What is the Value of Daily 1 MW Peak Demand Reduction for Tata Power?

SRI-B Energy Task Force

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Financial Value

1 MW = INR 2.02–2.04 crore/year
in direct annual savings for Tata Power

Environmental Impact

1 MW = 1,860 tonnes CO_2/year
Carbon credit value: INR 46.5 lakh/year

Infrastructure Value

1 MW = INR 4.5–6 crore
in deferred generation infrastructure costs

Executive Summary

For Tata Power, 1 MW of peak demand reduction delivers INR 2.02–2.04 crore in annual direct savings plus INR 4.5–6 crore in deferred infrastructure costs. This analysis combines operational data, regulatory filings, and demand response economics.

1 Cost Avoidance in Generation Infrastructure

1.1 Deferred Capacity Expansion

Peak reduction avoids INR 4.5–6 crore/MW capital expenditure for new coal plants:

$$\text{CapEx Savings} = 1\,\text{MW} \times (INR4.5 - 6\,\text{crore/MW}) \tag{1}$$

1.2 Fuel Cost Savings

Daily savings from reduced peaker plant usage:

$$\text{Daily Savings} = 1\,\text{MW} \times 4\,\text{h} \times INR10/\text{kWh} = INR40,000 \tag{2}$$

Annual savings reach **INR 1.46 crore**.

2 Transmission Optimization

2.1 Infrastructure Deferral

Tata Power's Mumbai network saves:

$$\text{NPV} = \sum_{t=1}^{10} \frac{INR1.5\,\text{crore}}{(1+0.07)^t} = INR9.8\,\text{crore} \tag{3}$$

2.2 Loss Reduction

Technical loss savings calculation:

$$\text{Annual Savings} = 94.9\,\text{MWh} \times INR5.2/\text{kWh} = INR4.93\,\text{lakh} \tag{4}$$

3 Demand Response Economics

Table 1: Demand Response Program Economics

Component	Cost (INR lakh)	Savings (INR lakh)
Customer Incentives	12.0	–
Fuel Cost Savings	–	146.0
T&D Loss Reduction	–	4.9

4 Regulatory Benefits

4.1 Capacity Markets

$$\text{Revenue} = 1\,\text{MW} \times INR6\,\text{lakh/MW} = INR6\,\text{lakh} \tag{5}$$

4.2 Renewable Credits

$$\text{RPO Value} = INR2.3\,\text{lakh/MW} \times 1\,\text{MW} = INR2.3\,\text{lakh} \tag{6}$$

5 Environmental Impact

Carbon credit valuation:

$$\text{CO}_2\ \text{Savings} = 1,860\,\text{t} \times INR2,500/\text{t} = INR46.5\,\text{lakh} \tag{7}$$

Conclusion

The total quantified value ranges demonstrate peak reduction's strategic importance:

$$\text{Total Annual Value} = INR2.02 - 2.04\,\text{crore} \tag{8}$$

Where did we get these numbers from?

(Note: these are shortened-links for readability. Clicking them on the PDF copy will take us to the full link)

1. We took the data about Peak demand projections, infrastructure costs, and technical loss benchmarks from National Electricity Plan, India
   Link: cea.nic.in/ceadocument/national-electricity-plan

2. We took the data related to Financials, renewable investments, and demand response initiatives from Tata Power Annual Report 2023-24
   Link: tatapowertrading.com/ANNUAL-REPORT-2023.pdf

3. T&D upgrade costs data was taken from PowerGrid of India (PGCIL)
   Link: powergrid.in/Application-for-Charges.pdf

4. Coal Plant Capital Cost data from IEA
   Link: iea.org/reports/coal-2024

5. AutoGrid+Tata Power Demand Response Impact report from Uplight
   Link: uplight.com/press/tata-power-and-autogrid