Institute for Global Prosperity

Unbundling Lebanon's Electricity Sector

Research Report

Prepared by Marc Ayoub, Pamela Rizkallah, Christina Abi Haidar

September 2021

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Suggested citation:
Ayoub, M., Rizkallah, P. and Haidar, C.A. 2021. *Unbundling Lebanon's Electricity Sector Research Report*. Beirut: Issam Fares Institute for Public Policy and International Affairs (IFI).

Layout and design: David Heymann

Formatted by Amanda Kartikasari

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CONTENTS PG.

CONTENTS

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Executive Summary

Lebanon's electricity sector is facing severe threats, and is at risk of complete collapse. Since the start of the financial crisis, and the country's default over its debt, the sector was among the first services to reflect the collapse of the economy. At the center of this collapse lies Lebanon's public utility, Électricité du Liban (EDL). The latter has not only been suffering from political, financial, and administrative burdens over decades, which made it a loss- making public utility and the second most costly public utility in the MENA region, with operational costs way above the regional median (IFI, 2017), but its headquarters in the Beirut area was also completely destroyed following the Blast on August 4, and is currently operating in unusual circumstances.

With a regulatory framework put in place over the last 19 years, Law No. 462/2002 was supposed to organize the electricity sector, establish the National Electricity Regulatory Authority (NERA), and unbundle the electricity activities, and which, to date, has never been implemented, due to the continuous political disagreement around its role and powers, and the official standpoint on the need to amend the law (specifically article 7) before its implementation. Without NERA, it is the minister of energy and water who effectively exercises authority over the sector, acting simultaneously as the key policymaker, implementation supervisor, and regulator, primarily in issuing licenses and sector planning (Ahmad et al., 2021). Rebuilding the electricity sector, EDL specifically, cannot remain untackled, and would need a transformative energy vision where the role of the utility has a significant impact on the way the power system will be operating in the future.

Based on extensive interviews with stakeholders in the sector—both at the central level and within EDL, including energy experts in the field—we try to understand EDL's current organizational structure and operations, the challenges it is facing at several levels, and the impact EDL's service can have on the overall operating model.

At the same time our study explores how it is possible to implement Law No. 462/2002 in its current form without any amendments, and presents a realistic timeline for its implementation, being the umbrella law governing the country's electricity sector, which has to be implemented in sequence. This is done through an in-depth legal assessment of the law's sections, along with other laws and decrees that govern both the electricity sector and EDL. We tackle NERA's appointment process, the needed transition period for NERA to finalize its internal bylaws and organizational structure as well as its relationship with the other institutions, including EDL. This implementation timeline, which would take almost a year, should go in parallel with the launching of the unbundling process and the formation of at least three publicly owned companies that will manage the generation, transmission, and distribution. This is followed by the involvement of the private sector in both the generation and distribution within a period of two years, and in up to 40 percent of the shares of the newly formed companies.

Finally, we draw on the lessons learned from other electricity utilities in the MENA and around the world, and deduce what could fit for the Lebanese context. We find through our research that the main takeaways revolve around the importance of a regulator, policy incrementalism, the impact of a successful unbundling of an electricity sector, the flexibility and adaptability of an electricity sector, and the importance of a comprehensive regulatory framework targeting renewable energy.

Serious talks on reforming the electricity sector, and more specifically the national electric utility Électricité du Liban (EDL), have been at the forefront of political discussions over the past years. Even though a series of plans was put in place by the concerned ministries, with the support of international organizations, and with the aim of placing the sector on the path of productivity and sustainability, political interference has always been the main obstacle impeding any solution or root change from taking place. The widening gap between supply and demand resulted in the spread of informal and decentralized power systems that are based on diesel generators, often stemmed from under-investments in generation capacity and high losses in transmission and distribution (Ahmad, 2020).

The August 4 Beirut Blast has had a significant impact on urban services—including energy, municipal services, and the environment— across the Greater Beirut area, and has garnered local and international efforts to support the rebuilding of the devastated area. While there have been loud calls by the international community's joint Rapid Damage and Needs Assessment (RDNA) to think of "build

back better" (World Bank Group, 2020a), the recent Marmot et al. report (2020) reminded us that we also need to "build back fairer." When it comes to energy, it is also thinking about building back greener.

Post-blast assessment reports aimed to address people's most pressing needs through a combination of people-centered recovery and reform, in addition provides a roadmap to help the country emerge from its multiple crises and lay the foundation for stable, inclusive growth. When it comes to the electricity sector, and as part of the much-needed institutional strengthening, the reports have stressed, among other issues, the need for an action plan to restore EDL's essential functions, in line with the vision of the utility's future role as a transmission operator in Lebanon's electricity sector.

This study represents a collaborative project between University College London's (UCL) RELIEF Centre and the Issam Fares Institute for Public Policy and International Affairs (IFI), focusing around the future of Lebanon's public utility EDL. The study seeks to inform the restructuring of Lebanon's electricity sector and public utility under the implementation of Law No. 462/2002, which revolves around the unbundling of Lebanon's electricity sector and its governance thereafter. The purpose of the study is to enable better energy governance and greater efficiency as well as encourage the adoption of more sustainable and environmentally friendly power generation technologies.

The study employed a qualitative mixed-methods approach, consisting of three components. The first component involved interviewing experts and key stakeholders in the energy sector to gather information about their insights and perspectives on Lebanon's electricity sector and Law No. 462/2002. The second component comprised a comprehensive legal assessment of Law No. 462/2002. The third component entailed a comparative analysis of various utilities in the MENA region and around the world in order to derive applicable lessons for Lebanon.

Partners:

AUB American University of Beirut 1866 الجامعة الأميركية في بيروت
Issam Fares Institute for Public Policy and International Affairs
معهد عصام فارس للسياسات العامة والشؤون الدولية

The British Academy

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2 I'm another footnote

Overview of the Lebanese Electricity Sector

For decades, Lebanon's electricity sector has been suffering from severe challenges, with increasingly frequent and lengthy blackouts across the country. Additionally, a serious risk of collapse has been recently threatening the entire system as a consequence of the economic meltdown. The confluence of banking, financial, social, and health crises have resulted in the erosion of public trust and a rapid deterioration of basic public services. The shortage of foreign currency at the Central Bank of Lebanon (Banque Du Liban [BDL]) implies that the national electric utility, EDL, is unable to perform its day-to-day operations, pay its dues, or even obtain equipment and spare parts for maintenance.[1] This shortage of foreign currency has also threatened fuel supply, compounding the operational challenges of both EDL power plants and private diesel generators, thus pushing citizens to seek alternative solutions (Ayat et al., 2021).

EDL had already been in a fragile financial situation and unable to meet the growing electricity demand, which has been exacerbated by the severe economic crisis the country is experiencing as well as the Beirut Blast on August 4. Preliminary assessments for the electricity sector find damage mainly to the distribution network and administrative assets of EDL as well as transmission assets (mainly the Achrafieh substation and National Control Center [NCC]) (World Bank, 2020c).

A political decision fixed the electricity tariffs in 1994, while the cost of electricity production from EDL's aging power plants was much higher, making it a highly subsidized sector with an unprofitable revenue model. This has resulted in huge EDL budget losses and constituted a burden on public finance for more than 20 years, consequently requiring regular transfers from the treasury and widening fiscal deficits. The latest figures showed that treasury transfer to EDL constituted 7.3 percent of the overall fiscal spending in the first eight months of 2020, which is the third largest expenditures item after public sector personnel costs and debt servicing. Treasury transfers to EDL were equivalent to 3.2 percent of GDP in 2018 and 2.8 percent of GDP in 2019.2 Aggregate transfers from the treasury to cover EDL's losses totaled around $23.1 billion between 2001 and the end of August 2020 (Byblos Bank, 2021) and around $43 billion between 1993 and 2020—or around 46 percent of Lebanon's public debt (Bank Audi, 2021).

Amid this gloomy outlook, EDL was always in charge of generating, transmitting, and distributing power, under the tutelage of the Ministry of Energy and Water (MoEW). Additionally, the Ministry of Finance (MoF) exercises control over EDL, particularly through the assessment of investment viability of all projects that may have financial surplus or financial deficit implications, and over the need for state financial contributions. De jure, EDL falls under the administrative supervision of MoEW and the financial supervision of MoF. However, de facto, the extent of interference exercised by MoEW and MoF remains unclear, resulting in ambiguity over EDL's autonomy, which is stipulated by law.3 In parallel, auditing institutions exercise control on prudent accounting and financial operation (EBRD, 2019). Ratified prior to the Paris II Conference, Law No. 462/2002 outlines the governance of the electricity sector following its unbundling; however, the law has not been implemented yet. Specifically, the law calls for the establishment of an independent Electricity Regulatory Authority (ERA), which unbundles Lebanon's power sector, and creates a more competitive market for electricity with independent power producers (IPP).

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The Rise of the Diesel Generator Market

The gap between electricity supply and demand is covered by expensive, polluting, and noisy diesel generators that are dispersed almost everywhere in the country. Over the years, these created a complex informal economy that has been resistant to regulations and government oversight, but have also been a conventional off-grid power solution, because of their relatively low upfront capital costs (Ahmad, 2020).

Assuming those generators cover the entire power deficit, Table 1 below summarizes the key figures of the diesel generator market.

Amid the unprecedented financial crisis the country is witnessing, and with the sharp fuel shortage, the Lebanese are continuously threatened with facing complete darkness, not only due to EDL's incapacity to generate its normal levels of production, but also because the private generator owners announced rationing of electricity supply to at least five hours per day, due to fuel shortages (Naharnet, 2021).

This reflects to what extent this industry is being stretched under the current crisis, where owners complain that state supply of electricity is dwindling sharply, pressuring their generators to function for longer hours, paralleled with a lack of continued diesel supply, which, if and when available, is sold at unofficial prices.

Table 1. Diesel Generators' market figures (Ahmad, 2020)

Parameter	Unit	Value
Approximate number of diesel generators across the country[a]	-	Between 32,000 and 37,000
Total Installed Capacity	MVA	1,738
Total Installed Capacity	MW	1,321
Total size of the commercial generators market	USD	1.1 billion
Market size of diesel generators' supporting sectors[b]	USD	1.964 billion
Estimated number of customers/ subscribers	-	1.08 million

Électricité du Liban

History

Électricité du Liban (EDL) was established by Decree No. 16878 on July 10, 1964, as a public institution serving as Lebanon's electric utility with administrative and financial autonomy. Despite its autonomy, a number of governmental entities retain oversight over the utility. In fact, EDL falls under the tutelage of the General Directorate of Investment within the Ministry of Energy and Water (MoEW), which is responsible for the overall strategic planning and policy development of the electricity, water, and oil sectors. Additionally, the Ministry of Finance (MoF) has financial oversight over EDL. Other governmental entities exercising control over EDL include the Court of Audit, the Civil Service Board, and the Central Inspection Board (EBRD, 2019).

In terms of functions, Decree No. 16878/1964 exclusively charges EDL with the task and responsibility of generating, transmitting, and distributing electricity all over Lebanon, which are discussed at length below (EBRD, 2019).

Relevant Governing Laws

The legal framework relating to the Lebanese electricity sector is defined by a series of laws and decrees that are summarized in Table 2 below:

Table 2. Governing Laws of Lebanon's Electricity Sector

Document Number	Document Type	Date of Issuance	Subject
16878	Decree	1964	The establishment of the Electricity Authority of Lebanon (Électricité du Liban, EDL).
20	Law	1966	The establishment of the Ministry of Water and Electricity Resources.
5469	Decree	1966	The organization of the Ministry of Water and Electricity Resources, and the designation of its staff.
4517	Decree	1972	The general structure of public institutions.
7580	Decree	1974	The Investment Law of Electricity for Lebanon.
247	Law	2000	Amendment of Law No. 20 from 1966, replacing the Ministry of Water and Electricity Resources with Ministry of Energy and Water.
462	Law	2002	Regulation of the Electricity Sector.
75	Law	2006	Amendment of article 7 of Law No. 462 of 2002 allowing, on a temporary basis and for a maximum period of one year, the CoM to issue permits and licenses for electricity generation upon the proposal of the Minister of Energy and Water until the ERA members are appointed.
288	Law	2014	Amendment of article 7 of Law No. 462 of 2002 allowing, for a period of two years, the CoM to issue permits and licenses for electricity generation upon the proposal of both the Ministers of Energy and Water with the Ministry of Finance, until the ERA members are appointed.
54	Law	2015	Extension of Law No. 288 of 2014 for two additional years (from April 2016 until April 2018).
107	Law	2018	Allowing EDL to enter into an agreement with EDZ as an electricity operator for a period of two years (2018-20).
129	Law	2019	Extension of Law No. 288 of 2014 for three additional years (from April 2019 to April 2022).

Decree No. 16878 from 1964

Decree No. 16878 from 1964 governs the establishment of the Electricity Authority of Lebanon (EDL) as a national public institution of an industrial and commercial nature for generation, transmission, and distribution of electricity in all Lebanese territories. Electrical constructions invested by other public and private bodies have been gradually transferred to it.

After the issuance of this decree, it has not been permitted to grant any person or concession license or authorization to generate, transmit or distribute electricity, or to renew or extend such power for any reason. "However, several concessions remain in place .... When these concessions expire, all their assets will be handed over to EDL" (EBRD, 2019). In fact, several concessions have expired and the assets were returned to EDL with an exception of Électricité de Zahlé (EDZ) where a special law (Law No. 107 from 2018 expired in December 2020 and extended through Law No. 198/2020 for two additional years until December 2022) was issued after the expiry of the concession. This law permits EDL to contract EDZ to offer services for the public sector through generation and distribution of electricity for a limited period within the geographic district, as per the expired concession.

However, this has not applied to persons who generate electricity to meet their personal needs only or to transfer this electricity without distribution to other people.

According to Decree No. 16878 from 1964:

- The EDL shall be managed in such a way as to enable it to meet all investment requirements and, on the other hand, to contribute reasonably to the financing of the investments necessary for the development of its activities and to develop its tariffs accordingly;
- The EDL can use credit facilities in commercial companies and hold intermediate or long-term bank loans that can be guaranteed by the State;
- The General Director has authority over all employees and ensures the proper functioning of the corporation, whereas regional heads of departments are placed under her/his authority and are personally responsible for the administration of the various regions;
- The EDL's accounting is maintained, in accordance with the principles of industrial and commercial accounting, and its activities are subject to a post audit f rom the Audit Bureau;
- The EDL's deposits are kept in an account opened for this purpose with the Central Bank; And
- Advances paid by the State to the EDL are paid gradually according to the EDL's needs and constructed to justify these needs.

Law No. 20 from 1966

Law No. 20 from 1966 governs the establishment of the Ministry of Water and Electricity Resources, whereas Decree No. 5469 f rom 1966 governs the organization of the Ministry of Water and Electricity Resources and the designation of its staff. However, these were amended by Law No. 247 from 2000, which governs the consolidation, cancellation, and establishment of ministries and council.

Decree No. 4517 from 1972

Decree No. 4517 from 1972 governs the general structure of public institutions, specifically the establishment, incorporation, and cancellation of public institutions, which have public facilities, and enjoy personality and financial and administrative independence.

In particular, the establishing act of a public institution defines the type, purpose, mission, status, scope of work, and the necessary technical, administrative, and financial means. Moreover, the establishing act links the public institution according to the nature of its work in one of the ministries that exercises administrative trusteeship over it.

To that end, the ministry exercising the authority of administrative trusteeship appoints a government commissioner in the management of the public institution, which is administered by a board of directors and executively managed by a general director. The board of directors consist of seven members, including the chairman and a general

director; they may be the same person or two different persons, and are appointed by a decree issued by the Council of Ministers (CoM) on the proposal of the ministry exercising the authority of administrative trusteeship, and after the Civil Service Council has been consulted. The board of directors supervises the implementation of the public institution's general policy and directs its activities, and generally takes the necessary decisions within the scope of laws and regulations to achieve the purpose for which it was established to ensure its proper functioning. The board of directors, in particular, approves inter alia tariffs, sales and purchase prices, and service allowances provided by the corporation, however, subject to the approval of the ministry exercising the authority of administrative trusteeship.

From a legal perspective, it is important to highlight that Decree No. 16878 from 1964 (Establishment of EDL) is a specific decree so it prevails over the general public institutions decree (Decree No. 4517 from 1972) with respect to EDL. This is applicable whenever there is contradiction between both decrees, and when there is a gap within the specific decree (Decree No. 16878 from 1964) the general decree is applicable. In this regard, it is important to note that EDL Board of Directors consists of seven members, including a chairman and a general director that may be the same person or two different persons. And in addition to the seven members the minister of energy and water appoints a Government Commissioner.

Decree No. 7580 from 1974

Decree No. 7580, issued on 5/4/1974 (The Investment Law of Electricity of Lebanon) states in its article 4 (entitled Source of Power), that EDL must ensure that the required electricity power for consumption is available at all times, and in order to achieve this purpose it can undertake the following:

- Produce the necessary energy power to supply its networks through thermal or hydro power plants that it receives from the state or that it develops by itself.
- Purchase the needed energy from other institutions or from concessions that produce electricity power through hydro or thermal resources.

Based on this decree, EDL purchases quantities of energy from local sources, such as the national authority of the Litani river, the Nahr Ibrahim river, and El Bared company (all these sources are hydro).

No. 247 from 2000

Law No. 247 amends Law No. 20 from 1966 and replaces the words Ministry of Water and Electricity Resources with Ministry of Energy and Water, and defines the MoEW as one of the ministries, which make the central apparatus of the State in the energy and water sectors. The previous Ministry of Water and Electricity Resources becomes one of three directorates general of the MoEW; the other two being the Directorate General of Investment and Directorate General of Oil).

