QualityLogic®

WHITEPAPER:
CA Rule 21 Communications Requirements and Certifications for Smart Inverters:

This whitepaper identifies the current, future, required and optional certifications relevant to implementing CA Rule 21 for Smart Inverter communications. Given the evolving nature of this effort, this whitepaper includes updates as of January, 2020.

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Note:

QualityLogic is contributing this Whitepaper to the DER integration efforts because of our role in the industry. Our mission is to accelerate interoperable communities by standardizing communications between grid operators and DER assets (both DR and DER), between aggregators and utilities, between aggregators and DER assets and even between DER assets and some form of transactive system. For more information on our contributions to the industry please visit https://www.qualitylogic.com/industries/smart-energy/.

Overview

California accounts for almost 40% of solar capacity installed in the US and close to 50% of all installations*. GTM Research forecasts that 60,000 new solar PV systems will be installed in 2020 and 100,000 or more per year after that as California's mandate for rooftop solar takes effect. California is clearly a compelling market.

Industry certification programs done well enable a more efficient implementation of interoperable DER products and management systems. There are several industry certifications required by CA Rule 21 and the CA utilities.

* http://www.energy.ca.gov/releases/2018_releases/2018-05-09_building_standards_adopted_nr.html

Smart Inverter Product and System Certifications

This whitepaper identifies the current, future, required and optional certifications relevant to implementing CA Rule 21 for Smart Inverter communications.

The certifications that this whitepaper focuses on are:

- UL 1741SA Certification, mandated in Rule 21 as of September 2017, to be supplanted by IEEE 1547.1-2020 Functional Certification when certification testing is available. UL will be updating UL 1741 to incorporate the IEEE update.
- SunSpec Common Smart Inverter Profile (CSIP), mandated in Rule 21 nine months after publication of the Test Procedures for the Program. Publication of the final version was June 22, 2018 and the effective date for mandated certification was initially set for August 22, 2019. Since then, the date has been postponed three more times and is currently June 22, 2020. We believe this will be the last postponement as the processes are in place and vendors are completing certification today.
- IEEE1547-2018 Interoperability Certification, effective once IEEE 1547.1 is completed and published, estimated Spring of 2020. The CPUC has instructed the IOUs to incorporate IEEE 1547.1/UL 1741 into CA Rule 21 after certification is available.
- CALSSA (California Solar & Storage Association) Testing

Key Point

QualityLogic is playing a major role in the IEEE-1547, IEEE 2030.5 and the SunSpec Common Smart Inverter Profile (CSIP).

Pathway, implemented July 11, 2019, creates a new mechanism to certify inverters for listing by the CEC starting June 22, 2020.[1]

- SIWG Phase 3 Functions certification requirements. The same order establishing the CALSSA Testing Pathway clarified the Phase 3 functions certification requirements.[2]

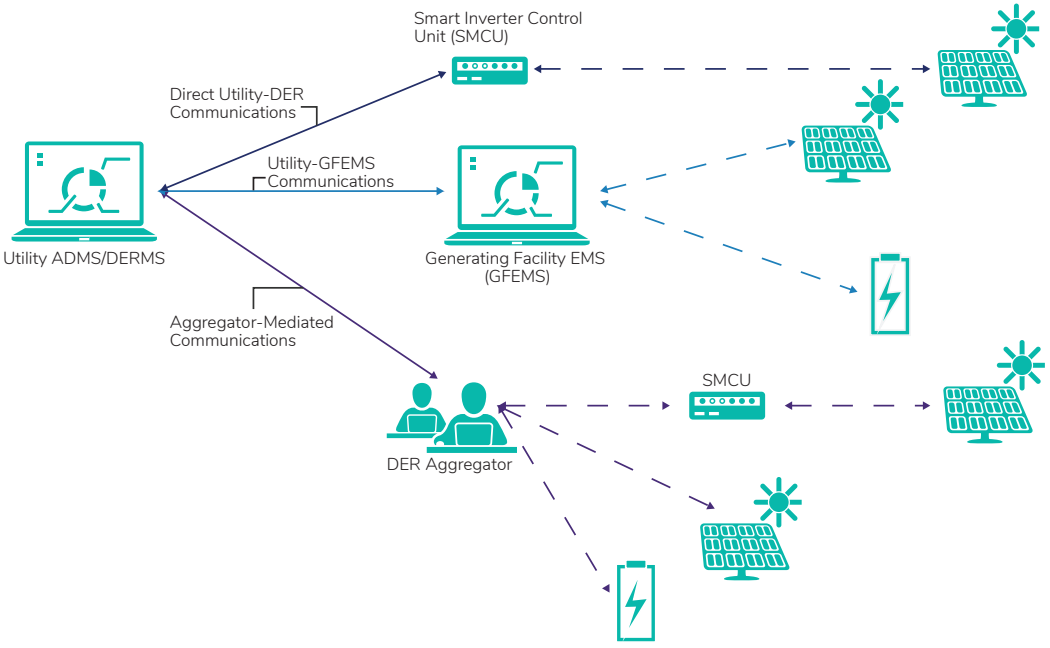
QualityLogic is or will be playing a major role in the test and certification of all of these certification requirements.

