# Major Project Dissertation Report

# On

# Business Development Opportunities and Growth Strategy for Power Sector PSU


Submitted By:

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# CERTIFICATE

This is to certify that Saubhagya Dwivedi of EMBA has successfully completed his project on topic "BUSINESS DEVELOPMENT OPPORTUNITIES AND GROWTH STRATEGY FOR POWER SECTOR PSU" as prescribed by supervisor during the academic year 2021-2023 as per the guidelines given by Delhi School of Management.

**Date: 20th MAY 2023**

**Mr. Yashdeep Singh**
**Assistant Professor, DSM**

# DECLARATION

This is to certify that the Project, entitled "BUSINESS DEVELOPMENT OPPORTUNITIES AND GROWTH STRATEGY FOR POWER SECTOR PSU" done by Mr. Saubhagya Dwivedi, University Roll Number EMBA/2k21/40 is an authentic work carried out by him at Delhi School of Management, Delhi Technical University. The matter embodied in this project work has not been submitted elsewhere to the best of my knowledge and belief.

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# ACKNOWLEDGEMENT

I wish to express my gratitude to my project guide and mentor for his valuable guidance and providing me an opportunity to do this project. This project was a great source of learning and provided me a good experience, as it has made me aware of the professional culture and conducts that exists in an organization.

I would like to express my innate sense of gratitude to my teachers who encouraged me a lot during the project and without their assistance and affection this project would not have been completed. I thank them for being there.

## Contents

## EXECUTIVE SUMMARY

Achieving net zero has become very important as it can pave the way to tackle climate change and also reduction in global warming of the world. Net zero commitments are now expected standards for companies, local, regional, and national governments.
In order to achieve this milestone, many companies have shifted their operations and have started walking in the direction of becoming net zero.

With this project, I have tried to identify and analyze organic and inorganic business development opportunities and have tried to plan their growth strategies or key success factors in order to enter new markets and aim towards achieving the net zero targets for a Power Sector PSU –
REC Power Development and Consultancy Limited.

The opportunities/areas of focus includes - a business opportunity, its viability on short term, medium term and long-term basis, analysis of the present market scenario, the opportunity size or the market size in terms of the potential clients or the evaluation of the market on cost basis, the key capabilities that are to be possessed by the client in order to excel in that domain and the appropriate business models that can be implemented along with business use cases.

Through deep market research and analysis of the above mentioned activities, I have tried to conclude some recommendation for the company which can be treated as the stepping stones to enter into new domains and gain experience and built their expertise overtime.

# 1. INTRODUCTION

## 1.1.Industry Profile

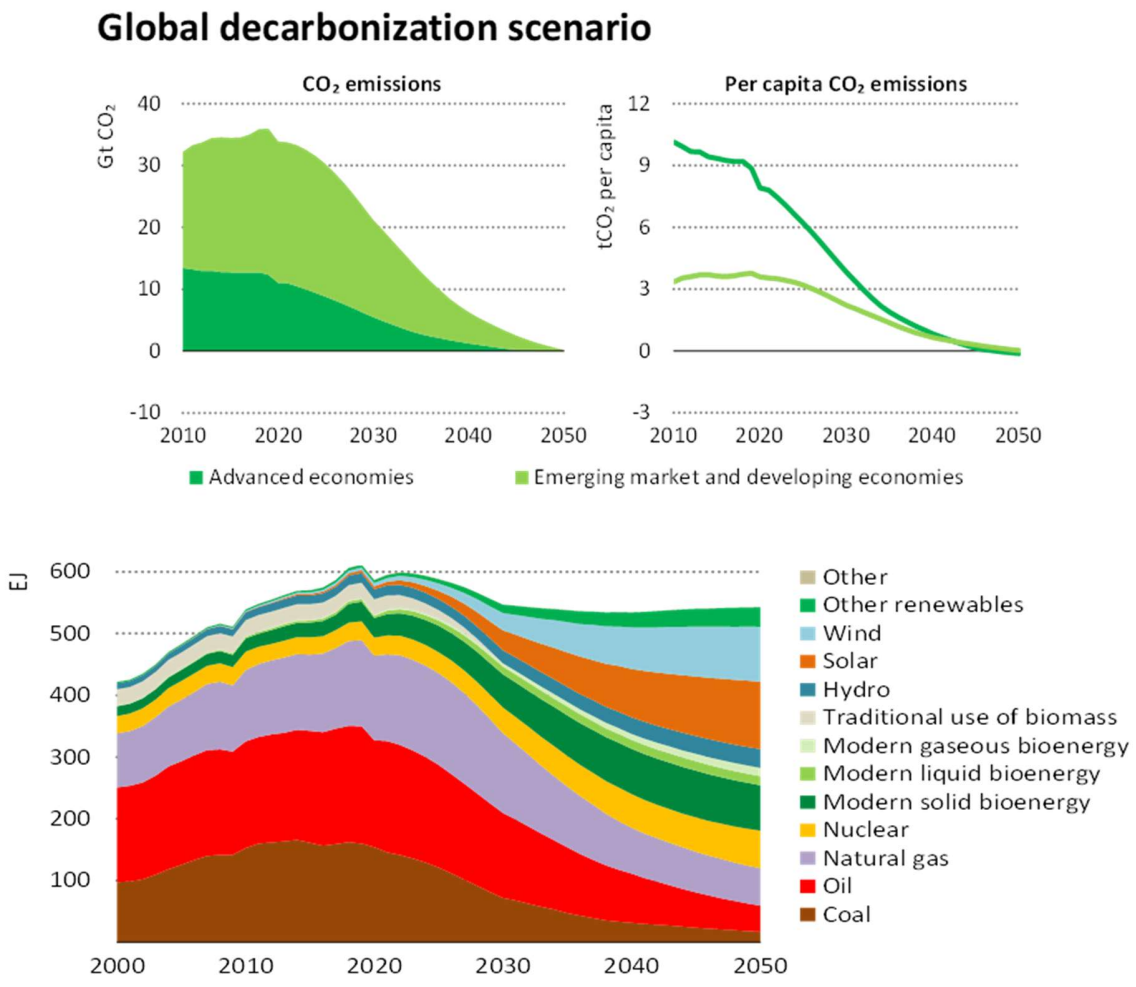
India has gradually paved the way to become net zero. In the recently held COP,26 summit held at Glasgow, PM Sh. Narendra Modi committed India towards ambitious five-part goals. Out of these five, four of them are specific for 2030. 1) Reach 500GW of non-fossil electricity capacity specific goals for 2030; 2) 50% generation for all energy requirements from renewables; 3) Reduction in emissions by 1 billion tons from now to 2030; and 4) reducing the emissions intensity of the Gross Domestic product by 45.%.
Attaining the net zero target means that decreasing India's GHG emissions and working on improving the efficiencies and technological advancements in every CO2 intensive sector. Decarbonization or net zero can be achieved by focusing on the following sectors:

India's power value sector chain is one of the major contributor in CO2 emissions, and in that, the coal fired PP( power plants) are majorly responsible. The energy sector comprises of heat, electricity, fuels combustion majorly accounts for India's 40% emissions approx., with coal combustion adding up to 70% of energy sector CO2 emissions.
The already set-up coal fired plants are still in existence and will continue to run for a long duration of time. Improving efficiency in terms of both operational and functional efficiency by means of infrastructure strengthening or operating parameter optimization can help lower down the emissions and can create a significant impact.

The best way possible is to replace the fossil fuels with renewable energy like solar, wind and hydro. India's government has taken several initiatives in promoting solar and other renewables and has laid out uplifting policies for the set-up of RE plants. With technological advancements and cost cut of solar day by day, the cost of setting up of new coal plant is estimated to be much more than setting up a solar plant. India's greenest energy change is accelerated with sophisticated and trending renewable solutions like battery storage and solar hybrid with battery solutions.

We have also seen new trends emerging like Block chain and peer to peer trading, gross solar metering and virtual solar metering rising in the world as well.

Another bet is hydrogen. By the clean energy sourced from hydrogen, it is believed to help many industries decarbonize sectors such as power, steel and oil refineries, cement factories, ports and logistics. Focusing on meeting its climate targets, Prime Minister had announced National Hydrogen & Mission (NHM) with the aim to assist government in achieving their climate targets and taking India on a next level to emerge as green hydrogen hub.



## 1.2. Organization Profile

REC Power Development and Consultancy limited erstwhile REC Power Distribution Company Limited (RECPDCL) , a wholly-owned subsidiary of REC Ltd, which was incorporated on the 12th of July, 2007. Followed by commencement of business on 31st of July, 2007. The company focuses on utilities' facilitation in their areas of operations, dealing with Power sector value chain, by providing expertise and their support to capitalize the emerging trends and the needs of Power Sector.

It has the following certifications like

ISO 9001:2015

ISO 14001:2015

OHSAS 18001:2007

***VISION AND MISSION***

- To facilitate availability of electricity for accelerated growth and for enrichment of quality of life of rural and semi-urban population.
- To act as a competitive, client-friendly, development-oriented organization and promoting projects covering power generation, power conservation, power transmission and power distribution network in the country.

***KEY ACTIVITIES:***

RECPDCL is implementing transmission and distribution infrastructure projects and providing Consultancy services to the Power sector Utilities under the following heads:

- AT & C Loss reduction.
- Smart Grid and SCADA, ADMS, OMS Solution, IT & OT in Utilities, etc.
- AMI Solution deployment & Smart Metering Rollout
- Unified Billing System & ERP implementation
- Digital Solutions & deployment - Mobile Application & Web Portal, Cloud & Cyber security, Analytics, Artificial Intelligence /Machine Learning, BI & Data Mining
- RT-DAS for feeders. (Real time data acquisition)
- EV Charging

- GIS and its Implementation
- IT implementation projects in IPDS scheme
- Solar PV Plants
- Power Distribution and its Strengthening works
- Transmission projects
- Distribution franchisee/licensee
- Smart meters implementation
- Energy Accounting and Auditing

## 1.3. Objective of the project

The objective of the project is to identify the new business opportunities for RECPDCL and plan their roadmap and strategies on how to enter into multiple domains and how to excel into their existing domains and strengthen them by drawing their business cases for all the prospective scenarios and providing them with the recommendations to act and deploy the necessary steps in order to grow and become a market leader serving the value chain of Power Domain.

## 2. LITERATURE REVIEW

Indian energy industry is in a transformation stage. Quite a few changes are happening across various levels. Government is proactive in driving such changes at a massive scale and speed. This creates lot of market opportunities for various players in the industry.

Following are some of the areas which are likely to generate business opportunities for players in the Power industry:

1. **Revamp Distribution Sector Scheme (RDSS):**

Projects involving the new scheme issued by the Central Government with a focus on improving the distribution & transmission infrastructure and enhancing operational efficiency. The scheme gives incentives to discoms for achieving and implementing the said works.

This also covers the 3,00,00,00,000 meters under smart metering on pan India basis.

2. **Digitization or Technological Upgradation:**

The new technologies have a lot of potential to meet the energy and its demand and push the sustainability initiative. Internet has augmented the advancement of all sectors and power sector is set to record these changes. Focus on Cloud and 5G based technology can be used for the enhancement of the efficiency of this power sector.

Digitalization using IoT in Distribution sector can be applied in:

- **Advance Metering Infrastructure/ Automated Meter Reading**
- **SCADA/ OMS or ADMS**
- **Power Purchase cost Optimization**
- **Substation automation**
- **Distributed energy resources, EVs, Energy Storage and Microgrids**
- **Home and Building Energy Management**

### 3. Emerging Technologies

India is set to increase its green energy production as a subset of the Paris agreement. India has committed its contribution in raising the green energy gen. from the 25% to 40% by end of 2030.

**A. SOLAR:**

With the mission for achieving 450 MW of renewable capacity by 2030, Solar will be the main technology with the most-wide application. Technology cost reductions with cost-competitive set market and policy support have quickly made it the cheapest option for new power generation.

**B. Battery Storage and EV**

Battery storage can act as an enabler in the replacement of the fossil fuels like coal and petroleum with (RE) renewable energy. By 2030, the sales of Electric Vehicles shall boom and EV will play a pivotal role in replacing the fossil fuels with clean energy.

**C. Green hydrogen**

The qualities of Hydrogen makes it a very exciting potential source of energy. Hydrogen based generation or Fuel Cell can be used for catering the energy demands

**D. Blockchain**

By the use of Block chain and P2P trading, Digitalized energy systems in the future may be able to deliver the energy at the right time to the right individual at the lowest cost.

### 4. Transmission of Electricity

500GW of RE by 2030, the govt. target set in Paris agreement is a key driver for grid expansion. Private investments will play an important role in grid expansion as competitive bidding is trending. With the focus on transmission, the government policies have boosted all transmission schemes like (TBCB) Tariff based Competitive Bidding or under cost-plus mechanism with (RTM) Regulated Tariff Mechanism.

Even the technologies that can be used in the transmission sector is cutting-edge. Some of the latest technologies which can impact future transmission projects are:

- Aerial Patrolling
- GIS Mapping
- UAV/Drone's Emergency Restoration Systems
- Hot line Maintenance

- Digital Sub-stations etc.

### 5. Reformation of Power Sector

With the Privatization of the discoms already in the picture, the upcoming reforms can also lead to a lot of potential Projects.

### 6. Cyber Security

It can be estimated that distribution companies will have the majority of IOT endpoints which is potentially high risk and vulnerable. Cyber security and safeguarding of infrastructure and operations would be necessary.

## 3. BUSINESS CASE ANALYSIS

Based on the opportunities identified in the above section, it is proposed that RECPDCL can work on the ORGANIC growth areas and IN-ORGANIC growth areas. The opportunities identified keeping in view RECPDCL's expertise to excel and grow in the areas are:

I. Battery Energy Storage as a Service

II. Distribution Operations of Electricity

III. Transmission Infra Developer

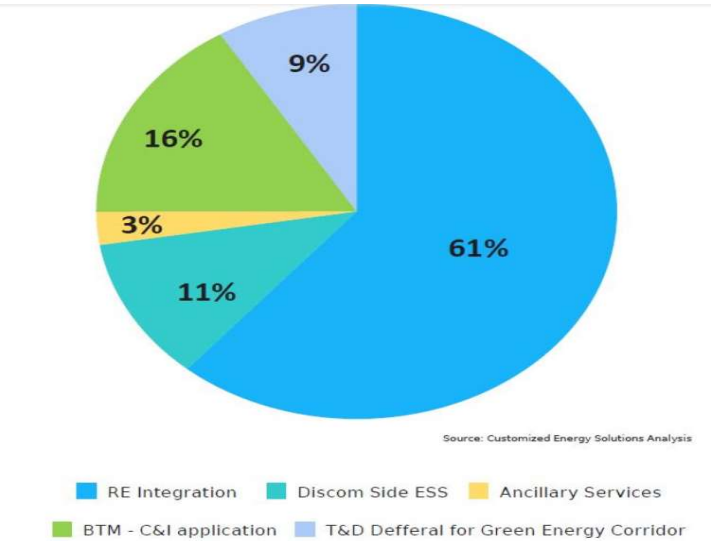
IV. Power Procurement Cost Optimization

V. Green Hydrogen

## 3.1 BATTERY ENERGY STORAGE AS A SERVICE

### 3.1.1 Present scenario

The recent addition of the Energy Storage Obligation (ESO) with 1% of power to be bought from storage solution by 2023-2024 and gradually rising to 4% by 2029-2030 alongside the RP obligations for the discoms. This paves a way for further growth opportunity in this particular area of the Power Sector.




