



California
Road Charge

APPENDIX B: **Concept of Operations**



Concept of Operations

Version: 1.1

Version Date: 04/30/2020

Prepared By:



DOCUMENT CONTROL		
File Name:	Task3_ConceptofOperations_FINAL_v1.1_20200430.docx	
Version Number:	1.1	
	Name	Date
Created By:	WSP	April 7, 2020
Reviewed By:	Caltrans review of v1.0	April 16, 2020
Modified By:	WSP – Updates based on Caltrans review of v1.0 – Revised v1.1	April 21, 2020
Approved By:	Caltrans	April 30, 2020

TABLE OF CONTENTS

Acronyms and Terms	7
1. Scope.....	9
1.1 Document Purpose	9
1.2 Project Scope.....	10
1.3 Schedule	11
2. Referenced Documents.....	12
3. Background.....	13
3.1 The Rationale for Road Charge.....	13
3.2 CA Transportation Funding and Road Charge History.....	13
3.3 Common Themes and Issues in Road Charge.....	16
4. User-Oriented Operational Description.....	19
4.1 Primary Stakeholders.....	19
4.1.1 Participants	19
4.1.2 California Department of Transportation (Caltrans).....	19
4.1.3 System Administrators.....	19
4.1.4 Business Partners	20
4.2 Secondary Stakeholders.....	21
4.2.1 California State Transportation Agency	21
4.2.2 California Road Charge Technical Advisory Committee.....	22
4.2.3 California Transportation Commission.....	22
4.2.4 Federal Highway Administration (FHWA).....	22
4.3 Tertiary Stakeholders.....	22
5. Operational Needs	24
5.1 System Needs.....	24
5.1.1 Flexible	24
5.1.2 Accurate.....	24
5.1.3 Reliable.....	25
5.1.4 Secure.....	25
5.1.5 Efficient.....	26
5.1.6 Scalable.....	26
5.2 State Needs	27
5.2.1 Public Outreach and Education	27
5.2.2 Cost Effective to Administer and Manage.....	27

5.2.3	Collaboration to Improve Cost Effectiveness and Public Acceptance	27
5.2.4	Enforceable	27
5.2.5	Auditable.....	27
5.3	Participant Needs.....	28
5.3.1	Understandable	28
5.3.2	Easy to Use	28
5.3.3	Offers Choice.....	29
5.3.4	Transparent.....	29
5.4	Business Partner Needs	29
5.4.1	Easily Integrated with Existing Systems.....	30
5.4.2	Non-intrusive to current operations.....	30
5.4.3	Improved Collaboration with the State.....	30
5.4.4	Market-Driven.....	30
5.5	FHWA STSFA Program Requirements.....	30
6.	Vision and Goals.....	32
6.1	Overarching Road Charge Demonstration Vision and Goals.....	32
6.2	Technology Phase Vision and Goals	32
6.2.1	Phase 1: Pay-at-the-Pump / Charge Point Vision and Goals.....	33
6.2.2	Phase 2: Usage-Based Insurance Vision and Goals.....	33
6.2.3	Phase 3: Transportation Network Company Vision and Goals.....	33
6.2.4	Phase 4: Autonomous Vehicle Vision and Goals.....	33
7.	The Demonstration Concept.....	34
7.1	Phase 1: Pay-at-the-Pump / Charge Point.....	37
7.2	Phase 2: Usage-Based Insurance	38
7.3	Phase 3: Transportation Network Companies.....	39
7.4	Phase 4: Autonomous Vehicles.....	40
8.	Operational Environment.....	41
8.1	Facilities.....	41
8.2	Demonstration Equipment.....	41
8.3	Computing Platforms.....	41
9.	Support Environment	43
9.1	Staff.....	43
9.2	Outreach and Education.....	43
9.3	Supporting Policies and Agreements.....	44
9.4	Testing.....	45

9.4.1	Certification Test Plan	45
9.4.2	Testing Phases	45
9.5	Customer Service.....	47
9.6	Surveys and Focus Groups.....	47
10.	Operational Scenarios	48
10.1	Interested Parties and Demonstration Enrollment.....	48
10.2	Phase 1: Pay-at the-Pump / Charge Point (PATP/CP)	49
10.2.1	Participant.....	49
10.2.2	PATP/CP Business Partner.....	50
10.2.3	Caltrans.....	51
10.2.4	System Administrator	52
10.3	Phase 2: Usage-Based Insurance	53
10.3.1	Participant.....	53
10.3.2	UBI Business Partner.....	54
10.3.3	Caltrans.....	56
10.3.4	System Administrator	57
10.4	Phase 3: Transportation Network Companies.....	58
10.4.1	Participant.....	58
10.4.2	TNC Business Partner	59
10.4.3	Caltrans.....	60
10.4.4	System Administrator	61
10.5	Phase 4: Autonomous Vehicles.....	62
10.5.1	Participant.....	62
10.5.2	AV Business Partner	63
10.5.3	Caltrans.....	64
10.5.4	System Administrator	65
11.	Failure Scenarios	66
11.1	Participant Enrollment Failures.....	66
11.2	Phase 1 (PATP/CP) Failures.....	66
11.3	Phase 2 (UBI) Failures.....	67
11.4	Phase 3 (TNC) Failures.....	68
11.5	Phase 4 (AV) Failures.....	69
11.6	Support System Failures.....	69

List of Figures

Figure 1: Systems Engineering V-Diagram	10
Figure 2: Project Schedule	11
Figure 3: California Road Charge Demonstration Functional Architecture Diagram.....	34
Figure 4: PATP/CP Demonstration Phase Flow.....	37
Figure 5: UBI Demonstration Phase Flow.....	38
Figure 6: TNC Demonstration Phase Flow	39
Figure 7: AV Demonstration Phase Flow.....	40

Acronyms and Terms

Acronym / Term	Definition
ADAS	Advanced Driver Assistive Systems
AES	Advanced Encryption Standard
AV	Autonomous Vehicle
CA	California
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CAN	Computer Area Network
CCPA	California's Consumer Privacy Act
ConOps	Concept of Operations
CP	Charge Point
CTC	California Transportation Commission
CTIP	California Transportation Infrastructure Priorities
DPAC	Division of Procurement and Contracts
EPA	Environmental Protection Agency
EV	Electric Vehicle
FAQ	Frequently Asked Question
FAST	Fixing America's Surface Transportation
FHWA	Federal Highway Administration
FY	Fiscal Year
ICD	Interface Control Document
ISO	International Organization for Standardization
IT	Information Technology
ITS	Intelligent Transportation Systems
MPG	Miles per Gallon
NIST	National Institute of Standards and Technology
OBD-II	On-Board Diagnostic
PATP	Pay at the Pump
PAYD	Pay-As-You-Drive
PCI-DSS	Payment Card Industry Data Security Standards
PII	Personally Identifiable Information
PRIME	Platform for Road charge Innovation and Mobility Evolution
RCPP	Road Charge Pilot Program
RTM	Requirements Traceability Matrix
RUC	Road Use Charge
SAEVs	Shared, Automated, Electric Vehicles
SB	Senate Bill
SEMP	Systems Engineering Management Plan
SEP	Systems Engineering Planning

Acronym / Term	Definition
SLA	Service Level Agreement
SP	Special Publication
STSFA	Surface Transportation System Funding Alternatives
TAC	Technical Advisory Committee
TNC	Transportation Network Company
UBI	Usage-Based Insurance
VIN	Vehicle Identification Number
VMT	Vehicle Miles Traveled
WASHTO	Western Association of State Highway Transportation Officials

1. SCOPE

1.1 Document Purpose

This Concept of Operations (ConOps) document provides a high-level overview of the California Road Charge Demonstration. The ConOps is one of the key Systems Engineering Planning (SEP) deliverables, identified in the California Road Charge Demonstration Project System Engineering Management Plan (SEMP). In the systems engineering process (See Figure 1: Systems Engineering V-Diagram), the ConOps is the first step of the demonstration development process and sets the basis for developing the demonstrations requirements. Among other items, this ConOps will provide the following:

- Demonstration vision, goals, and objectives
- Concept need, including related issues and needs that the demonstration concept must address
- An understanding of the recommended concept
- Stakeholder-oriented scenarios that builds the base details of the demonstration concept

This ConOps also acts as the springboard for future planning, development and implementation activities and supports the understanding of these activities. Thus, the ConOps is written in a non-technical manner to enable all potential stakeholders, including the California Department of Transportation (Caltrans), its partners, and other stakeholders directly and indirectly involved in the demonstration to understand the rationale for the demonstration and the expected activities that will occur. The ConOps feeds into future system engineering activities, including system requirements and high-level design, and in doing so builds quality into these activities and ultimately the demonstration itself.

As the primary stakeholder-oriented document, the ConOps provides stakeholders with a clear plan from which they can collaborate, exchange ideas, provide feedback, and ultimately gain consensus on how to proceed with demonstrating the road charge concept in California. Thus, the ConOps focuses on clarifying stakeholder roles, responsibilities, and project phases so there is common understanding on how to design the demonstration and aligns with stakeholder needs and identified issues.

Phase -1	Phase 0	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Interfacing with Planning and the Regional Architecture	Concept Exploration and Benefits Analysis	Project Planning and Concept of Operations Development	System Definition and Design	System Development and Implementation	Validation, Operations and Maintenance, Changes & Upgrades	System Retirement / Replacement

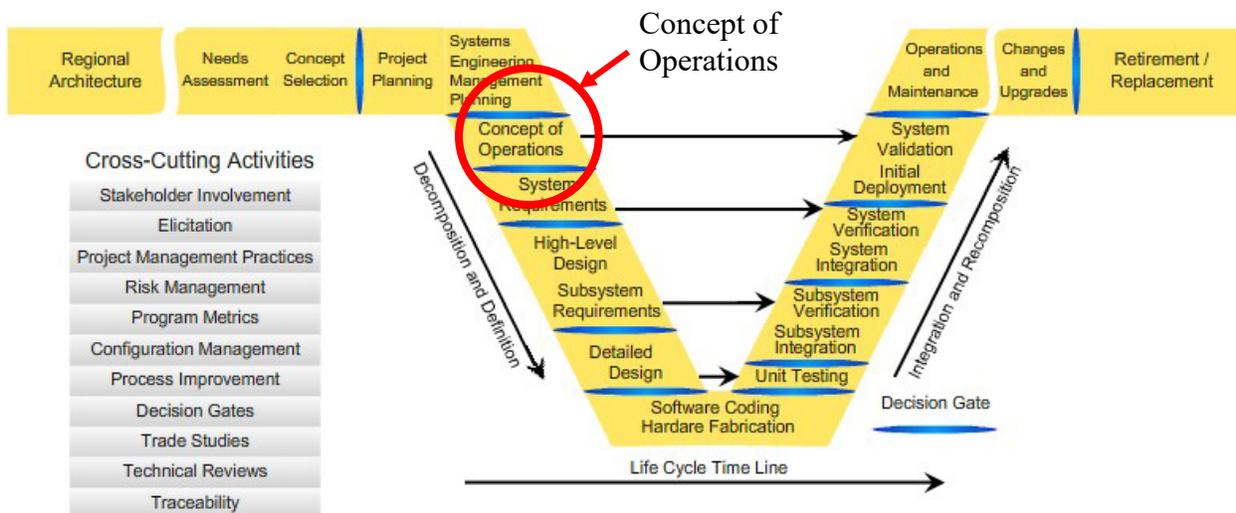


Figure 1: Systems Engineering V-Diagram

The ConOps is not intended to be a design document but rather address high-level questions associated with the demonstration that need to be answered prior to concept design and implementation. To this end, the ConOps represents the transitional step that occurs between the time the concept is proposed and the time when it is formally designed/demonstrated. The ConOps begins to answer the questions of who, what, where, why, and how for the road charge demonstration concept. Because the ConOps acts as the transitional step between concept exploration and concept design, it is important that the high-level characteristics and institutional understanding of the demonstration system are specified and that related details are communicated to all stakeholders potentially impacted by its implementation.

Because the concept of a road charge is relatively new in California and because the demonstration calls for several new approaches to revenue collection, there will undoubtedly be many uncertainties surrounding these concepts that may not be answered during the time in which this ConOps is authored. Given this and because project direction may evolve given the number of unique stakeholders and their needs, this document should be considered a living document until time which the demonstration concept is formally designed.

1.2 Project Scope

Caltrans is pursuing a systematic approach to the issue of transportation revenue generation by enhancing the state’s existing Road Charge Pilot Program (RCPP). Caltrans plans to implement a phased demonstration in accordance with the Fixing America’s Surface Transportation (FAST) Act, Surface Transportation System Funding Alternatives (STSFA) grant program. The demonstration includes the following phases:



Figure 2: Project Schedule

1. Pay-at-the-Pump/Charge Point (PATP/CP):

Demonstrate the technological device/point of sale options available for a pay-at-the-pump/charge point road charge model in a geographically constrained demonstration area.

2. Usage-Based Insurance (UBI): Demonstrate how auto insurance companies could provide road charge account management services using existing usage-based insurance platforms and accounts.

3. Transportation Network Companies (TNCs): Demonstrate the viability of collecting a road charge using technologies already incorporated into real-time ridesharing vehicles and applications by TNC (e.g. companies like Lyft).

4. Autonomous Vehicles (AVs): Demonstrate the ability to collect vehicle and occupancy data from AVs for road charge purposes and identify road charge opportunities that stem from AV usage on California roadways.

To support the demonstration and continued evolution of a road charge in California, communications, risk management, business case and revenue model development, evaluation, and reporting activities will occur throughout the project.

1.3 Schedule

The demonstration will occur in four phases over a 6-month period from January 2021 through July 2021. The first phase (PATP/CP) will begin on approximately January 1, 2021. Each subsequent phase is scheduled to begin approximately one month after each other, with the last phase beginning on April 1, 2021, with all phases completing by June 30, 2021. The project schedule showing estimated start and finish of demonstration phases is shown in Figure 2: Project Schedule.

Prior to demonstration launch, a two-week dry run will be conducted to run a final acceptance test and resolve any unexpected issues. Following the demonstration, results will be compiled and submitted in late 2021. The results will then be evaluated over the following 6 months (from October 2021 to March 2022).

2. REFERENCED DOCUMENTS

This ConOps was developed through holding several meetings with demonstration stakeholders and business partners and by reviewing key reference documents (listed below). These documents provide the history of road charge in California and context into how road charge efforts in California have evolved over the course of several years. Reference documents include:

- California Road Charge Demonstration – Functional Architecture, 2020
- California Road Charge Phased Demonstration White Paper, 2019
- California Road Charge Demonstration – Technical and Operational Environment and Scenarios Memorandum v1.0, 2020
- California Road Charge Demonstration – Systems Engineering Management Plan (SEMP, v1.0, 2020
- California Road Charge Pilot Program, Final Report, Senate Bill 1077, 2017
- California Road Charge Pilot Program Business Rules
- California Road Charge Pilot Program System Requirements Specifications
- Enhancing the California Road Charge Pilot Program: Pay-at-the-Pump/Charge Point Approach, Concept of Operations, Final Report, September 2018
- Systems Engineering Guidebook for ITS – Version 3.0, FHWA, 2009. (<http://www.fhwa.dot.gov/cadiv/segb/>)

3. BACKGROUND

Pursuant to Senate Bill (SB) 1077 (Chapter 835, 2014), California conducted a road charge pilot program to explore a road charge model as an alternative funding source to the existing fuels tax. To leverage road charge efforts, explore facets of the program that are not currently prescribed in SB-1077, and potentially expand the scope of the pilot, Caltrans is pursuing a systematic approach to the issue of transportation revenue generation to enhance the state’s existing RCPP with the goal of implementing a multi-year demonstration beginning FY 2019 in accordance with the STSFA Program.

3.1 The Rationale for Road Charge

In California, most of the funding for the operation and maintenance of the State’s transportation infrastructure is generated by gasoline and diesel fuel taxes (i.e. fuel taxes). Although fuel taxes, and thus transportation funding, have historically been eroded by inflation and increasing vehicle fuel efficiency, the rise of electric vehicles, the emergence of shared mobility services, and the establishment of policy goals to reduce vehicle miles traveled (VMT) has further diminished the viability of the fuels tax to serve as a long-term revenue source for California’s transportation network. While the Road Repair and Accountability Act of 2017 (Senate Bill 1) adjusted the State’s fuels tax for the first time since 1994 and tied future fuels tax increases to inflation to delay the expected funding shortage by a decade, California must explore alternative funding mechanisms to replace fuel taxes and maintain the State’s transportation system.

3.2 CA Transportation Funding and Road Charge History

California has been exploring road charge as a potential alternative funding source for the transportation network since 2013. Below, relevant events are presented chronologically.

2013 – 2015

In 2013, three events occurred that catalyzed California’s road charge activity.

First, in spring 2013, State of California representatives visited Oregon to learn more about road charge. On the trip, Caltrans representatives and the California Division of the Federal Highway Administration attended presentations by Oregon Department of Transportation personnel to share their studies on distance-based road charging including background research, policy development, the results of two pilot tests conducted from 2006 to 2007 and 2012 to 2013, and plans for permanent road charge legislation and implementation. The California representatives shared this information with leadership which led to the beginning of the California Transportation Infrastructure Priorities process.

