



Replicating Solar Rooftop

Sharing IFC's experience on structuring innovative solar PPP Projects in India

March 2016



Agenda

- ✓ Rooftop Solar Concept
- ✓ Gandhinagar Case Study :Background & Context
- ✓ Key project risks & stakeholders
- ✓ Transaction/Contract Structuring
- ✓ Current Status & Next Steps
- ✓ Key Enabling Factors

Roof top Solar Power - The Concept

The Concept

- Every building whether home, industry, institution, commercial establishment can generate some solar power by installing PV panels on the rooftop or on unutilized premises



Key Benefits

- Photovoltaic roof-top installations at the tail-end of the grid increase grid-stability and reduce losses
- Savings in land requirement and costs
- Savings in development of new transmission infrastructure
- Creation of value from under-utilized /unutilized rooftops



Rooftop solar - Metering Options

Parameter	Gross Metering	Net-metering
Objective	Electricity sale to utility	Self-consumption of electricity
Tariff Arrangement	PPA with the utility - utility to pay as per PPA price (FIT)	No payment by utility for electricity injected into the grid, annual settlement may be allowed
Financial burden	Cost borne by utility & then passed through to the consumer	Usually Govt. bears burden for any incentive/subsidy to bridge viability gap
Energy Accounting	Metering arrangement to measure generation only	Metering arrangement to measure generation as well as respective consumption
Beneficiary	Assist utility in meeting Solar RPO compliance	Assist consumer directly to reduce its electricity billing
Project Selection	Tariff based competitive bidding	First-cum-first basis (to start with)
Utility's Concern	Not keen on signing PPA with small rooftop projects - higher FiT & administrative burden.	Loss of revenue for utility - reduced grid consumption by consumers
Developer's Concern	Grid unavailability to impact revenue	Low level of incentives may impact viability of project for certain consumer segments

Solar rooftop implementation business models

Country, State	Metering	Incentive	Interconnecti on Agreement	Business Model	Ownership of assets	Contracting
Germany	Gross metered - self owned	Feed in tariff	Yes	Feed in Tariff	Self Owned	N/A
India, Gujarat	Gross metered - third party owned	Feed in tariff/ GBI	Yes	Feed in Tariff & Rooftop Lease (Green) Incentive	Third Party Owned	Rooftop Lease Agreement
Japan	Net metered - self owned	Net metering - capital subsidy	Yes - Net Metering	Savings in cost of energy	Self Owned	N/A
United States, California	Net metered - self owned	Net metering - tax rebates & RECs	Yes - Net Metering	Savings in cost of energy	Self Owned	Lease
United States, New Jersey	Net metered - third party owned	Net metering - tax rebates	Yes - Net Metering	Tax rebates/ sale of power to host	Third Party Owned	PPA

