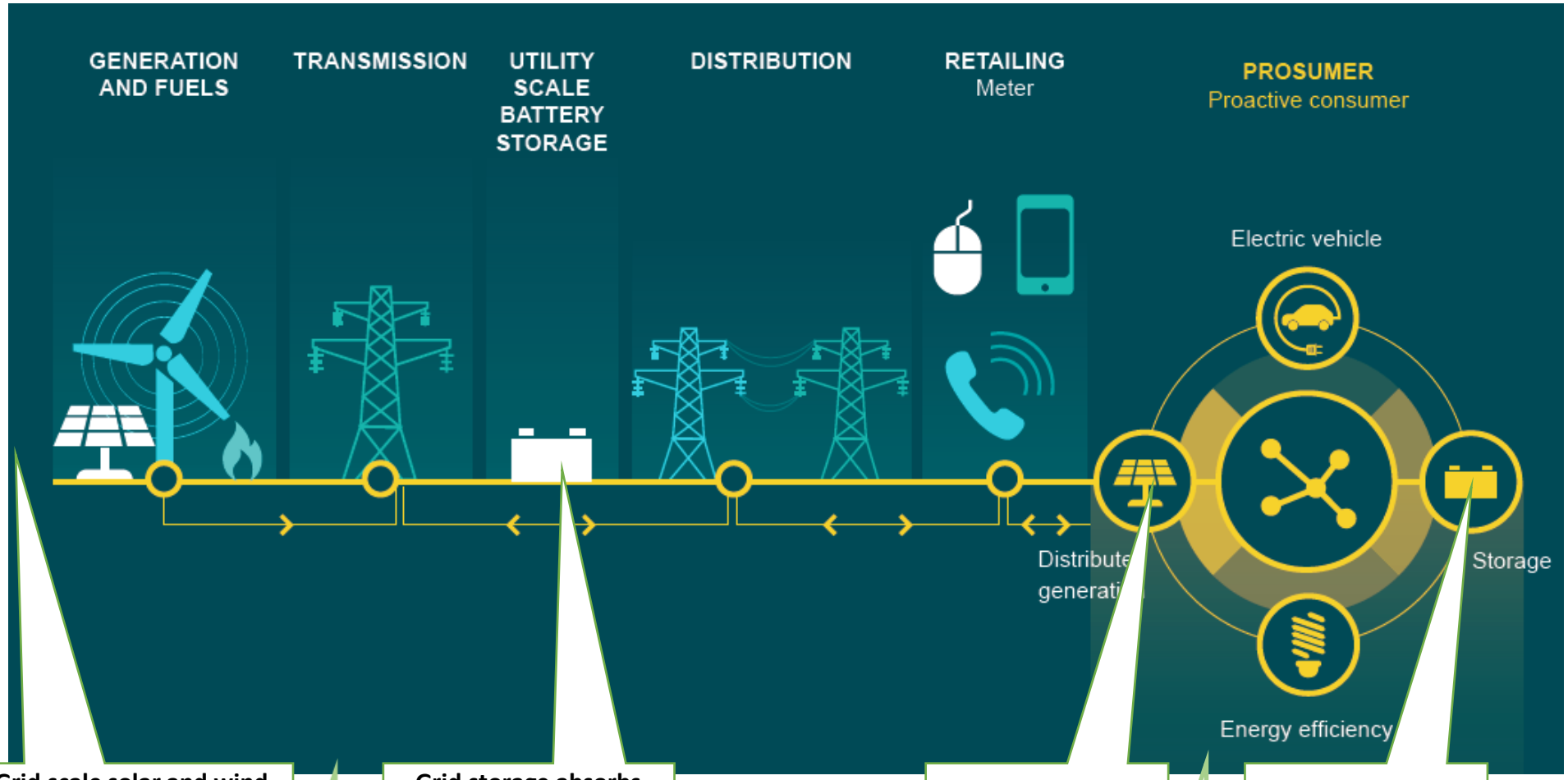
Need of Peak power projects in India- Significance of 100MW Solar 120 MWH storage projects in Chhattisgarh

Energy Storage is the Missing Link to RE penetration.



