Your Community Committed to Clean Energy – How to Electrify Your Fleet

June 18, 2020 2:00 -- 3:00 PM





Webinar Instructions

- Q & A at end
- Submit questions to "Panelists"
- Scheduled for an hour
- Can go beyond, if interest remains
- Slide handout
- Recording



Webinar Outline

- Vehicle Fleet Electrification Survey Questions & Results
- Discussion of Obstacles in Survey & Overcoming Them
- Assisting One Another as Peers
- Resources and Best Practices
- Possible Convening on Ongoing Basis

Organizational Partnership

- NC Clean Energy Technology Center /Rick Sapienza
- · Sierra Club of North Carolina /Diane Cherry/Cassie Gavin
- Sustainability Directors Network /Vanessa King/Meg Jamison



Local Fleet Survey

- Survey sent to more than 30 local fleet managers and sustainability directors across North Carolina
- Each jurisdiction has a 100 percent renewable energy solution for some future date
- Response rate 30 percent





Questions Asked

- Is vehicle electrification part of your gov't clean energy plan? Is there
 a written plan for its implementation?
- What are the top obstacles to electrifying the fleet?
- Is the <u>total cost of ownership</u> part of vehicle purchasing decisions? If vehicle savings are realized, can they be <u>reinvested</u>?
- Is a <u>cross functional</u> team part of guidance and buy in?





Survey Results

Vehicle electrification part of your gov't clean energy plan?

Yes – 90 percent No - 10 percent

No jurisdiction has a written plan for how to electrify their auto fleet.



Top Obstacles to Electrification

- Cost Budget
- Lack of Charging Infrastructure
- No Vehicle Model Available
- Concern About Limited Range
- Opposition from Vehicle Fleet Drivers



Vehicle Purchasing Decisions

Total Vehicle Cost of Ownership Considered?

Yes –100 percent

Realize Fuel Savings, is Reinvestment Possible?

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Yes – 20 percent
No – 80 percent
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Change Management Decisions

 Cross Functional Management Team to Identify, Communicate, and Provide Guidance on Sustainability?

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Yes – 40 percent
No – 60 percent
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Overcoming Obstacles

- VW Settlement Funding
- CARES Funding
- Best Practices/Lessons Learned
- NC Clean Tech Center Resources





Sierra Club's Ready for 100 Campaign



- Ready for 100 is a Sierra Club campaign focused on helping local governments transition to 100% renewable energy starting with a local resolution.
- The vision of 100% clean energy across the U.S. is growing fast: in 2019 alone, 51 cities and towns, 4, plus Puerto Rico and D.C. committed to 100% clean, renewable energy.
- In North Carolina, 26 local governments made the commitment so far and more are working on it.
- After a resolution is passed planning and funding are key.





Volkswagen Settlement \$ 92M

- States may invest 15% in EV infrastructure: acquisition, installation, operations & maintenance of light duty EV equipment including level 1 and 2 DC fast chargers in public spaces, workplaces and multiunit dwellings.
- NC Department of Environmental Quality managing funds.
- NC plan structured in 3 phases.
- **Phase 1:** 33% of funds (\$30.68M) for public projects. Application deadline passed.
- \$61.36M still be allocated.
- Phase 2 Planning: It pays to engage in the stakeholder process to determine the application process, how funds will be allocated, and to who.
- States are spending the funds but not NC because of a dispute between the legislature and Governor.
- Phase 2 stakeholder process delayed until DEQ begins funding Phase 1 projects, dependent on an appropriation from the legislature.



Federal Coronavirus Aid, Relief, and Economic Security Act (CARES) Act Funding

- CARES includes \$25B for public transit to prevent, prepare & respond to COVID-19.
- NC transit agencies to receive \$314M.
- Funds are primarily for measures to protect the public and transit workers but if there are leftover funds there may be a possibility to use some for EV transit buses.





