



ENVIRONMENTAL PROTECTION AGENCY

6560-50-P

[EPA-HQ-OAR-2020-0073; FRL-10005-61-OAR]

Alternative Methods for Calculating Off-cycle Credits under the Light-duty Vehicle Greenhouse Gas Emissions Program: Applications from Hyundai Motor Company and Kia Motors Corporation

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: EPA is requesting comment on applications from Hyundai Motor Company (“Hyundai”) and Kia Motors Corporation (“Kia”) for off-cycle carbon dioxide (CO₂) credits under EPA’s light-duty vehicle greenhouse gas emissions standards. “Off-cycle” emission reductions can be achieved by employing technologies that result in real-world benefits, but where that benefit is not adequately captured on the test procedures used by manufacturers to demonstrate compliance with emission standards. EPA’s light-duty vehicle greenhouse gas program acknowledges these benefits by giving automobile manufacturers several options for generating “off-cycle” CO₂ credits. Under the regulations, a manufacturer may apply for CO₂ credits for off-cycle technologies that result in off-cycle benefits. In these cases, a manufacturer must provide EPA with a proposed methodology for determining the real-world off-cycle benefit. Hyundai and Kia have submitted applications that describe methodologies for determining off-cycle credits from technologies described in their applications. Pursuant to applicable regulations, EPA is making these off-cycle credit calculation methodologies available for public comment.

DATES: Comments must be received on or before **[insert date 30 days after date of publication in the Federal Register]**.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ- OAR-2020-0073, to the Federal eRulemaking Portal: <http://www.regulations.gov>. Follow the online instructions for submitting comments. Once submitted, comments cannot be edited or withdrawn. The EPA may publish any comment received to its public docket. Do not submit electronically any information you consider to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Multimedia submissions (audio, video, etc.) must be accompanied by a written comment. The written comment is considered the official comment and should include discussion of all points you wish to make. The EPA will generally not consider comments or comment contents located outside of the primary submission (i.e. on the web, cloud, or other file sharing system). For additional submission methods, the full EPA public comment policy, information about CBI or multimedia submissions, and general guidance on making effective comments, please visit <http://www2.epa.gov/dockets/commenting-epa-dockets>.

FOR FURTHER INFORMATION CONTACT: Roberts French, Environmental Protection Specialist, Office of Transportation and Air Quality, Compliance Division, U.S. Environmental Protection Agency, 2000 Traverwood Drive, Ann Arbor, MI 48105. Telephone: (734) 214-4380. Fax: (734) 214-4869. Email address: french.roberts@epa.gov.

SUPPLEMENTARY INFORMATION:

I. Background

EPA's light-duty vehicle greenhouse gas (GHG) program provides three pathways by which a manufacturer may accrue off-cycle carbon dioxide (CO₂) credits for those technologies that achieve CO₂ reductions in the real world but where those reductions are not adequately captured on the test used to determine compliance with the CO₂ standards, and which are not otherwise reflected in the standards' stringency. The first pathway is a predetermined list of credit values for specific off-cycle technologies that may be used beginning in model year 2014.¹ This pathway allows manufacturers to use conservative credit values established by EPA for a wide range of technologies, with minimal data submittal or testing requirements, if the technologies meet EPA regulatory definitions. In cases where the off-cycle technology is not on the menu but additional laboratory testing can demonstrate emission benefits, a second pathway allows manufacturers to use a broader array of emission tests (known as "5-cycle" testing because the methodology uses five different testing procedures) to demonstrate and justify off-cycle CO₂ credits.² The additional emission tests allow emission benefits to be demonstrated over some elements of real-world driving not adequately captured by the GHG compliance tests, including high speeds, hard accelerations, and cold temperatures. These first two methodologies were completely defined through notice and comment rulemaking and therefore no additional process is necessary for manufacturers to use

¹ See 40 CFR 86.1869-12(b).

