

Road Charge: Pay-at-the-Pump Research



Report to the Legislature

July 1, 2018

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Executive Summary

STATE LED ROAD CHARGE EFFORT

On September 29, 2014, Senate Bill 1077 (SB 1077), was signed by the Governor (Chapter 835, Statutes of 2014) which required the California Transportation Commission (CTC), in consultation with the California State Transportation Agency (CalSTA), to create a Road Usage Charge Technical Advisory Committee (Technical Committee). The Technical Committee was tasked with studying Road Charge alternatives, gathering public comment, and making recommendations to CalSTA on the design of a pilot program. The California Department of Transportation (Caltrans) was tasked with providing all technical support to the Technical Committee, CalSTA, and the CTC.

SB 1077 originally required CalSTA to implement a Road Charge Pilot Program by January 1, 2017 and to submit findings to the Technical Committee, the CTC and the policy and fiscal committees of the Legislature by June 30, 2018. However, in mid-2015 the Administration accelerated the Road Charge Pilot Program which led to CalSTA submitting the final report in December 2017. Based on this revised schedule, the CTC also included its recommendations regarding the Road Usage Charge Pilot Program in its annual report to the Legislature in December 2017.

STATE/FEDERAL PARTNERSHIP

In December 2015, the United States Congress acknowledged the need to demonstrate a user-based alternative revenue mechanism to maintain the long-term solvency of the Highway Trust Fund with the passage of the Fixing America's Surface Transportation (FAST) Act, and specifically the Surface Transportation System Funding Alternatives (STSFA; Section 6020 of the FAST Act). STSFA is a five year \$95 million grant program, with the initial Federal fiscal year 2016 funding availability of \$15 million, followed by four years each funded at \$20 million.

The United States Department of Transportation's (USDOT) approach in Federal fiscal year 2016 was to seek applications for extensions or enhancements of existing demonstration projects or for required pre-demonstration activity leading directly to a planned future demonstration project in the near term (less than 18 months from award). The type of alternative revenue mechanism proposed is flexible so long as it is user-based. However, 2016 was the only year pre-demonstration activity would be funded.

In March 2016, the Federal Highway Administration (FHWA) announced \$15 million in available grant funding for states under the STSFA grant program. While all the mileage reporting methods deployed for the Road Charge Pilot Program were feasible, they cannot compete with the simplicity, cost effectiveness, and public acceptance of the current gas tax collection process. Caltrans identified the STSFA grant program as an opportunity to partner with FHWA and leverage important state transportation resources. Thus, Caltrans applied for and was awarded a federal grant to study a pay-at-the-pump concept and its viability for road charge mileage recording and reporting. Since the STSFA grant program requires a 50 percent state funding match, Caltrans immediately submitted a resource request and received approval from the State Legislature to move forward with the pay-at-the-pump research.

This report summarizes the pay-at-the-pump pre-demonstration research conducted by Caltrans and meets the mandates of fiscal year 2017-18 Budget, Item 2660-001-0042, Provision 21 states, "*The Department of Transportation shall distribute a report no later than July 1, 2018, on*

progress made on the pay-at-the-pump component of the road user charge study. This report shall be made pursuant to the criteria established in subdivision (a) of Section 6020 of the Vehicle Code.”

PAY-AT-THE-PUMP/CHARGE POINT RESEARCH

Based on finding from the original road charge pilot program, Caltrans acknowledged the need to develop a pay-at-the-pump/charge point option for collecting a road charge, similar to the current gas tax model, for the following reasons:

- Paying at the pump is how motorists currently pay gas taxes, so it provides a familiar and comfortable experience
- The current gas tax is relatively inexpensive to administer and easy to enforce