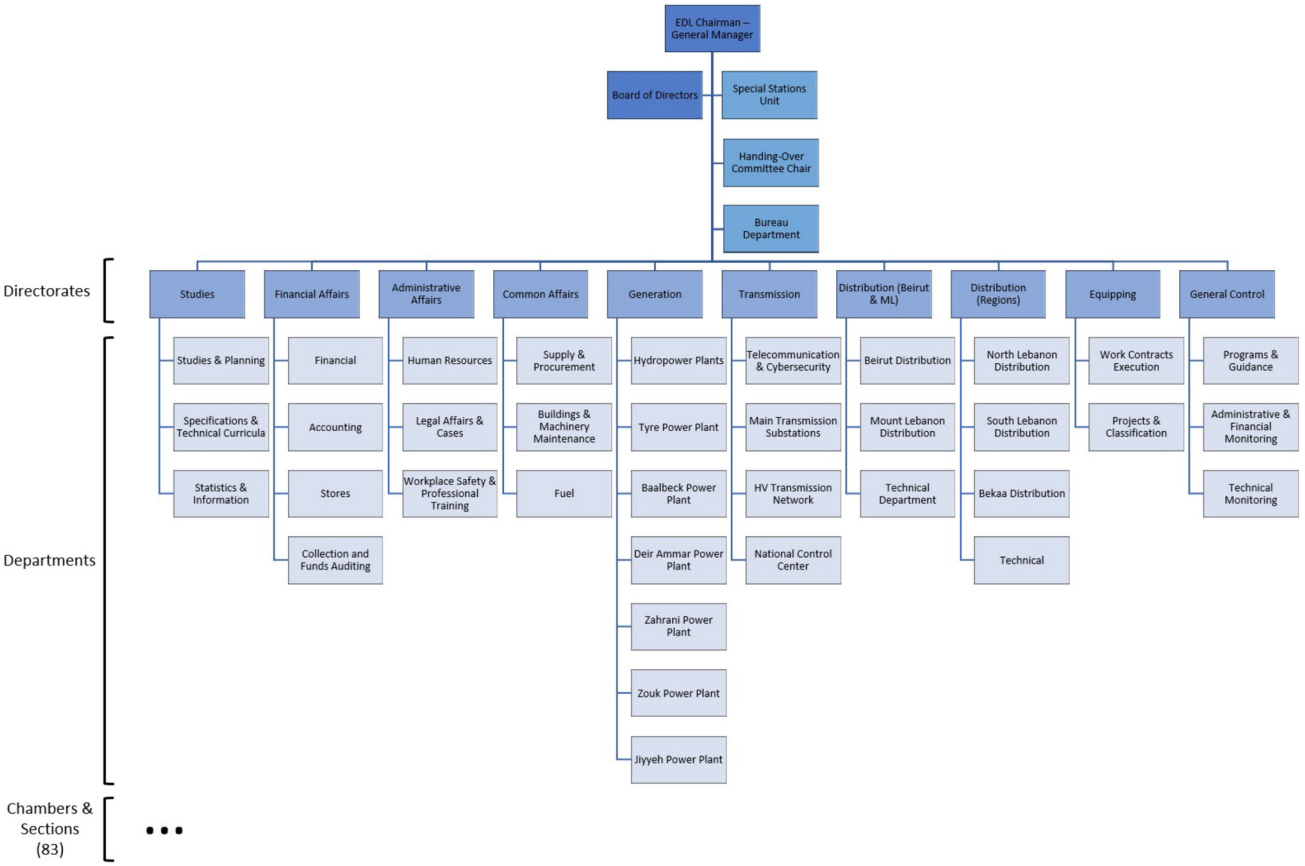
According to Law No. 247 from 2000, the minister of energy and water exercises the power of trusteeship over public utilities for electricity and water. Moreover, the MoEW (its Directorate General of Investment) exercises its authority over water and electricity public establishments. Funds appropriated in the general budget of the abolished Ministry of Water and Electricity Resources shall be transferred to the Ministry of Energy and Water. It is important to mention here the Ministry of Finance (MoF) also exercises control over EDL, particularly through the assessment of investment viability over all types of projects that may have financial surplus or financial deficit implications, and over the need for state financial contributions. In parallel, auditing institutions exercise control on prudent accounting and financial operation.

Organizational Structure

In its current capacity under Decree No. 16878/1964, EDL is Lebanon's public vertically integrated utility and is characterized as a public institution with both industrial and commercial functions (EBRD, 2019; EDL, n.d.). EDL's organizational structure is dictated by Decree No. 13537/1998, which outlines the various units in EDL and their respective functions and responsibilities (EBRD, 2019; EDL, 2021). Figure 1 below portrays EDL's organizational structure.

EDL is composed of a board of directors, ten directorates, their respective departments, and the corresponding chambers and sections (EBRD, 2019; EDL, 2021). The hierarchy shown in Figure 1 includes EDL's upper management, directorates, and their respective departments. Although not included in the organizational chart for legibility and

Figure 1. EDL Organizational Chart (EDL, 2021)



conciseness, each department consists of various chambers and sections, all of which amount to 83 chambers and sections in total.

Currently, EDL's general manager is also the Chairman of the Board of Directors, and acts as the executive authority to which all directorates, departments, chambers, and sections report. As illustrated in Figure 1, the ten directorates are as follows (EBRD, 2019; EDL, 2021):

- Studies Directorate, responsible for conducting studies, preparing general plans, conducting research and designs for expropriations, and carrying out topographic surveys.
- Financial Affairs Directorate, responsible for all financial and accounting matters.
- Administrative Affairs Directorate, responsible for all administrative and legal matters.
- Common Affairs Directorate, responsible for supply and procurement, maintenance of buildings and machinery, and fuel oversight.
- Generation Directorate, responsible for overseeing electricity generation, namely from EDL's hydropower plant and various other power plants located throughout Lebanon.
- Transmission Directorate, responsible for overseeing the electricity transmission.
- Distribution Directorate (Beirut and Mount Lebanon), responsible for overseeing electricity distribution in Beirut and Mount Lebanon.
- Distribution Directorate (Regions), responsible for overseeing electricity distribution in Northern Lebanon, Southern Lebanon, and Bekaa.
- Equipment Directorate, responsible for

overseeing various projects and work contracts.

- General Control Directorate, responsible for administrative, financial, and technical monitoring.

Generation

As mentioned earlier, Decree No. 16878/1964 grants EDL the exclusive right to generate, transmit, and distribute electricity in Lebanon. However, concessions and self-production for personal consumption constitute exceptions to EDL's monopolistic nature. In fact, article 4 of Decree No. 16878/1964 states that "natural and legal persons are eligible to produce electricity for their own consumption and to cover their personal needs only" (EBRD, 2019).

Figure 2 below provides a summary of the various facilities' generation capacities and their corresponding generation costs in 2018. In total, there are seven traditional power plants (between thermal power plants, combined cycle power plants, etc.), five hydroelectric power plants, two power barges, and one landfill (IRENA, 2020; Ministry of Energy and Water, 2019).

The Ministry of Energy and Water's updated policy paper for the electricity sector noted that

Figure 2. Generation Capacities in 2018 (IRENA, 2020; Ministry of Energy and Water, 2019)

Facility	Fuel type	Installed capacity (MW)	Effective capacity 2018 (MW)	Total generation cost (c$/kWh; USD 71/bbl)
Existing EDL				**2018**
Zouk 1 Thermal Power Plant	HFO	607	440	14.75
Jieh 1 Thermal Power Plant	HFO	343	180	19.39
Zouk 2 ICE Power Plant	HFO/NG-Z	198	157	10.83
Jieh 2 ICE Power Plant	HFO/NG-J	78	63	11.19
Zahrani I CCPP	DO/NG-ZAH	469	420	13.62
Deir Ammar I CCPP	DO/NG-DA	464	430	14.96
Baalbek Open Cycle GT	DO	64	57	20.26
Tyr Open Cycle GT	DO	72	56	21.44
Richmaya-Safa Hydro	-	13	3	3.66
Naameh (Landfill Gas)	-	7	7	1.00
Existing barges				
Power Barge Zouk	HFO/NG-Z	187	195	13.95
Power Barge Jiyeh	HFO/NG-J	187	195	14.03
Existing IPPs				
Litani Hydro	-	199	47	3.97
Nahr Ibrahim Hydro	-	32	17	2.65
Bared Hydro	-	17	6	2.65
Kadisha Hydro	-	21	15	2.65
Hrayche Thermal Power Plant	HFO	35	46	20.13
Existing barges				
Imports from Syria and Egypt		276	69	15.35

EDL's power plants constitute one of the factors contributing to the utility's financial deficit. Because of their aging and inefficient nature, not only do the power plants require constant costly maintenance, but their output is also insufficient (Ministry of Energy and Water, 2019). This issue had been highlighted on multiple occasions during the interviews when discussing some of the problems faced by the sector and EDL with respect to generation. It was noted that EDL's underperformance in generation is mainly attributed to insufficient, inefficient, and aging power plants that can no longer produce enough power to meet the growing electricity demand.[4] Consequently, this underperformance has led to unreliable provision of power.[5]

Additionally, the power plants incur high operation costs due to the use of expensive heavy fuel oil and diesel oil,[6] even though "some of the existing plants were designed to run on natural gas" (Ministry of Energy and Water, 2019). This issue not only increases generation costs, thus contributing to EDL's overall financial issues (Ministry of Energy and Water, 2019), but also brings into question the nature of the process of fuel procurement and its transparency.[7]

Transmission

Lebanon's transmission network is part of the eight-country regional interconnection which was initiated in 1988 and comprises the following countries: Egypt, Iraq, Jordan, Libya, Lebanon, Palestine, Syria, and Turkey (EIJLLPST), with the aim to upgrade the electricity systems to regional standards and electricity trading. The interconnection agreement however mainly exists on paper (World Bank, 2013). As under-supply, unsynchronized interconnections, weak regulatory frameworks, and bundled electricity market structure persists in most countries, trade has been modest among the EIJLLPST countries. For instance, when Syria exports energy to Lebanon, some parts of the Lebanese grid network have to be disconnected from the main grid to prevent major disruptions. While Egypt and Jordan currently have an over-supply in electricity, political engagement is still missing to activate a trading framework through Syria in order to sell the over-supply to Lebanon (World Bank Group, 2020b).

EDL is responsible for the transmission network in Lebanon, through its transmission directorate. The network consists of country- wide 66 kV lines, some 150 kV transmission lines in the central coastal area around Beirut, and newer 220 kV network lines that stretch from the North to the South coast and the northern zone of the Bekaa valley, as shown in Figure 3.

The transmission directorate is one of the key bodies within EDL that is responsible of the operation and maintenance of the transmission grid, including substations, and is formed, as shown earlier in Figure 1, of four main departments: high-voltage transmission network, main transmission substations, telecommunications and cyber-security, and the National Control Center (NCC), which was completely destroyed in the August 4 Beirut Blast, obliging employees to rely again on phone calls to assess and address network problems. The national grid, although being rehabilitated after the Lebanese civil war as part of the reconstruction activities, has been developed on a rigid, non-dynamic basis without being able to adapt quickly to change, in addition to being fragile to shocks over the past decade and built on old energy demands.[8] It also suffers from an insufficient number of transmission substations.[9]

As a consequence, Lebanese people have always been hearing of high losses (technical and non-technical) in transmission networks[10] and transmission underperformance.[11]

At the human capacity level within the transmission directorate, the latter suffers from a shortage in the needed skills and expertise to fulfill its original role, where hiring processes are conducted on a short-term basis, which later become permanent, and lacks training and capacity building for the existing highly competent and professional team.[12]

A transmission Master Plan was approved in 2017 to update the existing network, add new transmission lines, eliminate the 150 kV lines, and expand the 220 kV lines, focusing mainly on the North, South, and Zouk loops. The plan also accounted for the integration of the pledged 12 percent of renewable energy in 2020.[13] Yet, the plan is currently on hold due to the lack of financing for implementation, where preparation of tender documents is outsourced to consultants with the absence of in-house experts [14]

4 KII 1, 2020; KII 20, 2021
5 KII 2, 2020
6 KII 9, 2021
7 KII 24, 2021
8 KII 2, 2020; KII 10, 2021
9 KII 10, 2021
10 KII 1, 2020; KII 8, 2021
11 KII 20, 2021
12 KII 10, 2021
13 KII 13, 2021

and expropriations have not been totally secured.[15]

Before the crises in Egypt and Syria (2011), there was a plan to increase the transformation capacity by adding a substation in Ksara, 400/220 kV (300 MW), in addition to building a second 400 kV line in Syria to connect the second unused line in Lebanon on this voltage level (only one line exists now), hence increasing its interconnection capabilities. Unfortunately, this plan is also on hold due to conflicts in the region.[16]

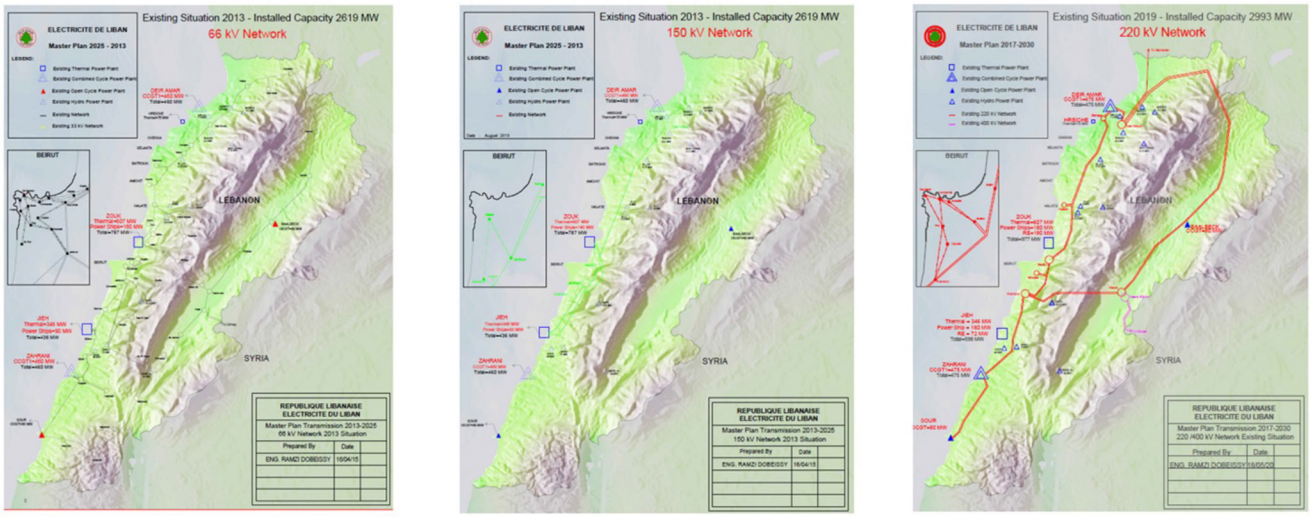
The transmission pillar is to remain under state ownership, when and if Law No. 462/2002 is implemented, while turning EDL into a transmission company. Nevertheless, a set of pressing issues should be addressed to maintain the optimal operational schemes, mainly rebuilding the NCC as well as EDL headquarters, while developing redundancy in the transmission lines and training the directorate's employees for the new NCC, for overhead lines, and for maintenance and management tasks.[17]

operation and maintenance work and the collection of bills. In April 2012, MoEW launched the Distribution Services Providers (DSP) projects with the aim of reducing the technical/non-technical losses, modernizing the grid and metering scheme—through moving to smart metering and reliability of data—as well as fixing and upgrading the distribution network and improving both collection and customer service (Kulluna Irada, 2020).

Three companies were selected to undertake the project: BUS (Butec), KVA (joint venture between Arabian Construction Company [ACC] and Khatib & Alami), and NEUC (Debbas), later joined by MRAD for the southern governorate, for an approximate total cost of 800 million USD for a period of four years (until August 2016). KVA has around 700 fulltime employees, BUS 850, and NUEC 1,200 (World Bank, 2020b).

Yet, the contracts were extended until 2018, and again until end the of December 2021, in order to implement their initial plans and targets and install around 1.1 million smart meters all over the country.

Figure 2. Generation Capacities in 2018 (IRENA, 2020; Ministry of Energy and Water, 2019)



Distribution

Prior to 2012, the distribution pillar was managed solely by EDL through direct contracts with contractors and daily employees responsible for

The installation of smart meters at the levels of M1 (generation plant busbar), M2 (high voltage [HV]/ medium voltage [MV] substation), M3 (MV feeders), and private M4 (MV/low voltage [LV] transformers) had already been completed by the DSPs in their respective regions (World Bank Group, 2020b).

15 KII 10, 2021; KII 13, 2021
16 KII 13, 2021
17 KII 13, 2021

The project was initially supervised by a project manager, NEEDS (Near East Engineering & Development Services) and was then followed by Decon International, and currently by Électricité de France (EDF).[18]

One distribution task, which is still in the hands of EDL, is the issuance of bills—keeping the utility responsible for all the delays that could arise, which remains a bottleneck in the implementation process—while the DSPs are in charge of bill collections.

These contracts were initially signed, based on a set of key performance indicators (KPIs), and continuously assessed, among which we can mention: SAIFI[19], SAIDI20, Feeder Utilization, Distribution Transformer Utilization, Distribution System Total Losses, Average Time to Make Electricity Connections, Percentage of Maintenance Completed, Customer Complaints, Average Time to Respond to a Customer with a Substantive Reply, Work Completed on Time, etc. (DSPs contract, 2012). Yet, and according to several interviewees, those KPIs were rarely implemented and monitored.[21]

With those contracts expiring by the end of December 2021, the main impression about the DSP project from several interviews we had conducted (mainly from EDL employees) is that it could not yield the desired results over the years[22] and that subscribers are still feeling an underperformance in distribution services[23], with 2016 being the last fiscal year to be fully collected in terms of bills[24], and partial collections over the following years. As a consequence, uncollected bills have been a major issue and a main contributor to the utility's fiscal deficit[25], coupled with high technical and non-technical losses in transmission and distribution networks.

Although some progress and developments at several stages of the distribution value chain were made, from the DSP's perspective, major challenges hindered the project's progress, mainly in relation to EDL's bureaucratic red-tape and processes that are not streamlined[26], in addition to delays in the meters' installation[27]; the latter needed around four approvals from EDL before being processed, thereby delaying the process of installing smart meters[28]. As for the contractual model, there is a clear affirmation on the need to apply the contract as written firsthand[29] and to reflect an advanced model of public private partnerships.

All of the above bring to the fore the importance of having an independent regulator to oversee the contract implementation as well as having an independent and capable project manager able to monitor and assess the progress.

Procurement In EDL

Articles 85 and 86 of EDL's board member's decision number 4, dated 9/10/1967, regulating its financial structure clearly states that EDL puts in place the special tender books, including all regulations needed for the institution, such as the construction and operation and maintenance of power plants. These contracts shall also be financed by EDL.

In addition, article 3 paragraph (4) of Decree Law No. 16878/1968, which establishes EDL, states the following:

Article 3: Shall be transferred directly to the Electricity Authority of Lebanon (which is now EDL) in accordance with a program approved by the Council of Ministers based on the proposal of the Minister of Public Works and Transport (Which became now the ministry of energy and water).

Paragraph (4): Facilities for the production, transmission, and distribution of electrical energy executed or to be implemented by the General Directorate for Water and Electrical Construction (which became General Directorate of Exploitation) in the Ministry of Public Works and Transport (which became the Ministry of Energy and Water), and by the Construction Projects Implementation Council, gradually upon completion.

18 KII 21, 2021
19 SAIFI is distribution system reliability KPI that measures the average number of times customers experience a supply interruption over a 12-month period.
20 SAIDI is distribution system reliability KPI that measures the total length of time in minutes that power is off for an average customer through interruption to supply over a 12-month period.
21 KII 11, 2021
22 KII 8/9/11/13/14/16/18/20, 2021
23 KII 20, 2021
24 Collection percentage of around 96.68 of issued bills on low and medium voltage lines, according to data provided by EDL (2021).
25 KII 1, 2020; KII 8/12, 2021
26 KII 21, 2021
27 A representative from the DSPs stated that EDL did not have the needed electromechanical meters to install from subscribers, and the DSPs were not allowed to install electromechanical meters that were previously removed because they needed to be tested, even though they had been functioning well previously.
28 KII 21, 2021
29 KII 21, 2021

This mainly covers all electrical utilities and construction works that do exist or shall exist by the ratification of the Decree Law No. 16878/1968, including properties and power plants that are owned by the concessions and/or municipalities.

This means that EDL is able build new power plants through engineering, procurement, and construction (EPC) contracts, in addition the Ministry of Energy and Water may build and transfer power plants, also through EPC contracts and transfer to EDL on completion (this took place with respect to Zouk and Jieh's new power plants; where the ministry did all the process with respect to procurement and contracts, and when the power plants were built, they were delivered through minutes of meetings to EDL).

The mission of the General Directorate of Exploitation at the Ministry of Energy and Water is to exercise control and tutelage over public institutions and other bodies operating in the field of water, electricity, and other public institutions that the government of Lebanon may mandate through a decree issued by the Council of Ministers.

EDL is allowed, as per its laws, to perform EPC contracts.

EPC contracts are engineering, procurement, and construction contracts utilized for the development of several types of construction projects, among which are power and energy projects. An EPC contract comprehensively addresses all aspects of the design, procurement, and construction of power and energy projects, including the duties, obligations, and responsibilities of the parties involved. It also defines the scope of work and allocation of risks among them, and sets forth their financial obligations and entitlements. Once the construction is finalized, the power plant is delivered to the owner (in our case to EDL) with no right of operation (Hosie, 2007)
Since EDL has a monopoly over the electricity sector in Lebanon, EPC contracts are regulated under public tender regulations and EDL decrees and laws (since there is no generation or sale of power).

