



# LEBANON POWER SECTOR EMERGENCY ACTION PLAN

2020



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POWER SECTOR  
EMERGENCY  
ACTION PLAN  
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# ACRONYMS

|         |   |
|---------|---|
| AFD     | Agence Française de Développement                             |
| AGP     | Arab Gas Pipeline   |
| AMI     | Advanced Metering Infrastructure                              |
| BDL     | Banque du Liban   |
| CMS     | Commercial Management Systems                                 |
| COM     | Council of Ministers  |
| CSC     | Civil Service Council   |
| DCUs    | Data Concentrator Units                                       |
| DSPs    | Distribution Service Providers                                |
| EBRD    | European Bank for Reconstruction and Development              |
| EDF     | Electricité de France   |
| EDL     | Electricité du Liban  |
| EE      | Energy Efficiency   |
| EIB     | European Investment Bank                                      |
| EPA     | Exploration and Production Agreement                          |
| ERP     | Enterprise Resource Planning                                  |
| FSRUs   | Floating Storage Regasification Units                         |
| GDP     | Gross Domestic Product  |
| GEFF    | Green Economy Financing Facility                              |
| GRM     | Grievance Redress Mechanism                                   |
| HFO     | Heavy Fuel Oil  |
| HV      | High Voltage  |
| ICDF    | International Cooperation and Development Fund                |
| IFRS    | International Financial Reporting Standards                   |
| IPP     | Independent Power Producer                                    |
| IT      | Information Technology  |
| KTONS   | Kilo Tons   |
| KWH     | Kilowatt Hour   |
| LCEC    | Lebanese Center for Energy Conservation                       |
| LEEREFF | Lebanon Energy Efficiency & Renewable Energy Finance Facility |
| LOI     | Lebanese Oil Installations                                    |
| LV      | Low Voltage   |
| MENA    | Middle East and North Africa                                  |
| MEW     | Ministry of Energy and Water                                  |
| MFA     | Ministry of Foreign Affairs                                   |
| MOF     | Ministry of Finance   |
| MOU     | Memorandum of Understanding                                   |
| MV      | Medium Voltage  |
| NEEAP   | National Energy Efficiency Action Plan                        |
| NEEREA  | National Energy Efficiency and Renewable Energy Action        |
| NREAP   | National Renewable Energy Action Plan                         |
| PPAs    | Power Purchase Agreements                                     |
| RE      | Renewal Energy  |
| RFP     | Request for Proposal  |



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# PREFACE

Lebanon has significant potential for economic growth but has historically had to contend with a myriad of economic, social, and geopolitical challenges on the path to fully achieving this potential. The latest crisis created by the coronavirus only compounds difficulties facing the country. The economic and financial crisis that the country was dealing with before the current pandemic hit had its roots in years of inaction in the face of a developing storm. Although not the cause of this storm, challenges in the power sector have significantly contributed to this storm and emerged as symptomatic of the governance issues at the heart of the storm.

While the governance issues require deeper public introspective about the country's direction and its cultural and social underpinnings, power sector challenges, which have ripple effects throughout Lebanon's economy and society, must be addressed effectively to reduce the fiscal pressures they create on the economy. Chronic power shortages affect household welfare and business activities, and reliance on heavy fuel oil and diesel for Electricity production by both the national utility and private generators has harmful health and environmental effects. The large subsidies to the sector drain public resources and add to unsustainable debt levels. These issues are interlinked and create a vicious cycle which also causes widespread mistrust among the population. Inaction, therefore, is not an option.

This Paper is a summary of the World Bank's analysis of the prevailing challenges in Lebanon's power sector and proposal for a way forward to address them. The priority actions are recommended from a technical perspective, that is, they are based on the World Bank's own assessment, its knowledge of international best practices as they apply to Lebanon's particularly complex environment, and its experience working with other countries on similar issues. Ultimately, the choices made and trade-off between priority actions should be developed further by the government in close consultation with the Lebanese Citizens and embedded within a comprehensive agenda to tackle the country's broader economic, fiscal, and social challenges.

While the technical problems facing Lebanon's power sector are not unique, past experience shows that Lebanon has been unable to mobilize the political commitment needed to take swift action. Many of the past failures are linked to the lack of transparency, poor sector governance and weak institutional oversight of the Energy Sector, leading to frequent policy reversals and inability to sustain implementation of multi-year reform and investment programs. The Paper, therefore, tackles Governance and institutional capacity head-on as it recommends a comprehensive plan to turn around the sector along four dimensions: (i) Governance; (ii) Security of supply; (iii) Financial stability; and (iv) Environmental sustainability. Setting a strong foundation for transparent governance in the sector requires: an autonomous regulator empowered to safeguard the sector's transparency and accountability, an efficient utility accountable to the public, and a Ministry with sufficient capacity to provide long-term planning and effective oversight. Ensuring *security* of supply means that new efficient thermal and renewable power plants should be procured immediately under a credible least-cost plan using transparent and competitive procurement processes. Recovering financial *stability*, which would ensure that the sector is no longer dependent on state subsidies, depends on switching to less expensive fuel – natural gas – and reducing fraud and non-payment. Finally, the sector can transition toward a *sustainable* pathway by integrating renewable and energy efficiency options. Elements of these actions were part of the Government's 2010 and 2019 updated Sector Policy, but many have not been implemented.

These actions are to be implemented within the first 100 days and 12 months of the new Government coming to office and a priority for both the sector and Lebanon's political and socio-economic stability. Delays and omission of any action would risk returning the sector to the vicious cycle that is now threatening to cripple the economy. The Paper, nevertheless, only proposes the broad direction and options for each action. The concrete design of the actions needs to be further elaborated by the Government initially in a vision statement that would then be expanded into a concrete time-bound reform plan through an inclusive consultative process with technical experts and the wider public. The World Bank Group stands ready to support Lebanon implement this bold but urgently needed reform program, through both technical and financial assistance, so that this vital sector can be set on a sustainable path and contribute again to the socio-economic development of the country.





# KEY MESSAGES

- » Lebanon's power sector has long been at the center of the country's economic and fiscal challenges as it adds to the high fiscal and trade deficits, requiring significant government subsidies due to inefficient costs and underpricing;
- » The power sector has been unable to secure adequate supply to electricity consumers, severely impacting economic and social development, and creating a public trust deficit that goes far beyond the technical and fiscal challenges;
- » Solutions to the sector's challenges have been extensively studied and largely agreed on at a technical level, but political will remains the key missing ingredient in progressing these solutions;
- » Prior actions in the sector amounted largely to crisis management, prioritizing speed over addressing the structural issues and sector sustainability based on proper planning and timely decision-making that are at the heart of sector woes;
- » The new Government should expeditiously confirm its own sector program initially through a vision statement, which this paper and the following suggested timeline are intended to inform, that would later be expanded to a full plan after extensive public consultations to ensure public support;
- » Communication, public consultations, and information disclosure are vital to regaining public trust in the sector;
- » Increasing the sector's transparency and accountability requires implementing the

long-stalled vision of Law 462 for more private sector participation in the distribution and generation sub-sectors. A clear and time-bound plan for putting this vision into effect is urgently needed;

- » Focus has traditionally been on increasing generation capacity, which is important, but it needs to be accompanied with fuel switching, reducing losses on the electricity network and improving end-use energy efficiency to reduce supply costs and ensure sustainable solutions;
- » Work on installing floating storage regasification units (FSRUs) to import gas at Zahrani and Deir Amar, and launching separate tender processes for additional temporary and permanent generation capacity need to be significantly accelerated;
- » Renewable energy (RE) generation, which played a secondary role in the sector so far, needs to be mainstreamed and scaled up significantly within a time-bound plan that starts in 2020 to reduce dependency on costly imported fuels. Over 4,700 MW of additional RE capacity is needed in the next 10 years to meet the Government's target of 30 percent of RE generation by 2030. This will not just address cost and environmental considerations, but also safeguard the country's energy security.
- » Sector governance needs to be significantly strengthened, with competence and relevant experience driving the selection of those who lead it;
- » While Electricité du Liban (EDL) reforms, including its external and internal governance, may not have immediate fiscal returns, they are vitally important to ensure the sector's economic efficiency and its long-term sustainability;
- » Modernization of all EDL's core business areas and administrative processes are urgently needed as the basis for improving EDL's operational and financial performance and as a foundation for attracting private sector participation;

- » Tariff reform needs to be pursued under a clear action plan to address interrelated sector challenges in parallel with a framework to eliminate subsidies through efficient and cost-reflective tariffs while protecting the poor;
- » Both Egypt and Jordan currently enjoy significant power (and, in the case of Egypt, gas) surpluses and are willing to export electricity and gas to Lebanon, but an agreement with Syria is needed to allow wheeling this power and gas on existing infrastructure that goes through Syria;
- » If the reform measures outlined in the priority actions below are implemented, the cost of electricity could decrease from as high as US\$27/kWh (billed) today to around US\$16.4/kWh by 2022. Supply could increase to provide all customers with reliable 24 hours of electricity, eliminating the need to rely on expensive and polluting private diesel generation. Even if tariffs are increased to recover costs, hence removing subsidies and saving the Government US\$1-2 billion a year, they would be at the current weighted average cost to consumers (the current costs average consumers pay for both public and private electricity). This would result in almost neutral impact on poverty and may even lead to positive economic impact for customers who rely more on private generators, which cost up to US\$30/kWh.

In the first 100 days in office, the Government should consider the following priority actions:

**Priority Action 1** - Prepare and disclose a policy statement that outlines the Government's vision for reforming the sector and the underlying principles, objectives and timeline it expects to rely on to implement this vision.

**Priority Action 2** - Revise and reissue the Request for Proposals (RfP) to focus on FSRUs for Zahrani and Deir Amar to the prequalified bidders.

**Priority Action 3** - Launch transparent and competitive procurement processes for new permanent power plant at Zahrani.

**Priority Action 4** - Adopt indexation for fuel price and foreign exchange fluctuations in EDL's retail tariff to apply with immediate effect.

**Priority Action 5** - Establish the Electricity Regulatory Authority (ERA) and appoint its members using a transparent process, based on their relevant expertise, qualifications and lack of conflicts of interest.

**Priority Action 6** - Appoint at least 7 independent members of EDL's board of directors selected based on their relevant expertise and lack of conflicts of interest, after public consultations.

- » In the first 12 months in office, the Government should consider the following priority actions under 4 strategic pillars to urgently improve sector performance:

## GOVERNANCE

**Priority Action 7** - Adopt a time-bound plan for restructuring the sector to privatize EDL's generation plants and establish private concessions for distribution services, starting 2022 after expiry of the existing distribution service provider (DSP) contracts.

**Priority Action 8** - Establish a planning department at the Ministry of Energy and Water (MEW) to prepare least-cost generation and transmission plan for all types of generation, including thermal and renewable energy.

**Priority Action 9** - Develop a contract between the Government and EDL to set specific performance targets and compliance conditions for EDL's operations over the next 4-5 years.

**Priority Action 10** - Adopt a time-bound plan to modernize EDL's operations, in line with the sector restructuring plan.





**Priority Action 11** - Significantly increase public communications regarding the Government's plans in the sector, including, but not limited to, the rationale underpinning those plans, timeframe expected to accomplish the anticipated milestones, and the associated costs.

**Priority Action 19** - Reinforce policy, regulatory, infrastructure, financing and capacity building mechanisms to scale up distributed RE and EE measures by large consumers.

The following is brief outline of these priority actions with an illustrative timeline for their implementation.

## SECURITY

**Priority Action 12** - Launch procurement for the Salaata plant (after completing necessary environmental and social assessments in compliance with international standards).

**Priority Action 13** - Assess competitiveness of Deir Amar II proposals to determine whether a competitive procurement process is needed.

**Priority Action 14** - Secure financing for transmission system expansion and upgrades.

## STABILITY

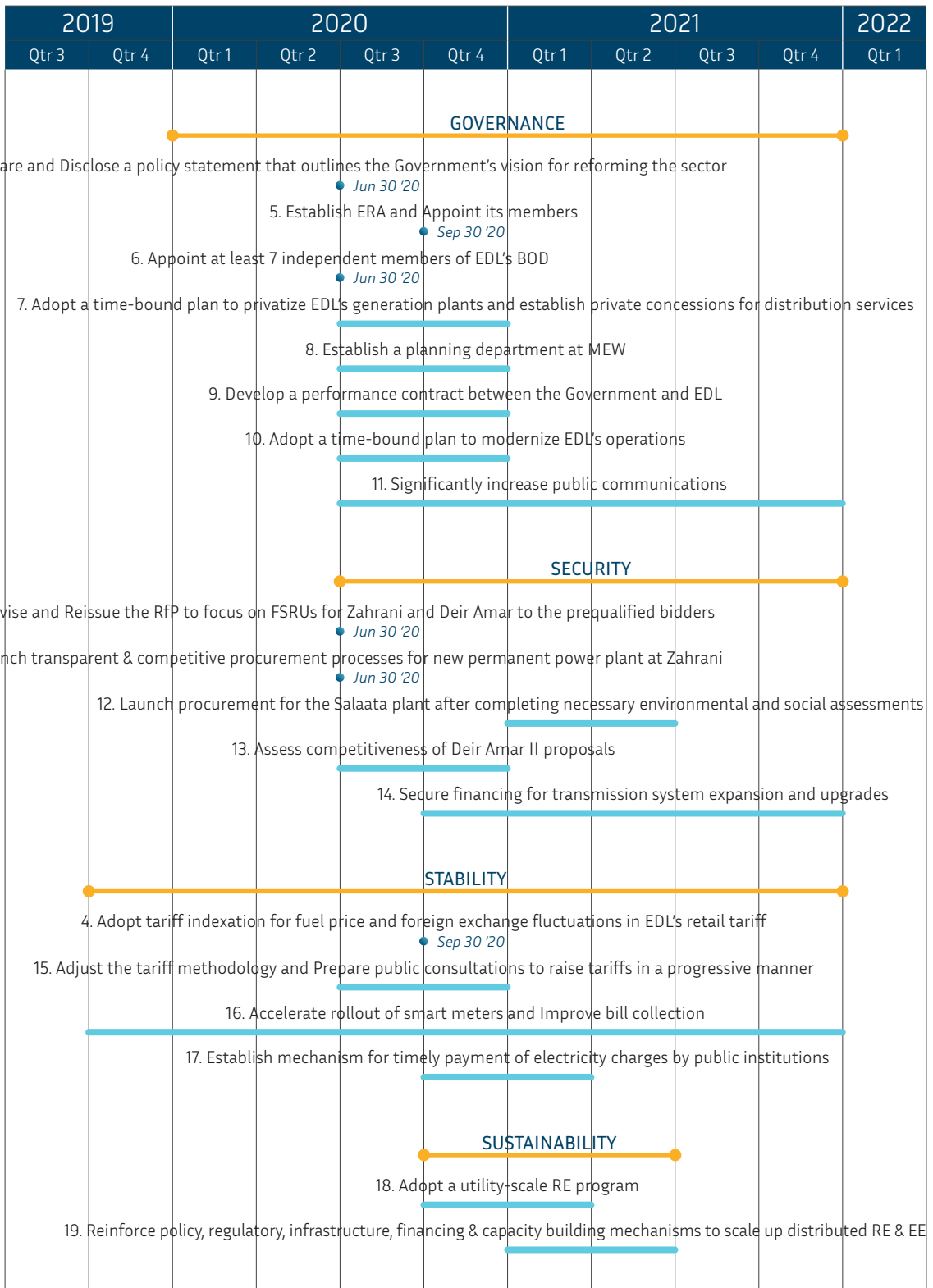
**Priority Action 15** - Adjust the tariff methodology and prepare public consultations to raise tariffs in a progressive manner, in line with the improvement of supply.

**Priority Action 16** - Accelerate rollout of smart meters and improve bill collection.

**Priority Action 17** - Establish mechanism for timely payment of electricity charges by public institutions.

## SUSTAINABILITY

**Priority Action 18** - Adopt a utility-scale RE program that reflects best practices and provides annual targeted capacity segregated by technology to implement the Government's announced 2030 RE policy objectives.



