



Energy and Environmental Implications of Automated Vehicles: Challenges and Opportunities

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Don MacKenzie, University of Washington

Zia Wadud, University of Leeds

Paul Leiby, Oak Ridge National Laboratory

Broad Challenge

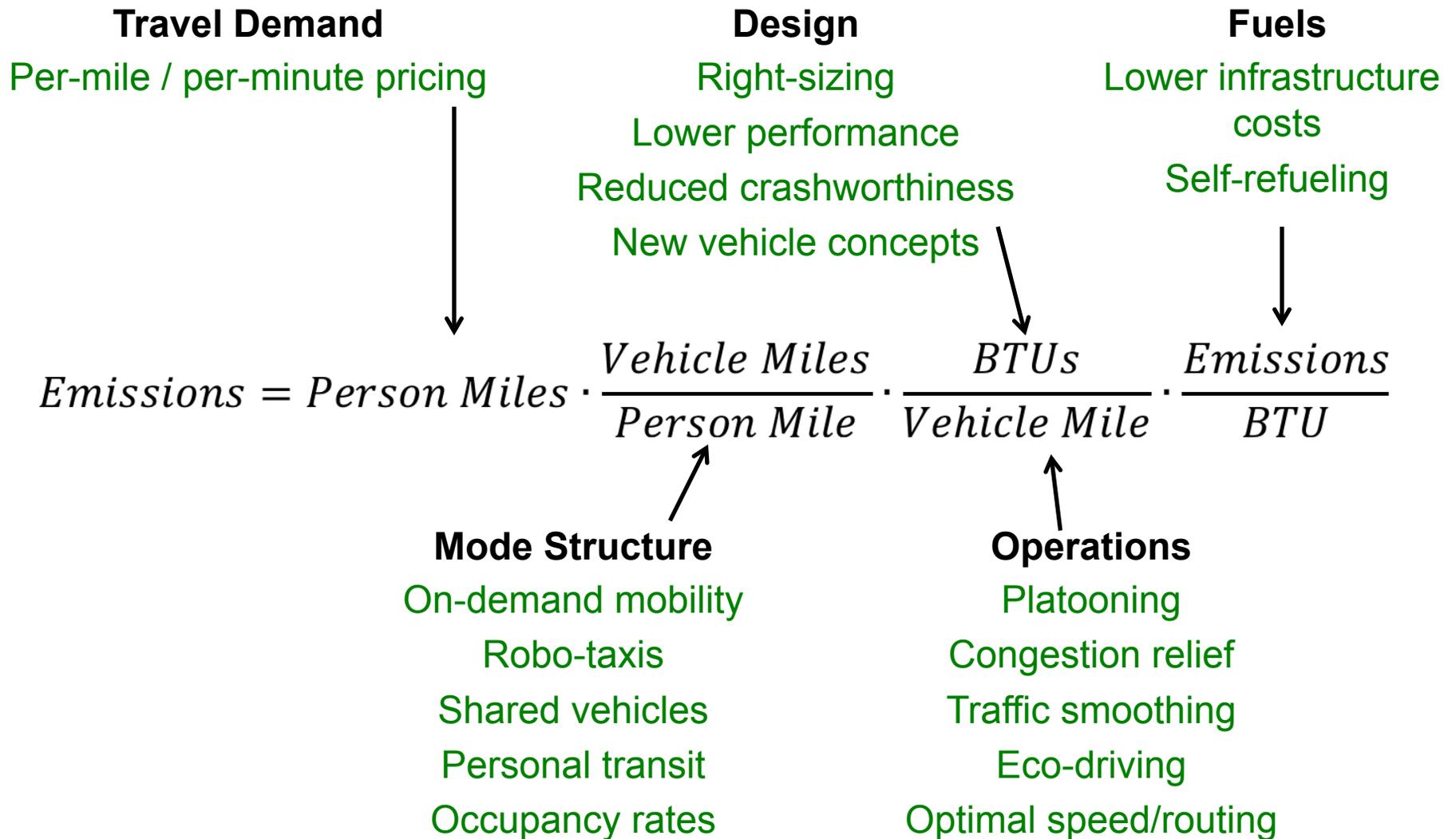
- Automated vehicles may **significantly change the way people travel**, in multiple ways
- Overall **energy & environmental implications** of automation are highly **uncertain**
- There is an need to get a sense of the **timing and pathways** by which automation may be introduced, and **identify important opportunities** to support and guide a **beneficial transition**



