Barriers to the institutionalisation of industrial energy efficiency in Africa: a case study from Uganda

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Abstract

Uganda has ambitions to become a middle-income country by 2040. Achieving this goal would require an economic transformation that is led and aided by industrialisation. Economic transformation and industrialisation also require efficient utilisation of energy, including electricity. The cost of electricity in Uganda is not cheap; thus, there is an incentive for industries and policymakers to invest in energy efficiency measures. The fact that energy efficiency could contribute to climate and other social policy objectives is also an added advantage. Since the mid-2000s, following a power crisis, the Government of Uganda has taken several initiatives to promote energy efficiency within the industrial sector. However, although targeted interventions delivered demonstrable gains, efforts to institutionalise industrial energy efficiency remains a challenge. In this paper, we use institutional theory and the political economy approach to explore why institutionalisation has been difficult to achieve in Uganda. The paper pays attention to the underlying political and economic processes to observe the factors that contribute to the non-institutionalised status. The paper argues the need to build a robust regulatory framework with a deliberate intent to broaden consensus around a shared understanding of the trade-offs and benefits associated with energy efficiency.

1. INTRODUCTION

Energy efficiency is widely viewed as a cost-effective way to reduce greenhouse gas (GHG) emissions and improve energy security. The International Energy Agency (IEA) estimates that energy efficiency could deliver more than a third of the cumulative GHG emissions reduction necessary to stabilise climate change (IEA, 2018). In developing countries and emerging economies, energy efficiency could potentially mitigate tensions between economic growth objectives and sustainable development commitments (Fowlie & Meeks, 2020). Goal 7 of the UN Sustainable Development Goals outlines a plan to double the rate of global energy-efficiency improvement by 2030. For countries that are motivated to

widen access to modern energy services, energy efficiency is considered a 'low-hanging fruit' that could potentially contribute towards ameliorating energy poverty (IEA, 2018; World Bank, 2015). These projections are predicated on the assumption that an investment in energy efficiency could help manage load growth and the electricity capacity gained could then be redirected to widening access (de la Rue du Can et al., 2018).

Globally, the industrial sector accounts for 40 per cent of the world's total final energy consumption. This number is expected to grow due to increasing demand and, particularly, due to expanding industrial output in energy-intensive subsectors in developing and emerging economies (IEA, 2018; UNIDO, 2017). Hence, investments to improve energy-efficiency are expected to contribute significantly to managing demand within the industrial sector both in developed and developing countries. According to the United Nations Industrial Development Organisation (UNIDO), energy efficiency within the industrial sector could reduce the sector's energy use by 25 per cent (UNIDO, 2017). From a policymakers' perspective, the potential for energy savings makes the industrial sector an important target for improving energy security and achieving national climate mitigation targets (Santana & Bajay, 2016). Hence, industries are encouraged to adopt energy-efficient technologies to slow GHGs and generate financial savings on costs that are associated with energy consumption (Fuchs et al., 2020).

In recent years, energy efficiency as a policy agenda has also been gaining traction among policymakers. According to the World Bank's Regulatory Indicators for Sustainable Energy (RISE), between 2010 and 2019, the percentage of countries with advanced energy-efficiency policy frameworks increased from 2 per cent to 29 per cent (ESMAP, 2020). However, there is also a gap between what is on policy documents and the rate of investment in improving energy efficiency. Studies into why the gap persists indicate that industries in developed and developing countries share similar barriers related to market failures and lack of conducive policy or regulatory framework (Compton, 2011; Fowlie & Meeks, 2020; Fowlie & Phadke, 2017; Martin et al., 2012; Sorrell et al., 2011). However, studies also observe some fundamental differences between developed and developing countries due to different economies, cultural

contexts and the nature of demand systems. Thus, in developing countries, where the economy is fragile, the energy infrastructure is unreliable, the quality of supply is inadequate, and the up-front cost of technologies is high, efforts to institutionalise energy efficiency is particularly difficult (Abdisa, 2018; Apeaning & Thollander, 2013; Fowlie & Meeks, 2020; Fowlie & Phadke, 2017; Olsthoorn et al., 2017; UNIDO, 2011; Weldemariam et al., 2016).

Despite all the potentials attributed to it, for policymakers and political leaders, promoting energy efficiency is not always a straightforward process. For instance, in circumstances where access is low, and the empirical evidence of benefits is either limited or not so visible, it is politically and pragmatically difficult for governments to make a case for the prioritisation of energy efficiency (de la Rue du Can et al., 2017). In countries where industries exert maximum demand on the energy system and propagate frequent system outages, improving their (i.e. industries) efficiency might appear to be something that ought to be welcomed by all (Okoboi & Mawejje, 2016a). However efforts are also often hindered by political-institutional barriers or barriers that originate from or are caused by factors directly related to political institutions (Langlois-Bertrand et al., 2015). In this respect, a political economy approach is valuable to observe the institutional constraints that stand in the way of high-impact policy interventions to promote energy efficiency (Fowlie & Meeks, 2020; Singh et al., 2012).

Researches into the adoption of energy efficiency in developing countries often focus on technical, economic and policy-based barriers and pay less attention to the long-standing debates over resources and the politico-economic incentives that stem from it (Næss et al., 2015). Furthermore, although in developing and low-income countries the lack of a conducive policy and regulatory environment is often cited as a barrier to promoting energy efficiency, discussions around the complexity surrounding the process and the role of competing ideas, interests, and preferences are still limited. Therefore, while the need for conducive policy adoption is often on the agenda, discussions around what needs to happen to ensure stability, durability and enforceability of these policies is missing.

