AGT Solar Monitoring System

Data Flow and Processes

2013

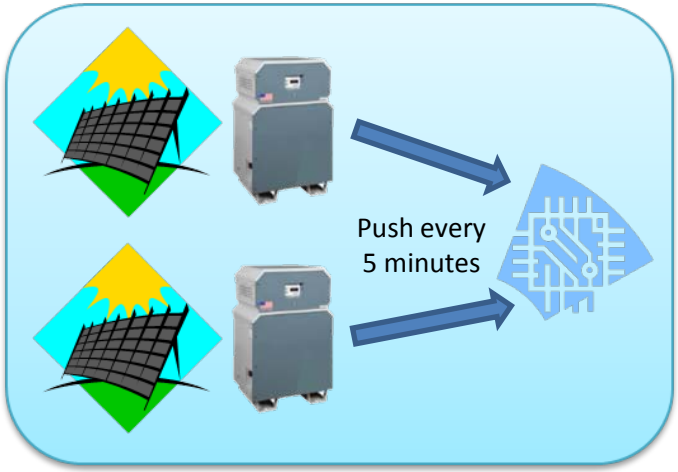
OVERVIEW

- One or more inverters at the client site connect to a local “data logger” device that collects their performance data and stores it onsite for a limited period of time.
- Periodically (typically every 15 minutes), certain data fields — depending on the logger — are communicated to a server on the Internet.
- For now, the data are restricted to high-level information such as the operating state of the inverters and interval kW and kWh statistics that are sufficient to drive the current SMS “dashboard”. Revenue-grade devices can collect many additional data points for more comprehensive reporting in the future.
- Data loggers like the PVP and SMA devices will “push” the data to the server at set intervals.
- Those such as the TRSun have to be queried *from* the server and the data values are “pulled” instead. One problem with this approach is that it requires external access into a (usually) secure corporate network in order to retrieve the data.
- The diagrams on the following pages give a high-level view of the path of the data, along with the fields that are currently available for reporting.
- The typical fault points are:
  - Failures in the PV panels or inverters so that data cannot be connected to the logger
  - Problems in the inverter such that the logger detect a problem
  - Failures in the logger or its local (client site) connection to the Internet so that it cannot upload the data
  - Issues with the site’s Internet Service Provider (ISP) or other general Internet disruptions
  - Outages or processing delays in the 3rd party (e.g., PVP) intermediate server
  - Outages or processing delays in the AGT server
  - Connectivity problems or failure of the SMS display computer
- The issues above that generate automated SMS Error Alerts are reviewed in the page entitled “Solar Monitoring System Error Codes”

PV Powered

PV Panels / Inverters

PVM2020 Data Logger



Internet / PVM Data Fields

PVP Server

Data subset of what's supplied by the PVM

Internet / PVP Data Fields

Pull every 15 minutes

Pull every 15 minutes

SMS Database Server

SMS Display

Data Fields from PVP's Server (a subset of data from the PVM):

- Summary Status ("Producing", "Sleeping", "Attention")
- Summary Instant kW
- Summary Daily, Weekly, Monthly, Lifetime kWh
- Summary Timestamp

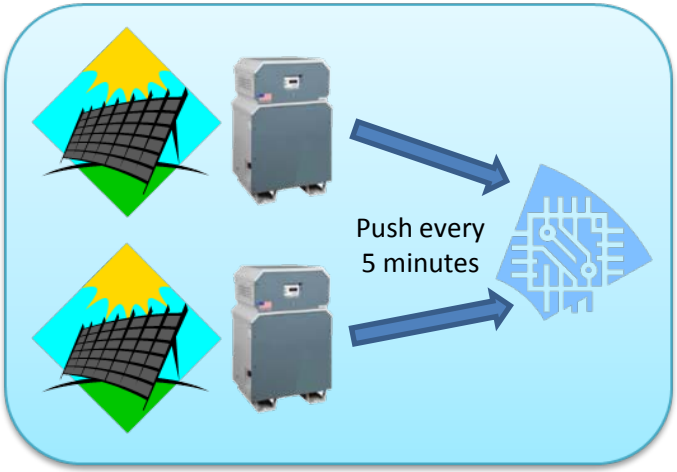
{the following fields are collected, but are unused for now}

- Inverter Status ("Producing", "Sleeping", "Attention")
- Inverter Instant kW
- Inverter Daily, Weekly, Monthly, Lifetime kWh
- Inverter Timestamp
- Inverter AC volts, DC volts, AC power

SMA Solar Technology

PV Panels / Inverters

SMA Webbox



Push every
15 minutes

Internet / Data Fields

SMS Database Server

Pull every
15 minutes

SMS Display

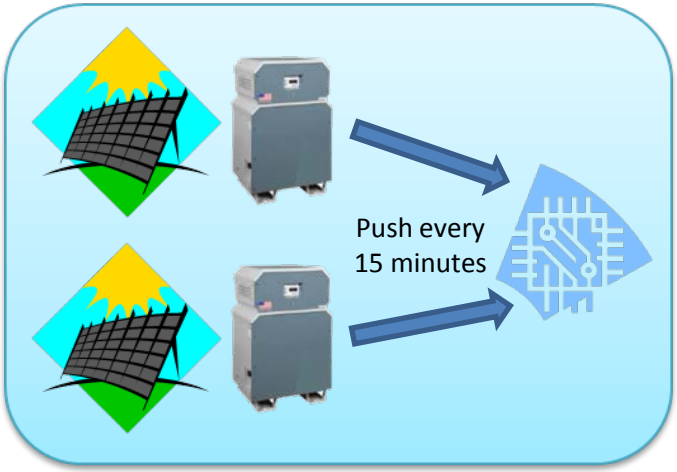
Data Fields from SMA Webbox:
{many additional fields for both solar trackers and inverters are available, but only the following are collected for now}

