

IDCOL Solar Home System Program

Operation and Maintenance of SHS: Case Study

Dissemination Webinar on
“Study to Investigate the Difficulties for Household Solar Home
System (SHS) in SAARC Region”
Tuesday, 6 March 2018

Junaed Tazdik - Assistant Manager, SHS Program
Mafruda Rahman- Assistant Manager, Green Climate Fund (GCF)

Brief Introduction of Infrastructure
Development Company Limited (IDCOL)

An Overview of IDCOL

- A fully government owned financial institution
- Started operation in 1997
- Largest financier in private sector infrastructure projects in Bangladesh
- Market leader in renewable energy sector
- Funded by the government and multiple development partners i.e. the World Bank, ADB, JICA, IDB, KfW, GIZ, USAID, DFID and GPOBA.
- Total employees 362 (117 in head office and the remaining in the regional office)



Power



Solar Programs



Telecommunications



Biogas Programs



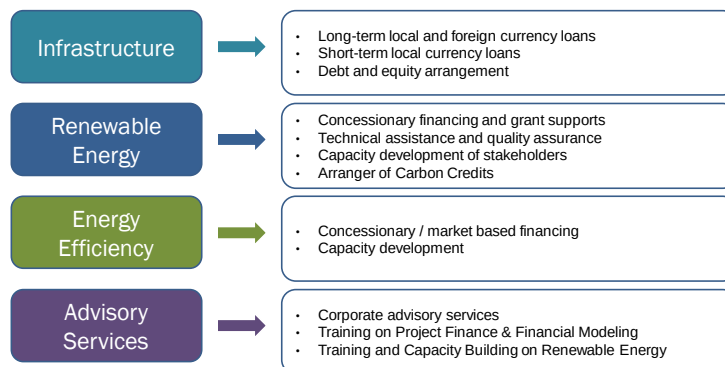
Port



ICS Programs



Products & Services

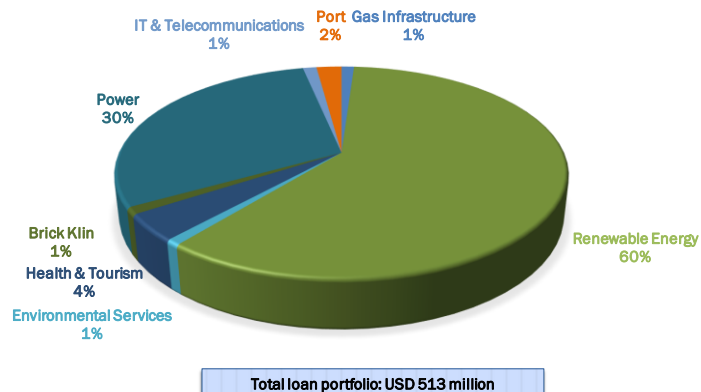


Eligible Sectors

- Power
- Telecommunications
- Information & Communication Technology
- Ports
- Social Infrastructure
- Gas and Gas related Infrastructure
- Water Supply and Sewage
- Toll Roads and Bridges
- Shipyards and Shipbuilding
- Hotel and Tourism
- Mass Transportation Systems
- Environmental Services
- Infrastructure Backward Linkage Industry
- Energy Efficiency
- Public Private Partnership
- Solar Home System (SHS) Program
- Biogas and Manure Program
- Other Renewable Energy Programs/Projects



Sector-wise Loan Portfolio – December 2016



Renewable Energy Activities



Financed 4.1 Million SHS



Installed 44,500 Biogas Plants



8 Solar Mini grid Projects in Operation



602 Solar Irrigation Pumps in Operation



9 Biogas Based Power Projects in Operation



Financed 1 Biomass Based Power Projects



Energy Efficiency Initiatives

IDCOL Energy Efficiency program focuses on:

1. Green Brick Program
2. Industrial Energy Efficiency
3. Improved Cookstoves Program



Financed 6 energy efficient Auto-brick projects



Installed 960,000 ICS



Financed energy efficient equipment



Advisory Services

- IDCOL Advisory Service focuses on:

1. Training & Capacity Building

More than **1,400+** professionals have been trained under various training programs

2. Experience Sharing

IDCOL supported more than **150** professionals from over **10** delegation around the world including Uganda, Sudan, Guinea, Ethiopia, Mali, Gambia, Niger, Senegal, Mauritania, Cambodia, Pakistan, Nepal, Thailand, UK, and Switzerland for implementing similar projects/programs in their country

