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From dysfunctional to functional corruption: the politics of decentralized electricity provision in Lebanon

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ABSTRACT

Dysfunctional and corruption-prone power sectors are a persisting challenge in many developing countries. Drawing from the theoretical framework about corruption from Khan, Andreoni and Roy [1] and applying it to electricity, this paper explores the service provision model of Electricite du Zahle (EDZ), a decentralized local utility in Lebanon. Our analysis shows that although EDZ has succeeded in improving the service experienced by its customers, its approach has not reduced corruption. However, despite its deviation from the "standard" model of power sector reform, the EDZ model has achieved a notable developmental outcome in a way that is consistent with the complex political settlement of the country. Our findings point to the possibility of extending similar – second-best, but politically feasible – approaches throughout Lebanon and, potentially, in many other countries where the implementation of centralized power sector reforms has not succeeded.

1. Introduction

Corruption in the electricity sector has been a major constraint to economic and social progress in many countries. The large literature about corruption in the sector tends to distinguish between several different types, from petty corruption and theft (e.g. bribing meter readers, illegal connections), to corrupt management practices (e.g. overpayment of fuel suppliers or the rigging of procurement processes), to grand corruption (e.g. the systematic extraction of rents through elite control over the entire electricity supply chain) [2]. Such corruption has harmful effects. It lowers the efficiency of utilities [3] and weakens overall sector performance – including technical efficiency, access rates and economic performance [4]. Corruption also damages the reliability of services. For example, Pless and Fell [5] show that bribes for electricity connections are associated with an increase of power outages and annual sales lost. Corruption also reduces labour productivity [6,7], increases transmission and distribution losses (particularly non-technical losses), and constrains the efforts to increase access to electricity services (see [8]).

Lebanon's electricity sector has been particularly prone to corruption, dysfunction and inefficiency. Given the negative effects of corruption in the sector, there have been repeated calls for reform [9], but none of these calls has materialised. However, Lebanon's electricity sector does have one example of seeming success. Amidst a hugely dysfunctional electricity sector throughout the country, with outages averaging between 3 and 12 hours per day, one city – Zahle – has 24/7 electricity without neighbourhood diesel generators. While the total losses in the general electricity network provided by the state-owned utility, Électricité du Liban (EDL), are 37 percent, they are 5 percent for Électricité du Zahle (EDZ). While EDL has constantly struggled to achieve high collection rates, Zahle's bill collection is nearly 100 percent, and the typical bill is no higher than that paid by customers in the rest of the country.[1]

This paper draws on a conceptual framework by Khan, Andreoni and Roy [1], elaborated below, to understand how this change occurred in Zahle, and why EDZ's innovations have been successful so far. Our central research question is "*How was it possible for EDZ to overcome (or circumvent) the political economy context and establish a functioning*

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[1] This paper was written prior to the almost total collapse of the electricity system in Lebanon in July 2021 as the economic crisis meant that the utility (EDL) was no longer able to pay for fuel resulting in the two of the major power stations being switched off and outages of 18 hours per day or more. Even EDZ was forced to introduce the rationing of power.

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mechanism for ensuring 24/7 electricity provision?"

Our findings challenge the simplistic success story of a local leader 'doing the right thing'. Rather, we find a murkier and more complex story in which progress has depended on the politically clever navigation of a dynamic and challenging context. The solution adopted by EDZ follows virtually none of the standard precepts of good power sector reform advocated by international donors[2] – it did not unbundle generation, transmission, and distribution, it was not transparent, it was not independently regulated (or not effectively so), and it entailed substantial rent-seeking. But it worked. It delivered a far higher quality of service to customers in Zahle – in terms of reliability and customer service – than available to customers elsewhere in the country, at an affordable price no greater than that paid by those outside the region, while remaining financially sustainable.[3] Our results matter because they provide some important (and potentially unwelcome) lessons for external actors seeking to support reforms in the electricity sector of developing countries – particularly in the cities and contexts that host the 1.5 billion people who rely on decentralized (often diesel-fired) power generation due to living with a "broken" grid and low quality service provision [11]. More constructively, our results suggest a different approach to sector reform in environments characterized by extensive corruption that might be more effective.

The remainder of the paper is structured as follows. Section 2 elaborates our conceptual framework. Section 3 provides an overview of the electricity sector in Lebanon. Our methodology is described in Section 4, while Section 5 provides detailed results from our fieldwork in Zahle and the surrounding areas, as well as Beirut. We conclude in Section 6 with a discussion of the implications of our findings for policy in Lebanon – including whether there are elements of the Zahle model that could be replicated and others that should be avoided – as well as wider lessons that may be drawn for electricity reform in other countries.

2. Conceptual framework

Recent research on the nature of corruption and the efficacy of alternative anti-corruption strategies sheds light on why efforts at reform in many sectors in developing countries have been unsuccessful. Khan, Andreoni and Roy [1] argue that in advanced economies, powerful organisations support generalised rule enforcement and have the power to ensure it happens. However, in poorer economies, powerful actors are able to shape the rules through informal means and so have less need for generalised rule enforcement. At the same time, the bulk of the population – who would benefit from generalised rule enforcement – lack the power to ensure that the rule of law is followed. In such circumstances, the authors argue, one cannot expect traditional anti-corruption strategies to work, since they are based on powerful political actors enforcing rules that are not in their interest. Khan, Andreoni and Roy [1] suggest that, in such contexts, effective reform strategies are likely to be those that both yield a development benefit and that are consistent with the interests of the key powerful groups. They argue for an 'understanding of rents and corruption typologies as well as an analysis of political settlements, with the objective being to identify potentially effective anti-corruption policies to improve development outcomes *given the configurations of organisational power in that sector and society*'[4] [1].

The importance of understanding the configurations of power in any context is not just important for anti-corruption strategies. For example, Levy's [12] work on "working with the grain" looks at several sectors and shows how the type of reforms that may be feasible in any country depends on the nature of its political settlement [13,14,15]. He suggests that better results may be achieved by supporting 'pockets of effectiveness' [16] rather than by attempting top-down initiatives to improve sector effectiveness. This is consistent with evidence that suggests that the imposition of 'best-practice' governance approaches from elsewhere has had a rather poor track record in achieving meaningful change [17]. It also points to the importance of learning from 'positive deviance', i.e. surprising examples of progress made in difficult circumstances [18], since such examples can provide insights about how impact can be achieved in a politically feasible way in that context.

The way in which the particularities of the political context affect the success of reforms in the electricity sector has been explored at the state level in India by Kale, Dubash and Bharvirkar [19]. They look at several decades of attempts to reform the electricity sector in fifteen major states in India and argue that a historically-rooted political economy analysis provides the most useful means to both understand the past and identify feasible approaches to reform for the future. Importantly, they argue that reform of the sector can only be understood within the context of the wider political economy of the country and that successful reform efforts, rather than attempting to depoliticize the sector, should aim at identifying synergies between electricity reform and electoral success.

While it may be true that understanding the particularities of the local political economy is key to identifying politically feasible pathways of change, this does not represent a theory of how positive change can come about. Fortunately, Khan et al [1] go a step further. Based on an analysis of several country case studies, they outline four characteristics of successful anti-corruption strategies in fragile and corrupt environments:

1. *Aligning incentives*. Where there is a group of organisations that would like to follow the rules, but do not do so because policy makes the returns too low or the risks too high, changes in policy that align incentives can create a critical mass of organisations that wish to enforce rule-following in their own interests [20,21].
2. *Designing for differences*. Since there is heterogeneity among different actors, it is necessary to build a coalition that wishes to comply with the rules and make it possible and desirable for them to do so, for measures to work against those that deliberately break the rules.
3. *Building coalitions*. Examples from Bangladesh [20] and Tanzania [22] suggest that it is important to find powerful organisations that are harmed by the current situation and include them in the coalition.
4. *Resolving rights*. Where the problem is really a conflict over rights and the corruption arises by bribing for different interpretations of existing rights then the solution has to entail better mechanisms for resolving the underlying conflict.

