

DEP SPECIFICATION

SOLAR POWER SYSTEMS

DEP 33.65.60.30-Gen.

February 2017

DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design, engineering, materials, fabrication and testing of a photovoltaic (PV), solar-powered, stand-alone system consisting of solar module(s), battery bank, control equipment, mechanical support, shelters and associated components.

This is a revision of the DEP of the same number dated February 2012; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorisation to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project, or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The Principal is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, or on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Autonomy	The number of full days that the system can supply the specified load, using 80 % of the effective battery capacity, without any charging by the solar modules.
Charge Factor (or Array to Load Ratio)	The ratio between the quantity of charge supplied to the battery and the quantity of charge taken from the battery on a daily basis.
Daily Depth of Discharge (DDOD)	The quantity of charge taken from the battery on a daily basis, expressed as a percentage of the effective capacity of the battery.
Effective Battery Capacity	Battery's capacity based on the actual-load discharge time, final voltage and reference temperature.
Hazardous Area	An area in which an explosive gas atmosphere is or may be expected to be present in such quantities as to require special precautions for the construction, installation and use of electrical apparatus.
Insolation (or Irradiation)	Integration of irradiance (sunshine) over a specified period of time (kWh/m ² per unit time).
Irradiance	Radiant power incident upon a unit area of surface (W/m ²).
Requisition	DEP 33.65.60.93-Gen., used by the Principal to specify the detailed requirements for a particular installation.
Standard Test Conditions (STC) (for Solar Module Ratings)	The standard test conditions are: (1) Cell temperature: 25 ± 2 °C (77 ± 4 °F). (2) Irradiance, as measured with a reference device: 1000 W/m ² with the reference solar spectral irradiance distribution. (3) Air mass: 1.5, representing the sun at 42° latitude.
State of Charge (SOC)	A ratio, expressed in percent, of the energy remaining in a battery in relation to its capacity when fully charged.
VRLA Batteries	Valve Regulated Lead Acid Batteries

1.3.3 Abbreviations

Term	Definition
MCB	Miniature Circuit Breaker
MCCB	Moulded Case Circuit Breaker
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
PV	Photo Voltaic
JRC PVGIS	Joint Research Centre Photovoltaic Geographical Information System

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets (). Other documents referenced by this DEP are listed in (7).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated February 2012. The following are the main, non-editorial changes.

Section/Clause	Change
All	Restructured and clarified requirements, enforced shall/should.
1.3.2	Worst case autonomy definition removed, it is not used further.
2	Removed, because it is incorporated in section 4 (new section 2)
3	Removed, because it is incorporated in section 4 (new section 2) and section 6 (new section 4)
2.2	Area requirements moved to own section and simplified/updated
2.3.1	Battery capacity requirements moved to autonomy section
2.3.2	Changed reliability into MTBF and included lifetimes for different parts
2.4	Simplified specification (extracted from DEP 33.64.10.33-Gen.)
2.5.1	Changed 150 km/h wind speed to as stated in requisition
2.5.2.1	Updated classification and moved enclosure requirements to (2.5.2.2)
2.5.3.2	Changed features and function list, options are moved to informative
2.5.4.4	Steady state output voltage limits adjusted to same value as DEP 33.65.50.31-Gen.
2.5.4.5	Steady state output voltage limits adjusted to same value as DEP 33.65.50.31-Gen.
2.5.6.2	Replaced RS-232/485 as communication protocol by industry standard open protocol
4.3	Type test for salt mist test to IEC 61701 added