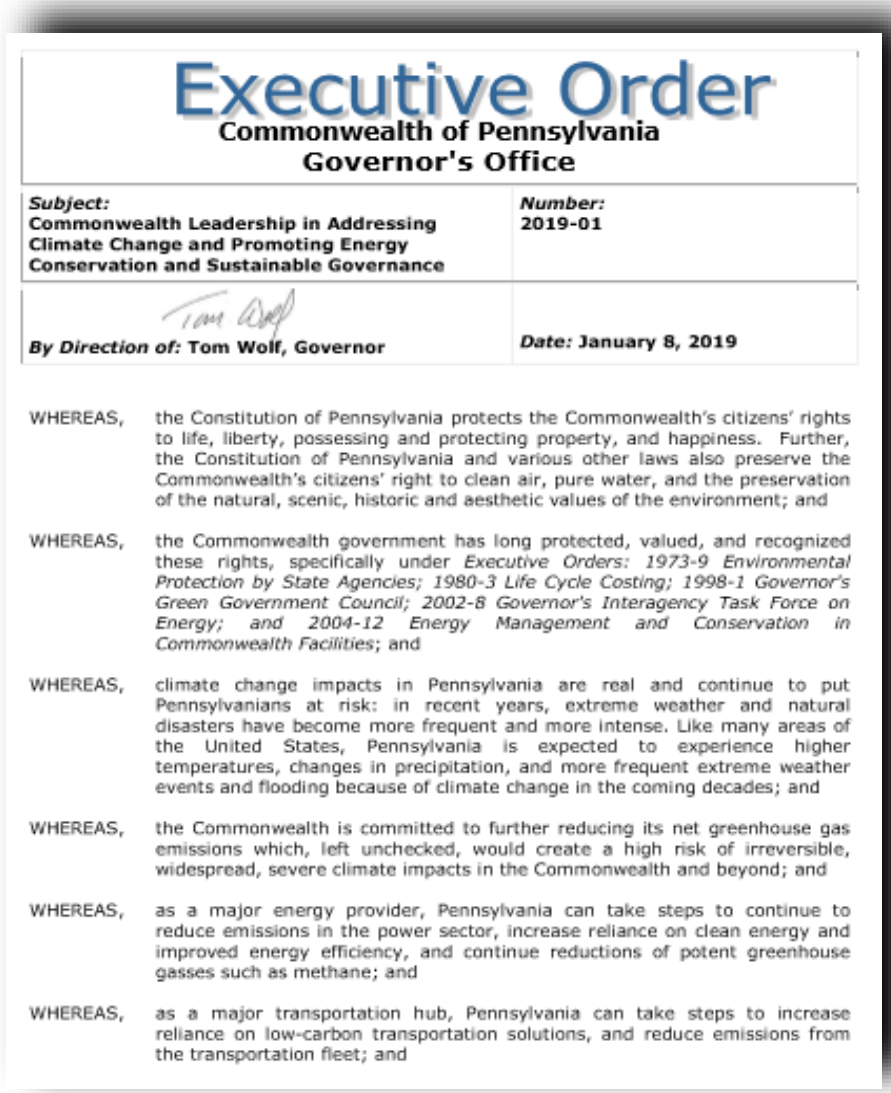
Commonwealth EV & EV Fleet Adoption

Considerations for Electric Vehicle Use

Executive Order 2019-01 – GreenGov Council



Executive Order

Commonwealth of Pennsylvania
Governor's Office

Subject:	Number:
Commonwealth Leadership in Addressing Climate Change and Promoting Energy Conservation and Sustainable Governance	2019-01
By Direction of: Tom Wolf, Governor	Date: January 8, 2019

WHEREAS, the Constitution of Pennsylvania protects the Commonwealth's citizens' rights to life, liberty, possessing and protecting property, and happiness. Further, the Constitution of Pennsylvania and various other laws also preserve the Commonwealth's citizens' right to clean air, pure water, and the preservation of the natural, scenic, historic and aesthetic values of the environment; and

WHEREAS, the Commonwealth government has long protected, valued, and recognized these rights, specifically under *Executive Orders: 1973-9 Environmental Protection by State Agencies; 1980-3 Life Cycle Costing; 1998-1 Governor's Green Government Council; 2002-8 Governor's Interagency Task Force on Energy; and 2004-12 Energy Management and Conservation in Commonwealth Facilities*; and

