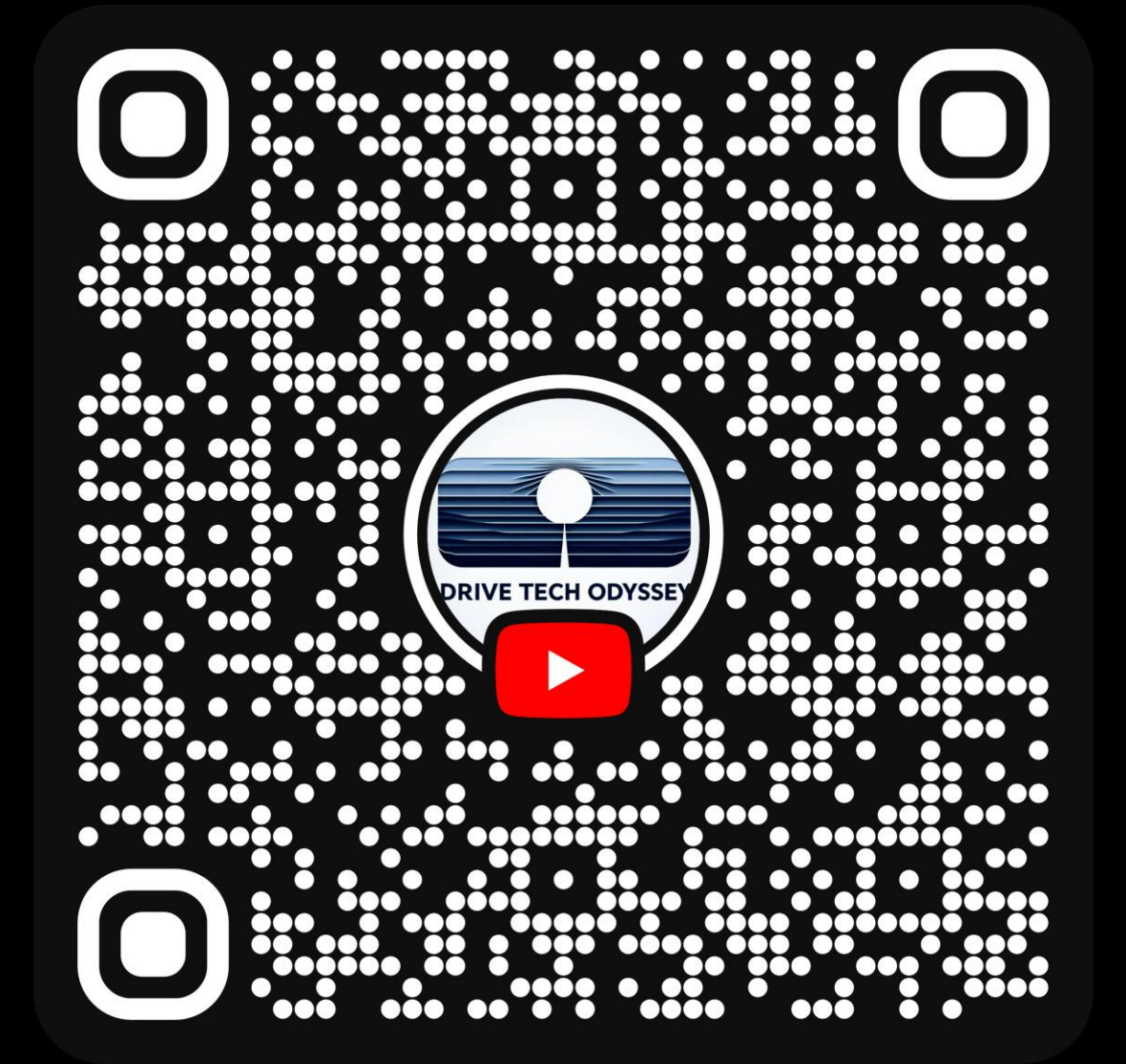


Autonomous Vehicle Powertrain Strategy



What happens to the car's powertrain when the driver is no longer human?