BESS has clear applicability in the following areas:-

**Distribution**

- Reduction in peak power procurement cost through peak shaving
- Quick ramp-up support and saving in DSM penalty
- Enhanced reliability and outage management
- Network loss reduction
- BESS participation in Ancillary Services (AS) and Power Market

**Transmission**

- Integration of BESS for optimal design of transmission line with high capex and low utilization
- With intermittency of RE, BESS can be used at the Generation end to optimally design the transmission line rating and size
- Suitable for long distance TL transmitting RE (e.g. TL in the hilly terrain of NER, J&K, Ladakh etc.)

Generation

- Battery storage integration with thermal power plants to avoid RE led load curve disruption
- Battery storage integration with Solar and Wind portfolio to ensure ” Despatchable RE”

| | |
|---|---|
| **Area required for setting up Battery Storage** | ¼ acre for 20MW with 2-hour storage.* |
| **Costing for Procuring batteries** | Rs. 3.28 – 4.0 Cr per MW Capex Cost* |

### 1.1.2 Opportunity size

DISCOMS can leverage the peak load by implementing battery storage systems and as Energy storage is incredibly diverse; RECPDCL should start with large C&I customer having storage applications upto 5 MW to meet their RTC RE targets. Later RECPDCL can focus on large scale grid application for Discoms and Generation utilities and RECPDCL can leverage its expertise and funds in doing so.

#### 1.1.2.1 Market Size

***Short to medium term market***

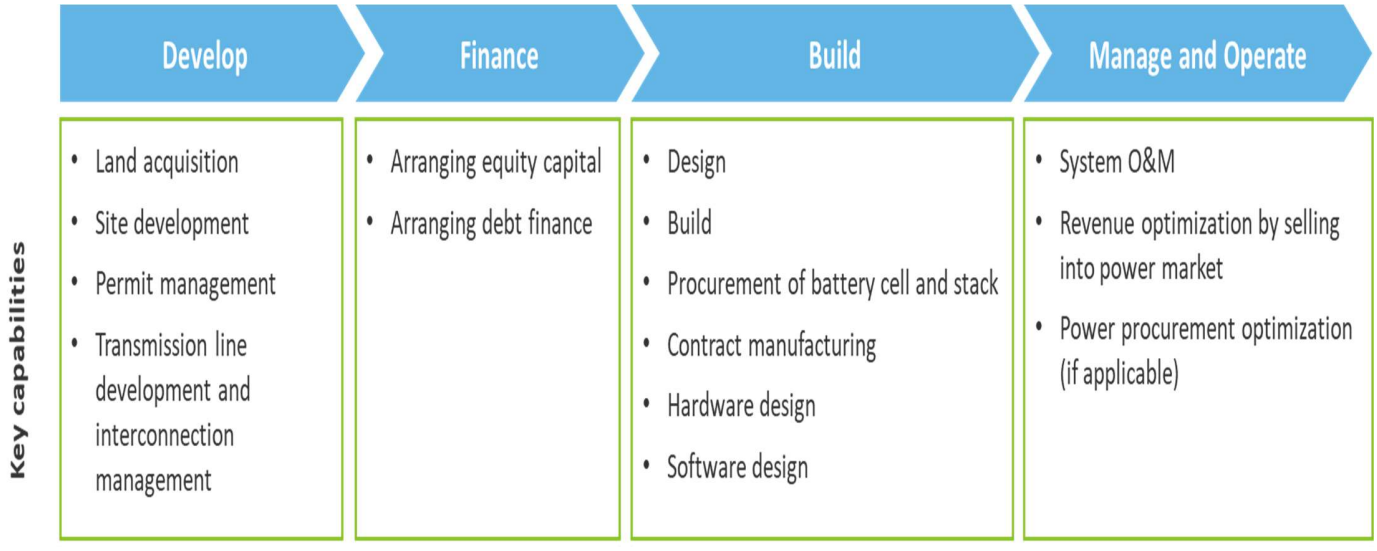
- **13 – 15 GWh** visibility in India in **next 2-3 years**
- Bids are either floated or announced by MOP, SECI and NTPC
- C&I customers need to be proactively approached and the overall solution would be designed to them

***Long term projections***

- **140 – 200 GWh battery storage** capacity by 2040.*
- **NREL projection**: By 2030, 50-120 GW, or 160-800 GWh, and 180-800 GW (750–4,800 GWh) by 2050.

### 1.1.3 Capabilities required

RECPDCL needs to evaluate right business model for BESS as a Service for Transmission, Distribution, C&I consumers. Alliance and collaboration with global battery manufacturers and system integrators will play a pivotal role for smooth entry in this market. RECPDCL also needs to ensure internal capability development through mobilization of right team.



Given the following capabilities required, RECPDCL has to map the capabilities existing in the system, capabilities that can be created and the capabilities that need to be outsourced to third party. However, the core capabilities related to lead generation, solution designing, financing of the project, procurement, implementation and O&M of BESS has to be housed internally.

**Key Risks:**

- Limited precedence of large-scale operations of BESS globally
- Reliability of Battery storage technology
- Fierce competition from global players
- Unfavorable contractual terms of battery PPAs

**Potential competition:**

- *Existing system integrators*: Will strengthen their position in this market.
- *RE players*: diversify in this space as an adjacency.
- *Transmission and Generation utilities*: diversify in this space as an adjacency.

### 1.1.4 Business Model

***Developing a flexible Commercial model***

- Going for a Subscription based model or a performance-based contract.
- A flexible profit model can be designed based on usage of the solution (Rs/kWh). It can also be a percentage of benefits realized by the customer.

***Forge relevant Alliance and Partnership***

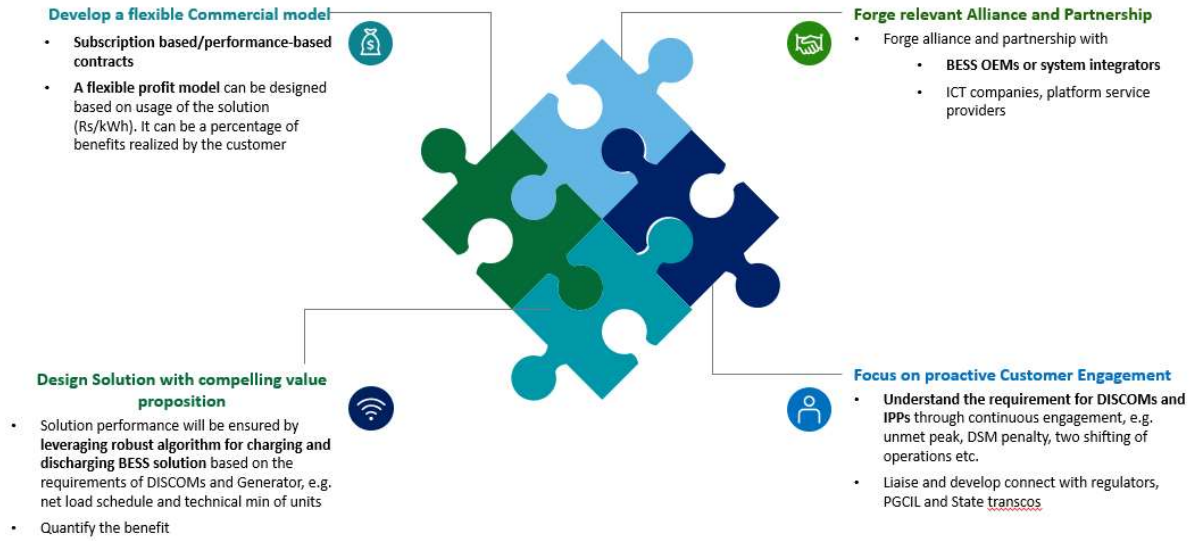
- Forge alliance and partnership through empanelment mechanism with
    - BESS OEMs or system integrators
    - ICT companies, platform service providers

***Designing a Solution with compelling value proposition***

- Solution performance will be ensured by leveraging robust algorithm for charging and discharging BESS solution based on the requirements of DISCOMs and Generator, e.g. net load schedule and technical min of units
- Quantifying the benefits
- Leverage existing technical resources to develop and manage this solution

***Focus on proactive Customer Engagement***

- Understanding the requirement for C&I Customers, DISCOMs and IPPs through continuous engagement, e.g. unmet peak, DSM penalty, two shifting of operations etc.
- Liaise and develop connect with regulators and State Transcos etc.




*Key Success Factors for Storage as a Service*

Highlight of Recent Tender and its Business Model:

| Capacity | Firm | Costing | Business Model |
|---|---|---|---|
| 1000 MWh (500 MW x 2hrs)<br>500 MWh (250 MW x 2 hrs)<br>SECI | JSW energy | Fixed capacity payment over a 12-year term of Rs. 10,80,000/MW. | 60:40 split between of the system's availability.<br>40% of the capacity can be used to generate additional revenues by the firm. |
| 3000 MWh<br>NTPC | Greenko Energies | Rs. 27.9L/MWh/year | Developed on a build, own, and operate basis.<br>25-year energy storage service agreement on an annual fixed charge basis. |

***Competitors in the market:***

- IndiGrid 1,
- JSW Neo Energy,
- Enel Green
- Hinduja renewables
- Greenko Energies
- ReNew Power

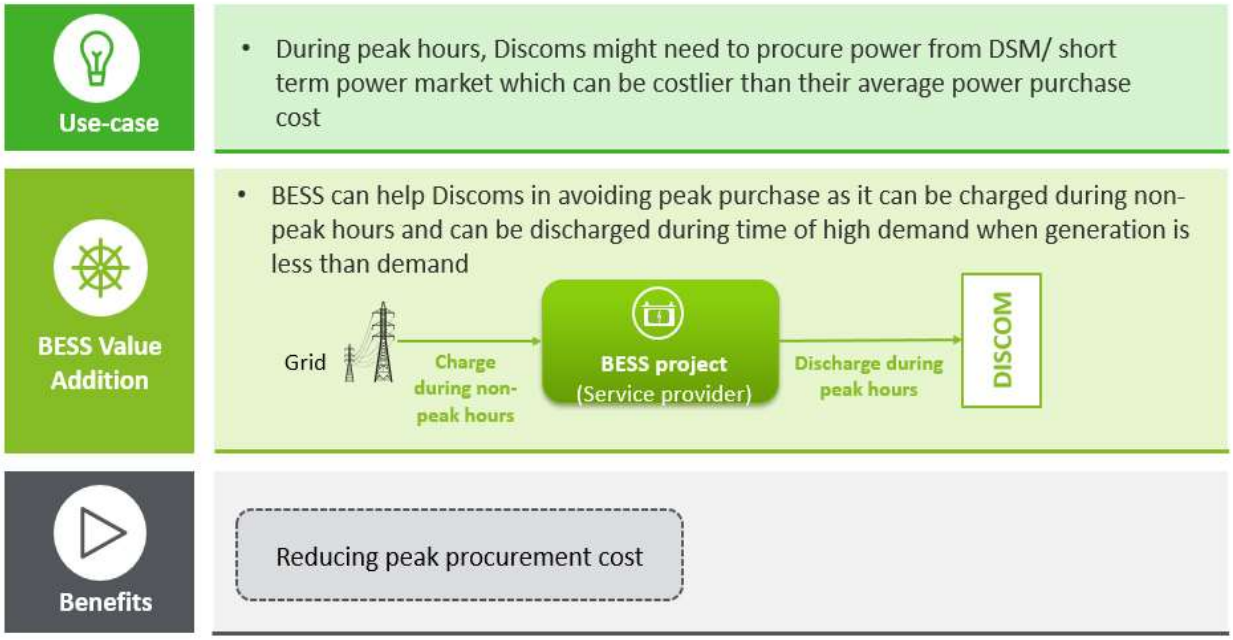
***Potential Customers:***

- C&I Customers
- Small Pvt Utilities
- Utilities with no storage installed till date.