Our hypothesis is that the same four strategies of effective anti-corruption strategies may also be key in understanding how organisations, such as EDZ, achieve functional service delivery in such environments. Our argument is that, in corrupt environments (i.e. situations in which private actors are able to capture public resources for their own benefit), there may still be configurations of institutions and incentives which induce actors to behave in ways that deliver a functional service (i.e. a service that meets or exceeds a certain threshold of functionality) even if it does not eliminate corruption (indeed some elements of corruption may be inherent in achieving functionality). We call this 'functional corruption' to distinguish it from configurations which are corrupt and which fail to deliver a minimum threshold of service ('dysfunctional corruption'). Specifically, we explore whether the success of EDZ's model depends on: the alignment of incentives, taking account of differences between actors, building coalitions, and resolving

[2] See Foster and Rana [10] for a description of the standard model and detailed evaluation of its performance globally.

[3] Our definition of 'functionality' (and also of 'success') is that it delivered a service that was reliable, affordable and financially sustainable. By contrast, EDL's service was affordable, but very unreliable and not financial sustainable. We note that EDZ's service was not a success in all dimensions; in particular, it relies heavily on diesel generation and therefore could not be regarded as a success in terms of reducing greenhouse gas emissions.

[4] Emphasis from the original paper.

rights. In this way, we hope to provide not merely an account of how EDZ provided a better electricity service, but also a test of a wider theory about how positive change can happen in an environment that has been highly resistant to 'best practice' reforms.

3. Overview of Lebanon's electricity sector and its impact

Lebanon has a single, vertically integrated utility – EDL – which is responsible for the provision of electricity for the entire country. It owns and runs eight Heavy Fuel Oil and Diesel Oil (HFO/DO) generation plants and five small hydro power plants, with a total installed capacity of 3,000 megawatts (MW) – of which 2,764 MW are thermal power plants mostly run on imported fuel oil. EDL also owns and manages the national grid and the distribution of power to customers through a network of wholly owned Distribution Service Providers (DSP) [23]. In a few areas, there remain some private electricity concession holders, the most notable of which is EDZ as discussed below.[5] When EDL electricity is available, EDZ simply acts as a distributer; when EDL electricity is not available, EDZ undertakes its own generation which it supplies to customers using the EDL-owned distribution network. No other concessions have large-scale generation, acting simply as distributors of EDL electricity. There is also a huge number of privately-owned diesel generators in Lebanon [24]. Each private owner owns one or more generator and supplies low voltage electricity direct to local households using their own bespoke distribution network.

3.1. Poor technical and financial performance

The poor technical and financial performance of EDL is well documented [9]. In 2018, EDL covered 63% of Lebanon's electricity demand, which translates into long hours of power outages, especially in peak demand periods. The geographic distribution of these outages is uneven, with Lebanon's inland regions carrying the burden of long outages of up to 12 hours per day on average.[6] Table A.1 in Annex A summarizes EDL's performance. The utility's high technical and non-technical losses amount to a third of EDL's total generation [25]. When compared to other vertically integrated utilities in the Middle East and North Africa (MENA) region, EDL is the least profitable (before 2019, the average tariff was roughly 27 percent of the cost-recovery level) and the second most costly utility to run [26].

EDL's high technical losses reflect the poor quality of infrastructure and maintenance work as well as a tendency to misuse resources. The high level of non-technical losses reflect corruption through theft,[7] provision of free electricity as favours, poor governance, and failure to enforce the law. Besides high losses, EDL has witnessed low collection rates in recent years [27]. In part, this is due to the refusal of politically connected individuals to pay their electricity bills [28]. Also, payments by the public sector are also low, including large consumers such as water utilities. In 2019, the International Monetary Fund estimated the total unpaid electricity by private and public sector entities to be $0.4 and $2 billion, respectively [29]. Poor collection has been allowed to go unchecked in recent years due to administrative understaffing, technical issues and myriad crises. EDL's average tariff is well below the cost of generation. Consequently, the company curbs generation to minimize losses. As EDL reduces its generation, diesel generator networks ramp up their share to fill the gap, transferring billions of dollars from consumers to fuel and generator cartels and the importers of diesel fuel.

3.2. Corruption and its impact

Notwithstanding EDL's long history of underperformance, Diwan and Haidar [30] argue that the Lebanese political elites are protective of the status quo because they benefit from it. EDL's operations include a large number of service contracts, employment opportunities and a space for the exchange of political favours. For example, EDL's inflated workforce and subcontracting companies reflect a clientelistic system, distributing jobs to those close to politicians and senior members of the public administration [31].

The dire state of EDL's service provision has contributed to the proliferation of private diesel generators. According to a recent World Bank study, diesel generators contribute 8.1 terawatt-hours (~37 percent) of the country's total demand [24]. Over the years, the influence of the owners of diesel generator networks has grown, in part through close relationships with politicians, municipal officials and security forces [32]. Until recently, the operations of these networks were not regulated or monitored. In 2018, the government started a campaign to regulate the operations of commercial diesel generator networks by forcing them to install metering systems for their subscribers and follow the monthly tariff issued by the Ministry of Energy and Water (MOEW). Although some enforcement measures have been taken, the level of compliance has not been independently assessed.

Corruption and mismanagement in the electricity sector have been a focal point in the growing public grievances that culminated in the October 2019 uprising [33]. The sector's failings, often blamed on the power utility, EDL, have impacted the livelihoods of Lebanese citizens in three distinct ways.

First, the frequent power outages leave most of the Lebanese public without access to reliable electricity, which has forced many of them to subscribe to expensive and polluting local diesel generator networks. The uneven distribution of power outages,[8] the inability of some groups to afford a connection to a generator network, and the emergence of powerful neighborhood-level structures have important implications for energy access and justice [34]. Second, the electricity sector's bleeding of financial resources, averaging 3.8 percent of Lebanon's GDP annually over the last decade alone, has been a major contributing factor to the rising public debt, and thus to the current economic collapse of the country and the devaluation of the Lebanese pound (LBP), resulting in high inflation and a large increase in unemployment and poverty. Third, there is evidence that the spread of diesel generators in dense residential neighbourhoods has had a substantial negative impact on the environment and public health. Operating diesel generators in Beirut neighbourhoods for only three hours per day accounted for 38 percent of the daily carcinogen exposure, representing a 60 percent increase over background levels without generators [35].

4. Methodology

We adopted an instrumental single case study approach [36,37,38], choosing EDZ because, as a relatively functional energy provider in a largely corrupt sector, it presented as an outlier in the energy sector in Lebanon. To understand how it was possible for EDZ to overcome (or circumvent) the political economy context and establish a functioning mechanism for ensuring 24/7 electricity provision, we explored: the history of EDZ; the energy supply in Zahle prior to the transition to EDZ generation; the resistance to and support for the company during that

[5] Although EDZ continues to operate according to its concession contract, technically, the concession contract with the Lebanese state was replaced with a management contract in 2018.

[6] The economic crisis in Lebanon intensified in 2021 such that all Lebanese cities and towns are now suffering outages of more than 20 hours per day because of a the lack of foreign exchange needed to buy fuel oil for EDL's power plants.

[7] Electricity theft in Lebanon is primarily manifested in illegal connections and meter manipulation. However, there are no available data that show the distribution of non-technical losses by component or region.

[8] According to Ahmad [29], the regional variation of electricity supply in 2019 ranged between 3 hours in Beirut to more than 12 hours in the Baalbak-Hermel governance.

period; the impact of the change; and the implications for the electricity sector in Lebanon. A case study approach allowed us to capture the complexity and interaction between technical, economic and socio-political variables and power relationships between different stakeholders [39].

Data collection consisted of three components. The collection and analysis of existing data on electricity in Lebanon and EDZ in particular, key informant interviews (KII) with selected individuals, both in Zahle and at the national level; and a series of interviews with members of the local community in and around Zahle in lieu of focus group discussions. Field work included site visits to EDZ offices and its power plant and informal conversations with members of the local community during time spent in Zahle.

