Fleet Electrification

Tools and Techniques for Tracking Your Fleet's Success

CALIFORNIA
CLEAN VEHICLE
REBATE PROJECT℠

Speakers

CALIFORNIA CLEAN VEHICLE REBATE PROJECT℠

- Rhona Matthews, Project Manager, Fleet & Dealership Programs - Center for Sustainable Energy
- Casey Fallon, Director Purchasing, Warehouse, Fleet - Sacramento Municipal Utility District
- Jacob Berks, Manager, Fleet Operations - Sacramento Municipal Utility District

Getting Started

https://cleanvehiclerebate.org/eng/fleet

CARB Incentives

CALIFORNIA CLEAN VEHICLE REBATE PROJECT℠

Up to $5,000 per vehicle

Standard CVRP Fleet Rebate

or

Up to $7,000 per vehicle

Increased CVRP Fleet Rebate (DAC Eligible Fleets)

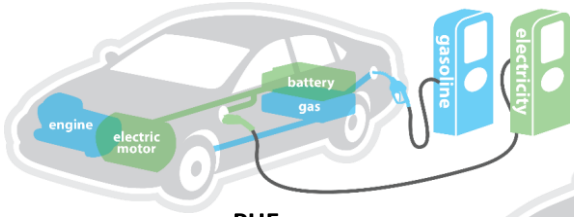
$8,000 to $120,000 per vehicle

Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project

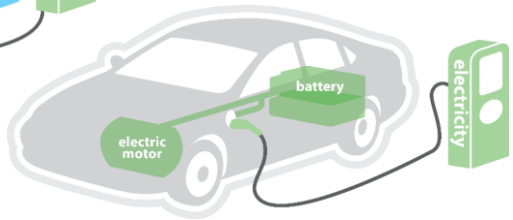
CALIFORNIA HVIP

CVRP Public Fleet Rebates

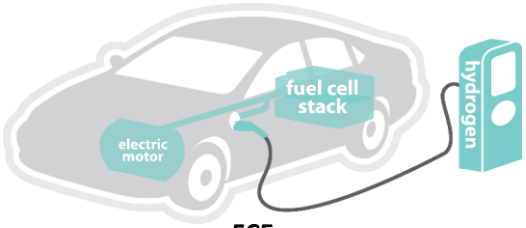
CALIFORNIA CLEAN VEHICLE REBATE PROJECT℠



PHEV



BEV



FCEV

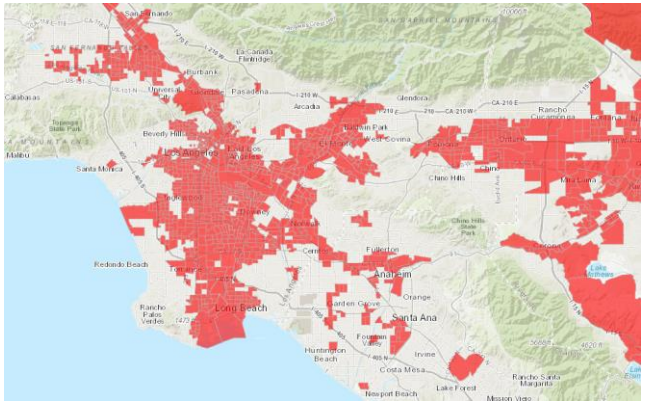
Vehicle Type	Standard Amount	Increased Amount
Fuel-cell electric vehicle	$5,000	$7,000
Battery or range-extended electric vehicle	$2,500	$4,500
Plug-in hybrid electric vehicle	$1,500	$3,500
Zero-emission motorcycle	$900	n/a

Increased CVRP Rebate Eligibility

CALIFORNIA CLEAN VEHICLE REBATE PROJECT℠

+$2,000

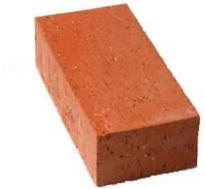
Available to vehicles located within a California disadvantaged community census tract.



CHECK MAP

Fleet Electrification

Where things can go wrong…



Bricked Vehicles
(no chargers)