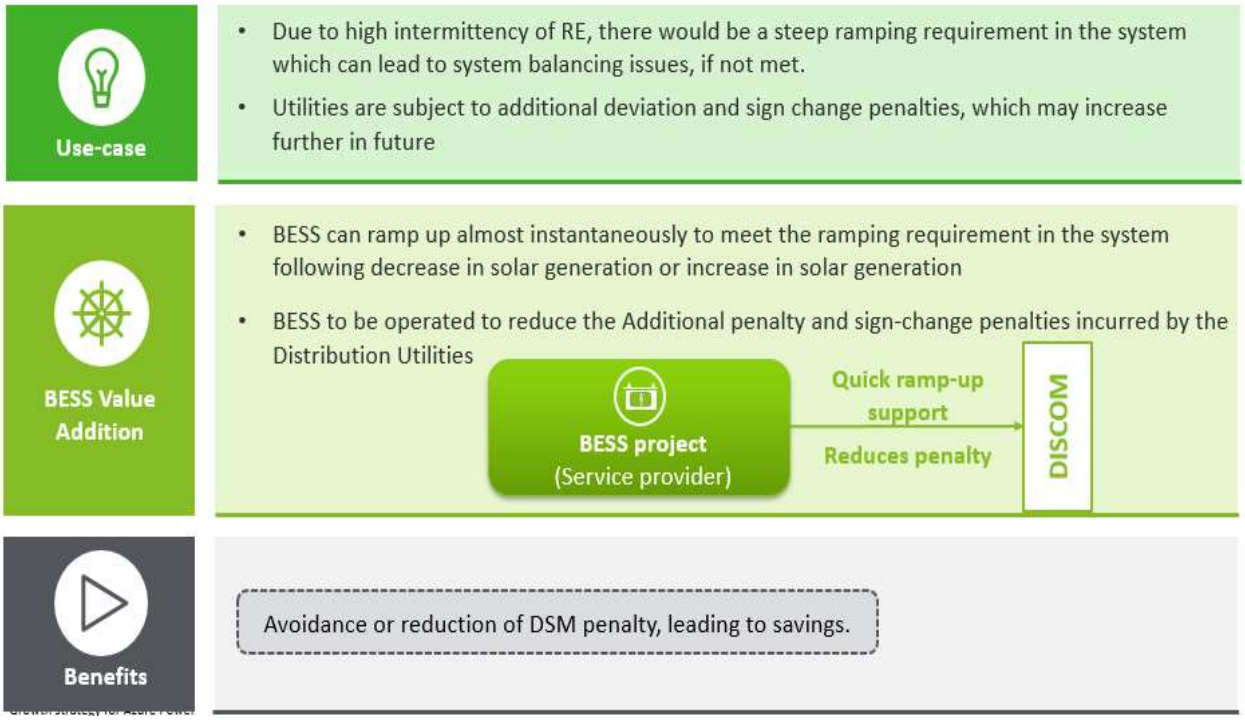
### 1.1.5 Business Use Cases:

***3.1.5.1 Business cases for Discoms that can be considered:***

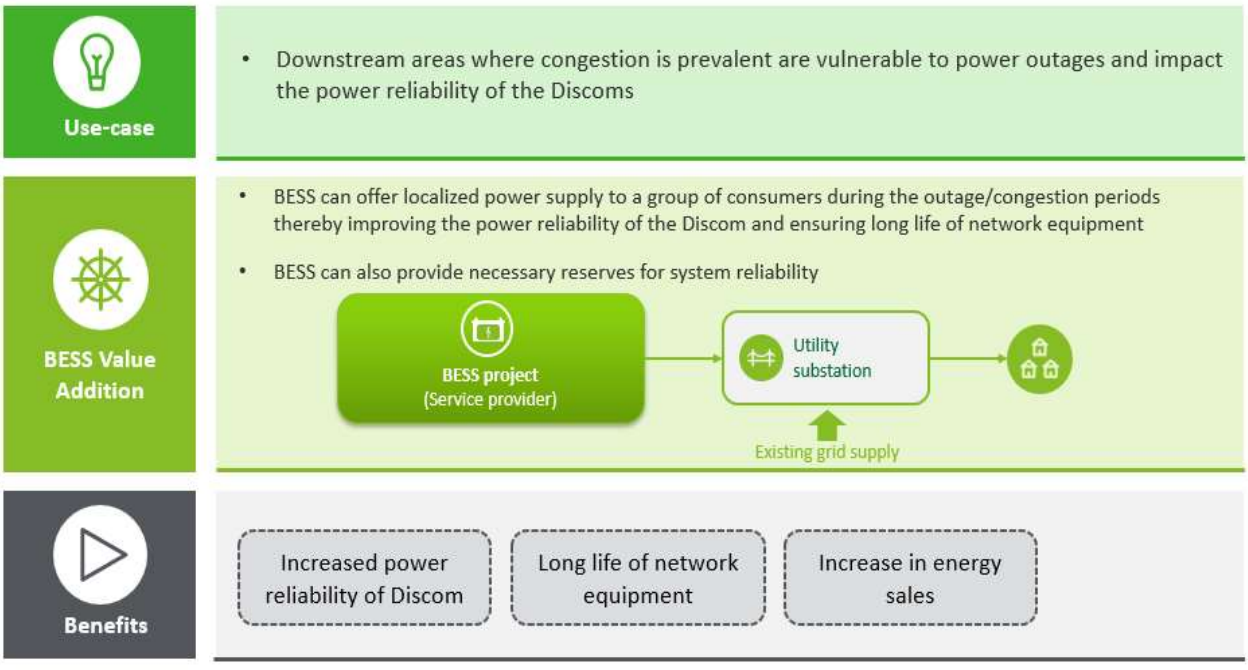
***Peak shaving/ Energy Arbitrage***



### *Ramping Support*




### *Reliability/ Outage Management*



### *Network loss reduction*

**Use-case**

- Discoms are subject to network losses when they procure power from power plants distantly located. Network losses increase the overall power purchase requirement for the Discom.

**BESS Value Addition**

- Adoption of BESS can help in reducing the network losses to some extent.
- As BESS is deployed in the network, during discharge of BESS, upstream network losses are reduced as it is catering to load locally.
- For example, if a BESS is deployed in the 11 kV side of the network, all upstream network losses (33 kV and above) are saved while BESS is being discharged.

**Benefits**

Benefits to utilities through reduction in network losses leading to reduction in power procurement cost of the utilities

### *Participation in electricity markets*

**Use-case**

- Discoms, as traders, do not participate much in the DAM/RTM. Moreover, AS are procured through regulatory mechanisms in India
- However, as the redesigning of electricity market is underway, there arise a possible revenue generation opportunity from power and ancillary market

**BESS Value Addition**

- Discoms can charge the BESS during off-peak hours at cheaper cost, and discharge/ sell at high price in the electricity and Ancillary markets


**Benefits**

Additional revenue to Discoms from Energy and AS markets

### *3.1.5.2 Business Use Case for Transmission Lines:*

With intermittency of RE, BESS can be used at the Generation end to **optimally design the transmission line rating and size**. The use case has potential for long distance TL transmitting RE (e.g. TL in the hilly terrain of NER, J&K, Ladakh etc.)

Potential scenarios where BESS can be viable

| **Line km** | **Utilization** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% |
| **300** | 1.58 | 0.79 | 0.53 | 0.39 | 0.32 | 0.26 | 0.23 | 0.20 | 0.18 |
| **400** | 2.10 | 1.05 | 0.70 | 0.53 | 0.42 | 0.35 | 0.30 | 0.26 | 0.23 |
| **500** | 2.63 | 1.31 | 0.88 | 0.66 | 0.53 | 0.44 | 0.38 | 0.33 | 0.29 |
| **600** | 3.15 | 1.58 | 1.05 | 0.79 | 0.63 | 0.53 | 0.45 | 0.39 | 0.35 |
| **700** | 3.68 | 1.84 | 1.23 | 0.92 | 0.74 | 0.61 | 0.53 | 0.46 | 0.41 |
| **800** | 4.21 | 2.10 | 1.40 | 1.05 | 0.84 | 0.70 | 0.60 | 0.53 | 0.47 |
| **900** | 4.73 | 2.37 | 1.58 | 1.18 | 0.95 | 0.79 | 0.68 | 0.59 | 0.53 |
| **1,000** | 5.26 | 2.63 | 1.75 | 1.31 | 1.05 | 0.88 | 0.75 | 0.66 | 0.58 |
| **1,100** | 5.78 | 2.89 | 1.93 | 1.45 | 1.16 | 0.96 | 0.83 | 0.72 | 0.64 |
| **1,200** | 6.31 | 3.15 | 2.10 | 1.58 | 1.26 | 1.05 | 0.90 | 0.79 | 0.70 |
| **1,500** | 7.89 | 3.94 | 2.63 | 1.97 | 1.58 | 1.31 | 1.13 | 0.99 | 0.88 |

*Cost of power transmitted (Rs/kWh) through HVDC line at various utilization and distances covered*

### *3.1.5.3 Business Use Case for Generation:*

Solution for battery storage integration with thermal power plants is expected to emerge with increasing flexible operation; BESS AFC would be comparable with the cost of two-shifting of TPPs.

*Solution Outline:*

High VC stations for **deployment of BESS solution,** which includes

- Technical integration between station, BESS and grid
- Defining the operating strategy to optimize cost and charging/discharging (algorithm based)
- Sizing of battery storage

*Key success factors:*

- Solution customization
- Demonstration of benefits to IPPs and regulators
- Flexible commercial model, e.g. success fee (revenue as a % of benefit)

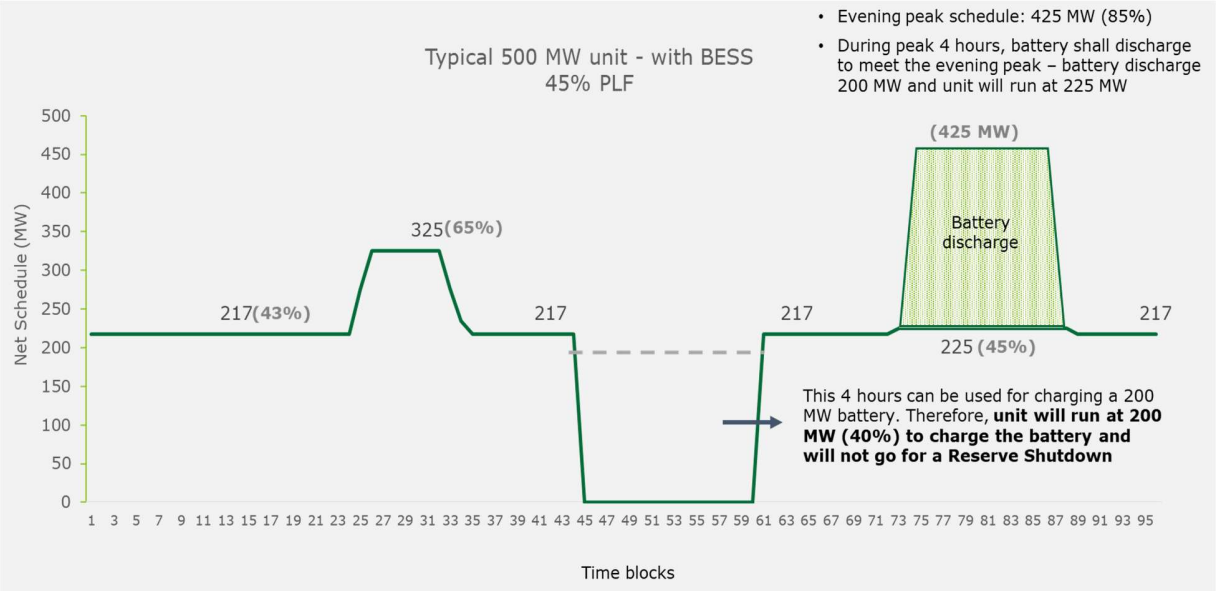



*Figure 4: Usage of Energy Storage for Generation*

## 3.2 DISTRIBUTION OPERATIONS OF ELECTRICITY

### 3.2.1 Present Scenario

The Government has taken several initiatives and efforts to turn around the health of Distribution sector. Many schemes have been launched by the government to benefit the financial health and to strengthen the distribution infrastructure in which REC has acted as a Nodal Agency. Some of the schemes are listed below.


Being involved in implementation of the Distribution Sector Schemes, RECPDCL can leverage their expertise in entering into distribution licensing. The present status of the Utilities that are being privatized is mentioned in the next section.

### 3.2.2 Opportunity size

The states/Union territories utilities will soon want to offer their discoms to private players. There are immediate options for RECPDCL to evaluate opportunities available with State DISCOMs and power departments of UTs.

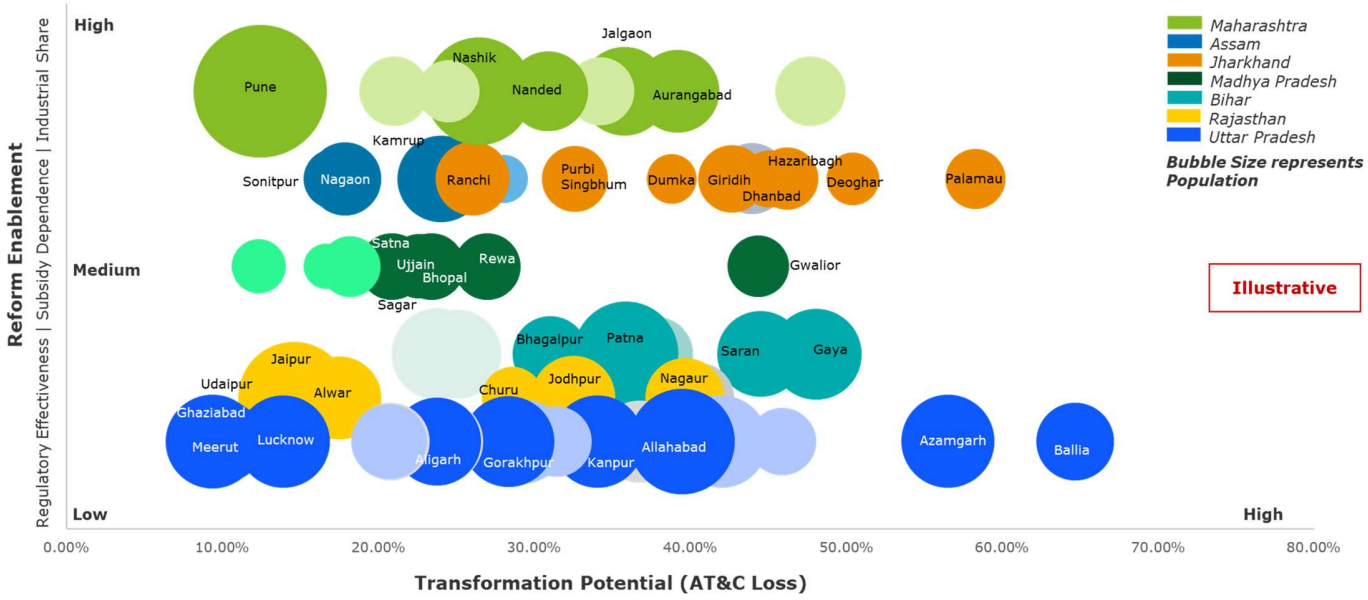
***Opportunities in UTs***

It has been observed that electricity departments/ discoms in the UTs have reasonable size and moderate loss levels (as shown in the following table), making them suitable for pursuing power distribution opportunities by RECPDCL.