● Strategic Pillar Name     
 ● Action in the first 100 days     
 — Action in the first 12 months

**الأولوية ٩:** إعداد عقد بين الحكومة ومؤسسة كهرباء لبنان من أجل تحديد أهداف أداء مُحدّدة وشروط امتثال لعمليات المؤسسة للسنوات الأربع-الخمس المقبلة.

**الأولوية ١٠:** اعتماد خطة مُحدّدة زمنياً لتحديث عمليات مؤسسة كهرباء لبنان، تماشياً مع خطة إعادة هيكلة القطاع.

**الأولوية ١١:** تكثيف جهود التواصل والإعلام العام حول خطط الحكومة في هذا القطاع، بما في ذلك عرض الأسباب الموجبة لهذه الخطة، والإطار الزمني المتوقع لتحقيق الإنجازات المتوقعة والتكاليف المتعلقة بها، على سبيل المثال لا الحصر.

## الأمن

**الأولوية ١٢:** إطلاق عملية التوريد لمعمل سلعاتنا (بعد استكمال عمليات التقييم الاجتماعي والبيئي الضرورية وفق المعايير الدولية).

**الأولوية ١٣:** تقييم القدرة على التنافس لمقترحات دير عقار ١١ لتحديد ضرورة تنظيم عملية توريد تنافسية.

**الأولوية ١٤:** تأمين التمويل لتوسيع قطاع النقل وإدخال التحسينات عليه.

## الاستقرار

**الأولوية ١٥:** تعديل منهجية التعرف وإعداد المشاورات العامة لزيادة التعرف بشكل تدريجي بما يتماشى مع تحسين الإنتاج.

**الأولوية ١٦:** تسريع تركيب العدادات الذكية وتحسين جباية الفواتير.

**الأولوية ١٧:** وضع آلية من أجل تحصيل فواتير الكهرباء من قبل المؤسسات العامة.

## الاستدامة

**الأولوية ١٨:** اعتماد برنامج للطاقة المتجدّدة على مستوى المنشأة يعكس أفضل الممارسات ويوفر القدرة المستهدفة السنوية الموزّعة بحسب التكنولوجيا من أجل تنفيذ أهداف سياسة الطاقة المتجدّدة المعلن عنها للعام ٢٠٣٠.

**الأولوية ١٩:** تعزيز الآليات المتعلقة بالسياسات والتنظيم والبنية التحتية والتمويل وبناء القدرات لزيادة اعتماد الطاقة المتجدّدة الموزّعة وتدابير كفاءة الطاقة من قبل كبار المستهلكين.

تأثير اقتصادي إيجابي للعلاء الذين يعتمدون بشكل أكبر على المولدات الخاصة، والتي تصل تكلفتها إلى ٣٠،٠ / كيلوواط ساعة؛

في الأيام المئة الأولى من ولاية الحكومة الجديدة، على الحكومة النظر في الإجراءات ذات الأولوية التالية:

**الأولوية ١:** إعداد وكشف البرنامج الذي يحدّد رؤية الحكومة لإصلاح القطاع والمبادئ والأهداف والجدول الزمني الذي تتوقع أن تعتمد عليه لتنفيذ هذه الرؤية.

**الأولوية ٢:** مراجعة وإعادة إصدار طلب تقديم العروض (RfP) للتركيز على FSRUs للزهراني ودير عمار لمقدمي العروض المؤهلين.

**الأولوية ٣:** إطلاق عمليات شراء شفافة وتنافسية لمعمل دائم وجديد في الزهراني.

**الأولوية ٤:** اعتماد مؤشرات لمواجهة تقلبات أسعار الوقود وسعر الصرف في تعرفّة مؤسسة كهرباء لبنان للتطبيق بأثر فوري.

**الأولوية ٥:** تأسيس هيئة تنظيمية للكهرباء وتعيين أعضائها من خلال عملية شفافة على أساس خبراتهم ومؤهلاتهم ذات الصلة والحرص على عدم وجود التضارب في المصالح.

**الأولوية ٦:** تعيين ما لا يقل عن ٧ أعضاء مستقّلين في مجلس إدارة مؤسسة كهرباء لبنان يتم اختيارهم على أساس خبراتهم ذات الصلة مع الحرص على عدم وجود تضارب في المصالح، بعد إجراء استشارات عامة.

في غضون الأشهر الاثني عشرة الأولى من ولاية الحكومة الجديدة، على الحكومة النظر في أولويات العمل التالية ضمن ركائز استراتيجية أربع من أجل تحسين أداء القطاع بشكل طارئ:

## الحكومة

**الأولوية ٧:** اعتماد خطة مُحدّدة زمنياً لإعادة هيكلة القطاع من أجل خصخصة معامل إنتاج الطاقة التابعة لمؤسسة كهرباء لبنان وتأسيس امتيازات خاصة لخدمات التوزيع، بدءاً من العام ٢٠٢٢ بعد انتهاء مدّة عقود مقدمي خدمات التوزيع الحاليين.

**الأولوية ٨:** تأسيس قسم للتخطيط في وزارة الطاقة والمياه لإعداد خطة الكلفة الأدنى للإنتاج والنقل لجميع أنواع الإنتاج، بما في ذلك الطاقة الحرارية والمتجدّدة.

يجب تعزيز توليد الطاقة المتجددة، التي تلعب دوراً ثانوياً في القطاع حتى اليوم، وإدراجها ضمن خطة مُحددة زمنياً تبدأ في العام ٢٠٢٠ من أجل الحدّ من الاعتماد على الوقود المستورد والمُكلف. في الواقع، هناك حاجة إلى أكثر من ٤٧٠٠ ميغا واط من القدرة الإضافية للطاقة المتجددة في السنوات العشرة المقبلة من أجل تحقيق هدف الحكومة بأن تشكل الطاقة المُتجددة نسبة ٣٠ في المئة من مجمل قدرة الإنتاج مع طول العام ٢٠٣٠. وهذا لن يعالج اعتبارات الكلفة والاعتبارات البيئية فحسب، إنّما سيضمن أيضاً حماية أمن الطاقة في البلد؛

يجب تعزيز حوكمة قطاع الطاقة بشكل جذري، باعتماد الكفاءة والخبرة ذات الصلة، كعنصران أساسيان في اختيار القادة في القطاع؛

لعلّ إصلاحات مؤسسة كهرباء لبنان، بما في ذلك الحوكمة الخارجية والداخلية، قد لا تولّد عوائد مالية فورية، لكنّها مهمة جدّاً من أجل ضمان الكفاءة الإقتصادية والإستدامة الطويلة الأمد للقطاع؛

هناك حاجة ماسة إلى تحديث جميع مجالات العمل والعمليات الإدارية الأساسية لمؤسسة كهرباء لبنان من أجل تحسين الأداء التشغيلي والمالي للمؤسسة وكأساس لإجتذاب مشاركة القطاع الخاص؛

يجب السعي إلى إصلاح التعرفة ضمن خطة عمل واضحة للتصدي لتحديات القطاع المترابطة بالتوازي مع إطار يهدف إلى إزالة الدعم المالي من خلال تحديد تعرفة فعالة تعكس التكاليف بشكل صحيح، مع تأمين الحماية اللازمة للفقراء؛

يتمتّع كل من مصر والأردن بفائض كبير في الطاقة في الوقت الحاضر (وفي حالة مصر فائض في الغاز) وهما مستعدّان لتصدير الكهرباء والغاز إلى لبنان، لكن لا بدّ من اتفاق مع سوريا للسماح بإمداد الطاقة والغاز من خلال البنى التحتية القائمة التي تمرّ عبرها؛

إذا تمّ تنفيذ التدابير الإصلاحية الموضحة أدناه في الإجراءات ذات الأولوية، فقد تنخفض كلفة الكهرباء من حدّ عالٍ يصل اليوم إلى ٠,٢٧ \$ / كيلوواط ساعة (مفوترة) إلى حوالي ٠,١٦٤ \$ / كيلوواط ساعة بحلول عام ٢٠٢٢. يمكن أن يزداد إنتاج الطاقة لتأمين ٢٤ ساعة من الكهرباء للعملاء، مما يلغي الحاجة إلى الاعتماد على المولدات الكهربائية الخاصة المكلفة والملوثة. حتى ولو تمّ زيادة التعرفة إلى حدّ إسترداد التكاليف، وبالتالي إزالة الدعم المالي وتوفير الحكومة من ١ إلى ٢ مليار دولار أمريكي سنوياً، فستكون التعرفة في المتوسط المرجح للتكلفة الحالية للمستهلكين (متوسط التكلفة الحالية التي يدفعها المستهلكون مقابل الكهرباء من مؤسسة كهرباء لبنان ومن المولدات الكهربائية الخاصة). سيؤدي هذا إلى تأثير محايد تقريباً على الفقر وقد يؤدي حتى إلى

« لطالما كان قطاع الطاقة في لبنان في قلب التحديات الاقتصادية والمالية التي يواجهها البلد، بما أنّها تُثقل العجز المالي والتجاري المرتفع، ممّا يستلزم دعماً مادياً كبيراً من قبل الحكومة بسبب التعرفة المتدنية والتكاليف غير الفعالة؛

« لم يتمكن قطاع الطاقة من تأمين الكهرباء الكافية للمستهلكين، ممّا أثر بشدّة على التنمية الاقتصادية والاجتماعية وسبّب أزمة ثقة لدى الرأي العام تتجاوز التحديات المالية والفنية إلى حدّ بعيد؛

« تمّت دراسة الطول لتحديات قطاع الطاقة بشكل مُعمّق وتمّ الاتفاق عليها إلى حد كبير على المستوى الفني، لكن تبقى الإرادة السياسية العنصر الغائب الأساسي لتطبيق هذه الحلول؛

« شملت المعالجات السابقة في القطاع بشكل عام إدارة الأزمات، حيث أعطت الأولوية للسرعة على حساب معالجة المسائل البنيوية واستدامة القطاع على المدى الطويل بناءً على التخطيط المُلائم واتخاذ القرارات في الوقت المناسب، التي تقع في صلب الصعوبات التي يواجهها القطاع؛

« على الحكومة الجديدة أن تصادق في البداية بشكل سريع على برنامج قطاع الطاقة الخاص بها، التي تهدف هذه الورقة والجدول الزمني المقترح أعلاه إلى تغذيتها، ومن ثم توسيعه إلى خطة كاملة بعد إجراء استشارات عامة مكثفة من أجل تأمين الدعم العام؛

« يُعتبّر التواصل، والاستشارات العامة، والكشف عن المعلومات من المكونات الأساسية من أجل استعادة ثقة الرأي العام في القطاع؛

« تستلزم زيادة الشفافية والمساءلة في القطاع تنفيذ رؤيا قانون ٤٦٢ العالقة منذ زمن بعيد من أجل مشاركة أكبر للقطاع الخاص في القطاعين الفرعيين للتوزيع والإنتاج، فلا بد من وضع خطة واضحة ومحددة زمنياً من أجل تنفيذ هذه الرؤيا بشكل طارئ؛

« لطالما تم التركيز تقليدياً على زيادة قدرة الإنتاج وهي مسألة مهمة لكنها يجب أن تتوافق مع استبدال نوعية الوقود، الحد من الخسائر على شبكة الكهرباء وتحسين كفاءة الطاقة للاستخدام النهائي من أجل تخفيض تكاليف تأمين التيار وضمان حلول مستدامة؛

« كما يجب تسريع وتيرة العمل بشكل كبير على إنشاء وحدات عائمة للتخزين وإعادة التغويز Floating Storage Regasification Units FSRUs من أجل استيراد الغاز في الزهراني ودير عمار وإطلاق عمليات استيراد عروس منفصلة من أجل توليد قدرة إنتاج إضافية مؤقتة ودائمة؛





# SECTOR CHALLENGES

1. The electricity sector has been at the heart of Lebanon's fiscal imbalances for decades. Annual budgetary transfers to the national electricity utility, EDL, averaged 3.8 percent of the country's Gross Domestic Product (GDP) over the last decade, amounting to close to half of the overall fiscal deficit. At its peak in 2012, the Government transferred US\$2.2 billion to EDL, equivalent to 5.1 percent of GDP.
2. Despite these subsidies, EDL supplied only 55-64 percent of Lebanon's electricity needs in 2018.<sup>1</sup> The balance of electricity needs was supplied by private diesel generators with an estimated cost of up to US\$30 per kilowatt hour (kWh). As such, the combined average cost to consumers from EDL and private generators is estimated to be approximately US\$16.8/kWh.<sup>2</sup> Failure to solve this problem for decades also led to an acute confidence crisis in the sector that goes far beyond the fiscal impacts and service issues.
3. There are three key challenges underlying the sector's woefully inadequate performance: (i) weak governance; (ii) underinvestment in supply; and (iii) lack of financial stability.

## Weak governance

4. EDL is significantly hampered by challenges in its (and the sector's) governance structure. It is subject to the MEW and the Ministry of

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1 Depending on which electricity demand assumption is used.

2 Consumer cost depend on the number of hours of EDL-supplied electricity. Consumers in Beirut, for example, where EDL supplies up to 21 hours of electricity likely pay less than this average in comparison to consumers in the Bekaa and Akkar that receive far less EDL power.

Finance's (MOF) administrative and financial oversight, respectively. Existing financial and organizational authorities of EDL's management and its board of directors are not balanced with their responsibilities, limiting accountability for performance. Management reporting, as a result, is mainly focused on operations, with limited consideration for indicators of the utility's financial, human resources or administrative performance.

5. EDL's board of directors currently consists of 3 members, two independent directors and the utility's Director General. This small size limits the board's ability to create committees of independent members for proper oversight of audits, compensation, finance, procurement, and other critical areas of EDL's business.
6. While the board had more members in the past (EDL's current legal framework allows up to 7 independent members), board appointments were historically made by political parties based on Lebanon's sectarian-based governance system rather than strictly competence. This approach naturally limits the board's ability to ensure compliance with typical board duties to pursue the interests of the utility and its customers without even the appearance of conflicts of interest (political or personal).
7. **EDL's limited control over its budget dilutes its focus on (much less accountability for) improving operations and services, making utility administration largely an exercise in daily crisis management.** Even though EDL's annual budget is subject to review and approval by MEW and MOF, spending authority by EDL's board and management within this approved budget is significantly curtailed. This requires regular interventions by MEW, MOF or both in EDL's core business, which creates ample delays and space for rent-seeking, whether for political or personal gain.
8. **There is no systematic, transparent process for determining just and reasonable tariffs that ensure the utility's financial equilibrium.** The utility has requested changes in its tariffs many times in the past. Although review and

approval of only MEW and MOF is required for such modifications, these requests are routinely escalated to (and denied by) the Council of Ministers (COM), even if the MEW and MOF agree to support them. The result is an environment where EDL is disincentivized from increasing generation supplies, which will only increase its operating deficit and subsidy needs.

