



# EPA MSTRS: FUELS SCENARIO SUBGROUP

## Members of Fuels Subgroup

Bob Anderson, Chevron

Michael Berube, U.S. DOE

John Eichberger, Fuels Institute

Kent Hoekman, Desert Research Institute

Tracey Jacksier, Air Liquide

Joanne Rotondi, Hogan Lovells

Diep Vu, Marathon

# Our Task:

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In a world where alternative fuels such as electricity and hydrogen are used to meet a significant percentage of the light duty and heavy duty on-road fuel demand, describe EPA's work and role in reducing emissions from the fuel pool.

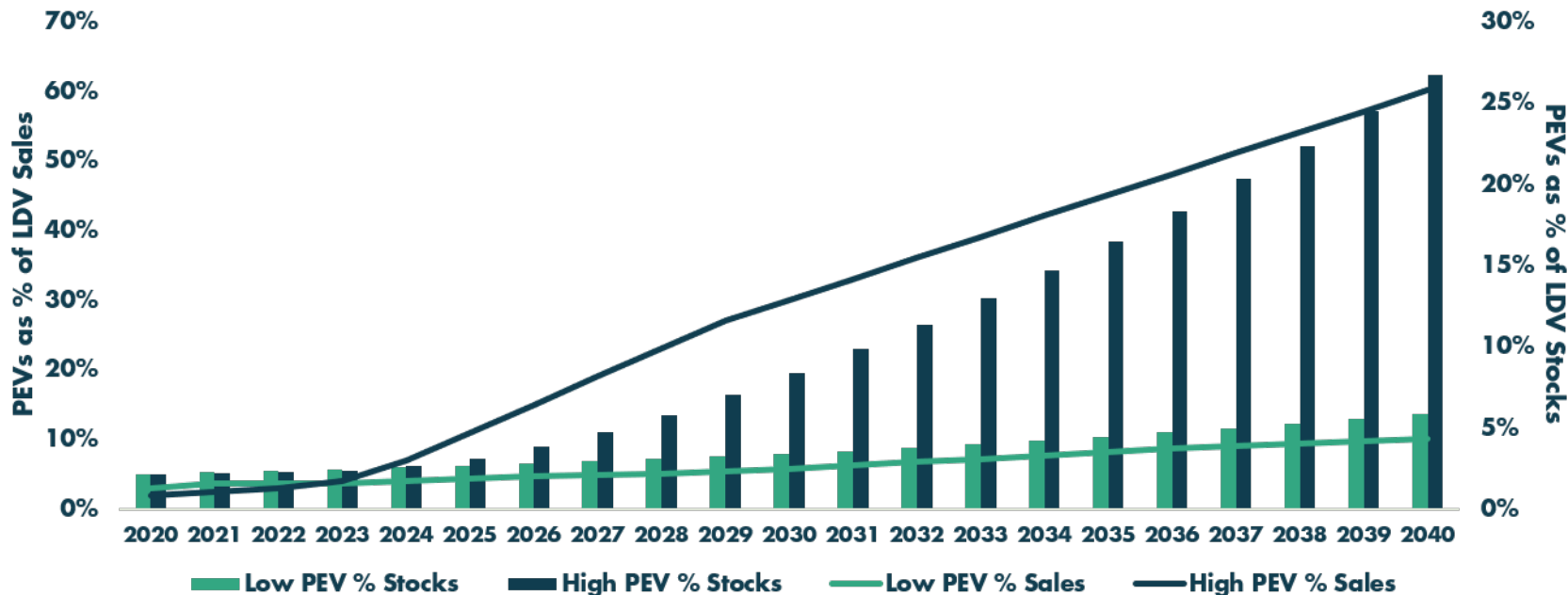
Are there transportation sub-sectors where liquid fuels will be critical? If so, which ones?

What actions should EPA take to provide that liquid fuels reduce emissions, particularly for fuels such as biofuels where a majority of the emissions could be upstream of the tailpipe?

# How much liquid fuel may remain?

Two very different forecasts provide insight into how important it remains for EPA to dedicate attention to the liquid fuel and combustion engine sector. In 2040, ICE vehicles may still represent as much as 73% of LDVs on the road and even more MHDVs.

