Solargis API User Guide

Overview of Solargis API

The purpose of the Solargis API is to provide automated access to Solargis data and services for computers over the web. API is a "user interface" for developers. Developers can automate getting Solargis products by using standard internet protocols (HTTP, FTP) and integrate Solargis data into their customized solutions for evaluation, monitoring, forecasting, validation, calibration, etc..

Solargis API	Availability of PV, solar and meteorological data					Technical features		
	historical	**operational**	**real-time and nowcasting**	**NWP forecast**	**long-term average**	**protocol**	**type of communication**	**content type**
Data Delivery Web Service	YES	YES	YES	YES	NO	HTTP	synchronous	XML
pvPlanner Web Service	NO	NO	NO	NO	YES	HTTP	synchronous	XML
FTP data delivery	YES	YES	YES	YES	NO	FTP	asynchronous	CSV

Table: Description of data available through the Solargis API.

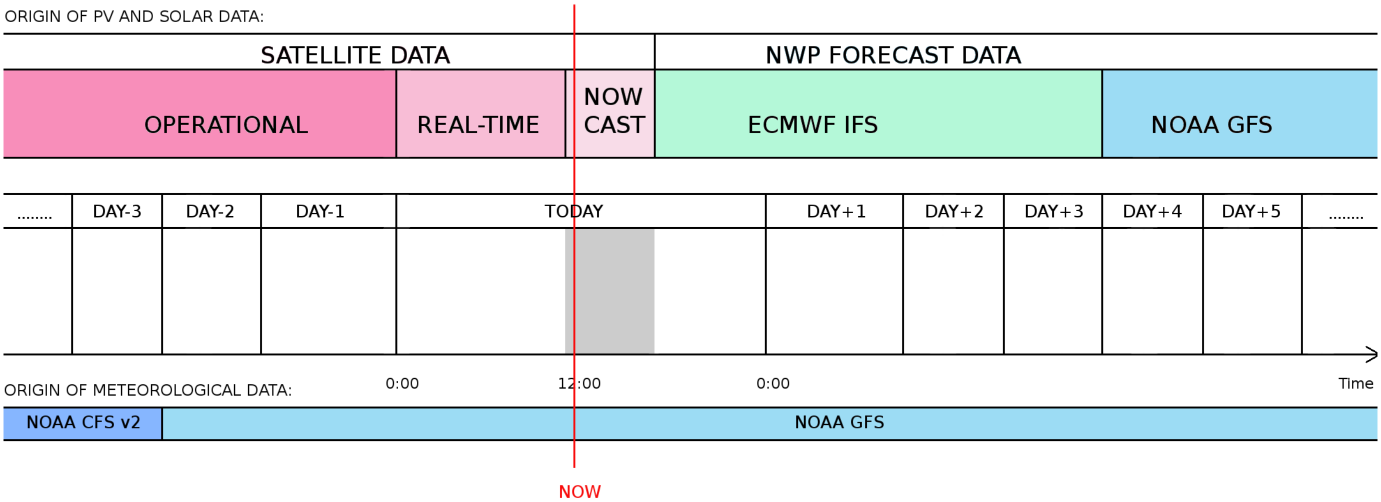
Solargis API consists of two different endpoints:

- **Data Delivery Web Service** - the main service for accessing Solargis time series data. Both request and response is an XML document. The request parameters (XML elements and attributes) are formally described by XML Schema Definition documents (XSD). By using the schema, request or response can be verified programmatically. For this service, we provide two architectural styles, the REST-like endpoint, and SOAP endpoint. Look for more technical information here. Authentication and billing is based on API key registered with the user. Please contact us to discuss details, set up trial or ask for a quotation.
- **pvPlanner Web Service** - this simple web service provides monthly long-term averaged data (including yearly value) of PV, solar and meteorological data with global coverage. The service is aimed for prospection and pre-feasibility. By sending an XML request the user mimics the click on the Calculate button in the interactive Solargis pvPlanner application. Request and response for the service is not described in this user guide. More information can be found here.

Additionally, we provide an **FTP data delivery** service where the request (a CSV file) is stored in the user's FTP directory. The service is then scheduled to deliver CSV response files regularly. Request processing is asynchronous - the client creates the CSV request, the server processes the request according to a schedule (e.g., 4x per day, every hour), the client then checks for the response files. The CSV request allows for multiple locations in one file. For pricing and setting up a trial FTP user account, please contact us.

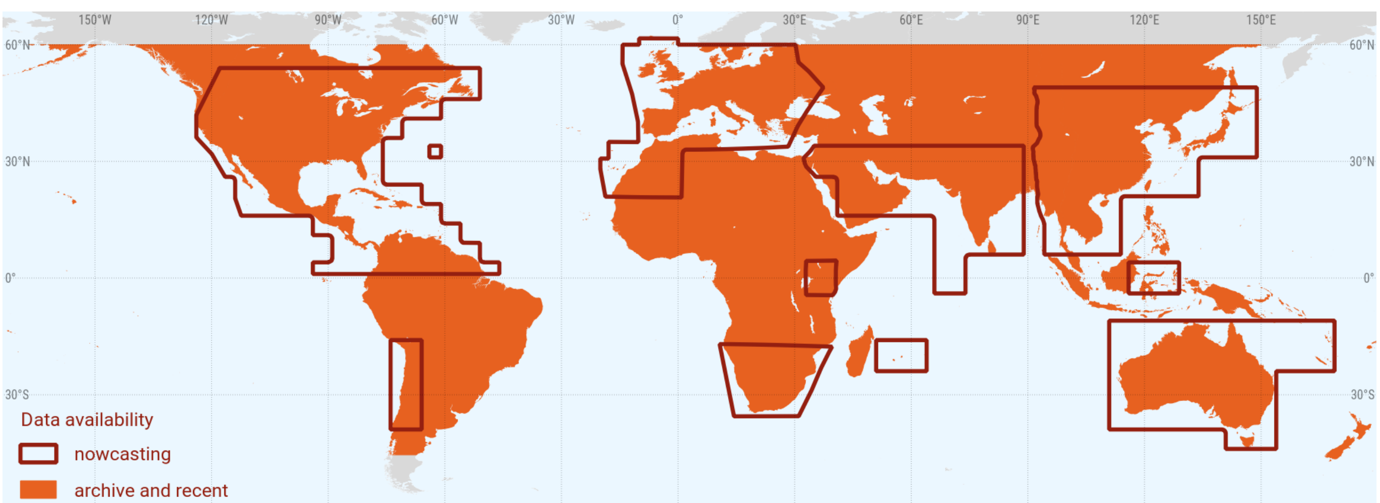
In the case of the solar and PV time series, we use satellite data since available history up to the present moment plus forecasting additional 5 hours ahead. The range of the satellite data includes historical / archived data, operational data, real-time data and Cloud Motion Vector model (CMV, also called the nowcasting). Historical data ranges up to the last completed calendar month and can be considered as "definitive". Data in the current calendar month up to DAY-1 is so-called "operational", and will be re-analyzed in the beginning of the next month using the final version of required data inputs (mostly aerosol data). Important is to note that differences introduced with the re-analysis are typically small. Solar data in the current day comes from the "real-time" satellite data and will be updated when the current day is finished. Then, based on the latest satellite images, we predict irradiation by using the CMV model in the range of next 4-5 hours. The present moment and a short period before is covered by the nowcasting data as the very recent satellite scene is still in progress. This delay can take up to 30 minutes (depending on the satellite scanning frequency). Later on, after the nowcasting time range, we use post-processed outputs from Numerical Weather Prediction models (NWP). Satellite-based data is seamlessly integrated with NWP forecasting data within one response. In the case of locations where real-time & nowcasting data is not yet available, the NWP data is used for the course of the current day. Also, not every location on the globe is supplied by high resolution NWP data (ECMWF IFS model). In such case, NOAA GFS model data is used for all forecasted values. Meteorological data (TEMP, WS, AP, RH...) comes from the NWP data.

