Lebanon's First National Survey Study of The Solar Water Heaters Market

COVERING 4 SEGMENTS:

- Residential
- Commercial/Industrial
- Suppliers/Dealers
- Organizations

+++ Including an Insight on the Solar Photovoltaic Market

March 2014

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UNDP Empowered lives. Resilient nations.	A publication by the United Nations Development Programme-Lebanon (UNDP)
gef CEDRO CEDRO, with energy efficiency on our mind	Funding by the Global Environment Facility (GEF) under the project entitled "Global Solar Water Heating Market Transformation and Strengthening Initiative" and the UNDP CEDRO Project
L.C.E.C. Lebanese Center for Energy Conservation المركز اللبناني لحفظ الطاقة	Supervised and hosted by the Lebanese Center for Energy Conservation (LCEC)
nielsen	Survey conducted by the international company Amer Nielsen as part of its contract with UNDP Lebanon
GREENFUTURE	Co-financed by The Green Pact

March 2014
Beirut, Lebanon

The United Nations Development Programme (UNDP) is the UN's principle provider of development, advice, advocacy and grant support. With 131 country offices, it has long enjoyed the trust and confidence of governments and NGOs in many parts of the developing as well as developed world. It is typically regarded as a partner rather than as an adversary, and its commitment to a universal presence proved especially useful in post-conflict situation and with states that have been otherwise isolated from the international community.

For further information:
United Nations Development Programme, www.undp.org.lb
Lebanese Center for Energy Conservation, www.lcecp.org.lb

Note: The information contained within this document has been developed within a specific scope, and will be updated in the future.

Foreword

This report is commissioned and produced by the "GEF Global Solar Water Heating and Market Transformation and Strengthening Initiative" project, managed by the United Nations Development Programme (UNDP) and implemented by the Ministry of Energy and Water through the Lebanese Center for Energy Conservation (LCEC). The financing was provided by the Global Environment Facility (GEF), the Ministry of Energy and Water (MEW), and the United Nations Development Programme (UNDP).

This GEF-funded initiative started back in 2009 and the project has come to an end by December 2013. Initially, the project aimed at the development of the solar water heaters market in Lebanon with an objective to reach a total additional installation of 190,000 square meters of solar water heaters by 2014. Actually, the project succeeded in meeting its overall objective.

The project team worked and continues working on a number of activities and initiatives hosted by the Ministry of Energy and Water through the work of the Lebanese Center for Energy Conservation (LCEC). In addition to the market transformation initiatives, the project team dedicated some efforts on understanding the nature of the solar water heaters market in Lebanon, and most importantly on identifying barriers and finding ways on how to overcome these. Furthermore, the project team is also aware on measuring the impact that the work being actually done can have on the solar market.

It is within this context that the UNDP Lebanon has contracted back in 2011 the internationally renowned company AMER Nielsen to conduct an assessment of the solar thermal market in Lebanon. This initiative was also financed by a private investment initiative called the Green Pact.

The purpose of the survey research is to assess the availability, adequacy, performance, and usability of the solar water heating systems in Lebanon. The current research provides quantitative and qualitative understanding of the solar thermal market in Lebanon. It also provides an insight on the development of the solar photovoltaic market in the country.

The GEF Global Solar Water Project team has strived to offer a comprehensive report based on the work and analysis of AMER Nielsen. The team is keen to keep updating this document in the future. All comments and suggestions are welcome at the following email address: energy@lcecp.org.lb

The GEF Global Solar Water Heaters Project Team
The Lebanese Center for Energy Conservation (LCEC)
Ministry of Energy and Water- Beirut, Lebanon
March 2014

Acknowledgement

This report is the result of the survey and analysis conducted by the teams of AMER Nielsen as per their contract with UNDP Lebanon, and in partnership with the Green Pact.

The "GEF Global Solar Water Heating and Market Transformation and Strengthening Initiative" team followed-up on all the stages of this work as part of the work of LCEC, starting with the preparation of the questionnaires until the analysis and presentation of the results. The task leader is Mr. Nader Hajj Shehadeh, member of the GEF Global Solar Water Heaters Project and LCEC Energy Engineer.

The current report is designed and written by Mr. Nader Hajj Shehadeh. Mr. Hajj Shehadeh also worked on the analysis of the different parts and graphs of this report.

The report is also reviewed by the following LCEC team members:

- Ms. Shatha Wansa, LCEC Economist and Administrative Coordinator
- Ms. Rola Tabbara, LCEC Administrative Coordinator
- Mr. Elie Abou Jaoudeh, LCEC Energy Engineer
- Dr. Joseph Al Assad, LCEC Energy Engineer, Advisor to the MEW / LCEC,
- Mr. Pierre El Khoury, LCEC Director and project manager of the GEF Global Solar Water Heaters Project.

List of Acronyms & Abbreviations

Amp	Ampere
APS	Access Power Solution
BDL	Banque du Liban (Central Bank of Lebanon)
BIPV	Building Integrated Photovoltaic
CEDRO	Country energy efficiency and renewable energy demonstration project for the recovery of Lebanon
EDL	Électricité Du Liban (Electricity of Lebanon)
EE	Energy Efficiency
EEL	Energy Efficient Light
GEF	Global Environment Facility
LCEC	Lebanese Center for Energy Conservation
LNG	Liquefied Natural Gas
MWh	Mega-Watt hour
N/A	Not Available
NGO	Non-Governmental Organization
NPO	Non-Profit Organization
PV	Photovoltaics
RE	Renewable Energy
SWH	Solar Water Heater
UNDP	United Nations Development Programme
UPS	Uninterruptable Power Supply
USC	United States Cent
USD	United States Dollar

Table of Contents

List of Figures

List of Tables

Numbers to

RESIDENTIAL SECTOR

- **81%** of Lebanese residences use electric heaters for domestic hot water
- **57%** of residences apply central heating using diesel while **31%** use electricity
- **70%** of residences are subscribed to private generators
- **52%** of residences have **5 Amps** generator subscription and **15%** have **10 Amps**
- Average residential generator bill is **$74** per month for subscribers
- Average residential EDL bill is **$43** per month
- **94%** of residences are aware of SWH, while **15%** only use them
- **63%** of installed solar water heaters were flat plate collectors
- **90%** of residential SWH users are satisfied. **94%** would recommend it to a friend
- **11%** of residential users are aware of SWH dealers
- **92%** of residential systems installed are in permanent residents while **8%** only are in seasonal
- **72%** of residential users require financing mechanisms to purchase a SWH
- **32%** of residential users are aware of solar PV systems, while only **1%** use them
- **60%** of residential users favor net-metering over feed-in tariff
- Only **5%** of residential users know about the LCEC, but more than **32%** are aware of LCEC activities

COMMERCIAL/ INDUSTRIAL SECTOR

- **54%** of commercial facilities use electric water heaters
- **76%** of commercial users own private generators
- **$30,000** is paid on average by commercial users to purchase a generator and around **$400** to subscribe in one
- **11%** of commercial users have a solar water heating system
- **16%** of commercial users have thought of SWH as an energy saving solution
- **58%** of commercial installations are evacuated tubes
- **100%** of commercial users recommend SWHs
- **67%** of SWH users would consider solar PV
- **84%** of commercial facilities would agree to connect their PV systems to the grid
- **15%** of commercial users are aware of the LCEC

Remember

SUPPLIERS/ DEALERS

- **38%** of the system cost goes for the collectors, and **33%** for storage tank
- **38%** of the dealers use locally manufactured products (mainly tanks)
- **48%** of dealers use simulation tools in the design
- **86%** of the dealers have Solar Keymark for their products
- **73%** of SWH see the MEW support program as a major reason behind market growth
- **50%** of dealers have grown between **20 and 30%** in the past years
- **98** days is the average stock turnover
- **74%** of systems are installed in residential facilities, **22%** in commercial, and **4%** in industrial
- **43%** of systems installed are thermosiphon systems, **22%** are pressurized, **16%** are low pressure
- **38%** of SWH dealers sell Photovoltaic cells
- **65%** of PV installations are in the residential sector, and **24%** in the commercial
- **29** USC/kWh is the lowest acceptable feed-in tariff by PV dealers
- **55%** of PV dealers prefer net metering over Feed-in
- **95%** of the SWH dealers see LCEC initiatives to have a positive impact on the market
- **78%** positive is the impact of LCEC on the SWH market

ORGANIZATIONS

- **85%** of the stakeholders see the SWH market having sufficient progress
- **60%** of stakeholders see the solar thermal market on the rise, and **50%** are satisfied with this performance
- **$770** is the average system price as seen by the stakeholders
- **75%** of stakeholders see the high cost as the major barrier to PV development
- **18** USC is the minimum average feed-in tariff as seen by stakeholders
- **100%** of stakeholders see that LCEC had a positive impact on the market

Background

The United Nations Development Programme (UNDP) had launched an initiative entitled "developing the solar water heaters market in Lebanon". The initiative is based on the GEF-funded project "global solar water heaters market transformation and strengthening initiative" covering six countries worldwide, including Lebanon. The UNDP-managed project aims at accelerating 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 2009-2014, an annual sale of 50,000 m2 reached by the year 2014, and most importantly lay the foundation for an expected continuing growth to reach the set target of 1,050,000 m2 of total installed solar water heaters capacity by 2020.

In terms of energy savings, this has been estimated to correspond to over 1,000,000 MWh of avoided new fossil fuel power capacity by using solar instead of electricity for water heating, and estimated cumulative greenhouse gas reduction potential of over 3 million tons of CO2 by the end of 2020.

The initiative will be developed on four levels: establishing an environment at the policy and financial levels for the promotion of solar water heating in Lebanon; raising awareness and increasing information about the marketing; implementing pilot projects and setting up certification and quality control schemes. All the activities will be captured and reported as lessons learnt and future needs.

The success of the initiative will be measured through the adoption of a national system for adequate product standards, labeling and quality control scheme (harmonized with international schemes); the enhanced capacity of the supply chain to offer their products and services and verified customer satisfaction; and the adoption of financial incentives and legislative reforms and the creation of a solar fund.

With a total budget of 1.1 million USD, the main partners of the initiative are the Ministry of Energy and Water, the Ministry of Finance, the Order of Engineers and Architects, the UNDP Country energy efficiency and renewable energy demonstration project for the recovery of Lebanon project CEDRO, the Lebanese Solar Energy Society, and many others. Through the good alignment of efforts, LCEC hopes the initiative will be able to leverage at least 50 to 100 million USD (about 50% to 100% of the total investments needs) over the period 2009-2014.

Introduction

The purpose of this survey research is to assess the availability, adequacy, performance, and usability of the solar water heating systems in Lebanon.

The research provides a quantitative and qualitative understanding of the solar thermal market in Lebanon through interviewing users from the residential and commercial sector in addition to stake holders, related organizations, suppliers and dealers.

Done in one-on-one interviews with the decision makers, managers, and official representatives, the survey covers 1850 residential users, and more than 100 commercial users, 29 dealers and suppliers, 20 organizations, institutions, and stakeholders.

The research is conducted based on survey questionnaires prepared by Amer Nielsen (The contractor) in collaboration with The Green Alliance (The Donor) and the Lebanese Center for Energy Conservation (LCEC).

The questionnaire is segment-specific, requiring four separate questionnaires (sample questionnaire is shown in annex 1), all covering the following information:

- Classification of Lebanon geographically (Urban, Suburban and Rural)
- Classification of end-users into categories (luxury apartments, single family house and seasonal, etc…)
- Contact info of interviewees for back checking
- Facility description (area, location, roof area, number of stories, occupants, ownership, activities, special needs, energy sources, energy consumption, water heating methods, hot water consumption, etc…)
- Understanding of renewable energy at the end-user level (perception of RE, cost of RE, vvpotential saving, ideal system, preferred system and country of origin, etc…)
- Perception of barriers to RE installation (willingness to pay, financial limitations, etc.)
- The installed surface area of solar water heaters in Lebanon (dealers only).
- The evolution of sales and market penetration for the past decade.

The final output of the research prepared by the contractor is presented in this report and includes households thermal energy consumption, in addition to the perception of renewable energy and knowledge about it specifically, analysis of potential demand/coverage relative to household characteristics, and the analysis of main barriers for each type of technology, in particular financial.

Study Methodology

The study follows a quantitative research approach through face to face interviews carried out using structured questionnaires amongst respondent categories of:

- End-users: Residential and Commercial/Industrial. Classified as users and non-users of solar water heaters.
- Dealers and Suppliers of SWH
- Institutions, Organizations & Stakeholders

A total of 2009 interviews were conducted, each lasting around 40 minutes distributed as shown in Table 1:

Table 1: Sample distribution

Segment	Sample Size	Total Size	Representation
Residential Users	1,850	~1,000,000	0.19%
Commercial Users	110	N/A	N/A
Dealers & Suppliers	29	110	26.36%
Institutions, Organizations & Stakeholders	20	N/A	N/A

The interviews were conducted in phases during 2010 by interviewers hired by Amer Nielsen after a technical training sessions given by LCEC and The Green Pact. The first segment interviewed was the residential users segment, followed by commercial users and dealers and suppliers segments in parallel, then finalized with the Institutions, Organizations & Stakeholders segment.

For the residential and commercial end-users, random selection was performed in a statistically reliable method. End-users were professionally approached getting an average success rate of 22% for residential users, and more than 58% for commercial users.

This low rate for residential users is caused by the fact that more than 50% of the approached residents were either not available or unwilling to take part of the survey. This rate drops for commercial users to a remarkable refuse of cooperation rate of as low as 7% as illustrated in figure 2.

Figure 1: Interviews success for residential end-users

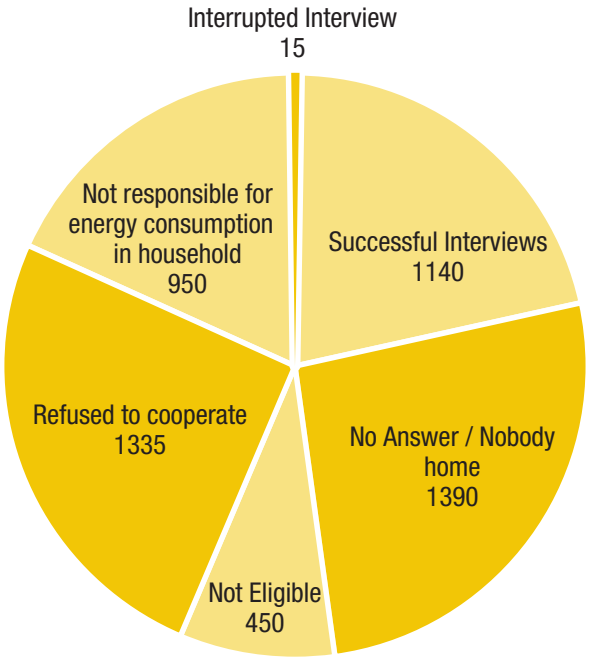
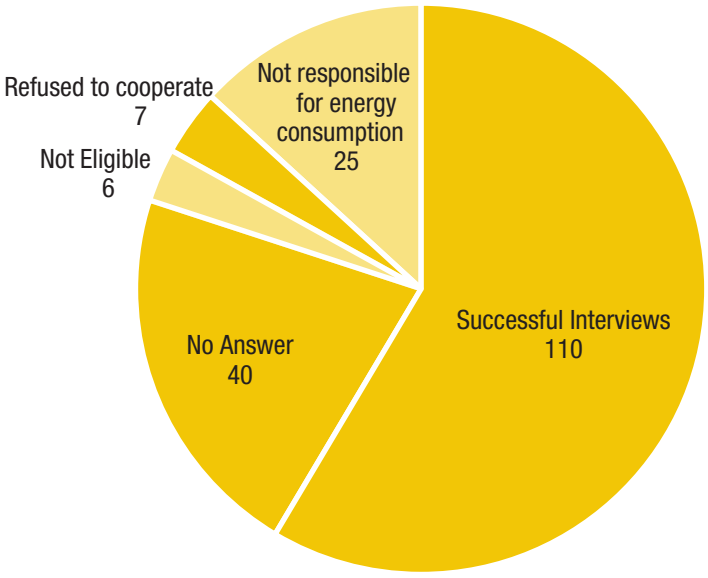


Figure 2: Interviews success for commercial end-users



For the other two segments, a list of major dealers and suppliers and a list of recommended stakeholders were provided by LCEC. Amer Nielsen contacted the recommended entities and succeeded to cover the required quota from the lists provided.

The results of the survey were collected and analyzed by the analysis department at Amer Nielsen and presented in separate outputs, each dealing with one segment.

Chapter 1 :
Residential End-users

KEY INFORMATION AREAS

- Awareness, perceptions & attitudes of residential users towards renewable energy
- Thermal energy consumption patterns & willingness to pay
- Consideration & preferences of residential non-users
- Current consumption patterns & perceptions after trial of SWH users
- Satisfaction levels of residential SWH users

KEY STATISTICAL FACTS

	Size	Size
Sample Size	1,850	0.24%
Interview Attempts	5,280	285%
SWH Users	266	14.4%
SWH Non-Users	1,584	85.6%

Quotas were initially set pertaining the users of solar water heaters of the overall sample, but were dropped during the data collection period in order to maintain random sampling method, and accordingly estimate the penetration of SWH among residential end-users.

SAMPLE PROFILE

Residential end-users were interviewed in different regions of the country, covering rural and urban areas, as well as wealthy and poor populations.

The majority of household involved in this survey had monthly income of between $2,000 and $3,000, and thus in the middle class level, while the family size was mainly 4 to 5 persons per household.

Figure 3: Average monthly household income (Residential users)

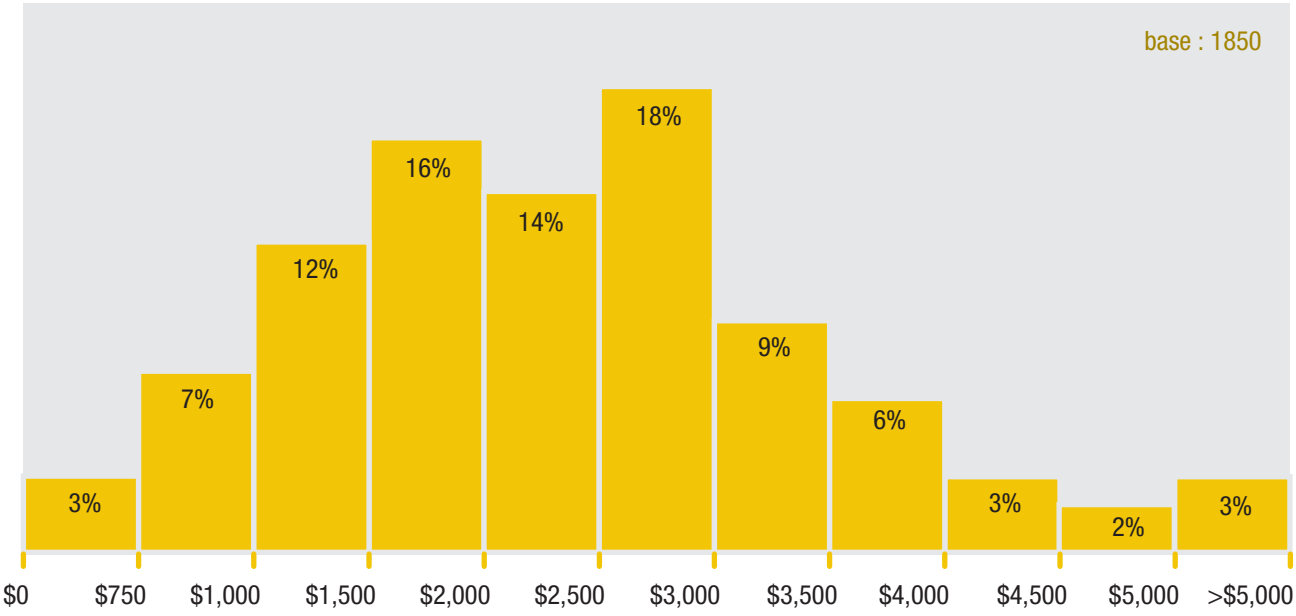
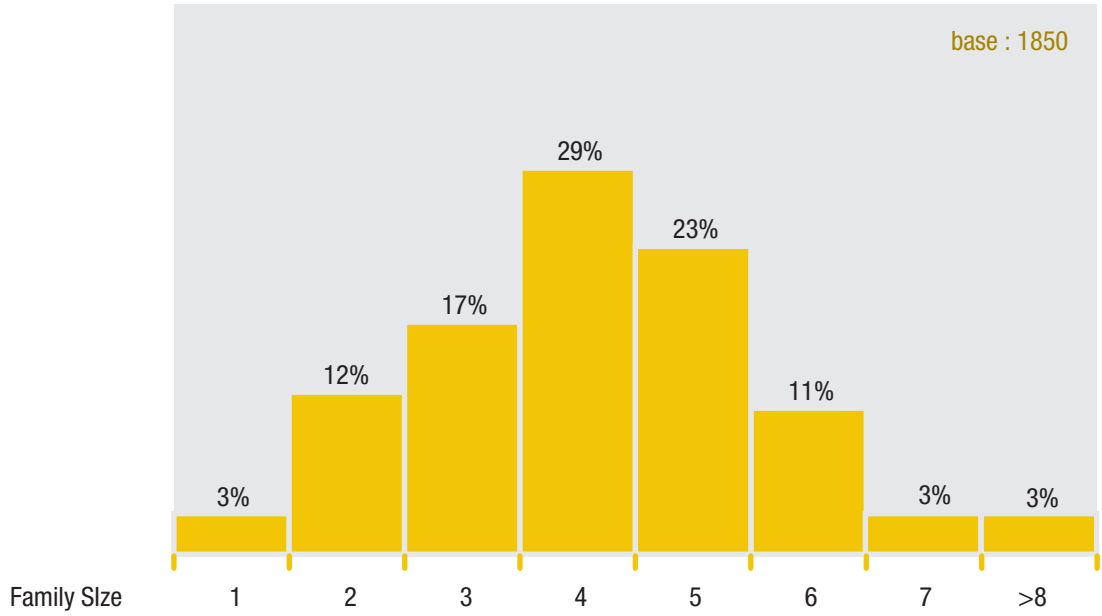
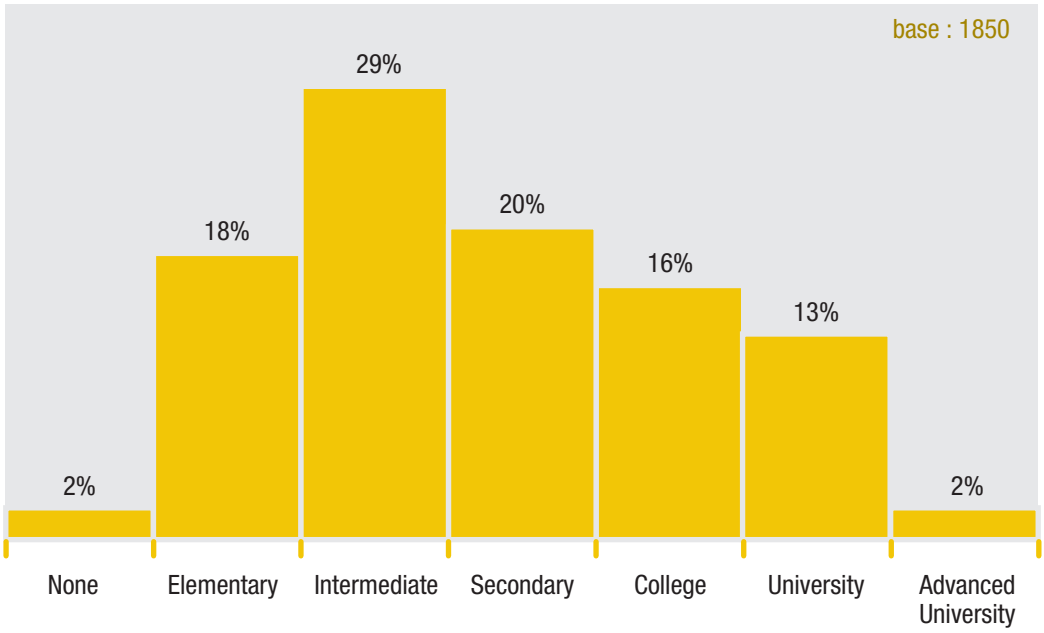


Figure 4: Number of persons in household (Residential users)



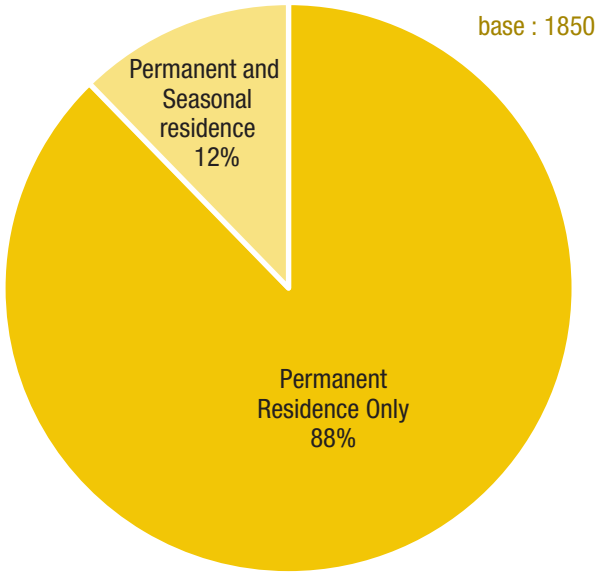
The education level of the head of the households varies between no formal education to advanced university degrees.

Figure 5: Education level of head of household (Residential users)



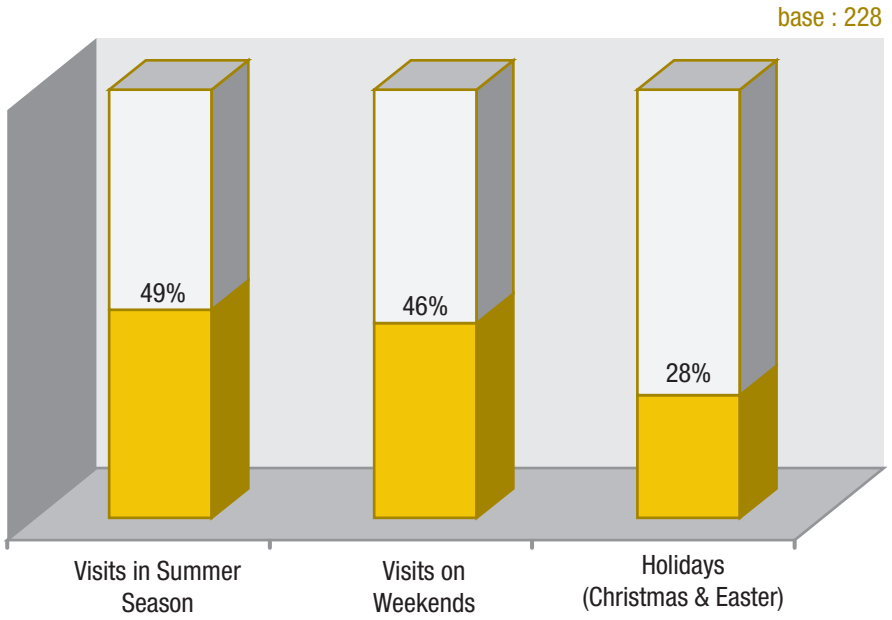
Out of the 1,850 respondents, the highest proportion of respondents seem to only have a permanent residence, with around 12% stating that they have more than one residence as shown in Figure 6.

Figure 6: Single and multiple residence ownership (Residential users)



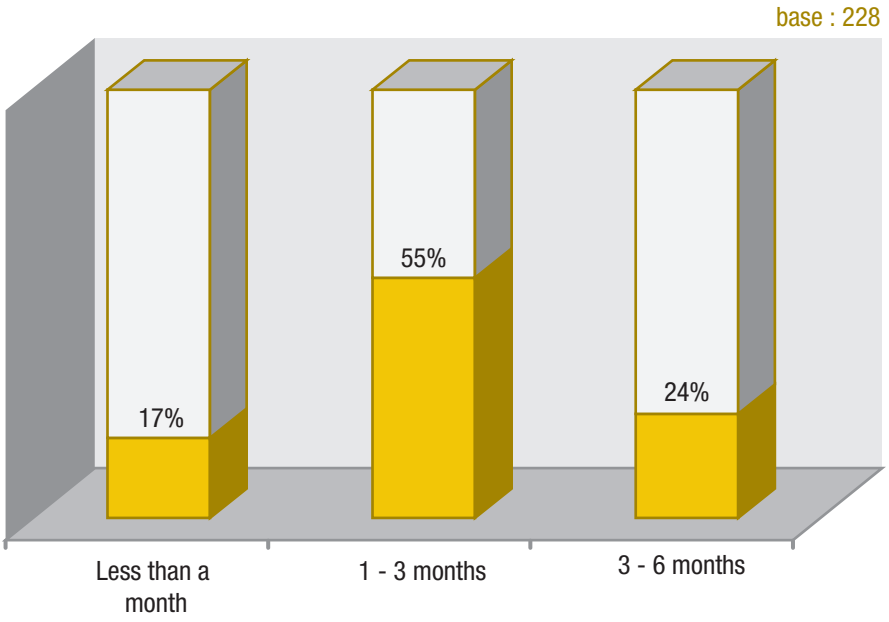
The frequency of visits varies based on different factors and conditions as in Figure 7 that shows seasonal residence to be mostly visited during summer season or during weekends, with 49% of end-users visiting their seasonal residences in summer season, 46% on weekends, and 28% of them visiting on holidays.

Figure 7: Reasons for visits to seasonal residences (Residential users)



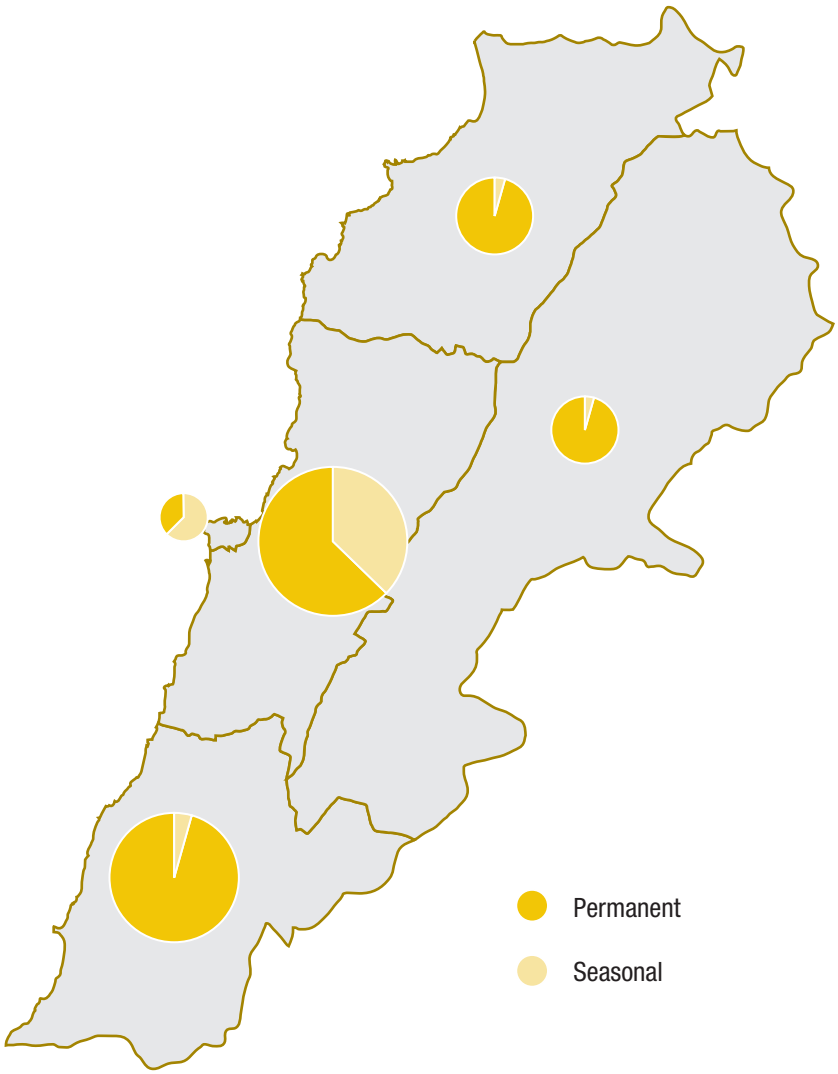
With most of the visits happening during the summer season, it has been shown that 55% of visitors spend 1 to 3 months a year. On the other hand, 24% spend between 3 and 6 months in their seasonal residences a year and only 17% stay less than a month there as shown in Figure 8.

Figure 8: Length of stay in seasonal residences (Residential users)



For the end-users owning more than one residence, they are mainly located in Mount Lebanon and the south region (including Nabatieh governorate) as presented in Figure 9.

Figure 9: Geographic distribution of end-users owning more than one residence (Residential users)



This sample included 228 respondents, 49 of which were interviewed in their seasonal residence making 27.4%, while the rest of 179 end-users were interviewed in their permanent residence making 72.6%.

KEY FINDINGS

1.1 Usage of Appliances

The major electric appliances used in residences are washing machine, ironing machine, electric heater, air conditioner, and clothing dryer.

Each electrical appliance seems to have a specific usage pattern. For example the electric heater is used in 1,553 residences and used usually on daily basis, with most of that happening during morning and evening times.

Further details are shown in Table 2.

Table 2: Frequency and time of use of major electrical appliances (Residential users)

	Responses	Frequency of use	Time of use
		>once a day, Daily, 3 Times a week, Weekly	Morning, Noon, Afternoon, Evening
Washing Machine	1,840		
Ironing Machine	1,814		
Electric Heater	1,553		
Air Conditioner	1,229		
Clothing Dryer	139		
Dish Washer	57		

1.2 Hot Water Usage Patterns

Permanent residences are supplied with city water through three major sources, the most dominant of which is water utility supply as shown Figure 1. The majority of these residences are supplied with water at sufficient pressure, which eliminates the need for a pressure pump. Only 37% of the residences use pressure pumps.

For water heating purposes, 81% of respondents use electric heaters as their primary source, with only 13% using solar thermal technologies to heat domestic water. Minor uses of diesel and gas burners in residences were also concluded as shown in Figure 12. Water heating is mostly used for shower need and clothes washing as well as dish washing.

Taking into account all possible household usage purposes of hot water, the need for hot water is evenly split between morning, evening, and noon-afternoon time.

Figure 10: City water supply sources (Residential users)

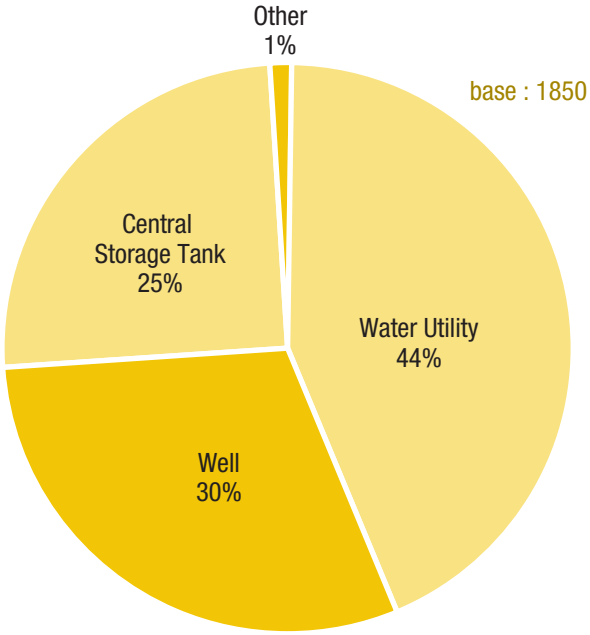


Figure 11: Use of cold water pressure pump (Residential users)

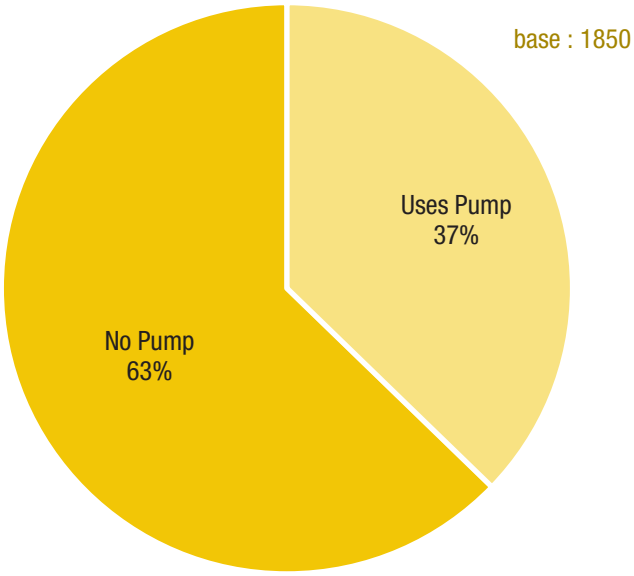


Figure 12: Domestic water heating methods (Residential users)

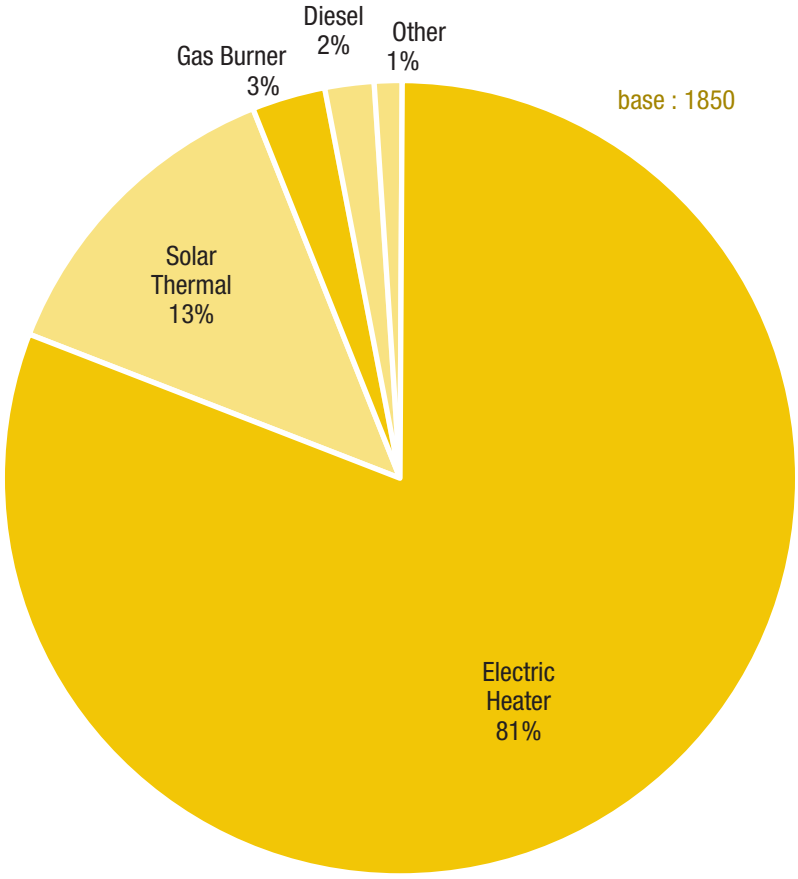


Figure 13: Domestic hot water needs other than shower needs (Residential users)

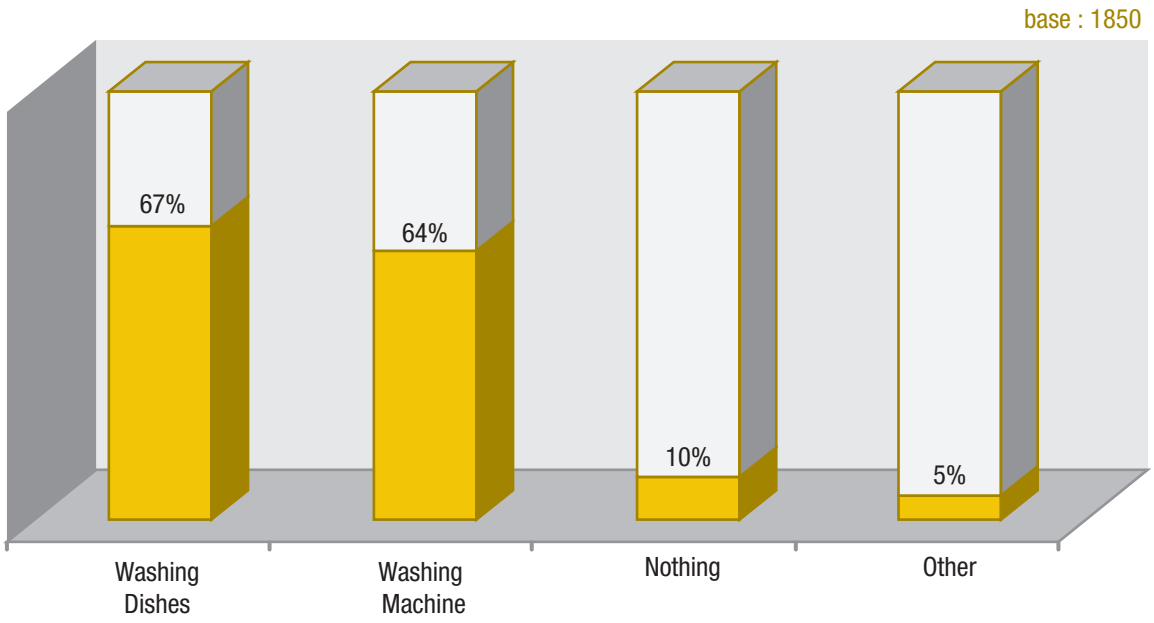
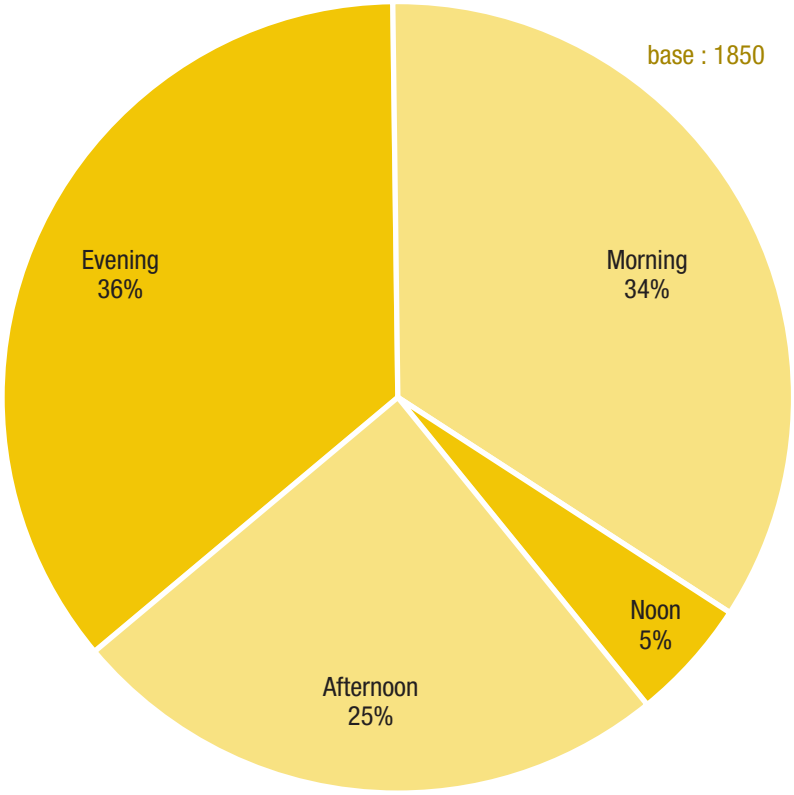


Figure 14: Times of domestic hot water need (Residential users)



1.3 Central Heating Patterns

Most of the end-users prefer using electric heating units for space heating. This is mainly driven by the low electricity tariff making electric heating more feasible than other means. Around 50% of the users use electric heating, while around 3% use central heating units as shown in Figure 15.

Central heating is mainly operated using diesel with a majority of 57%, and is mostly operated in January, February, and December, with 92% of the users operating their central heating systems in January compared to 88% in February and 76% in December.

During winter days, users tend to operate their central heating units on daily basis, with 67% of the users doing so mainly during evenings and afternoons with 76% and 43% respectively as shown in Figure 18 and Figure 19

Figure 15: Space heating methods (Residential users)

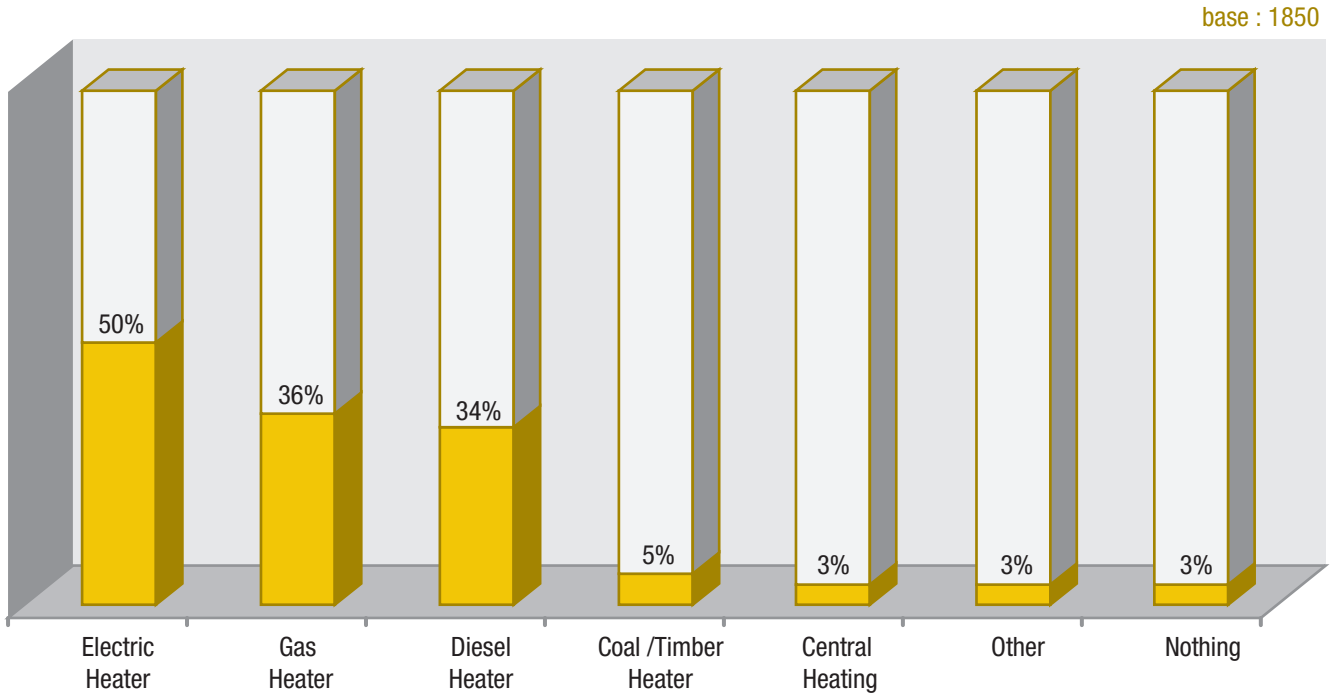


Figure 16: Central heating methods (Residential users)

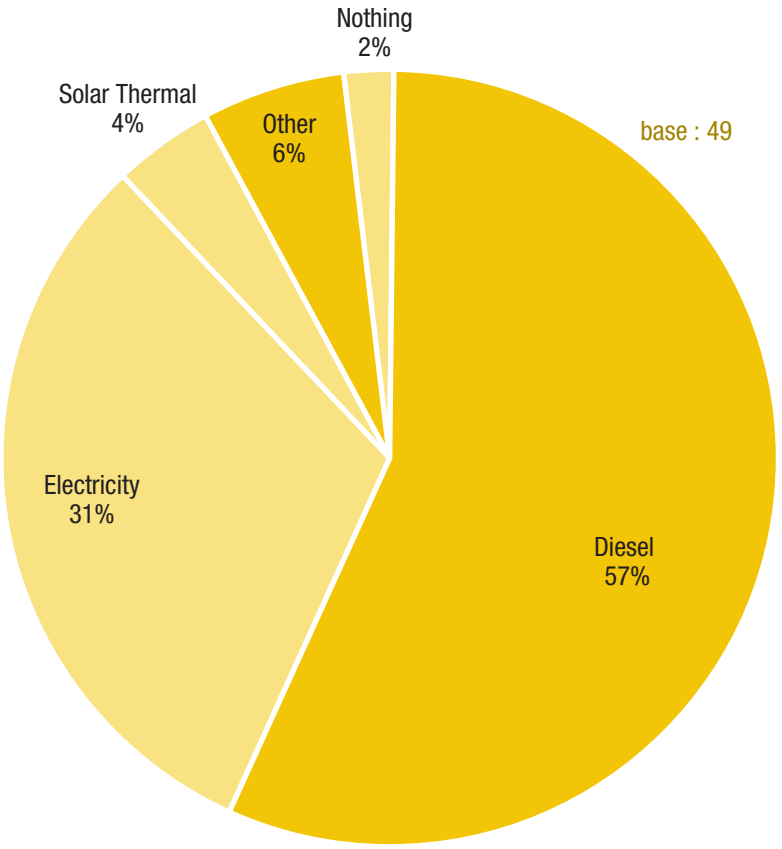


Figure 17: Users of central heating over the year (Residential users)

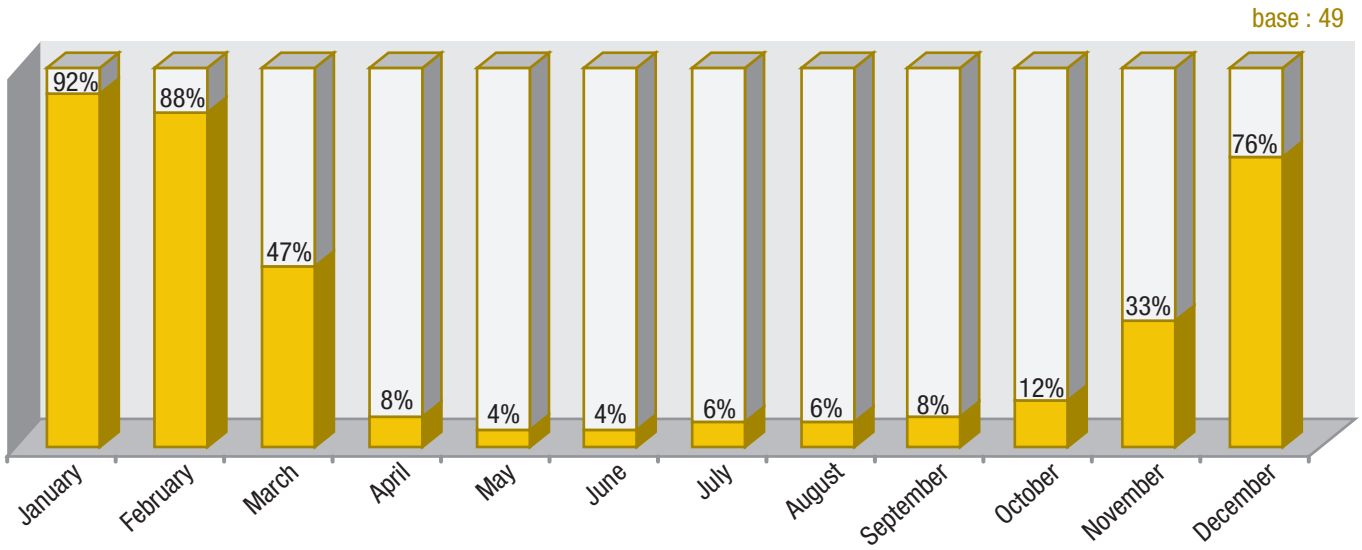


Figure 18: Usage patterns of central heating (Residential users)

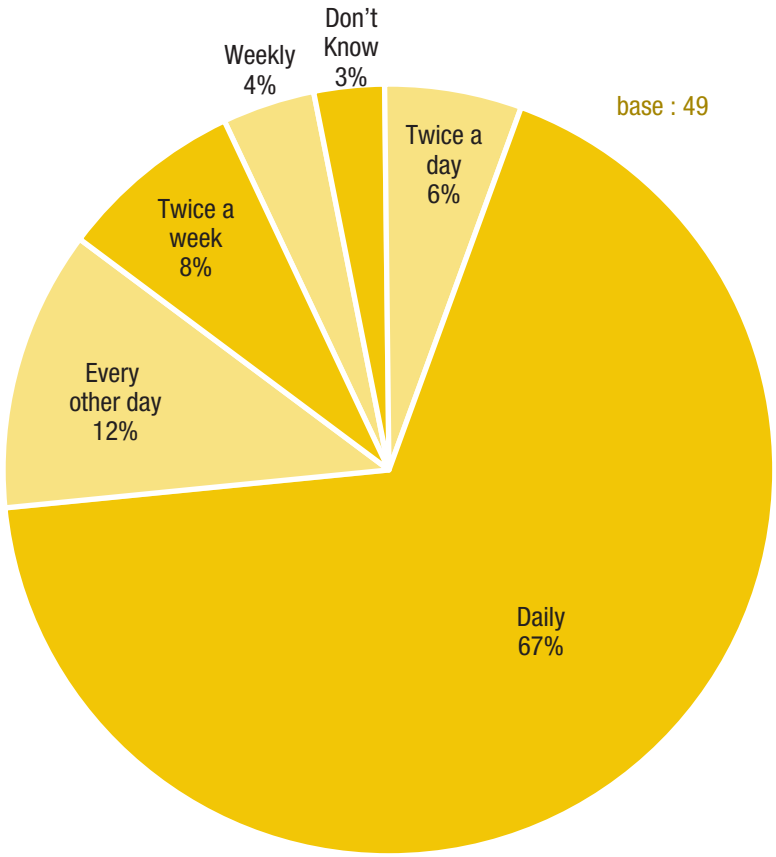
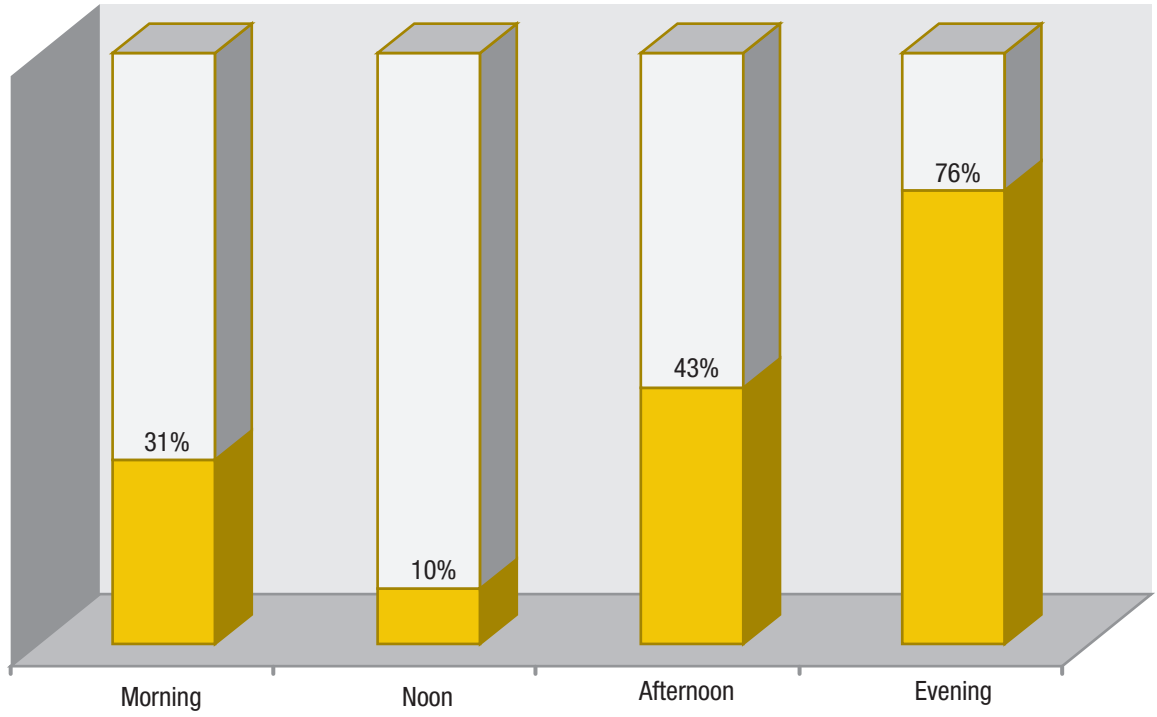


Figure 19: Times of use of central heating (Residential users)

base : 49



1.4 Electricity Cut-off and Related Costs

Cut-off hours range from throughout the year with an average ranging between 9 to 12 hours per day according to more than half of the sample. To cover this gap, the highest proportion of residents (70%) are subscribed to local generators, with only 12% not using any backup during cut-off periods as shown in Figure 21.

7% of the residential users own a private generator at an average purchase cost of $3,091, having an average running cost of $175 per month. The operation time of the generators vary, but seem to be mostly used once a day, especially during evening times as reported in Figure 24 and Figure 25.

The subscription capacity ranges from 5 to 20 Amperes, with the capacity of 5 Amps being the most common with 74%, followed by 10 Amps with 21%. Accordingly, the subscription rate mostly ranges between $71 and $106, with an average of $81.

Around 11% of residences use a UPS or APS system to be charged during EDL supply and discharged during cut-offs. The systems vary in price based on the capacity and autonomy, but mainly fall in the ranges between $200 and $500. These systems require annual maintenance as well, which has been shown to have an average of $74 per year as shown in Figure 28 and Figure 29.

