NM Interconnection Phase II, Advanced Inverter Working Group's Communications Subgroup

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Travis Dorr (SPS, Xcel Energy)
Jon Hawkins (PNM)
Jerry Delgado and Tracy VanSlyke (EPE)
Mike Ropp (Sandia National Labs)
Margie Tatro (Gridworks)

SUMMARY – ADVANCED INVERTER COMMUNICATIONS INTEROPERABILTY RULE PROPOSAL

The subgroup recognizes the need to move toward communications interoperability of DER resources and recommends a phased approach to doing so. Major issues include information and control systems capabilities as well as cyber security.

RULE PROPOSAL

- **All DERs shall include provisions for a local DER communications interface, per IEEE 1547™-2018.**

EXPLANATION: DER systems of any size are included in this communications interoperability requirement.
RATIONALE: taking advantage of the aggregated resources represented by DER systems will require them to be visible and interactive with the distribution system.

- **New Mexico allows any of the three IEEE 1547™-2018 eligible protocols to be employed by the electric service providers. Providers are allowed to implement any of the three in different parts of the distribution system, depending on the use case and infrastructure in place at a given location. Guidance regarding allowed protocols shall be documented in TIR documents.**

EXPLANATION: See Table 1
RATIONALE: It is expected that gateways or portals will be available to translate between the communications protocol used by the DER equipment and the electric service provider's communications network to which the DER will be connected, whereas the EPS's communication system has limited configurability.

QUESTION: WHEN IS THE PROTOCOL INTERFACE DETERMINATION MADE BY THE ELECTRIC SERVICE PROVIDER AND HOW IS IT COMMUNICATED TO POTENTIAL APPLICANTS? ONE IDEA…"Disclosure of the protocol(s) used by the DER for a specific interconnection should be included in the PRE-APPLICATION REPORT." Note: It appears that most current inverter manufacturers are using SunSpec Modbus, so if some other protocol is required, a gateway device would need to be added, by whom?

- **Interoperability capabilities of advanced inverters shall be tested according to IEEE 1547.1-2020.**

- **Communications interoperability is envisioned to occur in three phases:**

Phase 1 enables "monitoring" capabilities. (Note also that the autonomous functions and settings are addressed in other working group recommendations). NM utilities do not yet have visibility of DER resources and this first step is necessary before "control" capabilities can be implemented.

Phase 2 enables "control" capabilities in explicit pilot programs designed to identify best practices and develop solutions to challenges (e.g., cyber security). Note that cyber security (which was out of scope for IEEE 1547-2018) is a critical issue that is being worked at the national level. New Mexico needs to stay informed of

developments in this area. Two standard efforts worthy of tracking in this space are IEEE 1547.3 (Interoperability and Cyber Security, currently in balloting) and IEEE 1547.10 (Gateway standard, just forming a working group.)

Phase 3 enables full functionality of distributed resource - system interactions, takes advantage of the DER to support grid operations.

Table 1. Eligible protocols (Table 41 from IEEE 1547™-2018)

	Current uses include…	**Considerations**
IEEE Std 2030.5 (SEP2)	Many AMI and home energy mgt devices	Common web interface platform.
IEEE Std 1815 (DNP3)	Utility SCADA systems	Allows for granular level control, high speed communications. Must have the appropriate DER information content integrated to be IEEE 1547 compliant.
SunSpec Modbus	Many modern inverters	Submaps (content) added for specific applications.

Cyber security challenges are present regardless of the chosen protocol and must be addressed in partnership with the involved entities across the entire communications and control system.

Note that yet another protocol, IEC 61850 is also out there, but not included in the list of eligible protocols.

ANNEX OF SUPPORTING DETAILS

The below architecture from IEEE poses significant challenges in that the needs and requirements of a utility and an aggregator may be different. For example, the aggregator may favor open, fast, ubiquitous communications whereas the utility may be obligated to invoke higher levels of security while dealing with limited bandwidth.