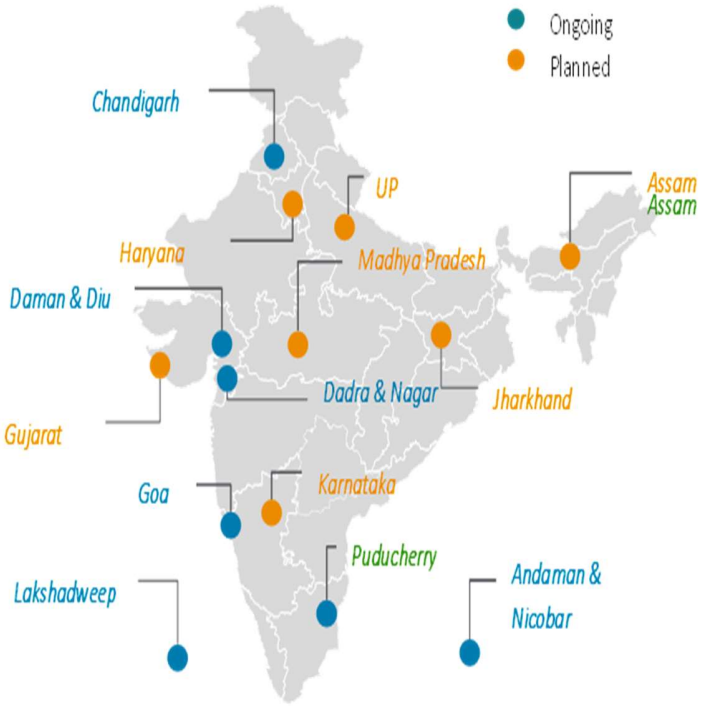
| Distribution Utilities in Union Territories | Intra-State Distribution loss % - approximate | Industrial Sales (Energy) | Consumer Base (Lakhs) | Key Features | Remarks |
|---|---|---|---|---|---|
| Daman & Diu ED | 6.74% | 92% | 0.60 | • Low Loss<br>• Highly Industrial<br>• Small consumer base | • Opportunity to invest may be limited |
| Dadra & Nagar Haveli PDCL | 5.40% | 97% | 0.77 | | |
| Lakshadweep ED | 13.10% | 2% | 0.25 | • Moderate loss (A&N is high loss)<br>• Small energy input<br>• Moderate consumer base | • Power purchase cost is on higher side<br>• PP may continue with Govt. even after privatization (like Odisha Gridco)<br>• Transition to Solar/ other low-cost sources will be key to meeting viability |
| A&N Islands | 16 - 18% | 8% | 1.35 | | |
| Chandigarh ED | 13.25% | 16% | 2.30 | • Moderate/ low loss<br>• Relatively larger/ domestic consumer base | • Urban areas with appetite for consumption growth<br>• Grid modernization initiatives going forward |
| Puducherry ED | 14.94% | 55% | 5.03 | | |

## ***Opportunities in State Discoms***

Significant opportunities are expected in state discoms also. Several states have showed interest in privatization of distribution utilities and are likely to come up with expression of interest (EOI) for selection of bidder.




Performance improvement potential of power distribution services is one of the major deciding criteria to assess attractiveness of DISCOMs. Therefore, states with Discoms performing poorly on operational or financial parameters are preferred options to foray. In the above diagram, districts/divisions of 7 states have been ranked based on 'transformation potential' (higher the AT&C loss, better the potential) and 'reform enablement' (it has been calculated based on a composite score derived from regulatory effectiveness, subsidy dependence and share of industrial consumers.



Performance improvement potential of power distribution services is one of the major deciding criteria to assess attractiveness of DISCOMs. Therefore, states with Discoms performing poorly on operational or financial parameters are preferred options to foray. The utilities can be targeted as per the below mentioned framework.

| Regulatory Effectiveness | | | | Subsidy Dependence | Industrial Share in Sales |
|---|---|---|---|---|---|
| **State** | **Differential Tariffs** | **Regulatory Asset** | **Timelines of Tariff Orders** | **Subsidy booked as % of Revenue** | **Industrial sales as % of total sales** |
| **Maharashtra** | • Different tariffs for AEML, Tata and MSEDCL | • Gap left between ARR and Revenue; Regulatory Asset Created | • MYT tariff determined | **MSEDCL –** 12% | **40%** |
| **Rajasthan** | • No diff. tariffs | • Gap created between ARR and Revenue | • Yearly orders issued but not before 31st March | **AVVNL** – 16%<br>**JDVVNL** – 27%<br>**JVVNL** – 14% | 30.3% |
| **Uttar Pradesh** | • No diff. tariffs | • Gap left between ARR and Revenue; Regulatory Asset Created | • Yearly orders issued but not before 31st March | **DVVN –** 17%<br>**KESCO –** 0%<br>**MVVN** – 19.5%<br>**Pasch VVN** – 9.2%<br>**Poorv VVN** – 22.4% | 25.5% |
| **Bihar** | • No diff. tariffs | • No revenue gap as per commission | • Yearly orders issued before 31st March | **NBPDCL** – 25%<br>**SBPDCL** – 25% | 18% |
| **Jharkhand** | • Different Tariffs for JBVNL, Tata, JUSCO and DVC | • No revenue gap as per commission | • Yearly orders issued but not before 31st March | **JBVNL – 21%** | **36%** |
| **Madhya Pradesh** | • No diff. tariffs | • No revenue gap as per commission | • Yearly orders issued but not before 31st March | **Central** – 28%<br>**West** – 38%<br>**East** - 33% | 26.4% |
| **Assam** | - | • No revenue gap as per commission | • Yearly orders issued before 31st March | **APDCL –** 4.5% | 26% |

*Source: orders of SERCs*

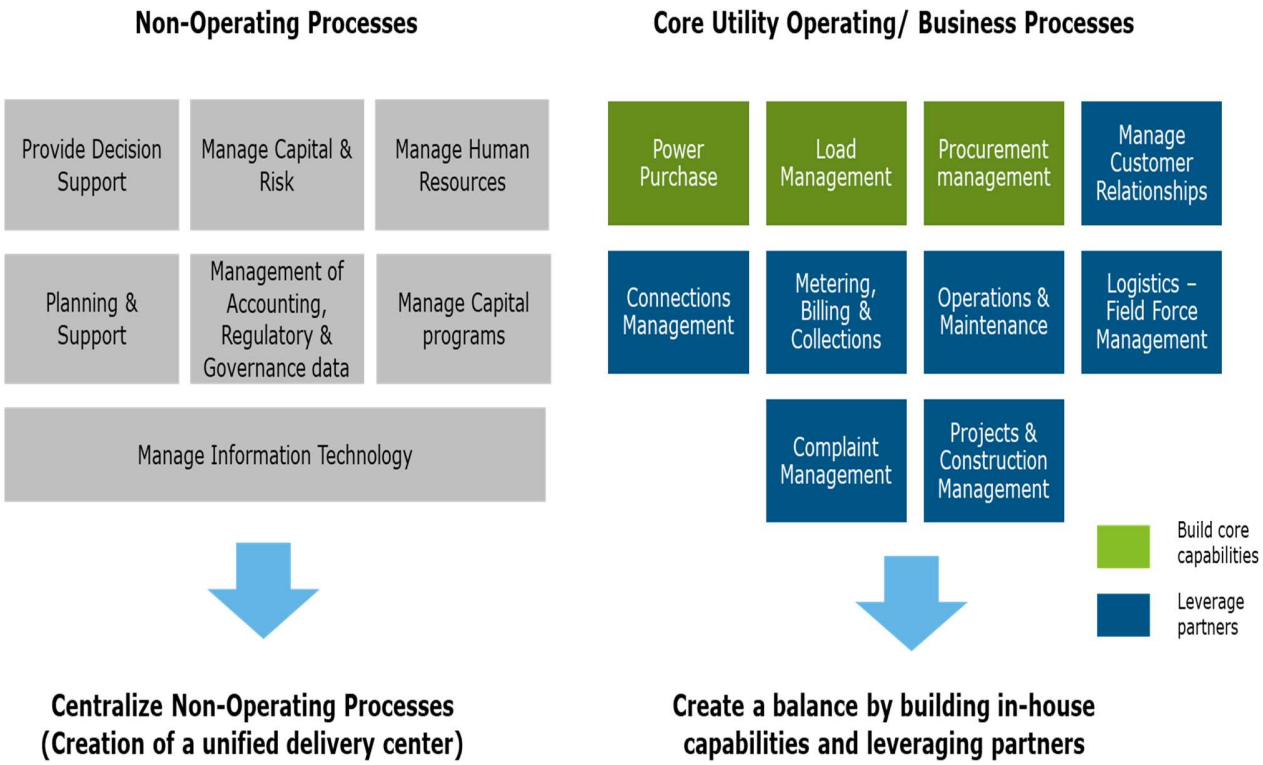
*Source: Report on performance of State utilities 2019*

### 3.2.3 Capabilities Required

**Setting up of business processes**

Setting up of distribution business processes would require developing capabilities in several functions of the utility. The functions of a power distribution utility can be divided into certain core operational and non-core supporting functions. With time as RECPDCL enters distribution business, a central unified delivery center may be envisaged for managing non-core operations in order to bring in efficiencies and standardization in various activities.

Further for several activities within core operational functions, already established channel partners can be leveraged for faster implementation and cost competitiveness. The figure below highlights the various core and non-core functions for power distribution utilities.




**Leveraging alliance partners**

For various functions under power distribution business, partnerships with established service providers or utilities can be leveraged for faster roll out of services to the consumers and improving cost effectiveness of operations. The table below provides a list of such players spreading across various types of entities, offering various types of services.

| Type of entitles | Existing Support to State/ Public Utilities | Select/ Sample Players |
|---|---|---|
| Private Utilities | • DF Operations<br>• IT implementation<br>• Capex PMC | 1. Tata Power Delhi Distribution Ltd.<br>2. Adani Electricity Mumbai Ltd.<br>3. Torrent Power Ltd.<br>4. CESC Ltd. |
| MBC Agencies | • Billing solutions<br>• MBC Outsourced Operations<br>• Spot billing | 1. Enzen Global<br>2. Fluentgrid<br>3. BCITS |

| Type of entitles | Existing Support to State/ Public Utilities | Select/ Sample Players |
|---|---|---|
| EPC Agencies | • Turnkey electrification works<br>• Augmentation/ network strengthening | 1. Tata Projects<br>2. L&T<br>3. Voltas<br>4. EIUL, SIPS etc. |
| O&M Agencies | • O&M of assets<br>• Fuse-off complaints from consumers etc. | 1. Small/ local agencies hired at Division or Sub-Division Level (Private utilities have devised SLA based contracting mechanisms) |

**Competition and Associated Risks:**

The EA Bill proposes to introduce competition in retail sale of electricity. Existing Discoms would be segregated into Content (Supply) company and Carriage (Wires) company.
Competition would be in Content (Supply) business, with following roles:

- Power Purchase
- Balancing & Settlement
- Metering & Billing
- Consumer Interface

**Segregation of Discoms**

- Balance sheet segregation of Discoms
- AT&C Loss segregation (between wires and supply companies)
- Boundary of separation (between supply and wires company)

**Preparation for Competition**

- Defining supply license area
- Treatment of cross subsidy
- Treatment of already privatized Discoms and parallel licenses

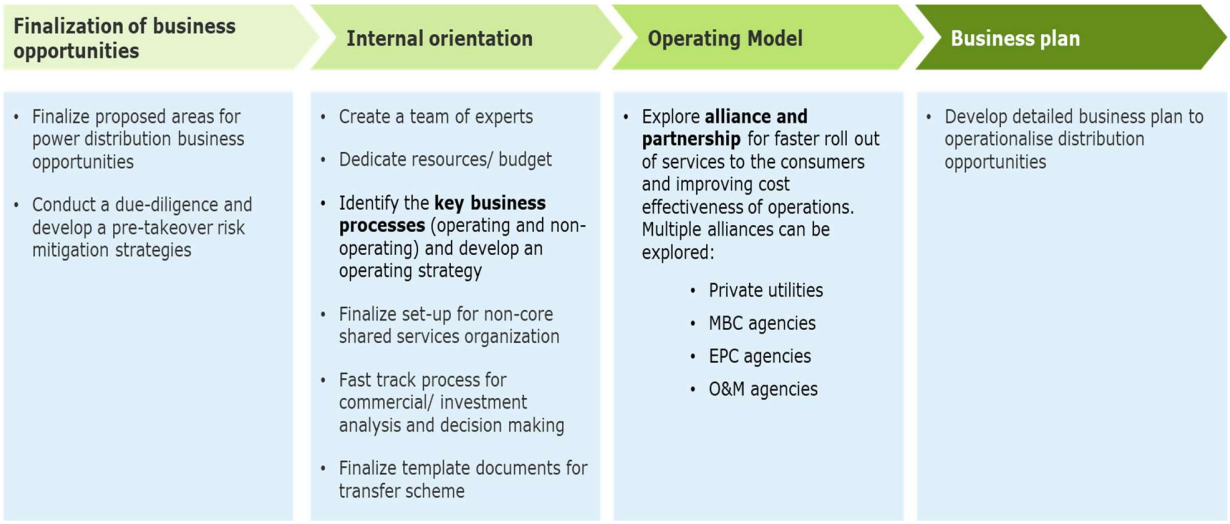
**Onset of Competition**

- Allocation of PPAs between supply companies
- Balancing and Settlement between multiple supply companies
- Consumer Switching Mechanism

### 3.2.4 Business Model

RECPDCL would need to build capabilities, including workforce, to run distribution business. Based on finalized power distribution opportunity and assessment of internal capabilities, RECPDCL would need to identify partners for undertaking the various operations related to power distribution. Alliances and partnerships can be created with private utilities in power distribution, OEM suppliers or with IT venders and solution providers.

As next step, a detailed business plan would have to be developed for the power distribution opportunity finalized along with a detailed financial and commercial forecast.




