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VRE Integration: The Journey of India

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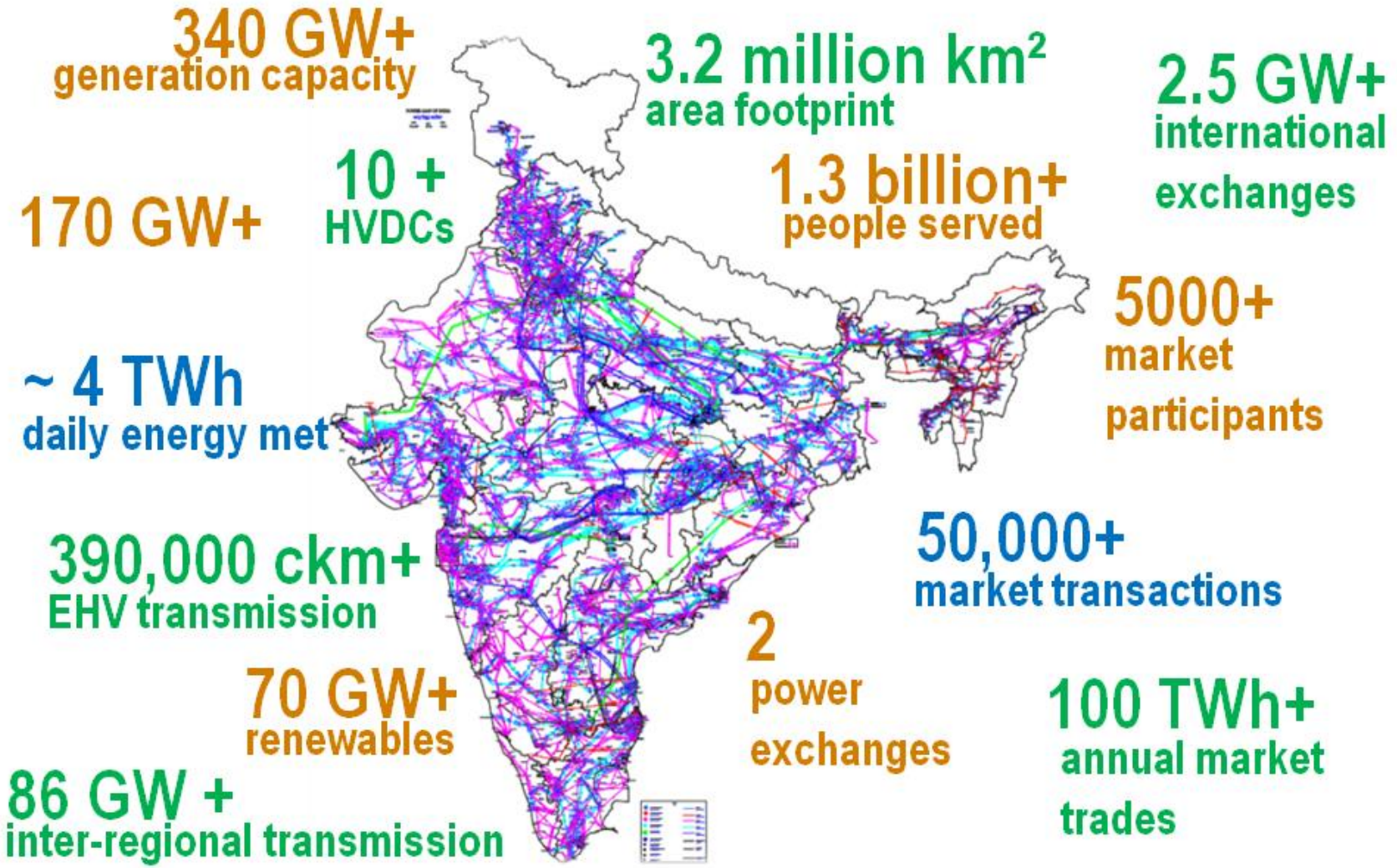
Indian Power Sector – A Snapshot



