

DOCKETED

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Welcome

Staff Workshop on
EV Charging Interoperability

We'll begin at **9:02 a.m.**

9:02 | Introduction

~9:07 | North America's charging ecosystem

~9:35 | Broad interoperability vision

~9:40 | Current and potential CEC actions

~9:55 | Open Q&A

There will be opportunities for Q&A throughout today's workshop.

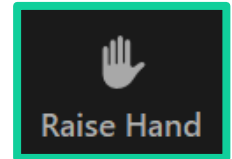
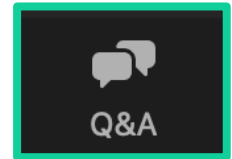


Housekeeping

- This workshop is being recorded. The workshop recording will be posted to the workshop [event page](#).
- Enter written questions into the **Q&A box**
- Spoken questions are also welcome during the workshop

Phone: *9 to raise/lower hand, *6 to unmute/mute

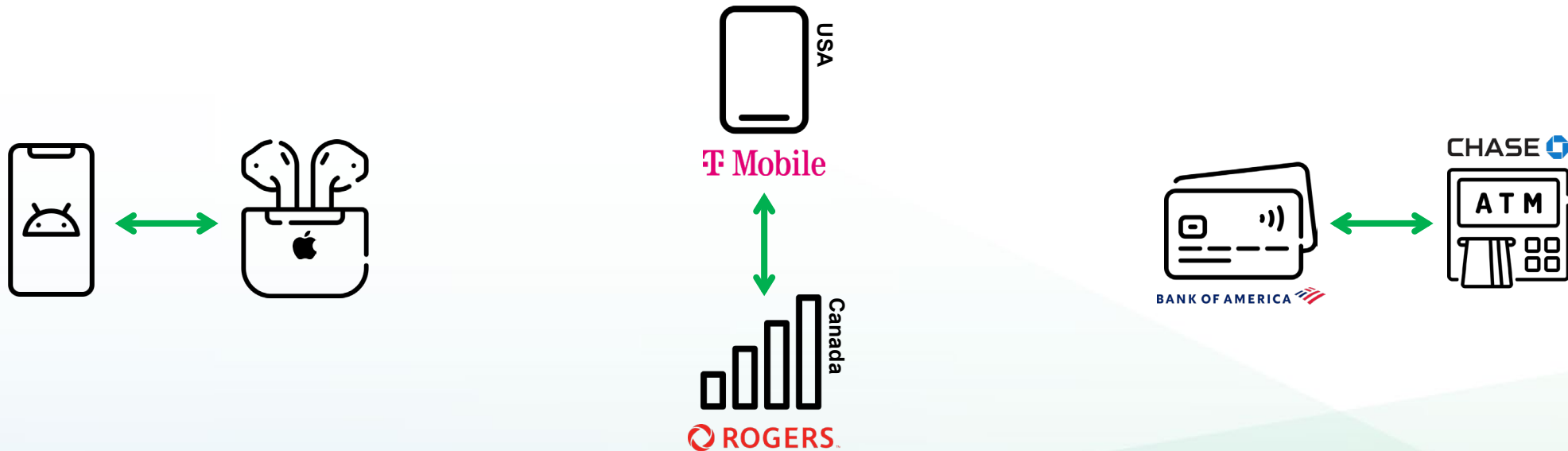
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What is interoperability?

→ Ability of different products and systems to function together without special effort from the user





Interoperability affords several important benefits



Customer ease of use and experience



Supports innovation and scalability

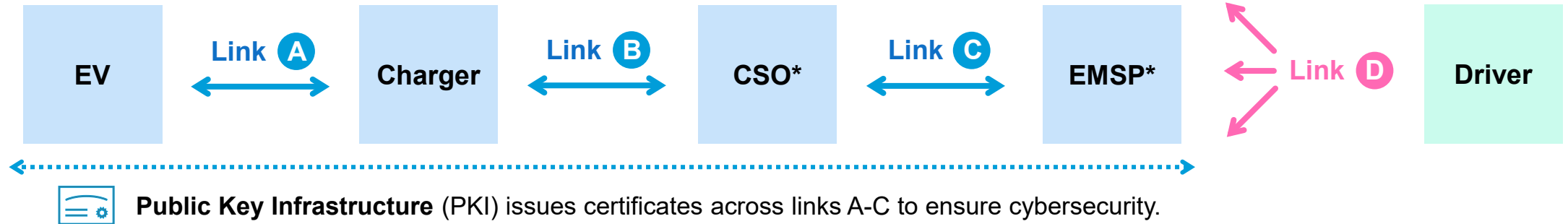


Expanded product choice



North America's charging ecosystem consists of several links, each with unique interop challenges