CA Rule 21 DER Communications Use Cases

Each of the certifications applies to some part or parts of the end-end management system for DERs as envisioned in CA Rule 21. Figure one shows the various components and the three use cases defined in the CA Rule 21 CSIP.

The California DER Communications model (the Common Smart Inverter Profile or CSIP) includes 3 primary use cases:

Figure One: CSIP Communications Use Cases



1. See CPUC Resolution E-5000, July 11, 2019, Appendix C.
2. See CPUC Resolution E-5000, July 11, 2019, Appendix D.

1. Direct-connected and managed DER resource

The actual DER interface is via a Smart Inverter Control Unit (SMCU) which is embedded in the inverter communications software or in an external gateway device. From a CA Rule 21 perspective, the requirement is that the SMCU be able to exchange IEEE 2030.5 messages. Whether the SMCU uses native IEEE 2030.5 messages or converts them to SunSpec Modbus[3], vendor proprietary or some other protocol to instruct the inverter behaviors (and return status and monitoring information) is out of scope for Rule 21.

2. Generating Facility Energy Management System (GFEMS)

Operationally, a GFEMS is treated as a "black box" with the specific DER assets hidden behind the IEEE 2030.5 interface with the utility. The assumption is that the GFEMS manages all of its DER (and DR) devices and the utility DER Management Systems (DERMS) have little or no visibility into what the DER assets are or how they behave. The utility looks to the GFEMS to provide the required behavior (VAR support, Frequency support, Ramping, Ride-throughs, etc) at the Point of Common Coupling between the building and the grid. The GFEMS must therefore be intelligent enough to interpret the required DER behaviors and program or instruct each of its DER assets to collectively provide the utility-required behavior.

3. Aggregator Mediated DER

In this communications model, the DER Management Systems (DERMS) has detailed knowledge of each DER that an Aggregator communicates

[3] SunSpec has developed and certifies a Modbus Information Model for smart inverters which is referred to as the "SunSpec Standard" or "SunSpec Modbus Information Model". This is not to be confused with SunSpec's IEEE 2030.5 Certification Program (the CSIP Certification).

with and manages. The Aggregator and Utility DERMS operate using groupings of DER assets (smart inverters in CA Rule 21) and the DERMS sends settings (Volt-VAR curves, Frequency-Watt Curves, Ramp rate, Ride-throughs, etc) to the Aggregator with instructions on which inverters or groups of inverters to pass the settings to. The Aggregator also collects monitoring, status and alarm information from each inverter and passes on to the DERMS, either as individual DER data or aggregated group data.

In CA Rule 21, the communication protocol between the Aggregator and the DER control system was out-of-scope until last July. An Aggregator is free to use proprietary or other standard communications – e.g., SunSpec Modbus, DNP3 – with its managed DERs as long as it can communicate to the utility the required information and is certified to the CSIP IEEE 2030.5 requirements. Of course, an Aggregator may also use IEEE 2030.5 if supported by the DERs it manages.

What has now been added to CA Rule 21 is a requirement that any inverter to be interconnected to the IOU grids must meet the minimum CALSSA Testing Pathway requirements. And, as noted, the CPUC has clarified the certification dates for the Phase 3 functions.

When using an Aggregator for DER management, the relevant certifications[4] are shown in Table One.

Table One: DER System Certification Requirements for CA Rule 21

Communications Interface/Functions	SunSpec CSIP IEEE 2030.5 Server	SunSpec CSIP IEEE 2030.5 Aggregator Client	SunSpec CSIP IEEE 2030.5 End-Device Client	IEEE 1547-2018	UL 1741SA / UL 1741-2020
Direct Utility to DER	√ (2020)		√ (2020)		
Utility to GFEMS	√ (2020)		√ (2020)		
Utility to Aggregator	√ (2020)	√ (2020)			
GFEMS to DER	CALSSA Testing Pathway (2020) ----------				
Aggregator to DER	CALSSA Testing Pathway (2020) ----------				
DER Communications (SunSpec, DNP3, IEEE 2030.5)				√ (2020/2021)	
DER Smart Functions Phase 1				√ (2020/2021)	√
DER Smart Functions Phase 3				√ (2020/2021)	(2020/2021)

Certification Requirements

The specific certifications required and anticipated for CA Rule 21 include:

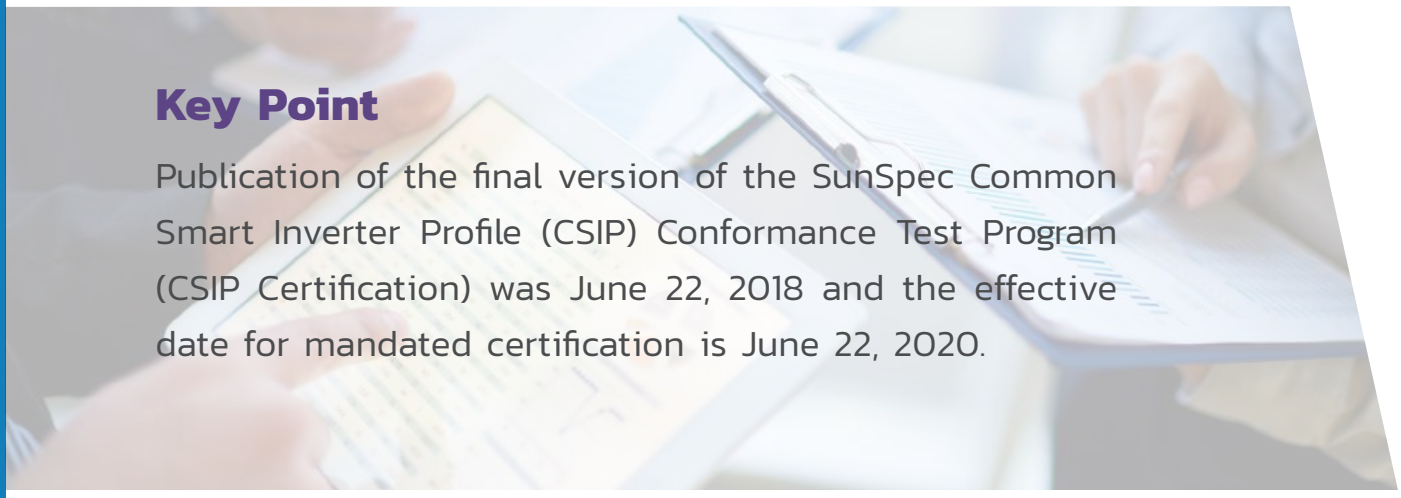
- IEEE 1547-2003, effective since 2003 and updated in 2014. Mandated by CA IOUs as a UL 1741 certification and to be supplanted by IEEE 1547-2018 and an updated UL 1741. Best guess is the new standard will be required in 2021.

[4] Note that in CA Rule 21 CSIP, Utility Servers are not required to be certified. It is up to the utility to require this. However, we strongly recommend Utility IEEE 2030.5 Server certification to advance interoperability in the larger eco-system.

- UL 1741SA Certification, mandated in Rule 21 as of September 2017, to be supplanted by IEEE 1547-2018 Functional Certification when it is available. The UL 1741 standard will be updated to incorporate IEEE 1547.1 in 2020.
- SunSpec Common Smart Inverter Profile (CSIP) Conformance Test Program (CSIP Certification), mandated in Rule 21 9 months after publication of the Test Procedures for the Program. Publication of the final version was June 22, 2018 and the effective date for mandated certification is now June 22, 2020.
- CALSSA Testing Pathway certification for inverters is now required for interconnection of any inverters not SunSpec CSIP certified after June 22, 2020.
- Phase 3 Functional certifications have varying dates for certification. Functions 5 and 6 are already required; Functions 1-3 and 8 are required by June 22, 2020 and Functions 4 and 7 will be required 12 months after the IEEE 1547.1-2020 is published.

UL 1741SA Certification

UL released its formal UL 1741SA Certification Test Specification in September of 2016. The CPUC mandated that all interconnected inverters be certified to the UL 1741SA standard as of September 2017. UL 1741SA covers Smart Inverter functionality as defined by CPUC Rulings adopting the Phase 1 and Phase 3 Smart Inverter Working Group (SIWG) Recommendations. UL 1741SA does not address communications to or from smart inverters.



Key Point

Publication of the final version of the SunSpec Common Smart Inverter Profile (CSIP) Conformance Test Program (CSIP Certification) was June 22, 2018 and the effective date for mandated certification is June 22, 2020.

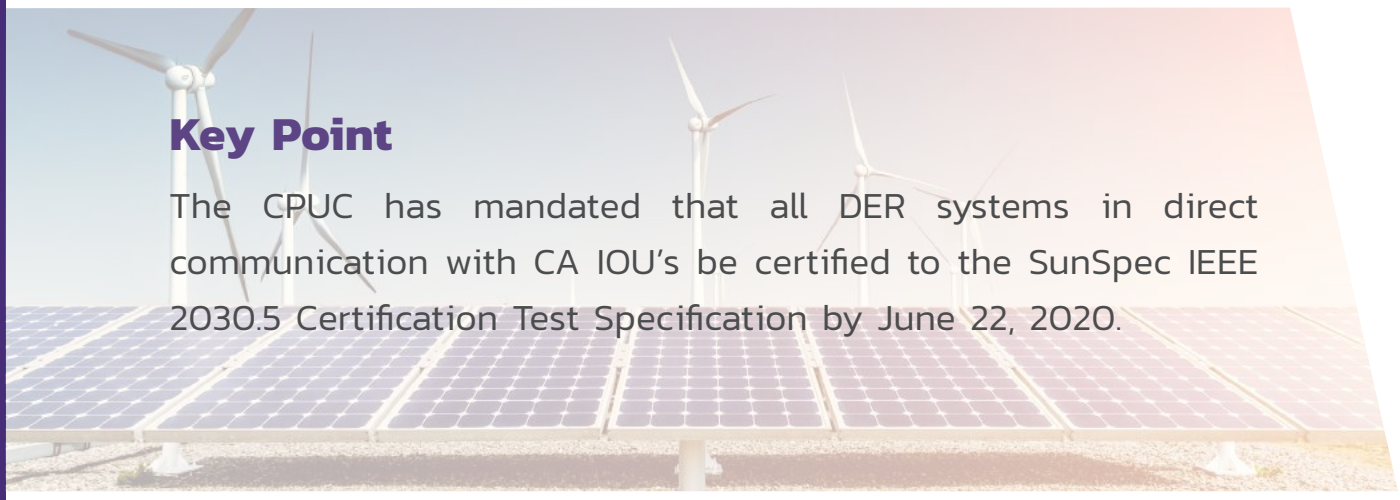
SunSpec Common Smart Inverter Profile (CSIP) Conformance Test Program (CSIP Certification)

The SunSpec Alliance is in the process of implementing an IEEE 2030.5 Certification Program that addresses all of the communications requirements in the CA Rule 21 CSIP document.