Fleet Pressure to Electrify

- Federal Expenditures—DOE R&D, DOT/FHWA Infrastructure
- Hot Topic for Legislators & Public
- State Level ZEV Plans: 16 states are developing or updating ZEV plans
- Planning activities can be created or required by:

Executive Order

Legislative Request / Bill / Directive

Public Utility Study

Multi-State Initiative or MOU

Source: Allison Carr, NCCETC, NC EO80 Presentation March 2019







State Examples

- NC Executive Order 80 December 2018:
 Goal of 80,000 PEVs by 2025 (from 7,000)
- MD Climate Action Plan January 2019:
 Goal 300,000 PEVs by 2025 (from 10,000)







Best Practices for ZEV Adoption

- 1. Statewide ZEV goals
- 2. Mandates for state fleets
- 3. Planning for corridors
- 4. Consumer education & outreach
- 5. Dealership education
- 6. Regulation to support infrastructure
- 7. State financial incentives for vehicles & infrastructure
- 8. ZEV Taskforce state

Source: Allison Carr & Heather Brutz, NCCETC, White Paper: State Actions & Best Practices in State ZEV Plans, April 2019.







Automotive Industry Investment/Commitment

- Global cumulative over \$200B (Jan 2019)
- VW \$40B w/ 50 full electric models making up 20-25% of sales by 2025
- Ford \$11B w/ 40 electrified (EV, PHEV and Hybrid) models by 2025
- GM 20 different EV models by 2023
- Hyundai \$17B to electrify most new models by 2025









William Clay Ford Jr., Executive Chairman of Ford Motor Company,

"We're all in. The only question is, will the customers be there with us?"

Source: https://www.reuters.com/article/us-autoshow-detroit-electric/global-carmakers-to-invest-at-least-90-billion-in-electric-vehicles-idUSKBN1F42NW







Electric Vehicle Benefits

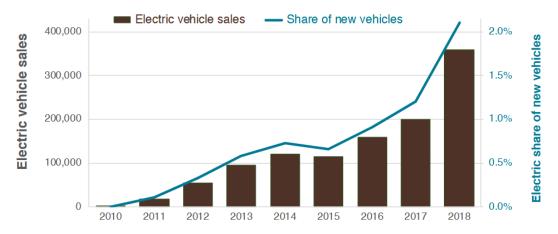
- Performance and reliability
- Efficiency (EV 90% vs. ICE 25%)
- Lower maintenance (brakes, fluids, no exhaust system, no starter, no transmission, no spark plugs, no catalytic converter . . .
- Low operating costs (2.5-3.0 cents/mile)
- Zero tail pipe emissions
- Energy independence
- Fuel diversity



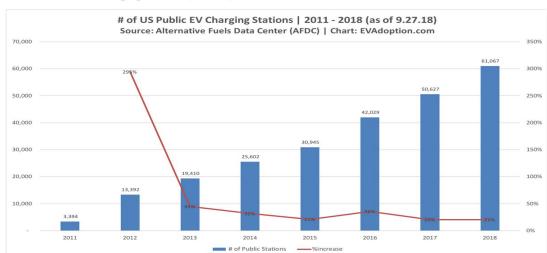




Growth in EV Adoption and Infrastructure



Number of Public Charging Stations (Outlets) in the US - 2011-2018









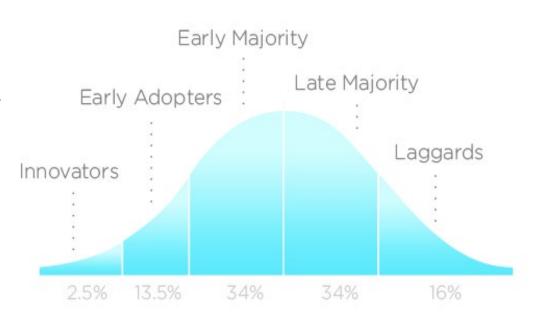
Technology Adoption Curve

Microwave Oven:

- 1st commercial microwave 1947
- 9 of 10 kitchens in US 1997

HEV/EV History:

- GM EV1 1996
- Nissan Altra EV 1998
- Prius HEV 1997, US 2000



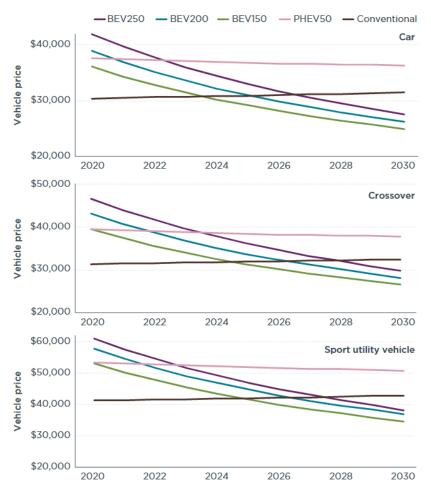
INNOVATION ADOPTION LIFECYCLE

Source: http://www.historyofmicrowave.com/microwave-history/microwave-oven-history/ and https://en.wikipedia.org/wiki/Early_adopter