In this paper, we use the experience of Uganda as a case study to explore efforts to institutionalise industrial energy efficiency in low income and developing countries. In the 1990s, Uganda was one of the first countries in Africa to undertake a power-sector reform with an objective to revive an energy system that was on the verge of collapse after two decades of civil war. In the 2000s, faced with an energy crisis that threatened the economy, the Government also embarked on a process to improve energy efficiency and conservation across all the economic sectors, including industry. However, after years of effort, under the Ministry of Energy and Mineral Development (MEMD) leadership, Uganda is yet to create a situation in which industrial energy efficiency is legally governed, morally sanctioned and culturally supported. This paper asks why it has been challenging to institutionalise industrial energy efficiency and what lessons can be drawn from Uganda's experience. The paper draws from the literature on institutionalisation and institutional theory, and political economy to place Uganda's efforts to introduce industrial energy efficiency within the broader historical and political context. In doing so, we aim to understand and observe the influence of the underlying political and economic processes and their embedded histories. The rest of the paper is organised as follows: Section 2 discusses the conceptual framework used to support and guide the data analysis. Section 3 outlines the methodological approach used to develop the paper and its arguments. In section 4, we offer an overview of the industrial and energy sectors in Uganda. Section 5 discusses the case study in four subsections. In section 6, we conclude the paper with a discussion and conclusion.

2. CONCEPTUAL FRAMEWORK: INSTITUTIONS AND INSTITUTIONALISATION OF ENERGY EFFICIENCY

Institutionalism encompasses a range of complementary but different approaches. Rational choice institutionalism emphasises institutions' regulative characteristics and the need for rules and the alignment of incentives (North, 1990). Sociological institutionalists pay attention to the normative feature of institutions, the logic of 'appropriateness' and its influence on behaviour (DiMaggio & Powell, 1991; Scott, 1995). Historical institutionalism takes a broader view of institutions and takes power and power relations into account to observe how institutions constrain change and are resistant to change (Thelen,

1999). There is no clear boundary between these approaches, and researchers liberally draw from all three to answer empirical questions or develop integrative frameworks (Andrews-Speed, 2016; Thelen, 1999; Williamson, 2000). This paper draws its understanding of institutions from all three and leans on organisational institutionalism to organise our case study. Organisational institutionalism is primarily about institutions and institutional processes at the organisation level. However, organisations are also embedded in an institutional context and are responsive to wider societal and institutional influences (DiMaggio & Powell, 1991). Hence, with institutions as 'the rules of the game' that enable and constrain actors' behaviour (DiMaggio & Powell, 1991; North, 1990), we pay attention to the broader institutional context to refer to both 'context as the cultural influence' and 'context as the regulatory framework' (Greenwood et al., 2008). We also draw from Scott (1995) on the role cognitive processes in explaining institutionalised behaviour and that institutional contexts structure behaviour through the reinforcement of rules, norms and cultural beliefs. Similarly, organisational change occurs when there are shifts within the institutional context on what is deemed to be appropriate and legitimate (Schneiberg & Soule, 2005). The process of creating a different institutional environment is what we refer to here as institutionalisation.

Institutionalisation is the process by which organisations come to accept a shared definition of social reality (Scott, 1987) and a process of creating a situation where organisational structures, procedures and norms work in harmony and uncontested (Zilber, 2002). Broadly stated, the process itself involves three interlinked elements: rule making (defining problem and solution); rule adaptation (the emergence of consensus or shared expectations and success criteria); and rule legitimation (a shared conception of what is legitimate) (Lawrence et al., 2001). DiMaggio and Powell (DiMaggio & Powell, 1983) conceptualise it as a three-steps process of diffusion: coercive (demand for compliance); mimetic isomorphism (a response to pressure); and normative isomorphism (convergence). Building on this, Scott (1995) introduces the three pillars of institutionalisation: regulative; normative; and cultural-cognitive. The regulatory pillar refers to the ability to establish rules and monitor conformity. The normative pillar refers to the process of defining the norms and the legitimate means of pursuing valued end goals. The cultural-cognitive pillar

refers to the process of ensuring compliance and the emergence of shared beliefs and logics. Tolbert and Zucker (1996) observe that although the mechanisms that are postulated to produce institutionalisation are slightly different, these theories predict the same organisational outcome, and not pay enough attention to variability in outcomes. For instance, the authors argue where behavioural patterns do not institutionalise equally, the variation could depend on a number of factors including how widely the new institutionalised behaviour is accepted by members. They then also highlight the need to pay attention to the threat from groups with competing interests

Tolbert and Zucker (1996) also propose adding a temporal dimension and introduce a sequential approach to examining the process of institutionalisation. The process, comprises four distinctive stages. It starts with innovation, which refers to an event that triggers the process, then habitualisation or the development of patterned problem-solving behaviour (by few actors), followed by objectification or the emergence of consensus and shared meanings, and sedimentation or the stage where the newly institutionalised behaviour acquires the quality of being taken for granted. Once full institutionalisation is achieved, structures and procedures are assumed to go hand in hand with their uncontested meanings and cultural endorsements.

However, full-institutionalisation also depends on the conjoint effects of relatively low resistance, continued cultural support and positive correlation with desired outcomes (Tolbert & Zucker, 1996). This means whether the process succeeds or fails rests on what happens at the objectification stage. Objectification involves the development of broader consensus and it is often at this stage that the process is met with resistance from those that oppose it or structural constraints such as path dependency, lock-in, and cognitive limitations (Thelen, 2003). This happens because the path of institutional change is shaped by a lock-in that comes from the symbiotic relationship between institutions and the organisations that have evolved as a consequence of the incentive structures provided by those institutions (North, 1990). Hence, whether full institutionalisation is achieved or not is determined by the strength of those who are against it and the ability of its advocates to demonstrate its added values. To say it differently, institutionalisation as a process that aims to regulate

behaviour is a political process imbued with power and interests (DiMaggio & Powell, 1991). Therefore, research into the process should pay attention to the role of groups and the institutional context (Lawrence et al., 2001). The latter is relevant here because institutionalisation is embedded in a historical, economic and political context that shapes the norms, values, and expectations that, then, in turn, influence the process and its outcome. In this regard, a political economy approach offers a useful point of entry to observe the forces that shape the process of institutionalisation and its outcome. A political economy approach seeks to understand why plans and policies that are apparently socially and economically desirable are often difficult to implement (Barnett, 2014). As an analytical tool, it pays attention to the interaction between politics and their material bases – or how economic issues shape interests, processes, and outcomes and vice-versa to understand how political constraints (which arise from the need to make a collective choice while dealing with conflicting and heterogeneous interests) may explain policy choices and outcomes (Beuran et al., 2011). Political economy has been used to understand the complexity surrounding energy transitions and explore the role of competing ideas, interests, and preferences (Baker et al., 2014; Newell & Mulvaney, 2013; Power et al., 2016; Roberts et al., 2018).

