Updated Funding Need, Program-Change Scenarios, and other Planning Considerations

CVRP Work Group #3 (4 Apr. 2019, Sacramento CA)

Brett Williams, PhD – Senior Principal Advisor, EV Programs, CSE

John Anderson – Research Analyst, CSE

With thanks to Amy Lastuka, Michelle Jones, and others at CSE and CARB

CALIFORNIA CLEAN VEHICLE REBATE PROJECT℠

Outline

I. Updated FY 2019–20 Funding Need (including FY 18–19 shortfall)

II. Updated Three-Year Funding Need (SB 1275)

III. Updated Funding Need for 5M EVs ('18–'19 Budget Act)

- Context: Private-investment estimates

IV. Program-Change Scenario Estimates

V. Discussion: Funding Needs and Program Changes

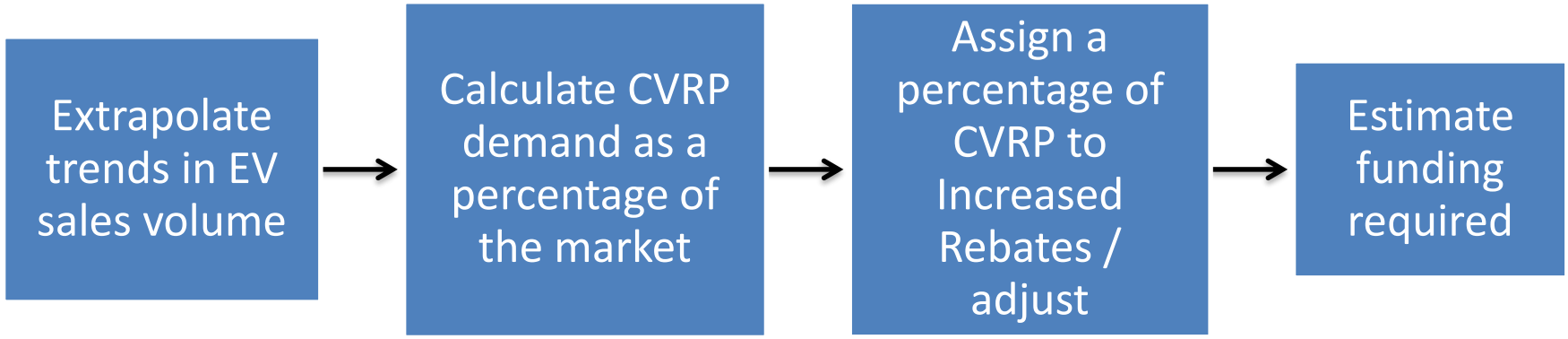
Appendix

- Caveats; previous versions from 22 March 2019 CVRP Work Group

Updated FY 2019–20 Funding Need

Including FY 2018–19 Shortfall

Method *"…all models are wrong; some are useful" –George Box*



Center for Sustainable Energy™

Extrapolations

Monthly sales data

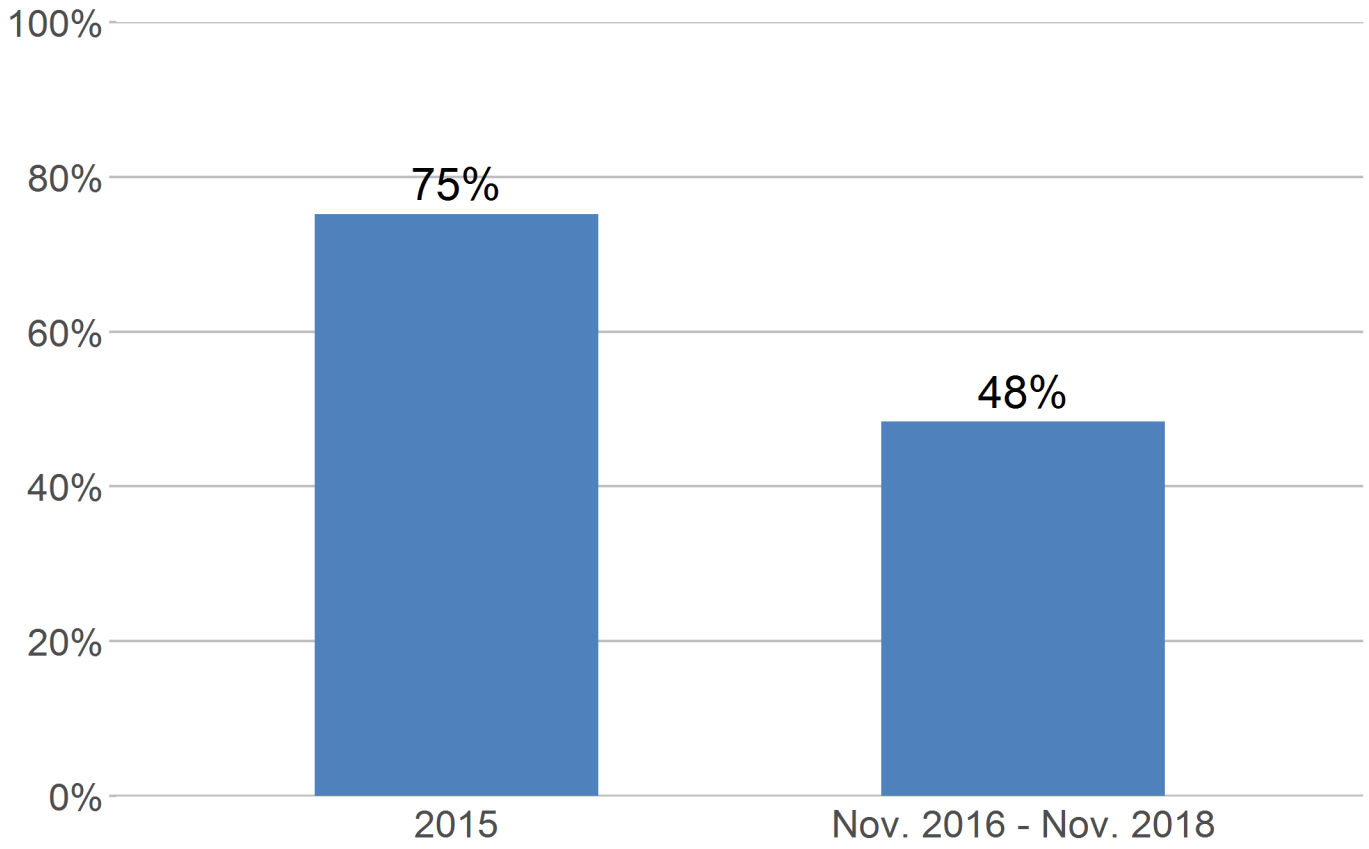
- Source: new-vehicle registrations (IHS), March 2010 – December 2018
- Vehicle categories created:
  1. Plug-in hybrid electric vehicle (PHEV)
  2. Range-extended battery electric vehicle (BEVx)*
  3. Tesla Model 3: “Medium,” “low” scenarios
  4. Tesla Model S
  5. Tesla Model X
  6. Chevrolet Bolt
  7. Other battery electric vehicles (BEV)
  8. Fuel-cell electric vehicle (FCEV)

