricity sector?
2. It's about vertical disintegration. It works fine until you get to the retail part. After that you need to have the capacity to regulate it. Because private sector tries to game the system (see California).
3. Most of these cities have high amount of power theft. Who is going to be responsible for power theft if there is retail competition?

Recommendations for successful reform

Don't reform the whole system at the same time. Have an iterative problem solving approach. Don't try to privatize everything at once.

Conclusion: the way to minimize risk is to liberalize different small parts. Take India for example. They made generation more efficient, as a first step. This was a primarily technical undertaking, so politicians don't interfere: divide and conquer!

B3.8 Anonymous

Interview summary

We are a private off-grid solar power developer in Egypt. We started with primarily small off-grid projects but are currently also doing on-grid projects of multiple MWs. We are happy with the decrease in subsidies, because first we could not compete with the government. We do standalone projects for private parties (resorts for example), and the competition with the government was difficult because prices for electricity are very low (there are also subsidies on gasoline so generators are also cheaper).

Generally, we are satisfied with the cooperation with the government. The major point where we would like to see improvement is transparency. There is not enough publicly available information, there are too many uncertainties. For example, new subsidy rates are announced on the last moment. So we just have to guess which makes making an investment difficult. Also, more transparency is needed in where grid access points are and what the capacity is of those points. It is impossible to get that information but we need this information to make an investment decision.

We look primarily at reimbursement rates for investment decisions (FiT), but also at political events.

B3.9 Mohamed Salah El-Sobki (Cairo University)

Professor Mohamed Salah El-Sobki is a big expert on Egypt's electricity sector. His knowledge and life-long experience in this field, combined with the willingness to share this on already multiple occasions with the author of this thesis, made him a crucial source for this research. Mr. El-Sobki was the founding Managing Director of the Electricity Regulatory Agency, between 2001 and 2006. After that he was Director of the Energy Efficiency and Renewable Energy Program at the Industrial Modernization Center (IMC). He also was the Executive Chairman of Egypt's New and Renewable Energy Agency (NREA) until 2016. Currently he is Professor of Energy Planning at the Faculty of Engineering of Cairo University. He published multiple technical articles and papers on Egypt's electricity sector, often with a focus on renewables.

Interview summary

Subsidy history

Until 1995 there were according to financial statements of the government no subsidies (only cross subsidies). After that, the cost of producing became higher. These subsidies grew until 2014 when the government decided to reduce the subsidies. There are two subsidy types:

- 1) To end users (covered by the utility)
- 2) From the petroleum sector to the electricity sector (because the gas is heavily subsidized)

There is no clarity about the cost of production of gas, so it is not clear how much is subsidized. Lot of factors are part of the price (international price, production sharing agreements, very dynamic). It is therefore hard to tell if the gas price is cost reflective, a grey area.

Status and challenges reform

The first type of reform was performed in early 2000s. It is taking a longer time than participated. One of the reasons is the slowdown of the tariff/subsidy reform. That is delaying liberalization, because it is hard to liberalize if the end product is not cost-reflective. If we don't have cost reflective sales, it will be very difficult for IPPs to compete in the market. The government will continue with the tariff reform. This was not only part of the IMF program, it only accelerated it (with the devaluation of the pound).

The precise status is unclear. There are some activities now within the EETC to become an ISO, but this is a complex process and for some within EETC a hard idea to digest. It is hard to move from a single buyer model to a liberalized model where they transfer the electricity. Also, their current execution of their daily activities does not reflect a full commitment to become a TSO/ISO. They should not be involved in PPAs anymore but the EETC is not convinced. That needs to be changed, as well within the EEHC.

The full implementation will take at least 10 years. If the government position changes. But it will be difficult. If we are fully committed, we can do it in 5 years. Currently, security of supply and strengthening of network is the number 1 priority of government. Liberalization is not.

From my point of view: EETC is not regulated anymore, that is a hurdle. 4-5 years ago it was decided by EgyptERA that they are not licensed as a utility anymore. That is not helping the liberalization because when you liberalize a market, you still need to have someone to overlook your performance. So if the Transco is not overlooked, then you are not helping your market. EgyptERA made this decision because they are a single service company since they don't compete with someone else. But my own explanation is that it was a show of lack of commitment for the liberalization. Summarized, it is very hard for government stakeholders to let go of the old vertically integrated model.