WHEREAS, climate change impacts in Pennsylvania are real and continue to put Pennsylvanians at risk: in recent years, extreme weather and natural disasters have become more frequent and more intense. Like many areas of the United States, Pennsylvania is expected to experience higher temperatures, changes in precipitation, and more frequent extreme weather events and flooding because of climate change in the coming decades; and

WHEREAS, the Commonwealth is committed to further reducing its net greenhouse gas emissions which, left unchecked, would create a high risk of irreversible, widespread, severe climate impacts in the Commonwealth and beyond; and

WHEREAS, as a major energy provider, Pennsylvania can take steps to continue to reduce emissions in the power sector, increase reliance on clean energy and improved energy efficiency, and continue reductions of potent greenhouse gasses such as methane; and

WHEREAS, as a major transportation hub, Pennsylvania can take steps to increase reliance on low-carbon transportation solutions, and reduce emissions from the transportation fleet; and

Executive Order 2019-01 Establishes the Goal Strive to Achieve a **26% Reduction of Net Greenhouse Gas Emissions Statewide by 2025**, and an 80% Reduction of Net Greenhouse Gas Emissions by 2050

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Commonwealth Agency Goals – Lead-By-Example

Reduce	• Overall energy consumption by 3% per year, and 21% by 2025 from 2017 levels;
Replace	• 25% of the state passenger fleet with Battery Electric Vehicles and Plug-In Hybrid Electric Vehicles by 2025;
Procure	• Renewable energy to offset at least 40% of the Commonwealth's annual electricity, and/or directly purchase renewable power generation sited within PA;
Build	• New buildings, major renovations, build to suit leased buildings to high-performance building standards.

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GreenGov Focus Group: EVs & EV Charging

Mission & Purpose

- Cover the Benefits of Electric Vehicle Use
- Educate Decision Makers on Electric Vehicles and Charging
- Provide Foundation for Policy Development
- Track and Share Updates on Commonwealth Electrification

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GreenGov Focus Group: EVs & EV Charging

- **Developing Charging Delivery Tools** for the Procurement of Vehicle Chargers and Electric Vehicle Supply Equipment (EVSE)
- **Vehicle Charging Inclusion** into Facilities Construction Projects to Grow Our Infrastructure
- **Develop Educational Programs** to Familiarize Staff with EVs and their Benefits

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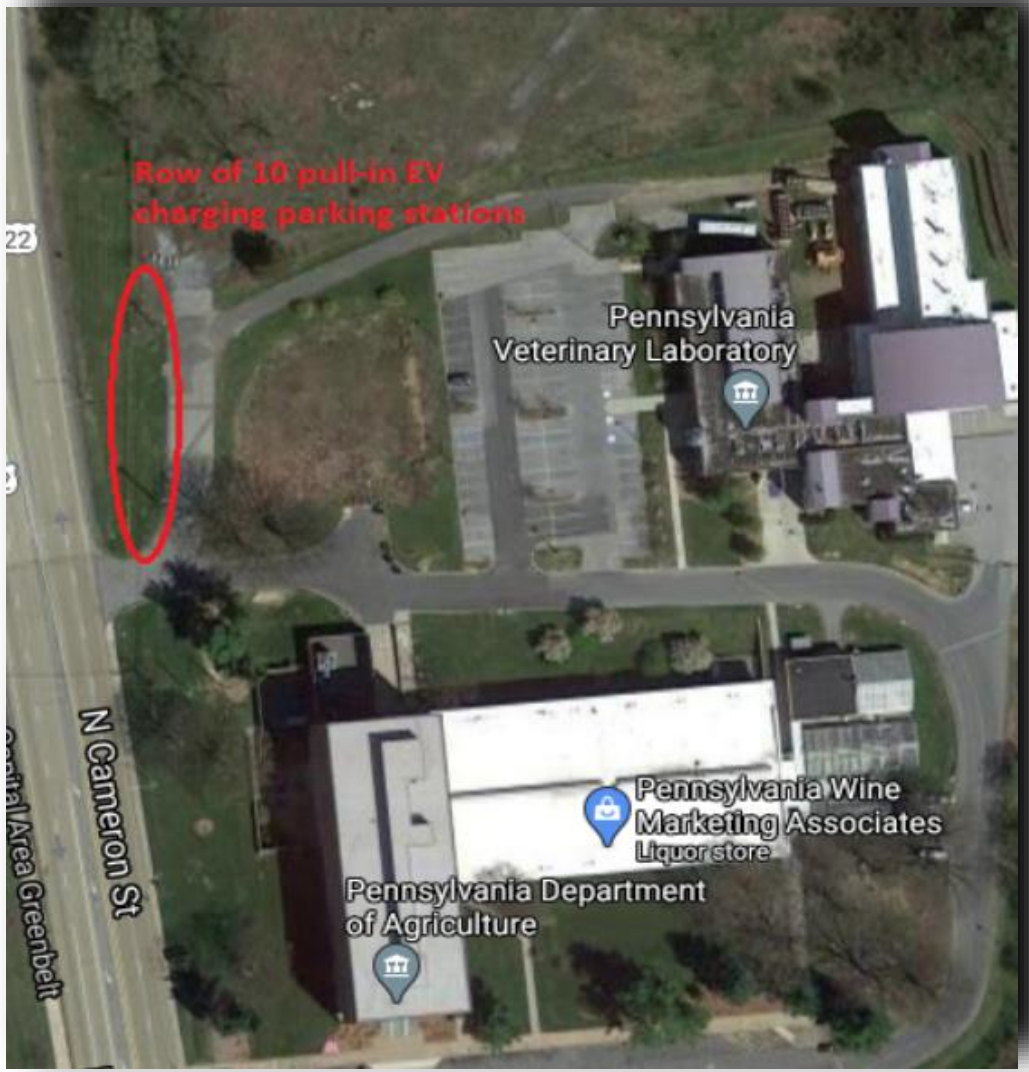
EVs & EV Charging – Project Development