3. Corporate Advisory

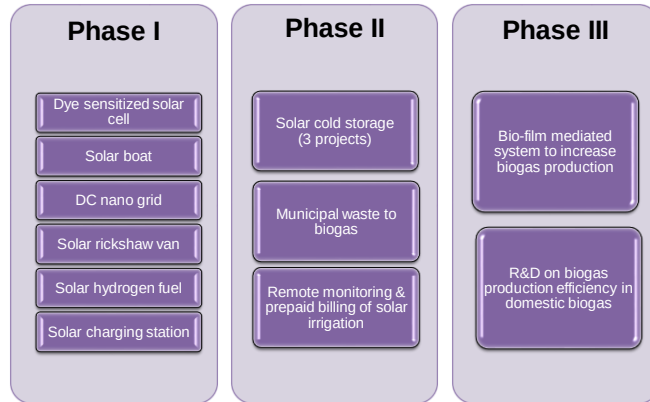
IDCOL initiated various corporate advisory services



Advisory Services - Activities



R&D Initiatives



*IDCOL approved funding of USD 1 million to 13 R&D projects.

* Findings will be available in 2017 and 2018.



R&D Initiatives



Solar rickshaw van



Solar charging station



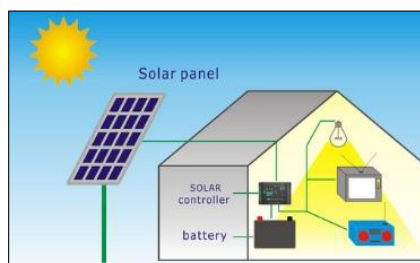
DC nano grid

*Three projects are now completed.



IDCOL's SHS Program

What is a Solar Home System (SHS)?



Capacity	Appliances	Operation
20Wp	3 W LED Lamp: 2 Mobile Charger: 1	4-5 hours
50Wp	3 W LED Lamp: 5 LED Color TV: 1 Mobile Charger: 1	4-5 hours
85Wp	3 W LED Lamp: 7 LED Color TV: 1 Mobile Charger: 1 12 W DC Table Fan: 1	4-5 hours

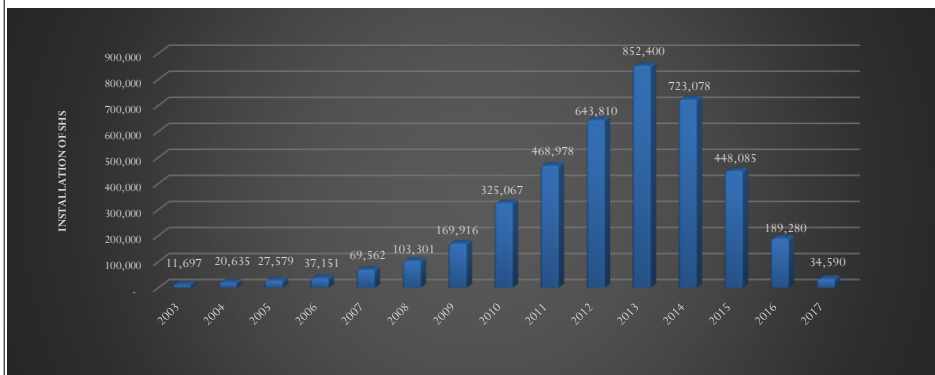
- Lead Acid Battery
- DC-DC Converter to run color television, fan etc.

Program at a Glance

- **Target** : 6 million SHSs by 2021
- **Achievement** : 4.13 million
- **No. of beneficiaries** : 18 million, 12% population
- **Size of SHS** : 10 Wp to 130 Wp
- **Power generation** : 150 MW (approx.)
- **Fossil fuel saving** : 200,000 ton/year
(USD 180 million/year)
- **Job creation** : 75,000 people
- **IDCOL investment** : USD 699 million