Charging ecosystem general architecture:



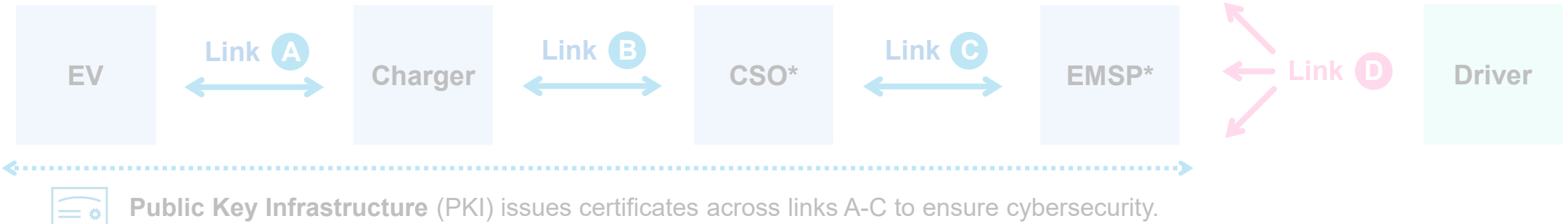
* **CSO** = Charging Station Operator, and **EMSP** = EMobility Service Provider.

Note: CEC and other agencies have sometimes used Electric Vehicle Service Provider (**EVSP**) to describe both CSOs and EMSPs

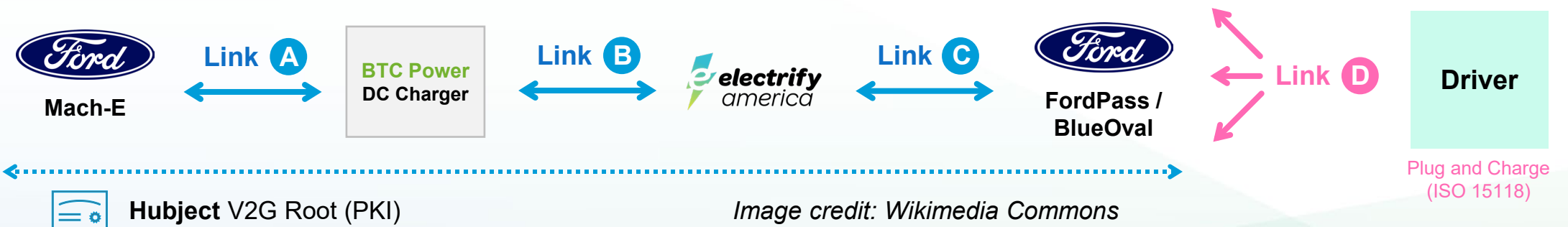


North America's charging ecosystem consists of several links, each with unique interop challenges

Charging ecosystem general architecture:



Present day example:



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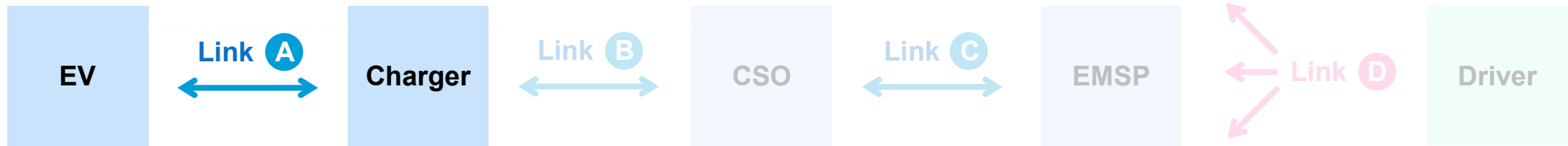


Interop challenges exist throughout the entire ecosystem

Today, **interoperability challenges exist in all links**, sometimes resulting in:

- Product development or integration barriers
- A clunky charging experience
- Unsuccessful charging sessions
- **Unhappy customers**

The subsequent slides discuss ongoing interoperability challenges by link.



