



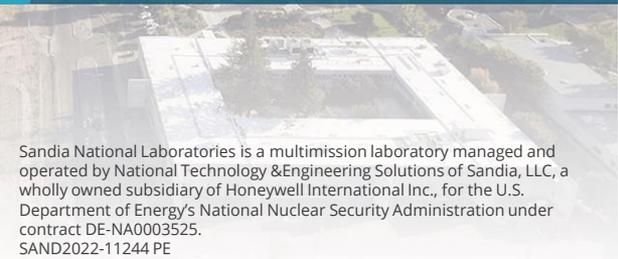
Orange Button: Accelerating PV Capabilities by Facilitating Data Exchange



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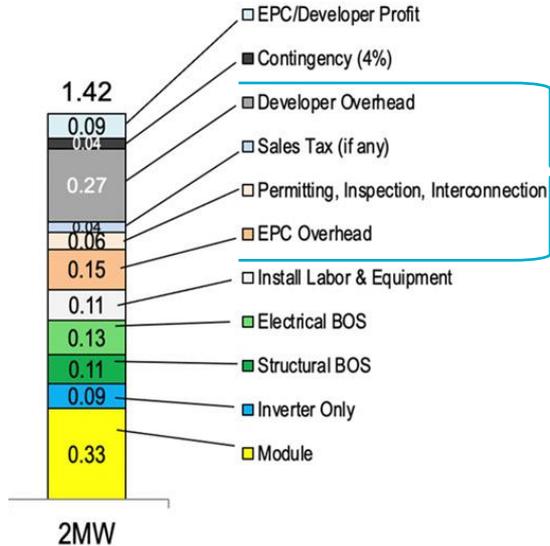


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SAND2022-11244 PE



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 W/m^2)
- ghi (interval-end timestamp, unit of Wh/m^2)
- GHI
- GHI (interval-beginning except at 1-minute resolution, then interval-ending)

The Orange Button (OB) Initiative

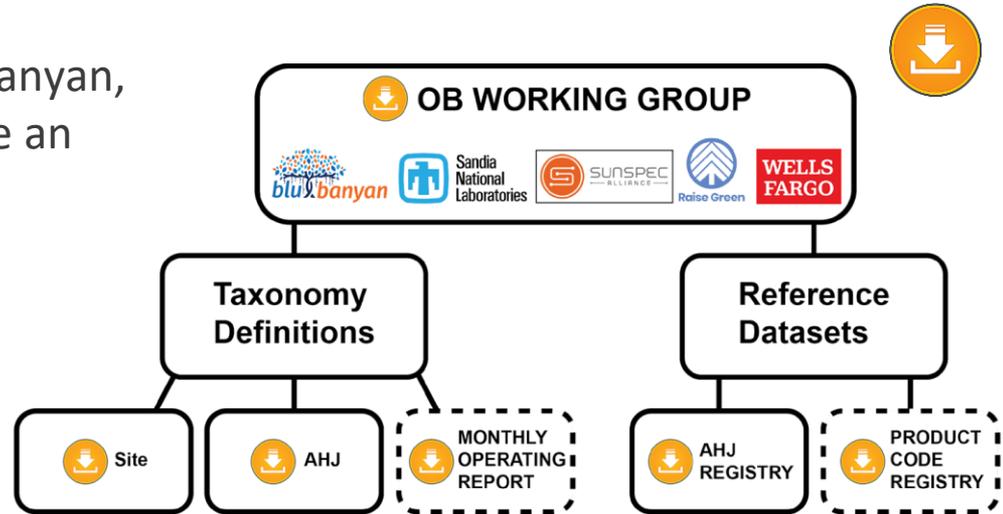


Vision: Harmonize solar data across the system life-cycle, from sales through operations

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?