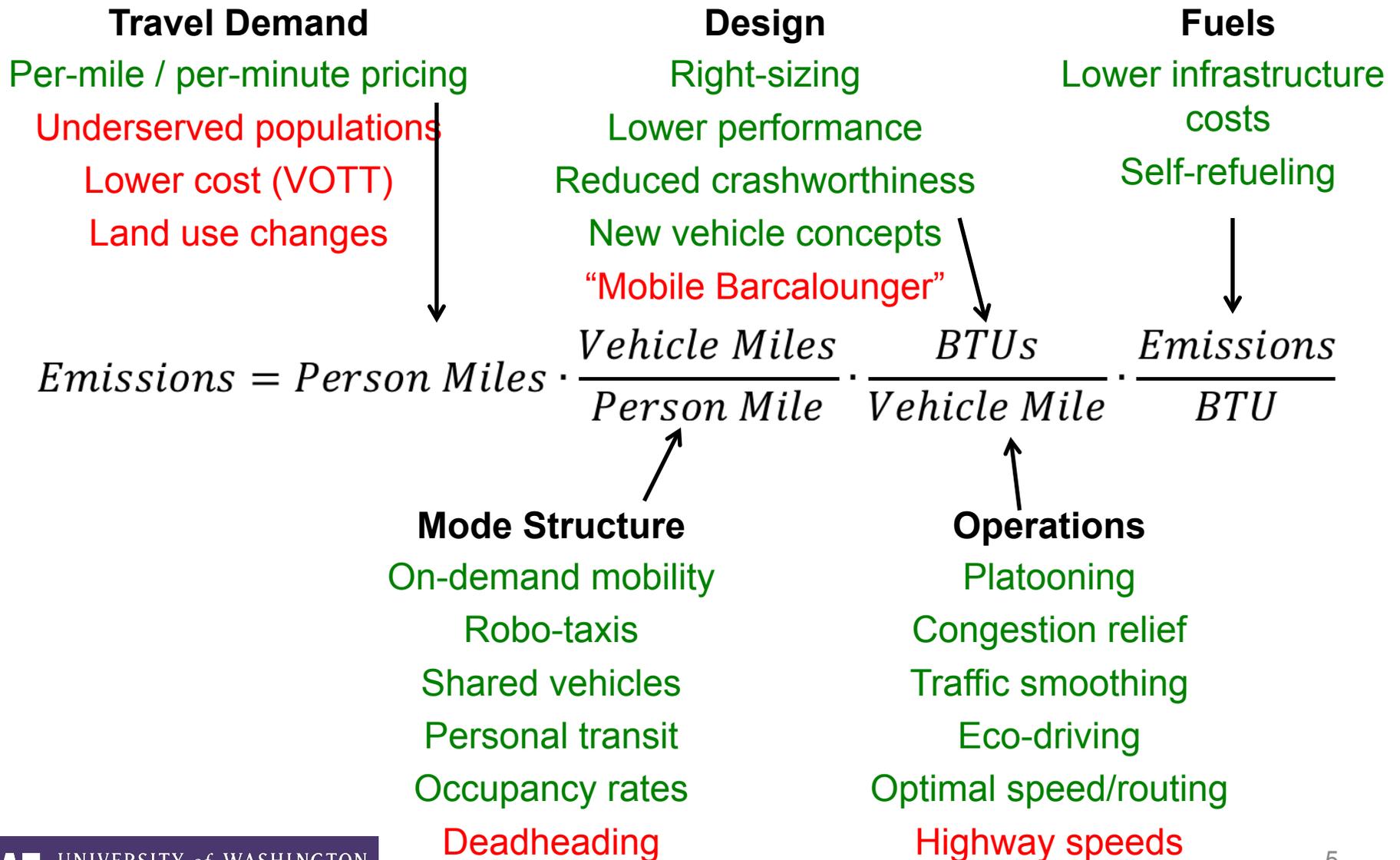
Energy and environment seen as significant, but secondary to capacity, safety, accessibility.

