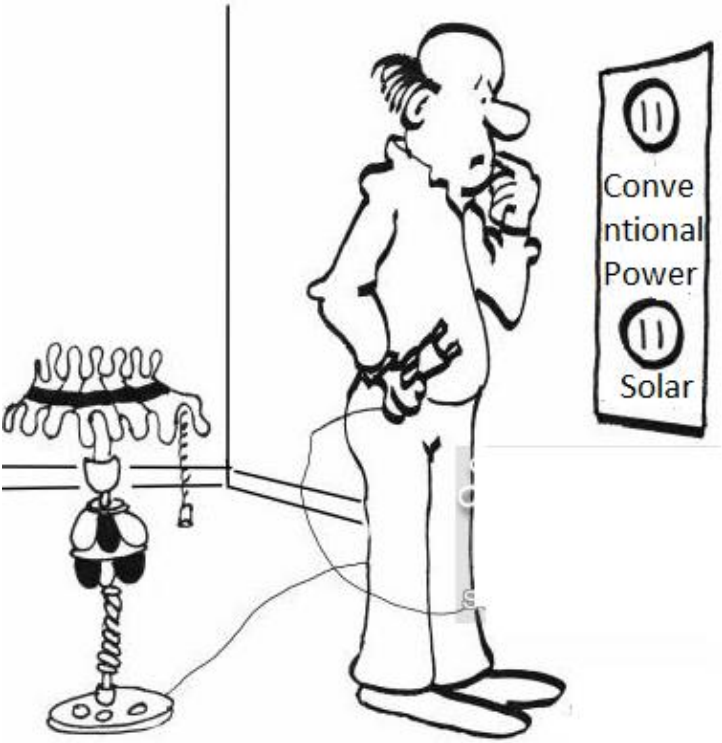
Solar Regulations Grid Connected, Ground Mounted and Solar Roof Top

सौर ऊर्जा – ग्रिड कनेक्टेड ग्राउंड माउंटेड और सोलर रूफटॉप एवं मीटरिंग विनियम



Joint Electricity Regulatory Commission (for Goa & Union Territories)

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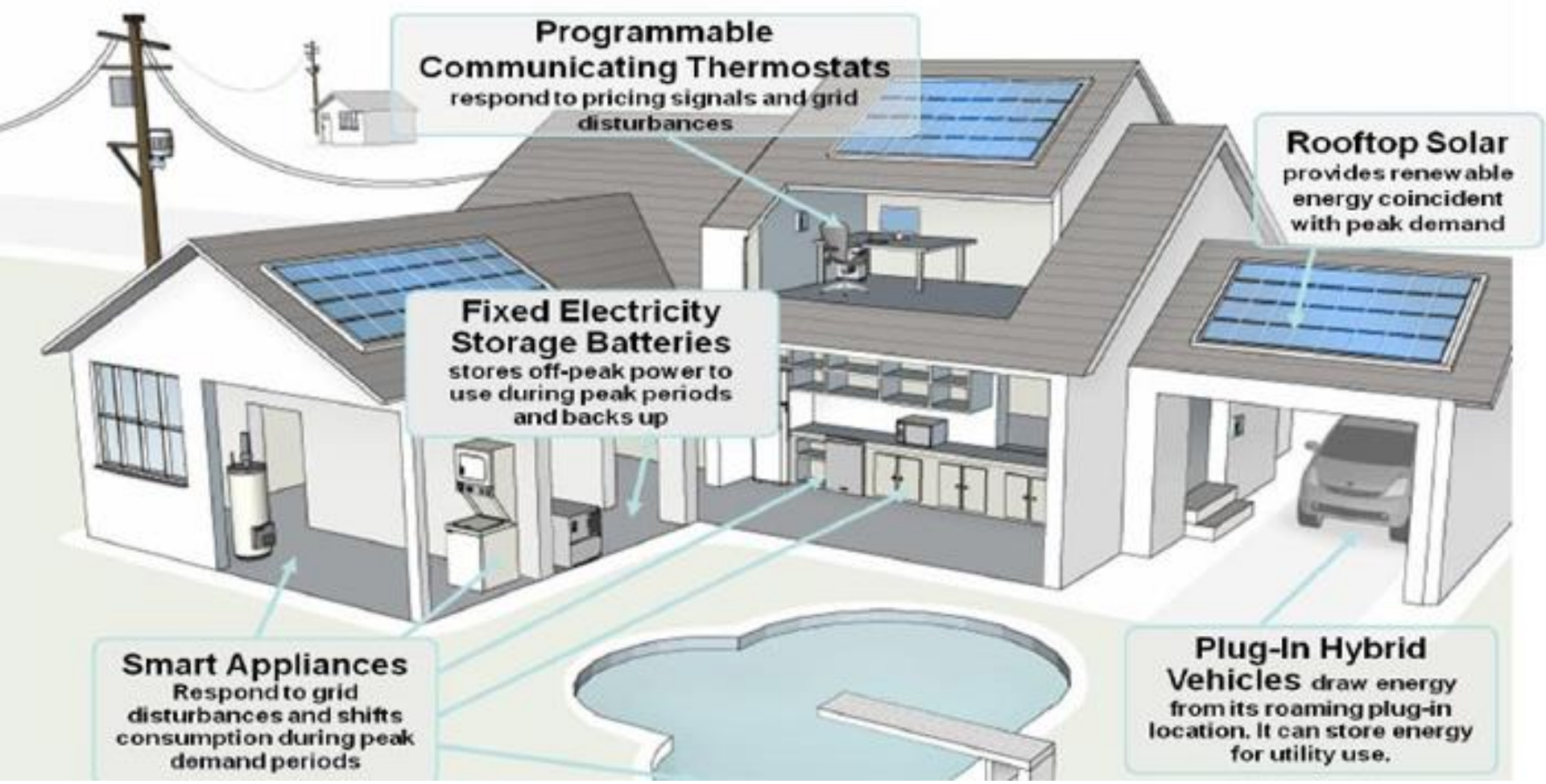
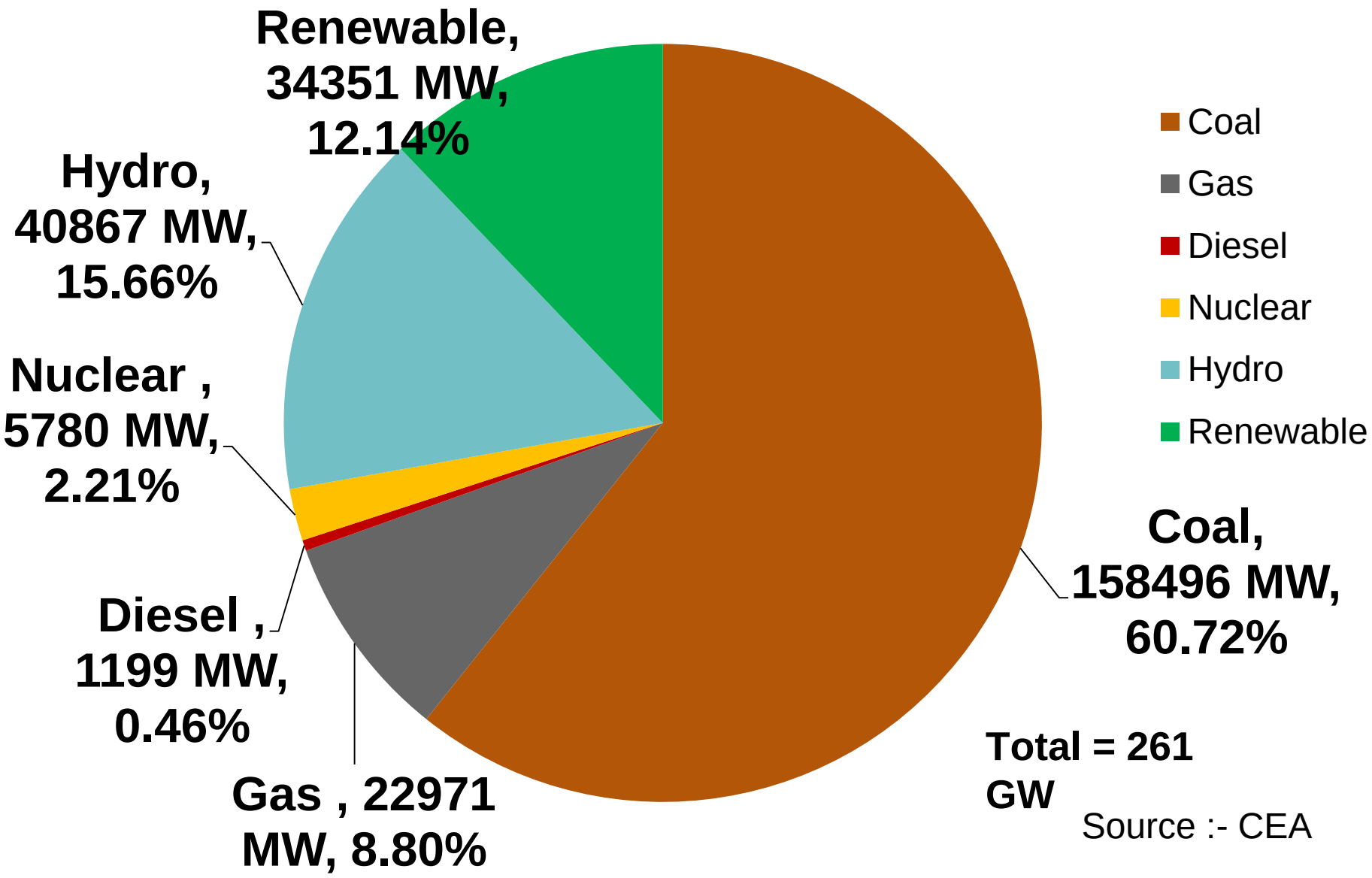
Power Market – Emerging Trends



