



Ministry of New and Renewable Energy  
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## Project Summary

Survey/Audit and Assessment of Potential  
of Solar Water Heating and Rooftop SPV Systems in  
Gurgaon-Manesar area of Haryana

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Prepared By:



Bhagwat Technologies and  
Energy Conservation Pvt Ltd



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knowledge solutions

Greentech Knowledge  
Solutions Pvt Ltd

## Project Team

### *Team*

**Mr. Anil Kumar**

*Bhagwat Technologies and Energy Conservation Private Limited (BTECON), New Delhi*

**Mr. Richard Sequeira**

*Solenge India, New Delhi*

**Mr. Dheeraj Lalchandani**

*GKS, New Delhi*

**Ms. Aesha Basri**

*BTECON, New Delhi*

**Mr. Himanshu Choudhary**

*BTECON, New Delhi*

**Ms. Shilpa Jain**

*BTECON, New Delhi*

### *Advisor*

**Dr. Sameer Maithel**

*Greentech Knowledge Solutions (GKS), New Delhi*

## **Survey/Audit and Assessment of Potential of Solar Water Heating and Rooftop SPV Systems in Gurgaon-Manesar area of Haryana**

### ***Objective***

The Gurgaon-Manesar Urban Complex has emerged as one of the fastest growing urban areas in the country. The current population is estimated at 25 lakhs in the year 2010, which is expected to reach 37 lakhs by 2021. Gurgaon-Manesar has two large industrial areas – Udyog Vihar and Industrial Model Township (IMT), Manesar, which are known for its Automobile and IT/ITES industries in the country. The rapid development of Gurgaon-Manesar has put enormous pressure on natural resources and environment. The region is facing severe shortage of both power and water. There is a good potential to integrate solar energy utilization in the new infrastructure which would help to some extent in reducing dependence of the region on resources sourced from outside the district.

The main objectives of the study are:

- i. Audit of the present requirement of hot water and backup power and the present means of meeting those requirements in existing institutions, establishments, complexes and industrial units
- ii. Assessment of the requirement of new institutions, establishments, complexes and industrial units being planned or under construction/ implementation
- iii. Provide and overall assessment of the demand for both types of systems in the Gurgaon-Manesar area
- iv. Evaluate the role of implementation in the ESCO mode
- v. Provide at least three case studies for each demand segment covering both types of installations (in all 12 case-studies)
- vi. Develop model preliminary project reports for each demand segment for different implementation modalities (in all 4 model project reports)

## *Methodology*

The first phase of the study involved stakeholder's interactions and conducting primary survey to build the inventory of the residential & commercial buildings and industries. During this phase Solar Water Heating and Solar PV installations for case studies were identified. The project team met various stakeholders as listed below and collected relevant information for the study:

- HAREDA (Haryana Renewable Energy Development Agency)
- HUDA (Haryana Urban Development Authority)
- SWH manufacturers/dealers
- Municipal Corporation
- Electricity distribution companies (DHBVN)
- Haryana Pollution Control Board
- Gurgaon Industrial Association
- Gurgaon Guest house Association
- Indian Medical Association-Gurgaon Chapter
- Automotive Component Manufacturing Association
- Telecom Industries
- Solar PV Experts
- Experts from Textile, Auto component Manufacturing, Dairy, Catering& laundry Industry

The second phase of the study was focused on case-studies for carrying out technological and financial assessment. During this phase detailed information on 12 case-studies on SWH and SPV applications was collected. This data was then analysed and case-studies were prepared in a standard format.

The third phase of the study was devoted to carrying out projections of the demand, assessing realistic market potential, collecting and analyzing data for preparing 4 model project reports and report preparation.

## *Hot Water Demand Assessment*

**Residential:** Based on the property tax data of the Municipal Corporation and data collected from the survey, it is estimated that Gurgaon has 85000 flats (having 2 or more bedrooms) in multi-storey housing and 32000 houses constructed on individual plots.

The total daily hot water requirement is estimated at 21 million lpd during winter months. The total annual demand taking 150 days of use would be 3292 million liter. Electric geysers are the most common technology used for heating water and the total number of electric geysers in the residential sector is estimated to be around 3 lakh. The life-cycle cost of heating water through electric geysers is calculated as Rs 0.42/ liter.

**Commercial & Institutional Sector:** From the view point of hot water use, the commercial and institutional sector comprised of:

- Hotels and guest houses
- Hospitals and nursing homes
- Hostels

Based on the data collected through both primary and secondary sources, total daily hot water requirement from the commercial and institutional sector is estimated to be 3.4 million lpd. The predominant mode of heating water in guest houses, small hotels and hospitals is electric geysers. Large hotels and hospitals rely on petroleum fuels based boilers and hot water generators.