Sungjun Maing

Powertrain specialist, ex-Tesla, Contents creator

Sungjun Maing

Powertrain engineer based on the simulation

Experience



Sr. Vehicle Modeling Test Engineer

Tesla

Mar 2022 – Jan 2025

Palo Alto, California, United States



Sr. Project Engineer

Intertek

Oct 2011 – Mar 2022

San Antonio, Texas, United States



Professor

UTSA College of Engineering

Jan 2018 – 2020

San Antonio, Texas, United States

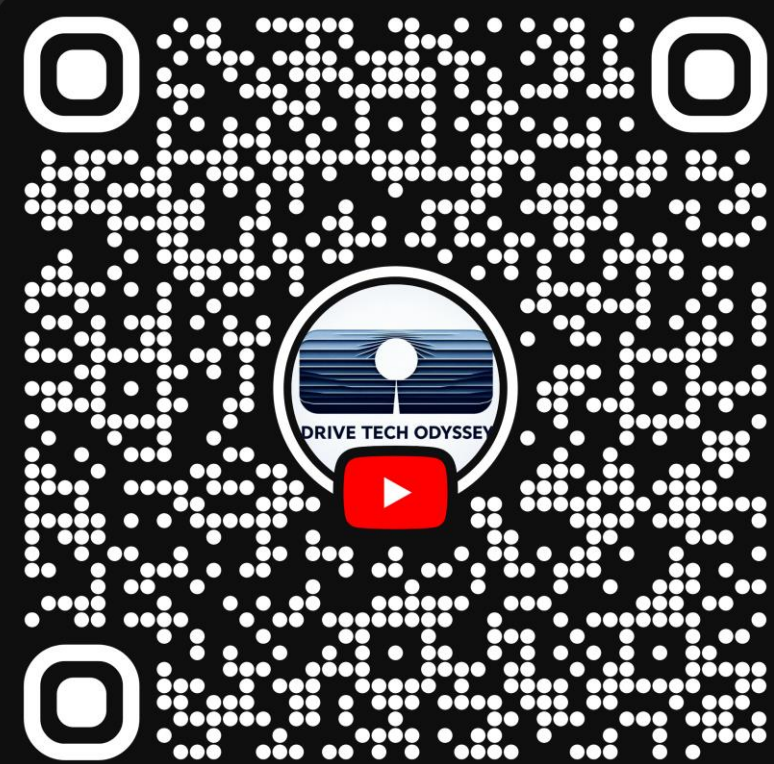


Research Engineer

Doosan

Nov 2007 – Aug 2011

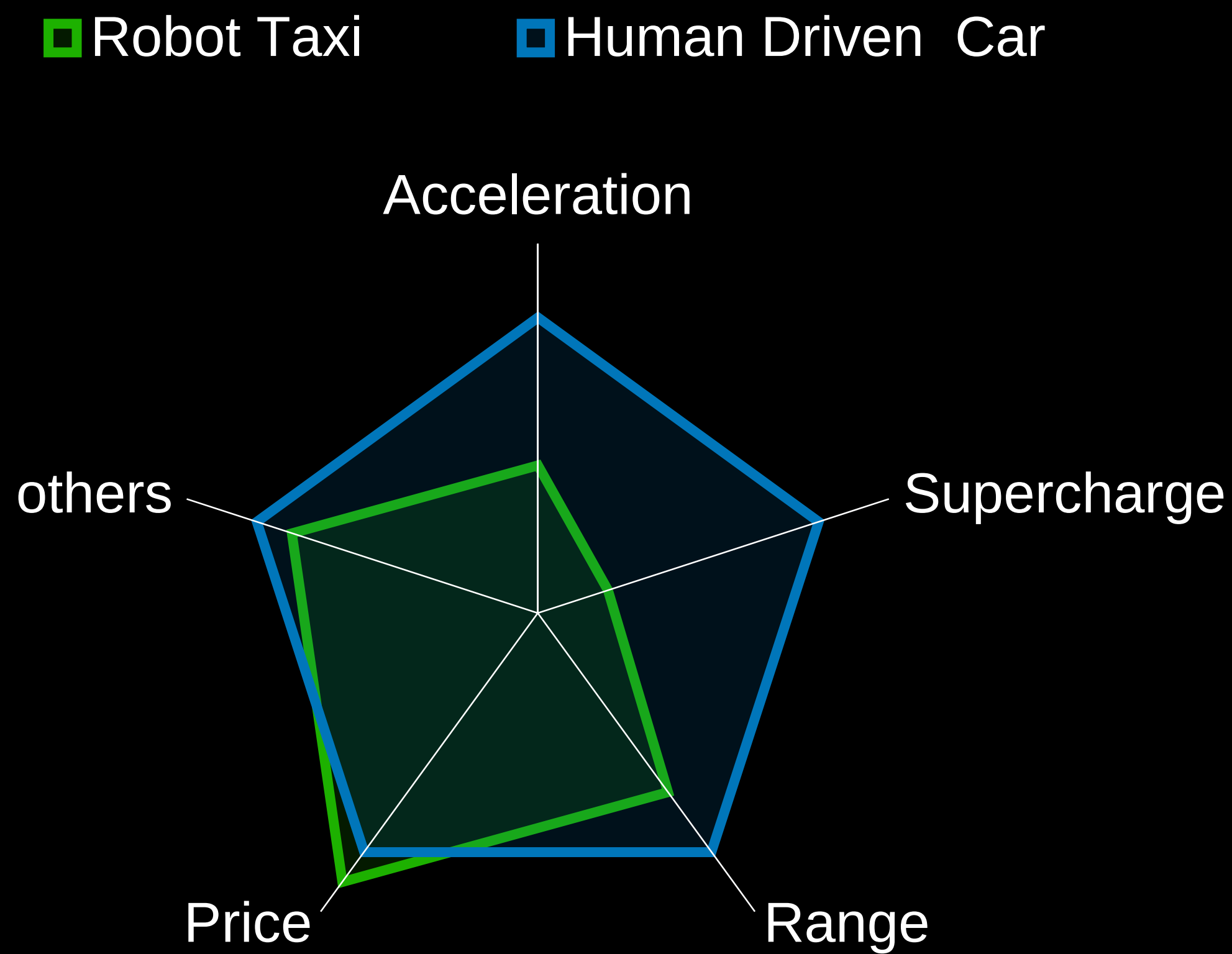
Incheon, South Korea



www.youtube.com/@DriveTechOdyssey

BEV Powertrain Requirements

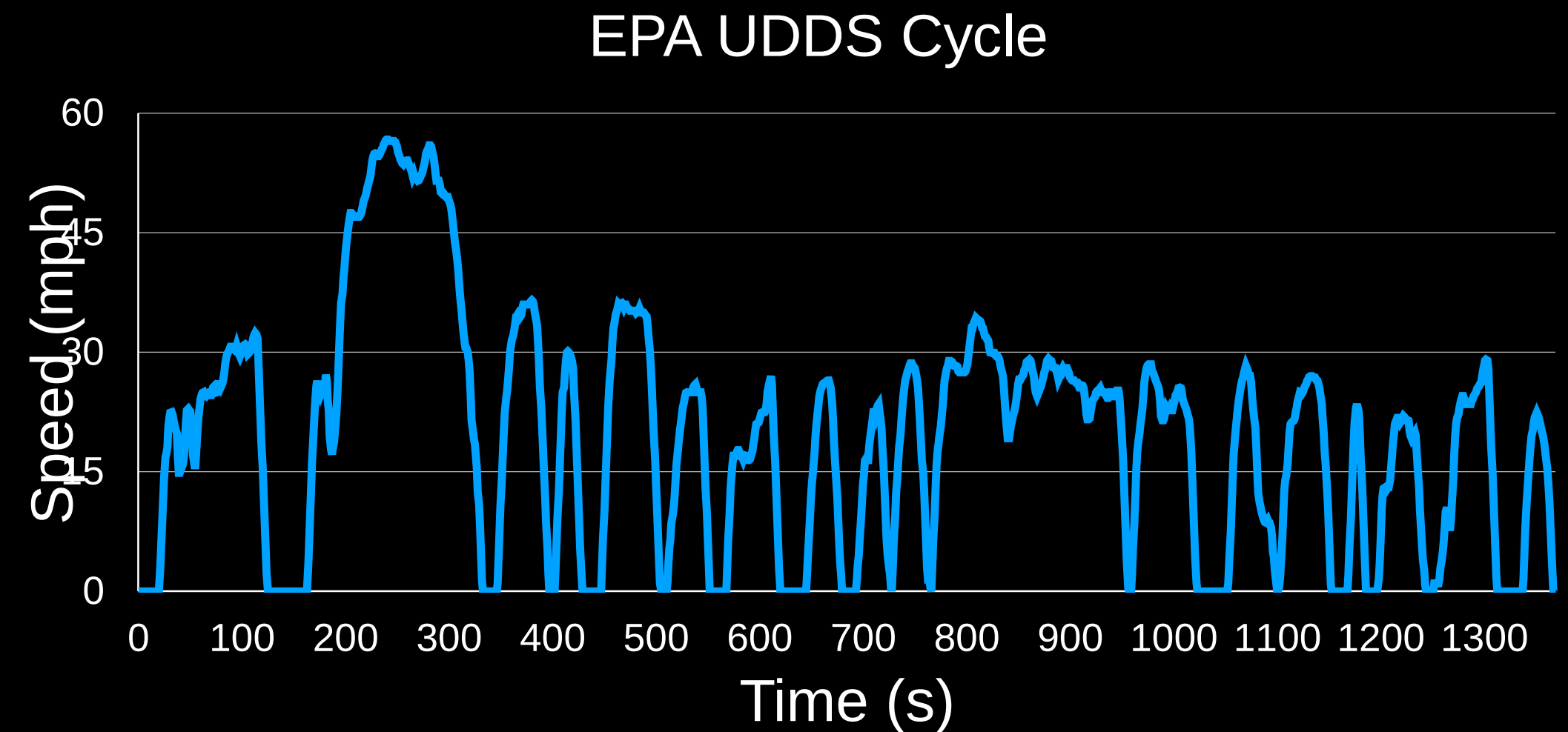
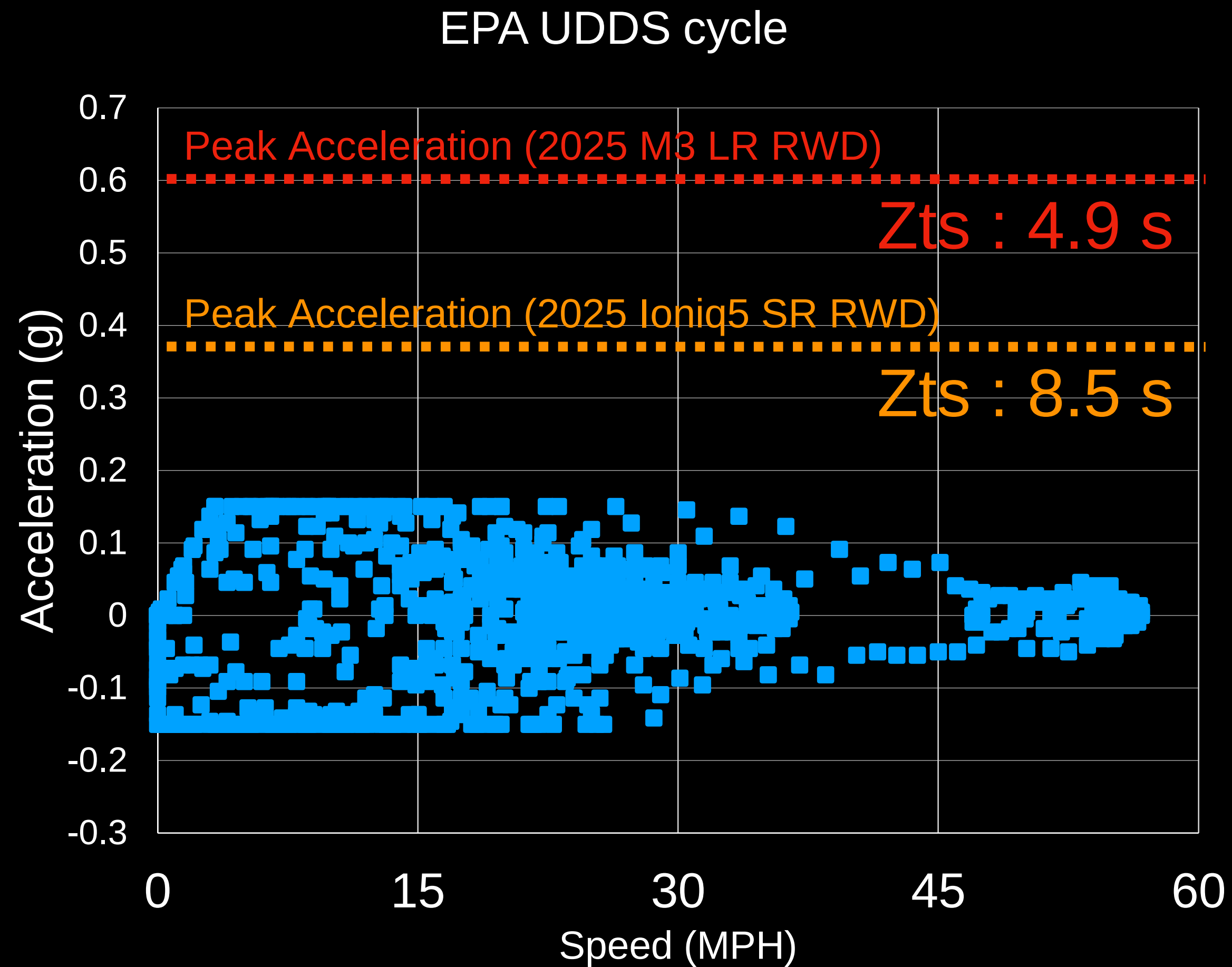
Different PT requirements between Human-Driven Vehicle and Robot-Driven Vehicle



