ACE SOAS Consortium Anti-Corruption Evidence
Making Anti-Corruption Real

Working Paper 030

From dysfunctional to functional corruption: The politics of reform in Lebanon's electricity sector

Ali Ahmad[1], Neil McCulloch[2], Muzna Al-Masri[3] and Marc Ayoub[4]

December 2020

[1] John F. Kennedy School of Government, Harvard University
[2] The Policy Practice
[3] Ebla Research Collective
[4] Issam Fares Institute for Public Policy and International Affairs, American University of Beirut

Correspondence to: Dr. Neil McCulloch (neil.mcculloch@thepolicypractice.com)

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Acronyms and abbreviations

CDR	Council for Development and Reconstruction
EDL	Électricité du Liban
EDZ	Électricité de Zahlé
FGD	Focus group discussion
FPM	Free Patriotic Movement
KII	Key informant interviews
KWh	Kilowatt hour
LBP	Lebanese Pound
LV	Low voltage
MP	Member of Parliament
MV	Medium voltage
MoEW	Ministry of Energy and Water
MW	Megawatt
TWh	Terawatt hour

Acknowledgements

We wish to thank all interviewees and other participants in the research for their time and invaluable insights. Our thanks are also extended to EDZ management for their openness and the time that they have given us.

We are grateful to Mouvement Social for supporting our fieldwork in the Zahle area, particularly Ms Carine Louis, Ms Carla Freiha and Ms Danielle Hindy; to Ms Rola Zaiter from the Lebanese Women Democratic Gathering - RDF; and to Ms Daniele Khayat and Mr Kassem El-Hayek. Special thanks are extended to the municipality of Zahle for contacts and information and the municipality of Ain Kfarzabad for hosting some of our interviews (in particular Ms. Helena Moussa Wehbe). Thanks also to Elie, Maria and Karma for welcoming our team into their home.

Finally, we are grateful to Arev Papazian for excellent research assistance; to Pallavi Roy for detailed comments; to Sonia Sezille for flexible and supportive project management; and to Ana Pueyo, Eric Verdeil and Alix Chaplain for insightful comments and discussions on earlier material.

This paper has been produced as part of the Anti-Corruption Evidence (ACE) research consortium led by Prof. Mustaq Khan at SOAS University of London.

Executive summary

Corruption in the electricity sector has been a major constraint to economic and social progress in many countries. In Lebanon, the electricity sector's dysfunction and inefficiency mask deeper political economy challenges, including rampant rent-seeking, captured institutions and a fractured state. Over decades, corruption and mismanagement in Lebanon's electricity sector has contributed to the draining of public finances and has deprived the Lebanese people of their right to reliable and affordable electricity. When Lebanon witnessed an uprising in October 2019, electricity (or the lack thereof) was a focal point of public grievance and it remains a central concern amidst the economic crisis that the country currently faces.

Lebanon's electricity performance is dismal. The state utility – Électricité du Liban (EDL) – covers only 63% of electricity demand, which results in rotating outages. These last longer as one moves away from Beirut's central district, thus widening social and developmental inequalities. There are also high technical and non-technical losses in power, together amounting to a third of EDL's total generation. Tariffs have not been adjusted since 1994, and consequently EDL makes huge losses – more than half of all of Lebanon's national debt stems from losses accrued by EDL.

One consequence of this dysfunction has been the emergence of tens of thousands of private diesel generators which provide power to households and businesses when EDL power is not available. This informal, illegal and, until recently, unregulated scattering of private generators provides a variable, high-cost and often low-quality service. In many places, generator owners are regarded as a 'mafia' that is both part of, and contributors to, the political patronage system in Lebanon.

Amidst the poor general state of the sector, one area of Lebanon has managed to operate a private utility that provides a reliable and high-quality electricity service – Électricité de Zahlé (EDZ) – which covers the city of Zahle and 16 surrounding villages. EDZ's technical losses stand at only 5%; it collects 100% of bills and is profitable while providing electricity at an overall cost no higher than that paid by households reliant on private generators to back up EDL's supply.

Our study explores how it has been possible to establish EDZ's functional, but problematic, service provision within the complex sectarian political context of Lebanon. We draw on a framework provided by Khan et al. (2019) to understand the rents and types of corruption in the sector and how the changes implemented by EDZ have been consistent with the nature of Lebanon's political settlement.

Based on extensive interviews with stakeholders in the sector – both at the central level and in Zahle, and including generator owners, politicians, journalists and civil society groups – we find a complex and sometimes uncomfortable story about how Zahle has achieved its success. We complement this with interviews with ordinary households and business owners, both inside and outside of EDZ's operating area; to understand what impact EDZ's service has had on them and their views regarding its operating model.

We find that EDZ's service provision success is the result of a highly professional technical approach, combined with astute navigation of the political context. Technically, EDZ is able to achieve reliable power by exploiting its century-old concession agreement to contract a private emergency power contractor to provide power for its coverage area when EDL power is not available. However, a key part of EDZ's business model has been its ability to come to beneficial arrangements with key political actors. Core to EDZ's profitability is the fact that – when EDL electricity is available – it purchases this electricity at a heavily subsidised rate, while selling it at the much higher EDL tariff. In effect, this is a direct transfer of resources from the central government (which underwrites EDL's losses) to EDZ.

At the same time, EDZ has been extremely successful at mobilising citizens in Zahle. It has created a strong sense of ownership in the local community around the provision of a reliable and professional service. This, in turn, has helped to ensure continuity – but it has also been instrumental in resisting attempts by central political actors to capture EDZ's monopoly for their own purposes.

Our interviews at the community level suggest that the overall impact of EDZ's service has been almost uniformly positive. This positive effect is felt mostly at the household level and that of small businesses, particularly by women in managing domestic affairs. Almost all respondents appreciate the professionalism and quality of the service provided. The main area of concern is cost – EDZ's new fixed charge, combined with regulations that reveal the high unit charges for EDZ electricity, mean that poorer households are paying a higher share of their income on electricty.

Finally, as the EDZ contract comes up for renewal at the end of 2020, we address the issue of whether the EDZ model could, or even should, be replicated elsewhere in Lebanon. Our short answer is 'not in its current form'. We put forward a model for reform that would allow other areas beyond Zahle to have reliable power supplied by profitable and well-run private utilities, without negative implications for EDL or the Lebanese government. This draws on lessons from EDZ's approach – how it has leveraged its legal status as a concession, aligned the incentives of key political actors and built supportive coalitions.

In a country riven by sectarian paralysis and dysfunctional corruption, EDZ's efforts have succeeded in significantly improving the service delivered to its customers. Its approach probably did not reduce corruption, but it achieved a remarkable developmental outcome in a way that was consistent with the complex political settlement of the country. We hope that our analysis will help point to ways in which similar – second-best, but politically feasible – approaches might be implemented throughout Lebanon and, potentially, in other countries too.

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 scandal associated with the purchase of emergency power in Tanzania (Kapika, 2013), the privatisation of distribution companies in Nigeria, and the ESKOM scandal in South Africa, among many others (Lovei and Mckechnie, 2000)).

Such corruption has harmful effects. It lowers the efficiency of utilities (Dal Bó and Rossi 2007) and weakens overall sector performance – including technical efficiency, access rates and economic performance (Imam et al., 2019). Corruption also damages the reliability of services: using data from 118 countries, Pless and Fell (2017) show that the propensity to bribe for an electricity connection is associated with an increase of 14 power outages per month and a 22% average increase in annual sales lost. Corruption also reduces labour productivity (Wren-Lewis, 2015; Dal Bó 2006), increases transmission and distribution losses, and constrains the efforts to increase access to electricity services (see Estache et al., 2009).[1]

Lebanon's electricity sector has been particularly prone to corruption, dysfunction and inefficiency. Indeed, corruption and mismanagement in the electricity sector have been a focal point in the growing public grievances that culminated in the October 2019 uprising (Francis, 2019). The sector's failings, often blamed on the power utility Électricité du Liban (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. Focusing on understanding the political economy of energy provision at the household and neighbourhood levels, Abi Ghanem (2018) has closely examined the impact of power outages on daily lives in terms of the normalisation of informal subscription-based generator suppliers in urban areas and the 'ecosystem' of behaviours, practices and objects that have emerged because of them. The uneven distribution of power outages,[2] the inability of some groups to afford a connection to a generator network, and the emergence of powerful neighbourhood-level structures have important implications for energy access and justice (ibid.).

[1] Ironically, the problems with poor access caused, in part, by corruption, lead to people having to bribe to obtain access. Cummins and Gillanders (2020) show that people who live in areas where more people report having paid a bribe to access household services are more likely to have access to electricity.

[2] According to Ahmad (2020), the regional variation of electricity outages in 2019 ranged between 3 hours in Beirut to more than 12 hours in the Baalbak-Hermel governance.

Second, in addition to EDL's inability to meet all of Lebanon's electricity demand, the company has been operating well below cost recovery levels. This has resulted in EDL's constant need for cash transfers that have contributed to draining government budgets and a widened fiscal deficit for decades. Between 2010 and 2018, transfers to EDL totalled more than US $14 billion (Credit Libanais, 2016). Over the last decade, EDL transfers averaged 3.8% of Lebanon's gross domestic product (GDP) per year and accounted for around half of the overall fiscal deficit. Consequently, the electricity sector's performance has been a major contributing factor in the current economic collapse of the country, which has resulted in the devaluation of the Lebanese pound (LBP), 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. In 2018, diesel generators emitted about 3,400 gigagram (Gg) CO_2 equivalent, which represents around 40% of Lebanon's total emissions from electricity and 11.4% of the country's total emissions (Ahmad, 2020). Operating diesel generators in Beirut neighbourhoods for only three hours per day accounted for 38% of the daily carcinogen exposure, representing a 60% increase over background levels without generators (Shihadeh et al., 2018). Health concerns are not only due to the operation of diesel generators; EDL's thermal power fleet is also a major polluter, especially facilities located in densely populated urban areas, such as the Zouk power plant in Jounieh, a coastal city 16 km north of Beirut (Salloum et al., 2018).

Given the negative effects of corruption in the sector, there have been repeated calls for reform. This has led to the development of reform plans (see, for example, GoL, 2010; Ministry of Energy and Water, 2019) and even the passage of laws (for example Law 462/2002)[3] that call for fundamental reforms. Additional calls for reform relate to the establishment of an independent regulator, the enforcement of existing laws, transparency over the costs and accounts of EDL and various concessions, clean procurement processes, and greater accountability for the current state of dysfunction in the sector. None of these calls has resulted in serious reform of the sector, however.

Recent research on the nature of corruption and the efficacy of alternative anti-corruption strategies sheds light on why such efforts may have been unsuccessful. Khan et al. (2019) 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.

[3] https://taqaway.net/documents/law-462-2002-product-electricity-en-edl-lebanon-2002

This explanation for the failure of reform and anti-corruption efforts appears to fit well with Lebanon's circumstances; we show below how the status quo is in the interests of powerful groups in Lebanon. However, such a characterisation of the problem naturally begs the question how progress might be made. Khan et al. (2019) suggest that – in such situations – 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'* (ibid: 15).

One implication of the approach suggested by Khan et al. (2019) is that anti-corruption strategies are likely to be highly specific to the particularities of any given political context. 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 (Booth, 2012). It also points to the importance of learning from 'positive deviance', i.e. surprising examples of progress made in difficult circumstances (Andrews, 2015), since such examples can provide insights about how impact can be achieved in a politically feasible way in that context.

Fortunately, Lebanon's electricity sector has one such example. 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 losses in the general electricity network provided by EDL are 37%, they are 5% in the Électricité de Zahlé (EDZ). While EDL has constantly struggled to achieve high collection rates, Zahle's bill collection is nearly 100%, yet the typical bill is no higher than that paid by customers in the rest of the country.

This paper explores how this change occurred in Zahle, drawing on Khan et al.'s (2019) framework to understand why the EDZ innovations have been successful so far. At the same time, 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. Nonetheless, our results matter – not only for anti-corruption reform in Lebanon – but because they provide some important (and potentially unwelcome) lessons for external actors seeking to support reforms in the electricity sector of developing countries.

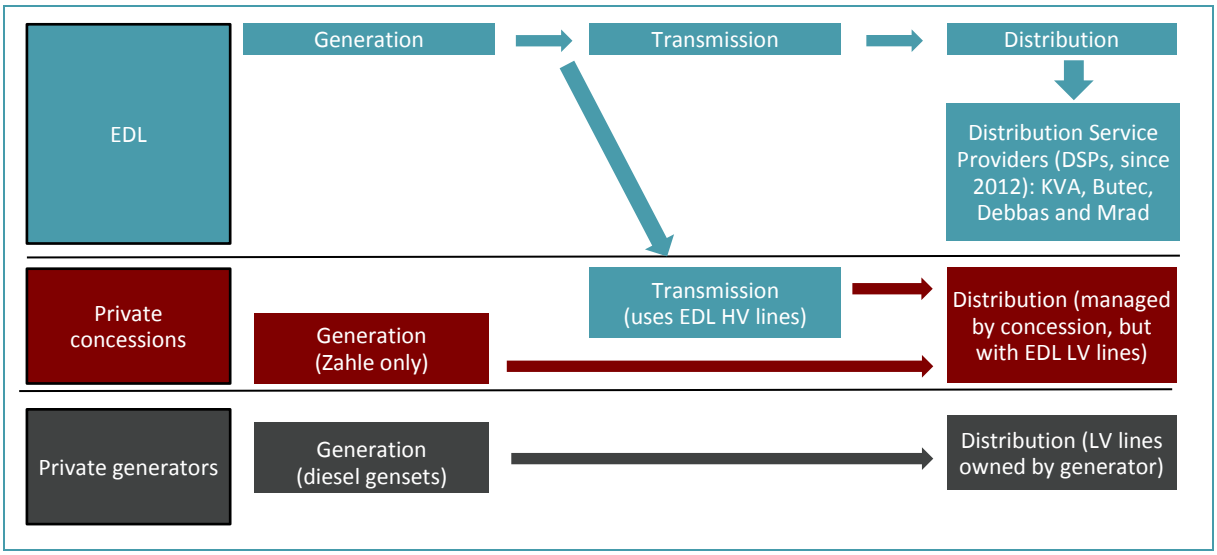
The remainder of the paper is structured as follows. Section 2 provides an overview of the electricity sector in Lebanon. We then describe our research questions and hypotheses in Section 3, based upon our theory of how successful reforms may be achieved, along with the methodology for our study. Section 4 provides detailed results from our fieldwork in Zahle and the surrounding areas, as well as Beirut. We then discuss the implications of our findings for policy in Lebanon in Section 5 – including whether there are elements of the Zahle model that could be replicated and others that should be avoided – and wider recommendations for anti-corruption policy, both in Lebanon and beyond.

