

# **Green Solutions to Power Problems**

**(Solar & Solar-Wind Hybrid Systems )**

For  
Telecom Infrastructure



# Mobile Tower Sites

- Mobile Towers : 5.88 Lakhs
- Power Requirement : 1 - 5 KW (24X7)
- Telecom Sector Energy Requirement : 14 Million Units per annum (Green Peace report).
- Energy is a dominant cost component for Telecom.
- Urban - 30% of OPEX      Rural - 50% of OPEX

# Specific Problems of Power

- Power availability is a major challenge
- Rural areas conventional grid power not available
- More than one lakh villages still remain to be electrified
- Wherever grid supply is available power quality is poor and erratic
- Power availability less than 12 hours a day.

## Contd..

- Poor power quality mainly due to
  - a. Supply interruption
  - b. Sudden change in voltage
  - c. Under voltage/over voltage
  - d. Voltage fluctuation
- Operators necessarily invest in providing back up options

# Two of the most common alternate power solutions

- **DG Set**

- Transportation, storage, pilferage, high cost of diesel pose major hurdles in operating DG sets.
- Causes pollution (environmental & noise)

- **Inverter-Battery Systems**

- Low voltage and intermittent supply of electricity renders inverter-battery ineffective and battery doesn't get fully charged due to unreliable supply of grid power.

Operator depend heavily on diesel generator to power BTS towers. Power deficit coupled with rising cost of diesel pose the significant challenge for the sector.

## D.G. Operation

- DG Running Hours : 16 – 20 Hrs per day.  
(Rural / Semi-urban)
- Each BTS tower : 4000 Lt diesel / year.
- Last year expenditure  
on Diesel : Rs. 7000 Crores.  
(Economic times 8<sup>th</sup> March)
- Without Diesel subsidy the cost of power generation shall go up by 20 – 25 % more.
- We need to integrate low energy and low carbon considerations in our operations.

# Carbon Emission

- Mobile Towers : 5.88 Lakhs
- DG set : 15/20 KVA
- Diesel Consumption : 2.75 Litres / hour.
- Diesel Running Hours : 8 - 12 Hours / day
- Diesel Consumption : More than 2 billion litres
- 1 litre diesel emits : 2.68 Kg of CO<sub>2</sub>
- Mobile Towers generating : Tons of carbon
- There is a need for estimation of carbon emission by the Telecom Industry.

# Monitoring and Accounting

- Fixation of bench mark standards.
  - (a) Units / mobile connection / month
  - (b) Units / mobile traffic / month
  - (c) Units / revenue generation / month
  - (d) Units / Cell site / month
  - (e) Carbon (Kg) / Cell site / month
    - 0.84 Kg. / unit of Grid supply
    - 2.68 Kg / litre of diesel consumption

# Alternate RE Solutions

- Decentralized Distributed Generation based on Renewable energy resources is an effective solution to power problems specially rural areas
  - Solar Photo Voltaic (SPV)
  - Wind Turbine Generator
  - Fuel Cells
  - Bio Mass
  - Hybrid Solutions

# Solar Initiatives

- Dept of Telecom carried out pilot projects of non-conventional energy sources

Solar

&

Solar-wind Hybrid system

To power mobile towers in USOF phase-I rural sites.

## Objectives.....

- ✚ **Utilization of natural Solar Power**
- ✚ **Optimization of Fuel consumption**
- ✚ **Minimise Run-Hour of Diesel Generator**
- ✚ **Low maintenance cost.**
- ✚ **Savings in Operational Expenses.**
- ✚ **Eco-friendly atmosphere will minimize operational hazards.**

# Solar Photo Voltaic Cells

- 1 Kwp SPV generates: 3.5 - 4 units (Kwh) / day
- Area requirement : 10-12 sq mt / Kwp SPV
- Installation : South facing, placement angle as per altitude of the place
- No maintenance (cleaning of panel necessary)
- Cost of installation : Rs. 2.2 – 2.5 lakhs / Kwp  
(SPV, battery & control panel)
- Life : 20 - 25 yrs (battery – 5 yrs)
- High CAPEX – Low OPEX