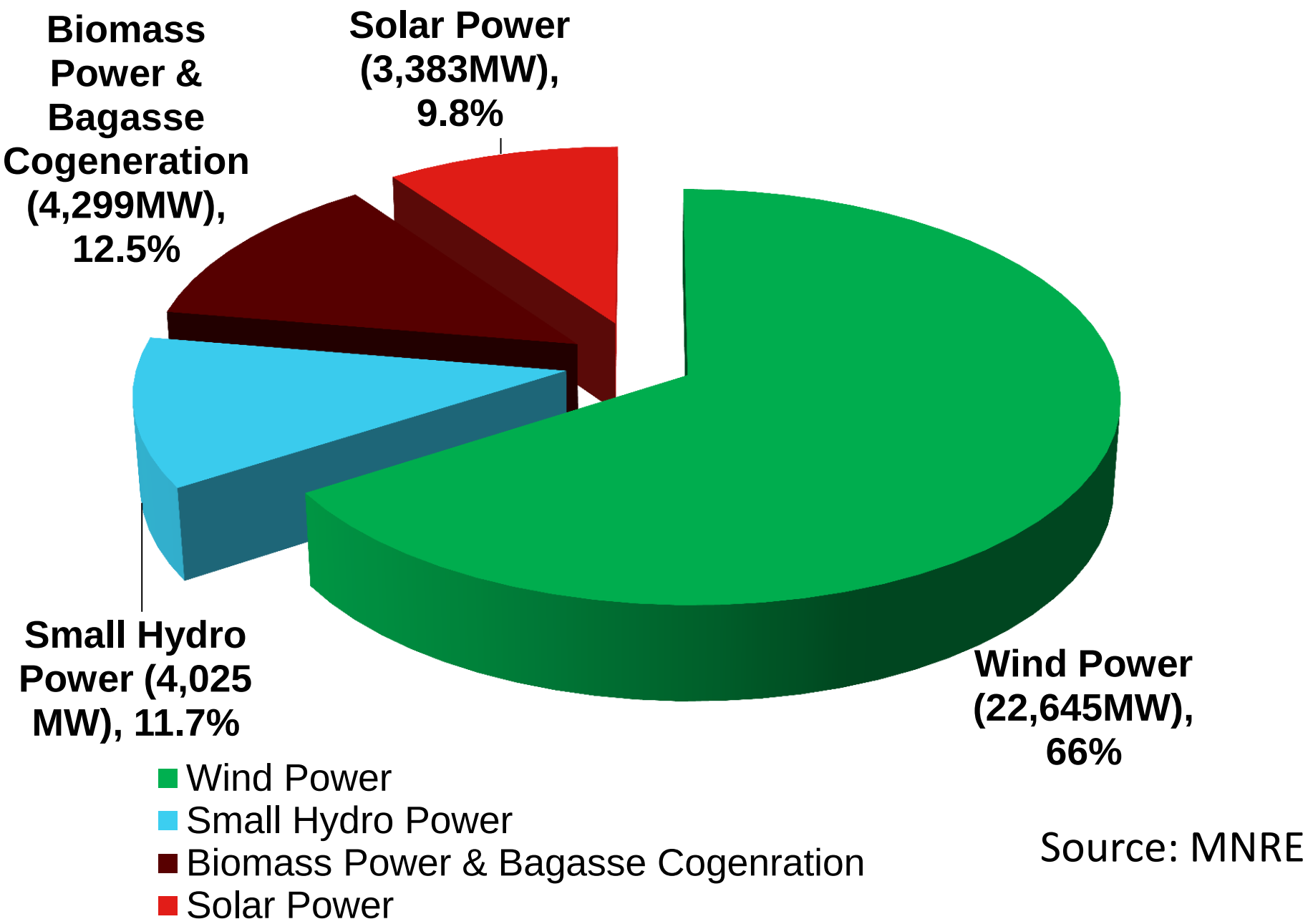
Installed Capacity in India as on 28-Feb-2015



Total = 261 GW

Source :- CEA

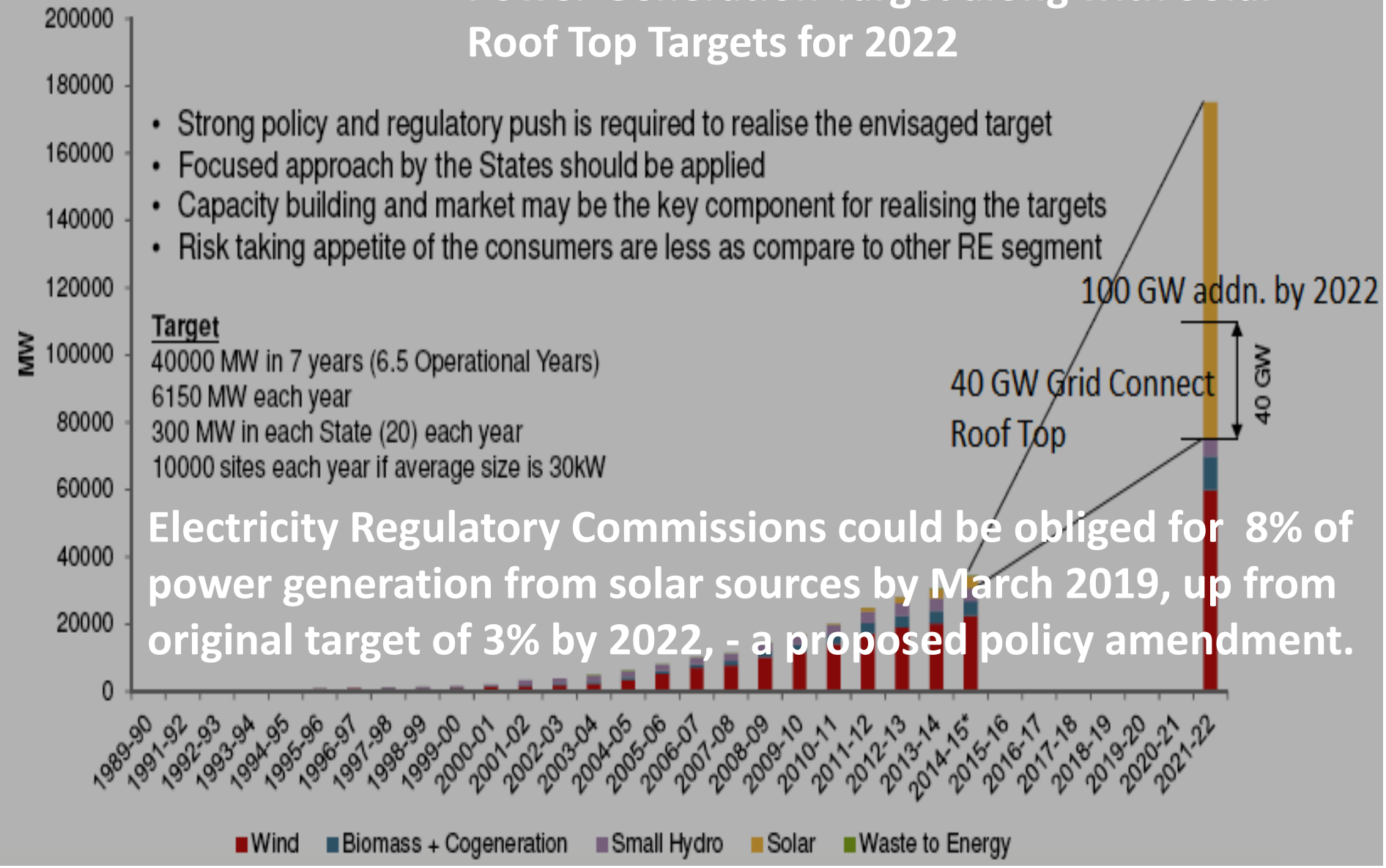
Renewable Generation Installed Capacity as on 28’ Feb-2015