Initial Purchase Price: Conventional vs EVs



- Price parity 2024-2029
 - Economies of scale
 - Technology advances

Source: https://theicct.org/sites/default/files/publications/EV_cost_2020_2030_20190401.pdf







>50 EV/PHEV options 2019/2020

| IOC | SIDEEVs | | AII-E | lectr | ic Ca | ar Cor | npar | ison | s - L | IS | | | | | |
|----------------|--|------|-------------------------|--------------------|---------------|------------------------------|--------------------------|-------------------------|----------------------|-----------------------|-----------------------|------------|------------|---------------------|----------------|
| | | | | | | Updated 202 | 20-06-01 | | | | | Estimated/ | Unofficia | l | |
| Brand | Model | | Base Price (MSRP) | Dest. Charge | Tax Credit | Price After Tax Credit | Battery Size (kWh) | EPA EV Range (mi) | 0-60 mph (sec) | Top Speed (mph) | Peak Power (kW) | EPA Ene | | sumption highway | Weigh (lbs) |
| Audi | e-tron (2019) | AWD | \$ 74 800 | \$ 995 | \$ 7 500 | \$ 68 295 | 95 | 204 | 5.5 | 124 | 300 | 455 | 455 | 462 | 5 49 |
| Audi | e-tron Sportback (2020) | AWD | \$ 77 300 | \$ 995 | \$ 7 500 | \$ 70 795 | 95 | 218 | 5.5 | 124 | 300 | 438 | 443 | 432 | 5 75 |
| BMW | i3 (2019) | RWD | \$ 44 450 | \$ 995 | \$ 7 500 | \$ 37 945 | 42.2 | 153 | 7.2 | 93 | 125 | 298 | 272 | 330 | 2 96 |
| BMW | i3s (2019) | RWD | | \$ 995 | \$ 7 500 | \$ 41 145 | 42.2 | 153 | 6.8 | 100 | 135 | 298 | 272 | 330 | 3 03 |
| Chevrolet | Bolt EV (2020) | FWD | \$ 36 620 | | N/A | \$ 37 495 | 66 | 259 | 6.5 | 90 | 150 | 286 | 265 | 312 | 3 56 |
| Fiat | 500e (2019) | FWD | \$ 33 460 | \$1 495 | | \$ 27 455 | 24 | 84 | 8.9 | 85 | 83 | 301 | 279 | 327 | 2 98 |
| Hyundai | IONIQ Electric (2020) | FWD | | \$ 955 | \$ 7 500 | \$ 26 500 | 38.3 | 170 | 10.0 | 102 | 100 | 253 | 232 | 279 | 3 3 |
| Hyundai | Kona Electric (2020) | FWD | \$ 37 190 | \$1 120 | \$ 7 500 | \$ 30 810 | 64 | 258 | 7.6 | 104 | 150 | 281 | 255 | 312 | 3.7 |
| Jaguar | I-PACE (2020) | | \$ 69 850 | \$1 025 | \$ 7 500 | \$ 63 375 | 90 | 234 | 4.5 | 124 | 294 | 443 | 421 | 468 | 4 7 |
| Kia | Niro EV (e-Niro) (2020) | FWD | \$ 39 090 | \$1 120 | \$ 7 500 | \$ 32 710 | 64 | 239 | 7.5 | 104 | 150 | 301 | 274 | 330 | 3 8 |
| MINI | Cooper SE | FWD | | \$ 850 | \$ 7 500 | \$ 23 250 | 32.6 | 110 | 6.9 | 93 | 135 | 312 | 293 | 337 | |
