AMERICAN UNIVERSITY OF BEIRUT

ENERGY ATTRIBUTES CERTIFICATES: A NOVEL MECHANISM TO SUPPORT ENERGY TRANSITION IN LEBANON

by
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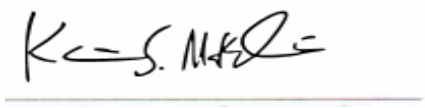

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AN ABSTRACT OF THE THESIS OF

Noura Nabil Layssi Stouhi for Master of Science
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Lebanon is slowly evolving towards reaching its international environmental commitments. Those commitments face many obstacles and challenges especially in terms of policies and regulations. We will see through this paper that neglecting the commercial and industrial sectors in Lebanon that consume more than 50% of the total electricity and responsible of 32.07% of emissions in the country is also delaying energy transition in the country. Indeed, there are no specific policies that regulate energy consumption and emissions for these sectors which negatively affect the progress towards achieving the country's environmental commitments.

Through this paper, a novel mechanism that is gradually being used in many countries across the world is suggested to support a sustainable energy transition and help reaching Lebanon's international environmental commitments. Energy attribute certificates (EACs) is a form of corporate sourcing of renewable energy that is proposed to be introduced to the Lebanese market. EACs are however faced by many criticisms from different involved stakeholders mainly in terms of their actual contribution to additionality and decreasing greenhouse gas emissions which challenges this paper's overall objective. There are however some new market tools such as the eco-labelled certificates that could be used in association with the EACs market to help addressing the critics and to make sure that EACs would be able to support a sustainable energy transition in Lebanon. The introduction of EACs associated with a concept based on the eco-labelled certificates but specifically tailored to the Lebanese case is studied in this paper. Our study highlights the additional benefits of an EACs market in terms of positive contribution to the Lebanese GDP from one side and the improvement of some people's living conditions from the other side.

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ABBREVIATIONS

CO_2	Carbon dioxide	MoEW	Ministry of Energy and Water
CSR	Corporate Social Responsibility	MW	Megawatt
DCCE	Dubai Carbon Centre of Excellence	MWh	Megawatt-hour
EAC	Energy attribute certificate	NEEAP	National Energy Efficiency Action Plan
EDL	Electricité du Liban	NREAP	National Renewable Energy Action Plan
GDP	Gross domestic product	PPA	Power purchase agreement
GHG	Greenhouse gas	PV	Photovoltaic
GW	Gigawatt	RE	Renewable energy
GWh	Gigawatt-hour	REC	Renewable energy certificate
I-REC	International Renewable Energy Certificate	RPS	Renewable Portfolio Standards
IRENA	International Renewable Energy Agency	SWH	Solar water heater
kW	Kilowatt	tCO2e	tonne CO2 equivalent
kWh	Kilowatt-hour	UNDP	United Nations Development Programme
LCEC	Lebanese Center for Energy Conservation	UNFCCC	United Nations Framework Convention on Climate Change
MENA	Middle East and North Africa		
MoE	Ministry of Environment		

CHAPTER 1

INTRODUCTION

During the United Nations Climate Change Conference in Copenhagen (known as the Copenhagen Conference) in 2009, the Lebanese government pledged to reach 12% of its energy supply from renewable energy (RE) sources by 2020. However, "the Lebanese government is evolving very slowly towards the 12% RE share of the total energy production by the year 2020" (Khoury *et al.*, 2016). For the longer term, Lebanon "committed to an unconditional reduction of 15% in greenhouse gas (GHG) emissions against Business as Usual (BAU) and an amended conditional target of 30% emission reduction by 2030" as part of its Nationally Determined Contribution (NDCs) (UNDP, 2019), which should be associated with decreasing reliance of energy produced from fossil fuel power plants. More recently, in the Updated Policy Paper for the Electricity Sector that was approved by the Lebanese Council of Ministers (CoM) in April 2019, the government committed to reach 30% renewable electricity share by 2030 (Ministry of Energy and Water, 2019). If these commitments were properly implemented, they would strongly contribute to a sustainable energy transition in the country. However, these commitments face many financial and regulatory barriers and limitations in addition to the absence of "technical and institutional capacities to carry out implementation and progress tracking" (UNDP, 2019). Indeed, the Lebanese government did not initiate any effective regulation that makes it mandatory for the utility and/or corporations in Lebanon to have a diversified energy mix with a specified percentage of renewable energy. The lack for appropriate regulations would make it difficult

for any country to decrease its emissions to achieve its NDC commitments, and this would definitely slow down the transition towards cleaner forms of energy.

Many examples (for example Law 462, enacted in 2002, which stipulates how the private sector can be involved in power production and calls for the establishment of the Lebanese Electricity Regulatory Authority, has not been implemented to date) show that passing a new law and/or implementing an existing one in Lebanon could be undermined due to many constraints, particularly constraints related to the political environment, lobby groups vying against a particular regulation being enacted and/or implemented, and other bureaucratic barriers.

According to the Lebanon's Second Biennial Update Report to the UNFCCC (2013), the manufacturing and construction industries, along with the commercial and institutional sectors, contributed together to 32.07% of the total energy emissions as of 2013 (Aboujaoudé & Chalfoun, 2017), which leads to a total of "3.1 million tonnes of CO_2" emitted per year (Diab *et al*., 2015). Decreasing thus the emissions of the commercial and industrial sectors would assist Lebanon in reducing a large amount of its greenhouse gases emissions in order to achieve its NDC targets and supports its energy transition. Additionally, it is important to note that the commercial and institutional sectors in Lebanon consumed alone about 9,332 GWh per year as of 2012, out of which 7,619 GWh was used for electricity (Diab *et al*., 2015). Since the total electricity consumption in Lebanon in 2012 was around 13,000 GWh (U.S. Energy Information Administration – EIA, 2016); therefore, the commercial and institutional sectors in Lebanon used around 50% of the total electricity in the country. This emphasizes a possible existence of a large potential market for energy

efficiency and renewable energy and more specifically for energy attributes certificates (EACs) in Lebanon, putting in mind that we are only taking into consideration one of the different Lebanese sectors that could be involved.

It is also important to note that the commercial sector in Lebanon is divided into two large categories. The first type would be multinationals that have made commitments to achieve a certain target of renewables in their total energy mix as part of their global strategies and corporate social responsibilities. These multinationals vary between the ones that already use EACs in some or all of their international operations and the ones that don't. The involvement of those multinationals in the energy transition process in the country could be of high significance especially the ones that are already aware of the existence of the EACs market. As of today, 185 companies from around the world "have made a commitment to go '100% renewable'" (RE100, 2019) and are members of the RE100 initiative, and around 30 of them have local branches and operations in Lebanon. Among them, 20 companies are currently using unbundled energy attributes certificates as part of their global approach to reach their renewable energy targets (RE100, 2018). Those companies would (at least in theory) take the lead in the transition and the establishment of the market and could be an important tool to motivate and incentivize other local companies to initiate a similar transition to cleaner sources of energy and to become a part of the corporate sourcing of renewables market. This leadership would be based on five elements according to RE100: ambition, impact, sustainability, influence and transparency (Pineda, 2018). The other type of companies are the local companies and institutions. We will show through this paper that many of them are already implementing some renewable energy and environmentally

friendly policies in their operations, they could thus be involved in the EACs market in Lebanon once established.

Establishing the energy attributes certificates market in Lebanon could be the result of the involvement and commitment of the multinationals which might influence other local companies that are interested in sustainability and corporate social responsibility to invest in those certificates. This might help in expanding the market and lead to more competitive prices which is crucial for the proper growth of this market as we will see through this paper.

Given that state actors in Lebanon are constrained by many factors, we will be looking in this study at the required process for establishing a voluntary EACs market with the respective roles of the involved stakeholders. The responsibility of corporations in incorporating and increasing the dependence on renewable sources of energy in the overall energy mix, particularly through renewable energy credits (RECs) or energy attribute certificates (EACs) [1]to ensure energy transition in the country would be highlighted as well through different examples from around the world. This idea emphasizes the need to rely on the acknowledgment of corporations of their highly crucial role to help in the transition towards a cleaner environment in the country. This kind of strategy would fall under a voluntary market approach where corporations (local and multinational) would integrate environmentally friendly policies as part of their corporate social responsibilities (CSR) while focusing on climate change (Falkner, 2016). This voluntary approach would be further driven by “meeting internal environmental and social objectives such as greenhouse gas

[1] These two terms can be used interchangeably

emission reduction targets and addressing the growing demand for corporate sustainability from investors and consumers" (REN21, 2018). It would also be correlated with an improved image of the company in the eyes of their respective consumers. Moreover, cost-competitiveness of renewable energy sources due to the significant reduction of renewable energy costs, accompanied by an increasing maturity of "market and policy environments", have contributed further to incentivizing the companies to increase the share of renewables in their energy mix (REN21, 2018). Based on the various critics and debates that revolve around this market, we will also be questioning the ability of an EACs voluntary market to contribute to the energy transition in the country on its own without the involvement of a mandatory market that is usually translated into laws and regulations set by the government.

There are many ways through which companies could switch in a transparent way to the use of renewable sources of energy keeping in mind that "transparency on climate risks in business operations" is becoming a necessary request for institutional investors (Falkner, 2016). One way of achieving the transition and for helping the country in realizing its ambitious NDCs would be through the initiation of an EACs market in Lebanon based on the corporations' voluntary actions.

For the purpose of this study, which is about using a novel mechanism to support energy transition in Lebanon, we will focus on the establishment of a corporate sourcing of renewable energy market in Lebanon as a tool for a low-carbon transition. A general description of the various options that face corporations will be described, along with advantages and disadvantages of each, with the main focus being the sourcing of energy attributes certificates (EACs). The study aimed also to illicit the opinion of at least 10

corporations in Lebanon about their awareness on and their willingness to source renewable energy through the EACs system on an annual and continuous basis. However, given the deteriorating economic conditions and the arrival of the Coronavirus pandemic in Lebanon as of late 2019 and 2020, this objective could not be met.

Through this study we will go over the characteristics of EACs markets along with some successful experiences of countries and positive impact of corporations that used the voluntary EACs market in addition to the criticism faced by the voluntary EACs market. These critics would help us in finding the most appropriate and efficient process to establish the EACs market in Lebanon while making sure to fulfill this paper's purpose and allowing Lebanon to get the most benefits out of it. The study will also focus on the need (or lack of) for a regulatory framework for setting up such a market for Lebanon, will describe the required regulations (if any) based on different countries' experiences, and will illicit the opinion of key stakeholders on the difficulty of passing such a regulation (if deemed necessary). The study will also suggest recommendations to develop and overcome the different challenges and barriers – that are grouped under three main categories: policy, financial and technical (RE100, 2018) – that are associated with this market in Lebanon and to incentivize corporations to invest in it focusing on the energy attributes certificates market.

CHAPTER 2

LITERATURE REVIEW

The establishment of a corporate sourcing of renewable energy market in different parts of the world is contributing towards a faster transition towards a cleaner environment with less emissions, a crucial objective for achieving the Paris Agreement objectives (IRENA, 2018). This market is evolving fast with more than 75 countries in 2017 with companies now sourcing renewable energy credits (IRENA, 2018). Those companies are from different economic sectors including industrial, financial, information technology, telecommunication and manufacturing. Corporate sourcing of renewables is considered as an active approach for companies to "consume, produce or invest in renewable energy to sustain their operations" (IRENA, 2018). This market has different forms including: production for self-consumption, renewable energy offerings from utilities or electric suppliers, power purchase agreements (PPAs) and energy attribute certificates (EACs) which could be bundled or unbundled (IRENA, 2018). Each one has its corresponding advantages, limitations, and required regulations and supporting policies that will be discussed throughout this paper in order to indicate which renewable energy sourcing type would be more relevant and feasible for Lebanon in light of its current energy regulatory frameworks. IRENA's data show that approximately half of renewable and green energy in the world is acquired through "unbundled EACs, followed by PPAs and utility purchase programmes" (IRENA, 2018) (Refer Figure 1).

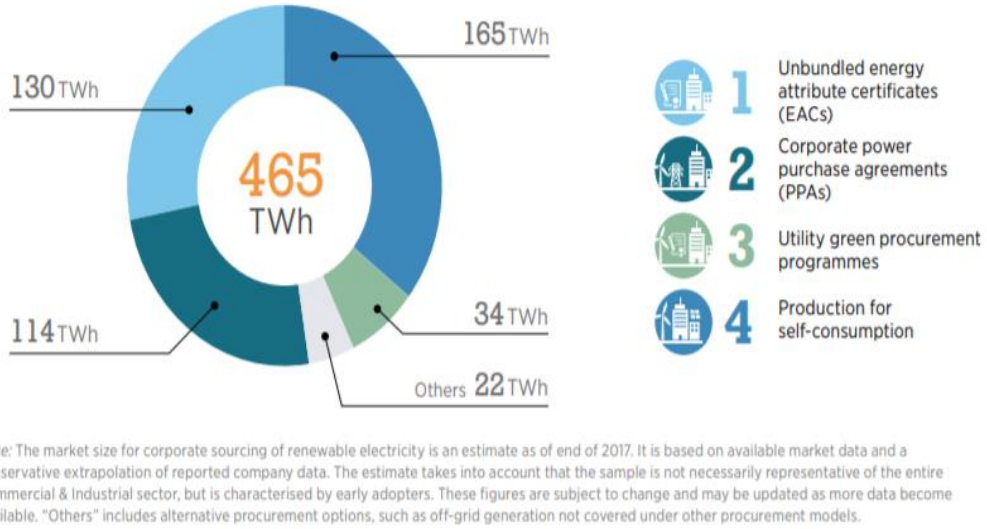


Figure 1 Global corporate sourcing of renewable electricity by sourcing model (Source: IRENA)

The data also emphasizes the fact that the largest portion of the procured renewable energy received by corporations comes from hydropower and bioenergy while wind and solar energy's share is smaller (IRENA, 2018).

2.1. Different forms of corporate sourcing of renewable energy

2.1.1 Direct investment in production for self-consumption (also called corporate ownership)

The first option for corporations is to produce renewable energy on their own to satisfy their electricity demand, this could be done onsite or offsite (IRENA, 2018). In this situation, the corporation would be in charge of the whole project since its establishment and would thus "assume the associated risks and financing responsibilities" (IRENA, 2018). This could be a barrier to the proper development of the project especially if the corporation does not possess the necessary expertise to deal with such a project. In the situation of an offsite

project, “transmission or wheeling charges may apply if the power needs to access to transmission lines” (Bird *et al.*, 2017), which usually limits the development of those systems to liberalized markets where it is permitted to have this kind of contracts (Bird *et al.*, 2017). This mechanism could be found in any country that allows the use of net metering or feed-in-tariffs (IRENA, 2018). The use of corporate ownership is associated with many advantages to the corporation such as the large control on the power production, the possibility to save energy, fixed power expense during the whole life of the project, “a visible renewable energy project with potentially local impacts”, larger power consistency especially with the use of storage techniques, and it constitutes an addition to the renewable energy capacity (Bird *et al.*, 2017). However, these benefits are constrained to the following factors: the need for a large capital investment, the establishment of an onsite project is not always possible due to limited available areas which could meet only a small share of the demand, the corporation would be bearing all the risks in addition to the responsibility of operation and maintenance of the project (Bird *et al.*, 2017). According to NREL, the most important barrier to the development of such a project is the “internal competition for capital” especially that the corporation would have many possible up-front investment opportunities (Bird *et al.*, 2017).

2.1.2 Renewable energy offerings from utilities or electric suppliers

Regulated energy offering from utilities or electric suppliers are programs that are usually found in a “regulated electricity market with vertically integrated utilities” (Bird *et al.*, 2017), passing through local utilities would thus be a requirement for corporations to purchase electricity from renewable energy sources “through green premium products or

through a tailored renewable electricity contract, such as green tariff programs offered" (IRENA, 2018). Another option would be through procuring certificates (Bird *et al.*, 2017). Green premium products (also called utility green pricing) that are mostly used for housing and small companies allow them to buy electricity directly from the utility without being committed to a longstanding contract (IRENA, 2018), thus there is no possibility of long-term savings (Bird *et al.*, 2017). Those products are beneficial for their minimal capital requirement and the non-involvement of the consumer in the operation and maintenance since it would be the utility's responsibility. Some constraints however limit the procurement of those products. They are not considered as global products since they are not offered by all the international utilities; moreover, working through utilities instead of a private generator decreases the control that the consumer has on the project and finally "pricing is often fixed and can be offered at a substantial premium to electric service" (Bird *et al.*, 2017). The second type of products are the utility green tariffs (also called utility renewable contracts) and these are found in vertically integrated markets and have similar characteristics to the PPAs that are used in the liberalized markets (Bird *et al.*, 2017). The utility green tariffs are mostly used by large corporations and are characterized by long-term commitments (IRENA, 2018). The utility in this case would be an intermediary between the corporate purchaser and the renewable energy producer, where the utility buys electricity on behalf of the corporation who "pays a special utility green tariff rate for the renewable energy service" (Bird *et al.*, 2017). The advantages associated with the utility green tariffs are (1) the chance for the consumer to decrease its electricity bill through some tailored programs offered to companies allowing them to buy renewable energy "from a specific asset through a longer-term utility contract similar to a PPA" (IRENA, 2018), (2) there is no need for an "up-front

capital investment" for the customer, and (3) the possibility to "work directly with current service provider" with longstanding fixed prices which offers stability and elimination of operations and maintenance expenses from the corporation's side (Bird *et al.,* 2017). They have similar barriers to the green premium products since the tariffs are not offered by all the utilities globally, and off-takers have decreasing control on the projects. Additionally, considerable negotiations could be needed on the rates and the program structure and finally, they "may not yield cost savings equivalent to PPAs or other structures" (Bird *et al.,* 2017).

Utility programs' market is still small globally compared to the above mechanisms with 34 TWh of renewable electricity bought through utility programs in 2017 (IRENA, 2018). The IRENA report states that those programs are currently available in 39 countries, mostly located in Europe (IRENA, 2018).

There is some criticism that is associated with the green premium products mechanism in the situations where utilities do not produce their own renewable energy. It is argued that despite the fact that utilities would buy unbundled EACs from third parties and retire them on behalf of the corporations allowing them to make renewable energy claims; some questions would arise in relation with the type and form of renewable energy and the ability of the premium paid by corporations to contribute to new renewable energy capacity (IRENA, 2018).

According to the National Renewable Energy Laboratory (NREL), there are some policies that should be implemented for the best practice of those programs including "renewable energy pricing that is market-based; long-term purchasing option; ability to

reduce or eliminate fossil fuel bill charges" (Bird *et al.*, 2017) which are not available in Lebanon as well. The best examples of the establishment of those programs are found in the United states.

2.1.3 Power Purchase Agreements (PPAs)

A power purchase agreement (PPA) is a contract where the energy consumer procures electricity for an agreed-upon term and rate from a renewable energy producer (Bird *et al.*, 2017). Usually, the contract's period is 10 years or more and it differs between sectors and countries (IRENA, 2018). There are two main forms of PPAs: direct and financial or virtual (Bird *et al.*, 2017).

A direct PPA is when the customer purchases some or all the produced electricity from the generator at the pre-determined price. The rates could be either fixed, escalating over the duration of the agreement or "indexed to a commonly used market index" (Bird *et al.*, 2017). Usually direct PPAs are found in the on-site projects, i.e., renewable energy projects installed by a third-party renewable energy developer to sell power to a beneficiary on or near the location of the beneficiary facility. As a requirement for PPAs, there should be local policies that authorize the consumer to buy "generation services directly from a third party that owns the renewable energy generator" (Bird *et al.*, 2017), which is not currently the case in Lebanon due to the absence of required policies. It is important to note however that during an interview with Dr. Hassan Harajli from Cedro-UNDP on March 12th 2020, he specified that the European Bank for Reconstruction and Development (EBRD) is working with the Ministry of Energy and Water in Lebanon and EDL to establish a distributed renewable energy law that includes allowing the use of direct PPAs. There are many benefits

associated with using the onsite PPA contracts. First, it does not require a large up-front investment from consumers or off-takers, the transfer of underperformance risk to the operator and the project's size could be scaled based on the site boundaries (Bird *et al*., 2017). There are some limitations that accompany the use of onsite PPAs such as the trouble to implement in the case of a rented building, the contract duration could be in contradiction with the corporation's "business strategy timeframes" and the unavailability of required regulatory policies like permitting a "contract with third party" (Bird *et al*., 2017).

