

Experience from First Solar Mini Grid Service in Bangladesh

By

Hasna J. Khan

Director

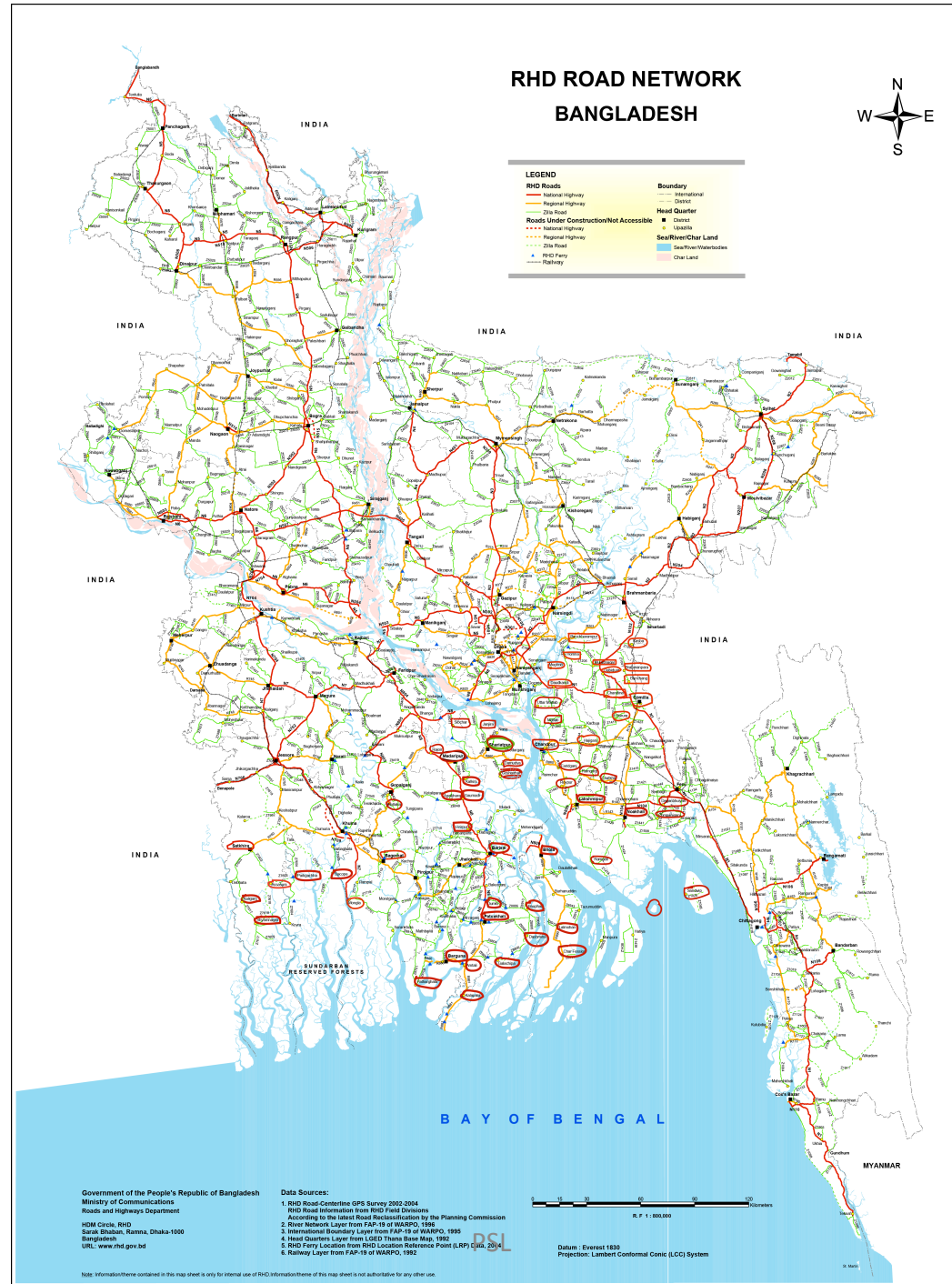
Prokaushali Sangsad Limited (PSL)

(hasnajkhan@gmail.com)

Innovating Energy Access for Remote Areas
Berkeley, April 10, 2014

People's Republic of Bangladesh

- Pop. 150 Million



4/9/14

Sandwip Island



Sandwip Island is located in the south-eastern Bangladesh with an area of 762 sq.km., and habitat to a population of 350,000.

detached from Chittagong mainland by a channel of about 75 kilometers the island has poor communication and infrastructure

Natural Disaster at Sandwip Island



4/9/14

PSL

Stages of 100kW Solar Mini-grid Installation (2009-2010)

- Survey of potential consumers
- Load assessment
- Plant design
- Proposal approval
- Project development
- Planning
- Procurement
- Implementation





11/02/2008 13:38

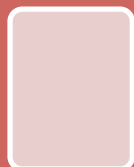
Commerce



Survey Findings

Tariff of Diesel Electrification Service

Appliance	Watts	kWh/day	\$/kWh
CFL Lamp	24	0.132	0.96
Ceiling Fan	60	0.33	0.77
Florescent Tube	40	0.22	0.58
Television	40	0.22	0.58



Power demand of all the market people is met by multiple Diesel providers and Captive power.