Drivers of storage

Indian power Sector - Key Drivers : **Energy security – Affordability - Minimal imports - Climate change - Employment generation**

Key Levers for Storage market

- Managing low-cost renewables in the grid
- Higher Utilization of Transmission Infrastructure
- Spinning reserves
- Maximization of distributed RE
- Carbon finance/market
- Greening transport

Operationalize key lever

- **RE to address base load :** Making Base load RE plants with Storage
- **RE to meet Peak Load** : RE+Storage will address peak demand.
- **Spinning reserve** to be replaced by storage in steps
- **Storage for Transmission:** Use of storage for grid extension and expansion
- **Distributed RE and storage** as embedded generation in cities, T&D deferral, DSM avoidance and local grid balancing.

Implementation Strategy

Old thermal Plants to be replaced with RTC RE Projects.

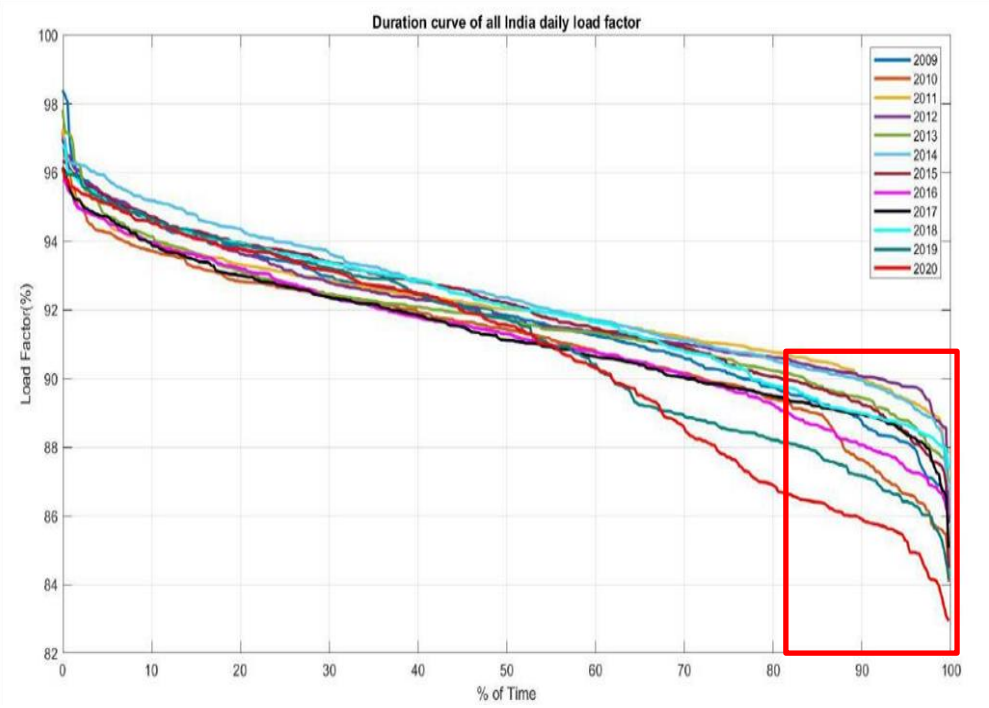
Low PLF conventional plants shall be replaced with RE+ Storage for peak load

Spinning reserve capacity in thermal may be replaced with Stand alone Storage systems.

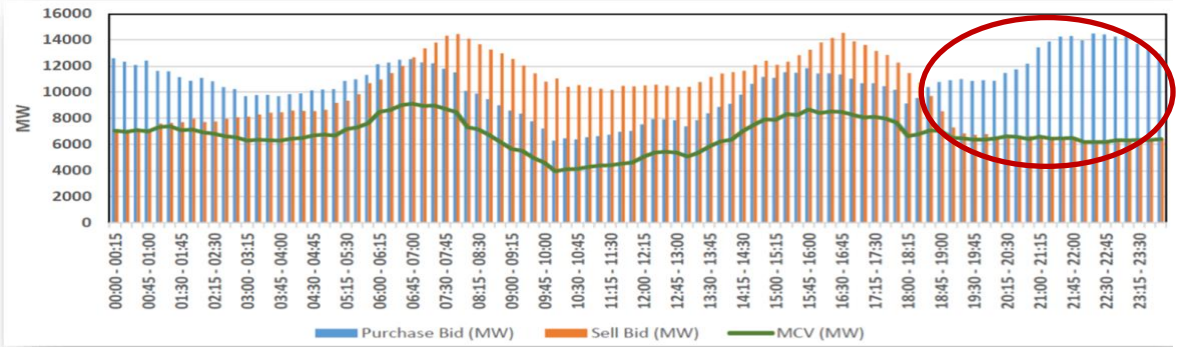
Transmission infrastructure for RE parks /Projects to be developed with Large scale energy storage

