

GENERAL MOTORS

Frederick S. Sciance
Manager Environment & Climate Policy
Global Public Policy
MC: 482-C30-B11
300 Renaissance Center
Detroit, MI 48265-3000

FE 6357

September 29, 2017

Linc Wehrly
Director, Light Duty Vehicle Center
Compliance Division
Office of Transportation and Air Quality
Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, Michigan 48105

Mr. Wehrly:

Request for GHG Credit for Active Climate Control Seat Technology

Pursuant to the provisions of 40 CFR § 86.1869-12(d), General Motors requests off-cycle greenhouse gas credit for the use of active climate control seat technologies (CCS). Based on the analysis provided in Attachment A, General Motors requests credits equal to 2.3 grams CO₂ per mile for passenger cars and 2.9 grams CO₂ per mile for trucks on all models that have used these CCS seats in both front seating locations. We also plan to submit a similar credit request to NHTSA for off-cycle CAFE credits for the appropriate model years.

As explained below in more detail, the current request is for a larger amount of credit for certain seat designs than could be earned by these designs using the pre-defined and pre-approved pick list of default off-cycle credits for ventilated seats.

Background

In October 2012, EPA and NHTSA released their Final Rule for 2017-2025 light-duty vehicle greenhouse gas and CAFE standards. This contained a pick list of pre-defined and pre-approved default off-cycle credits that could be used beginning in the 2014 model year. On this list were credits for passenger cars of 1.0 grams CO₂ per mile and for trucks of 1.3 grams CO₂ per mile for active seat ventilation. These credits were based on a study performed in 2005 by researchers at the National Renewable Energy Laboratory on a Cadillac STS using the simple seat ventilation system that was marketed on that vehicle at that time (SAE-2007-01-1194). This system was comprised of two small fans pulling air through the seat, one in the seat cushion and one in the seat back.

The NREL study, published as an SAE paper in 2007, estimated a 7.5% reduction in air conditioner related emissions could be realized through active seat ventilation, based on the potential allowable interior cabin temperature increases modeled by NREL, while achieving equivalent comfort. This 7.5% emission reduction was combined with the EPA estimates of baseline gasoline consumption and CO₂ emissions from vehicle air conditioner usage in the United States, which were 13.8 and 17.2 grams CO₂ per mile for cars and trucks, respectively, to calculate the default credits of 1.0 grams (.075 x 13.8) and 1.3 grams CO₂ per mile (.075 x 17.2) (EPA/NHTSA Joint Technical Support Document, EPA-420-R-12-901, p. 5-107).

During that rulemaking process, comments were received from ICCT that other studies supported a potentially much larger credit for ventilated seats, at approximately twice the proposed level (TSD, p. 5-107). However, EPA finalized the default credits at the proposed lower levels of 1.0 and 1.3 to provide a level of conservatism, in part to account for customer usage levels for the ventilated seat feature.

Technology Description

Seat comfort technologies have progressed since the 2005 NREL analysis, and more sophisticated systems are already being sold, primarily on premium vehicles. The current credit request is based on a specific design manufactured by Gentherm and used on several General Motors models. If this credit request is approved, it would create an extra incentive to use this beneficial technology on higher volumes of vehicles.

Active climate control seat technology (CSS), produced by Gentherm and used in General Motors vehicles, uses a combination of ventilation fans and cooling devices. Active cooling to the seat back is provided by the installation of thermoelectric devices (TED) and a blower which provides positive, temperature controlled airflow pushed towards the occupant. The seat cushion also features a blower operating in a pull mode, drawing the air surrounding the occupant into the seat cushion. The foams in both seating surfaces include a textile spacer fabric that facilitates lateral airflow under occupant load. The seat covers are made of cloth and backed by an additional layer of textile spacer fabric to promote airflow to the occupant.

This more sophisticated design provides a higher level of comfort performance than the simpler seat ventilation system used in the 2005 NREL analysis. As a result of its superior comfort performance, it also provides larger potential savings of energy to run the vehicle air conditioner, since the interior cabin temperature can be kept higher than with the previous ventilated seat technology, while maintaining equivalent comfort.

NREL 2017 Evaluation of CCS

Gentherm recently collaborated with NREL to analyze the current CCS seat technology using comparable methodologies to those used previously by NREL in its 2005 evaluation of the simpler ventilated seat design used at that time. This CCS evaluation was published in May 2017 (see Attachment A).

