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Planning Smart Infrastructure to Power Mobility's Future



Mike Usen, Senior Transportation and Environmental Planner, DKS

Shaping a smarter transportation experience.™

Introduction

- 1. What's new in Electric Vehicles (EVs)?**
- 2. What's so smart about EVs?**
- 3. What is EV charging infrastructure?**
- 4. How can EV charging integrate into smart city infrastructure?**

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1. What's new in Electric Vehicles (EVs)?

Transit: Electric Trolleybuses



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1. What's new in Electric Vehicles (EVs)?



Transit: Metro's new battery bus fleet

1. What's new in Electric Vehicles (EVs)?

Light Duty Electric Vehicles

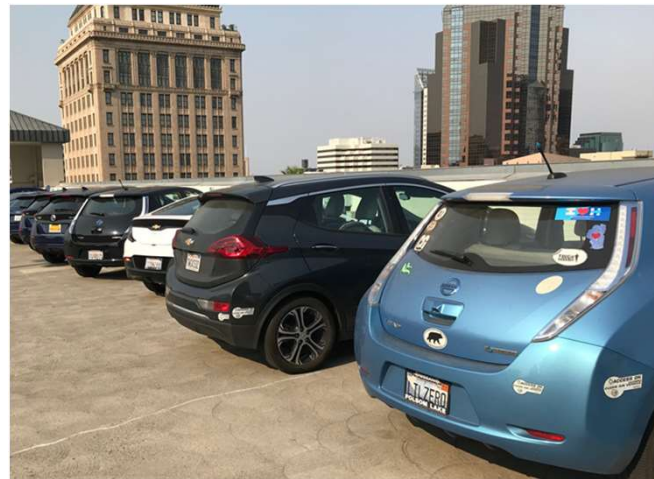


Table 1: Currently (2018) Available Electric Vehicles

Brand	Model	Price	Battery (kWh)	Range (miles)
BMW	i3	\$43,450	33	114
CHEVROLET	Bolt EV	\$37,495	60	238
FIAT	500e	\$31,800	24	84
FORD	Focus Electric	\$29,120	33.5	115
HONDA	Clarity Electric	\$34,290	25.5	89
HYUNDAI	Ioniq Electric	\$29,500	28	125
KIA	Soul EV	\$32,250	30	111
MERCEDES-BENZ	B250e*	\$39,900	36	87
MINI	Cooper SE	\$27,000	23	77
MITSUBISHI	i-MiEV*	\$22,995	16	62
NISSAN	Leaf	\$29,990	40	150
NISSAN	Leaf (1st Gen)	\$30,680	30	107
RENAULT	Zoe	\$31,000	41	186
SMART	Fortwo ED	\$23,800	17.6	100
TESLA	Model 3	\$35,000	55	220
TESLA	Model 3 (Long Range)	\$49,000	75	310
TESLA	Model S 100D	\$94,000	100	335
TESLA	Model S 75*	\$69,500	75	249
TESLA	Model S 75D	\$74,500	75	259
TESLA	Model S P100D	\$135,000	100	315
TESLA	Model X 100D	\$96,000	100	295
TESLA	Model X 75D	\$79,500	75	237
TESLA	Model X P100D	\$140,000	100	289
VOLKSWAGEN	e-Golf	\$30,495	35.8	125
VOLKSWAGEN	e-Up!	\$34,500	18.7	99

Source: EV Rater (<https://evrater.com/evs#ev-list>) Accessed 1/25/18

1. What's new in Electric Vehicles (EVs)?

Medium/Heavy Duty Electric Vehicles

XL Hybrids Ford F-150 upfit



Workhorse E-GEN step van



Thomas Built C2 Jouley



Proterra EV bus



Source: Puget Sound Clear Air Agency

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1. What's new in Electric Vehicles (EVs)?