Second, later in Fall 2013, California attended a special meeting of the Western Association of State Highway Transportation Officials (WASHTO) in which road charge was discussed. The States of Oregon and Washington presented their work on road charge and announced the creation of the Western Road Usage Charge Consortium (“WRUCC”), later renamed to “RUC West.” In Fall 2013, Caltrans joined RUC West.¹

Third, in late 2013, the California State Transportation Agency (CalSTA) assembled the California Transportation Infrastructure Priorities (CTIP) Workgroup to analyze California’s transportation

¹ <https://www.rucwest.org/about/state-progress/>

system and identify future challenges.² In early 2014, CTIP formed a road charge subgroup to discuss road charge.³ The subgroup met throughout 2014 and concluded that declining fuels tax revenues would not be a sustainable source of funding to maintain California's transportation network, identified road charge as a potential funding solution, and recommended exploring a road charge demonstration.⁴

In 2014, The California State Legislature passed SB-1077 which authorized a road charge study.⁵ SB-1077 required the Chair of the California Transportation Commission (CTC) to consult with the Secretary of CalSTA to create a Road Usage Charge Technical Advisory Committee (TAC) to study road charge alternatives to the fuels tax and provide recommendation to the Secretary on the design and evaluation criteria of a road charge pilot by January 1, 2017.⁶

In 2015, the TAC held monthly public meetings to discuss the design and implementation of a potential road charge pilot.⁷ These meetings culminated in the presentation of the RCPP Design Recommendations Report to CalSTA Secretary in late 2015.⁸ The report recommended the pilot achieve the following:

- 5,000 statewide participants that include a diverse group of individuals, households, businesses, and at least one government agency.
- A representative cross-section of vehicle types that reflect the vehicles currently using California's road network.
- Provide drivers the option of manual or automated mileage recording methods, in which at least one method does not require electronic reporting, through multiple business partners to test and evaluate various road charging mileage reporting methods.
- Protect privacy and data security through developing governance, accountability, and legal protections.

2016 - 2017

In 2016, California launched the RCPP based on the RCPP Design Recommendations Report.⁹ The pilot was designed to recruit 5,000 people to report vehicle miles traveled, participate in a simulated road charge payment, and provide feedback on the experience of participating in the pilot. The pilot was implemented by contracting with third party vendors to provide road charge services and technology so that participants could manually or automatically report their vehicle miles traveled during the required time period. Independent evaluators were also engaged to collect

²<https://calsta.ca.gov/-/media/calsta-media/documents/f0005372-docs-pdfs-2015-agency-ctip-rcwwhitepaper01122015.pdf>

³<https://calsta.ca.gov/-/media/calsta-media/documents/f0005372-docs-pdfs-2015-agency-ctip-rcwwhitepaper01122015.pdf>

⁴<https://calsta.ca.gov/-/media/calsta-media/documents/f0005372-docs-pdfs-2015-agency-ctip-rcwwhitepaper01122015.pdf>

⁵ <https://dot.ca.gov/programs/road-charge/legislation>

⁶ <https://catc.ca.gov/committees/road-charge/>

⁷ <https://dot.ca.gov/programs/road-charge/meetings>

⁸ <https://catc.ca.gov/-/media/ctc-media/documents/ctc-reports/other-reports/201512-road-charge-pilot-design-recc-al1y.pdf>

⁹ <https://caroadcharge.com/en-us/About/Road-Charge>

and analyze experiential data from the participants through surveys and focus groups. The pilot program concluded in March 2017 and the final report was published in December 2017.¹⁰

Ultimately, the pilot included 5,129 vehicles with 4,000 reporting data. 87% of vehicles were privately owned and registered in California, 7% were agency vehicles and out of state vehicles, 5% were light commercial vehicles, and 1% were heavy commercial vehicles. 79% of participants used the automated mileage reporting options while 62% used location-based reporting options. The RCPP was evaluated using the TAC's 8 goals:

- Revenue: Ability of road charge to serve as a suitable replacement revenue source for fuel taxes.
- Cost: Costs associated with administering and collecting road usage charges, both from a participant perspective and from an agency perspective.
- Operations: How well road charge collections operate, both from customer and agency perspectives.
- Participant Experience: How participants interface with the road charge system.
- Privacy: Privacy protection measures built into the RCPP.
- Data Security: Security of participant data collected, transmitted, stored, and used in the RCPP.
- Equity: Equity, perceived and real, along several dimensions.
- Communications: Communications with the RCPP participants and the public.

Simultaneously, throughout 2016 the California State Legislature worked to pass SB-1 in January 2017.¹¹ SB-1 acknowledged the transportation system's challenges and established the Road Maintenance and Rehabilitation Program to prioritize investments in roadway maintenance through funds provided by fuels tax increases tied to inflation and vehicle registration fees for electric and non-electric vehicles.

2018 – Present

To build on the RCPP, Caltrans applied for and was awarded an STSFA grant by the Federal Highway Administration (FHWA).¹² FHWA's STSFA program was created in December 2015 as part of the FAST Act to identify user-based revenue sources to secure the Highway Trust Fund.¹³ The STSFA program made available \$95M in federal grant dollars over a five-year period for states or groups of states to research road charge programs by testing designs, measuring public acceptance, studying project implementations, improving system functionality, conducting outreach to gather and provide information and ultimately providing recommendations regarding adoption, implementation, and minimizing administrative costs. The STSFA grant is, in part, funding the design of the current California Road Charge Demonstration.

¹⁰ <https://dot.ca.gov/programs/road-charge/final-report/full-final-report>

¹¹ <http://rebuildingca.ca.gov/>

¹² <https://www.fhwa.dot.gov/pressroom/fhwa1902.cfm>

¹³ <https://www.fhwa.dot.gov/fastact/factsheets/surfransfundaltfs.cfm>

3.3 Common Themes and Issues in Road Charge

Common themes and issues associated with road charge pilots, as well as considerations for the State of California, are presented below.

Privacy and Data

Road charge pilots must prove to stakeholders that any data collected during the demonstration, especially personally identifiable information (PII), is both protected from cybersecurity threats and the tracking of an individual by the government or a third-party vendor. Previous road charge pilots have identified methods, questions, and standards that should be defined to prove data are secure. Additionally, with California’s Consumer Privacy Act (CCPA) taking effect,¹⁴ the road charge demonstration will have to navigate regulations required of third-party vendors to comply with the CCPA.

Administrative Costs

In general, the fuels tax has low administrative costs and is efficient to collect due to the straightforward collection process:

1. Fuel taxes are assessed and collected from licensed fuel distributors.
2. Licensed fuel distributors purchase fuel from a manufacturer.
3. Fuel distributors distribute the fuel to local gas stations.
4. Drivers purchase fuel from local gas stations and reimburse distributors as the fuels tax is passed through the value chain.

This process has the advantages of having relatively few accounts to collect and, as a result, higher compliance.

Unlike the fuels tax, road charge requires more complex processes for assessment and collection which could lead to higher administrative costs relative to the fuels tax:

1. The State would have to collect the required road charge information on each vehicle, increasing the number of accounts that would have to be managed.
2. Typically, road charge requires in-vehicle technologies to record and report mileage traveled for each vehicle. This equipment would have to be provided for each vehicle. Additionally, data would have to be transmitted from vehicles to the collecting agency for processing, auditing, assessment, and collection, which would require the installation of communications technologies between vehicles and the agency.

Given these complexities, governments are exploring the ability of assessing and collecting road charges from private sector organizations to reduce the number of accounts that must be managed, to imitate the advantages of the fuels tax assessment and collection operations.

Enforcement and Compliance

While the fuels tax is easy to enforce given that it is paid by fuel distributors and thus requires enforcing a relatively low number of accounts, enforcing compliance for road charge is more complex which raises concerns of people avoiding a road charge and in turn reducing tax collection efficiency. Further increasing the complexities is that different road charge assessment and

¹⁴ <https://oag.ca.gov/privacy/ccpa>

collection methods are likely to have differing costs and compliance rates. Governments evaluating road charge are exploring the role of the private sector in enforcement and compliance to increase compliance and minimize costs.

Equity

As with any new policy proposal, equity issues must be explored, defined, and addressed to ensure fairness in how each policy affects both individuals and greater populations. Previous road charge studies identified equity issues around electric and hybrid vehicle ownership and urban and rural taxation rates.

Currently, people who use electric or hybrid vehicles pay less or nothing in fuel taxes given their decreased fuel consumption. Given that road charge is likely to increase the costs associated with driving for those who have purchased electric and hybrid vehicles, individuals who have purchased such vehicles are likely to feel a road charge system is unfair. In California, it is possible individuals feel they have been taxed twice given the required electric vehicle registration surcharges.

In previous demonstrations and raised by the TAC, there is concern of the equity implications a road charge would have relative to people who drive in rural areas as compared to people who drive in urban areas. The concern is that people who live in rural areas must drive farther per trip given the area they live in and thus a road charge burdens them unfairly relative to urban drivers who drive shorter distances per trip or have the options to use another transportation mode (e.g. public transit) to avoid the fuels tax altogether (and therefore a road charge).

Furthermore, as with any service that requires the collection of PII or a high degree of tech literacy, there are concerns for individuals who could be affected by the intentional or unintentional release of PII (e.g. undocumented citizens) as well as concerns with tech literacy and reporting (i.e. are people who are uncomfortable with technology burdened to a greater extent than those who are comfortable with technology?).

Scaling with Emerging Technologies and Services

While the fuels tax assessment and collection process leverages established stakeholders, technologies and services, the stakeholders, technologies, and services in road charge operations are currently under development. There are concerns about the scalability of road charge given these models are still being developed alongside a process that requires significant participation and active involvement from stakeholders and end-users. Road charge will not be successful unless the person driving is not required to do too much in the collection process in a similar way to how little is required of drivers for the fuels tax collection process other than purchasing fuel for their vehicle.

SB-1077 Requirements

In addition to these common issues, SB-1077 requires CalSTA to address the following topics in road charge demonstrations:¹⁵

- Privacy Protection

¹⁵ <https://dot.ca.gov/programs/road-charge/legislation>

- Data Security
- Jurisdictional Issues
- Compliance and Enforcement
- Potential for Additional Driver Services
- Cost Effectiveness
- Use of Revenues
- User Acceptance
- Implementation Issues

A discussion on each topic and SB-1077 requirements is provided in the California Road Charge Pilot Program Final Report.¹⁶

¹⁶ <https://dot.ca.gov/programs/road-charge/final-report/full-final-report>

4. USER-ORIENTED OPERATIONAL DESCRIPTION

Stakeholders that have a role or responsibility for the demonstration are identified and described in terms of their expected involvement.

4.1 Primary Stakeholders

4.1.1 Participants

Participants are individuals who participate in the demonstration either by owning a vehicle used in the demonstration, or by being an active customer of the business partners participating in the four demonstration phases. Participants may consist of existing business partner customers or be recruited to participate in the demonstration based on their interest in road charge.

To participate in the road charge demonstration, participants will create an account with a business partner (if required) using the same registration process that business partners currently use for their existing customers. Participants will access business partner systems, engage in services, and review simulated road charges. Participants may also be asked to support the demonstration by completing online surveys or attending focus groups to provide feedback on their experience with the business partners, or their overall attitudes towards road charge.

4.1.2 California Department of Transportation (Caltrans)

Caltrans funds transportation programs and develops transportation policies throughout the State of California. As the lead agency responsible for the success of the program, Caltrans is driving the overarching vision, goals, and objectives of the road charge concept. Caltrans is also ultimately responsible for the success of the demonstration through overseeing and guiding every facet of the demonstration design, development, implementation, operations, and evaluation. Caltrans also serves as the primary liaison for legislators, other state agencies, the road charge TAC, and the FHWA.

During the demonstration, Caltrans will be communicating status of the demonstration, reviewing financial reports from simulated road charges, and overseeing activities. Caltrans may also provide staff to participate in the demonstration. Caltrans will also review demonstration data, provide insight to and conduct road charge data analytics, support demonstration evaluation activities, and provide guidance to demonstration team members on how to improve demonstration operations, customer support, and communications.

4.1.3 System Administrators

System administrators are those actively managing and administering the system and demonstration. They will oversee the integration and administration of any technology systems, establish technical interfaces, conduct data queries on demonstration data, and provide expertise on how road charge technology systems may need to access State of California owned systems and technologies. A subset of the system administrators is the demonstration technical team, who will provide support and oversight for all technical design, development, testing, and operations aspects of the demonstration.

4.1.4 Business Partners

Business partners provide hardware, systems, technologies, and services to operate the demonstration. They will provide data collection technologies and mechanisms to participants, support the establishment, maintenance, and closeout of participant accounts, calculate road charge transactions, support the collection of simulated road charges, and perform customer service activities as needed. The business partners will also collect, aggregate, sanitize, retain, and transfer demonstration data to demonstration data repositories and other associated systems for further analysis and reporting. There are four business partners needed for the demonstration, presented below.

Pay-at-the-Pump / Charge Point Business Partner

Phase 1 of the demonstration will involve demonstrating how to collect, assess, and report road charge conveniently as possible to the participant, through fueling pumps and electric vehicle charge points. The Pay at the Pump/Charge Point (PATP/CP) Business Partner will provide the technology and services needed to collect, calculate, assess, and report road charge through fuel pumps and electric vehicle charge points. They will provide the hardware necessary to collect vehicle and travel information and transmit that information to an associated fueling station or charge point. They will also provide systems to support the calculation of the theoretical road charge through calculating the number of miles captured from the vehicle multiplied by a pre-established per-mile rate and crediting any state motor fuel taxes. The business partner will provide a means to present to the participant the simulated road charges owed, in real-time, and support simulated payment of road charge through an app or other means. The business partner will provide account management and customer service to the participants, Caltrans, systems administrators, and other stakeholders through providing customer service portals, reports, and performance metrics. The PATP/CP Business Partner may also support other facets of the demonstration including evaluation, revenue and cost forecasting, and stakeholder communications.

Usage-Based Insurance Business Partner

Phase 2 of the demonstration will involve demonstrating how to effectively and efficiently collect road charge through an existing Usage-Based Insurance (UBI) platform. The objective is to evaluate how road charge could be integrated with other existing transportation services and payment platforms. The UBI Business Partner will provide the technology and services needed to collect, calculate, assess, and report road charges through a Pay-As-You-Drive (PAYD) insurance platform. This will include providing a means to periodically report mileage traveled by a participant's vehicle, calculating the assessed road charge, crediting any state motor fuel taxes based on fuel consumed to travel those associated miles, and providing reports to participants and Caltrans based on the simulated road charges assessed. The UBI Business Partner may also support evaluation activities, customer service, revenue forecasts, and communications with participants or other stakeholders.

Transportation Network Company Business Partner

Given the recent surge in rideshare and ride hail services and the impact that transportation network company (TNC) fleets are having on vehicle ownership models, traffic congestion, and road use, Phase 3 of the demonstration will involve evaluating how a road charge could be assessed through an existing TNC provider. The TNC Business Partner will provide the fleet vehicles, outfitted with

required technology, systems, and services needed to demonstrate how a road charge could be assessed and collected through a TNC business partner. They will support ride hail scheduling with participants, collect mileage and related trip data from fleet vehicles, calculate the simulated road charges, report on the assessed simulated road charges, and provide a means for participants to see how much in a theoretical road charge they would have paid. As with other business partners, the TNC business partner may also support evaluation activities, customer service, revenue forecasts, and communications with participants or other stakeholders.

Autonomous Vehicle Business Partner

AVs are creating a considerable disruption in how users engage transportation. AV technologies are expected to ultimately remove the “human factor” from driving; thus, providing improved safety, reduced traffic congestion, and overall improved user experiences and productivity. It is also expected that AVs will ultimately be all electric, requiring no fossil fuel purchases or any paid motor fuel taxes. AVs could support an even greater surge in rideshare and ride hail services, where TNCs could create a fleet of Shared, Automated, Electric Vehicles (SAEVs) that operate continuously. Given these considerations, Phase 4 of the demonstration will focus on how to effectively and accurately collect road charge data using embedded telematics systems within an AV. The AV Business Partner will provide the AV, outfitted with the technology needed to collect and transmit road charge related data. Transaction processing, road charge calculation, reporting, simulated payment, and any other activities will be performed by the TNC Business Partner, further supporting the expectation that AVs will be primarily owned by rideshare or ride hail fleet providers.

4.2 Secondary Stakeholders

While this ConOps is primarily intended for primary stakeholders who will use, own, operate, and administer the demonstration, there are several secondary entities who may be affected by the demonstration. The interests and needs of these secondary stakeholders may feed the development of the demonstration. These are stakeholders that may have an indirect interest in the demonstration but will not provide direct guidance into how the demonstration is designed, procured, operated, or administered.

4.2.1 California State Transportation Agency

The California State Transportation Agency (CalSTA) is a cabinet-level agency focused on transportation related initiatives in the state. CalSTA oversees the operations of several transportation-related entities in California including the Department of Transportation and Department of Motor Vehicles. As established in SB-1077, CalSTA is also responsible for studying road charge alternatives, gathering public comment on road charge, and making road charge recommendations. CalSTA will continue to engage in the road charge program to set the program’s direction and will work with the CTC and Caltrans to advance road charge activities. The demonstration’s findings will be reported to CalSTA, the CTC, and the legislature whose support will be crucial for the governor and the Legislature to continue developing road charge strategies.

