Tesla Motors

Charging Toward an Electric Future

How to Increase EV Market Share?

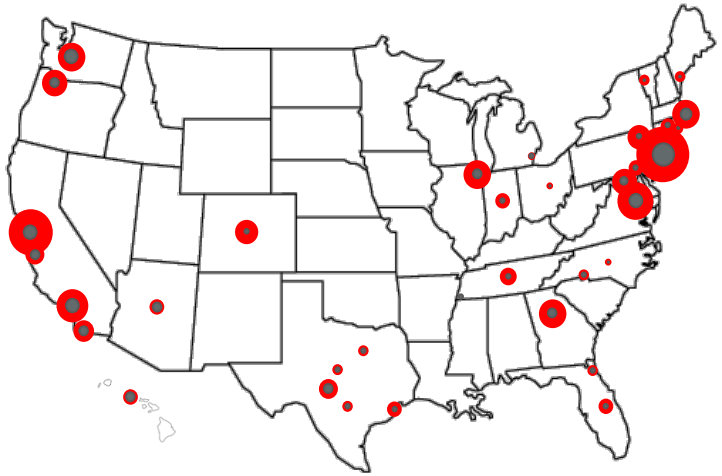
Moonlight

March 31, 2017

Colin Bond | Sara Katrancha | Matt Piva | Ethan Sarnoski

Executive Summary

To increase market share:



Expand
Charging Network

Capture
Market

Leverage
Exposure

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Current State of Affairs at Tesla

Strengths

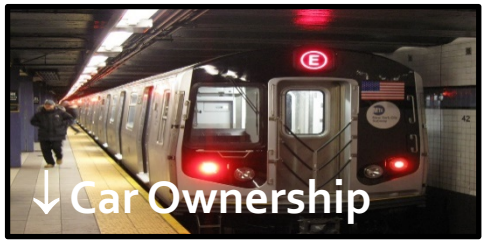
CR Consumer Reports
Top U.S. Car Brand 2016

Weaknesses

TESLA

Opportunities

Threats



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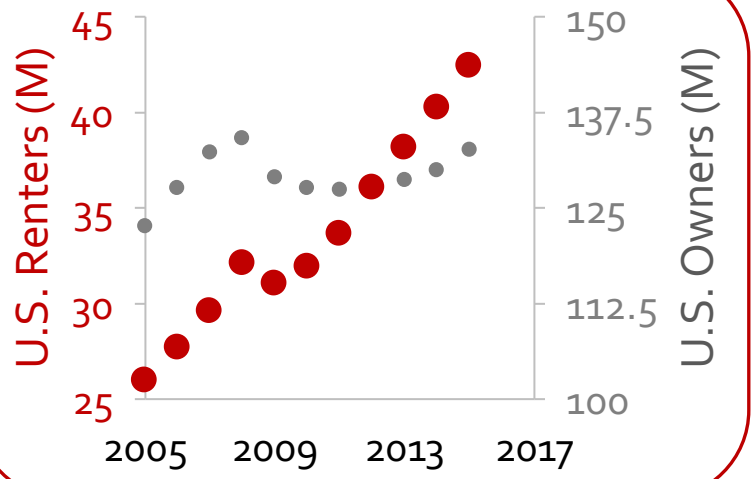
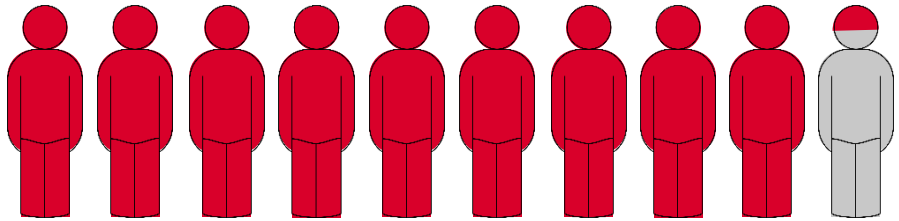
There is a growing number of U.S. renters without access to home charging



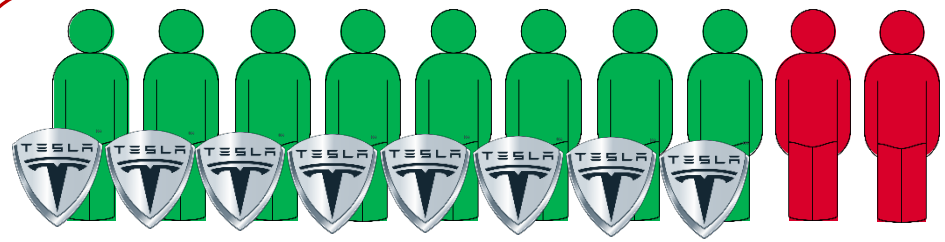
Compound Annual Growth Rate 2010-2015
Household Income >$50k/year

U.S. Renters: 6.5%
U.S. Owners: 1.4%

42.5 M U.S. Renters with Household Income>$50k/year



91% - No home-charging access
74% - Reason for not buying an EV



80% would consider a Tesla
if a charging station was nearby

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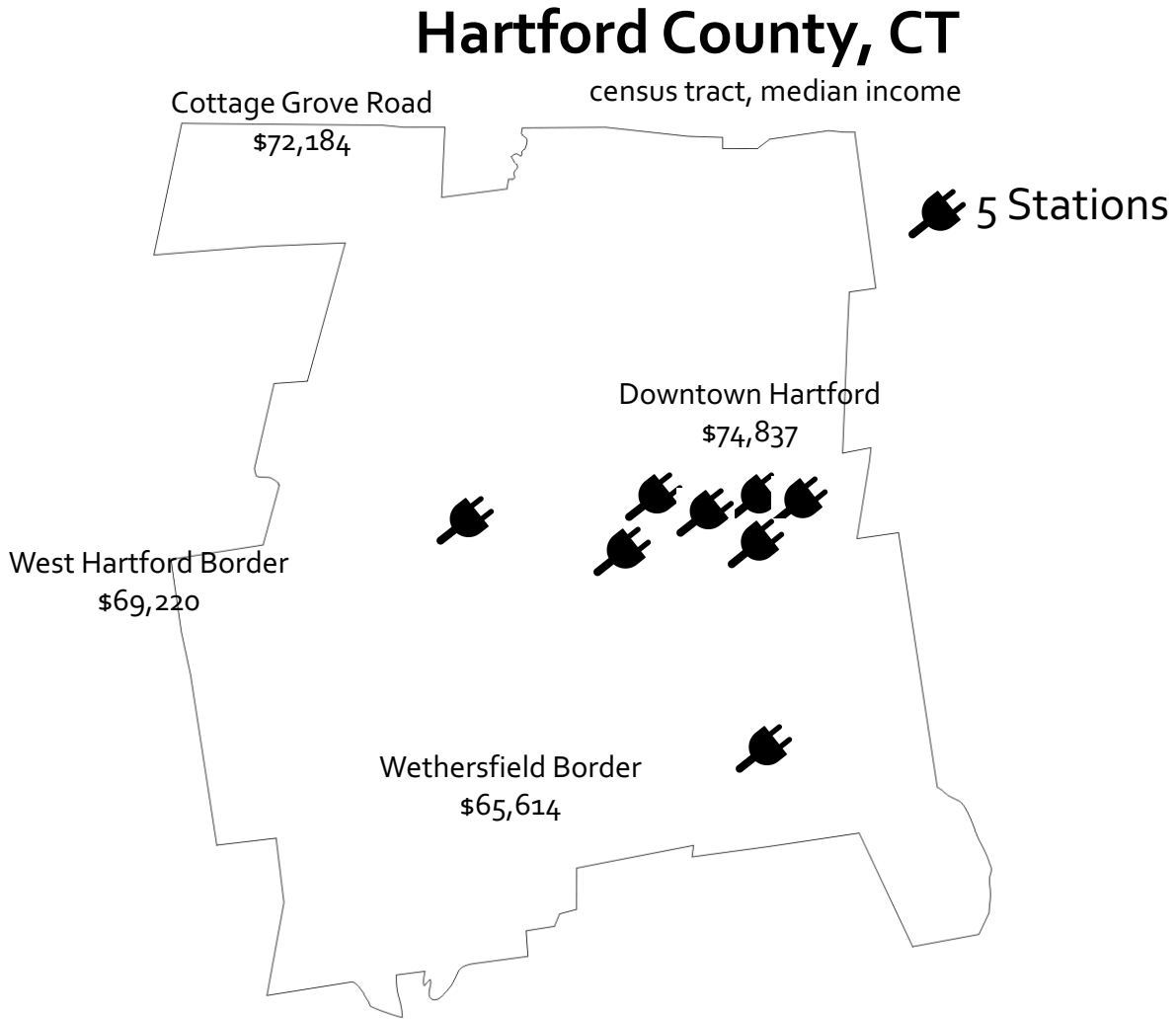
Current charger network focuses on commercial areas

- Growth rate of stations (20%) not expected to meet electric vehicle growth rate (32%)
- Public stations cluster in downtown centers, ignoring value at residential areas