| Activities | Months | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| **Bidding stage evaluation** | | | | | | | |
| **Create a cross functional team to respond to bid** | | | | | | | |
| **Review of the transaction document** | | | | | | | |
| *Analysis of the tender documents released by respective DISCOMs/ED* | | | | | | | |
| *Review of key regulatory issues i.e. power purchase agreements, capex, regulatory dues etc.* | | | | | | | |
| *Develop a risk map/matrix based on various clauses of bid document and assess the overall risk for RECPDCL* | | | | | | | |
| | | | | | | | |

| Activities | Months | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| **Carry out a High-level assessment on technical due diligence with focus on following areas** | | | | | | | |
| *Distribution map of the identified area containing the locations of the sub-stations* | | | | | | | |
| *Power scenario in the discom area - historical and forecast demand supply scenario, load growth in different categories with a high-level load flow study* | | | | | | | |
| *Current network and IT infrastructure adequacy - metering infrastructure, ageing and type of meters, status of implementation of AMR and SCADA etc.* | | | | | | | |
| *Study of energy audit data of last 3 years* | | | | | | | |
| *Study of the historical data on failures of line and transformers* | | | | | | | |
| *Division wise details of staff - O&M and Sub-station* | | | | | | | |
| *Assessment of the investment need and development of a capex plan* | | | | | | | |
| *Distribution map of the identified area containing the locations of the sub-stations* | | | | | | | |
| **Carry out a High-level assessment on commercial due diligence with focus on following areas** | | | | | | | |
| *Analysis of historical AT&C loss* | | | | | | | |
| *Analysis of quality and ageing of arrears* | | | | | | | |
| *Assessment of subsidy dependence* | | | | | | | |
| *Status of work under various government schemes e.g. RAPDRP* | | | | | | | |
| *Analysis of O&M cost in last 5 years* | | | | | | | |
| *Analysis of employee terminal liabilities* | | | | | | | |
| *Details of ongoing work and contracts* | | | | | | | |
| *Review of metering, billing, collection and other commercial process* | | | | | | | |
| *Establish reliable baseline data* | | | | | | | |
| | | | | | | | |
| **Prepare a financial model and develop the bid strategy** | | | | | | | |

| Activities | Months | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| *Develop customized financial model with scenario analysis* | | | | | | | |
| *Development of bid strategy based on competitive situation* | | | | | | | |
| | | | | | | | |
| **Takeover plan and detail as-is assessment (Post win)** | | | | | | | |
| Prepare the TOR for the various sub-groups for each of the aspect of the business ranging from HR to operations and maintenance | | | | | | | |
| Provide support to the administration for preparation of the transfer scheme | | | | | | | |
| Define and finalize the terms and conditions of takeover, opening balance sheet, treatment of liabilities (including employee's terminal liabilities) | | | | | | | |
| | | | | | | | |
| **Assessment of current infrastructure (Network and IT infra) of the DISCOM area** | | | | | | | |
| *Geographical demarcation of various division and sub-divisions* | | | | | | | |
| *Conduct infrastructure assessment including Circle, Division, Sub-Division & Section offices and connectivity within such establishments* | | | | | | | |
| *Assess physical mapping and verification of assets, across the geographic area of licensee* | | | | | | | |
| *Conduct assessment on past failures and availability of repair workshops available with the DISCOM area* | | | | | | | |
| *Assess As- Is Situation of Power in different regions across various consumer categories* | | | | | | | |
| *Study the as-is IT architecture; identify improvements to the IT infrastructure and prepare business cases for the modifications envisaged* | | | | | | | |
| *Assess current state and finalize the new requirements that for MIS systems, O&M management, distribution automation, energy audit, and ERP and customer services* | | | | | | | |
| *Develop the detailed network roll-out plan for business period, considering the geographical position of existing assets and the upcoming load centres* | | | | | | | |

| Activities | Months | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **Assessment of finance and operations** | | | | | | | |
| *Assess historical Operational performance and Capital Expenditure.* | | | | | | | |
| *Review key baseline operational performance parameters like power purchase mix and cost, AT&C loss, SAIDI/SAIFI, O&M cost, subsidy dependence etc.* | | | | | | | |
| *Develop an improvement plan with clearly defined trajectory of loss reduction, power purchase cost reduction and reduction of subsidy dependence* | | | | | | | |
| *Review and assess the existing financials and the impact of takeover of distribution business* | | | | | | | |
| *Identify serviceable and non-serviceable liabilities that may have a bearing on future viability* | | | | | | | |
| *Prepare a takeover plan of the accounts and finance functions of the department/Discom* | | | | | | | |
| *Develop a detailed efficiency improvement plan to achieve the target state* | | | | | | | |
| | | | | | | | |
| **Prepare a HR transformation plan** | | | | | | | |
| *Address the issues related to organization structure and protection of employee interest* | | | | | | | |
| *Hire an external expert for HR reorganization assessment, if required* | | | | | | | |
| *Create an in-house 'Distribution' team with a mobilization plan for next 1 year* | | | | | | | |
| *Create an end-to-end transformation plan with focus on change management* | | | | | | | |
| | | | | | | | |
| **Commercial and regulatory compliance** | | | | | | | |
| *Evaluate the regulatory requirements of the UT's/State DISCOMs along with other compliances in order to address the changeover of functions and duties* | | | | | | | |

| Activities | Months | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| *Evaluate existing power purchase agreements, regulatory dues etc.* | | | | | | | |
| | | | | | | | |
| **Business process evaluation** | | | | | | | |
| *Form a team and evaluate various changes in business process, which would be required to incorporate the distribution business of department/DISCOM in RECPDCL system* | | | | | | | |
| *Explore the options of applicability of their existing business practices (procurement, hiring, HR policies) wrt to the new distribution business* | | | | | | | |
| *Explore the impact of taxation, legal and GST related issues* | | | | | | | |
| | | | | | | | |
| **Consumer services plan** | | | | | | | |
| *Obtain the listing of the sub-stations and customer master database* | | | | | | | |
| *Evaluate the existing consumer services* | | | | | | | |
| *Prepare a plan to plug the gaps in consumer services offered* | | | | | | | |
| *Establish customer support cells and online services* | | | | | | | |
| | | | | | | | |
| **Publicity and communication plan** | | | | | | | |
| *Explore option to depute external agency for publicity and communication* | | | | | | | |
| *Form a team and prepare an effective communication plan pertaining to changes for consumers and employees* | | | | | | | |
| | | | | | | | |
| **Post takeover activities (for the initial 100 days)** | | | | | | | |
| Create a budget plan for next 3 years - Network expansion plan, network strengthening plan as per load-flow study and OPEX budget for different functions | | | | | | | |
| Prepare detailed list of initiatives to be monitored, as per budget and infra development plan, HR transformation plan, Change management plan, consumer services plan, communication plan etc. | | | | | | | |

**Beyond 6 months**

| **Activities** | Months | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Establish a Program Management Unit (PMU) for ensuring governance and progress monitoring | | | | | | | |
| Prepare standard project monitoring templates, fortnightly update to the top management on the progress: raising implementation issues, coordinating with implementation agencies to resolve such issues etc. | | | | | | | |
| Monitor of progress made under different schemes being implemented by the Discom | | | | | | | |
| Design various MIS based dashboards for various operational/functional levels for various projects being carried out within the Discoms | | | | | | | |
| Initiate capacity building of the Discom staff on managing the PMO | | | | | | | |
| Finalize set-up for non-core shared services organization | | | | | | | |
| Develop a procurement plan for next 3 years | | | | | | | |
| *Conduct a vendor due diligence for material and services* | | | | | | | |
| *Create an approved list of vendors and start onboarding them* | | | | | | | |
| Initiate partnership with approved vendors | | | | | | | |
| Consolidate risk and issues in a master register | | | | | | | |

## 3.3 GREEN HYDROGEN

### 3.3.1 Present scenario

The National Green Hydrogen Mission was launched with the objectives of:

- Making India a leading supplier of Green Hydrogen in the world.
- Creation of the export opportunities for the Green Hydrogen and its derivatives.

Based on production technologies, hydrogen is classified in three categories – Grey, Blue and Green hydrogen.

| Grey Hydrogen | Blue Hydrogen | Green Hydrogen |
|---|---|---|
| Hydrogen is produced from fossil fuels via carbon intensive processes | | Hydrogen is produced from clean energy resources |
| Technology: Coal gasification, steam methane reforming (SMR), and autothermal reforming (ATR) | Technology: Coal gasification, SMR, or ATR + Carbon capture, utilization and storage (CCUS) | Technology: Electrolysis using renewable electricity |
| $CO_2$ emitted | $CO_2$ captured (up to 90% for SMR, and 95% for ATR) | No $CO_2$ produced |
| Most of the current production | In addition to pilots, one operational facility in the US (at Valero Port Arthur Refinery in TX) and one in Canada. Another planned in UK. | Mostly pilot projects |

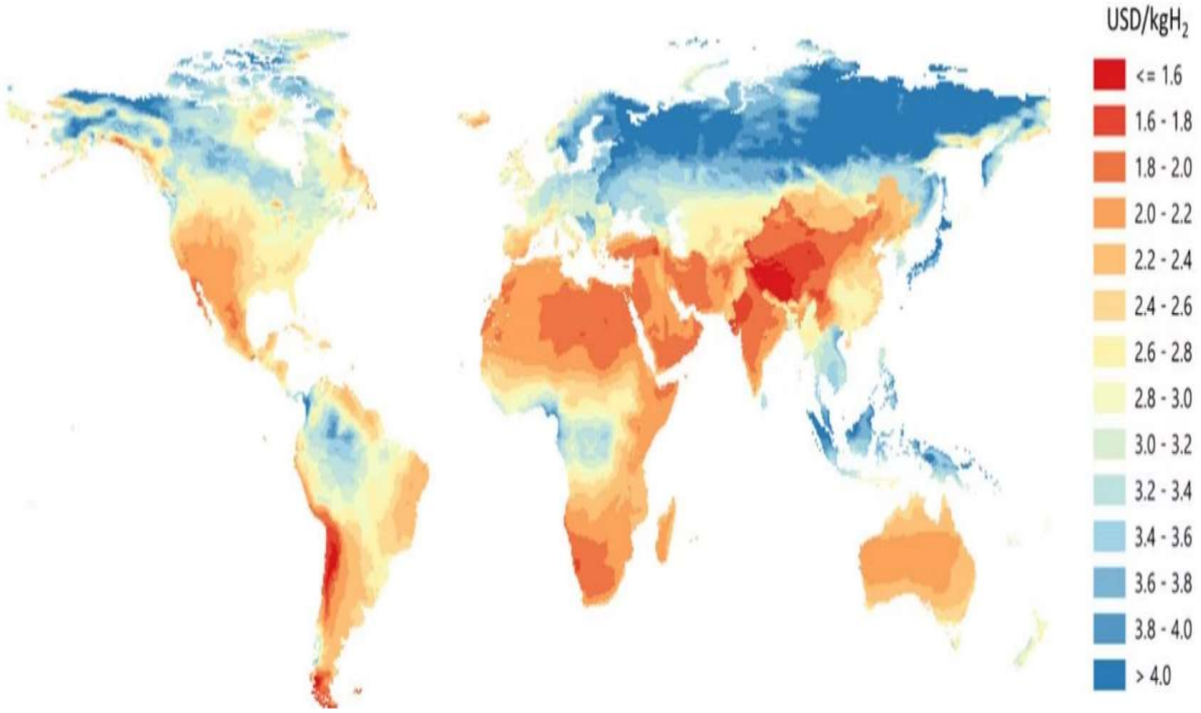
***Green hydrogen production through Electrolysis***

- In the production of hydrogen through electrolysis of water, the electrolysis breaks down water into hydrogen and oxygen by using electricity.
- If the electricity used comes from renewable energy sources like wind or solar, then the entire energy process would create no net emissions and is called as green hydrogen.

India has moved towards becoming energy independent by 2047 and specified target of achieving Net Zero by 2070. Green Hydrogen is a considering and promising alternative for aiding this transition. GH can be used for long-duration storage of RE, fossil fuels replacement, clean transportation, and can also be used as Distributed energy resources.

### 3.3.2 Opportunity size

| Short term (2023-25) | Medium term (2025 – 30) | Long term (beyond 2030) |
|---|---|---|
| • Substitute certain percentage of grey hydrogen used as chemical feedstock in sectors like refinery, fertilizer and other industrial processes (methanol, chlor-alkali etc.)<br>• Blending at natural gas grid (e.g. in HVJ gas pipeline)<br>• Decentralize use of Hydrogen in remote areas (mini grid, cylinders) to substitute diesel use<br>• Zero carbon Fuel cell long haul truck | • Increase penetration of green hydrogen in refineries, fertilizer production and in other industrial processes<br>• Green hydrogen for road transport – FCEVs and re-fuelling stations | • Power generation and grid balancing (as a seasonal storage)<br>• Decarbonization of other energy consuming sector – Steel, cement, shipping, aviation, industrial process heating etc. |




*Green Hydrogen Cost in the future*

### 3.3.3 Actions Steps to be taken

As the actions steps to create their capabilities, RECPDCL may focus on requisite policy advocacies, create and short-term and long-term business plan and start with a green hydrogen pilot.

| Business plan with investment outlay | Plan for 'Pilot'/PoC and identify suitable location | Initiate 'Pilot' and technology partnership | Policy advocacy for scaling up |
|---|---|---|---|
| • Create a 15-year plan for Power – to-hydrogen (up to 2035) with considerations for rapid growth post 2030 with projected capital outlay<br>• Demand assessment – medium term and long term<br>• Capex assessment<br>• Land requirements for pilot plants with scale-up post 2030<br>• Water requirements<br>• Access to pipelines/storage infrastructure<br>• Location feasibility assessment<br>• Business models<br>• Customer profiling<br>• Technology roadmap | • Identify location for pilot project, considering<br>• Proximity towards water source<br>• Access to gas grid with necessary infrastructure for storage and dispending of hydrogen gas (in pure form/others)<br>• Proximity to demand centers to avoid transmission losses – this would also help supply any localized peak demand | • Initiate a 'Pilot' before launching full-scale adoption of green hydrogen production through electrolysis-<br>• Collaborate with a technology player e.g. Siemens for selection of electrolysis technology, such as Polymer electrolyte membrane (PEM) electrolysis, Alkaline electrolysis or Solid Oxide Fuel Cell (SOFC) electrolysis etc.<br>• Conduct a detail Cost benefit analysis, jointly with technology partner | • Initiate policy advocacy in select areas to promote hydrogen use as well as de-risk investment for setting up electrolyser and associated infrastructure<br>• Explore opportunities to be the nodal body for aggregation of green hydrogen generation and supply to industries as feedstock |

### 3.3.4 Business Model

Strong competition is expected from O&G companies as well as large utilities. While several business models are likely to emerge in the future, RECPDCL may explore some of the following business models.