| Nissan | LEAF (40 kWh) (2020) | FWD | \$ 31 600 | \$ 925 | \$ 7 500 | \$ 25 025 | 40 | 149 | 7.4 | 90 | 110 | 304 | 274 | 340 | 3 43 |
| Nissan | LEAF e+ S (62 kWh) (2020) | FWD | \$ 38 200 | \$ 925 | \$ 7 500 | \$ 31 625 | 62 | 226 | 6.5 | | 160 | 312 | 286 | 347 | 3 7 |
| Nissan | LEAF e+ SV/SL (62 kWh) (2020) | FWD | | \$ 925 | \$ 7 500 | \$ 33 175 | 62 | 215 | 6.5 | | 160 | 324 | 296 | 359 | 3 81 |
| Polestar | Polestar 2 (2020) | AWD | \$ 59 900 | \$1 300 | \$ 7 500 | \$ 53 700 | 78 | 275 | 4.7 | | 300 | | | | |
| Porsche | Taycan 4S Perf Battery Plus (2020) | AWD | \$112 990 | \$1 350 | \$ 7 500 | \$ 106 840 | 93.4 | 203 | 3.8 | 155 | 420 | 488 | 496 | 475 | 4 9 |
| Porsche | Taycan Turbo (2020) | AWD | \$153 510 | \$1 350 | \$ 7 500 | \$ 147 360 | 93.4 | 201 | 3.0 | 161 | 500 | 488 | 496 | 475 | 5 13 |
| Porsche | Taycan Turbo S (2020) | AWD | \$187 610 | \$1 350 | \$ 7 500 | \$ 181 460 | 93.4 | 192 | 2.6 | 161 | 560 | 496 | 503 | 496 | 5 13 |
| Tesla | | RWD | \$ 37 990 | \$1 200 | N/A | \$ 39 190 | 59.5 | 250 | 5.3 | 140 | | 239 | 228 | 255 | 3 62 |
| Tesla Tesla | Model 3 Long Range AWD (2020) | | | \$1 200 \$1 200 | N/A N/A | \$ 48 190 | 80.5 80.5 | 322 299 | 4.4 3.2 | 145 162 | | 279 298 | 272 286 | 291 315 | 4 0 |
| | Model 3 Perf. LR AWD (2020) 20" | | \$ 54 990 | | | \$ 56 190 \$ 76 190 | 100 | | 3.2 | 155 | | 304 | 286 | 315 | 4 0 |
| Tesla Tesla | Model S Long Range Plus (2020) | AWD | | \$1 200 \$1 200 | N/A N/A | \$ 76 190 \$ 96 190 | 100 | 391 | 2.3 | 163 | | 304 | 324 | 315 | 4 88 |
| Tesla | Model S Performance LM (2020) 19" | | \$ 94 990 \$ 79 990 | \$1 200 | N/A N/A | \$ 96 190 \$ 81 190 | 100 | 351 | 4.4 | 155 | | 351 | 340 | 362 | 5 42 |
| Tesla | Model X Long Range Plus (2020) Model X Performance LM (2020) 20" | AWD | \$ 99 990 | \$1 200 | N/A N/A | \$ 81 190 \$ 101 190 | 100 | 305 | 2.6 | 163 | | 351 | 374 | 362 | 5 47 |
| Tesla | | | \$ 52 990 | \$1 200 | N/A N/A | \$ 101 190 \$ 54 190 | 80.5 | 316 | 4.8 | 135 | | 3/4 | 3/4 | 3/9 | |
| Tesla | Model Y Long Range AWD (2020) Model Y Perf. LR AWD (2020) | | \$ 60 990 | | N/A N/A | \$ 54 190 \$ 62 190 | 80.5 | 315 | 3.5 | 135 | | 279 | 261 | 301 | 4 4 |
| resia | I IVIOGEI T PEII. LR AVVD (2020) | AVVU | \$ 60 990 | ⊅ 1 200 | IW/A | 3 02 190 | 00.0 | 315 | ა.5 | 145 | | 219 | 261 | 301 | 4.4 |

