15 years of impact

FOURTH PARTNER ENERGY

CASE STUDY

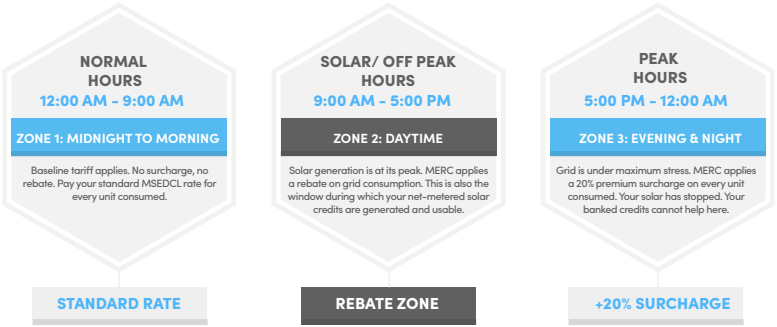
MAHARASHTRA's EVOLVING ENERGY BANKING FRAMEWORK

IMPLICATIONS FOR CORPORATE RENEWABLE ENERGY PROCUREMENT

EXECUTIVE SUMMARY

Maharashtra's recent changes to energy banking and Time-of-Day (ToD) tariff mechanisms are reshaping how Commercial & Industrial (C&I) consumers evaluate renewable energy investments.

Historically, energy banking provided flexibility by allowing surplus renewable energy generated during one period to be utilized during another. As renewable energy penetration increases across the grid, regulatory frameworks are gradually evolving technologies that enable closer alignment between generation and consumption.



For industrial consumers, particularly those operating beyond daylight hours, this shift places greater emphasis on renewable energy utilization, load matching, and energy availability across multiple operating windows.

As a result, renewable energy procurement strategies are increasingly moving beyond standalone solar projects toward integrated solutions that combine solar, wind, and Battery Energy Storage Systems (BESS). These technologies can help improve renewable energy utilization, reduce exposure to peak-period grid procurement, and support long-term decarbonization goals.

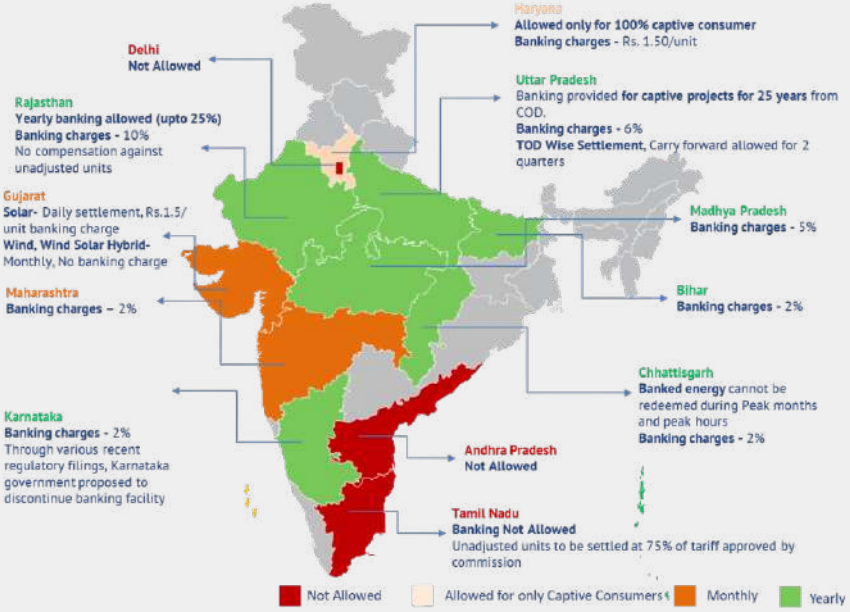
KEY TAKEAWAY

The next phase of industrial decarbonization will be driven not only by renewable energy generation, but by the ability to intelligently balance, store, and dispatch clean energy when it is needed most.

CHAPTER ONE

Understanding Maharashtra's Evolving Banking Framework; Its implications for the C&I Renewables Segment

Energy banking has historically played an important role in enabling renewable energy adoption among industrial consumers. Surplus electricity generated during periods of high renewable generation could be credited and utilized during periods when generation was unavailable.

