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## Workshop on Renewable Energy Integration and Procurement

March 18 -19, 2024

### **South Asia Regional Energy Partnership (SAREP) and Sri Lanka Energy Program**

*Session 3: Enhancing Bankability through Power Purchase Agreements (PPAs) in  
Renewable Energy Projects*



# AGENDA



- **History of Indian Renewable Energy Sector**
- **Introduction to India's renewable energy landscape, with a focus on Gujarat**
- **Overview of the importance of Power Purchase Agreements (PPAs) in renewable energy projects**
- **Significance of bankability in ensuring project success**
- **Bankability performance indicators with scores**

# Start of the story:

## Electricity Act, 2003 (Enabling provisions)



Section 86(1)(e) :  
Specify  
Renewable  
Purchase  
Obligation (RPO),  
grid connectivity



Section 61(h) :  
Tariff regulations  
to be guided by  
promotion of  
renewable energy  
sources



Section 3 :  
National  
Electricity Policy,  
Tariff Policy and  
Plan



Section 4 :  
National Policy  
permitting stand  
alone systems  
including  
renewable  
sources of energy  
for rural areas

# The Electricity Act, 2003: Section 86(1) (e)

The State Commission shall discharge the following functions, namely:

“promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;”



# The Electricity Act, 2003: Section 61(h)

The Appropriate Commission shall subject to the provisions of this Act, specify the terms and conditions for the determination of tariff, and in doing so, shall be guided by the following, namely:

(h) the promotion of co-generation and generation of electricity from renewable sources of energy



# National Electricity Policy: 2005



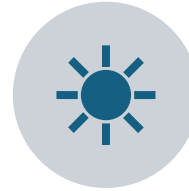
Urgent need for promotion of non-conventional and renewable sources of energy.



Efforts need to be made to reduce the capital cost of such projects.



Adequate promotional measures would have to be taken for development of technologies and sustained growth of these sources.



SERCs to provide suitable measures for connectivity with grid and fix percentage of purchase from Renewable sources.



Progressively such share of electricity need to be increased.

# Tariff Policy:2006 & 2016



Appropriate Commission shall fix RPO and SERCs shall fix tariff.



In future Discoms to procure Renewable Energy through competitive bidding within suppliers offering same type of RE.



In long-term RE technologies need to compete with all other sources in terms of full costs.



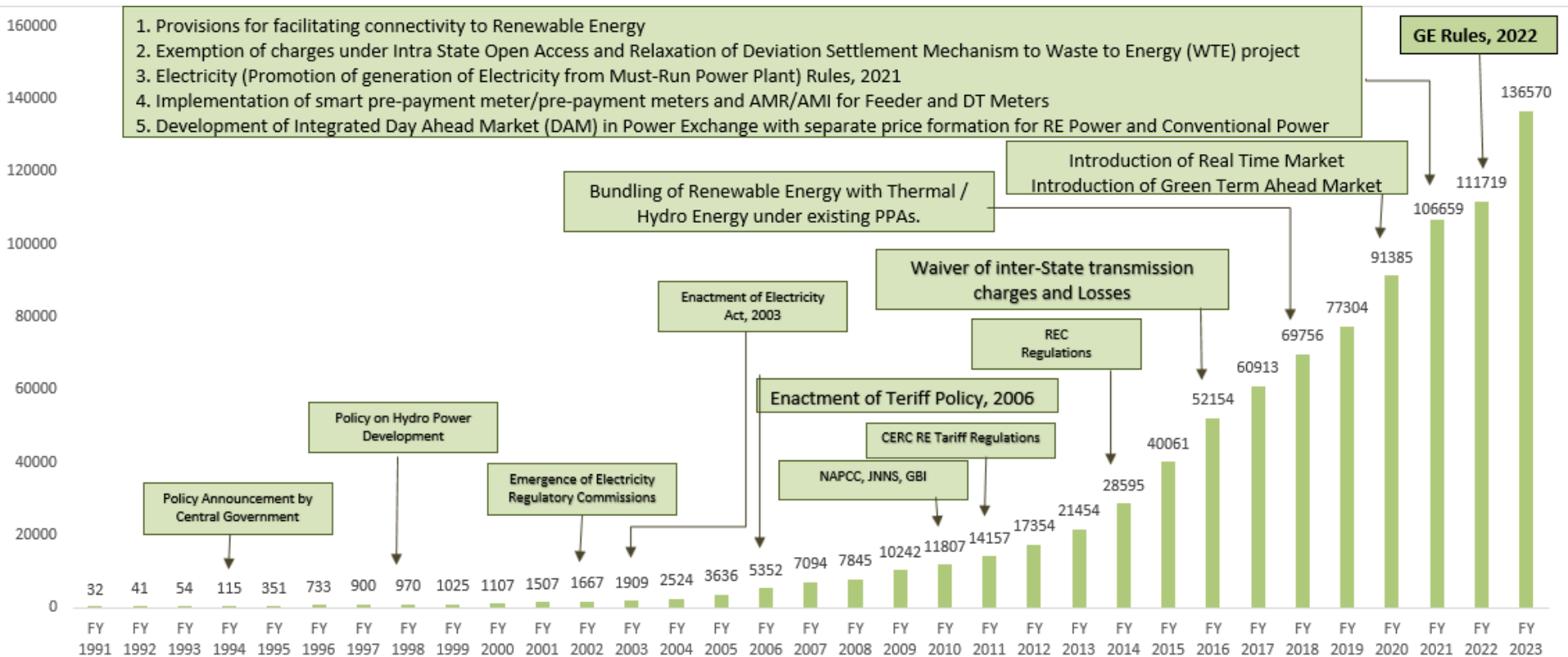
State will procure RE through competitive bidding except WTE plant