We started with the collection and analysis of existing data on electricity generation, consumption and regulation in Lebanon – including information about performance, both of EDZ and the electricity sector more broadly in Lebanon, as well as a review of media coverage of EDZ in the past ten years. This allowed us to create a detailed timeline of developments in relation to EDZ, and to capture the names of key national and local voices in the public debate on EDZ for our planned key informant interviews. A wide range of official documents and grey literature relating to electricity laws, policies, contracts and technical data was also collected.

Key informant semi-structured interviews were conducted with 29 participants between 23 June 2020 and 28 October 2020 (See Table A.2 in Annex A; Annex B provides a description of the affiliation/position of the respondents). Informants were purposively selected based on their knowledge and involvement in the sector, with care taken to ensure a wide range of stakeholders including: EDZ management and workforce, local- and national-level politicians and public servants, diesel generator owners, civil society leaders, private sector associations, journalists and energy experts. The majority of interviews were conducted face-to-face in Arabic, mostly involving at least two members of the research team. Most of these interviews were not recorded, because of the preference of interviewees due to the sensitivity of the topic. The interview questions were structured around a chronological narration of developments as experienced and perceived by the interviewee, allowing for a narrative analysis of the storyline(s) provided by research participants and the media and the various interviewees.

To obtain evidence about the impact of EDZ's generation, we conducted a series of individual interviews with 23 respondents from four local communities – two within EDZ's area of operation and two adjacent areas just outside the EDZ catchment area but which shared the same socio-political context (See Table A.3 in Annex A). We used purposive sampling to identify interviewees, ensuring variation in terms of gender, age, marital status and employment, and concluded the interviewing process when no new themes and information was emerging [40,41]. A local non-governmental organisation (NGO) and the municipality assisted in securing the sample based on pre-set criteria, and interviews were mostly conducted in the premises of the municipality, but some were in the place of residence or work of the interviewee, and a further five were conducted over the phone or Zoom due to Covid restrictions. The interviewees were asked to describe their daily routines, their use of electricity in that routine, and the impact of electricity supply on that routine. All interviews except those conducted over the phone were recorded, primarily to ensure proper documentation of the interview since most impact interviews were conducted by a single researcher. Our analysis noted differences between areas and between men and women.

It is important to note a number of limitations to the fieldwork. The political, economic and health conditions at the time of the fieldwork posed numerous obstacles to data collection and disrupted the research timeline. The fieldwork was conducted at a revolutionary time in Beirut, where, since the 17 October 2019 uprising, people have been taking to the streets nationwide in unprecedented cross-sectarian protests calling for change. Citizens have lost faith in the capacity of public institutions to govern or manage any sector, including electricity. In addition, June and July 2020 witnessed severe electricity shortages, prompted by the difficulty of securing diesel because of the economic crisis. During this time, 24/7 electricity provision in Zahle and its surrounding villages therefore appeared particularly exceptional when compared to the dismal 4-hour provision by EDL in other areas and this may have influenced participants' responses.

Conditions related to the Covid-19 pandemic also had significant impact on fieldwork. Our original plan was to conduct a series of focus group discussions (FGDs) with communities in the areas covered by EDZ, as well as with adjacent areas outside the EDZ catchment area at the same time as the rest of the fieldwork in July 2020. Lockdown measures instituted to tackle Covid-19 forced the postponement and subsequent cancelation of those focus groups in Zahle and qualitative individual, socially distanced interviews were conducted in July and October 2020 instead. This meant that some data collection was only completed after the catastrophic explosion at Beirut's port on 4 August 2020. This explosion led to the resignation of the government and has had a huge impact on the attitudes of the entire population towards the governance of the country which, again, may influence the nature of the responses obtained, although this is not evident in the impact interviews conducted.

The fieldwork was also conducted at a time when the contract for EDZ was up for imminent renewal. Therefore, some respondents may have doubted our motives as researchers, with the concern that we might have a political agenda relating to the negotiations about renewal. While we repeatedly highlighted that our only interest was academic, this perception may have contributed towards an overly positive perception of EDZ among some respondents.

Finally, despite having access to some secondary data, information related to EDZ and its relationship with EDL – in particular, contracts, decrees, EDL communications and letters, and many financial and technical documents – is not publicly available.

The impact of these constraints was either procedural - affecting our data collection timelines but with negligible impact on the data itself - or limited to projecting a more positive portrayal of EDZ, particularly at the level of the community. To minimise the latter, participants where asked for evidence or examples to explain the positive assessments they provided; and interview responses were compared with media archives and quantitative data for consistency.

5. Results and discussion

5.1. *The evolving business model of EDZ*

With a population of approximately 150,000 inhabitants, Zahle is the administrative and commercial capital of the Beqaa region and the largest Christian community in the Middle East. It is the seat of government for the Beqaa, where ministries and public/private institutions are located. Zahle has a Catholic majority, whereas Shiites and Sunnis are minorities. However, Zahle is surrounded by villages that are predominantly Sunni such as Bar Elias and Majdal Anjar, where a large number of refugees reside. Other villages in the Qaza have a Shiite minority with a predominance of Sunnis, such as Taalbaya, or have a mixture of Christians with a Sunni/shiite majority.

EDZ was established in 1923 under the Ottoman era process of *Imtiyazat* (concessioning) which continued under the French Mandate, post-independence [42]. *Imtiyazat* extended to most public services such as transport, water and electricity – with five major concessions in Aley, Kadisha, Bhamdoun, Jbail and Zahle. Under a typical concession agreement, the concession holder has the right to use public assets and resources, including transmission and distribution networks, on behalf of the state (later EDL). Even after the creation of the national power utility, EDL, in 1964, which was given a monopoly over power generation, the various concessions across Lebanon survived through their role in power transmission and distribution.

Initially, the EDZ concession was centered on a small hydropower project on the Berdawni River, with the concession holder responsible for distributing electricity to the town of Zahle.[9] In the late 1960s and throughout the Lebanese civil war (1975–1990), EDZ's generation capacity diminished and eventually ceased with EDZ essentially becoming a power distributor. After the civil war, Zahle was served by electricity from EDL. However, the damage to EDL's generation and transmission infrastructure caused by the war, as well as subsequent Israeli attacks[10], negatively impacted EDL's service provision and led to severe power outages. The level of service provision in Zahle and the Bekaa region was (and is) well below that in Beirut and other major coastal cities [24]. Even prior to the Syrian crisis, which led to an influx of refugees to Lebanon, the Bekaa region witnessed power outages up to 16 hours per day.

As a result of the deteriorating service, diesel generator networks in the city of Zahle expanded their own neighbourhood-level networks, reaching 'around 120 generators, operated by 50–60 owners'.[11] Prior to the enforcement of metering regulations in 2018, most of the owners of diesel generators in Lebanon imposed a flat tariff on their subscribers. In Zahle, the flat tariff increased with the number of hours of outages, reaching around US $120 per month (180,000 LBP) at its peak for a 5-ampere connection,[12] about two thirds of the minimum wage in Lebanon in 2008–2014 [43].

Imposing a flat tariff structure is substantially more profitable for the owners of diesel generators, particularly when operating their generators at lower loads [24]. According to Zahle's mayor, Asaad Zoughaib, who was also the city's mayor in 2008, the owners of diesel generators fiercely resisted the installation of meters and the shift to a volumetric tariff structure in spite of several rounds of meetings and negotiations.[13] Over the years, the local community started to witness the wealth accumulated by the owners of diesel generators. Referring to one of the generator owners in the town of Bar Elias, one interviewee commented 'He [the owner] used to buy a new car every year'.[14]

Moreover, the owners of diesel generators intimidated those who objected to their way of doing business. A representative of a local NGO said 'The generators were controlling us [الكمين]; if you disapprove [they] can cut you off'.[15] The power of the diesel generator cartel in Zahle (and possibly in other Lebanese cities and towns) was partly due to their collusion. As one interviewee put it, 'there was no competition; they [the owners] distributed the cheese among themselves; each one took a neighbourhood. If you lived in a certain neighborhood, you had to subscribe with a particular generator owner.'[16] In addition, the quality of supply provided by the generators was often poor. One interviewee stated 'appliances often broke down because of problems with supply',[17] and another added 'we used to install stabilizers to protect your electric appliances from generators' power'.[18]

The increasing frequency of outages, coupled with the reported ambition of EDZ's management to get involved in power generation since 2005 [44], led to discussions about reviving the concessions' role in generation. In late 2014, EDZ struck a deal with Aggreko, a UK-based company that specializes in temporary power rentals, to install a diesel-based generation with initial capacity of 35 MW.[19] EDZ leveraged the terms included in the concession contract and its historic role in power generation to justify its move.[20] The power plant supplies EDZ with electricity during EDL outages; it is owned and operated by Aggreko with EDZ acting as an 'offtaker' and distributor. By September 2020, the total installed capacity by Aggreko was 59.4 MW.[21] This additional capacity enables EDZ to provide 24/7 electricity to those in its concession area and has displaced almost all of the small private generators who had been providing back-up power. Fig. 1 shows the key events in the timeline of EDZ.

