

August 7, 2017 IN-PERSON MEETING NOTES

Summary

- Attendance: approximately 25 attendees in person and 19 on Webex
- Presentations and notes available online: <http://www.cpuc.ca.gov/vgi/>
- Presenter 1: Justin Regnier, CEC, Facilitator
 - Reviewed previous meeting.
- Presenter 2: Stephanie Palmer, ARB - Requirements Subgroup
 - Reviewed categorization of communication requirements (functional, non-functional) used to extract requirements. Requirements were normalized for consistency in reference to identification of actors.
 - The requirements extraction group sorted use cases into 7 categories: pricing, demand mitigation, load control, DC, V2G, Inverter control, & customer programs.
 - Presentation details the 7 use cases' 1) requirements, 2) alternative requirements, and 3) other requirements. (Note that these represent a distillation of 70+ initial use cases.)
 - Next steps:
 - Participants will overlay the implementation of a use case atop the framework of actors.
 - Subgroup will review final use cases and remove duplicate requirements.
 - Participants of the requirements sub-working group will review extracted requirements for thoroughness.
 - Requirements will be passed to mapping sub-working group after they are fully vetted.
- Presenter 3: Noel Crisostomo, CEC - Mapping Costs and Benefits of Smart Charging
 - Overviewed NREL economic value assessment, which found net benefits of PEVs and cost reductions from smart charging
 - Detailed lifecycle management process used to integrate hardware and software into a smart charging product, highlighting potential points of incremental cost and the need to understand where investments are needed.
 - Identified relevant stakeholders in smart charging per the workplan and listed categories of costs and benefits. Noted the need to have data contribute to ZEV Action Plan goals, and examine the question of costs and benefits, opportunity cost, and risk. Emphasized need for collaboration among industry actors to reduce costs and enable investment.
 - Proposed a framework on responding to deliverable 2, to identify costs and benefits as examined through the implementation of a protocol (or alternative).
 - Agencies requested feedback to help determine the process for answering the Deliverable 2 questions.
- Presenter 4: Alec Brooks, EMotorWerks – Aggregator perspective on Value
 - Developed its own communications protocol between EVSE and JuiceNet Cloud.
 - Implementing ISO 15118 based on “customer demand”, but there are shortcomings – some of which will be resolved in subsequent versions of the standard.
 - The EMW Juicenet platform allows customers to input preferences and increase RE use.
 - Policies should resolve barriers to aggregation.
- Presenter 5: Oleg Logvinov, IoTecha – EVSE Manufacturer’s perspective on Value
 - Customer interest should be key.
 - Standard is a first step, but not sufficient.

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- Provided quantitative cost estimates of implementing different types of charging equipment including those non-networked, networked, and certified to standards.
- Highlighted potential equipment design that incorporated multiple protocols (ISO 15118, SEP 2.0, OCPP, etc).
- Presenter 6: Judy Brunson, Daimler – Automaker’s perspective on Value
 - Identified costs associated with implementing a smart controller onboard the vehicle, detailing relative investments needed by OEMs and suppliers to equip vehicles and equipment for DC, AC & DC, and AC-Only controls with CCS.
 - Highlighted imperative for customers’ experience to be simple and reliable to improve potential for adoption.
 - Requested potential CEC grants for reducing manufacturers’ development costs for designing charging equipment with the ISO 15118 standards.
- Presenter 7: Jeremy Whaling, Honda – Automaker’s perspective on Value
 - Stated that standards (ISO 15118 and SEP 2.0b) were not silver bullets for VGI, identifying barriers to aggregation, installation of workplace charging, and the values of renewables integration and demand charge reduction.
 - EV-EVSE communications protocols make sense in some situations, but in others they don’t help or can hurt.
 - Should focus on getting as many vehicles on the road as possible.
- Presenter 8: Justin Regnier, CEC/Facilitator
 - Reviewed workplan Deliverable 1. Focused on part 3, which will culminate with the identification of the existing protocols that will map to the use case requirements.
 - This mapping analysis will not be specific to any one use case, and relevant experts to each of the seven communications protocols were identified (noted below).
 - The State Agencies proposed that the Mapping Sub-Working Group should focus on the version of the protocols that are currently approved, but asked for feedback on whether there was also a way to consider the functionality that a future version of the protocol is likely to enable.
 - Overviewed Draft of Deliverable 1.

