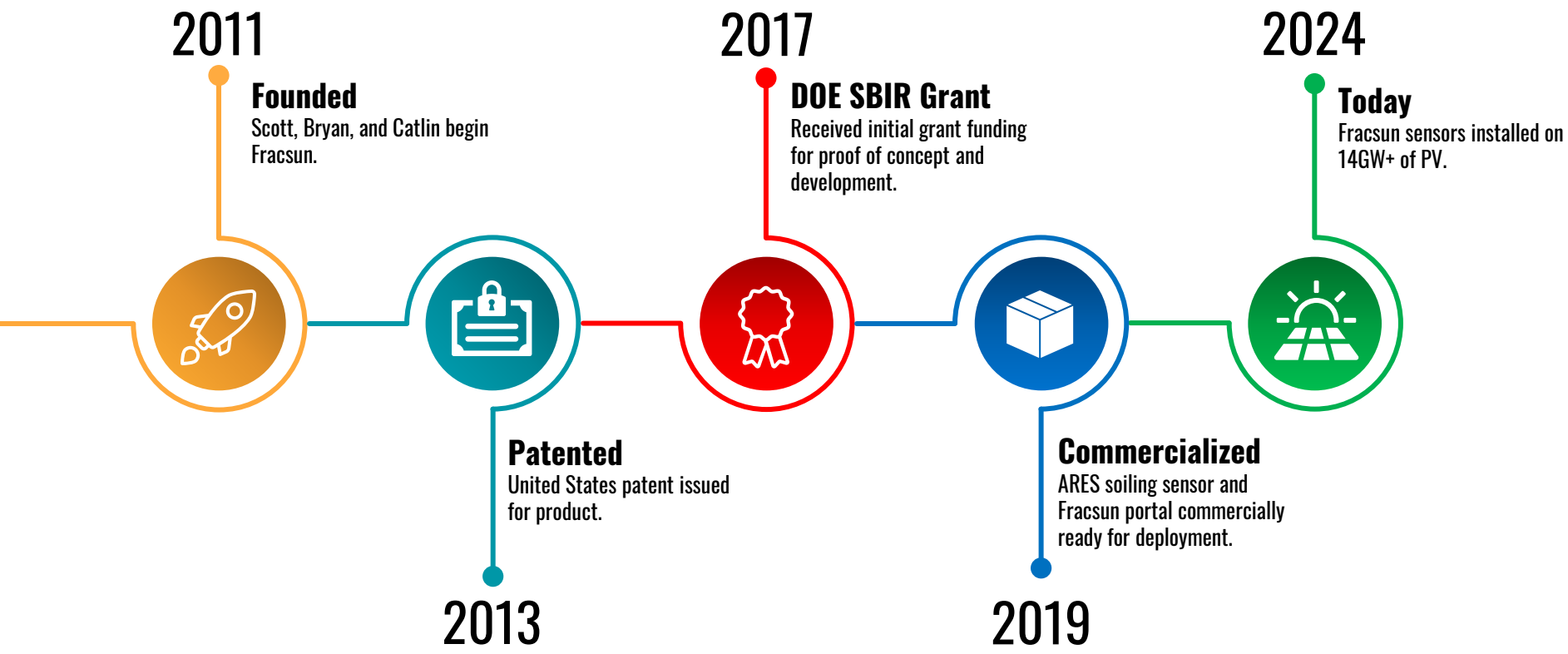
PV Soiling Monitoring Solution

Product Overview

Mission Statement

"Provide intelligent systems for the financially responsible and optimal deployment of solar power systems across the globe."