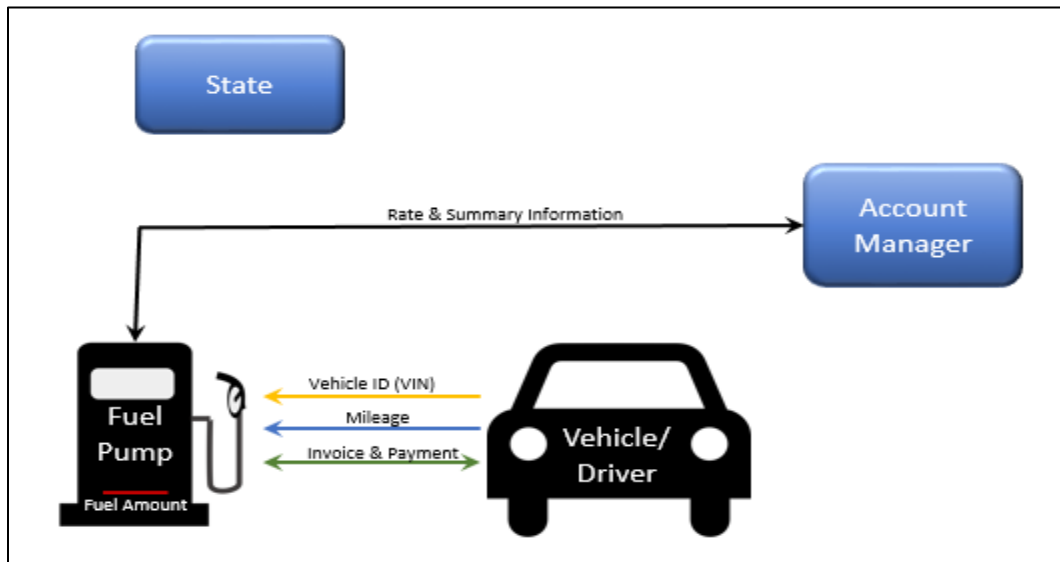
The Pay-at-the-Pump/Charge Point research focused on three goals:

- Develop a method for paying the road charge at gas stations or charge points by communicating mileage driven from the vehicle or device to the infrastructure;
- Identify technologically and economically viable pay-at-the-pump/charge point alternatives that provide a similar user experience as the current gas tax collection for further development; and
- Prepare a plan for demonstrating the effectiveness of a pay-at-the-pump/charge point alternative.

The overall goal of a pay-at-the-pump/charge point concept is to allow for the wireless exchange of data (vehicle-to-infrastructure), with three processes occurring as part of the retail purchase (see Figure 1):

- Vehicle identification
- Various transaction/data processing activities
- Assess net road charge payment (or credit in certain cases).

Figure 1. High-Level Architecture Diagram of Pay-at-the-Pump Road Charge Concept



KEY FINDINGS

The research concluded that a pay-at-the-pump pilot is operationally feasible. Table 2 provides a summary comparison of the proposed demonstration systems for each of the four technologies.

Table 2. Pilot Demonstration System Summary by Technology

Element	Technology 1	Technology 2	Technology 3	Technology 4
Miles driven	Actual	Actual	Actual	Estimated
Fuel purchase amount	Estimated	Actual ¹	Actual	Actual
Real time invoice which includes fuel purchased, road charge, and fuel tax credit.	No – Road charge and estimated fuel tax credit only	Yes ¹	Yes	Yes
Extendable to electric vehicle charge points	By geo-fencing charge points	By tracking charge point purchases on purchase card	By installation of vendor access point at charge point	By installation of tag reader at charge point ²
Ability to determine charge point purchase amount	No	Yes ³	Yes ⁴	Uncertain ⁵

LEGEND: Green = optimum characteristics; Yellow = further verification needed; Red = does not meet criteria well

¹ Uncertain if vendor can get amount of fuel purchase from cloud transaction data.

² Not clear that the direct payment to registered card can be implemented.

³ Only if dedicated payment card is used.

⁴ Only if fleet card is used. Not clear if vendor can track registered credit card transaction not through POS system.

⁵ Not clear if vendor can track transactions on registered card except through POS systems.