Action Items & Next Steps

- The next full Working Group meeting is a Webex on Monday, August 21.
- For Deliverable 1 sub-working group 3, protocol experts were identified to lead the assessment of how a protocol meets the requirements.
- Inaccuracies in presentations were identified
- Agencies will create a process for Deliverable 2

Resources

- Email the state agencies (CPUC, CEC, ARB, CAISO, GO-Biz) with any questions or comments: vgiworkinggroup@cpuc.ca.gov
- Access the Use Case Sub-Working Group documents, including requirements template, on Google drive: https://drive.google.com/drive/folders/0B4_ZRQzLAsLNxRYcjRka2FwUjg?usp=sharing
- Access the Definitions Sub-Working Group documents on Google drive: https://drive.google.com/open?id=0B4_ZRQzLAsLNdV9Fc0doVHZPZEU

Detailed Comments

- Questions on Requirements/Stephanie Palmer
 - Josh McDonald: How were they extracted?
 - Stephanie: Normalized the terms, placed them on the list. None were deleted at the moment. Now the group will check for duplicates.
 - Abigail Tinker: how would we consider multiple use cases at a single site? How would use cases conflict?
 - Stephanie: The requirements are meant to be individual. The group is not taking into account that many use cases can be done on the same site. After going through all the requirements there are many that repeat in the use cases.
 - Oleg Logvinov: valuable picture – look at how they overlap and the interaction. Important to understand how domains interact on the same platform. We’ve been discussing the fact that the car is not a battery or inverter. Cannot be considered a usual device – consumer has control over decision-making. Don’t want to remove customer. Customer must be central. If we look at PFE to PFE, but consumer demands, orchestration of multiple actors. Present from consumer point of view (rather than opposite). See synergies between actors and domains.
 - Hugh McDermott: communications is preferred but not mandatory?
 - Mike Bourton: BMS and device communications must be secured. Between PFE and another actor, happen over the internet.
- Questions for Costs and Benefits of Smart Charging/Noel Crisostomo
 - Mike Bourton: Need to define process steps to reduce workload.
 - Adam: Don’t directly identify costs and benefits, since they are difficult to calculate. Should implement to understand benefits. CPUC should establish a revenue source independent of benefits, test certain use cases and roughly quantify benefits.
 - Jeremy: OEMs can’t provide costs. Numbers will be different. Determine differentiation points whether or not the PEV uses CCS or is a PHEV.
 - Oleg: Simplify – for sustainable enterprise, at steady state C/B is ok. But early on, we can’t estimate the costs and benefits. We like it. If we don’t like it, we need to look at CBA from the perspective of someone who will buy the car because the costs are available. What will make the user experience positive? How to make it trickle down. Create positive experience. How to compose the device.
 - Noel: Lead benefit for user is “delightful customer experiences”
 - Mike Ferry: Focus on customer experience. Supports the process. Logical, necessary, fills the need.
 - Dean Taylor (SCE): For both mapping in Deliverable 1 and for c/b in deliverable 2, does it make sense to look at the market by segment: homes, fleets AC, fleets DC, workplace, public DC, and public AC? Are some communications pathways / standards only useful in a few charging market segments?
- Alec Brooks:
 - 100% Networked with revenue grade metering. On parity or lower with 40 A stations. Developed communications between EVSE and cloud with few second latency controls.