The schema below shows how the data sources are integrated into the response. The example depicts the Data Delivery Web Service response having total of 9 days of data mixing all data sources (generated at 12:00 of a given day).



Satellite based solar and PV data - from history up to the real-time and nowcasting

Current spatial coverage of satellite data available through the API. Click image to enlarge:



Orange regions on the map are accessible via the API and data is updated every day (DAY-1 is available). In the subset of these regions, the real-time and the nowcasting data is available (within the current day DAY+0, updated every 30 minutes). Main data parameters include GHI, DNI, DIF, GTI, PVOUT.

The following table will help users to schedule a time for sending requests to Data Delivery Web Service:

satellite region (from left to right as on the map)	data since	**local DAY-1 is available at**	real-time and nowcasting	original satellite scanning frequency

GOES-W (America and Pacific)	1999-01-01	13:30 UTC	planned	10 min. (30 min. old GOES-W)
GOES-E (America)	1999-01-01	10:00 UTC	15 min. resolution, 0-5 hours affected, data updated every 30 min., shipping by FTP every 1 hour	15 min. (30 min. old GOES-E)
MSG/MFG PRIME (Europe and Africa)	1994-01-01	03:45 UTC	15 min. resolution, 0-5 hours affected, data updated every 30 min., shipping by FTP every 1 hour	15 min. (30 min. old MFG PRIME before 2005)
MSG/MFG IODC (Middle East, Central and South Asia)	1999-01-01	22:40 UTC	15 min. resolution, 0-5 hours affected, data updated every 30 min., shipping by FTP every 1 hour	15 min. (30 min. old MFG IODC before Feb 2017)
HIMAWARI/MTSAT (Asia and Pacific)	2006-07-01	22:40 UTC	10 min. resolution, 0-5 hours affected, data updated every 30 min., shipping by FTP every 1 hour	10 min. (30 min. old MTSAT before 2016)

Each daily update of the data re-calculates values for two days backward (DAY-1 and DAY-2). Monthly update (on the 3rd day of each calendar month) re-calculates the whole previous month as soon as it's completed. The purpose of these updates is described in this article. We gradually expand spatial coverage of satellite data accessible via API. To request operational and historical data in the grey areas on the map, please use Solargis climData online shop.

The data from orange zones in the map is also available by using interactive application pvSpot (daily operational data) and the data is accessible within minutes after purchasing in the climData online shop (historical multi-year time series).

Meteorological data from numerical weather models - from history up to the current day

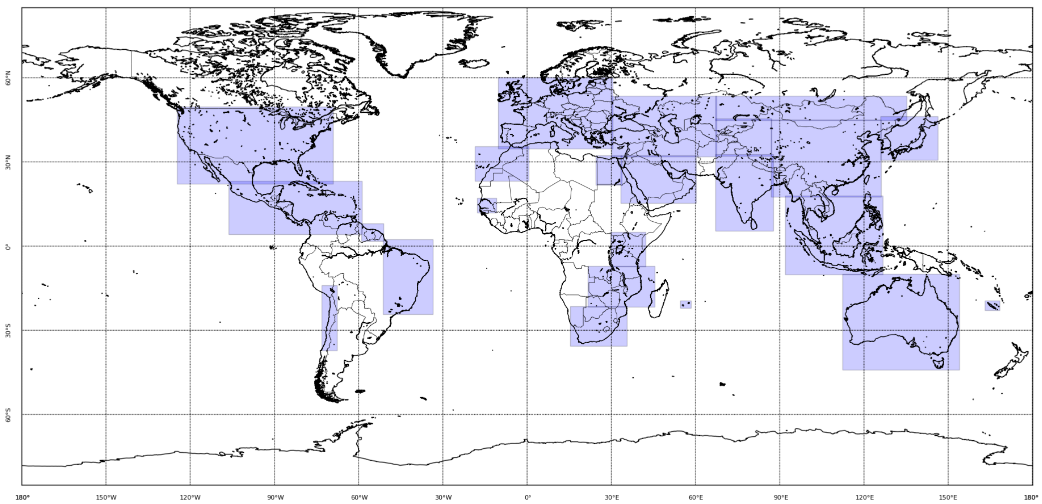
Main data parameters include air temperature (TEMP), wind speed (WS), wind direction (WD), relative humidity (RH) and many others. Historical meteorological data comes from post-processed numerical weather models and it is available globally. The DAY-1 and DAY-2 values are taken from NWP models - NOAA GFS (resp. ECMWF IFS) data sources (they are forecasted values). The preliminary meteorological data from the GFS model is later updated with data from the NOAA CFS v2 data source (re-analyzed archive data). Meteorological data for period DAY-3 and older can be considered as definitive.

Solar, PV and meteorological data from Numerical Weather Prediction (NWP) models - from the current day onward

Solargis forecast is based on the post-processing of outputs from NWP models. The forecast time series include the following data parameters:

- Global horizontal irradiance, GHI [W/m^2] - from NWP
- Direct normal irradiance, DNI [W/m^2] - from NWP
- Global tilted irradiance, GTI [W/m^2] - calculated parameter
- Air temperature at 2 m, TEMP [°C] - from NWP
- PV electricity output, PVOUT [kWh] - calculated parameter
- Wind speed at 10 m, WS [m/s] - from NWP
- Wind direction at 10m, WD [°] - from NWP
- Relative humidity, RH [%] - from NWP
- Atmospheric pressure, AP [hPa] - from NWP
- Precipitable water, PWAT [kg/m2] - from NWP

Map of NWP forecast coverage (last update 4 Feb 2020):



- violet regions: high resolution, higher reliability forecast data is available in the violet regions marked on the map. Upon request, we can start this kind of forecasting service for any other area. The source is the IFS model from ECMWF. The frequency of the update is at UTC hours 00, 06, 12 and 18 (4 forecasts runs per day, every 6 hours). The forecast range is from DAY+0 up to DAY+2 (three days in a row). Original temporal resolution for the first 48 hours is 1 hour, hours 49 - 84 are received in 3-hourly original resolution, however, in the final response, this is interpolated into desired resolution.
- the rest of the map (in white color) is covered by lower resolution global forecasting data from the GFS model (NOAA, USA). The forecast range is from DAY+0 up to DAY+9 (the DAY+0 means the current day, so we can deliver 10 full days in total). The frequency of the update is once in 6 hours.

Find more information about the forecast here.

Data Delivery Web Service

The client (most often a computer) will send the XML request and waits for the XML response. Users can test web services directly from the web browser by using e.g. REST Client for Firefox or via a native application like Postman. Before sending requests user must set the HTTP Method to "POST", define endpoint URL to https://solargis.info/ws/rest/datadelivery/request?key=demo and also set a header to "Content-Type: application/xml". Then use the XML request examples below and send them in the body of the HTTP request and explore XML responses. Typically, developers will create client code to send requests and handle responses scheduled in time. For creating client code, we provide samples for Python, Java, PHP. For all technical details visit this link.

XML request

Root

element name	dataDeliveryRequest
defined in	http://solargis.info/schema/ws-data.xsd
description	The root element of the XML request is the <dataDeliveryRequest> with required attributes 'dateFrom' and 'dateTo' for setting desired data period in the response. Accepted is a date string in the form of "YYYY-mm-dd" e.g., "2017-09-30". It is assumed UTC (GMT+00) time zone for both dates unless otherwise specified by the <timeZone> element of the <processing>.
content	required one <site> , required one <processing>
@dateFrom*	start of the data period, "YYYY-mm-dd"
@dateTo*	end of the data period, "YYYY-mm-dd"

Explanation of the table above: The element name is that what you can see in the XML request. If the element is of simple type, the content is a literal (text or number), otherwise the content can be list of another <element> or none. Attribute of the element is prefixed by '@' character. Required attribute is marked by '*' character.

