

increasing NO_x conversion efficiency in the catalyst or decreasing engine out NO_x. Control strategies include improving control of the A/F ratio, eliminating the lean-on-cruise calibration strategy, adjusting spark timing, adding or enhancing EGR systems strategic cycling of the A/C compressor, and improving catalysts to enhance NO_x conversion efficiency.

The testing at ACR confirmed that HC and CO were also impacted by A/C operation. The Agency believes that these HC and CO increases are related to the increased load on the engine triggering additional periods of commanded enrichment when the A/C is on. The Agency believes that the control strategies for HC and CO discussed in "IX.A. Aggressive Driving Emissions" will eliminate HC and CO emissions increases due to A/C operation as well as during aggressive driving.

X. Options Considered and Information Needed

The following outlines the options which EPA has considered in developing today's proposal and issues on which more information is needed. As has been indicated, EPA and other stakeholders conducted extensive research and examined many options. While today's proposal selects the approach EPA felt would provide the most emission benefits feasible, in developing the final rule EPA will reconsider each of the options in terms of new research and data submitted. The Agency welcomes comments and additional data on these and any other points. A full discussion of these issues and a detailed analysis of each option is found in the Support Document to the Proposed Regulations for Revisions to the Federal Test Procedure: Detailed Discussion and Analysis.

A. Affecting Aggressive Driving Cycle

The Agency evaluated three basic options for establishing standards and vehicle testing aimed at controlling emissions from aggressive driving. Two options were based on emission performance standards with compliance measured using a test cycle, and one option was based on a performance standard using the A/F ratio with a related test procedure.

The Agency was guided by seven criteria in evaluating the options. First, EPA sought an option that would lead to control of emissions over the broad range of aggressive driving behavior found in the in-use driving survey data. Second, due to the non-linear nature of HC and CO emission increase during enrichment, a high priority was to

ensure sufficient content from the highest-emission operating modes to prompt manufacturers to employ appropriate control strategies, including curtailing commanded enrichment. Third, the Agency sought consensus with CARB, to avoid duplicate or incompatible test requirements. Fourth, EPA sought to reasonably account for technical concerns raised by vehicle manufacturers, particularly manufacturer comment on the necessity of some commanded enrichment events to avoid elevated catalyst temperature levels from in-use operation leading to catalyst deterioration.²⁴ Fifth, EPA sought to pursue cost saving elements like reduction in test time where practical. Sixth, the Agency sought practical control of microtransient behavior, a candidate area of control that spans all driving. Finally, EPA favored strategies to control aggressive driving emissions that would also address the potentially significant (but unquantified) emissions from other engine load factors like road grade.

A full analysis of each option, how it was evaluated, how the level of emission control was determined, and the feasibility of the approach is in the Support Document to the Proposed Regulations for Revisions to the Federal Test Procedure: Detailed Discussion and Analysis and Technical Reports and comment on the analysis is welcome. Comment is specifically solicited on the following items:

- Comment is requested on the need to allow some commanded enrichment events during the US06 Cycle to avoid elevated catalyst temperature levels from in-use operation leading to catalyst deterioration.
- The Agency is proposing that US06 HC and NMHC emissions be controlled to the same gram-per-mile emission levels currently achieved on the second bag of the FTP. US06 CO and NO_x emissions are proposed to be controlled to overall FTP emission levels. These proposals are based upon the Agency's analyses of the potential control technology and their related costs and emission reductions, which are described in detail in the Technical Reports. Comments and additional data addressing these proposed levels of control are solicited. Additional information and data are also requested about the potential tradeoffs between NO_x and CO control during aggressive driving, and on the impact such

tradeoffs could have on the appropriate level of CO control.

- Although concern has been expressed that removal of commanded enrichment could impose a 2 percent to 10 percent power penalty, EPA believes power enrichment would not be precluded outright by this proposal, but rather curtailed only within the durations and speed-acceleration combinations found in the US06 cycle. Thus, the Agency has concluded on the basis of available data that compliance with the US06 standard should have a negligible effect on vehicle performance. Additional data on the effect on vehicle performance under this proposal is requested.

- The Agency has proposed adjustments to the US06 for all HLDTs and some LDVs and LDTs. These include a change in determining inertia weight for HLDTs, dynamic load adjustment for low-performance vehicles, and demonstration of stoichiometric control for wide-open throttle events for high-performance vehicles. Comments and data are solicited on the appropriateness of these adjustments and of the weight-to-power cutpoints. Of special concern is the possible unfair advantage the proposed high performance cut-off may provide to vehicles in the 18–21 W/P range.

- The Agency has proposed a W/P-based measure for the performance cutoffs after also considering the alternative performance criteria based on a vehicle's acceleration time from zero to 60 mph. The Agency rejected the zero to 60 time approach on the basis of practical problems related to establishing appropriate cutoff points and a standardized procedure for determining zero to 60 times. The Agency solicits comments on the proposed method for making vehicle performance adjustments, as well as input on alternatives, including the one discussed above.

B. Affecting Start Driving Cycle and Intermediate Soak

The compliance program approach evaluated for intermediate soaks and start driving was an emission performance standard applied to the results of testing over an emission control cycle following a soak period of intermediate duration. As with control program approaches for aggressive driving emissions, EPA believes that an emission performance standard provides the most direct method of controlling the emissions arising during the particular type of vehicle operation. Given the particular causes of high emissions in this case, use of design standards or system performance

²⁴ The relationship between curtailing commanded enrichment and catalyst deterioration is addressed in the discussion of feasibility in the Technical Report.