2020 SPRING VIRTUAL LEARNING SERIES
Powering your knowledge online.

Bridging the Gap Between Wind and Solar Operational Performance

Author: STEPHEN R LIGHTFOOTE, Senior Data Scientist, Power Factors
80 East Sir Francis Drake Blvd #2F Larkspur, CA 94939

POWER FACTORS

BACKGROUND

Mixed renewable technology (wind + PV) power plants and portfolios are becoming the norm, not the exception in the industry.

From a data / reporting / performance analysis perspective, there are a multitude of benefits to managing mixed technology operational portfolios in a more holistic, technology-agnostic manner.

OBJECTIVE

1. Discuss benefits of a combined approach to wind + PV asset management from a performance perspective.
2. Discuss PV-specific challenges for those coming from a wind perspective.
3. Discuss where and how to align the two technologies from the perspectives of:
   a) Asset Hierarchy
   b) Informational Model / Availability
   c) KPIs / Operational Performance
4. Provide illustrative examples of how this is done in the Power Factors Drive Platform.

MOTIVATIONS

Misconceptions

"PV is easy. With no moving parts, there really isn't much you can do to improve performance at a PV plant."

"Why go through the trouble of integrating the two technologies from a data, reporting and analysis perspective? Why not just treat them as two different animals?"

Benefits

- Reduced duplication
- Reduced complexity
- Prioritization across technologies
- Easier to scale

"Actuarial data indicate that comprehensive PV-only system O&M could improve the average performance ratio (PR, adjusted for age and temperature) of systems from 91.7 to at least 95%."
- Best Practices for Operation and Maintenance of Photovoltaic and Energy Storage Systems; 3rd Edition

TECHNOLOGY CONSIDERATIONS

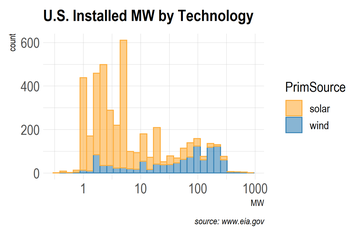
Solar Variants

PV projects are essentially assembled from components. Imagine building your own wind turbine by assembling components from various OEMs. This results in a wide variety of quality, reliability and level of detail available. For instance

- Array Orientation (Fixed Tilt, HSAT, VSAT, Dual Axis, Mixed)
- Inverter Configuration (Central, String, Micro, DC Optimizer)
- Communication / Data Completeness
- Residential / DG / Utility

Scale of Data

- Wind
  - 1 Plant x 100 WTG = 100 devices
  - **100 Plants = 10,000 devices**
- PV
  - 1 Plant x 100 Inverter x 10 Trackers x 10 Combiner x 10 Strings = 100,000 devices
  - **100 Plants = 10,000,000 devices**



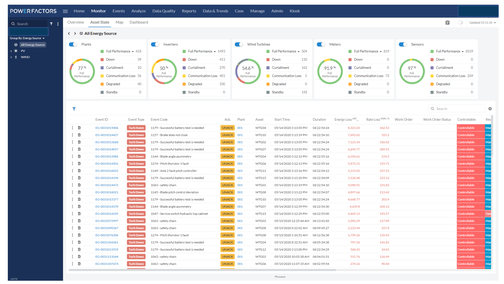
ASSET MODEL

Align where appropriate

- Collection systems are nearly identical
- "Asset of Record": WTG ← → Inverter

Respect differences

- "Generating Unit" of a wind plant is the wind turbine itself. There is no subdivision from an availability and performance perspective. For PV, the performance / availability can be subdivided down to the individual PV module.
- Resource modeling and energy capture.



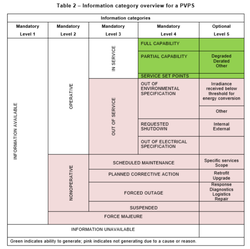
CONCLUSIONS

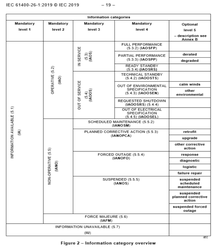
The scale and variety of PV plants present unique operational challenges for those coming from a wind perspective.

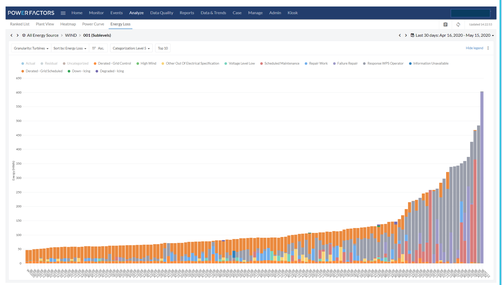
Aligning the asset, data and informational models of wind and PV power plants within a single, standardized system creates the ability to standardize workflows, reducing duplication and allowing for more comprehensive prioritization of action.

INFORMATIONAL MODEL / AVAILABILITY

PV	WIND
IEC 63019	IEC 61400-26
Capability	Performance
Day / Night	Cut-In / Cut-Out Wind Speed
Partial Capability	Degradation / Derating
Capacity Weighted Time-Based Availability	Production-Based Availability

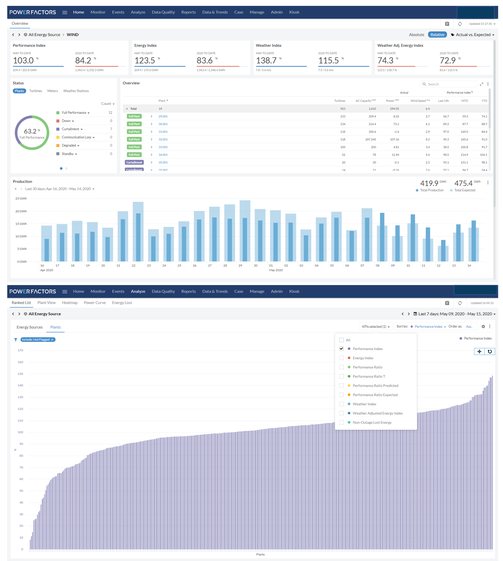






KPIS / PERFORMANCE

The ability to do comparison allows asset owners and operators to rank assets by common KPIs facilitating better informed, more efficient and more targeted O&M practices.



ACKNOWLEDGEMENTS

Special thanks to colleagues at Power Factors: specifically Steve Voss, Abilash Krishnan and Stephanie Hanawalt.

REFERENCES

IEC TS 63019:2019
Photovoltaic power systems (PVPS) - Information model for availability

IEC 61400-26-1:2019
Wind energy generation systems - Part 26-1: Availability for wind energy generation systems

CONTACT INFORMATION

slightfoote@pfdrive.com