



DEBUNKING MYTHS : SOLAR ROOFTOPS FOR RESIDENTIAL SECTOR

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THE BIG PICTURE

- **Most developed nations started their solar programme through rooftops. India and China were different as they started their programme through large scale installations. Overall, Rooftop Solar is more than 40 per cent of global solar power.**
- **Under National Solar Mission, the Indian Government is targeting to reach 100,000 MW (100 GW) of solar capacity by 2022. Of this, 60,000 MW is to be through ground mounted projects, while 40,000 MW is from rooftop projects. (Actual achievement 28 GW, of which rooftops is 3.4 GW).**
- **Rooftop potential in residential is much higher than industrial or commercial.**
- **Haryana has a target of adding 4,142 MW of solar by 2022, of which 1,600 MW is solar rooftops. (Less than 150 MW solar rooftops have been added so far).**
- **Gurugram rooftop potential is huge. The target could be atleast 100 MW by 2022. The rooftop installation about a year ago was about 25 MW. (5 MW with subsidy).**

WHY GURUGRAM SHOULD GO SOLAR?

- **320 days of high intensity solar radiation and presence of large buildings make Gurugram ideal for solar.**
- **Tackle Air pollution: Gurugram declared as the most polluted city in the world by IQAir Visual and Greenpeace recently.**
- **Opportunity to replace polluting and expensive diesel gensets – over 2,000 MW of DG set installations**
- **Solar can reduce the energy demand from the grid and reduce need for transmission infrastructure**
- **Cheaper than conventional power; reduce Electricity Bills; solar costs are falling while grid costs are rising**
- **Progressive Policy Framework; The Solar Policy 2016 (replacing 2014 policy) and the Net Metering Policy (2014, 15) is quite conducive.**
- **Gurugram is headquarters to ISA; should therefore be a solar city**

SOLAR BASICS

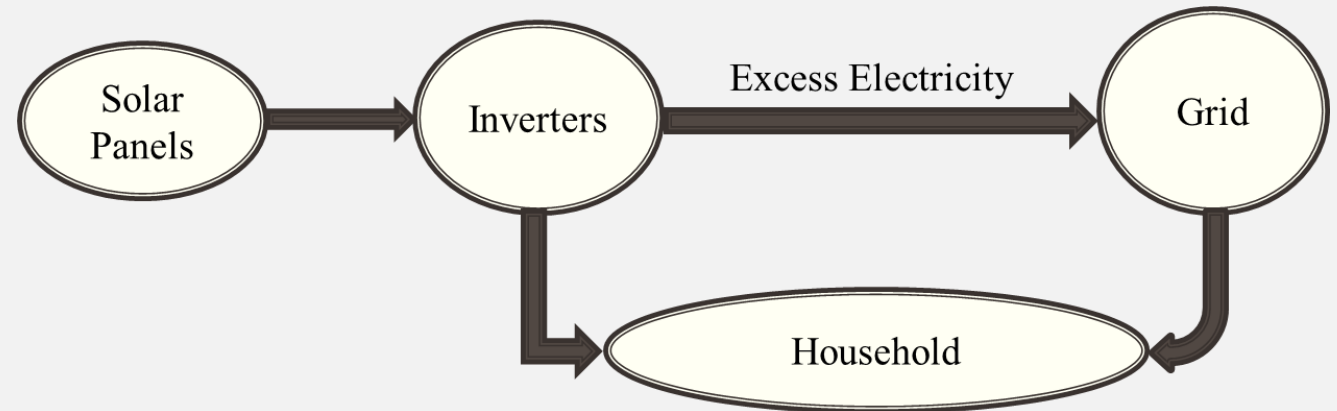
- **Solar Photovoltaic (PV) technology converts sunlight into usable Electrical energy. Electricity generated through solar PV can be fed into the grid.**
- **Size of the installation varies depending on space availability and amount of electricity consumption**
- **For a typical 1 Kwp Solar PV power plant, 80-100 square foot (or 10 square meter) of shadow-free area is required.**
- **A 1 Kwp Rooftop Solar PV Power Plant can produce about 4-5 units per day. The average Monthly Electricity Consumption of households is about 800 Units i.e. 27 Units per day.**

