Transportation Electrification in Nevada

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Southwest Energy Efficiency Project (SWEEP)

1. EV 101: Vehicles, charging & Nevada adoption
2. EV Benefits: Environmental and Economic Benefits
3. EV Mythbusting: Getting your EV facts straight
4. EV Policy Driving Adoption: Local and State Action
5. Utility Role in Transportation Electrification
6. EV Fees: funding road infrastructure

1. EV 101

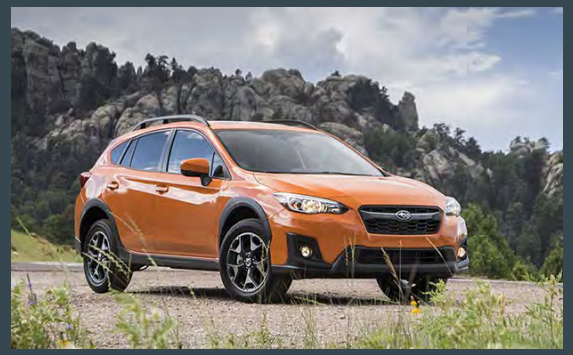
Two types of EVs:

1. Battery Electric Vehicles (BEV): electric motor
2. Plug-in Hybrid Electric Vehicles (PHEV): electric motor + gasoline engine

2018 Nissan LEAF (BEV)
151 miles electric range
$29,990 MSRP

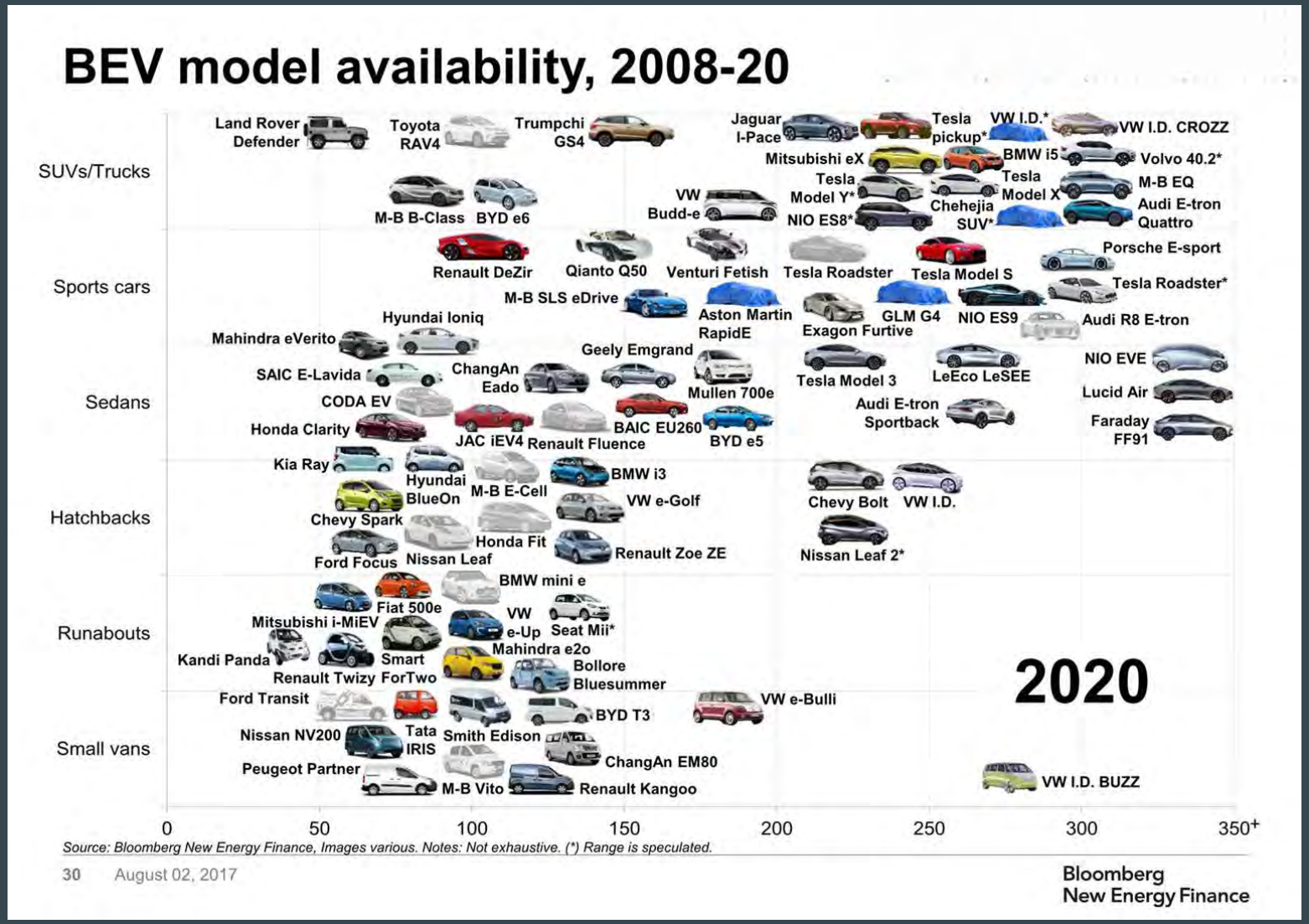
2018 Toyota Prius Prime (PHEV)
25 miles electric range, then 54 mpg gasoline
$27,300 MSRP

Automaker Investment in Electric Vehicle Development

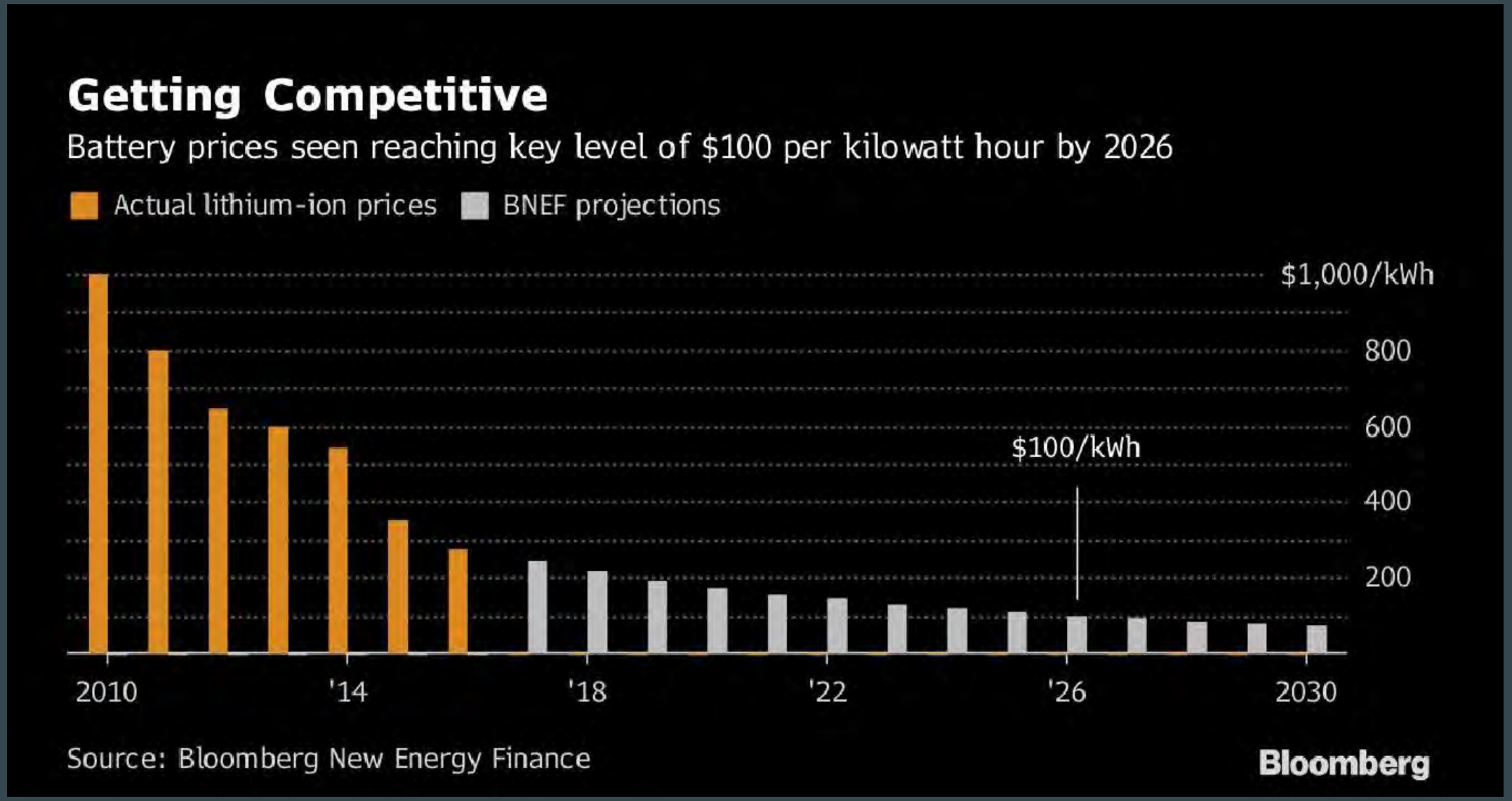


- **Ford** will invest $4.5 billion in electrified vehicles by 2020: including a 300 mile range fully electric SUV and a F-150 hybrid
- **GM** recently laid out a bold vision for a "zero crashes, zero emissions, and zero congestion" future, announced plans for 20 new electric vehicles by 2023 – including two by 2019, and rolled out the acclaimed Chevy Bolt across the U.S.
- **Toyota** committed to having at least 10 new models of all-electric vehicles by the early 2020's
- **Daimler AG** announced a billion dollar investment to build electric vehicles in the U.S. with production starting in the early 2020's
- **BMW** reached 100,000 in global electric vehicle sales while promising a dozen new models of electric vehicles by 2025
- **Fiat-Chrysler** to electrify portfolio (Wards Auto, July 2017)
- **Volvo** announced that "all the models it introduces starting in 2019 will be either hybrids or powered solely by batteries" (New York Times, July 2017)