4.2.2 California Road Charge Technical Advisory Committee

The California Road Charge Technical Advisory Committee (TAC) is a fifteen-member committee that examines alternatives to the fuels tax. While not directly involved in the road charge demonstration, the TAC will be highly interested in the demonstration findings and how they may play a role in shaping how road charge could be deployed throughout California. The TAC holds quarterly meetings, and Caltrans provides updates during those meetings as to the status of the demonstration. The TAC may also support the research elements of the demonstration, providing subject matter expertise relative to revenue forecasting, social equity, technology performance, and protection of participant privacy. The TAC may also review the demonstration evaluation results and provide additional recommendations to CalSTA on the overall performance of the demonstration and how the technologies, processes, and operations used for the demonstration could be applied to a larger statewide road charge program.

4.2.3 California Transportation Commission

The California Transportation Commission (CTC) is responsible for programming and allocating funds for the construction of highway, passenger rail, transit, and active transportation improvements throughout California. The CTC also advises and assists the Secretary of the CalSTA and the Legislature in formulating and evaluating state policies and plans for California's transportation programs. As such, they have a vested interest in how migrating to a road charge could affect future transportation funding initiatives and an interest in the success of the demonstration. Also, several CTC members sit on the road charge TAC, providing policy considerations and direction on how a statewide road charge program could be deployed. The CTC will take an interest in reviewing the demonstration evaluation results and possibly prepare next steps and recommendations to the California State Legislature.

4.2.4 Federal Highway Administration (FHWA)

The FHWA administers the STSFA grant program, which funds 50% of the demonstration. The FHWA, namely the Office of Operations, is overseeing each of the road charge demonstrations funded by STSFA, to include the California Road Charge Demonstration. The FHWA and their team of independent evaluators are highly interested in the outcomes of this demonstration, the lessons learned that could be applied to other states, how this model could be deployed on a larger scale, and how road charge is progressing at the state and federal level as an alternative funding mechanism for the nation's transportation network. Per grant requirements, Caltrans and the project team will provide quarterly and annual project progress updates to the FHWA STSFA program, as well as support ad-hoc meetings between FHWA, their independent evaluation team, and other STSFA grant awardees who are deploying road charge demonstrations.

4.3 Tertiary Stakeholders

Tertiary stakeholders include entities that may be indirectly affected by demonstration activities but are not directly involved or participating. These stakeholders are generally consumers of demonstration information and may provide input on demonstration activities, but their feedback is not critical to demonstration development or operations. Tertiary stakeholders include private organizations and companies and the general public, who need to be educated about potential benefits of the demonstration and broader road charge activities to gain eventual acceptance should

road charge legislation be approved. Partnerships with the media will be important in this regard. These entities may request information from Caltrans on the status of this demonstration to aid in the development of their own platforms or to support their missions and members.

5. OPERATIONAL NEEDS

This section provides the operational needs for the road charge demonstration. The operational needs listed below will drive how the system is designed, how participants, administrators, and Caltrans will access the system, and how ultimately the system will be deployed and operated over the course of the demonstration.

5.1 System Needs

The road charge system will be designed and implemented as a scalable, flexible, and innovative platform that can support the demonstration goals and objectives. To help promote this, the system needs to be designed to support the following characteristics:

- **FLEXIBLE:** Standards-based approach where relevant data can be collected and processed without using proprietary protocols, creating a technology and vendor agnostic platform.
- **ACCURATE:** Travel data and calculations are verifiably accurate to confirm quality of data, prevent fraud, and support confidence in the system.
- **RELIABLE:** Systems and networks are consistently available and functioning properly to support the demonstration.
- **SECURE:** Systems and networks are safeguarded against unauthorized access to and/or dissemination of data.
- **EFFICIENT:** Existing systems and technologies are leveraged to reduce the burden to the state, private sector partners, and participants.
- **SCALABLE:** Open system design to accommodate evolving private sector partners, business models, and technologies used to support road charge assessment, and the potential to expand to additional jurisdictions.

5.1.1 Flexible

The system must be flexible to accommodate multiple providers, technologies, and business models in their current state and as the transportation industry evolves through time. To be flexible, the system must include, at minimum, the ability to collect, assess, and process road charges from pay-at-the-pump / charge point (PATP/CP) solutions, usage-based insurance (UBI) companies, transportation network companies (TNCs) and autonomous vehicles (AV). The system should support open, standards-based platforms where relevant data can be collected and seamlessly shared with Caltrans and other key stakeholders without using proprietary protocols. This allows technologies, business models, and providers to seamlessly enter and exit the market as it evolves.

5.1.2 Accurate

Proving the accuracy of data collection, processing, and transfers is a key objective of the demonstration. Data must be accurate at every step in the process to ensure data integrity is upheld, from the point of vehicle travel data collection, to transaction processing and applying rates, through invoicing, payment, and reporting to Caltrans. The system must take measures to validate the accuracy and quality of demonstration data, which provides assurances against fraud and tampering, system malfunctions, and other potential degradation of data integrity. Having a system

that can accurately capture and report traveled mileage and provide accurate representation of fees will help promote driver confidence, assuage concerns, and lead the way for system acceptance.

5.1.3 Reliable

The systems and network in place to support demonstration operations must provide high availability to ensure reliability of data collection, storage, and processing. As such, the systems and network must remain available to support daily demonstration operations, at least a certain percentage of a 24-hour per day, 365-day per year period. Generally, systems and networks that support data collection for financial processing and reconciliation must maintain an uptime of 99.9%, meaning the system should be operable at least 59.94 minutes of every hour of every day in a year. This does not include system or network outages for regularly scheduled maintenance or situations out of the participating entities' control. Maintenance outages should be scheduled when the system is least likely to impact data collection and retention.

5.1.4 Secure

Securing the systems and networks that collect and transfer data from hacking and unauthorized access to and/or dissemination of data is a key demonstration objective. For a successful demonstration, participants need assurance that their data and personal information will be secure while technology partners need assurance that any proprietary, trade secret, and operations data is protected.

The demonstration systems must handle data in a secure manner that complies with state, federal, and industry standards and best practices. This includes compliance with industry standards for data storage and network security, such as the International Organization for Standardization (ISO) standard 27001 Information Security Management¹⁷ and data authorization and authentication standards, such as the National Institute of Standards and Technology (NIST) Digital Identity Guidelines (currently SP 800-63-3¹⁸).

At least two of the demonstration phases, Phase 1 PATP/CP and Phase 3 TNC, will leverage technology partners' live operations platforms, which include the collection of payment from the technology partners' existing customers. Therefore, the systems and networks must also comply with credit card security standards, such as the Payment Card Industry Data Security Standards (PCI-DSS) (currently version 3.2¹⁹). This ensures that any functionality used for the demonstration protects technology partner customer data and financial information.

Compliance with these standards (or their equivalents), coupled with penalties for the unauthorized access to and/or dissemination of data, are paramount in securing the system and protecting participant, provider, and state information.

Each facet of the demonstration system must also protect privacy against the unauthorized access to PII as a result of data breaches, whether it be intentional (e.g. hacking, phishing, man-in-the-middle attacks) or unintentional (e.g. misunderstanding or misusing authorized data access).

¹⁷ ISO 27001: <https://www.iso.org/isoiec-27001-information-security.html>

¹⁸ NIST SP 800-63-3: <https://pages.nist.gov/800-63-3/>

¹⁹ PCI DSS Document Library and Version History: https://www.pcisecuritystandards.org/document_library

The demonstration system will keep private the PII of participants (such as registration address or travel behavior), private sector partner proprietary information (or data that could be used to derive trade secrets, proprietary algorithms, etc.), and potential state information that requires protection from public disclosure.

System measures will be put in place to protect data privacy for drivers, providers, and the state, including but not limited to:

- Data privacy policies, enforced through law, contracts, and/or agreements (where appropriate)
- Data access, authorization, and authentication controls (such as multi-factor authentication and role-based access)
- Data encryption (both at rest and in transit)
- Separation of data access (such as safeguarding Technology Partner A’s data from access by Technology Partner B)
- Intrusion detection and prevention systems
- Data masking
- Data modification detection and notifications

5.1.5 Efficient

The system must be efficient to minimize administrative costs, foster private sector interest, and reduce the overall burden to the state, the private sector, participants, and business partners. To be efficient, the system must use every opportunity to leverage existing technologies, policy structures, and business models so as not to create a new road charge market but tap into existing markets to levy a road charge. To achieve this, participants will use their existing accounts and relationships with business partners while industry standards, state laws, and other existing policies and practices will be applied to systems and processes used for the demonstration to promote the smooth integration of business partners’ technologies and platforms with the demonstration system.

5.1.6 Scalable

The system must be scalable by both allowing for the potential expansion of a Caltrans road charge program and easy adoption by other jurisdictions, such as cities or other states looking to test or deploy road charge programs. To achieve scalability, the system will be designed as an open, standards-based platform. This approach enables system scalability by accommodating future expansions across additional jurisdictions, providers, and participants while also enabling subsystems and components to interchange and ‘break apart’ based on business need.

Through this demonstration, the project team will create a series of design documents – such as this concept of operations, functional architecture, business rules, system requirements, and interface controls – that can serve as a blueprint for future expansion or reuse by other jurisdictions. One of the key results of designing this blueprint is the Platform for Road charge Innovation and Mobility Evolution (PRIME), a solution that takes multiple, disparate technologies and data streams and integrates them into a single platform that serves as a foundation for an adaptable, scalable road charge system and offers the ability to perform data-centric decision making to improve the transportation network.

5.2 State Needs

5.2.1 Public Outreach and Education

Improvements to the general public’s understanding of transportation financing and why the fuels tax is no longer a sustainable solution is a key component of any road charge initiative. The California Road Charge Demonstration will expand ongoing efforts to increase public awareness on transportation funding programs and alternative methods of revenue generation. Over the course of the demonstration, communications will be a key component of success and will be integrated into many different aspects of the demonstration. Demonstration participants will experience first-hand how a road charge could be assessed, and Caltrans and other stakeholders will communicate demonstration findings in briefings, newsletters, websites, and other mediums.

5.2.2 Cost Effective to Administer and Manage

For road charge to be publicly acceptable, any road charge program will need to be cost effective to administer and manage. The California Road Charge Demonstration will employ easy to understand systems, provide real-time or near-real time data updates, and provide intuitive and easy to interpret reports to reduce the need for complex administrative organizations. During the demonstration, business case analysis and revenue modeling will also be conducted to examine potential capital cost estimates, revenue leakage and adjustments, and operating and staff needs and cost estimates to determine the cost-effectiveness of the program against revenue potential.

5.2.3 Collaboration to Improve Cost Effectiveness and Public Acceptance

A key need for California will be to collaborate with private sector companies and leverage their existing systems to improve cost effectiveness and further promote public acceptance. By leveraging existing technologies and private-sector systems to support road charge-related functions (e.g. cloud data warehousing), Caltrans can offer the most efficient road charge demonstration solutions to minimize costs, development time and likelihood of system failure. Caltrans is partnering with several private-sector companies, from technology providers, to a data warehouse provider, to communications strategy, research, and technology consultants; all of whom are leveraging existing systems and expertise to reduce the overall demonstration costs.

5.2.4 Enforceable

Another key state need is to evaluate how a road charge could be enforced. Given the straightforward process of collecting fuel taxes, this method is relatively easy to enforce with a high rate of compliance. In contrast, moving to a road charge system provides greater opportunities for avoidance, requiring the development of enforcement measures to minimize leakage. The demonstration will investigate enforcement activities, developing administrative procedures and determining what regulations may be needed for successful adoption of a road charge.

5.2.5 Auditable

With any state tax program, financial systems must be capable of supporting accurate and reliable audits. These audits can relate to the data or systems security, revenue reporting, collection, or any other facet of state revenue systems. The road charge demonstration system will be designed to

support audits. Auditing checkpoints will be in place throughout major system functions. Testing and certification of demonstration systems will require business partners to submit proof that their systems are capable of supporting accurate fee calculation, and the entire system will provide traceability, from the data reported by traveling vehicles, to the calculations and data used in transaction processing, to the systems used to report, store, and provide data interfaces.

5.3 Participant Needs

The success of a road charge program is highly dependent on participant acceptance of the program. Program acceptance is not guaranteed given that road charge is a new concept to most participants and is a significantly different process from fuels tax collections. As the California Road Charge Demonstration provides a platform for participants to experience how a road charge would operate, the needs of the demonstration participants become key. The participant needs associated with the demonstration include:

- Understandable
- Easy to Use
- Offers Choice
- Transparent

5.3.1 Understandable

To increase public understanding and acceptance of road charge, it is imperative to explain in accessible language how participant data is used to calculate road charges under each operational scenario (i.e. how pay-at-the-pump road charge collection and processing may vary from a usage-based insurance model).

While it is possible the pay-per-mile pricing mechanism of a road charge system is intuitively understood by the general public, how the system operates and how mileage is reported may be more difficult to understand. Further, there may be questions on the fee itself, such as how the price per mile was calculated, or how a participant enrolls and maintains their road charge account.

Providing transparency and clear direction and instruction for those who participate in the demonstration is key in promoting public understanding of the road charge concept. This demonstration will establish clearly defined instructions, transparent rate calculations, fees, credits, and a means for drivers to ask questions, such as electronic customer support, to assist in increased understanding and overall public acceptance.

5.3.2 Easy to Use

A significant feature of the current fuel tax funding model is its ease of use. Currently, all drivers need to do to contribute to the maintenance and operations of their roads is fuel their vehicles. Relative to the current fuel tax model, road charge is a new concept with an increased level of complexity. Under a road charge program, participants must sign up for an account, choose a mileage reporting option and monitor, and pay for their road use. Although significant efforts have been taken throughout previous pilot projects to make this process seamless for participants, the road charge process is still not as easy as filling up a vehicle at a fuel station.

For a road charge program to be successful and accepted by the general public, it is imperative that the system be easy to use. This demonstration builds on participants' existing behaviors by

utilizing existing transportation business models and technologies with which participants already have familiarity to streamline the process and reduce complexity.

5.3.3 Offers Choice

It is likely that participants will have differing preferences in how to participate in a road charge program. To increase adoption and satisfy each participant's preference, a road charge system could offer choices in how each participant will report their miles, access their business partners, and ultimately pay their road charge. Providing participant choices not only enables each to choose the option that best suits their needs but also provides participants a feeling of empowerment and control. Participants would seek choice in mileage reporting options, business partners and payment methods. Given their preferences, participants could prefer a digital road charge solution, or one based on more manual capabilities.

The California Road Charge Demonstration will showcase four potential choices to participants. Each of the four phases will demonstrate how a road charge could be reported, assessed, collected, and accessed through different technologies.

5.3.4 Transparent

Transparency is another key to increasing road user adoption of a road charge program. A transparent system will clearly show reported mileage by vehicle, delineation of those miles, assessed road charges, accurate fuel tax credits, and any other key information that will provide the participant confidence in how their charges are calculated and collected. Any administrative fees levied on the participant should be clearly identified and communicated prior to and during enrollment into the road charge program. How data will be collected, used, and protected must also be clearly identified and accepted.

The demonstration will provide means to showcase transparency while maintaining strict adherence to privacy protection of its participants. Clear communications on how data is collected, what types of data are collected, how systems are protecting information, how fees are calculated, how road charges are presented, and how (simulated) funds are collected will be provided throughout the demonstration to allow stakeholders to not only better understand how a road charge could be deployed, but also allow Caltrans the ability to gather additional considerations on how to better promote transparency between the State and its motorists.

5.4 Business Partner Needs

Business partners participating in each demonstration phase will have both common and unique needs. As the frontline business partner to participants and the liaison to the state, each partner will have specific needs and goals for the demonstration to achieve success. For business partners, a road charge system must:

- Be Easily Integrated with Existing Systems
- Be Non-intrusive to Current Operations
- Provide Improved Collaboration with the State
- Be Market-Driven

5.4.1 Easily Integrated with Existing Systems

To support acceptance and administrative and operational efficiency, the demonstration system should easily integrate with existing state and business partner systems. Proprietary design and customization will be kept to a minimum and no proprietary system-to-system interfaces or data protocols will be allowed. The project team will work with business partners before the demonstration to understand the interfaces needed between existing systems and those being proposed. Additionally, the demonstration system will be evaluated by State agencies that may ultimately operate a road charge system to determine how easily the system platforms and data could be integrated into existing systems.

5.4.2 Non-intrusive to current operations

The longevity of the business partners depends largely on the performance of their operations and customer service abilities. The demonstration will not impede the business partner's current operations and must provide a way for each to maintain current operations while allowing each to expand their customer base.

5.4.3 Improved Collaboration with the State

The road charge system must enable business partners and the State to improve collaboration. The business partners participating in this demonstration will have an opportunity to state their ideas for road charge, identify any barriers to entering or expanding the market, and establish how the State of California could streamline processes, fees, and policies that could improve market expansion.

5.4.4 Market-Driven

One of the key aspects of the demonstration architecture is an open system that supports interoperability and market competition. Private sector companies should compete against each other in this open marketplace for road charge participants' business, offering features, benefits, and value-added services to gain a competitive edge.

Using a market driven approach provides a benefit to business partners, as they can gain additional business and customers. The market driven approach also supports the State need to identify areas to minimize administrative costs, as there is potential to reduce or remove compensation for business partners if the business partners are instead incentivized to provide road charge services to support existing and potential customers.

5.5 FHWA STSFA Program Requirements

The FAST Act established the STSFA grant program to provide grants to states or groups of states to demonstrate user-based alternative revenue mechanisms that utilize a user fee structure to maintain the long-term solvency of the Highway Trust Fund. The California Road Charge Demonstration project is partially funded through STSFA program grant funding, and must meet the requirements set forth by the program.