Year-wise Installation of SHS

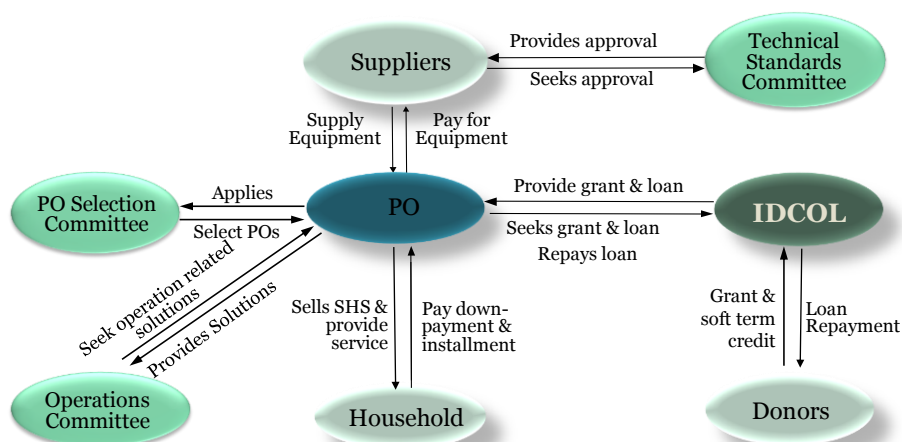


Solar Map

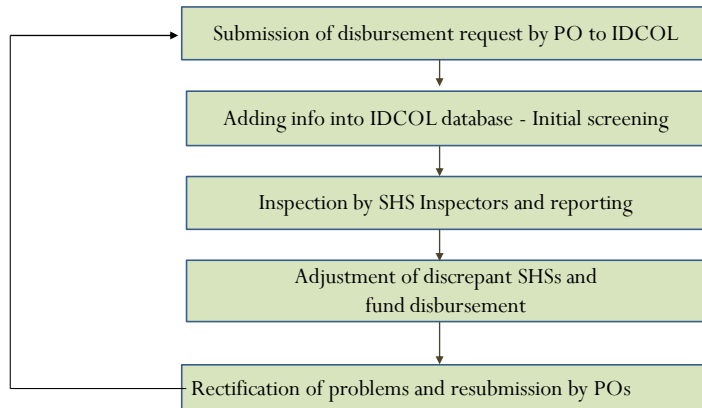
http://www.idcol.org/old/bd-map/bangladesh_map/



Program Structure

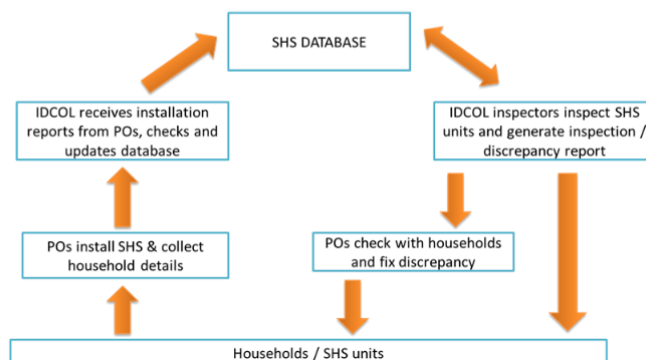


Fund Disbursement Process



IDCOL Solar MIS

Database Management Flow



PO Selection Committee (TSC)

Structure:

Comprising representatives from:

- Institute of Development Studies (BIDS);
- NGO Affairs Bureau;
- Palli Karma Shahayak Foundation (PKSF); and
- Economic Relations Division;

Terms of Reference:

- Sets selection criteria for selection of POs
- Selection of POs based on the approved criteria

Frequency of meeting: As and when required



Year-wise Selection of POs

Year	Number of New POs
2002	5
2003	4
2005	5
2009	7
2010	9
2013	17
2015	11
Total	58



Technical Standard Committee (TSC)

Structure:

Comprising representatives from:

- Private Technical University (UIT);
- Public Technical University (BUET);
- University of Dhaka;
- Power Cell (Technical arm of Power Division);
- Rural Electrification Board (REB); and
- Local Government Engineering Department (LGED)

Terms of Reference:

- Sets technical specification of SHS and its components
- Approves products to be used based on these specifications
- Monitor quality control mechanism time to time

Frequency of meeting: Once in every month



Equipment Suppliers

Equipment	Number of Suppliers	Major Suppliers
Solar Panel	46	Energypac, Navana, Electro
Battery	17	Rahimafrooz, Rimso, Hamko, Panna
Charge Controller	53	Navana, Atersa, STECA
LED Lamp	44	Easy Electronics, G-tech
DC-DC convertor	13	SolarIC



Operations Committee (OC)

Structure:

- Chaired by the CEO, IDCOL
- **Members:**
 - Program-in-charges from all POs and
 - Respective IDCOL officials

Frequency of Meeting: Once in every month

Major Agendas:

