Quarterly Progress Update

Jan – Mar 2024

CHARGEX consortium

LED BY

Argonne NATIONAL LABORATORY | INL Idaho National Laboratory | NREL Transforming ENERGY

4/1/2024

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INL/RPT-24-76367

CHARGEX consortium

Vision

Any driver of any EV can charge on any charger the first time, every time

Mission

Bring together EV charging industry members, national laboratories, consumer advocates, and other stakeholders to measure and significantly improve public charging reliability and usability in North America **by June 2025**

Scope

Focus on complex issues that require multi-stakeholder collaboration and national lab support to solve and simplify

Scope of Work

Working Group 1

Defining the Charging Experience

- Define KPIs
- Set and validate targets
- Track industry performance

Working Group 2

Reliability/Usability Triage

Create fixes for:

- Payment and user interface
- Communication
- Hardware

Working Group 3

Solutions for Scaling Reliability

Improve:

- Diagnostics
- Interoperability testing methods

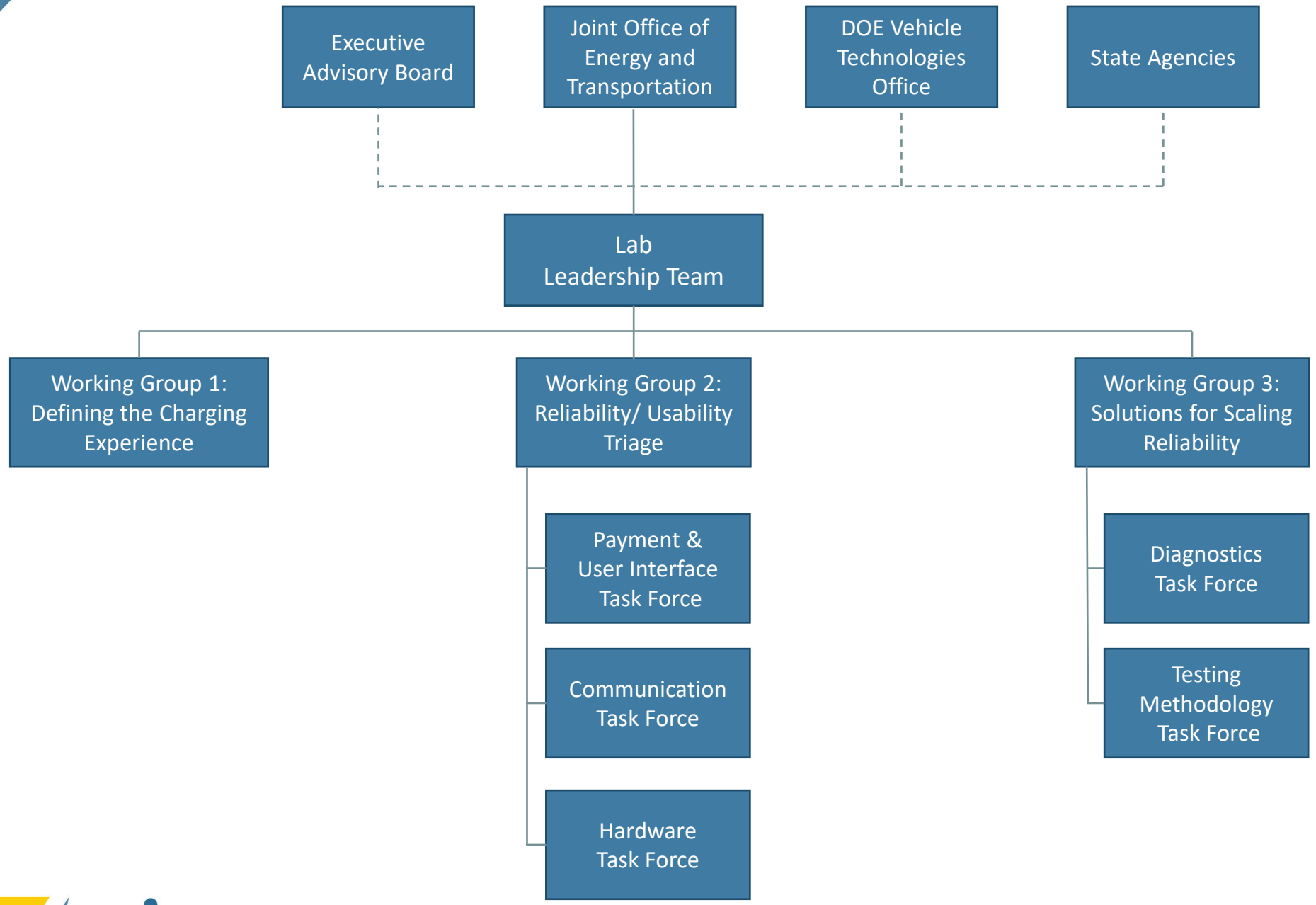
Outcomes

- Labs produce recommended practices, prototype tools, voluntary recognition program design
- Industry adopts practices and tools, improves standards

Participants (85 as of 3/31/2024)

Blue = added in Q2 FY24

Charger Manufacturers and Suppliers	ABB e-Mobility, Amphenol, Autel, Bosch, BTC Power, Dover Fueling Solutions, Eaton, **Evalucon**, EVBox, FreeWire Technologies, IoTecha, **Qualcomm**, Siemens, SK Signet, Tritium, Wallbox
Customer-Facing Charging Station Operators	**Apple Green Electric**, Blink Charging, bp pulse, ChargePoint, Electrify America, Enel X Way, EVgo, FLO, Francis Energy, InCharge, KIGT, Koulomb, NovaCHARGE, NYPA, **Rove**, SWTCH Energy, Xeal Energy
Charging Network and Software Providers	ampcontrol, AMPECO, ampUp, **Driivz**, EV Connect, PIONIX, Switch
