



# Orange Button: Accelerating PV Capabilities by Facilitating Data Exchange



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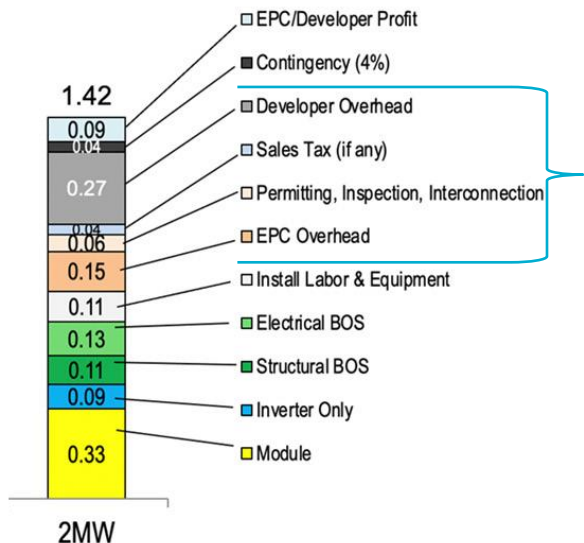
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# Data “friction” adds to PV system costs

## Soft costs are substantial



Although difficult to quantify, data friction (cost associated with collecting, reporting and communicating project data) contributes to **36%** of total solar project cost, making data exchange costs comparable with some hardware costs.

Anecdotal evidence suggests data friction costs are substantial.

Harmonizing data would break additional barriers:

- Increases access to capital by enabling automated risk assessment
- Data clarity translates directly to business process scalability

Fig. 6 from U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks: Q1 2021, NREL/TP-7A40-80694, November 2021



## Terms for GHI used by APIs offering irradiance data

- $G(h)$
- ghi (interval-beginning timestamp, unit of  $\text{W/m}^2$ )
- ghi (interval-end timestamp, unit of  $\text{Wh/m}^2$ )
- GHI
- GHI (interval-beginning except at 1-minute resolution, then interval-ending)

# The Orange Button (OB) Initiative

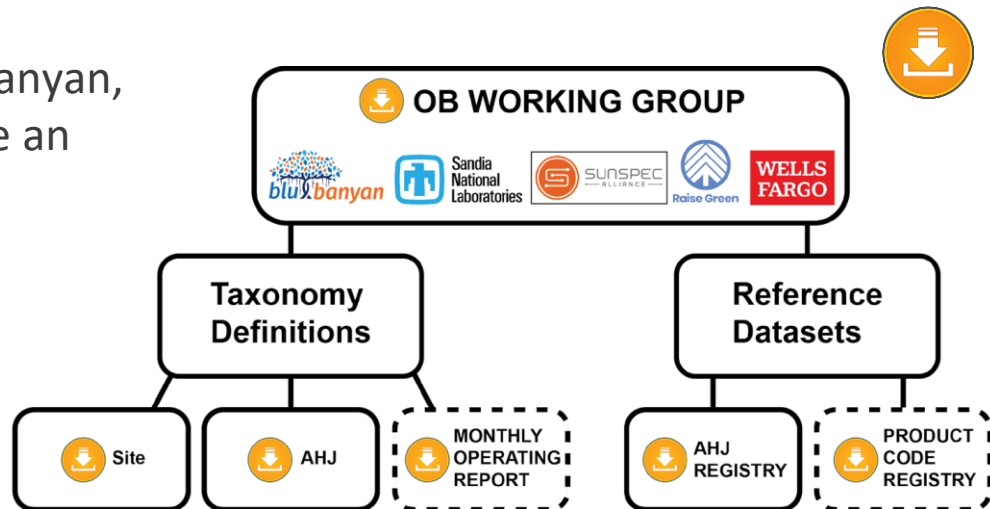


Vision: Harmonize solar data across the system life-cycle, from sales through operations

The OB Working Group (chaired by BluBanyan, Sunspec Alliance, Sandia) seeks to create an **open data exchange standard** for the distributed solar PV industry.