# Wind Turbine Generator

- Wind speed - National Average: 5-6 m/s.
- Aero Generator : 3-5 Kw. (Smaller capacity)
- Height : 20 mt.
- 1Kw WT Generates: 3 units / day.
- Cost of 1 Kw WTG : Rs. 1 lakh
- Life : 20-25 years

(Available in Maharashtra, Tamil Nadu, Gujarat, Karnataka and parts of Orissa, Andhra Pradesh & Madhya Pradesh.)

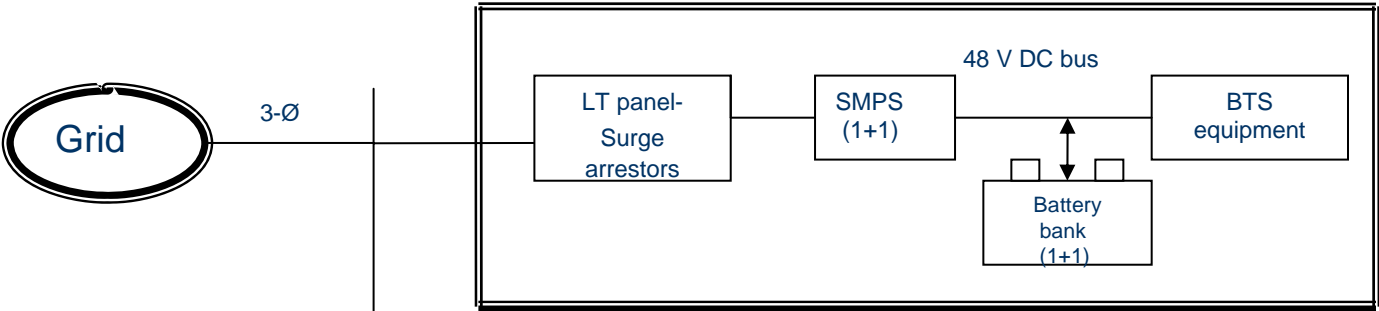
# Pilot Project

- System Designed for
  - A Solar PV panel : 10 Kwp
  - Wind Turbine Generator : 5 Kwp
  - Battery (48 V, 2500 AH) – Tubular VRLA Gel battery
  - Charge Control Unit(CCU)
- Centralized power plant, battery bank, SPV
- 2 - 7 hrs DG operation