- Automation could double lane capacity, or more
- “90% of accidents caused by driver error”
- Underserved groups including elderly & disabled
- Talk of energy & environmental impacts mostly focuses on potential benefits

Automation offers substantial energy & environmental benefits...



Automation offers substantial energy & environmental benefits... and risks



Energy & Environment breakout drafted 4 research needs statements.

- Assess potential mechanisms, magnitude, timing, and likelihood of changes in energy and emissions profiles, which may result from automation.
 1. Travel demand
 - e.g. new traveler groups; changes in VOTT, insurance, parking, energy, congestion costs; mode shifts
 2. Operations
 - e.g. eco-driving, platooning, traffic smoothing, highway speed changes

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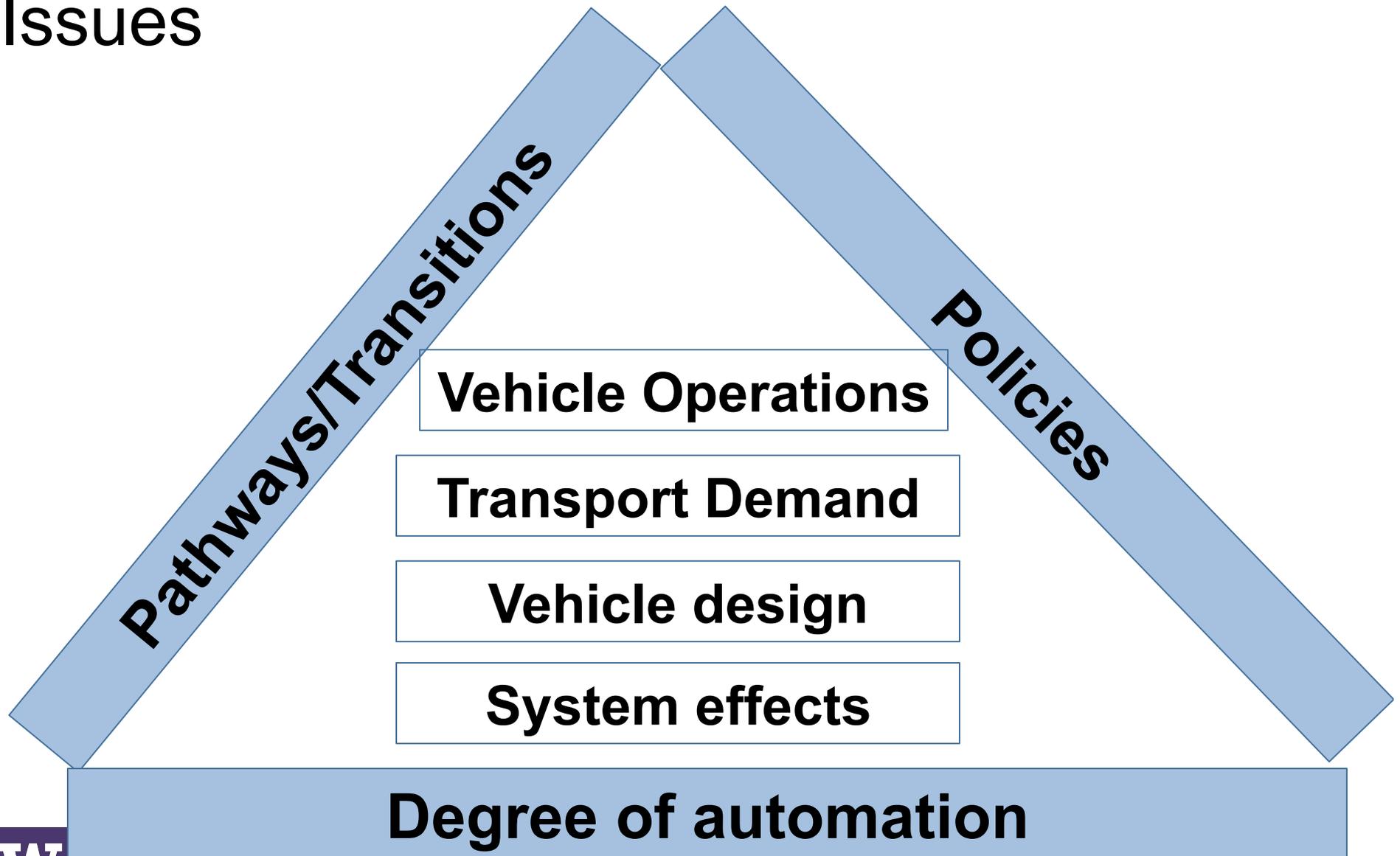
3. Vehicle design changes

