EPA Decision Document:

Off-Cycle Credits for General Motors Corporation LLC

United States Environmental Protection Agency

EPA Decision Document:

Off-Cycle Credits for General Motors Corporation LLC

Compliance Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

United States Environmental Protection Agency

EPA-420-R-21-017
July 2021

EPA Decision Document: Off-Cycle Credits for General Motors Corporation LLC

I. Introduction

EPA's light-duty vehicle greenhouse gas (GHG) rules include opportunities for manufacturers to generate CO_2 credits for technologies that provide CO_2 reductions not captured by the 2-cycle emissions test. There are three pathways by which manufacturers can generate off-cycle credits: (1) a pre-determined "menu" of technologies and credits that is available for 2014 and later model years, (2) a testing-based option, and (3) an alternative methodology that includes opportunity for public comment. These are described in more detail in Section II.

Pursuant to those rules General Motors Corporation (GM) submitted an application requesting off-cycle credits. GM applied for pulse width modulated (PWM) HVAC brushless motor (BLM) power controller technology off-cycle GHG credits.

EPA published a notice in the *Federal Register* on April 6, 2021 announcing a 30-day public comment period for this application.[1] EPA received no adverse comments regarding the methodology presented for determining the credit sought by GM, and is hereby approving the technology, the methodology for determining the credits, and the credit levels as described in GM's application and in the *Federal Register*.

Section II of this document provides background on EPA's off-cycle credits program. Section III provides EPA's decision. This decision document applies only to the applications referenced herein.

II. EPA's Off-cycle Credits Program

EPA's light-duty vehicle greenhouse gas (GHG) program provides three pathways by which a manufacturer may accrue off-cycle carbon dioxide (CO_2) credits for those off-cycle technologies that achieve CO_2 reductions in the real world but where those reductions are not adequately captured on the test procedure used to determine compliance with the CO_2 standards. The first is a predetermined list of credit values for specific off-cycle technologies that may be used beginning in model year 2014.[2] 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. In cases where additional laboratory testing can demonstrate emission benefits of an off-cycle technology, a second pathway allows manufacturers to use a broader array of emission tests (known as "5-cycle" testing because the

[1] 86 FR 17832, April 6, 2021.
[2] See 40 CFR 86.1869-12(b).

methodology uses five different testing procedures) to demonstrate and justify off-cycle CO_2 credits.[3] The additional emission tests allow emission benefits to be demonstrated over some elements of real-world driving not captured by the GHG compliance tests, including high speeds, hard accelerations, and cold temperatures. Credits determined according to this methodology do not undergo additional public review. The third and last pathway allows manufacturers to seek EPA approval to use an alternative methodology for determining the off-cycle CO_2 credits.[4] This option is only available if the benefit of the off-cycle 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 CO_2 credits:

- A manufacturer requesting off-cycle credits must develop a methodology for demonstrating and determining the benefit of the off-cycle technology 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 CO_2 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.

[3] See 40 CFR 86.1869-12(c).
[4] See 40 CFR 86.1869-12(d).

- 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.[5] EPA will consider public comments as part of its final decision to approve or deny the request for off-cycle credits.

Although these credits are requested under regulatory provisions that don't explicitly require limitations, or caps, on credit values, EPA is stipulating here that credits for technologies for which there is a regulatory cap must be held to the applicable regulatory cap, if such credits are approved by EPA. For example, for reasons described in the implementing rulemaking documents and analyses, EPA established caps on thermal technology credits of 3.0 grams/mile for cars and 4.3 grams/mile for trucks. The rationale for these caps is applicable regardless of the off-cycle pathway being used to achieve such credits. EPA also established caps on technologies that improve the efficiency of air conditioning systems (5 grams/mile for cars and 7.2 grams per mile for trucks). Thus, credits approved in this Decision Document are being approved only to the extent that the regulatory caps on credits for certain technologies or categories of technologies are not exceeded.

III. EPA Decision on Off-cycle Credit Application

Pulse Width Modulated HVAC Brushless Motor Power Controller Technology

Using the alternative methodology approach discussed above, GM applied for pulse width modulated (PWM) HVAC brushless motor (BLM) power controller technology greenhouse gas credits beyond those provided in the regulations. The PWM HVAC BLM power controller technology uses circuit switching instead of mechanical switching. The mechanical switching mechanism uses brushes to deliver current to motor windings. By implementing the PWM HVAC BLM power controller technology, frictional loses are reduced because there is no physical contact between stator and commutator. There is also a reduction in heat losses with the PWM HVAC BLM compared to the mechanical switching motor.

EPA did not receive any comments on GM's application.

The following table shows the approved credits for the GM PWM HVAC brushless motor power controller technology for model years 2015 and later.

Brushless Motor Credits	Total Credit (g CO2/mi)	A/C On (g CO2/mi)	A/C Off (g CO2/mi)
Manual A/C	0.4	0.2	0.2
Automatic A/C	0.4	0.3	0.1

[5] See 40 CFR 86.1869-12(d)(2).