

Case Study

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C&I RE Sector

Project Owner





JMK Research & Analytics is a specialist consultancy firm that provides research and advisory services to Indian and International

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GLOSSARY

| Abbreviation | Definition |
|--------------|--|
| API | Active Pharmaceutical Ingredients |
| AC | Alternating current |
| CRAMS | Contract Research and Manufacturing Services |
| CO2 | Carbon dioxide |
| C&I | Commercial and Industrial |
| DISCOM | Distribution Company |
| DG | Diesel Gensets |
| EaaS | Energy-as-a-Service |
| EV | Electric Vehicle |
| EPC | Engineering, Procurement, Construction |
| FPEL | Fourth Partner Energy Limited |
| FTE | Full-time Employees |
| FY | Financial Year |
| gCO2eq | Expression of the equivalent amount of CO2 |
| GW | Giga watt |
| GWh | Gigawatt-Hour |
| GDP | Gross Domestic Product |
| GNA | General Network Access |

| Abbreviation | Definition |
|--------------|---------------------------------|
| INR | Indian rupee |
| IEX | Indian Energy Exchange |
| ISTS | Inter-State Transmission System |
| kWp | Kilowatt-peak |
| kWh | Kilowatt-Hour |
| kV | KiloVolt |
| MW | Megawatt |
| MWp | Megawatt peak |
| MWh | Megawatt-hour |
| OPEX | Operational Expenditure |
| OA | Open Access |
| PPA | Power Purchase Agreement |
| RE | Renewable Energy |
| R&D | Research & Development |
| SEZ | Special Economic Zone |
| USD | United States Dollar |
| Wp | Watt-Peak |
| ZLD | Zero liquid discharge |

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ABOUT SOLARA ACTIVE PHARMA



Solara Active Pharma is a leading global provider of Active Pharmaceutical Ingredients (API) and Contract Research and Manufacturing Services (CRAMS). The Company has a portfolio of over 60+ commercial APIs. The Company has a presence in over 75 countries across the globe. The Company has 6 API manufacturing facilities in India and two Research and Development (R&D) centers.

Table 1: “Solara Active Pharma” Company Overview

| Parameter | Details |
|---|---|
| Name | Solara Active Pharma |
| Registered office | 201, Devavrata, Sector 17, Vashi, Navi Mumbai - 400 703, Maharashtra, India |
| Year of Establishment | 2017 |
| Type | Active Pharmaceutical Ingredients (APIs) manufacturer |
| Facilities | Seven (Six are manufacturing units) |
| States Served | 6 |
| Number of employees | 2361 |
| Number of scientists | 137 |
| Revenue (FY2023) | Rs 1,466.36 crore (US\$ 176.4 million) |
| On-Site-Rooftop solar capacity | 1 MW operational (1.1 MW under construction) |
| Off-site Solar Capacity | 6.3 MW |
| Wind Capacity | 10.5 MW |
| Total Scope 1 and Scope 2 emissions (per rupee of turnover) | 3.724 gCO ₂ eq/Rs |

ABOUT FOURTH PARTNER ENERGY



Fourth Partner Energy (FPEL) is India's leading Renewable Energy Solutions Company, serving commercial and industrial (C&I) businesses. The Company has set up onsite and offsite plants across multiple sites for Solara Active Pharma in India. FPEL was founded in 2010 as solar products and EPC Company that offers a comprehensive range of services, including energy analysis, design, financing, procurement, construction, operation, maintenance, and more. Currently, FPEL also offers wind, energy storage and EV charging infrastructure solutions for C&I segment. FPEL has a presence in India and South and Southeast Asian countries such as Vietnam, Indonesia, Bangladesh, and Sri Lanka. It also offers Energy-as-a-Service (EaaS) to help businesses offset almost 100% of their energy requirement through clean and green sources.

Table 2: Fourth Partner Company Overview

| Parameter | Description |
|-------------------------------|---|
| Name | Fourth Partner Energy Private Limited |
| Headquarter | Hyderabad, Telangana |
| Type | Renewable energy solutions provider |
| RE portfolio | 1.3 GW |
| CO2 emissions reduction | 17,85,638 tons/year |
| Number of clients | 200+ |
| Solution Offering | Solar, Wind, Technical Services, Wind-Solar (Hybrid), Energy storage, EV charging infrastructure. |
| Number of Full time Employees | 400+ |
| Presence in India | PAN India |
| Global Presence | Vietnam, Indonesia, Bangladesh, Sri Lanka. |

Source: Company Website

PHARMACEUTICAL INDUSTRY IN INDIA

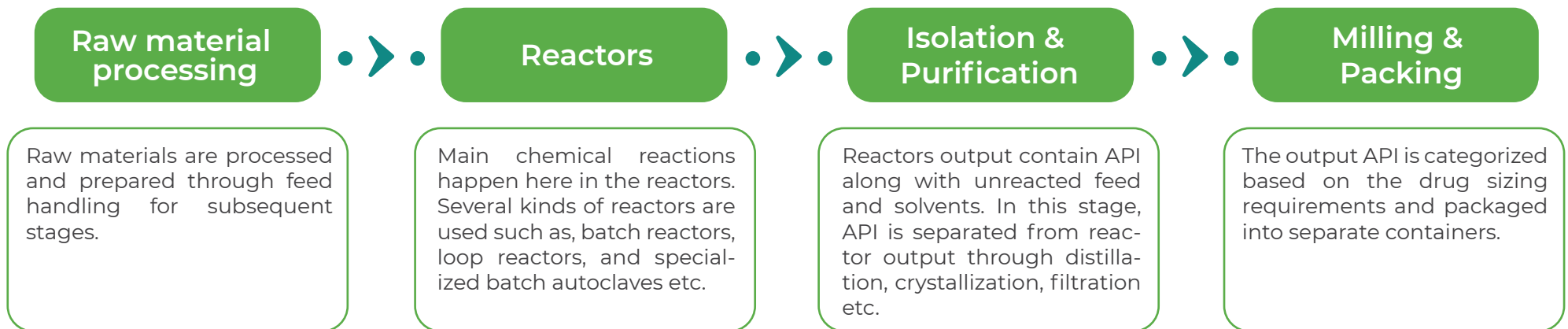
India leads the global market in generic pharmaceuticals, providing over half of the world's vaccine supply, 40% of generic drugs in the United States, and a quarter of pharmaceuticals in the United Kingdom. It's the third-largest pharmaceutical producer by volume and the fourteenth-largest by value, supported by a network of 3,000 medicinal businesses and 10,500 manufacturing units. The pharma sector currently contributes around 1.72% of the country's Gross Domestic Product (GDP).

