

# Leveraging rooftops to **increase** your renewable energy mix

Anand Upadhyay, *Fellow*

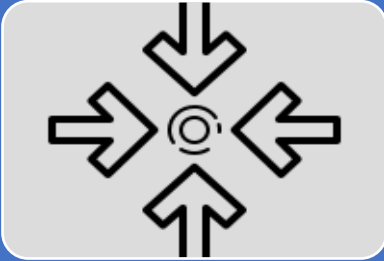
Mohammed Subhan Khan, *Research Associate*

# Why Renewable Energy?

Because

- It can make economic sense
  - Fossil fuel based electricity would continue to get costlier
- You may need to comply with government policies
  - Renewable Purchase Obligations compliance will become stricter
- Business is more than just profits
  - You may have your own sustainability goals
  - With increasing consumer awareness Indian consumers will get more demanding – this has already been happening in the west.

# Major hurdles to implementation



## Demand aggregation at corporate level

Identification of aggregate potential at top level incentivizes senior management to implement large capacity renewable energy projects, negotiate better rates and services, and also garner the interests of high quality rooftop solar project developers



## Low cost financing

Since rooftop solar projects have a higher portion of capital cost, access to low cost financing can significantly reduce the “cost” of the system.



## Access to high quality rooftop solar developers

Rooftop solar projects have a long life of use. Thus, beyond the initial capital costs, it is of very important to both select the suitable technical specifications and ensure proper operation and maintenance of these systems to achieve a reliable ROI.

# RE and Carbon footprint

- Operational Boundary defines the **scope of emissions** for operations falling under the company's organizational boundary
- Identify emission sources and classify them as direct and indirect
- Categorize the “scope” of emissions

Scope 1

Scope 2

Scope 3

100% RE is a foundational pillar  
for becoming carbon neutral

## And why do it NOW!

- No subsidy is not a problem – if it makes sense even without subsidy
- Expecting prices to continue falling through the floor? This is unlikely to happen, China has been trimming its overcapacity

## But where to start?

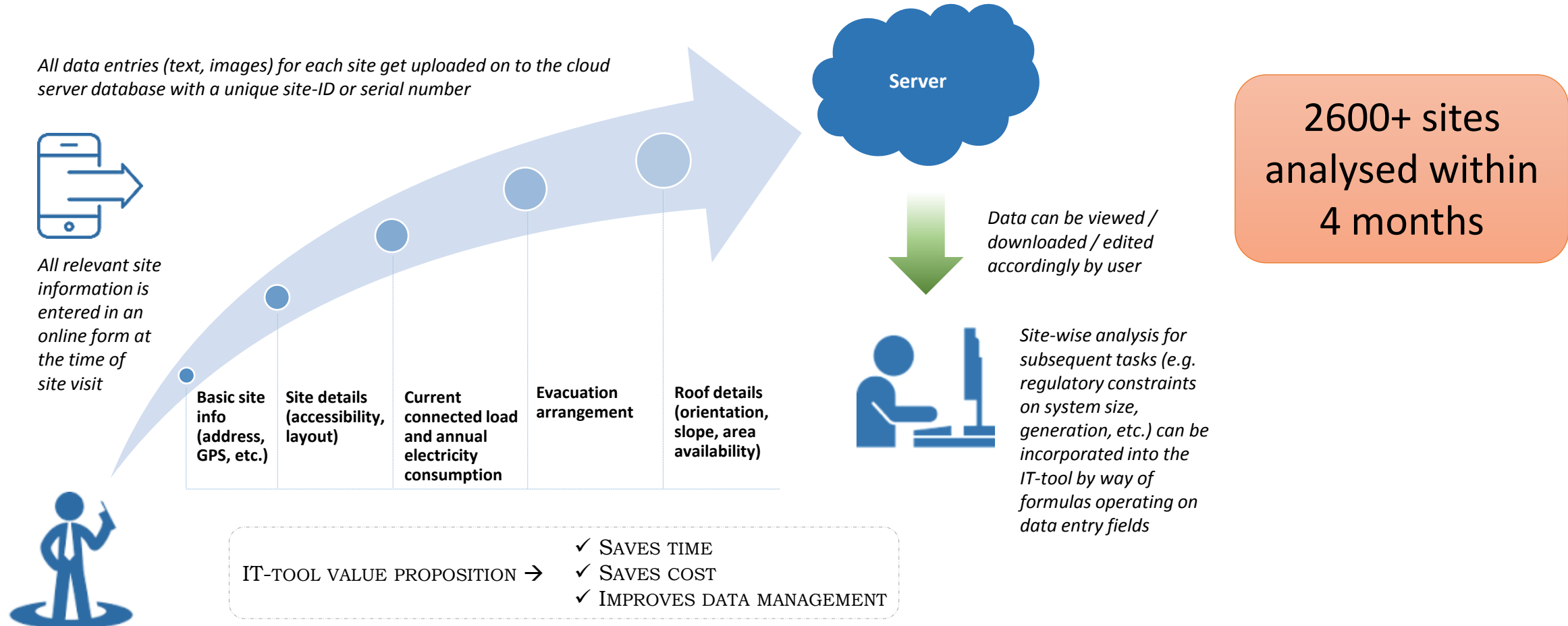
- What does not work well
  - Ad-hoc piecemeal installations
  - Small capacity – pure visibility “show off” installations
- Start with energy audit
  - Helps collect/organize internal
  - Will optimize the RE investment by avoiding over capacity
- And then, prepare a RE plan for your company