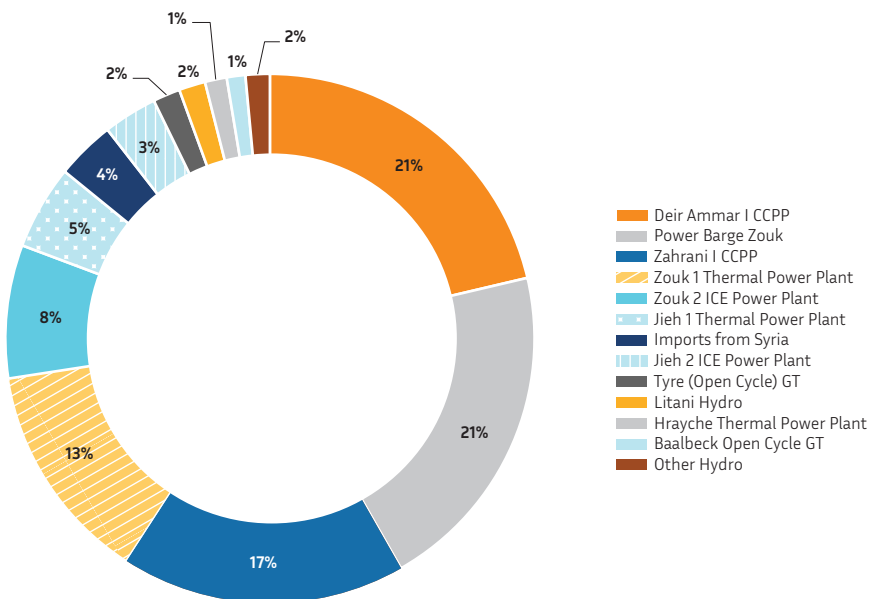
9. **Moreover, EDL's processes (finance, human resources, procurement, accounting, technical planning, etc.) lack transparency and promote control and risk-avoidance at the expense of flexibility and efficiency.** Delays due to rigid and arcane processes are exacerbated by significant deficiencies in EDL's information systems and the almost complete absence of process automation that have become standard in many utilities around the world for decades. Suboptimal customer information and billing systems hinder the ability to analyze and improve customer service and collections or provide accurate data for the board, MEW and MOF to ensure appropriate monitoring of the utility's performance. The annual audited financial report has been outstanding since 2011, with the last report reflecting significant qualifications. Chronic underinvestment in these systems and processes are ostensibly caused by EDL's seemingly perpetual negative operating revenue and continued reliance on Government transfers for financial equilibrium.
10. **EDL also has significant human resource challenges.** EDL employees are considered civil servants subject to rules and regulations of the country's Civil Service Council (CSC), which is part of the Prime Minister's Office. While the recruitment process is competitive and done in consultations with EDL, CSC's recruitment procedures are lengthy and cumbersome, and require approvals from MEW and the COM. As a result, EDL remains understaffed, with several critical positions vacant, forcing the utility to rely on contracted employees that may not have the requisite skills or commitment needed.

11. On the other hand, because EDL's employees are considered civil servants, they enjoy protections from retaliation afforded to them under CSC rules, which also limits EDL's flexibility to manage and incentivize performance. Perhaps to deal with this inflexibility, EDL's management has opted to delay promotions of its senior staff that meet the applicable requirements for higher positions. Instead, senior staff are required to assume responsibilities of higher positions in an 'Acting' capacity, which provides management more control over them and perversely disincentivizes staff's independent decision-making for fear of retaliation. This fear of retaliation makes staff more beholden to their political leaders for job security than to the organization or its customers.
12. The resulting confluence of these factors combine to create an inefficient system that requires micro-management at EDL's highest level and disincentivizes initiative at the staff level.

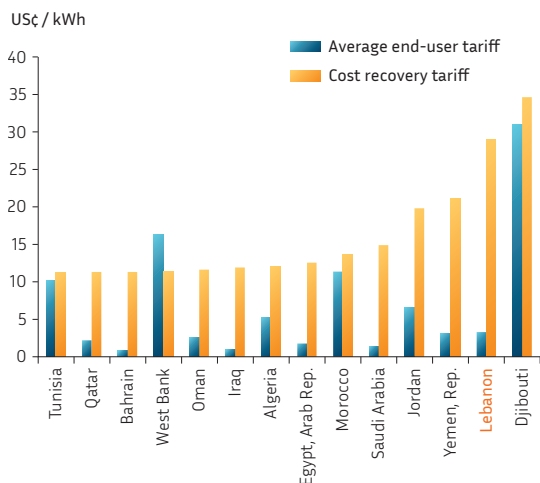
### Underinvestment in supply

13. The supply shortfall is mostly due to chronic underinvestment in new generation capacity. To bridge this gap, EDL has been reliant on temporary generation (power barges under contracts that expire in 2021), which comprises approximately 20 percent of EDL's available capacity. The old power plants at Zouk, Jieh, Sour, Baalbak, and Hrayche have outputs that are significantly less than their design capacity and are operating at much lower efficiency (36 to 68 percent) than newer reciprocating engines at Zouk and Jieh, and the combined-cycle plants at Deir Amar and Zahrani.
14. EDL's existing generation resources are dominated by thermal power plants that are currently running on HFO or diesel (gas oil) - see Figure 1. Most of these generation resources, including the rented power barges, are tri-fueled and can run on the much less expensive and more environmentally friendly natural gas. However, due to the lack of gas, they run on the more expensive liquid fuels (HFO and diesel).

**FIGURE 1 – BREAKDOWN OF EDL ENERGY GENERATED (2017)**

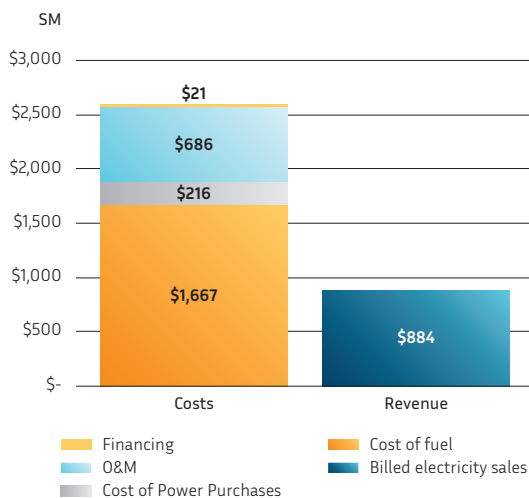


**FIGURE 2 – TARIFF COMPARISON IN THE MENA REGION (2013)**



Source: Shedding Light on electricity Utilities in the Middle East and North Africa: Insights from a Performance Diagnostic, World Bank (2017)

**FIGURE 3 – BREAKDOWN OF SECTOR COSTS (2018)**



Notes: (i) Cost of fuel includes fuel used for temporary generation (barges); (ii) Cost of power purchases includes imports from Syria, IPP costs, and temporary generation (barges).

## Lack of financial viability

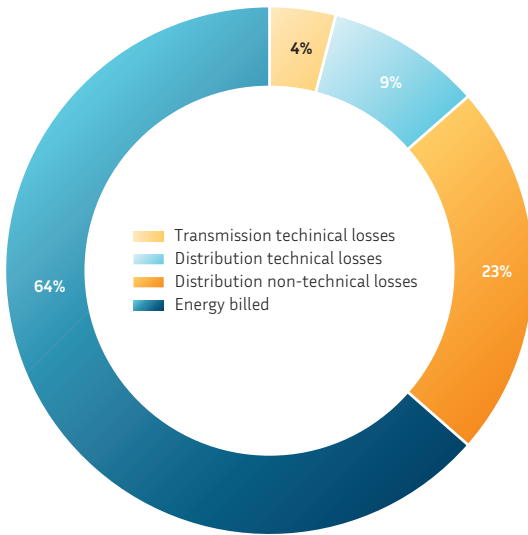
- The sector's financial deficit stems from the consistently low electricity tariffs and high sector costs, which reflect both underpricing and the sector's operational inefficiency. In a comparison of average end-user and cost-recovery tariffs across the MENA region, Lebanon's costs were second only to Djibouti's, but, unlike Djibouti and indeed all other MENA countries, Lebanon had the largest gap by far between cost and end-user tariffs (see Figure 2).
- High sector costs are due to high costs of supply (primarily due to continuing reliance on temporary generation and liquid fuels) and the sector's operational inefficiency (primarily due to high network losses and billing/collection challenges). In 2018, the sector's overall costs were estimated to be US\$2.6 billion, with fuel accounting for by far the largest portion of sector costs (around 64 percent) (see Figure 3), making the sector's

overall financial equilibrium extremely sensitive to fluctuations in international fuel prices. Remaining costs relate to other EDL operating expenses, such as power purchases from Independent Power Producers (IPP) (mostly small hydro plants), rented barges, and imports from Syria (8 percent), operation and maintenance costs (27 percent), and financing costs (1 percent).<sup>3</sup> Revenues, on the other hand, covered only one third of these expenditures.

- On the revenue side, EDL faces at least three significant challenges. First, in 2018, network losses - technical losses on the transmission and distribution networks and non-technical

<sup>3</sup> While it is difficult to fully assess EDL's financial position without audited financial statements (the last independent review was completed in 2010, resulting in a significantly qualified audit), an assessment of the utility's annual cashflow indicates that its staffing and administrative costs represent a small amount of the sector's overall costs (US\$ 139 million in 2018, or 5 percent of the sector's operating costs).

**FIGURE 4 – EDL NETWORK LOSSES (2018)**

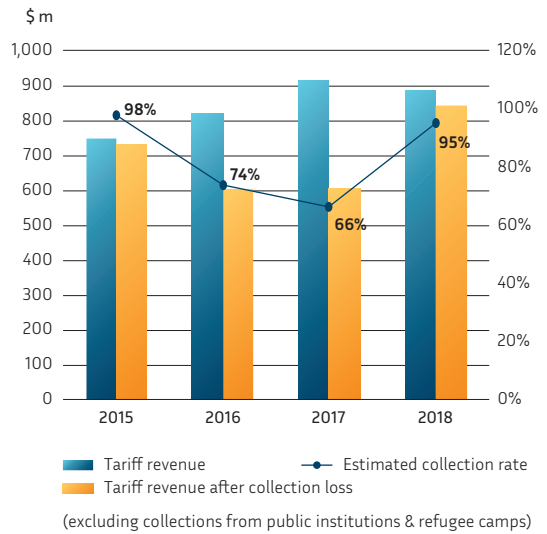


losses (primarily theft) on the distribution network - were estimated to be 36 percent of energy injected into EDL’s system. In other words, only 64 percent of the energy generated or purchased by EDL in 2018 was billed for (see Figure 4).

- Second, EDL’s retail tariffs, which currently stand at an average of US\$9.5/kWh, have not changed since 1994.<sup>4</sup> In comparison, in 2018, EDL’s fuel plus power purchase costs alone added to US\$12/kWh. Once network losses of 36 percent are added, this cost increases to US\$20/kWh (billed), *without accounting for collection challenges*. Other operating costs (including operation and maintenance of generation plants, staffing costs, network repairs and maintenance and financing costs)

<sup>4</sup> Analysis indicates that the average tariff is more like US\$ 8.7/kWh, which is the basis for the revenue calculations in this paper. However, because EDL and MEW have historically been relying on US\$ 9.5/kWh, a decision was taken to refer to the latter as the average tariff to avoid confusion. The conclusions reached are the same regardless.

**FIGURE 5 – REVENUE COLLECTION AND COLLECTION RATES (2015-2018)**



further increased EDL’s 2018 costs to US\$27/kWh (billed).

- Third, not only is revenue based on the tariff level insufficient to cover EDL’s costs, but also the amount billed is not fully collected. Cash receipts for 2016 and 2017 reflect a bill collection rate of 74 and 66 percent, respectively. In 2016, strikes by some of EDL’s staff halted billing. In 2017, one of the private sector DSPs, which were retained in 2012 to manage distribution operations on behalf of EDL, stopped its meter reading and bill collection activities because its contract expired in 2016 (the contract was extended in 2018).
- To date, billing continues to lag approximately 12 months in some areas (in other words, bills are issued for consumption a year earlier) so EDL has not yet fully recovered from the strikes’ impact (see Figure 5).<sup>5</sup> Historical

<sup>5</sup> Low collection rate is also caused by historically extremely low collections from public institutions and refugee camps.

trends are significantly higher and estimates for 2018's collection rate is close to 95 percent, *excluding collections from state institutions and refugee camps that historically had extremely low collections rate.*

21. In this respect, EDL's high fuel costs are compounded by operating inefficiencies that significantly increase its costs; network losses that reduce the amount of electricity EDL can bill for to recover these costs; billing and collection challenges that reduce cash receipts from billed electricity; and retail tariffs that significantly under-recover operating costs. To effectively address the fiscal stress caused by the sector on public finances, these issues need to be urgently resolved.





## THE WAY FORWARD

22. The daunting challenges in the sector are not new. There have been many studies that analyzed the prevailing issues and provided recommendations for their resolution. In fact, **the MEW developed a sector policy in 2010 (2010 Sector Policy) that provided solutions to address the generation deficit by increasing generation and transmission capacity, reducing sector costs by installing FSRUs to import natural gas to replace liquid fuels for power generation, and corporatizing EDL to modernize its functions and systems. Political disagreements and constraints resulted in little progress in implementing this plan.**
23. In 2019, the MEW updated this plan to primarily add greater emphasis on reducing EDL's network losses, recovery of billing arrears, and increasing electricity tariffs. The COM adopted this update in April of the same year. MEW and EDL made commendable progress since then on reducing technical and non-technical losses, but progress in implementing this updated plan stalled again when COM decisions were needed on several fronts.
24. **It is urgent to proceed with stalled initiatives to help address the fiscal crisis.** The fiscal crisis clearly requires prioritizing initiatives that have the most impact on sector finances in order to eliminate public subsidies as soon as possible. To that end, significant progress must be made in the short- to medium-term on initiatives that reduce sector costs and increase revenues.
25. This requires accelerating work on reducing network losses to reduce costs and ensure recovery of revenue due for electricity provided. It also requires accelerating work

on increasing generation and transmission capacity to improve EDL's electricity services and provide the basis for increasing tariffs, as discussed further below. It further requires reducing sector costs by accelerating work on switching fuel to natural gas for power generation.

26. **However, it is important to note that the current fiscal crisis has worsened initial conditions in the sector.** Projections in this paper are based on conditions in 2018 or earlier, but 2019 has seen dramatic negative shifts on many fronts. Network losses, for example, are likely to be far more than estimated as EDL's ability to make progress on reducing theft and improving collections are challenged by real financial and economic constraints facing consumers. Access to foreign currency to pay for fuel, spare parts and power plant services are also challenged as EDL is unable to find the support it previously had from BDL. This makes the starting point for reforms even more dire than projected in this paper and further underlines the urgent need for specific reforms outlined.
27. **Furthermore, priority initiatives aimed at alleviating the short-term fiscal crisis are insufficient without addressing the root causes of the problem in the sector.** The most basic tenet of sector operations is to provide consumers with good service at a reasonable price. International experience indicates that dysfunctionality of the sector's governance results in mismanaged systems that deliver inadequate service, incur excessive costs, or, as in the case of Lebanon, both. As such, good governance is a necessary cross-cutting ingredient to ensuring the sector's operational efficiency and improved service delivery.
28. **Experience has amply demonstrated that the current sector governance structure has not worked.** Much like the technical challenges in the sector, this is not new. In fact, Law 462, which was promulgated in 2002, already envisioned restructuring the sector by unbundling it and increasing private sector participation in EDL's distribution and generation operations. This prescription, which follows the power sector reform paradigm of the 1990s (discussed further in Section 1.1 below), remains unimplemented to date. It is thus imperative that the new Government adopts a time-bound plan to implement Law 462's mandates in the short- to medium-term. The initiatives proposed in this paper are intended to facilitate this process.
29. Furthermore, the 1990s sector reform model emerged during a period of relative technological stability. **In contrast, the electricity sector in the 21st century has found itself at the center of momentous technological change.** Almost all new investments in generation will soon be renewable, with implications for grid operations, system planning, and market design.
30. Initially, this requires, as discussed further below, revisiting some of the generation plans set out in the 2010 Sector Policy and its 2019 update to ensure future capacity development remains on a least-cost basis. It also requires accelerating implementation of the MEW's plans for rollout of energy efficiency (EE) and RE initiatives, and increasing resilience and flexibility of the transmission and distribution networks to prepare for the evolution to come.
31. **It is also worth noting that there has been a significant communications gap in the sector that needs to be urgently addressed.** There should be far more public consultations on critical issues affecting the sector's development before decisions are made, and communications around sector priorities should be central to the Government's initial message. The Government needs to communicate more on such topics as its plans in the sector, the rationale behind them and related risks, the expected implementation timeframe and milestones involved, etc.
32. The MEW developed a comprehensive communications strategy to address this issue but lacked funding to implement it. Nonetheless, there are some actions that can be taken now to improve access to



