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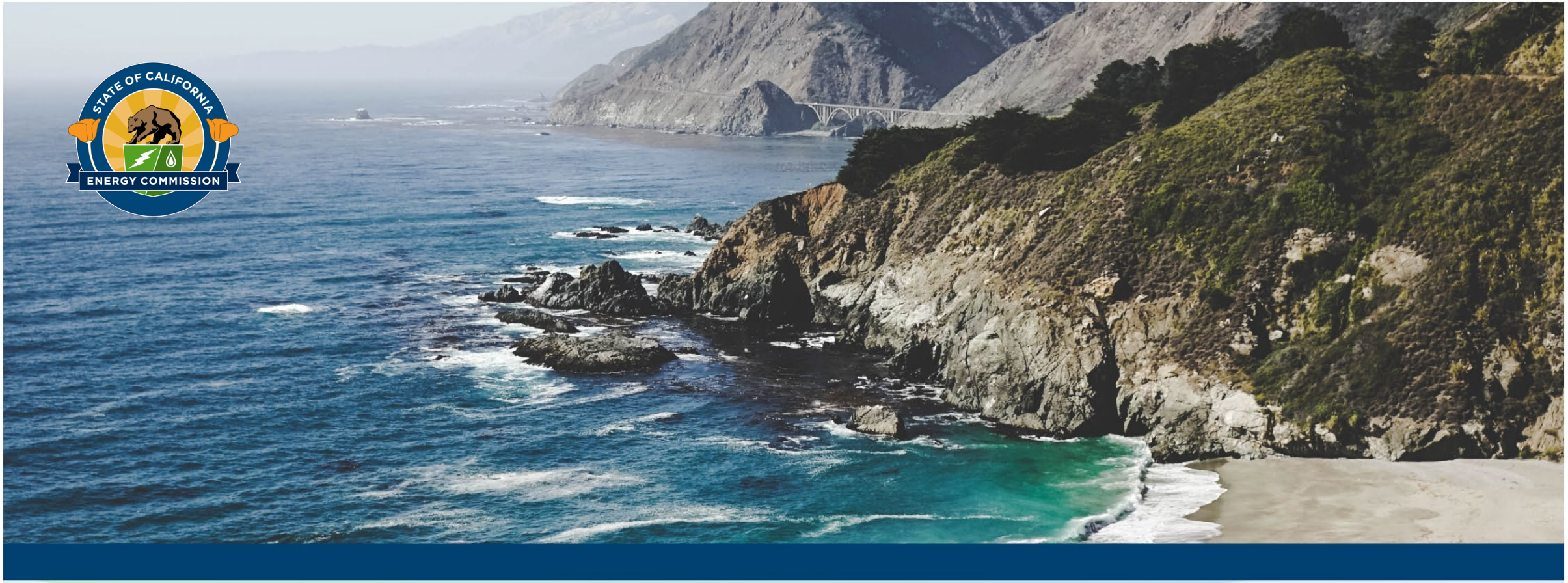


Staff Workshop

Charging Interoperability and Collaboration Yard Funding Concept

Fuels and Transportation Division

May 5, 2023 | 9:30 – 11:15 a.m.

Welcome

Funding Concept:
Charging Interoperability and Collaboration Yard

We'll begin at **9:31 a.m.**

9:31 | Housekeeping, Context, Policy Drivers

~9:50 | Potential Project Requirements

~10:25 | Potential Eligibility, Funding, Scoring

~10:50 | Next Steps

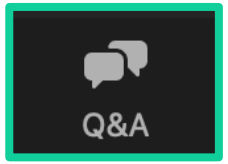
Opportunities for live feedback and Q&A throughout.

Photo: Jay Huang

Housekeeping

- Slides are available on the workshop event page
- We will record this workshop and post the recording to the link above

- During the workshop, use the **Q&A box** for written questions
- We **encourage** live feedback, questions, and back and forth!



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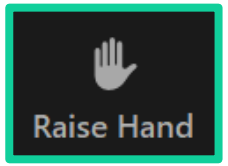


Charging Interoperability and Collaboration Yard Funding Concept

Context and Policy Drivers

Charging interoperability today

Growing industry convergence on **connectors, communication**

- J1772, ISO 15118, OCPP (reflected in, for example, NEVI and CALeVIP)

Growing concern over **no charge events**

- Limited root cause data publicly available today *(see AB 2061 Reliability Reporting)*
- Some no charge events may be due to vehicle-charger interoperability

Growing market demand for **interoperability testing**

- For example, to support V2X or a “continuous” Testing Symposium

This slide uses visuals from Flaticon.com

Interop is not a novel topic

Extensive **CEC analysis** on interoperability challenges and actions

- Statewide Charging Infrastructure Assessment, technical requirements, and so on