On the other hand, the financial or virtual PPA is when the power is sold by the generator in the spot market (IRENA, 2018). This is when a "price guarantee" is offered by the consumer to the renewable energy producer which will financially support any new projects development by the producer; however, the customer will not directly obtain "the power output from the facility" (Bird *et al.*, 2017). In the case where there is a difference between the market price and the agreed upon price (strike price), the power generator and the consumer would settle this difference depending on which price is higher (Bird *et al.*, 2017). Same as the direct PPA, the consumer will not have to pay an "up-front capital investment" in a virtual PPA and the operation and maintenance and project risks are transferred to the third party; furthermore, transactions that include big "renewable projects" are simplified while using financial PPAs through "economies of scale". Financial PPAs also offer a hedging potential when there are differences between market price and pre-determined rate (Bird *et al.*, 2017). There are also some barriers that are linked to the implementation of a financial PPA. Similar to the direct PPA, the contract length is not always aligned with the companies' "business strategy timeframes", a consent from the

corporation's directors is needed. Moreover, in the case where the location of the renewable energy generation project is different than the region in which is it being consumed, two forms of risks could appear: "power price risk and basis risk" (Bird *et al.*, 2017). The power price risk refers to the uncertainty related to the energy prices in the market over the PPA's term (Natali *et al.*, 2016) while the "basis risk is defined as the inherent risk a trader takes when hedging a position by taking a contrary position in a derivative of the asset, such as a futures contract" (Corporate Finance Institute, 2020). Also, a financial PPA could harden the task of reporting "the value of renewable energy procurement" for the corporations (Bird *et al.*, 2017).

PPAs are considered as an attractive tool for corporations to help in their switch towards renewable sources and to achieve their environmental targets especially that they allow to "lock in a cost-competitive price" (IRENA, 2018). Since corporations usually don't have a goal to "own and operate on-site renewable energy" facilities due to a high operational risk, considering an onsite PPA contract would help in decreasing the risks of operations and maintenance by shifting them to the third-party producer, it would also help in "avoiding internal financing hurdles" (Bird *et al.*, 2017). An important policy consideration should be accompanied with the use of onsite PPAs: "clarity on whether a third party can own and operate renewable energy systems" (Bird *et al.*, 2017). On the other hand, an offsite PPA is usually available in liberalized markets and is important for the corporate consumer since he would only pay for the power generated with a pre-determined rate, furthermore, the PPA would be comprised of "both the energy and the renewable energy attributes" (Bird *et al.*, 2017) hence the EACs would be bundled with physical renewable energy. The National

Renewable Energy Laboratory report suggested three main policy considerations for the establishment of a PPA market. They include “retail rates that track wholesale rates; ability to sign PPA with third party and polices that expand renewable energy supply” (Bird *et al.*, 2017).

The IRENA report found that virtual PPAs are more commonly used in “most larger PPA markets” since the pre-requisite of the consumer and the producer being connected to the same grid is not compulsory (IRENA, 2018). The report also stated that there is an increasing pattern of corporate PPAs that amount, as of 2017, to 114 TWh (Refer Figure 1). Most of the PPAs are found in Europe and North America and are spread over 35 countries as of 2017 (IRENA, 2018) (Refer Figure 2). Additionally, the best practices of PPAs are found in Brazil, Mexico, Netherlands, Sweden, the United Kingdom and the United States (Bird *et al.*, 2017).

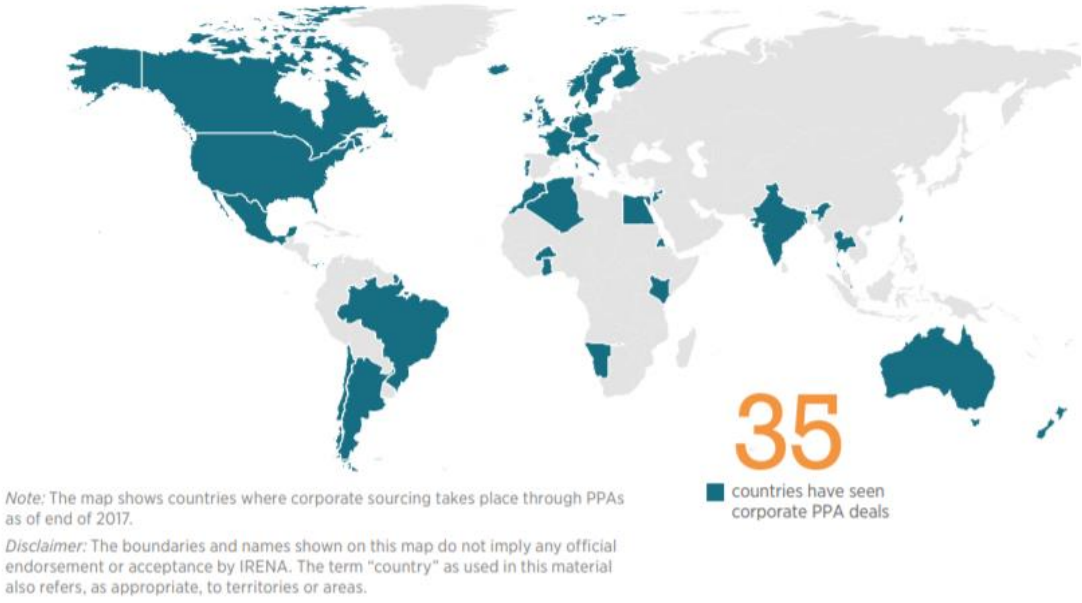


Figure 2: Countries in which corporate power purchase agreements (PPAs) are found (Source: IRENA)

2.1.4 Energy attributes certificates (EACs) or renewable energy certificates (RECs)

"An EAC is a contractual instrument that represents information about the origin of the energy generated. It allows markets to track renewable energy production and permits consumers to make credible claims of renewable energy use. Each certificate acquired and then retired certifies the use of a specific quantity of renewable electricity (typically 1 megawatt hour, MWh)." (IRENA, 2018). EACs could either be bundled through the purchase of physical renewable energy jointly with certificates or unbundled where certificates are bought distinctly from physical electricity (IRENA, 2018). EACs are mostly used in "liberalized electricity markets" and where a trustworthy "energy attribute tracking mechanism" is established (IRENA, 2018). However, they could also be available in vertically integrated markets (Bird *et al.*, 2017) such as that found in Lebanon. EACs are

frequently found in Europe and North America; however, it is noticed that it is being propagated fast in countries in the Asia-Pacific and Latin America (IRENA, 2018).

EACs allow to ensure the credibility of different corporations claiming the use of renewable energy in their energy mix especially that it not possible "to track physical electrons from renewable generation to consumption" when companies directly consume electricity from the grid that is powered by a diversified mix of energy sources (Natural Capital Partners, 2018).

There are three main forms of EACs that are used worldwide: Renewable Energy Certificates (RECs) are used in North America, Guarantees of Origin (GOs) are spread mostly in Europe and International RECs (I-RECs) and Tradable Instruments for Global Renewables (TIGRs) in the rest of the world (Natural Capital Partners, 2018). Since this paper's focus is on Lebanon, and Lebanon is an I-REC eligible country (IRENA, 2018) we will be focusing on the I-REC market especially that it is already used and implemented in some countries in the Middle East Region such as in Jordan, the UAE and Saudi Arabia (IRENA, 2018).

Figure 3: The stages of the I-REC process

"I-REC standard is a non-profit organization that maintains a framework for standardization across EAC tracking systems" (IRENA, 2018). Its' mission is to provide consumers and mainly corporations from different parts of the world with "access to internationally recognized, tradable and reliable electricity attribute tracking certificates" (The International REC Standard, 2019). I-RECs' process is simple and is divided into four main stages: (1) electricity generator, (2) certificate issuer, (3) certificate registry and (4) electricity end-user (Refer Figure 3). After the renewable energy is generated in accordance with each country's regulations, generators could "apply to a certificate issuer which is usually the government or a third party to provide attribute tracking certificates" (The International REC Standard, 2019). It is important to note that attribute certificates provide the electricity producers with a supplementary return for their production (The International REC Standard, 2019) which is considered by some as an additional incentive to develop new renewable energy projects. However, this is contested by other experts that question the significance of this additional incentive. The issuer on the other hand should act in accordance with the I-RECs standards in order to make sure that its attribute certificate system is credible, and this is usually ensured through external audits. The certificates would then be recorded in "a central registry" that guarantees "low cost for participants and issuing bodies while ensuring quality and security through third-party annual audits" (The International REC Standard, 2019). Finally, the renewable energy is procured and "disclosed by end-users" which ensures the corporation's credibility in its claim of using renewable energy sources, and this claim would be recognized globally (The International REC Standard, 2019). The I-REC standard will be explained more in detail in section 5.2.

The EACs' prices are associated with many factors such as "supply and demand, technology, locational attributes and contract length" and they highly vary from one country to another (IRENA, 2018). EACs are considered as a useful tool for countries and companies to achieve their renewable energy goals in a cost-effective, accurate and credible manner. Buying EACs could put affiliated corporations in leadership positions when it comes to rising demand for renewables which would be a key in the grid transformation and thus positively impact the environment (Natural Capital Partners, 2018). Moreover, this mechanism is known for its low project risk, its simplicity "to align with existing electricity procurement practices" and its flexibility especially that no long-term commitments are required (Bird *et al.*, 2017). EACs are considered as an attractive opportunity for small corporations and the large ones who have "small loads in multiple jurisdictions" to procure electricity from renewable energy sources (Bird *et al.*, 2017). Despite being an important mechanism for the companies to achieve their targets, some barriers and limitations exist which may prevent a wider expansion of EACs in the future. The most important limitation that was highlighted by IRENA was "the low average prices of unbundled EACs" which questions and leads to uncertainties in relation to the efficacity of the trading "to support existing or create new additional capacity" (IRENA, 2018). This reality creates a less compelling market (Bird *et al.*, 2017) and forms one of the main reasons behind the debates surrounding voluntary EACs markets. This is added to the decrease in the "control over resource type and project details" which corresponds to the limited ability of corporations to choose the form of renewable energy source from which they would be getting their electricity, and it might "not yield cost savings or long-term price certainty equivalent to other structures" (Bird *et al.*, 2017).

Corporate sourcing of renewables could be either a tool for companies to comply with a regulatory target or renewable quotas or a voluntary action in order to comply with their own targets set in their corporate social responsibility policies or sustainable commitments.

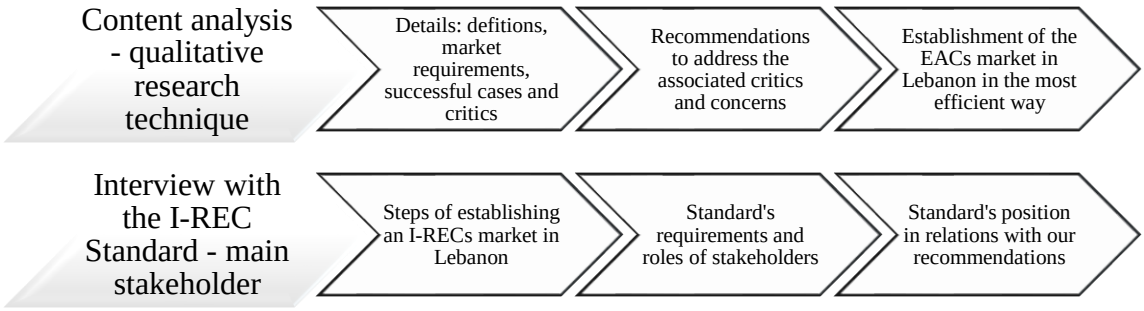
After elaborating the characteristics of the different forms of corporate sourcing of renewable energy, this study will focus on one type: energy attribute certificates (EACs) which due to the policy and regulations' restrictions looks the most relevant in the Lebanese situation in the time being. This study is focusing on the initiation of an energy attributes certificates' market rather than onsite or offsite energy self-generation from renewable sources even though Lebanon benefits from a large renewable energy potential, especially in terms of solar and wind power (UNDP-CEDRO, 2015) since we are considering EACs as a novel mechanism that would support the development of renewable energy in the country.

CHAPTER 3

METHODOLOGY

For the purpose of this paper, we will focus on content analysis which is a "qualitative research technique" (Hsieh and Shannon, 2005). Through this method, we will analyze how to establish this market in Lebanon in the most efficient way in terms of the process for starting EACs in Lebanon while providing the appropriate recommendations. To reach this goal we will focus on the controversial point of views and the critics that surround the establishment of voluntary EACs market and try to find solutions that help addressing the different concerns highlighted. Lessons learned from cases on EACs establishment from other countries that have similar characteristics as Lebanon are assessed in order to draw important insights for guiding Lebanon's establishment of EACs. Through content analysis we will also find the most appropriate form of EACs that should be implemented in Lebanon.

The second part of the methodology would be based on conducting an interview with representatives of the I-REC Standard – Mr. Jared Braslawsky and Mr. Jos Tuinenburg – which is one of the EACs forms used globally and an essential stakeholder in initiating the market. Through this interview we will understand the different steps of establishing an EACs market in Lebanon, the requirements imposed by the Standard in addition to the role of each involved stakeholder and its responsibilities. We will also be able to get the Standard's point of view in relation with the various debates that surround EACs markets. Moreover, we will discuss with them our proposed solution – based on content analysis – to overcome the critics and to supports energy transition in the country.


Content analysis - qualitative research technique
Details: defitions, market requirements, successful cases and critics
Recommendations to address the associated critics and concerns
Establishment of the EACs market in Lebanon in the most efficient way
Interview with the I-REC Standard - main stakeholder
Steps of establishing an I-RECs market in Lebanon
Standard's requirements and roles of stakeholders
Standard's position in relations with our recommendations

CHAPTER 4

EACS' CHARACTERISTICS

In this section we will highlight the main differences between a voluntary and a compliance investment in EACs.

4.1 Compliance EACs market

According to the World Resources Institute (WRI), the establishment of a compliance market of EACs is associated with regulatory policies that necessitate the electricity utilities in the country to produce a certain share of their electricity from renewable energy sources (World Resources Institute, 2008) which would allow them to generate EACs, they could also buy EACs to accomplish that obligation (Devenyi & Mladenova, 2012). According to the UNDP (2013), many cases across the world showed that establishing a strong renewable energy market requires the implementation of "appropriate policy design", and "quota-driven frameworks" is one such design policy that may be used. Renewable portfolio standards (RPS) is an example of the quota-driven frameworks that was applied in many countries and considered by some as a driver for starting an EACs market to be used by electricity utilities allowing them to reach the countries' mandatory renewable energy requirements. The RPS policies are known to be complicated to "design and implement" and are usually found in developed countries rather than developing (Carley *et al.*, 2016). Indeed, Carley *et al.* (2016) stated that there are currently 17 countries that implemented some RPS

policies where many of them are considered as developed countries with liberalized electricity markets unlike Lebanon.

Since this paper focuses on the commercial sector in Lebanon rather than the power structure and the utility, we will not go in the details and the specifications of the establishment of a compliance EACs market – related to utilities –in the country. However, since it is specified by IRENA (2018) that the majority of the countries using EACs possess both types of EACs markets (IRENA *et al.*, 2018) we will discuss briefly and based on some countries' cases the possibility for Lebanon to initiate an RPS system. We will explain below the power structure of the Lebanese market and the reasons that curb the implementation of the RPS system that usually involves the private sector. We will then compare the situation to two other countries with similar electricity market characteristics. Egypt and Indonesia are two of the 17 countries mentioned by Carley *et al.* (2016) with established RPS policies and publicly owned electricity utilities. Through these cases we will show that there is a possibility to include the private sector even when there is a monopoly that governs the electricity market.

4.1.1 Mandatory EACs utility: The case of Lebanon

In Lebanon, even though the updated electricity plan that was approved by the Lebanese Council of Ministers in 2019 specifies that there is a plan to build solar and wind power plants with a combined capacity of 1,440 MW, while collaborating with IRENA to reach "the target of 30% of the consumed energy by 2030 from renewable energies"

(Ministry of Energy and Water, 2019), there is a lack of a clear regulatory track and mandatory policies for the national utility to achieve that target (UNESCWA, 2017) and there is no reference to the use of EACs as a mandatory tool to support the claims of using renewable energy sources. Initiating a mandatory market in Lebanon is subject to many challenges that are mainly linked to the power structure.

Electricite du Liban (EDL) is responsible of the power sector in Lebanon and is "an autonomous state-owned power utility, whose mission is to generate, transmit, and distribute electricity to all Lebanese territories" (Chaaban *et al.,* 2012). EDL is a public organization that works under the executive tutelage of the Ministry of Energy and Water tasked with establishing policies for the electricity sector (Chaaban *et al.*, 2012). The fact that EDL has the monopoly over the power sector in Lebanon questions whether the government would allow the involvement of the private sector through establishing an EACs market in order to facilitate the achievement of the RPS policies and goals especially that Law 462 that should regulate the involvement of the private sector in the electricity sector is still, to date, ratified by parliament yet not implemented (Chaaban *et al.,* 2012). However, examples from Egypt and Indonesia, discussed below, show that mandatory EACs can take place in monopolistic power structures.

4.1.2 Egypt

The electricity sector in Egypt is run by the Egyptian Electricity Holding Company (EEHC) that is under the responsibility of the Ministry of Electricity and Energy (MoEE)

which “acts as the owner of the state entities in the power sector” (Razavi, 2012). This makes the EEHC a state-owned entity knowing that the Council of Ministers constitutes the leading institution that coordinates the electricity sector and sets the electricity prices in the country with the support of the Supreme Council of Energy that is led by the prime minister with main responsibility of setting policies and regulations for the sector (Carley *et al.,* 2016). It is also important to underline that the electricity sector in Egypt was unbundled through the establishment of different companies that operate in the distribution, transmission and generation sectors while being fully owned by the state (Carley *et al.,* 2016) (Ministry of Electricity and Energy, 2013). In relation with the RPS in Egypt, the policy imposes the production of 20% of electricity from renewable energy sources by 2020 with an emphasis of generating 12% of energy from wind sources (Carley *et al.,* 2016) as part of the Egyptian Renewable Energy National Strategy that was ratified by the Supreme Council of Energy on February 2008 (Mahina, 2015). Most importantly, this strategy requires to involve the private sector in the renewable energy generation with a share of 67% from the total production (Mahina, 2015). Additionally, Egypt is working on progressively liberalizing its electricity market that will be regulated by regulatory authority through the new law that was approved in July 2015 (Mahina, 2015). One example that highlights the inclusion of the private sector in generating renewable electricity is the Benban plant, one of the biggest solar parks in the world. This project was developed through the involvement of 32 “solar energy companies with investments worth $2bn” (Farag, 2019). Another important fact about Egypt is that it was recently authorized to issue I-RECs where it will soon be allowed to buy and retire I-RECs which ensures the credibility of renewable energy claims (I-REC Standard, 2019).

4.1.3 Indonesia

The state-owned electricity company in Indonesia PLN has the monopoly over transmission, distribution and supply of electricity in addition to being responsible for most of the generation sector (Kamarudin *et al.,* 2017) even though the private sector has the right to contribute to the electricity generation in the country (Dutt *et al.,* 2019). Thus, PLN has the monopoly over the electricity sector in Indonesia which makes it similar to EDL in Lebanon. Additionally, PLN is supervised and regulated through a group of relevant governmental institutions including: the National Energy Council, the Ministry of State-owned Enterprises, the Ministry of Energy and Mineral Resources (MEMR) and the Ministry of Finance. Each one of these institutions has its own role and responsibility concerning the power company. Their roles vary between preparing energy policies, supervising, setting objectives and implementing policies (Dutt *et al.,* 2019).

Due to its direct role in the power sector, MEMR ratified the 2017-2026 Electricity Supply Business Plan (RUPTL) of PLN which decreased its monopoly on the electricity generation sector through introducing a plan to buy energy from private IPPs which supports the transition towards cleaner sources of energy in the country (Hadiputranto, Hadinoto & Partners, 2017). This idea highlights the acknowledgment of the Indonesian Government of the importance of including the private sector, especially for electricity generation which is crucial to achieve environmental targets. Therefore, even though the state and its different institutions control the entire power sector in the country, they allowed to involve the private sector for better results.