In this paper, we use the sequenced process developed by Tolbert and Zucker and draw insights from political economy approach to observe why full-institutionalisation of industrial energy efficiency has been difficult to achieve in Uganda. In doing so, we observe not only at what point in the process the effort was impeded but also investigate why and explore the underlying political and economic factors that contribute to its current non-institutionalised status. A political economy approach offers insight about the forces that shape the institutionalisation process and its outcome.

3. METHODOLOGY

In the 1990s, Uganda was one of the first countries in Africa to undertake a power-sector structural reform with an objective to revive its energy system that was on the verge of collapse after two decades of civil war. In the 2000s, faced with an energy crisis that threatened the economy, the Government embarked on a process to improve energy efficiency and conservation across all the

economic sectors, including industry. However, after years of effort, under the Ministry of Energy and Mineral Development (MEMD) leadership, Uganda is yet to create a situation in which industrial energy efficiency is legally governed, morally sanctioned and culturally supported. This paper asks why it has been challenging to do so. To answer this question, we examine the process of institutionalisation and the broader context within which the process is unfolding. The paper takes a single case study and interpretive approach to explore the process of institutionalisation developed over a period of time and offer a rich description of the various elements that influence the process and its outcome. The case study approach is suitable for examining the process in a natural setting and with no specific variables are offered in advance (Sovacool et al., 2018). The descriptive-interpretive approach is useful to explore a phenomenon (i.e. institutionalisation of industrial energy efficiency in low income and developing countries context) that is currently understudied and not well understood.

The paper uses a mixture of qualitative research techniques, including literature review, interviews, and workshop participation and archival study to collect data. Semi-structured interviews were carried out in May 2019 and February 2020. In total, we interviewed more than 12 key informants. Those interviewed included civil servants within the relevant government agencies (Energy and Industry), civil-society organisations and professional associations representing the energy and industrial sectors, research institutions and energy-efficiency professionals (e.g., energy auditors). The sampling for interviews followed purposive snowballing based on stakeholder analysis and recommendations by interviewees. Information was also elicited at two multi-stakeholder workshops organised by the project in February 2020 (in Kampala) and August 2020 (online). The workshops were attended by representatives from government agencies (the industry, energy and environment sectors), industries, and civil society organisations. During the second workshop, participants were asked to fill an exit survey. Although the survey was too small to be representative, the insights gained from it were used to augment our analysis.

Interviews with key informants were carried out face to face and lasted from 45 minutes to an hour. Interviewees were asked to share their experience and

involvement in the effort to promote energy efficiency in Uganda. They were asked to reflect on the process and what, in their view, worked and didn't work. Interviewees and workshops participants were also asked to reflect on the Government initiatives to promote and regulate industries energy management practice. They were also asked to reflect on the barriers and opportunities to invest in energy efficiency and their views on the preferred approach to improving energy efficiency within their sectors. Policy analysis was also conducted on relevant policies, strategies and programmes and cross-referenced by interviewees.

Our approach to data analysis is akin to process tracing. Process tracing is an analytic tool for drawing descriptive and causal inferences from diagnostic evidence (Collier, 2011). As a tool of causal inference, process tracing focuses on the unfolding of events or situations over time. However, grasping this unfolding event is impossible if one can also not adequately describe an event or a situation at one point in time. Hence, the descriptive component of process tracing begins not with an observation of change but with snapshots of a series of specific moments (Collier, 2011). In other words, to describe a process, the research must also be able to describe the key steps in the process, which then is used to analyse changes. Our approach to tracing Uganda's effort to institutionalise industrial energy efficiency relies on Tolbert and Zucker's (1996) concept of institutionalisation as a sequenced process institutionalisation. The case study we present here and our analysis is associative and not necessarily causal.

4. OVERVIEW OF THE ENERGY AND INDUSTRIAL SECTORS IN UGANDA

In Uganda, the development of the electricity sector is inextricably intertwined with the industrial sector. The expansion of electricity started rather slowly in the 1930s, and no significant transformation happened until the 1940s when the Colonial Government developed an interest in the Nile River as a source of hydroelectric power. Historical accounts observe that Winston Churchill, then the Parliamentary Under-Secretary of State for Colonies, saw the Nile as an opportunity for industrialisation in Uganda and predicted that the Nile would 'one day be crowded with factories and industries' (Winston Churchill 1908 as cited

by (Maclean et al., 2016). The first hydroelectric dam, the Owen Falls Dam (later named the Nalubaale Dam), was built on the White Nile in the 1950s under the management of the Uganda Electricity Board (UEB) (Gore et al., 2019; Mawejje et al., 2013). The UEB (established in 1948) was tasked to use the Owen Falls Dam to facilitate the transformation of Uganda into an industrial hub as outlined in the 1946 five-year national development plan (Mawejje et al., 2013). However, while the colonial authority gave a financial guarantee for public electricity cooperation, it failed to make any provision for the establishment of industries that would take the electricity generated (Wilson, 1967). Hence, with fewer industries and factories to take power generated domestically, electricity supply remained limited to the European and Asian communities' urban areas (Hirschman, 1967). However, the vision of utilizing the electricity sector to build an export-oriented industrial economy continue to drive ambitions for the sector.