Discoms and specifically cities are to be mandated to have storage in the network

Business model 1 – Peaking power to be contracted by DISCOMs



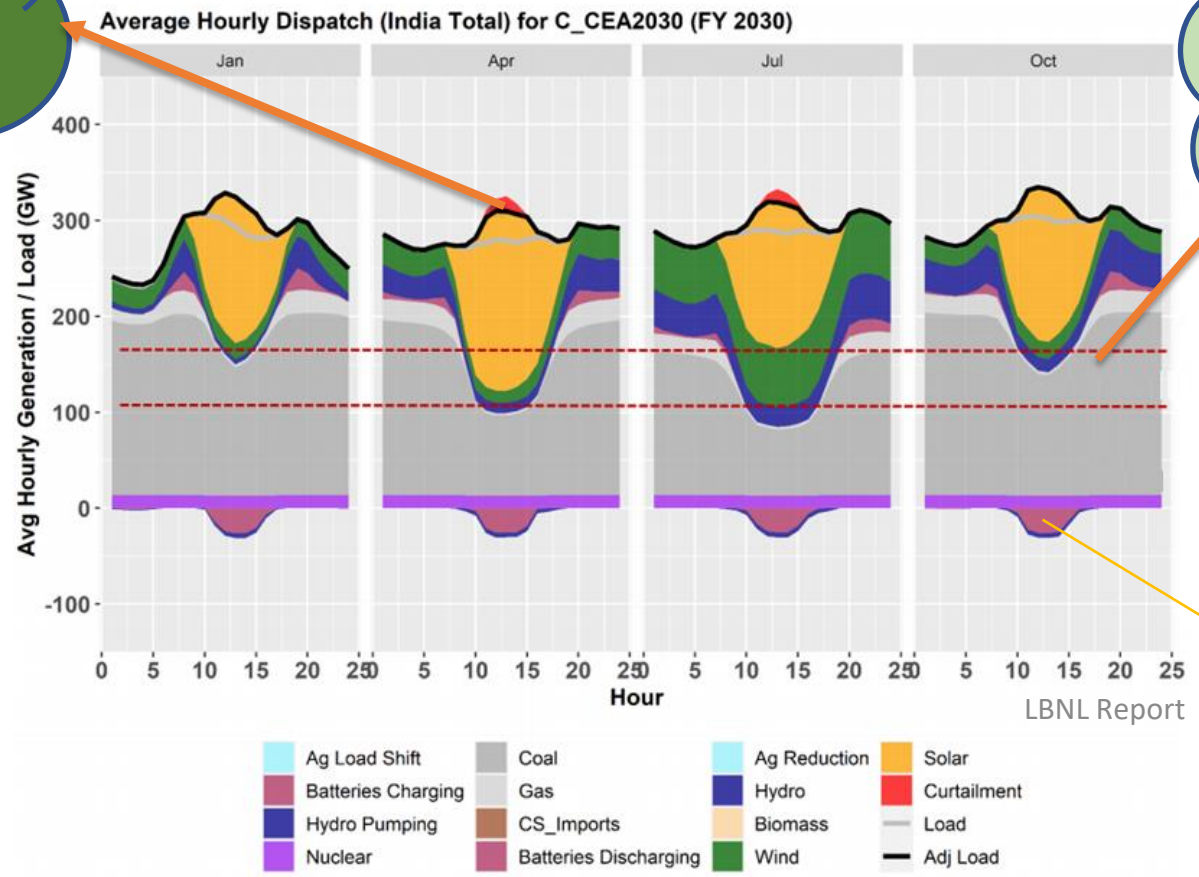
- Duration of Peak Power requirement is ~ 2-3 hours (10% of time).
- Considering fixed cost recovery at 55%, delivered fixed cost of such plants are around INR 9 /kWh - Variable Cost of energy increases significantly with falling PLFs
- Peak is growing faster than base and adding more thermal would increase more inefficient and costly peak power.
- Availability of Peak Power in the market (Ref. Buy and Sell Bids in Peak time) remains constrained (see fig. below from IEX)
- These capacity can be replaced by storage. Pilots can be done now that can be escalated and reassessment of thermal addition can be done observing performance of some pilots.