Indonesia has set a target of reaching 25% of renewable energy generation by 2025 (Heeter *et al.,* 2019) which could be considered as the main reason behind allowing the inclusion of the private sector in the electricity generation. Moreover, the involvement of the private sector was further witnessed when the "I-REC Standard Board approved Indonesia as a new I-REC country" (South Pole, 2018). The Muara Hydropower Plant is indeed the first renewable energy project in the country through which I-RECs were issued after approving Indonesia as an I-REC country around the end of 2018 (South Pole, 2018). The I-REC standard's data show that Indonesia issued as of August 2019 a total of 124,587 I-RECs and currently possesses 9 hydro power plants, 1 thermal and 1 wind power plants that are registered with the standard (I-REC Standard, 2019).

These two examples show that involving the private sector in electricity production to reach the RPS targets is possible even in the case of monopoly and state-owned utilities knowing that the utilities can prove their compliance through either producing their own renewable energy, acquiring it through PPAs or through purchasing EACs (Heeter *et al.,* 2019). Hence, despite the power structures of the countries and whether it's vertically integrated, liberalized or somewhere in between, the main reasons that contribute to the development of the renewable energy markets are based on "the national level policies" (Carley *et al.,* 2016).

As previously mentioned, the compliance market that targets utilities is not the subject of this paper, however it could be required in some cases for establishing a voluntary market. Moreover, it is argued that RPS policies are not always effective and are not always capable of promoting renewable energy (Carley *et al.,* 2016). For these reasons we will look

in the following section at the characteristics of the voluntary EACs market, we will also state the reasons that push corporations to buy voluntary EACs while providing some companies' cases and their successful impact on energy transition.

4.2 Voluntary EACs markets

The EACs voluntary market is an outcome of "the energy user preferences for green electricity" (World Resources Institute, 2008). Thus, the companies from different sectors would be able to meet their voluntary climate and environmental targets through the investment in EACs. There is a crucial condition for voluntary EACs market to be effective and attractive which revolves around contributing to a large benefit and added value to the purchasers (EPA, 2019). It is important to note that there is a large difference between the price of EACs in mandatory markets versus the voluntary markets driven by policies. EACs in voluntary markets are cheaper than in mandatory markets and this is mainly linked to mandatory EAC policies that impose "renewables volume, technology requirements, and penalties for non-compliance" (World Resources Institute, 2008) which increases the demand on EACs and hence increase their price. We will see through this paper that EACs' price is an important factor to ensure their efficiencies and role in energy transition.

One of the main challenges in voluntary markets is the ability to attract different corporations to purchase EACs voluntarily without the presence of mandatory policies or penalties in case of non-compliance. The WRI listed some of the reasons that would incentivize corporations to pay the extra capital for buying EACs. In addition to being an

important tool for companies to reach their renewable energy targets, they are considered to be attractive especially in regions where "green pricing programs" are not available or limited, or when governmental policies and regulations don't "support on-site projects" (World Resources Institute, 2008). This is the case in the Lebanese market where there is a large number of multinationals and local companies with climate and environmental commitments without the proper access to efficient means and market tools to achieve their goals. Another important driver for the companies with renewable energy targets that have branches in Lebanon to purchase EACs would be the fact that there are no geographic restrictions and transmission constrictions that limit their investment (World Resources Institute, 2008). The WRI states that "for corporations with facilities in multiple states or energy grids, a consolidated REC procurement can be part of a strategy to meet overall clean energy goals" (World Resources Institute, 2008). This kind of strategy could be applied for the multinational companies with Lebanese branches. Thus, increasing the EACs purchase process's scope of the RE100 companies with local operations by including their Lebanese branches would be an important step at a certain point to reach their ultimate goal of 100% renewable energy share. Indeed, according to the RE100 Progress and Insights Annual Report, any progress made by the RE100 companies would have a positive impact even in the countries where the members' consumption is minimal compared to other locations (Dinnadge *et al.,* 2018). In fact, "by bringing even a few megawatts of renewable power capacity online, they carry some of the early adoption risks inherent to technology deployment, helping to reduce costs and therefore facilitating wider deployment in about two thirds of the world's countries" (Dinnadge *et al.*, 2018). There are many examples – discussed below – that underline some of the RE100 members' positive impact on the transition to

clean and carbon free energy around the world and on the initiation of an EACs market. This emphasizes the leadership of the RE100 members which in many cases is surpassing the commitment of 100% renewable energy to "advocating for policy frameworks favorable to renewables, helping to raise global ambition by championing the business case for moving away from fossil fuels" (Dinnadge *et al.*, 2018).

4.2.1 Impact of environmental initiatives on the EACs market

A recent UNDP report highlights the importance and the crucial role of the private sector in achieving various countries' climate commitments, specifically within developing ones (Soezer, 2019). It states that many investments in the renewable energy sector are occurring in the developed countries of the North while developing countries face many challenges (Soezer, 2019) including "market structures, policy frameworks and economic conditions", leading to uncertainties in the prices and the accessibility to renewable energy (RE100, 2018). In fact, the main barrier to the progress of renewable energy in the developing countries is financial: the UNDP estimates that those countries require approximately $4 trillion per year to reach their international commitments under the Paris Agreement and the SDGs (Soezer, 2019). Hence the role of the private sector in meeting climate change targets is crucial. This idea was further emphasized by the RE100 Progress and Insights Annual Report which states that "RE100 members represent a significant source of private funding for renewable electricity deployment" (RE100, 2018) which is highly needed in developing countries since it would create demand for renewable sources of energy affecting its cost (RE100, 2018). In this section, we will show some examples that highlight the important role

and the influence of companies that are members of different sustainability initiatives focusing on the RE100 in some countries and try to link it to the Lebanese situation.

The Natural Capital Partners explained that the role of the RE100 companies is not limited to “sustainability reporting”, their role is evolving, hence they are becoming more knowledgeable about the renewable energy sector and the associated market which allows them to make enhanced decisions (Crouch, 2018). This had a large impact on the EACs market which witnessed a big increase in demand in the recent years, mainly from the European countries. The decisions of the RE100 members were also able to influence the I-REC market that is expected to grow in many regions and specifically Middle-Eastern countries (Crouch, 2018). The important role of the RE100 companies is translated by their ability to influence “project developers, suppliers and other key market players”, which is supporting the “shaping of the renewable energy systems around the world” (Natural Capital Partners, 2018). This influence is mainly witnessed in the cases of companies with smaller scopes and markets but with ambitions to switch to clean sources of energy. Initiating local EACs markets with the support of large multinationals from around the world could therefore be the main driver for other interested companies to start their investment in EACs. Indeed, many partnerships and collaborations between RE100 members and participants – which are defined as “market players, individuals or organizations given the opportunity to open trade and redemption accounts on the I-REC Standard registry in order to receive, purchase, trade and redeem I-REC certificates for themselves or their clients” (I-REC Standard, 2019) – allowed the use of renewable electricity “in markets where this was previously impossible” (Lindberg, 2016). The availability of renewable energy is becoming of an increasing

importance for corporations. According to Stein Amble Haugan, Key Account Manager of ECOHZ, the lack for reliable "renewable energy solutions" could affect the "competitiveness of countries" especially with the growing number of multinationals committed to 100% renewable energy (Munch, 2017) who wouldn't be able to reach their goals in the absence of proper renewable energy sources and policies. The country examples below emphasize the important role that was played by the RE100 members in implementing and growing the EACs markets in different parts of the world.

4.2.1.1 UAE

Tom Lindberg, Managing Director of ECOHZ, indicated that there is a growing demand for renewable energy sources to power the corporations' operations in the Gulf region (Munch, 2017). Even though globally PPAs are becoming more popular to help corporations in achieving their renewable energy commitments, they are not considered as an option currently in the Gulf region due to many regulatory restrictions and challenges (Munch, 2017) which resembles the Lebanese situation - as mentioned previously. These challenges are the result of unclear terms governing the PPA structure in addition to the subsidies applicable to fossil fuel, the emerging new policies that are being structured to manage the renewable energy sector, the need to update the currently installed energy infrastructure to be suitable for large scale renewable energy projects (Davies *et al.*, 2016) and finally the "ownership structures" (Munch, 2017).

The first example that highlights the impact of the RE100 companies in introducing and promoting renewable electricity and more specifically the purchase of EACs is Philips Lighting in the Gulf region. Philips Lighting is a member of the RE100 initiative with a goal of reaching 100% renewable electricity by 2020 (RE100, 2017). It was the first multinational to introduce the concept of EACs in the Gulf which was crucial for the company to support its transition towards clean energy sources and to achieve its commitments. Philips Lighting started to "source traceable renewable electricity from Dubai Electricity and Water Authority's (DEWA's) Mohammed bin Rashid Al Maktoum Solar Park, in Dubai, using the pioneering International REC Standard (I-REC)" through a collaboration with Echoz (RE100, 2017). This is considered as an important step for the transition in the Gulf region which is known to be the global leader in the provision of the conventional sources of energy mainly oil and gas, with only 1% of electricity coming from renewable sources (RE100, 2017). This example emphasizes the leadership position of Philips Lighting which is one of the main reasons behind the increased demand in the I-RECs market in the Gulf. Hence, this step could be replicated by other RE100 corporations present in the region in addition to other companies with some sustainability and climate targets. In fact, Haugan believes that there is a potential to replicate this movement by Unilever that is present in the Gulf especially that it already started to buy I-RECs for some of its global operations such as Malaysia, Thailand, Vietnam, and South Africa (Lindberg, 2016). Haugan mentions that this step by Philips Lighting could eventually be translated in a "imminent demand for I-RECs in the Gulf region" (Munch, 2017). Indeed, around two years after Haugan's statement, on the 2nd of September 2019, Unilever initiated its collaboration with DEWA through purchasing 20,757 I-RECs as part of "Unilever Middle East's strategy to be carbon-neutral in all its

operations by 2030" (DEWA, 2019). This action by Unilever Middle East preceded Unilever's recent announcement on the 16th of September 2019 that states that the company is now using 100% renewable electricity across five continents" (Unilever, 2019) as part of its international commitments towards the RE100. This step by the Middle Eastern branch of the company was thus necessary and crucial to ensure the credibility of that announcement, however it is also responsible in improving the company's image through positioning itself as one of the leaders in the region in the sustainability and climate preservation actions (DEWA, 2019) next to Philips Lighting. This step could be also promising concerning the role that Unilever could play in its Levant and Iraq operations that witnessed a recent expansion in 2018 (PRWEBME, 2018). According to Ayla Ziz, Managing Director of Unilever Levant & Iraq, the company plans to widen its operations in the region while making sure to "drive sustainable growth while reducing its environmental footprint and increasing social impact as laid out in the Unilever Sustainable Living Plan (USLP)" (PRWEBME, 2018). The actions and ambition of the corporation – that has a local branch in Lebanon – makes it a highly potential candidate for purchasing EACs once the market is established in Lebanon. The authorization that Dubai Carbon Centre of Excellence (DCCE) received from the I-REC standard to become its legal issuer in the United Arab Emirates (I-REC standard, 2018) which allowed the initiation of an EACs market in the Gulf region was an important motivation for Philips Lighting and more recently to Unilever to invest in I-RECs, especially that it ensured the credibility of the certificates (Lindberg, 2017). The CDP - previously known as the Carbon Disclosure Project "a not-for-profit charity that runs the global disclosure system that enables companies, cities, states and regions to measure and manage their environmental impacts" - technical director Pedro Faria believes that this step

taken by Philips Lighting highlights the interest of multinationals operating in the Gulf in investing and purchasing EACs (Lindberg, 2017). Thus, the establishment of the EACs market could encourage other multinationals present in the Gulf region to purchase EACs in order to achieve their commitments. This is added to the impact that the actions and decisions of companies such as Philips Lighting could have on the governments. Indeed, Tom Lindberg, Managing Director of ECOHZ believes that the strategies of purchasing I-RECs "can influence access to renewable energy in the future" (Lindberg, 2017). This case that has many similarities to the Lebanese market could be locally replicated once I-RECs become available especially with the presence of many RE100 branches as mentioned previously.

4.2.1.2 Brazil

The situation in Brazil is similar to the UAE. The introduction of I-RECs started in September 2016 and allowed companies – locals and multinationals – to purchase traceable and credible EACs (Morais, 2016). It was introduced through the collaboration between "I-REC and Brazil's Totum Institute, an organization that coordinates the renewable energy certification programme in the country" (Morais, 2016). The interesting outcome about the I-RECs in Brazil is that they are witnessing a large increase in issuance that surpassed expectations. The National Wind Energy Association (Abeeolica) believes that there is a direct connection between this increase and the RE100 initiative (Morais, 2018). Vivo is an example that translates that statement. It is a subsidiary of the Spanish telecommunication company Telefonica – a member of RE100 initiative – and it declared in October 2018 that it will commit to 100% renewable energy through purchasing I-RECs (Morais, 2018). The

impact of the RE100 members is further highlighted through the news that was announced by the I-RECs standard which specifies that Atlantic Energias Renovaveis (a Brazilian renewable energy company) “has signed a deal to deliver about 8.3 million I-RECs in Brazil over the next 6-years” (I-REC Standard, 2018). This news emphasizes the fact that a large demand exists for I-RECs in Brazil accompanied by the “support of market players”, mainly the RE100 companies such as Johnson & Johnson, Citi Bank and Procter & Gamble (Instituto Totum, 2018). This realization is empowered by the fact that around 33% of the RE100 members run operations in Brazil (Lopes, 2018) with a need to achieve their 100% commitment. This is added to “local authorities and the local issuer Instituto Totum” (I-REC Standard, 2018) that are positively affecting the EACs market.

4.2.1.3 Japan

Even though Japan is considered as one of the developed countries, it still lacks for the proper investment in renewable energy and for the proper policies and regulations that incentivize the use of such sources (Renewable Energy Institute, 2019) that are still expensive compared to the conventional sources of energy (The Climate Group, 2019). This is the case due to the high and continuance dependence on imported oil and gas for electricity production knowing that Japan is the only member of the G7 developing “new coal plants” (The Climate Group, 2019). The members of the RE100 headquartered in Japan are trying to make a change in the renewable energy sector in the country by making an impact on the government to amend its policies. There are currently 19 Japanese companies that are committed to the RE100 initiative, some of them are very influential multinationals such as Sony, Fujitsu and

AEON. Those companies have been playing an important role in the switch towards cleaner sources of energy in Japan. During June 2019, those large companies requested immediate action from the Japanese government in accelerating the transition towards the use of renewable energy sources through setting a target to reach "at least 50% of its electricity from renewables by 2030" instead of the current target of 22 to 24% (The Climate Group, 2019). This is considered as an influential policy demand from those companies and if implemented correctly it would help in the expansion and the development of the renewable energy in general and, more specifically, the corporate sourcing of renewables in Japan. According to IRENA, it is indicated that "as with any form of renewable energy deployment, corporate sourcing of renewables can realize its full potential only when it has government backing through the establishment of long-term, stable and predictable policy frameworks" (IRENA, 2018). This idea was further stressed in the companies' policy proposals addressed to the government and the policy makers; they believe that the government's support – through the adoption of the required policies – would help in accelerating the transition towards cleaner sources of energy (The Climate Group, 2019). The outcome of this policy proposal from the government's perspective is still not clear especially that it is very recent. However, the fact that some of those companies are influential multinationals could make a difference and have a positive effect on the government's actions. In addition to their climate motives, improving their global competitiveness and attracting more customers and investors form the main reasons behind those companies' move (Japan Climate Leaders' Partnership (JCLP), 2019).

The role of the RE100 companies in Japan was not limited to lobbying with the Japanese government, they were able to influence a growing number of "other companies,

SMEs, and municipalities" who were showing their interest in pledging to source 100% renewable energy (Japan Climate Leaders' Partnership (JCLP), 2019). These kinds of commitments could have a positive impact on the demand for renewable sources of energy (Japan Climate Leaders' Partnership (JCLP), 2019) and might contribute to a larger pressure on the Japanese government to make the desired policy improvements.

Out of the 19 Japanese RE100 companies 2 of them – Fujitsu and Sony – are currently using unbundled energy attributes certificates (RE100, 2018) as one method to achieve their goal. Sony, for example, "used Green Power Certificates that amounted to 17,640 MWh of green electricity, equivalent to reducing some 9,808 tons of CO2 emissions" in 2017 (Sony, 2019). Sony is considered a leader in the renewable energy sector in Japan especially that it was the one to "establish the Green Power Certification System" (Sony, 2020) in 2001 through a collaboration with the Japanese utilities (Sony, 2019). The system of green certificates was able to positively affect the demand for renewable sources of energy throughout the companies in Japan especially since it was used by more than 400 influential companies in around 10 years (WWF Climate Savers, 2014).

4.2.2 Criticism of voluntary EACs

Despite delivering many benefits and positively contributing to the corporations' CSR policies and improving their image in front of their stakeholders, unbundled EACs face a large amount of criticism.

4.2.2.1 The concept of additionality

The first and most controversial critic is related to the concept of additionality and the level of contribution of EACs to it. Additionality is defined by IRENA as "the net incremental renewable capacity deployed or renewable energy generated as a direct result of corporate sourcing of renewable energy beyond what would occur in its absence" (IRENA, 2018). Indeed, the concept of additionality is recently gaining a growing interest from different corporations (IRENA, 2018) for which reaching commitments is not the only target; they are actually highly concerned with their actual contribution to the energy transition which is considered as a tool of differentiation from their competitors with similar environmental commitments (Powers *et al.*, 2017). This fact is also highlighted with the continuously increasing number of corporations that are signing the WWF/WRI Corporate Renewable Energy Buyers Principles (Annex I) where the 4th principle stresses on additionality (Urban Grid, 2019) and criticizes the use of unbundled EACs that "do not deliver the same value and impact as directly procured renewable energy from a specific project or facility" (World Resources Institute, 2020). This criticism contributed in raising awareness concerning the importance of additionality and led to a significant decrease in the use of EACs between 2015 and 2017 (from 59.6% to 46% as a total percentage from the different corporate sourcing of renewables tools that are used) which was compensated by an increase by the same percentage in PPAs (from 3% to 16%) (RE100, 2018). This emphasizes the fact that some companies switched from the unbundled EACs to PPAs even though unbundled EACs are still the most commonly used type of corporate sourcing of renewables (IRENA, 2018).

Adding to the above argument, Richard Martin, the senior editor for energy at MIT Technology Review, believes that even though EACs are now "more transparent" they still require a lot of enhancement (Martin, 2015). One of his main criticisms for unbundled EACs especially in voluntary markets is their minimal to negligible contribution to the electricity grid in the form of additional renewable energy capacity (Martin, 2015). Martin believes that the extremely low prices of unbundled EACs in voluntary markets makes it almost impossible to support the energy transition through adding renewable energy capacity to the grid (Martin, 2015). One of the examples that Martin mentions to support his criticism and to underline the corporations' switch from buying EACs to other forms of corporate sourcing of renewables was the case of Johnson & Johnson. Johnson & Johnson, as aforementioned, was one of the first companies to join the RE100 initiative and one of the main facilitators and contributors to the EACs markets' establishment (Martin, 2015). Johnson & Johnson started to lower its EACs purchases especially after they realized that they are not able to "drive the change that they hoped it will" (Martin, 2015). Google is another example of corporations that are concerned with their impact on energy transition. They make sure that any energy project that they invest in should bring additional renewable energy capacity to the grid (Google, 2016). They further emphasized the importance of buying the physical renewable energy bundled with its EACs rather than unbundled EACs that they qualified as "naked RECs" that contribute insignificantly to a new "project's cash flow" (Google, 2016). Another major milestone that underlines the increased interest in additionality was highlighted by Salesforce, a software company and a member of the RE100 initiative. It actually "made an explicit commitment to additionality in its target to procure 100% of its energy from renewable sources by 2022" (Scott, 2018), making sure to invest exclusively in

the projects that have a positive impact on the environment (Scott, 2018). Thus, the idea of investing a similar amount of capital in more valuable and impactful projects mainly in form of additional renewable energy capacity emerged and is gaining increased interest from corporations. This idea was further emphasized by Dr. Matthew Brander, senior lecturer in carbon accounting at the University of Edinburgh Business School, who argued that the large amount of capital that is being currently spent on the purchase of unbundled EACs by corporations could be used in more efficient projects that have concrete impact on reducing GHG emissions and fighting climate change (Brander *et al.*, n.d.). All these examples backup Martin's criticism in relation to the contradiction between purchasing unbundled EACs and the contribution to additional renewable energy capacity to the grid which has a crucial role in fighting climate change and reduce GHG emissions.