| | SIDEEVs | Estimated/Unofficial Updated 2019-07-22 | | | | | | | | | | | | |
|------------|-----------------------------------|---|-----------------|---------------|------------------------------|--------------------------|-------------------------|------------------------|-----------------------|--------------------------|---------------------------|----------------------|--------------|---------------------|
| Brand | Model | Base Price (MSRP) | Dest. Charge | Tax Credit | Price After Tax Credit | Battery Size (kWh) | EPA EV Range (mi) | Total Range (mi) | Top Speed (mph) | Peak Power EV (kW) | Peak Power ICE (hp) | 0-60 mph (sec) | Weight (lbs) | Price per kWh |
| BMW | 530e iPerformance (2019) | \$ 53,400 | \$ 995 | \$ 4,668 | \$ 49,727 | 9.4 | 16 | 370 | 87 | 70 | 184 | 6.0 | 4,266 | \$5,681 |
| BMW | 530e xDrive iPerformance (2019) | \$ 55,700 | \$ 995 | \$ 4,668 | \$ 52,027 | 9.4 | 14 | 360 | 87 | 70 | 184 | 5.8 | 4,385 | \$5,926 |
| BMW | 745e xDrive iPerformance (2020) | \$ 95,550 | \$ 995 | \$ 5,836 | \$ 90,709 | 12.0 | 16 | 290 | 155 | 83 | 394 | 4.9 | | \$7,963 |
| BMW | i3 REx (2019) | \$ 48,300 | \$ 995 | \$ 7,500 | \$ 41,795 | 42.2 | 126 | 200 | 93 | 125 | 34 | 8.0 | 3,269 | \$1,145 |
| BMW | i3s REx (2019) | \$ 51,500 | \$ 995 | \$ 7,500 | \$ 44,995 | 42.2 | 126 | 200 | 100 | 135 | 34 | 7.6 | 3,302 | \$1,220 |
| BMW | i8 Coupe (2019) | \$ 147,500 | \$ 995 | \$ 5,669 | \$ 142,826 | 11.6 | 17 | 320 | 155 | 105 | 228 | 4.2 | 3,501 | \$12,716 |
| BMW | i8 Roadster (2019) | \$ 163,300 | \$ 995 | \$ 5,669 | \$ 158,626 | 11.6 | 17 | 320 | 155 | 105 | 228 | 4.4 | 3,671 | \$14,078 |
| Chevrolet | Volt (2019) | \$ 33,520 | \$ 875 | \$ 3,750 | \$ 30,645 | 18.4 | 53 | 420 | 98 | 111 | 101 | 8.4 | 3,543 | \$1,822 |
| Chrysler | Pacifica Hybrid (2019) | \$ 40,245 | \$1,495 | \$ 7,500 | \$ 34,240 | 16 | 32 | 520 | | 89 | 248 | | | \$2,515 |
| Ford | Fusion Energi - Titanium (2019) | \$ 34,595 | \$ 995 | \$ 4,609 | \$ 30,981 | 9.0 | 26 | 610 | | 88 | 141 | | 3,986 | \$3,844 |
| Honda | Clarity Plug-in Hybrid (2019) | \$ 33,400 | \$ 920 | \$ 7,500 | \$ 26,820 | 17 | 47 | 340 | | 135 | 103 | | 4,052 | \$1,965 |
| Hyundai | IONIQ Plug-in Hybrid (2019) | \$ 25,350 | \$ 920 | \$ 4,543 | \$ 21,727 | 8.9 | 29 | 630 | | 45 | 104 | | | \$2,848 |
| Hyundai | Sonata PHEV (2019) | \$ 33,400 | \$ 920 | \$ 4,919 | \$ 29,401 | 9.8 | 28 | 600 | 75 | 50 | 154 | | 3,787 | \$3,408 |