² See 40 CFR 86.1869-12(c).

these methods. The third and last pathway allows manufacturers to seek EPA approval to use an alternative methodology for determining the off-cycle CO₂ credits.³ This option is only available if the benefit of the technology cannot be adequately demonstrated using the 5-cycle methodology. Manufacturers may also use this option to demonstrate reductions that exceed those available via use of the predetermined list.

Under the regulations, a manufacturer seeking to demonstrate off-cycle credits with an alternative methodology (i.e., under the third pathway described above) must describe a methodology that meets the following criteria:

- Use modeling, on-road testing, on-road data collection, or other approved analytical or engineering methods;
- Be robust, verifiable, and capable of demonstrating the real-world emissions benefit with strong statistical significance;
- Result in a demonstration of baseline and controlled emissions over a wide range of driving conditions and number of vehicles such that issues of data uncertainty are minimized;
- Result in data on a model type basis unless the manufacturer demonstrates that another basis is appropriate and adequate.

Further, the regulations specify the following requirements regarding an application for off-cycle CO₂ credits:

- A manufacturer requesting off-cycle credits must develop a methodology for demonstrating and determining the benefit of the off-cycle technology

³ See 40 CFR 86.1869-12(d).

and carry out any necessary testing and analysis required to support that methodology.

- A manufacturer requesting off-cycle credits must conduct testing and/or prepare engineering analyses that demonstrate the in-use durability of the technology for the full useful life of the vehicle.
- The application must contain a detailed description of the off-cycle technology and how it functions to reduce CO₂ emissions under conditions not represented on the compliance tests.
- The application must contain a list of the vehicle model(s) which will be equipped with the technology.
- The application must contain a detailed description of the test vehicles selected and an engineering analysis that supports the selection of those vehicles for testing.
- The application must contain all testing and/or simulation data required under the regulations, plus any other data the manufacturer has considered in the analysis.

Finally, the alternative methodology must be approved by EPA prior to the manufacturer using it to generate credits. As part of the review process defined by regulation, the alternative methodology submitted to EPA for consideration must be made available for public comment.⁴ EPA will consider public comments as part of its final decision to approve or deny the request for off-cycle credits.

⁴ See 40 CFR 86.1869-12(d)(2).

II. Off-Cycle Credit Applications

A. Active Climate Control Seats

Hyundai and Kia are applying for off-cycle GHG credits for the use of active climate control seat technologies. Climate Control Seats (CCS) are a seat technology that utilizes motorized blowers, thermoelectric devices, and seating surfaces designed for high airflow to move chilled air through the seat and onto the occupant. In Hyundai and Kia vehicle applications, the CCS contains two thermoelectric chillers: one in the seat back, one in the seat cushion. The seat cushion contains one blower motor with air ducts to direct blower air flow through both the seat cushion and seat back. The technology provides active cooling, which occurs when the blower motor passes ambient cabin air across the integrated thermoelectric chillers; the chilled air then moves through the seating surfaces and onto the vehicle occupant. The technology allows vehicle occupants to reach equivalent thermal comfort at a higher cabin ambient temperature compared to a baseline seat, and therefore has the potential to reduce A/C system fuel use more than ventilated seats.

General Motors (GM) previously applied for credits for this technology, and EPA approved these credits for GM in 2018.⁵ GM's methodology referenced a 2017 study conducted by the National Renewable Energy Laboratory (NREL) in partnership with Gentherm, the manufacturer of the CCS system.⁶ This study found that the CCS

⁵ "EPA Decision Document: Off-cycle Credits for General Motors and Toyota Motor Corporation." Compliance Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency. EPA-420-R-18-014, June 2018.