5.2. The impact of EDZ generation

Although the EDZ-Aggreko model is still a diesel-based power generation model, it has some notable advantages over the previous dispersed private generators. First, from EDZ/Aggreko's perspective, they benefit from economies of scale to operate generators at an optimal load range and lower fixed operating and maintenance costs. Second, unlike private diesel generators that operated their own low quality, low voltage grid in parallel to that of EDL, Aggreko's power plant is connected directly to EDL's medium-voltage (MV) lines, which reduces technical losses.[22] Third, from an end-user perspective, alternating between EDL and Aggreko's generation makes the switch between the two sources seamless and without any loss of power quality.

In the interviews with EDZ subscribers, respondents highlighted two major benefits. They no longer experience interruption of power, unlike when they connected to small generators and blackouts occurred for a few seconds while the generator started up; and they received significantly higher quality billing and maintenance services.[23]

The impact of this improvement on community members is significant. In describing their power supply from EDZ, most interviewees spoke of it as a 'blessing' and 'relief from a major burden'. Comparing the experiences of residents in areas covered by EDZ to residents in adjacent areas who are not served by EDZ, respondents served by EDZ appreciated being free from having to abide by electricity's rhythm – to plan one's schedule around unpredictable power supply. This had the most significant impact on women, largely responsible for energy dependent domestic chores – including operating washing machines, ironing, vacuum cleaning and food processing. Residents had become free from the need to adjust their lives to unpredictable but daily power cuts, hefty generator subscription fees, and damage to household appliances caused by poor supply.

Zahle residents also spoke of the provision of a high-quality, reliable 24/7 electricity service as much more than just the proper functioning of a technical sector. One local resident described electricity in Zahle as the 'only thing that makes us feel human'. The failures of the electricity sector in Lebanon have become symbolic of the post-war failure of the state – as Abi Ghanim asserts, 'notions of progress and postwar recovery have always been linked to uninterrupted electricity provision'. Electricity cuts and dependence on diesel generators are associated with the period of the Lebanese civil war (1975–1990) when they were introduced. A representative of a local NGO in Zahle made the link directly: 'We are the war generation, we grew up during periods of war and generators'. For him, EDZ's power provision represents more than an

[9] This later expanded into a number of surrounding towns and villages.
[10] Between 1996 and 2006, Israel launched six attacks against EDL power stations [32].
[11] KII 3.
[12] KII 4; KII 5.
[13] KII 6.
[14] Impact interview 1: Group interview with local residents in Bar Elias
[15] KII 8.
[16] KII 5.
[17] KII 8.
[18] KII 5.
[19] EDZ was confident of its ability to drive the owners of diesel generators out of business by simply providing 24/7 electricity on EDL's grid, which would essentially force diesel generators to switch off.
[20] The MOEW and EDL had different opinion about the legality of EDZ's move (KII 1), but their efforts to curb EDZ's expansion into generation were constrained by EDL's inability to provide the same level of services to the city of Zahle, where the public was very supportive of EDZ.
[21] KII 9.
[22] KII 9.
[23] Various interviews.

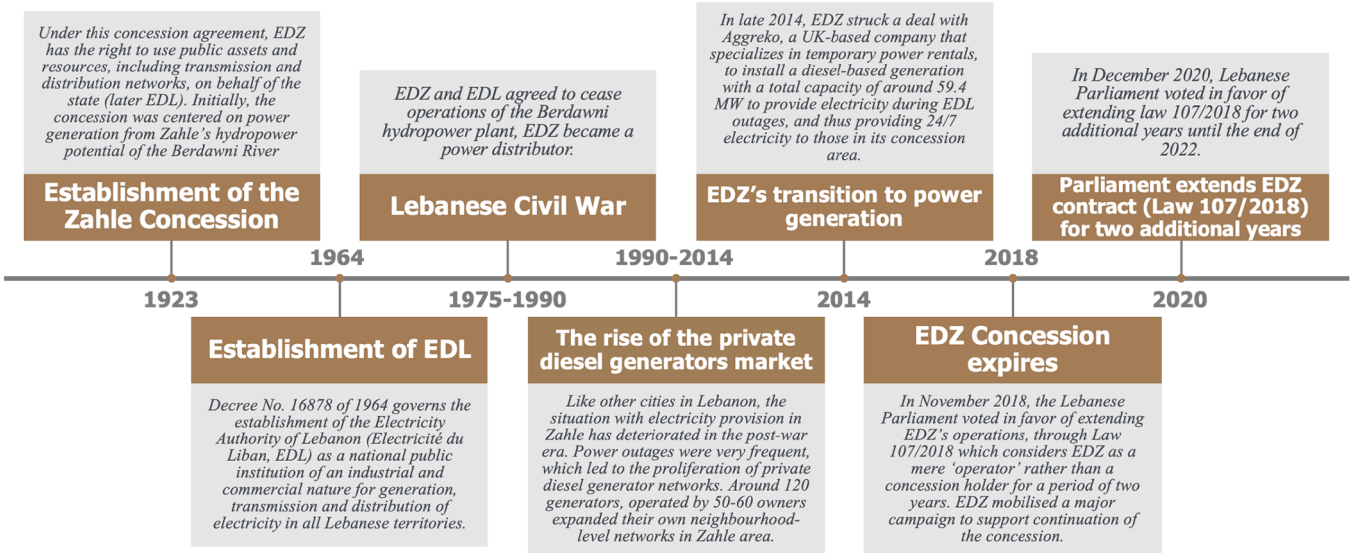

Fig. 1. EDZ – timeline of events.

improved service, but rather an assertion that, as people of Zahle, 'now we have reached somewhere, we have felt that something has improved in our life, we finally took a breath'.[24] Many respondents attached their positive evaluation of the company not only to its service but to feelings of 'dignity' and 'humanity'.

5.3. EDZ as a rent-seeking utility

Notwithstanding the improvements in service quality, it is clear that concessions have been used to extract economic rents. In the 1990s, when EDL's average selling price to its customers was LBP 147 per kWh, it priced its supply to most concessions at LBP 75/kWh and its supply to EDZ at only LBP 50/kWh.[25] While the tariff EDZ paid to EDL seems highly underpriced, we could not assess its "fairness" because EDL's tariff itself is below cost recovery [24], and because it was not possible to independently verify EDZ's own costs and investments as these numbers are not shared publicly. However, revised pricing offered to EDZ in the 2018 contract (discussed in detail below) as well as the desire of EDZ to hold on to the concession suggests that it was extremely profitable. This view was shared by almost all of our interviewees, except those who work at EDZ. As a senior EDL employee commented: 'concessions were agreements that worked for the benefit of powerful and rich people.'[26]

The combination of a highly subsidized consumer tariff and underpriced electricity sold to concessions, particularly to EDZ, has contributed to EDL's losses for decades. The large losses incurred by EDL and the Lebanese state from this arrangement naturally begs the question of why it was allowed to persist. Here, our interviews suggest this was influenced by EDZ's good relation with members or clients of the Syrian regime in Lebanon. The 1989 Taif accord consolidated Syria's influence over Lebanon, and until the exit of Syrian troops in 2005, Syria exerted significant influence over politics in Lebanon [45,46]. The Bekaa region, because of its proximity and strategic importance to Syria as well as historic relations, was the base of such control and the hub of the Syrian regime's strongest clientelistic networks [45,47]. Several interviewees suggested that EDZ and its management fostered good relations with members of the Syrian regime that were powerful in Lebanon to ensure the continuity of their operations. Senior officers at EDL and the MOEW stated that EDZ's preferential treatment from the 1990s until the Council of Minister's (CoM) decision in 2004[27] that confirmed the LBP 50/kWh price given to EDZ, was the result of high-level lobbying by senior members of the Syrian elite who benefited from EDZ in one way or another.

