UCDAVIS

POLICY INSTITUTE FOR ENERGY, ENVIRONMENT, AND THE ECONOMY

Leveraging university expertise to inform better policy

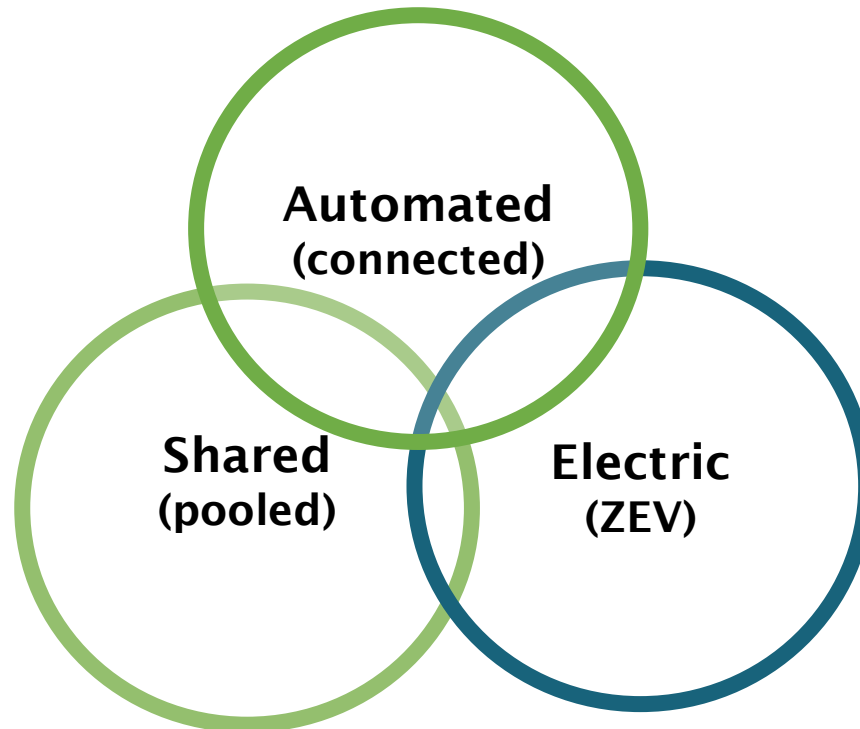3 Revolutions and Air Quality

Austin Brown, Ph.D.