Integration Challenges @ 450 GW RE

Generation Demand mismatch / curtailment – Development RE projects to suit demand

Demand Creation – Time to slowly replace Sub optimal coal Plants



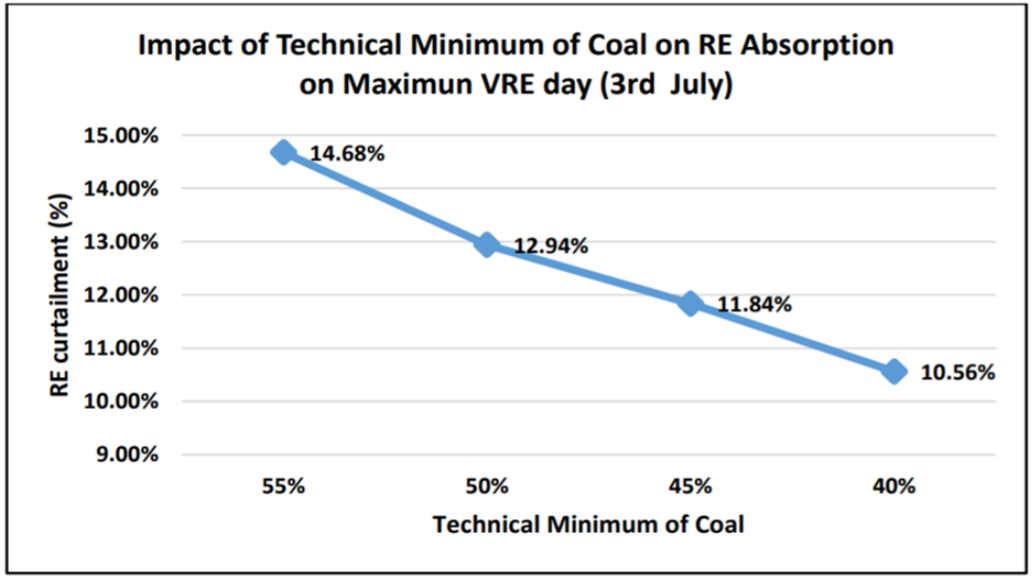
LBNL Report

Poor Utilization of T&D – Work on Higher PLF of RE plants

Storage Plays key role in reducing curtailment .

ESS Potential for peak shift projects

- Absorb maximum RE and minimize curtailment (*Fig: 10.56% curtailment even in the 40% PLF of Thermal Plant Scenario, Source: CEA Report*)
- Substitute Coal Plants located close to load centers creating pollution issues and also run on low PLFs
- Batteries can also perform other grid firming operation and host higher renewable, providing additional revenue.
- Spinning reserve with thermal units Can release up to 10 GW of power to be used in peak/base from present capacity
- Battery can replace 26 GW of coal, which are at low PLF, and cost of delivery and O&M is high.