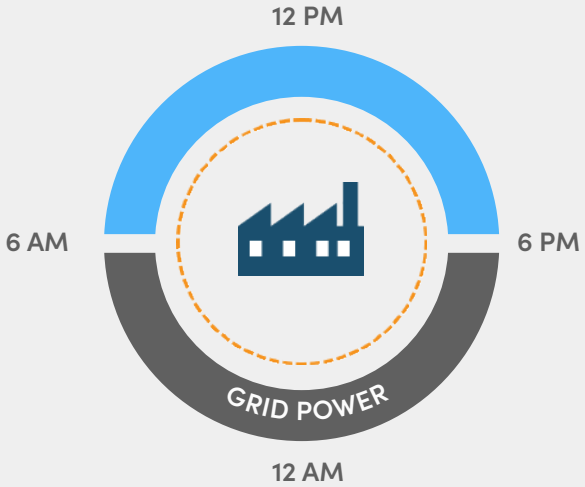


Source: JMK Research

Recent regulatory provisions have introduced greater linkage between energy generation and designated Time-of-Day (ToD) consumption windows. While the exact impact varies by consumer category and load profile-the practical flexibility available under traditional banking arrangements has reduced.

IT'S NOT HOW MUCH. IT'S WHEN.

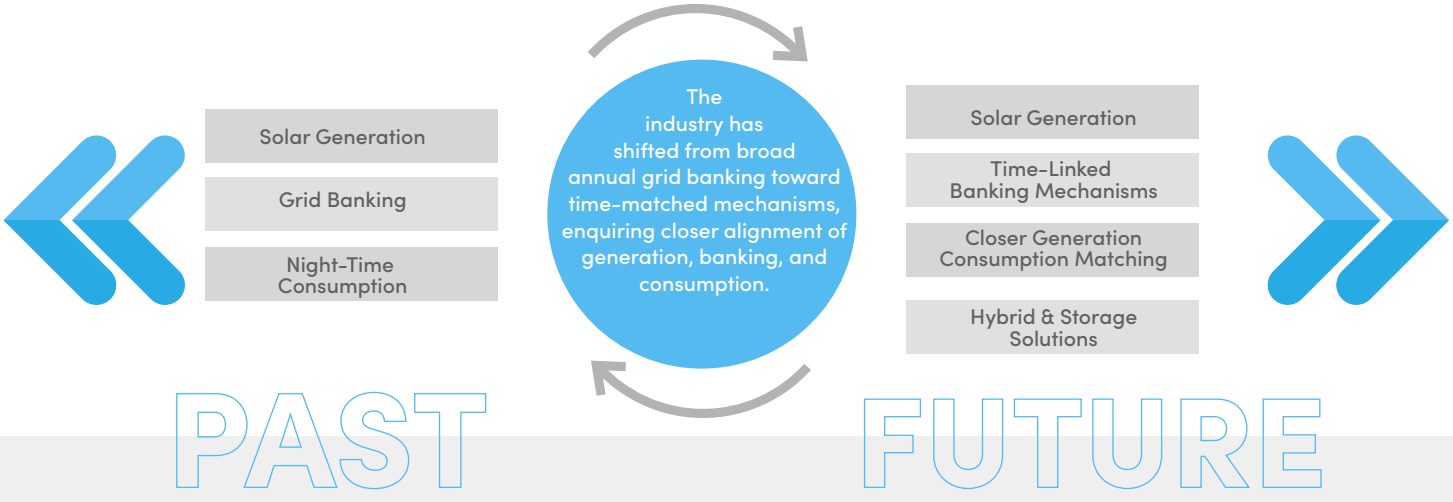
Solar generates by day, but your factory runs around the clock.



This evolution reflects a broader trend seen across electricity markets globally. As renewable energy penetration rises, regulators are increasingly focused on grid stability, localized balancing, and efficient utilization of network infrastructure.

For industrial consumers, the primary implication is that renewable energy procurement decisions must now consider not only total annual generation, but also when that energy is generated and consumed.

HOW RENEWABLE ENERGY UTILIZATION IS EVOLVING



IMPACT ON INDUSTRIAL ENERGY ECONOMICS

For facilities operating single daytime shifts, the impact of these changes may be limited. However, for businesses operating extended evening shifts or continuous 24x7 processes, the timing of renewable energy generation becomes increasingly important.

THREE KEY CONSIDERATIONS EMERGE:

1 RENEWABLE ENERGY UTILISATION

Surplus renewable energy generated during daytime periods may not always align with actual consumption requirements, creating a need for improved load matching strategies.