After independence, with expanding access to rural communities deemed too expensive, electricity was dominantly viewed as a service for industrial development and as an export commodity (Gore, 2017). Although a series of governments continued to assert the importance of electricity to economic growth, universal electrification was never at the top of the political agenda or part of the national development narrative (Gore, 2017; Gore et al., 2019; Maclean et al., 2016). In the 1970s and 1980s, electricity expansion ambitions were altogether abandoned due to political unrest and economic decline. Until the early 2000s, the Owen Falls Dam remained the only major source of electricity in Uganda (Mawejje et al., 2013). In the 1990s, the notion of electricity as imperative for economic growth was revived and concentrated its efforts on building large hydroelectric dams to facilitate industrialisation. Efforts were generally driven by the need to aid the modernisation of the economy and with the assumption that the spin-off effects would improve citizens' well-being and ability to afford access to electricity (Gore, 2017; Maclean et al., 2016; Mawejje & Mawejje, 2016).

4.1. A brief overview of the industrial sector

Documents show that Uganda has had a relatively well established industrial sector that supplied the local market and exported to neighbouring countries

(Wilson, 1967). In 1952, with the establishment of the Uganda Development Corporation (UDC), the sector was given priority in the national development strategy (Shinyekwa et al., 2016). However, the policy also paid limited attention to human resource development and the nurturing of local entrepreneurial capabilities. According to one account, at independence, Uganda had no electrical or mechanical engineers (Shinyekwa et al., 2016). After independence (1962), the UDC continued to play a central role in promoting industrialisation and providing investment capital for the private sector under the state-led import substitution industrialisation programme (Ggoobi et al., 2017). However, in the 1970s and 1980s, the economy was severely weakened by policies that led to the expulsion of Asian communities, the nationalisation and mismanagement of nascent enterprises and a civil war that lasted two decades. By the mid-1980s, physical infrastructure had been destroyed and manufacturing output had fallen significantly (Shinyekwa et al., 2016). Following the end of the armed conflict, the government introduced a sequenced structural reform policy package to revive the economy and stimulate private investment, including the privatisation of banks and public enterprises, including electricity. These efforts and the post-conflict reconstruction resulted in a period of growth and macroeconomic stability. The contribution of industry to GDP grew from 10 per cent in 1990 to 20 per cent in 2018 and export from 5.7 per cent of GDP to 15.4 per cent (Calabrese et al., 2019). The sector employs less than ten per cent of the national workforce (Walter & Aubert, 2018).

Today the industrial sector in Uganda is comprised of mining, manufacturing, electricity, water and construction. The manufacturing sector, which is the largest subsectors is divided into eight groups: are food processing (40 per cent); drinks and tobacco (20 per cent); chemicals, paint and soap (10 per cent); metal products (8 per cent); and cement (8 per cent) (Tanushree Sahai et al., 2020). The industry sector heavily relies on biomass (mainly firewood and agricultural residue). Biomass contributes over 80 percent of the sector's energy consumption and is mainly used for process heat and to fuel brick burning, tea drying and lime production. Petroleum products (mainly diesel) represents around 15 per cent of energy consumption by carrier and is mainly used to power-backup generators and fuel devices such as pumps. Industries consume over 60 per cent of all electricity generated and it is mainly used for the

operation of motors and machinery. However, electricity represents only five per cent of total energy consumption by industries (Walter & Aubert, 2018).

The manufacturing sector is populated by small and medium enterprises that are mostly owned by Ugandans. 93.5 per cent of firms operating within the industry sector fall under the category of SMEs (Uganda National Planning Authority, 2020). Most of the products produced are aimed at domestic consumption, and exports are limited to the regional markets. Uganda has a small proportion of large-scale manufacturing firms which are predominantly are foreign owned, last stage assembling firms. Most are concentrated in the metallurgical, textile, tannery, cement, brewing and bottling activities (Walter & Aubert, 2018). A handful of large Ugandan–Asian conglomerates, which tend to have diversified investment ranging from agriculture to manufacturing to services, are also present.

Over the years, and despite the growth rate achieved, the performance of the sector remains mixed, and private sector-led industrial development is yet to be realised (Calabrese et al., 2019; Kjær & Katusiimeh, 2012; Shinyekwa et al., 2016). Initially, growth was coupled with nascent signs of economic transformation, i.e., shifting labour and resources from low-value-added activities to those of higher productivity (Balchin et al., 2019) However, since the early 2000s progress has stalled and underemployment on the rise, which has led to the economy's diagnosis as one of 'jobless growth'. The problem of underemployment and inequality combined with population growth has motivated the government to address the economic stagnation through policies and strategies that aim to advance the industrial sector. For instance, Vision 2040 identifies industrialisation as the path to increasing industry's share of national labour from 7.6 per cent in 2010 to 26 per cent in 2040, as well as to increasing the share of manufacturing exports from 4.2 per cent to 50 per cent. In recent years, the government has also taken a more interventionist approach, as evident in the specific investments in infrastructure provision and the revival of the UDC to nurture manufacturing through long-term financing and the construction of industrial parks (Uganda National Planning Authority, 2020). The National Development Plan (2020) also identifies electrification and keeping the

cost of energy low as integral parts of plans to promote economic transformation through industrialisation.

4.2. A brief overview of the electricity sector

Electricity is a critical part of the government's ambitions to transform the national economy and achieve middle-income status. Currently, 87 per cent of the total primary energy consumed in Uganda is generated through biomass, and electricity contributes only about 2 per cent to the national energy balance. It is also estimated that the national electrification access rate is at about 26 per cent, and the per capita electricity consumption rate at 100 kWh per capita per year (Uganda National Planning Authority, 2020). Domestic users – followed by industry and transportation – form the biggest energy consumer group. Industries account for nine per cent of the total consumer base for the utility company (Umeme Ltd) and 66 per cent of the revenue it raises annually (UMEME, 2016). Growth in electricity use has been fastest in the industrial sector and slowest in the domestic sector (Walter & Aubert, 2018).