		
Acceleration	Faster is better	No needs to be fast
Range	Over 300MI	Under 300MI
Supercharge	Faster is better	No Supercharge
Price	Maket Position[SEP]Economy	Lower is better
Others	IRA Tax Credit Track Performance	Regulatory Cabin Space

Peak Acceleration requirement

Human Driven vs. Robot Driven

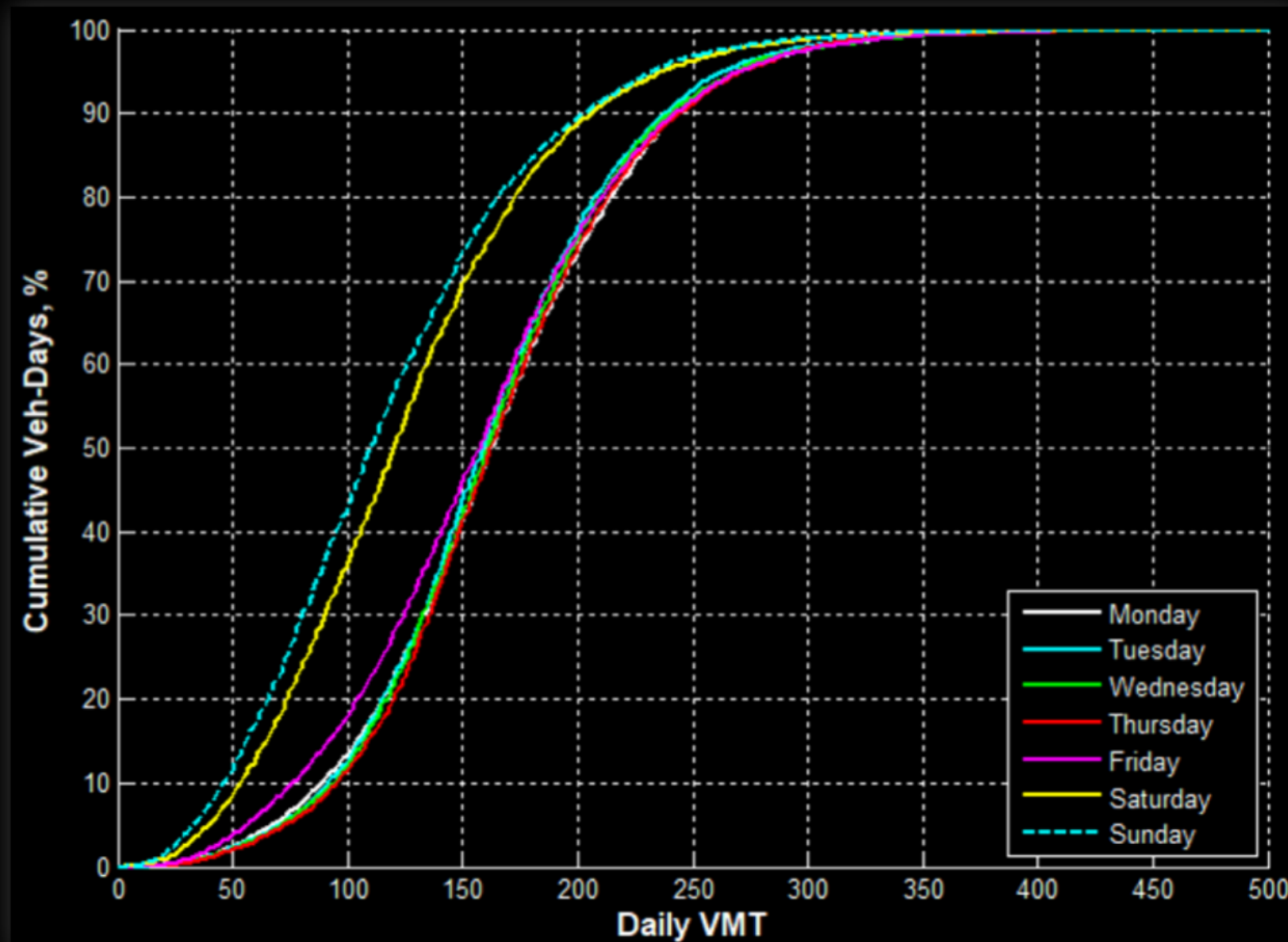


Feasibility Analysis of Taxi Fleet Electrification using 4.9 Million Miles of Real-World Driving Data

Matthew Moniot, Clement Rames, and Erin Burrell National Renewable Energy Laboratory