“If it is not **big**, it is not worth doing”

# Advantage of RE plan

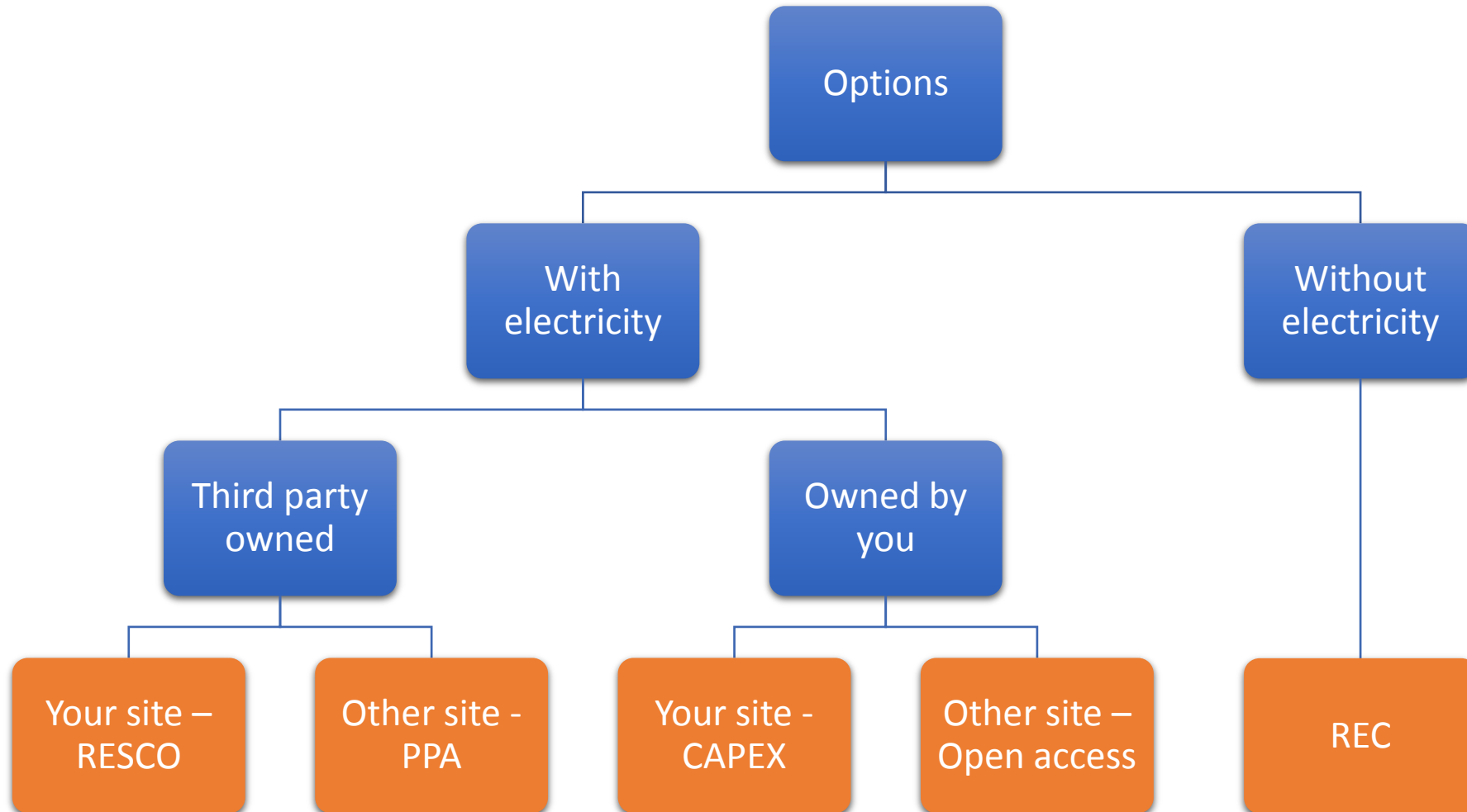
- You can follow a strategy (broken into short, mid, and long term goals)
- Integrate RE capacity with demand – necessary for bottom line benefits
- Especially useful when your assets are distributed at multiple locations
  - Different states, different policies.
  - Internal team inertia would otherwise slow things down
- Demand aggregation would allow better
  - Negotiation and pricing
  - O&M services

