Final Report
On
Design and Implementation of New Financing Mechanisms and Instruments for Promotion of Solar Water Heating Systems in India

Submitted to

Ministry of New and Renewable Energy
(Government of India)

Prepared by:

ABPS Infrastructure Advisory Private Limited

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ABBREVIATIONS

ANME	National Agency for Energy Conservation
BAFA	Federal Office of Economics and Export Control
BEE	Bureau of Energy Efficiency
BESCOM	Bangalore Electricity Supply Company
BIS	Bureau of Indian Standards
BMU	Nature Conservation and Nuclear Safety
BSW	German Solar Industry Association
CCP	Cities for Climate Protection Program
CDM	Clean Development Mechanism
CEF	Central Energy Fund
CIBIL	Credit Information Bureau of India
CO^2	Carbon Dioxide
DBSA	Development Bank of South Africa
DECCW	Department of Climate Change and Water
DME	The Department of Minerals and Energy
DRDA	District Rural Development Agency
DSM	Demand Side Management
DTEI	Department of Transport, Energy and Infrastructure
ECBC	Energy Conservation Building Code
EMI	Equated Monthly Instalments
ESCO	Energy Services Company
ETC	Evacuated Tube Collector
FIs	Financial Institutions
FPC	Flat Plate Collector
FY	Financial Year
GHG	Greenhouse Gas
HAREDA	Haryana Renewable Energy Development Agency
HUDA	Haryana Urban Development Authority
ICICI	Industrial Credit and Investment Corporation of India
IREDA	Indian Renewable Energy Development Agency
IRS	Internal Revenue Service
JNNSM	Jawaharlal Nehru National Solar Mission

KfW	German Development Bank
KWh/sq. m.	Kilo Watt hour per square meter
lpd	Litres per day
LPG	Liquified Petroleum Gas
M&V	Monitoring and Verification
MAP	Minimum Incentive Programme
MEDA	Maharashtra Energy Development Agency
MEDREP	Mediterranean Renewable Energy Programme
MFI	Micro Finance Institutions
MFMA	Municipal Finance Management Act
MNRE	Ministry of New and Renewable Energy
MOU	Memorandum of Understanding
MRET	Mandatory Renewable Energy Target
NABARD	National Bank for Agriculture and Rural Development
NAPCC	National Action Plan on Climate Change
NBFCs	Non Banking Financial Companies
NCT	National Capital Territory
NEDCAP	Non-conventional Energy Development Corporation of Andhra Pradesh Limited
NEP	National Electricity Policy
NGO	Non Government Organisation
NPV	Net Present Value
NSW	New South Wales
OOE	Office of Energy
ORER	Office of the Renewable Energy Regulator
OTB	Open to Buy
PDD	Project Design Document
PIN	Project Idea Note
PMU	Project Management Unit
PROSOL	Programme Solaire
PSU	Public Sector Undertaking
R&D	Research and Development
RBI	Reserve Bank of India
RECs	Renewable Energy Certificates
REEEP	Renewable Energy and Energy Efficiency Partnership

REFSO	Renewable Energy Finance and Subsidy Office
ROI	Registrations of Interest
RPO	Renewable Purchase Obligation
SABS	South African Bureau of Standards
SANS	South African National Standards
SBI	State Bank of India
SBLP	The Self-Help Group-Bank Linkage Programme
SEA	Sustainable Energy Africa
SEDO	Sustainable Energy Development Office
SERC	State Electricity Regulatory Commission
SEWA	Self Employed Women's Association
SFMC	SIDBI foundation for microcredit
SHGs	Self Help Groups
SHWR	Solar Hot Water Rebate
SHWRP	Solar Hot Water Rebate Program
SIDBI	Small Industries Development Bank of India
SNA	State Nodal Agency
SRCC	Solar Rating Certification Corporation
SRCC	Solar Rating Certification Corporation
STB	Société Tunisienne de Banque
STEG	Société Tunisienne d'Electricité et du Gaz
SWH	Solar Water Heater
SWHR	Solar Hot Water Rebate
SWHS	Solar Water Heating System
The Department	Department of the Environment, Water, Heritage and the Arts
UNEP	United Nations Environment Programme
VAT	Value Added Tax
VEECs	Victorian Energy Efficiency Certificates

A. EXECUTIVE SUMMARY

Worldwide, solar water heating has been attracting the attention of the policy makers due to its potential to reduce electricity consumption and consequent emission reduction. India has been bestowed with abundant solar energy, available almost around the year. All over the world, high initial cost of the Solar Water Heating System (SWHS) has been found to be the major hurdle for large-scale deployment of solar water heating (SWH). India is no different. Similar to other countries, India has undertaken several initiatives for promotion of SWH. Given the huge untapped market, Ministry of New and Renewable (MNRE) under UNDP-GEF funded 'Global Solar Water Heating Project' is exploring the possibility of developing promotional schemes, which will enable large-scale deployment of SWH in the country. In this regard, MNRE has mandated ABPS Infrastructure Advisory Private Limited (ABPS Infra) to develop the potential financing mechanisms. This document provides the Executive Summary of the Report and covers the following important aspects of the proposed financing mechanisms for promotion of SWHS.

- Segmentation of Market for SWHS
- Assessment of Financing needs of User Segments
- Identification of Financing Instruments
- Proposed Financing Mechanisms

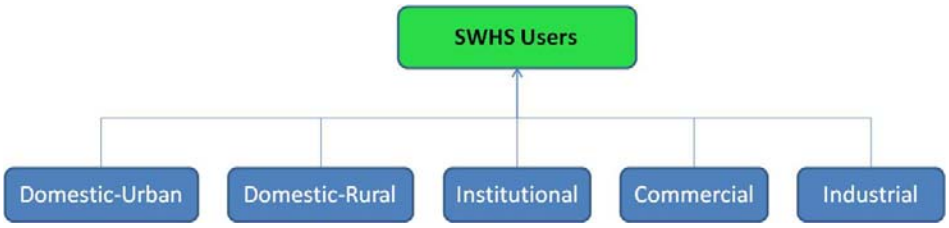
A.1 MARKET ASSESSMENT AND SEGMENTATION

While providing the financial assistance, it is important to estimate the financial need of a user, which is dependent on the hot water requirement and fuel used for the same. Based on these two factors we have divided the market for SWHS into distinct user segments and have assessed the market size. This will be helpful while designing appropriate financing mechanisms for these user segments.

A.1.1 Segmentation of Market for SWHS

Hot water has many applications such bathing, cooking, washing, process heating etc. Depending on the location, terrain, climate profile, economic status, etc. quantum as well as quality of hot water requirement varies significantly. Further, source of heat for hot water varies significantly across user segments and their locations. In domestic-urban category, heat source

is typically an electrical system while in domestic-rural category, heat is obtained by burning locally available biomass. Choice of heat source is also influenced by economic profile of the user or special requirements such as process inlet temperature. Different set of drivers influence the purchasing decisions of these users. Therefore, it is necessary to identify the major market segments. The following diagram presents the market segments identified by ABPS Infra as a part of this study.



The identification of user segments discussed here is correlated with the findings in the Report on 'Market Assessment Study for SWHS in India' prepared by other consultant under UNDP/GEF funded Global Solar Water Heating Project (Market Assessment Report).

A.1.1.1 Domestic-Urban Users

This category primarily consists of middle class population residing in ever-expanding urban areas in the country. This population is typically using electrical geysers for their hot water requirement. Most users in this category can afford to purchase solar water heaters. While maximum share of the current market for SWHS is held by this category of users, huge potential is still to be tapped. Since this category consists of working class, electrical geysers owned by the users in this category operate during morning period causing demand on electricity grid to increase significantly during the morning period.

In this category, considerable portion of population can afford to purchase and use SWHS. Low-rise independent houses with clear ownership of the roof offer most favourable conditions for installation of SWHS. A majority of existing SWHS installations fall under this category. In recent years, SWHS have been installed on multi-storey apartment buildings. As elaborated in the Market Assessment Report, around 80% of the SWH sales are likely to take place in new houses and only 20% can be attributed to existing/old houses. As most of the new houses are now coming in the form of multi-storey buildings, it is essential to have appropriate mechanism

and framework for promoting SWH in multi-Storey Buildings. This user class within the domestic-urban category should be targeted through the financing mechanism for their shift to the SWHS.

A.1.1.2 Domestic-Rural Users

This category consists of users from vast rural areas in the country. In terms of purchasing power, these users belong to the lower income group to middle income group. While hot water requirement exists, a few users use electrical appliances for hot water requirement. Most of the users in this category primarily use biomass for water heating.

The purchasing power of domestic-rural population varies over long range. It will be difficult to devise an incentive scheme, which will encourage the entire segment of domestic-rural users to shift to SWHS. Also, given the fact that such a scheme would create distortions in the market due to asymmetry in incentives, it is felt that domestic-rural segment be further divided on the basis of income levels for the purpose of targeting under the financing scheme. Within the category of domestic-rural users, there is a considerable portion of population, which can afford to purchase and use of SWHS. These domestic-rural users are from the higher to middle income class, who own a refrigerator, and a two-wheeler or a four-wheeler and also may afford SWHS. This user class within the domestic-rural category should be targeted through the financing mechanism for their shift to the SWHS.

A.1.1.3 Commercial Users

This user segment consists of commercial establishments such as hotels, malls, etc. As highlighted in the Market Assessment Report, the small hotels with room capacity up to 30 rooms utilise electricity or wood for meeting hot water requirement. The bigger hotels prefer non-electric fuels such as heavy oil, biomass, gas etc. Further, the hot water requirement of this segment is for all 12 months in a year, unlike domestic segment with 5 to 9 months of hot water requirement. Hence this segment is attractive as a potential customer for SWHS. Further, this class is cost-conscious and profit driven. However, the existing small number of SWHS installations in this segment indicates that the current cost-benefit ratio for SWHS is still not lucrative enough for them to shift to SWHS.

A.1.1.4 Institutional Users

The users in this segment consist of non-commercial establishments such as hostels, orphanages, educational institutions, clubs, religious places, etc. While a few of them use electricity, most of them use non-electric fuel such as waste wood, crop residue, gas, heavy oils, etc for water heating. Although the hot water requirement is difficult to standardise, most of the users in this segment have hot water requirement around the year. Thus a considerable potential for new SWHS exists in this segment. Hence, MNRE should provide financial assistance for this segment. Further, most of the users in this segment are not profit-oriented, which explains their hesitation towards large capital investment associated with SWHS. This fact needs to be taken into account while designing promotional schemes for this segment.

A.1.1.5 Industrial Users

Hot water has direct or indirect applications in many industrial processes running over entire day throughout the year. Most of the industrial users use non-electric means, hence for users in this segment SWHS have a longer payback period. Similar to the commercial segment, this segment is cost-conscious and profit driven. However, the existing small number of SWHS installations in this segment indicates that the current cost-benefit ratio for SWH is still not lucrative enough for them to switch to SWH.

A.1.2 Projected SWHS Installation for Different User Segments

The projections for the cumulative collector area across different user segments by year 2022 are shown in the Table A.1.

Table A.1 Projections for Cumulative Installed Collector area across Different User Categories (million sq.m.)[1]

Consumer Category	2010	2013	2017	2022	Contribution in SWHS sector by year 2022
Dom-Urban	2.23	3.83	7.17	15.14	80%
Dom-Rural	0.35	0.42	0.51	0.60	4%
Hotel	0.19	0.35	0.61	0.97	5%
Hospital	0.10	0.17	0.27	0.43	2%
Industry	0.19	0.33	0.57	1.05	6%
Others	0.18	0.27	0.39	0.52	3%

The abovementioned scenario provides the realisable potential for SWH in India. Given significant potential for SWH, development of promotional policies needs no further emphasis. From the projections in Table 8.1, it can be seen that the 'domestic-urban' is the single largest user segment, which is expected to contribute about 80% of the SWHS market by year 2022. Hence, it is necessary to provide major attention to this segment and also to build strong framework of enablers, such as lending institutions and qualified installers and smart space-conscious technology providers, etc.

Further, there is no doubt that, from broad environmental standpoint, it makes eminent sense to convert all water heating applications from other fuels to solar. The same is the primary objective of '***The Below 80^{0}C Challenge***' programme under National Solar Mission.

A.1.3 Expected Market Size for Different User Segments

Based on the projected collector area, the total market size assessed for different user segments in terms of total costs of SWH systems in Rs. Crore is given in Table A.2.

[1] *Based on Market assessment study carried out by M/S Greentech Knowledge Solutions for MNRE, December 2009.*

Table A.2 Projections for Market Size of Flat Plate Collector SWHS (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017
Domestic-Urban	438.14	565.99	599.95	635.95	1053.98	1117.22	1184.25	1255.31
Domestic-Rural	34.49	23.15	24.53	26.01	27.11	28.74	30.46	32.29
Hotel	35.92	55.15	58.46	61.96	82.21	87.15	92.37	97.92
Hospital	18.61	25.58	27.11	28.74	32.53	34.48	36.55	38.75
Industry	32.00	49.47	52.43	55.58	75.75	80.29	85.11	90.22
Others	48.00	31.80	33.71	35.73	37.87	40.15	42.56	45.11
Total	**607.17**	**751.13**	**796.19**	**843.97**	**1309.46**	**1388.03**	**1471.31**	**1559.59**

Table A.3 Projections for Market Size of Evacuated Tube Collector SWHS (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017
Domestic-Urban	74.35	96.05	101.81	107.92	178.86	189.59	200.96	213.02
Domestic-Rural	5.85	3.93	4.16	4.41	4.60	4.88	5.17	5.48
Hotel	6.10	9.36	9.92	10.52	13.95	14.79	15.68	16.62
Hospital	3.16	4.34	4.60	4.88	5.52	5.85	6.20	6.58
Industry	5.43	8.39	8.90	9.43	12.85	13.63	14.44	15.31
Others	8.15	5.40	5.72	6.06	6.43	6.81	7.22	7.65
Total	**103.04**	**127.46**	**135.11**	**143.22**	**222.21**	**235.54**	**249.68**	**264.66**

The assessment of market size for different user segments is made on the basis of following assumptions:

- It is assumed that the proportion of FPC and ETC SWH installations will maintain the current ration, which is about 80:20[4].
- Current Capital Cost of FPC SWHS is around Rs. 25,000 and ETC SWHS is Rs. 15,000.
- Capital Cost is assumed to increase at 6% on account for inflation

Based on the above assumptions, the total market size of SWHS (total cost of systems to be installed) till the end of 12th Five Year Plan period, i.e. up to year 2017, is estimated at around Rs 10,700 crore, in which the share of domestic urban user will be around 80%.

A.2 ASSESSMENT OF FINANCING NEEDS OF USER SEGMENTS

Considering the need for increasing uptake of SWHS, it has become necessary to identify the variables influencing the 'affordability' and financial viability' of SWHS and quantify their impact. The cost-benefit analysis forms the basis for estimation of financial viability and financing need of a user. The costs and benefits for different water heating methods have been computed over useful life of SWHS. Further, a computational model has been developed to estimate the difference between the net present value (NPV) of life cycle cost for SWHS and that for the existing water heating method of a user.

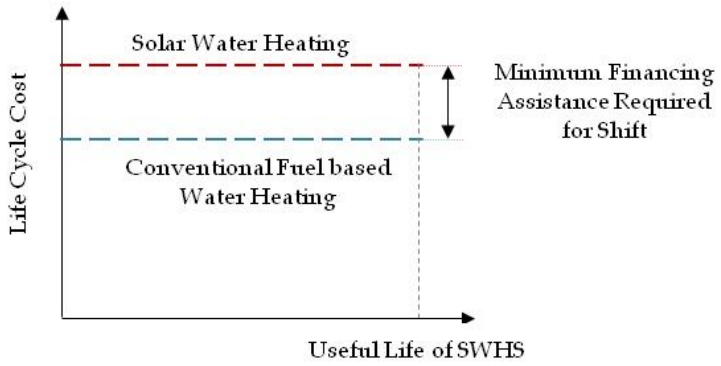
Installation of SWHS results in two different tangible benefits for its user, viz. reduction in fuel consumption and consequent reduction in GHG emission. The CDM framework may provide an additional revenue stream for the SWHS owner for the saved CO_2 emission. However, currently development of a SWHS based CDM project is a strenuous and time-consuming activity. Only a handful of projects based on SWHS technology have been proposed to UNFCC. Out of eight projects proposed to UNFCCC, only one project has been approved while remaining projects are at validation stage. This is mainly because the UNFCCC approved methodology appropriate for the large-scale deployment of SWHS is not in place and development of such methodology is beyond the scope of this Assignment.

Due to the abovementioned reason, ABPS Infra has not considered the revenue generated from CDM benefit in the model. Following components are assumed to constitute the saving for a user from shift to SWH.

- Cost of saved fuel;
- Differential in maintenance cost between conventional water heating & SWH;
- Capital cost of conventional water heating system.

Ideally, the user should select the water heating system on the basis of assessment of the life cycle costs of the alternatives for water heating. However, if the life cycle cost of SWHS is assessed to be higher than that of the conventional water heating, and if it is desired that user switches to SWH, then the user should be compensated for difference between the life cycle cost of SWH and that of conventional method. This can be explained using Figure **9.1**.

Figure A.1 Role of Minimum Financing Assistance



The method of compensation may take any form, i.e. interest subsidy or capital subsidy and it is expected to enhance the affordability of the SWHS to buyer.

A.2.1 Assumptions and Inputs to Model

Electricity, wood waste and crop residue, fuel oils, and coal are considered as water heating fuels for estimation of financing need of different user segments.

The important technical inputs to the model include the following:

- Parameters to capture and quantify the local climate;
- Parameters that quantify season wise hot water consumption pattern of a user;
- Type, specifications and Operational efficiencies of electric geyser and SWHS

The important commercial inputs to the model include following:

- Electricity tariff, Tariff escalation rate;
- Inflation rate & Discount rate;
- Initial cost and Installation cost of water heating systems;
- Maintenance cost and Maintenance schedule of water heating systems;
- Useful life of water heating systems.

The important commercial assumptions are as follows.

- Financing needs have been estimated for different user segments considering the use of Flat plate collector SWHS (FPC SWHS). This is due to the following two reasons.

- The existing diffusion of FPC SWHS and ETC SWHS is 80:20. Further it has been assumed that this ratio will continue for next few years.
- The capital cost of FPC SWHS is more than the Evacuated Tube Collector SWHS.

- Useful life of 16 years for the SWHS;
- User procures SWHS entirely through a term loan, which is to be paid back within 5 years with lending interest rate of 10% per annum.

A.2.2 Structure of Model

The structure of the model can be schematically represented as follows.

Figure A.2: Structure of Life Cycle Cost Model

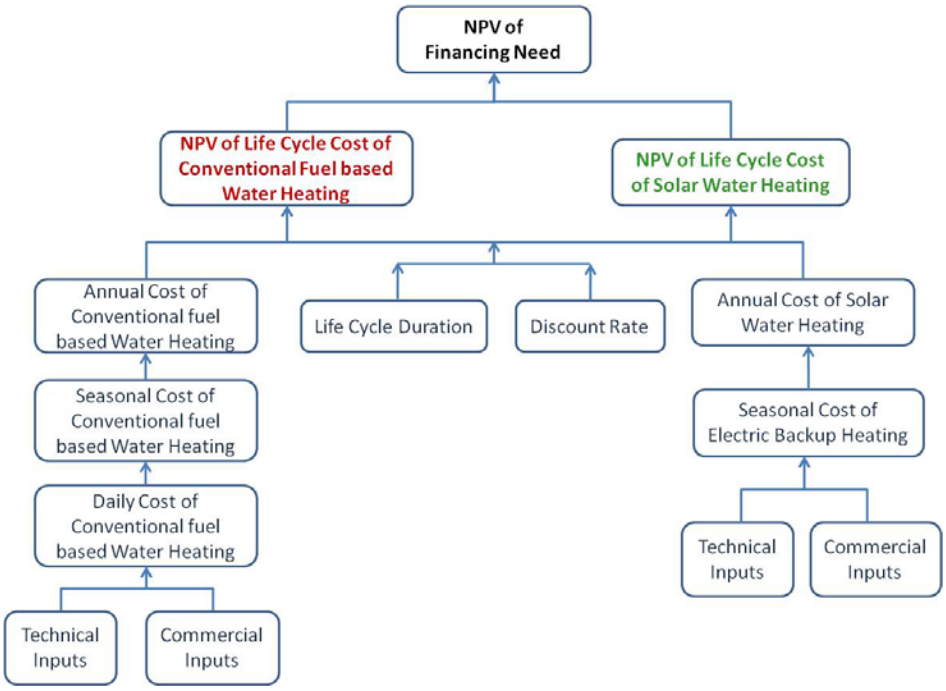


Table A. 4: Summary of Estimated Financing Needs

User Segment	Existing Fuel	Hot Water Requirement (months/annum)	Temperature of Hot Water (deg. C)	Approximate Financing Need (Rs./sq.m. of collector area installed)*
Domestic (Urban and Rural users in middle and higher income groups)	Electricity	5 - 9	40 - 45	2,500-6,000
Domestic (Urban and Rural users in Low income groups)	Wood waste, crop residue	5 - 9	40 - 45	8,000-13,000
Commercial Users with small hot water requirement	Electricity	12	40 - 45	Nil
Commercial Users with large hot water requirement	Coal, Wood waste, Heavy oils	12	40 - 45	1,300-5,000
Institutional Users	Coal, Wood waste, Heavy oils	12	40 - 45	1,300-5,000
Industrial Users	Coal, Wood waste, Heavy oils	12	50	1,000-5,100

** In case of installation of FPC SWHS with useful life of 16 years*
Assistance required by ETC Systems is typically lower by 30%

A.3 FINANCING NEEDS AND ASSISTANCE REQUIRED FOR MANUFACUTRING AND SUPPLY CHAIN

To understand the issues/hurdles faced by the manufacturers in improving the manufacturing process and supply chain, ABPS Infra conducted a field survey during Phase-II of the assignment. The manufacturers of both FPC and ETC systems were consulted to understand the various components of their financing need.

A.3.1 Quantification of Financing Needs of Manufacturers

The quantification of the financing need is required for the following two major areas:

- New Manufacturing Facilities or Expansion of existing Manufacturing Facilities
- Strengthening Supply Chain Network

A.3.1.1 New Manufacturing Facilities & Expansion of existing Facilities

As seen from Table 8.1, the total cumulative collector area is projected to increase to 9.52 million sq. m. by 2017 as against 2.6 million sq. m. in 2009. To meet this demand, the manufacturing

capacity will have to be increased substantially, either through setting up of new manufacturing facilities or by expansion of existing facilities. The year wise estimated increase in manufacturing capacity and investments required for increasing manufacturing capacity is given in the following Table.

Table A.5 : Projected Increase in Manufacturing Capacity and Investments Required

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017	Total
Increase in Manufacturing Capacity (million sq.m.)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	**1.2**
Cumulative addition in Manufacturing Capacity (million sq.m.)	0.15	0.3	0.45	0.6	0.75	0.9	1.05	1.2	-
Investment required to increase Manufacturing Capacity (Rs. Crore)	8	8	8	9	9	10	10	11	**73**

A.3.1 Suggested Financing Mechanism for Manufacturers

During the stakeholder consultation process, the manufacturers brought up the fact that financing assistance, currently provided by MNRE through IREDA in terms of soft loans, is available only for capacity building and technology up-gradation. i.e. only the existing manufacturers are eligible to receive MNRE's interest subsidy for manufacturers and the new entrants are not eligible for this soft loan. To meet the projected demand, the manufacturing capacity in the country needs to be enhanced and hence, it is essential that financing assistance is extended to new manufacturers as well. Therefore, we suggest the following:

- The condition of 100% bank guarantee for soft loan should be relaxed. The manufacturers may be allowed to mortgage the assets purchased and/or installed using that soft loan.
- In addition to IREDA, the interest subsidy should be channelled through the banks . This will eliminate the hurdles and delays due to the single location of IREDA at Delhi. Further, banks should have flexibility to decide on the lending rate and terms and conditions of the loan based on credit assessment of the borrower. MNRE should provide uniform interest subsidy through IREDA and banks.
- New and existing SWHS manufacturers should be made eligible for MNRE's interest subsidy, providing soft loans at 5% lending rate.

A.4 QUANTIFICATION OF FINANCIAL ASSISTANCE TO USERS

The financing needs of user segments differ depending upon the geographical location of the user. However, it will be difficult for MNRE to implement SWH promotional scheme, which provides variable financing assistance to users in same segment depending upon their location. As a result, it is necessary to develop the methodology for computation of financial assistance, application of which will yield maximum benefit for MNRE. It has been assumed that MNRE will be providing uniform financing assistance to all users from a particular user segment irrespective of the State or power supply Utility or geographical location of the user. As a result, financing needs have been quantified for users in a select few States.

A.4.1. Identification of Representative States

The findings of MNRE's 'Market Assessment Study' reveals that domestic users in five States, shown in the Table 11.1 will contribute up to 68% of total collector area installed in India by year 2022. Further, in non-domestic categories, these five States will contribute up to 55% of the total collector area. Hence, these five states have been considered for as 'representative' States and financing need of users in these States has been considered as 'representative' requirement of SWHS users in the country.

Table A.6 Representative States for Quantification of Financing Assistance[2]

Sr. No.	State	Projection for Cumulative Collector Area in Domestic Segment (million sq.m.)	% Contribution in Domestic Segment	Projection for Cumulative Collector Area in Commercial and Institutional Segments (million sq.m.)	% Contribution in Commercial and Institutional Segments (million sq.m.)
1	Karnataka	3.72	24%	0.16	11%
2	Maharashtra	3.5	22%	0.31	22%
3	Tamil Nadu	1.53	10%	0.14	10%
4	Andhra Pradesh	1.08	7%	0.09	6%
5	Gujarat	0.9	6%	0.06	4%
Above Five States		10.73	68%	0.76	54%
All the States in India		15.74	100%	1.4	100%

As seen from table above, out of these five states, Karnataka and Maharashtra have significantly higher potential, each around 24% in the domestic segment. Further, these two States do not

[2] *ABPS Infra's Analysis of data Obtained from the Market assessment study carried out by M/S Greentech Knowledge Solutions for MNRE, January 2010.*

have extreme climatic conditions such as very hot or very cold weather like Delhi and Uttarakhand. Hence, Karnataka and Maharashtra are considered as the most representative States and financing needs of the users in these States are considered for estimation of financial assistance by MNRE.

A.4.2 Quantum of Financial Assistance

The financial assistance was computed for different categories in identified two States. Based on the quantum of assessment, the financing needs have been estimated for different user categories which are presented in the table below.

Table A.7 Financing Assistance Quantified for various Users in Representative States*

User Segment	Proposed Quantum of Financing Assistance per User (Rs.)
Domestic	Rs. 5,000 for 2 sq.m. of collector area
Domestic-Low Income Group	Rs. 10,000 for 2 sq.m. of collector area
Commercial (small SWHS installations)	Rs. 5000 for every 2 sq.m. of collector area
Commercial (Large SWHS installations)	Rs. 2000- 2500 per sq.m. of collector area
Institutional	Rs. 3000 per sq.m. of collector area
Industrial	Rs. 2000- 2500 per sq.m. of collector area

** Financing Assistance to be provided for FPC SWHS with Useful life of at least 16 years*

It may be noted that the above computation has been carried out from the point of view of the user who would like to adopt solar water heating. The above quantum may be provided using any one or combination of multiple instruments. Further, above numbers are for FPC based systems. The calculation of financial assistance was carried out for ETC based systems as well. Financial assistance needed for ETC systems is usually 30% lower than that required for FPC based systems.

A.5 OPTIONS FOR FINANCING MECHANISMS

It is possible to provide the abovementioned financial assistance using combination of various financing mechanisms. It is necessary to identify the most appropriate financing mechanism for a particular user segment.

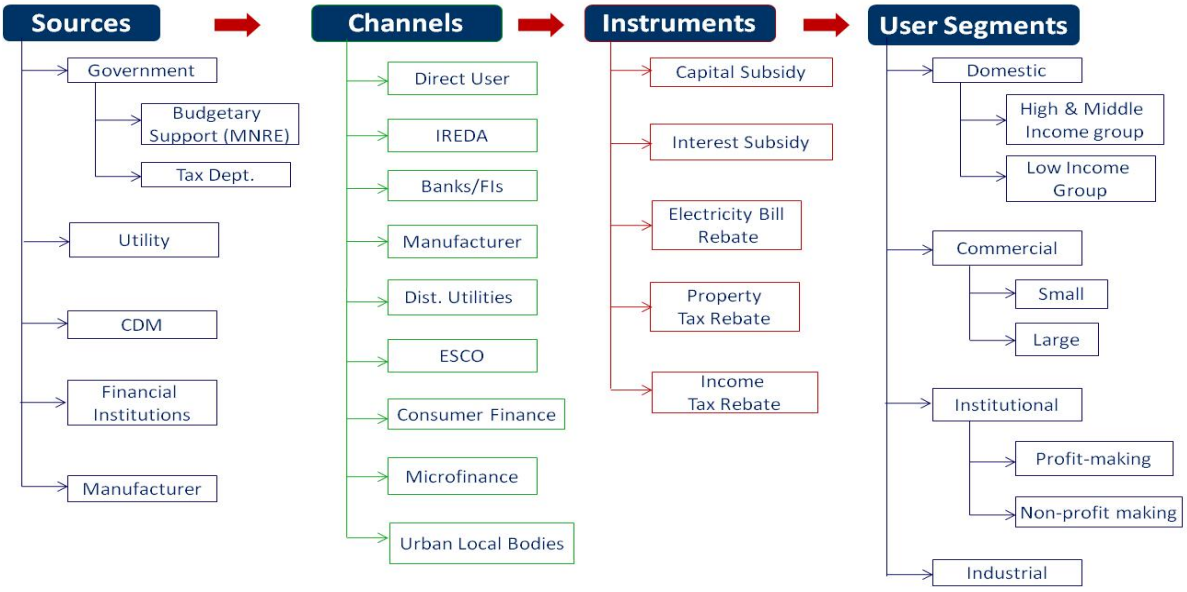
A.5.1 Constituents of Financing Assistance

A financing mechanism suitable for a particular user segment will require following.

- Financing source to ensure availability of fund;
- Delivery Channel: An intermediary to facilitate the fund flow from the financing source to the SWHS user;
- Financing instrument: An instrument used by an intermediary to deliver the financial assistance to the SWHS user.

The following figure shows the financing sources, channels and instruments, which have been identified and explored to provide financing assistance to different user segments.

Figure A.3 Identified Constituents of Financing Mechanism



In the above figure, five financing sources, nine distribution channels and five financing instruments have been identified for further assessment.

A.5.2 Identification of Suitable Financing Instruments and Channels

The analysis shows that not all the channels are suitable for all the user segments. The summary of combinations suitable for different user segments is shown below.

Table A.8 Summary of Suitable Financing Channels for User Segments

User Segment / Channel	Directly to Users	MNRE certified Manufacturer	Distribution Ulitity	Banks/Financial Institutions	IREDA	ESCO	Consumer Finance	Microfinance	Urban Local Bodies	Finance Ministry
Domestic	-	√	√	√	-	-	√	√	√	√
Commercial	-	√	√	√	√	-	√	-	√	√
Institutional	-	√	√	√	√	-	√	-	√	√
Industrial	-	√	√	√	√	-	√	-	√	√

The analysis also shows that not all the instruments are effective for all the user segments. The summary of suitable combinations is presented below.

Table A.9 Summary of Suitable of Financing Instruments for User Segments

Fin. Instrument / User Segment	Domestic	Commercial	Institutional	Industrial
Capital Subsidy	Most Effective	Less Effective	Less Effective	Less Effective
Interest Subsidy	Less Effective	Most Effective	Most Effective	Most Effective
Electricity Bill Rebate	Most Effective	Less Effective	Less Effective	Less Effective
Property Tax rebate	Effective	Effective	Effective	Effective
Income Tax rebate	Effective	Effective	Effective	Effective

Similarly, analysis has been carried out to assess effectiveness of the instruments vis a vis distribution channels identified for the purpose. The summary of is presented in the table below.

Table A.10 Summary of Suitable Combinations of Financing Instruments and Channels

Instrument \ Channel	Directly to Users	MNRE certified Manufacturer	Distribution Ulitity	Banks/Financial Institutions	IREDA	ESCO	Consumer Finance	Microfinance	Urban Local Bodies	Finance Ministry
Capital Subsidy	-	√	-	-	√	-	-	-	√	-
Interest Subsidy	-	-	-	√	√	-	-	√	-	-
Electricity Bill Rebate	-	-	√	-	-	-	-	-	-	-
Property Tax rebate	-	-	-	-	-	-	-	-	√	-
Income Tax rebate	-	-	-	-	-	-	-	-	-	√

While of most of the distribution channels identified above are very well known, two channels are relatively new in the context of solar water heating sector. These two channels are consumer finance and microfinance. Both the channels deliver finance to users at relatively high rate of interest. As a result, MNRE will have to make use of these channels in case of very specific requirement. These channels have been discussed below:

A.5.3 Consumer Finance

Consumer finance as a product is typically provided by the non-banking financial companies (NBFCs). These entities borrow money from banks/ financing institutions, etc. Therefore, the cost of their loan in terms of lending rate is more than that of the banks. Hence the lending rates of consumer finance companies are typically higher than the bank PLR by 200-300 basis points. Further, consumer finance is typically available for short duration of 2-3 years. Further, currently consumer finance industry is in doldrums with most consumer finance companies being shut and up for sale. Hence it can be concluded that MNRE/Government should not choose consumer finance as a channel to provide any kind of subsidy.

A.5.4 Microfinance Institutions (MFI)

Similar to consumer finance companies, MFIs borrow money from different types of sources of money in the market such as banks, private investors, NBFCs, etc. Therefore the lending rates of microfinance are higher than the commercial lenders. Further, microfinance is provided for revenue earning activity such as vegetable vending, pottery making, etc. Entire microfinance

industry operates on the basis of 'joint liability' principles. Further, repayment takes place on weekly basis. The costs associated with distribution of product and collection of payments typically vary in the range of 10-12%. As a result, the lending rates of MFIs are in the range of 24-30%. This makes MFIs unattractive candidate for SWHS financing channel. However, there are certain types of consumers whom could be accessed only through MFIs, To provide financial assistance to only these type of consumers, MFIs should be used as channel.

A.5.5 Financing Mechanisms for Domestic Users

A.5.5.1 Assessment of Interest Subsidy through Banks

Currently, MNRE provides financial assistance in the form of interest rate subsidy to the SWHS Users. The effective rate of interest for domestic buyers works out to be 2% p.a.. The stakeholder consultation process and the field surveys have identified following issues with this scheme.

- Many of the banks are not keen to act as a channel partner for implementation of interest subsidy scheme. The small ticket size of SWHS loans and procedural requirements result in higher administration costs for the banks/FIs. As a result, profitability of this loan portfolio to the banks/FIs is very low. Hence many private sector and some PSU banks/FIs have been hesitant to participate in this scheme.
- MNRE assumes uniform lending rate of 12.5% irrespective of the Prime Lending Rate of the bank for calculation of the interest subsidy. This is not always beneficial for the participating bank.
- Contrary to normal perception, Non-Performing Assets (NPAs) in SWHS are very high. Failure or less than envisaged performance of the SWHS is cited as the primary cause for high rate of NPAs.
- Only 15% of the new SWH systems are availing interest rate subsidy.

Due to the abovementioned reasons, the interest subsidy could not become an effective mechanism to provide financing assistance to this single largest segment of SWHS users. Further, any tweaking of the scheme is unlikely to improve banks' participation in interest subsidy scheme. Hence it can be safely concluded that interest subsidy is unlikely to be an effective instrument for MNRE to provide financial assistance to domestic users.

A.5.5.2 Assessment of Capital Subsidy through Manufacturers

In this mechanism, the government provides upfront capital subsidy to the buyers of SWHS in domestic sector through certified manufacturers. The subsidy is provided to the buyer (though received by the manufacturer) at the time of procurement of SWHS. Internationally this mechanism has been implemented by Australia, in which the federal government provides capital subsidy to the SWHS buyers in domestic segment through its certified SWHS manufacturers.

A.5.5.2.1 Proposed Framework for Capital Subsidy through Manufacturers

It is proposed that the capital subsidy to domestic consumers shall be provided through the manufacturers on installation of the system. Following are the key features of the proposed 'Capital Subsidy Mechanism for Domestic Category Consumers'.

- The scheme shall be available to all domestic category users of SWHS in the country.
- Capital subsidy shall be available only to new systems having capacity of less than 2000LPD, installed after the date of announcement of this scheme.
- IREDA shall act nodal agency for the scheme.
- The Scheme will be implemented through manufacturers of the SWHS, which would be certified by MNRE.
- Manufacturer must supply complete system i.e. solar collector, tank, associated piping and valves, etc.
- MNRE will certify manufacturers for each type of system that may be supplied by the manufacturers.
- Capital subsidy shall be available to only those systems which have 'type' testing certificate from MNRE;
- Manufacturer and dealer of the manufacturer, if any must mention on its all product catalogues regarding availability of capital subsidy from the MNRE. Further, all proposals / budgetary quotes must mention total costs, subsidy available and net cost payable by the user.
- Every system manufactured by a certified manufacturer shall have a unique serial number, date of manufacturing engraved on all important parts of the system, such as collector and tank. The number shall be engraved near outlet pipe of the collector and at

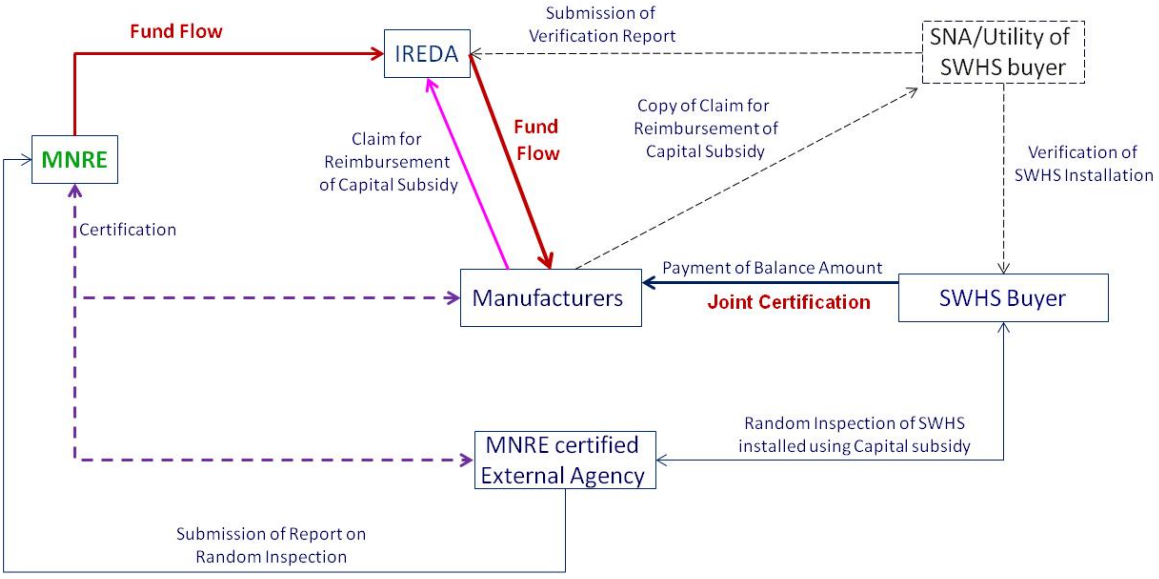
the bottom of the tank. It shall be responsibility of the manufacturer to ensure uniqueness of the number.

- Manufacturer shall enter into annual maintenance contract (AMC) with the user for five years from the date of sale of the system and cost of AMC to be included in the cost of the SWH system at the time of its sale.
- Manufacturer will have to give declaration regarding satisfactory operation of the SWH system on every March 31 for the first five years after installation of the system. In case of non-receipt of such declaration, manufacturer shall be automatically removed from the list of manufacturers eligible to participate in the scheme and no further subsidy claims from the manufacturer shall be entertained.
- Manufacturer shall claim capital subsidy on:
  - Installation of the new SWH system
  - Receipt of balance payment from the buyer
  - Joint Report by user and installer regarding successful installation of SWHS
- IREDA shall disburse the capital subsidy directly to the manufacturer, within 15 days of receipt of claim from the manufacturer. In case of delays, IREDA shall pay interest at the rate 2% above SBI PLR to the manufacturer for the period of delay.
- MNRE may require SNA to verify about 10% of installations carried out during that year. Systems shall be randomly selected by MNRE for the purpose of inspection. This shall be continuous process and report on verification shall be submitted to MNRE within one month of the inspection. MNRE shall reimburse the cost of inspection to SNA.
- MNRE certified manufacturers shall be required to maintain and share the database with MNRE. The information to be provided by the manufacturer will be specified by the MNRE as a part of the detailed procedures but at a minimum shall include unique serial number of system, LPD capacity of system, collector area of the system, details of the buyer, date and place of installation, name and address of system installer etc.
- MNRE shall carry out 'surprise inspections' using external agency for random inspection of the systems, which have received capital subsidy during the last five years. Number of systems and their location shall be at the discretion of the MNRE.
- Any wrong declaration by the manufacturer or identification of defective /non-operational systems during inspection by either SNA or MNRE appointed external

agency will lead to penalties. Repeated occurrences would result in manufacturer losing eligibility to participate in the scheme.

The schematic of the scheme has been presented in the figure as follows.

Figure A.4 MNRE's Capital Subsidy for Domestic Users through Manufacturers



A.5.5.2.2 Advantages of the Proposed Framework

It is believed that the proposed mechanism is distinctly superior to the existing mechanisms and offers following advantages:

- MNRE can influence the SWHS manufacturing sector. Currently, only collectors are being certified by the MNRE. This scheme will force all manufacturers to seek registration/accreditation with MNRE and thereby facilitating development of organized manufacturing sector for SWHS.
- 'Type' testing process will force all manufacturers to maintain quality prescribed under the terms of testing.
- Practice of annual maintenance contracts will get established. This will ensure proper maintenance of the systems.

- While it will increase overall administrative cost and time for MNRE, longer term benefits shall outweigh this increase in cost.
- Capital subsidy will require less time and resources from SWHS buyer while obtaining financial assistance from MNRE as compared to the existing interest rate subsidy scheme.
- Upfront capital subsidy to end users will address two main barriers of SWH technology i.e. affordability and financial un-viability.
- Upfront capital subsidy will demonstrate MNRE's confidence in SWHS sector. This will improve confidence of users in SWH technology and its market.
- In addition to capital subsidy mechanism, manufacturers once certified would be useful in operating other schemes such as partial interest rate subsidy or utility rebate scheme, etc.

Thus, the proposed financing mechanism will be useful to stimulate and accelerate the diffusion of SWHS in domestic user segment.

A.5.5.3 Proposed Financing Mechanisms for Domestic Users

While it is expected that 'capital subsidy scheme through manufacturers' shall drive the market for SWHS, there are important other categories for which specialised schemes are required. While the main report contains rationale and design for such special schemes/ additions to the main scheme, in the following table, complete list of the proposed mechanisms for domestic sector has been provided.

Table A.11 Financing Mechanisms Proposed for Domestic Users

Beneficiary (Owner of SWHS)	**MNRE's Financing Assistance**	
	Financing Instrument	**Attributes and Financing Channel**
Domestic users	Upfront Capital Subsidy	Rs. 5,000 for every 2 sq.m. of collector area from MNRE through its certified manufacturers in all the States except those identified below.

		Rs. 6,000 for every 2 sq.m. of collector area from MNRE through its certified manufacturers for consumers in North-Eastern States, and all special category States.
Domestic Users in Multi-storey building	Upfront Capital Subsidy	Rs. 5,000 for every 2 sq.m. of collector area through its MNRE certified manufacturers providing conventional SWH technology
		Rs. 6,000 for every 2 sq.m. of collector area through its MNRE certified manufacturers providing specified innovative space conscious SWH technology
Domestic user with Low income	Upfront Interest subsidy (in addition to MNRE's Capital Subsidy)	6% of lending interest rate contribution to Microfinance Institutions on behalf of buyer
Builder/Project developer of New Residential complex	Upfront Capital Subsidy	Rs. 5,000 or Rs. 6,000, whichever is applicable, for conventional SWHS and for innovative space conscious SWH technology, for every 2 sq.m. of collector area from MNRE through its certified manufacturers This capital subsidy to be passed onto the domestic residents of building
ESCO serving the Domestic users		

A.5.6 Financing Mechanisms for Non-domestic Users

The daily hot water requirement of most of the non-domestic users is usually high and difficult to standardise. Their high LPD requirement demands bigger SWHS installation and hence demands high capital cost for a buyer. Even with a fair quantum of upfront capital subsidy, the burden of capital cost may not get relieved substantially for such buyers. The buyers have to arrange the remaining portion of finances, which is a significant amount and most often challenging to arrange. Thus even a fair amount of capital subsidy seems to be a less effective

and inadequate form of financing assistance for non-domestic users. However, interest subsidy seems to be a suitable form of financing assistance for non-domestic users.

However, the most significant issue in the existing interest subsidy is MNRE's assumption regarding provision of loans at uniform lending rate of 12.5% at all the participating banks. To address this issue, we propose that while providing interest subsidy, MNRE should not bind the banks by fixing the uniform lending rate specified by MNRE. Banks should be allowed to adopt their own lending rates based on their own credit risk assessment framework. Most of the non-domestic buyers would be having banking relationship with some bank or other bank. Therefore, the bank would data on their transactions. Banks can analyze their past transactions before providing loan for purchase of SWHS. This will reduce bank's risk from SWH soft loan portfolio. In the proposed interest subsidy scheme, MNRE will be required to release the interest subsidy to the banks on annual basis over the duration of loan i.e. 5 years. These two aspects will improve profitability of SWHS loan portfolio for the bank and will encourage many banks to participate in the MNRE's interest rate subsidy scheme.

In case the hot water demand of commercial users is met through ESCO, MNRE should provide the applicable interest subsidy to the ESCO. The capital subsidy will not be provided to ESCO, as ESCO can operate profitably in case of large SWH installation.

Table A.12 Proposed Financing Mechanisms for Non-domestic Segment

Beneficiary	**Financing Instrument**	**Attributes and Financing Channel**
Individual Commercial user (up to 20 sq.m.)	Upfront Capital Subsidy	Rs. 2,,500 for every 2 sq.m. through MNRE certified manufacturers
Larger systems (more than 20 sq.m.) and ESCO (any area)	Annual Interest subsidy	7.5% from MNRE channelled through approved banks
Profit-making Institution or ESCO serving such institutions		7.5% from MNRE channelled through approved banks
Non-profit-making Institution or ESCO serving such institutions		9.5% from MNRE channelled through approved banks
Industrial user or ESCO serving one or many Industries		7.5% from MNRE channelled through approved banks

A.5.7 Comparison of Existing and Proposed Financing Mechanism

Table A.13 Comparison of Existing and Proposed Financing Mechanisms

User Segment	Financial Instrument	Financing Mechanism *	
		Existing	Proposed
Individual Domestic User	Capital Subsidy	-	For North-East States and special category States, capital subsidy of Rs. 3,000 per sq.m. of installed collector area. For other States, capital subsidy of Rs. 2,500 per sq.m. of installed collector area.
	Interest Subsidy - Soft Loans	MNRE assistance: @ 10.5% User's share: @ 2%	-
Domestic User residing in Biulding	Capital Subsidy	Rs. 1900 per sq.m. to the builders of Housing complexes with system capacity more than 2500 LPD	Rs. 3000 per sq.m. of collector area in case of innovative space conscious SWH technology Rs. 2,500 per sq.m. of collector area in case of conventional SWH technology
Domestic-Low Income Group	Interest Subsidy - Microfinance	-	MNRE assistance: @ 6% User's share : @ (MFI lending rate - 6%)
Commercial and Profit-making Institutions	Capital Subsidy	Rs. 1400 per sq.m.	Rs. 1,250 per sq.m. for installations of maximum 20 sq.m. Subsidy channeled through Manufacturer certified by MNRE
	Interest Subsidy - Soft Loans	Alternate to capital subsidy MNRE assistance: @ 7.5% User's share: @ 5%	Installation larger than 20 sq.m. MNRE assistance: @ 7.5% User's share : @ (FI lending rate - 7.5%)
Non-Profit-making Institutions	Capital Subsidy	Rs. 1750 per sq.m.	-
	Interest Subsidy - Soft Loans	Alternate to capital subsidy MNRE assistance: @ 9.5% User's share: @ 3%	MNRE assistance: @ 9.5% User's share : @ (FI lending rate - 9.5%)
Industrial	Capital Subsidy	-	-
	Interest Subsidy - Soft Loans	MNRE assistance: @ 7.5% User's share: @ 5%	MNRE assistance: @ 7.5% User's share : @ (FI lending rate - 7.5%)

* *Focus on financing instruments which MNRE can implement*

Financial assistance for ETC systems will be 30% lower than that for FPC systems.

A.6 IMPLICATIONS FOR MNRE

Table A.14 Implication for MNRE with new Financing Mechanisms (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017	Total
Domestic-Urban	109.54	133.49	133.49	133.49	208.71	208.71	208.71	208.71	1344.85
Domestic-Rural	8.62	5.46	5.46	5.46	5.37	5.37	5.37	5.37	46.47
Commercial-Hotels (Small)	2.69	3.90	3.90	3.90	4.88	4.88	4.88	4.88	33.94
Commercial-Hotels (Large)	2.20	3.18	3.18	3.18	3.98	3.98	3.98	3.98	27.68
Profit-making Institutions	5.09	4.14	4.14	4.14	4.27	4.27	4.27	4.27	34.58
Non-Profit making Institutions	6.45	5.24	5.24	5.24	5.40	5.40	5.40	5.40	43.80
Industry	4.89	7.14	7.14	7.14	9.18	9.18	9.18	9.18	63.02
Total	139.49	162.55	162.55	162.55	241.80	241.80	241.80	241.80	1594.34

Table A.15 Implication for MNRE in case of Continuation of Existing Financing Mechanisms (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017	Total
Domestic-Urban	86.97	105.99	105.99	105.99	165.72	165.72	165.72	165.72	1067.81
Domestic-Rural	6.85	4.33	4.33	4.33	4.26	4.26	4.26	4.26	36.90
Commercial-Hotels (Small)	3.30	4.77	4.77	4.77	5.98	5.98	5.98	5.98	41.53
Commercial-Hotels (Large)	2.20	3.18	3.18	3.18	3.98	3.98	3.98	3.98	27.68
Profit-making Institutions	5.09	4.14	4.14	4.14	4.27	4.27	4.27	4.27	34.58
Non-Profit making Institutions	6.45	5.24	5.24	5.24	5.40	5.40	5.40	5.40	43.80
Industry	4.89	7.14	7.14	7.14	9.18	9.18	9.18	9.18	63.02
Total	115.76	134.80	134.80	134.80	198.79	198.79	198.79	198.79	1315.32

The comparison of above two tables shows that MNRE will be required to make a budgetary provision of Rs. 1594 crore instead of Rs. 1315 crore, if the existing scheme is continued.

Table A.16 Implication for MNRE to Assist Supply Chain (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017	Total
Increase in Manufacturing Capacity (million sq.m.)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	**1.2**
Cumulative addition in Manufacturing Capacity (mil.sq.m.)	0.15	0.3	0.45	0.6	0.75	0.9	1.05	1.2	-
Investment required to increase Manufacturing Capacity (Rs. crore)	8	8	8	9	9	10	10	11	**73**

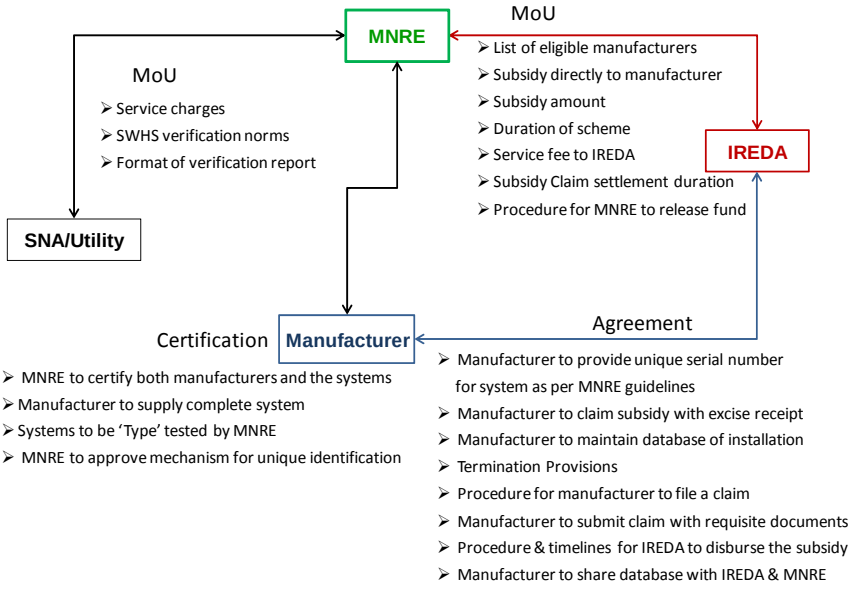
A.7 IMPLEMENTATION ARRANGEMENTS

Considering that MNRE will implement the financing mechanisms throughout the country, it is essential that implementation is undertaken in a systematic manner. Following contractual arrangement is envisaged for implementation of financing mechanisms.