Future Electric Trucks or Toys

Bollinger B1



Workhorse W-15



Rivian R1T

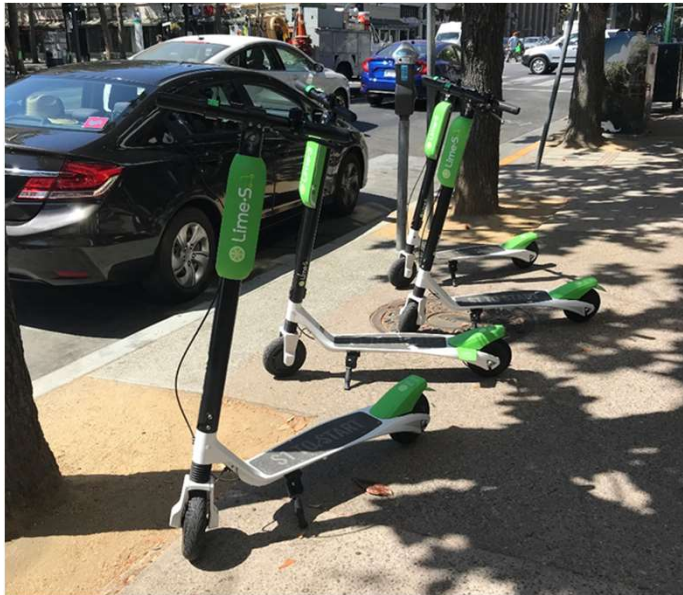


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1. What's new in Electric Vehicles (EVs)?

