

# Future of Solar O&M in India

Changing Landscape, Growing Role of Digitalization and New Opportunities

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## 1. EXECUTIVE SUMMARY

Solar plants are built to last 20-25 years. After the engineering procurement and construction period is completed, developers need to ensure that the operations and maintenance (O&M) activities are seamless for sustained energy generation over the project lifetime. The report highlights the emerging opportunities in this space and the growing role of new technologies like automation and artificial intelligence.

## 2. MARKET OVERVIEW

In the initial years of solar power development in India, O&M was often coupled with EPC and performed by the same vendors, but of late, solar O&M has emerged as a separate market with its own landscape, trends and dynamics. This chapter covers the following areas:

- ❖ Market Size and Growth
- ❖ Installed Capacity of Rooftop Solar (as of September 2017)
- ❖ Key Growth Trends and Drivers
  - Enabling Policy Environment
  - Decline in Solar Tariffs
  - Emergence of Serious Players
- ❖ Solar O&M Evolution in India
  - O&M Industry Structure
  - Contract Duration
- ❖ Emerging Role Of Energy Storage
- ❖ Key Issues And Concerns

## 3. COST TRENDS

The cost of O&M services has been declining over the past few years and the downward trend is expected to continue. The cost composition itself is changing due to greater automation and use of advanced tools. This chapter covers the following areas:

- ❖ Solar O&M Cost Trajectory (2012-18)
- ❖ Cost Breakup Analysis
  - Vehicles and Logistics
  - Equipment and Tools (Inverters, cables, modules, civil structures, transmission, etc.)
  - Overheads
  - Personnel/Manpower
  - Digital
  - Others
- ❖ Cost Projections (2019-24)
  - Business Model Evolution
  - Key Cost Considerations
  - Impact of Scale
  - Impact of Energy Storage
  - Future Cost Estimates

## 4. EMERGING O&M BUSINESS MODELS

Globally, there has been a rise of third party solar O&M service providers. As more sophisticated and structured approach emerges in the solar O&M market, third party providers are able to deliver more value to solar investors and owners. This chapter covers the following areas:

- ❖ Capex Based
- ❖ Profit Sharing Model

- ❖ O&M Extensions
- ❖ Other Models
  - O&M Company as a Qualified Coordinating Agency (QCA)
- ❖ Comparison of Emerging Solar O&M Business Model
- ❖ Key O&M Providers

## 5. TERMS OF O&M CONTRACTS

It is important for both developers and O&M service providers to clarify and list out their expectations and accordingly draw up a long-term contract. An effective contract will result in higher plant efficiencies. This chapter covers the following areas:

- ❖ Time Period
  - Contract Term
- ❖ Product Warranties
- ❖ Performance Guarantees and Service Level Agreements (SLAs)
  - Performance Guarantees
  - SLAs
- ❖ Penalties
- ❖ Ownership
- ❖ Legal Terms

## 6. GRID MANAGEMENT BY O&M PLAYERS

As the government becomes stricter in its implementation of forecasting, scheduling and deviation settlement mechanism regulations, grid management will become a key component of O&M players. Integration of energy storage on to existing plants will lead to a greater O&M play. This chapter covers the following areas:

- ❖ Forecasting and Scheduling
- ❖ Deviation Settlement Mechanism
  - Intra and Inter State Regulations for DSM
  - Case Study - Rajasthan
  - Outlook for Forecasting, Scheduling and DSM
- ❖ Integration of Energy Storage Into Existing Plants
  - Outlook for Energy Storage
- ❖ Cost Implications and Experience so Far
  - Forecasting, Scheduling and Deviation Settlement
  - Energy Storage
- ❖ Conclusion

## 7. O&M COMPANY PROFILES

A large number of O&M focused players are coming up, some as hive-offs from existing EPC companies and others as independent specialists. This chapter covers profiles of key O&M players in India:

- ❖ Avi Solar
- ❖ Inspire Clean Energy
- ❖ juwi India Renewable Energies
- ❖ L&T ECC
- ❖ Solarig Gensol
- ❖ Tata Power Solar

## 8. DIGITALIZATION AND AUTOMATION AT PLANT LEVEL

Digitalization and automation will play a key role in providing efficient O&M services, thereby changing the current O&M cost composition, which is currently dominated by manpower expenses. New technologies are being adopted for improving asset lifecycle management, predictive maintenance, remote sensing and control, cloud computing, and use of drones for visual imaging. A number of companies have also already started using robotics for cleaning modules. This chapter covers the following areas:

- ❖ Emerging Role, Applications and use Case for the following:
  - Manpower and Material Management
  - Automated Monitoring and Big Data Analytics
  - Robotics, Drones and Wearables
- ❖ Growing Role of Artificial Intelligence
  - Machine Learning Applications
  - AI Field Assistants and Predictive Analytics
  - Existing use Cases
- ❖ Key Technology Providers
- ❖ **Industry Perspective**  
(Views of key personnel from the solar O&M industry and technology providers on the growing role of AI, robotics and data analytics)

## 9. KEY CHALLENGES, BEST PRACTICES AND CASE STUDIES

The lack of attention given to O&M practices is one of the primary challenges that the segment is facing. If the plant is not maintained properly, developers can lose up to 15 per cent of the returns. This chapter covers the following areas:

- ❖ O&M Challenges
  - Costly Module Cleaning
  - Expensive Automated Monitoring Solutions
  - Frequent Equipment Breakdown
  - Loopholes in Contracts
  - Insufficient Spares Inventory
  - Difficulty in Mobilising Finance to Scale Operations
  - Short Contract Duration
  - YoY Increase in O&M Costs
  - High Costs of Advanced Security Measures
  - Manpower Management
  - Neglecting Safety Measures
- ❖ Best Practices
  - Technology
  - Monitoring
  - Contractual
- ❖ Case Studies
  - Krypton Cloud: SunPower
  - Aerospec Technologies: 100 MW Solar Farm
  - Ecoppia
  - Avi Solar - Pragathi Group's 10 MWp Plant, Midjil
  - Qos Energy

## 10. PROJECTED O&M MARKET SIZE

The total addressable market for solar PV O&M is expected to reach 30 GW in 2018-19. It is likely to more than triple by 2022 to exceed 100 GW. In fact, going forward, as the installed base gets larger, O&M revenue may even exceed the development and construction revenue. This chapter covers the following areas:

- ❖ Impact Factors
- ❖ Emerging O&M Industry Structure
- ❖ O&M Market Size Projections (2019-24)
  - Short-term Projections (2018-20)
  - Medium-term Projections (2020-23)
  - Long-term Projections (2023-25)

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