- Includes both the connector and underlying communication
- Most automakers have announced that models beginning ~2025 will use J3400/NACS
 - J1772/CCS and J3400/NACS appear to support the same communication protocols over powerline carrier – DIN 70121 and ISO 15118
- The specific communication protocol used between EV and charger often varies
 - Many implementing Plug and Charge using ISO 15118-2 (per [NEVI rules](#))
 - Several protocol options to enable bidirectional charging
 - Unclear pathway and timeline for migration from ISO 15118-2 to -20
- Currently, there is no standardized method (such as a certification) to verify that a product's implementation of ISO 15118 follows the protocol specification, and this results in inconsistent protocol implementation across products



- CSOs operate a digital backend to remotely manage one or more chargers
 - Some CSOs also own and maintain some or all these chargers
- Open Charge Point Protocol (OCPP) is widely used for communication between CSO backends and chargers
 - OCPP implementations sometimes differ across products, resulting in non interoperability
- The Open Charge Alliance launched a certification program to verify conformance with the OCPP specification, but most North American companies have not certified their products



- EMSPs provide a payment account that drivers can use to pay a CSO for charging
- Network roaming is the ability for a driver to use one EMSP account to pay different CSOs for charging (in other words, interoperability between CSOs and EMSPs)

Typical conditions *without* roaming (note that CSO and EMSP are the same, which is common in NA):

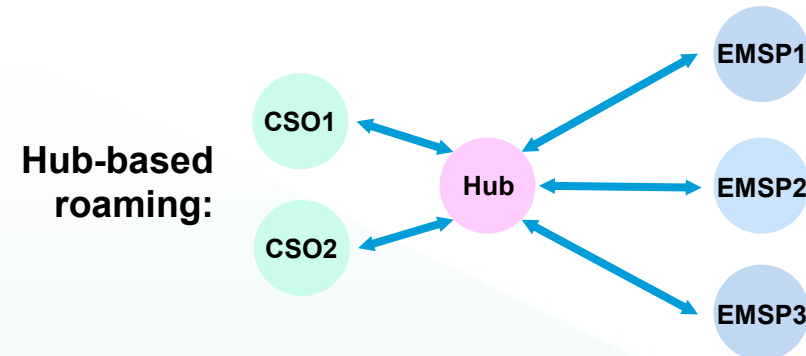
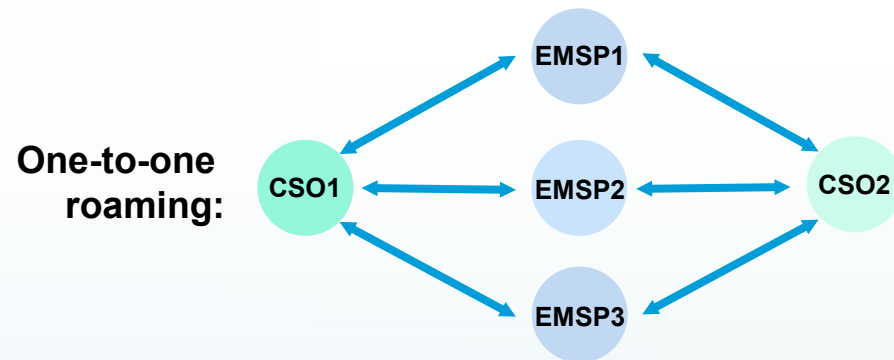


Earlier example *with* roaming (note that CSO and EMSP are different entities and must interoperate):





- Existing California regulations require CSOs to support network roaming *capability* using Open Charge Point Interface (OCPI), but do not require roaming *in practice*
 - To realize roaming in practice, CSOs and EMSPs must develop one-to-one business agreements with each other (below left) or through an intermediary hub (below right)