- SHS Installation performance of the POs
- Collection efficiency and Portfolio at Risk (PAR) 30 report
- Technical reports submitted by POs and IDCOL technical inspectors
- Implementation status of the decisions taken in the previous meeting
- Any issue related to implementation of the program



Mode of Financing: an Example

(a) Market Price of a 20 Wp SHS	USD 140
(b) Buy-down Grant (Grant A)	USD 20
(c) System Price for Household [(b)-(a)]	USD 120
(d) Down Payment from Household to PO [15% of (c)]	USD 18
(e) Loan Payable from Household to PO [(c)-(d)]	USD 102
Loan Tenor	2 years
Interest Rate	16% p.a.
Monthly Installment Amount	USD 5
(f) IDCOL Refinance [80% of (e)]	USD 82
Loan Tenor	5~7 years
Interest Rate	6~7% p.a.



A Sustainable Financing Structure

Phased -out Subsidy

	2003	2004~5	2006~7	2008~9	2010~11	2012	2013 onwards
Capital Buy down Grant	\$70	\$55	\$40	\$40	\$25	\$25	\$20*
Institutional Development Grant	\$20	\$15	\$10	\$5	\$3	\$0	\$0

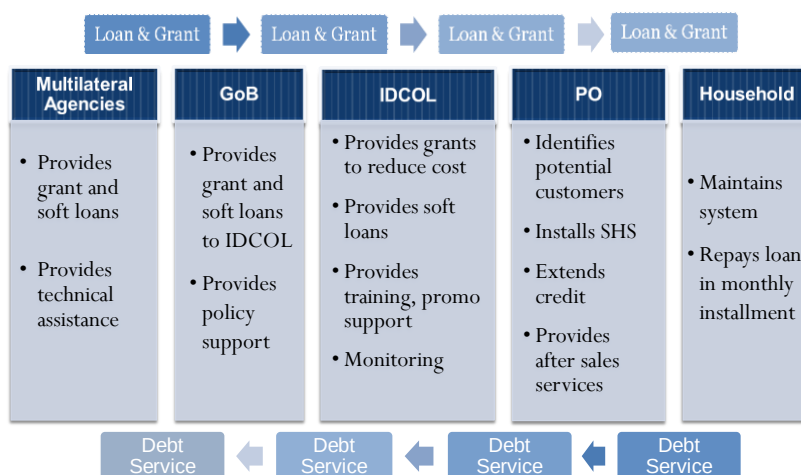
**only for smaller SHS*

Concessional to Semi-Commercial Credit

	2003~8	2009~11	2012~15	2016
Loan Tenor	10 yrs	6-8 yrs	5-7 yrs	5-7 yrs
Interest Rate	6%	6%-8%	6%-9%	6%-7%
% of Loan Refinanced	80%	80%	70%-80%	70%-80%



Fund Flow and Role of Partners



Clean Development Mechanism Fund

- IDCOL SHS program was registered as a CDM program with UNFCCC in 2012.
- IDCOL signed agreement with the World Bank to sell CERs (Certified Emission Reductions) under the program.
- UNFCCC issued 461,897 CERs for reporting period 2012 to 2015.
- Selling rate is EUR 9 per CER.
- CDM benefits has been passed through to the POs. IDCOL retained 25% as administration cost.



Quality Control Mechanisms

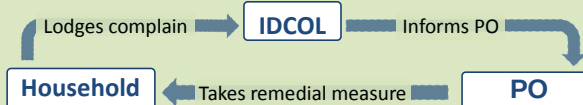
Physical inspection

- Physical inspection by technical inspectors of IDCOL
- Verification of collection efficiency by collection efficiency inspectors
- Independent technical and financial audit

Training Programs

- Training for trainers
- PO Staff / customer training
- Supplier consultation

Call Centre





Inspection & Monitoring

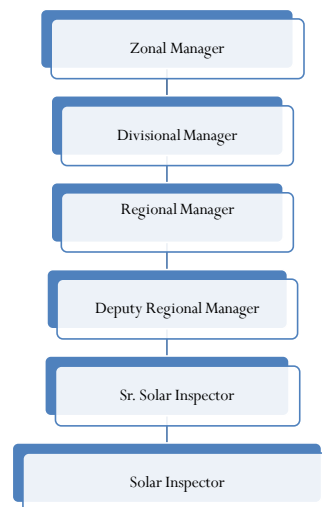


- IDCOL has *12 regional offices* across the country to inspect and monitor SHS installations by various POs
- Each regional office consists of a regional manager and 8-10 inspectors
- Each inspector inspects *around 300 systems* every month
- Any discrepancy identified on SHS units are updated into the database
- Follow up with the POs is carried out on minor defects found in SHS