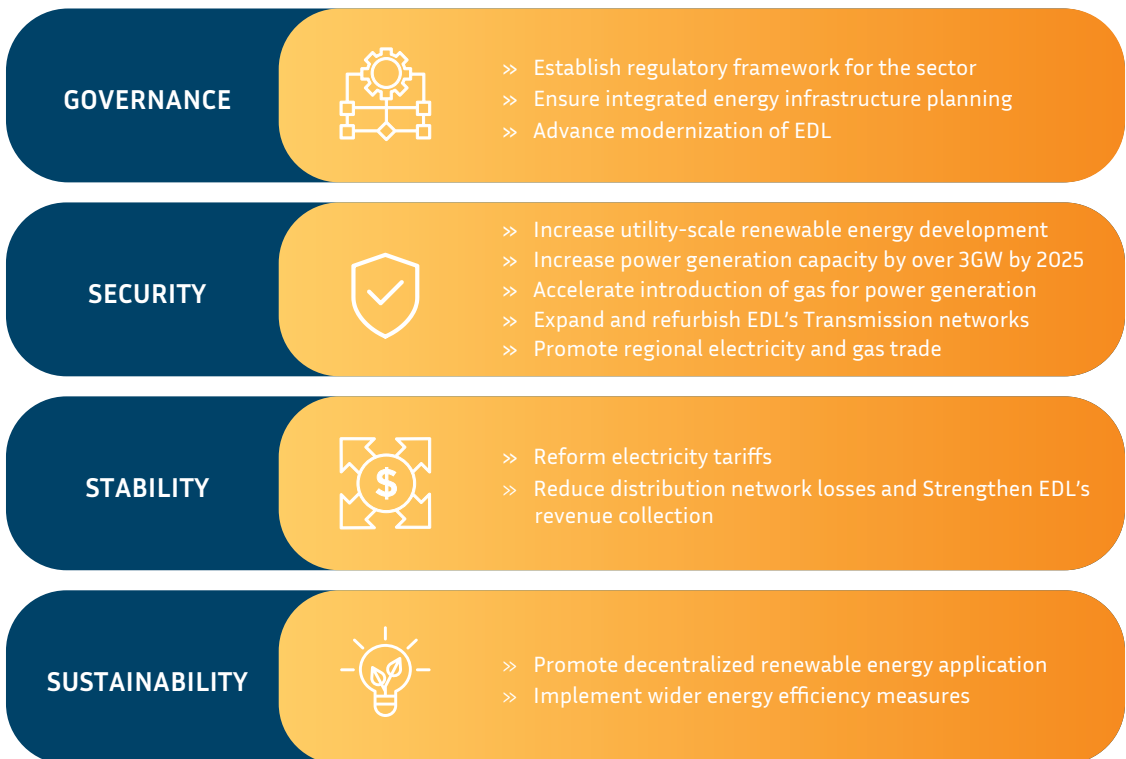
information without significant funding. These can be through a much-improved use of the Ministry's web site and social media to disseminate data and sector plans, and more frequent public meetings with civil society, the media and other stakeholders to explain sector plans and their rationale as well as provide a medium for a national dialogue on sector challenges.

33. Moreover, there is a need for coordination within the Government itself on issues related to the sector to avoid public confusion from conflicting statements or positions by public officials. This inter-governmental coordination should be undertaken at the Prime Minister's level to ensure consistency of the Government's messages. In addition, the Government, in its first 100 days in office, should confirm its sector plans through a clear vision statement. To ensure public buy-in, extensive stakeholder and public

consultations should be undertaken before translating this vision into a more detailed plan to be considered by the COM for adoption.

34. The Government's focus thus far has been largely on increasing the sector's stability and security. While these are important priorities for solving the short-term fiscal crisis, they are not enough. As noted above, the sector's governance challenges are a critical underlying cause of its current deficit, and, with the emergence of new technologies and climate change concern, ensuring environmental sustainability should be included in the sector's priorities. In this respect, the concrete and actionable policy measures proposed in this paper, which are in line with the 2010 Sector Policy and its 2019 update, are structured around these four energy policy pillars and should be pursued *in parallel* (see Figure 6).

**FIGURE 6 – FOUR SECTOR POLICY PILLARS AND PRIORITY OBJECTIVES**



# GOVERNANCE

## 1.1 Establish Sector Regulatory Framework

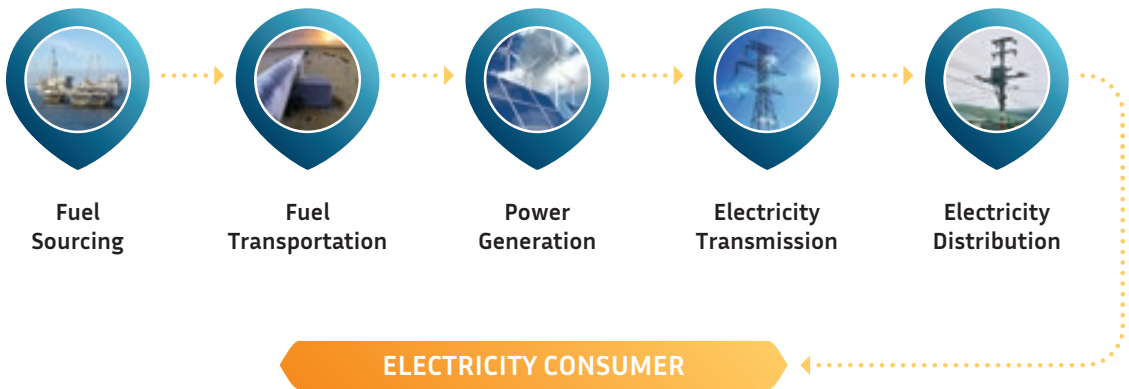
35. Law 462 has long envisioned the creation of an independent and autonomous Electricity Regulatory Authority (ERA) to provide technical oversight over a largely privatized generation and distribution subsectors. This vision was based on a new paradigm that emerged in the early 1990s for power sector reforms. This paradigm emphasized separation of power, with policymaking remaining with the line ministry, service provision done by an independent utility with commercial orientation, and an autonomous agency responsible for regulation. Within this context, the regulator often had the mandate of controlling market entry and setting tariffs and minimum service standards, so consumers receive adequate service quality.
36. In Lebanon's case, Law 462's general vision of a more liberalized power sector is still valid. The DSPs have largely been managing the distribution network for EDL since 2012, and power plants at Zahrani and Deir Amar have been operated and maintained for years under contract with private sector companies. In 2018, the Government also announced its plan to limit future generation expansion to IPPs. In this respect, there has already been significant progress towards realizing Law 462's vision of privatized distribution and generation. What remains is completing and formalizing the arrangements into a coherent market-based framework.
37. However, Law 462 needs to be strengthened (whether through an amendment of the primary legislation or through regulations and decrees, as permissible under Lebanese law) to address some significant gaps to ensure its effective implementation. The first key focus area of the Law – **restructuring the sector and unbundling EDL** – needs to be clarified. Law 462 does not provide a clear and comprehensive picture of the future functioning of the electricity sector and market model. Unbundling of EDL into separate generation, transmission and distribution entities, (starting with unbundling at the accounting level to increase transparency of financial flows in the sector) is a commendable objective that is aligned with best international practices. However, the law does not sufficiently define the respective roles of the incumbent players (created based on the unbundled EDL) vis-a-vis newcomers in generation and distribution/supply, a situation that results in legal uncertainty likely to prevent entry of reputable operators.
38. The second key focus area of Law 462 – **creating the ERA** – needs to be strengthened. The Law envisaged creation of a regulator that is both independent in structure and has decision-making autonomy in several important areas. To better understand the related issues, it is important to note the difference between independence and autonomy of a regulator. Regulatory independence is a concept that deals with how the regulator is **established**, primarily focused on the regulator's legal, financial, and administrative independence, including insulation from political pressures and from interests of the regulated entities. Regulatory autonomy, on the other hand, is focused on the autonomous nature of the regulator's **authority**, primarily focused on decision-making that is transparent, predictable and accountable but requires no approvals or concurrences from other public authorities.
39. International experience demonstrates that, under circumstances where autonomous regulatory regimes lack tradition (such as in Lebanon), a transition period during which the regulator formulates and adopts its necessary enabling internal rules and procedures is essential to provide an orderly transfer of powers and allow the nascent regulator to communicate its objectives and new functions to the public to build trust and credibility. Law 462 does not provide for such a transition.

40. The MEW proposed amendments to Law 462 that adopts a transition period. However, the amendments also weaken the independence and autonomy of their proposed regulator.
41. For example, while the Proposed Amendments expressly provide for formation of a regulator that is technically, financially and administratively independent, they propose to limit the regulator's legal independence by requiring it to be part of the Ministry, which raises question as to the regulator's ability to maintain its administrative independence. The proposed amendments also require the regulator's funding from the general budget, not from fees collected as envisioned in Law 462. This might be intended to ensure that the regulator is funded without having to depend on cashflow from sector entities (e.g., EDL) that historically had deep annual revenue shortfalls. However, relying on the general budget for funding exposes the regulator to political influence, not just for approval of the annual budget but also for periodic disbursement of this approved budget from the Ministry of Finance's accounts.
42. Importantly, the proposed amendments do not suggest transitioning this regulator to its autonomous form originally envisaged in Law 462, even as the enabling conditions in the sector become more supportive. As a result, while clarifications (through an amendment, regulations, or decrees, as permitted under Lebanese law) of the original Law 462 in this area are necessary, these clarifications need to reflect an orderly transfer of authority to a fully functioning independent and autonomous regulator, which would be an essential institution when Law 462's vision for a liberalized power market is realized at more advanced stages of reforms. Moreover, there should be a clear implementation schedule, with deadlines and milestones. Notwithstanding, it is important to note that establishment of ERA should proceed in parallel while these clarifications are formulated and adopted.
43. To ensure broad public support and clarity with respect to the Government's intentions, it would be advisable that the Government articulates its vision for sector reforms in a policy statement, which should be disclosed for broad public consultations before finalizing and expanding it to provide the sector's reform plan. This policy should, among other things, outline the Government's approach to sector transformation and implementing a strong regulatory mechanism to ensure transparency and accountability in the sector. The policy should also clearly indicate the objectives the Government seeks to achieve by such actions and the timeline within which it expects to realize them.
44. Accordingly, the Government should consider the following in the first 100 days in office:
- i. Developing and disclosing for public consultations a policy statement on its approach to sector reform;
  - ii. Establishing criteria for selection of ERA members;
  - iii. Forming a panel to identify and recommend qualified candidates for membership to ERA; and
  - iv. Appointing ERA's members and allocating an initial budget for the authority's operation.

## 1.2 Strengthen Integrated Energy Infrastructure Planning

45. While the sector is tied together in an interconnected value chain (see Figure 7), there are separate departments/entities within the MEW that are currently responsible for different aspects of sector planning and operations. The Lebanese Petroleum Administration (LPA) is responsible for upstream oil and gas activities; The Lebanese Oil Installations (LOI) is responsible for domestic oil and gas purchases, storage, and distribution; the Lebanese Center for Energy Conservation (LCEC) is responsible for EE and RE activities; and EDL is responsible for generation, transmission and distribution activities.
46. Coordination among these stakeholders is *ad hoc* and mainly undertaken by the Minister

FIGURE 7 – ENERGY SECTOR VALUE CHAIN



directly with the help of a team of consultants. If the Minister (or the political party in charge of the Ministry) changes, there is a high likelihood these consultants and sector priorities would be changed as well, which risks, among other things, losing valuable institutional memory and planning stability.

47. **Coordination for planning needs to be streamlined and harmonized to provide a coherent, integrated and least-cost sector development plan.** This plan will need to be systematically updated every 3-5 years to reflect changes in demand, demographics, technology, environmental standards, and other policy initiatives/priorities.
48. In order to ensure consistency, the MEW should establish a single infrastructure planning department within the Ministry and develop a planning framework that involves and redefines the roles of all major stakeholders at various stages of the planning process. The planning process needs to be transparent and participatory, and should cover hydrocarbon infrastructure (upstream, midstream - LNG/transportation pipelines - and downstream), power generation (thermal and RE) developments, electricity network investments (transmission and distribution) and off-grid developments and programs.

49. This process would therefore combine several existing planning documents (e.g., Integrated Oil and Gas Plan prepared by LPA, Transmission Masterplan prepared by EDL, the 2010 Sector Policy, its 2019 update and associated generation plan prepared by MEW, NREAP and NEEAP prepared by LCEC, etc.) and may make some obsolete. Clarity and transparency on energy planning can help in attracting private sector investment and ensures a holistic view on the energy sector across its sub-components.
50. **In the first 12 months in office,** the Government should therefore consider establishing this planning department in MEW.

### 1.3 Modernize EDL

51. **Implementation of most of the measures in any sector plan, including the quality of any governance framework, depends on the active participation of EDL. Hence, it is critical to thoroughly strengthen EDL's capacity to take on these important tasks.** Although EDL does not control tariffs, it can control other aspects of sector revenue (losses and nonpayment) and costs. EDL's financial viability as well as effectiveness of its transmission and distribution networks are prerequisites to developing additional generation capacity

through the private sector. Even if the future direction, as Law 462 largely envisions, is to unbundle the sector and have EDL as a system operator providing transmission service to largely privatized generation and distribution sub-sectors, reforming EDL is still critical to ensure that it can be the off-taker of privately generated electricity.

52. **EDL's modernization requires strengthening its governance structure, core business operations, and administrative performance.** This would help prepare EDL to be eventually commercialized and corporatized in the medium term.
53. **First, EDL's external and internal governance arrangements need to be improved to transform it into an independent, accountable and professional business.** Towards that end, the division of responsibilities among EDL, MEW, MOF, and the contemplated regulator (see Section 1.1) in the future needs to be assessed to find the adequate balance between the degree of autonomy that allows the company to operate efficiently and the degree of control that ensures that it is held accountable for its performance. There are different ways of striking this balance: typically, operational decision-making power belongs to the company while policy and regulatory functions are handled by respective Government agencies (MEW and ERA); practical measures can consist of establishing a (high) ceiling on particular expenditures (usually of an investment nature) that require a sign-off by MEW or MOF, or designing the Board with MEW and MOF representatives that can reflect Government priorities in those decisions. This of course would be accompanied by appropriate oversight by the regulator, with respect to EDL's performance, and MEW, with respect to sector policies.
54. **A performance contract can be agreed between EDL and MEW, with clear performance indicators, targets, and rewards/penalties to appropriately incentivize progress.** The MEW (then the regulator once it is established) can then track and report on EDL's progress in meeting those targets, and EDL's Board can integrate them into performance contracts for EDL's senior management, which should then be cascaded down into specific targets for EDL's middle management and staff. In addition, there should be an internal audit function to track EDL's finances on a continuous basis and inform management accordingly. Finally, EDL's oversight should include regular public disclosure of its operational and financial information, so that both the owners and customers of EDL could hold the company to account.
55. **However, such performance-based arrangements are unlikely to work without (a) strengthening EDL's board structure to ensure proper internal oversight and (b) significantly improving EDL's internal systems to ensure timely availability of accurate data to facilitate board and regulatory oversight.** As previously noted, EDL's current legal framework allows for the appointment of up to 7 members to its board. With only 2 independent members and 1 executive member, the current board is ill-equipped to undertake its fiduciary duties. Additional members should be selected based on their qualifications, relevant experience, lack of conflicts of interest, and willingness to dedicate enough time to carry out their duty of care to the organization. The Board members should have, among others, experience related to energy and leadership in a private or public sector organization and knowledge of the regulatory and business environments relevant to the Lebanese electricity sector. They should also uphold the highest ethical and integrity standards. To ensure that EDL's corporate decisions reflect the public interest, a certain number of seats should be reserved for representatives of external stakeholders.
56. **To select these members, the MEW should identify a set of clear selection criteria, and form a panel chaired by a MEW representative and comprised of respected independent local and international experts in relevant fields.** The candidate search should be publicly announced, and possibly involve the use of

recruitment agencies to ensure a thorough search. The panel would be tasked with shortlisting the candidates and interviewing the shortlisted, then recommending qualified candidates for the Minister's consideration. With the Minister's endorsement, the list of qualified candidates, as well as the rationale for their recommendation, can be disclosed publicly and submitted to the COM for approval. The appointment should then be for only a fixed period, after which the position is subject to re-election.