Funding for the **Vehicle Grid Innovation Lab** (ViGIL)

- Offers standards conformance/certification testing for chargers
- ViGIL is located in Concord (East Bay) and operated by DEKRA

Funding for the **Vehicle Interoperability Testing Symposium** (VOLTS)

- Interoperability conference and testing in Long Beach (next week; May 9-12)
- VOLTS is planned and hosted by a project team led by innos and CharIN

Interop challenges may compound as charging becomes increasingly feature rich

Customers and industry are demanding:

- **Seamless and easy charging**, including Plug and Charge, mapping/navigation integration, and network roaming
- **Next generation charging features** such as vehicle-to-building for bill savings and backup

Fundamentally, charging can and should take advantage of digital capabilities to create a **better than gas** customer experience

Ford's vehicle-to-home backup system

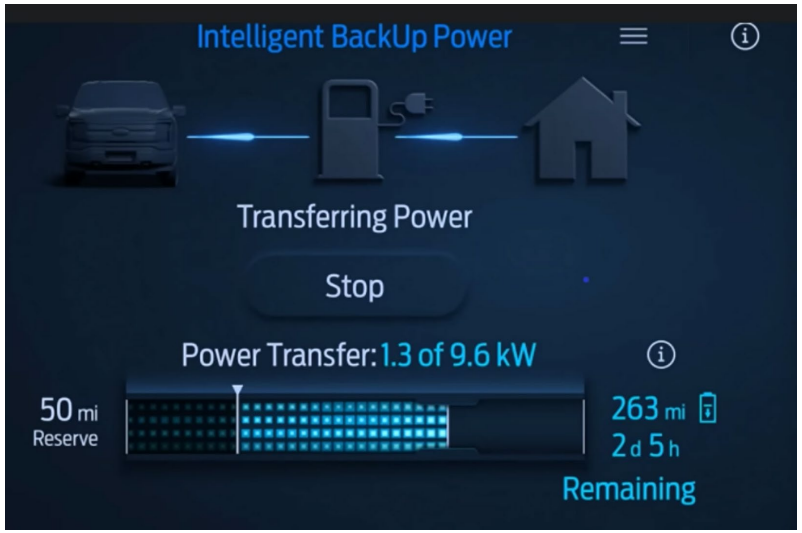


Image courtesy of State of Charge

Global standards are the baseline for interoperability

Global standards provide the building blocks for an **interoperable charging ecosystem** and for **global economies of scale**

- Align with globally accepted standards whenever appropriate and possible*

However, **standards alone are insufficient** to achieve interoperability

- Standards must be implemented by industry
- Standards must be implemented uniformly (check with conformance tests)
- Sometimes, relevant items are not specified in the standard
- Innovation generally moves more quickly than standards making

** CEC, with Elaad, hosted a webinar discussing V2G and global standards in February 2023*

Concept: Charging Interoperability and Collaboration Yard

Charge Yard is designed to support **all of the following:**

1. A better than gas charging experience
2. Consistent and uniform implementation of global standards
3. Accelerated development of scalable certification procedures
4. Testing of edge cases and features not fully captured in standards
5. Development and testing of next generation features and standards

Note: Charge Yard is a **concept**. CEC may develop Charge Yard into a funding solicitation. The concept descriptions in this deck are for deliberative purposes only.

What might Charge Yard look like?

An ongoing industry collaboration supporting **interoperability, certification / standards development, and tinkering** for next generation charging features

Permanent **“yard” like lab** capable of physically housing “resident” EVSE and “visitor” vehicles

Supports **testing with auxiliary components** such as transfer switches, local controllers, other distributed energy resources, and so on

Supports **private** as well as **semi public testing**

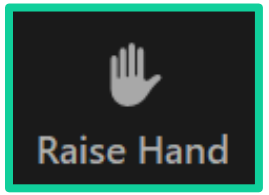
Various EVSE models at the Elaad Testlab in Arnhem, NL

Image courtesy of EVBox

Questions or comments?

Use Q&A box or the following:

- Phone: ***9** to raise/lower hand, ***6** to unmute/mute
- Zoom: Click **Raise Hand** and we will enable your audio



Charging Interoperability and Collaboration Yard Funding Concept

Potential Project Requirements

Potential requirements are divided into 7 categories

1. Physical Space
2. Interoperability Testing
3. Operations
4. Scalable Certification Procedures
5. Next Generation Development
6. Data Collection, Reporting, Dashboard
7. Other Industry Collaboration

Note: Charge Yard is a **concept**. CEC may develop Charge Yard into a funding solicitation. The potential requirements in this deck are for deliberative purposes only.