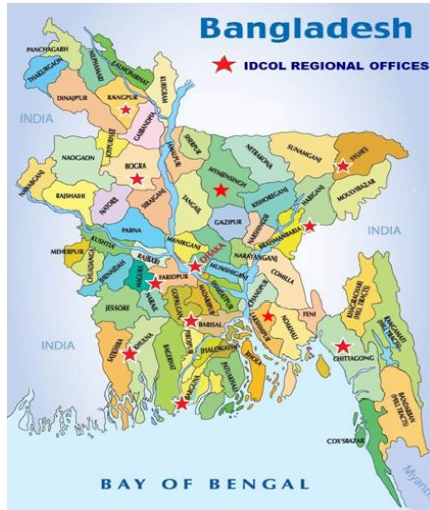


Current Organizational Structure of the SHS Quality Control Team

- Zonal Managers manages and monitors the activities of the divisional and regional offices under his zone.
- Divisional Managers supervise the activities of the regions under his division and make sure the regional offices under him are working properly.
- Regional Managers supervises the inspection and other activities of the inspectors of his region. He prepares the inspection schedule for his inspectors and prepare monthly reports for the Head Office.
- Deputy Regional Managers help Regional Managers and act as the second in command in each regional office.
- Sr. Solar Inspectors & Solar Inspectors inspect SHSs for physical and technical verification. They only inspect the systems installed within the regions they belong to.



IDCOL Regional Offices under SHS Program



1. Dhaka
2. Faridpur
3. Barisal
4. Khulna
5. Barguna
6. Chittagong
7. Brahman Baria
8. Sylhet
9. Bogra
10. Rangpur
11. Mymensingh
12. Laxmipur