2 GREATER IMPORTANCE OF ToD TARIFFS

Electricity procurement costs increasingly vary by time of consumption. As a result, facilities with significant evening or night-time demand may experience different economic outcomes compared to facilities operating primarily during daylight hours.

3 OPERATIONAL FLEXIBILITY

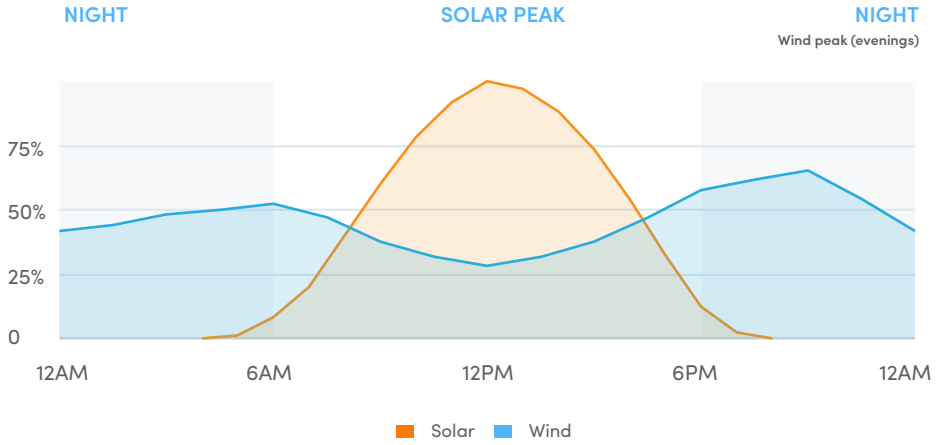
Renewable energy strategies that provide greater flexibility across multiple operating windows can help improve energy utilization and support more predictable long-term savings.

CHAPTER TWO

Comparing renewable energy strategies for Commercial and Industrial (C&I) consumers

To understand how different renewable energy configurations perform under evolving market conditions, consider a facility with continuous electricity demand across a 24-hour operating cycle.

INDICATIVE GENERATION PROFILES
ACROSS A 24-HOUR CYCLE



Profiles are indicative. Actual output varies by technology, location and seasonal conditions

Wind shows stronger evening and overnight performence while solar concentrates midday genaration.

CASE A

Standalone Solar

A conventional solar project supplies renewable energy primarily during daylight hours.

BENEFITS

- Strong daytime renewable energy generation
- Effective support for daytime operations
- Lower carbon footprint

CONSIDERATIONS

- Limited renewable energy availability after sunset
- Greater dependence on grid electricity during evening and night-time periods

MAXIMUM POSSIBLE ENERGY REPLACEMENT

20–35%

CASE B

Standalone Wind

A configuration where energy procurement relies solely on wind generation assets.

BENEFITS

- Supplies clean power outside of daylight hours, supporting non-daytime shifts
- Generates power during evening peak hours, offsetting expensive grid tariffs
- Strong power output during high-wind months like the monsoon season

CONSIDERATIONS

- Generation drops significantly during standard daytime working hours
- Reliant on seasonal variations and specific wind corridors, causing monthly fluctuations
- Requires extensive transmission lines, increasing exposure to wheeling and banking restrictions

MAXIMUM POSSIBLE ENERGY REPLACEMENT

20–35%

CASE C

Wind-Solar Hybrid

A wind-solar hybrid combines complementary renewable energy sources.

BENEFITS

- Improved renewable energy availability across more operating hours
- Reduced dependence on a single generation profile
- Better alignment with evening and early-morning demand

CONSIDERATIONS

- Renewable generation remains weather dependent
- Energy availability can vary seasonally

MAXIMUM POSSIBLE ENERGY REPLACEMENT

40–50%

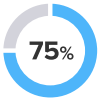
CASE D

Hybrid + Battery Storage (BESS)

A hybrid renewable energy system integrated with battery storage enables renewable energy to be stored and deployed when required.