In addition to capturing rents through the price differential between the purchase and sale price of EDL electricity, EDZ also likely made significant profits through sales of the electricity purchased from Aggreko. It achieved this because of the opacity of its pricing regime. After 2015, EDZ provided a single bill to all its customers for both EDL and its own electricity. On the bill it indicated the number of hours in which EDL power had been cut off, but it did not state the tariff applied to electricity from EDZ. The total therefore consisted of the number of kWh of EDL electricity times the EDL tariff; plus the kWh of EDZ electricity times an unpublished tariff based upon the diesel price. Fortunately, it is possible to calculate this unpublished effective tariff by deducting the cost of EDL electricity from the total bill and then dividing the remaining cost by the kWh consumed. Using this method, Table A.4 in Annex A shows the range of effective tariffs charged by EDZ in each year. It also shows the guidance published by the MOEW for tariffs by private diesel generators during the same period.[28] The tariffs charged by EDZ for its own electricity far exceed the regulated prices. This does not necessarily mean that they were excessive since the details of EDZ's contract with Aggreko are confidential and therefore we do not know the price that EDZ was paying for electricity from this supplier. Moreover, it is widely reported that the average total bill in Zahle fell after EDZ started generation, suggesting that EDZ's charges were lower than the monopoly prices charged by private generators. Nonetheless, it seems likely that EDZ was making a significant profit from its own electricity as well as the power that it distributed for EDL.

Controversy over the rents being captured by EDZ came to a head towards the end of 2018, when EDZ's concession was due to expire. EDZ mobilised a major campaign to support continuation of the concession. In November 2018, the Lebanese Parliament voted in favour of extending EDZ's operations, albeit under a different framework (Law 107/2018). The new contract considers EDZ as a mere 'operator' rather

[24] KII 8.
[25] KII 1.
[26] KII 10.
[27] Decree #5/2004.
[28] These were published by the government in an attempt to stop private generators from charging monopoly prices. However, they were widely ignored until 2018 when the government started to enforce both metering and adherence to the tariff.

than a concession holder and only lasted for two years.[29] Moreover, it raised the price of the electricity that EDZ purchases from EDL from LBP 50 (USD 0.033) to LBP 88.1 (USD 0.059) per kWh, although the tariff remains well below EDL's cost-recovery level of USD 0.16 per kWh in 2020 [24]. However, it also permitted EDZ to charge a LBP 15,000 (USD 10 in 2018) fixed charge for every connection each month. We estimate that increase in the price of EDL's electricity in the new contract in 2018 reduced EDZ's revenues from the sale of EDL power by around USD 6 million per year.[30] However, the addition of the new fixed charge of USD 10 (LBP 15,000 in 2018) added around USD 8.4 million in revenue.[31] In short, a mechanism was put in place to ensure the continuation of rents under the new contract.[32] Commenting on EDZ's profitability, one opposing MP put it, 'EDZ stole the public wealth for 108 years – it is a purely coordinated theft of public money'.[33] The same MP later admitted EDZ's superior service provision and management compared to EDL, reflecting an "uneasy" acceptance of the duality of rent-seeking and developmental progress that is in line with the theoretical framework presented in this paper.

5.4. Factors enabling EDZ's "success"

EDZ's success in providing its customers with a good quality, 24/7 electricity supply is a result of the intersection of four major factors: the company's historical rights; its success in obtaining endorsement by the local community; alignment with the incentives of the political elite; and an agile economic model that minimised risks. We discuss each factor in turn and relate them to the factors introduced in our conceptual framework.

The status of EDZ as an established utility and its concession's right to generate power were leveraged by EDZ's proponents as a pretext for its move in 2014. More recent legislation (such as Law 462/2002), reaffirmed the concessions' right to generate electricity. Despite the varying interpretations of the related contracts and laws, EDZ has taken advantage of the old concession framework to purchase power from sources other than EDL. In this sense, the existence of legal rights has been critical to the achievement of EDZ's success.

Second, EDZ has been proactive in building coalitions of support for its concession. EDZ's quality of service has historically been good[34] and this, coupled with increasing opposition to the private diesel generator operators, appears to have created a supportive context for EDZ's expansion in 2014. However, some of the local community's support to EDZ appears to have been carefully 'engineered' by EDZ's management, especially during critical moments in 2013–2014 when generation began, and in November 2018 when more than 10,000 people, including a number of current and former MPs, gathered outside EDZ's offices in Zahle to demand that the Parliament grant EDZ a contract extension. This support was crucial in bolstering EDZ's position in national-level negotiations for the new contract and its acceptance by parliamentarians.

The support-building mechanisms entailed a variety of strategies. Interviews with Zahle's community leaders revealed that EDZ had started building ties with community groups since 2010. EDZ formed a committee with a wide variety of businessmen, religious groups, media personnel and NGOs, and, while seemingly independent, its members coordinate closely with the company. Although most members are men, female membership has been sought and has been key in some cases. For example, one interviewee said she joined in 2018, when 'electricity was in danger', and the committee needed 'educated women to join'; she was then tasked with reaching out to households and schools.[35]

Another strategy deployed by EDZ is support for local NGOs, churches and schools – some of whom are represented in the committee. As one journalist explained: 'He [EDZ director] sponsored many activities. For example, a school would want money for independence day activities he would give the money, as long as the kids wore T-shirts asking for 24 hour electricity'.[36] In some cases, donations fed back directly to EDZ, for example where EDZ would donate to an NGO an amount equal to the electricity bills they were due, so that the NGO could pay an outstanding bill. In others, such activities shaped how the media portrayed EDZ. A number of interviewees stated that EDZ's management paid journalists and media outlets to ensure good coverage at both the local and national levels. However, community support was not just tied to clientelistic relationships of offering rewards in exchange for loyalty and support - affective and religious ties were also important. For example, in answer to why he believed EDZ's Chairman and CEO Assaad Nakad, when he promised 24/7 electricity, a leading businessman said 'He was by the statue of the virgin Mary in Zahle, and, in front of the bishops, promised 24/7 electricity, and we trusted that promise'.[37]

A further strategy that has further strengthened affective ties is an approach to marketing that speaks directly to its customer base, emphasizing the pride of receiving an uninterrupted power supply while the rest of the country is in darkness. This pride appears to be widely shared among Zahle's residents, and is tied to pride in the city in general.[38] A journalist commented: 'The ads were brilliant; and the people of Zahle identified with the ads. The director of the ads is from Zahle and he played a lot with the "Zahlawai" character.'[39] The ads have skillfully weaved an intimate portrayal of the city, the relationship it has with EDZ and have shown what the power cuts have meant in people's everyday lives.

EDZ also found creative ways of tackling the heterogeneity in interests among different actors i.e. designing for differences. It neutralized opposition from private diesel generator owners – reaching agreements with the owners to compensate them for driving them out of business, either by paying them out or hiring them as EDZ employees. It has also created a family-like corporate culture that instills a sense of ownership in its employees. The phrase 'we are a family' came up in almost every conversation with EDZ's management and employees. The company seems to hire almost exclusively from the community it serves and offers its staff competitive salaries, which further strengthens the sense of ownership.

The pragmatic win–win approach followed by EDZ's management at the local level to overcome the resistance of the diesel generator cartel also extended to building coalitions with political elites at the national level. Perhaps the clearest evidence of such a strategy is the majority vote in Parliament in 2018 in favour of the new contract, despite strong criticism of EDZ by many MPs (including some representing the Bekaa region).[40] While there was wide public approval of EDZ within the areas it serves, the debate on extending its contract beyond 2018 and the nature of that contract were the subject of heated political debates at the national level.