Nearly 100 electrified models by 2022



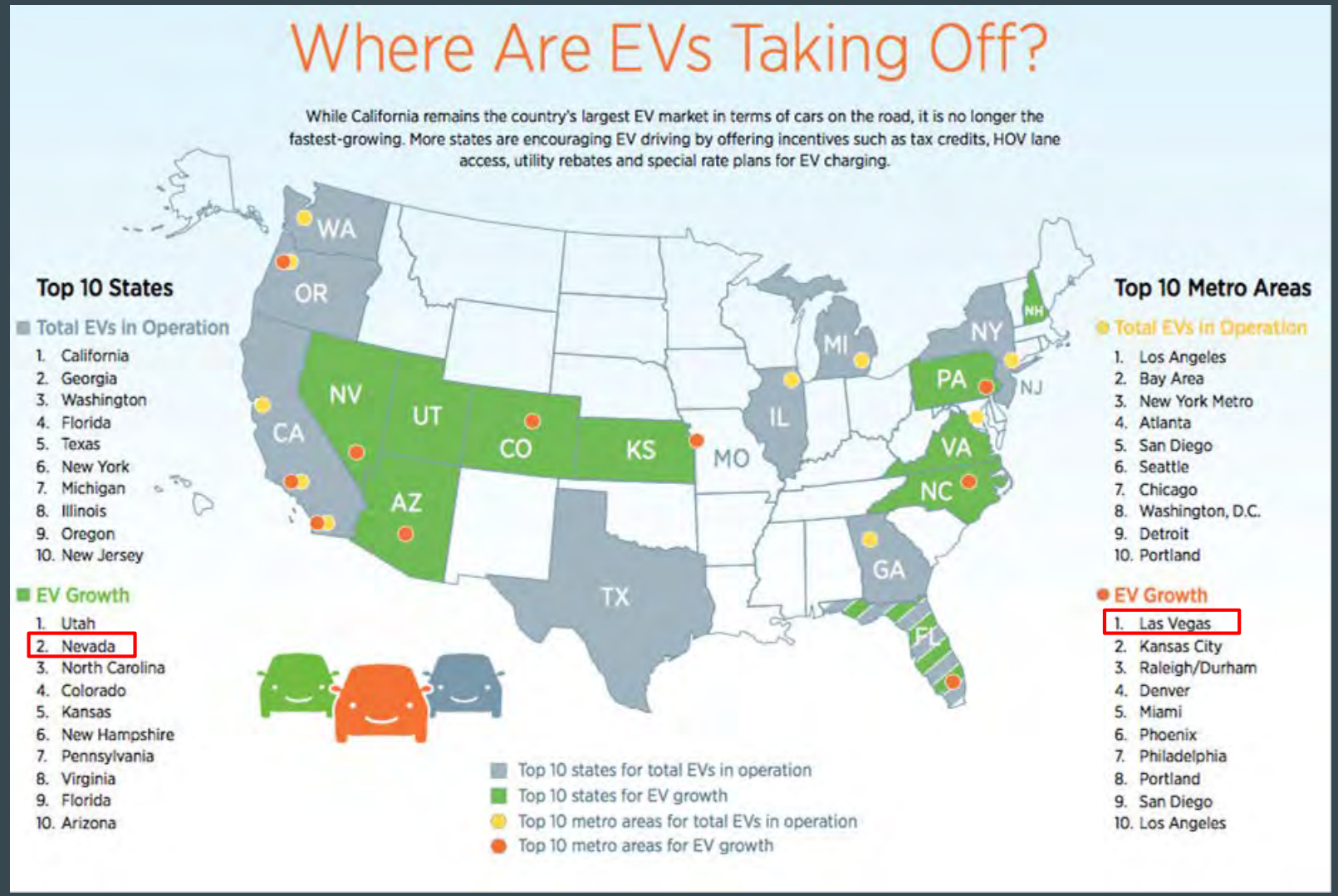
EV battery prices falling



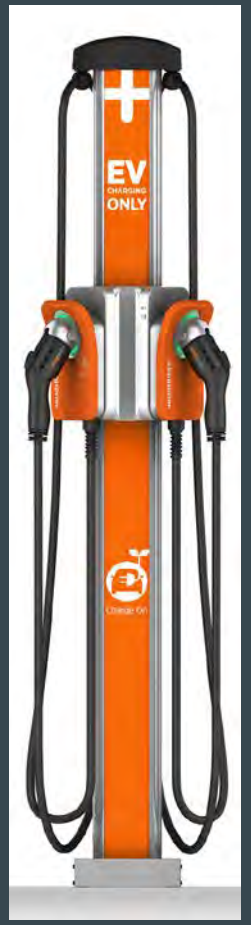
EV sales in Nevada

- 5,100 EVs sold in NV to date
- Growing EV markets across the Southwest:

EV market share	2017	2018	YOY growth
Nevada	0.68%	1.20%	75%
Utah	0.78%	1.22%	56%
Colorado	1.53%	1.94%	26%
Arizona	0.66%	1.62%	144%
New Mexico	0.35%	0.66%	89%



Types of EV Charging



Level 1 charging (1-2 kw) – just plug into a regular wall outlet. Can be used for overnight home charging, all day workplace charging

Level 2 chargers (4-22 kW) are **inexpensive** and **can provide grid services** with managed charging.

Level 2 is appropriate anywhere vehicles can stay a few hours:
- residences
- workplaces
- shopping areas
- charging depots

DCFC (50-350+ kW) are **very expensive** and **can't easily provide grid services** with managed charging.

DCFC is appropriate for:
- high-traffic urban centers
- commuting corridors
- stops on interstate highways
- charging depots for TNC fleets
- mass transit

2. EV Benefits: Environmental and Economic Benefits

1. **State economic benefits:** locally produced electricity versus imported oil
2. **Consumer savings:** $900-1,220 per year in fuel & maintenance savings
3. **Air quality benefits:** Emissions reductions for all 6 criteria pollutants
4. **Climate benefits:** As the electricity sector gets cleaner, so do EVs
5. **Energy savings:** EVs are 3x as efficient as gas
6. **Benefit to utilities and ratepayers:** increased load that is easily managed, revenues exceed costs = downward pressure on electricity rates

State economic benefits: sourcing transportation fuel

Nevada: $5.5 Billion of Imported Oil vs Local Renewables

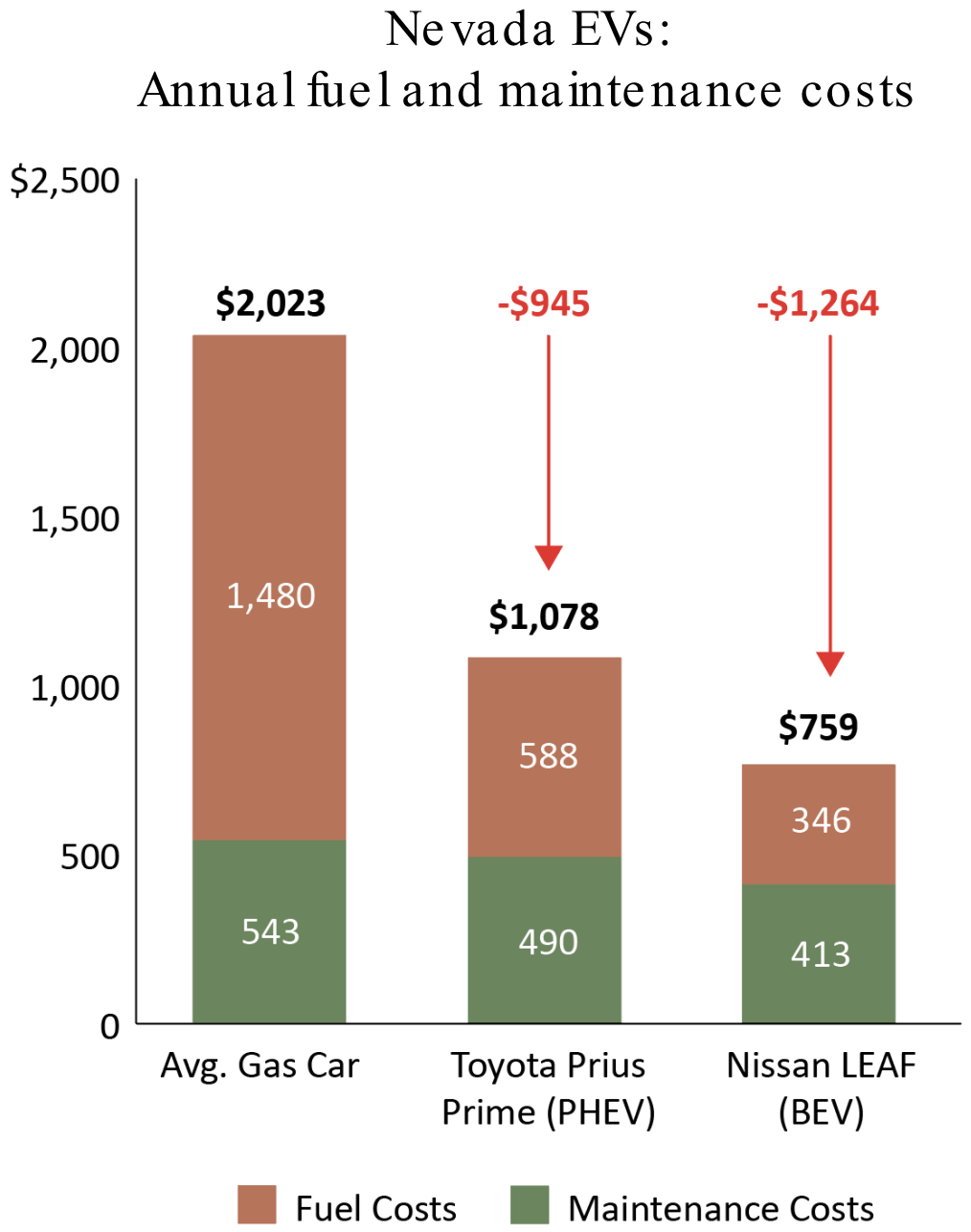
Nevada imports 99.5% of the oil it consumes.