Per FHWA ([FAST Act § 6020(d)(2)]), the activities carried out under the STSFA grant project shall meet the following goals:

- Test the design, acceptance, and implementation of user-based alternative revenue mechanisms;
- Improve the functionality of such user-based alternative revenue mechanisms;
- Conduct outreach to increase public awareness regarding the need for alternative funding sources for surface transportation programs and to provide information on possible approaches;
- Provide recommendations regarding adoption and implementation of user-based alternative revenue mechanisms;
- Minimize the cost of any potential user-based alternative revenue mechanisms; and
- To minimize the administrative costs associated with the collection of fees.

The demonstration must address implementation, interoperability, public acceptance, and other adoption issues; protection of personal privacy; the use of vendors to collect fees and operate the mechanism; market-based congestion mitigation impacts; equity concerns; ease of compliance; and the reliability and security of technologies used.

The demonstration may also address the flexibility and choices available for user payments; administrative costs; and the ability to audit and enforce compliance.

These goals and requirements align with the objectives and key stakeholders needs of the project and will be addressed throughout the demonstration. Following completion of the demonstration, an FHWA STSFA Program project final evaluation report will be developed that conducts a quantitative and qualitative analysis of what was done, challenges that had to be overcome, potential to deploy on a broader scale, findings and recommendations, and how the demonstration met each of the objectives and requirements of the STSFA program.

6. VISION AND GOALS

Caltrans, through their STSFA grant applications for FY 2016, 2017, and 2018, identified key visions and goals for the overarching road charge program, as well as each of the four phased technology platforms.

6.1 Overarching Road Charge Demonstration Vision and Goals

The vision and goals for the overarching road charge demonstration as presented in Caltrans' STSFA grant applications include:

- Address implementation, interoperability, public acceptance, and potential hurdles to further explore adoption of a demonstrated user-based alternative revenue mechanism.
- Incorporate measures to support privacy protection including governance and accountability provisions exploring model protection provisions supporting the California Consumer Privacy Act of 2018.
- Use independent and private third-party vendors.
- Consider how road charge may impact congestion mitigation on a limited scale, using available technologies that support location data collection.
- Explore and analyze equity concerns (including impacts on differing income groups, various geographic areas, and relative burdens on rural and urban drivers) to promote equitable distribution across the population.
- Test mileage reporting methods that promote ease of user compliance and shift a considerable amount of responsibility for compliance to the end-user and the business partners.
- Enlist technology that uses and promotes reliability and security, including stringent data security measures such as: authentication, authorization, data modification notification, data masking, encryption, data storage, data transmittal, data destruction, general IT network security, and third-party data security system verification.
- Provide users the choice of mileage reporting methods, manual and automated technologies, as well as different types of business partners.
- Examine the system, administrative, and organizational cost of administering the system, evaluating each mileage reporting method and estimating the costs associated with implementing a statewide system.
- Perform limited auditing and identifying areas for system improvements.

6.2 Technology Phase Vision and Goals

In addition to the overarching demonstration vision and goals, Caltrans' STSFA grant applications also identify vision and goals specific to each technology platform.

6.2.1 Phase 1: Pay-at-the-Pump / Charge Point Vision and Goals

VISION: Motorists currently pay fuel taxes by paying at the pump, albeit indirectly. Drivers are familiar with paying for gasoline at fueling stations, and many are familiar with the concept of fuels tax, even if they know little about how much it is or how the revenues are used.

- **Goal 1:** Develop a method for paying the road charge at fueling stations or charge points by communicating mileage driven from the vehicle or device to the infrastructure.
- **Goal 2:** Select technologically and economically viable pay-at-the-pump / charge point alternative(s) that provide a similar user experience as the current fuels tax collection for further development.
- **Goal 3:** Demonstrate the effectiveness of the software or applications to support a pay-at-the-pump / charge point alternative(s).
- **Goal 4:** Deploy new software or application(s) in a live pilot.

6.2.2 Phase 2: Usage-Based Insurance Vision and Goals

VISION: Vehicle insurance companies can act as commercial business partners for a road charge in a cost-effective, non-invasive, and mutually beneficial alternative to the fuels tax.

- **Goal 1:** Demonstrate the feasibility of auto insurance companies (those currently utilizing UBI) acting as business partners in the collection of a road charge.
- **Goal 2:** Assess the cost-effectiveness of auto insurance companies (those currently utilizing UBI) acting as business partners in the collection of a road charge.
- **Goal 3:** Build partner and public awareness of this type of road charge model.

6.2.3 Phase 3: Transportation Network Company Vision and Goals

Vision: Highly sophisticated fleet management and fare-charging systems at transportation network companies make the addition of a road charge simple, effective, and efficient.

- **Goal 1:** Demonstrate the feasibility of collecting a road charge through TNCs.
- **Goal 2:** Assess the cost effectiveness of collecting a road charge through TNCs.
- **Goal 3:** Build partner and public awareness of this type of road charge model.

6.2.4 Phase 4: Autonomous Vehicle Vision and Goals

VISION: Applying a road charge to autonomous vehicles is feasible and straightforward due to onboard vehicle technology. Autonomous Vehicles provide a method of phasing in a road charge over time as this market segment grows.

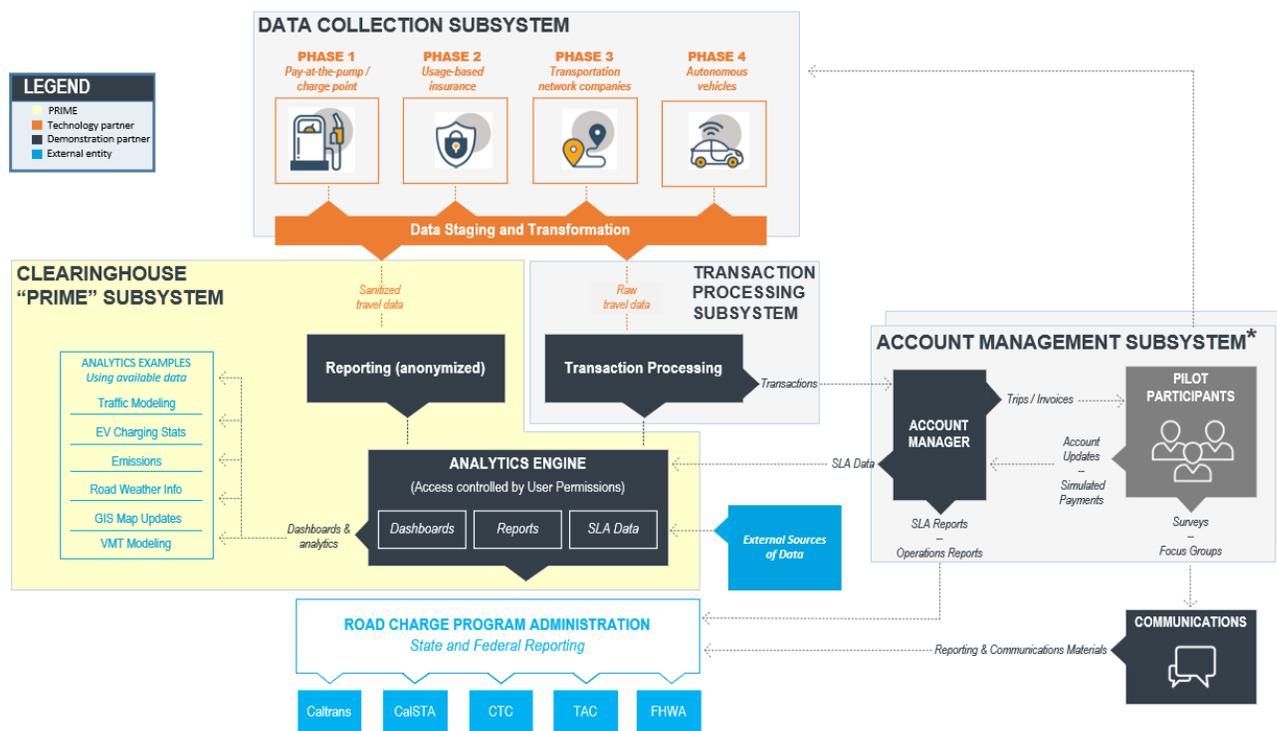
- **Goal 1:** Identify road charge opportunities that stem from autonomous vehicle usage of California roadways.
- **Goal 2:** Build partner and public awareness of this type of road charge model.

7. THE DEMONSTRATION CONCEPT

The California Road Charge Demonstration will be a technical feasibility study of how a road charge may be assessed through four emerging transportation technologies and trends:

- **Phase 1:** Pay-at-the-Pump / Charge Point (PATP/CP)
- **Phase 2:** Usage-Based Insurance (UBI)
- **Phase 3:** Transportation Network Companies (TNC)
- **Phase 4:** Autonomous Vehicles (AV)

For each phase of the demonstration, technology partners will collect travel data for vehicles and participants (where applicable), process the collected data into transactions, apply appropriate rates, credit fuel taxes, and calculate net road charges due. All charges will be simulated during the demonstration, with no real monies collected from participants. Each demonstration phase is described in greater detail in the following sections. The overarching demonstration functional architecture is provided below.



* Each phase will have a separate account management subsystem instance

Figure 3: California Road Charge Demonstration Functional Architecture Diagram

There are five major subsystems associated with the Demonstration System: Data Collection, Transaction Processing, Account Management, Administration, and Clearinghouse. The functional architecture for the demonstration’s operational environment is divided into logical groupings of systems and functions called a “subsystem”. Each subsystem will perform a series of functions to support the demonstration. Communications between subsystems will be standardized as defined in the California Road Charge Demonstration Interface Control Document (ICD). The purpose for each of these subsystems is described below:

- **DATA COLLECTION SUBSYSTEM:** The Data Collection Subsystem interfaces with the demonstration vehicles that are subject to the road charge to collect the travel data. Some of the common data elements captured from the Data Collection Subsystem include vehicle unique identifier, date/time, mileage or per-trip data, fuel consumption, and location. This information is then routed to the Transaction Processor for computation of the vehicle's assessed road charge and fuels tax credit.

For some technologies, the Data Collection Subsystem also includes location-based and mapping technologies that identify the roads subject to the road charge (generally publicly maintained roads) and can differentiate between public and non-public roads. This data is collected and then transmitted to the Transaction Processing Subsystem.

There are four forms of data collection being demonstrated for the California Road Charge Demonstration:

- **Phase 1 (PATP/CP)** will utilize vehicle telematics to report mileage and related trip data. This may be provided through either aftermarket, plug-in technologies, or (if technically feasible), provided directly through a vehicle's telematics Computer Area Network (CAN) bus.
 - **Phase 2 (UBI)** will utilize changes in odometer readings to calculate miles traveled, provided through uploading odometer pictures via a UBI phone app. This data could also be collected using plug-in telematics devices like the Progressive Snapshot, Allstate DriveWise, or State Farm's Drive Safe and Save programs.
 - **Phase 3 (TNC)** will leverage onboard technologies within ride hail vehicles and proprietary mobile apps to collect and calculate road charge.
 - **Phase 4 (AV)** will utilize existing AV technologies within the vehicle to report the number of miles traveled, location, and fuel/charge consumed.
- **TRANSACTION PROCESSING SUBSYSTEM:** The Transaction Processing Subsystem is a core component of the road charge demonstration system. The Transaction Processing Subsystem collects vehicle travel data from the Data Collection Subsystem, calculates and summarizes the road charge, credits any previously paid fuel taxes (based on the number of gallons consumed), and routes the calculated road charge due to the Account Management subsystem for processing and collection. Additionally, the Transaction Processing Subsystem aggregates all financial transactions and provides a series of sanitized, aggregated reports to the State that identify the number of miles reported, the number of gallons consumed, and the assessed road charge for participating vehicles and accounts.
 - **ACCOUNT MANAGEMENT SUBSYSTEM:** The Account Management Subsystem is the frontline interface to the participant. This subsystem provides the mechanism for participants to view information relative to each of the business partner's existing services (i.e. fuel pump/charge point, insurance, ride hail). Additionally, the Account Management Subsystem may provide information to participants on their respective assessed road charge. Generally, the Account Management Subsystem provides web portals, mobile apps, and customer support services (such as web forms, email services or call centers) for participants to interact with the subsystem.

The Account Management Subsystem maintains participant account information and status, handles Tier 2 customer service, and coordinates with the Administration subsystem to manage communications with participants. The Account Management subsystem will receive transactions transmitted by the Transaction Processing subsystem and post the transactions to the appropriate participant's account. The Account Management subsystem will provide participants access to road charge demonstration data, and the ability to review invoices and process simulated road charge payments.

- **ADMINISTRATION SUBSYSTEM:** The Administration Subsystem provides an interface to those managing the demonstration to access demonstration information, results, and reports. It will allow Caltrans and their designees the ability to certify business partners and manage ongoing compliance with demonstration requirements, verify participant eligibility against requirements, evaluate simulated tax reports, establish and manage per-mile rates, and set business rules. The Administration Subsystem may also provide access to the PRIME data clearinghouse subsystem where administrators may view informative dashboards created for the demonstration using collected demonstration data.
- **DATA CLEARINGHOUSE “PRIME” SUBSYSTEM:** The Data Clearinghouse Subsystem provides the central data repository for collecting all sanitized data collected for the demonstration. It consists of a central database, structured to allow secure upload and transfer of demonstration data.

Additionally, the Data Clearinghouse will house the Platform for Road charge Innovation and Mobility Evolution (PRIME) analytics engine. This engine will provide analytics and informational dashboards to Caltrans and other administrators and managers on the progress of the road charge demonstration, theoretical road charge revenues, and other transportation related metrics that could be supported using road charge data. Access to the Data Clearinghouse will be controlled through secure protocols to prevent unauthorized access from others.

Business partners for each demonstration phase will transmit sanitized raw and aggregated travel data from participating vehicles and accounts to PRIME, via the systems each owns and operates, to provide a robust set of data for analytics and reporting. PRIME will process incoming business partner data for each demonstration phase into the appropriate data storage buckets. Virtual warehouses will be built to host data processing and queries will generate a series of datasets that can be used for advanced data analytics, modeling, and trends.

Analytics from PRIME will support applications such as electric vehicle (EV) charging statistic reporting, enhanced asset management analysis, and travel pattern visualization. The real-time performance dashboards can provide a snapshot of demonstration progress for each phase. This snapshot could present metrics such as number of vehicles enrolled, vehicle miles traveled (VMT), simulated gross road charges, and net revenue. During focus groups and surveys, the project team could also use PRIME to process and visualize participant sentiment. The dashboards will be available via web or mobile platforms to engage stakeholders on both the participant and system perspectives of the demonstration.

7.1 Phase 1: Pay-at-the-Pump / Charge Point

The Pay-at-the-Pump/Charge Point (PATP/CP) phase of the demonstration will run for 6 months and include 30-50 active participants. The PATP/CP business partner(s) will operate in multiple, geographically constrained areas throughout California, where specific fueling stations and/or electric vehicle charge points will be equipped with the technology necessary for collecting road charge data, conducting transaction processing, and reporting on theoretical assessed road charge to both participants and Caltrans.

Participant vehicles will be outfitted with data collection technology and/or apps to collect the necessary road charge data. When a vehicle visits a specific fuel pump or charge point and initiates a fuel purchase or battery charge, the session data collected from the data collector will be transmitted to the PATP/CP Transaction Processor. The Transaction Processor will then receive the collected mileage data via vehicle-enabled reporting capabilities, assess the per-mile rate to the chargeable miles, calculate the assessed road charge, and credit any state motor fuel taxes based on fuel consumption. A notification to the participant on the road charge due either via a phone notification, email, or through a printed fuel receipt will then be presented to the participant as part through the Account Management Subsystem. The PATP/CP business partner will also collect and aggregate these individual transactions for monthly reporting to the Administration Subsystem. Note that for the demonstration, all transactions will be simulated, and no actual road charge or associated credits will be assessed.

Additional data beyond that required for road charge, such as electric vehicle battery state-of-charge or fuel pricing trends or locations may also be collected and transmitted to the Data Clearinghouse Subsystem for analysis using the PRIME analytics engine. A functional diagram for the PATP/CP Phase of the demonstration is provided below.

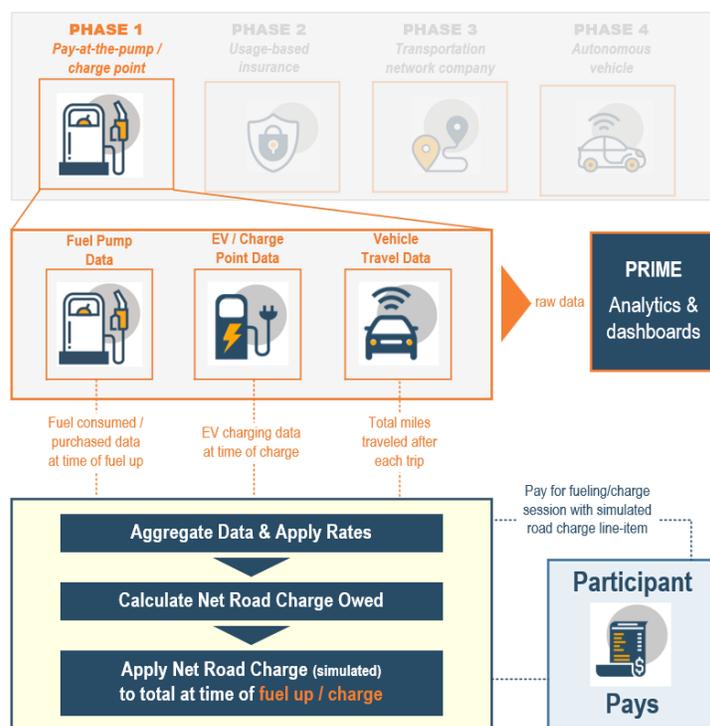


Figure 4: PATP/CP Demonstration Phase Flow

7.2 Phase 2: Usage-Based Insurance

The UBI phase will begin approximately one month after the PATP/CP phase kicks off. It will last approximately five months, encompassing five UBI monthly billing cycles and include 30-40 participants statewide. No geographic constraints are required so participants may reside or travel anywhere within California.