**PEV Sales and Stocks**  
(Low and High PEV Adoption Scenarios)



# General Recommendations

The Fuels Subgroup believes there are some over-arching things EPA should pursue regardless of specific policy considerations.

## Leadership

EPA should adopt a stronger leadership position relative to **regulatory and standard setting organizations**. EPA should engage pro-actively with regulated industry stakeholders, other federal agencies, and regulatory organizations such as ASTM and NCWM to promote collaboration and coordination.

## Collaboration

EPA has achieved great success in pursuit of its mission when it has adopted regulations that incentivize achievement, as opposed to mandating specific solutions. **Working with industry** to host educational workshops, including compliance training programs, has been extremely successful in the past and should be part of any new regulatory program.

## Integration

EPA should evaluate its myriad of **regulatory programs** that operate independently to determine if they could be more effective **working in tandem with others**. By enabling such programs to build off one another, the Agency could provide the market with tools and opportunities that may not be viable independently.

## Coordination

EPA should seek to coordinate with other federal, state and local regulatory agencies to **promote consistency in fuels regulations across jurisdictions**. When jurisdictions impose requirements incompatible with those of other jurisdictions the fuels distribution system can experience disruption, which can result in economic and environmental harm.

## Equity

Access to **reliable and affordable transportation** is essential for all people, and not all communities are equally equipped to accommodate new developments. Policies must be developed in such a way as to prioritize infrastructure and societal costs, facilitate public involvement, and **mitigate any potential negative implications for such communities**.

# Specific Recommendations

Subgroup identified eight areas on which EPA should focus and grouped them into two categories: Category 1 (fundamental) and Category 2 (policy specific).

	Near Term 0 to 5 years	Mid Term 5 to 10 years	Long Term 10 to 30 years
<b>Category 1 Recommendations</b>			
Life-cycle Analysis Criteria			
Database of Emissions Sources			
<b>Category 2 Recommendations</b>			
Low-Carbon Performance Standard			
Low-Carbon Biofuels			
Harmonize Gasoline Specs			
Non-Fuel/Non-Tailpipe Emissions			
Emissions from Legacy Vehicles			
Hydrogen and E-Fuels			

# Category 1 Recommendations

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The first two recommendations will provide fundamental direction from the Agency to enable effective assessment of the other recommendations. The subgroup recommends EPA establish these baselines for evaluating options so that all stakeholders understand what is under consideration and how it shall be measured. This should take the form of:

- **Life Cycle Analysis:** Work with stakeholders to establish a consensus-based methodology for life cycle analyses (LCA), to eliminate different models and versions that are subject to bias. A consensus-based model should conform to academic standards for sound science, peer review, and transparency and be used by EPA to evaluate and publish fuel and vehicle emissions pathways for all types of fuels.
- **Database of Emissions Sources:** Develop a comprehensive database of all sources of emissions to ensure attention is paid to those sources which present the greatest opportunity to reduce emissions and to ensure that transportation-focused regulations are appropriate and proportional.

# Life Cycle Analysis

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**LCA-based regulations and policies may help encourage various powertrain technologies and fuels to play a role in GHG reduction from transportation.**

## **LCA Criteria**

- A standardized LCA model with consistent methods, system boundaries and up-to-date data, such as Argonne's GREET model.
- The LCA model must be publicly accessible and well documented with respect to input parameters and assumptions.
- The LCA results should be transparent and subject to verification.
- The vehicle manufacturing cycle and end-of-life processes should be integral parts of LCA of various vehicle/fuel systems to allow for a complete carbon footprint assessment (CFA) of competing systems.

## **Holistic Vehicle/Fuel Systems Approach**

- The true carbon footprint of a particular vehicle depends upon how, where, and when the fuel is produced, in addition to the lifecycle of the vehicle itself.
- A holistic approach that considers the LCA of a vehicle and its energy source as a system is essential.
- It is necessary to fully account for the different components and processes involved in the production of various fuels.