57. **Second, performance of EDL's core business functions needs to be improved.** This would require the Government to agree on the timing of the sector's restructuring and EDL's role in it. Assuming the privatization of generation and distribution service (see Section 2.1 below), EDL will evolve to be mainly a transmission and system operator (TSO). In this aspect, EDL needs to strengthen its system planning, operation, and control, including integrating state-of-the-art information technology (IT) systems such as planning software, National Control Center, and smart grid applications making use of smart meters at the substation levels. More critically, EDL needs to continue to enhance its distribution function to get it ready for transfer to the private sector. This link in the energy value chain is essentially the sector's cash register, making challenges in this area reverberate through to the other links in the chain (see Section 3.2 for more details).
58. **Third, management of EDL's corporate resources needs to be improved by reengineering processes and activities in key business areas to maximize efficiency, transparency and accountability.** In procurement, for example, (i) current policies need to be upgraded by enhancing transparency through the incorporation of such measures as an independent procurement complaints mechanism allowing bidders to challenge procurement decisions until contract award; (ii) a procurement procedures manual needs to be developed covering the whole procurement cycle,

including procurement planning, market analysis, development of procurement strategies and streamlined automated processes throughout the procurement cycle; and (iii) contract management needs to fairly balance risks between the employer and the contractor such as defining settlement of disputes in an escalated manner, from amicable settlement to the right for arbitration until judicial adjudication.

59. EDL's financial policies and processes also need to be revamped, including adopting International Financial Reporting Standards (IFRS) for financial reporting; developing an asset registry; conducting fixed assets, receivables and inventory valuations; developing opening balances; catching up on EDL's overdue audited financial statements; and automating its financial directorate, among others.
60. **Incorporating an Enterprise Resource Planning (ERP) system will be key to achieving these objectives.** ERP systems integrate areas, such as logistics, production, accounting, finance, and human resources, so information flow would be seamless and accurate. ERP systems improve information technology (IT) and data services by providing greater transparency and tracking processes.
61. For example, all contracts and purchases could be tracked throughout the procurement cycle and converted to indicators to measure procurement efficiency. The related financial data would then enter the finance and accounting system, and goods purchased into the inventory management system. Such integration would contribute to greater accountability by tracking decisions and providing information on who is responsible for those decisions at each step.
62. **Moreover, successful implementation of a modernization plan will depend on a compatible human resources strategy.** EDL needs to carry out a needs assessment to map existing staff capacities against the new needs of the utility and identify reallocations and training requirements. Organizing EDL staff to

comply with the new management approach will require a thorough examination of roles within the organization, job descriptions, and a remuneration policy that includes performance incentives. Most importantly, to ensure staff participation and support, EDL will need a robust change management strategy, with regular internal communication between management and staff to keep everyone involved and informed.

63. **In the first 100 days in office**, the Government should therefore consider the following:
  - i. Establishing detailed and transparent criteria for the selection of EDL's independent board members;
  - ii. Forming a panel for identifying and recommending at least 7 qualified candidates for EDL board membership; and
  - iii. Appointing the new independent members to the board and tasking them and MEW with developing performance contracts within 3-6 months to cover EDL targets and improvement.
64. **In the first 12 months in office**, the Government should also consider the following:
  - i. Adopting a time-bound plan for restructuring the sector to privatize EDL's generation plants and establish private concessions for distribution services, starting 2022 after expiry of the existing DSP contracts.
  - ii. Adopting a time-bound plan to modernize EDL's governance, core business functions, and operational performance;
  - iii. Preparing a performance contract to set targets and conditions for EDL's performance improvement over the next 4-5 years; and
  - iv. Requiring EDL to publicly disclose its financial and operational information.

## SECURITY

### 2.1 Increase Utility-Scale Renewable Energy

65. Preliminary analysis of EDL's least-cost generation expansion path indicates the need to significantly increase the share of RE capacity in the system. This certainly supports the Government's aggressive new target to allow the country to meet 30 percent of the total electricity and heat from RE by 2030 and is integral to Lebanon's Nationally Determined Contributions to the global climate change agenda. However, to meet this target, which amounts to an almost 14-fold increase from 350 MW (including 282 MW of hydropower and 7 MW from landfill gas) currently operating to 4,714 MW over 10 years, a significant ramp-up of investments in RE capacity is needed.
66. Scaling up renewables would have significant benefit for Lebanon, not only in terms of cost savings for the power sector, but also in terms of energy security and environmental sustainability for the country. On average the levelized cost of renewable energy is lower than thermal generation, hence lowering the cost of supply overall. Renewables would also lower greenhouse gas emissions and air pollution, with associated health and social benefits. Additional benefits include improved energy security through reduced fuel imports and energy mix diversification, and promotion of domestic industries for manufacturing of components.
67. The MEW (through LCEC) developed the National Renewable Energy Action Plan (NREAP) for 2016-2020 that defines the target by 2020 to implement RE projects equivalent to 12% of the projected total electricity and heating demand. The announced target within the NREAP are 331.5 MW hydro, 200 MW wind, 150 MW large-scale solar photovoltaic (PV), 100 MW distributed solar, 1.1 m<sup>2</sup> solar water heating (SWH) by 2020, and almost double that for 2030; and the potential for RE in Lebanon is significantly higher.

68. In 2017, LCEC launched its first auction for 12 15-MW solar PV plants in the country's four main regions, with the main concentration of proposals located in the Bekaa Valley and Hermel region because of their higher solar irradiance and lower land costs. The procurement is now in the final stage. In 2018, the MEW and LCEC launched another bid to install three PV farms of 100 MW combined with storage. The MEW also signed its first power purchase agreements (PPAs) in 2019 for 3 utility-scale wind power projects for a total capacity of 226 MW, which are in the financing stage. The second round of wind auctions was launched in April 2018 with significant interest.
69. **Successful realisation of large-scale RE deployment to meet the Government's 2030 target requires significant adjustments to the policy, regulatory, infrastructure and financing mechanisms.** The creation of the ERA and MEW planning department, as discussed in Sections 1.1 and 1.2, should help to define an overarching regulatory framework for private sector investment. In addition, the Government will need to reinforce its commitment with individual target capacities and timeframe for different technologies (solar PV, wind, hydro, concentrated solar, biogas).
70. This can be done within the context of a detailed least-cost plan that integrates EE, renewable and thermal generation, and transmission investments needed, to provide clarity on the additional capacity and generation mix in the next 10 years. Ostensibly, this plan should be developed by the MEW's new planning department discussed in Section 1.2, with LCEC technical advice on RE.
71. **To secure low RE prices, which will help reduce the cost of electricity, the Government will need to streamline administrative processes and develop risk mitigation schemes to attract developers.** This would include eventually raising sector tariffs to reflect costs, enhancing the creditworthiness of EDL and providing adequate guarantees to reduce the off-taker's risks and the transactions' overall risk profiles. These issues are equally applicable to thermal generation expansion as they are to RE expansion. On the technical side, resolving the challenge of land availability and reinforcing the transmission grid would also be critical.
72. Towards that end, there may be options offered by some international institutions that provide the necessary packaged support to move this process forward. For example, the World Bank Group's "Scaling Solar" program brings together support for transactional advice, pre-packaged tender documents, fully developed and market-test legal agreements, competitive financing and insurance, and risk management and credit enhancement mechanisms. Program preparation and implementation for solar PV plants could span as little as 24 months, including procurement, financing, and construction of a plant.
73. In addition, the Global Solar Risk Mitigation Initiative (SRMI), a new joint World Bank and Agence Française de Développement initiative, provides an integrated approach to tackle policy, technical and financial issues associated with scaling up solar energy deployment. This effort supports developing the enabling policy environment, e-tendering platform to streamline the procurement process, and risk mitigation for smaller (< 20 MW) projects.
74. Accordingly, in its first 12 months in office, the new Government should consider adopting a least-cost generation plan that outlines RE expansion path in the first 10 years.

## 2.2 Increase Thermal Power Generation Capacity

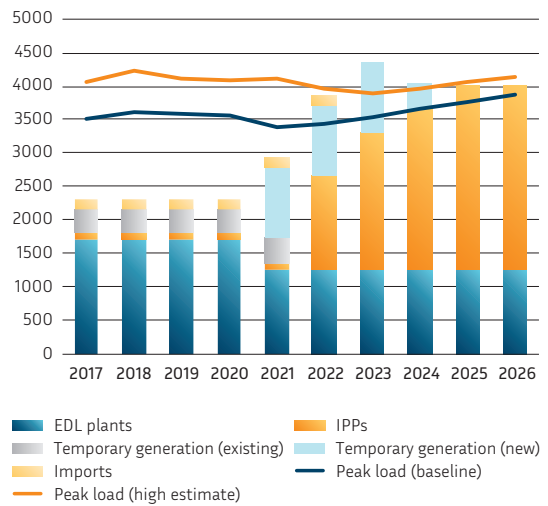
75. To rapidly expand supply, Lebanon needs to scale up both its thermal and RE capacity in parallel. In the short- to medium-term, installation of new gas-fired generation capacity should be accelerated. These gas-fired plants are needed to not only address the current generation deficit, but also to provide the necessary operating environment



to significantly scale-up RE generation. Flexible gas-fired generation would help manage the increased intermittency inherent in RE resources, grid frequency stability to ensure the electric system’s reliability, and distribution network’s resilience to accommodate and manage stresses from increased distributed RE.

- 76. Estimates of EDL’s current generation deficit varies depending on estimates of demand. Analysis indicates that at least 1500-2000 MW of additional capacity is needed just to eliminate, or at least minimize, reliance on private generators and temporary generation (see Figure 8). Towards that end, the 2010 Sector Policy and its 2019 update identified several gas-fired generation plants, primarily at Deir Amar, Salaata and Zahrani, that are urgently needed to meet this generation shortfall. Of course, this plan will need to be verified by a least-cost analysis to determine the size, location and timing of these plants as RE scale-up takes place.
- 77. In 2018, the Government announced its intention to develop new generation capacity, whether RE or thermal, under the private-sector independent power producer (IPP) model. This would reduce demands on public financing for new generation plants, thus reduce overall public debt, and promote private sector investments in the sector.
- 78. A typical gas-fired IPP secured on a competitive basis and commercially financed generally takes 12-18 months for procurement and financing to be completed; 16-18 months from start of construction for the plant to generate power from its gas turbines; and an additional 8-12 months for the combined cycle phase to be installed and the entire plant completed. In other words, it takes approximately 28 to 36 months from the time the procurement process is launched to the time initial electricity from the plant’s gas turbines can be injected into the grid (which typically represents approximately 60 percent of the plant capacity).

**FIGURE 8 – PLANNED ENERGY VS. FORECASTED DEMAND (MW)**



- 79. Given the fiscal imperative to significantly reduce subsidies as soon as possible, electricity supplies need to be increased to allow tariff increases. Current sector forecasts assume that, if electricity tariffs can be increased to the weighted average electricity costs to consumers by 2021, subsidies can be almost eliminated. Even if one presumes procurement for the new plants can be immediately launched, it is unlikely that initial power from these plants can be available by 2021, particularly if a competitive process for a commercially financed IPP is expected. Hence, temporary generation may need to be considered to provide power until the permanent plants can be brought online.
- 80. Towards that end, a process to secure the additional generation capacity needs to be urgently launched. In order to ensure transparency of this process, it should include such measures as public bid opening, an independent complaint mechanism to allow bidders to challenge decisions during the bidding process until contract award, publication of short-listed companies and contract award (with details on the scope, amount, bidder name, period of contract, etc.).



81. The MEW prepared Requests for Proposals (RfPs) that incorporate some of the foregoing measures. The RfPs are designed to solicit private sector proposals for two packages. The first combines 650 MW permanent gas-fired IPP at Zahrani and temporary generation at Zahrani (400 MW), Jieh (100 MW), Jeb Jenine (50 MW), and Bint Jbeil (50 MW). The second combines 750 MW permanent gas-fired IPP at Salaata and temporary generation at Deir Amar (450 MW). The temporary generation in both packages are technology neutral and provide bidders discretion to source their own fuel or, in the case of HFO, purchase it from the Government.
82. Combining permanent and temporary generation in a single package was done because of Lebanon's historical experience of delays in completing permanent generation, thus extending temporary generation for many years more than planned. There was a political imperative to ensure that temporary generation can be removed as soon as possible so a decision was made to link it with permanent generation to ensure that the same private sector developer is committed and incentivized to remove it.
83. However, private sector companies involved in permanent and temporary generation tend to be different. Temporary generation is also typically structured as a service with rented equipment and little capital investments, thus allowing for short mobilization periods. Permanent generation, on the other hand, is capital intensive and requires complex financing that takes some time to arrange.
84. Combining the two in one transaction, an approach intended to solve essentially a political problem, delays mobilization of temporary generation that would have to await conclusion of permanent generation commercial and financing arrangements. At the same time, it complicates financing of the permanent generation that would have to consider the developers' obligations to provide and remove the temporary generation.
85. If the political constraints underlying this packaged approach can be resolved, it is strongly advisable to split temporary and permanent generation into separate transactions to avoid potential delays and costs involved with the packaged approach.
86. Furthermore, the RfP is expected to require bidders to submit a secondary proposal that is optional for the Government, where bidders propose gas-to-power permanent solutions at both Zahrani and Salaata. In other words, the selected bidders would be responsible for designing, financing, constructing, owning and operating the permanent power plants at those locations, as well as arrange for all the gas supplies needed for them.
87. This optional bid significantly increases complexity of the procurement process (which remains geared towards an award based on providing only generation capacity) and brings into question the progress made on the ongoing FSRU procurement undertaken by LOI since May 2018. Given the urgent need for the additional generation capacity, it is highly advisable to simplify the bidding process and scope to focus on procuring permanent power plants in order to ensure availability of this power in the shortest possible time and at the most advantageous prices. **The procurement of gas supply, through FSRUs, should be carried out in a separate process, as further discussed in Section 2.3**
88. In addition to new permanent power plants at Zahrani and Salaata, efforts are well underway to develop a third new one at Deir Amar. Originally, the second power plant at Deir Amar (Deir Amar II) was to be constructed several years ago on a publicly-financed basis. The project was competitively awarded to J&P Avax, a Greek-Cypriot engineering, procurement and construction (EPC) company, and GE. However, disputes arose between the EPC contractor and the Government with respect to payment of value-added taxes, so Deir Amar II was never constructed.
89. As part of the process to resolve this dispute and proceed with construction of Deir Amar II

quickly, the Government conceptually agreed to convert the plant into an IPP with private sector financing on a direct negotiation basis. A new sponsor group was identified to design, finance, construct, own and operate the plant, and settle J&P Avax's dispute. The sponsors proposed a levelized capacity charge of US¢2.95/kWh (including the settlement costs with J&P Avax and excluding the costs of fuel to be provided by the Government) from the new plant. Direct negotiations of an energy conversion agreement have been ongoing on this basis.

90. In order to ensure transparency, fit-for-purpose, and value-for-money, such negotiated transactions need to be subjected to independent competitive tests. Ideally, the transaction should follow the same competitive process currently underway for permanent power plants at Zahrani and Salaata. Alternatively, the transaction could be subjected to a Swiss Challenge, whereby the MEW discloses the technical, financial and commercial details agreed with the current sponsor group to invite competing proposals to beat it. The current sponsors would then have an opportunity to beat any competing bid.
91. It is important to note, however, that generation forecasts currently anticipate Deir Amar II's initial power to be available in 2021, with the balance of plant completed in 2022. A competitive process is likely to delay this schedule, which in turn will increase the temporary capacity needs and its associated costs. In this respect, there are some trade-offs that will have to be considered.
92. At the very least, the transaction should be reviewed by a credible independent third party hired specifically to assess and certify the economy and efficiency of the transaction terms against relevant international benchmarks, with a summary of its conclusions publicly disclosed.
93. Moreover, there are two other overarching key issues that merit careful consideration and planning for all these transactions. **First, the**

**timing of procurement processes for plants at both Deir Amar and Zahrani (followed closely by the Salaata plant) means that there will be significant commercial financing needs (at least US\$ 2 billion) in a very short span.** This will also closely coincide with the FSRUs' financing process (which could add up to US\$ 500 million to the financing needs). Given the current turbulence in Lebanon's access to commercial capital, it is unclear whether such large financing needs can be accommodated over a short period. Furthermore, the foreign exchange requirements for repayment of these loans can add to the macro-fiscal stress on the economy, particularly in the medium-term. These issues need to be carefully evaluated and addressed in the transactions' structure.