Participants will download a mobile app to their smartphones from the UBI business partner. Once downloaded, participants will enter vehicle specific information (e.g. make, model, year, trim package) and take a picture of their participating vehicle’s odometer. At periodic intervals over the next five months, participants will receive a notification from the app asking them to take and upload a new picture of their odometer. The mobile app, the participants’ smartphones, and limited UBI business partner backend processing functionality will serve as the Data Collection Subsystem. Uploaded pictures will then be transmitted to the UBI business partner’s Transaction Processing portal. Once that picture is received, the Transaction Processor Subsystem will calculate the difference in odometer readings from the most recent picture to that previously uploaded. The calculated difference will then be used to determine the overall road charge to be assessed based on miles traveled. Fuels tax credits will be calculated using Environmental Protection Agency (EPA) Miles per Gallon (MPG) estimates for the vehicle make, model, year, and trim package provided during participant enrollment. An invoice for the simulated road charge due will then be presented to the participants via the mobile app as well as via email from the Account Management Subsystem. This mileage and road charge information will also be provided to the Administration Subsystem for monthly reporting, and to the Data Clearinghouse Subsystem for further analysis by the PRIME analytics engine. A functional diagram for the UBI Phase of the demonstration is provided below.

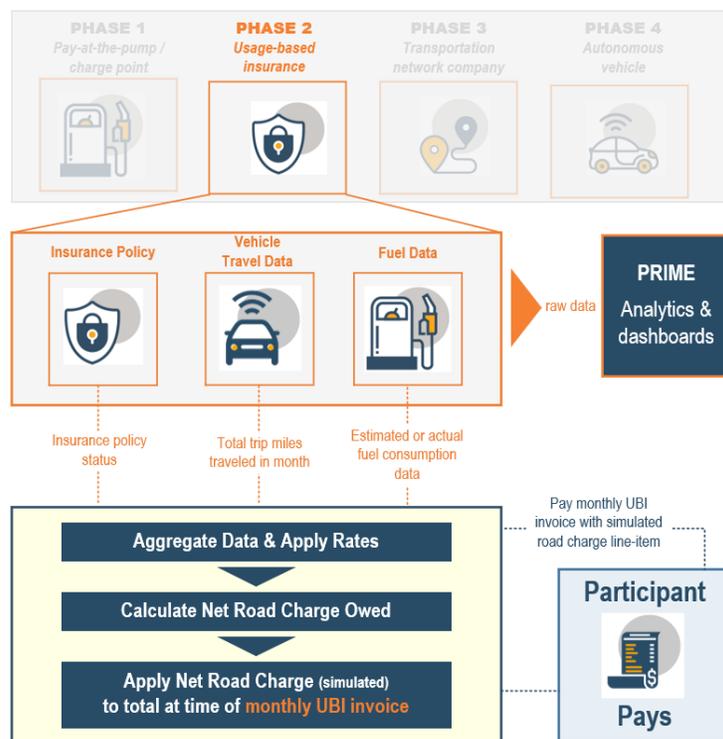


Figure 5: UBI Demonstration Phase Flow

7.3 Phase 3: Transportation Network Companies

The TNC phase of this demonstration will test the viability of collecting a road charge using technology already incorporated into real-time ride hailing vehicles and applications by transportation network companies (TNCs). This phase will last approximately four months and include 10 to 25 participants located within the West Sacramento area.

Participants will register with the TNC business partner, and download the appropriate mobile app. At certain intervals over the four-month demonstration period, participants will summon a ride with the TNC business partner using the app or another mechanism to access the Account Management system (such as online or via telephone). During that trip, embedded technology within the vehicle will log the mileage, fuel consumption, and location for the trip and upload that data to the Transaction Processing Subsystem. The Transaction Processing Subsystem will then calculate the road charge based on the miles traveled, credit any applicable fuel taxes, and present the simulated road charge due to the participant via the mobile app and email. The TNC business partner will also aggregate these individual transactions for monthly reporting to the Administration Subsystem. Additional information may also be uploaded to the Data Clearinghouse for reporting and analysis by PRIME. The TNC Phase functional diagram is provided below.

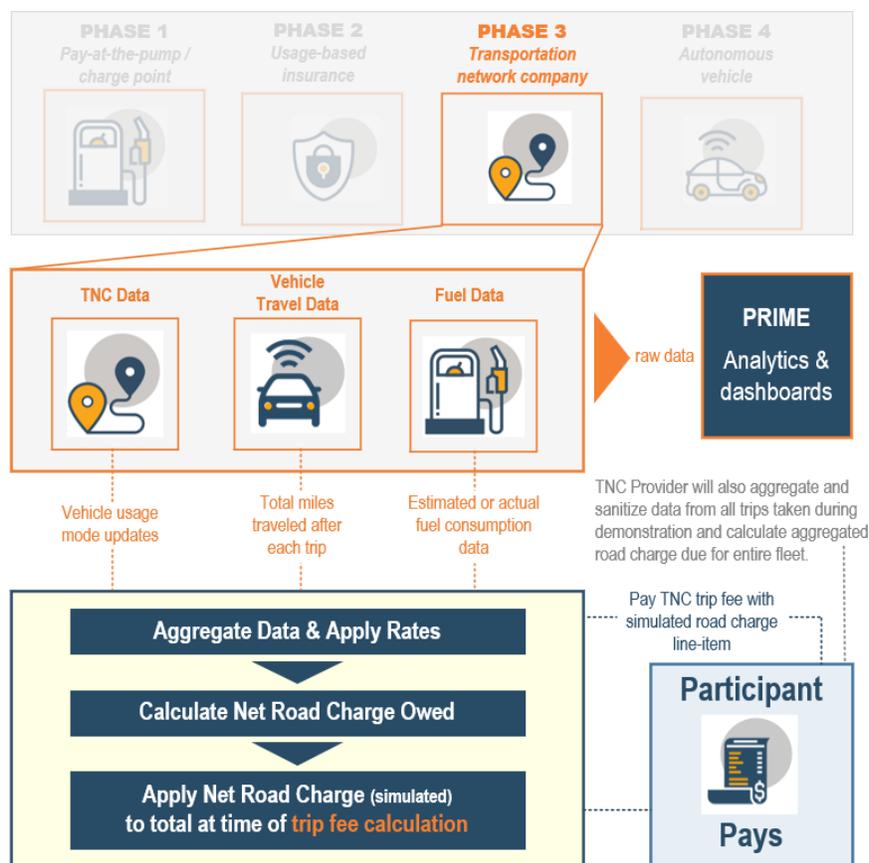


Figure 6: TNC Demonstration Phase Flow

7.4 Phase 4: Autonomous Vehicles

The AV phase will demonstrate how road charge data can be collected, reported, and assessed from Autonomous Vehicles (AVs). This demonstration will be conducted at periodic intervals over a three-month period, beginning within one month after the TNC phase begins. Given restrictions on AV operations within California, the demonstration will only be conducted on approved public roadways, or at private testing facilities, such as AV proving grounds.

No participant onboarding or enrollment will be conducted for the AV phase. Members of the demonstration technical team and Caltrans will participate in a prescribed ride hail test using the automated test vehicle and the TNC business partner’s systems to simulate trip data collection and road charge calculations. At prescribed times, the AV will make specific trips, and the onboard technology within the AV will collect mileage, location, charge information (participating AVs are expected to be fully electric), as well as other vehicle related data from onboard AV systems. The collected data will be transmitted to the TNC business partner’s Data Collection, Transaction Processor, and Account Management subsystems for integration, processing, and reporting. Once completed, a mock road charge invoice will be provided via the TNC Account Management Subsystem using the same methods identified in Phase 3. The TNC business partner will aggregate individual AV trip transactions for monthly reporting to the Administration Subsystem. AV data will also be transmitted to the Data Clearinghouse Subsystem for further analytics. The functional diagram for the AV Phase of the demonstration is provided below.

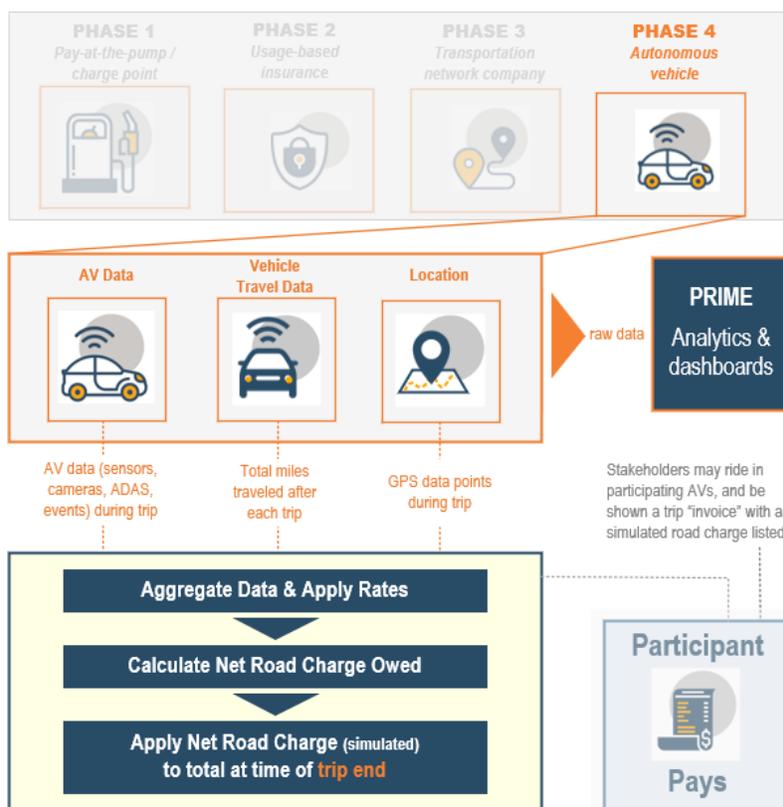


Figure 7: AV Demonstration Phase Flow

8. OPERATIONAL ENVIRONMENT

This section discusses the physical operating environment, such as facilities, equipment, computing platforms, and other items necessary to conduct each phase of the demonstration.

8.1 Facilities

No new facilities are expected to be developed as part of this demonstration. All functional activities will occur in existing facilities that are owned and operated by stakeholders that own and operate subsystems included in the demonstration.

The project is being administered through Caltrans Headquarters, located at 1120 N Street, Sacramento, California. Project delivery is being conducted by companies and teams located throughout the United States. Team meetings, to include TAC meetings and workshops are being conducted at various locations throughout the State of California.

While the demonstration will occur in live environments using existing roadways within the State of California, certain aspects will be geographically constrained. The Phase 1 fuel pump and charge point locations will be at specific locations around the state. The Phase 3 TNC portion of the demonstration will utilize a TNC business partner operating in the West Sacramento area. Phase 4 of the demonstration will occur in a controlled environment, such as using one of the California's AV testing facilities, the Contra Costa County's GoMentum Station or the San Diego Regional Proving Ground.

8.2 Demonstration Equipment

The equipment needed to conduct the demonstration will primarily be provided by the business partners for each phase. Participants will provide their own vehicles for Phase 1 and 2, and Vehicles for Phases 3 and 4 will be provided by the business partners. Participants will provide their own mobile smartphones for downloading apps and accessing Account Management portals, as necessary for each respective phase. No Caltrans or other agency fleet vehicles or equipment is anticipated to be needed.

Vehicle hardware, used to provide data collection capabilities, will vary based on the technology phase. Vehicle hardware needed for Phase 1 (PATP/CP) will consist of either technologies embedded directly in the vehicle and/or aftermarket technologies such as a plug-in device connected to the participant vehicle's on-board diagnostic (OBD-II) port. No vehicle hardware is needed for Phase 2 (UBI) as a participant's smartphone will serve as the data collector to capture and upload vehicle odometer pictures. For Phases 3 (TNC) and 4 (AV), the vehicle hardware needed for data collection will consist of several hardwired sensors and systems within the vehicle that capture mileage, location, fuel consumption, and other travel data.

8.3 Computing Platforms

Computer systems, servers, databases, and processing systems needed by each business partner will be provided by the partners and either be housed within their own facilities or leased as part of a cloud computing service agreement. Communications infrastructure needed to transfer data between systems will also be either provided by the partners or leased over the course of the demonstration.

State systems needed to access demonstration systems, download reports, or communicate with project team members is provided by State of California IT resources. No customized or

proprietary State systems or hardware is needed by Caltrans or other state agencies to administer or manage the demonstration.

Data storage, warehousing, and the Data Clearinghouse Subsystem will be provided as part of a “cloud storage” infrastructure. Under this concept, data will be stored across multiple servers, all of which may be physically separated but still connected through a secure, virtual network. All data uploaded to and collected within this warehouse will be secured using physical and virtual firewalls and be encrypted using, at minimum, 256-bit Advanced Encryption Standard (AES) protocols for data at rest and in transit.

9. SUPPORT ENVIRONMENT

This section discusses non-physical assets that may be leveraged in support of the four demonstration phases, specifically:

- Staff
- Outreach and Training
- Supporting Policies and Agreements
- Customer Service
- Testing

9.1 Staff

Caltrans has a dedicated team to oversee and manage the demonstration. There are four full-time staff assigned to the demonstration: Program Manager, Project Manager, Project Administrator, and Communications/Research Coordinator. In addition, there are several part time staff assigned to other projects or teams within Caltrans that are involved in some of the tangential aspects of the demonstration. Other state agencies and departments may have staff that become involved in the demonstration, but their involvement is expected to be limited to short-term engagements.

Additionally, Caltrans has enlisted the support of several consulting firms and companies to handle certain niche aspects of the demonstration (e.g. Communications strategy, public opinion research, organizational design, economic analysis, organizational design, systems integration, and project management). These companies have contracted with Caltrans either directly or as subcontractors to support various elements of the demonstration based on their niche expertise. Each of these companies are providing multiple part-time support to the demonstration.

Caltrans has also established a technical team, consisting of systems designers, technical subject matter experts, test managers, consultants, and implementation specialists. This team is responsible for designing, planning, coordinating, certifying, and administering the demonstration to the expectations established by Caltrans.

Finally, there are several technology firms enlisted to support the demonstration as business partners. These companies are providing technical hardware and services for each of the four phases. They consist of existing well-established companies who are expanding their existing service platforms to demonstrate how a road charge could be reported, collected, and paid by using their existing services.

9.2 Outreach and Education

Caltrans, in cooperation with its partners, will conduct public and stakeholder outreach, education and training. Each department will be responsible for training their staff with respect to changes that occur because of the demonstration. Caltrans will be responsible for conducting general outreach activities as needed to communicate project progress, related activities, and to solicit required input. While no formal training is expected to be needed, Caltrans may undertake some internal efforts to educate and provide information on both the demonstration and road charge. These efforts may be coordinated with CalSTA to ensure any messaging relative to road charge aligns with the overarching state strategic goals for innovative funding. Outreach and training efforts are expected to occur well before the demonstration begins and will continue through the end of the project.

Caltrans has created two websites relative to the road charge program to provide a platform for outreach and education on road charge. The first one (<https://dot.ca.gov/programs/road-charge/about-road-charge>) is an internal, Caltrans branded website that provides information relative to both the current road charge demonstration as well as the overarching road charge program. The second website (<http://www.caroadcharge.com>) is an external facing website that provides additional details on the program and resources for anyone interested in learning more about road charge. Additionally, a participant website may be developed either as a standalone website or as a portal within one of the existing sites to provide information to demonstration participants.

Business partners will generally be responsible for outreach to their customers but Caltrans, via the Communications Coordinator, will play a pivotal role in that they will develop outreach materials that business partners can provide or reference in their direct communications with their customers. Other stakeholder groups, such as the CTC, the TAC, state and local entities, federal agencies, and even professional organizations may also engage in communications activities relative to the demonstration. Each of these activities are expected to be overseen by the Caltrans Communications Coordinator.

9.3 Supporting Policies and Agreements

There are several guiding policies and documents established for the demonstration. First and foremost, SB-1077 (2013-2014) authorized the establishment of the California Road Charge Pilot Program. It included the establishment of the TAC and required them, in consultation with CalSTA, to study usage-based alternatives to the motor fuel tax. Subsequently, SB-1328, extended the provisions established in SB-1077 until January 1, 2023.

As previously mentioned, part of this demonstration is being funded through the STSFA grant program. As established in the FAST Act, Section 6020, the STSFA program directed the FHWA to provide grants to states or groups of states to demonstrate user-based alternative revenue mechanisms that utilize a user fee structure to maintain the long-term solvency of the Highway Trust Fund. Provisions and policies established in the grant awards are also being used to support the demonstration.