Too Many Vehicles Causes
Low Utilization

Driver Behavior

Problems Scaling Up

Leading the way

Electric transportation for a cleaner future

Jacob Berks
Manager, Fleet Operations

Casey Fallon
Director, Purchasing, Warehouse and Fleet

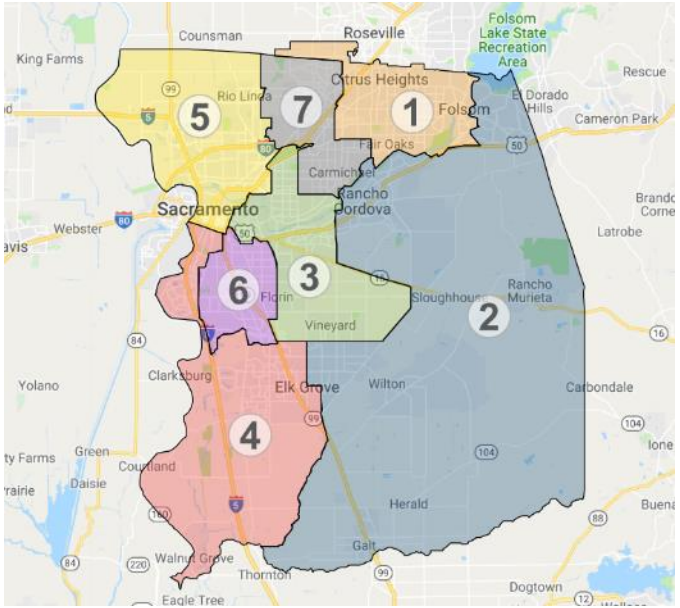
Webinar focus

Public and private fleet operators and managers can **learn about fleet success** and **how to measure it** from industry experts during this webinar sponsored by CVRP for Fleets. It will cover the **criteria, key performance indicators and software** used for evaluating fleet **utilization, tracking maintenance and operational costs and other critical factors**.

SMUD

Who are we?

Sacramento Municipal Utility District (SMUD)



Some facts and figures

- Population in our service area: 1.5 million
- Size of our service area: 900 square miles
- Total accounts served (residential + business): 628,952 (as of Dec. 31, 2017)
- Number of SMUD employees: 2,293
- Miles of power lines we own: 10,473
- Power from non-carbon-emitting resources: 50%

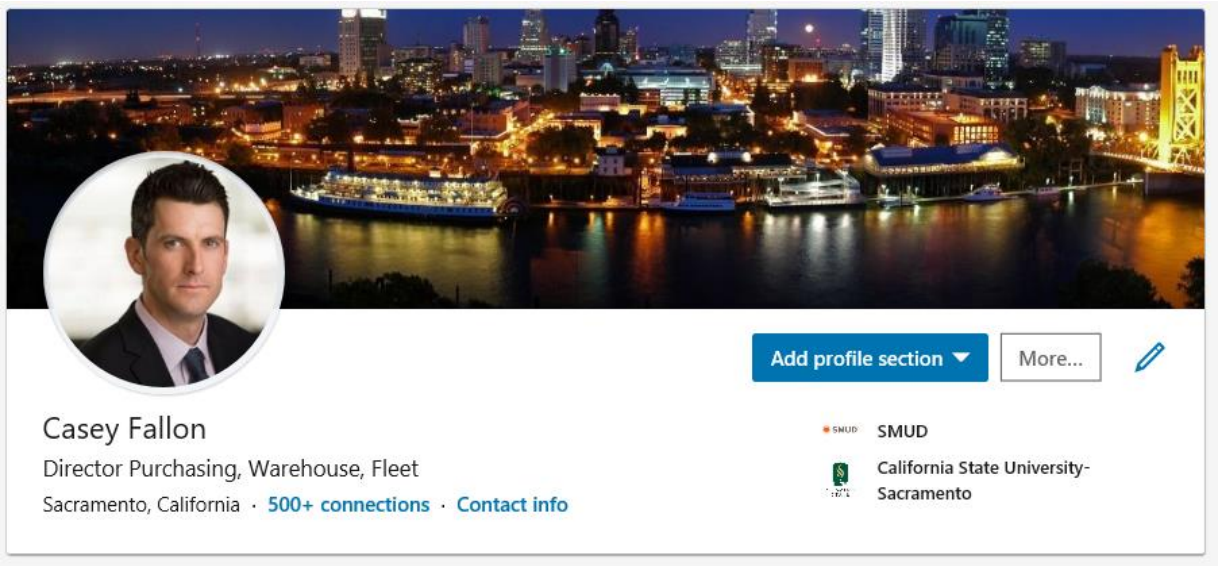
SMUD

Who are we?

Jacob Berks, Fleet Manager

Who are we?

Casey Fallon, Director Purchasing, Warehouse, Fleet



Agenda

- Introductions
- SMUD's fleet
- How we measure and manage the fleet
- Key performance indicators and metrics
- Planning for fleet electrification at SMUD
- Measures of success, examples, lessons learned
- Future goals and focus

SMUD's fleet

- 980 light, medium, heavy duty & off-road vehicles
  - ECOC &CSC: 850
  - Fresh Pond & Riverton: 116
  - Rancho Seco: 9
- Fleet total replacement value: $75M
- Fleet average age: 9.8 years
- Annual fuel spend: $1.9M
- Operating and Maintenance: $4M
- Annual replacement budget: $8M
- Replacement based on age, miles, maintenance, application and utilization
- 12% EV's including Hybrid technology across the entire fleet