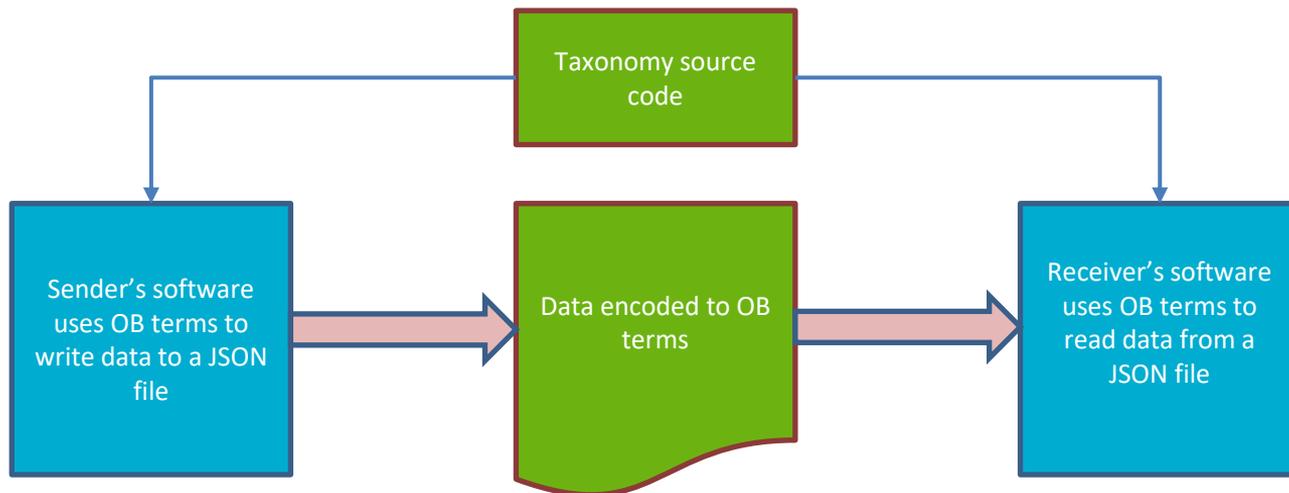
- “A taxonomy is... a semantic architecture - it is about naming things and making decisions about how to map different concepts and terms to a consistent structure.”¹
 - More than a dictionary or variable list because a taxonomy can provide hierarchical structure and can attach metadata to values
- 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 (dated)





The OB taxonomy provides common, reusable terms

- [-] EnergyProductions [EnergyProduction]
 - SiteID
 - [-] EnergyMeasurements [EnergyMeasurement]
 - DeviceID
 - EnergyAC
 - Decimals*
 - EndTime*
 - Precision*
 - StartTime*
 - Unit*
 - Value*

| 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 x +
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/>

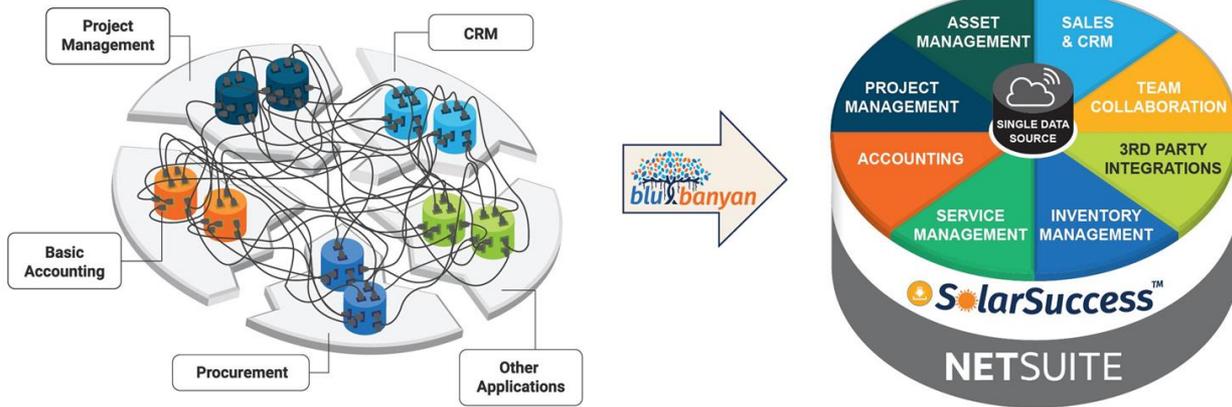
Kimpton Monaco
15 W 200 S, Salt Lake City, UT 84101





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

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

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