The above-mentioned arguments by Martin are contradicted by EACs advocates. Letha Tawney, the director of utility innovation at the World Resources Institute, and Jared Braslawsky, the director of the International REC Standard (Martin, 2015), for example, strongly argued that EACs are necessary market tools to ensure credibility of the corporations' claims in respect of powering their operations through renewable energy. They also defended their contribution in form of renewable energy capacity to the grid (Martin, 2015). This final statement is strongly criticized by Martin who described EACs as "at best … a token subsidy for renewable energy, whose sales don't do much beyond paying the salaries of people selling certificates" (Martin, 2015). He associated this statement with the low prices of unbundled EACs especially in voluntary markets (Martin, 2015).

The EACs' minimal contribution to additionality was further emphasized by Professor Daniel Press, Environmental Studies' professor and chairperson at the University of California, Santa Cruz, through his article for the Mercury News. Professor Press believes that there is a huge misconception and misunderstanding behind the corporations' purchases of EACs. Corporations are certain that their investments in EACs are actually contributing to adding renewable energy capacity to the grid (Press, 2009). However, Dr. Press criticizes the fact that large corporations are buying low priced unbundled EACs from brokers simultaneously with physical electricity from fossil fuel power plants (Press, 2009) which could be considered as a support for electricity generators from conventional sources of energy rather than supporting and adding renewable energy capacity to the grid. This idea highlights the controversial issue related to the amount of concrete contribution to energy transition and to the environment that the corporations are providing through their purchases of unbundled EACs.

The concept of additionality forces the question on whether purchasing unbundled EACs contributes to fighting climate change and to decreasing GHG emissions. Dr. Matthew Brander heavily criticized the use of EACs as a means of increasing renewable energy capacity and fighting climate change (Scott, 2018). He considers this idea as a "corporate greenwash. It's also a massive missed opportunity and one which is diverting millions each year away from actions which can genuinely mitigate climate change" (Scott, 2018). Dr. Brander questioned the ability of the market-based method – buying EACs – that corporations are using on providing accurate information about their claims concerning their GHG emissions and the source of their electricity (Brander *et al.,* n.d.). Dr. Brander and his

colleague, Dr. Francisco Ascui, described this approach as misleading with limited capability to contribute to additional renewable energy capacity to the grid (Brander *et al.*, n.d.).

The issue of additionality is of huge importance for many corporations who are devoted to create a positive impact on the environment. Interestingly enough, there is a large number of corporations that are still heavily investing in unbundled EACs around the world while being aware of the controversy caused by the issue of additionality. Many of those companies are members of the RE100 Initiative and are not only committed to entirely supply their operations through renewable energy sources but to support the energy transition as well. The reason behind the use of the market-based approach by those companies who have good intentions towards the environment was clarified by Dr. Ascui. He argued that from the point of view of the companies this method "seems to make some sense" especially that corporations won't go deep into the associated details (Brander *et al.,* n.d.). He added that corporations find that buying EACs is "a cost-effective solution" that allow them to reach their commitments (Brander *et al.,* n.d.). From his side, Dr. Press attributed the increased use of certificates by large corporations to the use of the word "renewable" in the EACs' nomenclature, something that he considers to be heavily misleading for them. Dr. Press argues that corporations were thus convinced by "certificate brokers" to buy the certificates instead of the renewable energy itself (Press, 2009). He considered this as "a big business" through which brokers are scamming large corporations to buy the certificates separately from the physical electricity making them believe that "100 percent of their power is green" (Press, 2009). The corporations' lack of awareness and retailers' misleading and confusing messages about unbundled EACs were further highlighted by the example of Natural Capital

Partners, a certificates' retailer. Brander et.al. (2018) criticize the retailer's message that is designed in a way to attract corporations and to make them believe that the certificates offered by them are the best solution to reach their international and internal commitments in terms of renewable energy (Brander *et al.*, 2018). An example of this message is shown in Figure 4, taken from Natural Capital Partners website. These criticisms make us question the credibility and the real intentions behind the large marketing campaigns that EACs are benefiting from.

Figure 4 Natural Capital Partners website – promoting EACs (Source: Natural Capital Partners)

(https://www.naturalcapitalpartners.com/solutions/solution/renewable-energy)

In relation to the Lebanese situation, adding renewable energy capacity to the grid is crucial for the energy transition in the country and for reaching Lebanon's international environmental commitments. As previously mentioned, Lebanon is an I-REC eligible country. The problem with I-REC however is that it "lacks for quality features including additionality" unlike some other EAC products (Rice *et al.,* 2017). Hence, a debatable question should be raised in the Lebanese situation concerning the positive contribution and the impact of investing in EACs on the growth of renewable energy infrastructure and if and how EACs will help Lebanon in reaching its international climate change commitments. This is also compounded through the fact that companies in Lebanon lack awareness about EACs – as detailed in section 5.3 – which could lead to an uncertain uptake of EACs in Lebanon.

In order to tackle this concern, there are some new market tools that were developed and defended through the literature to verify the contribution of EACs in general and I-RECs in specific in supporting the establishment of new renewable energy projects. Eco-labelled EACs constitute ones of the market tools that were established to ensure the additionality of the certificates (Heuberger, 2017). EKOEnergy label for instance could be associated with I-RECs based on precise conditions (EKOenergy, 2018) and they work together to "ensure that the price paid for electricity is reinvested in new renewable energy plants" (Heuberger, 2017). The main issue related to the EKOenergy labelled certificates is, however, connected to the extra amount of capital that should be paid by the corporations to guarantee that new renewable energy plants will be added to the grid where needed (EKOenergy, n.d.). According to the EKOenergy terms "when you buy EKOenergy eco labelled electricity or

gas, a minimum of 0.10 € per MWh must go to their Climate Fund", which funds the establishment of new projects that ensure additionality and sustainability (EKOenergy, n.d.).

Another example of a market tool that is used in European countries is the GO², initiated by ECOHZ in response "to demand from corporates to support the development of new renewables" (Pell, 2018). The GO² follows the same principle of the EKOenergy labels and consists of paying for the guarantee of origin in addition to a premium that varies between €0.60/MWh and €3.2 per MWh, depending on the corporation's size and level of involvement to ensure additionality of the investment (Pell, 2018). Lindberg, managing director in ECOHZ, insists that the reasons and incentives to purchase GO² are not linked to revenues nor hedging (Pell, 2018).

One of the most important questions that arise in this situation is: what would incentivize the corporations to pay an extra amount of money to ensure additionality above the extra capital used to buy the unbundled certificates? Are the CSR policies considered as a sufficient incentive for the corporations to pay the extra money?

Brander et.al. (2018) believe that being involved in CSR policies is not always the right incentive that could lead corporations to contribute to additional renewable energy capacity to the grid. They argued that if "public relations reasons" are the only drivers behind the companies' CSR policies, there is a high probability that companies would have minimal interest in guaranteeing the actual value and contribution of their actions towards the environment (Brander *et al.,* 2018), which will then curb them from paying the extra money to ensure additionality. Lindberg claimed that there are many non-financial incentives that

push corporations to purchase the GO². He argued that companies are increasingly willing to make the additional investment for "marketing and internal reasons" (Pell, 2018) such as environmental policies and CSR objectives. He also quoted a UK-based advisory firm that described buying GO2 as reaching the RE100 targets at very low costs while simultaneously supporting the establishment of new renewable energy projects. This increases the marketing value of the concerned corporations (Pell, 2018). This was further emphasized by qualifying additionality as a competitive market tool that allows corporations to attract the public by stressing their crucial role in the establishment of a certain green and sustainable energy project (Powers *et al.,* 2017) which strengthens their market position in front of their competitors. Those kinds of claims are described as "attractive to consumers, who are often willing to pay more for goods and services produced by responsible companies" (Powers *et al.,* 2017). Thus, how consumers perceive the corporation and its operations and their willingness to pay more could be considered as one of the most important incentives that should push corporations to pay the extra premium to ensure additionality. Consumers are not the only stakeholders that are interested in additionality claims, investors and employees are highly concerned as well (Urban Grid, 2019), which is an additional driver to corporations to differentiate themselves from their competitors.

The level of EACs' contribution to the electricity grid in the form of additional renewable energy capacity raises questions concerning their actual contribution towards decreasing the GHG emissions and hence fighting climate change.

4.2.2.2 Effectiveness of EACs on decreasing GHG emissions

The Greenhouse Gas Protocol classifies the three main forms of EACs as typical tools for disclosing Scope 2 emissions[2] (Munch, n.d.) and decreasing GHG emissions (Munch, n.d.). It is claimed by different parties – especially the providers of the different types of EACs – that the use of EACs usually decreases the corporations' footprint (Munch, n.d.) and supports the energy transition (Munch, n.d.). This idea is however debatable and constitutes another major criticism that EACs are facing. As a matter of fact, EACs were described by many as "ineffective mechanisms for reducing carbon emissions" (Barreto *et al.,* 2018). There are also some concerns linked to the absence of proofs that show the ability of EACs to decrease GHG emissions (Trexler, 2015), questioning the reliability of the companies' claims. In an open letter on Scope 2 GHG reporting, a group of GHG accounting practitioners and academics highly criticized the permission provided from the GHG Protocol for the companies to use EACs to report their Scope 2 emissions. They questioned the link between paying an extra amount of money to purchase the certificates and the companies' right to report zero emissions of GHG; stressing on the fact that buying unbundled EACs will have negligible to no effect on the total GHG emissions which qualifies in their opinion the companies' "emissions reductions claims as baseless" (Brander *et al.,* 2015). They also argued that the corporations' claims are misleading – usually unintendedly – to the different stakeholders involved who could believe that the corporation is powering its operations through renewable energy while there was no modification on the actual source of their electricity (Brander *et al.,* 2015). This idea was further explained through an example

[2] Scope 2 emissions are indirect emissions from the generation of purchased energy (GHG Protocol et al., n.d.)

that illustrates the situation in a concrete way: this example compares two companies where the first one buys EACs to cover its entire operations with no change in the physical electricity sources and the other company uses the same capital to invest in energy efficiency programs that support the decrease in its carbon footprint without resorting to EACs (Brander *et al.,* 2018). The first company, based on the GHG Protocol, was thus able to report "a scope 2 value of zero tCO2e in its supply chain reporting, and also a 30% reduction in its overall corporate emissions" while the other company reported a 10% decrease in its scope 2 emissions (Brander *et al.,* 2018). It is thus highly probable that both investors and consumers would prefer the first company that has a better "environmental performance" in the official reports even though in reality this company didn't have any positive impact on the GHG emissions, unlike the second company that was able to physically decrease its emissions (Brander *et al.,* 2018). This example highlights the controversy that could surround the accuracy of the companies' emissions reporting while using EACs (Brander *et al.,* 2018). However, using EACs could be considered as a two-edged sword for the company. Even though it could be favored by the involved stakeholders over its competitors as previously mentioned, its competitors from their side could publicly question its environmental integrity in front of its stakeholders with a goal of improving and strengthening their own market position though stressing to the public the inaccuracy of the emissions reporting.

The researchers highlighted another important impact of buying EACs on the GHG emissions, they believe that this market tool would negatively affect some companies' willingness to invest in more efficient and effective forms of physical renewable energy and energy efficiency strategies which leads to minimal involvement in the global target of

limiting GHG emissions (Brander *et al.,* 2015). This is mainly the case since the companies who buy unbundled EACs and claim 100% renewable energy share in their total energy mix could be misled to consider that their work in the climate change fight is done. These claims are also debated by other researchers who believe that the effectiveness of any market tool or mechanism depends on the way it is used (Barreto *et al.,* 2018).

Moreover, the debate around EACs and additionality detailed above questions their ability to "deliver social value" (Trexler, 2015). In a research conducted as part of MIT's Sustainability Lab Class, the authors argued that transforming the goal of decreasing GHG emissions into "a financial transaction" through the voluntary purchase of low-priced certificates leads to the creation of a "moral hazard". They claimed in their report that unbundled EACs' prices in voluntary market are "below the true social value of the avoided emissions" (Barreto *et al.,* 2018).

After going over the drivers, the challenges, the applications and critics connected to the EACs, we will explain in the next section the possibility and the process to introduce this market in Lebanon while taking into consideration all the above-mentioned information.

CHAPTER 5

EACS IN LEBANON

Since Lebanon is an I-REC eligible country as previously stated and thus the only possibility to start using EACs in the country would be through the I-REC Standard, we will go in the next section over the I-REC process while detailing the conditions to become an issuer and suggesting the potential institutions or organizations that could fill that role in Lebanon. However, before delving further into the I-RECs in Lebanon, we will briefly discuss the carbon trading mechanisms and their presence in Lebanon making sure that this tool does not overlap with the EACs market in case established.

5.1.The carbon market

Carbon trading is a mechanism that was first introduced by the Kyoto Protocol. It consists of allowing countries with emission surplus units to sell them to countries that exceeded their target (UNFCCC, 2020). This process qualified carbon to become a commodity and thus allowed the establishment of the carbon market (Hartmann, 2017). This idea was first introduced by the Kyoto Protocol and was further developed and led to an unusual collaboration within the carbon market between countries and corporations under the same goal of fighting climate change: countries use carbon trading and carbon taxes mechanisms while corporation resort to “internal carbon prices” (World Bank Group, 2014). Indeed, companies would “buy and sell the ‘right to pollute’ from each other” (Hartmann,

2017) and their emissions would be limited through permits, knowing that the number of authorizations will then be reduced with time which will "put pressure on the participating companies to invest in cleaner production options and reduce their CO2 outputs" (Hartmann, 2017). In this case the corporations that emit GHG lower than their allowances could sell their excess to others with substantial emissions that surpass their specified limits (The World Bank, n.d.).

The carbon market allows the use of carbon offsets as well, where companies – mainly in developed countries – that were able to reach "the most efficient technology available" can fund "clean development projects" (CDM) in less developed or developing countries allowing them to decrease their emissions from one side and benefitting from lesser prices on decreasing emissions from the other side (Hartmann, 2017). The certified emission reduction (CER) produced from the CDM projects represents one of the trading units that could be used as a proof of eliminating one tonne of CO2 (UNFCCC, 2020). "Seven projects have been approved by the CDM Executive Board generating a total of 91,721 CERs every year" in Lebanon (Refer Figure 5Figure 5). However, these projects never benefitted from any transfer of credit, i.e., they did not succeed from benefiting from income being transferred to Lebanon by any purchasers of the carbon reductions made. The crashing of the carbon market and the termination of the CDM and the Kyoto Protocol are the reasons behind this failure.

Since our target is establishing an EACs market in Lebanon, it is important to differentiate between the carbon pricing mechanisms specified above and the EACs market

and to highlight the various regulations and policies that govern their relationship and to discuss the possibility of their coexistence especially in the case of an I-REC market.

Project name	Project proponent	Estimated CO_2 savings per year
Thermal Solar Plant Project at Zeenni Trading Agency - Bsarma El Koura, Lebanon	Zeenni Trading Agency	1,685 tCO_2eq
The Lebanese CFL Replacement CDM Project – Mount Lebanon	Ministry of Energy and Water (MoEW) Lebanese Center for Energy Conservation (LCEC)	20,091 tCO_2eq
The Lebanese CFL Replacement CDM Project – South Lebanon	Ministry of Energy and Water (MoEW) Lebanese Center for Energy Conservation (LCEC)	14,435 tCO_2eq
The Lebanese CFL Replacement CDM Project - North and Bekaa	Ministry of Energy and Water (MEW) Lebanese Center for Energy Conservation (LCEC)	21,281 tCO_2eq
The Lebanese CFL Replacement CDM Project – in and around Beirut Central, Northern and Eastern Suburbs	Ministry of Energy and Water (MoEW) Lebanese Center for Energy Conservation (LCEC)	20,091 tCO_2eq
The Lebanese CFL Replacement CDM Project – in and around Beirut Southern Suburbs	Ministry of Energy and Water (MoEW) Lebanese Center for Energy Conservation (LCEC)	14,138 tCO_2eq
Programme for Grid Connected Renewable Energy in the Mediterranean Region	Renewable Energy for the Mediterranean (R.E.M.)	To be determined
Total Estimated CO2 savings per year		**91,721 tCO_2eq**

Figure 5: CDM projects in Lebanon (Source: MoE)

5.1.1 Relationship between EACs and carbon trading

EACs differ from the various carbon pricing mechanisms discussed above. Specifically, there are two main characteristics that prohibit treating EACs as GHG emissions offsets: it is considered that EACs don't represent an actual "claim of ownership to emission reductions" added to the additionality issue (Center for Climate and Energy Solutions, 2009). This difference is an additional argument that supports the criticisms that are faced by EACs and discussed in section 4.2.24.2.2.2.

Below are some recommendations from the Offset Quality Initiative (OQI) to properly govern the relationship between the EACs market from one side and the emissions offsets from the other and making sure that they do not negatively affect the effectiveness of each market:

- EACs should not be considered as equal to emissions offsets
- EACs definition should be specific and properly applied
- "It is inappropriate to treat EACs as an environmental commodity that conveys ownership of indirect "emission attributes" such as GHG emission reductions
- Purchasers of EACs should not make GHG emission reduction claims associated with the retirement of EACs" (Center for Climate and Energy Solutions, 2009).

Since this paper is about Lebanon, and we are suggesting to establish the EACs market through a collaboration with the I-REC standard, we will state and discuss below the

Standard's point of view concerning its relationship with the carbon market – mainly in terms of carbon trading and emissions offsets.

Within the I-REC code, there is a detailed part that explains the relationship between the two mechanisms:

> "An I-REC is a factual statement of an electricity production event. Such events may also contribute to a reduction in global emissions against a business as usual case. This notional additional benefit may be recognized through a carbon offset or emissions reduction certificate. For market transparency, the Registrant must declare on an Issue Request whether he and/or the Production Device or Production Group owner(s) retain(s) the right to obtain carbon offsets in relation to the energy which is the subject of that Issue Request. This declaration does not oblige the Registrant to obtain carbon offsets. However, where a Registrant has declared that offsets will not be obtained, this will form part of the contractual relationship with I-REC Services. Each I-REC will carry an identifier throughout its life to convey whether that right has been retained and this will be visible to I-REC Participants" (I-REC standard, 2019).

Thus, while insisting on the exclusivity of an I-REC statement, the code allows the co-existence of an I-REC and an "emissions reduction certificate or carbon offset that relates to the same MWh of electricity produced" (I-REC standard, 2019) based on specific conditions. The registrant's declaration in the Issuing Request Form mentioned in the code (Refer Figure 6) is essential for transparency.

Carbon Offsets	
Do you retain the right to obtain emissions reduction certificates or carbon offsets for the energy nominated in this Issue Request?	Yes/No*
If no, the Registrant warrants that the energy for which I-REC certificates are being applied has not and will not be submitted for any emissions reduction certificate or carbon offset.	

Figure 6: Offsets section from the Issuing Request Form

Since this relationship would properly be governed through the appropriate policies from the I-REC Standard and transparent disclosure of the registrants, there would be no concern of overlapping between the two mechanisms in Lebanon, and this is added to the absence of projects that produce CERs.