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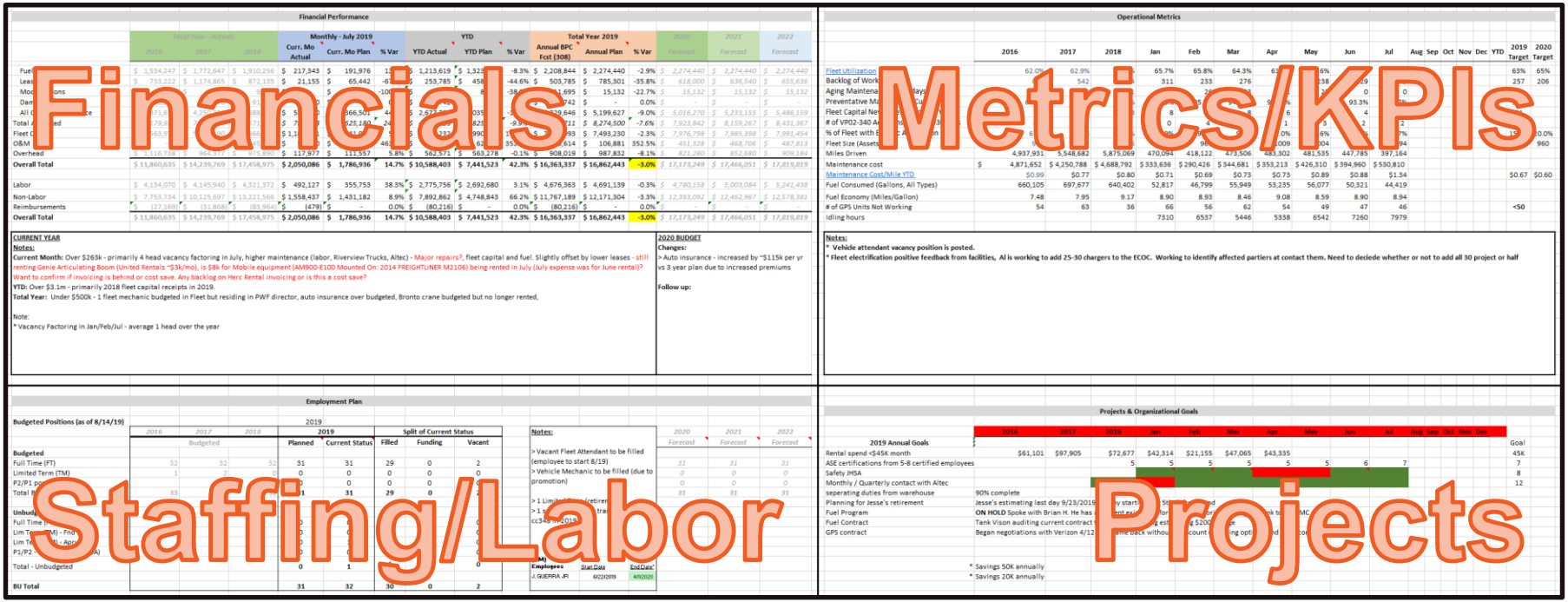
Fleet criteria

- Fuel
- Lease
- Damage
- Maintenance (Corrective/Preventative)
- Capital
- Projects

Fleet scorecard



Fleet key performance indicators

- Fleet Utilization %
- Backlog of Workorders
- Aging Maintenance > 135 days
- Preventative Maintenance Currency (%)
- Fleet Capital New Assets monthly/ YTD
- # of VP02-340 Aerial Inspections >30 days
- % of Fleet with Electric Application
- Fleet Size (Assets)
- Miles Driven
- Maintenance cost
- Maintenance Cost/Mile YTD
- Fuel Consumed (Gallons, All Types)
- Fuel Economy (Miles/Gallon)
- # of GPS Units Not Working
- Idling hours

