

Business Unit

# *Overview of SHS in SAARC Region Webinar*

*Strictly Private  
and Confidential*

*06 March 2018*



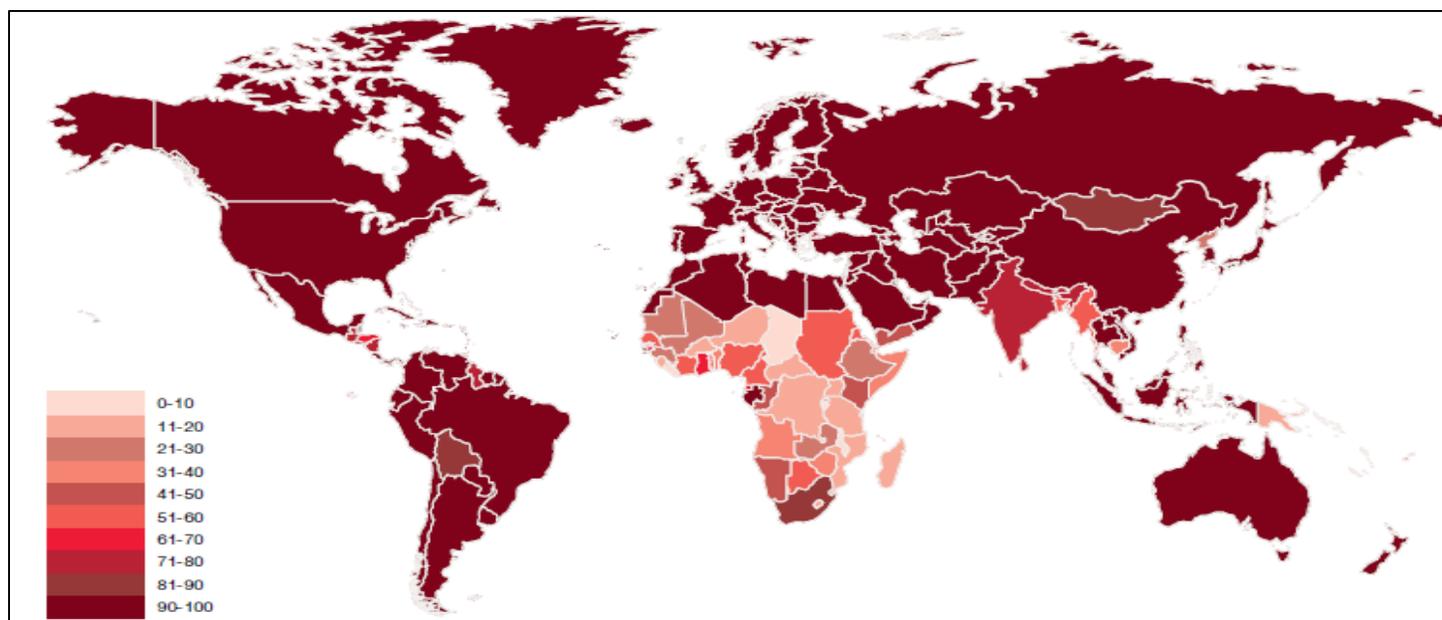
**pwc**

# Agenda

1	Introduction	3
2	Country Wise SHS Implementation Overview	9
3	Summary	33

## Worldwide emphasis on Electricity for All

- SDG #7 : “Ensure access to affordable, reliable, sustainable and modern energy for all by 2030”.
- Provision of electricity is also a recognized development agenda item and one of the key pillars of the Sustainable Energy for All (SE4ALL) Initiative of the UN.
- An estimated 1.2 billion people – 16% of the global population – do not have access to electricity as of 2016.
- Most of these people reside in the 20 developing countries of Asia and Sub-Saharan Africa, and about 80 percent of them live in the rural areas



Access to Electricity around the world : World Bank

## *Off-Grid Solution – Solar Home System : Providing Electricity beyond the Grid*

- Cost of supplying grid-based electricity is less than the cost of alternative off-grid options in most situations where transmission and distribution lines are nearby. Beyond a certain distance, the cost to serve becomes prohibitive
- As per IEA, ~ 80% of people without access to electricity live in rural areas, many of them with no nearby grid
- Need to embrace new starting points for energy - mini-grid or off-grid systems provide the most viable options
- Choice of off grid technology are mainly driven by cost, technology and resource availability and sustainability.
- Due to lower running costs, abundant availability, falling costs and emphasis on sustainable energy, renewable sources have become the more preferred choice. Solar is playing a center-stage role in providing energy to households through the spread of solar lanterns and standalone solar home systems
- Within the SAARC region, except Maldives, Sri Lanka India and Bhutan, households in the other countries have less than 75%-80% electricity access. Providing grid electricity access is challenging since most reside in rural areas, and typically have limited access as well as limited ability to pay for such energy services
- Hence, initiative for installing Solar Home Systems had been introduced by majority of the governments over different time periods in the past decade
- While it has been extremely successful in some countries like Bangladesh, the impact has not been effective in some other countries like Pakistan and Afghanistan on account of various issues and challenges
- Considering that the SAARC member states are endowed with high solar irradiation SHS still holds promise and potential to provide basic electricity access in the SAARC region