Geothermal (#2 installed capacity)

Solar (#1 solar resource)

Consumers savings & job growth

- EV fuel and maintenance savings
  - Fuel savings: EV charging is equivalent to $1.00/gallon
  - Maintenance: 10-25% cost reduction
  - $720 million annual savings by 2030 if 26% of cars are electric
- CA study: 15% EV market share goal creates 50,000 new jobs.



Clark County's Air Quality

- Clark County got an 'F' for smog in the 2016 State of the Air
- Clark County 15th most polluted county in U.S. for smog (ground-level Ozone)
- Over half of smog forming pollutants are from transportation
- Low-income communities are often most impacted by highway pollution

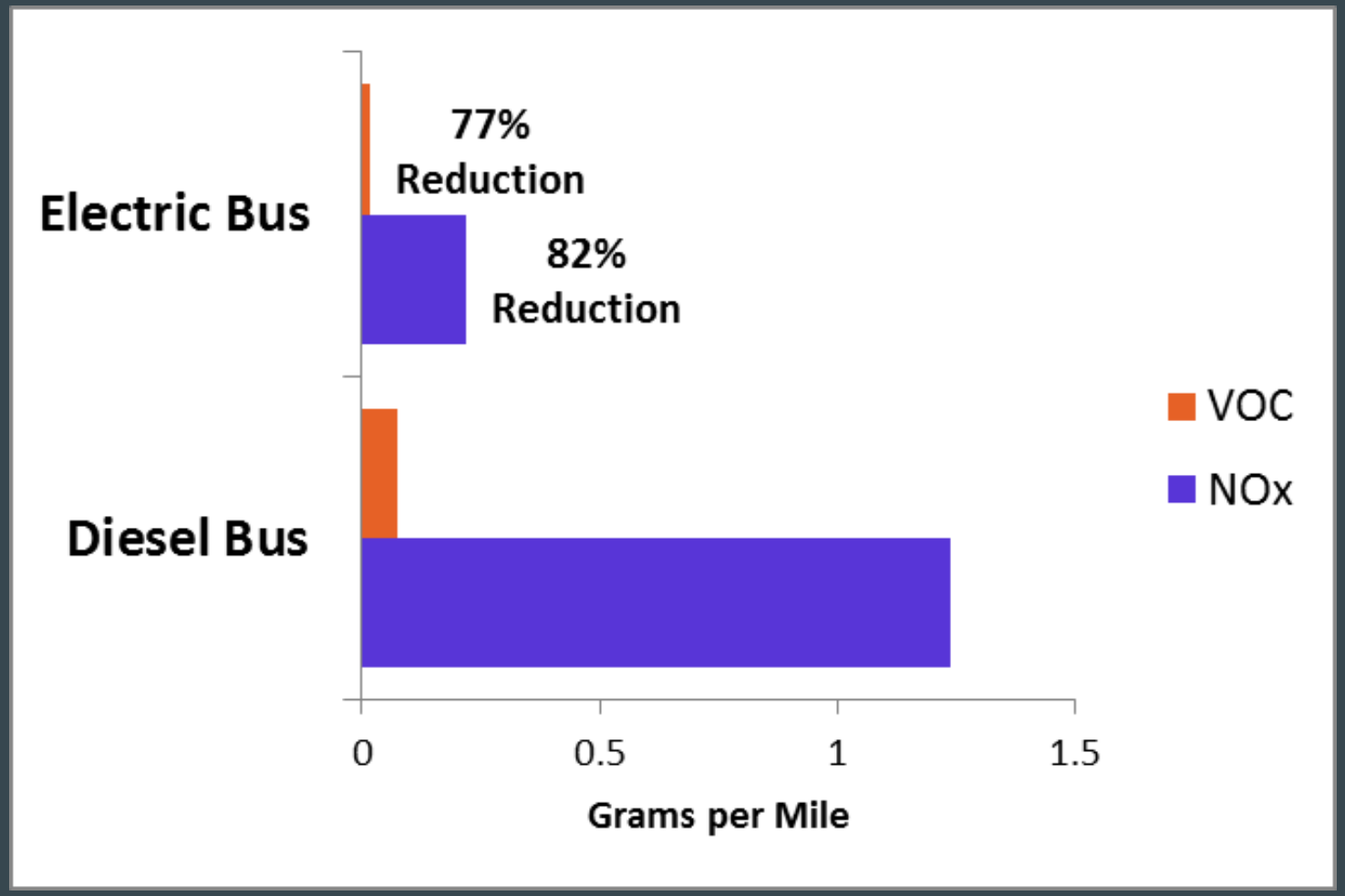
EVs benefit local air quality

How do EVs compare to gas cars on local air pollutants?

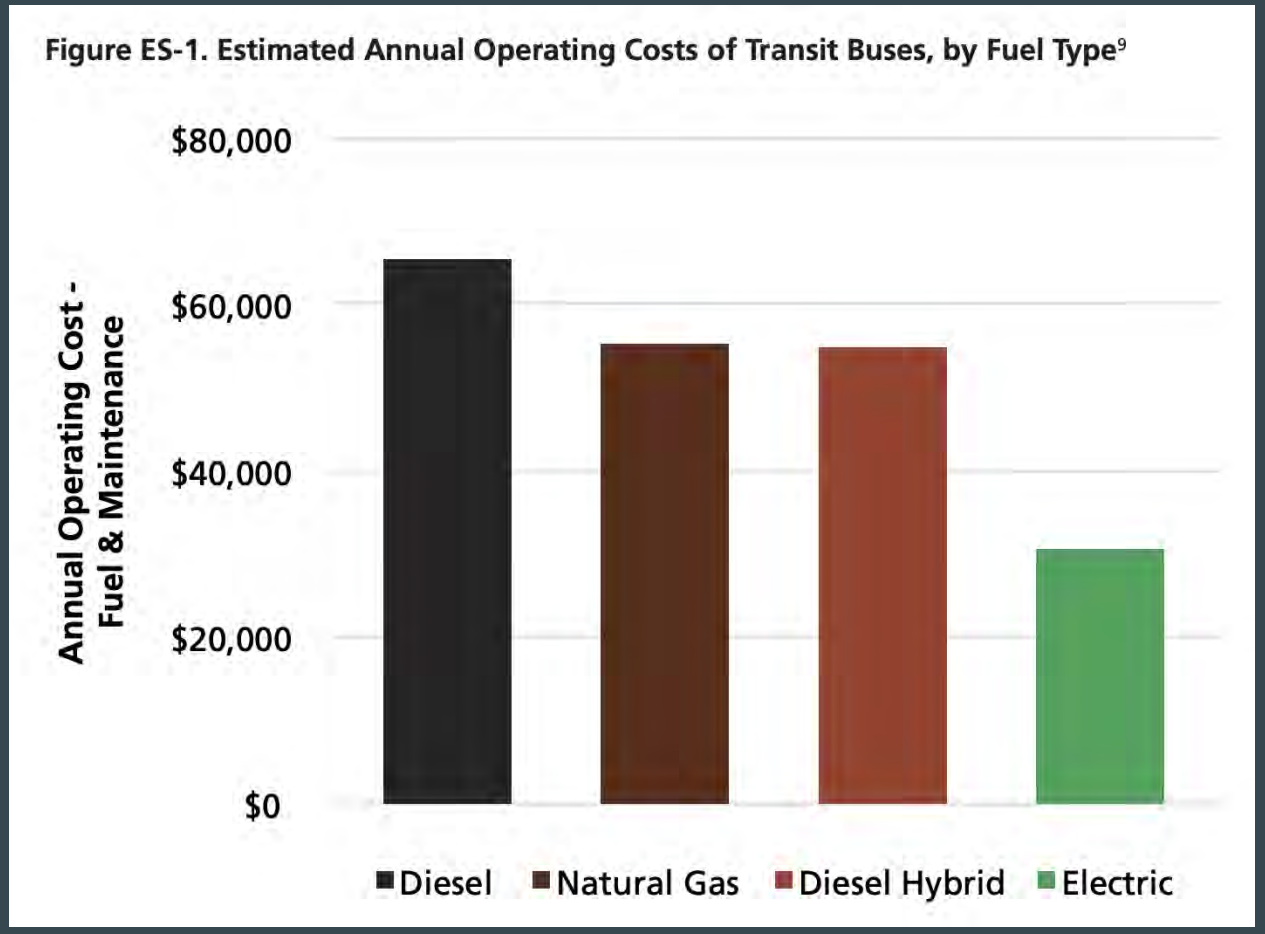
POLLUTANT	PHEV	BEV
VOC*	**-63%**	**-99%**
CO	-49%	-99%
NOx*	**-47%**	**-84%**
PM 10	-18%	-34%
PM 2.5	-31%	-58%
SO2	-26%	-51%
GHG	-44%	-74%

*VOCs and NOx combine to create ground-level Ozone or “smog”, which causes major respiratory issues.