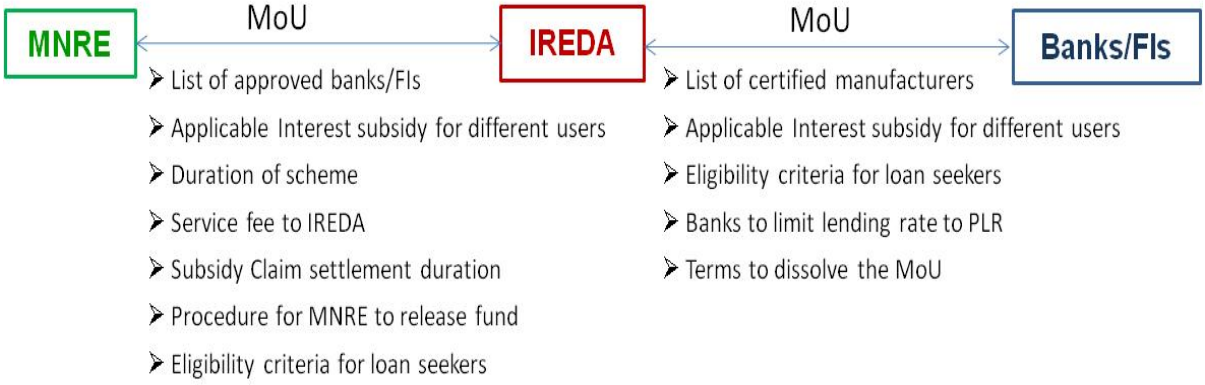
1. Memorandum of Understanding between MNRE & IREDA to act as Nodal Agency
2. Agreement between Manufacturer and IREDA for Capital Subsidy Scheme
3. Agreement between IREDA and banks/FIs/MFIs
4. Certification of Manufacturer and Systems
5. MOU between MNRE, IREDA and SNA/Utility

A.7.1 Implementation arrangement for Capital Subsidy for Domestic Users

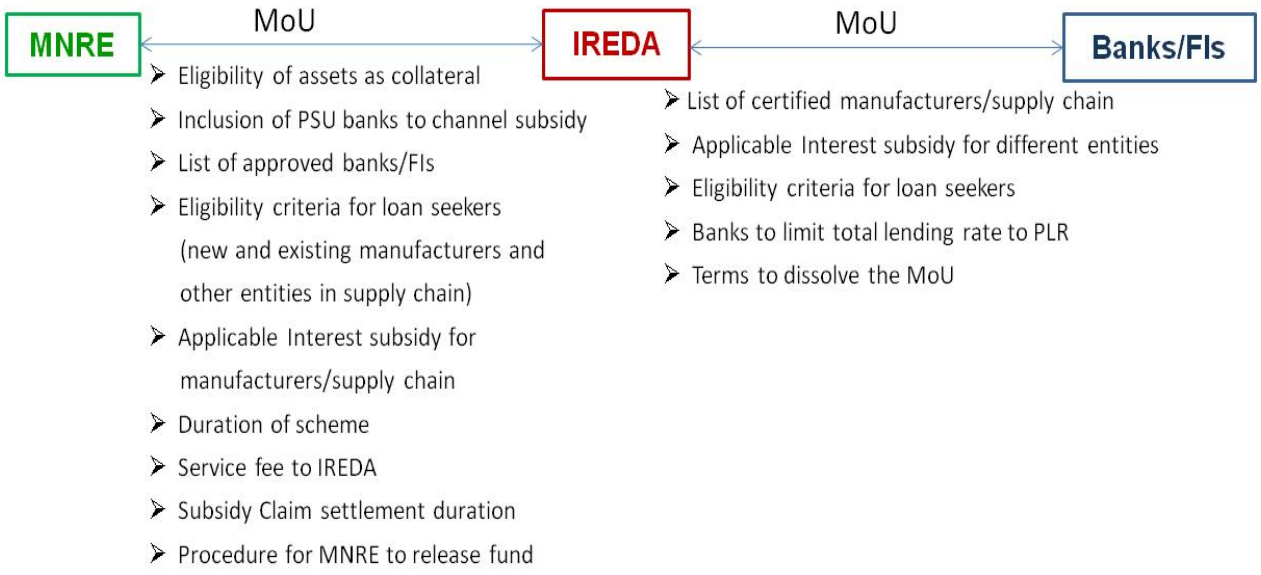
The picture below depicts contractual relationship between the various stakeholders involved in operationalization of the proposed 'Capital Subsidy' Scheme.



A.7.2 Implementation arrangement for Interest Subsidy for Non-domestic Users



A.7.3 Implementation arrangement for Interest Subsidy for Manufacturers and Supply Chain



A.7.4 Certification of Manufacturer / Systems

Quality of SWHS has been key issue. It is necessary to ensure that quality of the systems is maintained. For this purpose, it is proposed that MNRE establishes system of certification of manufacturers as well as certification of systems eligible for receipt of support under MNRE sponsored schemes. In this Section, broad contours of the proposed system of certification have been explained.

Certification of Manufacturers

- MNRE to specify criteria of eligibility to be certified manufacturer
  - Manufacturing ability –
    - Technology wise
    - Component wise
  - Net-worth
  - Production data in last three years
- R & D Capability
- Ability to install systems – Initially manufacturers to take responsibility of installation of the SWHS

- Distribution network
- Ability to maintain systems
- Undertaking for participation in the MNRE Schemes
- MNRE to specify the criteria for certification of system installers and system integrators
- Process of receipt of application for certification
- Process of disposal of applications

Certification of SWH Systems

- MNRE may continue using BIS standard for certification of conventional systems as well as new systems till such time it evolves its own mechanism of certification
- However, systems to be recognised based on the technology
- MNRE to design the suitable 'Type Test' for different types of SWHS
- MNRE to invite the interested manufacturers for 'Type Test'.
- MNRE to certify systems being produced by different manufacturers
- MNRE to specify the components and location on component where the unique serial number of the system is to be engraved.
- MNRE to specify the font and size to engrave the serial number.
- MNRE to specify the details to be incorporated into the system serial number. They can be the system capacity in LPD, collector area in sq.m., collector technology, manufacturers identification in terms of a code registered at MNRE, date of manufacturing of system, and place of manufacture.

B. DISCUSSIONS WITH MNRE ON 'FINANCING MECHANISMS'

ABPS Infra submitted its Report on Financing Mechanisms to the Project Management Unit on March 17, 2010. Subsequent to the submission of the Report, discussions were held on March 18 & 19, 2010 during which various issues associated with capital subsidy scheme were discussed. While there was an agreement on the issue of provision of capital subsidy for the domestic users and commercial users with small SWH installations, it was felt that the subsidy should be provided through distribution Utilities.

It was also felt that it may be easier for MNRE to monitor provision of subsidy through distribution Utilities than if the same is provided through manufacturers. During discussions, it

was felt that option of provision of subsidy through distribution Utilities should be developed by ABPS Infra and should be included in the Report.

Accordingly, in this Section, a scheme for provision of capital subsidy through distribution Utilities has been presented as an alternative for consideration of MNRE.

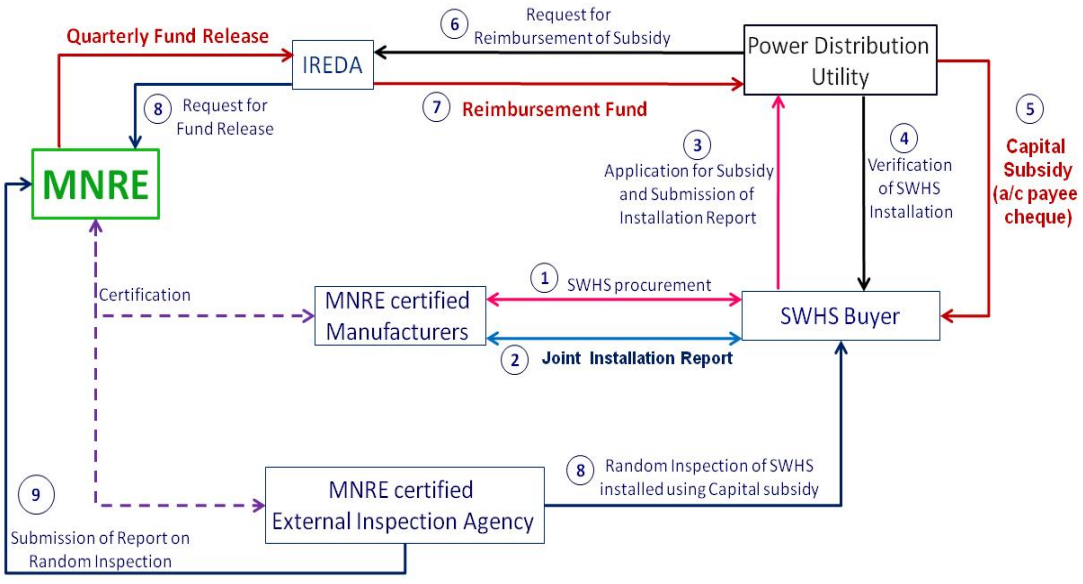
B.1 CAPITAL SUBSIDY THROUGH UTILITIES

In this mechanism, the Government will provide capital subsidy to the buyer of SWHS through the Utility of the buyer. It may be noted that the quantum of financing required by the user of SWHS is not dependent on mode of disbursement of subsidy. Hence, quantum of financing would remain be the same as presented before in Table A.7. Primary difference between the Scheme presented in subsection A.5.5.2, under Section A.5, and in this Scheme is involvement of Distribution Utility in place of Manufacturer. The consequent changes into the other provisions such as monitoring and verification has also been incorporated and presented in detail in Chapter-17 of this report.

B.1.1 Proposed Framework

The schematic of the scheme has been presented in the figure as follows.

Figure B.1 MNRE's Capital Subsidy for Domestic Users through Utilities



B.1.2 Key Features of the Proposed Capital Subsidy Scheme

- SWH system manufactured by MNRE certified manufacturers would be eligible to receive capital subsidy.
- Utility will verify the eligibility of the SWHS installed and provide capital subsidy to the buyer of SWHS by way of Account Payee Cheque.
- MNRE will reimburse this capital subsidy to the Utilities on confirmation of payment of the same to the buyer. IREDA will act as its nodal agency.
- As a result, the subsidy will not be received by the SWHS buyer upfront; i.e. at the time of procurement of system. It would be received after installation of the system.

B.1.3 Agreement between IREDA and Utility

It is envisaged that IREDA will sign Agreement with Utility to act as a channel partner for distribution of capital subsidy for solar water heating systems. This will be binding Agreement with specific functions assigned to both parties. Further, the Agreement shall have specific penalties for violation of the provisions of the Agreement. Broad Heads of Agreement would be as follows:

- Roles and responsibilities of IREDA and the Utility;
- Procedure for submission of claim for reimbursement of capital subsidy;
- Claim of the Utility to include the following information:
    - Unique Serial Number of the system,
    - Name and consumer number of owner of the system,
    - Date and place of installation of system,
    - Name of installer/system integrator,
    - Specifications of system such as LPD and collector area in sq.m.,
    - AMC duration,
    - Confirmation on receipt of Joint Inspection Report,
    - Confirmation of having conducted Utility Inspection.
- Procedure for intimation of installation of new SWH system;
- Cooperation with third party inspection agency appointed by MNRE;
- IREDA will disburse the claim within one month of receipt of claim;
- Provisions in case of delayed payment by IREDA to the Utility

1 INTRODUCTION

This chapter outlines the scope of the Study for 'Design and implementation of New Financing Mechanisms and Instruments for Promotion of Solar Water Heating Systems', and Approach and Methodology adopted for developing the financing mechanisms and instruments for promotion of SWHS.

1.1 Background

The Ministry of New and Renewable Energy (MNRE), Government of India, is implementing a United Nations Development Programme (UNDP) / Global Environment Facility (GEF) assisted Project on "Global Solar Water Heating Market Transformation and Strengthening Initiative: India Country Program." The project is expected to contribute to achieve the 11th Plan target through installation of two million sq. m. of SWHS. This will result in GHG Emission Reduction of 11 million tons of Carbon Dioxide (CO2) and aims at accelerating development of the market for solar water heating and facilitating the installation of 5 million m^2 of installed collector area by 2012. The overarching objective of the project is to leverage the Ministry's National Programme and create markets and widespread demand for solar water heating in different sectors especially in untapped potential areas.

1.2 Purpose of the Study

An effective financial assistance can play an important role in promotion of SWHS. The involvement of various stakeholders in the development and implementation of financing mechanisms and instruments is essential to understand the financial needs of different kinds of sectors and demand segments in India. Further, in order to examine the role that financing mechanisms and instruments can play in addressing such needs and promoting widespread deployment of SWHS, a comprehensive study of international schemes was also necessary. In view of this, Project Management Unit (PMU) of Ministry of New and Renewable Energy (MNRE) engaged ABPS Infrastructure Advisory Private Limited (ABPS Infra) to analyse the existing financing mechanisms and instruments implemented in India as well as in other countries, assess the financing needs and to design the new financing scheme and instruments for promotion of SWHS in India.

1.3 Scope of Work

In order to cover various aspects of development of financing mechanisms and instruments for promotion of SWHS, the PMU of MNRE has outlined the terms of reference of the study in three phases as given below.

1. Review the financial models and schemes implemented internationally and in India to promote SWH systems.
   - Detailed literature survey on the international and national financial mechanisms and instruments to promote SWH systems
   - Data collection from various key stakeholders about their financial mechanisms and instruments to promote SWH systems.

2. Field research to identify the barriers and issues faced by the financial mechanisms and instruments implemented so far to promote SWH systems. This involved collection of data for assessment of financing needs for different sectors and demand segments in India through structured interviews with groups of key stakeholders; surveys and field visits.

3. Design a new financing mechanisms and instruments for India and to develop a plan for their implementation in India
   - Design of new financing mechanisms and instruments for penetration of SWH based on the findings;
   - Design of specific financing support and delivery mechanisms to reduce risk for the lending institutions and to facilitate demand for their loans;
   - Design of Modalities to extend financial support for technology/product/manufacturing up gradation and expansion of the supply chain to reach the un-served areas in India;
   - A plan for implementation of the proposed financing mechanisms and instruments, along with a framework for monitoring/feedback and impact analysis.

1.4 Approach and Methodology

SWH has been extensively promoted various financing schemes in many countries, such as South Africa, Tunisia, Australia, Germany and USA. Their promotional schemes vary in detail and have been customized for local legislative frameworks and market situations. ABPS Infra undertook this assignment in a phased manner in order to provide structured approach for

designing a new financing mechanism and instruments for the Indian SWHS market. We executed this assignment through three phases as described below.

Phase I: Review of Existing Financing models and schemes implemented to penetrate SWH systems in India and in International case studies

This phase focused on study and data collection of the existing financial mechanisms and instruments supporting the SWH systems in India and in other countries. The objective of this phase was to gather details of the all the existing financial schemes, and identify their impact and limitations. The findings of this study provided an insight for design of new financial mechanisms and instruments which may overcome the limitations of the existing financial schemes. We undertook this phase through three sub-phases as explained below.

Phase I (a): Review of Existing Financing Models and Schemes in India

In this sub-phase ABPS Infra reviewed the existing financing support schemes implemented at National level and the State level financing schemes implemented in the States of Haryana, Delhi, Karnataka, Andhra Pradesh, and Maharashtra. Following tasks were undertaken for this purpose:

(a) Literature survey to identify financing schemes implemented at National level
(b) Literature survey to identify financing schemes implemented at State level
(c) Review of financing schemes and instruments implemented in different demand segments;
(d) Study and analysis of the financial impact and viability of these schemes;
(e) Review of the role and responsibilities of the stakeholders while implementing and monitoring the promotional financing mechanisms and instruments ;
(f) Identification of existing legal framework established for such financial promotion;
(g) Review of the regulatory procedures, if any, followed while determining the financial support for commercial and domestic category of consumers;
(h) Compilation of important information gathered through this sub-phase;
(i) Compilation of the lessons learnt from the existing schemes for the design of new financial mechanisms and instruments.

Phase I (b): Review of Existing Financing Models and Schemes in other Countries

Through this sub-phase ABPS Infra targeted to gather the insight of international financing schemes for SWH systems. Following tasks were undertaken for this process:

(a) Literature survey to identify financing schemes implemented in indentified countries;
(b) Review of financing mechanisms and instruments implemented in different demand segments such as domestic, commercial, and from different regions, such as rural and urban etc;
(c) Study and analysis of the financial impact and viability of these schemes;
(d) Review of the role and responsibilities of the stakeholders implementing and monitoring the promotional financing mechanisms and instruments ;
(e) Identification of existing legal framework in respective countries established for such financial promotion;
(f) Compilation of important information gathered through this sub-phase;
(g) Compilation of the lessons learnt from the schemes implemented in different countries for the design of new financing mechanisms and instruments.

Phase I (c): Stakeholders' Consultation

The purpose of this sub-phase was to gather the insight of the challenges faced by the stakeholders in the SWH sector while seeking the financial assistance under the existing financing mechanisms and instruments. The gathered insights were useful for designing the new financial mechanisms. We carried out stakeholder consultation process in the six identified States in which we involved four categories of stakeholders namely Banks, Manufacturers, State Nodal Agencies and consumers.

We performed the consultation process through two mechanisms namely, structured questionnaire and in-person interviews. In the first mechanism, structured questionnaire was prepared for each type of stakeholder. These questionnaires were sent to key stakeholders over email and responses were sought. Subsequently, we carried out in-person interviews with several stakeholders. During interviews, we sought more clarity on the views expressed by the stakeholders in response to our questionnaires. The data collected in the phase I was immensely useful to design the new financing mechanisms and instruments for promotion of SWHS.

During the stakeholder consultation organised by MNRE on November 18, 2009, we presented the international case studies, overview of existing financing schemes in India and key issues rasied by stakeholders on which several stakeholders including Banks & Financial Institutions, Manufacturers and consumer representatives provided their inputs.

Phase II: Field Research to Assess Financing Needs in Different Sectors and Demand Segments

The purpose of this phase was to gather the issues from various kinds of stakeholders through field visits and interviews so as to arrive at the financial needs of different kinds of sectors and demand segments in India. Under this phase we undertook the following tasks:

(a) Field visits and surveys to identify the barriers for penetration of SWH systems despite existing promotional financing schemes. The outcomes of this task helped us identify the reasons for limited success of the existing financing schemes.

(b) Identification and assessment of the existing financial needs of the different kinds of demand segments, and regions and envisage the needs in future. During this task we have categorised the potential SWH users among domestic, commercial, industrial and institutional users. Such classification was done to identify the financial needs for different sectors, demand segments, and regions and highlight the categories which require special attention. Further, suitable variables were being defined upfront to capture and quantify the need of financial assistance for various categories. The associated data was collected during the field visits.

Phase III: Design of New Financing Mechanisms and Instruments Along with a Plan for their Implementation

The Stakeholder Consultation Process in phase-I and II and field research in phase-II provided an insight of the conceptual issues prior to initiation of design process of new financial mechanisms and instruments. During this phase we undertook the following tasks.

(a) Design of the new financing mechanisms and instruments to stimulate the penetration of SWH systems across different segments and regions in India considering the practical aspects of implementing the instrument and mechanism;

(b) Suggested modalities to extend the financial support for technology/product/manufacturing up-gradation and expansion of supply chain;

(c) Design of a plan for implementation of the proposed financing mechanisms and instruments in India;

(d) Development of a framework for MNRE to monitor and gather feedback and impact analysis of the proposed financing mechanisms and instruments.

1.5 Organisation of the Report

This report has been organized through thirteen chapters.

Chapter 1 "Introduction" presents the background, purpose of study, scope of study, approach and methodology adopted for execution of the assignment and outline of the report.

Chapter 2 "Overview of Solar Water Heater Sector" highlights the developments, potential and achievements of the solar water heater sector in India.

Chapter 3 "National Level Financing Mechanisms" highlights the existing financing schemes promoted by MNRE at National level for SWHS and their effectiveness.

Chapter 4 "State Level Financing Mechanisms" highlights the various State level financing schemes promoted in different Sates for SWHS.

Chapter 5 "Lessons Learnt from International Schemes" highlights the lessons learnt from various international case studies

Chapter 6 "Results of Stakeholder Consultation Process" elaborates the views and suggestions of the various stakeholders and the challenges faced by them. Six States have been covered and the detailed analysis of the issues has been presented in this chapter.

Chapter 7 "Outcome from Review of Existing Schemes" highlights the lessons learnt from the existing national and international schemes from Indian perspective.

Chapter 8 "Market Assessment and Segmentation" presents market segmentation, expected market size for different user segments and drivers of financing to different user segments.

Chapter 9 "Assessment of Financing Needs of User segments" provides an overview of methodology for estimation of financing needs of various User Segments

Chapter 10 "Financing Needs and Support Required for Manufacturing and Supply Chain" provides issues faced by manufacturers and also in supply chain management of the systems. This chapter also highlights quantification of financing needs of manufacturers.

Chapter 11 "Quantification of Financial Assistance for User Segments" presents the methodology to estimate feasible financial assistance and also highlights proposed quantum of financial assistance.

Chapter 12 "Components of Financing Mechanism" elaborates the assessment of sources of finance and also criteria for assessment of Financing Mechanisms.

Chapter 13 "Assessment of Financing Instruments" presents the suitability of various financing instruments which is independent of possible financing sources and financing channels.

Chapter 14 "Assessment of Financing Channels" elaborates the assessment of the financing or the distribution channels.

Chapter 15 "Proposed Financing Mechanisms" provides the financing mechanisms to be proposed for different categories of users and the comparison of existing and proposed financing mechanisms.

Chapter 16 "Implementation Plan" presents the provision required for promotion, implementation arrangements for the financing mechanisms and assistance to manufacturers.

Chapter 17 "Discussions with MNRE on Financing Mechanism" elaborates the scheme for provision of capital subsidy through distribution utilities as an alternative for the consideration of MNRE.

Annexure to the Report provides the list of the stakeholders met during the execution of the assignment

Appendix to the Report presents International Case Studies in detail.

2 OVERVIEW OF SOLAR WATER HEATER SECTOR IN INDIA

This Chapter begins with review of development of solar water heating sector in India. It further presents different types of solar water heating systems and their working. The Chapter also discusses the potential for SWHS in India, legal and regulatory framework and proposed National Solar Mission. This Chapter also highlights the scenario for development of SWH sector in the country.

2.1 Solar Energy

India's theoretical solar power reception on its land area is about 5000 trillion per year. India has nearly 250-300 clear sunny days and average daily solar energy incidence varies from 4 to 7 KWh/sq. m. The sun provides a virtually unlimited supply of energy. The energy from the sun is virtually free once the initial cost of the system has been recovered. The use of solar energy can, not only bridge the gap between the demand and supply of electricity but it also displaces conventional energy, which usually results in a proportional decrease in GHG emissions. Solar energy usage in India is merely 0.5 % compared to other energy resources.

2.2 Solar Water Heaters – Types and Usage

Solar water heating has applications in several consuming categories such as domestic, hotels, institutions, industrial etc. Designs and structures of the solar water heaters vary depending on the quantity and temperature requirement of the application. While systems used for institutional and industrial applications are customised for the desired application, systems used in domestic application are fairly standard.

Solar water heating systems could be divided into two types, depending upon the method of water circulation. In the thermo-syphon systems, hot water is supplied using gravity of the principles. These systems are usually simple and relatively inexpensive. As name suggests, the forced circulation systems employ electrical pumps to circulate the water through collectors and storage tanks.

While abovementioned differentiation of SWH systems is technically correct, SWH Systems for industrial and commercial applications are better known by the type of solar collector used. Based on the type of collectors, SWHS are divided into following two types:

- Flat Plate Collectors (FPC)
- Evacuated Tube Collectors (ETC)

In the following paragraphs, we have described these in more detail.

2.2.1 Flat Plate Collector

A black absorbing surface (absorber) inside the flat plate collectors absorbs solar radiation and transfers the energy to water flowing through it. The solar radiation is absorbed by flat plate collectors, which consist of an insulated outer metallic box covered on the top with glass sheet. Inside there are blackened metallic absorber (selectively coated) sheets with built in channels or riser tubes to carry water. The absorber absorbs the solar radiation and transfers the heat to the flowing water.

2.2.2 Evacuated Tube Collector

The collector is made of double layer borosilicate glass tubes evacuated for providing insulation. The outer wall of the inner tube is coated with selective absorbing material. This helps absorption of solar radiation and transfers the heat to the water which flows through the inner tube. ETC is highly efficient with excellent absorption (>93%) and minimum emittance (<6%) as the tubes are round and sun rays are striking the tubes at right angles thus minimizing reflection. The entire system is controlled and monitored by an automatic control panel. There is no scaling in the glass tubes thus, suitable for areas with hard water.

2.3 Cost of SWHS

The cost of solar water heater consists of cost of collector, tank and brackets for supporting Piping etc. As per MNRE upper limit of cost of solar water heating system with 5 years warranty is as provided below:

Table 2.1: Cost of different capacities of ETC based SWHS

System Capacity in LPD	ETC based system (in Rs)	
	No. of tubes (min)	Upper Cost limit
50	7	7125
75	11	10875
100	14	13500
200	28	26250
250	34	31875
300	40	37500
400	52	48750
500	64	60000
600 to 2000 lpd	12 tubes per 100 lpd	Rs 905 per tube
2100 and above	12 tubes per 100 lpd	Rs 750 per tube

Source: www.mnes.nic.in

Table 2.2: Cost of different capacities of FPC based SWHS

System Capacity in LPD	FPC based system (Rs) Rate contract amount with 5 years CMC in Rs per no.	
	Soft Water	Hard Water
125	24411	25564
250	41275	42835
375	57574	59841
500	87185	89339
1000	161642	163160
1500	236607	244740
2000	308020	326320
2500	379433	407900
3000	451580	489480

Source: Maharashtra Energy Development Authority

ABPS Infra has used these costs while developing financial models for calculation of the financial support required on life cycle cost of SWH vis-à-vis life cycle cost of heating water either using electricity or other fuels.

2.4 Benefits of installation of solar water heating systems

Solar water heating systems or SWHS can easily heat water to temperature of 60-80° C. A 100 litres capacity SWHS can replace an electric geyser of 2 KW capacity, for residential use and may save upto 1500 units of electricity annually depending upon the location of the SWHS. The result of Market Assessment Survey carried out by 'Greentech Solutions' clearly brings out diversity in requirement of hot water across different parts of the country.

While in some parts of the country where hot water requirement is for 9 months or more, the SWHS may save about 1400-1500 units of electricity, the systems in other parts such as Rajasthan/ Delhi my save only 600-800 units per annum. The use of 1000 SWHS of 100 litres capacity each can contribute to a peak load shaving of approximately 1 MW while one SWHS of 100 litres capacity can prevent emission of up to 1.5 tons of CO_2 per year. SWHS systems have a vast potential in homes, hotels, hospitals, hostels, dairies, industries, institutions, govt. buildings etc. Large scale installations of SWHS could save enormous amount of electricity besides having load shavings during peak hours & abating CO2 emission.

2.5 Potential and Achievement of SWHS

The gross potential for SWHS in India has been estimated to be 140 million sq. m. of collector area. Of this, 40 million sq.m. has been estimated as the realizable techno-economic potential at this stage. A total of 3.1 million sq. m. of collector area has so far been installed in the country for solar water heating, of which about 1.55 million sq. m. has been installed since 2005-06. The achievement so far has been modest as compared to the overall potential. A target of 5 million sq. m. has been set for the 11th Plan (2007-12) and a goal of 20 million sq. m for 2020. Recently the Jawaharlal Nehru National Solar Mission (JNNSM) has been announced, and as per the mission, the deployment of SWHS has been divided into three phases. The target of 7 million sq. m. has been set for phase I i.e. FY 2010-13, 15 million sq. m. for phase II i.e. FY 2013-17 and 20 million sq. m. for phase III covering period FY 2017-22. The year wise achievement of SWHS has been shown below:

Table 2.3: Year wise achievement of SWHS

Year	Achievements (In sq m of collector area)
Up to 2002-03	**6,50,000**
2002-03	1,00,000
2003-04	1,50,000
2004-05	2,00,000
2005-06	4,00,000
2006-07	4,00,000
2007-08	4,50,000
2008-09 (Till 31.12.08)	3,00,000
Total	**26,50,000**

Source: www.mnes.nic.in

2.6 Promotional Schemes for Development of SWHS in India

Several schemes for promotion of solar water heaters have been operation in country. While most of these schemes were developed and coordinated by Ministry of New and Renewable Energy (MNRE), some schemes were developed at the State level. While we have presented interest subsidy, capital subsidy and state level financing schemes in the next chapters, in this Section we have presented all the schemes in brief.

2.6.1 Financial Assistance through interest rate / capital subsidy

In mid-nineties, Ministry of Non-Conventional Energy Sources, predecessor of Ministry of New and Renewable Energy or MNRE established programme for promotion of solar water heating systems. Since then MNRE has been refining promotional schemes for SWHS. As a part of its scheme, MNRE provides soft loans to the users under the interest subsidy scheme through a network of financial institutions, public/private sector banks, scheduled co-operative banks, RBI approved non-banking financing companies. Indian Renewable Energy Development Agency (IREDA) operates as a Nodal Agency for the scheme. Interest subsidy is provided to the consumers through various financial intermediaries so that effective interest rate works out to 2% for domestic users, 3% for institutional users and 5% for industrial/commercial users.

Interest free loans are available to domestic users in the North-Eastern States, Sikkim, Himachal Pradesh, Islands, J&K, Uttarakhand, Chattisgarh and Jharkhand. Overall fund management has been entrusted to IREDA. The banks/FIs are required to provide loans at prescribed rates to beneficiaries and claim interest subsidy (difference between the lending rate of banks/FIs and MNRE prescribed interest rates) from IREDA. As on date, 31 banks and financial institutions are participating in the scheme through their branch network in different parts of the country.

In addition, capital subsidy is available to builders & developers/ development authorities/ housing boards/ cooperatives/ Group Housing Societies for providing solar water heating systems in new buildings and housing/ commercial/institutional complexes. The Capital Subsidy is operated by MNRE through State Nodal Agencies.

2.6.2 Building bye-laws amendment to mandate SWHS installation

In a separate initiative, a model regulation / building bye-law for mandatory installation of SWHS in new buildings was circulated by the Ministry of Urban Development to all States and Union Territories with a request for onward circulation to all local bodies for incorporation in their building bye-laws. Necessary orders have been issued in 19 States and 41 Municipal Corporations/Municipalities have so far amended their building bye-laws. A few municipal corporations such as Thane, Amravati, Nagpur and Durgapur are providing 6-10% rebate in the property tax for users of solar water heaters. States like Andhra Pradesh, Madhya Pradesh, Punjab, Himachal Pradesh Maharashtra, Tamil Nadu, Rajasthan, Haryana, Uttar Pradesh, Uttaranchal, Chandigarh, Chhattisgarh, Nagaland, Delhi, West Bengal, Karnataka, Mizoram, Dadar & Nagar Haveli are emphasising on amendments in buildings bye-laws. States like Karnataka, Gujarat, West Bengal, Maharashtra, Andhra Pradesh, Uttar Pradesh and Chhattisgarh have amended the building bye-laws.

2.6.3 Utility rebates for SWHS installations

Rebate in Utility bills is a simple way of providing incentive for installation of SWHS. Utilities are being encouraged to provide rebates in electricity tariff to SWHS users. The Utilities in Haryana, Rajasthan, West Bengal, Assam, Haryana, Uttarakhand and Karnataka are already providing monthly rebates in electricity tariff.

2.6.4 Standardisation of Solar Collectors

BIS standards have been established for flat plate solar collectors along with appropriate test facilities. ETC based systems are also being promoted, though the tubes used in them are being imported at present. There are 63 BIS approved manufacturers of SWHS of flat plate collectors and 71 MNRE approved suppliers of evacuated tube collector based systems. They are eligible to supply solar water heating systems under the interest subsidy scheme.

2.6.5 Inclusion of Solar Energy in ECBC

The Energy Conservation Act 2001 authorises the Bureau of Energy Efficiency (BEE) to prescribe guidelines for Energy Conservation Buildings Code (ECBC). BEE has developed ECBC, which sets minimum energy efficiency standard for design and construction. ECBC is expected to impact and promote market development of various energy efficient products such as solar water heaters. SWHS are included among the building components covered under ECBC. SWHS are required to meet at least 20% of the design capacity for water heating.

2.7 Existing Legal and Regulatory Framework

This section describes the legal and regulatory provisions relevant for promotion of renewable energy based power generation. The section incorporates provisions from EA 2003, National Electricity Policy (NEP), and National Action Plan for Climate Change, and a brief on RPO orders/regulations notified by SERCs.

2.7.1 The Electricity Act 2003

The *Preamble* to the Electricity Act 2003 records the following,

"An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, ***promotion of efficient and environmentally benign policies****, constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto."*

The Objectives enshrined in the Preamble have to be implemented using specific provisions in the Act. In order to promote efficient and environmentally benign policies, Further, the EA 2003

has following provisions for promotion and development of Renewable Energy sources in India.

- **Section 3(1):** The Central Government shall, from time to time, **prepare the National Electricity Policy and Tariff Policy**, in consultation with the State Governments and the Authority for development of the power systems **based on optimal utilization of resources such as** coal, natural gas, nuclear substances or materials, hydro and **renewable sources of energy.**
- **Section 3(3): The Central Government may**, from time to time in consultation with the **State Governments**, and the Authority **review or revise, the National Electricity Policy and Tariff Policy** referred to in section 3(1).
- **Section 4: The Central Government shall**, after consultation with the State Governments, prepare and notify a national policy, permitting **stand-alone systems** (including those based on renewable sources of energy and non-conventional sources of energy) for rural areas.
- **Section 5: The Central Government** shall also formulate a **National policy**, in consultation with the **State Governments** and the **State Commissions**, for rural electrification and for bulk purchase of power and management of local distribution in rural areas through Panchayat Institutions, users' associations, co-operative socities, non-Governmental organisations or franchisees.
- **Section 61(h)**: The Appropriate Commission shall, subject to the provisions of the Act, specify the terms and conditions for the determination of tariff, and in doing so, shall be **guided by the promotion of co-generation and generation of electricity from renewable sources of energy.**
- **Section 66:** The **Appropriate Commission** shall endeavour **to promote the development of a market (including trading)** in power in such manner as may be specified and shall be guided by the **National Electricity Policy** referred in Section 3 in this regard.
- **Section 86(1)(b):** The **SERCs shall discharge the function to regulate electricity purchase and procurement process of Distribution Licensees** including the price at which electricity shall be procured from the generating companies or licensees or from other sources through agreements for **purchase of power for distribution and supply within the State.**
- **Section 86(1)(e):** The **State Commission** shall 'promote cogeneration and **generation of electricity from renewable sources** of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for

purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee.'

2.7.2 National Electricity Policy

National Electricity Policy was notified by Central Government in February 2005 as per provisions of Section 3 of EA 2003. The Clause 5.12 of National Electricity Policy outlines several conditions in respect of promotion and harnessing of renewable energy sources. The salient features of the said provisions of National Electricity Policy are as follows.

- *"5.12.1 Non-conventional sources of energy being the most environment friendly there is an urgent need to promote generation of electricity based on such sources of energy. For this purpose,* ***efforts need to be made to reduce the capital cost of projects*** *based on non-conventional and renewable sources of energy. Cost of energy can also be reduced by promoting competition within such projects. At the same time,* ***adequate promotional measures would also have to be taken for development of technologies and a sustained growth of these sources****.*
- *"5.12.2 The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted by the SERCs by* ***providing suitable measures for connectivity with grid*** *and* ***sale of electricity to any person*** *and also by* ***specifying****, for purchase of electricity from such sources, a* ***percentage of the total consumption*** *of electricity in the area of a distribution licensee. Such percentage for purchase of power from non-conventional sources should be made* ***applicable for the tariffs to be determined by the SERCs at the earliest****. Progressively the* ***share of electricity from non-conventional sources*** *would* ***need to be increased*** *as prescribed by State Electricity Regulatory Commissions. Such purchase by distribution companies shall be through competitive bidding process. Considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the* ***Commission may determine an appropriate differential in prices to promote these technologies****.*
- *5.12.3 Industries in which both process heat and electricity are needed are well suited for cogeneration of electricity. A significant potential for cogeneration exists in the country, particularly in the sugar industry.* ***SERCs may promote arrangements between the co-generator and the concerned distribution licensee for purchase of surplus power from such plants.*** *Cogeneration system also needs to be encouraged in the overall interest of energy efficiency and also grid stability."* ***(emphasis added)***

2.7.3 Tariff Policy

National Electricity Policy was notified by Central Government during January 2006 as per provisions of Section 3 of EA 2003. Tariff Policy has further elaborated the role of Regulatory Commissions, mechanism for promoting harnessing of renewable energy and timeframe for implementation etc. The Clause 4 of the Tariff Policy addresses various aspects associated with promotion and harnessing of renewable energy sources. The salient features of the said provisions of Tariff Policy are as under:

- *Pursuant to provisions of section 86(1)(e) of the Act, the Appropriate Commission shall* ***fix a minimum percentage*** *for purchase of energy from such sources taking* ***into account availability of such resources in the region*** *and* ***its impact on retail tariffs****. Such percentage for purchase of energy should be made applicable for the tariffs to be determined by the* ***SERCs latest by April 1, 2006****. It will take some time before non-conventional technologies can compete with conventional sources in terms of cost of electricity. Therefore,* ***procurement by distribution companies shall be done at preferential tariffs determined by the Appropriate Commission.***
- *Such procurement by Distribution Licensees for future requirements shall be done,* ***as far as possible****, through* ***competitive bidding process*** *under* ***Section 63*** *of the Act* ***within suppliers offering energy from same type of non-conventional sources****. In the long-term, these technologies would need to compete with other sources in terms of full costs.*
- *The* ***Central Commission*** *should lay down guidelines* ***within three months*** *for* ***pricing non-firm power****, especially from non-conventional sources, to be followed in cases where such procurement is not through competitive bidding."*

2.8 National Solar Mission

The National Solar Mission is a major initiative of the Government of India and State Governments to promote ecologically sustainable growth while addressing India's energy security challenge. It will also constitute a major contribution by India to the global effort to meet the challenges of climate change. This Mission is one of the eight key National Missions, which comprise India's National Action Plan on Climate Change or NAPCC.

The objective of the National Solar Mission is to establish India as a global leader in solar energy, by creating the policy conditions for its diffusion across the country as quickly as possible. The Mission includes major programme titled '***The Below 80^{0}C Challenge – Solar***

Collectors' for Solar Thermal Technology. Key provisions of the National Solar Mission in this regard are reproduced below:

2.8.1 The below 80°C challenge – solar collectors

The Mission in its first two phases will promote solar heating systems, which are already using proven technology and are commercially viable. The Mission is setting an ambitious target for ensuring that applications, domestic and industrial, below 80 °C are solarised. The key strategy of the Mission will be to make necessary policy changes to meet this objective:

- *Firstly, make solar heaters mandatory, through building byelaws and incorporation in the National Building Code,*
- *Secondly, ensure the introduction of effective mechanisms for certification and rating of manufacturers of solar thermal applications,*
- *Thirdly, facilitate measurement and promotion of these individual devices through local agencies and power utilities, and*
- *Fourthly, support the upgrading of technologies and manufacturing capacities through soft loans, to achieve higher efficiencies and further cost reduction."*

2.8.2 Policy and Regulatory Framework

The objective of the National Solar Mission is to create a policy and regulatory environment, which provides a predictable incentive structure that enables rapid and large-scale capital investment in solar energy applications and encourages technical innovation and lowering of costs. The Mission would seek to establish a sector-specific legal and regulatory framework for the development of solar power, in the shorter time frame.

The National Tariff Policy 2006 mandates the State Electricity Regulatory Commissions (SERC) to fix a minimum percentage of energy purchase from renewable sources of energy taking into account availability of such resources in the region and its impact on retail tariff. Mission envisages that National Tariff Policy, 2006 would be modified to mandate that SERCs fix a percentage for purchase of solar power. The solar power purchase obligation for States may start with 0.25% in the phase I and to go up to 3% by 2022 (the description of the three phases of the National Solar Mission has been described in the upcoming section of Proposed Roadmap). This could be complemented with a solar specific Renewable Energy Certificate (REC) mechanism to allow Utilities and solar power generation companies to buy and sell certificates to meet their solar power purchase obligations.

2.8.3 Targets under the Mission

National Solar Mission has framed the target for solar generated power for grid connected as well as the distributed and decentralized off-grid commercial energy services which has been depicted in the table given below:

Table 2.4: Target set for grid connected and off grid solar power

S.No.	Application segment	Target for Phase I (2010-13)	Target for Phase 2 (2013-17)	Target for Phase 3 (2017-22)
1	**Solar collectors**	**7 million sq meters**	**15 million sq meters**	**20 million sq meters**
2	Off grid solar applications	200 MW	1000 MW	2000 MW
3	Utility grid power & roof top	1,000-2000 MW	4000-10,000 MW	2000 MW

2.9 Achievement Status of Off-grid Renewable Power

The table below provides the achievements and cumulative achievements of off-grid / distributed renewable power including captive or CHP plants as on, and also provides the decentralized energy systems up to October 31, 2009.

Table 2.5: Achievements Status of solar associated applications

	Achievements during 2009-10 (upto 31.10.2009)	**Cumulative Achievements (upto 31.10.2009)**
Off-Grid/Distributed Renewable Power (including Captive/CHP Plants)		
Solar PV Power Plants and Street Lights	0.086 MWp	2.39 MWp
Aero-Generators/Hybrid Systems		0.89 MW
Decentralized Energy Systems		
SPV Home Lighting System	48 nos.	5,10,877 nos.
Solar Lantern	58,064 nos.	7,67,350 nos.
SPV Street Lighting System	2767 nos.	82,384 nos.
SPV Pumps		7,247 nos

Solar Water Heating - Collector Area	0.22 Mln. sq.m.	3.12 Mln. sq.m.
Solar Cookers		6.57 lakh

Source: www.mnes.nic.in

2.10 Analysis of the Legal and Regulatory Provisions

From the various provisions of the Electricity Act 2003 and policies enshrined under the Act, it can be observed that though the intention of the Act and policies is to develop environmentally benign policies, the current ambit of the said policies is restricted to grid and off-grid electricity generation applications. Here, it may be noted that National Solar Mission, though very important policy document, is not one of the mandatory policies under the legal framework. As a result, currently, none of the policies have specific provisions for promotion of non-electricity applications such as solar water heating.

However, importance of these applications in overall energy mix of the country cannot be ignored. These applications not only conserve electricity but also reduce the demand on the grid. Considering that electrical heating load typically cause morning peak, it is imperative that appropriate provisions are included in the policies for promotion of SWHS. It has also been envisaged by The National Solar Mission that it would be necessary to embed the activities of the Mission within the existing framework of the Electricity Act 2003. The Mission states that though the Electricity Act already provides a role for renewable energy, given the magnitude and importance of the activities under the Mission, it would be necessary to make specific amendments.

3 NATIONAL LEVEL FINANCING SCHEMES FOR SWHS IN INDIA

In order to promote the SWHS installations, Government of India and various State Governments in the country has been providing the financial support through various schemes for different categories of consumers. MNRE has implemented the interest and capital subsidy schemes, whereas the State Governments are providing the capital subsidy simultaneously with the Central Government scheme. The consumers of SWH are eligible to take either of the central level capital or the interest subsidy and the State Government capital subsidy. In the following sections of this chapter, we have discussed and analyzed the National Level financing schemes implemented by MNRE.

3.1 Financing Scheme at National Level

Government of India has implemented capital and interest subsidy schemes in the country as well as other promotional incentives and support measures since FY 2005-06. The main objective of the programme is to promote the widespread use of solar water heaters in the country through a combination of financial and promotional incentives, and other support measures so as to save a substantial amount of electricity and other fossil fuels apart from having peak load shavings in cities and towns.

The initial scheme dated **August 24, 2005** on "**Accelerated development and deployment of solar water heating systems in domestic, industrial and commercial sectors**" was introduced during FY 2005-06. As per the notification dated **September 27, 2006** the scheme was continued for FY 2006-07 with the addition of provision of capital subsidy for installation of SWHS to registered institutions and commercial establishments not availing soft loans. The scheme was also continued vide notification dated **April 25, 2007** for FY 2007-08.

Under the original scheme, a target of SWH installation of 3 lakh sq. m. of collector area was kept for FY 2005-06 with the following break up:

- Domestic Sector: 2,00,000 sq.m.
- Institutional Sector: 50,000 sq.m.
- Industrial/Commercial Sector: 50,000 sq.m.

Expenditure

The scheme stipulated that the expenditure on the scheme will be met from the allocated budget for the Solar Thermal Energy Programme during FY 2005– 2006.

3.1.1 Summary of Capital and Interest Subsidy Scheme applicable till FY 2007-08

The tables below present the summarization of the interest and capital subsidy.

Table 3.1: Financial Assistance through Interest Subsidy Scheme

Consumer Category	Subsidized Interest Rate (%)
Domestic	2
Institutional (without accelerated Depreciation)	3
Industrial, Commercial Consumers	5

Table 3.2: Financial Assistance through Capital Subsidy Scheme

Consumer Category	Capital Subsidy (Rs/sq.m.)
Registered Institutions	1100
Registered Commercial Establishments	825

3.2 Revised MNRE Financing Scheme

MNRE vide its notification dated August 18, 2008 modified the scheme on "**Accelerated development and deployment of solar water heating systems in domestic, industrial and commercial sectors**" which is currently applicable for FY 2008-09 and FY 2009-10. The salient features of the programme are as follows:

Physical Target

Under the scheme, an indicative target of 1.4 million sq. m. of collector area has been set for FY 2008-09 & FY 2009-10. The scheme envisages that the target will be achieved by

- providing interest/capital subsidy to the users of solar water heaters,

- incentive to motivators & BIS/MNRE manufacturers/suppliers,
- support for organizing seminars/symposia/workshops/business meets/exhibitions, training programmes, publicity and awareness campaign,
- support for technology up-gradation and studies/surveys
- support to Municipalities/Municipal Corporations
- support to Electricity Boards/Utilities that announce rebate in electricity tariff

Applicability of the Scheme

The interest/capital subsidy to the users of solar water heaters will be available upto March 31, 2010 and thereafter it will be reviewed for its continuation during rest of the 11th plan period.

Expenditure

An expenditure of Rs. 49.50 Crore is expected to be incurred under the Programme during FY 2008-09 & FY 2009-10 which will be met from the allocated budget for Solar Thermal Energy Programme of the Ministry.

Monitoring Mechanism

The scheme envisages that apart from other promotional activities, State Nodal Agencies will also undertake performance monitoring and data management. Financial institutions and banks involved in disbursing the MNRE support to the users will also set up their own arrangements to closely monitor implementation. They will furnish progress reports and other relevant information to IREDA, who will forward a consolidated report to MNRE on a quarterly basis. The progress of the scheme will also be monitored by the Ministry independently, including third party inspection and reporting.

3.2.1 Interest Subsidy Scheme

3.2.1.1 Incentive to Users

Under the present scheme, soft loans are provided @ 2% to domestic users "except in the States of North- East, Sikkim, Himachal Pradesh, Islands, J&K and for new States e.g. Uttaranchal, Chhattisgarh and Jharkhand, where interest free loans to domestic users are available. The soft loans are provided @ 3% to institutional users not availing accelerated depreciation; and, 5% to industrial/commercial users availing depreciation.

3.2.1.2 Eligibility

The borrowers of soft loans are eligible for loans upto an amount fixed by the Ministry repayable within a period of five years. Water Heating Systems comprising both FPC and ETC are eligible for soft loan under the scheme; however, the manufacturers/suppliers of systems with FPC should have approval from BIS ad those of ETC from MNRE.

3.2.1.3 Implementation Arrangements

The interest subsidy scheme has been implemented through IREDA and various banks/FIs/intermediaries with release of funds to be managed by IREDA on behalf of MNRE. Under the existing scheme, the banks/FIs provides loan at prescribed rates to beneficiaries and claim interest subsidy (difference between the lending rates of banks/FIs and MNRE prescribed interest rates) from IREDA after installation of systems.

3.2.1.4 Release of Interest Subsidy

The Interest Subsidy calculated on upfront basis for the entire loan period, discounted at 6.5% is released by IREDA to the banks/FIs/Intermediaries on reimbursement basis after installation of the systems and submission of the necessary documents. For the purpose of easy calculation of interest subsidy by the Banks/FIs/ Intermediaries and necessary examination by IREDA, a uniform lending rate based on the existing rates of various banks/FIs has been fixed at 12.5% by IREDA in consultation with MNRE, which may be reviewed, if necessary, keeping in view the revision in RBI rates. .

3.2.1.5 Settlement of Claims with Banks/FIs

The claims for interest subsidy including other related activities are settled by IREDA on receipt of a Statement of Expenditure duly certified by an authorized signatory from PSU banks and an audited Statement of Expenditure from other financial institutions.

3.2.1.6 Advance Release to PSU Banks

The scheme envisages that the interest subsidy may be released in advance to PSU banks by IREDA, subject to receipt of their business plans and past performance. The amount of advance may not exceed 50% of the interest subsidy claims submitted by them for the last financial year. In case of new PSU banks, it may be decided appropriately by IREDA based on their business

plans. The advance subsidy may be kept in the form of smaller Fixed Deposits and the interest accrued on the advance will be adjusted while settling the interest subsidy claim.

3.2.1.7 Intermediary Scheme

In addition to IREDA, PSU Banks may also act as financial institutions for providing loans to its intermediaries (SNAs/ NBFCs/ approved manufacturers/suppliers etc.) who may further on-lend to the users at the prescribed rates by MNRE. Intermediaries will be eligible to get loans at 2% lower interest rate than the prescribed rates for various categories of users.

3.2.1.8 Administrative Charges to IREDA, FIs / Banks, Intermediaries

The administrative charges under the scheme are as follows.

- To IREDA
  - 2% of interest subsidy disbursed to Banks/FIs and is direct users
  - 1% of loan amount disbursed to intermediaries
  - Rs 100 per loan disbursed by FIs/Banks/IREDA and its intermediaries towards support for market development, data management, feedback analysis, etc.
  - 1% of loan amount disbursed by PSU banks to their intermediaries towards administrative charges.

- To FIs / Banks
  - Rs. 200/- to FIs /banks on each loan disbursed to the users towards administrative charges.
  - 1% of loan amount disbursed by PSU banks to their intermediaries towards administrative charges.

3.2.1.9 Incentive to Motivators

Incentive @ Rs 100 per sq.m. of collector area to motivators/agents of FIs/Banks/IREDA and their intermediaries against disbursement of loans for attracting potential buyers of solar water heaters.

3.2.1.10Support to SNAs

SNAs to undertake performance monitoring and State-level data management. Assistance to SNAs @ Rs. 100/- per sq. m of collector area for domestic systems and @ Rs. 50/- per sq. m for

industrial/institutional systems installed in their States with at least one visit made by them during the first year of operation of the systems. The list of systems sanctioned should be provided by IREDA on request from SNAs. The release will be made by IREDA after visit of the systems and receipt of a report from the SNAs. 50% advance may also be released to SNAs based on the plan received by IREDA for undertaking the performance monitoring, with balance to be released after receipt of the report.

3.2.1.11MNRE approved Cost of SWHS

Table below presents the MNRE prescribed the upper limit cost of SWHS for the purpose of extending loans by Banks / FIs

Table 3.3: Upper limit cost of SWHS prescribed by MNRE

System Capacity (lpd)	ETC based system (in Rs)		FPC based system (in Rs)	
	Minimum No. of tubes	Upper Cost limit (Rs.)	Collector area (in sq.m.)	Upper Cost limit (Rs.)
50	7	7125	-	-
75	11	10875	-	-
100	14	13500	2	20000
200	28	26250	4	38500
250	34	31875	-	-
300	40	37500	6	55000
400	52	48750	8	71500
500	64	60000	10	88000
600 to 2000	12 tubes per 100 lpd	Rs 905 per tube	2 sq.m. per 100 lpd	16000 per collector
2100 and above	12 tubes per 100 lpd	Rs 750 per tube	2 sq.m. per 100 lpd	13000 per collector

Source: www.mnes.nic.in

The cost indicated above includes the cost of collectors, insulated hot water storage tank, system piping, instrumentation, electrical back up, controls, installation, and five year warranty. Costs towards piping from system to utility points, heat exchangers (if any), transportation, may be

extra. Cost over and above this amount shall be borne by the beneficiaries. Banks/FIs not to reject loans on account of higher cost of systems.

3.2.2 Capital Subsidy

3.2.2.1 To Institutions/ Commercial Establishments

Upfront Capital subsidy of Rs. 1750/- per sq. m. of collector area to registered institutions (non-profit making) and Rs. 1400/- per sq. m. to registered institutions/commercial establishments (profit making) that does not avail soft loans The systems installed in ESCO mode are also eligible for capital subsidy.