In the 1970s and 1980s, the electricity sector struggled. Infrastructure and generation suffered from extreme neglect, and production fell from 150MW in 1963 to 60MW in 1987 (Mawejje & Mawejje, 2016). In the 1990s, with support from international development institutions, the government started sector reform. Uganda was the first African country to unbundle generation, transmission and distribution into separate utilities and to offer private concessions for power generation and distribution. In 2004, Umeme Ltd entered into a 20-year concession agreement with the government to operate the business of electricity distribution. Currently, independent power producers account for nearly 60 per cent of the total generation capacity. When reform started, only one hydropower plant (Nalubaale power plant, 180MW) generated electricity for the national grid (Mawejje et al., 2013). Since the 1990s, increasing generation capacity has been top of the government's agenda to unlock development. Between 2011 and 2020, the total installed electricity capacity increased by 105 per cent (see Table 1). Growth in overall installed capacity has largely been because of investments in large and small hydropower generation.

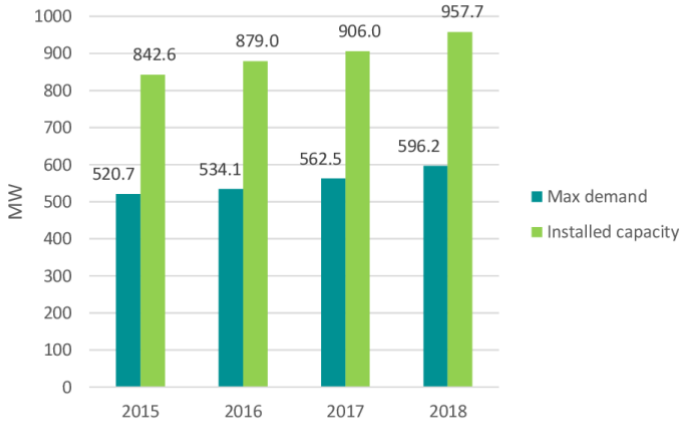
Table 1. Generation capacity of licensed plants under operation (MW).

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Large hydro	380.0	630.0	630.0	630.0	630.0	630.0	630.0	630.0	855.0	855.0
Small hydro	52.7	65.2	65.2	65.3	65.3	65.3	82.3	114.0	149.3	155.7
Thermal	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	100.0
Solar	0.0	0.0	0.0	0.0	0.6	10.8	20.8	40.8	50.8	60.8
Cogeneration	75.1	75.1	75.1	75.1	96.2	96.2	96.2	96.2	96.2	96.2
Diesel	0.1	0.1	0.1	0.1	1.1	1.1	1.1	1.1	1.1	1.1
Total	609.4	872.0	872.0	872.1	894.8	905.0	932.1	983.8	1254.0	1268.4

Source: ERA 2021 (Electricity Regulatory Authority, 2021).

Currently, reports indicate that as supply increases, demand is declining. As illustrated in Figure 1, between 2015 and 2018 electricity demand was low, at an average reserve margin of 38 percent against installed capacity. While this could be explained by a time-of-use demand-side management programme to shift consumption from peak to off-peak and the shoulder period, some also note supply has outstripped demand (Godinho & Eberhard, 2019). Surplus in supply threatens to have an impact on tariffs, as the take-or-pay clause standard in power purchase agreements also means the electricity generated must be paid for even if distribution or demand is not enough (Godinho & Eberhard, 2019; Akena & Wanless, 2020). Some warn the situation is likely to be exacerbated by the commissioning of more hydropower plants, with a capacity projected to jump to about 2000 MW in 2021 (Meyer et al., 2018). Furthermore, due to the unprecedented shocks caused by the Covid-19 pandemic and the subsequent lockdown measures, demand for electricity reduced significantly in 2020.

Figure 1. Installed capacity and peak demand



Source: Compiled by authors with data from Electricity Regulatory Authority (2020)

5. BARRIERS TO THE INSTITUTIONALISATION OF INDUSTRIAL ENERGY EFFICIENCY

In this section, we use Tolbert and Zucker's (1996) sequenced approach to trace efforts to institutionalise industrial energy efficiency and discuss why this ambition has not yet been realised. We start with an account of what triggered the process (innovation). We then discuss the activities carried out by the MEMD and development partners to define and build a shared understanding of the problem and the solutions (habitualisation). Next, we discuss the objectification phase or the attempt to legally crystalise the emerging understanding around energy efficiency (and, more specifically, the role of industries). As per Tolbert and Zucker (1996), the fourth phase refers to sedimentation or full-institutionalisation. However, given that industrial energy efficiency in Uganda has not yet been fully institutionalised, under this subsection, we examine the elements that contribute to its current non-institutionalisation status.

5.1. The institutional trigger or innovation

Disruptive events like economic crises, natural disasters and innovation have the effect of drawing attention to existing problems and triggering the process of change (Greenwood et al., 2008; Munir & Phillips, 2005). In Uganda, energy efficiency gained momentum in the mid-2000s when the country experienced an energy crisis and chronic power shortages. The crisis was linked to several factors, including prolonged drought, which caused a reduction in the energy generated from existing hydropower facilities; high levels of technical and non-technical system losses, which at the time was estimated to be about 44 per cent; and a lack of sufficient generation capacity due to the delayed commissioning of a hydropower project (Heffner et al., 2010; Mawejje et al., 2013). To mitigate the deficits in electricity supply and its effects on the economy, the Government procured three thermal plants with a total capacity of 150 MW. Between 2006 and 2010, the contribution of thermal power to the overall supply increased by 178 per cent, from 370 GWh to 1029 GWh, and the price of electricity by 115 per cent (Mawejje et al., 2013). Government subsidies covered the difference between the cost of supply and end-user tariffs. However, by 2011, the cost of reliance on emergency thermal generation became unsustainable and the Government defaulted on its obligations to the

thermal power suppliers, resulting in further power deficits (Kapika & Eberhard, 2013; Mawejje et al., 2013). With the entire energy sector's sustainability under threat, the Government developed short-and long-term intervention plans: short-term intervention focused on energy-efficiency interventions. In contrast, the long-term intervention included expanding generation capacity and other energy-efficiency measures (World Bank, 2012). The urgency to resolve the problem also led the government to specifically target sectors that are high consumers, i.e., energy-intensive industries as well as public enterprises.