Source: MNRE

Journey till 2022....

GoI has embarked upon a Massive Solar Power Generation Target along with Solar Roof Top Targets for 2022



Electricity Regulatory Commissions could be obliged for 8% of power generation from solar sources by March 2019, up from original target of 3% by 2022, - a proposed policy amendment.

Green Energy Technologies, the journey till 2022- giz presentation

Electricity Regulator Challenge is to balance

The Electricity Act

The Renewable Energy Act when amalgamated

The Electricity Policy

The Tariff Policy

Renewable Energy Policy

National Action Plan on Climate Change

State Policy on Renewable Energy

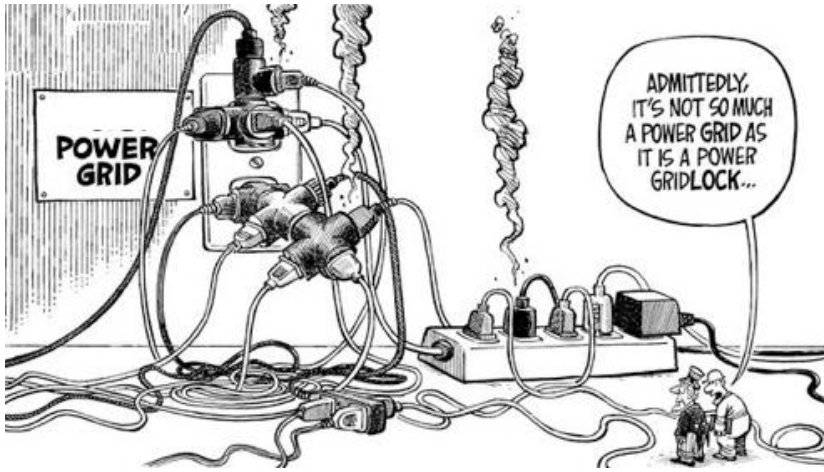
Electricity Grid Health

Metering

Economical Power to the Consumers

Due return on the investment by Discoms

Investments in Renewable Energy Sector