Size of time period in one XML request is limited to 31 days regardless of summarization attribute.

Processing

element name	processing
defined in	http://solargis.info/schema/data-request.xsd
description	Complex element with instructions about how response should be generated.
content	optional one <timeZone>, optional one <timestampType>
@summarization*	required, time frequency in the response. One of YEARLY, MONTHLY, DAILY, HOURLY, MIN_30, MIN_15, MIN_10, MIN_5
@key*	required, text value, output data parameters separated by white space. Example: key="GHI GTI TEMP WS PVOUT". See below table for all supported parameters.
@terrainShading	optional, boolean, if 'true', the distant horizon taken from SRTM data is considered, default is 'false' (no horizon obstructions at all), Note: a user can also apply custom horizon data by providing <horizon> element within the <site> element

Table of supported data parameters in the XML request:

parameter	**description**
GHI	Global Horizontal Irradiation [kWh/m2, Wh/m2 resp. W/m2]
GHI_C	Clear-sky Global Horizontal Irradiation [kWh/m2, Wh/m2 resp. W/m2]
GHI_UNC_HIGH	GHI high estimate (10 % prob. of exceedance) [kWh/m2, Wh/m2 resp. W/m2]
GHI_UNC_LOW	GHI low estimate (90 % prob. of exceedance) [kWh/m2, Wh/m2 resp. W/m2]
DNI	Direct Normal Irradiation [kWh/m2, Wh/m2 resp. W/m2]
DNI_C	Clear-sky Direct Normal Irradiation [kWh/m2, Wh/m2 resp. W/m2]
DIF	Diffuse Horizontal Irradiation [kWh/m2, Wh/m2 resp. W/m2]
GTI	Global Tilted Irradiation [kWh/m2, Wh/m2 resp. W/m2]
GTI_UNC_HIGH	GTI high estimate (10 % prob. of exceedance) [kWh/m2, Wh/m2 resp. W/m2]
GTI_UNC_LOW	GTI low estimate (90 % prob. of exceedance) [kWh/m2, Wh/m2 resp. W/m2]
GTI_C	Global tilted clear-sky irradiance [W/m2]
CI_FLAG	Cloud identification quality flag [categories], this parameter is presented as 'flagR' in the response
FLAG_R	alias for CI_FLAG
KTM	*Deprecated alias of KC. Can be discontinued in future versions.*
KC	Clear-sky index [unitless]
KT	clearness index, values range (0, 1.1), during the night -9
PAR	Photo-synthetically Active Irradiation [kWh/m2, Wh/m2 resp. W/m2]
SE	Sun Altitude (Elevation) Angle [deg.]

SA	Sun Azimuth Angle [deg.]
TEMP	Air Temperature at 2m [deg. C]
TD	Dew Point Temperature [deg. C]
WBT	Wet Bulb Temperature [deg. C]
AP	Atmospheric Pressure [hPa]
RH	Relative Humidity [%]
WS	Wind Speed [m/s]
WD	Wind Direction [deg.]
PREC	Precipitation Rate [kg/m2]
PWAT	Precipitable Water [kg/m2]
PVOUT	Photovoltaic Output [kW, resp. kWh]
PVOUT_UNC_HIGH	PVOUT high estimate (10 % prob. of exceedance) [kW, resp. kWh]
PVOUT_UNC_LOW	PVOUT low estimate (90 % prob. of exceedance) [kW, resp. kWh]
SDWE	Water equivalent of accumulated snow depth [kg/m2]
SWE	*Deprecated alias of SDWE. Can be discontinued in future versions. SDWE will be returned in a response.*
TMOD	Module temperature [deg. C]. This parameter needs a PV system defined in the request.
WG	Wind Gust [m/s]
WS100	Wind speed at 100 m [m/s]
WD100	Wind direction at 100 m [deg.]
SFWE	Water equivalent of fresh snowfall rate [kg/m2/hour] - source ERA5 , the latest data available is approx. one month backward (no data for very recent or forecast period)
INC	Incidence angle of direct irradiance [deg.], this parameter needs GTI or PVOUT in the request
TILT	Tilt of inclined surface [deg.], this parameter needs GTI or PVOUT in the request
ASPECT	Aspect of inclined surface [deg.], this parameter needs GTI or PVOUT in the request

element name	timeZone
defined in	http://solargis.info/schema/data-request.xsd
description	Simple element provides time zone in the response (how all timestamps should be shifted from GMT, resp. UTC). Hourly precision is currently supported.
content	required, string value in the pattern "GMT[+-][number of hours zero padded]", default value is GMT+00 (=UTC time zone), Example: GMT-04, GMT+05

element name	timestampType
defined in	http://solargis.info/schema/data-request.xsd

description	Simple element provides how aggregated time intervals in the response should be labeled. Valid for [sub]hourly summarization. Intervals can be time-stamped at the center (default) or at start or at end. In other words, users can choose the left (START) or the right (END) edge of the time interval for its label (besides the center).
content	required, one of START, CENTER, END

Site

element name	site
defined in	http://solargis.info/schema/data-request.xsd
description	Complex element representing site location, optionally with a PV technology installed
content	optional one <geometry>, optional one <system>, optional one <terrain>, optional one <horizon>
@id*	required, site identification, cannot start with number, cannot have white space
@lat*	required, site latitude in decimal degrees e.g, 48.61259
@lng*	required, site longitude in decimal degrees e.g, 20.827079
@name	optional, any name of the site, default is empty string

element name	terrain
defined in	http://solargis.info/schema/common-geo.xsd
description	Ground terrain characterized by altitude, terrain slope and terrain azimuth. This element can affect the self shading of a fixed-angle PV array.
content	none
@elevation	optional, meters above the mean see level. If missing, the value will be taken from SRTM terrain database
@azimuth	optional, orientation of tilted terrain in degrees, 0 for North, 180 for South, clockwise, default is 180, has no meaning for a flat terrain
@tilt	optional, slope tilt of terrain in degrees, 0 for flat ground, 90 for vertical surface, default is 0 (flat)

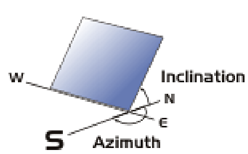
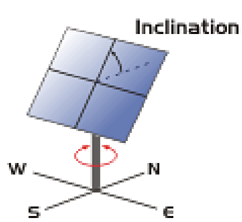
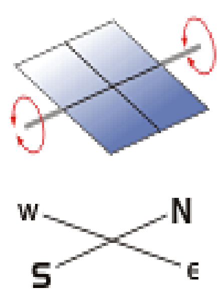
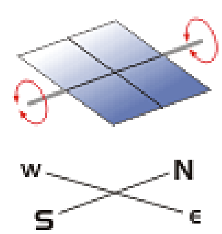
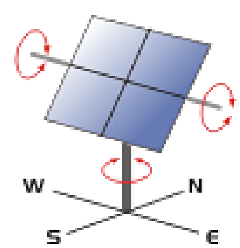
element name	horizon
defined in	http://solargis.info/schema/common-geo.xsd
description	User can provide custom skyline for expressing distant or close obstruction features (hills, trees, buildings, poles, etc.)
content	String of this form: space-delimited list of float number pairs [azimuth in degrees:0-360]:[horizon height in degrees:0-90], Example: "<geo:horizon>0:3.6 123:5.6 359:6</geo:horizon>"