SHS Inspection Procedures



Solar Panel Checking



Measuring Battery Voltage



Measuring S.G of Battery



Charge Controller Checking



Load Checking



SHS Inspection Forms

Solar Home System (S.H.S.) Inspection Form

ID Of The Entry _____ **Disbursement Request Number** _____

Branch Name: _____ **Village:** _____

1. Customer Name: _____ **Post Office:** _____

2. Customer Name: _____ **Phone:** _____

3. Customer Name: _____ **District:** _____

4. Installation date: _____

5. Installation date: _____

6. Installation date: _____

7. Price No: _____

8. Price No: _____

9. Price No: _____

10. Price No: _____

11. Price No: _____

12. Price No: _____

13. Price No: _____

14. Price No: _____

15. Price No: _____

16. Price No: _____

17. Price No: _____

18. Price No: _____

19. Price No: _____

20. Price No: _____

21. Price No: _____

22. Price No: _____

23. Price No: _____

24. Price No: _____

25. Price No: _____

26. Price No: _____

27. Price No: _____

28. Price No: _____

29. Price No: _____

30. Price No: _____

31. Price No: _____

32. Price No: _____

33. Price No: _____

34. Price No: _____

35. Price No: _____

36. Price No: _____

37. Price No: _____

38. Price No: _____

39. Price No: _____

40. Price No: _____

41. Price No: _____

42. Price No: _____

43. Price No: _____

44. Price No: _____

45. Price No: _____

46. Price No: _____

47. Price No: _____

48. Price No: _____

49. Price No: _____

50. Price No: _____

51. Price No: _____

52. Price No: _____

53. Price No: _____

54. Price No: _____

55. Price No: _____

56. Price No: _____

57. Price No: _____

58. Price No: _____

59. Price No: _____

60. Price No: _____

61. Price No: _____

62. Price No: _____

63. Price No: _____

64. Price No: _____

65. Price No: _____

66. Price No: _____

67. Price No: _____

68. Price No: _____

69. Price No: _____

70. Price No: _____

71. Price No: _____

72. Price No: _____

73. Price No: _____

74. Price No: _____

75. Price No: _____

76. Price No: _____

77. Price No: _____

78. Price No: _____

79. Price No: _____

80. Price No: _____

81. Price No: _____

82. Price No: _____

83. Price No: _____

84. Price No: _____

85. Price No: _____

86. Price No: _____

87. Price No: _____

88. Price No: _____

89. Price No: _____

90. Price No: _____

91. Price No: _____

92. Price No: _____

93. Price No: _____

94. Price No: _____

95. Price No: _____

96. Price No: _____

97. Price No: _____

98. Price No: _____

99. Price No: _____

100. Price No: _____

Solar Home System (S.H.S.) Inspection Form

ID Of The Entry _____ **Disbursement Request Number** _____

1. Visual Inspection

2. Measurement Inspection

3. Charge Controller

4. Battery

5. Module

6. Wiring

7. Discrepancy

8. Comments

Post Inspection Data Entry

Step 1

Filter By Customer ID _____ **Customer ID** _____

Filter By PO _____ **PO Name** _____

Panel Info

Selected Panel St: _____ **Search By Panel**

Agreement Code: _____ **Select Agreement**

Inspection Type: _____ **Update Agreement**

Equipment: _____ **Serial No:** _____ **Quant:** _____ **Model:** _____ **Size / Weight:** _____

Inspection Entry

Disbursement Request No: _____ **Loan End Date:** _____

Agreement Date: _____ **Service Charge (No):** _____

Price of the system (In Taka): _____ **Installation amount:** _____

Loan / Cash: _____ **Date of installation payment:** _____

Down payment: _____ **No Of Beneficiary:** _____

Loan amount: _____ **Reason for not paying the installment:** _____

Loan tenure: _____ **(If all the installments have not been paid)**

Type of installation: _____

Next

Step 2

Name of the Installer: _____ **Inspection Entry Found**

How did you come to know about the S.H.S.? _____

Number of SHS Installed: _____

Description of electrical appliances used

Appliance	Qty	Hour/Load	Size/Capacity	Select
Light				
TV				
DC Fan				
Cassette Player				
Mobile Charger				
Microphone				
VCD				
Others				

Effectiveness of the S.H.S. _____ **Appliance Entry Found**

Consumed Fuel (Monthly): _____

Do the people of the PO come regularly for maintenance? ☒ Yes ☐ No

House Hold Comment: _____

Representative of PO: _____

IDCOL Representative: _____

Inspection Date: _____

Back **Next**

Step-1

Step-2

Post Inspection Data Entry

Step-3

Step-4

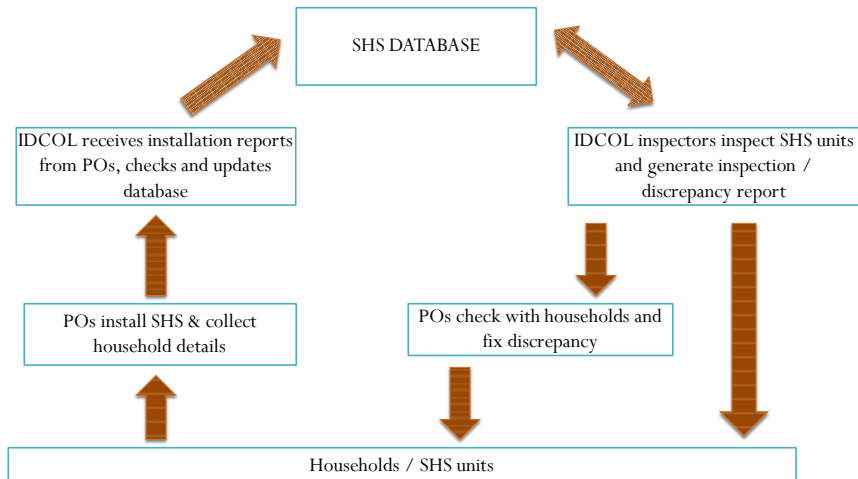


Database Management

- Details of **every SHS installation** by POs under the SHS program is registered in database
- Every SHS is identified by its **unique solar PV panel serial number**
- No two entries can be made for the same SHS system - hence **duplicate entries are excluded**
- Inspection report updated for every inspected SHS unit
- Any discrepant SHS system identified during inspection is **excluded from the program for funding**



Database Management Flow



Snapshots of SHS Database

House Hold Info

For New Customer Please Enter Data From Customer ID Field. To checking Existence You can click on Find.