O&M contracts are operation and maintenance contracts and are allowed only if contracted by EDL, and if done for its own interest, as per EDL board of directors' decision number 4, dated 1967.

The BOT contracts (Build Operate and Transfer contracts, where the public sector grantor grants to a private company the right to develop and operate a facility or system for a certain period) and the IPP contracts (Independent Power Producer, an entity that is not a public utility, but owns facilities to generate electric power for sale to utilities and end-users) are not allowed as per EDLs laws and regulations, since EDL exercises a monopoly over the electricity sector; no one is allowed to generate and/or sell electricity except EDL and this is according to established EDL decree.

This issue has been legalized through Law No. 129 from 2019, which extended Law No. 288 from 2014 for an additional three years (from April 2019 to April 2022). Stipulating that until the appointment of the members of the ERA production licenses and permits can be granted by a decision from the Council of Ministers upon the approval from both the Ministry of Energy and Water (MoEW) and the Ministry of Finance (MoF). Law No. 129 sets additional requirements for the construction of projects that use the design-finance-build-operate-transfer model of the public-private partnership. To date, no licenses were issued under Law No. 129/2019.

The severe financial deficit caused by EDL, discharging EDL from its board of director's members since 2002 until July 2020 (when appointments took place under international pressure but politically affiliated) paved the way for complete dominance of the tutelage authority by MoEW over the legal and financial independent institution EDL. All these factors deviated from conducting procurements, as per EDLs laws, permitting the MoEW to make these procurements on behalf of EDL and finance them from the public treasury, after achieving approvals from the Council of Ministers, which is not a legal pathway, raising question marks about the efficiency of such expenditure— such as the barges contract, wind contract, implementation of power plants—with no tangible amelioration in the power sector, despite significant public spending.

Human Capacity

Another matter of significant importance is EDL's human capacity. According to data from EDL (2021), EDL currently employs 1,690 individuals, which are divided between employees, part-timers, contract workers, and Qadisha assignees. Table 3 below shows the distribution of EDL's human capacity across the various types.

Table 3. EDL Human Capacity (EDL, 2021)

EDL Human Capacity	Number
Existing EDL	
Employees	1490
Part-timers	2
Contractual	13
Qadisha Assignees	185
Total	1690

Given that around 5,000 workers are needed for EDL to operate at full capacity,[30] it is evident that EDL suffers from a shortage of workers, which is a common problem observed across many of its directorates[31], and even bleeds into the work of the DSPs, regarding the issuance of customer bills[32], which are issued at the level of EDL, and collected by the DSPs on behalf of EDL. Another issue is the absence of capacity building and training/retraining for EDL's current staff [33], which significantly hinders the advancement and progress of both the utility and its employees, especially given EDL's mostly aging staff[34].

Many KIIs have also pointed out some problematic elements in EDL's hiring processes, namely that they are conducted on a short-term basis[35] and are often based on exchanging political favors, as opposed to formal hiring procedures.[36]

Fiscal Status

Lebanon's electricity sector and specifically EDL have long been highlighted as a key contributor to the economic and financial crisis the country is witnessing. Latest figures show cumulative transfers to EDL from 1993 until 2020 accumulated to $24 billion. Since the fiscal budget has been in deficit since, those transfers were funded by public debt. At an average debt cost of 6.7 percent, transfers to EDL have therefore contributed to $43 billion of the country's public debt (Bank Audi, 2021). EDL deficit stems from the high sector costs combined with low electricity tariffs. Despite being one of the main contributing factors, the latter cannot be solely responsible for this deficit. High costs are mostly linked to the use of inefficient fuels, such as Heavy Fuel Oils (HFO) and Diesel Oil (DO), to operate the country's aging power plants, at high network losses. In addition, the tariff reform has been a highly polarized topic on the political scene in the country for years now.

On the revenue side, EDL suffers from billing and collection challenges and a tariff that is well below cost recovery that has remained unchanged since the 1990s, when the price per oil barrel was $26/bbl. The average production cost by EDL varies between $c16- 22/kWh depending on the price of oil (Ahmad et al., 2020). For EDL to break even, tariff costs must increase significantly. The average break-even tariff for EDL, including technical and non-technical losses, is estimated at $c23/ kWh, of which, only $c0.9/kWh is paid by the end-user (Ahmad, 2020).

Over the past couple of years, the yearly transfers from the treasury to EDL have been fixed at $1 billion (or LBP1.5 trillion) but were previously variable depending on the quantities of fuel imports and the worldwide barrel price. For instance, 2017 profit and losses numbers show a net deficit of $1.432 billion, while the total 2017 revenues accounted for around $605 million USD with a 0.76 percent increase compared to 2016 (EDL, personal communication, 2017). The utility's yearly revenues from the collected bills represent around 64 percent of its annual budget (IFI, 2017).

However, an economic expert, whom we interviewed during our work, has insisted that there cannot be a future for EDL, if the utility does not come clean on its history to the public: the sources of debt accumulation, who benefited from the losses, and the institution's history over the past 30 years.[37] This could be reached by undertaking a full independent forensic audit on all energy and electricity contracts that are already signed, or not yet signed and/or that did not reach financial closure, to investigate the ultimate beneficiaries of such spending. This should cover contracts in the oil and gas sector and procurement of fuels, the wind and solar projects, IPPs/BOTs proposed projects, all EDL's operation and maintenance contracts, EDL procurement process, and existing legislation for subcontracted companies in the power sector (IFI, 2019).

30 KII 5, 2020
31 KII 10/12/20, 2021
32 KII 21, 2021
33 KII 10, 2021
34 KII 14, 2021
35 KII 10, 2021
36 KII 4, 2020; KII 16, 2021

Figure 4. EDL's 2018 Costs and Revenues (Bank Audi, 2021)

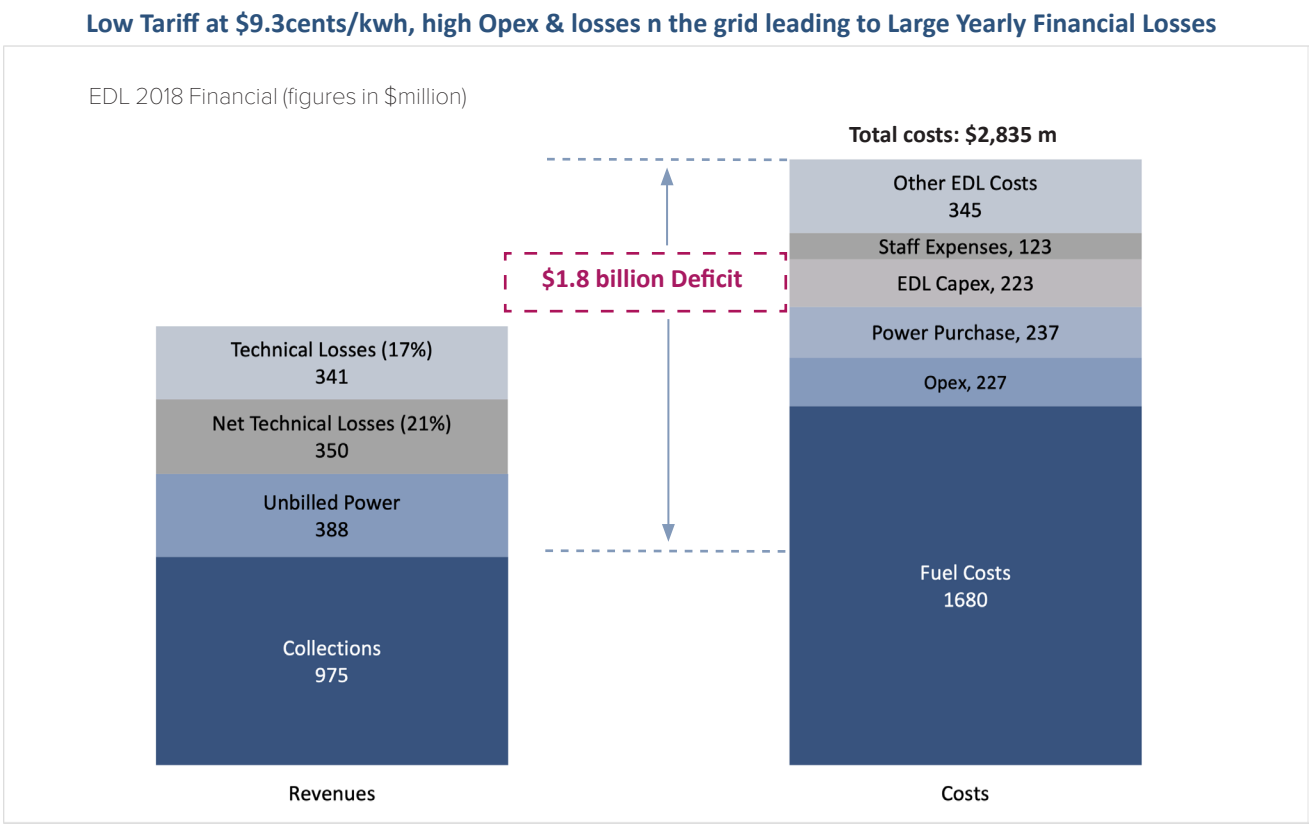
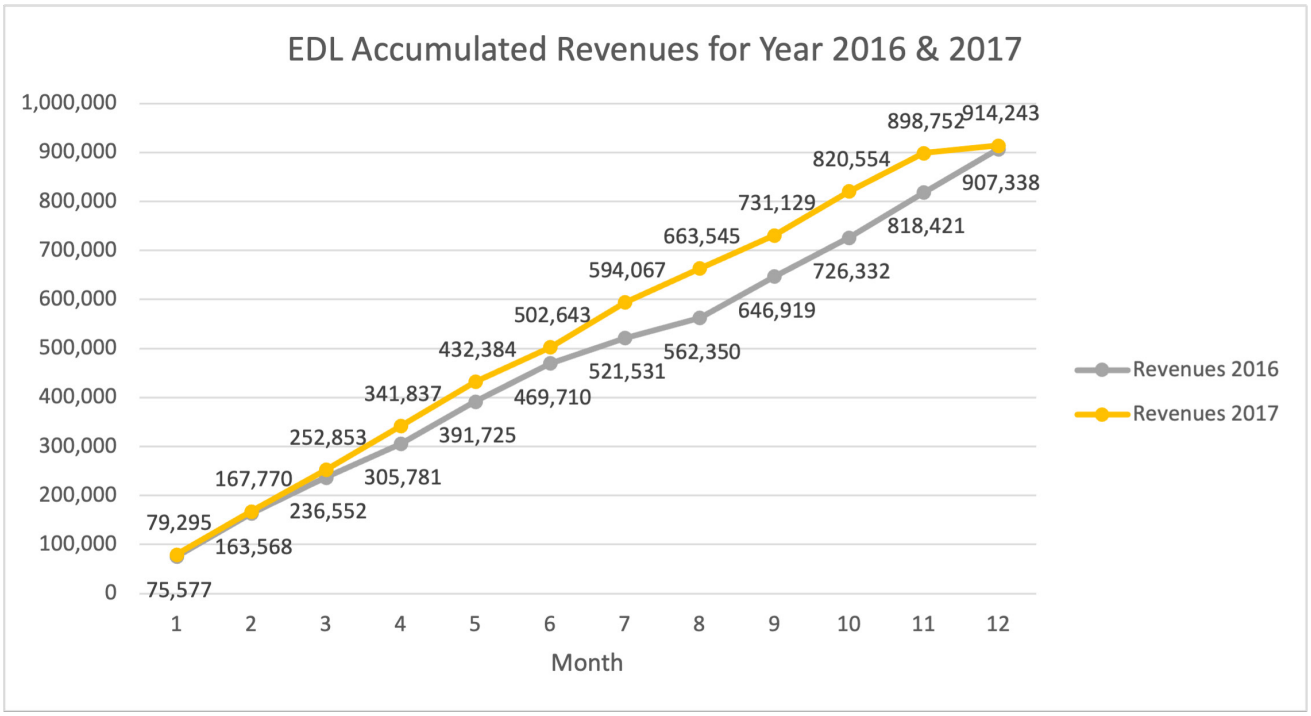


Figure 5. EDL's Cumulative Revenues for 2016 and 2017 (EDL, personal communication, 2017)



Research Questions and Methodology

Several research questions served as cornerstones shaping the study and the topics tackled therein:

- What is the applicability of Law No. 462/2002 in 2021?
- What are the minister's and NERA's roles?
- Can Law No. 462/2002 be implemented as is or should it be amended first?
- Does Law No. 462/2002 call for the privatization of the electricity sector or a public private partnership (PPP)?
- Are there legal gaps in Law No. 462/2002? If so, what are potential areas of improvement?
- If Law No. 462/2002 is implemented, what should EDL's future structure and role be?
- What should EDL's hierarchy and linkages to other authorities be?
- What resources and capacities are needed to help EDL adopt this new structure?
- How should renewable energy be integrated into Law No. 462/2002?

In order to address these research questions, the study employed a qualitative mixed- methods approach, consisting of three components: key informant interviews, a comprehensive legal assessment of Law No. 462/2002, and a comparative analysis of utilities in peer countries.

Key Informant Interviews

Interviews were conducted virtually with 24 individuals, either over Zoom or WhatsApp call, whose identities will remain anonymous. The interviews were held over a period of four months, between December 2020 and April 2021. The interviewees are experts and key stakeholders in the energy sector, and varied between EDL management, DSPs, public servants, local and international energy experts, and regional utilities.
Drawing from the research questions, the topics discussed during the interviews revolved around various themes, namely EDL's organizational structure and current status (in terms of administration, financials, legal, generation, transmission, and distribution), the DSP project, Law No. 462/2002, renewable energy, and the future of EDL and the electricity sector.

With the aim of inviting input from the different stakeholders, a consultation meeting was held on March 10, 2021. The purpose of the consultation meeting was to gather various experts and stakeholders in the electricity sector (such as MoEW, EDL, DSPs, donors, embassies, international organizations, NGOs, etc.) in a comprehensive and inclusive discussion to develop an outline for a multi-dimensional action plan, which will be integrated into this study.

Legal Assessment Of Law No. 462/2002

With the aim of tackling the research questions raised in this study, in addition to the ones mentioned during the consultation meeting on March 10, a review of EDL's current structure and legal framework was conducted. This covered its governing laws and decrees, its organizational structure, the existing directorates and mandate, and its role and responsibilities in generation, transmission, and distribution activities along with the procurement processes followed within the utility.

This also included an assessment and analysis of existing laws governing the electricity sector at large, and MoEW and EDL in particular. More specifically, a thorough review of Law No. 462/2002 was conducted to analyze its main articles and extract a simplified roadmap for its implementation in its current format (without any amendments). This highlighted the timeline for selecting and appointing ERA members, unbundling the electricity services, and the corporatization of EDL.

Having said that, the team has worked to connect several sections together and propose a realistic, complete pathway that can be set in place in virtue of this law.

Comparative Analysis Of Utilities

The selection of countries for the comparative analysis was based on a set of criteria, namely economic indicators (e.g. GDP, GDP per capita, and

debt/GDP ratio), demographics (e.g. population), and energy indicators (e.g. electricity consumption, total energy supply by source, electricity generation by source, share of renewables in power generation, and net energy imports). Figure 6 below displays a snapshot of the comparative spreadsheet in which the selection criteria were considered for several countries and weighted to select the ones most comparable to Lebanon, from which Lebanon could learn. The complete comparative spreadsheet is included in Appendix A.

Based on the criteria described above, Jordan, Morocco, Tunisia, Oman, Malaysia (Peninsular Malaysia), and New Zealand were selected as comparative countries for Lebanon. Jordan, Morocco, Tunisia, and Oman represent peer countries for Lebanon due to geographic proximity and similarities in economic measures, demographics, and energy profiles. While Malaysia and New Zealand may appear to be fundamentally different from Lebanon, both countries' electricity sectors have undergone significant reform and restructuring, not to mention New Zealand recorded the highest share of renewables in power generation among the selected countries, reaching 83 percent in 2018 (IEA, n.d.-d; Shen & Yang, 2012; The Oxford Institute for Energy Studies, 2021). Additionally, one commonality across all the selected countries is the fact that they serve as testimonial cases from which lessons can be drawn to inform Lebanon's own path to restructuring its electricity sector and integrating renewable energy into its energy mix in a more central and dedicated fashion.

When examining the utilities in each of the selected countries, the main factors of interest were the electricity sector's organization and whether the sector was unbundled, the sector and the utility model and structure, the presence of a regulatory authority, and renewable energy in terms of the existing regulatory and institutional framework.

Figure 6. Excerpt from Comparative Spreadsheet

Country	Economic Measures			Demographics	Energy Profile (2018)				
	GDP (2019) ($ USD)	GDP per capita (2019) ($ USD)	Debt/GDP (2018)	Population (2018)	Electricity consumption	Total Energy Supply by Source	Electricity Generation by Source	Share of Renewables in Power Generation	Net Energy Imports
Lebanon	51.992 billion	7,583.66	151.03%	6.855 million	19.0 TWh	Oil: 8,145 ktoe Natural gas: 212 ktoe Biofuels and waste: 155 ktoe Coal: 170 ktoe Wind, solar, etc.: 68 ktoe Hydro: 30 ktoe	Oil: 20,814 GWh Natural gas: 987 GWh Hydro: 348 GWh Solar PV: 68 GWh Wind: 6 GWh	2%	8.6 Mtoe
Jordan	44.503 billion	4,405.49	94.41%	10.101 million	19.5 TWh	Oil: 4,955 ktoe Natural gas: 3,438 ktoe Biofuels and waste: 99 ktoe Coal: 205 ktoe Wind, solar, etc.: 400 ktoe Hydro: 2 ktoe	Oil: 1,346 GWh Natural gas: 16,948 GWh Hydro: 23 GWh Solar PV: 1,441 GWh Wind: 720 GWh Biofuels: 4 GWh	11%	8.8 Mtoe
Morocco	119.7 billion	3,204.10	64.96%	36.472 million	34.6 TWh	Oil: 12,397 ktoe Natural gas: 924 ktoe Biofuels and waste: 1,311 ktoe Coal: 4,939 ktoe Wind, solar, etc.: 578 ktoe Hydro: 146 ktoe	Oil: 1,289 GWh Natural gas: 5,198 GWh Coal: 21,261 GWh Hydro: 1,998 GWh Solar PV: 1 GWh Solar Thermal: 949 GWh Wind: 3,841 GWh Other sources: 1,302 GWh	18%	20 Mtoe

Legal Assessment Of Law No. 462/2002

The electricity sector is governed by Law No. 462 (Regulation of the Electricity Sector), which was promulgated by the Lebanese parliament in 2002. To date, this law has never been implemented. The law is a general framework and an umbrella law that mainly calls for three main elements:

- Establishment of an independent Electricity Regulatory Authority (ERA) to provide technical oversight, grant licensing, and put in place a general plan for the sector, especially the generation, distribution, and transmission pillars (article 7 of Law No. 462/2002).
- Restructuring the electricity sector.
- Unbundling of energy activities that are currently monopolized by EDL through private sector participation in distribution and generation. According to the law, transmission activities shall remain owned by the public utility, where a transmission company has to be established (article 5 of Law No. 462/2002).

The sequencing of the law is a key element, as its main pillars are interconnected and its full implementation would take approximately two years, according to the following timeline:

1. First step is for the Council of Ministers to issue a decree appointing the Electricity Regulatory Authority chairman and four members.
2. Once the ERA chairman and members are appointed, the next priority would be the issuance of the ERA internal bylaws (action to be performed by the ERA chairman and members).
3. Unbundling EDL (may start in parallel while the ERA is working on its bylaws).