5.2. Habitualisation or pre-institutionalisation

In Ugandan and within the energy crisis context, pre-institutionalisation activities mainly focused on generating evidence and a shared understanding of ways to conserve energy. This involved gathering information and impact evidence to theorise the crisis and the recommended solutions. Hence, besides short-term solutions like renting emergency thermal power, the Government turned to international development partners for technical and financial support. Between 2006 and 2011, with assistance and guidance from the World Bank and the German Gesellschaft für Internationale Zusammenarbeit (GIZ), the MEMD then carried out activities targeting households, industries and institutional consumers. These targeted interventions were carried out with two objectives: alleviate the immediate problem with supply shortage and demonstrate results to cultivate a shared appreciation of what values lie behind energy-efficiency investments.

Under the Power Sector Development Programme (2007–2011), a World Bank-financed project, the MEMD carried out energy audits targeting public institutions (hospitals, schools, state buildings, universities) and installed efficiency equipment. It was later estimated this intervention reduced electricity consumption by about 10 GWh (De la Rue du Can et al., 2018). The Power Factor Correction Programme is another example. In 2008 the MEMD, with support from the World Bank, audited large manufacturing plants energy consumption. The audits showed that most of the large industries were energy inefficient and operate with a power factor ranging between 0.52 and 0.85. The range was lower than what is stipulated in Uganda's Electricity (Primary Grid Code) Regulations (2003), which recommend that the power factor for big

consumers should not fall below 0.9 (Okoboi & Mawejje, 2016b). This was followed by a distribution of power factor correction equipment at a significantly subsidised cost for large industries (Okoboi & Mawejje, 2016b). Subsequently, the monitoring of enterprises that benefited from the power factor improvement showed an energy saving equivalent to 8.4 MW of electricity (De la Rue du Can et al., 2018; Okoboi & Mawejje, 2016b).

In 2014, the MEMD, with support from the GIZ, followed this up with an energy-efficiency management programme specifically targeting large and energy-intensive industries. Under the programme, the MEMD carried out energy audits of 26 industries to establish a consumption baseline and sensitise industries to the benefits of energy management. The programme also made two key findings: first, low uptake of energy management, i.e. after being audited, very few industries made changes to improve efficiency. Only three of those audited took measures to improve their operational efficiency (de la Rue du Can et al., 2017). The second finding was that with appropriate energy management practices, the energy-saving potential of the industrial sector is between 15 and 25 per cent (MEMD, 2015). Subsequently, these findings became the basis for the development of the national energy-efficiency bill and strategy.

5.3 Objectification or semi-institutionalisation

According to (Tolbert & Zucker, 1996) the habitualisation or pre-institutionalisation phase is about ensuring the new structure or institutionalised behaviour cognitive and normative legitimacy and developing its regulatory legitimacy. The phase is about building consensus. Activities include developing a regulatory framework and demonstrating a high-level commitment to address the problem by formally endorsing the theorised solution. At this stage, factors like political will, good cooperation across institutions, and commitment of resources are critical to facilitating the process.

In Uganda, further efforts to institutionalise energy efficiency came about with the drafting of the National Energy Efficiency Strategy (2010–2020). The Strategy was developed by MEMD with support from the GIZ. It outlines efficiency programmes for all economic sectors, including households, institutions, industry, commerce, and power transmission and distribution

sectors. It also outlines an intervention plan targeting five key areas: awareness and information; training and education; research and development; finance and other incentives; and legislation.

The Strategy document then paved the way for the drafting of the Energy Efficiency and Conservation Bill (2010) to provide the statutory basis for promulgating rules and regulations to promote energy efficiency. The draft Bill authorises the establishment of an Energy Efficiency and Conservation Fund to incentivise investments and provides the institutional and regulatory framework for the implementation of the Energy Efficiency Strategy. More specifically, and regarding industries, the Bill sets out a regulation for the establishment of minimum energy performance standards for equipment. To stimulate a higher level of investment in energy efficiency, it requires large energy users to appoint an energy manager to conduct regular energy audits and report progress on the implementation of energy-efficiency measures to the MEMD. Since it was first introduced in 2010, the Bill has gone through a few reviews. Although the principles of the Bill were approved by the Ministerial Cabinet in 2016, it has not been officially endorsed and enacted.

5.4 Inadequate institutionalisation

Theoretically, sedimentation or full-institutionalisation is characterised by the complete spread and perpetuation of institutionalised behaviour (Tolbert & Zucker, 1996). In Uganda, this has not yet been achieved and the process remains incomplete. In this case, by full institutionalisation we mean a situation energy management practices and periodical energy audits within the industrial sector is legally sanctioned, morally governed and culturally supported in Uganda. Hence, this section is dedicated to exploring the barriers that contribute to the current state of non-institutionalisation. The discussion focuses on the cumulative effect of three types of barriers: technical, infrastructural and regulatory.

Technical capacity or the capacity to generate evidence, demonstrate impact and deliver sound advice is key to the process of institutionalisation. The process depends on the credibility of those that advocate the new structure or institutional behaviour. Reputation (a perception of capacity to deliver on core

tasks) is an important resource for entities that strive to establish authority and legitimacy (Busuloc & Rimkute, 2019; Carpenter & Krause, 2012). Hence, the availability of skilled energy auditors is important from technical, normative and regulatory perspectives. The normative influence of an energy audit depends on how much confidence those that are being audited have in those that are doing the auditing (Olsthoorn et al., 2017). One key obstacle to the plan to make energy audits a standard practice among large-scale industries is the shortage of auditors with the technical capacity the task requires. Currently, in Uganda, there are only a few certified energy auditors (CEAs) and one certified energy manager (CEM), but no accredited measurement and verification professionals (CMVPs). There is no certification programme for energy auditors and the accreditation of inspectors (MEMD, 2019). Interviewees often commented that where auditors do not meet the degree of complexity on which larger industries operate, the value of an audit is often undermined. Firms managers are also generally disinclined to go through the process due to lack of confidence regarding the credibility of evidence and wariness to disclose commercially sensitive data.