The technology solutions presented are often incorporated with other driver services and amenities, many focusing on point of sale application (e.g., other retail sales while at the gas pump, loyalty programs for gas companies, etc.). These concepts can be further adapted to provide a pay-at-the-pump road charge mechanism. **Note: While the technologies have evolved tremendously since Oregon’s original pay-at-the-pump pilot in 2006, no single entity has developed a complete pay-at-the-pump system and it is likely that a consortium of entities will be needed to make a next-stage pay-at-the-pump/charge point pilot feasible.**

DEMONSTRATION PLAN FOR A PILOT

The final step in this research effort was the development of a demonstration plan for designing, implementing, and evaluating the proposed pay-at-the-pump/charge point pilot, to ensure it is consistent with the goals and budget in STSFA grant award. An estimated pilot activity schedule is provided below in Table 3.

Table 3. Estimated Pilot Activity Schedule

Pilot Activity	Dates
Develop the necessary procurement documents	July 2018 – September 2018
Execute procurement	October 2018 – March 2019
Execute contract(s)	April 2019 – May 2019
Update Demonstration Plan and Concept of Operations	June 2019 – July 2019
Update technical requirements to reflect the pay-at-the-pump/charge points requirements	August 2019 – September 2019
Recruit/select pilot participants; system development	October 2019 – December 2019

Table 3. Estimated Pilot Activity Schedule

Pilot Activity	Dates
Pilot system installation and participant on-boarding	January 2020 – February 2020
Conduct pilot	March 2020 – August 2020
Pilot evaluation and final report	September 2020 – December 2020

NEXT STEPS

The next steps will focus on the pay-at-the-pump pilot demonstration. The pay-at-the-pump pilot is expected to provide an initial proof-of-concept for one or two approaches for accommodating data collection and subsequent payment of the per-mile road usage charge at the retail point of sale.

Background

Statutory Reference & Purpose

Fiscal year 2017-18 Budget Act, Item 2660-001-0042, Provision 21 states, “*The Department of Transportation shall distribute a report no later than July 1, 2018, on progress made on the pay-at-the-pump component of the road user charge study. This report shall be made pursuant to the criteria established in subdivision (a) of Section 6020 of the Vehicle Code.*”

Program Background

OVERVIEW

The Road Charge Program is responsible for providing all technical support surrounding mileage-based revenue collection research (“road charge”), as an alternative to the current gas tax, to the California State Transportation Agency, California Transportation Commission and Road Charge Technical Advisory Committee. The program solely facilitates all research related activities surrounding road charge within California, and both nationally and internationally. This program was established through legislation (Senate Bill 1077 - 2014). Since then, the program has established itself as a national leader in road charge research and is a true example of how leadership, innovation, and teamwork can put Caltrans at the leading edge of modern transportation policy and practice.

THE CALIFORNIA ROAD CHARGE PILOT PROGRAM

In March of 2017, California successfully completed the largest road charge pilot in the nation, known as the California Road Charge Pilot Program. This pilot, pursuant to SB 1077 (Chapter 835, 2014), tested the functionality, complexity, and feasibility of a mileage-based system as a new potential revenue collection method for transportation funding. More than 5,000 vehicles, representing the state’s vast demographics, reported in excess of 37 million miles over this nine-month duration. Six reporting methods, manual to high technology options, were offered and tested throughout the pilot and for the first time light and heavy commercial vehicles were represented in this type of road charge research.

During the research, California “recognized the need to develop a method which mimics the current gas tax model.” Motorists currently pay gas taxes as part of their gas purchase when fueling at the pump. The current pay-at-the-pump fuel tax mechanism is also inexpensive to administer and requires little enforcement. Accordingly, if the necessary road charge data can be collected and transmitted to an account manager as part of the current re-fueling processes, or as part of the re-charging process for the increasing number of electric vehicles, it may be possible to minimize administrative costs and maximize compliance for a road charge system.