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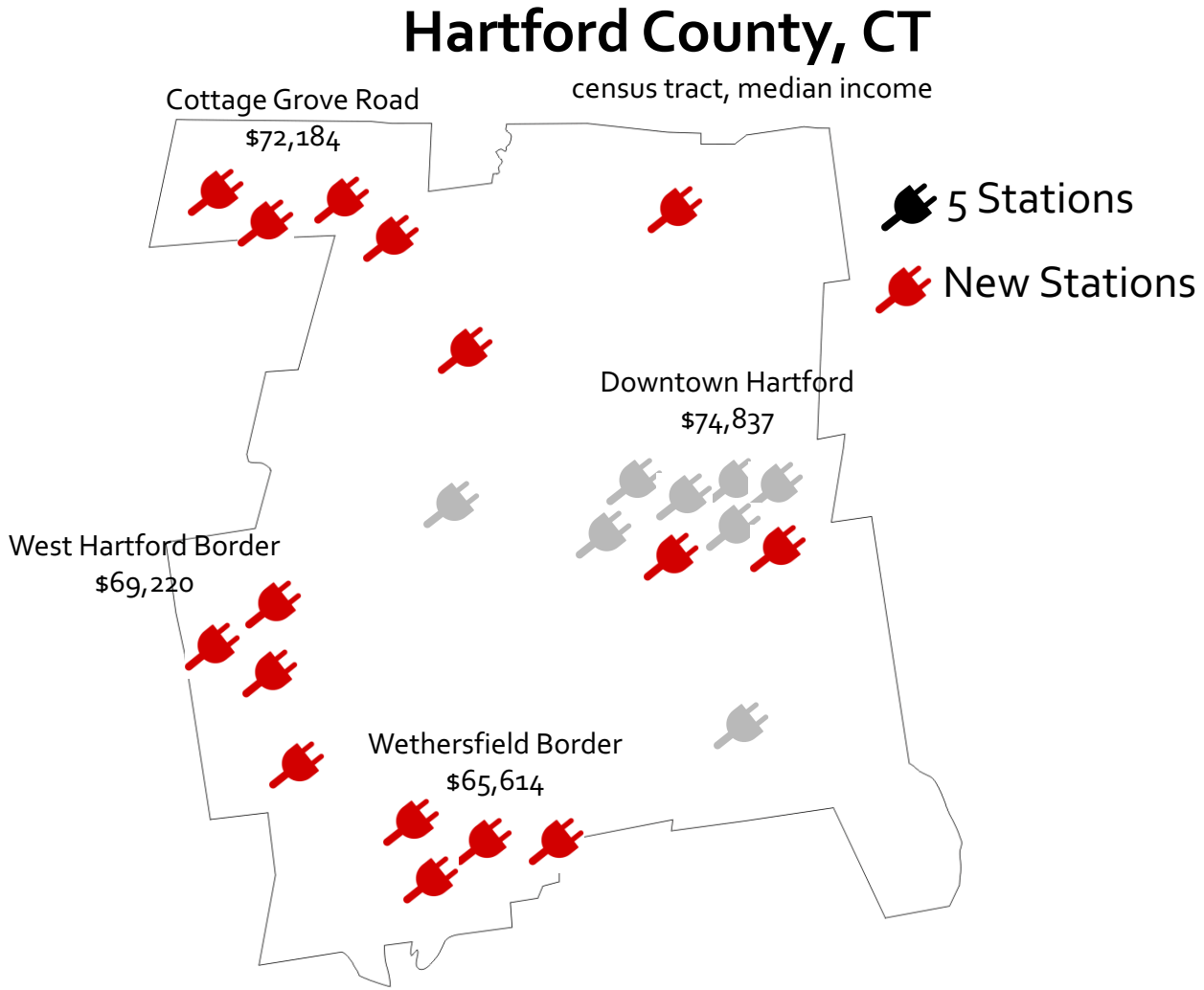
Current charger network focuses on commercial areas

Recommendation

Increase the number of charging stations in residential areas



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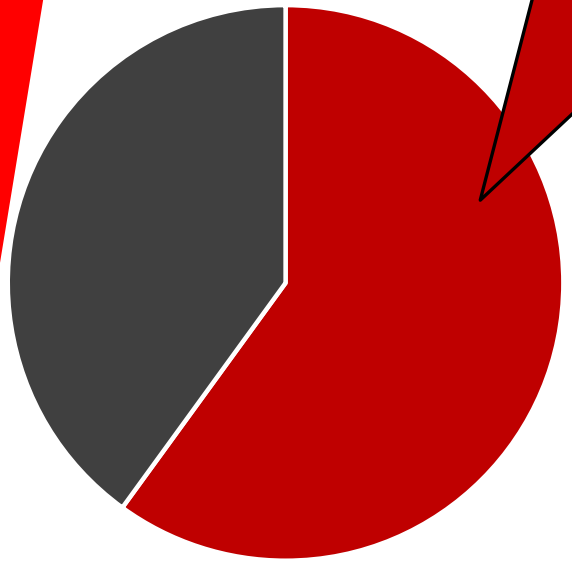
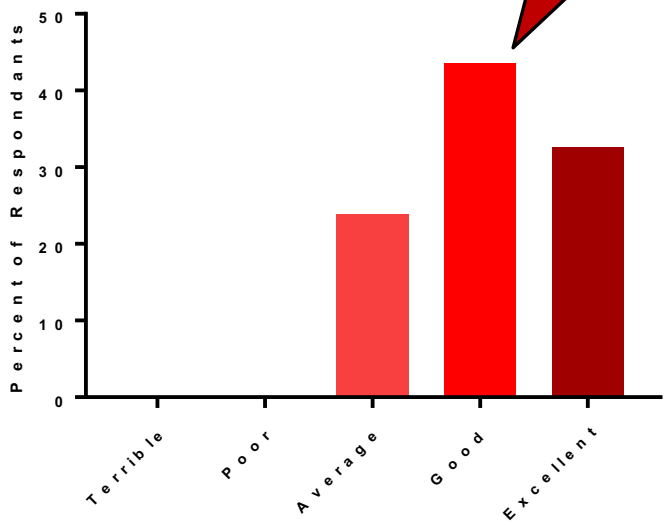
Recommendation
Leverage New Tesla Chargers for Low-key Advertising

60% of Americans know little-to-nothing about EVs



Tesla's advertising achieves high esteem



Educate unobtrusively

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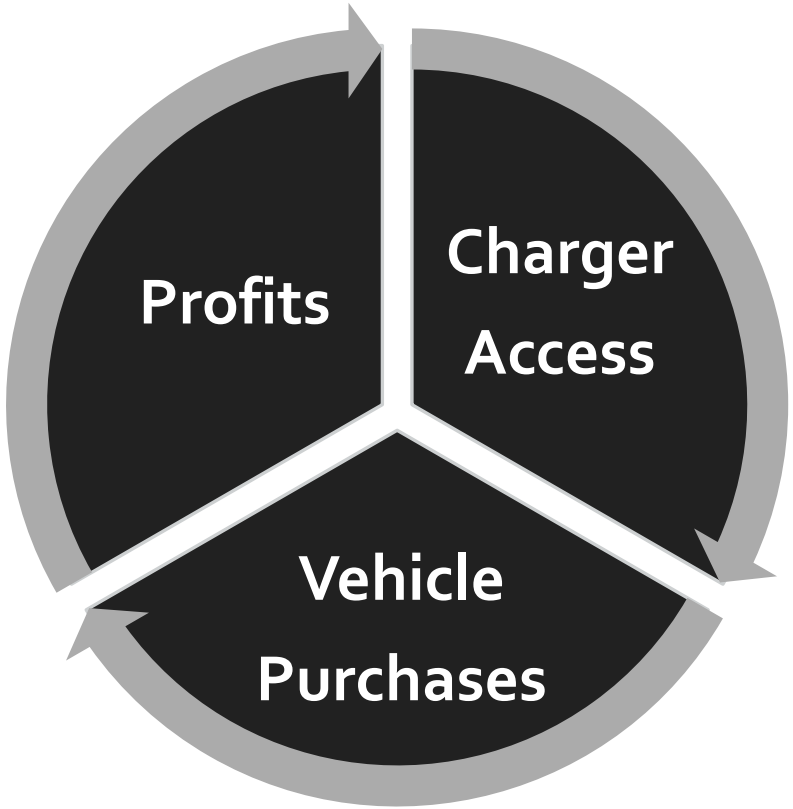
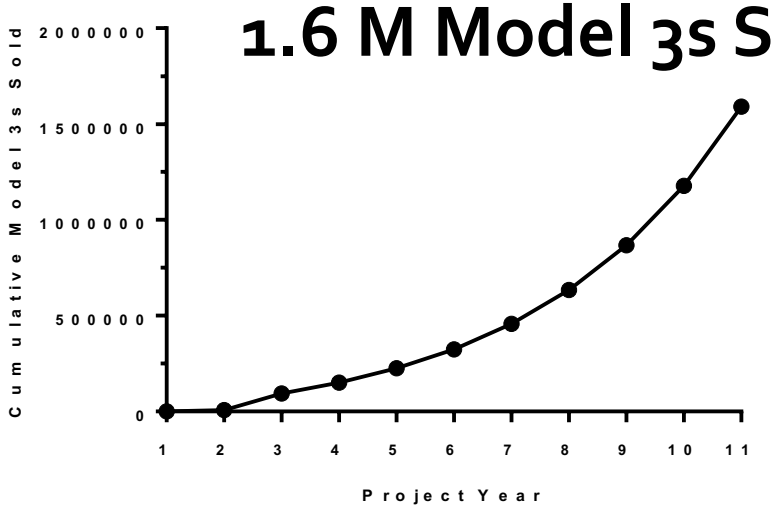
Key Outcomes

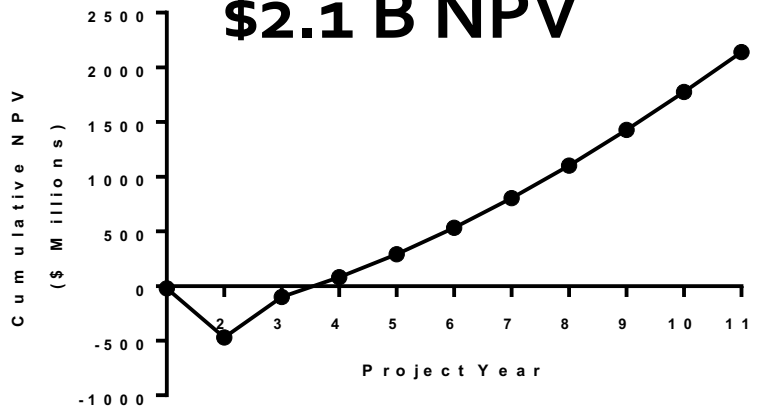
A virtuous cycle



1.6 M Model 3s Sold



$2.1 B NPV



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Our Recommendation Creates a Strong Position

- Optimizes autonomous fleet opportunity
- Protection against market share decline
- International growth compatible

Charging Forward: Rollout Strategy

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Revenue	*59*	*442*	*4125*	*3114*	*4173*	*5561*	*7383*	*9777*	*12924*	*17064*	*22514*
Cost	(82)	(936)	(3437)	(2743)	(3696)	(4962)	(6645)	(8882)	(11854)	(15804)	(21053)

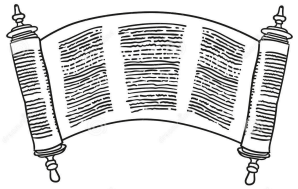
P1

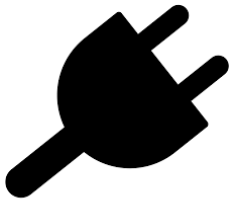
Expand network to **82 under served,** high demand cities

Pilot 1: Targeting **22** high potential cities

Population + Education + Incentives + Parking desirability = Charging stations







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Charging Forward: Phase 1

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Revenue	59	442	4125	3114	4173	5561	7383	9777	12924	17064	22514
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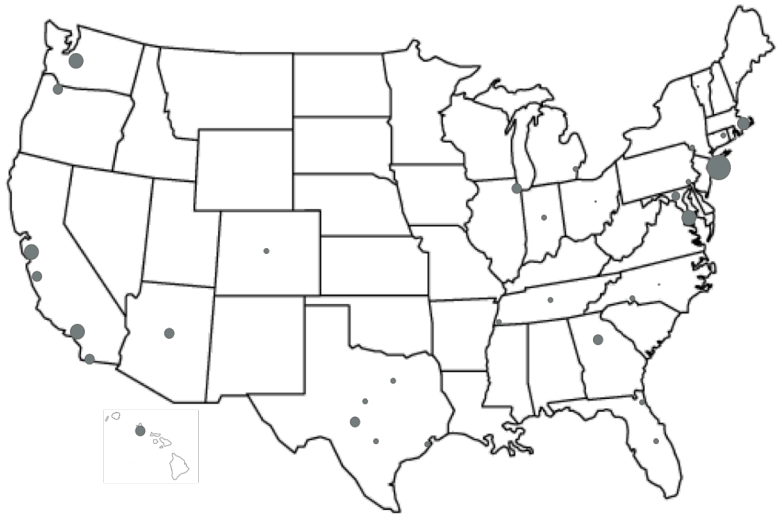
Decision Point: Evaluate effect of charger access on sales. **0.18**/station minimum increase for profitability.