Fracsun at a Glance

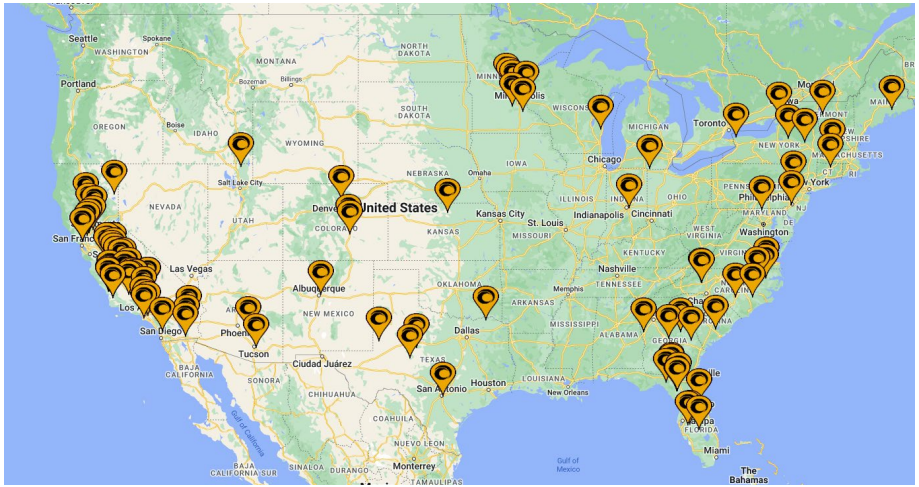


Fracsun at a Glance

Fracsun soiling loss sensors deployed in key solar regions across the globe.

850+ Units deployed in 27+ Countries

700+ Units deployed in U.S.



Products

ARES Soiling Sensor

- Measures on-site soiling loss
- PV reference cell based soiling sensor
- Automatically cleaned daily
- Patented solution utilizing proprietary technology

ARES Soiling Sensor

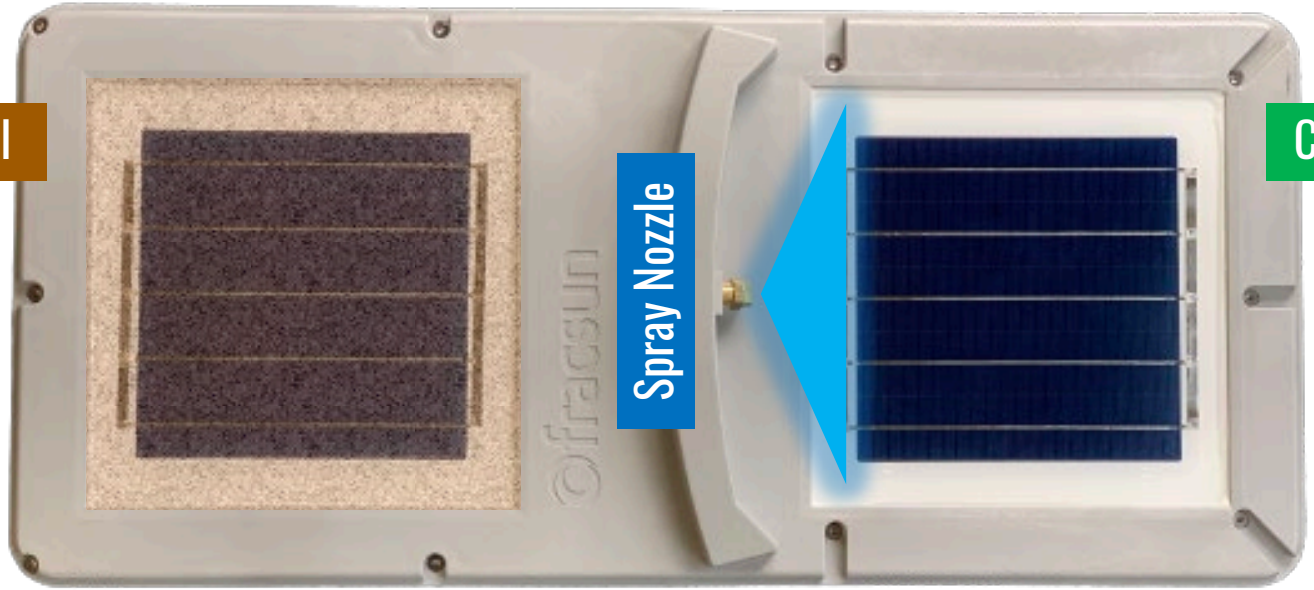
How it works

$$\frac{Soiled}{Clean} = 1$$

Day 1...