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- Not waiting to implement standards for someone to tell us what to do– Submetering Protocol, Rule 24/32, JuiceNetgreen, solar absorption
- OpenADR 2.0b, aggregations, interval submeter billing, charging controls -user OR JuiceNet defined.
- eMotorWerks is implementing ISO 15118 to meet market demand, will implement other standards, too.
 - Cost is not large, it involves an additional circuit board and back-end deployment, but doing so must provide something to the end user.
 - Some limitations could be mitigated by the newer version of 15118, currently in development
 - Amount of energy required by when. SOC – will be included in future
 - Different paradigm with long range cars.
 - Optionality based on price elasticity, renewables integration, lost information.
 - Frustrating with the Bolt: low Wholesale price. Utility tariff doesn't have utility tariff. JuiceNet API programmed when negative. Changes target price. Could go a couple of days – no way to monetize yet.
 - Must know more information – fill in blanks with telematics.
 - Existing vehicles don't have 15118 – not sufficient on its own. Find use cases for market pull. All current have telematics could provide together.
 - Not focus on 1 at this point.
 - There are customers that are procuring charging stations. Have an active program. Implementing for customers. Extra hardware could also do SEP 2.0.
- Oleg/Justin: Alec should revise presentation to clarify what is in the current version of 15118 and what may be added in the future.
- Barry: Additional costs are accrued in the station under a retrofit case, but how could it be reduced in a new-build solutions? ISO 15118 can send energy information metadata, i.e. "I don't need to charge now, but there's free energy."
 - Alec: But you don't have information yet, will need to be fixed.
 - Barry: 2nd version released in 2018 and would simply require a software update supporting it.
- Noel: What was "additional" in the EVSE? Was another circuit board required?
 - Alec: eMotorWerks' EVSE already had an IC, so it encoded the standard onto it.
- Oleg Logvinov:
 - ISO 15118 & SEP 2 are based on the Home Plug Green PHY Power Line Communication.
 - Build a charger with knowledge of every bit and byte running along the cable.
 - EVSE is the nexus of multiple domains. Has to develop system as developers/designers – grid, car, home.
 - Diverse use cases reflect the different demands. What makes sense to put in the charger?
 - What enables adoption? The consumer's interest. Enables us to do what we want to do.
 - Multi-vendor support- must compete for our attention, needed for a growing vibrant market.
 - Multi-vendor interoperability. Market reached a point where organizations building fences stopped. Economy of scale through interoperability.
 - Affordable solutions cost – coordinate, competitor, cost-reduction.
 - Protocols. Disconnect feature sets today. WHAT ENABLES ALL OF THIS?

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- Is there support of multiple vendors that are willing to get together, invest time and resources for interoperability? Standard is the first, fundamental. Necessary but not sufficient. Next step is more difficult – build interoperability across standards. Multi-vendor interoperability gives 15118 the edge. “Speed-dating” between EV & EVSE.
 - Interoperability tests – all vendors were plugging in with each other, multiple geographies.
 - Even if you created a new standard, they would need to go through process.
 - PlugNCharge – don’t worry, it’ll just work.
- The cost for a smart charger
 - Wifi - \$3
 - Software is unique
 - Cloud
 - Cell modem - \$17
 - Software for SEP 2 to talk to meter
 - Components
 - STMicro 2100 = MCU and communications = 2\$ for filtering – a coupling component insulates DC
 - Qualcomm = 5\$
 - Software
 - Software – EPRI’s implementation of SEP 2.0 Open source –Oleg will correct slide
- Conclusion
 - Interoperability takes a long time. Design cycle -5 years for production vehicle. Must be the most common denominator.
 - Charger becomes a convenient, multi-lingual device. Orchestrate multiple components.
 - What if I’m getting tariff information from the meter
 - Using Juicenet
 - SOC from the car? How to benefit??
 - What’s the common denominator, using simplest path forward – 15118 in any permutation possible.
 - Proposed 15118 as the car and charger standard, then everything from the charger outward could work with more than one way of communications.
- Dean Taylor: What about the annual back office fees?
 - Having a standard for communication between EVSE and EVSP and the back office can give the power of predictive maintenance and actually reduce costs and increase learning. A lot of smart devices implement dying gasp. Sends signal for a failure condition. Dump of information that can be analyzed. Manufacturer can understand and act appropriately. Doesn’t need to send a technician.
 - Most of the homes have broadband connectivity. Back office connection less expensive. AWS, Azure, costs are de minimis. Not possible to sell a device without a back office. Preventative maintenance.
 - When we do modules, building into the system – heart of the charger has a unique ID with a database, production time, lot, how was born. When the manufacturer looks what happened, serial number lot. Failures happen in the field, but the ability to look at the data. Platform helps avoid mitigate failures and revenue loss.