# *Objectives and Limitations of the Study*

## Objectives of the Study

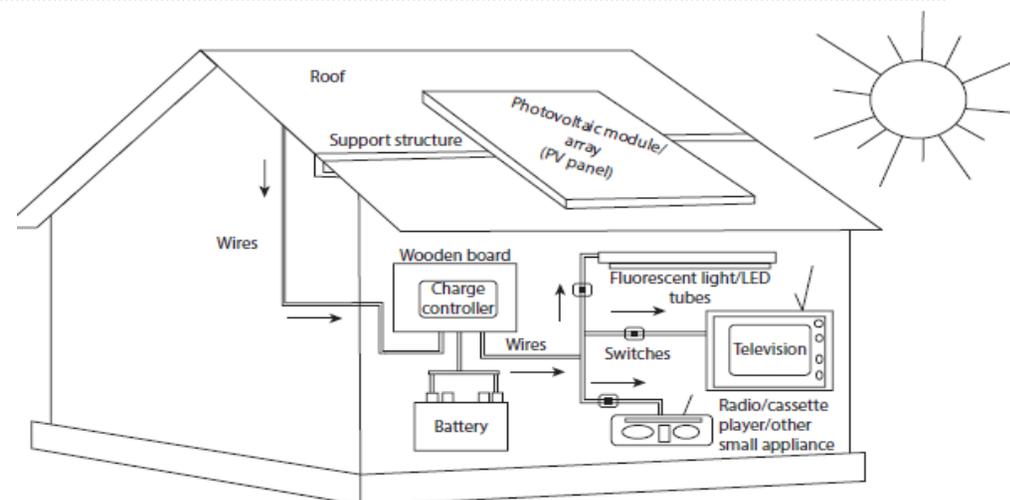
- Review the already completed household Solar Home System programmes and Projects implemented by the Member States.
- Identify and investigate barriers and constraints in SHS implementation and suggest measures for improving situation of SHS deployment

## Limitations of the Study

- The analysis and data collection is based on public sources of information such as industry reports, journals, publications and various research databases
- The study undertaken is primarily from secondary sources and discussions
- No primary research has been undertaken
- During the course of analysis and benchmarking widely acceptable norms have been relied upon in case the actual information was unavailable
- Availability of data and updated statistics for some countries may have not been captured if the same has not been documented in any public source

# Overview of Solar Home System

- Decentralised energy generation mechanism based on standalone solar photovoltaic system
- Designed to meet the electricity demand of a single household.
- Provides a cost effective means of supplying basic electricity access to communities or households which are not connected to the grid.
- Acts as a convenient source of electricity for lighting and running small appliances
- SHS can be designed and sized based on the consumer's requirement and usage pattern.
- Thus the operation time can range from 3 hours to even 12 hours in some cases.
- As electricity generated by a solar panel is DC (Direct Current) in nature, SHS is generally used for powering DC appliances.

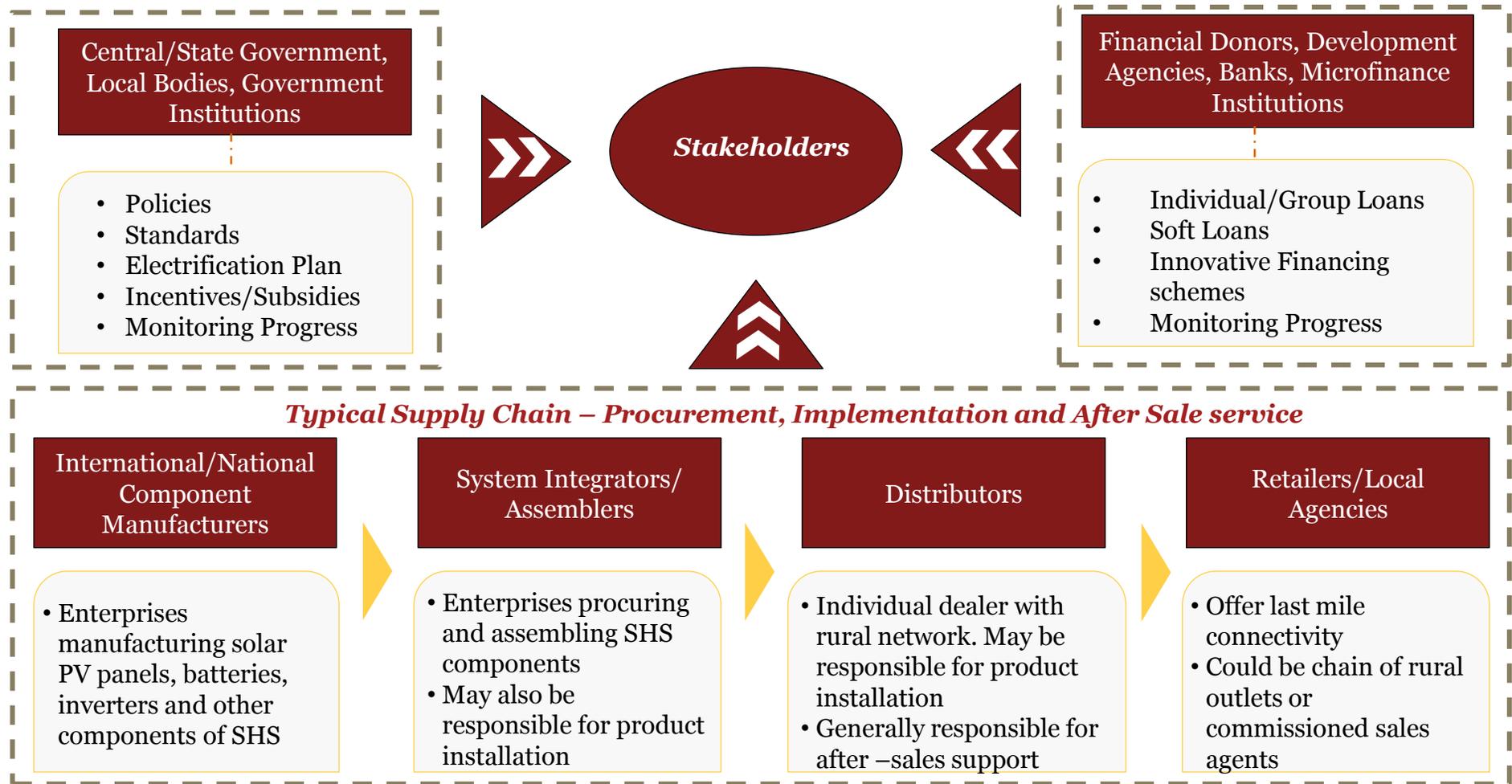


**Typical Configuration of Solar Home System**

## Primary Components of SHS

1. Solar Modules
2. Battery
3. Charge Controller
4. Mounting Structure
5. Cables and Connecting devices
6. CFL or LEDs
7. Installation kit that may contain a universal outlet for charging cell phones and small appliances
8. Inverter (optional)

