Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

INTERNATIONAL COOPERATION

# EXTERNAL EVALUATION - SHORT REPORT


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## Strengthening Quality Infrastructure for the Photovoltaic Sector in Indonesia

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| Country/Region: | Indonesia |
| Project number: | 2019.2113.9 |
| Project term: | 11/2020 – 5/2025 |
| Lead executing agency: | PTB – National Metrology Institute of Germany |
| Executing agency: | Directorate General for New and Renewable Energy (EBTKE) |
| PTB \| Section: | PTB Group 9.3 |
| PTB \| Project Coordinator: | Cora Buchenberger |
| Date: | 13 July 2024 |

This evaluation is an independent assessment. Its contents reflect the evaluator's opinion which is not necessarily equivalent to PTB's view.

**List of abbreviations**

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| AESI | Indonesia Solar Energy Association |
| BMKG | Indonesian Agency for Meteorology, Climatology and Geophysics |
| BMZ | Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung |
| BRIN | Agency for Research and Innovation |
| BSN | Badan Standardisasi Nasional Agency for Research and Innovation (National Standardization Agency) |
| EBTKE | Directorate General of Renewable Energy and Energy Conservation |
| ESDM | Ministry of Energy and Mineral Resources |
| DC | Development Cooperation |
| IEC | International Electrotechnical Commission |
| KAN | Komite Akreditasi Nasional (National Accreditation Body of Indonesia) |
| MoI | Ministry of Industry |
| OECD-DAC | Organization for Economic Cooperation and Development Assistance Committee |
| PCC | Project Coordination Committee |
| PLN | Perusahaan Listrik Negara (state-owned electricity company) |
| PTB | Physikalisch-Technische Bundesanstalt |
| PV | Photovoltaic |
| QI | Quality infrastructure |
| SNI | Indonesian National Standards |
| TC 27-08 | Technical Committee on Solar Energy |

## 1. Executive summary of the project

The evaluation subject is the project “Strengthening Quality Infrastructure for the Photovoltaic Sector in Indonesia”, running from November 2020 to May 2025 with a planned volume of 2.25 Mill. Euro, commissioned by the German Ministry for Economic Cooperation and Development (BMZ). The project’s political partner is the Directorate General of Renewable Energy and Energy Conservation (EBTKE), a department within the Ministry of Mines and Energy (ESDM). The project works with three pillars or fields of activity. The project works (1) with institutions providing quality assurance services for the PV sector to strengthen the capacity of these providers so that the providers expand their services. Furthermore, it works (2) with decision makers in the PV sector to better inform them and to improve their understanding of QI services for PV. Finally, it works (3) with PV practitioners to increase their quality awareness and quality assurance services.

The core problem that the project addresses is that currently in Indonesia, the QI ecosystem is not fully established hence quality aspects are not sufficiently included in PV processes. Necessary services for quality assurance are not sufficiently available and used. They are needed to ensure quality, security and longevity of PV installations. One problem is that on small islands, where there is a massive need for electricity, quality services are difficult to establish. An opportunity to develop an industry for solar energy has arisen in the growing industry on islands outside of Java, and particularly on Batam with a contract to supply renewable energy to Singapore. Project objective is: *The improved quality assurance in the PV sector for new and existing PV systems in Indonesia in line with international good practice.* The evaluation was conducted on-site, with an online inception phase and after the evaluation mission an online survey of the photovoltaic industry in Indonesia.

## 2. Evaluation of the project

The evaluation was conducted from January to July 2024. Its purpose was to provide accountability to the BMZ, to support internal learning processes and to improve the quality of the project in terms of the Organization for Economic Cooperation and Development Assistance Committee’s (OECD-DAC) evaluation criteria. The evaluation approach comprises the analysis of documents and data available at PTB and partners, and interviews and group discussions with all implementing partners, some participants and a few stakeholders that are not so closely involved. An online survey has been conducted which targeted practitioners from the solar industry to inquire their needs and their perception of the project. All implementing partners were invited to the kick-off and closing workshop. The kick-off workshop received a good response.