In FY2023, India's pharmaceutical exports reached Rs. 2,08,231 crore (US\$ 25.3 billion). The **Indian pharmaceutical industry is estimated to be valued at around US\$ 50 billion, with over half of that value (more than US\$ 25 billion) originating from exports.** India meets approximately 20% of the global demand for generic drugs.

Globally, the Pharmaceutical industry emits 48.55 tonnes of CO₂ per US\$ million revenue. **Thus, for India, the total CO₂ emissions from Pharmaceuticals are estimated to be around 2.4 million tonnes/annum viz. ~ 1% of the total carbon emissions of India.**

The pharmaceutical manufacturing process can be classified into four stages: raw material processing, main reactions, isolation and purification of reaction output and final packaging. Across these stages, electricity is the primary energy source. The main electricity load comes from electric motors utilized at almost every stage of the manufacturing process and lighting of the facility.

Figure 1: Process flow of active pharmaceutical ingredient (API) manufacturing



Source: JMK Research

Through this case study of a leading pharmaceutical manufacturer in India, we aim to analyze pharmaceutical corporations' sustainability efforts towards decarbonization.

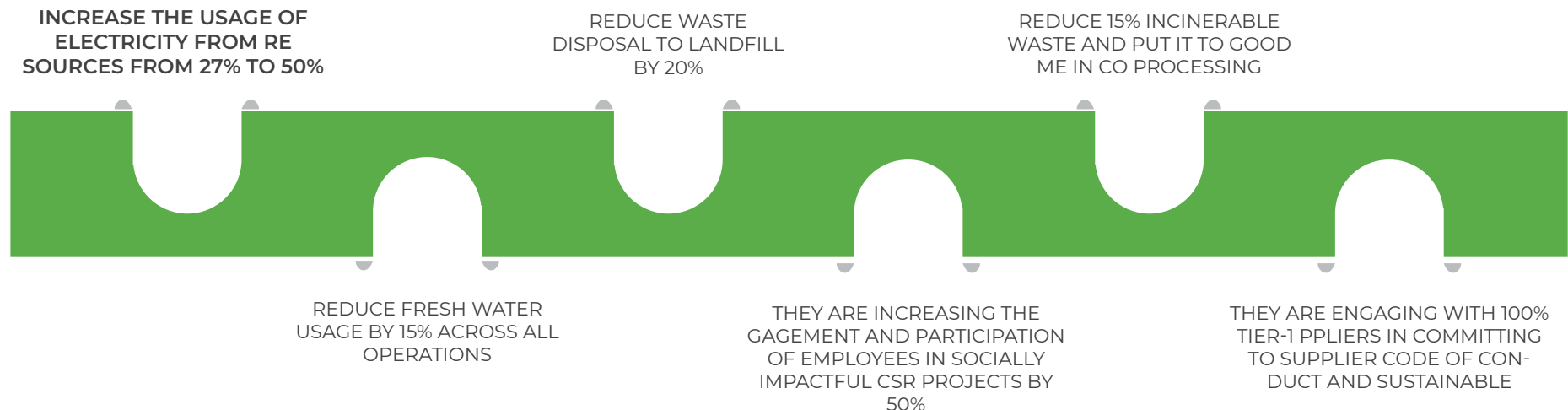
SOLARA ACTIVE PHARMA SUSTAINABILITY INITIATIVES

Solara Active Pharma focuses on reducing GHG emissions through renewable sources or alternative fuels and is actively involved in reducing water usage through zero-liquid discharge (ZLD) projects.

“Pharmaceutical manufacturing demands maintaining specific process/conditions in terms of temperature, pressure, crystallization, sterilization, containment etc. which makes it very energy intensive. As part of decarbonization goals, Solara continuously strives for energy efficient processes, green chemistry, increased renewable energy contribution, etc. Renewable energy projects help us with cost savings and contribute towards sustainability. Our aim is to bring the overall renewable energy contribution to 50% by FY 2025.”

– M.Mohan, COO, Solara Active Pharma Sciences

Figure 2: Solara Active Pharma Targets 2025 Sustainability Goals



ELECTRICITY CONSUMPTION MIX OF SOLARA ACTIVE PHARMA

In FY2023, the total electricity consumption by Solara Active Pharma was 90,766 MWh. Of this total, 62% was supplied by Discoms, which is 2% less than the previous year. This fall can be attributed to the commissioning of solar plants in Tamil Nadu and Maharashtra in the past year.

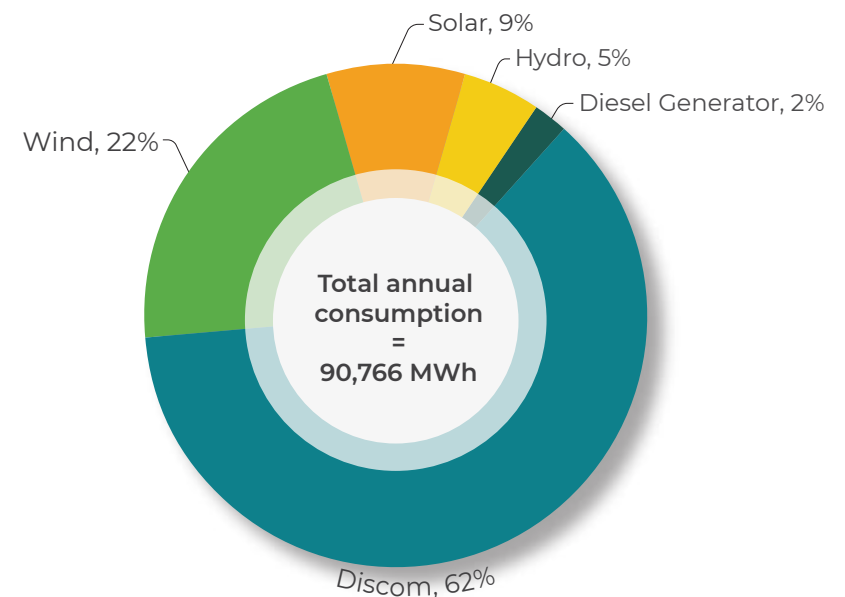
As a result, the share of solar energy in electricity consumption rose to 9% in FY2023. Wind power contributed 22%, and diesel generation units contributed 2%. Notably, the Company also procured power from power exchange in previous years. However, there was no energy procurement from power exchanges (IEX) in FY2023, mainly due to an increase in captive solar and wind generation across different sites of Solara. Another critical factor for this trend was the high prevailing energy prices on power exchanges in FY2023.