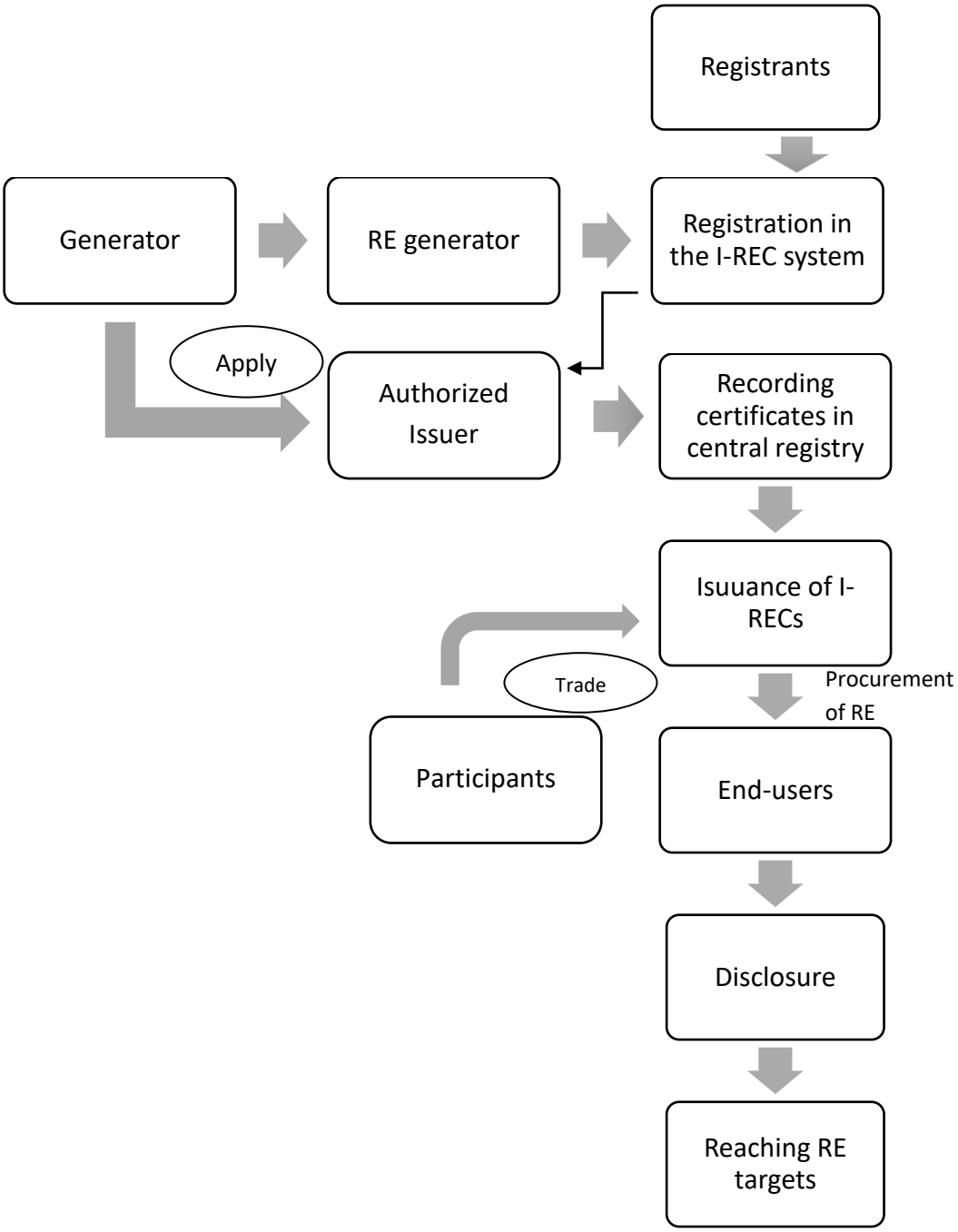
5.2 The International Renewable Energy Certificates (I-RECs) standard

The I-RECs standard is defined as the "list of rules, regulations and best practices which are to be used by all attribute tracking systems", they constitute the I-REC code (I-REC standard, 2015I-REC standard, 2015). The I-REC code offers a "standardized tracking system" which could be applied all over the world (I-REC standard, 2015). This tracking system would ensure claims' credibility by removing "double claiming, double counting and double certificate issuance" (I-REC standard, 2015). I-RECs provide the possibility to follow the attributes or performance characteristics of renewable energy "from its location of generation to its place of consumption" (I-REC standard, 2015). Those attributes refer to "the location of the electricity generator, the type of primary energy input, the date of commissioning, the installed capacity, the volume of electricity produced and when the electricity was produced" (I-REC standard, 2015). The relevance of the I-REC standard regarding the Lebanese situation relies in the fact that it could be accessible in the countries that lack for "a reliable and transparent electricity tracking system" (I-REC standard, 2015).

There are four main stakeholders involved in the I-REC system: participants, registrants, issuers and auditors (I-REC standard, 2015). Participants are people or

institutions that are interested in trading I-RECs which necessitates to hold “at least one account on the I-REC registry” (I-REC standard, 2015). Hence the role of the participants would be holding accounts on behalf of the end-consumers (I-REC standard, 2015). A list of 54 possible participants could be found on the I-REC standard website and is continuously updated. Some of those participants have experience in the Middle Eastern Market and could be considered in the establishment of the I-RECs market in Lebanon. To mention a few, ECOHZ for instance, is one of the participants that played an important role in the initiation of the I-RECs market in the UAE. South Pole is another possible participant that is spread in more than 20 countries (South Pole, 2020). Schneider Electric on the other hand is another company that is highly involved in the establishment of EACs markets. The full list of participants could be found in the Annex II. Registrants on the other hand represent the individual or institution that is responsible for registering the renewable energy generators with the I-REC system which is a necessary step before the issuance of I-RECs (I-REC standard, 2015). It could be either the renewable energy generator or his/her agent (I-REC standard, 2015). Finally, the I-REC standard imposes the existence of an issuer which is “authorized to make certificate entries in the I-REC Registry. These Issuers operate under a contract with I-REC Services as the facilitator and administrator of the tracking system. The issuers have a “geographical remit and must be formally accredited as providing a quality of service that befits a monitoring and verification function” (I-REC standard, 2019). Issuers should be approved by the I-REC standard as well (I-REC standard, 2015) (Refer Figure 7).

Figure 7 The I-REC process



The issuer could either be a local issuer or a default central issuer of I-RECs in the case of unavailability of a local issuer and/or when there is a small number of registered renewable electricity generators with a generated capacity below a certain threshold (I-REC standard, 2019), which is currently set at 50 MW (I-REC standard, 2019). For instance, the I-RECs standard approved the use of DCCE as issuer in some countries of the MENA other than the UAE such as Jordan and Saudi Arabia (I-REC standard, 2018). Recently, in May 2018, DCCE became the official legal issuer of I-RECs in Morocco (I-REC standard, 2018). "Morocco's Khalladi Wind Farm owned and operated by ACWA Power has been registered with the first International Renewable Energy Certificate Standard (I-REC) by Dubai Carbon Centre of Excellence" (ACWA Power, 2018). This step would allow the electricity consumers in Morocco that are interested in sustainability and reducing their emissions – mainly corporations – to credibly trace their renewable energy sources. Moreover, this would be translated into a positive image of the country in terms of promoting the use of renewable energy sources globally (ACWA Power, 2018).

5.2.1 Conditions to become an issuer

There are two options to choose issuers in a certain country. They could be either appointed by local governments or "by the I-REC Standard as elected by the market players involved" (I-REC standard, 2015). In both cases, the issuer should be characterized with "independence, reliability and transparency" (I-REC standard, 2015). This is ensured through the agreement that occurs between the I-REC standard and the potential issuer (I-REC standard, 2015). Along with the application's submission, potential issuers should

provide their “internal local working instruction document” that includes information about their method of managing the different types of evidence and independently authenticating them. They should also demonstrate the anti-fraud measures they use for the verification (I-REC standard, 2019).

Interested organizations or institutions could become issuers after applying to the I-REC services and getting their accreditation based on the recommendations of the I-REC quality assurance auditor who would have a six weeks’ deadline to perform the audit. “The terms of reference” for the assessment shall include, but not be limited to:

- the conformity of the applicant’s internal procedures with the requirements and objectives and principles of the I-REC Code;
- the ability of the applicant to deliver a compliant quality service;
- the likely impact of any regions excluded within the nominated country;
- the probability of the business plan being delivered” (I-REC standard, 2019).

One of the challenges that could be faced by a new local issuer would be the lack of necessary expertise especially in the first phase. Thus, we expressed this concern to Mr. Jared Braslawsky and Mr. Jos Tuinenburg from the I-REC standard who explained to us the process of overcoming the difficulties associated with this new role. Mr. Braslawsky described the role of a local issuer as a learning process that will be ensured – especially in the early stages – by the I-REC services. According to Mr. Tuinenburg, the I-REC services are responsible of guaranteeing that issuers are completely aware of their new role’s requirements in terms of regulations as requested by the standard and they are fulfilling their role “in a robust, reliable and trustworthy manner”. Mr. Braslawsky and Mr. Tuinenburg clarified how the

accreditation process, divided into two aspects, supports the issuers' learning process and help overcome the above-mentioned challenges.

The first aspect of the accreditation process is the probational issuance where the issuer will be provided with the rights of issuing certificates in the country "on a probational basis" knowing that this status is only internal, hence it doesn't affect the external stakeholders' point of view that will recognize the designated entity as the issuer. The probational issuance's process was detailed by Mr. Tuinenburg:

- "I-REC Services will give the issuer access to the registry. With this access they will be provided the role of issuer. At this time, I-REC Standard will open the market and I-REC Services will allow the issuer to register devices and issue certificates. This will be publicly announced via the website.
- At this point interested registrants can officially request a registrant agreement and can start registering devices and issuing certificates (pending the appropriate documents and information).
- As a probational issuer they will have to get approval to complete the issuance request or device registration. This approval is granted on behalf of I-REC Services by GCC (the central issuer). This step is required to ensure the quality of market as the issuer is learning to use the system.
- Once certificates are issued the issuer can issue invoices, based upon the posted fees, to the registrants".

The active accreditation is the second aspect of the accreditation process. During the active accreditation, the issuer will be exposed to the various circumstances linked to the new

role on a step by step basis and the issuer would go through “the process of device registration/issuance”. Then the issuer will have to create the local working instructions (LWI) which specifies “the process of device registration and certificate issuance specifically in the country” as explained by Mr. Tuinenburg.

This entire procedure supports and highly contributes to the new issuer’s learning process and ensures the proper flow of certificates issuance in a new country and thus helps the new issuer in overcoming some of the challenges that could be faced.

There are currently 5 issuers accredited by the I-REC standard that are spread over 25 countries, 2 of them are considered as central issuers – DCCE and Green Certificate Company (GCC) – and are approved in different regions of the world (I-REC standard, 2019).

5.2.2 Potential issuers

The establishment of an I-RECs market in Lebanon requires the existence of an issuer which could be a central issuer in the first phase before the “Production Device and Production Group capacity” reach the threshold capacity of 50 MW – indicated by the terms of the standard (I-REC standard, 2019) keeping in mind that the central issuer could continue with registering renewable energy generators to the I-RECs registry in the absence of a local issuer (even when the threshold capacity is reached) (I-REC standard, 2019). Even though the recourse to DCCE – the central issuer of I-RECs in many MENA countries – looks like an interesting option in the first stage, we believe that such action would lead to income leaving the country rather than contributing to the national GDP. Additionally, choosing to

have a central issuer might lead to the purchase of EACs from renewable energy generators from outside the country (Hewlett, 2017) and this is subject to different critics and queries in terms of efficiency and ability to contribute to energy transition. Hence, we suggest the use of a local issuer which could be authorized based on the I-RECs terms. The recourse to a local issuer since the beginning would be beneficial for Lebanon especially in economic terms since it would positively impact the local income generation. The benefits of having a local issuer rather than a central issuer were further discussed with Mr. Jared Braslawsky and Mr. Jos Tuinenburg from the I-REC standard. They confirmed the importance of a local issuer in terms of local income generation. They also insisted that choosing a local issuer of I-RECs supports the fast development of the market. They actually believe that a local issuer that "speaks the local language, has contacts with authorities, contacts with its market players" would have more positive impacts on the I-RECs market than a central issuer especially that it would be able to gain the local stakeholders' trust faster. They added that many countries wouldn't allow foreign institutions or organizations to be involved in their local energy market even if it was only through the process of certificates issuance. Mr. Braslawsky and Mr. Tuinenburg stated that the standard "tries to keep the market as local as possible but make sure that all these countries follow the same rules (I-REC Standard) which is in adherence to international best practices. This leads to a situation where the certification market can stay local while at the same time the adherence to international best practices is guaranteed which means that multinationals and reporting organizations such as RE100, CDP acknowledge the reliability of the system which leads to a higher usage of the system."

There is a number of possible candidates who could fill the local issuer position in the Lebanese market once established if they meet the requirements of the I-REC standard –

mentioned above – and if they are willing to fulfill the role of an issuer. Those potential issuers could be the UNDP (Lebanon), the Lebanese Center for Energy Conservation (LCEC) or an energy regulator (once established). Those institutions possess expertise in the renewable energy sector thanks to the different related projects that they implemented or that they are currently working on. In fact, LCEC is a nationally supported NGO (i.e. supported by the Ministry of Energy and Water) in Lebanon and is the responsible of the different activities that are linked to the "support and promotion of renewable energy" in Lebanon (El Khayat *et al.*, 2014).

5.2.3 The standard's point of view in relation with the EACs critics

After explaining the I-REC process, we will highlight the standard's point of view in relation with the different critics associated with the EACs market mentioned in section 4.2.2 in order to display the various sides of the debate, which would help us in establishing the EACs market in the most efficient way while reaching our goal of supporting energy transition in the country. During our meeting with Mr. Braslawsky and Mr. Tuinenburg we expressed our concerns about the ability of the I-REC market – once established in Lebanon – to support energy transition in the country. The standard believes that the concept of additionality "suggests a binary option" and they argue that what is important to them is the amount of impact that different corporate sourcing of renewables mechanisms can have rather than additionality itself. Mr. Tuinenburg stated that knowing the level of impact is not an easy process especially that different mechanisms' impact varies from one country to

another depending on the available policies and the market's requirements. To support his argument, he gave the below example:

"consumers who purchase attribute tracking certificates in a market that is short may believe they have a bigger impact on pushing the whole market towards becoming renewable than consumers who build a wind turbine for their own use and consumption. In other markets, however, consumers may consider it better to work with environmental labels or purchase criteria to maximize the additional impact of their purchases. In yet other situations, it may be most additional to have a long-term purchase agreement with a new or existing renewable device because such agreements can take projects from concept to reality".

Mr. Braslawsky added that the presence of an EACs market is crucial and a necessity to prove the renewable origin of electricity procured by consumers. He also believes that this process results in some level of impact on the renewable energy sector's development as a whole and eliminating the EACs market could lead to canceling that impact. This idea was emphasized by an example where he compared the process of buying electricity from two types of generators: one conventional energy producer and another renewable energy producer. He said that an end-user that pays the additional premium for the certificates while procuring electricity from a renewable energy generator would contribute to strengthening the renewable energy generator's position in the market in front of the conventional energy sources and polluting generator. When the certificates' demand increases due to companies' environmental policies, the certificates' price would increase which positively affect the renewable energy generators. This case was witnessed in the Netherlands where a large demand for Dutch wind resulted in a big rise in the certificates' prices to reach 8 euros/MWh as specified by Mr. Braslawsky. These arguments by the I-REC standard make us question the EACs' criticisms described in section 4.2.2. Indeed, an increased demand on EACs correlated with the corporations' environmental policies would form an incentive for the

renewable energy generator to produce more renewable energy and hence register their new devices with the standard. This would constitute a secondary revenue stream for the generator and help him in raising additional profit due to the in-demand renewable electricity sources. This idea refutes the criticism stipulating the inability of EACs to contribute to energy transition and to adding new renewable energy projects to the grid.

In relation with the criticism about the ability of EACs to reduce emissions, Mr. Tuinenburg stipulated that EACs' objective is giving electricity consumers the possibility to choose the type of the energy they are purchasing rather than decreasing GHG emissions. This nevertheless does not contradict the idea that the process of purchasing EACs endorses the current measures that "promote energy transition". From the standard's point of view, it is an important tool that allows governments around the world to differentiate between the companies and consumers that are actually using renewable energy sources and the ones that are not. Governments would thus impose an additional price on consumers using polluting sources of energy resulting in an additional burden on them, which could make them switch to renewable sources of energy. We also believe that this is not only related to governments. Involved stakeholders that are increasingly interested in sustainable energy could lead to the same level of impact as the governments.

The standard agrees however that low priced certificates are unable to lead to the anticipated impacts and support the energy transition process. They also insisted that trust in the EACs system is a prerequisite for higher demand on the certificates which is translated into higher prices and larger impact on the environment.

Establishing the EACs market in Lebanon using the I-REC Standard would thus require initiating the proper channels of communication between the involved stakeholders

including the standard itself. However, one of the main challenges revolves around the corporations that are present in the country and the possibility to trade EACs.

5.3 Corporations' awareness

Despite looking promising in many countries, starting a voluntary EACs market in Lebanon looks very challenging. Below are some preliminary results while trying to contact some companies in Lebanon for the initially aimed survey.

Despite the fact that some members of the RE100 initiative have branches in Lebanon, none of the Lebanon headquartered companies are members. We can nevertheless witness an increased interest in the concept of sustainability from many Lebanese companies which is clear through their annual reports and their commitments (Refer Table 1). Indeed, there is a growing number of Lebanese companies that have international or local environmental commitments such as the United Nations Global Compact's Ten Principles (UN Global Compact, 2020) out of which 3 principles are related to the environment (UN Global Compact, 2020) and the Lebanon Climate Act that has as a main objective to "create economic growth in a way that also creates value for the society by addressing Climate Change challenges" and is based on Lebanon's NDCs (UN Global Compact, 2020).

Table 1 List of Lebanese Companies and their sustainability policies

Lebanese companies	Industry	Sustainability link	Important and relevant initiatives
Blom Bank	Banking	https://www.blombank.com/Library/Files/BLOM%20COP%20Report%202018.pdf	1. Greenhouse Gas (GHG) audit that measured in tCO2eq for their Head Offices, branches & warehouses in Lebanon. 2. Total GHG emitted by Blom Bank dropped from 15,267.2 tCO2eq (GHG official value in 2016) to 14,919.6 tCO2eq in year 2017. More importantly, GHG emissions in tCO2eq/m2 have decreased by 11% in 2017. 3. BLOM BANK's Environmental Standards go in line with SDG 12 "Responsible Consumption and Production" and SDG 13 "Climate Action". 4. Concerning their impact on the environment, their policies and strategies were amended to take climate change into consideration by reducing their carbon footprint on a national level.
Bank Audi	Banking	https://pwstg02.blob.core.windows.net/pwfiles/ContentFiles/9807PdfLink.pdf	1. Comprehensive audit of their carbon footprint by monitoring all their premises ==> comply with GRI standards on environmental impact. 2. Their GHG inventory based on the GHG-Protocol Corporate Standard.
Banque Credit Libanais	Banking	https://www.creditlibanais.com.lb/Content/Uploads/AnnualReport/AR18-Web-version.pdf	1. In conformity with the SDG 13 calling for climate action, their strategy centers around three priorities: . Reducing the intensity of our environmental footprint. . Promoting environmentally responsible business activities. . Offering environmental products and services. 2. At CL Group Head Office Tower, special attention has been given to using environmentally friendly construction materials, taking into account the use of renewable energy sources for future daily utilization. 3. Credit Libanais also implemented a plan to reduce the Bank's carbon footprint.
Arab Printing Press	Printing	http://www.arab-printing-press.com/uploads/profile_2018.pdf	1. APP cares about the environment and people. This is why APP adheres to ethical and environmental practices; fully complies with laws, regulations and other requirements; and strives to be a leader in reducing negative environmental impact considers environmental factors and the well-being of the community when making all commercial decisions. 2. Special certificate from the Ministry of Environment and the United Nations Development Program for efforts to reduce GHG emissions
Bank Med	Banking	https://www.bankmed.com.lb/BOMedia/subservices/c	1.Tracking electricity and paper consumption. 2. Constructing a fully green new headquarters

		ategories/News/201903281202528 47.pdf	3.Leadership in Energy and Environmental Design (LEED) accreditation.
Byblos Bank	Banking	https://www.byblosbank.com/Library/Assets//Gallery/FinancialResult/AnnualReports/Downloadthefull2018AnnualReport/Annual%20Report%202018.pdf	1. Two isolated forests brought together. 2. Four parties working together: USAID, the Lebanese Reforestation Initiative, the Shouf Biosphere Reserve, and Byblos Bank, with the support of local communities and municipalities. 3. 10,720 seedlings of other native species planted. 4. 14,980 cedar seedlings planted. 5. 440,000 square meters of habitat reforested.
Touch	Mobile telecomm-unications and data operator	https://d364xagvl9owmk.cloudfront.net/media-10-4-18/media/filer_public/27/83/2783ccb4-885b-425a-abe2-d1236fafc9e9/sustainability_report_2017-_full.pdf	1. Touch partnered T.E.R.R.E Liban an independent Lebanese non-governmental organization that aims to develop and implement environmental and waste recycling education in Lebanon. Through this partnership, touch significantly reduced waste within its premises and ensured that its waste management program abides to international standards. 25 tons of paper were recycled by Touch between 2016 and 2017 2. touch in partnership with Lebanon Reforestation Initiative (LRI) launched the third edition of the 'touch Forest' initiative in 2017.
Alfa	Mobile telecomm-unications and data operator	https://www.alfa.com.lb/AnnualReport-20162017.html#book5/page115	1. Adopting new ways to reduce their energy consumption and cut down their carbon emissions. 2. Adopting energy efficiency technologies 3. Using energy efficient components in their building. 4. Renewable energy sourcing: powering their base stations with solar energy.
IPT	Stations and gas solutions provider	https://www.iptgroup.com.lb/Library/Assets/IPT%20CSR%20Report%202018-%20final%20for%20web-010920.pdf https://www.iptgroup.com.lb/ipt/en/activities/ipt-energy-and-environmental-management-strategy-eems	1. IPT's First Sustainable Gas Station and first of its kind in Lebanon with advanced solutions and innovations in the field of energy and water conservation and pollution reduction. One of the main features of the station includes: Energy efficiency & renewable energy solutions to reduce energy consumption
ABC	Retail	https://www.abc.com.lb/Experience/Read/2/Committed-To-Green	1. ABC Verdun is committed to achieving LEED certification 2. ABC was the first mall in Lebanon to use the photovoltaic energy.
ITG	Holding Company with technologi	https://www.itgholding.com/upl/doc_doc_50.pdf	1. ECOsys (their affiliate) provides renewable energy solutions, thus helping promote the green initiative culture among our clients, and fellow citizens. 2. ECOsys implemented 6 Solar Photovoltaic projects with a total

