



California
Road Charge

APPENDIX J: **Business Partners Audit** **Memorandum**



MEMO

TO: Lauren Prehoda & Carolyn Plummer - Caltrans
FROM: Mike Warren, Varad Kelkar, & Markell Moffett – WSP
SUBJECT: Caltrans RCD Business Partner Audit Memo
DATE: April 28, 2021

INTRODUCTION

As part of the Caltrans Road Charge Demonstration (“demonstration”) operations, a Business Partner (“BP”) operations data audit was conducted. The audit focused on ensuring the accuracy of data collection, processing, and reporting of simulated road charges by BPs to the California Department of Transportation (“Caltrans”).

OBJECTIVE

The objective is to audit the different datasets (transactions, VIN Summary Report, participant reports, and travel records) to validate consistency and flag any anomalies in data collected, processed, and (simulated) revenue reported to Caltrans, and to ensure BPs follow required procedures.

AUDIT SCOPE & PROCEDURES

WSP performed the BP audit on behalf of Caltrans, as described below:

- At the outset of the audit process, WSP consolidated and organized the multiple datasets available for each BP. GasBuddy and ChargePoint datasets includes January through March 2021 data. Mile Auto datasets includes February and March 2021 data. Via datasets include March 2021 only.
- WSP analyzed and reconciled these summary reports and datasets to determine if the miles driven, fuel purchased / estimated consumed, and charges (road charges, fuels tax credits, and net balance) were correctly captured, calculated, and reported. The datasets were assessed to check for any overlaps, gaps, or anomalies. Unique vehicle/account identifiers were randomly selected, and checks and balances were implemented using complementary metrics to cross-validate the overall robustness of the reports.
- The audit findings were compiled and are presented in the remainder of this memorandum.

The remainder of this memorandum summarizes the observed findings for each BP’s operations data audit.



FINDINGS

BP: CHARGE POINT

There are four levels of data available for Charge Point – travel data (BitBrew device data and ChargePoint electric vehicle charging sessions), transactions (Transaction Summary Report), and summary (VIN Summary Report). This phase started in January 2021 and hence each dataset includes details for January, February, and March 2021. The datasets are well organized and appropriately labeled with required sufficient level of detail.

As seen in the snapshot below, the Transaction Summary and VIN Summary Reports use the correct road charge rate per mile for calculating the (simulated) net road charge balance for the participating vehicles.

VIN	Miles	Road Charge \$	Road Charge \$ per mile
1N4AZ1CP4KC302990	601.6	\$ 13.24	\$ 0.0220
5YJSA1CP1DFP21455	384.2	\$ 8.45	\$ 0.0220
1G1FW6S04J4139222	1162	\$ 25.57	\$ 0.0220
1N4AZ1CPXJC314589	570.2	\$ 12.54	\$ 0.0220
1FADP3R48DL353360	97.6	\$ 2.15	\$ 0.0220
1G1FW6S00J4140013	3365.7	\$ 74.05	\$ 0.0220
KL8CL6S09EC548467	517.8	\$ 11.39	\$ 0.0220
1G1FY6S01K4150576	617	\$ 13.57	\$ 0.0220
1N4AZ1CP7JC307809	184.4	\$ 4.06	\$ 0.0220

Figure 1: ChargePoint road charge per mile

The Rule ID (6) and SubRule ID (1) detected for the participant vehicles correspond to ‘California public roads’ and read the appropriate flags in alignment with the guidelines outlined in the System Requirement Specifications (SRS) defined for the project. The “VIN Status” value of 3 detected for the participant vehicles is accurate and indicates an ‘Active’ status consistent with the system requirements. As an example, please see the snapshot below.

VIN	VIN Status	Rule ID	Subrule ID
1N4AZ1CP4KC302990	3	6	1
5YJSA1CP1DFP21455	3	6	1
1G1FW6S04J4139222	3	6	1
1N4AZ1CPXJC314589	3	6	1
1FADP3R48DL353360	3	6	1
1G1FW6S00J4140013	3	6	1
KL8CL6S09EC548467	3	6	1
1G1FY6S01K4150576	3	6	1
1N4AZ1CP7JC307809	3	6	1

Figure 2: ChargePoint Rule ID, SubRule ID and VIN Status

Miles driven indicated in the Transaction Summary Report and VIN Summary Report match. However, they did not align with the corresponding values seen in the BitBrew dataset. In general, the BitBrew data has much higher values for distance traveled when compared to the other two datasets. The below figure highlights these differences across the various plug-in device IDs (also known as “MROID”).