Citation: Moniot, M., Rames, C., and Burrell, E., "Feasibility Analysis of Taxi Fleet Electrification using 4.9 Million Miles of Real-World Driving Data," SAE Technical Paper 2019-01-0392, 2019, doi:10.4271/2019-01-0392.

FIGURE 2 Cumulative CYC dVMT distributions separated by day of week.

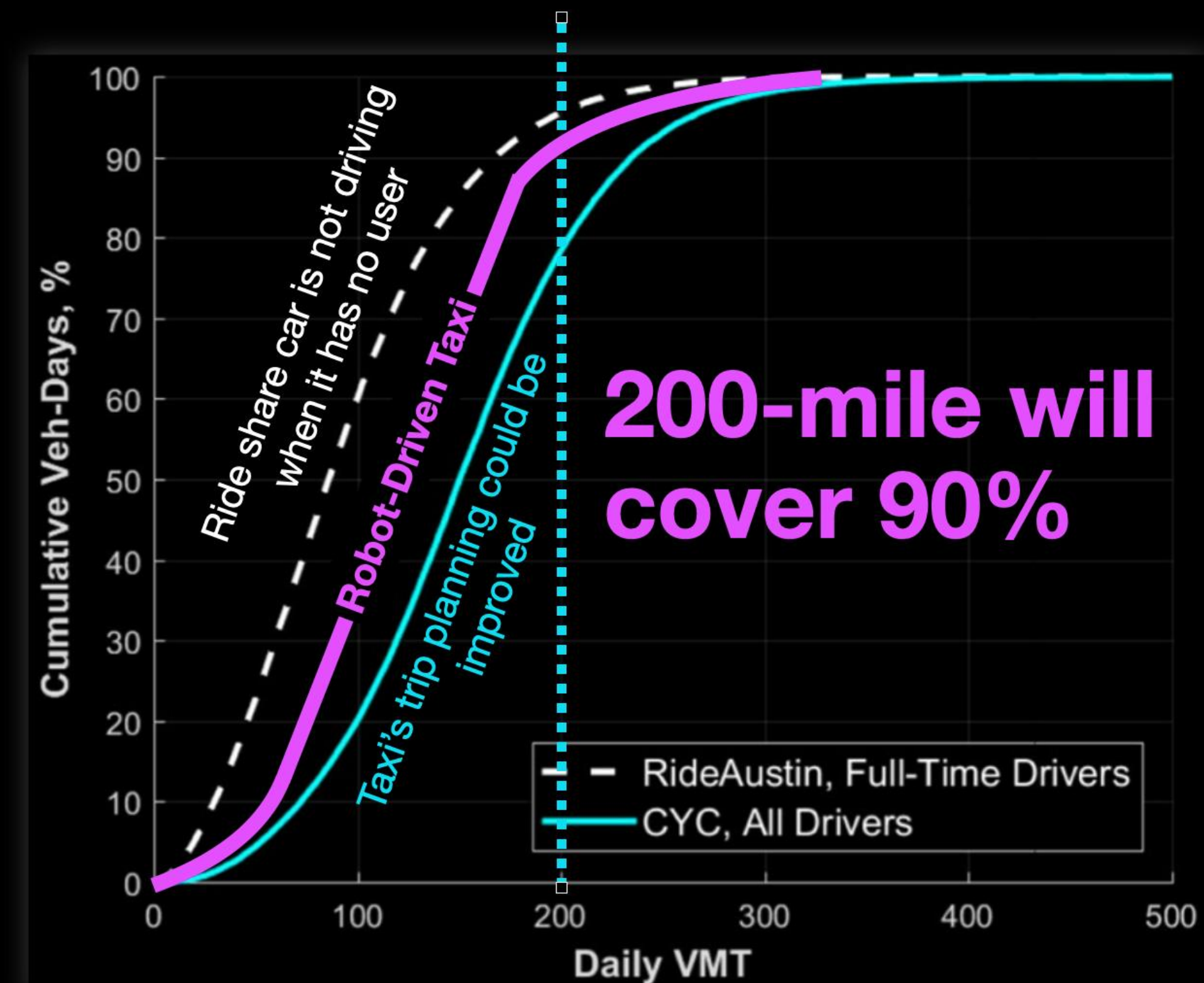


2019 National Renewable Energy Laboratory.

2019 National Renewable Energy Laboratory.

Location : Austin, TX
Taxi Fleet : Columbia Yellow Cab (CYC)
RideShare : RideAustin

FIGURE 6 dVMT comparison between CYC vehicle-days and RideAustin vehicle-days.