The six OECD/DAC criteria were used as an evaluation basis for this evaluation:

- Relevance: Is the project doing the right things?
- Coherence: How well does the project fit?
- Effectiveness: Is the project achieving its objectives?
- Impact (higher-level development results): What difference does the project make?
- Efficiency: How well are resources being used?
- Sustainability: Will the results last?

The following marking scale was used for the evaluation:

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| very successful | successful | successful to a limited extent | rather unsuccessful | mainly unsuccessful | entirely unsuccessful |

Overall, the project received the mark: 1.6.

**Relevance**

The project's objectives are fully geared to the partners' policies and priorities, and particularly to the political partner EBTKE. The government of Indonesia has several older and recent policies to promote renewable energy including solar power, and to improve its QI as a means to promote its transition to a post-extractive economy. The project fully fits into these policies and is designed to contribute to the development of the PV and QI sector.

The partners' political and institutional framework is considered in the project design. The project design is fully geared to the German Development Cooperation (DC) programme Energy in Indonesia which also includes various other projects of: Kreditanstalt für Wiederaufbau (KfW), Gesellschaft für Internationale Zusammenarbeit (GIZ) and Bundesanstalt für Geowissenschaften und Rohstoffe (BGR). The project is considered as successful regarding its orientation at national, regional and global priorities of the partners and BMZ.

The project objectives are aligned with the development needs and the capacities of beneficiaries and stakeholders. In terms of the evaluation dimension on needs and capacities of target groups, the project is considered very successful. It is far above expectations in addressing needs of partner institutions, particularly through its broad and flexible design.

The project design is considered very appropriate and realistic in the sense that its design allows for an improvement of technical capacity, political support and practitioner response. The project design is sufficiently precise and plausible, and particularly also flexible, and it is based on a holistic approach towards sustainable development. In terms of the evaluation dimension on appropriateness, the project is considered very successful.

The project design has responded appropriately to changes in the environment during implementation, the greatest challenge being the Covid crisis. In terms of the evaluation dimension on response to changes in the environment, the project is considered very successful. It responded very well and considerate to quite a number of changes, continuously adapting the implementation approach.

Overall, the criterion received the mark: 1.3

**Coherence**

The project is essentially designed in a complementary manner within German development cooperation, as part of the DC programme *Energy in Indonesia*. Synergies have been leveraged to a small extent but have helped to increase the efficiency of the programme. In terms of the evaluation dimension on internal coherence, the project is considered successful.

The project strongly complements partner efforts. There are substantial capital investments, own contribution of time and ideas by partners. There were clear efforts in the project design and implementation to coordinate with a few other donors. The project design has been strongly geared to use existing systems and structures. In terms of the evaluation dimension on external coherence, the project is considered very successful.

Overall, the criterion received the mark: 1.5

**Effectiveness**

The project indicators have been largely fulfilled or are expected to be fulfilled by the end of project. There are also several completed achievements that are not counted in the indicators but provide a good base to achieve more in a follow-on phase. In terms of the evaluation dimension on achievement of objectives, the project is considered successful.

The defined inputs have been largely delivered and outputs have been achieved, and many have been over-achieved particularly regarding the informing of decision-makers and practitioners. Overall, the beneficiaries

have used the benefits and results in their work, like increased awareness and knowledge, new regulations and institutional capacities. The assumptions and risks mentioned in the project planning documents were considered during the project implementation. In terms of the evaluation dimension on inputs and outputs, the project is considered very successful.

The implementation quality is assessed according to the five Capacity WORKS (CW) success factors, as elaborated below. The project team has used the mandatory Capacity WORKS tools and the project benefited from this process. Strategy: The project strategy has been developed and continuously refined with the political partner and the implementing partners throughout the project period. Cooperation: The project builds on the cooperation of partners. Most partners cooperate intensively, although sometimes slowly. Steering structure: The Project Coordination Committee (PCC) membership reflects the relevant actors and interests. Processes: Appropriate processes are established, and cooperation partners contribute to increase the overall performance. In terms of the evaluation dimension on the quality of implementation, the project is considered very successful.

