QualityLogic

# Webinar Q&A

## Confused About V2G Standardization?

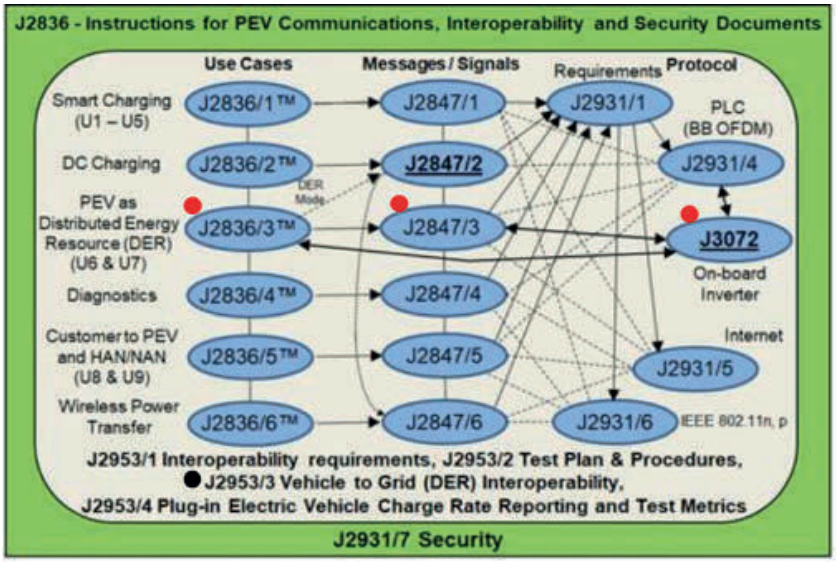
**On May 4, 2023, QualityLogic held a webinar to provide the latest updates on V2G. These are answers to the questions that came up during the presentation. *The information and opinions expressed in the webinar and Q&A are QualityLogic's best understanding of the topic. We do not represent any other organization in this discussion. We welcome clarifying questions and corrections where our information is not accurate. Please send comments to info@qualitylogic.com***

### 1. Does anybody know which document or standards first defined the acronym V1G?

We'd have to do some research on it. I don't have a good answer for that. A Wikipedia article on V2G has some mention of V1G. Initial use of the term is likely in one of the referenced documents.

### 2. What SAE standards complement the utility standards you discussed?

J3072 is the key one. There's also J3068. There's a whole series of about 15 standards around automotive EV use cases and interactions with grids and with homes and other things so it's a very well-developed area within SAE as the interconnection stuff. So J3072 is the key one for VD\2G AC. And then there's the 2847 series, which is dealing with V2G DC. The graphic shows the relevant SAE V2G standards. J2836 can be downloaded at J2836_201807: Instructions for Using Plug-In Electric Vehicle (PEV) Communications, Interoperability and Security Documents - SAE International



### 3. You mentioned that SAE J3072 requiring IEEE 1547 conformance in onboard grid support inverters, and shortly after that "ANY EXPORT to the grid requires IEEE 1547 compliance". I would like to understand which state or federal legislation mandates the use of SAE J3072 and/or IEEE 1547 and/or potentially other protocols.

So today, there's no state that mandates the J3072. There is federal legislation that was passed in 2005 that mandates the use of IEEE 1547 and its subsequent updates for any DER interconnection. All the states implement some form of IEEE 1547 requirement. Now, it's up to them how much of it they want to do, they've got some leeway. But most states basically ask for a UL 1741 certified inverter. UL 1741 is the UL safety standard that validates conformance to IEEE 1547 among other tests. We actually have a map that shows which states are mandating the UL 1741 SB. No one has so far mandated SAE J3072. California is likely to be the first one to do so as soon as UL 1741 SC is available and EV makers can provide certified J3072 EVs.

### 4. Can you speak to distribution utility preparation and some of the work you're aware of that's being done to address this challenge?

Most utilities that we run into, in the context of an EV conference or other venue, are interested in understanding this area. The starting point for the utility is to figure out how to support the charging infrastructure. That's a big job in itself. But there are utilities such as the California IOUs that are already way down the road on doing demonstration projects and pilots to understand how to take advantage of vehicles as DER V2G assets. There are other utilities around the country looking at it and a number of that have done pilots and demonstration projects for V2G. There's actually a really interesting map that Fermata did with Verizon that shows where there are pilot projects for V2G, and the amount of money that's actually been generated for the vehicle owners. A short Fermata Energy video includes the map of actual V2G revenue projects. See J2836_201807: Instructions for Using Plug-In Electric Vehicle (PEV) Communications, Interoperability and Security Documents - SAE International.

### 5. What are current auto OEM concerns about battery life/warranty impact if V2G used on daily basis?

I can't speak in detail to that, but I do know that the auto manufacturers have certainly come around seriously to embrace the idea of their vehicles as battery resources for consumers and the grid. Just look at the Ford F150 Lightning that's been popular. It has demonstrated to the EV industry that consumers like the idea of battery backup. You've got to have basically the same electronics, as you do for V2G to do home backup. You've got some of the same duty cycles. But this is not an issue we've dug into yet.

### 6. Are the OEM companies like Tesla, et cetera, cooperating or trying to push back on the standards compliance?

Tesla does participate in the standards organizations, so they know what's going on. And they have by far the best charging network, the most reliable, interoperable charging network around. In Europe, they've been required to support 15118 – CCS basically. They are starting to open up their network on a limited basis to other vehicles to take advantage of the network. Other car makers are very involved in the standards. But in large organizations, you're always going to have a group of people that are believers and want to do the standards and they're all paid for and authorized by the companies. But you also have other parts of the company that want to make sure they maintain their proprietary edge. So, it's a mixed bag.