Auto Manufacturers	American Honda, BMW of North America, Ford Motor Company, General Motors, Lucid, Mercedes-Benz North America, Rivian, Stellantis, Subaru of America, Tesla, Toyota Motor North America, VinFast Auto, Volvo Car USA
3rd-Party Roaming Hubs and eMSPs	AeonCharge, Bluedot, ChargeHub, Hubject
Field Services and Analytics Firms	Atlas Public Policy, ChargerHelp!, Energetics, EVSession, Field Advantage, **ReliON**, Uptime Charger
Consumer Advocates	Cool the Earth, Consumer Reports, J.D. Power, Plug In America
Fleets	Hertz
Payment Industry Stakeholders	Discover Global Network, Nayax, Noodoe, Payter
Standards Organizations, Technology Alliances	CharIN North America, COVESA, EPRI, Open Charge Alliance, SAE Sustainable Mobility Solutions
Research Organizations and Universities	American Center for Mobility, EPRI, Transportation Energy Institute, University of California, Davis; University of Washington
State Agencies and Policy Firms	California Air Resources Board, California Energy Commission


Executive Advisory Board
Joint Office of Energy and Transportation
DOE Vehicle Technologies Office
State Agencies
Lab Leadership Team
Working Group 1: Defining the Charging Experience
Working Group 2: Reliability/ Usability Triage
Working Group 3: Solutions for Scaling Reliability
Payment & User Interface Task Force
Communication Task Force
Hardware Task Force
Diagnostics Task Force
Testing Methodology Task Force

Operating Model

1. Working Group or Task Force defines focused project, identifies champion, and forms small project team
2. Project team performs work, develops draft product
3. Project team seeks input from Task Force, collects additional data, refines and publishes product
4. Task force implements, demonstrates product, and socializes across consortium
5. Consortium pushes for broad industry implementation

