LSES

Solar & Renewable Energy

|Newsletter|

By The Lebanese Solar Energy Society (LSES)

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In This Issue

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Editorial

It is the Solar Era for Lebanon.

At last, Mega Watt Scale Solar PV projects became a reality in Lebanon. With the first 1 MWp stage of the Beirut River Snake already kicked off few moths ago, the Era of Mega Scale PV injecting energy into the national grid just started. The promising market is expected to escalate tremendously in the coming few years due to many considerations.

First, the economy of the system became very attractive and feasible. Nowadays, PV suppliers are finding no hard time defending their case. At about $2000 selling price for each completely installed kWp, and with a rich local solar resource resulting in production figures of 1600 kWh/kWp for a well-designed system; the simple calculation for energy cost produced in a 25 years solar plant would attractively fall within $0.05/kWh! Actual levelized cost may increase slightly, especially if the cost of money and land were considered. However, such cost will still result in an economically attractive case.

Second, it is not a secret to tell that the National Electrical Sector is deteriorating further each year. Unfortunately, the current blackouts are not only caused by technical reasons due to deficiency in production, but upsettingly due to serious economic reasons. EDL, the public monopoly, is not finding enough funds to run its power plants! As shocking as it may sound, the operator does not seem to be much annoyed about it. From pure economic point of view, the less generation they do the lower the losses they incur. It was estimated that the energy cost produced by EDL exceeded $0.24/kWh in 2013. Such cost being projected at the power plants doors, thus not including technical and non-technical (theft of energy) losses. This same energy is sold to users at stunning subsidized prices of about $0.12 /kWh. With about 15,000 GWh of annual production, a budget deficit of about $2 Billion ensues. Such a miserable scenario has been repeated over the past 20 years in what seems to be an endless story. Ultimately, such a scenario may end when the source of the defect depletes. Evidently, this was always the clash between the Ministry of Finance and EDL. Ironically the Ministry of Finance came late with this, but currently just started to cut off some of the funds designated for EDL to push them for a better and improved operation. It is known that EDL has limited resources and such desired corrections will not happen without extensive and new ideas on EDL side. Here comes the importance of solar energy resources at the Mega scale. It was said that Independent Power Producers IPP will be soon invited to present their offers for projects ranging from 1050- MWp. This means that the call that LSES has always advocated for, has at last come into being. This would cause a boom in the large scale solar sector and may end up having many projects disseminated all over Lebanon and cleanly inject green energy to the national gird. Optimistically, if about 200 MWp found their way into the gird in the coming 5 years, they would contribute about 300 GWh of green energy annually (About 2% of the annual energy currently produced). Sadly, such solution alone may certainly not solve EDL's longstanding crises, but may provide a good help in the right direction. Above all this will not create any budgetary burden on EDL since it will be a pure IPP investment. EDL should simply be buying cheaper energy than what it can conventionally produce or import from neighboring countries. Subsidizing such energy will still be a political decision that has to be tackled separately.

Third, private investors are becoming more interested in such proven technology. It should not be so difficult to find large investment groups adopting Mega-scale power plant projects, given their high IRR. Before it becomes fully mature, it will be hard to know how the private investors will react on such a lead. Nevertheless, huge interest was given for similar projects in other neighboring countries. For example, in Jordan such a call for proposals attracted very big names and investor groups who are currently fiercely fighting to get a piece of the cake.

Finally, once the Mega Solar concept governs, exotic ideas on the good use of solar plants will start to pop out. One of those ideas would be to allow mega scale consumers to produce their own Mega solar energy in locations apart from where it is originally consumed. Due to the "compact" nature of Lebanon and the not-evenly distributed population especially that industrial areas are located in condensed and relatively expensive land locations. Also, due to the fact that land price may be dramatically cheaper in further away locations, the apparent trend to keep EDL in control of transportation only while privatizing the generation and distribution sectors, and the announcement of IPP's and the way the mobile barges power plants are being contracted, at some point, the legislators may find it beneficial for all players to allow private producers to generate their own Mega scale energy including solar in locations away from their own. Better late than never, optimistically enough, the Lebanese Solar energy at Mega scale just moved into a new phase, and this is what the LSES is and have always been advocating for.

Eng. Ramzi AbouSaid.
LSES President.

LSES Board for 2014 -2015

The Lebanese Solar Energy Society (LSES) held its annual general assembly meeting on January 18, 2014 during which a new board was elected.