	-cal and business services		capacity of 2,770KW, producing 3,236,517 kWh and saving 2,265,562 Kgs of CO2.
Fransabank	Banking	https://www.fransabank.com/English/SociallyCommittedGroup/FransabankCSRInitiatives/Environment/Pages/default.aspx	1. Implementing renewable energy solutions (PV on roof and facade) (project under study)
Lebanese American University (LAU)	Academia	http://fm.lau.edu.lb/sustainability/energy-saving-and-water-conservation/	Implementation of projects to reduce energy consumption and generate energy from renewables such as: 1. The Byblos Library and Central Administration project features power and hot water generation from the sun. The same building will feature a solar tracking system. 2. Beirut's Wadad Sabbagh Khoury Student Center has been outfitted with a solar water heating system. 3. Preliminary studies are underway for the introduction of solar water heating at Beirut's indoor pool and the Byblos dorms.
Fattal	Agent of multinational companies and distributors of Premium brands	https://www.fattal.com.lb/csr/environment https://s3-us-west-2.amazonaws.com/ungc-production/attachments/cop_2016/331661/original/LR_2710_CSR.pdf?1477717447	1. "Change for Life" focuses on reducing company waste, reusing and recycling, as well as concentrating on clean energy, power saving and costs. 2. Photovoltaic alternatives (solar panels) are still under study but at a very advanced level, green diesel oil is systematically used to fuel the Group's electricity generators in Lebanon.
Sanita	Manufacturer and distributor of a wide range of products	http://www.sanitalb.com/sustainability?id=10&pageTitle=Community%20Relations	Renewable Energy Solar PV farm installation in Lebanon & Egypt. Biomass power & steam generation in Lebanon. Heat recovery in Lebanon.
American University of Beirut	Academia	https://www.energydigital.com/company/american-university-beirut-continues-build-better-tomorrow#	They have embarked on a number of solar energy projects for water heating and for electricity generation and they are progressively replacing their lights into more efficient energy-saving ones. They often buy energy-efficient equipment throughout the campus

As part of our initially intended methodology that we had to substitute due to the reasons stated in the introduction, communicating with different corporations present in Lebanon (headquarters and branches) was necessary to get their feedback concerning the initiation of a potential EACs market in Lebanon. The first step was based on trying to schedule a meeting or a call with the corresponding contact person – responsible of sustainability – in the company. After contacting some companies to request their feedback regarding our initially intended survey, we noticed that most local companies are not aware of the EACs concept. Thus, it was difficult to explain to them the purpose of the survey through a phone call or an email. For instance, many of the companies chose not to answer the survey despite having actual environmental commitments towards the UNGC[3] or the Lebanon Climate Act[4], in addition to their focus on energy efficiency and decreasing energy consumption and carbon emissions in their global corporate social responsibility reports. Even in the case of the international corporations that have global commitments towards the RE100 initiative, we noticed that local branches lack the necessary knowledge about the concept of EACs and even lack knowledge of their companies' headquarters commitments towards renewable energy and the environment. Hence, in many situations it was not easy to find the corresponding contact person within the corporation with whom the interview would be conducted. Indeed, this was the case while contacting the local offices of PricewaterhouseCoopers (PwC), Tetra Pak and Citi Bank. Those findings were discussed

[3] United Nations Global Compact: "The world's largest corporate sustainability initiative: A call to companies to align strategies and operations with universal principles on human rights, labour, environment and anti-corruption, and take actions that advance societal goals".

[4] "A platform for non-state actors that aims at creating transformational change towards a decarbonized and climate resilient economy in line with the Paris Agreement through leading by example and showing the economic and social benefits of climate action".

with Mr. Braslawsky and Mr. Tuinenburg who confirmed the multinationals' limited knowledge of the EACs market and its effect on renewable energy demand from one side and its indirect influence on their growth and development from the other side. In their opinion, the corporations' main interest is to be able to disclose "their scope 2 emissions in an easy and reliable way that is in adherence with international best practices" while the tool used for appropriate reporting is considered "secondary" by many of those multinationals. They also emphasized that "sometimes local representatives will have less knowledge about EACs than their corporate head offices" which is one of our findings through our communications with the multinationals' local branches.

This fact emphasizes the crucial need for awareness campaigns regarding the concept of EACs in Lebanon in the case of the intention to implement such a project and initiate this market in the country. These campaigns would explain the process of entering this market with all the associated definitions, benefits and challenges which would help in increasing the corporations' knowledge about EACs. This might affect in return their appetite and willingness to be part of this market. During our interview with Mr. Braslawsky and Mr. Tuinenburg we questioned the role that is played by the I-REC Standard in the awareness or marketing campaigns especially when introducing the concept in a new region. They stated that the standard doesn't actively maintain such campaigns and they stressed on the crucial role that should be played by the local stakeholders – mainly the approved local I-RECs issuer – and the importance of its high involvement in the I-RECs marketing process knowing that it will be supported by the standard through Webinars for example. The local issuer's

profit making ensured by a larger number of registered devices should constitute one of the main incentives behind the issuer's involvement in the awareness campaigns.

Another interesting but worrying finding that was noticed through contacting the corporations – mainly the international ones – is that many of those corporations classify their Lebanese operations as secondary or limited. Thus, they find it unnecessary in the current time to make any changes in relation to their energy consumption and CO_2 emissions in Lebanon. Johnson & Johnson, which is a member of the RE100 initiative, is one example. The company possesses an office in Lebanon - Johnson & Johnson Middle East FZ LLC (Lebanon Branch) – which is mainly responsible of the pharmaceuticals line of business (Johnson & Johnson, 2020). For the purpose of filling the initially intended survey, we contacted the company's global corporate governance team via email. In their response, they believed that they have a limited presence in Lebanon which in their opinion prevents them from participating in the project at the current stage; hence they decided not to fill the survey. This reality contradicts with a key principle that is usually being followed by the members of RE100: their leadership position. An RE100 report states that the global commitments of the members should not be limited to their largest operations and offices (RE100, 2018). The report stresses that even in the situation of minimal operations in a certain country; the RE100 members should respect their commitments and work to achieve their renewable energy targets especially that this could have a large positive impact on the corresponding country (RE100, 2018). In the case of Lebanon, if an international corporation such as Johnson & Johnson decided to use EACs (once the market is established) to achieve its global commitments, it could position itself as a market leader in the country and thus support in

spreading the knowledge and awareness about EACs. Hence the example of Philips Lighting in the UAE should be replicated in Lebanon with Johnson & Johnson and others if it they are to include their smaller operations in their global commitments and environmental targets.

Using awareness campaigns to introduce the commercial sector to the EACs' concept could solve one portion of the issue, however the need to ensure additionality while trading EACs in Lebanon is crucial to deliver the anticipated outcomes in terms of energy transition and international environmental commitments. In the next section we will go over the existing renewable energy policies linked to the commercial sector (if any) and try to explain the need to use the voluntary EACs market while considering the tools that could ensure additionality.

5.4 Voluntary EACs market aspects

5.4.1 The commercial sector and its corresponding renewable energy policies

Despite that the Lebanese government adopted in April 2019 an updated policy paper for the electricity sector (policy paper Ministry of Energy and Water, 2019), it is clear that the paper doesn't focus on the commercial sector and its important role in achieving the country's international commitments. Additionally, the National Renewable Energy Action Plan (NREAP 2016-2020) and the National Energy Efficiency Action Plan (NEEAP) for Lebanon face the same issues as the electricity policy paper with minimal emphasis on the commercial sector that, as mentioned in the introduction section, has a large contribution to electricity consumption and consequent carbon emissions. Even though the commercial sector is mentioned in one of the NEEAP's (2011-2015) 14 initiatives: "Promotion of

decentralized power generation by PV and wind applications in the residential and commercial sectors" (El Khoury *et al.,* 2016), there isn't a clear policy to support the commercial sector shift to renewable energy and /or the use of EACs. This lack of policies to govern the commercial sector's transition to renewable sources of energy classifies the establishment of an EACs market that ensures additionality as a highly significant step. In the next section, we will explore some of the offered eco-labelled certificates that contribute to additionality. This would help us understanding the required steps that should be taken in association with the establishment of the I-RECs market in Lebanon to deliver the purpose of this paper.

5.4.2 Eco-labelled certificates

Eco-labels are defined as voluntary tools that are usually monitored by third-party and independent institutions and permit "the use of a specific environmental label on products that comply with certain ecological criteria in order to differentiate these products within the same product group" such as energy (Willstedt & Bürger, 2006). Thus, the role of eco-labelled certificates would be guaranteeing additionality and lessening negative environmental impacts of existing power plants which is correlated with most of the buyers' expectations of positively contributing to the environment while switching to renewable energy (Willstedt & Bürger, 2006). Therefore, relying on eco-labelled certificates might have a positive impact on boosting the voluntary EACs markets through providing interested corporations with additional reasons to invest in those certificates. It is actually argued that being part of international or local environmental initiatives doesn't always meet corporations' aspirations; therefore, despite the importance of using EACs to make credible

and reliable claims, not all certificates have the same environmental impacts (Gorina, 2017). According to Gorina (2017) (Gorina, 2017), there is a number of benefits for corporations that differentiate themselves even further through buying eco-labelled EACs and they are not limited to decreasing GHG emissions. These certificates also allow corporations to show their environmental commitments towards their stakeholders in addition to providing them with a "hedging tool against regulatory risks" (Gorina, 2017). Indeed, according to Mr. Tuinenburg, the I-REC standard is witnessing a rise in the use of eco-labelled certificates. This is correlated with the increased number of corporations implementing environmental policies that require buying EACs with certain eco-labels. We will discuss below some examples of the most worldwide spread eco-labelled certificates that could be implemented in Lebanon and from which Lebanon could learn. The literature highlights two main types of certificates: EKOenergy and GoldPower.

5.4.2.1 EKOenergy

Using the EKOenergy label is described by the United Nations as "climate-smart business practices" (UN, 2019) through which companies are not only showing their commitments towards the environment, they are also highlighting their support to the global energy transition which requires the development of new renewable energy plants and the employment of energy efficiency strategies. This is done through their compulsory contribution to a climate fund required by the EKOenergy label in addition to an optional contribution to an environmental fund based on the type of the renewable energy source (Sustainable Development Goals Partnership Platform, n.d.). The EKOenergy label has 3

main purposes that are directly involved in the fulfillment of the SDGs, especially the ones linked to the environment and climate change. They revolve around modifying the economic structure to become more sustainable, reducing energy poverty through financing small scale renewable energy projects in developing countries - which ensures additionality - in addition to increasing awareness about climate change and the importance of switching towards renewable sources (Sustainable Development Goals Partnership Platform, n.d.). The EKOenergy label is interesting for Lebanon (which is an I-REC eligible country) since they are not limited to the European countries anymore. Indeed, the foundation has an objective to propagate in countries with minimal renewable energy legislation, and this is currently done through its collaboration with the I-RECs standard (Sustainable Development Goals Partnership Platform, n.d.). This willingness to spread is also highlighted through increased interests in the Middle East and Arab countries: EKOenergy already established a solar project in Palestine, this is added to the intention to introduce the label in the Arab world (EKOenergy, 2018) which they want to complete with the help of "Arabic speaking volunteers" (Sustainable Development Goals Partnership Platform, n.d.).

5.4.2.2 GoldPower

GoldPower is another eco-label that is being used globally by different corporations with a purpose of showing their interest in supporting the global energy transition (GoldPower, 2020). Similar to EKOenergy, the concept of GoldPower is based on the idea that many corporations are unable to avoid the use of fossil fuel to power their operations even though they have an objective of reducing their emissions which is mainly related to

the unavailability or lack for cleaner alternatives. The eco-label would provide the corporations with GoldPower certificates that correspond to their fossil fuel consumption. Those certificates ensure additionality, GHG emissions reductions and contribution to three of the SDGs through the premium paid by the corporations (Kasmi, n.d).

5.5 Renewable energy potential

In this section we will go over Lebanon's renewable energy potential mainly in terms of solar and wind energy and we will try to assess if and how the establishment of an EAC market in the country could increase the renewable energy capacity in the country – ensuring additionality – and thus decrease the GHG emissions. This would be linked to the demand on I-RECs from one side and the setting of the "right" price for the certificates from the other side.

5.5.1 Solar potential

Lebanon has a large potential for solar energy with "around 3000 hours of sunshine" per year (The Heinrich Böll Foundation, 2019). According to the Solar PV Status Report, electricity produced by solar PVs in Lebanon as of 2017 represented a share of 0.35%, this is equivalent to a total PV "installed capacity of 35.45 MWp" (Amine *et al.,* 2018). It increased as of 2019 to a total of 45 MW (Ministry of Energy and Water, 2019). This is compared to the GoL's plan to install a total capacity of 840 MW of solar plants to achieve

its commitments to the Paris Agreement (Ministry of Energy and Water, 2019). Thus, the current installed capacity of solar PVs represents a share of only 5.57% of the abovementioned plan. One of the purposes of this study would therefore be establishing an EACs market in Lebanon which focuses in the first phase on the commercial sector to help and accelerate the reach of the GoL's plan while making sure that additionality and decreasing GHG emissions are ensured. It is also important to underline the commercial sector's current contribution to the installed PV capacity which corresponds as of 2017 to 6.72 MWp (share of 19% of total installed solar PV capacity) knowing that it is ranks second in the "top leading solar PV sectors" (Amine *et al.,* 2018). The commercial sector is the third after the residential and the industrial sectors in terms of investment in the solar PV capacity with a total investment of $14.81 million as of 2017 (Amine *et al.,* 2018).

5.5.2 Wind potential

In terms of wind energy, Lebanon benefits from a "potential onshore wind power capacity of 6.1 GW" according to the National Wind Atlas of Lebanon by UNDP/CEDRO, this value could however decrease based on the worst case scenario to the level of 1.5 GW (Hassan, 2011). In the MoEW's updated policy paper, there is a plan to install wind farms with a total capacity of 600 MW (Ministry of Energy and Water, 2019). As a first step to achieve this plan, three windfarms will be installed in the north of Lebanon after the government "approved three permits for private companies to operate wind turbines for electricity" (Alieh, 2017). Those companies will produce 200 MW of electricity (Ministry of

Energy and Water, 2019). This is a small share of the overall potential, especially when considering the best-case scenario.

We believe that if the EACs market was established appropriately and efficiently in Lebanon while tackling the critics that it is facing could positively impact the overall share of renewable energy sources in the total energy mix of the country. This would be translated in increasing the benefits from the large potential for renewable energy sources that Lebanon possesses.

In the next sections we will detail the different aspects linked to the establishment of an EACs market in Lebanon based on our meeting held with Mr. Braslawsky and Mr. Tuinenburg from the I-REC Standard.

5.6 Different aspects of the I-RECs market in Lebanon

For the purpose of establishing the EACs market in Lebanon through the use of I-RECs, there are some criteria that specify whether a certain country should be approved as an I-REC country knowing that this decision is made by the International REC Standard Foundation as mentioned by Mr. Braslawsky. It is important to have an idea about the market's overall potential in terms of energy (in MW) that would be procured using EACs and the monetary amount that would be raised; this is translated in knowing the potential EACs demand in addition to the supply that renewable energy generators are willing to offer from one side and the process of setting the certificates' price from the other side. However, the most crucial criteria that the Standard takes into consideration while deciding to penetrate

new countries is a proof of market stability as explained by Mr. Braslawsky. This criterion is added to the legislation and the demand that are deemed by the standard as secondary. The price setting process was also discussed with the I-REC standard taking into consideration the fees that the involved stakeholders including participants, registrants and end-users will have to pay.

5.6.1 Market stability

From the standard's perspective and through their role as a market facilitator, Mr. Braslawsky specified that appropriate contact with national authorities and local stakeholders is crucial and is a proof of market stability. National authorities could refer to the Ministry of Energy and Water, the electricity regulator or the grid operator depending on the local electricity market design. Through their contact with local authorities the Standard makes sure that there is "permission or at least some sort of acknowledgement or awareness from the local authorities that I-RECs will be issued and traded in their country" which ensures market stability. Its significance was explained in detail by Mr. Braslawsky. Through market stability, the I-REC Standard would not have to face a situation where local authorities start questioning their presence after operating in the country for a certain period. Mr. Braslawsky argued that the purpose of market stability is preventing "at all costs that they set up a market in a country resulting in market players signing long terms contracts or even develop projects based upon EACs to only have the government stepping in a year later saying that I-RECs are not allowed for another mechanism". Thus, involving local authorities even at a minimal levels – knowing that a legislation is not a requirement – is an indicator of market stability and is necessary for the adequate continuation of the market.

The I-REC standard classifies initial demand as a secondary requirement due to the low cost needed for initiating the EACs market. During our meeting with Mr. Braslawsky and Mr. Tuinenburg, they insisted on the cruciality of local stakeholders' support who usually take the lead in developing and growing the EACs market in new countries.

5.6.2 EACs supply and demand

Even though EACs demand was classified by the Standard as a secondary criterion, Mr. Braslawsky stated that there will always be "some demand" in newly initiated market, and this is correlated with the local issuer's benefits. According to the Standard, demand should be ensured through the local issuer's marketing and awareness campaigns in addition to its relationships with the local stakeholders.

There are two aspects to consider while projecting EACs' demand. The first one discussed in section 5.3 revolves around the corporations' lack of awareness concerning the concept of ECAs, while the second one is based on the remarkable contribution of the commercial institutions in the renewable energy sector as explained in section 5.4.1 in addition to the sustainability policies and measures that are being applied by many corporations in the country – multinationals and locals (Refer Table 1). The corporations' involvement and interest in the renewable energy sector could constitute the basis for ensuring a demand for EACs and could be the first targets of awareness and marketing campaigns that would be maintained by the local issuer.

While considering the EACs market as a tool to support Lebanon's energy transition, it is important to highlight one of the challenges that could be faced after establishing the market (using I-RECs specifically) which is observed in some countries: the absence of registered production devices with the I-REC standard which is translated in no EACs supply. It was actually acknowledged by Mr. Tuinenburg that in the first phase of the I-REC market, there are some countries that have a very small number of registered devices. Mr. Tuinenburg attributed this issue to the absence of local issuers in many of those countries and to the dependence on the central issuer that is usually considered as a foreign institution. There are some examples from the I-REC registry that support Mr. Tuinenburg's claim. For instance DCCE was approved as a central issuer for UAE, Morocco, Oman, Jordan and Saudi Arabia (I-REC Standard, 2019), however and according to the I-REC registry, only projects in UAE, Morocco and Jordan were registered with the standards (I-REC Standard, 2020) (Refer Figure 8). Thus, despite that DCCE is an Arab institution it was unable till date to efficiently support the EACs' market in Oman and Saudi Arabia with limited intervention in Jordan till date through the registration of a single device of 50 MW (I-REC Standard, 2020).