2. Overview of Lebanon's electricity sector

The structure of the electricity sector in Lebanon is illustrated in Figure 1. Lebanon has a single, integrated utility – EDL – which is responsible for the provision of electricity for the entire country. It owns and runs eight Heavy Fuel and Diesel Oil (HFO/DO) generation plants and five hydropower plants, with a total installed capacity of 3,000 megawatts (MW) – of which 2,764 MW are thermal power plants run on imported fuel oil. In addition, EDL contracted with Karadeniz Powership in 2013 to provide 385 MW of emergency power from floating power barges (MoEW, 2019). 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). In a few areas, there still remain some private electricity concession holders, the most notable of which is EDZ as discussed below. 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 private generators in Lebanon. Each private generator supplies low voltage electricity direct to local households using its own bespoke distribution network.

Overall policy for the sector is determined by the Ministry of Energy and Water (MoEW), while regulation of the sector is undertaken by EDL. The Ministry of Finance is responsible for the large subventions to EDL to cover its losses. The concessions are, in theory, regulated by EDL and have legal concession agreements. Private generators are not registered or, generally, legal, but are widely accepted. MOEW attempts to provide some regulatory oversight of their activities.

Figure 1: The structure of the electricity sector in Lebanon



Notes: HV = high voltage; LV = low voltage
Source: The authors.

2.1. EDL's performance and corruption indicators

The poor technical and financial performance of EDL is well documented. Based on 2018 numbers, EDL covers 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 (Ahmad, 2020).

Table 1 summarises EDL's key numbers and indicators. The most revealing of these are the high technical and non-technical losses, which together amount to a third of EDL's total generation. When compared to other vertically integrated utilities in the Middle East and North Africa (MENA) region, EDL is the least profitable (the average tariff is roughly 27% of the cost-recovery level) and the second most costly utility to run (Camos et al., 2017).

Table 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.

In 2008, a World Bank report identified four key electricity sector performance indicators that can provide a 'first order signal' of possible corruption in the sector (Halpern et al., 2008). These indicators are electricity coverage, system losses, collection ratio and cost recovery. On all of these indicators, EDL raises red flags. For an upper-middle-income country like Lebanon to have such dysfunctional coverage both in quality and quantity of electricity reveals that resources are not being put to good use.

High technical losses reflect poor quality of infrastructure and maintenance work as well as a tendency to misuse resources. The substantial 20% of non-technical losses reflect corruption through theft, provision of free electricity as favours, poor governance, and failure to enforce the law. Smith (2004) argues that non-technical losses and corruption are closely intertwined, and that electricity theft thrives in systems of poor governance. Besides high losses, EDL has witnessed low collection rates in recent years (66% in 2017 (Bramley et al., 2020a). This ratio is due to several factors that are directly linked to corruption practices such as the refusal of some politicians to pay their electricity bills (Al Akhbar, 2008). Additionally, payments by public administration is extremely low, including large consumers such as water utilities.

Moreover, EDL's low average tariff (9 cents/kWh) is well below the cost of generation, which varies with oil prices but is in the range of 16–22 cents per kWh. Lack of cost recovery in the case of EDL is the main reason that the company curbs its generation, since its losses increase as generation increases. 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. Although there is no evidence so far of collusion between EDL and the generator or fuel cartels, the low quality of EDL's maintenance of the generation and transmission infrastructure means that they often run below their operational capacity, which ultimately enables fuel importers and generator network owners to make more money. Additionally, with poor levels of cost recovery, EDL tends to be less accountable to its customers.

2.2. Governance considerations

Although EDL's technical and financial performance can be tracked and monitored, the underlying reasons behind its dire state are less obvious. Beyond the generalities of corruption, bad governance or mismanagement, there appears to be a web of complex influences that governs the sector. The first (historical) layer of this web dates back to the pre-civil war period. Abu-Rish (2015) argues that even prior to the civil war (1975–1990), electricity provision in Lebanon was tainted by structural deficiencies and competing interests, which caused the same issues that are debated today such as uneven distribution and access to electricity, power outages and poor quality and pricing of electricity. Further, Abu-Rish argues that the civil war 'transformed an existing structural problem rather created it' (MESPI, 2019).

The second layer is rooted in the post-war political economy, which divided power and rents between recognised and intertwined religious and political groups, with each group assigned a share of public sector jobs, services and contracts to distribute to its loyal followers. Salloukh (2019) argues that the Taef agreement that ended Lebanon's civil war more than 30 years ago created a more balanced consociational power-sharing arrangement; however, this led to a 'bigger, more clientelist, more corrupt public sector'.

The poor governance and performance of Lebanon's electricity sector dates back to the early days of the post-war construction efforts (Verdeil, 2008). One reason for this is the lack of coordinated vision and the sectarian distribution of state funds, as in the case of the Council of Development and Reconstruction (CDR).[4] Dibeh (2005: 24) states that the CDR approach to post-war construction was essentially a 'collection of projects proposed to the council of ministers without social return or cost benefit analysis'.

Since the early 1990s, electricity sector planning and operations in Lebanon have been characterised by fragmented and diffused decision-making processes (Ahmad, 2020). The direct result of this is a lack of accountability wherein the sector's failings cannot be traced

[4] CDR was one of the state funds established after the Taef agreement. In the 1990s, it was largely dominated by Sunnis (Hariri loyalists). See (Hudson, 1999).

to specific individuals or groups. The blame-shifting strategies and 'everybody is responsible' slogan that is often cited by politicians and the public further the murky environment in which corruption can thrive.

Given EDL's long history of underperformance and tainted reputation and management practices, one can ask, why are the political elites protective of EDL and how has it managed to continue with the same modus operandi for such a long time? The surveyed political economy literature provides a multi-layered answer. Diwan and Haidar (2019) argue that the Lebanese political elites are protective of the status quo – despite the economic challenges it generates – because they benefit from it. Although EDL is a loss-making utility, its operations incorporate a large number of service contracts, employment opportunities and a space for the exchange of political favours. For example, EDL's inflated[5] workforce and subcontracting companies has been highlighted as a platform to maintain a clientelistic system by distributing jobs to those close to politicians and senior members of the public administration. As one of EDL's workers put it: 'if you want to work at EDL, you can't just go and ask for work, you need to pull strings' (CSKC, 2014).

Annex A provides a more detailed mapping of the various manifestations of corruption in Lebanon's electricity sector.

2.3. Overview of the operations of diesel generator networks

The dire state of EDL's service provision has contributed to the proliferation of private diesel generators. According to a recent World Bank study, the total number of diesel generators in Lebanon ranges between 32,000 and 37,000, mostly dispersed in dense urban areas (Ahmad, 2020). Over the years, the influence of the owners of diesel generator networks has grown as they have expanded their complex business-power structure, which has been resistant to reforms and regulation. The influence of generator owners has been promoted by sustaining close relationships with politicians, municipal officials and security forces (Nucho, 2016). In interviews with diesel generator owners, many of them mentioned that they also 'donate' free electricity to municipalities and religious institutions within their territory of operations.[6] As such, owners of diesel generators exert high influence at the local municipal level.[7]

Nucho (2016: 2) points out that, although the owners of diesel generators have a reputation as an 'unscrupulous and ruthless mafia', they are part of (and contributors to) the political patronage system in Lebanon. Therefore, their position is empowered by their image as 'equal players' with the state when it comes to electricity provision. Navigating through

[5] Between 1995 and 2011, daily workers at the EDL increased from around 500 to 2,400. As for subcontractor companies, before 2011 their number pivoted between 100 and 200 (see https://civilsociety-centre.org/party/edl-workers).

[6] Interviews conducted by Ali Ahmad (April 2019).

[7] The municipalities that have not cooperated with installation of meters in diesel generator networks are often those with mayors who either own the generator network or are close to those who own it (Ahmad, 2020).

many examples of the interactions between the public and services such as electricity in Burj Hammoud, one of Beirut's suburbs, Nucho argues that the electricity provision by private diesel generator networks is a channel of sectarianism. This channel, however, manifests through a 'process' rather than an 'identity' through links built between service providers with sectarian parties and religious organisations (ibid.).

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 MOEW. Although some enforcement measures have been taken – such as inspection visits, issuing non-compliance fines, confiscation of assets, and, in some cases, arrests of generator owners – the real level of compliance has not be independently assessed. In an additional step towards regulating the operations of commercial diesel generators, the 2019 budget law included a tax, which was predicted to generate LBP 100 billion (US $66 million)[8] (Azhari 2019).[9] However, the cash-based diesel generator economy remains largely outside the formal financial system.

[8] Based on the official exchange rate in October 2019. Since October 2019, the Lebanese pound has devalued by more than half.

[9] It is not known yet how much this tax has generated, but in any case, the initial amount (at the old exchange rate of October 2019) is insignificant. Since bills are paid in Lebanese pound, the value of this tax is expected to fall in proportion with the currency devaluation.

3. Research questions, hypotheses and methodology

3.1. Research questions and hypotheses

Our core research question is: *How has it been possible for EDZ to overcome (or circumvent) the political economy context and establish a functioning mechanism for ensuring reliable 24/7 electricity provision?* That is, we seek to understand the nature of the political settlement and how the actions of EDZ and others have enabled the service reform to happen.

Our initial hypothesis regarding our core question is that the reform has been possible for two reasons:

1 Ordinary Lebanese citizens are increasingly dissatisfied with the appalling electricity provision and see it as a consequence of the dysfunctional confessional system of government. As recent country-wide protests indicate, many people are looking for a more fundamental shift in the political settlement and are not afraid to work together to achieve this.

2 Local leadership has leveraged this sentiment among the local community in order to resist a violent response from the local generator mafia to the EDZ initiative. In particular, we are interested to understand the role of women in the community – who often suffer most from electricity outages – in mobilising against the vested interests in the sector.

In addition to our core research question, we have also sought to address two follow-on questions:

a) What has been the impact of the reforms? Specifically, in what way has provision changed; what has been the impact on the experience of consumers (with particular attention to the different experience of men and women); and what impact have the reforms had on corruption?

b) What are the lessons learned from the EDZ experience and to what extent is the model scalable or replicable?

3.2. Methodology

We adopted a mixed-methods qualitative research methodology for the study, consisting of three components: key informant interviews (KII) with selected individuals, both in Zahle and at the national level; 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; and a series of interviews with members of the local community in and around Zahle in lieu of focus group discussions (see below). In total, interviews were conducted with 52 adults (33 men and 19 women), including community members and key informants. Field work also included site

visits to EDZ offices and its power plant and informal conversations with members of the local community during time spent in Zahle.

3.2.1. Key informant interviews

Interviews with 29 participants were conducted between 23 June 2020 and 28 October 2020 (see Table 2). These included EDZ management, local- and national-level politicians and public servants (both for and against the EDZ model), diesel generator owners, civil society leaders, private sector associations, journalists and energy experts. The semi-structured interviews covered four main pillars that speak to the research questions. Specifically, they discussed the:

1 context of electricity supply in Lebanon generally and the situation in the area covered by EDZ before 2015

2 process that allowed the EDZ model to take shape, including internal factors and external resistance and support at both the political and community level

3 impact of EDZ operations, as a model of electricity management and governance, on the population covered, including the gendered impact if any

4 prospects for EDZ itself and possibilities for the replication and scalability of its model.

Although focused on the above areas, the interviews provided flexibility to follow the flow of the narrative chosen by key informants. This allowed the team to obtain a holistic understanding of the issues and the impact of the changes introduced by EDZ. The vast majority of interviews were conducted face-to-face in Arabic, mostly involving at least two members of the research team.

Table 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

Source: The authors.

3.2.2. Data collection and analysis

A wide range of official documents and grey literature relating to electricity laws, policies, contracts and technical data was also collected. These include:

- *Legal:* The old EDZ concession contract (1923–2018) and the new 2018 contract, as well as Law 107/2018 ratified by the Lebanese government in November 2018 that allowed EDL to subcontract EDZ within a scope of service provision to generate and distribute electricity for a limited period of time (two years) in the area of jurisdiction of the concession. This allowed the research team to conduct a comparative analysis of previous and current laws governing the relationship between EDZ and EDL.

- *Technical:* Average production costs for EDZ compared to other power plants in Lebanon.
- *Tariff:* Estimates of monthly and yearly tariffs and how they varied over time (2015–2018) based on EDZ/EDL cut-off hours.
- *Financial:* Copies of EDZ invoices for residential and industrial households during the three main periods of interest in this study: prior to 2014, 2014–2018 and from 2018 onwards. This helped in tracking the changes in EDZ's billing system over time as well as in identifying the implicit tariffs relating to the generation source. Annual costs throughout the three periods were analysed and an estimate made of EDZ kWh pricing during each period.

3.2.3. Community impact interviews

Our original intention 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 but which shared the same socio-political context. The aim was primarily to understand the impact of the changes introduced by EDZ with particular attention to the different impacts on men and women. By comparing any changes in the livelihoods and activities of communities within and outside the EDZ catchment area before and after the introduction of EDZ generation, we could undertake a simple qualitative 'difference-in-difference' evaluation of impact.[10]

The FGDs were originally planned to take place with the rest of the fieldwork in July 2020, but, due to lockdown measures instituted to tackle Covid-19, it became impossible to conduct the discussions. Consequently, we conducted a series of individual, socially distanced interviews with 23 respondents from the local communities in July and October 2020 to address the same set of issues.

Table 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

3.2.4. Limitations

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

[10] Unfortunately, we did not have the resources to complement this with a more extensive quantitative survey of impact. However, this design enabled us to obtain a better sense of the likely impact than a simple before-after comparison of those within the EDZ catchment. Moreover, the FGD format allowed us to explore how such changes had an impact and the reasons why they took place.