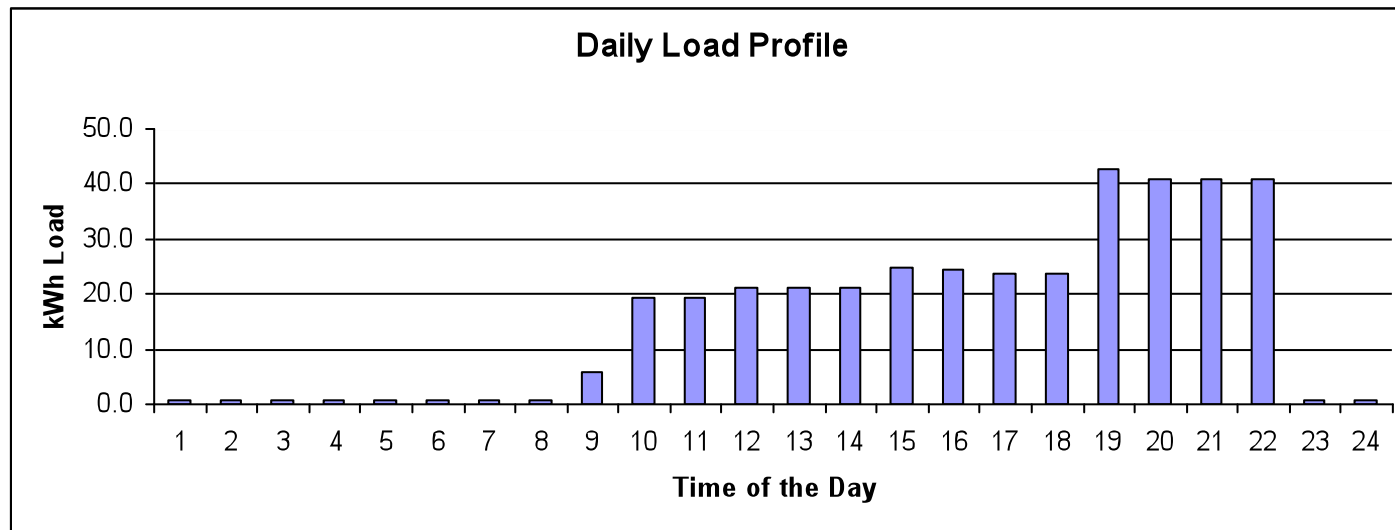
Electricity is provided in an adhoc manner 4-5 hours daily.



Providers set their own fixed charge for each unit of appliance used.

100 Watt incandescent Lamp	256
40 Watt Tube Light	242
48" Ceiling Fan	115
12" Table Fan	82
Black and White TV (14"/17")	62
Refrigerator	6
Photostat Machine	3
Computer	30
X-ray Machine	2
ECG	2
Laminating Machine	6
Laser Printer	17
Colour Printer	6
Hair Dryer	7
Hotgun (repairing mobile)	8
40 Watt Soldering Iron	8
Scanner	8