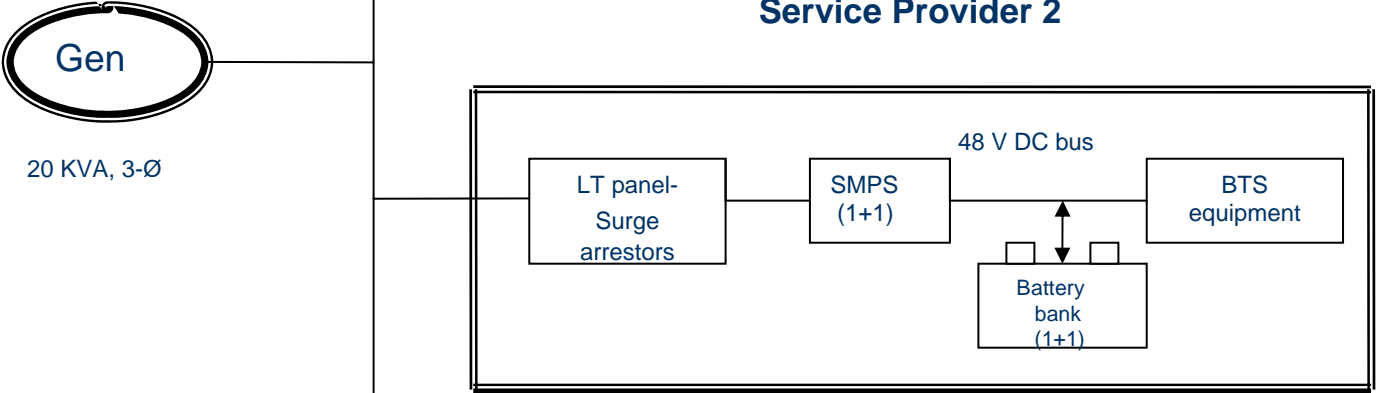
# SPV Calculations

Eqpt. Load	SPV (Stand alone)	<b>SPV + DG (2- 7 Hrs)</b>	Area reqd. (12m <sup>2</sup> /KWp)	Cost (Rs.250/ Wp) Rs. Lakhs
2 KW	15 KWp	<b>7.5 KWp</b>	90 m <sup>2</sup>	19
3 KW	22 KWp	<b>11 KWp</b>	130 m <sup>2</sup>	28
4 KW	30 KWp	<b>15 KWp</b>	180 m <sup>2</sup>	38
6 KW	44 KWp	<b>22 KWp</b>	250 m <sup>2</sup>	55