Waiver of IST charge for wind & Solar plants



Solar RPO shall be minimum 8% by 2022



## Beginning of RE in India

*Policy and regulatory intervention is essential to promote renewable energy*



# Various types of Renewable Energy

## Wind

**(45,153 MW)**

- On shore
- Off-shore

## Solar

**(75,575 MW)**

## Small Hydel

(up to 25 MW)

**(4994.75 MW)**

## Biomass

**(9,433 MW)**

## Co – generation

**(828.25 MW)**

## Municipal Solid waste

**(650 MW)**

## Geo –Thermal

**(50 MW)**



**1**

**India ranks 4th globally for total renewable power capacity additions**

**2**

**India has already achieved its target of 40% installed electric capacity from non-fossil fuels in Nov 2021 itself**

**3**

**India ranks 4th in Wind Power Capacity and 5th in Solar Power Capacity globally.**

# Understanding Power Purchase Agreements (PPAs)

- Key components of a PPA
  1. Pricing mechanisms
  2. Contract duration and termination clauses
  3. Performance standards and penalties
  4. Payment terms and financial arrangements
  5. Grid connection and evacuation arrangements
  6. Dispute Resolution



# Importance of Bankability in Renewable Energy Projects

## Driving factors of renewable energy projects

Regulatory framework and policy support

Supportive Renewable Energy Policy

Proactive Regulations

Financial structuring and access to capital

Business model & Credit worthiness

Technical feasibility and resource assessment

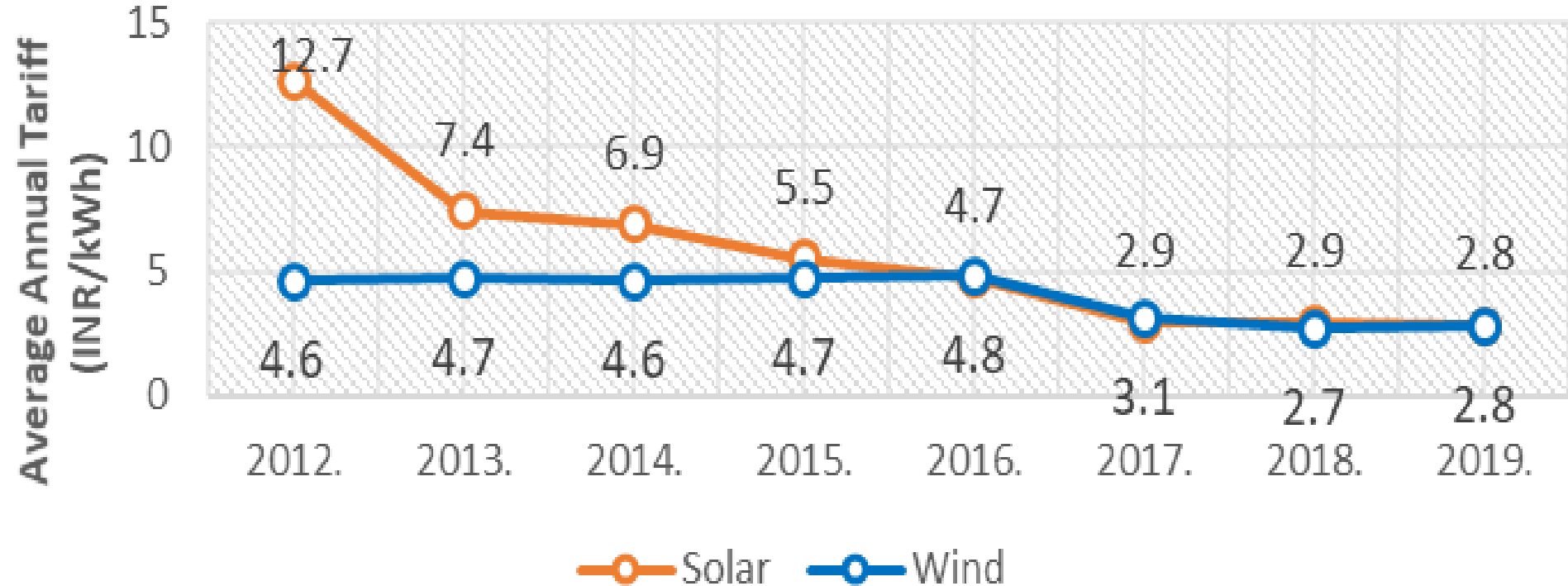
Connectivity with the grid

Site Location and adequate natural resources

Off-take agreements and revenue certainty

Duration, terms and condition of PPAs

# Falling Trend of Renewable Energy Tariffs



## Drastic Decline in Solar Tariffs

The plummeting solar tariffs, from **INR 17.91/kWh** to **INR 2.85/kWh**, signify a remarkable **86%** decrease, underlining the significant cost reduction and competitiveness of solar energy.