Pilot Locations



- Existing Stations 2017

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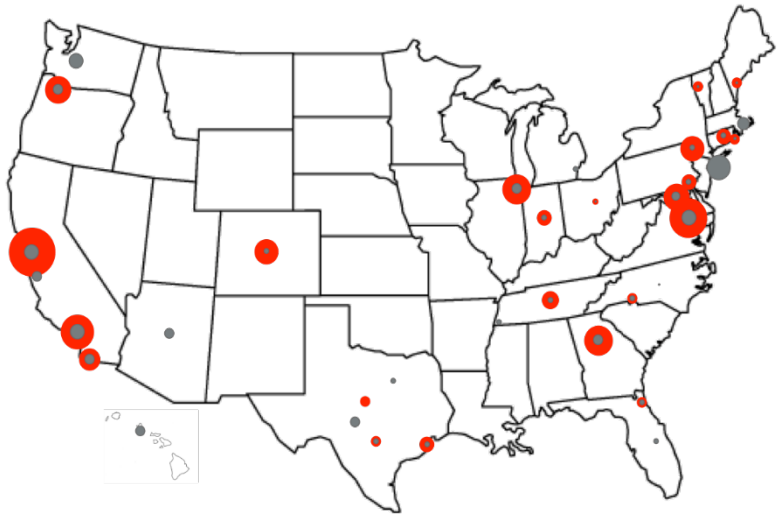
Phase 1 Pilot Locations



- Existing Stations 2017
- Added Stations

Area of dots corresponds to 250 stations

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Charging Forward: Phase 2

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Revenue	*59*	*442*	*4125*	*3114*	*4173*	*5561*	*7383*	*9777*	*12924*	*17064*	*22514*
Cost	(82)	(936)	(3437)	(2743)	(3696)	(4962)	(6645)	(8882)	(11854)	(15804)	(21053)

P1 — Expand network to 82 under served, high demand cities

P2 — Expand network to **62 moderately** served, high demand cities

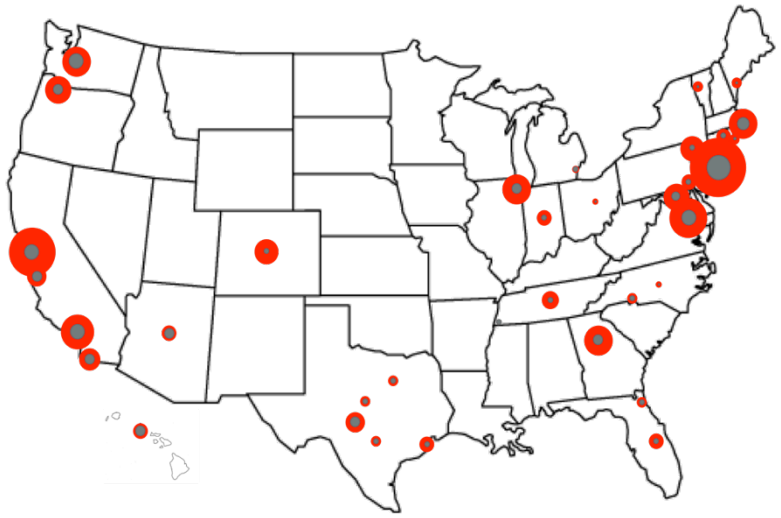
Pilot 2: Targeting **13** medium potential cities

Decision Point: Evaluate effects of charger access on sales. **0.16**/station minimum increase for profitability.

- Existing Stations 2017
- Added Stations

Area of dots corresponds to 250 stations

Phase 2 Pilot Locations



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Charging Forward: Phase 3

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
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Cost	(82)	(936)	(3437)	(2743)	(3696)	(4962)	(6645)	(8882)	(11854)	(15804)	(21053)

P1: Expand network to 82 under served, high demand cities

P2: Expand network **to 62 moderately** served, high demand cities

Decision Point: Evaluate effects of charger access on sales. **0.16**/station minimum increase for profitability.

Decision Point: Evaluate EV market growth rate for future rollout. Desired ratio of **10** cars/outlet

Location

- Evaluate consumer segments & geography
- Monitor trends in high-density area car ownership
- Re-evaluate roll out to respond to ADV, ownership, and EV adoption rates

Pricing

- Monitor user mix and adjust to market rates & Tesla consumers response to price changes

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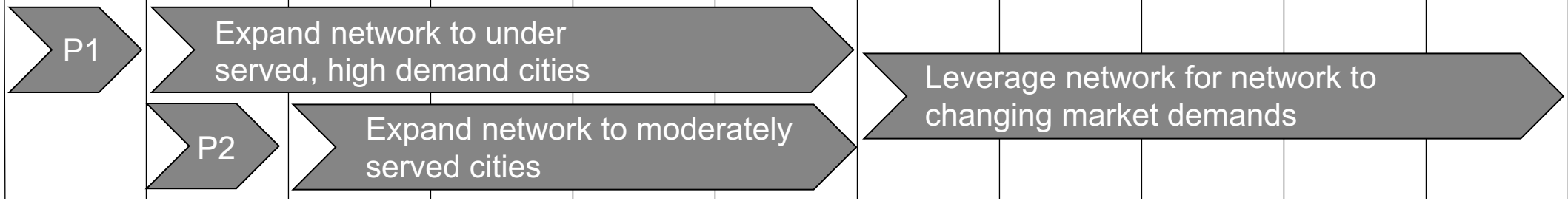
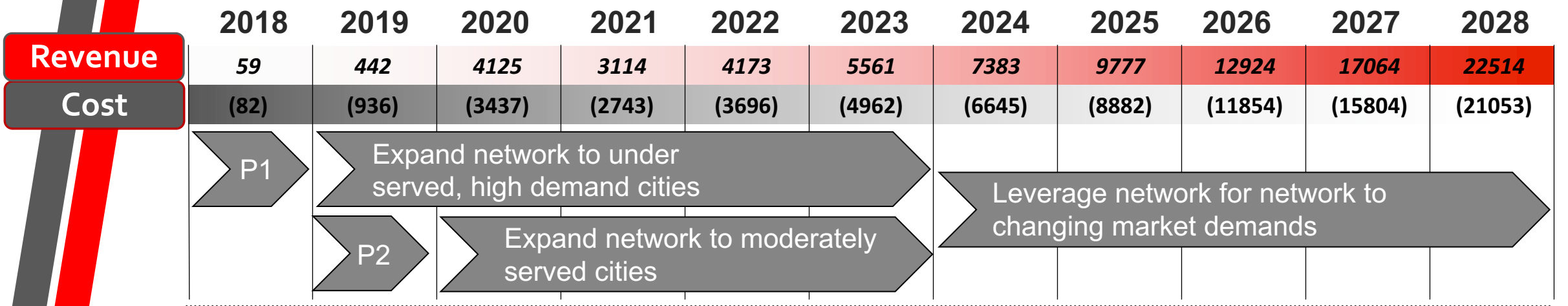
Risk Mitigation Strategies

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Revenue	59	442	4125	3114	4173	5561	7383	9777	12924	17064	22514
Cost	(82)	(936)	(3437)	(2743)	(3696)	(4962)	(6645)	(8882)	(11854)	(15804)	(21053)



Risk Type	Specific Risks	Mitigation A	Mitigation B
Consumer Demand	1. Low adoption of EVSE network 2. Declining car ownership, alternate means of travel	1. Refine geographic targeting 2. Look for corporate partnerships	1. Rollout strategy to test adoption rates 2. Continue to develop ADV technology, deploy ADV fleet
Competition	1. Large expansion by competitor network 2. Aggressive EV push from major incumbent	1. Evaluate mix of long and short term charging network 2. Continue to develop technology, and branding, maintain lead	1. Focus on core Tesla: production and sales of EV 2. Leverage network to profit from competitor sales
Policy & Regulatory	1. Decline in support for emission regulations. Decline in EV subsidies and grants	1. Maintain close relationship with political and business leaders. Always look for P3 projects.	1. Deploy to EV friendly domestic states and locales Refocus on international markets

Summary of Position



Expanded Charging Network

- Increasing EV desirability
- Generating revenues from competitors
- Synergy with future tech storage and production

Captured Market Share

- Expand brand
- Profits to roll back into to technology and product mix development
- Increased use of network

Leveraged for Evolving Industry

- Secure capital
- Expand model to international market
- Decrease fuel costs for fiercely competitive ADV market

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Thank you from the Moonlight Consulting Group!