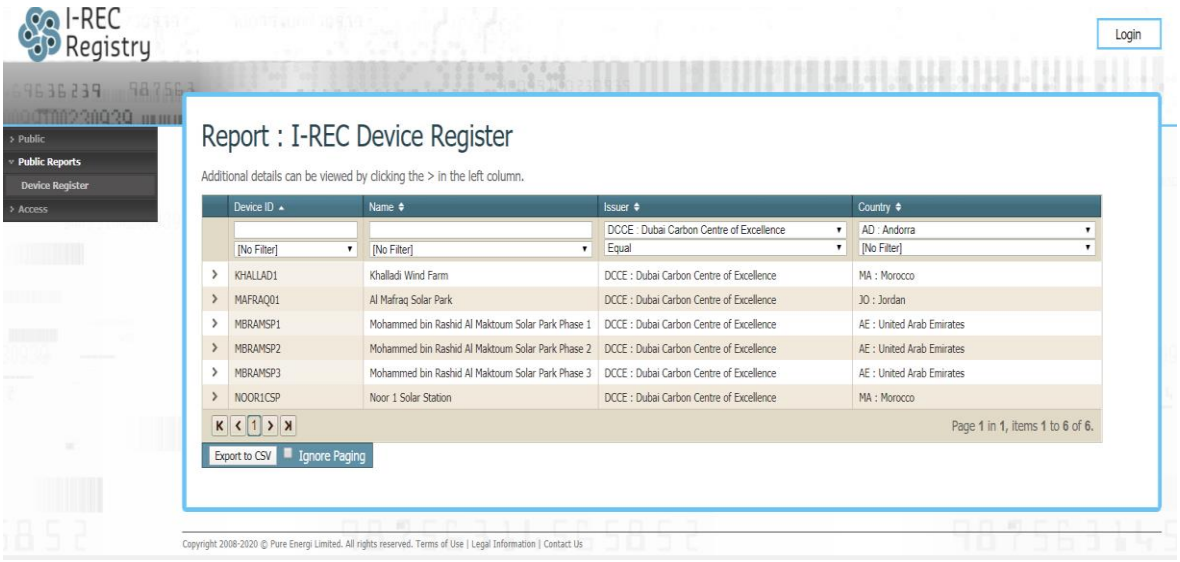


Figure 8: I-REC Device Register (Issuer: DCCE)

Another example that strengthens the importance of having a local issuer rather than a central one was witnessed in the Egyptian situation. Egypt got the approval from the I-REC board on October 2019 to issue certificates with GCC as the approved central issuer (I-REC Standard, 2019), however till date there are no registered renewable energy generators with the standard in the country (Refer Figure 9) even though other countries that were approved on the same day as Egypt such as Costa Rica and Panama and have the same issuer (I-REC Standard, 2019) already registered production devices with the standard as seen in Figure 10 and Figure 11 (I-REC Standard, 2020). It is important to note however that Costa Rica's EACs market is still limited to one registered device with a small capacity of 23.48MW (I-REC Standard, 2020) which is expected while initiating the market as specified by Mr. Tuinenburg.

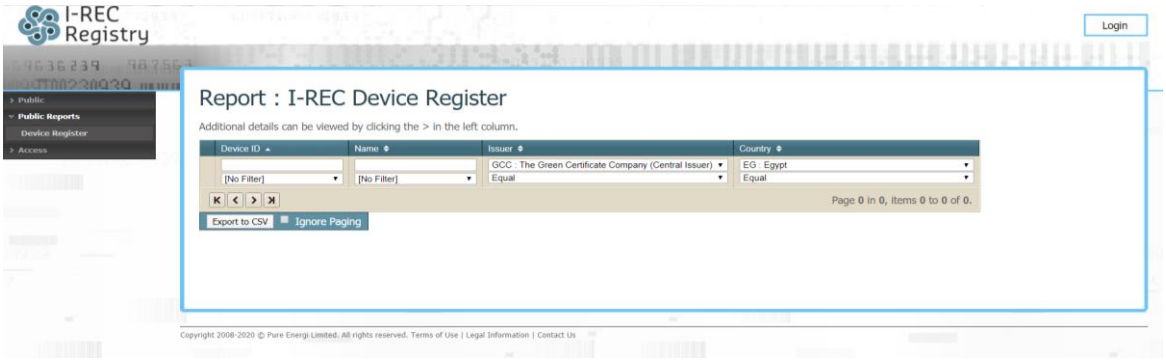


Figure 9 : I-REC Device Register (Issuer: GCC)

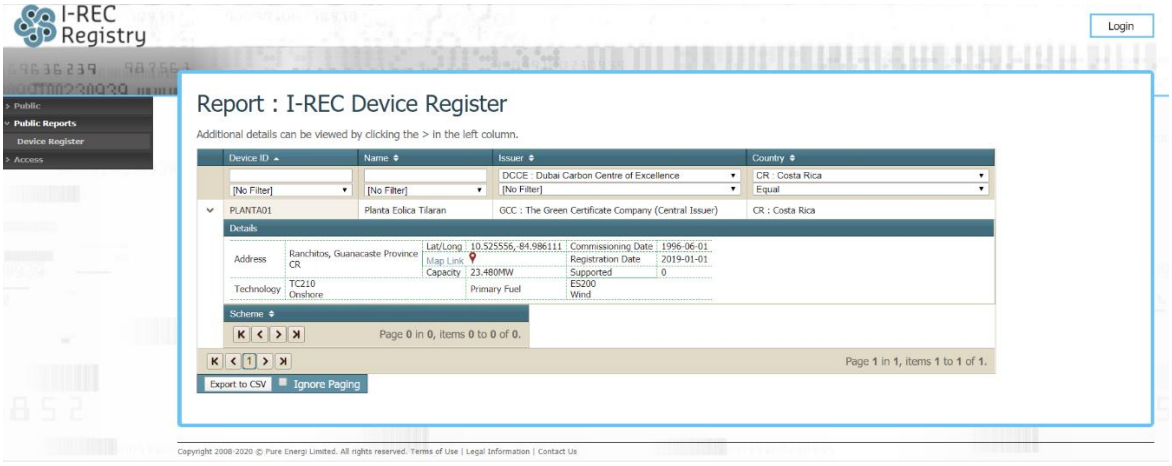


Figure 10: I-REC Device Register (Costa Rica)

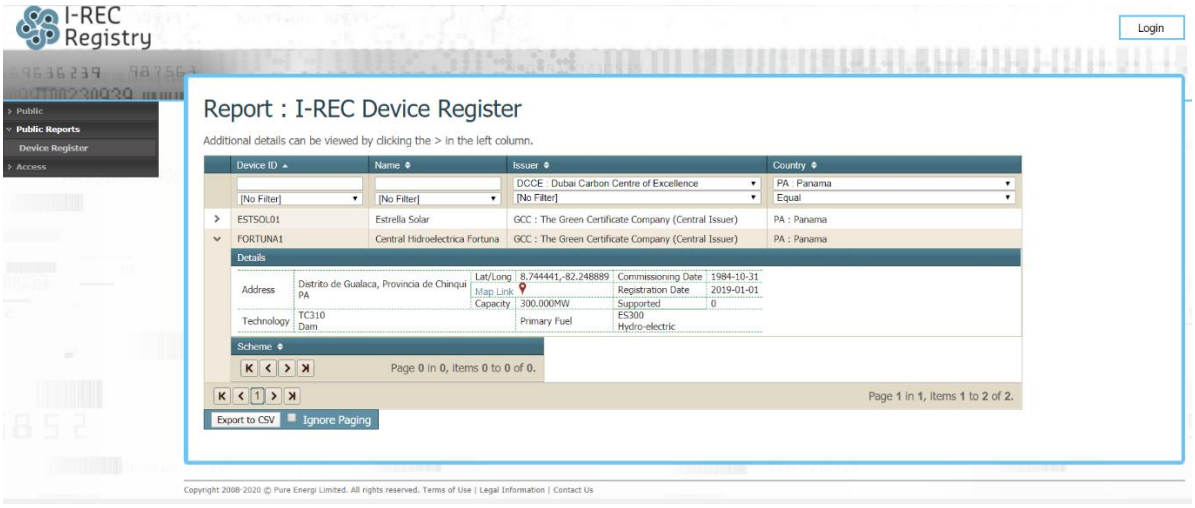


Figure 11: I-REC Device Register (Panama)

The third example represents a case with an approved local issuer. Energy Peace Partners (EPP) was approved as local issuer of I-RECs in the Democratic Republic of the Congo (DRC) on October 2019 (I-REC Standard, 2019); however, the I-REC Registry does not show any renewable energy projects in the DRC to which EPP issued certificates as shown in Figure 12 (I-REC Standard, 2020). This barrier could be either attributed to recent approval that EPP received or the lack of awareness campaigns from the local issuer.

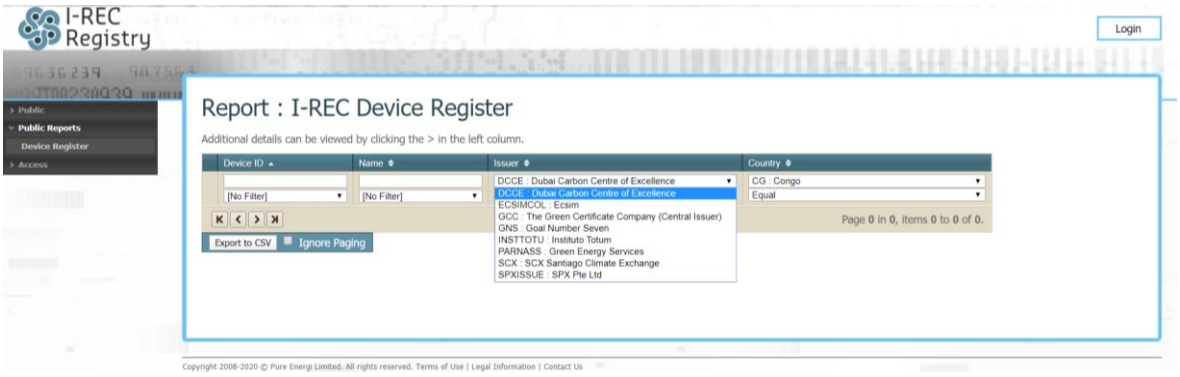


Figure 12: I-REC Device Register (DRC)

The above-mentioned examples are important to learn from while establishing the market in Lebanon; thus, we believe that it is critical to have a local issuer that would be highly invested in maintaining the necessary campaigns to ensure supply and demand of EACs. Knowing the exact demand of EACs before starting the market is not an easy task especially with the lack of knowledge, however, as mentioned by Mr. Braslawsky it is not mandatory. As things progress, and the market grows the local issuer would have the necessary means to be able to properly project demand.

5.6.3 Price setting process

Mr. Braslawsky explained in detail the fees structure for the different stakeholders in an I-REC approved country.

5.6.3.1 Participants

Participants would have to pay an amount of 2000 euros on a yearly basis to the I-REC services, this is added to a fee of 0.06 euros/MWh redeemed. It was also specified by Mr. Braslawsky that usually only large electricity companies and utilities (renewable energy generators) would consider relying on participants since the participants' cost represents a small share of the generators' other expenses, knowing that this action eliminates any risk that the generator could face. In the case of smaller companies and utilities, the Standard offers them the possibility to trade certificates without a participant in the market place. This task could be done by the registrant who puts the certificates in the market.

5.6.3.2 Registrants

Registrants from the other side can register and get access to the I-REC registry for free with their local issuer. Registrants would nevertheless have to pay to the local issuer per production device registered and per MWh issued. Mr. Braslawsky stated that those fees are required in order to cover the issuer's costs that occur while ensuring those processes. During the device registration and issuance, those costs cover the verification and validation of information received from the device owner by the issuer in addition to the "administrational costs for setting up all the information in the registry".

According to Mr. Braslawsky, the process of setting the fees is done by the local issuer in cooperation with the I-REC standard. The I-REC Standard makes sure that the fees imposed by the local issuer don't surpass the limit specified by the default issuer GCC

especially that the Standard considers that local issuers' administrational costs should be lower than the costs incurred by the default or central issuer "due to their local knowledge and access to data". Mr. Braslawsky stated that negligible variations between local issuers in different countries could occur, but what is important from the Standard's point of view is the unification of fees paid by registrants within the same country.

Mr. Tuinenburg detailed the fees set by different issuers starting with the default or central issuer GCC. GCC charges 1000 euros per production device registration and 0.025 euros per MWh issued. These fees were compared to 3 other local issuers, and we can notice that the imposed charges are below the GCC's limits:

- At Instituto Totum (Brazil): 934 euros per production device registration and 0.025 euros/MWh issued,
- SCX (Chile): 500 euros per small production devices registration and 0.025 euros/MWh issued,
- GN7 (Russia): 750 euros per production device registration and 0.02/MWh issued.

5.6.3.3 Certificates' price paid by consumers

Mr. Braslawsky stated that due to the voluntary nature of the market, the certificates' prices follow the supply and demand rule. We inquired whether setting a floor price for the certificates is possible from the Standard's point of view and if it would be beneficial to have follow such a regulation. Mr. Braslawsky stipulated that it is possible to implement a floor price regulation in certain conditions however he does not think it is beneficial and he

believes that it is associated with many challenges and critics. First, a legislation would be needed to set a minimum price and in the case of Lebanon this would mean that issuing certificates would be in the government's hands as specified by Mr. Braslawsky. The main critic linked to having a floor price concerns the production devices' owners who have already paid for the project's establishment. In case they want to declare the use of renewable energy sources, they require certificates as proof. However, setting a floor price is translated into an unfair additional cost on the owners that they would be required to pay to fulfill the floor price legislation.

5.6.4 Legislation

The Standard deemed a legislation as difficult especially that a legal framework would take a lot of time to be prepared and approved.

CHAPTER 6

ESTABLISHING THE I-RECS MARKET IN LEBANON

After elaborating all the characteristics of EACs, going over some successful cases of the EACs market, explaining the process of establishing an I-REC market in a new country and after detailing the various debates associated with that market and the tools used to overcome the critics, in this section, we will propose a plan for establishing the EACs market in Lebanon while taking into consideration energy transition and reaching Lebanon's environmental commitments. Our plan would help in achieving a higher renewable energy capacity – hence additionality – especially in terms of solar and wind energy. We will focus on following a concept similar to the eco-labelled certificates discussed above which helps in overcoming the previously detailed critics.

What we suggest is the initiation of a separate fund in conjunction with the EACs market that will finance or partially support the construction of new renewable energy projects. This fund would be similar in concept to the climate fund used by the EKOenergy institution. We have discussed this suggestion with Mr. Braslawsky to check whether the Standard's regulations allow such actions. He affirmed the possibility of dedicating an amount added to the certificates' initial price that permits the establishment of a separate fund that ensures additionality. He stated that the Standard would not have any objection in that concern, adding that from their end all what is required would be a mutual decision between the local issuer and the I-REC Standard on the supplementary charge. Then upon certificates' issuance the fee would be raised accordingly. He also acknowledged that such fund would

support additionality in the country. It is nevertheless worth mentioning that such a fund requires correlated legislations for proper functioning. It also requires a study to specify the appropriate fixed amount that should be added to the initial certificates' price and dedicated to the fund.

The renewable energy projects ensured through this fund do not need to be on large scale, especially in the initial stages. For instance, there are many regions in Lebanon especially the villages far from the capital that still lack proper access to the electricity grid. New renewable energy projects would thus be installed thanks to the fund in those villages which improves the population's living conditions knowing that there are many proposed ideas that still lack for financing. Indeed, this was the case in many regions around the world that benefitted from the climate fund projects. The successful projects of the climate fund from the EKOenergy organization could form an important reference while setting the required legislation for the new fund in Lebanon. In fact, the climate fund was able to collect an amount of 824,311 € through which they were able to finance 36 small scale clean energy projects mainly in the rural regions of some developing countries starting 2015 (EKOenergy, 2020).

The establishment of an I-RECs market in Lebanon based on our suggested plan would have many positive impacts on several levels in the country. Indeed, it will not only support energy transition and improve the quality of life for many, it would also contribute to ensuring legitimacy of Lebanon's claims regarding its environmental commitments towards the international community in addition to positively impacting the GDP in Lebanon.

6.1 Legitimacy

The recourse to the I-REC market in Lebanon would ensure the credibility of the country's claims in terms of renewable energy commitments and targets and would be a proof to the international community that Lebanon is actually moving towards achieving its commitments. Thus, rather than providing the international community with unverified numbers, the establishment of the I-REC market in Lebanon will enhance the country's trustworthiness and credibility in front of the international community which would improve its image and strengthen its position in the global efforts of fighting climate change.

6.2 Income generation

Further to the benefits associated with developing new renewable energy projects we will discuss briefly and based on some assumptions, the annual income that the Lebanese renewable energy sector can potentially generate using the 2030 projections of RE scenarios from the NREAP 2016-2020 (El Khoury *et al.*, 2016) through the EACs mechanism and we will conclude on the amount that the RE Fund will benefit from.

The assumptions adopted to estimate the potential benefits of applying EACs to RE generation in Lebanon by 2030 are as follows:

- The renewable energy electricity components of RE aimed for by 2030 excluding SWH, hydro, geothermal and bioenergy according to the NREAP report (Refer Figure 1Figure 13) is 2483 GWh RE supply annually.