SOLAR ROOFTOP SYSTEMS

- GRID CONNECTED SYSTEM
- HYBRID SYSTEM
- OFF-GRID SYSTEM

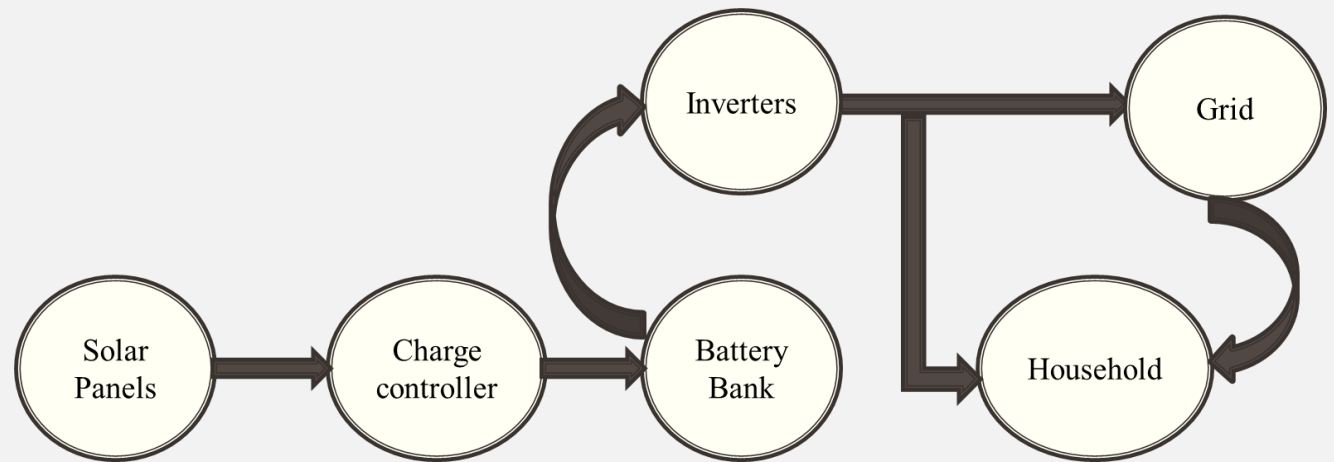
GRID CONNECTED SYSTEM

- Electricity generated is fed into the grid.
- Net or gross meters are used to measure the electricity.
- These systems shut down when there is a blackout or a grid failure.



HYBRID SYSTEM

- System is like the grid connected system except battery backup.
- Battery backup for avoiding discontinuity of power supply during grid failures.
- Most suitable for areas having frequent power cuts.



OFF-GRID SYSTEM

- System stores the electricity produced in batteries and uses the stored electricity when required.
- Most suitable for areas having frequent grid failures.



METERING

1

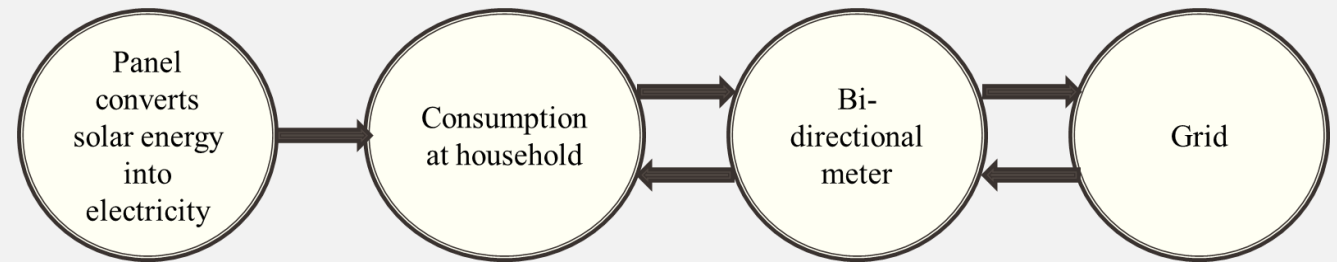
NET
METERING

2

GROSS
METERING

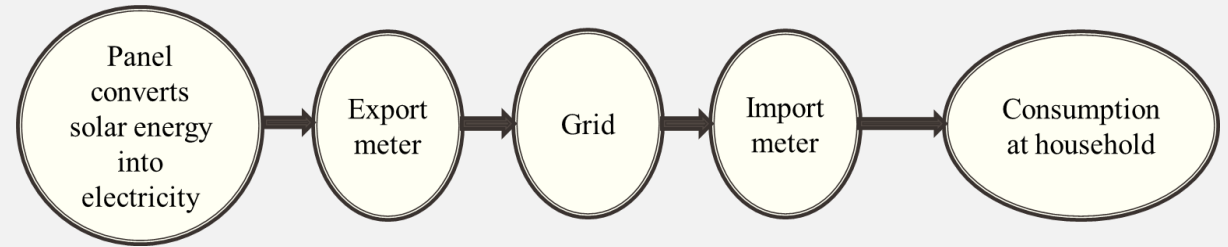
NET METERING

- Electricity generated is first consumed at the household.
- Excess electricity is fed into the grid for fixed pre-decided tariff.
- Meters work in both the direction, measures both import and export of electricity.