President : Eng. Ramzi Abu Said
Vice President: Ziad Doumit
Secretary : Adnan Zein
Treasurer : Jean Paul Sfeir
Accountant : Youssef Ghantouss
Governmental affairs: Salah Aboul Khoudoud
Board Members:
Zouhour Ghaddar
Walid El Baba
Rabih El Osta
Ziad Daou
Ahmad Houri

Chairs of committees for 2014- 2015

- Research, Activities, and Exhibitions Committee: Ahmad Houri / Youssef Ghantous
- Membership, Public Relations, and Awareness Committee: Rabih El Osta
- Financial Committee: Walid El Baba

News

• Conference at InfoPro 2014

The LSES was invited to participate at the conference organized by InfoPro at Phoenicia Intercontinental Hotel Beirut on February 19th,2014 "Economic Sustainability during crisis". LSES President Ramzi Abu Said moderated the Energy efficiency roundtable where several presentations were given about renewable energies and energy efficiency.

• MED-DESIRE

The LSES was invited to the MED-DESIRE conference and meeting in Bari/Italy on March 31 and April 1, 2014. Mr. Rabih Osta represented the LSES and participated in the roundtable "Mediterranean Solar Market Constraints and Opportunities".

• Ecorient and Project Lebanon 2014

The LSES participated to the EcOrient conference held in BIEL on June 4-5, alongside two major exhibitions: Project Lebanon and Energy Lebanon. LSES Secretary Adnan Zein presented the EcoTruck missions and activities, alongside the LGBC's Green demonstration Room. LSES members were happy to welcome the exhibition visitors at its Project Lebanon booth.

• Honorary member of the WEC

The LSES became an honorary member of the World Energy Council and hopes to foster the relation and coordinate green oriented activities and actions with the WEC organization.

Geothermal Energy

Geothermal energy is the heat from the Earth. It is clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down even deeper to the extremely high temperatures of molten rock called magma.

Almost everywhere, the shallow ground or upper 3 meters of the Earth's surface maintains a nearly constant temperature between (10° and 16°C). Geothermal heat pumps can tap into this resource to heat and cool buildings. A geothermal heat pump system consists of a heat pump, an air delivery system (ductwork), and a heat exchanger-a system of pipes buried in the shallow ground near the building. In the winter, the heat pump removes heat from the heat exchanger and pumps it into the indoor air delivery system. In summer, the process is reversed, and the heat pump moves heat from the indoor air into the heat exchanger. The heat removed from the indoor air during the summer can also be used to provide a free source of hot water.

Hot dry rock resources occur at depths of 4.5 to 8 km everywhere beneath the Earth's surface and at lesser depths in certain areas. Access to these resources involves injecting cold water down one well, circulating it through hot fractured rock, and drawing off the heated water from another well. Currently, there are no commercial applications of this technology. Existing technology also does not yet allow recovery of heat directly from magma, the very deep and most powerful resource of geothermal energy.

Many technologies have been developed to take advantage of geothermal energy - the heat from the earth. NREL performs research to develop and advance technologies for the following geothermal applications:

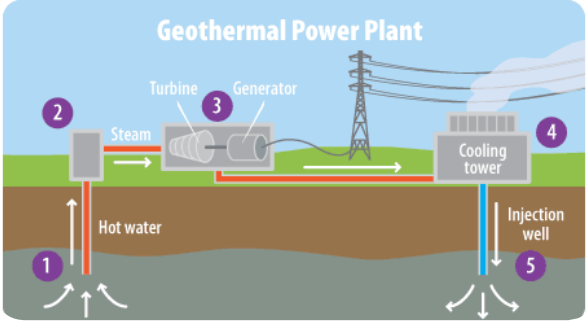
1 - Geothermal Electricity Production

Geothermal power plants use steam produced from reservoirs of hot water found a couple of kilometers or more below the Earth's surface. There are three types of geothermal power plants:dry steam, flash steam, and binary cycle.

Dry steam power plants draw from underground resources of steam. The steam is piped directly from underground wells to the power plant, where it is directed into a turbine/generator unit

Flash steam power plants are the most common. They use geothermal reservoirs of water with temperatures greater than (182°C). This very hot water flows up through wells in the ground under its own pressure. As it flows upward, the pressure decreases and some of the hot water boils into steam. The steam is then separated from the water and used to power a turbine/generator. Any leftover water and condensed steam are injected back into the reservoir, making this a sustainable resource.