During power breakouts, the Company also uses Diesel Gensets (DG) across various sites. In FY2023, power consumed from DG gensets was about 2% of the total annual electricity consumption by Solara Active in India.

Figure 3: Monthly electricity consumption trend



Figure 4: Electricity consumption, by source (FY2023)



Source: Solara Active Pharma

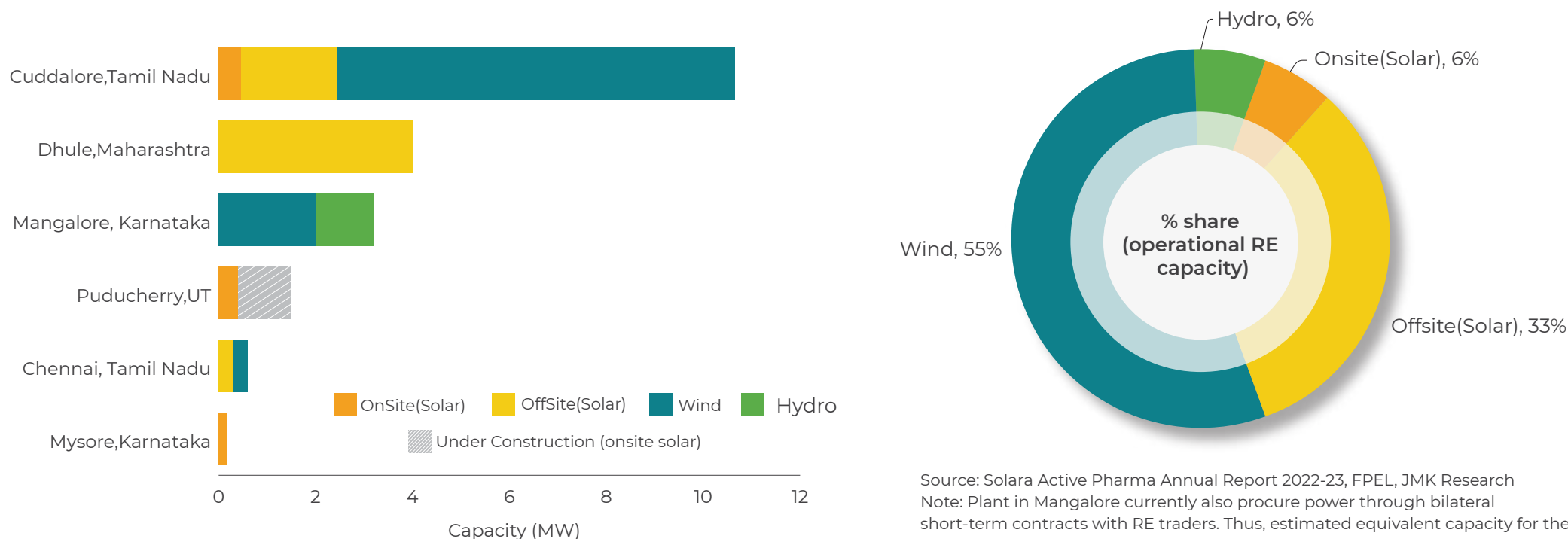
RE CAPACITY AT SOLARA ACTIVE PHARMA MANUFACTURING FACILITIES

Solara Active Pharma operates six manufacturing units in different locations across India, including Tamil Nadu, Karnataka, and Maharashtra, Andhra Pradesh and Puducherry. In Andhra Pradesh, the manufacturing site is located in Visakhapatnam, which comes under the Special Economic Zone (SEZ), and complete power for this site is procured from the local grid.

Over the last few years, Solara Active Pharma has initiated significant projects to enhance renewable energy electricity procurement across all its sites, particularly solar and wind electricity. It is collaborating with companies engaged in group captive solar power projects.

The total RE capacity of Solar Active Pharma is 19.022 MW operational and another 1.1 MW under construction. Of this, 33% is contributed from off-site solar, 6% is on-site solar, and the remaining is from wind (55%) and hydro (6%).