Technical capability

Currently the grid and type of power plants are sufficient. Strengthening them is important because they anticipate growth of demand. The current technical capability within the transcos and discos is sufficient to fulfil the required demand in the future.

Viewpoints different stakeholders

They have conservative tendencies towards liberalization. On the one hand they want to keep the ongoing relation with the government in general, and on the other hand they want to push for liberalization. This balance is from my point of view leading to a slowdown. They want to achieve liberalization, but don't set

deadlines. But, they helped a lot with tariff restructuring and pushed the government.

Consumers have a tendency to prefer state owned electricity provision. They do not trust the private sector in general and believe that the government will protect them from high prices.

The private sector is interested, it is a promising market, it might have some difficulties in the beginning. But they will also be the pioneers, so the returns can be high.

The standard model

The standard model should be adapted to the transitional period. In this period you are moving from the state owned service to a hybrid-market which is hard to differentiate. All these challenges you need to overcome. In a hybrid market, the government is dominant. If you don't have an effective regulator, than it will take a lot of time.

B3.10 Anonymous

B3.11 Anonymous

Interview summary

The private sector, dominated by a few families, are very close to the government; oligopolistic behavior. This inherently means that there is no transparency and a lack of competition. In general the investment climate is difficult in Egypt. Egypt is known for its bureaucracy and corruption but it seems like this is increasing. Another difficulty is the role that the army plays in the economy. Often companies are dependent on generals or other high ranking army officials.

Political stability is important for a good investment climate and I think Egypt will remain stable on the short run with Sisi's re-election. However, this stability is fully dependent on the fate of one man. The parliament is not functioning and a new strong man can change the current policies with 180 degrees. Sisi is developing more and more as a military dictator but I believe he is committed to continue with the IMF reform program.

The questions remains how long the people will tolerate the current economic conditions. The economic growth is not as big as it should and most of the people are employed in the informal sector. Except from the oil and gas sector, foreign direct investment is not coming into Egypt, especially not for SMEs.

The advantage of this type of government is that they can make some big steps initially with reform because they are not accountable to anyone. However, on the long run this cannot function. The private sector is not getting the space it needs, also because a thriving private sector means a little bit of democratizing. The government is obviously extremely scared for that.

B3.12 Anonymous

Interview summary

The second round of FiT was a success in the sense that it attracted a lot of investors. However the bureaucracy of the process is cumbersome. Corruption is a big issue, the government has to approve the commission of the FiT, so a lot of companies face delays (EETC was delaying the PPA signing).

A lot of things happen here through networks [crony capitalism], there is no fair competition. KarmSolar and SolarRise are the only successful ones in a way, they are both well connected within the government.

Liberalization of the electricity sector is good, but it also requires a lot of institutional work. This process cannot start if there is no willingness within the government. Unfortunately this willingness is currently lacking. The Electricity Law was approved when there was a shortage in supply. Siemens solved the supply gap with the 14GW of gas plants, so now the commitment is less.

B3.13 Volko de Jong (GGNI & Energy Delta Institute)

Dr. Volko de Jong is Managing Partner at Global Gas Networks Initiative (GGNI), and co-founder of the Energy Delta Institute (EDI), a business school for the oil and gas sector. He has been involved in projects in Egypt, Mexico, Saudi Arabia, Russia, Israel, Cyprus and Tanzania. Primarily in the fossil fuel sector but also in renewables. When he was the first Managing director of EDI he established the cooperation between Gazprom and Gasunie in 2002. He has a PhD in econometrics, and started his career as a professor at the Econometrics Department at the University of Groningen, and the Information Science Department at Western Washington University (KVGW, n.d.). Currently he is setting up a training program in Egypt for the gas regulator, an organization that will play a key role in Egypt's gas sector liberalization.