Binary cycle power plants operate on water at lower temperatures of about (107°-182°C). These plants use the heat from the hot water to boil a working fluid, usually an organic compound with a low boiling point. The working fluid is vaporized in a heat exchanger and used to turn a turbine. The water is then injected back into the ground to be reheated. The water and the working fluid are kept separated during the whole process, so there are little or no air emissions.



2 - Geothermal Direct Use

Geothermal reservoirs of hot water, which are found a couple of miles or more beneath the Earth's surface, can be used to provide heat directly. This is called the direct use of geothermal energy.

Geothermal direct use dates back thousands of years, when people began using hot springs for bathing, cooking food, and loosening feathers and skin from game. Today, hot springs are still used as spas. But there are now more sophisticated ways of using this geothermal resource.

In modern direct-use systems, a well is drilled into a geothermal reservoir to provide a steady stream of hot water. The water is brought up through the well, and a mechanical system - piping, a heat exchanger, and controls - delivers the heat directly for its intended use. A disposal system then either injects the cooled water underground or disposes of it on the surface.

Geothermal hot water can be used for many applications that require heat. Its current uses include heating the buildings, raising plants in greenhouses, drying crops, heating water at fish farms, and several industrial processes, such as pasteurizing milk. With some applications, researchers are exploring ways to effectively use the geothermal fluid for generating electricity as well.

3 - Geothermal Heat Pumps

The shallow ground, the upper 3 m of the Earth, maintains a nearly constant temperature between (10°-16°C). Like a cave, this ground temperature is warmer than the air above it in the winter and cooler than the air in the summer. Geothermal heat pumps take advantage of this resource to heat and cool buildings.

Geothermal heat pump systems consist of basically three parts: the ground heat exchanger, the heat pump unit, and the air delivery system (ductwork). The heat exchanger is basically a system of pipes called a loop, which is buried in the shallow ground near the building. A fluid (usually water or a mixture of water and antifreeze) circulates through the pipes to absorb or relinquish heat within the ground.

In the winter, the heat pump removes heat from the heat exchanger and pumps it into the indoor air delivery system. In the summer, the process is reversed, and the heat pump moves heat from the indoor air into the heat exchanger. The heat removed from the indoor air during the summer can also be used to heat water, providing a free source of hot water.

Geothermal heat pumps use much less energy than conventional heating systems, since they draw heat from the ground. They are also more efficient when cooling your home. Not only does this save energy and money, it reduces air pollution.

Ziad Daou
Technical Engineer
LSES Board Member

Nader Hajj Shehadeh*

Solar PV Self-Cleaning Solutions

In 2013 I have been involved in several projects utilizing solar PV in desert regions with minimal access to human resources. Was it in Saudi Arabia packaging solar-powered solutions for remote telecommunication site to reducing fuel and O&M expenses, or in Jordan developing a 50 MW grid-connected PV Farm in the dusty region of Zarqa, the issue of reduced system performance was a major problem to be defeated. Self-cleaning became a hot topic that if well implemented could improve system performance and increase the return on the project.

Photovoltaic Performance & Efficiency

A Solar Array consists of a set of solar modules connected together. Each module is made of solar cells that are in turn made of semiconductor material with positive and negative sides. As sunlight hits the panels, electrons are excited from one side to another and thus electricity is produced. The more light allowed in, the more electrons move, and of course the more electricity the solar module produces.

It has been reported in numerous studies and publications that insufficient cleaning of solar panels leads to a 25% loss in the overall energy production, and sometimes 30% as reported by Heliotex (a leading panel cleaning solution provider). As a matter of fact, it could occur that the whole string shuts off because of dirt and the system loses a major component that goes out of order.

That is definitely not good news, especially with solar PV cells efficiency failing to pass the 23% efficiency ceiling. Of course research could reach more than 40% (44.7% achieved at Fraunhofer Institute in 2013) for solar cells converting light to energy, but this has not yet been reflected to increased PV cells efficiency, reaching 22.5% at its best with Sunpower's Maxeon mono-crystalline cells.

This makes it particularly important to avoid any unwanted losses that could drop the overall performance of the PV system to a point where it makes absolutely no sense at all. This by itself was enough motivation to divert research into developing surface washing solutions with noticeable interest in self-cleaning applications.

