

EFFECTS OF OFF-CYCLE CREDITS ON PASSENGER VEHICLE EFFICIENCY IN BRAZIL

In October 2012, Brazil's Ministry of Development, Industry and Foreign Trade (MDIC) approved a policy to foster vehicle technology innovation and industrial competitiveness.¹ Inovar-Auto provides fiscal incentives to automakers that invest in national vehicle manufacturing, and produce safer and more efficient vehicles utilizing advanced technologies. The policy establishes corporate average targets for vehicle energy consumption designed to reduce new-vehicle fleet consumption to 1.82 MJ/km by 2017, equivalent to 137 gCO₂/km or 15.8 km/L_{E22} (kilometers per liter of gasoline with 22% of ethanol by volume).²

Off-cycle credits can be awarded for the use of technologies or designs that increase efficiency and reduce fuel consumption in the real world, but whose benefits are not captured via the standard testing procedure. Examples of such off-cycle technologies include solar panels on hybrids, adaptive cruise control, use of non-HFC refrigerant in air-conditioning systems, and high-efficiency lights. Off-cycle technology credits were not initially considered for inclusion in Inovar-Auto. In March 2015, MDIC published an amendment to Inovar-Auto defining pre-determined credits for four off-cycle technologies, as well as ethanol and flex-fuel engines.³

The International Council on Clean Transportation supports off-cycle credits in concept, since they can incentivize new and innovative technologies resulting in vehicle efficiency improvements that are not reflected in current test procedures. Such credits can

reduce manufacturers' cost of compliance in the short run and create cost-effective pathways for greater fuel efficiency and GHG emission reductions in the long run. However, to be effective off-cycle credits must:

- » Avoid double-counting benefits that also occur on regulatory test cycles
- » Be based on robust data showing real, quantifiable, and verifiable energy savings that are not captured on the test cycles
- » Be limited to those technologies whose activation is autonomous and independent from the driver
- » Have energy-saving benefits independently verified
- » Reflect actual in-use reductions, with demonstrable impacts on vehicle efficiency over the vehicle lifecycle
- » Not be required by other laws (e.g., safety regulations)

Credits that do not meet these conditions do not directly result in comparable in-use reductions in energy consumption, and thus severely undermine the effectiveness and credibility of GHG/efficiency standards (and Inovar-Auto's target, in the case of Brazil).

MDIC's amendment includes pre-determined off-cycle credits (i.e., for specific off-cycle technologies that are independent of vehicle characteristics and associated with a specific credit value), which are harder to justify. In theory they can create streamlined incentives for manufacturers to invest in off-cycle technologies. In practice, however, benefits can vary substantially from vehicle to vehicle, making it difficult to avoid creating windfall credits for some technologies and vehicles that reduce fuel consumption and GHG emissions benefits of the program.

1 Ministry of Development Industry and Foreign Trade (MDIC 2012). Decreto nº 7.819/2012.

2 International Council on Clean Transportation (ICCT 2015). Brazil's Inovar-Auto Fiscal Incentive Program Updates. Policy Update.

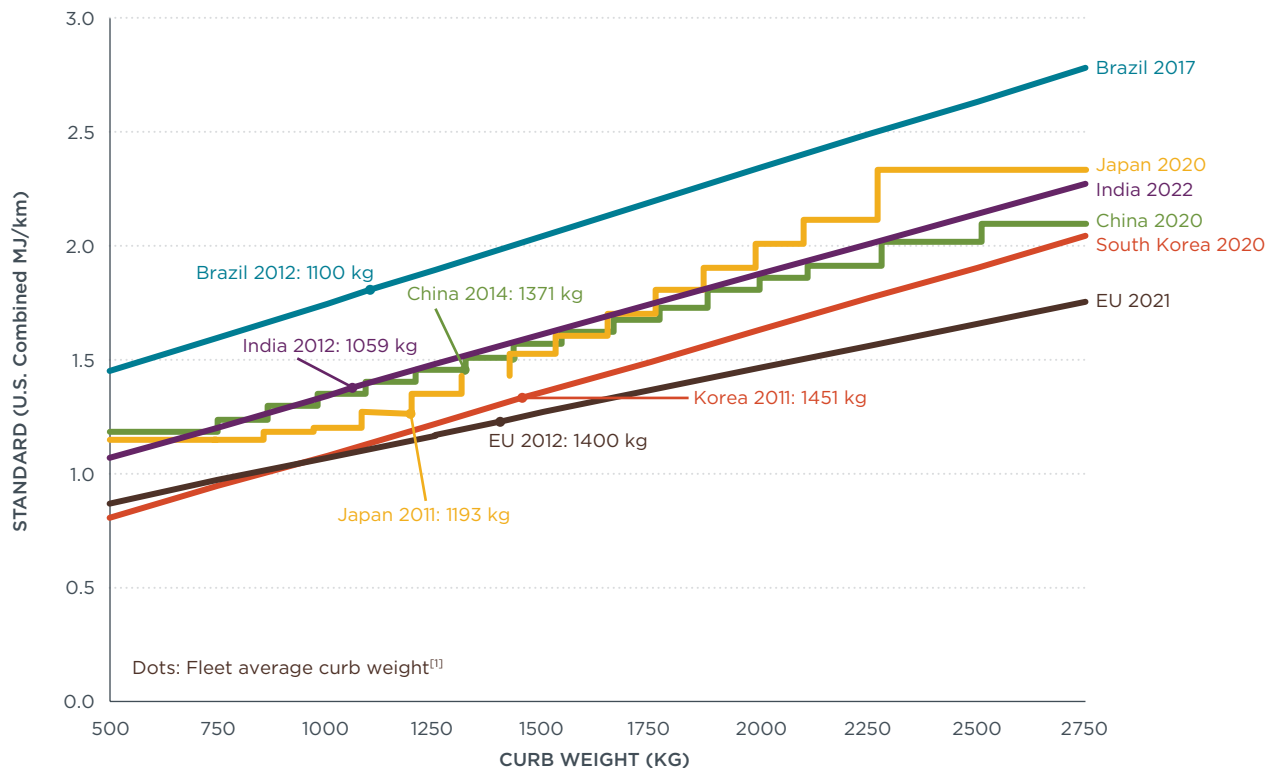
3 Brazilian Ministry of Development, Industry and Foreign Trade (MDIC 2015). Portaria no 74/2015.