# Typical stakeholders involved in a SHS program



## Afghanistan – Energy Overview



- Low population density of about 51 people per sq. km
- 73% of the population resides in rural areas.
- Extremely low per capita consumption
- The high transmission and distribution cost of electricity for such low energy consumption in rural areas makes it infeasible to extend the utility grid
- Additionally, rural Afghan people typically live in small villages, often scattered over challenging mountainous or desert terrain. There is little likelihood for most of them to ever receive electricity from the conventional electric grid
- With annual solar irradiance of 5.5 kWh/m<sup>2</sup>/day, stand-alone solar systems such as SHS can be an effective way of providing electricity access
- No dedicated SHS program in Afghanistan

Parameter	Unit	2016
Installed Capacity	MW	566
Solar Installation	MW	1
Solar Contribution	percent	0.17%
Rural Population	Mn	24.38
Total Population	Mn	33.4
Grid Connected Electricity Access (Country level)	percent	28.9
Grid Connected Electricity Access (Rural Level)	percent	11
Per capita consumption of Electricity	kwh	176
Solar Irradiance	kWh/m <sup>2</sup> /day	5.5

# *SHS Overview - Administrative, Implementation and Financing*



## **Administrative/Coordinating Bodies**

- In 2013, a separate department for rural was formed – the Rural Energy Department (REnD)
- **No national level program has been drafted for the promotion or implementation of SHS**
- REnd promotes the use of solar photovoltaic systems to meet the demand of rural households.
- Any demand for SHS can be raised through Community Development Council (CDC) or District Development Council (DDC). The minimum number of SHSs in a settlement should be 10.
- Once a demand is received, REnd conducts feasibility studies and prepares a detailed design of the system with its cost estimate. Community interest, participation and willingness to pay are the main basis

## **Implementation and Financing**

- Isolated instances of SHS implementation in Afghanistan (as part of pilot projects).
- In 2009, the Afghanistan Clean Energy Program (ACEP) was launched to provide basic electrification services to villages not connected to the grid. Winrock International provided engineering technical support
- USAID was the primary sponsor - US\$22 million funded program from September 2009 to March 2012
- Earlier projects had faced quality and design issues – hence there was emphasis on using good quality panels and batteries. Installers were given adequate training and installations were verified by independent evaluators
- There is hardly any other government led SHS installation program that has been conducted (or documented)
- Few private companies in Afghanistan have been involved with SHS installations

## Bangladesh - Energy Overview and Installation status



- Amongst the most densely populated countries in the world
- As of 2015, around 92.9% of urban and only 67.6% of rural population have access to electricity
- The government plans to provide electricity to all by 2021.
- However, the target cannot be met by rural grid expansion alone - due to inaccessibility and low consumer density in many rural areas, as well as financial constraints
- Among the few countries in SAARC Region which has a dedicated program for Solar Home Systems

### SHS Installation Status

- The IDCOL SHS program had target of financing 50,000 SHSs by Jun, 2008. They achieved it almost 3 years before schedule
- Subsequently, IDCOL set itself a target of financing 1 million SHSs by 2012. They achieved this target by July 2011.
- IDCOL now has a target of financing 6 million SHS by 2018 with an estimated generation capacity of 198 MW of electricity.
- They have already done 4 million installations by May 2017

Parameter	Unit	2016
Installed Capacity	MW	11,765
Solar Installation	MW	17
Solar Contribution	Percent	0.0%
Rural Population	Mn	103
Total Population	Mn	161
Grid Connected Electricity Access (Country level)	Percent	76.7%
Grid Connected Electricity Access (Rural Level)	Percent	67.6%
Per capita consumption of Electricity	Kwh	281
Solar Irradiance	kWh/m <sup>2</sup>	4-6.5

# *SHS Overview - Administrative and Technical*



## **Administrative/Coordinating Bodies**

- Launched in 2003 - Rural Electrification & Renewable Energy Development (REREDP); funded by WB & GEF
- Under REREDP the SHS program was planned to be implemented by two different institutions - Infrastructure Development Company Limited (IDCOL) and the Bangladesh Rural Electrification Board (BREB)
- Two parallel approaches employed - BREB pursued a fee-for-service approach while IDCOL's approach was based on an ownership model which they felt was more sustainable
- Although BREB managed to achieve its initial goal by 2008, it did not continue the SHS program further
- Reached initial goal 50,000 SHSs almost 3 years before schedule. Continued the program further with the support of several additional donors over the years, such as ADB, DFID, GPOBA, JICA, KfW etc.