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Fleet KPI examples

Count of Assigned In-Service Assets	2015	2016	2017	2018	Q1	Q2	7/12/19	7/19/19	7/26/19	8/2/19	8/9/19	8/16/19
Boat, ATVs, Ground Maint, Sweeper	74	76	78	177	73	73	68	69	69	69	67	67
Forklift	35	34	42	33	32	32	32	32	32	32	32	32
Heavy Duty Aerial - 85'	9	8	5	7	7	7	7	7	7	7	7	7
Heavy Duty Dump Truck	15	15	16	14	14	15	15	15	15	15	15	15
Heavy Duty Service/Line Truck	32	32	39	32	30	30	30	30	30	30	31	31
Light Duty Pickup	201	193	184	182	192	203	201	200	201	202	196	196
Light Duty Sedan	48	48	49	50	51	54	53	53	52	51	50	50
Light Duty SUV	67	67	69	73	72	72	71	71	71	71	71	71
Medium Duty Aerial 37'-65'	79	79	72	81	81	83	83	83	83	83	83	83
Medium Duty Dump Truck	28	28	33	0	28	28	28	28	28	28	28	28
Medium Duty Pickup	143	142	168	167	160	161	161	163	163	163	161	161
Medium Duty Service Truck	15	15	15	17	17	17	18	18	18	18	18	18
Non-Motorized Equipment	119	122	114	13	116	118	118	120	120	120	120	120
Off Road Const Equipment	35	30	28	30	31	31	30	30	30	30	27	27
Van	85	84	73	73	72	74	75	75	75	75	74	74
Fleet Count	**985**	**983**	**985**	**977**	**976**	**999**	**990**	**994**	**994**	**994**	**980**	**980**

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Fleet KPI examples

Fleet Metrics Summary	Year	Quarter		Week					
Average Age of Assigned In-Service Asse	2018	Q1	Q2	7/12/19	7/19/19	7/26/19	8/2/19	8/9/18	8/16/19
Boat, ATVs, Ground Maint, Sweeper	11.45	11.79	12.11	11.83	11.68	11.70	11.72	11.63	11.65
Forklift	10.71	10.85	11.10	11.25	11.27	11.29	11.31	11.32	11.35
Heavy Duty Aerial - 85'	5.63	5.76	6.01	6.16	6.18	6.20	6.22	6.24	6.26
Heavy Duty Dump Truck	11.94	11.77	11.53	11.68	11.70	11.72	11.74	11.76	11.78
Heavy Duty Service/Line Truck	11.06	10.80	11.05	11.20	11.22	11.24	11.26	10.93	10.95
Light Duty Pickup	11.46	10.20	9.76	9.69	9.69	9.66	9.63	9.50	9.52
Light Duty Sedan	8.96	8.94	7.48	6.42	6.44	6.33	6.20	6.33	6.35
Light Duty SUV	8.68	8.40	8.65	8.72	8.74	8.76	8.78	8.79	8.82
Medium Duty Aerial 37'-65'	5.45	5.58	5.68	5.83	5.85	5.87	5.89	5.91	5.93
Medium Duty Dump Truck	11.14	11.28	11.52	11.68	11.69	11.71	11.74	11.75	11.77
Medium Duty Pickup	9.63	9.50	9.57	9.57	9.48	9.50	9.52	9.47	9.50
Medium Duty Service Truck	11.22	10.00	10.21	9.86	9.88	9.89	9.92	9.93	9.95
Non-Motorized Equipment	22.60	10.79	9.98	9.76	9.62	9.64	9.66	9.68	9.70
Off Road Const Equipment	12.40	10.05	10.01	10.35	10.36	10.38	10.41	10.14	9.55
Van	9.06	9.13	8.88	8.43	8.45	8.47	8.49	8.40	8.42
Fleet Average Age	**10.12**	**9.67**	**9.47**	**9.34**	**9.31**	**9.32**	**9.33**	**9.27**	**9.27**

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Fleet KPI examples

Fleet Metrics Summary	Year		Quarter						Week					
	2017	2018	Q1	Q2	Q3	Q4	Q1	Q2	7/12/19	7/19/19	7/26/19	8/2/19	8/9/19	8/16/19
Corrective Work Orders > total queue														
VC01 - Corrective	**289**	**194**	**259**	**165**	**162**	**175**	**167**	**142**	**154**	**152**	**135**	**155**	**165**	**190**
302 - Install	78	23	45	0	0	21	14	3	2	3	2	2	2	1
303 - Repair	90	75	79	72	72	75	69	69	72	71	74	88	96	118
348 - Modification	5	6	6	4	6	7	4	10	25	23	17	17	18	10
349 - Accident (Excluded)	31	29	29	32	28	27	21	5	6	6	6	7	5	7
V02 - Vehicle Repair from PM Service	116	90	129	89	84	72	80	60	55	55	42	48	49	61
Backlog Work Orders > 30 days														
VP01 - Preventative	**151**	**104**	**105**	**101**	**114**	**102**	**55**	**55**	**85**	**87**	**105**	**89**	**86**	**81**
Class 1-5	52	32	28	28	32	35	19	25	47	50	46	51	47	41
BIT Inspection	3	2	0	2	3	3	0	1	3	3	2	7	5	2
Class 6-8	2	6	4	7	9	6	5	7	7	7	6	6	8	8
BIT Inspection	1	2	1	3	4	2	1	0	4	3	1	1	1	6
Class 9-13	86	55	69	51	57	50	27	20	23	23	24	23	24	23
BIT Inspection	7	6	2	11	9	5	3	2	1	1	1	1	1	1
PM Currency	**84.47%**	**89.13%**	**89.28%**	**89.72%**	**88.31%**	**89.52%**	**94.24%**	**94.53%**	**91.41%**	**91.25%**	**91.95%**	**91.05%**	**91.22%**	**91.73%**
VP02 - Regulatory	**50**	**45**	**60**	**61**	**35**	**29**	**51**	**42**	**22**	**25**	**23**	**24**	**33**	**26**
340 - Crane/ Aerial Inspection	8	7	18	8	4	2	1	2	2	2	2	5	5	5
341 - SMOG Inspection	0	2	1	3	2	1	1	0	0	0	0	0	0	0
342 - Snap Idle Test	0	20	12	36	22	18	35	29	12	14	14	17	20	12
343 - Rope Inspection	13	8	6	10	6	7	13	9	8	9	8	7	8	9
344 - Diesel Emissions	1	0	1	0	0	0	0	3	0	0	0	0	0	0
V01 - Vehicle Recall	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V09 - Non-Deficiencies	28	7	22	4	1	1	1	0	0	0	0	0	0	0
Total	**490**	**344**	**428**	**326**	**311**	**306**	**273**	**239**	**261**	**264**	**238**	**273**	**284**	**297**