2019 National Renewable Energy Laboratory.

www.fueleconomy.gov

the official U.S. government source for fuel economy information

[Mobile](#) [Español](#) [Site Map](#) [Links](#) [FAQ](#) [Videos](#)

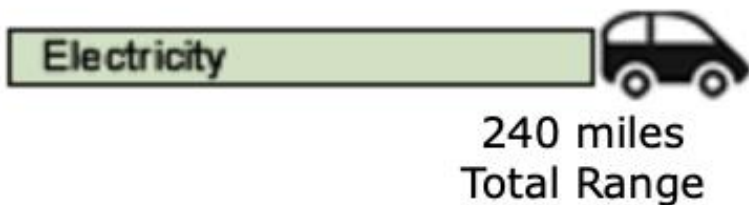
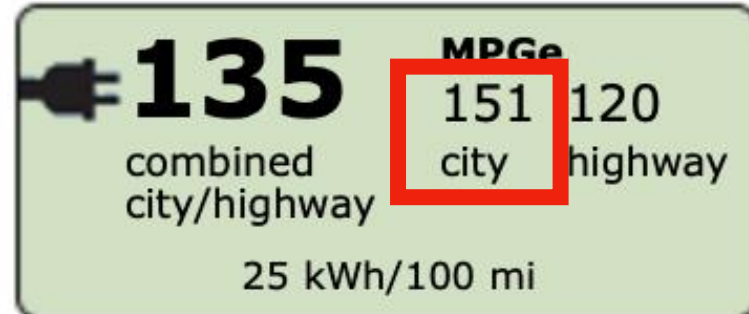
2025 Hyundai Ioniq 6 Standard Range



Automatic (A1)

MSRP: \$37,750

Electricity



Showing All 4 trims

[Help me choose a trim](#)☐ Highlight differences☒ Expand allVehicle shown for illustrative purposes
only. Actual model may vary.

SE Standard Range

\$37,750 Starting MSRP

[Build >](#)

