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REGULATORY IMPACT ASSESSMENT

ENERGY CONSERVATION AND RENEWABLE ENERGY LAW



LEBANESE REPUBLIC
MINISTRY OF ENERGY
AND WATER



LEBANESE CENTER FOR ENERGY CONSERVATION
المركز اللبناني لخدمة الطاقة

Credits

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List of symbols

AC	Air conditioner
CoM	Council of Ministers
BdL	Central Bank of Lebanon
CFL	Compact fluorescent lamp
EC	European Commission
EDL	Electricité Du Liban
EPC	Energy performance contract
ESCO	Energy services companies
EU	European Union
GDP	Gross domestic product
GHG	Greenhouse gases
IRI	Industrial Research Institute
kWh	Kilowatt hour
LAS	League of Arab States
LBP	Lebanese pound
LCEC	Lebanese Center for Energy Conservation
LIBNOR	Lebanese Standards Institution
MED-ENEC	Euro-Mediterranean Project on Energy Efficiency
MEPS	Minimum energy performance standards
MoE	Ministry of Environment
MEW	Ministry of Energy and Water
MoF	Ministry of Finance
MPW&T	Ministry of Public Works and Transport
NEEAP	National Energy Efficiency Action Plan
NEEREA	National Energy Efficiency and Renewable Energy Action
OMSAR	Office of the Minister of State for Administrative Reform
PV	Photovoltaic
P.S.	Private sector
RIA	Regulatory impact assessment
SEAP	Sustainable Energy Action Plan
SME	Small and medium enterprise
SWH	Solar water heater
UNDP	United Nations Development Program
US\$	United States dollars

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1. CONTEXT

The electricity sector in Lebanon suffers from technical and financial problems. In Lebanon, power demand is increasing by 7% annually whereas the power supply is not increasing. Approximately 40% of electrical energy produced is lost between generation and delivery to end-users. Moreover, the electricity sector is subsidized, burdening the Lebanese economy.

The Lebanese economy is highly dependent on imported petroleum derivatives. The electricity sector, composed mainly of conventional power plants, relies on imported fuel and diesel oil. As such, it is vulnerable to varying market prices, which can threaten energy security.

In 2009, the Ministry of Energy and Water (MEW) published their Policy Paper for the Electricity Sector in Lebanon that details the problems and constraints restricting the sector's development. The paper also suggests several measures to improve the sector, including rehabilitating conventional power plants, rehabilitating the grid, developing the renewable energy sector and developing an energy efficiency action plan.

The first National Energy Efficiency Action Plan (NEEAP) for Lebanon was developed in 2010 for the years 2011–2015 and adopted by the government of Lebanon and MEW. This action plan includes initiatives aiming to develop Lebanon's energy efficiency and renewable energy sectors. An evaluation of NEEAP 2011–2015 revealed several problems and constraints that limited progress on numerous initiatives.

The second NEEAP, published in March 2016, addressed the development of the energy efficiency sector for the years 2016–2020. NEEAP 2016–2020 took into consideration the constraints faced implementing the first NEEAP, and it was developed based on European and Arab guidelines. Each initiative designated a fixed general target as well as milestones, outputs and outcomes. Most of the measures are quantitative to facilitate evaluation of the five-year plan. The second NEEAP was followed by the National Renewable Energy Action Plan (NREAP 2016–2020) that details steps to bring Lebanon’s share of energy coming from renewable sources to 12%. Lebanon has committed to producing 12% of its thermal and electrical energy from renewable energy sources by 2020.

Projected improvements fall shy of meeting the country’s energy needs due to the fact that the policies and action plans are voluntary and dependent on funding.

A law establishing standards for energy efficiency and renewable energy could address the aforementioned problems. However, issuing this law might lead to additional burdens on the Lebanese stakeholders, including the government, end-users and developers.

This impact assessment evaluates the potential impact of several options in order to gauge the feasibility of such a law and its potential impact within Lebanon’s energy sector and beyond.

This document shows the projected impact of several options, including the imposition of a law, on the Lebanese economy. It includes several sections and begins by outlining the procedure for a regulatory impact assessment (RIA). It goes on to define three options: do nothing, non-regulatory and regulatory. Where possible, quantitative assessments were performed, although a lack of data made this impossible for some measures. An RIA usually includes a monitoring and compliance section, but this juridical aspect falls outside LCEC’s expertise and has been left out of this report.

This report was developed in accordance with European guidelines and templates for RIAs.

2. REGULATORY IMPACT ASSESSMENT

2.1 Definition

An RIA is a procedure of actual and successive steps initiated in the initial phases of a regulatory drafting process. An RIA follows a specific methodology to evaluate the impact of a draft law, a new law or an existing law that is under revision. An RIA directs and advises appropriate authorities on the benefits and drawbacks of different regulatory options by evaluating their potential impact.

An RIA should take into account all aspects that might be impacted by the regulations being assessed. Vigorous regulations play a crucial role in accomplishing general and organizational objectives and unsuitable regulations can impose harmful burdens on stakeholders.

RIAs can reduce undesirable impacts on stakeholders and on a country's economy and society. An RIA can also present implementation challenges since it often addresses monitoring and evaluation systems in its evaluation of the law in question.

An RIA sheds light on the practicability of regulatory goals and allows for evaluation of whether the potential benefits of a law offset its costs and drawbacks. Information from an RIA can help achieve optimal means of reaching a regulation's objectives.

2.2 Procedure

Guidelines for the RIA of the Energy Conservation and Renewable Energy Law were prepared by Office of the Minister of State for Administrative Reform (OMSAR) with the assistance of SIGMA in 2015. They aim to identify the potential impacts and benefits of regulations prior to their implementation, establish communication and consultation channels with stakeholders and ensure congruence between policies and regulations.

RIA guidelines also aim at improving the quality of legislation by considering all aspects linked to the costs and benefits of regulations, so as to ensure the compliance of targeted groups and achieve a full understanding of the regulation by the authorities in charge of its implementation.