The political opposition towards EDZ stems from the widespread and cross-party acknowledgment of the large profits made over the decades by concessions such as EDZ at the expense of EDL's profitability.

[29] In 2020, it was renewed for a further two years.

[30] Assuming an exchange rate of $1 = 1,500 LBP. After the currency devaluation, gains and losses in LBP are much reduced when converted to US dollars.

[31] Detailed calculations available on request from the authors.

[32] Our interviews also found evidence about practices that EDZ may have used to disguise rent-seeking – see [38] for details.

[33] KII 15.

[34] KII 11, 12, 13.

[35] KII 14.

[36] KII 4.

[37] KII 11.

[38] Various interviews.

[39] KII 4.

[40] The opposing MPs were Salim Aoun (Zahle), Michele Dhaher (Zahle), and Nazih Najem (Beirut, head of Energy and Public Works Committee).

Additionally, the model of EDZ that is based on decentralised power generation contradicts the 2010 'Policy paper for the electricity sector' [48]. This advocated for expanding EDL's generation base by building and rehabilitating thermal power plants to phase out all generation outside EDL, including that by diesel generators. The 2010 paper was prepared by an MOEW team under the guidance of Gebran Bassil, the then Minister of Energy, and the de-facto leader of the Free Patriotic Movement (FPM), which has controlled the energy portfolio in Lebanon since 2010.

Despite the confrontation between Bassil and EDZ's Assaad Nakad, a mutually advantageous political arrangement seems to have emerged in 2018, under which EDZ was granted an extension for two years. Central to this arrangement was shifting EDZ's status from a concession holder to an operator. Under the new contract, the parties opposed to EDZ were able to claim that they had ended a regressive concession from the Ottoman days,[41] while EDZ secured a continuation of its operations for two more years, albeit under a different contractual arrangement and terms.[42]

Another 'win' for the opposing side was increasing EDZ's power purchasing tariff from EDL from 50 to 88 LBP per kWh. As noted above, EDZ was allowed to imposed a new fixed charge likely yielding larger revenues than before. Some respondents alleged that some of the additional resources from the fixed charge may have been used to secure the new contract, although we are not aware of any direct evidence for this.

Finally, a key factor in EDZ's success has been its ability to align the incentive of the key actors through the use of an economic model which is profitable for them, without increasing the costs faced by consumers. Prior to EDZ starting generation in 2014, the people of Zahle had two sources of electricity: a heavily subsidised but intermittent EDL, and an expensive and low-quality diesel generator network. EDZ has positioned itself in the middle, offering better quality and reliability than the diesel generators while charging a tariff that is higher than EDL but lower than the generators' flat tariffs back in 2014. As a result, it improved the quality of service while lowering overall bills and, by enabling 24/7 supply, it has exploited the latent willingness to pay by many in Zahle for significantly more electricity, even at a higher price.

At the same time, the model has reduced risks for key market players. For example, EDZ controls the procurement of the diesel fuel, relieving Aggreko of any fuel supply risks. Given the value of the diesel supply, which covers around 90 percent of the cash flows in the diesel generator value chain [24], EDZ may have used this strategically when negotiating settlements with local diesel fuel suppliers to ensure that their operations were not impacted by the shift from supplying private generators to Aggreko's large generators. In a country like Lebanon where political, regulatory and currency risks are high, de-risking is particularly important to increase the probability of success of any infrastructure project.

6. Conclusions

The model employed by EDZ has wider implications for the reform of electricity systems in countries suffering from pervasive corruption. We find that Khan et al's [1] conceptual framework for understanding the success of anti-corruption interventions also helps to explain how a good developmental outcome was achieved even while corruption persisted. Exploring historical rights, building coalitions both with the local community and with elites and using a business model that accounted for the heterogeneity of interests of different actors enabled a shift, not away from corruption, but from dysfunctional and inefficient corruption to more efficient and functional corruption. Our case study therefore shows how this framework can be used to help understand how functional electricity systems can come about in corrupt environments. Understanding what kinds of pathways of change are feasible in any particular context may also help development actors to design more effective interventions.

We acknowledge that the limitations in our methodology, both due to COVID-19 and, particularly, due to the political circumstances around the time of our fieldwork, may have provided an overly positive account of EDZ's performance, although the consistency of the evidence from a wide range of sources makes us confident that a significant improvement in service provision did take place. However, these weaknesses do not detract from our more general finding that the functionality of an electricity system can be improved, even in a highly corrupt environment and that the conceptual framework used represents a valuable way of explaining how such developmental changes can come about.

Could and should the EDZ model be replicated? A case can be made for creating similar concessions for other major cities and regions. However, it is also likely that EDZ's ability to improve its service depended on aspects of the historical, geographical and political context which may not apply elsewhere. Moreover, there are some elements of EDZ's model that should not be replicated. EDZ's profitability rests, in part, on receiving electricity from EDL for much less than the price at which it can be sold. This transfer from EDL to EDZ is both inefficient and unfair and should not be replicated. Further exploration is also needed on the role of the central state, if any, in making replication possible and more equitable.

However, EDZ does point to an alternative, potentially feasible model for reform. The success of the EDZ model relies, in part, on the fact that it permits reform 'at the margin'. That is, customers are no longer rationed by the amount of electricity that EDL can produce since they can pay a higher price for additional electricity when EDL's supply is not available. As a result, the market clears – consumers are able to purchase as much electricity as they wish at the (locally determined) tariff. This is a major benefit to consumers because, although prices are higher, they no longer have the uncertainty of knowing whether they will be able to obtain supply or not. This suggests that, if the price that concessions pay to EDL for their power was raised to something approaching the price at which EDL sells power to customers,[43] this would remove the drain on public finances caused by selling electricity cheap to concessions, but still allow concessions to make a profit through their pricing of additional electricity when EDL cannot supply. Moreover, the value of 'reform at the margin' is not limited to EDZ or Lebanon – there are many countries where supply is effectively rationed by a dysfunctional and insolvent utility operating in a corrupt environment, but where many customers would be willing to pay much higher prices for a functional service.

In a country riven by sectarian paralysis and dysfunctional corruption, EDZ has succeeded in its efforts to significantly improve the service experienced by its customers. Its approach probably has not reduced corruption, but it has achieved a remarkable developmental outcome in a way that is consistent with the complex political settlement of the country. It points to the possibility of extending similar – second-best, but politically feasible – approaches throughout Lebanon. But it also has international implications. The poor state of Lebanon's electricity sector is by no means unique – numerous other countries face similar challenges with insolvent, corrupt and inefficient electricity sectors – Iraq, Nigeria, Pakistan, Yemen to name just a few. Long standing efforts at 'best practice' reform have also made little progress in such countries. Our analysis suggests that an approach embedded in a deep appreciation

[41] Press conference of Minister Cesar Abi Khalil following the vote on EDZ's new contract.

[42] In this context, it is interesting to note that Nakad was included as a candidate on FPM's 2018 election list for Zahle (although he did not win). This is further evidence of Nakad's access and connections to the political elite at the national level.