ARES Soiling Sensor

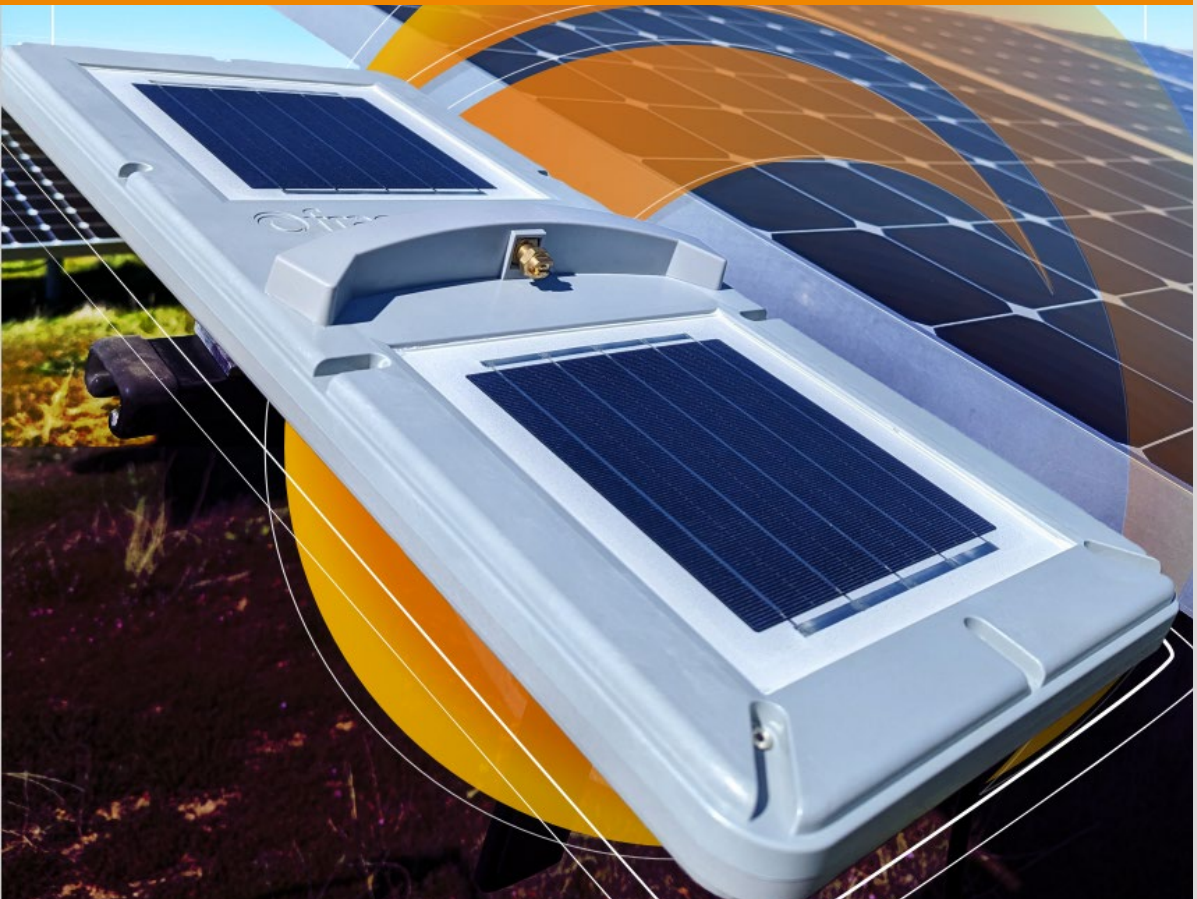
How it works



$$\frac{Soiled}{Clean} = 0.9$$

...after 30 days

ARES Soiling Sensor



Features

- Matched PV reference cells
- Self-powered
- Integrated cellular modem (IoT) or Modbus RS-485
- Integrated 120° spray nozzle
- Threaded inserts for universal mounting
- *Fast installation, under 1 hour*