- Without network roaming, drivers must maintain multiple accounts (using apps, keycards, or digital contracts) to access chargers managed by different CSOs or rely on manual credit card payment where available



- Industry has developed diverse options for drivers to interact with the charging ecosystem
 - There isn't (nor should there be) a single, standard way for drivers to interact with the ecosystem
- Today, most drivers are expected to be hands on as there is limited ability for a driver to simply “plug and charge” to initiate and pay for a charging session
- Due to lack of network roaming, North American drivers often maintain “folders of apps” or multiple keycards to access chargers on different networks

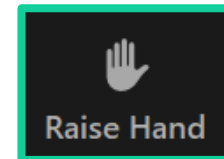
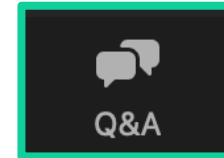


Questions?

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Broad interoperability: Seamless charging with any car, any charger, any network

- Long term goal: **Broad interoperability**, meaning a future where any driver with any car can easily charge at any charger on any charging network.
 - **Example:** Ben drives his Kia to an ABB charger operated by 7-11. Once plugged in, Ben's Kia automatically starts charging and pays 7-11 for the session using Ben's EVgo account linked with the car.*



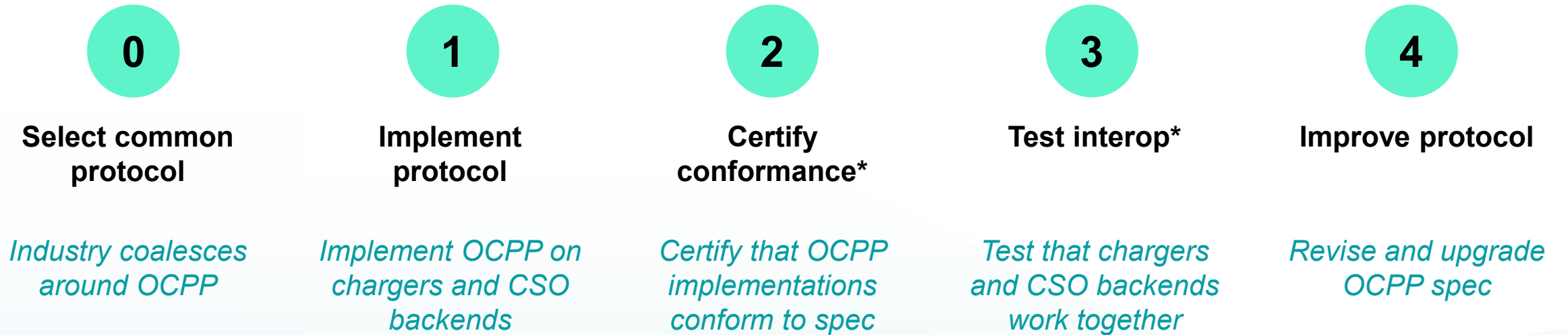
- Broad interoperability is achieved when all links achieve interoperability across that individual link. Today, **all links face interoperability challenges.**
 - A link achieves interoperability when both parties of the link can consistently and successfully connect to exchange power, exchange communication, or both.

* This hypothetical example **does not exist today**. Logos and company names are for illustrative purposes only. Image credit: Wikimedia Commons



A link achieves interop using a five step process

The same five steps apply to links A-C. The general steps, along with *example actions* for link B, are shown below:



* A product **conforms** to a protocol if it follows the protocol specification. A product is **interoperable** if it functions with other products without extra user effort. These are related but distinct concepts.



The CEC is pursuing and exploring actions to aid progress toward broad interoperability

- Holistic approach needed to achieve broad interoperability
 - CEC actions are designed to help address root causes within each link
 - Some actions described in the subsequent slides are already pending, while others are subject to further exploration or refinement
- Continued progress toward broad interoperability will depend on industry commitments and follow through