Figure 5: Solar and Wind Installations across sites by Solara Active in India

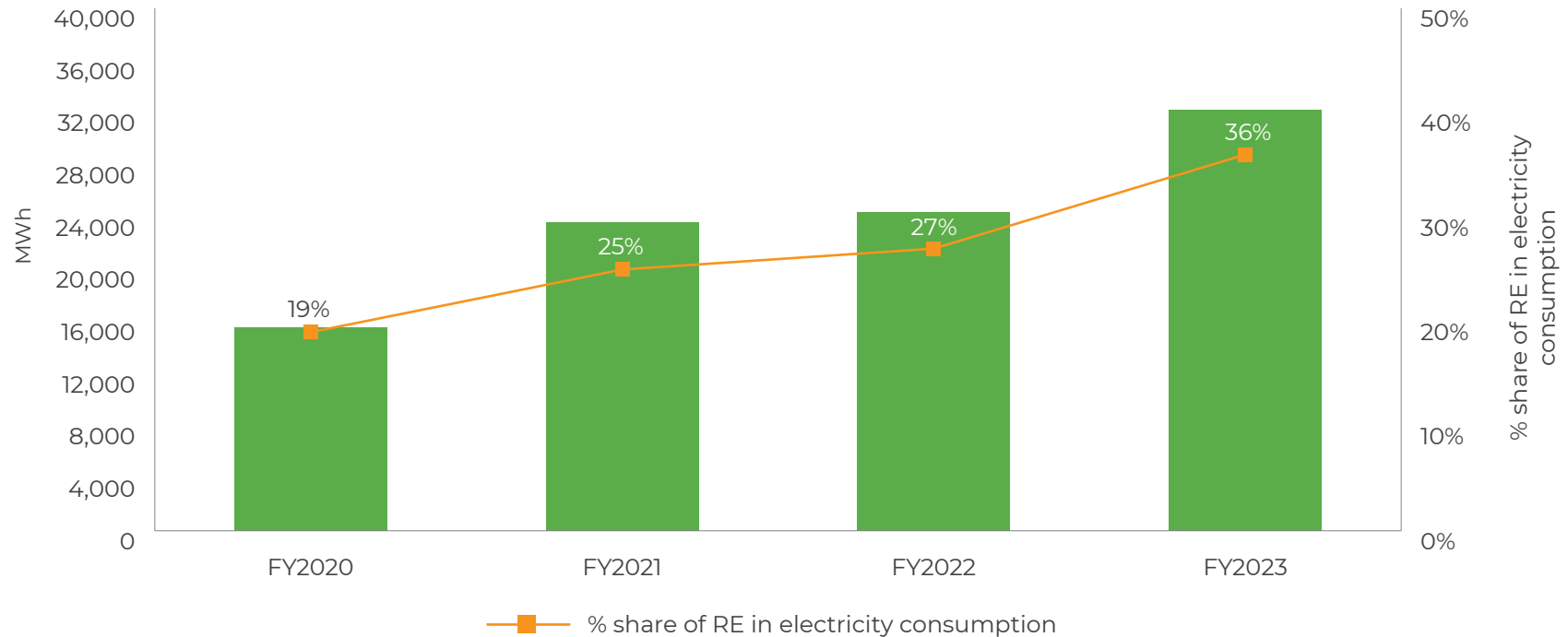


Source: Solara Active Pharma Annual Report 2022-23, FPEL, JMK Research
 Note: Plant in Mangalore currently also procure power through bilateral short-term contracts with RE traders. Thus, estimated equivalent capacity for the same is provided.

RE CONSUMPTION ACROSS DIFFERENT SITES

In Solara Active Pharma, over the years, the electricity consumption from RE has risen steadily from around 19% in FY2020 to approximately 36% in FY2023. The growth is driven primarily by the growth of solar (both offsite and onsite) and wind capacity.

Figure 6: Yearly RE generation trend of Solara Active Pharma

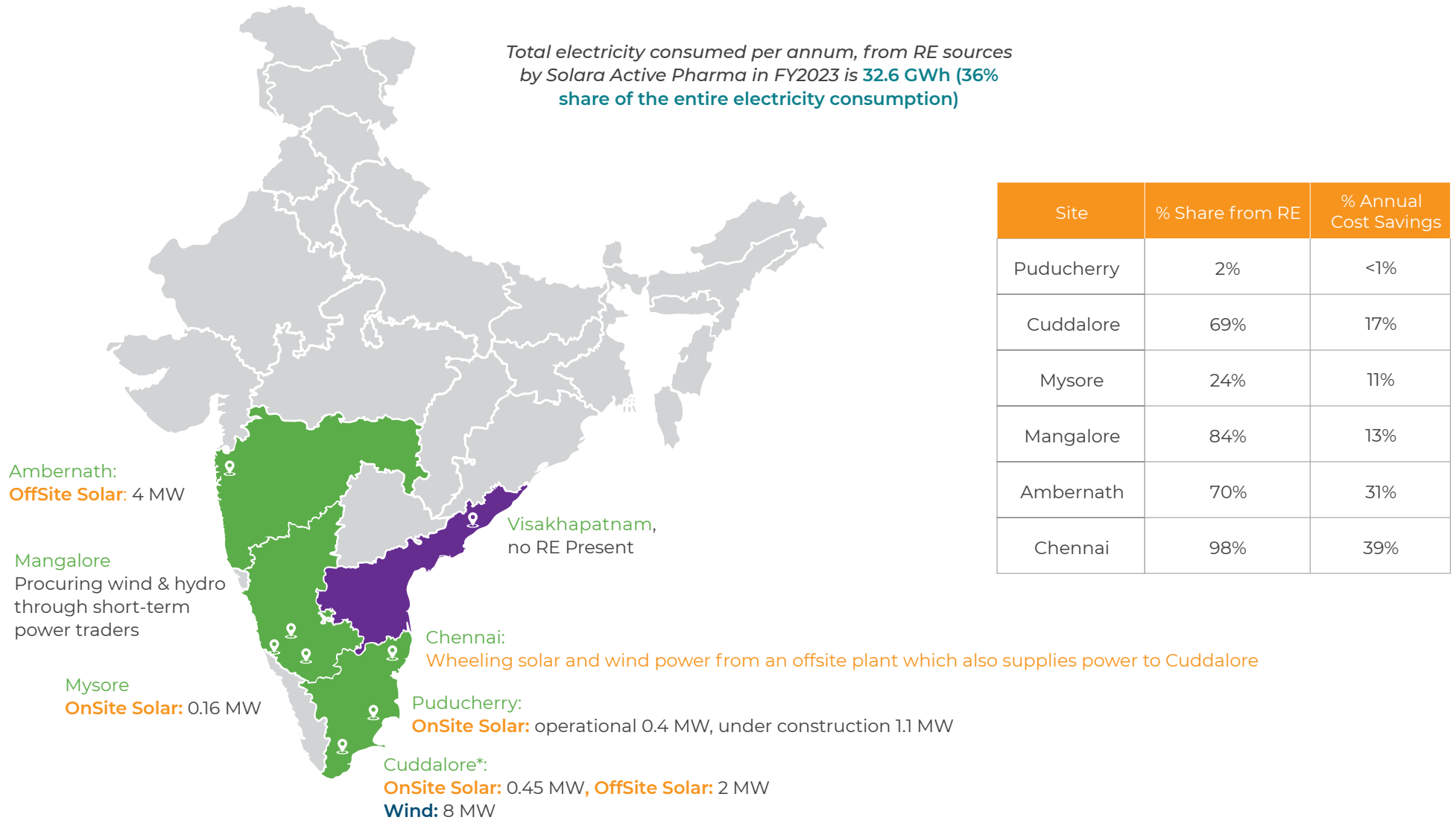


Source: Solara Active Pharma annual report 2022-2023

In FY2023, about 36% of their electricity came from renewables. RE power contributed 70% in Ambernath(Maharashtra), 24% in Mysuru (Karnataka), and 69% & 2% in Cuddalore(Tamil Nadu) & Puducherry, respectively.