94. **Second, financing institutions will likely require adequate guarantees to backstop the public obligations of the power purchaser.** Given the current economic conditions and the country's deteriorating credit rating, government guarantees alone may not be enough. Additional support may be needed, which can be in the form of export credit support, sector cash-trap mechanisms, multilateral guarantees, programmatic guarantees (e.g., Argentina's Renewable Energy Guarantee Fund (FODER)), or, more likely, a combination of some of these options. It is vitally important that alternatives are quickly formulated with credible financial advisors and tested through market sounding to ensure availability of, and avoid delaying financing for, these critical investments.
95. In the medium-term, the 2019 update to the sector plan also calls for decommissioning of the old plants at Zouk and Jieh, which, aside from low efficiency, high operating costs, and significant environmental impacts, use HFO-fired steam turbines that cannot be switched to natural gas. The MEW plans to replace these old plants with new peaking capacity using gas-fired open-cycle gas turbines, but additional analysis is needed to confirm the impacts scaling up RE can have on the timing of this replacement. The loss of generation

capacity from these old plants, plus the potential loss of rented barges at the same locations in 2021 upon expiry of their current purchase contracts, requires careful planning to avoid sudden drops in generation capacity.

96. In order to begin addressing some of the generation challenges facing the sector, the Government should therefore consider the following in the first 100 days in office:
  - i. Hiring credible financial advisors to assist MEW in structuring the transactions and ensuring adequate cover for anticipated financing needs;
  - ii. Revising the RfPs to separate temporary and permanent generation into two separate procurement processes; and
  - iii. Launching the procurement processes for permanent generation at Zahrani.
97. In addition, the Government should consider the following in the first 12 months in office:
  - i. Launching a transparent and competitive procurement process for temporary generation at Zahrani, Jieh, Jeb Jenin, Bint Jbeil and Deir Amar; and
  - ii. Completing and publicly disclosing a preliminary assessment of the environmental and social impacts, including associated public consultations, of the proposed plant at Salaata that meets International Financial Institutions' standards, analyzes costs and impacts at each of the identified sites, and recommends the most suitable location.
  - iii. Launching a competitive procurement process for Deir Amar II or an independent review of the current transaction.

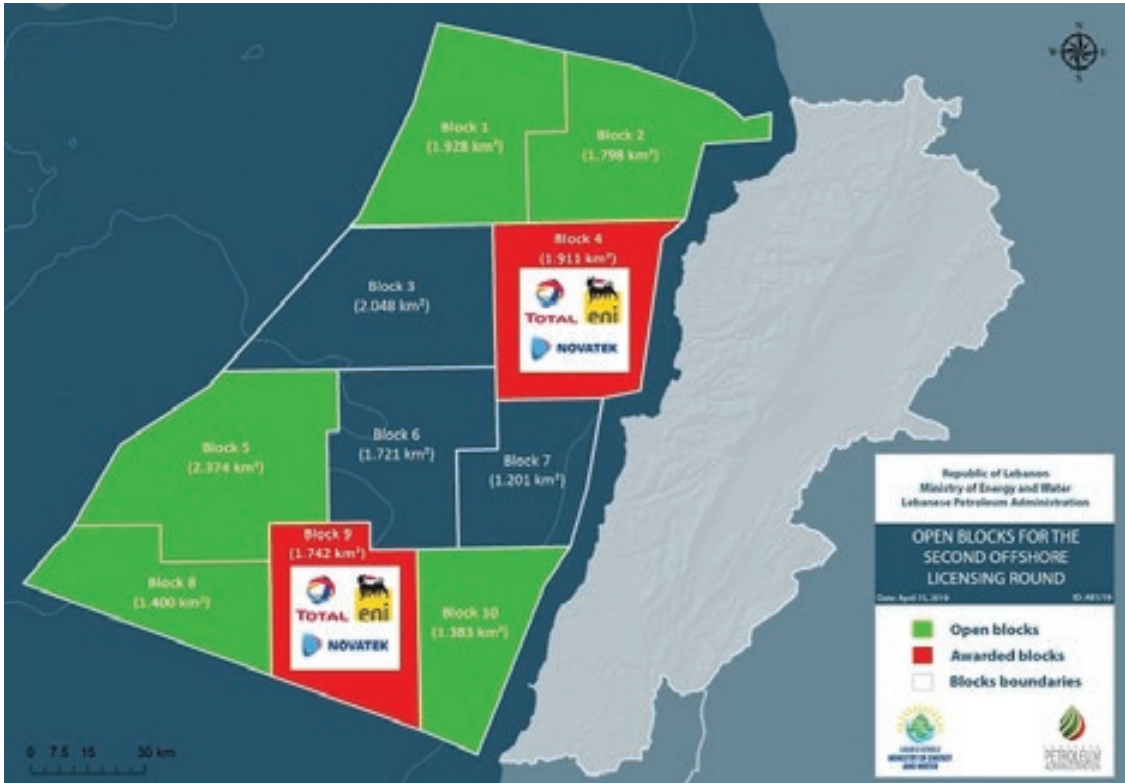
### 2.3 Accelerate Introduction of Gas for Power Generation

98. Given the significance of fuel to EDL's operating costs, it is estimated that switching from liquid fuels to natural gas can save the sector up to US\$200 million per year based

on current capacity alone. As generation capacity increases, so would these savings. It is projected that if fuel switching happens in 2022 for the existing plants which can run on gas and for the temporary generation to be secured (see Section 2.1), costs can be lowered to the current weighted average cost of electricity to consumers, allowing for tariffs to be raised to this level with limited impact on customer welfare and eliminating subsidies. It is thus imperative to secure natural gas for power generation as soon as possible, but Lebanon's options are limited.

99. In 2017, Lebanon concluded the first competitive bidding round that awarded exploration and production rights to a sole bidder making offers for only two of the blocks (see Figure 9). The disappointing depth of competition was somewhat mitigated by the caliber of the winning consortium, which consists of France's Total (40 percent), Italy's ENI (40 percent), and Russia's Novatek (20 percent). The COM approved the exploration and production agreement (EPA) in December 2017, and work has already commenced on drilling initial exploratory wells.
100. Under the EPA, the consortium has the right to explore for oil and gas during a 5-year exploration phase, divided into 2 periods of 3 and 2 years each, which can be extended for up to 10 years with COM approval. If oil or gas is discovered, the consortium must appraise the commercial potential of the discovery and, assuming confirmation, propose a plan, subject to COM approval, to develop the discovery and produce oil and gas. Once the plan is approved, the production phase lasts up to 25 years, which can be extended by 5 years if additional investments are made.
101. Assuming no external factors or force majeure, LPA projects that the exploration phase would last 4-6 years (commencing in 2019), followed by 1-2 years for evaluation of any discoveries and 1-3 years for any facility upgrades needed to operationalize commercial finds. In other words, it would take another 6 to 11 years before the production phase can start, making

FIGURE 9 – LEBANON OIL AND GAS EXPLORATION BLOCKS



domestic gas resources for power generation more of a long-term prospect.

102. In the short- to medium term, Lebanon has 3 options for access to gas. The first two options are discussed in more details in Section 2.4 below. While these options should not be ignored for Lebanon’s medium- to long-term gas supply needs, the fastest source for the gas volumes Lebanon needs remains the third option, namely liquefied gas imported by ship to a receiving regasification terminal. As illustrated in Figure 10, there are two main types of such receiving terminals: onshore terminals and FSRUs. These options were studied extensively over the past decade, concluding that FSRUs are better for various reasons. Moreover, installation of FSRUs will also help diversify Lebanon’s energy sources

over the anticipated 10-year term of any gas purchase transaction, even if the first and second options materialize.

103. Several attempts have been made in the past to install FSRUs, without much success, largely for political reasons. Prior discussions on FSRUs focused on installing a unit offshore from the existing and planned power plants at Zahrani. This assumed that gas can be imported to supply current and planned power plants at Deir Amar in the north through the Arab Gas Pipeline (AGP), which has not yet or is expected to pan out in the short- to medium-term, as further discussed in Section 2.4. Plans then shifted to installing an FSRU in the north at Deir Amar and constructing a gas pipeline linking Deir Amar with southern power plants at Zouk, Jieh, Zahrani, and Tyre. However, this

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**FIGURE 10 – COMPARISON OF ONSHORE TERMINALS AND FSRU**


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### ONSHORE IMPORT TERMINAL

- » Higher capital costs
- » Long lead time (3-5 years)
- » Significant upfront investment capital needed
- » Complex regulatory approval processes
- » Limited flexibility and scalability
- » Requires large tracts of land
- » Fixed location
- » Intended for long-term use



### FLOATING REGAS (FSRU)

- » Lower upfront capital costs
- » Short lead time (2-3 years)
- » Fewer environmental and social issues
- » Flexible and scalable
- » Unit deployed close offshore
- » Moveable or even used as LNG carrier
- » Flexible for shorter terms

too did not pan out primarily because of political objections to installing an FSRU only in the north.

104. In May 2018, a political compromise was reached so the MEW, through the LOI, launched an international competitive procurement process to select a private sector developer to design, finance, construct, own and operate FSRUs and associated infrastructure. The RfP called for non-binding bids to (a) install FSRUs, terminals, and storage tanks at Deir Amar, Zahrani, and Salaaata; and (b) construct 36-inch gas pipelines from Deir Amar to Zouk and from Zahrani to Jieh and Tyre. The RfP was designed for award of (a) and (b) as a package (see Figure 11).
105. There is rationale for installing FSRUs at Deir Amar and Zahrani. Installing only one unit at either Deir Amar or Zahrani would require construction of a north-to-south gas pipeline to ensure supply of gas along the coastline

to all power plants. The biggest challenge of this coastal line is the link between Zouk and Jieh, which will have to go through or around Beirut. While more extensive analysis is needed to firm up this option, preliminary assessment indicates that the associated cost and time to complete this link may be significant. Securing the rights-of-way through the densely populated Beirut or installing a marine pipeline in that area, though eventually needed for a national gas transportation backbone, may be challenging. At a minimum, this option would require extensive additional studies to firm up and a new procurement process that would delay availability of gas by at least 12-18 months. In this respect, two FSRUs at Deir Amar and Zahrani seem reasonable.

106. However, the basis for installing a third unit at Salaaata remains unclear. If an FSRU is installed at Deir Amar and a gas pipeline is constructed to link it with Zouk, it is unclear

why any future power plants at Salaaata could not be served through the same pipeline. Analysis of bids submitted in response to the RfP indicates that this third FSRU terminal at Salaaata would add US\$1 billion to the overall net costs over the anticipated 10-year term of any gas supply arrangement without supporting any more generation capacity than the 2-FSRU solution. This additional cost, which amounts to approximately US\$100 million per year, primarily consists of the FSRU lease (approximately US\$54 million), amortization of the costs of the marine infrastructure and FSRU mooring, and operation and maintenance of the facilities.

107. Additionally, the rationale for the required 36-inch pipelines is also unclear. The volume required to serve anticipated demand at Salaaata and Zouk in the north and Jieh and Tyre in the south requires a 10-20-inch pipeline, an estimate in line with LOI's own conclusion (12 inch). There is of course a valid argument to size the pipeline at 24-inch to match the size of the AGP in anticipation of flowing gas to and from Lebanon regionally. Sizing the pipeline at 36 inches would unnecessarily increase the transaction costs and requirements for the pipeline rights-of-way, in the event the line is constructed onshore.
108. Changing the number of FSRUs required and reducing the size of the pipeline in the RfP would represent a significant deviation from the original scope of the tender. Initially, 8 strong international consortia prequalified, of which 2 were later disqualified at the bid stage, leaving 6 providing credible bids. The technical evaluation was completed in January 2019, and the financial evaluation was completed after a long delay in July 2019. The decision on how to proceed has been with the COM since.
109. Given the need to adjust the RfP scope, the new Government should urgently settle this process. The options could include (i) negotiate with the preferred bidder to resubmit offer for the new scope; (ii) negotiate with top three bidders to form a consortium to submit offer

**FIGURE 11 – PLANNED LOCATION OF FSRUS**



(Note, Beddawai below refers to the Deir Amar location)  
Source: Ministry of Energy and Water (2018).

- for the new scope; (iii) request each of the 6 prequalified bidder to resubmit offer for the new scope; and (iv) issue a new bid, but only for one FSRU at Deir Amar and a pipeline to Tyr. The first two options risk complaints from the other qualified bidders about the transparency and fairness of the process. The final option would prolong the process and, as explained above, risk increasing the costs and complexities of the project due to the pipeline going through or around Beirut.
110. The recommended approach is therefore Option 3, namely to revise and reissue the RfP to the same technically prequalified bidders that participated in the bidding process. The revised scope would focus on 2 FSRUs at Deir Amar and Zahrani as a package, with construction of at most 24-inch pipelines from Beddawai to Zouk and from Zahrani to Jieh and Tyre. The process, from revising the RfP to determining a preferred bidder based on the new bids, is expected to take 3 months. This approach would ensure transparency and competition. It will also give an equal



opportunity to all bidders to participate, thus reducing the risk of complaints.

111. Once a preferred bidder(s) is identified, another process starts that would likely take months to complete before any construction can start (e.g., firming up technical and demand requirements, negotiating gas supply agreements (GSAs), completing the environmental and social impact due diligence, and financing). This process needs to be carefully coordinated with the negotiations of PPAs for planned IPPs at Zahrani, Deir Amar, and Salaata. There are many key common considerations for both FSRUs and IPPs, including base import gas volumes, storage and backup supply, power plant dispatch rates and seasonal variability that will impact gas demand, maintenance and dry-dock scheduling, testing and commissioning, power plant outages, force majeure, etc.
112. Towards that end, the new Government should consider the following actions in the first 100 days in office:
  - i. Hiring (or extending existing contracts for) technical and legal consultants to assist the Government in completing the procurement and negotiation process;
  - ii. Resolving the procurement scope (e.g., gas pipeline, number of FSRUs, manner of award, etc.) in a transparent manner that avoids risks of complaints from bidders; and
  - iii. Completing and announcing selection of preferred FSRU bidder(s) for Deir Amar and Zahrani.

## 2.4 Expand and Refurbish the Transmission Network

113. EDL's transmission network includes the older 66-kV grid, with country-wide coverage; some 150-kV transmission lines in the central coastal area around Beirut introduced once the 66-kV network started to experience bottlenecks as the transmission system grew; and the newer 220-kV network that stretches from north to

south in the coastal areas and loops through the northern Bekaa valley toward Beirut area.

114. EDL's long-term technical strategy is to transition away from the 150-kV voltage network and base the transmission system on 66-kV and 220-kV equipment as standard sub-transmission/transmission voltages. This will require both rehabilitating and strengthening the 66-kV grid, and significantly expanding the 220-kV network to become the country's transmission backbone. The system can then better help meet increasing demand and support the corresponding increasing power generation needs and its shifting technology mix, and the need for stronger regional integration.
115. Priority transmission investments in the short- to medium-term could thus be generally organized into the following groups:
  - i. Investments related to connecting and evacuating power from the planned thermal power plants at Deir Amar, Zahrani, and Salaata;
  - ii. Investments related to new renewable energy plants across the country; and
  - iii. Investments driven by the need to supply growing load at the main population and economic centers in the country.
116. Transmission grid reinforcements are needed across the country to accommodate the planned additional generation capacity, and to ensure reliable supply to demand centers. These investments are outlined in the 2019 update to the 2010 Sector Policy, which lists about 40 transmission projects for a total investment of approximately US\$470 million. The list is based on transmission studies conducted by Electricité de France (EDF) in 2013 and 2017 and currently being updated.<sup>6</sup>

<sup>6</sup> "Republique du Liban, Electricité du Liban (EDL): Etude du Schéma Directeur Transport du Secteur Electrique au Liban, Plan d'Investissement", EdF, Août 2013, Version Finale "Republique du Liban, Electricité du Liban (EDL): Update of the Transmission Master Plan", EdF, Final Report, May 2017.