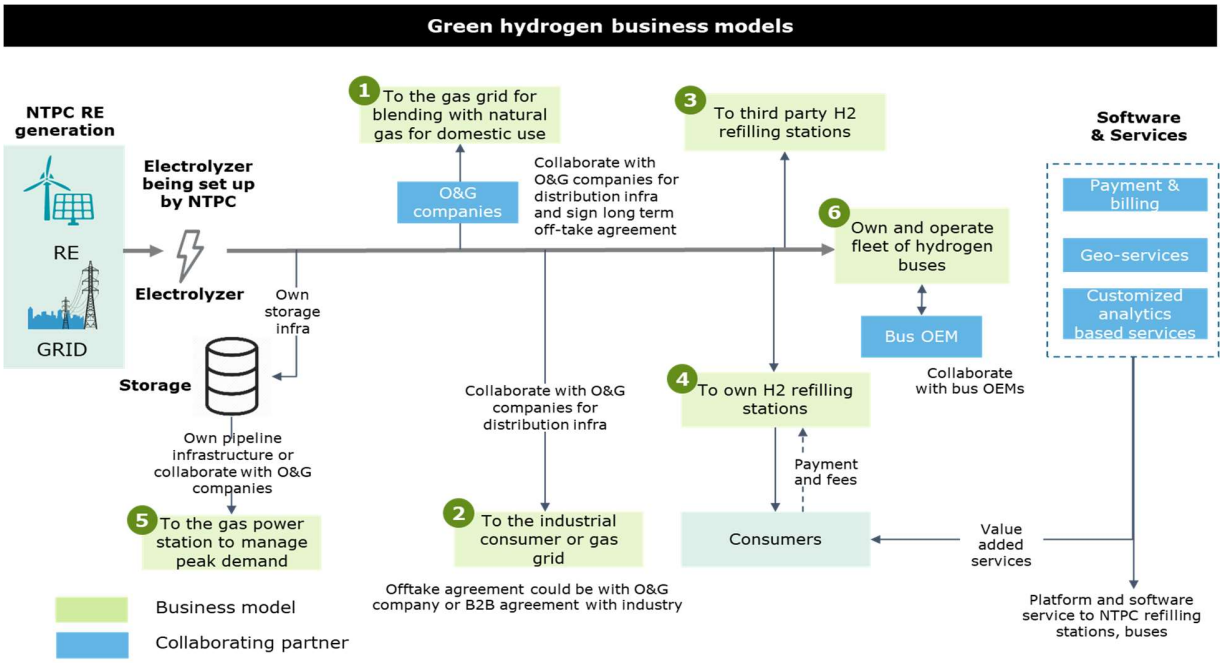



*Figure 8: Green Hydrogen Business Model*

It is important to note that RECPDCL may need to collaborate with O&G companies to for offtake arrangement or using distribution infrastructure.

| Model | Description | Synergy rationale | |
|---|---|---|---|
| | | Favorable/ Opportunities | Unfavorable/risk |
| **Production and selling of Hydrogen** | Set up own green hydrogen plant, produce hydrogen and sell that to end-users i.e. fertilizer and ammonia producing companies, methanol producers, re-fuelling stations and power stations | • Complement RECPDCL's power business – surplus RE capacity can be used for electrolysis<br>• Sound financials<br>• Low competition due high entry barrier<br>• Significant opportunity size - India's green hydrogen potential by | **Market/Demand risk**<br>Green H2 production cost may not be follow the cost curve as predicted, causing subdued demand<br>Other alternative sources of energy are significantly cheaper e.g. RE+BESS, Fossil fuel hydrogen+ CCS etc. |

| | | | |
|---|---|---|---|
| | Act as an aggregator of green hydrogen generation and supply to industries as feedstock | 2030 can reach up to 4 - 6 GW if policies are targeted to boost demand and development of eco-system | Policies to boost demand are not defined or not implemented<br>Consumers (refineries, fertilizer companies) set up their own electrolysers to save on logistics cost<br>**Operational risk**<br>Associated infrastructures i.e. pipeline, storage, transportation infra etc. are not developed |
| **'Hydrogen-as-a-Storage' for grid balancing** | Store H2 and generate power in CCGT by blending with natural gas when there is a deficit in own generating stations as well as in stations of other IPPs. Also, there are options to generate power through fuel cell | • Size can be significant if the production cost of hydrogen comes below $1/kg of H2. Hydrogen can be used to serve the requirement of peaking power<br>• Low competition and high entry barrier are high due to large capex involved<br>• Likely to offer better margin during peak hours<br>• Existing capability has a good fitment with activities pertaining to grid balancing | **Market/Demand risk**<br>• Green H2 production cost doesn't come down significantly, causing subdued demand<br>• Other alternative sources of energy are significantly cheaper e.g. RE+BESS (Rs. 4 -6/kWh), Fossil fuel hydrogen+ CCS (USD 1.7 – 2.5/kgH2) etc.<br>**Operational risk**<br>• Associated infrastructures i.e. pipeline, storage, transportation infra etc. are not developed |
| **Distribution and storage** | Invest in commercial scale storage and distribution infrastructure jointly | • Size can be large with the demand for green Hydrogen picking up – expected hydrogen | **Market/Demand risk**<br>• Strong competition from O&G player |

| | | | |
|---|---|---|---|
| | with O&G companies, with revenue share agreement | demand are 10 MTPA and 28 MTPA by 2030 and 2050 respectively<br>• Likely to offer better margin through regulated return in the initial years<br>• RECPDCL has strong balance sheet, availability of low-cost finance and vast experience of operating and maintaining asset heavy plants and stations | • Green H2 production cost may not be follow the cost curve as predicted, causing subdued demand; (however, with an agreement, preferably JV with O&G companies, offtake risk will be mitigated)<br>• Access to gas grid is not available for demand point |
| **H2 filling stations for FCEVs** | Set-up own H2 filling stations or emerge as an aggregator for O&G companies and bill customers for their use | • Market size may be significant as demand picks up<br>• Complements RECPDCL's production of hydrogen, mitigating offtake risk<br>• RECPDCL has strong balance sheet, availability of low-cost finance | **Market/Demand risk**<br>• Limited adoption of FCEV; FCEVs face strong competition from BEVs<br>• Rapid decline of battery cost makes BEVs a cheaper alternative<br>• O&G companies set up their own refilling stations<br>**Operational risk**<br>• Retail customer management; limited experience in B2C business<br>• High level of customer services not delivered |

| | | | |
|---|---|---|---|
| | | | • Collaboration with eco-system players is not adequate |
| **Fleet operation (Own and operate)** | Finance and manage fleet of hydrogen vehicles with revenue share agreement with transport corporations | • Financing capability to fund high capex of H2 Buses<br>• Predictable annuity cash flow for entire lease period<br>• High Capex requirement pose high entry barrier | **Market/Demand risk**<br>-> Limited adoption of Hydrogen buses, as they face strong competition from Electric buses<br>-> Rapid decline of battery cost makes Electric buses a cheaper alternative<br>**Limited business fit - Not aligned with RECPDCL's business; limited value addition**<br>**Operational risk**<br>• Requires high level of monitoring and administration of asset health<br>• Revenue risk related to route management, ridership management<br>• Risk of litigation in case of accident or any wrong event, leading to reputation risk |

## 3.4 POWER PROCUREMENT COST OPTIMIZATION

### 3.4.1 Present Scenario

The world is witnessing an Energy Transition wave and a push to cleaner sources of energy has been made. The clean energy push in India has been fuelled by the Government of India's climate change commitments. Aligning with the clean energy future, many of the large power consumers have made commitment to only contract clean generation sources to meet the requirements of its distribution consumers. Power utilities in India also increasingly looking at green options to meet any additional power requirement provided it helps them optimize the cost and also meet the load profile of the region.

However, the challenge that lies ahead is to serve the energy requirements of its customers while keeping the future power procurement cost at the minimum and maintaining a clean portfolio. This challenge is riddled with uncertainties in policies and regulations, market dynamics and risks, and uncertainty of variable renewable energy sources in future. It is hence important to analyze the future demand trends and find an optimal generation contracting plan, and optimal scheduling under different scenarios in the future to reduce the future power procurement cost.

### 3.4.2 Short-term Power Cost Optimization

One of the key interventions that could bring down the Average PPC for power utilities is Short-Term Optimization. Many of the utilities already follow a rigorous methodology to optimize their day-ahead procurement and scheduling in power exchanges. However, an automated tool for short-term optimization may help utilities save significantly.

The key objective of the day-ahead short-term procurement is to identify the shortages (surplus) during the day and to make purchases (sales) of the power to meet the demand balance during all slots of the day, while trying to minimize the total cost of scheduling and procurement. The challenge in day-ahead short-term procurement is optimal scheduling of the generators in the portfolio and coming up with a procurement/sale plan that minimizes the total cost.

In order to make the purchase/sale decision, utilities prepare bidding sheets. The various inputs that typically go into the bidding sheet are described below:

| S No. | Step | Details |
|---|---|---|
| 1 | **ECR** | At a monthly level ECR of thermal generators is updated, based on the last month's billings |
| 2 | **Losses** | Losses are accounted for each thermal generator to arrive at VC. A blanket loss factor of X% is used for all must-run generators. |
| 3 | **Load and Prices** | Load and Price forecast is input based on last day's IEX prices |

| S No. | Step | Details |
|---|---|---|
| 4 | **Must Run Generation** | Based on email received, or schedules from last day a predicted must run profiles are input into the bid-sheet |
| 5 | **Rate Sheet** | This is a sheet that is built on monthly VC |

Based on the rate-sheet, the surplus remaining (in the form of back-up), or possible back downs of generators is aggregated into 2-3 bands. The surplus volume in each of the bands is then offered for sale based on the weighted VC of the band (calculated using ECR of the generators included in each band in merit order). IEX clearances are accounted for, and the portfolio is scheduled for the next day. The bid sheet is verified at multiple levels.

**Practical issues:-**

The typical practice ensures that the bids in power exchange go through a rigorous analysis and checks before they are placed. However, the bids generated this way are subject to multiple practical considerations that prevent the most optimal short-term procurement strategy.

- There is an improved coordination with RLDC generators only. URS power is easily taken for cheaper generators by other states for RLDC generators only.
- It is manually not possible to monitor every decimal opportunity to sell and buy power when the forecasted prices have fluctuated by small margins. Team relies on smooth trends of buy and sell bids. This is due to ramp limits in real time scheduling later in the day.
- In lieu, of time-constraints the bids in power exchange are placed in 2-3 bands only.

### 3.4.3 Optimal bidding framework

We propose to transform the bidding problem into a Linear Programming (LP) problem. An optimization model is created in line with the power procurement philosophy. The model has an objective to minimize the total PPC throughout the day while meeting the demand during the day.

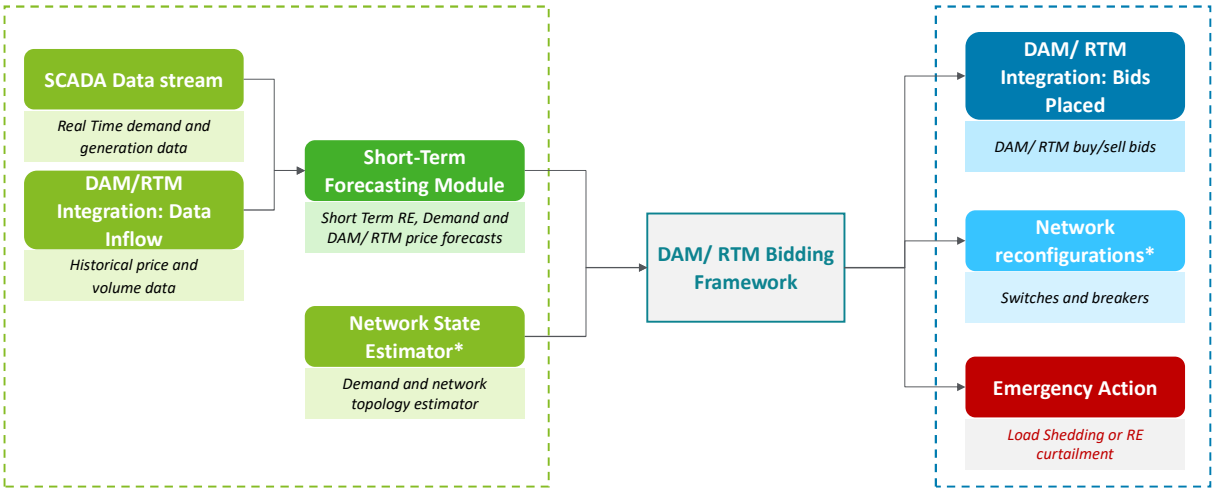
A comparison between the proposed framework and manual bidding process is shown below.

| PROPOSED FRAMEWORK | MANUAL |
|---|---|
| • **Run Time:** The total time to create bids is reduced to a few seconds<br>• **Zero chance of error:** The bids are guaranteed to be optimal | • The time to build the bids and verify is large<br>• Possibility of manual error and suboptimal bids |

- **Ramping:** Can consider ramp-limits with slight modifications
- **UC:** Can consider unit commitment as an internal variable
- Is a black-box model and needs capacity building to augment/update
- Can accommodate different loss factors for all generators
- Multiple bids in power exchange

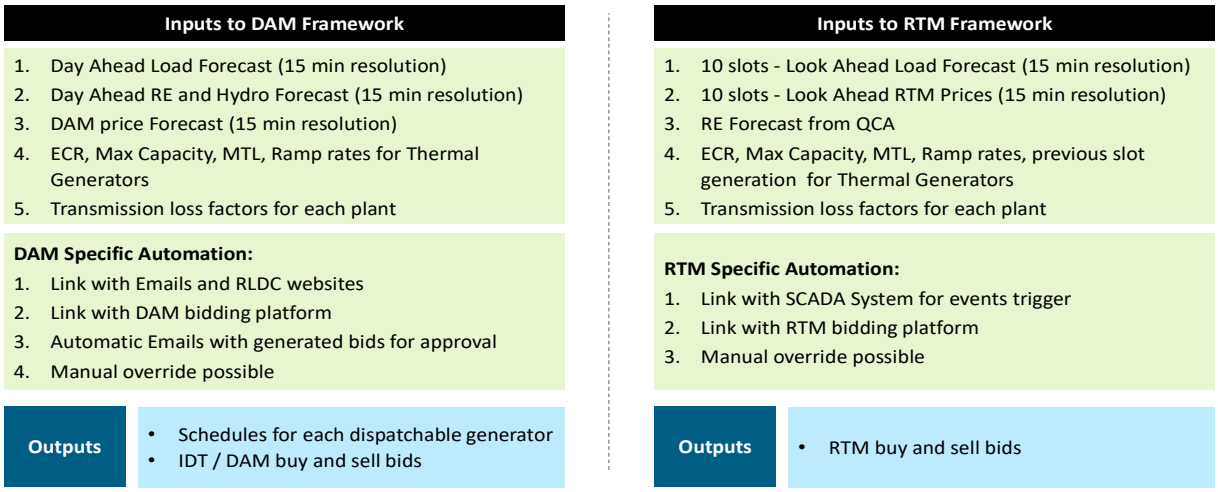
- Cannot consider ramp limits inherently in the day-ahead scheduling
- Unit Commitment is external
- Is open model and internal workings can be manually verified
- Can consider different loss factors for Thermal generators but a blanket loss factor for must-run generators
- Limited number of bids in power exchange

The Scheduling and Bidding model uses a Mixed Integer Linear Programming based optimization framework to ensure lowest net cost of power procurement. The envisaged bidding framework flow is shown below:




** Optional advanced features subject to current practices and IT integrations in RTM stage only*

**Inputs required for the framework and outputs**




**Potential and Realizable Benefits of Proposed Bidding Framework**

The realization of potential benefits of the proposed bidding framework is only possible when the interventions suggested in the last section would be carried out. The realization of this potential is critically dependent on the total clearance in the power exchange. Based on the historical data and running a pilot with a Discom the framework gave a power procurement cost optimization in the range of **INR 10-20 Lac/day** for the utility that has energy input **of 8-10K Mus annually.**

### 3.4.4 Long-term Power Cost Optimization

The Long-Term resource Optimization for a utility is done with an objective to minimize the total cost of power procurement in future. In doing so, an optimization model is setup which chooses the most optimal resource expansion decisions.

**Integrated Resource Expansion Planning (IRP) Framework**

An IRP can answer the following questions:

- How to optimally utilize existing resources?
- What type, quantum and when generation / transmission capacity should be built to meet the electricity & operating reserve demand?
- How can system be optimized in delivering reliable power to consumers at the least cost?
- What are the costs, impacts and implications of the power sector policies or regulations?