element name	geometry
defined in	http://solargis.info/schema/common-pv.xsd

description	Parametrization of PV system mounting type used for calculating GTI and PVOUT. If this element is missing and GTI/PVOUT is requested, flat-lying PV panels are considered (GTI=GHI). Examples: <pv:geometry xsi:type="pv:GeometryFixedOneAngle" azimuth="180" tilt="25"/> <pv:geometry xsi:type="pv:GeometryOneAxisHorizontalNS" rotationLimitEast="-90" rotationLimitWest="90" backTracking="true" azimuth="180"/> <pv:geometry xsi:type="pv:GeometryOneAxisInclinedNS" axisTilt="30" rotationLimitEast="-90" rotationLimitWest="90" backTracking="true" azimuth="180"/> <pv:geometry xsi:type="pv:GeometryOneAxisVertical" tilt="25" rotationLimitEast="-180" rotationLimitWest="180" backTracking="true"/> <pv:geometry xsi:type="pv:GeometryTwoAxisAstronomical" rotationLimitEast="-180" rotationLimitWest="180" tiltLimitMin="10" tiltLimitMax="60" backTracking="true"/>
content	none
@type*	required, concrete type of given geometry. Use one from GeometryFixedOneAngle, GeometryOneAxisHorizontalNS, GeometryOneAxisInclinedNS, GeometryOneAxisVertical, GeometryTwoAxisAstronomical, see table below
@azimuth	the value in degrees of a true geographical azimuth (0: north, 90: east, 180: south, 270: west, 360: north --> a compass value) . In the case of 'GeometryFixedOneAngle' the azimuth attribute is required. In the case of two tracker types (GeometryOneAxisHorizontalNS, GeometryOneAxisInclinedNS) the value is the compass value at which the southern end of the tracker axis is oriented. Regardless of the Earth's hemisphere. With trackers, the value is limited to the range from 135 deg. to 225 deg. inclusive, so the deviation from the north-south line is not bigger than 45 degrees. With trackers, the attribute is optional and it defaults to 180 deg. (which means the southern end of the axis faces to geographical south, so the tracker field is aligned with the north-south line which is the optimal solution for most cases).
@tilt	tilt of panel surface in degrees range (0, 90), 0=horizontal, 90=vertical surface, required for 'GeometryFixedOneAngle' and 'GeometryOneAxisVertical' types
@axisTilt	optional, tilt of rotating inclined axis in degrees, 0 = horizontal, 90 = vertical axis, only applicable for 'GeometryOneAxisInclinedNS', WARNING: if this attribute is missing, the value defaults to 30 degree.

@rotationLimitEast	optional, default is the unlimited motion in the range (-180, 180), used for all trackers. The general rule is: negative value is used for the east side, positive for the west side, the same rule applies for both Earth hemispheres). The meaning is slightly different for different types of tracker: GeometryOneAxisHorizontalNS: rotation limits are defined as tilt of tracker table relative to its central position (which is horizontal=0 deg.), both limits are typically symmetric, e.g., rotationLimitEast=-50, rotationLimitWest=50 GeometryOneAxisInclinedNS: rotation limits are defined as tilt of tracker table relative to its central position (in this case the inclined plane defined by axisTilt attribute), both limits are typically symmetric, e.g., rotationLimitEast=-50, rotationLimitWest=50 GeometryOneAxisVertical: rotation limits are defined relative to 0 deg. (initial tracker position regardless of hemisphere), default range from -180 to 180 deg (-90 deg. east and +90 deg. west) GeometryTwoAxisAstronomical: definition (for vertical axis) is the same as with GeometryOneAxisVertical tracker
@rotationLimitWest	optional, westward motion limit, described above
@tiltLimitMin	optional, only used with the horizontal axis of 'GeometryTwoAxisAstronomical' tracker. Limit is defined in the range of degrees (-90, +90), relative to the horizontal position of the tracking surface (0 deg.). Example: tiltLimitMin="0" tiltLimitMax="60", the tracker follows the sun elevation in the range from horizontal position to 60 degree of tilt.
@tiltLimitMax	optional, max tilt of the tracking surface, described above
@backTracking	optional boolean value, default is 'false' - tracker moves freely regardless of the neighbors, value is 'true' - tracker moves in the way it avoids shading from neighboring tracker constructions.

Table of supported geometries (PV mounting types):

GeometryFixedOneAngle	**GeometryOneAxisVertical**	**GeometryOneAxisInclinedNS**	**GeometryOneAxisHorizontalNS**	**GeometryTwoAxisAstronomical**
				
• fixed surface described by azimuth and tilt • self-shading simulation supported	• single vertical tracker axis • tilted fixed surface • rotation limits • back-tracking • relative column spacing • self-shading simulation not implemented	• single inclined tracker axis • tilted surface • rotation limits • azimuth of the axis • back-tracking • relative column spacing • self-shading simulation supported	• single horizontal tracker axis • rotation limits • azimuth of the axis • back-tracking • relative column spacing • self-shading simulation supported	• two tracker axes • rotation limits for both axes • back-tracking • relative column spacing • self-shading simulation not implemented

PV system

element name	system
defined in	http://solargis.info/schema/common-pv.xsd
description	Parametrization of the PV system. Required for simulating PVOUT parameter.
content	required one <module> element, required one <inverter> element, re quired one <losses> element, optional one <topology> element,
@installedPower*	required float value (greater than zero). Total installed DC power of the PV system in kilowatts-peak (kWp). The total PV system rating consists of a summation of the panel ratings measured in STC.
@installationType	optional, use one from FREE_STANDING (default), ROOF_MOUNTED, BUILDING_INTEGRATED. This property of the PV system helps to estimate how modules are cooled by air. For sloped roof with PV modules on rails tilted at the same angle as the roof choose 'ROOF_MOUNTED' value. For PV modules incorporated into building facade choose 'BUILDING_INTEGRATED' value. This option is considered as the worst ventilated. As the best ventilated option is considered 'FREE_ STANDING' installation. This typically means stand-alone installation on tilted racks anchored into the ground. Also choose this option if a PV system is installed on a flat roof.
@dateStartup	optional string formatted as "yyyy-mm-dd" (example 2015-01-01). Start-up date of the PV system (unpacking of modules). This parameter is used for calculation of degradation of modules caused by aging. If omitted, the degradation is not taken into account.
@selfShading	optional, default is 'false'. The parameter affects PV power calculation for 'GeometryFixedOneAngle' geometry, then 'Geometry OneAxisInclinedNS' and 'GeometryOneAxisHorizontalNS' trackers if backTracking="false". When 'selfShading' is switched on, the simulated PV power is typically lower comparing to standalone PV construction not affected by shading from its neighbors. With trackers, always switch off 'backTracking' attribute, because the back tracking avoids self-shading.

element name	module
defined in	http://solargis.info/schema/common-pv.xsd
description	Parametrization of the PV system modules. Required for simulating PVOUT parameter. All modules in one PV system are considered of the same type.
content	optional one <degradation> element, optional one <degradationFirstYear> element, optional one <nominalOperatingCellTemp> element, optional one <PmaxCoeff> element
@type*	required. Enumerated codes for materials used in PV modules. Use 'CSI' for crystalline silicon, 'ASI' for amorphous silicon, 'CDTE' for cadmium telluride, 'CIS' for copper indium selenide. For the estimate of module's surface reflectance we use an approach described here.

element name	degradation
defined in	http://solargis.info/schema/common-pv.xsd
description	Estimated annual degradation [%] of rated output power of PV modules. This element is only considered if "dateStartup" attribute of PV system is present. If the element is missing, degradation defaults to 0.5%/year.