| Karma | Revero (2018) | \$ 130,000 | \$1,400 | \$ 7,500 | \$ 123,900 | 21.4 | 37 | 240 | 125 | 301 | 260 | 5.4 | 5,400 | \$6,075 |
| Kia | Niro PHEV (2019) | \$ 28,500 | \$ 995 | \$ 4,543 | \$ 24,952 | 8.9 | 26 | 560 | | 45 | 104 | | 3,391 | \$3,202 |
| Kia | Optima PHEV (2020) | \$ 36,090 | \$ 925 | \$ 4,919 | \$ 32,096 | 9.8 | 28 | 630 | 74 | 50 | 154 | 9.1 | 3,799 | \$3,683 |
| Land Rover | Range Rover P400e (2019) | \$ 95,950 | \$1,295 | \$ 7,087 | \$ 90,158 | 13.1 | 20 | | 137 | 85 | 296 | 6.4 | 5,532 | \$7,324 |
| Land Rover | Range Rover Sport P400e (2019) | \$ 78,600 | \$1,295 | \$ 7,087 | \$ 72,808 | 13.1 | 20 | | 137 | 85 | 296 | 6.3 | 5,448 | \$6,000 |
| Mercedes | GLC 350e (2019) | \$ 50,650 | \$ 995 | \$ 4,460 | \$ 47,185 | 8.7 | 9 | 350 | | | 320 | 6.2 | | \$5,822 |
| MINI | Cooper S E Countryman ALL4 (2019) | \$ 36,900 | \$ 850 | \$ 4,001 | \$ 33,749 | 7.6 | 12 | 270 | 78 | 65 | 136 | 6.7 | | \$4,855 |
| Mitsubishi | Outlander PHEV (2019) | \$ 35,795 | \$1,095 | \$ 5,836 | \$ 31,054 | 12.0 | 22 | 310 | | 120 | 117 | | | \$2,983 |
| Porsche | Cayenne E-Hybrid (2019) | \$ 81,100 | \$1,250 | \$ 6,670 | \$ 75,680 | 14.1 | | | 157 | 100 | 340 | 4.7 | | \$5,752 |
| Porsche | Panamera 4 E-Hybrid (2018) | \$102,900 | \$1,250 | \$ 6,670 | \$ 97,480 | 14.1 | 16 | 480 | 172 | 100 | 330 | 4.4 | 4,784 | \$7,298 |
| Porsche | Panamera Turbo S E-Hybrid (2018) | \$ 186,200 | \$ 1,250 | \$ 6,670 | \$ 180,780 | 14.1 | 14 | 450 | 192 | 100 | 550 | 3.2 | 5,093 | \$13,206 |
| Subaru | Crosstrek Hybrid (2019) | \$ 34,995 | \$ 975 | \$ 4,502 | \$ 31,468 | 8.8 | 17 | 480 | | 86 | 137 | | 3,726 | \$3,977 |
| Toyota | Prius Prime (2019) | \$ 27,600 | \$ 930 | \$ 4,502 | \$ 24,028 | 8.8 | 25 | 640 | | 68 | | | 3,365 | \$3,136 |
| Volvo | S60 T8 Twin Engine (2019) | \$ 55,045 | \$ 995 | \$ 5,002 | \$ 51,038 | 10.4 | 22 | 520 | | 64 | 313 | | | \$5,293 |
| Volvo | S90 T8 Twin Engine (2019) | \$ 64,545 | \$ 995 | \$ 5,002 | \$ 60,538 | 10.4 | 21 | 490 | | 64 | 313 | 4.7 | 4,579 | \$6,206 |
| Volvo | XC60 T8 Twin Engine (2019) | \$ 54,345 | \$ 995 | \$ 5,002 | \$ 50,338 | 10.4 | 17 | 500 | | 64 | 313 | 4.9 | | \$5,225 |
| Volvo | XC90 T8 Twin Engine (2019) | \$ 67,645 | \$ 995 | \$ 5,002 | \$ 63,638 | 10.4 | 17 | 490 | | 64 | 313 | 5.9 | 5.059 | \$6.504 |