Rebate data

- Source: CVRP rebates (public dashboard), March 2010 – November 2018
  - “Current program” design (after lowering of income cap) = Nov. 2016 – Nov. 2018
- Vehicle Categories created:
  9. Zero-emission motorcycle (ZEM)
  10. Tesla Model 3: “High” scenario

* Receives a BEV rebate. See CleanVehicleRebate.org for more detail.
To date = BMW i3 REx.

Updated Percent of Market Rebated Before and After the Income Cap (illustrative eras)



"Before" era excludes anomalous run-up to income cap
"After" = after the most recent change in income cap
Includes all PHEV, BEVx, BEV, and FCEV rebates from CVRP

Center for Sustainable Energy®

Calculate CVRP demand as a percentage of the market

Percentage of the EV market rebated: November 2016 – November 2018

PHEV	44%
BEVx	43%
Tesla Model 3	48%
Tesla Model S	31%
Tesla Model X	31%
Chevrolet Bolt	54%
Other BEV	72%
FCEV	90%
ZEM	n.a.*

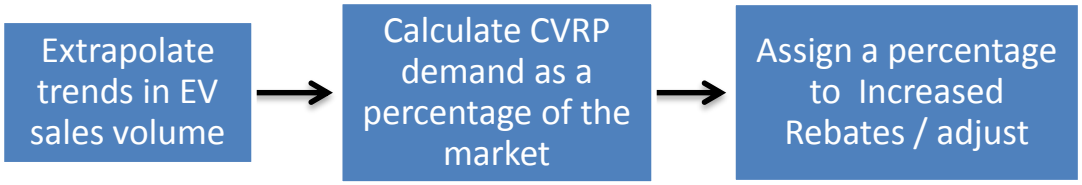
Extrapolate trends in EV sales volume → Calculate CVRP demand as a percentage of the market

* Data not available to calculate a percentage for the ZEM category; the overall BEV percentage is assumed for the ZEM category in the projections

Percentage Assumed to Be Increased Rebates for Lower-Income Consumers

Participants that received an *Increased Rebate:* Nov. 2016 – Nov. 2018

	Increased Rebate Percentage
PHEV	10.2%
BEVx	8.2%
Tesla Model 3	3.3%
Tesla Model S	2.1%
Tesla Model X	2.9%
Chevrolet Bolt	6.5%
Other BEV	12.4%
FCEV	5.8%
ZEM	*Not eligible for increased rebates*

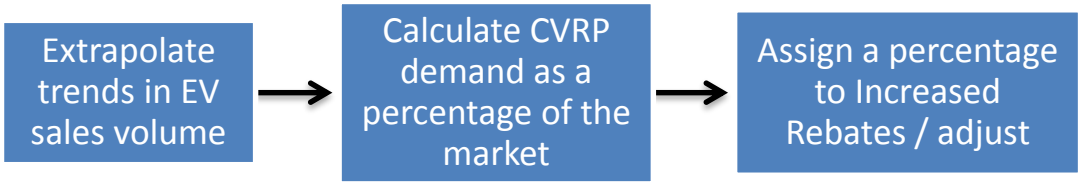


Center for Sustainable Energy™

Add *Growth* to Increased Rebate Percentage

Assumed *additions* to Increased Rebate Percentage

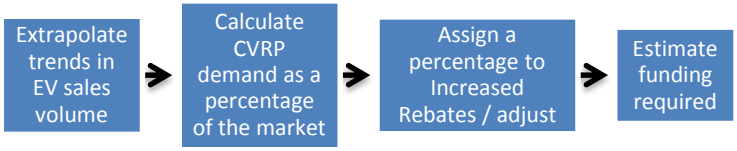
	Low	Middle	High
Cycle 1*	+0%	+5%	+15%
Cycle 2	+3%	+8%	+20%
Cycle 3	+5%	+10%	+25%



Funding Cycles: October–September

Scenarios Recap

	Low	Middle	High
Data	Registration data (IHS)*	*Registration* data	***Model 3: Rebate data***; Others: registration data
Method	***Model 3: constant*** at highest past sales month; Others: linear extrapolation	Linear extrapolation	Linear extrapolation
Assumed *additions* to historical percentage of lower-income increased rebates**	1st cycle: +0%, 2nd cycle: +3% 3rd cycle: +5%	1st cycle: +5% 2nd cycle: +8% 3rd cycle: +10%	1st cycle: +15% 2nd cycle: +20% 3rd cycle: +25%

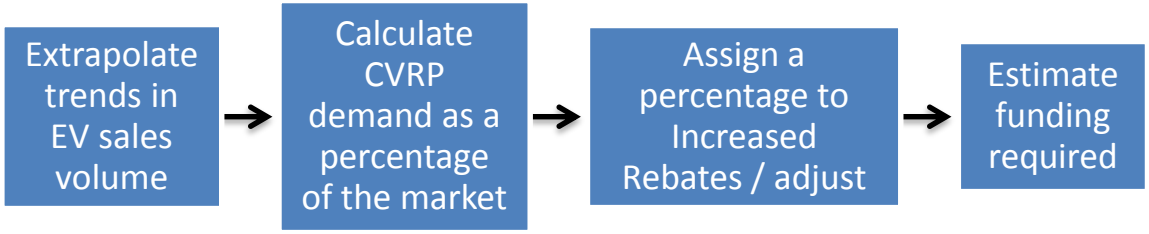


* Rebate data is used for ZEMs. **To account for *greater* uptake of the increased rebate compared to *current* levels, i.e., increased "induction"