Electric scooter share

Lime-S electric scooters



Bird electric scooters



1. What's new in Electric Vehicles (EVs)?

Electric Bikeshare

Lime electric bikes



JUMP Bike

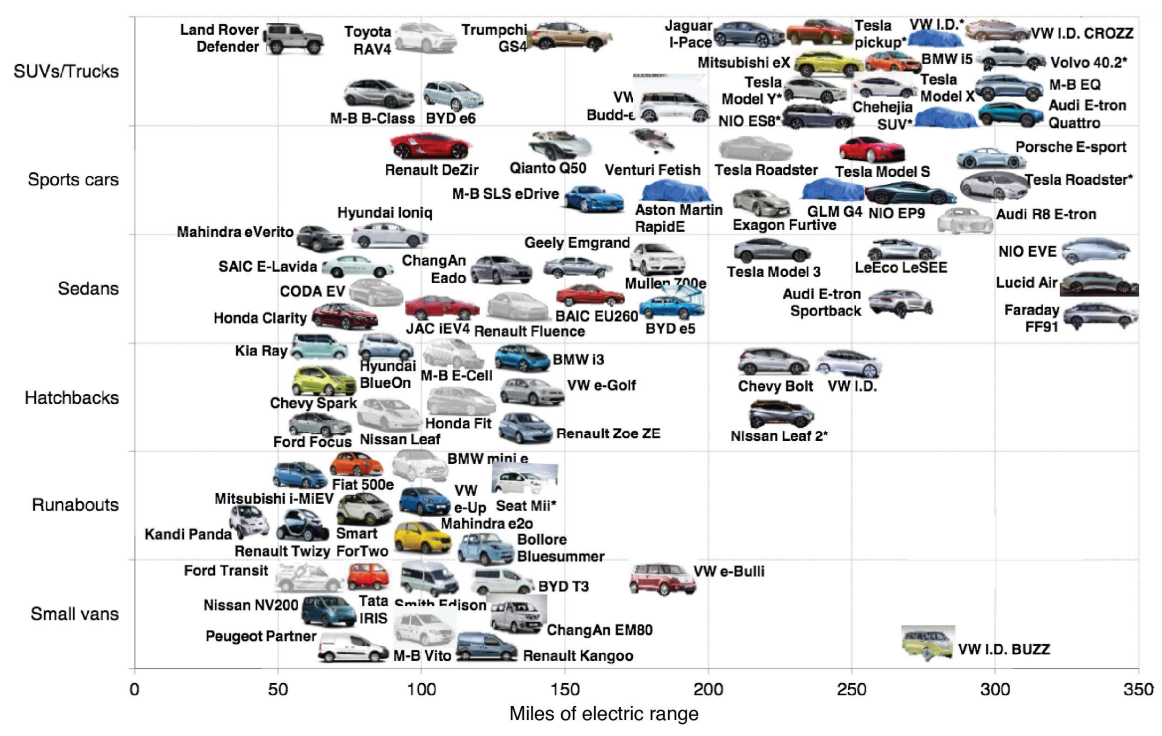




1. What's new in Electric Vehicles (EVs)?

EV Range and Buyer Choice

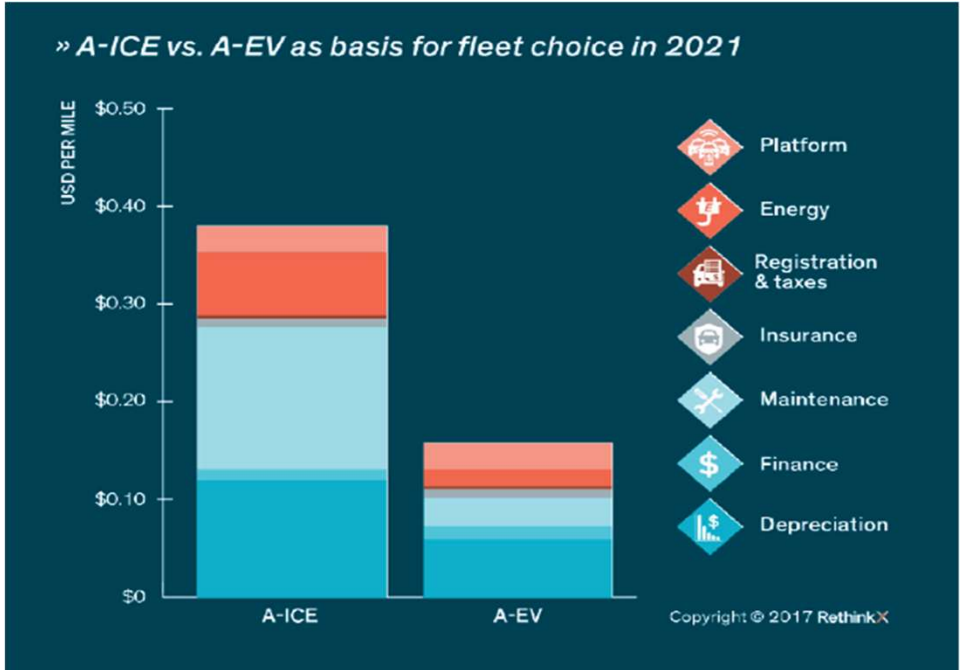
Models by style and range available through 2020



Source: https://i.redditmmedia.com/5tehvhm0F-i_XCOag7ojZeWSCrd2KHFE6YTWC2NQsJg.png?s=2a353cfffdd3c128a26f40c01c9e16641

2. What's so smart about EVs?

Needs and Benefits: Economics



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2. What's so smart about EVs?



2. What's so smart about EVs?

Providing infrastructure to charge Electric Vehicles is the first step in preparing for smart (ACES) mobility:

- **Autonomous**
- **Connected**
- **Electric**
- **Shared**



Navya's Autonom driverless shuttle

2. What's so smart about EVs?

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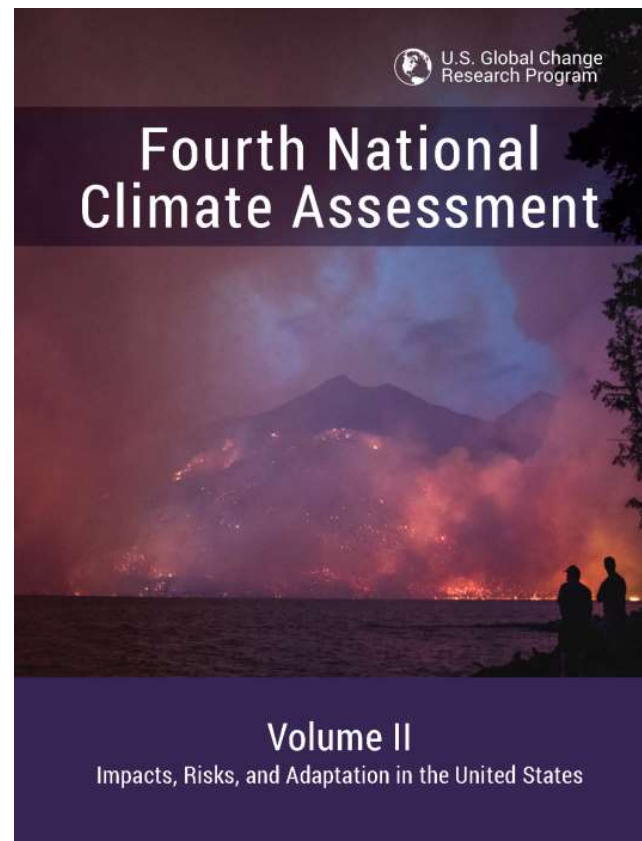
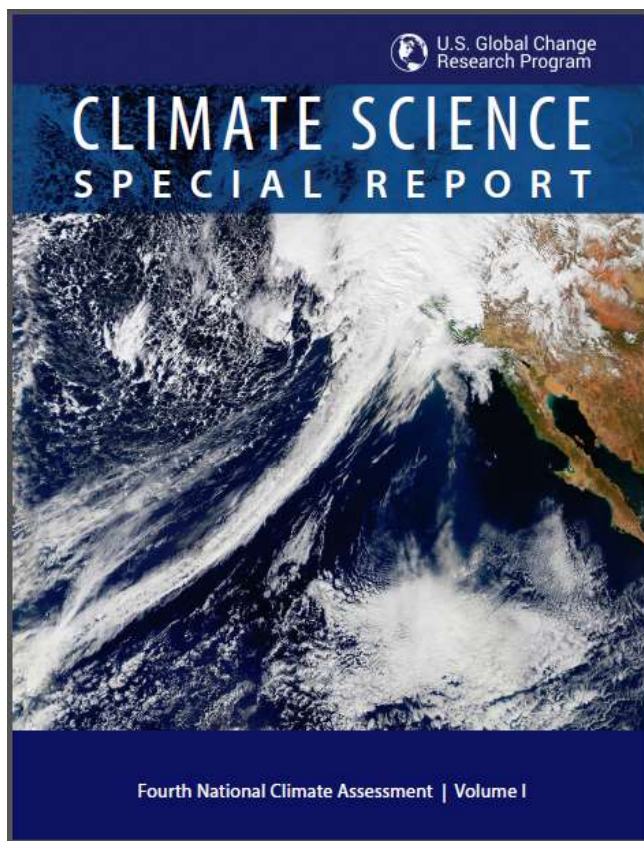


NEXT's futuristic autonomous electric pods

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2. What's so smart about EVs?

Providing zero-emissions mobility mitigates climate change



2. What's so smart about EVs?

Along with cutting GHG, switching from traditional combustion engines to electric vehicle in urban areas will:

- Reduce volatile organic compounds (VOC) and carbon Monoxide (CO) by 100 percent;
- Reduce sulfur oxide (Soc)by 75 percent;
- Reduce nitrous oxide (Nox) by 69 percent, and;
- Save millions of gallons of gas and keep money in the local economy.