Figure 20: Average daily cut-off hours (Residential users)

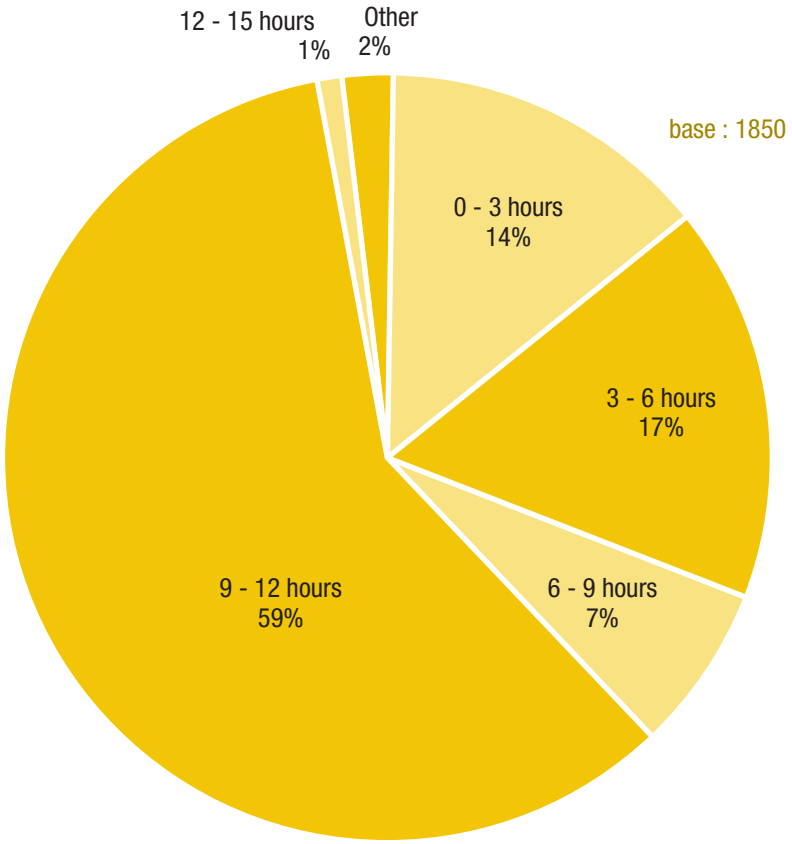


Figure 21: Usage of generator during cut-off hours (Residential users)

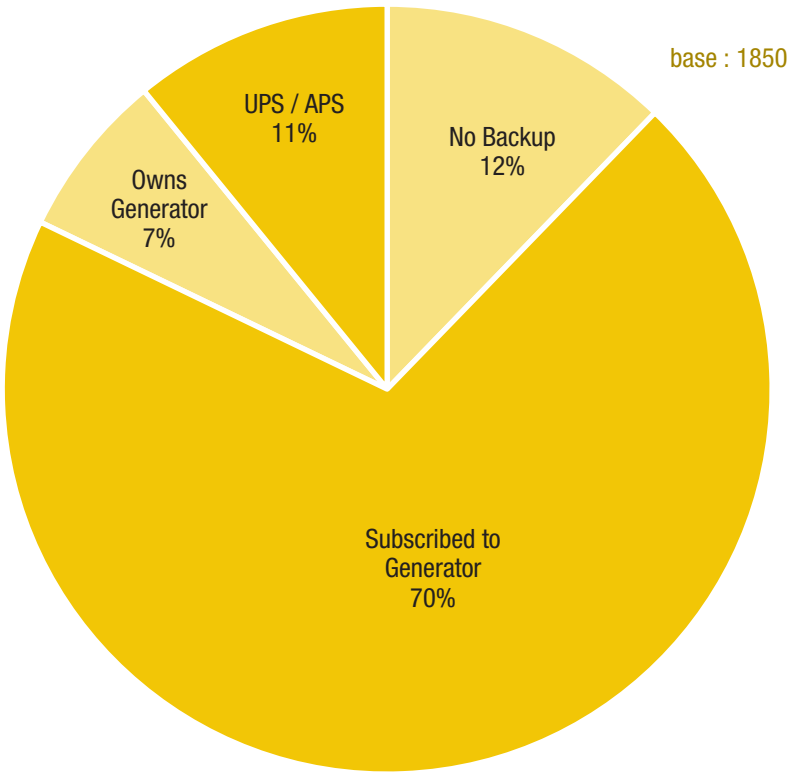


Figure 22: Purchase cost range and average of private generator (Residential users)

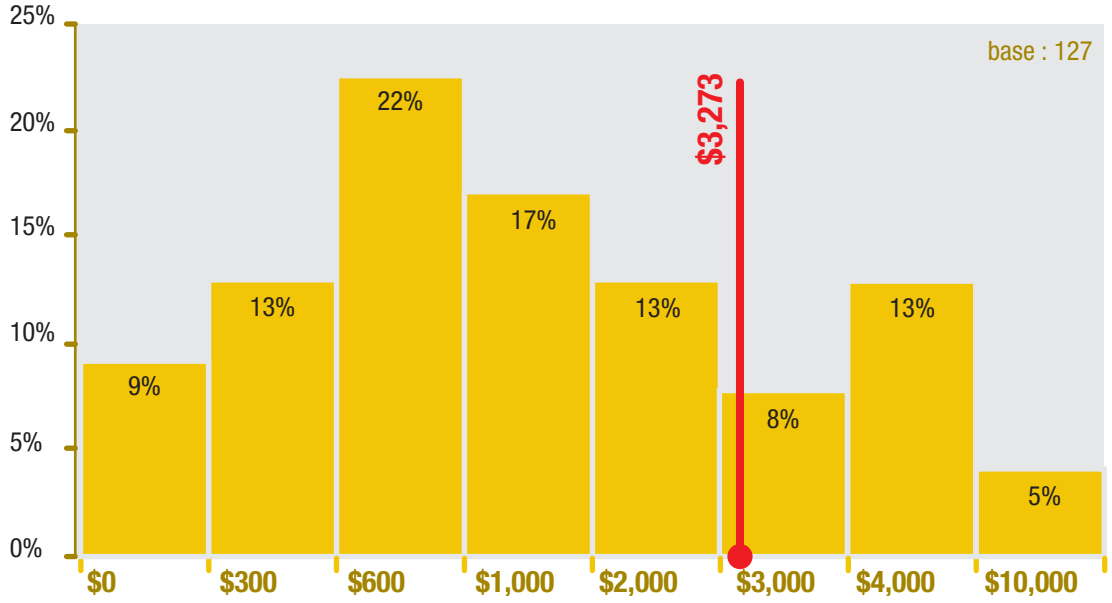


Figure 23: Running monthly expenses and average of private generator (Residential users)

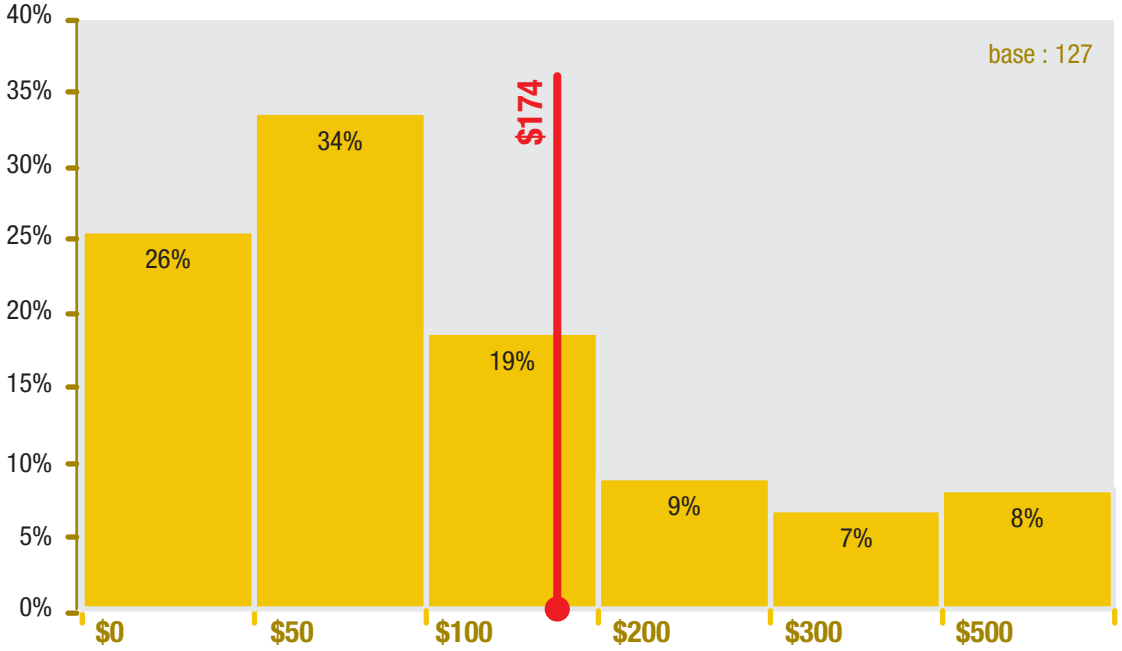


Figure 24: Frequency of private generator activation among generator owners (Residential users)

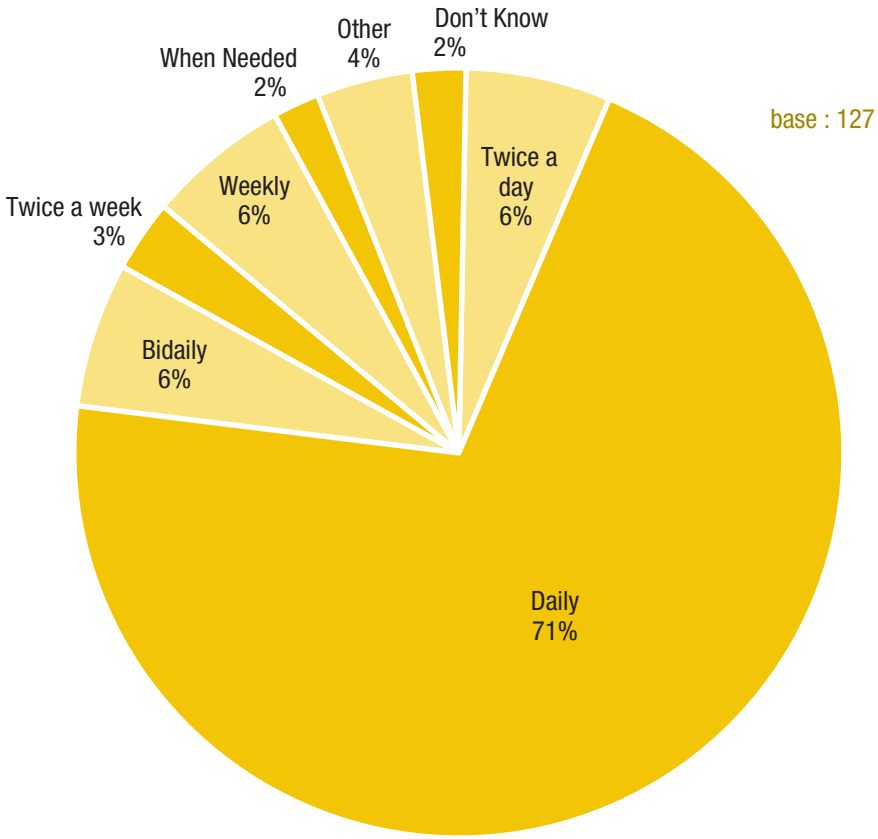


Figure 25: Frequent time of private generator activation among generator owners (Residential users)

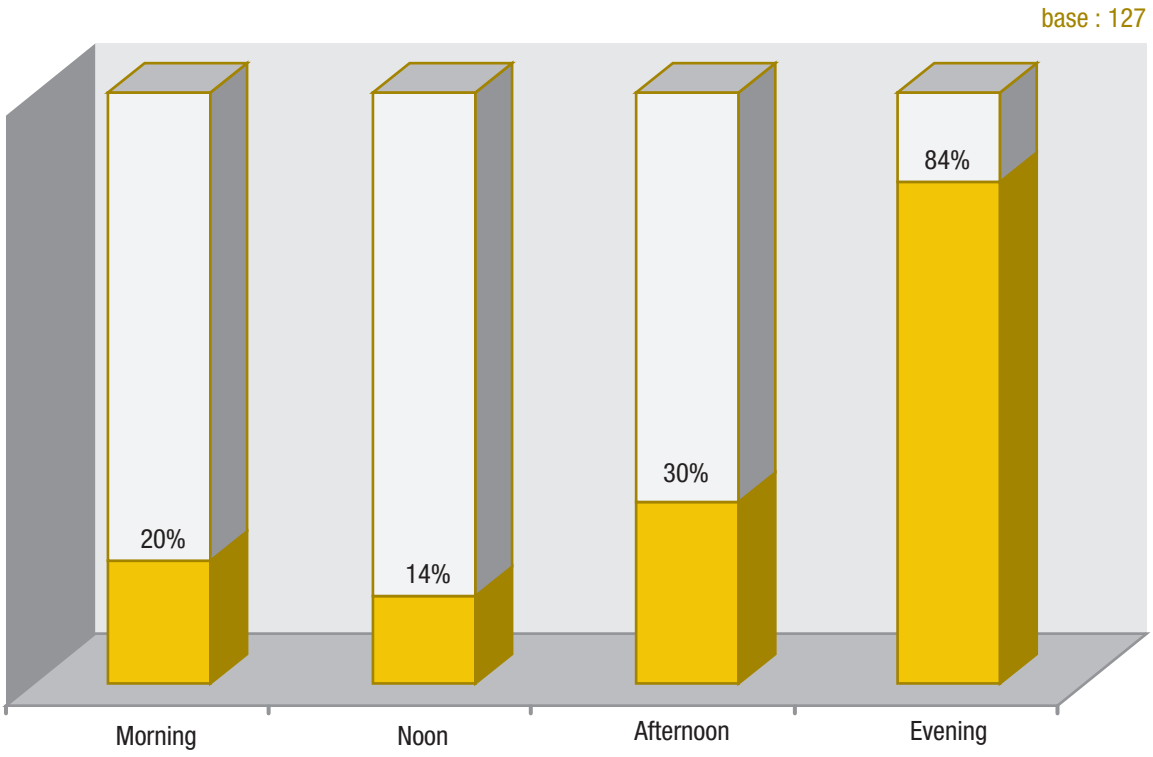


Figure 26: Generator subscription capacity (Residential users)

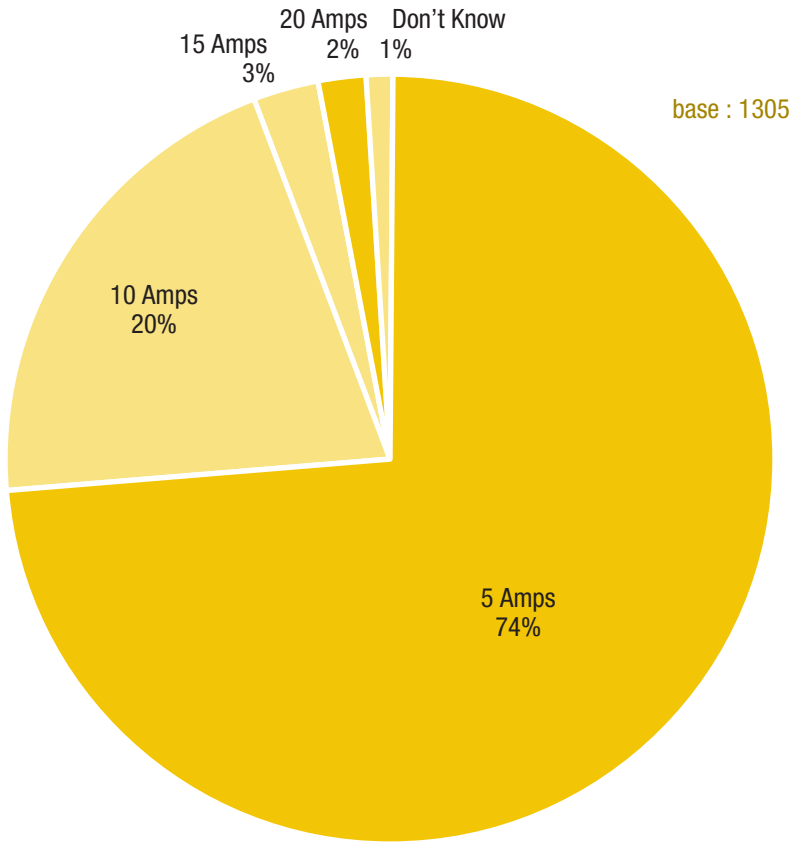


Figure 27: Subscription rate range and average (Residential users)

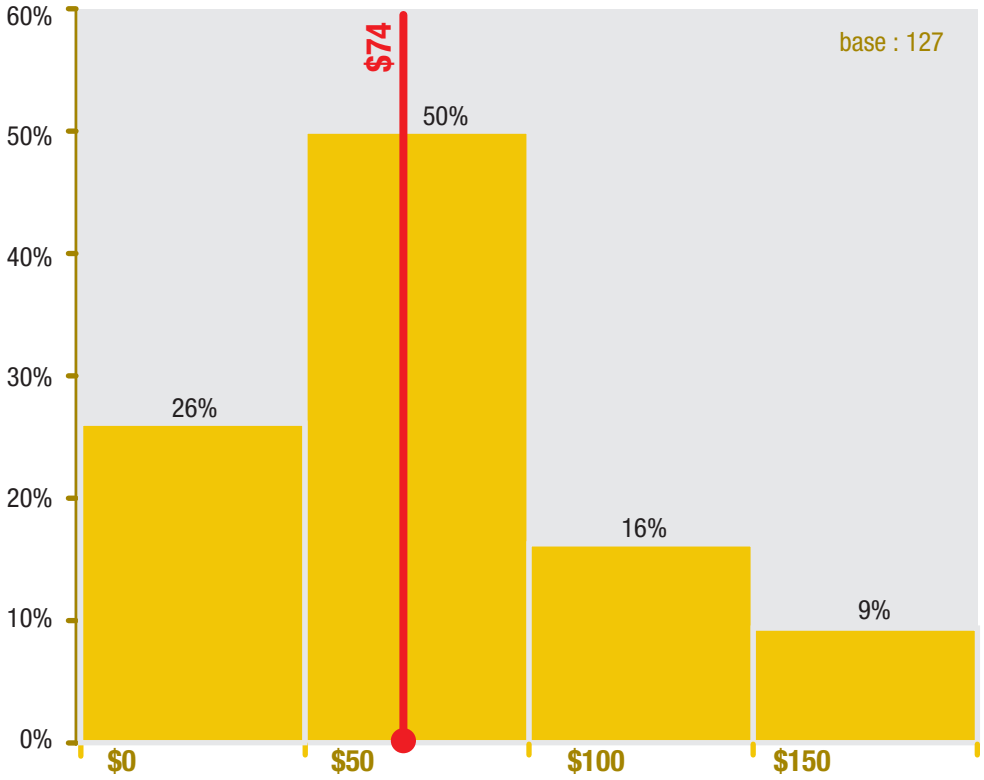


Figure 28: Purchase cost range and average of APS/UPS (Residential users)

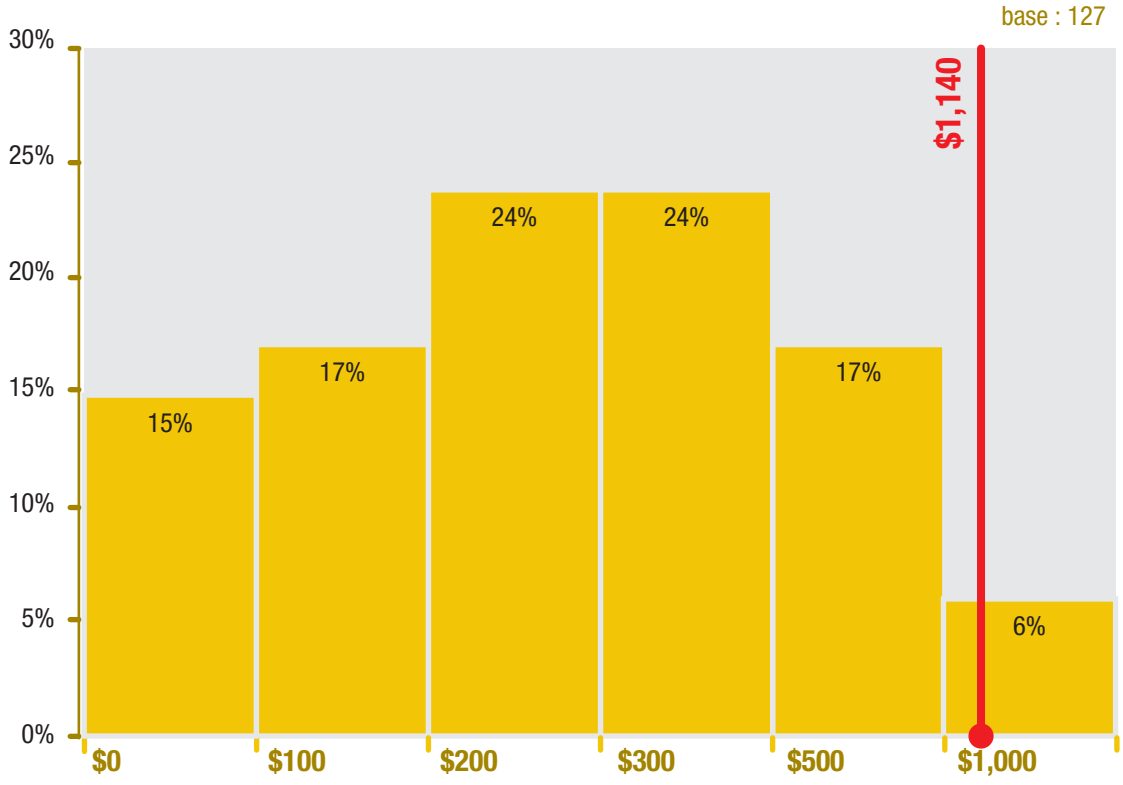
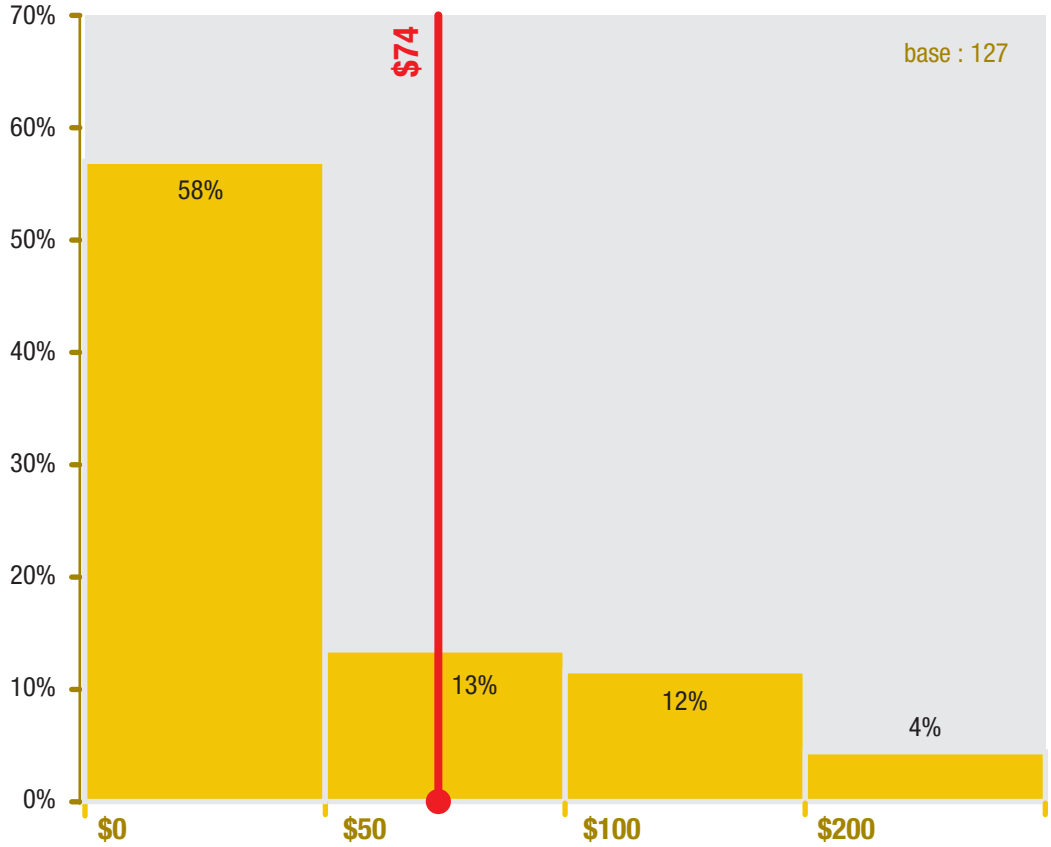


Figure 29: Running annual expenses on average of APS/UPS (Residential users)

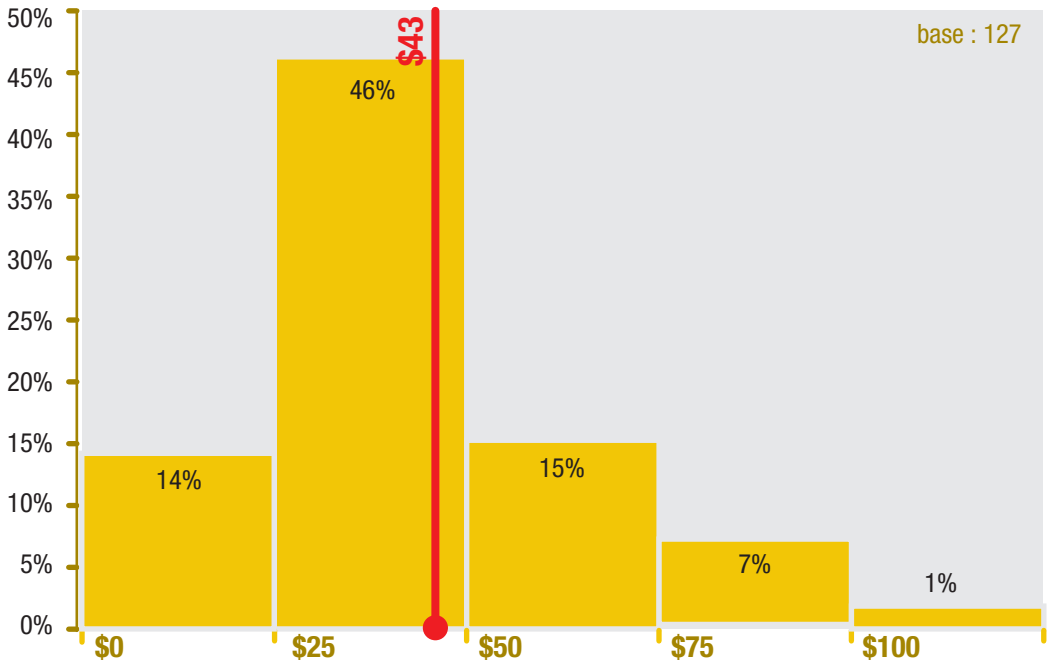


1.5 EDL Electricity Usage Patterns

The EDL consumption is low compared to generator subscription due to the underpriced tariff. Residential users were asked to provide their latest EDL bill which showed an average of $43 with most of the bills ranging between $25 and $50. Slightly more than half of the sample (52%) perceives their household electricity bills as “expensive” to “very expensive”.

This bill is broken down into four major categories as seen by the end-users, who claimed that utilities make up the highest split from the electricity bill, followed by water heating expenditure and lighting as shown in Figure 31.

Figure 30: Average EDL bill (Residential users)



`Figure 31: Users perception of electricity bill breakdown (Residential users)

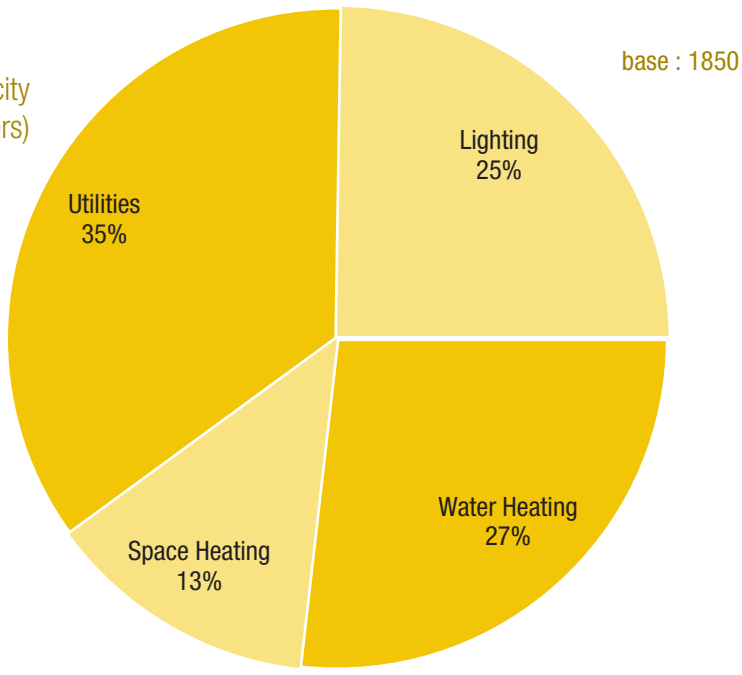
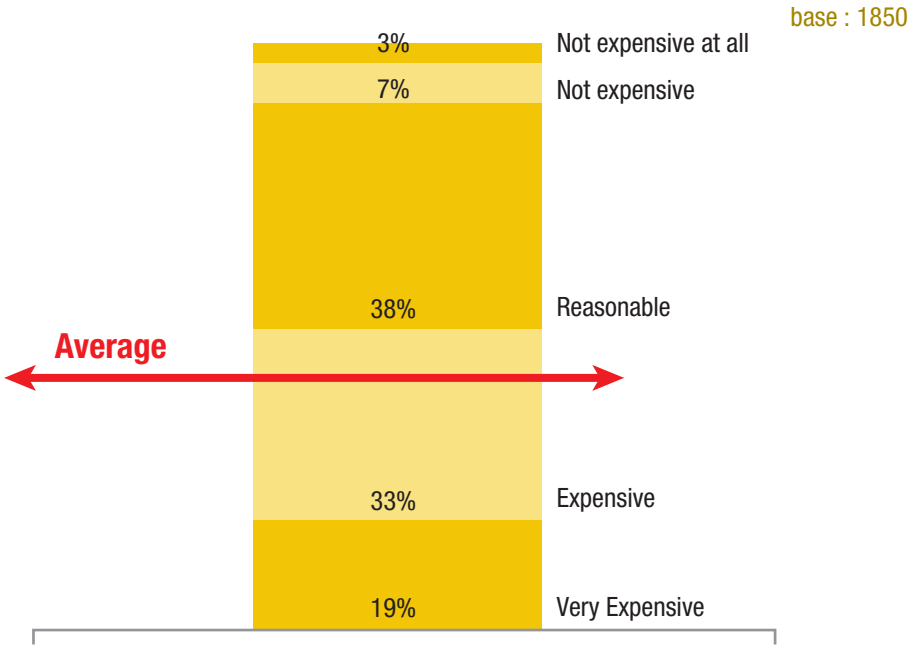


Figure 32: Perception of EDL electricity bill (Residential users)



1.6 Awareness & Usage of SWH

The fact is that the majority of residents have never thought of any solution to reduce their electricity bills. Only 28% were aware to consider energy saving solutions. Among these, more than half have considered installation of solar water heaters, while the others consider energy conservation measures including energy efficient lighting (EEL).

Apparently solar water heating is a well aware of solution. More than 94% have heard of solar water heaters and already know about it, but another fact is that only 15% of them have installed a solar solution in their residence.

The source of this awareness seems to be heavily driven by the advertisement campaigns including TV, billboards, newspapers, and the internet. The majority of residents (57%) first heard of solar water heaters from their friends, relatives, neighbors & other acquaintances.

Figure 33: Solutions considered to reduce electricity consumption (Residential users)

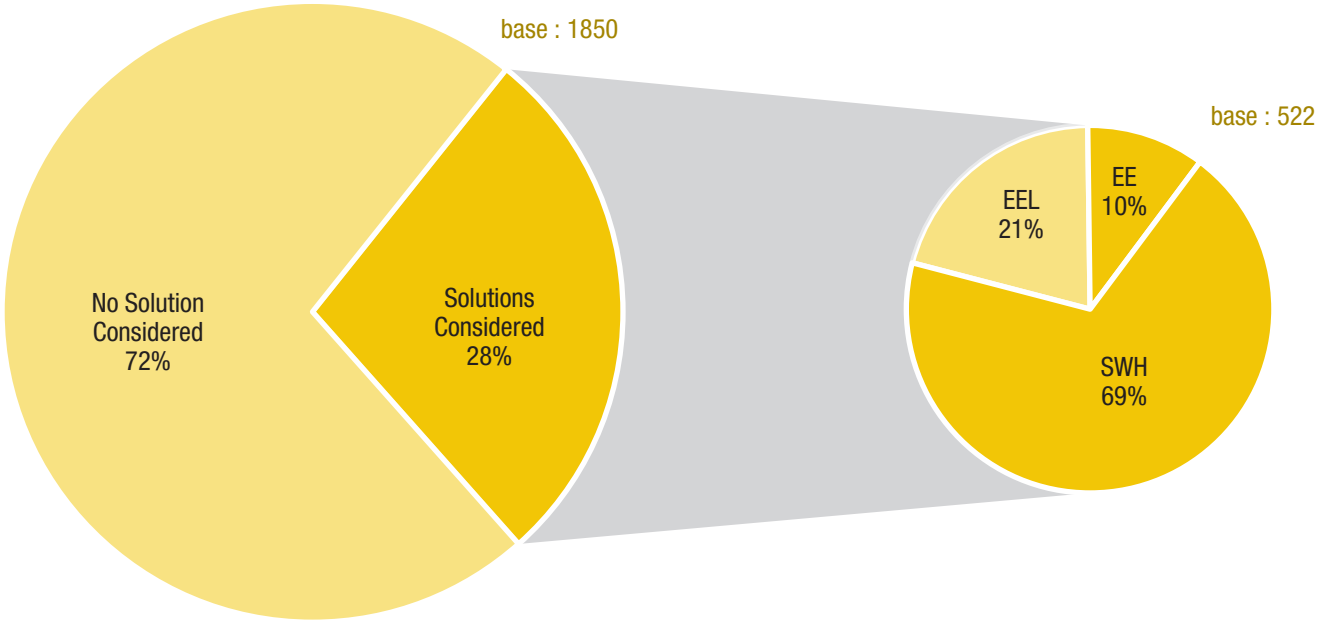


Figure 34: Awareness versus use of solar water heaters (Residential users)

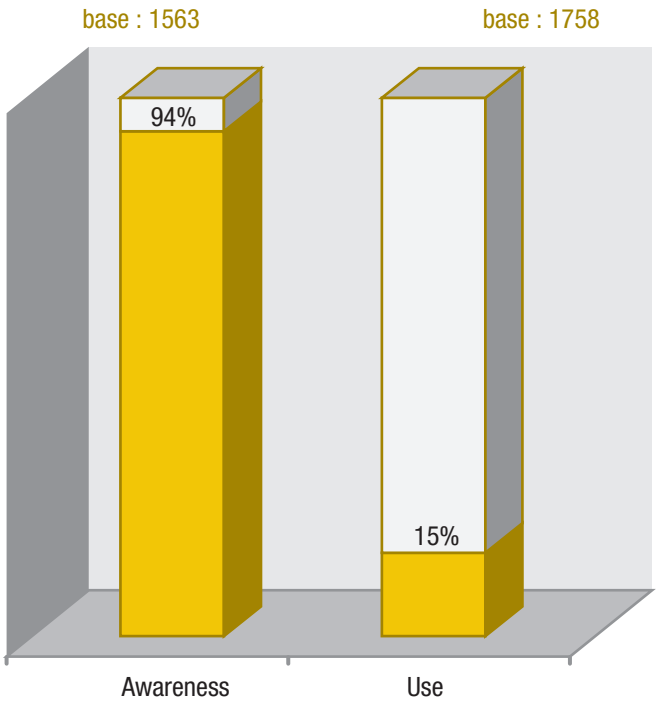
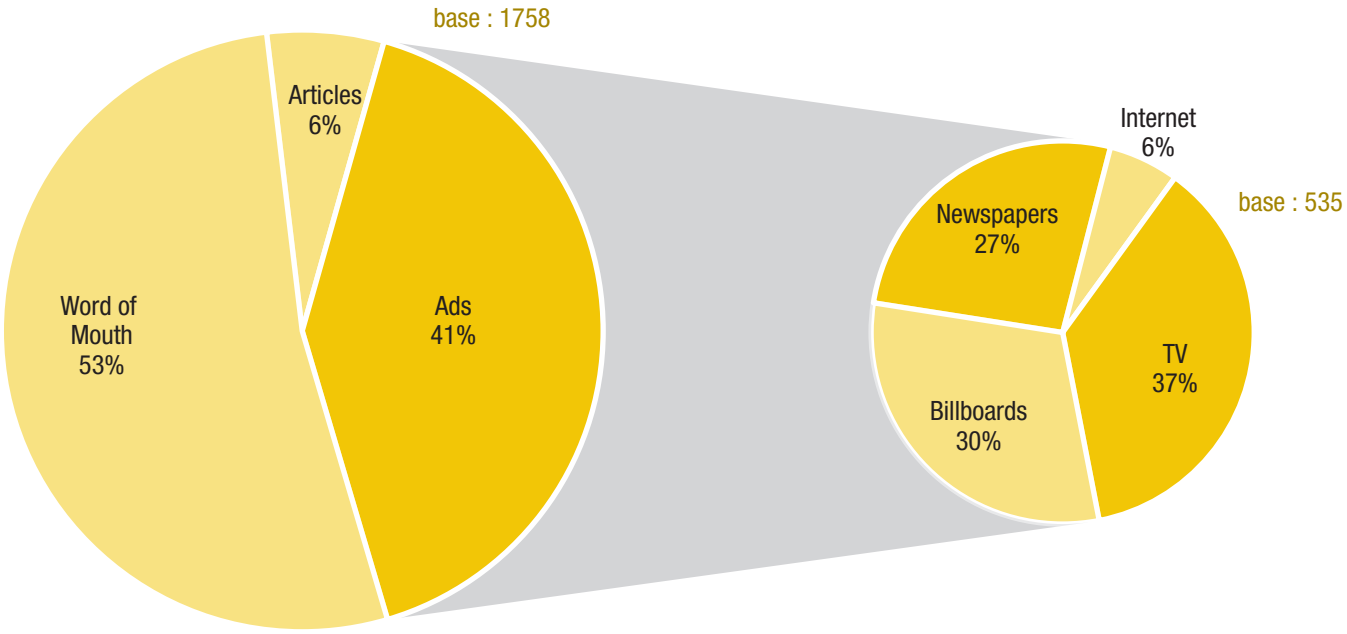


Figure 35: Source of solar water heaters awareness (Residential users)



1.7 SWH Installations and Perceptions

A total of 266 of the respondents have already installed solar water heating systems, the majority of which had their SWH installation 2-5 years earlier (relative to the date of the survey). A similar proportion of respondents installed their SWH in the last couple of years as Figure 36 shows. These installations were mainly using the older flat plate collectors, with only 37% of the installation using evacuated tubes.

On average, a residence installs a solar water heater with a capacity of 359 liters with a collection area of 5.64 square meters. The majority of residences install solar water heaters with storage capacities between 200 and 300 liters.

Problems in the system may occur, but the fact is that only 3% of those already having a solar water heater faced installation problems, while 14% faced operational problems and 5% experienced issues with the aftersales service.

This satisfaction rate was outstanding whereby up to 90% seem to be satisfied to very Satisfied. This satisfaction is mainly driven by the availability of hot water at all times and the reduction in electricity bill. These, in addition to other reason has led to more than 97% of the respondents willing to recommend solar water heating solutions to their friends and families.

Figure 36: Date of SWH installation (Residential users)

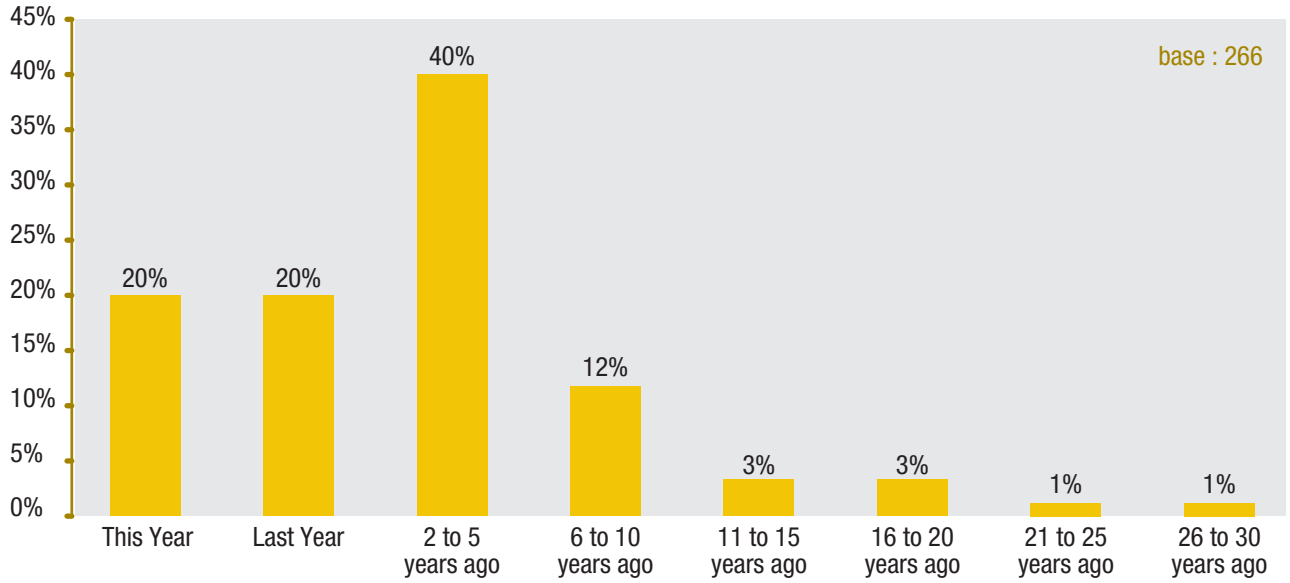


Figure 37: SWH installations by type (Residential users)

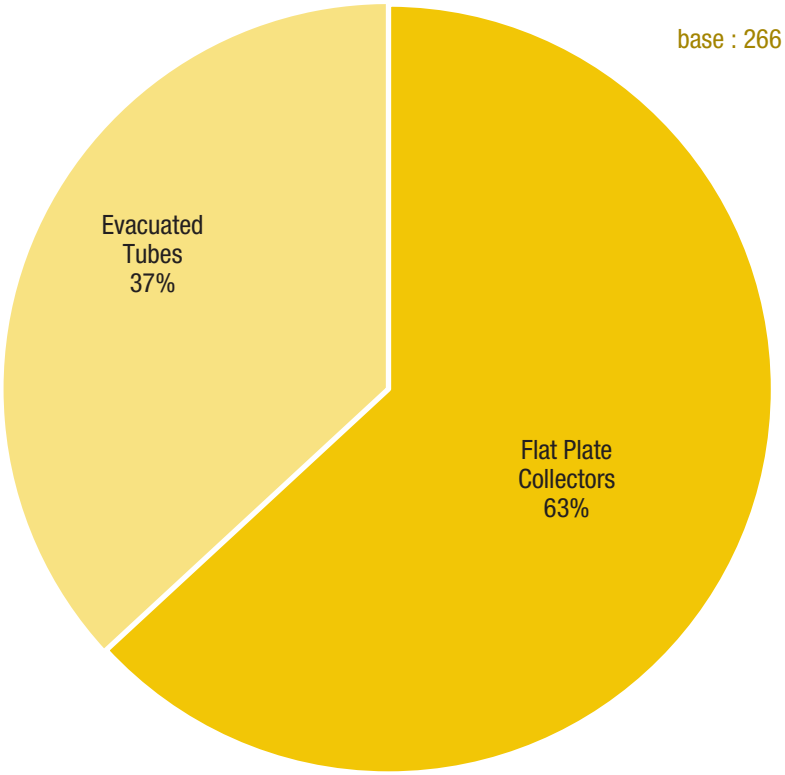


Figure 38: Installed collection area in square meters per residence (Residential users)

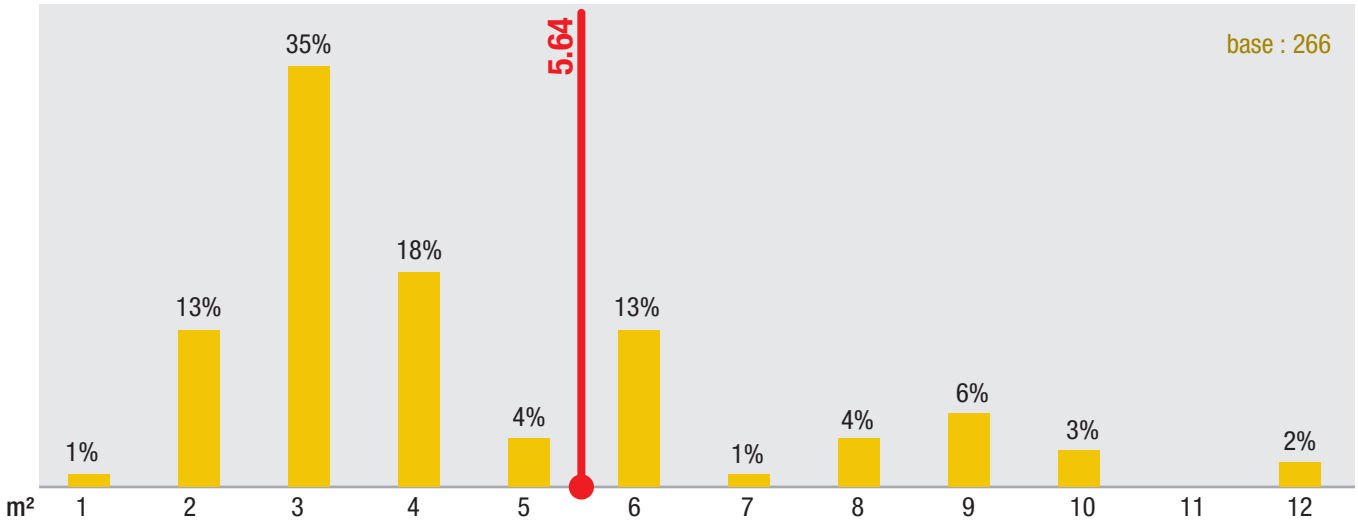


Figure 39: Installed capacity in liters per residence (Residential users)

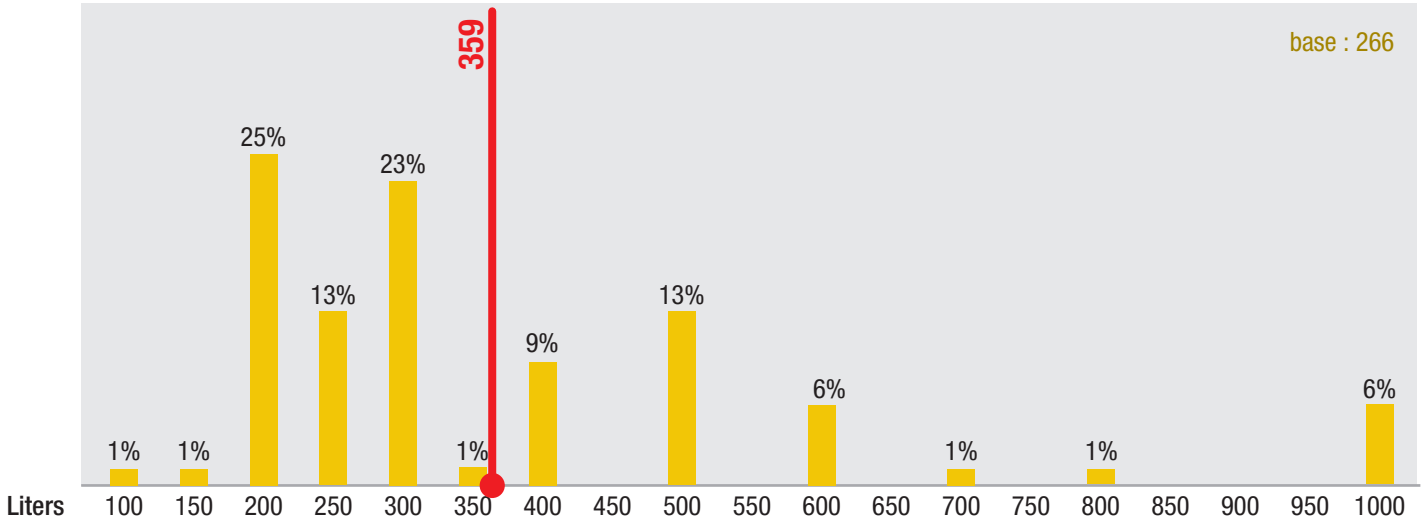


Figure 40: Installation and operation problems experienced among users of SWH (Residential users)

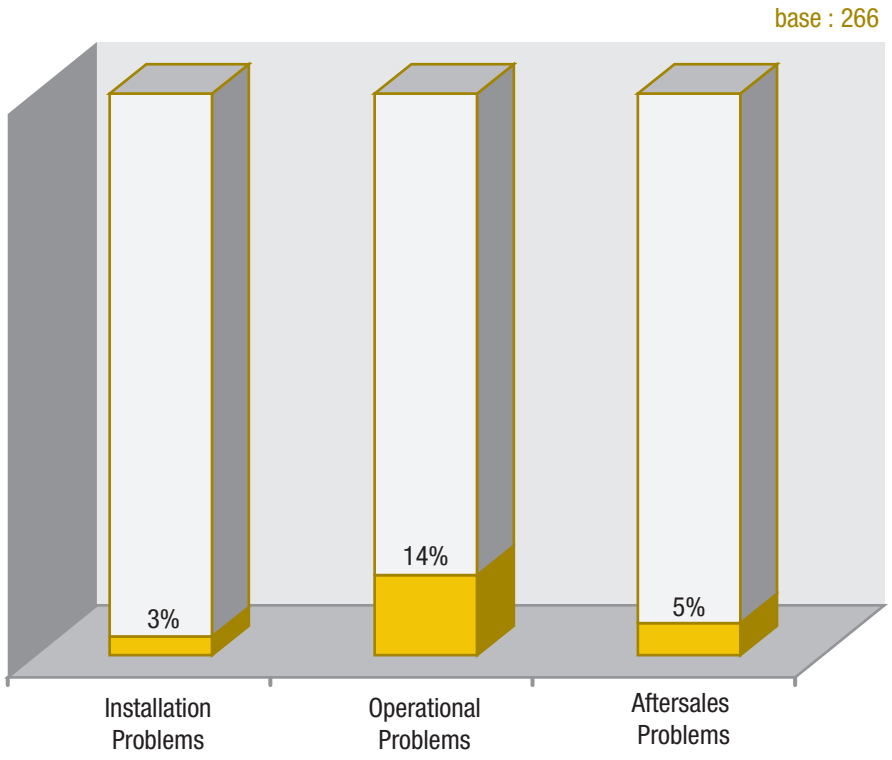


Figure 41: Satisfaction with the solar water heater installed (Residential users)

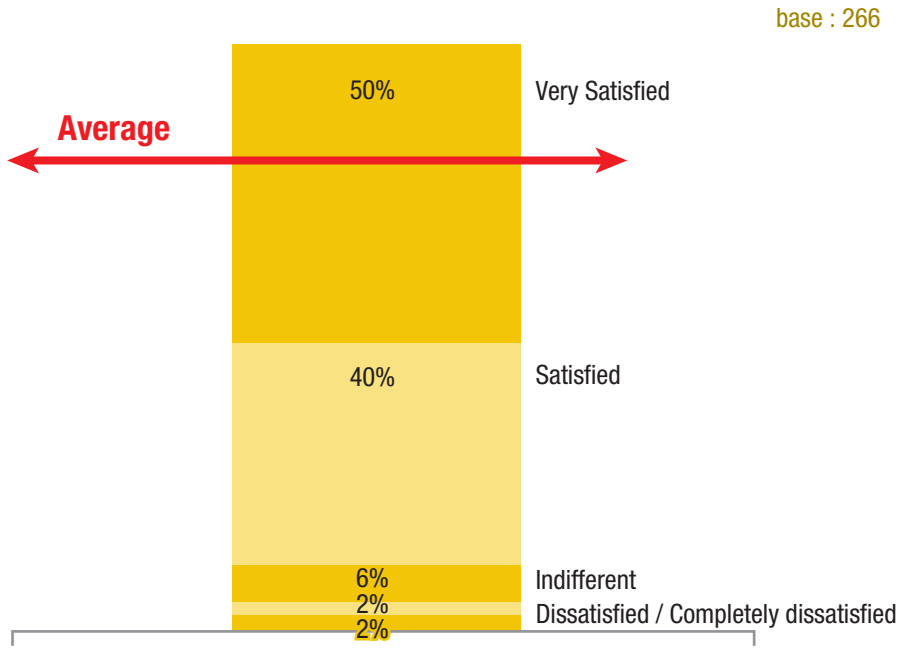


Figure 42: Main reasons of satisfaction with the SWH (residential users)

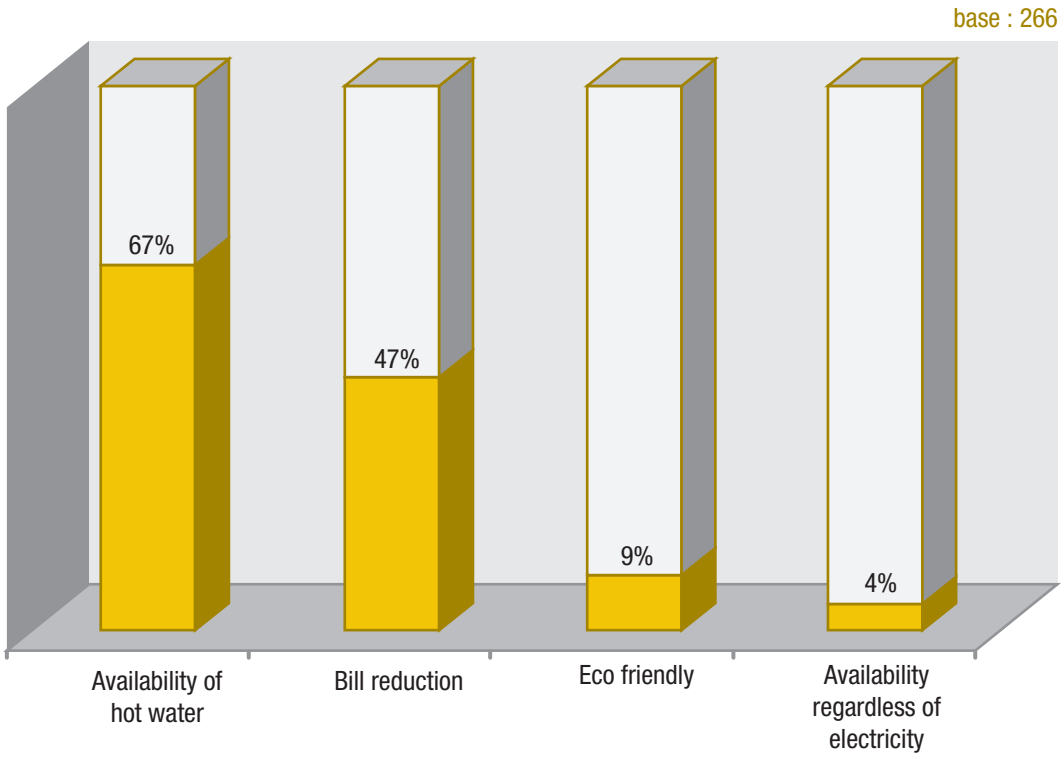
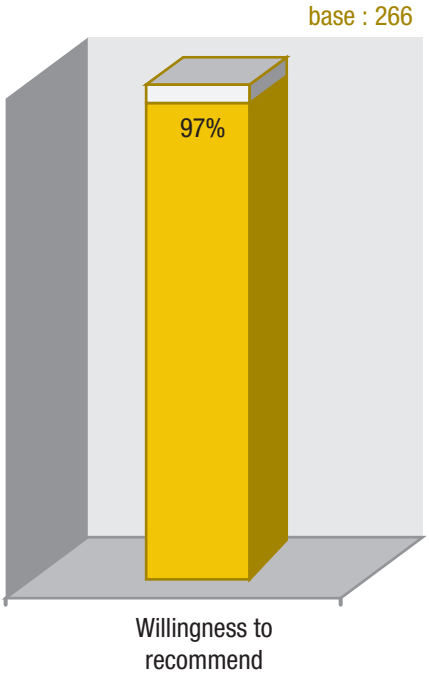


Figure 43: Willingness to recommend SWH to friends and family (Residential users)



1.8 Consideration, Drivers & Barriers

The main motivation for installing solar water heaters seems to be, by and large, financial savings through the reduction of electricity bill. It is common among both users and non-users.

For those who do not own a solar water heater, the high cost is the major burden behind them not considering the system and avoiding installing it. More than 25% of those who haven't considered this solution, and those who considered it but have installed see it as unnecessary and would rather pay for other priorities.

When it comes to the reduction of electricity bill following installation of SWH, people tend to underestimate the savings that could be achieved by the system. Among those who never installed a solar water heater, the average saving was estimated to be 35%, while users of solar water heaters have declared that their systems save on average 42% of the electricity bill as Figure 47 shows.