Center for Sustainable Energy™

Factors Not Addressed

- Disruptive future EV releases ($35k Model 3, Kona, pickups, etc.)
- Federal Tax Credit phase out (reduced after 200,000 vehicles)
  - Tesla
  - General Motors
- Rebate Now
  - Greater reservation funding requirements, uncertain rates of conversion from reservation to rebate, and uncertain market impact
  - Pilot in San Diego County
- Other incentives and supportive policies
  - e.g., ZEV regulations, LCFS POP, Clean Cars for All
- New public-fleet features
  - Access to procurement-friendly application/reservation
  - $1M DGS grant
- Choice: HOV or rebate [AB 544 (Bloom, Stats. 2017, Ch 630)]



Updated FY 2019–20 Funding Need (as of 4/2/19)

Funding Cycle (Oct.– Sep.)	Rebate Type (All = Standard + Increased)	Funding Requirements (millions)			Rebates (thousands)		
		Low	Middle	High	Low	Middle	High
FY 2018–19	*Standard and DAC-Fleet Increased*	$84	$97	$99	31	77	78
	*Lower-Income Increased Rebates (**surplus**)*	($8)	($7)	($5)	0	0	0
	Net Shortfall	**$76**	**$90**	**$94**	**31**	**77**	**78**
FY 2019–20	*Standard and DAC-Fleet Increased*	$275	$371	$382	109	145	149
	Lower-Income Increased Rebates	$35	$43	$48	8	9	10
	Total Need	**$310**	**$414**	**$429**	**117**	**155**	**160**

Grand total need thru Sep. 2020: **$386** **$505** **$523**

Budget: **$200**

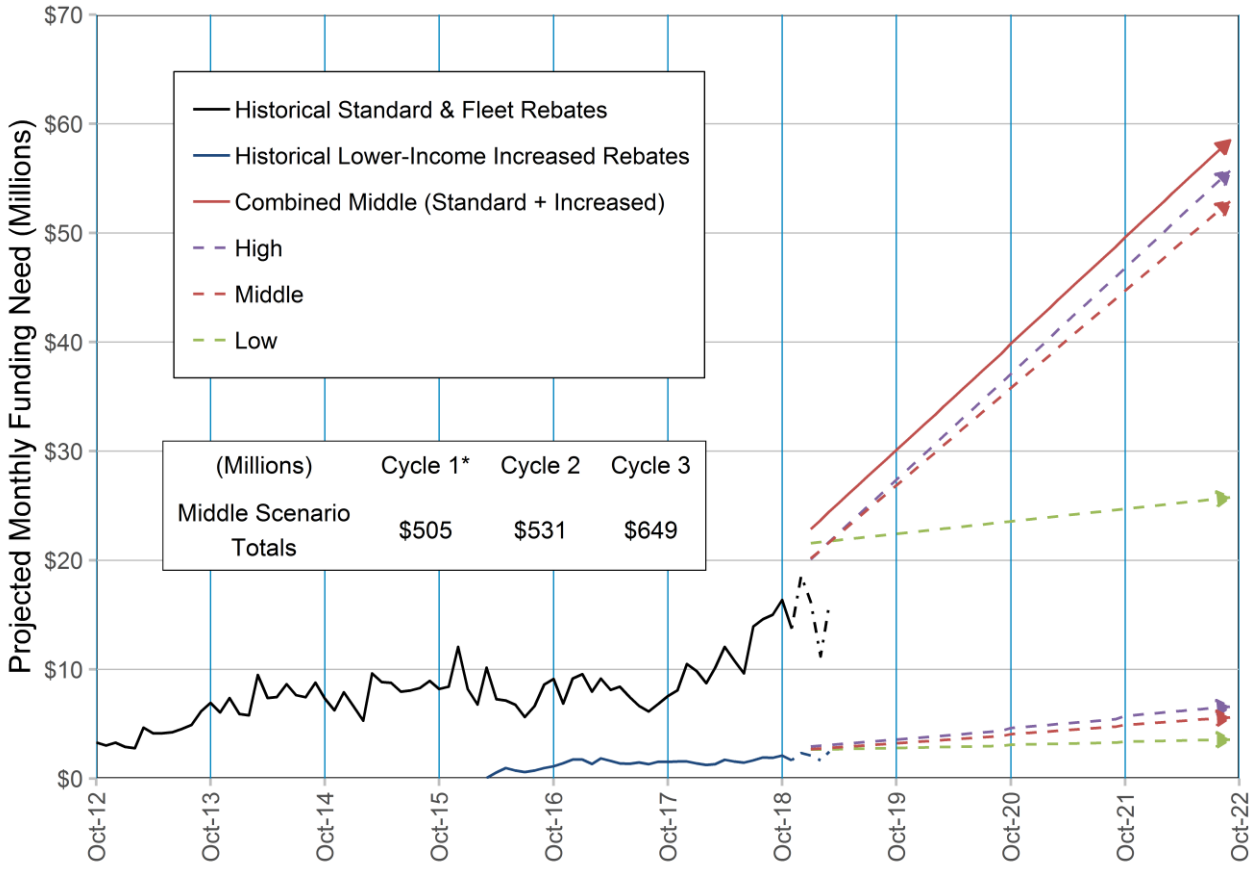
*Note: $60 M of FY 2018–19 funding was needed to fund FY 2017–18 rebates.

Center for Sustainable Energy®

Updated Three-Year Funding Need (SB 1275)

Updates March Workgroup, December Workshop and FY 2018–19 Funding Plan Appendix C

Updated Three-Cycle* Funding Need Summary



Projected Demand:	402,000—698,000 rebates
Funding Need:	$1.1–1.8 billion

*Funding Cycles = October–September
First cycle includes FY 2018–19 shortfall

Center for Sustainable Energy™

Three-Year Funding Need (as of 4/2/19)

Funding Cycle (Oct.– Sep.)	Rebate Type (All = Standard + Increased)	Funding Requirements (millions)			Rebates (thousands)		
		Low	Middle	High	Low	Middle	High
FY 2018–19	*Standard and DAC-Fleet Increased*	$84	$97	$99	31	77	78
	*Lower-Income Increased Rebates (**surplus**)*	($8)	($7)	($5)	0	0	0
	Net Shortfall	**$76**	**$90**	**$94**	**31**	**77**	**78**
FY 2019–20	*Standard and DAC-Fleet Increased*	$275	$371	$382	109	145	149
	Lower-Income Increased Rebates	$35	$43	$48	8	9	10
	Total Need	**$310**	**$414**	**$429**	**117**	**155**	**160**
FY 2020–21	*Standard and DAC-Fleet Increased*	$289	$478	$498	115	186	193
	Lower-Income Increased Rebates	$38	$53	$60	9	12	13
	Total Need	**$327**	**$531**	**$559**	**124**	**198**	**207**
FY 2021–22	*Standard and DAC-Fleet Increased*	$303	$585	$615	121	226	237
	Lower-Income Increased Rebates	$42	$63	$74	9	14	16
	Total Need	**$344**	**$649**	**$689**	**130**	**240**	**254**
3-Year Average (Middle Scenario, *excl. shortfall*)			**$531 M**			**198,000**	
Grand Total Need thru Sep. 2022			**$1.1 B–$1.8 B**			**402,000–698,000**	

*Note: $60 M of FY 2018–19 funding was needed to fund FY 2017–18 rebates.