117. Priority is given to strengthening the North and South Beirut Loops to ensure reliable supply to the Beirut area. There is also the need to modernize and strengthen power system monitoring and control to improve security and reliability of system operations, respond to the challenge of the anticipated increase of intermittent renewable generation on the transmission system, and protect the power system against cyber-attacks.
118. Accordingly, in its first 12 months in office, the new Government should consider securing financing for the identified priority investments to ensure security of supply to Beirut and integration of new generation capacity.

## 2.5 Promote Regional Electricity and Gas Trade

119. While regional electricity trade is unlikely in the short-term, such an option remains critical for Lebanon's medium- and long-term energy security. In 1988, Egypt, Iraq, Jordan, Syria and Turkey established a transmission link that was later expanded to include Lebanon, Palestine, and Libya. The agreement among these countries required them to upgrade their electricity system to ensure minimum standards to facilitate flows on this transmission line.
120. In October 1992, the original 5 countries signed a general trading agreement to cooperate on trade, and to provide mutual assistance and share benefits of surplus power they may have. This agreement was followed in 1996 with a comprehensive agreement that outlines the terms and conditions for using the transmission link.
121. Despite these developments, there has been little trade on the transmission line since its inception. The committees established under the various agreements do not appear fully functional, and terms and conditions of trade have not been enforced. Nevertheless, in the medium- to long-term, Lebanon can access lower cost electricity from Egypt and Jordan, both of which currently have excess generation capacity, through these existing transmission lines. Both Egypt and Jordan are willing to sell Lebanon electricity at competitive prices, but this potential requires an engagement on the political level to activate or re-establish the trading framework on the line, particularly through Syria.
122. Similarly, on the gas side, the cheapest source of gas for Lebanon is likely to be through the AGP that links Egypt and Lebanon through Jordan and Syria. The pipeline operated for only 1 year after it was completed in 2008, but deliveries stopped shortly after when Egypt's available gas resources dwindled. Egypt has since made significant gas discoveries in the Mediterranean (Zohr field) and the Nile Delta (West Nile field) and is able to export gas again. The Egyptian Government has already indicated willingness to export gas to Lebanon, but this gas will have to transit through Syria where the AGP's condition after the country's civil war remains unclear. There are also other geopolitical complexities that will need to be addressed before any commercial transactions can take place, making this option, while important, more of a medium- to long-term prospect.
123. Any such transactions (for both electricity and gas on the existing infrastructure) require cooperation and coordination at the political level first to facilitate transit through Syria. It would thus be advisable for the Government to task the Ministry of Foreign Affairs (MFA) to work with MEW to address the broader regional questions and explore the feasibility of an agreement with Syria to wheel Egyptian and Jordanian power and gas to Lebanon.
124. Moreover, in 2019, the Governments of Lebanon and Cyprus agreed to cooperate in areas related to gas transportation. Production from Cyprus's Aphrodite gas field is expected to begin in 2024/25 timeframe, giving Lebanon access to another regional gas supply source. However, to access Cypriote gas, a marine gas pipeline needs to be installed to link the Aphrodite field to receiving facilities in Lebanon. The

complementary benefit from this pipeline is that it could also be used to export Lebanese gas, once off-shore discoveries are made, to markets in Europe through the planned East Mediterranean pipeline linking Cyprus to Italy through Crete and Greece. It could also help transport Lebanese gas to Egypt’s liquification facilities for export to European and other markets by ship through the Suez Canal.

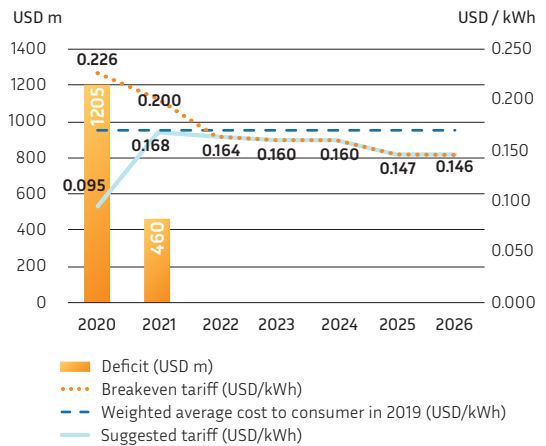
- 125. However, while this option should not be ignored, prospects for this marine pipeline from Lebanon remain in the conceptual stage and still need extensive studies and discussions among stakeholders. There are also other geopolitical considerations that may complicate prospects for linking to an energy hub in Cyprus that may require coordination between MEW and MFA. This makes it more of a medium- to long-term gas supply prospect for Lebanon’s power generation.

## STABILITY

### 3.1 Reform Electricity Tariffs

- 126. As previously noted, electricity tariffs are far below EDL’s average cost of supply. The Government’s decision in the 2019 update of the sector policy to undertake tariff reforms is thus justifiable.
- 127. As the first step, the update adopted, in principle, indexation of EDL’s tariff to reflect fluctuations in market prices of fuel purchased for power generation. Given the current financial crisis, it may be advisable to also consider including indexation for exchange rate fluctuations between the Lebanese lira that is the basis for EDL’s revenue and US dollar, which is likely to be the basis for EDL’s purchases of fuel, equipment, and spare parts.
- 128. To illustrate, with respect to fuel, tariff could be fixed at the beginning of the year based on the estimated cost of supply, with realistic assumptions on demand, fuel costs,

**FIGURE 12 – ILLUSTRATIVE SCENARIO FOR TARIFF ADJUSTMENTS**



The breakeven tariff is estimated based on the oil price of \$60/barrel

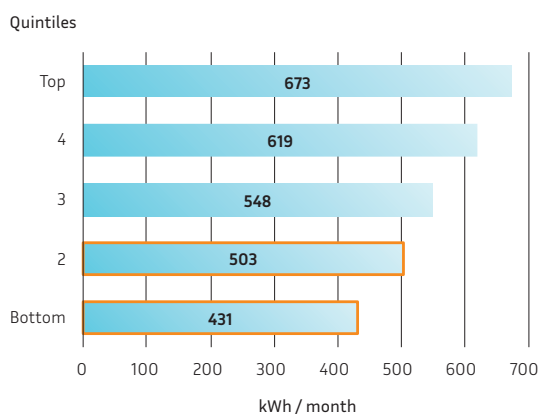
operational costs, etc. Indexation would be carried out on a quarterly basis, based on the difference between the average cost of fuel (plus working capital costs) for the previous 3 months and the baseline established at the beginning of the year. Thus, if at the beginning of a given year, electricity tariffs are calculated based on Brent oil price of US\$60 per barrel (bbl) and, during the first quarter, prices averaged US\$65/bbl, the increased costs to EDL of US\$5/bbl (plus working capital costs) would be passed on to consumers in the second quarter through the indexation mechanism. Inversely, if prices were to fall to US\$55/bbl, tariff indexation would provide consumers a credit equivalent to EDL’s savings.

- 129. EDL should disclose quarterly the details of these calculations to ensure full transparency, with a true-up calculation undertaken at the end of the year, subject to EDL’s annual audit and review by the MEW (and subsequently ERA, once it is operational). A similar approach can be adopted for fluctuations in foreign exchange (with respect to the portion of EDL’s costs that is in foreign currencies). Towards that end, the Government should consider in the first 100 days in office adopting the

mechanism that will operationalize these indexations.

130. Further tariff adjustments in the short- to medium-term will require focused efforts on increasing supply and reducing sector costs by faithfully and timely implementing the policy initiatives outlined in this paper. EDL's average cost-reflective tariff is projected to be US¢22.6/kWh in 2020, assuming targets for reducing network losses are met (see Figure 12). This leads to a subsidy requirement in 2020 of US\$1.205 billion (*US\$205 million more than allocated in the 2020 budget*) at the current average EDL tariff of US¢9.5/kWh.<sup>7</sup>
131. In 2021, subsidy requirements fall to US\$460 million, assuming EDL's average tariff can be increased by then to the weighted average cost of electricity to consumers (i.e., the combined cost of EDL and private generator-supplied electricity to the average consumer) of US¢16.8/kWh, which would still be below EDL's average cost-reflective tariff. In 2022, subsidies would be eliminated entirely, assuming EDL completes the switch to natural gas for power generation and EDL's average costs continue to decrease as new gas-fired and RE plants come online and progress is made on reducing losses.
132. In addition, a new tariff methodology is needed to more appropriately target subsidies and ensure recovery of the sector's efficient costs while, at the same time, protect customers from shouldering the burden of sector inefficiencies. The tariff methodology follows an incremental block structure that makes the heavily subsidized rates for initial consumption levels available to consumers in higher consumption blocks. This means that even commercial and residential customers whose consumption exceeds 500 kWh/month benefit from extremely cheap prices (US¢2.3-

**FIGURE 13 – DISAGGREGATED MONTHLY HOUSEHOLD ELECTRICITY CONSUMPTION FROM PUBLIC GRID PER POPULATION QUINTILE (2011/12)**



Source: World Bank staff calculations based on extrapolated HBS 2011/2012 data

3.6/kWh) for the first 300 kWh of their consumption. This universal subsidy is highly inefficient and costly.

133. An analysis of 2011/12 electricity consumption indicates that the poorest 20 percent of households in Lebanon consume on average 430 kWh/month from the public grid (see Figure 13). This number increases to 503 kWh when looking at the bottom two quintiles of the population (poorest 40 percent of households). These consumption levels are significantly higher than international standards, emphasizing the need for implementing demand-side energy efficiency measures and adopting a tariff structure that incentivizes energy conservation.<sup>8</sup>
134. In the short-term, however, it may be necessary to initially restrict low tariffs to those who consume up to 500 kWh/month in order to protect the welfare level of poor

<sup>7</sup> Without an increase in the amount to cover the estimated US\$205 million of additional sector costs, it is likely that the only recourse EDL has to manage its cashflow is to increase load shedding to save on fuel expenditure and remain within the US\$1 billion budget envelop for subsidies.

<sup>8</sup> In terms of quantity of electricity consumed, household consumption of electricity in Lebanon (public and private) is high in comparison to relevant international benchmarks, averaging around 744 kWh per month.

and most vulnerable households. With more recent economic challenges in the country, the poverty level may have gotten worse, further emphasizing the need for gradual tariff adjustments at different consumption blocks.

- 135. If tariff increases are progressive, combined with the increase in grid supply to replace private generators, the poverty and distributional impact can be limited. Average tariffs can be increased in 2021 to the current average cost to consumers of US\$16.8/kWh in a progressive manner, with the highest increases in tariffs gradually targeting higher consumption blocks (501+ kWh/month).

**TABLE 1: ILLUSTRATIVE IMPACT OF PROGRESSIVE TARIFF INCREASE AND SHIFTING TO PUBLIC GRID**

|                           | Pre-Reform (I) | Post-Reform (II) | Change (II-I) |
|---------------------------|----------------|------------------|---------------|
| Poverty (%)               | 32.30          | 33.08            | 0.78          |
| Inequality (%)            | 32.14          | 32.12            | -0.02         |
| Transfers (LBP millions)* | 0              | 193,409          | 0             |

Note: Estimated impact of tariff increase to the current average cost to consumers in a progressive manner (higher increase for higher consumption blocks)

\*These are the universal transfers required to bring poverty levels back to pre-tariff increase levels, which are a small fraction of the fiscal savings from tariff increase

- 136. If grid supply could achieve almost 20-24 hours by 2021 based on current plans, households and businesses could shift their electricity use from private generators to the public grid. This is estimated to almost cancel out the average welfare impact of tariff increases, even when considering indirect impact of price increases of other goods and services as businesses pass on their tariff increase to consumers (Table 1).
- 137. Besides changes in the tariff's level and methodology, the tariff categories need to be reviewed. Currently, residential and commercial low voltage customers pay the same tariff, under a rising block tariff structure. Separating out residential and

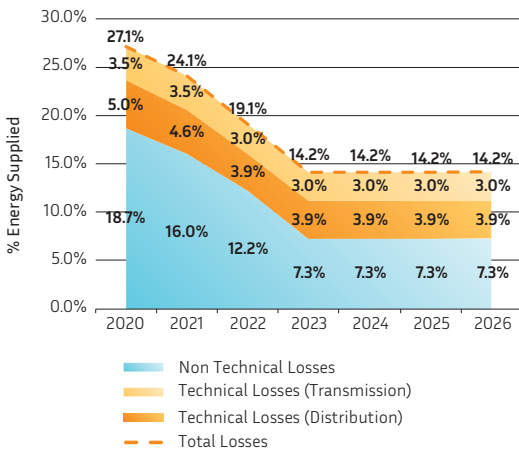
commercial customers is one option for EDL to increase revenues while better aligning tariffs with different users.

- 138. On the one hand, this would restrict commercial businesses from receiving heavily subsidized tariffs for the first increments of monthly consumption, which is meant mainly for vulnerable households. On the other hand, it would allow raising tariffs for very large residential customers (e.g, those consuming more than 1,000 kWh/month) while not affecting small businesses. Alternatively, energy charges could be varied by capacity of customer connections. The guiding principles in this restructuring should be efficient price signaling and affordability.
- 139. It is worth noting that it is vitally important for any changes in tariff levels, structure or methodology to be undertaken after extensive public consultations. Aside from the prevailing lack of trust in the sector, electricity has a pervasive impact on all walks of society. As such, it is critical that stakeholders (including disadvantaged/marginalized groups) understand how issues in the sector are being tackled and the rationale behind adopted solutions.
- 140. Toward that end, in its first 12 months in office, the new Government should launch a public communication and consultation campaign to raise awareness about tariff issues and prepare a plan to adjust tariffs (including tariff structure) as soon as supply improves.

### 3.2 Reduce Distribution Network Losses and Strengthen EDL's Revenue Collection

- 141. It is critical that ongoing work on reducing technical and non-technical losses on EDL's distribution network is accelerated. Upstream investments in additional generation and transmission capacity make little sense if the cost of the added energy in the network cannot be recovered from those benefiting from it. While the 2019 update to the sector policy provides aggressive annual targets

**FIGURE 14 – PROJECTED IMPROVEMENTS ON EDL'S NETWORK**



towards this end, given the challenges in implementing the necessary steps to achieve these reductions, a more moderated (but still ambitious) trajectory for loss reduction is presented in Figure 14.

142. **Losses are compounded the lack of payment discipline of public institutions and refugee camps.** The MEW estimates that accumulated overdue invoices from these consumer groups over the past 10 years are currently over US\$1.2 billion and US\$300 million, respectively. This significantly contributes to the sector's collection losses and, in the case of public institutions, represents what is, in essence, indirect extra-budgetary contributions.
143. **While recovery of these arrears would certainly be helpful in improving the sector's finances, the bigger concern is the impact this lack of payment discipline can have on future calculations of the sector's cost-reflective tariffs.** Without Government transfers, non-payment of these bills would need to be reflected in the tariffs, which would essentially require other consumers to subsidize public institutions and refugee camps' electricity consumption. As such, the Government needs to act decisively on this issue to avoid future distortions of sector tariffs.