Tesla Motors:

Charging Toward an Electric Future

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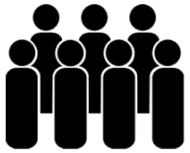
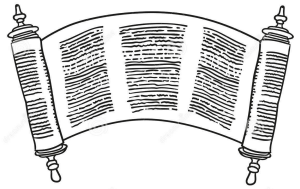
Appendix 1A:
Predicting Amount of Chargers in Individual Cities

	 Portland, OR	 Burlington, VT	 Austin, TX
Predicted	96	36	64
Actual	81	32	91

Population + Education + Incentives + Parking desirability = Charging stations



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Appendix 1B:
Optimizing Charging Opportunity in Individual Cities

	 Portland, OR	 Burlington, VT	 Austin, TX
Predicted	96	36	64
Actual	81	32	91

- Model identifies opportunities in individual cities and neighborhoods
- Balancing station number with predicted values will increase accessibility to charging for potential Tesla owners, boosting Tesla sales, customer satisfaction, and implicit marketing

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Appendix 2:
GLM for Station Locations

Initial GLM

```
Generalized Linear regression model:
    y ~ 1 + x1 + x2 + x3 + x4 + x5 + x6 + x7
    Distribution = Normal

Estimated Coefficients:
                   Estimate        SE        tStat      pValue
                   ________    _________    _______    _________

    (Intercept)      -59.679      23.315    -2.5597     0.025017
    x1             -0.032728    0.022909    -1.4286      0.17863
    x2              0.0040257   0.0007495     5.3712   0.00016774
    x3             -0.00044992  0.00040812    -1.1024       0.2919
    x4             -0.016108    0.011213    -1.4365      0.17641
    x5               125.83       42.118     2.9875     0.011326
    x6               5.5376       1.1414     4.8516   0.00039713
    x7               10.311        2.923     3.5277    0.0041643


20 observations, 12 error degrees of freedom
Estimated Dispersion: 295
F-statistic vs. constant model: 27.2, p-value = 1.89e-06
```

x1: Land area

x2: Population density

x3: Electric vehicles for sale

x4: Median household income

x5: Education

x6: Incentives

x7: Parking cost

Refined GLM

```
Generalized Linear regression model:
    y ~ 1 + x1 + x2 + x3 + x4
    Distribution = Normal

Estimated Coefficients:
                   Estimate        SE        tStat      pValue
                   ________    _________    _______    _________

    (Intercept)      -67.15       15.515    -4.3281   0.00059704
    x1             0.0045007   0.00071296     6.3127   1.3922e-05
    x2               100.77       38.474     2.6191      0.01935
    x3               4.0949      0.95212     4.3009   0.00063069
    x4               7.3669       2.5077     2.9377     0.010185


20 observations, 15 error degrees of freedom
Estimated Dispersion: 333
F-statistic vs. constant model: 41.1, p-value = 6.52e-08
```

x1: Population density

x2: Education

x3: Incentives

x4: Parking cost

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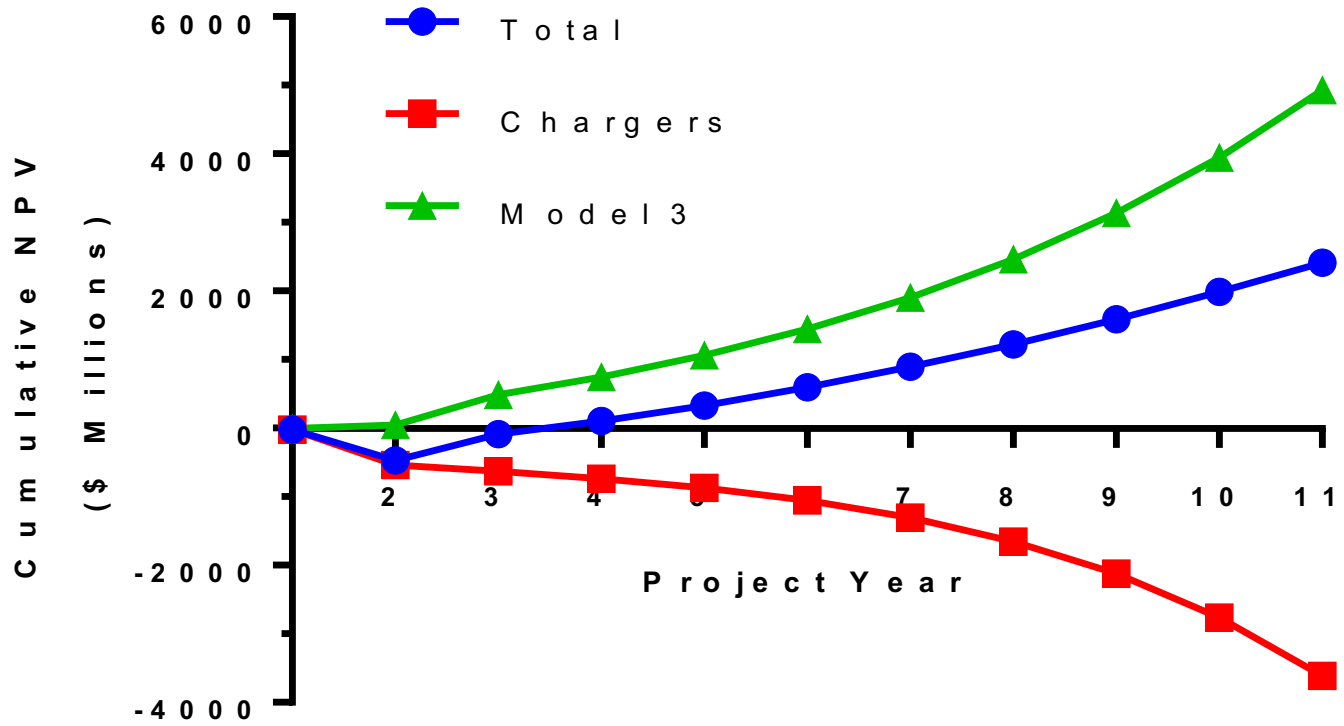
Appendix 3:
Model 3 Sales Are Required for Positive NPV

Tesla uniquely stands to profit from building a residential charger network



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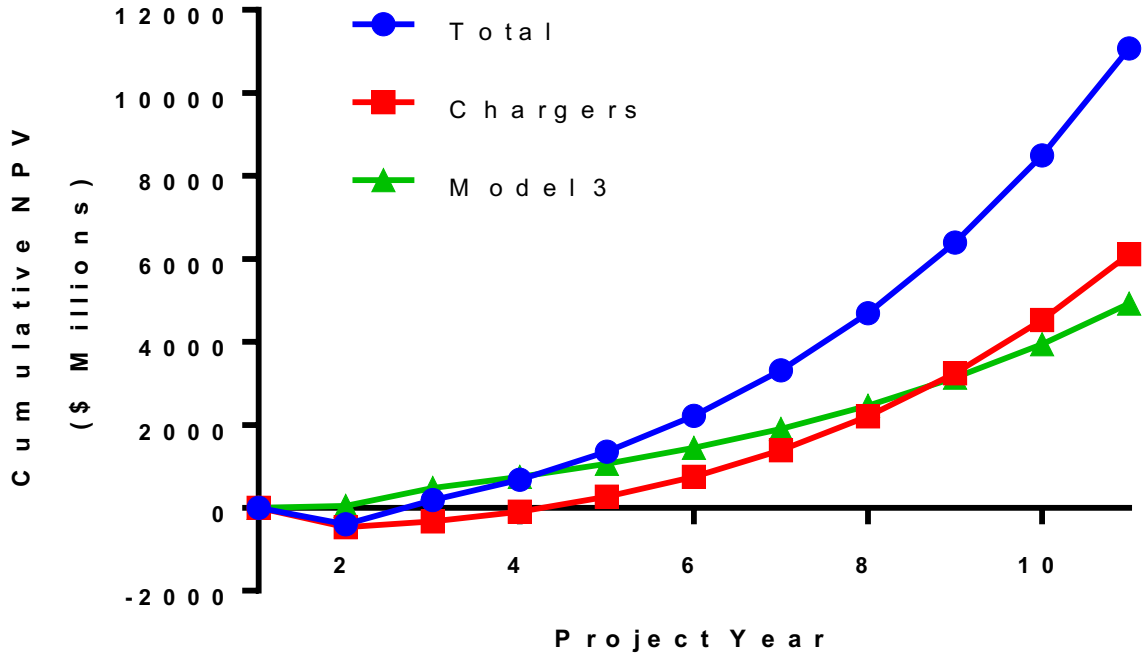
Appendix 4:
NPV Obtained by Charging All Vehicles Market Rate

Charger station NPV becomes positive when market rate is charged



Not recommended! Does not account for Tesla market share effects or competitive response

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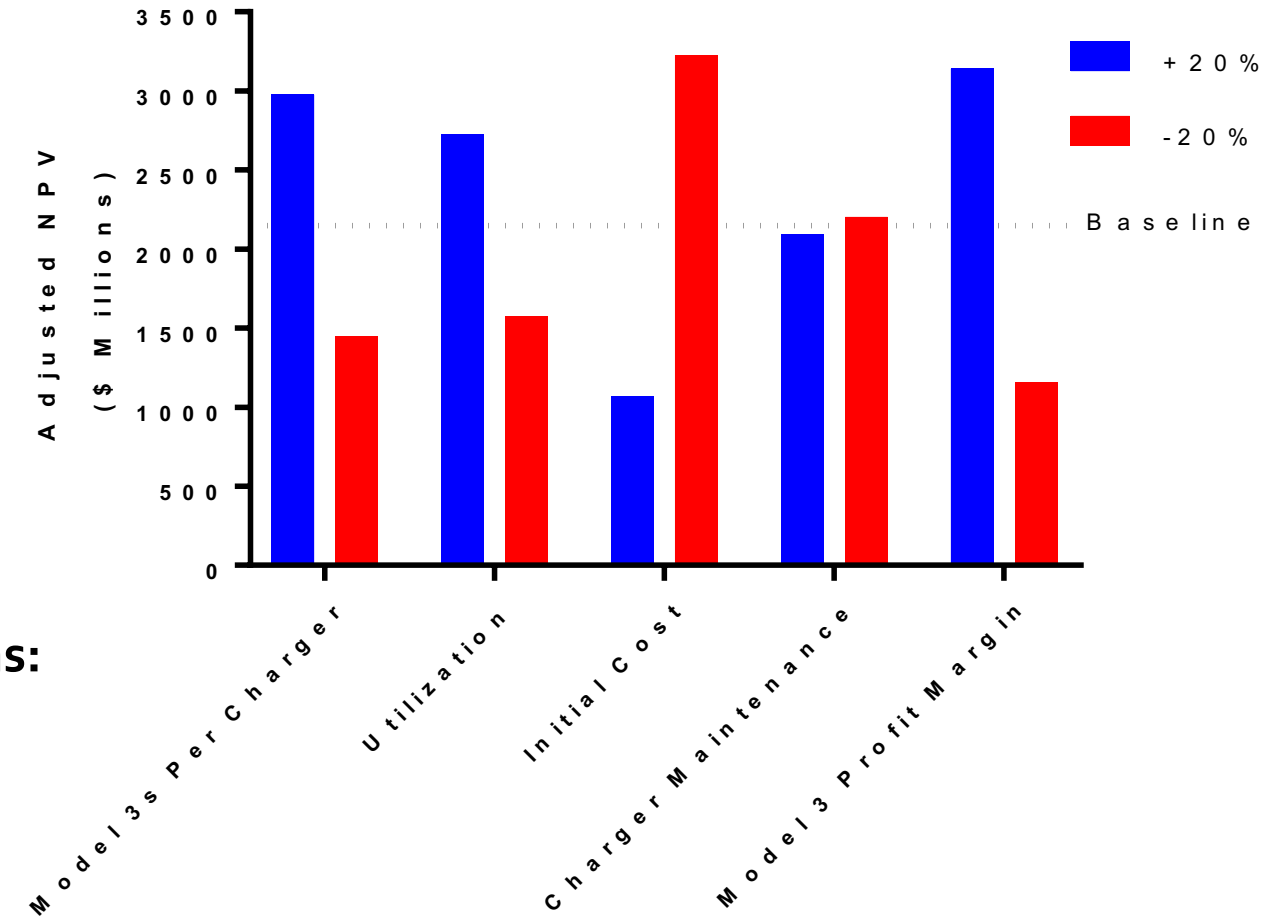
Appendix 5:
Sensitivity Analysis