Center for Sustainable Energy®

Updated Funding Need for 5M EVs ('18–19 Budget Act) & Trajectory Relative to State Goals

Continuing the Trajectory

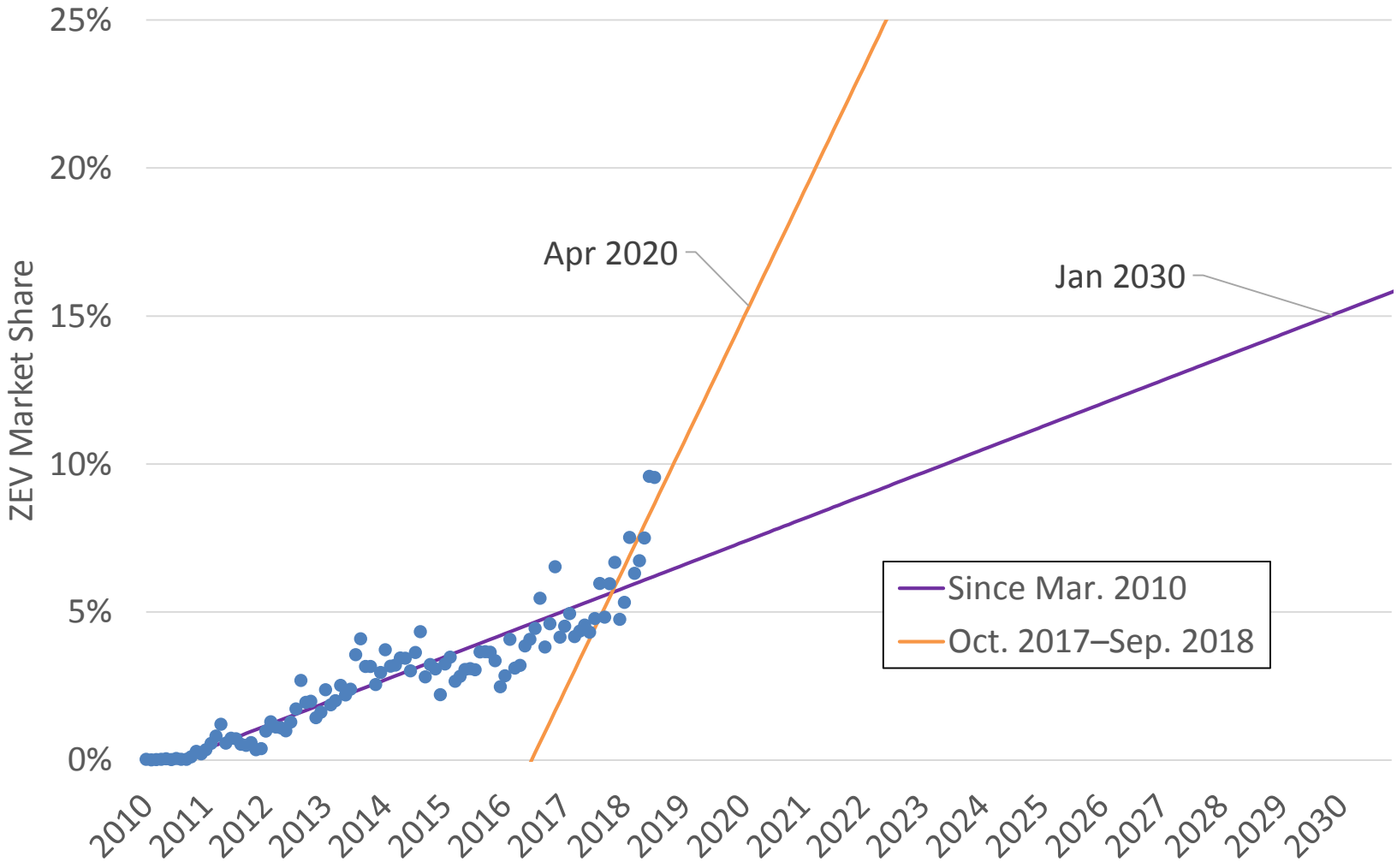
(caution: assumes recent trends continue "as are")

Estimates as required by '18–'19 Budget Act, based on *current* program design and market conditions	**Middle Scenario**	
	Funding Need	Additional Vehicles Rebated
3-year Total	$1.7 B	670,000
1 Million	$505 M	232,000
1.5 Million	$1.2 B	485,000
5 Million	$5.9 B	2.2 M

Compare to: >>$180 B in private investment (base MSRP of forecasted EV sales)

$5.9 B << 3% of total transition costs (vehicles only, no infra., etc.)

EV Market Share Extrapolation



Includes content supplied by R.L. Polk & Co, © 2018;
Projections may underestimate PHEVs.