Self-Cleaning Techniques

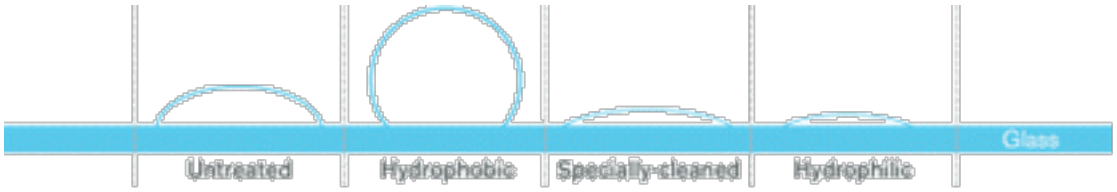
Dust, leaves, bird poop, and airborne particles could stick on solar panels for months, blocking sunrays from energizing electrons and increasing power loss. Several techniques have been employed at residential, commercial, and utility levels that included DYI techniques using manual water sprayers, long-armed brushing tools, and cleaning soap. Regardless of the risk these activities included with respect to electric safety and equipment maintenance, such methods have been helping system owners avoid unwanted losses, yet were insufficient to preserve an efficient operation especially after

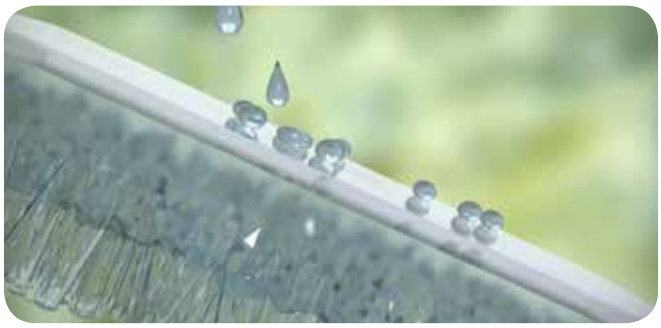
* Former Vice President of the LSES and member since 2009, and founder of Engineers Without Borders Lebanon since 2009

the rapid growth of remote applications where maintenance activities had to be kept to a minimum.
The industry was responsive to these needs, developing numerous self-cleaning practices based on electrical, mechanical, and passive techniques.

1 - Glass Coating

The simplest and most trivial solution was the application of special coating material, using the windows cleaning experience from in dusty regions. Different coating composition and treatments have been tested until the recent introduction of hydrophobic coatings with properties repelling water and forcing it to take the shape spherical droplets, so that it easily rolls off the PV surface of inclined solar panels.