NPV is positive for all key assumptions +/- 20%



Key assumptions:

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Appendix 6:
NPV Forecast User Interface

Inputs: Yellow values can be modified	
Logistics	
Years for NPV Inclusion	12
Selected Charger:EV Ratio	0.1
2017 Tesla Charger Stations	9491.85
Model 3s Sold Per Charger	0.81807
Model 3s Sold Year 0	223319
Outlets Per Station	2.37
Tesla Market Share Year 1 by Vehicle #	0.63109369
Year 0 Year End EVs	1232435.944
Total Year 0 EV Sales	469957.4089
EV Sales Growth Rate	0.246980311
Year 0 Competitor Public Charger Ports	44906.66309
Industry Charger CAGR	0.245574026
Revenues	
Price/kWh for Tesla drivers ($)	0.1019
Price/kWh for Non-Tesla drivers ($)	0.5
Growth rate of Non-Tesla Price	0
Charge Rate (kWh/hr)	19.2
Revenue/Model 3	42000
Utilization	0.084966027
Costs	
Average Charging Efficiency	0.85
Average USA Variable Cost/kWh ($)	0.1019
Average Initial Cost/Station	6000
Average Annual Fixed Cost/Station	300
Cost to Produce Model 3	32508
Effective Variable Cost/kWh ($)	0.119882353
Financials	
Tax Rate	0.35
Discount Rate	0.1
Model 3 Profit Margin	0.226

		Year 1 = 2018	
	Sum	**1**	**2**
Charger Revenue	$20,312,611,108	$59,118,731	$98,569,748
Charger COGS	$12,675,764,632	$21,751,281	$40,149,018
Initial Costs This Year	$15,695,416,015	$60,000,000	$629,442,318
Time Discounted Initial Cost	7,998,251,854	$60,000,000	$572,220,289
Charger Profit	-$8,058,569,539	-$22,632,550	-$571,021,588
Charger Tax-Adjusted Profit	-$8,058,569,539	-$22,632,550.02	-$571,021,587.86
Charger Net Present Value	-$4,036,879,994	-$22,632,550	-$519,110,534
Additional Model 3s Sold (1 Year Offset)	1,591,067	0.00	8,180.70
Percent of Annual EV Sales	5%	0	0.013767394
Model 3 Revenues	$66,824,818,095	$0.00	$343,589,400.00
Model 3 Costs	$51,722,409,206	$0.00	$265,938,195.60
Model 3 Profit	$15,102,408,890	$0.00	$77,651,204.40
Model 3 Tax-Adjusted Profit	$9,816,565,778	$0.00	$50,473,282.86
Model 3 Net Present Value	$4,929,600,260	$0	$45,884,803
Total Revenues	$87,137,429,204	$59,118,730.51	$442,159,148.45
Total Cost	$80,093,589,853	$81,751,280.53	$935,529,531.91
Total Gross Profit	$7,043,839,351	-$22,632,550	-$493,370,383
Profit Margin (%)	8%	-38%	-112%
Total Tax-Adjusted Profit	$4,405,815,944	-$14,711,157.51	-$493,370,383.46
Total Net Present Value	$2,148,646,778	-$14,711,158	-$448,518,530

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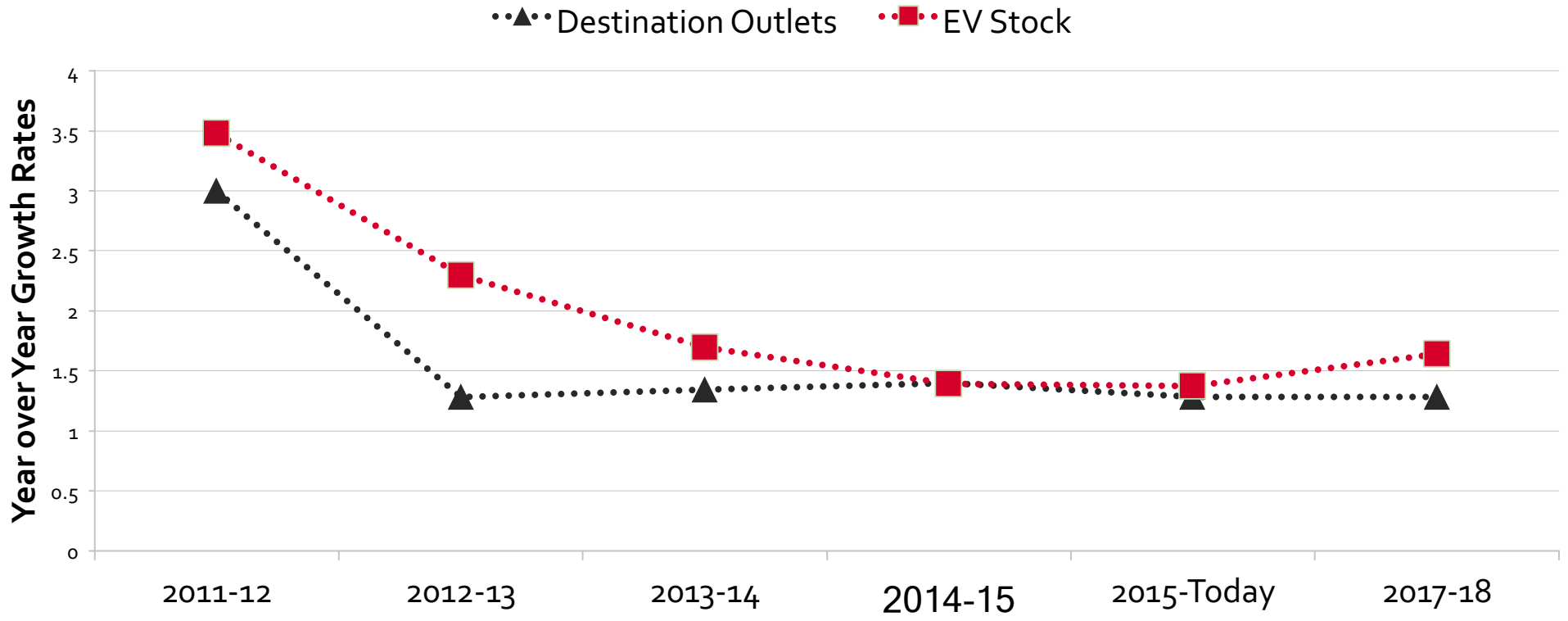
Appendix 7:
EVSEs Do Not Match EV Growth



0.35 growth gap 2018!

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Data from: US Department of Energy ◆ International Energy Agency ◆ Tesla Model 3 reservations

Appendix 8:
EV Car Sales to EVSE Outlets

[**Model 3 reservations/cap**] =

$B_0 + B_1$ [**outlets/cap**] + B_2[**median income**] + B_3 [**# laws/regulations targeting EV**]+ B_4 [**% with bachelors(+)**]

	Estimate	SE	tStat	pValue
(Intercept)	-50.068	15.482	-3.234	0.0022362
x1	0.81807	0.32305	2.5324	0.01473
x3	1.6247	0.38738	4.194	0.00012031
x4	2.9554	0.57346	5.1536	4.9956e-06

51 observations, 46 error degrees of freedom
Estimated Dispersion: 445
F-statistic vs. constant model: 27.4, p-value = 1.18e-11

Income, linear, and quadratic interaction terms dropout/not significant. $R^2 = 0.71$

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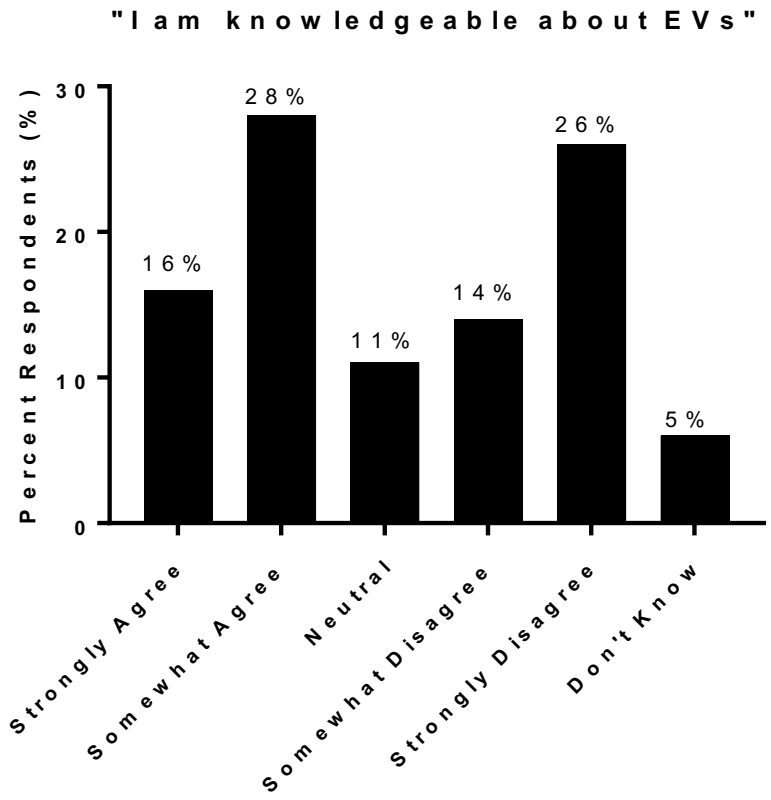
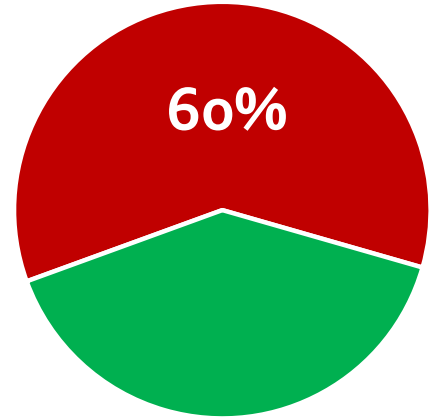
Appendix 9:
Lack of EV Knowledge in the General Population