# Demand aggregation for GoI – 500 MW

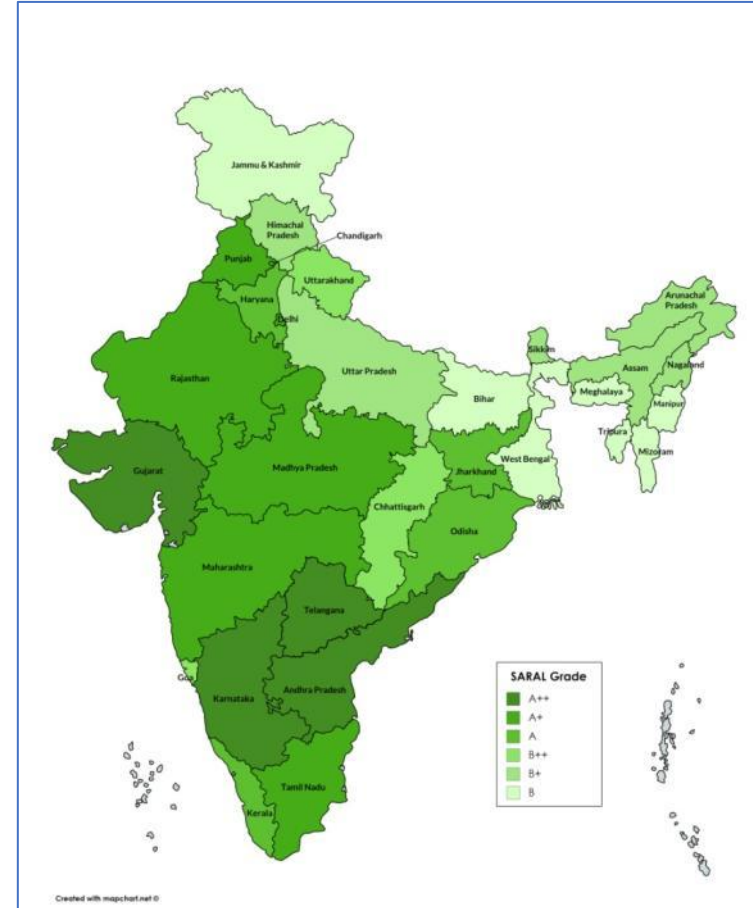
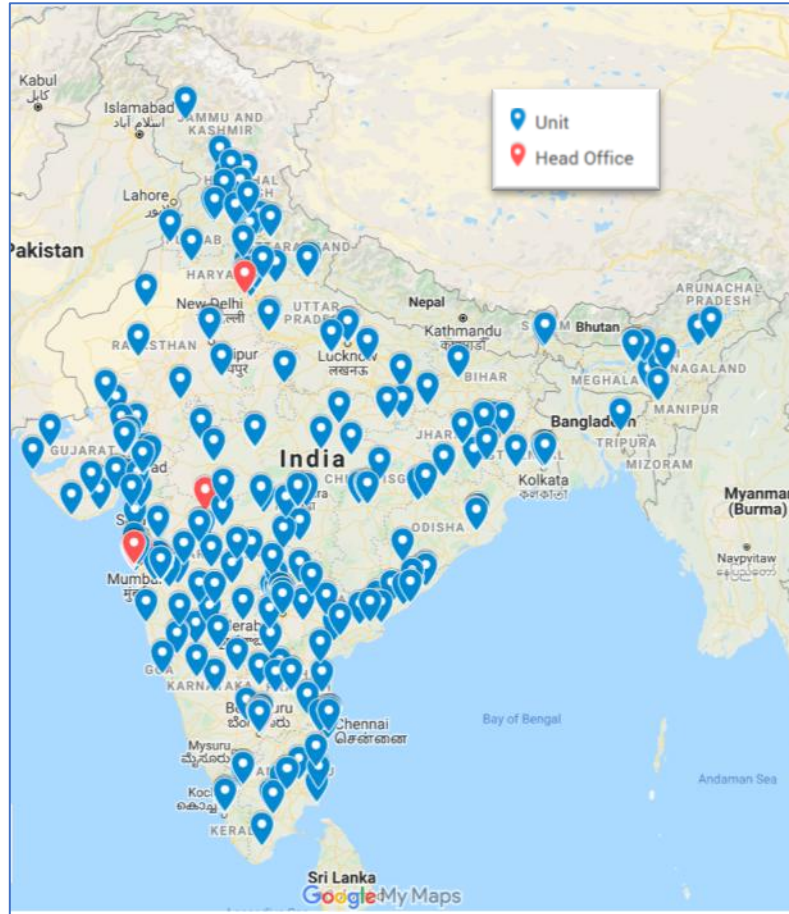