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- Joshua McDonald: What is tested during the interoperability tests?
 - Car to charger communications.
 - Jeremy Whaling: It is hard to base everything as “customer driven” as customers are not going to choose a standard. They are more likely to adopt and EV due to a use case or requirement or feature that a standard could enable, such as plug-and-charge. Agreed. PlugNCharge – wants to work every single time.
- Judy Brunson
 - Costs cannot be disclosed
 - The most cost effective way is to collaborate by working with Tier 1 suppliers to reduce the cost of a new technology, regardless of whether or not it is a standard or a breakthrough.
 - Smart charge communications module makes the vehicle intelligent.
 - An answer for what consumers are asking.
 - 4 primary barriers to EV adoption: range, TCOE, branding/model available, consumer’s charging experience.
 - Both must be positive. – Enabled via ISO 15118
 - Costs of EV & EVSE
 - DC capable vehicles – sunk. Not much for AC messaging and PnC/load balancing.
 - For cars, Costs of AC only equivalent to DC only
 - Cost to utilize AC energy
 - On EVSE, need a PLC chip to accept cars.
 - Lifecycle piece price – 4 years. Tier 1 supplier
 - Cost = Volume * Piece Price * 5 years
 - For AC solution, less than 20% of cost of DC solution.
 - For those OEMs that will have DC charging, additional cost is small.
 - Solutions
 - Grants to reduce development costs
 - Funding opportunities are primarily for EVSEs
 - To have a conclusive picture of entire market, need support for OEMs.
 - Need AC/DC ISO 115118
 - Engineering (different) and software (small) needed for DC converted to AC.
 - Total investment is small.
 - A-Sample, B-Sample: those are sunk costs because the DC architecture is already there.
 - Reporting requirements to receive funding. Resources to monitor funding.
 - OEMs collaborate to reduce economies of scale
 - For greater volumes, piece prices is smaller.
 - Importance of standards
 - Consumer oriented, is easy. Quality, efficiency, service, reliability
 - Benefits: integration of emobility assets, efficient grid, GHG
 - Hank McGlynn: Would you update ISO 15118 to ensure backward compatibility?
 - Mike B: Store last copy of the dictionary.
 - Oleg: Version 2 is backward compatible for version 1.
- Jeremy Whaling
 - Standards are not a silver bullet.

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- Can improve UX, but could result in excessive cost.
 - Balance high level and detailed view
 - Can assist with demand charge mitigation – intelligently allocating power improves customer experience.
 - \$1800/month for 60 chargers
 - Adds extra information from the vehicle- kWh and departure
 - Reality: provide good implementations to improve customer experience.
 - Automakers:
 - Design for the application for a customer experience. Price per power curve – use machine learning, exception handling for overrides, compatibility testing.
 - EVSPs:
 - Seamless portal for host
 - What is the risk of a bad implementation?
 - Standards alone don't solve aggregation for participation in the wholesale market
 - Conclusions
 - Get as many vehicles on the road as possible with affordable infrastructure
- Justin:
 - When considering the existing protocols for the mapping exercise, which version(s) of the protocols should we consider to determine how it meets the requirements?
 - Mike: Give three points if it's in the existing standard and one point if it's in a proposed version of a standard.
 - Mike: Need to understand the architecture to see what is put together. How, then What.
 - Oleg: Don't map in a vacuum.
 - Joshua McDonald: Industry traction. We have interfaces for beyond the meter communications, including for Rule 21. Translation and security.
 - Dean Taylor: slice by market segment.
 - Barry: California centric utilities. Worldwide. Enable to interface for global production.
 - Jamie Hall (GM): If CPUC is considering adopting standards, should only consider existing, fully vetted ones.
 - Vincent: consider industry traction.
 - Oleg: For a new thing, to get that in deployment, are we willing to wait 4-5 years?
 - Need to understand OEM needs and vehicle plans.
 - VW group – within the next 2 years, 15118 AC and DC capable will be standard on vehicles.
 - Mercedes Benz – AC architecture (Smart), underutilized because infrastructure does not support it. DC architecture, and AC architecture. All of the best interest to accept vehicles. They are ready, the infrastructure is lagging. We need a standard between the EV and EVSE when they are brought to market, near term. We have an AC 15118 vehicle today.
 - BMW: Should be specific on the question of what needs to be on the charging station. Principal problem is that there is no value and no programs to create opportunity for customers.
 - GM: No timeline on when they would implement 15118