Load Profile of Rural Consumers in Enam Nahar market

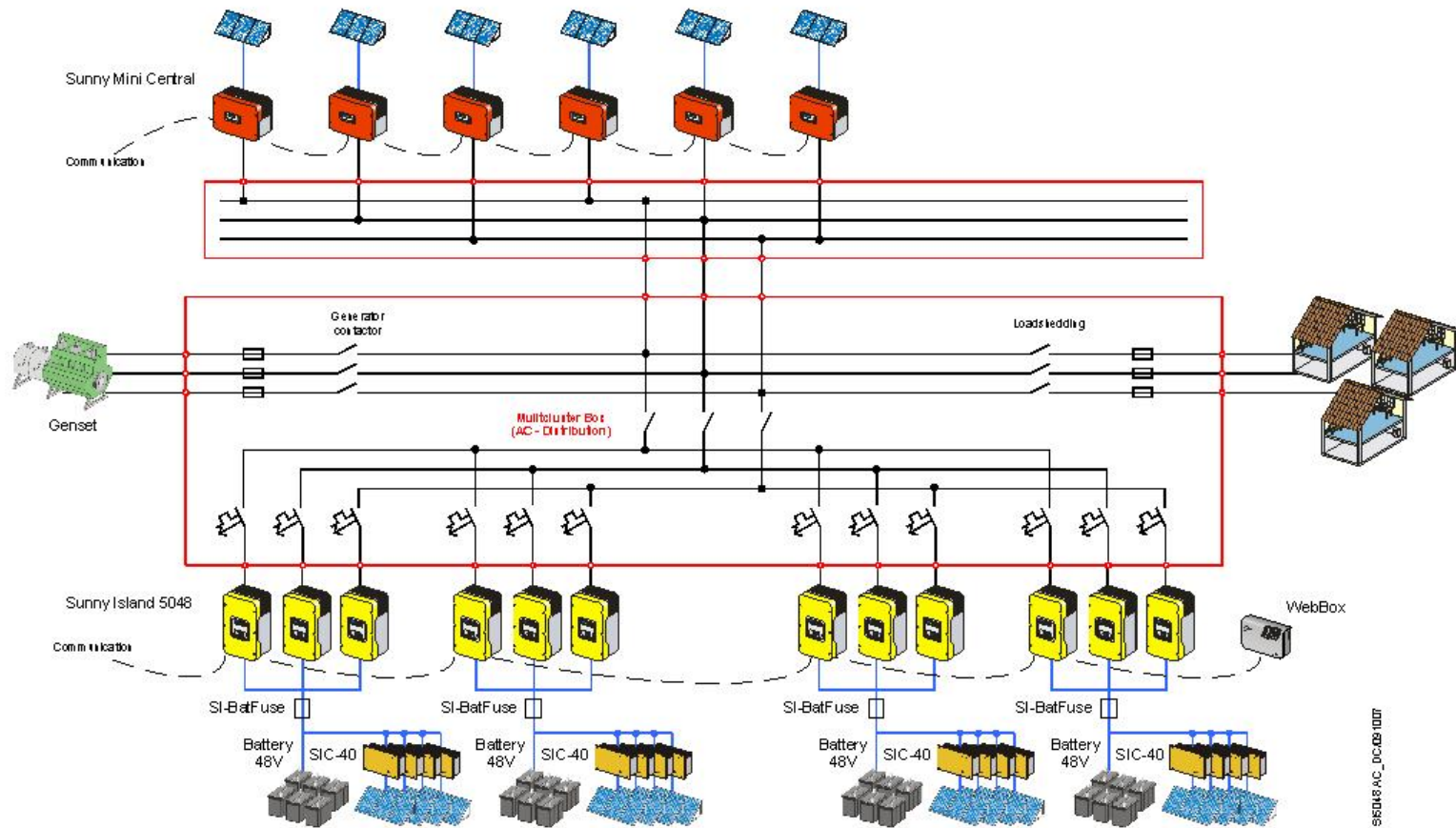


Business Plan for 100 kW Solar Mini Grid

- Daily load 374 kWh
- Shops and house hold: 390, school: 5, health center: 5
- Project cost USD 730,000
- Financing: Equity 20%, grant 50%, loan 30%
- Economic life 20 yrs