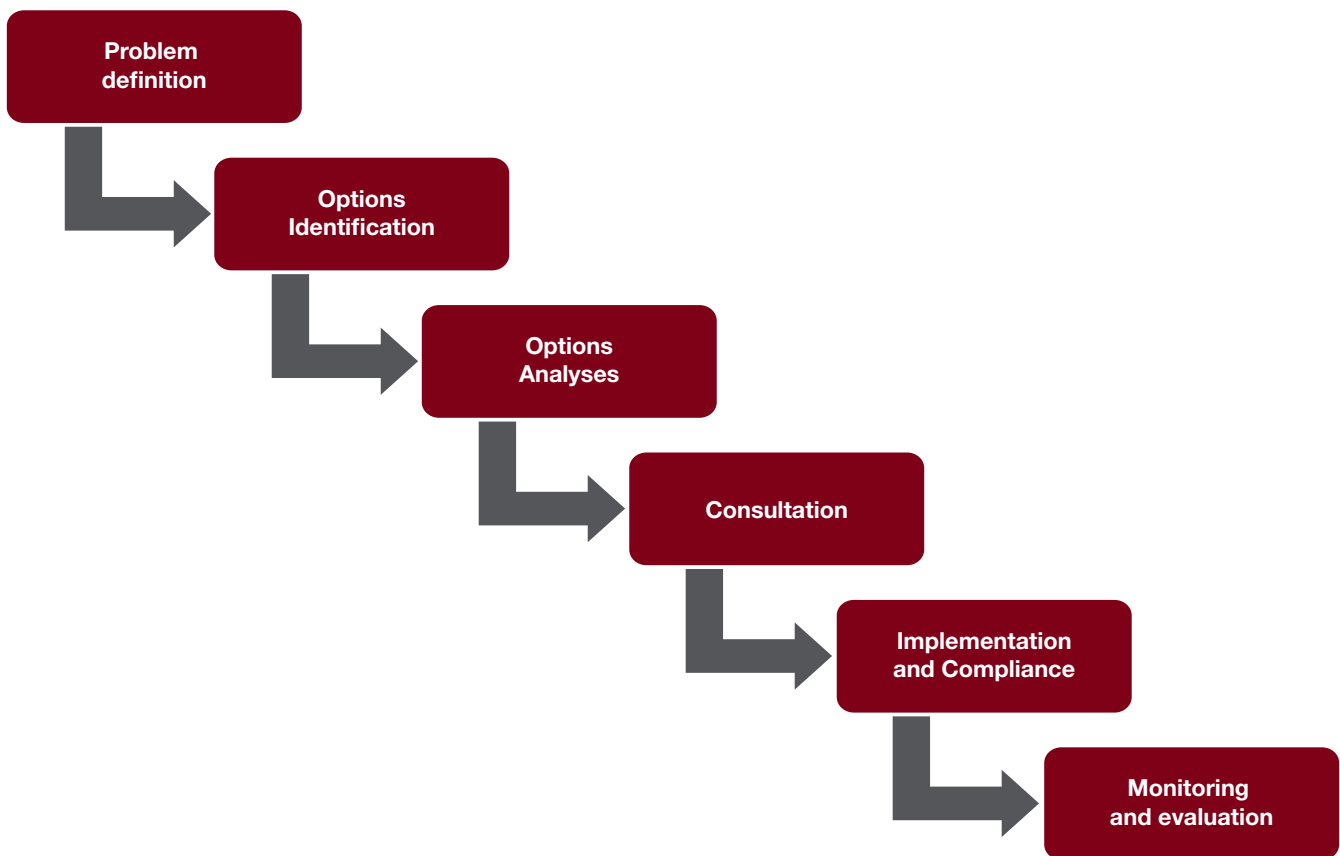
The European Commission introduced an impact assessment system in 2002, integrating and replacing previous single-sector assessments.

According to the European Commission, Impact Assessment (IA) is a process that structures and supports the development of policies. It identifies and assesses the problem at stake and the objectives of interventions. It also identifies options for achieving those objectives and analyzes their probable impacts in the economic, environmental and social fields. The impact assessment outlines the advantages and disadvantages of each option and examines possible synergies and trade-offs.

In 2005 and 2006 the Commission updated its approach to include economic, social and environmental dimensions, thus moving in the direction of Sustainability Impact Assessment (SIA).

The RIA methodology is shown in figure 1, below. The first step is defining the problem under consideration. Definitions of the problem should discuss the context and circumstances that cause it and also evaluate its magnitude.

Figure 1:
RIA methodology



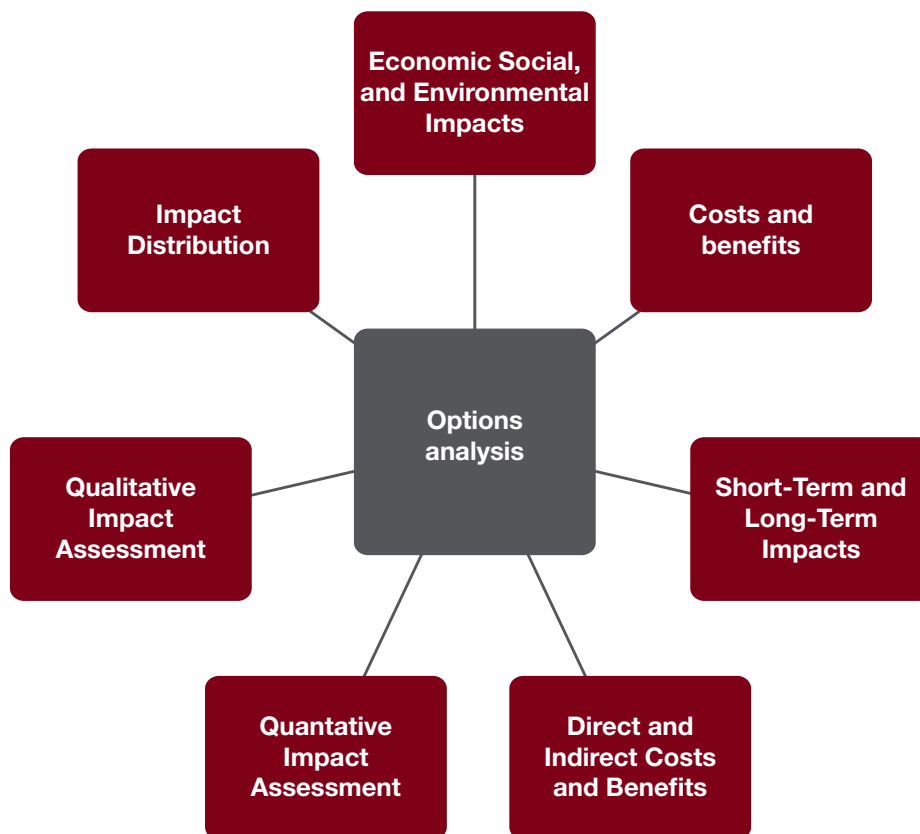
This step describes past and potential future consequences of the problem and outlines the reasons why government intervention is needed.

The second step identifies options and might include a wide range of regulatory and non-regulatory options. Regulatory options include amending existing laws or proposing new ones whereas non-regulatory options include internal reforms applied to a specific group without need for a regulatory text, such as internal circulars, memos, amending of internal regulations or improvements in communication between the parties to the problem, to promote mutual understanding despite conflicting interests.

The third step explores the impact of several options. As shown in figure 2, economic, social and environmental impacts are included along with cost-benefit assessments. Depending on the proposed regulation type, assessments could be qualitative, quantitative or both. There are three types of analysis:

- Cost-benefit analysis (CBA)
- Least cost analysis (LCA)
- Cost effectiveness analysis (CEA)

Figure 2:
Options analysis step in the RIA process



Data collection is a crucial step in the RIA process. It includes identifying required data and other information and outlining procedures for gathering it over the duration of the study, including through regular consultation workshops with stakeholders. When data collection is impossible, it is possible to use reasonable assumptions.

Consultation meetings are essential for two main phases of the RIA process. Data collection can be performed directly through consultation meetings and workshops. Consultation meetings are also used in the last phase, where stakeholders are consulted on the final draft of the RIA study and their comments are incorporated before any changes are made.

This step requires advance planning to identify stakeholders that might be affected by changes or that possess critical information related to the regulation being assessed. The consultation methodology should be well planned in order to assign tasks appropriately to each stakeholder or administrative partner. The results of consultations should be shared with stakeholders.