Beirut, where, since the 17 October uprising, people have been taking to the streets nationwide in unprecedented cross-sectarian protests calling for change and expressing a lack of trust in the current political class and governing parties.

The fragile political context delayed our interviews with members of the political elite and consultations with policy actors. In addition, June and July 2020 witnessed severe electricity shortages, prompted by the difficulty of securing diesel because of the economic crisis as well as mismanagement in the sector. At this time, 24/7 electricity provision in Zahle and its surroundings therefore appeared particularly exceptional when compared to the dismal 4-hour provision by EDL in other areas and this may have influenced participants' responses. As noted above, the measures taken to tackle the Covid-19 pandemic forced the postponement of focus groups in Zahle. This meant that they were finally conducted 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.

The fieldwork was also conducted at a time when the contract for EDZ was up for 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. This, and the many other constraints noted above, means that some of our conclusions are tentative. Nonetheless, we believe that the evidence we have gathered tells a compelling story and provides robust evidence about corruption innovations in the sector.

4. Case study: Électricité de Zahlé

In this section, we explore the way in which EDZ, a power utility in the district of Zahle in Lebanon's Bekaa governorate, has managed to achieve a high-quality electricity service for its residents in the midst of the highly dysfunctional and corrupt electricity system described above. EDZ is one of few surviving concessions and one of the most prominent. Over the last century, many concessions were given to private entities in different parts of the country that allowed them to generate and distribute power within their geographical range. Today, the Lebanese government is gradually phasing out the 'traditional' business model of the remaining few concessions. However, the severe lack of service provision by EDL is refuelling the debate about the role of concessions and bringing them back to the centre of energy policy discussions in Lebanon.

There are several reasons why EDZ presents a compelling case study.

First, in terms of the number of customers, EDZ is the largest concession that is still managed privately (and the second largest overall after Électricité Kadisha, which is now managed and run by EDL). In 2010, EDZ's share of the total customers of concessions across Lebanon (excluding Kadisha) was 56% (Al Akhbar, 2010).

Second, unlike other concessions, EDZ's geographic coverage includes a concentration of significant commercial, industrial and agricultural activities that are important to the national economy. Historically, Zahle and the surrounding towns (Shtura and Bar Elias) have been the center of the economy of Lebanon's inland regions and an important link in the trade between Lebanon and Syria (Harris, 1985).

Third, in a country plagued by power cuts, EDZ seems to have demonstrated a model of high-quality service provision and 24/7 electricity coverage. However, the ongoing economic crisis in Lebanon and the dire state of EDL raise questions about the validity and sustainability of the EDZ model. Moreover, as we discuss below, the EDZ case exposes channels of rent-seeking that are also likely to be present in other concessions. These channels are only observable in the case of EDZ due to the high level of polarisation that have accompanied the national debate about its model, which does not extend to other concessions. To some extent, the debate has revolved around EDZ's role and expansion towards power generation. On the one hand, EDZ has been seen as an 'outdated' model that extracts rents and weakens central institutions such as EDL (Al Akhbar, 2017a). On the other hand, EDZ has been praised for its ability to provide reliable service provision to its customers, unlike in the rest of the country (Al Akhbar, 2016).

Finally, the polarised debate on EDZ seems to mask a deeper, more interesting issue related to the role of decentralisation in Lebanon's power sector. EDZ has been used as a pretext to both argue for and against decentralisation with both views using the need to fight corruption as the cornerstone of their arguments. The wide national (and sometimes international) media coverage of EDZ's operations has attracted the attention of the public and policy-makers and has made it an often-used reference in policy debates.

4.1. The history of EDZ

4.1.1. The early history of EDZ

EDZ was established in 1923 through the concept of *Imtiyazat*, a process that dates back to the Ottomans. The singular form *Imtiyaz* means a privilege or concession. Essentially, it is a preferential privilege given to a foreign entity to conduct a commercial activity within a territory that belonged to the Ottoman Empire. Ahmad (2000) notes that this practice proliferated in the last years of the Ottoman Empire as the Empire became weaker and unable to meet people's demands for services. *Imtiyazat* extended to most public services such as transport, water and electricity, which had five major concessions in Aley, Kadisha, Bhamdoun, Jbail and Zahle (*Al Akhbar,* 2010). 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).

Although EDZ was established after the capitulation of the Ottoman Empire, *Imtiyazat* persisted during the French Mandate, post-independence (Abu-Rish, 2015). 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 (ibid.).

Initially, the EDZ concession was centered on Zahle's hydropower potential of the Berdawni River, whereby the concession holder was responsible for distributing electricity to the town of Zahle.[11] At the time, the production limit was based on the hydropower capacity of around 1 MW. Additionally, the concession gave EDZ the right to invest in public works and infrastructure such as transmission lines (EDZ, 1923).

In the late 1960s and throughout the Lebanese civil war (1975–1990), EDZ generation capacity started to diminish and eventually ceased. Since 1975, when EDZ and EDL agreed to cease operations of the Berdawni hydropower plant, EDZ essentially became a power distributor. However, the agreement between EDZ and EDL stated that in times of high demand, EDZ has the right to use a thermal generator with a maximum capacity of 1 MW.[12]

Different interviewees offered different reasons as to why EDZ ceased its role in power generation. Over time, the flow of the Berdawni River started to decline and so did its power capacity until EDZ shifted its operations to power distribution.[13] A 2003 study estimated the generation capacity of the Berdawni hydropower station at only 1.1 MW (El-Fadel et al., 2003). A more recent 2011 study by the United States Agency for International Development (USAID) confirmed the Berdawni's low flow levels and highlighted that in the previous two decades the river had seen a drastic decline in its flow and that it stopped flowing in the summer (USAID, 2011). However, Asaad Nakad, EDZ's Chief Executive Officer, stated that

[11] This later expanded into a number of surrounding towns and villages.

[12] KII 1: former senior official at MOEW.

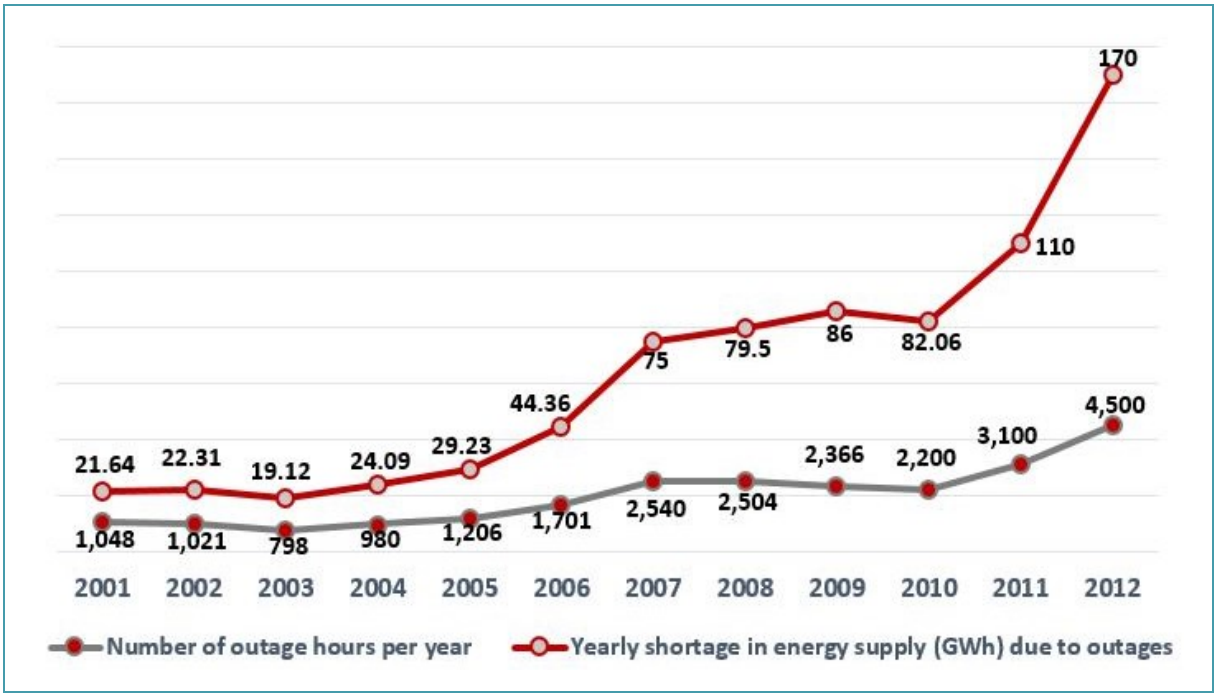
[13] KII 1. Note: we heard conflicting information on the generation from Berdawni.

EDL demanded that EDZ stop generation and focus on distribution as it ramped up its generation capacity.[14] Others have highlighted that EDZ was forced to cease power generation after its generation units were targeted during the civil war (Naylor, 2016). It is likely that all of these reasons contributed to EDZ ceasing generation.

4.1.2. Electricity provision in Zahle before 2014

To a large extent, the situation with electricity provision in Zahle before 2014 was similar to other Lebanese cities and towns, with a prevalence of power outages and a proliferation of private diesel generator networks. In fact, the level of service provision in Zahle and the Bekaa region in general was (and still is) well below that in Beirut and other major coastal cities (Ahmad, 2020). 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 (Lebanon Files, 2008). Figure 2*: EDL yearly shortages in energy supply to EDZ* shows the dramatic growth in energy shortages for the supply by EDL to EDZ.

Figure 2: EDL yearly shortages in energy supply to EDZ due to power outages



Source: EDZ data (2012)

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'.[15] By filling such a gap in service provision, the owners of diesel generators took advantage of the public's need for electricity, especially during high-demand

[14] KII 2: Assad Nakad.

[15] KII 3: former owner and operator of a diesel generator network in Zahle. Note: different interviewees gave slightly different estimates of the numbers of diesel generators and their owners.

periods, to impose tariff hikes and/or reduce their service while keeping the same flat tariff. 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, which is barely enough to meet the basic electricity needs of a small household.[16] To put this number into perspective, US $120 was about two thirds of the minimum wage in Lebanon in 2008–2014 (ILO, 2011). Clearly, under a flat tariff structure, high consumers benefit more as they usually own more electrical appliances, and thus consume more power.[17]

Imposing a flat tariff structure is substantially more profitable for the owners of diesel generators, particularly when operating their generators at lower loads (i.e. lower fuel costs) (Ahmad, 2020).[18] 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.[19] 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'.[20]

In Zahle, public grievances against the owners of diesel generators were not limited to their perceived unfair and opportunistic tariff structure and pricing.[21] Because of the flat tariff system, diesel generator operators had incentives to turn off their generators to save fuel, which they often did after midnight as demand diminished.[22] Similarly, they sometimes restricted power supply whenever EDL's network suffered major disruptions to avoid using too much fuel or causing damage to the generator.

Moreover, the owners of diesel generators exercised intimidation for those who objected to their way of doing business. A representative of a local non-governmental organization (NGO) said 'The generators were controlling us [حاكمينا]; if you disapprove [they] can cut you off'.[23] The power of the diesel generator cartel in Zahle (and possibly in other Lebanese cities and towns) was partly due to their collusion.[24] As one interviewee put it, 'there was no

[16] KII 4: Zahle-based journalist. KII 5 (a member of the Zahle municipal board) highlighted that the operator of diesel generators under-delivered their amperage (supplying 3 amperes instead of 5).

[17] It should be noted that some poor families connected to a lower amperage (3 amperes) to avoid paying such high charges. However, even a 5-ampere connection is not enough to power energy-intensive appliances such as air conditioners and washing machines, which could only be operated at the more expensive level of 10 amperes.

[18] And the profits would have been boosted further during periods of low oil prices.

[19] KII 6: Assad Zoughaib.

[20] KII 7: Group interview with local leaders in BarElisas

[21] Interviews revealed that many other towns near Zahle such as Bar Elias have had metered diesel generator networks.

[22] Various interviews.

[23] KII 8: representative of a local NGO in Zahle.

[24] It is interesting to note that despite the large number of diesel generator networks, there is no evidence of any substantial in-fighting, perhaps due to the 'organic' way they proliferated in their own neighbourhoods, where others are not allowed to operate, and the apparent loyalties at the neighbourhood and sectarian levels (Abi Ghanem, 2018).

competition; they [the owners] distributed the cheese among themselves; each one took a neighbourhood. If you lived in a certain neighbourhood, you had to subscribe with a particular generator owner.'[25]

Another aspect that directly links to the livelihood of the residents of Zahle area is the issue of low power quality delivered by diesel generators. Clearly, this is an issue that is prevalent across Lebanon, but the interviewees highlighted the relevance to those living in Zahle and surrounding villages. One interviewee stated 'appliances often broke down because of problems with supply',[26] and another added 'we used to install stabilizers to protect our electric appliances from generators' power'.[27]

However, the largely negative view of generators was not always shared by surrounding towns. In Bar Elias, for example, some local generator owners offered a metered tariff, and the prices for a flat tariff, 5-ampere subscription stayed at around US $66, almost half the price paid in Zahle city.

4.1.3. EDZ's transition to power generation

When EDL's generation base was able to meet the country's entire demand, there was no need for electricity generated by EDZ and the other concessions. However, the damage to EDL's generation and transmission infrastructure caused by the civil war and Israeli attacks negatively impacted EDL's service provision and led to severe power outages.[28] When these outages became too frequent, discussions on reviving the concessions' generation role started to emerge. In 2013, a local news website reported that, in the late 2000s, EDZ had presented a plan to shift back to its power generation role but the MOEW kept resisting the idea (Asdaa Zahle & Bekaa 2013).[29]

In late 2014, EDZ struck a deal with Aggreko, a UK-based company that specialises in temporary power rentals, to install a diesel-based generation with initial capacity of 35 MW.[30] EDZ leveraged the terms included in the concession contract and its historic role in power generation to justify its move.[31] 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.[32]

[25] KII 5.

[26] KII 8.

[27] KII 5.

[28] Between 1996 and 2006, Israel launched six attacks against EDL power stations (Ahmad, 2020).

[29] However, we heard from respondents that such plans had existed since at least 2005 (interview with Eric Verdiel).

