**Supplementary Information**

Case Report

Information technology interventions in the implementation of grid-connected rooftop solar projects in India

Ishan Purohit1, Ashish Kumar Sharma1 and Pallav Purohit2\*

1 International Finance Corporation (IFC), The World Bank Group, New Delhi – 110037, India; ipurohit@ifc.org (I.P.), asharma39@ifc.org (A.K.S.)

2 International Institute for Applied Systems Analysis (IIASA), Schlossplatz 1, A-2361, Laxenburg, Austria; purohit@iiasa.ac.at (P.P.)

**\*** Correspondence: ipurohit@ifc.org (I.P.); Tel.: +91-9899113184

**Table S1. Capacity (MW) allocated to states for RTS implementation in India.**

|  |  |  |
| --- | --- | --- |
| **States/UTs** | **Capacity (MW)**  | **Target capacity** **(MW)** |
| **2015-16** | **2016-17** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **Total** |
| Andhra Pradesh\* | 10 | 240 | 250 | 300 | 350 | 400 | 450 | 2,000 | 68 |
| Bihar | 5 | 120 | 125 | 150 | 175 | 200 | 225 | 1,000 | 34 |
| Chhattisgarh | 4 | 84 | 88 | 104 | 120 | 140 | 160 | 700 | 24 |
| Delhi | 5 | 132 | 138 | 165 | 190 | 220 | 250 | 1,100 | 37 |
| Gujarat | 15 | 385 | 400 | 480 | 560 | 640 | 720 | 3,200 | 108 |
| Haryana | 5 | 200 | 200 | 235 | 280 | 320 | 360 | 1,600 | 54 |
| Himachal Pradesh | 2 | 38 | 40 | 48 | 56 | 64 | 72 | 320 | 10 |
| Jammu and Kashmir | 2 | 54 | 55 | 74 | 80 | 90 | 95 | 450 | 15 |
| Jharkhand | 4 | 96 | 100 | 120 | 140 | 160 | 180 | 800 | 27 |
| Karnataka | 10 | 275 | 290 | 344 | 403 | 460 | 518 | 2,300 | 78 |
| Kerala | 4 | 96 | 100 | 120 | 140 | 160 | 180 | 800 | 27 |
| Madhya Pradesh | 10 | 265 | 275 | 330 | 385 | 440 | 495 | 2,200 | 74 |
| Maharashtra | 20 | 565 | 588 | 704 | 823 | 940 | 1060 | 4,700 | 160 |
| Orissa | 5 | 120 | 125 | 150 | 175 | 200 | 225 | 1,000 | 34 |
| Punjab | 10 | 240 | 250 | 300 | 350 | 400 | 450 | 2,000 | 68 |
| Rajasthan | 10 | 275 | 288 | 344 | 403 | 460 | 520 | 2,300 | 78 |
| Tamil Nadu | 15 | 420 | 438 | 524 | 613 | 700 | 790 | 3,500 | 118 |
| Telangana\* | 10 | 240 | 250 | 300 | 350 | 400 | 450 | 2,000 | 68 |
| Uttarakhand | 2 | 42 | 44 | 52 | 60 | 70 | 80 | 350 | 12 |
| Uttar Pradesh | 20 | 510 | 538 | 650 | 752 | 860 | 970 | 4,300 | 145 |
| West Bengal | 10 | 252 | 263 | 315 | 370 | 420 | 470 | 2,100 | 70 |
| Arunachal Pradesh | 2 | 5 | 5 | 8 | 10 | 10 | 10 | 50 | 2 |
| Assam | 4 | 30 | 30 | 38 | 42 | 50 | 56 | 250 | 8 |
| Manipur | 4 | 3 | 6 | 8 | 9 | 10 | 10 | 50 | 2 |
| Meghalaya | 1 | 6 | 6 | 8 | 9 | 10 | 10 | 50 | 2 |
| Mizoram | 1 | 6 | 6 | 8 | 9 | 10 | 10 | 50 | 2 |
| Nagaland | 1 | 6 | 6 | 8 | 9 | 10 | 10 | 50 | 2 |
| Sikkim | 1 | 6 | 6 | 8 | 9 | 10 | 10 | 50 | 2 |
| Tripura | 1 | 6 | 6 | 8 | 9 | 10 | 10 | 50 | 2 |
| Chandigarh | 1 | 12 | 12 | 14 | 18 | 20 | 23 | 100 | 3 |
| Goa | 1 | 20 | 20 | 22 | 23 | 30 | 34 | 150 | 5 |
| Dadra & Nagar Haveli | 1 | 24 | 25 | 30 | 35 | 40 | 45 | 200 | 7 |
| Daman & Diu | 1 | 12 | 12 | 14 | 18 | 20 | 23 | 100 | 3 |
| Puducherry | 1 | 12 | 12 | 14 | 18 | 20 | 23 | 100 | 3 |
| Andaman & Nicobar | 1 | 2 | 2 | 2 | 5 | 4 | 4 | 20 | 1 |
| Lakshadweep | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 10 | 1 |
| **Total** | **200** | **4,800** | **5,000** | **6,000** | **7,000** | **8,000** | **9,000** | **40,000** | **1350** |