# Options for increasing RE share



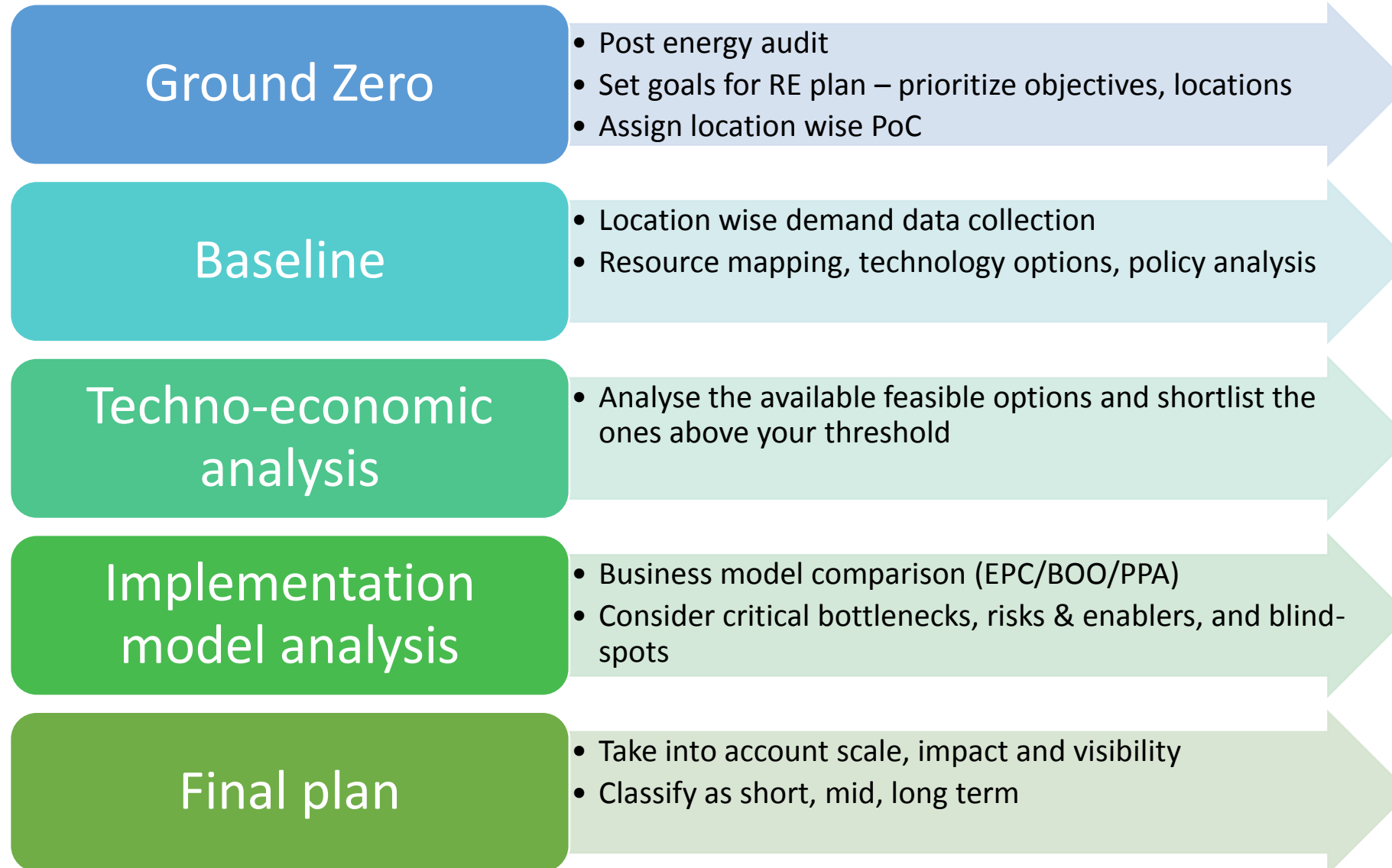
# Ease of policy – A state-wise comparison



# What does a good RE plan entail

- Location-wise assessment – potential, suitable technologies, feasibility, benefits, policies and regulation, financing options
- Benefits across large impact, high visibility, and integration with CSR
- Overall implementation schedule – short, mid, and long term
- Mode of implementation (EPC/BOO/PPA models)
- Identification of critical bottlenecks, risks & enablers, and blind-spots etc.
- Identification of implementation partners
- *Are you also helping your supply chain?*