## Wind Tariffs' Substantial Decrease

Sheds light on the noteworthy decrease in wind tariffs, reflecting the sector's resilience and cost-efficiency advancements over the past decade.



# Policy Initiatives and Growth of Renewables

1

## Government's Ambitious Targets

The Government's pivotal role in setting ambitious targets and implementing policies to drive renewable energy growth has been a cornerstone of the sector's evolution.

2

## Technological Advancements and Industry Growth

The culmination of technological innovations, policy initiatives, and industry growth reflects the dynamic landscape of renewables and showcases the sector's potential for further advancement.





## Transformation in Energy Storage

# 85% Decrease

**Plummeting Storage Costs**

The remarkable 85% decrease in storage costs over the past decade underlines the transformative advancements, efficiency improvements, and competitive pricing in the energy storage segment.

# Standalone Battery Energy Storage System (BESS) - 250 MW / 500 MWh

- Approach of Battery Energy Storage System(BESS):
  - Optimizing excess energy in BESS and reutilizing it during Peak hours.
- Key points on tender:
  - GUVNL tender capacity of 250 MW: 100% of capacity for GUVNL
  - No additional support of PSDF or VGF.
  - GUVNL tender BESS to be installed under- B-O-O mode.  
(After 12 Year Developer need to remove all supportive structure and disposal of Batteries are to be done by Developer)
  - Three Substation options given to bidders for 250 MW capacity.
  - Bucket filling approach.
    - Minimum bid capacity of 70 MW ( to optimize 66 KV bus capacity).
  - Pooling switchyard between multiple bidders.
  - Right of Use Agreement for utilizing spare land of Substation.