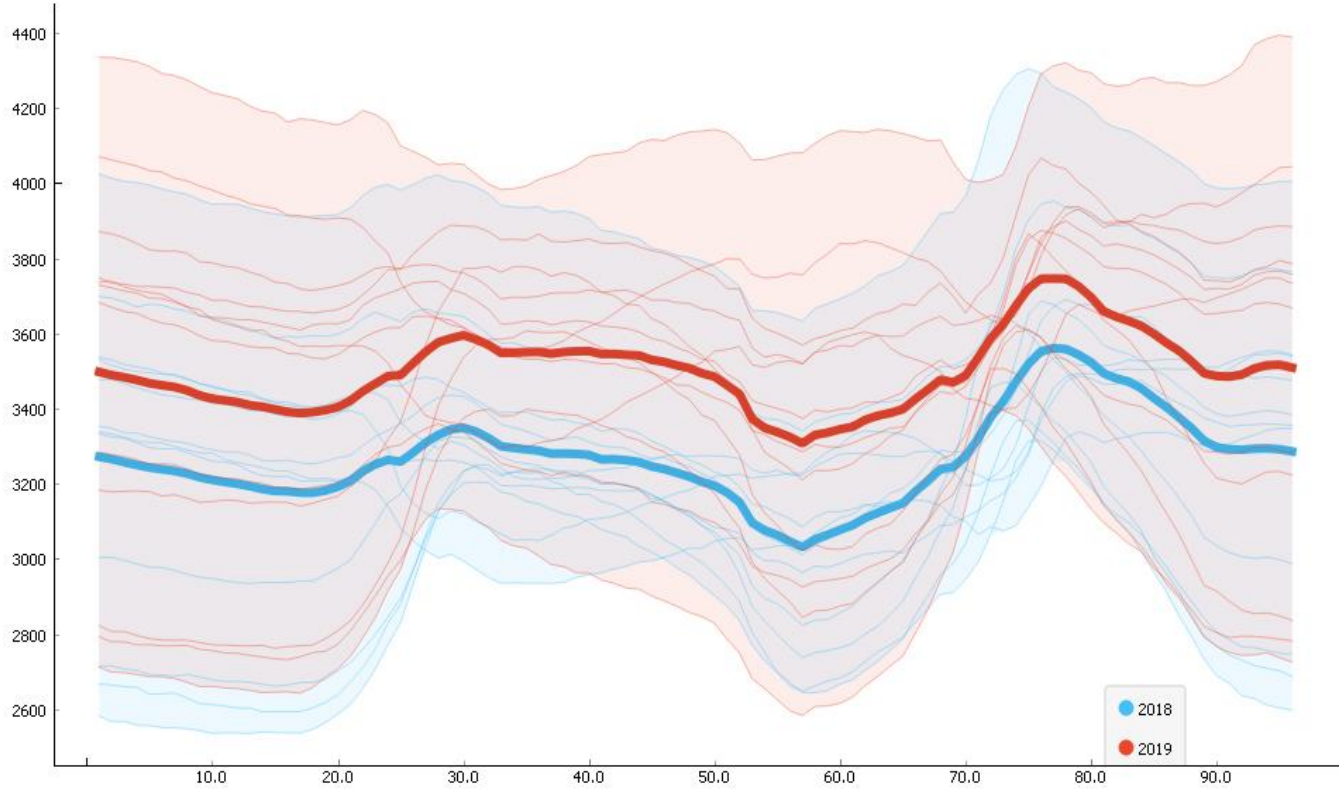


Impact of Technical Minimum of Coal on RE Absorption

Load pattern of Chattisgarh

- Load pattern of Chattisgarh is quite dynamic in nature.
- The night load varies from 2700 MW to 4400 MW
- During some months the night load is higher than the day load.
- During all the months evening peak is prominent.
- Base load is of around 2600 MW.
- Annual increase in load is of ~ 6%.