The project's intended effects are very broad, and positive effects like a strong demand for testing services were then integrated into project activities, supporting a private company to open a second lab for PV module testing. No further unintended positive effects were identified. The only unintended negative result that could be identified is caused by the regulation SNI IEC 61215 that all imported PV modules need to undergo testing and certification in Indonesia. Due to this regulation, the labs are so occupied that there currently is a testing backlog of almost a year. In terms of the evaluation dimension on unintended results, the project is considered successful.

Overall, the criterion received the mark: 1.5

**Efficiency**

The evaluators could not identify results at output or outcome level that could have been delivered using less financial resources, or any results that could have been maximised using the same financial resources. In terms of outputs and outcomes, the expenses appeared reasonable. Production and allocation efficiency are rated as successful.

Overall, the criterion received the mark: 2.0

**Impact (higher-level development results)**

In setting its overall objective, the project has defined outcomes at a rather high level of development results. Therefore, by achieving the project goal (on outcome level), the project has already achieved results on quite a high level. Only a few changes that are on a higher level than the project goal could be discerned. One such change is that those PV module manufacturers that started about 10 years ago with little QI support, are now challenged to meet the requirements of SNI IEC 61215 on module quality. Others are that there is a process of steady improvement of the QI, and potential for MoI and ESDM to cooperate on QI for the PV sector has evolved. In terms of the evaluation dimension on actual higher-level results, the project is considered successful.

Many of the high-level results can be clearly linked to the project activities and their results. In terms of the evaluation dimension on the contribution to higher-level results, the project is considered successful. These high-level results to which the project contributed are all considered positive effects. The project has largely avoided causing negative effects. In terms of the evaluation dimension on unintended higher-level results, the project is considered successful.

Overall, the criterion received the mark: 2.0

**Sustainability**

It is difficult to assess to what extent the partners have the resources and willingness to sustain the positive changes over time. Overall, a strong capacity has been developed. Institutions that have developed new capacities, like new testing services, are likely to sustain these services as long as the equipment remains intact. The strong commitment of Indonesia to improve its QI in general makes it likely that equipment will also be replaced after some time. The partners have sufficient resources to counteract risks to the successful continuation of the achieved results. In terms of the evaluation dimension on available local capacities, the project is considered successful.

The project has contributed much to the resources and willingness to sustain positive changes. There has been an initial intent in Indonesia to improve the PV QI, but during the project period, this was substantiated and expanded to more actors. In terms of the evaluation dimension on capacity building, the project is considered very successful.

Most project results are likely to be durable given that with the growth of the PV industry in Indonesia, though not as fast as predicted, needs for QI services for PV are likely to increase, and because the results are well established in stable institutions in Indonesia. In terms of the evaluation dimension on durable results, the project is considered very successful.

Overall, the criterion received the mark: 1.3

## 3. Learning processes and experiences

The project had many systematic and planned processes of learning, “learning processes” and also many unplanned insights, “experiences”. On project level, planned **learning processes** were: Firstly, the development of the steering structure that is now well established. Secondly, the establishment of more cooperation with new partners as opportunities and needs arose. **Unplanned insights** were the realisation that installation and maintenance need to be addressed to improve the usefulness of the QI project for the sector. The TC 27-08 included this in its work plan. The larger than planned demand for testing PV modules was a realisation that came during the process after testing became mandatory, and the support to a second, private testing lab came as a consequence. Another insight was that there was potential and demand to expand work on awareness to more islands than initially planned. Other unplanned insights were the need for stronger support from leadership in some of the partner institutions (which was partly addressed) and the tendency in the new agency BRIN to focus on research (which was addressed but may have to be addressed again to continually ensure the BRIN service for module testing).