In summary, an RIA study includes three phases:

- A preliminary study that explains the problem, enumerates the consequences of not taking action and identifies desired objectives and potential means of achieving them.
- A provisional study that presents a short list of options for analysis and for possible use in formal consultation procedures. It is developed in parallel with data collection and analysis.
- A final study that synthesizes the evaluation and analysis of all proposed options and incorporates consultation results to identify one recommended option.

3. THE LEBANESE CASE

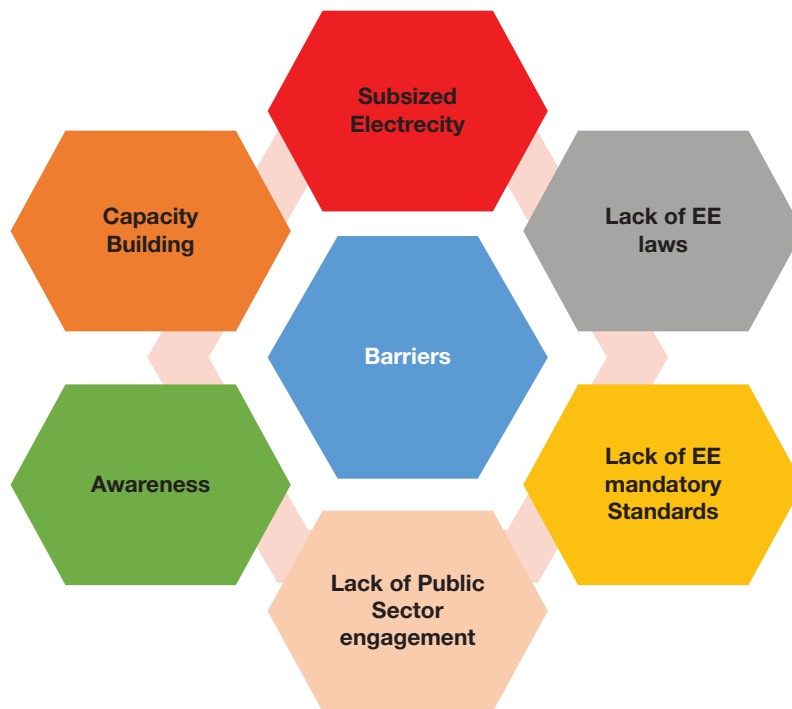
3.1 Defining the problem

The electricity sector in Lebanon suffers from several problems that make electricity production insufficient relative to increasing demand, leading to the widespread use of private generators.

Electricity in Lebanon is primarily generated from thermal and hydroelectric power plants. In 2009, around 7.5% of Lebanon’s electricity was purchased from Syria (589 GWh) and Egypt (527 GWh) through regional interconnections. In addition to the deficit in electricity supply, the Lebanese electricity sector is facing several problems such as load shedding, technical losses and aging power plants. This situation results in technical and financial impacts on end-users, the government and the entire economy. Lebanese end-users are forced to rely on diesel generators to overcome electricity shortages.

Barriers to developing energy efficiency and renewable energy in Lebanon are shown in figure 3, below.

Figure 3:
Barriers to developing the energy efficiency and renewable energy sectors



3.2 Existing regulations

The Lebanese market in appliances and electrical equipment is not governed by a single regulatory framework. Rather, regulation is partial and varies by product.

The Lebanese Standards Institutions (LIBNOR) adopted voluntary energy efficiency standards for five household appliances: solar water heaters (SWH), compact fluorescent lamps (CFL), refrigerators, A/C split units and electric and gas water heaters. In decree 5305, passed on October 28, 2010, Lebanon's Council of Ministers (CoM) made the standards mandatory for solar water heaters (SWH) and compact fluorescent lamps (CFL).

Other advances in standardization include the installation of a testing facility for solar collectors by the Industrial Research Institution (IRI) as part of a project financed by Hellenic Aid, jointly managed by the United Nations Development Programme (UNDP) and the Greek Center for Renewable Energy Sources (CRES) and implemented by the LCEC. This was followed by a testing facility for CFLs.

The lack of minimum energy performance standards (MEPS) for appliances and electrical equipment in Lebanon increases end-user consumption. The absence of a labelling system also affects perceptions of energy efficient equipment. Appliances and equipment (except for CFL and SWH) imported to Lebanon or manufactured locally are not subject to energy standards, so the end-user is buying appliances and equipment that consume high amounts of electricity.

MEPS are essential to control and monitor the market. Lebanon considered this point in NEEAP 2016–2020 where the definition and the implementation of MEPS is cited as a major objective.

On the other hand, Laws 462 and 288 regulating the electricity sector allow private electricity generation. Law 462 was passed in 2002 but is still not ratified. This law organizes the electricity sector in Lebanon and allows participation of the private sector in electricity generation. Law 288/2015 is an amendment of law 462 that states: "Provisionally and for a period of two years, until the appointment of the Regulatory Authority members, electricity production licenses are granted by a decision of the CoM upon the proposal of MeW and MoF."

3.3 Objective and targets of an Energy Conservation and Renewable Energy Law

The main goal is to ensure energy security and diversify energy sources by increasing the share of renewable energy in Lebanon's energy mix and decreasing energy demand. Together these changes protect the environment in Lebanon and ensure energy sustainability, lowering costs for citizens and meeting the growing need for energy.

Broad objective:

The main goal is to ensure energy security and diversify energy sources by increasing the share of renewable energies in Lebanon's energy mix and decreasing energy demand.

SMART objectives:

- Reach 12% of electric and thermal supply through renewable energies by 2020.
- Control energy demand growth to save a minimum of 5% of the total demand by 2020.

3.4 Options analysis

As stated in previous sections, the option analysis should include regulatory and non-regulatory options. Regarding the Lebanese case, three options will be analyzed:

- The do-nothing option, which evaluates the electricity sector in its current state.
- The non-regulatory option, which analyzes the electricity sector taking implemented policies and action plans into account.
- The regulatory option, which considers the possibility of an Energy Conservation Law.

This section analyzes these three options. A detailed stakeholders analysis is shown in annex 1. Annex 1 includes the list of stakeholders, a leadership/power analysis, position mapping of stakeholders, an impact analysis of the regulatory option on all stakeholders and a stakeholder analysis matrix.

3.4.1 Option 1: Do nothing

The average capacity and imports of electricity available in Lebanon in 2009 was 1500 MW, while the average demand was 2000–2100 MW and the instantaneous peak in the summer was 2450 MW. Total energy demand in 2009 was 15,000 GWh, while total production and purchases was 11,522 GWh. The electrical energy deficit in Lebanon is estimated at around 3,478 GWh. Electric energy is basically produced from hydroelectric and thermal power plants. Around 7.5% of total electricity production is purchased from Syria (589 GWh) and Egypt (527 GWh) through regional interconnections. The Lebanese electricity sector is facing several problems such as technical losses, old plants, aged grids and other issues that have technical and financial impacts on customers, the government and the entire economy. Lebanese end-users rely on diesel generators to make up electricity shortfalls.

These losses are detailed in the 2010 *Policy Paper for the Electricity Sector in Lebanon*.