"Make 2022 a Robust EV Charging Delivery Year!"

- **Identify Ideal Locations** for EV Charging Stations Based on Vehicle Assignments
- **Summarize Project Site Specifics** Including Equipment Needed & Installation Recommendations
- **EVSE Contract Now Available** through DGS Procurement!

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Electric Vehicle Education - Benefits

Financial Savings

- Lower energy costs – kWh to gasoline
- Greatly improved mileage per gallon (MPG) or MPG equivalent
- Longer expected vehicle service life

Lower Emissions

- Battery only vehicles offer zero emissions
- Plug-in hybrid vehicles can offer zero emissions
- Hybrid vehicles offer greatly reduced emissions

Reduced Maintenance

- Longer intervals between service
- Regenerative braking yields longer brake life
- No engine service in battery only vehicles

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Electric Vehicle Education - Types

Battery Electric Vehicle (BEV)

- Powered solely by an electric battery – no gasoline engine
- Plug-in charging only, can travel 100-300+ miles on battery
- Zero emissions

Plug-In Hybrid Electric Vehicle (PHEV)

- Powered by an electric battery and gasoline engine
- Utilizes plug-in charging, can travel 10-50 miles on battery
- Low-emissions

Hybrid Electric Vehicle (HEV)

- Powered by an electric battery and gasoline engine
- Cannot utilize plug-in charging, can travel 2-3 miles on battery
- Low emissions

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Electric Vehicle Education – Charging Levels

Level 1

- Power provided by a standard 110V AC wall outlet
- Typical charging rate of 4-5 miles per hour of charge
- Not recommended for business use

Level 2

- Power provided by a standard 208/240V AC outlet
- Typical charging rate of 12-30 miles per hour of charge

DC Fast Charging

- Power provided by a high power 400-900V DC circuit
- Typical charging rate of 3-20 miles per minute of charge

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Electric Vehicle Education – Charging Best Uses

Level 2

- **BEV overnight charging**
- **Opportunity charging when dwell time is greater than an hour**
- **Pool vehicle charging**

DC Fast Charging

- **Charging during long-distance travel**
- **Meeting demands of quick charging needs**
- **Medium & heavy-duty fleet vehicle charging**

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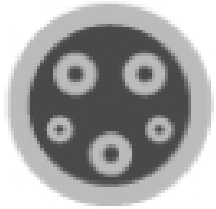
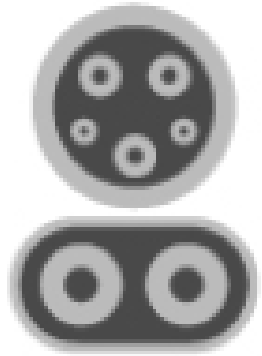
Electric Vehicle Education – Charging Plug Types