Center for Sustainable Energy®

Program-Change Scenario Estimates

Statewide Electric Vehicle Rebates (as of Jan. 2019)

	CALIFORNIA CLEAN VEHICLE REBATE PROJECT	MOR-EV Massachusetts Offers Rebates for Electric Vehicles	CHEAPR Connecticut Hydrogen and Electric Automobile Purchase Rebate	NEW YORK STATE
Fuel-Cell EVs 	$5,000	$1,500	$5,000	e-miles ≥ 120 $2,000 ≥ 40 $1,700 ≥ 20 $1,100 < 20 $500
All-Battery EVs 	$2,500	$1,500	e-miles ≥ 200 $2,000 ≥ 120 $1,500 < 120 $500	
Plug-in Hybrid EVs 	$2,500 (i3 REx) $1,500	BEVx only: $1,500	≥ 45 $1,000 < 45 $500	
Zero-Emission Motorcycles 	$900	$450		
	e-miles ≥ 20; Consumer income cap; Increased rebates for lower-income	MSRP ≤ $50k, no fleet rebates	MSRP ≤ $50k (PHEV & BEVs), MSRP ≤ $60k (FCEVs); dealer assignment; $150 dealer incentive	MSRP > $60k = $500 max.; point-of-sale via dealer

Center for Sustainable Energy™

Levels exploring so far

- MSRP Cap (FCEV exempt)
  $60k, $50k, $40k
- EPA All-Electric Range (AER) Minimum
  >25, >30, >40, >50, >100
- Income Cap (FCEV exempt)
  Tax-filing status: $250k, $204k, $150k
- Rebate amounts
  -$500 for standard rebates, no Standard Rebates, no PHEV rebates, no Standard PHEV rebates
- Application limitations
  Limit one per person, limit three months to apply

Electric Vehicles by Electric Range & Base MSRP

Vehicle Make and Model	Base MSRP	AER (EPA)
BMW 530e xDrive iPerformance	55700	14
Audi A3 e-tron	39500	16
BMW 530e iPerformance	53400	16
Volvo XC60 T8	55300	17
Volvo XC90 T8	67000	17
Volvo S90 T8	63900	21
Mitsubishi Outlander PHEV	34595	22
Toyota Prius Prime	27350	25
Ford Fusion Energi	34595	26
Kia Niro Plug-in Hybrid	28500	26
Hyundai Sonata Plug-in Hybrid	32400	28
Hyundai Ioniq PHEV	25350	29
Kia Optima Plug-in Hybrid	35390	29
Chrysler Pacifica	39995	32
Honda Clarity Plug-In Hybrid	33400	47
smart Electric Fortwo Cabriolet	28100	57
smart Electric Fortwo Coupe	23900	58
FIAT 500e	32995	84
Honda Clarity Electric	37540	89
BMW i3 REx	48300	97
Kia Soul EV	33950	111
Ford Focus Electric	29120	115
Hyundai Ioniq Electric	30315	124
Volkswagen e-Golf	30495	125
BMW i3s REx	51500	126
Nissan LEAF	29990	150
BMW i3	44450	153
BMW i3s	47650	153
Tesla Model 3	35000	215
Jaguar I-PACE	69500	234
Chevrolet Bolt	36620	238
Tesla Model X	88000	238
Hyundai Kona Electric	36540	258
Tesla Model S	85000	310

Sources:

MSRP:

- Manufacturer websites, FuelEconomy.gov, Kelley Blue Book

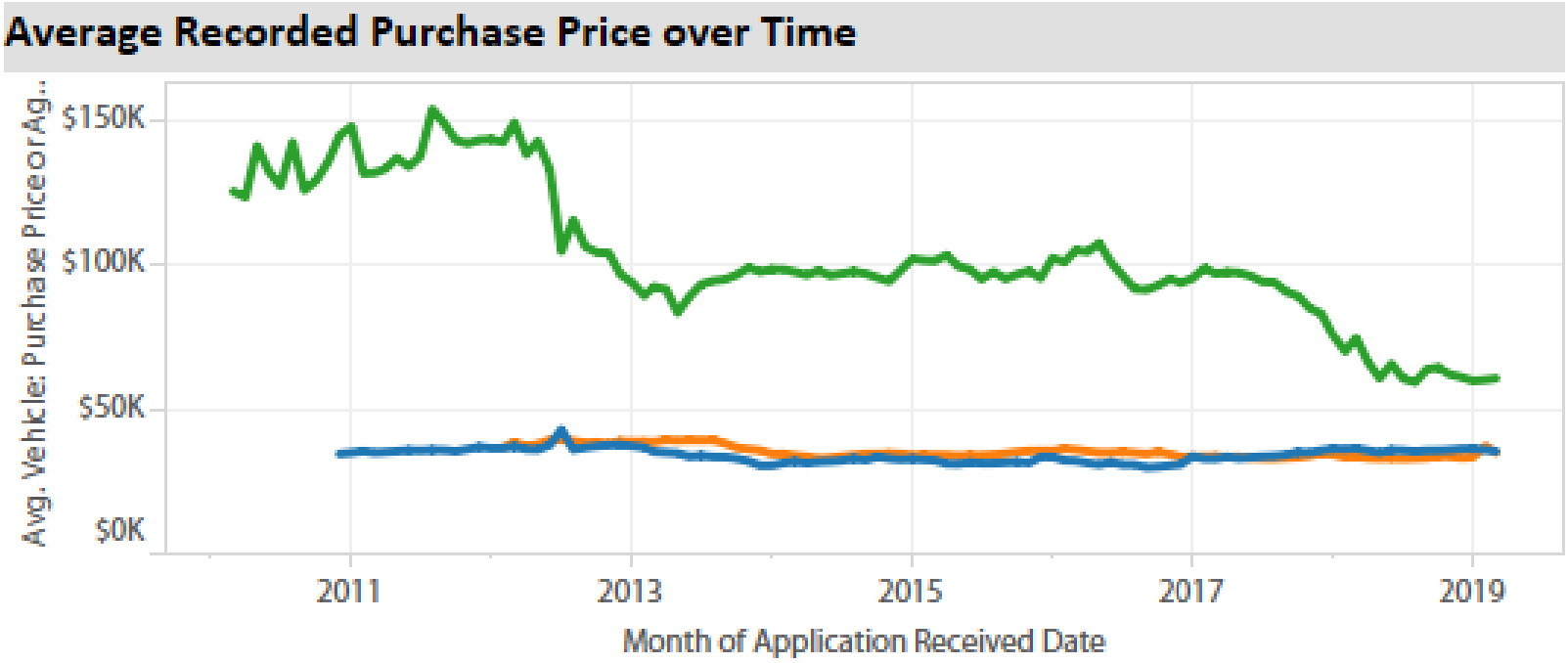
EPA all-electric range:

- FuelEconomy.gov, manufacturer websites
- Most recent model year

Note: ZEMs, FCEVs, and discontinued PEVs not included.