A data exchange standard comprises:

- A taxonomy
- Tools to access reference data sets
- A compliance test suite (future work)



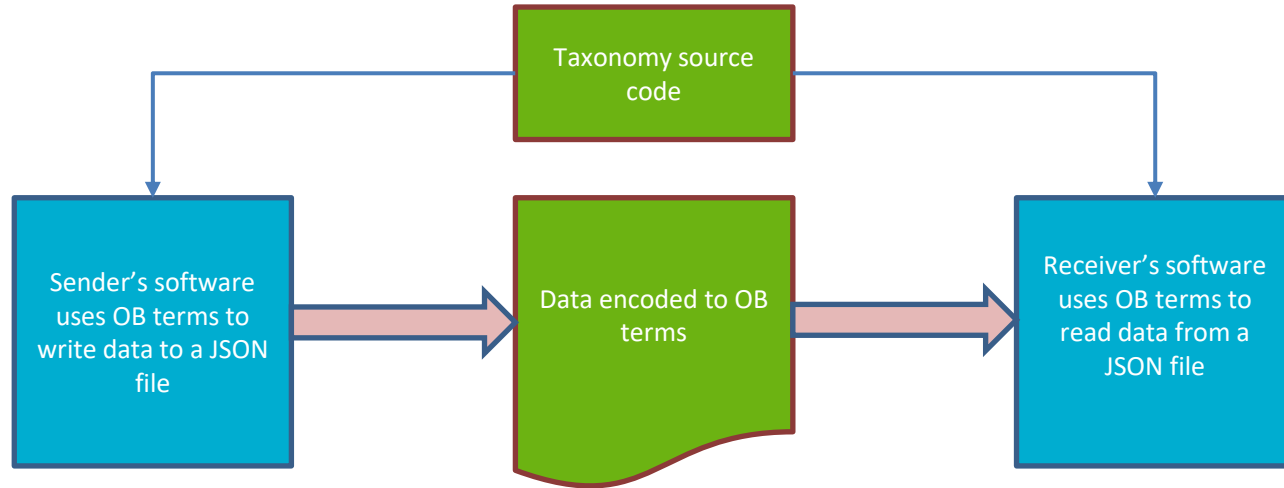
# What is a taxonomy?

- “A taxonomy is... a semantic architecture - it is about naming things and making decisions about how to map different concepts and terms to a consistent structure.”<sup>1</sup>
  - More than a dictionary or variable list because a taxonomy can provide hierarchical structure and can attach metadata to values
- A taxonomy provides
  - Consistency (agreement on terms)
  - Connections (related terms can be grouped together into information objects), and
  - removes Ambiguity (terms can possess primitive data such as a timestamp and a unit) (credit to [1]).

1. <https://www.earley.com/insights/why-taxonomy-critical-master-data-management-mdm>

# The Orange Button taxonomy

- Open-source, public, free-to-use
  - JSON compliant with the OpenAPI 3.0 specification
  - Javascript style conventions
  - <https://www.github.com/Open-Orange-Button/Orange-Button-Taxonomy.git>
- Editor at <https://openobeditor.sunspec.org>
- Documentation at [www.orangebutton.io](http://www.orangebutton.io) (dated)





The OB taxonomy provides common, reusable terms

[-] EnergyProductions [ EnergyProduction ]
• SiteID
[-] EnergyMeasurements [ EnergyMeasurement ]
• DeviceID
• EnergyAC
<i>Decimals</i>
<i>EndTime</i>
<i>Precision</i>
<i>StartTime</i>
<i>Unit</i>
<i>Value</i>

Field name	Value	Units	StartTime	EndTime	Decimals	Precision
Energy AC	11.98	MWh	2021-07-20T12:00:00-07:00	2021-07-20T23:59:59-07:00	2	

# Examples of instance documents

```
{
  "EnergyAC": {
    "Decimals": "1",
    "EndTime": "2020-02-08 09:59:59+07:00",
    "StartTime": "2020-02-08 09:00:00+07:00",
    "Unit": "kWh",
    "Value": 50.1
  }
}
```

```
{
  "EnergyACArray": [
    {
      "Decimals": "1",
      "EndTime": "2020-02-08 09:59:59+07:00",
      "StartTime": "2020-02-08 09:00:00+07:00",
      "Unit": "kWh",
      "Value": 50.1
    }
  ]
}
```



# Editor demonstration – PVSystem object



ob-editor

openbeditor.sunspec.org/#/

Orange Button OpenAPI Editor

Master-OB-OpenAPI.json x

PVSystem

Search Modes:  
☒ Find By Name ☐ Find Direct Usage ☐ Find All Usage

PVSystem +

- CapacityAC
- CapacityDC
- ElectricalServiceID
- RiskCategory
- StructureID
- Description
- FileFolderURL
- OperationalPhase
- OperationalStatus
- SystemID
- SystemPrice
- SystemType
- + BillOfMaterials
- + BillOfServices
- + EnergyModels [ EnergyModel ]
- + EnergyProductions [ EnergyProduction ]
- + PVArrays [ PVArray ]
- + Devices [ Device ]
- + AlternativeIdentifiers [ AlternativeIdentifier ]