SAE J1772 Connector (J-Plug)



- Standard in all plug-in vehicles sold in North America (excluding Tesla)
- Supports Level 1 & Level 2 charging

Combined Charging System (CCS)



- Utilizes J-Plug in addition to 2 high speed charging pins
- Supports DC Fast Charging
- CCS is becoming the industry standard

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- Formed through partnership of Japanese manufacturers
- Supports DC Fast Charging
- May be phased out in the US

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Electric Vehicles – Charging Limitations & Considerations

- **Vehicles have varied on-board charging limitations**
- **Charging infrastructure investments have impacts on charging times, vehicle choices and policy decisions**
- **Incorporation of retail sector DC Fast Charging into business operations is critical to increased EV successes**

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Electric Vehicle Education – Full Charging Times

Level 2 Full Charge Times			
Model	**7.2 kW 40 Amp**	**9.6 kW 50 Amp**	**19.2 kW 100 Amp**
Chevrolet Bolt	**9** Hours	**8.5** Hours	**8.5** Hours
Ford F-150	**13.5** Hours	**10** Hours	**5** Hours

- **Chevrolet Bolt is limited to 7.7 kW Level 2 charging**
- **Ford F-150 can accept up to 19.2 kW Level 2 charging**
- **Note that pricing differences between charging equipment with higher output is negligible**

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Electric Vehicle Education – Charging Rates

Vehicle Battery Data				Maximum Charge Rate	
Model	**Battery Capacity**	**Range (Full Charge)**	**Vehicle Efficiency**	**Level 2**	**DC Fast Charging**
Chevrolet Bolt	**65** kWh	**259** Miles	**4** Miles/kWh	**7.7** kW **30.6** Miles/Hour	**55** kW **36.5** Miles/10 Min.
Ford F-150	**98** kWh	**230** Miles	**2.3** Miles/kWh	**19.2** kW **45.0** Miles/Hour	**150** kW **58.7** Miles/10 Min.

- **The Ford F-150 has a larger battery but is less efficient due to its size**
- **The Chevrolet Bolt has a greater range but cannot charge as quickly**
- **DC Fast Charging delivers dramatically faster charging rates**
- **Highest kW delivery should be considered when delivering charging stations**

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Electric Vehicle Education – Retail DC Fast Charging

Miles Gained in 30 Minute Charge		
Model	**DC Fast Charging (55 kW)**	**DC Fast Charging (150 kW)**
Chevrolet Bolt	**110** Miles	**110** Miles
Ford F-150	**65** Miles	**176** Miles

- **Chevrolet Bolt is limited to 55 kW DC Fast Charging**
- **Highest rate DC Fast Charging chargers should be utilized for the F-150**

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Electric Vehicle Education – Business Use

Daily Trip Use

- **Vehicle should be plugged in overnight to be fully charged for morning travel**
  - **Level 2 charging is recommended for this use**
  - **Charger will shut itself off when battery is full**

- **One-way trip distance should be less than half of the vehicle's total range, unless:**
  - **The driver knows they can stop at a DC Fast Charging location**
  - **Level 2 charging is available at the driver's destination**

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Electric Vehicle Education – Business Use

Overnight Trip Use

- **Drivers can easily cover longer trips by utilizing charging maps, apps and tools such as:**
  - **PennDOT's 511pa.gov for publicly accessible charging locations along the route**
  - **Others such as: ElectrifyAmerica, PlugShare & vehicle on-board charging maps**

- **Drivers should NOT go out of their way for Level 2 charging unless necessary as it necessitates longer wait times than DC Fast Charging**
  - **Level 2 charging cannot provide range as quickly as DC Fast Charging**
  - **Level 2 charging may be utilized once at your destination**

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Electric Vehicle Education – Infrastructure

Charging Station Projects

- Deliver projects in facilities with large numbers of owned fleet vehicles
- Select electrical equipment & conduit to support future growth
- Select charging equipment with the highest charge rates possible
- When upgrading building electrical systems, plan for future EV charging needs

Agency Sharing

- Encouraged when charging stations are accessible
- Encouraged when other agencies visit for meetings
- 1 hour of guest charge may cost a quarter!