**Industrial Sector:** The industrial segments in Gurgaon- Manesar that are of interest from a hot water point of view are:

- Automobile (hot water use in electroplating, degreasing and phosphating)
- Textile (hot water use for washing and dyeing)
- Dairy (hot water use for pasteurization, cleaning)
- Catering (hot water use for cooking, cleaning and keeping food hot)
- Laundry (washing of clothes)

Apart from these there are other industries that use boilers or have canteens and hence have solar water heater potential. The total estimated hot water demand for industries is calculated as 5.6 million lpd.

## Existing SWH Installed Capacity

The total installed capacity of solar water heaters is estimated at 0.33 million lpd. This is around 1.5% of the total daily requirement of hot water. A list of prominent SWH installations in Gurgaonis given in table 1.

Table 1: Large Solar Water Heater Systems in Gurgaon

		Capacity (lpd)
1	Chelsea Mills, Sector 5, IMT, Manesar	50,000
2	Anant Raj Industries, Sector 8, Manesar	5,000
3	Maruti Udyog Ltd	4,000
<b>Hospitals</b>		
1	Columbia Asia Hospital	5,000
2	Healers Hospital Pvt Ltd	1,500
3	Medicity Hospital	8,000
<b>Multi-storey Housing</b>		
1	Unitech Group Housing	4,000
2	Omex Group Housing	5,000
3	Haryana Housing Board, Sec 43	32,000
4	BPTP, Freedom Park Life, Sector 57	15,700
5	IVY Complex	12, 800
<b>Institutional</b>		
1	Om Shanti Retreat Centre, Boran Kalan – Bilaspur	21,000
2	Working Women Hostel, Civil Line, Gurgaon	2,000
3	Shanti Gram Niketan, Vill Mandawar, Sohna	2,600
4	Dronacharya College of Engineering	2,000
5	HIPA	3,000
<b>Hotels</b>		
1	Crowne Plaza	20,000
2	Galaxy	16,000

The SWH market has benefited from the state government order making the use of solar water heater mandatory in a variety of buildings, however, the regulation is yet to be enforced in an effective manner. The annual installation of SWH at Gurgaon- Manesar for the year 2010-11 is estimated at around 0.1 to 0.15 million lpd.

### *Assessment of Back-up Power*

Gurgaon-Manesar urban complex is facing an acute power crisis and has a very large back-up power generation capacity in the form of diesel based generators (approx 2000 MW). On an average there is a power shortage of 20% which during peak demand periods goes up to 35%. The average duration of daily power cut ranges from 4-8 hours.

### *SWH Demand Projections*

To carry out realizable market potential of SWH in the area till the year 2022, following three cases has been assumed:

1. Business As Usual (BAU) scenario
2. Growth Scenario -I
3. Growth Scenario -II

The projections have been carried out by:

- a) Projecting future demand for hot water for each category assuming growth rates for different time periods i.e. 2010-2014, 2014-2018 and 2018-2022.
- b) Assuming gradual increase in penetration levels to assumed terminal penetration rates in 2022 for each category.
- c) For projections, new and existing buildings have been treated separately, given the fact that several of the mandatory provisions are applicable to new buildings and incorporation of SWH is much easier and economically viable in new buildings.

### *Business As Usual Scenario:*

This scenario corresponds to the business as usual condition, where:

- The government does not take any specific steps for promotion of SWH in high potential categories as well as for implementing mandatory provisions.

- The growth of the market is left primarily to marketing efforts of the SWH suppliers and growing awareness amongst potential users.

### ***Growth Scenario - I:***

The growth scenario-I assumes:

- A more pro-active policy on mandatory provisioning of SWH which has elements of stricter enforcement as well as periodic revision of the provisions taking ground-realities into account.
- A focused and targeted approach for awareness generation and technical training.
- Promotion of ESCOs for segments such as industries and commercial buildings.

### ***Growth Scenario - II:***

Growth Scenario –II builds on Growth Scenario –I and assumes that Energy Conservation Building Codes (ECBC) would become mandatory and would have a better implementation compared with the mandatory provisioning of SWH.

The results are summarized in tables below:

### **SWH Demand Projection (Cumulative installation in m2 of collector area)**

Category	Scenario	Demand Projection			
		2009-10	2013-14	2017-18	2021-22
<b>Residential</b>	BAU	3,688	19,421	30,315	37,068
	Growth – I	3,688	24,063	47,942	70,508
	Growth – II	3,688	27,750	62,069	97,248
<b>Commercial</b>	BAU	774	4,295	7,573	10,160
	Growth – I	774	5,793	14,254	24,284
	Growth – II	774	7,291	20,936	38,408



<b>Institutional</b>	BAU	306	502	676	878
	Growth – I	306	521	760	1,084
	Growth – II	306	540	844	1,291
<b>Industrial</b>	BAU	1,000	3,214	6,444	10,449
	Growth – I	1,000	5,213	11,521	19,418
	Growth – II	1,000	7,456	17,144	29,275
<b>Overall</b>	BAU	<b>5,767</b>	<b>27,432</b>	<b>45,007</b>	<b>58,555</b>
	Growth – I	<b>5,767</b>	<b>35,590</b>	<b>74,477</b>	<b>115,294</b>
	Growth – II	<b>5,767</b>	<b>43,037</b>	<b>100,993</b>	<b>166,222</b>