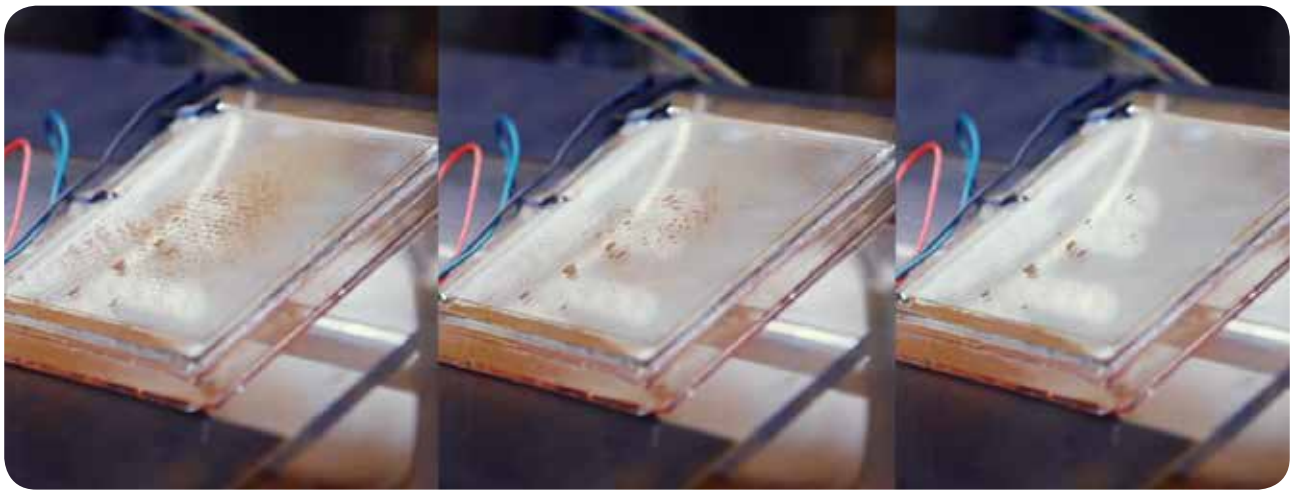


Source: Ritec International, Balcony Systems Solutions Ltd

Hydrophobic coatings are lab-manufactured to consist of numerous bases with manganese oxide polystyrene, zinc oxide polystyrene, calcium carbonate, carbon nano-tube, and silica nano-coating being the most possibly used. Super-hydrophobic coating is being recently developed to bring in advanced characteristics for higher performance and better reliability.
Regardless of its effect on transmittance, hydrophobic and super-hydrophobic coatings solve the issue of water, but remain inefficiently effective against other airborne and solid particles. This requires the installation of manually or automatically-controlled water sprinklers, to spray the panel regularly and help get rid of the accumulating particles on its surface.
Meanwhile, more research was being undertaken to have another method combined with hydrophobic coatings for a more comprehensive self-cleaning solution.

2 - ElectroDynamic Screen

Driven by NASA's support to develop self-dusting solar panels for their missions to Mars, Boston University's ECE department developed the first self-cleaning technology of its kind in 2010. The solution developed under the Professor Malay Muzamder involved transparent electrically sensitive material covering the panels, with sensors monitoring dust levels and energizing the material when dust reaches critical levels. The electric charge produces dust-repelling waves that lifts away around 90% of dust and solid materials, getting it off the solar cell within a timeframe of 2 minutes.

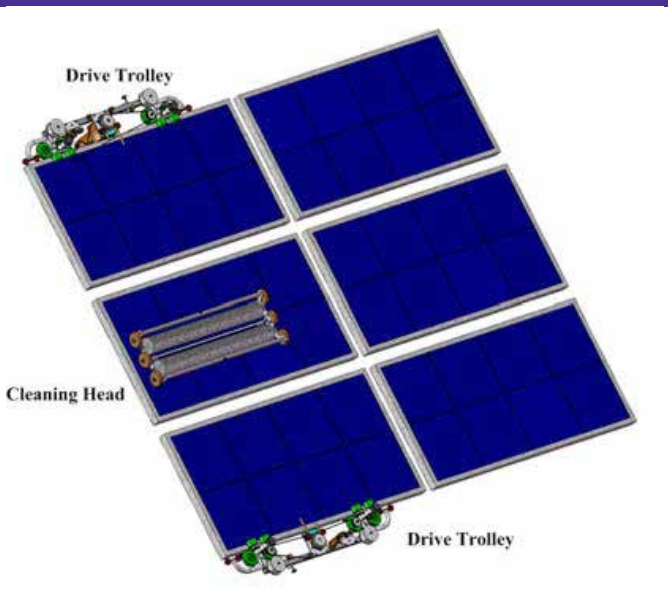


Source: Boston University Official Video: https://www.youtube.com/watch?v=aBrMCUEemrE#t=65

This technology still hasn't left the lab, but it is ready with its first prototype to hit the market. Having no moving parts, less maintenance, and the ability to use in existing manufacturing lines, this solution appears to have a bright future in leading self-cleaning techniques for remote solar PV applications

3 - Robot Cleaning Devices

Mechanical solutions have always been developed to perform panel cleaning tasks, and several robotic cleaners have were designed at universities in an aim to improve system performance and reduvce cleaning costs.
It takes almost a day for a team of two to clean up 1,000 solar panels, consuming more than 40,000 liters of water and soap. Robotized solutions aim at reducing these costs and performing the job with less resources and less time.
One common robotized solution is based on a cleaning head moving across panels and driven by motorized trolleys hanging at both sides of the array. This system requires a support vehicle that includes the auxiliary equipment for power and water supply.



Source: Northeastern University

Another robotic solution is the Gekko G3 developed by Niederberger Engineering. This cleaning tool is inspired by the Gecko reptile, having 20 suction feet connected to carrier frame, enabling the robot to grip and making it move over the array. This beats the inclined solar panels challenge.

Niederberger Engineering

Gekko is almost ready for commercial use with Niederberger Engineering targeting large scale PV farms especially those located in desertous areas and dusty regions.