The CPUC has mandated that all DER systems in direct communication with CA IOU's (inverter control systems, GFEMS and Aggregators) be certified to the SunSpec IEEE 2030.5 Program by June 22, 2020. QualityLogic is a key contributor to this effort, developing a major portion of the test cases and updating its test tools to implement them. All of the active certifying test labs are using our tools to conduct the certification testing and submit results to SunSpec. The SunSpec Test procedures are based on the IEEE 2030.5-2018 update and CSIP V2.

The SunSpec Certification IEEE 2030.5 Program certifies the following:

- **IEEE 2030.5 Server** - There is one set of Server tests and any system that acts as a Server – e.g., the Utility Communications gateway, an Aggregator Server – is certified against these tests.
- **IEEE 2030.5 End-Device Client** - Whether an IEEE 2030.5 Client is embedded in an inverter's firmware, an external SMCU (essentially a Gateway device) or in a Generating Facility Energy Management System (GFEMS or Facility EMS), the IEEE 2030.5 requirements are the same and the certification testing is identical in each case.



Key Point

The CPUC has mandated that all DER systems in direct communication with CA IOU's be certified to the SunSpec IEEE 2030.5 Certification Test Specification by June 22, 2020.

- **IEEE 2030.5 Aggregator Client** - The Aggregator Client has some distinct features and functions that are not required in the End-Device Client. For instance, Aggregator Clients need to be aware of the group assignment of specific inverters while the End-Device Client does not need to know this information. The Aggregator certification is a separate certification for an IEEE 2030.5 Aggregator Client. Most of the tests are identical to the End-Device Client tests but with additional Aggregator Client unique tests.

The IEEE 2030.5 certifications in the SunSpec program validates the CSIP IEEE 2030.5 communications but does not validate the electrical performance of an inverter. The inverter functionality is validated by the UL 1741SA and, in the future, the IEEE 1547.1-2020/UL 1741-2020 certification testing[5].

SMCU devices may act as a gateway device that translates IEEE 2030.5 to another standard such as SunSpec or a proprietary protocol for communications with the end-device controls. The IEEE 2030.5 certification does not address the communications after the IEEE 2030.5 messages are translated nor whether such messages are correctly translated into a new protocol. Such certification is the subject of the recently added CALSSA Testing Pathway.

QualityLogic is a major contributor to the SunSpec Common Smart Inverter Profile (CSIP) Conformance Test Specification (CSIP Test Specification). Our IEEE 2030.5 Test Tools have been in use by the industry since 2011. The newest version implements the Test Cases defined by SunSpec and the

[5] It is likely that UL will update their UL 1741SA Test Specification to implement the new requirements in IEEE 1547-2018.

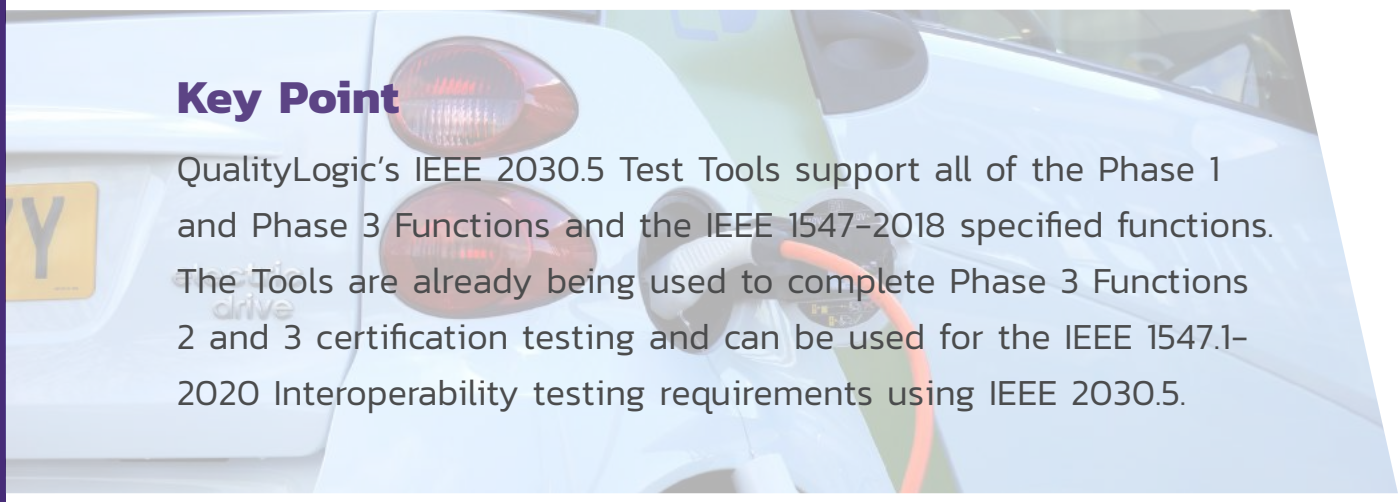
updated IEEE 2030.5-2018 Schema. The Test Tools are used by developers during the development process and by SunSpec approved test labs use the same QualityLogic Test Tools to execute certification tests.