**2050: 70% of the
people will be living in
cities**



3. What is EV charging infrastructure?

EV Infrastructure Types

Level 1 Charging

Up to 2 miles, 30 minutes



Level 2 Charging

Up to 10 miles, 30 minutes



DC Fast Charging

Up to 75 miles, 30 minutes



3. What is EV charging infrastructure?

Charging Categories: *Residential*



Photo credit: Leviton <http://blog.leviton.com/next-step-electric-vehicle-charging-stations>



Photo credit: <http://www.plugincars.com/planning-electric-vehicle-ownership-accessible-apartment-dwellers-129340.html>

3. What is EV charging infrastructure?

Charging Categories: *Workplace*





3. What is EV charging infrastructure?

Charging Categories: Fleet



GENERAL NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE IBC AND ALL APPLICABLE CODES.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL AUTHORITIES HAVING JURISDICTION.
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SHEET NOTES:

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PROTECTIVE BOLLARD DETAIL

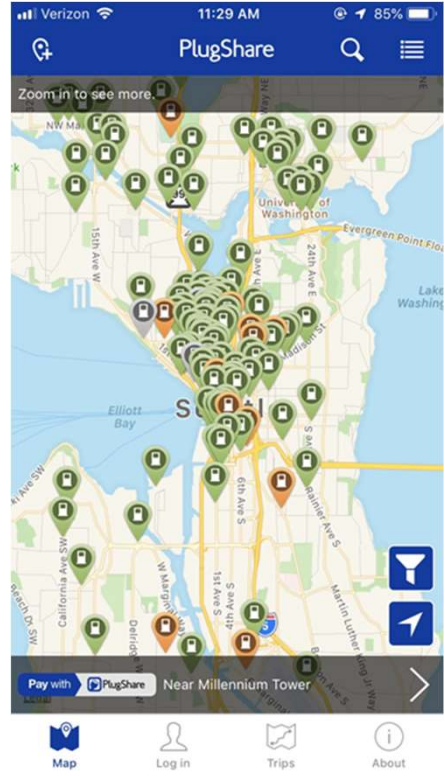
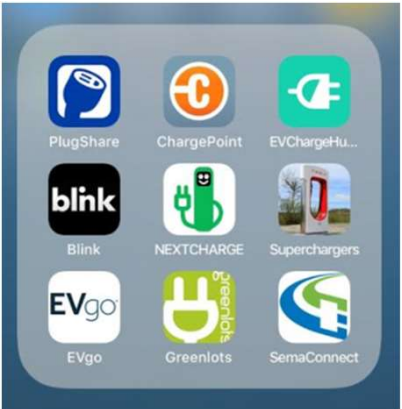
TRENCH DETAIL