1. Physical Space

1. Existing space in California (no new construction; expansion OK)
2. Accommodate, at minimum, 12 large EVSE and 4 vehicles
3. Sufficient indoor and/or outdoor space for multi-party testing
   - *Should CEC specify minimum square footage?*
4. Sufficient electrical capacity to serve testing needs (expansion OK)
   - *Should CEC specify minimum electrical capabilities? If interoperability is the focus, does lower power suffice (say, 50 kW)? What about testing at higher powers (>=150 kW)?*
5. Available indoor meeting space
6. May optionally accommodate medium- and heavy-duty vehicles

2. Interoperability Testing (1/2)

1. Procure 12 or more resident EVSE to support charger-vehicle testing
   a) At least 8 different manufacturers and at least 5 AC EVSE
   b) EVSE must support, at minimum, J1772/CCS
   c) EVSE must be certified for OCPP 2+ and CharIN CCS Extended* (or equivalent) before being made available for interoperability testing
      - *Interoperability testing with EVSE containing non conforming implementations is not broadly helpful. Certifications help ensure correct implementation of these protocols. Minimum certifications should evolve with the market.*
      - *Is CharIN CCS Extended the appropriate certification to require? Are there other certifications for ISO 15118 CEC should consider instead?*
   d) EVSE may be loaned by EVSE manufacturers

** CharIN CCS Extended certification for DC EVSE is expected to become available in 2023*

2. Interoperability Testing (2/2)

2. Support testing with multiple Public Key Infrastructure (PKI) roots
   - *That is, support multiple North American V2G roots to test Plug and Charge*
   - *How should CEC specify "support" for multiple roots? Is it sufficient to simply have different EVSE using different V2G roots? Are there other PKI related requirements CEC should consider?*
3. Procure and commission onsite test tools, including but not limited to charger/vehicle emulators, sniffers, and grid emulators. The facility may optionally offer certification testing services using these tools.
   - *Is this preliminary list of equipment reasonable to require? Are sniffers useful (especially given greater adoption of TLS encrypted communication)? Are there other equipment types to include here?*
   - *Should CEC require certification testing services to be offered? This would be a commercial service, which may exclude certain entity types from applying.*

3. Operations

1. Neutral and open to industry
   - *How should "neutral" be defined? Is this important?*
2. Onsite support (test technicians, test engineers, and so on)
3. Support private **and** semi public testing
   a) Support testing between visiting vehicles and resident EVSE
   b) Support testing between visiting vehicles and visiting EVSE
   c) Must develop confidentiality and security processes
4. Does not have to be free
   - *How can Charge Yard become a permanent and self-sustaining facility? What cost recovery structures may be viable to ensure continued operation?*

Questions or feedback?

Guiding questions (physical space, interop, and operations):

1. Should CEC specify minimum square footage and/or electrical capabilities? If interoperability is the focus, does lower power suffice (say, 50 kW)? What about testing at higher powers (>=150 kW)?
2. Is CharIN CCS Extended the appropriate certification to require? Are there other certifications for ISO 15118 CEC should consider instead?
3. How should CEC specify “support” for multiple roots? Is it sufficient to simply have different EVSE using different V2G Roots? Are there other PKI related requirements needed?
4. Should CEC require certification testing services to be offered? This would be a commercial service, which may exclude certain entity types from applying.
5. How should “neutral” be defined? Is this important?
6. How can Charge Yard become a permanent and self-sustaining facility (cost recovery structure)?

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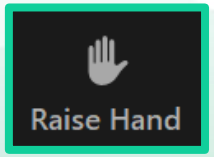

4. Scalable Certification Procedures

1. In collaboration with industry, accelerate the development and finalization of ISO 15118-2 certification testing procedures for both AC and DC chargers (such as CharIN CCS Extended)
   - *Certification testing is a scalable way to ensure uniform implementation of protocols.*
   - *Is this needed or appropriate? CEC notes the current lack of ISO 15118-2 certification testing procedures for AC chargers. Should this include vehicle side certification too?*
2. In collaboration with industry, accelerate the development and finalization of ISO 15118-20 certification testing procedures for both AC and DC chargers, including bidirectional charging
   - *Is this needed or appropriate? No ISO 15118-20 certifications are available today.*
   - *Given that ISO 15118-20 support bidirectional charging, certification procedures may have implications for future interconnection requirements. How should certification procedures for -20 be developed to support future interconnection requirements?*

Questions or feedback?

