Considerations for Traffic-Related Air Pollution in a Changing Transportation Landscape

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Some Thoughts Leading Into the Panel Discussion

- We will not meet our target goal of keeping the temperature rise below 1.5 C by the end of the century
  - IPCC projects we will pass the critical CO2 concentration for the 1.5 C limit in the early 2030's
- We will not meet the proposed rate of EV penetration into the market by 2035
  - Constrained by:
    - The time lag of acquiring, and the geo-political challenges associated with, the huge increase in minerals needed for EV production and renewable electricity generation
    - Lack of critical infrastructure necessary to make EVs ubiquitous
      - Charging infrastructure, electric grid capabilities, storage for renewable electricity
    - EV's are not well suited for certain sectors of the mobility market – long haul trucking, aviation, marine transport, large portions of the non-road market, certain portions of the light and medium duty mobility market (construction workers towing tailers with significant mass, or operating in cold climates.)
    - The challenge of making EVs accessible and convenient for the entire socio-economic realm.
- The prevalence of IC engine vehicles will persist for much longer than hypothesized, and we'll probably see the average age of the vehicle on the road increase as well.

Implications of these realizations

- **We should immediately implement strategies that achieve meaningful emissions reductions this decade.**
  - **Adopt a paradigm of minimizing the total GHG emission that occurs during our transition to a sustainable future – as opposed to selecting an ideal solution and focusing on that pathway at the expense of neglecting additional GHG reductions pathways.**
- **For mobility applications, in which IC engines will be prevalent for decades to come, fuel is the elephant in the room; but also the operational efficiency of the vehicle and transportation system is important.**
  - **We should consider pushing HEVs or PHEVs over full EVs during the transition to full sustainability**
    - **The material for 1 EV batter will yield 50-100 HEV batteries and 10-15 PHEV batteries**
  - **Lower carbon intensity fuels (ultimately net-zero to zero carbon fuels) are needed.**
  - **The technology exists for such fuels, and the infrastructure is in place for many of them.**
    - **Drop in bio-derived fuels, synthetic fuels, e-fuels can use the existing infrastructure and be used in the legacy fleet as soon as they are made.**
    - **Methanol and Hydrogen engines are being developed in the private sector now. These could be used in localized fleets.**
    - **Ammonia is being seriously investigated for ocean going vessels. There is a known technology pathway to zero carbon ammonia**
  - **From and HEI perspective a relevant question is: What will the impact be on TRAP with a progressive change in fuel composition over several decades for the long lived legacy fleet?**
    - **Fuels with an increased oxygen content (15% ethanol could become more common)**
    - **Methanol and hydrogen fueled vehicles transiting through, or around, metropolitan areas.**
    - **Impacts of TRAP from electric vehicles: higher tire wear, and according to Argonne National Laboratories LCA analysis – significant portions of the US (primarily in the middle of the country) will experience higher PM10 relative to ICE vehicles due to the carbon intensity of the electric grid which is used to recharge.**

Acknowledgements and Further Reading: Numbers Not Adjectives

- **John Koszewnik, Wallace Wade and Ward Winer,** co-authors with me on the paper; *Pathways To More Rapidly Reduce Transportation's Climate Change Impact* **https://issues.org/reduce-vehicle-transportation-emissions-foster-koszewnik-wade-winer/**
- **Kelly Senecal:** Co-author of; *Racing Towards Zero, The Untold Story of Driving Green:* ISBN 978-1-4686-6
- **U.S. National Blueprint for Transportation Decarbonization**
- **EERE Transportation Blueprint Fact Sheet**
- **The Role of Critical Minerals in Clean Energy Transitions – Analysis – IEA**
- **Wind and Solar Energy Projects Risk Overwhelming America's Antiquated Electrical Grids - The New York Times (nytimes.com)**
- Daniel Yergin; *The New Map, Energy, Climate, and the Clash of Nations*; Chapter 46, Penguin Press, 2020, ISBN 9780698191051