Figure 44: Main reasons behind considering SWH for users and non-users (Residential users)

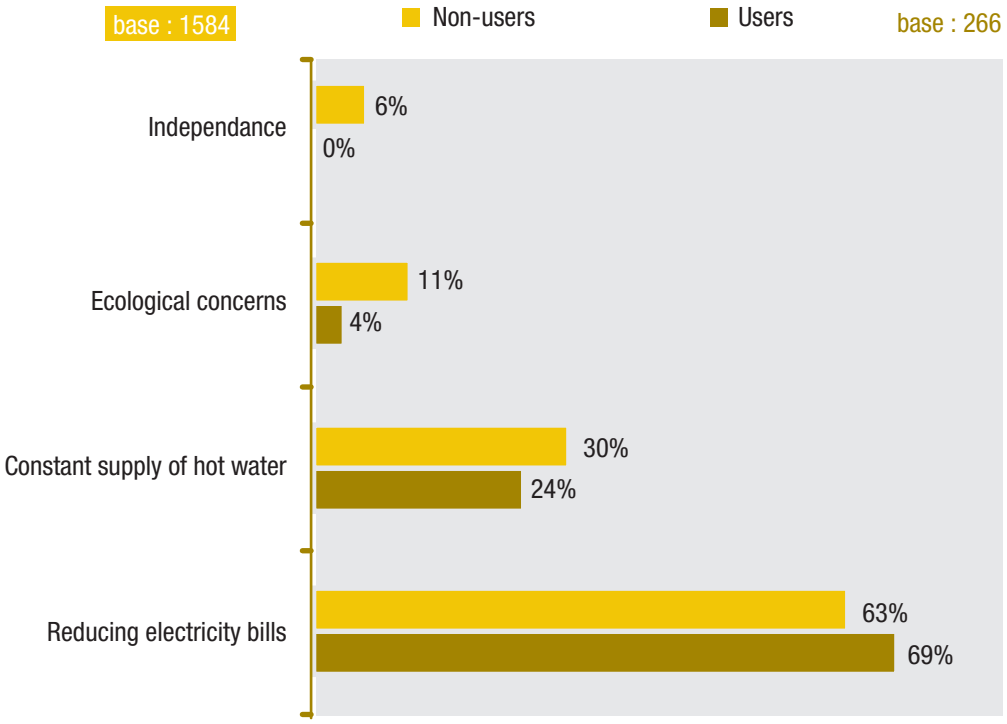


Figure 45: Reasons for not installing and not considering SWH (Residential users)

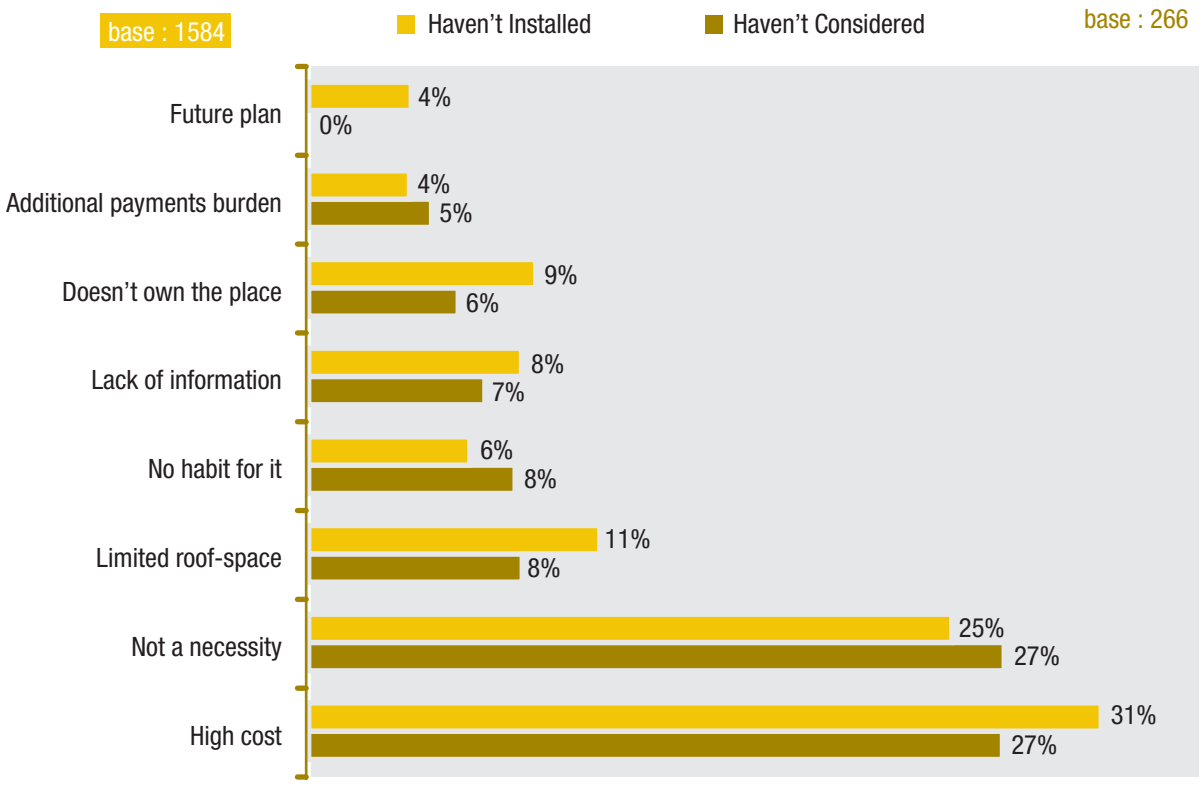


Figure 46: Awareness about SWH suppliers and dealers among non-users (Residential users)

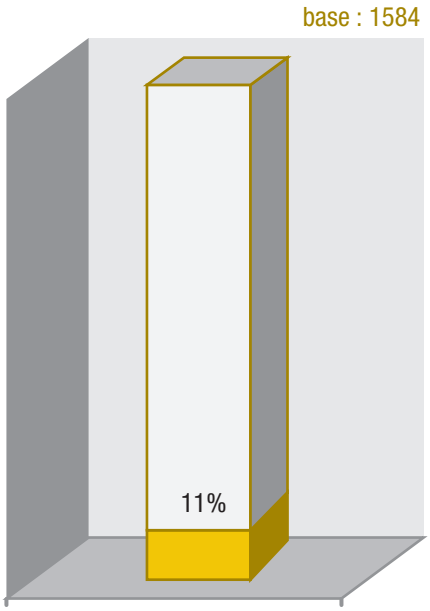
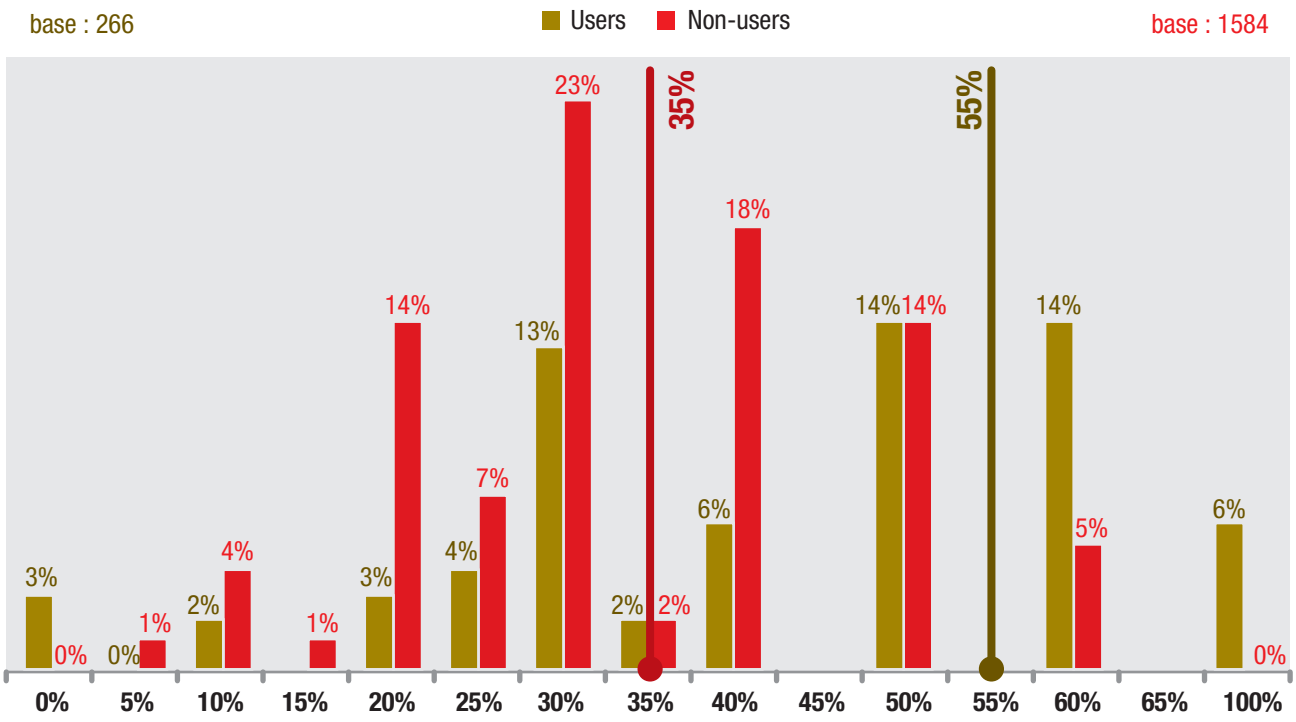


Figure 47: Estimated electricity bill reduction from the SWH among users and non-users (Residential users)



1.9 Decision Making Factors

Most of the SWH users have their systems installed in the permanent residence, with only 8% having a SWH in a seasonal house. The majority of respondents mentioned the existence of an exposed roof of 3 m2 available for installations.

When it comes to the cost of the system, non-users seem to have a difficulty in financing their system, as they will to pay an average of $651 per system, which is 53% lower than what users have claimed that the average system used has cost $1,114 as shown in Figure 50. Users of SWH claim that this average cost tends to be inexpensive, with 28% saying that the price of the system was not expensive and the majority of 74% say that the price was reasonable.

Majority of respondents would prefer payment facilities (installment programs) from the SWH dealer in settling its payment, with the loans being the least preferred option. While in fact the majority of users have bought their systems in cash.

The reduction of electricity bill and price of the system seem to be the main decision-making factor when it comes to installing SWH. 36% of the users ranked the savings as first, and around 35% ranked the functioning mode as top priority. Non-users seem to have different priorities with the cost being first followed with the functioning of the system and then the savings. The results are shown in Figure 53.

Finally, it has been noticed that only 19% of SWH users were aware of other RE technologies, namely wind and hydropower as shown in Figure 54.

Figure 48: Type of residence for the installation of SWH for users and non-users (Residential users)

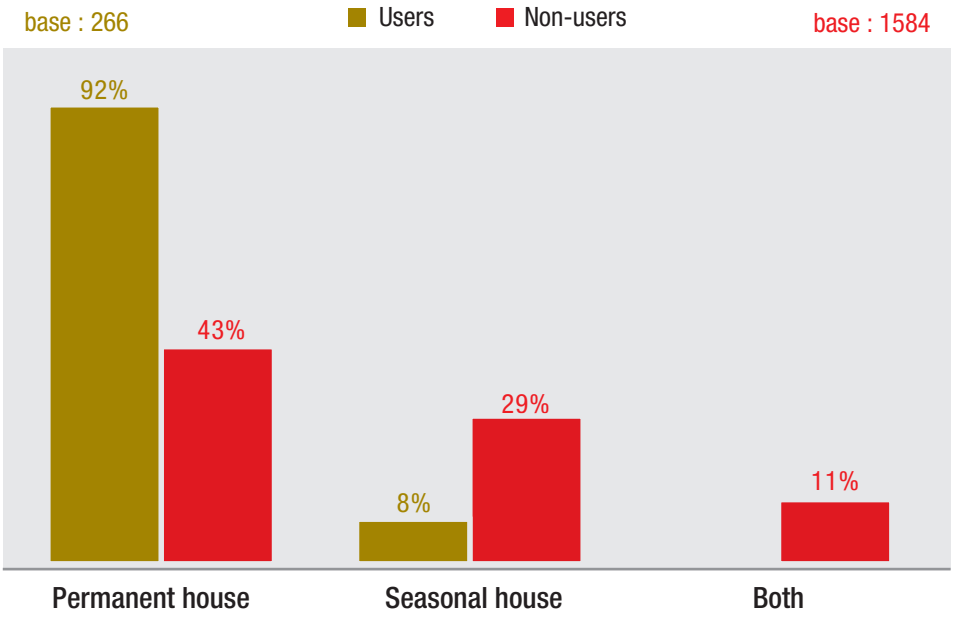


Figure 49: Availability on roof among non-users (Residential users)

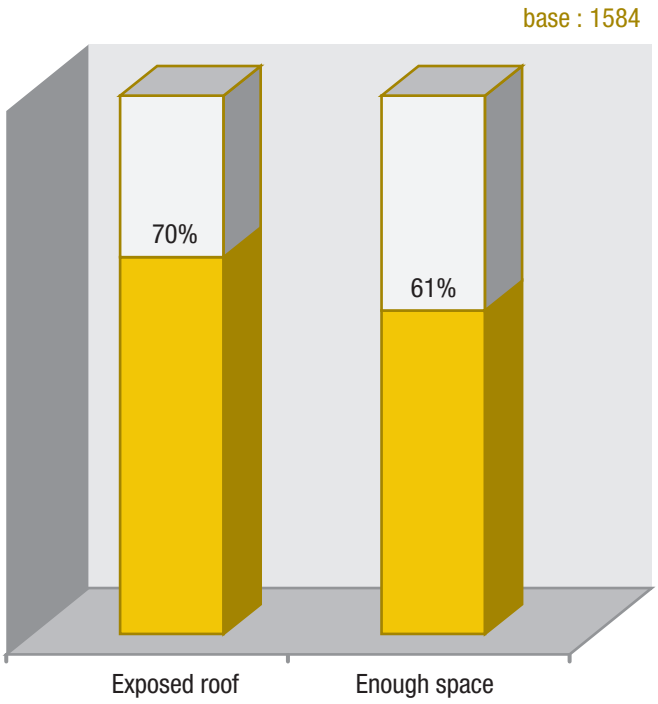


Figure 50: Price acceptable by non-users versus price paid by users for a SWH (Residential users)

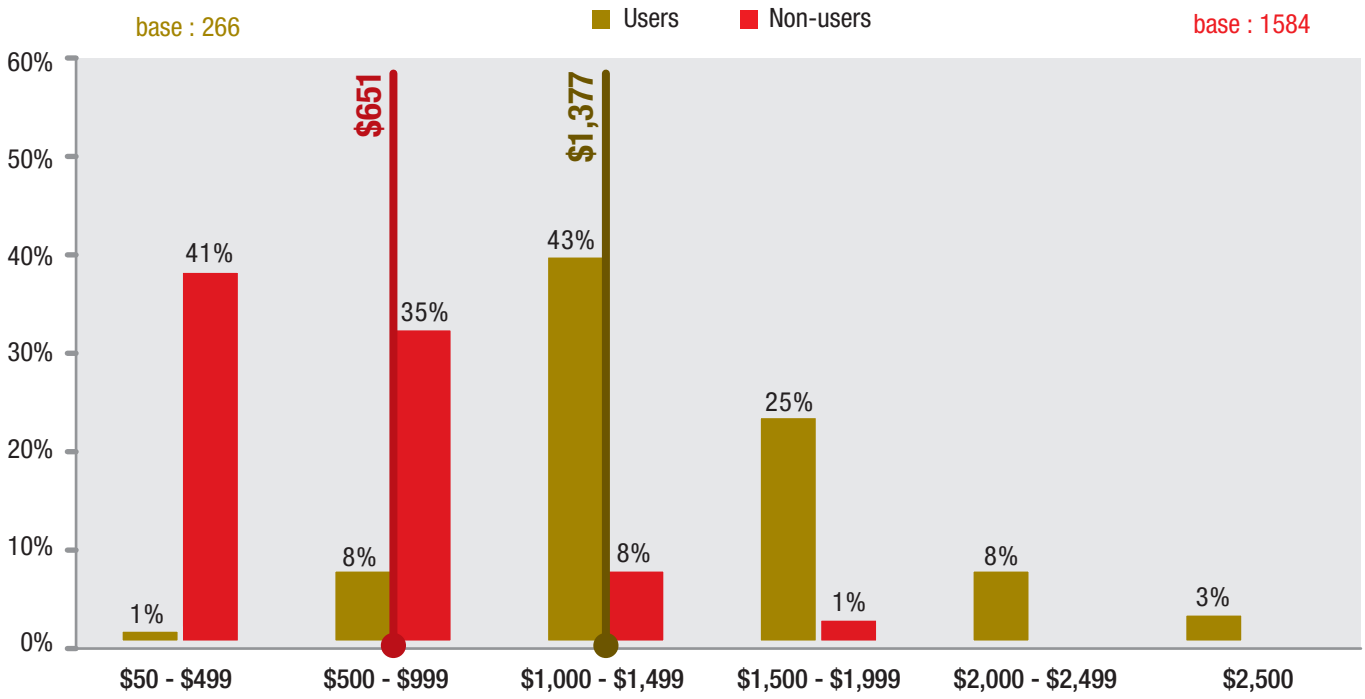


Figure 51: Perception of SWH price by owners of systems (Residential users)

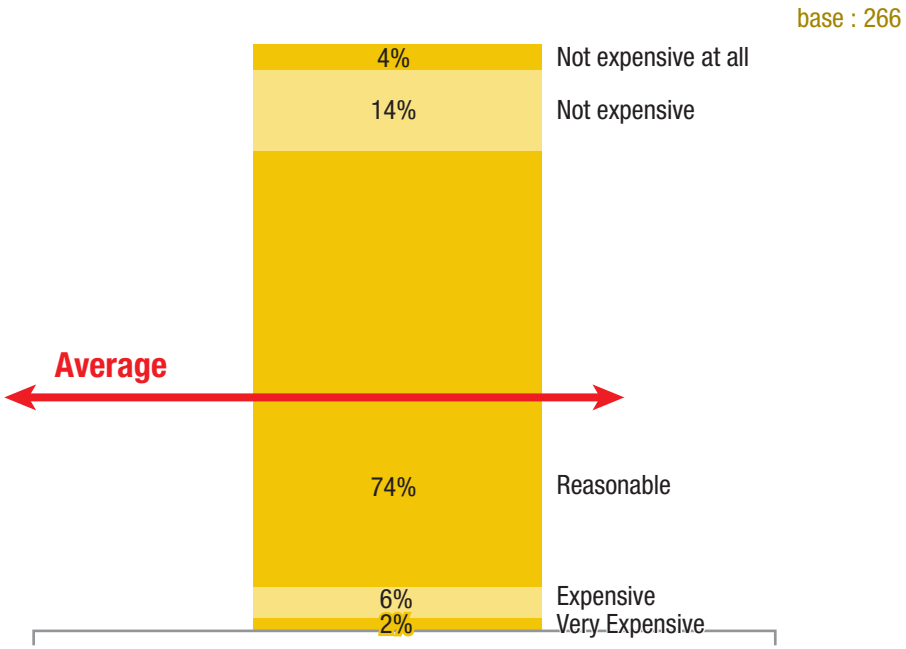


Figure 52: Preferred payment facilities by non-users and used by SWH users (Residential users)

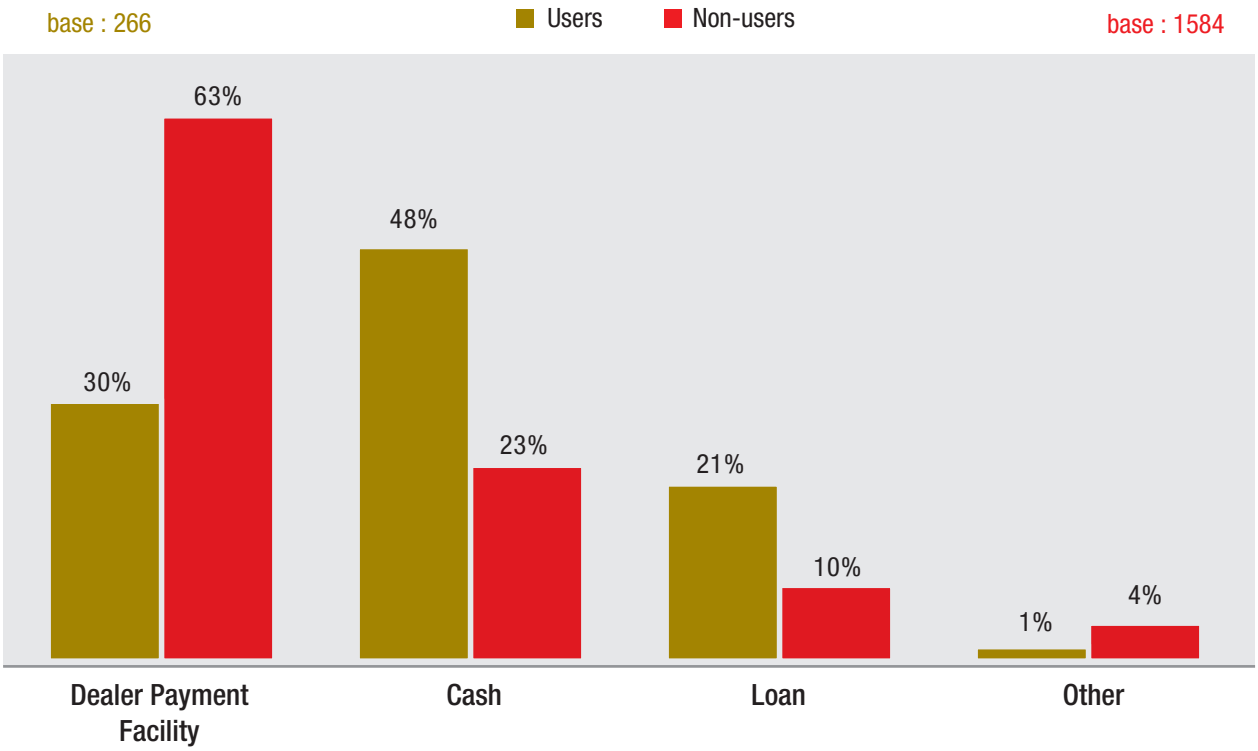


Figure 53: Decision process for the purchase of SWH among users and non-users (Residential users)

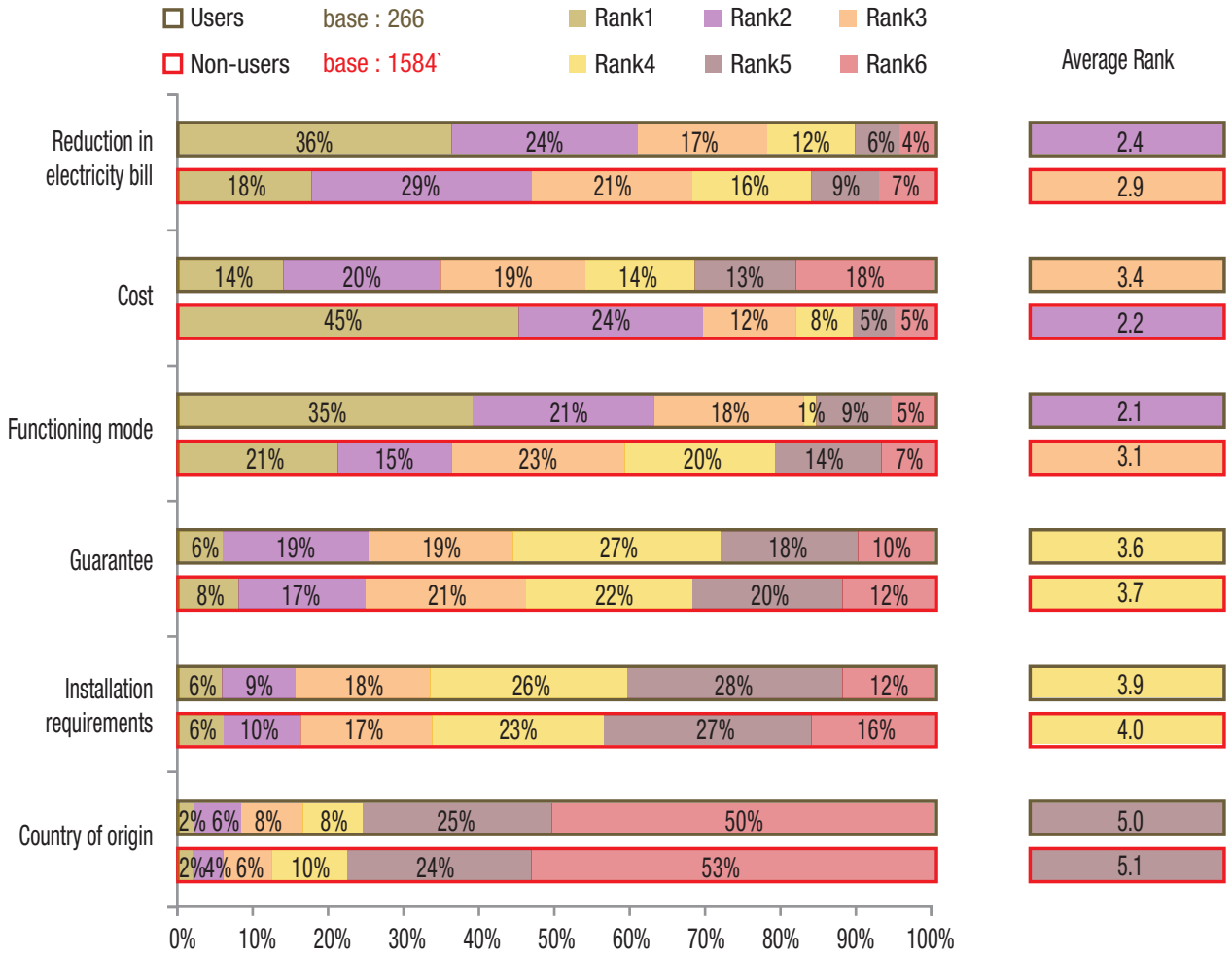
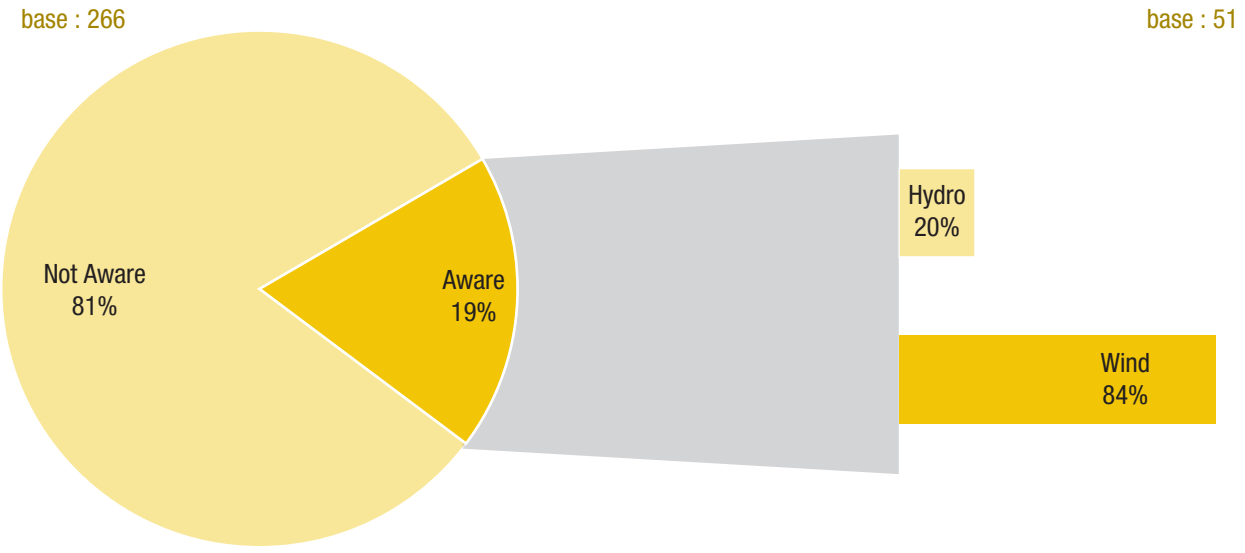


Figure 54: Awareness of other RE applications among users of SWH (Residential users)



1.10 Photovoltaic (PV) Cells

Although they are aware about solar water heating technologies, only 32% of SWH users are aware of what PV is, and even less (4% only) have actually installed solar PV system at their residences.

This minority is very aware of the major advantages of PV systems, and both users and non-users of SWH agree that the financial savings and frequent electric supply are the major advantages of such systems, but they also share the same disadvantages especially the high cost and the frequent system maintenance requirements they stated.

When it comes to amounts to be paid for the installation of PV Cells, the overall average is $1,638 for those who do not own a solar water heater and $2,157 for owners of solar water heaters. Users of solar water heaters tend to be less interested in solar PV compared to non-users as shown in Figure 59

The expected savings are estimated by the users and non-users of solar water heaters as well as users of PV to be between 53% and 56%.

These savings become even more when connecting to the grid, which has shown to be interesting to the majority except those who already installed PV systems. This includes one of two methods namely net-metering and feed-in. The first seems to be more attractive to end-users and those interested in installing a PV solar system, especially that minimum feed-in tariff demanded by end-users exceeds 50 cents per kWh, which is more than 4 times the current EDL tariff.

Figure 55: Awareness versus use of solar PV among SWH users (Residential users)

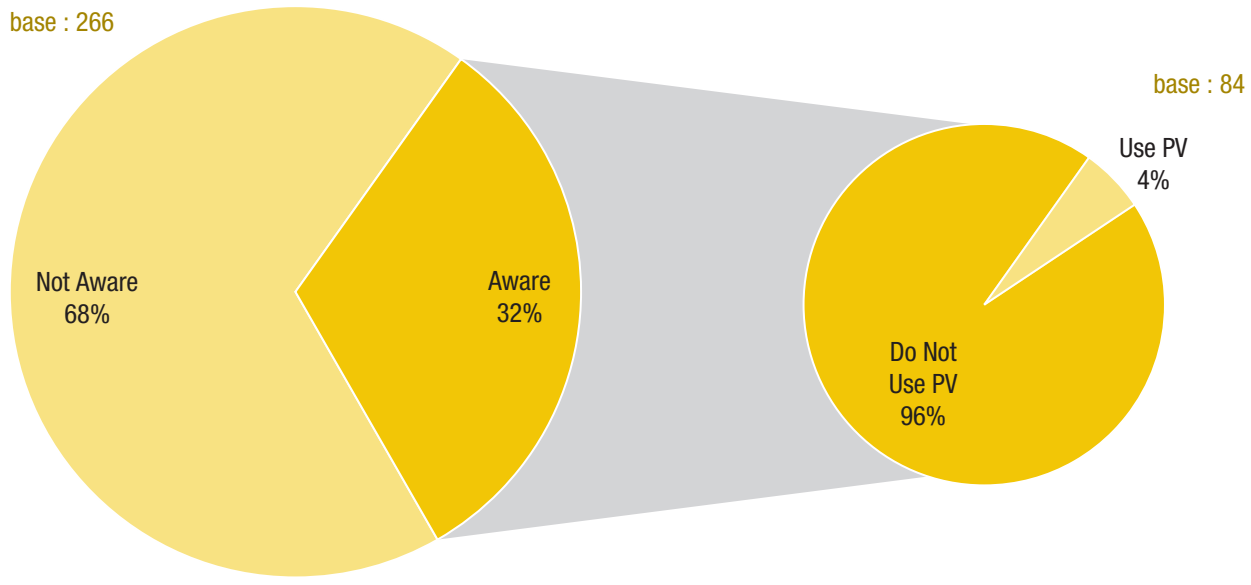


Figure 56: Major advantages of PV as perceived by users and non-users of SWH (Residential users)

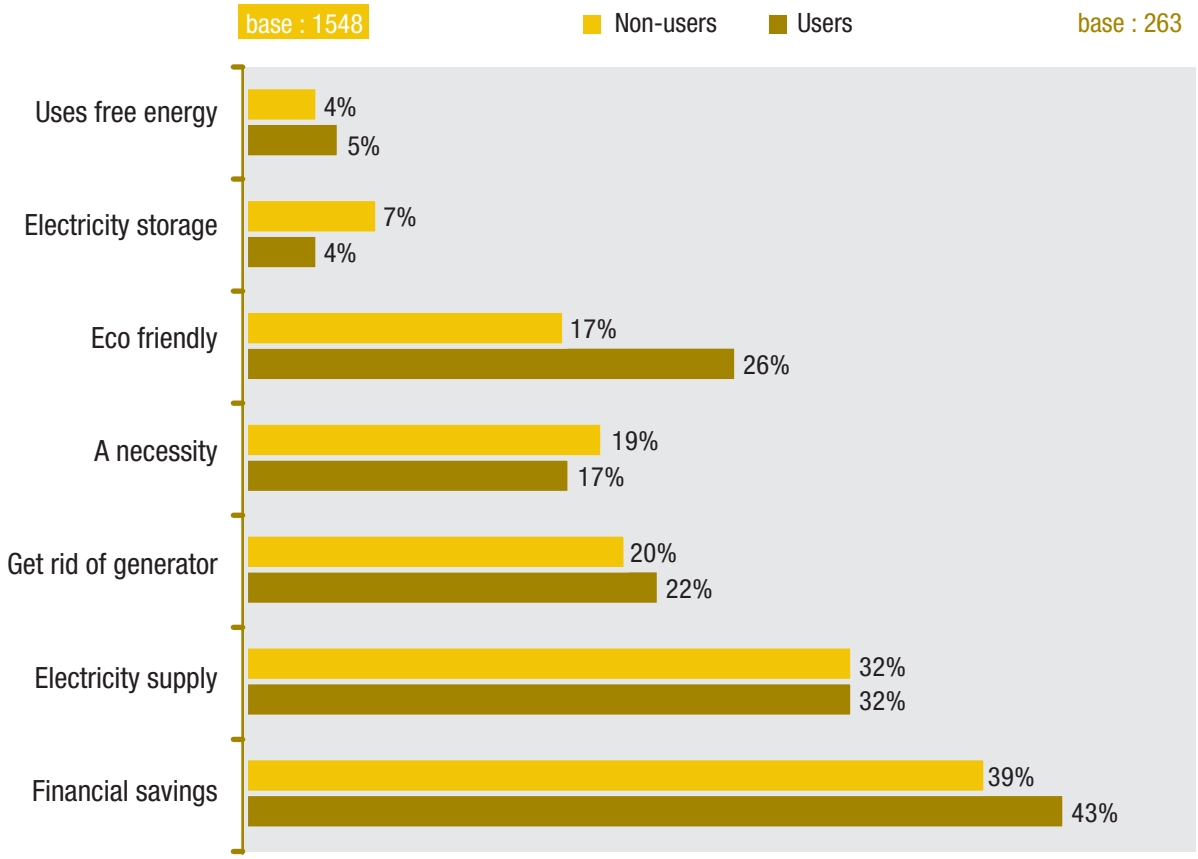


Figure 57: Major disadvantages of PV as perceived by SWH users and non-users (Residential users)

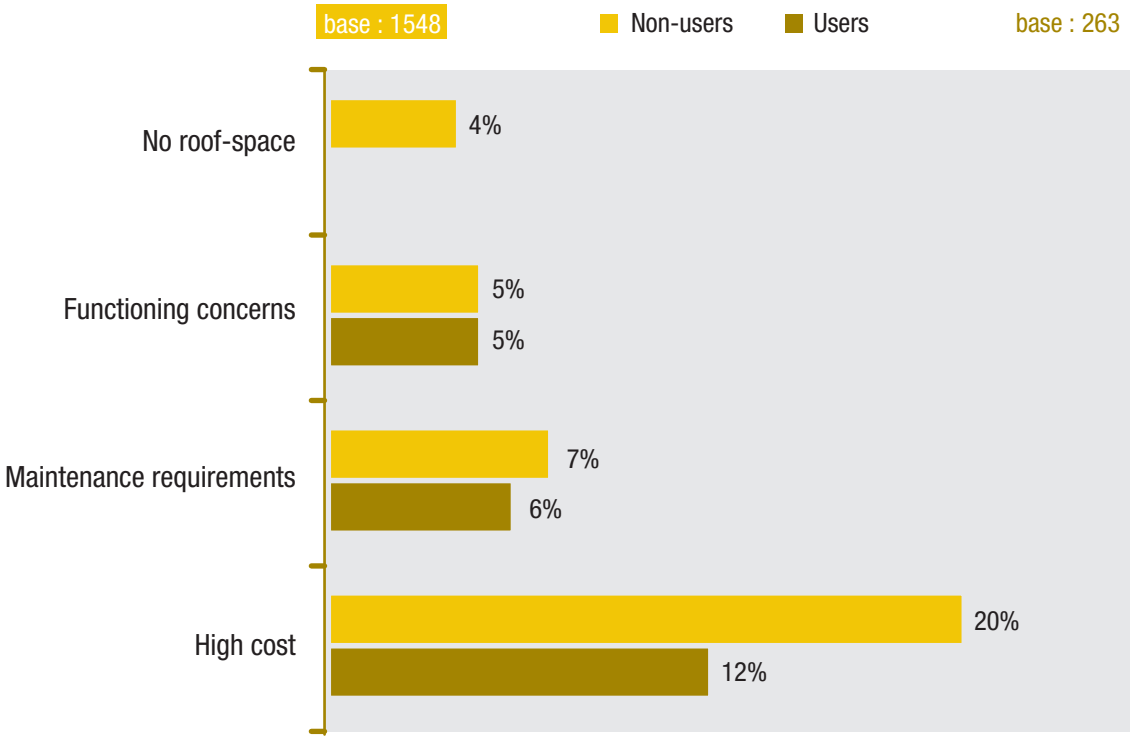


Figure 58: Willingness to pay for installation of PV (Residential users)

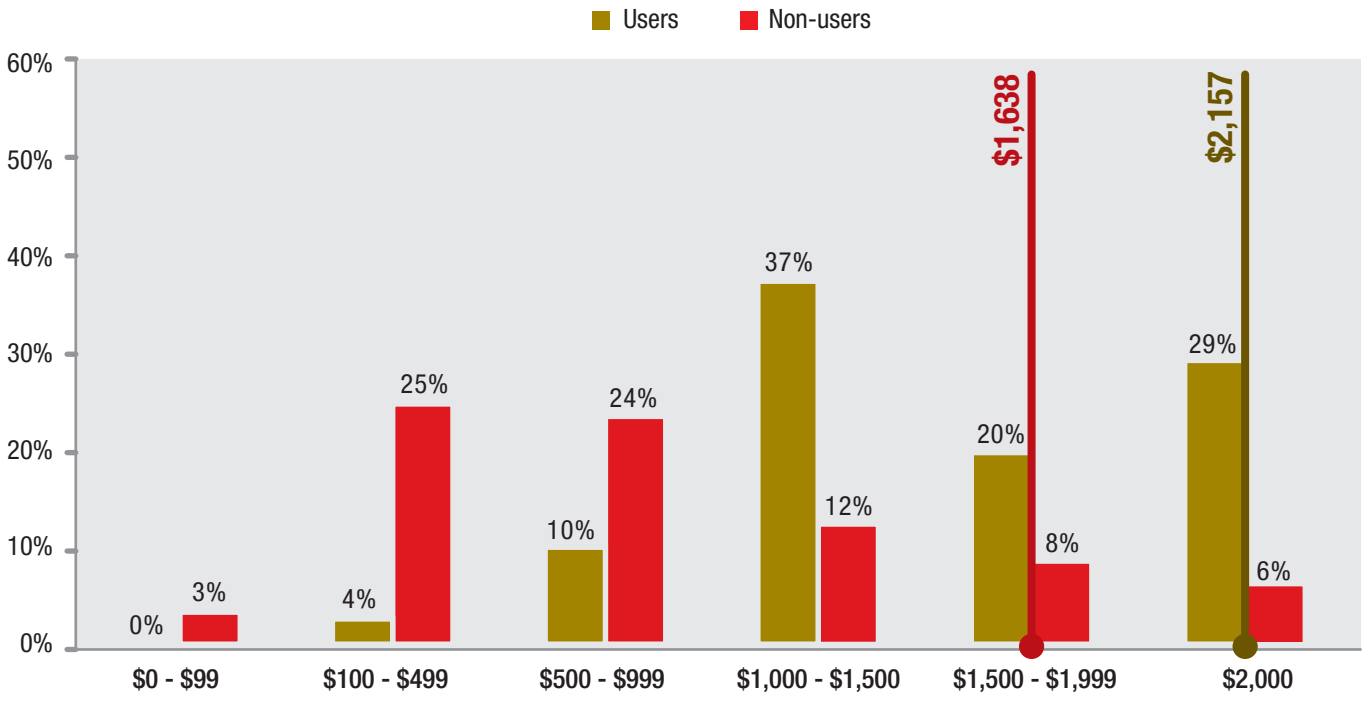


Figure 59: Willingness to get a solar PV system for SWH users and non-users (Residential users)

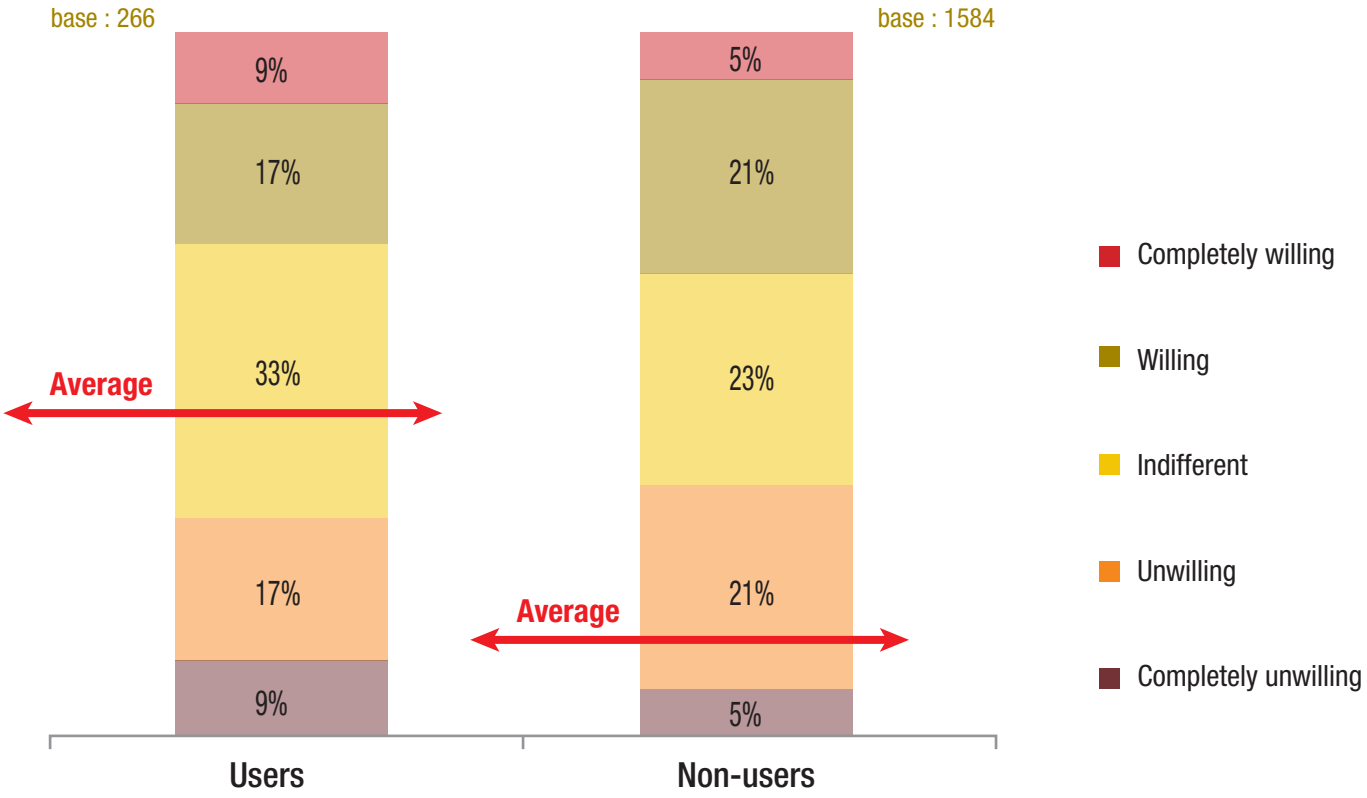


Figure 60: Estimated PV savings by users of PV and SWH and non-users (Residetnail users)

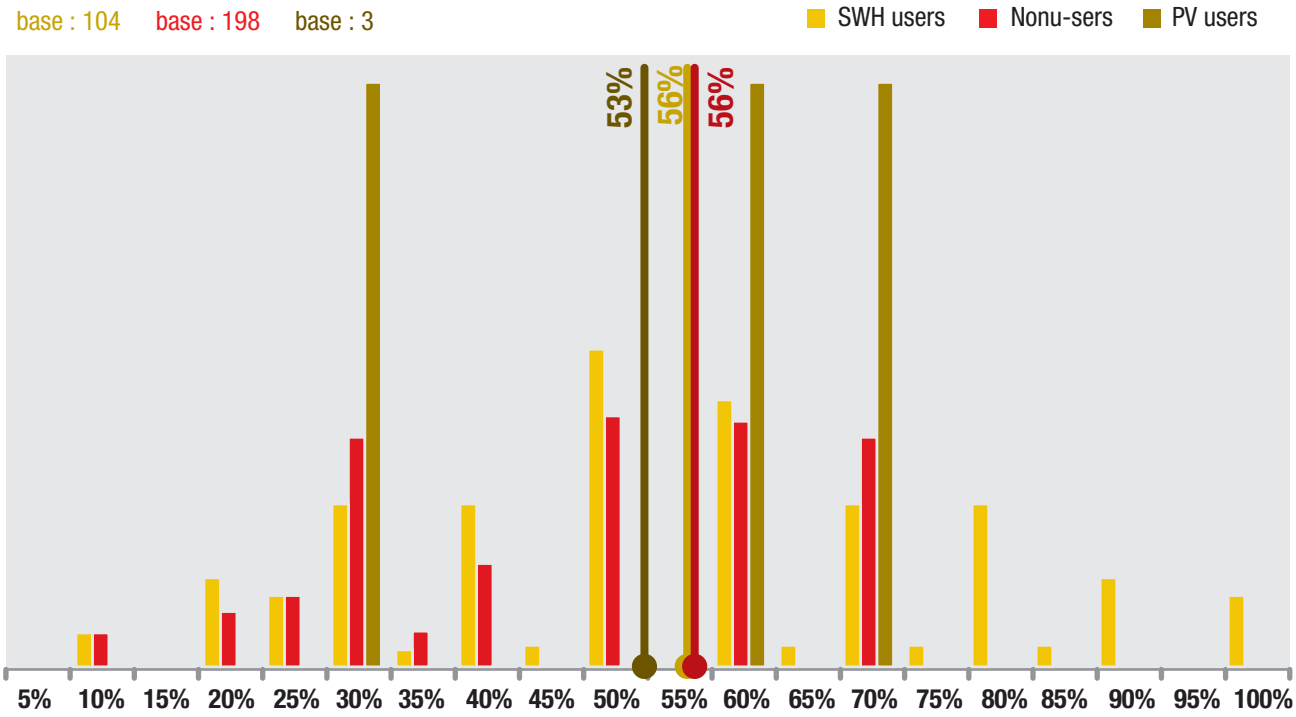
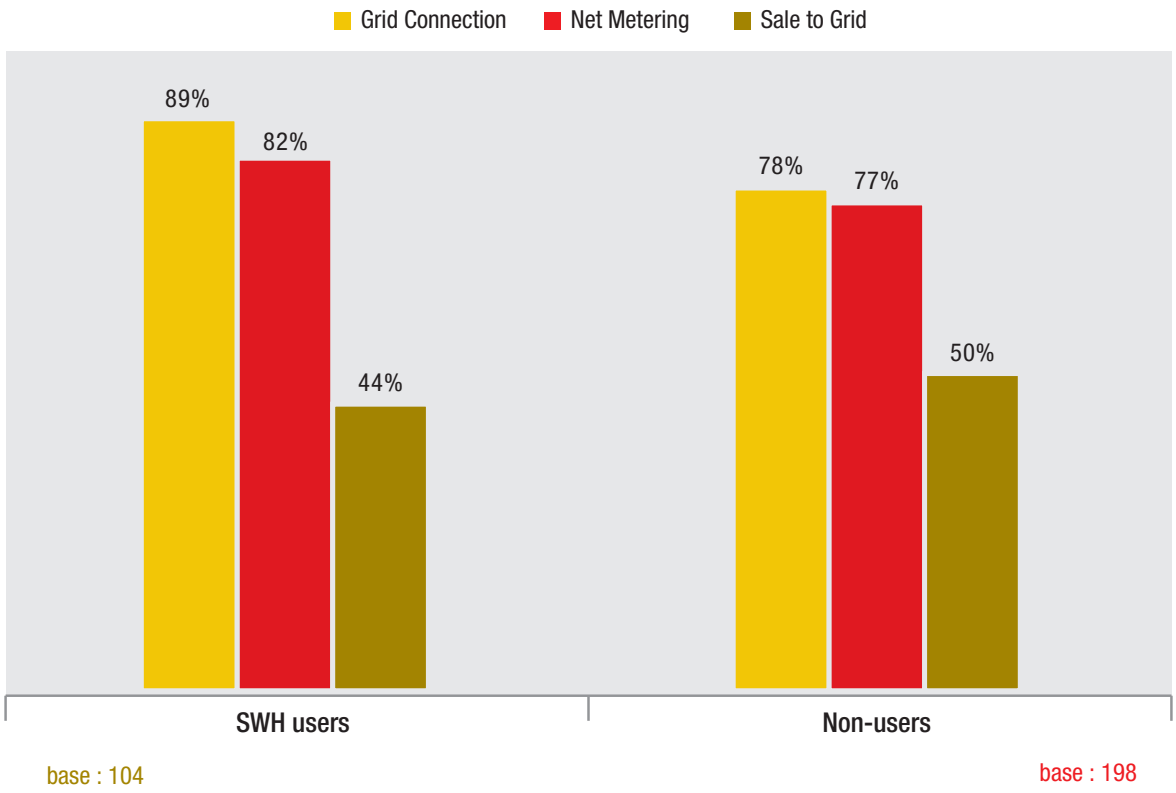


Figure 61: End-users interest in grid connection, net-metering, and selling to the grid (Residential users)



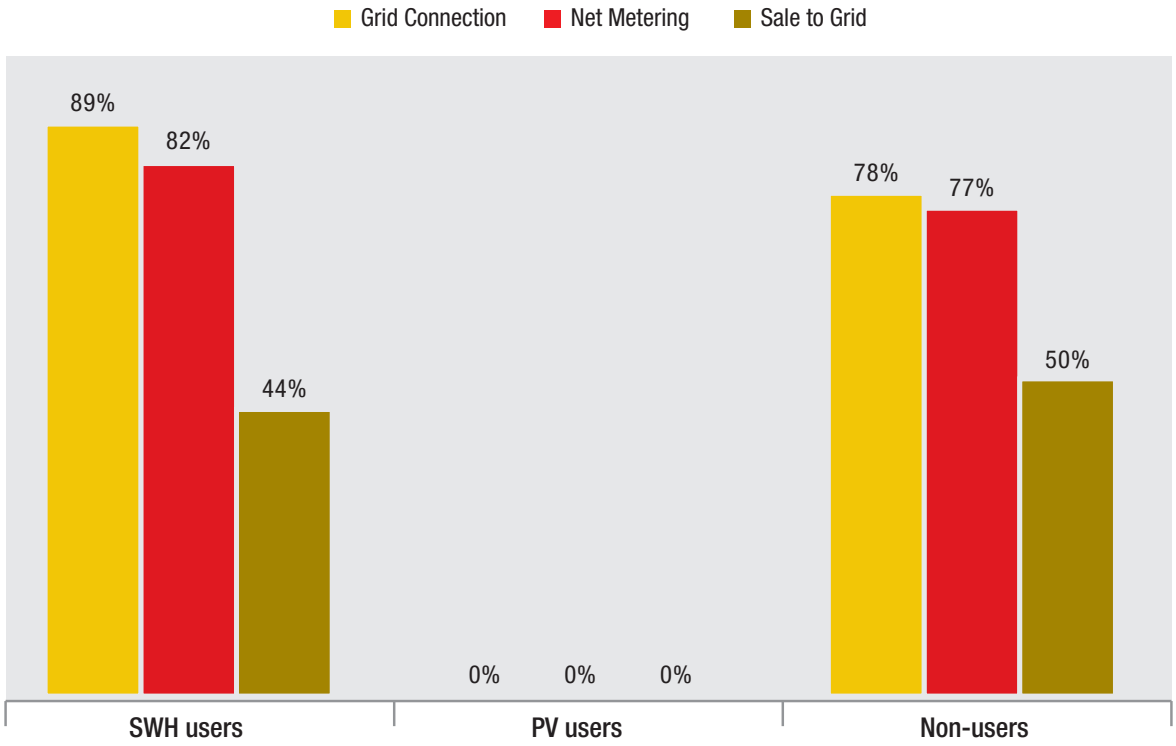


Figure 62: Preference of net-metering over feed-in tariff (Residential users)

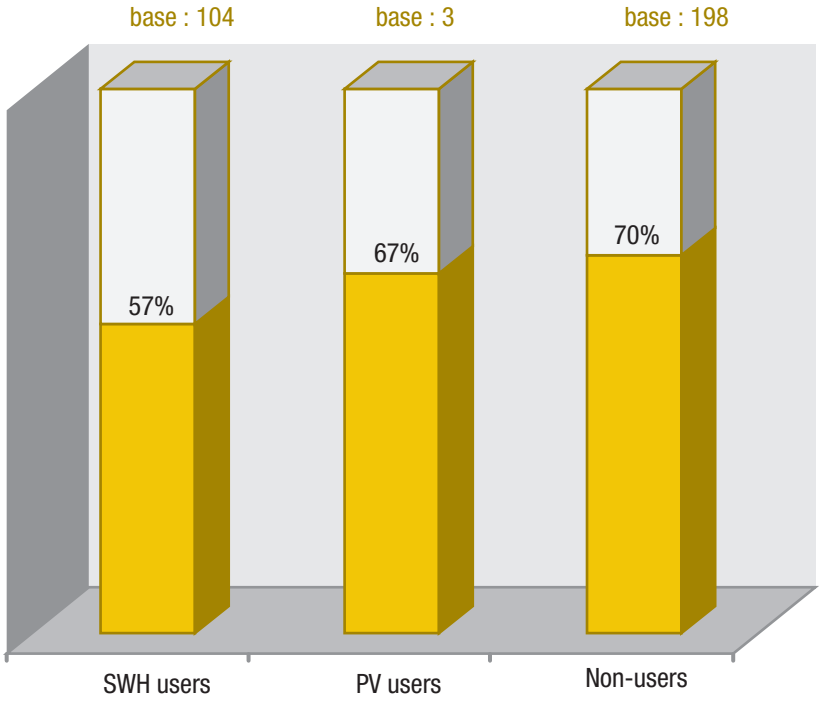
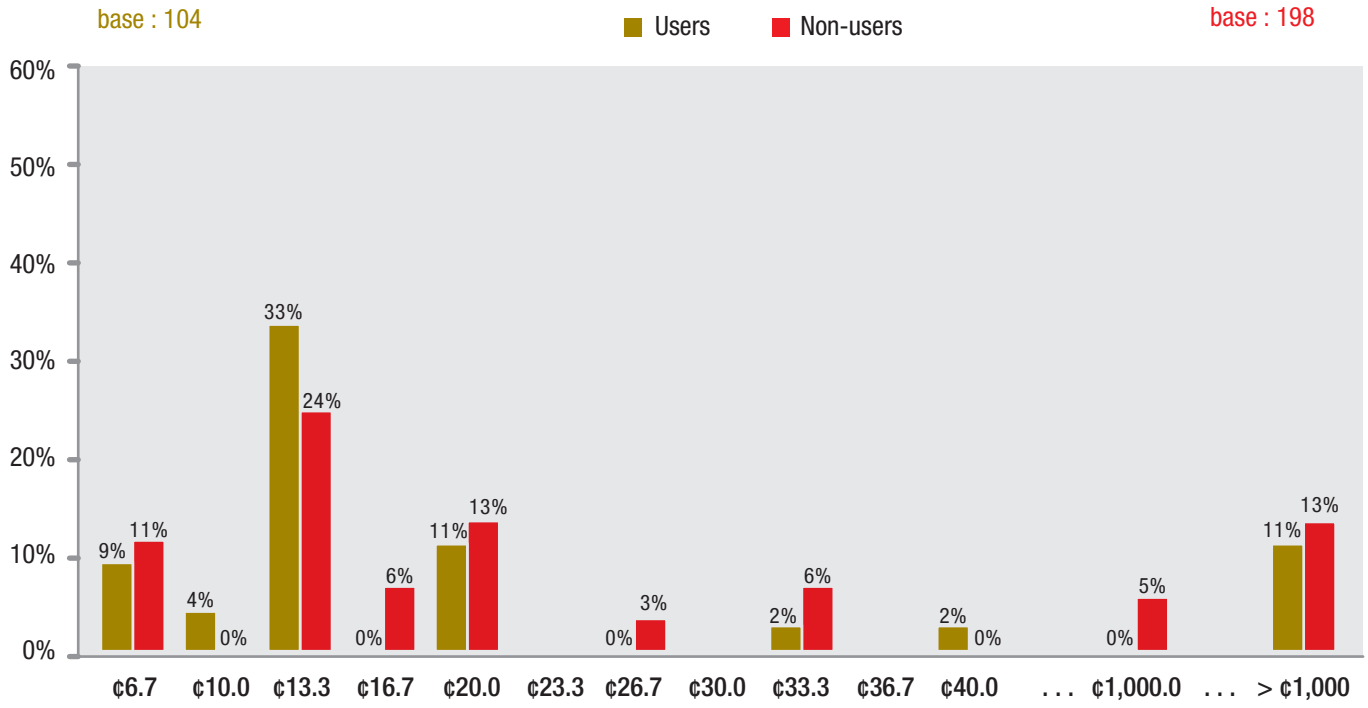


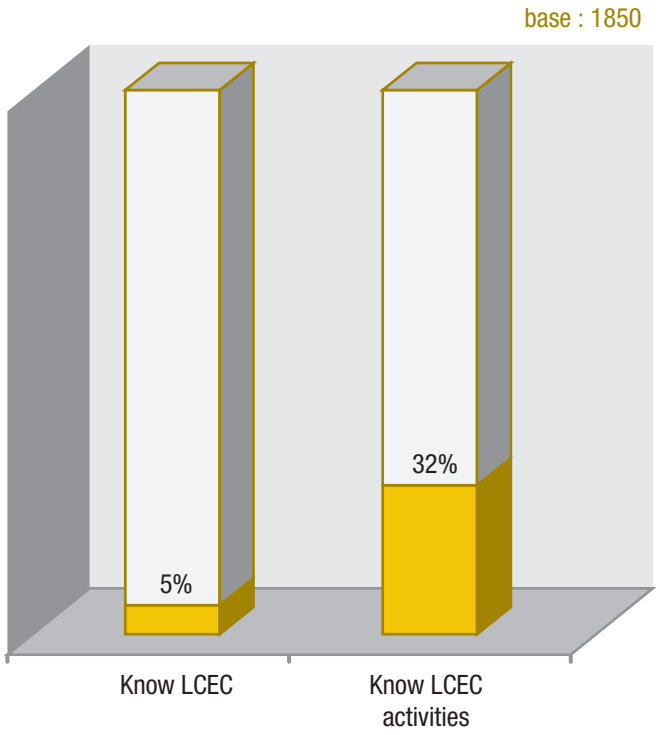
Figure 63: Lowest acceptable feed-in tariff in USC per kWh (Residential users)



1.11 Awareness of LCEC

Only 5% of the residents were aware of LCEC and a larger proportion of 32% of residents were aware of LCEC's initiatives & activities.

Figure 64: The awareness level of LCEC activities and projects (Residential users)



1.12 Key Extracts

- Current household practices indicate that the most commonly used water heating method is the usage of electric water heaters, used mainly in early mornings and late afternoons.

- Central heating relies heavily on diesel followed by electricity for thermal energy generation.

- Being faced with high cut-off hours, respondents mostly rely on generators, specifically through subscriptions. The majority of residences (70%) are subscribed to private generators, while 7% have their own generators, 11% use UPS systems and 22% have no back up.

- Having a generator costs around $3,000 as an investment and requires a running cost of around $175 a month to cover fuel and maintenance costs.

- Having a UPS/APS system costs around $400 as an investment and requires a running cost of around $70 a month to cover maintenance costs.

- Generator subscription capacity ranges between 5 Amps and 20 Amps for residential users, with 73% of subscriptions having 5 Amps, and 21% having 10 Amps, which incurs additional monthly expenses averaging at $81.

- EDL bill varies by month with an average of $43, perceived as slightly expensive with a 2% above average, however, the highest proportion of respondents have not thought of solutions to reduce their current electricity bills. Only 28% thought of solutions such as SWHs, energy efficient lighting, and energy consumption reduction.

- The perceived breakdown of the electricity bill highlights that it is mostly composed of lighting, followed by water heating.

- Awareness of SWH came out to be particularly high with 94% of residential users aware through word of mouth, advertisements and newspapers. However when it comes to current usage of SWH, up to 15% of the sample came out to be users.

- An average residence has a collection area of 5.64 s square meters for a capacity of 359 liters, with 92% on installations in permanent residents 63% using flat plate collectors technologies.

- Residential users of solar water heaters are very satisfied with a satisfaction rate of 87%, and a willingness of 97% to recommend to a friend.

- Reasons for satisfaction include availability of hot water all the time, electricity bill reduction, and environmental impact, while major reasons for dissatisfaction included operational and aftersales issues.

- Non-users say that the high cost and low priority of SWH are the major reasons behind their decision. The lack of roof space is also a major reason with 30% saying they do not have an exposed roof, and 13% of those who have an exposed roof do not have enough space.

