

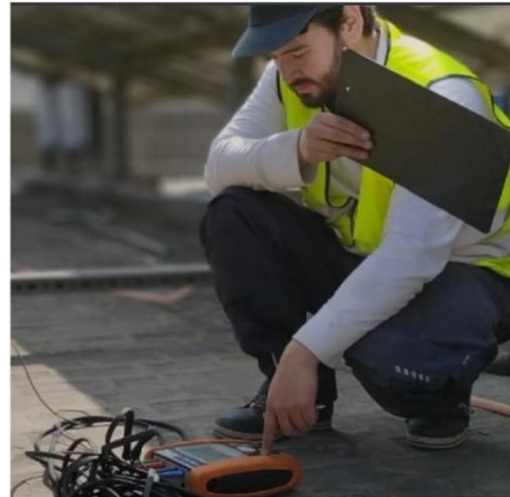
# Phase II of the Study on Low-Performance Rooftop Photovoltaic Plants in India gets Underway



## Case Study



Image 1-1 Location map



### Phase I

The initiative of the Government of India, in particular of the Ministry of New and Renewable Energy (MNRE), to exponentially boost the number of renewable energy installations aims at generating 100 GW of photovoltaic energy, 40 GW of which on rooftops. Due to the importance of this type of solutions in implementation plans, it is especially relevant to ensure and guarantee the optimal performance of all projects.

As part of the cooperation agreement between the ministries of Germany and India, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) was commissioned to analyze the performance of several systems, and found that some of them were not working properly. As a follow up on these findings, GIZ hired us to identify the causes of the poor performance, quantify them, and propose feasible solutions.

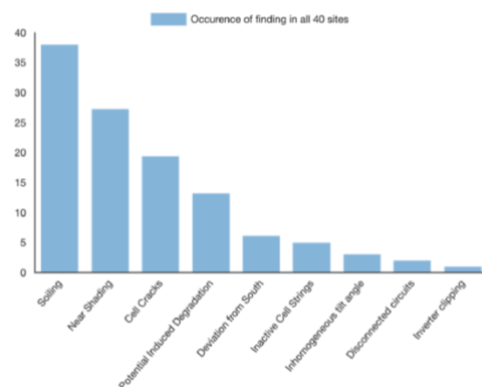
Phase I of this project involved the analysis of 40 rooftops with photovoltaic plants distributed as follows: 15 in Delhi, 5 in the Andaman and Nicobar Islands, 10 in Pune, and 10 in Surat (Image 1-1).

### Results

The most frequent issues identified in these installations were: build-up of dirt on modules (in 38 plants), strong shading (in 27 plants), and cracks on photovoltaic cells (in 19 plants) (Table 1-2).

In addition, we could verify that Potential Induced Degradation (PID), circuit disconnection and inverter unavailability could result in cumulative losses of up to 56 % of the plant's annual production.

Table 1-2: Most frequent issues identified on the 40 rooftops



## Suggestions

After collecting evidence demonstrating that the performance of the analyzed plants could be much higher (from 5 % to even 50 % in some cases), PI Berlin launched 5 revamping proposals to partially mitigate the negative consequences of the various issues detected:

- Reordering of modules and strings.
- Increase in the cleaning frequency of modules.
- Replacement of modules under warranty.
- Increase in soil albedo.
- Reduction in the number of serial modules.

Besides, these suggestions do not involve large investments, and can be implemented with a reasonable budget: an average of 1.54 ₹/Wp (0.021 USD/Wp) of capital expenditure (CAPEX) and 0.57 ₹/Wp/a (0.0079 USD/Wp/a) of operational costs (OPEX) per plant.

## Phase II

Results obtained in Phase I were very positively received by the MNRE, so both the MNRE and GIZ proposed to launch a second phase. In this phase, 60 new rooftops with photovoltaic plants in the state of Gujarat and the southern states of the country will be studied.

The procedure will be similar to that of Phase I, and, once again, we will be in charge of assessing the installations. However, for this purpose, we have a new system that creates digital copies of the plants, which will be then uploaded to an online portal (hosting). In this project, we will be working hand in hand with Above Surveying, a British company with whom we have been collaborating for years.

In addition, two other entities will collaborate with us in the inspection of the selected plants, thus mitigating the restrictions arising from the pandemic. One of the participants will be Mitsui Chemicals India, the company with whom we established a Joint Venture in the country and built a laboratory to test photovoltaic modules. The laboratory has recently been certified

according to the ISO 17025 standard and the Bureau of Indian Standards (BIS). Likewise, the company Aerocompact will be in charge of contacting the owners of photovoltaic plants on rooftops, as well as of analyzing the structures on which the modules are installed.

At this second stage, we will see if the trend identified in Phase I is confirmed, so we can get a broader view of the causes for poor performance of photovoltaic plants in India.

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