Source: <https://www.itsmysun.com/solar-state-wise-policy/> (accessed on 31/01/2023)

**Table S2. RTS policy and regulations in India**

|  |  |  |  |
| --- | --- | --- | --- |
| **States** | **Gross/ Net** | **Specifications on capacity** | **Specifications for grid integration (electricity or power)** |
| **Allowed range**  | **Allowed system size at voltage levels** | **Max. capacity****w.r.t sanctioned load** | **Transformer capacity Limit** | **Export of electricity allowed when compared to consumption** | **The billing period for settlement** | **Compensation period for surplus** | **Compensation for surplus** |
|  | **LT****single phase** | **LT****three-phase** | **HT level** |
| Andhra Pradesh | Both | 1 kW–1MW | < 3 kW | < 56 kW | 56 kW–1 MW | 100% | 80% for LT100% for HT | Above 100% | Monthly | Quarterly | APPC\* |
| Arunachal Pradesh | Net | 1 kW–1MW | < 5 kW | < 50 kW | 50 kW–1 MW | NA | 15% | Above 100% | Monthly | Yearly | APPC rate |
| Assam | Both | 1kW–1 MW | < 4 kW | < 20 kW | 20 kW–1 MW | 80% | 20% | 90% | Monthly | Yearly | Nil |
| Bihar | Both | 1 kW–up to the sanctioned load | < 7 kW | < 100 kW | 100 kW-1MW | 100% | 80% | Above 100% | Monthly | Yearly | Tariffs determined by BERC |
| Chhattisgarh | Both | 10 kW–1 MW | NA | 10- 100 kW | 100 kW-1MW | Above 100% | NA | Above 100% | Monthly | Yearly | Tariff by CSERC\* |
| Delhi | Net | 1 kW – NA;for group/ virtual metering5 kW – 5 MW | NA | NA | NA | 100% | 20% | Above 100% | Monthly | Yearly | Tariff by SERCs |
| Goa | Both | NA–500kWpfor group/ virtual net metering 5 kWp–NA | < 10 kW | 10- 100 kW | >100 kW | 100% | 75% | Above 100% | Monthly | Yearly | APPC or FiT |
| Gujarat | Both | 1 kW–1 MW | < 6 kW | 6- 100 kW | >100 kW | Residential- > 100%; non-residential 50% (for initial two years) | 65% | Above 100% | Monthly | Yearly | APPC |
| Haryana | Both | NA–1 MW | < 5 kW | 5- 50 kW | >50 kW | 100% | 30 % for LT and 15% for HT | 90% | Monthly | Yearly | Nil |
| Himachal Pradesh | Net | 1 kW–1 MW | < 7 kW | 7-20 kW | 20 kW–1 MW | Under two-part tariff± | 30% | Above 100% | Monthly | Yearly | 30% of the weighted APPC rate |
| Jammu and Kashmir | Net | 1 kW–1 MW | < 5 kW | 5-100 kW | >100 kW | 50% | 20% | 90% | Monthly | Yearly | Nil |
| Jharkhand | Both | 1 kW–2 MW | < 5 kW | 5-50kW | >50 kW | 100% | 100% | Above 100% | Monthly | Yearly | Tariff determined by JSERC |
| Karnataka | Both | 1 kW–1 MW | < 5 kW | 5–50 kW | >50 kW | 100% | 80% | Above 100% | Monthly | Monthly | Higher tariff agreed to in PPA or retail supply tariff |