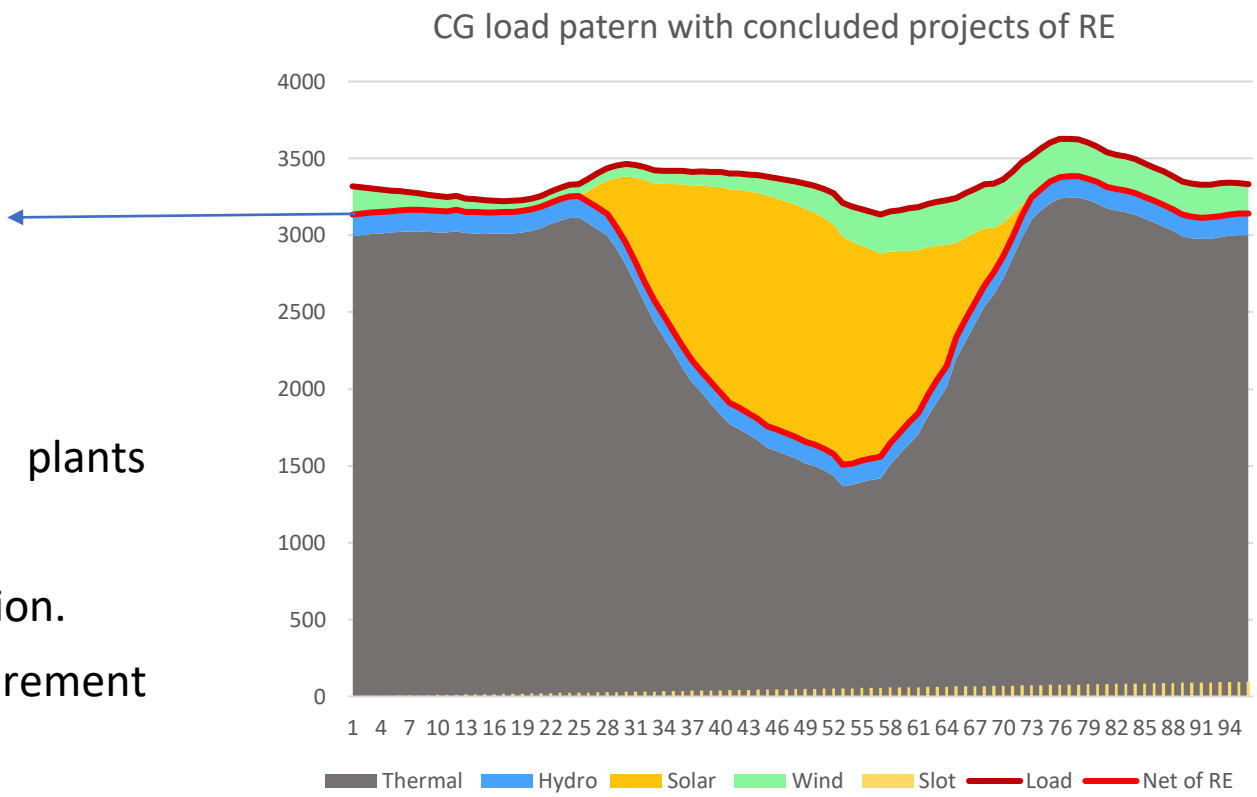
With the dynamics strategic procurement of RE power to be thought off



Source CS SLDC

Load analysis tied up RE capacities.

- After completion of the already tied up solar projects
- Solar generation in the noon - >50% of average load.
- Affects thermal plants PLF.
- Increase in balancing cost.
- Occurrence of Duck Curve
  – demands steep ramping rates of conventional power plants
  – Requirement of fast response balancing plants like gas or Storage
- Grid stability issues - due to fluctuations in RE generation.
- Huge independent balancing Storage capacity requirement to maintain grid.