⁶ "Impact of Active Climate Control Seats on Energy Use, Fuel Use, and CO₂ Emissions: Test and Analysis." Cory Kreutzer, John Rugh, Bidzina Kekelia, Gene Titov, Strategic Partnership Project Report, Contract No. DE-AC36-08GO28308, May 2017.

technology reduced air conditioner loads by 17%, substantially more than the 7.5% reduction for the older technology tested by NREL in 2005 and used to derive the menu-based credit in the regulations. Applying this 17% reduction to the EPA baseline A/C emissions (13.8 for cars and 17.2 for trucks) results in off-cycle credit for CCS systems of 2.3 grams/mile for passenger cars and 2.9 grams/mile for trucks (instead of the default credits of 1.0 and 1.3 grams/mile, respectively). EPA considers the CCS system to be a thermal control technology that, if approved, will be subject to the maximum per vehicle limits of 3.0 g/mi for passenger automobiles and 4.3 g/mi for light trucks specified in the regulations.⁷

Hyundai and Kia use the Gentherm seat technology, thus they similarly referenced the NREL report and have requested credits identical to those already approved for GM. Their requests are for 2012 and later model year vehicles using this technology. If approved, these credits would be for vehicles using this technology in both front seating locations, consistent with the NREL evaluation and the credits granted to GM.

B. Air Conditioning Compressor with Variable Orifice Valve Technology

Hyundai and Kia are applying for off-cycle GHG credits for the use of the Hanon air conditioner compressor with variable orifice valve technology. The Hanon compressor design improves the internal valve system to reduce the internal refrigerant flow necessary throughout the range of displacements that the compressor uses during its operating cycle. This is achieved through the addition of a variable orifice valve.

⁷ See 40 CFR 86.1869-12 (b)(1)(viii).

Conventional compressors have a fixed orifice, so the flow of refrigerant exiting the crankcase is fixed. The sizing of the orifice is a compromise among the conditions when either a high or low rate of flow would be more ideal. However, variable orifice valve technology can provide a larger mass flow under maximum capacity and compressor start-up conditions by opening the valve, when high flow is ideal; it can then reduce to smaller openings with reduced mass flow in mid or low capacity conditions. Thus, overall, the refrigerant exiting the crankcase is optimized across the range of operating conditions, improving system efficiency and therefore lowering indirect CO₂ emissions due to use of the air conditioning system.

Hyundai and Kia are applying for credits for the 2021 and later model years for vehicles sold in the U.S. and equipped with the Hanon A/C compressor with variable orifice valve technology. The credits requested range from 1.5 g/mi to 1.8 g/mi, depending on the specifics of the A/C system. EPA considers this compressor technology to be a technology that, if approved, will be subject to the maximum limits for an A/C system of 5.0 g/mi for passenger automobiles and 7.2 g/mi for light trucks specified in the regulations.⁸ Details of the testing and analysis can be found in the manufacturer's applications.

III. EPA Decision Process

EPA has reviewed the applications for completeness and is now making the applications available for public review and comment as required by the regulations. The

⁸ See 40 CFR 86.1868-12 (b).

off-cycle credit applications submitted by the manufacturers (with confidential business information redacted) have been placed in the public docket (see **ADDRESSES** section above) and on EPA's web site at <https://www.epa.gov/vehicle-and-engine-certification/compliance-information-light-duty-greenhouse-gas-ghg-standards>.

EPA is providing a 30-day comment period on the applications for off-cycle credits described in this document, as specified by the regulations. The manufacturers may submit a written rebuttal of comments for EPA's consideration, or may revise an application in response to comments. After reviewing any public comments and any rebuttal of comments submitted by manufacturers, EPA will make a final decision regarding the credit requests. EPA will make its decision available to the public by placing a decision document (or multiple decision documents) in the docket and on EPA's web site at the same manufacturer-specific pages shown above. While the broad methodologies used by these manufacturers could potentially be used for other vehicles and by other manufacturers, the vehicle specific data needed to demonstrate the off-cycle emissions reductions would likely be different. In such cases, a new application would be required, including an opportunity for public comment.

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Byron J. Bunker,

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