3.2.2.2 To Builders & Developers/ Development Authorities/ Housing Boards etc

Capital subsidy equivalent to upfront interest subsidy is available to Builders &Developers/ Development Authorities/ Housing Boards and other such agencies/corporations for incorporating SWHS in housing complexes/ commercial/ institutional buildings. This provision is available for systems having capacity of 2500 lpd or more:

- Housing Complexes: @ Rs 1900 per sq.m.
- Institutional buildings: @ Rs 1750 per sq.m.
- Commercial buildings: @ Rs 1400 per sq.m.

3.2.2.3 Implementation

The scheme has been implemented through SNAs with the inclusion that consolidated claims for reimbursement of capital subsidy for the systems installed during a year may be submitted on half yearly basis. In specific cases, the scheme can also be implemented by Municipal Corporations or Central / State Government departments / PSUs.

3.2.2.4 Administrative Charges

SNAs are provided administrative charges @ Rs.100/ sq. m. of installed collector area to a maximum of Rs. 5000 per system. The Municipal Corporations, Central/State Government Departments/PSUs are also eligible to receive similar administrative charges for the claims processed and forwarded by them to the Ministry.

3.2.3 Support for other activities

3.2.3.1 Seminars/ Symposia/ Workshops/ Business Meets/ Exhibitions etc

Financial assistance for these activities on a case-by-case basis upto Rs. 2 lakh per event, depending upon number of participants/ duration etc.

3.2.3.2 Amendment in Building Bye-Laws & Announcement of Rebate in Property Tax/ Electricity Tariff

- To Municipal Corporations / Municipalities

A one-time grant of 5 lakh for municipalities and Rs. 10 lakh for municipal corporations has been provided for those that adopt and notify the modification of their building bye-laws making installation of solar assisted water hearing systems mandatory and also to those Municipal corporations/ Municipalities that announce rebate in property tax to the users of solar water heating systems.

- To State Utilities

Grant of upto Rs.10 lakh to State Electricity Boards/Utilities that announce rebate in electricity tariff to the users of SWHS in their monthly electricity bills.

3.2.3.3 Publicity and Awareness Campaign

- To SNAs/ IREDA/ Banks/FIs/ State Utilities/ Municipal Corporations etc

The present scheme envisages that all possible avenues such as print/ electronic media (audio and visual) and other methods will be utilized to create awareness of the benefits of SWHS by IREDA/ SNAs/ Municipal Corporations/ State Utilities/Banks/FIs etc. Support of upto Rs. 10 lakh for campaigns planned for the full year.

- To Industry

Support available on 50% cost sharing basis up to a maximum of Rs. 5 lakh to Manufacturer's Associations/ BIS & MNRE approved manufactures for advertisement campaigns based. The support is available on re-imbursement basis through IREDA for which advance funds may be made available to IREDA by MNRE. Prior sanction giving details of publicity plan required from IREDA by the industry.

3.2.3.4 Technology Up-gradation and Exposure Visits Abroad by Industry

For the technology up-gradation in industry, soft loans available to manufactures of solar water heating systems for projects involving improvement in technology, expansion in production facilities etc. at a reduced interest rate of 5% through IREDA for a period of 5 years excluding one year moratorium. The interest subsidy calculated on upfront basis at uniform lending rate fixed under soft loan scheme for solar water heating programme and discounted at 6.5 % will be borne by MNRE.

3.2.4 Summary of Revised MNRE Financing Scheme

The tables below present the summarises the interest and capital subsidy available to various consumer segments.

Table 3.4: Financial Assistance through Interest Subsidy Scheme

Consumer Category	Subsidized Interest Rate (%)
Domestic Consumers in States of North-East, Sikkim, Himachal Pradesh, Islands, J&K, and for new States like Uttaranchal, Chattisgarh and Jarkhand	0
Domestic	2
Institutional (without accelerated Depreciation)	3
Industrial, Commercial Consumers	5

Table 3.5: Financial Assistance through Capital Subsidy Scheme

Consumer Category	Capital Subsidy (Rs/sq.m.)
Non-Profit making registered Institutions including ESCO mode (Not availing Interest Subsidy)	1750
Profit making registered Institutions, Commercial Establishments including ESCO mode (Not availing Interest Subsidy)	1400
Builders, Housing Boards, Agencies developing Housing complexes (all with capacity of 2500 lpd & more)	1900
Builders, Agencies developing Institutional (all with capacity of 2500 lpd & more)	1750
Builders, Housing Boards , Agencies developing Commercial (all with capacity of 2500 lpd & more)	1400

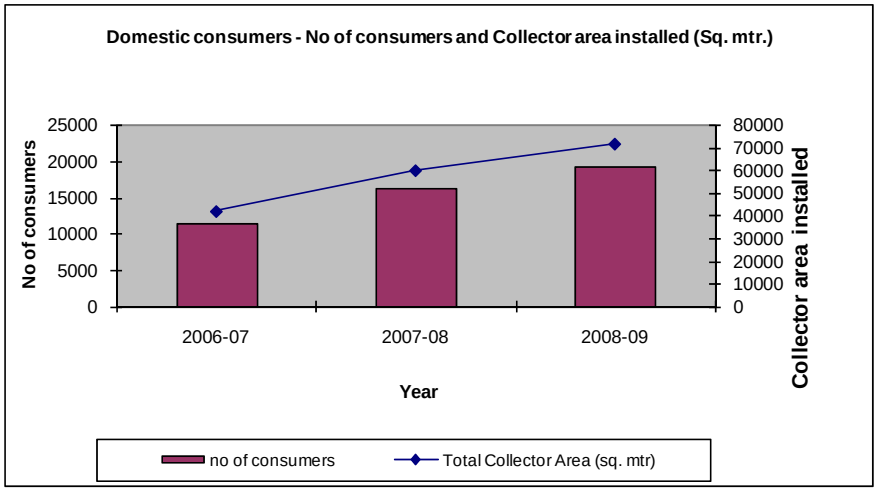
3.3 Effectiveness of Financing Schemes in Different Demand Segments

In order to assess the effectiveness of the present scheme in different demand segments, ABPS Infra undertook stakeholder consultation in banks and financial institutions and collected the information of the consumers availing interest subsidy. This section presents the analysis of the subsidy scheme. Under the present scheme, 31 banks are participating.

3.3.1 Penetration of Interest Subsidy in Domestic Sector

The figure below represents the year wise number of domestic consumers of SHWS who have availed interest subsidy, the collector area installed in sq.m., and the loan amount in Rs Crore.

Figure 3.1: Number of Domestic Consumers and Collector Area Installed



FY	Loan amount (Rs Crore)
2006-07	27.26
2007-08	41.07
2008-09	47.49

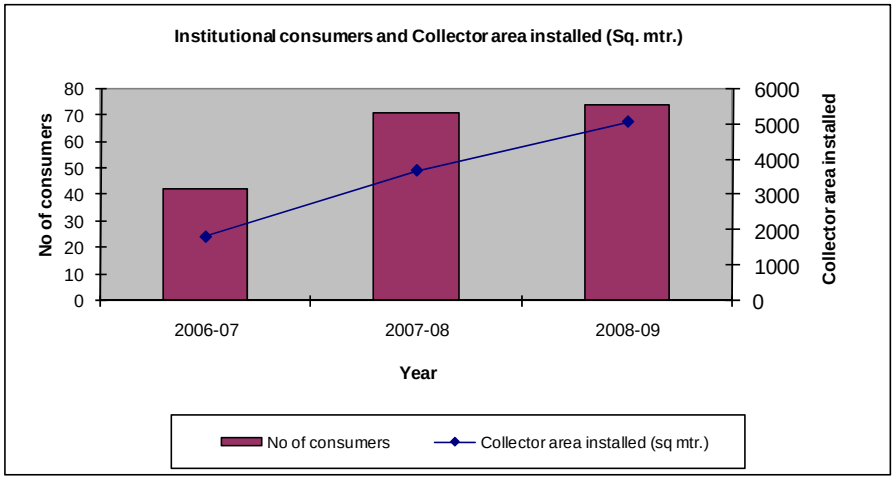
Source: IREDA

The figure represents that the number of domestic consumers who have availed interest subsidy scheme have increased from 11520 in FY 2006-07 to 19265 in FY 2008-09. The loan amount disbursed under the soft loan scheme has increased from Rs27.26 Crore in FY 2006-07 to Rs 47.49 Crore in FY 2008-09.

3.3.2 Penetration of Interest Subsidy in Institutional Sector

The figure below presents the year wise number of institutional SWH consumers, who have availed interest subsidy, the collector area installed in sq.m., and the loan amount in Rs Crore as per MNRE guidelines.

Figure 3.2: Number of Institutional Consumers and Collector Area Installed



FY	Loan amount (Rs Crore)
2006-07	1.01
2007-08	2.03
2008-09	2.11

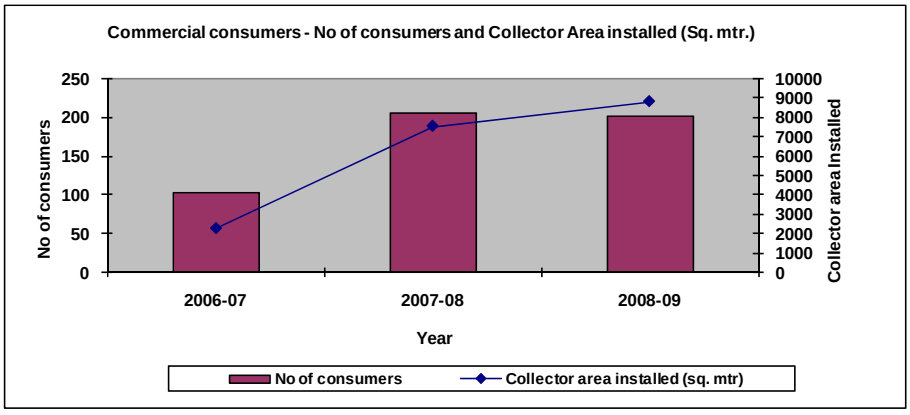
Source: IREDA

The figure represents that the number of institutional consumers who have availed interest subsidy scheme have increased from 42 in FY 2006-07 to 74 in FY 2008-09. The loan amount disbursed under the soft loan scheme has increased from Rs1.01 Crore in FY 2006-07 to Rs 2.11 Crore in FY 2008-09.

3.3.3 Penetration of Interest Subsidy in Commercial Sector

The figure below represents the year wise number of commercial consumers of SHWS, who have availed interest subsidy, collector area installed in sq.m., and the loan amount in Rs Crore.

Figure 3.3: Number of Commercial Consumers and Collector Area Installed



FY	Loan amount (Rs Crore)
2006-07	1.44
2007-08	4.13
2008-09	5.20

Source: IREDA

The figure represents that the number of commercial consumers who have availed interest subsidy scheme have increased from 102 in FY 2006-07 to 202 in FY 2008-09. The loan amount disbursed under the soft loan scheme has increased from Rs1.44 Crore in FY 2006-07 to Rs 5.20 Crore in FY 2008-09.

3.3.4 Summary of Penetration of Interest Subsidy into Different Demand Segments

The table below presents summarization of penetration of interest subsidy with the number of consumers, installed collector area in sq.m. and total loan amount, into different demand segments namely, Domestic, Institutional and Commercial Consumers.

Table 3.6: Summary of Penetration of Interest Subsidy into Different Demand Segments

Consumer Category	No. of Consumers	% Share of Consumers	Collector Area (sq.m.)	% Share of Collector Area	Total Loan Amount considered at IREDA for calculation of Upfront Interest Subsidy (Rs Crore)	% Share of Loan Amount
Domestic	53363	98.26	196946	85.68	130.82	87.78
Institutional	222	0.41	11884	5.17	5.90	3.96
Commercial	724	1.33	21033	9.15	12.31	8.26
Total	**54309**		**229863**		**149.03**	

Source: IREDA (as on August 31, 2009)

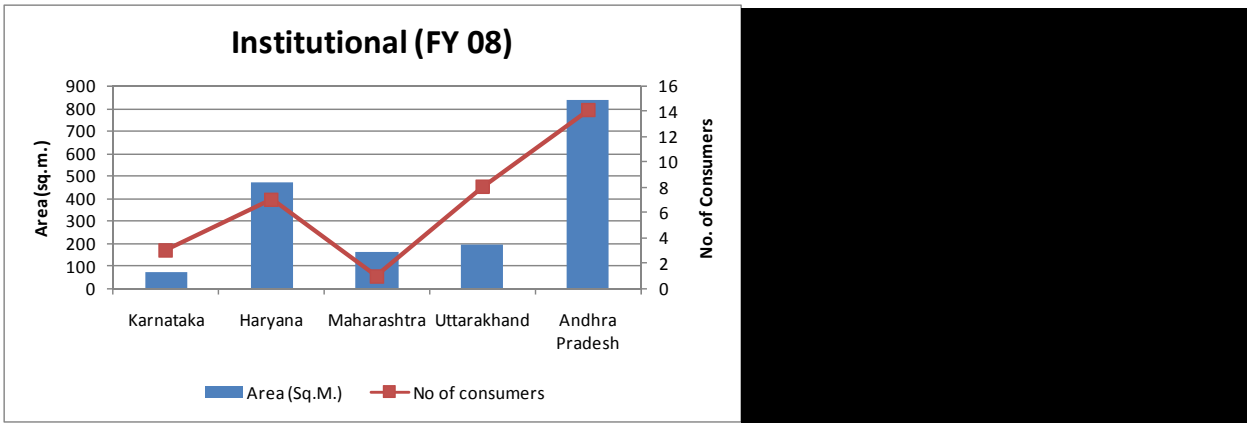
The table above has been compiled based on the loan amount disbursed by 26 banks and IREDA. However, at present 31 banks are taking part in the financing scheme. MNRE financing scheme was implemented from FY 2005-06 and the table above depicts that up till August 31, 2009 there is a minuscule installation of collector area of 2,29,863 sq.m. and all the categories put together, total 54,309 consumers have availed interest subsidy from banks / FIs and the total loan amount disbursed under the scheme is Rs 149.03 Crore.. Contrary to this, a target of 5 million sq. m. has been set for the 11th Plan (2007-12) and a goal of 20 million sq. m for 2020 and as per the National Solar Mission the deployment of SWHS has been divided into three phases. Target of 7 million sq. m. has been set for phase I i.e. FY 2010-13, 15 million sq. m. for phase II i.e. FY 2013-17 and 20 million sq. m. for phase III covering period FY 2017-22. The rationale for the poor penetration of interest subsidy scheme has been discussed in Chapter 6 on results of stakeholder consultation process.

The major PSU giant, State Bank of India (SBI), and under the private sector, Industrial Credit and Investment Corporation of India (ICICI Bank) having the maximum reach in different demand segments in the country, till now have not participated in the scheme. This emerges a need to develop new financing scheme.

3.3.5 Penetration of Capital Subsidy

The figure below presents the number of institutional SWH consumers who have availed capital subsidy with the installed collector area in sq.m. and the e. sanctioned subsidy amount including the service charges in 5 States namely Karnataka, Haryana, Maharashtra, Uttarakhand and Andhra Pradesh.

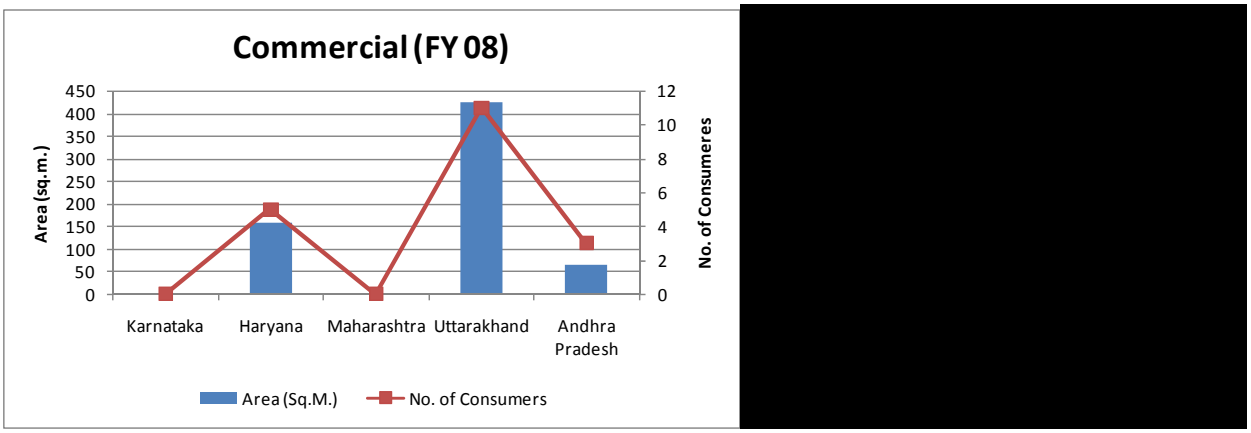
Figure 3.4: Institutional Consumers and Collector Area Installed with MNRE share



Source: MNRE (as on September 2009)

The figure above depicts the penetration of capital subsidy in institutional sector in FY 2007-08. Andhra Pradesh is having the maximum installed collector area of 836 sq.m. with 14 number of claims and Karnataka being the lowest of 72 sq.m. of installed collector area with 3 claims.

Figure 3.5: Commercial Consumers and Collector Area Installed with MNRE share



Source: MNRE (as on September 2009)

The figure above depicts the penetration of capital subsidy in commercial consumers in FY 2007-08. Uttarakhand is having the maximum installed collector area of 424 sq.m. with 11 number of claims and Andhra Pradesh being the lowest of 64 sq.m. of installed collector area with 3 claims.

3.3.6 Summary of Penetration of Capital Subsidy

The table below presents the summarization of numbers of claim, collector area in sq.m. and MNRE share for institutional and commercial segments.

Table 3.7: Summary of Penetration of Capital Subsidy

States	Institutional Segment			Commercial Segment		
	No. of Claims	Area (sq.m.)	MNRE Share (Rs)	No. of Claims	Area (sq.m.)	MNRE Share (Rs)
Karnataka	6	212	345400	-	-	-
Haryana	29	2072	2914100	11	300	323500
Maharashtra	1	160	192000	1	32	29600
Uttarakhand	16	566	679200	18	702	649350
Andhra Pradesh	36	3751.1	4977594.5	18	677.61	1083690
Total	**88**	**6761.1**	**9108294.5**	**48**	**1711.61**	**2086140**

Source: MNRE (as on September 2009)

MNRE capital subsidy scheme has been implemented from FY 2006-07 and till September 2009, the number of claims in institutional sector in the above mentioned 5 States reaches to a miniature of 88 with installed collector area of about 6761 sq.m. and number of claims in commercial sector has been 48 with installed collector area of 1711 sq.m. The reasons for sluggish increase in the collector area have been discussed in Chapter 6 on results of stakeholder consultation process. This again creates a need for the development of suitable financing mechanism to promote the wide spread use of SWHS in the country.

4 STATE LEVEL FINANCING MECHANISMS

Most States in the country are facing significant demand – supply gap and any reduction in demand would help Utility serve more consumers and assist in meeting their 'Universal Service Obligation'. At the same time, India has installed Solar Water Heating Systems covering 2.6 million m² of collector area. Solar Water Heating Systems (SWH) can play an important role in energy system in India. SWH assist transmission and distribution systems by reducing the demand on electrical systems as these systems replace electric geysers, immersion heaters etc used for water heating purposes. Several schemes for promotion of solar water heaters are in operation in the country. While most of these schemes are developed and coordinated by Ministry of New and Renewable Energy (MNRE) at national level; some schemes are implemented by the State Governments at the State level.

In a separate initiative, a model regulation / building bye-law for mandatory installation of SWHS in new buildings was circulated in February 28, 2008 by the Ministry of Urban Development to all States and Union Territories with a request for onward circulation to all local bodies for incorporation in their building bye-laws. Necessary orders have been issued in 19 States and 41 Municipal Corporations/Municipalities have so far amended their building bye-laws. A few municipal corporations such as Thane, Amravati, Nagpur and Durgapur are providing 6-10% rebate in the property tax for users of solar water heaters. Apart from this, few States such as Delhi and Haryana have introduced State level subsidy schemes, which are driven by the State Government.

4.1 State Level Schemes

In this Section, we have analysed the State Level schemes introduced in five States for promotion of SWH systems.

4.1.1 Delhi

The Government of NCT of Delhi issued building bye laws as well as capital subsidy schemes for promotion of SWHS in State of Delhi. The Government of NCT of Delhi issued a notification on September 28, 2006 for mandatory use of SWHS for various categories of buildings like hotels, banquet halls, hospitals, industries, large canteens etc. Further, to promote use of solar energy, the Government of NCT of Delhi issued a notification on April 30, 2007 providing an

incentive/rebate of Rs. 6000 to each domestic consumer for installation of the SWHS from the approved and authorised manufacturers/dealers. Under such scheme, the authorised dealer/supplier to sell the Solar Water Heating System to the consumers on subsidized rate i.e. after reducing the price of the System by the rebate/ incentive amount of Rs.6000/- on production of photocopy of last paid electricity bill. The dealer/supplier has to send consolidated claim of the rebate /incentive passed on to the consumers for getting it reimbursed from EE & REM centre of Delhi Transco Limited. Reimbursements of such rebate/incentive amount to be made by DTL within 15 days after receipt of the claim after the representative of DTL verifies the commissioning of SWHS.

In view to promote the installations of SHWS systems in non-commercial institutions, the Govt. of NCT of Delhi had issued an Order on January 18, 2008 for installation by non-commercial institutions in Delhi. For promotion of SWHS by non-commercial institutions like colleges, hostels, charitable institutions etc the Government is providing an incentive/rebate to the extent of Rs. 6000 every 100 LPD SWHS and upto a maximum amount of Rs. 60000/- for 1000 LPD system installed. These schemes were further extended by Govt. of NCT of Delhi upto March 31, 2010. However, inspite of such mandatory scheme and capital subsidy schemes, the installations of SWHS in the State of Delhi have been very low. The Stakeholders has been facing lot of issues for claiming the capital subsidy which has been discussed in Chapter 6 of the report.

4.1.2 Haryana

Haryana was the first State in the country to issue a comprehensive notification dated July 29, 2005 on Energy Conservation Measures. The said notification makes Solar Water Heating Systems mandatory for water heating application in all functional buildings where hot water is required. The Haryana Urban Development Authority adopted the mandatory provisions of Haryana Renewable Energy Development Agency (HAREDA) vide their letter dated November 28, 2005. The Department of Urban Local Bodies, Haryana also amended the Haryana Municipal Building Bye-laws vide Notification dated November 16, 2007.

To conserve electricity and other conventional fuels in water heating applications, HAREDA is implementing a scheme on popularizing the use of solar water heating systems. The State Govt. has made the use of solar water heating systems mandatory in industries where hot water is

required for processing, hospitals and Nursing Homes, Govt. Hospitals, Hotels, Motels and Banquet Halls, Jail barracks, Canteens, Housing Complexes set up by Group Housing Societies/Housing Boards, all Residential buildings built on a plot of size 500 sq. yards and above falling within the limits of Municipal Committees/Corporations and HUDA Sectors, all Govt. buildings, Residential Schools, Educational Colleges, Hostels, Technical/Educational Institutes, District Institute of Education and Training, Tourism Complexes and Universities etc. HAREDA has been declared as an approved source for supply and installation of solar water heating systems in the State to ensure installation of optimally designed quality systems as per the specification.

HAREDA has initiated a programme for providing 100% financial assistance to solar water heating systems installed in socially oriented schemes of the Govt. like working women hostels, Primary Health Centres & Community Health Centers, Orphanages, Deaf and Dumb Centers, Crèches, Old age homes, Bal Greh, Nari Niketans, Bal Niketans, Sports Hostels, Charitable Institutes (working for last three years), Govt. Hospitals and other Govt. controlled buildings or buildings run/ supported by Govt. during the 11th FYP period. The system in these institutions will be installed on 100% grant basis but the beneficiary institution will have to deposit 10% of the system cost with HAREDA towards maintenance of the system.

HAREDA vide its letter no. 4148-68 dated October 27, 2008 has notified capital subsidy pattern on domestic solar water heater systems. The said scheme was applicable from October 01, 2008. On flat plate collector based system, the subsidy is @Rs.2500/- per sq. meter of the collector area limited to Rs.10, 000/- and for ETC based systems, the subsidy is @ Rs.4000/- per 100 LPD limited to Rs.8000/-. District Rural Development Agency Office (DRDA, District level offices in State) are ensured to have a fund of Rs. 1 Lac, which is released upfront to DRDA. The provision of upfront fund release enables DRDA to early release of subsidy to consumers (15 days to 2 months of application).

4.1.3 Andhra Pradesh

Government of Andhra Pradesh vide its Order dated August 03, 2004 issued instructions to all the Municipal Corporations/ municipalities, Vice-Chairman of Urban Development authorities of the State to take immediate action for installation of solar system on the existing municipal buildings/Urban Development authority buildings and any new buildings being built by the

Urban Local Body concerned. The relevant extract of Order No GO.Ms.302.2004 of Government of Andhra Pradesh is enclosed hereunder:

"2. Government after careful examination of the matter have decided to make use of solar energy for advertisement hoardings / street lights and hot water as mandatory to conserve conventional electrical energy. Therefore, the following instructions are issued to all Commissioners of Municipal Corporations / Municipalities, Vice-Chairmans of Urban Development Authorities of the State;

(i) All the Municipal Commissioners / Vice-Chairmans of Urban Development Authorities shall take immediate action for installation of solar system on the existing Municipal buildings / Urban Development Authority Buildings and any new building being built by the Urban Local Body concerned and shall use energy efficient lamps;

(ii) The conventional lights of advertisement hoardings shall be replaced by solar photo voltaic power at the cost of the franchisee.

(iii) Conventional lights of all street lights (upto to 20 feet height) shall be replaced by solar photo voltaic power.

(iv) Clearance of plan for the proposed construction of hospitals, nursing homes, hotels, guest houses, lodges and Multi-storeyed buildings shall only be given (a) if they have a provision in the building design itself for an insulated pipe line from the roof top in the building to various distribution points where hot water is required and the building must have a provision for continuous water supply to the solar water heating system and should also have open space on the roof top which receives direct sunlight; and (b) if they have a provision to make use of energy efficient lamps. All new buildings of the above category must complete installation of solar water heating system and energy efficient lamps before obtaining necessary license to commence their business."

4.1.4 Karnataka

The Government of Karnataka in its Notification dated November 13, 2007 has issued directions for mandatory use of SWHS for buildings such as industries, hospitals and nursing homes including Government hospitals, hotels, motels, banquet halls and guest houses, jail barracks, canteens, housing complexes, residential buildings built on measuring 600 sq. feet of floor area or site area of 1200 sq. feet and above falling within the limits of municipal committees/ corporations and Bangalore Development Authority Sectors and all Government buildings, residential schools, educational colleges, hostels, technical/vocational education institutes, district institutes of education and training.

BESCOM, the distribution licensee in the State of Karnataka is implementing the State Government order dated November 13, 2007 on mandatory use of SWHS. .For implementation of the Order, the BESCOM envisaged that the applicants who have completed all the formalities for availing power supply and work orders issued on or before June 30, 2009, power supply may be arranged to such buildings without insisting for installation of SWHS, however, applicants must provide an undertaking stating that they shall install SWHS within a period of 3 months from the date of service, failing which installation shall be discontinued without further notice.

BESCOM's notification was legally challenged by a group of builders and domestic consumers on grounds of of lack of availability of space in multi storey buildings and affordability issues. The court directed BESCOM to put on hold implementation of this scheme.

4.1.5 Maharashtra

In the State of Maharashtra, some of the municipal corporations have announced property tax rebate for SWHS consumers. Nagpur Municipal Corporation has announced 10% annual rebate in property tax, Thane Municipal Corporation provided 10% annual rebate in property tax for the existing houses and Amravati municipal corporation has given rebate of annual 5% to the maximum of Rs. 5000/-. The following table shows the schemes of different municipal corporations in Maharashtra.

Scheme	Thane	Navi-Mumbai	Bhiwandi-Nizampur	Kalyan-Dombivali	Pune	Pimpari-Chinchwad	Nagpur	Dule
Obligatory installation of SWHS	√	√	√	√	√	√	√	√
Property Tax Rebate	√	Proposed	×	×	×	×	√	×

A few Municipal Corporations in Maharashtra have made it mandatory for all the new buildings to install SWHS systems in all the institutions namely hospitals, hotels, guest houses, policemen/army barracks, canteens, laboratories and research institutions. Municipal Corporation of Thane has made it mandatory that all the new building to be constructed shall have an insulated hot water lone from the rooftop and also insulated distribution pipelines to each of the points where hot water is required in the building.

5 LESSONS LEARNT FROM INTERNATIONAL SCHEMES

Financing instruments and mechanisms to promote SWHS have been implemented in different parts of the world. Within the scope of the assignment it was necessary to study the financing tools available in the international scenario and incorporate lessons learnt from them in the process of designing the financing mechanisms and instruments suitable for Indian context for promoting SWHS. The objective of this exercise is to bring desirable features into the schemes to be designed and avoid mistakes committed by other countries. Therefore, during the kick-off meeting of the assignment, four countries viz. Australia, Germany, South Africa and United States of America were identified for the development of the case studies. Further, inclusion of the Tunisian Case Study was also felt necessary and it has been included in the report.

ABPS Infra has carried out in-depth analysis of various financing schemes for SWHS in these countries and has prepared case studies for each country. In order to ensure that main report does not become excessively lengthy, these Case Studies have been provided in Appendix to this Report. However, in this Chapter, we have presented lessons learnt from each of these Case Studies and possible implications in Indian the context.

5.1 Australia

The Australian Government has identified water heating as the biggest energy user in Australian homes as installing SWHS is a step towards tackling climate change. It has been very strongly pushed by the Department of the Environment, Water, Heritage and the Arts at a National level and also by State Governments and City Councils/Municipality at a State/Territory level and local level respectively. The Australian National, State and Territory governments are now working together to phase out GHG intensive electric hot water systems, commencing during 2010.

In the case of Australia, we have prepared Case Studies for both National and State level schemes. At a National level we have studied the Australian Government's Solar Hot Water Rebate (SHWR) along with Green Loans Program. Further, we have also studied individual financing schemes at a State level. Lessons learnt from the State schemes and the SHWR are presented together. Whereas, lessons learnt from Green Loans Program is presented separately.

5.1.1 National Solar Hot Water Rebate (SHWR) and State Financing Schemes

Following is the list of State and Territory level financial incentives available to eligible SWHS installations in Australia in addition to the National Solar Hot Water Rebate. These schemes are explained in detail in the Appendix on International Case Studies.

- New South Wales Hot Water Systems Rebate
- Victoria Solar Hot Water Rebate program
- South Australia Solar Hot Water Rebate
- Western Australia Solar Water Heater Subsidy Scheme
- Queensland Solar Hot Water Program
- Northern Territory Solar Hot Water Retrofit Rebate
- Tasmania Hobart City Council Solar and Heat Pump Hot Water Rebate Scheme

Lessons learnt from the abovementioned schemes are as follows:

- **Additive Nature of the Schemes**

Incentives provided by State government are additional to any other rebate or incentive offer available to residents under the Australian Government's SHWR Scheme and MRET. Together these schemes provide adequate financial assistance to reduce the burden of capital cost of the SWHS on consumers and make SWHS a financially viable and attractive option. Again, to ensure equitable access to available funding there is a condition applicable in all the schemes i.e. the total sum of payments received by the SWHS owner cannot exceed the total cost of installed SWHS. In such case, the owner should request a reduced payment for the rebate. In New South Wales for example, the total amount of Home Saver Rebates a household can receive cannot exceed $1500 per property (there are several rebates available to NSW households under this scheme; Hot Water Systems Rebate is one of them).

- **Role of Installer**

Licensed plumbers/installers and electricians have an important role in the application process. Installers need to complete and sign part of the customer's application form when the SWHS is installed. The information provided by installers is used by the Government to verify certain eligibility requirements (number of RECs generated at the time of installation, adherence to installation standards, applicant's details etc) for the rebate.

- **Training for Installers**

In all the schemes a registered trained installer plays a very important and defined role. In the case of Federal SHWR training to installers is provided by Australian Government's Department of Education, Employment and Workplace Relations (DEEWR). DEEWR maintains a websites called SkillsInfo which is designed to provide skills-related information for industries and regions, as well as on education and training and skills issues. Their website provides contact details of the Registered Training Organizations (RTOs) that impart training on scope that meets the requirements of the Energy Efficient Homes Package. This is supporting many jobs in manufacturing, distribution and installation.

Apart from the Federal government initiative, some specific State government programs also impart formal training to the installers, for example Western Australia's GreenPlumbers program.

- **Compliance Monitoring**

Compliance to the guidelines of the SHWR as well as the State schemes is checked and monitored in the following manner by the Government:

- For making an application for any financial assistance, an applicant has to submit a copy receipt proving date and place of SWHS purchase, certificate of occupancy etc.
- The application form has to be signed by installer and he SWHS tank serial number has to be mentioned on the application form.
- Applying for any financial assistance requires the applicant to agree that, an applicant will provide evidence to support claims made on the application form if requested.
- Applying for any financial assistance requires the applicant to agree to allow an authorized inspector access to the SWHS for audit purposes, if required.

- **Quality Assurance**

Quality assurance of the schemes is ensured in the following manner:

- SWHS Standards and Certification
- Performance Standards for Domestic Water Heater Installations
- Installation by certified installer
- Buildings Permits and Plumbing Codes
- Warranty on major system components

- List of participating suppliers provided by the government
- The State incentives maintain strong links and are dependent on the National SHWR and MRET Scheme for RECs, in terms of eligibility criteria, for successful implementation and overall coherence of the schemes.

5.1.2 Green Loans Program

The lessons learnt from the Federal SHWR and State schemes are applicable to the Green Loans Program as well. In addition, the following are the specified lessons learnt from this scheme:

- Access to low cost finance through a subsidised Green Loan is possible only after getting a comprehensive Home Sustainability Assessment done. This helps the applicant make an informed decision on the energy efficient home improvements and choose a qualifying financial product from the assessment report. **Moreover, these Assessments are carried out free of charge**.

- To participate in the Program, Financial Institutions have to comply with the Department requirements regarding the application of the subsidy as set out in the Financial Institutions Subsidy Deed. The Department maintains a list of financial institutions, published on the Program's website, that have signed a Deed of Agreement with the Australian Government to develop Green Loans products.

- The Australian Government has set up a new training and registration scheme for Home Sustainability Assessors who wish to undertake assessments for the Green Loan Program. Only Assessors who meet the new training and registration standard will be contracted by the Australian Government to conduct assessments for the Green Loans Program.

- Assessors conducting standardised Home Sustainability Assessments for the Australian Government are required to be registered with a recognised Assessor Accrediting Organisation.

5.2 Tunisia

The Tunisian PROSOL Programme was launched to revitalize the declining Tunisian SWHS market, which was more recently followed by PROSOL II. The following lessons were learnt from these Programmes:

- The PROSOL-programme via its interest subsidy facility sets an example of a mechanism that could mainly be used to mitigate the problem of high up-front investment costs for SWHS on household-level in connection with limited access to credit markets. The Programme offers lower interest rates as compared to market rates and had longer repayment period than usual which obviously is encouraging and attractive for the customer.

- The engagement of STEG (Electricity Utility) in recovering the loan payments through its electricity bills provides enough guarantees to banks to extend the loan terms and lower the interest rates. In the event of a default, banks can take action against the SWHS suppliers that were granted the loan. At the same time, STEG suspends the electricity supply to the customer. Moreover, making use of already existing infrastructure (electricity bills) of the public utility has several advantages – it is an extremely simple mechanism, has lower transaction costs and involves low bureaucratic effort.

- Engaging the banks seems to be a successful strategy, since they have the potential to leverage enough financial resources to stimulate the creation of a market for solar thermal. By identifying new lending opportunities, banks have now started building dedicated loan portfolios, thus helping to shift from a cash-based to a credit-based market. The promotion programme shows that banks definitely can be motivated for commitment in new markets.

- Within this Programme, banks did not have any direct contact with the customer, who is the final beneficiary of the loan. They dealt instead with SWHS suppliers. Loans are officially granted to the SWHS suppliers. Although, this unburdens the load of arranging finance for installing a SWHS for consumers, this was started because banks neither had enough confidence in the solar thermal market nor over its customers. But after PROSOL, the financial sector in Tunisia has strengthened and gained enough confidence to offer credits directly to households in PROSOL II.

- PROSOL involved series of accompanying measures, which included an awareness raising campaign, a capacity building programme and carbon finance. Besides commercials in TV and advertising over radio, the publicity campaign included announcements in several print media. In banks and governmental buildings the programme was promoted with leaflets and posters. Additionally, seminars about SWHS were organised. These measures provide further stability to the Programme.

- Success of such a programme is dependent on the strong involvement of various stakeholders – government, banking sector, electricity utility, manufacturers, importers and installers of SWHS and local consultants. This provides the key players a platform for developing partnership, capacity building, and information exchange.

- Quality assurance is maintained by carrying out a quality-verification carried out by National Agency for Energy Conservation (ANME). Technical requirements are published in a performance specification sheet. Another element in the course of quality assurance provided by the programme is training for installers of SWHS. In addition, the following were also performed:
  - Auditing of the scheme by an independent auditor
  - Monitoring carried out by continuous data collection process to gauge progress and penetration level of the scheme
  - Involving accredited SWHS suppliers and installers
  - Inspection of SWHS installations by ANME technical staff

- There was progressive phasing out of the PROSOL Programme. It is crucial for a sustainable impact of a promotion mechanism that a market for SWHS evolves and persists beyond the completion of the promotion period. For this reason, a promotion programme should ideally arrange for decreasing levels of promotion for households (phase-out). Experiences show, that non-consideration of such a promotion strategy can lead to abrupt and significant falling down of sales and installation figures once promotion phases out.

- In such a Programme, there is fear of system breakdown in case that the utility steps back from its role as collection agency. In the course of such a promotion programme it should be

considered how the risk of excessive indebtedness can be avoided. Middle or long-term commitment of public utility is required to avoid such a condition.

5.3 South Africa

South Africa's Energy Services Company (ESCO) model is well known for its attempt to promote mass deployment of SWHS. Lessons learnt from this model are mentioned below:

- **ESCO Model for mass roll-out of SWHS**

ESCO as a vehicle for mass roll-out of SWHS is attractive because the hot water user bears neither capital costs nor maintenance of the system. Although in the long run users may pay more than if they bought and installed a system themselves, this mechanism works well as it avoids prohibitive capital costs and is relatively hassle free (no maintenance, repair, responsibility etc). Hence, it is anticipated that this model will break down the largest barrier to mass SWHS implementation currently, namely the high initial capital cost.

- **ESCO Model may not be suitable in low income housing**

Fee-for-service mechanisms are ideal for large institutions, such as flats and retirement homes. Their application within low cost housing schemes needs to be explored. Institutional and financial models will have important applications for City housing delivery.

- **ESCO Model may not work where solar industry is not mature**

This model doesn't seem to fit in places where the SWHS industry is very small. It is probably better to work in areas where there is the large concentration of suppliers. This approach also needs interaction and long term agreements between large numbers of stakeholders.

- **ESCO Model would require strong targets to be successful**

Government support in the form of realistic targets is necessary. In case of South Africa, apart from the national commitment (White Paper on Renewable Energy 2003) local targets also exist. For e.g.: City of Tshwane Energy Strategy sets out a target of installing SWHS in 50% of the households by 2020. This is further supported by Building By-Laws.

- **Roles and Responsibilities of Key Players**

Identification of key players and defining their roles and responsibilities is a very important task. Involvement of energy utilities, non-profit organizations, local Government, industry associations, carbon financing players, implementing agents (public and private), and long term financing support along with other supporting players is critical. The contracts/MOUs should also have details on length of agreement, and conditions of continued collaboration.

- **Enabling legislation is required**

Underpinning legislative framework and governing policy issues that could affect financing relationships and procurement options need to be identified and be part of the delivery mechanism.

- **Compliance, Monitoring & Verification**

Current compliance and quality assurance processes embedded in the model are weak. These should be made integral part of the model. Similarly, strong monitoring and verification protocol should be included in the model.

- **Financial Feasibility**

The ESCO model requires integration of financial resources into the model on a sustained and medium to long-term basis. There should be availability of various incentives or subsidies which reduce the capital cost of a SWHS and make the model financially attractive.

5.4 Germany

Germany's Minimum Incentive Programme (MAP) is by far considered to be the largest and most outstanding programme with respect to promotion of solar thermal systems. Lessons learnt from the Programme are as follows:

- Success of the MAP Programme is attributed to generous promotion rates provided to German households. Such an attractive Programme is essential to help SWHS penetrate and establish in the renewable energy market and also bring down the barrier of high capital cost. Attention was paid on realizing economy-of-scales-effects during the design of the mechanism so the solar industry can evolve into a successful and sustainable industry sector.

- The Programme requires mandatory operation of promoted systems for at least seven-years. Hence, this requirement makes sure that energy and environment benefits are accrued for a fixed time period.

- Quality assurance is maintained within the programme by promoting only certified SWHS bought from participating suppliers.

- Development of a supporting legislative framework in the form of the Renewable Energy Heating Act, 2009 which provides significantly more investment security for the solar thermal sector by establishing a steady MAP budget and at the same time introduction of the renewable energy buildings obligations further strengthens both the supply and the demand-side.

5.5 United States of America

Lessons learnt from the Federal Tax Credits for Consumer Energy Efficiency Programme are as follows:

- Under the Federal Tax Credits Programme eligible SWHS specifically have been exempted from upper credit limit.
- Under this Programme quality assurance is maintained by adhering to Solar Rating Certification Corporation (SRCC) standards for SWHS, installation standards, health and safety norms and buildings codes. In addition, manufacturer's certification in writing that the SWHS is qualified residential energy property is also required.
- The tax credits received by a taxpayer for an eligible SWHS installation are in addition to any other financial assistance received at a National/State/Local level. These do not reduce the tax basis for calculating the 30% tax credit for the SWHS.

6 RESULTS OF STAKEHOLDER CONSULTATION PROCESS

6.1 Background

As noted earlier, different types of promotional financing schemes are operation in different parts of the country, which promote installation of SWHS. These schemes have been described in detail in Chapter 3 and 4 of this Report. These Schemes have met with varied degrees of success. Further, these schemes have different perceptions in the minds of people. In order to understand the perception of the consumer about the scheme as well as possible amendment to the scheme, the Terms of Reference for the assignment required ABPS Infrastructure Advisory Private Limited to carry out stakeholder consultation process. Following were the primary objectives behind this stakeholder consultation exercise to:

- Understand the perceptions of the various consumers regarding existing schemes
- Study and analyse the challenges faced by different stakeholders in the SWH sector.
- Understand procedural and administrative hurdles faced by the stakeholders under the scheme
- Seek inputs on possible amendments to the scheme

During kick-off meeting for the assignment held on August 19, 2009 at MNRE, New Delhi, following six States were short-listed for Stakeholder Consultation Process.

1. Karnataka,
2. Andhra Pradesh,
3. Delhi,
4. Orissa,
5. Haryana and
6. Maharashtra

Of the abovementioned six States, only Haryana and Delhi has State government capital subsidy scheme while MNRE financing scheme is available for the whole country. Property tax rebate is available in few municipal corporations of Maharashtra, and mandatory scheme in almost all the States.

6.2 Categories of Stakeholders

During the kick-off meeting, it was also decided to cover primarily four types of stakeholders during this consultation process i.e. Banks / FIs, Manufacturers, Consumers and State Nodal Agencies (SNA). ABPS Infra undertook this stakeholder consultation process in two steps; first, the structured questionnaires were developed for each category of stakeholders and second, these questionnaires were run during in-person interviews. Here, it may be noted that ABPS Infrastructure Advisory Private Limited was also mandated to Design Scheme and Framework for Promotion of Solar Water Heating Systems by Utilities and Regulators. As a result, ABPS infra could carry out stakeholder consultation process in which views of the stakeholders on both financing schemes and Utility driven schemes were sought. This not only helped in seeking views of other players such as State Electricity Regulatory Commissions (SERCs), Distribution Utilities on the different promotional financing schemes but also resulted in inclusion of one more State in the process. Following table summarises the stakeholder consultation process carried out by ABPS Infra.

Table 6.1: Stakeholder Consultation carried out in Different States

State	State Nodal Agency	Manufacturers	Municipal Corporations	SERC	Dist. Licensees	Consumers
Andhra Pradesh	✓	✓	-	✓	✓	✓
Delhi	✓	✓	-	✓	✓	✓
Haryana	✓	✓	-	✓	✓	-
Karnataka	✓	✓	✓	✓	✓	✓
Maharashtra	✓	✓	✓	✓	✓	✓
Orissa	-	-	-	✓	✓	-
Uttaranchal	✓	-	-	✓	✓	-

Table 6.2: Stakeholder Consultation carried out in Different Banks

Banks	
1	Canara Bank
2	Vijaya Bank
3	Andhra Bank
4	Bank of India
5	ICICI Bank
6	State Bank of India

This also helped ABPS Infra in developing comprehensive understanding of the issues faced by various players in solar water heating market. While we carried out common stakeholder consultation process for different types of stakeholders, in this report we have presented the views of these stakeholders on the promotional financing schemes. Further, it may be noted that as one would expect the stakeholder consultation process involved explanation of the scheme and provision of the opinion on various aspects of the existing or proposed schemes. This Chapter covers only that portion of the stakeholder consultation process, which has not been covered anywhere else in the Report. Annexure to this Report provides the list of the persons covered as a part of the stakeholder consultation process. In the subsequent section, we have presented our findings of the stakeholder consultation process.

Before discussing the results of stakeholder consultation, the process at the banks under interest subsidy scheme[3] is described below, as it leads to more explication on the issues faced by various stakeholders

- Eligibility Criteria
  - Minimum Monthly income of salaried applicant : higher out of the two i.e., 25% of gross salary as take home salary or Rs 2,000/- (after meeting the loan installment for SWH)
  - Minimum Annual income or Rs 50,000 for Professionals and non salaried applicants
  - System of any Capacity

[3] Printed Pamphlet of Canara Bank

- Applicable for both collector technologies BIS approved FPC and MNRE approved ETC

➢ Loan Amount
- Up to 85% of total cost of Equipment and accessories excluding installation cost

➢ Security
- Hypothecation of SWH and accessories purchased out of loan
- Collateral equivalent to loan amount

➢ Repayment
- Option of 36, 48, 60 EMI with repayment holiday of 3 months
- Maximum term of 5 years

➢ Maintenance Guarantee
- Suppliers to be responsible for maintenance of the systems for 5 years and the maintenance cost will form part of system cost.

➢ Documents to be produced
- Proof regarding income such as salary certificate, Income Tax Assessment Order etc.
- In case of business establishments, where higher capacity is required, the applicants have to produce balance sheet/other financial statements for the last three years.
- Proforma invoice / quotation
- Performance guarantee letter from the dealer after the installation.

6.3 Issues raised during stakeholder consultation

During the stakeholder consultation process, following issues were raised by various stakeholders. The issues raised have been categorised Stakeholder-wise as follows.

A. Issues raised by Banks/FIs

- Installation Cost Norms
- Performance Related Issues
- Operational and Administrative Issues

- Differential vs Uniform Interest Rate
- Time Consuming Process for availing interest subsidy

B. Issues raised by Consumers

- Preference to Existing Customers
- Cumbersome Process
- Initial Lending at Applicable Rates
- Lack of Publicity
- Inadequate Financial Support
- Capacity Limit

C. Issues raised by Manufacturers

- No Scheme for New Manufacturers
- Bank Guarantee
- Process Involved

D. Issues raised by Municipal Corporations

- Capacity Norms
- Compensation of Revenue Loss
- Monitoring and Verification (M&V)

The gist of the discussion with various stakeholders including the suggestions given by stakeholders in different States with respect to each of the abovementioned issues is discussed in the following paragraphs.

6.4 Issues raised by Banks/FIs

6.4.1 Installation Cost Norms

Banks / FIs opined that presently MNRE has specified the upper limit of the cost of the system for the interest subsidy scheme. However no norms have been specified for transportation costs and installation costs and hence the interest subsidy is not available for the entire amount of installed costs of the system. As a result, the interest subsidy is only available on around 75-80% of the total installed cost of the systems and the funding for balance 20-25% has to arranged by

consumers itself. If the region-wise transportation costs and installation costs are also specified by MNRE, the soft loan can be made available for the entire installed costs of the system and the consumers will have not have to arrange any funding for installing the systems. Some of the consumers also raised this issue and mentioned that the Banks reject the loan applications when they submit an application for availing loan for the total installed cost of the system.

6.4.2 Performance Guarantee

Some of the Banks / FIs opined that some of manufacturers / suppliers / theservice companies are not providing any kind of performance guarantee, which leads to lack of trust of consumers in the product and create hassles in recovery mechanism of the loan amount disbursed to consumers, as the users stop paying installments once the system stops working. Few banks also stated that this has added to the Non Performing Assets of banks. Some of the banks / FIs also opined that absence of non uniform standards lead to entry of various small level manufacturers into the market and resulted into poor quality/reliability of complete installation.

6.4.3 Operational and Administrative Issues

Banks / FIs indicated that the present MNRE interest subsidy scheme is a resource intensive process as the loan amount involved particularly for domestic consumers is too low. For loan management and documentation, it involves lot of effort and increases the administrative work of banks due to small value multiple loan. Further, the banks have to put lot of efforts for recovery of small installments from individual consumers. Managers of most of the branches are not keen to provide interest subsidy as their first priority is to meet business targets and it is not an income generating activity for them.

6.4.4 Time Consuming Process

Banks / FIs indicated that it takes a long time nearly three to six months to avail upfront subsidy from IREDA which increases the hassles for the banks under the present financing scheme. They suggested that the application process can be further optimized to reduce the response time for example , an online application system can be introduced to reduce the delay in release of subsidy.

6.4.5 Uniform vs Differential Interest Rate

The other issue raised is about the uniform vs differential rate for providing loans to the end users (consumers) of SWHS. Under the current interest rate subsidy scheme, the interest rates at which the loans are to be provided to consumers has been specified. For the purpose of easy calculation of interest subsidy by the Banks/FIs/ Intermediaries and necessary examination by IREDA, a uniform lending rate based on the existing rates of various banks/FIs has been fixed at 12.5% by IREDA. The Prime Lending Rates (PLRs) of Banks and FIs for retail lending varies across the Banks/FIs. As uniform lending rate has been specified for reimbursement of interest subsidy, some of the Banks/FIs does not find the scheme attractive considering the administrative costs involved and hence has not joined the scheme.

6.4.6 Other Suggestions by Banks/FIs

Some of the other suggestions given by Banks / FIs are as follows:

- There is a need for strong recovery mechanism
- Lending to SWH may be brought under priority sector (may be part of housing loan)

6.5 Issues raised by Consumers

6.5.1 Preference to Existing Customers

Consumers opined that the Banks prefer to provide interest subsidy loans to existing customers (already having account or deposits in the bank) as this provides security towards recovery of loan amount for banks. This issue was also discussed with Banks and they have agreed that they prefer to extend loans to their existing customers. This puts a limitation for those consumers of SWH who does not have bank account with participating banks to avail soft loan for installing SWH systems.

6.5.2 Initial Lending at Applicable Rates

User of SWHS were also of the view that banks provide loans at present applicable interest rate and after receiving claims from IREDA, banks reduce the number of installments of the users. In this way, the users are not relieved off from the initial high capital cost of the system.

6.5.3 Cumbersome Process

Almost all the users of the SWHS opined that comprehensive documentation process is involved in order to avail interest subsidy from the banks and the process of availing interest subsidy needs to be simplified.

6.5.4 Delay in Release of Capital Subsidy

Most of the industrial and commercial users highlighted that it takes around six months to one year to avail the capital subsidy as the SNAs take lot of time for certifying the installations and processing the documents. They further opined that it require a duplication of document and regular follow ups for getting the capital subsidy.

6.5.5 Lack of Publicity

During stakeholder consultation process, some of the consumers opined that they are not aware of any State or Central level subsidy scheme. This represents that the promotional schemes are not publicized effectively.

6.5.6 Inadequate Financial Support

Some of the consumers indicated that the amount of subsidy is inadequate, as the users are still not relieved off from the initial high capital cost of the system.

6.5.7 Capacity Limit

Builders and developers raised the issue, that under present MNRE capital subsidy scheme, the subsidy is available for systems having capacity of 2500 lpd or more. With this, the capital subsidy is not available for systems below 2500 lpd.

6.6 Issues raised by Manufacturers

6.6.1 No Scheme for New Players

During stakeholder consultation process, discussions were undertaken with various manufacturers who opined that soft loans are available for capacity building and technology upgradation for existing manufacturers, but there is no such facility available for new manufacturers who want to enter into manufacturing of SWH business.

6.6.2 Bank Guarantee

Most of the manufacturers stated that in order to raise fund for capacity building and technology upgradation, they have to provide 100% bank guarantee for availing loan at a reduced interest rate of 5% and it is difficult to arrange collateral and their funds gets blocked with banks for the tenure of the loan.

6.6.3 Process Involved

Manufacturers opined that comprehensive documentation process is involved in order to avail interest subsidy from the banks. Manufacturers also stated that it is difficult to raise fund for capacity building and technology upgradation, as loans are sanctioned by IREDA which is having only one office in India. The manufacturers from any part of the country have to take loan only from the head office of IREDA.