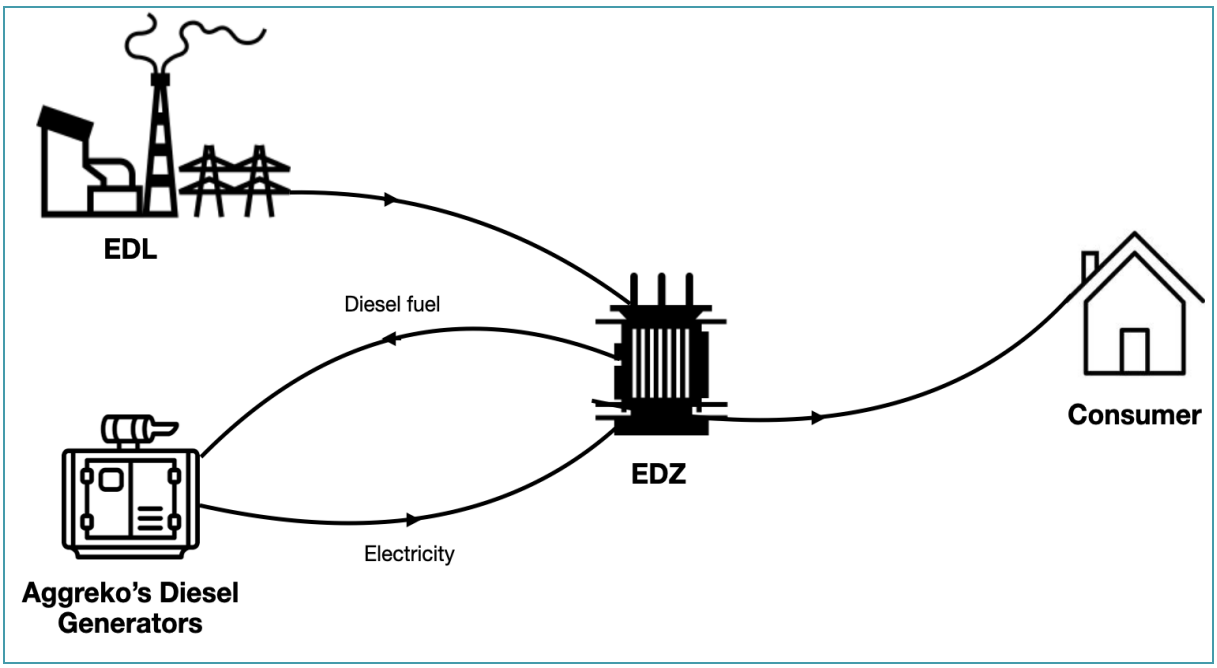
[30] EDZ was confident of its ability to drive the owners of diesel generators out of business by simply providing 24/7 electricity on EDL's low-voltage (LV) grid, which would essentially force diesel generators to switch off.

[31] 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.

[32] KII 9: senior manager at Aggreko.

This additional capacity enables EDZ to provide 24/7 electricity to those in its concession area, and has displaced a large number of small private generators who had been providing back-up power. One interesting aspect of the EDZ-Aggreko model is that 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% of the cash flows in the diesel generator value chain (Ahmad, 2020), EDZ may have used this strategically when negotiating settlements with local diesel fuel suppliers whose operations were not impacted by the shift of ownership of the generators they feed. Figure 3 illustrates how EDZ purchased electricity from both EDL and Aggreko and distributed power to its concession area.

Figure 3: A conceptual model of EDZ's operations



Source: The authors

Although the EDZ-Aggreko model does not offer much innovation or deviation from the diesel-based power generation model, it has some notable advantages over dispersed 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 (O&M) costs. Second, unlike diesel generators that are connected to a low-quality grid that is parallel to that of EDL, Aggreko's power plant is connected to EDL's medium-voltage (MV) grid, which reduces technical losses.[33] Third, from an end-user perspective, alternating between EDL and Aggreko's generation, which is directly fed to the MV grid, 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. First, 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. Second, EDZ

[33] KII 9.

provides customers with an integrated bill with significantly higher quality billing and maintenance services at a reduced overall cost.[34]

4.2. EDZ as a rent-seeking utility

Notwithstanding the improvement in service quality, it is also evident that concessions have been used to extract rents. A senior EDL employee commented: 'concessions were agreements that worked for the benefit of powerful and rich people',[35] and alluded to the fact that EDZ received preferential treatment even compared to other concessions.[36] 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.[37] The financial model under which concessions operated was therefore extremely profitable, particularly for EDZ.

This preferential pricing is particularly problematic because even EDL's average tariff is well below cost-recovery level.[38] Since EDL's deficit is covered by direct treasury transfers, the presence of concessions, particularly EDZ, has contributed to EDL accumulating losses for decades. As shown in Figure 4, the total revenues of four concessions were around LBP 16 billion (US $10.8 million) in 2012; EDZ's share alone was more than 60% of this total. Although this number may not seem too large, it was 'easy money' with the profit accruing to the private owners of the concessions.

The huge losses to EDL and the Lebanese state from this financial arrangement naturally begs the question of why it was allowed to persist. Here, our interviews point to a Syrian influence. From the Taef agreement that ended the civil war in 1989 until the exit of Syrian troops that were based in Lebanon in 2005, Syria exerted significant influence over politics in Lebanon. Because of its proximity to Syria and as the base for Syrians in Lebanon, the Bekaa region was particularly under the control of Syria. Several interviewees suggested that EDZ and its management fostered good relations with Syrians to ensure the continuity of their operations. Senior officers at EDL and the MOEW stated that EDZ's preferential treatment in the 1990s until the Council of Minister's (CoM) decision in 2004 was primarily because of pressure by Syrian officials.[39] We were told by multiple sources that the 2004 CoM decree (decree # 5/2004) 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.

[34] Various interviews.

[35] KII 10: senior EDL official.

[36] EDZ's 50 LBP per kWh was cheaper than that of Jbail and Kadisha concessions at 63 and 61 LBP per kWh, respectively (Al-Akhbar, 2010).

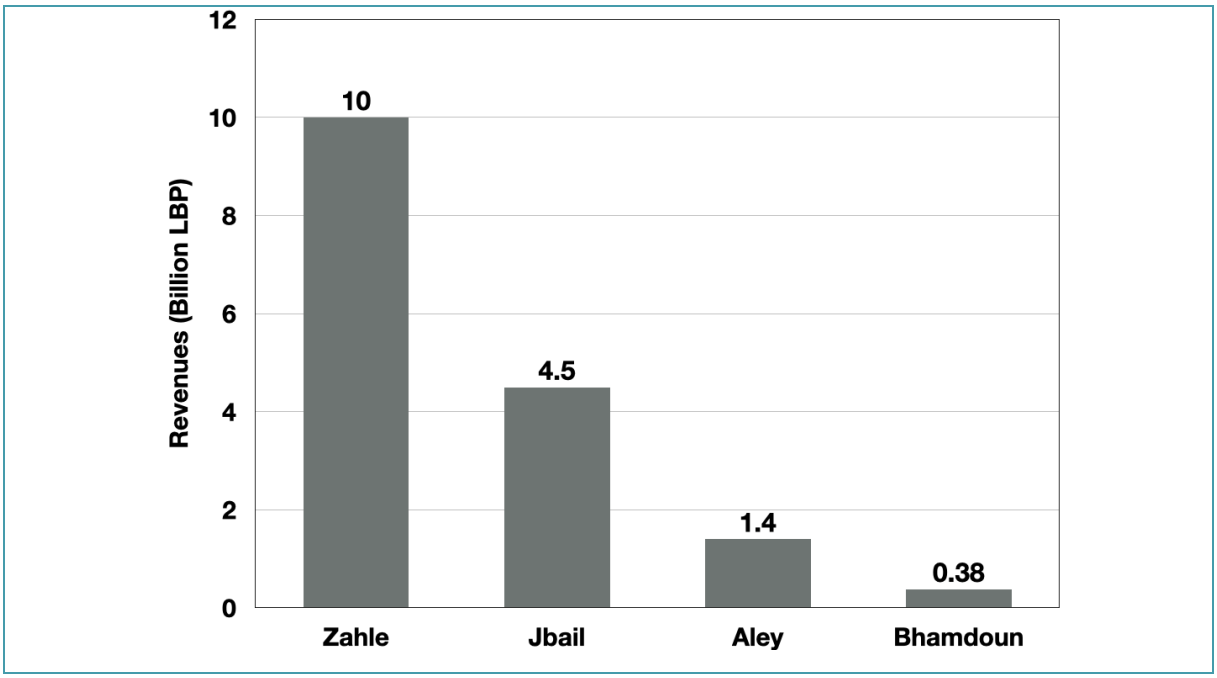
[37] KII 1.

[38] EDL's cost-recovery level is dependent on oil prices, but it usually ranges between 13 to 22 cents per kWh (195 to 330 LBP per kWh).

[39] Various interviews.

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. This is because of the opacity of the tariff regime in place. 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. Table 4 shows the range of values of the EDZ tariff in each year. It also shows the guidance published by the MoEW for tariffs by diesel generators during the same period. 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.

Figure 4: Concessions' revenues in 2012



Source: *Al Akhbar* (2012).

Table 4 shows that the tariffs charged by EDZ for its own electricity far exceed the regulated prices. However, 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. As described below, 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 than a concession holder and only lasts for two years. Moreover, it raises the price of the electricity that EDZ purchases from EDL to LBP 88.1 per kWh. However, EDZ is also permitted to charge a LBP 15,000 (US $10 in 2018) fixed charge for every connection each month (for details of the differences between the concession and the new contract, see Annex B).

Table 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)[40]	Average MOEW price/kWh for diesel generators (LBP/kWh)[41]
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 **Public institutions/schools/hospitals:** 140 LBP/kWh **Industry/agriculture:** 115 LBP/kWh **Medium voltage:** Night tariff --> 80 LBP/kWh Afternoon --> 320 LBP/kWh Rest of day --> 112 LBP/kWh	–	Not applicable
2015	50		Between 342 and 531.7	241
2016	50		Between 346.5 and 527.5	207.41
2017	50		Between 363.2 and 544.8[42]	237.25
2018	50		Between 514 and 700[43]	325
2019 (new contract)	88.1		Between 312 and 369[44]	395
2020 (new contract)	88.1		Between 283 and 536[45]	472

Source: The authors

Figure 5 shows estimated revenues for EDZ based on its EDL-linked operations before and after its contract extension in 2018.[46] EDZ revenues are derived from the price differential between electricity sold and that purchased either from EDL or Aggreko, but Figure 5 shows only the revenues of selling EDL's electricity since we do not have access to the EDZ contract with Aggreko. The increase in the price of EDL's electricity in the new contract in 2018

[40] 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.

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

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

[43] 2018 figures are for December 2018, just before the new contract.

[44] 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.

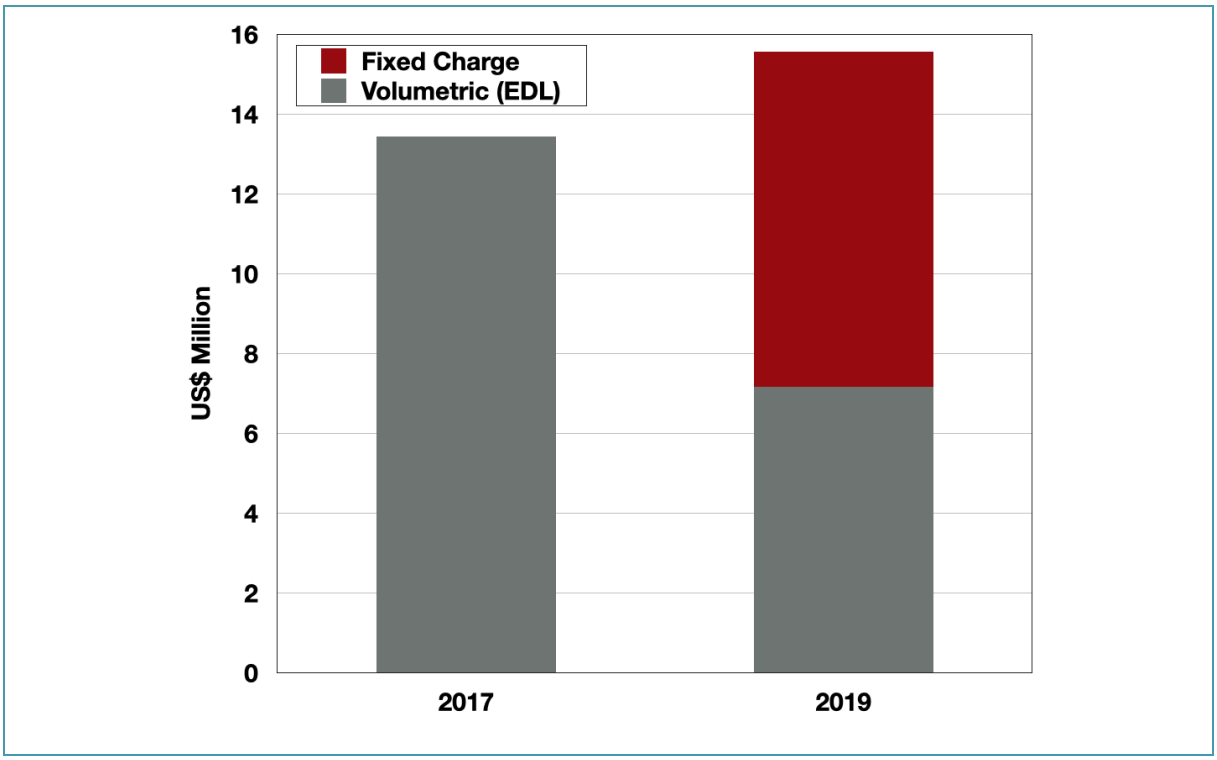
[45] 2020 EDZ price/kWh range is based on the actual EDZ monthly tariffs between January and October 2020.

[46] Estimates based on data collected from EDL, MOEW and authors' assumptions – see Annex D for details.

reduced revenues from the sale of EDL power by around US $6 million per year.[47] However, the addition of a new fixed charge of US $10 (LBP 15,000 in 2018) greatly added to revenues. In June 2020, EDZ had around 70,000 connections, which implies an annual revenue of around US $8.4 million from this charge. This suggests that EDZ's fixed charge more than compensated for the losses incurred by agreeing to a higher purchasing tariff from EDL.