Transit Bus Emissions Comparison



Bus electrification – cleaner air and cost savings

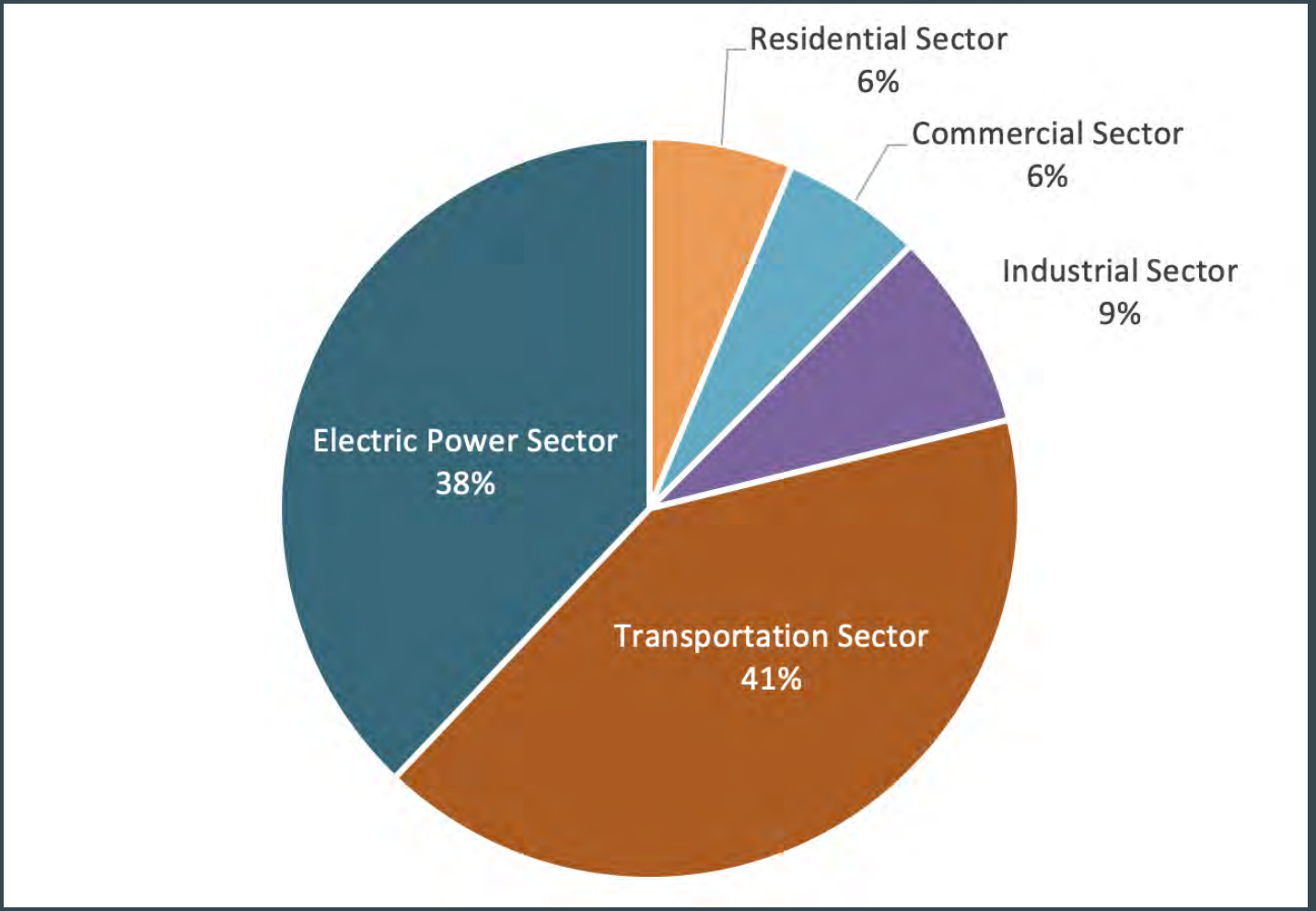


"We see electric vehicles as being the future, replacing conventional gasoline and diesel vehicles," David Jickling, director of public transportation and operations at RTC Washoe

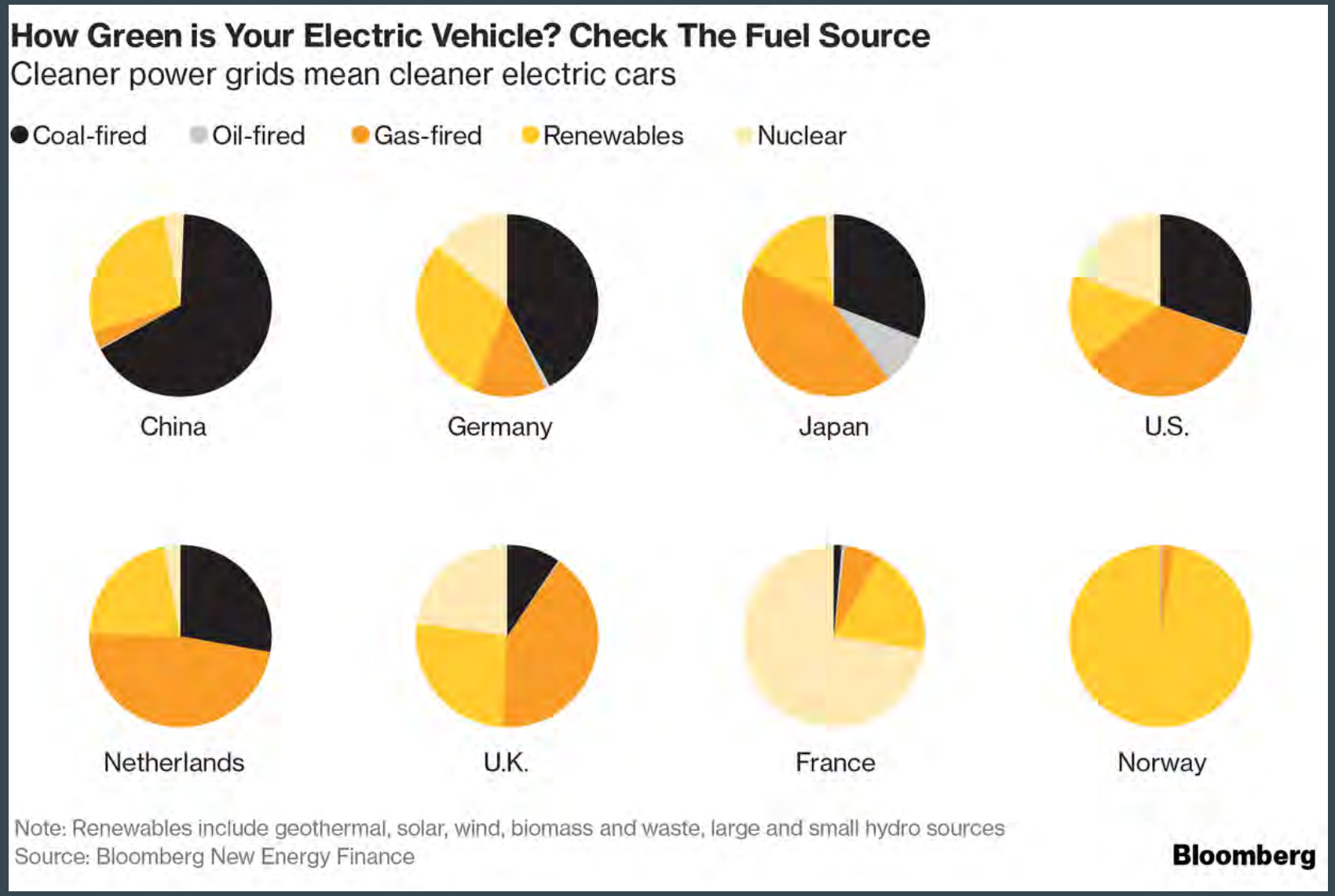
Source – US PIRG , Electric Buses Study, May, 2018

Transportation now largest source of GHGs in U.S.