Project Progress Updates

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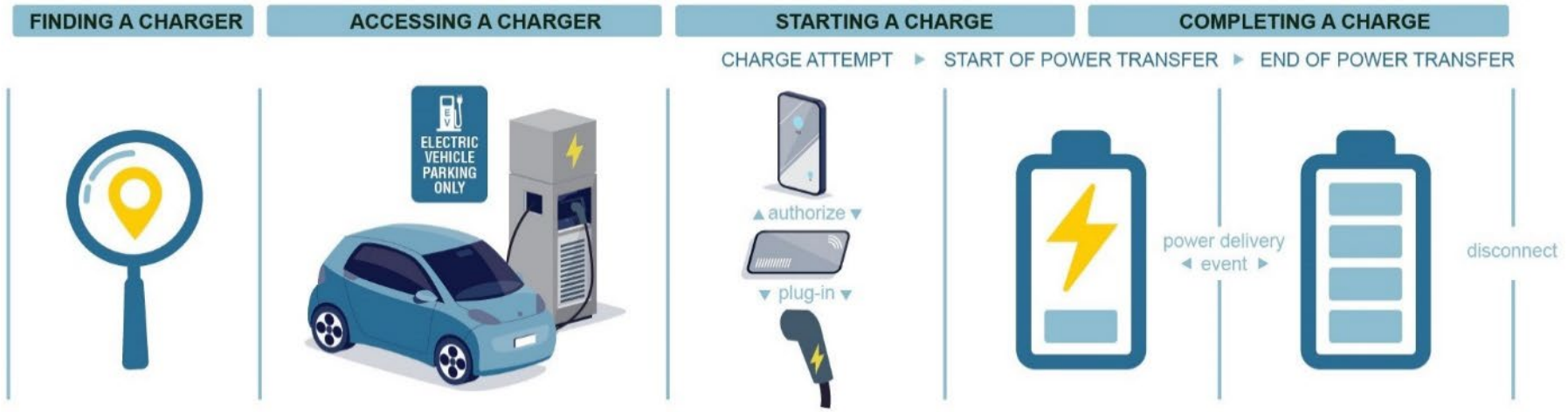
Defining the Charging Experience

WG1
Lead lab: INL

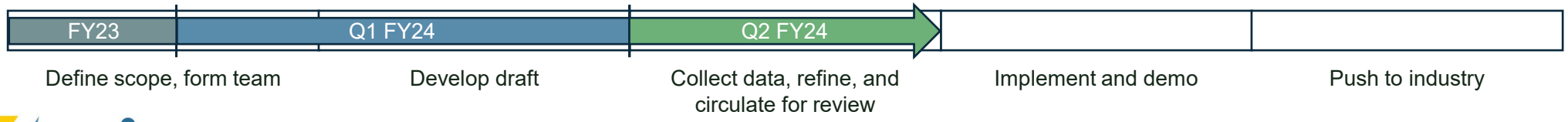
Defined key aspects of the charging experience:



Defining KPIs to measure and improve performance:

Interim set of KPIs (for near-term implementation)

Ideal set of KPIs (require development for long-term implementation)



Payment System Reliability

Working Group 2,
Payment & User Interface
Task Force
Lead Lab: NREL

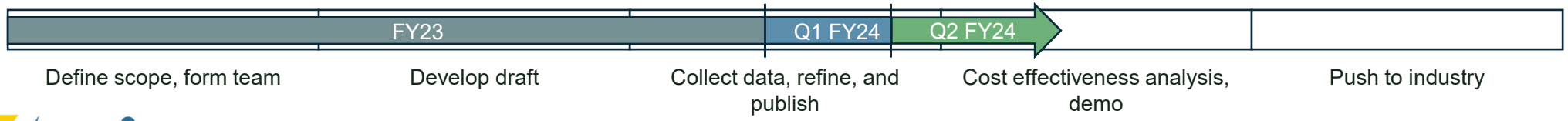
Goal: Document problems and recommend solutions for wide range of payment system issues seen in the field

Progress:

- Published best-practice document 2/29/24
- Industry informing cost effectiveness analysis, ~70% complete

Next Steps:

- Complete cost effectiveness analysis
- Collect data from CSOs to validate and/or demonstrate most cost-effective solution(s)



Adapter Reliability and Safety

Working Group 2,
Hardware Task Force
Lead Lab: NREL

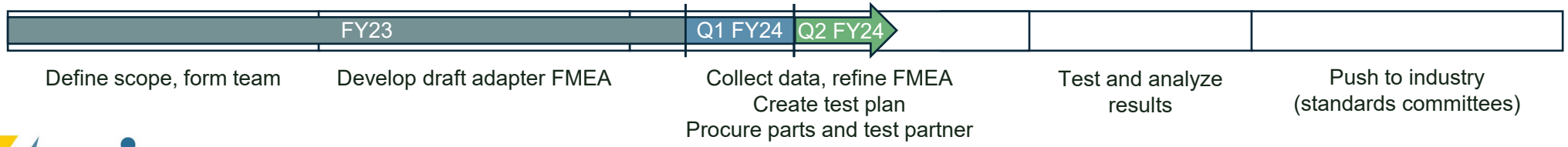
Goal: Ensure performance standards (J3400/1), conformance standards (UL 2252), and industry practices catch all major failure modes

Progress:

- Completed draft FMEA and eval plan for first of three cases:
  - CCS to J3400 rigid; J3400 to CCS rigid; J3400 to J3400 extension cable
- Design of standard reference inlet thermal properties complete
- Broader safety-related failure modes identified

Next steps:

- Failure testing to validate FMEA
  - Pin cap testing identified as a critical failure mode to inlet/connectors, pulled ahead
- Complete reference inlet mechanical design
- Create connector and inlet FMEA, though



Seamless Retry

Working Group 2,
Communications Task Force
Lead Lab: NREL

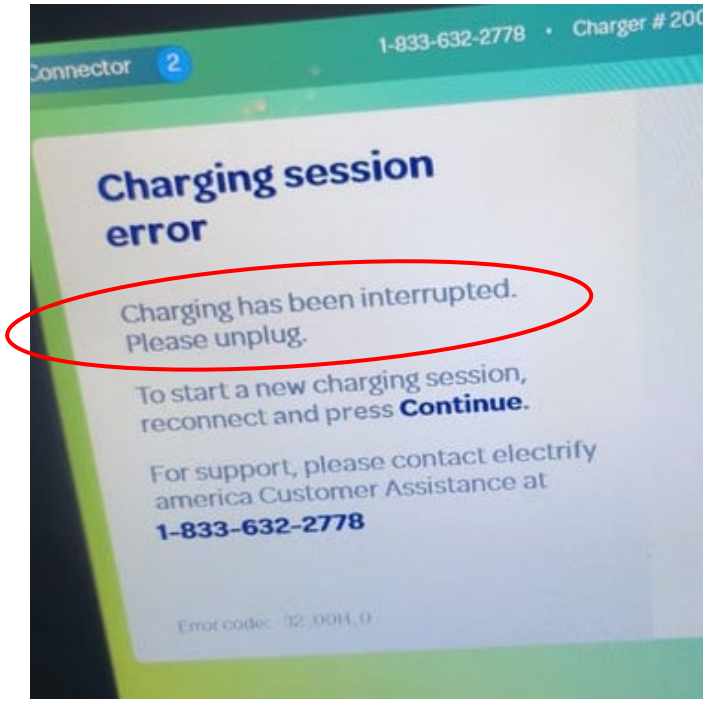
Goal: Institute process to automatically retry session initialization after failure to prevent customer unplug/replug

Progress:

- Gathered feedback on recommend practice document
- Demonstration in CSO's lab

Next Steps:

- Evaluate relevant changes in new std ISO 15118-2, Edition 2
- Complete final version of Seamless Retry document
- Secure commitment for additional demonstrations