- e.g. size, performance, crashworthiness

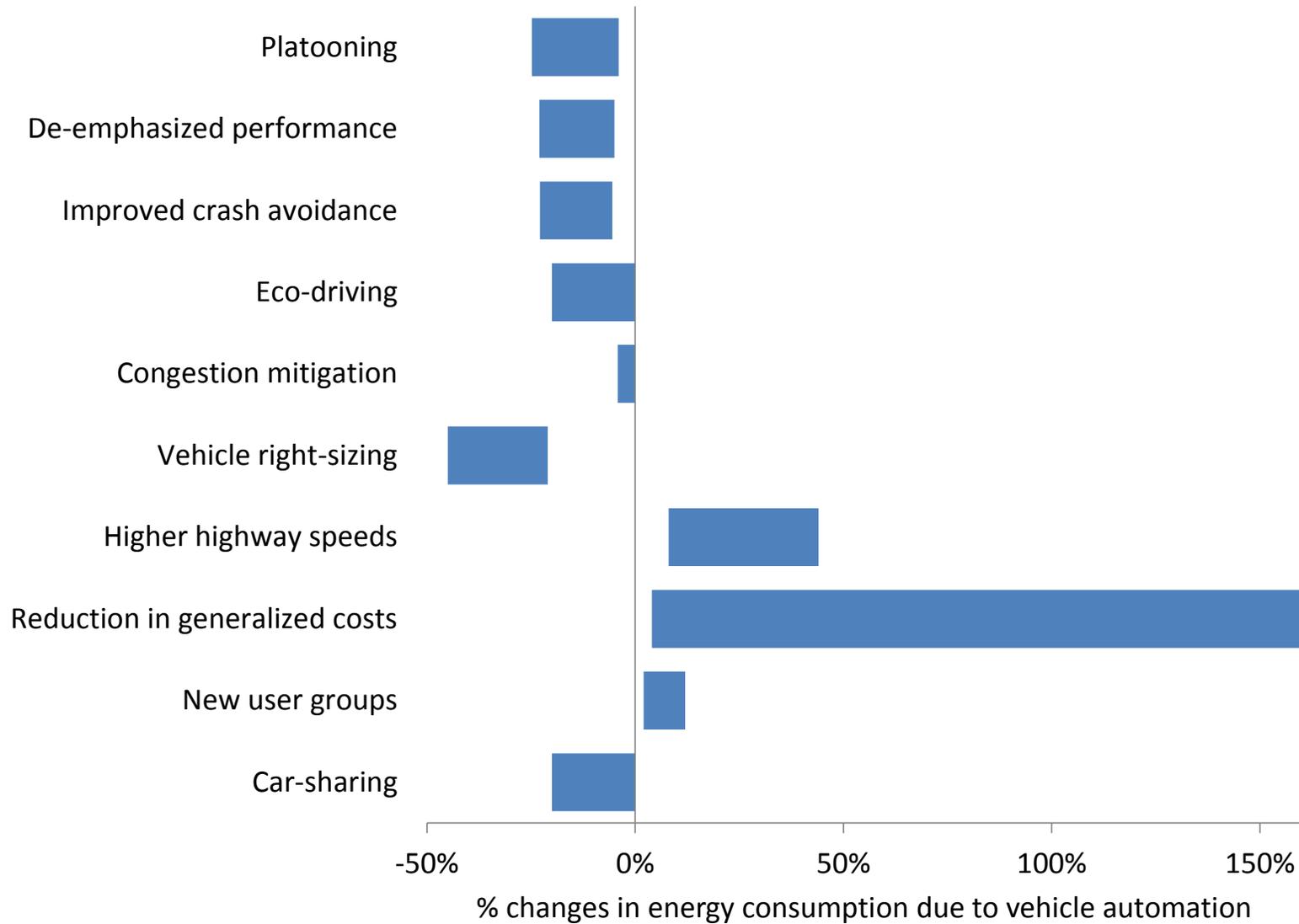
4. System-level effects

- e.g. on-demand mobility; alternative fuels infrastructure needs; land-use impacts; emergent behavior with widespread AV adoption; integrated assessments of