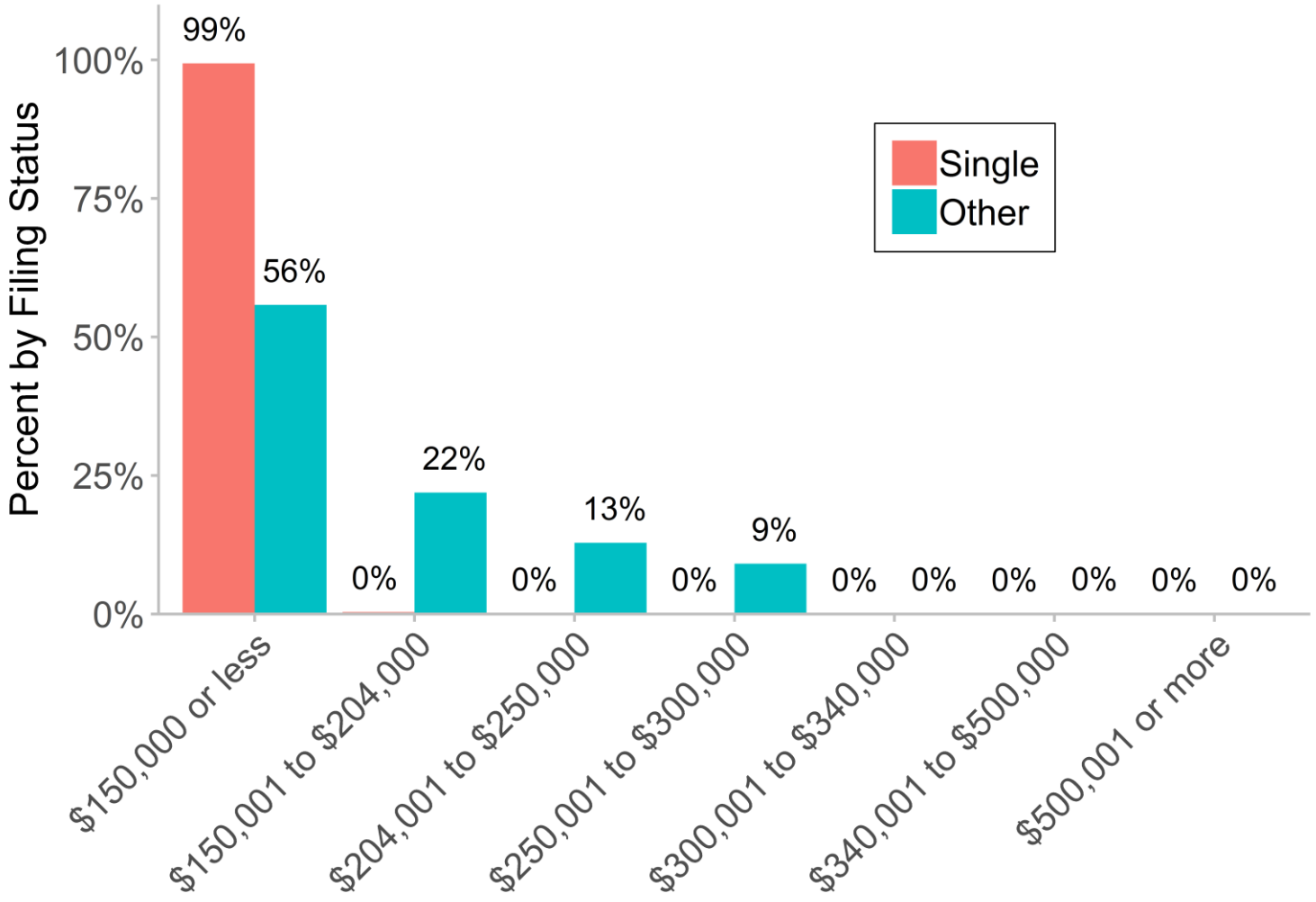
Average Rebated-Vehicle Purchase Price

DRAFT, for illustrative use only



Center for Sustainable Energy®

Current Program Income Distribution



"Current Program" = since last major program change on 11/1/2016 through October 2018

Center for Sustainable Energy®

Lease Rates by Rebate Type and Over Time

Lease Rates by Rebate Type

	Standard Rebate (N=100,481)	LMI Increased Rebate (N = 8,943)
Lease	47%	66%
Purchase	53%	34%

Differences significant (p = 0.000)

Program-Change Scenarios: Individual Measures

#	Scenario	Savings, % of Middle	First-cycle cost	% of first-cycle vehicles lost	$ saved per vehicle lost
1	Middle (baseline)	0%	$505 M	-	-
2	Limit one per person	-2%	$494 M	1%	$3,820
3	Limit 3 months between purchase and application	-3%	$488 M	1%	$3,961
4	<$60k MSRP	-3%	$487 M	1%	$4,232
5	<$50k MSRP	-4%	$486 M	1%	$4,021
6	>30-mi EPA all-electric range (AER)	-4%	$484 M	2%	$3,092
7	>40-mi AER	-4%	$482 M	2%	$3,040
8	<$40k MSRP	-5%	$481 M	2%	$3,953
9	>50-mi AER	-5%	$479 M	2%	$2,947
10	Income cap—single filers: ≤$150k, other filers: ≤$250k	-5%	$479 M	2%	$3,832
11	>30-mi AER for PHEV/BEVx, >100-mi for others	-7%	$467 M	3%	$3,477
12	>50-mi AER for PHEV/BEVx, >100-mi for others	-8%	$463 M	3%	$3,326
13	>100-mi AER	-11%	$447 M	4%	$3,269
14	Standard rebates lowered $500	-12%	$444 M	NA	NA
15	Income cap—single filers: ≤$150k, other filers: ≤$204k	-12%	$445 M	4%	$3,737
16	Income cap—all filers: ≤$150k	-22%	$392 M	8%	$3,718