IEEE 1547

IEEE 1547 specifies the details for safely interconnecting distributed energy resources – e.g., diesel generators, battery systems, solar PV, etc. – to the distribution grid. IEEE 1547-2003 has been mandated by the CA IOUs since 2003 and updated in 2014. An update was published in 2018, IEEE1547-2018, and will be adopted by the CA IOUs as a replacement for the IEEE-2014 update.

IEEE 1547.1 specifies the testing requirements to validate compliance with IEEE-1547. An update was published in 2020. UL has already updated UL 1741 with UL 1741 Supplement B (SB) to supplant the current UL 1741SA certification program. The smart inverter functionality testing described in the updated IEEE 1547.1 is very similar to the SIWG Phase 1 and 3 functions and all of the UL 1741SA test requirements. The SIWG is in the process of reconciling differences between its Phase 1 and 3 Smart Inverter Functions and the IEEE 1547-2018 functions and will adopt the IEEE 1547- 2018 Functions where differences occur. We expect the requirement for UL 1741 SB certification for CA to become effective by the end of 2021 if not sooner. The State of HI has already mandated UL 1741 SB compliance by mid-2021.

IEEE 1547-2018 requires a major new feature: demonstration of interoperable communications using one of three named protocols. The three protocols



Key Point

QualityLogic's IEEE 2030.5 Test Tools support all of the Phase 1 and Phase 3 Functions and the IEEE 1547-2018 specified functions. The Tools are already being used to complete Phase 3 Functions 2 and 3 certification testing and can be used for the IEEE 1547.1-2020 Interoperability testing requirements using IEEE 2030.5.

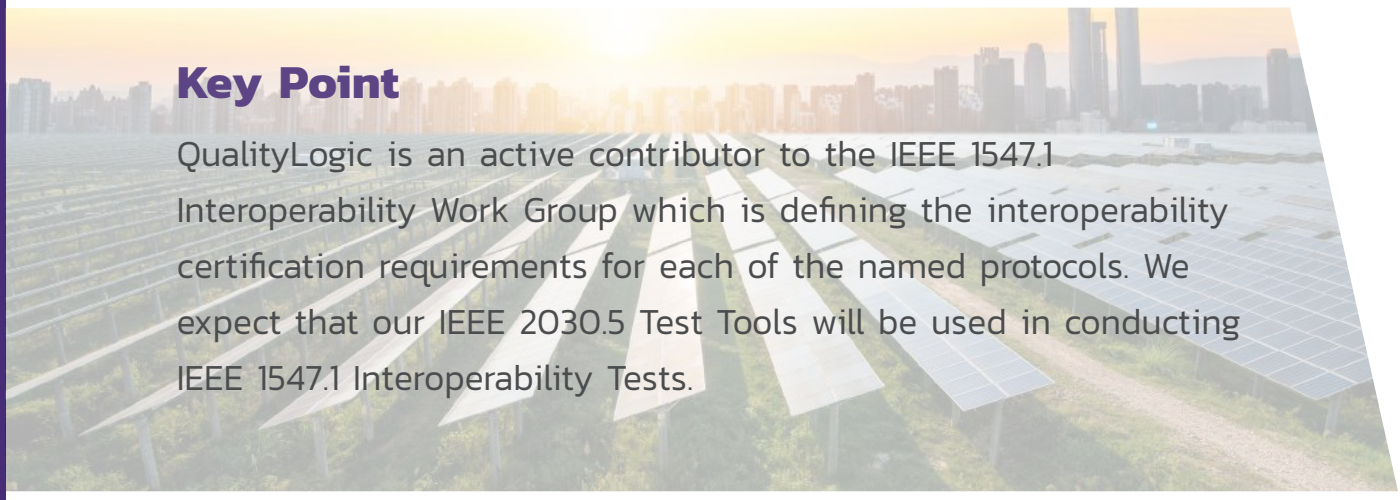
are SunSpec Modbus, IEEE 1815 (DNP3) and IEEE 2030.5. The SunSpec Modbus Technical Specification is focused on inverter control settings and is not likely to be used as a utility to SMCU or utility to aggregator communication protocol. DNP3 is designed for direct DER communications with utility controlled DER where SCADA or near real-time control is required. This will typically be larger scale wind, solar or battery DER installations in front of a customer meter.

IEEE 2030.5 is the protocol of choice for CA Rule 21 for communication to behind-the-meter DER resources and to aggregators of those resources. This fits very well with the communications model for CA Rule 21 and provides SMCU and inverter vendors with a second regulatory reason to ensure that DERs can support IEEE 2030.5 communications.