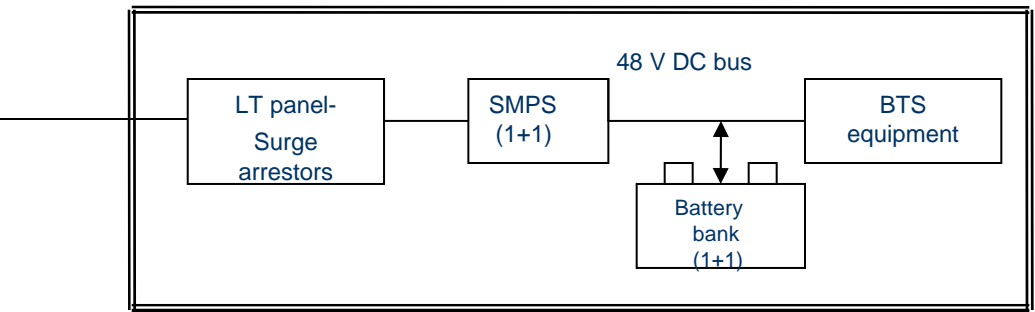
### Service Provider 1

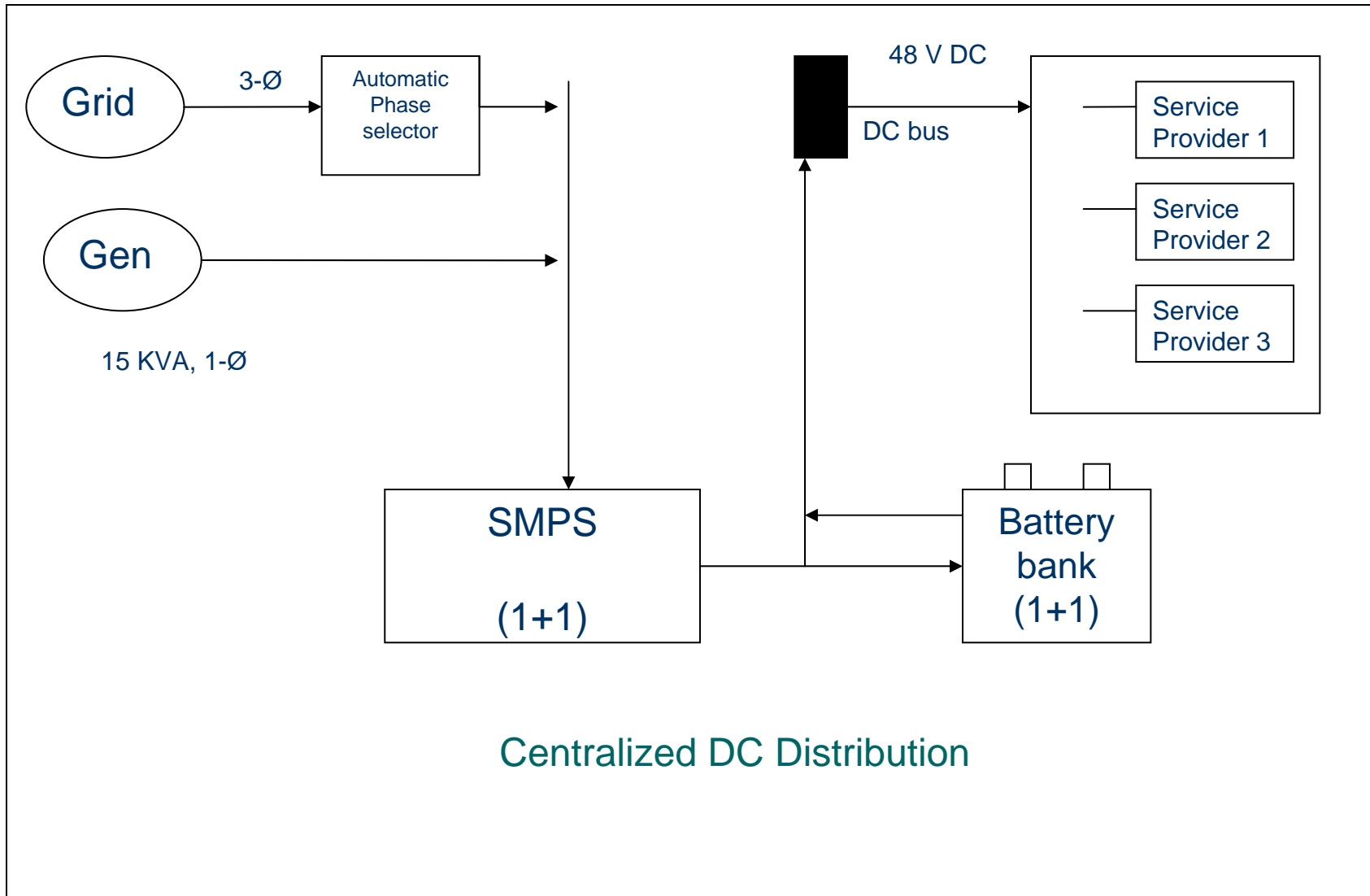


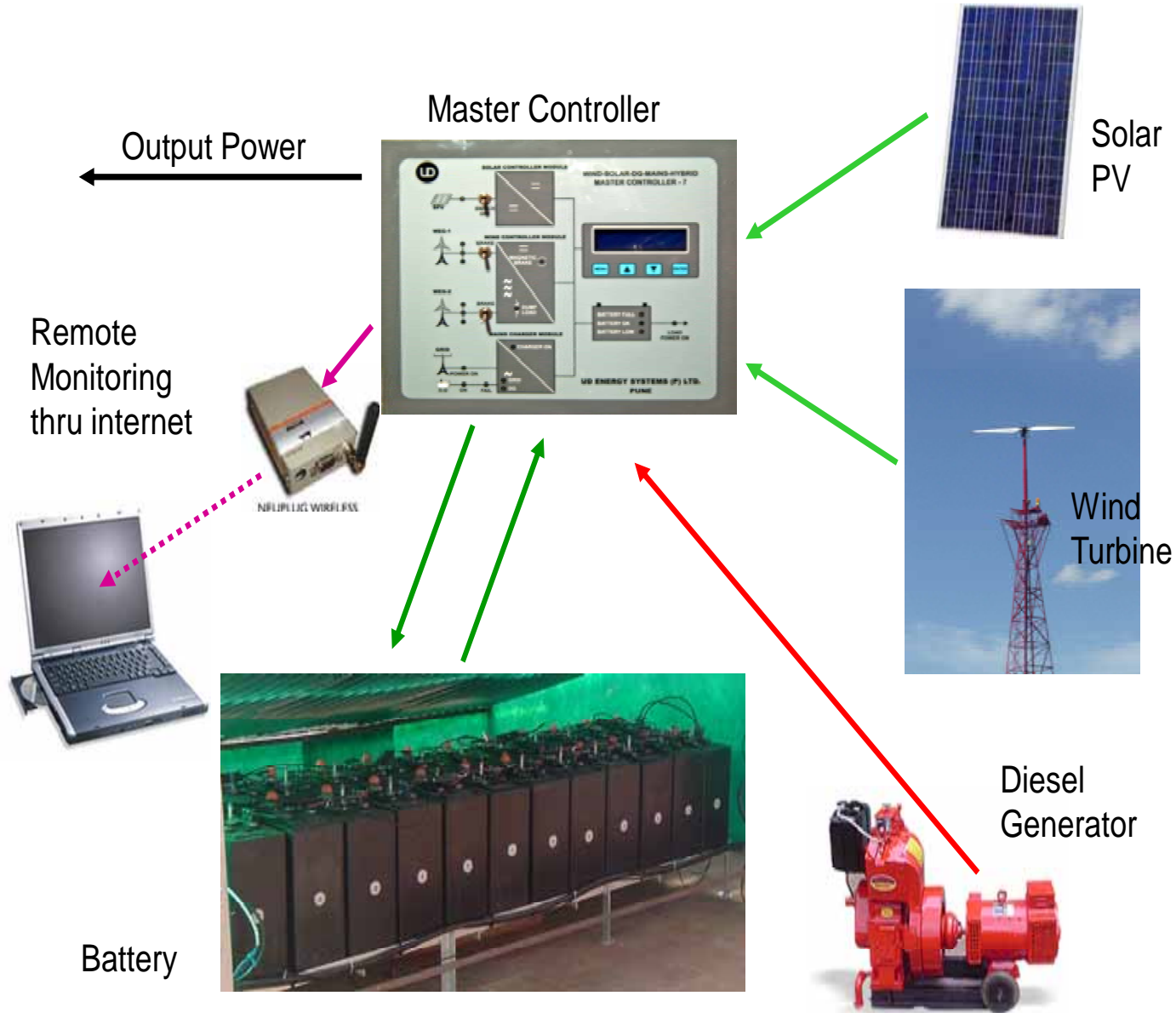
### Service Provider 2



### Service Provider 3







## Option-I: 10 KWp SPV

### COST COMPARISON OF RUNNING THE EQUIPMENT ON DG SET & SPV

Existing		Proposed					
24 Hrs. DG Operation 4 Lt/hr - Rs. 35 /lt  Costing for 7 years, 10% inflation / year		Load - 3 KW SPV- 10 KW Daily DG operation : 3 Hrs Capital Cost - 25 Lakhs Loan @ 13.75% for 7 yrs					
Year	Diesel Cost (Rs.-Lakhs)	Diesel Cost (Rs.-Lakhs)	Installment (Rs.-Lakhs)	Interest (Rs.-Lakhs)	Total outflow (Rs.-Lakhs)	Benefit	Cumulative Benefit
1	12.26	1.53	3.57	3.44	8.54	3.72	3.72
2	13.49	1.69	3.57	2.95	8.20	5.29	9.01
3	14.84	1.85	3.57	2.46	7.88	6.96	15.97
4	16.32	2.04	3.57	1.96	7.58	8.75	24.71
5	17.96	2.24	3.57	1.47	7.29	10.67	35.38
6	19.75	2.47	3.57	0.98	7.02	12.73	48.11
7	21.73	2.72	3.57	0.49	6.78	14.95	63.05

Pay Back Period : 4 Yrs (approx.)