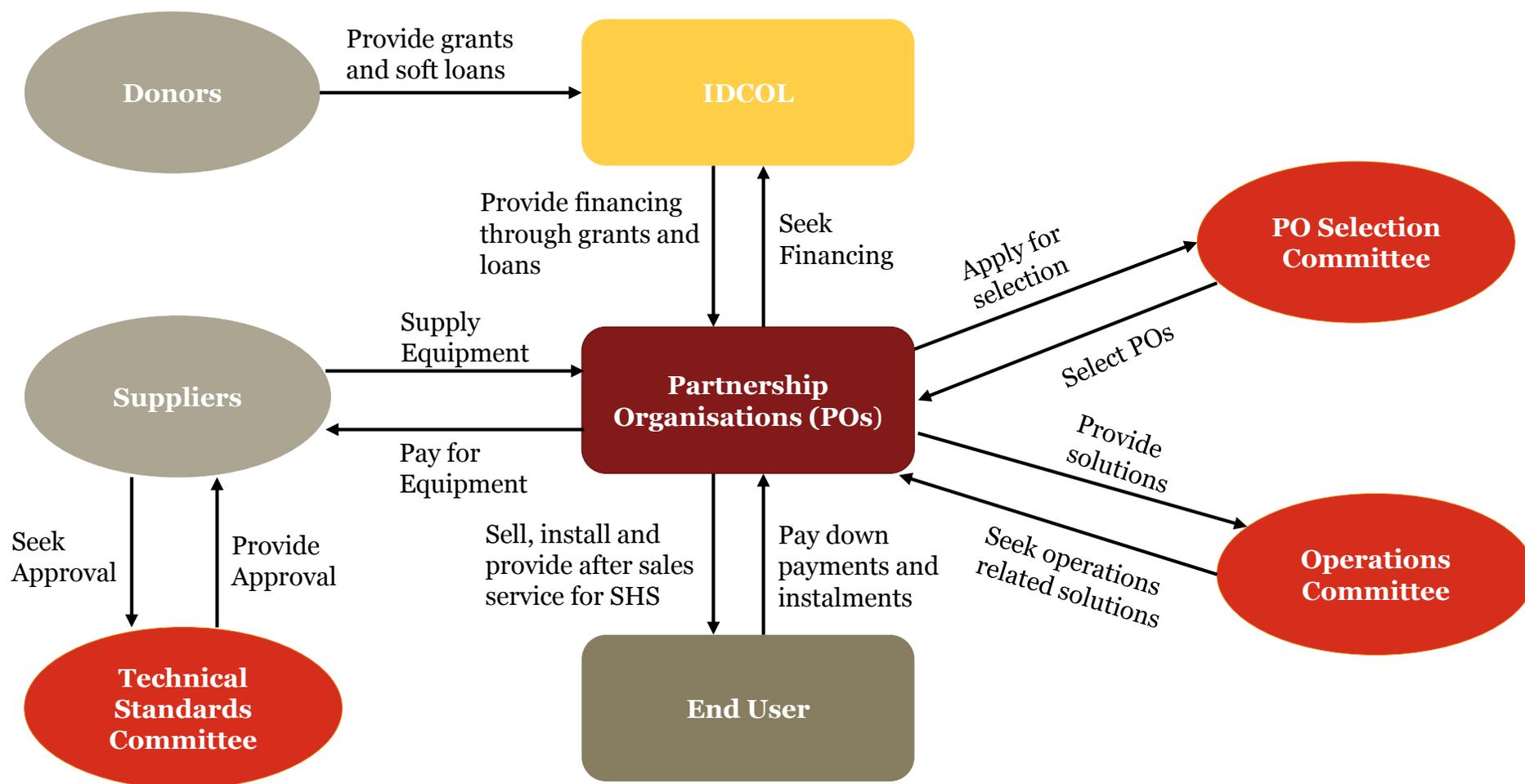
## **Technical Details**

- IDCOL has designed a rigorous Quality Assurance (QA) framework for the SHS program. Framework is comprehensive and includes standards and procedures for all aspects - testing of SHS components, financing of approved packages, field inspections of installed systems and strong and enforceable warranty requirements.
- There is an independent Technical Standard Committee (TSC) which defines the technical and warranty specifications that systems and components must meet in order to be financed under the IDCOL SHS program
- Prospective suppliers provide their components to a local authorized testing institution that evaluates the components against the specifications set by TSC. Once testing has been completed, the resulting test report is provided to the TSC. On the basis of the report approval is granted to the supplier

# SHS Overview - Implementation and Delivery



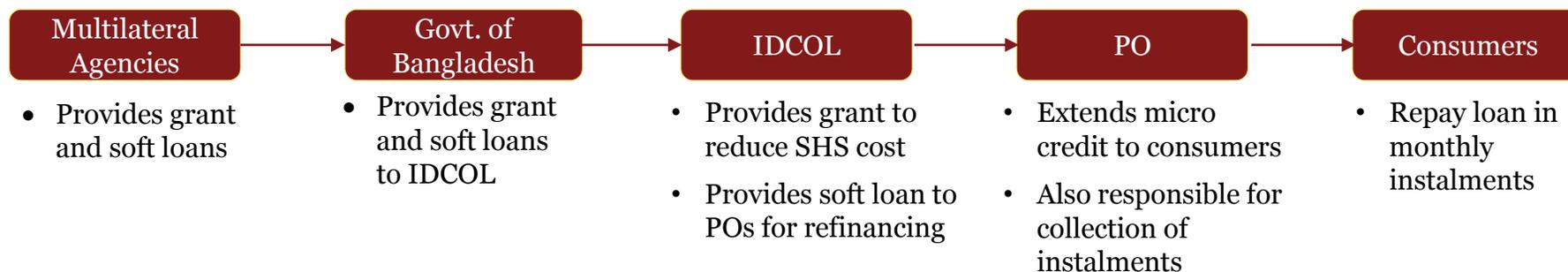
## IDCOL SHS program structure and implementation



## SHS Overview - Financing

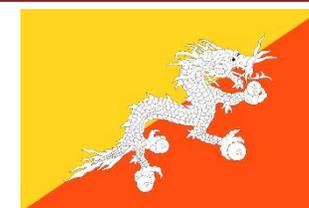


### IDCOL SHS Program flow of funds



- The grants provided by the donor agencies have been in the form of buy down grant to lower initial investment cost of SHS and Institutional Development Grant for capacity building of the SHS program. Over the years both components of grants have declined as the markets have expanded and become commercially viable
- All POs are obliged to report their installation figures and financial details, such as collection efficiency and overdue collection rates, to IDCOL on a monthly basis in order to maintain financial transparency.
- A micro credit scheme is followed through which IDCOL facilitates the purchase of SHS. Consumers make a down payment to IDCOL of around 10 to 15 % of the SHS cost post subsidy. The remaining cost is financed by micro-credit, with PO contributing around 20 to 30% and IDCOL providing 70 to 80%.
- The entire credit is passed to the consumer who can opt for a 24- or 36-month loan period. Loans are given at 10 to 12 % interest rate with the SHS itself used as collateral. Once SHS is installed by the PO, IDCOL inspects the installation. Once it is approved, the PO approaches IDCOL for refinancing of credit given to the consumers

# ***Bhutan - Energy Overview and Installation status***



- Due to the mountainous topography of Bhutan, providing electricity to remote rural areas through grid extensions is neither easy nor viable
- Government considers households with SHS as electrified
- Along with Maldives, it is the only SAARC nation with 100 percent electricity access which it achieved in 2014
- The Royal Government of Bhutan identified households where grid based access would not be cost effective and provided SHSs free of cost to such households

## **SHS Installation Status**

- As per ADB, around 984 solar home systems have been installed and 1,132 sets of old solar home systems have been rehabilitated.
- The original target was to install 1,896 solar home systems in the targeted households.
- As per ADB, the demand has been less than envisaged due to people's preference for grid connected electricity.