The New CALSSA Testing Pathway

One of the compromises in defining the CSIP requirements was that communication from an aggregator or building EMS to the DER was out-of-scope and therefore undefined. The CPUC is labeling these two entities as "gateways" even though that is not really a correct term. But we will use the "gateway" term in this discussion to mean these entities and any other system component that acts as the interface between the utility DERMS and the end-DER system.

The revised, final E-5000 order included a "testing pathway" for non-CSIP



Key Point

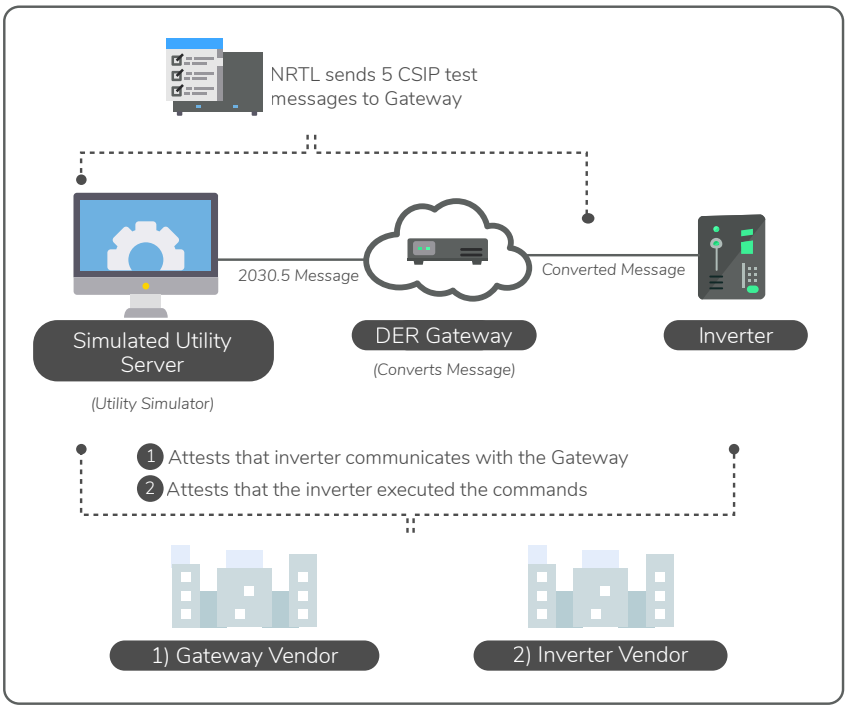
QualityLogic is an active contributor to the IEEE 1547.1 Interoperability Work Group which is defining the interoperability certification requirements for each of the named protocols. We expect that our IEEE 2030.5 Test Tools will be used in conducting IEEE 1547.1 Interoperability Tests.

inverters proposed by CALSSA. Essentially, the new testing pathway relies on:

"...type testing to allow inverter manufacturers to demonstrate that their products meet the Phase 2 communications requirements via Nationally Recognized Testing Lab (NRTL) testing only...the NRTL would test each model with each compatible gateway and then produce two types of reports: one test report stating that the gateway meets CSIP requirements and one letter that states which inverter models successfully connected to the gateway during testing."

The plan does not require the lab to verify that the inverter actually performed the required functions but allows the vendor to "attest" to conformance with the functional requirements. These non-CSIP inverters must tested and listed by the June 22, 2020 date in order to be sold and interconnected in CA after that date.

Since the E-5000 Order was published in July, 2019, there have been several clarifications that have allowed the testing and listing of these inverters to proceed.



QualityLogic's IEEE 2030.5 Client FTS is being used by vendors and test labs to simulate the Utility IEEE 2030.5 Server for the CALSSA Testing Pathway. For details see our CALSSA Testing Pathway Guide at https://www.qualitylogic.com/knowledge-center/content-library/application-guide-for-ca-rule-21-calssa-testing-pathway/

What are the implications of this new "testing pathway"? Our initial conclusions are:

1. For inverter vendors who have decided not to get a SunSpec CSIP IEEE 2030.5 certification, getting listed so that the CA IOUs can interconnect with your inverters should still be a priority. Teaming up with an aggregator or building EMS and going to a lab (either your partner's certification test lab or yours) and conducting the CALSSA test path would be the most efficient process.

2. For inverter vendors that have achieved SunSpec certification through an adapter device (protocol converter) or by implementing your own cloud-based DER control system for your inverters, no further action seems required.

3. For aggregators, EMS and DER Control system vendors (microgrid controllers or integrated with an EMS), you may want to consider offering to do the CALSSA testing with one or more of your inverter partners. If they are already integrated and support the Phase 1 and Phase 3 functions, the testing should be minimal (but still requires an NRTL).

4. For test labs, if you are already doing inverter and/or "gateway" certification testing, adding the CALSSA testing pathway should be straightforward.

Key Point

For all Aggregation, GFEMS, SMCU and direct utility connected inverters, the SunSpec CSIP Certification will be required in CA by August 22, 2019.

One concern with the program is what happens when there is actually a need to manage a specific end device? If an inverter is on the list because it demonstrated it can communicate with a specific gateway platform, it is not required to do so when interconnected. It could be one or two years before the IOUs are ready to communicate with these inverters. By then, not only has the firmware probably changed and not been re-tested, the chances that the same gateway platform would be the interface to the grid seems remote. We can envision some sort of IOU communications commissioning process to address this issue.