Includes FY 18–19 shortfall, assuming changes effective 1 Jan. 2020

Individual Measures by Start Date

		1 Jan 2020 Implement.		1 Aug 2019 Implement.	
#	Scenario	Savings, % of Middle	First-cycle cost	Savings, % of Middle	First-cycle cost
1	Middle (baseline)	0%	$505 M	0%	$505 M
2	Limit one per person	-2%	$494 M	-3%	$489 M
3	Limit 3 months between purchase and application	-3%	$488 M	-5%	$480 M
4	<$60k MSRP	-3%	$487 M	-5%	$478 M
5	<$50k MSRP	-4%	$486 M	-6%	$476 M
6	>30-mi EPA all-electric range (AER)	-4%	$484 M	-6%	$473 M
7	>40-mi AER	-4%	$482 M	-7%	$471 M
8	<$40k MSRP	-5%	$481 M	-7%	$469 M
9	>50-mi AER	-5%	$479 M	-8%	$466 M
10	Income cap—single filers: ≤$150k, other filers: ≤$250k	-5%	$479 M	-7%	$468 M
11	>30-mi AER for PHEV/BEVx, >100-mi for others	-7%	$467 M	-11%	$448 M
12	>50-mi AER for PHEV/BEVx, >100-mi for others	-8%	$463 M	-13%	$441 M
13	>100-mi AER	-11%	$447 M	-17%	$417 M
14	Standard rebates lowered $500	-12%	$444 M	-18%	$416 M
15	Income cap—single filers: ≤$150k, other filers: ≤$204k	-12%	$445 M	-17%	$418 M
16	Income cap—all filers: ≤$150k	-22%	$392 M	-33%	$341 M

Includes FY 18–19 shortfall

Program-Change Scenarios: Combos—CORRECTED

#	Scenario	Savings, % of Middle	First-cycle cost	% lost	$ saved / vehicle lost
1	Middle (baseline)	0%	$505 M	-	-
K1	Three months to apply; <$50k MSRP; inc. cap—single filers: ≤$150k, other filers: ≤$204k; >25-mile AER	-19%	$408 M	7%	$3,747
K2	Three months to apply; <$40k MSRP; inc. cap—single filers: ≤$150k, other filers: ≤$204k; PHEVs >25-mile AER, others: >100-mile AER	-28%	$363 M	8%	$4,273

Includes FY 18–19 shortfall
assuming changes effective 1 Jan. 2020
Updated 5 April 2019

Combos – August Implementation—CORRECTED

#	Scenario	Savings, % of Middle	First-cycle cost	% lost	$ saved / vehicle lost
1	Middle (baseline)	0%	$505 M		
K1	Three months to apply; $<50k MSRP; inc. cap—single filers: ≤$150k, other filers: ≤$204k; >25-mile AER	-19%	$408 M	7%	$3,747
K2	Three months to apply; $<40k MSRP; inc. cap—single filers: ≤$150k, other filers: ≤$204k; PHEVs >25-mile AER, others: >100-mile AER	-28%	$363 M	8%	$4,273
K1a	Three months to apply; $<50k MSRP; inc. cap—single filers: ≤$150k, other filers: ≤$204k; >25-mile AER; 1 Aug implementation	-23%	$390 M	8%	$3,806
K2a	Three months to apply; $<40k MSRP; inc. cap—single filers: ≤$150k, other filers: ≤$204k; PHEVs >25-mile AER, others: >100-mile AER; 1 Aug implementation	-34%	$335 M	10%	$4,352

Includes FY 18–19 shortfall
assuming changes effective 1 Jan. 2020
Updated 5 April 2019

Program-Change Scenarios: Aggressive Combos—CORRECTED

#	Scenario	Savings (% of Middle)	First-cycle cost
1	Middle (baseline)	0%	$505 M
K3	Three months to apply; <$40k MSRP; PHEVs >50-mile AER, others: >100-mile AER inc. cap—single filers: ≤$150k, other filers: ≤$204k;	-24%	$382 M
K3a	Three months to apply; <$40k MSRP; PHEVs >50-mile AER, others: >100-mile AER LMI-only program (300% FPL)	-59%	$204 M
K4	Three months to apply; <$40k MSRP; >25-mile AER LMI-only program (300% FPL);	-58%	$211 M

Includes FY 18–19 shortfall
assuming changes effective 1 Jan. 2020
Updated 5 April 2019

Bridge Funding

- Bridge Funding = Funding needed to get to January 1st, 2020 program change
  = FY 2018–19 shortfall + 3 months FY 19–20
  = $90 M + $93 M = $183 M

Discussion:
Funding Needs and Program Changes

CARB/Stakeholder Discussion Agenda

- Current FY budget (and shortfall)
- Next FY budget and Bridge Funding to keep program running to January 1st, 2020
- Plan for future changes

Appendix

Caveats

- Data include
  - Lease-only vehicles
    - Honda Clarity Fuel Cell
    - Honda Clarity Electric
  - Fleet-only vehicles
    - Bolloré Blue Car
  - Out-of-production vehicle models
    - Cadillac ELR
    - Chevrolet Spark EV
    - Ford C-MAX Energi
    - Hyundai Tucson Fuel Cell (also lease only)
    - Mercedes-Benz B250e
    - Mercedes-Benz S550e
    - Mitsubishi i-MiEV
    - Toyota Prius Plug-in Hybrid (< 2016 model year)
    - Victory Empulse TT
- Market-loss estimates utilize rebate essentiality data from the time of application and excludes non-responses, which may overestimate market impacts

Estimating Total Vehicle Costs (Price * Quantity)

- Vehicle prices
  - Use 2018 vehicle sales proportions to create weighted average base MSRPs for each vehicle category
  - Assume most base MSRPs stay constant
    - Downward pressure on price: battery technology is getting cheaper
    - Upward pressure on price:
      - Vehicles becoming more fully featured over time
      - Inflation
  - Consider three scenarios for Tesla Model 3 base MSRP
    - Low: $35k
    - Middle: $40k
    - High: $45k
- Vehicle quantities
  - Use vehicle volumes by category from projections middle scenario
  - Sum vehicle base MSRP * quantity from June 2019 through March 2026 (5M vehicles)

Initial estimates

Not accounted for:

- Changing vehicle mix, e.g. light duty trucks
- Vehicle Trim levels—base MSRP is used for all cars
- Inflation
  - Nominal vehicle prices in CVRP Application Data (excluding Tesla vehicles) appear to be flat since 2011

Total vehicle costs for projected vehicles added to reach 5 million ZEV goal:

	Low	Middle	High
Market value	$172 B	$188 B	$203 B

Rebate Essentiality for Repeat Participants

Would have purchased without state rebate	One Application (n = 83,262)	More than One Application (n = 6,529)
No	67%	68%
Yes	33%	32%

Differences *not* significant (p = 0.599)

Program Change Methodology

- Historical percent of program that would have been excluded under new program design calculated by rebate type (standard/fleet and lower-income-increased rebates)
- Percent excluded removed from projected rebates
- Rebate essentiality calculated for excluded participants
- Rebate essential percentages used to calculate market losses based on future excluded rebates