# Planning your RE plan

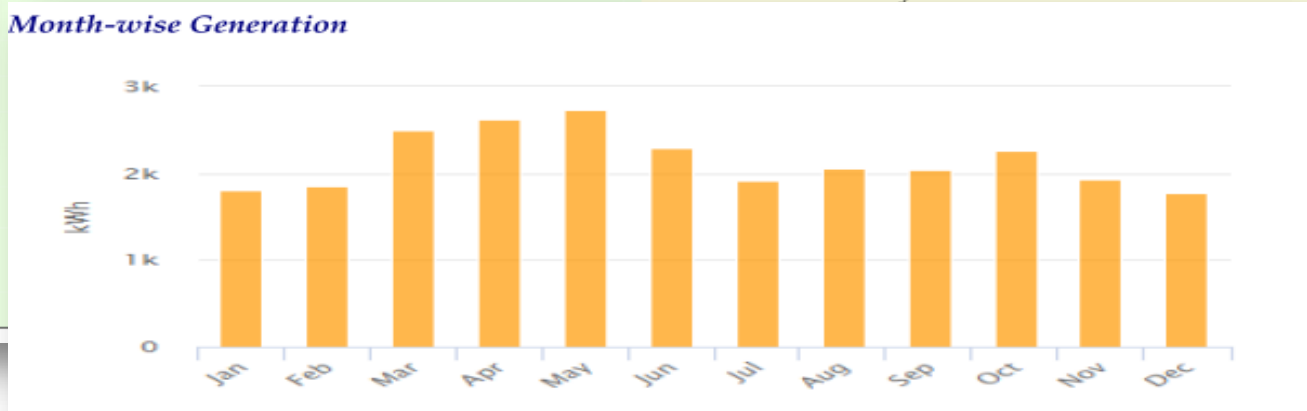


# Rooftop Solar Aggregation – A major apparel brand

Aggregated a capacity of 25 MW techno-economically feasible capacity



| System Design Matrix (Technical)   |   |
|------------------------------------|---|
| Module DC nameplate capacity       | ████ kW   |
| Inverter AC nameplate capacity     | ████ kW   |
| Annual Production                  | ████ MWh  |
| Performance Ratio                  | 76 %  |
| h/kWp                              | 1472  |
| Weather Dataset                    | TMY, █████ ISHRAE (epw)                         |
| Type of Power Plant                | Rooftop   |
| Overall Savings (non cash)         |   |
| Generation in 25 years             | ████ MWh  |
| CO <sub>2</sub> Offset in 25 years | ████ tons                                       |
| Financial Analysis                 |   |
| Assumptions:                       | Cost per Watt of the system : Rs █████ per watt |
| 1. Debt: Equity (ratio) = 70:30    | Total Project Cost: Rs █████ Lac                |
| 2. Cost of Equity at 13.6%         | Life of the PV System: 25 Years                 |
| 3. Cost of Debt at 10%             |   |
| 4. <i>Month-wise Generation</i>    |   |
| 5.                                 |   |
| 6.                                 |   |
| 7.                                 |   |
| 8.                                 |   |



# RE Roadmap for a steel company

Don't forget floating solar



*Focus on RPO requirements (beyond RECs) and reducing carbon footprint*

*173 MW of techno-economically feasible capacity which will lead to 250 million units clean energy annually*

