



# Evaluating the Costs and Benefits of Transitioning to Electric Vehicles (EVs) in the State Fleet

## *A Leadership Challenge*

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# Current Initiatives

## *Virginia*

- ❖ Governor Northam Announces \$20 Million Electric School Bus Initiative
- ❖ “Each electric school bus can save districts nearly \$2,000 a year in fuel and \$4,400 a year in reduced maintenance costs, saving tens of thousands of dollars over the lifetime of a bus.
- ❖ The City of Alexandria to test feasibility of electric police cars



# Operating Cost Advantage

*According to the Department of Energy it costs half as much to fuel an electric vehicle per year*

- ❖ Assuming current gas and electricity prices, \$800 - \$1000 less per year to power an EV

*Maintenance Costs are lower*

- ❖ Electric vehicles do not require oil changes and regenerative braking limits brake pad wear, \$100 - \$200 less per year in maintenance cost



# Operating Cost Advantage

Estimated savings per vehicle replacing gas car with an EV:

Savings of **over \$1000** per year



# Up-front Costs are Higher

EVs are more expensive...

- ❖ Longer range mid-size EVs are currently approximately \$10,000 more expensive than mid-size gas-powered cars
- ❖ Suggests a 10-year break-even period to gas car costs factoring in lower fuel and maintenance costs



## Future EV Total Cost of Ownership

- ❖ According to the Department of Energy, EV battery costs (33% of EV vehicle cost in 2019) are expected to halve over the next decade, which is expected to result in close to parity up-front pricing with gas cars

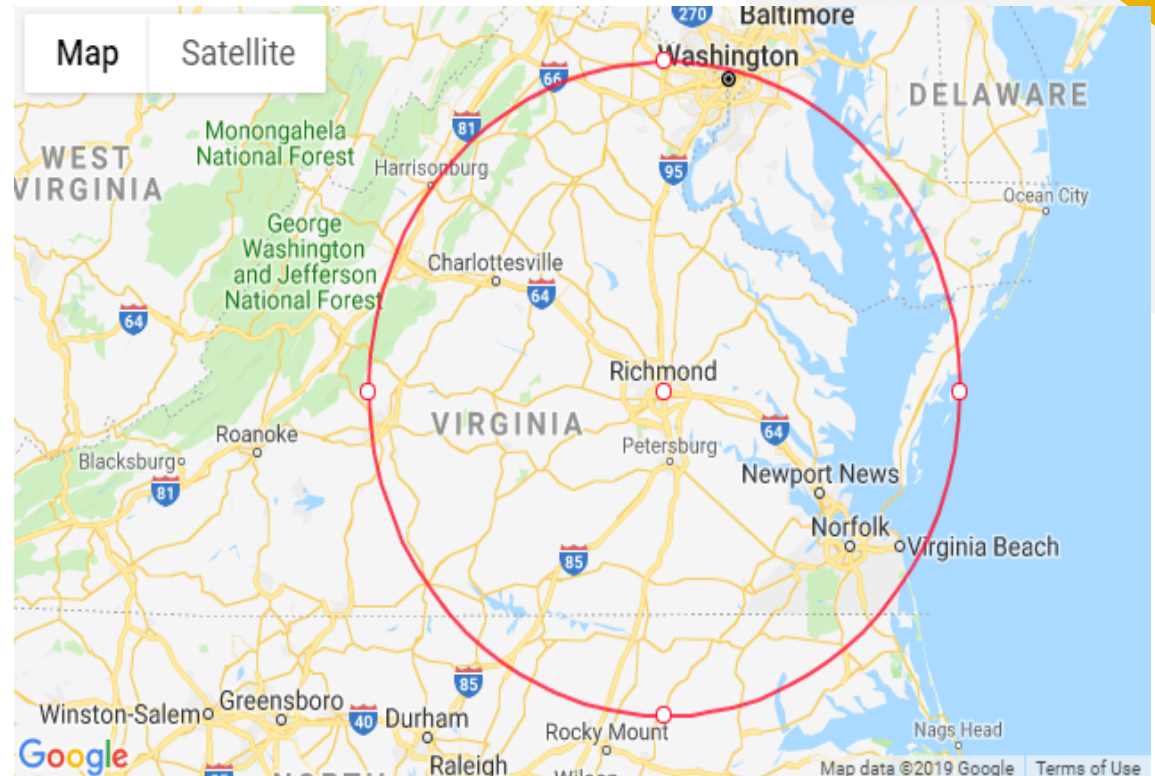


*Cost Advantage of EVs will grow over time*

# Range of EV on Full Charge

- ❖ National average daily driving distance = **30 miles/day**
- ❖ Typical EV distance (full charge) = **200 miles**
- ❖ Using Richmond as the center, a 100 mile drive could reach:

Location	Distance from Richmond
Charlottesville	75 miles
Emporia	70 miles
Fredericksburg	60 miles
Norfolk	95 miles
Williamsburg	60 miles



# Charging Stations – Public Use Cost

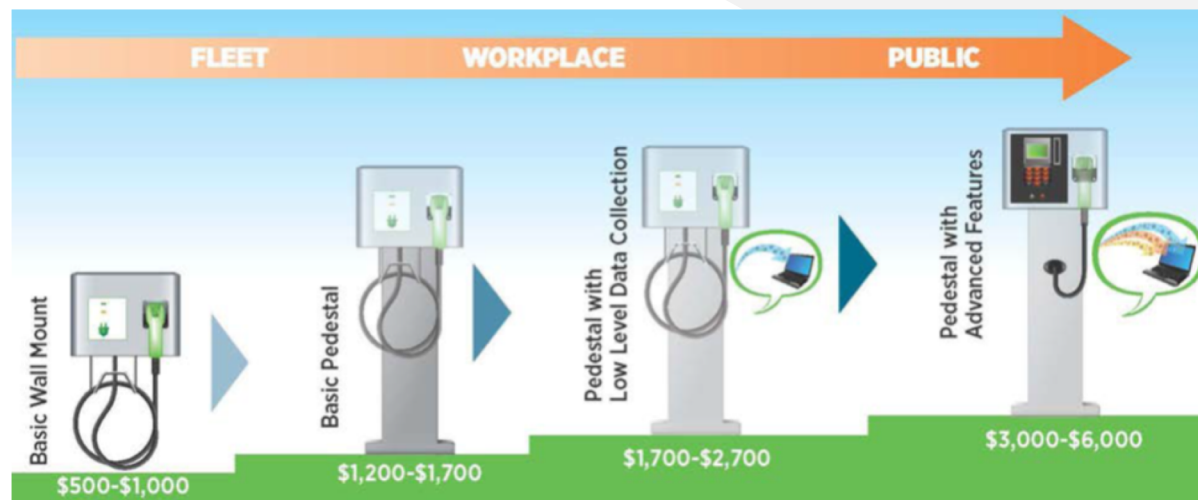
❖ Total number of charging stations in Virginia: **549**

Location	Level 2 Public Charging Stations
Charlottesville	9
Emporia	1
Fredericksburg	6
Norfolk	13
Williamsburg	10