BENEFITS

- Improved utilisation of surplus renewable generation
- Enhanced ability to support evening demand periods
- Greater operational flexibility
- Improved alignment between generation and consumption



CONSIDERATIONS

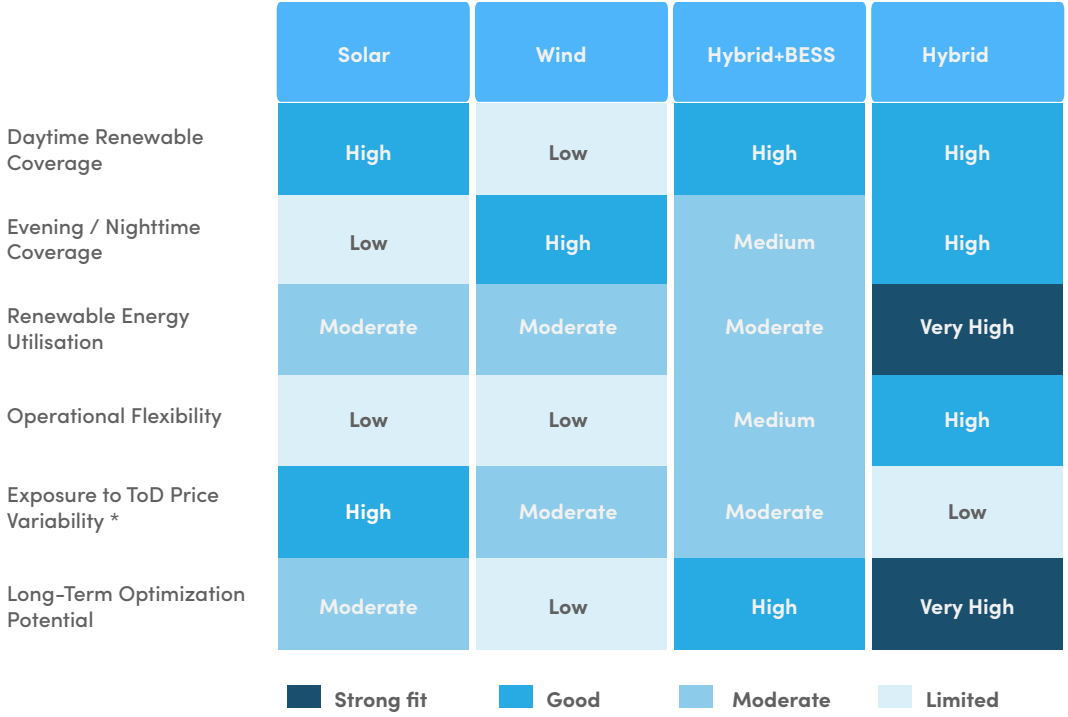
- Additional capital investment
- Storage sizing must be aligned with facility load requirements

MAXIMUM POSSIBLE ENERGY REPLACEMENT

70–75%

RENEWABLE ENERGY STRATEGY COMPARISON

How four procurement strategies perform across a 24-hour C&I load



* For ToD exposure, lower is better

CHAPTER THREE

Industry Case Example – A Fourth Partner Energy Analysis

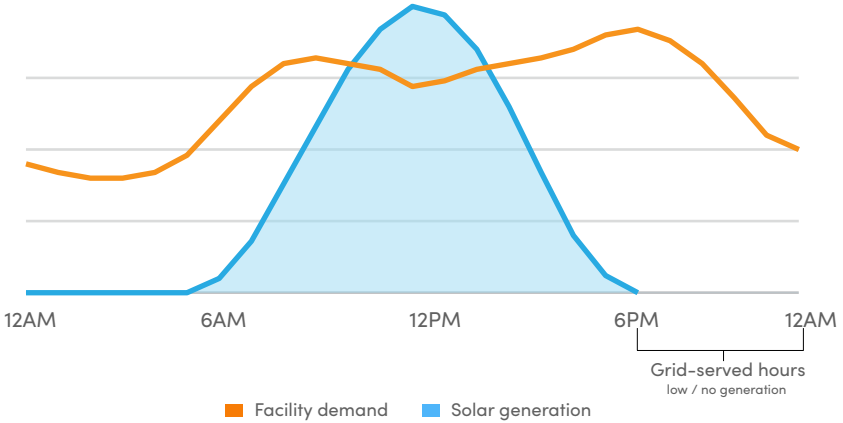
Beyond immediate grid balancing adjustments, the introduction of restricted banking structures directly changes the operational economics for existing clean energy assets. According to risk assessments by major rating agencies like CRISIL and ICRA, shifting to tighter real-time or Time-of-Day (ToD) slots alters the core financial baselines under which prior investments and long-term Power Purchase Agreements (PPAs) were finalized. For operational projects, this unmitigated banking gap introduces clear asset underperformance risks—typically compressing expected Equity IRRs by 150 to 250 basis points, extending capital payback horizons by approximately 2 years, and escalating the effective landed cost of power by ₹0.60 to ₹0.95 per unit. Ultimately, modifying established regulatory frameworks mid-agreement creates planning uncertainty, serving as a deterrent to long-term corporate investment sentiment and complicating project bankability for C&I consumers trying to meet state sustainability goals.

