

IEC 61724-1:2021

How many monitoring systems at a utility scale PV solar power plant?

The 61724-1 standard for PV system performance monitoring has been revised. The latest version, released July 2021, contains a recommendation for the number of monitoring stations at a PV power plant. The numbers suggested are too low. Here is what we have found interviewing Hukseflux users.



Figure 1 Two SR30 Class A pyranometers measuring GHI (Global Horizontal Irradiance) and POA (Plane of Array) in a PV performance monitoring system. How many systems should there be on such a power plant?

Introduction

IEC 61724-1: Photovoltaic system performance monitoring – Guidelines for measurement, data exchange and analysis –, includes recommendations for the number of monitoring stations at a PV power plant. See below the IEC recommendations and Hukseflux’s observations of common practice in tables 1 and 2. Hukseflux sees many more stations at PV power plants than recommended by IEC.

In some cases, Class A and Class B monitoring systems are mixed. Class B systems, in such case, contain only the most important sensors; POA, GHI and PV module temperature.

Table 1 How many monitoring systems per PV power plant? Copied from IEC 61724-1: 2021 table 3. The number suggested by IEC is not a requirement, but “guidance” (IEC 61724-1 Clause 7).

PV SYSTEM SIZE (AC)	NUMBER OF STATIONS: SUGGESTED BY IEC	COMMENT HUKSEFLUX
[MW]	[#]	Although not specifically mentioned in IEC 61724-1, the suggested numbers are generally understood to be a minimum
< 40	2	
40 to 100	3	
100 to 300	4	
> 300	+ 1 / every additional 200 MW	The number of 1 / 200 MW is generally considered much (at least a factor 4) too low. See next table for common practices

Table 2 What number of monitoring stations to use? Common practices at utility scale solar power plants as observed by Hukseflux.

PV SYSTEM SIZE (AC)	NUMBER OF STATIONS	COMMON PRACTICES AND CONSIDERATIONS AS OBSERVED BY HUKSEFLUX
[MW]	[#]	
	+ 1 / offtaker	In case of a large power plant with multiple offtakers (buyers of electricity): at least 1 station per offtaker
all	+ 1 / VPP source	In case a large power plant consists of smaller sources grouped together (together forming a VPP or Virtual Power Plant): at least 1 station per smaller source
	+ 1 / terrain type	The topography of the terrain may require deployment of additional systems to attain good representativeness.
all	+ mixing Class A and Class B systems	In some cases, some of these added systems are not all Class A. Class B or "secondary systems" may be added to Class A systems to reduce costs. IEC 61724-1 Class B systems contain a limited set of sensors only, at least as POA, GHI and panel temperature. In such cases, the Class B systems are equipped with the same "high quality" sensors POA, GHI and panel temperature as used in the Class A systems.
all	+ soiling systems	All systems contain soiling measurement, however, in case non-uniform soiling is expected over the power plant: add separate systems only equipped with soiling measurements.
all	+ albedo / reflected	The optional albedo or rearside reflected irradiance measurement is often seen when bifacial systems are used. Typically at every station, however at least at 1 station / 50 MW.
all	+ diffuse irradiance	The optional diffuse measurement is often seen when 1 axis trackers are used. Typically at 1 station / 50 MW.
> 10 MW	minimum number: 2	Users consider use of Class A systems above 10 MW.
20 to 40/50 MW	minimum number: 3	Above 20 MW Class A systems are commonly required as part of asset management. Many - but not all - users prefer a minimum of 3 systems because this guarantees: <ul style="list-style-type: none"> - spatial coverage - redundancy of data (possibility for cross checks) - redundancy in case of system malfunction - redundancy in case sensors are sent away for recalibration
> 40/50 MW	+ additional systems Simple rules of thumb that we see used in practice as the starting point for design:	<ul style="list-style-type: none"> - minimum 3 Class A, above 40 MW + 1 / 20 MW, all Class A - minimum 3 Class A, above 40 MW + 1 / 40 MW, all Class A - minimum 3 Class A, above 50 MW + 1 / 50 MW, all Class A - minimum 2 Class A, above 50 MW + 2 / 50 MW, all Class A - minimum 3 Class A, above 50 MW + 2 / 50 MW, (1 Class A + 1 Class B) - minimum 2 Class A, above 60 MW + 1 / 30 MW, all Class A

Where can I order the standard?

The standard can be purchased from the [IEC Webshop](#).

About Hukseflux

Hukseflux is the leading expert in measurement of energy transfer. We design and manufacture sensors and measuring systems that support the energy transition. We are market leaders in solar radiation and heat flux measurement. Customers are served through our headquarters in the Netherlands, and locally owned representative sales offices in the USA, Brazil, India, China, Southeast Asia and Japan.

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