- We will assume 3 scenarios for the RE projects that establish EACs for their generation: 90% of RE generation applies EACs as the best-case scenario, 50% for the average case scenario and 10% for the worst-case scenario (Refer Table 2, Table 3 and Table 4).
- Since there is no single global published certificates' price range, we will base our assumption on data from the US that shows the variation of "voluntary national REC prices" between January 2012 and August 2018 (Refer Figure 14). We will also take 3 scenarios of highest price reached, lowest price reached, and average price reached. These values correspond respectively to $1.2/MWh, $0.31/MWh and $0.75/MWh (equivalent to $c120/kWh, $c31/kWh and $c75/kWh) (EPA,2019).
- An additional 10% of the certificates' price will be dedicated to the fund

Year	2025			2030		
	MW	GWh	ktoe	MW	GWh	ktoe
Wind	350	1,087.9	235.0	450	1,422.6	307.3
PV, CPV	200.0	320.0	69.1	300.0	480.0	103.7
Distributed PV	125.0	200.0	43.2	150.0	240.0	51.8
SWH	1,345,185 m²	755.8	163.2	1,716,835 m²	1,116.6	241.2
CSP	50.0	170.6	36.8	100.0	341.2	73.7
Hydro	402.3	1,391.3	300.5	473.0	1,677.3	362.3
Geothermal	6.5	30	6.5	15	69.2	15
Bioenergy	-	974.3	210.4	-	1,177.0	254.2
Total RE	**-**	**4,929.9**	**1,064.8**	**-**	**6,969.8**	**1,409.2**
Total primary energy demand	**-**	**39,231.5**	**8,474.0**	**-**	**52,032.4**	**11,239.0**
Target %	**12.6**			**12.5**		

Figure 13: Renewable energy resources electricity shares beyond 2020

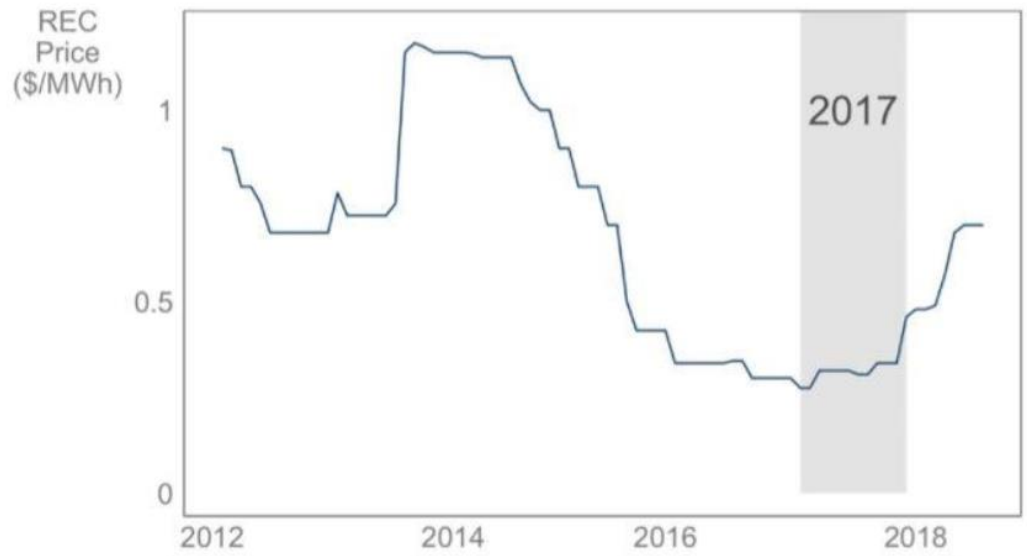


Figure 14: Voluntary national REC prices" between January 2012 and August 2018

	Highest price	$c0.12/kWh		
	Formulas used	**Best Case Scenario**	**Average Case Scenario**	**Worst case Scenario**
RE supply annually (GWh)		2,483	2,483	2,483
RE supply annually (kWh)	*RE supply annually in GWh * 1000000*	2,483,000,000	2,483,000,000	2,483,000,000
Percentage of RE projects that establish EACs for their generation		90%	50%	10%
Total RE that establish EACs for their generation (kWh)	*RE supply annually kWh * Percentage of RE that use EACs for their generation*	2,234,700,000	1,241,500,000	248,300,000
Certificate price ($c/kWh)		0.12	0.12	0.12
Floor price dedicated for the fund ($c/kWh)	*Certificate price * 10%*	0.012	0.012	0.012
Total income generated from EACs ($c)	*Total RE that establish EACs for their generation in kWh * certificate price*	268,164,000	148,980,000	29,796,000
Total income generated from EACs ($)	*Total income generated from EACs ($c) / 100*	**2,681,640**	**1,489,800**	**297,960**
Total amount dedicated to the fund ($c)	*Total RE that establish EACs for their generation in kWh * Floor price dedicated for the fund*	26,816,400	14,898,000	2,979,600
Total amount dedicated to the fund ($)	*Total amount dedicated to the fund ($c) / 100*	**268,164**	**148,980**	**29,796**

Table 2: Total income generated from EACs and amount dedicated for the fund based on 3 cases scenarios using the 2030 projections with the highest price reached of $1.2/MWh

	Lowest price	$c0.031/kWh		
	Formulas used	**Best Case Scenario**	**Average Case Scenario**	**Worst case Scenario**
RE supply annually (GWh)		2,483	2,483	2,483
RE supply annually (kWh)	*RE supply annually in GWh * 1000000*	2,483,000,000	2,483,000,000	2,483,000,000
Percentage of RE projects that establish EACs for their generation		90%	50%	10%
Total RE that establish EACs for their generation (kWh)	*RE supply annually kWh * Percentage of RE that use EACs for their generation*	2,234,700,000	1,241,500,000	248,300,000
Certificate price ($c/kWh)		0.031	0.031	0.031
Floor price dedicated for the fund ($c/kWh)	*Certificate price * 10%*	0.0031	0.0031	0.0031
Total income generated from EACs ($c)	*Total RE that establish EACs for their generation in kWh * certificate price*	69,275,700	38,486,500	7,697,300
Total income generated from EACs ($)	*Total income generated from EACs ($c) / 100*	**692,757**	**384,865**	**76,973**
Total amount dedicated to the fund ($c)	*Total RE that establish EACs for their generation in kWh * Floor price dedicated for the fund*	6,927,570	3,848,650	769,730
Total amount dedicated to the fund ($)	*Total amount dedicated to the fund ($c) / 100*	**69,276**	**38,487**	**7,697**

Table 3: Total income generated from EACs and amount dedicated for the fund based on 3 cases scenarios using the 2030 projections with the lowest price reached of $0.31/MWh

	Average price	$c0.075/kWh		
	Formulas used	**Best Case Scenario**	**Average Case Scenario**	**Worst case Scenario**
RE supply annually (GWh)		2,483	2,483	2,483
RE supply annually (kWh)	*RE supply annually in GWh * 1000000*	2,483,000,000	2,483,000,000	2,483,000,000
Percentage of RE projects that establish EACs for their generation		90%	50%	10%
Total RE that establish EACs for their generation (kWh)	*RE supply annually kWh * Percentage of RE that use EACs for their generation*	2,234,700,000	1,241,500,000	248,300,000
Certificate price ($c/kWh)		0.075	0.075	0.075
Floor price dedicated for the fund ($c/kWh)	*Certificate price * 10%*	0.0075	0.0075	0.0075
Total income generated from EACs ($c)	*Total RE that establish EACs for their generation in kWh * certificate price*	167,602,500	93,112,500	18,622,500
Total income generated from EACs ($)	*Total income generated from EACs ($c) / 100*	**1,676,025**	**931,125**	**186,225**
Total amount dedicated to the fund ($c)	*Total RE that establish EACs for their generation in kWh * Floor price dedicated for the fund*	16,760,250	9,311,250	1,862,250
Total amount dedicated to the fund ($)	*Total amount dedicated to the fund ($c) / 100*	**167,603**	**93,113**	**18,623**

Table 4: Total income generated from EACs and amount dedicated for the fund based on 3 cases scenarios using the 2030 projections with the lowest price reached of $0.75/MWh

Table 2, Table 3 and Table 4 provide 3 scenarios of the total annual income generated from EACs and the amounts that could be dedicated for the fund to develop new renewable energy projects and contribute to a sustainable energy transition in the country based on 3 possible percentages of RE projects that would establish EACs for their generation using the 2030 projections from NREAP 2016-2020 (El Khoury *et al.,* 2016). We notice that in the best-case and average-case scenarios a small, yet important annual income could be generated despite the certificates' price knowing that it could vary with increased demand. It was indeed previously mentioned that prices reached 8 euros/MWh in the Netherlands due to the big rise in demand.

The annual generated income varies between $2,681,640 in the best-case scenario using the highest certificate price reached (i.e. $c0.12/kWh) and $76,973 in the worst-case scenario with the lowest certificate price reached (i.e. $c0.031/kWh). The annual contribution to the fund on the other hand varies between $268,164 in the best-case scenario with the highest certificate price reached (i.e. $c0.12/kWh) and $7,697 in the worst-case scenario with the lowest certificate price reached (i.e. $c0.031/kWh). The worst-case scenario reveals very low numbers and questions the viability of such a project knowing that the generated income could barely cover the administrative expenses. However, from the tables above we can notice that taking the average case scenarios in the entire certificates price range assumed can provide annual income of more than $350,000 (with the lowest certificate price). This emphasizes the need for a large involvement from the generators' side in order to register their RE projects with the I-REC standard which would contribute in moving the percentage of RE projects that establish EACs for their generation towards the best-case scenarios.

Regarding the fund, reaching small annual amounts is acceptable to establish new small-scale renewable energy projects, for example targeting public and other small schools or community centers, which is the purpose of fund in the initial stages. Indeed, if we go over the list of projects that were established through the Climate Fund, we can see that an amount as low as 10,000 euros was used for developing different projects in various regions across the world (Refer Figure 15). Despite that some of those projects look small in scale they were able to have a positive impact from different perspectives especially in terms of adding new renewable energy capacity to the grid, improving living conditions and reducing GHG emissions.

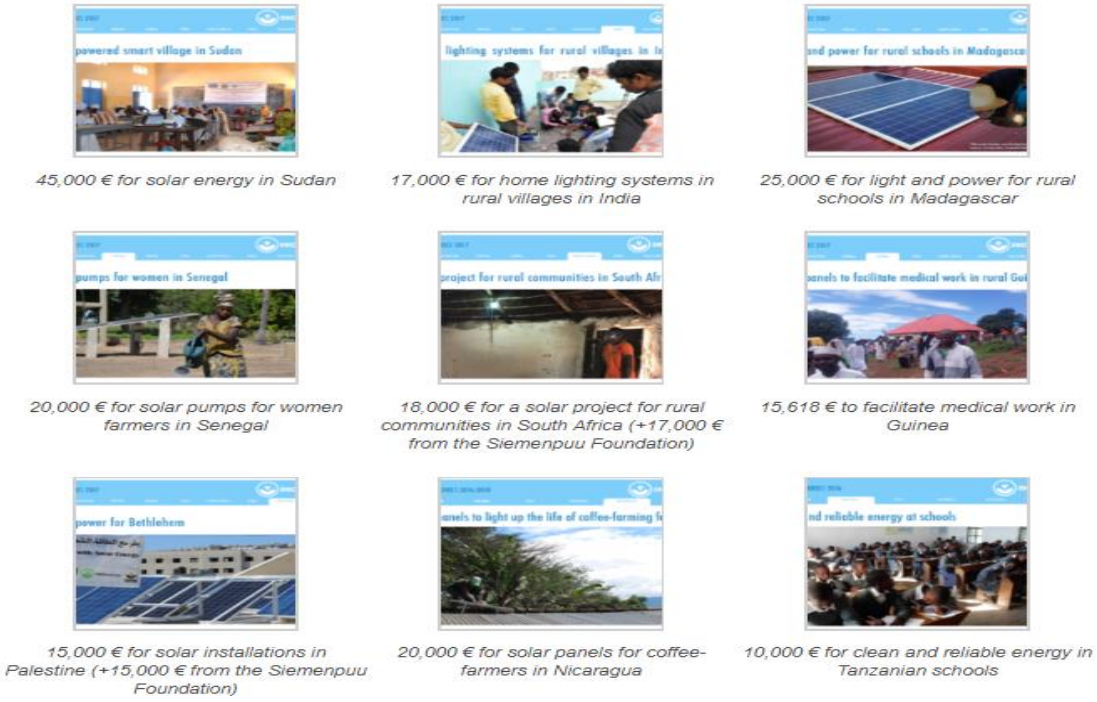


Figure 15: Some projects implemented by the Climate Fund

The above numbers show again the importance of having a highly involved local issuer who could convince corporations in the country to purchase the EACs which is key to increase the demand and therefore lead to higher returns in terms of local income and renewable energy projects' scale.

6.3 The fund's proposed legislation

This fund shall be established in conjunction with the I-RECs voluntary market in Lebanon and controlled by the local issuer and subject to quarterly or yearly audits by an independent international audit company in addition to audits from the appropriate ministries – we suggest the Ministry of Energy and Water, the Ministry of Environment and the Ministry of Social Affairs.

- This fund should help closing the gap between energy demand and energy production in Lebanon.
- This fund should finance partially or totally clean energy projects.
- Like the climate fund from the EKOenergy organization, the projects supported and financed by this fund shall be "implemented by experienced organizations" (EKOenergy, 2020) rather than the fund itself which ensures a higher level of transparency and a higher level of professionalism.
- The financed projects should contribute to SDG 7 "Affordable and clean energy" added to at least one other sustainable development goal (SDG).

- The projects shall be chosen through a specialized committee formed by expert representatives from the different involved ministries in addition to the local issuer and representatives from the UN to confirm the projects' contribution to the SDGs.
- A floor price of the additional charge shall be decided between the local issuer and the I-REC Standard. We suggest that the floor price would be equal to a percentage of 10% of the initial certificates' price.
- Contributing to this fund would be mandatory while purchasing the certificates.
- The new renewable energy projects established through the fund should be registered with the I-REC standard and issue certificates which supports the supply.
- This fund shall be established in accordance with international environmental and climate standards to allow involved companies to properly report and disclose their emissions and to be appropriately recognized.

CHAPTER 7

CONCLUSION

The purpose of this paper was introducing a novel mechanism to the Lebanese market to support energy transition while contributing to the country's international environmental commitments. Throughout this study, we realized that involving the commercial sector responsible of more than 50% of electricity consumption and neglected in most of the renewable energy policies that were recently introduced, is essential for attaining the anticipated targets. After detailing the different possible forms of corporate sourcing of energy, we chose EACs since it is considered as the simplest, most flexible and cheapest mechanism that could be applied rapidly with minimal risk. We focused on voluntary EACs markets rather than compliance markets due to the long time required and difficulties associated with enacting new laws in Lebanon in addition to the regulatory obstacles that could be encountered while trying to include the private sector in the monopolistic Lebanese power structure.

To establish the EACs market in the most efficient way and accomplish this paper's goal we went over various debates and criticism that surround the EACs market. Indeed, it was argued by many scholars that EACs are incapable to ensure additionality and to provide GHG emissions reduction which is translated into an inability to support energy transition and a failure to achieve this paper's objectives. Through going over the literature, we found some market tools that could be used in association with the EACs market that permit to overcome the critics. For instance, a larger number of corporations around the world are

increasingly resorting to eco-labelled certificates and their associated funds as a mean to show their support and involvement in energy transition. On the other hand, some argue that EACs should not be always linked to additionality, it is more about the impact that EACs markets can deliver which varies from one country to another. Thus, founding our conclusions on cases from various regions while addressing the criticism faced by this market is important to accomplish the most satisfactory results.

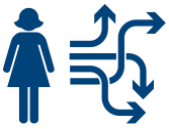
We also studied the process of establishing the EACs market in Lebanon and we decided to get in contact with the I-REC Standard since it is the only form of EACs that could be applied in Lebanon. The Standard's code organizes the whole process which is characterized with simplicity and transparency. The Standard deemed market stability as key for the proper establishment and continuity of an I-REC market putting linked legislation and certificates' demand and supply in the second phase. The Standard also stressed on the importance of having a local issuer rather that a central issuer and we showed some examples that support this argument, a local issuer can have better relationships with the market's stakeholders which supports its fast development. This kind of relationship is crucial for the Lebanese situation especially that we witnessed that corporations in the country are mostly unaware of the existence of such a mechanism.

As a result of this study and while taking into consideration both sides of the EACs debate we recommended the establishment of an EACs market in Lebanon in collaboration with the I-REC Standard linked to a separate fund through which new renewable energy projects will be built. This action allows us to make sure that through this novel mechanism the large renewable energy potential that Lebanon benefits from would appropriately and

efficiently being explored and used. This fund would firstly target the rural areas that lack for the proper access to electricity through small scale projects. After increasing the contributions to the fund – which was witnessed with different eco-labels over the years – the renewable energy projects could be established on bigger scales and targeting greater population. This way we are ensuring a positive impact of the EACs market while putting additionality and decreasing GHG emissions as our priorities, we would also be contributing to enhancing the living conditions many people.

To maximize EACs impact and given that Mr. Braslawsky argued that it is important to increase consumers' trust in the certificates' system which ensures higher prices and thus incentivizes generators to add more renewable energy capacity to the grid and since the inability to ensure additionality formed the scholars' main critic in relation with EACs, we suggest a supplementary recommendation that could be applied in later stages. As a mean to further develop the EACs market and to increase its impact we advise to enact a legislation that would make it mandatory for the large corporations of the commercial sector to have a certain share of renewable energy in their total energy mix. This would be based on Lebanon's environmental commitments mentioned in the introductory section. This legislation could be amended with time to include larger number of smaller corporations in addition to the other economic sectors in the country. Indeed, it was explained by IRENA that linking renewable energy goals to several particular "policy or implementation-related measures" is crucial in "designing effective renewable energy targets" (IRENA, 2015).

ANNEX I: WWF/WRI CORPORATE RENEWABLE ENERGY BUYERS PRINCIPLES



CHOICE

1. Greater choice in procurement options,

It is important to have choice when selecting energy suppliers and products to meet our business and public goals.

COST-COMPETITIVENESS

2. More access to cost competitive options,

We know renewable energy can already achieve cost parity, or better, compared with traditional energy rates. When purchasing renewable energy directly, we would like to be able to buy renewable energy that accurately reflects the comprehensive costs and benefits to the system. Many of us are willing to explore alternative contract arrangements (e.g., entering into long term supply arrangements with utilities and other suppliers to provide revenue certainty) that can bring down the cost of capital.

LONG-TERM PRICING

1. Longer- and variable-term contracts,

   A significant part of the value to us from renewable energy is the ability to lock in energy price certainty and avoid fuel price volatility. Many companies would like to have options for entering into contracts over various time periods.

NEW PROJECTS

4. Access to new projects that reduce emissions beyond business as usual,

We would like our efforts to result in new renewable power generation. Pursuant to our desire to promote new projects, ensure our purchases add new capacity to the system, and that we buy the most cost-competitive renewable energy products, we seek the following:

Access to bundled renewable energy products— energy and Renewable Energy Credits (RECs)

- We are increasingly interested in access to bundled energy and REC products. Unbundled RECs do not deliver the same value and impact as directly procured renewable energy from a specific project or facility.

Ability to prevent double counting within the energy consumer community

- In order to claim the benefits of our renewable energy purchases to satisfy our public goals and reduce our carbon footprint, current US rules require that we retain ownership of the RECs or that they are retired on our behalf. Some companies find this single-instrument system creates competition between energy generators and energy users that can slow the growth of voluntary corporate renewable purchases. We welcome discussion to explore market mechanisms that enable greater voluntary growth of renewable energy while maintaining accounting integrity. What is most critical to us is that we have the ability to add more renewable energy to the system and claim the consumption of the relevant renewable energy and GHG emission benefits while preventing another energy user from claiming consumption of the same renewable energy.

Renewable energy delivery from sources that are within reasonable proximity to our facilities

- Where possible, we would like to procure renewable energy from projects near our operations and/or on the regional energy grids that supply our facilities so our efforts benefit local economies and communities as well as enhance the resilience and security of the local grid.

FINANCING TOOLS

5. Increased access to third-party financing vehicles as well as standardized and simplified processes, contracts and financing for renewable energy projects

To access renewable energy at the competitive prices and scale we need to meet our goals, many companies are financing and/or procuring renewable energy through third-party providers using power purchase agreements (PPAs) and/or lease arrangements. Increasing access to these types of effective and affordable financing tools is critical. Initially, for some companies, these processes can be complex and costly since they are outside of their core business functions. Simplifying and standardizing policies, permitting, incentives and other processes for direct procurement are high priorities for many companies.

COOPERATION

6. Opportunities to work with utilities and regulators to expand our choices for buying renewable energy

Procuring renewable energy in partnership with our local utilities may be a more efficient and cost-effective option. We welcome the opportunity to work with local utilities to design and develop innovative programs and products that meet our needs as well as those of our energy suppliers. In such collaborations, we would seek renewable energy products and programs that address the above principles and that

Fairly share the costs and benefits of renewable energy procurement

- We seek to purchase renewable energy that reflects the net costs and benefits to the system, including the actual cost of procurement and benefits, such as, but not limited to, avoided energy and capacity benefits, without impacting other rate payers.

Apply to new and existing load

- To meet our public goals, we need renewable energy for both new and existing operations.

ANNEX II: LIST OF APPROVED PARTICIPANTS BY THE I-REC STANDARD

3Degrees Group

A.
Agder Energi
ACT Commodities
AES Tietê Energia
Atlantic Energias Renováveis
Atvos Agroindustrial

B.
Belektron Ekotrading
Bischoff & Ditze Energy
Borusan EnBW Energy

C.
Climate Bridge
CRX CarbonBank
CTE - Centro de Tecnologia de Edificações

E.
ECarbon Energia Renovável e Carbono Zero
EcoAct
ECOHZ
EcoTraders
EDF Trading
EKI Energy Services Limited
Embrasca
Emgesa
Endesa Generación
Enel Brasil
Engie Brasil Energia (EBE)
Engie Global Markets (EGM)
ES Carbon Credits

F.
First Climate Markets

G.
Gaia Environment
Goldchina Consultancy International
GreenYellow
GTE Carbon

K.
Kanaka Management Services Private
Keyassociados
Kinect Energi
Kyoto Energy

M.
Matrix Energy Trading
Mérito Energia
Mt. Stonegate Green Asset Management

N.
Natural Capital Partner
Neoenergia - Força Eólica do Brasil (FEB)
Nutawa sagi
Numerco
Nvalue

O.
Origo

P.
Profit Carbon Environmental Consulting

Q.
Quanta Geração

R.
Raizen Energia

S.
Schneider Electric
Statkraft Markets
STX
Surat Thani Green Energy
South Pole Group / Swiss Carbon Assets

T.
Timing Carbon Asset Management

V.
Voltalia

W.
Waycarbon

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