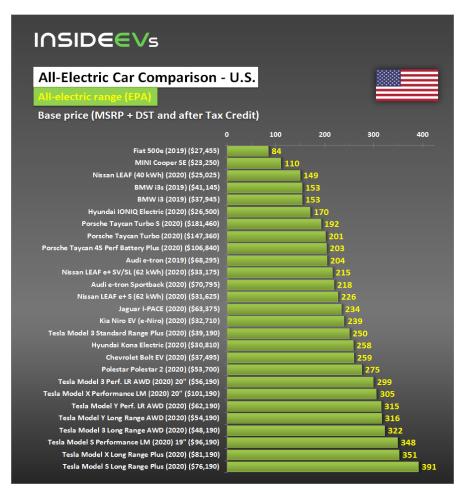


Source: https://insideevs.com/compare-plug-ins/





EV Ranges Increasing/Battery Cost Decreasing



Source: https://insideevs.com/compare-plug-ins/







Electric Pickups Coming Soon











Electric Low Speed Applications/Options









MD/HD Electric Options Growing









Electric Vehicles Here and More Coming



Question w/ Adopting An Alternative Fuel

Is there fuel access? Can I/how do I get fuel when I need it?











US Charger/Connector Types

| | 120V cordset with SAE J1772 standard connector comes with all electric vehicles except Tesla. The J1772 connector plugs into the car; the other end plugs into a three-prong outlet. | Level 1 | 1.4kW |
|----|--|--------------------|-------------------|
| | SAE J1772 standard connector used with charging station. | Level 1 Level 2 | 3.3kW – 19.2kW |
| 00 | SAE Combo connector used with American and European cars that are fast-charging capable. | DC Fast Charge | 30kW – 100kW |
| 66 | CHAdeMO connector used with Asian cars that are fast-charging capable. | DC Fast Charge | 30kW – 50kW |
| | Tesla connector used only with Tesla Model S and | Level 2 | 10kW – 20kW |
| | Model X. | Supercharger | Up to 145kW |







Miles per Charging Time

| Charging Types Summary | | | | | | | | |
|------------------------|----------------|----------------------|--|--|--|--|--|--|
| | Charging Rates | | | | | | | |
| Level 1 | 4 to 5 | miles per hour | | | | | | |
| Level 2 | 11 to 60 | miles per hour | | | | | | |
| DC Fast | | | | | | | | |
| 25kW | 22.5 | miles per 15 minutes | | | | | | |
| 50kW | 45 | miles per 15 minutes | | | | | | |
| 120kW | 108 | miles per 15 minutes | | | | | | |
| 150kW | 135 | miles per 15 minutes | | | | | | |
| 350kW | 315 | miles per 15 minutes | | | | | | |
| 400kW | 360 | miles per 15 minutes | | | | | | |

Sources: https://www.fleetcarma.com/electric-vehicle-charging-guide/

https://evobsession.com/electric-car-charging-101-types-of-charging-apps-more/

https://insideevs.com/what-are-the-power-limits-of-available-dc-quick-charging-standards/https://www.caranddriver.com/news/1800-miles-per-hour-ultrafast-charging-tech-moving-far-

faster-than-anticipated

https://plugincars.com/first-150-kw-fast-charging-station-opens-tesla%e2%80%99s-backyard-132652.html

https://www.firstenergycorp.com/content/dam/customer/get-help/files/PEV/guide-to-ev-charging.pdf







EVSE Fleet Considerations

- Future proof:
 - Ability to easily expand
 - Next generation higher power (L2 50-60 amp)
 - Site preparation for future
- Asset utilization:
 - Share with other departments/towns
 - Make available to public
 - Platooning
- Smart (networked) vs. Dumb Chargers
- De-rate chargers to avoid expensive panel and power upgrades
- Power needs, upgrade requirements and timing
- Use level 1 (add 120V outlets)
- Chargers reach/service multiple spaces
- Utility rates and smart charging to minimize costs







Organizational Change

Requires:

- Goal/Vision
- Planning and action
- Communication and understanding
- Involvement and buy-in across organization
- Training and support
- Celebration and incentives—moral/momentum

Examples of Errors:

- LA PD 228 vehicles (160 all electric)
- City of Indianapolis 425 Chevy Volts
- Charlotte Airport Electric Transit Buses









NETWORKED

WIFI or cellular connection required.

PAYMENT

Capable of accepting credit card or RFID card payment. (when used for public access)

DATA COLLECTION

Track information on usage, meter, driver, etc.

CONSIDER YOUR GOALS

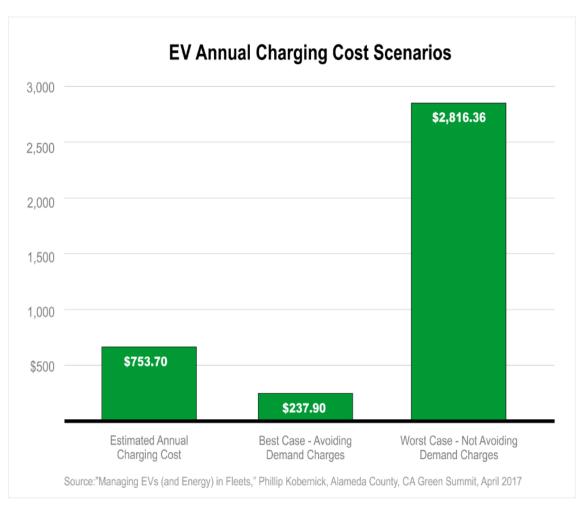
When choosing between Smart vs. Non-Networked charging – what information do you need to be successful?