# Database of Emissions Sources

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Only by accurately identifying the myriad sources of emissions can EPA develop strategies to effectively reduce emissions in the most efficient manner possible while not overly and disproportionately burdening one source of emissions.

## **EPA should:**

- Develop a comprehensive database of emissions sources
- Database should include all sources that may impact the total contributions of primary emissions into the atmosphere, including and beyond transportation.
- This will provide the necessary information to develop regulations that:
  - Provide the greatest benefit
  - Are most efficient and effective
  - Are proportional to the emissions contributions of subject sector
    - Transportation should not be held responsible for offsetting emissions from unrelated sources



# Category 2 Recommendations

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## **Specific policy recommendations presented include:**

- Establish a low-carbon performance standard for fuels and vehicles
- Facilitate development and introduction of low-carbon fuels
- Harmonize gasoline specifications to facilitate improved vehicle-fuel performance
- Develop a plan to address non-fuel/non-tailpipe emissions
- Develop a plan to address criteria and GHG emissions from legacy vehicles
- Explore the role of low-carbon hydrogen and electricity in the production of future liquid fuels

# Low Carbon Performance Standards

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Fuel producers and engine manufacturers have very different standards (i.e., RFS and CAFE) which complicates efforts to collaborate for the most efficient solutions. A new holistic approach is needed. Modeling vehicles and fuels on the same plane will create a higher understanding of emissions stemming from transportation and opportunities for more efficiently and effectively reducing emissions.

## **EPA should:**

- Pursue a holistic approach to setting standards for engines and fuels, without overlapping requirements.
- Apply the standard LCA when evaluating performance and apply it to all vehicles and all fuels
- Coordinate and streamline pathway assessments for all fuels and be fuel agnostic to encourage innovation
- Approach fuel economy more directly via a standardized model reflecting similar metrics as fuel modeling
- Combine knowledge and efforts with DOE and other applicable agencies to apply LCA principles to automobile production and mileage.

# Low Carbon Biofuels

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Lowering the CI of liquid fuels is essential to derive benefits from the long-lived legacy fleet.

## **EPA Should:**

- Apply at the highest levels carbon reduction policies that:
  - Are technology and fuel neutral
  - Are market based
  - Target the lowest marginal abatement cost for reducing carbon
  - Are large in scale for maximum cost effectiveness
- Consider incentives for full life cycle carbon reduction to stimulate the growth of advanced and cellulosic biofuels.
  - Ex: Develop new RIN opportunities for fuels that have a full LCA carbon intensity below the statutory thresholds
- Improve process for approving new fuel pathways to encourage the opportunities for innovation:
  - Streamline process to approve/deny new pathways within 60 days and remove the current backlog of pending pathway approvals
  - Eliminate confusion and avoid multiple layers of regulation
  - Consider vehicle and infrastructure compatibility
- Consider opportunities/challenges of a national LCFS and how it might be integrated with existing programs (RFS)
- Coordinate with stakeholders re: eRIN pathway for RFS, ensure it is balanced with other electricity incentive programs

# Harmonizing Fuel Specifications

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## EPA should:

- Continue it's fuel regulatory program which has significantly reduced criteria pollutant emissions from the light duty fuel/vehicle sector.
- Monitor the impact of the Regulatory Streamlining requirements to determine if additional standards would be beneficial in the future.
- Manage any further regulatory or performance changes for cost-benefit effectiveness
  - Further opportunities for harmonization and pollution reduction may exist but are likely reaching the point of diminishing returns.
  - Performance standards, like higher octane fuels, may present new opportunities for greater GHG reduction but also present significant and potentially expensive challenges.
- EPA should increase coordinated efforts with engine manufacturers and producers of fuels to assure fuels complement the effectiveness of an engine's performance and emission control devices (i.e., Department of Energy's Co-Optimization of Fuels and Engines Initiative)

# Non-road Sources and Emissions

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Nonroad sources comprise a significant portion of transportation-related emissions and are expected to grow in percentage. Therefore, nonroad sources should be a priority for low carbon fuel solutions and advanced technologies, including hybridization, for applications where complete electrification may not be feasible or cost effective.