*Note: For Ambernath, FY23 RE supply commenced only during the last 6 months. RE contribution of 70% is based on annual RE estimation for the plant.

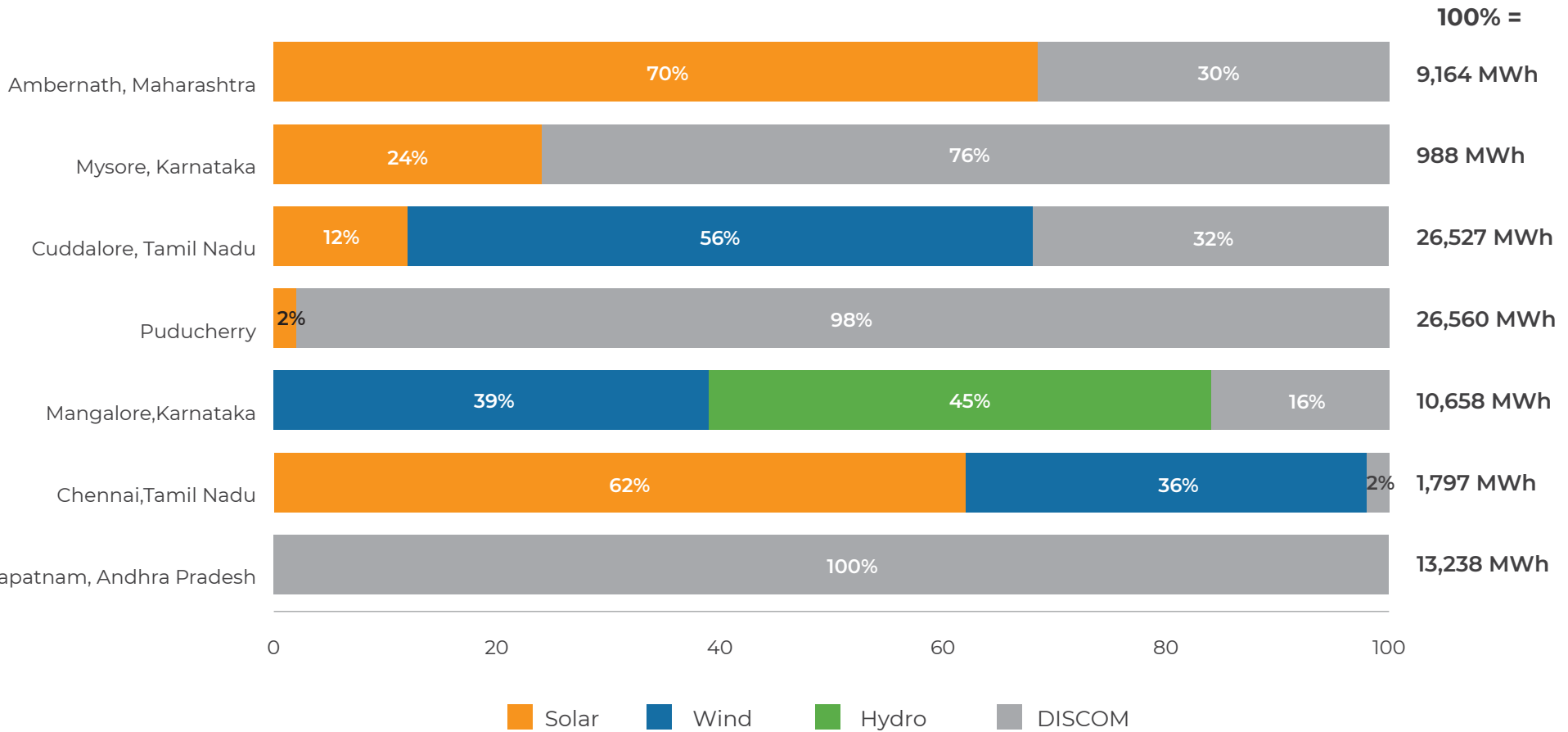
Figure 7: Location of Solara Active Pharma Manufacturing units and respective share of RE in total electricity consumption



Source: Solara Active Pharma, JMK Research

Note: Cost savings have been estimated from the reference of variable grid tariff in the respective state

Figure 8: Annual Electricity mix of Solara Active Pharma sites



Source: FPEL, Solara Active, JMK Research

In Tamil Nadu, there is a shared off-site wind (8 MW) and solar (2 MW) power source for both Chennai (which primarily houses a R&D facility of Solara) and Cuddalore locations. Remarkably, Chennai location procures 98% of its energy from RE sources. However, DISCOM remains the primary electricity procurement source for three Solara sites at Vishakapatnam, Mysore and Puducherry. The Mysore manufacturing plant is smaller, accounting for only about a tenth of the electricity procured at Cuddalore and Ambarnath.