Guiding questions (scalable certification):

1. Is accelerated development of ISO 15118-2 certification needed or appropriate? CEC notes the current lack of ISO 15118-2 certification testing procedures for AC chargers. Should this include vehicle side certification too?
2. Is accelerated development of ISO 15118-20 certification needed or appropriate? No ISO 15118-20 certifications exist today.
3. Given that ISO 15118-20 support bidirectional charging, certification procedures may have implications for future interconnection requirements. How should certification procedures for -20 be developed to support future interconnection requirements?

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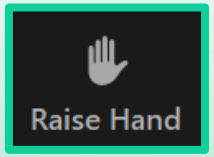

5. Next Generation Development

1. Support ability to install and test a complete vehicle-to-home setup for both grid interactive and islanded operation
   - *Is this needed or appropriate? Should CEC specify additional or other requirements to support bidirectional charging?*
2. Use the above to convene industry, mature development of future standards, and support interconnection policies with utility buy in
   - *Is this needed or appropriate? Are there other requirements CEC should include here?*
   - *How can Charge Yard's efforts best enable utility buy in and streamlined interconnection? For example, should involvement with IEEE, UL, or similar parties be recommended or required here, or in the previous set of requirements (Scalable Certifications)?*
3. May optionally support testing with other distributed energy resources, energy management systems, or similar.

6. Data Collection, Reporting, Dashboard

1. Collect anonymized data on all testing with onsite test tools and resident EVSE. Use this data to identify and track common implementation errors, misunderstandings, and other non conformities. Aggregate and publish these findings twice a year.
   - *Is this appropriate? Is there other data reporting that should be called out here?*
   - *Will industry feel confident using Charge Yard if it reports anonymized data?*
2. Maintain a public log / dashboard tracking the number of vehicle and EVSE models tested in Charge Yard (do not specify brand/model) and the protocols and use cases tested.
   - *Is this needed, appropriate, or useful? The dashboard can help identify which protocol versions and use cases are widely implemented.*

7. Other Industry Collaboration

1. During the project term, host at least **three onsite events per year** to conduct interoperability testing, further standards development, disseminate learnings, **and/or** other priority topics as determined by the project team.
   - *Is this needed or appropriate?*
   - *Are there other requirements CEC should include to foster industry collaboration?*
   - *Such events may include but **do not have to be** interoperability testing events.*

Interoperability testing in Portland, OR

Image courtesy of CharIN

Questions or feedback?

Guiding questions (next gen development, data collection, industry collaboration):

1. Is complete vehicle-to-home testing needed or appropriate? Should CEC specify additional or other requirements to support bidirectional charging?
2. How can Charge Yard's efforts best enable utility buy in and streamlined interconnection? Should involvement with IEEE, UL, or similar parties be recommended or required?
3. Will industry feel confident using Charge Yard if data is anonymously collected?
4. Is an anonymized dashboard needed or appropriate? The dashboard can help identify which protocol versions and use cases are currently widely implemented.
5. Is requiring three onsite events per year needed or appropriate? Are there other requirements CEC should include to foster industry collaboration?

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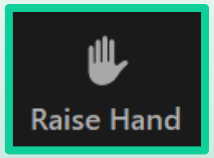

Charging Interoperability and Collaboration Yard Funding Concept

Potential Eligibility, Funding, and Scoring

Potential Applicant Eligibility Criteria

Coalitions of public and/or private entities may apply

- At least one coalition member must be a lab or lab operator
- The lab shall be the applicant for purposes of agreement management
- Other coalition members should be industry entities or other charging related parties

1. *Is a coalition the most sensible and effective setup for Charge Yard? Or should Charge Yard be hosted by a non industry (more neutral?) entity?*
2. *Should Charge Yard specify minimum coalition requirements? For example, minimum one automaker, one utility, one test tool developer, one charger manufacturer, and so on.*
3. *What is the most effective applicant type to ensure learnings from Charge Yard are disseminated across industry, to utilities, and incorporated into products and policy?*
4. *Should Charge Yard prohibit certain types of entities from participating?*

Note: If Charge Yard requires the recipient to offer certification testing or other commercial services, this would likely **exclude** national labs and university labs.

Potential Eligible Costs

1. Labor, materials, and resources supporting:
   a) Charge Yard physical setup and commissioning
   b) Charge Yard operation, including data collection and onsite events
2. Labor, materials, and resources supporting accelerated development of industry certification testing procedures
3. Test tools and test bench components
   a) For example, transfer switches, disconnects, and so on

- *This may not be an exhaustive list.*
  Are there notable costs that should be eligible not shown above?

Potential Funding Amounts

Up to **$3 million** available with minimum 25 percent applicant match.