Nevada: CO2 emissions by sector (2016)



EVs are only as clean as their electricity grids



Nevada

Natural gas: 70%

Renewables: 20%

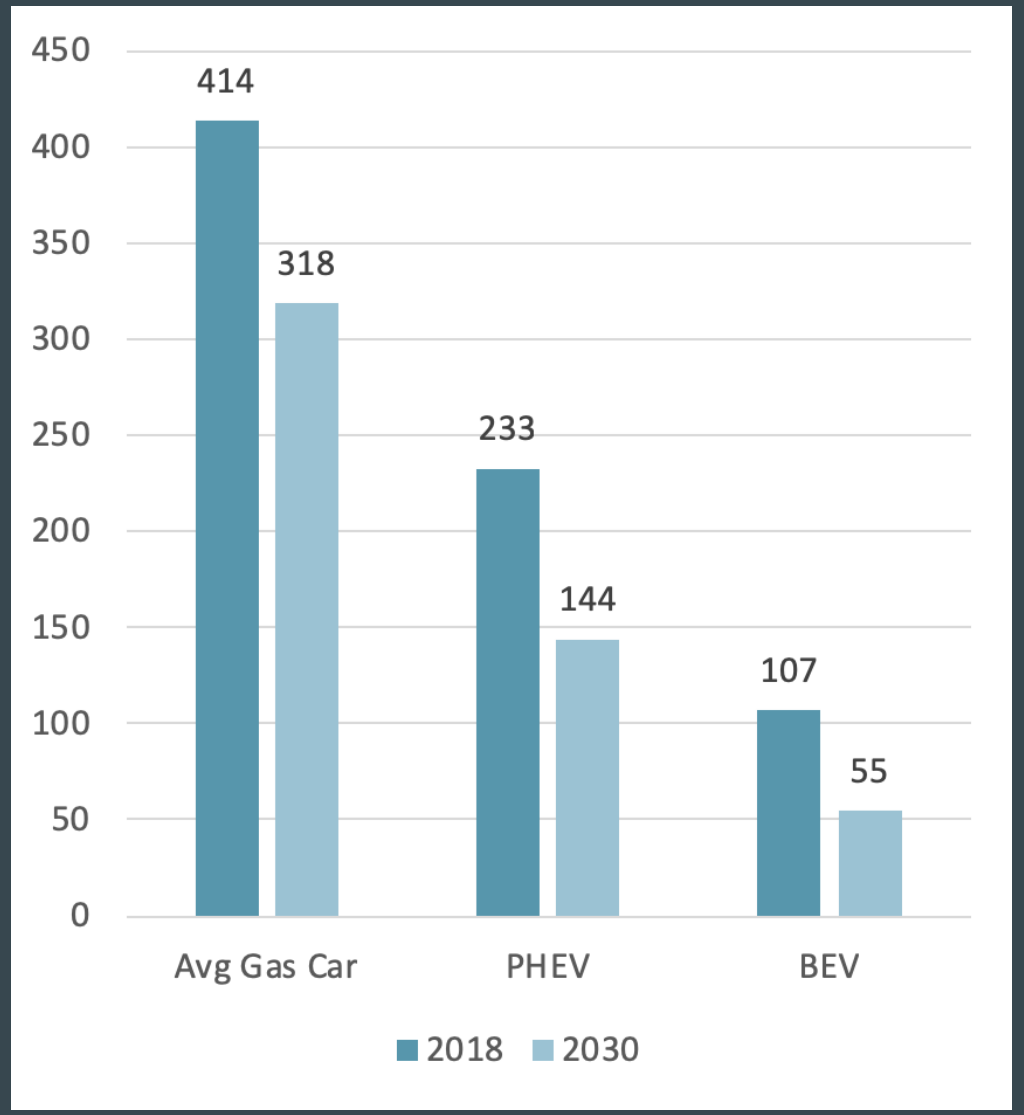
Hydroelectric: 5%

Coal: 5%

EV Climate Benefits

How do EVs compare to gas cars on GHG emissions?

- EVs get cleaner each year alongside the electricity grid
- PHEV: Toyota Prius Prime GHGs:
  - -44% in 2017 (=46 mpg gas car)
  - -55% in 2030 (=78 mpg gas car)
- BEV: Tesla Model 3 GHGs:
  - -74% in 2017 (=101 mpg gas car)
  - -83% in 2030 (=207 mpg gas car)

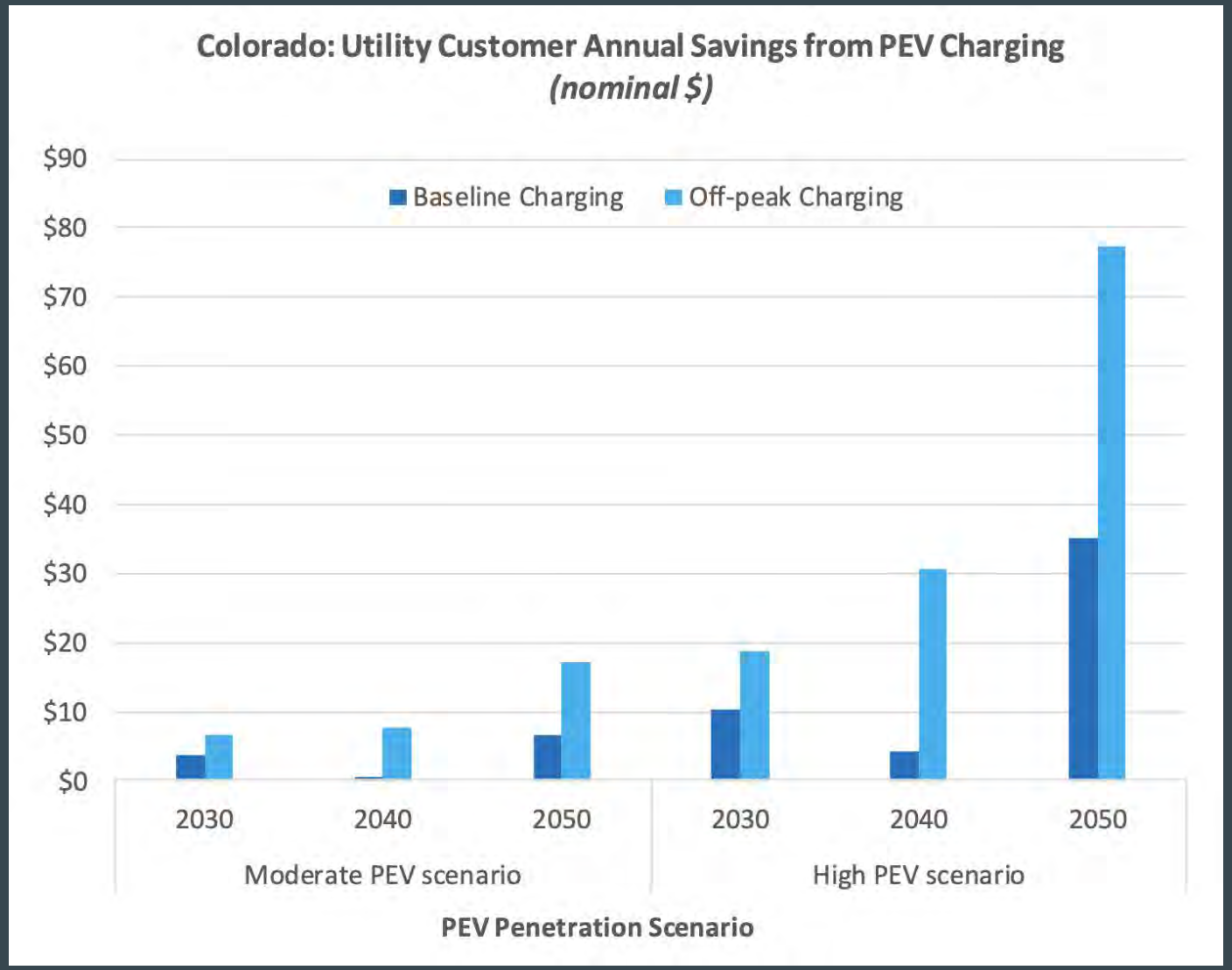


GHG emissions (g/mile)

Getting EVs on the road benefits all utility customers

1. Enough spare capacity to power all cars off-peak.
2. Charging is flexible and can be managed to absorb variable renewable generation.
3. Greater grid efficiency puts downward pressure on electric rates leads to reduced electric bills and savings for all electricity customers.

Example: Cost benefit analysis of EVs to Colorado grid



Source: MJ Bradley cost benefit study, 2017

Who opposes EVs?

- **EV Revolution Could Wipe Out $21 Trillion In Oil Revenue**
  - Irina Slav - May 23, 2018, from oilprice.com
- **Utilities, oil interests clash over EV policy at conservative policy summit**
  - Utility Dive, April 30, 2018
- Big oil and the Koch affiliated groups like Americans for Prosperity have begun significant efforts to spread anti EV myths and oppose state and federal EV policy

3. Misinformation on EVs

- MYTH: “EVs just substitute dirty coal for gasoline”

  TRUTH: EVs are cleaner than gas vehicles everywhere in the US. In Nevada, EVS are far cleaner - 99% lower VOC, 84% lower NOx, GHG emissions = car getting 101mpg in 2017 and increases to 207mpg in 2030.

- MYTH: EVs are are just a toy for the rich

  TRUTH: Many EVs cost less than the average new car sold. Average new vehicle is $36,000+. Prius Prime PHEV, Nissan Leaf around $20,000 - 22,500 after federal tax credit.