Streamlining Timeouts

Working Group 2,
Communications Task Force
Lead Lab: NREL

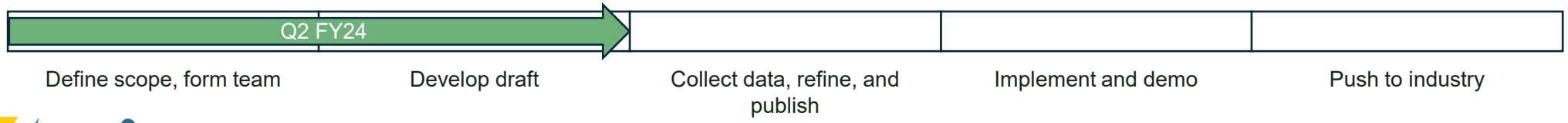
Goal: Identify timeout issues in EV-EVSE communications and document industry best practices

Progress:

- Labs wrote first draft of recommended practice based on industry input and existing standards
- Began review on draft document with industry

Next Steps:

- Share with industry members for full review
- Secure commitment for industry demonstrations
- Define scope and form team for next topic: TBD



Minimum Required Error Codes

Working Group 3, Diagnostics Task Force
Lead Lab: INL

Goal: Institute common set of error codes across industry to accelerate problem resolution

Progress:

- Charger MRECs published, added to EV-ChART guidance
- Preliminary demo conducted at CharIN Testival on 11/28/23
- Implemented in open-source OCPP 1.6J (EVerest project)

Next Steps:

- Full implementation, demonstration
- Work with Accenture, PIONIX to implement EVerest OCPP 2.0.1
- Expand scope to address EV- and roaming-specific MRECs

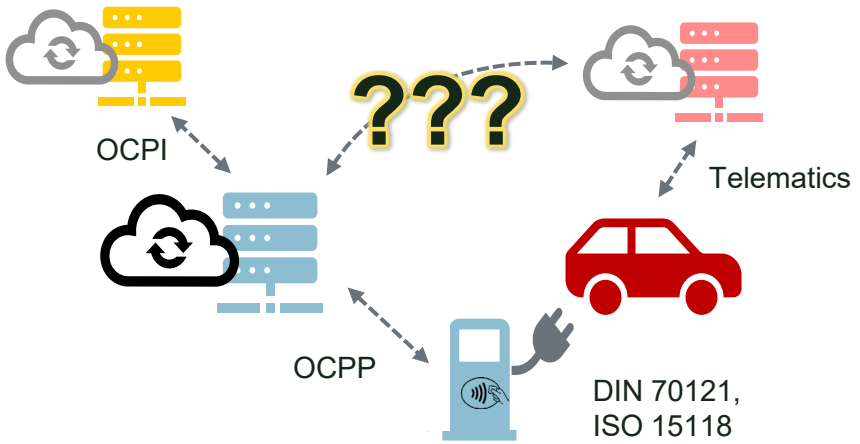
Diagnostic Data Sharing

Working Group 3,
Diagnostics Task Force
Lead Lab: INL

Goal: Develop solution to allow industry to efficiently share diagnostic data between charging and vehicle sides of ecosystem

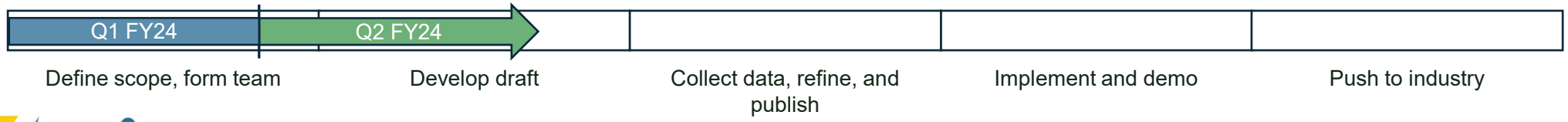
Progress:

- Agreement that increased data sharing needed:
  - EV/EVSE co-identification, MRECs, additional data to determine who is at fault
- Writing data specification, called Minimum Required Diagnostic Information (MRDI)



Next Steps:

- Complete draft MRDI specification, receive industry feedback
- Design short-term pilot, recruit participants



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Interoperability Test Cases

Working Group 3,
Testing Task Force
Lead lab: ANL

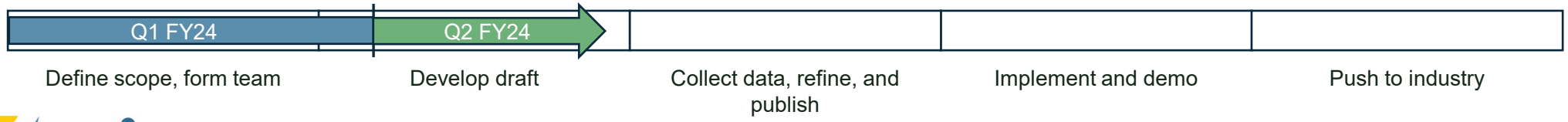
Goal: Develop comprehensive set of interoperability test cases to accelerate EV and charger product development

Progress:

- Completed report on current testing practice
- Defined scope of EV-EVSE Interoperability Test Plan
- Soliciting industry feedback on details
- Wrote SOW for CharIN; subcontracting process underway

Next Steps:

- In-person workshop at ANL
- Complete test plan
- Demonstrate subset of test cases at industry test event



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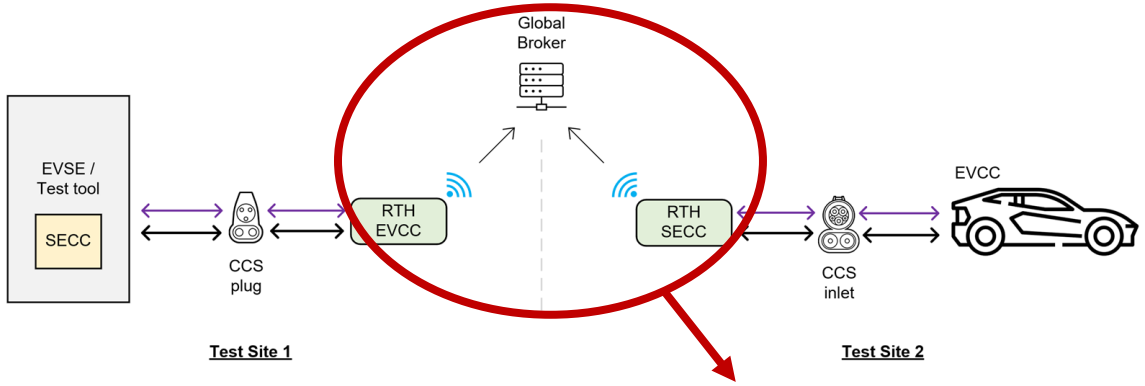
Remote Test Harness

Working Group 3,
Testing Task Force
Lead lab: ANL

Goal: Develop first-of-a-kind testing system to conduct remote interoperability testing with EVs and EVSE at separate locations

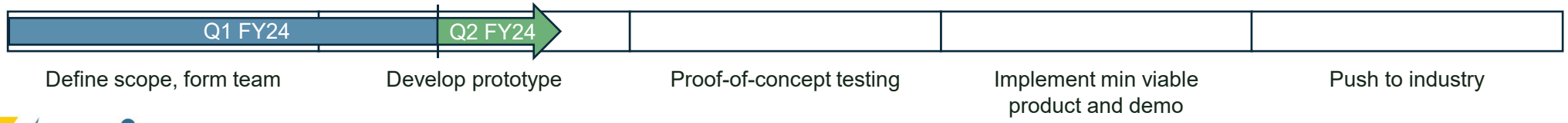
Progress:

- Completed system design specification and feasibility testing
- RTH-to-RTH hardware and software interfaces developed and functional



Next Steps:

- Finish test plan
- Build EV and EVSE interface hardware and software
- Complete proof-of-concept demonstration (for DIN only)
- Recruit industry champions for minimum viable product testing



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