FEDERAL SURFACE TRANSPORTATION SYSTEM FUNDING ALTERNATIVES PROGRAM

In December 2015, President Obama signed into law the Fixing America’s Surface Transportation Act (FAST Act). The FAST Act included Section 6020 of the FAST Act established the Surface Transportation System Funding Alternatives (STSFA) Program, authorizing up to \$95 million in federal grant dollars over a 5-year period. The purpose of the STSFA program is to provide grants to state departments of transportation to conduct demonstration projects that explore user-based alternative revenue mechanisms. California, working through the Department of Transportation (Caltrans), took this opportunity to partner with the Federal Highway Administration (FHWA) to enhance facets of the pilot that were not

originally tested. Caltrans submitted a STSFA application in 2016 and was subsequently awarded the grant which funded this research: planning and pre-demonstration activities to enhance the original pilot program research.

Previous Report

- California Road Charge Pilot Program Final Report
<https://www.californiaroadchargepilot.com/final-report/>

Program Status/Program Accomplishments

PAY-AT-THE-PUMP/CHARGE POINT RESEARCH

As mentioned earlier, the original pilot provided a number of high and low technology mileage reporting options for collecting mileage-based revenue, or road charge. This research led to Caltrans acknowledging the need to develop a pay-at-the-pump/charge point option for collecting road charges, similar to the current gas tax model for the following reasons:

- Paying at the pump is how motorists currently pay gas taxes, so it provides a familiar and comfortable experience.
- The current gas tax is relatively inexpensive to administer and easy to enforce.

Additionally, with the growing number of plug-in hybrids and electric vehicles in California, an approach to capture mileage and support a road charge payment process at charge points is another component of this research effort. The long-term vision for road charge is that the collection of mileage-based fees will be an integral part of other services and driver amenities. Therefore, an approach where road charge data can be collected, processed, and/or transmitted as part of current re-fueling or re-charging processes represents an opportunity for integration within existing infrastructure and emerging pump-based transaction applications that may lower operating and administrative costs, facilitate enforcement, and increase public awareness of a mileage-based transportation funding mechanism.

The research focused on three goals:

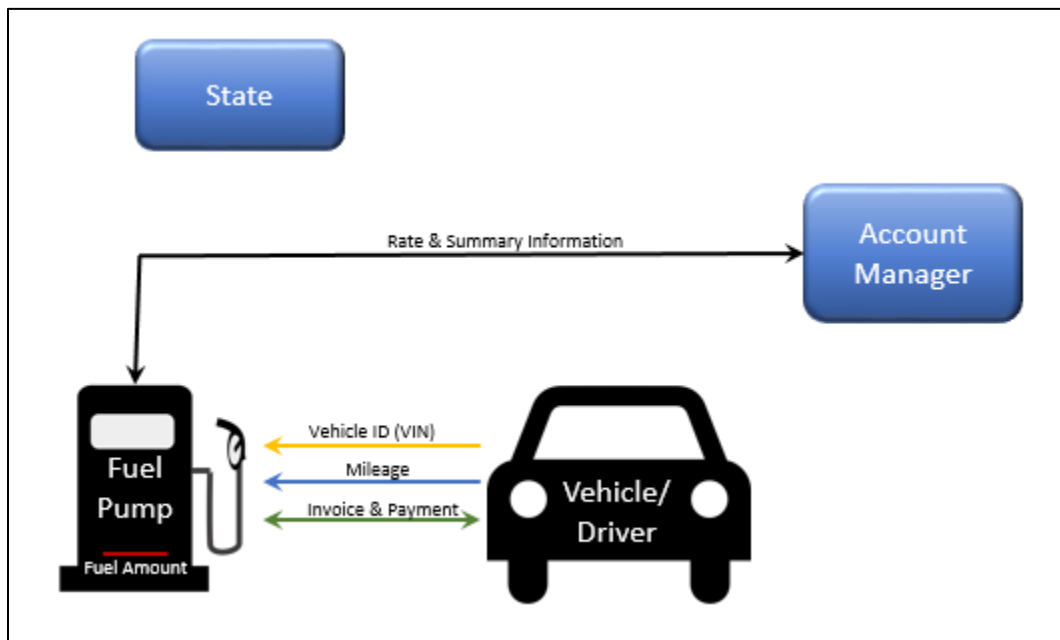
- Develop a method for paying the road charge at gas stations or charge points by communicating mileage driven from the vehicle or device to the infrastructure;
- Identify technologically and economically viable pay-at-the-pump/charge point alternatives that provide a similar user experience as the current gas tax collection for further development; and
- Prepare a plan for demonstrating the effectiveness of a pay-at-the-pump/charge point alternative.