Contrary to the reigning rhetoric, as a general framework law, Law No. 462/2002 does tackle issues related to the appointment of the ERA, duties and obligations of ERA as well as those of the minister of energy and water, the Council of Ministers, and the Higher Council for Privatization and Partnerships (HCPP). It also approaches the unbundling of EDL and the electricity activities, the private sector involvement, environmental considerations as well as the situation of current personnel, wage earners, contractors, and ministry employees concerned with the electricity sector and EDL.

Does Law No. 462/2002 Contradict Article 66 Of The Lebanese Constitution?

Over the past years, former ministers of energy and water emphasized the need to amend Law No. 462/2002 before its implementation, as it contradicts the Lebanese constitution with respect to the role of the minister of energy and water.

In fact, article 66 of Lebanon's constitution of 1926 with its amendments states the following:

The Ministers assume the management of the State's interests, and they are responsible for implementing the orders and laws, each in the matters of his department and within his jurisdiction.

The Ministers are collectively liable to the Lebanese Parliament for the Government's public policy, and individually assume the responsibility of their personal actions.

On the other hand, Law No. 462/2002 states that the minister shall have the following powers:

- First section of article 8 and article 10 of the law highlights the role of the minister of energy and water in the creation and the expiration/ termination of the authority.
- Article 6 of the law highlights a wide range of authorities to the minister of energy and water in regulating the electricity sector, such as:

  a) Set in the general policy of the sector and the general plan, examine the studies, put them in final forms and submit them to the Council of Ministers for adoption.

  b) Propose the overall policy for the regulation of the electric power production, transmission, and distribution services, and oversee the implementation through the reports submitted by the

authority.

c) Propose draft laws and decrees governing the electricity sector.

d) Propose public safety and environmental guidelines and technical specifications required in the electrical facilities and installations, by virtue of a decree taken by the Council of Ministers, upon the proposal of the competent minister, after obtaining the authority's and other competent parties' opinion, and issue the required instructions.

e) Carry out the necessary contacts with other countries for establishing electrical connections and exchanging electric power and sign the necessary agreements after obtaining parliament's approval.

f) Take all authorized measures according to the laws and contracts signed by the government to deal with any failure in any activities of the electricity sector, which may have a negative impact on the sector's interest or consumers' rights and interests.

g) Propose the designation of the chairman and members of the board of directors of the authority.

The aforementioned duties and obligations of the minister as mentioned in Law No. 462/2002 do not contradict with ERA's role stated in article 12, and consequently not with the Lebanese constitution, since it does not withdraw or minimize the powers of the minister. To the contrary, it works in harmony and synergy with the ministry and the minister's authority.

Amendments to article 7 of law no. 462/2002

Article 7 of Law No. 462 explicitly states upon the establishment of a regulatory authority under the name of The Regulator of Electricity Sector Organization that is in charge of organizing and controlling the electricity affairs according to the law's provisions, enjoys a legal personality, and technical, administrative, and financial independence, and shall have its headquarters in Beirut city.

Four amendments to article 7 of Law No. 462/2002 took place over the years, where the CoM replaces the ERA—until it is appointed—in granting licenses upon the proposal of both the minister of energy and water and the minister of finance.

The amendments are as follows: Law No. 775 of 2006 amended article 7 of Law No. 462 of 2002 stipulating that, on a temporary basis and for a maximum period of one year, permits and licenses for electricity generation are granted by a decision of the CoM upon the proposal of the minister of energy and water until the members of the ERA have been appointed.

Law No. 288 of 2014 amended article 7 of Law No. 462 of 2002 stipulating that for a period of two years, permits and licenses for electricity generation are granted by a decision of the CoM upon the proposal of both the ministers of energy and water and of finance, until the members of the ERA have been appointed. This law served for the period between 2014 and 2015.

Law No. 54 of 2015 extended Law No. 288 of 2014 for two more years (from April 2016 to April 2018). Law No. 129 of 2019 extended again Law No. 288 of 2014 for an additional three-year period (from April 2019 to April 2022). Moreover, it has set additional requirements for the construction of projects that use the design-finance-build-operate-transfer model of the public-private partnership (a clause is added on public procurement procedures and the application of public accounting law related to such projects).

In line with the above mentioned multiple temporary amendments to article 7 of Law No. 462 dated 2002, the CoM has been given the right to issue permits and licenses to the private sector to generate electricity. Despite several temporary amendments, no licenses were issued except for the wind projects in Akkar, which got the license from the CoM back in 2018 under Law No. 54 of 2015, but this project never kicked-off for several reasons, among which
the issuance of the licenses before bankability acquisition, and the current economic crisis and Lebanon's default that came to halt any progress on this project. If ERA had been in place as per Law No. 462/2002, no licenses would have been issued if the competitive portfolio tender were not complete. This reflects that the Council of Ministers is not the

most compatible authority to replace the ERA within the Lebanese context, as politically appointed decision-makers usually lack the technical and legal expertise.

It is important to highlight that granting licenses before unbundling EDL would not be efficient. This is clearly stated in article 12 of Law No. 462/2002 regarding the authority's duties and powers to ensure and encourage competition in the electricity sector, supervise and control non- competitive tariffs, and ensure the transparency of the market. It also determines and classifies the various categories of production, transmission, and distribution services, which appropriately reflect variances in the use of electricity, according to various consumption categories, the quality and time of service, etc.

The establishment of the ERA is necessary before issuing any licenses. This is also the case for the restructuring the electricity sector and the unbundling of EDL, which should be done before issuing any licenses in order to ensure a sustainable and efficient licensing acquisition.

Although Law No. 462/2002 does not explicitly mention that it is preferable not to issue licenses before restructuring the power sector and unbundling EDL, however, it is a sequential law, the prerequisites mentioned above should be done before issuing any licenses. In addition, and as soon as an ERA is appointed, Law No. 129 dated 2019 will expire before April 2022.

Process For The Appointment Of ERA Board Members

The Electricity Regulatory Authority shall consist of a chairman and four Lebanese full-time members, who shall be appointed by virtue of a decree taken by the Council of Ministers, upon the minister's (MoEW) recommendation for a term of five non-renewable years, and holders of a university degree in electricity, electronic, economic, business, law, finance, and engineering fields with experience in these fields (article 8 section 1).

In addition, the terms of the chairman or a member of the ERA shall be terminated with the termination of the term, death, resignation, revocation, or shall be removed from post, by virtue of a decree taken by the Council of Ministers, upon the minister's proposal, based on a flagrant breach of duties. The chairman and the members shall receive a monthly compensation, specified by a decree taken by the Council of Ministers as well, upon recommendation of the minister of energy and water and the minister of finance (articles 10 and 11).

Nomination steps are clear by virtue of this law, and include the following:

- Identification and nomination of the members of an ERA, based on a transparent and merit-based recruitment process (MoEW as lead).

This process is expected to require around 3-4 months to finalize. A document produced by the World Bank Group (2020a) related to the nomination process of the EDL board of directors could be a good reference document to MoEW for the ERA member appointments. Another draft law "determines the mechanism of appointment in first category employees in public administrations" and specifies the selection and nomination processes. The law has been ratified by Parliament but rejected by Constitutional Council on grounds that it is unconstitutional (The Daily Star, 2020). If and when ratified again by Parliament, it could be used for ERA member appointments.

- Appointment of the ERA members, following a CoM executive decree (CoM as lead).

This decree will have to include a clear timeframe (e.g., three months) allowing the ERA members to develop the ERA's own regulations governing its internal organization, including its employees' provisions and roles in light of its specific functional and organizational needs.

- Set-up of ERA and staff that is able to function properly (ERA members as lead).

Secondary legislations related to the ERA's internal regulations and structure are issued. The ERA should be organized into departments wherein specific expertise is required to deal with diverse and highly specialized issues. Staffing should be based on a strict recruitment process and include an optimal mix of skills (gender, technical, legal, administrative, economic, financial, etc.).

The law clearly states a transitional phase (article 45, sections 1 and 2) with respect to hiring qualified employees in order to ensure efficient and sustainable services.

It is important to highlight that the Ministry of Energy and Water, as per article 45, had to revisit its organizational structure through implementation decrees within three months from the ratification of Law No. 462 of 2002. As this period had expired a long time ago, it could be recuperated within the appointment decree of the ERA members. As per the provisions of Law No. 462 and the implementation decree that has to be issued, the employees of the ministry related to the electricity sector as well as to EDL, who are needed and do have the regulatory conditions, will be transferred to the new employers, be it ERA or the other public and/or private companies.

Also, the law mentions explicitly that within three months of the regulator's appointment, ERA has to set the conditions for choosing the required and qualified employees related to the electricity sector from both the Ministry of Energy and Water and EDL. Setting the conditions shall be done in coordination with the minister, provided that the financial rights of those employees are settled pursuant to the provisions set forth under section 2 of article 45 of this law, which describes thoroughly the transfer process and the financial implications, whether the employees decide to terminate their duties or agree to be transferred, whether to ERA or to private companies.

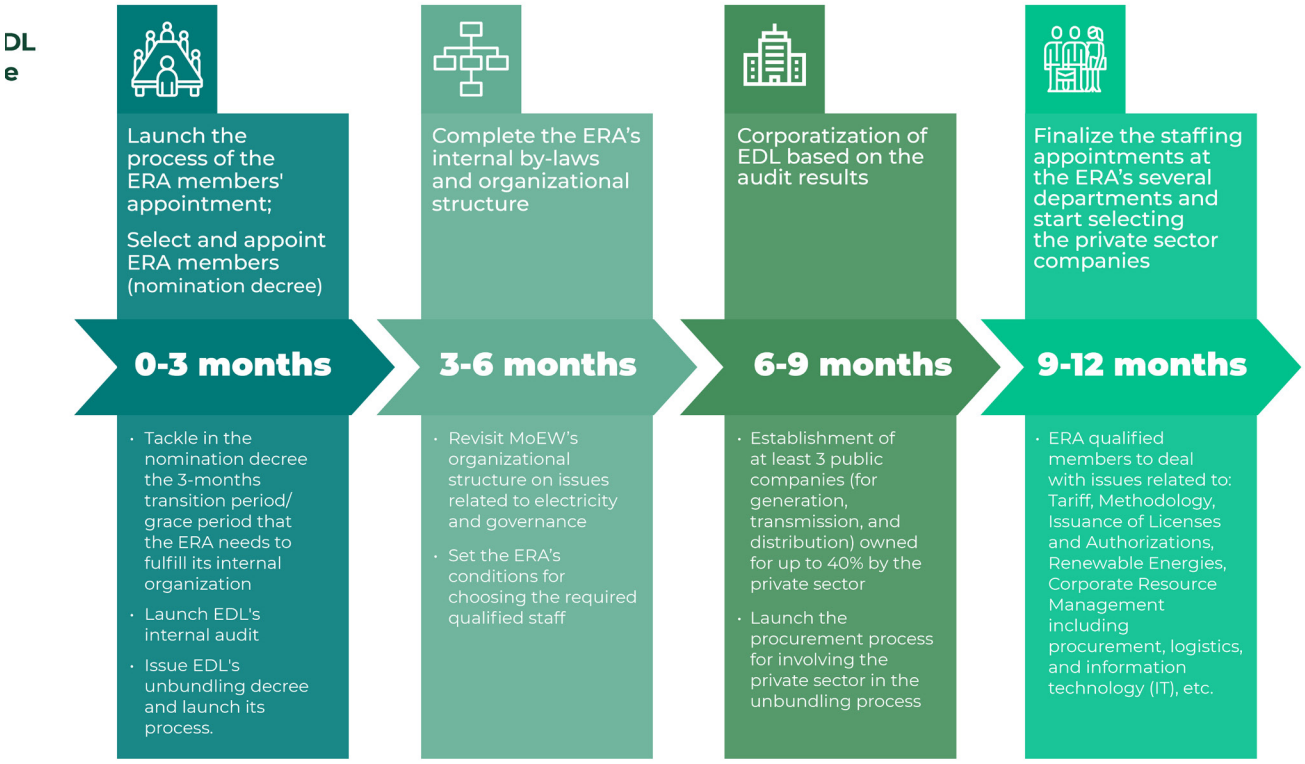
The current law provides the mechanism and the needed grace period so that ERA conducts its internal bylaws and organizational structure to hire a qualified experienced team, ensuring a quick and smooth operation.

- **Establishment of key substantive rules related to the exercise of the ERA authority (ERA members as lead).**

Assuming that ERA is set-up, ERA members shall have numerous duties and powers, such as ensuring and encouraging competition in the electricity sector, supervising and controlling non-competitive tariffs, and ensuring the transparency of the market.

They will also be working on the following: tariff methodology, licenses and authorizations (requirements that need to be included in any Request for Proposal [RfP] for new generation plants), resolution of disputes, fines, etc.

Figure 7. ERA Appointment and EDL Unbundling Timeline



- Issuance of licenses and authorizations Power Purchase Agreements (PPA) by the ERA (ERA members as lead).

The ERA issues the licenses and authorizations.

ERA's Financial And Administrative Autonomy

As per Law No. 462/2002, the ERA shall enjoy financial and administrative autonomy and shall be subject only to a posterior audit by the Public Audit Court. The authority's funds shall be deposited in a specific account opened within the Central Bank of Lebanon (article 14 of Law No. 462/2002).

With very similar independence, we may find other public institutions, such as the Regional Water Establishments (RWE) and EDL itself, which does have its own powers, with administrative and financial autonomy. For the latter, regulatory independence is a means towards ensuring effective and efficient public service delivery through market players.

Governments and legislatures choose to delegate decision-making powers to independent regulators, since the legislators are assumed to be rational actors who seek to favor certain interest groups, in order to gain their support when they are up for re-election. ERA independence mainly aims to ensure impartiality by limiting political interference and ensuring high technical and legal expertise (article 7 of Law No. 462/2002).

In addition, the technical nature of a regulatory field can also act as pressure for the delegation in at least two ways: first, because there is a real demand for great technical expertise of the regulator, and second, because when politicians delegate, they get rid of complicated and bureaucratic tasks with more efficiency to the public. Ideally, independent regulatory authorities do not produce services or perform ordinary administrative tasks, nor do they engage in policymaking. Instead, they are given the power to lay down rules, regarding, for instance, "Issue, renew, suspend, amend and cancel Licenses and Authorizations" to reach the goals set out in the legislation (article 12 of Law No. 462/2002).

The law clearly states in article 15 the resources of the regulator's income, which ensure full financial independence, consisting of the following revenues:

a) The license applications and permits fees.
b) A percentage on the electricity consumption bill, not exceeding 1 percent of its value.
c) Unconditional aids and grants from sources having no direct or indirect interest in the electricity sector, after the Council of Ministers' approval.

In addition to the above stipulated revenues, the regulator is exceptionally financed for a maximum of a two-year period from the establishment date, either by way of contributions assigned in the general budget or via special contributions decided by parliament, according to a budget the regulator sets up annually, with staffing needs (article 15).

ERA's Internal Bylaws And Transition Period

Article 13 of the law allows for ERA to develop its own internal rules and procedures, without providing any timeframe for ERA to develop them. This could be tackled within the nomination decree for appointing ERA officials. The decree could specify a limited period of time (e.g. three months) where ERA is expected to develop internal rules and procedures. The law provides explicitly for a transition period in article 45 that is specifically focused on the status of the ministry and EDL's employees, after restructuring and unbundling the utility. This transition period had been defined for three months from the date of the law's publication, and therefore had expired since its passing in 2002. This period is still needed, even if ERA is fully operational today and may be recuperated in the nomination decree.

Also, another explicit transition period is mentioned in the law in article 48, which indicates "all legal and regulatory provisions applicable before the entry into force of the present law shall remain in force until the present law becomes effective." As mentioned earlier, this law should be implemented in sequence. This means that it is preferable that no licenses are to be permitted before unbundling EDL or conducting the partnership process with the private sector, as per articles 4 and 5 of Law No. 462/2002. Until then, EDL's regulations shall be implemented. This will give the ERA additional time to set its organizational structure.

Relationship Between ERA and EDL

When appointed, the ERA will always have a direct role on the public utility by having direct control and ownership over its transmission activities[38], as

38 Both current EDL and future EDL transmission companies.

follows (article 12):

- The ERA will prepare the general master plan studies for the sector in the fields of production, transmission, and distribution, and will submit it to the minister to get the CoM approval.
- It is responsible for determining the price ceiling for production services, applying tariffs to various electricity transmission and distribution services, and for subscription, service fees, and fines, and their collection system.
- The ERA sets up the technical and environmental norms. It also assures the equality between the licenses and permit-holders in benefiting from the transmission equipment, according to the specified tariffs.
- The ERA monitors the good functioning of production, transmission, and distribution services up to conveying the electric current to the consumer, post consultation with competent authorities.

Once the ERA is appointed, EDL will no longer exist in its current status. The unbundling process of EDL will take place, which means the ERA will have a direct relationship with the public utility handling transmission activities.

Unbundling of the Electricity Activities Under Law No. 462/2002: Privatization or Partnership?

The electricity activities production, transmission, and distribution are deemed public utilities, each of which is independent functionally, administratively, and financially from the other. The principles of this independence are determined pursuant to decrees taken by the Council of Ministers, upon the minister's proposal.

Unbundling electricity activities currently monopolized by EDL involve the following stakeholders: EDL, ERA, CoM, Minister of Energy and Water, and the Higher Council for Privatization and Partnership (HCPP).

This independence does not prevent EDL, after being converted into one or more commercial companies, from being able to perform more than one of the three above mentioned activities, provided that the transmission of electrical energy remains a property of the transmission company, which is the electricity establishment (EDL) or any other company owned by the public sector to which the properties of energy transport equipment is transferred (article 3).

The term privatization has been used in this law, but from a legal perspective what is meant is partnership and not privatization, and this is mainly clarified after the ratification of Law No. 48 dated 2017 (PPP law), which amends and complements Law No. 288 dated 2000: "the privatization law," which plays an important role in the unbundling activities, clearly stated in Law No. 462/2002.

The partnership relationship is made clearer through article 5 of Law No. 462/2002 where the government, by decree taken in the Council of Ministers and within a period not exceeding two years from the date of founding any privatized company, can sell a proportion—not exceeding forty (40) percent of the shares—of every private company, an investor in the private sector, enjoys the expertise, specialization, and reputation in the electricity sector would like to establish. This shall be done through international tender, in accordance with a tender document prepared by the HCPP, after consulting the ERA, and ratified by the Council of Ministers by virtue of decree pursuant to the minister's proposal.

Keeping the transmission activities solely owned by the public utility while involving the private sector—with a maximum 40 percent, throughout the distribution and generation activities—demonstrates that the public sector will continue to play a role in electricity activities alongside the private sector, where no total dominancy for the latter will be possible for at least four years from kicking-off the unbundling process. While the legal implication for privatization means the dominant involvement of the private sector over a sector or activity within the total absence of the public sector for a long period of time, it does not fully apply to Law No. 462 dated 2002.

The Need for an Audit for EDL Prior to Its Unbundling

According to article 4 section 2 of Law No. 462/2002, an EDL audit needs to be conducted prior to unbundling it. The auditor procurement will be launched by the HCPP. The value of the assets, properties, liabilities, and works in progress whose ownership or right to benefit from them is to be

transferred to any Company, shall be determined by the HCPP with the assistance of an international financial or accounting company, designated by the HCPP (through procurement), which shall, in turn, determine the basis for such a valuation. The procurement for selecting the company to carry out the audit needs to be transparent and competitive.