- The average cost of electricity in 2009, including EDL's fixed costs, was \$0.1714 per kWh (255 LBP), of which \$0.1077 per kWh are fuel (high fuel bill) and \$0.0637 per kWh are for generation, transmission and distribution. The contribution of the fuel bill to the total cost was around \$1.45 billion (75%) and \$1.165 billion (62%) in 2008 and 2009, respectively, due to fluctuations in the cost of fuel.
- The total losses on the system are estimated to \$300 million, 15% of which comes from technical losses, 20% from non-technical losses and 5% from uncollected bills. The arrears and uncollected bills are estimated at more than \$1.3 billion.
- The average financial deficit of EDL is \$1.5 billion. The total investment from 1992– 2009 was only \$1.6 billion (\$50 million from 2002– 2008) and the subsidy for the same period was \$6.4 billion, amounting to a total deficit of around \$8 billion without interest.
- The cost of energy not supplied has been estimated to vary between \$200 and \$2,000 per MWh in a Public Expenditure Review (PER) by Electricité de France and the World Bank. Using an average value of \$700 per MWh not supplied, which includes the cost of private generation, losses are estimated at \$2.5 billion in 2009 for the Lebanese economy, which is divided between \$1.3 billion for private generation and \$1.2 billion for direct consumer losses.

The difficulty in reforming the electricity sector is causing an annual deficit of \$1.5 billion and losses to the national economy estimated at not less than \$2.5 billion annually. This crisis is caused by

- the lack of worthy investments
- high fuel bill
- inadequate power plants, half of which are old and inefficient and the other half uneconomical
- high technical and commercial losses in transmission and distribution, ineffective tariff structure and low average tariff and the deteriorating financial, administrative, technical and human resources of EDL

Table 1, below, summarizes the current cost of these inadequacies to the Lebanese economy, noting that the owners of private generators and Lebanese generator manufacturers are the main beneficiaries of the status quo. However, the benefit to generator manufacturers cannot be quantified at this stage.

Table 1 : Cost-benefit (in millions) analysis of the do-nothing option

Measures	Cost	Benefit
Cost Private Generators	\$19 371.91	0
Economic cost (value of lost load)	\$16 029.51	0
Subsidies total	\$9 549.50	0
Total losses/subsidies	\$44 950.91	0

The cost analysis of the do-nothing option is detailed in the 2010 Policy Paper for the Electricity Sector in Lebanon.

The average cost of electricity in 2009, including EDL’s fixed costs, was \$0.1714 per kWh, whereas the energy charge for low voltage residential customers varies from \$0.023 (35 LBP) to \$0.13 (200 LBP) per kWh in blocks of 100 kWh. In addition, customers pay a monthly subscription fee of \$0.80/5A and a rehabilitation fee of \$3.30–\$6.60 per month. The industrial tariffs are based on operating hours (day/night, winter/summer) and vary between \$0.053 (80 LBP) and \$0.21 (320 LBP) per kWh. The current tariff structure is not equitable because it subsidizes all customers, large and small, and penalizes small consumers with very large fixed charges.

Regarding generator bills, the customer typically pays a lump sum for a subscription. This sum varies depending on the region and the cutoff hours. A usual generator subscription would be \$100 per 5A per month. Some generators use meters that allow them to charge customers for their unique consumption. However, those charges are high compared to EDL’s.

Since electricity subsidies in Lebanon amount to nearly 4% of GDP, and generator bills are in lump sums, there is little incentive for Lebanese end-users to reduce electricity consumption or adopt energy-efficiency measures.

3.4.2 Option 2: Non-regulatory measures

MEW tackled the aforementioned issues in order to find a comprehensive and durable solution. MEW first developed a comprehensive energy policy that was approved by the CoM on June 21, 2010. This policy paper establishes an overall structure for the electrical energy sector in Lebanon. The 2010 Policy Paper for the Electricity Sector in Lebanon committed to launching, supporting and reinforcing all public, private and individual initiatives to utilize renewable energy in order to reach the goal of sourcing 12% of electrical and thermal energy from renewable sources. This policy also committed to control growth in energy demand to save at minimum 5% of total demand.

It comprises ten strategic initiatives that cover the sector's infrastructure, supply and demand and legal aspects. If implemented, this policy's outcome would be an electricity sector with 5,000 MW generation capacity and a reliable and efficient electrical grid that would boost the Lebanese economy.

Implementing the recommendations in the policy paper and restructuring the electricity sector would increase generation to more than 5,000 MW, create reliable transmission and distribution networks and provide efficient electricity delivery to support Lebanon's social and economic development. The policy specifies gradual implementation in the short and medium terms totaling \$4.87 billion for 4,000 MW (the Lebanese government's expected contribution is up to \$1.55 billion; the private sector, \$2.32 billion and the international donor community, up to \$1 billion), and an additional amount of \$1.65 billion in the long term. The full implementation of all the strategic initiatives in this policy will reduce total losses from \$4.4 billion in 2010 to zero in 2014.

Along with the policy paper, NEEAP 2011–2015 enumerated success criteria in five categories: legal, institutional, technical, financial and communication. NEEAP 2011–2015 was approved by the CoM in 2010. Fourteen initiatives addressed renewable energy and energy efficiency problems in Lebanon by enforcing energy conservation standards, launching renewable energy projects and promoting energy efficiency measures across Lebanon. It includes 14 initiatives that tackle energy efficiency and renewable energy.

The 14 initiatives of NEEAP 2011–2015 are:

Initiative 1: Towards banning the import of incandescent lamps to Lebanon

This initiative aims at banning the import of incandescent lamps to Lebanon by the end of the year 2012. This decision can only be reached through the application of different independent but interrelated actions, mainly the three million CFLs project.

Initiative 2: Adoption of the Energy Conservation Law and institutionalization of the Lebanese Center for Energy Conservation (LCEC) as the national agency for Lebanon

This initiative aims at the adoption of an Energy Conservation Law for Lebanon, including the institutionalization of the Lebanese Center for Energy Conservation (LCEC) as the national energy agency. The law offers a legal framework for energy audits, energy efficiency standards and labels, financial incentives for energy efficiency appliances, net-metering and the LCEC's national role.

Initiative 3: Promotion of decentralized power generation by PV and wind in the residential and commercial sectors

This initiative aims to support residential and commercial uses of wind energy and solar photovoltaic systems by increasing decentralized power generation from renewable energy sources. It targets an installed capacity of 50 to 100 MW by 2015. This requires technical, marketing and financial support and adjustments to the existing legal framework.

Initiative 4: SWHs for buildings and institutions

This initiative aims at promoting the use of SWHs, mainly in the residential sector, with the aim of installing 190,000 m² of solar collectors by 2014. This can be achieved through different means, including financial and technical schemes.

Initiative 5: Design and implementation of a national strategy for efficient and economic public street lighting in Lebanon

This initiative aims at the design and implementation of a national strategy for public street lighting in Lebanon, offering safe and energy-efficient street lighting with adequate procedures for monitoring, control and maintenance. This initiative can be achieved by updating, replacing and installing photo-sensor devices in existing street lighting where it is needed and developing technical specifications for energy-efficient street lighting lamps, while increasing the capacity of personnel working on operation and maintenance.