Affordable EVs on the market (2018)

	EV Model	Price after tax credit	Incremental Cost*
1	Chevrolet Bolt (BEV)	$ 29,995	$ 5,395
2	Chevrolet Volt (PHEV)	$ 26,595	$ 1,995
3	Fiat 500e (BEV)	$ 25,495	$ 895
4	Ford Focus Electric (BEV)	$ 21,620	**$(2,980)**
5	Ford Fusion Energi (BEV)	$ 23,900	**$ (700)**
6	Honda Clarity (PHEV)	$ 25,900	$ 1,300
7	Hyundai Ioniq (BEV)	$ 22,000	**$(2,600)**
8	Hyundai Ioniq (PHEV)	$ 17,450	**$ (7,150)**

	EV Model	Price after tax credit	Incremental Cost*
9	Kia Soul EV (BEV)	$ 26,450	$ 1,850
10	Kia Niro (BEV)	$ 20,400	**$(4,200)**
11	Kia Optima (PHEV)	$ 27,710	$ 3,110
12	Mini Cooper SE Countryman (PHEV)	$ 29,400	$ 4,800
13	Mitsubishi Outlander (PHEV)	$ 27,095	$ 2,495
14	Nissan LEAF (BEV)	$ 22,490	**$(2,110)**
15	Toyota Prius Prime (PHEV)	$ 19,800	**$(4,800)**
16	Volkswagen e-golf (BEV)	$ 23,845	**$ (755)**

*Incremental cost compared to the average gas-powered vehicle price in 2018 = $24,600

More Myths

2018 Mitsubishi Outlander (PHEV)

- MYTH: EVs are just for small sedans.

  TRUTH: There are already SUVs available (Chrysler Pacifica, Mistubishi Outlander PHEV, Hyundai Kona BEV), will be 19 more models by 2021

- MYTH: EVs are responsible for declining gas tax revenues

  FACT: EVs in Nevada have had less than one tenth of one percent (<0.1%) impact on gas tax; inflation and fuel economy have much larger impact

Major barriers to EV adoption

1. The upfront cost is coming down, but still more expensive than gasoline vehicles
2. People need to know that charging infrastructure is available
3. Automakers provide limited model availability, many dealers discourage EV buyers
4. There is a huge gap in consumer awareness of EVs (though AAA surveys shows that more than 20% want to buy one)

4. Policy Driving Adoption!

- Zero emission vehicle standards and ICE bans
- Purchase incentives: national and state
- Infrastructure investments
- EV building codes
- Utility EV programs
- HOV/HOT lane incentives
- State and local fleet procurement
- Education/outreach efforts

China has first national ZEV standard; GM has proposed a US national standard

Chinese new energy vehicle mandate is modeled after California ZEV

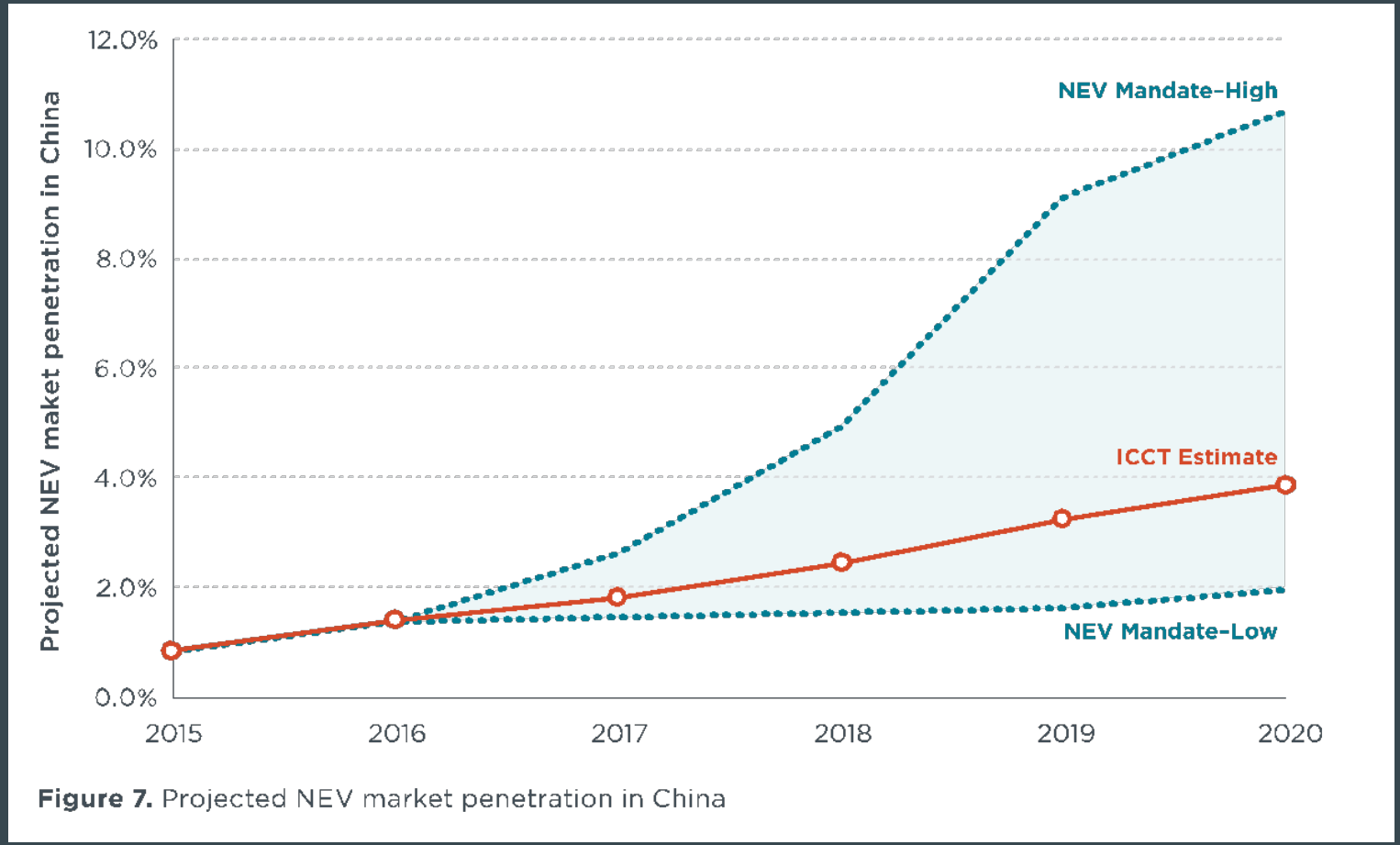


Figure 7. Projected NEV market penetration in China

Countries planning to ban ICE vehicles (17 countries, 22 cities)

Country	Ban announced	Ban commences	Scope	Selectivity
Austria	2016	2020[4]	Gasoline and diesel	New vehicle sales
China	2017	2040[4]	Gasoline and diesel	Production & New vehicle sales
Costa Rica	2018	2021[4]	Gasoline and diesel	New vehicle sales
Denmark	2018	2030 [a] 2035 [b] [14]	Gasoline and diesel	New vehicle sales
France	2017	2040[15]	Gasoline and diesel	New vehicle sales
Germany	2016	2030[16]	Combustion engine	New vehicle sales
India	2017	2030[17]	Gasoline and diesel	New vehicle sales
Ireland	2018	2030[18]	Gasoline and diesel	New vehicle sales
Israel	2018	2030[19]	Gasoline and diesel	New vehicle sales
Japan	1996	Ongoing[4]	Incentives	New vehicle sales
Netherlands	2017	2030[20]	All vehicles	New vehicle sales
Norway	2016	2025[4]	Gasoline and diesel	New vehicle sales, buses are exempt[21]
Portugal	2010	Ongoing[4]	Incentives	New vehicle sales
South Korea	2016	2020[4]	Incentives	New vehicle sales
Spain	2017	Ongoing[4]	Incentives	New vehicle sales
Taiwan	2018	2040[22]	Non-electric	New vehicle sales
United Kingdom	2017	2040 - England, Wales, Northern Ireland[23] 2032 - Scotland[24]	Gasoline and diesel	New vehicle sales

Nevada opportunity to consider ZEV

- Clean Air Act allows states to adopt CA ZEV standards – 10 other states have done so; Colorado is considering
- Requires automakers to gradually increase sales of EVs
- Can be adopted by administrative rule-making or legislation
- Practical impact – more models of EVs, more marketing, more automaker support for pro EV state policies

VW eGolf (BEV) is one of several EVs that are only available in ZEV states.