The Unbundling Process

Unbundling, Distribution, And Generation: Founding Stages Of The Private Companies

As per article 4 section 1 of the law, one or more joint stock companies shall first take over the EDL establishment and shall be owned either by the Lebanese government or the public. In parallel, an auditing process of EDL's assets will begin.

Here we need to distinguish between the existing power plants and/or infrastructure and new power plants and/or potential infrastructure regarding distribution and generation activities.

The transformation of current EDL establishment is done into one or more joint stock companies owned by the public sector. This is done pursuant to a decree taken in the Council of Ministers and based on HCPP's proposal. All the shares of any established company shall be owned by the Lebanese government or by any other public entity, which shall remain the sole shareholder until partial or total involvement of the private sector at a later stage, and, if deemed necessary, by the Council of Ministers (article 4 section 3).

Auditing EDL's assets shall take place to determine the value of the assets, liabilities, obligations, works in progress, and existing rights of which the ownership transfer, or benefit from, is transferred to the company. As mentioned earlier, the auditing is decided by the HCPP with the help of a financial company or an international accounting company for which HCPP appoints and determines the basis and principles of assessment.

Existing Power Plants

The HCPP, in executing the privatization law provisions—Law No. 228 dated 2000: organization of privatization operations and specifying its conditions and the scopes of its application; in addition to Law No. 48 dated 2017: regulating public private partnership law, which amends and compliments Law No. 228)—is entitled to propose involving the private sector for all or part of the activities of the production and distribution equipment, through a tender or bid, in accordance with the following:
The government, by decree taken in the Council of Ministers and within a period not exceeding two years from the date of founding any public commercial company, shall sell a proportion, not surpassing forty (40) percent, of every newly established company. This latter could be shared with a private investor enjoying the expertise, the specialization, and reputation in the electricity sector, and this is done through international tender in accordance with a tender document prepared by the supreme council of HCPP after consulting the ERA and ratified by the Council of Ministers by virtue of a decree pursuant to the minister's proposal (article 5 section A).

The investor, who comes first in the bid, is nominated as the strategic partner, and they shall take charge of the company's management, as long as they remain the owner of at least half of the shares they originally purchased, and abide by the tender specifications, as long as the Lebanese government still owns the company's majority shares.

New Power Plants

With respect to new power plants intended to be built after establishing the ERA and unbundling its energy activities by involving the private sector, the process shall be subject to licenses issued by the ERA for a period of up to fifty years, as per article 5 section B, through the following:

- Public tenders for power production exceeding 25 MW for distribution in regions where the number of consumers exceeds fifty thousand.
- Solicitation (invitation to tender) for power production not exceeding 25 MW for distribution in regions where the number of consumers does not exceed fifty thousand.

In addition, article 26 states that production intended for private use with power not exceeding 1.5 MW shall not be subject to the authorization condition, provided that the environmental, public health, and public safety standards comply with specific standards adopted by the ERA after reviewing the Ministry of Environment and the concerned

administrations and institutions' opinions.

The Transmission Company

The transmission of electric power shall always remain owned by the Transmission Company (one company taking over transmission activities). The national transmission company shall be owned by the public utility, which could be EDL Company SAL after its transformation, or owned by any other public establishment, which establishes a joint stock company to which the properties of energy transport equipment is transferred.

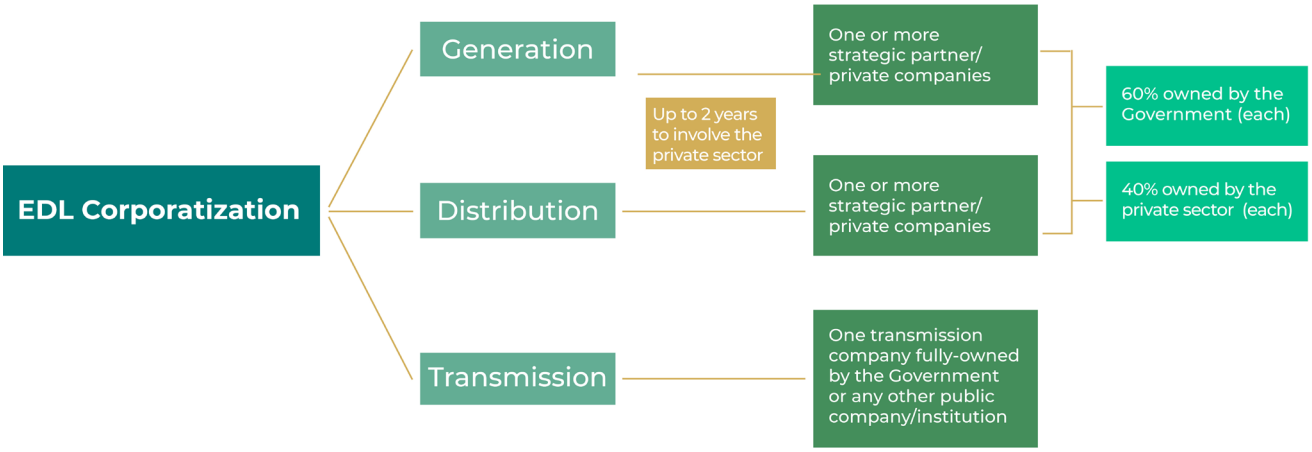
Management, operation, development, or equipping contracts related to transmission activities may be awarded to the private sector upon a CoM decision.

The same concept is applicable to the ERA and the companies that are likely to be established, there shall be within three months of the regulator appointment or the company foundation date determining conditions of selecting the need of both of them to the ministry employees and all the other workers, concerned with the electricity sector, in it and in EDL; and this in coordination with the minister of energy and water.

Law no. 462'S focus on the environment

The environmental aspect is tackled in numerous articles of the law, be it in the powers related to the Minister of Energy and Water or that of the ERA.

Figure 7. ERA Appointment and EDL Unbundling Timeline



ERA's And EDL's Human Resources

Article 45 of the law states that within a three- month period of its publication date in the official gazette, the Ministry of Energy and Water has to reconsider its organizational structure. For this reason, it has to issue, within the aforementioned period, its new organizational decrees determining its own staff, and the employees and workers concerned with the electricity sector at the ministry and in EDL. Those who are needed and enjoy the statutory conditions can be transferred to new staff, according to the provisions stipulated in the mentioned statutory decrees. Since the three- month period has long expired, this could be re-initiated within the appointment decree of the ERA's board members.

Article 6 of Law No. 462/2002 clearly mentions that one of the minister's authorities and duties is to propose the public safety and environmental guidelines, as well as the technical specifications required in the electrical facilities and installations by virtue of a decree issued by the Council of Ministers, upon the proposal of the minister of environment, and after obtaining ERA's opinion.

On the other hand, article 12 of the law states that, among the ERA's duties and powers, it shall set the technical and environmental standards governing the verification of compliance with said rules and controls their implementation.

The ERA shall grant Licenses and Authorizations

according to conditions already set by the law, as per article 20, in addition to conditions specified by virtue of a decree taken by the Council of Ministers.

Among these, we can list:

- Technical and safety conditions;
- Geographical location of equipment;
- Production quality, cost, prices, and consumer protection; And
- Environmental protection, etc.

In addition, article 22 gives the ERA the authority to establish technical standards and conditions applicable to all electricity equipment to protect from any harm, the electricity networks, or the public health or the public safety or the environment. The ERA may require approval for types of electricity equipment related to electricity production in order to ensure that they are environmentally compatible.

As previously mentioned, the production of electricity intended for private use with power less than 1.5 MW shall not be subject to the authorization condition provided that the environmental, public health, and public safety standards comply with the specific standards adopted by the ERA, after reviewing the Ministry of Environment and the concerned administrations and institutions' opinions.

Most importantly, what is mentioned in article 42 is that all electricity regulations governing the use of public and private property and the granted licenses and authorizations shall comply with legal and regulatory provisions relating to the protection of the environment and the public health and classified archaeological and tourist sites.

All the above proves that special attention has been given in Law No. 462/2002 to the environment. All environmental issues and guidelines are to be governed per decrees issued by the Council of Ministers upon suggestion and/or revision by the minister of environment. This also maintains the commitment to the international treaties/ conventions adopted by the Lebanese government in this regard, after the adoption of the law through secondary legislations-decrees.

Renewable Energy and Law No. 462/2002

Law No. 462/2002 defines the terms of electricity generation through the production of electrical energy by thermal, hydraulic, renewable, or other resources. Aside from this definition, there is no further elaboration regarding renewable energy regulations. Therefore, secondary legislations after the appointment of an ERA may address missing topics in Law No. 462/2002, such as Renewable Energy (RE) and energy efficiency matters.

One example is the current draft distributed renewable energy law that includes issues related to the single-buyer, net-metering, wheeling, etc. Such a regulatory framework will enable a quicker development and utilization of renewable energy resources, including more investments, and an increased indigenous capacity in technology under ERA regulations. In addition, it is essential to enact an energy efficiency law that will promote, through the use of a combination of economic incentives and policies, the reduction and efficiency in energy use in Lebanon's residential, commercial, and industrial sectors, targeting both behavioral changes and a more efficient stock of appliances and equipment (Ayat et al., 2021).

Based on the above, there is no need to amend Law No. 462/2002 to address these issues, as they can be included in separate secondary legislations. Rather, it becomes more and more important to set a transformative vision for the sector that will define the path for energy transition, and that should be set by MoEW and approved by the CoM.

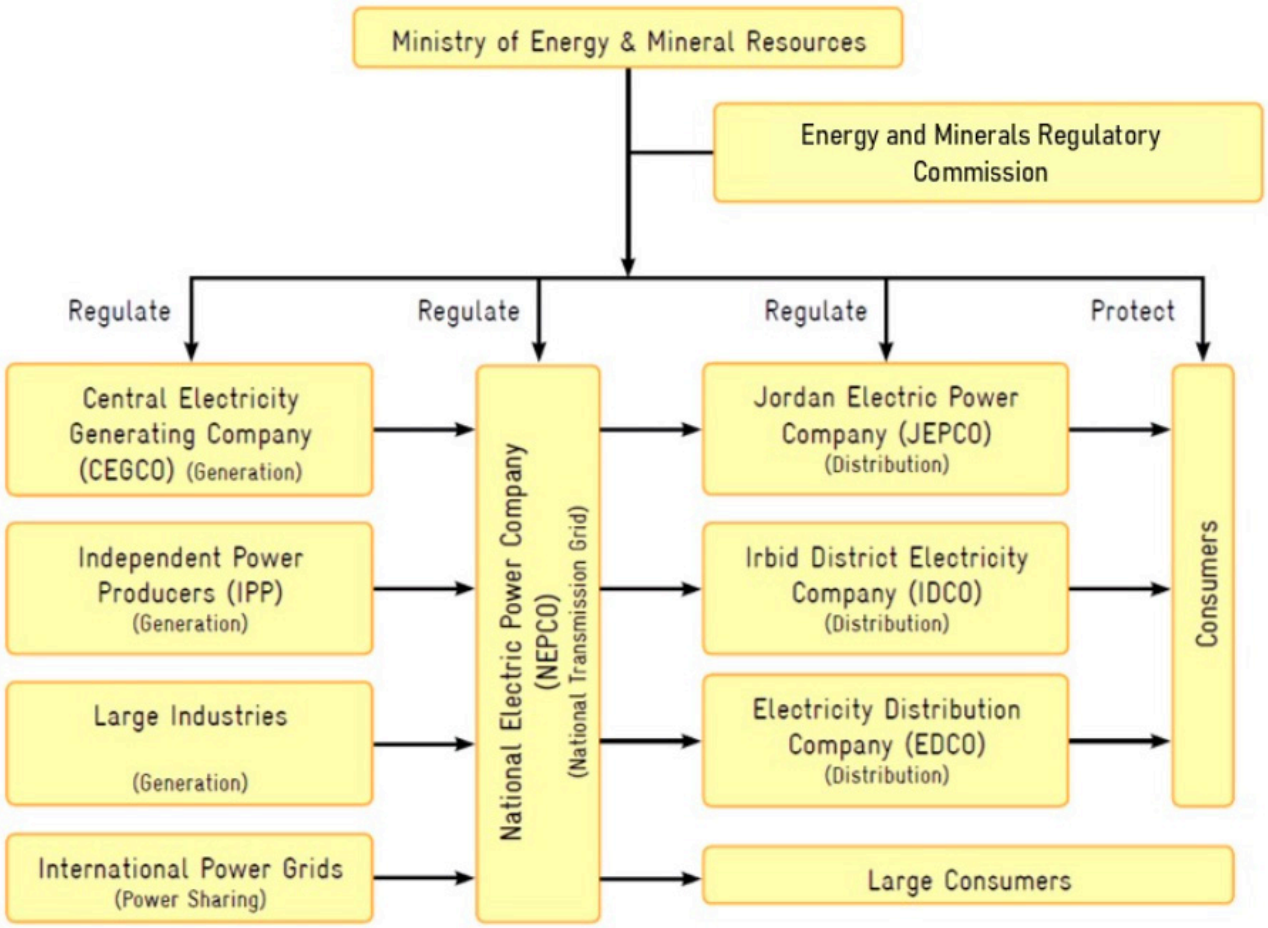
As for an oversight body on RE deployment, a new department covering renewable energy and energy efficiency is put in place within the ERA as part of its internal bylaws, with employees that are appointed according to a merit-based and transparent process. In parallel, qualified employees, with expertise in RE whenever needed, should be hired at the new companies handling the generation and generation pillars.

Modernizing Law No. 462/2002 Through Secondary Legislations

As previously mentioned, Law No. 462/2002 constitutes an umbrella law for governing Lebanon's electricity sector. One of its main advantages is that it is technology-agnostic, and has rather set the general implementable guidelines while not diving into technological details. Knowing the electricity sector is very dynamic and in continuous progress, in terms of technologies, business models, adaptive tariffication, turning consumers into prosumers, etc., modernizing this law could be continuously made

through secondary legislations, tailored to introduce new concepts and terminologies, as part of a transformative and holistic energy vision for the country, among others: the distributed renewable energy, microgrids, smart grids, artificial intelligence, blockchains, etc. and that can come as appendices to complement the existing framework.

Figure 9. Jordan Electricity Sector Structure (Knaack, 2014)



Comparative Analysis of Utilities

Drawing possible pathways for restructuring the power sector involves not only an assessment of the existing technical, organizational, legal, and financial contexts, of both the sector and EDL, but also an examination of best practices and restructuring schemes adopted in other countries.

As such, another component of this study consists of a comparative analysis of utilities in other countries in the Middle East and North Africa (MENA) region and worldwide, in order to derive lessons learned that would consequently inform the restructuring of Lebanon's electricity sector.

JORDAN

Electricity Sector Structure

Prior to being unbundled, Jordan's electricity sector structure was similar to that of Lebanon, as the Jordanian Electricity Authority (JEA) was the governmental public utility that had a monopoly on power generation, transmission, and distribution. However, in 1998, the Jordanian electricity sector was vertically unbundled, and a single buyer model was adopted. Consequently, JEA became the National Electric Power Company (NEPCO), a private company owned by the state, and which is the sole purchaser and supplier of electricity in Jordan (Camos et al., 2018; Foster et al., 2017).

Policy

The Ministry of Energy and Mineral Resources (MEMR) is responsible for setting the framework and policies for the Jordanian electricity sector. It also proposes policies to the Council of Ministers (Camos et al., 2018; Knaack, 2014; Komendantova et al., 2017).

Regulation

The Energy and Minerals Regulatory Commission (EMRC) is the regulatory body with respect to electricity, nuclear and radiation, oil shale, gas, mining, and renewable energy. EMRC is administratively and financially autonomous. Some of its responsibilities include issuing licenses (generation, transmission, distribution, system operation, and bulk supply), issuing sector regulations, setting tariffs and connection charges, contributing to setting technical and environmental standards, and advancing the competitive electricity market (AlRabadi, n.d.; Knaack, 2014; Komendantova et al., 2017).

Generation

The companies responsible for generation are the Central Electricity Generation Company (CEGCO), a public shareholding company, and Samra Electric Power Generating Company (SEPCO), a private shareholding company. Four IPPs also generate electricity in Jordan: AES Jordan, Qatrana Electric Power Company (QEPCO), Amman Asia Electric Power Company (AAEPC), and AES Levant (Camos et al., 2018; Knaack, 2014; NEPCO, n.d.).

Transmission

NEPCO, an entirely state-owned company, is the sole purchaser and supplier of power in Jordan and the owner of Jordan's transmission grid. NEPCO is also the transmission system operator and is responsible for managing and maintaining the transmission grid, procuring fuel for generation companies, which shields generation companies and IPPs from fuel price fluctuations, and importing/exporting electricity from/to other countries (Camos et al., 2018; NEPCO, n.d.).

Distribution

Three public shareholding companies (all within the private sector) are responsible for distribution in Jordan, each in a specific region. The Jordanian Electric Power Company (JEPCO) is responsible for distribution in the central part of Jordan, covering the Zarqa, Ma'daba, and Balqa governorates (excluding Central Jordan Valley). The Electricity Distribution Company (EDCO) is responsible for distribution in the southern part of Jordan, covering the Aqaba Maan, Karak, Tafila, Jordan Valley, Azraq, Safawi, Royweshed, and Reshah governorates. The Irbid District Electricity Company (IDECO), which is majority owned by EDCO, is responsible for distribution in the northern part of Jordan, covering the Irbid, Mafraq, Jerash, and Ajloun governorates (excluding Northern Jordan Valley and eastern areas) (Camos et al., 2018; Knaack, 2014).

Renewable Energy

In terms of regulatory framework targeting renewable energy, Jordan has put in place several laws, strategies, and policies, with the aim of fostering and supporting renewable energy projects in Jordan.
Some of the main ones are highlighted below and illustrated in the figure below.

National Energy Strategy

The National Energy Strategy aims to develop solar and wind resources and was the catalyst that jump-started Jordan's commitment to renewable energy, as it set a target to generates 10 percent of Jordan's electricity from renewable sources by 2020 (Komendantova et al., 2017).

National Master Strategy of the Energy Sector

The Royal Commission updated the national master strategy of the energy sector and formed a subcommittee related to the renewable energy and energy conservation sector (Komendantova et al., 2017).

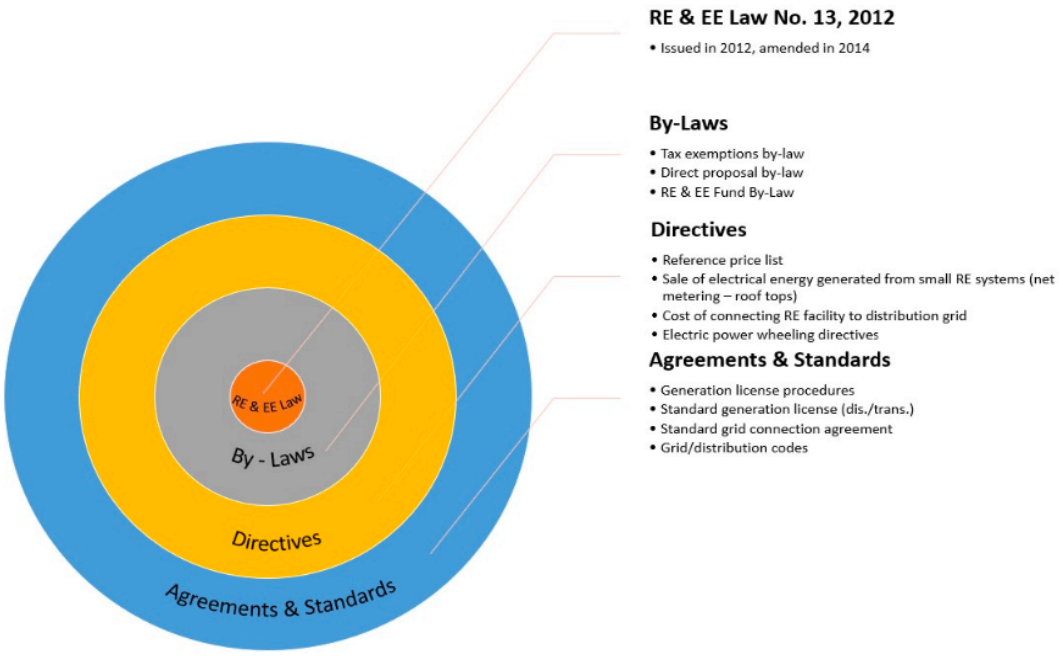
National Strategy for the Development of Renewable Resources

Part of the National Energy Strategy, the National Strategy for the Development of Renewable Resources prioritizes large-scale deployment of renewable energy sources as well as recommends the development and implementation of wind projects, in addition to the development of the Renewable Energy and Energy Efficiency Fund, which has been instrumental for Jordan's renewable energy sector (Komendantova et al., 2017).