CHARGE POINT		MILES DRIVEN		
ID		Txns Summary	VIN Summary	Bitbrew Summary
1011288150		184	184	310
1011288227		384	384	618
1011288228		1162	1162	1870
1011288241		98	98	157
1011288242		602	602	968
1011288245		3366	3366	5418
1011288246		617	617	993
1011288261		518	518	836
1011288280		570	570	918
TOTALS		7501	7501	12088
OVERALL CHECKS		Error		

Figure 3: Charge Point Miles Driven comparison

To understand more about these differences, we further analyzed the datasets and picked unique IDs to compare data and check inconsistency. Please see BitBrew and VIN Summary Report snapshots below for additional details. As an example, we selected MROID ‘1011288150’ and assessed the BitBrew trip events. It is observed that BitBrew trip event data is logical and does not portray any weird anomalies. The odometer start and end readings are consistent, trip start and end times/dates make sense and the total distance calculations are correct. This was true also for other additional selected device IDs. In case of the Transaction and VIN Summary Reports, they were populated once every month, with one entry for each month the respective vehicle was actively participating in the program and recorded the total driven in the corresponding month. There was no major anomaly observed in this data.

Upon further investigation, it was identified that the “distance traveled” data included in the BitBrew data sets report distance traveled in kilometers, rather than miles. If the “distance traveled” values for each record are converted from kilometers to miles (conversion rate 1 kilometer = 0.621371 miles), there is no difference in distance traveled between datasets.

CHARGE POINT		MILES DRIVEN		
ID		Txns Summary	VIN Summary	Bitbrew Summary
1011288150		184	184	184
1011288227		384	384	384
1011288228		1162	1162	1162
1011288241		98	98	98
1011288242		602	602	602
1011288245		3366	3366	3366
1011288246		617	617	617
1011288261		518	518	518
1011288280		570	570	570
TOTALS		7501	7501	7501
OVERALL CHECKS		OK		

Figure 4: ChargePoint Miles Driven comparison - UPDATED



For Charge Point phase, there should be no fuel consumed since these are electric vehicles. However, the January 2021 Transaction Summary erroneously recorded fuel data as seen in the snapshot below. These are minor errors and going forward have been appropriately addressed.

CHARGE POINT		FUEL GALLONS		
ID		Txns Summary	VIN Summary	Bitbrew Summary
1011288150		0	0	0
1011288227		-1	0	0
1011288228		-1	0	0
1011288241		0	0	0
1011288242		-1	0	0
1011288245		0	0	0
1011288246		0	0	0
1011288261		0	0	0
1011288280		0	0	0
TOTALS		-3	0	0
OVERALL CHECKS		Error		

Figure 5: Charge Point Fuel Error

BP: GASBUDDY

There are four levels of data available for GasBuddy – travel data (BitBrew device data and GasBuddy fueling sessions), transactions (Transaction Summary Report), and summary (VIN Summary Report). This phase started in January 2021 and hence each dataset includes details for January, February, and March 2021. The datasets are well organized and appropriately labeled with required sufficient level of detail.

As seen in the snapshot below, the Transaction Summary Report and VIN Summary Reports use the correct road charge rate per mile for calculating the (simulated) net road charge balance for the participating vehicles.

MROID	VIN	Miles	Road Charge \$	Road Charge \$ per mile
1011288296	1FT7W2BT6JEB65894	3658	\$ 77	\$ 0.021
1011288279	1FTEW1CB4JKE47136	1035	\$ 23	\$ 0.022
110986005	1GNKRFED5FJ250776	210	\$ 5	\$ 0.022
1011288248	1HGCD5639TA162676	274	\$ 6	\$ 0.022
1011288127	1N4AL3AP2GC187183	801	\$ 18	\$ 0.022
1011288240	1N4AL3AP4DN585589	1433	\$ 32	\$ 0.022
1011288140	2HKRM3H5XGH517901	372	\$ 8	\$ 0.022
1011288111	3GNAXUEU0JS615104	136	\$ 3	\$ 0.022
1011288132	3VW6T7BU2KM176796	221	\$ 5	\$ 0.022
1011288259	3VWKZ71K29M299604	1483	\$ 33	\$ 0.022
1011288163	5GAKRAKDXHJ277976	1409	\$ 31	\$ 0.022
110986006	5N1AT2MT0KC773477	1701	\$ 37	\$ 0.022
1011288297	5TDKK4CC9AS306273	69	\$ 2	\$ 0.022
110987005	5yfbu4ee5dp126391	115	\$ 3	\$ 0.022
1011288258	7FARW1H87HE029194	1152	\$ 25	\$ 0.022
1011288142	JH4KC1F54EC000242	1451	\$ 32	\$ 0.022
1011288277	JTEBU5JR9L5784916	1459	\$ 32	\$ 0.022
1011288247	JTLKE50E591075274	646	\$ 14	\$ 0.022
1011288162	JTMWFREV6FD046113	470	\$ 10	\$ 0.022
1011288298	JTNBB46K873006765	831	\$ 18	\$ 0.022
1011288143	WBASU7C04LFH06145	1564	\$ 34	\$ 0.022
1011288164	WDDGF56X79R052495	656	\$ 14	\$ 0.022

Figure 6: GasBuddy road charge \$ per mile check



The Rule ID (6) and SubRule ID (1) detected for most participant vehicles corresponds to ‘California public roads’ and reads the appropriate flags in alignment with the guidelines outlined in the SRS. However, as illustrated in figure below, for the vehicle with VIN ‘1FT7W2BT6JEB65894’, the Rule ID (0) and SubRule ID (2) indicates ‘Location undefined, but known non-taxable’. As a result, no road charges or fuel tax credit was applied. This likely arose due to the system not geo-fencing locations outside of California. This indicates the vehicle traveled out-of-state, and the system appropriately assigned the travel to a non-taxable RuleID/SubRuleID.

