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The feasibility of PV for distributed power generation; an assessment of PV farms for replacing diesel in Indonesia

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Abstract

For reducing fossil fuel consumption and CO_2 emission from power sector, the development of renewable energy is highly recommended. Advances in science and technology have provided us with several alternative means of producing energy on a sustainable level, such as wind, geothermal, biomass, and solar power. Of these means, solar (photovoltaic or PV technology) provides the most widely adaptable applications in global. Yet there are some drawbacks of its implementation due to some determinant factors; technical, financial, human resources, policy etc. This study will analyze the feasibility of PV as a power distributed generation replacing diesel power station at some remote areas in Indonesia.

Using "Balance Score Card" and "Pareto Loss Output Analysis" it is focusing on the financial, customer, business process, and human resource factors based on the tree structural data base, and also are determining the root cause factors of low production output (kWh) based on some criteria. Using both methods by 4 KPAs within 12 KPIs, this study want to set-up a draft guideline standard assessment method based on practices of asset management approach for PV evaluation and implementation process, to provide an overview of existing conditions as well as doing portraits gap analysis assessment of PV projects viewed from various perspectives. A total of 9 scattered PV farms which are already operated as a part of PLN's renewable energy project have been examined.

This study found that PV is highly potential to replace diesel station at "on grid system" (without battery) and "the day time - off grid system" (stand alone PV which operate during day time within battery as a buffer) in all areas. PV is probably feasible to compete with diesel power station at "24 hours off grid system" (stand alone PV within sufficient module and battery capacity) at some areas in Indonesia. However, this study also argues that PV is not recommended for "24 hours Off Grid" at locations which have irradiant less than 5 $kWh/m^2/day$ (or 5 hours of Equal Sun Hour). Other finding is that the cause of low production output (kWh) is solvable matters.

The results of this study is mostly relevant to the electricity utility company who seek a suitable and effective tool analysis to assess feasibility of green energy for reducing fossil fuel. Some recommendation has been proposed in order to achieve a successful PV technology adoption. In addition some factors of PV production output losses have been identified for further counter measure investigation.