Initiative 6: Electricity generation from wind power

This initiative aims to promote electricity generation through wind energy. Targeting the construction of wind farms for power generation and the launch of Independent Power Production (IPP) with the private sector at an anticipated capacity of 100-200 MW by 2014, this requires technical and policy-related actions.

Initiative 7: Electricity generation from solar energy

This initiative aims to start and promote the development of electricity generation using photovoltaic (PV) and concentrated solar power (CSP) farms. One milestone of this initiative is to build PV and/or CSP farms for power generation and launch Independent Power Production with the private sector at an anticipated capacity of 100-200 MW by 2014. For this to be achieved, proper policy and technical actions are to be taken in addition to ensuring the right financial modalities.

Initiative 8: Hydro power for electricity generation

This initiative aims to encourage and promote the use of hydro power to produce electricity. This is to be achieved through support of hydro and micro hydro projects and more effective use of water resources. Rehabilitating existing power plants (additional 20–30 MW) and building new ones (of around 10 MW capacity) are the main targets of this initiative.

Initiative 9: Geothermal, waste-to-energy and other technologies

This initiative aims to help reduce waste and benefit from waste to energy conversion techniques in addition to the geothermal power to produce electricity. This is to be achieved through several actions, including finding a solution to solid waste treatment.

Initiative 10: Building code for Lebanon

This initiative aims at establishing energy efficiency codes for new buildings and major retrofits in Lebanon. An effective code would determine a minimum acceptable energy performance for buildings that addressed equipment energy efficiency and thermal requirements appropriate to Lebanese climatic conditions.

Initiative 11: Financing mechanisms and incentives

This initiative aims to provide a financing mechanism promoting the use of energy efficiency and renewable energy, primarily through collaborative work with MoF and BdL.

Initiative 12: Awareness and capacity building

This initiative aims to raise awareness and build capacity among stakeholders working in the energy efficiency and renewable energy sectors. It also focuses on analyzing and disseminating good practices, creating skills and experience in energy efficient technologies and building existing capacities.

Initiative 13: Paving the way for an energy audit and ESCO Business

This initiative aims to support the development of Energy Service Companies (ESCOs) working in the energy audit business and provide them with financial, fiscal and technical incentives to remove barriers to audit activities.

Initiative 14: Promotion of energy-efficient equipment

This initiative aims to promote the use of energy-efficient equipment, including electrical equipment, in households and commercial buildings. This includes establishing a national energy efficiency standard.

While many initiatives have already been implemented, other initiatives were delayed or obstructed. The implementation of NEEAP 2011–2015 was evaluated by the LCEC in November 2014 in collaboration with the EU-funded MED ENEC project. Initiatives 1, 2, 4, 10 and 14 present a direct energy efficiency aspect. Initiatives 10 and 14 received low scores for implementation (0% and 10%, respectively). This is due to the fact that the final step of the initiatives is to have a law or regulation in place, which was not achieved during the last four years because of the political situation in Lebanon. However, initiative 11 led to the creation of financing mechanism NEEREA and scored 80% in the evaluation. This evaluation determined that the targeted reduction of growth in electricity demand of 5% was not achieved.

NEEAP 2011–2015 is available at <http://www.lcec.org.lb/en/LCEC/DownloadCenter>.

The data used to calculate the costs and benefits for NEEAP 2011–2015 are represented in table 2, below.

Table 2: Tariffs and savings per kWh

Tariffs	LBP	US\$/kWh	Savings (Generation cost–selling cost)
Generation cost		0.202	
Street and public lighting	140	0.093	0.11
Residential fluorescent lamps	70	0.047	0.16
Industrial	120	0.080	0.12
Residential PV		0.120	0.08

Table 3, below, presents the levelized cost of electricity generated from renewable energy sources.

Table 3: Levelized cost of energy generated from different sources

Levelized cost of energy	US\$/kWh
Wind power	0.1285
PV systems	0.065
Decentralized solar PV	0.12
Concentrated solar power	0.16
Solar water heaters	0.023
Geothermal	0.2
Hydro micro	0.0817
Hydro rehabilitated	0.0157
Hydro new	0.0239
Hydro average	0.0404
Blackout EDL	50%

The cost- benefit analyses of the NEEAP 2011–2015 initiatives are detailed in table 4, below.

Table 4: Cost and benefit analysis of the non-regulatory option

Measures completed	Cost (millions of \$US)	Benefit (millions of \$US)
Initiative 1	7	68.55
Initiative 2	0.225	0
Initiative 3	1.671	13.03
Initiative 4	4.5	71.42
Initiative 5	2.59	1.164
Initiative 6	0	0
Initiative 7	4.933	6.312
Initiative 8	0	0
Initiative 9	0.012	0.610
Initiative 10	0	0
Initiative 11	16.88	397.15
Initiative 12	0.378	0
Initiative 13	0.004	0
Initiative 14	0	0
Total	38.19	558.25
Measures not completed	Cost (millions of \$US)	Benefit (millions of \$US)
Initiative 3	135	0
Initiative 6	255	0
Initiative 7	487	0
Initiative 8	653	0
Initiative 9	134	0
Total	1 701.85	558.25

These policies and plans helped create a new market for energy efficiency and renewable energy systems leading to job creation. More than 10,000 direct and indirect jobs in the sustainable energy sector were created in Lebanon. The number of SWH companies rose from 25 in 2010 to more than 170 in 2016. The number of companies working in the green energy and energy audits rose from 4 in 2010 to more than 30 in 2015. The number of companies working in the solar PV sector increased from 5 in 2010 to more than 70 in 2016.

The indirect impacts of using renewable energy sources and saving energy through energy efficiency measures include reducing greenhouse gas emissions, leading to less pollution and a healthier environment. They also enhance energy security and reduce dependence on fossil fuels and on private generators.

3.4.3 Option 3: Energy Conservation and Renewable Energy Law

The proposed law would include 10 chapters:

Chapter 1: Definitions

Chapter 2: The scope of the law

Chapter 3: National strategies and plans
Chapter 4: Energy efficiency in buildings
Chapter 5: Tools, machinery, equipment and energy-consuming supplies
Chapter 6: Tax exemptions
Chapter 7: Identification of renewable energy plant sites
Chapter 8: Renewable energy production from the private sector
Chapter 9: Violations and penalties
Chapter 10: Transitional provisions

The next section details the benefits and costs of each chapter. Quantitative measures are included where data is available.

A. Chapter 3: National strategies and plans

Chapter 3 of the proposed law proposal addresses the adoption and implementation of action plans targeting energy efficiency and renewable energy. In March 2016, LCEC published NEEAP 2016–2020, which is based on the European Union directive on energy end-use efficiency and energy services. NEEAP 2016–2020 includes energy efficiency measures in different sectors of the Lebanese economy (electricity, industry, public buildings, transport and agriculture). NEEAP 2016–2020 is available at <http://www.lcec.org.lb/en/LCEC/DownloadCenter>.

The National Renewable Energy Action Plan (NREAP) 2016–2020 was published in November 2016. NREAP 2016–2020 includes the Lebanese strategy for increasing the renewable energy share of the Lebanese electricity mix. It details possibilities for solar PV systems, concentrated solar power systems, SWHs and wind energy systems.