MONTH	VIN	VINS	RULEID	SUBRULEID	MROMILEAGEINS	MROFUELUSAGE
Mar-21	1FT7W2BT6JEB65894	3	0	2	168.2	25.27

Figure 7: GasBuddy Rule ID, SubRule ID for VIN - 1FT7W2BT6JEB65894

VIN	VINSTATUS
3VWKZ71K29M299604	3
1FT7W2BT6JEB65894	3
5N1AT2MT0KC773477	3
3VWKZ71K29M299604	3
7FARW1H87HE029194	3
1FT7W2BT6JEB65894	3
JTEBU5JR9L5784916	3
1N4AL3AP4DN585589	3
1HGCD5639TA162676	3
1FTEW1CB4JKE47136	3
JTLKE50E591075274	3
1GNKRFED5FJ250776	3
5N1AT2MT0KC773477	3
JTMWFREV6FD046113	3
5GAKRAKDXHJ277976	3
WBA5U7C04LEH06145	3

Please see adjacent snapshot highlighting a sample of the participant vehicles. The VIN Status value of 3 detected for all the participant vehicles is accurate and indicates an ‘Active’ status consistent with the system requirements.

Figure 8: GasBuddy VIN Status

Miles driven indicated in the Transaction Summary Report and VIN Summary Report match. However, they did not align with the corresponding values seen in the BitBrew dataset. In general, the BitBrew data has much higher values for distance traveled when compared to the other two datasets. The below figure highlights these differences across the various plug-in device IDs.



GASBUDDY		MILES DRIVEN		
ID		Txns Summary	VIN Summary	Bitbrew Summary
110986005		210	210	417
110986006		1701	1701	2891
110987005		115	115	185
1011288111		136	136	219
1011288127		801	801	1292
1011288132		221	221	357
1011288140		372	372	599
1011288142		1451	1451	2335
1011288143		1564	1564	2535
1011288162		470	470	762
1011288163		1409	1409	2267
1011288164		656	656	1094
1011288240		1433	1433	3199
1011288247		646	646	1040
1011288248		274	274	441
1011288258		1152	1152	1855
1011288259		1483	1483	2387
1011288277		1459	1459	4122
1011288279		1035	1035	1666
1011288296		3658	3658	5887
1011288297		69	69	118
1011288298		831	831	1338
TOTALS		21148	21148	37005
OVERALL CHECKS		Error		

Figure 9: GasBuddy Miles Driven comparison

To understand more about these differences, we further analyzed the datasets and picked unique IDs to compare data and check inconsistency. Please see BitBrew and VIN Summary Report snapshots below for additional details. As an example, we selected MROID ‘1011288111’ and assessed the BitBrew trip events. It is observed that BitBrew trip event data is fairly logical and doesn’t portray any major anomalies. The odometer start and end readings are mostly consistent, trip start and end times/dates make sense and the total distance calculations are within margin of error. This was true also for other additional selected device IDs.

In terms of the Transaction and VIN Summary reports, they were populated once every month with one entry for each month the respective vehicle was actively participating in the program and recorded the total miles driven in the corresponding month. There was no major anomaly observed in this data.



DEVICE_ID	START_TRIP_TIME	START_ODOME	END_ODOME	DISTANCE_TRAVELLE
1011288111	03/10/2021 07:32:33 PM	0	3	4.8
1011288111	03/10/2021 07:51:36 PM	44723	44736	12.4
1011288111	03/11/2021 07:06:36 AM	44736	44742	6.5
1011288111	03/11/2021 03:37:18 PM	44742	44749	6.5
1011288111	03/11/2021 05:15:53 PM	44749	44760	11.2
1011288111	03/11/2021 06:14:16 PM	44760	44771	10.8
1011288111	03/12/2021 07:07:52 AM	44771	44778	6.5
1011288111	03/12/2021 03:09:09 PM	44778	44784	6.5
1011288111	03/13/2021 05:20:39 AM	44784	44792	8.3
1011288111	03/13/2021 07:04:33 AM	44792	44797	4
1011288111	03/13/2021 09:10:36 AM	44797	44807	10.8
1011288111	03/20/2021 05:34:59 AM	44807	44818	10.1
1011288111	03/20/2021 06:55:59 AM	44818	44823	5.3
1011288111	03/20/2021 07:24:14 AM	44823	44826	4.4
1011288111	03/22/2021 07:08:48 AM	44826	44834	6.4
1011288111	03/22/2021 04:24:20 PM	44834	44841	6.6
1011288111	03/23/2021 07:14:09 AM	44841	44847	6.5
1011288111	03/23/2021 04:52:44 PM	44847	44853	6.6
1011288111	03/24/2021 07:09:12 AM	44853	44860	6.4
1011288111	03/24/2021 05:44:09 PM	44860	44866	6.5
1011288111	03/25/2021 07:05:06 AM	44866	44873	6.5
1011288111	03/25/2021 04:25:41 PM	44873	44874	0.3
1011288111	03/25/2021 04:31:53 PM	44874	44874	0.5
1011288111	03/25/2021 05:39:50 PM	44874	44881	7.6
1011288111	03/26/2021 07:08:43 AM	44881	44889	6.5
1011288111	03/26/2021 06:03:13 PM	44889	44895	6.9
1011288111	03/27/2021 05:36:24 AM	44895	44903	8.3
1011288111	03/27/2021 08:44:48 AM	44903	44911	8.4
1011288111	03/27/2021 12:09:14 PM	44911	44926	14.3
1011288111	03/27/2021 12:57:39 PM	44926	44926	0.1
1011288111	03/27/2021 01:23:48 PM	44926	44940	12.7
1011288111				219