System Design for 100 kW Solar Mini Grid

Four Cluster Sunny Island 5048 – Sandwip Island



Infrastructure



Project Site at Sandwip in 2010



4/9/14



PSL

Logistics



PSL

4/9/14

Transport situation



Plant Commissioning



Inside the Control & Battery Room



Hardware Installation- SMA Inverters



4/9/14

PSL

Grid Tie Inverters and batteries



4/9/14



PSL

100 kW Solar Mini grid is operational since September 2010

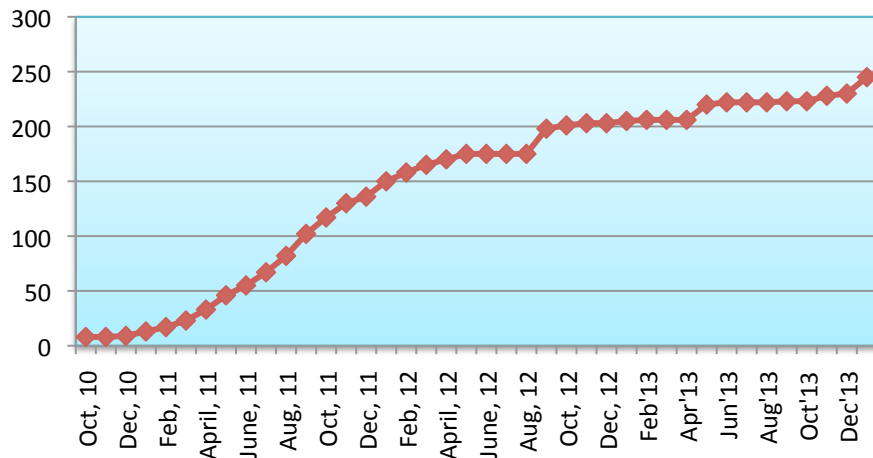


PSL and AS Team, September 29, 2010

Turned on the solar plant first time

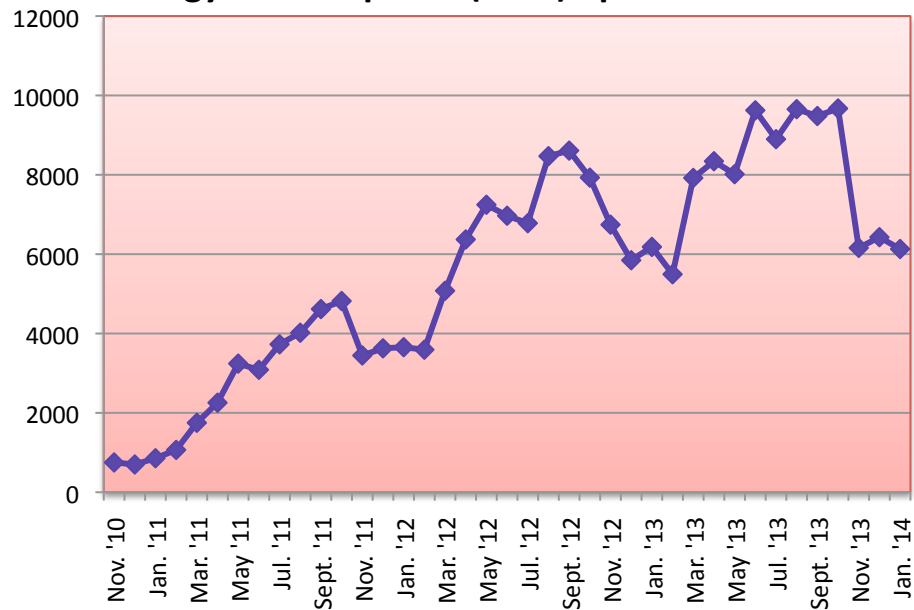


Total Nos. of Connection up to Jan'2014



No. of connections as of January 2014

Energy Consumption (kWh) up to Jan'2014



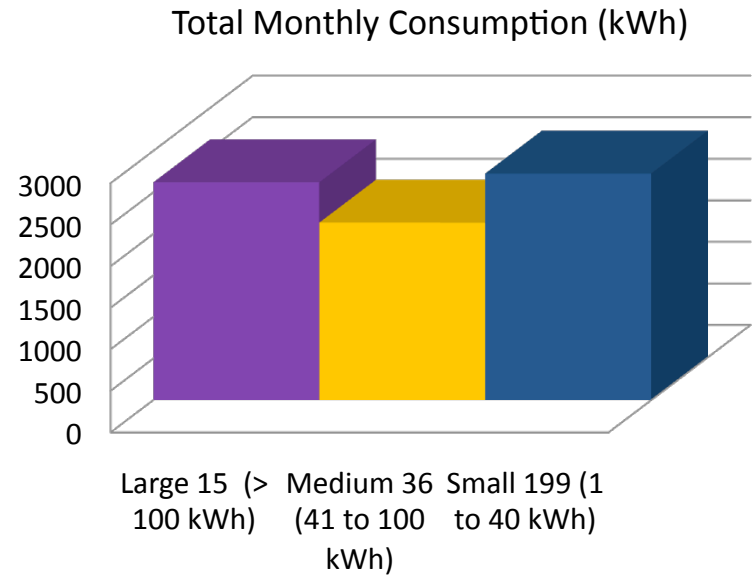
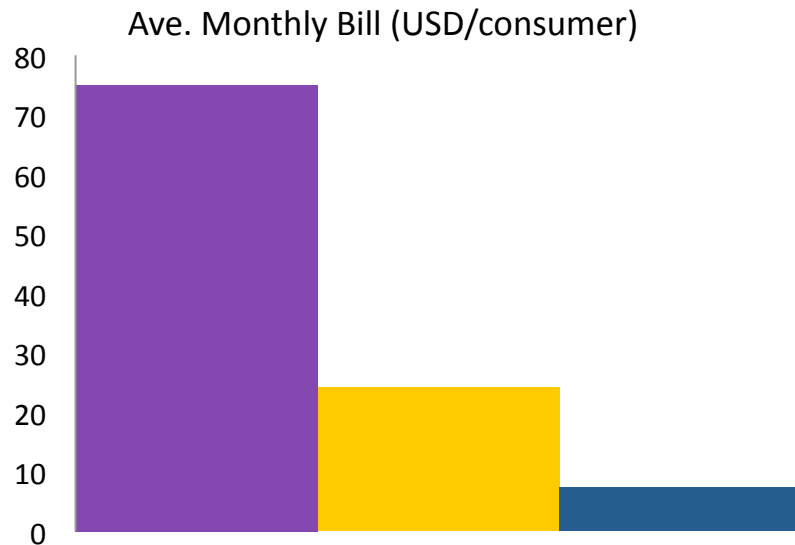
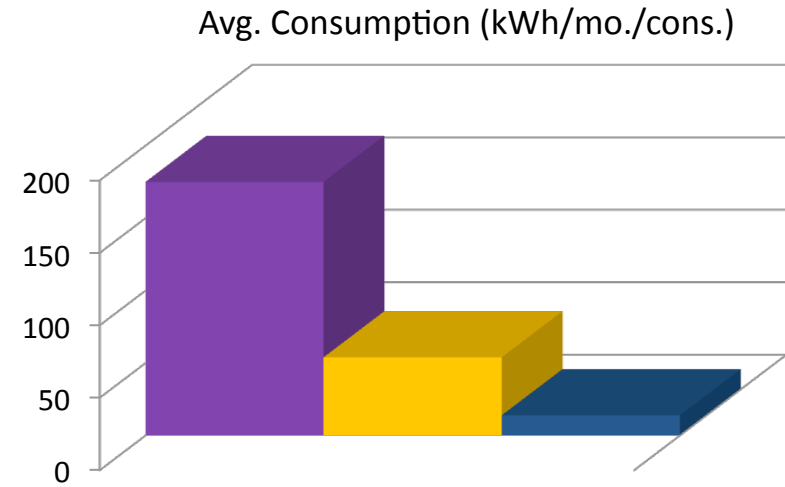
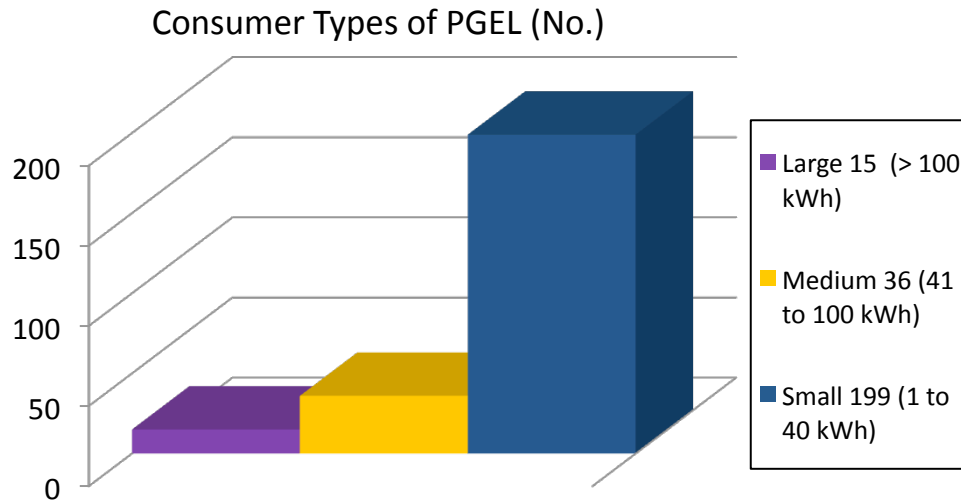
Consumer Type	Nos.
Commercial Shops	174
Financial institutions/ Bank/ Govt. office	15
School	2
Mosques	4
Hospital/Pathological Lab	8
Households	42
TOTAL	245

Type of consumer	Nos.	Avg. consumption (kwh)/month	Avg. Bill Tk./month
Large Consumer	15 (6.12%)	176	6,034
Medium Consumer	36 (14.69%)	60	2,136
Small Consumer	194 (79.18%)	14	590

Energy consumption categories

Results: Consumer Characteristics of PGEL

Operation up to Jan 2014



Taz Hotel & Restaurant is connected to Solar mini grid since October, 2010

**Monthly Avg. consumption= 299 kWh, and
Monthly Avg. bill= 9,600 BDT**



Ma Enterprise is connected to Solar mini grid since January, 2012

**Monthly Avg. consumption= 2 kWh, and
Monthly Avg. bill= 190 BDT**



**Agrani Bank Ltd, a Government owned bank, is enjoying electricity from Solar mini grid in March, 2012.
Monthly Avg. consumption= 104 kWh, and Monthly Avg. bill= 3,440 BDT**