Interview summary

Pre-conditions for successful reform

If you want to change something in an organization (in this case an electricity SOE), you have to consider 5 layers:

- 1) Strategy (or goals): "we want this organization to change"
- 2) Organization: new rules implemented for the organization
- 3) Personnel/staff: needs to get educated
- 4) Culture: a culture change is necessary to facilitate this change
- 5) Systems: IT systems for example to implement changes

Especially in the culture and personnel layer there is a plan that is too utopic. It can take 10-20 years to change a culture within an organization (in this case a government owned electricity company). This is a mismatch with the goals and strategies that are often planned for just a few. "Culture eats strategy for lunch". In Egypt there are so called 'crony entrepreneurs', they are 'semi' entrepreneurs that are smart in keeping up their relationship with the government; that is needed in a country like Egypt. So there is no culture of a fair, competitive market. This crony culture is the complete opposite of that. Everybody that comes from outside, inside this culture, won't stand a chance.

Challenges

Within the government and politics, there are way more interests than just liberalizing. This is a risk because there are a lot of ways for some people to make a lot of money when there is liberalization. And again, it will take time since the culture in Egypt does not match with liberalizing; a fair, open, transparent competitive market.

Recommendations

Use the capability and maturity model; which tempo is the most realistic to implement reforms? So do it slowly and in different segments. For the gas sector for example, take a look at the value chain. Could there be competition upstream? Yes, the big players like ENI, Shell, Exxon etc. will keep each other 'sharp'. But is this also possible downstream? Possibly not because the government players are too dominant.

There have to be enough small players as well and this is not possible currently in Egypt. Also, people need to get trained in what the real pre-conditions are for competition. Currently we only see laws, legislation and fancy strategy power point slides.

This change in culture can happen if there are competent leaders with a strong vision and opinion, but are also open for those of others ('third level leadership'). This will take at least 10 years. Multinationals use such a time frame, the Egyptian government is on the other side of the spectrum, they want to do it way quicker. For the electricity sector it will take longer than the gas sector, because they are way less internationally focused.

In general, is liberalizing the solution? A smaller government might be more efficient, see the Laffer curve. But this theory is hard to apply directly on Egypt.

B3.14 Anonymous

Interview summary

Status reforms

EEHC is a monopoly, so there is no liberalized market (97% of the generators is state-owned). Question is how fast can you liberalize. In 5 years, approximately 20% IPPs would already be a huge improvement. AfDB checked if they are willing to open their shares for private stakeholders. They said, no majority shares. They will give priority to the new Siemens plants that will come operational, but they cannot guarantee anything.

Barriers

In Egypt, the government has always been the main provider of utilities. People get used to this, also industries. Privatization is a bad word for a lot of people in Egypt. Therefore retail competition is not feasible. Right now, priority should be the wholesale market. It will not go as far as retail competition. Perhaps for large to medium sized consumers. So in the bulk generation sector competition is more likely. Competition cannot work if you only have a few players, as is the case in Egypt. There is currently appetite to invest in the generation side, look at the feed in tariff.

It is not an easy process. Based on international experiences, we did not put in hard deadlines (for example 1 year to liberalize EEHC). World Bank once did, and that backfired. The EEHC chairman said to us that he is still doing EETC tasks. They believe they are still the transmission company. That is a big problem: the Minister believes in it, as well as the senior management. But the middle management doesn't. Also probably because of a lack of communication between those two layers. They don't fully understand what is happening and what needs to happen.

EETC needs to become an ISO or TSO which means they are independent; I have no connection at all with generations. This is not the case right now, EETC is owned by the generation companies.

Short-medium term challenge: we have oversupply in the market. I am not sure that the private sector will come to invest in additional capacity. Transmission will not be privatized. Distribution: is already there, a very small percentage. I think it will increase. Currently a large share of the compounds/resorts are made with private distribution networks (owned and built by the real estate developers). Developer buys it in bulk, and sells it to the consumers. But it is still a monopoly, no retail.

Percentage of hydro will go down. And nuclear is also small. Problem with generation assets are old and not efficient, so they cannot really compete. (owned by EEHC). Therefore the regulated market will remain, otherwise the government owned plans cannot compete. Therefore regulated market will remain, for the residential sector. Transmission capacity needs to be sufficient to support a competitive market. For example, selling electricity from Aswan to Alexandria cannot happen. So congestion can counteract the competitive market. Currently they are fortunately investing heavily in transmission; they are doubling the capacity, with the help of the Chinese.