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Electric Vehicle Education – Infrastructure

DEP Charging Rebates

- **Current rebate: $3,000 per plug or 50% of project cost (Based on whichever is the lesser cost)**
- **Must apply for rebates PRIOR to project start**
- **Cap of $100,000 per applicant**

Networked Charging

- **Networked capability and 3rd party contracts add significant costs to charging projects**
- **Network alternatives should be considered such as Wi-Fi capability**
- **The Commonwealth cannot "vend" good & services such as power**

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Electric Vehicle Education – Payments & Billing

Retail Payments

- Bureau of Vehicle Management is working with vendors on fleet payment solutions
- Payment cards, fobs and smart phone apps are all being considered
- No timeframe is currently set as the market is rapidly changing as charging networks expand

Commonwealth-Owned Chargers

- Agency to agency charger sharing is strongly encouraged
- Agency to agency billing or funds transfers are not recommended due to low cost of charging
- Chargers not available for personal use vehicles

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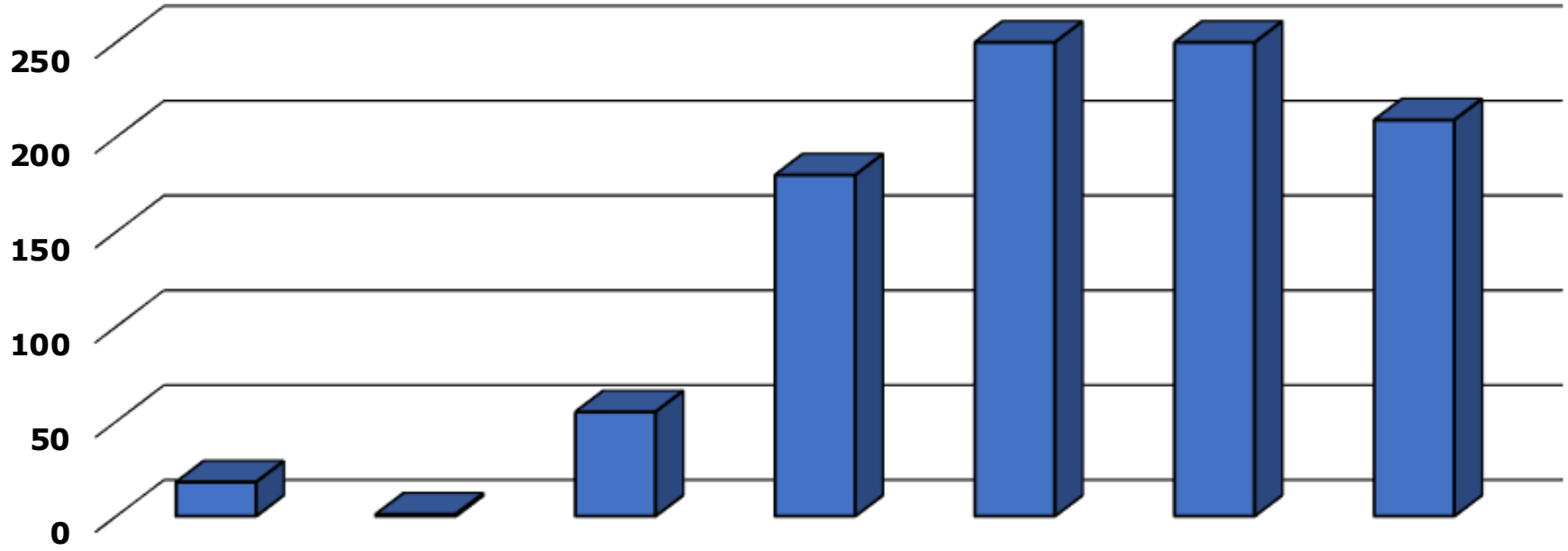
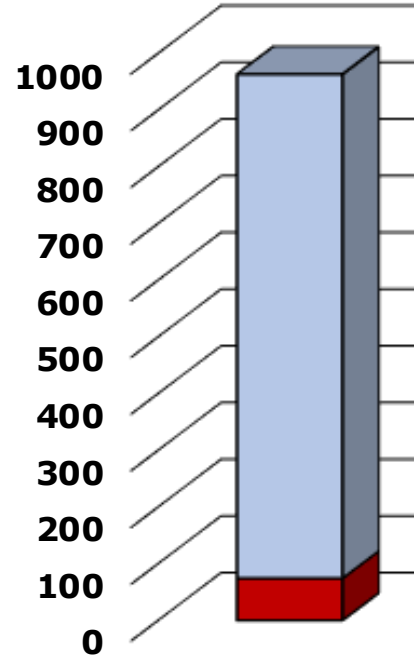
Charging Plug Annual Delivery Projected 963 Unit Goal