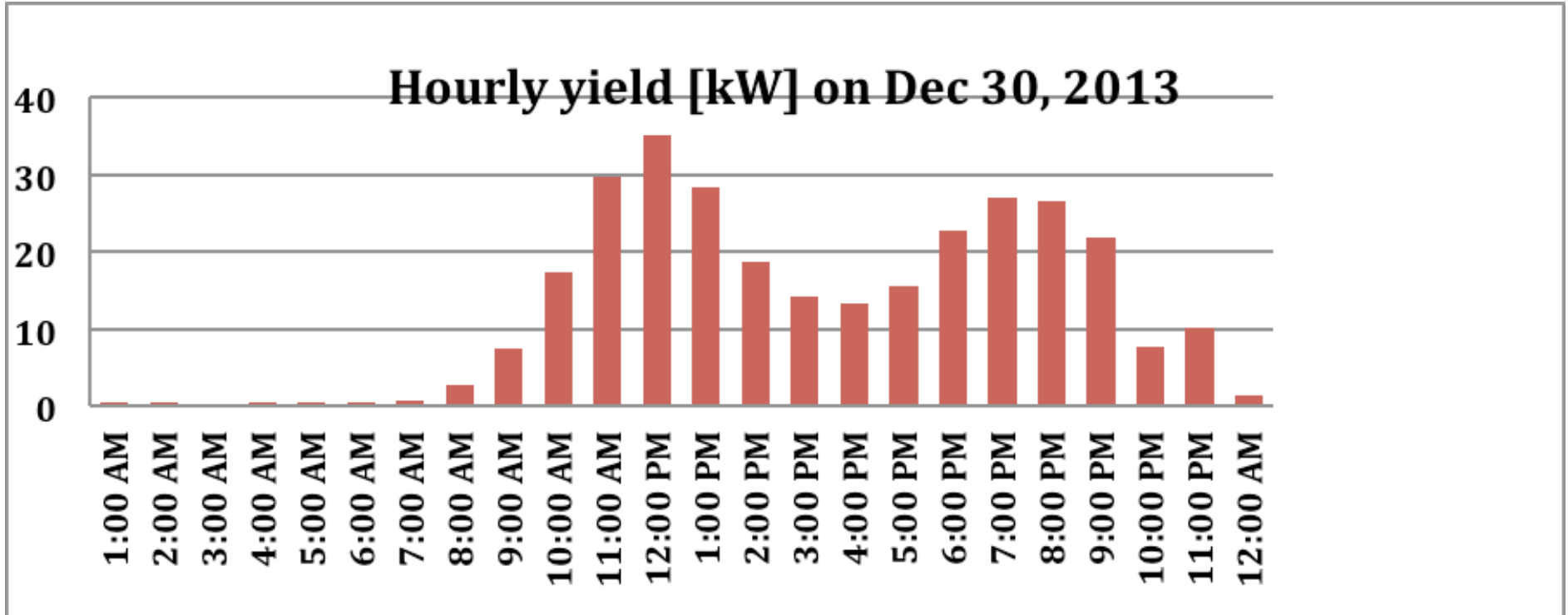
**Rupali Cooperative Society is connected to mini grid in October, 2010
Monthly Avg. consumption= 60 kWh, and Monthly Avg. bill= 2,040 BDT**



Results: Daily Energy Profile of PGEL

A Daytime peak appeared in PGEL service.

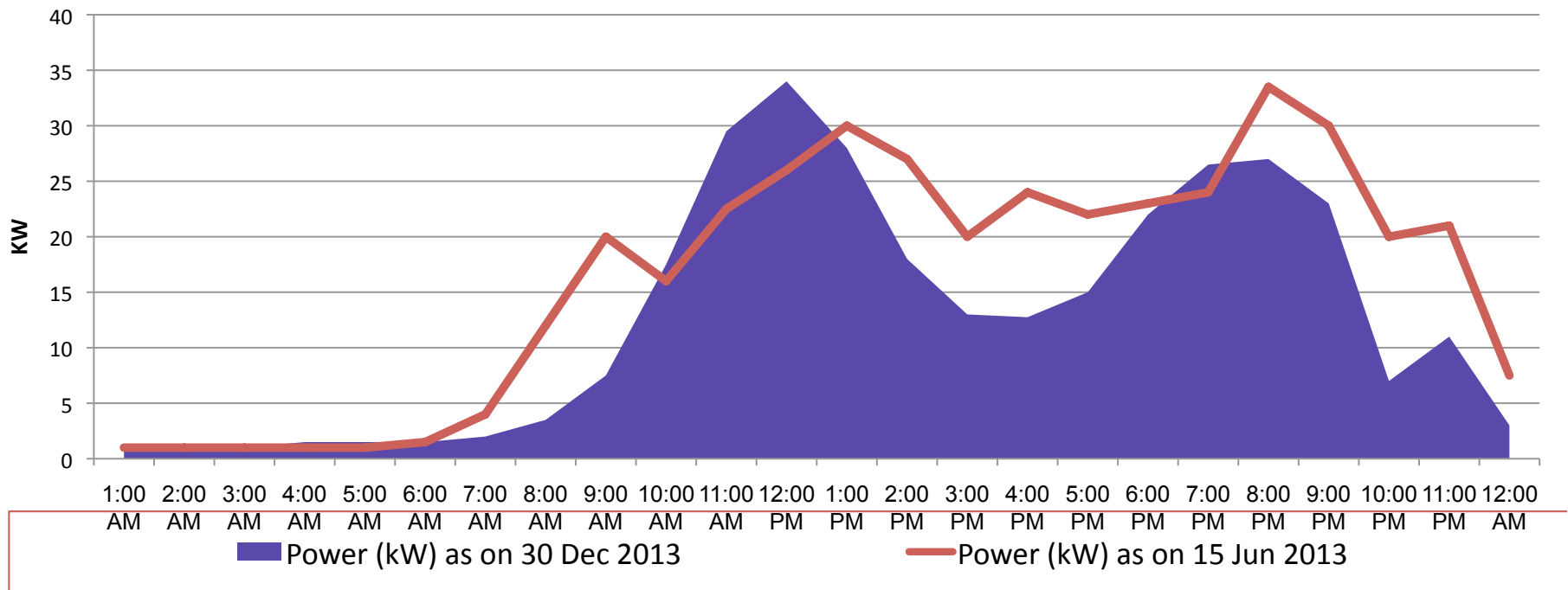
This is an important revenue stream for PGEL, and excellent service to the local economy.