144. For example, with respect to public institutions, the Government could adopt direct payment of electricity bills by the MOF from budget allocations of the public institutions involved or offsetting payment arrears from taxes payable to the Government by EDL.
145. To manage distribution network losses, EDL must be able to locate them. **This requires deploying and operationalizing an Advanced Metering Infrastructure (AMI) Program,** which is already a major (albeit yet to be implemented) component of the private-sector DSP contracts put in place in 2012 to effectively manage the distribution network on EDL's behalf.
146. The AMI Program provides for, among others, improved billing, loss and network outage reduction, and improved load management. Smart meters, which are an integral part of the AMI Program, would allow for timely and accurate billing and detect location of distribution losses. Furthermore, these meters would allow remote disconnect/reconnect of customers to strengthen enforcement actions for theft and nonpayment, which raise collection rates.
147. The installation of smart meters at the levels of M1 (generation plant bus bar), M2 (high voltage (HV)/medium voltage (MV) substation), M3 (MV feeders), and private M4 (MV/low voltage (LV) transformers) have already been completed by the DSPs, each in its region. The next step is to fully deploy the AMI system by installing, commissioning and operating all the remaining components, including smart meters at the public M4 and all M5 level customers, data concentrator units (DCUs), starting from high consumption customers, including public sector customers, and eventually covering the majority of customers by the AMI Program completion.<sup>9</sup>

<sup>9</sup> Full deployment of meters at the customer level may not be possible due to security restrictions in some areas and resistance by a few customers without a clear Government policy decision on this deployment, backed up with effective enforcement by security services.

148. **At the heart of the AMI Program is an AMI Center to be established by EDL.** The Center would provide control over EDL's revenue cycle and customer service activities and consist of head meter management and Commercial Management Systems (CMS) for all commercial processes and activities of EDL, including support for a customer Grievance Redress Mechanism (GRM).
149. The CMS provides an integrated single-platform for commercial processes and activities (P&A), and fully eliminates the unaccountable manual execution of key processes, such as transfer of data for billing, customer service, complaint management, etc. As a result, the CMS would enable detection of billing errors and fraudulent behavior, maximize efficiency and transparency of commercial management P&A, and facilitate quick and efficient response to customers' commercial requests. The CMS would also provide a central database of all customers to enable EDL's effective oversight over the DSPs' performance.
150. Together with the incorporation of the AMI system, **focus should be on re-engineering of all retail operations' P&A and incorporating state-of-the-art systems and supporting tools.** P&A should include commercial management processes and revenue cycle activities, including metering, billing, collections, disconnection/ reconnection, and customer service.
151. The AMI Program allows remote fraud detection, but dealing with fraudulent activities requires field enforcement, which would mostly be undertaken by DSPs with support from EDL and law enforcement organs of the state, when necessary. However, the activities require an appropriate framework to be agreed to incentivize DSPs to achieve specific loss reduction targets. This framework has already been a topic of extensive discussions between MEW, EDL, and the DSPs, and is expected to be included in a memorandum of understanding (MOU) that should be urgently finalized.
152. It is important to note, however, that the DSP contracts currently expire on December 31, 2021, without as yet a clear decision of what will happen afterwards. The policy direction on this point will have a profound impact on how challenges on the distribution network will be addressed in the short- to medium-term. Law 462 (and its recently COM-approved amendment) contemplate partially privatizing or more likely creating private sector concessions around EDL's distribution operation. This seems to be the most practical and technically sound solution for the distribution network's future, considering that the DSPs are already undertaking most of the work on the network. The DSP framework, while reasonable for the purpose it was created for, is unnecessarily complex and leaves ambiguities as to the roles of EDL and the private sector for distribution services that would be resolved by converting it to a concession model.
153. The first step towards implementing Law 462's vision therefore would ostensibly be unbundling the distribution functions of EDL into separate companies. These companies would then operate concessions over geographic territories similar to the split observed under the DSP contracts, and their partial ownership sold to strategic partners in accordance with limits prescribed in Law 462.
154. These strategic partners should be competitively selected based on a new procurement process set up within a new sector governance framework. The implementation plan for this effort, which should be disclosed for public consultations before finalization, should be completed and approved for execution 12-18 months prior to expiry of the DSP contracts (i.e., by mid to late 2020). This would allow enough time to transfer related businesses among the parties involved. It would also avoid the uncertainty that occurred at the end of the first phase of the DSP contracts in 2016 when they were extended on a quarterly basis due to lack of clarity as to the Government's disposition on the topic. Even more importantly, it would

avoid disruptions in distribution operations and customer service and maintain momentum towards achieving loss reduction targets.

155. In its first 12 months in office, the new Government should therefore consider the following:
  - i. Adopting an MOU between EDL and the DSPs to, among others, (a) improve allocation of roles and responsibilities among EDL and DSPs in executing commercial operations and customer management, (b) define the baseline and annual targets for the distribution loss key performance indicators for DSPs to achieve, (c) streamline EDL's process for DSP invoice validation and payments, and (d) request internal security and Ministry of Justice support, consistent with the COM's decision approving the 2019 update to the sector policy, for treatment of illegal connections;
  - ii. Adopting procedures to ensure enforcement of timely payment of electricity bills by public institutions;
  - iii. Launching the procurement process for the AMI Center and accelerate rollout of smart meters; and
  - iv. Adopting a clear policy, with implementation timeline, for creating concessions to handle electricity distribution in Lebanon.

## SUSTAINABILITY

### 4.1 Promote Decentralized Renewable Energy Applications

156. In addition to increasing utility-scale RE, sector plans should account for small-scale and distributed generation. One aspect of LCEC's RE vision is the National Energy Efficiency and Renewable Energy Action (NEEREA) initiative, developed in collaboration with Banque du Liban (BDL), that provided

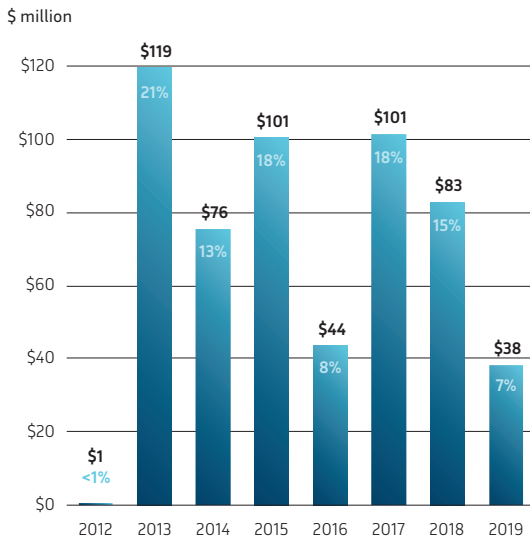
access to low interest rate loans (2.5%) for all RE applications and energy efficiency projects, with a loan ceiling of US\$10 million per project and a maximum term of 14 years – including a grace period of between 6 months and four years. To date, this initiative financed more than 940 projects with a total investment amount of more than US\$560 million, which include rooftop PV and public street lighting PV.

157. In 2018, 19 MW of solar PV capacity were added, bringing the total installed capacity to 56.37 MW, as compared to the NEEREA 2020 target of 100 MW. Most (over 60 percent) of this installed capacity so far is funded through NEEREA mechanisms. The industrial sector continues to play an important role in this market, with 18.38 MW of installed capacity, incentivized by cost savings resulting from the increase in oil prices.
158. With regards to SWH, as of December 2018, LCEC indicated that the total installed surface area of SWHs is approximately 1 million m<sup>2</sup>. With this level of penetration, LCEC estimated that SWH contributed to reducing electricity demand by 239,820 MWh per year, offset yearly greenhouse gas emissions by 156 kilo tons (ktons) of carbon dioxide (CO<sub>2</sub>) and created more than 1,000 jobs in Lebanon since its launch in 2010. The successful implementation of NEEREA's SWHs objectives has largely been due to the plan's loans and cash-back programs, which slowed in 2015. Further incentives and introduction of regulatory tools are crucial to regaining growth in this market.

159. However, as illustrated in Figure 15, the percentage of loan amount per year dropped from 18 percent in 2017 (which amounted to US\$101 million), to 7 percent in 2019 (which amounted to US\$38 million). This is most likely due to the increase of the NEEREA interest rates for these loans. However, it is important to note that, because of the current fiscal crisis, it is unclear whether this initiative is still available with BDL support and whether there is actual demand for these loans anymore.



**FIGURE 15 – NEEREA LOANS & PERCENTAGE OF LOANS PER YEAR**



Source: LCEC NEEREA

160. The levelized cost of small-scale solar PV is low and keeps decreasing, but, without storage, it will need to be used in conjunction with grid electricity. To make investment returns attractive, power purchase prices will need to be sufficiently high. While EDL has a net metering code to provide additional returns for RE power injected into its system, this code provides insufficient incentive. However, this is limited to industrial and commercial sectors. There is lack of public knowledge about net metering and EDL has limited capacity to process applications. Electricity sold to EDL under this code is compensated for by only a credit against future consumption of EDL power. To make matters worse, credits cannot be rolled over from one year to another, and private-to-private wheeling on EDL's distribution network is not currently allowed. These and other limitations significantly disincentivize small-scale third-party generators from developing solar systems to supply multiple consumers or consumers that

wish to monetize their direct investments in solar systems.

161. The solution is therefore initially to design a net *billing* policy, with an appropriate tariff structure, that incentivizes decentralized applications. In the short term, technical support can focus on community-scale systems, as well as projects that involve commercial and industrial clients, which are already financially viable. In the long term, the Government can also consider a legal framework that permits third-party access and private-to-private arrangements.

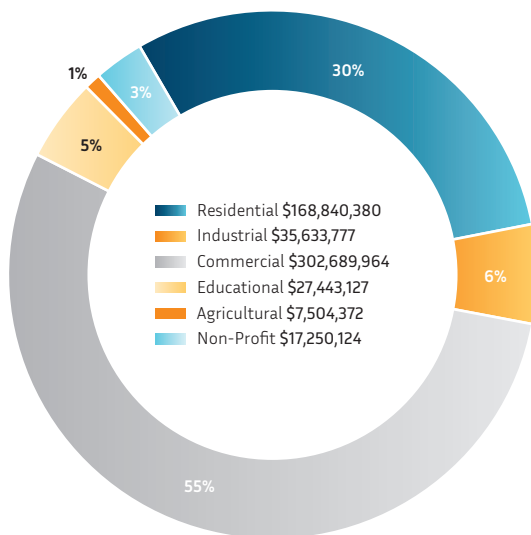
## 4.2 Implement Wider Energy Efficiency Measures

162. In addition to increasing utility-scale RE, small-scale and distributed generation, implementation of EE measures to reduce energy consumption and related operations costs should be reinforced. Synergy between renewable technologies and EE measures is required to increase the country's energy security and sustainability, and to exploit the huge opportunities for development.

163. The first National Energy Efficiency Action Plan (NEEAP) was developed in 2011 for the period 2011-2015, combining both RE and EE initiatives based on the 2010 Sector Policy. Creation of the NEEREA financing mechanism was the most successful achievement of the plan. One of the main identified gaps in this NEEAP was the lack of a clear baseline for energy savings.

164. The second adopted NEEAP covers another five years from 2016 to 2020 and includes several EE initiatives dedicated to primary energy savings and end-use measures. The end-use measures target mainly the building, industry, agriculture and public sectors, in addition to horizontal measures that have a cross-sectoral impact on the economy. The primary proposed energy saving measures were on the supply side, primarily in the generation, transmission, and distribution segments of the power sector. They mainly

**FIGURE 16 - NEEREA LOANS AMOUNT DISTRIBUTION PER SECTOR**



Source: LCEC NEEREA

tackle the upgrading OCGT to CCGT in Baalbeck and Tyre power plants, increasing efficiency of EDL transformers, reducing system reactive power, modifying distribution voltage level to 20 kV. The total estimated impact on energy saving is 686.14 GWh, but, to date, no progress has been achieved on these measures.

165. **New financing facilities were developed to encourage RE and EE financing.** Under the “Financing Mechanism” horizontal measure, NEEAP builds on extending the action of NEEREA mechanism and creating new credit line facilities. The Lebanon Energy Efficiency & Renewable Energy Finance Facility (LEEREFF) was established by European Investment Bank (EIB), Agence Française de Développement (AFD) and BDL consists of €80 million global loan provided by EIB (€50 million) and AFD (€30 million) with interest rate subsidies provided by BDL to support small-scale investments between €40,000 and €15 million (total investment amount) in EE, RE and green buildings by private companies in Lebanon. It

also offers free technical assistance funded by the European Union (EU) for project implementation.<sup>10</sup>

166. The European Bank for Reconstruction and Development (EBRD) also established the Green Economy Financing Facility (GEFF) agreement. GEFF includes funding of US\$90 million loan, to be complemented by US\$10 million in concessional funding from Taiwan’s International Cooperation and Development Fund (ICDF), for financing and technical assistance to private sector businesses to improve competitiveness, through high performance EE and RE technologies and practices. The facility operates through only one bank in Lebanon.<sup>11</sup>
167. Distribution of NEEREA loans indicates that some sectors are not sufficiently participating in EE & RE national roadmap (see Figure 16). As such, implementation of EE and RE measures across all sectors need to be reinforced, with special focus on the buildings sector, which is the main source of savings on the end-user side (up to US\$46 million of savings per year).
168. The participation of the industry sector in reducing its consumption is crucial to meet the EE national plan energy savings target. Industrial facilities, with focus on the higher consumers, should conduct mandatory regular energy audits, and implement EE measures to reduce their energy consumption and operation costs.
169. **Moreover, given the high energy consumption of heating and cooling for both space and water, integrating efficient and sustainable heating and cooling applications also needs to be strengthened.** Figure 17 illustrates that “Building Envelope” measure represents 45 percent of total measures, which emphasizes the urgent need for promoting and deploying support programs to realize the full potential

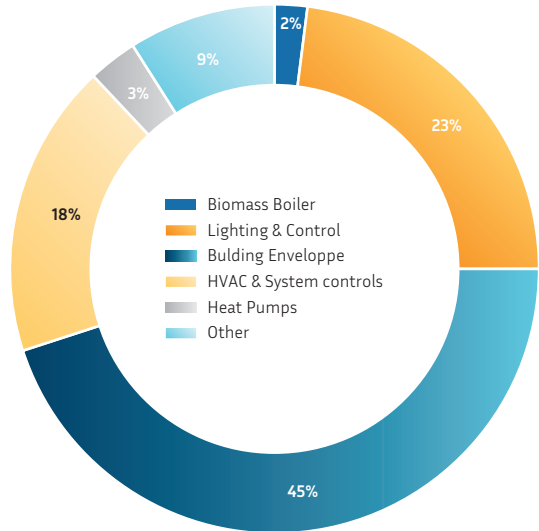
<sup>10</sup> Reference: <https://leereff.com/>

<sup>11</sup> Reference: <https://ebrdgeff.com/lebanon/the-programme/the-facility-4/>

of efficient equipment (SWHs and heat pumps replacing the electric boilers and heaters) and boost efficiency and sustainability in Lebanon's heating and cooling sector.

170. **Updating the building code to force developers to incorporate and accommodate renewable and energy efficiency technologies at the design phase should be considered.** This, for example, results in better design of rooftops to accommodate RE equipment and eliminate the upfront cost of installing this technology at a later stage. The Government should also adopt an energy conservation law that offers a legal framework for EE measures (e.g., standards and labels), financial incentives for EE appliances, banning imports of non-efficient appliances and equipment, incentivizing imports of efficient equipment, and mandating energy audits (even though this measure was introduced in the action plans since 2011, it has not been implemented).
171. **Reinforcing the NEEREA financing mechanism and other incentives and grants is essential.** To make effective any law for EE, RE, and green buildings, the respective existing financing mechanisms should be competitively rebooted, and new credit lines and grants should be established. The public sector should also participate in conservation, which could be aided by, enforcing payment discipline for their EDL consumption as a start, and creating financing mechanisms that encourage investment in EE and RE projects (e.g., municipal investments in efficient public street lighting).
172. In addition, the Government should increase awareness, build capacity and gain trust of all stakeholders working in the EE and RE sectors through regular communication, consultations, and information disclosure.

**FIGURE 17 - NEEREA EE MEASURES DISTRIBUTION**



Source: LCEC NEEREA