content	required, float number in the range (0, 100), %

element name	degradationFirstYear
defined in	http://solargis.info/schema/common-pv.xsd
description	Estimated annual degradation [%] of rated output power of PV modules in the first year of operation. If the element is missing, degradation defaults to 0.8%/year.
content	required, float number in the range (0, 100), %

element name	nominalOperatingCellTemp
defined in	http://solargis.info/schema/common-pv.xsd
description	Normal operating cell temperature (NOCT). Float value of the temperature in degrees Celsius of a free standing PV module exposed to irradiance of 800 W/m2 in the ambient air temperature of 20°C and wind speed of 1 m/s. The value is given by manufacturer and for ventilated free-standing PV systems only. If the element is missing, the NOCT value defaults to (based on technology): CSI=46°C ASI=44°C CDTE=45°C CIS=47°C
content	required, float number in degrees Celsius

element name	PmaxCoeff
defined in	http://solargis.info/schema/common-pv.xsd
description	Negative percent float value representing the change of PV panel output power for temperatures other than 25°C (decrease of output power with raising temperature). This property is given at the STC by manufacturer. If the element is missing, the PmaxCoeff value defaults to (based on technology): CSI=-0.438%/°C ASI=-0.18%/°C CDTE=-0.297%/°C CIS=-0.36%/°C
content	required, float number, percent per degree Celsius (%/°C)

element name	inverter
defined in	http://solargis.info/schema/common-pv.xsd
description	Parametrization of the PV system inverter. Required for simulating PVOUT parameter. All inverters in one PV system are considered of the same type.
content	optional one <efficiency> element, optional one <limitationACPower> element

element name	efficiency
defined in	http://solargis.info/schema/common-pv.xsd

description	Efficiency of the inverter. If the element is missing, the efficiency is given as a constant value of 97.5%.
@type*	required, concrete type of how efficiency of the inverter should be modeled. Use one from EfficiencyConstant, EfficiencyCurve
content	required, based on type: EfficiencyConstant: float number, [%]. Value of inverter's efficency known as Euro or CEC (California Energy Commission) efficiency. This value is a calculated weighted efficiency given by manufacturer. It gives a simplified picture about an inverter's, in fact non-linear, performance. Valid range of this value is typically in the range 70% -100%. For better results, it is recommended to provide inverter's efficiency curve. EfficiencyCurve: text value, pairs of kW:percent. Efficiency of inverter is of non-linear nature, so it can be described as simplified curve defined as list of data points. Data point on the curve is defined by coordinates, where the x coordinate is absolute float value of input power in kilowatts (kW) and y coordinate is percent float value of the corresponding inverter's efficiency (%). This parameter accepts string value of this pattern: 'x1:y1 x2:y2 x3:y3 xn:yn'. A dot should be used as decimal separator, white space as a pair delimiter and colon as x:y delimiter. We assume the last point determines the maximum input power of the inverter (with corresponding efficiency). Example of an efficiency curve with the maximum input power of 3 kW is: <pv:efficiency xsi:type="pv:EfficiencyCurve" dataPairs="0:85.6 0.5: 96.2 1:98 1.5:97 2:97 2.5:96 3.0:96"/> It is assumed, that one efficiency curve is valid for all inverters of the PV system (their powers are summed).

element name	limitationACPower
defined in	http://solargis.info/schema/common-pv.xsd
description	Maximum power accepted by the inverter as AC output. Higher power values are 'clipped'. Clipping refers to the situation where the AC power output of an inverter is limited due to the peak rating of the inverter (the parameter value in kW), even though the additional power may still be available from the solar modules. If you have power factor (PF) and AC limit in kVA available, use this formula: PF * AC_limit_kVA = kW, to obtain the value of this parameter. No default.
content	required, float number, kilowatts [kW]

element name	losses
defined in	http://solargis.info/schema/common-pv.xsd
description	Estimation of various PV losses.
content	optional one <acLosses> element, optional one <dcLosses> element

element name	dcLosses

defined in	http://solargis.info/schema/common-pv.xsd
description	Estimation of power losses on the DC side. If the element is missing, the specific DC losses are estimated by default as: snowPolution: 2.5% cables: 2.0% mismatch: 1.0%
content	none
@snowPollution	annual value of estimated dirt and snow losses [%]
@monthlySnowPollution	Distribution of the 'snowPollution' attribute value into 12 monthly average values. Value of the parameter must consist of 12 percent float values delimited by white space. If this parameter is present, it takes precedence over 'snowPollution' attribute. Example: <pv:dcLosses cables="0.2" mismatch="0.3" monthlySnowPollution=" 5 5.2 3 1 1 1 1 1 1 1 2 4"/>
@cables	annual value of estimated DC cabling losses [%]
@mismatch	annual value of estimated DC mismatch losses [%]

element name	acLosses
defined in	http://solargis.info/schema/common-pv.xsd
description	Estimation of power losses on the AC side. If the element is missing, the specific AC losses are estimated by default as: transformer: 1.0% cables: 0.5%
content	none
@transformer	annual value of estimated transformer losses [%]
@cables	annual value of estimated AC cabling losses [%]

element name	topology
defined in	http://solargis.info/schema/common-pv.xsd
description	The element is for defining PV plant layout on the ground. The reason is to provide inputs for calculation of self-shading impact on PV power (e.g., how close to each other are PV constructions).
content	none
@type*	XML element type, required, concrete type of how topology should be modeled. Use one from TopologyRow (applies for the 'GeometryFixedOneAngle' geometry), TopologyColumn (use for all trackers). It is assumed trackers are spaced equally in both directions (rows and columns) creating a regular grid.
@relativeSpacing	required, unitless ratio. The attribute specifies the ratio of distance between the neighboring PV table legs and PV table width. Direction of the distance depends on whether topology is specified as TopologyRow or TopologyColumn. See picture below how to calculate the value.

@type	optional. This parameter estimates a magnitude of loss of PV power when modules are shaded or semi-shaded. The effect depends on wiring interconnections within a module. Shading influence ranges from 0% (no influence) to 100% (full influence) and it is classified into following categories (based on the influence value): PROPORTIONAL = 20% UNPROPORTIONAL_1 = 40% UNPROPORTIONAL_2 = 60% UNPROPORTIONAL_3 = 80% When this attribute is missing, the self-shading influence is estimated to 5%.

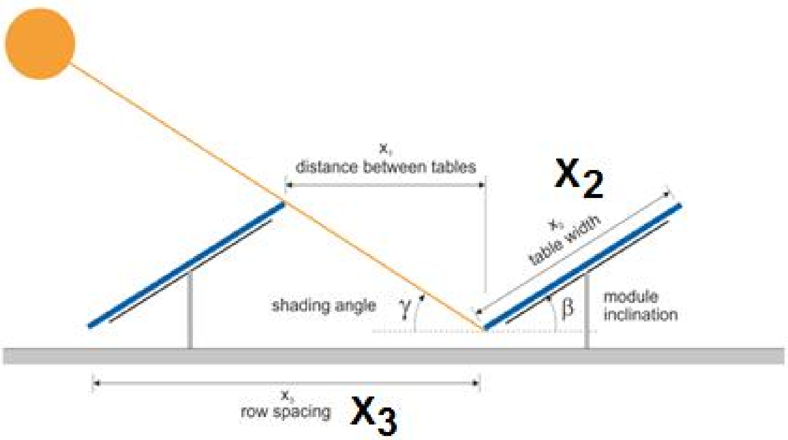


Figure: Calculation of relative row spacing value (= x3/x2).