6.7 Issues raised by Municipal Corporations

6.7.1 Capacity Norms

During the stakeholder consultation process, the municipal corporations were of the view that mandatory schemes for installation of SWHS does not insist corporations to specify the required capacity of SWH system for a particular building. In order to fulfill the norms of the mandatory scheme, the users install SWHS with a very low capacity.

6.7.2 Compensation of Revenue Loss

Some of the Municipal Corporations also opined that while providing the rebate in property tax, there is an issue of compensation of loss of revenue. They suggested that either the State Government has to provide some kind of rebate to them or the Municipal Corporations can increase the property tax in their area to compensate the revenue loss and then provide rebate in property tax to the users of SWHS.

6.7.3 Monitoring and Verification (M&V)

Few of the municipal corporations indicated that that the scheme does not oblige corporations to track and maintain the record of installed SWH system capacity (lpd/collector area in m^2). The responsibility of the corporations ends at issuance of Occupation Certificate, after that there is no verification process involved. And the scheme does not have any mechanism to monitor continuous usage of installed SWH system.

7 OUTCOME OF REVIEW OF EXISTING SCHEMES

As a part of the assignment, ABPS Infra developed four international case studies and carried out review of financing schemes at State Level and MNRE financing schemes. Further, stakeholder consultation process was carried out in six States in the country. While MNRE financing schemes have been discussed in Chapter-3, State Government capital subsidy schemes and lessons learnt from international case studies have been covered in Chapter 4 and 5, respectively. Stakeholder consultation process has been covered in Chapter-6. The rationale behind carrying out this extensive study of domestic and international cases was to understand reasons for their successes and failures.

Further, stakeholder consultation process was designed to obtain inputs and suggestions from the key stakeholders on the effectiveness of the existing schemes and desirable features of new scheme. The stakeholder consultation process was also designed to study and identify the challenges faced by key stakeholders in the SWH sector. These inputs are to be used while designing the new scheme. In this Chapter, an attempt has been made to synthesize the key lessons from international case studies, learning from domestic experience and inputs from key stakeholders into one single list of issues, which should be taken into account while designing the new scheme. These issues have been presented below:

7.1 Simple and shorter process for availing benefits

It has been observed that in case of both interest and capital subsidy schemes, the reimbursement of subsidy is a lengthy process and takes around six months to one year. To avail the benefits of promotional interest subsidy scheme, users of SWHS need to submit the required documents mentioned in previous chapter to the banks and to complete all the formalities. And in case of MNRE and State Government capital subsidy scheme, repetitive documentation and continuous follow up is required. So the new scheme developed should have simple and shorter process to avail benefits for SWHS users. Some of key stakeholders suggested that there is a need to develop an online system for the reimbursement of claims.

7.2 Standardization of the SWH Systems

All international schemes required installations to be compliant with standards defined in their policies. Though, in some cases the local Standards Board designed 'Standards' for SWHS, in

other cases, agency responsible for implementation of scheme (for e.g. the ORER) took responsibility for the same. In some cases, the agencies have taken significant efforts and designed mechanism to suggest consumer suitability of SWHS depending on the geographical location of the consumer. In case of Germany, proper Solar Keymark Certification and testing is required. In India, it is essential that suitable mechanism is developed to create standards for Solar Water Heating Systems.

7.3 Certification/ Registration of the installer or contractor

Another significant feature of the international schemes is involvement of certified installer or contractor. These installers are responsible for installation of SWHS in accordance with the local building standard and installation manual of the SWHS supplier. In some countries, these installers also perform other roles, for e.g. Registered Agent in Australia. Usually installer's certification regarding installation of SWHS is sufficient and necessary condition for availing the benefits under the financing schemes. All countries including South Africa have developed mechanism to certify and/or register these installers. India will also have to find out ways and means to identify and certify installer. In this regard, experience of BEE in certifying Energy Auditors may be taken into consideration.

7.4 Development of ESCO Model

International case studies, especially South Africa ESCO Model envisages leasing and contracting between the consumers, ESCO, financiers etc., which overcomes the barrier of a up-front investment by the household. The ESCOs also act as province wise marketing entities for SWHS that rollout programs to spread awareness and develop acceptance among consumers.

7.5 Comprehensive Quality Assurance Program

International case studies demonstrate the importance of comprehensive quality assurance program. These programs maintain quality by adhering to SWHS Standards and Certification; Installation by certified installer; Buildings Permits and Plumbing Codes; Warranty on major system components etc. There is a need to develop such kind of comprehensive quality assurance program in the new financing scheme.

7.6 Priority Sector Lending

Banks/FIS indicated that SWHS should be included as 'priority sector lending', which would facilitate lending to this category of consumers. Further, lending for SWHS may be considered as a part of housing loan.

7.7 Long Duration Schemes

Almost all the international case studies have long duration financing schemes. This provides stability to investors, which has significant positive impact on the market. In India, the Government announces the schemes, which are in force for typically 3 years duration. There is a need to develop long duration schemes to attract serious investments in SWHS manufacturing sector and supply chain development.

7.8 Need for suitable Monitoring and Verification process

If compared to elaborate monitoring and verification processes defined in the international case studies, the monitoring and verification processes in India are thin and weak. It is necessary that as soon as broad contours of the scheme are agreed upon, design of detailed monitoring and verification process is undertaken.

7.9 Awareness Creation about benefits of SWHS

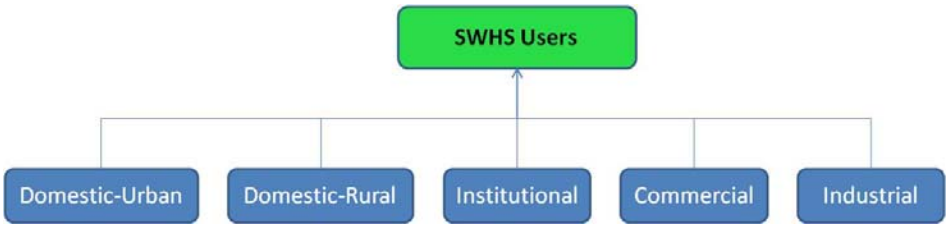
Many stakeholders opined that the current incentive schemes are adequate and are not responsible for ineffective and inadequate progress on solar water heating sector in India. It was felt that the lack of understanding/awareness about the benefits of SWHS and cumbersome process involved in availing incentive are the main reasons behind poor performance of the solar water heating sector in India.

8 MARKET ASSESSMENT AND SEGMENTATION

In this Chapter, we have attempted to assess the total market size and to divide the market for Solar Water Heating Systems into distinct user segments so that it is possible to design appropriate financing mechanisms for these market segments.

8.1 Segmentation of Market for SWHS

Hot water has many applications. In domestic category, it is typically used for bathing while in industrial category; it is used during pre-heating processes. In commercial and institutional category, hot water is used for variety of purposes such as bathing, cooking, washing, etc. Depending on the location, terrain, climate profile, economic status, etc. quantum as well as quality of hot water requirement varies significantly. Further, source of hot water varies significantly from region to region. In domestic-urban category, hot water for bathing is typically obtained from electrical system while that in domestic-rural category, it is likely to be obtained by burning locally available biomass. In some cases, source of hot water could be influenced by economic profile of the user or special requirements such as process inlet temperature and pressure. Different set of drivers influence the purchasing decisions of these users. Therefore, it is necessary to identify the major market segments and the barriers faced by them in installation of SWHS. Following diagram presents the different market segments identified by ABPS Infra for the purpose of this study.



In the following paragraphs, each market segment has been discussed in brief for its characteristics, and necessity of promotional scheme. The identification of user segments in this Chapter is based on the findings in the report on the study entitled 'Market Assessment Study for SWHS in India' carried out by other consultant under UNDP/GEF funded Global Solar Water Heating Project.

8.1.1 Domestic-Urban Users

This category primarily consists of middle class population residing in ever-expanding urban areas in the country. This population is typically using electrical geysers for their hot water requirement. Most consumers in this category can afford to purchase solar water heaters. While maximum share of the current market for SWHS is held by this category of consumers, huge potential is still to be tapped. Since this category consists of working class, electrical geysers owned by the consumers in this category operate during morning period causing demand to increase significantly during the morning period.

Within the category of domestic-urban users, there is a considerable portion of population, which can afford to purchase and use of SWHS. As mentioned before these domestic-urban users are from the upper middle class, who own a refrigerator, and a two-wheeler or a four-wheeler and also may afford a SWHS. In this category, Low-rise independent houses with clear ownership of the roof offer most favourable conditions for installation of SWH. A majority of existing SWH installations fall under this category. In recent years, SWH have been installed on multi-storey apartment buildings. As elaborated in the Market Assessment Report, around 80% of the SWH sales are for new housing and only 20% can be attributed to existing/old housing. As most of the new housing is now coming in the form of multi-storey buildings, it is essential to have appropriate mechanism and framework for promoting SWH in multi-Storey Buildings. This user class within the domestic-urban category should be targeted through the financing mechanism for their shift to the SWHS.

8.1.2 Domestic-Rural Users

This category consists of users from vast rural areas in the country. In terms of purchasing power, these users belong to the lower income group to middle income group. While hot water requirement exists, a few users use electrical appliances for hot water requirement. Most of the users in this category primarily use fossil fuels or biomass such as waste wood, crop residue etc. for water heating. Given low purchasing power, this category is generally not considered as potential customers for SWHS.

The purchasing power of domestic-rural population varies over long range. It will be difficult to devise an incentive scheme, which will encourage the entire segment of domestic-rural users to shift to SWHS. Also, given the fact that such a scheme would create distortions in the market

due to asymmetry in incentives, it is felt that domestic-rural segment be further divided on the basis of income levels for the purpose of targeting under the financing scheme. Within the category of domestic-rural users, there is a considerable portion of population, which can afford to purchase and use of SWHS. These domestic-rural users are from the higher to middle income class, who own a refrigerator, and a two-wheeler or a four-wheeler and also may afford SWHS. The user class in this category who may afford SWHS will have electricity connection, though, some of the consumers may not be using electricity for heating water. This user class within the domestic-rural category should be targeted through the financing mechanism for their shift to the SWHS. Such focus becomes necessary since it will be difficult for MNRE to make budgetary provisions for financing the all the domestic-rural users from lower income groups, who may not have tap water connections and are not potential users for SWHS.

8.1.3 Commercial Users

This user category consists of commercial establishments such as hotels, malls, etc. As highlighted in market assessment report, the small hotels-room capacity upto 30 rooms utilise electricity or wood for meeting hot water requirement. The Hotels located in areas facing severe power shortage and long hours of power cut often opt for SWH. Within this class, there are users, for e.g. bigger hotels, who prefer non-electric fuels for water heating such as heavy oil, gas etc. Further, the hot water requirement of this category is for all 12 months in a year, unlike domestic segment with 5 to 9 months of hot water requirement. Hence this category is suitable to be considered as a potential customer for SWHS. Further, this class is cost-conscious and mainly a group of profit making entities. However, the existing small number of SWHS installations in this category indicates that the current cost-benefit ratio for SWHS is still not lucrative enough for them to switch to SWH. This highlights the unaddressed financial need of this category.

8.1.4 Institutional Users

This user category consists of non-commercial establishments such as hostels, orphanages, educational institutions, club, religious places, etc. While a few of them use electricity, most of them use non-electric fuel such as waste wood, crop residue, gas, heavy oils for water heating. Although the hot water requirement is difficult to standardise, most of the users in this category have hot water requirement around the year. Thus a considerable potential for new SWHS exists in this category. Hence MNRE should provide financial assistance for this category.

Further, most of the users in this category are not profit oriented, which explains their hesitation towards large capital investment. This fact needs to be taken into account while designing promotional schemes for SWHS. Further, user in this category is unlikely to default the loan repayment and hence hence the risk for lending institution is low. Therefore, a financing portfolio with more liberal terms for loan payback may be devised for this category.

8.1.5 Industrial Users

Hot water has direct or indirect applications in many industrial processes running over entire day throughout the year. While most industrial users use non-electric means such as fuel oils, biomass, gas, etc. for water heating, there are a few who still prefer electricity as a dependable and easily controllable source for water heating. For example it is a common practice in the dairy industry to use petroleum fuels for steam generation in boilers. In case of textile industry, use of low-cost solid fuels like biomass and coal for hearing water results in longer pay-back periods for SWH systems.

Since the requirement of each user in this category is different, unique solar water heating solutions have to be identified. However, it is possible to explore the option of integrating solar water heaters into the process wherein standard SWHS will provide preheated feed water. Thus large potential exists which can be realised from this user category. Further, similar to the commercial category, this category is cost-conscious and mainly a group of profit making entities. However, the existing small number of SWHS installations in this category indicates that the current cost-benefit ratio for SWH is still not lucrative enough for them to switch to SWH. This highlights the unaddressed financial need of this category.

8.2 Projections for SWHS for Different User Segments

The projections for the cumulative collector area across different user categories by year 2022 are shown in the Table 8.1.

Table 8.1 Projections for Cumulative Installed Collector area across Different User Categories (million sq.m.)[4]

Consumer Category	2010	2013	2017	2022	Contribution in SWHS sector by year 2022
Dom-Urban	2.23	3.83	7.17	15.14	80%
Dom-Rural	0.35	0.42	0.51	0.60	4%
Hotel	0.19	0.35	0.61	0.97	5%
Hospital	0.10	0.17	0.27	0.43	2%
Industry	0.19	0.33	0.57	1.05	6%
Others	0.18	0.27	0.39	0.52	3%

From the projections presented in Table 8.1, it can be seen that the domestic-urban will be the single largest user segment, which is expected to contribute about 80% of the SWHS market by year 2022. Hence it will be worth providing major attention to this category and to build strong ecology of the enablers such as lending institutions, qualified system installers and smart space-conscious SWH technology providers, etc for this category.

Further, there is no doubt that, from broad environmental standpoint, it makes eminent sense to convert all water heating applications from other fuels to solar. The same is the primary objective of '***The Below 80^{0}C Challenge***' programme under National Solar Mission.

8.3 Market Projections for Different User Segments

Based on the projections for collector area, the total market size assessed for different user segments in terms of total costs of SWH systems in Rs. crore is given in following table.

[4] *Based on Market assessment study carried out by M/S Greentech Knowledge Solutions for MNRE, December 2009.*

Table 8.2 Projections for Market Size of Flat Plate Collector SWHS (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017
Domestic-Urban	438.14	565.99	599.95	635.95	1053.98	1117.22	1184.25	1255.31
Domestic-Rural	34.49	23.15	24.53	26.01	27.11	28.74	30.46	32.29
Hotel	35.92	55.15	58.46	61.96	82.21	87.15	92.37	97.92
Hospital	18.61	25.58	27.11	28.74	32.53	34.48	36.55	38.75
Industry	32.00	49.47	52.43	55.58	75.75	80.29	85.11	90.22
Others	48.00	31.80	33.71	35.73	37.87	40.15	42.56	45.11
Total	**607.17**	**751.13**	**796.19**	**843.97**	**1309.46**	**1388.03**	**1471.31**	**1559.59**

Table 8.3 Projections for Market Size of Evacuated Tube Collector SWHS (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017
Domestic-Urban	74.35	96.05	101.81	107.92	178.86	189.59	200.96	213.02
Domestic-Rural	5.85	3.93	4.16	4.41	4.60	4.88	5.17	5.48
Hotel	6.10	9.36	9.92	10.52	13.95	14.79	15.68	16.62
Hospital	3.16	4.34	4.60	4.88	5.52	5.85	6.20	6.58
Industry	5.43	8.39	8.90	9.43	12.85	13.63	14.44	15.31
Others	8.15	5.40	5.72	6.06	6.43	6.81	7.22	7.65
Total	**103.04**	**127.46**	**135.11**	**143.22**	**222.21**	**235.54**	**249.68**	**264.66**

The assessment of total market size for different user segments is made on the basis of following assumptions:

- In future, FPC and ETC SWH installations will maintain the same ratio as currently exists i.e. 80:20[4].
- Current Capital Cost of FPC SWHS is Rs. 25,000 and ETC SWHS is Rs. 15,000.
- Capital Cost is assumed to increase at the rate of 6% p.a. on account of inflation.

Based on the above assumptions, the total market size of SWH (total cost of systems to be installed) till the end of 12th Five Year Plan period, i.e. up to year 2017, is estimated to be about Rs. 10,700 crore, of which share of domestic urban user segment is 81%.

8.4 Drivers for Financing

It has been observed over past few decades that the high capital cost of SWHS has been a major hurdle for diffusion of solar water heating among the user segments. The analysis shows that the 'affordability' and 'financial viability' are the two facets of the hurdle, which need to be addressed while developing financing mechanisms for potential SWHS customers. Here, it may be noted that 'affordability' is linked to the quantum of capital cost and ease of availability of funds which is required for SWHS and the 'financial viability' is linked to the payback period for SWHS, during which the savings made by installing SWHS compensate for user's investments for SWHS.

In the next Chapter, methodologies for estimation of financing need of different user categories have been defined. Further, financing need has been quantified for different users located in different parts of the country having different annual hot water requirement.

9 ASSESSMENT OF FINANCING NEEDS OF USERS

As mentioned in the previous Chapter, there are two drivers for financing need of a potential SWHS user, viz. 'affordability' and 'financial viability' of SWHS as an alternate water heating technology. They govern buyer's purchase decision and also quantify buyer's need for financing assistance. In view of the current stagnant diffusion rate of SWHS, it has become necessary to identify the factors influencing the decision of the user and quantify their impact. In this chapter, the important factors have been identified and their influence is captured through a model, which quantifies the financing need of users in different segments.

The cost-benefit analysis forms the basis for estimation of financial viability and the financing need of a user. The costs and benefits for different water heating methods have been computed over the useful life of SWHS. Further, a computational model has been developed to estimate the difference between the net present value (NPV) of life cycle cost for SWHS and that of the existing water heating method.

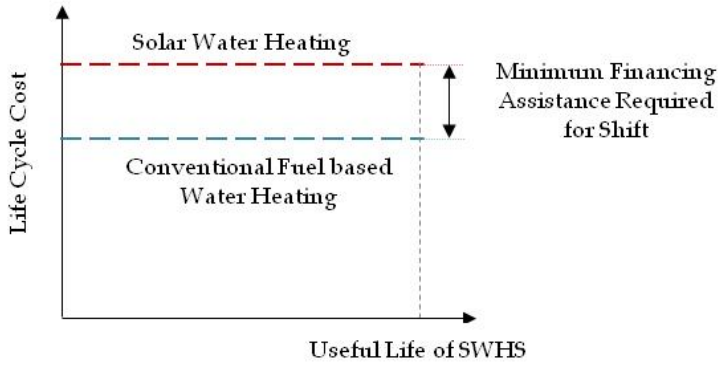
For development of financial model, the following components are assumed to constitute the saving for a user from shift to SWH.

- Cost of saved fuel;
- Differential in maintenance cost between the conventional and solar water heating;
- Capital cost of conventional water heating system.

Ideally, the user should select water heating system on the basis of his assessment of the life cycle costs of the alternatives, in this case solar water heating and user's conventional water heating method. If the life cycle cost of SWH is assessed to be lower than that of the conventional water heating, the consumer will obviously opt for SWHS. However, if the life cycle cost of SWHS is assessed to be higher than that of the conventional water heating, and if it desired that user should switch to SWH, then the user needs to be compensated for the difference between the life cycle cost of SWH and life cycle cost of user's conventional method of water heating. The method of compensation may take any form, i.e. interest subsidy or capital subsidy etc. The minimum financing assistance is required to compensate the consumer

for shifting from less costly conventional water heating to expensive solar water heating. This can also be explained with the help of Figure 9.1.

Figure 9.1 Role of Minimum Financing Assistance



Further, in addition to compensation for life cycle cost difference, the quantum of financing assistance is expected to enhance the affordability of the SWHS to buyer.

For estimation of financing needs, the following fuels, which are currently used in India for water heating, have been considered.

- Electricity;
- Wood waste and crop residue (with Kerosene as pre-ignition fuel);
- Fuel Oils.

9.1 Estimation of Financing Need of Users currently using Electric Water Heating

As discussed in previous Chapter, the middle and high income domestic users and commercial users with small hot water requirement typically use electricity for water heating. The methodology presented in this section will be applicable for estimation of financing need of these user segments.

While many users in commercial segment use non-electric fuels, such as gas, wood waste, fuel oils etc., the substantial number of users, especially small commercial users use electricity for water heating. Further, users in this segment such as small to medium hotels, restaurants have hot water requirement around the year. Hence commercial users with small hot water requirement have been treated similar to users in the domestic segment.

The quantum of electricity saved has been computed for the following scenarios.

- SWHS replaces the Instant type Electric Geyser
- SWHS replaces the Storage type Electric Geyser

Here it may be noted that these two types of electric geysers dominate the electric water heating market in India. Share of each type of geyser in the market is provided in the table below:

Table 9.1: Market Share of Electric Geysers in India[5]

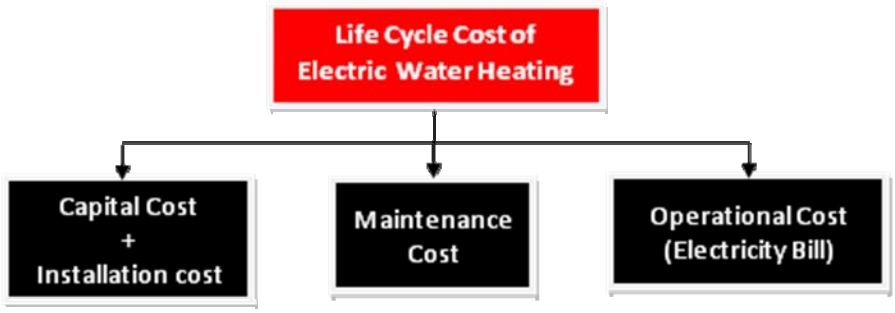
Electric Geyser Type	Indian Market Share
Instant Geyser	35%
Storage Geyser	65%

The details related to diffusion of other types of electric water heaters such as heating rods etc. were not available from the reliable sources, hence not considered in this study.

- **Life Cycle Cost of Electric Water Heating**

User of electric water heating incurs the expenses shown in Figure 9.2 during the entire useful life of an electric geyser.

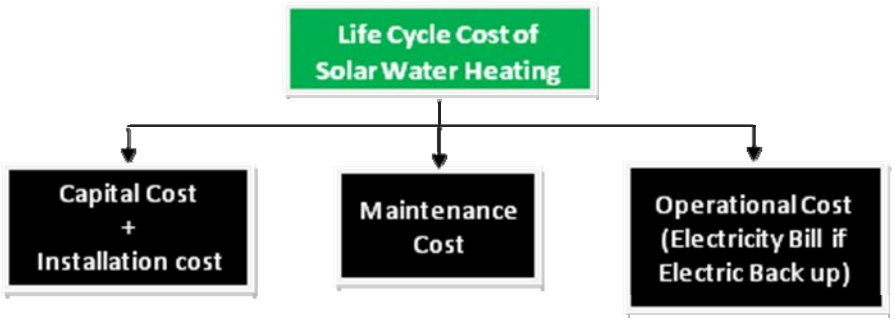
Figure 9.2 Life Cycle Cost of Electric Water Heating



[5] ICF report on *'Baseline Analysis for Labeling of Electric Water heaters in India'* prepared for Bureau of Energy Efficiency, October 2008

- **Life Cycle Cost of Solar Water Heating**

Figure 9.3 Life Cycle Cost of Solar Water Heating



Here it can be noted that the operational cost of SWHS is the operational cost of its electric backup, which is expected to be operated during a few days in monsoon with insufficient sunshine.

Thus financing need can be obtained as follows.

Financing Need = Life Cycle Cost of Solar Water Heating - Life Cycle Cost of Electric Water Heating

Here, it is important to note that the financing need will differ based on the category of a consumer using SWHS. This is so because, for the fixed hot water demand, the differential electricity tariff will result into the different operational costs among the different user categories. For e.g., in case of a fixed demand of 100 litres of hot water, by a domestic category user and a commercial category user, the lower tariff for domestic category will result into a higher financing need than that for a commercial category user. The details of the life cycle cost computation are presented separately in section 9.1.2.

9.1.1 Estimation of Electricity Saved due to Use of SWHS

In most parts of India, the SWHS will save significant part of electricity used for water heating during the seasons of winter and summer. In some parts, SWHS may also save some electricity requirement during the monsoon season as well. Thus the quantum of annual electricity saved by use of SWHS installed at a given location has been computed.

As discussed further in module-1 of subsection 9.1.4, the seasonal electricity requirement and cost of electric water heating can be estimated for winter and summer. The electricity saving due to SWHS during monsoon will be equivalent to the sensible heat addition to water in the form of solar energy tapped by SWHS with available sunshine.

The summation of savings during these three seasons will provide annual electricity saving due to use of SWHS. Further, annual and lifetime operational cost saving by SWHS can be computed. This computation incorporates the impact of local climatic conditions, and efficiencies of water heating systems under consideration.

9.1.2 Estimation of Life Cycle Cost

This section presents the life cycle cost analysis for water heating using various electrical appliances such as instant geyser and storage geyser. Further, the life cycle costs have been assessed for different scenarios of solar water heating, as shown in Table 9.2.

Table 9.2 Different Scenarios of Water Heating

Electric Water Heating Scenarios	Solar Water Heating Scenarios
Instant Geyser	SWHS (Base configuration without any electric backup)
Storage Geyser	SWHS + Integral electric backup
	SWHS + Instant Geyser as backup
	SWHS + Storage Geyser as backup

The life cycle costs have been estimated for the useful life of a SWHS even though life of electrical geysers is much lower, nearly half that of SWHS. Such common basis of duration is required for comparative assessment of different water heating appliances.

9.1.3 Assumptions and Inputs to Model

The life cycle cost for each water heating scenario has been modelled using several technical and commercial inputs. The important technical inputs to the model include the following:

- Parameters to capture and quantify the local climate;
- Parameters that quantify season wise hot water consumption pattern of a user;

- Type and specifications of electric geyser and SWHS configurations;
- Operational efficiencies of heating systems.

The important commercial inputs to the model include following:

- Electricity tariff;
- Tariff escalation rate;
- Inflation rate & Discount rate;
- Initial cost of water heating systems;
- Installation cost;
- Maintenance cost of chosen configuration and capacity of water heating system;
- Maintenance schedule of water heating systems;
- Useful life of water heating systems.

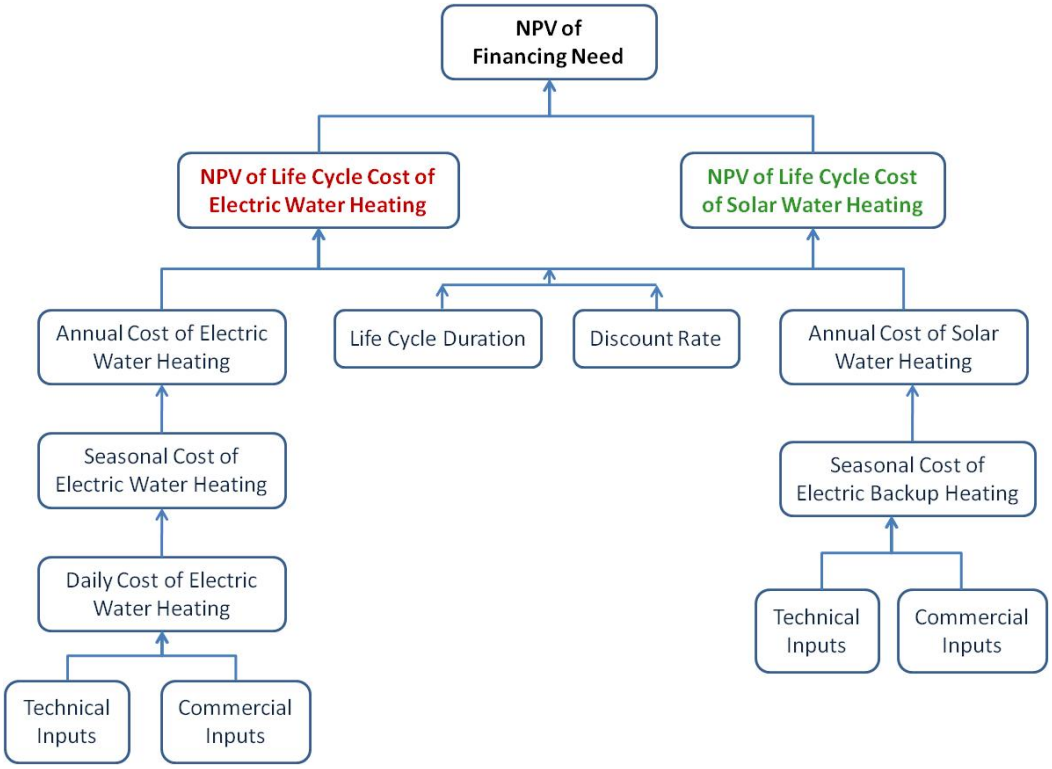
The important commercial assumptions are as follows.

- Financing needs have been estimated for different user segments considering the use of Flat plate collector SWHS (FPC SWHS). This is due to the following two reasons.
  - The existing share of FPC SWHS is 80%, whereas share of ETC SWHS is as low as 20%. It has been assumed that the share of these two technologies will remain same at least for the next few years.
  - The capital cost of FPC SWHS is more than the Evacuated Tube Collector SWHS.
- Useful life of 16 years for the SWHS;
- User procures SWHS entirely through a term loan, which is to be paid back within 5 years with lending interest rate of 10% per annum.

9.1.4 Structure of Model

The structure of the model can be schematically represented as follows.

Figure 9.4: Structure of Life Cycle Cost Model



The important modules incorporated in the model are discussed below.

1. Operational Cost

The operational cost is essentially a measure of cost of electricity required for water heating. This electricity requirement varies during the year, depending upon the seasonal variations at a particular location and subsequently changing hot water demand. Hence electricity requirement needs to be computed separately for all the seasons and their summation will provide annual electricity requirement, and then the electricity requirement over entire useful life can be computed.

Quantum of electricity required is calculated using the energy balance i.e. the electrical energy input results into sensible heat addition to the specified mass of water to be heated. Further, the electricity tariff for chosen consumer category will provide operational cost in case of electric water heating. Thus operational cost computed for a day, can be used to compute seasonal operational cost. In case the SWHS, the operational cost is applicable for its configuration with electric backup, which is typically operated during monsoon season.

The developed model provides the flexibility to the simulator to specify the useful life of different water heating systems, for e.g., for different kinds of geysers (useful life between 8 to 10 years) and different configurations of SWHS (useful life between 16 to 20 years for both FPC SWHS, and ETC SWHS).

2. Estimation of Capacity and Cost of SWHS

This module estimates solar energy required to heat specified mass of water. Further, SWHS collector area required to capture this quantum of solar energy can be computed from the global solar radiation in the season of winter, at the location and efficiency of the collector. The initial system cost of the SWHS has been obtained from MNRE's rate contract and the climate data has been taken from the 'Solar Radiation Handbook, 2008' published by the Solar Energy Centre, MNRE. The performance characteristics of different kinds of SWHS collectors, standard sizes and capacities of SWHS, and useful life of systems at different locations of the country, have been obtained directly from the SWHS suppliers specified in MNRE's rate contract.

3. **Estimations of Maintenance Cost**

The maintenance of SWHS essentially includes cleaning of system components. In case of electric water heating systems, the maintenance includes replacement of certain components, mainly heating element and thermostat. While the component cost is almost same, the cost of servicing differs for urban, semi-urban and rural segments mainly due to following two factors.

- region specific labour charges on daily basis;
- impact of local water hardness on components.

These two factors affect the cost per service and frequency of servicing and thus decide the cost of maintenance over entire useful life of system. The model provides flexibility for its user to specify two variables, maintenance cost per service and intervals of maintenance.

The abovementioned three modules are used in computation of life cycle cost of electric water heating and solar water heating. All the costs including the annual costs incurred for water heating over the specified duration of 16 years, are converted to their NPV and the summation of these NPVs provides the life cycle cost of a water heating option. The NPV based life cycle cost of solar water heating and electric water heating need to be compared to arrive at NPV of financing need of a user.

As discussed in previous Chapter the use of electric water heating is most common among the users in domestic-urban category. Hence it is the only class considered as the representative while estimation of financing need for shift from electric water heating to SWH.

9.1.5 Quantification of Financing Need for Domestic-Urban Users

The model based on the methodology and modules discussed before in the subsections 9.1.1, and 9.1.2 can be used to estimate the financing need of a users residing in the four States identified for this study. These users typically consume 200 or more electricity units (kWh) per month. The electricity tariff has been referred from their respective tariff orders for FY 2008-09. The following subsections present the values of different input variables used for the estimation of financing need of domestic-urban users with the standard hot water requirement of 125 litres per day for specified number of months in a year.

9.1.6 Inputs to the Model

Table 9.3 Hot Water Usage Pattern

Consumer Category	Hot Bath Water Requirement per person (Litres)	Number of Persons at Consumer's Location
Domestic: Urban	25	5
Domestic: Rural	15	7
Commercial:	25	Can Not be Standardised

Table 9.4 Climate specific Inputs to the Model**

Variable	Delhi	Karnataka	Maharashtra	Uttarakhand
Location	New Delhi	Bangalore	Pune	Pauri Garhwal
Number of seasons	3	3	3	3
Seasonal Duration (months/year)	Winter:4 Summer:4 Monsoon: 4	Winter: 4 Summer: 4 Monsoon: 4	Winter: 4 Summer: 4 Monsoon: 4	Winter: 4 Summer: 4 Monsoon: 4
Hot water requirement (months/year) *	5	9	8	9
Seasonal Hot water consumption pattern (% in a season)	Winter: 100% Summer: 0% Monsoon: 25%	Winter: 100% Summer: 40% Monsoon: 100%	Winter: 100% Summer: 25% Monsoon: 100%	Winter: 100% Summer: 40% Monsoon: 100%
Average daily sunshine in a season (hrs/day)	Winter: 7.5 Summer: 7.9 Monsoon: 1st month: 6.9 2nd month: 6.3 3rd month: 6.2 4th month: 7	Winter: 8 Summer: 8.6 Monsoon: 1st month: 6.5 2nd month: 6.3 3rd month: 6.0 4th month: 6.4	Winter: 9 Summer: 10 Monsoon: 1st month: 7 2nd month: 5.5 3rd month: 5.5 4th month: 7	Winter: 6 Summer: 8.5 Monsoon: 1st month: 8.8 2nd month: 8.5 3rd month: 7.6 4th month: 7.9
Average daily	Winter: 3.7	Winter: 5.0	Winter: 4.9	Winter: 3

Global solar radiation in a season (kWh/m2)	Summer: 6.5 Monsoon: 1st month: 6.26 2nd month: 5.3 3rd month: 4.94 4th month: 5.25	Summer: 6.5 Monsoon: 1st month: 4.9 2nd month: 4.64 3rd month: 4.49 4th month: 5.25	Summer: 6.8 Monsoon: 1st month: 5.37 2nd month: 4.47 3rd month: 4.36 4th month: 5.2	Summer: 5 Monsoon: 1st month: 6.18 2nd month: 5.6 3rd month: 5.21 4th month: 5.06
Average ambient temperature during sunshine hours (deg. C)	Winter: 20 Summer: 36 Monsoon: 32	Winter: 25 Summer: 30 Monsoon: 26	Winter: 28 Summer: 35 Monsoon: 26.5	Winter: 6 Summer: 20 Monsoon: 26
Initial Temperature of Water provided to heating system (deg. C)	Winter:10 Summer: 28 Monsoon: 28	Winter: 17 Summer: 22 Monsoon: 21	Winter: 14 Summer: 23 Monsoon: 22	Winter: 2 Summer: 13 Monsoon: 18

** Obtained from the Market assessment study carried out by M/S Greentech Knowledge Solutions for MNRE, December 2009.*

*** Climate inputs obtained from Solar Radiation data released by Solar Energy Centre and MNRE*

Table 9.5 Technical Inputs to the Model

Consumer Category	Instant Geyser	Storage Geyser	Standard specifications of SWHS *	Integral Electrical Backup of SWHS
Domestic Urban	3 kW	25 Litres	Flat Plate: 2 m^2, 100 Litres	2 kW
Domestic Rural	3 kW	25 Litres		2 kW
Commercial (e.g. Hotel per room)	2 kW	15 Litres	Referred From MNRE's Rate contract List	2 kW

** Collector area has been estimated for the specified climatic conditions and hot water usage pattern and standard available tank capacity has been chosen.*

Table 9.6: Commercial Inputs to the Model*

Cost type	Instant Geyser	Storage Geyser	FPC SWHS (2 sq.m. & 100 LPD)	Integral Electrical Backup of SWHS
Initial cost (Rs.)	3 kW: 1500 2 kW: 1300	25 Litres: 6000 15 Litres: 4500	25564	2 kW: 800
Transport and Installation cost (Rs.)	3 kW: 150 2 kW: 130	25 Litres: 500 15 Litres: 450	3000	2 kW: 400
Existing One time maintenance cost (Rs.)	3 kW: 500 2 kW: 400	25 Litres: 700 15 Litres: 580	1000	2 kW: 500

- *Costs collected from MNRE, MEDA and Authorised Manufacturers and Dealers*

9.1.7 Quantified Financing Need for Domestic Users

Table 9.7: Estimated Financing Need of Domestic Users in Identified States

State	Location of User	Annual Hot Water requirement (months)**	Required number of Standard Collectors for 100 LPD system (FPC: 2 sq.m.)	Tariff Rate for Electricity FY 2008-09 (Rs/kWh)	Financing Need per Household for SWHS (Rs.)
Delhi	New Delhi	5	1	3.9	**12,050**
Karnataka	Bangalore	9	1	3.4	**6,625**
Maharashtra	Pune	8	1	3.9	**5,086**
Uttarakhand	Pauri Garhwal	9	2	2.0	**25,560**

** Financing Need in case of installation of FPC SWHS with Useful life of 16 years.*

*** Market assessment study carried out by M/S Greentech Knowledge Solutions for MNRE, Dec.2009.*

9.1.8 Quantification of Financing Need of Commercial Users using Electricity for Water Heating

The speciality of this category is that, irrespective of the location of the commercial users, such as hotel or a mall, the customers of the commercial category users have tendency to use hot water irrespective of seasonal condition. Hence the commercial users can be considered to have hot water demand for all twelve months of a year. The cost of electricity consumed for water heating will differ depending upon the location of commercial user i.e. depending upon its power distribution Utility, and State. The tariff rate for users in this category varies from Rs. 3.5 to Rs. 5.0 per kWh across the States in India. Based on these tariff rates, the financing need of commercial category users on the basis of difference between life cycle cost of SWHS and life cycle cost of electric geyser, works out to be negative. It means that solar water heating is actually cheaper option for commercial category users than the electric water heating. However, considering the existing limited number of SWHS installations in commercial category, a suitable financing assistance, if provided, will accelerate the diffusion rate of SWHS in this user segment.

9.2 Methodology for Estimation of Financing Need of Users to Shift from Non-Electric Water Heating

As discussed in previous Chapter, users in industrial, institutional and low-income group domestic-urban and domestic-rural categories typically use non-electric fuel for water heating. This section presents a methodology for estimation of financing need of these users and provides the quantified financing need for users in these categories in four States identified for this study.

As shown in Figure 9.1, and discussed in the beginning of this Chapter, the differential of NPV of life cycle cost for solar water heating and that for conventional fuel based water heating, provides the financing need for a user in these categories as well. Due to their lower purchase power, the low-income users from domestic-urban, and domestic-rural categories who currently use non-electric means for water heating are typically not considered as the potential customers for SWHS. Further, the life cycle cost of conventional fuel based water heating is less than the life cycle cost of electric water heating. Hence financing need of this class will be much more than the user class discussed in section 9.1. Large quantum of external financing assistance will be required for shift of such a class of users to SWH.

9.2.1 Estimation of Fuel Saved due to Use of SWHS

The entire fuel required for water heating during the seasons of winter and summer will be saved by SWHS. Further, some quantity of fuel will also be saved during monsoon. The fuel saving during monsoon will be equivalent to the sensible heat addition to water in the form of solar energy tapped by SWHS with available sunshine.

9.2.2 Estimation of Life Cycle Cost

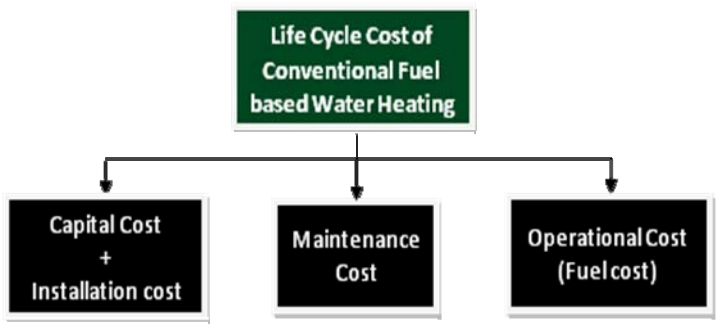
This section presents the life cycle cost analysis identified for conventional non-electric water heating using wood waste, crop residue, kerosene, gas or fuel oil. Further, the life cycle costs have been assessed for different scenarios of solar water heating, as shown in Table 9.8.

Table 9.8 Different Scenarios of Water Heating

Conventional Non-electric Water Heating Scenarios		**Solar Water Heating Scenarios**	
1	Wood waste and Crop residue (with kerosene as pre-ignition fuel)	1	SWHS (Base configuration without any electric backup)
2	Kerosene	2	SWHS + backup water heating system (mostly wood waste and crop residue based)
3	Fuel Oil		

The life cycle costs have been estimated for the useful life of a SWHS. Such common basis of duration is required for comparative assessment of different water heating scenarios. Currently the user incurs the expenses shown in Figure 9.5.

Figure 9.5 Estimation of Life Cycle Cost of Conventional Fuel based Water Heating



9.2.3 Assumptions and Inputs to Model

The life cycle cost for each water heating scenario has been modelled using several technical and commercial inputs.

The important technical inputs to the model will include following:

- Fuel specific properties such as density, lower calorific value, etc.;
- Parameters to capture and quantify the local climate;
- Parameters that quantify season wise hot water demand of a user;
- Operational efficiencies of heating systems.

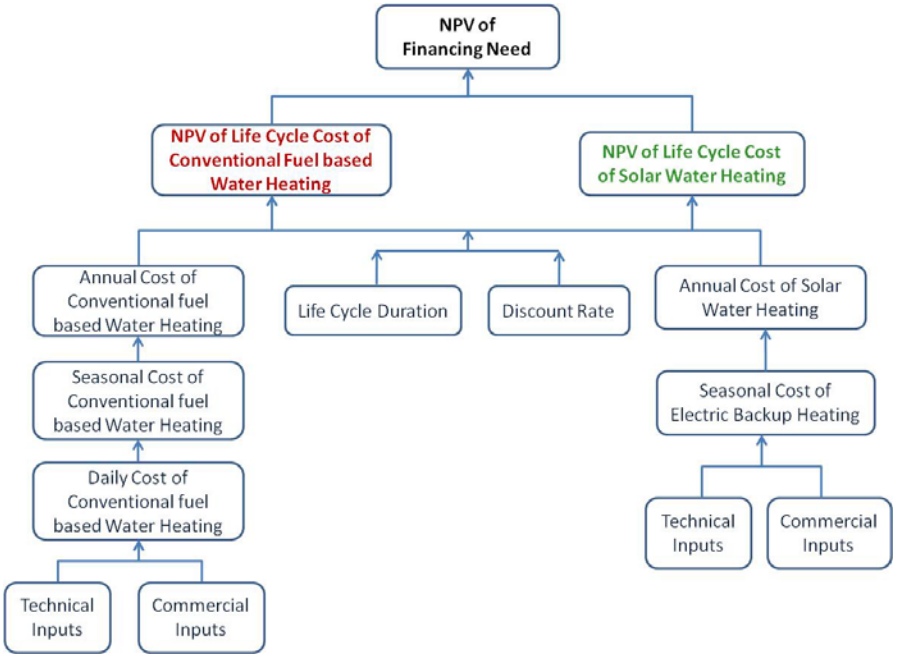
The important commercial inputs to the model include following:

- Costs of different Fuels;
- Fuel cost escalation rate;
- Inflation rate & Discount rate;
- Initial cost of water heating system;
- Installation cost;
- Maintenance cost of chosen configuration and capacity of water heating system;
- Maintenance schedule;
- Useful life of conventional water heating systems and SWHS.

9.2.4 Structure of Model

The structure of the model can be schematically represented as follows.

Figure 9.6: Structure of Life Cycle Cost Model



The important modules incorporated in the model can be discussed as follows.

1. **Operational Cost**

The operational cost is essentially a measure of cost of fuel required for water heating. This fuel requirement varies during the year, depending upon the seasonal variations at a particular location. Hence fuel requirement needs to be computed separately for each of the seasons and their summation will provide annual fuel requirement, and then the fuel requirement over entire useful life can be computed.

Quantum of fuel required can be found using the energy balance i.e. the fuel energy input results into sensible heat addition to the specified mass of water to be heated. Further, the fuel cost will provide operational cost in case of conventional water heating. Thus operational cost computed for a day, can be used to compute seasonal operational cost. In case of SWHS, the operational cost is applicable for its configuration with a backup system consuming conventional fuel, which is typically required during monsoon season.

2. Estimation of Capacity and Cost of SWHS

This is similar to the module-2 discussed before, under subsection 9.1.4.

3. Estimations of Maintenance Cost

This is similar to the module-3 discussed before, under subsection 9.1.4.

Abovementioned three modules are used in computation of life cycle cost of conventional water heating and solar water heating. The NPV based life cycle cost of solar water heating and that of conventional fuel based water heating need to be compared to arrive at NPV of financing need of a user.

9.2.5 Quantification of Financing Need of Low income Group in Domestic-Rural and Domestic-Urban Users

The domestic-rural users from lower to middle income group, mainly use crop residue and waste wood as fuel, and *chulha* as an energy conversion or water heating system. The capital cost and maintenance cost are almost nil for *chulha*. The operational cost is entirely the fuel cost, and it constitutes the cost of crop residue and waste wood as main fuel and kerosene as a pre-ignition fuel. The quantum of fuel required can be computed using energy balance. The market cost for such fuel is used to compute cost of fuel saved.

9.2.6 Inputs to the Model

The following subsections present the values of different input variables used for the estimation of financing need of domestic-urban users with the standard hot water requirement of 125 litres per day for specified number of months in a year.

Climate inputs are same as those specified before in Table 9.4.

Table 9.9 Hot Water Usage Pattern

Consumer Category	Hot Bath Water Requirement per person (Litres)	Number of Persons at Consumer's Location
Domestic-Rural	15	7

Table 9.10 Technical Inputs to the Model

SWHS *	Backup of SWHS
2 m^2, 100 Litres	Conventional water heating system (Combustion of Wood waste & crop residue in *chulha*)
50% efficiency	22% efficiency

** Collector area has been estimated for the specified climatic conditions and hot water usage pattern and standard available tank capacity has been chosen.*

Table 9.11: Commercial Inputs to the Model*

Cost type	*Chulha*	FPC SWHS (2m^2, 100 Litres)
Initial cost (Rs.)	0	25564
Transport and Installation cost (Rs.)	0	3000
Existing One time maintenance cost (Rs.)	0	1000
Fuel Cost (wood waste and crop residue)	Rs. 1.5/kg	0

** Costs collected from MNRE, MEDA and Authorised Manufacturers and Dealers*

9.2.7 Quantified Financing Need of Domestic-Rural User

Table 9.12: Estimated Financing Need of Domestic-Rural User in Four States

State	Location	Annual Hot Water requirement (months)	FPC Area Required per Household (sq.m.)	Financing Need per Household for FY 2008-09 (Rs.)
Delhi	New Delhi	5	2	19,700
Karnataka	Bangalore	9	2	16,700
Maharashtra	Pune	8	2	17,200
Uttarakhand	Pauri Garhwal	9	4	26,120

*****_Financing Need in case of installation of FPC SWHS with Useful life of 16 years_

9.2.8 Financing Need of Industrial, Institutional and Large Commercial Users

These three segments can be discussed together as they have following common aspects.

- They have hot water requirement for all twelve months in a year;
- Their hot water requirement is difficult to standardise;
- They typically use three fuels for water heating, namely, wood waste, coal, or heavy oils.

With these considerations and other assumptions discussed in above sections, the financing need of large commercial and institutional user is estimated to be in the range of Rs 1,300 to Rs 5,000 per sq. m. of collector area and financing need of industrial user is estimated to be in the range of Rs 1,000 to Rs 5,100/ sq. m. of collection area.

9.3 Summary of Estimated Financing Need of Users to Switch over to SWHS

In this summary the estimations of Uttarakhand have been ignored as Uttarakhand is hill State, which is different than most of the other geographical locations in India.

Table 9.13: Summary of Estimated Financial Assistance Requirements of User Segments

User Segment	Existing Fuel	Hot Water Requirement (months/annum)	Temperature of Hot Water (deg. C)	Approximate Financing Need (Rs./sq.m. of collector area installed)*
Domestic (Urban and Rural users in middle and higher income groups)	Electricity	5 - 9	40 - 45	2,500-6,000
Domestic (Urban and Rural users in Low income groups)	Wood waste, crop residue	5 - 9	40 - 45	8,000-13,000
Commercial Users with small hot water requirement	Electricity	12	40 - 45	Nil
Commercial Users with large hot water requirement	Coal, Wood waste, Heavy oils	12	40 - 45	1,300-5,000
Institutional Users	Coal, Wood waste, Heavy oils	12	40 - 45	1,300-5,000
Industrial Users	Coal, Wood waste, Heavy oils	12	50	1,000-5,100

**Financing Need of Users in case of installation of FPC SWHS with Useful life of 16 years*

The next Chapter presents the estimated financing needs of SWHS manufacturers and supply chain.

10 FINANCING NEEDS FOR MANUFACUTRING & SUPPLY CHAIN

For increasing the penetration of SWHS in India and to meet the targets under Jawaharlal Nehru National Solar Mission, it is not only essential to design a financing mechanism to support the consumers but also it is equally important to provide adequate support to the manufacturers to improve the productivity of the existing manufacturing set-up, to improve the quality of the product, to enable new entrants in manufacturing of SWH and to bridge the gaps in the supply chain. In order to improve the manufacturing set-up, it is essential to understand the financing needs of the manufacturers and issues faced in meeting such financing needs. To understand the issues/hurdles faced by the manufacturers in improving the manufacturing process and improve supply chain, ABPS Infra conducted a field survey during Phase-II of the assignment. During this survey, we met with several the manufacturers of both FPC as well as ETC based systems to understand the manufacturing & supply chain processes and hurdles while raising finances for enhancing the manufacturing facilities and supply chain. While manufacturer's responses have been collated and presented in the Chapter 6, which is titled 'Results of Stakeholder Consultation Process', this chapter critically analyses the issues raised by the stakeholders in this regard and suggests potential solutions.

This Chapter begins with overview of manufacturing supply chain for SWH Systems and what constitutes the 'supply' in case of SHWS, be it FPC or ETC based systems. This chapter also identifies the financing needs of the manufacturers, which need to be analysed to develop appropriate financing mechanism.

10.1 Key Issues in Supply Chain Management of SWHS

Supply chain management (SCM) is the oversight of materials, information, and cash flows as they move in a process from supplier to manufacturer to wholesaler to retailer and ultimately to consumer. Supply chain management involves coordinating and integrating these flows both within and amongst companies. It is said that the ultimate goal of any effective supply chain management system is to reduce inventory (with the assumption that products are available when needed). Supply chain management flows can be divided into three main flows:

- The product flow
- The information flow

- The finances flow

The product flow includes the movement of goods from a supplier to a customer. The information flow involves transmitting orders and updating the status of delivery. The financial flow consists of credit terms, payment schedules, and consignment and title ownership arrangements. Supply chain is the indispensable requirement of any product or technology in the market. While all three components are important from the point of view of improving the supply chain processes for SWHS, this report deals with only those issues, which are related to product flow. Further, since aim of this Report is to identify the financing requirements of various players in the supply chain, we have looked at only those processes, which are associated with delivery of the product to consumers.

10.1.1 Lack of standards for Solar Hot Water Systems

One of the important aspects of the supply chain is what constitutes Product or in our case SWHS? In India, currently MNRE approves the manufacturers of ETC panels while BIS approves the manufacturers of flat plate collectors. However, no standards exist for either FPC systems or ETC systems. As a result, the products could be of differing quality and manufacturing standards. Non-existence of standards results in lowering the bar for entering into manufacture of SHWS, which results in non-serious, spurious or 'fly by night' operators entering the business of manufacturing of SHWS. Such non-serious players create grey market for the product and sell product at very low price, which creates pressure on established or serious players to reduce the manufacturing costs, which inadvertently results in lowering the standards of manufacturing.

Another consequence of the 'low cost – low quality' manufacturing is high rate of failure of the SWHS. This creates impression in the minds of users that SWH Systems don't work in reality, which results in further hurdles in deployment of SWHS.

In order to address these issues, it is desired that MNRE/BIS develop standards for Solar Water Heating Systems. These standards should encompass not only collectors but also other components such as water tank and piping. The standards should define quality of material as well as efficiency parameters such as collector efficiency, standing heat loss, etc. Further, MNRE should prescribe that only those systems, which have MNRE/BIS Certification, shall be eligible

for incentives. This will effectively force all non-serious players to seek MNRE/BIS Certification and maintain quality as required under the standard. This will help in development of healthy market.