Survey of 501 men and 503 women (1,004) in December 2013



Not Knowledgeable Knowledgeable

Altman Vilandrie & Co Survey of 2,500 U.S. Consumers in July 2016

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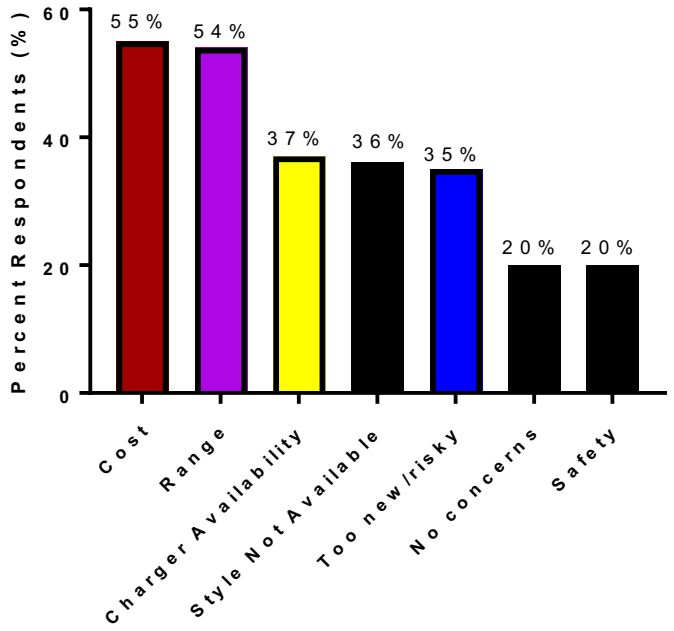
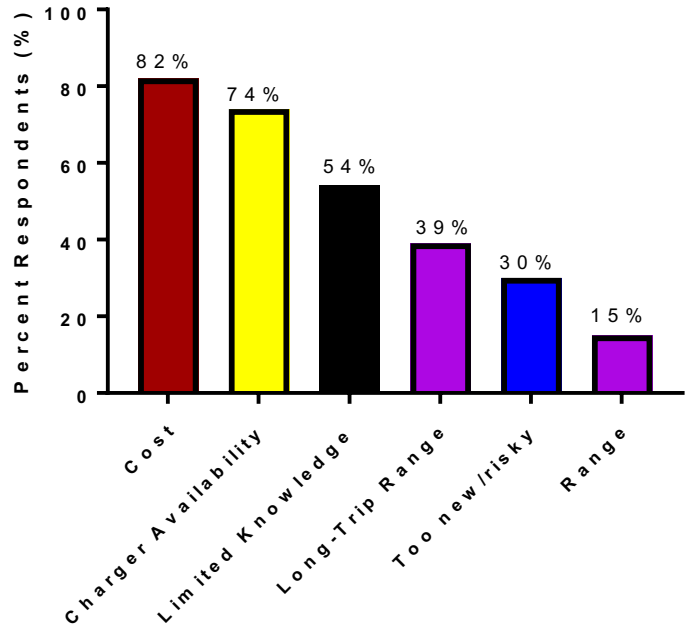
Appendix 10:
Major Concerns for General Population about EVs

"What are your major concerns about owning an EV?"



Survey of 501 men and 503 women (1,004 total) in December 2013

"Which of the following prevent you from owning a Tesla?"



Survey of 37 renters and 10 home owners in March 2017

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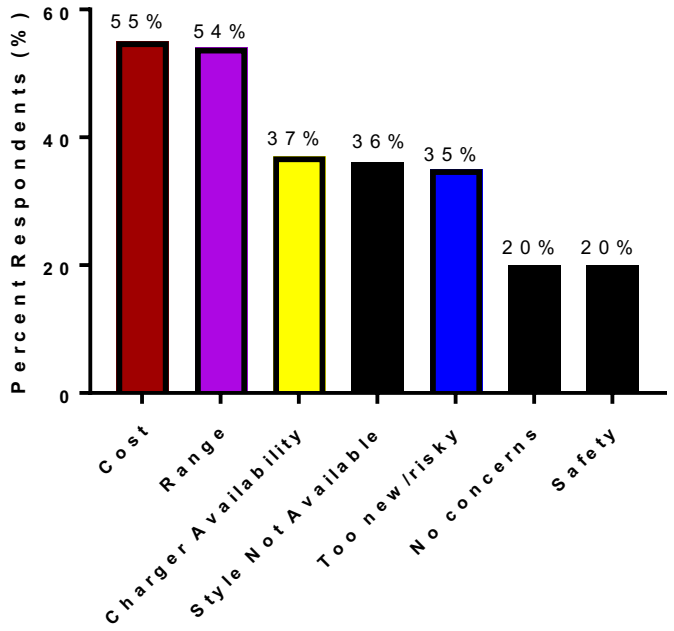
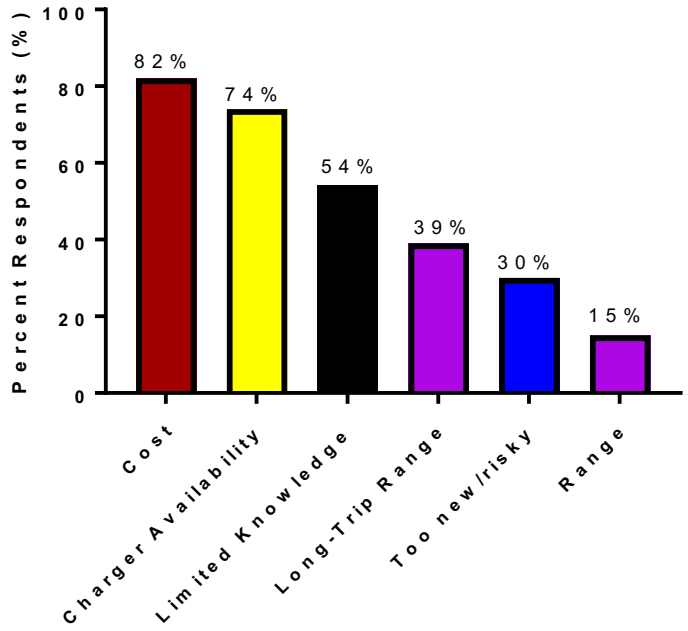
Appendix 11:
Major Concerns for General Population about EVs

"What are your major concerns about owning an EV?"



Survey of 501 men and 503 women (1,004 total) in December 2013

"Which of the following prevent you from owning a Tesla?"



Survey of 37 renters and 10 home owners in March 2017

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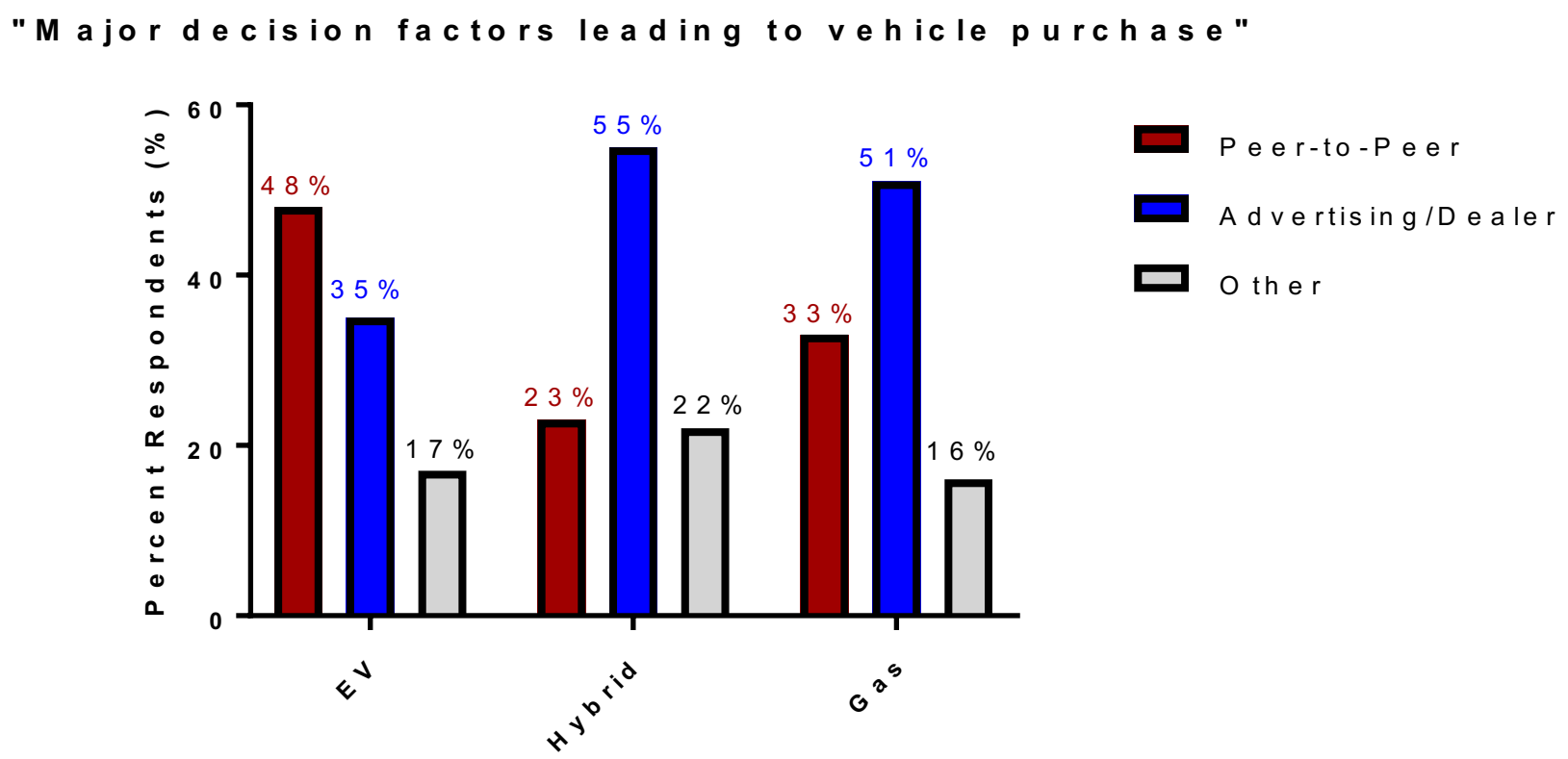
Appendix 12:
Major decision factors that led current owners to buy