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Fleet capital

	2016	2017	2018	YTD Actual	2019 Jul	Aug	Sep	Oct	Nov	Dec	Year
Fleet Capital											
Actuals/Forecast	$ 3,254,375	$ 5,324,241	$ 8,361,904	$ 4,196,308	$ 2,079,936	$ 700,818	$ -	$ 75,250	$ -	$ -	$ 7,052,312
Budget/3 Yr Plan	$ 3,841,000	$ 7,049,847	$ 7,119,114	$ 805,790	$ 1,000,000	$ -	$ 1,464,713	$ 805,790	$ 1,000,000	$ 2,018,382	$ 7,094,675
Forecast Over/(Under) Budget	$ (586,625)	$ (1,725,606)	$ 1,242,790	$ 3,390,518	$ 1,079,936	$ 700,818	$ (1,464,713)	$ (730,540)	$ (1,000,000)	$ (2,018,382)	$ (42,363)
Fleet Labor											
Forecast	$ 309,597	$ 428,050	$ 325,429	$ 270,515	$ 54,556	$ 35,433	$ 61,034	$ 53,861	$ 50,877	$ 76,734	$ 603,010
Budget/3 Yr Plan	$ 170,512	$ 443,279	$ 410,927	$ 161,613	$ 44,197	$ 24,590	$ 51,837	$ 41,179	$ 43,229	$ 68,118	$ 434,763
Forecast Over/(Under) Budget	$ 139,084	$ (15,229)	$ (85,498)	$ 108,901	$ 10,359	$ 10,843	$ 9,197	$ 12,682	$ 7,648	$ 8,616	$ 168,247

Fleet utilization

	2016	2017	2018	Jan	Feb	Mar	Apr	May	Jun
Fleet Utilization	62.0%	62.9%	62.3%	65.7%	65.8%	64.3%	61.0%	64.6%	63.3%

Inventory	Cost Cen	Description	Average Utilization	January	February	March	April	May	June	July
0016K	887	0016K VC8 LINE TRUCK	19.0	23	18	17	22	14	20	19
0017K	887	0017K VC8 LINE TRUCK	14.3	17	12	10	16	20	11	9
0018K	887	0018K VC8 LINE TRUCK	18.5	18	15	18	21	19	20	25
0019K	887	0019K VC8 LINE TRUCK	22.0	22	19	22	26	22	21	24
0020K	887	0020K VC8 LINE TRUCK	18.8	17	17	22	21	18	18	12
0021K	887	0021K VC8 LINE TRUCK	18.2	14	18	19	21	19	18	18
0022K	887	0022K VC8 LINE TRUCK	21.3	21	20	22	23	21	21	21
0023K	887	0023K VC8 LINE TRUCK	20.8	24	19	15	21	24	22	16
0024K	887	0024K VC8 LINE TRUCK	21.3	22	18	23	24	20	21	24
0025K	887	0025K VC8 LINE TRUCK	22.0	20	19	24	23	23	23	23
0026K	887	0026K VC8 LINE TRUCK (PUERTO RICO)	17.0	14	17	15	23	19	14	15
0027K	887	0027K VC8 LINE TRUCK (PUERTO RICO)	14.3	13	6	15	20	18	14	20
0028K	887	0028K VC8 LINE TRUCK	16.7	19	18	18	19	15	11	14
0029K	887	0029K VC8 LINE TRUCK	16.7	19	13	16	19	20	13	20
0031K	887	0031K VC8 LINE TRUCK	19.7	23	18	20	15	22	20	19
0032K	887	0032K VC8 LINE TRUCK	18.5	22	18	21	21	10	19	29
0033K	887	0033K VC8 LINE TRUCK	20.0	18	21	18	21	23	19	23
0034K	887	0034K VC8 LINE TRUCK	20.7	24	16	22	25	21	16	19
0035K	887	0035K VC8 LINE TRUCK	20.7	24	17	20	23	20	20	21
0036K	887	0036K VC8 LINE TRUCK	25.7	26	20	26	27	28	27	26
0037K	887	0037K VC8 LINE TRUCK	19.0	20	17	22	19	18	18	18
0038K	887	0038K VC8 LINE TRUCK	22.5	19	21	23	25	25	22	25