On **content and thematic level**, planned learning occurred throughout all the training courses and expert visits. There was extensive learning amongst participants and institutions. An unplanned learning is the realisation of partners that there will be a need to develop silicon economy circular streams in which PV modules and other silicon waste, like electronic gadgets, are reused and recycled. Another realisation was that there will be a need for lithium and lead acid batteries reuse and recycling, and that these also provide economic opportunities for Indonesia, and a need to develop a respective QI. BMKG staff and an AESI member realised that AESI has 54 pyranometers, presented to the public in a database (https://indonesiasolarmap.com/), while BMKG has 34 Automatic Solar Radiation Systems (ASRS), and that they partly measure comparable data. The question arose if the ASRS data could also be presented in the AESI data base.

## 4. Recommendations

A selection of recommendations is presented here. The numbers are as in the evaluation report’s long version.

<u>Recommendations to the partners:</u>

1. Recommendation to core partners: Engage more in IEC meetings, beyond participation, to establish closer working relationships with IEC members from other countries.
2. Recommendation to EBTKE: Consider to accept the foreign certification of imported modules if they have been certified by other accredited institutions according to IEC standards, or reduce the requirement to a

confirmation testing or confirmation certification. For this, find a way with KAN to accept certificates or tests by accredited certifiers.

4. Recommendation to EBTKE and others: Identify a region outside of areas of electricity over-supply where QI outreach services for PV could be established locally; possibly on an island where there is a polytechnic that conducts PV/hydro power specialisation training for engineers. An institution like such a polytechnic could become the change agent for human capacity development, testing, inspection, and services dedicated to maintenance, like spare part provision. Considering the expected high demand of electricity for nickel processing around the mines on Sulawesi and North Maluku, these islands might be most suitable for this approach.
5. Recommendation to EBTKE: Consider inviting the MoI, Directorate of Machinery and Agricultural Equipment, to the TC 27-08, and involve the MoI in monitoring and promotion of the standard application.
6. Recommendation to MoI: Focus more on quality production in local manufacturers and make QI and the need for quality better accepted amongst local manufacturers.
8. Recommendation to EBTKE and BSN: Develop concepts and standards for the silicon economy circular streams with reuse and recycling PV modules and other silicon waste, like electronic gadgets.
9. Recommendation to EBTKE and BSN: Develop concepts and standards for reuse and recycling of lithium and lead acid batteries.
10. Recommendation to BRIN: Evaluate the BRIN policy for dedicating the PV Module Testing Laboratory for research purposes and consider to return the initial function of testing laboratory to serve the demand of PV module industrial sector.
11. Recommendation to PV module testing laboratories: Develop the capacity to test modules that are larger in size and Watt peak.
12. Recommendation to national associations of the PV industry: Promote more QI awareness of members.
14. Recommendation to ESDM and PLN: Review regulations and their implementation so that PV rooftop investments become more attractive after some experience with the new regulation.

Recommendations to the project team:

16. Engage top management in government institutions, e.g. through short information meetings about the essence of capacity building programmes conducted for their respective organisation.
17. Find ways of communicating, also in the PCC, how the activities with partners are embedded in the context of the overall PTB project. Explain the whole context of the project and its overall, very agile, strategy to more partners.
18. Facilitate more regular exchange with other German development organisations involved in PV promotion and with the German Embassy.
19. Work with the MoI for strengthening QI in local manufacturers. Associations could be strategic partners for PTB in reaching local manufacturers alongside MoI.
22. Develop letters of intent with some strategic partners and PCC members, that were so far involved in distributing information and would like to be more involved in the development.
24. Discuss with partners in the appraisal mission the following options to be taken up in phase 2 of the project:

24.a Provide more support to the industry and particularly to associations and partners working with the industry in dissemination of and capacity building on standards

24.c Adopt and adapt the existing international standards for installation and for operation, monitoring and maintenance.

24.d In standards for installation, consider the transport costs and methods so that modules can be transported safely and cost-effectively to remote islands. Possibly develop guidelines for transport to remote islands, including module size.

24.e Promote outdoor pyranometer calibration.

24.f With BSN's Standard Implementation Division, assist small and medium enterprises to apply the SNI IEC 61215 standard. Do a case study or best practice publication about the way the promotion of a standard was done.

Recommendations to the Working Group 9.01 (administration, public relations and evaluation unit):

25. Facilitate faster travel cost reimbursement to partners.