### 7. If a future ISO 15118 edition were to include all information (e.g., grid codes) needed for the onboard inverter to act as a DER, would any other protocol (e.g., IEEE 2030.5 or J3072) be needed between the EVSE and the EV in parallel to ISO 15118?

In theory, the answer's no. We'll just see how fast ISO gets there. The issue is what happens in the interim. So, if we go down the road, and we start implementing a lot of stuff with 2030.5 and 15118-20 in parallel, then you've got an infrastructure and an investment already in place in both standards. Once it's there, it's hard to change.

However, even if ISO 15118 supports all the grid code requirements, it still will require translation from an

upstream protocol like IEEE 2030.5 or OCPP (if they support 1547 also). Every time you translate between protocols, you increase risks of interoperability and cybersecurity issues.

### 8. Of everything presented here, is this just for light duty cars/trucks, or is all basically the same up to class A trucks?

If you think about fleets that sit in depots overnight — bus fleets, dump trucks, delivery vehicles that aren't used 24/7 — then all of this applies very well to them. In fact, they're great candidates for V2G. The Class A trucks only d make money when they're on the road moving freight or commodities. Charging is something they want to do as fast as possible. They're not really very good candidates for V2G.

### 9. Which (state/federal) legislation mandates that the EV (i.e., the onboard inverter) be certified in order to act as a DER? This could lead to the necessity to acquire a high number of certificates for a particular EV, if this EV is developed for the "world market"! I assume this certification was established with stationary (e.g., solar) inverters in mind – for which it makes perfect sense. However, for a vehicle, that could connect to many different grids, this would be an overkill.

There's federal legislation that any DER has to be 1547 compliant, and each state decides which version of 1547 they're compliant to. So, states are moving to the latest version, which is 2018. So that is the primary focus. It doesn't say where the inverter would be. It's more a question of how many PKI's utilities implement or the OEMs themselves implement for the security infrastructure. But this is not a unique problem in the technology realm, so we believe it is quite manageable.

### 10. Can you talk about the powerline carrier use with 15118? How much of an issue is this?

For those who know it, this is nothing new. It's a really noisy communication channel in the J1772 or CCS cable. One of the things that 15118 had to do in order to use this powerline carrier channel was to put something in place called SLAC which is a way of insuring the EV/EVSE communications. If you pull up to a bank of four charging station and plug in one of them, your vehicle will think it's talking to all four of them because the PLC is so noisy. The EV and EVSE have to go through a protocol handshake to actually determine which EVSE it's actually talking to. There are other issues also. We've talked to people who wish that we didn't have that as the primary communications channel, but it is what we have and what we are standardizing on. ISO 15118 also has defined a wireless communications method using Wi-Fi, but it does not seem to be in use as yet.

### 11. If the inverter for DC V2G is off-board, what type of telematics would occur between the EV and the Utility? Can the EV still be considered a DER if the inverter if offboard?

The EV is not considered a DER unless the inverter is on-board. It would be the actual charging station that's considered the DER, and the EV is just a battery that is connected to it. Because have to have bi-directional power flows, the telematics may be part of the overall system to enable a vehicle to discharge power back to the charging station. From a utility standpoint, it is considered part of the DER, but not the DER itself.

### 12. If the EV/EVSE is exporting in response to pricing (rather than utility dispatch), is there still a comms requirement w/the grid/utility other than with the CNO?

First of all, there's a requirement of moving the pricing if it is location specific although a CNO could manage the EVSE's without communicating price to them. If EVSE's as DERs are responding to pricing, they still have to be programmed locally with the IEEE 1547 settings. And they still have to be monitored in terms of their actual responses to grid fluctuations. So, communications are definitely required whether pricing is a trigger for export of power or not.

**13. If I'm not mistaken, almost all standards/specifications you mentioned are communications standards/ specifications. I have been working on IEC 61851-23 and SAE J1772 for more than a decade.**

**Both these standards specify in detail requirements for controlling voltage/ current/power for DC charging – but not yet for bidirectional DC charging. In my perception, many experts seem to forget that bidirectional charging, in particular bidirectional DC charging, does not only need communications standards/ specifications, but also standards/ specifications specifying the "energy transfer" in detail.**

**What is your take on this?**

Most definitely in agreement.

**14. Does UK have any standardization on V2G?**

Not that we are aware of, but we have not been involved in UK V2G so far. If they follow the EU standards, then they may get V2G standardization that way. It is very possible the British Standards Institute is or will address this topic. A quick look at the BSI site suggests they are following the ISO 15118 roadmap for EV communications.

**15. Isn't it more valuable having bigger battery capacities for V2G use cases? if yes then trucks must be more important for V2G use cases.**

See above answers. Battery capacity is a major factor but probably less so than the duty cycles of the vehicles. The longer vehicles remain connected to charging stations and the less they are actually used, the more valuable they can be (potentially) as DERs. School buses are a favorite target for V2G and have an ideal profile for this application. But other kinds of fleets are also good candidates as is a growing residential charging infrastructure with EVs that are used like regular passenger vehicles – e.g., lots of stationary time in general.

**16. EVs using CHAdeMO connectors have been doing bidirectional charging for many years, whereas CCS connectors require custom implementations for V2X. There are many examples of CHAdeMO solutions successfully providing V2X services today. Why the push toward standardization around V2G-AC/CCS when CHAdeMO is a readily available, successful option for bidirectional charging, while CCS still has some reliability issues that need to be worked out? Why not a technology neutral approach?**

Agree with your assessment. But for whatever reason, the ISO and OCPP standards are being mandated in the US and this is not a decision that we at QualityLogic were involved with. Our focus is on working to make the chosen charging infrastructure support V2G in one way or another.