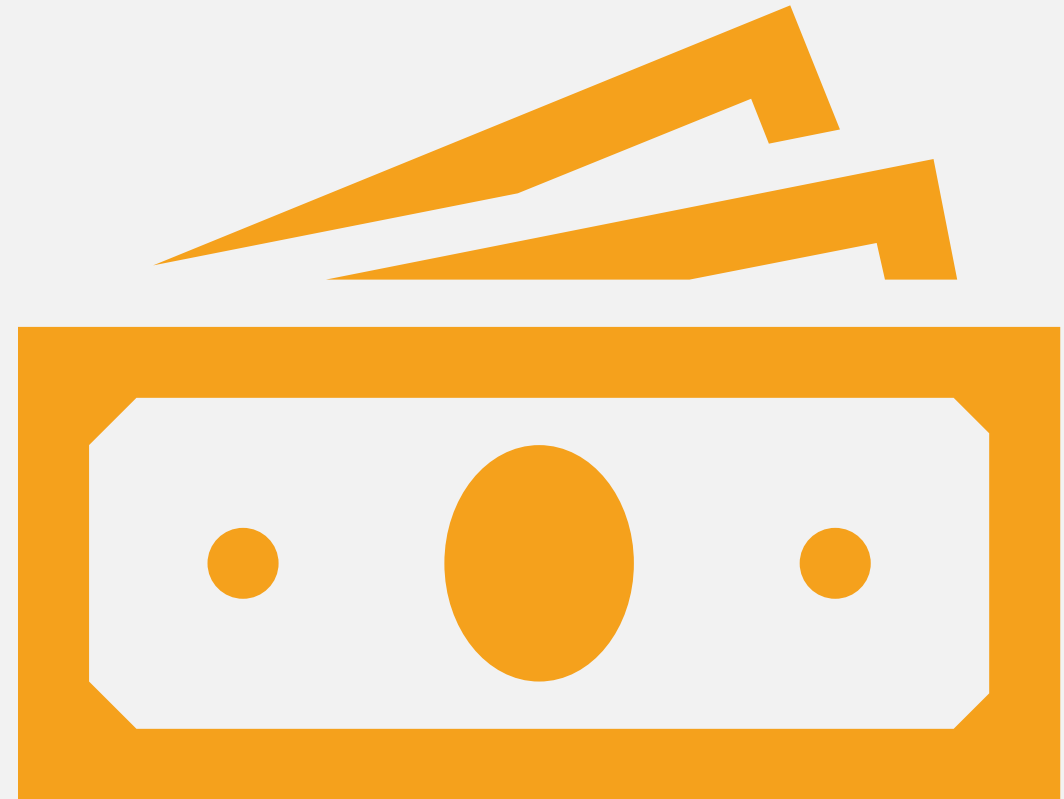
GROSS METERING

- Electricity generated is directly fed into the grid and is measured by an export meter (Feed-in meter) at a predetermined feed-in tariff.
- Electricity consumed by the household measured by an import meter.
- DISCOMS have flexibility to charge export and import of electricity at different rates.



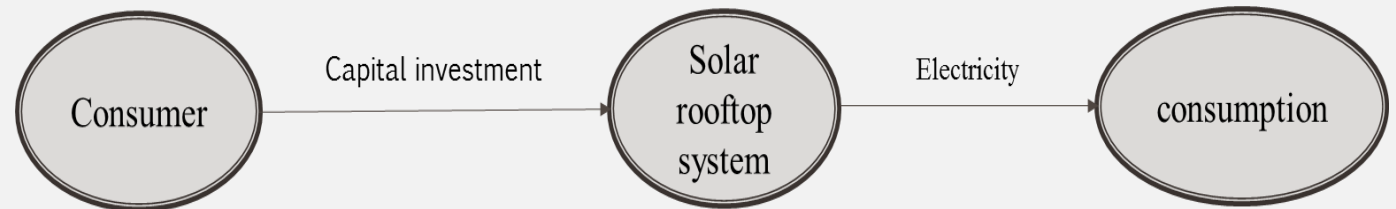
FINANCING OPTIONS

- **Capital Expenditure (CAPEX) Model**
- **Renewable Energy Service Company (RESCO) Model**