- Residential SWH users say that the SWH saves 42% of their electricity bill, and see a price of $1,114 reasonable. While non-users estimate a saving of 35% and see a system price of $686 reasonable.

- The majority of SWH owners paid in cash, while 62% of non-users would prefer dealer payment facilities.

- Cost of SWH was considered as the most essential decision-making factor for non-users, while those who own a SWH see the electricity saving and the functionality of the system as priorities.

- Renewable energy awareness is not very common among residential users, with only 21% aware of other technologies such as wind energy and hydro power.

- Awareness of PV did not exceed 32% of the users with only 4% using this technology, mainly because of the high cost, maintenance requirements and roof space.

- Residential PV and SWH users say that the SWH saves 56% of their electricity bill, and see a price of $2,157 reasonable. While non-users estimate a saving of 53% and see a system price of $1,683 reasonable.

- None of PV users wish to get grid connection, while those willing to install tend to prefer net metering of feed-in tariff.

- The majority of residential users require a fee of 13 USC per kWh as feed-in tariff.

Chapter 2:
Commercial End-users

KEY INFORMATION AREAS

- Awareness, perceptions & attitudes of commercial users towards renewable energy
- Thermal energy consumption patterns & willingness to pay
- Consideration & preferences of commercial non-users
- Current consumption patterns & perceptions after trial of SWH users
- Satisfaction levels of commercial SWH users

KEY STATISTICAL FACTS

	Size	Size
Sample Size	110	N/A
Interview Attempts	188	59%
SWH Users	12	11%
SWH Non-Users	98	89%

SAMPLE PROFILE

Commercial end-users were interviewed from different business lines and different regions of the country. The majority was from the trade and industrial sectors, and was mainly present in Mount Lebanon and Beirut as shown in Figure 65 and Figure 66.

Figure 65: Business lines of surveyed users (Commercial users)

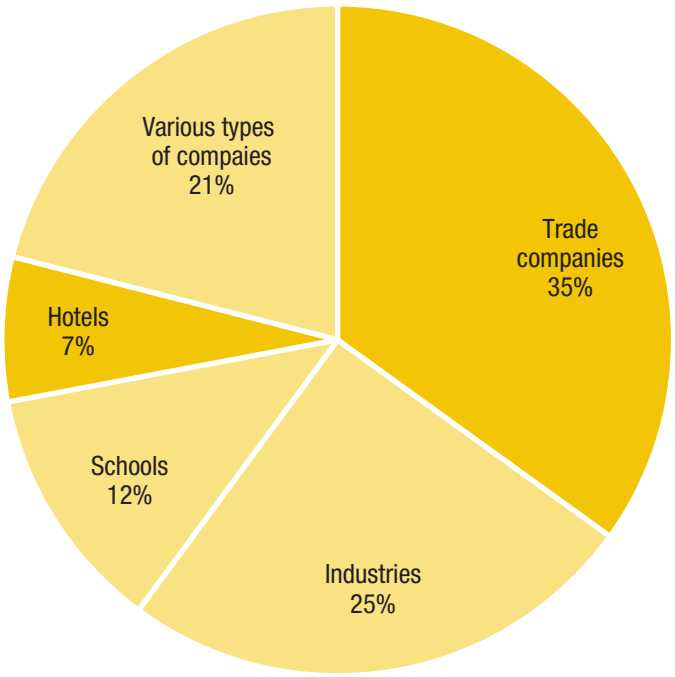
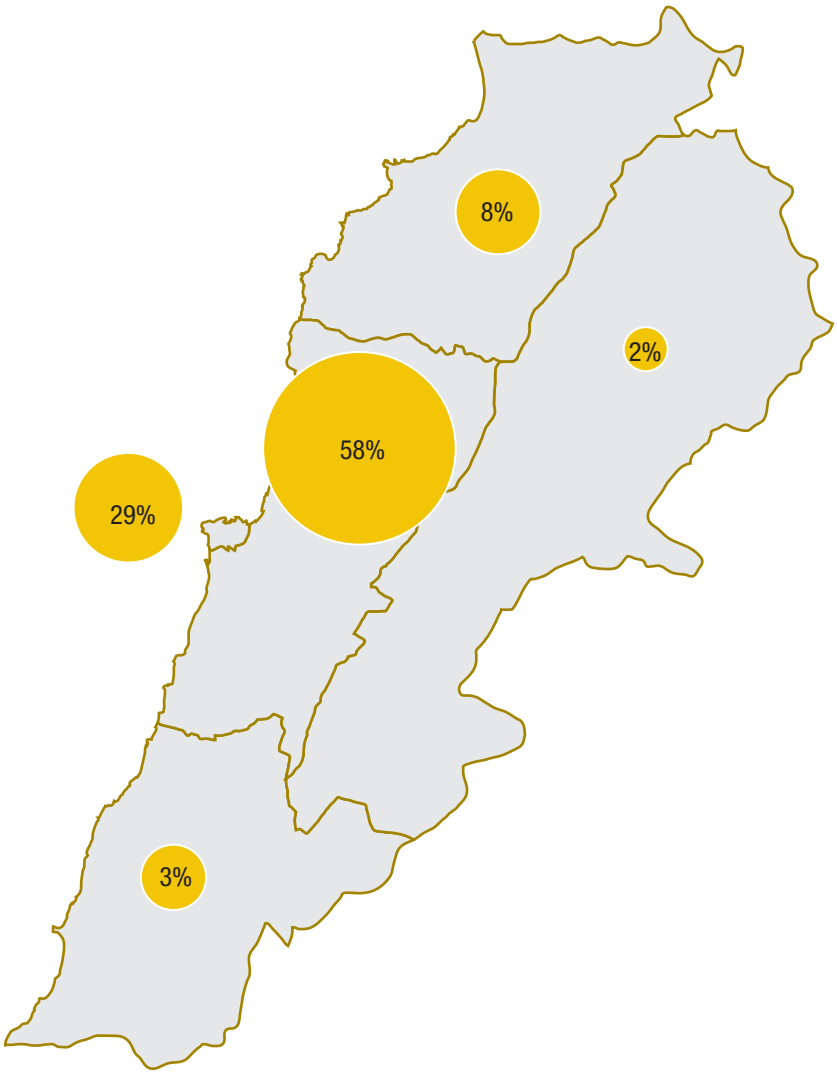


Figure 66: Geographic distribution of surveyed users (Commercial users)



As for the size of the commercial users, the majority of the buildings were composed of 1 floor and going up to more than 7 floors with an average of 3 floors, making an average surface area of 2,337 square meters per facility with most of the buildings falling in the range of less than 600 square meters.

This survey included small as well as medium and large size companies ranging from 4 to more than 200 employees having an average of 59 employees per company.

Figure 67: Average building floors (Commercial users)

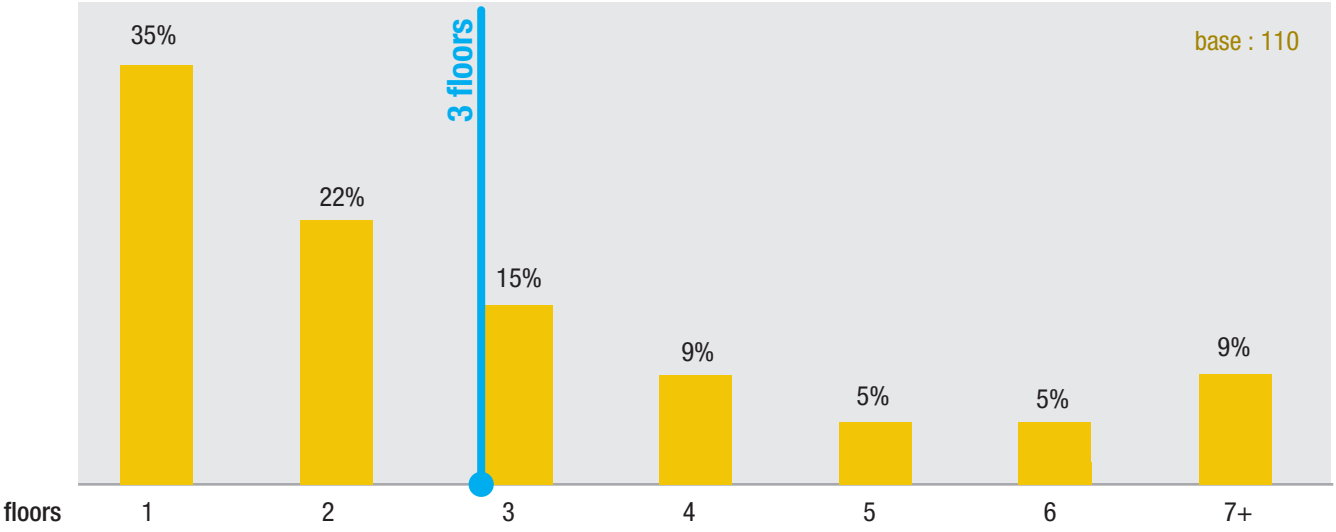


Figure 68: Average building surface area (Commercial users)

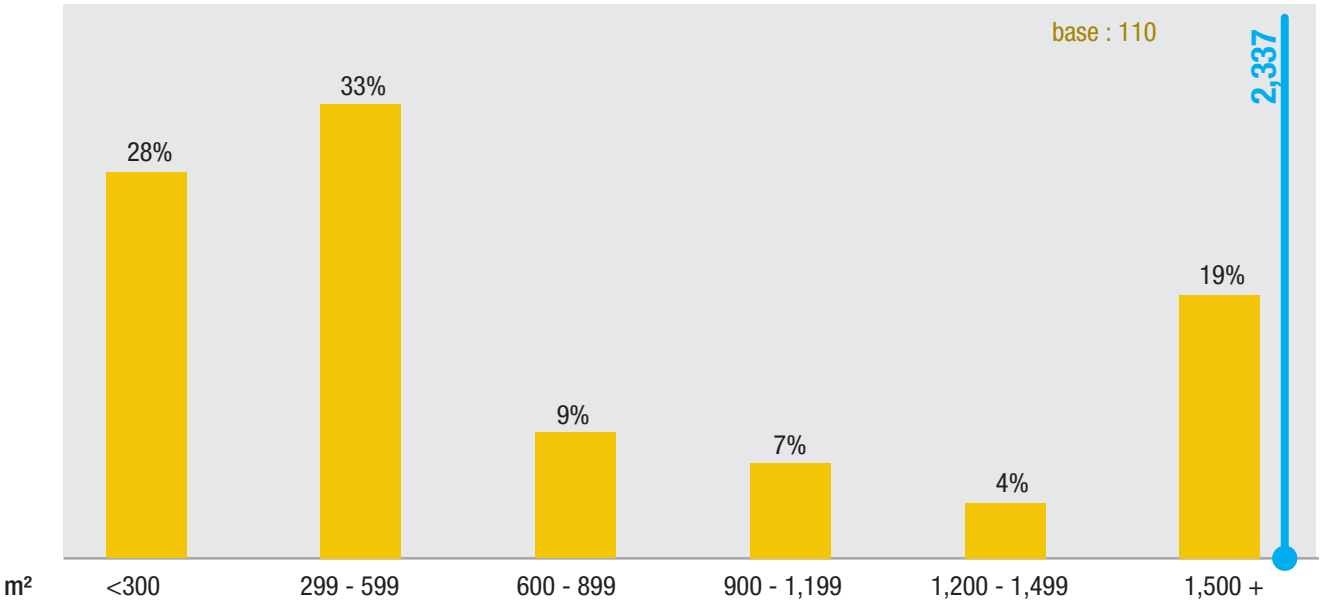
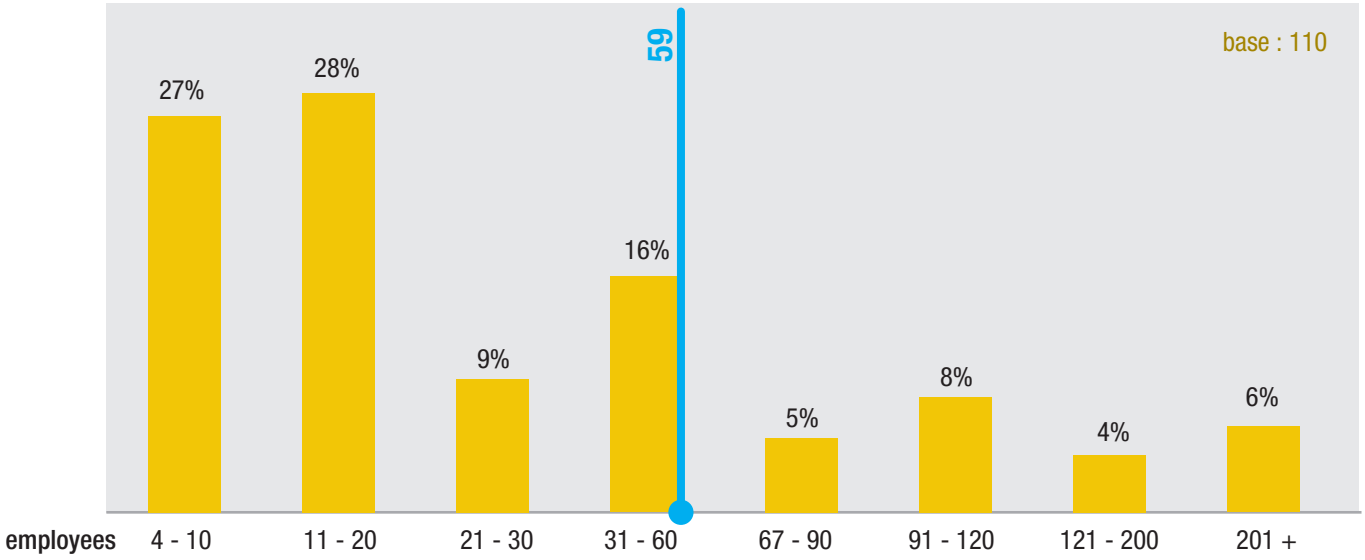
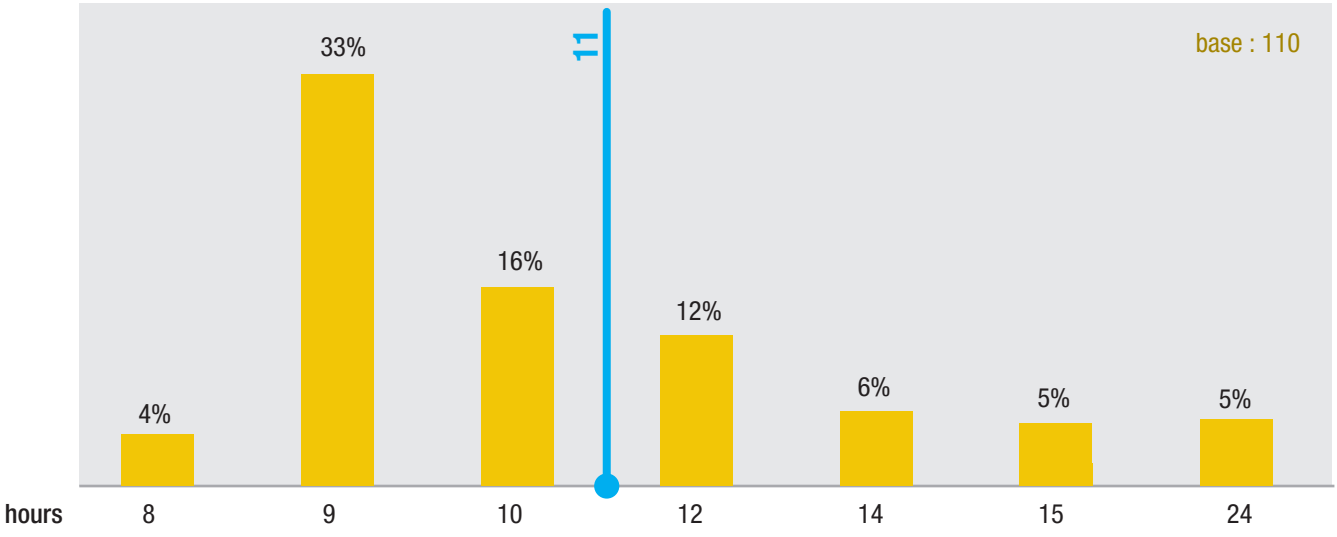


Figure 69: Average number of employees (Commercial users)



The majority of interviewed commercial facilities operate for 9 hours a day with others ranging from 8 to 24 hours at an average of 11 hours daily.

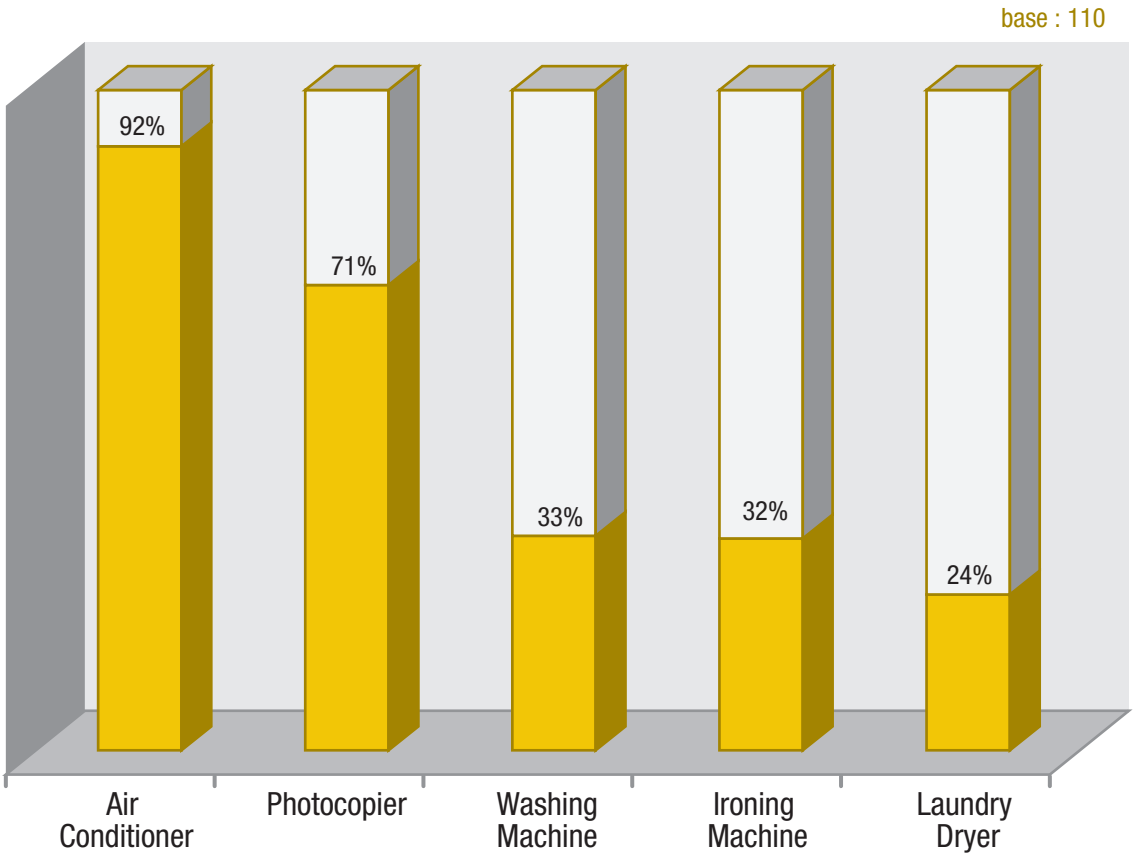
Figure 70: Average daily working hours (Commercial users)



2.1. Usage of Appliances

The majority of users claim that the air conditioner is what they operate most during winter and summer days, followed by the photocopier, and other appliances as shown in Figure 71.

Figure 71: Frequently used electrical appliances (Commrecial users)



2.2. Hot Water Usage Patterns

The commercial facilities have shown to reply on more than one source of water supply, with water utility and wells as the major two sources.

For water heating purposes, 54% of respondents use electric heaters as their primary source, with only 11% using solar thermal technologies to heat domestic water. The use of diesel and gas has also been noted.

Taking into account all possible household usage purposes of hot water, the need for hot water is split between morning, noon, afternoon, and evening, with more needs in the morning. These needs are met through an average of 3,175 liters of hot water per day as shown in Figure 76.

Figure 72: City water supply sources (Commercial users)

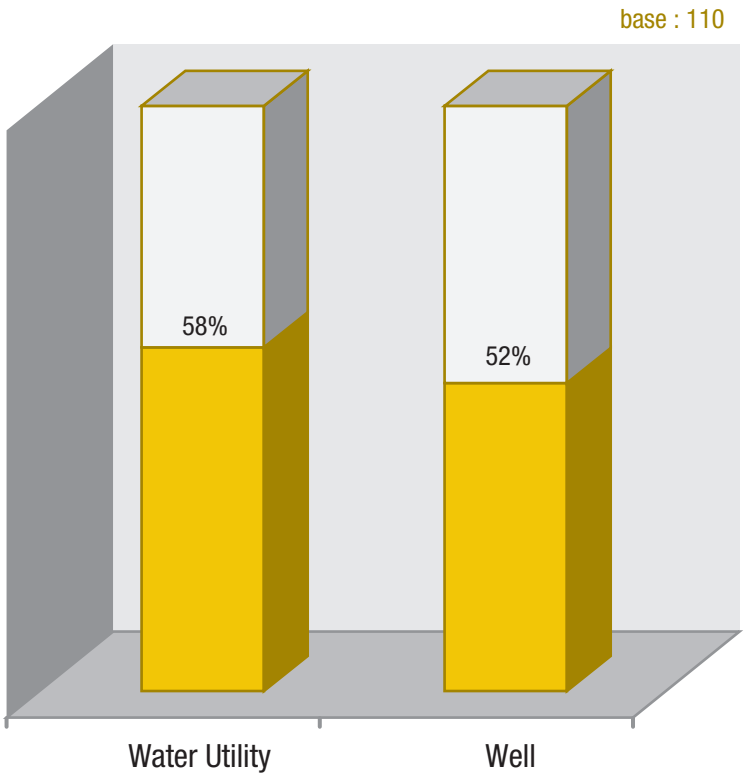


Figure 73: Domestic water heating methods (Commercial users)

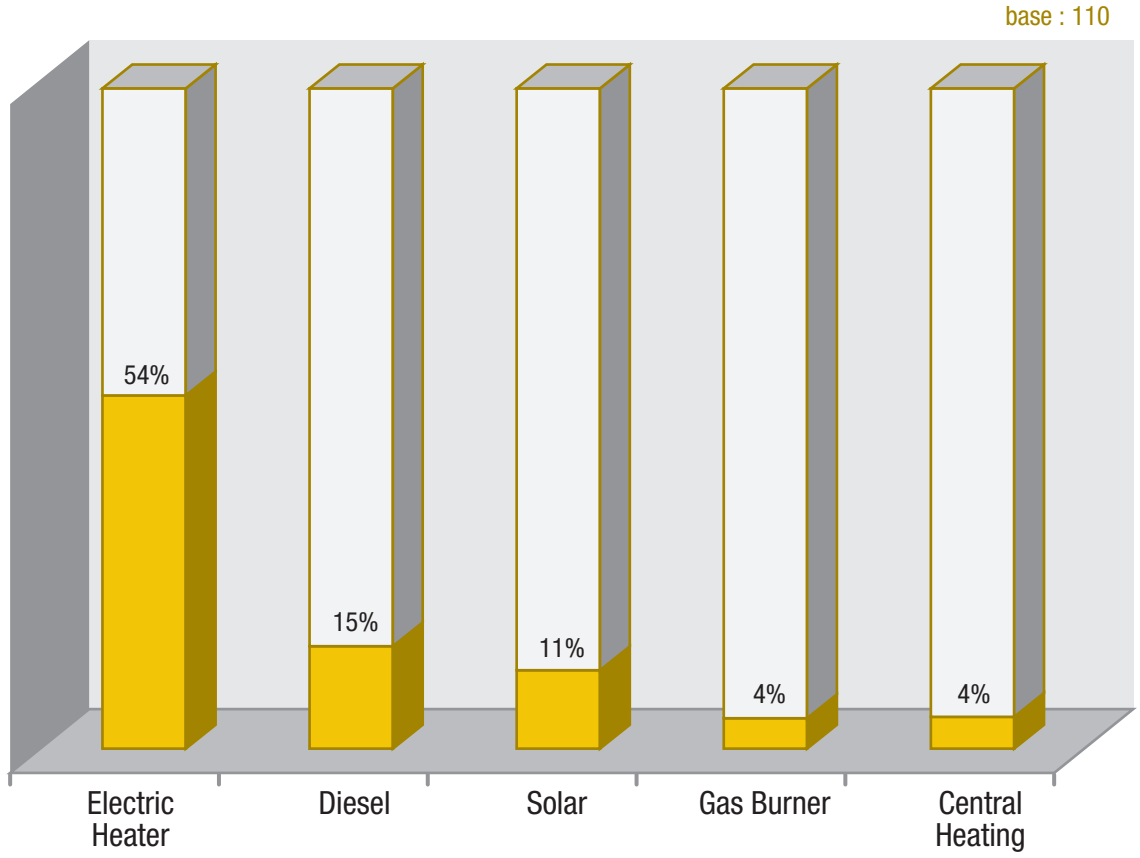


Figure 74: Major domestic hot water needs other than shower needs (Commercial users)

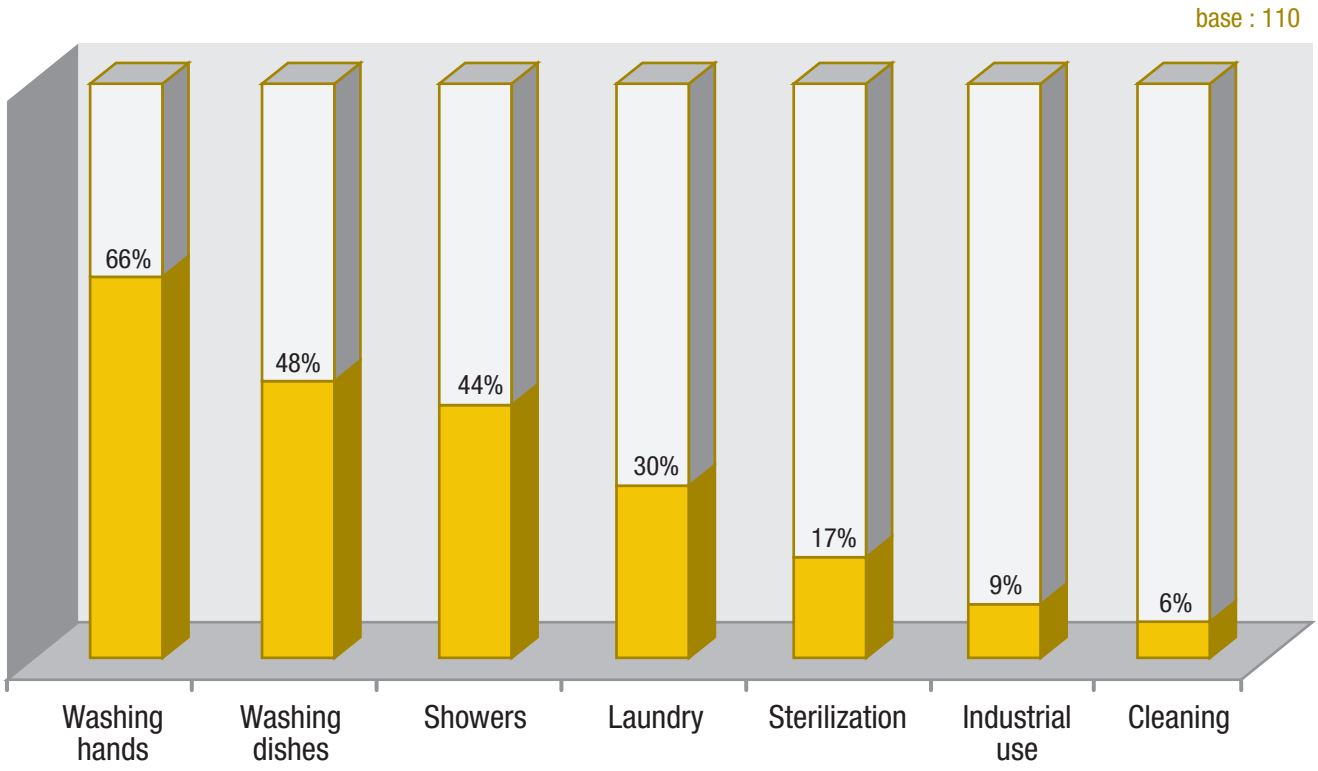


Figure 75: Times of domestic hot water need (Commercial users)

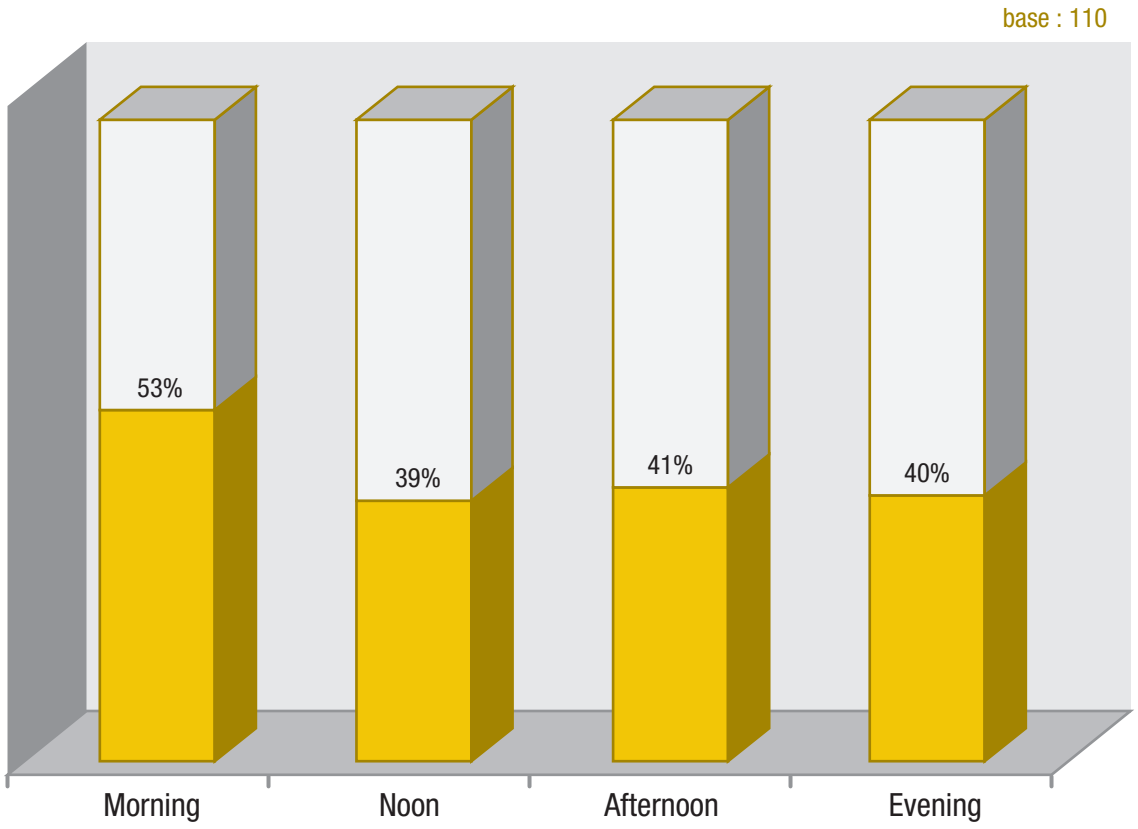
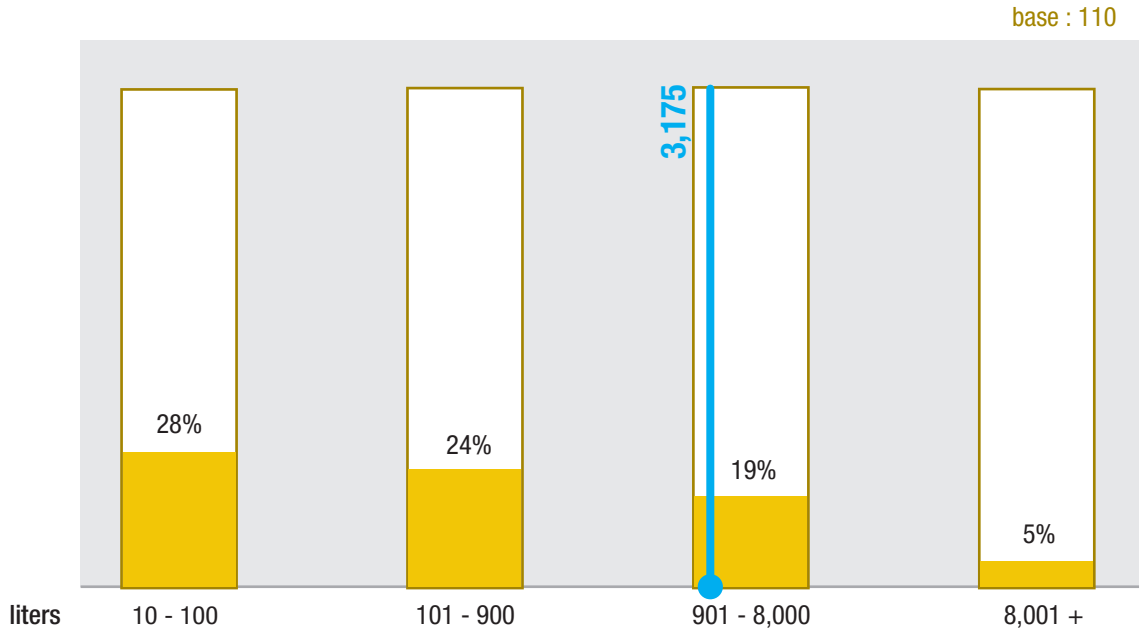


Figure 76: Average hot water capacity installed (Commercial users)



2.3. Central Heating Patterns

The survey reveals that 62% of commercial users prefer using electric heaters for space heating, followed by central heating with 23% using diesel or electric heating, which is also used to cover a portion of the domestic water heating needs.

The use of central heating diminishes in the months of June to September, peaking in February and January when central heating is operated on daily basis especially in mornings and noons as shown in Figure 80 to Figure 82.

Figure 77: Space heating methods (Commercial users)

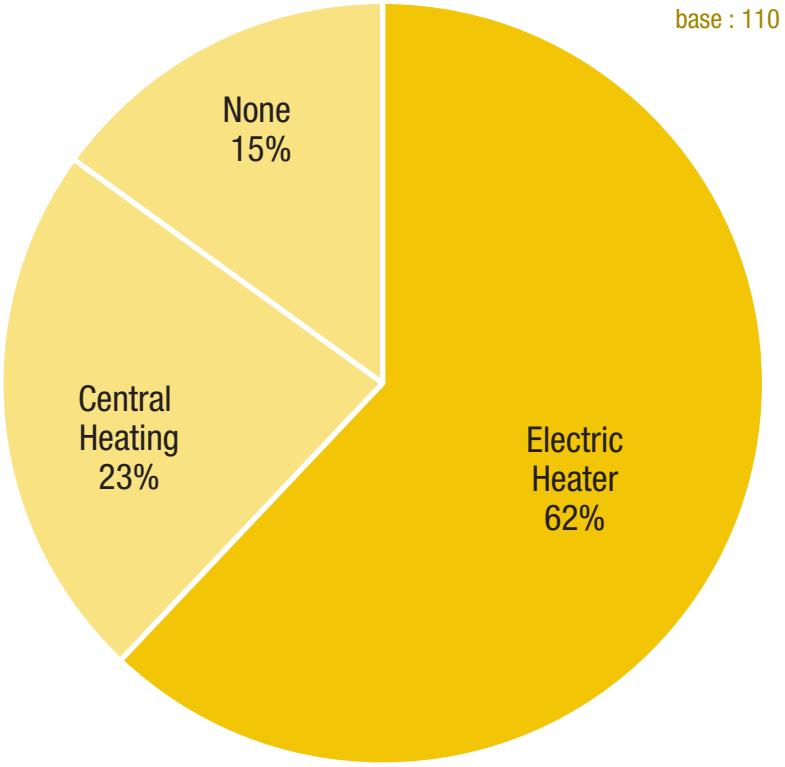


Figure 78: Central heating fuel used (Commercial users)

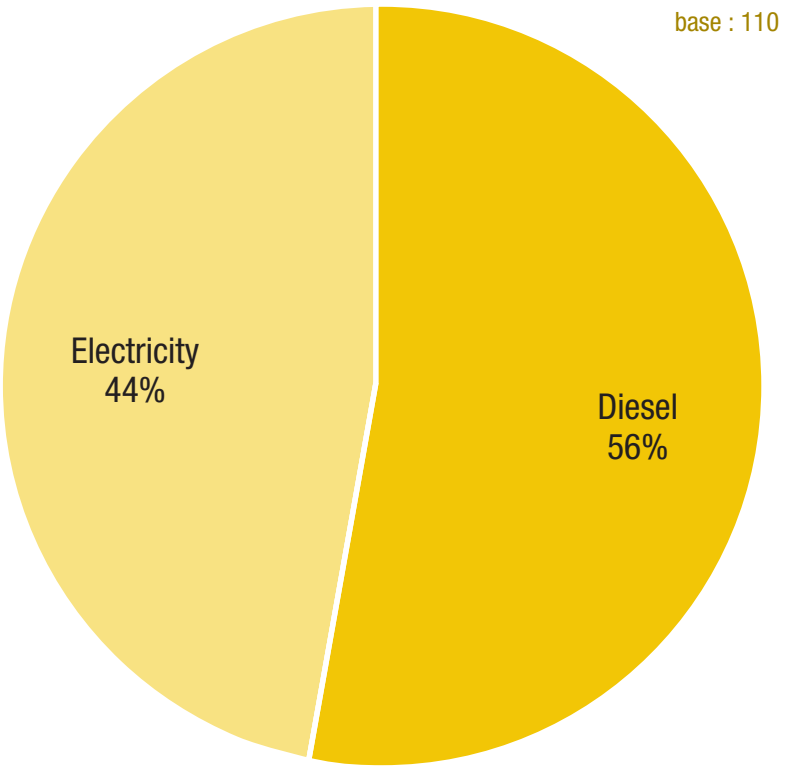


Figure 79: Other central heating needs (Commercial users)

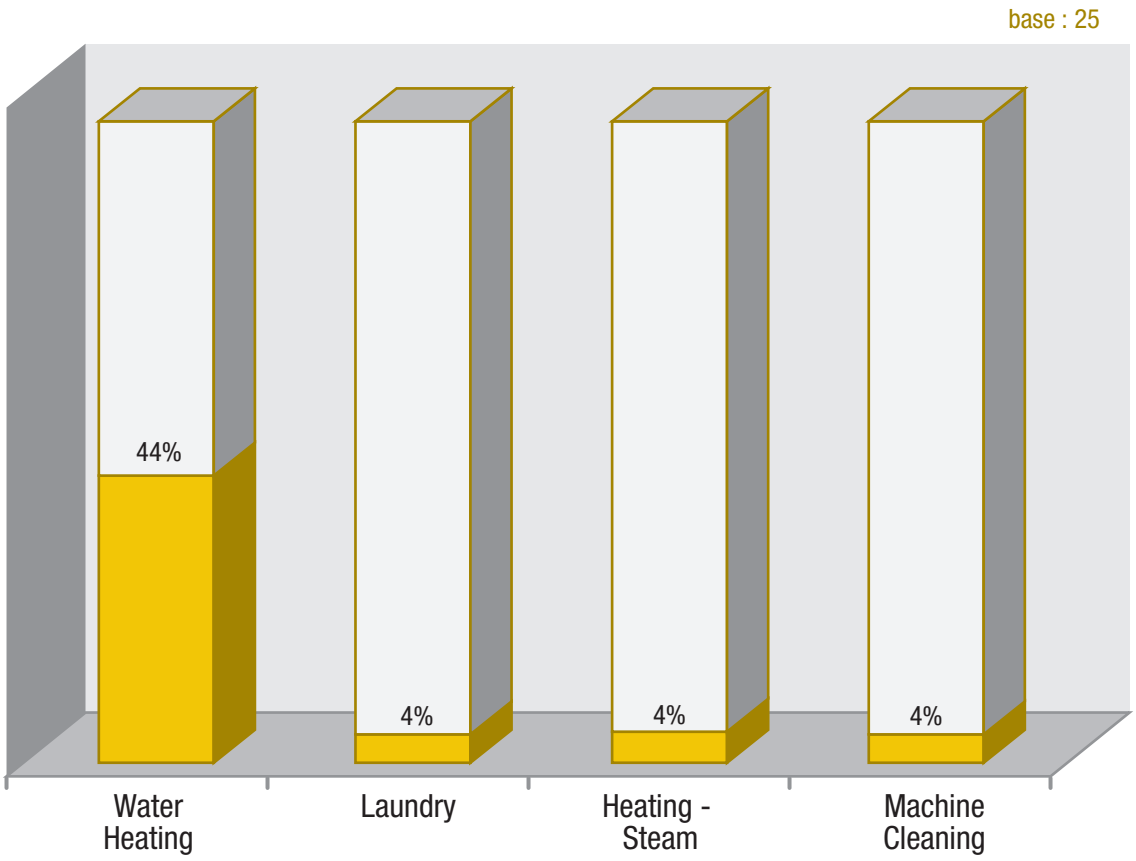


Figure 80: Users of central heating over the year (Commercial users)

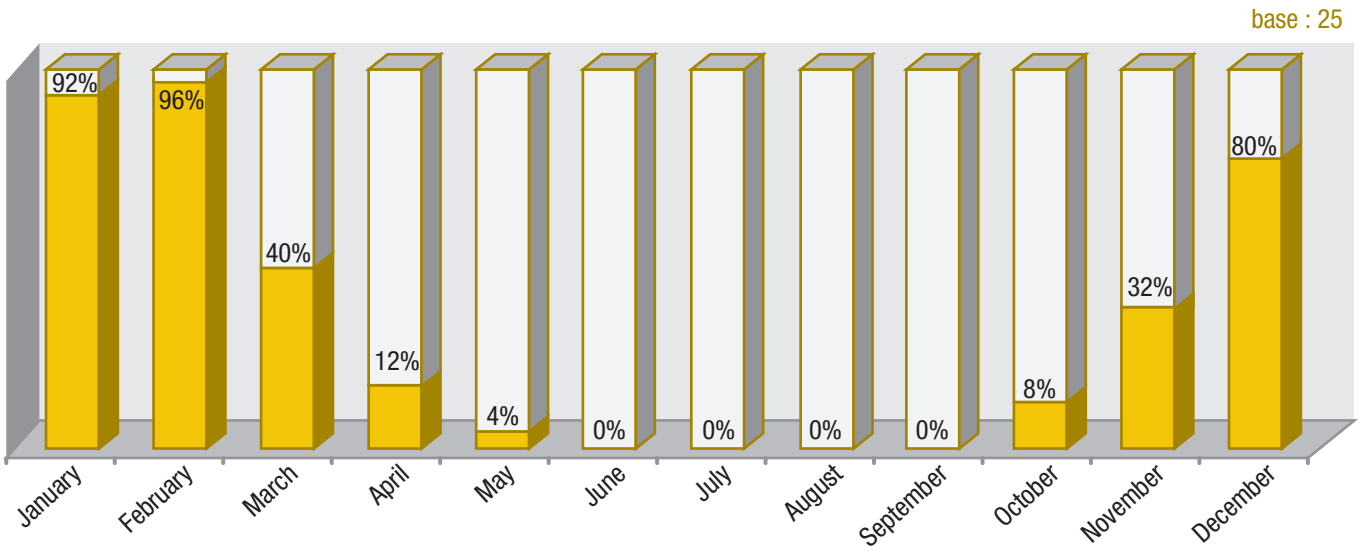


Figure 81: Usage patterns of central heating (Commercial users)

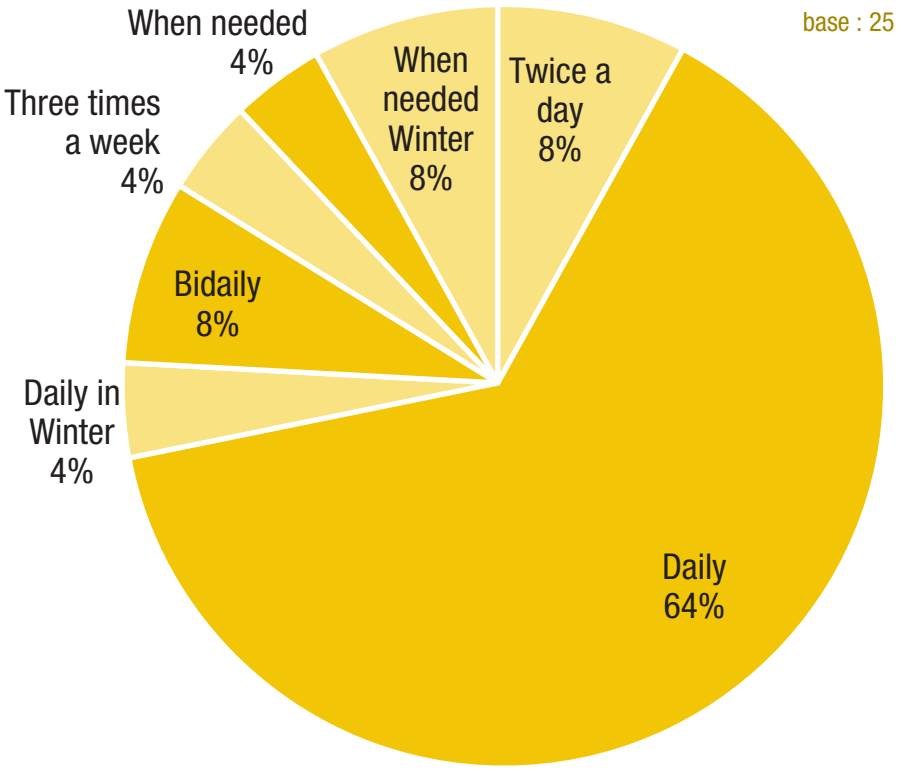
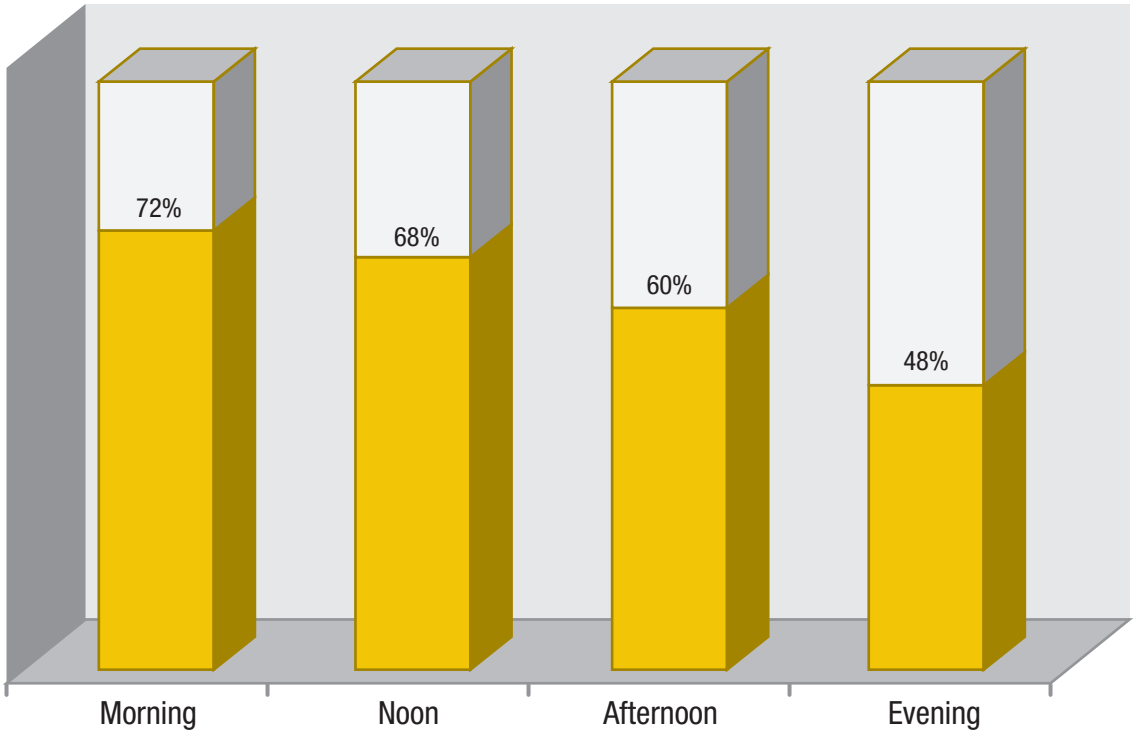


Figure 82: Times of use of central heating (Commercial users)

base : 25



2.4. Electricity Cut-off and Related Costs

Cut-off hours range from throughout the year with an average ranging between 9 to 12 hours per day according to around 40% of the sample. To cover this gap, the highest proportion of commercial facilities (76%) own their own private generation systems, with only 1% not using any backup during cut-off periods as shown in Figure 84.

A private generator costs on average around $30,000 to purchase and much more to run. Its use depends on the cut-off rate with daily usage on mornings, noon times, and afternoons being the most dominant.

The subscription capacity ranges from 5 to 20 Amperes, with the capacity of 10 Amps being the most common with 45%, followed by 20, 15, and then 5 Amps. Accordingly, the subscription rate at an average of $410.

In addition to private generator, some facilities have their own UPS and APS systems with more than 30% of the users using them to reduce fuel consumption. These systems cost an average of $5,820 as an investment and more than $1,320 per annum for maintenance.

Figure 83: Average daily cut-off hours (Commercial users)

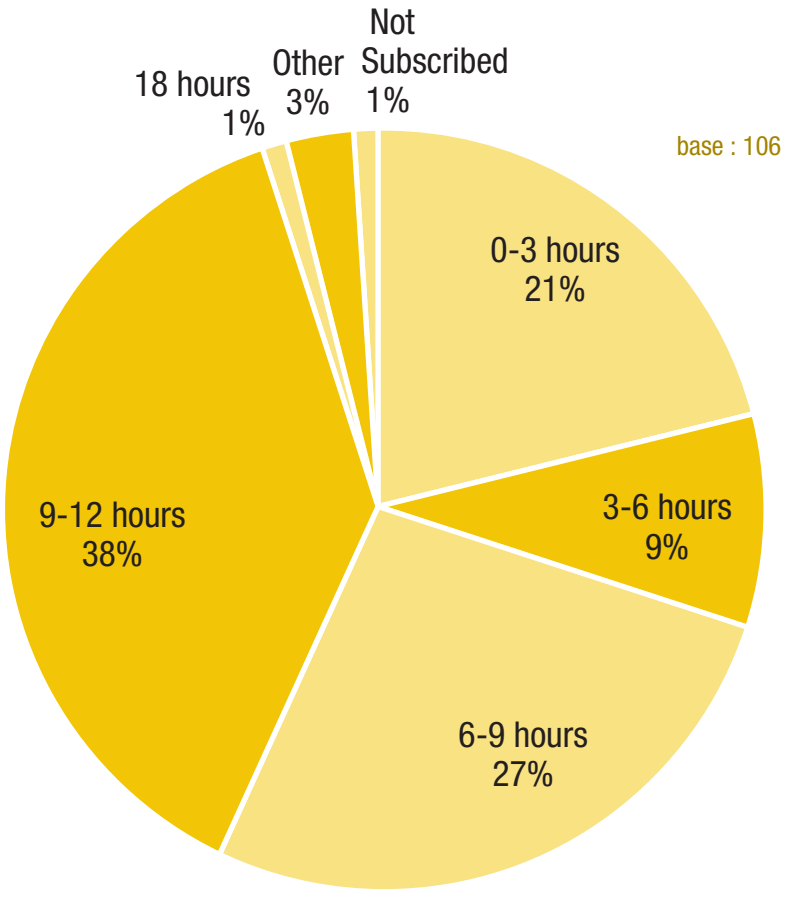


Figure 84: Usage of generator during cut-off (Commercial users)

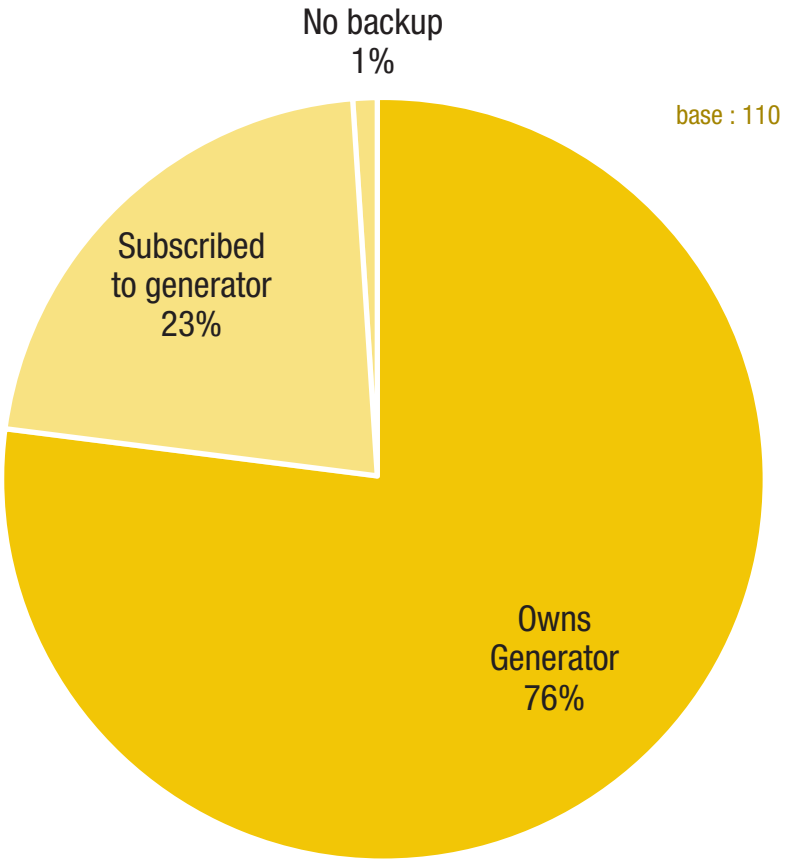


Figure 85: Purchase cost range and average of private generator (Commercial users)

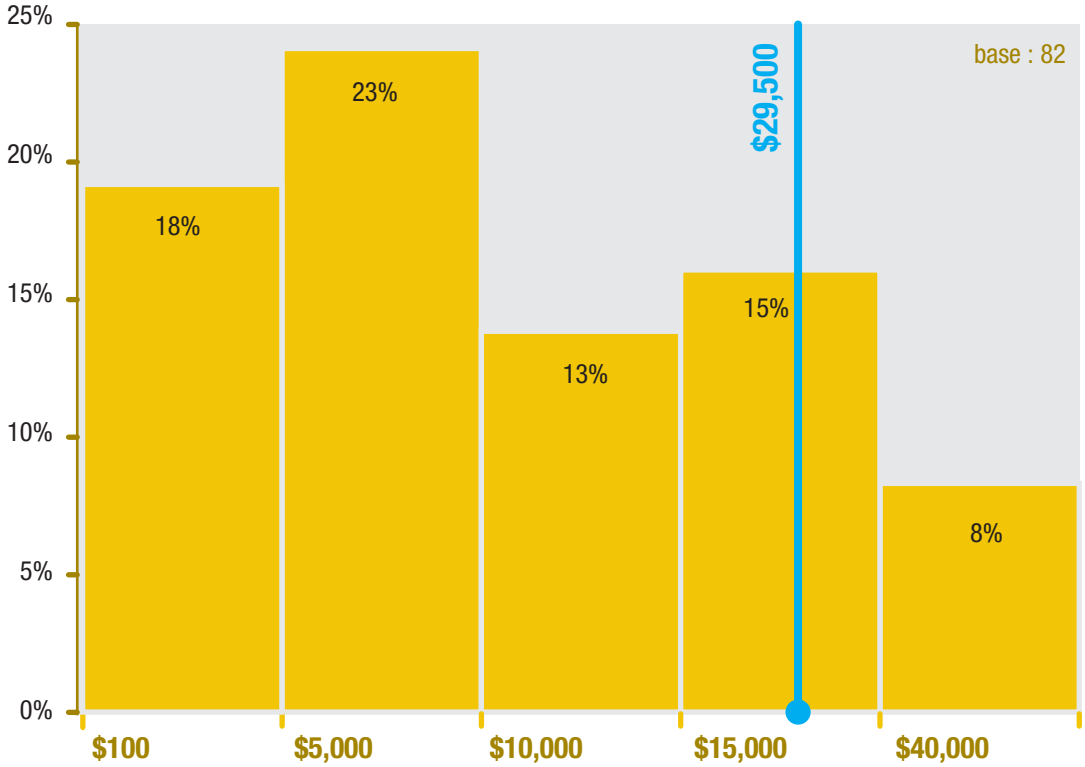


Figure 86: Frequency of private generator activation (Commercial users)

base : 82

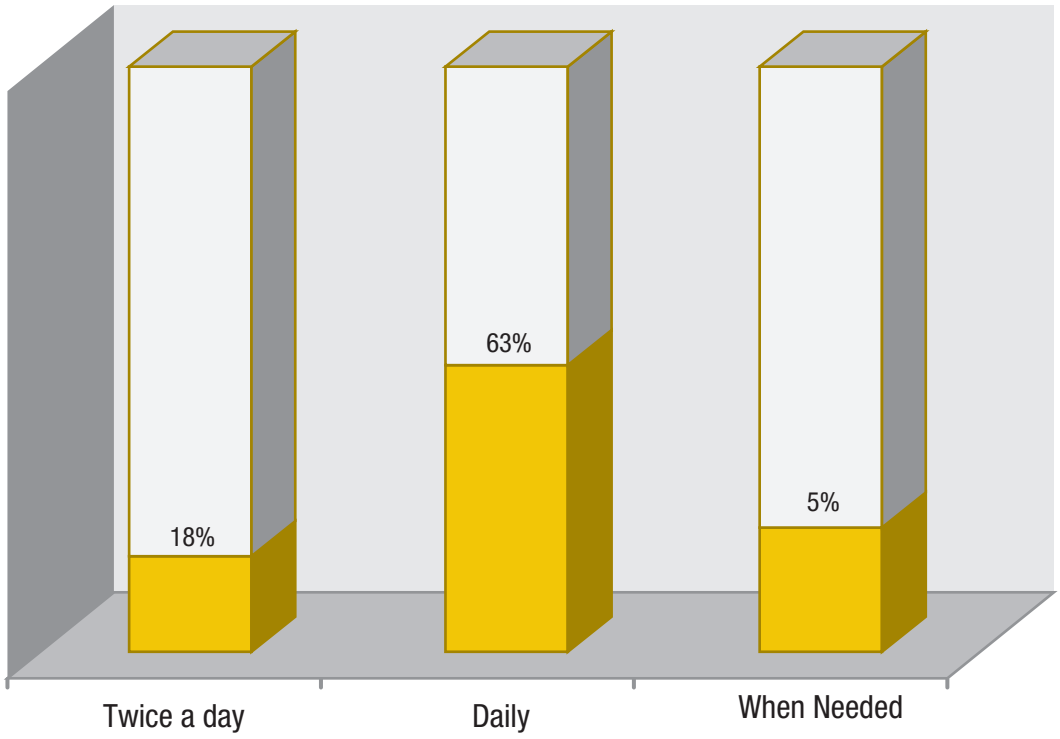


Figure 87 Frequent time of private generator activation (Commercial users)

base : 82

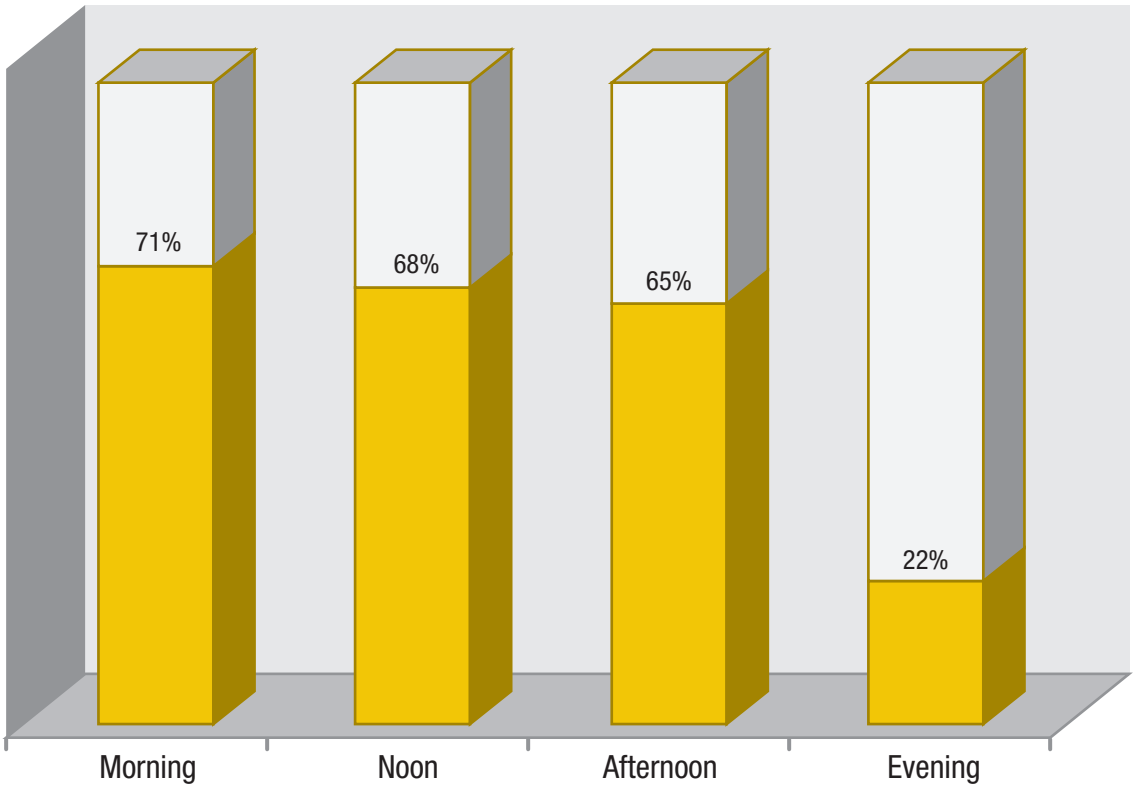


Figure 88: Generator subscription capacity (Commercial users)