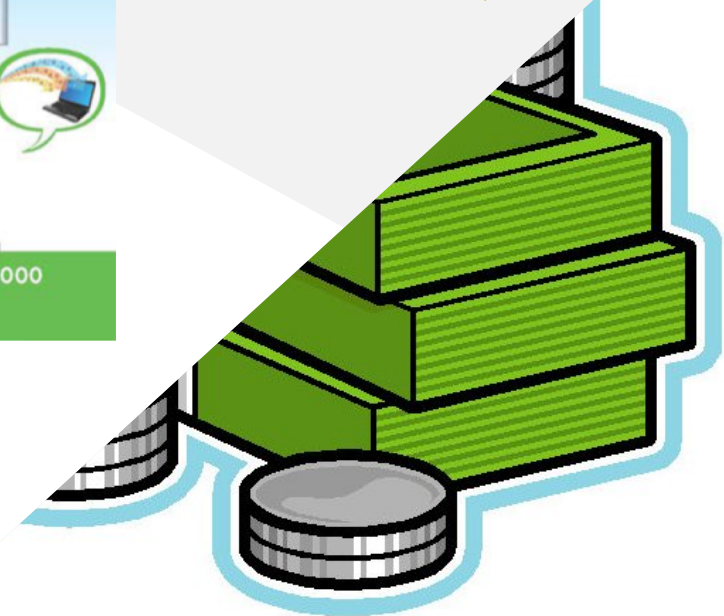




# Charging Stations – State Infrastructure Cost

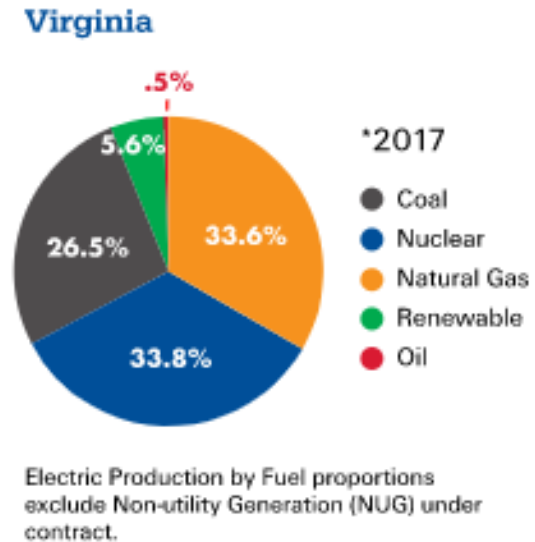
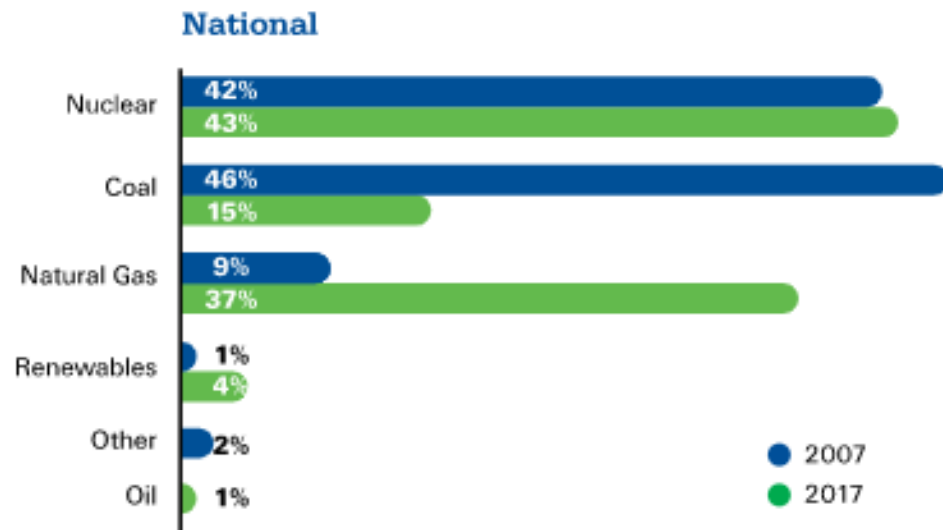


- ❖ Cost of Level 2 charging station for fleet garages: **\$1,000 - \$3,000 / station**
- ❖ Minimum of **3 charging stations** for selected state garages housing EVs



# Environmental Impact

- ❖ Fully battery electric vehicles have zero direct emissions
- ❖ However, supply sources of electric power do have emissions (<https://www.dominionenergy.com/company/making-energy>)



# Environmental Impact: Emissions

- ❖ EPA introduced the “MPGe” (miles per gallon of gasoline-equivalent)
- ❖ Electric cars are 3 to 4 times more fuel efficient than gasoline cars
- ❖ EVs have 25% - 33% of the environmental impact of gasoline cars

Year/Make/Model	Combined MPGe	City/Hwy MPGe
<b>2018 Chevy Bolt</b>	119 MPGe	128 city/110 hwy
<b>2018 Chevy Spark</b>	34 MPG	30 city / 38 hwy
<b>2018 Ford Focus Electric</b>	107 MPGe	118 city / 96 hwy
<b>2018 Ford Focus</b>	35 MPG	30 city / 40 hwy

## Environmental Impact: Reusing EV Batteries

- ❖ EV batteries have 80% storage capacity after normal automobile lifespan
- ❖ Can be used for less demanding tasks:
  - ❖ Storing electricity from solar panels
  - ❖ Conserving power from electrical grid during peak hours
  - ❖ Provide backup power for its data center (GM)
  - ❖ Nissan is marketing “The Reborn Light” for street light uses





# Implications for State Workforce

## Demand Factor:

- ❖ Increased critical mass will require new/revised workforce training programs focused on the "transitional" industry cluster needs.