Private sector will not come to invest in a competitive market if there are no cost reflective prices. The cross-subsidies will hopefully disappear (unless it is part of the regulated market).

Power theft is an issue here, but only problematic for reforms when there is a retail market. Not necessarily for wholesale market. Privatization is in that sense good because it will never allow power theft. The public sector currently turns a blind eye sometimes. Power theft is only an issue for retail market. Not for wholesale.

Standard reform model

Most suitable market structure: partly unbundling of vertically integrated monopoly. By taking out the transmission company combined with introduction of IPPs. Competition will happen on the wholesale market. Currently there is no independent regulator. This has advantages and disadvantages:

- Pros: can set the rule of the games more fairly. Prevent conflict of interest.
- Cons: benefit of regulator part of the 'system': it makes dialogue between the government and the regulator much easier. They are now basically colleagues so they have a more friendly discussion.

In the new Electricity Law, EgyptERA gets more power, but still the ministry has a say. I believe that in the Egyptian context, an independent regulator is not a big pre-condition, as pre-scribed in the standard model.

Role of IFIs in reform

High losses, high debts, inefficient generation and theft. Those are reasons why electricity becomes very expensive. Development banks cannot finance or support that. So therefore there has been pressure from IFIs to reform. Context specificity is very important! It is a mixture of reasons why the standard model doesn't work. In Egypt, the government already had a reforming program.

B3.15 Anonymous

Interview summary

Status of reforms

The electricity law covers the whole sector, so it is hard to define the current status. First, what do you expect in terms of planning? In some parts it is going well, in some parts it is not. It is a process. An important part of this process is the restructuring of EETC to make it a TSO. This is difficult since not everyone within the EETC is ready for it. Similarly in EgyptERA, a cultural shift has to take place. There is now a big gap in vision between the younger and older generation. Egypt needs a strong regulator. That is why we are so active with them. If Egypt would not be able to have a strong regulator, the market transformation will not be complete.

Why reform in the first place?

Why do you liberalize? A economic vision? There are other means to achieve security of supply. There was also a pressure from the donors/IMFs, world bank primarily. But I don't think that is always the best solution. But now they entered this pathway, and they have to follow it.

There is difference between Egypt and developed countries, so you really need a tailor-made model. Take the high poverty rates here for example; If you want to keep up the high level of electrification 99,5%) you need to think about that. With a wholesale market poor people will get disconnected of the grid. Prepaid meters are needed, currently the collection rate is low. The government wants to install 30 million meters, prepaid, in the coming 10 years.

Transparency

It seems that the government does not want to liberalize or privatize the fossil fuel part. Only privatization in the renewables part. The more transparency the better, but that is a problem with this government. The old school regulation books say: regulation equality. All market participants should have the same amount and type of information. I don't see this work in Egypt, mentality wise. This will obviously take time.