Closing Remarks

Apparently the market is in need for self-cleaning solutions, and the industry is showing interest in developing automated and semi-automated methodologies to save on maintenance expenses and maintain a stable performance of PV panels.
With water-based cleaning having the benefit of reducing modules temperature and thus maintaining optimum efficiency levels, and waterless methods providing more technologically advanced solutions, the question of how to bring in an efficient practice that combines the benefits of both in a cost effective system remains challenging.
A question to be answered in research labs and engineering workshops.

Towards a Sustainable and Green Industry in Lebanon

By Eng. Walid El BABA Board member and Former LSES President (2002 - 2005)

The mission of the Lebanese Solar Energy Society, LSES, is and will remain to promote sustainable energy at the national level. Its key role is to actively collaborate and continuously push the national policy makers towards better and widespread usage of new and renewable energy sources, for reducing the fossil fuel energy bills and consequently tackling the climate change issue and limiting the global warming effects.
In Lebanon the energy mix between the various sources as well as the slowness in applying the National Energy Action Plan are major handicaps, generating instability and extra cost related to the means of energy production. In those conditions, industrialists are unable to establish the proper and long term strategies with the adequate cost of their energy solutions adapted to their process and production facilities.
Therefore and in order to reduce the energy bills it becomes crucial, for the industrialists, to develop sustainable and energy efficiency policies leading to a better production cost and opening the way to enter new regional and international markets.
Reducing the energy cost (Electricity and water) by using renewable energy sources mainly solar ones, and installing high energy efficiency machines with energy performance optimization are important directives for a sustainable Industry.
Among various possible Innovative green and sustainable solution aiming at developing clean production systems and reducing carbon and environmental footprints are:

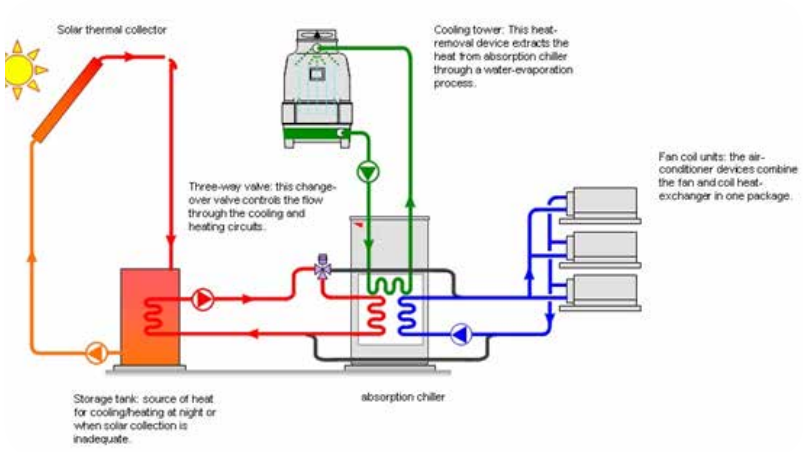
- Better sustainable services in Energy management system (Energy & Water), engineering and maintenance.
- Recovery heat system for reuse of heat or by using solar heat sources in air conditioning applications through absorption chillers.
- Renewable energies mainly solar thermal and PV for heat or electricity production
- Water recycling
- Effluent treatment and Treatment of polluting gases

We shall enumerate two applications in Industry using Solar system, for:

- Air Conditioning application with hot water or steam through absorption chillers
- Sea water desalination through Multi Effect Humidification (MEH) system

A- Air conditioning applications using absorption chillers:
Active solar cooling uses solar thermal collectors to provide solar energy to thermally driven absorption chillers. Solar energy heats a fluid that provides heat to the generator of an absorption chiller and is re-circulated back to the collectors. The heat provided to the generator drives a cooling cycle that produces chilled water. The chilled water produced is used for commercial and industrial cooling.
Solar thermal energy can be used efficiently to cool in summer and heat domestic hot water and buildings in winter. Single or double absorption cooling cycles are used in different solar-thermal-cooling system designs. The more cycles, the more efficient they are. Absorption chillers operate with less noise and vibration than compressor-based chillers, driving energy for absorption chillers is taken from renewable energy (solar-thermal hot water) and thus CO2-neutral, and reduction of electrical consumption is well achieved.