## Strategies:

- ❖ Develop partnership opportunities with transitional industry cluster members on new requirements such as skill set, location, supply chain needs, etc.
- ❖ Explore resource leveraging opportunities with state/local/industry clusters on emerging training needs such as first providers, safety training, etc.



# Implications for State Workforce

## Supply Factor:

- ❖ Increased critical mass will require a new/retrained workforce in this industry cluster

## Strategies:

- ❖ Get in front of skill gap challenge
- ❖ Labor Market Participation Rate versus Unemployment Rate



## Implications for State Workforce

Higher participation rate + Higher employment

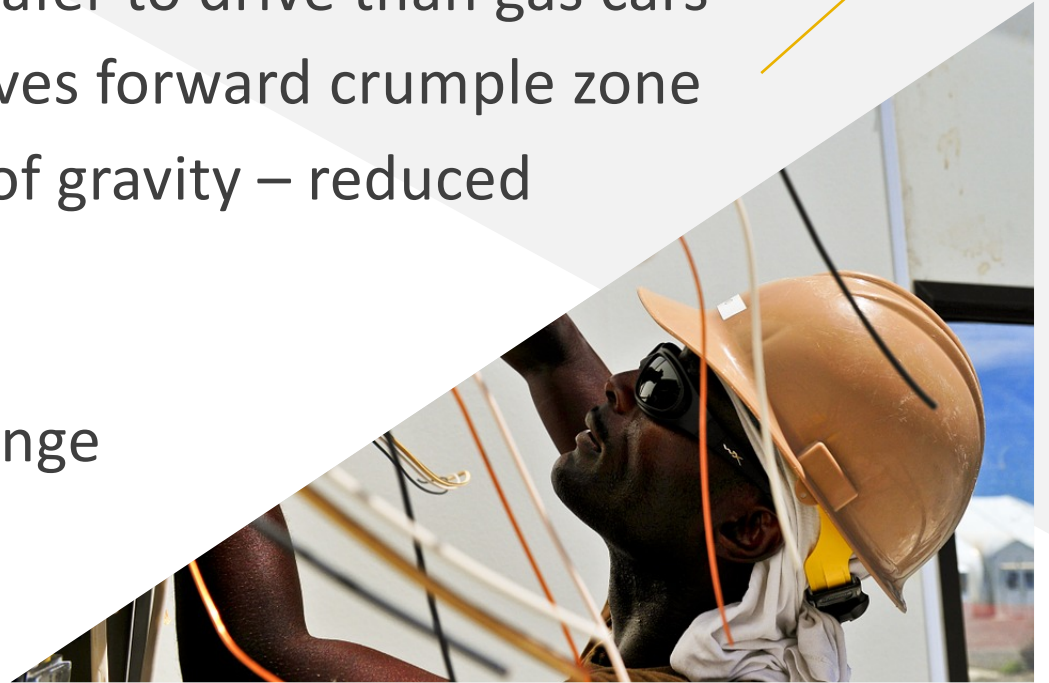
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***New Revenue to the Commonwealth!***



## EVs considered safer than gas cars

- ❖ NHTSA rate EVs just as safe or safer to drive than gas cars
- ❖ Absence of engine block improves forward crumple zone
- ❖ Battery location lowers center of gravity – reduced rollover risk
- ❖ No flammable liquids!
- ❖ Pedestrian safety – still a challenge







## Conclusions and Recommendation

- ❖ Recommend limited/targeted introduction of vehicles and fleet lot charging stations
- ❖ Perhaps 10-15 EVs introduced into state agency service in the Richmond area
- ❖ Gain valuable knowledge of EV driving habits, infrastructure, advantages, and limitations to inform future transition initiatives

## RESOURCES / REFERENCES

- (<https://www.energy.gov/eere/electricvehicles/saving-fuel-and-vehicle-costs>)
- (<https://www.electricchoice.com/electricity-prices-by-state/>),