Future steps

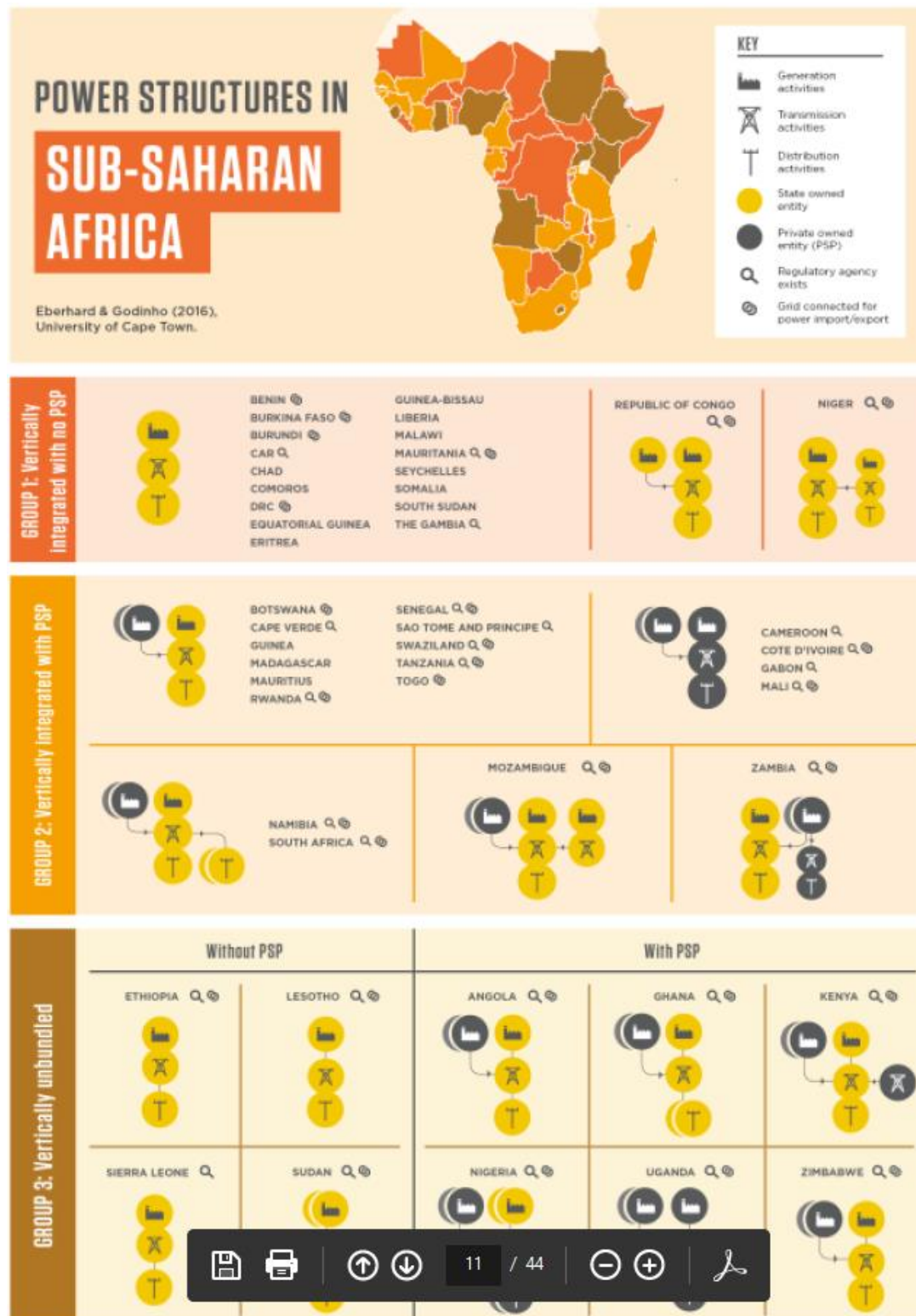
My priorities would be an independent regulator and a total phase out of subsidies. This will come with other aspects like energy efficiency (to mitigate the impact of higher electricity bills) and system stabilization. Make clear decisions: do want to continue with state owned fossil fuel plants on the generation side? The creation of a spot market is not an issue for the coming years.

Public acceptance

There is not only a distrust towards the private sector, also towards the government. People don't care about liberalization or privatization, they only care about prices. As long as people can pay their electricity bills they don't care.

Appendix C: Overview of different electricity market structures in sub-Saharan Africa

Source: Eberhard & Godinho (2017, p.11).



Appendix D: Egypt's socio-economic profile in numbers

Source: World Bank (2018b)