Efficient absorption chillers nominally require water of at least 88 °C. For single-effect machines the coefficient of performance (COP) is in the range from 0.6 to 0.8. Double-effect machines with two generator stages require driving temperature above 140 °C, but the COP's may achieve values up to 1.2.
High temperature flat plate, concentrating or evacuated tube collectors are needed to produce the higher water temperature required. For chilled water above 0 °C, as it is used in air conditioning, typically a liquid H2O/LiBr solution is applied with water as refrigerant. The main components of an absorption chiller are the generator, the condenser, the evaporator and the absorber.
The cooling effect is based on the evaporation of the refrigerant (water) in the evaporator at very low pressure. The vaporized refrigerant is absorbed in the absorber, thereby diluting the H2O/LiBr solution. To make the absorption process efficient, the process has to be cooled. The solution is continuously pumped into the generator, where the regeneration of the solution is achieved by applying the driving heat such as from hot water supplied by a solar collector. The refrigerant leaving the generator by this process condenses through the application of cooling water in the condenser and circulates by means of an expansion valve again into the evaporator.



B- Sea water desalination through Multi Effect Humidification system (MEH)

Among the basic solar thermal desalination system is the Multi Effect Humidification (MEH) including condenser, humidifier, and an external heat exchanger using a solar heat source, the necessary pumps, fan, with various sensors for the good monitoring of the operation.
The process consists of two opposite flows, the closed circuit of the air to produce the condensate, and the raw water flow in opposite directions. The untreated water flows to the condenser and then is distilled through an external heat exchanger up to 95 °C.
Hot and untreated water then flows through a humidifier, exchanging heat with the air that moved through the fan and through the unit. While crossing the humidifier from bottom to top, air is heated up by the hot water which is trickling from the top (flowing from the heat exchanger) and absorbs the water in the form of steam, and the trickled water is cooled (Humidification process)
The cold-water-saturated air flows again back to the condenser, where it is cooled on the outside of the condenser(shell) producing condensed treated water, while the water flowing inside the condenser tubes is pre-heated, and heated up in the external heat exchanger connected to solar system (by achieving that, it increases the condenser efficiency).
The external heat exchanger is heated from a solar system consisting of evacuated U tubes collectors sized according to local conditions. These collectors are, in comparison with flat plate ones, more efficient at a temperature level of 110 °C
The efficiency of these collectors, being around 55 %, and assuming a solar radiation of 1000 W/m2, a field of 75 m2 will produce around 42 KW of heat able to produce around 5 m3 of fresh water daily.This system is efficient and feasible up to 10 m3 per day of treated water.

Mediterranean Solar Market Constraints and Opportunities – Lebanese Case

Lebanon is a small Mediterranean country and it is well situated to profit from solar energy. The annual solar flux is about 2200kWh/m2 and the daily solar irradiation reaches 4.8 kWh/m2.
Despite a noticeable growth of the solar water heater (15% average annual growth), the part of REs in the energy balance sheet of the country is still marginal and does not go beyond 1%. But the interest in REs is growing as the prices of fossil fuels are climbing and a lot of private and public initiatives are taking place. Here we must stress that the government in its ministerial declaration said that contribution of renewable energies should reach 12% of the total energy in 2020.

Thermal Solar market

The thermal solar market suffered greatly during the long years of war (1975 – 1990) because of the economic recession linked to the unstable socio - political situation. The total market for solar collectors was about 4,000 units per year.
The first public initiative started in 2007 where the Government signed a project with UNDP entitled "The Country Program of Lebanon under the Global Solar Water Heating Market Transformation and Strengthening Initiative"

These initiatives aim to accelerate the market development of solar water heating in Lebanon with an objective to facilitate:
The installation of 190,000 m2 of new installed collector area over the period 20092014-; an annual sale of 50,000 m2 to be reached by the year 2014; and with expected continuing growth to reach the set target of 1,050,000 m2 of total installed SWH capacity by 2020.

The second important public initiative was the National Energy Efficiency and Renewable Energy Action for SWH (NEEREA). NEEREA is a national financing mechanism initiated by the Central Bank of Lebanon in collaboration with the Ministry of Energy and Water, UNDP, and the LCEC. In 2010 NEEREA offered loans for SWH installation with 0% interest rate and a repayment period of 5 years. MEW offers 200 USD grant money for the first 7,500 installations (a total of 1.5 Million USD)

The third important initiative is: CEDRO Country Energy Efficiency and Renewable Energy Demonstration Project for the Recovery of Lebanon initiated by the UNDP.