Assuming EDZ's costs were roughly the same between 2017 and 2019, the new tariff regime is estimated to have boosted EDZ's profits by around US $3 million. In reality, EDZ's profit margin is likely to have become much slimmer recently due to the currency devaluation. However, the purpose of the simulation is not to estimate EDZ's profit, but rather to show how an institutional mechanism was put in place to ensure the continuation of rents under the new contract.

Figure 5: Estimation of EDZ revenues from its power arbitrage with EDL



Source: The authors

Beside the above 'legitimate' rent extraction, our interviews also provide information about the mechanisms and practices that EDZ may have used to disguise rent-seeking. For example, there is a lack of transparency about EDZ's financial data. EDZ is obliged to share this data with the concession owner, EDL/MOEW. However, a former senior MOEW official stated: 'EDZ used to never send their expenses/revenues to MOEW/EDL'.[48] Additionally, our

[47] 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.

[48] KII 1.

respondents pointed to a variety of financial management and reporting tactics allegedly used by EDZ to disguise rents. For example, the EDZ contract with EDL allows it to charge 9% interest on the investments that EDZ makes on behalf of the state. We heard allegations that EDZ claimed large yearly purchases of equipment on behalf of MOEW/EDL to maximise the interest revenue – but then treated these purchases as part of EDZ's company assets even though the concession agreement states that they should be registered and transferred to MOEW/EDL.[49] EDZ also allegedly registered additional ineligible costs as deductibles and subject to interest, such as audit costs, marketing and advertising campaigns, and flights.[50]

4.3. How did EDZ achieve 24/7 power supply?

By analysing the responses to our interviews, we find that EDZ's success in providing its customers with acceptable quality electricity supply around the clock is a result of the intersection of four major factors: 1) the company's historical context, 2) endorsement by local community, 3) a win-win political settlement approach, and 4) presenting an agile economic model that minimised risks. We discuss each factor in turn..

4.3.1. Historical factors

The status of EDZ as an established utility and its concession right to generate power – albeit from hydropower or an equivalent thermal capacity – were leveraged by EDZ's proponents as a pretext for its move in 2014. Asaad Nakad, EDZ's CEO, noted that 'EDZ is a company that was formed 40 years before EDL'. He added: 'During the Lebanese civil war, EDL started to suffer in terms of electricity supply with power shortages [that] began in the 1980s. As a result of that, the people of Zahle started requesting to find a solution.'[51]

Besides the 1923 concession agreement and its subsequent extensions, 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.

Amid public anger towards the diesel generator operators and EDL's poor service, EDZ cultivated the trust of its customer base by providing them with an alternative service that was responsive and professional. This difference in performance is illustrated by one of the community leaders interviewed in a village near Zahle that is not included within EDZ's territory. He summed up his experience with EDL: 'Four years ago there was a problem with EDL and there was no electricity for 17 days ... 17 days, without any light. It was around the Adha Eid.'[52] In contrast, in almost all of the interviews respondents cited EDZ's responsive customer service and good management. Commenting on EDZ's power distribution role, a

[49] In our interviews with senior staff at MOEW and EDL it was interesting to observe that officials did not feel empowered to prevent such behaviour by EDZ, referring to higher levels of political pressure (KII 10).

[50] KII 1.

[51] KII 2.

[52] KII 7.

local leader said 'the management and service of EDZ were excellent, and has built confidence in the company'.[53] Even a Zahle Member of Parliament (MP) who opposed EDZ's model stated that 'the main good thing about EDZ is the service and O&M, which has continued'.[54] This point was reaffirmed by an owner of a diesel generator who fought against EDZ: 'The best thing about EDZ is its service and management'.[55]

The interviews revealed that EDZ was delivering excellent service and was well managed even before the major shift to power generation in 2014. As a distribution company, EDZ has always had one of the highest collection rates compared to EDL. It is this level of verified and trusted service provision by EDZ, coupled with increasing opposition to the diesel generator cartel, that seems to have created a supportive context for EDZ's expansion in 2014.

4.3.2. Endorsement by local community

A core element of EDZ's ability to secure support for its energy generation plans is the community's appreciation of the company's professionalism and service, as well as their trust that EDZ will deliver on the promise of 24/7 electricity. The literature suggests that community trust in an actor, be it a company or another institution, depends on the perceived similarity in goals and values between the community and that actor, which, in turn, influences the 'perceived competence and intentions' of the actor (Huijts et al., 2007). EDZ is a case in point. Also, customers trust EDZ because of its managerial competence, and it was EDZ's investment in consolidating clientelistic ties – both at the national and community level – that harnessed community support around it.

Indeed, some of the local community's support to EDZ appears to be 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 (جريدة اللواء 2018). This support was crucial in bolstering EDZ's position in national-level negotiations for the new contract and its acceptance by parliamentarians, especially those from the areas, even if they did not agree in principle with the project. Clientelism remains a dominant feature of Lebanese politics and is central to relationships between the elite and their constituencies, as well as in negotiations between political elites. In the case of EDZ, these ties have both instrumental elements (including buying off the local generators and sponsoring local actors) and affective elements, that played on both the religious and regional affiliations of Zahle's citizens. The support-building mechanisms entailed a variety of strategies.

First was the establishment of a committee to support EDZ. Interviews with a number of Zahle's community leaders revealed that EDZ had started building ties with, and in some cases organising, community groups since 2010. The committee comprises a wide variety of

[53] KII 11: local businessman and community leader in Zahle.

[54] KII 12: MP for Zahle.

[55] KII 13: Former owner of a diesel generator in Zahle.

actors, businessmen, religious groups, media personnel and NGOs, and, while seemingly independent, its members coordinate closely with the company. The committee has continued to grow and adapt as needs and challenges have arisen. Because they are chosen based on their community standing, most members are men; but 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.[56] This is not to say that there was only token female participation in the activism for EDZ, but rather to show that the orchestration of community support has been mostly top-down, and in line with existing community-level power dynamics and the limited space afforded to women within that.

A second strategy deployed by EDZ is support for local NGOs, churches and schools – some of whom are represented in the committee. This support seems to be connected with the public image that EDZ wants to spread. As one journalist explained: 'He [Nakad] 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'.[57] 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. A local journalist mentioned: 'His [Nakad's] budget for media was not secret; he paid a lot and had strong media presence and propaganda. He focused on media – it helped create a very supportive public opinion.'[58]

Nevertheless, community support was not just tied to the classic clientelistic relationship of offering rewards in exchange for loyalty and support. Affective and religious ties were also important. For example, in answer to why he believed 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'.[59] Despite claims of a non-sectarian character, the office of Nakad himself, and the various offices in the company, reflect a religious character and the EDZ CEO participates every year in the Christmas light ceremony for the Zahle cathedral.

A third strategy that has further strengthened affective ties is an approach to marketing that speaks directly to its customer base, emphasising 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.[60] A journalist commented: 'The ads were brilliant; and the people of Zahle identified with the ads. The

[56] KII 14.

[57] KII 4.

[58] KII 4.

[59] KII 11.

[60] Various interviews.

director of the ads is from Zahle and he played a lot with the "Zahlawai" character.'[61] Most of EDZ's ads have been made by a director from Zahle, who has skillfully weaved an intimate portrayal of the city, the relationship it has with EDZ and what the power cuts have meant in people's everyday lives.

The key protagonist of the advertisements, Samira, is an older woman from Zahle who has a distinctive local accent and is personally known by many in the city. In one ad we see her bragging about the electricity in Zahle to her relatives in Beirut, a trope of comparison to other regions that the director has intentionally chosen to play in several ads. At times, when EDZ's continued operation is threatened, we see her having nightmares of a return to electricity cuts, with the stored food defrosting and the daily schedule a mess. The 24/24 slogan[62] that has become synonymous with the company was already in use by EDZ, but the tropes and ideas were that of the director. Outside ads are filmed in the narrow streets of traditional city quarters, and, while some ads have featured men, the impact of electricity is portrayed mostly in the domestic space at the household level, further tying the image of EDZ to the daily lives of women, the roles they take and the spaces that they occupy.

The production of the advertisements further portrays the relationship between the company and its community. The director claims that he initiated the relationship with EDZ and charged a lower fee for them, sometimes producing ads at a lower cost by filming with basic equipment for a social media audience. The director has explained that the initiative was motivated by his own pride in Zahle. However, our interviews suggest that the strategy has not only garnered support for EDZ, but it has galvaniszed pride in Zahle, both in Lebanon as well as with emigrant Zahlawis, sustaining a self-perpetuating bond between EDZ and the people of the city.[63] However, the emphasis on the city of Zahle, may explain why the intimate relationship between the community and EDZ is not shared in most other areas covered by EDZ. Indeed, the protests in favour of EDZ around the time of the new contract took place only in Zahle city, while most residents of neighbouring towns hesitated to take part.

A fourth strategy for building community support relates to the diesel generator owners. EDZ's management appears to have reached agreements with the owners to compensate them for driving them out of business. Two approaches were reported by interviewees: paying them out or hiring them as EDZ employees. A former owner of a diesel generator network said 'Asaad Nakad continued to pay monthly salaries for the families that used to live from diesel generators. For each owner around US $1,000. This has been the case until 2018.'[64] However, this practice was almost exclusive to Zahle city; diesel generator owners in the neighbouring towns did not benefit from such compensation. One interviewee, whose husband owned generators in a neighbouring village, voiced frustration for how this

[61] KII 4.

[62] The slogan was for '24/24' power, i.e. 24 hours of power in every 24-hour period.

[63] KII 19: director of EDZ advertisements.

[64] KII 3. KII 4 commented further 'After losing the elections in 2018, Nakad's impact decreased, and he minimised his media and social appearances. He did not get the number of votes he expected.'

transition was managed, saying that EDZ would not even consider postponing the launch of their 24-hour supply by a few weeks so that generator owners could collect outstanding payments they had with their customers.[65]

Finally, EDZ seems to have 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, even those who were met randomly in a local café during the research. 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. A local female activist said 'The family atmosphere in the company is what makes it successful'.[66] Moreover, EDZ management appears to be very keen on fostering good relations with its workers' syndicate, organising special events on Workers' Day and acknowledging the efforts of retiring employees (*Asdaa Zahle & Bekaa,* 2015).

The above strategies show that EDZ and its management have not solely relied on its good track-record and the genuine public support it received. It has solidified this support and built a consensus around the company's role in providing electricity around the clock. A local leader from Zahle commented, 'Nakad is a successful businessman and has a pragmatic mindset. He knows how to build strong relationships with the key players of the community in the city as well as with various political parties. He even had good relations with the Syrians when they were in Lebanon.'[67]

4.3.3. A win-win political settlement approach

The pragmatic win-win approach followed by EDZ's management at the local level to overcome the resistance of the diesel generator cartel extended to obtain political approval 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).[68] 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 huge profits made over the decades by concessions such as EDZ at the expense of EDL's profitability. As one opposing MP put it, 'EDZ stole the public wealth for 108 years – it is a purely coordinated theft of public money'.[69] Additionally, the model of EDZ that is based on decentralised power generation contradicts the 2010 'Policy paper for the electricity sector' (GoL, 2010). This advocated for expanding EDL's generation base by building

[65] KII 20: representative of a local NGO in Zahle.

[66] KII 14: local community leader.

[67] KII 6.

[68] The opposing MPs were Salim Aoun (Zahle), Michel Dhaher (Zahle), and Nazih Najem (Beirut, head of Energy and Public Works Committee) (*An-Nahar*, 2018a).

[69] KII 15: MP.

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 the FPM) and EDZ's Asaad Nakad, a win-win political arrangement seems to have emerged in 2018, under which EDZ was granted an extension for two years. Central to this arrangement is shifting EDZ's status from a concession holder to an operator. Under this new deal, the opposing parties (mainly FPM) have been able to claim that they have ended a regressive concession from the Ottoman days,[70] while EDZ secured a continuation of its operations for two more years, albeit under a different contractual arrangement and terms.[71]

Another 'win' for the opposing side was increasing EDZ's power purchasing tariff from EDL from 50 to 88 LBP per kWh (US $ 0.033 and US $ 0.059 respectively), mentioned above, although the tariff remains well below EDL's cost-recovery level of US $ 0.16 per kWh in 2020 (Bramley et al., 2020b). The increase in the power purchasing tariff lowers EDZ's profit margins by around US $6 million, as shown in Figure 5. However, to compensate for such a loss, EDZ imposed a fixed tariff of LBP 15,000 (US $10 in 2018) per connection. Certain 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.

4.3.4. Economic factors

The political polarisation caused by the EDZ model since 2014 masks economic considerations that played an important role in the success of EDZ's service model. From an economic perspective, there are two major innovative aspects to the EDZ model.

First, the model capitalises on people's eagerness to get rid of the diesel generator cartel and reflects their willingness to pay for a reliable electricity supply.[72] A Zahle resident stated: 'As people of Zahle we still think it is better to pay more and get 24 hour electricity'.[73] Besides the 24/24 slogan, EDZ and its management have also promoted the narrative of providing electricity that is cheaper than diesel generators. As a local businessman put it, 'Nakad has promised to reduce 40% of the bill'.[74]

Prior to EDZ's intervention 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

[70] Press conference of Minister Cesar Abi Khalil following the vote on EDZ's new contract (An-Nahar, 2018b).

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

[72] Of course, the high marginal tariffs charged by EDZ mean that some consumers cannot pay, with negative implications for inclusion – see section 4.4 on impact below.

[73] KII 5.