With the increasing share of intermittent resources in the system, resource planning requires more robust methodologies compared to the existing means. A few key challenges necessitating an Integrated Resource Planning model are given below.

**✓ What does an IRP model do?**

- *An IRP model is a **long-term planning model** which tries to answer capacity investment questions*
- *The model can also identify the future performance of current assets*
- *The model can quantify the effect of various policies*
- *The model can also quantify the impact of various risks which will help design mitigation measures*

**✗ What does an IRP model NOT do?**

- *An IRP model is not used to determine operational best practices such as **power scheduling strategy** which a utility should follow over a shorter-duration (intra-day /day-ahead / week-ahead / etc.)*

- **Challenges of integrating Renewables:** The profile of renewable generators don't necessarily follow the load, unlike traditional dispatchable resources. Conventional generators also cannot operate below a certain minimum and are generally ramp limited. Increasing renewables also require more quantity of spinning reserves. Thus, to evaluate RE integration, the model should be capable of simulating the real system.

- **Matching demand and supply:** IRP models ensure that the demand and supply are matched, thus avoiding over-capacity, and reducing stranded assets. Similarly, the models avoid under-capacity and ensure Resource Adequacy.

The key constraints in the model are what enable the model to simulate the actual system. The key constraints in the model are detailed below.

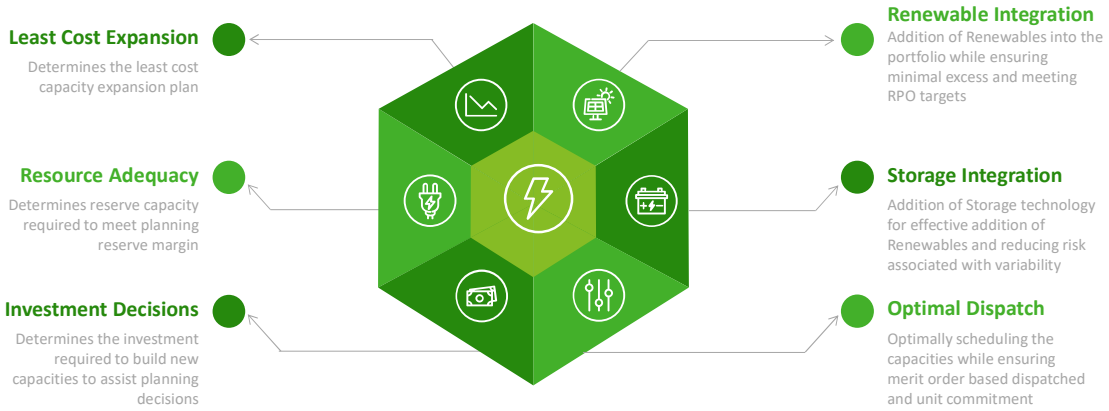
**Load balance constraints**

The load balance constraints ensures total generation and import of power is equal to sum of the demand, the exports and unserved energy and curtailment, for each hour. The penalty for unserved energy, or the value of the lost load will be taken as per suitable benchmarking and model calibrations.

**Generation constraints**

For renewable resources, such as solar, wind and hydro run-of-river, the generation is constrained as per the regional hourly profile of the resource. Based on the LCOE of the resource and regional generation profile, the optimum capacity of RE resources will be chosen. Additional constraints to ensure that the country's overall renewable generation targets can also be included. This gives the model the flexibility to run and compare outcomes for different scenarios.

The Energy Mix Planner uses Python based MILP model to the most optimal least cost solution:




### 3.4.5 Business Models

RECPDCL can assess the opportunity to provide short term and long term power procurement cost optimization solutions to various power utilities with the support of technical consultant having such models/capabilities.

| | |
|---|---|
| **Potential clients** | Power distribution utilities in India |
| **Revenue Model** | RECDPCL may look at an hybrid model to charge the utilities which is mix of:-<br>a) **Fixed cost –** to recover basic manpower cost to be deployed<br>b) **Success fee** – based on benefits received to clients in comparison with the baseline agreed right at the beginning |
| **Technical partners** | RECPDCL may tie up with technical partners who have developed such tools to expedite the process. It can have manpower based arrangement with the partner to avoid software/tool procurement related complications. |
| **Capabilities required** | To begin with, technical partner can support RECPDCL in all the client discussions. Later RECPDCL can develop these capabilities internally |

## 3.5 TRANSMISSION INFRA DEVELOPER

### 3.5.1 Present Scenario

In past years, there has been a substantial and significant growth in installed generation capacity and the Transmission and Distribution capacity infrastructure.

The government's target of 500GW RE by 2030 can be a key driver for grid expansion. Transmission lines are backbone of India's power system, with the highest transmission (V) voltage with 800kV (HVDC). With the transmission capacity addition in transmission line- 12,261ckm, 54,425MVA of transformer capacity addition, India has become amongst the largest interconnected electricity grids in the world with 4,63,758ckm of (TL) transmission line and 11,56,105 MVA of (TC) transformation capacity (as on Jan'23).

Key sectoral observations are:

- Growth of transmission is commensurate with growth of installed generation capacity (8%)
- Investment in Inter-state transmission system (ISTS) has enabled a vibrant power market and a secured and reliable national grid
- As a result, congestion has been reduced, leading to a decline in the volume of electricity that could not be cleared

Key drivers for India's transmission sector are:

- **Rising electricity demand** - All-India peak demand is expected to grow at a CAGR of approx. 7%, leading to huge investment.
- **Focus on renewable energy addition** – renewable energy evacuation will also lead to new transmission projects
- **Presence of inter-regional demand supply gap** – Existing gap in the inter-regional demand supply would encourage building of new inter-state transmission lines.
- **Upgradation of existing lines** – There are continuous efforts towards upgradation of existing lines in order to reduce technical losses. This is also expected to drive new investment in the sector.

### 3.5.2 Opportunity size

Considering the market potential, investment of ~Rs. 4 trillion is expected in the transmission sector in between 2023-30.

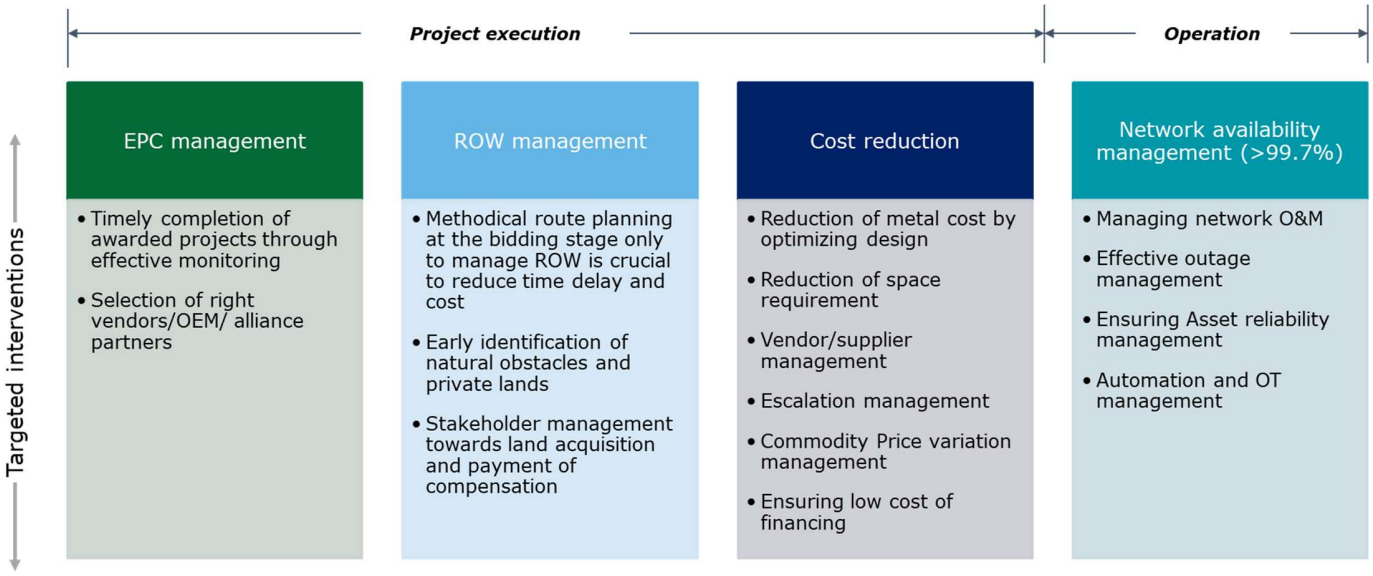
Out of the total market size, addressable market for RECPDCL is ~Rs. 1.20 trillion, where RECPDCL would have to compete with PGCIL and other private entities through TBCB process.

| | | | FY23-30 |
|---|---|---|---|
| **Total Market** | | **Rs Lakh Crore** | **4.00** |
| *Assumption* | | | |
| | Inter state | % | 50% |
| | Intra State | % | 50% |
| | | | |
| | Inter state | Rs Lakh Crore | 2.00 |
| | Intra State | Rs Lakh Crore | 2.00 |
| | | | |
| | Inter State – TBCB | % | 70% |
| | Intra State – TBCB | % | 30% |
| | | | |
| **TBCB Market** | | | |
| | Inter state | Rs Lakh Crore | 1.40 |
| | Intra State | Rs Lakh Crore | 0.60 |
| | Total | Rs Lakh Crore | 2.00 |
| | | | |

**Returns Expectation:**

Though TBCB projects have brought down the tariff significantly, major private developers are maintaining a healthy return by introducing operational, procurement and construction efficiency.

Transmission projects are linear projects and their success rate depends on four key factors – EPC management, 'Right of Way' (ROW) management, cost optimization and network availability management. Any developer should focus on targeted interventions on above four areas.




- **EPC management** – Robust EPC management will ensure minimal escalation from budgeted cost and the estimated return can be achieved. Any time and cost escalation would reduce the project IRR in a competitive regime, impacting the profitability of project. To ensure timely completion, the developer would need to form alliance and partnership with reputed vendors and OEMs.
- **ROW management** – ROW management is a very critical aspect for executing a linear project. Any deviation in route planning can potentially escalate the time and cost of a project, thus impacting the project IRR. Therefore, methodical route planning and identification of key obstacles are recommended at the bidding stage only. Digital technologies like GIS based route survey, drone enabled surveying etc. can help in accurate estimation at the bidding stage only. Proactive engagement with stakeholders to minimize surprises in land acquisition is also recommended.
- **Cost reduction** – Reduction of material cost through metal cost hedging (steel, aluminum) and design excellence can help in optimizing the project cost, thus improving the project IRR. Design optimization can potentially optimize the tower design as well as space requirement. Other areas include arranging low-cost finance, procurement negotiation, supply chain optimization and escalation management.
- **Network availability management** – Transmission projects demand very high asset and network availability (>99.7%). Therefore, ensuring asset reliability through proper O&M and adequate resource mobilization is a key operating criterion. Automation, remote operation and digital technologies could be important enablers to achieve this.

### 3.5.3 Capabilities Required:

In order to enter and succeed in transmission business, RECPDCL needs to create a balance by building in-house capabilities and leveraging partners.

| Capability | Description | Build core capabilities | Leverage partners |
|---|---|---|---|
| Design & Engineering | • D&E skillset is necessary to ensure:<br>• Engineering optimization for participating in TBCB bids<br>• Tower design and weight optimization<br>• BOM optimization | ✓ | |
| Procurement | • EPC and package procurement<br>• Metal (Steel and Aluminum) procurement | ✓ | |
| Commodity price risk management | • Ability to hedge the commodity price risk (steel, aluminum) and optimize the overall material cost | ✓ | |
| Route Survey | • Ability to identify the most optimal route at the bidding stage to optimize project cost<br>• Ability to identify the natural obstacles, terrain etc.<br>• Leverage new age technologies like GIS based route survey, drone etc. | | ✓ |
| Construction management | • Ability to construct the project within budgeted time and cost | | ✓ |
| Project Management | • Ensuring overall governance of project including interfaces with multiple partners during construction phase | ✓ | |
| RoW Management | • Ensuring seamless Right of Way (RoW) management through stakeholder consultation | ✓ | ✓ |
| O&M | • Ability to operate the assets with highest reliability (>99.7%) | | ✓ |
| Field force management | • Ability to optimize field force deployment in multiple sites | | ✓ |

**Risk and Competition:**

***Competitive landscape***

While there are many small and medium size players have entered the transmission business through TBCB route, for analysis purpose, only large 3 players have been considered – PGCIL, Adani Transmission Ltd. And Sterlite Grid.

| | PGCIL | Sterlite Grid | Adani Transmission |
|---|---|---|---|
| Portfolio | • Line: 174113 ckm<br>• Sub-station: 499362 MVA<br>• TBCB Capex: 24000 Cr | • Line: 13600 ckm<br>• Sub-station: 24000 MVA<br>• TBCB Capex: 24000 Cr | • Line: 14814 ckm<br>• Sub-station: 27000 MVA<br>• TBCB project: 13<br>• TBCB Capex: 15250 Cr |
| Key strategies adopted | • Aggressive bidding followed by robust execution by leveraging partners/vendors<br>• Developed in-house expertise in the in Planning, Design, Engineering and O&M<br>• Launching InvIT to monetize TBCB assets | • Focus on cost optimization through metal cost hedging: own manufactured conductors<br>• Partnering with leading EPC players and OEMs (e.g. GE T&D, Tata Projects, UPTL, APSPL etc.) for timely execution<br>• Very strong focus on D&E for cost optimization- recently, implemented India's first vertical GIS substation to reduce land cost by 75%<br>• Focus on tower design optimization to reduce weight and space | • Focus on engineering excellence to reduce consumption of material such as steel, aluminium and insulators<br>• Cost optimization through metal cost hedging<br>• Adding capacity through TBCB as well as inorganic route (recently acquired KPTL transmission assets)<br>• Focus on very strong program management for Right of Way<br>• Heavily invested in digital technologies for managing linear |

| | | | |
|---|---|---|---|
| | | • Launched InvIT to monetize transmission assets and recycling equity to new projects<br>• Heavily invested in technologies for managing 'linear projects'<br>  • First to use helicrane to set up a power transmission line<br>  • Use UAV for automated inspection & analytics | projects and mitigating project risk<br>• GIS enabled route survey<br>• Bid intelligence platform<br>• Smart O&M enabled by centralized control & command Centre |

### 3.5.4 Business Models:

***Execution strategies***

Execution strategies adopted by key players are focused on cost optimization and project management. Primarily, there are 3 models, as explained below:

| Model | Description | Adopted by | Key strategies |
|---|---|---|---|
| **Model 1:**<br><br>**Turnkey EPC** | • The developer awards a contract on turn-key EPC basis<br>• EPC contractor appoints multiple sub-contractors | • PGCIL<br>• Adani Transmission in the initial phase | • While execution risk is transferred to the EPC contractor, sub-contractors are also empanelled by the developer, ensuring quality<br>• Developer e.g. PGCIL maintains strong relationship with sub-contractors and component manufacturers also |

| | | | |
|---|---|---|---|
| **Model 2:**<br><br>**Partnering with multiple contractors** | • Project is executed through partnership with multiple parties e.g. construction company, tower manufacturers and OEMs | • Sterlite<br>• Adani Transmission | • Direct awarding/negotiation with tower manufacturers optimizes cost<br>• Program management is done by the developer<br>• Execution risk is mitigated by proper contracting arrangement |
| **Model 3:**<br><br>**Partnering with multiple contractor with free issue of material** | • Multiple parties involved– construction companies, tower manufacturers, OEMs<br>• Material (steel, aluminum) is free issued to tower manufacturers | • Sterlite<br>• Adani transmission | • Margin expansion through material cost optimization - Procurement of metal is the responsibility of developer<br>• Metal cost is optimized through adequate hedging and risk management strategies<br>  • Transmission tower – 100% steel<br>  • Conductor – Al ingot and Galvanized steel core wire |

Developers need to adopt the right model based on maturity and capabilities developed towards procurement excellence and metal cost hedging.