- Inverter Status (many state/error codes are provided)
- Inverter Instant kW
- Inverter Lifetime kWh
- Inverter Daily, Weekly, Monthly kWh (derived from Lifetime)
- Inverter Timestamp

Obvius Data Logger*

PV Panels / Inverters

Obvius Logger



Push every
15 minutes

Internet / Data Fields

Pull every
15 minutes

SMS Database Server

SMS Display

Data Fields from Obvius Logger:
{some additional fields for both solar trackers and inverters are available, but only the following are collected for now}

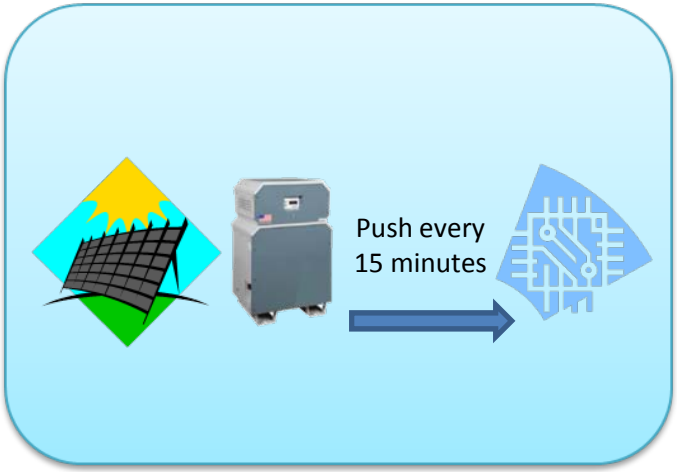
- Inverter Status
- Inverter Instant kW
- Inverter Lifetime kWh
- Inverter Daily, Weekly, Monthly kWh (derived from Lifetime)
- Inverter Timestamp

* May be used with a variety of inverters or other devices

Energy Tracker Meter*

PV Panels / Inverters

Energy Tracker Meter



Data Fields from Energy Tracker Meter:
{some additional fields for both solar trackers and inverters are available, but only the following are collected for now}

- Inverter Status
- Inverter Instant kW
- Inverter Lifetime kWh
- Inverter Daily, Weekly, Monthly kWh (derived from Lifetime)
- Inverter Timestamp

Push every
15 minutes

Internet / Data Fields

Pull every
15 minutes

SMS Database Server

SMS Display

* May be used with a variety of inverters or other devices

SOLAR MONITORING ERROR CODES

Error Type	Description	Action / Response
A. System State = 'Attention'	The entire PV system may be producing, but at least one inverter is offline.	This may be a transient condition, but more than one occurrence should be pursued with the inverter company.
B. 'Sleeping' during "day"	The system is reporting that it's operational, but is not producing power. "Day" is defined as more than 3 hours after sunrise and more than 3 hours before sunset.	This may be caused by local weather conditions that prevent sufficient light from falling on the solar panels. Check the "Weather" column in the Solar Client List. Monitor during the day. Pursue with inverter company if condition persists.
C. Instant Power = 0 during "day", or E. Zero power while 'Producing'	The logger is communicating with the server that the system is active, but there is no power being reported.	Monitor, and pursue with the inverter company if condition persists.
F. Daily Power = 0	The data accumulator module is not reporting cumulative 'daily' power generation anytime from >3 hours after sunrise until midnight. May occur if very low kW output at beginning of day doesn't reach 1 kWh.	Monitor, confirm that conditions should be allowing power accumulation and pursue with inverter company if condition persists.
G. Weekly Power = 0, or H. Weekly Power = 0 after sunrise	No cumulative 'weekly' anytime from >3 hours after sunrise.	Same as above, but new SMA installations will require time for the Weekly and Monthly accumulators to be calculated.
J. Monthly Power = 0, or K. Monthly Power = 0 after sunrise	No cumulative 'monthly' anytime from >3 hours after sunrise on first day of the month.	See above.
L. Lifetime Power = 0 after sunrise, or M. Lifetime Power= 0	No cumulative 'lifetime' anytime.	'Lifetime' should always be reported. Pursue with inverter company if missing.
N. XML data error	No inverter record was received - timed out. For PVP, this means that no record was received from their server.	This may be a transient error, but more than one occurrence in a row should be pursued. See "N Error"** below.
P. Timestamp overage	The data record is more than 29 minutes old, which is beyond the performance standard. For PVP, this may be caused by delays on their server. For all clients, it may indicate a problem with the network at the client's site.	Monitor over a few reporting intervals. For PVP clients, pursue with the vendor if the condition persists. For non-PVP, ensure that there are no network problems.

INVERTER MANUFACTURERS

AE SOLAR ENERGY (Formally PV Powered)
+1 541-323-4143
invertersupport@aei.com

SMA AMERICA
+1 877-697-6283
+1 877-MY-SMATech
Service@SMA-America.com

SOLECTRIA RENEWABLES
+1 978-683-9700
inverters@solectria.com

SATCON
support@satcon.com