# Standalone Battery Energy Storage System (BESS) 250 MW / 500 MWh

- System Availability = 95 % ( Sum of Monthly Availability)
  - Less than 95 % system availability =Double penalty applicable.
- Round trip Efficiency (RtE) =85%
  - For RtE <70%, there shall be a liquidated damage @ APPC tariff of previous financial year of the Discoms of excess conversion losses considering system RtE= 85% and tariff payment for the corresponding month shall not be made to the BESSD;
  - For  $70\% \leq \text{RtE} < 85\%$ , there shall be a liquidated damage levied @ APPC tariff of previous financial year of the Discoms of excess conversion losses considering system RtE = 85%;
  - For RtE > 85%, there shall be incentive @Rs. 0.50 per unit of excess discharge of energy considering system RtE = 85%.

# Standalone Battery Energy Storage System (BESS)

## 250 MW / 500 MWh

➤ Year on Year allowed degradation of BESS

Year	Min. Dispatchable Capacity at the end of Year (as a % of Capacity at the Beginning of Life/Final COD)
1	97.50%
2	95.00%
3	92.50%
4	90.00%
5	87.50%
6	85.00%
7	82.50%
8	80.00%
9	78.50%
10	75.00%
11	72.50%
12	70.00%

# GUVNL & SECI BESS tenders

## SECI Tender (500 MW / 1000 MWh)

- SECI tender capacity of 500 MW: 30% of capacity for DISCOMs + 30% Ancillary Services (Grid India) + 40 % Marchant Capacity.
- SECI tender Supported by PSDF Fund.
- SECI tender BESS to be installed under- B-O-O-T mode.
- SECI tender – 30% of project capacity required for Ancillary services.
- SRAS & TRAS - requires complex support to grid, as Nos. of cycles were not defined in operation. (Batteries life is defined on Nos. of cycle only) Hence, high risk engaged in designing of BESS system.
- Location-Rajasthan , ISTS connected Project
- Effective Levelized Cost of Storage (LCOS) with PSDF fund- 6.04 per unit.

## GUVNL Tender (250 MW / 500 MWh)

- GUVNL tender capacity of 250 MW: 100% of capacity for GUVNL
- No additional support of PSDF or VGF.
- GUVNL tender BESS to be installed under- B-O-O mode.
- GUVNL has demanded 95% monthly availability in place of annual availability. (This makes Developers to adhere availability of system, else heavy penalties applicable to them)  
(Annual availability= sum of all month availability.  
Where, more than 95% considered as 95%, less than 95% considered at derived availability.
- Location- Gujarat, In-STS connected Project
- Effective Levelized Cost of Storage (LCOS) - 4.43 per unit.

# Standalone Battery Energy Storage System (BESS)

## 250 MW / 500 MWh

### ➤ Conclusion:

- Considerable reduction in the prices of Battery Pack: As per Bloomberg NEF's assessment, the battery pack prices have dropped by 14% between 2022(\$161 per kWh) and 2023 (\$139 per kWh). Further by 2025, it is expected to drop to \$113 per kWh. Since the project will come up by 2025, there is already a 30% difference in terms of the cost of battery pack, which is reflected in the lower bid results.
- 100% offtake assurance from BESS: Comparing with SECI bid, there is uncertainty of utilization due to SRA and TRS, which may impact the life of battery packs. Hence there is a risk of replacement over the contract period of 12 years. Under GUVNL bid, since the offtake is only for a single application that is energy arbitrage, the number of cycles for utilization is certain and the system design is less complex, hence reducing the risk of replacement, leading to a potential reduction in the quoted bid.

<https://about.bnef.com/blog/lithium-ion-battery-pack-prices-hit-record-low-of-139-kwh/>

# Standalone Battery Energy Storage System (BESS)

**E-RA discovered rates of NTPC tender, SECI tender & GUVNL tender:**

➤ **SECI Tender:**

➤ <https://drive.google.com/drive/u/1/folders/1Wj8rMYpNUZnZqMVuHfiws7ZpgJ3jDZ4F>

➤ **GUVNL Tender:**

➤ <https://drive.google.com/drive/u/1/folders/1Wj8rMYpNUZnZqMVuHfiws7ZpgJ3jDZ4F>

- GUVNL has recently floated a tender of 250 MW / 500 MWh Standalone Battery Energy Storage System in Gujarat on dated 15.03.2024.