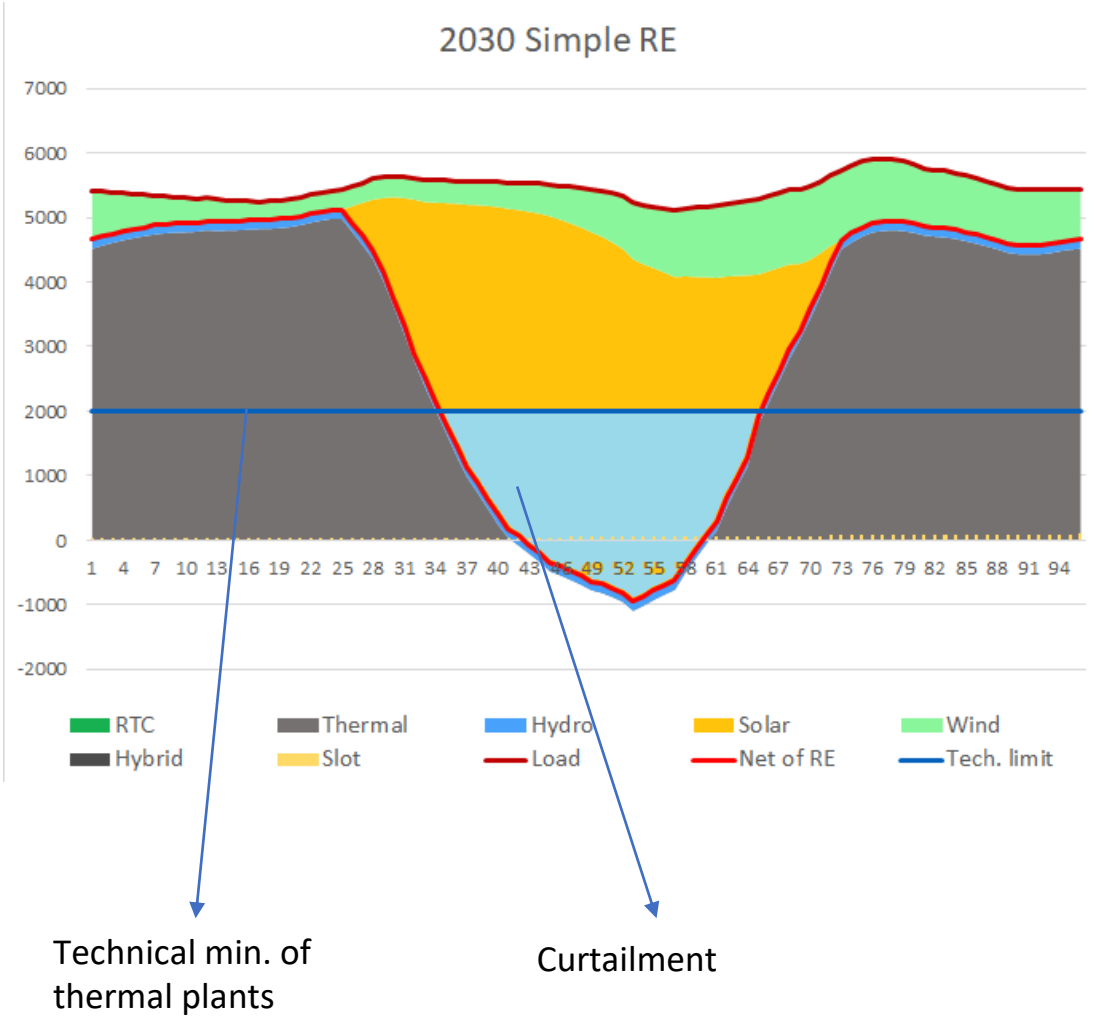
2030 – simple RE capacities deployment

It is required to absorb 5 GW of solar and 2 GW wind by Chattisgarh as per the national RE target of 450 GW.

If the simple solar and simple wind are continued to deploy :-

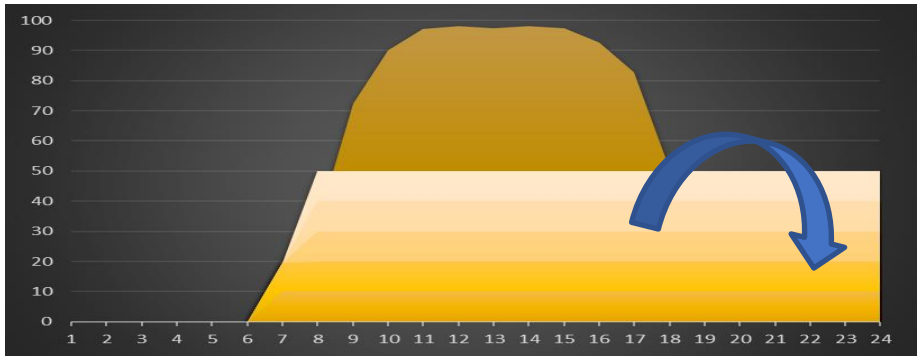
- Continued dependence on conventional plants for balancing power during non RE generation hours.
- Simple solar /wind lead to huge curtailment of RE power
- Steep ram up and ramp down.
- Need Huge Storage capacity to maintain grid.
- Poor utilization of transmission network with Low CUF.
- Stressed operation of balancing plants.