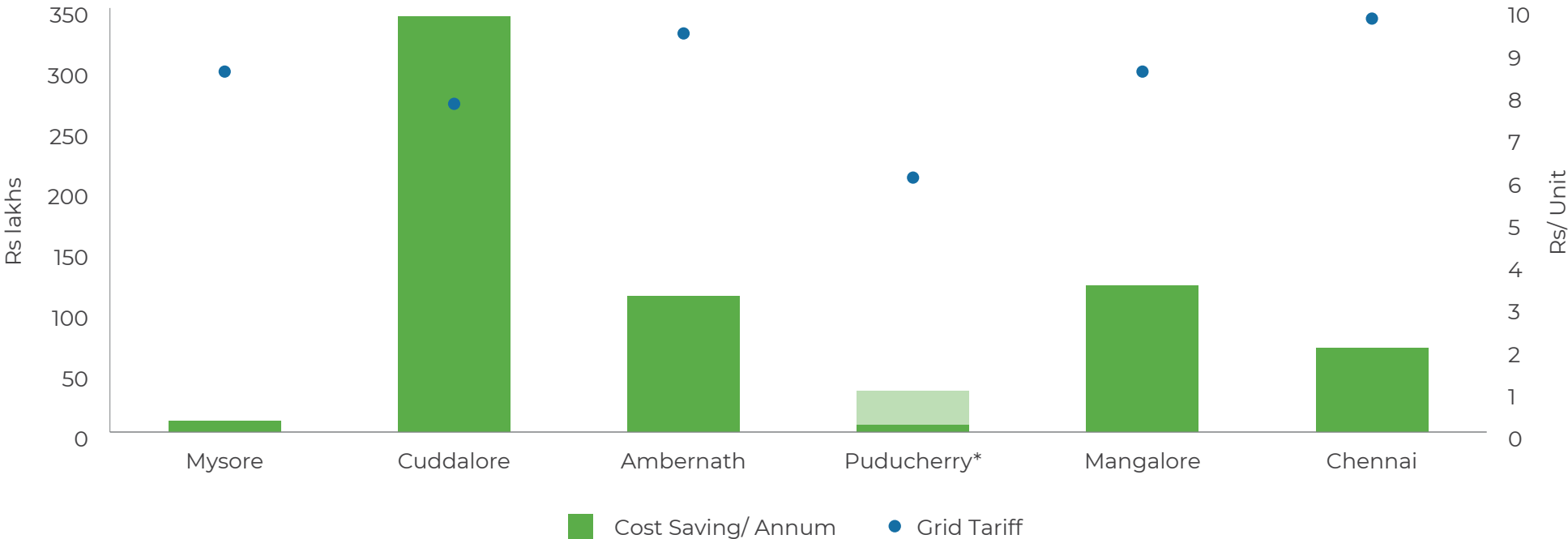
Cost Savings

From its RE procurement, **Solara Pharma can save around Rs. 817 lakhs in annual electricity costs and an equivalent carbon reduction of 27,831 tonnes/annum.**

Puducherry manufacturing plant's onsite rooftop project has the highest onsite solar PPA tariff among the sites analyzed. As this project was the first to be commissioned in 2019, its PPA tariff is according to the solar project costs at that time.

For Maharashtra, even though the state has a high industrial grid tariff of Rs 9-9.5/kWh, the per unit savings from solar is lesser vis-à-vis other sites at Cuddalore and Mysore, mainly due to the imposition of additional Open Access(OA) charges in case of power procurement from open access offsite solar plant. Even though per unit cost savings in onsite solar are higher vis-à-vis offsite/open access solar, the capacity of onsite solar is limited subject to the suitability of the available project area.

Figure 9: Cost Savings from RE per annum across all sites



Source: FPEL, JMK Research

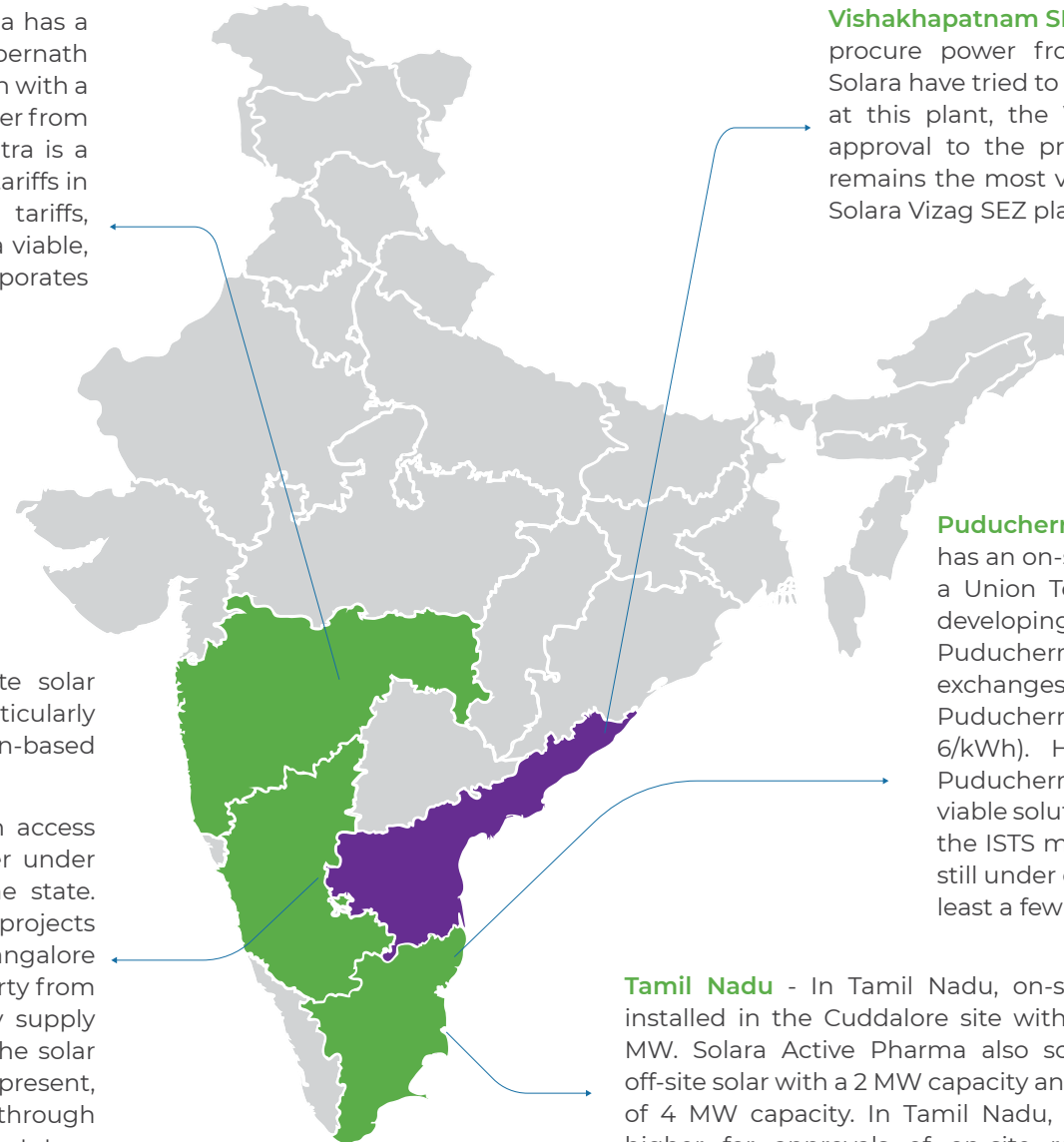
Note: * Puducherry estimates are basis data furnished for an under construction of 1.1 MW on-site solar plant and 0.4 MW commissioned solar plant