ARES Soiling Sensor

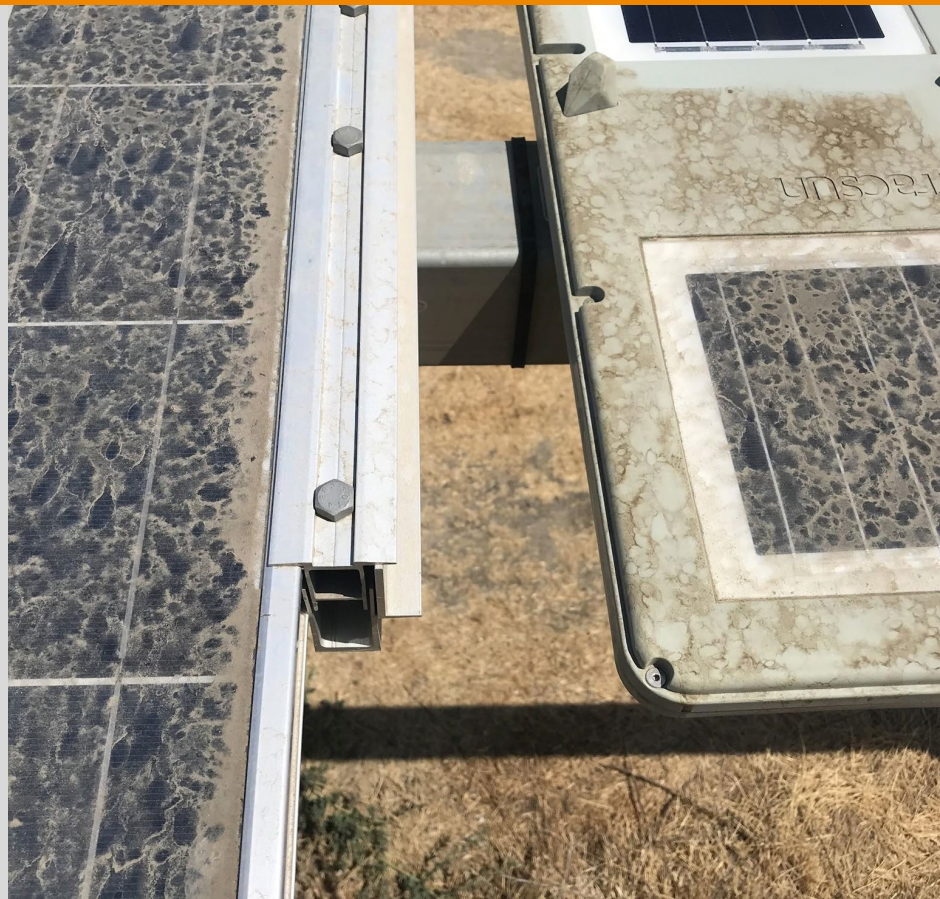
Other Features

- Compatible with innovative cleaning methods

ARES Soiling Sensor

Other Features

- Compatible with innovative cleaning methods
- Easy Visual Scan



ARES Soiling Sensor

Other Features

- Compatible with innovative cleaning methods
- Easy Visual Scan
- Universal M12 automation receptacles to simplify wiring

ARES Universal Mounting Kits

Purlin Bracket Kit

HSAT Bracket Kit

Wash Extension

- Enables automatic washing of the ARES clean reference cell
- Water storage and high-pressure pumping system
- Configurable wash schedule and duration

Wash Extension

Features

- 16 gallon reservoir
  - Use distilled / filtered water
  - Lasts ~1 year between refills
- Solar charged UPS battery system
  - 20W solar module
  - Lead-acid Battery
  - Charge controller
- High pressure water pump
- Infrared liquid level sensor
- Mounting bracket w/ ground spikes