Seasonal Effect on Energy Profile

System monitoring shows the increased mid-day load during summer

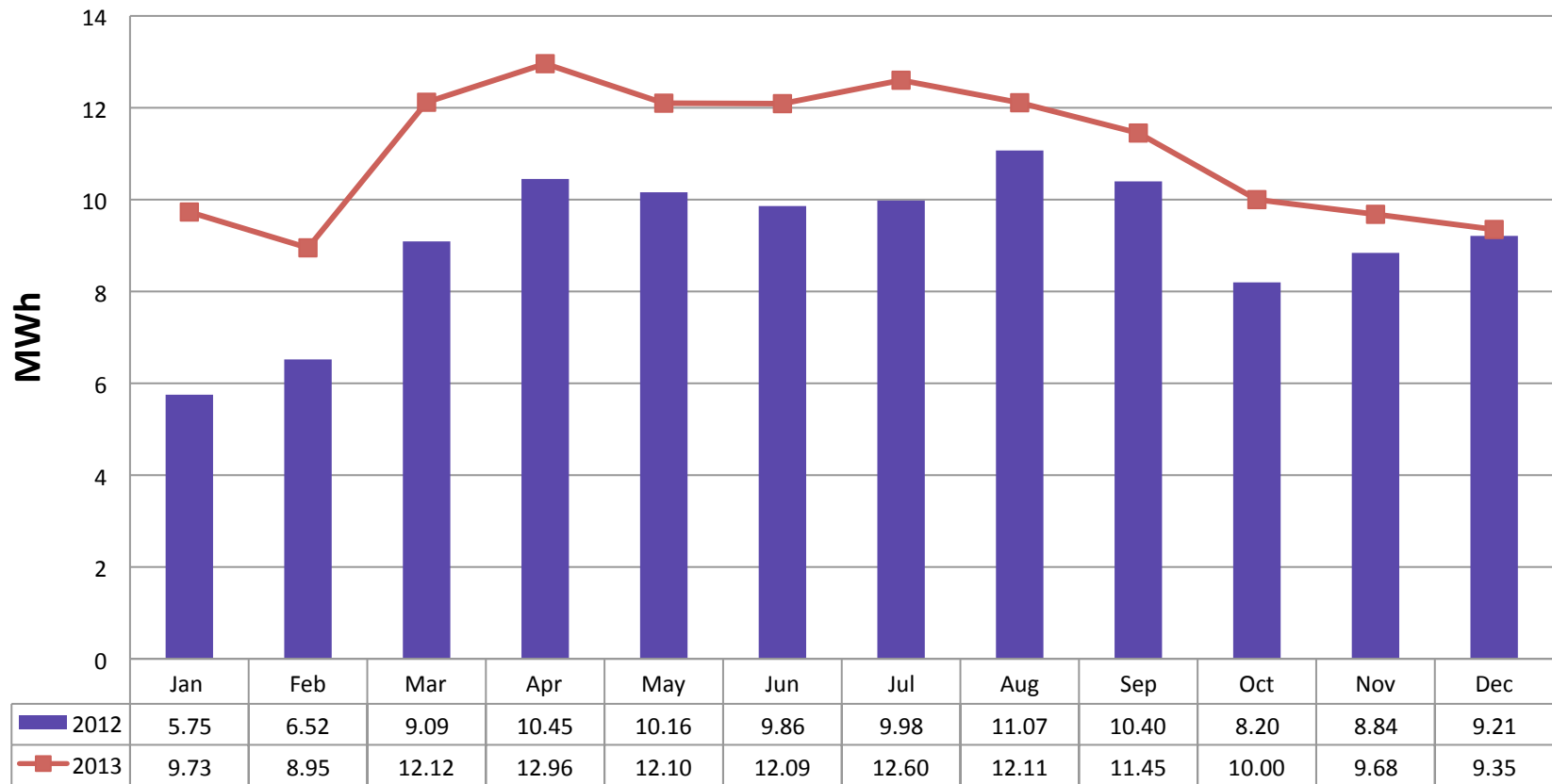
Power (KW) as on 15 June & 30 December 2013