The House Hold ID will be generate Automatically when you will click on Create

☒ Recursive

House Hold ID	BR133380
Customer Id	BR_54_881
Customer Name	Md Ajhar
Customer Type	Mosque
Gurdan Name	Md Habbur Rahman
Relation	Father
District	NARSINGDI
Thana	NARSINGDI SADAR
PO	BRAC Foundation
Branch Name	ABHANAGER
Post Office	Akhala
Village	Rakhamagar
Phone	01918653895

* Auto Generated, Search Purpose ** Insert OR Search Purpose

Household Information

Lease Agreement

RESALE/SECOND SYSTEM ?? ☐ Yes

Agreement ID For Search Purpose: BR133661

PO Name: BRAC Foundation

Branch Name: BRAC Foundation

Household ID: BR133380

Customer ID: BR_54_881

Panel Serial No: C200513620163

Agreement Date: 24/06/2008

Installation Date: 24/06/2008

System Price: 3600

Down Payment: 1500

Loan Amount: 2100

Percentage of Refinance: 80

Refinance: 1680.6

Loan Tenure (year): 2

Installment Type: Weekly

Loan End Date: 24/06/2010

Total Installment: 24

Installment Due Date: 10

Service Charge (%): 12.5

Installment Amount: 865

Used Fuel: ☐ Diesel ☒ Canoin

Consumed Fuel: 0

Installed panel (including this panel): 1

No Of Beneficiary: 5

Equipment	Serials	Quantity	Model	Size Capacity
Solar Panel	C200513620163	1	BRP125_75	75
Charge Controller		1	ST1210P_10	10
Fluorescent Lum.		6	ST16_120T_07	07

Please check RESALE for System resale. Also check Cash note button for cash sale system.

For new agreement when you will click create, then it will generate a agreement ID.

Please put this agreement ID on customer's Document Profile for further use.

Please Enter All Serial Number Carefully.

☐ Use of Appliance

Description of electrical appliances will be used

Lease Agreement Information



Dedicated Customer Care Call Centre

- IDCOL has set up a *dedicated customer care call centre* to which customers shall report directly on system defects/maintenance issues, etc. during the 3 years warranty period



Sample IDCOL Call Centre Sticker given to Customers



IDCOL Call Centre Number printed on the Charge Controllers



Snapshot of Call Center Database

Call center entry

Entry Name: Phone: District: Thana: Village or Ward: PO: Branch: Branch Phone: Size: Is Solved: Yes No Call Date: 10/11/2013

Customer complain: 26-GENERAL QUERY PO complain: NA

Comments:

Clear Create Save Delete

Data View

Phone: Call Date: 10/11/2013 Entry Date: 10/11/2013 PO: ADAMS District: B BARIA

Cus complain: 26-GENERAL QUERY PO complain: NA

CallDate	CustomerName	PhoneNo	POName	DistrictName	ThanaName	BranchName	Village Name	PanelSize	Name of the Problem	Solved(Y/N)	Status(F No)
7/31/2013 10:07	HANIF	01783456740		MANIKGANJ	GHOR		SHINULURI	0	26-GENERAL Q...		CUSTOMER DO...
9/5/2013 10:41	KASHEM	01771503547		MANIKGANJ	GHOR		MASHIL	50	26-GENERAL Q...		CUSTOMER DO...
5/28/2013 10:18	NASRI DUDDIN	01732283113		MANIKGANJ	DAULATPUR		KAKRAITH	0	26-GENERAL Q...		CUSTOMER DO...
5/29/2013 10:18	AFZAL	01765526647		MANIKGANJ	DAULATPUR		BISHNOPUR	0	26-GENERAL Q...		CUSTOMER DO...
5/7/2013 5:49 PM	SIDDOQUE	01727795523		GAZIPUR	KAPASIA		DIGIRKANDA	0	26-GENERAL Q...		CUSTOMER DO...
9/5/2013 10:41	ALL AMIN	01754369868		GAZIPUR	KAPASIA		TAKABOR	0	26-GENERAL Q...		CUSTOMER DO...
6/23/2013 10:25	MOKSHED	01746707129		MANIKGANJ	MANIKGANJ SA...		GOSTA	0	26-GENERAL Q...		CUSTOMER DO...
5/15/2013 10:41	SHUNDOR ALI	01760734316		MANIKGANJ	MANIKGANJ SA...		BASHIDOBPUR	0	26-GENERAL Q...		CUSTOMER DO...
5/13/2013 10:31	DULAL	01846742660		MANIKGANJ	MANIKGANJ SA...		BARPARCHAR	0	26-GENERAL Q...		CUSTOMER DO...
7/30/2013 10:07	APON	01779109345		MANIKGANJ	MANIKGANJ SA...		BASHIDOBPUR	0	26-GENERAL Q...		CUSTOMER DO...
8/1/2013 10:10	JAHANGIRI MOL	01965115459		GAZIPUR	SREEPUR		KHODDOR RA...	0	26-GENERAL Q...		CUSTOMER DO...
5/29/2013 10:18	AKTAR	01841445631		GAZIPUR	SREEPUR		HATSRHOL	0	26-GENERAL Q...		CUSTOMER DO...
5/27/2013 10:22	AKTARUZZAMAN	01827916181		GAZIPUR	SREEPUR		TENGRA UTTO...	0	26-GENERAL Q...		CUSTOMER DO...
6/4/2013 9:54 AM	DULAL	01772151011		GAZIPUR	KAPASIA		GOSHAKANDI	0	26-GENERAL Q...		CUSTOMER DO...
5/13/2013 12:35	BAZLUR RAHM...	01711575164		GAZIPUR	KALIGANJ		GOLABARI	0	26-GENERAL Q...		CUSTOMER DO...
8/4/2013 9:59 AM	KHOSHED AL	01828074690		NARSINGDI	RAIPURA		BALUAKANDI	0	26-GENERAL Q...		CUSTOMER DO...
9/3/2013 12:58	HABIB MIA	01776258610		NARSINGDI	RAIPURA		KACHARKAWDI	60	26-GENERAL Q...		CUSTOMER DO...
9/3/2013 12:58	MYHJUDIN	01776258610		NARSINGDI	RAIPURA		KACHARRIKAN	60	26-GENERAL Q...		CUSTOMER DO...