Unreliable power supply and insufficient physical infrastructure also hinder industries from prioritising in investment to improve operational energy efficiency. The transmission grid in Uganda currently is at a circuit length of 1627km and out of step with generation capacity (Electricity Regulatory Authority, 2016). Industries experience frequent voltage drops and power interruptions due to variations in electricity demand and failures of transmission and distribution lines (see Table 2). The poor reliability of the transmission system is due to the prevalence of radial rather than ring networks (MEMD, 2019). Energy sector experts the infrastructural network suffers from inadequate public funding and widespread vandalism of transmission equipment. For industries whose productivity is dependent on electricity, a slight destabilisation or disruption to the power quality (voltage deviation) undermines operation significantly (production interruption, reduced total production time, and, in some instances, equipment damage) (Mao et al., 2018). Thus, firms in Uganda prioritise investing in power surge protectors and standby generators (Walter & Aubert, 2018).

Table 2. Power outage in megawatt hours (MWh).

	Scheduled outages	Forced outages	Force Majeure / Low system demand	Caused by generator
2017	5,018	3,473	601,027	123,165
2016	2,616	3,769	1,019,438	484,527
2015	2,139	2,768	833,492	535,514
2014	8,745	3,546	904,693	599,071
2013	10,248	4,616	761,124	567,087
2012	4,317	2,964	266,850	130,305
2011	17,010	419	22,501	16,161

Source: UEGCL 2018

Cultivating norms and values around efficient energy management requires a coordinated effort across multiple fronts and activities ranging from the operationalising of policies and enforcement of regulations. In Uganda, relevant policies are either not in place and those that are not being implemented or enforced. For instance, the Electricity (Reporting and Record-keeping) Regulation (2019) is an important tool the Government has to ensure supply-side management. It requires power operators to record and report on system performance, including power reliability, quality, transmission loss and voltage deviation. However, due to a lack of a comprehensive information system, this regulation is currently not being enforced. Uganda also lacks the Standardisation and Specification of Equipment in the industrial sector and a strategy to mandate minimum performance standards for industries. Thus, although the Bureau of Standards has developed energy performance standards for lighting, refrigerators, freezers and air conditioners, and motors, these have not yet been endorsed due to the absence of regulation (de la Rue du Can et al., 2017).

The delay to ratify the Energy Efficiency and Conservation Bill (2010) has the most sobering effect on efforts to institutionalise industrial energy management in Uganda. Failure to enact meant the MEMD has not been able to operationalise the National Energy Efficiency Strategy or set up the Energy Efficiency and Conservation Fund as planned. This gap in legislative mandate has created a structural vacuum and heightened the risk factor regarding the costs and benefits associated with investments to improve industries energy efficiency.

Nevertheless, efforts to promote industries energy efficiency in Uganda is still ongoing. The draft National Energy Policy (2019), currently under review, considers energy efficiency and demand-side management as important and tasks the MEMD to create an enabling framework to promote efficiency in sectors across the economy. The draft policy document also outlines a set of activities to promote energy efficiency within the industrial sector. Some of the activities include: promote commercial financing of demand side management initiatives; promote the institutionalisation of demand-side energy management in high energy consuming industries; and to promote the uptake of energy auditing for high energy-consuming industries (MEMD, 2019). The latest approach is different from what was pursued in the past, i.e. regulative approach with periodic mandatory energy audits for large consumers. The draft Policy document makes no reference to the draft Energy Efficiency Bill or the strategy document that already exists. The latest approach (if adopted) is also less ambitious. For example, it no longer mentions a plan to set up an Energy Efficiency Fund suggested in the Energy Efficiency Bill or stipulates how the interventions outlined would be financed.

6. DISCUSSION AND CONCLUSION

6.1. Extending political economy analysis

As noted earlier, full institutionalisation is characterised by the spread of institutionalised behaviour. The persistence of this institutionalised behaviour then depends on the conjoint effects of low resistance from those opposing it; continued cultural support and promotion by those supporting it; and its positive correlation with desired outcomes (Tolbert & Zucker, 1996). The taken-for-granted status achieved at this stage is then determined by the strength of those who are against it and the ability of its advocates to demonstrate its added values. In Uganda, one possible explanation as to why full institutionalisation has not yet realised is that either because those opposing it have a stronger argument against it or those advocating for it have not been able to demonstrate its benefits or a combination of the two factors.

Like most low-income and developing countries, Uganda's development ambitions are predicated on the view that the industrial sector could lead not only to an economic transformation but also put the country on a path to

achieving middle-income status. With energy consumption and industrialisation interlinked cognitively and normatively, industries' increased energy consumption is valued as an indicator of progress. The NDP III (2020) comments that 'more needs to be done to increase industrial energy consumption' (Uganda National Planning Authority, 2020). Keeping the electricity tariffs low for large industries is an important part of the national strategy to attract investors and nurture the manufacturing sector. Concerned about the potential challenge the high tariff could cause to investment within the industrial sector, President Yoweri Museveni is a vocal advocate and champion of lowering the tariffs for industries (Calabrese et al., 2019; Meyer et al., 2018). However, compared with commercial and domestic consumers, large enterprises already enjoy lower tariffs. Domestic users pay the highest average price of the three consumer groups. The average tariff for residential customers stands at 0.20 USD/kWh, while large size industries pay 0.08 USD/kWh. The prevalence of subsidised electricity undermines the economic argument for improved energy efficiency.

Diverging interests also contribute to the different preferences regarding the nature, relevance and legitimacy of pursuing industrial energy efficiency in Uganda. While the MEMD regulative approach stresses energy management practices and periodic energy audits, industries argue efficiency could be achieved by improving supply-side management. For government agencies and civil society organisations that are mandated to promote investment in the manufacturing sector, there is a vested interest in lessening the regulatory requirements targeting industries. Hence, advocate for lowering the cost of electricity to enable the manufacturing sector to grow. The question who should drive the efficiency improvement effort is also a point of diverging opinions. Some interviewees comment that although government intervention is pertinent it should be limited to activities around raising awareness because to do more is against Uganda's approach to a private sector led economy. Others express an opinion that a public and private partnership is best suited.