<b>Parameter</b>	<b>Unit</b>	<b>2016</b>
Installed Capacity	MW	1614
Solar Installation	MW	0
Solar Contribution	Percent	0
Rural Population	Mn	0.47
Total Population	Mn	0.77
Grid Connected Electricity Access (Country level)	Percent	100
Grid Connected Electricity Access (Rural Level)	Percent	100
Per capita consumption of Electricity	Kwh	2671.6
Solar Irradiance	kWh/m2	4.99

# *SHS Overview - Administrative and Technical*



## **Administrative/Coordinating Bodies**

- Rural electrification has been a focus point of RGoB. Since 2008, the DOE started installing SHS in off-grid villages through various programs financed by the RGoB and Asian Development Bank (ADB)
- In 2010, ADB launched the “Rural Renewable Energy Development Project” which had four components with Off-grid rural electrification sourced from solar power (Solar Home System) being one of them
- The objective of the Off-Grid Component was to provide electrification in rural households where extension of grid was not possible for techno-economic reasons. It had two subcomponents –
  - 1. Installation of SHS for 1,896 households in remote, isolated off-grid villages in ten dzongkhags
  - 2. A sustainable SHS O&M program to ensure all installed SHS will be functional in the long run

## **Technical Details**

- The specifications for the SHSs were finalized taking into consideration the difficulty and cost of transporting, installing and maintaining SHS sets in remote households present in mountainous areas
- Lighter weight and maintenance-free solar batteries, more efficient and longer life LED lights, and more reliable controllers were used
- The product design also took into account other factors such as weather conditions, solar insolation resources, cable losses, pane degradation factors, battery and charge controller efficiencies and aging of components over time.

# *SHS Overview - Implementation and Financing*



## **Implementation and Delivery**

- The DoE (IA) was responsible for procuring, installing, testing and monitoring the installed SHS sets
- Turnkey Solar Home System packages were procured by DoE through International competitive bidding (ICB)
- For O&M of SHS sets, previous approaches of using District Technicians and Village Women Technicians had not been successful. Hence the DoE eventually outsourced O&M services to Bhutan Power Corporation (BPC)
- Idea was to leverage on the existing resources and institutional strength of BPC, which was also in charge of the on-grid O&M services for households.
- Both entities signed a MoU that stipulated their respective roles and responsibilities for the SHS O&M services
- No external or private implementing agencies are present in Bhutan

## **Financing and Ownership**

- SHS was provided free of cost to all households. Repair and maintenance was also provided without any charge
- However in order to enhance the feeling of ownership and avoid misusing the systems, the households were required to pay the equivalent of 10% of the cost of the spares in case of spare parts replacement
- The government beared the administration and overhead costs including staffing, taxes and duties, and part of the social and environmental mitigation costs
- ADB allocated a grant amount of \$2.41 million, mainly for the supply of materials. It also financed the O&M works including spare parts and costs of village technicians contracted with BPC over the initial three years
- The government has since been making adequate budgetary allocations to cover the cost for O&M services

# India - Energy Overview and Installation status



- More than two-third population living in rural areas
- Nearly 35% of the rural population have no electricity access
- Govt. has set itself a target to provide electricity to all households by 2019
- A lot of emphasis is on increasing the share of renewables, especially solar. Government has also been focusing on decentralized solar power systems
- Potential for off grid energy market to cater to around 41 million households without electricity access

## SHS Installation Status

- As per data available in the MNRE Strategic Plan 2011-17, there were only around 0.61 million Solar Home Lighting Systems installed in India as of Dec, 2010
- Plan envisaged an ambitious target of covering 20 million rural households with solar lights by 2022
- However as per MNRE National Solar Mission Annual Report 2016-17, the total number of Solar Home Lighting systems installed in India is 1.39 million as of Dec 2016

Parameter	Unit	2016
Installed Capacity	MW	310005
Solar Installation	MW	8513
Solar Contribution	Percent	2.7
Rural Population	Mn	887
Total Population	Mn	1324
Grid Connected Electricity Access (Country level)	Percent	93
Grid Connected Electricity Access (Rural Level)	Percent	65
Per capita consumption of Electricity	Kwh	1075
Solar Irradiance	kWh/m <sup>2</sup>	4-7

# *SHS Overview - Administrative/Coordinating Bodies*



- Rural electrification falls under the ambit of the Ministry of Power (MoP) and the Ministry of New and Renewable Energy (MNRE) who have rolled out various schemes in the past with mixed results.
- While there is no dedicated program for SHS, installation of stand alone systems is currently covered under two different schemes
- **Decentralized Distributed Generation (DDG) scheme – Falls under MoP**
- Scheme was envisaged to provide electricity access to the un-electrified villages/habitations where grid connectivity is either not feasible or not cost effective.
- It aims to deploy suitable locally available technologies, either conventional or renewable
- Under the guidelines of the scheme, standalone systems is provided in the villages/hamlets where the cost of electrification per HH through mini-grid is more than Rs.1 lakh or the no. of HHs in the villages is less than 15 or the HHs are scattered and the average distance of LT line per HH is more than 200 meters
- **Off-grid solar application scheme - Falls under MNRE**
- Under the programme, various off-grid/grid-connected and decentralized photo voltaic systems/applications up to a maximum capacity of 500 kWp per site are supported. This includes solar home lighting systems
- Scheme is implemented through multiple implementing agencies - State Renewable Energy Development Agencies, FIs like NABARD and RRBs, Channel Partners, SECI etc