EV Charging and Demand Charges



Avg. /yr. **\$753.70**

Avoiding Demand
Charges \$237.00

Not Avoiding
Demand Charges
\$2,816.36





Electric Vehicle Charging

Cost Savings

As just noted, the EVMC can reduce cost of power facilities by up to 50% or more.

The "more" is a function several factors:

What type of vehicles are being charged? How far is it from the panel to the charging stations? Is trenching needed? If so, under concrete? Is there room in the existing panel for more connections?

The EVMC also reduces the "peak" charges assessed by electrical utilities.

Peak Charge Savings:

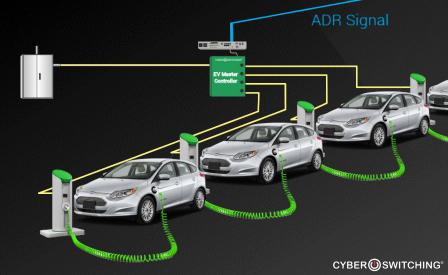
The actual savings varies, but a standard peak charge billing structure for commercial buildings take a normal charge from 22 cents to over 15 dollars a killowatt hour.

The EVMC is designed to respond to **Auto Demand Response**, and will cut power automatically.

Customers utilizing ADR capable systems can be paid utility incentives (or avoid costly penalties).

PG&E ADR Incentives:

| Technology Category | Incentive Rate (\$ per kW of load shed) |
|------------------------------|---|
| Automated Demand Response | \$200 |
| Advanced Technology HVAC/R | \$350 |
| Advanced Technology Lighting | \$400 |
| | |









SOLAR EV CHARGING



How to Fund/Accomplish Electrification

- Private companies: ChargePoint, ABB, Clipper Creek, Electrify America, . . .
- VW Settlement Mitigation Fund
- CMAQ funding/NC CFAT (infrastructure)
- State funding and tax credits (currently 31 states)
- Public private partnerships—Northeast EV Network, the West Coast Electric Highway, Washington State EV Action Plan, . . .
- Cooperatives—Sourcewell, National Cooperative Buying Alliance, Fleets for the Future
- Leasing strategies—cash flow, Federal rebate
- Purchase strategies—lease, buy, used/resale market





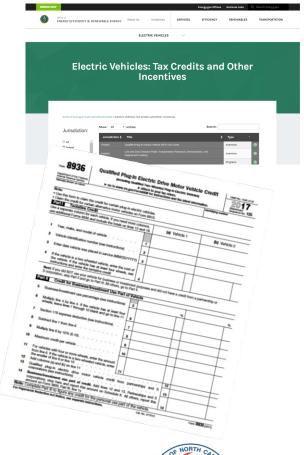


Federal Tax Credits of up to \$7,500/vehicle Are Available

For the purchase of electric vehicles.

Unfortunately, these credits only have value to taxable entities.

Most Leasing and Fleet Management Companies (FMC's) do not offer a mechanism to allow non-taxable clients to realize the benefit of these credits.









Take Advantage of Federal EV Tax Credits

Offers a lease structure that provides municipal and other tax-exempt client/partners the ability to monetize a significant portion of these tax benefits while still complying with their existing contracting and sourcing restrictions.

By sharing available tax credits with a leasing company, municipalities, school districts, private foundations, nonprofits, and other tax-exempt entities can fulfill green goals and initiatives at the lowest possible cost.







General Comments

- PEVs are real and a viable transportation option
- EVSE network is critical for wide scale adoption
- "Perceived range anxiety" is an obstacle
- Rate and time of growth is uncertain
- Going to take a combination of awareness and motivation generation through education, policy, incentives and collaboration
- Moving target with rapid technology changes
- Largest obstacle to overcome is human nature to resist change
- Level 1 charging has its place







North Carolina State University
NC Clean Energy Technology Center
Clean Transportation Program

www.cleantransportation.org

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