## Electric Vehicle Revolution

1

### Policy Push for Electric Vehicles

The implementation of policy incentives and regulatory support for electric vehicles has propelled the sector's growth, laying the foundation for a paradigm shift in India's transportation landscape.

2

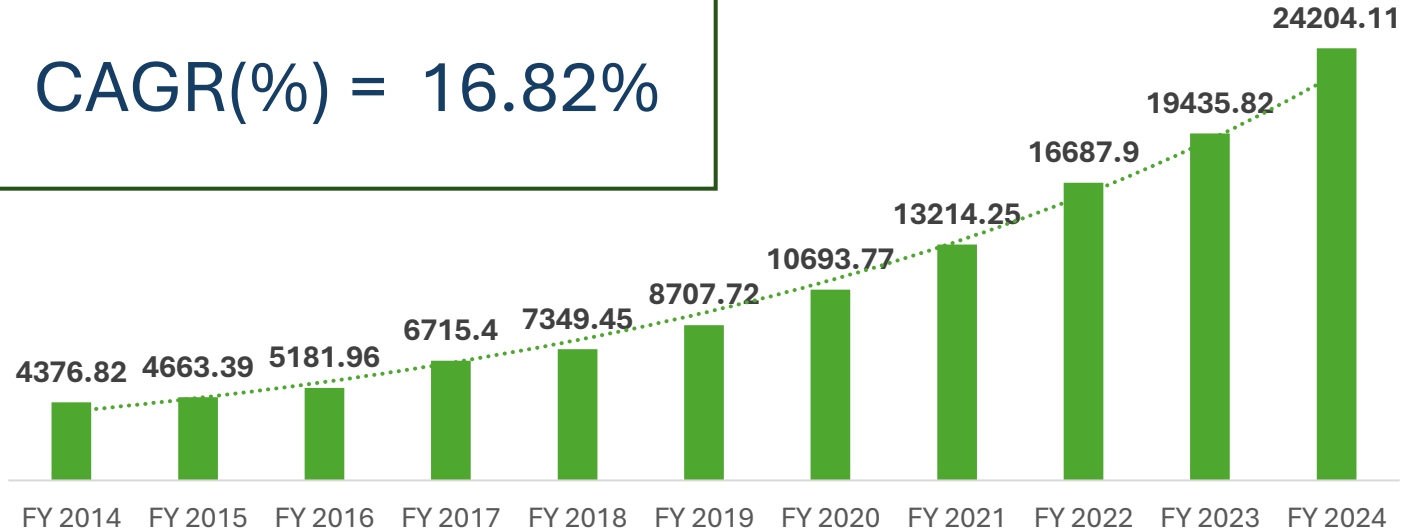
### Market Projections and Industry Industry Potential

The upward trajectory and projected sales of electric vehicles reflect the burgeoning market potential and consumer readiness for embracing sustainable mobility solutions.

# Gujarat's Green Energy Development trend

RE installed Capacity In Gujarat  
(MW)

CAGR(%) = 16.82%





# Current scenario of RE in Gujarat

RPO Targets in Gujarat	Wind	Solar	Hydro Power	Others	Total
2023-24	8.40%	9.50%	0.05%	0.75%	18.70%
2024-25	8.55%	11.25%	0.10%	0.80%	20.70%

# Guidelines

MNRE Guideline of tariff based competitive bidding for wind and solar & BESS projects

- This promotes the RE development in competitive market

SERC (terms & condition for Green Energy Open Access Regulations, 2024)

- Having all the provisions of Ministry of Power Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022

# Other Important Green Energy Initiatives in Gujarat

## Overview of Gujarat's renewable energy targets and policies

- **Gujarat Renewable Energy Policy, 2023**
  - Size : 100 GW by 2030
  - Utilizing **4 Lakh Acre** of Land
  - **Investment** : 5 Lakh Crore
  - Amounting **50%** of its energy from renewable (RE) sources

## Technology adopted for green energy for round-the-clock power supply

- Solar-Wind hybrid projects
- Energy storage solutions
- Renewable energy forecasting and scheduling
- Grid infrastructure upgrades