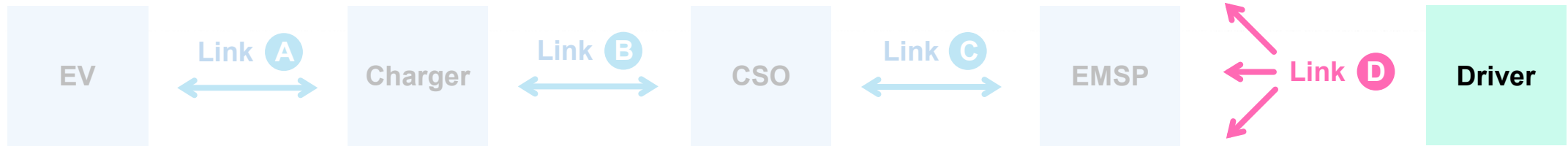
#	Description	Addresses
A.1	Maintain J1772/CCS and ISO 15118 as minimum requirements in the immediate term. Consider expanding these requirements to projects beyond block grants.	Steps 0,1
A.2	Monitor J3400/NACS standardization and explore ways to support a one connector future, including through revised connector requirements. See NACS statement .	Steps 0,1
A.3	Explore publishing a report outlining steps toward widespread implementation of ISO 15118-20, including discussion of hardware and software migration pathways.	Steps 0,1
A.4	Explore including ISO 15118-20 implementation as eligible cost in CEC projects.	Step 2
A.5	Explore ISO 15118 conformance testing requirements for chargers. For example, CharIN is developing an ISO 15118-2 certification. Possible 2025 phase in.	Step 2
A.6	Explore additional ways to support interoperability testing.	Step 3



#	Description	Addresses
B.1	Continue specifying OCPP with certification as the minimum requirement, including a 2025 deadline for certification to OCPP 2.0.1 or later. Consider expanding this requirement to projects beyond block grants.	Steps 0,1,2
B.2	Explore including OCPP implementation and certification as eligible costs in CEC solicitations and other projects.	Steps 1,2



#	Description	Addresses
C.1	Explore whether network roaming requirements may be appropriate for CEC projects, with phase in potentially as early as 2025-2026. For example, projects could require eligible networks (CSOs) to maintain a minimum number of roaming agreements with other networks (EMSPs) or enroll with a roaming platform.	Step 1
C.2	Explore methods to encourage CSOs to develop roaming agreements with EMSPs without the use of project requirements.	Step 1



#	Description	Addresses
D.1	Explore opportunities, including with the federal government, to clarify the forums for determining national market and governance rules for PKI.	N/A
D.2	Explore opportunities, including with appropriate public agencies, to ensure non discriminatory EMSP selection. Most automakers will likely launch EMSPs products (many already have) and offer their service by default on the EV, and customers should have the ability to select and use an alternate EMSP on their EV if desired.	N/A



Link	Feedback Requested
A	CharIN is developing a “CCS Extended” certification that verifies ISO 15118-2 conformance. CEC staff believes CharIN CCS Extended may be an appropriate future requirement for certain CEC projects. Are there other available ISO 15118 certifications or conformance procedures that would be more appropriate?
A,B	CEC staff proposes potentially allowing ISO 15118-20 and OCPP implementation and certification costs as eligible costs in certain CEC projects. Would this be an effective use of public funds, or would funds be more effective elsewhere to support broad interoperability?
C	Existing regulations require CSOs to maintain OCPI capability. Is OCPI the preferred protocol to enable roaming agreements? Are there limitations within OCPI that should be addressed?
C	How should the CEC support the development of roaming agreements? Alternatively, should potential roaming requirements be structured in a certain way to support replicability of agreements, a level playing field, and/or the inclusion of smaller CSOs?

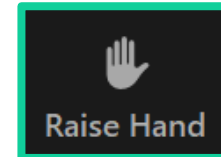
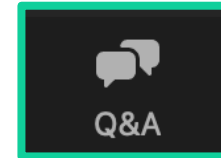


Questions, comments, feedback?

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Thanks! Please let us know what you think

- Submit electronic comments to docket 22-EVI-06
 - Guiding questions are provided on slide 21
 - Comments may cover any topic, not just those outlined in guiding questions
 - Commenting deadline is **5 p.m., Friday, December 22, 2023**
 - Please see the workshop notice for alternate commenting methods
-

Questions after the workshop? Reach out to jeffrey.lu@energy.ca.gov

THANKS FOR ATTENDING!