PVSystems [ PVSystem ]

- + PVSystem

Collapse All

Create New Definition

Load In Definition

Item Types Editor

Detailed View

Create Sample JSON

Save As

Attributes	Values
Name	PVSystem
Documentation	A solar photovoltaic system
Type	Object
Superclasses	System
Usage Tips	None

Edit definition

Create Sample JSON

Delete

Demo of AHJRegistry  
<https://ahjregistry.sunspec.org/>

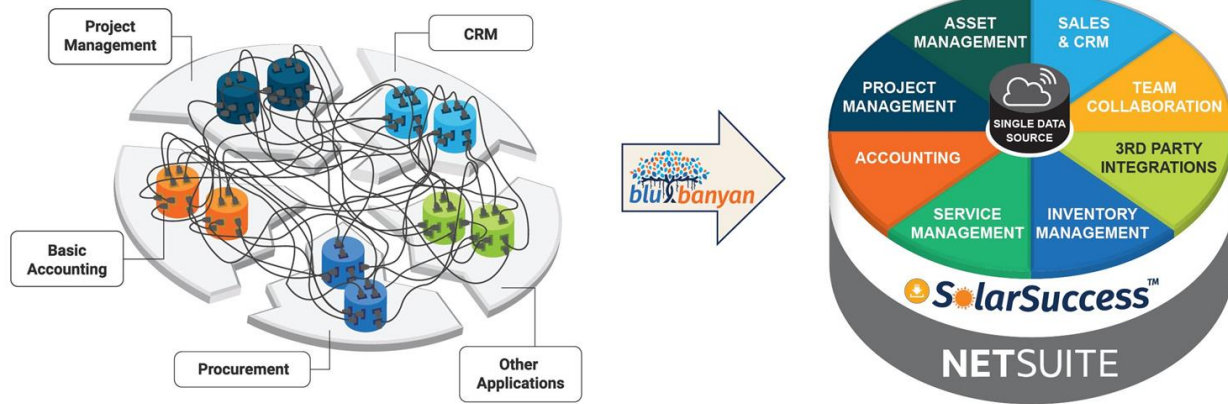
Kimpton Monaco  
15 W 200 S, Salt Lake City, UT 84101



# Blu Banyan's role in the Solar Industry...



Blu Banyan built **SolarSuccess™** - the award-winning fully-integrated business application for the solar industry, eliminating the biggest challenge of disparate and disconnected systems.



Solar installers who account for 25% of the installed residential PV capacity in the US run their business on **SolarSuccess™**



[www.blubanyan.com](http://www.blubanyan.com)

# OB is enabling scalability

**SolarSuccess™** – integrates with application providers to deliver a cohesive solar applications' ecosystem that **helps reduce solar project costs, grow the addressable market, and scale deployment.**



## Legend

- \* Road Map
- Orange Button

<b>Lead Generation</b> Solar Reviews ☀️ GetTheReferral.com	<b>Dialers</b> Five9 Contivio	<b>Proposals</b> ☀️ Enerflo OpenSolar Solo	* Solar Blaze * Aurora * Ryve CRM	<b>eSignatures</b> DocuSign
<b>Financiers</b> Goodleap * Dividend	<b>Payments</b> Paystand eBizCharge	<b>Site Surveys</b> Eagleview	<b>HOA/Property</b> bluProperty	<b>Weather</b> AccuWeather
<b>Customer Engagement</b> ☀️ Bodhi Ipsun Sunvoy MessageMedia (SMS)	<b>File Storage</b> AWS G-Drive SharePoint	<b>Warehouse Management</b> RF-SMART	<b>Equipment</b> BayWa r.e. * Wesco CED Greentech	<b>Other Systems</b> ☀️ Celigo Salesforce HubSpot
<b>DOE Orange Button</b> ☀️ AHJ Registry * SolarAPP+ * Product Code Registry * Monthly Operating Report	<b>Monitoring</b> Also Energy SolarEdge * Enphase * eGauge	<b>Asset Monitoring</b> ☀️ Soltell PowerFactors * PowerHub * 3MW	<b>Field Service</b> FieldAware Shepherd CMMS * Scoop Solar * Salesforce Lightning * Site Capture	

# Conclusion

We welcome your participation in taxonomy development and want to hear your use cases and friction points

- <https://github.com/Open-Orange-Button/Orange-Button-Taxonomy.git>  
Download and save Master-OB-OpenAPI.json for latest version
- <https://obeditor.sunspec.org/>  
Open the file you downloaded

For participation in the working group, contact

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