10.1.2 Lack of mechanised manufacturing capacity

Given the low-tech nature of SWHS manufacturing which is essentially 'fabrication' and not 'manufacturing' in its true sense, barriers for entering the business of manufacturing SWHS are very low. Further, non-existence of standards for systems allows manufacturer to permit varying quality for the product. It does not put any pressure on manufacturer to maintain or improve the quality. As a consequence, he existing manufacturing capacity is significantly fragmented with hundreds of registered / un-registered manufacturers across the country. There are very few large-scale manufacturers with mechanised / automated facilities in the country. If India has to achieve the targets set under Jawaharlal Nehru National Solar Mission, large-scale mechanised/ automated, high-quality manufacturing capacity would be needed. Incentives under the scheme will have to be directed in such a manner that non-serious players will not have incentive to continue in the business.

10.1.3 Leakages in Supply Chain

In case of SWHS systems, primarily two channels are used for delivery of the systems to the consumer. First is the direct sale by the manufacturer to the user and second is through the dealer network. In case of SWHS, around 70–80% of the systems are sold through the dealer network and rest through direct sales by the company.

The dealer network rarely consists of dedicated suppliers of SWHS, as low volumes can't justify investments in dedicated dealer network. As a result, dealers are usually involved in sale of not only SWHS but also other equipments such PV systems, water handling equipments, etc. In some cases, some manufacturers mentioned that the dealers switch between manufacturers to get benefit of low cost product and higher margins. In some cases, dealers purchase only panels and install water tanks of their choice. As a result, manufacturer is not in a position to provide comprehensive warranty for operation of the equipment, which is very important from the point of view of consumer.

10.1.4 Lack of qualified installers

The SWHS are currently installed by the dealers with the help of plumbers, which are not specifically trained for installation of SWHS. These unqualified personnel are not able to maintain the quality of insulation, proper head etc. As a result, SWHS do not perform according to expectation. To improve the performance of the SWHS, it is necessary develop dedicated manpower for installation of SWHS. MNRE should start programme for identification, training and certification of installers. This will bridge the crucial gap in supply chain of the SHWS.

10.2 Key issues faced in SWHS Manufacturing in India and support required

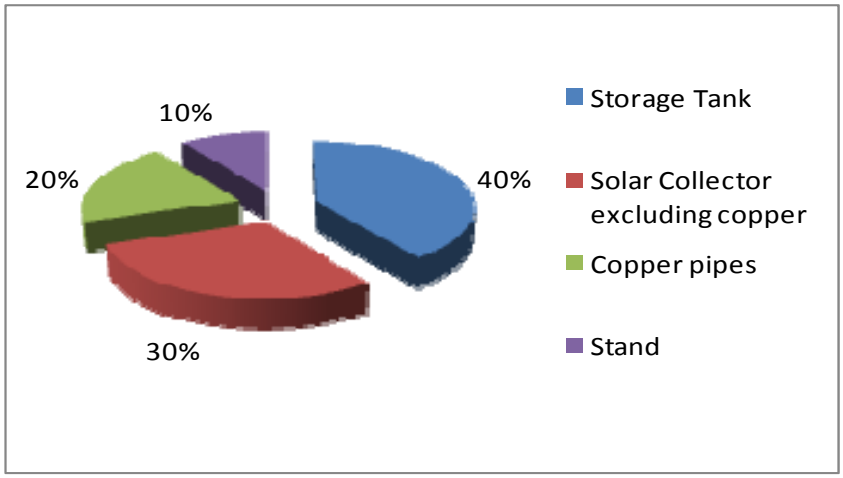
At present, in India, there are 63 approved manufacturers of Flat Plate Collectors (approved by Bureau of Indian Standards (BIS)) and 71 MNRE approved suppliers of Evacuated Tube Collector based systems. These manufacturers are eligible to supply Solar Water Heating Systems under the interest subsidy scheme. However, apart from the approved manufacturers, more than 200 suppliers of SWHS are available in the market. It is to be noted that the approved manufacturers are facing tough competition from these suppliers. Few of the suppliers are importing the systems from China and the cost of such systems is substantially lower as compared to SWHS manufactured and sold in India.

The raw material required for manufacturing FPC based system is readily available in India. The major components required for FPC based SWHS are as under:

- Hot water insulated storage tank
- Solar Collectors
- Header Pipe
- Riser Pipe
- Stand

The hot water insulated storage tank is made of stainless steel. The header and riser pipes used in SWHS are made of copper. The figure below represents the component wise breakup of the FPC based systems.

Figure 10.1: Component wise break up of FPC based system



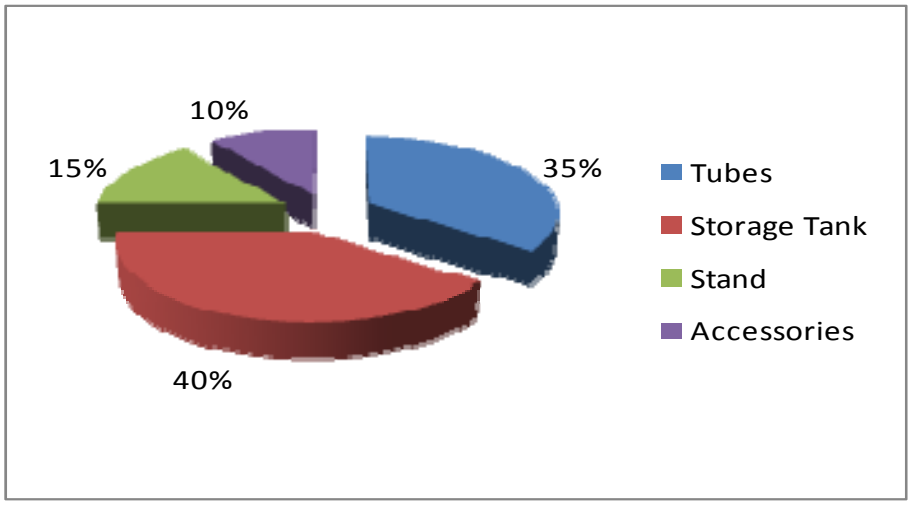
The figure shows that out of the total cost of the system, maximum cost contribution of 40% is of storage tank. The solar collector excluding copper contributes to 30% of the total cost. The other components of a FPC based system are stand and copper pipes that form around 10% and 20% respectively of the total system cost.

However, in case of ETC based system, the critical component are the tubes, which contributes around 35% of the total system cost. However, at present there is only one manufacturer of tubes for ETC based system in India namely M/s Borosil Glass Works Limited. Most of the other manufacturers of ETC systems are are importing tubes from China. The major components required for ETC based SWHS are as under

- Tubes imported
- Storage Tank
- Stand
- Accessories

The figure below highlights the component wise breakup of the ETC based systems.

Figure 10.2: Component wise break up of FPC based system



The figure shows that out of the total cost of the system, storage tank contributes to 40% of total system cost and accessories contribute as 10% of total system cost. As mentioned earlier, in India, at present there is only one manufacturer of evacuated tubes required for ETC systems. For promotion of ETC based system in India it is essential to establish manufacturing facilities for tubes in India. However, setting up such facility requires capital investment of approx. Rs. 50 Crore.

During stakeholder consultation process, discussions were undertaken with various manufacturers who opined that soft loans are available for capacity building and technology up-gradation for existing manufacturers, but there is no such scheme available for new players who want to set up manufacturing facilities.

Further, manufacturers are not getting adequate loan for bridging the gaps in the supply chain. Most of the manufacturers stated that, to raise funds for capacity building and technology up-gradation, they have to provide 100% bank guarantee for availing loan at a reduced interest rate of 5% and it is difficult to arrange such collateral. Further, process of availing such loan involves comprehensive documentation. Such a situation necessitates the development of a financing mechanism which could help manufacturers to establish the manufacturing facility for ETC and

FPC based systems in India. This will essentially involve providing the financial assistance to manufacturers of SWHS having higher efficiency, to improve the productivity of the existing manufacturing set-up, and to expand the market for SWH systems, in particular by establishing a supply chain for un-served areas.

10.3 Quantification of Financing Needs of Manufacturers and Support required

In order to promote the use of SWHS, there is a need to finance the manufacturers for expanding manufacturing facilities and also to strengthen the supply chain network. Therefore, there is a requirement to quantify the need, or the requirement of manufacturer to improve or enhance the production, quality etc. as per the customer requirements, and make the product efficient and reliable in the solar thermal market. The quantification of the financing needs is required for the following two major areas:

- New Manufacturing Facilities or Expansion of existing Manufacturing Facilities
- Strengthening Supply Chain Network

A. New Manufacturing Facilities or Expansion of existing Manufacturing Facilities

As discussed in Chapter 8, the total cumulative collector area is projected to increase to 9.52 million sq. mtr., by end of 12th five year plan i.e. up to 2017 as against the cumulative collector area of around 2.6 Million sq. mtr. in 2009. To meet the projected cumulative collector area till 2017, the manufacturing capacity for SWHS systems will have to be increased substantially either through setting up new manufacturing facilities or by expansion of existing manufacturing facilities. The increase in manufacturing capacity to meet the projected demand till 2017 is estimated at around 1.2 million sq. mtr. The year wise estimated increase in manufacturing capacity and investments required for increasing manufacturing capacity is given in the following Table:

Table 10.1 : Projected Increase in Manufacturing Capacity and Investments Required

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017	Total
Increase in Manufacturing Capacity (million sq.m.)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	**1.2**
Cumulative addition in Manufacturing Capacity (million sq.m.)	0.15	0.3	0.45	0.6	0.75	0.9	1.05	1.2	-
Investment required to increase Manufacturing Capacity (Rs. Crore)	8	8	8	9	9	10	10	11	**73**

B. Strengthening Supply Chain Network

In order to strengthen the supply chain network, the manufacturers will have to increase the number of dealers. Further, with increase in volume as per the projected demand, it will be preferable to have dedicated dealership for SWHS systems so that the manufacturers can train the dealer's staff and provide the comprehensive warranty to the consumers. The financial support required for strengthening the supply chain network is for the training/capacity building of dealer's staff by the manufacturer.

10.4 Suggested Financing Mechanism for Manufacturers

During the stakeholder consultation process, some of the manufacturers opined that soft loans are available for capacity building and technology up-gradation for existing manufacturers, but there is no such facility available for new manufacturers who want to enter into manufacturing of SWH business. As highlighted above, in order to meet the projected demand, the manufacturing capacity in the country needs to be enhanced and hence, it is essential that financing support is also extended on new manufacturers. Therefore, it is suggested that the existing mechanism of providing soft loans at 5% interest rate for capacity building and technology up-gradation may be continued with the modification that the soft loans shall also be provided to the new entrants entering into the market for setting up new manufacturing facilities.

The another important issue raised by manufacturers in order to raise fund for capacity building and technology up-gradation, they have to provide 100% bank guarantee for availing loan at a reduced interest rate of 5% and it is difficult to arrange collateral and their funds gets blocked with banks for the tenure of the loan.

It is preferred that for the new manufacturing facilities or up-gradation of existing manufacturing facilities involving purchase and/or installation of assets including Land, Plant & Machinery, the condition of 100% bank guarantee may be relaxed and instead of 100% Bank Guarantee, mortgage of the assets purchased and/or installed in the manufacturing facility may be considered.

11 QUANTIFICATION OF FINANCIAL ASSISTANCE

The financing needs estimated in Chapter-9 differ for various user segments depending upon the climatic condition and geographical location of the user. It will not be possible for MNRE to implement SWH promotional schemes with variable financing assistance to the users depending upon their location. Therefore, it is required to estimate the quantum of financing assistance that MNRE can provide uniformly to all the users in particular segment located across the States. This chapter presents a methodology for estimation of uniform financing assistance to be provided by MNRE and provides estimate of the same.

11.1 Methodology to Estimate Financial Assistance

The methodology to estimate the financing need of the SWHS user is presented in section 9.1 of this Report. Further, Table 9.13 shows that financing need of users in the same segment varies depending upon user's location. While financing need of the user may vary from location to location, it is desired that the quantum of assistance is determined in such a manner that it achieves the maximum impact in terms of collector area installed. Further, the quantum of assistance should satisfy the need of the users where maximum potential for SWHS has been identified.

The 'Market Assessment Study for SWHS in India' carried out under UNDP/GEF funded Global Solar Water Heating Project, (December 2009), projects that the domestic users in the five States shown in Table 11.1 will contribute up to 68% of total collector area installed in India by year 2022. Further, in non-domestic categories, these five States will contribute up to 55% of the total collector area. Further, out of these five states, Karnataka and Maharashtra are likely to contribute 46% of the total collector area installed for domestic urban segment during this period. These States have better insolation levels as well as hot water requirement over multiple seasons in the year. As a result, lower quantum of financial assistance for individual system is sufficient to make these systems financially viable. This would result in finite financial assistance being distributed to large number of individual users. Therefore, it will be appropriate to consider the financing needs of users in these States to calculate the financing assistance required by individual user.

Table 11.1 Shortlisted Representative States to Quantify Financial Assistance[6]

Sr. No.	State	Projection for Cumulative Collector Area in Domestic Segment (million sq.m.)	% Contribution in Domestic Segment	Projection for Cumulative Collector Area in Commercial and Institutional Segments (million sq.m.)	% Contribution in Commercial and Institutional Segments (million sq.m.)
1	Karnataka	3.72	24%	0.16	11%
2	Maharashtra	3.5	22%	0.31	22%
3	Tamil Nadu	1.53	10%	0.14	10%
4	Andhra Pradesh	1.08	7%	0.09	6%
5	Gujarat	0.9	6%	0.06	4%
Above Five States		10.73	68%	0.76	54%
All the States in India		15.74	100%	1.4	100%

The following tables, reproduced from Chapter-9, present the financing needs of different user categories located in the States of.Karnataka and Maharashtra. Table 11.2 shown below provides the estimated financing needs of domestic users who are currently using electricity for water heating.

Table 11.2: Financial Need of Domestic Users currently using electricity*

State	Location of User	Annual Hot Water Demand (months)**	Required number of Standard FPC of 2 sq.m. for 100 LPD system	Electricity Tariff for Domestic Users in FY 2008-09 (Rs/kWh)	Financing Need per SWHS User (Rs.)
Karnataka	Bangalore	9	1	3.4	**6,625**
Maharashtra	Pune	8	1	3.9	**5,086**

*** Financing Need in case of installation of FPC SWHS with Useful life of 16 years**
**** Market assessment study carried out by M/S Greentech Knowledge Solutions for MNRE, Dec.2009**

[6] *ABPS Infra's Analysis of data Obtained from the Market assessment study carried out by M/S Greentech Knowledge Solutions for MNRE, December 2009*

Table 11.3: shown below provides the estimated financing need of domestic users who are currently using non-electric water heating methods.

Table 11.3: Financial Need of Low Income Domestic Users in Representative States*

State	Location of User	Annual Hot Water Demand (months)**	Required number of Standard FPC of 2 sq.m. for 100 LPD system	Financing Need per User for FPC SWHS (Rs.)
Karnataka	Bangalore	9	1	**16,700**
Maharashtra	Pune	8	1	**17,200**

** Financing Need in case of installation of FPC SWHS with Useful life of 16 years*

*** Market assessment study carried out by M/S Greentech Knowledge Solutions for MNRE, Dec.2009*

As shown in Table 9.13 in Chapter-9, the financing need of large commercial and institution user is estimated to be in the range of Rs 1300 to Rs 5000/sq. m. of collector area and financing need of industrial user is estimated to be in the range of Rs 1000 to Rs 5100/sq. m. of collector area.

11.2 Proposed Quantum of Financing Assistance

From the financing need estimated above, following quantum of financing assistance may be provided to users in different segments.

Table 11.4 Financial Assistance Quantified for various Users in Representative States*

User Segment	Proposed Quantum of Financing Assistance per User (Rs.)
Domestic	Rs. 5,000 for 2 sq.m. of collector area
Domestic-Low Income Group	Rs. 10,000 for 2 sq.m. of collector area
Commercial (small SWHS installations)	Rs. 2500 for every 2 sq.m. of collector area
Commercial (Large SWHS installations)	Rs. 2500 per sq.m. of collector area
Institutional	Rs. 3000 per sq.m. of collector area
Industrial	Rs. 2500 per sq.m. of collector area

** Financing Assistance to be provided for FPC SWHS with Useful life of at least 16 years. Financing assistance for ETC systems will be lower by 30%*

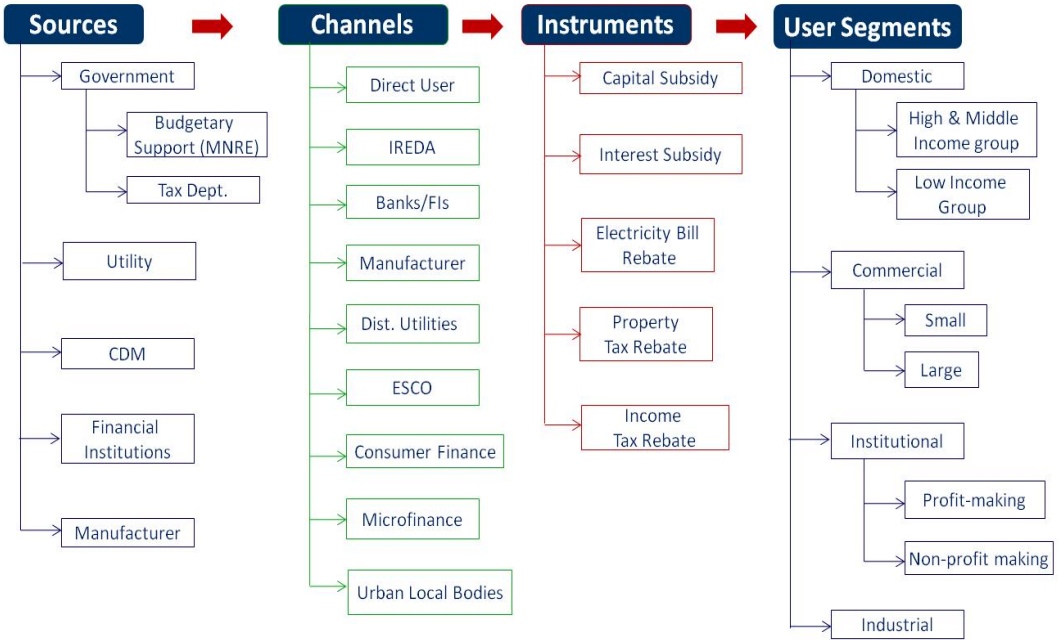
12 COMPONENTS OF FINANCING MECHANISM

As discussed in earlier Chapters, the SWHS buyers need financing assistance to reduce the burden of high capital cost of SWHS and make installation of SWHS financially viable investment. The Government of India will have to provide this financial assistance. The Government will have to identify appropriate mechanism to deliver this financial assistance to the targeted user segment. This chapter identifies the important constituents of financing mechanism, which are:

- Financing source: to ensure availability of fund;
- Delivery Channel: An intermediary to facilitate the fund flow from the financing source to the SWHS user;
- Financing instrument: An instrument used by an intermediary to deliver the financial assistance to the SWHS user.

The following figure shows the financing sources, channels and instruments, which have been identified and explored to provide financing assistance to different user segments.

Figure 12.1 Identified Constituents of Financing Mechanism



In the above figure, five financing sources, nine distribution channels and five financing instruments have been identified for further assessment. While assessment of sources of finance has been carried out in this Chapter, assessment of distribution channels and financing instruments has been carried out in subsequent chapters.

12.1 Assessment of Sources of Finance

In the subsequent paragraphs, detailed analysis of each source of finance has been carried out.

12.1.1 Government Support

Given that the nature of financial assistance would be some sort of subsidy, Government Support is the most certain and reliable source of finance. In this case, the Government is expected to create budget for provision of subsidies to SWHS users. This budget could be disbursed through different sources such as interest rate subsidy through banks, capital subsidy through IREDA or certified manufacturers, etc. The choice of distribution channel and instrument would be dependent on the circumstances and target users.

One of the ways, the Government can provide support is using tax provisions to provide financial incentive to the user. The financing assistance to eligible SWHS users can be given by providing waiver/rebate in income tax. MNRE has been exploring this option for last couple of years. However, as shared by the MNRE, while the Finance Ministry is willing to accommodate the resulting revenue loss, it has expressed major concern regarding need to develop new administrative framework to monitor such mechanism.

Further, it may be noted that implementation of Direct Tax Code, in order to simplify the tax procedures, is expected to remove many such benefits available to the taxpayer. Further, tax benefit can be availed by only those who pay taxes; as a result the benefit cannot be availed by the non-tax payers. The scheme would be limited to only taxpayers.

12.1.2 Utility Support

Installation of SWHS benefits utility as SWHS helps utility in reducing expensive power purchase during morning peak period. The utilities could share this benefit with the consumers. Even if it is assumed that there is no direct benefit of SWHS to the utility, the utilities can provide financial assistance to SWHS to support broader climate agenda as installation SWHS

certainly reduces GHG emissions. The utility can either provide one time upfront financial assistance or regular rebate in monthly utility bills. The amount spent in providing such support may either be recovered through annual revenue requirement or may be provided by the Government. In a separate study, ABPS Infra has carried out assessment of utility driven rebate mechanism for promotion of SWHS. This mechanism is not suitable for provision of upfront one-time incentive as this would lead to significant additional cost to other consumers of the utility.

12.1.3 CDM funding

Post Kyoto – Protocol, CDM funding has emerged as one of the important sources of finance for the projects, which are otherwise not financially viable. Given that installation of SWHS is not a viable solution to the user and therefore needs financial assistance, SWHS could be an excellent case for funding under CDM. However, CDM Project Development is a lengthy, expensive activity which is also fraught with risk that the ultimately the project may not get funded. Only eight CDM projects based on SWHS have been proposed to UNFCCC and all of these projects are at validation stage. For no project, CERs have been issued. Further, given that one SWHS replaces only about 1.5T of CO2, standalone CDM project using SWHS technology cannot be developed.

It is necessary to adopt 'Program of Activities' methodology to develop CDM Project using SWHS technology. Out of eight projects mentioned above, four CDM projects are using 'Program of Activities'. Typically, CDM project takes 2-3 years for issuance of CERs. Hence currently CDM framework is an uncertain source of finance.

Further, SWH users are eligible to receive such CDM benefit only after installation of SWHS and validation of the performance of the System. Therefore, CDM revenue may enhance the viability of SWH for its users/owners, but certainly it will not be available to SWHS buyer at the time of purchase to reduce the upfront burden of high capital cost of SWHS. Under such circumstances CDM revenue cannot be considered as a reliable source of financing.

12.1.4 Financial Institutions/ Banks

In theory, financial institutions/ banks can be source of finance. However, in practice such funding will be at the cost of high lending rates to other customers, which would make the

institution uncompetitive. As a result, banks/ financial institutions are more likely to play role of distribution channel than source of finance.

12.1.5 Manufacturer

Similarly, manufacturers cannot provide financial assistance to make systems viable for SWHS user. However, they can act to be intermediary for distribution of finances.

12.1.6 Conclusion

From the above discussion it can be safely concluded that the budgetary support from the Government is the most certain and reliable source for financial assistance for promotion of SWHS in India. Hence, in subsequent discussions, government support is the only source of financing which has been considered.

12.2 Criteria for Assessment of Financing Mechanisms

The combination of the four i.e. source, distribution channel, instrument and a user segment/category creates a financing mechanism. Given that, five sources of financing, nine distribution channels and five instruments have been identified, several combinations of these are possible. While some of these are not legally possible mechanisms, several others are legally possible and would have to be evaluated on the basis of certain criteria, It is proposed to evaluate these mechanisms on the basis of 'hurdles' which these address. Following is the list of common hurdles, which are encountered by the SWHS user.

- High initial Cost of SWHS;
- Inability to raise finances;
- Scarcity of cost-effective and easy loans;
- Financially unviable in comparison with conventional water heating;
- Lack of awareness about SWHS technology;
- Non-availability of equipment.

In subsequent chapters, the feasibility of financing mechanisms has been assessed using the criteria developed in this Chapter.

13 ASSESSMENT OF FINANCING INSTRUMENTS

In this Chapter, suitability of various financing instruments mentioned in Chapter-12 has been assessed. This assessment is independent of possible financing sources and financing channels. At the end of this Chapter, analysis of financing instruments and their suitability for various user segments has been assessed,

The instruments analyzed in this chapter are:

- Capital Subsidy
- Interest Subsidy
- Electricity Bill Rebate
- Property Tax Rebate
- Income Tax Rebate

In subsequent paragraphs, each of these instruments has been analysed in greater details.

13.1 Capital Subsidy

Capital subsidy is a monetary assistance, which is provided upfront to the SWHS buyer so as to provide a relief from burden of high capital cost of SWHS.

While any person may provide the Capital Subsidy; in the context of financial incentives for SWHS by Governments, capital subsidies have been provided by the Governments at various levels. The three levels at which the subsidy is provided are:

1. Central Level
2. State Level
3. Local Level / Urban or Rural Local Body

Worldwide, capital subsidy is the prime instrument used for promotion of SWHS. The salient features of the typical capital subsidy scheme are:

- High Capital cost has been the barrier for SWH technology across all the user segments, and therefore capital subsidy is an effective to address this barrier.
- However, capital subsidy does not address barrier of 'Inability to raise finance' adequately;

- Capital subsidy increases upfront burden on the Government but reduces the administrative burden in the long run.
- Subsidy schemes could be developed and implemented by the governments at different levels. These schemes could be either exclusive or additional.
- Usually these schemes are run independently with differing objectives.
- Usually, more susceptible to malpractices, hence strong mechanism of checks & balances is required.

13.1.1 Suitability of Capital Subsidy for Domestic Users

Typically, domestic user in India uses SWHS with collector area of 2 sq.m., which produces 100 LPD of hot water. This quantity of hot water satisfies the requirement of family of a domestic user. The cost of FPC based SWHS is around Rs. 25,000. Reduction in upfront capital cost due to receipt of subsidy is likely to make these systems more affordable. Hence, financial assistance in the form of upfront capital subsidy is considered as the most suitable instrument.

13.1.2 Suitability of Capital Subsidy for Non-Domestic Users

The daily hot water requirement of most of the non-domestic users is high and difficult to standardise. Their high hot water LPD requirement demands bigger SWHS installation and results in high capital outlay. Even with a fair quantum of upfront capital subsidy, the burden of capital cost does not get relieved substantially for such buyers. The buyers look forward to support to raise finances to install solar water heaters. Therefore, capital subsidy seems to be inadequate form of financing assistance for non-domestic users.

13.2 Assessment of Interest Subsidy

Interest subsidy reduces the rate at which the loan is availed by the users and thus relieves the burden of high capital cost of SWHS for its buyer, without significantly hampering the viability of SWH. In India, interest rate subsidy scheme is currently in operation for domestic category consumers. However, this scheme is not very effective. Following are the salient features of typical interest rate subsidy scheme:

- Soft loans are provided through identified banks and financing institutions.
- Banks follow their usual credit assessment processes.

- Government acts as financing source and compensates the banks for difference between normal lending rate and reduced interest rate
- Difference may be provided either upfront or over the duration of loan;
- Both the barriers of financial viability of SWHS and inability to raise finance while purchase of SWHS; can be effectively addressed by the interest subsidy;
- Banks and financing institutions (FIs) with large network are required;
- Banks and financing institutions set their individual prime lending rate (PLR) and interest subsidy on the basis of their PLR will be an attractive proposition for banks and FIs to participate in interest subsidy;
- Interest subsidy involves higher administrative cost for banks/FIs to manage the account with small loan amount for entire duration of the loan;
- The borrowers need to complete a comprehensive documentation for e.g. 'know your customer' (KYC) from lending bank/financing institutions.

13.2.1 Suitability of Interest Subsidy for Domestic Users

Usually, SWHS with collector area of 2 sq.m. and capacity of 100 LPD fulfils the hot water demand of domestic users. Such system usually costs around Rs. 25,000, which is a very small loan amount for a bank/FI.

- Administrative cost for banks/FIs is higher in case of such small size of loan, which has been discouraging many public and private sector banks/FIs from participating in scheme.
- Existing interest subsidy scheme assumes uniform PLR for all the participating banks/FIs, which is sometimes lower than the contemporary PLRs of the bank/FI;
- Loan for purchase of SWHS falls under term lending requiring performance of all credit assessment procedures.

From the above discussions, it is obvious that interest subsidy is not preferred instrument for provision of financial assistance/ subsidy to domestic category consumers.

13.2.2 Suitability of Interest Subsidy for Non-Domestic Users

The hot water requirement of the non-domestic user is high and difficult to standardise. Their high LPD requirement demands bigger SWHS installations and hence higher capital cost for a buyer. Therefore, these users seek large quantum of loan from banks/FIs. These loans are typically profitable proposition for banks/FIs due to low average administrative cost.

13.3 Assessment of Electricity Bill Rebate

The electricity bill is charged by the power distribution Utilities to its consumers. The tariff rates differ across various consumer categories. Typically the tariff for domestic consumer category is low and higher tariffs are applicable for non-domestic consumers, in particular the commercial and industrial consumer categories. Further, Utilities in some of the States in India, have acknowledged the correlation between timing of electric water heating and Utility's morning peak demand and hence Utilities and SERCs are promoting the use of solar water heating in their area of operation. Use of SWHS results into shaving off the morning peak demand and avoids expensive power purchase and thereby avoids new generation capacity addition. Utilities share the accrued DSM benefit with its consumers using SWHS in return of consumers' investment in capital cost of SWHS. The DSM benefit is shared by Utility in the form of a fixed rebate in consumer's monthly electricity bill. Most of the Utilities provide rebate only to its domestic consumers. The following table summarises rebates provided by different Utilities in different States.

Table 13.1 Electricity Bill Rebate across various States in India

State	Electricity Bill Rebate
Assam	Rs. 40/month
Rajasthan	15 paise/kWh saved
Haryana	Rs. 100 for 100-200 LPD RS. 200/200-300 LPD Rs. 300 for 300 LPD & more
Karnataka	50 Paise/ kWh saved
Uttarakhand	Rs. 75/month
West Bengal	40 paise/ kWh saved to max. of Rs. 80

13.3.1 Salient Features of Electricity Bill Rebate

Though a few utilities provide rebates for installation of SWHS, most utilities don't. Hence MNRE has carried out a separate study in 2009-10, with assistance from ABPS Infra, on 'Designing the Scheme and Framework for Promotion of Solar Water Heating Systems by Utilities and Regulators'. The study has argued in favour of such rebate and has proposed electricity bill rebate as preferred form of assistance, which Utilities should provide to consumers using SWHS. Salient features of the scheme are:

- Utility will provide rebate through monthly electricity bill of its consumer, after the verification of SWHS installation at the consumer's location;
- The Utility rebate may enhance the financial viability of SWH for its owner but it will not be available at the time of purchase of SWHS and hence will not reduce the burden of high capital cost of SWHS;
- The amount of rebate will be decided by Utility with approval of respective SERC.

One of the concerns about this scheme is that Utility and SERC will not be keen to provide rebate to those consumer segments which are currently using non-electric means for water heating, such as wood waste, cow dung, heavy oil and coal. For e.g. Utilities may not provide rebate to user segments such as domestic-rural users, industrial users etc.

13.3.2 Suitability of Electricity Bill Rebate for Domestic Users

Usually SWHS with collector area of 2 sq.m. and 100 LPD fulfils the hot water demand of domestic users in a geographical area can be standardised and electricity saving and hence the resulting DSM benefit for Utility can be estimated with high confidence level. The electricity bill rebate can be some portion of this DSM benefit accrued by Utility. Such rebate is likely to considerably enhance the financial viability of SWHS for domestic users.

13.3.3 Suitability of Electricity Bill Rebate for Non-Domestic Users

Non-domestic consumers of Utility are less likely to use electric water heating due to their high tariff rate and hence more likely to use non-electric means such as waste wood, coal, heavy oils etc. Hence Utility may be reluctant to provide rebate to its non-domestic consumers.

- Non-domestic users usually have high hot water requirement, which is difficult to standardise. Hence it is difficult to estimate possible DSM benefit for Utility due to use of SWHS by its non-domestic consumers, even if they are using electricity for heating water.

- Even if Utility provides rebate to the non-domestic users, it may not facilitate SWHS installation as the primary hurdle faced by these consumers inability to raise finances.
- Thus, electricity bill rebate may not be adequate financing support for non-domestic users.

13.4 Income Tax Rebate

Typical features of income-tax rebate scheme for domestic SWHS are as follows:

- Government levies income tax as per provisions of the Income Tax Act 1965.
- Government may incentivise SWHS users by allowing investment in SWHS as eligible investment under Section 80(c).
- The rebate will not be useful in reducing the financial burden of high initial capital cost.

13.4.1 Suitability of Income Tax Rebate for Users

- Market for SWHS might get limited only to the taxpaying users. For e.g. considerable portion of domestic segment does not fall within tax bracket and hence will not receive the financing assistance.
- Also in case of non-domestic users, non-profit making institutional segment will not be eligible to receive the income tax rebate;
- Benefit will be subjected to tax liability on the person and changes in the laws;
- Difficulties to develop mechanisms for verification by individual user.

13.5 Property Tax Rebate

Property tax is levied by the local authorities such as Municipal Corporation, which levy the tax on property owners in their designated area. Further, a few State Governments have issued orders to their Municipal Corporations to promote SWH by providing a rebate in annual property tax to the property owners with SWHS in their designated area.

Table 13.2 Property Tax Rebate across various Municipal Corporations

Name of Municipal Corporation	Rebate in Annual Property Tax
Thane (Maharashtra)	10%
Amaravati (Maharashtra)	5%
Navi Mumbai (Maharashtra)	Proposal
Durgapur (West Bengal)	10%

13.5.1 Suitability of Property Tax Rebate for Users

- Property owner is not always the SWHS owner/user. Hence, property tax scheme may not be effective in such cases.
- Each ULB has its own mechanism for property tax, as a result quantum of property tax would vary from one ULB to another;
- ULBs do not receive direct benefit from installation of SWHS, hence ULBs may not be keen to provide this rebate;
- Though this instrument will increase viability of SWHS, it is unlikely to provide adequate financial support;
- Success of 'Property Rebate Scheme' depends entirely on the diktat of the State Government;
- The provisions are required to compensate the ULB for loss of revenue.

13.6 Summary

From the discussion in this Chapter, it can be concluded that a particular financial instrument can be more favourable and offer unique advantage for promotion of SWHS in a particular user segment. The findings of the analysis is summarised in the table below.

Table 13.3 Summary of Feasible Combinations of Financial Instruments and User Segments

Fin. Instrument / User Segment	Domestic	Commercial	Institutional	Industrial
Capital Subsidy	Most Effective	Less Effective	Less Effective	Less Effective
Interest Subsidy	Less Effective	Most Effective	Most Effective	Most Effective
Electricity Bill Rebate	Most Effective	Less Effective	Less Effective	Less Effective
Property Tax rebate	Effective	Effective	Effective	Effective
Income Tax rebate	Effective	Effective	Effective	Effective

14 ASSESSMENT OF FINANCING CHANNELS

In this Chapter, initially the distribution channels identified in earlier Chapter have been discussed in detail. The discussion not only covers primary mode of operation but also includes advantages and disadvantages of using a particular channel for a particular user segment or for particular instrument. For e.g. while 'Directly to User' could be used by the Government for distribution of capital subsidy; it will not be practical for the Government to use this channel, as it would involve huge administrative costs. If Government wishes to provide financial assistance directly to the user, rebate in tax may be better mechanism. At the end of the Chapter, feasibility of deploying these distribution channels for different user segments has been discussed.

14.1 Financing or Distribution Channels

In this Chapter, following distribution channels have been discussed. It may be noted that the terms 'financing channels' and 'distribution channels' have been used interchangeably. Both the term referred to mode of delivery of financial assistance to users.

- Directly to Users
- MNRE certified Manufacturers
- Distribution Utilities
- Banks/Financial Institutions
- IREDA
- ESCO
- Consumer Finance
- Microfinance
- Urban Local Bodies

These Channels have been described below.

14.1.1 Directly to Users

The Government of India may provide financial assistance to every user of SWHS. However, to implement such a scheme huge administrative support would be required. Further, resource intensiveness of monitoring and verification processes make this channel less attractive for all the user segments.

The Government can provide financing assistance to SWHS buyer from any segment through the tax department of the Finance Ministry. The entities, domestic and non-domestic, which are liable for tax payment, will be eligible to receive the financial assistance channelled through Finance Ministry.

14.1.2 MNRE Certified Manufacturers

In this case, the Government may provide financial assistance or subsidy through the manufacturer. The government may register or certify the manufacturer to be eligible to operate this scheme. Further, the government may place certain obligations on those manufacturers who would like to participate in the scheme. Considering that manufacturers will have access to all potential users of SWHS, this is an excellent mechanism for all user segments. Some of the advantages and/or limitations of this channel have been presented below:

- **Advantages**:
  - An effective channel to can ensure that financial assistance reaches every SWHS user;
  - SWHS complying with quality and performance standards specified by MNRE, will be available to the buyers/users at competitive price;
  - Excellent opportunity for the Government to organize the manufacturing sector of SWHS and enforce quality standards;
  - Interest of the manufacturer and the Government are in sync as both would like to promote SWHS, hence it is likely to be the most effective channel.
- **Limitation:**
  - Significant 'checks and balances' are required for effective implementation of scheme.

14.1.3 Power Distribution Utilities

In this case, funding could be routed through the distribution utilities, which are mostly government owned entities. Following advantages make Utilities a suitable financing channel for all the user segments.

- Power distribution Utilities have the widest reach and network, larger than any other type of channel listed above.
- Most, if not all users are likely to be the consumers of electricity. Thus most of the potential buyers/users for SWHS have commercial relationship with a Utility.

- The cost of providing financing assistance for MNRE will likely to be low since Utility's existing infrastructure and processes can be leveraged by MNRE to provide financing assistance to SWHS buyers/users connected to Utility's network.

However, following are limitations of using this channel for provision of financial assistance:

- Power distribution Utilities are tightly regulated institutions with functions defined in the Statute. Provision or channelling of capital subsidies is not one of the functions assigned to the distribution utilities. As a result, it will be difficult to get them to adopt this function.
- Primary function of utilities is to supply electricity. Traditionally, supplying more electricity would be their main objective. Promotion of SWHS, which reduces consumption of electricity, runs contrary to the primary business function.

In the following paragraphs, suitability of the utilities for particular instrument has been assessed in detail.

Suitability of Utilities to facilitate Capital / Interest Rate Subsidy

Most of the Distribution Utilities in India are public sector entities; hence, Government may be able to direct such Utilities to take up task of routing capital/interest rate subsidy to users. Apart from abovementioned factors, which affect the viability of routing capital/interest rate subsidy, following factors also need to be taken into consideration.

- Given poor credit worthiness and piling deficits of most Utilities, banks or financing institutions will be reluctant to venture with Utilities in such effort.
- Due to poor operational efficiencies and procedural hassles, the end users may not receive desired financing support on time and with adequate comfort.

Suitability of Utilities to facilitate Electricity Bill Rebate

Use of SWHS provides considerable DSM benefit to Utilities of SWHS users and Utilities may share this DSM benefit with its consumers using SWHS in the form of rebate in monthly electricity bill. Further, MNRE may provide funds to Utilities to provide such rebate. Utility rebate is the best mechanism to provide the financial assistance to the SWHS users. Utilities can play instrumental role due to following factors.

- Utilities have the widest reach among all the identified channels;
- Uniform interface with users across all Utilities across India;

- Their business is highly regulated;
- Utilities are likely to be receptive to the idea of rebate as SWH enables Utility to reduce the expensive power purchase and thereby in reducing Utilities' losses and tariff rates, which will improve their tariff-competitiveness.
- SERCs are likely to encourage and facilitate the rebate scheme as SWH enables Utility in providing better service to its consumers and reduce the power purchase cost for Utility which may reduce either tariff or load shedding;

There is no apparent limitation/disadvantage in Utilities providing rebate in the electricity bill to its consumers using SWHS.

14.1.4 Banks/Financing Institutions

Banks/FIs are specialised institutions to provide financing assistance. These institutions can understand and estimate the risks associated with different forms of financing assistance for different user segments. These banks can ensure that financing assistance reaches the potential buyers for SWHS across all user segments.

Currently, many PSU banks are participating in the interest rate subsidy programme of the MNRE. Complete discussion on interest rate subsidy programme can be found in earlier chapters of this report. The banking channel offers following advantages for channelling financial assistance to the SWHS users:

- Banks have wide network across length and breadth of the country;
- Banks have good reach to potential SWHS users;
- Most non-domestic SWHS users are likely to have banking relationship for their other activities. This is helpful to the banks in risk assessment.

However; certain drawbacks have been observed over a period of time, in particular for domestic users of SWHS.

- The small ticket size of loan results in very high administrative costs for bank. As a result many private sector banks and a few PSU banks have been reluctant to participate in interest subsidy.
- Banks/FIs follow 'term lending' policies for loan against purchase of SWHS, as a result the process is subjected to significant checks and KYC procedures;

- Contrary to perception, NPAs in SWHS category are very high;
- Only 15% of new installations avail interest subsidy.

From experience of interest rate subsidy scheme, it can be safely concluded that while banks offer effective channel for distribution of financial assistance, it is necessary to appropriate incentive mechanism for banks to participate in the scheme.

14.1.5 IREDA

IREDA is a specialised institution to provide financing assistance to renewable energy projects. Further, Government has entire control over its operations. As a result, Government could make effective use of the institution to implement its policies. However, IREDA is located in New Delhi and lacks network necessary for access to retail consumers. As a result, IREDA cannot implement any scheme on its own which requires access to retail consumers. However, IREDA could provide financial assistance to large users of solar water heating.

14.1.6 Energy Services Companies (ESCO)

ESCO Model envisages that ESCO will install SWHS and will provide hot water as a paid service. ESCO is not the end user, it is the buyer of SWHS. In this case, the technical and operational risks associated with SWHS are taken over by specialised agency i.e. ESCO. However, risks associated with financing of the project are not automatically mitigated by ESCO model. Rather, ESCO faces the same financial risks as those faced by the ultimate user of hot water. It may be noted that the ESCO is a profit-making entity and not a channel for the Government to provide financing assistance to the buyers of SWHS.

In order to expand the market for SWHS, it is necessary to develop different models including different types of ESCO models. As a result, it will be necessary to design mechanisms to provide financial assistance to ESCOs.

14.1.7 Consumer Finance Companies

Consumer finance is regarded as a channel to provide comfortable and easy financial assistance to the buyers of goods. Consumer finance is typically provided by Non-Banking Finance Companies (NBFCs), which usually tie up with manufacturers of goods and make the finance available at the dealership or retail outlets of the manufacturers.

This channel has completely changed buying patterns in India especially in case of automobile segment. More than 70% cars are currently sold through loans. Branded consumer durables with standard design such as refrigerators, colour TVs, air-conditioners, etc. are sold through consumer finance.

- Consumer finance is typically provided by the non-banking financial companies (NBFCs) such as GE Capital, Bajaj Capital, etc. These entities borrow money from banks or other financing institutions. Hence the lending rates of consumer finance are higher than the bank PLR by 200-300 basis points. Therefore the cost of their loan in terms of lending rate is more than that of the banks. Hence the cost to Government while providing the soft loan increases.
- Consumer finance does not use 'term lending' policies but provide short term finance against mortgage of purchased equipment;
- Manufacturers provide discount which is adjusted by consumer finance institutions towards interest payable by a buyer;
- Currently consumer finance industry is in doldrums with most consumer finance companies being shut and up for sale.

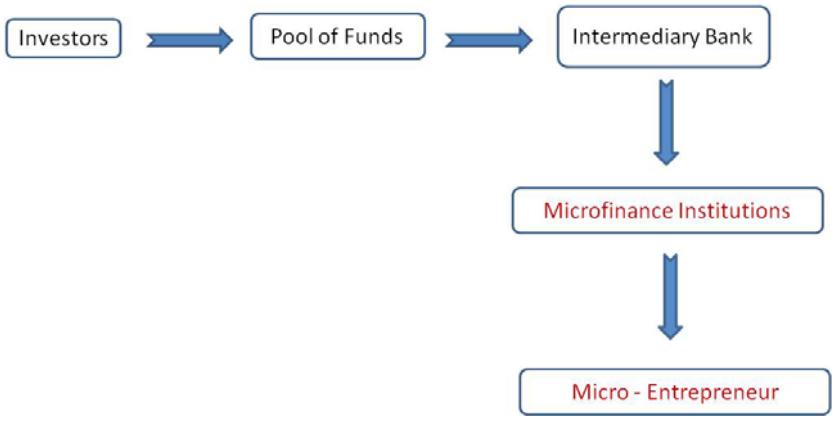
In theory, this channel can be used to provide financing assistance to retail users. However, it may be noted that currently SWHS are supplied through dedicated dealerships and not through consumer goods outlets. Further, on many occasions, while collectors are supplied by a manufacturer; tanks are supplied by another manufacturer. As a result, it is not one system that can be financed by the consumer finance companies.

Further, since the consumer finance companies borrow money from the banks, their lending rates are usually way higher than that of banks. As a result, in view of the user, this channel shall be much more expensive than bank. Hence it can be concluded that Government should not choose consumer finance as a channel to provide any kind of subsidy.

14.1.8 Microfinance Institutions

Microfinance is a specialized channel through which access to finance is provided for the purpose of creating earning potential. Microfinance is the most suitable for the poor and low - income entrepreneurs, who can be termed as micro-entrepreneurs. The investors and banks

lend the fund to microfinance institutions (MFIs). The fund flow to the loan seeker can be seen from figure below.



The infrastructure of MFIs may be leveraged to facilitate Government's capital and interest subsidy. Following discussion provides features of microfinance channel.

- **Relevance of Microfinance:**

Microfinance has been able to address the need of the poor and low income entrepreneurs. The commercial entities are not willing to lend them, due to following reasons.

- No collateral is available with these debtors; which increases risk for commercial financing institution;
- Difficult for commercial lending institutions to generate KYC documents for such customers;
- Their very low-income levels increase the risk for commercial lending institution.

- **Principles of microfinance:**
  - Usually microfinance is provided to the joint liability group of borrowers and not as the individual lending. This minimizes risk of lending.
  - Virtually all customers are woman.
  - MFIs provide lot of training with weekly meetings.
  - Repayment of loan is in the form of small instalments – typically weekly.
  - Small loan duration which rarely longs for more than one year.

- **Drawbacks of Microfinance for promotion of SWHS**
  - As shown in figure above, MFIs borrow money from other kinds of lenders in the market such as banks, or private investors. Therefore the lending rates of microfinance are higher than the commercial lenders and in the range of 24-30%. This lending rate of MFIs includes following.
    - Lending rate of MFI's lender such as bank/investor;
    - Risk of non-collateral loan for MFI;
    - Cost of weekly meetings and training conducted by MFIs;
    - Profit margin for MFI, in case it is intended to.

  - Further, the small loan durations of one or two years for loan repayment to MFIs will not be suitable for interest subsidy for SWHS.

Due to all above reasons microfinance will be an expensive channel for Government to facilitate its interest subsidy and well as capital subsidy.

14.1.9 Urban Local Bodies

The Government can provide financing assistance to SWHS users in any segment through urban local body (ULB). The entities, domestic and non-domestic, located in the area of ULB could get financial assistance through that ULB. The assistance could be in the form of rebate in taxes or straight upfront subsidy. However, given likely procedural bottlenecks at ULBs, this channel is likely to be time consuming and susceptible to malpractices. Further, if the scheme is designed with ULB as a channel partner, Government will have to develop separate channel for rural consumers, as ULBs have access to only urban consumers.

Further, ULBs pose different type of implementation challenge. Each ULB has statutory powers to set its bye-laws for buildings. As a result, each ULB need to amend its bye-laws for incorporation of any subsidy or financial assistance scheme for SWHS. As a result, any scheme which is dependent on each ULB amending its bye-laws is likely to have limited success. As a result, this makes ULBs an impractical channel for provision of financial assistance for SWHS.

14.2 Summary

From the discussion in this Chapter, it is obvious that a particular channel for distribution of financial assistance can be more useful in case of certain types of user segments and of no use in other types of users. The table below provides synopsis of the finding regarding usefulness of the channels vis a vis user segments identified for SWHS market.

Table 14.1 Summary of Suitable Combinations of Financing User Segments and Channels

User Segment / Channel	Directly to Users	MNRE certified Manufacturer	Distribution Ulitity	Banks/Financial Institutions	IREDA	ESCO	Consumer Finance	Microfinance	Urban Local Bodies	Finance Ministry
Domestic	-	√	√	√	-	-	√	√	√	√
Commercial	-	√	√	√	√	-	√	-	√	√
Institutional	-	√	√	√	√	-	√	-	√	√
Industrial	-	√	√	√	√	-	√	-	√	√

Similarly, it can be noted that not all distribution channel support all types of financial instruments, rather some of the instruments can be supported by only specific distribution channel, for e.g. rebate in property tax can be offered by only urban local bodies. Similarly, for some instruments, a few channels are clearly more competitive as compared to other channels, for e.g. while interest rate subsidy could be routed through banks, utilities as well as directly to users, bank is likely to be the most preferred distribution channel. The following table provides mapping of the distribution channel against financial instruments.

Table 14.2 Summary of Suitable Combinations of Financing Instruments and Channels

Instrument \ Channel	Directly to Users	MNRE certified Manufacturer	Distribution Ulitity	Banks/Financial Institutions	IREDA	ESCO	Consumer Finance	Microfinance	Urban Local Bodies	Finance Ministry
Capital Subsidy	-	√	-	-	√	-	-	-	√	-
Interest Subsidy	-	-	-	√	√	-	-	√	-	-
Electricity Bill Rebate	-	-	√	-	-	-	-	-	-	-
Property Tax rebate	-	-	-	-	-	-	-	-	√	-
Income Tax rebate	-	-	-	-	-	-	-	-	-	√

In the next Chapter, the financing mechanisms have been developed as combinations of financing channels and instruments feasible for a given user segment, as identified through the discussion in this chapter and the previous two chapters. The assessment of these financing mechanisms is useful to arrive at feasible financing mechanism.

15 PROPOSED FINANCING MECHANISMS

In this Chapter, an attempt has been made to identify financing mechanisms suitable for promotion of SWHS in India. On identification of these mechanisms, analysis has been carried out to identify the most suitable mechanisms, which may be adopted by Ministry of New and Renewable Energy.

15.1 Options for Financing Mechanisms

The financing sources, channels and instruments have been discussed in last three chapters of this Report. In the last Chapter, we had mapped distribution channels against financial instruments as well as user segments. In the following table, an attempt has been made to map distribution channels against both user segments and financial instruments to identify the feasible financial mechanisms for promotion of Solar Water Heating Systems in India.

Table 15.1 Summary of Potential Financing Mechanisms for SWHS Promotion

User Segment / Financing Instrument	Capital Subsidy from Central Govt.	Interest Subsidy	Electricity Bill Rebate	Property Tax Rebate	Income Tax Rebate
Domestic-Urban	MNRE certified Manufacturers	Utilities Banks/FIs Consumer Finance Microfinance	Utilities	ULBs	Income Tax Dept., Finance Ministry
Domestic-Rural	MNRE certified Manufacturers	Utilities Banks/FIs Consumer Finance Microfinance	Utilities	ULBs	Income Tax Dept., Finance Ministry
Commercial	MNRE certified Manufacturers	Utilities Banks/FIs Consumer Finance	Utilities	ULBs	Income Tax Dept., Finance Ministry
Institutional	MNRE certified Manufacturers	Utilities Banks/FIs Consumer Finance	Utilities	ULBs	Income Tax Dept., Finance Ministry
Industrial	MNRE certified Manufacturers	Utilities Banks/FIs Consumer Finance	Utilities	ULBs	Income Tax Dept., Finance Ministry

While the above table depicts several potential financing mechanisms, it will not be cost-effective for MNRE to implement some of these mechanisms for e.g. interest subsidy channelled

through consumer finance. Therefore, it is necessary to identify the suitable financing mechanism for each user segment.

It is apparent that for MNRE, capital subsidy and interest subsidy are the prime financial instruments under its direct control. The other financing instruments such as Utility rebate and tax incentives are beyond the jurisdiction of MNRE. Further, these subsidies are the only two financing instruments, which can reduce the upfront burden of high capital cost of SWHS on the domestic users. Hence, in this Report, we have considered only these two instruments. It is suggested that MNRE adopts advocacy role in case of remaining instruments and actively pursue with appropriate players regarding implementation of these instruments. In case, any other mechanism is adopted by other agencies, it will give further push for deployment of SWHS in the jurisdiction of that agency.

In the subsequent sections, we have assessed the suitability of potential financing mechanisms using two instruments i.e. interest rate subsidy and capital subsidy. At the end of the chapter, we have summarised the most appropriate financing mechanisms for each user segment. We have also provided the comparison of proposed financing mechanisms with the financing mechanisms currently used by MNRE.