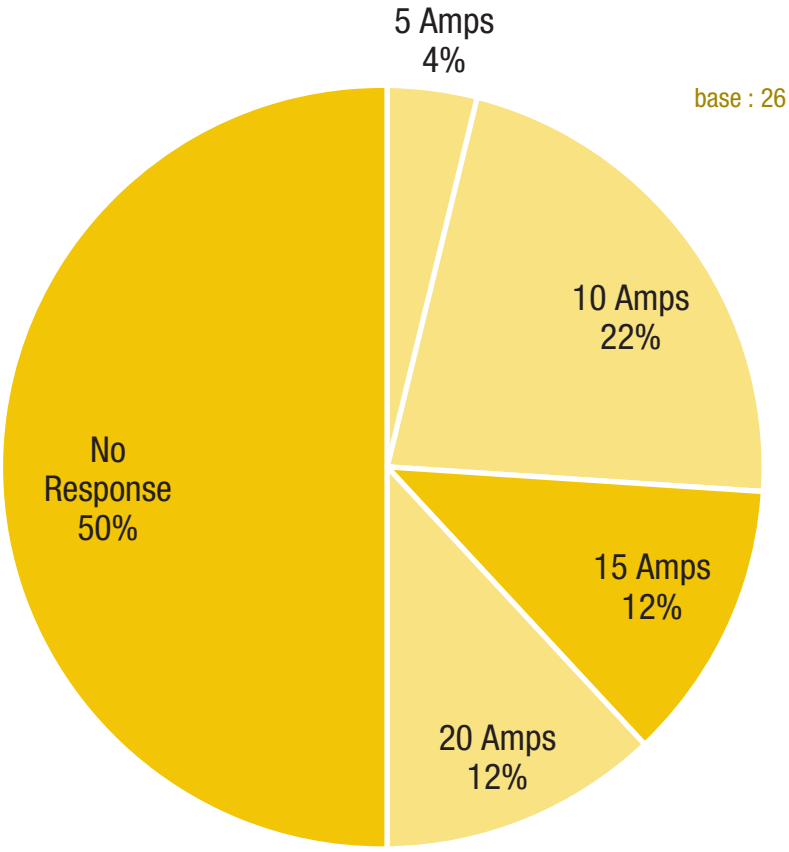


Figure 89: Subscription rate range and average (Commercial users)

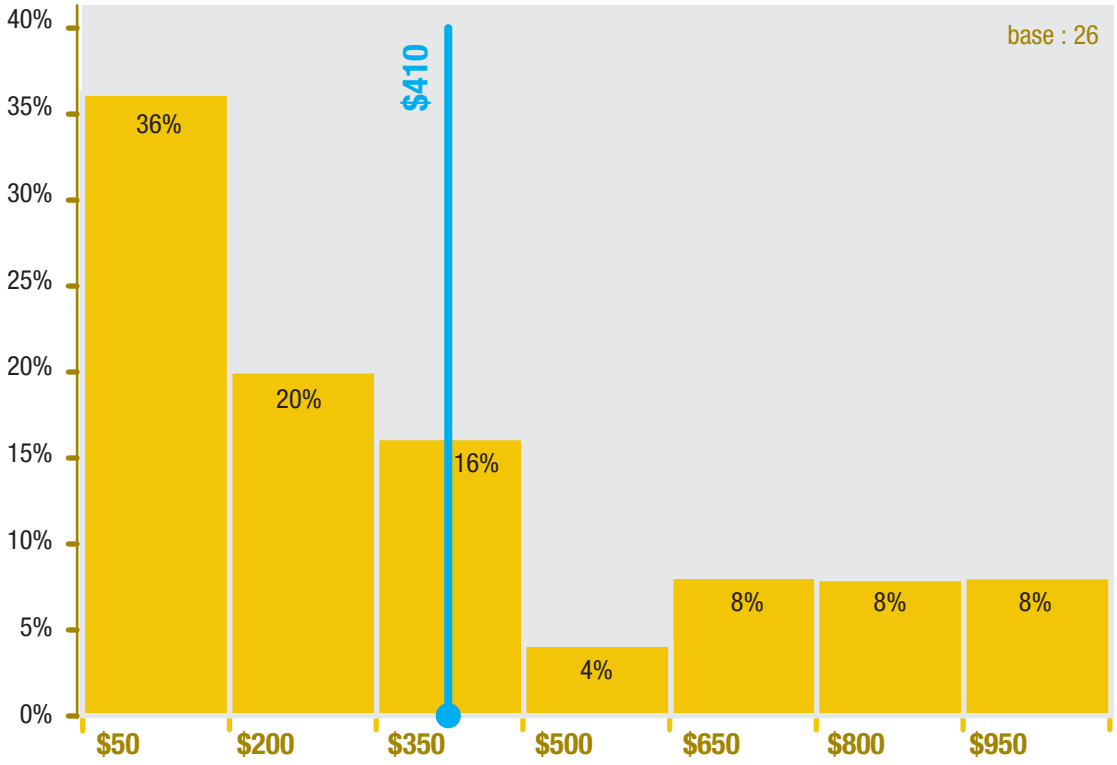


Figure 90: Availability of another backup system (Commercial users)

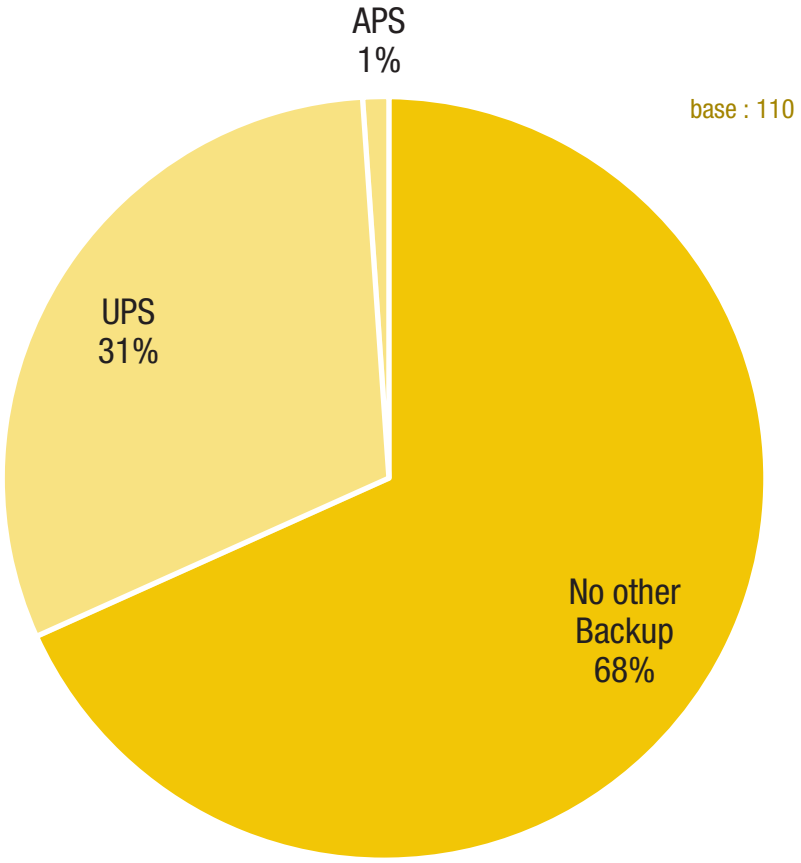


Figure 91: Purchase cost range and average of APS/UPS (Commercial users)

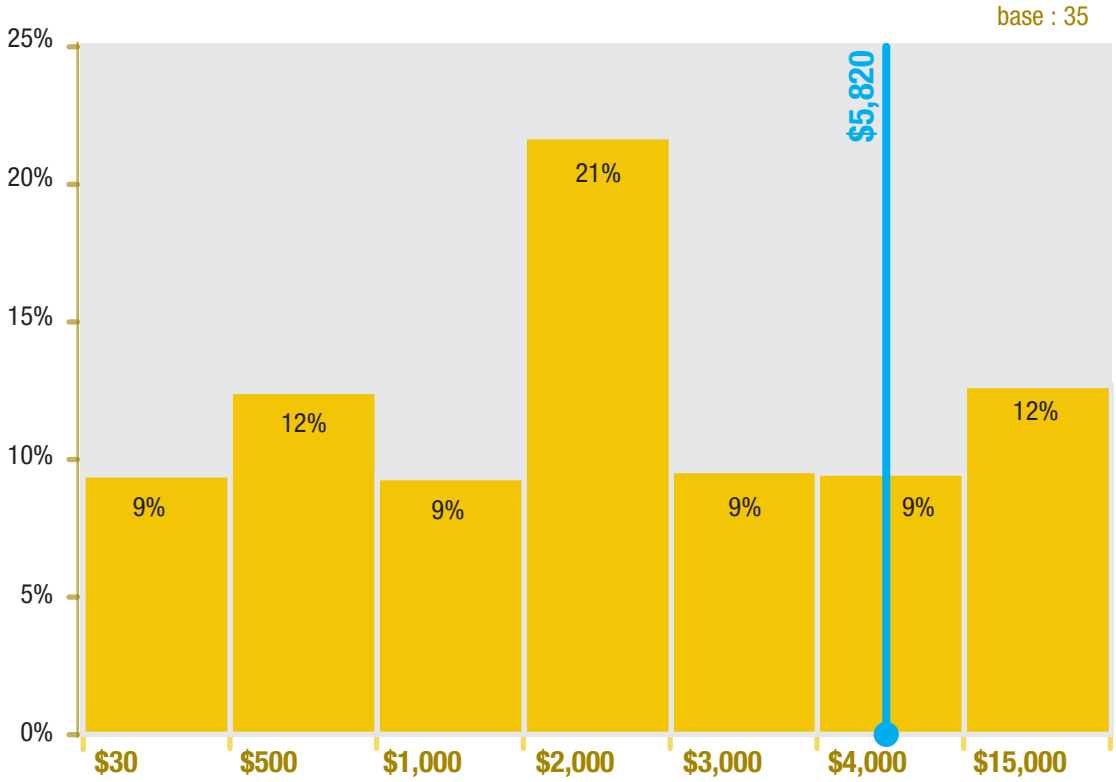
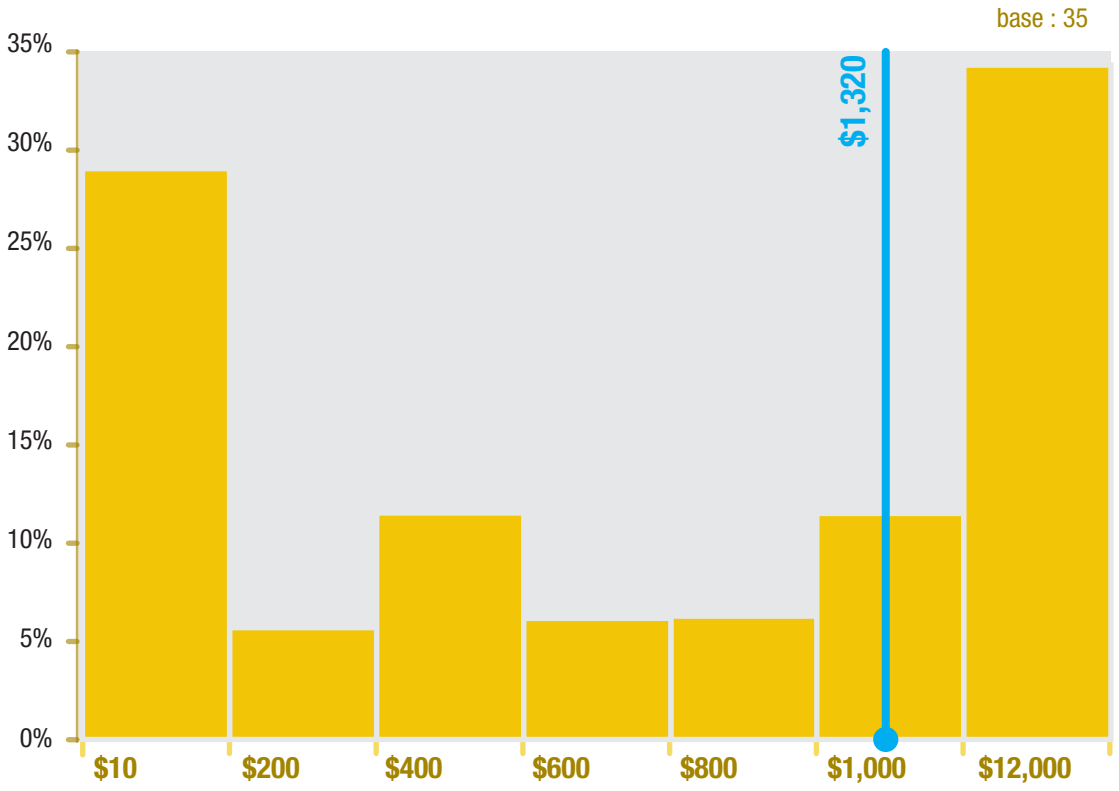


Figure 92: Running annual expenses and average of APS/UPS (Commercial users)



2.5. EDL Electricity Usage Patterns

According to more than 70% of the commercial users, the EDL bill is expensive and probably overpriced, with only 3% of the respondents think that the tariff is inexpensive.

The majority of facilities have their monthly bills in the range of $25 to $500 with some reaching more than $4,000 leading to an overall average of $3,110.

This bill is broken down into four major categories as seen by the end-users, who claimed that utilities make up the highest split from the electricity bill, followed by lighting as shown in Figure 94.

Figure 93: Average EDL bill (Commercial users)

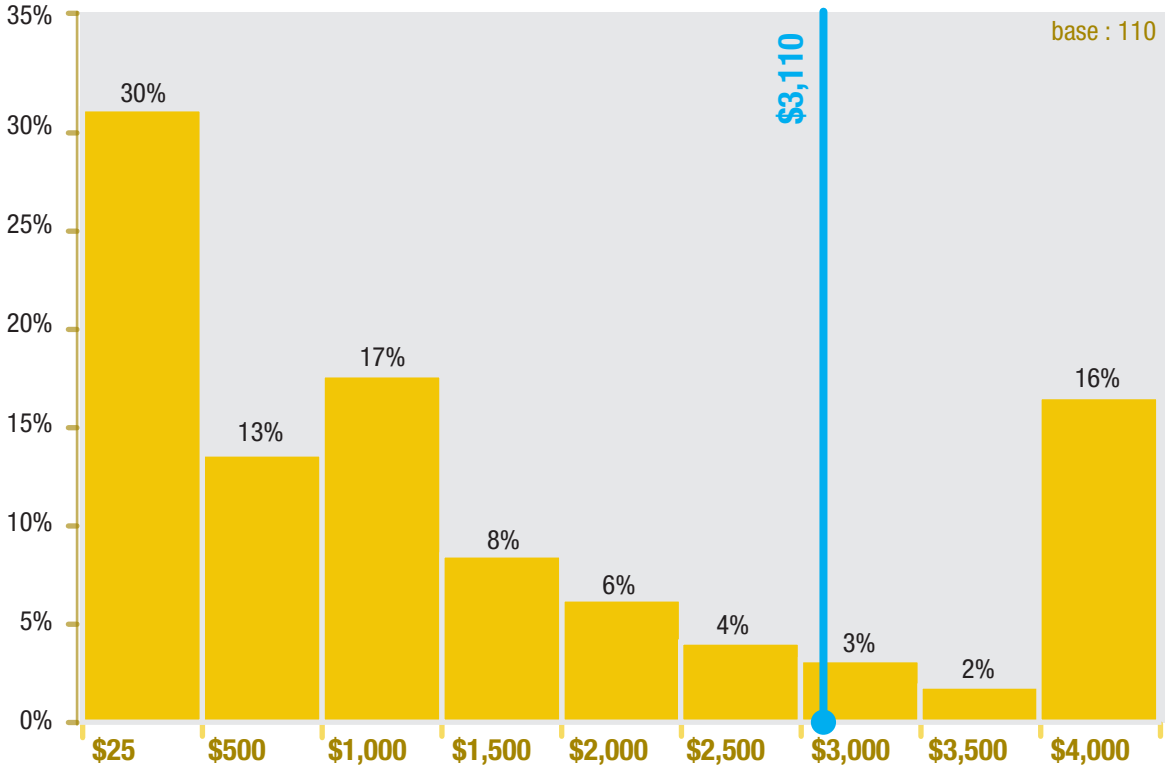


Figure 94: Users perception of electricity bill breakdown (Commercial users)

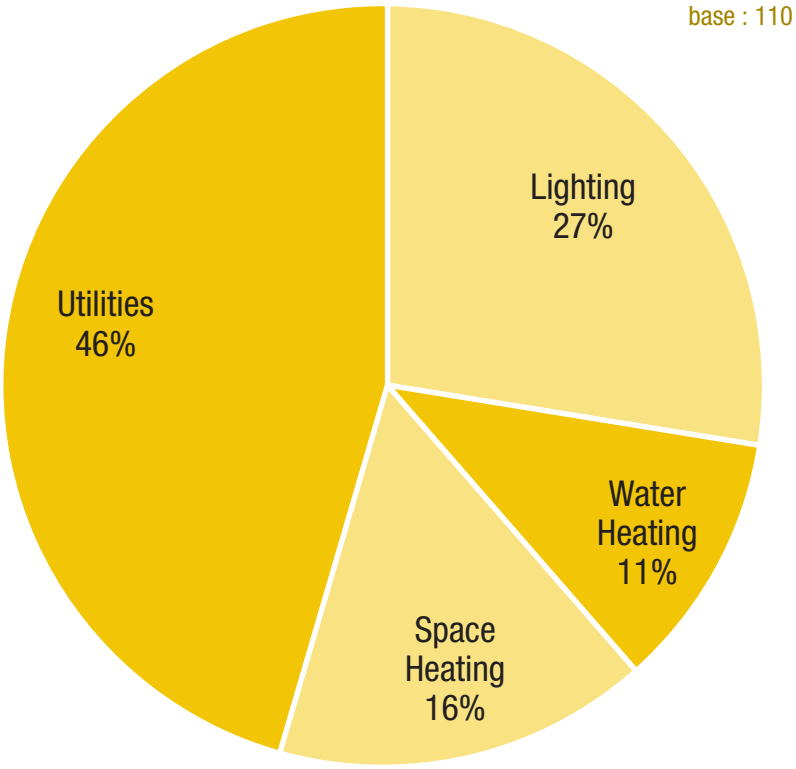
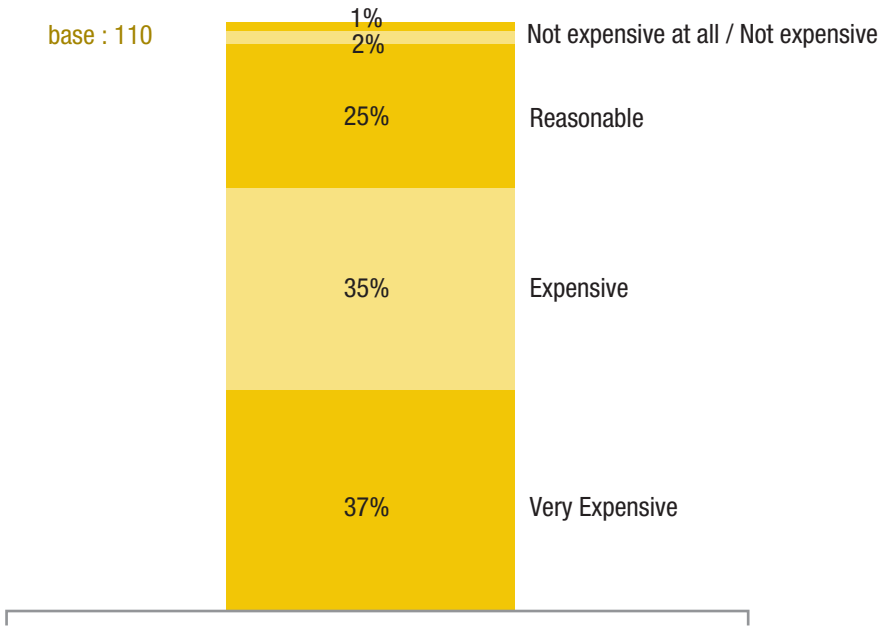


Figure 95: Perception of EDL electricity bill (Commercial users)



2.6. Awareness & Usage of SWH

It is controversial that 72% of the commercial users complain about the expensiveness of the EDL bill, but only 38% of the users have considered solutions to reduce their consumption. In total, around 16% of the commercial users have thought of solar water heaters and considered installing such a system to save on their expenses.

The survey has revealed that 99% of the population are aware of solar water heaters while only 11% actually use them.

Figure 96: Solutions considered to reduce electricity consumption (Commercial users)

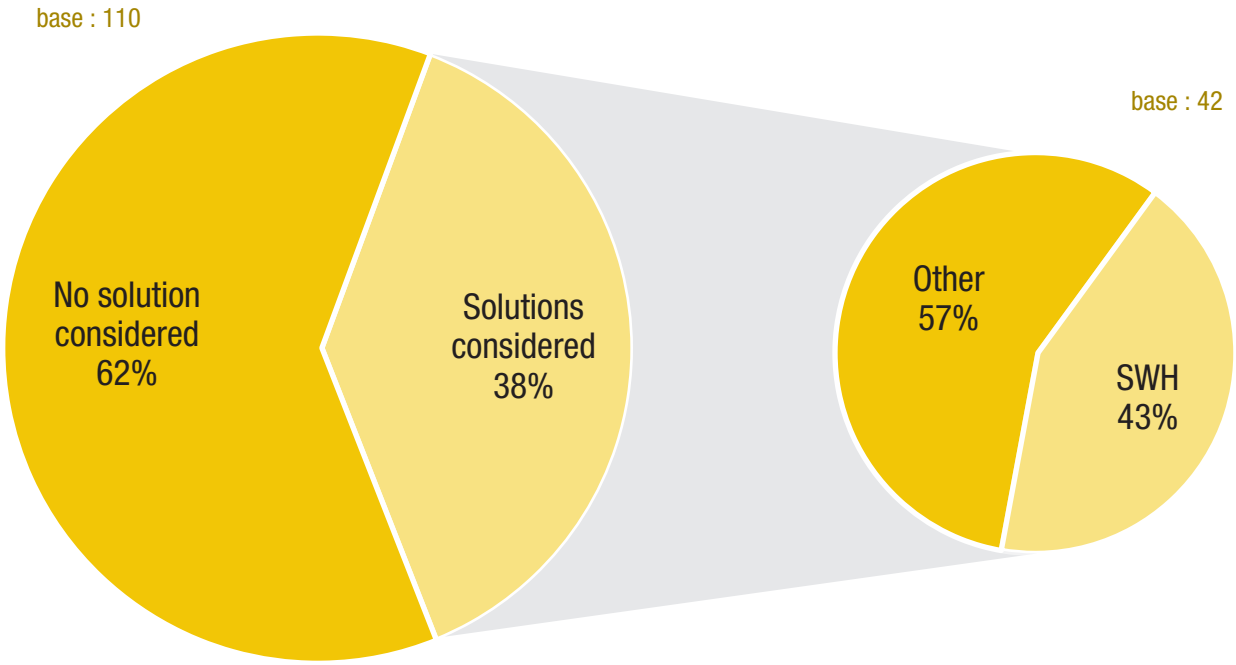
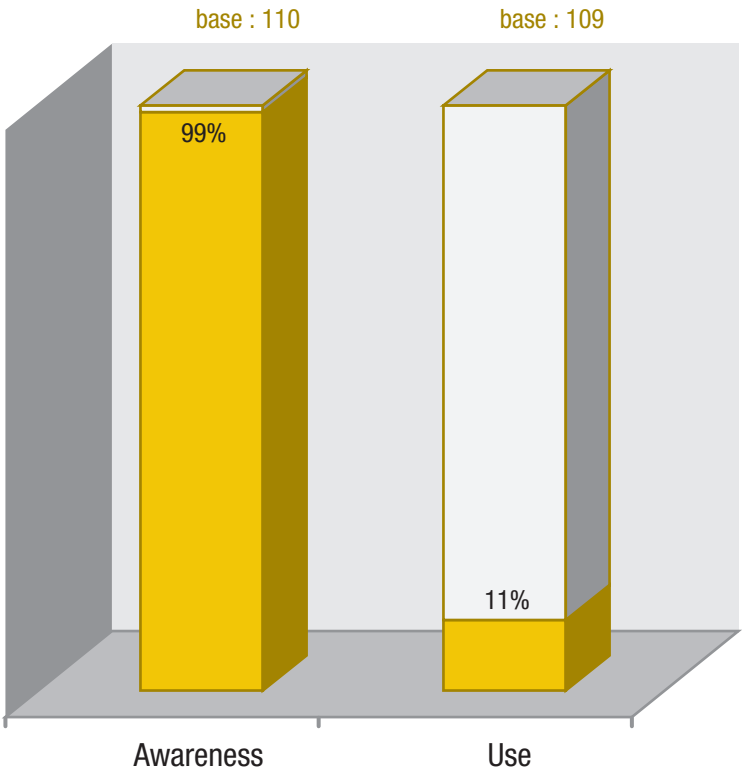


Figure 97: Awareness versus use of solar water heaters (Commercial users)



2.7. SWH Installations and Perceptions

Around 11% of the respondents have installed a solar water heating system, most of which were installed 2 to 5 years since the survey was conducted. The majority of the systems installed are evacuated tubes at an average collection area of 47 square meters per system. This has an average of 1,833 liters per facility.

Commercial systems seem to have less installation and aftersales issues. Only 8% of users have experienced operation problems, leading to an overall satisfaction rate exceeding 70% as shown in Figure 103.

The major reasons behind this high rate of satisfaction mainly include the continuous availability of hot water, the electricity saving and the good performance of the systems. Accordingly, 100% of the interviewed commercial facilities who have installed a solar water heating system would recommend this technology.

Figure 98: Date of SWH installation (Commercial users)

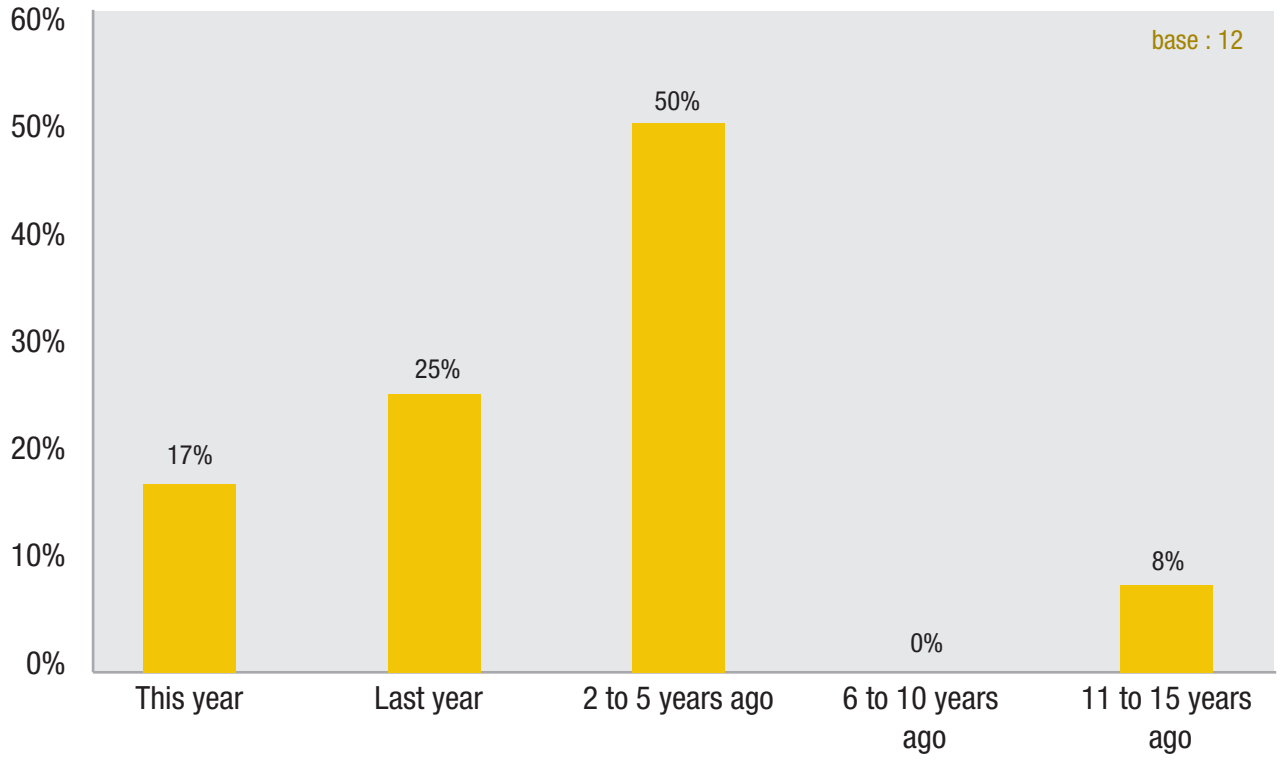


Figure 99: SWH installations by type (Commercial users)

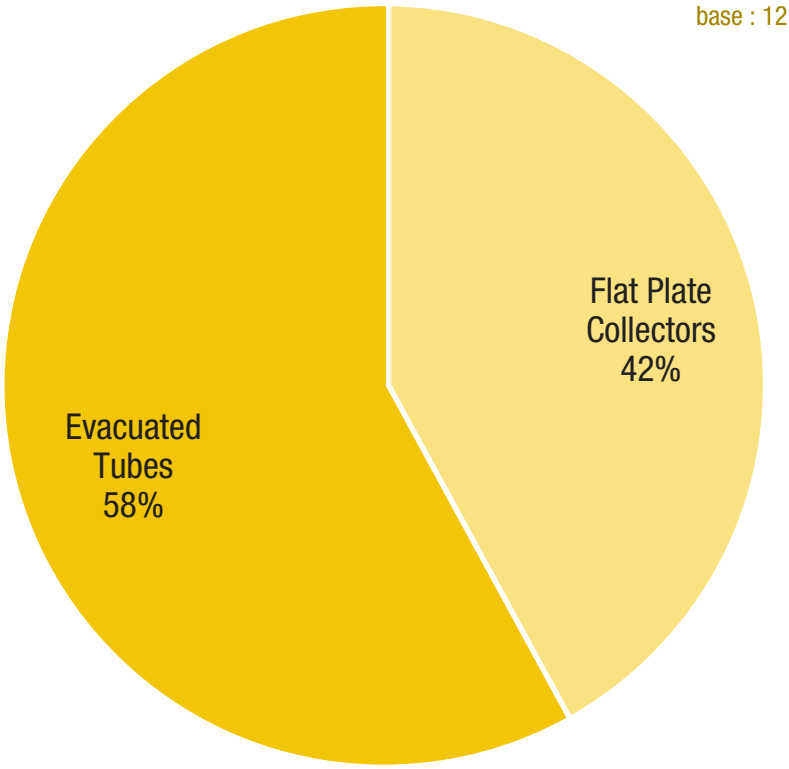


Figure 100: Installed collection area in square meters per facility (Commercial users)

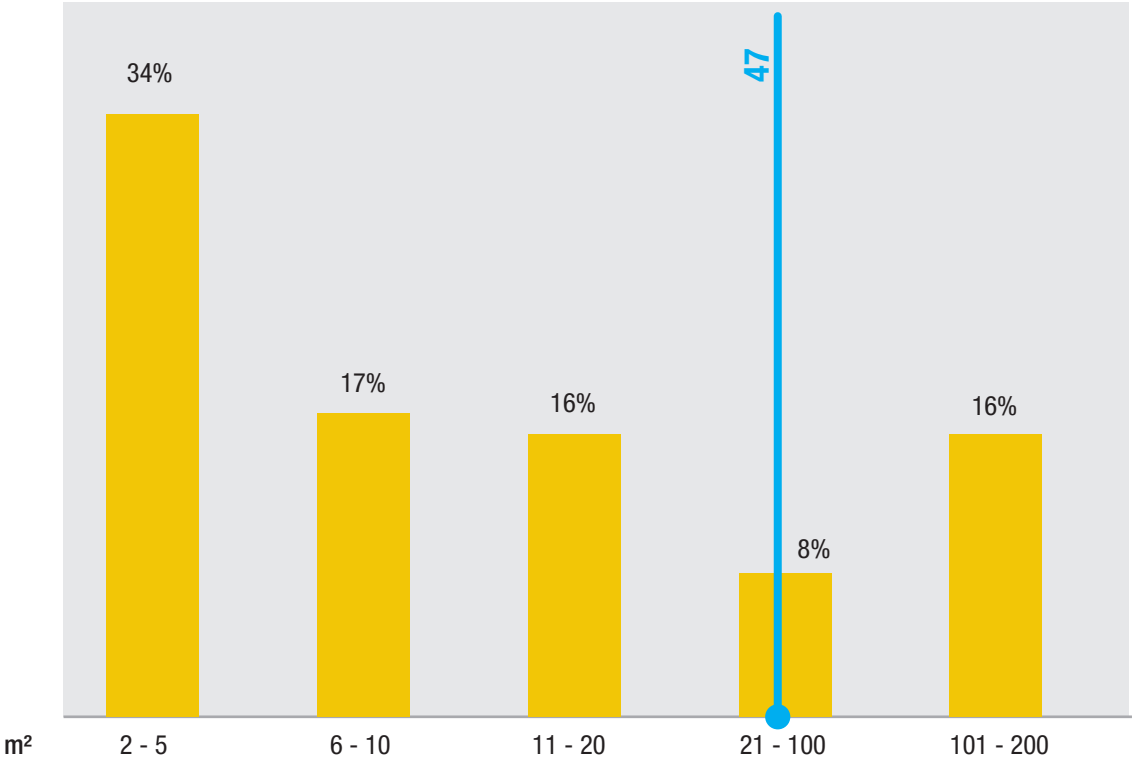


Figure 101: Installed capacity in liters per facility (Commercial users)

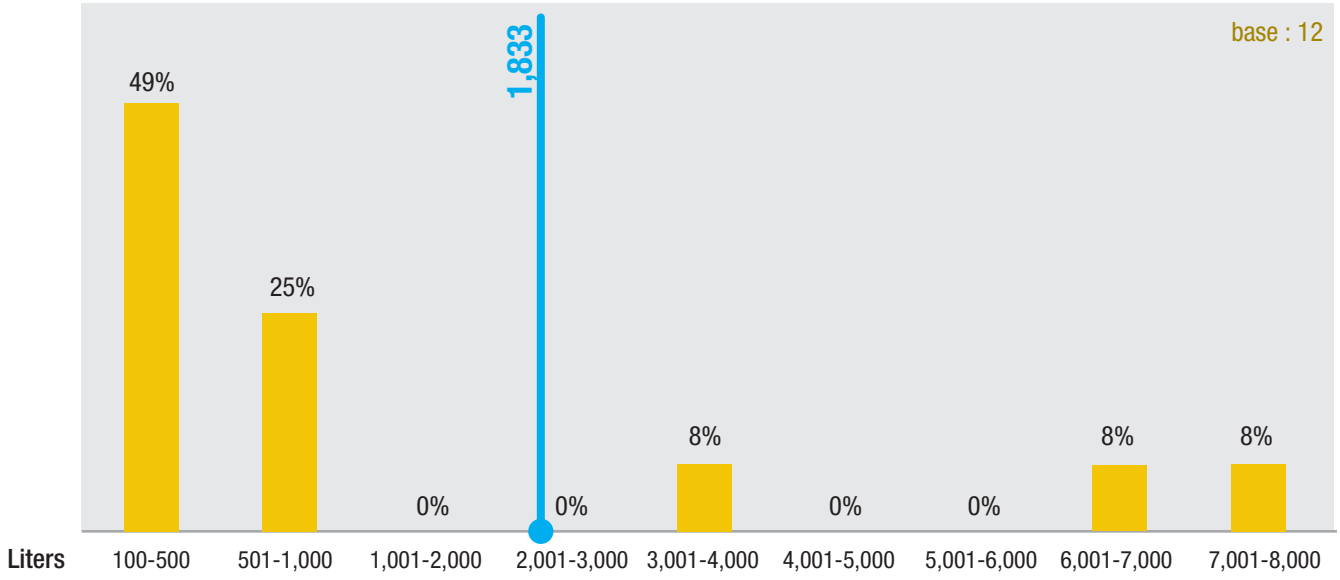


Figure 102: Installation and operation problems experienced (Commercial users)

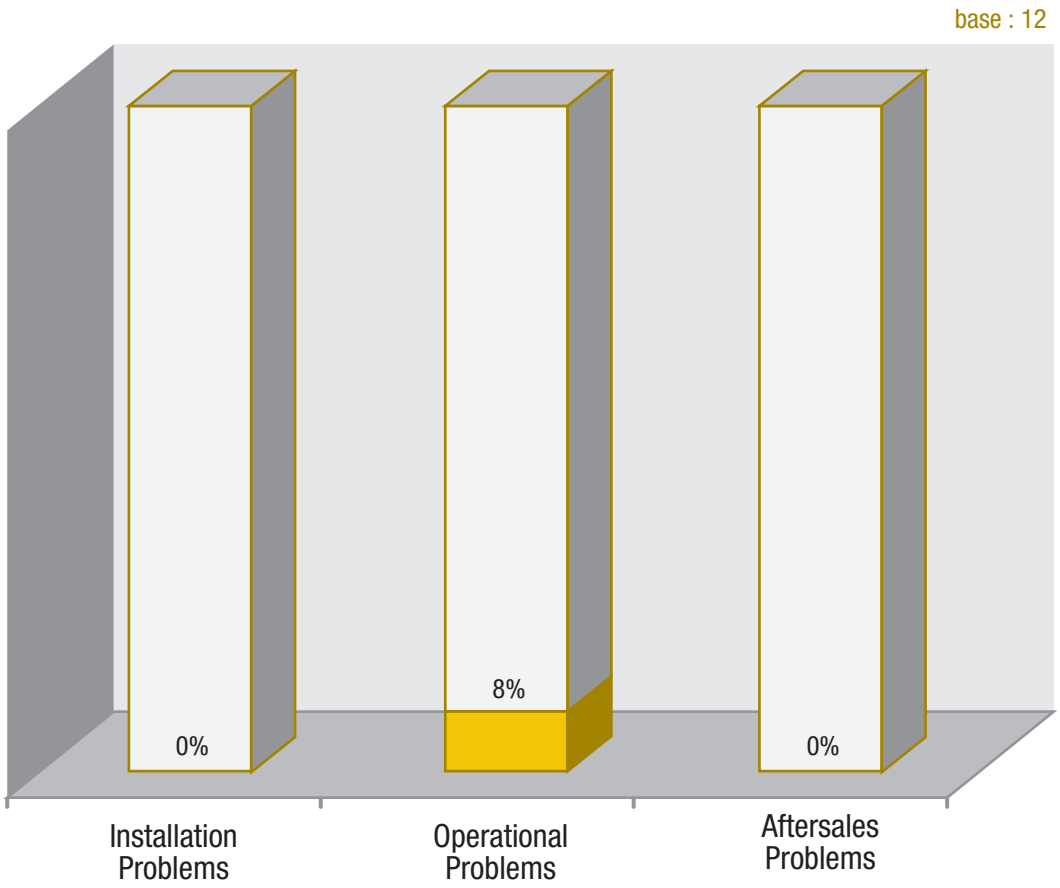


Figure 103: Satisfaction with the solar water heater (Commercial users)

base : 12

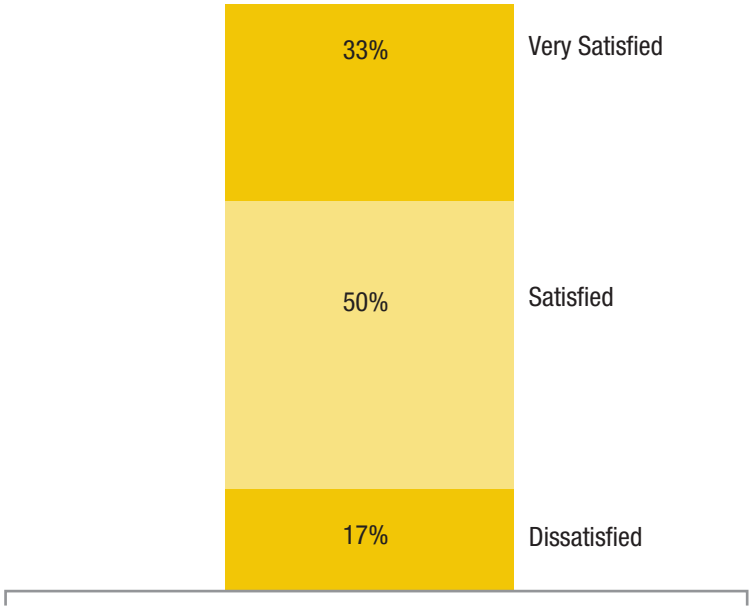


Figure 104: Main reasons of satisfaction with the SWH (Commercial users)

base : 12

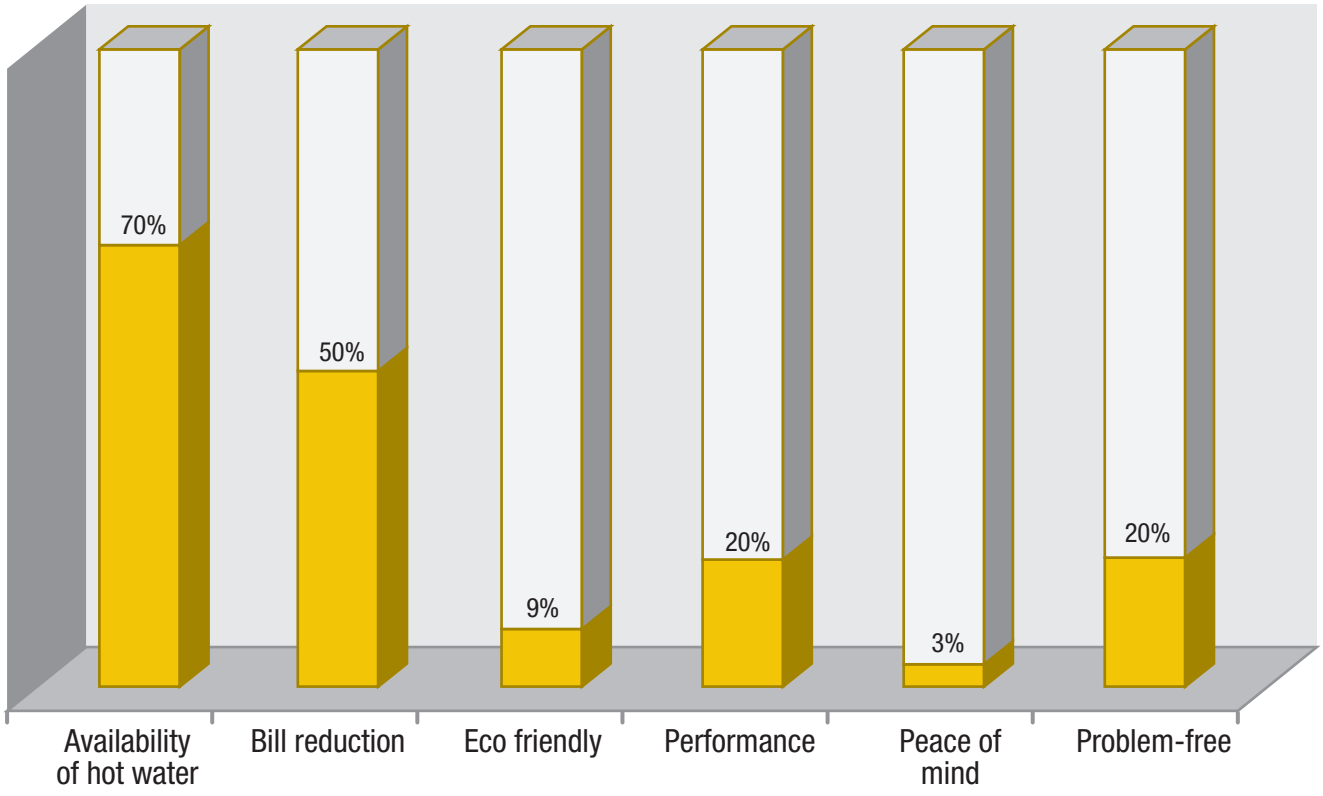
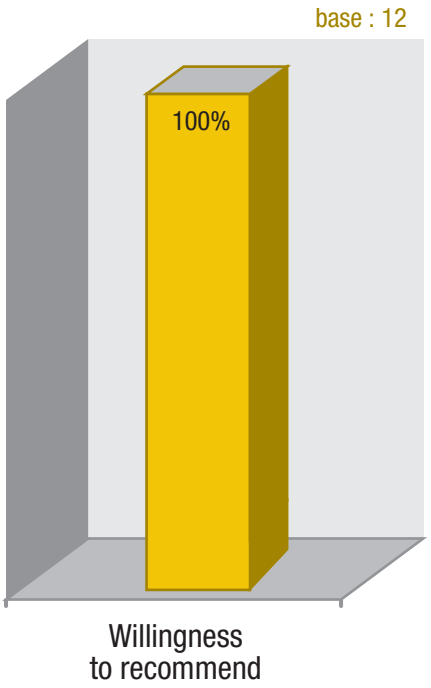


Figure 105: Willingness to recommend SWH (Commercial users)



2.8. Consideration, Drivers & Barriers

The main motivation for installing solar water heaters seems to be financial savings through the reduction of electricity bill. It is common among both users and non-users.

But the high investment continues to be the major burden hindering more development of such systems and making users seeing solar water heating as something of less priority to them. This could be understood and analyzed as a result of the lack of information among end-users, which has been obvious in the results of the estimated savings questions. 30% of non-users of solar water heaters think that such systems do not have any savings, and thus making the average estimated savings to be 27%, 20% lower than what users have achieved as shown in Figure 105.

Figure 107: Reasons for not installing SWH (Commercial users)

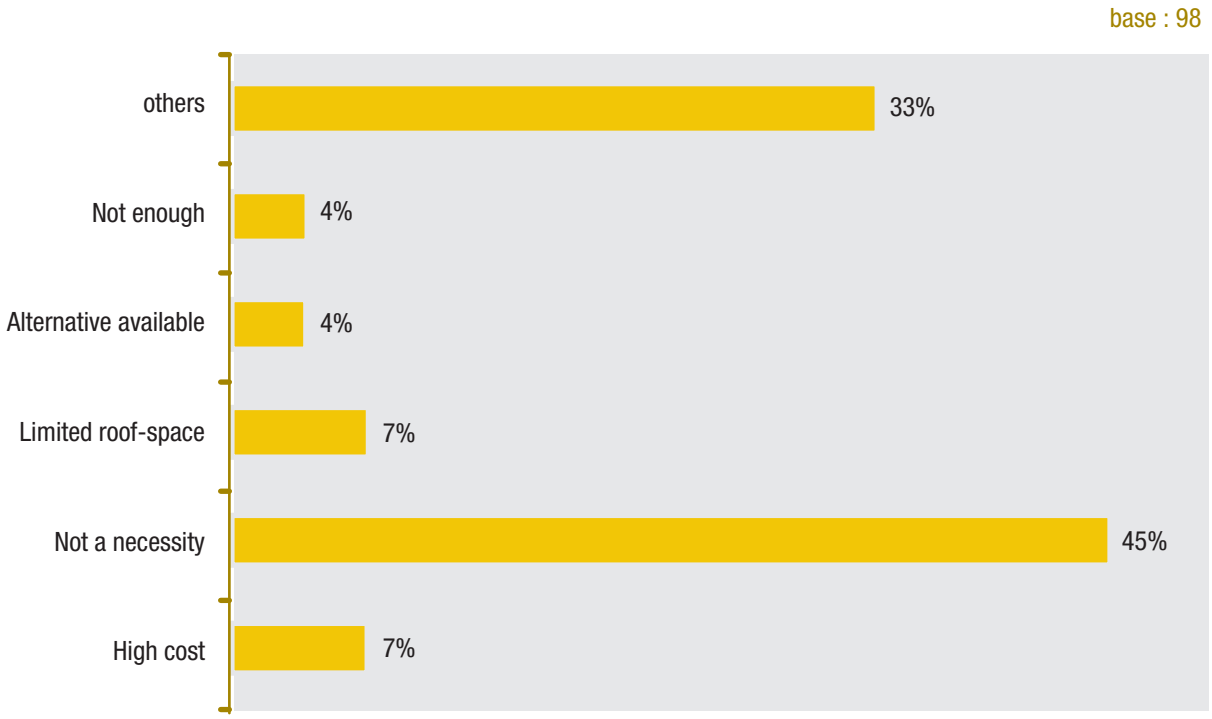
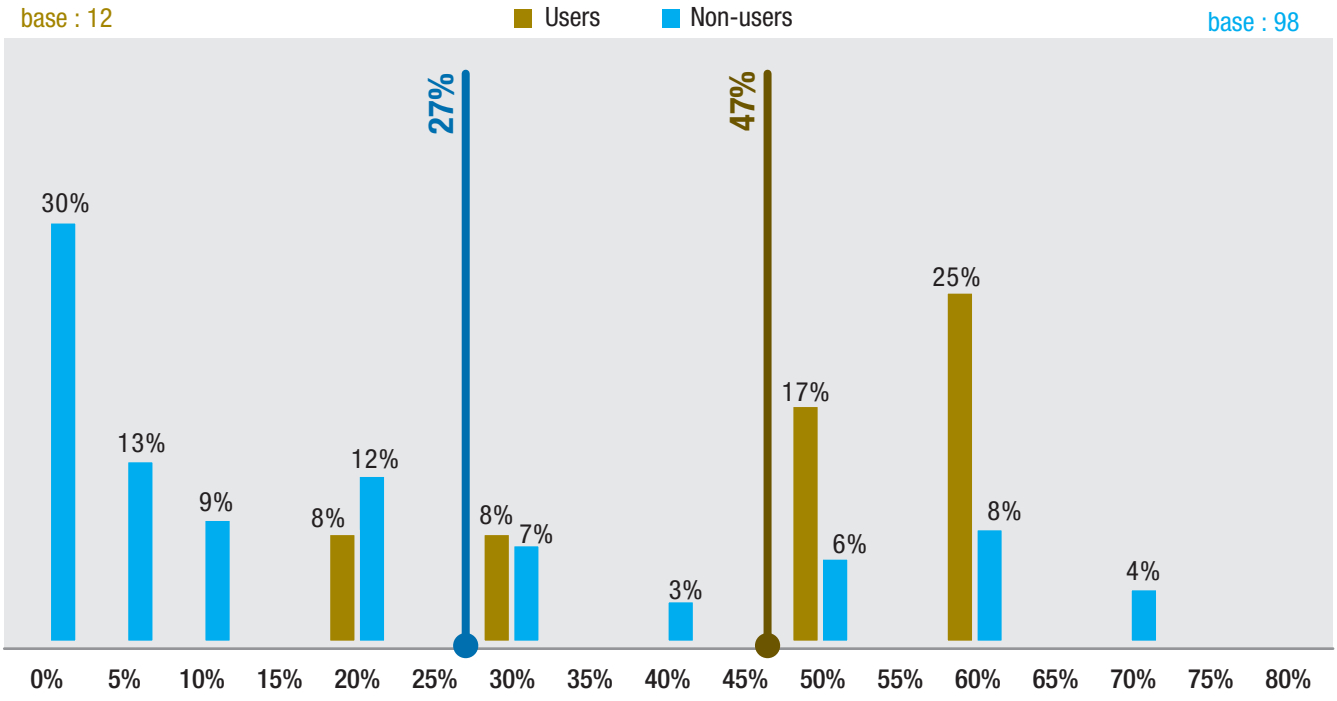


Figure 108: Estimated electricity bill reduction from the SWH among users and non-users (Commercial users)



2.9. Decision Making Factors

More than 7% of commercial facilities have indicated that the lack of enough roof space is a major reason that made the installation of a solar water heating system unfeasible. The results of the survey revealed that 84% of the respondents had an exposed roof, 97% of whom have sufficient area to fit in a solar water heating system.

The price of the system is seen reasonable by 83% of the respondents, while the rest see it as expensive. Users of SWH have paid an average of around $16,000 for their system, which is much higher than what non-users expressed their willingness to pay. This is probably a result of confusion between commercial collective systems and residential individual systems.

In regards to the decision making prices, the reduction of electricity bills came out to be the key consideration for owners of solar heaters, while the cost and initial investment is what non-users think of first when considering a solar water heating system.

Around 39% of commercial users are aware of other renewable energy technologies, mainly wind, hydro power, geothermal, and other renewable energy technologies.