No Power Generation in the Territories of JERC

Except : A small gas turbine in Puducherry

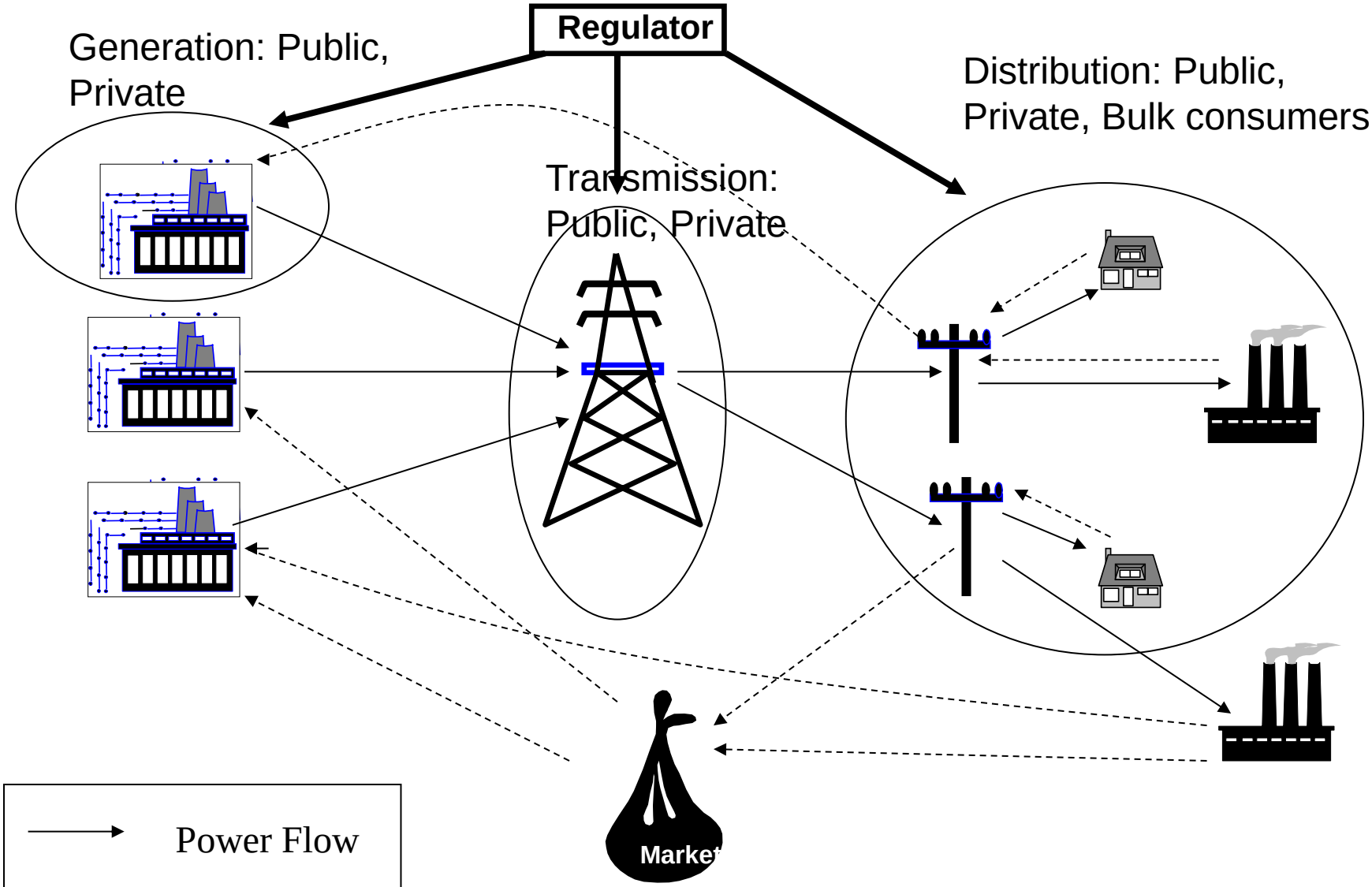
A small Hydro in A&N

Smaller Solar Plants in Lakshadweep

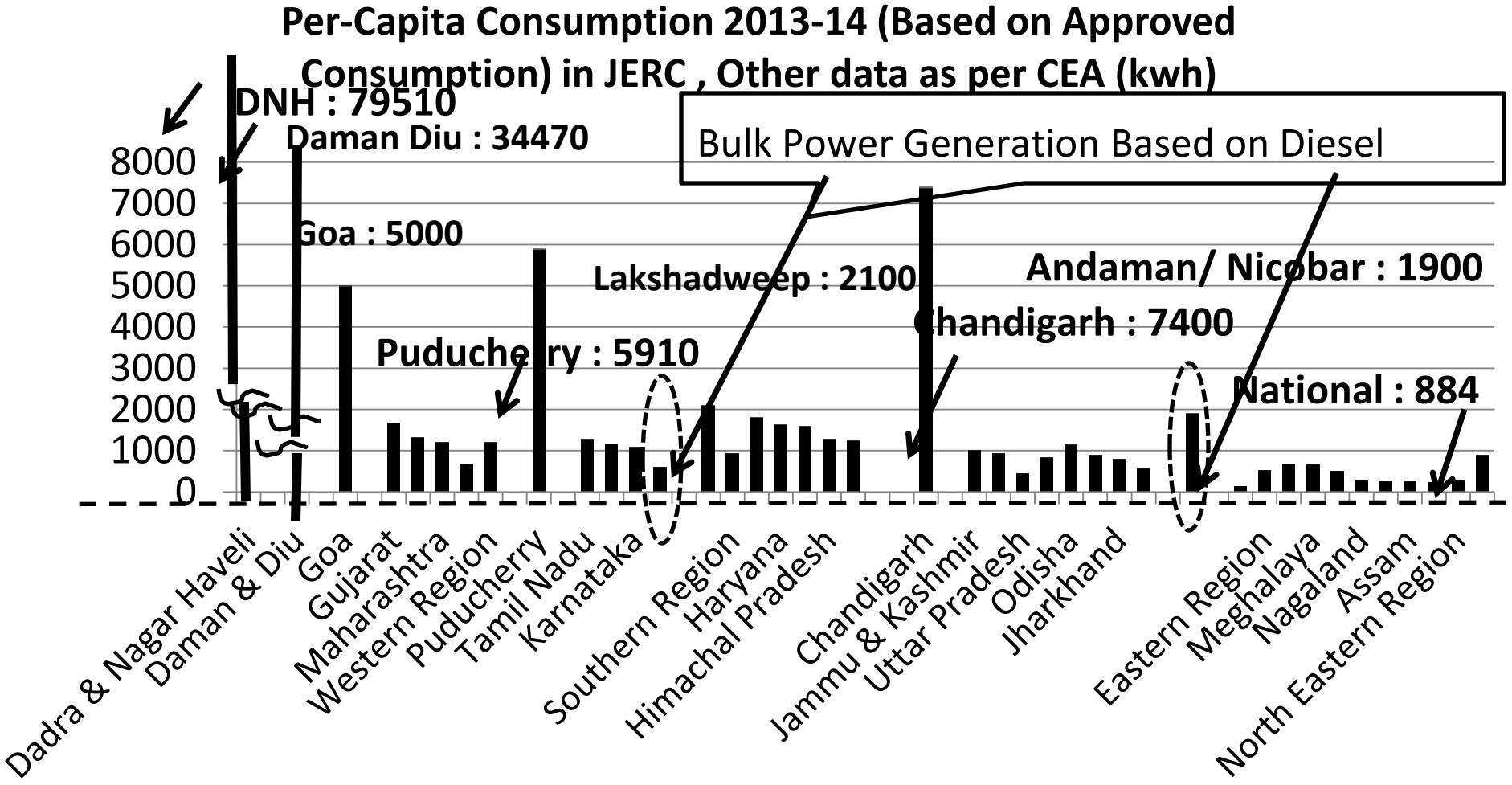
& 1x5 MW Solar Plant in A&N

A&N and Lakshadweep is depending on Diesel Power Generation.

Institutional Framework



JERC also faces a very wide Consumer base and Per Capita Electricity Consumption, Four Territories peaking highest in India .



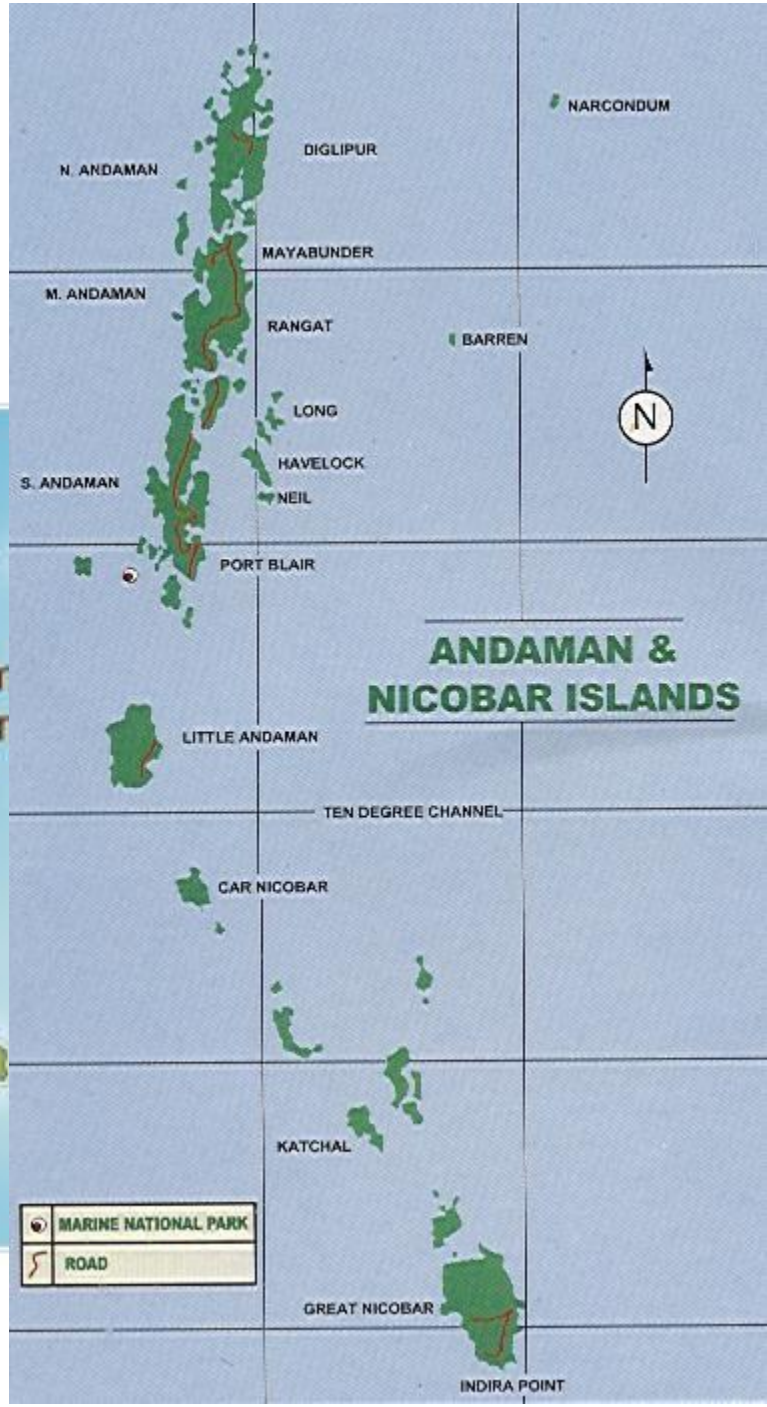
Challenges are compounded by small land base with almost nil Waste land, Poorer CUF compared to many areas.

Every State has its own Challenges for Solar Power Generation

Joint Electricity Regulatory Commission for Goa & Union Territories faces more changes for Solar Power Generation for its widely physical diversification of its constituent territories.