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- Honda: No exact timeline for use of 15118, but is examining existing pathway including PWM on EVSE.
 - Vincent: Supports ISO 15118
 - Judy: What’s the scope? In order for widespread electrification, it is critically important to address the customer charging experience. Supports CPUC Ruling as needed to ensure user friendly conductive charging experience.
 - Ford: supports value and finding programs, understands that IOUs need pathways to learn about value with any communications pathway.
 - Porsche: Interoperability IOU EVSE and EVs from multiple OEMs.
 - BMW: VGI programs and standards are separate issues. Some data sensitive parts, but the customer chooses whether or not to transfer that data. Data and cyber security. It is the choice of the customer. Don’t discriminate against telematics.
 - Hank McGlynn: There are differences between utilities in North America and EU. OEMs should expect some need to tailor by region as with other vehicle requirements.
 - Dave McCreddie: agrees with Adam's (BMW) earlier comments that the main barrier to VGI adoption is that we don't have a good understanding of the value, and we don't seem to have an available pathway/program to unlock it and make it available to our customers. I can understand why the agencies need to address the EVSE standard question, as the IOUs are on the verge of spending a lot of money. I'm OK with that. But to me, the larger picture question to kickstart widespread VGI is to give us a pathway to learn about the value - with whatever communication pathway we choose (15118, telematics, SEP, etc).
- Participants nominated experts to represent each protocol that will be discussed as part of the Mapping Sub-Working Group. Jeremy Whaling also volunteered to provide the “voice of the customer” in the process.

<u>Protocol</u>	<u>Subject Matter Expert (SME)</u>	<u>Organization</u>
IEEE 2030.5 (SEP 2.0)	Gordon Lum	Kitu
Telematics	George Bellino	EPRI – will coordinate with Automakers
OpenADR	Rolf Bienert / Josh McDonald	OpenADR / Southern California Edison
ISO 15118	Judy Brunson/Fahad Saadat	Daimler / Mercedes Benz R&D
CHAdeMO (IEEE 2030-1-1)	Lance Atkins	Nissan USA
CNMP (IEEE P 2690)	Craig Rodine	ChargePoint
SAE J3072	Rich Scholer	Fiat Chrysler America
SAE J2847		

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SAE J2931		
SAE J1772		
OCPP v1.6	Tom Ashley	Greenlots

- Rule 21 Electric Vehicle use as DER
 - Mike Bourton requested Josh McDonald could present on Rule 21. Josh suggested also discussing current IOU interfaces, such as OpenADR.
- Dean Taylor:
 - Do you have ideas on source documents in public domain that can help the cost-benefit subgroups with determining costs and benefits (qualitative or quantitative)?
 - On the functional requirements, it is confusing because there are some use cases that are so simple they have NO functional requirements. Shouldn't this "null" case also be shown?
 - In the context of Deliverable 2, can we evaluate what the risk is if we require a protocol on the EVSE, but then OEMs don't use the EVSE or protocol to communicate with the vehicles?
 - Barry: would the OEM do nothing? And still use telematics
 - Some use cases are much less expensive than others. Seems that deliverable 2 should help determine why this is. In other word how can costs be removed from use cases for fleets, homes, workplaces and others?

Attendees in person:

- Mike Bourton, George Bellino, Oleg Logvinov, Judy Brunson, John Mengwasser, Tamotsu Kawamura, Satoko Horie, Mike Ferry, Alec Brooks, Charlie Botsford, Jeremy Whaling, Steven Yip, Wufan Jia, Lance Atkins, Josh McDonald, Jamie Hall, Anthony Harrison, Adam Langton, Hannah Goldsmith, Sebastian Schelper, Martin Roemheld, Judy Brunson, Abigail Tinker, Jordan Smith, Barry Sole
- State Agencies: Carrie Sisto, Amy Mesrobian, Jennifer Kalafut, Justin Regnier, Stephanie Palmer, Tyson Eckerle, Noel Crisostomo
- Webex Attendees: Tim Lipman, Steve Davis, Stephan Voit, Scott Turik, Quang Pham, Phillippe Phanivong, Matt Fung, Mahdi Ghamkhari, Lydia Krefta, Lisa McGhee, James Tarchinski, Hugh McDermott, Hank McGlynn, Delphine Hou, Dean Taylor, David McCreadie, David Goldgraben, Ted Bohn, Beth Reid