## **EPA should:**

- Develop a comprehensive and consistent emissions inventory for nonroad sources, including aviation, locomotive and marine sources.
- Consider a comprehensive performance-based strategy to address both new and in-use vehicles and engines to allow for multiple technological solutions among varied applications.
- Consider the contributions of tire and brake wear (among other components) to air quality and conduct or commission further research to assess the impact of such emissions.
- Evaluate the results of such research to determine whether non-exhaust emissions, such as from tire and brake wear, should be the subject of further requirements, including for EVs.

# Legacy Vehicle Fleet

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**Legacy fleet in context of 2050 consists of today's current vehicle fleet plus all vehicles sold over the next 10-20 years.**

Given the expected useful life of vehicles and the slow-turnover of the fleet, EPA should commit significant attention to identifying strategies for reducing emissions from legacy vehicles. Not a single technology option, but a diversification of technologies and programs are essential to achieve reductions that fulfill the various needs of the transportation sector.

## **EPA should:**

- Study effectiveness of inspection and maintenance programs
  - Might be based on dated methodologies that don't take into consideration modern vehicle technology
  - Outdated programs might overstate emissions, leading to ineffective/unnecessary regulations
  - Outdated programs might underestimate of the true cost of the emissions reductions
- Continue fuel efficiency standard program to improve emissions profile of new ICE vehicles entering the market
- Develop pathways and programs to support the use of cleaner fuels and advanced alternative fuels:
  - Accelerate those that lower CI
  - Recognize that different fuel options may be better suited for certain vehicle classes/use cases
- Emphasize retirement of the oldest and most polluting vehicles - a disproportionate contributor of emissions
- Work with the DOT to educate localities on congestion mitigation strategies to lower emissions in high traffic regions

# Hydrogen and E-fuels

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Even with widespread electrification of on-road vehicles, the need for energy-dense, carbon-based liquid fuels is projected to remain, especially in long-distance travel and transport, whether on-road long-haul, maritime, air, or rail.

- Uncertainty remains on the extent of electric vehicle adoption, especially for heavy trucks, which in turn influences the requirements for liquid fuels and other alternatives, like hydrogen.
- The transition to electric or alternative fuels will take time to allow the entire fleet to turn over, and there will be a long transition with legacy vehicles in all sectors for decades to come sustaining demand for liquid fuels during this time.
- There are sub-sectors of transportation that will be hard to transition to direct electrification (i.e., aviation, maritime, rail, and long-haul trucks). These sub-sectors are projected to grow faster than light-duty vehicles in the next decades.

There has been significant recent interest in developing “efuels” by using electricity to power the conversion of CO<sub>2</sub>, either via renewable H<sub>2</sub> or direct carbon electroreduction. Such fuels have the potential to effectively “electrify” portions of the transportation system that remain difficult for battery technologies to serve.

## **EPA should:**

- Support research and development in integrating and rightsizing downstream strategies with CO<sub>2</sub> reduction technologies as well as understanding how these technologies would be integrated with a renewable electricity system that favors flexibility.

# Summary

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## EPA should:

- Assert its leadership position, engage with standards setting bodies, collaborate with industry on education and implementation, integrate programs in a holistic manner, coordinate among regulatory agencies and ensure policies seek to provide all communities with access to affordable and reliable transportation
- Base regulations on a consistent and transparent LCA and consider fuels & vehicles as a holistic system
- Build a database of all emissions sources to help prioritize regulatory attention and ensure regulations are proportional to contribution of emissions
- Develop LCA-based low carbon performance standard, encourage innovation, speed introduction of lower CI fuels
- Monitor the effects of the streamlining rule, evaluate any new changes with a cost-benefits perspective
- Establish performance-based strategy for non-road sources, evaluate non-tailpipe emissions, i.e. tire & brake wear
- Continue improved efficiency of new vehicles, support retirement of oldest vehicles and ensure methods for assessing emissions of legacy fleet reflect modern vehicle technologies
- Support R&D to leverage renewable electricity and H<sub>2</sub> to produce zero carbon liquid fuels that can support vehicle classes and use cases that may be extremely difficult to electrify