### *Strategy to achieve SWH Potential*

The priority sectors for the realizable SWH potential are stated below (in the descending order of their potential):

1. New Multi-storey housing
2. Industries (Hybrid systems of SWH and Waste heat recovery units)
3. Guest houses and Hotels
4. Existing and New Plotted housing
5. SEZs

Actions required to realize the SWH potential is described below:

- Awareness creating measures for potential users through seminars, media and promotional events.
- Specific awareness programmes for potential industries with the help of industrial associations like ACMA/ SIAM/ Indian Dairy federations.
  - Organization of at least 3 awareness cum technical training programme on hybrid Solar Water Heating systems (SWH + Waste heat recovery Units) with site visits and case studies.
  - Awards and recognition for installation of large innovative and complex solar water heating systems.
- There is a need to re-look into the mandatory provisions for multi-storey housing, to make them more realistic. The mandatory provisions need to be creatively formulated.

- Stricter enforcement of the mandatory provisions.
- Capacity building measures amongst the developers and architects and plumbing consultants about the mandatory provision.
- A technical solar cell should be established which will be responsible for the independent monitoring of SWH systems, providing technical support for designing of SWH systems, and look into genuine problems of the developers and users (e.g. lack of space at roof-tops/ rooftop orientation in high-rise buildings) and provide solutions.
- Facilitation and monitoring of 2-4 model ESCo projects in industrial and commercial sector.

### *Rooftop Solar PV Market Development*

The primary aim of rooftop solar PV in Gurgaon would be diesel saving. Our analysis show that given the large installed DG capacity (2000 MW) and present economics of solar PV (even after considering incentives offered under JNNSM), the contribution of solar PV on Gurgaon power situation would be only marginal in immediate future.

The two options which look attractive for Gurgaon-Manesar area are:

- Off-grid day time use PV systems: In this configuration solar power generated through PV system is directly used to provide power to the day-loads. The system has a minimal battery bank to compensate for the fluctuations in the power generated through PV system during the day-time as well as to fill the gap between the peak power and the generated power, whenever required during the day time. In this configuration solar power can be used only during the day time and will not be stored for use in the night time or during the periods when there is no sun hence this type of solar PV system can substitute DG power only in the day time. This mode is suitable when stable day-time loads are available and there are frequent and long power cuts during the day time. Given the large investment required and simple pay-back period of 8 years and more one can expect only a few projects materializing in immediate future. The three most attractive segments based on the availability of day-time loads as well as space availability are:

- Large multi-storey housing complexes
- Guest houses
- Industries

(Existing telecom towers in Gurgaon-Manesar does not seem to be an attractive segment).

- Grid-connected rooftop systems: In this configuration solar power generated can be directly fed into the grid. These systems work on net metering system, which meters both the electricity supplied from the PV system to the grid as well as the electricity used by the facility from the grid. This mode helps the local utility in getting supply of additional electricity during peak demand period during the day and also helps in utilizing the un-utilised roof area of the buildings. The two attractive segments seems to be:
  - Industries
  - Housing complexes

School is another segment which may be interesting due to large rooftop area which is available.

## **Bhagwat Technologies and Energy Conservation Pvt Ltd**

Bhagwat Technologies and Energy Conservation Private Limited (BTECON) aims to promote new and innovative ideas in the field of renewable energy, energy conservation and to educate the general public and other stakeholders about the economic benefits of using energy efficiency and renewable energy systems. Company's motto is not only to spread the ideas but also to contribute in the practical implementation of the ideas and help in solving the problems faced in technical and commercial development of energy conservation devices and technologies. The major objectives and areas of operation are Energy conservation and management through energy planning in industrial, commercial, institutional, agricultural and domestic sectors.

## **Greentech Knowledge Solutions Pvt Ltd**

Greentech Knowledge Solutions Pvt. Ltd. (GKSPL) offers research and consultancy services for deployment of energy efficiency and renewable energy solutions. Solar thermal is a focus area of work at GKSPL. GKSPL is credited with conducting the first-ever market assessment study on solar water heating in India. GKSPL has been actively working for the promotion and deployment of Solar Water Heating in industrial, commercial, institutional and residential sectors. The range of services offered include: feasibility studies, Detailed Project Report (DPR) preparation, project management support, market research, policy advice and training services.

## **For more information, please contact**

**Dr Sameer Maitheh**

**Director**

**Greentech Knowledge Solutions Pvt Ltd.**

**342, Abhiyan Apartments, Plot 15,**

**Sector 12, Dwarka, New Delhi – 110078**

**E-mail: [sameer@greentechsolution.co.in](mailto:sameer@greentechsolution.co.in)**

**Mobile: +91 9811392256**

**Telefax: +91 11 45535574**

**Web: [www.greentechsolution.co.in](http://www.greentechsolution.co.in), [www.gkspl.in](http://www.gkspl.in)**