# PROJECT – 1

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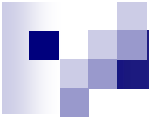
Location : Shreepati Nagar  
(Sundar ban)

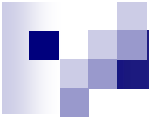
State : West Bengal



## Solar Photovoltaic Project

- a. OFF Grid site.  
Service Providers: Reliance / BSNL / Vodafone.  
Average Energy Required: 1530 Units / Month  
: 51 Units/day.
- b. 20 KVA D.G. set running: 16 hours / day.
- c. Solar array capacity: 10 KWP  
Total Unit Generated during a month: 1220.60 Units.  
Average unit generated daily: 40.69 units/day.





# BATTERY & CONTROL PANEL.....

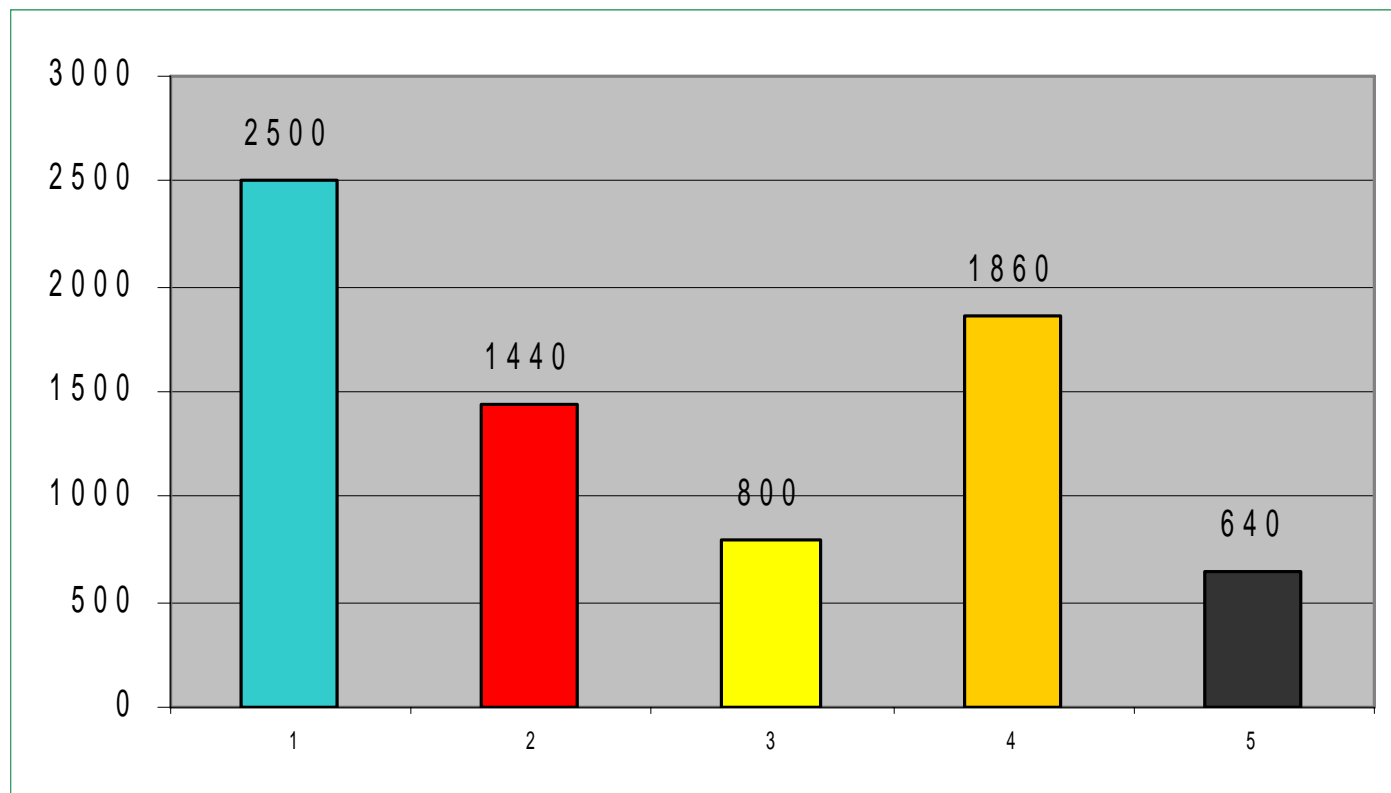


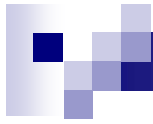




### 3 K W Load - 10 K W p S P V, 2500 A H B a t t e r y

Battery Status(AH)	Daily Consumption(AH)	SPV(AH)	Balance(AH)	Deficiency to be catered by DG(AH)	DG(Amps)	DG Hrs
2500	1440	800	1860	640	283.33	2.26





S.No.	Items	Before	After With SPV	Savings
1	20 KVA DG Set running	16 Hours/day	2.5 Hours/day	13.5 Hours/day
2.	Fuel Consumption (2.75 litres/hour)	1320 litres/month	206.3 litres/month	1113.7 litres/month (Rs. 44,548/- per month)  <b>Rs 5,34,576/- per annum</b>
3.	Carbon Emission	3405 Kg/ month	541 Kg/month	2864 Kg/month <b>34368 Kg/annum</b>

## PROJECT - 2

Location : Shivarampura

Distt. : Tumkur

State : Karnataka.



a. Grid site.

Service Providers : Airtel/BSNL/Vodafone.  
Average Energy Required: 2200 Units / Month.  
:72 (36 + 36) Units/day

b. Grid Supply : 6 hours / day  
20 KVA D.G. set running : 10 hours / day.

c. Solar array capacity : 10 KWP  
WTG Capacity : 5.1 KW  
Unit Generated :1470(1110+360) /M.  