Table 5 summarizes the cost of implementing the regulatory options outlined in NEEAP 2016–2020 and the public projects outlined in the NREAP. The demonstration projects were not counted since they are dependent on the availability of funds, whereas the following measures are necessary for developing the energy efficiency and renewable energy sectors.

B. Chapter 4: Energy efficiency in buildings

This chapter is divided into six articles addressing energy efficiency in buildings and advocating for mandatory energy audits of buildings exceeding a certain threshold of consumption. This has several impacts, beginning with the creation of energy services companies and including job creation and market momentum.

This chapter discusses regulations for construction permits and links regulation to levels of energy efficiency defined later on in the report.

C. Chapter 5: Energy consumption of tools, machinery, equipment and supplies

This chapter addresses energy efficiency standards for equipment. MEPS must be defined for all equipment consuming energy. A labelling system must also be initiated and implemented. This should be regulated by MEW, MOI and the Council of Customs in Lebanon.

Table 5: Cost- benefit analysis of the regulatory option: NEEAP 2016–2020 and NREAP

NEEAP 2016–2020 measures	Cost (millions of \$US)	Benefit (millions of \$US)
H01: Minimum energy performance standard (MEPS)	1.00	0.00
H 02: Financing mechanism and incentives	28.83	2.02
H 03: Awareness campaigns and capacity building	0.85	0.00
H 04: ESCO's business development	0.80	0.00
B 01: Double wall ordinance	8.30	2.06
B 02: Testing facility for building components	0.70	0.00
B 03: Building code	0.60	0.00
B 05: Energy performance certificate for buildings	1.00	5.16
B 09: Capacity building for refurbishment	0.60	0.00
I 01: Mandatory energy audits	25.00	5.13
Pu 01: Creation of financing mechanism for the public sector	0.10	0.00
Pu 02: Green procurement for new and existing public buildings	1.40	0.23
Pu 03: SEAPs for municipalities	0.20	0.00
NREAP measures	Cost (millions of \$US)	Benefit (millions of \$US)
Wind power	76.55	120.33
Solar PV and concentrated PV	15.60	48.48
Solar PV	19.20	6.56
Concentrated solar power	27.30	34.46
SWHs	15.77	138.47
Hydro power	38.89	194.30
Geothermal	1.20	1.21
Total	263.88	558.42

Developing and implementing standards and labels would lead to raising market standards and regulating imported products entering the Lebanese market. Gradually, the equipment and appliances market would be more energy-efficient, helping Lebanon reach its target.

However, more efficient equipment is more expensive, and the Lebanese end-user absorbs the increased cost. The exact increase cannot be quantified given the data now available.

D. Chapter 6: Tax exemptions

This chapter suggests exempting energy-efficient tools, appliances, equipment as well as renewable energy systems and their components from value added taxes. This would lead to market development as well as cost savings for the end-user.

This chapter also recommends exempting energy-efficient vehicles from taxes or reducing current taxes. A secondary legislation process would be needed to determine conditions for these exemptions.

E. Chapter 7: Identification of sites for renewable energy plants

It is up to MEW to define the sites of renewable energy plants based on criteria to be defined in memos issued by the ministry. It incentivizes the public sector to allocate property to renewable energy development.

This is an important parameter in pushing the public sector to take the lead in renewable energy development and enforcing its engagement with the private sector, leading to potential partnerships in the future.

F. Chapter 8: Renewable energy production from the private sector

MEW defines an annual benchmark for energy production from renewable energy sources by the private sector. The bids procedure is explained in this law. Allowing the private sector to generate electricity and regulating it by power purchase agreements to be defined later would lead to increasing the renewable energy share in the energy mix and reducing dependence on conventional power plants.

G. Overall assessment of the law

The proposed law allows electricity generation from renewable energy sources. It would lead to a decrease in demand by implementing energy efficiency measures. The direct impacts are easily identified:

- Increased energy security from decreased dependence on conventional power plants and fuel imports
- Decreased greenhouse gas emissions

Other social and economic impacts can be identified. Positive impacts include:

- Creation of niches for the implementation of climate change mitigation projects
- Increase in energy conservation projects, leading to an increase in the active role of EW and potential increase in the budget allocated to MEW
- Potential markets for banks, ESCOS and renewable energy components manufacturers
- Increase in business cycle activity
- Reduced energy bill on the end-user
- Reduced health bill

However, the law has potential negative effects on the Lebanese economy. The potential negative impacts are:

- Further legislation needed to apply the framework law
- Technical and financial limitations
- Need for grid improvements
- Potential market decrease for fuel importers, generator owners and generator manufacturers

4. RIA FINAL REPORT

Title: Impact assessment of the Energy Conservation and Renewable Energy Law

Ministry or concerned entity: Ministry of Energy and Water/Lebanese Center for Energy Conservation

Regulatory tools: Law

Problem definition and goal setting

1- What problem needs to be addressed?

In Lebanon, electrical energy is primarily produced from hydroelectric and thermal power plants. Around 7.5% of all energy is purchased from Syria and Egypt through regional interconnections. The Lebanese electricity sector is facing several problems such as technical losses, old plants, aged grids and other issues, implying technical and financial impacts on customers, the government and the entire economy.

In fact, the average capacity and imports available in 2009 was 1,500 MW while the average demand was 2,000–2,100 MW and the instantaneous peak in the summer was 2,450 MW. Lebanon's energy deficit is estimated at around 3,478 GWh (23% of the total demand). Lebanese end-users rely on diesel generators to overcome the electricity shortage.

The yearly financial deficit of EDL averaged \$1.5 billion in 2009. The subsidy from 1992–2009 was \$6.4 billion, amounting to a total deficit of around \$8 billion without interest.

Losses to the national economy include the cost of energy not supplied (Value of Lost Load/VoLL), estimates of which vary between \$200–\$2,000/MWh. Losses amounted around \$2.5 billion in 2009 for the Lebanese economy using an average value of \$700 per MWh not supplied.

The main problem that should be addressed is:

A steady increase of around 7% in the Lebanese energy demand, with energy production relying mainly on high-cost imported conventional energy sources.

2- Why is government intervention needed?

The use of conventional energy sources as well as the problems in the Lebanese sector expose the country to energy insecurity and pollution.

Using energy efficiency measures and relying more on electricity generated from renewable sources reduce the energy demand and provide alternatives to using fossil fuels.

Several policies for the electricity, energy efficiency and renewable energy sectors, as well as awareness activities and financing mechanisms, were initiated and developed mainly by LCEC since 2010. The LCEC activities helped increase awareness and facilitated implementation of energy efficiency and renewable energy concepts. However, the target set by the Lebanese government of reducing the demand on electricity by 5% and having 12% of renewable energy in the Lebanese energy mix has not been met or even approached, making regulation the only option.

3- What are the expected goals and results?

The main goal is to ensure energy security and diversify energy sources through increasing the share of renewable energies in the Lebanese energy mix while decreasing energy demand in order to secure a better environment for Lebanon and the sustainability of energy sources, leading to lowering the cost on the citizen as well as securing the growing need for energy sources in all its forms.