Sl.	Location	Latitude	Longitude
1.	Goa	15.4989° N	73.8278° E
1.	Andaman & Nicobar	11.68° N	92.77° E
1.	Chandigarh	30.75° N	76.78° E
1.	Dadra & Nagar Haveli	20.27° N	73.02° E
5.a	Daman	20° 25' N	72°.53° E
5.b	Diu	20° 42' N	71.01° E
6.a	Puducherry- Puducherry	11.93° N	79.83° E
6.b	Karaikal- Puducherry	10° 55' N	79. 52° E
6.c	Mahe- Puducherry	11.7011° N	75.5367° E
6.d	Yanam- Puducherry	16.7333° N	82.25° E
7.	Lakshadweep	10° 00' N	73.00° E

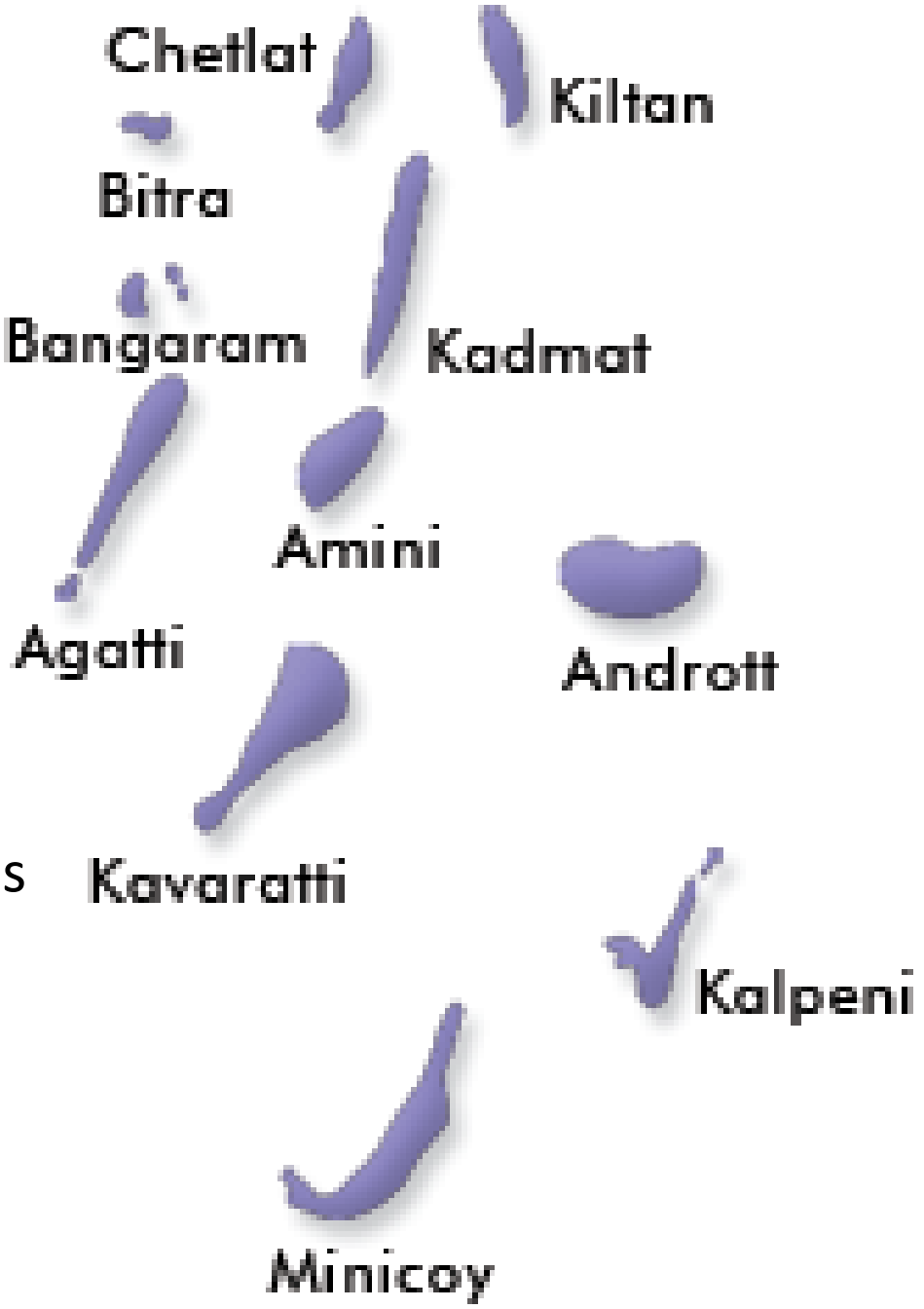
Andaman & Nicobar Islands Important from National Security Angle, need to be lighted up. Not connected to National Grid. Have own micro grids at each Island. Power Generated is mainly by Diesel.



Population : 380581 (2011 Census), 8249.00 Sq. Kms.

Area	32 sq. km
Population	64,429

Lakshadweep Islands also equally Important from National Security Angle needs to be lighted up. The Islands are not connected to National Grid. Have own micro grids at each Island. Power Generated is mainly by Diesel.