Average unit generated : 49 (37+12) Units/day



**BHARAT SANCHAR NIGAM LIMITED**



**Village: SHIVARAMPURA**

**District: TUMKUR**

**Date: of Installation: 27/5/2009**

**IP: BHARAT SANCHAR NIGAM LIMITED**

**USPs: 1. HUTCHISON ESSA SOUTH LTD**

**2. BHARATI AIRTEL LTD**

**3. BHARAT SANCHAR NIGAM LTD**

**THIS SITE IS SUPPORTED BY USO FUND**





S.No.	Items	Before	After With Solar-Wind Hybrid System	Savings
1.	20 KVA DG Set running	10 Hours /day	0 hours	10 Hours /day
2.	Fuel Consumption (2.75 litres/hour)	825 litres/ month	0 Litres	825 Litres / month. Rs. 33,000/- per month. <b>Rs. 3,96,000/- per annum.</b>
3.	Carbon Emission	2211 Kg/month	0	<b>26532 Kg/annum</b>
4.	Grid Supply	36 Units / day	23 Units / day	<b>13 Units /day</b> Rs. 28,080/- per annum.



# Incentives / Subsidies

- Due to High CAPEX of SPV installation operators look at Incentives/subsidies from Government.
- 30% subsidy available on Solar off grid Solutions from MNRE .
- 80% accelerated depreciation in Income Tax.
- We have to look at CAPEX Vs OPEX savings.

# Conclusion

- ❖ Converting solar energy into electricity could be the answer to the mounting power problems in rural areas for powering telecom towers.
- ❖ Its suitability for decentralized applications and its environment-friendly nature make it an attractive option to supplement the energy supply from other sources.
- ❖ If we install Solar Photovoltaic Cells / Wind turbine generator, much of the rural power needs could be met, adequately cutting down harmful greenhouse gases and reduction in carbon footprint.
- ❖ Carbon emission targets and energy efficiency standards need to be followed and disclosed.

THANK YOU