STATE-WISE ANALYSIS AND CHALLENGES FACED BY SOLARA

Maharashtra - In Maharashtra, Solara Active Pharma has a multipurpose API and Intermediate facility at Ambernath and takes off-site solar power from the Dhule location with a capacity of 4 MW. This facility procures 70% of its power from solar as part of its annual consumption. Maharashtra is a large industrial state having relatively high C&I grid tariffs in the range of Rs. 8-10/unit. Because of such high tariffs, switching to renewable energy sources is not only a viable, cost-effective solution but also helps bigger corporates achieve their sustainability targets.

Karnataka - In Karnataka, Mysore has an on-site solar capacity of 0.169 MW. Industries in the state, particularly those in IT, technology, pharmaceuticals, and iron-based sectors, are increasingly switching to RE sources.

In Karnataka, there was a very attractive RE open access scheme allowing C&I consumers to avail RE power under third party agreement from any developer in the state. Benefits under the scheme was only accorded to projects commissioned until 2018. Under this scheme, at Mangalore plant, Solara also entered a PPA for availing third-party from a solar plant for a tenure of 10 years. The energy supply started in mid-2020 but just after a few months, the solar developer had to sever the power delivery. At present, Mangalore plant is currently only procuring power through short-term bilateral contracts from RE traders in the state.



Vishakhapatnam SEZ – Solara’s plant at Vizag SEZ only procure power from the state DISCOM. Although Solara have tried to implement rooftop on-site projects at this plant, the Vizag SEZ have not accorded its approval to the project. Thus, like Puducherry, ISTS remains the most viable solution to avail RE power at Solara Vizag SEZ plant.

Puducherry - In Puducherry, Solara Pharma has an on-site solar capacity of 0.4 MW. Being a Union Territory, there is limited space for developing open-access projects in Puducherry. Procuring RE power from power exchanges is not viable as grid tariff in Puducherry is generally very low (currently Rs. 6/kWh). Hence, for industries present in Puducherry, ISTS based projects is the only viable solution to procure RE energy. However, the ISTS market for C&I consumers in India is still under development and is likely to take at least a few more years to take off.

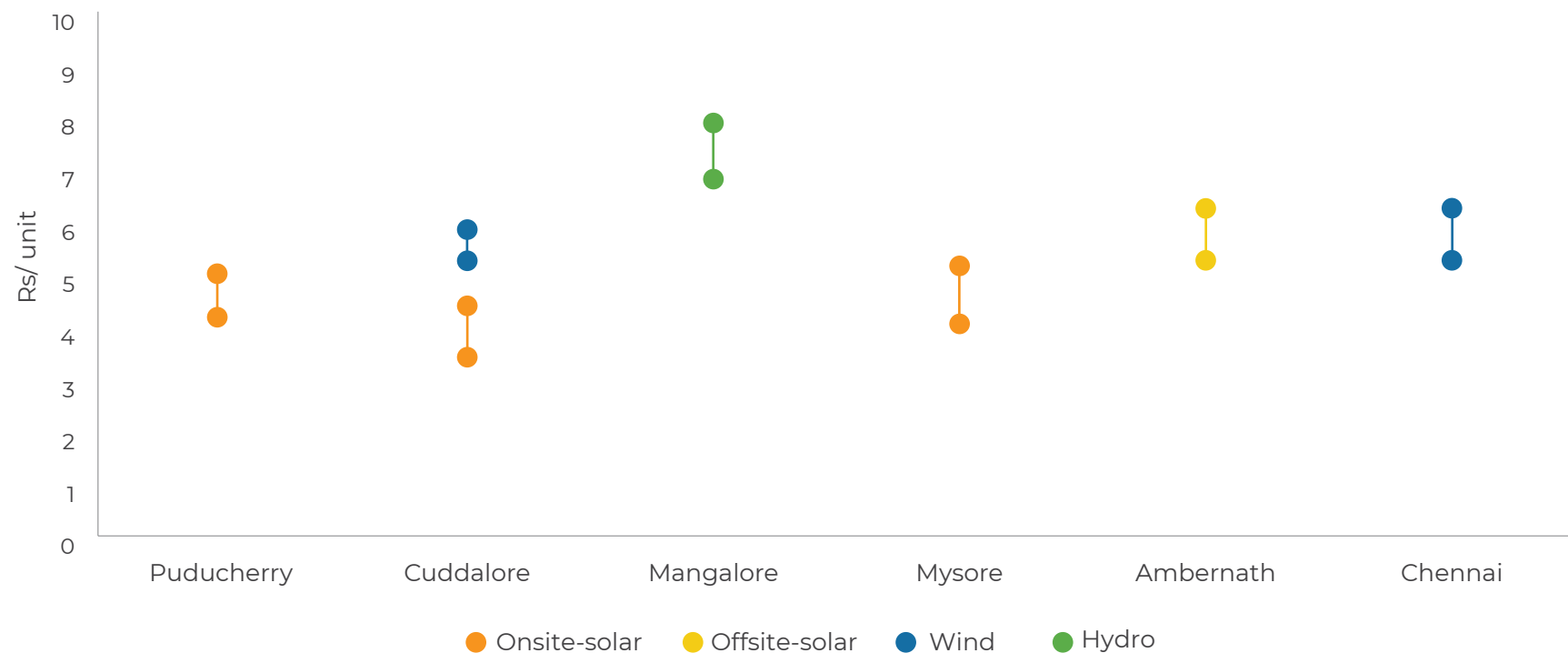
Tamil Nadu - In Tamil Nadu, on-site rooftop solar is installed in the Cuddalore site with a capacity of 0.45 MW. Solara Active Pharma also sources power from off-site solar with a 2 MW capacity and from a wind plant of 4 MW capacity. In Tamil Nadu, gestation period is higher for approvals of on-site rooftop solar, often leading to project delays.