XML request examples

Example of all options (full request)

Some elements or attributes are mutually exclusive and are commented-out in the listing e.g., user must decide which geometry type to simulate.

```
<ws:dataDeliveryRequest dateFrom="2017-09-22" dateTo="2017-09-30"
    xmlns="http://geomodel.eu/schema/data/request"
    xmlns:ws="http://geomodel.eu/schema/ws/data"
    xmlns:geo="http://geomodel.eu/schema/common/geo"
    xmlns:pv="http://geomodel.eu/schema/common/pv"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

    <site id="demo" lat="48.61259" lng="20.827079">
       <geo:terrain elevation="120" azimuth="180" tilt="5"/>
       <geo:horizon>0:3.6 123:5.6 359:6</geo:horizon>
       <pv:geometry xsi:type="pv:GeometryFixedOneAngle" azimuth="180"
tilt="25"/>
       <!-- <pv:geometry xsi:type="pv:GeometryOneAxisHorizontalNS"
rotationLimitEast="-90" rotationLimitWest="90" backTracking="true"
azimuth="180"/>  -->
       <!-- <pv:geometry xsi:type="pv:GeometryOneAxisInclinedNS" axisTilt="
30" rotationLimitEast="-90" rotationLimitWest="90" backTracking="true"
azimuth="180"/> -->
       <!-- <pv:geometry xsi:type="pv:GeometryOneAxisVertical" tilt="25"
rotationLimitEast="-180" rotationLimitWest="180" backTracking="true"/> -->
```

```
       <!-- <pv:geometry xsi:type="pv:GeometryTwoAxisAstronomical"
rotationLimitEast="-180" rotationLimitWest="180"
                                   tiltLimitMin="10" tiltLimitMax="60"
backTracking="true"/> -->
        <pv:system installedPower="1000" installationType="FREE_STANDING"
dateStartup="2014-01-03" selfShading="true">
            <pv:module type="CSI">
                <pv:degradation>0.3</pv:degradation>
                <pv:degradationFirstYear>0.8</pv:degradationFirstYear>
                <pv:nominalOperatingCellTemp>45</pv:
nominalOperatingCellTemp>
                <pv:PmaxCoeff>-0.38</pv:PmaxCoeff>
            </pv:module>
            <pv:inverter>
                <pv:efficiency xsi:type="pv:EfficiencyConstant" percent="
97.5"/>
                <!--<pv:efficiency xsi:type="pv:EfficiencyCurve"
dataPairs="0:20 50:60 100:80 150:90 233:97.5 350:97 466:96.5 583:96 700:
95.5 750:93.33 800:87.5 850:82.35 900:77.8 950:73.7"/>-->
                <pv:limitationACPower>900</pv:limitationACPower>
            </pv:inverter>
            <pv:losses>
                <pv:acLosses cables="0.1" transformer="0.9"/>
                <pv:dcLosses cables="0.2" mismatch="0.3" snowPollution="
3.0"/>
                <!-- <pv:dcLosses cables="0.2" mismatch="0.3"
monthlySnowPollution="5 5.2 3 1 1 1 1 1 1 1 2 4"/> -->
            </pv:losses>
            <pv:topology xsi:type="pv:TopologySimple" relativeSpacing="
2.4" type="UNPROPORTIONAL2"/>
            <!-- <pv:topology xsi:type="pv:TopologyColumn"
relativeSpacing="2.5" type="UNPROPORTIONAL2"/> -->
        </pv:system>
    </site>
    <processing key="GHI GTI TEMP WS PVOUT" summarization="HOURLY"
terrainShading="true">
      <timeZone>GMT+01</timeZone>
      <timestampType>END</timestampType>
    </processing>
</ws:dataDeliveryRequest>
```

Example of fixed mounted PV system

```
<ws:dataDeliveryRequest dateFrom="2018-02-11" dateTo="2018-02-11"
    xmlns="http://geomodel.eu/schema/data/request"
    xmlns:ws="http://geomodel.eu/schema/ws/data"
    xmlns:geo="http://geomodel.eu/schema/common/geo"
    xmlns:pv="http://geomodel.eu/schema/common/pv"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

    <site id="demo" lat="48.61259" lng="20.827079">
       <geo:terrain elevation="246" azimuth="180" tilt="2"/>
       <!--azimuth and tilt of terrain affects PVOUT values only if
selfShading attribute of the system is true-->
        <pv:geometry xsi:type="pv:GeometryFixedOneAngle" tilt="25"
azimuth="180"/> <!--azimuth and tilt attributes are required-->
        <pv:system installedPower="1" installationType="FREE_STANDING"
selfShading="true">
                <!--by setting selfShading=true we can switch on the
impact of inter-row shading on PVOUT-->
            <pv:module type="CSI"></pv:module>
            <pv:inverter></pv:inverter>
            <pv:losses></pv:losses>
                  <pv:topology xsi:type="pv:TopologyRow" relativeSpacing="
2.5" type="UNPROPORTIONAL2"/>
        </pv:system>
    </site>
    <processing key="GTI TEMP PVOUT" summarization="HOURLY"
terrainShading="true">
           <timeZone>GMT+01</timeZone>
        <timestampType>CENTER</timestampType>
    </processing>
</ws:dataDeliveryRequest>
```

Example of tracking PV system with one horizontal axis in the north-south direction

```xml
<ws:dataDeliveryRequest dateFrom="2018-02-11" dateTo="2018-02-11"
    xmlns="http://geomodel.eu/schema/data/request"
    xmlns:ws="http://geomodel.eu/schema/ws/data"
    xmlns:geo="http://geomodel.eu/schema/common/geo"
    xmlns:pv="http://geomodel.eu/schema/common/pv"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <site id="demo" lat="48.61259" lng="20.827079">
        <pv:geometry xsi:type="pv:GeometryOneAxisHorizontalNS"
rotationLimitEast="-90" rotationLimitWest="90" backTracking="true"
azimuth="180"/>
                <!-- rotation limits are defined as tilt of tracker table
relative to its central position (horizontal=0 deg.), limits are usually
symmetrical-->
        <pv:system installedPower="1" installationType="FREE_STANDING"
selfShading="false">
        <!--by setting selfShading=true and backTtracking=false we can
switch on the impact of inter-row shading on PVOUT-->
            <pv:module type="CSI"></pv:module>
            <pv:inverter></pv:inverter>
            <pv:losses></pv:losses>
            <pv:topology xsi:type="pv:TopologyColumn" relativeSpacing="
2.5" type="UNPROPORTIONAL2"/>
        </pv:system>
    </site>
    <processing key="GTI PVOUT TEMP" summarization="HOURLY"
terrainShading="true">
           <timeZone>GMT+01</timeZone>
        <timestampType>CENTER</timestampType>
    </processing>
</ws:dataDeliveryRequest>
```

Example of tracking PV system with one inclined axis in the north-south direction

```
<ws:dataDeliveryRequest dateFrom="2018-02-11" dateTo="2018-02-11"
    xmlns="http://geomodel.eu/schema/data/request"
    xmlns:ws="http://geomodel.eu/schema/ws/data"
    xmlns:geo="http://geomodel.eu/schema/common/geo"
    xmlns:pv="http://geomodel.eu/schema/common/pv"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

    <site id="demo" lat="48.61259" lng="20.827079">
        <pv:geometry xsi:type="pv:GeometryOneAxisInclinedNS" axisTilt="30"
rotationLimitEast="-90" rotationLimitWest="90" backTracking="true"
azimuth="180"/>
                <!-- tilt of tracker axis defaults to 30 degrees if the
attribute axisTilt is omitted -->
                <!-- tracker axis is tilted towards equator on each Earth
hemisphere, e.g. towards 180 deg. azimuth on the Northern hemisphere, 0
deg. azimuth for the Southern hemisphere-->
                <!-- rotation limits are defined as tilt of tracker table
relative to its central position (in this case inclined plane), limits are
usually symmetrical-->
        <pv:system installedPower="1" installationType="FREE_STANDING"
selfShading="false">
        <!--by setting selfShading=true and backTtracking=false we can
switch on the impact of inter-row shading on PVOUT -->
            <pv:module type="CSI"></pv:module>
            <pv:inverter></pv:inverter>
            <pv:losses></pv:losses>
            <pv:topology xsi:type="pv:TopologyColumn" relativeSpacing="
2.4" type="UNPROPORTIONAL2"/>
        </pv:system>
    </site>
    <processing key="GTI PVOUT TEMP" summarization="HOURLY"
terrainShading="true">
           <timeZone>GMT+01</timeZone>
        <timestampType>CENTER</timestampType>
    </processing>
</ws:dataDeliveryRequest>
```