	1990	2000	2010	2016
Population, total (millions)	57.41	69.91	84.11	95.69
Population growth (annual %)	2.5	1.8	2.0	2.0
Surface area (sq. km) (thousands)	1,001.5	1,001.5	1,001.5	1,001.5
Population density (people per sq. km of land area)	57.7	70.2	84.5	96.1
Poverty headcount ratio at national poverty lines (% of population)	..	16.7	25.2	27.8
Poverty headcount ratio at \$1.90 a day (2011 PPP) (% of population)	7.3	2.0	3.0	1.4
GNI, Atlas method (current US\$) (billions)	42.48	97.28	196.21	326.26
GNI per capita, Atlas method (current US\$)	740	1,39	2,33	3,41
GNI, PPP (current international \$) (billions)	213.66	413.21	796.13	1,050.59
GNI per capita, PPP (current international \$)	3,72	5,91	9,47	10,98
People				
Income share held by lowest 20%	8.7	8.9	9.1	9.1
Life expectancy at birth, total (years)	65	69	70	71
Fertility rate, total (births per woman)	4.7	3.2	3.2	3.3
Adolescent fertility rate (births per 1,000 women ages 15-19)	82	54	52	51
Contraceptive prevalence, any methods (% of women ages 15-49)	48	56	60	59
Births attended by skilled health staff (% of total)	37	61	79	92
Mortality rate, under-5 (per 1,000 live births)	86	47	29	23
Prevalence of underweight, weight for age (% of children under 5)	10.5	4.3	6.8	7.0
Immunization, measles (% of children ages 12-23 months)	86	98	96	95
Primary completion rate, total (% of relevant age group)	77	90	104	104
School enrollment, primary (% gross)	90.4	93.5	107.1	103.9
School enrollment, secondary (% gross)	75	81	72	86

School enrollment, primary and secondary (gross), gender parity index (GPI)	1	1	1	1
Prevalence of HIV, total (% of population ages 15-49)	0.1	0.1	0.1	0.1
Environment				
Forest area (sq. km) (thousands)	0.4	0.6	0.7	0.7
Terrestrial and marine protected areas (% of total territorial area)	0.4	3.8	..	9.6
Annual freshwater withdrawals, total (% of internal resources)	..	3,794.4	4,333.3	4,333.3
Improved water source (% of population with access)	93	96	98	99
Improved sanitation facilities (% of population with access)	73	84	95	95
Urban population growth (annual %)	2.2	2.0	1.9	2.2
Energy use (kg of oil equivalent per capita)	562	581	863	815
CO2 emissions (metric tons per capita)	1.32	2.02	2.41	2.20
Electric power consumption (kWh per capita)	663	962	1,551	1,658
Economy				
GDP (current US\$) (billions)	43.13	99.84	218.89	332.79
GDP growth (annual %)	5.7	5.4	5.1	4.3
Inflation, GDP deflator (annual %)	18.4	4.9	10.1	6.3
Agriculture, value added (% of GDP)	19	17	14	12
Industry, value added (% of GDP)	29	33	38	33
Services, etc., value added (% of GDP)	52	50	48	55
Exports of goods and services (% of GDP)	20	16	21	10
Imports of goods and services (% of GDP)	33	23	27	20
Gross capital formation (% of GDP)	29	20	20	15
Revenue, excluding grants (% of GDP)	23.0	24.3	24.8	21.0
Net lending (+) / net borrowing (-) (% of GDP)	-2.0	-6.7	-7.7	..
States and markets				
Time required to start a business (days)	..	40	13	15
Domestic credit provided by financial sector (% of GDP)	99.8	89.0	69.4	119.6
Tax revenue (% of GDP)	13.2	13.4	14.1	12.5
Military expenditure (% of GDP)	3.6	2.7	2.1	1.7

Mobile cellular subscriptions (per 100 people)	0.0	2.1	90.5	113.7
Individuals using the Internet (% of population)	0.0	0.6	21.6	39.2
High-technology exports (% of manufactured exports)	..	0	1	0
Statistical Capacity score (Overall average)	86	88
Global links				
Merchandise trade (% of GDP)	37	20	36	24
Net barter terms of trade index (2000 = 100)	101	100	140	147
External debt stocks, total (DOD, current US\$) (millions)	33,016	29,195	36,834	67,214
Total debt service (% of exports of goods, services and primary income)	28.6	9.8	6.1	18.9
Net migration (thousands)	-460	-74	-275	..
Personal remittances, received (current US\$) (millions)	4,284	2,852	12,453	16,59
Foreign direct investment, net inflows (BoP, current US\$) (millions)	734	1,235	6,386	8,107
Net official development assistance received (current US\$) (millions)	6,065.2	1,370.8	599.2	2,130.3