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Fleet electrification

PWF Weekly Metrics

Count of Assigned In-Service Assets (EV)	2015	2016	2017	2018	Q1	Q2	7/12/19	7/19/19	7/26/19	8/2/19	8/9/19	8/16/19
Boat, ATVs, Ground Maint, Sweeper	18%	17%	17%	7%	21%	21%	22%	22%	22%	22%	22%	22%
Forklift	43%	41%	36%	48%	47%	47%	47%	47%	47%	47%	47%	47%
Heavy Duty Aerial - 85'	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heavy Duty Dump Truck	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heavy Duty Service/Line Truck	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Light Duty Pickup	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Light Duty Sedan	38%	44%	47%	50%	97%	97%	98%	98%	98%	98%	100%	100%
Light Duty SUV	13%	13%	1%	0%	15%	15%	15%	15%	15%	15%	15%	15%
Medium Duty Aerial 37'-65'	8%	8%	15%	23%	23%	23%	23%	23%	23%	23%	23%	23%
Medium Duty Dump Truck	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Medium Duty Pickup	0%	0%	0%	0%	0%	0%	1%	2%	2%	2%	2%	2%
Medium Duty Service Truck	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Non-Motorized Equipment	1%	1%	1%	0%	0%	2%	3%	3%	3%	3%	3%	3%
Off Road Const Equipment	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Van	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fleet Count	**6.29%**	**6.51%**	**6.60%**	**7.37%**	**11.23%**	**11.50%**	**11.82%**	**11.87%**	**11.77%**	**11.67%**	**11.84%**	**11.84%**

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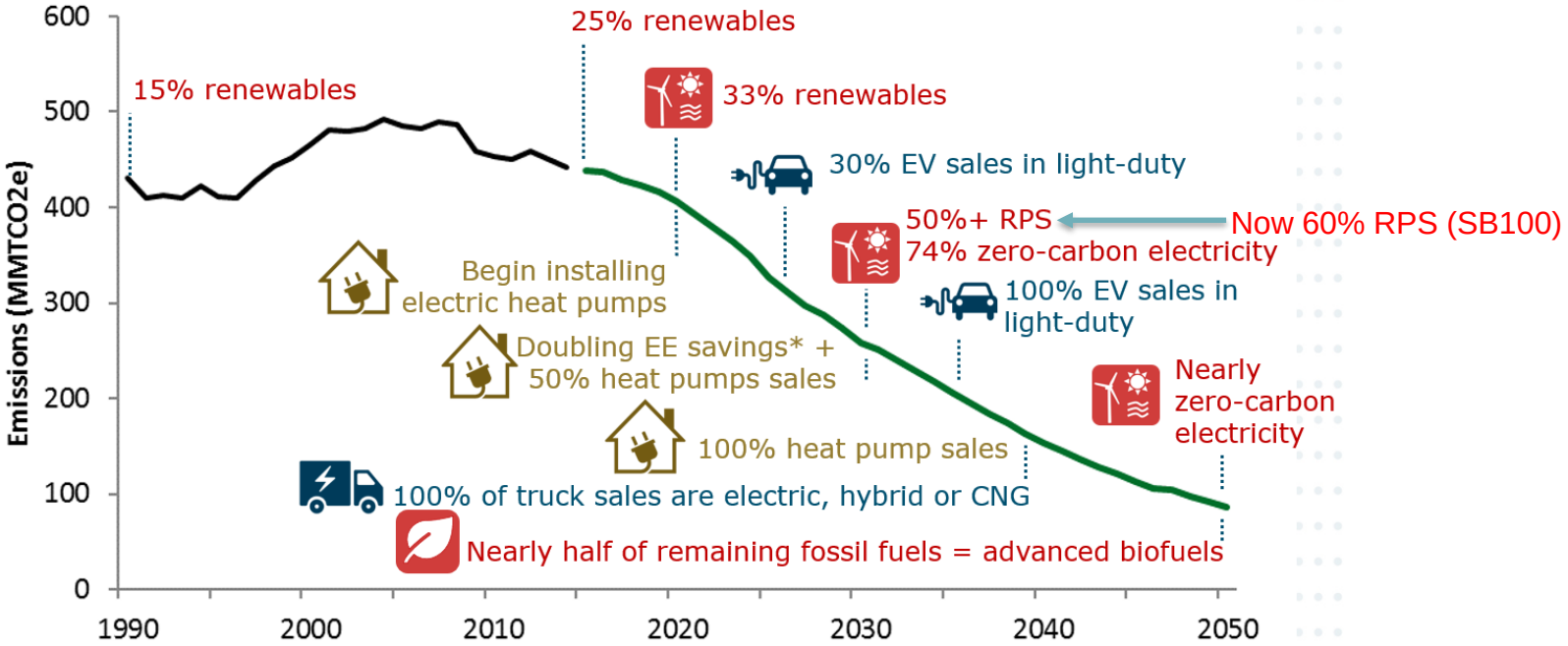
SHOPS
STOP