[43] The price might still be slightly below the EDL consumer price to compensate the concession for the cost of distributing EDL electricity, but the difference should not be large.

of the political context is more likely to identify feasible ways of making progress in these countries too.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A:. Tabulated data

Table A.1: EDL's performance in 2018

Performance parameter	Value
Total capacity (owned and purchased) (MW)	2512
Generation capacity (% of peak demand capacity)	72.7
Total generation delivered (terawatt hours, TWh)	14
Total generation (% of total demand)	63
Average load factor (%)	75
Technical losses (%)	14
Non-technical losses (%)	20
Average tariff (US cents per kilo-watt hour, kWh)	9
Average tariff (% of cost-recovery tariff)	27
Collection ratio (%)	66 (2017)

Source: Various sources including EDL, World Bank, and interviews

Table A.2: Number and distribution of key informant interviews conducted

	Local community - Zahle	Local Community – wider areas served by EDZ	National-/regional-level actors and key informants	EDZ	Total
Male	6	4	9	2	21
Female	6	0	1	1	8
Total	12	4	10	3	29

Table A.3: Number and distribution of community impact interviews conducted

	Outside EDZ area of operation		Within EDZ area of operation		Total
	Kfar Zabad	Ain Kfar Zabad	Bar Elias	Riyak	
Male	3	3	4	2	12
Female	5	2	2	2	11
Total	8	5	6	4	23

Table A.4: Implicit tariffs charged by EDZ 2015–2018

Period	Tariff paid by EDZ to EDL (LBP/kWh)	Tariff charged by EDZ to customers *when EDL is available* (LBP/kWh)	EDZ price/kWh range *under EDZ production* (LBP/kWh)[1]	Average MOEW price/kWh for diesel generators (LBP/kWh)[2]
Before 2015	50	**Low voltage:** **residential:** 0–100 kW/month –> 35 LBP/kWh 100–300 kW/month –> 55 LBP/kWh 300–400 kW/month –> 80 LBP/kWh 400–500 kW/month –> 120 LBP/kWh > 500 kW/month –> 200 LBP/kWh	–	Not applicable
2015	50	**Public institutions/schools/hospitals:** 140 LBP/kWh	342–531.7	241
2016	50	**Industry/agriculture:** 115 LBP/kWh	346.5–527.5	207.41
2017	50	**Medium voltage:** Night tariff –> 80 LBP/kWh Afternoon –> 320 LBP/kWh Rest of day –> 112 LBP/kWh	363.2–544.8[3]	237.25
2018	50		514–700[4]	325
2019 (new contract)	88.1		312–369[5]	395
2020 (new contract)	88.1		283–536[6]	472

Source: The authors based on collected and analyzed bills from the concession area.

[1]The EDZ price/kWh varies both by month and by consumption category; the range shown is the annual average price of the lowest and the highest consumption category.

[2]Annual average MOEW price/kWh is the average of the official monthly tariff released by MOEW.

[3]EDZ price/kWh range for years 2015, 2016 and 2017 are based on KII 13 data analysis.

[4]2018 figures are for December 2018, just before the new contract.

[5]2019 EDZ price/kWh range is based on the actual EDZ monthly tariffs published on bills under the new contract. The significant drop in EDZ's price/kWh may reflect the fact that bills under the new contract included a new flat fee of LBP 15,000 per month.

[6]2020 EDZ price/kWh range is based on the actual EDZ monthly tariffs between January and October 2020.

Annex B: Affiliation/Position and date of interview for Key Informants

Key Informant Interviews (KII)	Date of Interview	Affiliation/Position
KII 1	02/07/2020	Former senior official at MoEW
KII 2	08/07/2020	Assaad Nakad, CEO of EDZ and Nicolas Saba, technical director at EDZ
KII 3	15/07/2020	Former owner and operator of a diesel generator network in Zahle
KII 4	09/08/2020	Zahle-based journalist
KII 5	16/07/2020	Female member of the Zahle municipal board
KII 6	09/08/2020	Asaad Zougheib, Mayor of Zahle
KII 7	23/06/2020	Energy Expert, who was involved in the DSPs project with MoEW
KII 8	17/07/2020	Representative of a local NGO in Zahle
KII 9	16/09/2020	Senior manager at Aggreko, the company with whom EDZ signed the rental contract for the diesel gensets since 2014
KII 10	15/07/2020	Senior EDL official, following-up within EDL on the implementation of the several concessions' contracts throughout the country
KII 11	08/07/2020	Local businessman and community leader in Zahle, who was part of the social mobilization with EDZ during the 2018 period prior to the contract renewal
KII 12	09/07/2020	MP for Zahle, who was involved in the discussions at the Lebanese Parliament for the EDZ contract renewal in 2018 and 2020
KII 13	15/07/2020	Former owner of a diesel generator in Zahle, who continued to monitor EDZ pricing and tariffs over the years
KII 14	17/07/2020	Female Local community leader
KII 15	08/07/2020	MP, who was involved in the discussions at the Lebanese Parliament for the EDZ contract renewal in 2018 and 2020
KII 16	09/07/2020	MP for Zahle, who was involved in the discussions at the Lebanese Parliament for the EDZ contract renewal in 2018 and 2020
KII 17	17/07/2020	Head of a local NGO in Zahle
KII 18	16/07/2020	Head of a local healthcare provider
KII 19	28/10/2020	Director of EDZ advertisements
KII 20	26/10/2020	Representative of a local NGO in Zahle
KII 21	17/07/2020	2 members of the municipal staff of Kfar Zabad
KII 22	15/10/2020	MP, who was involved in the discussions at MOEW and the Lebanese Parliament for the EDZ contract renewal in 2018 and 2020
KII 23	08/07/2020	EDZ employee responsible for handling net-metering/renewable energy
KII 24	15/07/2020	Factory owner in Zahle with solar power generation installed
KII 25	17/09/2020	PhD student, who is covering Lebanon's renewable energy and minigrids projects as part of her thesis
KII 26	15/07/2020	Solar energy provider cooperating with EDZ
KII 27	15/10/2020	Ex-advisor to the Minister of Energy and Water
KII 28	26/10/2020	Owner of a previous concession in Lebanon

References

[1] M. Khan, A. Andreoni, P. Roy, Anti-Corruption In Adverse Contexts: Strategies For Improving Implementation, Anti-Corruption Evidence Working Paper 013, SOAS University of London, London, 2019.

[2] L. Lovei, A. Mckechnie, The Costs of Corruption for the Poor—The Energy Sector, World Bank, Washington, DC, 2000 https://openknowledge.worldbank.org/handle/10986/11437.

[3] E. Dal Bó, M.A. Rossi, Corruption and inefficiency: Theory and evidence from electric utilities, J. Public Econ. 91 (5-6) (2007) 939–962, https://doi.org/10.1016/j.jpubeco.2006.11.005.

[4] M.I. Imam, T. Jamasb, M. Llorca, Sector reforms and institutional corruption: Evidence from electricity industry in Sub-Saharan Africa, Energy Policy. 129 (2019) 532–545, https://doi.org/10.1016/j.enpol.2019.02.043.

[5] J. Pless, H. Fell, Bribes, bureaucracies, and blackouts: Towards understanding how corruption at the firm level impacts electricity reliability, Resour. Energy Econ. 47 (2017) 36–55, https://doi.org/10.1016/j.reseneeco.2016.11.001.

[6] L. Wren-Lewis, Do infrastructure reforms reduce the effect of corruption? Theory and evidence from Latin America and the Caribbean, World Bank Econ. Rev. 29 (2015) 353–384.

[7] E. Dal Bo, Regulatory capture: A review, Oxf. Rev. Econ. Policy. 22 (2) (2006) 203–225.

[8] A. Estache, A. Goicoechea, L. Trujillo, Utilities reforms and corruption in developing countries, Util. Policy. 17 (2) (2009) 191–202, https://doi.org/10.1016/j.jup.2008.07.002.

[9] World Bank, Lebanon Power Sector Emergency Action Plan, 2020. http://documents1.worldbank.org/curated/en/500281593636676732/pdf/Lebanon-Power-Sector-Emergency-Action-Plan.pdf (accessed August 3, 2020).

[10] V. Foster, A. Rana, Rethinking power sector reform in the developing world, The World Bank (2019), https://doi.org/10.1596/978-1-4648-1442-6.

[11] IFC, The Dirty Footprint of the Broken Grid, International Finance Corporation, 2019. https://www.ifc.org/wps/wcm/connect/Industry_EXT_Content/IFC_External_Corporate_Site/Financial+Institutions/Resources/Dirty-footprint-of-broken-grid (accessed August 8, 2021).

[12] B. Levy, Working with the Grain: Integrating Governance and Growth in Development Strategies, Oxford University Press, New York, USA, 2014.

[13] M.H. Khan, Political settlements and the governance of growth-enhancing institutions, SOAS Univ. London (2010).

[14] M.H. Khan, Political settlements and the analysis of institutions, Afr. Aff. 117 (2018) 636–655, https://doi.org/10.1093/afraf/adx044.

[15] T. Kelsall, M. vom Hao, Beyond Institutions: Political settlements analysis and development, Institut Barcelona Estudis Internacionals (2020).