Figure 10: GasBuddy BitBrew Data - MROID '1011288111'

PeriodStartDate	PeriodEndDate	MROID	MROMILEAGEINSI
2021-03-01T00:00:00.	2021-03-31T23:59:59+	1011288111	136

Figure 11: GasBuddy VIN Summary Report - MROID '1011288111'

Upon further investigation, it was identified that the “distance traveled” data included in the BitBrew data sets report distance traveled in kilometers, rather than miles. If the “distance traveled” values for each record are converted from kilometers to miles (conversion rate 1 kilometer = 0.621371 miles), the difference in distance traveled adjusts to within 1846 miles. Please see updated miles comparison snapshot below.



GASBUDDY		MILES DRIVEN		
ID		Txns Summary	VIN Summary	Bitbrew Summary
110986005		210	210	259
110986006		1701	1701	1796
110987005		115	115	115
1011288111		136	136	136
1011288127		801	801	803
1011288132		221	221	222
1011288140		372	372	372
1011288142		1451	1451	1451
1011288143		1564	1564	1575
1011288162		470	470	474
1011288163		1409	1409	1409
1011288164		656	656	680
1011288240		1433	1433	1988
1011288247		646	646	646
1011288248		274	274	274
1011288258		1152	1152	1152
1011288259		1483	1483	1483
1011288277		1459	1459	2561
1011288279		1035	1035	1035
1011288296		3658	3658	3658
1011288297		69	69	73
1011288298		831	831	831
TOTALS		21148	21148	22994
OVERALL CHECKS		Error		

Figure 12: GasBuddy Miles Driven comparison – UPDATED

To further analyze the differences in miles driven, we spot checked a few MROIDs with high variance. MROID “1011288240” had a 28% difference in BitBrew data. Analyzing further, the Transaction and VIN Summary Reports only reported on BitBrew data for this vehicle starting February 11th. BitBrew data captured prior to that date was not reported in the Transaction or VIN Summary. Discussing this finding with the technical team, it was pointed out that some Phase 1 participants received their plug-in device before they had fully completed their enrollment with GasBuddy. This caused them to incur trips (BitBrew data) before their official enrollment completion date. **Any trips incurred prior to the official enrollment completion date were removed from transaction generation, and therefore from the Transaction and VIN Summary Reports.** *The technical team noted that the enrollment process was amended in February to require confirmation of GasBuddy enrollment prior to shipping plug-in devices to resolve this issue.*

The technical team provided enrollment completion dates for the respective vehicles, and trips that occurred prior to the appropriate enrollment completion date were removed from the BitBrew data being analyzed. **With those invalid trips removed, the BitBrew data totals come within one mile of the Transaction and VIN Summary datasets,** an acceptable margin of error (likely due to rounding in the analysis). See final dataset analysis in screenshot below.



GASBUDDY		MILES DRIVEN		
ID		Txns Summary	VIN Summary	Bitbrew Summary
110986005		210	210	210
110986006		1701	1701	1701
110987005		115	115	115
1011288111		136	136	136
1011288127		801	801	803
1011288132		221	221	221
1011288140		372	372	372
1011288142		1451	1451	1451
1011288143		1564	1564	1564
1011288162		470	470	470
1011288163		1409	1409	1409
1011288164		656	656	656
1011288240		1433	1433	1433
1011288247		646	646	646
1011288248		274	274	274
1011288258		1152	1152	1152
1011288259		1483	1483	1483
1011288277		1459	1459	1459
1011288279		1035	1035	1035
1011288296		3658	3658	3658
1011288297		69	69	69
1011288298		831	831	831
TOTALS		21148	21148	21149
OVERALL CHECKS		Error		

Figure 13: GasBuddy Miles Driven comparison – FINAL

Fuel usage (gallons) indicated in the Transaction and VIN Summary Report match. However, they did not align with the corresponding values seen in the BitBrew dataset. In general, the BitBrew data has much higher values for fuel consumption. The below figure highlights these fuel data differences across the various device IDs.