Total rows: 4543





After Sales Service



- After 3 years of warranty, users can sign *annual maintenance agreements* with Pos
- IDCOL provides *incentives to customers* if they replace the old batteries through POs itself - this *ensures safe disposal of used batteries* by suppliers
- *Training manuals, booklets/brochures* on SHS system operation and maintenance are also prepared and provided to POs/customers



Evaluation by Development Partners

Consultancy Firm	Development Partner	Timeline	Number of SHS Inspected
PSE	KFW	2011-2014	9,500
BIDS	The World Bank	2011-2012	1,600
MJF	The World Bank	2013	606
BIDS	DFID	2015	462
Keystone	JICA	2015-2018	3,579
			15,747

* During the third party inspections, all the systems were found functional and without any major technical difficulties.



Collection performance of the Program

- A collection team of 18 field auditors
- Total inspection as of Dec'16: 3,703 branch offices
- Inspection percentage: 65% of branch offices
- Overall collection efficiency: 85%
- Offices with satisfactory (90%) performance: 68%



Training Program

Type of Training	Arranged by	Participants	Trained so far
ToT Training	IDCOL	PO Officials	496
Management Training	PKSF	PO Officials at Head Office	202
Staff Training	PO	PO Field Staffs	30,197
Customer Training	PO	Customers	1,565,942
Technician Training	Technical Institutes	Local people	1,894



Battery Recycling

- Battery recycling policy was adopted under the program in 2006.
- There are 4 ISO certified battery recyclers in Bangladesh.
- POs are required to collect old batteries while selling new batteries.
- Customers receive 24% of new battery price as salvage value.
- IDCOL inspected 94,210 warranty expired batteries since Nov'12.
 - 91% batteries are functioning well
 - 5% has been replaced
- Support from IDCOL:
 - PO gets USD 5 for collection
 - PO receives up to USD 100 as loan for each new battery sale
 - Battery recycler get USD 5 for recycling



Pay-As-You Go (PAYG)/Prepaid System

- IDCOL has a plan to introduce prepaid SHS system since February 2017.
- A prepaid device will be installed on battery top to take control of the battery.
- The pilot phase was successfully conducted in an upazila (sub-district) during August 2016 – November 2016.
- 3 local suppliers are currently providing the solution.



Success Factors

- Innovative financing structure - Ownership model
- Financial contribution of all parties
- Sustainable business model
- Cost-efficient standardized technical design
- Quality control and after sales service
- Development of local support industries
- Bangladesh's micro-finance experience
- Support from the Government, the World Bank and other donors



Current Challenges

- SHS market outside IDCOL program
- Free distribution of SHS under safety-net programs of the Government
- Rapid expansion of REB grid
- Collection performance of POs has deteriorated
- Lack of customer awareness regarding the maintenance of the SHS
- Lack of trained technical resources working on field



Mitigation Measures

- Engaging POs in safety-net programs of the Government
- Initiatives for Product/Business Diversification
- Support from Rural Electrification Board (REB) in collection
- National Standard for SHS through SREDA
- Collection efficiency improvement program – CEIP



THANK YOU