Survey of 3,111 EV, 2,065 hybrid, and 3,080 gas owners (8,256 total) in August 2016

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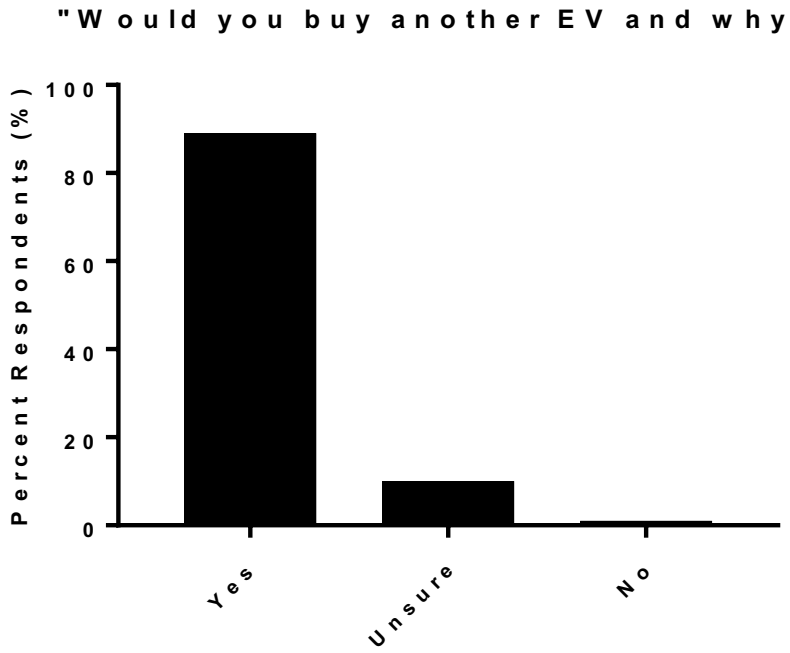
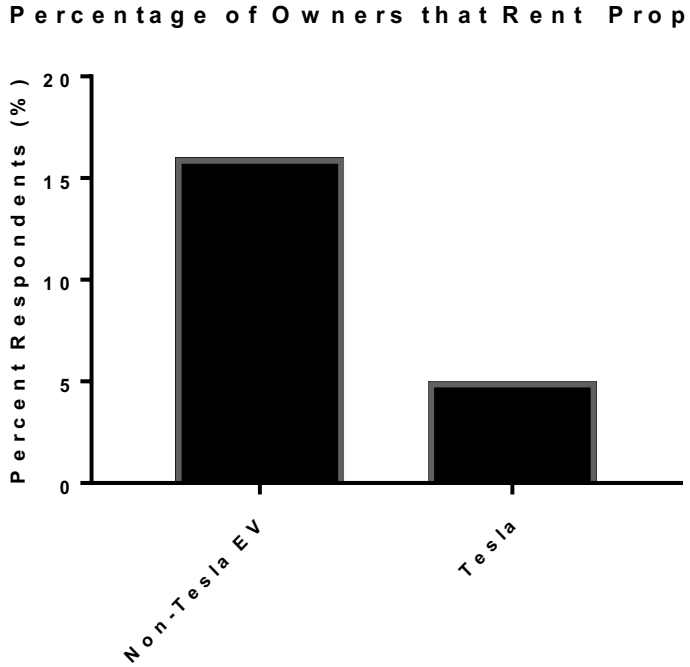
Appendix 13:
Current Owners: Satisfaction & Property Ownership



Yes: economy of use, technology, environmental reason, and government exemptions

No: charging availability and range problems with early models

Survey of 3,111 EV, 2,065 hybrid, and 3,080 gas owners (8,256 total) in August 2016



Survey of 6,591 non-Tesla EV owners and 2,106 Tesla owners in 2016

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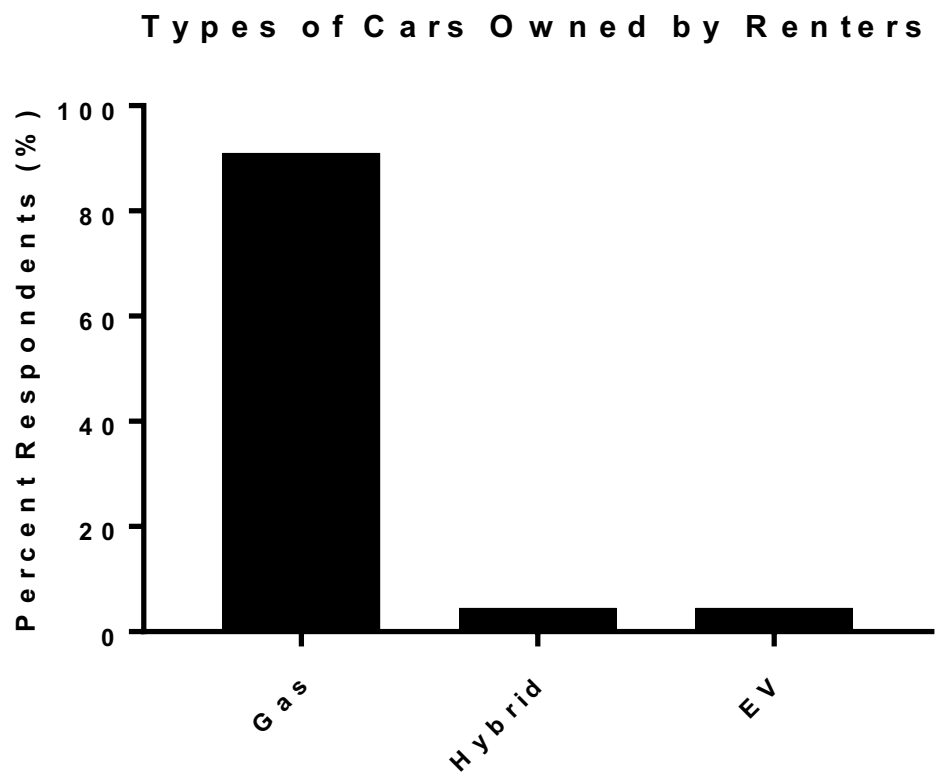
Appendix 14:
Types of Cars owned by renters



Median Household Income: $51k
Average Car Price: $34k

Survey of 37 renters and 10 home owners in March 2017

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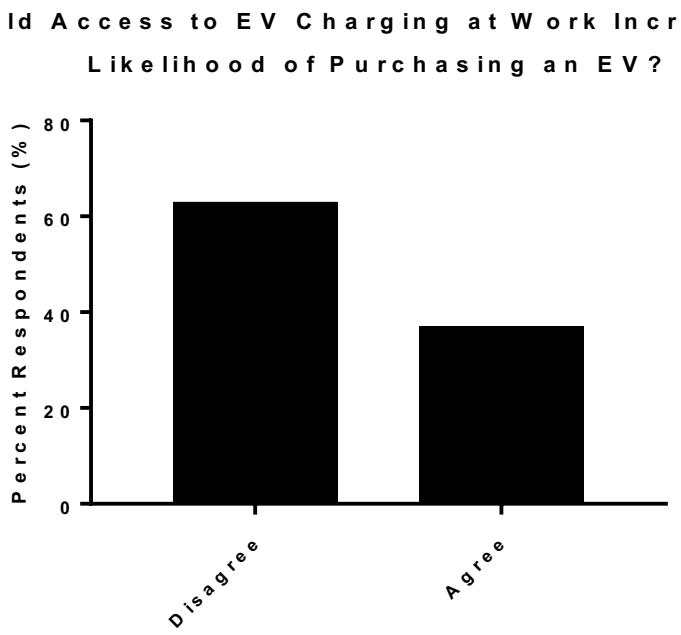
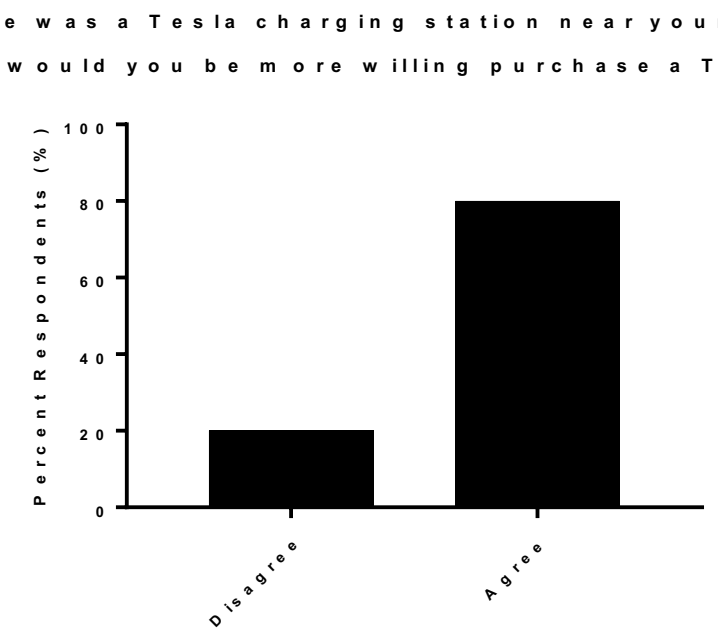
Appendix 15:
Workplace vs. Residential EV Charging



