Towards a Contextual Framework for Assessing the Suitability of Electricity Sector Restructuring Modalities in Developing Countries

E.S. (Ernst) Schütte
Faculty of Technology, Policy & Management, Delft University of Technology

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Abstract

Market-oriented electricity sector reforms have spread across developing countries around the world. In many cases these reforms did not meet expectations in terms of, among others, pricing, social welfare and efficiency. An often mentioned reason in the literature is that contextual factors were not duly considered: too often a ‘one-size-fits-all approach’ has been used. Despite that most developing countries pursued the standard reform model in which a wholesale market with retail competition is the final step, this model has not been realized in any developing country. Instead, different types of restructuring emerged. The aim of this research is to design a framework that can determine which type of restructuring fits the best with a certain institutional context. Based on literature about electricity sector reforms in developing countries, such a framework has been created, as the first of its kind. This framework can help policy makers and other practitioners in the field. Further research is needed to improve and extend this framework, primarily in terms of weighing the pre-conditions and validation.

1. Introduction

Market-oriented electricity sector reforms have spread across the world in the last decades. 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., 2007). 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 (Jamasb et al., 2015). The final step in this model is a wholesale market with retail competition. 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 type of restructuring somewhere between the pre-reform structure and retail competition (see figure 1).

Figure 1: An overview of electricity sector restructuring modalities around the world. Source: IEA (2016).

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; Jamasb 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 & Jamasb, 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 (Jamasb, 2015).

An often mentioned reason for these undesired outcomes is that the context in which the reforms took place was not duly considered; too often a ‘one-size-fits-all approach’ was used (Nepal & Jamasb, 2012; Williams & Ghanadan 2006; Tankha, 2009). As will be outlined in section 2, despite the amount of literature that has been written about (contextual) factors that contributed to undesired electricity sector reforms in developing countries, there is not yet a framework that can assess which restructuring modality fits the best in a certain country context. This research made an attempt to create one. This leads to the following research question:

**How can a contextual framework be developed for assessing the suitability of electricity sector restructuring modalities in developing countries?**

In order to answer this question, first the reasons for undesired outcomes will be discussed. Based on this, different pre-conditions are formulated that will function as input for the framework.

### 2. Reasons for undesired outcomes

The emergence of different restructuring modalities around the world, although roughly following the same (‘standard’) model, implies that the outcomes were not straightforward. Especially in developing countries. 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. These reasons are presented in Table 1.

<table>
<thead>
<tr>
<th>Reasons for undesired outcomes</th>
<th>Source</th>
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<tr>
<td>No focus on long term prosperity/low access rates among the poorest</td>
<td>Kessides (2012), Wamukonya (2003), Tankha (2009), Karekezi &amp; Kimani (2002), Nagayama (2007)</td>
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<tr>
<td>Pressure from external donors/agencies</td>
<td>Wamukonya (2003), Williams &amp; Ghanadan (2006)</td>
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<tr>
<td>Political instability</td>
<td>Bhattacharyya (2007)</td>
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*Table 1: Overview of reasons for undesired outcomes of electricity sector reforms in developing countries*

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). 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 are the justification for the creation of this context focused framework. In the next section, the different pre-conditions for this framework are discussed.

### 3. Pre-conditions for successful reforms

The different pre-conditions are classified as either institutional, economic & financial, political, technical and social.

#### 3.1 Institutional

**Part of broader institutional reform**

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. Several authors emphasized on the necessity of broader institutional reform when one wants to achieve successful electricity sector reforms in developing countries.

### Regulatory Independence

Regulatory independence is crucial for a well-functioning liberalized electricity sector as several case studies concluded (Jamasb et al., 2015).

“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).

### Effective regulation

Next to independent, a regulator also 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).

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3.2 Economic & Financial

**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. 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).

**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. Similarly, Kessides (2012) states that electricity prices should first be raised to cost-recovering levels before privatization takes place.

**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). Examples come from Argentina and Brazil where during currency crises in the late 1990s and early 2000s reforms stalled and electricity sector investors left the country.

3.3 Political

Political stability

Bhattacharyya (2007) 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. Political stability is not a clear cut term and it can be interpreted and measured in various ways. For this research, the definition as used by Radu (2015) will be used: “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).

Political commitment

Political commitment is not only needed to initiate reforms, but also to execute it fully. Correljé & De Vries (2008) argue that some governments who initiated electricity sector 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.

3.4 Technical

Appropriate grid layout

Transmission and distribution capacity needs to be sufficient to support a competitive market El-Askari (2018). Also from an investment perspective, the capacity of a grid is important before an investment decision can be made (Scheepens, 2018; Abdelkader, 2018). 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 yet completed.

3.5 Social

Public acceptance

For electricity sector reforms to be successful it requires public acceptance or social legitimacy (Jamash & Nepal, 2015; Williams & Ghanadan, 2006; Wamukonya, 2003). A lack of public acceptance can result in non-commercial losses (electricity theft) and non-payment of electricity bills (Jamash & Nepal, 2015). But eventually also to protests resulting in the ousting of a government responsible for the reforms (Williams & Ghanadan, 2006).

Social programs in place

Related to the public acceptance criteria is the precondition 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).

4. Restructuring Modalities

Now that based on the literature, the different contextual pre-conditions have been defined, 5 restructuring modalities will be distinguished. Several authors and organizations made an attempt to categorize the different varieties that emerged after global efforts to reform electricity sectors. Some classifications are more quantitative (like the EBRD), whilst other 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).

4.1 Vertically integrated Monopoly

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 management) and that there is no private sector participation in the entire electricity system.

4.2 Vertically integrated utility with IPPs
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 it turn has the monopoly on selling it to the end customers.

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.
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.

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. One 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 predetermined 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.

4.5 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 don’t 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.

5. Towards a Restructuring Framework
Based on the liberalization and restructuring literature described in section 3, and the description of the 5 different restructuring modalities a framework has been created as shown in Table 2. This framework can determine which pre-conditions are important, or less important, per restructuring modality.

Multiple assumptions have been made, based on the gained insights from the previous sections. 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).

6. Discussion
This framework can be useful for policy makers in developing countries that have the ambition to restructure their electricity sector. This framework takes into account a variety of contextual factors; the factors that according to the majority of the literature written about electricity sector reform in developing countries, was the reasons for undesired outcomes.

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Table 2: Schematic overview of the chosen pre-conditions, divided under five different categories
However, this framework is open for improvement or extension since multiple assumptions had been made.

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 can be a political decision to keep the regulator as a part of the government. 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 section 4, there are multiple classifications possible. 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.

7. Conclusion and Recommendations

Despite the variety of literature written about electricity sector reform in developing countries that concluded that contextual factors lay at the heart of undesired reform outcomes, there is not yet a framework that can determine which restructuring modality is the most appropriate. This research attempted to make one which can help policy makers and other actors in developing countries that have the ambition to transfer the state-dominated status quo into a more competitive one. Especially considering that, as could be seen in figure 1, the majority of the developing countries (especially on the African continent) still have a vertically integrated utility.

The created contextual framework has been made with multiple assumptions regarding the delineation and ordering of both the pre-conditions and the restructuring modalities. Also, the pre-conditions are not weighted and are therefore not prioritized. Additional research in those areas are needed to improve this framework and therefore also the application in ‘real life’.

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