A second concern is that the CALSSA Testing Pathway does not really address end-end interoperability, performance and cyber-security. The testing is minimal and the certification relies on vendor attestations rather than independently validated results.

The adoption of the CALSSA testing pathway is definitely a step forward that provides a mechanism to determine which inverters can be interconnected with the CA IOUs. However, it clearly leaves a number of questions to be answered which will need to be addressed in the future.

Phase 3 Function Certification

As noted, CPUC Order E-5000 clarified the certification requirements of the Phase 3 smart inverter functions. Phase 3 Functional certifications have varying dates for certification. Functions 5 and 6 are already required;

Key Point

The 1547.1 communication certification can be thought of as addressing the missing link between a protocol certification process and validation of the actual behavior of the end-device inverter based on the exchanged messages.

Functions 1-3 and 8 are required by June 22, 2020 and Functions 4 and 7 will be required 12 months after the IEEE 1547.1-2020 is published.

Functions 1 (Monitor DER Data) and 8 (Scheduling Power Values and Modes) do not have any national testing standard at this point. Function 1 is included in IEEE 1547.1 while Function 8 is not. Both are required to be certified by vendor attestation by June 22, 2020.

Functions 2 and 3 are the most interesting. UL developed additional test specifications in the UL 1741SA to address these two functions and they were adopted by the CPUC. The major advance these two tests incorporate is the requirement for IEEE 2030.5 messages to be used to manage the inverter settings for the tests. Since the tests are defined and can be conducted by the test labs, 3rd party certification is required by June 22, 2020.

CA Rule 21 Implementation Status

As of this update, a number of vendor products have successfully completed the CSIP IEEE 2030.5 certification process using QualityLogic's test tools and at test labs using these tools[6]. Dozens of other vendors are in the process of completing and certifying their products. The CALSSA Testing Pathway and the new Phase 3 Functions 2 and 3 certification testing are underway. The CPUC and SIWG continues to refine the process and address new issues as they arise.

[6] See SunSpec Certified products at https://sunspec.org/2030-5-csip-certified-products/.

QualityLogic's Perspective

QualityLogic's Smart Grid mission is to enable and accelerate interoperable systems using open standards. The CA Rule 21 adoption of open communications and functional standards for Utility to DER communications is exactly the type of policy that we support. Our role is to provide test tools, training and support for development and certification of products designed to meet these requirements and to accelerate industry adoption of standards-based communications..

The CPUC Order adopting the Smart Inverter Working Group (SIWG) Phase 2 communications recommendations[7] included the statements:

- "All inverter-based DER systems shall be capable of communications"
- "Default Application Level protocol shall be the IEEE 2030.5" as "...defined in the Common Smart Inverter Profile of IEEE 2030.5 (CSIP)"

Any vendor of an SMCU, Aggregation system or GFEMS needs to be certified for IEEE 2030.5 to meet the CA Rule 21 requirements. And any inverter control system that will be directly-connected to the Utility DERMS must use, as a minimum, a certified SMCU if IEEE 2030.5 is not supported in the inverter firmware.

The addition of the CALSSA Testing Pathway improves the overall eco-system interoperability for the CA IOU DER management infrastructure but still leaves out critical aspects of a future "plug and play" eco-system.

[7] California Public Utilities Commission (CPUC) "Rulemaking 11-09-11. Agenda ID #14667, June 23, 2016", http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M163/K822/163822449.pdf.

Key Point

The reason CA Rule 21 is standardizing the inverter communications is to gain the benefits of deployment speed, lower costs and a larger vendor community that come with standardizing the communications protocol.

Enter IEEE 1547-2018

In California, if an inverter will only be behind an Aggregator or GFEMS, a very minimal certification is required. If it will be in direct communication with a Utility DERMS or ADMS, a CSIP certified SMCU or Inverter control system will be required. In no event does the CA Rule 21 CSIP or CALSSA SSA requirement include a 3rd-party certification of the correct inverter functionality that is specified in Phases 1 and 3 in conjunction with the communications requirements.

However, the new IEEE 1547-2018 standard will require an inverter to demonstrate interoperable communications using one of 3 protocols: SunSpec Modbus, DNP3 or IEEE 2030.5 whether utility communications are mediated by an Aggregator, GFEMS or any other intermediary system. In fact, where the messages come from is not a factor in the IEEE 1547-2018: only that they are correct and get to a local inverter control system or local external gateway device.

The specification of how such communications will be certified has been developed by an IEEE 1547 Work Group. The certification will be a combination of communications tests and validation of inverter functional programming: an end-end spot check to ensure that a utility can send instructions in a standard protocol to a 1547-2018 smart inverter and that the inverter will behave as required.

The Interoperability Certification in 1547.1 may recognize a SunSpec Modbus, DNP3 or IEEE 2030.5 protocol certification but will not duplicate

it. The 1547.1 communication certification can be thought of as addressing the missing link between a protocol certification process and validation of the actual behavior of the end-device inverter based on the exchanged messages.