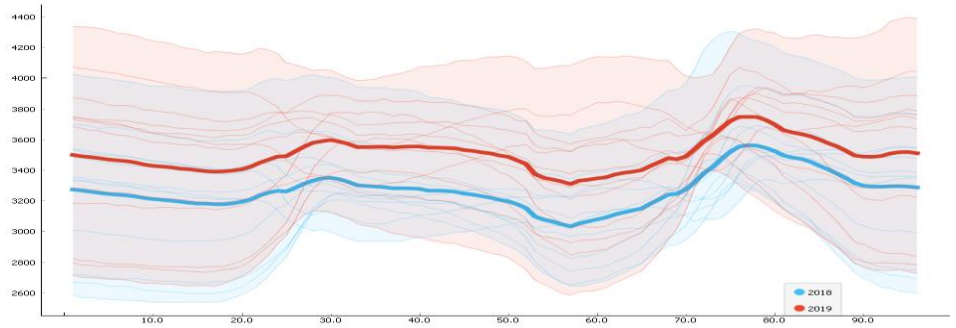
It is required to shift some part of solar generation to Evening peak



100MW solar project with 120 MWh storage in Chhattisgarh

- SECI approached CG government with the concept of solar + Storage project with assured peak power form energy storage.
- CG government shown interest in the project and given go ahead and agreed to provide land for the project.
- Plant design : 100MW/160 & 40MW/120 MWh





- Innovation
  - Efficient land utilization ~ 1 hectare/MWp
    - 160 MW in 180 Hectares
  - Use of High efficiency bifacial solar panels.
    - >20% efficiency solar panels
  - Largest battery project in the country
    - 120 MWh at single location

- The proposed project will provide 120 MW energy during peak hours.
- The project will pave way forward for
  - Avoidance of duck curve.
  - Meeting Ramp rate and frequency control through energy storage.
  - **Future innovative RE projects to address the peak demand of the states.**

Impact of ISHTP Scheme on other developments

- The learning of the various projects under the scheme lead to the following developments in RE Projects innovations
  - Development peak power scheme.
  - Developed RTC RE scheme
  - Developing Load Following RE RTC scheme.
  - Developing Flexible RE generation Projects
  - About to issue Large scale stand alone storage projects
  - Developed plans/solutions for
    - Greening of Islands
    - De-carbonization of Ladakh

RfS for Setting up of Pilot Projects of 500 MW/ 1000 MWh Standalone Battery Energy Storage Systems in India under Tariff-based Global Competitive Bidding (ESS-I)

(RfS No. SECI/C&P/IPP/15/0001/22-23 dated 13.04.2022)

Solar Energy Corporation of India Limited

(A Government of India Enterprise)

Salient features of the RfS - 500 MW/ 1000 MWh

- Standalone BESS Project : 2 Projects of 500 MWh (250 MW x 2 hrs) each.
- To be set up on "B-O-O-T" basis for providing storage facility to Procurer "on-demand" basis. – Transfer at the end of 12th year
- Land & connectivity will be provided by the transmission licensee at Fatehgarh-III S/S of ISTS network.
- Both Projects to be set up at the same location, a bidder can quote for either one or both of the Projects.
- Bidding to be conducted on a single tariff i.e. capacity charges (INR/MW), payable on monthly basis
- SECI shall sign BESPA for utilization of 60% of Project Capacity - 40% to be taken care by developer

Project Performance Criteria

- Min. availability of 95% on annual basis. – Annual Degradation factored.
- Min. 85% Round-trip efficiency to be maintained – LD on lower efficiency (APPC tariff).
- Charging/discharging as scheduled by Off-taker - Resting period" of 1 hour
- BESS to be made available for daily utilization of 2 cycles/day.
- Penalty on account of no availability - 2X capacity charges for non-availability

Thank You

Innovation in Solar power and Hybrid Technologies (ISPHT)

- SECI and World Bank is working on "*Innovation in Solar power and Hybrid Technologies" program to promote innovative concepts in Solar and Hybrid power projects.*
- Loan Components: WB will support 50% of the project cost
  - IBRD : $150 Million
  - CTF : $28 million
  - CTF grant : $22 million (incl. 2million TA)

- Under the World Bank Loan Support SECI is developing
  - **100MW/160 MWp project with 40MW/120 MWh Battery storage for providing peak power In Chattisgarh .**
  - 100 MW Floating solar project at Getalsud Reservoir, Jharkhand.
  - 140 MW solar, 60 MW Wind hybrid project with 120 MW/150 MWh storage, at Ramagiri, AndhraPradesh for supply firm RE power on demand basis to Utilities