Renewable Energy and Energy Efficiency Law (REEL)

The Renewable Energy and Energy Efficiency Law (REEL) is Jordan's main legislation targeting renewable energy, which aims to encourage private sector investments in renewable energy. REEL sets the guidelines for the implementation of renewable energies and energy efficiency measures. It also prioritizes renewable energy by requiring NEPCO and distributors to buy electricity from renewable energy projects and pay for grid connections as well as exempting systems and equipment needed for renewable energy projects from customs duties and sales tax. In addition, it established the Direct

Figure 10. Jordan's Renewable Energy Regulatory Framework (REEE, n.d.)



Proposal (DP) scheme, which allows private companies to directly negotiate with MEMR concerning renewable energy projects.

Additionally, REEL established the Renewable Energy and Energy Efficiency Fund, a tax- exempt fund used to finance the exploitation and rationalization of renewable energy sources and systems. This fund is managed by MEMR and is funded by the Jordanian government, the European Union (EU), Société de Promotion et de Participation pour la Coopération Economique (PROPARCO), and the Gulf Cooperation Council (Komendantova et al., 2017).

With respect to Jordan's institutional framework pertaining to renewables, the National Energy Research Center constitutes one of the main research institutes for renewable energy.

National Energy Research Center

The National Energy Research Center was established as part of the Royal Scientific Society and is mainly responsible for the "research, development, training in the fields of new and renewable energy, and raising the standards of energy use in the different sectors" (ESCWA, 2018a). Additionally, it is tasked with gathering "wind and solar data around the country for researchers and investors" (ESCWA, 2018a).

MOROCCO

Electricity Sector Structure

Morocco has a partially unbundled electricity sector, whereby Office National de l'Electricité et de l'Eau Potable (ONEE), the state-owned utility, still maintains a monopoly over transmission activities but has allowed private sector participation for generation and distribution activities (in addition to delegating distribution tasks to local municipal distribution utilities). Figure 11 portrays the various stakeholders in Morocco's electricity sector and the relationships between them, while Figure 12 provides a more detailed look at Morocco's electricity sector structure and its organization.

Policy

The Ministry of Energy, Mines, and Sustainable Development (MEMDD) sets the framework and policies for the energy sector (Camos et al., 2018).

Regulation

Established in 2016, the National Electricity Regulatory Authority (Agence Nationale de Régulation de l'Energie [ANRE]) is the regulatory entity for the electricity and gas markets. Its responsibilities include regulating access to the market, setting tariffs in the "free- market" portion of the electricity market, and ensuring efficient functioning of the market (Usman & Amegroud, 2019).

Figure 11. Stakeholders in Morocco's Electricity Sector (Usman & Amegroud, 2019)

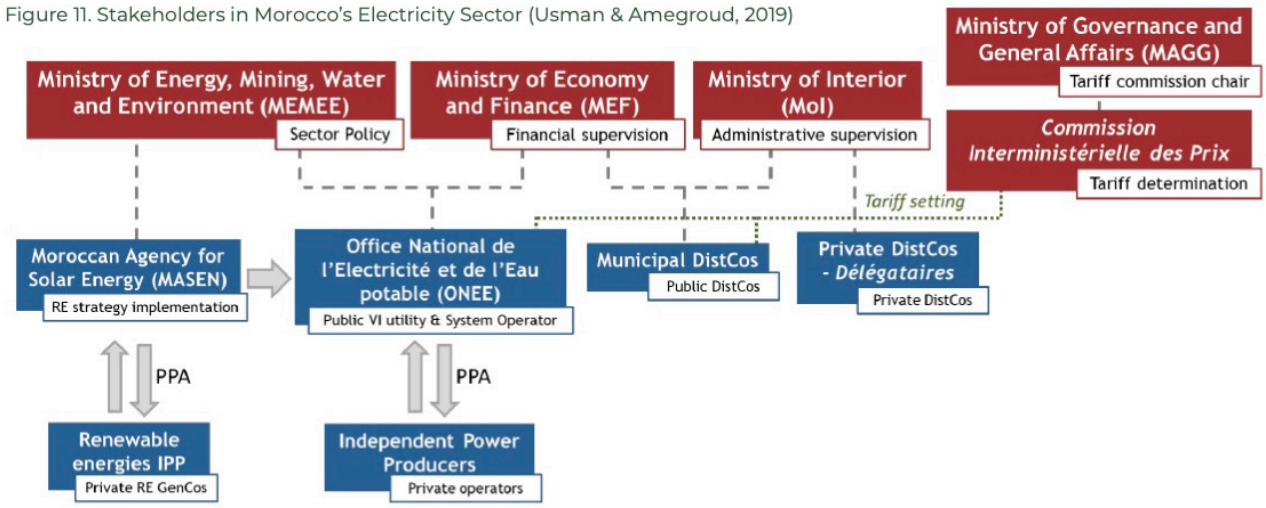


Figure 12. Morocco's Electricity Sector Structure (Khatib, 2018)

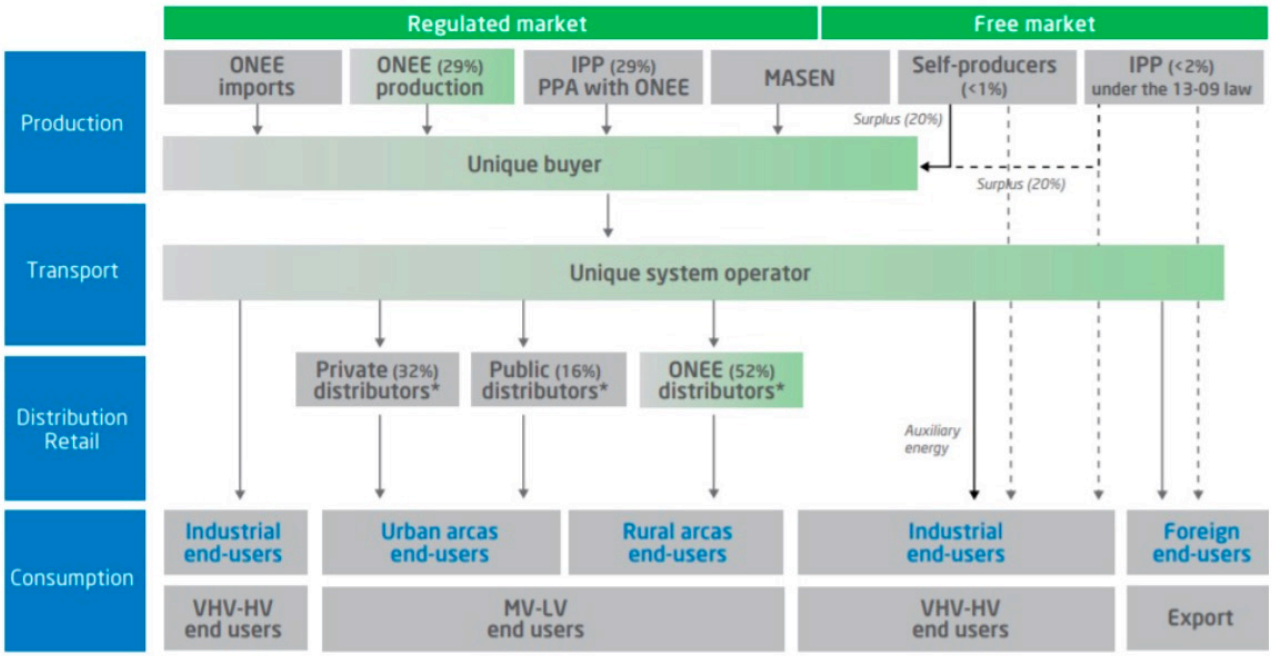


Table 4. Morocco's Municipal Distribution Utilities (Camos et al., 2018; Usman & Amegroud, 2019)

Municipal Distribution Utility	Region
RAEEF	Fès
Régie Autonome de Distribution d'Eau d'Électricité et d'Assainissement liquide de la province de Kenitra (RAK)	Kenitra
RADEEL	Larache
Régie Autonome de Distribution d'Eau et d'Électricité de Meknès (RADEM)	Meknès
Régie Autonome de Distribution d'Eau et d'Électricité de Marrakech (RADEEMA)	Marrakech
Régie Autonome de Distribution d'Eau, d'Électricité et d'Assainissement liquide des Provinces d'El Jadida et de Sidi Bennour (RADEEJ)	El Jadida
Régie Autonome Intercommunale de Distribution d'Eau et d'Électricité de Safi (RADEES)	Safi

Generation

Generation of electricity in Morocco is divided between ONEE and IPPs. ONEE is a vertically integrated state-owned utility in charge of generation, transmission, and distribution of electricity in Morocco. It is overseen by MEMDD on technical matters and by the Ministry of Economy and Finance (MEF). ONEE generates power from its own plants (Camos et al., 2018; Usman & Amegroud, 2019).

With respect to IPPs, ONEE signs PPAs with IPPs to secure a portion of the needed electricity. This is made possible by Decree Law No. 2-94-503 in 1994, which amended Decree No. 1-63-226, allowing ONEE to sign PPAs with IPPs (Camos et al., 2018; IEA, 2019; Khatib, 2018).

Transmission

ONEE is responsible for transmission in Morocco. It has a monopoly on transmission such that it is the sole purchaser and supplier of power. It is responsible for managing, operating, and maintaining the transmission grid and interconnections with other countries (Spain and Algeria) (Camos et al., 2018).

Distribution

Distribution of electricity in Morocco is divided between ONEE, local municipal distribution utilities (régies autonomes de distribution), and private distribution utilities (sociétés délégataires). ONEE owns and operates the majority of the distribution network and is thus the main distributor in Morocco. MEMDD oversees ONEE's distribution activities.

Seven local municipal distribution utilities are responsible for distribution to specific areas of Morocco. The Ministry of Interior (MoI) has administrative oversight, while MEF has financial oversight (Camos et al., 2018; Usman & Amegroud, 2019). The seven municipal distribution utilities are shown in Table 4.Three private distribution utilities manage concessions for specific areas in Morocco. The municipalities elect the private distribution utilities and grant them concessions. Molis responsible for overseeing the private distribution utilities, shown in Table 5.

Table 5. Morocco's Private Distribution Utilities (Camos et al., 2018; Usman & Amegroud, 2019)

Municipal Distribution Utility	Number
LYDEC [a]	Casablanca-Mohammedia
AMENDIS [b]	Tangier and Tetouan
REDALI [b]	Rabat-Sale
Total	1690

a Engie is the main shareholder.
b Part of Veolia.

Renewable Energy

Morocco has made significant strides with respect to renewable energy, and that is evident in its share of renewables in power generation, which reached 18 percent in 2018 (IEA, n.d.-c), the second highest among the chosen peer countries. Morocco's progress can be attributed to a comprehensive and sound regulatory framework, supported by the required institutions and incentive mechanisms.

Law No. 16-08 on Self-Production

Passed in 2008, Law No. 16-08 mainly revolved around self-production, such that it raised the self-production threshold from 10 MW to 50 MW and granted renewable power plants access to the transmission network. The law also "allowed direct awards of concession agreements for electricity generation from domestic energy resources" (ESCWA, 2018b).

Law No. 13-09 on Renewable Energies

Passed in 2010, Law No. 13-09 explicitly targets renewable energies and allows renewable energy producers to generate electricity directly for consumers connected to the medium-voltage (MV), high-voltage (HV), or very-high-voltage (VHV) networks. The law also eliminated the 50 MW ceiling for renewable power plants. Additionally, the Moroccan government reemphasized its commitment to renewable energy by setting objectives to "promote energy production from renewable sources" (ESCWA, 2018b), "subject energy-production facilities from renewable sources

to an authorization or declaration regime" (ESCWA, 2018b), and "grant an operator the right to produce electricity from renewable sources on behalf of a consumer or group of consumers connected to the MV, HV, or VHV network" (ESCWA, 2018b).

Law No. 54-14

Law No. 54-14 altered the stipulations on self-production and allowed self-producers with capacity greater than 300 MW to access the grid and sell their surplus to ONEE (ESCWA, 2018b).

In terms of institutional framework, several companies and institutes have been established to promote renewable energy in various capacities to implement renewable energy plans.

Agency for the Development of Renewable Energies and Energy Efficiency (ADEREE)

The Agency for the Development of Renewable Energies and Energy Efficiency (ADEREE) develops policies regarding energy management, in addition to developing and implementing "national and regional renewable energy and energy efficiency plans" (ESCWA, 2018b).

Moroccan Agency for Sustainable Energy (MASEN)

Established in 2010, the Moroccan Agency for Sustainable Energy (MASEN) is a publicly funded company, jointly owned by the Moroccan government, Hassan II Fund for Economic and Social Development, ONEE, and the Energy Investment Company (SIE). Initially established to lead and manage Morocco's national solar power plan, MASEN now leads and manages the deployment of all renewable energy projects. Some of its responsibilities include developing integrated projects, promoting renewable energy technologies, and fostering the national renewable energy industry by providing the needed training, capacity building, research and development, and demonstrations (ESCWA, 2018b; Khatib, 2018).

Energy Investment Company (SIE)

The Moroccan government founded the public investment company Energy Investment Company (SIE) in 2010 to oversee the Energy Development Fund. SIE's responsibilities and tasks revolve around "facilitating the diversification of energy resources and promoting renewable energy and energy efficiency" (ESCWA, 2018b).

Research Institute for Solar Energy and New Energy (IRESEN)

Established in 2009, the Research Institute for Solar Energy and New Energy (IRESEN) aims to "promote research, development, and innovation of renewable energy technologies" (ESCWA, 2018b). Some of its tasks include conducting and financing research projects and fostering a community of researchers and universities "to strengthen the knowledge of renewable and low-carbon technologies" (ESCWA, 2018b).

TUNISIA

Electricity Sector Structure

Although private sector participation has been introduced in power generation, Tunisia's electricity sector is still largely vertically integrated, with Société Tunisienne d'Electricité et de Gaz (STEG) operating as the state-owned utility maintaining a monopoly on generation, transmission, and distribution. STEG also acts as the single buyer, purchasing power from IPPs, though IPPs are only responsible for 14 percent of total production (Detoc, 2016). Figure 13 below shows Tunisia's electricity sector structure.

Policy

The Ministry of Industry, Energy, and Mines regulates and sets the overall policies, framework, and strategy for the energy sector. Agence Nationale pour la Maîtrise de l'Energie (ANME) is an entity under the administrative supervision of the Ministry of Industry, Energy, and Mines. ANME is responsible for implementing the ministry's policies and regulatory framework and for conducting research to promote energy efficiency, renewable energy, and energy substitution. ANME consists of two sections: one is focused on renewable energy projects while the other on energy efficiency (Detoc, 2016; Döring & El Golli, 2019; World Bank, 2019).

Regulation

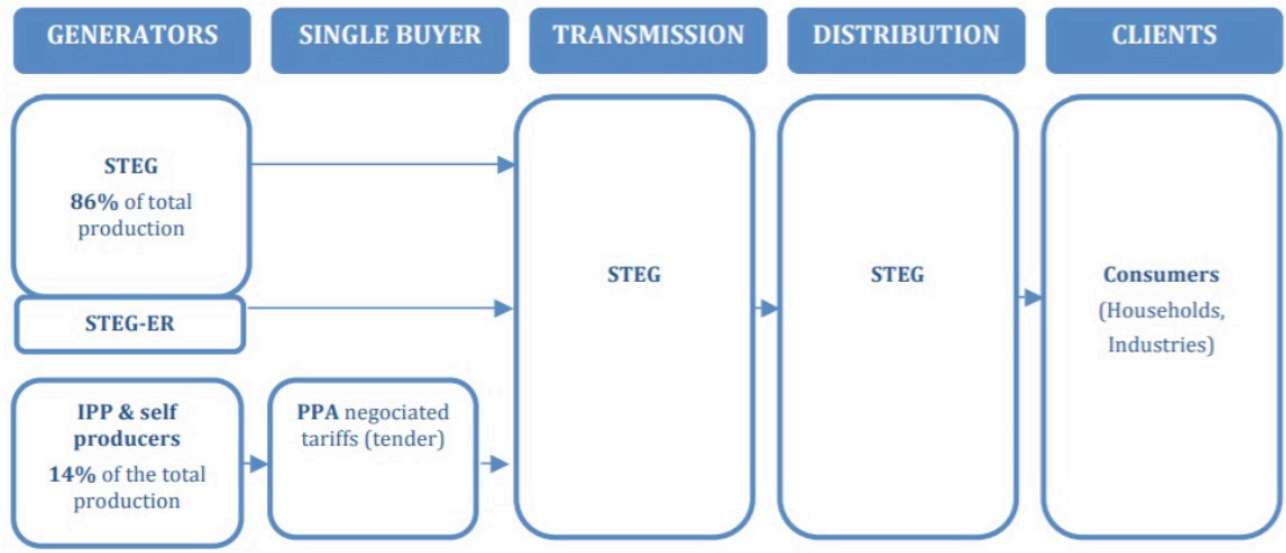
To date, Tunisia does not have an independent regulatory authority in the energy sector. The Tunisian government and ministries in charge of energy had tried to set up such authority, but the power of STEG (the state-owned utility) and the strategic interest aiming to maintain the key position in the sector has slowed down the process of such a high-level decision. STEG's primary objective is to maintain the "business as usual" situation in which it has the strong role and position allowing it to conserve its monopoly in the sector. (Döring & El Golli, 2019).

Generation

Société Tunisienne d'Electricité et de Gaz (STEG) is the state-owned company responsible for generation, transmission, and distribution of power in Tunisia. STEG has financial autonomy but is overseen by the Ministry of Industry, Energy, and Mines. STEG maintained monopoly on generation until 1996 when Law No. 96-27 (Law on Energy Production and Independent Production) was passed. Law No. 96-27 authorized the state "to grant independent producers 'IPP' concessions of power generation for exclusive sale to STEG by a PPA" (Detoc, 2016).

Currently, Tunisia's only IPPs are Carthage Power Company and Societé d'Electricité d'El Bibane, which, alongside self-producers and concessions,

Figure 13. Tunisia's Electricity Sector Structure (Detoc, 2016)



are responsible for 19 percent of electricity generation in Tunisia. The remaining 81 percent of the electricity is generated by STEG (Benedetti et al., 2013; World Bank, 2019).

Transmission

STEG has a monopoly on transmission. It is also the single buyer of electricity from IPPs, self- producers, and concessions (Benedetti et al., 2013; Döring & El Golli, 2019).

Renewable Energy

Tunisia has put in place various laws, decrees, and plans with the aim of promoting and integrating renewable energy into their energy mix. Highlighted below are some of the main ones.