GASBUDDY		FUEL GALLONS		
ID		Txns Summary	VIN Summary	Bitbrew Summary
110986005		12	12	13
110986006		3	3	57
110987005		0	0	4
1011288111		0	0	3
1011288127		10	10	27
1011288132		10	10	0
1011288140		0	0	15
1011288142		0	0	59
1011288143		2	2	0
1011288162		7	7	18
1011288163		50	50	65
1011288164		0	0	27
1011288240		68	68	93
1011288247		0	0	30
1011288248		7	7	0
1011288258		47	47	0
1011288259		0	0	0
1011288277		43	43	83
1011288279		0	0	0
1011288296		154	154	198
1011288297		0	0	4
1011288298		0	0	24
TOTALS		415	415	719
OVERALL CHECKS		Error		

Figure 14: GasBuddy fuel comparison



To understand more about these differences, we further analyzed the datasets and picked unique IDs to compare data and check inconsistency. As an example, we selected MROID '1011288111' and assessed the BitBrew trip events data. As seen in snapshot below, the odometer start and end readings are mostly consistent, and trip start and end times/dates make sense. The fuel usage data is available for every trip event and is highly detailed. It seems like BitBrew doesn't reflect the fuel transaction occurring at a gas station but rather captures live fuel consumption data fed in from the vehicle's dashboard system. On the other hand, the Transaction and VIN Summary Report demonstrate only the fuel purchased using a Pay with GasBuddy payment card.

GASBUDDY		FUEL GALLONS		
ID		Txns Summary	VIN Summary	Bitbrew Summary
1011288111		0	0	3

Figure 15: Fuel gallons comparison for MROID 1011288111

DEVICE_ID	START_TRIP_TIME	START_ODOME	END_ODOME	DISTANCE_TRAVELLE	FUEL_CONSUMI
1011288111	03/10/2021 07:32:33 PM	0	3	4.8	0.317
1011288111	03/10/2021 07:51:36 PM	44723	44736	12.4	0.204
1011288111	03/11/2021 07:06:36 AM	44736	44742	6.5	0.087
1011288111	03/11/2021 03:37:18 PM	44742	44749	6.5	0.097
1011288111	03/11/2021 05:15:53 PM	44749	44760	11.2	0.129
1011288111	03/11/2021 06:14:16 PM	44760	44771	10.8	0.161
1011288111	03/12/2021 07:07:52 AM	44771	44778	6.5	0.082
1011288111	03/12/2021 03:09:09 PM	44778	44784	6.5	0.118
1011288111	03/13/2021 05:20:39 AM	44784	44792	8.3	0.094
1011288111	03/13/2021 07:04:33 AM	44792	44797	4	0.046
1011288111	03/13/2021 09:10:36 AM	44797	44807	10.8	0.124
1011288111	03/20/2021 05:34:59 AM	44807	44818	10.1	0.11
1011288111	03/20/2021 06:55:59 AM	44818	44823	5.3	0.051
1011288111	03/20/2021 07:24:14 AM	44823	44826	4.4	0.061
1011288111	03/22/2021 07:08:48 AM	44826	44834	6.4	0.125
1011288111	03/22/2021 04:24:20 PM	44834	44841	6.6	0.096
1011288111	03/23/2021 07:14:09 AM	44841	44847	6.5	0.095
1011288111	03/23/2021 04:52:44 PM	44847	44853	6.6	0.125
1011288111	03/24/2021 07:09:12 AM	44853	44860	6.4	0.085
1011288111	03/24/2021 05:44:09 PM	44860	44866	6.5	0.118
1011288111	03/25/2021 07:05:06 AM	44866	44873	6.5	0.087
1011288111	03/25/2021 04:25:41 PM	44873	44874	0.3	0.007
1011288111	03/25/2021 04:31:53 PM	44874	44874	0.5	0.015
1011288111	03/25/2021 05:39:50 PM	44874	44881	7.6	0.115
1011288111	03/26/2021 07:08:43 AM	44881	44889	6.5	0.088
1011288111	03/26/2021 06:03:13 PM	44889	44895	6.9	0.14
1011288111	03/27/2021 05:36:24 AM	44895	44903	8.3	0.115
1011288111	03/27/2021 08:44:48 AM	44903	44911	8.4	0.115
1011288111	03/27/2021 12:09:14 PM	44911	44926	14.3	0.195
1011288111	03/27/2021 12:57:39 PM	44926	44926	0.1	0.004
1011288111	03/27/2021 01:23:48 PM	44926	44940	12.7	0.11
1011288111				219	3

Figure 16: BitBrew fuel trip event records for MROID 1011288111

It was also noted that several device IDs in the Transaction Summary and VIN Summary Reports have zero fuel usage, despite having driven more than 800 miles in some cases.