Year	2019	2020	2021	2022	2023	2024	2025
Count	18	1	55	180	250	250	209
Percentage Complete	1.87%	1.97%	7.68%	26.38%	52.34%	78.30%	100%

EV Plug Delivery Status

Count	Percentage
74 of 963	7.68%





2021 Progress: 74 Plugs Total

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EVs & EV Charging – High Efficiency Vehicles

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DEPARTMENT OF GENERAL SERVICES

Bureau of Vehicle Management
Low-Emission Vehicles on State Contract

Segment	Year	Make	Model	Fuel	Procurement
Compact/Midsize Sedan (10)	2022	Chevrolet	Bolt EUV	BEV*	New**
	2022	Chevrolet	Bolt EV	BEV*	Carryover
	2022	Honda	Accord EX Hybrid	HEV	New**
	2022	Honda	Accord Hybrid	HEV	Carryover
	2022	Honda	Insight Hybrid	HEV	New**
	2022	Nissan	Leaf S	BEV*	New**
	2022	Nissan	Leaf S Plus	BEV*	New**
	2022	Nissan	Leaf SL Plus	BEV*	New**
	2022	Nissan	Leaf SV	BEV*	New**
	2022	Nissan	Leaf SV Plus	BEV*	New**
Small/Medium SUV (6)	2022	Ford	Escape 4dr	HEV	Carryover
	2022	Ford	Escape 4dr	PHEV*	Carryover
	2022	Ford	Mustang Mach-E 4dr	BEV*	New**
	2022	Honda	CR-V Hybrid	HEV	New**
	2022	Jeep	Wrangler 2-door eTorque	HEV	New**
	2022	Jeep	Wrangler 4-door eTorque	HEV	New**
Mini-Van (1)	2022	Chrysler	Pacifica Hybrid	PHEV*	Carryover
Large SUV (1)	2022	Ford	Explorer 4dr	HEV	Carryover
Light Duty Pickup Truck (8)	2022	Ford	F-150 Lightning SC	BEV*	New**
	2022	Ford	F-150 SuperCrew Hybrid	HEV	New**
	2022	Ford	F-250 Regular Cab XL	Gas,CNG,Pro	Carryover
	2022	Ford	F-250 SuperCrew XL	Gas,CNG,Pro	New**
	2022	Ford	Maverick SuperCrew	HEV	New**
	2022	Ram	1500 Crew Cab eTorque	HEV	New**
	2022	Ram	1500 Quad Cab eTorque	HEV	New**
	2022	Ram	1500 Quad Cab HFE eTorque	HEV	Carryover
Medium Duty Pickup Truck (2)	2022	Ford	F-350 Regular Cab XL SRW	Gas,CNG,Pro	New**
	2022	Ford	F-350 SuperCrew XL SRW	Gas,CNG,Pro	New**
Cargo Van (3)	2022	Ford	E-TRANSIT 350 High Roof	BEV*	New**
	2022	Ford	E-TRANSIT 350 Low Roof	BEV*	New**
	2022	Ford	E-TRANSIT 350 Medium Roof	BEV*	New**
Chassis Cab Van (2)	2022	Ford	E-TRANSIT 350	BEV*	New**
	2022	Ford	E-TRANSIT 350 SRW	BEV*	New**
Chassis Cab Truck (3)	2022	Ford	F-550 Regular Cab XL	Gas,CNG,Pro	New**
	2022	Ford	F-550 SuperCrew XL	Gas,CNG,Pro	New**
	2022	Ford	F-600 Regular Cab	Gas,CNG,Pro	New**

* BEV & PHEV vehicles are specifically mandated within EO2019-01

Continually Improving:

- **Adding High-Efficiency Vehicles** on State Contract through DGS Bureau of Vehicle Management
- **13 Additional Models Added** for 2021/2022 – a 57% increase!
- **36 High-Efficiency Vehicles** Available on State Contract

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Open Forum Question & Answer

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Thank You!!

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