



## MARKET ANALYSIS: Energy Access for Syrian Refugees in Lebanon

Globally in 2018 alone, it has been estimated that more than **US\$ 223 million were spent by refugees and internally displaced people for off-grid lighting**: US\$ 121 million in camps, US\$ 27 million in slums, US\$ 65 million in rural areas, and US\$10 million in urban areas. Thus, worldwide, there is a growing importance to support the energy access needs of forcibly displaced persons. During humanitarian crises, energy access is often considered a lower priority when compared to the basic human needs of nutrition, health, education, etc.

Yet, investing in clean, sustainable energy could save resources, improve living conditions, and accelerate access to the most crucial humanitarian needs. Further, empowering a marketplace for displaced people strengthens self-determination, enables the development of sustainable economies and increases the supply of life-improving services and goods.

Lighting Global has created sustainable off-grid solar markets around the world for the past decade. Our work now includes providing expertise to relief agencies on how to best support energy access needs for displaced people, engage the private sector, and unlock a new potential market for high quality, reliable and affordable solar lighting products.

Now in its eighth year, the Syrian crisis has had a profound humanitarian, socio-economic and political impact on Lebanon,

which has the highest number of per capita refugees worldwide. As of July 2019, there were 929,624 displaced Syrians registered with the UNHCR, though the Directorate General of General Security (DGGS) estimates it at 1.5 million people.

While much efforts have been made, the needs of these communities are rapidly outpacing resources, and service delivery becomes more difficult as the crisis prolongs, resulting in additional burdens for the local government and refugees - host community frictions.

A study undertaken by the Lebanese MoEW and UNDP reveals the need to supply additional 450MW to cover the demand of the refugee influx. With load shedding common across all of Lebanon (only 13 hours of electricity supply per day on average), diesel generators as a backup source are ubiquitous.

At the same time, the solar industry has been growing significantly since 2010, and the Lebanese government has a commitment to reach a 12% renewable energy target by 2020, growing from roughly 3.5% in 2014.

**The assessment below provides insights on the large potential for interventions that target both displaced people and contribute to the sustainable development of host communities for the longer term.**

# The Energy Market Assessment

This assessment included a baseline survey of the demand side of the market, with 740 households interviewed, including 8 focus group discussions; and of the supply side with 68 general retailers, as well as solar companies, and micro-finance institutions. The entire study was conducted across five Governorates (Bekaa, Beirut, Mt. Lebanon, North, Akkar and Baalbek- Hermel) where Syrian refugee concentration is highest. The three analyzed cohorts are: the vulnerable Lebanese host community, the Syrian refugees living in rented accommodations, the Syrian refugees living in camps. Usually, Syrians in rented accommodations pay rent themselves.



**Income:** Most Syrians either earn irregular daily income (66%), have no income (13%) or rely on aid (9%), putting them in the lower income ranges, whereas most Lebanese either earn a fixed monthly salary (47%) or are self-employed (41%). Average monthly income is US\$777 for Lebanese, US\$200 for Syrians in rented accommodation and US\$143 for Syrians in camps.



**Power Supply:** Grid connection is high, with 99% of the sample self reporting being connected and the majority of those having a backup diesel generator connection (80%). More than 80% of those who rely on grid electricity without generators are from lower income bands and earn less than \$3000 a year. Syrian refugees living in informal settlements have the lowest connection rates to diesel generators as a backup to the grid, but they rank highest when it comes to being solely dependent on generators with no grid connection, and so do the residents of Baalbek-Hermel and Bekaa. People spend a considerable amount on energy access, particularly generator connections. Nonetheless, satisfaction with grid power supply remains low for all cohorts at 45% (though slightly higher for generator connections at 58%).



**Expenditure on Power:** People pay separate bills for grid and generator power, with generator bills being significantly more expensive. In total, the weighted monthly expenditure on power is highest among Lebanese at \$72 followed by refugees in rented accommodation (\$46) and finally those in camps (\$27). 54% of Syrians in camps spend up to 30\$ on generators per month, whereas 68% of Syrians in rented accommodations spend between 16 and 50\$ on generators per month. 62% of Syrian refugees are paying for both grid and generator-based energy on a monthly basis. On average, Lebanese spend 9% of their income on energy needs, compared to 18% for Syrians in refugee camps and 23% for those in accommodation.

Table 1: Average energy expenditure on grid and diesel generators for Syrians and Lebanese

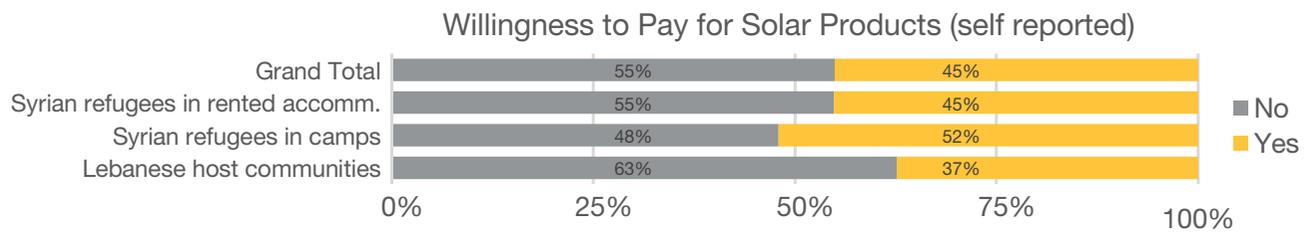
Weighted expenditure on power	Monthly expenditure on Grid	Monthly expenditure on Generator	Expenditure on Grid + Generator
Lebanese host communities	\$ 33.8	\$ 38.5	\$ 72.3
Syrian refugees in refugee settlements	\$ 12.2	\$ 15.0	\$ 27.2
Syrian refugees in rented accommodation	\$ 22.5	\$ 23.6	\$ 46.1



**Appliances and Mobile Phones:** Most households own a TV, phone chargers, fridges, and fans. 97% of the sample relies on 2 or more light bulbs, while for most interviewed households, television is an indispensable appliance (97% of interviewees have at least 1 television.) Syrian refugees in camps are outliers in access to cold storage: 50% of the cohort does not own a fridge compared to 100% of Lebanese. High importance is placed on connectivity, where 99% of Lebanese households, 93% of Syrians in camps and 88% of those in accommodation own at least one mobile phone, and data services and internet are widely used (92% of the sample).