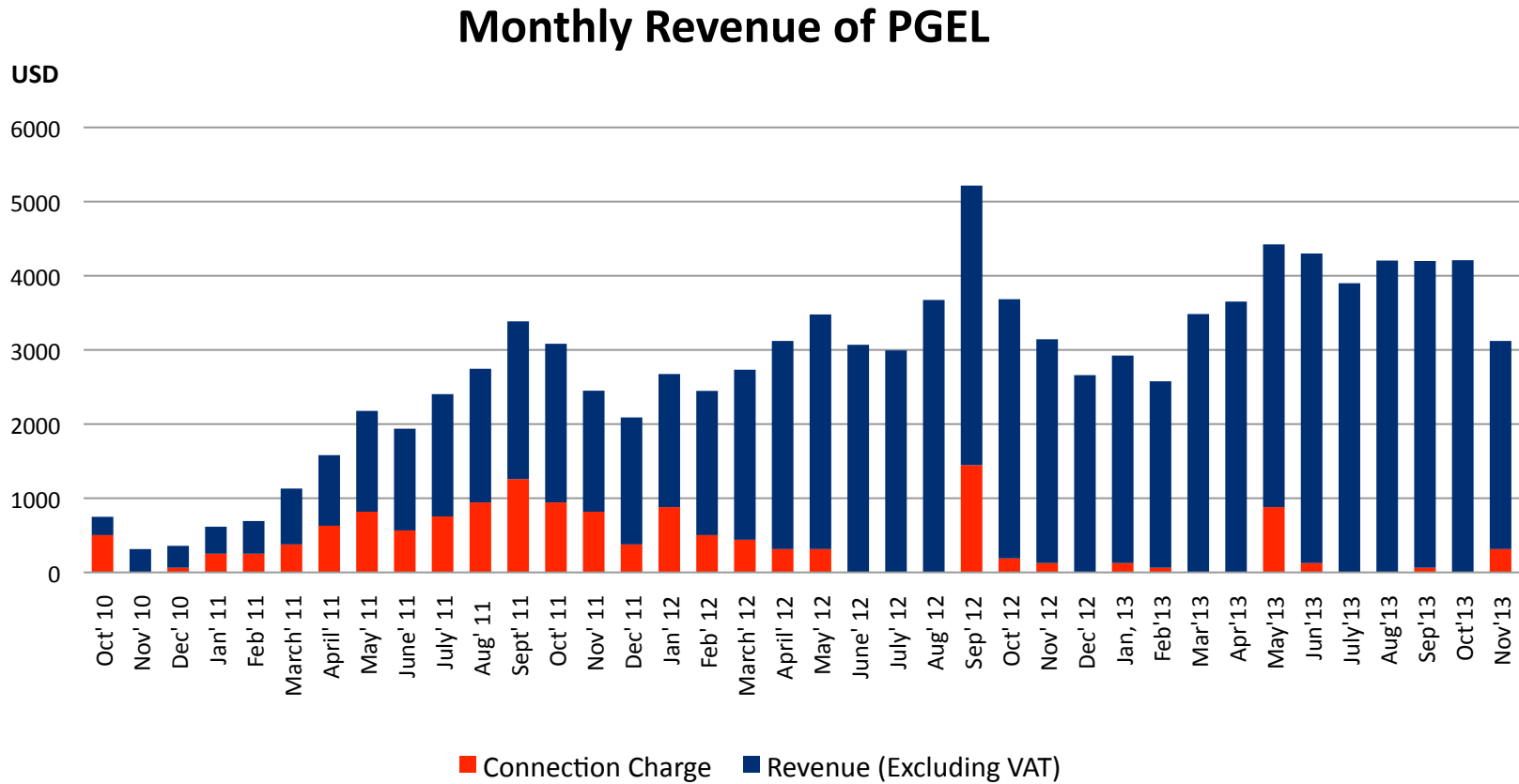
Annual Energy Profile

Increase in Energy Demand for Consumers

Annual Energy Production in 2012 and 2013



Revenue from Solar Mini grid Service



Challenges Faced by Mini Grid Service

- **Policy Uncertainties**
 - Regulatory inertia
 - Undefined policies
 - Environmental Clearance
 - “Guideline for the Implementation of Solar Power Development Program” (MEMR, 2013)
- **Project Cost**
 - The high level of investment on hardware is typical for renewable energy projects
 - lead acid batteries was 26% of total hardware cost
 - Recurring fuel cost must be managed over time by spreading the peak power load
- **Subsidies and Incentives**
 - Financing Solar Mini grids
 - public grid expansion to the area in the near to medium term.
 - compensation for private assets in favorable terms



PGEL has generated more than 320 MWh displacing 222,230 kg of Co2



4/9/14

PSL

Thank You