Contracting terms, agreements, and project scope statements are being established by Caltrans to define the expectations, scope, schedule, and contracting terms for each private sector entity's role in the demonstration, either as a direct consultant or provider to Caltrans or as a subcontractor. These agreements are all being overseen by California's Division of Procurement and Contracts (DPAC) who will engage private sector partners as necessary to implement certain aspects of the demonstration.

Finally, all demonstration details, and technical and operational expectations are being documented in a series of requirements. These requirements are being levied against each business partner needed to conduct demonstration operations. Prior to demonstration launch, business partner compliance with each of the developed requirements will be tested as part of a certification process. Full compliance with certification testing will be required prior to allowing a business partner to participate in the demonstration. Each requirement will be captured in a Requirements Traceability Matrix (RTM) that identifies the requirement, identifies the test cases and steps needed to validate compliance with the requirement, and the expected results needed for compliance.

9.4 Testing

All systems, technologies, and processes will be tested prior to launch. Such testing will consist of the following stages, where the successful completion of one stage will serve as the entry criteria for the next:

1. **Unit Testing:** Detailed testing of each component to ensure the component meets all requirements;
2. **Integration Testing:** Validation that components work together and communicate with each other and the system;
3. **Acceptance Testing:** Comprehensive, end-to-end verification of the demonstration system;
4. **Demonstration Dry Run:** Full end-to-end system dry run; and
5. **Data Security Auditing:** Validate data security and integrity using industry standards such as ISO 27001, PCI DSS 3.2 and NIST 800-63-3.

9.4.1 Certification Test Plan

A certification test plan will be developed by the technical team that outlines the methodology and strategy used for evaluating all systems, processes, and interfaces needed to operate the demonstration, to ensure alignment with requirements. The certification test plan will include details for each test stage (including test cases and evaluation criteria), testing roles and responsibilities, exit criteria for each stage of testing, and any potential risks and mitigation strategies. The certification test plan will follow objectives and requirements outlined in the project scope, as well as industry best practices and standards.

The demonstration technical team will develop a comprehensive test plan, detailing the demonstration testing strategy, methodology, test stages, roles & responsibilities, and test scenarios. The test scenarios will simulate operational expectations for each demonstration phase, and will be used as the base for unit, integration, and acceptance test scripts. All test scripts will be clearly traced back to requirements and business rules through the requirements traceability matrix (RTM).

9.4.2 Testing Phases

The demonstration technical team, in concert with the business partners, will then conduct testing of each demonstration phase individually to ensure the goals of the specific phase are being met. The team will then test the overall systems integration, validating that disparate data collection methods can be integrated into a single, seamless platform to support data analytics and dashboarding efforts. The testing will culminate in the overall Acceptance Test which will test the entire end-to-end functionality. The successful completion of each progressive test stage will serve as the entry criteria for the next stage. Only when all tests are successfully executed and Caltrans has approved test results will the systems, technologies, and processes for the demonstration be considered ready for launch.

Unit Testing

Unit testing is the first test phase to be conducted. This involves independent validation of any systems and processes to be used during the demonstration, necessary to prove compliance with

all requirements in the requirements documents. Unit testing will include data collection, transaction processing, account management, reporting, and simulated financial reconciliation.

Unit testing results of each component and how it meets related requirements will be documented in the RTM. These results will then be reviewed to verify that all requirements are met through verified testing of one or more system components.

Integration Testing

Once unit testing is successfully completed, the demonstration technical team, and business partners will conduct integration testing of all demonstration interfaces. Integration testing will include generating each of the required reports, validating the format of each report, and transmitting each report and associated data to the Data Clearinghouse Subsystem. The demonstration technical team will coordinate integration testing activities with each business partner to ensure the proper systems, interfaces, protocols, and formats are used to verify interface connectivity and compliance with requirements.

Acceptance Testing

Following successful completion of unit and integration testing, systems acceptance testing of all systems, interfaces, and processes to be used during demonstration operations will commence. The systems acceptance test will include a short, simulated real-world test, verifying that all individual components and interfaces interact properly with one another as expected and defined in the requirements.

Demonstration Dry Run

At the end of acceptance testing, a two-week, full end-to-end systems dry run with Caltrans and other technical team members will be launched. This dry run will use prescriptive test scripts to validate the onboarding, scheduling, operations, transaction processing, invoicing, reporting, and PRIME data analytics for each of the four demonstration phases. Outcomes will be documented, including positive results, negative results, and overall failures. Remediation efforts, including systems and process updates, may be conducted during this period based on the severity of the documented issues. At the end of the two-week period, Caltrans, the demonstration technical team, business partners, and other identified testers will meet to review results, determine what worked well, what needed improvement, and what enhancements should be made prior to demonstration launch.

Punchlists

In the event a test is not successfully executed, or a requirement is not fully met through one or more tests, the technical team will evaluate the level of criticality the item has on the remainder of testing and ultimately demonstration operations launch. If an item is not critical to overall operation of the system, the technical team will flag the item as “punchlisted”, allowing the progression of testing without fully completing the stage in which the item was flagged. All punchlisted items will be reviewed with Caltrans at time of assignment to the punchlist and will be reviewed on regular check-ins with Caltrans and with business partners to evaluate the progress of further testing to move the item into compliance.

Data Security and Auditing

Data security assessments will be conducted to ensure that Personally Identifiable Information (PII) is protected, data is encrypted and secure both in transit and at rest, and that the integrity of data is being upheld through the entire process. The technical team will conduct a data security audit to validate the demonstration systems are compliant with the latest security standards including ISO 27001, PCI DSS 3.2, and NIST 800-63-3 (where applicable). The technical team will compile a list of audit criteria, validate the security processes and protocols in place, and conduct penetration testing where appropriate, documented in a Data Security Audit Report.

9.5 Customer Service

Throughout the demonstration, participants may need to engage customer service. As such, the demonstration will deploy a customer service element to provide specific account support. Caltrans and the technical team will provide frontline, Tier 1, customer service to participants, helping to register accounts, install hardware, download apps, and provide direct engagement services between demonstration participants and each of the business partners. To help provide participants with a direct means of accessing customer support, Caltrans and the technical team will establish a toll-free customer support hotline, an issue tracking log, and a series of Frequently Asked Questions (FAQs) on demonstration websites for participants to address simple issues before needing to engage customer service resources. Note that the customer service provided for the demonstration relates to only road charge activities. Each business partner already maintains customer service mechanisms for their existing services and will continue to provide those services to customers enrolled in their existing programs.

9.6 Surveys and Focus Groups

One of the key objectives for the demonstration is to improve public understanding of road charge. To help determine if the demonstration is meeting this objective, participants may be asked to engage in surveys and focus groups. These research instruments will capture both attitudes relative to road charge, and specific experiences on how participants accessed their business partners and engaged in the demonstration. These surveys and focus groups will be provided both in online (web-based) and live, facilitated venues. Participants may be compensated for their contribution based on their involvement as well as any restrictions placed by employers.

10. OPERATIONAL SCENARIOS

This section provides operational scenarios describing how the demonstration concept might function from the perspective of specific stakeholders. These operational scenarios are intended to provide supplemental information and clarity on how each phase of the demonstration will occur, which includes reporting, assessing, and collecting a road charge across each technology platform. The operational scenarios are presented for each of the demonstration’s phases as previously defined.

- **Phase 1:** Pay-at-the-Pump / Charge Point (PATP/CP)
- **Phase 2:** Usage-Based Insurance (UBI)
- **Phase 3:** Transportation Network Companies (TNC)
- **Phase 4:** Autonomous Vehicles (AV)

10.1 Interested Parties and Demonstration Enrollment

Over the course of the public outreach and communications activities, individuals interested in learning more about the demonstration will be directed to the California road charge demonstration website where they can access information on the demonstration as well as the larger potential road charge program. The website will include a link for them to become an “Interested Party.” Upon clicking this link, they will be directed to a separate webpage where they will complete and submit a participant recruitment form, which includes entering their email address, some general geographic and demographic information, and any vehicles they wish to enroll in the demonstration.

Caltrans and the project technical team will evaluate each of the submitted recruitment forms and identify interested parties to become participants, based on eligibility requirements (such as geographically located near a participating fueling station for Phase 1 (PATP/CP)). Once selected, an email will be sent to the individual, using the email address provided, that gives them specific instructions on how to become a demonstration participant. This email will contain a link to a webpage allowing the participant to select their demonstration preference and enter in any additional information needed to participate. The webpage will prompt participants to indicate their first and second choices, if their primary selection is unavailable.

The website will list requirements for participating in each phase, such as geographic location, possession of a mobile phone, or a vehicle with a dedicated OBD-II port that is accessible for the duration of the demonstration. Caltrans and the project technical team will review participant choices against stratification requirements and assign participants to a demonstration phase. Upon selection, the participant will be notified via email with instructions for registering and participating in their assigned phase.

The participant website will also serve as a means for participants to submit Tier 1 customer support requests. These requests will be fielded by project technical team members who will coordinate directly with the participant to address any issues. They may also serve as a liaison between the participant the business partners to resolve complex issues.

Throughout the demonstration period, both participants and interested parties will continue to receive communications, newsletters, and updates from the road charge program. Additionally, interested parties and participants may be asked to participate in surveys and focus groups to further support the opinion research aspects of the program communications.

10.2 Phase 1: Pay-at-the-Pump / Charge Point (PATP/CP)

This section provides insight as to how participants, business partners, administrators, and Caltrans would participate in the Phase 1 (PATP/CP) demonstration.

10.2.1 Participant

Onboarding

For Phase 1 enrollment, participants will enter their information into the PATP/CP business partner's enrollment platform, such as: name, mailing address, vehicle year/make/model, and vehicle identification number (VIN). Shortly after initial enrollment, they will also receive any technologies/devices needed to enable data collection (such as an OBD-II plug-in device or Bluetooth beacon for communicating to a fuel pump) along with instructions on how to install, activate, and use the technology.

Additionally, participants may need to download and install a mobile app from the business partner to enable data collection and reporting capabilities, view activity and receipts, and simulate road charge payments.

Demonstration Operations

Participating vehicles will refuel or charge their vehicles at prescribed fueling stations or charge points at designated pumps/charge points, just as they would at any other time. They will pay for their fuel or charge as they would any other time and receive their transaction receipt. In addition to the standard receipt, they will receive a notification via app, text message, and/or email that shows their "Net Road Charge Due or Credited." This net charge is the difference between the California State motor fuels tax paid (calculated by the number of gallons purchased times 47.3 cents per gallon)(if applicable) and the theoretical road charge they would have paid (calculated by the number of miles traveled times the per-mile rate). The message will contain the demonstration customer support number where participants can contact the demonstration technical team to dispute the road charge calculations or report technical issues.

Dispute Resolution and Questions

A toll-free number will be provided on the message received by participants for them to notify the demonstration technical team to report any issues. Additionally, the participant web portal will contain an issue notification portal where participants can log issues or send messages to demonstration team members. The participant may be asked to validate certain information from the customer service representative to aid in troubleshooting.

Note that this customer support will only relate to the road charge portions of the demonstration. Any other issues related to normal fueling/charging operations will be directed to the PATP/CP business partner's customer support team for resolution.

Offboarding and Closeout

At the end of the six-month demonstration period, participants will offboard from the demonstration. This will involve closing out accounts (as necessary), returning any provided data collection technology/devices, and uninstalling any mobile apps. Participants may also be asked

to participate in closeout surveys and/or focus groups to provide experiential feedback on their participation.

10.2.2 PATP/CP Business Partner

System Deployment

The PATP/CP business partner will be responsible for installing, operating, and maintaining the necessary hardware and systems needed to successfully conduct the Phase 1 demonstration. They will identify and install hardware and systems at participating fuel pumps and charge points, develop and deploy the systems needed to collect data, calculate transactions, and report to participants and Caltrans. They will also be responsible for configuring, shipping, and administering vehicle-installed data collectors to participants.

They will also work with the demonstration technical team to develop the necessary technical and business requirements, test plans, and test cases. Finally, the business partners will conduct the required unit, integration, acceptance, and dry-run testing needed prior to demonstration launch.

Onboarding

The PATP/CP business partner will be directly involved in onboarding participants. This includes establishing participant accounts, shipping vehicle data collectors to participants, verifying correct installations, assigning data collectors to accounts, and ensuring participant accounts are successfully established prior to demonstration launch. As needed, the business partner will also provide customer service, by coordinating directly with the demonstration technical team to ensure participants, fueling stations, and charge points are ready for demonstration launch. The PATP/CP business partner will also provide a list of participants with minimal contact information to the demonstration technical team to aid in customer support activities.

Demonstration Operations

During demonstration operations, the PATP/CP business partner will provide systems administration and technical expertise to participants and the demonstration technical team. For each fueling/charging session initiated by participants, the business partner's deployed systems will collect travel data from the installed vehicle data collectors and session data from the fuel pump / charge point. The business partner will calculate the simulated assessed road charge and provide credits for any paid state motor fuel taxes (based on fuel purchased). The business partner will then communicate this net road charge to participants for each transaction via a session receipt, mobile app, or email. To promote public and Caltrans acceptance of their deployed PATP/CP systems, the business partner will verify the accuracy of the collected data and calculated transactions.

The business partner will be responsible for creating the financial reports necessary to show the theoretical road charge revenues captured during the reporting period. The business partner will aggregate all captured vehicle mileage and fuel/charge data, calculated transactions, and net simulated road charge revenues. They will then compile a series of revenue, travel data, and event reports, using formats prescribed by Caltrans, providing guidance on the road charges calculated during the reporting period.

The business partner will also upload data from their systems to PRIME. Data captured during each transaction will flow between the participant vehicle, the fuel pump/charge point, and the business partner's back office system. During these transfers, the business partner will sanitize each data element, removing any PII, and then upload that data to PRIME for further analysis and processing.

Invoicing and Payment Collection

The only payment scenarios anticipated for the demonstration will involve the current payment operations between participants and the business partners when fueling and charging their vehicles. To demonstrate the transfer of monies, a simulated charge will be implemented but no actual road charges will be collected or paid by participants.

Customer Service

Throughout the demonstration, the PATP/CP business partner will provide customer support. In this capacity, the business partner will coordinate with members of the demonstration technical team, who are providing Tier 1 frontline support to participants. The business partner will coordinate on updating accounts, troubleshooting and replacing vehicle data collector hardware, revising transaction data, and providing information to the demonstration technical team members. If needed, the business partner may also coordinate directly with the participant to resolve issues that cannot be handled by the demonstration technical team.

Offboarding and Closeout

At the end of the six-month demonstration period, the PATP/CP business partner will offboard participants and closeout accounts. This will involve coordinating the return of any vehicle data collector hardware, removing any previously deployed hardware and systems at fueling and charging stations, closing out participant accounts, creating final reports, destroying any demonstration data from their systems, and conducting a project hot wash with the demonstration technical team and Caltrans to identify lessons learned and support the demonstration evaluation.

10.2.3 Caltrans

Onboarding

During the onboarding phase, Caltrans will oversee the onboarding activities to ensure that participant experiences are positive. They will communicate demonstration activities to participants, engage as needed to resolve issues, and liaise with members of the demonstration technical team and the business partner to oversee onboarding activities. Caltrans employees may be recruited as participants given their unique perspective to overall demonstration activities. Caltrans may also identify potential recruits to participate in the demonstration through direct interaction, meetings with other state agencies, and communications and outreach activities.

Demonstration Operations

During demonstration operations, Caltrans will take on several roles. First, they will serve as the demonstration owner, working directly with members of the demonstration technical team, business partners, and other stakeholders to report on demonstration status. They may also

participate in communications and outreach activities, serving as the demonstration owner and taking feedback from participants and members of the public.

Caltrans will evaluate the financial reports provided by the PATP/CP business partner. They will evaluate the revenue reports and provide feedback to the demonstration technical team on how reporting accuracy, readability, and understanding could be improved. They may also participate in financial audits and liaise with other state agencies that may become engaged with future road charge initiatives.

Caltrans will also access analytics and informative reports provided by PRIME. They will review collected sanitized data transmitted from the business partners and other sources, analyze the data and overall systems performance, and provide feedback to demonstration technical team members on other dashboards that could be created using demonstration data. They will communicate the benefits of PRIME to other state agencies and may even conduct training sessions on how to access PRIME, how to analyze PRIME dashboards, and how to conduct data queries in the data clearinghouse.

Customer Service

Caltrans may provide spot customer support to participants by directing them to the demonstration technical team or the participant website. They will also work with the demonstration technical team to evaluate customer service satisfaction and ways to improve overall demonstration performance and participant experiences.

Offboarding and Closeout

Caltrans will ensure that offboarding and account closeout activities are done to the satisfaction of their demonstration participants. They will coordinate with demonstration technical team members, business partners, and participants to ensure hardware has been returned, accounts have been closed, final reports have been compiled, and demonstration data has been destroyed. Caltrans will also participate in the demonstration hot wash with the technical team and respective business partners to identify lessons learned and support the demonstration evaluation.

10.2.4 System Administrator

Onboarding

The System Administrator will provide support to business partners during the enrollment and onboarding of participants for the PATP/CP phase. Support may include providing Tier 1 customer support for enrollment, app or device installation and activation, and other related onboarding activities.

Demonstration Operations

The System Administrator will actively oversee PATP/CP business partner operations, including ongoing compliance checks and data validations to ensure operations are running as expected.