15.2 Financing Mechanisms for Domestic Users

Domestic segment consists of disparate set of consumers with varying levels of incomes, different habits, and spread over large area across the country. As a result, one single financing mechanism will not be sufficient to address the needs of all members of this user segment. At the same time, it will not be possible to design and implement financing mechanism for each type of user within domestic category. Theoretically, it is possible to divide domestic users using different criterion such as geographical area, language, education, income level, etc. However, given the purpose of the categorization i.e. development of financing mechanism, it would be the most appropriate to identify the consumers on the basis of income level.

Therefore, in the discussion below, we have categorized domestic users on the basis of income levels and the financing mechanisms have been identified for each category within the domestic user segment. Typically, domestic users are classified into three categories viz. high income, middle income and lower income group. It is believed that no financing schemes are required

for high-income group users. However, it would be difficult to exclude high-income group from any scheme, which may be designed for promotion of SWHS. The financial assistance required by middle income and lower income groups are bound to be different. It may be necessary to provide additional incentives to lower income group users for diffusion of SWHS.

15.2.1 Financing Assistance Required by Domestic User

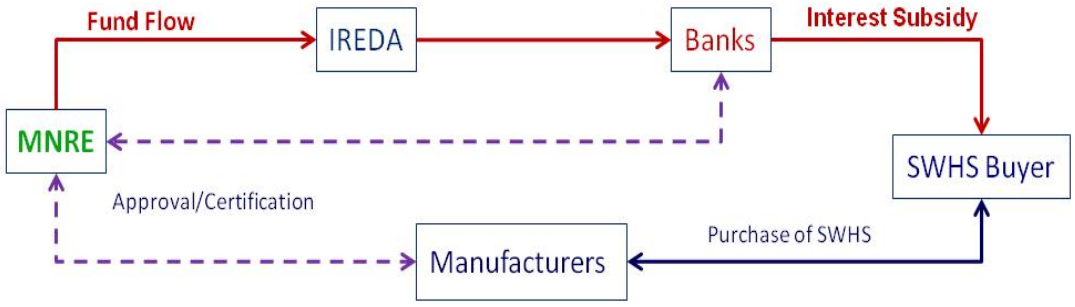
In Chapter-11, financing assistance requirement of all the users has been calculated. Considerations relevant for domestic users have been reproduced below:

- Financing assistance required by domestic user in Maharashtra and Karnataka is between Rs. 5,000 and Rs. 6,600 for 2 sq.m. FPC SWHS. It is proposed that subsidy of Rs. 5000 is provided to all domestic users in the country installing FPC systems with collector area of 2 sq.m.
- Cost of existing interest subsidy to MNRE is around Rs. 3,900 for the same configuration
- For users in North-Eastern States, newly formed States, and special category States the capital subsidy of Rs. 6,000 may be provided for installation of SWHS with 2 sq.m. collector area, in lieu of MNRE's existing interest subsidy scheme under which soft loans are provided to these users at 0% rate of interest.

15.2.2 Assessment of Current Scheme of Interest Subsidy through Banks

As discussed in the Chapter-3, currently MNRE provides financing assistance in the form of interest subsidy at interest rate of 2% to the domestic buyers. The schematic framework of financing mechanism is as shown in the figure below.

Figure 15.1 MNRE's Interest Subsidy for Domestic Users Channelled through Banks/FIs



The stakeholder consultation process and the field surveys identified following issues with this scheme.

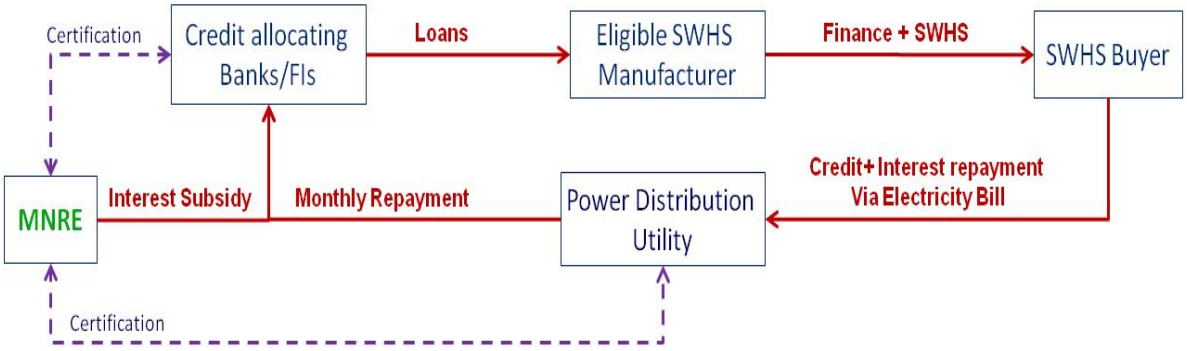
- Many banks are not keen to act as a channel for implementation of interest subsidy. Two largest banks, public sector bank - State Bank of India and private sector bank - ICICI Bank are not participating in the scheme. In fact none of the private sector banks are participating in the scheme. The small ticket size of loans in this category and procedural requirements result into higher administrative costs for the banks. As a result, profitability of this loan portfolio to the banks is very low.
- MNRE assumes uniform lending rate of 12.5% irrespective of the Prime Lending Rate of the bank for calculation of the interest subsidy. This is not always beneficial for the participating banks.
- Contrary to normal perception, Non-Performing Assets (NPAs) in SWHS are very high. Failure or less than envisaged performance of the SWHS is cited as the primary cause for high rate of NPAs.
- Only 15% of the new SWH systems are availing interest rate subsidy.

Due to the abovementioned reasons, the interest subsidy could not become an effective mechanism to provide financial assistance to this single largest segment of SWHS users. Further, any tweaking of the scheme is unlikely to improve banks' participation in the interest subsidy scheme. Hence, it can be safely concluded that interest subsidy is unlikely to be an effective instrument for MNRE to provide financing assistance to domestic users.

15.2.3 Interest Subsidy with involvement of Power Distribution Utilities

This is an alternative framework for MNRE to provide interest subsidy to domestic users. This framework has been developed on the lines of Tunisia's interest subsidy model, in which administrative expenditure for banks/FIs related to the loan repayment is reduced by involving Utility for collection of loan amount and interest from borrowers through their monthly electricity bill. The framework proposed for MNRE's interest subsidy is shown in the figure below.

Figure 15.2 MNRE's Interest Subsidy for Domestic Users with involvement of Utilities



As seen from the figure, MNRE will be required to provide the interest subsidy to the Banks/FIs. The banks will provide loan to the eligible SWHS manufacturers, which will be available for the domestic SWHS buyers. The Utilities will play the pivotal role in recovery of the loan provided at subsidised interest rates. The Utility will recover loan through the monthly electricity bill of the domestic SWHS buyer and will pass it to the respective banks/FIs.

This financing mechanism has following advantages.

- Expenditure of banks/FIs on administration of loans will get reduced. Therefore cost of the loans will be low.
- Also the cost of recovery through Utility will not be expensive as existing infrastructure and processes of Utility will be used for loan and interest recovery.
- Since most Utilities are public sector, MNRE/the Government may be able to influence them to participate in the scheme.

However, implementation of this financing mechanism in India is impractical for following reasons:

- Electricity Act, 2003 does not require Utilities to participate this kind of schemes. Even if the utilities decide to participate, it may not be able to collect charges through electricity bills, as metering, billing & collection are tightly regulated activities.
- Given poor creditworthiness and operational inefficiencies of the Utilities, banks/FIs will be reluctant to participate in such a financing mechanism.

15.2.4 Assessment of Capital Subsidy Channelled through Manufacturers

In this mechanism, the government provides upfront capital subsidy to the buyers of SWHS in domestic sector through certified manufacturers The subsidy is provided to the buyer at the time of procurement of SWHS. Internationally this mechanism has been implemented by Australia, in which the federal government provides capital subsidy to the SWHS buyers in domestic segment through its certified SWHS manufacturers.

15.2.4.1Proposed Framework for Capital Subsidy through Manufacturers

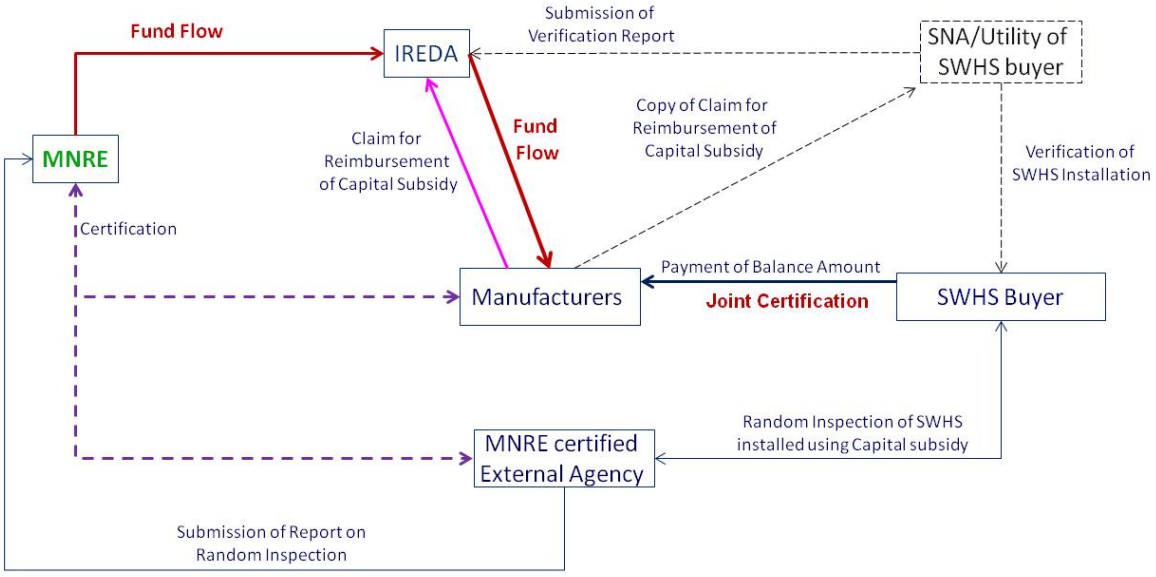
It is proposed that the capital subsidy to domestic consumers shall be provided through the manufacturers on installation of the system. Following are the key features of the proposed 'Capital Subsidy Mechanism for Domestic Category Consumers'.

- The scheme is available to all domestic category users of SWHS in the country.
- Capital subsidy shall be available only to new systems having capacity of less than 2000LPD, installed after the date of announcement of this scheme.
- IREDA shall act nodal agency for the scheme.
- The Scheme will be implemented through manufacturers of the SWHS, which would be certified by MNRE.
- Manufacturer must supply complete system i.e. solar collector, tank, associated piping and valves, etc.
- MNRE will certify manufacturers for each type of system being provided by the manufacturers.
- Capital subsidy shall be available to only those systems which will have 'type' testing certificate from MNRE;
- Manufacturer and dealer of the manufacturer, if any must mention on its all product catalogues regarding availability of capital subsidy from the MNRE. Further, all proposals / budgetary quotes must mention total costs, subsidy available and net cost payable by the user.
- Every system manufactured by a certified manufacturer shall have a unique serial number, date of manufacturing engraved on all important parts of system, such as collector and tank. The number shall be engraved at near outlet pipe of the collector and bottom of the tank. It shall be responsibility of the manufacturer to ensure uniqueness of the number.

- Manufacturer shall enter into annual maintenance contract (AMC) with the user and cost of AMC to be included in the cost of the SWH system at the time of its sale.
- Manufacturer will have to give declaration regarding satisfactory operation of the SWH system on every March 31 for the first five years after installation of the system. In case of non-receipt of such declaration, manufacturer shall be automatically removed from the list of manufacturers eligible to participate in the scheme and no further subsidy claims from the manufacturer shall be entertained.
- Manufacturer will be required to claim capital subsidy on:
  - Installation of the new SWH system
  - Receipt of balanced payment from the buyer
  - Joint Report by user and installer regarding successful installation of SWHS
- IREDA shall disburse the capital subsidy directly to the manufacturer, within 15 days of receipt of claim from the manufacturer. In case of delays, IREDA shall pay interest at the rate 2% above SBI PLR to the manufacturer for the period of delay.
- MNRE may require SNA to verify about 10% of installations carried out during that year. Systems shall be randomly selected by MNRE for the purpose of inspection. This shall be continuous process and report on verification shall be submitted to MNRE within one month of the inspection. MNRE shall reimbursement of cost of inspection to SNA.
- MNRE certified manufacturers shall be required to maintain and share the database with MNRE. The information to be provided by the manufacturer will be specified by the MNRE as a part of the detailed procedures but at a minimum shall include unique serial number of system, LPD capacity of system, collector area of system, details of buyer, date and place of installation, name and address of system installer etc.
- MNRE shall carry out 'surprise inspections' using external agency for random inspection of the systems, which have received capital subsidy during last five years. Number of systems and their location shall be at the discretion of the MNRE.
- Any faulty declaration by the manufacturer or identification of defective /non-operational systems during inspection by either SNA or MNRE appointed external agency will lead to manufacturer losing eligibility to participate in the scheme.

The schematic of the scheme has been presented in the figure as follows.

Figure 15.3 MNRE's Capital Subsidy for Domestic Users Channelled through Manufacturers



15.2.4.2Advantages of Framework for Capital Subsidy through Manufacturers

It is believed that the proposed mechanism is distinctly superior to the existing mechanism and offers following advantages:

- MNRE can influence the SWHS manufacturing sector. Currently, only collectors are being certified by the MNRE. This scheme will force all manufacturers to seek registration/accreditation with MNRE and thereby facilitating development of organized manufacturing sector for SWHS.
- Accreditation process will force all manufacturers to maintain quality prescribed under the terms of accreditation.
- Practice of annual maintenance contracts will get established. This will ensure proper maintenance of the systems.
- While it will increase overall administrative cost and time for MNRE, longer term benefits shall outweigh this increase in cost.
- Capital subsidy will require less time and resources from SWHS buyer while obtaining financing assistance from MNRE as compared to the existing interest subsidy.

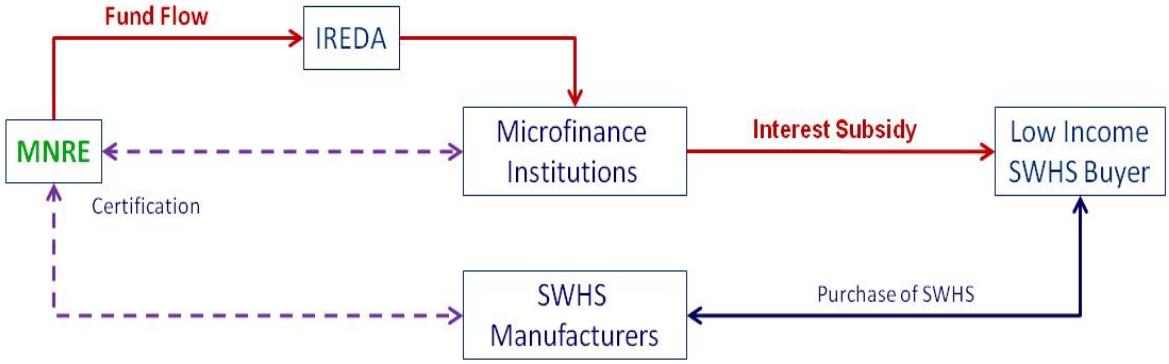
- Upfront capital subsidy to end users will address two main barriers of SWH technology i.e. affordability and financial un-viability.
- Upfront capital subsidy will demonstrate MNRE's confidence in SWHS sector. This will improve confidence of users in SWH technology and its market.
- In addition to capital subsidy mechanism, manufacturers once certified would be useful in operating other schemes such as interest rate subsidy or utility rebate scheme, etc.

Thus, the proposed financing mechanism will be useful to stimulate and accelerate the diffusion of SWHS in domestic user segment.

15.2.5 Interest Subsidy through Micro Finance Institutions

Low-income domestic users have financing need higher than that of the other income group users in domestic segment. This is essentially due to their lower affordability. Further, life cycle cost of switching to SWHS is high as these consumers are currently using waste wood, biomass, etc. Hence, it is suggested that MNRE may provide additional financial assistance in the form of interest subsidy to such users through MFIs. The schematic framework of such mechanism is shown in the figure below.

Figure 15.4 Interest Subsidy for Domestic Users through Microfinance Institutions



The salient features of this mechanism are as follows.

- Interest subsidy will be provided only in case of purchase of SWHS from MNRE certified manufacturer.

- MNRE to provide interest subsidy through Microfinance institutions for low-income domestic users. This subsidy shall be in addition to the capital subsidy provided through certified manufacturers.
- MNRE may contribute interest subsidy of 6% out of the total lending rate of the MFIs.
- MNRE should not bind MFIs to fix their lending rate while participating in the interest subsidy scheme.
- To keep costs low, MNRE should motivate certified MNRE manufacturers to tie up with the MNRE approved MFIs.
- MNRE may extend this scheme to all the users in domestic segment residing in hilly areas, in north-east States and special category States in India.

15.2.6 Consumer Finance at Dealership

As discussed earlier, consumer finance is an expensive financing option. However, middle-income users of SWHS within the domestic category may need financing assistance in addition to the capital subsidy from MNRE. This assistance can be arranged by the manufacturers directly in the form of consumer finance at their dealership in association with consumer finance companies. However, MNRE will have no role to play in such arrangement. Manufacturers may tie up with banks or other financing institutions to provide easy consumer finance at their dealership. The manufacturers and their financing partners will adopt standard market practices while deciding on the lending rate and other terms & conditions of the loan. It is perceived that availability of easy consumer finance at dealership will be useful to make the sector competitive and organized.

15.2.7 Financing Mechanism for Domestic Users in Multi-storey Buildings

As shown in Market Assessment Study, the domestic urban users will contribute the highest portion of collector area. However, large portion of the potential customers of SWHS in the domestic-urban category are likely to be residing in multi-storey buildings. Hence it is important to identify and address their barriers and financing need.

The domestic population currently residing in multi-storey buildings usually has high income. A resident typically owns a washing machine, a refrigerator, a colour television set, and in many cases one vehicle: two or four wheeler. Therefore, their preference for a water heating method to SWH is essentially driven by their convenience and not by the financing constraints.

The major barrier faced by this category is the scarcity of space for installation of SWHS, and essentially not the affordability. Hence, marginal or considerable financing assistance is less likely to attract very large number of these residents to switch over to SWH. Therefore, MNRE's financing assistance will not be able to accelerate diffusion of SWHS in this domestic user segment.

It is difficult to accurately quantify the need for space in terms of financing need and thereby assure the removal of space barrier. Despite this fact, MNRE has been promoting SWHS installations by providing capital subsidy of Rs. 1900 per sq.m. of installed collector area to the builders of housing complexes with system capacity of 2500 LPD or more. We believe that financial assistance should be continued. The amount of financial need quantified in Chapter-9 takes into account the life cycle cost of solar water heating and includes capital cost, transportation cost, installation cost, and maintenance cost. Therefore, the financing assistance quantified in Chapter-11, includes impact of all these costs but does not account for the need for space.

However, recently innovative space sensitive SWH technologies/projects have been developed. These technologies have demonstrated feasibility of SWHS in the multi-storey buildings in the Indian market. These systems are 10-15% costlier than the conventional SWHS. These systems ensure that certain quantity of hot water is stored separately for every household and made available as and when individual household needs it.

The financing need in case of use of such space conscious smart technologies is expected to be higher. Therefore, it is proposed to give financial assistance of Rs. 3000 per sq.m. for installation of SWHS in multi-storey buildings. MNRE may encourage SWHS installation in new and existing multi-storey buildings and for this purpose encourage tie-up between SWHS manufacturers and builders/residents.

- MNRE may identify the manufacturers of space conscious SWH technologies who can ensure the availability of fixed quantity of hot water for every household.
- MNRE may provide capital subsidy of Rs. 3000 per 2 sq.m. of collector area only if the certified space conscious SWH technology is installed in multi-storey buildings.

- MNRE should provide same capital subsidy irrespective of whether the building is new or old.
- In case of installation of conventional SWHS in multi-storey building, MNRE will provide capital subsidy of Rs. 2500 per sq.m. of collector area.

15.2.8 ESCO Framework

As explained in Chapter 14 of this Report, ESCO model does not mitigate financial risks and ESCOs need same level of financial assistance as that needed by the actual user of hot water. However, the ESCO model can help in mitigating technical and operational risks. In this model, the ESCO is expected to install the SWHS with suitable planning for space required to cater to the need of identified multi-storey building. ESCO can tie up with the building project developer or directly with the residents of building.

- After setting up a SWH project, this ESCO will sell hot water to the residents as per the contract with residents/ project developer.
- ESCO model can provide a cost-competitive SWH solution for existing as well as new multi-storey buildings.
- MNRE shall provide the financial assistance to ESCO in terms of capital subsidy for the domestic users, i.e. Rs. 5,000 for every 2 sq.m. of installed collector area of conventional SWHS or Rs. 3,000 per sq.m. of installed collector area for smart space conscious technologies which use common top hot water tank.

15.2.9 Summary of Financing Mechanisms for Domestic Users

Following table summarizes the financing mechanisms proposed for domestic segment.

Table 15.2 Financing Mechanisms Proposed for Domestic Users (MNRE driven)

Beneficiary (Owner of SWHS)	MNRE's Financing Assistance	
	Financial Instrument	**Attributes and Financing Channel**
Domestic users	Upfront Capital Subsidy	Rs. 5,000 for every 2 sq.m. of collector area for users in all the States except those identified below.
		Rs. 6,000 for every 2 sq.m. of collector area for users in North-Eastern States, and all special category States.
Domestic Users in Multi-storey building	Upfront Capital Subsidy	Rs. 5,000 for every 2 sq.m. of collector area providing conventional SWH technology
		Rs. 6,000 for 2 sq.m. of collector area for systems using common hot water tank. Subsidy shall be payable on the basis of collector area.
Domestic user with Low income (Users in North-East and special category States, Hilly areas, etc.)	Interest subsidy (in addition to MNRE's Capital Subsidy)	6% of lending interest rate contribution to Microfinance Institutions on behalf of buyer
Builder/Project developer of New Residential complex	Upfront Capital Subsidy	Rs. 5,000 or Rs. 6,000, whichever is applicable, for conventional SWHS for every 2 sq.m. of collector area from MNRE through its certified manufacturers
ESCO serving the Domestic users		

15.3 Proposed Financing Mechanisms for Non-domestic Category

As discussed in Chapter-8, the hot water demand is difficult to standardize for users in the non-domestic user segments, such as industrial, commercial and institutional. Further, these users usually have very high hot water requirement, and therefore require large systems. Following sections discuss the proposed financing mechanisms for these user segments.

15.3.1 Financing Mechanism for Commercial Segment

Commercial segment typically includes restaurants, hotels, malls, motels, private club houses, private guesthouses, lodges, etc. Their hot water requirements differ significantly from a few hundred LPD to few thousand LPD. This is a unique non-domestic segment in which some instances may exist where hot water requirement is less and therefore they typically prefer electric water heating. Their hot water demand can be fulfilled by a SWHS with a collector area of a few sq.m. The capital cost of such small SWHS installation will be less and therefore the transaction costs associated with debt finance are likely to be higher. This will not be the case for significantly large SWHS installation.

Therefore, it is suggested that the commercial users with small SWHS installations should be provided financing assistance in the different form than that for the commercial users with big SWHS installations. Therefore, it is required to create two user segments on the basis of installed collector area. These two user segments can be classified as small commercial users with collector area of up to 20 sq.m. and large commercial users with collector area of more than 20 sq.m. We propose following financing mechanisms for these two classes within the commercial user segment.

As mentioned before, the small users in commercial segment are likely to use electric water heaters. The life cycle cost analysis for the commercial segment shows that their shift from electric water heating to SWH is profitable to them. This is due to high electricity tariff applicable for commercial category. Therefore, theoretically the commercial users do not need external financing assistance. However, low penetration of SWHS in this user category highlights the necessity of promotional scheme and external financing assistance.

The large commercial users such as hotels, malls, lodges are likely to use non-electric means for water heating, which are mainly conventional fuels such as wood, coal, and to some extent

heavy oils. Their financing need based on the life cycle cost analysis with non-electric fuels is significantly large. Therefore MNRE should provide financial assistance to this class of commercial users.

15.3.2 Proposed Quantum of MNRE Financing Assistance

Currently, MNRE provides an option to the commercial users to select between the capital and interest subsidy. This capital subsidy is equivalent to the applicable upfront interest subsidy. Currently these users can receive the capital subsidy of Rs. 1400 per sq.m. of installed collector area or receive a soft loan under MNRE's interest subsidy scheme by paying 5% interest.

In lieu of current capital subsidy or interest subsidy, it is proposed that the capital subsidy of Rs. 2,500 for 2 sq.m. of collector area for systems with collector area of up to 20 sq.m. shall be given through MNRE certified SWHS manufacturers.

However, as discussed in the previous chapters, capital subsidy will be an inadequate financial instrument for the users with large hot water demand who require large collector area. For larger SWHS installations, with collector area of more than 20 sq.m., MNRE should provide interest subsidy of 7.5%. This contribution from MNRE is exactly same as that in the existing interest subsidy scheme. Further, all the commercial users will be eligible for accelerated depreciation benefit on SWHS.

The most significant issue in the interest subsidy is MNRE's assumption regarding provision of loans at uniform lending rate of 12.5% for all the participating banks. To address this issue, we propose that while providing interest subsidy, MNRE should not bind the banks to the uniform lending rate specified by MNRE. Banks should be allowed to adopt their own credit assessment practices and lending rates. MNRE should subsidize by contributing upfront interest subsidy at the rate of 7.5%.

Further, most of the commercial buyers are likely to be the customers of a bank. As a result, the bank will information about the credit risk associated with the customer. The Bank can use this information during credit risk assessment and may provide loan interest rate commensurate with the associated credit risk. This will reduce bank's risk from SWH soft loan portfolio. This

will improve bank's profit from SWH soft loan portfolio and may encourage other banks to participate in MNRE's interest subsidy scheme.

In case the hot water demand of commercial users is met through ESCO, MNRE should provide the applicable interest subsidy to the ESCO.

15.3.3 Summary of Financing Mechanisms for Commercial Users

Following table summarizes proposals for financing mechanisms for commercial users.

Table 15.3 Proposed Financing Mechanisms for Commercial and Profit-making Segment

Beneficiary	Financial Instrument	Attributes and Financing Channel
Individual Commercial user (up to 20 sq.m.)	Upfront Capital Subsidy	Rs. 2,,500 for every 2 sq.m. from MNRE channelled through MNRE certified manufacturers
Larger systems (more than 20 sq.m.) and ESCO (any area)	Upfront Interest subsidy	7.5% from MNRE channelled through approved banks, without fixing the total lending rate of bank

15.4 Proposed Financing Mechanisms for Institutional Segment

As discussed in Chapter-8, the hot water demand cannot be standardized for users in institutional segment. Large portion of hot water demand in this segment is currently being fulfilled by non-electric means, mainly using conventional fuels such as wood, coal, and to some extent heavy oils. As discussed in the Chapter-9, their financing need based on the life cycle cost analysis with non-electric fuels is significantly large. Hence, MNRE should provide financial assistance to the users in this segment to encourage shift to SWH.

15.4.1 Proposed Quantum of MNRE Financing Assistance

Currently, MNRE categorises users in institutional segment as profit-making and non-profit making. For both these categories MNRE provides an option to choose between the capital and interest subsidy. Currently the capital subsidy provided is equivalent to the applicable upfront interest subsidy. Currently profit-making institutions can opt to receive the capital subsidy of Rs. 1400 per sq.m. of installed collector area or soft loan at the interest rate of 5%. Also they are eligible to receive the benefit of accelerated depreciation. The non-profit-making institutions can

opt to receive the capital subsidy of Rs. 1750 per sq.m. of installed collector area or soft loan at the interest rate of 3%.

Depending upon the fuel used for water heating, the life cycle cost analysis estimates the financing need of institutional users to be between Rs. 1300 to Rs. 2000 per sq.m. of SWHS collector area. We propose that MNRE should provide the required financial assistance in the form of interest subsidy routed through the banks. MNRE should continue to provide interest rate subsidy of 7.5% for profit-making institutions and at 9.5% for non-profit-making institutions.

This higher interest subsidy may be given to non-profit-making institutions with an idea to compensate for lack of accelerated depreciation, which these users do not avail. The proposed financial assistance is exactly same as the existing interest subsidy scheme of MNRE for this segment.

15.4.2 Assessment of Capital Subsidy for Institutions through Manufacturers

Capital subsidy is an inadequate form of providing financing assistance for large users. The limitations of capital subsidy for large users have already been discussed earlier and therefore have not been repeated here. Therefore, interest subsidy has been proposed as the appropriate form for provision of of financial assistance to institutional users.

15.4.3 Assessment of Interest Subsidy for Institutional Users through Banks

Institutional users currently can avail the soft loan at lending rate of 5% or 3% and MNRE compensates for the lending rate of 7.5% or 9.5%. However, most of the issues associated with the existing interest subsidy for domestic users, discussed in section 15.2.2 are also applicable to interest subsidy for institutional users.

The most significant issue is MNRE's assumption regarding provision of loans at uniform lending rate of 12.5% by all the participating banks. This issue has been already been discussed in earlier section and it has been suggested that MNRE should allow banks to set their own lending rate.

15.4.4 Summary of Financing Mechanisms for Institutional Users

Following table summarizes proposals for financing mechanisms for institutional users.

Table 15.4 Proposed Financing Mechanisms for Institutional Segment

Beneficiary (Owner of SWHS)	Financial Instrument	Attributes and Financing Channel
Individual Profit-making Institution or ESCO serving such institutions	Upfront Interest subsidy	7.5% from MNRE channelled through approved banks, without fixing the total lending rate of bank
Individual Non-profit-making Institution or ESCO serving such institutions		9.5% from MNRE channelled through approved banks, without fixing the total lending rate of bank

15.5 Proposed Financing Mechanisms for Industrial Users

As discussed in Chapter-8, the hot water demand is difficult to standardize for industrial users. Though electricity is still preferred in certain industrial applications as reliable and controllable source of water heating, large portion of hot water demand, in particular for preheating, in this segment is typically fulfilled by non-electric means, mainly using conventional fuels such as wood, coal, and to some extent using heavy oils. As discussed in the Chapter-9, their financing need based on the life cycle cost analysis with non-electric fuels is significantly large. Hence MNRE should provide financial assistance to the users in this segment.

15.5.1 Proposed Quantum of MNRE Financing Assistance

Currently MNRE provides only interest subsidy for industrial segment. They can avail the soft loan at interest rate of 5% and MNRE contributes for 7.5% of interest rate. These users also receive the incentive of accelerated depreciation.

Further, depending upon the fuel used for water heating, the life cycle cost analysis estimates that the financing need of these users lies between Rs. 1,000 to Rs. 5,100 per sq.m. of SWHS collector area, as shown in Table 9.13 in Chapter-9. We propose that MNRE should provide the financial assistance in the form of interest subsidy through the banks. MNRE should continue

providing interest rate subsidy of 7.5% and the industrial users should be allowed to avail the benefit of accelerated depreciation. The proposed financing assistance from MNRE is exactly the same as the existing interest rate subsidy scheme of MNRE for this segment.

Issues associated with the interest rate subsidy scheme have been already discussed in this Chapter of the Report and therefore not repeated. Those issues are equally applicable for interest rate subsidy scheme for industrial users and should be taken into account while announcing the new scheme.

15.5.2 Summary of Financing Mechanisms for Industrial Users

Following table summarizes the proposed financing mechanism for industrial consumers using SWHS.

Table 15.5 Proposed Financing Mechanism for Industrial Segment

Beneficiary (Owner of SWHS)	Financial Instrument	Attributes and Financing Channel
Individual Industrial user	Upfront Interest subsidy	7.5% from MNRE channelled through banks, irrespective of total lending rate of banks.
ESCO serving one or many Industries		

15.6 Comparison of Existing and Proposed Financing Mechanism

The following table provides comparison of the existing and proposed financial mechanisms for different user segments in the country. It may be noted that capital subsidy proposed here is for FPC based systems and financial assistance for ETC based systems shall be 30% lower than that for corresponding FPC based system.

Table 15.6 Comparison of Existing and Proposed Financial Mechanisms

User Segment	Financial Instrument	Financing Mechanism *	
		Existing	Proposed
Individual Domestic User	Capital Subsidy	-	For North-East States and special category States, capital subsidy of Rs. 3,000 per sq.m. of installed collector area. For other States, capital subsidy of Rs. 2,500 per sq.m. of installed collector area. MNRE to channalise this capital subsidy through its certifiedManufacturers
	Interest Subsidy - Soft Loans	MNRE assistance: @ 10.5% User's share: @ 2%	-
Domestic User residing in Biulding	Capital Subsidy	Rs. 1900 per sq.m. to the builders of Housing complexes with system capacity more than 2500 LPD	Rs. 3950 per sq.m. of collector area in case of innovative space conscious SWH technology Rs. 2,500 per sq.m. of collector area in case of conventional SWH technology MNRE to channalise capital subsidy through its certifiedManufacturers
Domestic-Low Income Group	Interest Subsidy - Microfinance	-	MNRE assistance: @ 6% User's share : @ (MFI lending rate - 6%)
Commercial and Profit-making Institutions	Capital Subsidy	Rs. 1400 per sq.m.	Rs. 1,250 per sq.m. for installations of maximum 20 sq.m. Subsidy channeled through Manufacturer certified by MNRE
	Interest Subsidy - Soft Loans	Alternate to capital subsidy MNRE assistance: @ 7.5% User's share: @ 5%	Installation larger than 20 sq.m. MNRE assistance: @ 7.5% User's share : @ (FI lending rate - 7.5%)
Non-Profit-making Institutions	Capital Subsidy	Rs. 1750 per sq.m.	-
	Interest Subsidy - Soft Loans	Alternate to capital subsidy MNRE assistance: @ 9.5% User's share: @ 3%	MNRE assistance: @ 9.5% User's share : @ (FI lending rate - 9.5%)
Industrial	Capital Subsidy	-	-
	Interest Subsidy - Soft Loans	MNRE assistance: @ 7.5% User's share: @ 5%	MNRE assistance: @ 7.5% User's share : @ (FI lending rate - 7.5%)

* *Focus on financing instruments which MNRE can implement*

16 IMPLEMENTATION PLAN

The previous chapters have discussed the financing mechanisms suitable for MNRE to provide financial assistance to the SWHS buyers in different user segments. This chapter presents the estimates of impact of the proposed scheme on MNRE and recommendations on 'Way Forward' Here, the estimation of implication for MNRE is based on the projections available from study 'The market assessment study for SWHS in India' carried out under UNDP/GEF funded Global Solar Water Heating Project. Those projections are as presented in Table 16.1 below.

Table 16.1 Projections for Cumulative Installed Collector area across Different User Categories (million sq.m.)

Consumer Category	2010	2013	2017	2022	Contribution in SWHS sector by year 2022
Domestic-Urban	2.23	3.83	7.17	15.14	80%
Domestic-Rural	0.35	0.42	0.51	0.6	4%
Commercial-Hotel	0.19	0.35	0.61	0.97	5%
Institutional-Hospital	0.1	0.17	0.27	0.43	2%
Industry	0.19	0.33	0.57	1.05	6%
Others	0.18	0.27	0.39	0.52	3%

The budgetary support required by MNRE has been estimated using the Table 16.1 and Table 15.6 in Chapter-15. Following sections provide the annual outgo for MNRE towards funding capital and interest subsidy, from 2011 to 2017, i.e. till end of 12th National Plan.

16.1 Provision Required for Promotion

This section provides the estimate for budgetary provision, which MNRE will have to make to provide financial assistance to the users from various segments.

16.1.1 Budgetary Provision for Capital Subsidy to Domestic Users

It has been proposed that MNRE will provide upfront capital subsidy of Rs. 5,000 or Rs. 6,000, as applicable, to users in this segment for installation of 2 sq.m. collector area.

Table 16.2 Budgetary provision for Capital Subsidy to Domestic Users (Rs. crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017	Total
Domestic-Urban	109.54	133.49	133.49	133.49	208.71	208.71	208.71	208.71	**1344.85**
Domestic-Rural	8.62	5.46	5.46	5.46	5.37	5.37	5.37	5.37	**46.47**
Total Annual Expense on Proposed Capital Subsidy	**118.16**	**138.95**	**138.95**	**138.95**	**214.08**	**214.08**	**214.08**	**214.08**	**1391.33**

Thus MNRE will be required to make a budgetary provision of Rs. 1391 crore to provide capital subsidy to the users in domestic segment till end of 12th National Plan i.e. till end of 2017. Further, the additional subsidy payable for North-Eastern States, low income users, special States, and new States has not been considered while calculating the budgetary provision, which is expected to be less than 10% of the budgetary provision calculated above.

The estimation of Rs. 1391 crore can be compared with the fund requirement in a scenario, wherein MNRE continues with its current interest subsidy for domestic users till 2017. In existing interest subsidy, MNRE provides an upfront interest subsidy of about Rs. 3,970 for each SWHS of 2 sq m area. Table 16.3, shows that, MNRE would have required budgetary provision of Rs. 1105 crore till year 2017 in case of continuation of the current interest subsidy for domestic segment.

Table 16.3 Budgetary provision to continue with current Interest Subsidy for Domestic Users (Rs. crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017	Total
Domestic-Urban	86.97	105.99	105.99	105.99	165.72	165.72	165.72	165.72	**1067.81**
Domestic-Rural	6.85	4.33	4.33	4.33	4.26	4.26	4.26	4.26	**36.90**
Total Annual Expense with Existing Interest Subsidy	**93.82**	**110.32**	**110.32**	**110.32**	**169.98**	**169.98**	**169.98**	**169.98**	**1104.71**

The comparison of Table 16.2 and Table 16.3 shows that for the proposed capital subsidy scheme MNRE will be required to make additional budgetary provision of Rs. 287 crore over next 7 years.

16.1.2 Budgetary Provision for Subsidy to Commercial Users

As discussed in Chapter-15, the users in the commercial segment can be classified into two categories, those having hot water demand of about 1000 LPD who will prefer small size of installations of up to 20 sq.m., who otherwise would prefer electricity for water heating, and the remaining users as large users, who otherwise would prefer non-electric fuels.

It has been assumed here that 60% of the total collector area projected under commercial segment in Table 16.1 will comprise of small SWHS installations with collector area up to 20 sq.m. As proposed in Chapter-15, MNRE can provide them capital subsidy of Rs. 2,500 for every 2 sq.m. of installed collector area. The following table provides fund required from MNRE for such support.

Table 16.4 Budgetary Provision for Capital Subsidy to Small Installations in Commercial Segment (Rs. crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017
Fund required with proposed Capital Subsidy	2.69	3.90	3.90	3.90	4.88	4.88	4.88	4.88
Fund required for existing Interest Subsidy	3.30	4.77	4.77	4.77	5.98	5.98	5.98	5.98

The proposed upfront capital subsidy of Rs. 2,500 for every 2 sq.m., for small installations in commercial segment will save Rs. 7.6 crore for MNRE till end 2017, in comparison with the scenario with existing interest subsidy.

Further, it can be assumed that remaining 40% of the collector area will comprise of large SWHS installations of users in hotel business under commercial segment. As proposed in Chapter-15,

MNRE will provide an interest subsidy of 7.5% to the users in this category, as it is done currently. However, there will be two differences as proposed in Chapter-15.

- Banks will have flexibility to decide on lending rate for such soft loan and MNRE will not bind the banks to fix uniform lending rate. This is expected to increase participation of private sector banks.
- With the proposed interest subsidy MNRE will be required to release the interest subsidy to the banks on annual basis over the duration of loan i.e. 5 years. This is expected to reduce risk to MNRE in comparison with the existing arrangement of release of entire interest subsidy at the beginning of soft loan duration.

It is proposed that MNRE will continue with its existing interest subsidy of 7.5% for commercial users with large installations. As a result, MNRE does not need any additional fund. Following table shows the estimation of MNRE support for SWH installations by large commercial users.

Table 16.5 Budgetary provision for Interest Subsidy to Large Installations in Commercial Segment (Rs. crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017
Commercial-Hotels (Large)	2.20	3.18	3.18	3.18	3.98	3.98	3.98	3.98

As in case of the existing interest subsidy scheme, MNRE will be required to make budgetary provision of Rs. 28 crore; to provide interest subsidy to users with large SWHS installations in commercial segment till end of 12th Plan i.e. 2017.

16.1.3 Budgetary Provision for Interest Subsidy for Institutional Segment

This segment has been conventionally categorised by MNRE into profit-making and non-profit-making institutions. In this section the financing assistance required by both these categories has been projected till year 2017.

As mentioned in the Chapter-15, in line with MNRE's existing schemes for institutional segment, it has been proposed that the profit making institutions should be treated similar to the commercial users, who avail the benefit of accelerated depreciation. Further, as proposed in Chpater-15 MNRE can continue its existing interest subsidy scheme, and provide interest

subsidy of 7.5% to the profit-making institutional users. Further, MNRE can continue providing interest subsidy of 9.5% to non-profit-making institutions. However, there will be two differences in the existing interest subsidy as discussed in Chapter-15.

- Banks will have flexibility to decide on cumulative lending rate for such soft loan and MNRE will not bind the banks to fix uniform lending rate. This is expected to increase participation of banks.
- With the proposed interest subsidy MNRE will be required to release the interest subsidy to the banks on annual basis over the duration of loan i.e. 5 years. This is expected to reduce risk to MNRE in comparison with the existing arrangement of release of entire interest subsidy at the beginning of soft loan duration.

'The Market Assessment Study' does not provide separate projections for the collector area from profit-making and non-profit-making institutional users. Therefore, ABPS Infra has distributed the projected collector area between profit-making and non-profit-making institutional users as follows.

- The users from the identified 'hospital' and 'Others' categories shown in Table 16.1 comprise of total institutional users. This is because, as mentioned in the 'The Market Assessment Report', the 'Others' category shown in Table 16.1, includes users such as railway, defence, hostels, religious places, etc., which are essentially institutional users.
- It is assumed that, 50% out of the total collector area shown for 'hospitals' in Table 16.1, will be installed by profit-making hospitals; and remaining by the non-profit making hospitals;
- It is assumed that 50% of the total collector area installed in 'Others' category is provided by the profit-making institutional users and remaining by the non-profit making institutional users.

The financial support required from MNRE has been segregated for these two categories within institutional segment and has been shown in Table 16.6. Here it is assumed that FPC SWHS installation of 30 sq.m., will be common among these users which costs Rs. 2, 44,740 as per MNRE's rate contract. As mentioned before, profit-making institutions will be eligible to receive the interest subsidy similar to that of commercial users with large installations i.e. existing interest subsidy of 7.5%. Therefore, MNRE does not need any additional fund. As in the existing interest subsidy MNRE will require to provide Rs. 45,900 over the duration of loan, i.e. 5 years.

Further, MNRE will continue its existing interest subsidy of 9.5% for the non-profit-making institutional users which will provide Rs. 58,126 to such user buying a SWHS with 30 sq.m. collector area.

Table 16.6 Budgetary provision for Interest Subsidy to Profit-making and Non-Profit making Institutional Segment (Rs. crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017
Profit-making Institutions	5.09	4.14	4.14	4.14	4.27	4.27	4.27	4.27
Non-Profit making Institutions	6.45	5.24	5.24	5.24	5.40	5.40	5.40	5.40
Total	**11.55**	**9.38**	**9.38**	**9.38**	**9.67**	**9.67**	**9.67**	**9.67**

As mentioned before, MNRE will not require any additional fund. As in the existing interest subsidy MNRE will require to make a budgetary provision of Rs. 78 crore, to provide interest subsidy to users in institutional segment till end of 12th National Plan ending in 2017.

16.1.4 Budgetary Provision for Interest Subsidy for Industrial Segment

As proposed in Chapter-15 MNRE will continue its existing interest subsidy of 7.5% to the industrial users. However, there will be two differences in scheme, as discussed in Chapter-15.

- Banks will have flexibility to decide on cumulative lending rate for such soft loan and MNRE will not bind the banks to fix uniform lending rate. This is expected to increase participation of banks.
- With the proposed interest subsidy MNRE will be required to release the interest subsidy to the banks on annual basis over the duration of loan i.e. 5 years. This is expected to reduce risk to MNRE in comparison with the existing arrangement of release of entire interest subsidy at the beginning of soft loan duration.

Table 16.7 Budgetary provision for Interest Subsidy to Industrial Segment (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017
Industry	**4.89**	**7.14**	**7.14**	**7.14**	**9.18**	**9.18**	**9.18**	**9.18**

As mentioned before, MNRE will not require any additional fund. As in the existing interest subsidy MNRE will require to make a budgetary provision of Rs. 63 crore, to provide interest subsidy to users in industrial segment till end of 12th National Plan ending in 2017.

16.1.5 Summary

The following table provides summary of budgetary provisions for provision of financial assistance to different types of user segments.

Table 16.8 Summary of Budgetary Provision with Proposed Financing Mechanisms (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017	Total
Domestic-Urban	109.54	133.49	133.49	133.49	208.71	208.71	208.71	208.71	1344.85
Domestic-Rural	8.62	5.46	5.46	5.46	5.37	5.37	5.37	5.37	46.47
Commercial-Hotels (Small)	2.69	3.90	3.90	3.90	4.88	4.88	4.88	4.88	33.94
Commercial-Hotels (Large)	2.20	3.18	3.18	3.18	3.98	3.98	3.98	3.98	27.68
Profit-making Institutions	5.09	4.14	4.14	4.14	4.27	4.27	4.27	4.27	34.58
Non-Profit making Institutions	6.45	5.24	5.24	5.24	5.40	5.40	5.40	5.40	43.80
Industry	4.89	7.14	7.14	7.14	9.18	9.18	9.18	9.18	63.02
Total	139.49	162.55	162.55	162.55	241.80	241.80	241.80	241.80	1594.34

Table 16.9 Summary of Budgetary Provision with Continuation of Existing Schemes (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017	Total
Domestic-Urban	86.97	105.99	105.99	105.99	165.72	165.72	165.72	165.72	1067.81
Domestic-Rural	6.85	4.33	4.33	4.33	4.26	4.26	4.26	4.26	36.90
Commercial-Hotels (Small)	3.30	4.77	4.77	4.77	5.98	5.98	5.98	5.98	41.53
Commercial-Hotels (Large)	2.20	3.18	3.18	3.18	3.98	3.98	3.98	3.98	27.68
Profit-making Institutions	5.09	4.14	4.14	4.14	4.27	4.27	4.27	4.27	34.58
Non-Profit making Institutions	6.45	5.24	5.24	5.24	5.40	5.40	5.40	5.40	43.80
Industry	4.89	7.14	7.14	7.14	9.18	9.18	9.18	9.18	63.02
Total	115.76	134.80	134.80	134.80	198.79	198.79	198.79	198.79	1315.32

As seen from above two tables, for the proposed promotional framework MNRE will require to make an additional budgetary provision of Rs. 279 crore, in comparison with the budgetary provision required for continuation of existing promotional framework.

Table 16.10 Summary of Budgetary Provision required for Manufacturers (Rs. Crore)

Calender Year	2010	2011	2012	2013	2014	2015	2016	2017	Total
Increase in Manufacturing Capacity (million sq.m.)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	**1.2**
Cumulative addition in Manufacturing Capacity (million sq.m.)	0.15	0.3	0.45	0.6	0.75	0.9	1.05	1.2	-
Investment required to increase Manufacturing Capacity (Rs. Crore)	8	8	8	9	9	10	10	11	**73**

16.2 Implementation Arrangements for Financing Mechanisms envisaged in this Report

Considering that MNRE will implement the financing mechanisms throughout the country, it is essential that implementation is undertaken in a systematic manner. Following contractual arrangement is envisaged for implementation of financing mechanisms.

6. Memorandum of Understanding between MNRE & IREDA to act as Nodal Agency
7. Agreement between Manufacturer and IREDA for Capital Subsidy Scheme
8. Agreement between IREDA and banks/FIs/MFIs
9. Certification of Manufacturer and Systems
10. MOU between MNRE, IREDA and SNA/Utility

The following discussion is organised to cover these contractual arrangement for implementation of financing mechanisms proposed in this Report.

16.2.1 MOU between MNRE and IREDA

It is envisaged that IREDA will act as Nodal Agency for implementation of financing mechanisms proposed in this Report. IREDA for this purpose will sign MOU with MNRE, which will specify the Roles and Responsibilities of MNRE, and IREDA. At a minimum, the MOU shall cover following aspects:

- Specific financing assistance to be provided by IREDA to different user segments under financing mechanisms announced by MNRE
- Procedure for release of fund from MNRE to IREDA, funds should be made available to IREDA in advance at the beginning of every quarter/year;
- MNRE to direct IREDA on procedure for release of capital subsidy to the manufacturer, without involvement of SNA/Utility or any other entity in disbursement;
- Communication protocol regarding addition/ deletion of names of certified manufacturers, certification of systems, accreditation of installers, etc
- Penalties to be levied on SWHS manufacturer in case of violation of the provision of the agreement, malpractice, etc for e.g. duplication of claim for capital subsidy against the same SWHS installation or the same user;
- MNRE to maintain national database of all SWHS installed in the country.
- Procedure for disbursement of claims of the manufacturers, provision of payment of penal interest charges in case of delay beyond stipulated period
- IREDA to maintain database of capital subsidy disbursed to the manufacturers and share this database with MNRE. Such database will include unique serial number of SWHS, name and address of SWHS manufacturer, date of receipt of claim from manufacturer and disbursement of subsidy to manufacturer.

16.2.2 Agreement between IREDA and Manufacturer

It is envisaged that IREDA will sign Agreement with Manufacturer to act as channel partner for distribution of subsidy for solar water heater systems. This will be binding Agreement with specific functions assigned to both parties. Further, the Agreement shall have specific penalties for violation of the provisions of the Agreement. Broad Heads of Agreement would be as follows:

- Roles and responsibilities of IREDA and the Manufacturer
- Manufacturer to maintain certification with MNRE
- Procedure for submission of claim for reimbursement of capital subsidy
- Documentation in support of claim for reimbursement of capital subsidy
    - Unique serial number of the systems sold
    - Excise receipt for the system, if any.
    - Name of owner of system,
    - Date and place of installation of system,

- Name of installer/system integrator,
- Specifications of system such as LPD and collector area in sq.m.,
- AMC duration,
- Total and net Cost of the SWH system to the buyer.
- Joint Inspection Report
- Receipt of payment of balance payment

- Procedure for intimation of installation of system to SNA/ Utility
- Cooperation with inspection by SNA/ MNRE/ IREDA
- IREDA will disburse the claim within one month of receipt of claim
  - Provisions in case of delay in payment to the manufacturer
- Periodic submission of information by Manufacturer to IREDA to cover:
  - List of dealers and installers
  - Systems installed in each geographical area
  - List of systems installed under support from MNRE
  - Any other information as may be sought by IREDA/MNRE
- Declaration on March 31 of each year regarding systems in operation
- Penalties in case of violation of AMC
- Termination clauses
- Consequences of termination
- Obligations to survive termination

16.2.3 Agreement between IREDA and Banks/ FIs/ MFIs for Interest Subsidy

It is envisaged that IREDA as a Nodal Agency for the programme shall sign an Agreement with participating banks for operationalisation of the 'Interest Rate Subsidy' Programme for non-domestic consumers. Broad features of the proposed agreement are presented below:

- Roles and Responsibilities of MNRE, SWHS buyer/user and banks;
- MNRE to publish the list of its certified manufacturers, certified installers and certified system integrators;
- MNRE to publish list of eligible PSU and private sector banks who will channelize interest subsidy for non-domestic users;
- Banks to provide soft loan under interest subsidy only in case SWHS is procured from MNRE certified manufacturer and installed by MNRE certified installers or certified system integrators;

- Banks to follow their own credit risk assessment procedures and determine the lending rate for the buyer.
- The user will submit a joint report with the system installer about satisfactory installation and performance of system. Banks to submit this report along with the claim for interest subsidy to IREDA.
- Protocol for disclosure of information by banks to IREDA at regular interval
- The procedures regarding disbursement of interest subsidy can be same as those followed for the existing interest subsidy
- Procedure for eligibility approval of SWHS installation;
  - Only new SWHS to be permitted;
  - MNRE/BIS approved SWH systems to be permitted;
  - Financing assistance to be provided for SWHS with MNRE approved collector technologies;
  - Financing assistance to be provided for SWH systems produced by MNRE certified manufacturer and installed by any of the MNRE certified installers;
  - MNRE certified manufacturers also to be included into MNRE certified installers;
- Banks to maintain and share their online database with IREDA and MNRE, which will capture following important details. Unique serial number of system which availed the soft loan, name and address of the loan seeker, name of the certified manufacturer of SWHS, name and address of system installer/integrator, specification of system installed such as LPD, sq.m. of collector area and type of collector technology, capital cost of system, and total lending rate of bank for than loan.
- Termination provisions
- Procedure for withdrawal by banks

16.2.4 Certification of Manufacturer / Systems

Quality of SWHS has been key issue. It is necessary to ensure that quality of the systems is maintained. For this purpose, it is proposed that MNRE establishes system of certification of manufacturers as well as certification of systems eligible for receipt of support under MNRE sponsored schemes. In this Section, broad contours of the proposed system of certification have been explained.