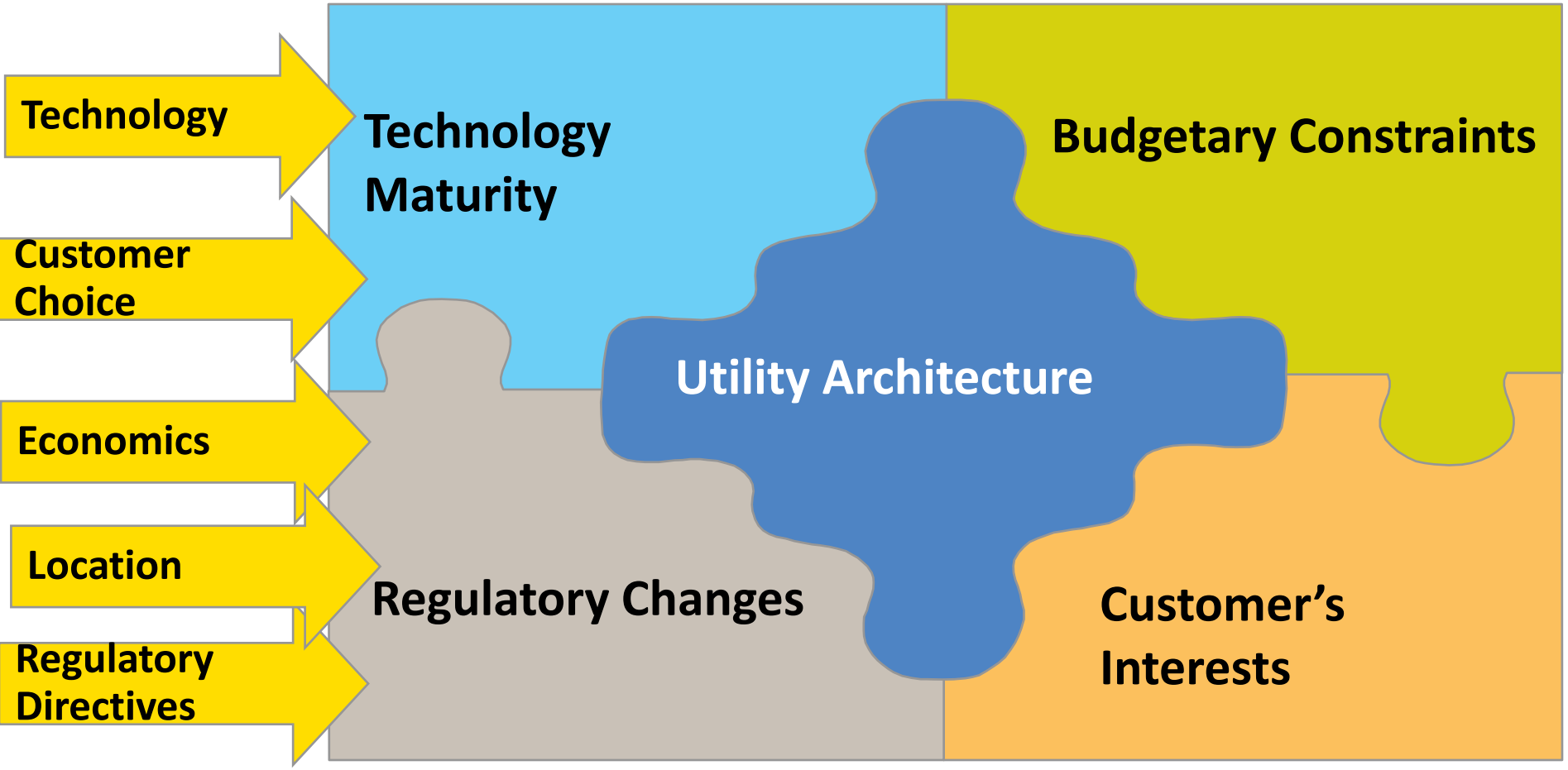


Merits of Solar Generating in own state rather than buying RECs

Sl	Location	Avg. Cost of Power Purchase	Solar REC	Total Cost of RPO	Solar Tariff
a	b	c	d	e	f
		Rupees / kWh			
1	Goa	4.13	3.50	7.63	6.95-5.46
2	Andaman & Nicobar	32.73	3.50	36.23	7.62-6.93
3	Chandigarh	4.76	3.50	8.26	6.95-5.46
4	Dadra & Nagar Haveli	3.74	3.50	7.24	6.95-5.46
5	Daman	4.99	3.50	8.49	6.95-5.46
6	Puducherry	3.39	3.50	6.89	6.95-5.46
7	Lakshadweep	21.32	Enough Solar gen.	21.32	7.62-6.93

Col. "f" is Solar Tariff for FY 2015-16 by JERC Higher Tariff for Plants up to 500 kWp. JERC welcomes Battery Stored Power for A &N and Lakshadweep with different Tariff

Challenges the Commission face:



Ref: TCS Metering Presentation

Solar Regulations to cater for…

- Defining who can be a Project Developer
- Defining Eligible Consumers (For Roof Top)
- Defining interconnection Voltage with Grid
- Project developed on Net Metering or Gross Metering.
- Meter Specifications
- Commercial arrangements
- Benefits to Solar Generator
- Smart Utility and the changing Power System Network
- **Regulations for Stored Solar Power Supply**

Solar Regulations of JERC

Sl.	Particulars	Description
1	Eligible Entities	Any person / Any Electricity consumer of the territory of JERC / Corporate body/ Company/ Government Body / Institution/ PSUs /State / Departments / Local Governments/Municipal Corporations/National Housing Board/ Individual's / factory owner / Ware house owner / / Resident Welfare Associations/ Market Associations / Group Housing Society/ Panchayat Bhavan / Canal owners / Ports / Vehicle Parking Sheds or any other similar entity or a place etc.
2	Control Period	Up to end of FY 2016-17 or till it is revised. The present control period will be from the date of notification which shall continue till the same is revised. Broad Parameters will remain unchanged till revision is affected. Tariff will be reviewed every Financial year based on market Capital Cost Changes.

Solar Regulations of JERC……. Contd.

3	**Nodal / Accredited agency**	**For advising the applicants, the Nodal agency is as notified by the Commission for each of the territory under its jurisdiction and for RECs. Ref these regulations**
4	Approval Agency	The Distribution Licensee of the area concerned
5	Motivation	By State Nodal agency / Distribution Licensee.
6	Metering	Solar Power Generation including Roof Top being promoted, under Gross Metering / or Net Metering as opted by the Solar Power Generator.
7	Solar Power Generation Plant Targets	Up to the limit to meet the RPO requirements of the territories in the territories under the jurisdiction of the Commission. However, for Lakshadweep as well Andaman & Nicobar, there is no restriction as of now. **JERC welcomes Proposals on Battery Stored Solar Power for Andaman & Nicobar and**

Solar Regulations of JERC……. Contd.

8	**Financial Assistance**	**State bodies or Public Institutions might get the financial Assistance from the State Government or Utility Administration if announced by them**	
9	Subsidies	Respective Nodal Agencies will help in guiding for the Subsidies from MNRE	
10	Connecting Voltage as per the System capacity	1 kWp to 10 kWp	Single Phase , 220 V
11		>10 kWp to 25 kWp	Three Phase , 415 V
		>25kWTo 100 kW	Three Phase , 415 V
12		>100kWpTo 4 MWp	6.6/11 KV as per availability on the Site
13		>4 MW to any size	11KV / 22 KV /33 KV as per availability on the Site
14	Meter Specification	As specified by CEA. The meter will be arranged by the Solar power Generator from approved vendor of the Licensee. The meter shall be installed by the licensee.	

Provisions of JERC Solar Regulations

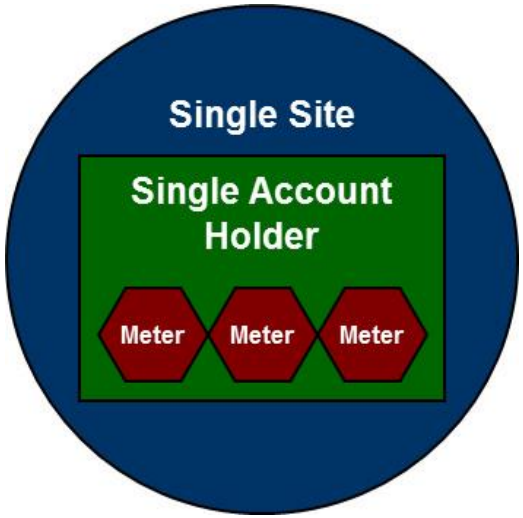
a. Solar PV Roof Top and Ground Mounted also to cover Solar panels mounted on the Structures (like Parking Sheds), Co–operative housing societies.
b. Higher Tariffs for Solar PV due to Costs higher than considered by the Commission & Lower CUF.
c. Higher Tariff for Small Solar Plants due to higher Capital Costs on per MW basis for small size projects.
d. Additional Cost of Sea freight to be considered for A&N and Lakshdweep.
e. Cost of Civil Works in A&N is higher due to import of River sand from main land.
f. Higher Costs of Structures in A&N due to sloping waste land
g. The financial Electricity bill adjustment to be on gross metering basis.
h. RPOs to be counted if generated Solar power is metered, even if consumed by the consumer by self.

Allowed for Parking lots

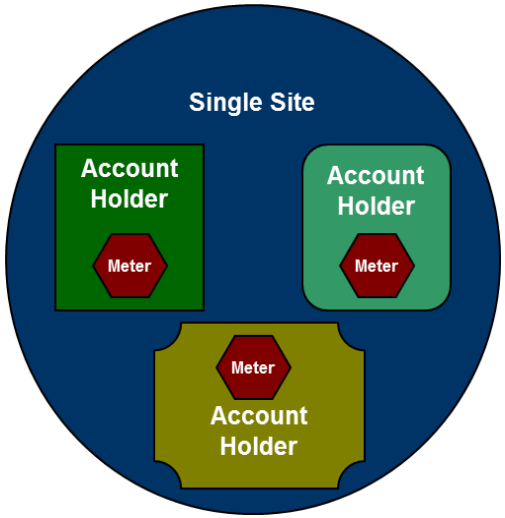
- **AGGREGATED NET METERING(ANM)-** Aggregated net metering allows for a property owner with multiple meters on one property or adjacent properties to implement net metering, such as with a group of university buildings or adjacent farm properties .