ENLARGED ADA EVICE PLAN

USA NORTH

3. What is EV charging infrastructure?

Charging Categories:
Public



Commercial



Destination



Right-of-way

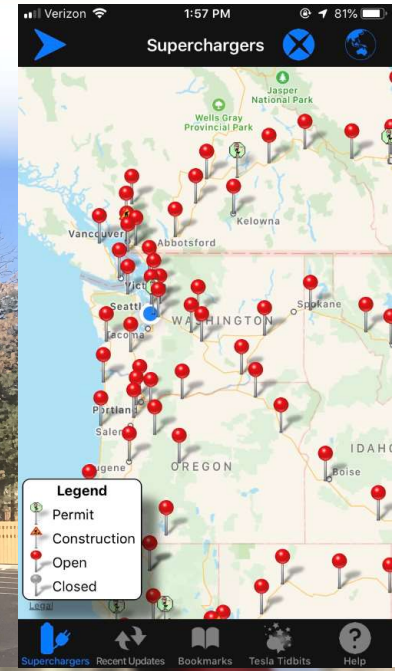


3. What is EV charging infrastructure?



West Coast Electric Highway

Charging Categories: *Public*



Tesla Superchargers

3. What is EV charging infrastructure?

Charging Categories: *Shared Mobility*



DC FAST CHARGER



PRISM PAYMENT KIOSK



LEVEL 2 LIGHT & CHARGE



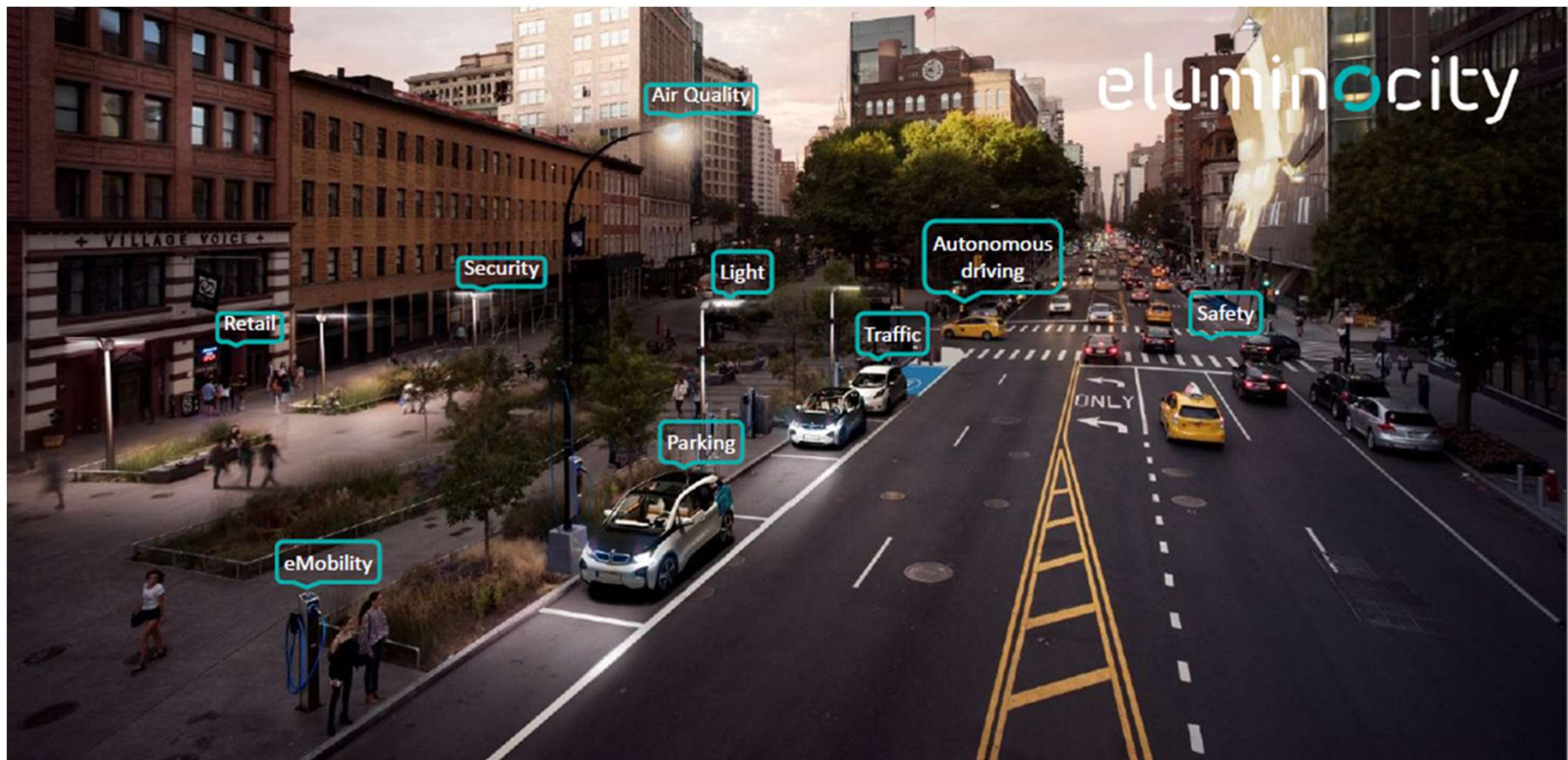
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4. EV charging infrastructure & smart cities