Source: POSOCO

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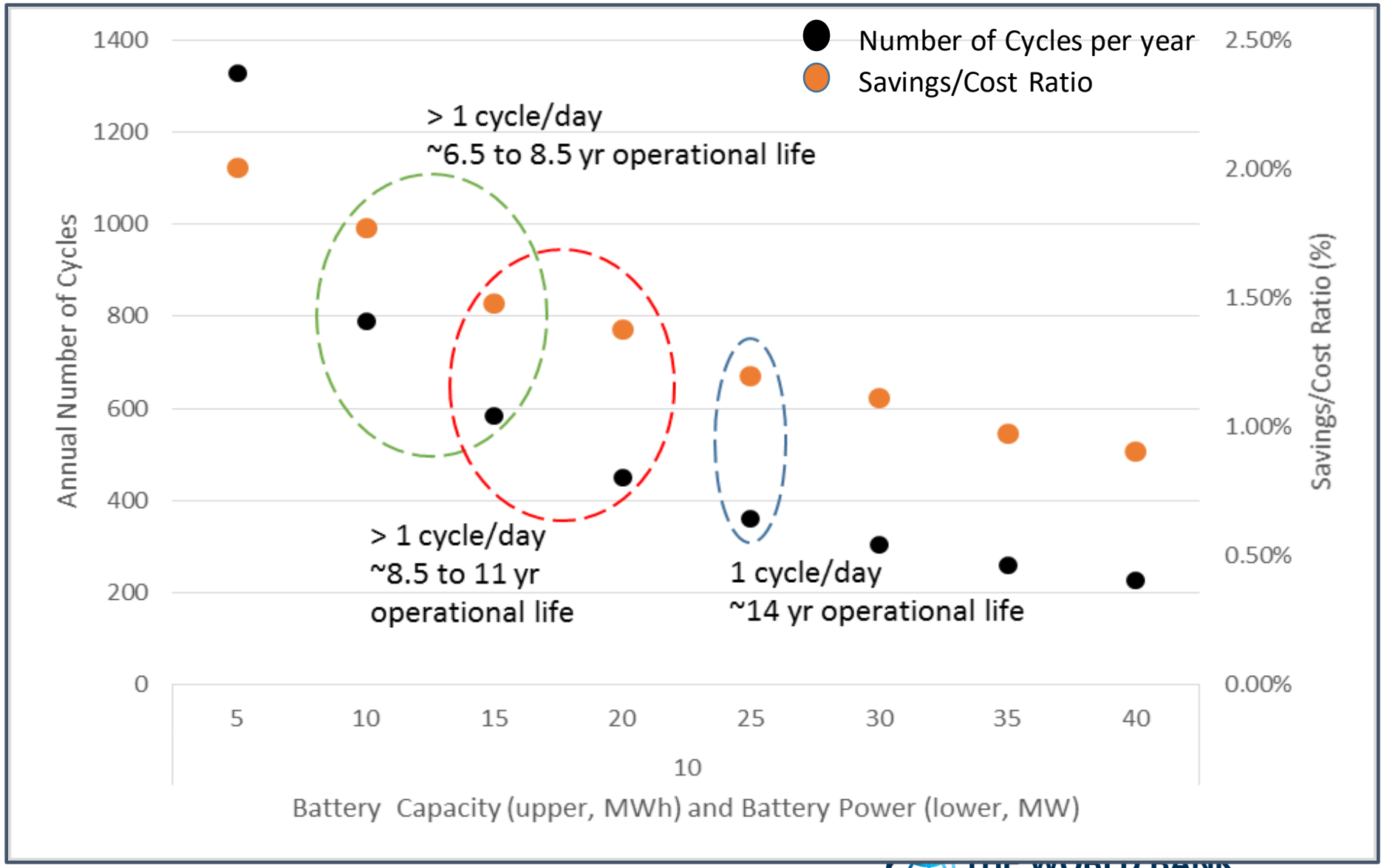
Battery Storage revenue streams- India

Primary Use Case- Curtailment Avoidance

Secondary Use Case- Ramp Rate Control

Tertiary Use Case- DSM Penalty Avoidance



A Case Study from an Innovative RE in Chhattisgarh

LCC at Bid Design Stage

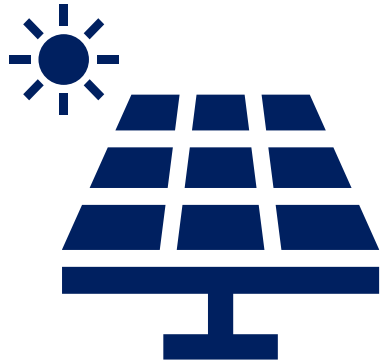
- Technology Agnostic Technical Specifications
- Price Bid for Full DSI (incl NPV of 10 years of O&M)
- Battery Supplier kept open (to avoid technology bias)

LCC for Tariff Calculation with Regulators

- Inverter Replacement cost (Every 4200 cycles or 7 Years)
- BESS components replacement cost (10th Year).

LCC while formulating QR for the Bidders

- DSI/EPC experience of similar sized/ specifications project in the last 5 years.
- Battery supplier as pure OEM at a later stage to prevent technical cartelization



160 MW (DC)/100 MW (AC)

+

40 MW/120 MWh

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1. The Oversized Solar field (160 MW DC) charges the BESS during the day while delivering cheap solar power to the state grid- capped at 100 MWAc at the transformer level.
2. The stored solar power is discharged during the evening peak hours – 1900 – 2200 hours.
3. The BESS output of 40 MW/ 120 MWhr replaces a coal thermal PPA.
4. This project demonstrates 3 big technical solutions.

- Energy arbitrage of Solar power.
- Replacement of a coal PPA.
- Increased penetration of RE in a coal –heavy state grid, helping meet RPO.

Project Brief- Repurposing a 40 year old Thermal power plant:Summary

Sl No	Repurposing Options	Feasible / Not Feasible	Remarks
1	Synchronous Condensers	Feasible	U#8 & U#9 are recommended for conversion to SYNCON based on analysis
2	Solar PV Based Generation	Feasible	Total 300 MW Generation Potential with 230 MW ground mounted;69 MW Floating and 1 MW Rooftop
3	**Battery Energy Storage**	**Feasible**	**Total recommended rounded off capacity is 440 MWHr**
4	Small Hydro Electric Plant	Feasible	3 x 5 MW to be installed on the Dam Toe
5	Biomass Firing	Not Feasible	Considering existing boiler type and modification required and lack of availability of biomass in bulk amount in vicinity – Not Feasible
6	Green Hydrogen	Not Feasible	Considering nonavailability of Off Take infra and lack of local demand – Not Feasible
7	Wind Power	Not Feasible	Low wind Power Density and speed – Below minimum technical threshold for feasibility

Battery Energy Storage

Charging Source	Purpose / Duty	BESS (MWHr)
Unit # 10	To improve flexibility of Generation	212
Unit # 11		
Solar: 40 MWp	To Reduce Variability of Solar Generation	245
Solar: 60 MWp		
Total Technical Potential		457
Commercially Recommended Capacity		**440**

Thank You!

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