CASE STUDY

Gujarat Rooftop Solar PPP Project Background

• Client Need

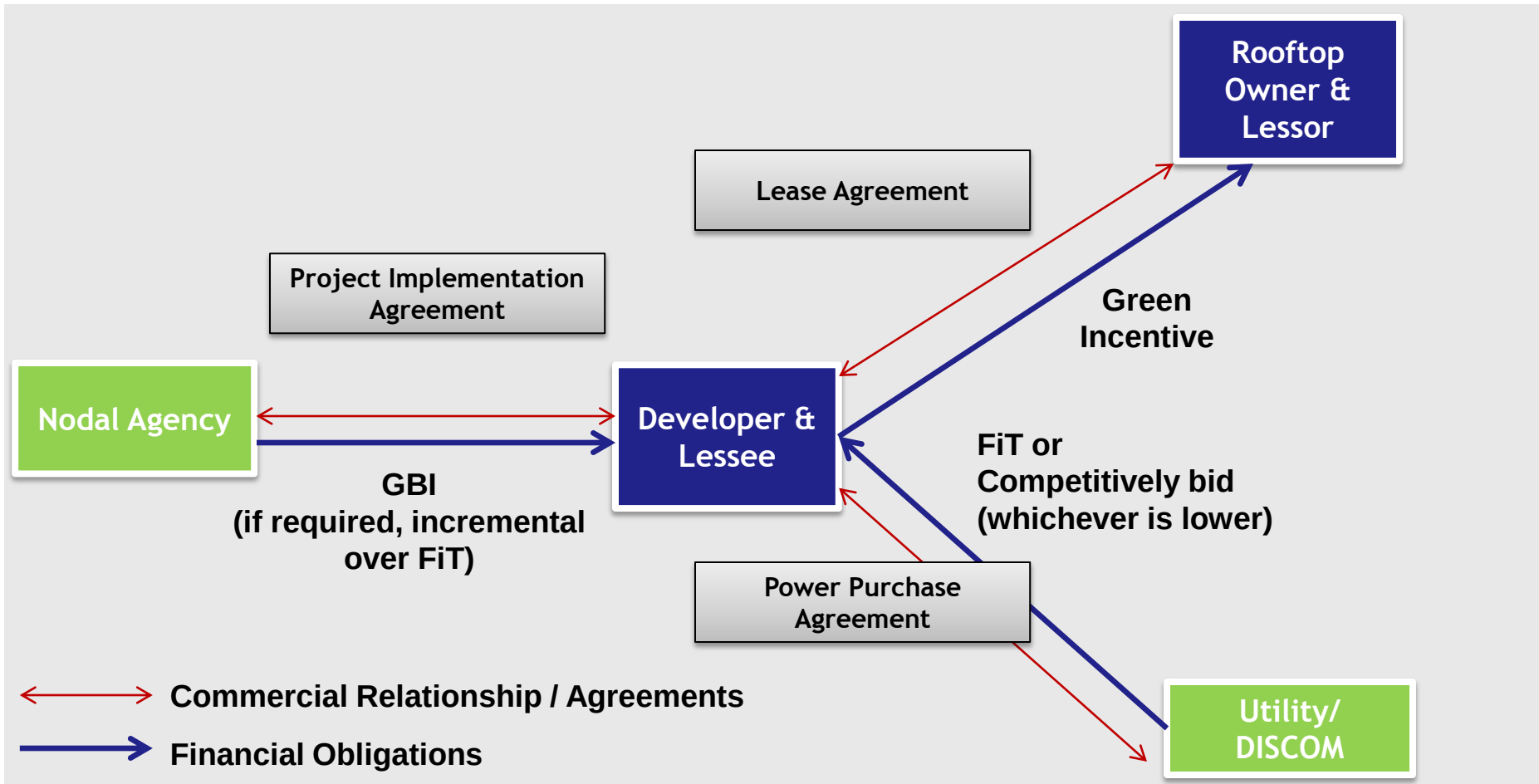
- ✓ Govt. of Gujarat (GoG or Client) envisaged to implement a pilot 5 MW grid connected distributed rooftop solar project in Gandhinagar on a PPP model
- ✓ Demonstrate technical, commercial and regulatory viability and sustainability of rooftop solar concept.
- ✓ IFC was requested by GoG for technical assistance in implementing the project in around May'2010

• Expected Impact

- ✓ Pilot Project has potential to reduce ~ 6000 tons of CO₂ equivalent annually
- ✓ Potential private sector investment for the pilot project: approx US\$ 10 million
- ✓ Potential for replication in Gujarat and beyond



Gross metering: FiT based *Commercial arrangements*



Contract Structuring

Key Terms

PPA

- Inter-connection scheme defined
 - Delivery point defined(meter)
- System specs. Defined
 - Panels/Inverters/Meters
- Assured 90% Grid Availability
- Off take limits:13-22% CUF
 - Penalty below 13%
- Payment Security (LC)
- Deemed Generation
- Assignment (lenders)

PIA

- Facilitate Implementation
 - Identify rooftops
 - Regulatory approvals
- Clustering of rooftops
- Project Supervision
 - Independent Engineer
 - Monthly monitoring
- Pay GBI if required
- Provide alternate rooftops with transfer benefits
- Phased Commissioning
- Assignment allowed
- Termination benefits (default of both parties)

RLA

- Provide terms of access to rooftops
- Rent Structure (per unit basis to encourage participation of owners)
- No change for first five years
- Uninterrupted access
- Broad technical specs. Pre-defined

Key terms like effective date, term, termination etc. Interrelated among the three agreements