When the miles-per-gallon (MPG) was calculated for each reported vehicle, dividing miles traveled by fuel usage reported, many vehicles record significantly higher MPG than usual industry standards. For more details, please refer the 'GasBuddy Txn' and 'GasBuddy VIN' tabs in the 'BP Audit Analysis' spreadsheet.



The variance between GasBuddy fuel purchased during the reporting period and the fuel consumption captured by the device (and higher than expected MPG values) likely indicates that participants are purchasing fuel without using the Pay with GasBuddy card.

This is how the demonstration Phase 1 pay-at-the-pump phase was designed, therefore there is no recommendation to update anything to resolve the variance. It is advised to monitor the variance to better understand how this may impact a future implementation.

Bitbrew Data missing from CP and GasBuddy Summary		
ID	Miles	Fuel
1011288243	24	1
1011288278	4	0
9112501100	19	0
9112501224	143	4
TOTALS	191	5

Figure 17: Bitbrew Data missing from Charge Point and GasBuddy Summary

Furthermore, for both ChargePoint and GasBuddy, the BitBrew trip events dataset includes IDs and associated Miles Driven and Fuel information which is missing from the Transaction and VIN summaries of both Charge Point and GasBuddy. This is illustrated in adjacent figure. Upon further investigation of each device ID, the following resolutions have been identified for why

these devices reported BitBrew data but were not included in ChargePoint or GasBuddy Transaction Summary or VIN Summary Reports.

- 1011288243: Test device used by project team to validate production BitBrew devices sent in early January 2021 for Phase 1 demonstration operations; not reported as part of operations.
- 1011288278: Device associated to a participant that requested to switch from Phase 1 ChargePoint to Phase 2 Usage-Based Insurance after only a day or two of participating in Phase 1.
- 9112501100: Test device used by project team for completing Phase 1 pay-at-the-pump Dry Run (and secondary Dry Run) with GasBuddy; not reported as part of operations.
- 9112501224: Test device used by project team for completing Phase 1 Charge Point Dry Run with ChargePoint; not reported as part of operations.

In aggregate, the data collection, processing and reporting for Charge Point and Gas Buddy follows expected guidelines. There are some minor inconsistencies and gaps in the datasets which should be duly considered and addressed in potential future implementations.

BP: MILE AUTO

There are three datasets available for MileAuto – the Transaction Summary Report, VIN Summary Report, and Travel Record Data. This phase includes data for February and March 2021. The datasets are appropriately labeled with required sufficient level of detail.

There were some challenges in compiling the data for this audit, especially for the Travel Record summary. It was observed that the March data pull from the system ended up repeating the data from February and hence this had to be carefully dissected before analyzing the datasets. As an example, please see figure below reflecting a Travel Record data pull for March 2021. For Vehicle ID



‘JTJZB1BA8C2006292’, it repeats data from Feb 5th to Feb 26th which has already been recorded earlier in February. Furthermore, data for Feb 27th-Feb 28th is classified under March 2021 instead of February 2021. This issue of including data for few days from prior month was also seen for other Vehicle IDs.

BPID	MRODetails	Miles	Fuel	ReportingPeriodStart	ReportingPeriodEnd	VehicleID
2001	mileauto	341	11.76	2021-02-05T17:41:25+00:00	2021-02-26T20:41:22+00:00	JTJZB1BA8C2006292
2001	mileauto	873	30.1	2021-02-26T20:41:22+00:00	2021-03-28T23:32:56+00:00	JTJZB1BA8C2006292

Figure 18: MileAuto Travel Record Summary – Data Issue

This issue is due to an error in the Mile Auto API endpoint for Travel Records – the “date range” parameter that allows the demonstration administration system to pull data only for certain reporting periods was not filtering dates, and simply providing all travel records instead of filtering on the requested date range. This issue has been elevated to the demonstration technical team for resolution.

As seen in the snapshot below, the VIN Summary Report mostly uses the correct road charge rate per mile for calculating the (simulated) road charge revenues. The Fuel Tax Credit (FTC) rate applied is correct.

	Miles	Fuel	Road Charge \$	FTC	Road Charge \$ per mile	FTC Rate
Overall - All Vehicles	16917	530	\$ 372	\$ (268)	\$ 0.022	\$ (0.505)

Figure 19: MileAuto VIN Summary Report – road charge \$ per mile and FTC rate

There are anomalies for certain vehicles traveling significant miles but not recording any fuel usage. Please see snapshot below. Vehicles (VIN # 5YJXCBE24JF091935, # WBY7Z6C53JVB88890, # 1G1FZ6S05K4135222) highlighted in light orange color have no fuel usage data in spite of driving over 400 miles in some cases.