Battery type	Lithium ion
Voltage	480 Volts
Battery system capacity	53.0 kWh

$$CityConsumption(whpm) = 33.7 * 1000 * 0.9 / 151 = 200.9whpm$$

33.7 kWh = 1 Gal

AC Charging
Efficiency

MPGe

$$200miles city driving total energy = 200.9 * 200 / 1000 = 40.2kWh$$

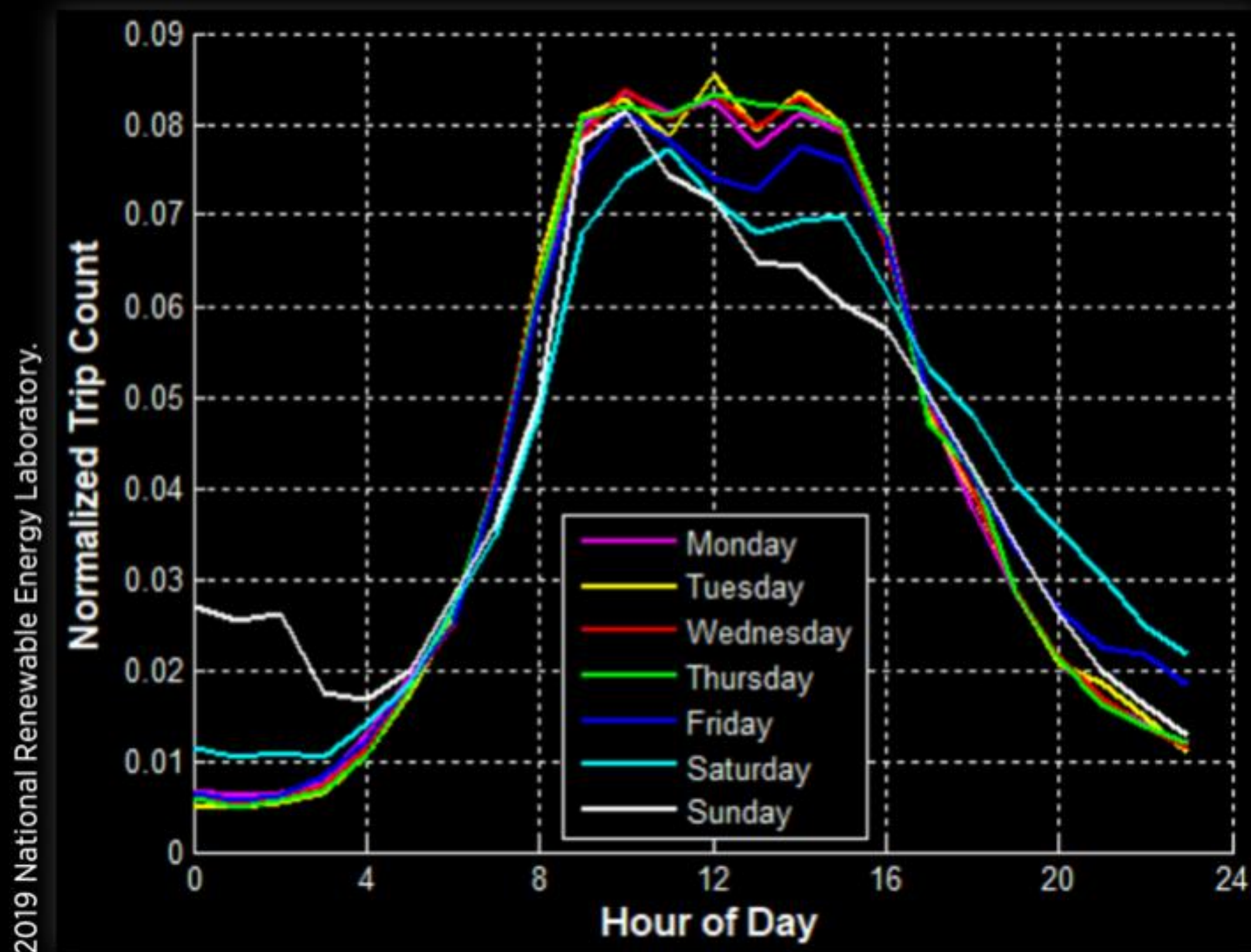
+ Self Driving AI HW consumption

All-Electric vehicle (EV) fuel economy is given in Miles Per Gallon equivalent (MPGe), where 33.7 kWh = 1 gallon of gasoline.

When Robot Taxi can be charged?

Supercharge or No Supercharge

FIGURE 3 CYC trip frequency by time of day and separated by day of week.



There is not many demand for Taxi during night time. Robo Taxi can be charged during this time.

With 45~50 kWh battery pack, 8kW AC Level2 charger will take 5-6 hour to charge from 0 - 100%

Supercharge Requirements

- Cell Chemistry
- High Performance Thermal management system
- HV DC link and connector
- CAPEX
- Higher pack energy

Price Break-down

Human-Driven Standard Range

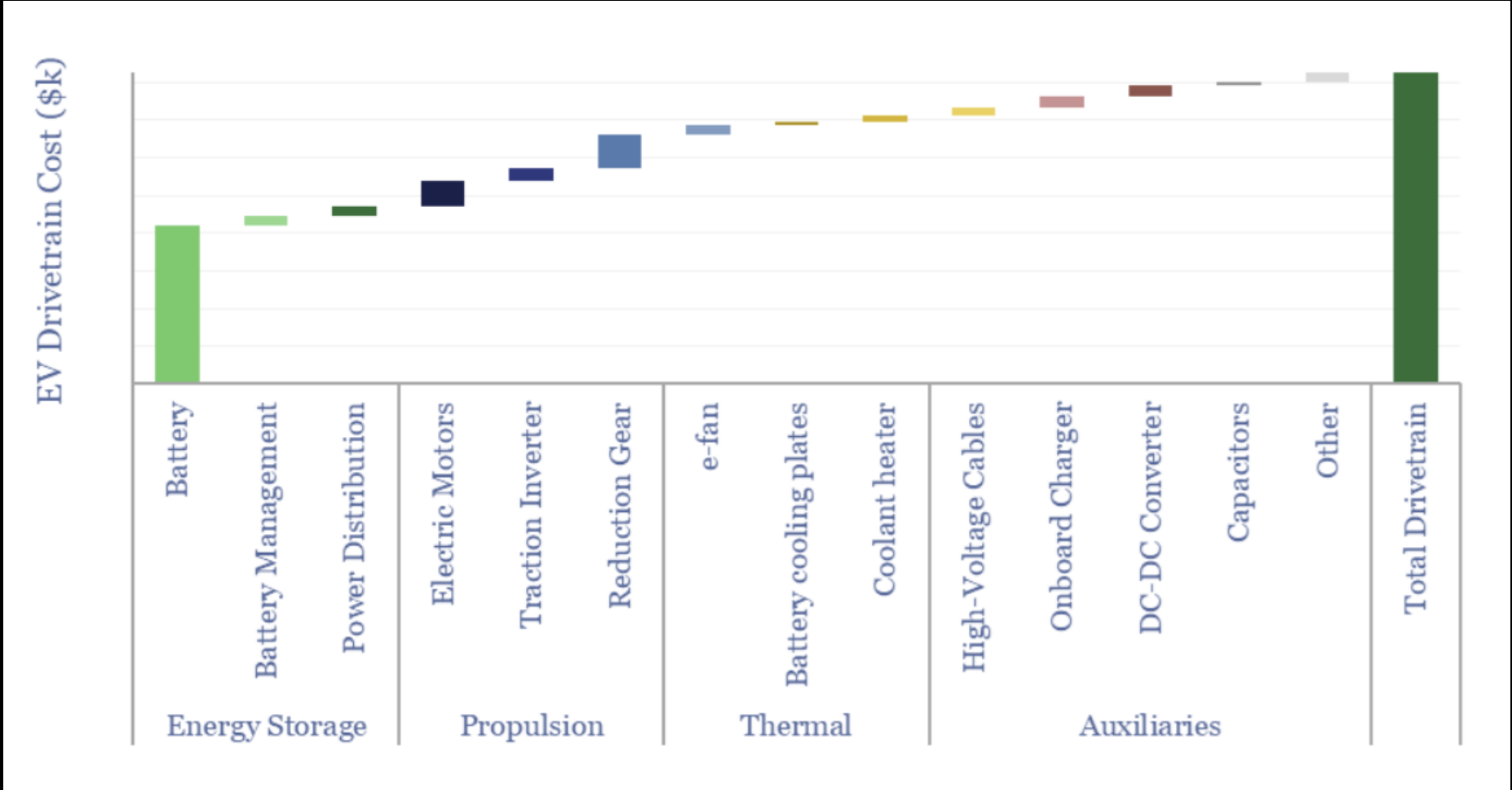
- Reduced Pack size
- Lower Performance DU
- Delete Supercharge
- Saving from Chasis
- New AI HW