CAPEX MODEL

- Under this model the consumer must pay the entire amount at the time of installation.
- Rooftop owners are also eligible for capital subsidy from MNRE under this model.
- Commercial and industrial installations are not eligible for subsidy, instead, a tax benefit in the form of accelerated depreciation (AD) is provided by the government

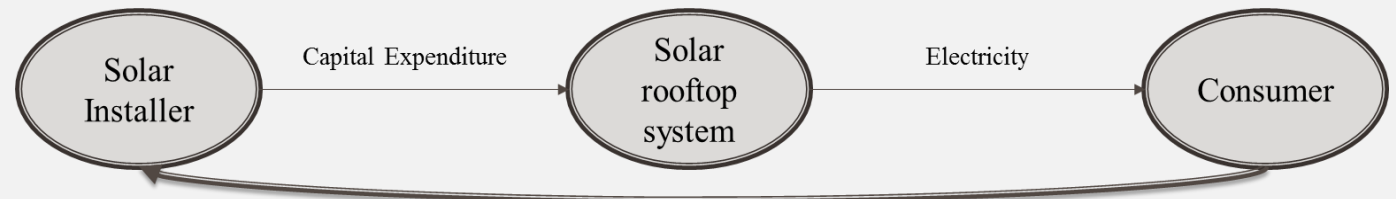


Consumer makes his own investment in full or by partially availing loans from banks.

More than 80 per cent rooftops have been funded under Capex model.

RENEWABLE ENERGY SERVICE COMPANY (RESCO) MODEL

- Under this model, Renewable energy service company finances and installs the solar plant on rooftop and sells the generated electricity to the consumer at a pre-decided tariff.
- The operation and maintenance costs are also the responsibility of the installer.
- Subsidy cannot be availed in this model



- **In RESCO model, a third party implements the facility at the roof and sells electricity from the rooftop to the consumer at a pre-determined rate. Under the RESCO model, subsidy cannot be availed.**
- **16 per cent rooftops have been funded under RESCO model; mostly exploited by commercial buildings. Households credit profile and profitability is a question mark.**

SOLAR INSTALLATION PROCESS

Rooftop owners select the channel partner



Channel partner submits a proposal to the rooftop owner



An online application is submitted to HAREDA by the rooftop owner



HAREDA reviews the application and documents submitted for subsidy; approach DHBVNL



Rooftop owner receives approval of subsidy from HAREDA



Start installation; submit the project completion report for subsidy to be released after installation, ask DHBVNL for net metering

COMPONENTS REQUIRED

- **Solar Panels:** They collect solar radiations and convert it into energy. They collect either heat energy or light energy.
- **Inverters:** Inverter is one of the most crucial components of a Solar PV system. It ensures that the power provided by the panels is in a usable form, it converts the DC power from solar panels into AC power which can be used to power appliances.
- **Mounting Structure:** It is the most crucial component of a solar PV system. It should be designed to withstand the maximum wind speeds possible in that region. A sturdy structure is needed to keep the panels in place for years.
- **Batteries:** In case of an off-grid system, batteries are a very important part as they store the electricity generated by the solar panels and use it when required. The life of these batteries is generally between 4-5 years.
- **Other Components:** Components other than panels, inverters, mounting structure and batteries are called Balance of Systems (BOS). These include cables, cable trays, earthing kits, Lightning arrestors, Meters, etc.

MNRE BENCHMARK COST

Benchmark costs and payback periods have been falling over the years....payback period now as low at 4-5 years with subsidy and 6-7 years without subsidy...

For systems up to 10 Kwp benchmark cost is Rs 60,000 per Kw

For systems >10-100 Kwp benchmark cost is Rs 55,000 per Kw

For systems >100-500 Kwp benchmark cost is Rs 53,000 per Kw

HARYANA GOVT. SOLAR POLICY



- The new solar policy of Haryana announced in 2016 has set a target to add **4,000 MW** in the next five years of which **1,600 MW** alone will be added through **solar rooftops**.
- A consumer in Haryana can install a system of the capacity matching his **sanctioned load**.
- The **Net Metering Policy** of Haryana allows the solar generating consumers to export solar electricity at the “**same price**” at which he/she is buying conventional power from the grid. (Since, consumer’s consumption from the grid reduces due to switching to solar, the consumer shifts to a lower slab in the tariff rate card, and lower slabs ensure lower per unit electricity rates).
- As per an order in November 2018, solar users in Haryana can claim a rebate – Rs. 1 per unit for every unit of electricity generated from solar energy. Another Rs. 1 per unit is available for those with battery back-up. This is on the gross amount of solar installed at the end of the financial year.
- Subsidy of **30 per cent** of the benchmark cost or Rs 20,000 per kwh whichever is lesser. Subsidy can only be availed under the **CAPEX** financing model. Only solar PV modules **manufactured in India** are eligible for subsidy.