VIN	MROMILEAG	MROFUEL
KNDCB3LC6L5413207	476	9.52
JTJZB1BA8C2006292	873	30.1
2C3CDXBG5FH742035	867	37.7
5YJXCBE24JF091935	219	0
JTDKDTB39E1060771	747	14.94
1HGCM66544A096028	131	5.95
WBY7Z6C53JVB88890	410	0
4T1B31HK5JU508207	1760	38.26
JN1CV6AP8BM301174	194	8.82
5NPE24AF0KH800846	1107	35.71
3HGCG6657YG701660	81	3.68
1G1FZ6S05K4135222	523	0
JTHSZ5BC0K5009367	294	14
1FTPW125X5FB39505	497	33.13

Figure 20: MileAuto VIN Summary Report – Missing fuel data



Upon further investigation, it was discovered that these three vehicles are, in fact, electric vehicles. Because electric vehicles do not use fuel, and therefore do not report any fuel usage, it was determined that Mile Auto handled the records appropriately, assigning a “fuel use method” of 3 (non-taxable fuel, e.g. electric) and not calculating any estimated fuel usage for the electric vehicles.

The miles per gallon (MPG) cross-check for most vehicles was logical and in line with industry standards. Please see snapshot below showing a sample of the trips. **At first, the MPG of 50 (highlighted in light orange) for some vehicles seemed high but further analysis revealed these were hybrid vehicles and hence the higher MPG makes sense.**

VIN	MROMILEAG	MROFUELL	MPG
JM3KFADM0J1434187	453	16.18	28.0
KNDCB3LC6L5413207	248	4.96	50.0
JTJZB1BA8C2006292	341	11.76	29.0
2C3CDXBG5FH742035	850	36.96	23.0
JTDKDTB39E1060771	581	11.62	50.0
4T1B31HK5JU508207	1230	26.74	46.0
JN1CV6AP8BM301174	270	12.27	22.0
5NPE24AF0KH800846	863	27.84	31.0
3HGCG6657YG701660	54	2.45	22.0
JTHSZ5BC0K5009367	276	13.14	21.0
1FTPW125X5FB39505	0	0	
JM3KFADM0J1434187	782	27.93	28.0

Figure 21: MileAuto VIN Summary Report MPG Check – consistent

The Rule ID and SubRule ID included for most participant vehicles was ‘0’ and ‘1’ respectively. As per the SRS, it corresponds to ‘Undifferentiated – No location is detected or reported for travel’. Mile Auto takes validated odometer photos and calculates the distance traveled for the appropriate participating vehicle during the reporting period (current odometer reading minus previous odometer reading equals distance traveled). Thus, there is no location data associated with Mile Auto records, and therefore all data is reported in RuleID 0 (zero) and SubRuleID 1 “Undifferentiated”.

Miles driven and fuel usage indicated in the VIN and Travel Record summary don’t match each other. As seen in the figure below, some Vehicle IDs have higher miles driven and fuel usage in the Travel Record compared to VIN Summary Report.



MILEAUTO		MILES DRIVEN		FUEL GALLONS	
ID		VIN Summary	Travel Record	VIN Summary	Travel Record
1FTPW125X5F839505		497	497	33	33
1G1FZ6S05K4135222		523	708	0	0
1HGCM66544A096028		131	183	6	8
2C3CDXBG5FH742035		1717	1717	75	75
3HGCG6657YG701660		135	135	6	6
4S3GTAB66L3727692		0	0	0	0
4T1B31HK5JU508207		2990	2990	65	65
5J6RM3H71DL049740		1263	1263	49	49
5NPE24AF0KH800846		1970	1970	64	64
5YJXCBE24JF091935		219	348	0	0
JF2SKARCLH587188		277	277	10	10
JF2SKAUC7KH431180		636	636	22	22
JM3ER2B53B0364472		181	181	8	8
JM3KFADM0J1434187		1235	1624	44	58
JN1CV6AP8BM301174		464	464	21	21
JN8A55MT7EW615086		108	108	4	4
JT2GK12EXS0084265		29	29	1	1
JTDKDTB39E1060771		1328	1328	27	27
JTHSZ5BC0K5009367		570	570	27	27
JTJZB1BA8C2006292		1214	1214	42	42
JTKIF5C78C3034580		174	174	7	7
KMTG34LE1MU070661		122	122	6	6
KNDCB3LC6L5413207		724	724	14	14
WBY7Z6C53JV888890		410	698	0	0
TOTALS		16917	17960	530	546
OVERALL CHECKS		Error		Error	

Figure 22: MileAuto Miles Driven and Fuel Usage comparison

To understand more about these differences, we further analyzed the vehicle IDs with inconsistent values. As an example, we selected vehicle ID ‘1G1FZ6S05K4135222’ and assessed the VIN Summary Report and Travel Record. Referencing the snapshot below, it is observed that Travel Record summary includes miles driven by this vehicle in both February and March 2021. From Feb 11th to Feb 27th the mileage is 185, while from Feb 27th to March 30th the mileage is 523 with the total sum across the two months being 708 miles. On the other hand, the VIN Summary Report for this vehicle only reflects miles driven from Feb 27th to March 30th equivalent to 523 miles while the February data is missing. Thus, it seems the VIN Summary Report hasn’t captured all the trips.