Survey of 501 men and 503 women (1,004 total) in December 2013



Survey of 37 renters and 10 home owners in March 2017

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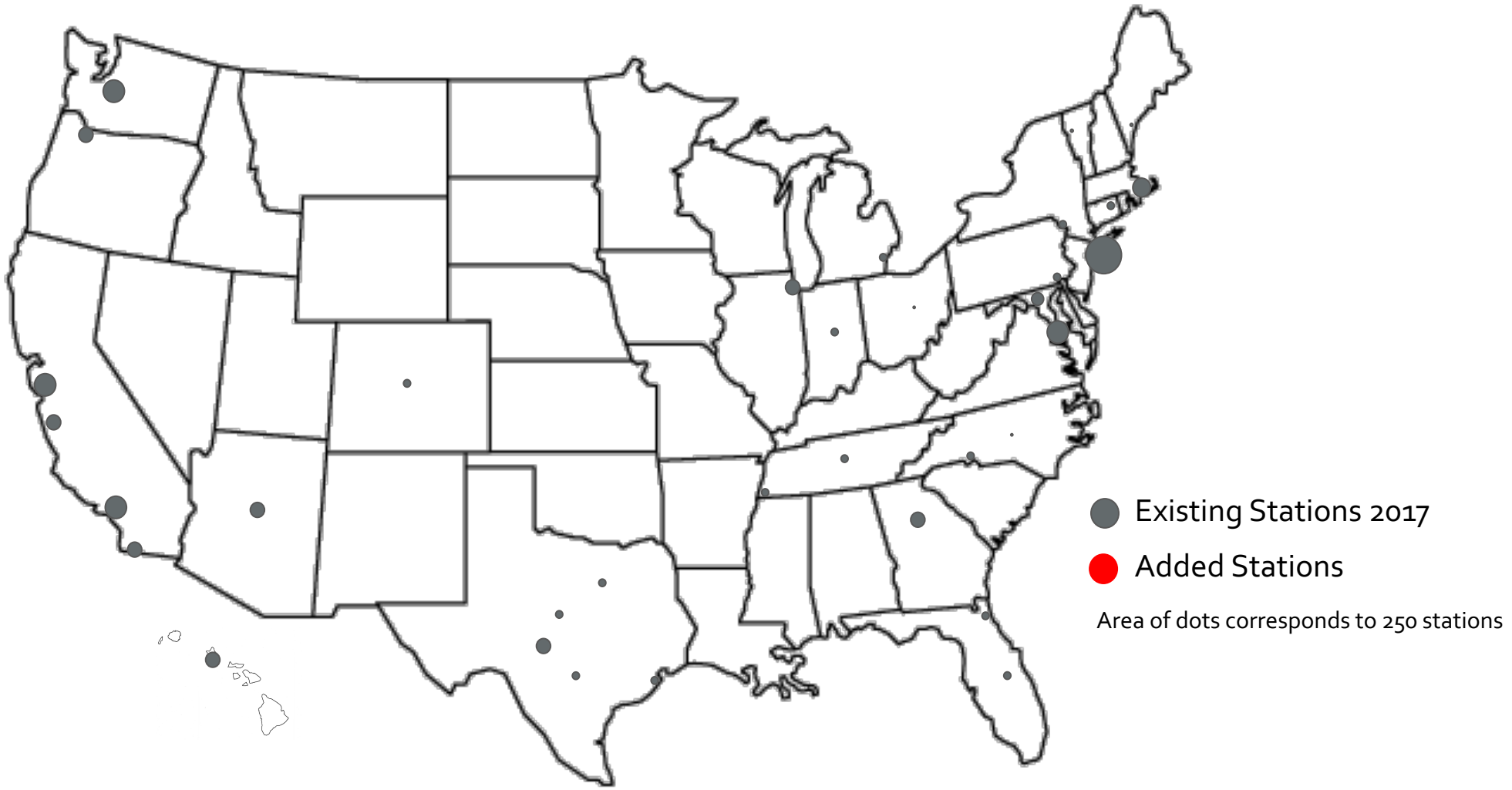
Appendix 16:
Roll Out Strategy Animation

Before Phases



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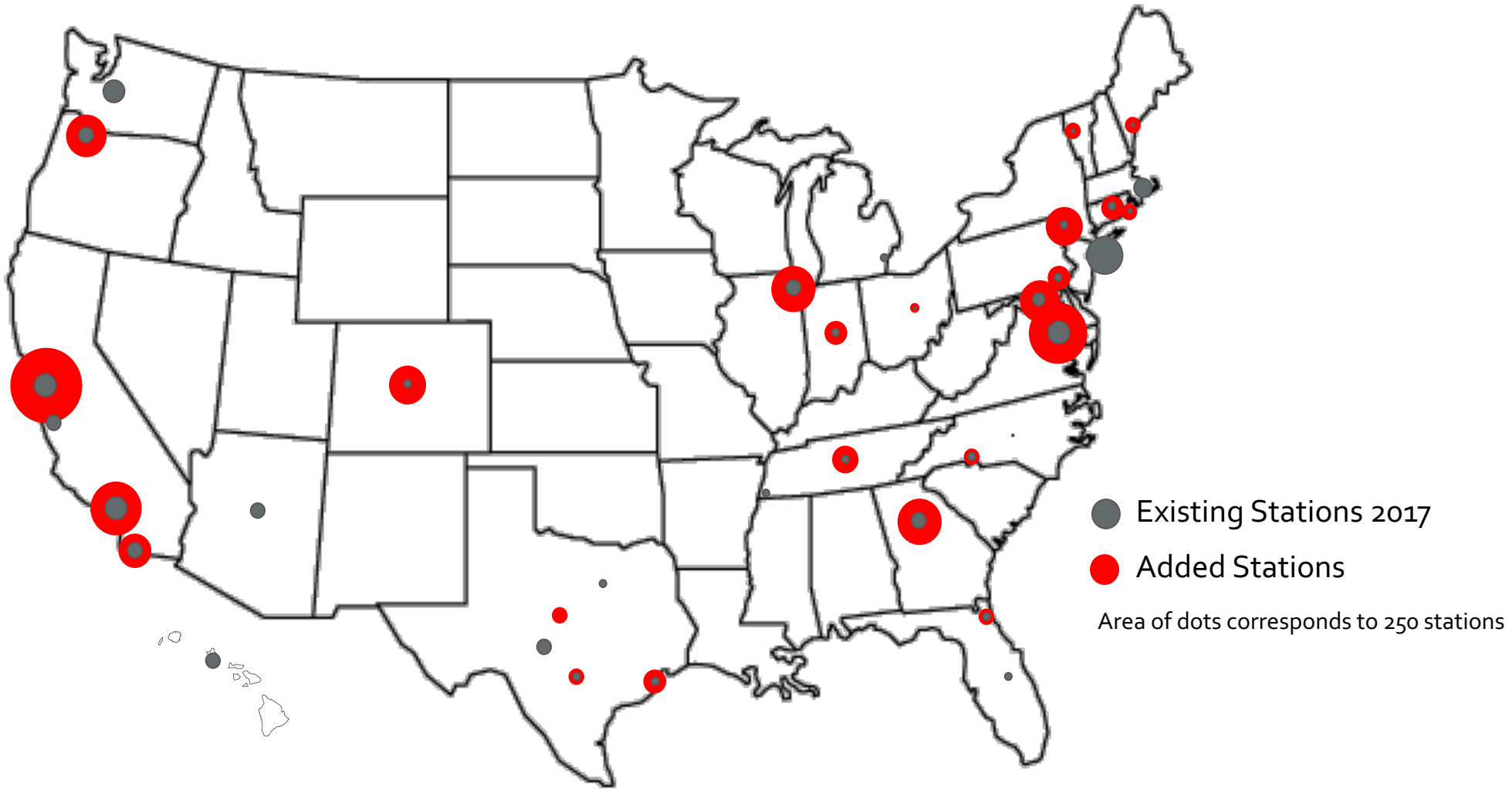
Phase 1 Rollout



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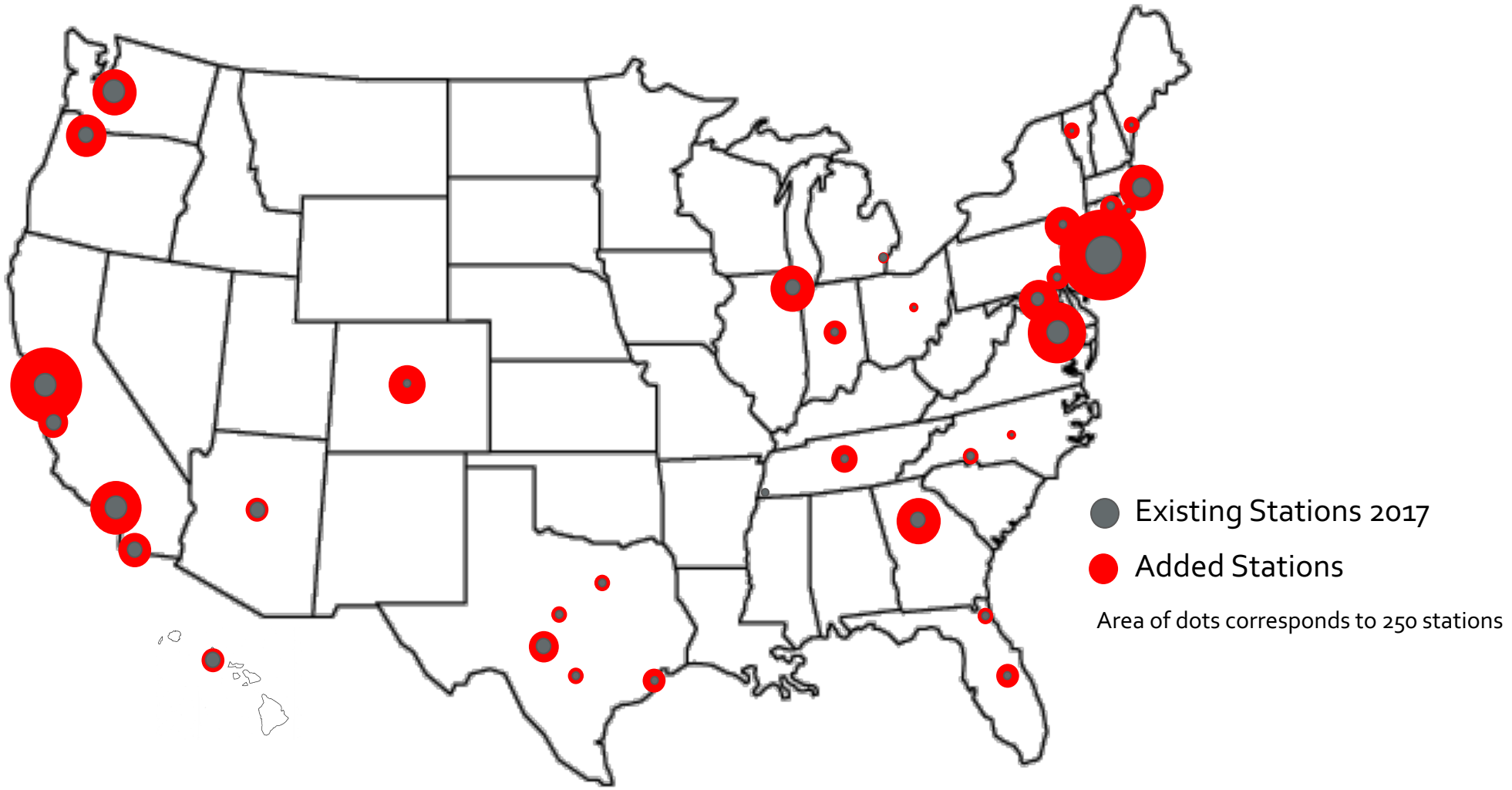
Phase 2 Rollout



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