# Major Renewable Projects

Project	Capacity	Status
Gujarat Hybrid Renewable Energy Park – Khavda, Kutchh	30,000 MW	Construction
Charanka solar park	730 MW	Operating
<a href="#">Dholera Solar Park</a> (Phase 1 and 2)	4,300 MW	Pre-construction
<a href="#">Kutch (NTPC) Solar Park</a>	4,750 MW	Pre-Construction
<a href="#">Bhuj (Alfanar) wind farm</a>	300 MW	Operating
<a href="#">Worlds first Canal Top Solar Powr Project</a>	1 MW	Operating
Model Solar City Project- Gandhinagar	10 MW	Operating

# Enhancing Bankability through Effective PPAs

- Negotiating favorable terms and conditions
- Incorporating risk mitigation measures
- Ensuring alignment with regulatory requirements
- Engaging with stakeholders and communities

Strategies for robust PPAs to enhance bankability



- Competitive bidding processes and tariff determination
- Long-term agreements with discoms and industrial consumers
- Innovative financial structures and risk-sharing mechanisms

Successful PPAs in renewable energy projects



# Features of Bankable PPAs

Parameter	Covered in the PPA
Dispatch Risk	<p>The risk that the generation plant won't be dispatched by the off taker. Could be take-or-pay or take-and-pay.</p> <ul style="list-style-type: none"><li>• Minimum CUF in Wind and Solar Projects</li><li>• Up to 20 % -&gt; Half Tariff, More than 20 % is ok.</li><li>• Clause of minimum contracted CUF in Wind and Solar PPAs.</li></ul>
Fixed Tariff	<p>Following clauses are incorporated in the Wind &amp; Solar PPA in accordance with the MOP's Guidelines:</p> <ul style="list-style-type: none"><li>a) Clause of compensation for backing down (50% of avg generation x PPA tariff);</li><li>b) Clause of compensation for grid unavailability (excess generation is being offset in next 3 years)</li></ul>
Foreign Exchange	<ul style="list-style-type: none"><li>• Risk of volatile currency prices and restriction on transferring funds offshore.</li><li>• PPA should be linked to the currency of the debt issued or hedged. (Only applicable to foreign investors.)</li><li>• RE PPAs do not have any linking with forex variation / scalable VC component, however, in the policy document it is mentioned that it should be hedge by developer.</li></ul>
Change in Law or Change in Tax	<p>Explicit provisions for Change in law in the PPAs defining what changes are allowable for pass-through.</p>

# Features of Bankable PPAs(Cont.)

Parameter	Covered in the PPA
Force Majeure	<p>Power producer's obligations should be excused in a situation which is beyond the reasonable control of the power producer.</p> <p>Explicit provisions of Force Majeure are there in the PPAs clearly stating -</p> <ol style="list-style-type: none"><li>What events are covered under Force Majeure Events</li><li>What are Force Majeure exclusions</li><li>Procedure to claim relief viz. notice, details of remedial actions to be conveyed and details of restoration of work, etc.</li><li>What is the remedy (time-extension)</li></ol>
Dispute Resolution	<ul style="list-style-type: none"><li>• Agreement for offshore arbitration should be provided under generally acceptable terms to the international community.</li><li>• Policies appointed conciliating committee to resolve disputes</li><li>• In the events of disputes, the matters are required to be referred to GERC or CERC (as the case may be)</li><li>• Policy decide the timeframe for dispute resolution</li></ul>
Termination and Payments	<ul style="list-style-type: none"><li>• PPA should clearly define the basis on which termination may be carried out and outline clear termination payment mechanism.</li><li>• Detailed provisions of Events of Default, cure period / remedy default, termination procedure, compensation, etc. are set out in the PPAs.</li><li>• The PPA provides for both Sellers as well as Buyers Events of Default, termination compensation provisions</li></ul>