PPA ARRANGEMENTS OF SOLARA ACTIVE PHARMA

Across its operational sites, Solara Active Pharma has entered into multiple power purchase agreements (PPA) to source RE power for its operations. For solar, Solara have executed majority of its PPA's with FPEL with tariffs ranging from a low of Rs 3.5-4/ unit in Cuddalore, Tamil Nadu to Rs 5.5-6/ unit (incl. OA charges) in Ambernath, Maharashtra. In Tamil Nadu, a leading wind developer have set up a group captive WSH project (2 MW solar + 8 MW wind) to supply RE power to the two Solara sites within Tamil Nadu.

While majority of them are long-term PPA's with tenure up to 25 years, Solara also procure power through a short-term PPA for procuring Hydro Power and Wind Power at Mangalore from energy trading entities. Among all the RE PPA's of Solara, this short-term PPA has the highest tariff of ~Rs 7/unit.

Figure 10: PPA tariff range, by location and RE technology



PROJECT CONFIGURATION (FPEL SOLARA PHARMA PLANTS)





As discussed earlier, Solara Active Pharma has seven facilities located across India. Six are manufacturing plants, while one is a research & development (R&D) facility. Over the years, FPEL has worked closely with Solara Pharma in aiding their decarbonization efforts and has set up solar projects across its facilities. Cumulatively, FPEL has set up ~4.6 MW solar capacity at Solara Pharma facilities, viz. more than 50% of the solar portfolio of Solara Pharma. This capacity includes both onsite and offsite projects.

For the specific site assessment, we considered three Solara manufacturing facilities across four sites wherein FPEL solar projects supply power. These include Solara's manufacturing plants at Cuddalore (Tamil Nadu), Mysore (Karnataka), Ambernath (Maharashtra) and an under construction plant in Puducherry.

- At **Cuddalore, Tamil Nadu** – A 453 kWp onsite rooftop project implemented under OPEX mechanism. Under OPEX, the developer bears the entire initial project investment, while the consumer only pays for the electricity consumption under a PPA. Cuddalore plant also wheels power from an offsite wind (8 MW) and solar (2 MW) project.
- At **Mysore, Karnataka** – A 169 kWp onsite rooftop project implemented under OPEX mechanism.
- At **Ambarnath, Maharashtra** - Procuring power from a 4 MWp offsite group-captive open access project at **Dhule, Maharashtra**. Under group-captive, the RE project is partially owned (at least 26%) by the C&I off-taker.
- Additionally, FPEL is constructing a 1.1 MW onsite solar project under the OPEX mechanism at the **Puducherry** plant of Solara, which is likely to be commissioned by the end of 2023.



Table 3: Solar PV Project Details

| | | Cuddalore, Tamil Nadu | Mysore, Karnataka | Dhule, Maharashtra | Puducherry |
|-------------------------------|--------------------------|---|---|---|---|
| Basic Details | Solar Installed Capacity | 453 kWp | 169 kWp | 4000 kWp | 1100 kWp |
| | Project Status | Operational | Operational | Operational | Under Construction |
| | Solar Module Technology | Polycrystalline | Polycrystalline | Mono PERC | Polycrystalline |
| | Module Make |  |  |  |  |
| | Module Capacity | 335Wp | 330Wp | 540Wp | 335 Wp |
| | Project Type | Onsite rooftop solar OPEX | Onsite rooftop solar OPEX | Offsite group captive open-access solar | Onsite Rooftop solar OPEX |
| | Month of Commissioning | August 2022 | November 2019 | October 2022 | December 2023 |
| | Interconnection Voltage | 445 V | 445 V | 132 kV | 445 V |
| | Project Performance | Annual Generation | 694 MWh | 259 MWh | 6424 MWh |
| % site consumption met | | 3% | 10% | 70% | 5% |
| CUFdc | | 17.5% | 17.5% | 18.3% | 17.5% |
| PPA tariff range (Rs per kWh) | | 3.5-4 | 4.5-5 | 3.5-4 | 4-4.5 |

OUTLOOK

RE Technology

For their future RE projects, in terms of RE technologies, Solara Pharma is focusing more on solar than wind. All major under-construction or planned projects are based on solar. These include the 1.1 MW under construction onsite rooftop solar project at Puducherry and a probable ISTS based solar project for the Puducherry plant.

Intra-state transmission system (In-STS) vs. Inter-state transmission system (ISTS)

Puducherry is a union territory with limited scope of solar project development within its territories. Hence, Solara Pharma is also looking to source power for its Puducherry manufacturing plant through ISTS open access.

The Government of India (GoI) has been actively working to streamline obstacles in developing C&I ISTS RE projects in the past few years. This includes waivers to transmission charges and losses formulating the general network access (GNA) guidelines. The industry has welcomed these ISTS provisions positively, and many ISTS projects in the C&I segment have been announced within the past year.

Business Model

Increasing rooftop capacity is technically limited to suitable area availability and prevailing government regulations in the state. In most states, the outlook towards setting up rooftop solar (especially the OPEX model wherein no initial investment from the consumer is required) is highly restrictive. These restrictions (in the form of net metering or capacity limitations) are employed by state DISCOMs to prevent revenue outflow from their high-paying C&I consumers. Also, pharmaceutical manufacturing plants are relatively more minor, with smaller rooftop space, further restricting the feasibility of rooftop solar.

Hence, in the future, most of the RE capacity expansion at Solara Active Pharma will likely be under the open-access business model. The annual electricity mix across all manufacturing sites demonstrates that there is still ample scope for increasing the mix of RE in overall electricity consumption, which will ultimately contribute to Solara Pharma attaining its target of 50% share of RE in overall electricity consumption by 2025 (from around 36% currently in FY2023).



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