Example of tracking PV system with one vertical axis

```
<ws:dataDeliveryRequest dateFrom="2018-02-11" dateTo="2018-02-11"
    xmlns="http://geomodel.eu/schema/data/request"
    xmlns:ws="http://geomodel.eu/schema/ws/data"
    xmlns:geo="http://geomodel.eu/schema/common/geo"
    xmlns:pv="http://geomodel.eu/schema/common/pv"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <site id="demo" lat="48.61259" lng="20.827079">
        <pv:geometry xsi:type="pv:GeometryOneAxisVertical" tilt="25"
rotationLimitEast="-180" rotationLimitWest="180" backTracking="true"/>
                <!-- tilt of module defaults to 30 degrees if the
attribute tilt is omitted -->
        <!--rotation limits of the vertical axis are defined relative to 0
deg. (initial tracker position) from -180 to 180 deg with -90 deg.(east)
and +90 deg. (west), regardless of the hemisphere-->
        <pv:system installedPower="1" installationType="FREE_STANDING">
            <pv:module type="CSI"></pv:module>
            <pv:inverter></pv:inverter>
            <pv:losses></pv:losses>
             <pv:topology xsi:type="pv:TopologyColumn" relativeSpacing="
2.5" type="UNPROPORTIONAL2"/>
                         <!--with this tracker, constructions are equally
distributed in both directions, i.e. column spacing = row spacing -->
        </pv:system>
    </site>
    <processing key="GTI PVOUT TEMP" summarization="HOURLY"
terrainShading="true">
           <timeZone>GMT+01</timeZone>
        <timestampType>CENTER</timestampType>
    </processing>
</ws:dataDeliveryRequest>
```

Example of tracking PV system with two axes

```
<ws:dataDeliveryRequest dateFrom="2018-02-11" dateTo="2018-02-11"
    xmlns="http://geomodel.eu/schema/data/request"
    xmlns:ws="http://geomodel.eu/schema/ws/data"
    xmlns:geo="http://geomodel.eu/schema/common/geo"
    xmlns:pv="http://geomodel.eu/schema/common/pv"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <site id="demo" lat="48.61259" lng="20.827079">
        <pv:geometry xsi:type="pv:GeometryTwoAxisAstronomical"
rotationLimitEast="-180" rotationLimitWest="180"  tiltLimitMin="10"
tiltLimitMax="60" backTracking="true"/>
               <!--rotation limits of vertical axis are defined relative
to 0 deg. (initial tracker position) from -180 to 180 deg with -90 deg.
=east and +90 deg.=west, regardless of hemisphere-->
                   <!--rotation limits of horizontal axis defined in the
range of degrees (-90, +90), relative to horizontal position of the
surface (0 deg.)-->
        <pv:system installedPower="1" installationType="FREE_STANDING">
            <pv:module type="CSI"></pv:module>
            <pv:inverter></pv:inverter>
            <pv:losses></pv:losses>
             <pv:topology xsi:type="pv:TopologyColumn" relativeSpacing="
1.5" type="UNPROPORTIONAL2"/>
                         <!--with this tracker, constructions are equally
distributed in both directions, i.e. column spacing = row spacing -->
        </pv:system>
    </site>
    <processing key="GTI PVOUT" summarization="DAILY" terrainShading="true"
>
           <timeZone>GMT+01</timeZone>
        <timestampType>CENTER</timestampType>
    </processing>
</ws:dataDeliveryRequest>
```

XML response

The root element of the XML response is the <dataDeliveryResponse> containing one <site> element inside. The <site> element has the 'id' attribute referencing the site in the request. The <site> consists of <metadata> section, one <columns> element and multiple <row> items. The <row> holds timestamp information in the 'dateTime' attribute and the numeric values in space-separated text value of the 'values' attribute. Values are sorted in the same order as their labels in the <columns> element.

> Timestamps used in the XML response comply with the ISO 8601 standard for date and time representation https://en.wikipedia.org/wiki/ISO_8601. Time stamps are also aware of time zone (offset from UTC). Time zone designators are appended after the the time part of timestamp string. If the time is in UTC (https://en.wikipedia.org/wiki/Coordinated_Universal_Time), *Z* is added directly after the time without a space. *Z* is the zone designator for the zero UTC offset e.g., 2017-09-22T01:00:00.000**Z** . If there is an offset from UTC, this is designated by appending +/-HH:MM after the timestamp string, e.g., 2017-09-22T01:00:00.000-**05:00** (UTC-5).

```
<?xml version="1.0"?>
<dataDeliveryResponse xmlns="http://geomodel.eu/schema/ws/data" xmlns:ns2="
http://geomodel.eu/schema/common/geo">
  <site id="demo" lat="48.61259" lng="20.827079">
```