## *SHS Overview - Technical Details*



- Due to wide variety of customers, there are a number of different configurations of SHS that are available.
- Two distinct delivery models. The SHSs are either sold through commercial model or through government programs (with subsidies) via government empaneled suppliers.
- **Commercial Model** : Not governed by standards or specifications
  - Akin to market based sales.
  - Flexibility to customize the SHS configurations based on the individual needs of the end users.
  - Most of these SHS enterprises offer a broad range of products between 10W and over 200W.
  - The sellers have their own after sales service and warranty offerings which is often dependent on the delivery model followed by them (sell only firms, 'servicing company' )
  - Different types of after sales support such as: maintenance through service centers, replacement of entire products, on-site maintenance, over the phone service, and linking customers with manufacturers
- **Government Programs** : Governed by technical specifications and standards defined by the scheme
  - Defined technical requirements, performance specifications, configurations, warranty conditions
  - List of empaneled manufacturers/suppliers through which SHS package or components have to be procured
  - Mandatory to follow all procedures in order to be eligible for the government subsidy

# SHS Overview - Implementation and Delivery



- Multiple SHS enterprises operating in India ranging from large and established players to small enterprises who have deeper rural connect – Hence different business models adopted by players
- While business model for the government program is very standardized, there are a number of different business models adopted by players during commercial sales
- Most of the medium and large players who have the expertise to get empanelled and the experience of navigating large amounts of paperwork sell their products through both the delivery models
- Some of the commonly employed business models –

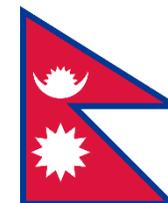
Classification	Type	Description
<b>Based on Distribution model</b>	In house channels	Selling via network of proprietary franchises or trade channels. All personal are directly employed by the company. Usually employed by large players.
	Village Level Entrepreneur (VLE)	VLEs act as a touch point between the firm and the customer. The VLE chosen are typically well known individuals in the target community. They earn commission on every sale they make.
	Multi-Channel	Selling via leveraging multiple existing retail channels such as – Use of Common Service centers (CSC), Use of Post and telegraph department, use of cooking gas channel of HPCL or BPCL
<b>Based on type of sale</b>	Only selling product	Firms which only sell the product without taking direct responsibility of after sales service.
	Selling and providing service	Firms which take responsibility of after sales support and service. They have their own trained technicians who go to the customer's home for repair and maintenance.

## *SHS Overview - Ownership and Financing*



- Due to high upfront costs the initial adoption of SHS relied heavily on traditional end user financing (subsidy)
- Over time, innovations in technology have led to decline or small increase in prices of SHS while the propensity and ability to pay of the rural population in India has increased.
- Government subsidies can be availed through two different schemes as mentioned earlier -
- DDG Scheme
  - Subsidy up to 60 % of the system cost; For special category states, it amounts to 85 %
  - An additional subsidy of 15 % (5 % for special category states) ,subject to timely completion
- Off-Grid Solar Application scheme
  - Applicable only for individuals, Self Help Groups (SHGs), Joint Liability Groups (JLGs) and NGOs
  - 40 % of the cost related to SHS is subsidized and the remaining 60 % of the cost is eligible for a soft loan through a registered bank. Loan has to be repaid over a five year period
  - **Subsidy under this scheme has been stopped by MNRE with effect from 15 March 2017**
- Process of availing government subsidy is long and cumbersome
- Hence private SHS enterprises also provide financing to consumers for purchasing products. Firms facilitate financing through micro-finance institutions (MFIs), self-help groups (SHGs), or regional rural banks (RRBs)
- FIs provide credit with down payment of generally 20 percent while the repayment period usually ranges from 3 to 5 years. Tripartite agreement signed between the FI, the supplying firm and the consumers
- Firms have also come up with different models for financing such as - Rental model and Pay-as-you-go

# Nepal - Energy Overview and Installation Status



## Energy Overview

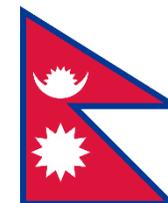
- Over 80% of the population lives in rural areas and around 28% of rural population lack access to grid connected electricity
- Kerosene is the primary source of lighting for off-grid households
- With national average sunshine hours of 6.8/day and solar insolation intensity of about 4.7 kWh/m<sup>2</sup>/day, there is huge potential for solar

## Installation Status

- SHS market is heavily dependent on subsidies.
- Total number of SHS and small SHS installed in Nepal is 606,730 and 53,733, respectively, resulting in a total installed capacity of 14,624 kWp and 537.3 kWp, respectively

Parameter	Unit	2016
Installed Capacity	MW	855.9
Solar Installation	MW	18.4
Solar Contribution	Percent	2.4
Rural Population	Mn	23.4
Total Population	Mn	28.9
Grid Connected Electricity Access (Country level)	Percent	76
Grid Connected Electricity Access (Rural Level)	Percent	72
Per capita consumption of Electricity	Kwh	129.6
Solar Irradiance	kWh/m <sup>2</sup>	3.6-6.2

# *SHS Overview – Administrative and Technical*



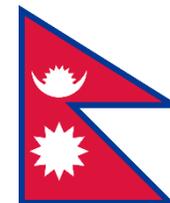
## **Administrative/Coordinating Bodies**

- The SHS program is overseen by the nodal organization for renewable energy promotion in the country, the Alternative Energy Promotion Centre (AEPC). AEPC administers the SHS program under the Solar Energy Support Program (SSP) which is the nodal program for the promotion of off-grid lighting
- SHS installations through the AEPC program constitute approximately 75-80% of the overall installations
- The role of SSP entails setting the technical standards for SHS, qualifying the suppliers, approving the subsidies and monitoring the program implementation
- The Nepal Photovoltaic Quality Assurance (NEPQA), developed and adopted by AEPC, specifies the documents and technical requirements of the components