16 plus state in USA are running with (ANM) are Arkansas, California, Colorado, Connecticut, Delaware, Maine, Maryland, Minnesota, Nevada, New Jersey, New York, Oregon, Rhode Island, Utah, Washington , West Virginia , Australia

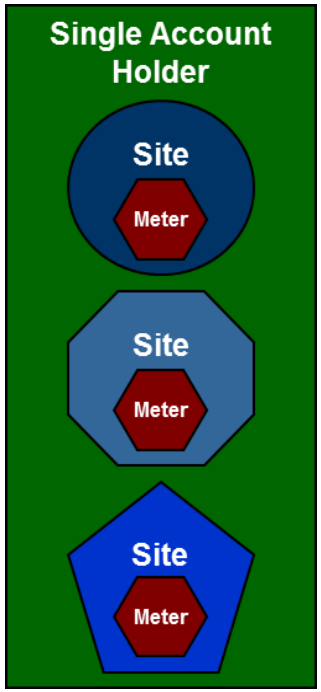
Meter Aggregation



Basic Meter Aggregation

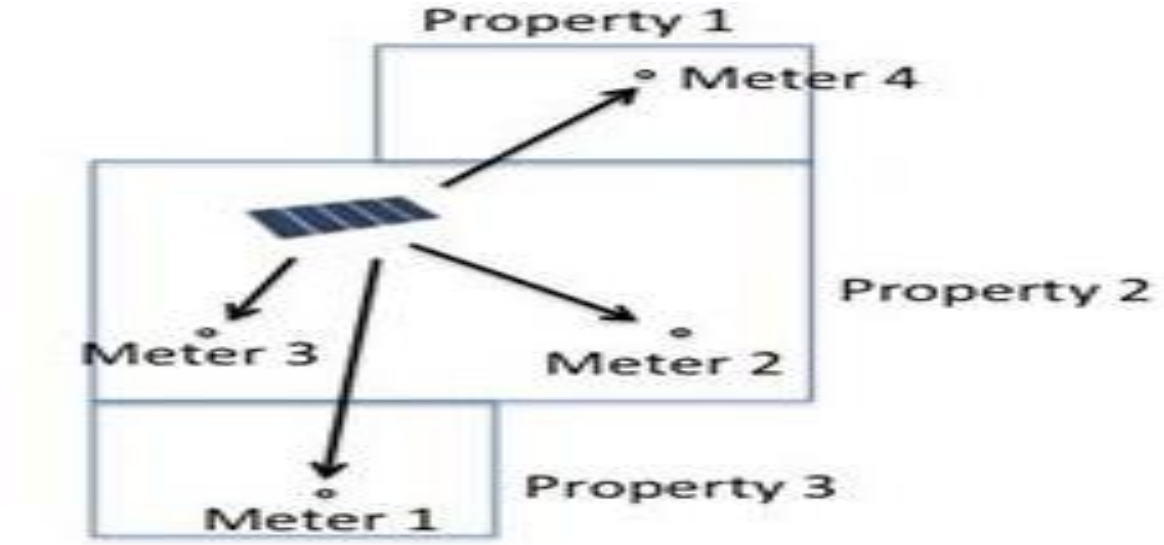


Tenant Meter Aggregation



Multi-Site
Meter Aggregation

Virtual Net metering (VNM)

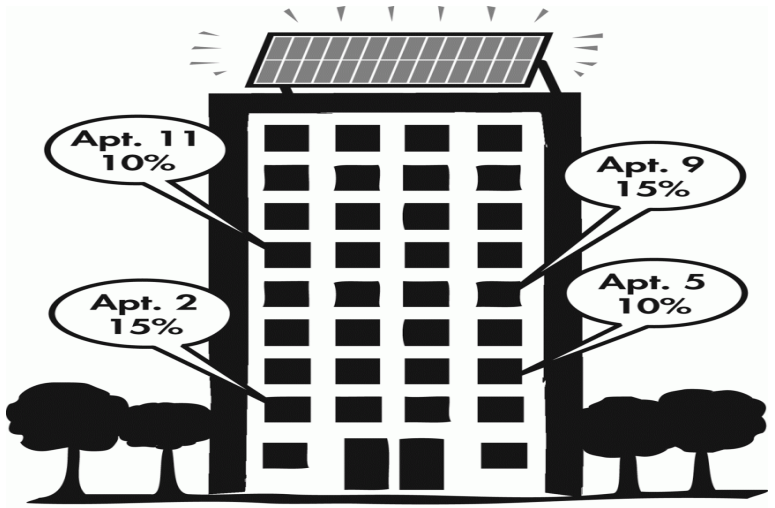


- VNM refers to when an electricity customer with on-site generation is allowed to assign their 'exported' electricity generation to other site/s.
- The other site/s may be owned by the generator or other electricity customers.
- The term 'virtual' is used to describe this sort of metering arrangement as the exported electricity generation is not physically transferred to the consumer, but rather transferred for billing reconciliation purposes

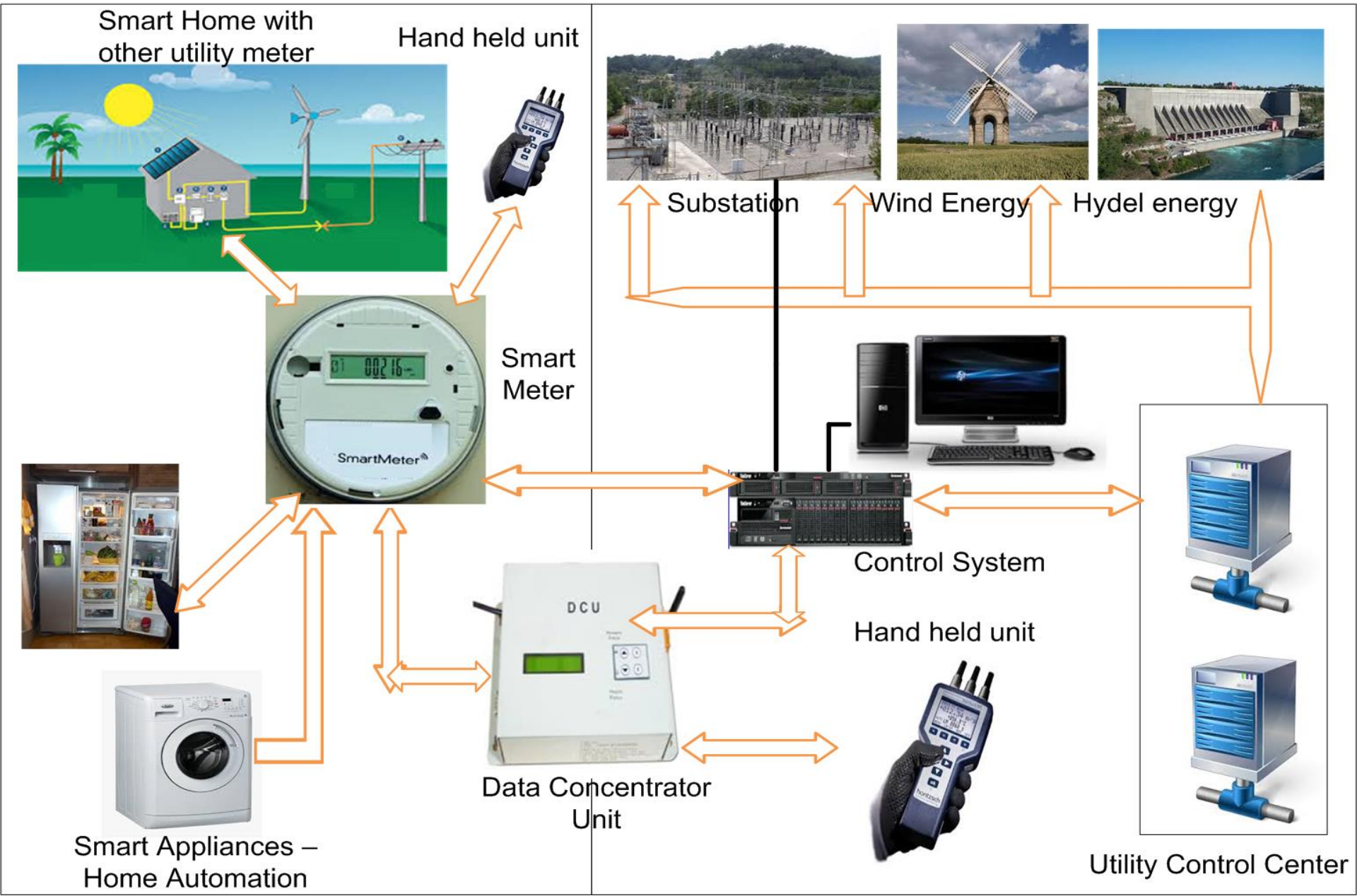
Community Net Metering

- A third concept, community net metering (also known as neighborhood net metering, community-based renewable energy or community solar) allows for multiple users to purchase shares in a single net metered system, either located on-site or off-site. For example, this could take the form of residents in a community or condominium buying shares in a medium-sized solar array.