IEEE 1547 itself only applies to the actual smart inverter systems and not to any upstream aggregation, GFEMS or DERMS communications. These are covered in CA by CSIP and CA Rule 21. But IEEE 1547 will require a certification for one of the three protocols for any smart inverter that will be interconnected in any utility that requires IEEE 1547 compliance.

Thus, even if an inverter control system or communications gateway has no requirement to be certified for CA Rule 21 communications (because it will be behind an aggregator), IEEE 1547.1 will require a certification for at least one standard communication protocol. If an inverter's control system is behind a local communications gateway (an SMCU), the IEEE 1547.1 certification will test that either a SunSpec Modbus, DNP3 or IEEE 2030.5 message to the SMCU is correctly interpreted in the inverter settings.

Bottom line for vendors selling to the CA smart inverter market: it is likely that the SunSpec CSIP IEEE 2030.5 will be a requirement. At the same time, support for SunSpec Modbus, DNP3 or IEEE 2030.5 will be mandated by IEEE 1547-2018. Inverter vendors would be wise to support natively or through an SMCU the IEEE 2030.5 protocol and address both requirements with one protocol implementation.

The Larger Interoperability Question

At QualityLogic, we believe that standardizing the communications protocol between systems leads to faster deployments, lower costs of integration and higher levels of interoperability. Standardization of the communications between systems – e.g., Utilities and Aggregators or Smart Inverters – frees significant resources otherwise devoted to developing and maintaining proprietary and custom communications interfaces. Those freed-up resources can instead be focused on product features and differentiators such as algorithms, speed, scalability, user-interface, security, etc.

Vendors who have invested significant resources in proprietary and custom communications interfaces, often because no standard exits, may feel that standardizing the communications reduces their value-added in the marketplace. This is understandable. Most inverter vendors and aggregators have developed their own communications protocols that are tuned to their systems and applications that are positioned as a competitive advantage.

But, the reason CA Rule 21 is standardizing the inverter communications is to gain the benefits of scale: deployment speed, lower costs and a larger vendor community that come with standardizing the communications protocol. The goal and benefit for all participants is a larger, more rapidly growing market for their products because of the lower costs and time for integration.

The confluence of CA Rule 21 CSIP and IEEE 1547-2018 creates a unique

opportunity and set of regulatory drivers that will benefit those purchasing and using smart inverter communications infrastructures and those vendors that aggressively adopt the emerging standards for communications. For instance:

- Inverter vendors that support all three protocols required by the 1547 standard will be more attractive to utilities, aggregators and others looking for faster, lower-cost integrations of new systems.
- Aggregators will be interested in inverters that use one of the standards as a way to reduce integration and maintenance costs.
- Utilities outside of CA will benefit from an emerging eco-system that supports standard communications: from the DERMS communications portal to the end-device inverters.

The Bottom Line

From our perspective, we see a virtuous cycle starting to happen:

- CA Rule 21 is mandating the use of IEEE 2030.5 for communications between utilities and aggregators, generating facility EMS and gateways or direct to inverters.
- IEEE 1547 is mandating support for one of three communications protocols including IEEE 2030.5.
- Vendors of DERMS, DER Aggregation systems or services, Generating

Facility DER management systems (GFEMS), gateways or Smart Inverter Control Units (SMCU) wanting to do business in CA will certify their products for SunSpec CSIP IEEE 2030.5 communications.

- The inverter vendors will also need a 1547.1-2020 certification for SunSpec, DNP3 and/or IEEE 2030.5. If they are already certifying for CA Rule 21, then it is an easy add-on to certify for IEEE 1547 interoperability using IEEE 2030.5.
- Utilities in the US and elsewhere that require IEEE 1547 compliance will have an ecosystem of inverter vendors that support SunSpec, DNP3 and/or IEEE 2030.5. Many will support IEEE 2030.5 because of the CA Rule 21 requirements.
- DERMS vendors and Aggregators will have access to a growing ecosystem of IEEE 2030.5 compliant products. They will also have access to a growing ecosystem of DNP3 and SunSpec IEEE 1547 interoperable certified products. This will make it easier to specify one of the standard protocols for their own communications to DER assets.
- Since the largest of the inverter, DERMS, aggregator and gateway vendors will comply with CA Rule 21 certification requirements, the world outside of CA and the US will also have access to a growing ecosystem of certified IEEE 2030.5 products that can be used in their own DER management solutions. This will make it easier for them to adopt the standards in use in the US instead of developing their own.

About QualityLogic

QualityLogic is a major contributor to the standardization of DER communications in California, North America and throughout the world. In addition to development and certification test tools, we offer training for IEEE 2030.5 development and pre-certification testing and consulting to vendors and utilities working to build a DER management communications infrastructure using the emerging communications standards.

The global imperative to implement renewable electric power is challenging the industry to accelerate the integration of solar PV, storage systems, EVs and demand management systems into electric grid operations. QualityLogic is at the forefront of making this happen. Our deep expertise in communications standardization and interoperability is being used to accelerate development and adoption of key standards (OpenADR and IEEE 2030.5) for the communications infrastructure that is essential for DER integration and coordination. Our efforts are now expanding beyond demand response and DER integration to include testing standards for interoperability between utilities and EVSE's, V1G and V2G applications, and microgrids.

For More Information

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