Minimum project term is 4 years.

- *An application requesting $3M in CEC funds with minimum match = $3.75M project*
- *Is this enough funding to kick off Charge Yard? Is this too much?*
- *Is 25 percent match appropriate? Too high or too low?*
- *Is a 4 year project term appropriate?*
- *Note: CEC funding is intended to help launch Charge Yard. Projects should outline viable strategies to ensure sustained operation of Charge Yard beyond the project term.*

Potential Scoring Criteria

In addition to criteria reflecting the project requirements described earlier:

1. Cost effectiveness (lower cost is better, all else equal)
2. Timeline (faster is better, all else equal)
3. Integration and knowledge transfer with industry
4. Integration and knowledge transfer with utilities
5. Integration with standards and certification bodies
6. Plans for long term sustainability and operation
7. Team experience with standards conformance, implementation, and testing
8. Past performance

- *Anything missing from this list?*

What's next?

1. CEC collects public comment on Charge Yard (instructions on next slide)
2. CEC internally discusses whether to evolve Charge Yard into a solicitation
3. ***TBD:*** CEC refines Charge Yard requirements, eligibility, and so on
4. ***TBD:*** CEC releases Charge Yard solicitation for competitive bids

Please submit written feedback!

Continued development of Charge Yard is subject to public feedback.

Please submit written comments to docket 22-EVI-06

- Comment deadline: **Wednesday, May 24**
- Submit online and include **"Charge Yard"** in title
- Or email docket@energy.ca.gov with subject "22-EVI-06 Charge Yard"

Thanks for your participation and feedback! **Any last comments or questions?**

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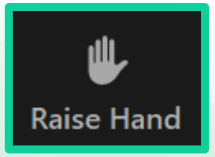

Thank you!

Connect after the workshop: jeffrey.lu@energy.ca.gov

Appendix (1/4)

Guiding questions are aggregated below. CEC also strongly encourages feedback on aspects not captured within the guiding questions.

1. Should CEC specify minimum square footage and/or electrical capabilities? If interoperability is the focus, does lower power suffice (say, 50 kW)? What about testing at higher powers (>=150 kW)?
2. Is CharIN CCS Extended the appropriate certification to require? Are there other certifications for ISO 15118 CEC should consider instead?
3. How should CEC specify “support” for multiple roots? Is it sufficient to simply have different EVSE using different V2G Roots? Are there other PKI related requirements needed?
4. Should CEC require certification testing services to be offered? This would be a commercial service, which may exclude certain entity types from applying.
5. How should “neutral” be defined? Is this important?
6. How can Charge Yard become a permanent and self-sustaining facility (cost recovery structure)?

Appendix (2/4)

7. Is accelerated development of ISO 15118-2 certification needed or appropriate? CEC notes the current lack of ISO 15118-2 certification testing procedures for AC chargers. Should this include vehicle side certification too?
8. Is accelerated development of ISO 15118-20 certification needed or appropriate? No ISO 15118-20 certifications exist today.
9. Given that ISO 15118-20 support bidirectional charging, certification procedures may have implications for future interconnection requirements. How should certification procedures for -20 be developed to support future interconnection requirements?
10. Is complete vehicle-to-home testing needed or appropriate? Should CEC specify additional or other requirements to support bidirectional charging?
11. How can Charge Yard's efforts best enable utility buy in and streamlined interconnection? Should involvement with IEEE, UL, or similar parties be recommended or required?

Appendix (3/4)

12. Will industry feel confident using Charge Yard if data is anonymously collected?
13. Is an anonymized dashboard needed or appropriate? The dashboard can help identify which protocol versions and use cases are currently widely implemented.
14. Is requiring three onsite events per year needed or appropriate? Are there other requirements CEC should include to foster industry collaboration?
15. Is a coalition the most sensible and effective setup for Charge Yard? Or should Charge Yard be hosted by a non industry (more neutral?) entity?
16. Should Charge Yard specify minimum coalition requirements? For example, minimum one automaker, one utility, one test tool developer, one charger manufacturer, and so on.
17. What is the most effective applicant type to ensure learnings from Charge Yard are disseminated across industry, to utilities, and incorporated into products and policy?
18. Should Charge Yard prohibit certain types of entities from applying / participating?

Appendix (4/4)

19. Are there notable costs that should be eligible not shown on slide 27?
20. Is $3M in CEC funding enough funding to kick off Charge Yard? Is this too much?
21. Is 25 percent match appropriate? Too high or too low?
22. Is a 4 year project term appropriate?
23. Are there scoring criteria CEC should include besides those shown on slide 29?