Broad objective:

- Ensure energy security and diversify energy sources through increasing the share of renewable energies in the Lebanese energy mix while decreasing energy demand.

SMART objectives:

- Reach 12% of electric and thermal supply through renewable energies by 2020.
- Control the energy demand growth in order to save a minimum of 5% of the total demand in 2020.

Options

4- What options have been studied in detail and evaluated?

Option 1: Do nothing

Description: This option consists of making no changes. Doing nothing will leave the country in the same situation, with an electricity deficit estimated at around 3,478 GWh, or 23% of the total demand). The average capacity and imports available in 2009 was 1,500 MW, while the average demand was 2,000–2,100 MW and the instantaneous peak in the summer was 2,450 MW. Outcome: Zero benefit for the electricity sector in Lebanon.

Option 2: Non-regulatory

Description: This option includes three types of initiatives.

- Voluntary commitments: National Energy Efficiency Action Plan (NEEAP 2011–2015), Policy Paper for the Electricity Sector in Lebanon, standards for CFLs and SWHs
- Financial instruments: National Energy Efficiency and Renewable Energy Action (NEEREA), solar water heater subsidy (\$200), EU grant
- Awareness and training
- Encouraging projects
 - CFL distribution (3 million CFLs distributed)
 - Efficient street lighting
 - UNDP projects (CEDRO: Installing PV and SWH systems)

Outcome: The reduction in the electricity demand is negligible compared to the country demand, and the electricity deficit remains. Although the non-regulatory option presents a lot of advantages, it responds to only a small part of the problem defined earlier, which is to diversify the energy mix. Due to the low share of RE in the Lebanese energy mix, it does not solve the problem defined earlier in ensuring energy security.

Option 3: Regulatory

Description: This option includes a framework law regulating the energy efficiency and renewable energy situation in Lebanon.

Outcome: It will help Lebanon overcome its electricity deficit by decreasing the yearly electric demand growth rate by around 17% and increasing the renewable energy share in the Lebanese energy mix to around 12%.

Assessment

Option 1: Do nothing

The failure of the government in managing the electricity sector led to an annual public deficit of \$1.5 billion dollars and national economic losses estimated at not less than \$2.5 billion annually.

Option 2: Non-Regulatory

Policies and action plans

Implementing the policy paper and restructuring the electricity sector would allow generation of more than 5,000 MW, reliable transmission and distribution networks and efficient delivery of electricity to cope with Lebanon's social and economic development. The policy targets a gradual implementation of the initiatives in the short and medium terms, totaling \$4.87 billion for 4,000 MW (with the Lebanese government contributing up to \$1.55 billion, the private sector

contributing \$2.32 billion, and the international donor community up to \$1 billion), and an additional amount of \$1.65 billion in the long term. The full implementation of all the strategic initiatives in this policy will reduce total losses from \$4.4 billion in 2010 to zero in 2014 where 24/24.

The implementation of NEEAP 2011–2015 for Lebanon would cost \$38.19 million. However, some of the measures were not implemented due to lack of funding. The total cost of the first NEEAP implemented measures added to the value of lost benefit due to unimplemented measures are equivalent to \$1.701 billion. The cumulative benefit of the implemented measures is an estimated \$558.25 million in energy savings.

Financial instruments

The NEEREA financing mechanism is one of the first NEEAP measures. Its total implementation cost is \$16.88 million, whereas its benefit (energy savings) is estimated at \$397.14 million. The \$200 Solar water heaters grant led to a creation of a momentum in the market. Its total cost is estimated at \$4.5 million, leading to energy savings of \$71.42 million.

Social and economic impact

These policies and plans helped create a new market for the energy efficiency and renewable energy systems, leading to job creation. More than 10,000 direct and indirect jobs in the sustainable energy sector were created in Lebanon. The number of companies working in the field of solar water heaters rose from 25 in 2010 to more than 170 companies in 2016. The number of companies working in the green energy and energy audits business rose from 4 in 2010 to more than 30 companies in 2015. The number of companies working in the solar PV sector increased from 5 in 2010 to more than 70 companies in 2016.

The indirect impacts of using renewable energy sources and saving energy through energy efficiency measures reside in reducing greenhouse gas emissions, leading to less pollution and a healthier environment. They also positively affect energy security and reduce the dependency on fossil fuels and private generators at the individual level.

Option 3: Regulatory

This option is related to the development of a new framework law that regulates the energy efficiency and renewable energy sectors. The objective is to ensure energy security, reduce dependence on imported fuel in electricity generation, reduce the growth rate of demand for electricity and increase the renewable energy share of Lebanon's electricity mix.

The proposed law includes 10 chapters: Definitions; scope of the law; national strategies and plans; energy efficiency in buildings; tools, machinery, equipment and energy-consuming supplies; tax exemptions; identification of sites for renewable energy plants; renewable energy production from the private sector; penalties for violations and transitional provisions.

These chapters will be regulated in secondary legislations.

The implementation of NEEAP 2016–2020 and NREAP measures would cost \$263.88 million and achieve savings of around \$558.42 million.

This law will allow electricity generation of in the private sector, whereas it is now limited to EDL. It will also allow for job creation in the energy audit and green procurement sectors.

Consultation

5- Which key stakeholders were consulted?

Public, private, educational and industrial sectors

6- What was the nature of the consultation? (brief description)

The consultation took place as a workshop in July 2016. The following points were discussed with local stakeholders.

- Barriers to growth in the energy efficiency and renewable energy sectors
- Need for a law to regulate the market and enhance the use of energy efficiency and renewable energy to overcome these barriers
- Positive and negative impacts of a law to regulate the market

It was concluded that a law with a well-tailored monitoring mechanism would help the country overcome its electricity and energy problems.

Annex I: Stakeholder analysis

List of Stakeholders

International

- European (EU) projects (MED-ENEC, SISSAF, etc.)
- United Nations (UN) agencies (UNDP, UNIFIL, etc.)

Regional

- League of Arab States (LAS)
- Regional Center for Renewable Energy and Energy Efficiency (RCREEE)

Governmental

- Lebanese Parliament (LP)
- Council of Ministers (CoM)
- Ministry of Energy and Water (MEW)
- Ministry of Finance (MoF)
- Ministry of Environment (MoE)
- Ministry of Public Works and Transport (MoPWT)
- Ministry of Industry (MoI)
- Ministry of Tourism (MoT)
- Ministry of Health (MoH)
- Ministry of Education and Higher Education (Mehe)
- Ministry of Agriculture (MoA)
- Ministry of Interior and Municipalities (MoIM)
- Office of the Minister of State for Administrative Reform (OMSAR)

Public

- Lebanese Center for Energy Conservation (LCEC)
 - Central Bank of Lebanon (BDL)
 - Electricité du Liban (EDL)
 - Lebanese Standards Institution (LIBNOR)
 - Industrial Research Institute (IRI)
 - Council for Development and Reconstruction (CDR)
 - Directorate General of Urban Planning (DGUP)
 - Directorate General of Customs (DGC)
 - Labor (Order of Engineers and Architects, Unions, etc.)
-

Commercial

- Commercial banks
- Small and medium enterprises (SMEs), energy service companies (ESCOs), etc.
- Private generator (PG) owners
- Fuel (F) distributors
- Renewable energy (RE) components manufacturers

Nonprofit

- Non-governmental organizations (NGOs)
- Societies (Lebanese Solar Energy Society/LSES, Lebanese Green Building Council/LGBC, etc.)