4. EV charging infrastructure & smart cities

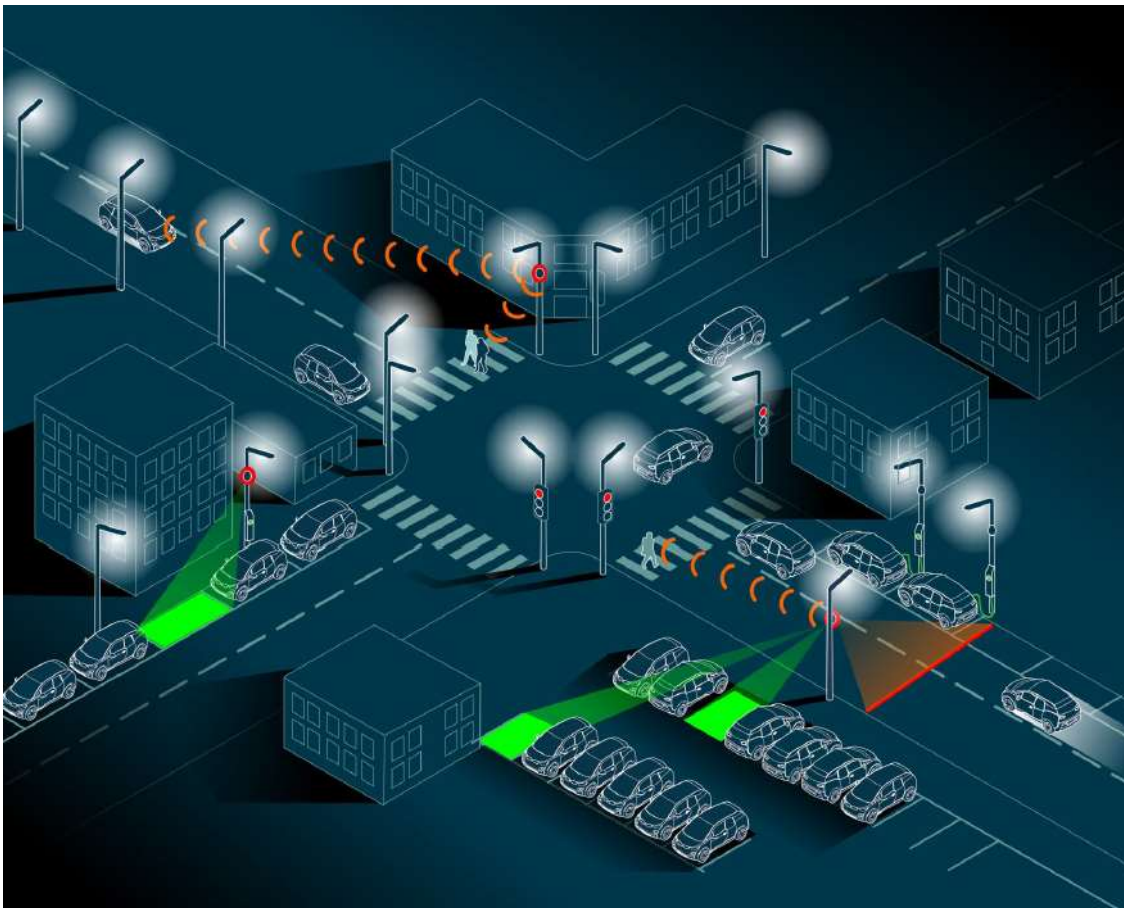
Digitizing cities by creating intelligent infrastructure hubs



4. EV charging infrastructure & smart cities

Intelligent street lights

eluminocity



- Adaptive lighting
- Vehicle charging
- Parking management
- Traffic management
- Pedestrian avoidance
- Environmental monitoring
- Spotter
- Security alerts
- Preventative maintenance
- Data analysis/processing
- Resilience

5. Conclusions

- 1. Replacing engines with Zero-emissions motors mitigates climate change.**
- 2. Providing infrastructure to charge EVs is the first step in preparing for smart (ACES) mobility.**
- 3. We need to plan charging for: residential, workplace, fleet, public, & shared mobility applications**
- 4. In the future, electricity will power future mobility of every type.**
- 5. Intelligent infrastructure integrates street lights with EV charging, parking & traffic management, safety systems, environmental monitoring and more.**



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