## **Technical Details**

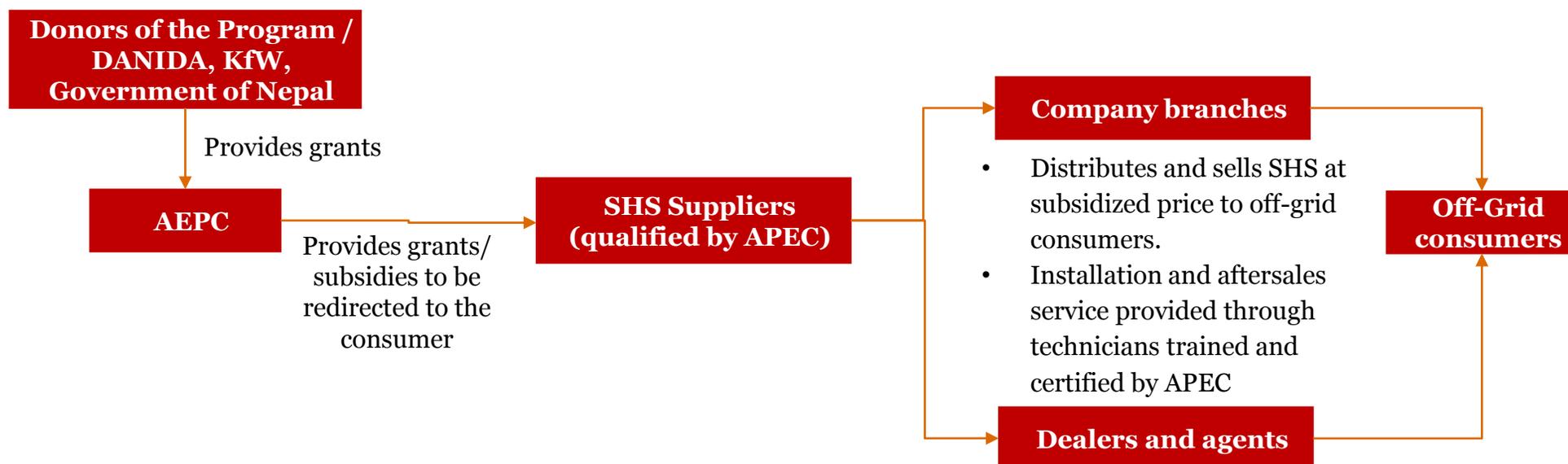
- AEPC produced a basic system sizing guideline for Small Solar Home System (SSHS) - 10Wp and Solar Home Systems (SHS) - 20W and 50Wp. Typical warranty - five years on battery and ten years on the panel
- AEPC has adopted several quality control measures - All companies supplying SHS through AEPC have to adhere to the NEPQA standards and get certified through mandated Renewable Energy Test Stations (RETS)
- AEPC invests in giving training to the technicians who are involved in installations and after sales service
- It also conducts field visits to monitor and verify the SHS installations. Suppliers are evaluated against quality of installation, performance, consumer satisfaction, degree of consumer awareness and after sales service
- 10% of the subsidy amount is always retained to make sure that there is no issue with the after sales service

# SHS Overview- Implementation and Financing



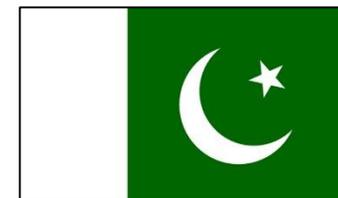
- Up to 60% of the system cost is covered by subsidy based on wattage and location
- The higher the panel wattage, and the more remote the location, the higher the subsidy provided
- The Nepal government has received grants from Danish International Development Agency (DANIDA) and KfW for the SHS program

## SHS subsidy structure - Nepal



- There is also a Special subsidy arrangement for earthquake affected areas

# Pakistan - Energy Overview, Ownership and Financing



## Energy Overview

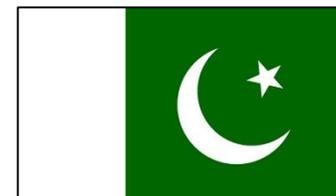
- 6<sup>th</sup> Most Populous Country in the world
- Approximately 27% of the households are off-grid with 39% residing in rural areas
- Pakistan receives solar insolation over more than 95% of its area
- No dedicated SHS program in Pakistan
- Small scale projects are underway to provide consumer financing for SHS.

## Installation Status

- The GIZ along with Tameer Bank (Telenor Bank) envisaged a pilot project to promote SHS.
- Promotion would be on the basis of micro – credit.
- With a targeted installation of 20,000 SHS in 2 years.
- The project will offer a range of different products ranging from 30 Wp to 90 Wp.

Parameter	Unit	2016
Installed Capacity	MW	23,718
Solar Installation	MW	100
Solar Contribution	Percent	0%
Rural Population	Mn	120.6
Total Population	Mn	195.4 <sup>53</sup>
Grid Connected Electricity Access (Country level)	Percent	73 <sup>1</sup>
Grid Connected Electricity Access (Rural Level)	Percent	61 <sup>1</sup>
Per capita consumption of Electricity	Kwh	521.8 <sup>53</sup>
Solar Irradiance	kWh/m2	5.3

# *SHS Overview – Administrative and Technical*



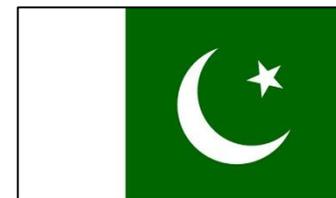
## **Administrative/Coordinating Bodies**

- Alternate Energy Development Board (AEDB), which was set up in 2003, is a government body which is dedicated to the promotion of renewable energy in Pakistan
- Under Roshan Pakistan Program and Parliamentarian Schemes for Rural Electrification under AEDB, more than 8,000 villages are to be electrified through RE technologies. A large proportion is expected through SHS
- Pakistan Council of Renewable Energy Technologies (PCRET), is responsible for coordinating R&D and promotional activities in different RE technologies. Pakistan Poverty Alleviation Fund (PPAF), a fund dedicated to poverty alleviation, under the MoF has an independent Renewable Energy (RE) Unit that is involved in the development of indigenous RE resources to generate electricity locally to off grid communities
- **No national level program by the government to promote the usage of SHS**