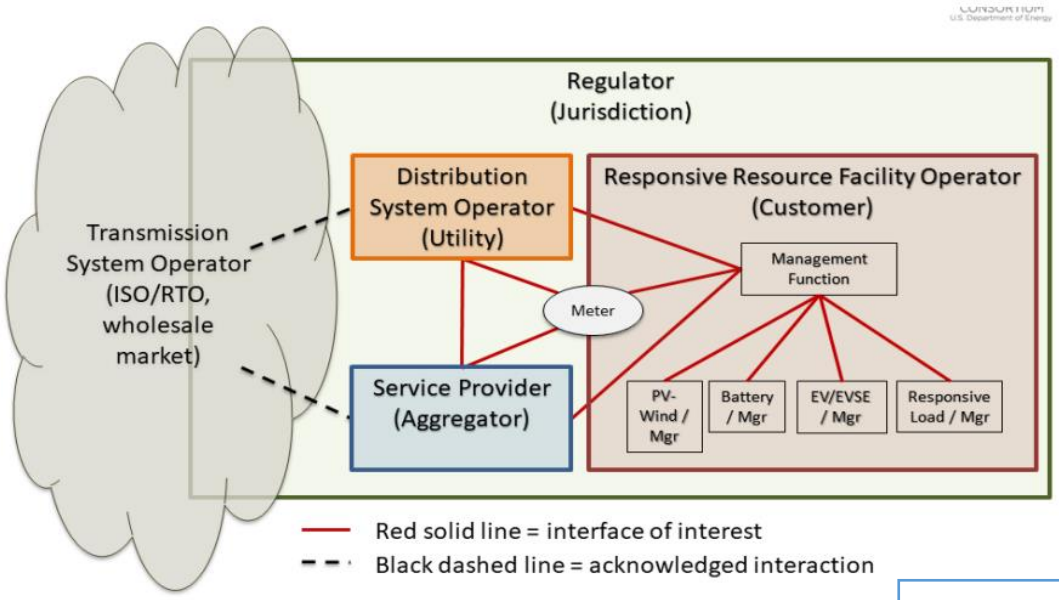

Figure 1—Interfaces of interest conceptual diagram

Source: IEEE SA, "Interoperability Maturity Roadmap IEEE Std 2030.5"

Input from IREC regarding decisions related to communications protocols is contained in the decision matrix, below elements are from July 07, 2022, document.

Mid Term Decisions

Communication protocols & ports	Consider specifying protocols and ports if known and of interest to utilities.	**DO 14-1**: Specify protocols and ports to be used at the DER interface.	☐
		DO 14-2: Do not specify protocols and ports at the DER interface.	☐

Long Term Decisions

DER communications/ control roadmap	Identify goals and strategies for deploying IEEE 1547 standardized communications/control of DER over time. Consider timeline for utilization of monitoring data, changes to autonomous function settings, scheduled function changes, and continuous direct control. Consider deployment for larger systems versus numerous small systems, and utility communications infrastructure versus DER aggregator model. Will communications infrastructure, DER equipment requirements and protocols be harmonized to any degree amongst utilities? How can investments in ADMS, DERMS or AMI be optimized to meet various goals? Consider linkage to grid modernization discussions.	**DO 22-1:** Establish a formal roadmap development process to take into account Commission's, stakeholders' and utilities' DER management goals.	☐
		DO 22-2: Allow individual utilities to determine needed communications investments based on internal DER management goals without external direction.	☐
		DO 22-3: Avoid directive management of communications deployment.	☐
Communications deployment	DER communications deployment is still nascent and best practices for interconnection rules and technical requirements are still in development. The decision option list at right is a list of potential actions to consider, but is not intended to be exhaustive. Consider the need to change the interconnection rule's "telemetry," "SCADA," or "monitoring" DER size threshold. What requirements apply to the DER site/equipment? What actions need to be taken to adopt a DER aggregator model?	**DO 23a:** If not done previously, specify protocols and ports to be used at the DER interface or aggregator.	☐
		DO 23b: Define equipment requirements for DER or aggregator.	☐
		DO 23c: Create or reference guide for utilization of communications protocol (e.g., California Common Smart Inverter Profile).	☐
		DO 23d: Update "telemetry" requirements to change size threshold.	☐
		DO 23e: Update "telemetry" and/or other communication requirements to reference IEEE 1547 communications requirements.	☐
		DO 23f: Include certification/validation requirements for communications equipment (e.g., California Common Smart Inverter Profile).	☐
		DO 23g: Define standard aggregator requirements and agreements.	☐
Interconnection agreement updates for communications/ control	As DER communications becomes deployed more widely, standard interconnection agreements should reflect such utilization. Control of the reactive power, volt-watt, limit maximum active power, permit service and other functions can affect energy production/delivery and have financial repercussions on the affected DER. It should be understood and agreed as to how these functions will be used. These aspects should be memorialized in the interconnection agreement. A standardized agreement can be developed to help establish expectations and limits while streamlining the interconnection process.	**DO 24a-1:** Develop standard interconnection agreements language to define whether a communications pathway is required and of which type it will be (e.g., utility direct to inverter, utility direct to gateway, or aggregator participation).	☐
		DO 24a-2: Establish communication requirements within each individual interconnection agreement.	☐
		DO 24b-1: Define expectations for control in the standard interconnection agreement (e.g., when and how long will the DER be curtailed or controlled and over what range of adjustment for specific parameters).	☐
		DO 24b-2: Establish expectations for control within each individual interconnection agreement.	☐

From IEEE 1547-2018™

Table 41—List of eligible protocols

Protocol	Transport	Physical layer
IEEE Std 2030.5 (SEP2)	TCP/IP	Ethernet
IEEE Std 1815 (DNP3)	TCP/IP	Ethernet
SunSpec Modbus	TCP/IP	Ethernet
	N/A	RS-485

Physical port: IEEE 1547-2018 ™ standardizes the use of an Ethernet port with TCP/IP transport layer for any of the three protocols, with an option for an RS-485 port for SunSpec Modbus.

Table 42—Communication performance requirements for DER interfaces

Parameter	Requirement	Description
Availability of communication	When DER is operational	The *local DER communication interface* shall be active and responsive whenever the DER is operating and in a *continuous operation region* or *mandatory operation region*.
Information read response time	≤ 30 s	The maximum amount of time to respond to read requests.

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Insert (simplified) summary of the three protocols as presented by Bob Fox of the SunSpec Alliance.