Life Cycle Assessment as a Mobile Source Policy Tool

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Summary

- How does EPA use LCA with respect to mobile sources of emissions?
- What criteria does EPA consider important for transportation-sector LCA?
- What criteria does EPA recommend for LCA in general?
- What types of automotive LCI are under development at EPA?

How does EPA use LCA with respect to mobile sources of emissions?

- Renewable Fuel Standards (RFS)
  - LCA is used to assess GHG impacts of fuels in comparison to the direct emissions from the baseline petroleum fuel it displaces. This includes emissions from:
    - Feedstock production and transportation
    - Fuel production and distribution
    - End-use of the finished fuel
  - Results are used to determine if the fuel pathways meet the GHG reduction thresholds required by the Clean Air Act.
- Statutory Reporting Requirements Under the Energy Independence and Security Act
  - Section 204 of EISA directs EPA, in consultation with the U.S. Departments of Agriculture and Energy, to assess and report triennially to Congress on the environmental and resource conservation impacts of the RFS Program
  - EPA and USDA include LCA as part of the assessment within the triennial report

How does EPA treat LCA with respect to mobile sources of emissions?

- EPA regulates mobile source emissions under Clean Air Act (CAA) authority
  - LCA is not specifically mentioned under the CAA, however LCA is one factor, among many others, that informs EPA policy decisions. This can include:
    - Review of LCA literature
    - Review of LCA submitted as comment to proposed rules
    - Inclusion of LCA within regulatory analyses of health and welfare benefits

- EPA's CAA mobile source regulatory authority includes both criteria pollutants and GHG and increased levels of vehicle electrification impact both criteria pollutants and GHG
  - Comparative LCAs for mobile sources should not consider carbon or GHG emissions in isolation from criteria pollutants
    - Potential upstream and use-case impacts also include NOx, PM, VOC, SOx, and air toxic pollutants depending on the energy carrier
    - Use-phase impacts include tailpipe and evaporative emissions
    - Modeling of fuels for internal combustion engines should consider the full fuel cycle
      - Extraction and/or production, land-use, refining, distribution, and end-use
  - Full accounting of methane emissions from all stages is particularly important to determining life-cycle GHG emissions

- The North American electric grid uses a complex system of interconnection and dispatch
  - Capturing dispatch, EGU build/retirement and the interplay with stationary source emissions regulations is critically important to understanding the upstream emissions impacts of PEV energy use in the United States
  - Dispatch modeling is a key tool for understanding these complex relationships
    - E.g., the Integrated Planning Model: https://www.epa.gov/airmarkets/power-sector-modeling

What criteria does EPA recommend for LCA and LCI in general?

- Follow ISO 14040 and 14044 definitions and guidelines
- Follow U.S. Federal LCA Commons guidelines and UNEP GLAD metadata standards for Life Cycle Inventories (LCI)
  - https://www.lcacommons.gov/
  - https://www.globallcadataaccess.org/
- Use the Federal LCA Commons Elementary Flow List
  - https://github.com/USEPA/Federal-LCA-Commons-Elementary-Flow-List
- Score all LCI according to the EPA Guidance on Data Quality Assessment for LCI Data
  - https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=NRMRL&dirEntryId=321834
- Use existing life cycle inventory data where applicable
  - Use of transparent, publicly available, and reproducible LCI is crucial

What types of automotive LCI are under development by EPA?

- Characterization of future U.S. light- and medium-duty fleet composition, emissions and energy use
  - EPA OMEGA model
- Auto manufacturing
  - Bill of materials from comparative tear-down analyses of dedicated BEV and dedicated ICE platforms
- Battery manufacturing
  - BatPaC v. 5.x
- Refinery emissions
- Emissions from the electric generation
  - Charge infrastructure regionalization model for determining geographic distribution of PEV charging demand
  - PEV upstream emissions from IPM dispatch modeling

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