**BACKGROUND**

**PASSenger**
- Passenger transportation comprises about 17% of all domestic rail energy consumption (NREL).
- Approx. 2-3% of passenger rail track is electrified (Amtrak), but due to high frequency of passenger traffic in NE, operation is split about evenly between diesel and electric (TEDB).
- Amtrak nationwide ridership ↑ 29% since 2005; Commuter rail ridership ↑ by 2.9% in 2014 (APTA).

**FREIGHT**
- Freight accounts for about 83% of all rail transportation energy consumption in the U.S. (NREL).
- (Virtually) all freight in the U.S. runs on diesel power (NREL).
- Nearly 1.5 Billion Locomotive Unit Miles in 2013 (AAR).
- Over $11 Billion spent on diesel fuel in 2014 (AAR); Close to 4 Billion gallons consumed in 2014 (AAR).
- California’s freight rail network includes 6,863 miles of track and moved 156.1 million tons of commodities (2011, Caltrans).

**ANALYSIS ASSUMPTIONS**

All LCA GHG emissions values are based on GREET, 2014, values. (And liquid H2 is derived via current methods of Steam Methane Reformation. Newer, improved methods would likely reduce emissions from diesel.) All technological efficiency assumptions come from GREET, 2014, except for LNG HPDI, whose efficiency is assumed as same as diesel.

**ELECTRICITY SENSITIVITY**

While not specifically modeled here, the additional traffic could come from freight trains, in which case diesel infrastructure costs would be shared, and even leased for the passenger rail agency (and possibly involving a lease from a freight firm).

**RESEARCH NEXT STEPS**

- Add sensitivities for different train types and weights (potentially including lighter weights for electric vs. diesel locomotives).
- Learn more about potential for further improvements with diesel engine technology.
- Add hybridized powertrains into analysis (Hybridization could potentially help with technology lifetimes and efficiencies. Regenerative braking, to be available on the Siemens “Charger,” is just one example.)
- Address broader findings for the rail system as a whole.

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