The overall goal of a pay-at-the-pump/charge point concept is to allow for the wireless exchange of data (vehicle-to-infrastructure), with three processes occurring as part of the retail purchase (see Figure 1):

- Vehicle identification
- Various transaction/data processing activities (i.e., identifying the number of miles driven since the last payment, applying the per-mile charge to this mileage amount; identifying the accurate amount of state fuel tax paid; applying a credit for state fuel tax paid¹); and
- Assess net road charge payment (or credit in certain cases).

¹ It is envisioned that in a nationwide system, the federal gas tax would also be credited.

Figure 1. High-Level Architecture Diagram of Pay-at-the-Pump Road Charge Concept



The “state” shown in Figure 1 will receive the net road charge funds, deposit in the treasury, and provide on-going audit activities. Three basic approaches for achieving this necessary activity have been identified: (1) road charge funds are collected and transferred to the state by the fuel wholesalers (mimicking the current fuel tax system); (2) the funds are transmitted to the account manager who remits the net road charge to the state; or (3) some sort of combination.

RESEARCH APPROACH AND FINDINGS

Several steps were completed to identify potential pay-at-the-pump solutions and providers, and assess their approaches and technologies in support of a road charge. The research considered options for collecting vehicle mileage, other information (e.g., vehicle identification number, fuel used or purchased), and revenue collection at the gas pump, electric vehicle charge points, or other retail level configurations.

A review of transportation, automotive, and fuel station industry literature was conducted to identify technologies and potential approaches that currently support retail fueling stations, payment processing at the point-of-sale, and vehicle-to-infrastructure communications. This research identified several entities who were further investigated and contacted to determine their respective level of interest in receiving a Request for Information (RFI).

An RFI was issued to collect written information about the capabilities of various entities, and was made available for any interested parties to view. The RFI was not part of a formal procurement process; but provided a mechanism to assess viability, obtain information for developing an approach and deployment plan for the pay-at-the-pump/charge point pilot. All responses to the RFI were received and reviewed by the research team. After evaluating the RFI responses, four technologies were identified for collecting additional road charge information. Each respondent also included descriptions of their team; other services and driver amenities; privacy protections and data security approaches; and a high-level scope for a pilot project to demonstrate the technology. As some of the information provided in the RFI process was confidential or proprietary in nature, entities providing responses are not identified herein.

Table 2 provides a comparison of the proposed demonstration systems for each of the four technologies. The comparison is based on those elements which could be considered for requirements in a pay-at-the-pump/charge point road charge demonstration procurement. Green cells indicate the optimum characteristics to meet the criteria, yellow cells indicate further verification is needed, and red cells indicate where the technology solution does not fully meet the criteria at this time.

Table 2. Pilot Demonstration System Summary by Technology

Element	Technology 1	Technology 2	Technology 3	Technology 4
Miles driven	Actual	Actual	Actual	Estimated
Fuel purchase amount	Estimated	Actual ¹	Actual	Actual
Real time invoice which includes fuel purchased, road charge, and fuel tax credit.	No – Road charge and estimated fuel tax credit only	Yes ¹	Yes	Yes
Extendable to electric vehicle charge points	By geo-fencing charge points	By tracking charge point purchases on purchase card	By installation of vendor access point at charge point	By installation of tag reader at charge point ²
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⁵ Not clear if vendor can track transactions on registered card except through POS systems.