Current Status & KM Initiatives

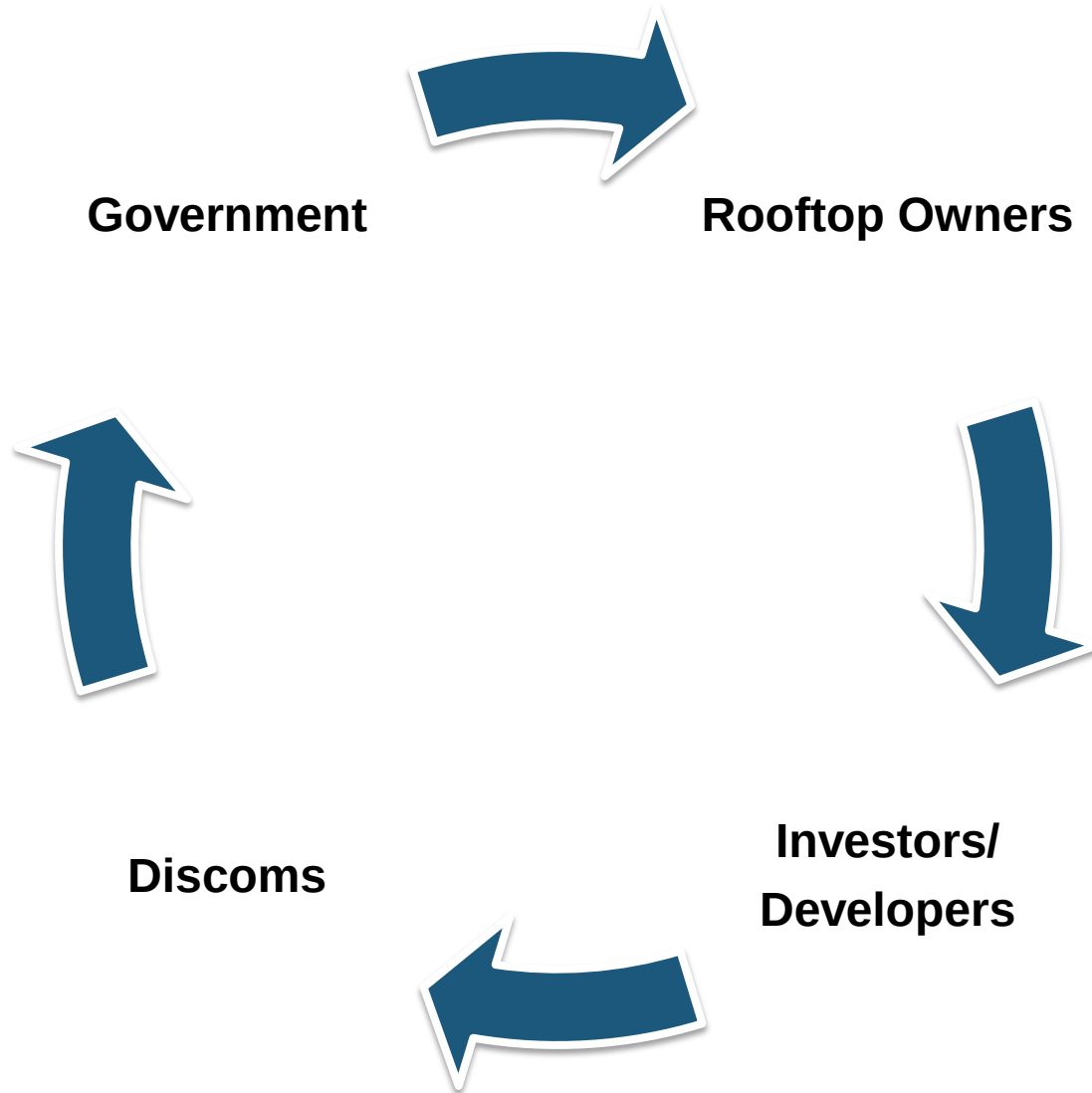
Current Status

- Four bids received & Evaluated
- Regulatory approval obtained
- Project Awarded to- Azure & Sun Edison (2.5 MW each)
 - Competitive bids with net positive fiscal impact for GoG
- ~5 MW has already been commissioned including 1 MW on residential

Other initiatives

- Knowledge Sharing & Dissemination for wider replication:
 - A White Paper on Solar Rooftop prepared and launched in November'14
 - Draft Regulations for rolling out rooftops in the country for the national regulator
 - Over 15 Govt. officials taken on Study tour to Germany & US
- Replication in Vadodara ,Gujarat (5 MW)- already awarded
- Madhav Solar is the selected bidder- Commissioned in FY15
- Replication project being executed in Odisha on Net metering- Azure likely to be awarded. Interest shown by many other states for replication -(Delhi, Jharkhand, MP)

Managing stakeholders' expectations- Key to replication



Key Enabling Factors- Solar Rooftop

- **Perspective /Priority of Government**

- Any Renewable or Solar Policy in the state
- Availability of incentives &/or funds for subsidy, if required
- Involving people in an innovative & green initiative
- Going for cleaner power with minimal E&S issues

- **Perspective of Rooftop Owners**

- Tariff for various categories consumers (Higher tariff suitable for solar RT)
- Availability of Grid Power (High diesel power may promote solar RT)
- Alternate use of Rooftops (Monetizing idle rooftops)
- Any other incentives-Rebate in duties/taxes, carbon credits etc.
- How to get access to Finance?

Key Enabling Factors- Solar Rooftop...2/2

• Perspective of Investors (Who and How are their cost and returns secured?)

- Incentive Structure – High grid tariff, Feed In tariff, GBI, Capex Subsidy, Tax benefits)
- Reliability of available solar resources
- Reliability of Grid at low voltage level (>90%)
- Credit risk – Discoms/ Rooftop owners
- Access to Finance

• Perspective of Discoms

- Need for Regulatory Compliance (Renewable Purchase Obligations)
- Savings in the T&D losses & the need for incremental evacuation lines
- Impact on their revenues
- Impact on their system stability
- Inter-connection requirements

Residents install solar panels on their roof tops to generate power which will earn them revenue; production to start by July end

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