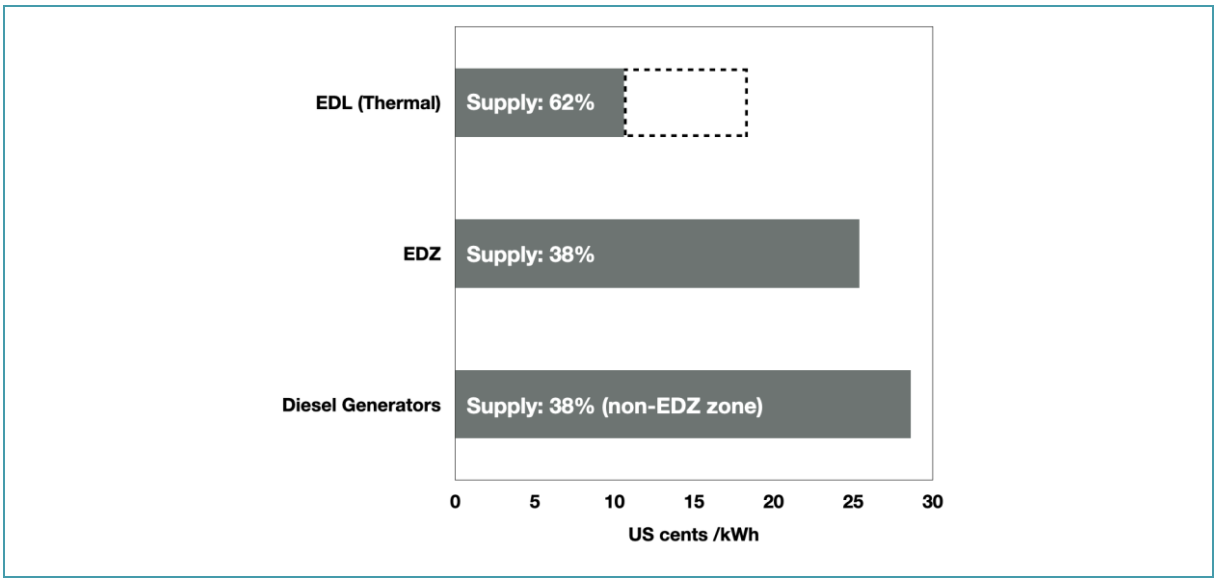
[74] See EDZ website: http://edz.com.lb/landing.aspx?pageid=12

network. In a way, EDZ has positioned itself somewhere in the middle, offering better quality and reliability than the diesel generators and charging a tariff that is higher than EDL but lower than the generators' flat tariffs back in 2014 (see Figure 6).

The second economic driver is EDZ's inclusion of de-risking measures. 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. EDZ's decision to partner with Aggreko, a leading company in providing temporary power solutions, is a de-risking measure. If EDZ owned the generation plant, then it would be obliged to sell electricity at the same tariff as it sells EDL's power to its customers, as per the concession contract. That would not have worked since the LBP 125–135 average selling price of EDL power is well below the cost-recovery level of EDL's large thermal power plants, let alone that of Aggreko's smaller plant. However, because the power plant is owned by Aggreko, it could be treated in a similar way to the other diesel generator networks in terms of tariff pricing, with the price risk being transferred to the consumer.

EDZ's success is that it managed to identify a model which is both more profitable overall than the pre-existing combination of EDL and private generators, but which also generates greater customer satisfaction and welfare (see Annex C for the economics of how this is possible).

Figure 6: Cost of generating electricity and supply in 2019 (%)



Note: Costs of EDL thermal power plants range between 10.6 cents and 18.4 cents/kWh. EDZ's generation costs (dotted part) range between EDL's generation cost and that of Aggreko's, based on EDL's own estimates.
Source: The authors

4.4. The impact of EDZ's shift to power generation

The addition of power generation to EDZ's operations since 2014 has had a notable, and mostly positive, impact on its customers. Based on interviews conducted in Zahle and some of the nearby towns that are also connected to EDZ's grid, EDZ's customers seem to appreciate its mode of service provision vis-à-vis their previous experience with EDL and the diesel generator networks.

Table 5 summarises the key differences in performance between EDL, diesel generator networks and EDZ. From the consumers' perspective, issues related to service provision (reliability, quality and customer service) and the cost of service (tariff and tariff structure) matter the most. From EDZ's perspective, aspects such as technical losses and collection rate are important indicators that can (and have) been used to compare EDZ's corporate performance with that of EDL.

Table 5: Comparison of performance across different electricity providers in Zahle

	EDL	Diesel generator networks	EDZ
Tariff structure	Volumetric + fixed tariff component	Flat or volumetric	Volumetric + fixed tariff component
Tariff	9 cents / kWh (average)	If flat, calculated depending on amperes. If volumetric, variable but substantially higher than EDL although now regulated by Ministry of Finance	Variable but substantially higher than EDL
Service provision	Regular blackouts	Often interrupted after midnight	24/7
Service quality (electricity)	Stable voltage	Voltage swings often lead electrical appliances to malfunction	Stable voltage since its own generators supply power directly to EDL's MV lines
Service quality (customer service and repairs)	Low	Variable	High
Technical losses	16.5%[75]	15%[76]	5%[77]
Collection rate	~70%	No accurate data available but presumably high	~100%
Renewables (net-metering)	Limited support (~2.5% of the total installed capacity)	Not practiced	Supported under certain conditions (~10% of the total installed capacity)

Source: The authors.

To better understand the impact of EDZ's shift to power generation, this section makes two types of comparison. First, we compare the experiences of communities within EDZ's area of operation with those of similar communities (i.e. rural, similar socio-economic context, close geographical location and in the same administrative area) outside of EDZ's catchment. Second, we invited interviewees from areas covered by EDZ to compare the situation now with the period before EDZ started power generation when they depended on diesel generators to cover their energy needs.

In terms of service provision, there is abundant evidence from the interviews of EDZ's positive impact on its customers. However, EDZ's service improvement is seen and felt differently across the wide spectrum of customers it serves.

[75] According to (GoL, 2019)

[76] According to (Ahmad, 2020)

[77] According to EDZ website: http://edz.com.lb/landing.aspx?pageid=12

4.4.1. Living to electricity's rhythm

To understand the impact of the addition of power generation to EDZ's operations, it is necessary to understand the impact of unreliable and poor quality electricity on the lives of ordinary citizens and their dependence on a hybrid system.

In describing their daily routines, residents of villages outside of EDZ's operational areas spoke of the way in which the availability of electricity affects their daily rhythm. The electricity needs of most interviewees were relatively limited and all (with one exception) had a subscription to a local generator. But the electricity source at any moment in time affects what they can and cannot do.

This is particularly true for women, who are largely responsible for domestic chores – including operating washing machines, ironing, vacuum cleaning and food processing – and therefore depend on their electricity supply. While some waited for their supply from EDL to implement certain tasks and reduce their electricity bill (e.g. for operating a washing machine or turning on the air conditioning (AC)), others spoke of their inability to use the poor quality supply to iron or use a hairdryer, and waited for the generator to do these tasks despite the higher cost.

Some of these adaptations were due to the type of generator subscription interviewees had. In areas where the generator operator charges a flat rate, customers are limited by the amperage that they subscribe to, which dictates what appliances they can use. For example, a household subscription is often limited to 10 amperes, which can operate a fridge and AC, in addition to lights and smaller appliances. Residents then need to turn off the AC in order to turn on the hot water or vacuum cleaner, and, in some cases, they may have appliances that can only be operated when they have EDL supply.

Where the generator subscription is dependent on the volume of electricity used, the interviewees' concerns related mostly to cost and quality of supply. In July 2020, for example, when power cuts were frequent, many reported shifting from using fully automatic washing machines to labour-intensive semi-automatic ones to reduce electricity consumption. Many also spoke of other adjustments to daily life, like unplugging the fridge at night to reduce generator costs or concentrating activity in one room of the house to reduce AC costs.

These adjustments take place in parallel with poor quality supply and service, with numerous interviewees citing examples of the former causing damage to household appliances. Moreover, the unpredictability of power outages exacerbates the difficulties of managing daily life. One interviewee, despite working over 12 hours a day, often has to go to her bakery in the middle of the night to ensure that the power has not tripped (during any transition between EDL and the generator) for fear that the freezers will be off all night and the food will spoil. She described how, only a month before the interview, one of the fridges in her bakery broke down due to the instability of the electric current, costing her a large amount at a time when the family was 'barely scraping by'.[78] Another interviewee described

[78] KII 25: female owner of a small business in Ain Kfar Zabad.

how she was in the middle of filming a web-based interview when the power cut off; she had to continue filming with the crew in very hot weather without the AC as the generator could not operate it, but they could not open the windows because of the noise.[79]

Several interviewees spoke of the impact of electricity cuts on the elderly in particular, noting the need for oxygen concentrators, or other electric medical devices, as well the higher risk of falls and accidents when there are electricity cuts and limited lighting. While a subscription is necessary in such cases, some generators are turned off during the night to reduce diesel consumption or noise, or at times when electricity cuts are too frequent.[80] Because generators are not able to operate for long periods of time, some families resort to buying private generators for emergencies.

The need to adapt to the rhythm of electricity – to plan one's schedule around unpredictable power supply – is a source of daily stress for many. Freedom from this stress is probably the most prominent positive impact of EDZ's operation. In describing their power supply from EDZ, interviewees spoke of it as a 'blessing' and 'relief from a major burden'. The strongly held views about EDZ's improved service provision arise from daily practical impacts. As one respondent put it: 'We are not worried anymore that the fridge won't work, that the "Mouneh" (stored food) will be spoiled, that we would get stuck in the elevator…'.[81] For many, losing the level of service EDZ provides, even temporarily, is a reminder of how far things have improved for them. As one interviewee recalls: 'Once, we had an electricity cut for 15 minutes this year, at the time of breaking the fast in Ramadan. For the first time, we broke our fast in candle light but we all felt gratitude for EDZ, because we appreciated the service we have'.[82]

This largely positive effect is felt mostly at the household level and by small businesses. Some larger businesses found the cost of EDZ's electricity too expensive and opted to have their own diesel generators to cover their energy needs. In other cases, EDZ could not supply the amount of electricity that was needed in some areas, as one hospital director explained, and they had to resort to diesel generators again.[83]

Similarly, a few respondents pointed out that improvements in electricity alone is not enough for good service provision. While interviewees, especially women, appreciated streets being lit and the sense of safety and security that came with it, street lighting appears less dependent on the availability of power and more on the ability of the municipality to maintain street lights and pay their bills. Similarly, online schooling, which has been key during the Covid-19 pandemic, has suffered because of poor internet connectivity even if power is available. Another example, which indicates some of the limits of decentralised power solutions, is water supply. In the case of some of the villages visited, the water supply depends on a water station in another region. That station suffers from

[79] KII 21: teacher and social activist from Kfar Zabad.

[80] Including in July 2020 when fieldwork was conducted.

[81] KII 8.

[82] KII 7.

[83] KII 18: head of a local healthcare provider.

inadequate EDL power supply, which delays pumping water through the villages and causes water shortages.

4.4.2. Electricity as dignity

The failures of the electricity sector in Lebanon have also become symbolic of post-war failure of the state – as Abi Ghanim asserts, 'notions of progress and postwar recovery have always been linked to uninterrupted electricity provision' (cited in Abu-Rish et al., 2019). It is no surprise then that Zahle residents see the provision of a high-quality, reliable 24/7 electricity service as much more than just the proper functioning of a technical sector.

In an informal dinner in Forzol, a village adjacent to Zahle but within area covered by EDZ, a local resident expressed the fear that our research could threaten the continuity of EDZ, describing electricity in Zahle as the 'only thing that makes us feel human'.

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 that direct link: 'We are the war generation, we grew up during periods of war and generators'. For him, EDZ's power provision represents more than an 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'.[84] Many respondents attached their positive evaluation of the company not only to its service but to feelings of 'dignity' and 'humanity'.

However, the performance of EDZ is often viewed more favourably because of the poor performance of generators, EDL and state institutions in general. For example, a director of a local hospital, while satisfied with EDZ's good service, management and proper use of technology, explained that 'good service is not enough – EDZ is expensive and not environmentally friendly'. He stressed that EDZ is seen in a more favourable light because of poor state performance, but questioned whether the Lebanese should aspire for diesel generators following the Zahle model or whether, 'if there was a proper state', it would be better to have renewable energy sources.[85]

Most interviews carried this comparative narrative, where, in explaining why EDZ is providing good service, they also elaborated on the long list of problems they had had with EDL, including frequent power cuts, poor quality service and delays and corruption in repairs. These comparisons were also made with other state services, such as water supply and road works, often highlighting corruption and mismanagement. One activist from Bar Elias further explained: 'our experience with the state is really bad... [the state] has not been honest with us ... and this is why you would see us excited about EDZ, because they have been honest with us'.[86]

[84] KII 8.

[85] KII 18: head of a local healthcare provider.

[86] KII 7.

However, the privilege felt by people in the EDZ coverage area contrasts with feelings of discrimination by some residents in adjacent areas, many of whom had relatives and friends in EDZ's area of operation. A young female interviewee from Kfar Zabad said that 'it hurts when I go to my grandparents' house [in an area served by EDZ] and see what electricity they have and what we have; it also hurts as I drive back to the village through Zahle and see shops and houses lit up and get to my village to see it in the dark'.[87] The vast majority of interviewees outside of EDZ's operational area would strongly support being under EDZ's area if they had a chance. Interestingly, residents within EDZ's coverage area echoed the sentiments regarding privilege and discrimination; a resident of Bar Elias, which is covered by EDZ, said: 'I am not really happy with the fact that we have 24/24 electricity and people in nearby Baalbek have no electricity. Is this the country we want to live in? It honestly upsets me.'[88]

4.4.3. Cost: a service worth paying for?

While the interviews revealed that EDZ's service model is generally admired by its customers, a wider range of views were expressed when the issue of EDZ's tariff was discussed. The addition of power generation to EDZ's operations in 2014 brought down the overall monthly electricity/generator bill for the residents of Zahle city, particularly given the extremely high generator tariffs there.[89] However, the price difference was not as stark in some of the surrounding villages, and a decrease in cost is not what residents highlighted in terms of impact.

Comparing the prices of EDZ with those of private generators in neighbouring areas today shows only a minor difference (see Table 6). With relatively new regulations calling for the installation of meters on private generators following the monthly tariff published by the MOEW, the range of prices in villages we visited did not vary significantly. Rather, the main influence on the pricing of generator subscriptions and the perceptions of households about generator owners appears to be the ability of the municipality to regulate their operation. In the village of Ain Kfarzabad, for example, the kWh price is agreed at the beginning of every month between the private generator owner and the municipality, which owns the other generator. Both generators have similar connecting wires and subscribers can easily switch between one and the other if they wish. In neighbouring Kfar Zabad, where the municipality has been dissolved because of internal conflict, the prices are slightly higher. Even before it was dissolved, the municipality had only limited influence on the operation and pricing of generators[90] and consumers seemed much less satisfied.