Certification of Manufacturers

- MNRE to specify criteria of eligibility to be certified manufacturer
  - Manufacturing ability –
    - Technology wise
    - Component wise
  - Net-worth
  - Production data in last three years
- R & D Capability
- Ability to install systems – Initially manufacturers to take responsibility of installation of the SWHS
- Distribution network
- Ability to maintain systems
- Undertaking for participation in the MNRE Schemes
- MNRE to specify the criteria for certification of system installers and system integrators
- Process of receipt of application for certification
- Process of disposal of applications

Certification of SWH Systems

- MNRE may continue using BIS standard for certification of conventional systems as well as new systems till such time it evolves its own mechanism of certification
- However, systems to be recognised based on the technology
- MNRE to design the suitable 'Type Test' for different types of SWHS
- MNRE to invite the interested manufacturers for 'Type Test'.
- MNRE to certify systems being produced by different manufacturers
- MNRE to specify the components and location on component where the unique serial number of the system is to be engraved.
- MNRE to specify the font and size to engrave the serial number.
- MNRE to specify the details to be incorporated into the system serial number. They can be the system capacity in LPD, collector area in sq.m., collector technology, manufacturers identification in terms of a code registered at MNRE, date of manufacturing of system, and place of manufacture.

16.2.5 MOU between MNRE, IREDA and SNA/Utility

It is proposed that MNRE/IREDA will institute a system by which approx 10% of the systems installed during the year will be inspected by either SNA or Utility. MNRE is expected to take final decision in this regard. In this section, we have explained the modalities of operation of this scheme of inspection:

- MNRE/IREDA to identify the organisation at state level, which can undertake the function of inspection.
- SNA or Utility officials to physically verify at least 10% of the new systems installed by every manufacturer in their area, after they receive a copy of claim form manufacturer. The officials are expected to carry out just physical verification of the system.
- Officials to submit a verification report in the form of an online database shared with IREDA and MNRE. The format of the verification report will be specified by IREDA. It should essentially contain the unique serial number of SWHS verified, location of installation, name and address of the owner, name of the user, system specifications such as collector area in sq.m., LPD, collector technology, etc
- The SNA or Utility officials will be required to submit a verification report to IREDA twice in a year, by March 31 and September 30. The report for the systems installed during September of previous year to February of that year should be submitted by March 31 of that year and report for the systems installed during March of that year and August of that year should be submitted by September 30.
- The delay in submission of report will invite a penalty of deduction of 50% from the service charges receivable from IREDA.
- Procedure for submission of verification report by SNA/Utility officials to IREDA;
- Procedure for the release of service fees from IREDA to SNA/Utility officials;

16.2.6 MOU between MNRE, IREDA and External Inspection Agency

MNRE will appoint an external agency/s for inspection of SWHS installed across all the user segments across various States in India. (The framework shown in Figure 15.3, in Chapter-15 has referred to the agency in this report before.)

- This agency to inspect at least 10% of newly installed systems during that financial year and 10% of the systems installed in earlier years,
- MNRE to share relevant databases with external inspection agency/s.

- MNRE to specify the norms for visual and performance inspection of a system. These would include the procedure for inspection, components, performance tests, etc.
- The visual inspection seems to suffice the purpose. However, MNRE may specify the circumstances under which the agency to carry out performance inspection.
- The agency will inspect 10% of systems installed by every certified manufacturer for each of the user segment. The agency should separately cover 10% of each of the following types of SWHS users,
    - Domestic-urban,
    - Domestic-rural,
    - Commercial users such as hotels with SWHS up to 20 sq.m. collector area, hotels with large systems, malls, etc.
    - Institutional users such as hospitals, hostels, government organisations, orphanages, oldages, etc.
    - Various types of industrial users with different hot water applications such as dairy, textile etc.
- The agency to submit a report for an individual user segment, served by a certified manufacturer.
- The agency to submit separate inspection reports for new and old systems.
- The agency to submit the reports to MNRE in every quarter.
- In case of verification report submitted by SNA/Utility officials highlights any issue about a particular installation, that system will be inspected by the external agency and monitored for a prolonged duration.
- The service fees for the agency to be specified;
- The circumstances under which the contract can be dissolved.
- The agency will submit a separate detailed inspection report to MNRE regarding the issues found in the faulty system.
- Procedure for release of service fees by IREDA
- IREDA to make payment within two weeks of receipt of claim from agency.
- The agency to take utmost care to avoid malpractices.
- MNRE's investigations based on any reported/observed malpractices will dissolve the contract of agency with MNRE and thereafter it will not be eligible to participate.
- MNRE to keep IREDA informed about addition or deletion of names in the list of the external inspection agencies.

16.3 Implementation Arrangements for Assistance to Manufacturers

As shown in Chpater-10, MNRE will be required to make a budgetary provision of Rs. 73 crore to support the addition of new manufacturing capacity. IREDA shall continue to be the nodal agency to provide financing assistance to the manufacturers. The procedures and implementation plan followed for the existing scheme can be used after incorporating the following changes.

- New as well as existing manufacturers, both certified by MNRE, will be eligible for MNRE's soft loan scheme.
- Provision for collateral (existing condition of 100% bank guarantee) to be replaced by eligibility of assets as collateral;
- In addition to IREDA, soft loan should be made available through PSU banks also. This will eliminate the delays and inconvenience caused by the borrowers due to single location of IREDA at Delhi. IREDA will make payment to the concerned bank towards interest rate subsidy.
- In case banks MNRE's soft loan, the entire responsibility of loan repayment will lie with the banks and MNRE should offer flexibility to banks to work out smarter loan portfolio/s for manufacturers. This will also include choice between 100% collateral/bank guarantee or soft loan with appropriately higher interest rate
- IREDA and the participating banks to maintain and share an online database with MNRE about the assistance provided to various SWHS manufacturers across various States and their repayments, and defaulting events. The information on defaulting events will be useful to MNRE while revising its list of certified manufacturers by deleting the names of frequently defaulting manufacturers.

17 DISCUSSIONS WITH MNRE ON 'FINANCING MECHANISMS'

ABPS Infra submitted its Report on Financing Mechanisms to Project Management Unit on March 17, 2010. Subsequent to the submission of the Report, discussions were held in MNRE on March 18 & 19, 2010. During these discussions, various issues associated with capital subsidy scheme were discussed. While there was an agreement on the issue of provision of capital subsidy for the domestic users and commercial users with small SWH installations, it was felt that the subsidy should be provided through distribution Utilities.

It was also felt that it may be easier for MNRE to monitor provision of subsidy through distribution Utilities than if the same is provided through manufacturers. During discussions, it was felt that option of provision of subsidy through distribution Utilities should be developed by ABPS Infra and should be included in the Report.

Accordingly, in this Chapter, a scheme for provision of capital subsidy through distribution Utilities has been presented as an alternative for the consideration of MNRE.

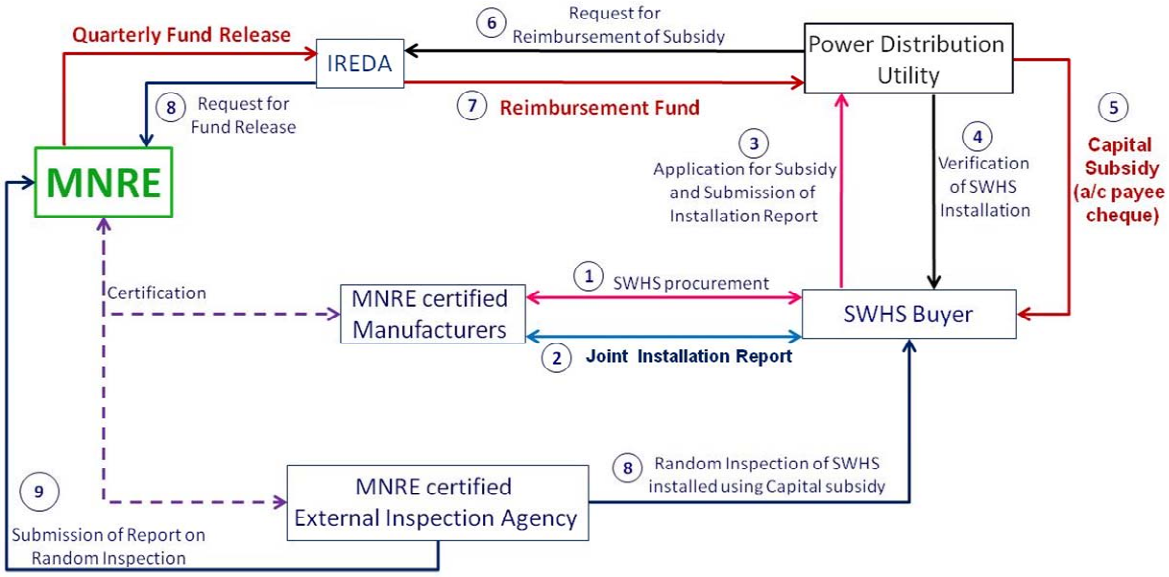
17.1 Capital Subsidy through Utilities

In this mechanism, the Government will provide capital subsidy to the buyer of SWHS through the Utility of the buyer. It may be noted that the quantum of financing required by the user of SWHS is not dependent on mode of disbursement of subsidy. Hence, quantum of financing would remain be the same as presented in Chapter 9 of this Report. Primary difference between the Scheme presented in Chapter 15 and in this Scheme is involvement of Distribution Utility in place of Manufacturer. In this Chapter, we have also incorporated consequent changes to other provisions such as monitoring and verification.

17.1.1 Proposed Framework

The schematic of the scheme has been presented in the figure as follows.

Figure 17.1 Disbursement of Capital Subsidy through Utilities



17.1.2 Key Features of the Proposed Scheme

Following are the key features of the proposed subsidy scheme:

- SWH system manufactured by MNRE certified manufacturers would be eligible to receive capital subsidy.
- Utility will verify the eligibility of the SWHS installed and provide capital subsidy to the buyer of SWHS.
- MNRE will reimburse this capital subsidy to the Utilities on confirmation of payment of the same to the buyer. IREDA will act as its nodal agency.
- As a result, the subsidy will not be received by the SWHS buyer upfront; i.e. at the time of procurement of system. It would be received after installation of the system.

This section further discusses the criteria for eligibility of SWH systems and role envisaged for key stakeholders for effective implementation of the capital subsidy.

17.1.2.1Eligibility of SWH System

Solar Water Heating Systems satisfying the following criteria shall only be eligible for capital subsidy under this scheme:

- The systems that have been manufactured by MNRE certified manufacturers.
- The subsidy shall be available only to new SWH systems installed after the date of announcement of this scheme.
- Systems having 'type' testing certification from MNRE shall only be eligible .
- The scheme shall be available to all the buyers in the domestic segment and to those buyers in commercial segment, which have small SWH installations up to 20 sq.m. of collector area.
- The entire system should be procured from a certified manufacturer i.e. solar collector, tank, associated piping, insulation, valves, etc.
- SWHS should be associated with Annual Maintenance Contract for five years from the date of installation of the system.
- The SWH system should be installed by MNRE certified installers or system integrators.

17.1.2.2Roles and Responsibilities of Stakeholders

In this Section, we have identified Roles and Responsibilities of various stakeholders involved in the process of disbursement of capital subsidy.

Ministry of New and Renewable Energy (MNRE)

MNRE is envisaged to perform following activities.

- Develop application forms, operational procedures and guidelines for implementation of the scheme.
- Release quantum of subsidy to IREDA as per quarterly estimations submitted by IREDA to MNRE.
- Certify manufacturers for each type of SWH system eligible under the scheme.
- Create awareness about the scheme among utilities and regulators. Encourage State Regulators to include implementation of the proposed scheme as DSM Measure.
- Develop procedures for the 'type' testing certificate. Only type tested SWH systems should be eligible for Capital subsidy.

- Carry out 'surprise inspections' using external agency for random inspection of the systems, which have received capital subsidy during the last five years. Number of systems and their location shall be at the discretion of the MNRE.
- Design and implement criteria for disqualification of the manufacturers in case of defective/non-operational systems are identified during surprise inspections.
- Monitoring of the scheme so as to ensure that the subsidy is disbursed by IREDA to the Utility and by Utility to the SWHS buyer.
- Incorporate sufficient checks and balances to avoid the malpractices.

IREDA

It is envisaged that the IREDA shall act as a nodal agency for the scheme and is expected to perform following activities:

- Develop procedures and formats for implementation of scheme.
- Prepare quarterly estimation of the subsidy requirement for submission to MNRE.
- Reimburse Distribution Utility, the capital subsidy paid by it to the user of SWHS.
- IREDA shall disburse the capital subsidy to the Utility, within 15 days of receipt of claim from the Utility. In case of delays, IREDA shall pay interest at the rate 2% above SBI PLR to the Utility for the period of delay.
- Assist MNRE in monitoring performance of the utilities in timely disbursement of the subsidy to the users.

Distribution Utility

The capital subsidy scheme will be implemented through the Distribution Utilities. The distribution Utility will be required to perform following activities:

- Create awareness about the scheme among consumers of the utility.
- Issuance/sell of application form for capital subsidy at all bill collection centres of the Utility
- Acceptance of duly filled application forms at the bill collection centres
- Verification of the SWH installation within 15 days of receipt of application from the SWHS buyer. For this purpose, Utility may train its meter reading personnel.
- Disburse capital subsidy through an account payee cheque within 30 days of receipt of the application from the consumer through the same bill collection centre.

- Submit an application to IREDA for reimbursement of capital subsidy, specifying the details of capital subsidy, name of buyer, place of installation, date of application for subsidy and date of disbursement of subsidy.
- Utility shall be required to maintain the database of SWHS installations in its area of supply. The information to be maintained by the Utility will be specified by the MNRE as a part of the detailed procedures but at a minimum shall include unique serial number of system, LPD capacity of system, collector area of system, details of buyer, date and place of installation, name and address of system installer, cost of system, date of claim for subsidy submitted by consumer, date of claim for subsidy submitted by Utility, date of subsidy disbursed from IREDA etc.

Manufacturers of SWHS

It is envisaged that the MNRE shall influence the organisation of the SWHS manufacturing sector using the proposed scheme. MNRE will certify manufacturers, which will be eligible to participate in the scheme. These manufacturers will be responsible not only for supply of the systems but also for upkeep of these systems for a period of five years from the date of installation of the system. Following are the specific responsibilities to be performed by the manufacturers of SWHS.

- Engrave a Unique Serial Number (USN), date of manufacturing, etc on important parts of the SWHS such as collector and tank. The USN shall be engraved near outlet pipe of the collector and bottom of the tank. It shall be responsibility of the manufacturer to ensure uniqueness of the number.
- Manufacturer shall enter into Annual Maintenance Contract (AMC) with the buyer and cost of AMC to be included in the cost of the SWH system at the time of its sale.
- Manufacturer will have to give declaration to MNRE regarding satisfactory operation of the SWH system on every March 31 for the five years after installation of the system.
- Manufacturer and its dealers, if any, must mention on its all product catalogues regarding availability of subsidy from the MNRE through distribution Utilities.
- Manufacturers must ensure that their accreditation with MNRE does not lapse to ensure that the systems supplied by them are eligible for subsidy.
- MNRE certified manufacturers would be required to maintain the database and share the same with MNRE. The information to be provided by the manufacturer will be specified by the MNRE as a part of the detailed procedures but at a minimum shall

include Unique Serial Number (USN) of system, LPD capacity of system, collector area of system, details of buyer, date and place of installation, name and address of installer etc.

Eligible Consumer

It is envisaged that all legal users of the electricity shall be eligible for participation in this scheme. Following are the responsibilities of the consumer:

- A Utility consumer who does not have any arrears with the utility shall be eligible for participation in the scheme.
- Utility consumers should be the legal owner of the SWHS.
- User shall ensure the continuous use of the SWH system installed under this scheme.
- To avail the capital subsidy, the consumer to submit following documents to its Utility along with the application form
  - Joint Report prepared by consumer (i.e. SWHS buyer) and installer regarding successful installation of SWHS
  - Receipt of purchase of SWHS
  - Proof of electricity bill paid for last three months
  - Application form must be filled by the purchases of SWHS in whose name the electricity connection exists.
  - Proof of identity for User as issued by any Government body.

17.1.2.3Checks and Balances

Following are checks and balances envisaged for implementation of the Scheme.

- In the proposed capital subsidy scheme, the Utility will be required to verify the installation only once while assessing the eligibility of installation. The Utility will also have to assess the status of it's the consumer before provision of capital subsidy. These checks will be 'one time' and the Utility will not be required to carry out any checks for operation of the SWHS and its continuous use. Therefore, Utility will not be involved in monitoring and hence will not be burdened excessively.
- MNRE shall appoint a third party external inspection agency to check operation of SWHS and its usage. This will provide MNRE better control over not only the capital scheme but also manufacturer certification process.

- The scheme proposed envisages Utility to first release the subsidy to its eligible consumers and then to apply for reimbursement of the subsidy amount from IREDA. This will ensure that excessive subsidies are not provided by MNRE. However, this has one significant drawback. Some of the Utilities in the country are in poor financial health. These Utilities may not have sufficient funds to make payment of subsidy before receiving reimbursement of the same. For such Utilities, MNRE may develop special mechanism for payment of subsidy in advance.

17.1.3 Implementation Arrangements for Capital Subsidy

Considering that MNRE will implement the financing mechanism throughout the country, it is essential that implementation is undertaken in a systematic manner. Following 'Contractual Arrangement' is envisaged for implementation of capital subsidy scheme through Utility.

11. Memorandum of Understanding between MNRE & IREDA to act as Nodal Agency
12. Agreement between Utility and IREDA for Capital Subsidy Scheme
13. Certification of Manufacturer and Systems by MNRE
14. MOU between MNRE, IREDA and External Inspection Agency

The following discussion is organised to cover this 'Contractual Arrangement' for implementation of capital subsidy.

17.1.3.1MOU between MNRE and IREDA

It is envisaged that IREDA will act as a Nodal Agency for implementation of capital subsidy. IREDA for this purpose will sign MOU with MNRE, which will specify the Roles and Responsibilities of MNRE, and IREDA. At a minimum, the MOU shall cover following aspects:

- Specific financing assistance to be provided by IREDA to different user segments under capital subsidy mechanism announced by MNRE;
- Procedure for release of fund from MNRE to IREDA, funds should be made available to IREDA in advance at the beginning of every quarter;
- Procedure for release of capital subsidy by IREDA to the Utilities, without involvement of SNA or any other entity/institution in disbursement;
- Procedure for disbursement of claims of a Utility, provision of payment of penal interest charges in case of delay beyond stipulated period;

- Communication protocol regarding addition/deletion of names of certified manufacturers, certification of systems, accreditation of installers, etc.;
- Assistance to MNRE in development and maintenance of national database of all SWHS installed in the country;
- IREDA to maintain database of capital subsidy disbursed to every Utility and share this database with MNRE. Such database will include unique serial number of SWHS, name and address of SWHS manufacturer, date of receipt of claim from Utility and disbursement of subsidy to Utility.

17.1.3.2Agreement between IREDA and Utility

It is envisaged that IREDA will sign Agreement with Utility to act as a channel partner for distribution of capital subsidy for solar water heating systems. This will be binding Agreement with specific functions assigned to both parties. Further, the Agreement shall have specific penalties for violation of the provisions of the Agreement. Broad Heads of Agreement would be as follows:

- Roles and responsibilities of IREDA and the Utility;
- Procedure for submission of claim for reimbursement of capital subsidy;
- Claim of the Utility to include the following information:
    - Unique Serial Number of the system,
    - Name and consumer number of owner of the system,
    - Date and place of installation of system,
    - Name of installer/system integrator,
    - Specifications of system such as LPD and collector area in sq.m.,
    - AMC duration,
    - Confirmation on receipt of Joint Inspection Report,
    - Confirmation of having conducted Utility Inspection.
- Procedure for intimation of installation of new SWH system;
- Cooperation with third party inspection agency appointed by MNRE;
- IREDA will disburse the claim within one month of receipt of claim;
- Provisions in case of delayed payment by IREDA to the Utility

17.1.3.3Certification of Manufacturer / Systems

During public consultation process, Quality of SWH Systems has been referred to as one of t he let issues. It is necessary to ensure that quality of the systems is improved over a period of time. For this purpose, it is proposed that MNRE establishes system of certification of manufacturers as well as certification of systems eligible for receipt of support under MNRE sponsored schemes. In this Section, broad contours of the proposed system of certification have been explained.

- Penalties to be levied on SWHS buyer, SWHS manufacturer, Utilities in case of violation of the provision of the agreement, malpractice, etc. for e.g. duplication of claim for capital subsidy against the same SWHS installation or the same user;

Certification of Manufacturers

The certification process for manufacturers shall address following issues:

- Criteria for eligibility to be the certified manufacturer
  - Manufacturing ability
    - Technology wise
    - Component wise
  - Net-worth
  - Production data in the last three years
- R & D Capability
- Ability to install systems – Initially manufacturers to take responsibility of installation of the SWHS
- Distribution network
- Ability to maintain systems
- Process of receipt of application for certification
- Process of disposal of applications
- Penalties in case of violation of AMC
- Authority of MNRE to prescribe additional requirements from time to time
- Termination clauses
- Consequences of termination
- Obligations to survive termination

Certification of SWH Systems

It is envisaged that MNRE shall not only develop mechanism for manufacturers but also design mechanism for 'type' testing and certification of SWHS. Following issues will have to be dealt with while developing such system.

- MNRE to use BIS standard for certification of conventional systems as well as new systems till such time it evolves its own mechanism of certification
- However, systems to be recognised based on the technology
- MNRE to design the suitable 'Type Test' for different types of SWHS
- Development of infrastructure to carry out 'Type Tests'.
- Issuance of 'Type Test' certificates for different systems
- Conditions for validity of certificates, violation of conditions and consequences
- MNRE to specify the components and location on component where the Unique Serial Number of the system is to be engraved.
- MNRE to provide technical specification for engraving
- MNRE to specify the details to be incorporated into the USN.

17.1.3.4MOU between MNRE, IREDA and External Inspection Agency

MNRE will appoint an external agency/s for inspection of SWHS installed across all the user segments across various States in India.

- This agency to inspect at least 10% of newly installed systems during that financial year and 5% of the systems installed in earlier five years. The agency to ensure that all manufacturers are covered adequately and uniformly during inspection, Further, it shall be ensured that all user categories are covered adequately.
- MNRE to share relevant databases with external inspection agency/s.
- MNRE to specify the norms for visual and performance inspection of a system. These would include the procedure for inspection, components, performance tests, etc.
- MNRE to specify conditions under which visual inspection suffices and the circumstances under which the performance audit is to be carried out.
- The Report of the Agency shall, at the minimum cover following:
    - Analysis of SWHS installed by each user segment
    - Manufacture-wise analysis
    - Analysis for each type of system
    - Analysis of performance audits

- The agency to submit separate inspection reports for new and old systems.
- The agency to submit the reports to MNRE in every quarter.
- The service fees for the agency and procedure for release;
- The circumstances under which the contract can be terminated.
- The agency will submit a separate detailed inspection report to MNRE regarding the issues found in the faulty system.
- IREDA to make payment within two weeks of receipt of claim from agency.
- MNRE to keep IREDA informed about addition or deletion of names in the list of the external inspection agencies.

ANNEXURE: DETAILED LIST OF STAKEHOLDER CONSULTED

State	Type of Stakeholder	Name of Stakeholder	Date of consultation
Delhi	Manufacturer	Mr. Biren Bhambri, MD, M/s Bhambri Enterprises	1-Oct-09
	Manufacturer	Mr. Ankur Anand, Director, M/s Prachi International	1-Oct-09
	Manufacturer	Mr. KK Roy, MD, M/s Kalisons Telvent Pvt. Ltd	31-Dec-09
	Manufacturer	Mr. Pankaj Kumar, Energy Engineer, M/s Shriram Green Tech	2-Jan-10
	DERC	Mr. Shyam Wadhera, Member	1-Sep-09
	NDPL	Mr. R Pillai, AGM, DSM Ms. Amita Sharma, AM	30-Sep-09
	Govt. Of Delhi	Dr. Anil Kumar, Director, Department of Environment	30-Sep-09
	Energy Efficiency and Renewable Energy Management Centre	Ms. Niti Ninjal, Project Engineer	1-Oct-09
Haryana	Manufacturer	Mr. Umesh Garg, MD, M/s Solanand Solar Systems	5-Oct-09
	Manufacturer	Mr. Mahavir Singh Chhillar, Director, M/s Rose Enterprises	6-Oct-09
	HERC	Mr. Sanjay Verma, Director Tariff	5-Oct-09
	DHBVN	Mr. KK Gupta, DGM, Energy Audit	7-Oct-09
	HAREDA	Mr. P.K. Nautiyal, Sr. Technical Manager	6-Oct-09
Karnataka	Manufacturer	Industries	8-Sep-09
	Manufacturer	Mr RS Sethuraman, Director, M/s Solar Hitech Geysers	8-Sep-09
	Manufacturer	Mr. Parkash, Director, Nuetech Solar Systems Pvt. Ltd.	11-Sep-09
	Manufacturer	Mr. DV Manjunatha, Emmvee Solar	10-Sep-09
	KERC	Mr. Safiulla Khan, Director Tariff	9-Sep-09
	BESCOM	Mr Satyaprem Kumar, GM, DSM	10-Sep-09
	KREDL	Mr Naganna Gowda, AGM	11-Sep-09
Andhra Pradesh	Manufacturer	Mr. K Sundaram, MD, Sri Sundaram Solar Solutions	16-Sep-09
	APERC	Mr. M. Ravindra Sai, Secretary	15-Sep-09
	APCPDCL	Mr. Sudhakar Reddy, CGM	16-Sep-09
	NEDCAP	Mr. Yarram Reddy, GM	15-Sep-09

State	Type of Stakeholder	Name of Stakeholder	Date of consultation
Orissa	OERC	Mr. Bijoy Kumar Das, Chairman	15-Sep-09
	WESCO, SouthCO	Mr. VK Sood, MD	15-Sep-09
Maharashtra	Manufacturers and supply chain	Mr. Hemant Revankar, MD, Bipin Engineers Pvt. Ltd.	2-Sep-09
	Manufacturer	Mr Sanjay Jinturkar, Director, M/s Sudarshan Saur	19-Dec-09
	Manufacturer	Mr. Himanshu Doshi, M/s Borosil Solar	4-Jan-10
	MERC	Dr. Deshpande (DSM) Consultant to MERC	4-Sep-09
	MSEDCL	Mr. Vishwarup	8-Sep-09
	Reliance	Mr. Kishore Patil, Associate President, DSM Cell	4-Sep-09
	BEST	Mr. Bedekar, Chief Engineer	4-Sep-09
	SNA	Mr. Abhijeet Hinge/Bagde	2-Sep-09
	Semi Urban Domestic Consumer/s	Mr. Tengale, Dombivali	16-Sep-09

LIST OF BANKS CONSULTED

Name of Bank	Name of Stakeholder	Date of consultation
Canara Bank	Mr. M Narasa Reddy, GM	10-Sep-09
Vijaya Bank	Mr Venkappa Hedge, GM	10-Sep-09
Andhra Bank	Mr. AL Nageshwara Rao, GM	16-Sep-09
Bank of India	Mr. Sushil Kumar, DGM	18-Sep-09
ICICI Bank	Umesh Kumar Chaddha, Head, Client Relationship	13-Nov-09
State Bank of India	Mr. R. Saksena, DGM	16-Nov-09

LIST OF CONSUMERS CONSULTED

S.No	NAME OF THE PARTY	SWHS Installed	PLACE	Type	Consumer type
1	Shivaji University – Ladies Hostel	Yes	Kolhapur	Hostels	Institutional
2	Institute of Urology	Yes	Pune	Hospitals	Institutional
3	Suman Medicare	-	Delhi	Hospitals	Institutional
4	Chandra Hospital	Yes	Delhi	Hospitals	Institutional
5	Metro Hospital & Heart Institute	-	Delhi	Hospitals	Institutional
6	Multipurpose Training Centre for Deaf	Yes	Delhi	Training Centre	Institutional
7	Hitashi Hospital	-	Delhi	Hospitals	Institutional
8	Residency Club	Yes	Pune	Hotels	Commercial
9	Purohit Holiday Resorts PVt.Ltd.	Yes	Lonavala	Hotels	Commercial
10	Hotel Hari International	Yes	Lonavala	Hotels	Commercial
11	Bhide Holiday Resort	Yes	Lonavala	Hotels	Commercial
12	DIG Farm House	Yes	Delhi	Farm House	Commercial
13	Sterling IT Park, Noida	Yes	Noida	IT Park	Commercial
14	K.K. Industries	Yes	Delhi	Industrial	Industrial
15	Numero Uno Clothing Ltd.	Yes	Gurgaon	Industrial	Industrial
16	Synthokem Laboratories	Yes	Hyderabad	Industrial	Industrial

APPENDIX: INTERNATIONAL CASE STUDIES

1 AUSTRALIA

1.1 Federal Schemes

1.1.1 Solar Hot Water Rebate

1.1.1.1 Overview

The Solar Hot Water Rebate (SHWR) is a key part of the Australian Government's Energy Efficient Homes Package, under the Nation Building – Economic Stimulus Plan. The Australian Government is investing $4 billion over 5-years in the Solar Hot Water Rebate Program (SHWRP). Water heating has been identified to be the largest single source of greenhouse gas (GHG) emissions from an average Australian home, accounting for around 28% of home energy use[1]. This SHWR is specifically targeted at the replacement of existing electric storage hot water systems.

1.1.1.2 Implementing Agency

The SWHRP is administered under the Energy Efficient Homes Package by the Australian Government's Department of the Environment, Water, Heritage and the Arts (the Department), established on December 3, 2007.

1.1.1.3 Program Details

The Australian Government provides a rebate of $1,600 to eligible applicant's installing an eligible solar water heating system (SWHS)* that replaces an electric storage hot water system at an existing privately owned home[2]. The rebate is offered for installations from February 3, 2009 until June 30, 2012 (installations made before February 3, 2009 i.e. from July 18, 2007 until February 2, 2009 may be eligible to receive a rebate of $1,000, applications for the previous rebate was accepted until August 2, 2009[1]), subject to the availability of funds. The Government will stop accepting SHWR applications after June 30, 2012.

The SHWR is in addition to Renewable Energy Certificates (RECs) provided by the Australian Government under the Mandatory Renewable Energy Target (MRET) Scheme discussed in depth in the Report on Scheme and Framework for Promotion of SWHS by Utilities and

* Heat pump hot water system are also eligible

Regulators submitted to MNRE. A list of eligible SWHS is available in the Register of Solar Water Heaters on the Office of the Renewable Energy Regulator (ORER) website.

1.1.1.4 Eligibility Criteria[2]

Applicant's requirements*

Important eligibility criteria for an applicant to obtain SHWR are as follows:

- The applicant must not have previously applied for the Homeowner Insulation Program# at the same address
- The applicant must submit an application, attaching a copy of proof of system purchase, within six months of SWHS installation
- The applicant must be the owner or tenant of the dwelling where the SWHS was installed at the time of installation
- The applicant must be the purchaser of the system or have written permission from the purchaser to apply for the SWHR
- The applicant's taxable family income must have been less than $100,000 in the most recently completed tax year prior to system installation

Only one rebate is granted per eligible SWHS. While, in case of multiple applications for a single SWHS, the rebate is paid to the first eligible applicant.

System requirements

To be eligible to obtain a rebate, the SWHS must meet the following criteria:

- Be installed by a suitably qualified person (for e.g.: an electrician and/or plumber)
- Be installed on or after February 3, 2009, as certified by the licensed installer
- Be a new and complete SWHS that replaces+ an existing electric storage hot water system previously operational at the dwelling, as certified by the licensed installer

* A homeowner residing in Queensland State is not eligible to apply for assistance under SWHRP if assistance under the Australian Government's Home Insulation Program or Homeowner Insulation Program has been received.

Part of Government's Energy Efficient Homes Package

+ Exception: If applicant's home was destroyed in the February 2009 Victorian bushfires, he/she may be eligible for the rebate for the newly rebuilt home on the same site.

- Be eligible for at least 20 RECs under MRET at the time and place of installation, as certified by the licensed installer
- Be installed to the relevant building standards and government requirements, as certified by the licensed installer
- Be fully functional, as certified by the licensed installer

SHWR is not eligible where:

- The system replaces or is additional to an existing solar or heat pump hot water system
- The system will be used for non-domestic purposes or primarily for heating a swimming pool, spa or similar
- A 'retrofit' system is installed

1.1.1.5 Rebate Application Process

To claim the SHWR, applicant must fully complete, sign and submit an application form with the requested supporting documentation (copy of proof of purchase only). Applying for the rebate requires the applicant to agree, if requested, to provide evidence supporting claims made in the application form and allow an authorized inspector access to the SWHS for audit purposes by the Australian Government.

Applying for the SHWR requires a licensed installer to certify the following on the application form:

- SWHS installation date
- That the SWHS replaced an existing electric storage hot water system
- That the SWHS is eligible for at least 20 RECs
- That the SWHS was installed to the relevant building standards and government requirements

An application for the Australian Government's SHWR is not affected by any rebates that the State Governments may offer. Suppliers and installers of SWHS cannot apply for the SHWR on behalf of their customers.

1.1.1.6 Disbursement of Rebate

Rebate payment is made to the successful applicant by electronic funds transfer into their Australian bank account within eight weeks of receiving a completed and eligible application form. For this purpose, the applicant provides a BSB* number along with personal bank account number. The Government uses the applicant's bank details for making the payment only. The Government manages storage and disposal of bank account and other personal details in accordance with the Privacy Act 1988.

Currently, rebates for applications received on October 28, 2009 are being processed by the Australian Government.

1.1.2 Green Loans Program

1.1.2.1 Overview

Green Loans Program is an Australian Government initiative to help Australians tackle climate change. The Program assists Australian families to install SWHS along with other water saving and energy efficient products.

The key objectives of the Program are to:

- Encourage wide-scale improvement of energy and water efficiency in existing homes
- Provide sound advice to households on the most appropriate actions to reduce the environmental impact of operating their home
- Provide financial assistance to households to gain access to the resources they need to invest in energy and water efficient technologies
- Reduce annual GHG emissions

1.1.2.2 Implementing Agency

The Australian Government's Department of the Environment, Water, Heritage and the Arts (the Department) is the national authority responsible for implementation of the Green Loans Program. At a national level, it develops and implements national policy, programs and

* A BSB number is a unique 6-digit code that identifies the bank/financial institution and branch where the applicant's bank account is held

legislation to protect and conserve Australia's environment and heritage and to promote Australian arts and culture.

1.1.2.3 Program Guidelines

Green Loans has two main components of support from the Australian Government[3]:

- A subsidised Home Sustainability Assessment conducted by a suitably qualified Assessor, including a tailored Assessment Report
- Access to low cost finance through a subsidised Green Loan of up to $10,000 for a maximum of 4-years to implement changes recommended in the Assessment Report.

The Program commenced on July 1, 2009. Assessments were expected to commence mid 2009 and be available until December 31, 2012 or until available funding is exhausted (whichever comes first). Subsidised Green Loans are intended to be available until March 31, 2013 or until available funding is exhausted (whichever comes first).

Eligibility for the loan subsidy is not affected by other available subsidies and incentives for SWHS♦. The Green Loans Program has a target upper threshold of $250,000 annual income for the applicant. Suitable evidence of an applicant's taxable income may be requested and may include the most recent Notice of Assessment produced by the Australian Taxation Office.

Home Sustainability Assessment

The Home Sustainability Assessment contains four main activities:

- Booking of the assessment using the Phone Booking Service, the Online Booking System or directly through an Assessor who has been contracted to undertake assessments for the Program
- Free home inspection and Assessment by an Assessor
- Provision of initial advice to the Household by the Assessor
- Receipt of an Assessment Report within approximately ten business days

♦ or any other item or action

Through the Green Loans Program, householders are able to access a free, comprehensive Home Sustainability Assessment to reduce their energy and water bills, increase the comfort of their home and help reduce damaging carbon pollution.

This independent assessment by a qualified expert assessor provides advice from the smallest behaviour change to major investments such as a SWHS. The assessment involves the physical inspection of major energy and water systems relating to thermal comfort, water heating, lighting, refrigeration, cooking, entertainment, water efficiency and outdoor consumption, and waste management. Each assessment usually takes around 1.5 hours to complete.

To ensure Green Loans Home Sustainability Assessments are of a consistent high standard and are positive experiences for households, the Australian Government has set up a new training and registration scheme for Home Sustainability Assessors who wish to undertake assessments for the Program. Only Assessors who meet the new training and registration standard will be contracted by the Australian Government to conduct assessments for the Green Loans Program. Assessors conducting standardised Home Sustainability Assessments for the Australian Government are required to be registered with a recognised Assessor Accrediting Organisation.

For the purposes of seeking a subsidised Green Loan, the Assessment Report remains valid for 6 months from the Assessment Report Date.

Subsidised Green Loan

Households who receive an Assessment Report may seek financing to undertake various energy and water system improvements recommended in the Assessment Report. To assist these households, the Department lowers the cost of finance by providing a loan subsidy to participating Financial Institutions for the benefit of the Household. The Householder can choose any qualifying financial product, this includes SWHS, from any of the participating Financial Institutions to benefit from the subsidy.

To participate in the Program, Financial Institutions will have to comply with the Department requirements regarding the application of the subsidy as set out in the Financial Institutions Subsidy Deed. The Department maintains a list of financial institutions, published on the

Program's website, that have signed a Deed of Agreement with the Australian Government to develop Green Loans products.

Where the requirements in the Subsidy Deed are met, the Department provides the subsidy to the Financial Institution in respect of Green Loans for a maximum loan amount of $10,000 and a maximum period of 4-years.

1.1.2.4 Eligibility Criteria

Eligibility for a Home Sustainability Assessment

Householders are eligible for a free Home Sustainability Assessment if the following conditions are met.

- The applicant must be an Australian citizen or a permanent resident of Australia
- The applicant must have a taxable income not greater than $250,000 per annum.
- The applicant must be either an owner of the Home or a trustee of the Home or listed on the current lease of the home
- The home being assessed must be in Australia or its territories, and be the principal place of residence for a household
- The home being assessed must have been completed and occupied for at least 12 months (not necessarily by the applicant). Suitable proof may include a certificate of occupancy or similar certificate issued by a local, state or territory government agency
- The applicant must give the Department permission to access (through their energy and water suppliers) energy and water consumption information for a period of 12 months (where available) preceding the Assessment, and up to 24 months after the Assessment
- Government owned dwellings are not eligible
- Dwellings owned by corporate organisations or companies are not eligible

Eligibility to apply for a subsidised Green Loan

Applicants are eligible to apply for a subsidised Green Loan if the following criteria have been met.

- The applicant must be the recipient of a valid Assessment Report for the Home
- The applicant must be either the owner of the Home or a trustee of the Home (as shown on the current title) or listed on the current lease of the Home at the time of applying for the Green Loan

- The applicant must have a taxable income no greater than $250,000 per annum. Suitable evidence of income may include the most recent Notice of Assessment produced by the Australian Taxation Office
- The applicant is eligible for only one Green Loan per Assessment Report

To receive a subsidy the applicant must:

- Apply for a Green Loan from a participating Financial Institution within 6 months of the date of issue of a valid Assessment Report and by March 31, 2013 at the latest
- Satisfy the criteria of the relevant participating Financial Institution offering the Green Loan
- Complete and sign a Green Loan Declaration that the Green Loans funds received from the Financial Institution will only be used for eligible actions listed on a valid Assessment Report

1.1.2.5 Progress of the Program

The key outcomes of the Program are the reduction of GHG emissions and water consumption in existing Homes through:

- The engagement of Households in reducing the environmental impact of operating their Home
- A recognised industry of expert Assessors providing tailored information and guidance on energy and water saving actions
- A research industry analysing the environmental impact of Homes and Households

As of January 15, 2010 over 166,000 home sustainability assessments had been booked under the program.

1.2 State Schemes

Apart from the Australian Government's Solar Hot Water Rebate and Green Loan Scheme, few State Governments have additional schemes for eligible SWHS installations. Each incentive has varying eligibility requirements but is mainly dependent on the Australian Government's Solar Hot Water Rebate and MRET Scheme guidelines.

List of States and Territories in Australia that have incentives for installing SWHS are:

- New South Wales
- Victoria
- South Australia
- Western Australia
- Queensland
- Northern Territory
- Tasmania

1.2.1 New South Wales Hot Water Systems Rebate

1.2.1.1 Overview

The New South Wales (NSW) Government allocated $700 million under the Climate Change Fund to help business, households, schools, community groups and government to save energy and water. It includes $175 million for rebates to help householders who make their homes more water and energy efficient. The government has identified water heating as the biggest energy user in NSW homes. Electric hot water systems typically account for more than one third of household energy use. Each electric hot water system replaced with a climate-friendly model saves on average 2.5 tonnes of GHG emissions a year.

1.2.1.2 Implementing Agency

NSW Department of Climate Change and Water (DECCW) is administering the NSW Home Saver Rebates along with a number of funding programs and initiatives. DECCW is the lead NSW Government department with responsibility for protecting environment, managing water resources and developing and coordinating programs to address the impacts of climate change in NSW.

1.2.1.3 Eligibility Criteria

Applicant's Requirements

To be eligible for a rebate, the applicant must be an owner of the residential property in NSW where the SWHS* is installed, complete an official 'Application for a Hot Water System Rebate'

* Instantaneous hot water system with 5 star rating or more, gas hot water system and heat pump systems also eligible for rebate, conditions and rebate amount varies. Retrofit kits are not eligible for the rebate.

form and attach the original receipt(s) for the purchase and installation of the SWHS. The receipt(s) must be in the applicant's name[4].

Application forms for SWHS installed between October 1, 2007 and January 14, 2010 (inclusive) must be received by DECCW no later than April 30, 2010. Rebate applications for SWHS installed on or after January 15, 2010 must be received by DECCW within 6 months of the installation date or no later than September 30, 2011 (whichever is sooner).

System Requirements

To be eligible for a rebate, the SWHS must:

- Be a new SWHS that is eligible for at least 20 RECs under the MRET
- Replace an existing electric hot water system
- Paid for system in full and installed on or after October 1, 2007 and on or before June 30, 2011
- Meet all relevant standards and local council requirements
- Installed by a licensed plumber
- Not be used for non-domestic purposes such as heating a pool, spa or similar

1.2.1.4 Rebate Amount

Under the NSW rebate scheme, eligible SWHS can receive a rebate of up to $1200. Rebate is based on the amount of GHG emissions saved, determined by the eligibility of the system for RECs as currently listed in the Register of Solar Hot Water Systems published by the Australian Government's ORER. The rebate is scaled as follows:

Table 1.1: NSW Hot Water Systems Rebate[5]

Number of RECs	Rebate Amount ($)
20-27	600
28-35	800
36-43	1000
44+	1200

The total sum of payments received by the SWHS owner cannot exceed the total cost of installed SWHS. In such case, the owner should request a reduced payment for the rebate.

The NSW Government rebates are additional to any other rebate or incentive offer available to NSW residents under the Australian Government's Solar Hot Water Rebate Scheme and MRET. To ensure equitable access to available funding, from January 15, 2010, the total amount of NSW Home Saver Rebates a household can receive cannot exceed $1500 per property. The cap only applies to rebates under the NSW Climate Change Fund and does not include rebates received by the household from the Australian Government. The cap does not include any NSW rebates received prior to January 15, 2010.

1.2.1.5 Disbursement of Rebate

To receive the rebate, DECCW requires an original tax invoice or receipt stating:

- Date and place of purchase
- Exact system model number
- Receipt number
- ABN of the supplier
- That payment has been made in full

Payment of approved rebates is either by cheque or is deposited directly to the eligible owner's nominated bank account as identified in the application form. Payments are made within 60 days of receiving the completed application form and receipt(s), subject to verification of the application details.

1.2.1.6 Progress of the Scheme

The NSW Government's current Home Saver Rebates program has helped more than 180,000 NSW households (as at December 15, 2009) save more than 2.9 billion liters of water and 215,000 tonnes of GHG emissions per year. These rebates are assisting households save more than $21 million a year on their energy and water bills.

The Australian, state and territory governments are now working together to phase out greenhouse intensive hot water systems, commencing during 2010. From 2012 onwards all Class 1 dwellings (detached and semi-detached houses) replacing an electric hot water system must choose a low greenhouse alternative.

1.2.2 Victoria Solar Hot Water Rebate program

1.2.2.1 Overview

The Solar Hot Water Rebate program, administered by Sustainability Victoria, is part of the Victorian Government's commitment to reduce GHG emissions and increasing the sustainability of Victoria's energy supply and use. Conventional hot water systems account for around 20% of a household's GHG emissions in Victoria.

1.2.2.2 Implementing Agency

Sustainability Victoria is Victoria government's initiative established with the purpose to show the way to use the State's resources more efficiently and reducing the citizen's everyday environmental impacts. It provides funding for range of projects and initiatives in Victoria.

1.2.2.3 Eligibility Criteria

Applicant's Requirements[6]

This rebate is available for the principal place of residence only (or a residence where there is a permanent tenant and the electricity/gas bills are in the name of the tenant). The installation must be in an existing home where the current water heater has been operating at that address for at least 12 months (or 5-years if replacing solar). Only one rebate per dwelling is allowed. Rebates are not available to commercial and non-commercial entities; only individuals that are owner-occupiers or landlords may apply. The rebate is offered until December 31, 2010, subject to the availability of funds.

The program provides rebates for installations in households that:

- Replace a natural gas or LPG water heater with a gas-boosted solar system
- Add solar to an existing natural gas or LPG water heater by installing a solar system as a pre-heater
- Add solar to an existing electric water heater by installing a retrofit kit
- Replace an existing solar, solid fuel or oil fired water heater with a solar system. Must be natural gas boosted if available in the street. Existing LPG boosted solar water heaters can only be replaced with gas boosted systems
- Replace an electric water heater with gas boosted or electric boosted solar system (if natural gas is not available in the street) where the applicant has installed ceiling insulation under the Australian Government's Homeowner Insulation Program

System Requirements

Only accredited SWHS that fulfill the following criteria are eligible for a rebate:

- Provide greater than 60% solar fraction in Southern Victoria as assessed in AS 4234-1994 Solar water heaters – Domestic and heat pump – Calculation of energy consumption or AS/NZS 4234:2008 Heated water systems – Calculation of energy consumption except from January 1, 2010 where assessment using AS/NZS 4234:2008 is mandatory
- Include a warranty on major components of no less than 5-years including damage from freezing
- Are new and not second-hand (new preheaters can be attached to an existing tank)
- Result in reduced GHG emissions (therefore the replacement of an existing natural gas or LPG water heater with an electric boosted solar system would not attract a rebate)
- Are approved by Sustainability Victoria and listed on its website
- Are oriented between 60 degrees west or east of true north on the roof and not be overshadowed by trees or buildings
- Are installed by a licensed plumber and a compliance certificate issued

1.2.2.4 Rebate Amount

Rebates for complete SWHS vary depending on the size and performance of the system, relative installation costs, location and other incentives available. Rebates for installations in regional Victoria range from $400 to $1600. In metropolitan Melbourne the rebates range from $300 to $1500. An additional rebate of $200 is available for eligible households replacing an electric water heater where there is gas available in the street and this is the first connection to the property.

A Victorian rebate is only available to applicants replacing an electric water heater where ceiling insulation has been installed under the Australian Government's Home Insulation Program and are thus unable to access the Australian Government's Solar Hot Water Rebate.

1.2.2.5 Incentives for SWHS in Victoria

There are currently four different incentives available to Victorians replacing an existing hot water system with a SWHS. Each incentive has varying eligibility requirements:

- Victorian Government Solar Hot Water Rebate - Regional and Metropolitan

- Australian Government Solar Hot Water Rebate
- Renewable Energy Certificates (RECs)
- Victorian Energy Efficiency Certificates (VEECs); also known as the Energy Saver Incentive

Most installations will attract RECs and VEECs and either the Victorian Government Rebate or the Australian Government's Rebate. The operational details of RECs and VEECs has been explained in depth in the Report on Scheme and Framework for Promotion of Solar Water Heating Systems by Utilities and Regulators, submitted to MNRE. The following Table 1.2 provides summary of incentives available in Victoria.

Table 1.2: Summary of incentives available in Victoria[7]

Installation Situation	**Victorian Government Rebate**	**Australian Government Rebate**	**RECs eligible**	**VEECs eligible**
For private homes (owner-occupied or permanently tenanted)				
Replacing a natural gas or LPG water heater with a gas-boosted solar system	Yes	No	Yes	Yes
Adding a SWHS to an existing natural gas or LPG water heater, as a preheater	Yes	No	No	Yes
Adding solar panels to an existing off-peak electric water heater either with a pump or by thermosiphon as a retrofit kit	Yes	No	No	Yes
Replacing an existing solar, wood, briquette or oil fuelled water heater with gas-boosted or electric solar system. Must be natural gas boosted if available in the street. Existing LPG boosted solar water heaters can only be replaced with gas boosted systems.	Yes	No	Yes	No
Replacing an electric water heater with gas-boosted or electric solar system (if natural gas is not available in the street) where the	Yes	No	Yes	Yes

Installation Situation	Victorian Government Rebate	Australian Government Rebate	RECs eligible	VEECs eligible
applicant has installed ceiling insulation under the Australian Government's Home Insulation Program				
Replacing an electric water heater with gas-boosted or electric solar system where applicant has not installed ceiling insulation under the Australian Government's Home Insulation Program	No	Yes	Yes	Yes
New homes and buildings installing a gas-boosted or electric solar system	No	No	Yes	No
For commercial buildings				
New or existing buildings installing a SWHS	No	No	Yes	No

1.2.2.6 Disbursement of Rebate

The Victorian Government rebate takes the form of a point-of-sale discount on the supply and installation cost and is only available through participating suppliers. The Victorian government maintains a list of participating suppliers, solar hot water system manufacturers and accredited SWHS. The participating supplier is required to arrange installation and provide Sustainability Victoria with a copy of the customer invoice itemizing the system cost, installation cost and the Victorian Government rebate amount. The supplier is then reimbursed by Sustainability Victoria upon receipt of a valid application. The supplier must claim the rebate from Sustainability Victoria within thirty days of the installation.

The rebate applicant is required to acknowledge that the SWHS may be inspected by Sustainability Victoria (upon reasonable request) during the first 5-years of operation.

1.2.3 South Australian Solar Hot Water Rebate

1.2.3.1 Overview

The South Australian Solar Hot Water Rebate Scheme is targeted at low income households to help them comply with the Performance Standards for Domestic Water Heater Installations, effective from the July 1, 2008. These new standards aim to increase the uptake of high-efficiency gas, solar and electric heat pump water heaters. Under South Australian laws, most new or replacement water heater installations in South Australian homes need to be either high efficiency gas, solar or electric heat pump systems. Household water heating has been identified to be typically the largest use of energy in a home and a significant source of GHG emissions.

1.2.3.2 Implementing Agency

The Energy Division of South Australian Department of Transport, Energy and Infrastructure (DTEI) administers the South Australian Solar Hot Water Rebate Scheme. The Energy Division provides policy advice on energy issues, energy program delivery and regulatory services for the competitive, sustainable, safe and reliable supply and use of energy, for the benefit of the South Australian community.

1.2.3.3 Eligibility Criteria

To be eligible for the South Australian Government rebate, the rebate applicant must be an eligible applicant and commission an eligible installation.

Applicant's Requirements[8]

Eligible applicants are home owners who install a complying water heater, as outlined in the Table 1.3, should serve their principal place of residence and at the time of installation hold at least one of the following Australian Government concession cards**:**

- Centrelink Health Care Card
- Centrelink or Department of Veterans' Affairs Pensioner Concession Card
- Department of Veterans' Affairs Gold Card - Totally and Permanently Incapacitated
- Department of Veterans' Affairs Gold Card - War Widow
- Department of Veterans' Affairs - Extreme Disablement Adjustment

Commonwealth Seniors Health Card and Medicare Card are not eligible to avail the rebate. From July 1, 2008, eligible home owners will have six months from the date of completed

installation, as per the Electrical or Gas Certificate of Compliance, to lodge their rebate applications.

System Requirements

The SWHS must be eligible for a minimum of 18 RECs in ORER Zone 3, regardless of the zone in which it is installed. A list of eligible systems is available in the Register of Solar Water Heaters available from the Office of the Renewable Energy Regulator. All systems must be installed by a qualified and licensed person and must have a warranty of 5- years or more on all major component parts, including frost protection, if required, in affected regions. Retrofits and second-hand water heaters, including systems with second-hand component parts, are not eligible installations. The following Table 1.3 summarizes hot water systems eligible for the rebate:

Table 1.3: Summary of hot water systems eligible for South Australian Solar Hot Water Rebate[9]

	New Home or Renovation*		**Established Home Replacement of Existing Hot Water System**			
New System	No Gas** access	Yes Gas** access	Gas***	Gas*** Solar	Electric Element, Electric Solar, Heat Pump	All Other Types - including Oil & Combustion
Gas Solar	Yes	Yes	Yes	Yes	Yes	Yes
Electric Solar, or Heat Pump	Yes	No	No	No	Yes	Yes
Electric or Gas Storage / Instantaneous	No	No	No	No	No	No

* Renovation - new hot water system not replacing an existing one

** Gas access is natural gas or LPG, reticulated in the street

*** Includes reticulated and bottled gas already in use for water heating

1.2.3.4 Rebate Amount

The South Australian Government's Solar Hot Water Rebate Scheme provides a rebate of $500 on the cost of a new SWHS installed on or after July 1, 2008. This rebate is in addition to the Australian Government's Hot Water Rebate. Different eligibility criteria apply for these rebates. A low income household may be eligible to receive both the State Government and the Australian Government rebate for their SWHS installation.