Law No. 2005-82. Law No. 2005-82 set up a financing scheme to "support measures designed to rationalise energy consumption, promote renewable energies, and achieve energy substitution" (Cessac, 2014). It also introduced subsidies for "schemes generating electricity from renewable energy sources" (Cessac, 2014; ENEL, 2016).

Law No. 2009-7. Law No. 2009-7 permitted the generation of electricity from renewable energy sources for self-consumption, in addition to allowing these self-producers to sell their excess power (should be up to 30 percent of their total produced power) to STEG (Tractebel, 2019).

Law No. 2015-12. Law No. 2015-12 is the main legal instrument for renewable energy in Tunisia. It "established a legal framework governing the development of renewable energy projects" (Tractebel, 2019). It also outlines the procedures and regulatory schemes for power generation with respect to self-consumption, exclusive sale of power to STEG to meet demands and export (Detoc, 2016; Tractebel, 2019). Through these procedures and schemes, it aims to "facilitate the production, network access, and export of electricity generated by renewables" (Oxford Business Group, 2019). The law also sought to increase the contribution of renewable energy sources to 30 percent of total electricity production by 2030 (ENEL, 2016).

Decree No. 2016-1123. Decree No. 2016-1123 "set the conditions and procedures for the production and sale of electricity through renewable energy sources" (Tractebel, 2019).

Renewable Energy Action Plan 2030

The action plan outlined several goals in order to accelerate Tunisia's progress with renewable energy, some of which generate "roughly one-third of electricity with renewables by 2030" (Oxford Business Group, 2019), "adding 1000 MW of renewable-generation capacity and reducing energy consumption by 17%" for the period of 2016-2020, and "an additional 1250 MW of renewable-generation" capacity for the period of 2021-2030 (Oxford Business Group, 2019).

With respect to the institutional framework, various entities in Tunisia have been established, each with specific aims and responsibilities with respect to renewable energy, including Agence Nationale pour la Maîtrise de l'Energie (ANME) and STEG-ER.

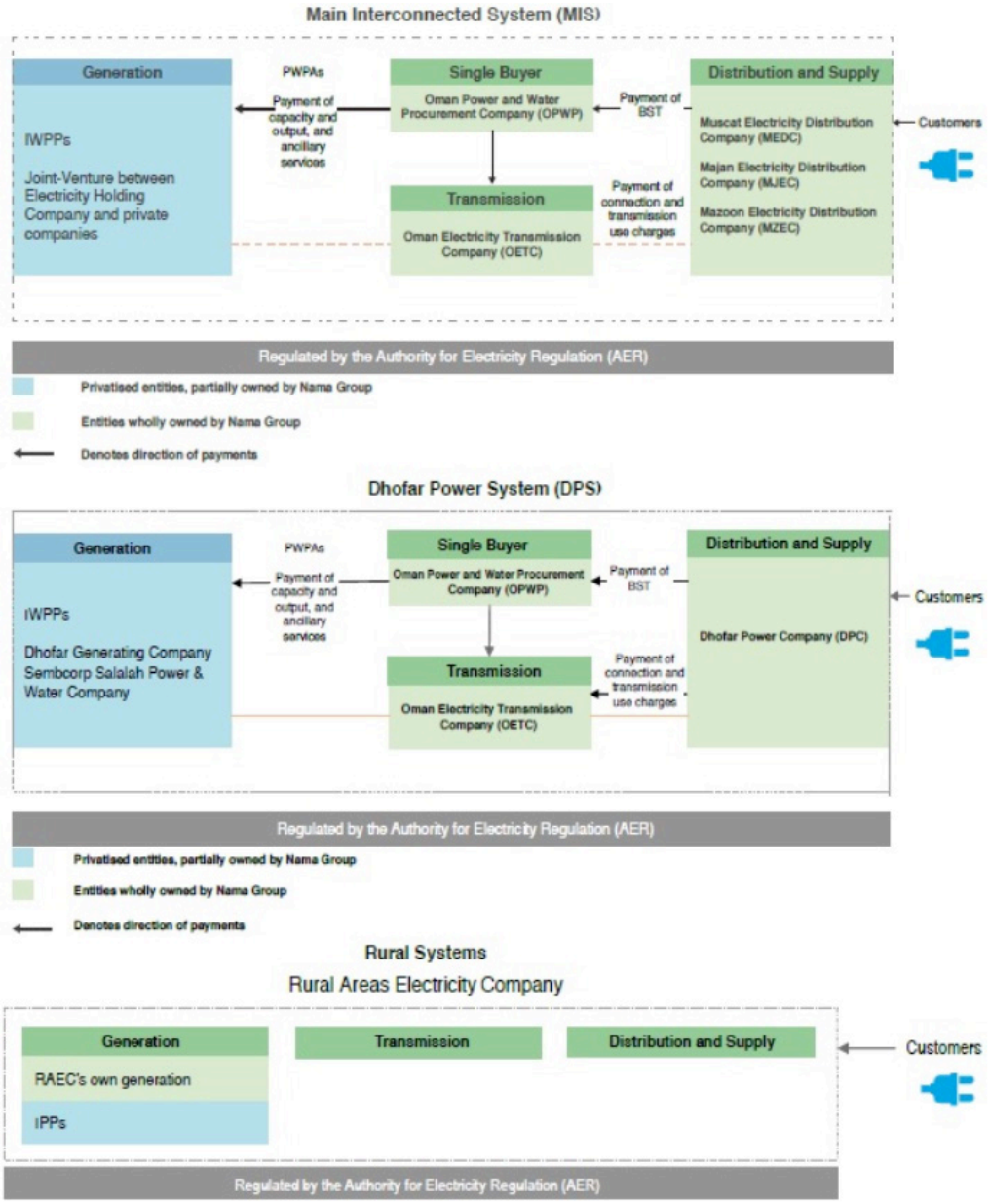
Agence Nationale pour la Maîtrise de l'Energie (ANME)

ANME is an entity under the administrative supervision of the Ministry of Industry, Energy, and Mines. It is responsible for implementing the ministry's policies and regulatory framework and for conducting research to promote energy efficiency, renewable energy, and energy substitution. ANME consists of two sections: one focused on renewable energy projects and the other on energy efficiency (Detoc, 2016).

STEG-ER

STEG-ER is the renewable arm of STEG and some of its responsibilities include the promotion of the Tunisian Solar Plan, project development (conducting feasibility and resource studies), project realization (ownership and supervision), and exploitation and maintenance (Detoc, 2016).

Figure 14. Oman's Electricity Sector Structure (Hasan et al., 2019)



OMAN

Electricity Sector Structure

Oman's electricity sector consists of three distinct isolated market segments: the Main Interconnected System (MIS), northern Oman; the Dhofar Power System (DPS), southern Oman; and the Rural System of the Rural Areas Electricity Company (RAEC) in the rural areas of Oman. MIS and DPS have single buyer models, while RAEC is vertically integrated (Hasan et al., 2019). Figure 14 below illustrates the electricity sector structure in the three regions of Oman.

Policy

The Ministry of Oil and Gas (MOG) is the policymaker for Oman's electricity sector (Oxford Business Group, 2020).

Regulation

The Authority for Public Services Regulation (APSR) is the independent regulatory body in

Oman's electricity sector. APSR is financially and administratively autonomous. It is responsible for regulating the electricity sector for issuing licenses, setting tariffs, facilitating the privatization of the electricity sector, looking further into the liberalization of the electricity sector, and integrating renewable energy into the energy mix (Authority for Public Services Regulation, n.d.-a; Hasan et al., 2019; Oxford Business Group, 2020).

Nama Holding

Nama Holding (formerly Electric Holding Company) is "a joint-stock company that is the custodian of the government's shares" in various electricity and water generation, procurement, transmission, and distribution companies (Oxford Business Group, 2020). Nama Holding is owned by Nama Group, which is owned by the Ministry of Finance (Oxford Business Group, 2020). Figure 15 below shows the government ownership structure.

Main Interconnected System (MIS)

Generation. Through PPAs with the Oman Power and Water Procurement Company (OPWP), eleven IPPs are responsible f§or generating electricity in MIS for northern Oman (Albadi, 2017; Hasan et al., 2019). OPWP, a subsidiary of Nama Holding, is the single buyer and supplier of electricity generated in Oman (MIS and DPS) (Hasan et al., 2019).

Transmission. The Oman Electricity Transmission Company (OETC), a subsidiary of Nama Holding, owns and operates the transmission MIS and DPS networks. OETC has a monopoly on transmission activities in MIS (Albadi, 2017; Hasan et al., 2019).

Distribution. Muscat Electricity Distribution Company (MEDC), Majan Electricity Distribution Company (MJEC), and Mazoon Electricity Distribution Company (MZEC) are the three state-owned companies responsible for distributing and supplying electricity in dedicated areas in the northern part of Oman, as part of MIS. MEDC, MJEC, and MZEC are all subsidiaries of Nama Holding (Albadi, 2017; Nama, n.d.).

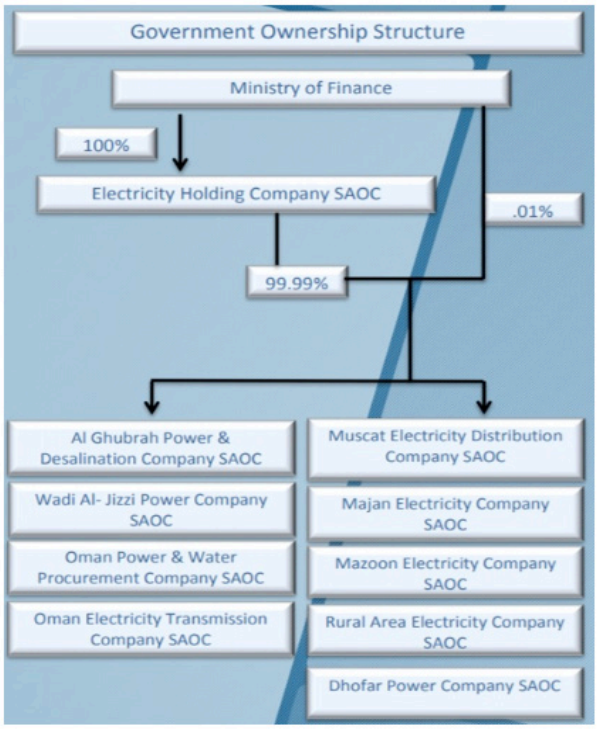
Dhofor Power System (DPS)

Generation. Through PPAs with OPWP, Dhofar Generating Company and Sembcorp Salalah Power & Water Company are the two IPPs responsible for electricity generation in DPS. OPWP is the sole buyer and seller of electricity generated in Oman (MIS and DPS) (Hasan et al., 2019).

Transmission. The Oman Electricity Transmission Company (OETC), a subsidiary of Nama Holding, is the transmission system operator (TSO) that owns and operates the transmission MIS and DPS networks. OETC has a monopoly on transmission activities in DPS (Albadi, 2017; Hasan et al., 2019).

Distribution. Dhofar Power Company (DPC), a subsidiary of Nama Holding, is responsible for the distribution and supply of electricity in southern Oman (Albadi, 2017; Nama, n.d.).

Figure 15. Government Ownership Structure (Al Hinai, n.d.)



Rural System of the Rural Areas Electricity Company (RAEC)

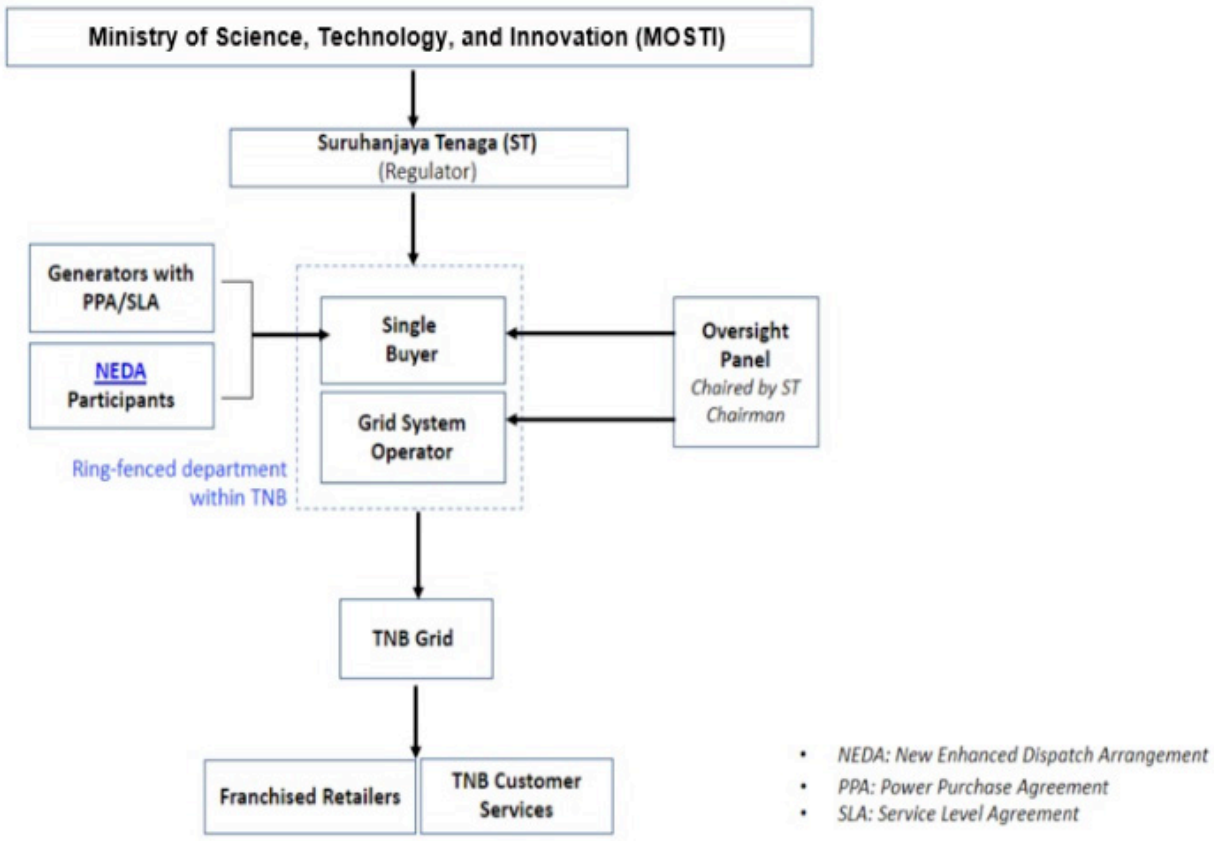
Generation, Transmission, Distribution. The Rural Areas Electricity Company (RAEC; Tanweer) is the vertically integrated utility responsible for generation, transmission, and distribution of electricity in the rural areas of Oman. In addition to RAEC's own generation, two IPPs (Musandam Power Company and Bahwan Astonfield Solar Power) also generate electricity for the rural areas (Authority

for Public Services Regulation, n.d.-b; Hasan et al., 2019).

Renewable Energy

Oman lacks both a holistic regulatory framework and appropriate institutional framework targeting renewable energy. In fact, "renewable energy resources such as solar and wind energy are currently limited to niche applications" (IRENA, 2014). The Residential Solar PV Rooftops Initiative (Sahim Initiative) is an example of such niche applications. The former Authority for Electricity Regulation (now The Authority for Public Services Regulation) developed a regulatory framework to "allow distribution companies to act as agents for OPWP … to buy rooftop PV-generated electricity from consumers, establish minimum technical standards for rooftop PV, and establish an incentive mechanism to compensate for electricity generated by rooftop PV panels" (Al Ghaithi, 2017; IEA, n.d.-a).

Figure 16. Peninsular Malaysia's Electricity Sector Structure (Single Buyer, n.d.)



MALAYSIA (PENINSULAR MALAYSIA)

Electricity Sector Structure

Similar to Oman, Malaysia's electricity sector consists of three geographically distinct structures in the state of Sabah, the state of Sarawak, and Peninsular Malaysia (covered in this paper). The electricity market structure in Peninsula Malaysia is that of a single buyer model, as illustrated in Figure 16 below.

Policy

The Ministry of Science, Technology, and Innovation (MOSTI) (formerly the Ministry of Energy, Science, Technology, Environment, and Climate Change [MESTECC]) and the Energy Section of the Economic Planning Unit under the prime minister's department are responsible for setting the policies and framework for the energy sector (Jalal & Bodger, 2009; The Oxford Institute for Energy Studies, 2021).

Regulation

The Energy Commission (EC) is the independent regulatory entity responsible for "regulating the power sector, enforcing rules on licensees' electricity supply infrastructure, and administering the Single Buyer Rules" (The Oxford Institute for Energy Studies, 2021).

Generation

Tenaga Nasional Berhad (TNB) Generation and IPPs (under PPAs or SLAs) are responsible for generating electricity in Peninsular Malaysia and selling it to the Single Buyer Department of TNB (ring- fenced entity within TNB). The single buyer "conducts electricity planning, manages electricity procurement services, oversees least-cost dispatch scheduling, and manages the PPAs and the settlement processes" (Abdul Aziz & Khor, 2020; The Oxford Institute for Energy Studies, 2021).

"The Grid System Operator (GS) (ring-fenced entity within TNB) is responsible for operational planning, real-time scheduling, dispatch, and control of the Peninsular grid system" (The Oxford Institute for Energy Studies, 2021). GSO is also responsible for coordinating all the generation, transmission, and distribution systems that are connected to the grid (Aris, Jørgensen, & Hussain, 2019).

Transmission and Distribution

TNB Transmission and TNB Distribution are responsible for transmitting and distributing the purchased electricity to the customers via retailers (Abdul Aziz & Khor, 2020; The Oxford Institute for Energy Studies, 2021; TNB, n.d.).

Retail

Electricity retail is performed by TNB Retail and franchised retailers to sell electricity to the customers in Peninsular Malaysia (Abdul Aziz & Khor, 2020; The Oxford Institute for Energy Studies, 2021; TNB, n.d.).

Renewable Energy

Malaysia has developed policies and legislation targeting renewable energy, such as the National Renewable Energy Policy and Action Plan and the Renewable Energy Act 2011, which are supported by the Sustainable Energy Development Authority (SEDA).

National Renewable Energy Policy and Action Plan

The National Renewable Energy Policy and Action Plan aims to promote renewable energy generation and enhance "the utilization of renewable energy resources to contribute towards national electricity supply security and sustainable socio-economic development" (Ghazali & Ansari, 2018).