Figure 109: Availability on roof (Commercial users)`

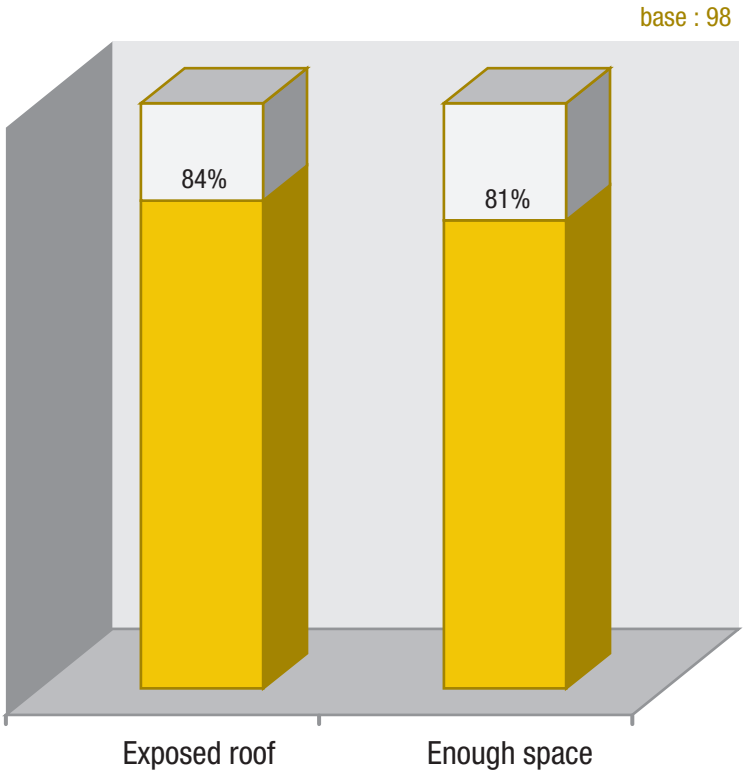


Figure 110: Price acceptable by non-users versus price paid by users for a SWH (Commercial users)

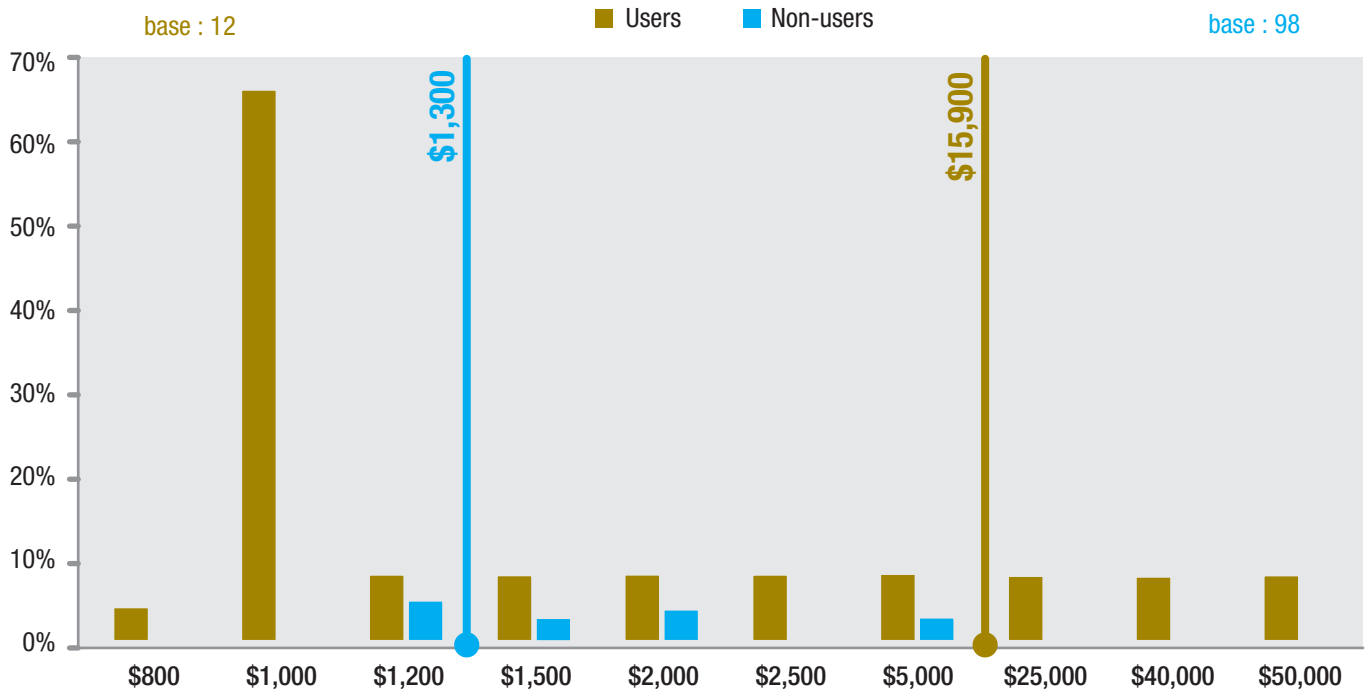


Figure 111: Perception of SWH price by owners of systems (Commercial users)

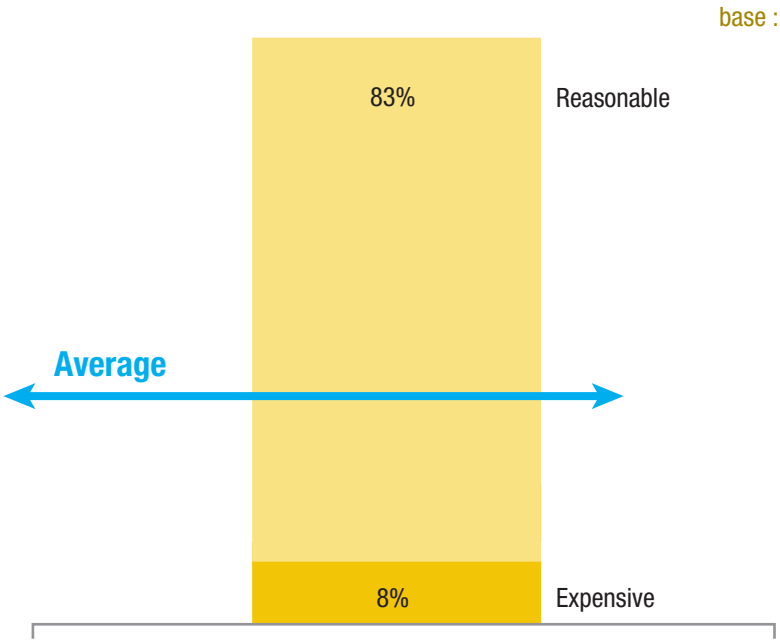


Figure 112: Decision process for the purchase of SWH among users and non-users (Commercial users)

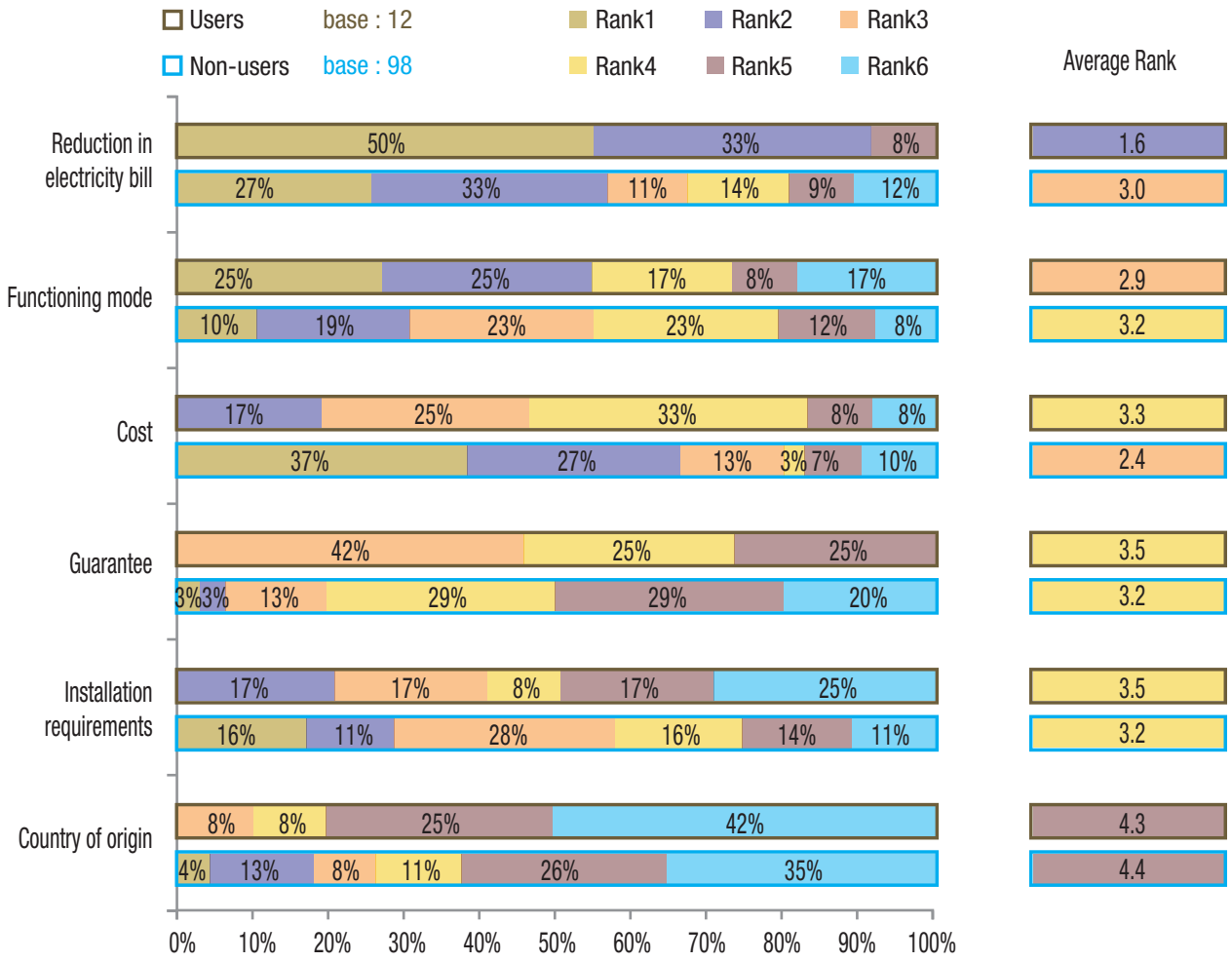
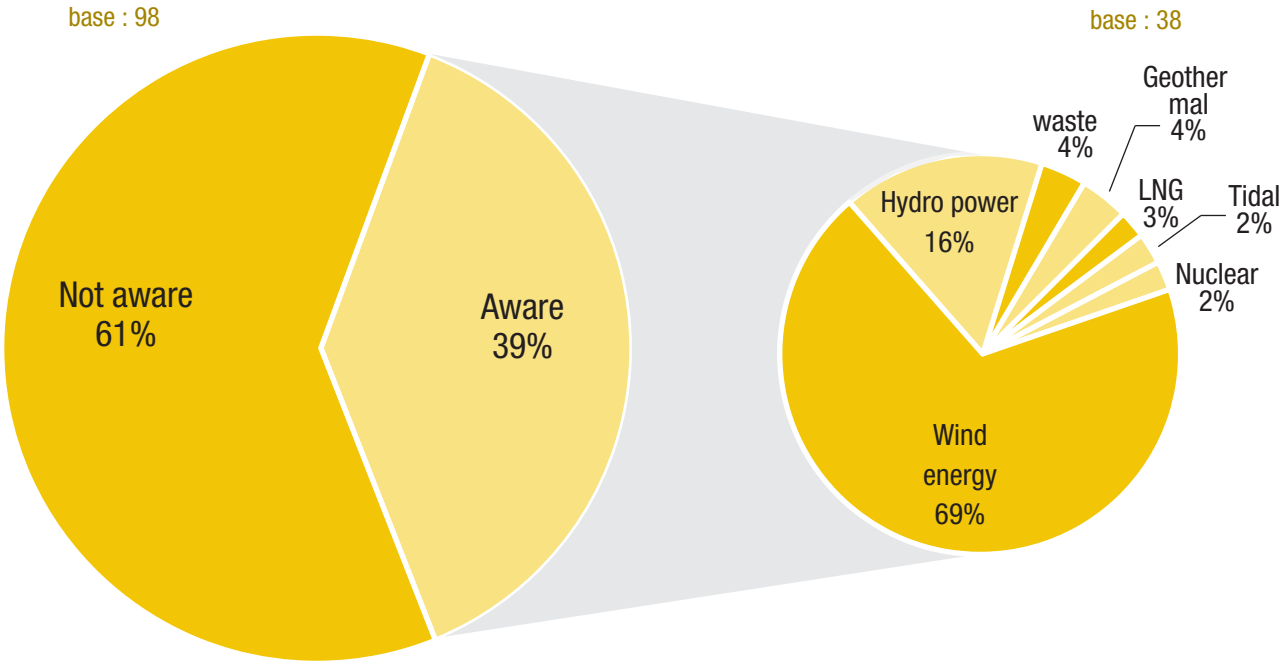


Figure 113: Awareness of other RE applications (Commercial users)



2.10. Photovoltaic (PV) Cells

Although they are aware about solar water heating technologies, only 33% of SWH users are aware of what PV is, with none of them implementing solar PV solutions. Yet the benefits of PV systems are very clear especially in the financial savings and continuous electricity supply.

Price usually varies depending on the size of the system and the electricity demand at the facility. When asked about their willingness to pay for a PV system, non-users of a SWH are willing to pay $12,400, while users are willing to pay an investment of up to $33,000.

SWH users are more willing to invest in solar PV, with 67% expressing their intention to install a solar PV solution expecting to save an average of 61% of their electricity bill, while 36% of non-users were willing to do so expecting a saving of 56%.

Commercial facilities willing to invest in solar PV are 84% with grid connection and very positive to have a net metering contract and benefit from electricity storage in the grid. Only 58% wouldn't mind selling electricity to the grid, which was obvious that 58% of users prefer net-metering compared to 48% favoring feed-in tariff.

Those who favor net metering demand high tariffs reaching an average of 43 USC per kWh, with the majority accepting 13.3 USC, which is a reasonable tariff.

Figure 114: Awareness versus use of solar PV (Commercial users)

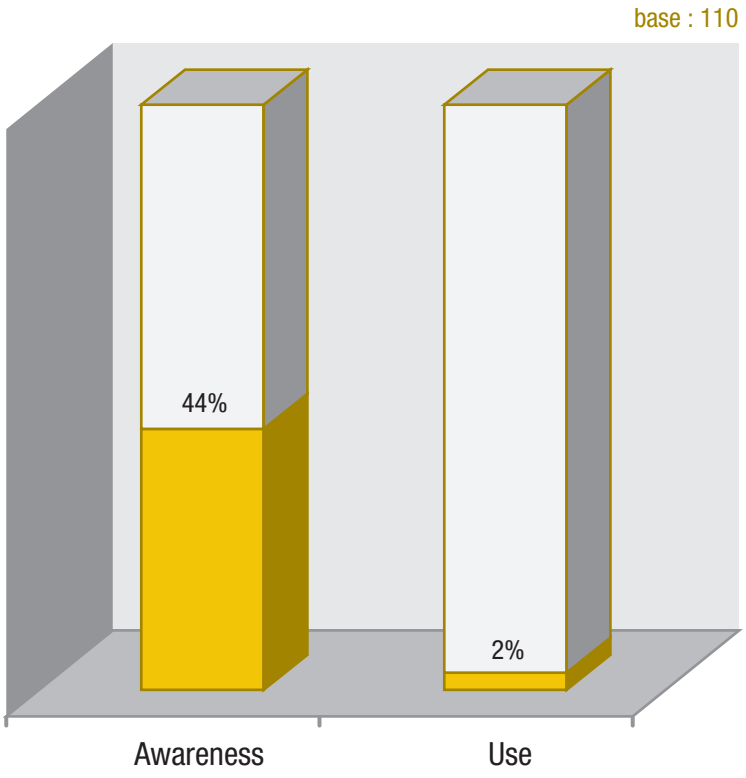


Figure 115: Major advantages of PV as perceived by SWH users and non-users (Commercial users)

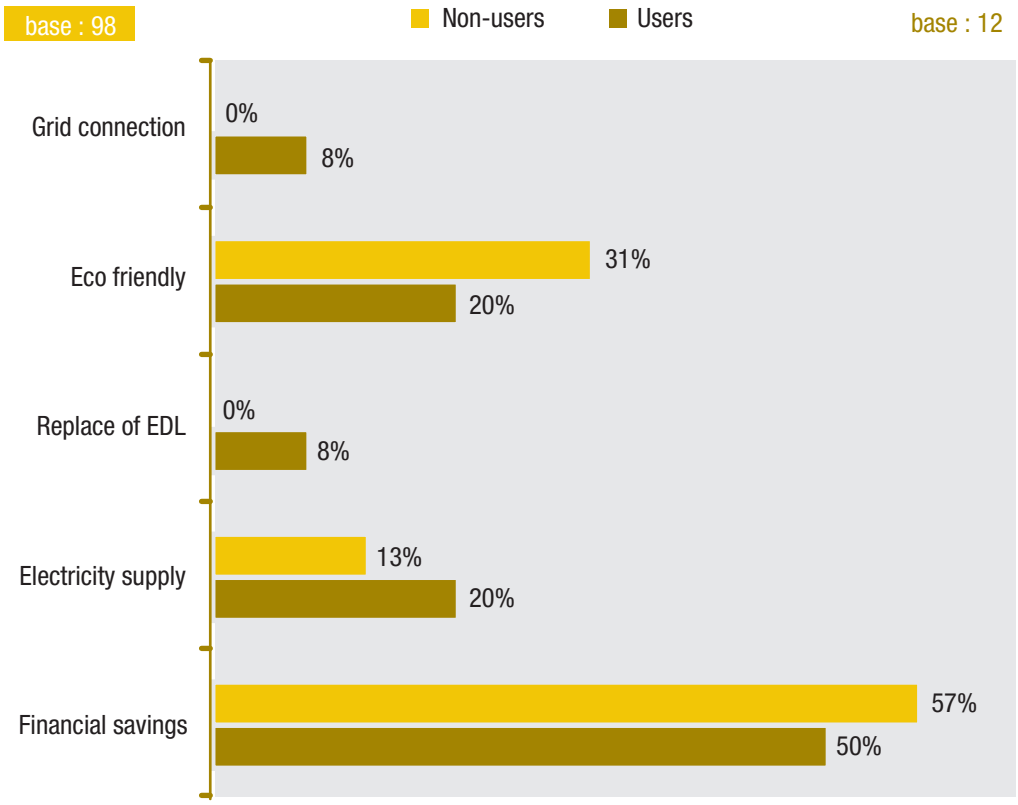


Figure 116: Major disadvantages of PV as perceived by SWH users and non-users (Commercial users)

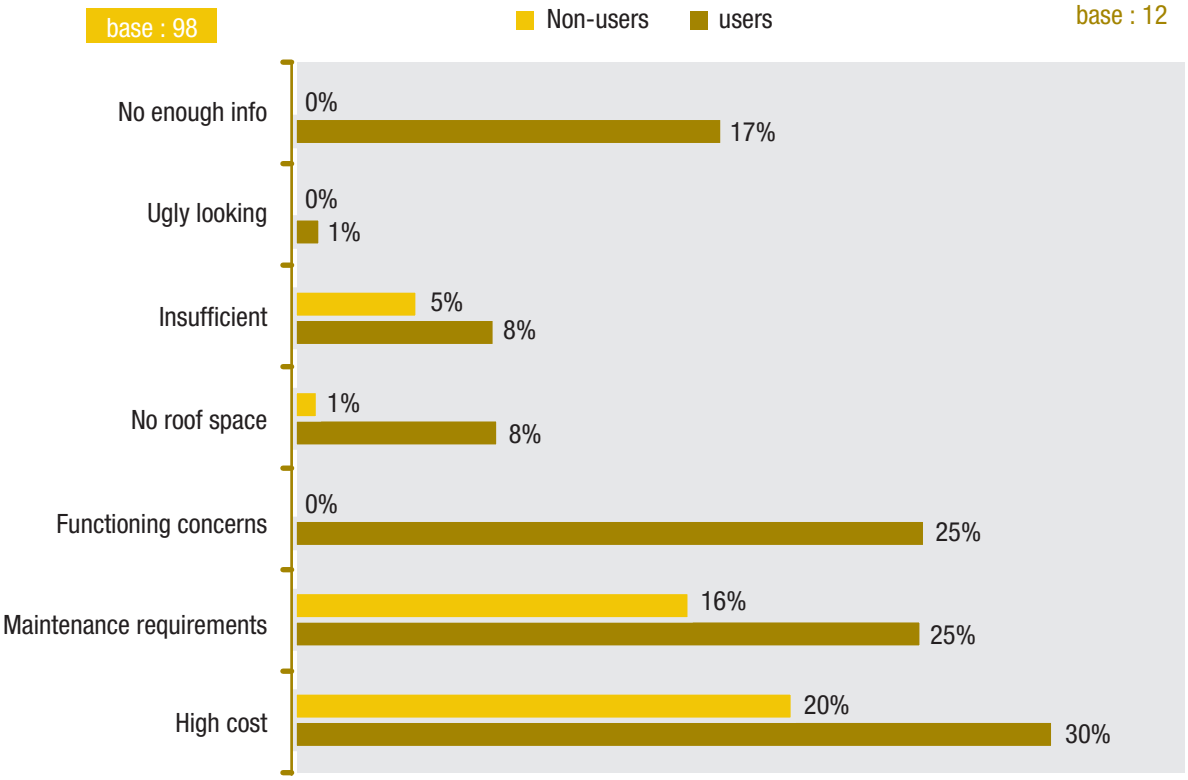


Figure 117: Willingness to pay for installation of PV (Commercial users)

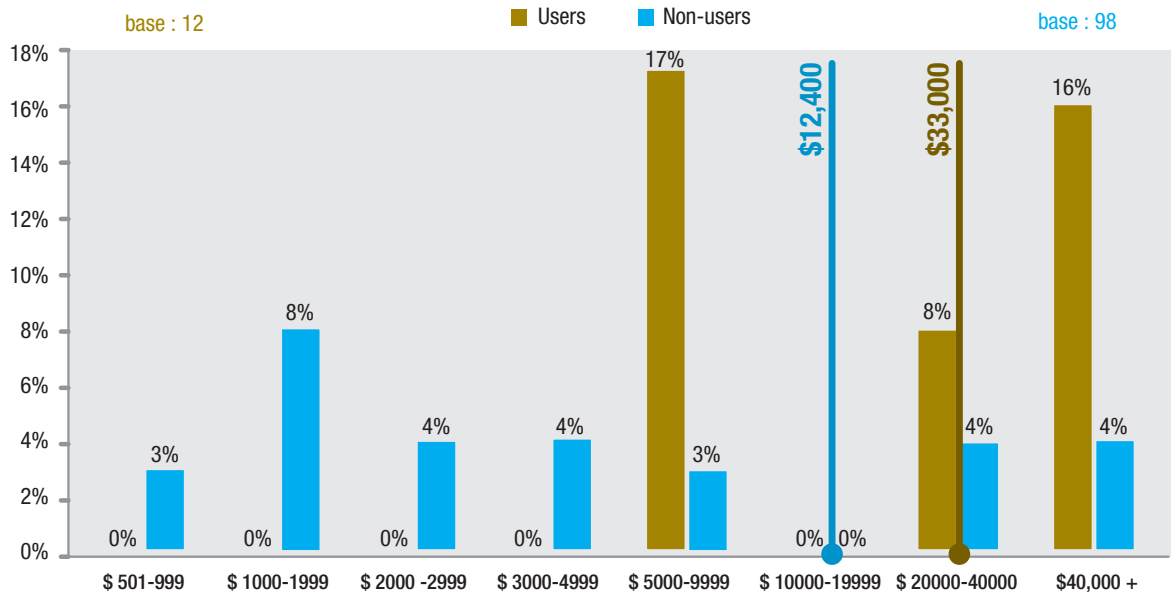


Figure 118: Willingness to get a solar PV system for SWH users and non-users (Residential users)

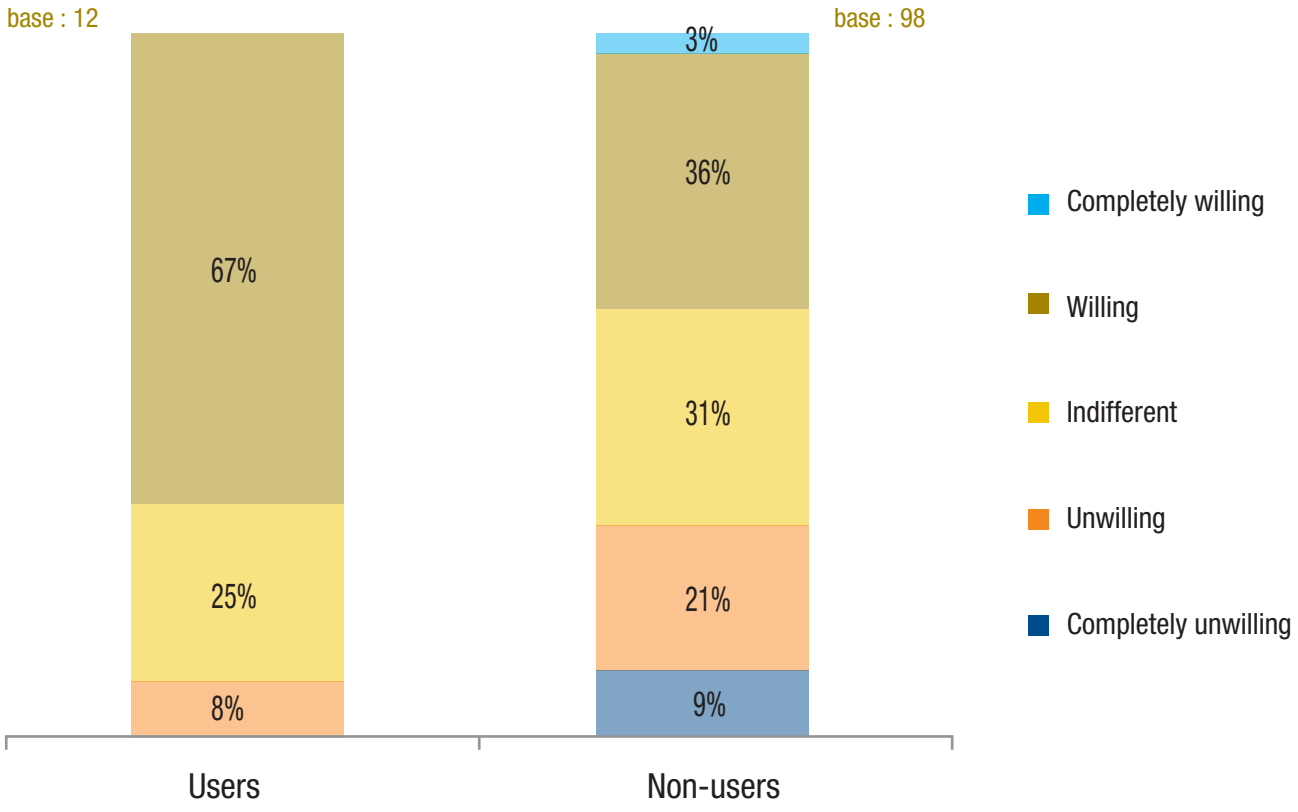


Figure 119: Estimated PV savings by users and non-users of SWH (Commercial users)

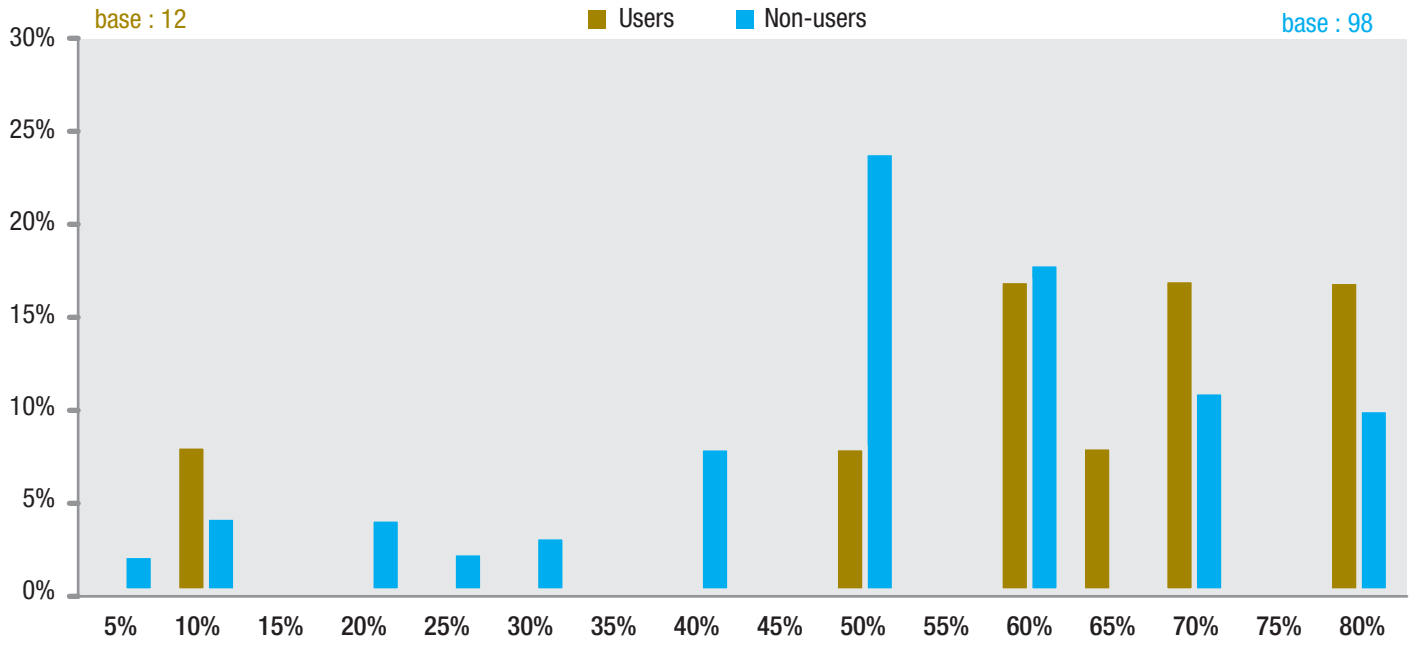


Figure 120: Non-users interest in grid connection, net-metering, and selling the grid (Commercial users)

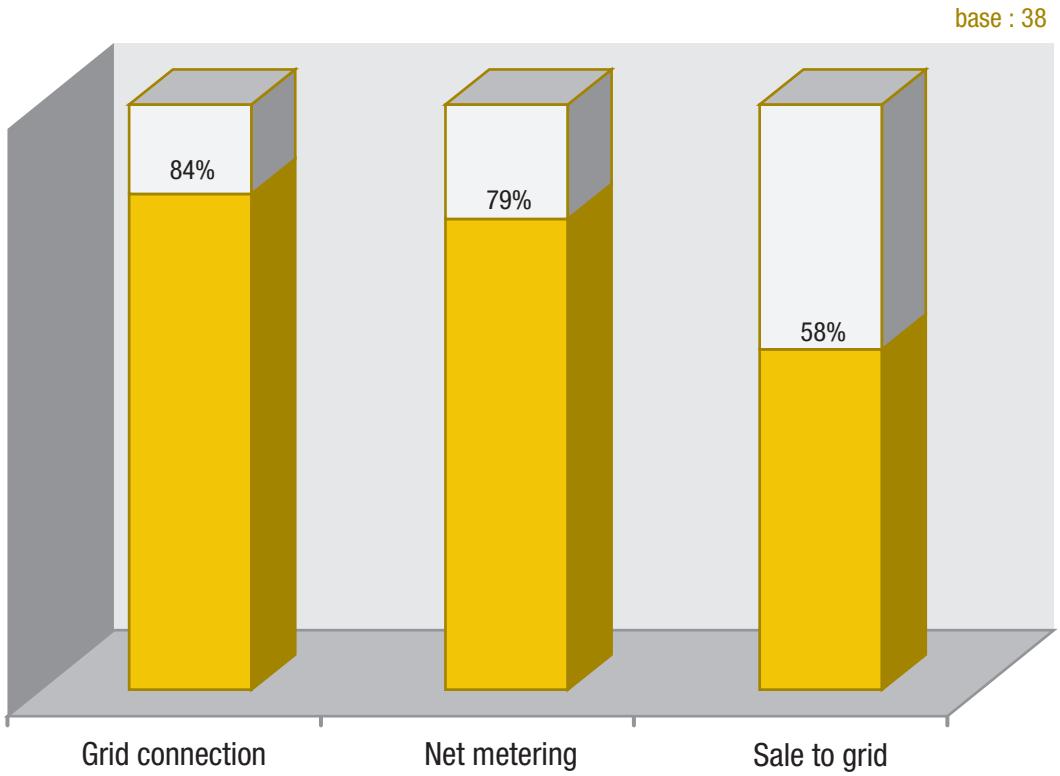


Figure 121: Preference of net-metering over feed-in tariff (Commercial users)

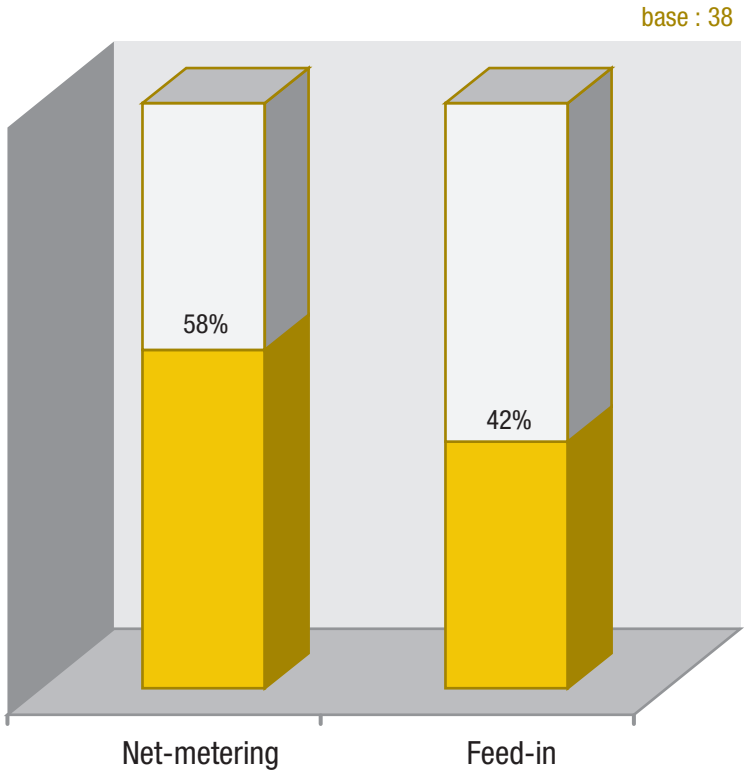
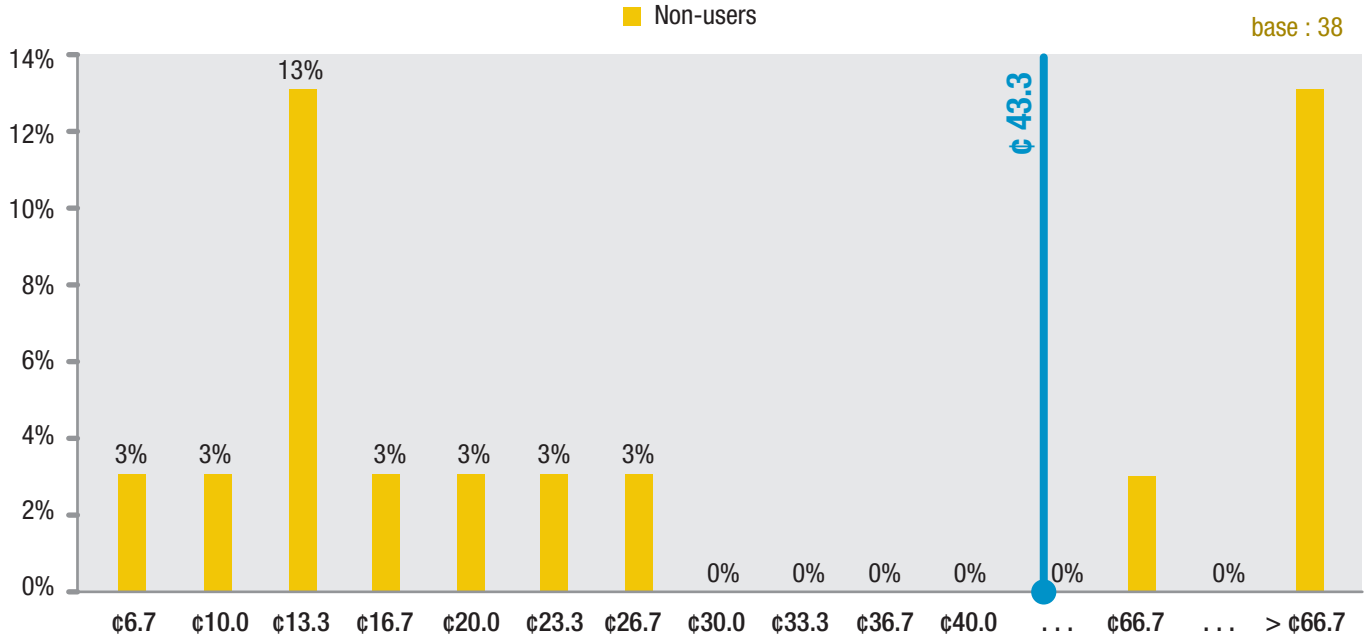


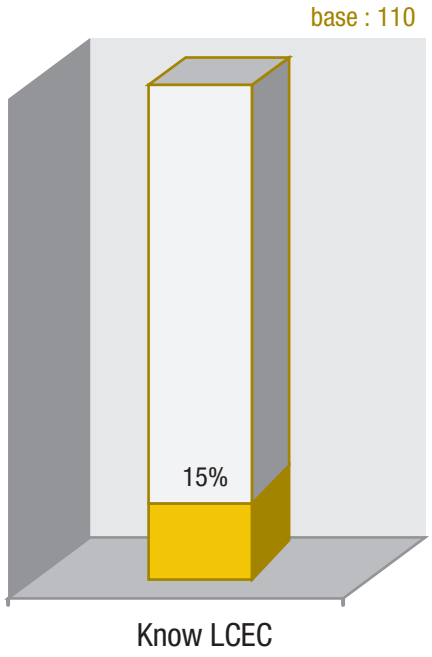
Figure 122: Lowest acceptable feed-in tariff in USC per kWh (Commercial users)



2.11. Awareness of LCEC

Among the 110 interviewed commercial facilities, only 15% of them are aware of LCEC.

Figure 123: The awareness level of LCEC (Commercial users)



2.12. Key Extracts

- The air conditioner is the mostly used appliance followed by the photocopier especially in office buildings

- The electric water heater is the major water heating appliance in commercial buildings.

- Commercial users tend to own generator backup units rather than subscribing to other backup systems. 40% even have additional UPS and APS systems to save on the generator consumption.

- A UPS system costs around 5,820 to purchase and more than $1,300 per annum to maintain.

- The average monthly EDL bill for a commercial facility is $3,110, perceived as expensive by more than 70% of the respondents

- Around 38% of the users have thought of a solution to reduce their electricity consumption, among whom more than 40% through primarily of solar water heating.

- Most of the commercial facilities use evacuated tubes and have an average collection area of 47 square meters for a storage capacity of 1,833 liters.

- Non-users of solar water heaters do not have an accurate idea about the estimated price of the solar water heating system.

- While the savings matter most to uses of solar water heaters, the initial investment is the top consideration of non-users.

- Financial savings and continuous electricity supply are the major motivations behind considering solar PV, while the high investment and regular maintenance costs are the major barriers users identified.

- Commercial facilities expect a solar PV system to save around 56% of their electricity consumption.

- The majority of commercial users would prefer net metering over feed-in tariff.

Chapter 3:
Dealers and Suppliers

KEY INFORMATION AREAS

- The market situation from a business perspective of suppliers and dealers of SWH
- Total market penetration by highlighting installed surface, main regions of installations, and types of installations
- Discussion of perceived perspectives and potential for SWH

KEY STATISTICAL FACTS

	Size	Share
Sample Size	29	29%
Interview Attempts	44	152%
PV Dealers	11	38%

It was originally agreed to include 20 dealers and suppliers in this survey to cover around 20% of the solar water heaters companies, but in an aim to have a more representative analysis and diversify the sample, additional companies were included to reach a total of 29 companies, making 29% of the whole market at that time.

SAMPLE PROFILE

The survey tried to cover a wide range of company profiles to include companies from different regions and different background and experience in the solar thermal market.

Companies selling flat plate as well as vacuum tubes were involved in this survey, with the majority having an average experience in flat plate collectors exceeding 8 years, while reaching 5 years for vacuum tubes as shown in Figure 125.

Figure 124: Types of systems sold by SWH dealers

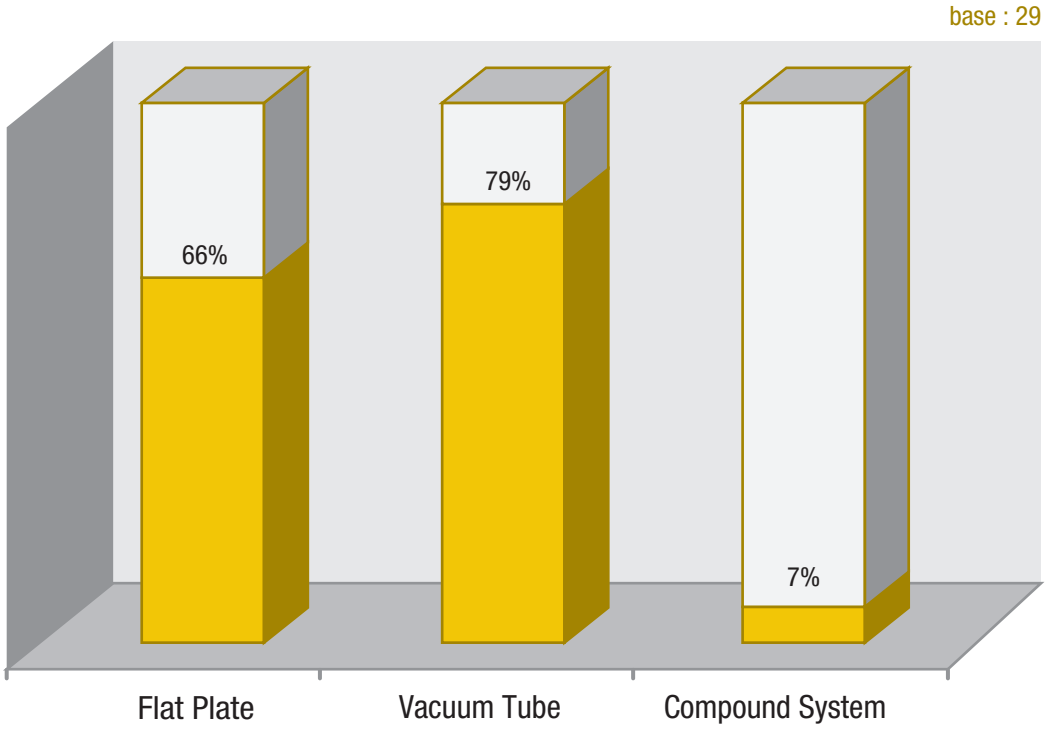
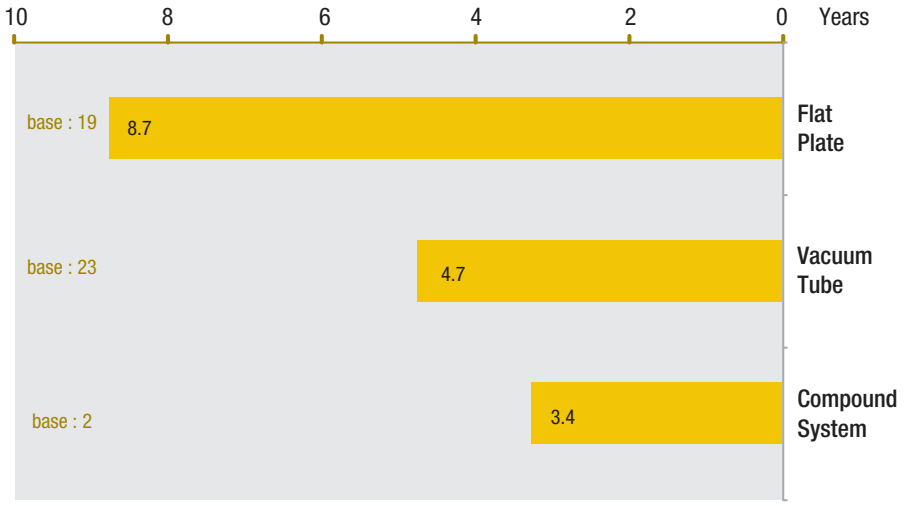


Figure 125: Experience of dealers in types of SWHs



3.1. Market Products

The market includes different products with prices ranging with a difference slightly exceeding $100 per square meter. Compound flat plate is the most expensive amongst SWH types, with an average selling price of $425 per m2, while vacuum tube systems are noted as the lowest average selling price of $317.

The breakdown of the price of Solar Water Heaters indicates that the solar collector is the most expensive component followed by the tank, both making together more than 70% of the system cost. Other expenses include piping and an automation system, in addition to installation costs that make up to 13% as Figure 127 shows.

The share of installation expenses vary by system type reaching its peak for thermosiphon system where it varies from 20 to 30%. This share drops for pressurized system to 17% and varies for large scale from 19 to 21% as shown in Figure 128.

In regards to manufacturing, only 38% of the companies manufacture some of their components, especially hot water tanks. Around 55% of manufacturers construct their own tanks, while only 18% manufacture solar panels.

The majority of the respondents do not use simulation/special design software, however, among users, AutoCAD noted slightly higher results compared to the other programs which are each used by 1 respondent only.

For the country of origin, Figure 131 clearly shows that products are mainly imported from China and Turkey, with only 21% of the dealers using components that are locally manufactured.

In terms of certification, 86% of the products do carry a Solar Keymark, with half of the rest using another certification system and around 7% not having any internationally recognized certification.

Figure 126: Average system pricing per meter squared

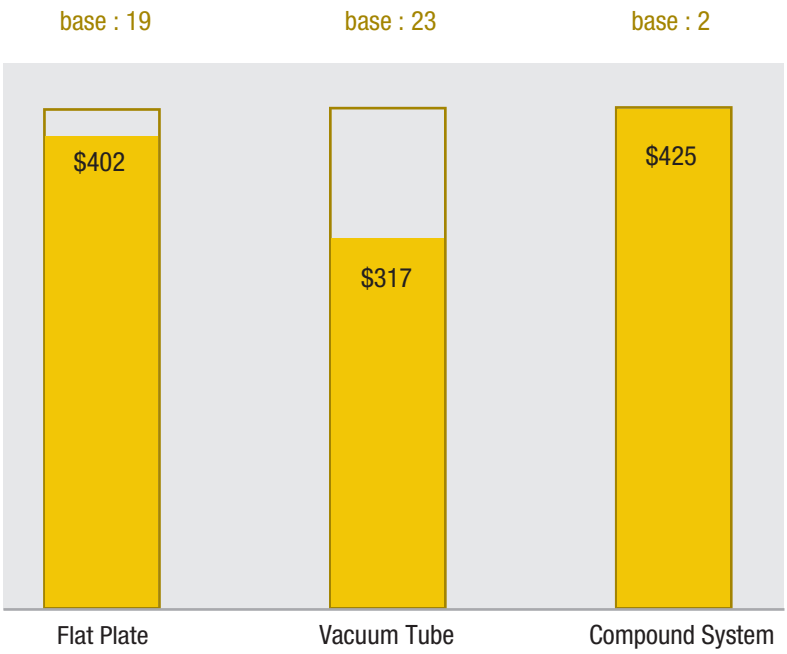


Figure 127: Pricing breakdown of SWHs

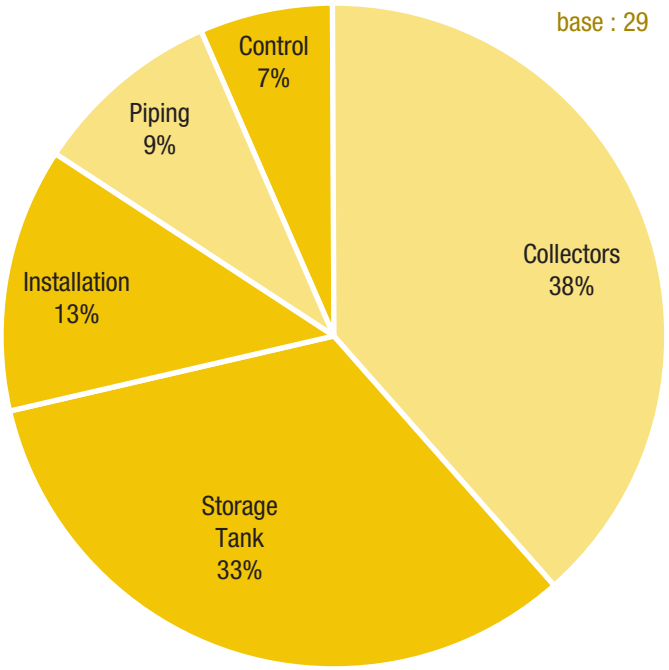


Figure 128: Installation share of the total cost by type of SWH

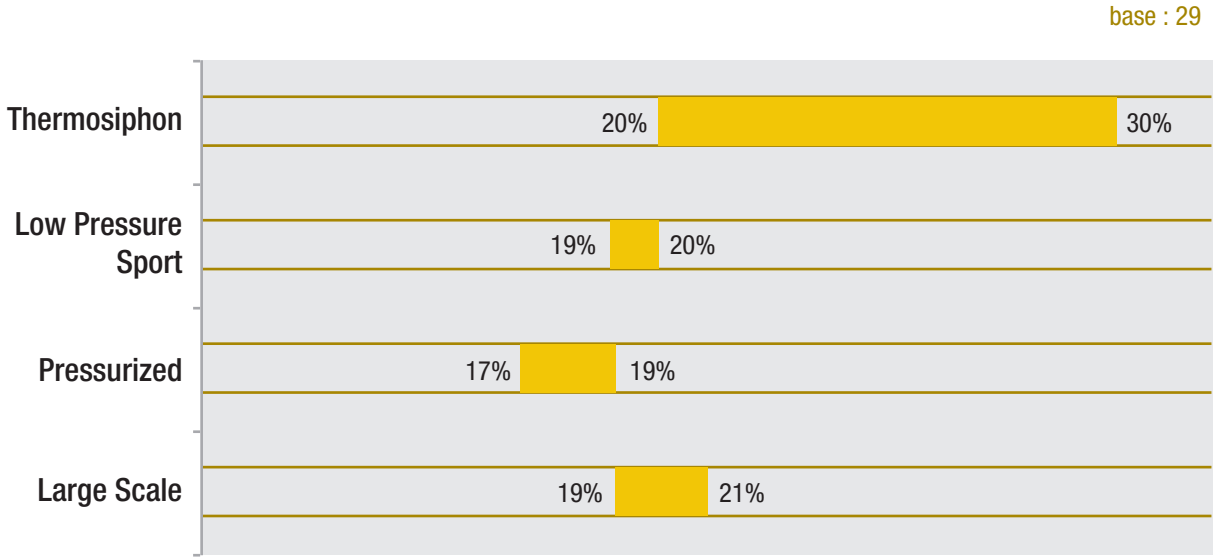


Figure 129: Local manufacturing of SWH equipment

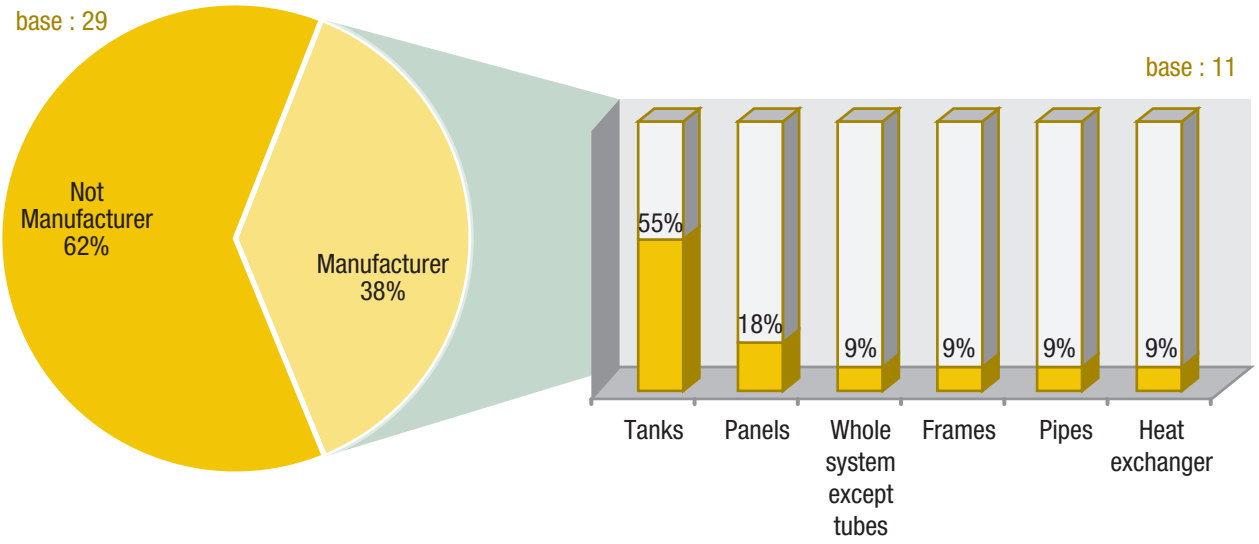


Figure 130: Simulation software used in the design of SWH systems

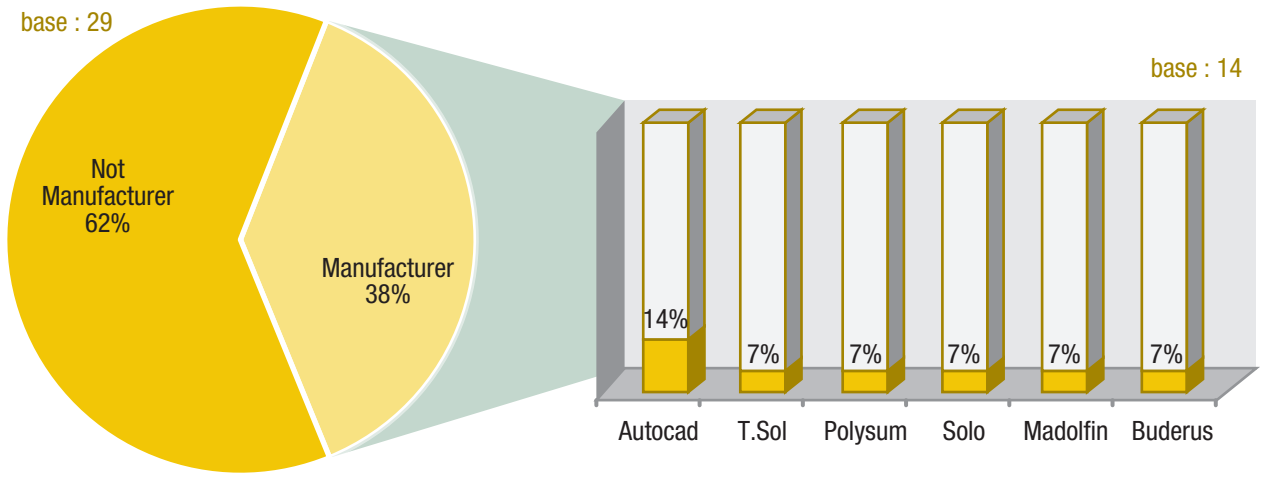


Figure 131: Country of origin of components

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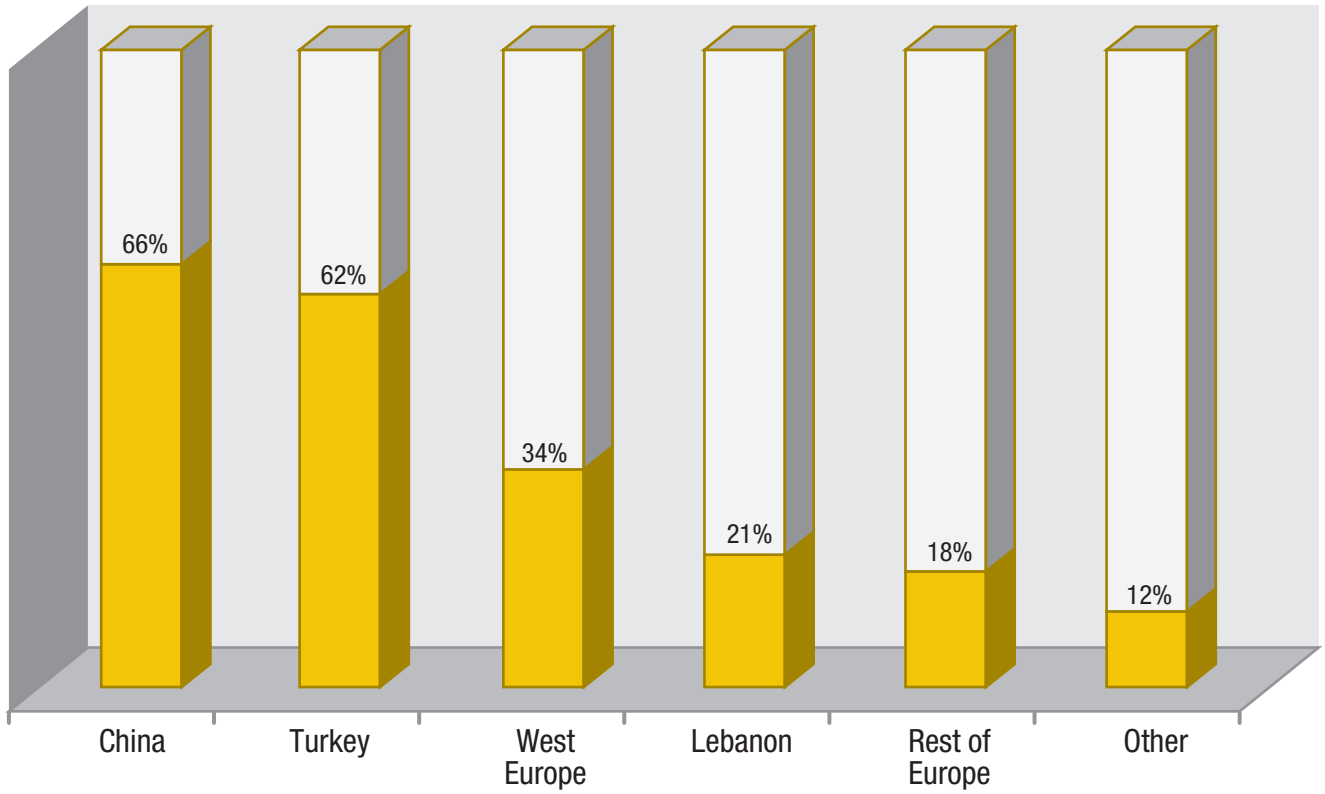
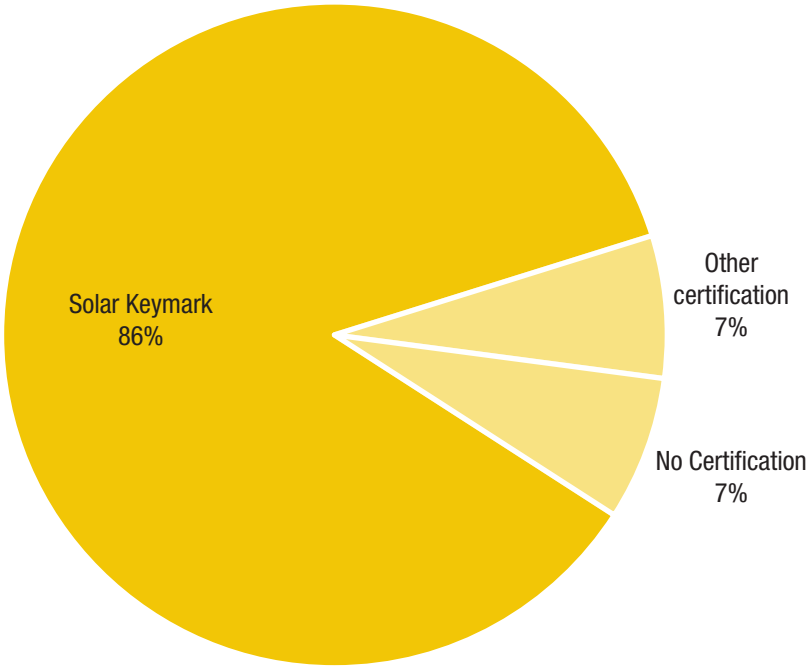


Figure 132: Solar system certifications available



3.2. Trends and Growth

The solar water heating market has been witnessing tremendous growth during the past years, and more specifically in the past 6 months, with 76% of the dealers claiming that they have seen growth in their activities during the 6 months as shown in Figure 133.

The average increase of demand in terms of requests came out to be 41%, with the highest proportion of respondents mentioning 30% as an increase rate, and some companies claiming an increase of as much as 100% as shown in Figure 134, which presents the percentage of companies reporting each growth or drop rate with the growth rate being the outward rays and the frequency of answers being the inside circles.

The reasons behind this growth seems to be primarily driven by the MEW SWH support initiative, with more than 70% of the dealers seeing this as a major market driver. Others believe that electricity shortage and increasing fuel prices are making solar water heating solutions more feasible and appealing to end-users.

On the other hand, reasons for stagnation in requests show that it is mostly suppliers who are bearing the consequences of an uncontrolled market where competition is disloyal. The economic and political situation seems to also be a reason for the stagnation or the decrease of requests as presented in Figure 136.

Demand coming from residential users seems to be mostly increasing, as per the feedback of 72% of the dealers, among which the majority see an increase of 100% in demand as Figure 137 shows.