Some municipalities have been unable to regulate the operation of the generators because of connections between the owner and the political elite of the municipality. However, in general, the negative perception attached to generator owners in Zahle city was not shared

[87] KII 21.

[88] KII 22: female school teacher and social activist from Bar Elias.

[89] KII 7.

[90] KII 16: local leader in the village of Kfar Zabad.

by residents outside the EDZ area of operation, who continue to be served by private generators today. Instead, generator owners are seen as providers of a much-needed service, who often also allow several free subscriptions for poor families or the elderly, and with whom customers negotiate delayed payments when they face financial problems.

Table 6: Private generator vs EDZ generator pricing (September 2020)

Prices and fees (LBP)	EDZ	Ain Kfarzabad		Kfarzabad	
		Municipality owned generator	Private generator	Private generator 1	Private generator 2
Price/Kwh	526	610	620	650	630
Monthly subscription fee	15,000	15,000	15,000	10,000	20,000
Additional expenses	+11% VAT	–	–	–	–
Total bill for monthly 200 kWh usage	133,400	137,000	139,000	140,000	146,000
EDL	**Collected with EDZ bills**	**Delay in collection –latest bills paid are for 2018**			

Note: EDZ's September 2020 tariff for its generators was set at 521 LBP/kWh (excluding value added tax (VAT)). As private generators in Kfarzabad and Ain Kfarzabad do not consider VAT as part of the bill structure, the difference between their price/kWh and the one of EDZ is unknown.

Source: The authors. Calculation by authors based on bills for the month of September collected from interviewees.

For many interviewees though, the service they receive from EDZ is well worth the price. As one interviewee in Bar Elias insisted: 'If I was offered to pay 10,000 for EDL or a pay a million for EDZ, I would prefer EDZ'.[91] But other interviewees seemed less convinced that EDZ's tariff is fair. One interviewee stated 'It is true EDZ electricity is 24/7 but what people do not take into consideration is the high electricity bill'.[92] A member of the group interviewed in Bar Elias added, 'Some poor households did not have a generator subscription before and used to pay LBP 15,000 (US$10) a month [just for EDL electricity]. Now, no matter what, they pay LBP 50,000 (US$33) and this is too much for them.'[93]

With the financial crisis that Lebanon is facing and the rapid increase in poverty levels, high electricity costs – whether for EDZ or private generators – is likely to be even more problematic for residents. This is reflected in the behaviour of consumers. Under the new contract, EDZ is required to install two meters in some locations – one for EDL electricity and another for its own.[94] As a result, some customers have again shifted their consumption pattern to take advantage of EDL's cheaper tariff for their electricity-intensive tasks.[95] The feelings of relief that many women expressed from not having to organise one's day around the availability of electricity supply might need to be sacrificed if a family's financial situation deteriorates.

[91] KII 7.

[92] KII 16.

[93] KII 7.

[94] At the time of our fieldwork, this two meter system was only installed in a small percentage of houses and we could not estimate its impact more widely.

[95] KII 17: head of a local NGO in Zahle.

4.4.4. Incorporation of renewable energy

Compared to EDL, EDZ seems to be more adaptive to the incorporation of renewable energy into its operations. First, as highlighted above, EDZ has a low level of technical grid losses (~5%), which means that most of the renewable electricity that is exported to EDZ's gird via net-metering is transferred to consumers and not wasted away. In contrast to EDZ's low grid losses, EDL's transmission and distribution operations are characterised by high levels of technical and non-technical losses, which, combined, are approaching the 40% mark. Such high levels of grid losses significantly harm the economics of on-grid net-metering schemes and imply a substantial subsidy carried by EDL. EDZ has encouraged the development of solar power and has installed significant net-metering technology. As of June 2020, EDZ had 8 MW of solar photovoltaics (PV) capacity connected to its grid, around 10% of EDZ-Aggreko's total installed capacity.[96] Second, EDZ has also amended some of the net-metering pre-requisites and procedures adopted by the MOEW and has a dedicated technical staff that are responsible for studying the impact of net-metering applications on grid stability and performance. For one of the major industrial customers who has a net-metering arrangement with EDZ, around 50-60% of the energy produced is sent back to the grid through the net-metering scheme.[97] Indeed, EDZ has put some limitations on the size of the installed renewable energy systems as well as on the ability to feed energy back in order to maintain the integrity of their grid.[98] For example, net-metering is not functional on Sundays in industrial areas where factories are closed because the net supply of electricity would be too high given the lack of demand on this day.[99]

However, EDZ's core generation capacity remains based on diesel. Since 2014, EDZ has had opportunities to shift power generation to models that utilise renewable energy, especially solar PV systems, which have witnessed dramatic cost reductions in the local market. While Aggreko offered to incorporate solar systems in their generation, EDZ refused because the relatively long contractual timeframe required by Aggreko was inconsistent with the highly uncertain policy and regulatory context that EDZ faced.[100] Additionally, a shift towards renewables-based power generation would impact EDZ's business with powerful local diesel fuel suppliers, creating an additional layer of resistance.

[96] KII 23: EDZ employee responsible for handling net-metering/renewable energy.

[97] KII 24: factory owner in Zahle with solar power generation installed.

[98] KII 25: solar energy provider cooperating with EDZ who mentioned that this amount is limited to 30% when it comes to industrial subscribers.

[99] KII 24.

[100] KII 9

5. Conclusions

Our core research question was: *How was it possible for EDZ to overcome (or circumvent) the political economy context and establish a functioning mechanism for ensuring 24/7 electricity provision?* Our account provides an explanation of how this was possible. A combination of historical factors – notably the existence of the legal concession – combined with a politically intelligent strategy of building coalitions with the local community enabled the provision of a high-quality service which, simultaneously, used a business model that created rents to allow strategic alliances with powerful central actors.

At the same time, our hypotheses turned out to be mostly incorrect. The EDZ innovation was not the result of an upwelling of popular opposition to the concession system. It was the result of the deft use of the system by EDZ, building on local people's sense of identity to garner political support, while ensuring that opposing factions were either marginalised or suitably compensated. While this reform was unquestionably beneficial to the people of Zahle, it was designed, driven and controlled by local elite actors.

Moreover, our hypothesis about the role of women in the community in driving the reform was also incorrect. While EDZ successfully secured support from women's groups, among many others in the community – and women therefore featured among those defending the reforms during the contract renewal contest in 2018 – this was a political strategy by EDZ, not an endogenous movement by women to claim energy justice.

Our final two research questions were on the impact of the reforms and the scalability of the model.

Regarding impact, we found strong evidence that the impact of EDZ has been positive.

Electricity reliability is highly valued by citizens; the ability to receive a service without having to worry where the power comes from is a major improvement to residents of Zahle. The freedom from having to adapt to electricity's rhythm and plan one's day around it is probably the most prominent positive impact of EDZ's service, particularly at the household level for women primarily responsible for domestic chores. And this sense of relief was tied to feelings of dignity – in some ways, EDZ's model simply magnified people's views about corruption in state institutions and the deep despair felt with regard to poor performance.

Moreover, the overall value of bills fell for most people, at least in Zahle city. In part this was due to the greater professionalism and efficiency of EDZ relative to local generator providers; but it was also because of the replacement of numerous small local monopolies with one larger monopoly (as shown in section 4.3.4). With greater reliability, improved service quality and lower overall costs, there is no question that the reform has had a positive impact for EDZ customers.

There are only two areas where the reform might not be seen as positive. The first is that EDZ's generation depends on the use of a large number of diesel gensets. In itself, it has therefore done very little to reduce Zahle's reliance on fossil fuels. However, even here the story is nuanced. EDZ's use of a modern, well maintained cluster of gensets probably reduced pollution in several neighbourhoods. Moreover, EDZ is a leader in Lebanon in the roll-out of smart metering and, initially at least, proactively encouraged the development of renewable energy. Indeed, EDZ would probably have invested more in renewable energy had it not been for the uncertainty about the continuation of its concession and the short term nature of its existing contract.

The second area where the impact might not be seen as positive is on corruption. While the corruption of Lebanon's wider electricity system is well documented, EDZ's business model has also generated large rents which have never been accounted for in a transparent way. While we found no direct evidence for corruption in EDZ, several well-informed respondents said that they did not see the EDZ reform as an example of a successful anti-corruption initiative. Indeed, the most commonly expressed view was that the reform represented a shift from dysfunctional and inefficient corruption, to professional and efficient corruption. But, for many, this is still seen as a major improvement. As one respondent put it, 'We know that he (Nakad) has enough money for his children and his children's children, but we don't care – we have 24/7 power!"

5.1. Could and should the EDZ model be replicated?

Our final research question asked what are the lessons learned from the EDZ experience and to what extent is the model scalable or replicable? We elaborate on the wider lessons of the EDZ experience for anti-corruption strategies below. On the issue of scalability, our findings are mixed. On the one hand, EDZ is an efficient, well-managed utility. As a private, profit-making utility its incentives are well aligned with good customer service. Bills are issued and collected; technical and commercial losses are low; service problems are addressed rapidly and effectively; the utility communicates well with its customers and is widely admired. This suggests that the government's policy of reabsorbing concessions that are ending within EDL is not likely to improve service for customers. Indeed, if good service is the objective, then a case could be made for the more systematic issuing of reasonably long-lived concessions for major cities and geographical regions.

However, there are some elements of EDZ's model that cannot and should not be replicated. An important element of EDZ's profitability is the fact that it receives electricity from EDL for LBP 88/kWh and sells it at an average of LBP 125/kWh.[101] In other words, the state provides a fiscal transfer to EDZ purely for distributing electricity to customers. This is both inefficient (because it bears no connection to the cost of distribution) and unfair (because it imposes a cost on EDL – and ultimately taxpayers across Lebanon - for the benefit of electricity customers in Zahle). Replicating this aspect of the EDZ model would simply render EDL even less profitable than it already is.

[101] Based on the 2018 contract between EDL and EDZ.

The EDZ business model does, however, 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; under the EDZ model they have the option of paying 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 huge benefit to consumers because, although prices are higher, they are able to consume as much as they wish and, critically, they no longer have the uncertainty of knowing whether they will be able to obtain supply or not. These improvements in reliability and quality are the key benefit of the change.

This suggests that, if it is possible to tackle the unfair fiscal transfer associated with the underpricing of electricity to the concession, it would be possible to improve customer service by allowing private concessions to manage supply, while minimising the overall cost to EDL and the state. To achieve this, it would be necessary to raise the price that concessions pay to EDL for their power to something approaching the price at which EDL sells power to customers.[102] This would remove the large 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. One of the advantages of this approach is that it does not need any change in the tariff charged to customers (which has been one of the obstacles to reform of EDL for decades); only the tariff charged to the concessions would change. Moreover, because they would be permitted a degree of monopoly pricing within their concessions (subject to limits), they have no incentive to increase their prices when the rent that they receive from underpricing EDL's electricity is removed. This is because the monopoly price is still profit-maximising for the concession at the margin – a higher price would not yield them more revenue. In short – the EDZ model should not be replicated – but there is a way of creating a viable decentralised power generation model that is integrated with EDL's supply.

Unfortunately, there appears to be little likelihood of a move in this direction. EDZ's contract is due to expire at the end of 2020. Elements of the national political elite still appear to be intent upon subsuming EDZ within the national electricity system (and thereby capturing the rents it generates), by proposing to put out a tender for EDZ's distribution contract. At the same time, EDZ is lobbying hard for a continuation of its current contract and mobilising support from the people of Zahle, most of whom do not believe that the state institutions have the capability or intention to provide the same level of service provision as that of EDZ. At the time of writing, the most likely outcome appears to be a further extension of EDZ's existing contract. But in the absence of a new national political settlement that allows individual cities and regions the autonomy over service provision enjoyed by Zahle's concession, it is hard to see how the model might be replicated elsewhere, especially with the looming prospects of fuel subsidies removal. Rather, the challenge today is to prevent Zahle's imperfect, but workable model of service provision from becoming another victim of Lebanon's sectarian politics.

[102] 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.

5.2. Wider lessons for anti-corruption strategies

While our primary aim has been to understand the governance innovation that has enabled a high-quality, reliable 24/7 electricity service in Zahle, our study also contributes to the wider literature on anti-corruption strategies in challenging contexts. As noted above, Khan et al. (2019: 15) suggest that anti-corruption strategies need to 'improve developmental outcomes given the configurations of organisational power in that sector and society'. Specifically, they put forward four characteristics of successful anti-corruption efforts in other countries:

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 (Khan et al., 2020; Roy et al., 2020).

2 *Designing for differences*. Since there is heterogeneity among firms, it is necessary to build a coalition of firms that wish to comply with the rules and make it possible and desirable for them to do so, in order for measures to work against those that deliberately break the rules.

3 *Building coalitions*. Examples from Bangladesh and Tanzania (see Khan et al., 2019) 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, e.g. to land – 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.

Although not intended as an anti-corruption innovation, it is interesting to reflect the extent to which the EDZ reforms – as well the amended approach proposed above – conform with these characteristics.

One of the reasons for EDZ's comparative success is that – unlike the bulk of the electricity sector in Lebanon – its incentives are well aligned for service delivery. The revised concession approach proposed above also aligns the incentives of concessionaires with the interests of consumers. At the same time, were there to be multiple concession holders, they would have a strong incentive to ensure that they are treated fairly with respect to one another, thus providing a mechanism to reduce overall rent capture by concessions.

Similarly, each area of Lebanon has important differences in terms of the viability of running an electricity concession. Any reform that attempts to improve service delivery and reduce corruption needs to take these differences into account. Specifically, the costs of electricity provision in large urban areas are significantly lower than in more remote and sparsely populated regions. This would need to be reflected in the terms of any concessions provided[103] to ensure that all concessions have an incentive for effective service delivery.

[103] Along with a mechanism for continually discovering true costs.

As described above, EDZ’s success derives in large part from the coalitions it has built with the community, which, in turn, have been instrumental in bolstering political bargaining power with national-level elites. This points to a wide range of actors who lose out from the current dysfunctional electricity system, including businesses, hospitals, community centres, schools, sports clubs and many more. While most of these actors are not individually politically powerful, collectively they represent important constituencies both to promote change and, critically, to defend reforms from self-interested parties (e.g. generator owners) who seek to stop such changes.