IRP – Electrification Focus



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SMUD's Path to Fleet Electrification

1991 | 1997 - 2007 | 2006 | 2007-2010

1991 Chevy S-10

Chevy S-10 pickups were converted from gasoline to electric; the engines were removed and the pickup beds filled with batteries to fuel the vehicle

Rav-4 Electric Vehicle

SMUD leased Rav-4's; one of the few EV's on the road produced by a manufacturer. Toyota recalled these upon the end of their leases

Miles Vehicle

Electric forklifts and Miles station wagons purchased for campus use

All Electric Ford Ranger

All electric Ford Rangers used for local services

SMUD

SMUD's Path to Fleet Electrification

2009 | 2015 | 2018

Eaton Hybrid Electric Drive Line Truck

SMUD's first hybrid electric drive line truck with 60' boom

Altec JEMS Hybrid Electric Bucket Truck

SMUD's first hybrid electric bucket truck with Jobsite Energy Management System (JEMS)

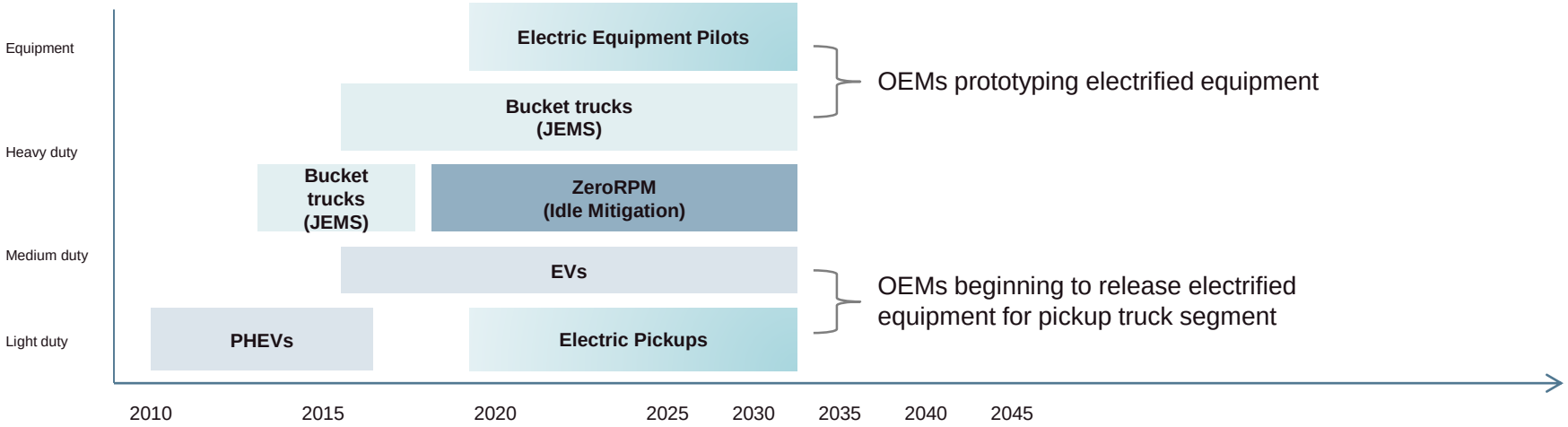
Idle Mitigation Systems

Idle mitigation systems adopted by SMUD; promoting cleaner air, reduced fuel costs & worksite noise and cab comfort minus the running engine

SMUD


SMUD
Hybrid Vehicle

Roadmap & Goals



DRAFT GOALS

- $1M EV investments (year end 2019)
- 100% EV sedan fleet (year end 2020)
- Increase fleet electrification by 5% during 2019
- 100% Eligible Fleet Electrified (year end 2025)

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SMUD's Future with Fleet Electrification

2019 | 2023 | 2025 | 2030

2019 Chevy Bolt

- **100% sedan electrification by EOY**
- **EPA goal of 13%-15% electrification of total fleet, currently at 10%**