| Kerala | Net | 1 kW–1 MW | < 5 kW | 5–100 kW | >100 kW | NA | 80% | Above 100% | Monthly | Yearly | As per tariff order |
| Madhya Pradesh | Net | NA–1 MW | < 3 kW | 3–112 kW | >112 kW | 100% | 30%, as per amendment in 2017 | Above 100% | Monthly | Yearly | APPC rate |
| Maharashtra | Net | NA–1 MW | < 8 kW | 8–150 kW | >150 kW | 100% | 40% | Above 100% | Monthly | Yearly | APPC rate |
| Manipur | Both | 1 kW –1 MW | < 8 kW | 8–50 kW | >50 kW | 100% | 40% | Above 100% | Monthly | Yearly | FiT by JERC |
| Meghalaya | Net | 1 kW–1 MW | < 5 kW | 5–50 kW | >50 kW | NA | 15% | 90% | Monthly | Yearly | Nil |
| Mizoram | Both | 1 kW–1 MW | < 8 kW | 8–75 kW | >75 kW | 100% | 40% | Above 100% | Monthly | Yearly | FiT by JERC |
| Nagaland | Net | NA–1 MW | NA | NA | NA | 100% | 15% | 90% | Monthly | Yearly | Nil |
| Orissa | Net | Up to sanctioned load | < 5 kW | 5-70 kW | >70 kW | 100% | 75% | 90% | Monthly | Yearly | Nil |
| Punjab | Net | 1 kW–1 MW | < 7 kW | 7–100 kW | >100 kW | 80% | 30% | 90% | Monthly | Yearly | Nil |
| Rajasthan | Net | 1 kW–1 MW | < 5 kW | 5–50 kW | >50 kW | 80% | 30% | Above 100% | Monthly | Yearly | Domestic category– above 100 units @INR 3.14/kWh, other categories- Nil |
| Sikkim | Net | 1 kW–1 MW | < 5 kW | 5–25 kW | >25 kW | 80% | NA | Above 100% | Monthly | Yearly | Tariff order of SSERC |
| Tamil Nadu | Net | NA | < 4 kW | 4–112 kW | >112 kW | 100% | 90% | 90% | Bi-monthly | Yearly | Nil |
| Telangana | Both | 1 kW–1 MW | < 5 kW | 5–75 kW | >75 kW | Residential: 100%Others: 80% | 50% | Above 100% | Monthly | Half-yearly | APPC rate |
| Tripura | Net | 1 kW–1 MW | < 5 kW | 5–20 kW | >20 kW | 100% | 15% | 90% | Monthly | Yearly | Nil |
| Uttar Pradesh | Both | 1 kW–2 MW | < 5 kW | 5–50 kW | >50 kW | 100% | 25% | Above 100% | Monthly | Yearly | INR 2/kWh or as per rates decided by UPERC |
| Uttarakhand | Net | NA – 1 MW | < 4 kW | 4–75 kW | >75 kW | 80% | NA | 95% | Monthly | Yearly | Nil |
| West Bengal | Net | 5 kW–not specified | NA | NA | NA | NA | NA | 90% | Monthly | Yearly | Nil |
| UTs + | Both | NA++ | < 10 kW | 10- 100 kW | >100 kW | 100% | 75% | Above 100% | Monthly | Yearly | APPC or FiT determined for that year |

\*Average Pooled Power Purchase Cost (APPC)

±80%; under single-part tariff < 5 kW – 100%, Between 5 kW–10 kW – 5 kW or 70% >10 kW – 7 kW or 70%

+Union territories including Andaman & Nicobar, Chandigarh, Dadar and Nagar Haveli, Daman & Diu, Lakshadweep and Puducherry

++500 kWp for group/ virtual net metering 5 kWp–NA