vehicle design, operations, and travel demand; policy interventions to influence energy and environmental impacts

Four Research Areas, Three Over-Arching Issues

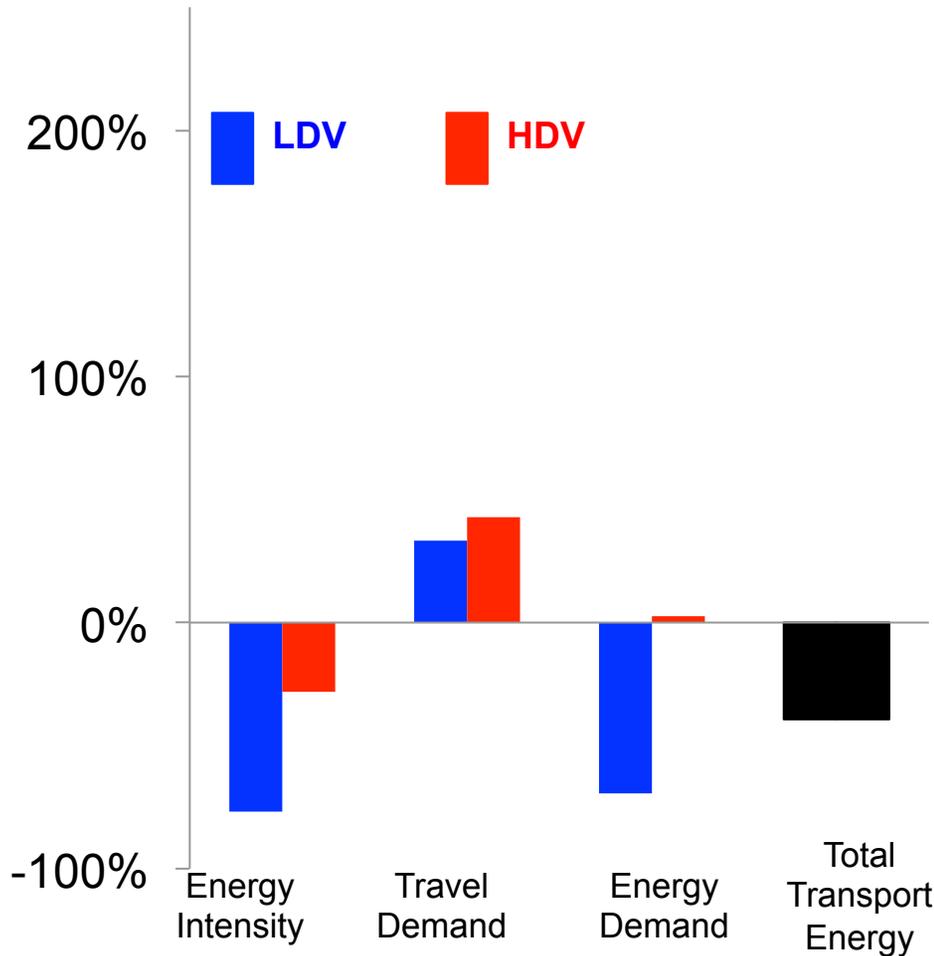


Automation may influence energy demand through numerous mechanisms.