Education:

- Universities
- Vocational schools
- Training bodies

Users/Consumers:

- Public sector (PS)
 - Buildings (B)
 - Industry and agriculture (IA)
 - Transport sector (TS)
-

1. Leadership/Power Analysis

Group 1: Leadership and high power	Group 2: Leadership and medium power	Group 3: No leadership and medium or high power
MEW	EU projects	MoF
OMSAR	UN entities	MoE
LP	LAS	EDL
CoM	RCREEE	IRI
LCEC	NGOs	CDR
BDL	Societies	DGUP
LIBNOR	Education	Banks
Mol		ESCOs, NECs
Mehe		User: PS
MoA		Labor
		PG owners
		SMEs
		User: B
		User: IA
		User: TS
		MoPWT
		MoT
		MoH
		DGC
		F. Distributors
		RE Manufacturers

2. Position map of stakeholders

Tariffs	Support high ↔ moderate	Neutral	Oppose moderate ↔ high
Political sector, national and international	EU projects UN entities LAS RCREEE MEW MoI MoA OMSAR	LP CoM MoF MoE MoPWT MoT Mehe MoIM DGC	Oppose
Public sector	LCEC BDL LIBNOR	EDL IRI CDR DGUP	
External stakeholders (labor unions, business associations and NGOs)	Banks ESCOs, NECs NGOs Societies Education/Capacity building RE Manufacturers	User: PS	Labor PG owners SMEs User: B User: IA User: TS F. Distributors

3. Impact Analysis of the Regulatory Option

Stakeholder	Positive Impact	Negative Impact
EU projects	<ul style="list-style-type: none"> Creation of niches for the implementation of climate change mitigation projects 	
UN entities	<ul style="list-style-type: none"> Creation of niches for the implementation of climate change mitigation projects 	
LAS	<ul style="list-style-type: none"> Creation of niches for the implementation of climate change mitigation projects 	
RCREEE	<ul style="list-style-type: none"> Creation of niches for the implementation of climate change mitigation projects 	
MEW	<ul style="list-style-type: none"> Increase in energy conservation projects leading to an increase in the active role of MEW Potential increase in the budget allocated to MEW 	<ul style="list-style-type: none"> Increased administrative burden
OMSAR	<ul style="list-style-type: none"> Active role in RIA implementation 	
LP	<ul style="list-style-type: none"> Image improvement 	<ul style="list-style-type: none"> Increase in legislation needs (to apply the framework law)
CoM	<ul style="list-style-type: none"> Image improvement 	<ul style="list-style-type: none"> Need for ministerial decrees (to apply the framework law)
MoF		<ul style="list-style-type: none"> Financial burden Administrative burden
MoE	<ul style="list-style-type: none"> Image improvement 	<ul style="list-style-type: none"> Administrative burden
MoPWT	<ul style="list-style-type: none"> Reduced emissions 	<ul style="list-style-type: none"> Administrative burden
MoI	<ul style="list-style-type: none"> Image improvement 	<ul style="list-style-type: none"> Administrative burden
MoT	<ul style="list-style-type: none"> Image improvement 	<ul style="list-style-type: none"> Administrative burden
MoH	<ul style="list-style-type: none"> Reduced production cost 	<ul style="list-style-type: none"> Administrative burden
Mehe	<ul style="list-style-type: none"> Image improvement 	<ul style="list-style-type: none"> Administrative burden
MoA	<ul style="list-style-type: none"> Image improvement 	<ul style="list-style-type: none"> Need for new curricula
MoIM	<ul style="list-style-type: none"> Image improvement 	<ul style="list-style-type: none"> Administrative burden
LCEC	<ul style="list-style-type: none"> Image improvement 	<ul style="list-style-type: none"> Administrative burden Increase in HR requirements
BDL	<ul style="list-style-type: none"> Image improvement 	<ul style="list-style-type: none"> Administrative burden Increase in HR requirements
LIBNOR	<ul style="list-style-type: none"> Increase in activity in the RE/EE field Image improvement 	<ul style="list-style-type: none"> Administrative burden Increase in HR requirements

Stakeholder	Positive Impact	Negative Impact
EDL	<ul style="list-style-type: none"> Reduced increase in energy requirements Reduced financial losses 	<ul style="list-style-type: none"> Technical and financial limitations Needs for grid improvements Training required for staff
IRI	<ul style="list-style-type: none"> Increased activity in RE/EE testing Potential increase in budget allocation Image improvement 	<ul style="list-style-type: none"> Technical and financial limitations Administrative burden Increase in HR requirements Training required for staff
CDR	<ul style="list-style-type: none"> Increased activity in RE/EE projects Potential increase in budget allocation Image improvement 	<ul style="list-style-type: none"> Technical and financial limitations Administrative burden Increase in HR requirements Training required for staff
DGUP	<ul style="list-style-type: none"> Increased activity in RE/EE projects Potential increase in budget allocation Image improvement 	<ul style="list-style-type: none"> Administrative burden Increase in HR requirements Training required for staff
DGC	<ul style="list-style-type: none"> Potential increase in budget allocation 	<ul style="list-style-type: none"> Administrative burden Increase in HR requirements Training required for staff
Banks	<ul style="list-style-type: none"> New potential markets 	<ul style="list-style-type: none"> Administrative burden
ESCOs, NECs	<ul style="list-style-type: none"> New potential markets 	
NGOs	<ul style="list-style-type: none"> New potential markets Potential increase in grant opportunities 	
Societies	<ul style="list-style-type: none"> Potential increase of activities Potential increase in grant opportunities 	
Education/ Capacity building	<ul style="list-style-type: none"> Creation of new curricula Image improvement Potential increase in grants opportunities for research 	<ul style="list-style-type: none"> Administrative burden Increase in qualified HR requirements
User: PS	<ul style="list-style-type: none"> Reduced energy bills 	<ul style="list-style-type: none"> Investment needs
Labor	<ul style="list-style-type: none"> Creation of new job opportunities 	<ul style="list-style-type: none"> Need for training and capacity building
PG owners		<ul style="list-style-type: none"> Potential market decrease
Fuel Distributors		<ul style="list-style-type: none"> Potential market decrease
RE Manufacturers	<ul style="list-style-type: none"> Potential market growth 	
SMEs	<ul style="list-style-type: none"> Potential of market increase 	<ul style="list-style-type: none"> Need for capital investment
User: B	<ul style="list-style-type: none"> Reduced energy bill 	<ul style="list-style-type: none"> Need for capital investment
User: IA	<ul style="list-style-type: none"> Reduced energy bill 	<ul style="list-style-type: none"> Need for capital investment
User: TS	<ul style="list-style-type: none"> Reduced energy cost 	<ul style="list-style-type: none"> Need for capital investment

5. REFERENCES

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REGULATORY IMPACT ASSESSMENT



LEBANESE REPUBLIC
MINISTRY OF ENERGY
AND WATER



LEBANESE CENTER FOR ENERGY CONSERVATION
المركز اللبناني لحفظ الطاقة