As for the past 6 years, the market growth is clear with 79% of respondents witnessing it and only 12% seeing the market has dropped. Thinking back of the requests received over the past 6 years, the sample, at the exception of 1 dealer, found that there was an increase, with the average growth rate coming out to be 60%.

In an overall perspective, the dealers themselves have witnessed a growth in their companies ranging from 10% to 100%, with the majority being between 20 and 30% as the pie chart in Figure 140 explains.

Figure 133: SWH market trends for the past 6 months

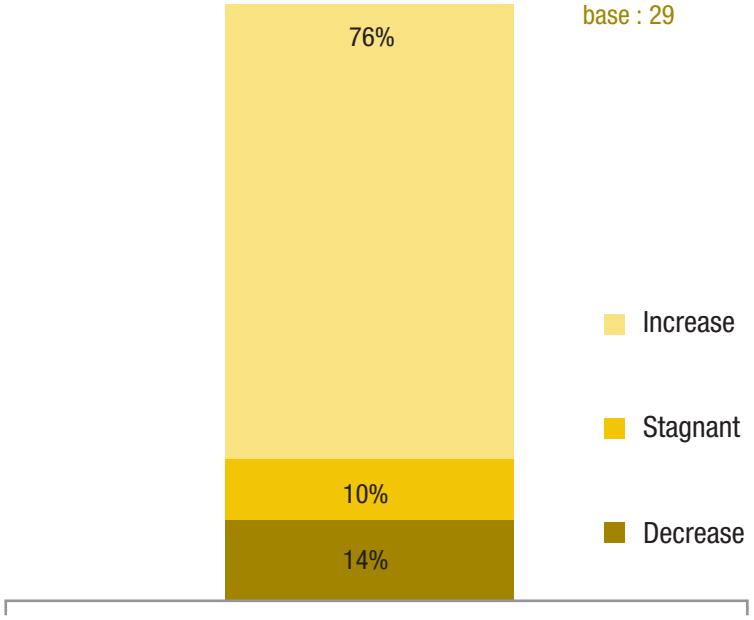


Figure 134: Market growth rate for 6 months as reported compared to the frequency of answers

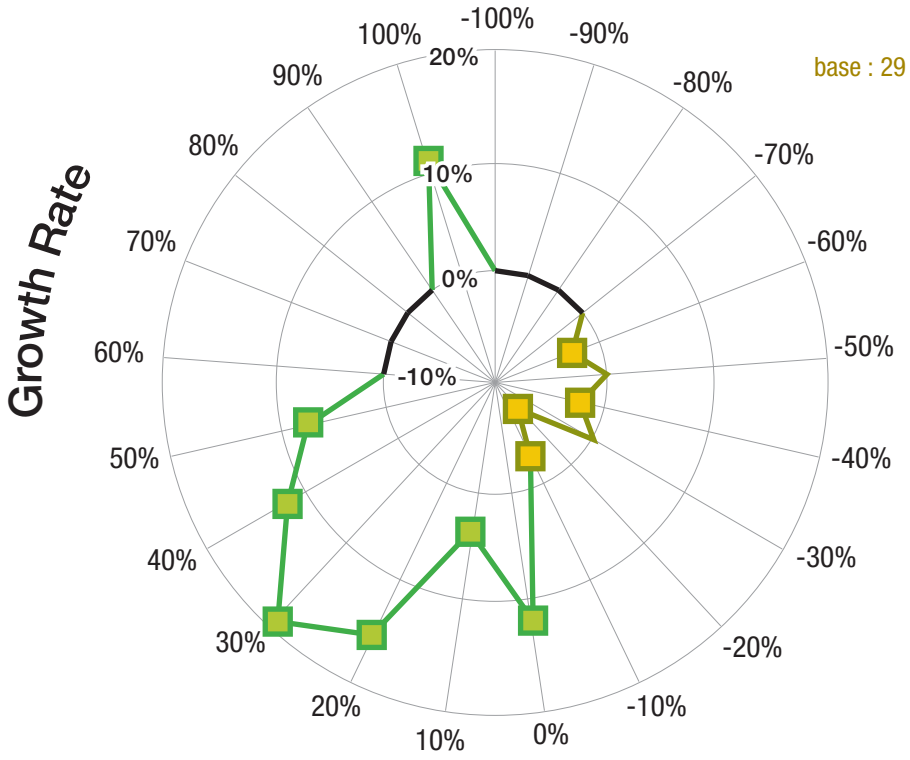


Figure 135: Spontaneously mentioned reasons behind increase of demand in requests

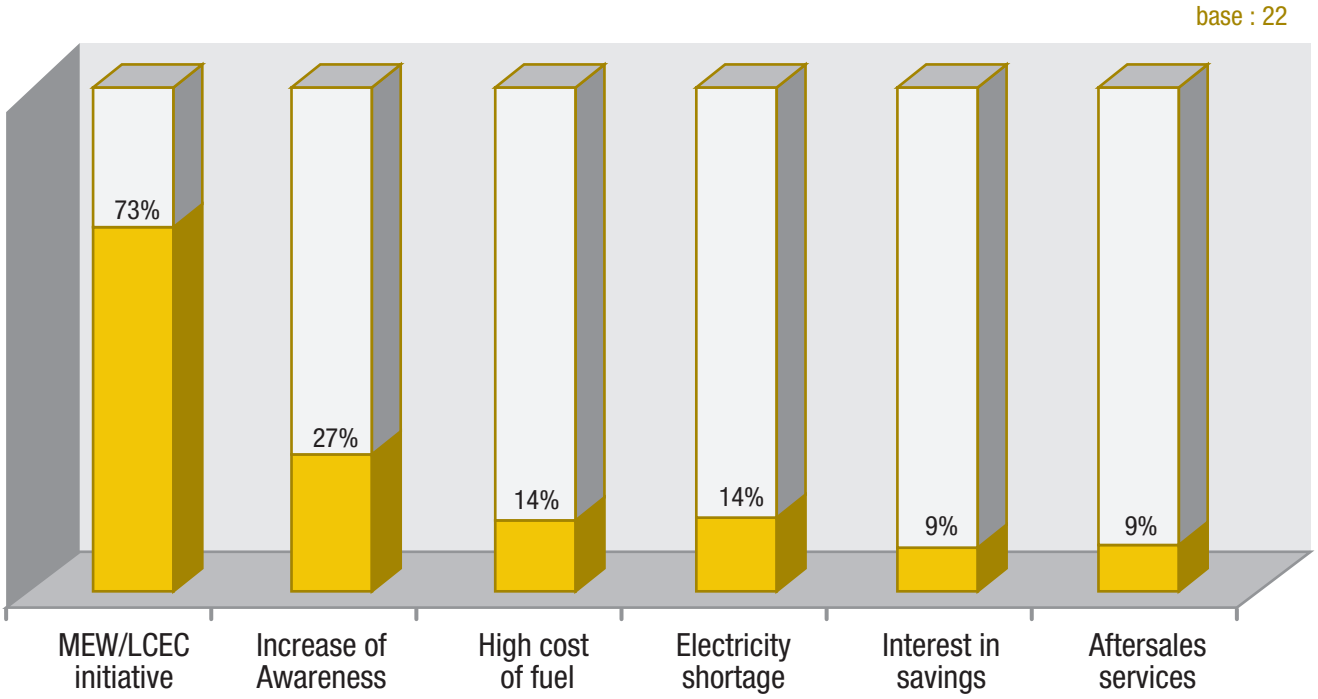


Figure 136: Spontaneously mentioned reasons behind stagnation and decrease in demand

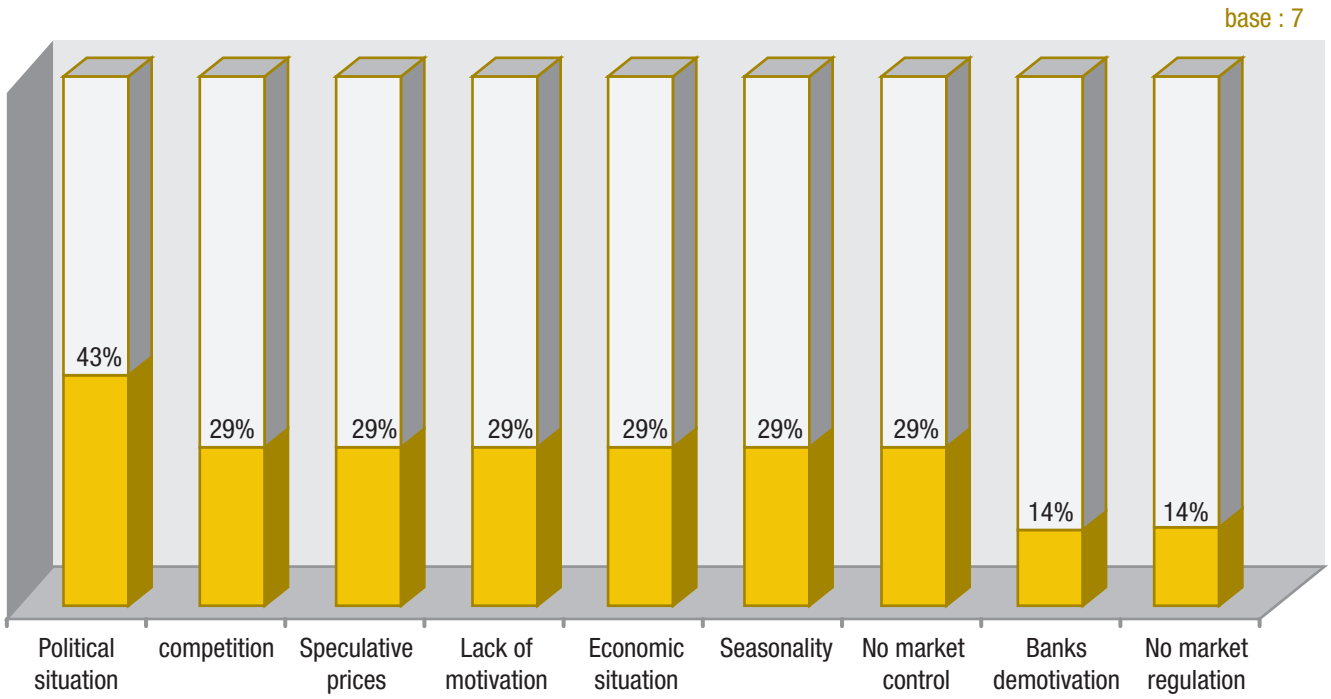


Figure 137: Detailed trend among residential end-users

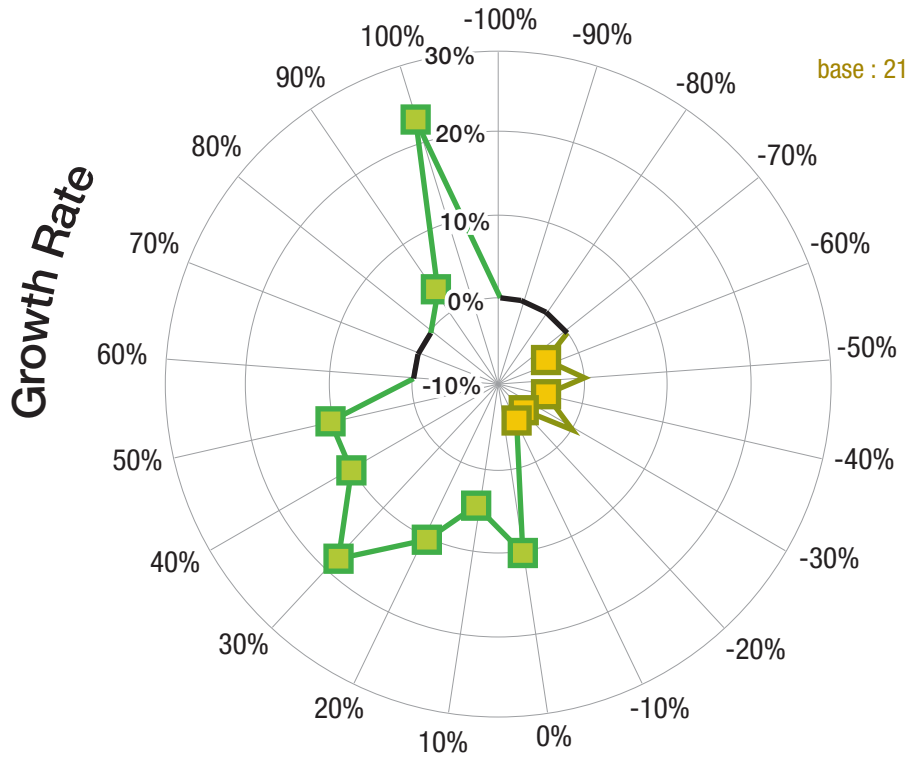


Figure 138: Market trends in the past 6 years

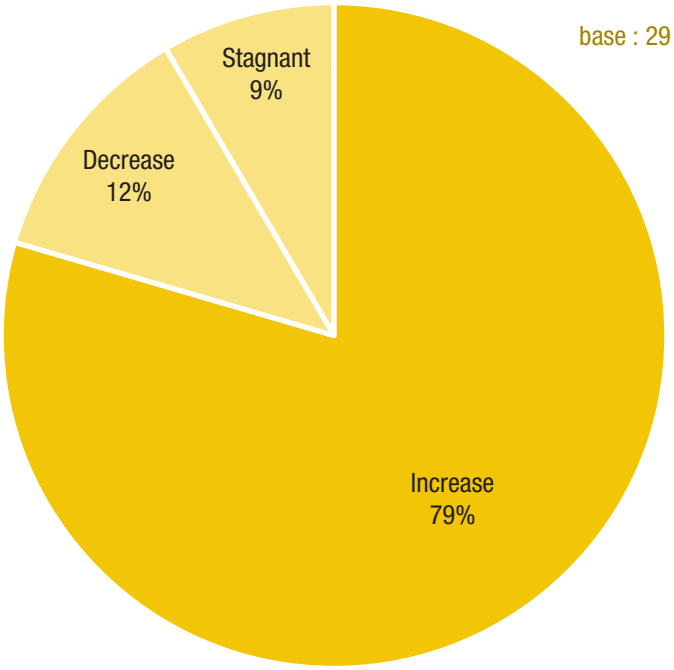


Figure 139: Market growth rate for 6 years as reported compared to the frequency of answers

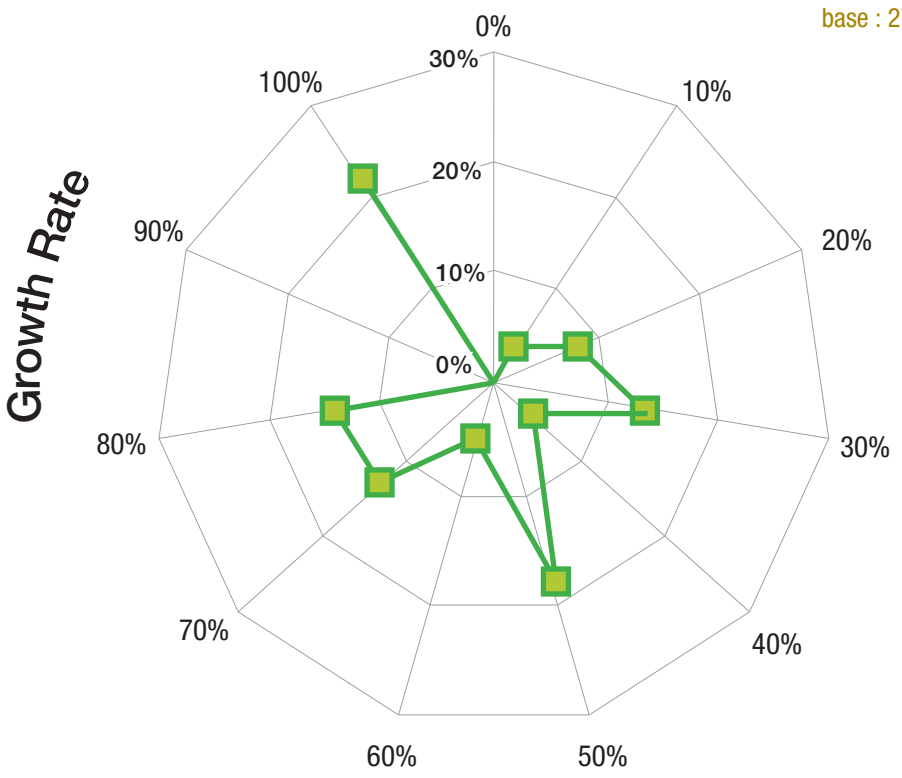
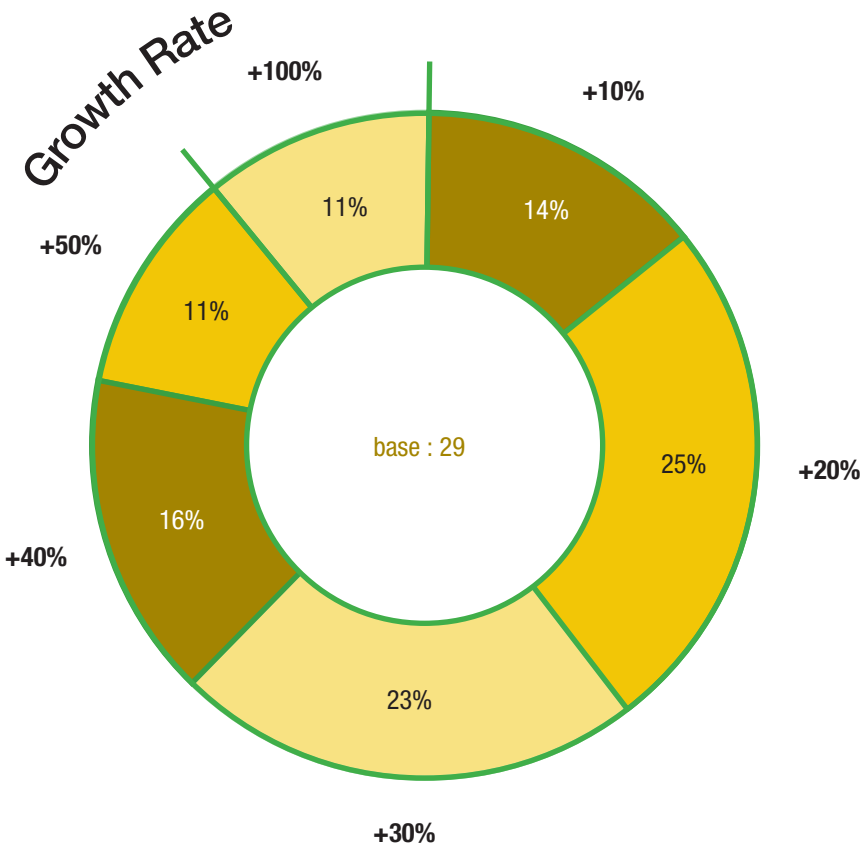


Figure 140: Growth rate of the dealers



3.3. Market Dynamics (Marketing, Sales, and Challenges)

In terms of market dynamics and activities performed by the dealers, the average stock turnover rate came out to be 98 days, with almost half the dealers falling in the range between 1 and 2 months, and others reaching almost a year. The details are sown in Figure 141.

In terms of sector, the residential sector seems to be having the highest share with 74%, followed by the commercial sector with 22%. The major industrial business using solar water heating systems is the food and catering business with 21% of the industrial installations, while the major commercial are hotels, restaurants, health clubs and hospitals as illustrated in Figure 142.

The dominance of the residential sector is also obvious in the types of systems sold, with an obvious presence of thermosiphon systems making 43% of the sales, and ranging from 100 to 300 liters with the majority in the 200 and 300 liters capacity range. The mean breakdown of systems by company is shown in Figure 143.

Despite the growth of the market and the spread of solar water heaters installation, operational and technical issues still occur as reported by the dealers. The major issues facing SWH systems are overheating, water leakage, insufficient water storage and other minor technical issues.

In terms of square meters, the majority of dealers install what ranges between 100 and 1000 square meters of solar collectors a year. One of the 29 companies claimed to install what exceeds 4,500 square meters per year. The distribution is shown in Figure 145. These systems are installed in the different regions of the country with the majority going to Greater Beirut and Mount Lebanon, with also a big share to North Lebanon and 26% to Bekaa and South together.

When asking the dealers about potential regions, it was obvious that South Lebanon had untapped potential with 45% of the dealers seeing it as a promising region. Mount Lebanon was projected to have the highest potential with 7 stars, followed by Beirut with 6 stars as shown in Figure 147.

The advancement of the sector is facing some problems as declared by the dealers, on top of which comes the lack of market regulation, lack of qualified labor, unfair competition, lack of awareness, and construction issues. These problems and potential solutions proposed by the users are presented in Figure 148.

Finally, the dealers use different marketing and outreach strategies to sell their products and reach end-users. Specialty publications came out to be the main way for the promotion of products, closely followed by billboards & newspapers as shown in Figure 149.

Figure 141: Stock turnover period at SWH dealers

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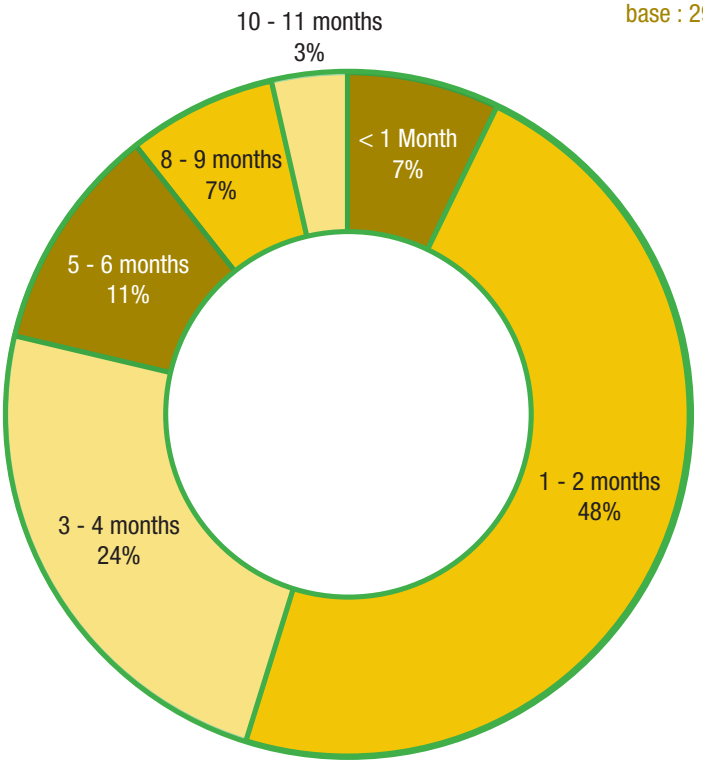


Figure 142: Installed SWH systems by sector

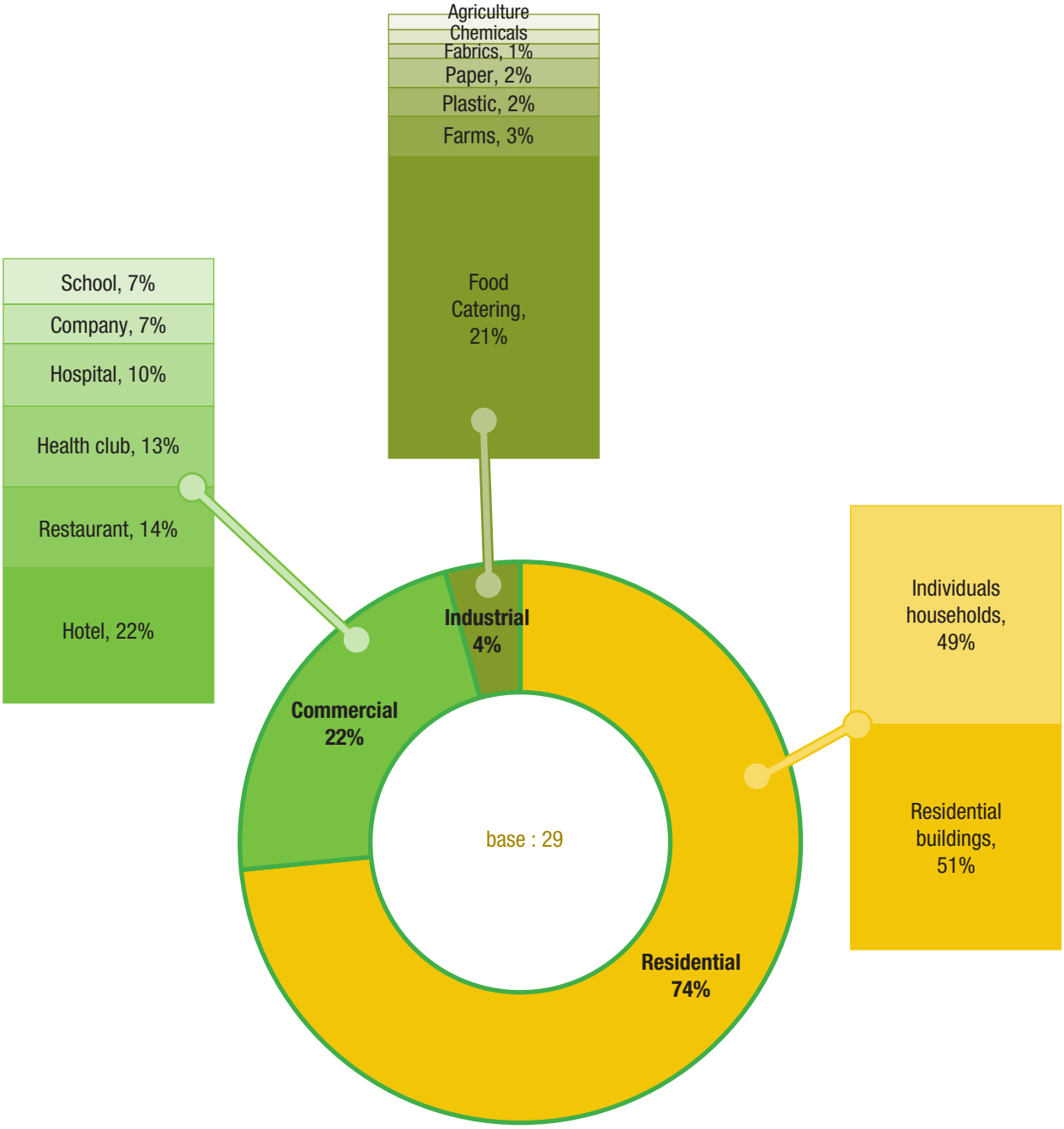


Figure 143: Product mix of each type of product

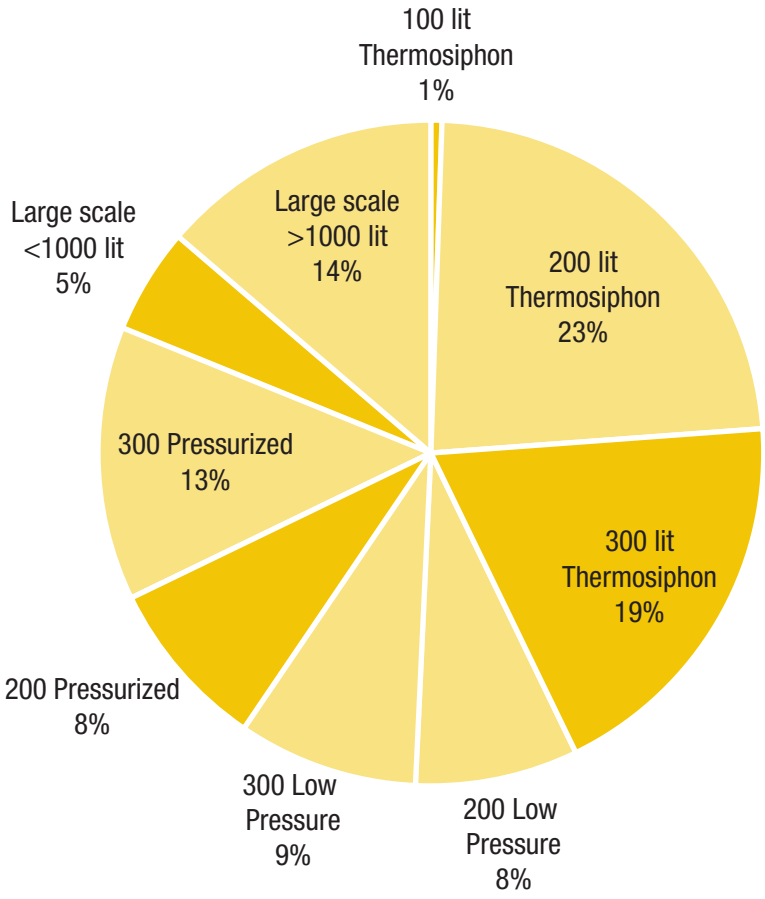


Figure 144: Common problems reported by end-users

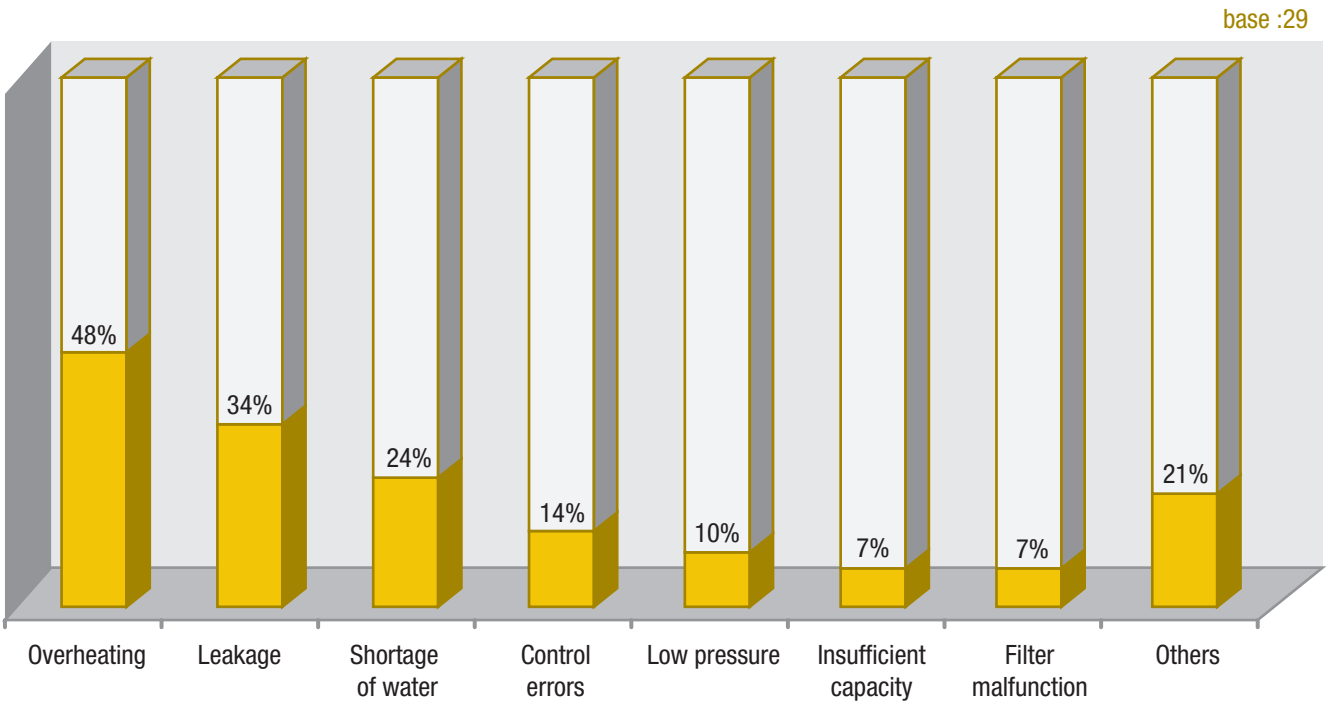


Figure 145: Surface area installed by year by SWH dealers

base : 29

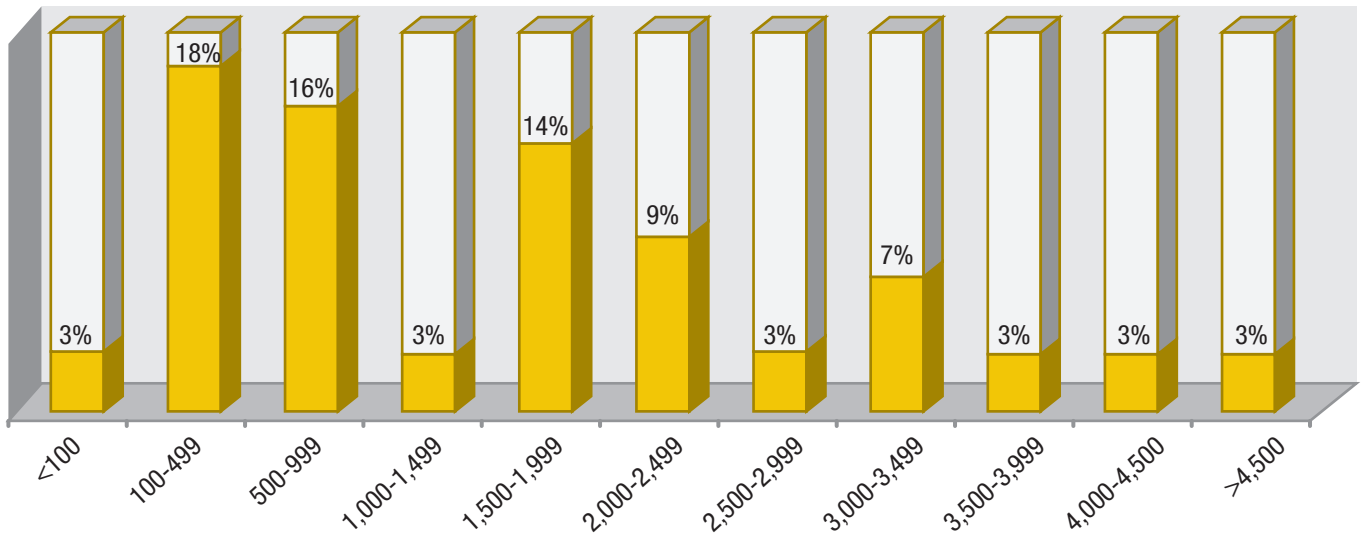


Figure 146: Annual average installed SWH installed by region

base : 29

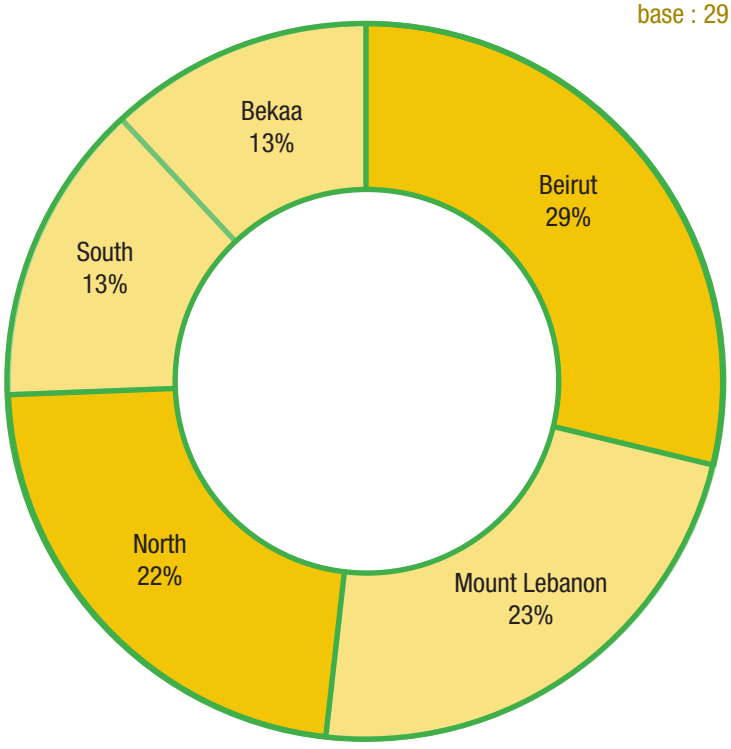


Figure 147: Promising regions for SWHs

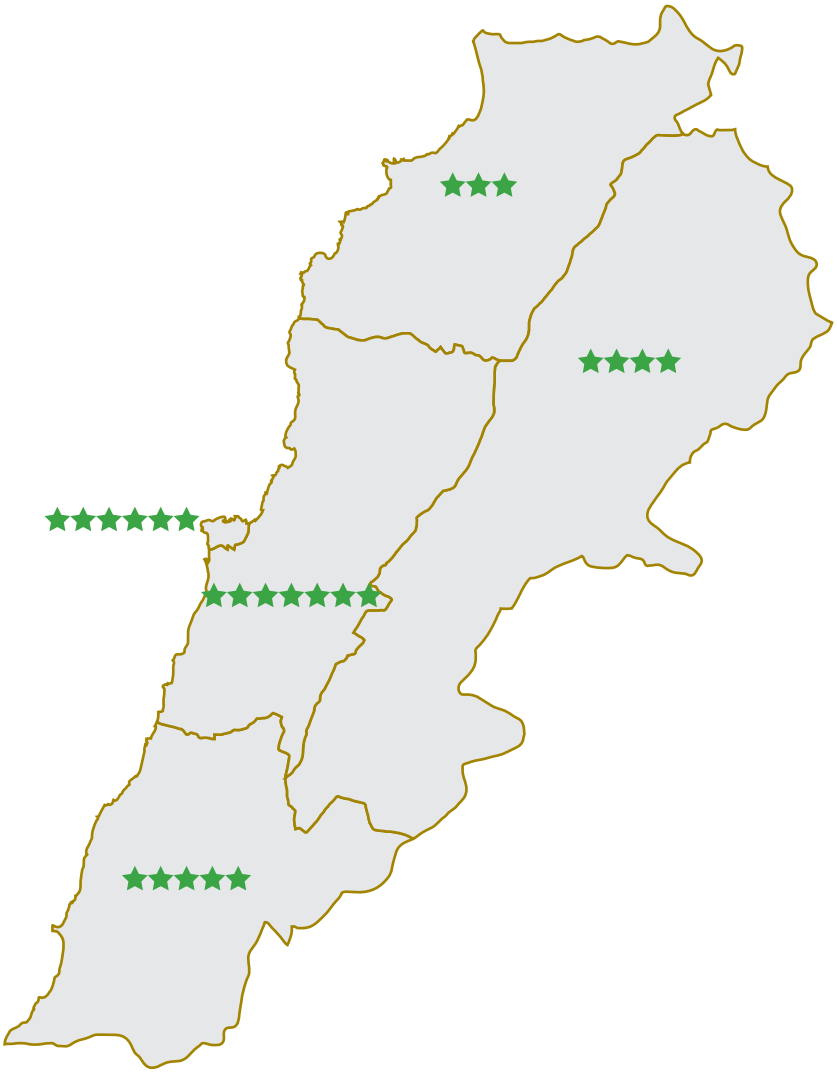


Figure 148: Challenges faced and proposed solutions

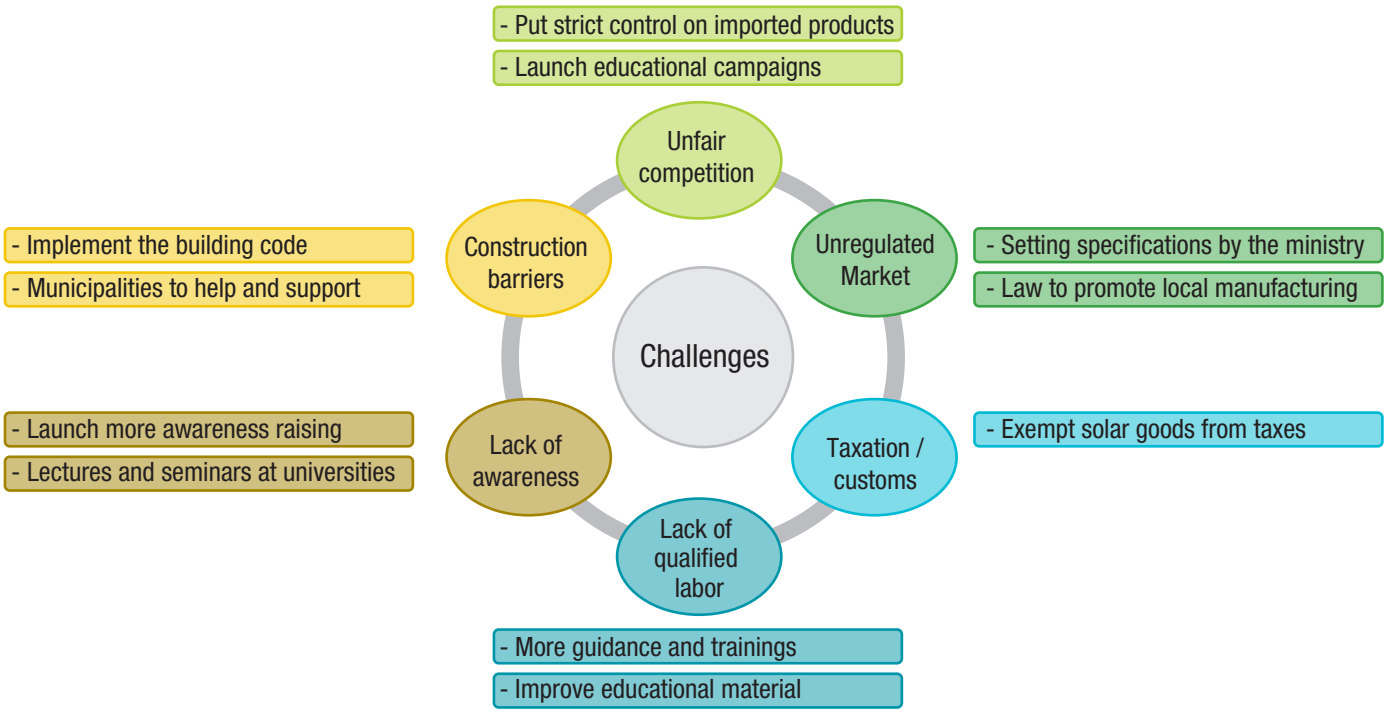
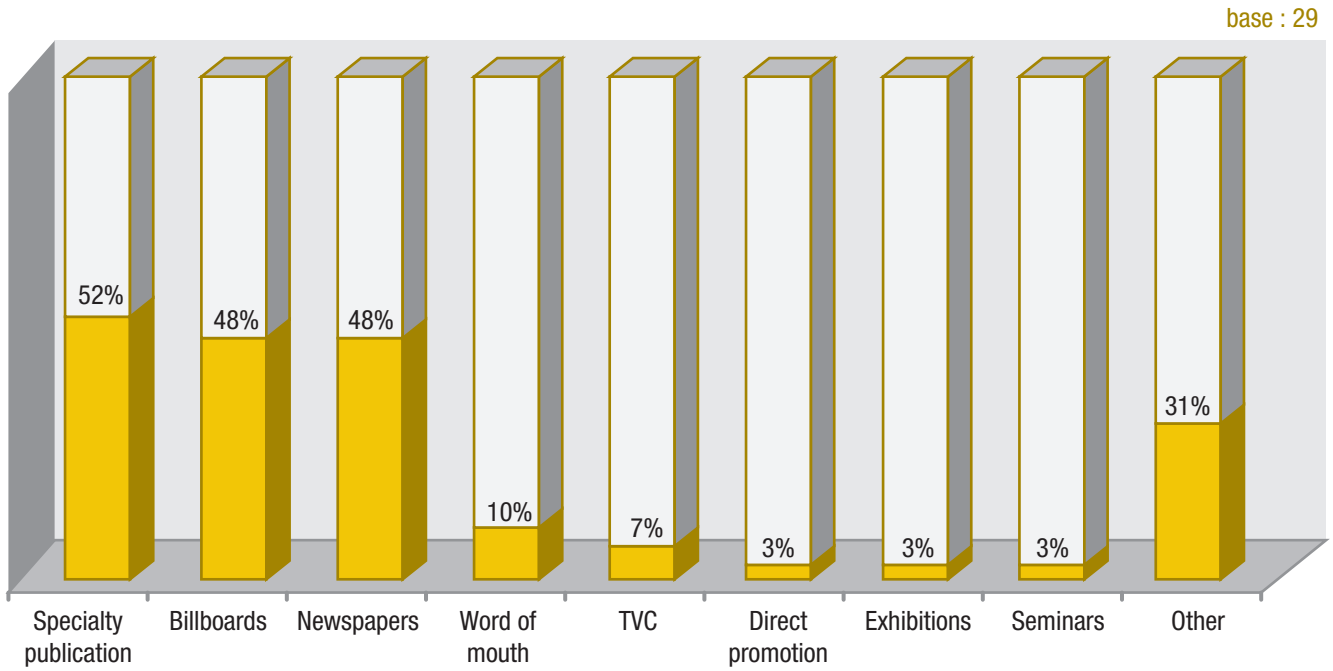


Figure 149: Promotion strategies followed by SWH dealers



3.4. Solar Photovoltaic Cells

Around 38% of solar water heater dealers deal with PV systems, selling separate components as well as whole systems. Products are mainly imported from China and Germany, with some components from Switzerland, India, and other European countries.

With PV systems requiring more area than solar water heating, it becomes less feasible in Beirut, and thus dropping the share to 11%. North Lebanon and Mount Lebanon have the biggest shares when it comes to PV installations as shown in Figure 153. These installations are mainly in the residential sector that makes 65% of the installations, followed by the commercial sector with 24%.

When asked about their grid connection preference, the majority of PV dealers were in favor of net-metering. Feed-in tariff seemed interesting to 36% of the dealers, who required a minimum average tariff of 29 USC per kWh.

Figure 150: Dealers selling PV systems

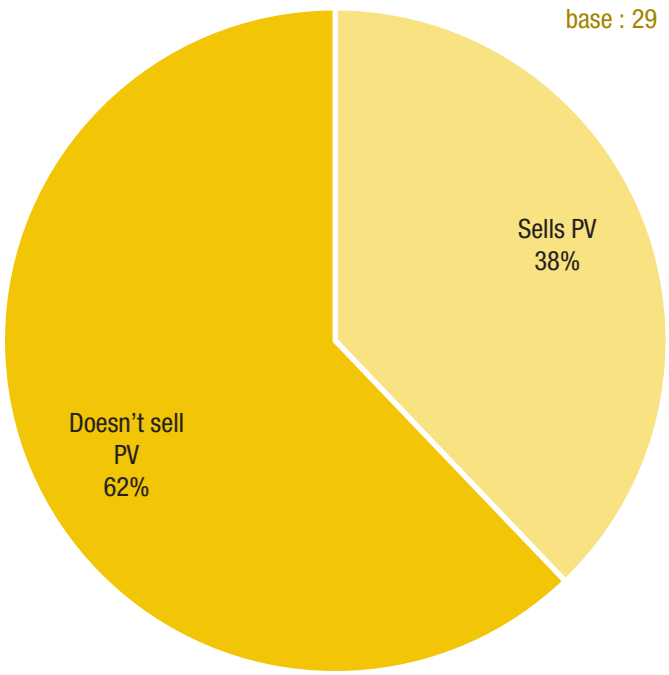


Figure 151: PV system components sold

base : 11

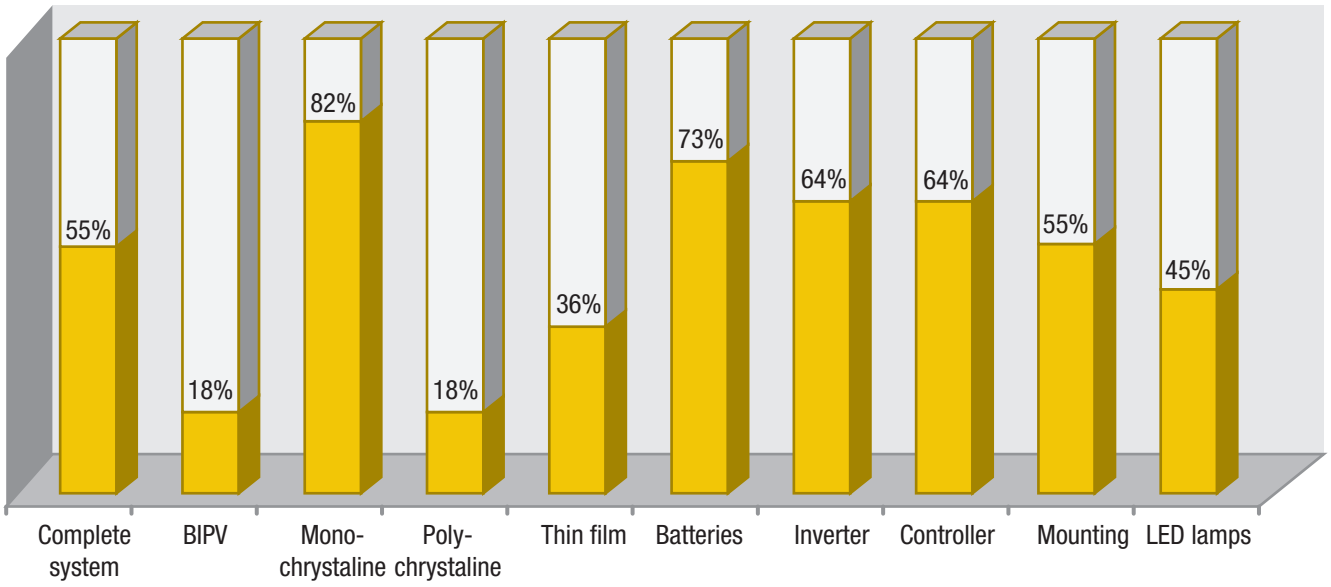


Figure 152: country of origin of PV components offered by dealers

base : 11

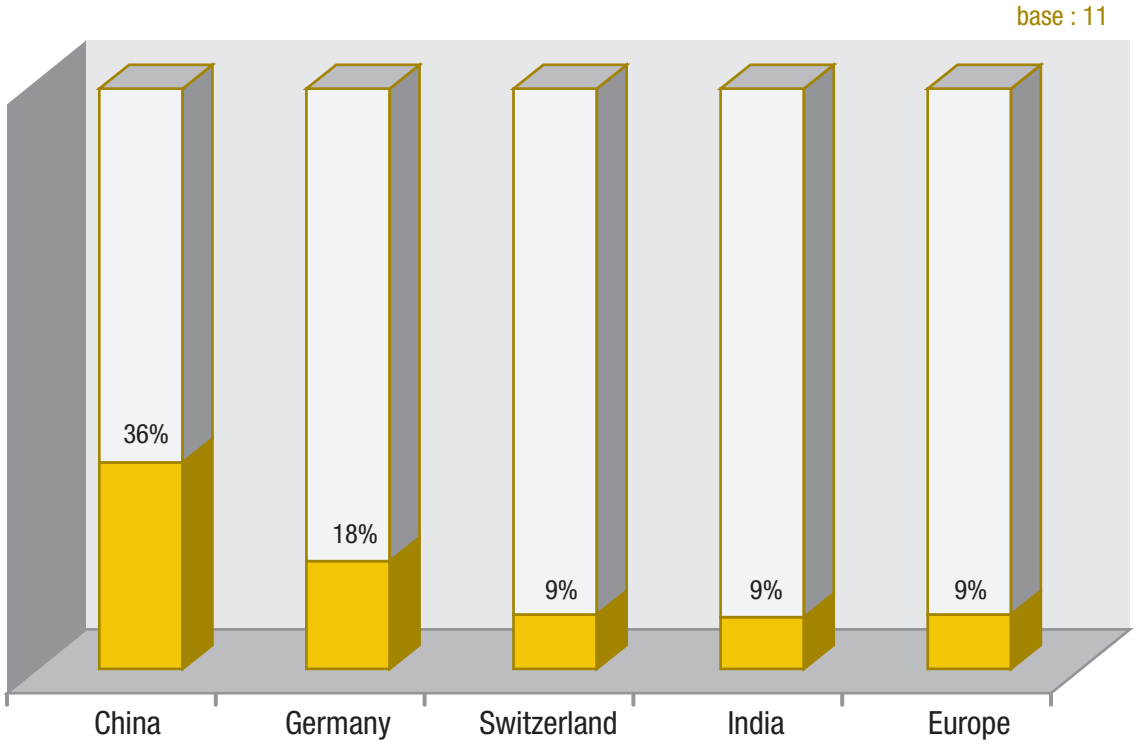


Figure 153: PV installations by region as reported by dealers

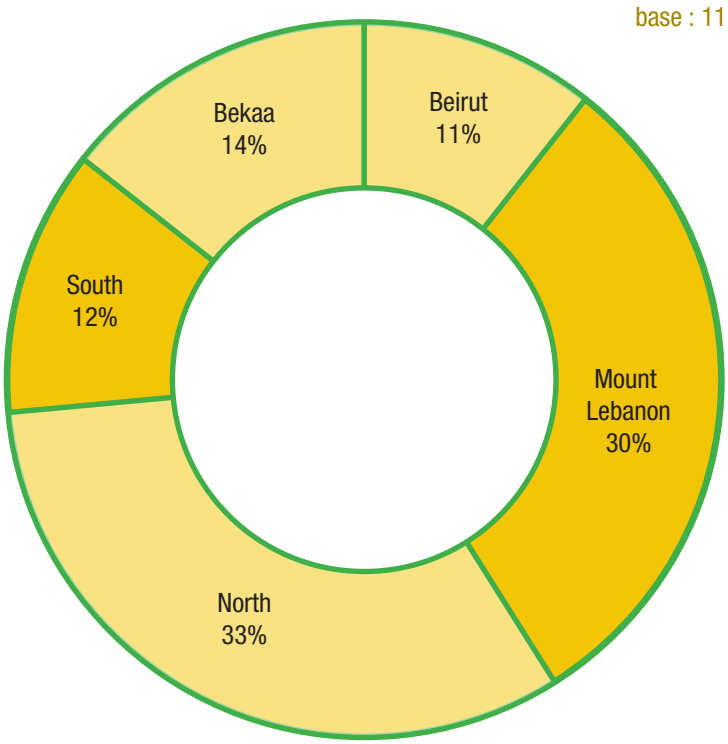


Figure 154: Split of PV end-users

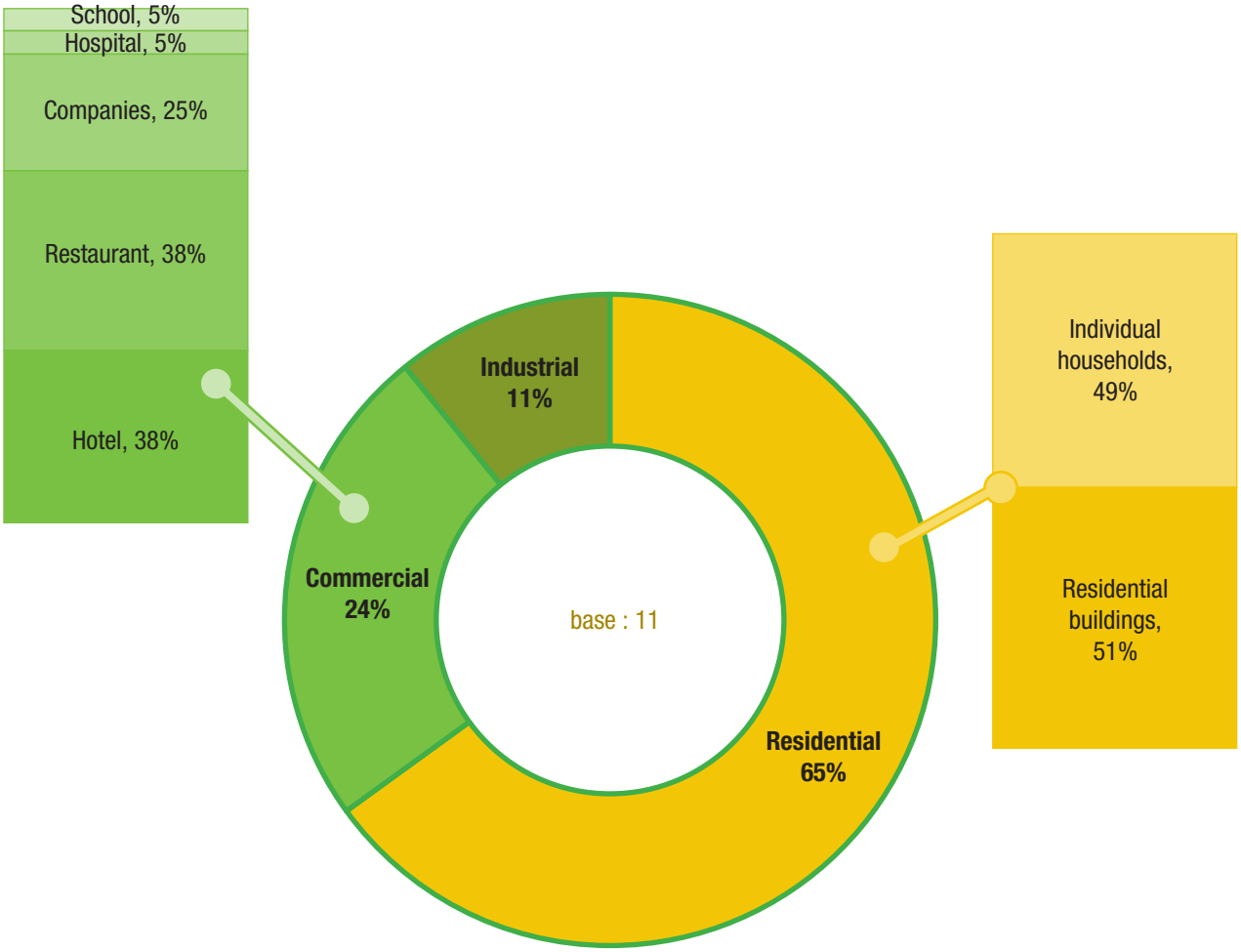


Figure 155: Net-metering versus feed-in tariff as seen by the dealers

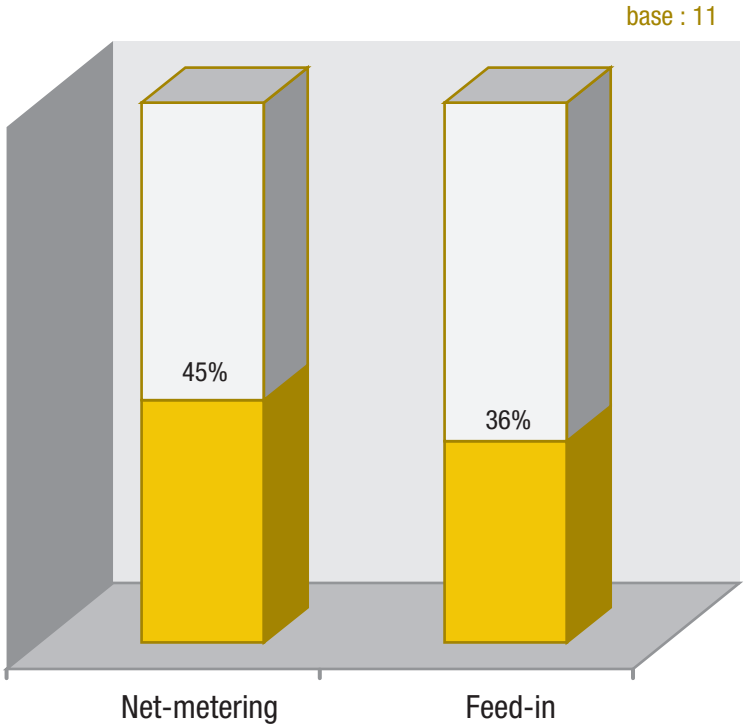
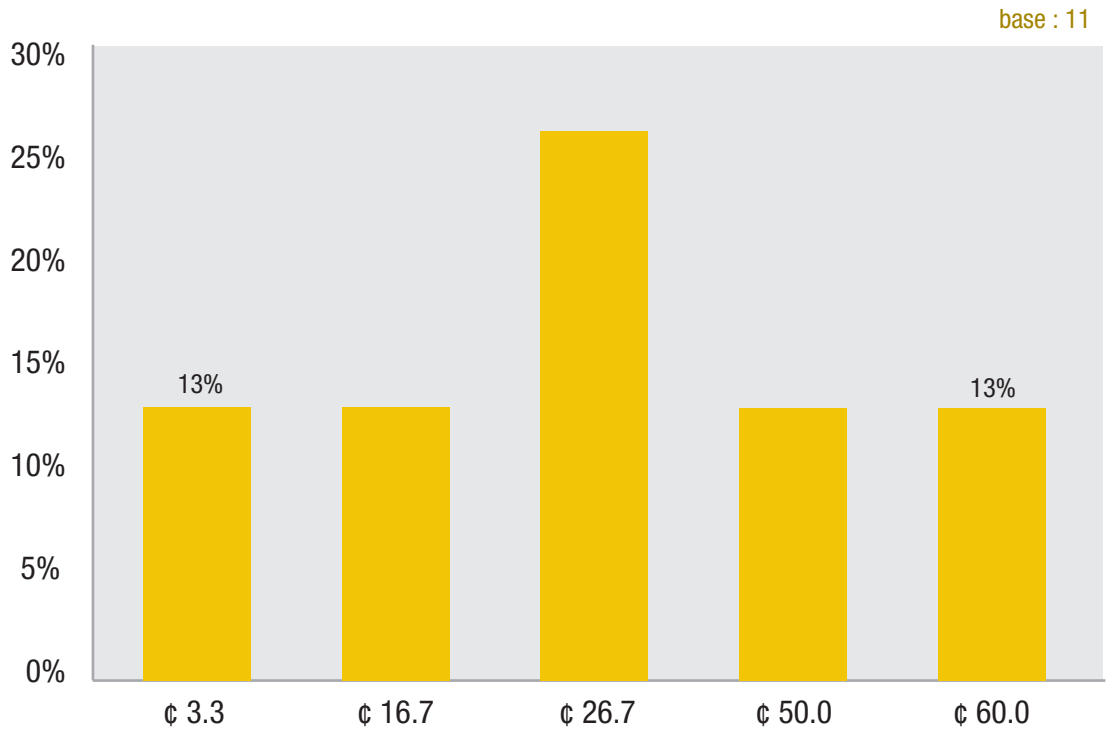


Figure 156: Lowest tariffs acceptable as proposed by the dealers



3.5. Awareness of LCEC

The role of LCEC is major in the development of the market, and was reported to have a positive impact on 88% of the companies, 41% of which saw that as a very positive impact. Only one company claims to be negatively affected by the LCEC initiatives, which could probably be a result of the quality control program. The overall score is 4.58 over 5, which is a very impressive result.