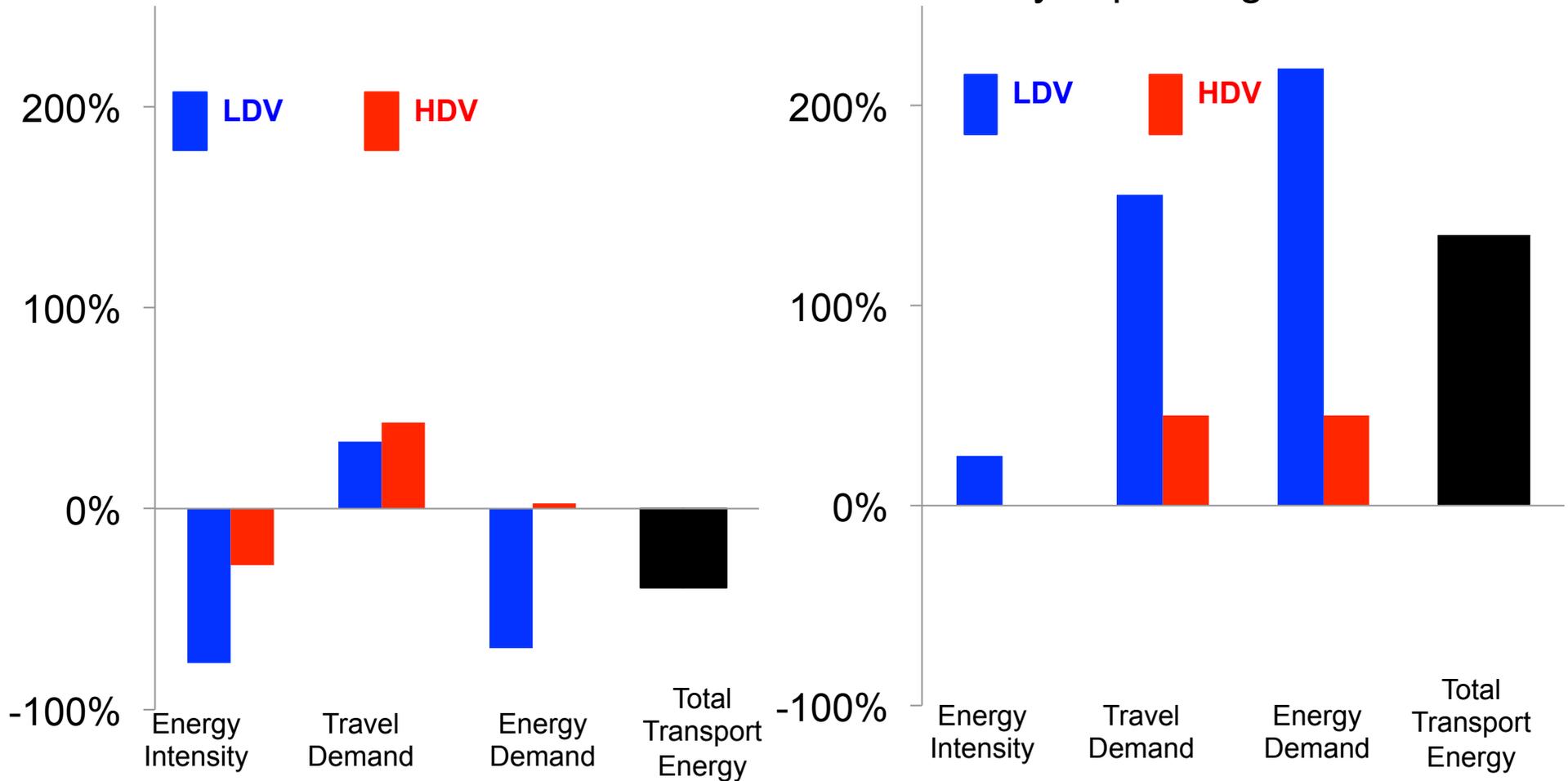


Net effect of automation depends on degree to which mechanisms materialize.

“Have our cake and eat it too”



“Dystopian nightmare”



Conclusions & Implications

- Potential energy consumption reductions are substantial
 - but far from assured
 - do not necessarily follow from automation *per se*
- Total fuel consumption could increase notably
 - If full driving costs decrease substantially