The System Administrator will maintain and operate the Data Clearinghouse Subsystem and PRIME analytics and dashboard platform. The System Administrator will verify that the PATP/CP business partner is transmitting expected reports and data at the defined intervals, matching

Caltrans' prescribed formats. The System Administrator will develop queries, perform analytics, and build dashboards to meet Caltrans' needs using PATP/CP data during Phase 1. The System Administrator will also manage PRIME user access, maintenance, security, and configuration.

Customer Service

The demonstration technical team (subset of System Administrators) will provide Tier 1 customer support to participants for the PATP/CP phase, which includes: managing the toll-free customer service hotline, answering online and email inquiries, and escalating issues to business partners and Caltrans for Tier 2 customer support as needed. The demonstration technical team will monitor customer service levels for Tier 1 support and Tier 2 business partner support. The team will report customer service levels and satisfaction to Caltrans on to improve overall demonstration performance and participant experience.

Offboarding and Closeout

The System Administrator will oversee participant offboarding and business partner closeout activities to ensure participant accounts are closed, apps are uninstalled, hardware/devices are returned, final reports are transmitted, demonstration data is destroyed, and final analytics and dashboards are preserved for Caltrans' future use. The System Administrator will also host a project hot wash with business partners and Caltrans to identify lessons learned and support the demonstration evaluation.

10.3 Phase 2: Usage-Based Insurance

10.3.1 Participant

Onboarding

Participants who enroll in the Phase 2 UBI demonstration will access the business partner's enrollment platform and enter in their relevant information, such as: name, mailing address, vehicle year/make/model, and VIN. They will also be directed to download the UBI Business Partner's mobile app, which serves as the data collector and account management interface for the demonstration. Then, the participant will use this app to upload a picture of their participating vehicle's odometer, which will serve as the initial odometer reading for the demonstration. Once registration is complete and the baseline odometer reading is successfully received by the business partner, the participant will receive a mock insurance policy via email.

Demonstration Operations

By demonstration launch, participants will have uploaded a picture of their vehicle's odometer using the UBI Business Partner's app. At periodic intervals, the app will send notifications to the participant to upload subsequent pictures of their vehicle's odometer. At monthly intervals, participants will receive a mock invoice from the UBI Business Partner that shows the simulated monthly insurance premium owed based on the number of miles driven and the simulated assessed road charge. The mock invoice will also show the "Net Road Charge Due or Credited." This net charge is the difference between the estimated California State Motor fuels tax paid over the reporting period (calculated by the miles between odometer readings, divided by the EPA

estimated fuel economy (MPG), times 47.3 cents per gallon) and the theoretical road charge they would have paid (calculated by the number of miles traveled times the per-mile rate). The invoice will also contain the demonstration customer support number where participants can contact the demonstration technical team to dispute road charge calculations or report technical issues. Similar information will also be available via the downloaded app used to transfer odometer pictures.

Customer Service

A toll-free number will be provided on the message received by participants for them to notify the demonstration technical team to report any issues. Additionally, the participant web portal will contain an issue notification portal where participants can log issues or send messages to demonstration team members. The participant may be asked to validate certain information from the customer service representative to aid in troubleshooting.

Note that this customer support will only relate to the road charge portions of the demonstration. Any other issues related to normal UBI operations will be directed to the UBI business partner's customer support team for resolution.

Offboarding and Closeout

At the end of the five-month demonstration period, participants will offboard from the demonstration. This will involve closing out business partner UBI mock policy accounts and uninstalling any mobile apps. Participants may also be asked to participate in closeout surveys and/or focus groups to provide experiential feedback on their participation.

10.3.2 UBI Business Partner

System Deployment

The UBI Business Partner will be responsible for deploying, operating, and maintaining the systems needed to successfully demonstrate how road charge can be integrated with a UBI provider. They will develop and deploy the systems and apps needed to collect data, calculate transactions, and report to participants and Caltrans, and generate mock Pay-As-You-Drive (PAYD) insurance policies.

They will also work with the demonstration technical team to develop the necessary technical and business requirements, test plans, and test cases. Finally, the business partners will conduct the required unit, integration, acceptance, and dry-run testing needed prior to demonstration launch.

Onboarding

The UBI business partner will oversee participant onboarding, providing subject matter expertise, systems administration, and onboarding accuracy and validation. They will work with the demonstration technical team to address any onboarding issues with participants, providing technical guidance and updating participant accounts as necessary. The UBI Business Partner will also provide a list of participants with minimal contact information to the demonstration technical team to aid in customer support activities.

As part of the onboarding process, the UBI business partner will coordinate with participants to download the UBI mobile app and provide instructions to participants on how to take and upload

their initial odometer pictures. The UBI business partner will store the initial odometer picture as the “baseline” odometer reading, to be used to calculate miles traveled when subsequent odometer pictures are uploaded. The UBI business partner will create a mock insurance policy for each participant and provide the policy via email.

Demonstration Operations

During demonstration operations, the UBI Business Partner will provide systems administration and technical expertise to participants and the demonstration technical team. Their systems will receive odometer pictures uploaded by participants and analyze the pictures to confirm their validity and integrity (e.g. comparing the uploaded picture against a backend database of dashboard images, to confirm the correct year/make/model vehicle’s dashboard is pictured). The business partner will compare uploaded odometer pictures to calculate the difference in mileage between the odometer readings, calculate the simulated PAYD insurance premiums, calculate the simulated assessed road charge, provide credits for any paid state motor fuel taxes (based on the miles traveled divided by the vehicle’s EPA estimated MPG), and communicate with participants the simulated road charge assessed during the reporting period.

The business partner will be responsible for creating the financial reports necessary to show the theoretical road charge revenues captured during the reporting period. The business partner will aggregate all captured vehicle mileage and fuel consumption, calculated transactions, and net simulated road charge revenues, as well as their simulated PAYD insurance premiums. They will then compile a series of revenue, travel data, and event reports, using formats prescribed by Caltrans, providing guidance on the road charges calculated during the reporting period.

The business partner will also upload sanitized transaction-level data to PRIME. Specific odometer pictures are not expected to be uploaded, rather the calculate mileage, fuel consumption, theoretical road charge, and related sanitized transaction data will be used for analysis.

Invoicing and Payment Collection

The UBI Business Partner will submit monthly invoices to each participant. These invoices will show the calculated number of miles reported, mock PAYD insurance premiums due, theoretical road charge due, estimated state motor fuel taxes paid based on the miles reported, and the total net road charge due, which is the difference between calculated road charges and fuels tax credits. No actual payment activities will occur during this phase for the purpose of the demonstration.

Customer Service

Throughout the demonstration, the UBI business partner will provide customer support, coordinating with members of the demonstration technical team, and providing Tier 2 and higher technical support, as needed. This may include updating accounts, troubleshooting inaccurate odometer readings, revising transaction data, and providing information to the demonstration technical team members. If needed, the business partner may also coordinate directly with the participant to resolve issues that cannot be handled by the demonstration technical team.

Offboarding and Closeout

At the end of the five-month demonstration period, the UBI business partner will oversee participant offboarding and account closeout. This will involve closing out participant accounts

and mock insurance policies, coordinating with participants to uninstall the UBI mobile app, creating final reports, and conducting a project hot wash with the demonstration technical team and Caltrans to identify lessons learned and support the demonstration evaluation.

10.3.3 Caltrans

Onboarding

During the onboarding phase, Caltrans will oversee the onboarding activities to ensure that participant experiences are positive. They will communicate demonstration activities to participants, engage as needed to resolve issues, and liaise with members of the demonstration technical team and the business partner to oversee onboarding activities. Caltrans employees may be recruited as participants bringing a unique perspective to overall demonstration activities. Caltrans may also identify potential recruits to participate in the demonstration through direct interaction, meetings with other state agencies, and communications and outreach activities.

Demonstration Operations

During demonstration operations, Caltrans will take on several roles. First, they will serve as the demonstration owner, working directly with members of the demonstration technical team, business partners, and other stakeholders to report on demonstration status. They may also participate in communications and outreach activities, serving as the demonstration owner and taking feedback from participants and members of the public.

Caltrans will evaluate the financial reports provided by the UBI business partner. They will evaluate the revenue reports and provide feedback to the demonstration technical team on how reporting accuracy, readability, and understanding could be improved. They may also participate in financial audits and liaise with other state agencies that may become engaged with future road charge initiatives.

Caltrans will also access analytics and informative reports provided by PRIME. They will review collected sanitized data transmitted from the business partners and other sources, analyze the data and overall systems performance, and provide feedback to demonstration technical team members on other dashboards that could be created using demonstration data. They will communicate the benefits of PRIME to other state agencies and may even conduct training sessions on how to access PRIME, how to analyze PRIME dashboards, and how to conduct data queries in the data clearinghouse.

Customer Service

Caltrans may provide spot customer support to participants by directing them to the demonstration technical team or the participant website. They will also work with the demonstration technical team to evaluate customer service satisfaction and ways to improve overall demonstration performance and participant experiences.

Offboarding and Closeout

Caltrans will ensure that offboarding and account closeout activities are done to the satisfaction of their demonstration participants. They will coordinate with demonstration technical team

members, business partners, and participants to ensure accounts have been closed, final reports have been compiled, and demonstration data has been destroyed. Caltrans will also participate in the demonstration hot wash with the technical team and respective business partners to identify lessons learned and support the demonstration evaluation.

10.3.4 System Administrator

Onboarding

The System Administrator will provide support to business partners during the enrollment and onboarding of participants for the UBI phase. Support may include providing Tier 1 customer support for enrollment, app installation and activation, and other related onboarding activities.

Demonstration Operations

The System Administrator will actively oversee UBI business partner operations, including ongoing compliance checks and data validations to ensure operations are running as expected.

The System Administrator will maintain and operate the Data Clearinghouse Subsystem and PRIME analytics and dashboard platform. The System Administrator will verify that the UBI business partner is transmitting expected reports and data at the defined intervals, matching Caltrans' prescribed formats. The System Administrator will develop queries, perform analytics, and build dashboards to meet Caltrans' needs using UBI data during Phase 2. The System Administrator will also manage PRIME user access, maintenance, security, and configuration.

Customer Service

The demonstration technical team (subset of System Administrators) will provide Tier 1 customer support to participants for the UBI phase, including managing the toll-free customer service hotline, answering online and email inquiries, and escalating to business partners and Caltrans for Tier 2 customer support as needed. The demonstration technical team will monitor customer service levels for Tier 1 support and Tier 2 business partner support, and report to Caltrans on customer service levels and satisfaction to improve overall demonstration performance and participant experience.

Offboarding and Closeout

The System Administrator will oversee participant offboarding and business partner closeout activities to ensure participant accounts are closed, apps are uninstalled, final reports are transmitted, demonstration data is destroyed, and final analytics and dashboards are preserved for Caltrans' future use. The System Administrator will also host a project hot wash with business partners and Caltrans to identify lessons learned and support the demonstration evaluation.

10.4 Phase 3: Transportation Network Companies

10.4.1 Participant

Onboarding

Participants who enroll in the Phase 3 TNC demonstration will access the business partner's enrollment platform and enter in their relevant contact and payment information. They will also be directed to download the TNC Business Partner's mobile app, which serves as the primary method for ride hailing. Once enrollment is complete, the participant will receive a confirmation email from the business partner welcoming them to the ride hail service. Note that participants for this phase of the demonstration will be geographically constrained to reserving ride hailing trips in the West Sacramento metropolitan area. Participants will be selected for this phase based on their proximity to West Sacramento.

Demonstration Operations

During this phase of the demonstration, participants, both at prescribed times and at their own selected times, will reserve a TNC ride. They will access the TNC business partner's Account Management subsystem (from the mobile app, website, or via telephone), reserve a ride, and travel in the participating vehicle just as they would under any typical TNC operation. At the end of their trip, participants will receive a receipt from the TNC business partner showing how much they paid for their ride.

Additionally, a separate notification via the app and a separate emailed receipt will be provided that show how much in California State motor fuels tax they paid for the trip (calculated by the miles traveled during the trip, divided by either the number of gallons consumed or the EPA estimated MPG, times 47.3 cents per gallon), the theoretical road charge they would have paid (calculated by the number of miles traveled times the per-mile rate), and the difference between the two values to show the "Net Road Charge Due or Credited".

Customer Service

Participants may access the participant customer support number where they can contact members of the demonstration technical team to dispute road charge calculations or report technical issues. The participant may be asked to validate certain information from the customer service representative to aid in troubleshooting. Additionally, the participant web portal will contain an issue notification portal where participants can log issues or send messages to demonstration team members.

Note that this customer support will only relate to the road charge portions of the demonstration. Any other issues related to normal TNC operations will be directed to the TNC Business Partner's customer support team for resolution.

Offboarding and Closeout

At the end of the four-month demonstration period, participants will offboard from the demonstration. If participants wish to remain customers with the TNC business partner, no offboarding or closeout activities are needed. If participants wish to end their relationship with the

TNC Business Partner, they will close out their accounts, pay any unresolved TNC invoices, and uninstall any mobile apps. Participants may also be asked to participate in surveys and/or focus groups to provide experiential feedback on their participation.

10.4.2 TNC Business Partner

System Deployment

The TNC business partner will be responsible for deploying, operating, and maintaining the systems and vehicles necessary for TNC and road charge demonstration operations. They will develop and deploy the systems and apps needed to summon rides, collect data, calculate transactions, and report to participants and Caltrans, and generate actual TNC invoices and mock road charge invoices.

They will also work with the demonstration technical team to develop the necessary technical and business requirements, test plans, and test cases. Finally, the business partners will conduct the required unit, integration, acceptance, and dry-run testing needed prior to demonstration launch.

Onboarding

The TNC business partner will oversee participant onboarding, providing subject matter expertise, systems administration, and onboarding accuracy and validation. They will work with the demonstration technical team to address any onboarding issues with participants, providing technical guidance and updating participant accounts as necessary. The TNC business partner will also provide a list of participants with minimal contact information to the demonstration technical team to aid in customer support activities.

As part of the onboarding process, the TNC business partner will coordinate with participants to download the TNC mobile app, and provide instructions to participants on how to schedule, take and pay for rides.

Demonstration Operations

During demonstration operations, the TNC business partner will provide systems administration and technical expertise to participants and the demonstration technical team. Their systems will coordinate ride hailing events from participants, operate TNC vehicles, collect trip data from embedded data collectors within the participating vehicles, calculate the simulated assessed road charge, provide credits for any paid state motor fuel taxes (based on the miles traveled divided by the vehicle's EPA estimated MPG), and communicate with participants the simulated road charge assessed during the reporting period.

At the end of each trip, the TNC business partner will provide a receipt showing the participant how much they paid for their ride. Additionally, the business partner will send the participant a separate notification via the mobile app and an emailed receipt showing how much in California State motor fuels tax they paid for the trip (calculated by the miles traveled during the trip, divided by either the number of gallons consumed or the EPA estimated MPG, times 47.3 cents per gallon), the theoretical road charge they would have paid (calculated by the number of miles traveled times the per-mile rate), and the difference between the two values to show the "Net Road Charge Due or Credited".

The business partner will be responsible for creating the financial reports necessary to show the theoretical road charge revenues captured during the reporting period. The business partner will aggregate all ride hailing events, captured vehicle mileage and fuel consumption, calculated transactions, and other trip information. They will then compile a series of revenue, travel data, and event reports, using formats prescribed by Caltrans, providing guidance on the simulated road charge that was calculated during the reporting period.

The business partner will also upload transaction data to PRIME. Data will be sanitized of all PII and will not consist of any proprietary information from the TNC business partner's systems or operations.

Invoicing and Payment Collection

The only payment scenarios anticipated for the demonstration will involve the current payment operations between participants and the TNC business partner for scheduling and taking rides in the participating TNC vehicles. Simulated trip receipts showing theoretical road charge assessed will be provided as a separate report to the participants at the end of each trip.

Customer Service

Throughout the demonstration, the TNC business partner will also provide customer support both as part of their ongoing TNC operations as well as for the demonstration. Relative to the demonstration participants, the business partner will coordinate with members of the demonstration technical team, who are providing Tier 1 frontline support to participants. The business partner will coordinate on updating accounts, revising transaction data, and providing information to the demonstration technical team members. If needed, the business partner may also coordinate directly with the participant to resolve issues that cannot be handled by the demonstration technical team. Note that any customer service issues related to normal TNC operations will be directed to the TNC business partner's customer support services and not be handled by the demonstration technical team.

Offboarding and Closeout

Participant offboarding for the TNC phase of the demonstration are expected to be very minimal. Participants may choose to delete any created accounts which would require payment of any unpaid invoices to the TNC business partner, but no direct actions by the TNC business partner are expected. The TNC business partner will support TNC phase closeout efforts, including producing final reports, destroying any demonstration data from their systems, and conducting a demonstration hot wash with Caltrans and members of the technical team to identify lessons learned and support the demonstration evaluation.

10.4.3 Caltrans

Onboarding

During the onboarding phase, Caltrans will oversee the onboarding activities to ensure that participant experiences are positive. They will communicate demonstration activities to participants, engage as needed to resolve issues, and liaise with members of the demonstration technical team and the business partner to oversee onboarding activities. Caltrans employees may

be recruited as participants bringing a unique perspective to overall demonstration activities. Caltrans may also identify potential recruits to participate in the demonstration through direct interaction, meetings with other state agencies, and communications and outreach activities.

Demonstration Operations

During demonstration operations, Caltrans will take on several roles. First, they will serve as the demonstration owner, working directly with members of the demonstration technical team, business partners, and other stakeholders to report on demonstration status. They may also participate in communications and outreach activities, serving as the demonstration owner and taking feedback from participants and members of the public.

