

MESA Standards Alliance Energy Storage Communications Standardization and Testing and Certification Efforts

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ABSTRACT

The MESA Standards Alliance’s mission is to accelerate the interoperability of distributed energy resources by developing open and non-proprietary communication specifications.

The MESA-DER specification defines the mapping between the utility SCADA protocol IEEE Std 1815 (DNP3) to the IEC 61850-7-420 DER information model creating an interoperable profile of DER functions, monitored information, and control commands. MESA-DER was incorporated into the DNP3 Application Note AN2018-001. The MESA-DER specification also supports all the IEEE Std 1547 and CA Rule 21 DER functions and additional market-based DER functions to support safe, reliable, and efficient operations.

MESA, in partnership with PNNL, is developing a MESA-DER testing and certification program to improve interoperability, reduce integration costs, and ensure systems and components interact as expected.

Keywords: energy storage; communications; standards; testing and certification; DER integration; utility controls

1 MESA STANDARDS: OVERVIEW

The Modular Energy System Architecture (MESA) Standards Alliance [1] is an industry association of electric utilities and technology suppliers. MESA’s mission is to accelerate the interoperability of distributed energy resources, in particular utility-scale energy storage systems, through the development of open and non-proprietary communication specifications. MESA has developed and published two specifications: MESA-DER (formerly MESA-ESS) and MESA-Device/SunSpec Smart Storage.

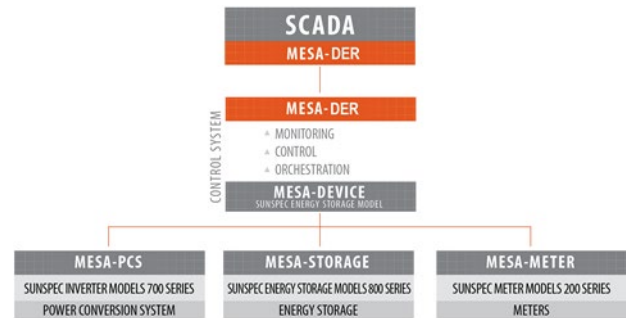


Figure 1: MESA Specifications

The MESA-DER specification defines the mapping between the commonly used utility SCADA protocol IEEE Std 1815 (DNP3) to the IEC 61850-7-420 DER information model, thus creating an interoperable profile of DER functions, monitored information, and control commands. This MESA-DER interoperable profile was incorporated into and is defined in the DNP3 Application Note AN2018-001. The MESA-DER specification also supports all the IEEE Std 1547 and CA Rule 21 DER functions as well as additional market-based DER functions to support safe, reliable, and efficient operations.

2 MESA-DER TESTING AND CERTIFICATION

MESA is partnering with the Pacific Northwest National Labs (PNNL) to develop a testing and certification program for the MESA-DER specification. MESA’s Testing and Certification Working Group, led by PNNL, is comprised of utilities, vendors, and other stakeholders with the goal of improving interoperability, reducing cost to integrate, and providing confidence that systems and components interact as expected.

2.1 MESA-DER Testing and Certification Program: Phase One

Phase One of MESA-DER Testing and Certification addresses DNP3 communication including the format and semantics¹ of the MESA-DER points as defined in the DNP Application Note AN2018-001. To that end, DNP3 (IEEE Std 1815) conformance testing will be required to validate basic point to point data transmission, as defined by the DNP Users Group. MESA is coordinating with the DNP Users Group in developing the MESA-DER testing and certification program.

In addition to points' format and input/output associations, Phase One testing will include scheduling, an essential function of the MESA-DER specification. Phase One will address the format and accurate data transmission from point to point, reading and writing via the scheduling mechanism, and role based access control are communicated correctly.

Functional testing (i.e., testing that the function performs as required, as opposed to testing the communication of the data to and from the function) may be part of Phase One but only as related to IEEE Std 1547 functional testing. MESA is coordinating with the IEEE vendor developing the test tools for IEEE Std 1547.1 and will require related UL 1741-SB certifications prior to or concurrently with MESA-DER testing and will coordinate to ensure these testing and certification programs interact seamlessly.

2.2 MESA-DER Testing and Certification Program: Phase Two

Times or Times Roman is the recommended typeface for the main text using 10-point type. The smallest allowed type size for all text, figures, captions, references and within figures is 10-points. See Table 1 for a complete summary of Font formats. Single (1.0) line spacing is recommended for the main text.

Additional testing beyond Phase One is needed to guarantee that performance expectations are met and Phase Two will focus on testing communication and functionality. For example, interoperability with equipment using points associated with IEC 61850-7-420, schedule implementation, input/output value accuracy and tolerance, and functionality such as ramp rate or state of charge are incredibly important to operation and longevity of equipment.

¹ “semantics” refers to the point such as AI537 (Analog Input), its association (System Meter Frequency), scaling, units (in Hz), data object type, and common data class

MESA will develop a set of requirements based on conformance to IEEE Std 1815.1 (the mapping of IEC 61850 CDCs to the DNP3 formats). This testing will include only those points and structures included in MESA-DER. Once those points and structures are determined, a Phase Two MESA-DER test procedure will be developed to verify conformance.

The functional tests should include ground truth metrology to confirm that input/output, voltage, current, real and reactive power and other such physical characteristics are within tolerance of those specified and communicated. Testing of this nature can be performed in a laboratory setting for software and small-scale hardware but will need to be in situ for the energy storage system components of any large scale.

Phase One testing that a schedule was sent and received correctly may not indicate that the schedule and associated functions were implemented correctly at the receiving device. Therefore, functional testing of the scheduling mechanism will also be an important part of Phase Two.

3 TESTING AND CERTIFICATION PROGRAM TIMING

MESA is currently developing the Phase one test tool and anticipates rolling out the program in mid-2022. Phase two will begin in the second half of 2022 and will be completed in early 2023 as funding allows.

REFERENCES

- [1] www.mesastandards.org