EV Purchase incentives

- $7,500 federal tax credit
  - Federal tax credits begin to phase out after 200k vehicles sold (Tesla, Chevy, Nissan)
- State rebates and tax credits

State	Maximum Rebate	Notes
California	$5,000	California Clean Vehicle Rebate Project; subject to an income cap of $204,000 for individuals and $300,000 for joint filers. No current expiration date
Colorado	$5,000	Refuel Colorado. Program expires: 1/1/2022
Louisiana	$2,500	Alternative Fuel Vehicle Tax Credit. (Up to 10% of purchase price.) No current expiration date
Maryland	$3,000	Maryland Excise Tax Credit. Limited to vehicles costing less than $60,000. Program expires: 6/30/2020
Massachusetts	$2,500	MOR-EV Program. Total program budget $12.5 million
New York	$2,000	Drive Clean New York. Total program budget $70 million
Oregon	$2,500	Zero Emission Vehicle Program. Limited to vehicles costing less than $50,000. Additional "Charge-Ahead" rebate of up to $2,500 for low-income residents scrapping a vehicle at least 20 years old. Start date: 1/1/2018

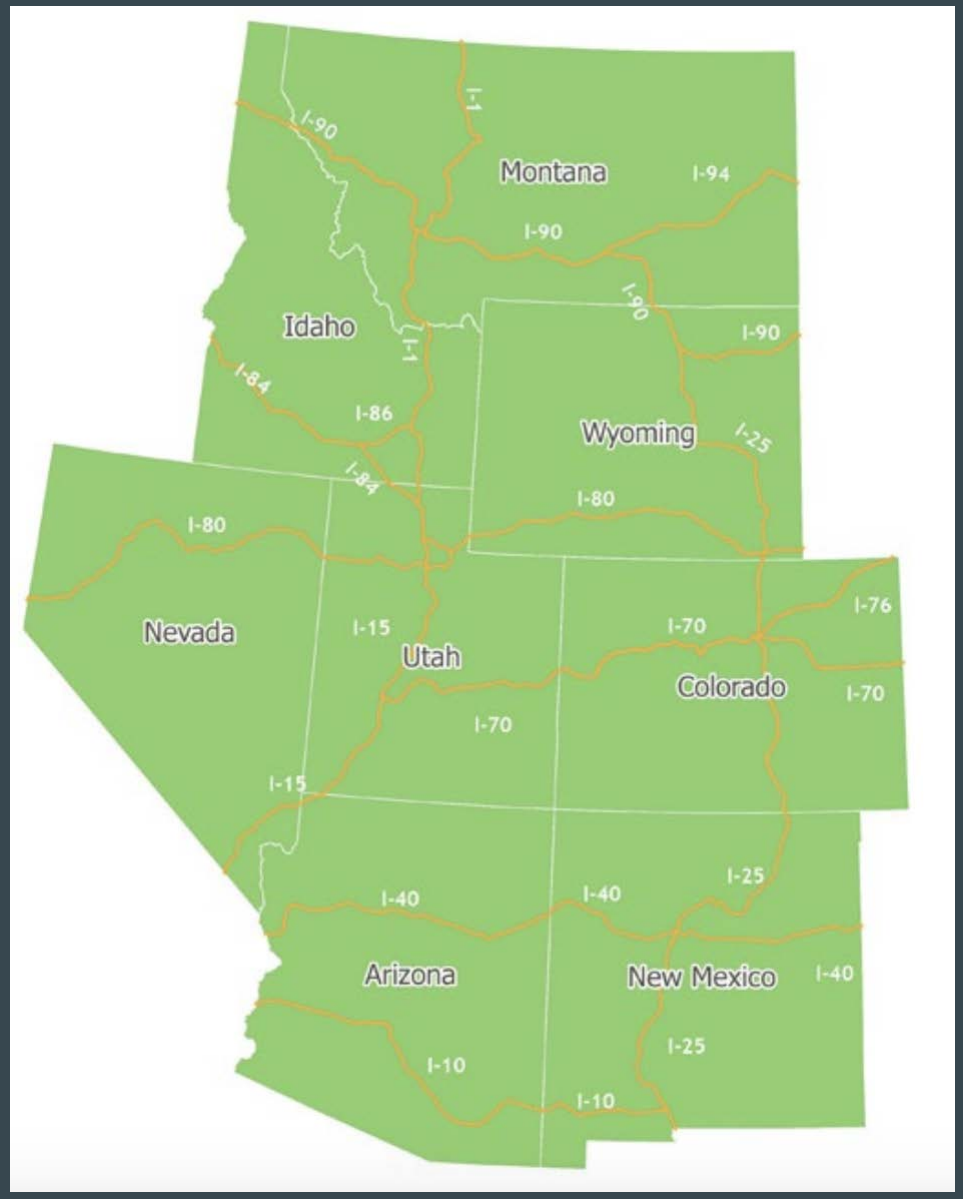
Nevada state purchasing incentive

- States with incentives have higher EV adoption
- Most effective incentives are “cash on the hood” – rebates or sales tax credits
- Most effective incentives are $2,500 or more
- Rebate on state general fund sales tax would be $600-$1,000 for most EVs
- A poll for the Nevada Conservation League found 61% support for sales tax incentive

REV West Plan

MOU between governors of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming

- Interstates 25, 70 and 76 in Colorado;
- Interstates 15, 84, 86, and 90 in Idaho;
- Interstates 15, 90 and 94 in Montana;
- Interstates 15 and 80 in Nevada;
- Interstates 10, 25 and 40 in New Mexico;
- Interstates 15, 70, 80 and 84 in Utah; and
- Interstates 25, 80 and 90 in Wyoming.



Highway Charging Infrastructure

- Network of DCFC charging stations to be completed by 2020
- 38 different locations on US-95, US-93, US-50, I-15, I-80
- VW fund (Electrify America) investments and NV Energy investments

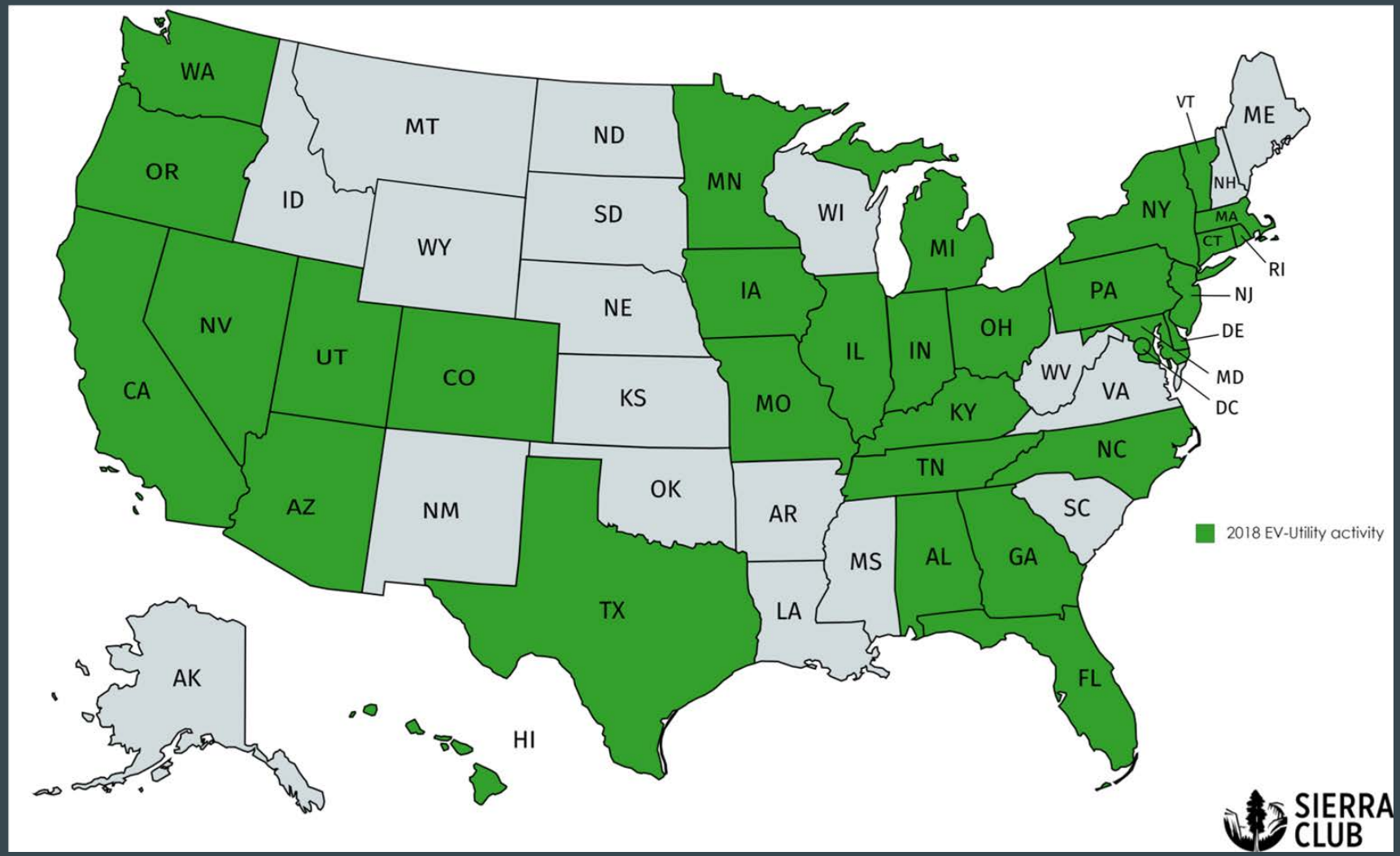
Nevada VW fund allocations

- Nevada will receive $25 million
- 15% ($3.75 million) allocated to EV charging
- 80% allocated to trucks, buses, airport equipment
- First round of funding: $6.6 million, 81% to electric airport ground support equipment