Autonomous Soiling Station

Data Flow and API

Fracsun ARES

* LTE / 3G

Cellular Tower

Fracsun Cloud

Web Portal

Outbound API

Inbound API

Modbus RS-485

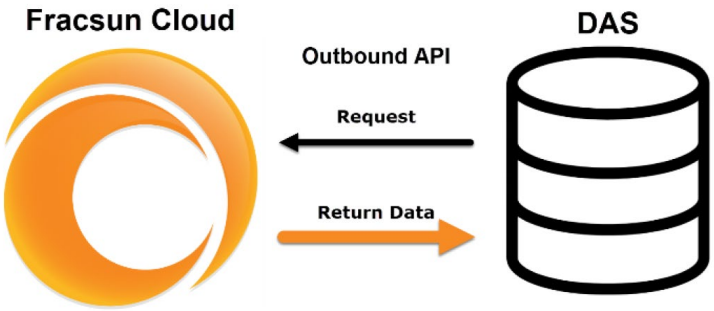
SCADA

Other Database

*Cellular mode preferred

Data Flow and API

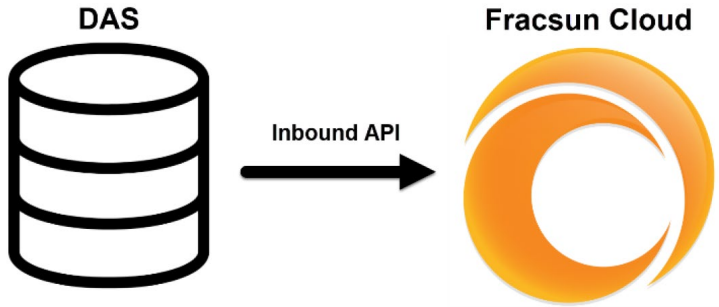
Outbound API



Intended for downloading data from the Fracsun Cloud to the site DAS asset management software.

Primarily used when ARES in *cellular mode*.

Inbound API



Intended for uploading raw soiling data from the DAS into the Fracsun Cloud.

Primarily used when ARES is directly connected to the SCADA system via *Modbus RS-485*.

Fracsun Dashboard for Soiling Analysis

fracsun

2021-01-01 ~ 2021-10-31

Dashboard Staff Device Data Account

Solar Plant Location

Sunflower #1 - 65WG+M8 Lemoore, CA, USA

Device

Sunflower ARES #1

Reset

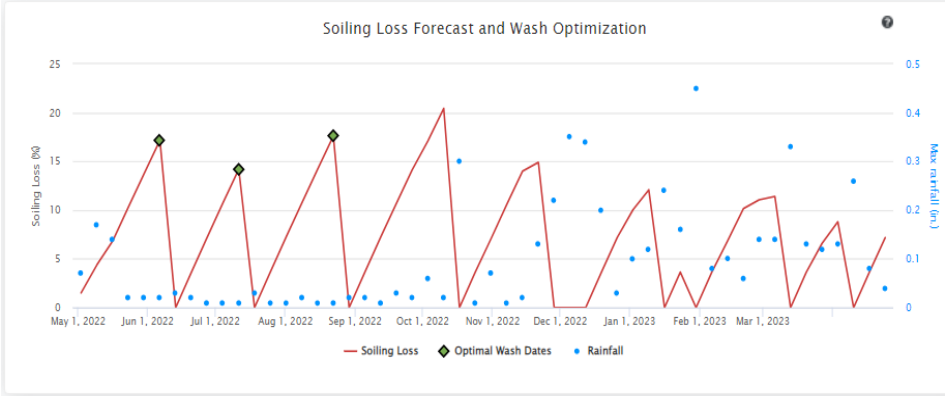
Current Year Loss
$ 11198.76

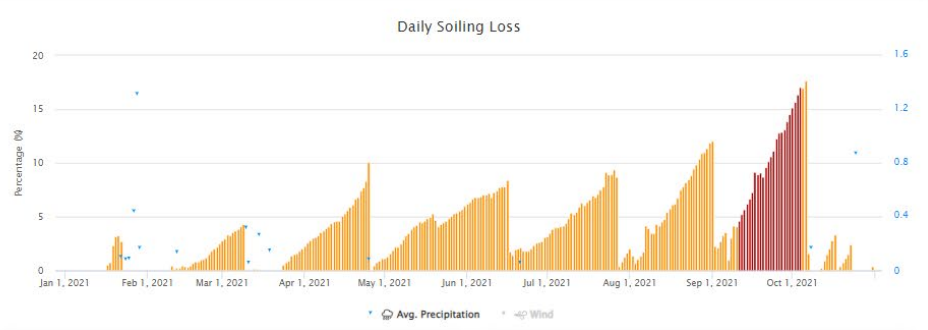
30 days Loss
1.73%

7 days Loss
1.07%

View soiling data and calculate financially optimal wash schedule based on PPA rate, washing cost, and expected rainfall

Wash Analysis





Daily Soiling Rate (%): 0.52

Weekly Soiling Rate (%): 3.64

Soiling Sensor Comparison

Soiling Sensor Technologies:

- PV Reference Cell
- PV Reference Module (manually cleaned)
- Optical (LED or Image Sensor)

Issues w/ Reference Modules

- Manually washing is burdensome
- Low data granularity

Issues w/ Optical Sensors:

- Spectral response unmatched to PV performance (calibration issues).
- Small sensor area not representative of module soiling and patterns
- Poor performance at sites with variable soiling types

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