[16] M. Roll, The Politics of Public Sector Performance: Pockets of Effectiveness in, Routledge, 2014 https://www.routledge.com/The-Politics-of-Public-Sector-Performance-Pockets-of-Effectiveness-in-Developing/Roll/p/book/9781138956391 (accessed April 12, 2021).

[17] D. Booth, Development as a Collective Action Problem: Addressing the Real Challenges of African Governance, Overseas Development Institute, London, 2012.

[18] M. Andrews, Explaining positive deviance in public sector reforms in development, World Dev. 74 (2015) 197–208, https://doi.org/10.1016/j.worlddev.2015.04.017.

[19] S. Kale, N. Dubash, R. Bharvikar, Mapping power: The political economy of electricity in India's states. Mapp. Power, Oxford University Press, Delhi, 2018, 10.1093/oso/9780199487820.003.0001.

[20] M. Khan, M. Matin, I. Zahan, Z. Ashraf, J. Ajefu, Cheaper, Cleaner Power: De-Risking As An Anti-Collusion Strategy In Bangladesh, School of Oriental and African Studies, London, 2020.

[21] P. Roy, K.C. Iwuamadi, J. Ibrahim, Breaking the Cycle Of Corruption in Nigeria's Electricity Sector: A Political Settlements Analysis, School of Oriental and African Studies, London, 2020.

[22] A. Andreoni, S. van Huellen, L. Katera, C. Jahari, Breaking the Impasse: Aligning Incentives To Address Corruption in Tanzania's Skills Sector, SOAS University of London, London, 2021.
[23] M. Ayoub, P. Rizkallah, C. Abi Haidar, Unbundling Lebanon's Electricity Sector, AUB Issam Fares Institute https://www.aub.edu.lb/ifi/Pages/publications/research_reports/2020-2021/unbundling-lebanon-electricity-sector-research-report.aspx?utm_source=BenchmarkEmail&utm_campaign=20210907_-_Research_Report-_The_AUB_Issam_Fares_Institute_%e2%80%93_EPS_-_Unbundling_Lebanon%27s_Electricity_S&utm_medium=email.
[24] A. Ahmad, Distributed Power Generation for Lebanon : Market Assessment and Policy Pathways, The World Bank, 2020. http://documents.worldbank.org/curated/en/353531589865018948/Distributed-Power-Generation-for-Lebanon-Market-Assessment-and-Policy-Pathways (accessed June 1, 2020).
[25] GoL, Updated Policy Paper for the Electricity Sector, Ministry of Energy and Water, 2019. https://www.energyandwater.gov.lb/mediafiles/articles/doc-100515-2019_05_21_04_27_25.pdf.
[26] D. Camos, R.W. Bacon, A. Estache, M.M. Hamid, Shedding light on electricity utilities in the Middle East and North Africa : insights from a performance diagnostic, The World Bank, (2017). http://documents.worldbank.org/curated/en/193561510134322792/Shedding-light-on-electricity-utilities-in-the-Middle-East-and-North-Africa-insights-from-a-performance-diagnostic (accessed June 1, 2020).
[27] R. Bramley, M. Chojnowska, P. Lewington, Lebanon Cost-of-Service and Tariff Design Study : Final Report, The World Bank, 2020. http://documents.worldbank.org/curated/en/772521589865844161/Lebanon-Cost-of-Service-and-Tariff-Design-Study-Final-Report (accessed June 1, 2020).
[28] Al Akhbar, 2008, When the electricity collector returns with a bill ... and stories, (Ḥyna yaʿūd jaby al-kahrabāʾ bifātura… wa ḥakāyā.), https://al-akhbar.com/Archive_Research/159598 (accessed June 14, 2020).
[29] IMF, Lebanon Country Report, International Monetry Fund, Washington D.C., 2019. https://www.imf.org/-/media/Files/Publications/CR/2019/1LBNEA2019002.ashx.
[30] I. Diwan, J. Haidar, Do Political Connections Reduce Job Creation? Evidence from Lebanon, in: Crony Capital. Middle East – Bus. Polit. Lib. Arab Spring, 2019. https://global.oup.com/academic/product/crony-capitalism-in-the-middle-east-9780198799870?cc=us&lang=en&.
[31] CSKC, EDL workers, Civ. Soc. Knowl. Cent. (2014). https://civilsociety-centre.org/party/edl-workers (accessed June 15, 2020).
[32] J. Nucho, Everyday Sectarianism In Urban Lebanon: Infrastructures, Public Services, And Power, Princeton University Press, Princeton, 2017.
[33] E. Francis, Electricity, mobiles and cash: a snapshot of Lebanese grievances, Reuters. (2019). https://www.reuters.com/article/us-lebanon-protests-grievances-idUSKBN1XI1VN (accessed May 31, 2020).
[34] D. Abi Ghanem, Energy, the city and everyday life: Living with power outages in post-war Lebanon, Energy Res. Soc. Sci. 36 (2018) 36–43, https://doi.org/10.1016/j.erss.2017.11.012.
[35] A. Shihadeh, M. Al Helou, N. Saliba, S. Jaber, N. Alaeddine, E. Ibrahim, Effect of Distributed Electric Power Generation on Household Exposure to Airborne Carcinogens in Beirut, (2018). http://scholarworks.aub.edu.lb/handle/10938/21130 (accessed July 28, 2020).
[36] R.E. Stake, The Art Of Case Study Research, Sage Publications, Thousand Oaks, 1995.
[37] R.K. Yin, Case Study Research: Design And Methods, fifth ed., SAGE, Los Angeles, 2014.
[38] B.K. Sovacool, J. Axsen, S. Sorrell, Promoting novelty, rigor, and style in energy social science: Towards codes of practice for appropriate methods and research design, Energy Res. Soc. Sci. 45 (2018) 12–42, https://doi.org/10.1016/j.erss.2018.07.007.
[39] N. Hyett, A. Kenny, V. Dickson-Swift, Methodology or method? A critical review of qualitative case study reports, Int. J. Qual. Stud. Health Well-Being. 9 (1) (2014) 23606, https://doi.org/10.3402/qhw.v9.23606.
[40] J.J. Francis, M. Johnston, C. Robertson, L. Glidewell, V. Entwistle, M.P. Eccles, J. M. Grimshaw, What is an adequate sample size? Operationalising data saturation for theory-based interview studies, Psychol. Health. 25 (10) (2010) 1229–1245, https://doi.org/10.1080/08870440903194015.
[41] K. Malterud, V.D. Siersma, A.D. Guassora, Sample size in qualitative interview studies: guided by information power, Qual. Health Res. 26 (13) (2016) 1753–1760, https://doi.org/10.1177/1049732315617444.
[42] Z. Abu-Rish, Electricity in Early Independence Lebanon, (2015). http://lcps-lebanon.org/agendaArticle.php?id=55 (accessed June 15, 2020).
[43] ILO, Lebanon - Minimum Wages, (2011). http://www.ilo.org/dyn/travail/travmain.sectionReport1?p_lang=en&p_structure=1&p_year=2011&p_start=1&p_increment=10&p_sc_id=1&p_countries=LB&p_countries=MA&p_print=Y (accessed August 16, 2021).
[44] É. Verdeil, Securitisation of urban electricity supply A political ecology perspective on the cases of Jordan and Lebanon Eric Verdeil, (2019) 246–264.
[45] R. El-Husseini, Pax Syriana: elite politics in postwar Lebanon, 1st edition, Syracuse University Press, Syracuse, New York, 2012.
[46] J. Harik, Syrian foreign policy and state/resistance dynamics in Lebanon, Stud. Confl. Terror. 20 (3) (1997) 249–265, https://doi.org/10.1080/10576109708436038.
[47] M. Chaoul, 17. Zahlé: de la zaʿâma nationale à la zaʿâma dépendante, in: Lead. Partis. Au Liban, Karthala, Paris, 2012: pp. 435–459. https://doi.org/10.3917/kart.mermi.2012.01.0435.
[48] GoL, Policy Paper for the Electricity Sector, Ministry of Energy and Water, 2010. http://www.databank.com.lb/docs/Policy%20paper%20for%20the%20electricity%20sector%202010.pdf.