The Private sector was very active in supporting and implementing the public initiatives and in responding quickly to the market demand.
The implications of all these initiatives on the Lebanese market were:

- More than 15,000 solar water heaters (77,000 m2) are installed in the residential sector of Lebanon in 2013.
- The estimated market value for solar water heaters in Lebanon reached 14 Million USD in 2013 with more than 140 companies working in the solar system .

PV Solar Eenergy

The technology for the use of PV Solar Energy has achieved today very good steps in reliability, in higher efficiency and better prices for energy produced.

Despite the favorable geographic location of Lebanon, the installed PV power didn't exceed 1MW till now and this is due to several barriers .

- Lebanon is 98% electrified and isolated sites are rare.
- EDL still have the monopoly of production and distribution of electricity.
- The electricity actual tariffs did not change for the past 15 years and do not reflect the real costs of production and distribution.

Some PV pilot Projects are developed mainly for schools, industries and remote hospitals but didn't yet create a sustainable market specially that the majority of the projects are off–grid and by adding the battery cost, project pay back period will be longer.
The analysis of the situation revealed that the most important policy option is the development of a suitable market, followed by the engagement of the private sector in projects related to PV and involving technology transfer, followed by the need to update and enforce laws and regulations and finally benefit from the work programs of international donor agencies like UNDP. A lot of work has been done in this regard.

Policies and Legislations: Net metering has been launched in 2011: this initiative partially solve the problem of the storage batteries however it has 3 major limitations :

1. limitation to 60 KVA
2. When we have a blackout , there is no possibility to feed the generated power
3. Limited to the entity consumption.

Availability of Funding: NEEREA played a major role in availing the funds for PV projects and in fact a lot of medium size projects are actually picking up.

Commerciality and Competitiveness: A lot of competent local organizations are now active in the market, the major reason behind it, is the launching of many public bids for solar street lights and lately the most important bid to build 1 MW over the Beirut River (BRSS) which has been won by a Lebanese group of companies.

Here the participation and commitment of the private sector in the project will help meet the National Energy Efficiency Action Plan's (NEEAP) target of installing around 200 MW of solar farms by 2020.

The first phase of the BRSS project will commence with the installation of one photovoltaic (PV) farm of 1MW on the Beirut River. Phoenix – ASACO expect to complete phase one by end 2014. Lebanese Ministry of Energy and Water provided the funding through the Lebanese Center for Energy Conservation (LCEC).

After the project is complete all cumulative revenues will be collected and used to prepare for the construction of additional solar plants of up to 10 MW, which will cover the entire river of Beirut and provide electricity for 10,000 houses without any costs for EDL.

In addition to all of these favorable elements: green market trend, oil price increase and the, lack of electricity are main market drivers also. However we still have several barriers preventing the natural expansion of the market, especially:

- The policy of energy rates which do not reflect the real cost and particularly electricity rate.
- An inadequate consideration of the environmental impact and public health due to atmospheric pollution.
- No laws allowing the access to the grid through feed in
- High initial cost of PV systems
- Monopoly of electricity by EDL
- Lack of environmental commitment
- Small available areas
- NO Buy-Back for excess power in case of the Net Metering

Political instability and political prioritization is also a major reason. Rising concerns on other more pressing national issues are given higher priorities compared to RE. Examples include the consistent delays in approving environment-related decrees and feed-in tariffs and laws in the Parliament and in the Council of Ministers.

To finalize with a constructive summary, I would like to list some market incentives that can help in the PV market growth:

- Well distributed grid and less black outs
- An attractive feed-in tariff of regulation and a long term guarantee
- Tax exemption and incentives / rebate program for renewable energy products
- Removing the custom duties on the renewable energy products
- Implementation of CDM and Green Credits

Finally, I would say that all the stakeholders should collaborate in order to encourage the development of RE sector in Lebanon in all their forms as well as the development of local manufacturing of systems creating employment opportunities and some independence in the supply of equipment.

Rabih Osta
LSES Chairman of Membership, Public Relations & Awareness Committee.

EcoTruck Activities

The EcoTruck, an educational tool executed by LSES in collaboration with the Industrial Research Institute IRI a mobile green demonstration platform, participated to a number of school visits, the RHU open house event, and to a green day organized by the Baabdat Municipality. The EcoTruck is expected to do many more school and event visits during the upcoming 2014-2015 academic year. Public schools will be visited with the support of local and regional foundations.

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