Not addressed:

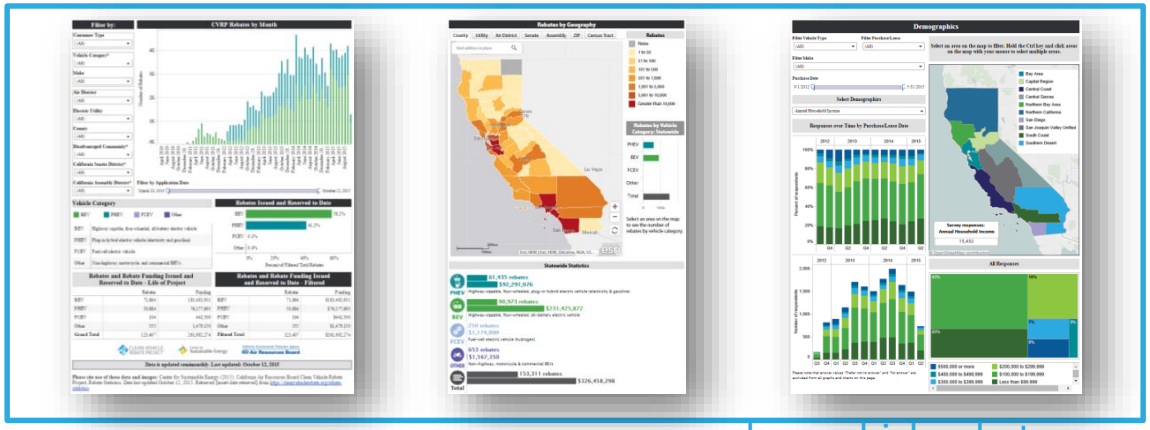
- Market losses due to lower rebate amounts in some scenarios
- Market-loss rebound effect due to increased resources subsequently available due to program changes for remaining, more-rebate-essential consumers

Data

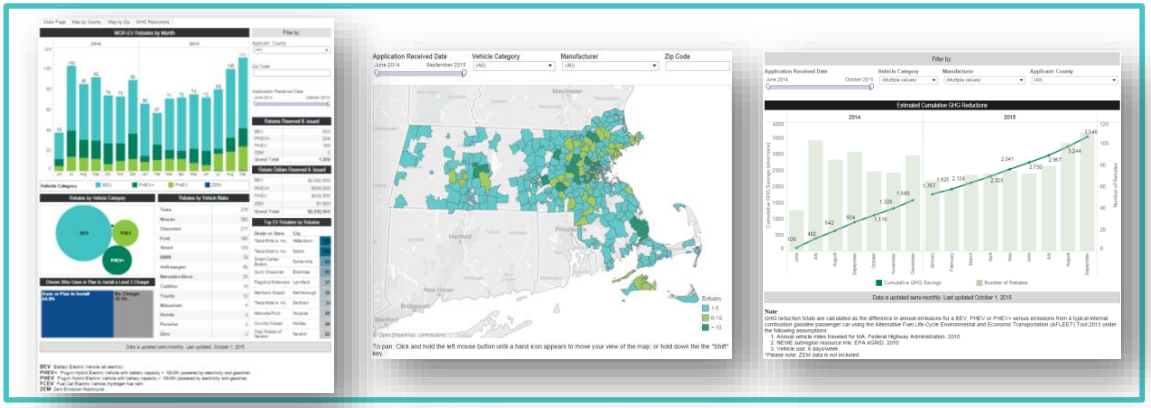
- Sources:
  - CVRP rebates
    - Baseline starting point (middle scenario): November 2016 – November 2018
  - Additional program data informing changes
    - November 2016 – October 2018
- Model Details:
  - MSRP:
    - Manufacturer websites, FuelEconomy.gov, Kelley Blue Book
  - EPA all-electric range:
    - FuelEconomy.gov, manufacturer websites
    - Most recent model year

Public dashboards and data facilitate informed action

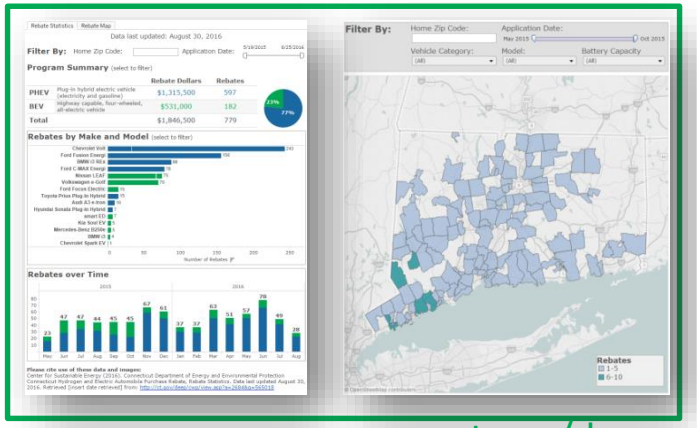
- >285,000 EVs and consumers have received >$630 M in rebates
- >19,000 survey responses online, statistically represent >91,000 consumers
- Reports, presentations, and analysis growing



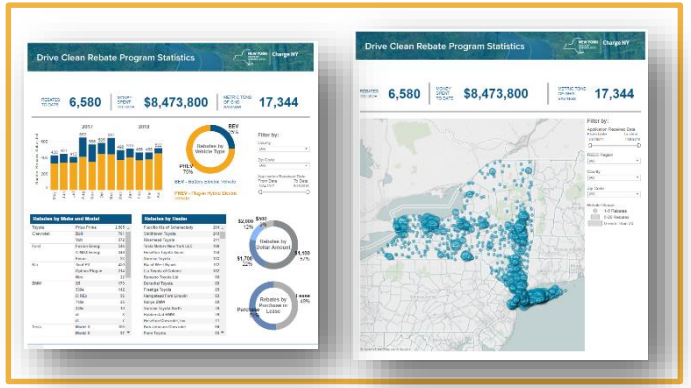
cleanvehiclerebate.org



mor-ev.org



ct.gov/deep



nyserda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate

Center for Sustainable Energy™

brett.Williams@energycenter.org
john.anderson@energycenter.org

CleanVehicleRebate.org

CALIFORNIA AIR RESOURCES BOARD

CALIFORNIA CLIMATE INVESTMENTS
Cap and Trade Dollars at Work

Center for Sustainable Energy®