At least 10 states in USA and Washington, D.C., have authorized community net metering or pilot projects: California, Colorado, Delaware, Illinois, Massachusetts, Maine, Minnesota, Rhode Island, Vermont and Washington.



Challenges of JERC in Metering , Goa and UTs are still continuing with vintage Meters. Solar Metering to gel with new Metering likely.

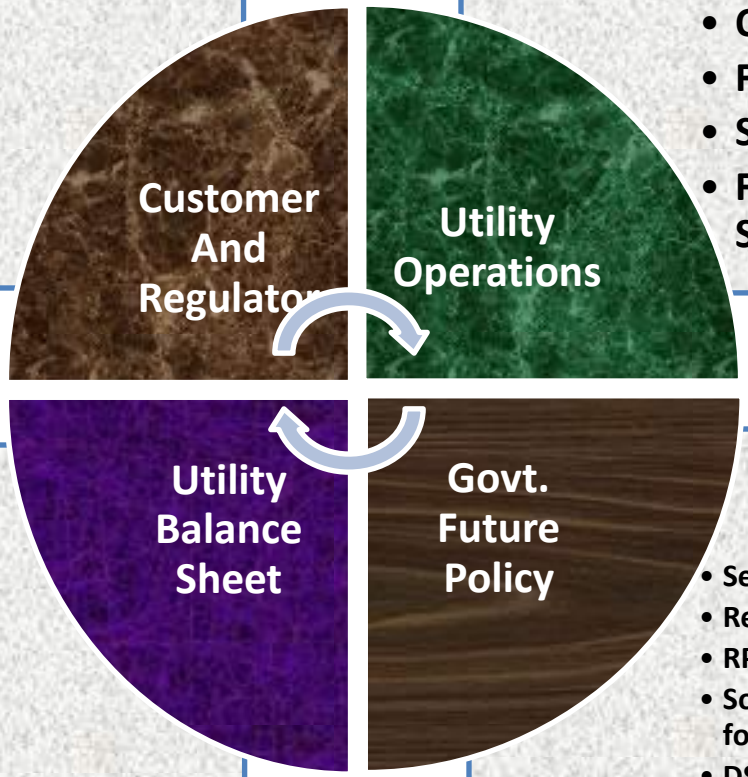


You're only as strong as your weakest link
COMMERCIAL - SMART METERING
Metering Challenges
RESIDENTIAL - SMART METER HOMES
SMART METERING NETWORK MANAGEMENT
INDUSTRIAL - SMART METERING

Solar Power Generation Effects All the Stakeholders

- Tariff compliance
- SLA compliance
- Information to customer
- Supply quality
- Billing dispute

- Network health & availability
- Network Planning
- Outage management
- Fault prediction
- Supply quality
- Field team efficiency & Safety



- Cash box
- Theft control
- Revenue cycle

- Service level norms
- Renewable integration
- RPO Compliance
- Solar Generation growth forecasting
- DSM & EE
- RGO when introduced.

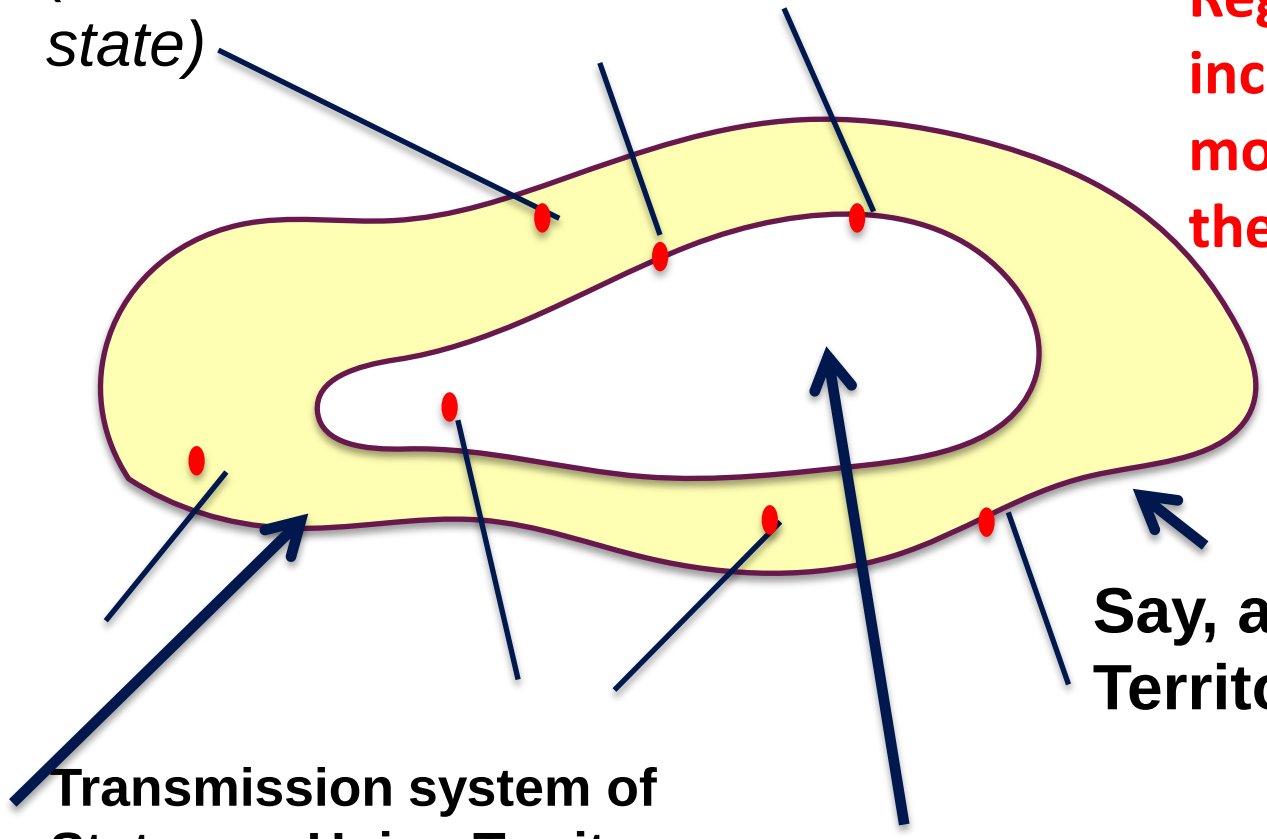
- **Solar Energy accounting in the Grid**
- It is an interval-wise and month-wise accounting for
  - Gross/ Net energy entering the system
  - Energy exported from the Solar Generation System
  - Net energy drawn by the Consumer

Wheeling, and wheeling loss- Solar

These are inter-utility lines *(inter-state lines and intra-state)*

These red dots are the boundary locations (meters) defining **utility boundary** for a transmission utility

Regulator Challenge increases if there are more than 1 Discom in the state



Say, a State or a Union Territory

Transmission system of State or a Union Territory

Standardization

Discom:

- **Rationalize the Distribution process.**
- **Reduce Commercial Losses.**
- **Reduce the T& D losses**
- **To meet RPO economically.**

Customer:

- **Assurance of the quality of Power Supply and services received.**
- **Provide better value for money.**
- **Convenient for settling disputes, if any, with the Discoms.**

Discom

Regulations to help Build Trust between the Stake Holders

Customer

Conclusions

- Electricity being concurrent subject, the policies and regulations on Solar Power Generation change depending on the Solar Insolation of each area, availability of Waste land etc.
- Power deficit in the State

Recommendations

- Solar Energy to be made a priority sector.
- The Commercial & Industry Consumers having power to invest are not getting any subsidy (in new scheme). The payback period of Solar Plant is still higher than their prime business. They need to be motivated.
- A huge trained manpower is required to install and maintain these Solar Plants, an immediate action is required in this regard.

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