<metadata>#15 MINUTE VALUES OF SOLAR RADIATION AND METEOROLOGICAL PARAMETERS AND PV OUTPUT
#
#Issued: 2017-09-03 12:40
#
#Latitude: 48.612590
#Longitude: 20.827079
#Elevation: 7.0 m a.s.l.
#http://solargis.info/imaps/#tl=Google:satellite&loc=48.612590,20.827079&z=14
#
#
#Output from the climate database Solargis v2.1.13
#
#Solar radiation data
#Description: data calculated from Meteosat MSG satellite data ((c) 2017 EUMETSAT) and from atmospheric data ((c) 2017 ECMWF and NOAA) by Solargis method
#Summarization type: instantaneous
#Summarization period: 28/04/2014 - 28/04/2014
#Spatial resolution: 250 m
#
#Meteorological data
#Description: spatially disaggregated from CFSR, CFSv2 and GFS ((c) 2017 NOAA) by Solargis method
#Summarization type: interpolated to 15 min
#Summarization period: 28/04/2014 - 28/04/2014
#Spatial resolution: temperature 1 km, other meteorological parameters 33 km to 55 km
#
#Service provider: Solargis s.r.o., M. Marecka 3, Bratislava, Slovakia
#Company ID: 45 354 766, VAT Number: SK2022962766
#Registration: Business register, District Court Bratislava I, Section Sro, File 62765/B
#http://solargis.com, contact@solargis.com
#
#Disclaimer:
#Considering the nature of climate fluctuations, interannual and long-term changes, as well as the uncertainty of measurements and calculations, Solargis s.r.o. cannot take full guarantee of the accuracy of estimates. The maximum possible has been done for the assessment of climate conditions based on the best available data, software and knowledge. Solargis s.r.o. shall not be liable for any direct, incidental, consequential, indirect or punitive damages arising or alleged to have arisen out of use of the provided data. Solargis is a trade mark of Solargis s.r.o.
#
#Copyright (c) 2017 Solargis s.r.o.
#
#
#Columns:
#Date - Date of measurement, format DD.MM.YYYY
#Time - Time of measurement, time reference UTC+2, time step 15 min, time

```
format HH:MM
#GHI - Global horizontal irradiance [W/m2], no data value -9
#GTI - Global tilted irradiance [W/m2] (fixed inclination: 25 deg.
azimuth: 180 deg.), no data value -9
#TEMP - Air temperature at 2 m [deg. C]
#WS - Wind speed at 10 m [m/s]
#WD - Wind direction [deg.]
#AP - Atmospheric pressure [hPa]
#RH - Relative humidity [%]
#PVOUT - PV output [kW]
#
#Data:
Date;Time;GHI;GTI;TEMP;WS;WD;AP;RH;PVOUT</metadata>
    <columns>GHI GTI TEMP WS WD AP RH PVOUT</columns>
  ....
    <row dateTime="2014-04-28T05:11:00.000+02:00" values="0.0 0.0 10.2 1.9
10.0 1005.4 81.2 0.0"/>
    <row dateTime="2014-04-28T05:26:00.000+02:00" values="5.0 5.0 10.4 1.9
10.0 1005.4 80.3 0.0"/>
    <row dateTime="2014-04-28T05:41:00.000+02:00" values="12.0 11.0 10.6
1.9 10.0 1005.3 79.5 2.85"/>
    <row dateTime="2014-04-28T05:56:00.000+02:00" values="25.0 25.0 10.9
2.2 10.0 1005.3 78.7 11.936"/>
    <row dateTime="2014-04-28T06:11:00.000+02:00" values="38.0 37.0 11.2
2.2 10.0 1005.2 77.9 21.25"/>
    <row dateTime="2014-04-28T06:26:00.000+02:00" values="102.0 70.0 11.9
2.2 10.0 1005.1 76.5 38.582"/>
    <row dateTime="2014-04-28T06:41:00.000+02:00" values="144.0 112.0 12.7
2.2 10.0 1005.0 75.0 68.925"/>
    <row dateTime="2014-04-28T06:56:00.000+02:00" values="183.0 156.0 13.4
2.1 9.0 1004.9 73.5 106.197"/>
    <row dateTime="2014-04-28T07:11:00.000+02:00" values="223.0 202.0 14.2
2.1 9.0 1004.8 72.1 150.239"/>
    <row dateTime="2014-04-28T07:26:00.000+02:00" values="265.0 252.0 14.8
2.1 9.0 1004.7 71.2 197.703"/>
    <row dateTime="2014-04-28T07:41:00.000+02:00" values="308.0 304.0 15.3
2.1 9.0 1004.7 70.3 248.14"/>
    <row dateTime="2014-04-28T07:56:00.000+02:00" values="354.0 359.0 15.8
1.7 8.0 1004.6 69.4 301.096"/>
    <row dateTime="2014-04-28T08:11:00.000+02:00" values="403.0 420.0 16.4
1.7 8.0 1004.6 68.4 357.374"/>
    <row dateTime="2014-04-28T08:26:00.000+02:00" values="450.0 479.0 16.9
1.7 8.0 1004.7 66.0 411.019"/>
    <row dateTime="2014-04-28T08:41:00.000+02:00" values="497.0 544.0 17.5
1.7 8.0 1004.8 63.5 468.12"/>
    <row dateTime="2014-04-28T08:56:00.000+02:00" values="539.0 599.0 18.0
1.8 26.0 1004.8 61.0 515.073"/>
  ...
    <row dateTime="2014-04-28T23:41:00.000+02:00" values="0.0 0.0 14.1 2.9
353.0 1004.8 93.3 0.0"/>
    <row dateTime="2014-04-28T23:56:00.000+02:00" values="0.0 0.0 14.0 2.8
354.0 1004.8 93.3 0.0"/>
  </site>
```

```
</dataDeliveryResponse>
```

FTP data delivery

CSV request examples

FTP delivery request is stored on user's FTP directory. Data request file must have header with input parameter names on a first row. Below header, there can be unlimited number of rows with parameter values (each row is treated as one request). Order of parameters in the header is optional. CSV request for the FTP contract delivery is typically prepared, maintained and validated by Solargis.

Example of regular CSV request for monitoring

Note, there are no "fromDate" and "toDate" parameters. Date period is resolved according to contract and managed by the scheduled automated process.

siteId	lat	lng	alt	geometry	azimuth	tilt	summarization	terrainShading	processingKeys	pvModuleTechnology	pvInstallationType	pvInstalledPower	pvInverterEffConstant	pvModuleTempNOCT	pvModuleTempCoeffPmax	pvLossesDCPollutionSnow	pvLossesDCCables	pvLossesDCMismatch	pvLossesACTransformer	pvLossesACCable	pvModuleDegradation	pvModuleDegradationFirstYear	dateStartup	pvFieldColumnSpacingRelative	pvTrackerBackTrack	pvTrackerRotMin	pvFieldTerrainSlope	pvFieldTerrainAzimuth	pvFieldSelfShading	pvFieldTopologyType	active
PV_plant_example	48.61259	20.827079	20	OneAxisHorizontalNS	0	0	hourly	TRUE	GHI GTI DIF TEMP PVOUT	CSI	FREE_STANDING	40020	98.4	45	-0.45	3.5	2	0.5	0.9	0.8	0.5	0.8	20150701	2.53	TRUE	-45,45	0.5	45	TRUE	UNPROPORTIONAL_1	TRUE

Example of on-time CSV request

Parameters "fromDate" and "toDate" are required in this case. Such request is processed only once. Note, only radiation and temperature is requested in this case, so no PV system settings are needed to enter.

siteId	lat	lng	alt	geometry	azimuth	tilt	summarization	terrainShading	processingKeys	fromDate	toDate	active	timeZone	satelliteTimeStamp	timeStampType

Variant_4	48.61259	20.827079	20	FixedOneAngle	180	20	min15	FALSE	GHI GTI DIF TEMP	20120601	20121130	TRUE	0	TRUE	CENTER

Example of CSV request for forecasting

Note the usage of "forecastFromDay" and "forecastToDay" parameters. In this example data will be send (e.g., every 12 hours) for the period since today (forecastFromDay=0) up to 7 days ahead (forecastToDay=7).

siteId	lat	lng	geometry	azimuth	tilt	summarization	forecastFromDay	forecastToDay	terrainShading	processingKeys	pvModuleTechnology	pvInstallationType	pvInstalledPower	pvInverterEffConstant	pvModuleTempNOCT	pvModuleTempCoeffPmax	pvLossesDCPollution	pvLossesDCCables	pvLossesDCMismatch	pvLossesACCable	pvLossesACTransformer	pvModuleDegradation	pvModuleDegradationFirstYear	dateStartup	pvFieldRowSpacingRelative	pvFieldColumnSpacingRelative	pvTrackerBackTrack	pvFieldTerrainSlope	pvFieldTerrainAzimuth	pvFieldSelfShading	pvFieldTopologyType	active	pvInverterLimitationACPower	timezone	timestampType
1	48.612591	17.346977	FixedOneAngle	0	31	hourly	0	7	TRUE	GHI GTI TEMP PVOUT	CSI	FREE_STANDING	100	97.3	45	-0.45	3.5	2	0.8	1	0.5	0.5	0.8	20150521	1.73	1.73	FALSE	1	180	TRUE	UNPROPORTIONAL2	TRUE	30000	2	START

CSV response examples

FTP delivery response is stored on user's FTP directory. Responses from this service are files in the Solargis CSV format with title, metadata and data sections. Files are suitable for automated processing. Examples of CSV response files:

- hourly time-series: Solargis_TS_hourly_sample.csv,
- monthly time-series: Solargis_TS_monthly_sample.csv,
- monthly long-term averages: SolarGIS_LTA_monthly_sample.csv