Each technology provider above was interviewed as part of the research process and it was determined that a pay-at-the-pump pilot is operationally feasible. The technology solutions presented are often incorporated with other driver services and amenities, many focusing on point of sale application (e.g., other retail sales while at the gas pump, loyalty programs for gas companies, etc.). These concepts can be further adapted to provide a pay-at-the-pump road charge mechanism. Note: While the technologies have evolved tremendously since Oregon’s original pay-at-the-pump pilot in 2006, no single entity has developed a complete pay-at-the-pump system and it is likely that a consortium of entities will be needed to make a next-stage pay-at-the-pump/charge point pilot feasible.

DEMONSTRATION PLAN FOR A PILOT

The final step in this research effort was the development of a demonstration plan for designing, implementing, and evaluating the proposed pay-at-the-pump/charge point pilot, to ensure it is consistent with the goals and budget in STSFA grant award. The demonstration plan and the subsequent pilot system is expected to provide an initial proof-of-concept for accommodating data collection and subsequent payment of the per-mile road charge as part of a retail transaction for the purchase of fuel and/or electric charging. The goals of the pilot include:

- Explore and investigate if a pay-at-the-pump/charge point concept is a viable mileage recording and reporting option for road charge.
- Identify what additional features (e.g., hardware, software, processing capabilities, integration) would be required for the pilot architecture and configuration to achieve the long-term concept for a pay-at-the-pump/charge point approach.
- Achieve these goals within the allocated \$1.5 million STSFA grant budget for the pilot.

Table 3. Estimated Pilot Activity Schedule

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Develop the necessary procurement documents	July 2018 – September 2018
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Pilot system installation and participant on-boarding	January 2020 – February 2020
Conduct pilot	March 2020 – August 2020
Pilot evaluation and final report	September 2020 – December 2020

Conclusion

The next steps will focus on the pay-at-the-pump pilot demonstration. In 2017, California was awarded a second STSFA grant to perform the actual demonstration of pay-at-the-pump as a potential mileage recording and reporting mechanism. In June 2018, the California Legislature approved the budget to move forward with this next phase of road charge research. The pay-at-the-pump pilot is expected to provide an initial proof-of-concept for one or two approaches for accommodating data collection and subsequent payment of the per-mile road usage at the retail point of sale.

Appendix A. Statutory Reporting Reference

2017 – 18 Final Budget Summary

Item	Amount
*2660-001-0042—For support of Department of Transportation, payable from the State Highway Account, State Transportation Fund	2,384,672,000
Schedule:	
(1) 1835010-Capital Outlay Support	708,132,000
(2) 1835020-Local Assistance	50,854,000
(3) 1835029-Program Development	38,155,000
(4) 1835038-Legal	127,206,000
(5) 1835047-Operations	246,524,000
(6) 1835056-Maintenance	1,363,408,000
(7) 1840019-State and Federal Mass Transit	54,000
(8) 1840028-Intercity Rail Passenger Program	571,000
(9) 1845013-Statewide Planning	80,559,000
(9.5) 1870-Office of Inspector General	9,467,000
(10) 9900100-Administration	362,120,000
(11) 9900200-Administration—Distributed	-362,120,000
(12) 1850010-Equipment Service Program	200,394,000
(13) 1850019-Equipment Service Program—Distributed	-200,394,000
(14) Reimbursements to 1835010-Capital Outlay Support	-184,550,000
(15) Reimbursements to 1835020-Local Assistance	-1,278,000
(16) Reimbursements to 1835029-Program Development	-860,000
(17) Reimbursements to 1835038-Legal	-2,872,000
(18) Reimbursements to 1835047-Operations	-6,195,000
(19) Reimbursements to 1835056-Maintenance	-36,400,000
(20) Reimbursements to 1845013-Statewide Planning	-8,103,000
(21) Reimbursements to 9900100-Administration	-20,486,000
(22) Reimbursements to 9900200-Administration—Distributed	20,486,000
Provisions:	

21. The Department of Transportation shall distribute a report no later than July 1, 2018, on progress made on the pay-at-the-pump component of the road user charge study. This report shall be made pursuant to the criteria established in subdivision (a) of Section 3092 of the Vehicle Code.