***Partnership and alliance***

For various functions under transmission business, partnerships with established suppliers or service providers can be leveraged for faster execution, optimizing project cost and improving reliability of operations. The table below provides a list of such players spreading across various types of entities, offering various types of services:

| Type of entitles | Support required | Select/ Sample Players |
|---|---|---|
| **Survey Agencies** | • Transmission Route survey and planning<br>• Image preparation to identify obstacles<br>• Dissemination of knowledge of vast geographical spread of India | Multiple boutique survey agency, for example:<br>1. AMDL, Bengaluru<br>2. Geotrak, Kanpur<br>3. Apex Spatial Tech Solution, Nagpur<br>4. Samvriddhi infotech, Gurgaon |
| **EPC Agencies (Large)** | • Turnkey construction work<br>• Erection and commissioning | 1. KEC International<br>2. Tata Projects<br>3. L&T<br>4. Kalpataru Power Transmission |
| **EPC – Project subcontractors** | • Project construction, erection, and commissioning | 1. A2Z INFRA ENGINEERING LIMITED<br>2. Powermech projects<br>3. EMC Limited<br>4. Unitech Power transmission |
| **OEMs** | • Substation equipment and system OEMs | 1. GE T&D<br>2. ABB<br>3. Siemens<br>4. BHEL |
| **Tower Manufacturer** | • Tower manufacturers and erectors | 1. KEC International<br>2. Kalpataru Power Transmission<br>3. L&T<br>4. Associated Power Structure Pvt. Ltd.<br>5. Bajaj Electricals<br>6. Karamtara Engg<br>7. Skipper |

| | | |
|---|---|---|
| **Component and system supplier** | • Supply of components during execution and operation phases (spares) | 1. Cable manufacturers – KEI, Polycab, Finolex etc.<br>2. Conductors – Sterlite, Apar Industries, JSK Industries, Lumino<br>3. Spares - OEMs |
| **O&M Agencies** | • O&M of assets<br>• Field force mobilization and management<br>• Outage management | Multiple small/ local agencies available for O&M of Substation and transmission assets<br>1. A2Z Maintenance & Engg Ltd<br>2. Encotec Energy<br>3. JBS Enterprise<br>4. Elite Powertech |

# 4. CONCLUSION & RECOMMENDATION

## 4.1 Recommendations for Opportunity-1: BESS as a service:

### 4.1.1 Potential target for next 2-3 years

- To begin with, REPDCL can focus on small scale storage projects to the size up to 5 MW for C&I (Commercial and Industrial) consumers.
- Later, to scale it up, RECPDCL can also look at large scale storage projects providing grid applications for utilities and wholesale power market as energy storage will facilitate integration of 500 GW of RE capacity to be done by 2030 on India's electricity network infrastructure.
- RECPDCL then focus on storage-based tenders announced by MoP/SECI/NTPC - there is an immediate and direct visibility for 13-15 GWh of tenders coming out next 2-to-3 years.

### 4.1.2 Strategy for execution

- **Business model** –
  - Proactively approach to C&I consumers to provide RE RTC power (complemented by BESS) and develop BESS as a service capability within RECPDCL.
  - Later, respond to SECI/MOP/PSU/DISCOM bids for BESS
  - Approach to IPPs for generation support at low load (to avoid two-shifting)
  - Approach to any other player looking for RTC power through RE
- An approach towards building capabilities and leveraging ecosystem partners is recommended
  - Forge alliance with battery pack manufacturers, EPC contractors etc. through empanelment process, if required
  - Build capabilities in basic engineering, BMS design, power electronics and hardware, BESS O&M etc.
- Establish an internal technical team with expertise in battery technology – chemistry, performance etc.
  - Appoint a BESS lead
  - Build capability to do Basic Engineering and other designs needed
  - Add resource to manage lead and customer management

| | | |
|---|---|---|
| Target capacity | 100 MWh in next 3-4 years | |
| Equity IRR | Approx. 14% | However, considering risk profile is similar to transmission, market may turn aggressive |
| Revenue maximization options | Apart from PPA, revenue can be maximized by selling power during peak hours in the market | |

## 4.2 Recommendations for Opportunity-2: Distribution Operations of Electricity

### 4.2.1 Performance improvement targets

Certain measurable performance improvement targets would have to be defined for selected territories as a part of takeover strategy. Such targets and their potential benefits would also form the basis for negotiations with the existing Discom or Government for transfer of power distribution territory. However certain areas can be defined as showcased below, along which such performance benchmarks or delivery commitments can be formed.

| Efficiency Improvement | Customer Service | Network/Infrastructure Improvement | New Energy Interventions |
|---|---|---|---|
| • AT&C loss levels of 10% within 5/ 10 years of take-over.<br>• Committed trajectory on reduction | • Reliability indices: SAIFI, SAIDI, Volt/ Var etc. at National Benchmark level (24 X 7 PFA)<br>• Reduced level of complaints.<br>• Complaint resolution within 24/ 48 hours<br>• Enhanced customer contact points (No. of CCCs, Call Center Operations, Web/ APP interface etc.) | • Building network adequacy/ redundancy<br>• Underground Cabling/ LT ABC, HVDS etc.<br>• Network Automation – SCADA, FRTUs etc.<br>• Operations Technology – DMS, OMS etc.<br>• Smart Metering | • Supporting Solar Roof-tops<br>• Electric Vehicle Charging facilitation<br>• Leveraging Energy Storage solutions<br>• Propagating DSM interventions |

### 4.2.2 Pre-takeover risk mitigation

Power distribution sector has several legacy issues such as accuracy of performance data and accumulated losses of utilities. Also, power distribution utilities have long term agreements for power purchase which could limit the scope of performance improvement in future. Such issues would need detailed evaluation at a pre-take over stage by RECPDCL. Following measures can be taken for risk mitigation:

- **Baseline performance data -** Prepare adjusted baseline performance data of power utilities with due consideration to accuracy of data maintained

- **Asset Mapping and Asset Register -** Assess physical mapping and verification of assets, across the geographic area of licensee

- **Allocation of Liabilities -** Identification of serviceable and non-serviceable liabilities, having a bearing on future viability

- **Allocation of PPAs -** Evaluate long term PPAs of the utility and their possible allocation mechanisms, with due consideration to subsidy levels and cost of supply for utility

**Employee related issues -** Change management to minimize resistance from employees towards operational and organizational changes

#### 4.2.2.1 RECPDCL Potential target for next 2-3 years

- Given the expertise and vast experience of RECPDCL in the distribution domain of Power Sector, a new opportunity may be explored to take up Distribution Licensing or Distribution franchise of electricity.
- Primarily, RECPDCL can focus on creating a valued experience by exploring distribution franchisee in select Special Economic Zones (SEZ)/ large townships or the Smart cities that are being developed. List of some probable SEZ's that can be foreseen for this initiative can be:
    - Noida SEZ
    - Indore SEZ
    - Moradabad SEZ

#### 4.2.2.2 Way Forward

- As next-steps after the building a strong credentials, RECPDCL can look upon expanding this business and can focus on the acquiring distribution licensee for Select UTs which are under the government's mission that can be privatized.

## 4.3 Recommendations for Opportunity-3: Green Hydrogen

### 4.3.1 Key recommendation areas for policy advocacy

To bring down the cost of green hydrogen to the level comparable with grey hydrogen by **2025 and establish RECPDCL as a prominent player**, policy advocacies are recommended in certain areas.

Green hydrogen could be electric and gas building blocks in converging energy markets, enabling a renewable energy system and decarbonizing end-use markets. Create a national level 'hydrogen policy and roadmap.' Form - collaborative national green hydrogen task force, comprising PP sector leadership to provide momentum for accelerated deployment of green hydrogen. Set clear target for deployment of electrolyser.

- Bring policy on 'Green Hydrogen Purchase Obligation' for end-user industries, such as refinery, ammonia, and methanol. Initially, 10% obligation can create 0.50 – 0.60 million tons of demand for green hydrogen.
- Promote decentralized hydrogen use in remote and cold areas to unlock additional demand by substituting diesel as energy source
- India currently imports 85% of its oil and 50% of its natural gas. A 'Phased Manufacturing Programme' (PMP) can be introduced, and a roadmap/framework can be prepared to engage with prominent international OEMs.
- Grants, tax incentives, accelerated depreciation and concessional financing to provide an impetus to green hydrogen commercialization. Initial budgetary support may also be required to bridge the cost difference between grey hydrogen and green hydrogen.
- Explore incentive programmes for green ammonia, green fertilizer plants.
- While immediate focus should be at bringing down the cost of green hydrogen, long term interventions should be targeted at increasing share of hydrogen in energy mix (say 5 - 10% by 2040), addressing areas like steel, transport, shipping, aviation, cement, metal, glass, ceramics, etc.
- Strong tie-ups with OEMs for indigenization of the electrolyser manufacturing which is critical for rapid scaling up of the green hydrogen.

### 1.4 Recommendations for Opportunity-2: Power Procure Cost Optimization

**Potential Benefits/key recommendations (based on a case study)**

1. **Addition of New Capacity**

- For one of the evaluated utilities, the IRP model suggested addition of **250 MW of solar** from **Rajasthan region** and **185 MW of wind** from the **Kutch region** till 2025.
- Addition of **345 MW** of hybrid capacity was also suggested before 2025, based on a recent approval received by the utility
- Further additions suggested between 2025-30 were smaller compared to above capacities, as no transmission waiver would be available for RE commissioned post 2025

2. **Exits from Costly PPAs**

- Exits from high cost PPAs were also evaluated using decision variables which helps the model choose whether to continue the PPA or replace them with alternate sources
- For the utility, the model also suggested **exits from high cost PPAs** which crossed 25 years.

## 1.5 Recommendations for Opportunity-5: Transmission Infra Developer

### 1.5.1 RECPDCL Potential target for next 2-3 years

- Tariff Based Competitive Mode and some State Government has appointed for intra state transmission projects. This arrangement is likely to come to an end soon with a central transmission company formation.
- Keeping, this in mind, RECPDCL can explore an opportunity to enter into the transmission business with ISTS asset.
- At the current pace, TBCB may remain limited in inter-state investments. With market development and advocacy efforts from private players can lead to a sharp rise in addressable market creating additional opportunities for growth.

### 1.5.2 Strategy for execution

- As entering into this segment requires a lot of Greenfield investment, some smaller players who are looking to exit due to certain financial challenges can be acquired, as the risk is high for greenfield projects and RECPDCL may focus on suitable acquisition opportunities.
- This will help in building O&M capabilities and having first-hand experience of transmission business
- RECPDCL should quickly work on capability development for, transmission line execution and Operation and Maintenance of the transmission infrastructure.
- Alliance strategy – RECPDCL can partner with EPC contractors, Tower manufacturers, Route surveyors etc. through empanelment mechanism for better backing and leverage their expertise in the initial phases.

Project Plan:

| | | CY | 2021 | | 2022 | | 2023 | | 2024 | | 2025 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Focus areas** | Responsibility Centre | Half | H1 | H2 | H1 | H2 | H1 | H2 | H1 | H2 | H1 | H2 |
| **Growth area - Transmission** | BD | | | | | | | | | | | |
| Conduct a capability assessment of existing resource | | | | | | | | | | | | |
| ***Go/No-Go decision by leadership (Board)*** | | | | | | | | | | | | |

| | | CY | 2021 | | 2022 | | 2023 | | 2024 | | 2025 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Focus areas** | Responsibility Centre | Half | H1 | H2 | H1 | H2 | H1 | H2 | H1 | H2 | H1 | H2 |
| **If the leadership decision is to go ahead,** | | | | | | | | | | | | |
| Create a team of experts for Design & engineering, bid management and project management (through external hiring, if required) | | | | | | | | | | | | |
| Dedicate resources/ budget; dedicate resource for Bid process management | | | | | | | | | | | | |
| Identify key business processes and develop an operating strategy | | | | | | | | | | | | |
| Fast track process for commercial/ investment analysis and decision making | | | | | | | | | | | | |
| Explore alliance and partnership for faster execution and improving cost effectiveness of operations and optimize bidding decisions. Multiple alliances can be explored | | | | | | | | | | | | |

| Focus areas | Responsibility Centre | CY Half | 2021 H1 | 2021 H2 | 2022 H1 | 2022 H2 | 2023 H1 | 2023 H2 | 2024 H1 | 2024 H2 | 2025 H1 | 2025 H2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Develop detailed business plan to identify opportunities and year wise planning | | | | | | | | | | | | |
| Design the operating model for executing transmission projects | | | | | | | | | | | | |
| Participate in TBCB bids | | | | | | | | | | | | |

RECPDCL may explore acquisition of independent power transmission projects (IPTC) awarded to smaller players to establish footprint into the sector. Following list indicates few projects which could be probable targets for RECPDCL.

| Developer | Line | Ckm | KV | Capex (Cr.) |
|---|---|---|---|---|
| KPTL | Kohima-Mariani | 254 | 400 | 653 |
| | Satpura-Astha | 240 | 400 | 340 |
| BSG, Patel & Simplex | Raichur-Sholapur | 208 | 765 | 440 |
| EMCO | Nawalgarh-Jhunjhunu | 60 | 220 | ~ 40 |
| Megha | Mainpuri-Hapur | 654 | 765 | 4,150 |
| Isolux | Mainpuri-Bara | 1,600 | 765 | 7,000 |

From the above list, the **addressable market for acquisition can be pegged at Rs. 10,000 Cr. However, large players like Adani and Sterlite are already in process of exploring some of the above opportunities.**

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