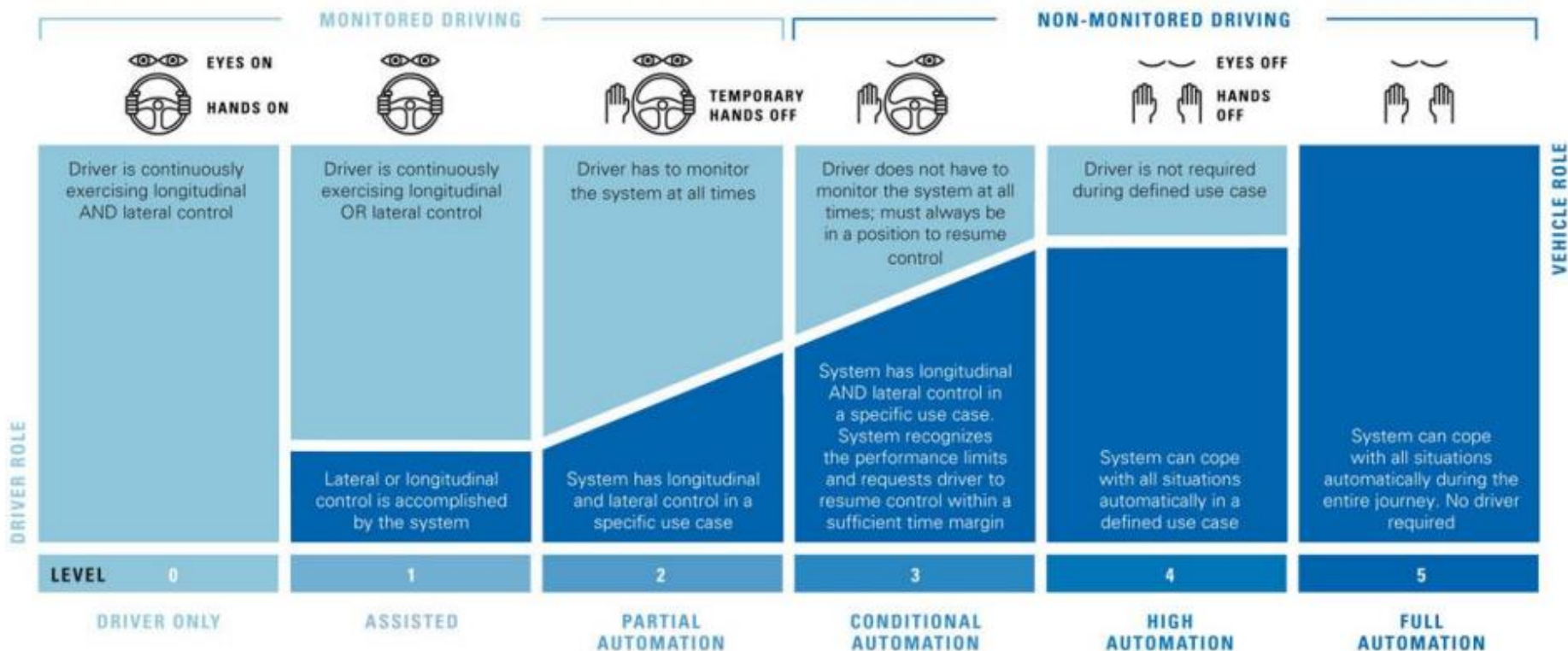Executive Director

May 23rd, 2018

3 Revolutions

Automated
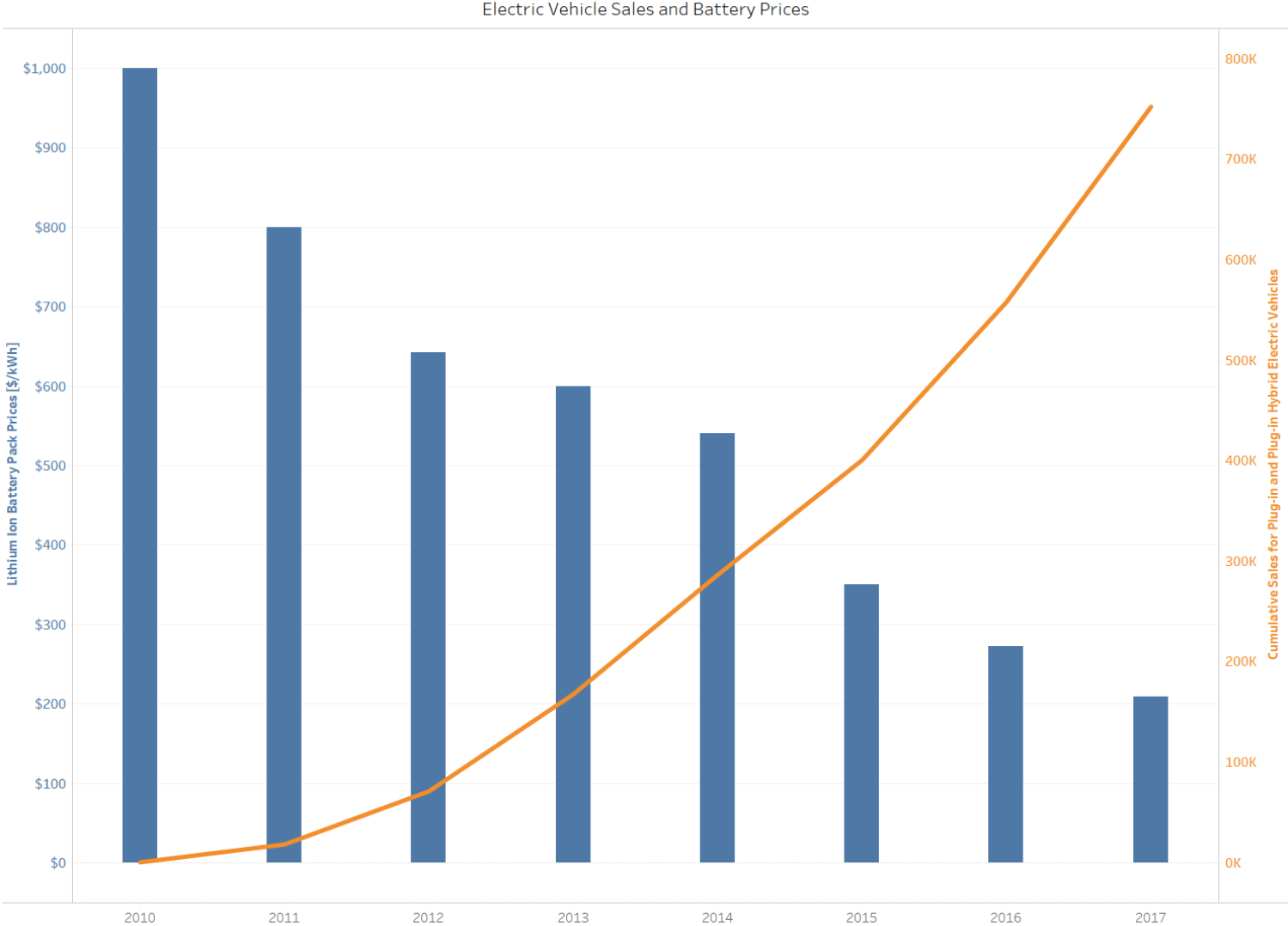**(connected)**

Shared
(pooled)