Upon further investigation, it was discovered that the VIN Summary Report level data records for these vehicles were not fully reported to the demonstration administration system until April 2021, so they will be reflected in the April 2021 VIN Summary (data is reported in the month it was reported to the system, even if the travel occurred in a separate month; this method ensures data is not missed if reported late). It is recommended that a follow-up occur after April 2021 data is reported to confirm this data is, indeed, reported appropriately.

In aggregate, the collection, processing, and reporting for Mile Auto follows expected guidelines with minor inconsistencies for due consideration for future implementations.



BP: VIA

There are two datasets available for Via, the Participant Summary (variation of the “VIN Summary” for Via, who manages at the participant level rather than at the vehicle level), and Travel Record data. This phase started in March 2021 and hence the dataset only includes a handful of trips taken during the month. The datasets are well organized, appropriately labeled with required sufficient level of detail.

A spot check conducted on the March 2021 Participant Summary was to manually calculate the road charge and fuel tax credit rates to validate if the gross road charge and fuel tax credit values are calculated correctly. To calculate the road charge rate, the gross road charge was divided by mileage reported. Fuel tax credit rate was calculated in a similar fashion, dividing the fuel tax credit by the fuel usage reported. As seen in the snapshot below, the road charge rate per mile and the fuel tax credit rate used in the Participant Summary seem off.

BP	PERIODSTART	PERIODENDE	MROMILEAGE	MROFUELUSAGE	MROROADCHARI	MROFUELTXC	Road Charge \$ per mile	FTC rate
3001	3/1/2021	3/31/2021	12.9	0.51	0.28	-0.26	\$ 0.022	\$(0.510)
3001	3/1/2021	3/31/2021	1.9	0.08	0.04	-0.04	\$ 0.021	\$(0.500)
3001	3/1/2021	3/31/2021	3	0.12	0.07	-0.06	\$ 0.023	\$(0.500)
3001	3/1/2021	3/31/2021	3.1	0.12	0.07	-0.06	\$ 0.023	\$(0.500)

Figure 23: VIA road charge per mile and fuel tax credit rate check (sanitized of PII)

However, when looking further, there is a margin of error due to rounding to whole dollars and cents that can account for this. Take the first row as an example. The fuels tax credit rate, when calculated manually, indicates a rate of $-\$0.510$ was used, rather than the demonstration defined rate of $-\$0.505$. However, when you multiple the fuel usage by the expected rate ($0.51 \times -\$0.505$), it results in a value of $\$0.25755$ which becomes $\$0.26$ when rounded appropriately. **This rounding variation can be applied to each of the road charge and fuel tax credit rates that seem off, and all are reconciled when evaluating the unrounded and rounded values.**

The dataset currently has a handful of transactions, but as demonstration progresses and eventually is implemented at a larger scale, these rounding variations could accumulate and become substantial. It would be worthwhile to evaluate and refine rounding expectations and rules to reduce potential variation issues moving forward.

Please see below snapshot from the Participant Summary report. The Rule ID and SubRule ID detected for the participant vehicles correspond to ‘California public roads’ and read the appropriate flags in alignment with the guidelines outlined in the SRS.

BP	PERIODSTART	PERIODENDE	RULEID	SUBRULE
3001	3/1/2021	3/31/2021	6	1
3001	3/1/2021	3/31/2021	6	1
3001	3/1/2021	3/31/2021	6	1
3001	3/1/2021	3/31/2021	6	1

Figure 24: VIA Rule ID, SubRule ID Check

Miles driven and fuel usage indicated in the Participant and Travel Record summary match-up. The below figure confirms the alignment between the datasets.



VIA	MILES DRIVEN		FUEL GALLONS	
	Participant Summary	Travel Record Summary	Participant Summary	Travel Record Summary
TOTALS	20.9	20.9	0.83	0.83
OVERALL CHECKS	OK		OK	

Figure 25: Via Miles Driven & Fuel Usage comparison

The miles per gallon (MPG) cross-check for the datasets was logical and in line with industry standards.

BP	PERIODSTART	PERIODENDC	MROMILEAGE	MROFUELUSAGE	MPG
3001	3/1/2021	3/31/2021	12.9	0.51	25.3
3001	3/1/2021	3/31/2021	1.9	0.08	23.8
3001	3/1/2021	3/31/2021	3	0.12	25.0
3001	3/1/2021	3/31/2021	3.1	0.12	25.8

Figure 26: Via Participant and Travel Record Summary – MPG Check

In aggregate, for the limited information available (only March 2021), the collection, processing and reporting for Via follows expected guidelines with some minor inconsistencies for due consideration for future implementations.

OUTCOME

The value of this audit lies in identifying discrepancies and assessing likely causes, so that these inconsistencies can be avoided, reduced, and/or addressed in future implementations. **In aggregate, the overall data collection and reporting by all BPs generally follow expected guidelines. However, there are some gaps and anomalies in the datasets which should be duly considered and resolved for future implementations.**