## **Technical Details**

- Since there has been no dedicated SHS program, technical, quality or configurations standards and specifications are non existent.
- As per an IFC report on Solar Off-Grid Lighting published in 2012, the 20Wp and 50Wp SHS have been the most commonly sold configurations in the rural areas. However, declining solar component prices in the past 2 years has increased the affordability of the systems, leading to increasing usage of 80 Wp to 120 Wp SHS
- SHS components are entirely imported, and the assembling takes place in Pakistan. The solar panels are mainly bought from Japan, China, Austria, UAE and Germany whereas the LED's are imported from China

# *SHS Overview - Implementation and Financing*



## **Implementation and Delivery**

- Isolated instances of SHS implementation in Pakistan
- AEDB had launched a pilot project in 2005 to propagate and distribute SHS in rural locations
- Agenda of the project was to disperse the SHS free of charge and later collect fees for the after sales support
- While the project envisaged to distribute around 15,000 SHS, only 3,000 SHSs were eventually distributed
- Main reasons for failure were lack of funding and poor planning.
- Another project implemented by AEDB in 2008 in Tharparker district was a success
- Five people from each village were trained to do the regular maintenance and operations of the entire system. The suppliers/installers provided free maintenance and guaranteed satisfactory operation of the system for one year
- Apart from the above programs, IFC has launched a Lighting Asia – Pakistan program in 2015. Intent is to remove market entry barriers, provide market intelligence, foster B2B linkages and raise consumer awareness

## **Ownership and Financing**

- Small scale projects are underway to provide consumer financing for SHS.
- The GIZ along with Tameer Bank (now known as Telenor Bank) have envisaged a pilot project to promote SHS.
- This promotion would be on the basis of micro – credit. With a targeted installation of 20,000 SHS in 2 years. Tameer bank is using its existing customer touchpoints for the implementation of this project.
- The project offers a range of different products ranging from 30 Wp to 90 Wp.
- Not much is documented regarding further details and progress of the project

# Sri Lanka – Energy Overview and Installation Status



## Energy Overview

- Around 82% of the population resides in the rural areas
- By 2016, almost 98% of the total rural population had access to electricity
- As it is located near the equator the country has good solar potential
- The country has benefitted from off-grid projects co-funded by the World Bank and Global Environment Facility (GEF)

## SHS Installation Status

- According to an SEA survey (2010), around 20,000 SHS were installed under ESD project
- Around 106000 SHS were installed under Renewable Energy for Rural Economic Development Project (REREDP) project.

Parameter	Unit	2016
Installed Capacity	MW	3887
Solar Installation	MW	1.2
Solar Contribution	Percent	0.03
Rural Population	Mn	17.3 <sup>*34</sup>
Total Population	Mn	21.1 <sup>12</sup>
Grid Connected Electricity Access (Country level)	Percent	99 <sup>1</sup>
Grid Connected Electricity Access (Rural Level)	Percent	98 <sup>1</sup>
Per capita consumption of Electricity	Kwh	677.7 <sup>62</sup>
Solar Irradiance	kWh/m <sup>2</sup>	3.5-4.5 <sup>*</sup>

# *SHS Overview - Administrative and Technical*



## **Administrative/Coordinating Bodies**

- Sri Lanka Sustainable Energy Authority (SLSEA) is the primary body responsible for the issuance of licenses for sustainable energy developments in Sri Lanka.
- It is also in charge of promoting renewable energy in the country.
- The Sustainable Energy Authority has a Renewable Energy Services “Off grid for Rural” Programme.
- Program objective is to electrify households away from the national grid using off grid solar system and off-grid mini grid solutions by 2017.
- SHS has been considered as a viable technology under this scheme.

## **Technical Details**

- SHS sold in Sri Lanka are usually in the range of 30 W-60 W.
- The solar companies registered under the World Bank projects were selling SHS to the off-grid customers.
- Providing after sales services was also a responsibility of the solar company.

## *SHS Overview - Implementation and Financing*



- World Bank and Global Environment Facility (GEF) have co-funded two sequential projects, the Energy Services Delivery Project (ESDP), and the Renewable Energy for Rural Economic Development Project (REREDP)
- Both the projects had a significant off-grid component where SHS played a major part
- The ESDP project ended in December 2002 and the success of the project encouraged the World Bank and GEF to design a follow-on project – REREDP (from 2003 – 2011)
- The REREDP was a \$133.7 mn project, which included a \$8M GEF grant component. It was designed essentially as a ramp-up of the ESD project
- Majority of the sales in both the projects were through the micro-credit route. Consumers were given credit (loan) through the participating credit institutions (PCI) that worked closely with the solar companies.
- PCIs included commercial banks, microfinance institutions, and leasing companies
- The solar companies, via their dealer networks, sold SHS and offered operation and maintenance services.
- The business model was structured through a MoU between the PCI and the solar company.
- The PCIs could refinance up to 80% of their loan amount and offered sub-loans to households, community-based organizations, and private developers, to finance SHS purchase.

## Summary

- SAARC member states have high solar potential - Opportunity to provide cost-effective electricity access to the rural population through Solar Home Systems
- Member states have received varied amount of success in SHS implementation in their respective countries
- Bangladesh acts as a role model in the dissemination and implementation of SHS
- India and Nepal have received mixed success
- Pakistan and Afghanistan – Least penetration of SHS; However huge potential exists

### SHS penetration in SAARC member states

High	Medium	Low
Bangladesh, Sri Lanka, Bhutan,	India, Nepal	Pakistan , Afghanistan

- In order to increase the adoption of SHS it is important to address the barriers and challenges
- The challenges being faced in each country will be taken up in next session.