Electric
(ZEV)

Automation

Figure 1: Description and comparison of automated vehicle functionality levels[4]

https://www.eia.gov/analysis/studies/transportation/automated/pdf/automated_vehicles.pdf

Electrification

Electric Vehicle Sales and Battery Prices

https://www.nrdc.org/revolution-now

Pooling
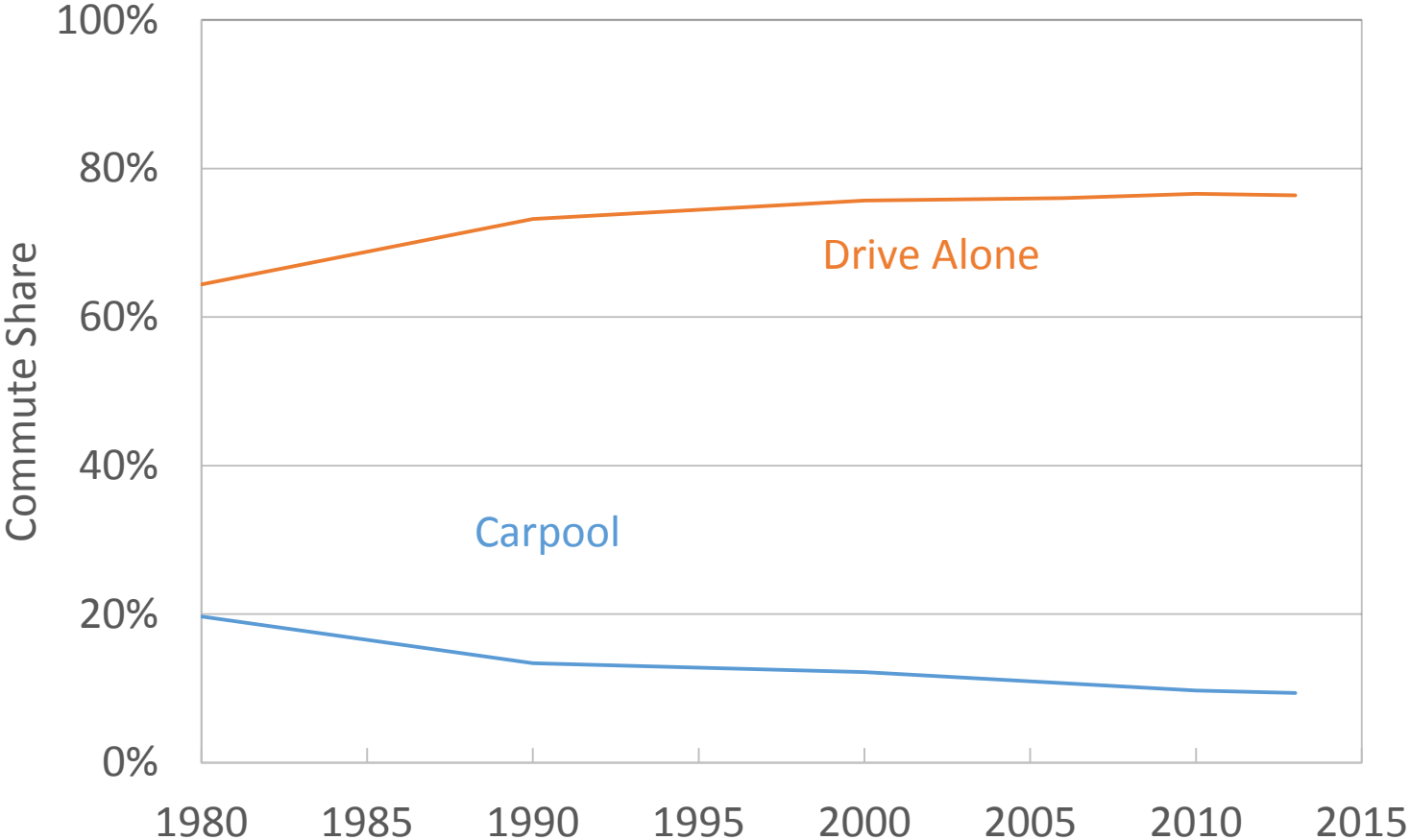
Unintended Consequences

1. Demand
(Changes in VMT)
(Changes in 'mobility')

- Easier Travel
- Underserved
- Empty Miles
- Mode Shift
- ↓ Hunting for Parking
- ↓ Ridesharing