Altec JEMS Hybrid Electric Bucket Truck

- **Increased hybrid bucket truck electrification**

Ford F-150 EV Prototype

- **100% eligible fleet electrification**

CA State Electrification

- **5,000,000 ZEV's in CA State**
- Align with city, state & regional goals for electrification

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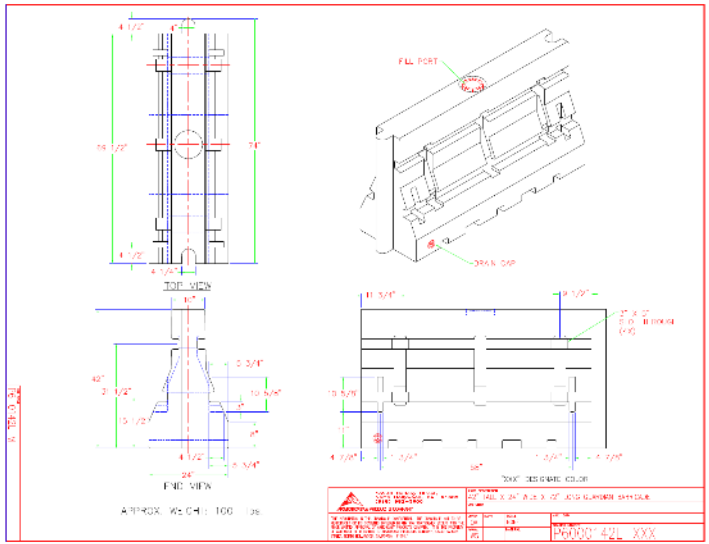
Level 1 Charging

- Yard Charging (2018-2019)
- Proposed Charging



Measuring Electrification

PWF Weekly Metrics

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Boat, ATVs, Ground Maint, Sweeper	18%	17%	17%	7%	21%	21%	22%	22%	22%	22%	22%	22%
Forklift	43%	41%	36%	48%	47%	47%	47%	47%	47%	47%	47%	47%
Heavy Duty Aerial - 85'	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heavy Duty Dump Truck	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heavy Duty Service/Line Truck	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Light Duty Pickup	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Light Duty Sedan	38%	44%	47%	50%	97%	97%	98%	98%	98%	98%	100%	100%
Light Duty SUV	13%	13%	1%	0%	15%	15%	15%	15%	15%	15%	15%	15%
Medium Duty Aerial 37'-65'	8%	8%	15%	23%	23%	23%	23%	23%	23%	23%	23%	23%
Medium Duty Dump Truck	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Medium Duty Pickup	0%	0%	0%	0%	0%	0%	1%	2%	2%	2%	2%	2%
Medium Duty Service Truck	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Non-Motorized Equipment	1%	1%	1%	0%	0%	2%	3%	3%	3%	3%	3%	3%
Off Road Const Equipment	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Van	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fleet Count	**6.29%**	**6.51%**	**6.60%**	**7.37%**	**11.23%**	**11.50%**	**11.82%**	**11.87%**	**11.77%**	**11.67%**	**11.84%**	**11.84%**

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Credits

	Credits Earned - Metered Data					Non-Metered Credits Earned			Total Credits Earned
Quarter	Residential	Public	Fleet	Private	Total	Residential	Forklift	Total	
1	164	-	-	-	164	2,686	1,596	4,282	4,446
2	141	-	-	-	141	2,538	1,596	4,134	4,275
3	125	6	-	-	131	2,758	1,596	4,354	4,485
4	129	5	2	-	136	3,112	1,596	4,708	4,844
1	128	9	1	-	138	3,606	1,594	5,200	5,338
2	120	11	1	-	132	3,768	1,516	5,284	5,416
3	108	13	1	1	123	3,954	1,516	5,470	5,593
4	102	17	1	1	121	4,217	1,524	5,741	5,862
1	44	15	2	4	65	4,359	1,502	5,861	5,926
2	44	16	1	11	72	5,500	1,466	6,966	7,038
3	43	21	3	34	101	7,364	1,448	8,812	8,913
4	44	25	2	33	104	7,940	1,464	9,404	9,508
1	45	27	2	69	143				143
2					0				0
3					0				0
4					0				0

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Benefits


Nugget
MARKETS
FRESH TO MARKET
DELIVERED DAILY
SMUD
smud.org/DriveElectric
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SMUD
Powering forward.
Together.
All-electric

Lessons learned

- Electrification cannot just be a fleet goal
- It costs a lot of money, planning, infrastructure
- It’s not one-size-fits-all; market solutions are limited for our industry.
- Get out front and control the conversation
- Credits and rebates can’t necessarily drive decisions
- Pay attention to the battery warranties $$$

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Any Questions?

Contact Us

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