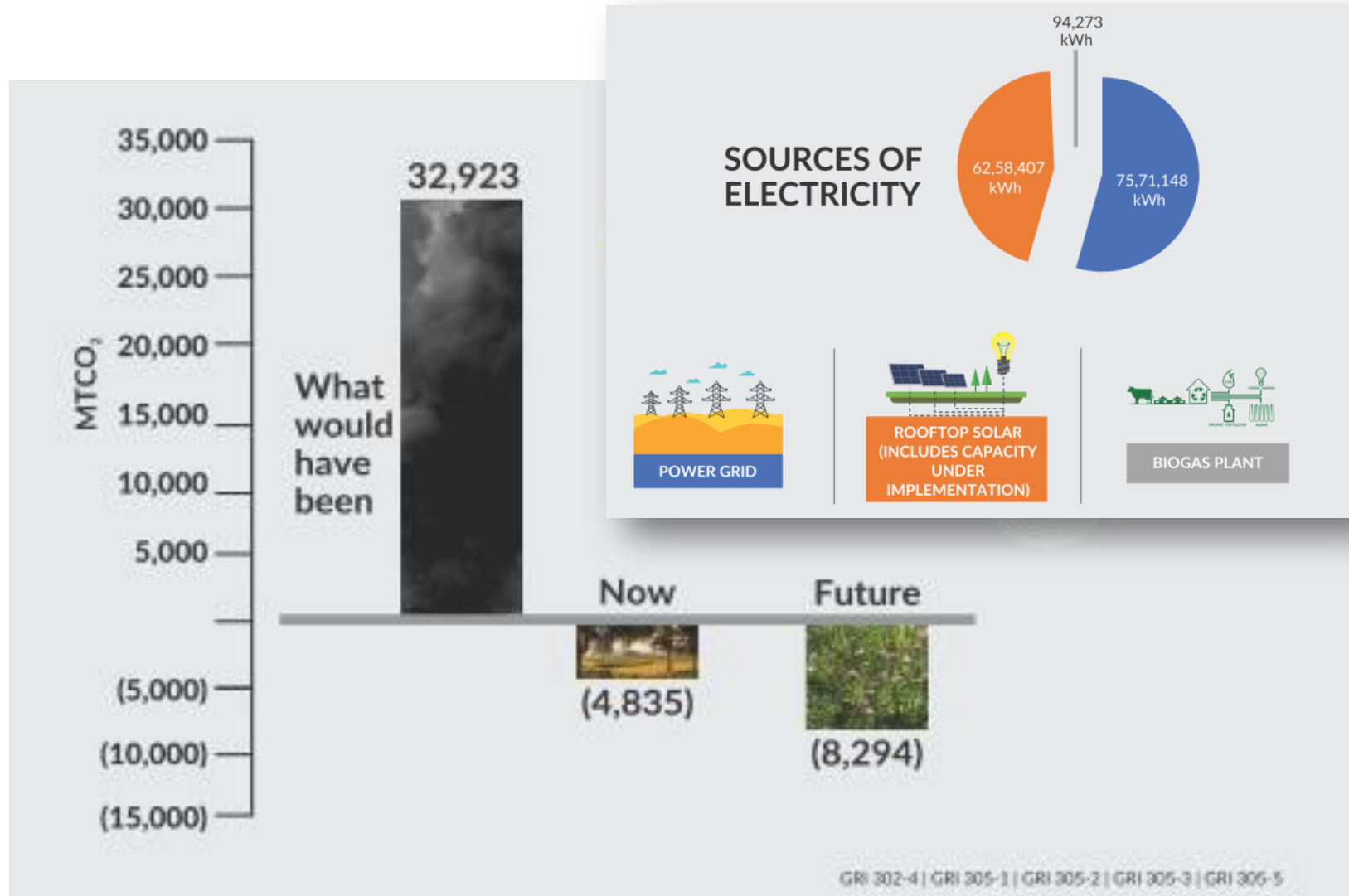
*Rs. 800 crores with 6 years payback*

*Analysis spread over manufacturing sites, townships, mining areas, stockyards, steel processing centers, and CSR locations*

# Common pitfalls in planning

- Mostly due to lack of experience and short-term thinking
- For example - Mapping solar potential
  - Water availability at site
  - Rooftop accessibility – required for O&M
  - Any upcoming construction near the site
  - Inadequate cumulative direction analysis
- Important that your team (internal or external) is well aware of end to end project cycle

# Creating impact – Magarpatta City



*The 2018-19 Sustainability report of Magarpatta City, Pune was awarded as “Asia’s Best First Time Sustainability Report” by Asia Sustainability Reporting Awards*



# What follows the plan?

- Connecting with implementation partners
- Tendering
- Due diligence and negotiations
- Contracting
- Communications and outreach
- Performance measurement

# What TERI can do?

- Help you navigate through policy and regulatory processes
- Strategize and prepare a RE implementation plan
- Implementation advisory
  - Tendering & finding right partners
  - Handholding during contracting and negotiations
- Third party independent performance validations

# Next steps for you



## 1. *Demand aggregation*

# *Thank You!*

For case studies & more information  
Please contact

*Arupendra Nath Mullick*

*Vice-President*

*TERI Council for Business Sustainability*

**M** +91 98106 43072

**E** [amullick@teri.res.in](mailto:amullick@teri.res.in)

*Anand Upadhyay*

*Fellow*

*Renewable Energy Technologies Division*

**M** +91 98119 14995

**E** [anand.upadhyay@teri.res.in](mailto:anand.upadhyay@teri.res.in)