Over the last two decades, the energy context and the economic incentive for utilities in Uganda has also changed significantly. In the 2000s, when the drive for energy efficiency kicked off, the country was experiencing an energy crisis

and power shortfalls. Since then, the installed generation capacity has more than doubled. There is now much more electricity than the demands of all connected to the grid. Hence, the challenge the sector faces has shifted from 'unmet demand' to 'unconsumed electricity'. Under such circumstances, nudging high energy consumers to lower their consumption stands in direct contrast to the utility's interest in raising revenue and earning profit. This is relevant when considering industries consume over 60 per cent of all electricity generated in Uganda. In terms of revenue contribution, industries and commercial customers also contribute over 70 per cent of total revenue from electricity sales (UMEME, 2016).

It is often argued that in countries where access to modern energy is low, energy efficiency could potentially contribute towards widening access. Such argument is predicated on the assumption that by managing load growth, the electricity capacity added to the grid could then be used to either improve service to those that are currently underserved or connect more users to the grid (De la Rue du Can et al., 2018). In Uganda, these connections are not made explicitly, and the wider societal benefits of energy efficiency have not been part of the broader narrative. The potential benefits of energy efficiency, such as climate-compatible growth, green jobs creation, opportunities to widen access to communities that are currently underserved, have not been theorised, evidenced and interwoven in the national discourse. This overlook corresponds to the observation made by (Gore et al., 2019) and (Maclean et al., 2016) about energy provision in Uganda, i.e. historically widening access to citizens has not factored in the national developmental narrative, and citizens' expectation in this regard is low. Thus, the Government is rarely under pressure from citizens to improve access to reliable electricity.

Thus far, the effort to institutionalise energy efficiency has also paid little attention to another group that could benefit the most from such intervention, i.e., SMEs. Spread across all sub-sectors of the Ugandan economy, SMEs represent over 90 per cent of the manufacturing sector and generate over 80 per cent of the manufactured output in Uganda. During the energy crisis of the 2000s, the decision to target high energy consuming large companies was made because the short-term intervention aimed at achieving immediate and

significant impact. However, in the subsequent years, the failure to include SMEs in the broader consensus building activities is a missed opportunity to advance the normative and cognitive legitimacy of energy efficiency within the manufacturing sector.

6.2. The way forward for industrial energy efficiency

In Uganda, although there have been some substantial efforts and demonstrable gains, the attempt to institutionalise industrial energy efficiency has not yet materialised due to the absence of a regulatory framework, limited capacity and lack of consensus. This paper draws insights from political economy and institutionalisation literature to observe the challenges and competing needs that acted as barriers to the process. We also paid attention to the underlying political and economic processes and their embedded histories to observe possible causal mechanisms that may also shed light on barriers and opportunities for change. Moving forward, the Government of Uganda and development partners could potentially take some steps to revive and put the process back on the path to achieving its objectives. These may include ratifying the Energy Efficiency Bill and implementing the Energy Efficiency Strategy. However, before doing so, it might be necessary to address the apparent tension between energy efficiency and development, adopt a comprehensive view and approach to energy efficiency, and reimagine the path to energy efficiency to fit the Ugandan context.

Industrialisation and economic growth ambitions influence and drive Uganda's energy security policies. However, normalising energy management practices within industries does not need to be seen to hinder or contradict the sector growth. Energy efficiency needs to be seen not as an energy crisis management tool but as an integral part of energy planning with a well-defined mandate embedded within the broader energy governance mechanism. Doing so could allow for a shared understanding to emerge around the synergies associated with energy, industrial growth and the future of climate-compatible growth within the Ugandan context. Deepening the links between Uganda's climate mitigation goals could also provide further incentives to accelerate energy efficiency strategies.

In this paper, we also raised the issue of balancing the demand- and supply-side management as an important aspect of the institutionalisation process. Within the demand-side, industries are encouraged to modify their level and pattern of energy usage, apply conservation and appliance improvement, and change organisational behaviour. Within the supply side, actors are encouraged to take actions upstream to ensure generation, transmission and distribution are carried out efficiently. A commitment to balancing supply and demand means that energy providers focus on energy-efficiency programmes that have resource value. Manufacturing firms are making energy related decisions in the face of constrained budget. Faced with reliability and power quality issues, investment in efficiency is not high on their priority list. If the energy providers (and policy makers) aim to see firms as partners in energy demand reduction efforts, action would need to be taken at the supply end so as investments for energy efficiency are prioritised. One advantage of taking a comprehensive approach and treating energy efficiency as equivalent to a supply-side resource is that within the context of a power development plan, it makes it much easier to gauge cost-effectiveness, evaluate results and justify programmes (IEA, 2010). The need for the demand- and supply-side management of energy efficiency to operate in sync also extends to the need to deliver energy services that are sustainable (socially acceptable, environmentally responsible and economically feasible).

More also needs to be done to demonstrate where the energy-saving benefits are and to make a credible linkage between the benefits to be gained with other policy areas that have broader societal benefits. In developing countries, the argument for energy-efficiency investment suffers from credibility problems (Fowlie & Meeks, 2020). Evidence and data from computer-based modelling exercises need to be grounded by what is practically achievable and relevant. In other words, energy efficiency and its benefits need to be reimagined and harmonised with the Ugandan context. The process needs to be inclusive and be guided by an assessment of distributive impact or who can benefit the most from it. In the Ugandan context, for example, this potentially could mean reimagining industrial energy efficiency as a way to enable SMEs to improve their resource management. Or, it could mean improving the supply infrastructure to remove uncertainties and risk factors that currently inhibit investment in efficiency

improvement. In the Uganda, normalising industrial energy efficiency could mean building a robust institutional framework for a wider stakeholders' engagement to build consensus and align interests around a shared understanding of the trade-offs and benefits.

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