2. Efficiency
(Changes in MPG)
(Changes in 'operation')

- Vehicle Resizing
- Drive Smoothing
- Platooning
- Collision Avoid
- Intersection V2I
- ↓ Fast Travel

Source: Stephens et al., Estimated Bounds and Important Factors for Fuel Use and Consumer Costs of Connected and Automated Vehicles, http://www.nrel.gov/docs/fy17osti/67216.pdf (2016)

Three Revolutions in Urban Transportation

Business-as-Usual Scenario
20th Century Technology

Through 2050, we continue to use vehicles with internal combustion engines at an increased rate, and use transit and shared vehicles at the current rate, as population and income grow over time.

2 Revolutions (2R) Scenario
Electrification + Automation

We embrace more technology. Electric vehicles become common by 2030, and automated electric vehicles become dominant by 2040. However, we continue our current embrace of single-occupancy vehicles, with even more car travel than in the BAU.

3 Revolutions (3R) Scenario
Electrification + Automation + Sharing

We take the embrace of technology in the 2R scenario and then maximize the use of shared vehicle trips. By 2030, there is widespread ride sharing, increased transit performance—with on-demand availability—and strengthened infrastructure for walking and cycling, allowing maximum energy efficiency.

Number of Vehicles on the Road by 2050 = 250 million vehicles

2.1 billion | 2.1 billion | 0.5 billion

CO2 Emissions by 2050 = 500 megatonnes of CO2

4,600 megatonnes | 1,700 megatonnes | 700 megatonnes

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Policy Principles

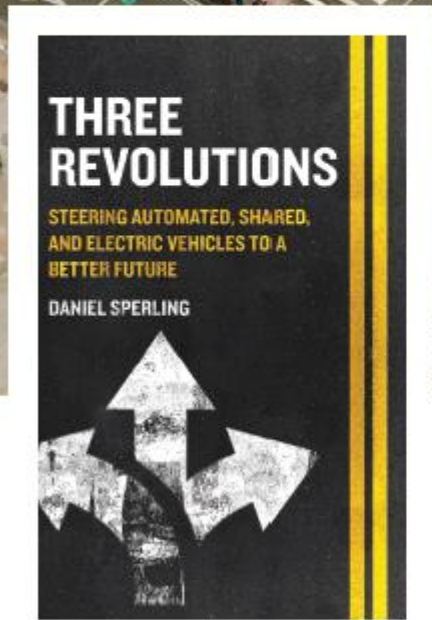We ask that automation advances all of these goals:

1. Reduce traffic crashes, injuries and fatalities

2. Improve access for everyone, including all income levels, as well as people of all ages and physical abilities

3. Ensure an equitable transportation system

4. Foster healthy communities

5. Create an environmentally sustainable transportation system that dramatically reduces greenhouse gas emissions

6. Mitigate job loss and create new well-paying jobs for those displaced

7. Support sustainable land use development patterns and advance city goals for housing

8. Improve traffic congestion

Policy Needs

1. **User incentives:** Incentivize travelers to choose pooled mobility services over individual ownership of vehicles now, and more so when driverless vehicles become available.

2. **Pooling and EVs:** Encourage mobility service companies to embrace pooling and EVs (including hydrogen fuel cell vehicles). Motivate automakers to design AVs for pooling that are powered by electricity or hydrogen.

3. **Equity and transit:** Encourage transit operators and mobility service companies to collaborate in providing more access and service at lower cost.

4. **Land use:** Begin redesigning cities for a transportation system that uses less parking and fewer roads and is more conducive to pooling, walking, biking, and affordable living.

THREE REVOLUTIONS

STEERING AUTOMATED, SHARED, AND ELECTRIC VEHICLES TO A BETTER FUTURE

DANIEL SPERLING

A BETTER TRANSPORTATION FUTURE

PAPERBACK: $29.00
PAGES: 280
PUBLISHING: MARCH 2018
ISBN: 9781610919050

Three Revolutions

Daniel Sperling

Last Thoughts

- The transportation system could be much better.
  - Pollution, but also safety, congestion, equity
- New technologies and business models are a risk and an opportunity.
- This is a unique time to get the policy framework in place to get benefits from automated vehicles (and minimize unintended consequences).
  - Need all 3 Revolutions
- We don't know how long this will take, but we need to get the right policy in place now.
- Regional governments will lead the way