Photovoltaic (PV) financial models are used by project developers, banks and asset managers to evaluate the profitability of a PV project. This work presents an overview of current practices for financial modelling of PV investments and reviews them in view of technical and financial risks during the different phases of a PV project. This report focuses on establishing common practices for translating the technical parameters of performance and reliability into financial terms. The full report delivers a comprehensive set of practical guidelines and recommendations for mitigating and hedging financial risks in a PV investment.

In the first part, this document reports on the current practices on the use of technical parameters in PV financial models. The report presents the results of a survey including 84 PV projects covering nine countries, several technologies and different business concepts. A questionnaire was distributed among contributors of the Task 13 Subtask 1 to portray the current assumptions made by project developers for solar resource and yield estimations, yearly revenue, operating expenditures and financing. The information collected through the questionnaire was complemented with the findings from the Solar Bankability1 project.

In the second part, the report presents a detailed review and analysis of the current practices. Findings from the survey are compared with scientific data, state-of-the-art methods and recommended best practices. The main weaknesses when dealing with technical assumptions and risks in PV financial models today are summarized and presented as fact sheets in the report. The analysis highlights that a likely method for managing the risk of losing the validity of an assumption made during the financial planning is to focus on the technical aspects of the engineering, procurement and construction (EPC) and operation and maintenance (O&M) scopes of work to manage the technical risks linked to the capital expenditures (CAPEX) and operational expenditures (OPEX) of PV investments. To this end this report describes these aspects in each segment of a PV project; energy yield estimates and the solar resource on which these are based and the CAPEX and OPEX, summarizing the shortcomings encountered in the survey. Furthermore, the reliability and failures of PV system components, specifically the PV modules and inverters as well as the handling and transporting of these and other elements of the project are discussed in detailed in the report.

In the third part, methods for increasing the accuracy of the assumptions and for mitigating risks to these assumptions are proposed. The report presents fact sheets of the shortcomings found in the review and analysis on the current practices accompanied by methods to mitigate these shortcomings in the technical management of the project during the design, construction and operational phases. Special attention is paid to mitigating the uncertainty parameters calculated or assumed for the inputs to the business model. One of the keys to mitigate and hedge financial risks as highlighted in the

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report, is to ensure that the financial model prepared during the feasibility and early development stages of a project will continue to reflect the financial activity of the plant over the 20-30 years of operation. The necessity for ensuring that the design and construction of the plant will enable the assumptions to be realized is extremely important. The guidelines and assumptions necessary to fulfil this task must also include suggestions regarding the project pre-feasibility, plant design, procurement and construction, acceptance, and operation of the plant.

Finally, this report suggests detailed guidelines and recommendations for undertaking the design, construction and operation of a PV plant in a manner that will enable fulfilling the calculated financial plan. Furthermore, a method of calculating final business model values for produced energy, revenue and IRR using statistical tools such as Monte Carlo calculations on the input values, and then again on the output values is introduced. This method demonstrates how a P50 and P90 model can be generated. Further statistical graphic tools, such as the tornado and spider plots are introduced as tools to visualize the relative effect of each of the input parameters on the final calculated output values.