BUILDING BYE-LAWS FOR SRT

Haryana is the second state after Tamil Nadu to have mandated the use of solar by buildings of and beyond 500 square yards. All new residential buildings on a plot size of **500 sq. yards or more** have to install a solar rooftop system with a capacity of at least **1 Kwp or 5% of the sanctioned load, whichever is higher.**

For new housing complexes solar rooftop size is dependent on area of the plot

- 0.5 - 1 acre – minimum 10 kWp
- 1 – 2 acre – minimum 20 kWp
- 2 – 5 acre – minimum 30 kWp
- >5 acre – minimum 40 kWp

HARYANA BUILDING CODE 2017

Benefit of additional floor area ratio (FAR)¹ if solar PV power plant is installed

% of total connected load of the building generated by Solar PV plant	15-25	26-50	51-75	76-100
Additional Floor area ratio (FAR)	3	6	9	12

¹ Floor area ratio (FAR) is the ratio of a building's total floor area (gross floor area) to the size of the piece of land upon which it is built.

MYTHS AND ISSUES

- Solar is hard to understand; fast-changing technology
- It is too expensive
- Why now, it will get cheaper in the future
- Is technology reliable? Techno-commercial risk: How to decide, which vendor.? How to optimise Cost vs Quality.
- Installation process is cumbersome
- Grid supply has improved; reduced power cuts
- Hard to maintain the panels; dust conditions in Gurugram;
Not effective cold, rainy, cloudy, dusty conditions
- Technology will change and leave my panels obsolete
- Why spoil rooftops?

MYTHS AND ISSUES

- Comparing quotes from various solar companies selling multiple qualities of products leave consumers perplexed. Benchmark pricing on government sites gives some indication, but can lead to compromises in technology
- Technical glitches :When **Grid power** stops in case of an outage, solar generation at their premises stops too. The solution to this problem is to have a hybrid system that has a solar, battery and grid combination. However, it comes at double the cost. Yet, another option is to go “off-grid” but that defeats the purpose of net-metering gains
- **Net Metering** A) It has taken DHBVNL 2 years just to select the net meter vendors. B) The entire system of application and approvals for net metering was initially quite cumbersome and took a lot of time. C) DHBVNL staff were not trained to handle net meters D) The billing systems were not synchronised sat DHBVNL end, need for new software. **Is it efficient, What will be the future tariff rates and net metering policy.**
- **Finances** : Limited access to low cost financing from banks. Some banks have included solar rooftops under house improvement loans

SUGGESTIONS



- **Awareness. Awareness and more Awareness!** Demystifying solar and promoting it as a commodity or a product rather than a project will remove the acquisition barriers to a large extent. Citizen visits to National Institute of Solar Energy on Gurugram-Faridabad road to get acquainted with solar technology. More workshops by facilitators of solar.
- **Single window clearances** and seamless coordination among all involved agencies such as HAREDA (for subsidy) and DHBVN (for net metering).
- **Capacity building in HAREDA :** too many roles - technical support, awareness, monitoring etc etc
- Since **“net metering”** is the real clincher, availability of net meters, their speedy installation, and integrating with billing systems need to be resolved at the earliest.
- **DHBVNL should play a more proactive role**, much beyond providing “net metering” functionality. Tripartite agreements between Discoms, Rescos and consumers can ease payment risk.

SUGGESTIONS...CONT'D

- HUDA should have more **regulatory oversight** to ensure all new buildings above 500 square yards install solar.
- If all government buildings run on solar, it has a **huge demonstration effect** on citizens.
- **Innovative policies** such as rent-a-roof policy or those that support community solar projects need to be put in place.
- **Neutral “hand-holding”** required that is missing from the government; all vendors have become channel partners.
- A **complaint cell** at DC/ADC office could be set up. It could also take up coordination issues.
- Solar awareness can be promoted under **CSR** by Gurugram corporates.
- **Municipal bonds** could be explored for low-cost funds and better securitisation of solar projects.

LET'S TARGET 100 MW BY 2022...



- Many schools, commercial buildings, institutions, RWAs have been solarised in Gurugram.
- Some RWAs that have taken to solar are :
 1. **Hewo Apartment -I, Sector 56, Gurgaon**
 2. **Maple Heights**
 3. **Devendra Vihar RWA**
 4. **Wellington RWA**
 5. **DLF Icon**
 6. **Bestech Park View Residency...**

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Thank You