Robot-Driven 200-mi car

- Sensor fusion HW
- More Pack Energy

Sensor Fusion Robo Taxi

Price

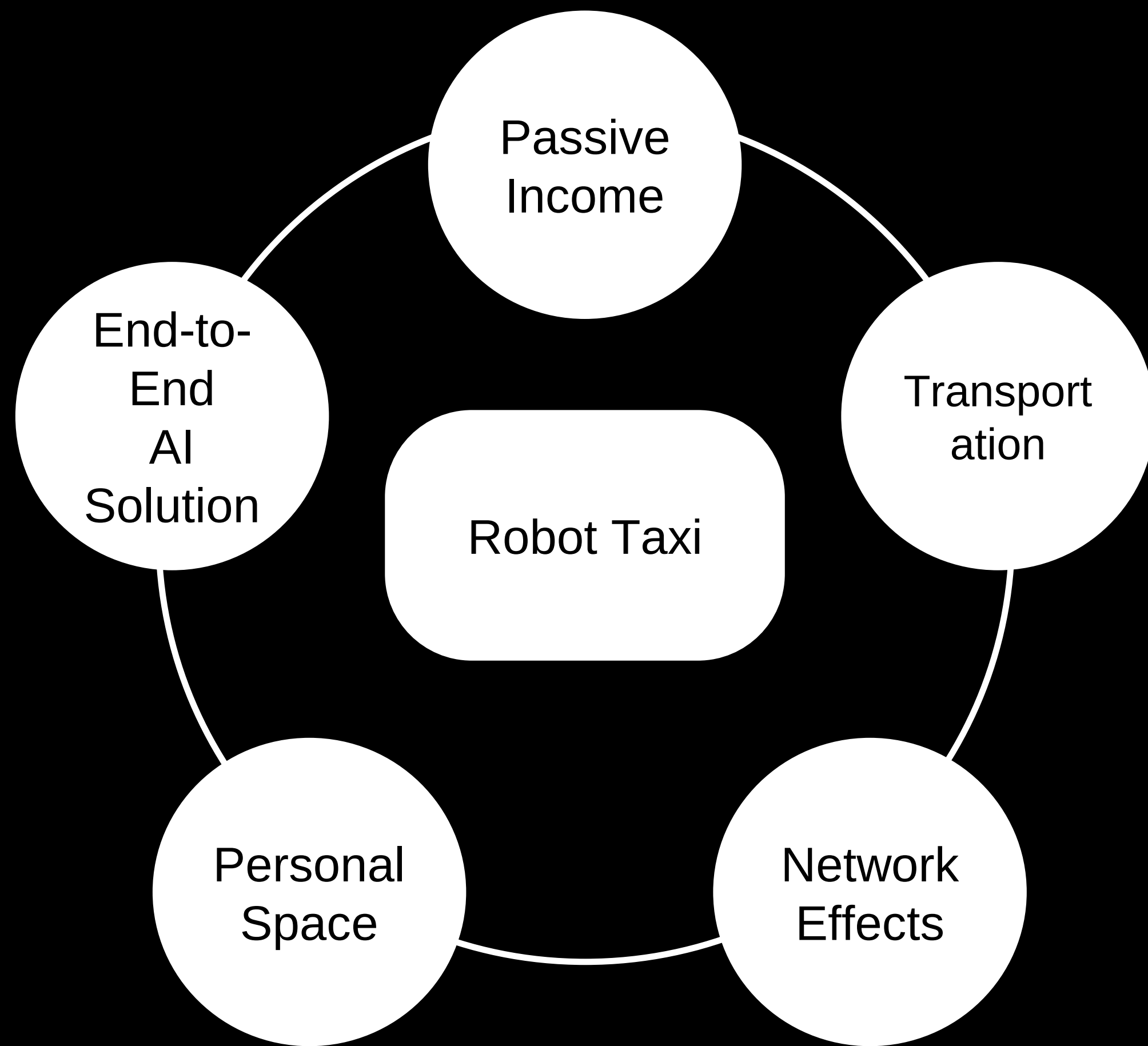


Reference : <https://thundersaidenergy.com/>

Sensor fusion requires higher energy consumption. This will cause to higher pack energy, and it will increase the total price.

Robot Taxi = AI platform

Next platform for AI Generation



- Network effects are a powerful force in the technology platform arena.
- They not only drive rapid growth and create competitive moats but also foster innovation and improve user experiences.
- However, capitalizing on network effects requires careful planning, robust infrastructure, and strategies to manage potential downsides as the network scales.
- Understanding and leveraging these effects can be key to a platform's long-term success and market dominance.

AI will impact every industry

Conclusion

- AI will impact every industry – including automotive.
- The shift from human-driven cars → robot-driven cars will redefine requirements.
- Components that once demanded high performance and strict specs may now only require lower specifications to meet the needs of autonomous fleets.
- Example: durability, precision, or comfort requirements may relax when vehicles are operated by AI rather than human drivers
- Key insight for engineers:
 - Always question how your product's role and specifications may change in the AI era.

