Sustainable Pathways for Trucking
DTNA Recommendations for Rulemaking

STEPS Workshop

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Our longtime mission…

but fuel economy is constrained by NOx
Are the 80 to 90% reduction targets achievable?

Relationship between Fuel Economy Improvement and Fuel Consumption Reduction

Are the 80 to 90% reduction targets achievable?

<table>
<thead>
<tr>
<th>Engine</th>
<th>Second Law Limit Vehicle</th>
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</thead>
<tbody>
<tr>
<td>Aero CdW</td>
<td>Second law, maximum theoretically possible</td>
</tr>
<tr>
<td>Transmission &amp; Axle</td>
<td>Less than ½ of best vehicle on the market</td>
</tr>
<tr>
<td>Auxiliaries</td>
<td>No friction, best axle and gearing available</td>
</tr>
<tr>
<td>Overall Rolling Resistance</td>
<td>Steel wheels</td>
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<table>
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<tr>
<th>Electric heavy-duty vehicle</th>
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<tbody>
<tr>
<td>200 gallon diesel equivalent range = approx. 75,000 lb. tare weight</td>
<td>At best, 5,000 lb. left for freight</td>
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Bottom line: No, the tractor targets exceed what a tractor may feasibly achieve.
And regulations must reflect the fact that—even if technology costs and feasibilities were not issues—not all vehicles can be Super Truck.

Bottom line: for any regulatory subcategory, standards must be based on technologies' FCRs times their achievable market penetration rates.
Multiple approaches to reduce braking losses

..and energy kinetic energy optimization erodes energy recoverable from waste heat.

Energy Consumption on Highway Route

- Minimize Brake Usage
- Regenerate Brake Energy
- Propulsion to overcome braking losses
- Positive Propulsion


Most of benefit is derived at minimal hardware, weight, and cost.
The optimal approach is a balance of vehicle GHG reductions and more.

Vehicle-related measures
- Vehicle
- Trailer
- Tires

Fuel
- Renewable Fuels

Operations
- Operation
- Infrastructure
- Fleet renewal