Fourth Partner Energy evaluated the impact of changing energy-utilisation dynamics across multiple industrial operating profiles.

One representative assessment involved a large industrial facility with substantial renwable energy procurement and continuous operating requirements.

The analysis indicated that a significant portion of renewable energy generation occurred during periods that did not fully align with operational demand patterns. This resulted in lower-than-expected renewable energy utilization and increased reliance on grid procurement during non-generation hours.

Generation vs. Consumption across a typical operating day



The study highlighted an important industry insight

The value of renewable energy increasingly depends not only on how much energy is generated, but also on how effectively renewable eneration aligns with consumption.

Integrated hybrid and storage solutions demonstrated the potential to improve utilization of renewable energy while supporting greater operational flexibility.

The emerging role of Hybrid and Storage solutions

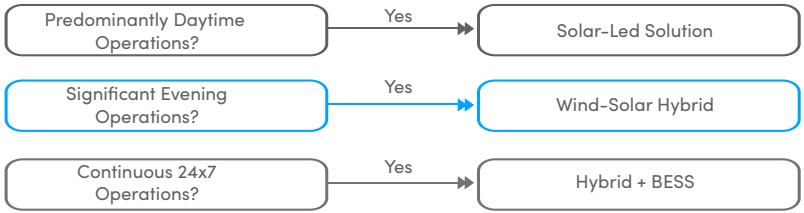
The growing adoption of Battery Energy Storage Systems (BESS) across industrial energy portfolios reflects a broader shift within the energy sector. Historically, the grid provided much of the balancing function required to manage variability in renewable-energy generation. Increasingly, however, balancing capabilities are being embedded directly within energy infrastructure through a combination of diversified renewable generation and energy storage.

For Industrial Consumers, this creates several opportunities:

- Improved renewable-energy utilisation
- Reduced dependence on external balancing mechanisms
- Better alignment between energy generation and demand profiles
- Enhanced energy resilience and reliability
- Greater predictability of long-term energy economics

As battery costs continue to decline and storage technologies mature, hybrid renewable energy systems are expected to play an increasingly important role in industrial decarbonization strategies.

Decision Framework for C&I Consumers



CHAPTER FOUR

Strategic Considerations for C&I Consumers

As energy markets continue to evolve, industrial consumers should consider the following actions

1

Analyze Load Profiles

Develop a detailed understanding of hourly and seasonal electricity demand patterns.

2

Evaluate Technology Combinations

Assess the role of solar, wind, and storage technologies in improving renewable energy utilisation.

3

Prioritize Flexibility

Design energy strategies that can adapt to changing regulatory and market conditions.

4

Partner for Long-Term Optimization

Work with experienced renewable energy partners capable of designing integrated solutions tailored to operational requirements.

Conclusion

Maharashtra's evolving energy banking framework reflects a broader transition taking place across India's electricity sector. As renewable energy penetration grows, energy systems are increasingly prioritizing balancing, flexibility, and efficient utilization alongside clean energy generation.

For industrial consumers, this evolution highlights the importance of aligning renewable energy procurement strategies with actual operating requirements. While standalone solar projects continue to offer significant value, facilities with extended operating hours may increasingly benefit from solutions that combine solar, wind, and battery storage technologies.

The future of industrial decarbonization will not be defined solely by the quantity of renewable energy generated, but by the ability to intelligently orchestrate that energy across every operating hour.

Organizations that successfully integrate generation, storage, and energy management capabilities will be well positioned to achieve both sustainability and long-term energy resilience.

KEY TAKEAWAYS

- Renewable energy economics are increasingly influenced by when energy is generated and consumed.
- Time-of-Day considerations are becoming an important factor in energy procurement decisions.
- Wind-solar hybrid projects can improve renewable energy availability across a broader operating window.
- Battery Energy Storage Systems (BESS) help improve renewable energy utilisation and operational flexibility.
- Energy storage is emerging as a key enabler of industrial decarbonisation.
- Future-ready energy strategies will increasingly combine generation, balancing, and storage capabilities.
- Integrated renewable energy solutions can support both sustainability goals and long-term energy resilience.

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