Caltrans will evaluate the financial reports provided by the TNC business partner. They will evaluate the revenue reports and provide feedback to the demonstration technical team on how reporting accuracy, readability, and understanding could be improved. They may also participate in financial audits and liaise with other state agencies that may become engaged with future road charge initiatives.

Caltrans will also access analytics and informative reports provided by PRIME. They will review collected sanitized data transmitted from the business partners and other sources, analyze the data and overall systems performance, and provide feedback to demonstration technical team members on other dashboards that could be created using demonstration data. They will communicate the benefits of PRIME to other state agencies and may even conduct training sessions on how to access PRIME, how to analyze PRIME dashboards, and how to conduct data queries in the data clearinghouse.

Customer Service

Caltrans may provide spot customer support to participants by directing them to the demonstration technical team or the participant website. They will also work with the demonstration technical team to evaluate customer service satisfaction and ways to improve overall demonstration performance and participant experiences.

Offboarding and Closeout

Caltrans will ensure that offboarding and account closeout activities are done to the satisfaction of their demonstration participants. They will coordinate with demonstration technical team members, business partners, and participants to ensure accounts have been closed where appropriate, final reports have been compiled, and demonstration data has been destroyed. Caltrans will also participate in the demonstration hot wash with the technical team and respective business partners to identify lessons learned and support the demonstration evaluation.

10.4.4 System Administrator

Onboarding

The System Administrator will provide support to business partners during the enrollment and onboarding of participants for the TNC phase. Support may include providing Tier 1 customer support for enrollment, app installation and activation, and other related onboarding activities.

Demonstration Operations

The System Administrator will actively oversee TNC business partner operations, including ongoing compliance checks and data validations to ensure operations are running as expected.

The System Administrator will maintain and operate the Data Clearinghouse Subsystem and PRIME analytics and dashboard platform. The System Administrator will verify that the TNC business partner is transmitting expected reports and data at the defined intervals, matching Caltrans' prescribed formats. The System Administrator will develop queries, perform analytics, and build dashboards to meet Caltrans' needs using TNC data during Phase 3. The System Administrator will also manage PRIME user access, maintenance, security, and configuration.

Customer Service

The demonstration technical team (subset of System Administrators) will provide Tier 1 customer support to participants for the TNC phase, including managing the toll-free customer service hotline, answering online and email inquiries, and escalating to business partners and Caltrans for Tier 2 customer support as needed. The demonstration technical team will monitor customer service levels for Tier 1 support and Tier 2 business partner support, and report to Caltrans on customer service levels and satisfaction to improve overall demonstration performance and participant experience.

Offboarding and Closeout

The System Administrator will oversee participant offboarding and business partner closeout activities to ensure participant accounts are closed, apps are uninstalled, final reports are transmitted, demonstration data is destroyed, and final analytics and dashboards are preserved for Caltrans' future use. The System Administrator will also host a project hot wash with business partners and Caltrans to identify lessons learned and support the demonstration evaluation.

10.5 Phase 4: Autonomous Vehicles

10.5.1 Participant

Onboarding

No participant onboarding activities are anticipated for this phase of the demonstration.

Demonstration Operations

No participant operation activities are anticipated for this phase of the demonstration. If safety provisions and policy allow, members of the demonstration technical team and/or Caltrans may ride in automated test vehicles during prescribed test trips, but no other actions are needed.

As part of a prescribed demonstration test activity, a ride hailing event will be simulated using the TNC business partner's Account Management subsystem and the AV test vehicle. This activity is expected to be conducted by demonstration technical team members and/or Caltrans, but no participant actions are anticipated.

Customer Service

No participant customer service activities are anticipated during this phase.

Offboarding and Closeout

No participant offboarding or closeout activities are anticipated during this phase.

10.5.2 AV Business Partner

System Deployment

The AV business partner will provide the automated test vehicle, sensors, and systems necessary to capture road charge relevant data (as well as other vehicle data). The AV business partner is not expected to provide Transaction Processing or Account Management subsystems for this phase of the demonstration. A prescribed test will be conducted where AV data will be routed to the TNC business partner's Transaction Processor and Account Management subsystems for integration testing, processing, and reporting.

The AV business partner will work with the demonstration technical team to develop the necessary technical requirements, test plans, and test cases. Finally, the business partners will conduct the required unit, integration, acceptance, and dry-run testing needed prior to demonstration launch.

Onboarding

No onboarding activities are anticipated during this phase.

Demonstration Operations

This phase of the demonstration will involve prescribed tests in a controlled test environment. During each test, the AV will travel along a prescribed path, while sensors onboard the vehicle capture road charge relevant data and transmit that data to a data repository. Once captured, the collected data will be analyzed to determine if it is accurate for calculating a road charge.

The collected and validated data will then be transferred to the TNC business partner's Transaction Processing subsystem. Once transferred, the TNC business partner's systems will calculate the simulated assessed road charge and provide a report to Caltrans showing the theoretical road charge assessed. Note that the automated test vehicles used for this demonstration are expected to be all-electric and as such, will not have a state motor fuel tax credit calculated.

The TNC business partner will be responsible for creating the financial reports necessary to show the theoretical road charge revenues captured during the reporting period. The business partner will report travel data, events, and simulated road charge revenues, using formats prescribed by Caltrans, providing guidance on the simulated road charge that was calculated during the reporting period.

The demonstration technical team will also upload the captured AV data to PRIME for further analysis and processing. Data will be sanitized of any proprietary information from the TNC business partner's systems or operations or any proprietary AV technologies.

Invoicing and Payment Collection

No invoicing or payment collections are anticipated for this phase. Simulated trip receipts showing theoretical road charge assessed may be provided as a separate report from the TNC business partner at the end of each trip during the prescribed ride hailing portion of the AV phase.

Customer Service

No customer service actions are anticipated for this phase.

Offboarding and Closeout

No offboarding or closeout activities, other than those already being conducted by the TNC business partner are anticipated for this phase. The AV business partner will support a demonstration hot wash with Caltrans and members of the technical team to identify lessons learned and support the demonstration evaluation.

10.5.3 Caltrans

Onboarding

No onboarding activities are anticipated during this phase.

Demonstration Operations

During demonstration operations, Caltrans will take on several roles. They will serve as the demonstration owner, working directly with members of the demonstration technical team, business partners, and other stakeholders to report on demonstration status. Caltrans may also participate in prescribed testing with the automated test vehicle, using the TNC business partner mobile app and process to schedule, take and receive receipts for rides.

Caltrans will also evaluate the financial reports provided by the TNC business partner. They will evaluate the revenue reports and provide feedback to the demonstration technical team on how reporting accuracy, readability, understanding, and how the reports could be improved. They may also participate in financial audits and liaise with other state agencies that may become engaged with future road charge initiatives.

Caltrans will also access analytics and informative reports provided by PRIME. They will review collected sanitized data transmitted from the business partners and other sources, analyze the data and overall systems performance, and provide feedback to demonstration technical team members on other dashboards that could be created using demonstration data. They will communicate the benefits of PRIME to other state agencies and may even conduct training sessions on how to access PRIME, how to analyze PRIME dashboards, and how to conduct data queries in the data clearinghouse.

Customer Service

No customer service activities are anticipated during this phase.

Offboarding and Closeout

Caltrans will ensure that AV phase closeout activities are completed. They will coordinate with demonstration technical team members and AV and TNC business partners to ensure final reports have been compiled, and demonstration data has been destroyed. Caltrans will also participate in the demonstration hot wash with the technical team and respective business partners to identify lessons learned and support the demonstration evaluation.

10.5.4 System Administrator

Onboarding

No onboarding activities are anticipated during this phase.

Demonstration Operations

The System Administrator will actively oversee AV and TNC business partner operations, including ongoing compliance checks and data validations to ensure operations are running as expected.

The System Administrator will maintain and operate the Data Clearinghouse Subsystem and PRIME analytics and dashboard platform. The System Administrator will verify that the TNC business partner is transmitting expected reports and data and the defined intervals for Phase 4, matching Caltrans' prescribed formats. The System Administrator will develop queries, perform analytics, and build dashboards to meet Caltrans' needs using AV data during Phase 4. The System Administrator will also manage PRIME user access, maintenance, security, and configuration.

The demonstration technical team (subset of System Administrators) may also participate in prescribed testing with the automated test vehicle, using the TNC business partner mobile app and process to schedule, take, and receive receipts for rides.

Customer Service

No customer service activities are anticipated during this phase.

Offboarding and Closeout

The System Administrator will oversee AV and TNC business partner closeout activities to ensure final reports are transmitted and demonstration data is destroyed. The System Administrator will also make sure final analytics and dashboards are preserved for Caltrans' future use. The System Administrator will also host a project hot wash with business partners and Caltrans to identify lessons learned and support the demonstration evaluation.

11. FAILURE SCENARIOS

This section provides potential system failure scenarios for each of the demonstration phases. The potential failure situation is presented along with a recommended recovery scenario to mitigate the failure. The failure scenarios are presented for each of phase as previously defined as well as participant enrollment systems and other support systems (Customer Service, PRIME, Revenue Reporting).

- Participant Enrollment
- **Phase 1:** Pay-at-the-Pump / Charge Point (PATP/CP)
- **Phase 2:** Usage-Based Insurance (UBI)
- **Phase 3:** Transportation Network Companies (TNC)
- **Phase 4:** Autonomous Vehicles (AV)
- Support Systems

11.1 Participant Enrollment Failures

SCENARIO 1.A: Not enough participants to meet anticipated quantities

Not enough participants are enrolled to meet the expected quantities for each demonstration phase. This could be caused by inadequate communications or recruiting efforts, or simply lack of interest by the general public.

Recommended Recovery: Identify internal Caltrans, TAC, CTC, and other state agency staff to participate through informal and formal meetings, TAC sessions, or email correspondence to identify additional participants to meet expected quantities.

SCENARIO 1.B: Participant Enrollment Website Failure

The participant portal and website fail and no participants can access business partner portals to register their accounts or enroll in services.

Recommended Recovery: Have demonstration technical team and Caltrans host informative webinars and local sessions to register participants directly with business partners.

11.2 Phase 1 (PATP/CP) Failures

SCENARIO 2.A: Aftermarket Data Collection Hardware Causes Damage to Vehicle Systems

The aftermarket device provided by the PATP/CP business partner causes damage to a participant vehicle's telematics or electrical systems.

Recommended Recovery: Deploy warranty repair actions, including coordination with PATP/CP vehicle data collector provider.

SCENARIO 2.B: Inaccurate reporting of data or calculation of fueling transactions

The data reported from a participant's vehicle or the calculation of the road charge transactions is inaccurate.

Recommended Recovery: Direct participants to customer support for further review and resolution. If necessary, test connectivity between vehicle, fuel pump/charge point, and back office systems. For first few fueling sessions, require participants to upload pictures of any fuel receipts to validate transaction calculations.

SCENARIO 2.C: Incompatibility with Participant Vehicles and Data Collection Hardware

A participant’s vehicle’s telematics system is incompatible with the PATP/CP data collection aftermarket hardware.

Recommended Recovery: Prior to enrollment, verify participant’s vehicle is compatible with current aftermarket device specifications and no outstanding issues exist with vehicle telematics systems. Verify connectivity between the device and PATP/CP business partner systems. Verify firmware is up to date with device. Replace device as necessary.

SCENARIO 2.D: Electric vehicle (EV) incompatibility with Demonstration Charge Point

A participant’s EV is incompatible with the charge points used for the demonstration. Some EVs use proprietary interfaces and cannot connect to some charge point systems.

Recommended Recovery: Prior to enrollment, determine if participant EVs are compatible with demonstration charge points. If problem persists, transfer participant to another demonstration phase.

SCENARIO 2.E: Complete failure of data collection, calculation, or reporting systems

This scenario represents a complete failure of at least one PATP/CP system.

Recommended Recovery: Direct participants to customer service. Verify systems connectivity with PATP/CP business partner. Have participants keep and provide pictures of odometer readings and fuel receipts (sanitizing/redacting any personally identifiable information as appropriate). Conduct manual transactions until PATP/CP systems are operational.

11.3 Phase 2 (UBI) Failures

SCENARIO 3.A: UBI app is incompatible with participant’s mobile device

A participant’s mobile device cannot download or use the UBI business partner’s app which is critical to data collection activities for the demonstration.

Recommended Recovery: Demonstration technical team will send separate notifications via text messages to participants. Participants will manually take and upload photos to demonstration technical team members. If not allowed by participant, then recommend they participate in another phase.

SCENARIO 3.B: Inaccurate odometer readings or uploads

The photos uploaded by participants are illegible or inaccurate.

Recommended Recovery: Coordinate with participants to reattempt upload. Recommend they clean camera lenses as needed. For inaccurate readings, coordinate with UBI business partner on

any transaction updates that need to be made on a participant's account. If numerous inaccurate readings are encountered, have participants maintain physical mileage logs.

SCENARIO 3.C: After multiple notifications participants fail to upload odometer pictures

Enrolled participants do not upload their odometer pictures within two days of notification from the UBI Business Partner.

Recommended Recovery: Customer service to reach out to participant to determine if there are technical issues. If no issues exist, or participant refuses to upload pictures, then either remove them from the demonstration or move them to another demonstration phase.

SCENARIO 3.D: Complete failure of data collection, calculation, or reporting systems

This scenario represents a complete failure of the UBI business partner's systems.

Recommended Recovery: Direct participants to customer service. Verify systems connectivity with UBI systems. Identify potential cellular network outages in participant geographic areas, preventing successful upload of pictures. Have participants keep and transmit any pictures of odometer readings via email or text to demonstration team members for manual comparison and calculations.

11.4 Phase 3 (TNC) Failures

SCENARIO 4.A: Ride hailing attempts fail

Participants' ride hailing attempts either fail or are ignored by the TNC business partner.

Recommended Recovery: Initially, prescribe days and times for trips to familiarize participants with ride hailing services. Conduct training sessions between demonstration technical team members and key TNC vehicle and systems operators as part of test activities prior to demonstration launch.

SCENARIO 4.B: Inaccurate road charge calculations compared to trip logs

The road charge calculations are inaccurate when compared to trip logs received by participants.

Recommended Recovery: Capture both trip logs and calculated road charge message from participant. Assume since trip logs are using operational systems that they are the most accurate. Coordinate with TNC business partner on inaccuracies and update road charge transactions to reflect accurate trip mileage captured from trip log.

SCENARIO 4.C: Complete failure of data collection, calculation, or reporting systems

This scenario represents a complete failure of the TNC business partner's demonstration systems.

Recommended Recovery: Direct participants to customer service. Capture trip logs from participants. Conduct manual road charge calculations using captured trip log information and EPA estimated fuel economy for participating TNC vehicles.

11.5 Phase 4 (AV) Failures

SCENARIO 5.A: Onboard systems do not capture road charge data

The automated test vehicle does not capture road charge relevant sensor and travel data during its prescribed trip.

Recommended Recovery: Evaluate potential issues with sensors or onboard data collection systems. If problems persist or no issues can be identified, conduct testing using legacy data collected from earlier trips.

SCENARIO 5.B: Legislative or AV provider restrictions prevent AV testing in California

The automated test vehicles are not allowed to conduct testing in California, including at one of the California AV Proving Grounds.

Recommended Recovery: Identify testing areas (proving grounds, private facilities, approved public roadways) in other states that could be leveraged for testing. If testing areas cannot be identified in other states, calculate theoretical road charge from historical trip data instead of conducting trips during demonstration period.

11.6 Support System Failures

SCENARIO 6.A: Customer Support systems fail

Customer support systems, to include participant portals or phone numbers, fail preventing participants from accessing demonstration customer services.

Recommended Recovery: Maintain manual customer service logs to report issues. Deploy fallback scenarios with each business partner to assume all customer service operations relative to each of their demonstration participants including Tier 1 support and higher.

SCENARIO 6.B: Business partner customer support response times less than adequate

Business partners do not respond to inquiries from the demonstration customer support team within the prescribed timeframes.

Recommended Recovery: Establish service level expectations with business partners through business rules and technical requirements. Monitor response times and implement corrective action as necessary. Require administrative access for key customer service members to business partner demonstration systems to maintain customer service continuity should response times be inadequate.

SCENARIO 6.C: Data Clearinghouse fails

The Data Clearinghouse Subsystem used to house road charge demonstration data fails, causing an inability to access demonstration data or a corruption of existing data.

Recommended Recovery: Perform weekly backups of Data Clearinghouse subsystem data to physically separate systems (external hard drives, other secure repositories). Require daily backup of demonstration business partner data. Restore from systems backups as necessary.

SCENARIO 6.D: PRIME analytics and dashboarding failure

The PRIME analytics and dashboard system fail, causing an inability to access performance dashboards.

Recommended Recovery: Establish analytics capabilities on local Caltrans or demonstration technical team local machines to maintain reporting continuity, using PRIME design and development documentation to recreate PRIME analytics and dashboarding functionality. Periodically update local machines with new data and algorithms over the course of the demonstration.

SCENARIO 6.E: Revenue reports from business partners are inaccurate

The revenue reports provided by each business partner are inaccurate based on per-trip or per-transaction data.

Recommended Recovery: Identify processes for data aggregation and calculation to determine if inaccurate methods are used. Conduct spot audits as necessary on metered use data to determine if future inaccuracies may exist.