Table 2: Percentage of people who self report that they are willing to pay for solar products by population segment



**Solar Awareness and Willingness to Pay:** 62% of the sample is interested in solar products, however, 69% has no awareness or experience with them. Most respondents (85%) report purchase cost as a main barrier, though most (80%) would prefer a large SHS capable of powering appliances (\$300-450). Solar lanterns are mainly known by Syrians living in camps (25%), most likely due to prior distributions by aid organizations. The self-reported willingness to pay (WTP) of Syrian refugees living in camps was the highest at 52%, compared to 45% for Syrians in accommodation and 37% for Lebanese. For Lebanese, the ideal product would operate the fridge. Willingness to pay is mainly affected by: the sources of power supply (those reliant on generators are more likely to pay), region, fridge ownership (non fridge owners are more willing to pay), shelter type (single rise shelters most willing to pay owing to practicality and better financials).



Cohort	Light bulbs					Fridge	
	1	2	3	4	> 4	Yes	No
Lebanese host communities	0%	1%	2%	13%	84%	100%	0%
Syrian refugees in camps	9%	27%	40%	13%	11%	50%	50%
Syrian refugees in rented accomm.	1%	14%	40%	22%	23%	91%	9%



**Retail shops:** Of the 68 retail shop owners interviewed across Lebanon, 75% do not sell any solar products, 50% do not provide retail financing and only 9% would finance refugees. 85% are not interested in selling solar energy products and larger SHS are considered the most promising product.

## Energy Requirements of Syrian Refugees in Lebanon

The survey conducted in Lebanon corroborates global trends on displaced peoples' spending on energy. In fact, Syrian refugees in Lebanon are spending a considerable proportion of their income on energy sources that are financially and environmentally unsustainable.

Compared to other displacement situations in Africa and Asia, Syrians in Lebanon have high energy requirements, expectedly so considering that their country of origin was nearly 100% electrified. In such conditions, willingness to pay is higher for bigger systems, which may also be used as backup energy sources in areas prone to load shedding. For those, SHSs would be a cost-effective and reliable option to provide sufficient energy to power low-level appliances at a much lower rate than polluting and expensive diesel generators.

The market opportunity translates in a potential demand of 20,000 - 25,000 SHSs and approximately US\$ 5 million market (assuming an average of US\$ 200 per kit), where the main target customers would be Syrian refugees in camps and rented accommodations. With an average monthly expenditure of US\$ 27, a Syrian household in a camp would be able to bear a SHS annual cost of US\$ 324 (US\$27x12 months = US\$ 324/year).

For a Syrian household in rented accommodation, the SHS annual cost would translate in US\$ 552/year, using the same calculation. In such yearly price range, and hypothesizing a 2-year payback period, a household in a camp would be able to afford a large 100W SHS with 5 lightbulbs capable of powering

a TV (the TV would be extra) or similar appliance (such as fan), while a household in a rented accommodation would be able to purchase the same SHS, which would also include the TV or a similar appliance. These types of SHS would be able to power fridges but they would not be included in the cost.

Another aspect worth noting is the potential for a SHS to substitute diesel generators as a back-up source during load shedding hours. Although not fully comparable – standalone DC SHSs come with their own appliances (LEDs, Tv, etc) while diesel generators power those running on the grid – for lower tiers of energy access (lighting and mobile phone charging only) the high operational costs of diesel generators make SHS an efficient, reliable and clean alternative.

A Syrian household in a camp is spending on backup energy solutions (generators) an average of USD 15 x 12 months = 180 USD. This means that if financing for such small SHS would be available, the energy expenditures of the overall household would be 20% lower during the first year and over 50% once the SHS is fully paid, without incurring in any additional upfront cost. Additional insights on the load demand from diesel generators are required to further substantiate these findings.

Energy needs are specific to each situation, and solutions need to be flexible and take account of changing energy dynamics; however, the diagnostic work conducted demonstrates that the demand for energy is high among displaced people and that there is a potential to increase access to sustainable energy sources in an efficient and cost-effective way while generating income opportunities for entrepreneurs and local businesses.

## Improving Access to Clean, Sustainable, and Affordable Renewable Energy

Large component-based systems (i.e. 300 Watt or more), currently being tested by Lighting Global, would represent a viable, sustainable, long-term solution to provide sufficient energy services for an average refugee household at a fraction of the price paid for the current energy mix utilized. For those, increasing access to sustainable energy sources in an efficient and cost-effective way would also generate relevant income opportunities for entrepreneurs and local businesses.

In rural and peri-urban areas for example, interventions could include mini-grids to replace neighborhood/local diesel generators. In some informal settlements, generators can be replaced by containerized solar mini-grids run by private companies based on the pay-as-you-go model. Standalone backup solar AC generators could meet an adequate level of electrification while still being affordable, for another 10-15% of the refugees' population in Lebanon. Combinations of solar, diesel and grid at neighborhood level could eliminate the need for expensive storage by taking advantage of the informal generator grid.