As with many previous analyses of vehicle air conditioner technologies, the 2017 NREL analysis shows potentially very large real-world emission reductions compared to the EPA baseline emissions

levels and off-cycle pick list default credit amounts. The average air conditioner load reduction was estimated at 17%, compared to the 7.5% reduction for the older 2005 ventilated seat design. If the CCS emission reductions are scaled based on the EPA baseline emissions (13.8 for cars and 17.2 for trucks), the resulting off-cycle credits are still significantly higher than the default levels for active ventilated seats from the pre-approved pick list. Based on a 17% emission reduction, the resulting total off-cycle credit for CCS seats would be 2.3 grams CO₂ per mile for passenger cars and 2.9 grams CO₂ per mile for trucks (instead of the default credits of 1.0 and 1.3 grams, respectively).

Credit Methodology

In the 2017 NREL analysis, baseline emissions for air conditioner usage are 23.5 grams CO₂ per mile (NREL 2017, Table 13, p. 27). A series of simulations was performed on three vehicle platforms using various driving patterns to generate a range of estimated emissions savings from CCS technology (NREL 2017, p. 19). The average result was air conditioner emissions of 19.5 grams CO₂ per mile, which is a 17% savings from the baseline (NREL 2017, Table 13, p. 27). This includes emissions attributed to the power consumption of the CCS seat (NREL 2017, p. 22-23). Upper and lower boundaries were estimated for a 90% range of the simulation results for the CCS seats. At the lower boundary of this 90% range, the air conditioner emissions savings were 12%, which is still significantly better than the 2005 ventilated seat technology, which yielded a 7.5% savings (NREL 2017, Table 13, p. 27). Based on the low end of the 90% range of simulations, the off-cycle credits would be 1.7 grams CO₂ per mile for cars (0.12 x 13.8) and 2.1 grams CO₂ per mile for trucks (0.12 x 17.2), which is still significantly higher than the default credits on the pre-approved pick list (1.0 and 1.3, respectively).

Durability

Durability of active climate control seats used in GM products has been thoroughly tested to meet General Motors specifications. These CCS seats are tested and validated to maintain their functionality without deterioration for a specified lifetime of at least 15.0 years or 150,000 miles. GM only uses CCS seats which successfully pass all durability testing.


One objective of these durability evaluations is to determine the performance level that effectively represents GM active climate control seats in actual use over the full useful life of candidate in-use vehicles of each vehicle design, including predicting any expected in-use deterioration. Based on these tests, GM is willing to attest that the seats covered in this petition are expected to meet EPA requirements for in-use durability over the complete vehicle lifetime of at least ten years for cars and eleven years for trucks, and no reduction has been applied for in-use degradation of the benefits of these CCS seats.

Conclusion

Based on the analysis presented in this petition, General Motors hereby requests that EPA approve an off-cycle greenhouse gas credit of 2.3 grams CO₂ per mile for cars and 2.9 grams CO₂ per mile for trucks which use active climate control seat technology in both front seating locations. The current request would apply these credit amounts to the list of 2010-2016 model vehicles contained in Appendix B. This credit calculation methodology conservatively estimates the fuel savings that can be expected from this technology in actual real-world usage in U.S. national average conditions, and the conservatism of this methodology should result in the real-world fuel savings exceeding the credited amounts.

In many cases, the credits in Attachment B would cause certain vehicles to exceed the credit caps for thermal control off-cycle technologies. Therefore, a further analysis was performed to ensure that these caps were not exceeded for any individual vehicle. The results of this analysis are shown in Attachment C, and the credit totals in Attachment C are the incremental credits that would be added to General Motors credit bank. The thermal control credit caps eliminate approximately 55% of the additional megagrams that could otherwise be claimed for the active climate control seat technology.

Thank you for your consideration of this application for off cycle greenhouse gas credits.



Fredrick S. Sciance
Manager, Environment, Energy and Safety Policy
General Motors Public Policy Center

Attachments:

Attachment A: National Renewable Energy Laboratory Study – “Impact of Active Climate Control Seats on Energy Use, Fuel Use, and CO₂ Emissions: Test and Analysis”, by Kreutzer, Rugh, Kekelia and Titov, May 2017

Attachment B: Confidential Listing of 2010-2016 GM Vehicles with Active Climate Control Seats, Sales Volumes and Credits

Attachment C: Adjusted for the Thermal Control Credit Cap, Confidential Listing of 2010-2016 GM Vehicles with Active Climate Control Seats, Sales Volumes and Credits

c: Roberts French
David Wright
James Tamm
Barbara Kiss
Scott Simon