Multifamily charging

- About half Americans live in multifamily housing
- Home charging is key: >80% of charging
- Very challenging to get charging in existing MFU, especially low-income
- Most successful programs are turnkey utility programs, with chargers owned /operated by utility
- Currently in Nevada, there are small rebates for multifamily from NV Energy

5. EV Utility Activity in 2018



Current Nevada utility programs

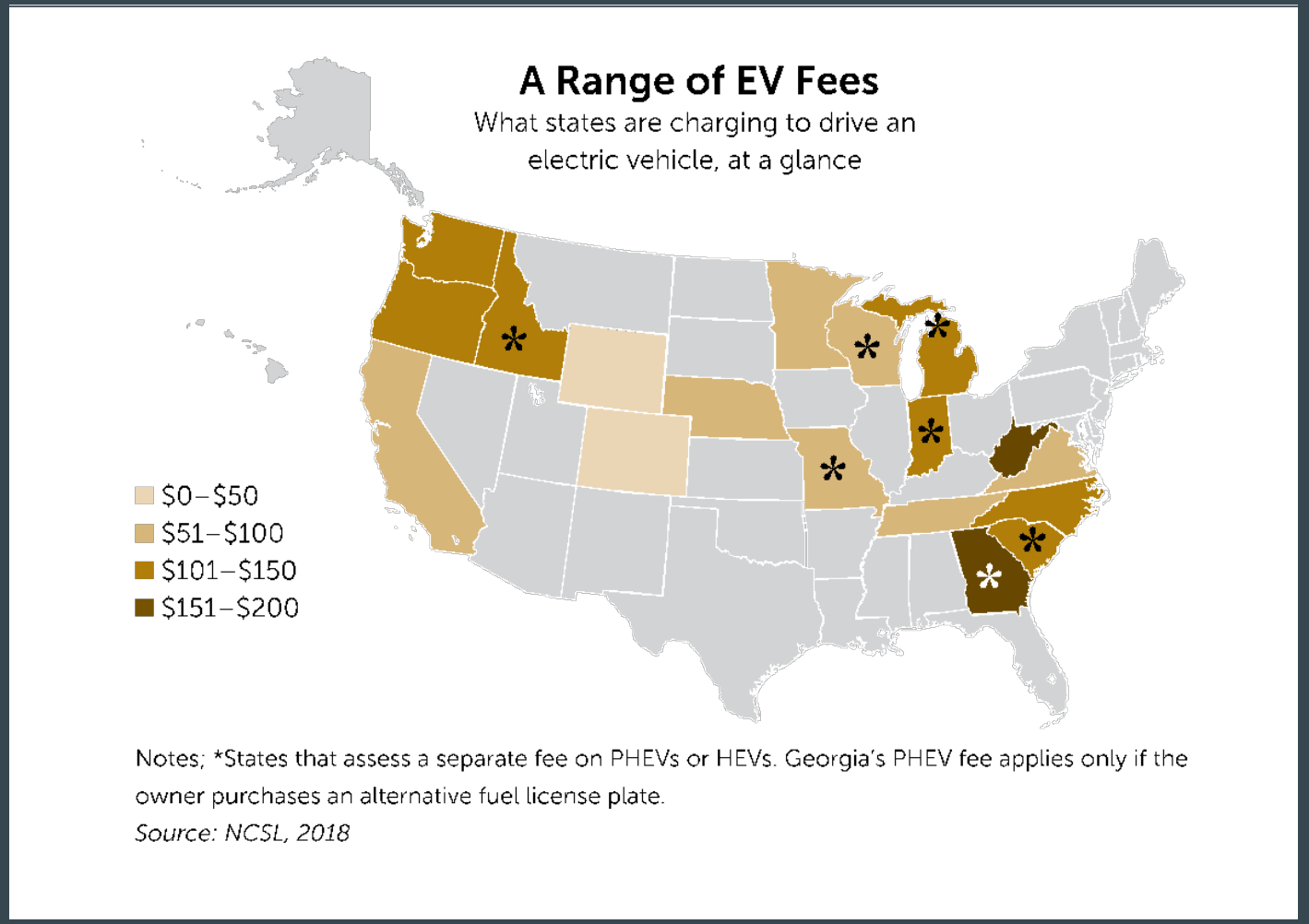
- Electric Vehicle Infrastructure Demonstration Program, pursuant to SB 17-145
- $15 million allocated over 3 years
- Rebates for chargers for fleets, workplaces, multifamily housing
- Custom grant program for projects like electric bus charging
- Support for electric highway program
- Some customer education and outreach
- Potential opportunity – bill to allow/require larger scale utility programs to support electrification

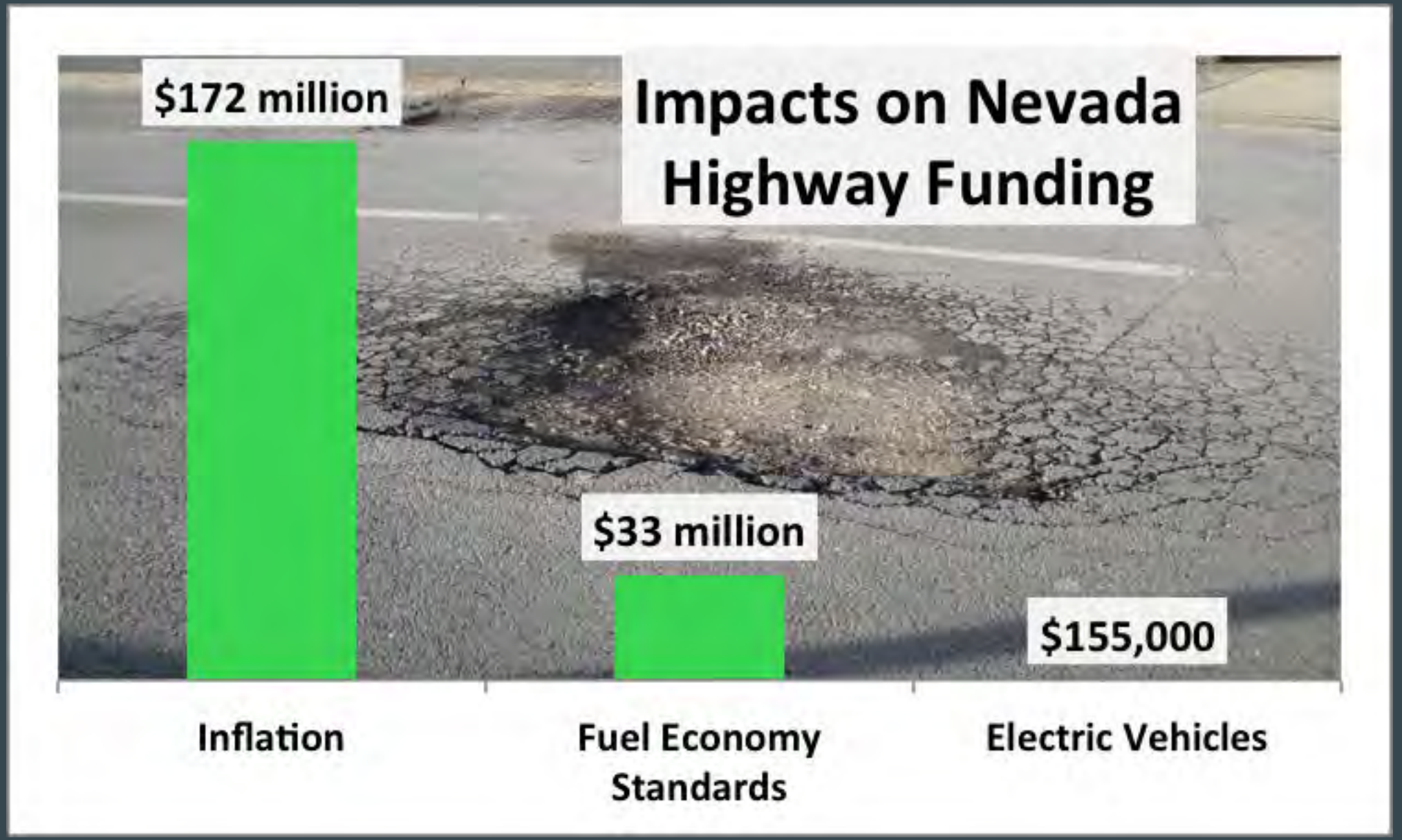
Examples of what utilities could do

- TOU rates/ EV tariffs
- Commercial tariff/demand charge optimization
- Utility rebates for charging infrastructure
- Investment in charging infrastructure where market is not providing
- Investment in electrical service to support charging
- Investment to support electrification of public transit and of ridesharing
- Utility rebates for vehicles; midstream incentives for dealers
- Customer education & outreach

6. EV Fees

How should EVs pay into road funds?




Impacts on Nevada Highway Funding
$172 million
$33 million
$155,000
Inflation
Fuel Economy Standards
Electric Vehicles

EV Fee: Key principles

- EVs should pay a fair share – but right now this is a new technology, in the very early days
- Currently, EVs have no material impact on gas taxes
- EVs should not pay more than efficient gasoline vehicles
- Fees should not be so high that they strangle the market (See: Georgia)
- One approach – energy equivalent fees (pay the same amount/BTU as a gas car does)
- Couple fee with incentives to increase EV sales

Takeaways

- We can’t solve climate change without electrifying transportation
- Market is headed the right direction, but moving way too slow
- Government policy support is essential to speed the transition

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