Renewable Energy Act 2011 (REA)

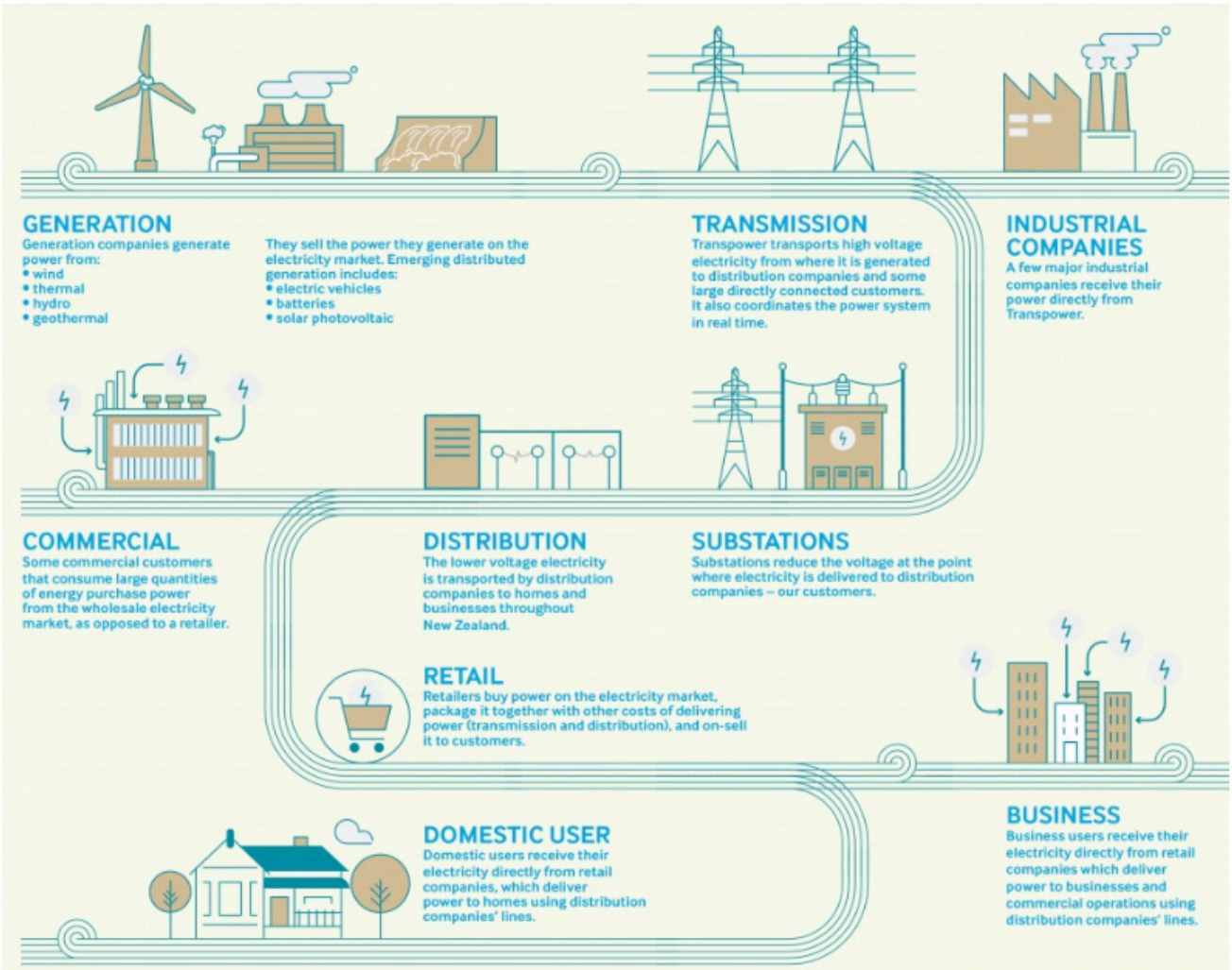
The Renewable Energy Act 2011 (REA), implemented under the Sustainable Energy Development Authority Act 2011 (SEDA), is the main legislation targeting renewable energy in Malaysia. REA "aims to increase the generation of electricity from renewable sources of energy by establishing and implementing a feed-in-tariff system, which will allow producers and users to sell excess power to the national power grid" (ECOLEX, n.d.; Lian & Abdul Majid, 2016).

Accompanying REA are other relevant sub-legislation, namely Renewable Energy (Feed-In Approval and Feed-In Tariff Rate) Rules 2011, Renewable Energy (Renewable Energy Power Purchase Agreement) Rules 2011, and Renewable Energy (Technical and Operational Requirements) Rules 2011 (Abdul Aziz & Khor, 2020).

Sustainable Energy Development Authority (SEDA)

SEDA is "a statutory body formed under the Sustainable Energy Development Authority Act 2011 to administer and manage the implementation of the feed-in tariff mechanism under the Renewable Energy Act 2011" (Abdul Aziz & Khor, 2020).

Figure 17. New Zealand's Electricity Sector Supply Chain (Transpower, 2018)



NEW ZEALAND

Electricity Sector Structure

As portrayed in Figure 17 below, the electricity market structure in New Zealand is that of a wholesale competition market, with retail competition.

Policy

The Ministry of Energy and Resources is responsible for all primary legislation and policy for the energy and electricity sector. The Ministry of Business, Innovation & Employment (MBIE) is the steward of the energy markets regulatory system. It leads the system strategy and advice on energy policy and monitors the energy policy environment (Ministry of Business, Innovation & Employment, 2018).

Regulation

The Electricity Authority is the entity that oversees and regulates the electricity sector in New Zealand. It sets the market rules, enforces them, and monitors the market's performance, "The Commerce Commission is responsible for enforcing laws relating to competition and fair trading. Its regulatory responsibilities in the energy markets regulatory system include the electricity lines companies and gas pipelines sectors" (Ministry of Business, Innovation & Employment, 2018).

Generation

Five companies are responsible for generating electricity in New Zealand: Genesis Energy, Mercury, Meridian Energy, Contact, and Trustpower. These companies own and operate the generation power plants. Contact and Trustpower are private companies, while the government owns Genesis Energy, Mercury, and Meridian Energy (government holds majority stake). The generation companies submit offers to sell the generated electricity on the wholesale market (Electricity Authority, 2018; Ministry of Business, Innovation & Employment, n.d.).

Transmission

Transpower is the state-owned enterprise that owns and operates New Zealand's transmission network and "is responsible for new grid investments and … all transmission development processes" (Electricity Authority, 2018).

Distribution

There are 29 lines companies that are responsible for distribution of electricity in New Zealand. Twelve of these companies are community-owned trusts, while the remaining 17 are public companies (Electricity Authority, 2018; Powerco, n.d.).

Retail

The five generation companies are also the retailers that sell electricity to the customers (i.e. vertical integration between generation and retail) (Electricity Authority, 2018; Worksafe, 2017). Retailers make bids to "buy electricity at wholesale (spot and contract) prices from generating companies and transmission or distribution services from lines companies" (Electricity Network Association, n.d.).

Renewable Energy

National Policy Statement for Renewable Electricity Generation 2011 (NPS)

The National Policy Statement for Renewable Electricity Generation (NPS) aims to promote renewable energy developments and provides "guidance for local authorities on how renewable electricity generation should be dealt with in Resource Management Act 1991 (RMA) … regional policy statements, regional plans, and district plans" (Ministry for the Environment, 2019; Trixl, 2020). NPS "promotes a more consistent approach to balancing the competing values associated with the development of New Zealand's renewable energy resources when councils make decisions on resource consent applications" (Trixl, 2020).

Key Takeaways And Lessons Learned

All six peer countries serve as examples from which key takeaways and lessons can be drawn to guide and inform Lebanon's path to unbundling its electricity sector and increasing the integration of renewable energy into its energy mix. These takeaways and lessons revolve around policy incrementalism, the successful unbundling of an electricity sector, the flexibility and adaptability of an electricity sector, the importance of a regulator, and the importance of a comprehensive regulatory framework targeting renewable energy.

Policy Incrementalism

Both Morocco and Malaysia illustrate how policy incrementalism is a viable and effective way to gradually transition to an unbundled electricity sector without introducing sharp and immediate change that could disrupt the sector and result in political gridlock. This is especially important for Lebanon's case, whose electricity sector is highly contended and a cradle of political discord in Lebanon.

While the state-owned utility ONEE still maintains a monopoly on transmission and most of the distribution, policy incrementalism has allowed Morocco to slowly transition into a partially unbundled electricity sector by opening up to the private sector in the form of IPPs through PPAs, without clashing with legacy actors and entities, such as ONEE (Usman & Amegroud, 2019). Similarly, prior to adopting its current single buyer model, Malaysia had already been contracting with IPPs, which facilitated the transition to the single buyer model without introducing significant disruptions to the electricity sector (Aris et al., 2019). As such, both the Moroccan and the Malaysian examples illustrate how minor steps to moving to a single buyer model can ultimately greatly facilitate this final transition.

Unbundling the Electricity Sector

With respect to unbundling their electricity sectors, Jordan, Oman (specifically the Main Interconnected System [MIS] and the Dhofar Power System [DPS]), and Peninsular Malaysia serve as adequate and suitable examples for Lebanon, all of whom have adopted single buyer models following their unbundling. In particular, Jordan could represent the model peer country for Lebanon, given their similarities in geographic locations, economic indicators, demographics, and some energy indicators, as shown in Figure 18 below.

One distinction to note between the single buyer models of Jordan, Oman's MIS and DPS, and Peninsular Malaysia is that the single buyer and the transmission system operator are separate entities in Oman (MIS and DPS) and Peninsular Malaysia, while in Jordan they are merged into one company, NEPCO. Moreover, in Peninsular Malaysia, while the two entities are still owned by TNB, the single buyer and transmission system operator have been ring-fenced, which involves the separation of accounts

Figure 18. Comparison Between Lebanon and Jordan

Country	Economic Measures			Demographics	Energy Profile (2018)				
	GDP (2019) ($ USD)	GDP per capita (2019) ($ USD)	Debt/GDP (2018)	Population (2018)	Electricity consumption	Total Energy Supply by Source	Electricity Generation by Source	Share of Renewables in Power Generation	Net Energy Imports
Lebanon	51.992 billion	7,583.66	151.03%	6.855 million	19.0 TWh	Oil: 8,145 ktoe Natural gas: 212 ktoe Biofuels and waste: 155 ktoe Coal: 170 ktoe Wind, solar, etc.: 68 ktoe Hydro: 30 ktoe	Oil: 20,814 GWh Natural gas: 987 GWh Hydro: 348 GWh Solar PV: 68 GWh Wind: 6 GWh	2%	8.6 Mtoe
Jordan	44.503 billion	4,405.49	94.41%	10.101 million	19.5 TWh	Oil: 4,955 ktoe Natural gas: 3,438 ktoe Biofuels and waste: 99 ktoe Coal: 205 ktoe Wind, solar, etc.: 400 ktoe Hydro: 2 ktoe	Oil: 1,346 GWh Natural gas: 16,948 GWh Hydro: 23 GWh Solar PV: 1,441 GWh Wind: 720 GWh Biofuels: 4 GWh	11%	8.8 Mtoe

and operations. Ring- fencing was done in an effort to address the imperfect competition resulting from the presence of only one buyer, which had left the model "prone to corruption, weakening payment discipline, and imposing large contingent liabilities on the government" (Aris et al., 2019). Aris et al. (2019) mention that ring-fencing constituted a prerequisite for the reform undertaken in Peninsular Malaysia's electricity sector, which aimed "to improve the efficiency of regulated entities and give greater transparency to customers." In fact, an energy expert further validates this by pointing out a critical prerequisite to unbundling Lebanon's electricity sector is the separation of financial accounts of the different departments to be unbundled within EDL.[39]

Flexibility and Adaptability

Another important lesson that Lebanon can learn from lies in the flexibility and adaptability of Morocco's electricity sector. As discussed earlier, Morocco did not adopt a specific power sector reform model; rather it reformed its sector and introduced changes in a way that fit its needs to perform the desired functions. In fact, a World Bank case study by Usman & Amegroud (2019) highlights, "despite not conforming to the textbook model, Morocco's power sector institutional arrangements performed the necessary commitment, coordination, and cooperation functions to achieve energy sector objectives of attracting private investments to boost installed generation capacity and output." Thus, this illustrates the importance of placing more weight on the institutions' functions and duties rather than their forms and structures, an observation supported by various literature (Usman & Amegroud, 2019).

Regulator

Another important aspect of any developed electricity sector is the presence of a regulatory authority, an element shared by the selected peer countries, with the exception of Tunisia. In their case study, Usman and Amegroud (2019) point out that the absence of a regulator leads to "poor regulatory governance and limited application of best practice methodologies for tariff regulation," in addition to compromising accountability and autonomous decision making, which highly affect cost recovery and quality of service.

Similar to Lebanon, Tunisia has had difficulties in establishing a regulatory authority because of vested interests in maintaining the status quo within the electricity sector. In an effort to conserve its monopoly, STEG, Tunisia's state- owned utility, has hindered the establishment of such a regulatory authority and has sought to hold on to its power and key position within the sector (Döring & El Golli, 2019).

In the long run, if Lebanon were to move to a wholesale electricity market in the long run, attention should be given to another type of regulatory entity, after having established a national regulatory authority, as is illustrated in New Zealand's case. Other than the Electricity Authority, the main regulatory authority overseeing the electricity sector, New Zealand established the Commerce Commission, which is a separate regulatory entity dedicated to maintaining fair trade and upholding competition law in the sector. The importance of such an entity lies in the protection of consumers and the prevention of collusion among actors in various segments of New Zealand's wholesale electricity market (Ministry of Business, Innovation & Employment, 2018).

Comprehensive Renewable Energy Regulatory Framework

Also emphasized is the importance of a comprehensive renewable energy regulatory f ramework to strengthen and solidify a country's commitment to renewable energy. For instance, in addition to developing a national energy strategy with achievable targets, Morocco has a clear and comprehensive legal and institutional framework that has supported the development of its renewable energy sector. Morocco had also put in place the necessary financial incentive mechanisms, another key driver of renewable energy in Morocco. Some of these financial incentive mechanisms include the EnergiPro Program, competitive bidding contracts, and the Global Rural Electrification Programme (PERG). For instance, the EnergiPro Program allows ONEE to guarantee "the purchase of all renewable energy produced in excess of the company's needs at an incentive tariff" (ESCWA, 2018b). PERG enabled the electrification of rural areas through the installation of small off-grid PV systems, of which "ONEE covered more than 60% of the equipment and administrative costs" (ESCWA, 2018b). All the above have contributed in driving Morocco's progress in the renewable energy sector, thus increasing its share of renewables to 18 percent of its energy mix in 2019 (IEA, n.d.-c).

39 KII 19, 2021

Jordan is another country among the selected peer countries that has made significant progress regarding the integration of renewables into its energy mix, which was around 11 percent in 2018 (IEA, n.d.-b). Similar to Morocco, Jordan's progress can be attributed to its regulatory framework, mainly REEL and its associated bylaws and directives, alongside the necessary incentive mechanisms, such as the feed-in tariff system, the direct submission proposal procurement scheme, competitive tenders, and others (ESCWA, 2018a).

Thus, Jordan is a prime example illustrating how its overall energy vision and strategy and comprehensive regulatory framework were key elements in securing the needed financing to reform its electricity sector and accelerate its transition to renewables. In fact, Jordan has been able to attract an array of private actors; all of whom are significant players in the investor and lender community, in order to financially support the renewable energy projects and IPPs.[40] However, in parallel to its fast and ambitious transition to renewables, Jordan had also signed "long-term agreements for gas and oil purchases" (Vidal, 2020), thus "tying it to the fossil fuel industry" (Vidal, 2020). These gas and oil contracts clash with Jordan's long- term take-or-pay PPAs for renewables, which, alongside the absence of phasing out plans for traditional thermal power plants (Obeid, 2019), have played a part in slowing down Jordan's transition to renewables. This has also contributed to creating "a supply and demand mismatch" and "generation capacity both from renewable and conventional sources kept surging, exceeding electricity demand growth" (Khashman & Schmidt-Haupt, 2021). In fact, in 2019, Jordan's installed generation capacity was 5.7 GW, while the maximum load event was only 3.4 GW (Khashman & Schmidt- Haupt, 2021).

Unlike Morocco and Jordan, Oman lacks a comprehensive and holistic regulatory and institutional framework for renewable energy, which has led to limited, dispersed, and niche applications of renewable energy, such as the Residential Solar PV Rooftops Initiative (Sahim Initiative) (IEA, n.d.-a; IRENA, 2014). This illustrates the critical role a country's regulatory and institutional framework plays in driving and strengthening the integration of renewable energy.

Besides renewable-centered legislation, other policy instruments that may not explicitly target renewable energy also play a vital role in promoting and accelerating the adoption of renewable energy technologies, as is illustrated in New Zealand's case. Apart from its National Policy Statement for Renewable Electricity Generation, New Zealand has put in place the Emissions Trading Scheme—a cap and trade system—and the Zero Carbon Legislation) (Trixl, 2020), which have been instrumental drivers of renewable energy integration. This is evidenced by New Zealand's high share of renewables in power generation, which was around 83 percent in 2018 (IEA, n.d.-d).

39 KII 19, 2021

The Future of EDL and the Way Forward

The aforementioned sections, along with the conducted legal assessment, clearly show that Law No. 462/2002 is an umbrella law that governs Lebanon's electricity sector that should be implemented as is, since it includes a framework of the needed pillars to move forward with its unbundling by tackling institutional, technical, financial, and human resources aspects.

As it had been ratified back in 2002, the evolution of the electricity sector has been happening at a very rapid pace through innovative technologies; the latter could be tackled through secondary legislations that do not contradict the spirit of the law, to support it and enforce its implementation.

Moving forward, implementing the law without any amendments will have to take into consideration the following essential recommendations:

On governance and policy levels

- Initiate the process of appointing highly qualified ERA members, according to transparent selection criteria.
- Appoint ERA members and issue the necessary decrees with respect to the transition period that allow ERA to form its internal bylaws.
- Launch an audit of EDL assets in preparation for its unbundling.
- Implement the steps included in the timeline detailed in Figure 7.

Unbundling of the electricity sector

Generation

- For existing power plants: Issue the necessary decrees allowing private companies to become a shareholder at a maximum of 40 percent of the publicly owned generation company/companies each.
- Follow the process detailed under New Power Plants of this paper regarding the public tenders and/ or solicitation.

In the current business-as-usual scenario and the state of emergency the country is living, and if a serious decision and will to reform the electricity sector is made, two generation licenses could be exceptionally granted for two immediate power plants under EPC contracts (Der Aamar 2 and Zahrani 2), while kicking-off the process of ERA appointments, and whose ownership remain for the publically-owned generation company. Those tenders should be made according to the tender board requirements and through transparent procurement measures.

Transmission

Issue the necessary decree by the CoM to form the fully publicly owned (100 percent) transmission company that will be responsible for grid infrastructure, while taking into account the possibility of contracting the private sector for O&M activities.

Distribution

- Issue the necessary decrees allowing private companies to become a shareholder at a maximum of 40 percent of the publicly owned distribution company/companies each.
- Assess and determine the number and geographical jurisdiction of distribution companies, according to grid considerations (substation location, number of subscribers, etc.), based on the MoEW's national plan for the distribution sector.
- The level of autonomy between the DSPs and EDL shall be reviewed to remove any bottlenecks and allow DSPs to act more independently while setting boundaries between the scope of the public utility and private companies.

In the current business-as-usual scenario, and if current DSP models are to be maintained and/ or renewed (contracts expected to end by December 31, 2021), an audit of those contracts should be conducted, and new contracts are to be issued based on KPIs and audit results. If new companies are to be involved in the process, this should be

done according to the tender board procurement guidelines. The new contracts' terms will expire at the completion of the unbundling process.

Human Resources

The process detailed under ERA's and EDL's Human Resources of this paper on terminating, merging, and distributing current EDL/MoEW employees among the ERA and the newly formed private companies is clearly stated in Law No. 462/2002 (article 45) and its subsections.

Renewable Energy

- Issue the necessary decrees allowing private companies to become a shareholder at a maximum of 40 percent of the publicly owned distribution company/companies each.

- Assess and determine the number and geographical jurisdiction of distribution companies, according to grid considerations (substation location, number of subscribers, etc.), based on the MoEW's national plan for the distribution sector.

- The level of autonomy between the DSPs and EDL shall be reviewed to remove any bottlenecks and allow DSPs to act more independently while setting boundaries between the scope of the public utility and private companies.

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Appendix A

The comparative spreadsheet is also located at the following link: https://docs.google.com/spreadsheets/d/1cYY7cyK4m89PJUBJt4QoKpBbY7HFAWSOiYJcWUieg9c/edit#gid=0

Appendix B

Decision No. 4 issued on 9/10/1967.المالي النظام. EDL formation. Almoustashar Electronic Version.

Decree No. 4517 issued on 13/12/1972. العامة للمؤسسات النظام العام. Almoustashar Electronic Version.

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