1.2.3.5 Disbursement of Rebate

The rebate is disbursed on submission of the following documents along with the rebate application form:

- A copy of the Electrical or Gas or Plumbing Certificate of Compliance
- A copy of applicant's Tax Invoice or Lease/Maintenance Agreement
- A copy of a notice from South Australian Water or Local Government (Council Rates) that is less than four months old or a copy of a notice from Revenue South Australia
- A copy of one of the cards listed under Eligible Applicants

The South Australian Government rebate takes the form of a point-of-sale discount on the supply and installation cost and is only available through participating suppliers. The supplier is then reimbursed by DTEI upon receipt of a valid application. The government approved 1,807 rebate applications from July 1, 2008 onwards. The installations are periodically inspected by the Office of the Technical Regulator.

1.2.4 Western Australia Solar Water Heater Subsidy Scheme

1.2.4.1 Overview

The Government of Western Australia Solar Water Heater Subsidy Scheme provides rebates for gas-boosted SWHS used for residential purposes. Aim of the Solar Water Heater Subsidy Scheme is to:

- Reduce GHG emissions
- Replace the use of fossil fuels with renewable energy
- Assist in the long term development of the solar water heater industry
- Reduce household expenditure on energy and increase accessibility to sustainable technology
- Increase public awareness about sustainable energy technology

1.2.4.2 Implementing Agency

The SWHS Scheme has been developed and is administered by the Sustainable Energy Development Office (SEDO) and the Office of Energy (OOE). The OOE plays a vital role in accelerating the adoption of renewable energy and energy-efficient strategies across all sectors of the community - from business and industry to government and the general public. The Scheme is funded by the Government of Western Australia**.** SEDO was integrated into the OOE from January 1, 2010.

1.2.4.3 Eligibility Criteria

Rebates are only available for new and complete gas-boosted SWHS accredited to the Australian Standard AS2712. Gas-boosted SWHS must be fully installed and commissioned before a rebate application is approved. The scheme is expected to run from June 2005 to June 2009 or until funds available are fully committed.

Applicant's Requirements[10]

- The applicant must be the householder of the residence where the gas-boosted SWHS is installed except in case of following criteria :
  - Builders may apply for a rebate on eligible SWHS installed in display homes
  - Private residential developers may apply for rebates on eligible SWHS installed on residential dwellings subject to pre-approval in writing by SEDO for 20 or more SWHS in one development
- Gas-boosted SWHS must be installed in a Western Australian residence
- Only one rebate is available per household
- After May 31, 2006 all rebate applications pertaining to new homes must be formally pre-approved for a rebate by SEDO prior to claiming the rebate
- After May 31, 2006 all rebate applications pertaining to replacement SWHS for existing homes must be accompanied with a sales receipt
- Applicants must complete and submit an application form with a signed and dated applicant declaration

System Requirements[10]

To be eligible for the rebate the SWHS should meet the following criteria:

- SWHS must be purchased from suppliers recognized by the OOE

- Rebates are available for new, two or more panel, gas-boosted SWHS that are accredited to Australian Standard AS2712
- Family sized systems (250 liter or more storage capacity and 2.7m^2 or more collector surface area)
- New, complete systems (i.e. not pre-heating an existing gas storage system) and must be installed and commissioned before a rebate application is made
- Designed to meet all relevant plumbing and gas-fitting standards and regulations
- Warranted for a minimum of 5-years with at least one year for all major components. Systems installed in areas that are frost-prone or experience poor water quality should be designed appropriately for such conditions
- Rebates will not be available for:
  - Replacement parts
  - Commercial or semi-permanent premises, such as tourism facilities, mining facilities, caravan parks and dairies
  - Premises funded by other Government agencies such as Employee Housing, Homeswest and Family and Children's Services
  - SWHS with the element removed, pre-heating an existing gas-storage hot water system

Additional Requirements

- Manufacturers or principle suppliers of gas-boosted SWHS in Western Australia must enter and abide by an Agreement with SEDO
- Gas-boosted SWHS must be installed by a licensed tradesperson. The installer should have formal training from the manufacturer or have completed the solar hot water module of the GreenPlumbers program
- Suppliers should provide applicant's an operation manual, which includes operational procedures, a maintenance schedule and warranty procedures for each gas-boosted SWHS supplied

1.2.4.4 Rebate Amount

The current rebate level is:[11]

- $500 for gas-boosted SWHS connected to a reticulated gas network
- $700 for bottled LPG boosted SWHS where reticulated gas is not available

Approval of rebates is subject to availability of funds. The rebate amount may be reduced depending on uptake. This rebate is in addition to the Australian Government's Hot Water Rebate.

1.2.4.5 Disbursement of Rebate

The applicant needs to contact the suppliers of gas-boosted SWHS to determine the appropriate type and size of system required. SEDO recommends that the applicant should not contact more than one supplier. Applicant's details are registered by the supplier for pre-approval after a commitment is made to purchase a SWHS (for new homes). Applications that meet the requirements for pre-approval are pre-approved by SEDO meet (for new homes).

Once the system is installed, the applicant has to complete the Rebate Application Form in conjunction with the installer and send it to the manufacturer. The applications are then sent to SEDO by the manufacturer. SEDO approves those applications that meet the requirements of the Scheme.

Payment of the rebate is made by cheque and usually occurs within eight weeks of receipt of a completed application. Rebates are paid to suppliers on behalf of eligible applicants. It is the applicant responsibility to check with the supplier whether the rebate has been applied as an upfront discount or credited after their application has been approved by SEDO.

1.2.5 Queensland Solar Hot Water Program

1.2.5.1 Overview

The Queensland Solar Hot Water Program aims to make it easier and more affordable for Queenslanders to switch to solar. Under the Program, eligible participants have access to a standard installed and warranted SWHS at a more affordable price than what is currently available in the open market. The Program encourages replacement of energy intensive electric storage hot water systems with greenhouse friendly SWHS.

Installing a SWHS will offer households energy savings of up to 25% and cut household GHG by up to 30%. The Program will also help transition the community towards the 2010 Electric Storage Hot Water System Phase Out. The Queensland Solar Hot Water Program is a major

component of the Queensland Government's Q2¥ strategy and Queensland Renewable Energy Plan to reduce Queenslanders' carbon footprint by one third by 2020. The Queensland Solar Hot Water Program is one of the largest and most complex industry transformation project of its kind and aims to move solar from a niche industry to mainstream product.

1.2.5.2 Implementing Agency

The Queensland Government's Department of Employment, Economic Development and Innovation - Office of Clean Energy is the authority responsible for administering the Queensland Solar Hot Water Program. Over 3-years, the Program aims to reduce approximately 630,000 tonnes of GHG emissions or about 4.9 million tonnes over the 15-year life of installed greenhouse efficient hot water systems. The Office of Clean Energy contributes to the state government's Q2 vision and Queensland Renewable Energy Plan.

1.2.5.3 Eligibility Criteria

The Queensland Solar Hot Water Program is dependent upon the Australian Government's Solar Hot Water Rebate Program and RECs created under the Australian Government's Renewable Energy Target. The Program was rolled out on July 1, 2009 and is expected to continue for 3-years¤ leading to a state-wide installation of around 200,000 solar and heat pump hot water systems.

This offer is only open to Queenslanders who have an electric storage hot water system installed in their home. If the existing hot water system fails, a new system has to be purchased from the marketplace. There is no access to a new system under this Program but the SWHS owner may still be eligible for the Federal Government's Solar Hot Water Rebate and RECs. Furthermore, the following eligibility criteria are also applicable:[12]

- Applicants must be replacing an existing electric storage hot water system with a solar or heat pump hot water system offered under this Program

¥ The Queensland Government has set five goals that address current and future challenges for Queensland. Within each of these areas, long-term targets have been set to be achieved by 2020.
¤ Subject to the continuation of Federal assistance - the Australian Government's Solar Hot Water Rebate and RECs.

- Applicants cannot replace an existing gas hot water system with a solar or heat pump hot water system under this Program
- Applicants are not eligible for the Queensland Program if they have previously applied for the Australian Government's Homeowner Insulation Program
- Non residential premises, eg: commercial, are not eligible under this Program
- An owner-occupier, landlord or tenant can apply under the Queensland Program as long as the dwelling where the hot water system is to be installed is a principal place of residence
- If the applicant is a pensioner or low income earner, the applicant must hold a Centrelink Pension Concession Card, a Centrelink Low Income Health Care Card, a Commonwealth Seniors Health Card or a Department of Veterans' Affairs Pension Concession Card.

A selection of solar or heat pump hot water systems is offered to eligible participants depending on a number of factors, including the size of the dwelling, roof aspect and water quality. A list of accredited installers is maintained by the Office of Clean Energy. Products offered under the Program comply with relevant Australian Standards and carry the same warranty as products offered for retail sale.

1.2.5.4 Financial Assistance under the Program

The Queensland Solar Hot Water Program is not a rebate scheme. Successful applicants are not reimbursed for purchasing an eligible system. The Queensland Government pays the federal rebate upfront on the applicant's behalf, to the installer, to ensure quick installation of the SWHS. Hence, for this reason, to be eligible for the Queensland Government Solar Hot Water Program, applicants must be eligible for the Federal Solar Hot Water Rebate.

The Queensland Government has established a Standing Offer Arrangement with a number of companies to supply high quality SWHS for an affordable customer payment of $500 or $100 for eligible pensioners and low-income earners**.** All costs associated with the installation of the new solar technology hot water system are detailed in a quote provided to the applicant by the Queensland Solar Hot Water Program supplier prior to installation. The Program does not cover any additional costs such as council inspection fees or any other non-standard installation costs (for example cranage, cyclone brackets, extra copper piping etc). Council inspection fees varies throughout Queensland ranging from no charge in some areas, up to about $300 in a small number of council areas.

Standard installation is available for the following SWHS:

- Split SWHS
  - Electric Boosted Split System
  - Gas Boosted Split System
- Roof Mounted SWHS
  - Electric Boosted System

1.2.5.5 Application Process

After the application has been submitted, the Office of Clean Energy sends the applicant a letter confirming receipt of the application. Once the application has been processed, the Office of Clean Energy notifies the applicant in writing about the eligibility status.

Once the SWHS is installed, the Queensland Government forwards the applicant a final receipt**.** The applicant is then required to apply for the Federal Government's Solar Hot Water Rebate as soon as possible, attaching a copy of the final receipt. The applicant is required to repay the Queensland Government the amount equivalent to the full rebate within seven days of receiving a rebate or advice from the Federal Government. If after receiving the rebate or advice from the Federal Government the applicant does not pay the rebate to the Queensland Government within the stipiulated time, a reminder notice is sent.

The Federal Rebate is a separate process assessed by the Federal Government, Department of the Environment, Water, Heritage and the Arts (the Department). On applying for the Federal rebate once the system is installed, and is the application is deemed by the Federal Government to be ineligible, the applicant will still be responsible for forwarding this payment amount to the Queensland Government.

The first group of applicants, who registered before July 1, 2009 are currently being processed with installations underway. Eligible applicants are currently being matched with suppliers in their area. The Program currently has two suppliers appointed, Conergy Australia and Ecovation. Registrations of Interest (ROI) for the program is still open. Those who registered after July 1, 2009 will receive application packs after the first group of applicants have been processed.

1.2.6 Northern Territory Solar Hot Water Retrofit Rebate

1.2.6.1 Overview

Under the Renewable Electricity Act the government has mandated that by 2010 an additional 9,500 GWh of electricity must come from renewable energy sources. For the Northern Territory this means that the Power and Water Corporation requires an additional 61,500 MWh (or 61,500 RECs) of renewable energy sources by the end of 2010 to comply. There are a number of incentives available to Territorians to become greenhouse friendly and save money on their power and water bills.

The Solar Hot Water Retrofit Rebate program provides a financial incentive to pre-existing homes in the Northern Territory to replace electric systems with SWHS. The rebate is designed to compensate for additional plumbing and roof structure upgrading that may be required to complete the installation.

1.2.6.2 Implementing Agency

The Northern Territory Government's Department of the Chief Minister offers the Solar Hot Water Retrofit Rebate, administered by the Power and Water Corporation.

1.2.6.3 Eligibility Criteria

Applicant's Requirements[13]

Applicants and households requirements to avail the rebate are as follows:

- The household should be a Northern Territory residential property and should be the primary place of residence of the applicant
- The household should have been built in or prior to the year 2000
- Applications must be lodged before June 30, 2010 and are dependent on funds available
- Only one rebate will be issued per customer
- The installer must install the SWHS in accordance with the Department of Planning and Infrastructure's Building Notes 56 and 63 of the Building Notes Register. This may require strengthening of the roofing support members.

System Requirements[13]

To be eligible to claim the rebate, a number of conditions apply including the type of SWHS and place of residence of the installation.

The SWHS must:

- Replace an electric hot water system
- Be a new system that is eligible for at least 20 RECs at the time and place of installation
- Include a 'one-shot' booster switch
- Be purchased and installed on, or after June 28, 2009
- Be installed by an appropriately licensed and qualified electrician or plumber who certifies that the roof structure of the building was modified to bring it to compliance with the Northern Territory Building Act (in the relevant location in the Territory)
- In cyclonic areas the fixing of the unit must comply with the Deemed to Comply Manual.
- All plumbing work should be carried out in accordance with the relevant National Plumbing and Drainage Code
- Be installed in its entirety and completely operational, as certified by the licensed installer

Rebates are not available for the following:

- Applicants who don't own or rent the home where the system was installed at the time of the retrofit
- Government departments, businesses, or other organizations (applicants must be individuals)
- Systems replacing or in addition to an existing SWHS

1.2.6.4 Rebate Amount

Residents may be eligible for a rebate of up to $1,000. The actual rebate depends on the modifications required to the roof and is based on SWHS that replace electric systems and attract at least 20 RECs under the MRET. The Northern Territory Government rebate is additional to any other rebate or incentive offer available to Northern Territory residents under the Australian Government's Solar Hot Water Rebate Scheme and MRET. Table 1.4 below provides further information on the rebate amount depending on specific home requirements.

Table 1.4: Northern Territory Government Rebate amount depending on specific home requirements[14]

Rebate amounts	Requirement
Up to $1000*	Homes built in or prior to the year 2000 that have timber trusses in their roofs which will require reinforcement in order to support the new SWHS. Additional plumbing will also need to be completed.
Up to $400*	Homes built in or prior to the year 2000 that have steel trusses in their roofs which will only require additional plumbing.

* Power and Water reserves the right to change the rebate amount at any time.

Applicants can apply for the rebate once the system has been installed and certificated by a qualified installer. Applications for the rebate must be submitted within six months of the new SWHS being installed. Applications will not be accepted after June 30, 2010.

1.2.6.5 Application Process

On meeting all the eligibility requirements of the Solar Hot Water Retrofit Rebate, the applicant has to locate a certified contractor/installer who can provide a design and cost of a SWHS and modification that best suits the applicant's needs and is in accordance with the Northern Territory Building Act.

On completion of the works the applicant should obtain a certificate from the plumber stating that the plumbing work has been installed in accordance with the relevant National Plumbing and Drainage Code. After the installation has been completed and having received the certificate of compliance, the applicant can now apply for the rebate by completing the application form and submitting it to Power and Water Corporation along with the required paperwork.

1.2.6.6 Disbursement of Rebate

Payment to successful applicants is made by electronic funds transfer into the nominated bank account provided in the application form. Payment will be made within eight weeks of receiving a completed and eligible application form. Proof is required that the retrofit has

occurred and an existing electric hot water system has been replaced with a new SWHS eligible for 20 or more RECs. The installer can certify this along with providing the tank serial number.

1.2.7 Tasmania Hobart City Council Solar and Heat Pump Hot Water Rebate Scheme

1.2.7.1 Overview

In April 2001, Hobart City Council launched an initiative aimed at encouraging energy efficient new houses and home extensions. To encourage existing home owners and home builders to pursue energy efficient options, Hobart City Council offers the Solar and Heat Pump Hot Water Rebate Scheme along with other domestic rebate schemes. By continuing to offer such incentives, the Hobart City Council is maintaining its active and leading role in tackling the effects of global climate change at a local level in Tasmania by promoting the use of more efficient design, systems and renewable energy for domestic hot water heating.

1.2.7.2 Implementing Agency

The Government of Tasmania Hobart City Council is administering and funding the Solar and Heat Pump Hot Water Rebate Scheme. The Council was the first in Tasmania to join the Cities for Climate Protection Program (CCP) in 1999. Hobart City Council is committed to finding practical and effective ways to address climate change concerns within the Hobart municipality.

1.2.7.3 Eligibility Criteria

Applicant's Requirements[15]

To be eligible to qualify for the rebate the applicant must:

- Have purchased and installed the SWHS between July 1, 2007 and December 31, 2011. No rebate will be offered for systems that have been purchased outside of this period.
- Replace an existing electric storage hot water system and be eligible for at least 20 RECs at the time and place of installation
- Be an owner-occupier of the property
- Install the system on the property which is located within the City of Hobart

System Requirements[15]

- The SWHS must be installed by a currently registered plumber
- The rebate scheme imposes no restrictions on the brand, size or cost of the unit but it must be eligible for at least 20 RECs at the time and place of the installation. A list of eligible

systems is available in the Register of Solar Water Heaters on the Office of the Renewable Energy Regulator

- The SWHS should comply with building and plumbing permits

1.2.7.4 Application Process

After purchasing an eligible SWHS from a local distributor and its installation by a registered plumber (plumber must sign the application form to be eligible for the rebate) the applicant should submit the completed rebate application form along with receipts (information on the place and the date of purchase), manufacturer's certificate (for SWHS make and model information) and any other required documentation (eg: plumbing permits with the associated plumbing completion certificate, building permit from a registered building surveyor, planning permit if the property is identified as being either located within a Heritage Area or listed under the Heritage Schedule of the City of Hobart Planning Scheme 1982, and for all properties located within the Battery Point and Sullivans Cove Planning Scheme Areas) to the Council.

1.2.7.5 Rebate Amount and Disbursement

The Rebate Scheme began on July 1, 2007 for SWHS and will continue until December 31, 2011. The rebate provides a one-off payment of $500 per solar (and heat pump) hot water system for Hobart ratepayers who are ineligible for Council's current planning and building administration fee rebate. This rebate is additional to any other rebate or incentive offer available to the Council residents under the Australian Government's Solar Hot Water Rebate Scheme and MRET.

The Council usually takes about two weeks time for notification of the application success. Council's permit fees associated with SWHS installations that involve no additional development other than that required to install the system is waived. Subject to approval, the rebate is then deducted from subsequent rates instalment notice(s).

2 TUNISIA

2.1 The PROSOL Project

2.1.1 Overview

PROSOL (*Programme Solaire*) is a 2-year project developed within the Mediterranean Renewable Energy Programme (MEDREP) umbrella. It had a total budget of €1.7 millions, donated by the Italian Ministry for the Environment, Land and Sea. The project was initiated in 2005 by the Tunisian Minister for Industry, Energy and Small and Medium Enterprises and the National Agency for Energy Conservation (ANME), with the support of the UNEP-MEDREP Finance Initiative.

The objective of PROSOL was to revitalize the declining Tunisian SWHS market. The innovative component of PROSOL lies in its ability to actively involve the finance sector, and turn it into a key actor for the promotion of clean energy and sustainable development. By identifying new lending opportunities, banks have started building dedicated loan portfolios, thus helping to shift from a cash-based to a credit-based market.

2.1.2 Implementing Agencies

The PROSOL Project was initiated in Tunisia by the **United Nations Environment Programme** (UNEP). UNEP has been working with the finance sector to develop innovative mechanisms for the promotion of sustainable energy technologies in developing countries. Through its Renewable Energy and Finance Unit, UNEP has implemented a variety of "financial catalysts" with the aim to lower risks, buy down transaction costs, build capacity and address soft market barriers that constrain sustainable energy technologies growth.

The **Mediterranean Renewable Energy Programme** (MEDREP) Finance initiative represents one of the most recent and successful examples of providing finance in the area of renewable energy technologies. The aim of the MEDREP is to expand the share of renewable energy technologies in the Southern Mediterranean region, in order to reduce poverty.

The **National Agency for Energy Conservation** (ANME) is a non-administrative public entity belonging under the authority of the Ministry of Industry, Energy and Small and Medium Enterprises, Tunisia. The ANME scope of intervention encompasses the whole range of

initiatives and actions aimed at improving the level of energy efficiency and diversifying energy sources.

Other key partners in the Project apart from UNEP and ANME are:

- The Société Tunisienne de Banque (STB)
- Two commercial banks (UBCI and Amen bank)
- The State electricity utility STEG (Société Tunisienne d'Electricité et du Gaz)
- Manufacturers, importers and installers of SWHS
- Local consultants

2.1.3 Details of the Scheme

The main features of the PROSOL financing scheme are:

- A loan mechanism for domestic customers to purchase SWHS
- A capital cost subsidy provided by the Tunisian government, up to 100 Dinars (€57) per m216
- Discounted interest rates on the loans that progressively phase out
- A series of accompanying measures, which includes an awareness raising campaign, a capacity building programme and carbon finance

2.1.4 Operational Details

In the PROSOL scheme, loans for SWHS are effectively driven by suppliers, who act as indirect lenders of money for their customers. The process begins when a customer decides to purchase a SWHS from an eligible supplier. It is worth highlighting that only suppliers accredited by ANME can operate within PROSOL. Products must meet a series of technical requirements and performance standards, as set in a manual prepared by ANME.

After initial agreement between the customer and the supplier, the latter submits a loan application (along with form confirming participation in the PROSOL Programme, customer's ID proof and latest STEG's, Electricity Utility, electricity bill) to a participating Tunisian bank that qualifies the customer's ability to repay the loan. Once the bank approves the loan to the supplier, the SWHS is installed at the customer's home. At this stage, the customer pays only the administrative costs of the process i.e. Dinar 35 to STEG.[17]

The supplier is now responsible for installation and operation testing of the equipment. The customer fills out and signs an "acceptance form" which stands as an acknowledgement receipt and evidence that the client has accepted the equipment installed by the supplier company (or its representative agent) in its premises. After complete installation of the SWHS, the supplier receives the following payments¤:[18]

- A subsidy payment from ANME of 200 Dinars (€114) for a 200-litre system or 400 Dinars (€228) for a 300-litre unit which is passed on to the customer who is responsible for acknowledging the same to ANME
- A loan from the bank of 750 Dinars (€428) for the 200-litre SWHS, or 950 Dinars (€542) for the 300-litre system

The customer repays the loan on a pro-rata basis over a 5-year term, through the electricity bills issued bi-monthly by STEG. In some cases, however, the extra cost for the SWHS is compensated by reduced electricity consumption, thus lowering the overall amount to be paid. Within this scheme, banks do not have any direct contact with the customer, who is the final beneficiary of the loan. They deal instead with SWHS suppliers. This unusual arrangement provides a double security:

- Loans are officially granted to the SWHS suppliers who are responsible for repayments
- The consumer cannot easily default because the loan debt is recovered through the customer's electricity bill.

In the event a customer does not pay the bill (and hence the SWHS loan), banks can take action against the SWHS suppliers that were granted the loan. At the same time, STEG has the authority to suspend the electricity supply to the customer. The customer commits to payment in full of the loan related to the SWHS in case he/she chooses to temporarily or definitely disconnect its STEG subscription.

The customer also commits to reimbursing the loan (inclusive of interest) based on thirty installments as per each electricity bill (bi-monthly), or sixty installments (monthly), for a period of 5-years. Table 2.1 provides further details on this.

¤ The total amount (loan + subsidy) cannot exceed the cost of the SWHS installed (cost of a 200 liter thermosiphon SWHS in Tunisia is Dinar 1200).

Table 2.1: PROSOL and PROSOL II Loan and Installments Amounts[20]

Loan Amount (Dinars)	Installment Amount (payment every 2 months in Dinars)	Installment Amount (payment every month in Dinars)
550	21.441	10.721
750	29.238	14.619
950	27.035	18.518
1150	44.832	22.416

In PROSOL, loan duration was 5-years instead of the usual 3-year term. As for interest rates, the commercial lending rate for similar loan products in Tunisia is 14%. Within PROSOL, banks agreed to a 7% reduction. Through the MEDREP Fund, UNEP provided a 7% interest buy-down for loans disbursed in the first 12 month and 3% for subsequent loans. This means the rate initially charged to customers was 0% and after 12 months 4%. The transparency of the system is ensured by independent third party evaluation. At the beginning of 2007, PROSOL was audited by KPMG.

The most distinctive aspects of the PROSOL financing scheme are:

- The engagement of banks and the active involvement of the State utility. In PROSOL, banks play a very important role since they provide the necessary funds to develop the market, accounting for the highest percentage of the finance for SWHS
- The engagement of STEG in recovering the loan payments through its electricity bills provides enough guarantee to banks to extend the loan terms and lower the interest rates

2.1.5 Progress and Outcomes

The PROSOL Project became a major stimulant behind the growth and success of SWHS market in Tunisia. The figures gathered in 2007, end of PROSOL, and confirm this encouraging trend. [17,19]

- The Scheme was launched in April 2005 and has resulted in an immediate success. In less than 1-year (April-December 2005), sales reached the record figure of 7,400 SWHS, for a total surface installed of 23,000 m2.

- At the end of 2006, an additional 11,000 units were sold, corresponding to approximately 34,000 m2. The capacity added in the year 2006 was higher than the cumulative capacity installed in the entire period 1985-1996, prior to the GEF project. Overall, in less than 2-years the SWHS market surpassed 57,000 m2, representing as much as 50% of the cumulative surface installed from 1985 to 2004. Under PROSOL II, in 2008, a total surface area of 60,000 m2 was installed.
- In terms of equipments, most installations are represented by flat plate solar panels but vacuum tube collectors are slightly gaining market share.
- As for financial data, banks granted loans for more than 6 million Dinars (€3.4 million) in 2005 and 9 million Dinars (€5.3 million) in 2006.
- A new manufacturing plant is being established and new technology providers are entering the market.
- As far as installers are concerned, their number reached 384 units, i.e. three times the figure achieved at the end of the GEF project.

2.2 Future Outlook

These remarkable results have led the Tunisian government to set very ambitious targets and launch of PROSOL II and a similar Tertiary PROSOL Program to finance SWHS installation in the Services sector. The PROSOL II Program has fixed the objective to install 540,000 m^2 in the period 2007-2011, i.e. over 100,000 m^2 per year on average. If this target is met, the annual market for SWHS in Tunisia would become comparable to current levels of countries like Spain or Italy and the solar thermal capacity in operation would become comparable to current levels of countries like Germany, Denmark or Switzerland.

- In order to give visibility to the project, a comprehensive communication plan was developed at national level to inform customers on the advantages of the mechanism and promote the purchase of SWHS.
- A Training Support Facility was established to build capacity amongst financiers and expand their confidence degree in renewable energy technologies, with the ultimate goal to increase the number of sustainable energy loan portfolios.
- Carbon finance is another important component of PROSOL. A Project Idea Note (PIN) was prepared by ANME and submitted to the Designated National Authority in April 2006. A Project Design Document (PDD) is currently under development.

- The first important change driven by the project is the setting by law (Law 82/2005 and decree 2234/2005) of a 20% capital cost subsidy on all new SWHS installations. This provides a further stimulus to the development of the renewable energy technology market.
- In order to improve technology level and decrease costs, the decree 4/2006 has exempted SWHS from VAT and decreased custom duties.

In PROSOL II certain program modifications have been incorporated to strengthen it further and remove drawbacks. In PROSOL, SWHS suppliers were the sole party dealing with banks and were obliged to accept responsibility for the loans they had taken out on behalf of their customers. Ironically, a successful vendor was measured by his level of indebtedness. This limit has been corrected in the new PROSOL II. In PROSOL II, end users are directly granted the loan from the bank, thus eliminating the burden for suppliers. The new mechanism has been entirely developed by local actors. This represents a very positive outcome, since it demonstrates that a self-sustaining market and policy decision making process are being built up. Furthermore, a maintenance cost subsidy has been incorporated in PROSOL II for the Tourism and Service Sector, in order to ensure long term efficiency of the systems installed, and create expertise in the sector.

The abovementioned measures help create a more level playing field where solar thermal can better compete against conventional energy sources, like natural gas or LPG. Capacity building and information exchange have also played an important role in stimulating a dynamic attitude of the Tunisian government, which has set very ambitious targets for solar thermal and has established a comprehensive strategy made of policy, financial and fiscal incentives, awareness raising campaigns (including the "Solar month" campaign), monitoring measures, etc.

3 SOUTH AFRICA

3.1 Energy Services Company (ESCO) Model

3.1.1 Overview

ESCO model or 'fee-for-service' Mechanism is one of the approaches suggested by Renewable Energy and Energy Efficiency Partnership (REEEP) and Sustainable Energy Africa (SEA) for large-scale deployment of SWHS in South Africa.[21] The idea behind this mechanism is that people buy a service, in this case hot water, from an Energy Services Company (ESCO), rather than energy to perform the service. This is the proposed business model for large scale roll-out of SWHS in three Gauteng Metros.[22]

3.1.2 Legislative Framework

According to the study carried out by REEEP and SEA for implementation of the proposed ESCO model in the three Gauteng Metros, the following municipal level legislations were identified to be the most important from the perspective of the ESCO model.

- Municipal Finance Management Act (MFMA)

The Act controls the way local Government manages its finances. It specifies the local Government's financial relationship with private companies and has potentially important implications in the effective delivery of the implementation plan. If the City contracts a private sector implementation agency, then there needs to be some consideration for extending the appointment beyond three-year in accordance with the provisions of the MFMA.

- Municipal Systems Act

The Act specifies the process through which procurement options within the local Government are to be assessed.

- Public Finance Management Act

The Act specifies Government's financial relationship with public companies and holds relevance in any local Government partnership with a public company. This act is relevant in the case of Nelson Mandela Bay Metropolitan Municipality where Central Energy Fund (CEF) is the ESCO.

3.1.3 Stakeholders Involved

Various stakeholders involved in the South African ESCO model and their respective responsibilities have been discussed in this section.

The Implementing Agent/ESCO plays a key role in co-coordinating the model in its area of jurisdiction. It could be a public/private company that puts together a suitable SWHS financing package, drawing on the Eskom DSM incentive, carbon funding and/or bulk financing deals. The ESCO is also able to negotiate a reduction in current SWHS unit costs through mass purchase of systems. It enters into a contract with the SWHS users and thereafter gets the SWHS installed and maintains it in individual households at its own cost. ESCO retains ownership of the system and sells hot water to the owner/business in any of the following ways:

- Metering the hot water/volume
- A lease or hire/purchase agreement for a fixed period
- A fixed monthly fee

In case of Nelson Mandela Metro, the CEF is acting as an Implementing Agency. As it is a public entity, it is not subject to the same legal procurement constraints as private companies, and can therefore easily enter into implementation agreements with cities.

The SWHS should meet the eligibility criteria stated under Eskom's Solar Water Heating Programme. The system should be supplied by the Registered Supplier and installed by a Registered Installer. The SWHS should comply with South African Bureau of Standards (SABS) and South African National Standards (SANS) and should be guaranteed for a minimum of five-year.

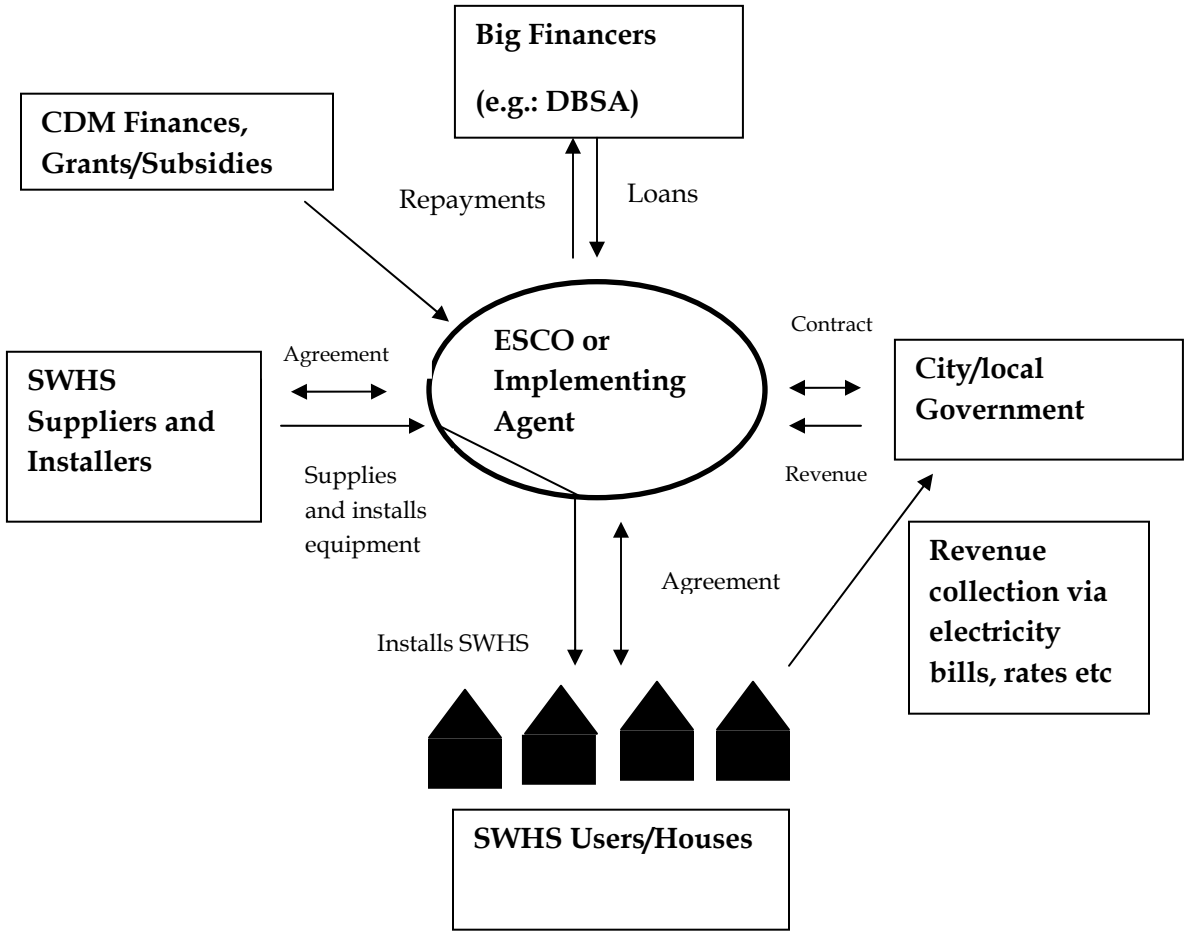
Many Financers like banks (Development Bank of South Africa, Central Energy Fund) or any other financing agency provide funds in the form of loans to the ESCO for bearing overall costs (equipment cost, maintenance costs etc). Other supporting streams of finances that could go into the model are CDM finances, grants and subsidies (Department of Minerals and Energy). They help in improving financial viability of ESCO model.

City or Local Government Within the residential or commercial sectors, cities could play a role in supporting 'fee for service' mechanisms through administering and collecting the monthly service fee on the ESCO's behalf, through their established rates collection process. The revenue collected is then passed on the ESCO on regular basis.

SWHS User pays a monthly fee to the ESCO for the service offered. This monthly fee should ideally be equal to or less than the cost of electricity saved from a SWHS.

The following Figure 3.1 provides a schematic representation of the ESCO Model.

Figure 3.1: Solar Water Heating ESCO Model [21,22]



Of the above players, the Implementing Agent/ESCO, Financers, City or Local Government and the SWHS User play a vital role in generating revenue and sourcing funds into the ESCO Model. The following Table 3.1 provides an overview of their responsibilities.

Table 3.1: ESCO Model Players and Responsibilities[23]

Player	Responsibilities
Implementing Agent/ESCO	➢ Overall co-ordination of the Model ➢ Puts together a suitable SWHS financing package – Eskom Solar Water Heating Rebate#, bulk purchasing discounts from registered supplier♦ etc ➢ Enters into a contract with the SWHS user, gets the SWHS installed and maintains it in individual households at its own cost ➢ Retains ownership of the SWHS and sells hot water to the SWHS user
Big Financers (eg: Development Bank of South Africa, Central Energy Fund)	➢ Provides loan to ESCO for bearing overall costs (equipment cost, maintenance costs etc) ➢ Other supporting streams of finance - CDM finances, Government grants and subsidies
City or Local Government	➢ Administers and collects monthly service fee on the ESCO's behalf, through their established rates collection process ➢ Revenue collected is passed on to ESCO on regular basis
SWHS User	➢ Pays a monthly fee to the ESCO for the service offered

SWHS should meet Eskom Solar Water Heating Rebate eligibility criteria.

♦ ESCO has the option of to be able to negotiate a reduction in current SWHS unit cost through mass purchase of systems.

3.1.4 Financial Feasibility

In South Africa, SWHS have not become main-stream in spite of their potential benefits. One of the main reasons for this is the high capital cost of the equipment (typically between R12,000 to R35,000) which is prohibitive to households in spite of the fact that this outlay is recovered in water heating electricity savings over several years (often around 8 – 10-years). A critical aspect of a business plan is therefore the provision of adequate financing so that households do not have to pay the large capital amount up-front. The success of ESCO Model depends on continued commitment, sharing of responsibilities and integration of financial resources into the Model on a sustained and medium to long-term basis. There are various incentives or subsidies which reduce the capital cost of a SWHS to make them financially attractive. Possible source of funding is as follows:

1. Eskom Solar Water Heating Rebate – It is an incentive offered by Eskom, ranging from around R2000 to R4000 per system on average, depending on the system size, energy performance and other factors.
2. Carbon financing - Carbon revenue generated by trading of carbon credits resulting from the SWHS energy savings may be in the range of R1500 to R4000 per system, depending on various factors.
3. Big Financers – Assured medium to long term financing from innovative financing house or banks which have access to national and international funds to promote sustainable energy, for eg: Development Bank of Southern Africa (DBSA), Central Energy Fund, E+Co etc, are essential for bearing the overall costs of the ESCO Model. They buy down the risk for investments in this field, thereby facilitating implementation for emerging technologies. The Implementing Agent is responsible for repaying the lender the loan amount from the profits it generates from the model.
4. Bulk purchasing discounts - Bulk purchase of the SWHS from a registered supplier can provide an incentive of approximately 20% i.e. R2000. This reduction is possible only in case of mass implementation of SWHS.

The first two incentives together can reduce the capital cost of the SWHS by 30% to 50%. Furthermore, The Department of Minerals and Energy (DME) is the government authority responsible for the renewable energy policy framework in South Africa. They run a fund managed by Renewable Energy Finance and Subsidy Office (REFSO) which provides small subsidies to certain renewable energy projects including SWHS. In addition, the anticipated

future electricity price in South Africa will increase continually (approximately 15% pa increase); as a result, savings resulting from the use of SWHS will also increase.

The following Table 3.2 shows the potential for capital cost reduction of a SWHS unit when considering a bulk purchase and installation approach. The average SWHS cost is taken from the average cost of approved SWHS units from the Eskom Solar Water Heating Programme, and includes installation and a timer. A 150 liter system was chosen for the reason that it is the least economically feasible SWHS. As the size increases, so do the financial benefits, provided that the SWHS is matched to the user's needs and is not oversized.

Table 3.2: Potential for Capital Cost Reduction of a SWHS Unit in South Africa[24]

Average SWHS Cost (150l)	**R 17,000**		
Immediate Reductions		**Benefits**	**Paid to**
Bulk Purchase	R -2,000	Implementing Agent	Implementing Agent
Eskom Incentive	R -2,500	End User	Implementing Agent
Immediate End user SWHS cost	R 14,500		
Immediate Implementing Agent SWHS Cost	R 12,500		
Future Reductions			
CDM/Voluntary market	R -1,000^	End User	Implementing Agent
Tradable RECs (TRECS)	R -2,000^^	End User	Implementing Agent
Future End user SWHS cost	R 11,500		
Future Implementing Agent SWHS Cost	R 9,500		

^R2000-R4000 over next 10-year period

^^1 TREC = 1MWh generated or offset. SWHS typically generates 20 TRECS over 10-year lifespan, which can translate to R2000

The following Table 3.3 provides a business case for mass implementation of SWHS. For this to be a viable business, some profit needs to be taken off the monthly repayments received. Here, it is assumed that a finance rate of 2% below that charged to the end user is secured and the SWHS is installed at a cost R2000 less than that quoted to the end user.

Table 3.3: Business Case for Mass Implementation of SWHS in South Africa[25]

	Amounts in South African ZAR
End user pays	14,500
ESCO pays	12,500
Interest rate of (pa)	13.5%
Over (yrs)	5
ESCO monthly repayments	299.78
Customer pays/month	364.74
Cumulative income/unit/year	779.51
NPV (5-years,10% discount)	2,955

The Table 3.3 shows that a gross profit of R780 per unit per year can be achieved. It also shows potential income in today's terms i.e. Net Present Value (NPV) from the mass implementation of ESCO Model, based on installation quantities. Translated over 5-years with a discount rate of 10% this equates to nearly R3000 per unit. Here, the monthly cost to customer does not take into account carbon revenue earned through CDM projects. As a mass scale business, obviously the more units signed up, the more profits can be achieved.

SEA drafted the SWHS mass implementation plan for three Gauteng Metros which is mostly applicable to mid to high income households. A key component of the ESCO Model lies in creating the right environment for the emergence of suitable Implementing Agents. The Metros will have to work closely with Eskom. Cities have the responsibility to support the mass implementation approach in their mandated area of control. The ESCO approach is also currently being explored by SEA in the City of Joburg in low income households and in Nelson Mandela Bay Municipality in mid to high income households. [26]

Both the public and private sector are developing feasible business models to achieve the mass rollout of SWHS in South African cities via ESCO. It is necessary for the Metros to undertake detailed business feasibility analysis and look at broad indicators to obtain adequate confidence that implementation of ESCO Model is indeed viable. Each Implementing Agent/ESCO will have to use innovative financial tools, implementation and marketing strategies as appropriate. The South African Metros are leaving the business model up to the entrepreneurs, who draw on their innovation and competitive motivation for efficient and effective delivery.

Lastly, for successful implementation and realizing benefits from the ESCO Model, initial road-blocks need to be tackled like small manufacturing base and trained installation capacity, issues of SWHS hardware availability, clarity on carbon revenue, standardization of SWHS testing process, ensuring delivery of incentives, delay in implementation of By-Laws etc. If the financial feasibility of SWHS through ESCO mode of implementation can be proved, then a large implementation barrier can be removed leaving the Cities open to fulfil further modalities.

4 GERMANY

4.1 Minimum Incentive Programme (MAP)

4.1.1 Overview

Germany is the indisputable market leader in solar thermal market in Europe, with a market share of approximately 41% and 11.3 million m^2 installed collector area in 2008[27]. Until 2010, the Federal Republic of Germany aims at increasing the share of renewable energies of total primary energy consumption to 4.2%. Until 2050, the aim is to generate 50% of total energy supply from renewable energy sources. In order to achieve these very ambitious aims, Germany committed itself to fulfilling climate protection targets and replacement of fossil energy sources with renewable energies.

In 1995, the '100 Million Roofs Programme' was introduced, which for the first time provided promotion of solar thermal systems in Germany. This programme was administered by the Federal Ministry for Economy and Technology (BMWi). The total amount of approximately €51 million was used to promote a collector area of 40,000 m^2 in 1995 and 1996 alone. Since demand went beyond the scope of promotion, the government issued a follow-up programme in 1999 called the Market Incentive Programme (MAP) which is still continuing successfully. Till date, MAP is considered to be the largest and most outstanding programme with respect to promotion of solar thermal systems.

4.1.2 Implementing Agency

The Federal Office of Economics and Export Control (BAFA) is a superior federal authority, subordinated to the Federal Ministry of Economics and Technology (BMWi). A major focus of BAFA's activities is to implement the programme to promote renewable energies of the Federal Environmental Ministry. BAFA is responsible for funding and administering the German MAP Programme.

4.1.3 Program Details

The MAP is intended to support the generation of solar heat for domestic hot water and heating purposes. Promotion guidelines were adjusted many times since the introduction of MAP in 1999. Smaller systems, commonly used at household-level, are mainly promoted with direct grants, whereas larger systems are promoted rather via low interest loans. Funds for promotion payments originate from the income generated by the German Government's Ecological and

Fiscal Reform and additional income from electricity tax. The budget is tied to the federal budget and requires a new funds release each year. The total overall budget for the support of renewable heating systems (including solar thermal systems) within MAP was €350 million in 2008 and €468 million in 2009.[28]

According to the present promotion guidelines for the installation of SWHS, promotion subsidy amounts to €105 per started square meter of installed gross-collector area. This rate applies for systems up to 200 square meters. Each additional square meters as well as extensions of already existing systems are subsidized with €60. Since 2005, solar systems for combined hot water provision and radiator are subsidized with €135 per square meter© of newly installed collector area.[29]

Private individuals, freelancers and small and medium-sized commercial enterprises (SMEs) are authorized for application and promotion under MAP. However, approximately 99% of all promoted SWHS are domestic systems.

4.1.4 Application Process

The announcement of MAP is carried out by the BAFA via publication in the federal bulletin, press releases as well as by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), and the German Development Bank (KfW). However, majority of the applicants finds out about promotion possibilities through craftsmen, architects or consultants. It was observed that the Programme received further publicity from benefited households. Private campaigns as well as government supported outreach initiatives contributed towards wide-spread awareness generation towards the programme.

Applicants can avail financial support for SWHS installations by submitting an application form to the BAFA. Conclusion of delivery or service contracts for purchase and installation of the SWHS at the time of application is not permitted. Although, request of cost estimates and consulting services is allowed. A further requirement is that promoted systems must be

© Minimum collector area of 10 m² for flat collectors and 8 m² for tube collectors as well as a buffer storage of 50litres/m² and 60 litres/m² for flat collectors and tube collectors respectively is required to avail a promotion of €105/m2.

operated at least for 7-years. Acceptance of promotion expires, if the SWHS is not installed and ready for operation within the approval period of nine months, beginning with the benefit notification.

If application is approved, the subsidies are transferred in a single payment to the household. The promotion is only offered once per any square meter installed. Availing financial support from any other SWHS promotion programmes at Federal, State or Municipal-level is not permitted. The SWHS available in the market are certified and have high performance quality. The installation of the SWHS should be carried out by a trained installer.

4.1.5 Outcomes and Future Outlook

The large number of applications received and accepted under the MAP in recent years has resulted in fluctuating rate of promotion offered by BAFA. In 2003, for instance, the solar thermal market was booming as subsidies were raised temporarily (increase from 92 €/m² to 125 €/m²) but this was followed by a cutback in 2004 (decrease from 125 €/m² to 110 €/m²) causing a converse effect on the number of applications received. On account of the results in 2005, the budget was reduced and the scheme temporarily blocked. It did not resume until March 2006. Due to the immense popularity of the programme, many applications for financial support had to be rejected towards the end of 2006, again because the funds had been exhausted. This can be seen as a sign for a strong sensitivity of demand depending on the promotion rates for SWHS. Till date, predominantly flat plate collector systems are popular in the German solar thermal market and the major share of funds under MAP goes to private households.

Germany sets an example that a promotion, which leads to a strong growth of demand for SWHS, can impact significantly on the local solar industry. Immense cost reductions could be observed because of increasing industrialization and broadening of the manufacturing base. The following Table 4.1 provides an overview of the growth of German solar thermal market. Thus, attention should be paid on realizing economy-of-scales-effects during the design of the mechanism. In this way solar industry can evolve into a successful and sustainable industry sector like in Germany.

Table 4.1: Overview of the German Solar Thermal Market in 2008[28]

Number of solar thermal companies	Approx. 5,000
Of which producers of collectors, storage units and components	Approx. 100
Newly installed collector surfaces in Germany in 2008	2.1m sqm / 210,000 new solar thermal installations
Newly installed capacity	Approx. 1,470 MW (therm.)
Total solar thermal capacity installed	Approx. 11.3m sqm
CO2 savings	Approx. 1.2m tonnes per year
Sales in 2008 (incl. assembly)	€1.7billion
Value added in Germany	> 75 %
Reduction of costs for solar thermal installations from 1990 to 2008	40 %
Reduction of costs for solar thermal installations from 1990 to 2020*	66 %
Share of German heat consumption 2008 / 2050*	< 1 % / approx. 30 %

* BSW-Solar projection

Furthermore, in June 2008, the government finally followed BSW-Solar recommendations and passed a "Renewable Energy Heating Act" which came into force on January 2009. The Act provides significantly more investment security for the solar thermal sector by establishing a steady MAP budget of up to €500 million per year for 2009-2012. In addition to fixing the MAP budget, the law introduces renewable energy buildings obligations. These obligations require new buildings to cover a minimum share, 14% by 2020, of their heat demand from renewable energy. Furthermore, the Act provides opportunity for the German federal states to set up additional legislation in order to introduce building obligations for existing buildings.

Thus the Renewable Energy Heating Act meets the following objectives:[30]

- It decouples the release of funds from the respective budgetary situation in order to assure prosperity of the programme.

- It provides a reliable regulation necessary for sustainable development of the solar thermal market, both on the supply and the demand-side.

Although this legislation is very encouraging for the industry, since the German market could now be characterized as a self-supporting one, firstly the necessity of a promotion in economic terms and secondly the possibility of introducing a promotion with a declining rates leading to gradual phase-out needs further investigation by policy makers.

5 UNITED STATES OF AMERICA

5.1 Federal Tax Credits for Consumer Energy Efficiency

5.1.1 Overview

Federal Tax Credits for Consumer Energy Efficiency was established by the Federal Energy Policy Act of 2005, United States of America, for residential energy efficient systems and initially applied to solar-electric systems, SWHS and fuel cells. The credit was further enhanced in February 2009 by The Energy Improvement and Extension Act, 2008 and The American Recovery and Reinvestment Act, 2009. SWHS qualify for the federal tax credit.

5.1.2 Implementing Agency

Federal Tax Credits is administered by the United States Department of the Treasury - Internal Revenue Service (IRS). The Internal Revenue Service is the nation's tax collection agency and administers the Internal Revenue Code enacted by Congress.

5.1.3 Program Details

Under this Programme, a taxpayer may be able to take a credit of 30% of the costs of qualified SWHS. This includes labour costs properly allocable to the onsite preparation, assembly, or original installation of the property and for piping or wiring to interconnect such property to the home. If the SWHS installation is on a new home, the "placed in service" date is the date of occupancy by the homeowner. None of the residential tax credits are available to owners of rental properties.

Apart from the abovementioned the following conditions are also applicable to SWHS: [31]

- There is no maximum credit for SWHS placed in service after 2008. They are eligible for a 30% tax credit. The maximum credit is $2,000 for systems placed in service before January 1, 2009.
- Systems must be placed in service on or after January 1, 2006, and on or before December 31, 2016.
- Equipment must be certified for performance by the Solar Rating Certification Corporation (SRCC) or a comparable entity endorsed by the government of the state in which the property is installed.

- At least half the energy used to heat the dwelling's water must be from solar in order for the solar water-heating property expenditures to be eligible.
- The tax credit does not apply to solar water-heating property for swimming pools or hot tubs.
- The home served by the SWHS does not have to be the taxpayer's principal residence.
- For purposes of taking the credit, the taxpayer can rely on a manufacturer's certification in writing that a product is qualified residential energy property.
- Tax credits for SWHS cannot be carried forward to future years.
- The tax credits are non-refundable i.e. the taxpayer cannot get back more in credits than he/she paid to the government in taxes throughout the year.

Two or more unmarried people living in the same home who own the SWHS jointly are each eligible for the tax credit on the amount of money they each individually spend to make home improvements. For SWHS "placed in service" in 2009, a taxpayer can file tax returns and submit the appropriate form along with 2009 taxes (by April 15, 2010). For SWHS "placed in service" in 2010, tax credits can be claimed on 2010 income taxes.

Grants or loans from state or local governments must ordinarily be reported as taxable income and does not reduce the tax basis for calculating the 30% tax credit for the SWHS whose purchase price is paid in part with the grant. A rebate received by a homeowner in a residential context usually does not have to be reported as income when the rebate is received from the local utility.

The owner of new SWHS put to commercial use and placed in service in 2009 or 2010 qualifies potentially for a 30% cash grant from the United Stated Treasury Department Grant. The owner would receive this grant in place of the commercial tax credit. The grant will be paid within 60 days after the equipment is "placed in service" or, if later, after the application is submitted and approved for the grant. Grants will also be paid on commercial SWHS on which the owner commences construction in 2009 or 2010, provided the system is placed in service by 2016. The American Recovery and Reinvestment Act of 2009 does not allow taxpayers eligible for the residential renewable energy tax credit to receive a United States Treasury Department Grant instead of taking this credit. [32]

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