Finally, our case study illustrates the importance of EDZ’s formal right to generate power through its concession. This provides a legal basis for any reforms and makes it difficult for them to be arbitrarily dismissed. The critical importance of this legal status was illustrated by the major campaign to extend the concession in 2018, which led to an act of Parliament specific to Zahle to enable a new contract for EDZ.

We therefore find that Khan et al.'s (2019) approaches to anti-corruption also describe well the political strategies adopted by EDZ to achieve its service delivery reforms. However, the authors also point to the fragility of such reforms. While incentives can be aligned for delivery, most often they are not, as the performance of EDL attests. Although concessions could be designed to account for the differences between regions, current policy is to apply a one-size-fits-all approach that leaves large parts of the country underserved. Moreover, while coalitions can be built to support reform, it is not in the interests of some powerful political players at the national level to support such efforts. And, finally, although a law was specifically passed to provide EDZ with the rights to continue provision, this short-term extension to the end of 2020 reflects the desire of the state to withdraw such rights, thus making the possibility of further progress precarious.

We conclude on a positive note, however. Zahle has 24/7 electricity. 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. And it points to the possibility of extending similar – second-best, but politically feasible – approaches throughout Lebanon and, potentially, in many other countries too.

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Annex A. Mapping of corruption-linked practices in Lebanon's electricity sector

Most of the available evidence on corruption and corruption-linked issues in Lebanon's electricity sector is scattered in secondary sources, which reveals the need for a rigorous and well-researched mapping and analysis of the topic. In the Lebanese context, it is hard to find conclusive 'evidence' of corruption, because the governance structure in the electricity sector (and the country at large) is designed to institutionalise corrupt practices.

Table A 1 lists some of the issues linked to corruption in the electricity sector in Lebanon that are discussed in the literature. These link either directly to reported corrupt practices or indirectly through the facilitation of corruption and bad governance. Most of the issues highlighted have been articulated in the demands of civil society movements in the wake of the October 2019 uprising (Energy Policy and Security Program, 2019). However, the poor state of electricity provision in Lebanon had become a space for political mobilisation well before 2019 (Verdeil, 2016).

More recently, a major corruption case has been investigated that relates to the importation of substandard fuel and its effect on EDL's operations and quality of service. The Sonatrach's fuel scandal, as it is known, goes back to the early 2000s. It centres around importing fuel from a subsidiary company of the Algerian state energy firm Sonatrach, which does not meet the technical specifications required and has thus halted a portion of Lebanon's power generation capacity. Early investigation revealed that many public sector employees received regular bribes and 'gifts' from the companies involved (*Al Akhbar*, 2020c).

Benefiting from EDL's dire service and frequent outages, the owner of diesel generator networks and the diesel fuel importers behind them have made huge profits. This is especially true if they are not following the recent regulations with regards to installing meters and following the monthly tariff published by the MOEW. Ahmad (2020) has shown that the profit margins of diesel generator owners varies with scale and load factor, but it can be as high as 25%. However, the fuel importers are the main profiteers with more than US $1.7 billion of fuel sales made in 2018 by 12 companies (ibid.).

Another prominent case linked to corruption in Lebanon's electricity sector is the issue of rented Turkish power barges. These ships, with a capacity of 388 MW (in 2018), were brought in in 2012 as a temporary solution, but have remained since no new investments in EDL's generation capacity have been made. The cost of renting these power ships has had a huge impact on EDL's budget, with annual costs reaching US $800 million per year (*Al Akhbar*, 2017b). The huge sums of money paid to these power ships is enough to build two or three permanent power generation units with a lifetime of 25 years.

Alleged corrupt practices in EDL's procurement and maintenance contracts have also been highlighted in the media but have never been properly investigated by the judiciary. In 2003, it was reported that one EDL contractor paid millions of dollars in kickbacks to influential Lebanese politicians to keep contracts. The same contractor was a 'go-between' in a US $750 million contract to purchase equipment for EDL (Abdelnour, 2003). Similarly, various issues have been reported with contracts given to distribution companies without legal and proper administrative processes being followed. Again, these instances have not been followed up by the judiciary (*Al Akhbar*, 2018).

Electricity theft is also an issue for EDL. Although some uncollected bills stem from people's inability to pay for their electricity and they then connect to the gird illegally, some politicians, their businesses and cronies, and some public administrations also refuse to pay for electricity. In 2015 it was reported that the unpaid electricity of 13 politicians totalled around US $800,000 (*Alquds*, 2015). In an interview with one of the bill collectors in 2008, he said 'there are houses that we are not even allowed to enter to read the meter, these are houses of politicians' (*Al Akhbar*, 2008).

Details of such corruption in Lebanon's electricity sector have been reported for more than two decades. In 2001, the United Nations Center for International Crime Prevention commissioned a corruption assessment report on Lebanon, which stated that 40% of households in the country did not have meters and, consequently, are not billed for electricity (Abdelnour, 2001). While Law 462 was adopted in 2002 that provided the legal framework to establish an independent electricity regulatory authority (ERA), the body is yet to be established. And, despite the pressing need to fix the sector, there is still much debate on whether the ERA should be independent or not (*Al Akhbar*, 2020a).[104]

Table A 1: Mapping corruption-linked issues in Lebanon's electricity sector

	Issue	Source(s)
Fuel procurement, power generation and non-technical losses	Sonatrach's fuel quality scandal	(Allouche, 2020) (*Al Akhbar*, 2020b)
	Profiteering by the fuel and diesel generator cartel	(Dziadosz, 2018) (Ahmad, 2020)
	Power barge contracts	(*The Economist*, 2018) (*Al Akhbar*, 2019) (*Al Akhbar*, 2017b)
	Inflated maintenance contracts	(Abdelnour, 2003) (*Al Akhbar*, 2018)
	Politicians' and their cronies' refusal to pay for electricity	(*Al Akhbar*, 2008) (Abdelnour, 2001)
Governance and management	Delays in establishing the Electricity Regulatory Authority (ERA)	(Ahmad, 2019) (*Asharq Al Awsat*, 2018)
	Delays in appointing EDL's board of directors	(*Asharq Al Awsat*, 2018)
	Using EDL as a platform to exchange political favours (such as hiring)	(Abdelnour, 2003) (CSKC, 2014)
	Distribution of free electricity to political elites and their constituents	(Abdelnour, 2003) (Abdelnour, 2001)

[104] The level of regulatory autonomy has been debated with regards to its consistency with the Minister's constitutional rights, according to which he/she 'shall be entrusted with applying the laws and regulations pertaining to his department' (Source: Lebanon's constitution)

Annex B. Comparison of EDZ's concession agreement and the 2018 contract

Table B 1: EDZ concession agreement vs 2018 contract

	Concession agreement	2018 Contract
Date of signature	1923	2018
Validity	70 years (extendable) (we know from KIIs that EDZ was able to extend it for 15 years, due to delays related to the civil war)	2 years (non-renewable)
Signatories	General Weygand (Higher French Commissioner in Lebanon and Syria) and Bishops Yaacoub Riachi & Youssef Breidy	EDL (represented by its Director General Kamal Hayek) and EDZ Société anonyme libanaise (SAL) (represented by its Director General Asaad Nakad)
Supporting laws	Ottoman Empire Decision dated in 1910 to generate electricity and to have a tramway in Zahle and the surroundings	Law 107/2018 ratified by the Lebanese Parliament on 30/11/2018 allowing EDL to sign a new contract with EDZ
Generation allowed	Only from the Berdawni River of 75m length and of a capacity ranging between 160 kW and 530 kW	Yes, when EDL power is not available in order to provide 24/24 service
Contract type	*EMTIYAZ* or concession to be given back to the government when the period ends	Exclusive contract, performance-based, indicator-based to be calculated at the end of each year
Oversight	The Lebanese Government which is required to replace the concession when it expires	EDL is allowed to oversee the contract execution, access all EDZ data, subscribers, billing systems and equipment etc.
Electricity production	Hydropower: with the right to build a damn of 76m height to hold the water, and have a water flow of 1.5 m3/s; as well as a hydropower generation plant in Wadi Al Arayech village with a capacity of 160kW (+ potential 160kW of backup generation)	Hydropower + EDZ generators
Transformers	8,500V/50Hz	15,000V/50Hz
Billing system	Unified billing	Dual billing: EDL & EDZ
Tariff (LBP/kWh)	50 LBP for each kWh purchased from EDL From EDZ to consumers: The contract sets a ceiling tariff as follows: • for lighting: 15 piasters/kWh • for other usages: 8 piasters/kWh • If fixed tariff: 30 piasters for each 25W lamp	88.1 (based on a cost analysis of fiscal year 2017)
Minimum yearly kWh supplied by EDL	–	240,000,000

Source: EDZ concession agreement and EDZ 2018 agreement

Annex C. The welfare economics of EDZ's concession

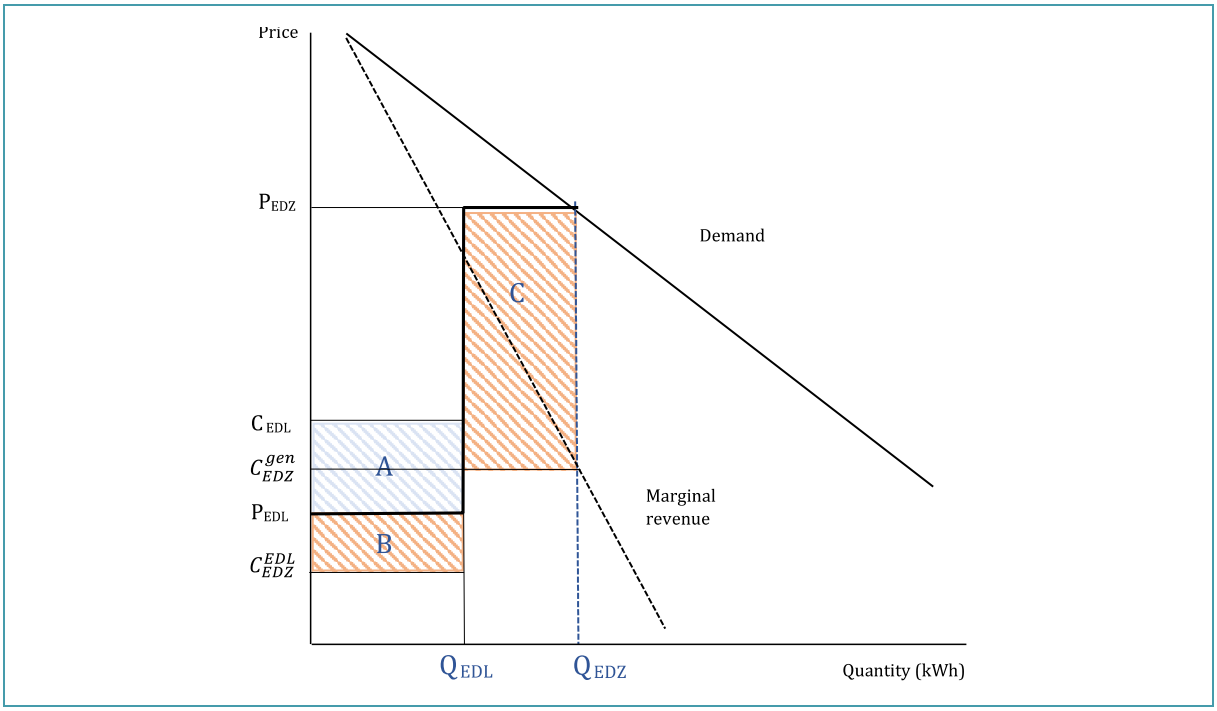
The economics of EDZ's concession is illustrated in Figure C1 below.

Consider first the cost of EDL electricity, C_{EDL}, which is significantly above the price at which it is sold, P_{EDL}. The difference between these, multiplied by the quantity of EDL electricity produced, equals EDL's losses, indicated by the blue shaded area A.

Next, consider the gap between the price at which EDL electricity is sold and the price which EDZ pays for it, which is much lower. This gap – represented by the orange shaded area B – is a further loss to EDL, which is transferred as a rent from EDL to EDZ.

Finally, when EDL electricity cuts off, EDZ is able to sell the electricity that it generates at a much higher implicit tariff rate, P_{EDZ}. The gap between this and the cost of electricity from EDZ's generators (which we have here assumed to be slightly lower than the cost of EDL electricity because the Aggreko generators are well maintained) is the additional profit made by EDZ when EDL is not supplying power. This is the orange area C. Note that the price P_{EDZ} is chosen by EDZ because it is a monopolist. It therefore chooses a level of production that equates its marginal revenue with its marginal cost, which determines the (high) price. Consequently, consumers are better off under the EDZ concession because, despite the much higher price, they are able to obtain the electricity that they want rather than being constrained by limited availability from EDL.

Figure C 1: The economics of EDZ's concession



Source: The authors.

Annex D. Assumptions used to estimate EDZ revenues in 2017 and 2019

		2017	2019	Assumptions/sources
Demand capacity	Mega-Volt Amperes	58.25	63	4% increase per year
Demand capacity	MW	49.5125	53.55	Power factor = 0.85
Total generation	GWh	433.7	469.1	
EDL share (%)		0.62	0.62	Using bills obtained from Zahle residents
EDZ share (%)		0.38	0.38	
Number of customers		65000	70000	4% increase per year
EDL purchase price	LBP	50	88	Old concession contract and new operation contract
Av. EDZ-EDL tariff	LBP	125	125	
Fixed charge	LBP/month	0	15000	
Volumetric revenue	LBP (billions)	88	122	
Volumetric revenue	US $ (millions)	58.4	81.5	Exchange rate US $1 = 1,500 LBP (As of October 2019)
Fixed revenue	LBP (billions)	0	12.6	
Fixed revenue	US $ (millions)	0	8.4	
Total revenue	US $ (millions)	58.4	89.9	
Revenues from EDL supply		13.4	7.2	
Fixed charge revenues		0	8.4	
Total		13.4	15.6	Doesn't take into account other costs such as labour, management, etc.

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SOAS University of London, Thornhaugh Street, Russell Square, London WC1H OXG
T +44 (0)20 7898 4447 • **E** ace@soas.ac.uk • **W** www.ace.soas.ac.uk

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