# Features of Bankable PPAs(Cont.)

Parameter	Covered as
Assignment	<ul style="list-style-type: none"><li>• Assignment shall be permissible only for entire contracted capacity.</li><li>• No Approval is required from the off taker for assignment to the bank</li><li>• PPAs have Assignment Clause for assignment of rights in favor of Lenders or any other Third Parties.</li><li>• Therefore, by virtue of the Financing Agreements, Escrow Agreements, etc. (between Lenders &amp; Generators), the Lenders may step-in and exercise their rights in the events of default.</li></ul>
Off taker Payment Support	<ul style="list-style-type: none"><li>• Provision of Criteria for Generation (-20% to +20 % CUF )</li><li>• Letter of Credit (LC) as Payment Security Mechanism.</li><li>• The LC provisions vary from PPA to PPA viz. some thermal PPAs have weekly revolving LC while some have monthly revolving LC.</li></ul>



# Features of Bankable PPAs(Cont.)

Parameter	Covered as
Transmission and Interconnection Risk	<ul style="list-style-type: none"><li>• PPAs should clearly indicate the party that bears the risk of connection and interconnection.</li><li>• Transmission up to delivery point is usually in the scope of Generators and beyond delivery point is in the scope of Buyer (GUVNL).</li><li>• PPAs clearly provide the responsibility / scope of the Generators to secure connectivity, laying of transmission lines / bay / transformers, etc. and bear applicable transmission charges (up to Delivery Point) from time to time.</li><li>• The connectivity is ensured in case of Solar/Wind park (Plug &amp; Play)</li></ul>
Financial Health of Off taker	<ul style="list-style-type: none"><li>• All DISCOMs of Gujarat having PPA of A+ rating for the past 10 years</li></ul>
Clearances from various department like MoD, Aviation Ministry, Forest Ministry, etc.	<ul style="list-style-type: none"><li>• Single window clearances / policy support appointing nodal agencies for getting all clearances.</li></ul>

**All the risk mitigating features as mentioned in the Presentation (except linking RE tariff with forex variation) have been duly addressed in the MOP's Guidelines for Wind and Solar Bidding.**

# Bankability Score (Out of 10)

Criteria	Details	Score
Dispatch risk	Based on solar and wind penetration, curtailment, and transmission infrastructure.	
	Guaranteed revenue for deemed generation	10
	Highly prone to curtailment and revenue not guaranteed	0
Returns risk	Based on PV LCOE competitiveness against wholesale power prices and alternative generation technology.	
	PV LCOE highly competitive against wholesale power prices	10
	PV not competitive against wholesale power prices	0
Foreign exchange	Based on currency hedges availability, volatility, convertibility, and pegged exchange rate.	
	Currency hedges available, low volatility/convertibility, and pegged exchange rate	10
	Very high degree of currency volatility and convertibility risk, and scant or absent hedging options	0

# Bankability Score (Out of 10)

Criteria	Details	Score
Dispute resolution	Based on strength of investor protection and offshore arbitration.	
	Option for offshore arbitration according to reasonable international standards	10
	No offshore arbitration available and precedent of unfair practices	0
Termination payment	Baked into regulatory risk, which is determined by rule of law and policy stability index.	
	Termination payment available and clauses clearly defined, rule of law strongly respected	10
	No provision for termination payment and little respect for rule of law	0
Credit risk	Based on availability of payment support and credit profile of the offtaker.	
	Market-oriented tariff structure and availability of offtaker payment support	10
	High degree of subsidies and unavailability of offtaker payment support	0

# Bankability Score (Out of 10)

Criteria	Details	Score
Transmission/ interconnection	Adjusted based on transmission infrastructure.	
	Very low level of transmission constraint; interconnection responsibility and timeline clearly defined	10
	High levels of transmission bottlenecks and interconnection clauses that are vague and unclear	0
Regulatory risk	Adjusted based on stability of renewable energy related policy.	
	Stable policy environment	10
	Highly uncertain policy environment with historical precedent of retroactive policy changes	0
Force majeure	Based on rule of law index.	
	Rule of law strongly respected, force majeure clauses (risk allocation and responsibility for addressing damages clearly specified)	10
	Weak rule of law and force majeure clauses	
Others	Degree of subsidization is used as a proxy for credit quality of the off taker, land acquisition, and permitting are also considered.	

# Thank You & Open for Discussion