The impact of LCEC initiatives on the market is estimated at a growth rate of 78%, with some dealers saying that what LCEC has done in cooperation with the Ministry of Energy and Water and the Central Bank of Lebanon has improved the market by 400%.

Figure 157: Dealers' opinion on LCEC initiatives

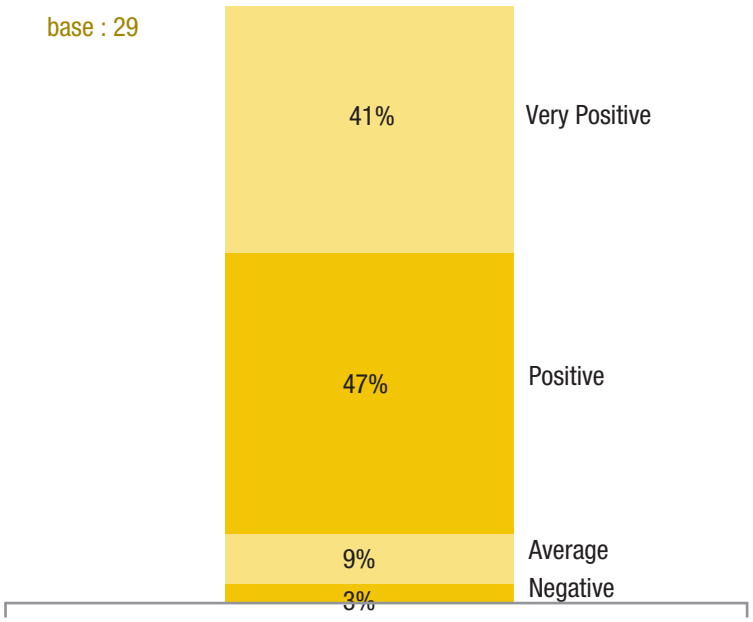
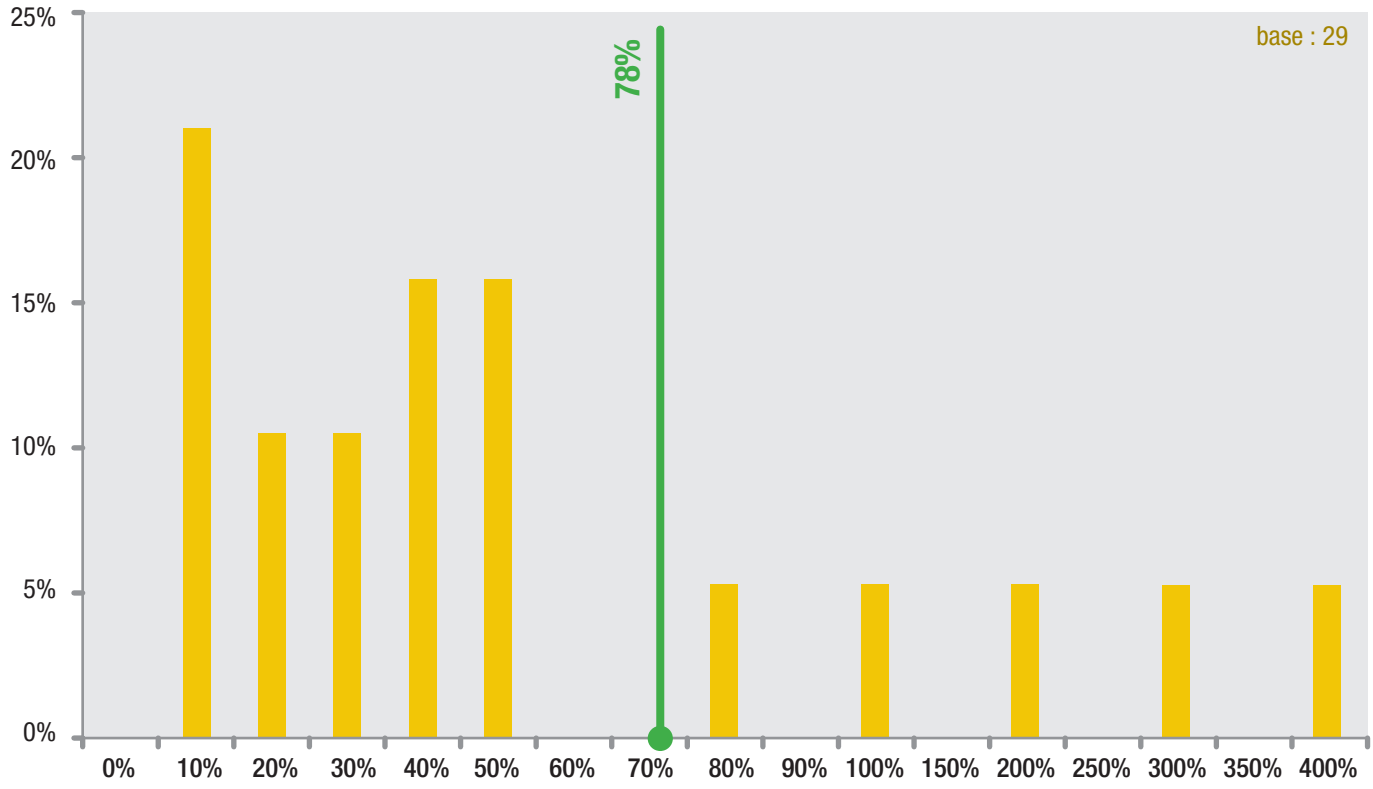


Figure 158: Dealer's opinion on the impact of LCEC on the solar thermal market



3.6. Key Extracts

- Evacuated tube systems are less expensive than flat plate with an average rate of $317 per square meter, 21% less than that for flat plate systems.

- Collectors and tanks make more than 70% of the system cost for all types of systems, while installation sometimes costs around 30% for thermosiphon systems.

- Around 62% of dealers import their products, while the rest get some locally manufactured products such as the tanks, panels, frames, etc.

- AutoCAD is the most widely used software followed by T-Sol and Polysun. These are used by less than 48% of the dealers.

- 66% of companies get their products from China, 62% from Turkey, and only 21% from Lebanon.

- China and Turkey have the biggest market shares, followed by Western Europe and Lebanon.

- Almost 91% of the products have certifications with around 86% having the Solar Keymark.

- 79% of SWH dealers witnessed demand growth during the past 6 years, and 72months mainly driven by the SWH subsidy program and the awareness raising campaigns.

- The average stock turnover rate is 98 days with the majority of companies claiming it to be between 1 and 2 months

- The residential sector has the lion's share in the current installations with 74%, split in halves between individual households and residential buildings.

- The most common SWH system is the thermosiphon making 43% of the installation, followed by pressurized system, then large scale and low pressure systems.

- Beirut and Mount Lebanon are the most tapped regions, with declared untapped potential in South Lebanon

- PV systems are mainly imported from China, Germany, Switzerland, and India

- PV systems are mostly installed in Mount Lebanon and the Northern regions of the country, with 65% for residential use and 24% for commercial.

- 55% of PV dealers favor net-metering over feed-in. The lowest Feed-in tariff acceptable by the dealers is at an average of 29 USC/kWh

- The majority of SWH dealers say that their business grew between 10% and 50% as a result of LCEC's initiatives

Chapter 4:
Institutions, Organizations, and Stakeholders

KEY INFORMATION AREAS

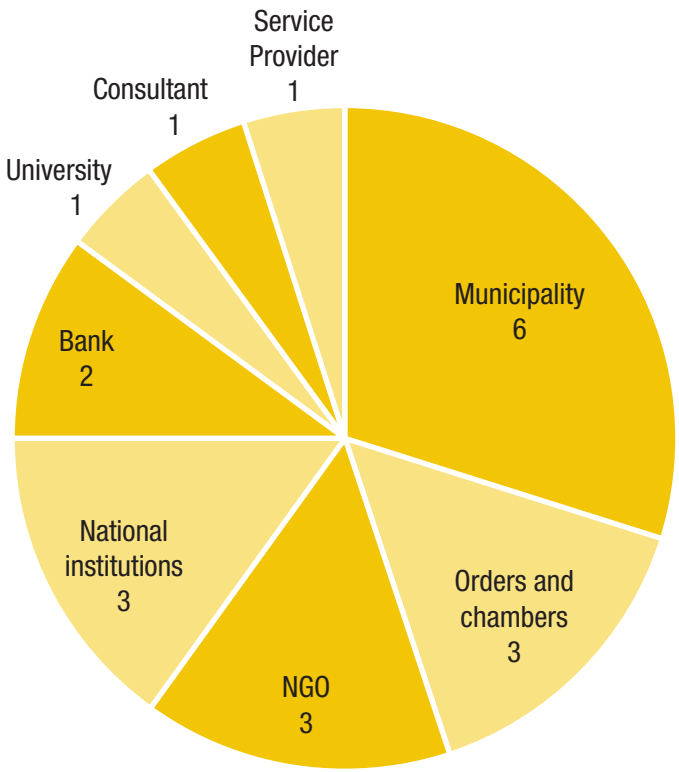
- Current market dynamics & Future perspectives
- Market development perceived barriers
- Necessary measures to promote awareness and facilitate market development

USERS PROFILE

The study surveyed 20 experts and stakeholders involved and aware of the solar thermal market in the country. A list of potential stakeholders was provided by LCEC to cover different sectors and operational roles, as shown in Figure 159.

The questionnaire used for Institutions, Organizations & Stakeholders study consisted of 80% open-ended questions in order to extract the maximum feedback. Hence, in order to maintain the in-depth approach, some findings were reported in a qualitative format.

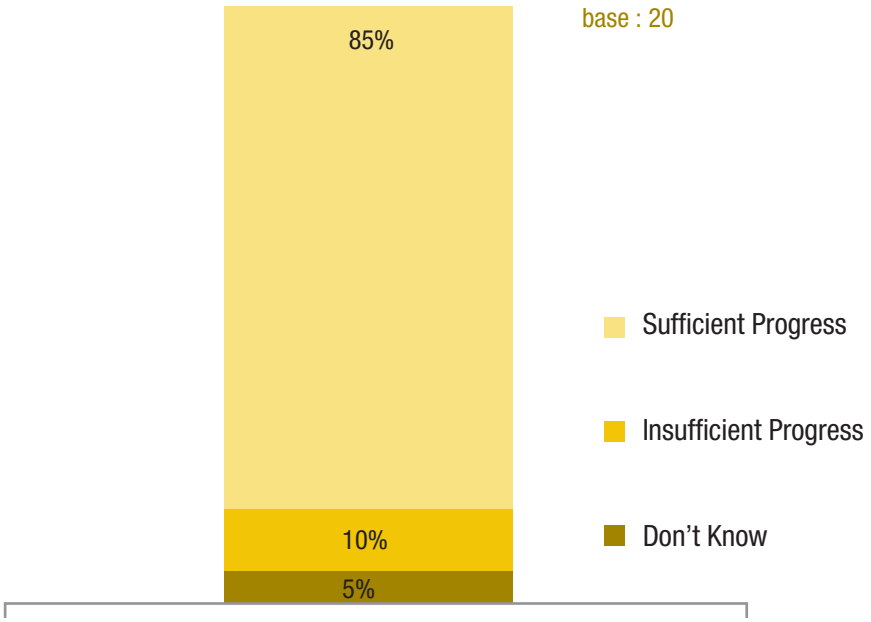
Figure 159: Breakdown of institutions, organizations & stakeholders surveyed (Stakeholders' opinion)



4.1. Market Progress

The solar water heating market has been growing for the past years. The demand is seen to have grown tremendously by 85% of the stakeholders as shown in Figure 160.

Figure 160: Progress in demand over the past 5 years (Stakeholders' opinion)



This increase of demand is mostly attributed to the following:

a. The growing need for making financial savings, as mentioned by all respondents, which is mainly strengthened by the increasing cost of electricity and the ongoing increase of the price of fuel.

b. The decrease of the price of the products and installation material encourages the demand and make the solar water heater more affordable.

c. The recurrent electricity outages which triggers considering alternative energy solutions to avoid the increasing and unreliable backup generators.

d. The initiatives done by the Ministry/ LCEC, especially the $200 subsidy, loans at no interest, the system for testing products, awareness campaigns. The last is in fact the improvement of the awareness level is among the key factors leading to the increase of demand, which was mostly enhanced by advertisements, followed by word-of-mouth among neighbors.

This insufficient increase of demand that does not level up with the expectations is mostly attributed to the following:

a. Lack of awareness among population

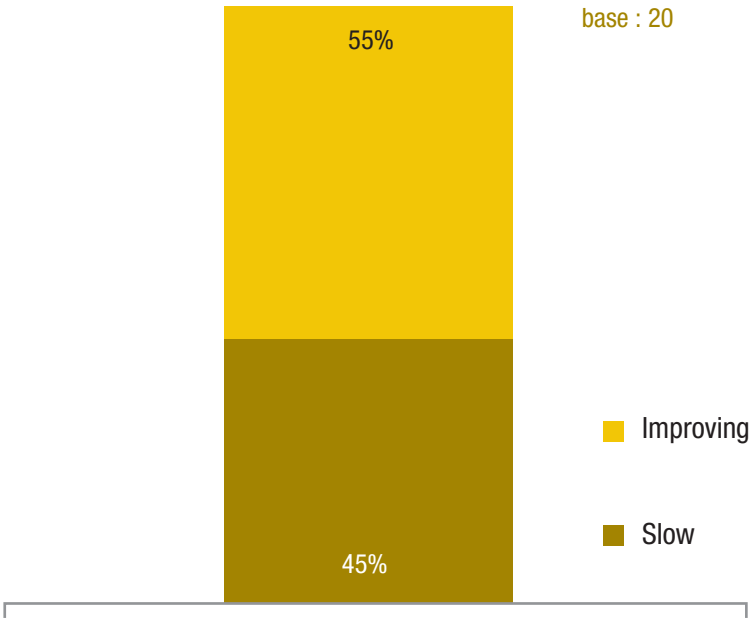
b. Lack of qualified technicians for maintenance; hence, issues can be faced by users of solar water heaters

c. Limited roof-space especially facing the increase of population density

d. Not being equipped for large scale projects which are more profitable than installations for individual houses

Speaking of renewable energy in general, slightly more than half the sample consider that the acceptance of the concept of renewable energy has improved, while the remaining part of the sample find that the progress has been insufficient.

Figure 161: Progress of acceptance of renewable energy (Stakeholders' opinion)



This increase in the acceptance of renewable energy in general is mostly driven by 2 key factors: awareness campaigns and trial and usage. This positive progress is mainly attributed to the following:

a. Awareness campaigns, advertisement, and lectures that highly contributed in triggering & increasing demand, including talks about global warming in the media and increasing the environmental awareness

b. Positive experiences with RE systems, making users influence their surrounding by sharing their experience and recommending RE solutions to friends and siblings.

c. Pilot projects implemented with simple observation can trigger curiosity

d. Increase of fuel cost pushing people to look for other options, which raised their interest in knowing more about renewable energy

e. Support & subsidy programs that bolstered the acceptance of renewable energy, making establishments more interested in ecological considerations as well social responsibility.

This slow increase in the acceptance of renewable energy in general is mostly driven by 2 key factors: insufficient information communication and imbalance in education and exposure. This slow progress is mainly attributed to the following:

a. The incomplete understanding of the concept of renewable energy that requires educational campaigns to be carried out, with clear directions, guidance and explanations.

b. The imbalance of exposure and educational level between the habitants of different areas, respondents consider that the understanding of the concept varies greatly between urban and rural areas.

At the supply side, there is a consensus that it has grown with a major indicator being the number of dealers selling and trading solar water heating systems. This could be also understood from the diversified products existing in the market. This increase is mostly attributed to the following:

a. The continuous increase in the number of dealers, leading to high competition and expansion of the market size, which has also resulted in the decrease of the price of products.

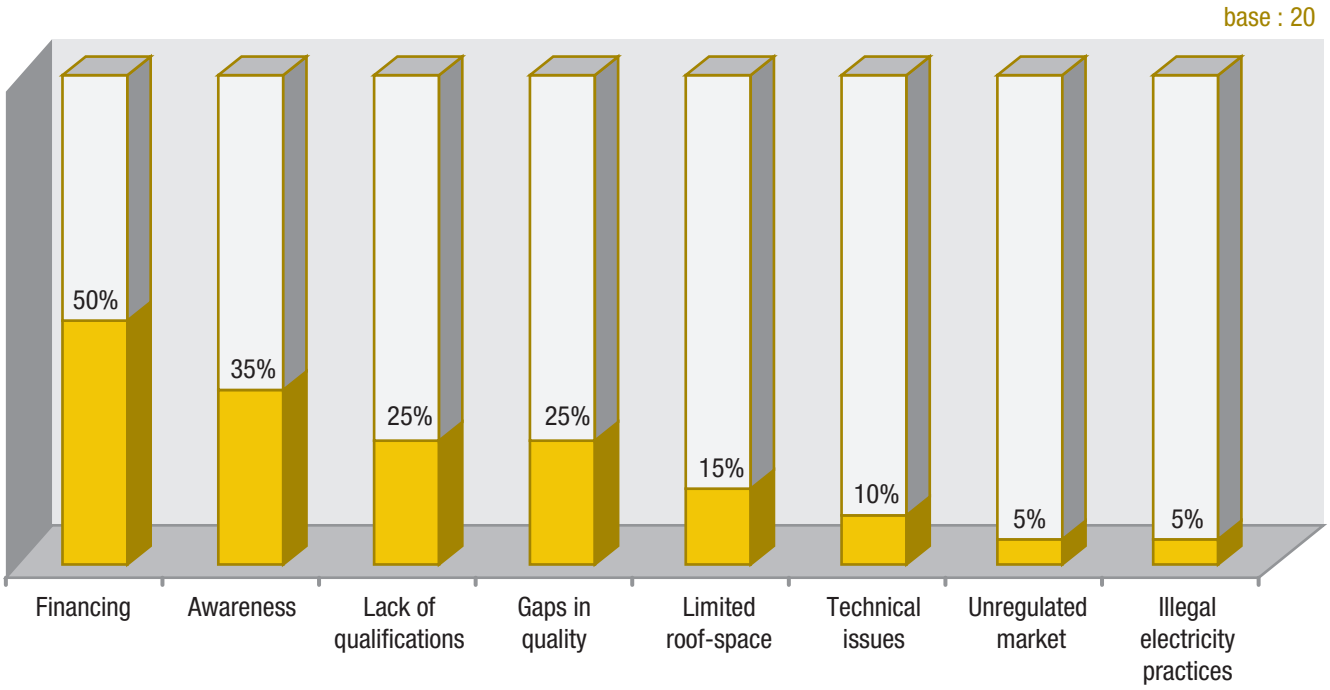
b. Ads and billboards that are seen as a sign of dynamism.

c. Diversified products offered on the market giving end-users several options adapted to their needs and budget.

4.2. Market Challenges and Performance

The main barriers hindering further development of the market are diverse with the financing playing a major role with 50% of the companies seeing this as a major reason. Other challenges include lack of awareness and technical qualification as well as roof-space issues and other technical matters.

Figure 162: Major challenges facing the solar thermal market in the past 5 years (Stakeholders' opinion)



The overall performance of the market has been evaluated in a positive manner, with 95% seeing it increasing and only 5% stagnating as shown in Figure 163. This has been perceived as satisfactory by more than half the respondents. This led to an overall score of 3.4 on a scale of 1 to 5.

Figure 163: Current performance of the market (Stakeholders' opinion)

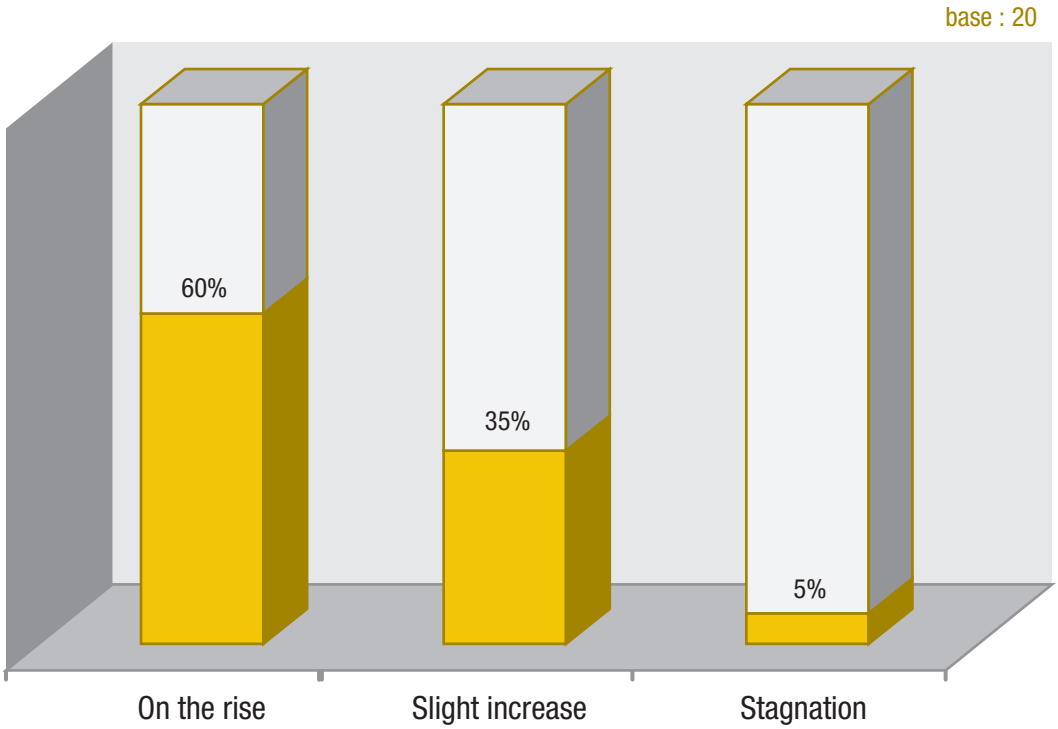
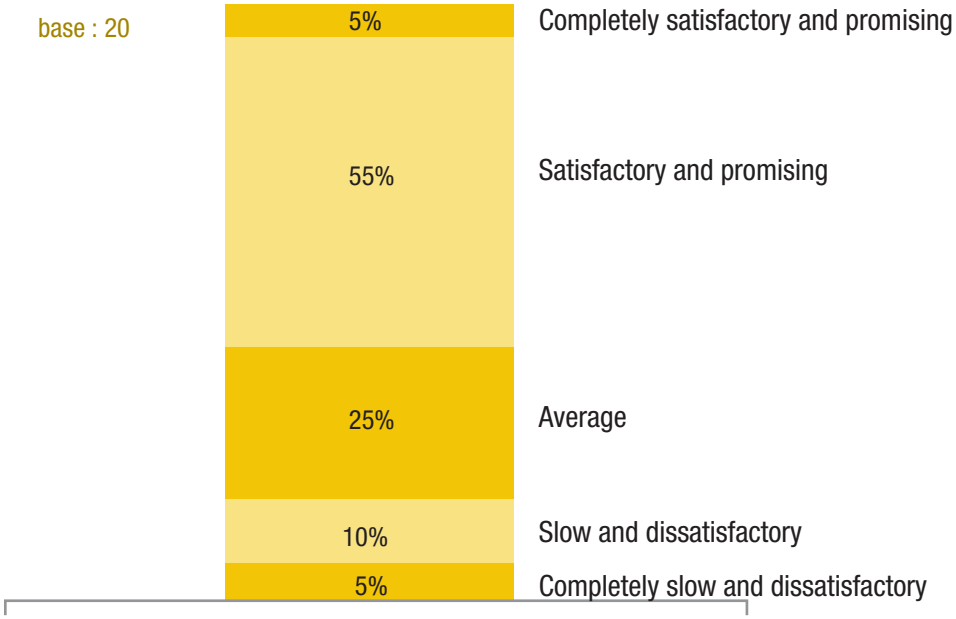


Figure 164: Perception of current market perspectives (Stakeholders' opinion)



In terms of renewable energy, stakeholders have different opinions with some saying it has improved and others seeing it is insufficient and needs more efforts. Around 60% of the respondents see an improvement in the general understanding of renewable energy systems, while 30% see it insufficient and needs more efforts to achieve full understanding.

Figure 165: Perception of current understanding of renewbale energy (Stakeholders' opinion)

4.3. Achievements and Initiatives

The Ministry of Energy and Water, the LCEC, the United Nations Development Programme, and other NGOs were mentioned as major players and top contributors in the development of the market in Lebanon. Their, and others, contributions led to several achievements that were vital for the development of the market as summarized in Table 3:

Table 3: Achievements, contributors, and initiatives (Stakeholders' opinion)

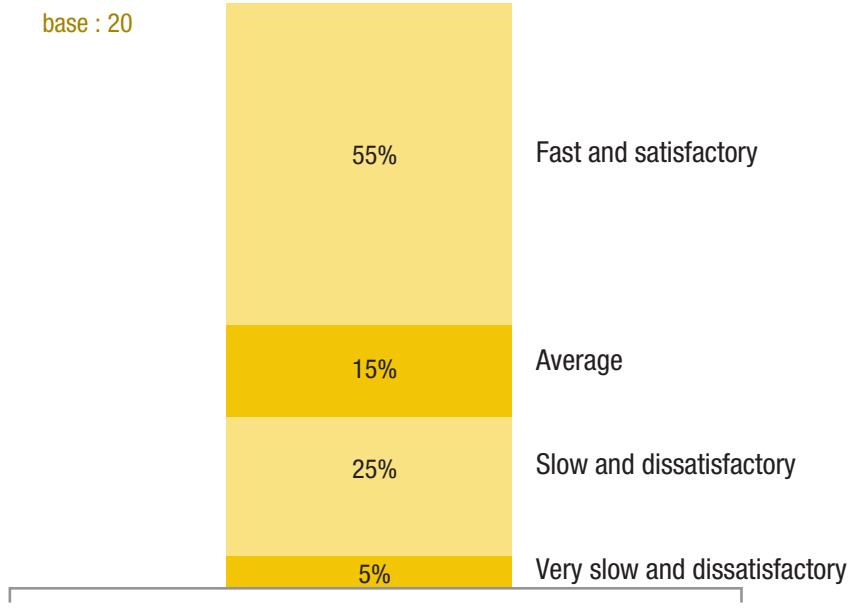
Achievement	Contributors	Initiatives
Increasing awareness	Primary role: • LCEC • MEW • Private dealers Supporting role: • LGBC • Green Line • UNDP	• Awareness campaigns • Publicities • Financing research and studies
Increase in demand	Primary role: • MEW • LCEC • BDL • Green Arms Lebanon • Municipalities Supporting role: • UNDP • Banks • Dealers • LGBC	• Financial facilitations: interest free loans • Subsidy program • LGBC's assessment system
Large-scale installations	Primary role: • UNDP (Greece, Spain) • CEDRO • China Supporting role: • Municipalities • Banks • Green Arms Lebanon	• SWH donation from China • Large scale projects for schools(CEDRO) • Projects for public institutions (UNDP)
Quality control scheme	Primary role: • UNDP (Greece) • IRI • LIBROR • LCEC	• Establish the SWH testing facility at IRI

Financial solutions	Primary role: • MEW • LCEC • Private companies • Banks Supporting role: • European Union • Municipalities • BDL	• Offering soft loans • The national SWH subsidy program • National initiative for the activation of RE
Standardization	Primary role: • LCEC • LIBNOR • IRI • MEW	• Setting norms at a national level • Performing training on the standards
Large-scale activities	• MEW	• Distribution of economical lamps
Practical tools	• LGBC	• Rating system
Spreading knowledge	• LCEC	• Energy Forums

These initiatives were not perfect, and were seen to include some gaps and require additional collaborative work to improve their impact. Respondents mentioned aps in the implementation of the financing scheme seeing it as insufficient and having some limitations. They also mentioned gaps due to technical issues such as limited roof-space, and installation and maintenance obstacles and limitations. Another major gap mentioned is the lack of market regulation and the uncontrolled electricity theft, making it unfeasible to invest in solar water heaters.

The overall impact of these initiatives is positive, reaching a score of 3.2 over 5 as rated by the respondents. Around 55% of respondents see the growth of the market as completely fast and satisfactory while 30% see it slow and dissatisfying.

Figure 166: Perception of market development pace (Stakeholders' perspective)



4.4. Proposed Actions and Recommended Solutions

With the several problems and barriers facing the market, stakeholders see room for improvement and propose a wide range of solutions that could remove barriers and enhance the solar thermal market.

Table 4: Solutions and actions needed to improve the solar thermal market (Stakeholders' perspective)

Challenge	Action needed
Financial constraints	• More initiatives • Installments with long settlement period • Installment embedded in electricity bill
Limited roof-space	• Find innovative technologies • Install common collectors • Organize roof-space • Make installations mandatory for new construction permits
Lack of awareness	• More awareness campaigns • Target academic milieu
Technical constraints	• Apply the set specifications • Explain more to customers about the quality/ types of products • Offer training programs
Unregulated market	• Regulate and control the market by implementing the set quality specifications • Complement the quality specifications with sanctions in case of non-compliance
Manufacturing issues	• Large-scale training programs about manufacturing techniques and technologies • Financial support: Facilitate the granting of loans for manufacturing purposes, tax exemption or reduction
High cost	• Tax exemption • Reduction of VAT and customs • Support: subsidy programs
Insufficient information	• Spread awareness on different products through the media

Table 5: Roles and contributions by major stakeholders (Stakeholders' perspective)`

Stakeholders	Initiatives that can be taken
MEW LCEC The Government	• Design long-term national plan • Lead initiatives to solve funding issues (Tax exemption,…) • Lead awareness campaigns • Constant coordination with other entities (NGOs,…) • Work on legislations for this sector • Put in place a set of reforms tackling the Theft of Electricity, tariffs, shortage issues
Municipalities	• Awareness campaigns/ Encourage • Putting in place with other entities a mechanism for exemption of municipality taxes for end-users
NGOs	• Contribute in raising awareness • Conferences, lectures, publications • Participate and take part in the initiatives led by Ministry of Energy
Central Bank	• Increase subsidized amounts
Banks	• Design special funding programs
Technical teaching centers	• Create a diploma for maintenance and installation
Academic milieu	• Integrate the concept of Renewable Energy to curriculum
Media	• Talk shows, documentaries, publication of figures about the progress and the savings

In order to have an affordable product to end-users, stakeholders see that the solar water heater should be priced at an average of 770 USD as Figure 167 shows.

Figure 167: Optimal price of SWH (Stakeholders' perspective)

4.5. The Solar PV Market

The solar PV market seems to be perceived as less promising than the solar thermal market. Around 75% of the respondents see that the high cost of the PV systems is a major issue and will stay a barrier hindering the development of the market. Several solutions are proposed on this front, mainly financial mechanisms including tax exemption, subsidy programs, and other support initiatives.

Figure 168: Major problems facing the PV market (Stakeholders' perspective)

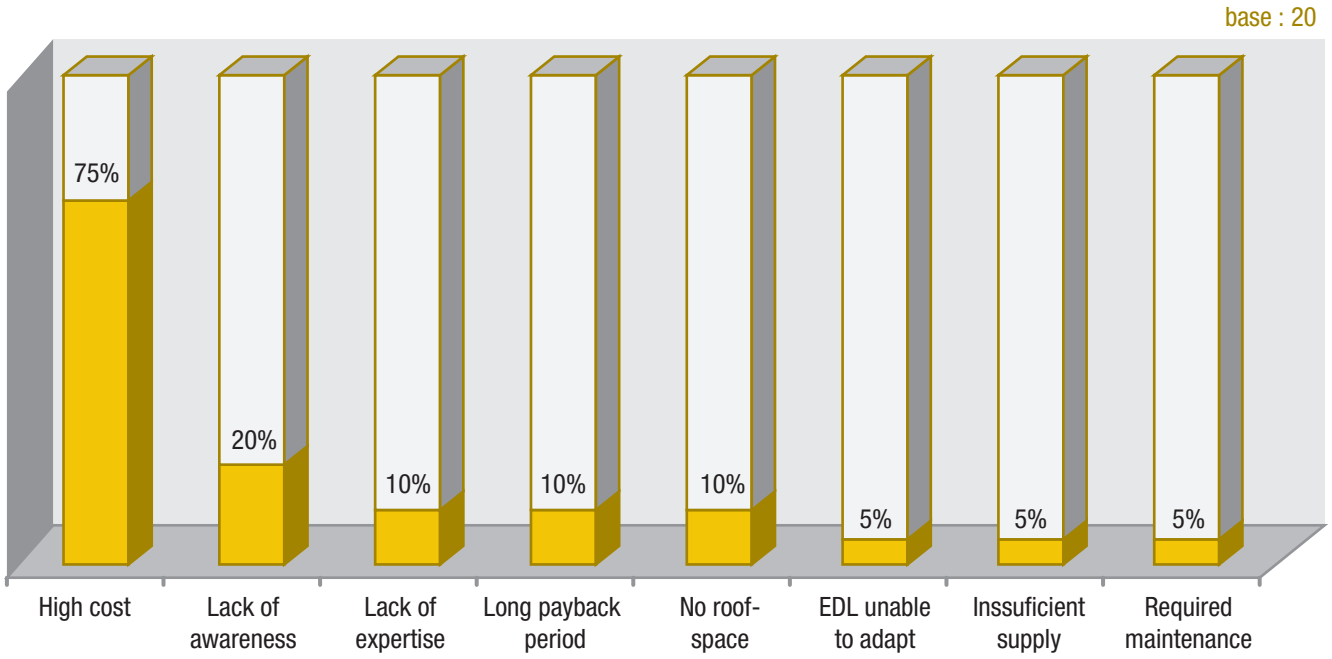
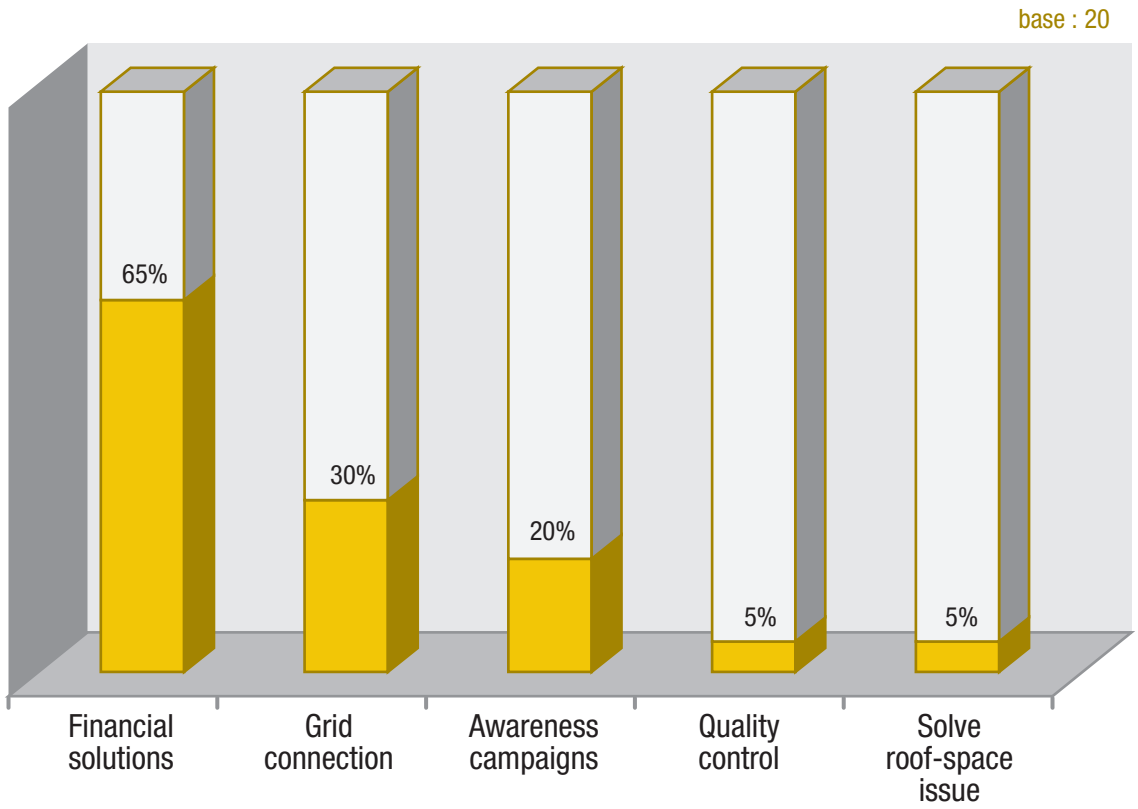


Figure 169: Proposed incentives and solutions to improve the solar PV market (Stakeholders' perspective)



Grid connection was mentioned as an incentive the decision makers need to consider, especially net-metering which was seen by 85% of the stakeholders to create a positive momentum in the PV market. The impact varies by method, and seems to be perceived as more for feed-in. 60% preferred feed-in seeing that it improves the market by 54%, while 25% preferred net-metering that would improve the market by 34% only as shown in Figure 171 and Figure 172.

Figure 170: Preference of grid connection methods (Stakeholders' perspective)

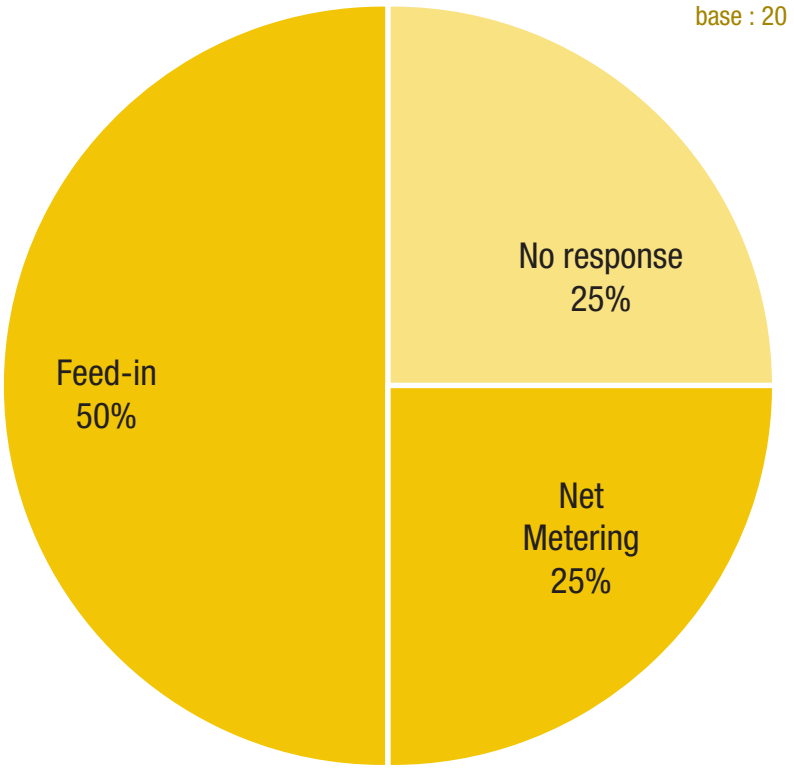
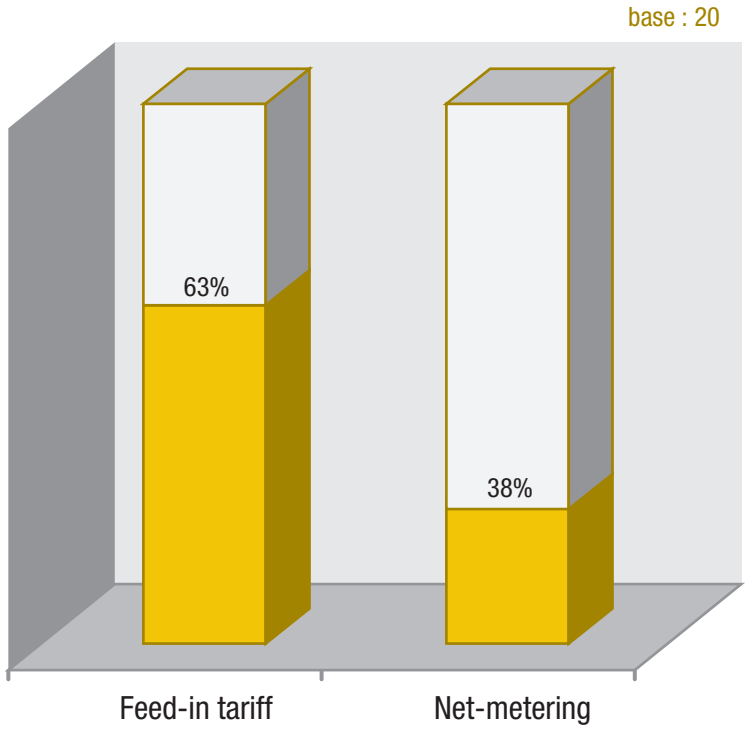
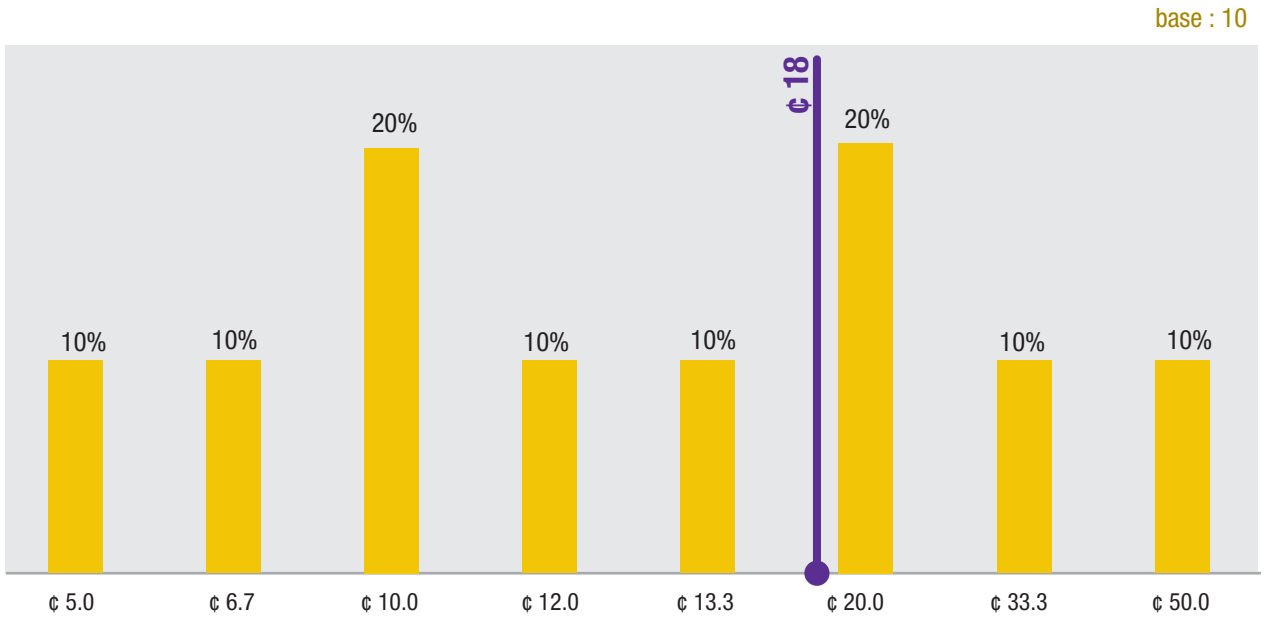


Figure 171: Preference of net-metering and feed-in tariff on the market (Stakeholders' perspective)



In case of Feed-in tariff, the average proposed tariff is estimated to be 18 USC as shown in Figure 172.

Figure 172: Lowest feed-in tariff possible (Stakeholders' perspective)



4.6. The Impact of LCEC

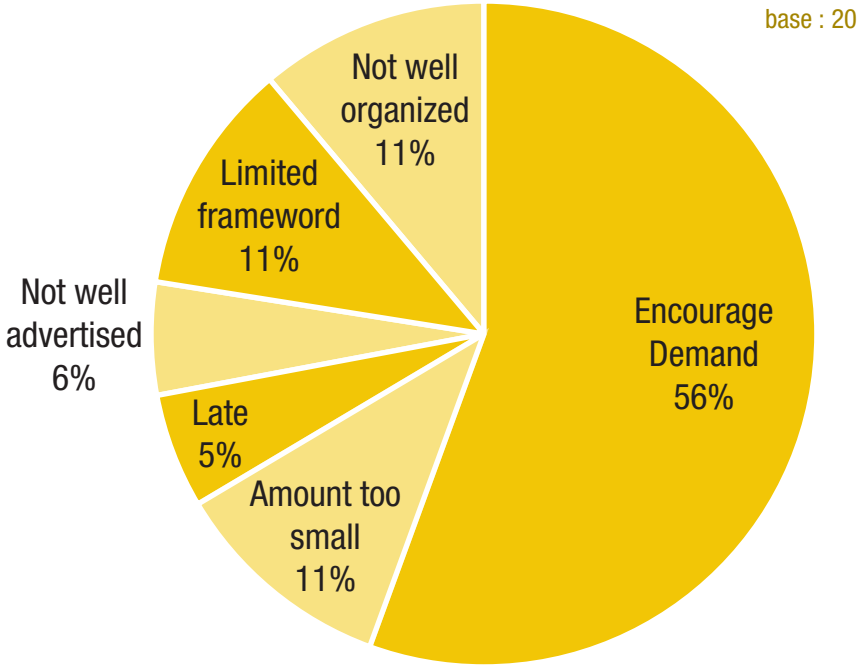
LCEC has been working on the development of the solar thermal market for years now, and mainly through the implementation of the GEF-funded project "global solar water heaters market transformation and strengthening initiative".

In 2010, the LCEC succeeded in setting a national financing scheme for solar water heaters, which has shown to have a very positive impact on the market.

According to the stakeholders and organizations, LCEC's initiatives are perceived to be effective and positively contributing to progress, with 50% of respondents seeing LCEC as a proactive entity which is producing tangible results & hence should maintain this level of activities. 25% of respondents consider that the initiatives are good; however they see that more initiatives are needed to tackle funding issues, and more alignment is needed with different stakeholders & entities to focus more on quality specifications and expand the scope of work of LCEC.

Speaking of the latest LCEC initiative, the national SWH financing mechanism, 56% of the stakeholders see that this initiative has improved the market and increased the demand. Yet some see the initiative to lack major issues for proper implementation.

Figure 173: Perceived impact of the LCEC-run $200 subsidy program (Stakeholders' perspective)



In general, all respondents saw room for improvement with suggestion made. The two main suggestions came out to be broadening the group of beneficiaries and target all applicants, in addition to increasing the subsidized amount.

Other key suggestions came out to be to complement and accompany the subsidy with tax exemption, and communicate more about this initiative.

Said about the LCEC

"Great, they are actively working and are achieving tangible results, such as the economical lamps campaign" - Institution

"We expect from them to play a strategic role by designing a plan for the next 10 years which can be implemented; their achievements are good, especially in reference to their short life" - Research Institution

"Good initiatives on the awareness front but more is needed on the financial level; they do try to understand the reasons for all issues, trends, but it is not enough" - Academic Institution

"Good initiatives; LCEC is doing the required but should seek solutions for customs tariffs with the government" - Institution

4.7. Key Extracts

- The solar thermal market in Lebanon is growing rapidly, with 85% of stakeholders seeing this progress sufficient.

- Financing, lack of awareness, and lack of qualified labor are the major challenges facing the sector.

- Understanding of renewable energy is improving but still needs additional efforts. More than 40% see this as insufficient and requires more effort to communicate a good understanding of RE.

- More efforts are needed at the financial level and the technical level. Stakeholders see that it is a major issue that there is no qualified engineers and labor in this market.

- The major actions seen as market mobilizers are the national SWH financing scheme, the increase of awareness, and the pilot projects

- Stakeholders see that an affordable price for a solar water heater should be 770 USD on average

- The PV market is still undeveloped and faces several problems mainly led by the high cost as seen by 75% of the stakeholders

- Best solutions to improve the solar PV market include financial support such as subsidy program soft loans, as well as grid connection methods such as feed-in tariff and net-metering.

- Stakeholders seem to prefer feed-in over net-metering, as they see it more to be accepted by the end-users and would have a better impact on the market.

- The average minimum feed-in tariff as seen by the stakeholders is 18 USC

- All the stakeholders interviewed see that LCEC had a positive impact on the market and that its initiatives have helped improve the solar thermal market in the country

Annexes

Annex 1: Institutions and stakeholders questionnaire
Annex 2: List of interviewed institutions and stakeholders
Annex 3: List of interviewed dealers and suppliers

Annex 1: Institutions and stakeholders questionnaire

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Assessment of the Solar Thermal Market

Questionnaire:

Institutions, stakeholders

The Nielsen Company
Job No.: EMG
Date: July08
Fieldwork: July/August 2011

SERIAL NO.			**CARD NO.**	
Punchers Code			Coders Code	

QUOTA CONTROLS

Institutions	**1**					
Stakeholders	**2**					
	3					

RESPONDENT DETAILS

NAME of respondent	
Name of institution	
Designation	
ADDRESS	
TELEPHONE NO.	

INTERVIEWER NAME								
INTERVIEWER NUMBER								
INTERVIEW DATE					2	0	1	1
TIME OF INTERVIEW (a.m/p.m)								

BACKCHECK	
YES	1
NO	2

QUALITY CONTROL	
TELEPHONE	1
PERSONAL	2

BACKCHECK SUPERVISOR								
BACKCHECK DATE					2	0	1	1

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A. Evolution of the market

Let us start by retracing the evolution of the Thermal Heating market throughout the 5 past years:
In order to understand the market progress, I would like to ask you about each aspect separately:

A1. First, how has the demand progressed over the 5 past years? What has triggered this evolution?

A2. How has the understanding and acceptance of the concept of Renewable Energy evolved? For which reasons?

A3. And, how has the supply varied?

A4. What were the main challenges faced across the past 5 years?

A5. What were the main achievements? Who are the parties who mostly contributed in accomplishing them? And what are the initiatives that led to this result?

Achievements	Contributors	Initiatives

A6. In which development areas do you think there were gaps in terms of efforts and initiatives?

A7. Do you consider the market development pace over the past 5 years to be:

Completely slow & dissatisfying	**1**
Slow & Dissatisfying	**2**
Neither satisfying nor dissatisfying	**3**
Fast & Satisfying	**4**
Completely Fast & Satisfying	**5**

A8. How did the subsidy of the Ministry of Energy and Water (200$ per system) impact the growth?

A9. In your opinion, can this scheme be improved?

A10. If yes, How?

A9		**A10**
Yes	1	
No	2	

A. Evolution of the market

Now, moving on to current market dynamics, before I ask you separately about the current demand & supply, I would like to know:

B1. How is the market currently performing? Is the market size on the rise, is it stagnant, or is it on the downfall? For which reasons?

B2. How would you rate current market perspectives?

Completely dissatisfying & unpromising	**1**
Dissatisfying & unpromising	**2**
Neither satisfying nor dissatisfying	**3**
Satisfying& promising	**4**
Completely satisfying& promising	**5**

B3. For which reasons?

Now specifically talking about demand:

B4. How has the demand evolved since last year? By what proportion has it varied?

B5. In your opinion, what has triggered this trend?

I would like to understand the origin of demand:

B6. B6.a Is demand currently coming mostly from residential or commercial end-users? Could you please give me the split in % among these 2 categories of end-users?

Residential end-users	
Commercial end-users	
Total	**100%**

B6.b For which reasons do you think that this breakdown exists?

Now, speaking separately about each category of end-users:

B6.c What are the profiles of residential end-users who are interested in installing solar water heaters? (SEC, size of family, type of residence…)What is their main motivation for proceeding with the installation?

B6.d What about the types of commercial end-users who are interested in solar water heaters? What is their main motivation for proceeding with the installation?

B7. B7.a What about the geographic split of demand? From which regions is it mostly coming from?
B7.b For which reasons do you think this trend exists?

B7.a Insert %		B7.b Reasons
Beirut		
Mount Lebanon		
North		
South		
Bekaa		

B8. Today, to which extent do you think that end-users understand and relate with the concept of Renewable Energy?

B9. What are the barriers facing demand?

B10. What do you suggest in order to boost the demand of solar water heaters?

Barriers	Suggestions

Supply

B11. How is the supply currently performing against the demand?

B12. What are the challenges facing supply? What could be the solutions to these challenges?

Barriers	Suggestions

B13. How can the dealers and suppliers be provided with more support to grow their business? Who would be responsible for leading these initiatives?

Support	Parties to lead initiatives

B14. In your opinion, what is the optimal price per household (per 200 liters typical system)?

Amount in USD ($)

Amount in LBP (LL)

				0	0	0

B15. Do you think that legislation would help improve market?

B16. If yes, which ones?

B15		B16
Yes	1	
No	2	

B17. Are you aware of the national CDM project for solar energy?

Yes	1
No	2

I would like to have your opinion regarding PV systems:

B18. What are the problems you face within the PV market in Lebanon?

B19. In your opinion, what are the incentives needed to promote Solar PV system?

B20. Do you think net metering would make clients more interested in installing PV systems?

Yes	1
No	2

B21. Do you think that clients would be interested in selling electricity to the EDL?

Yes	1
No	2

B22. If yes, what is the optimal tariff which the kWh should be sold at?

Amount in USD ($)

Amount in LBP (LL)

				0	0	0

B23. Speaking of net-metering and Feed-in tariff, do you think that either one can remove the barriers of PV usage?

B24. If yes which one?

B23		B24	
Yes	1	Net Metering	1
No	2	Feed In	2

B25. In your opinion, by what percentage would each of Net Metering & Feed-in affect the market growth?

Net Metering		%
Feed In		%

B26. What would you prefer between:

Net Metering	1
Feed In	2

C. Future Perspectives

After having discussed current market dynamics, let us now move to future perspectives, where I would like to have your opinion in addition to your expectations & projections regarding a couple of matters:

C1. First, how do you see the progress of the market size in the next 5 years? What are your projections regarding the market growth %? For which reasons?

C2. In your opinion, what are the main challenges ahead? And what are the solutions to these challenges?

Challenges ahead	Solutions

C3. What are the most needed initiatives which would support & sustain market development?

Initiatives

C4. Speaking of end-users, in your opinion, which category of end-users should be primarily targeted and focused on in terms of market development (Residential/ Commercial)? For which reasons?

C5. What about the geographic areas to focus on? For which reasons?

Geographic Area		Reasons
Beirut	1	
Mount Lebanon	2	
North	3	
South	4	
Bekaa	5	

C6. In terms of promoting the installation of solar water heaters, what should be the key communication messages that would enable end-users to fully relate with the concept?

C7. Please name all the parties who can contribute in developing the thermal heating market by further specifying their contribution:

Parties	Initiatives

C8. How can your institution contribute to market development?

C9. Finally, what do you think of LCEC's initiatives?

Annex 2: List of interviewed institutions and stakeholders

Municipalities	Banking Sector	Order of Engineers & Architects	Various Entities
Ablah	BLF	Beirut	AUB
Batroun	Central Bank	Tripoli	Chamber of Commerce
Becharreh			CDR
Beit Mery			Consultant
Hola			ESCWA
Machghara			EDZ
			IRI
			LGBC
			LIBNOR
			LSES

Annex 3: List of interviewed dealers and suppliers

Al Bina	MESMO Zreik
Dawtec	Naccouzi Solar
Emarts	Naturenergy
Enercom	Renewable Med Energies
Falcon	Sawan
Fayez Abou Cheykh Trading	Servicom.Ecosol
Ghadar Trade & Industry	Solar Power
GMG Tabbouch SARL	Solar Solutions
Green Arms	Solarnet
Green Energy NTC	Solartech By Al Chamsi
Ismael Ibrahim Saloum	Sun Power
Itani Company For Industry	Techno Mass
Kinaan Trading - Solar World	Tefaily Solar Energy
Kypros	Webco
MECATECH	

March 2014
Beirut, Lebanon

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