Table 1 summarizes the technologies and credits included in the amendment, how other countries consider off-cycle credits for these technologies, and the credits recommended by ICCT. There is a technical basis for off-cycle credits for start-stop systems and active grill shutters, since their effects on vehicle energy consumption might not always be fully captured in the test cycles. However, the methodology to calculate those credits should be based on robust and verifiable data. In the case of gear shift indicators (GSI) and tire pressure

monitoring systems (TPMS), off-cycle credits are not justifiable since they depend on driver activation. No other country in the world gives off-cycle credits for these technologies. TPMS is also mandatory for safety purposes in the United States and Europe, thus violating another criterion defining an effective and justifiable credit. In the case of ethanol and flex-fuel engines, their effects on vehicle energy consumption are fully captured in the test cycles, and thus should not qualify for off-cycle credits. In addition, flex-fuel cars represented 94% of sales of passenger cars

Table 1. Summary of off-cycle credits in Inovar-Auto (in MJ/km)

Technology	Approved Credit	Credit recommended by ICCT
Start-stop	0.0227	0.0067
Active grill shutter	0.0049	0.0046
Gear shift indicator	0.0134	No credits (effects depend on driver activation)
Tire pressure monitoring system	0.0134	No credits (effects depend on driver activation)
Ethanol and flex-fuel engines	0.0041	No credits (effects are captured in test cycles)



[1] The definition of curb weight is commonly vehicle empty weight with standard equipment, except that the EU requires adding in 75kg occupant and luggage weight. The requirements for standard equipment and oil tank load vary slightly from country to country.

Figure 1. International comparison of weight-based vehicle standards

in Brazil in 2013 and thus do not merit any sort of incentive to encourage further adoption.⁴

Inappropriate off-cycle credits will weaken the stringency of Inovar-Auto’s vehicle energy consumption target, which is already lenient in comparison to other countries. Figure 1 compares Brazil’s Inovar-Auto target with all countries that have adopted corporate average weight-based vehicle standards (versus the alternative size-based vehicle standards). Mass-based fuel consumption or GHG emissions standards are based on the sales weighted average for a given auto manufacturer. The standards are adjusted by the corporate average weight, therefore, automakers with a higher average vehicle weight have higher targets for energy consumption or GHG emissions. It is evident from the chart that, for any given vehicle weight, Brazil’s target is the most lenient among all countries with weight-based vehicle standards.

Brazil’s target would be further weakened by the inclusion of inappropriate off-cycle credits. Starting from a 2012 baseline of 2.07 MJ/km (156 gCO₂/km or 13.9 km/L_{E22}), Inovar-Auto’s vehicle energy consumption target for 2017 (Figure 2) is 1.82 MJ/km (137 gCO₂/km or 15.8 km/L_{E22}). Unjustified off-cycle credits could weaken Inovar-Auto’s vehicle energy consumption target to 1.87 MJ/km (141 gCO₂/km or 15.4 km/L_{E22}), the equivalent of a 19% reduction in stringency.⁵

Although off-cycle credits can have technical merit and result in real-world energy savings if well implemented, inappropriate credits can weaken the stringency of vehicle energy consumption targets. Brazil should reject proposals to amend Inovar-Auto to include credits for gear-shift indicators, tire-pressure monitoring systems, and ethanol and flex-fuel engines, which will undermine the standard and do little or nothing to improve the overall energy efficiency of the country’s new-vehicle fleet.

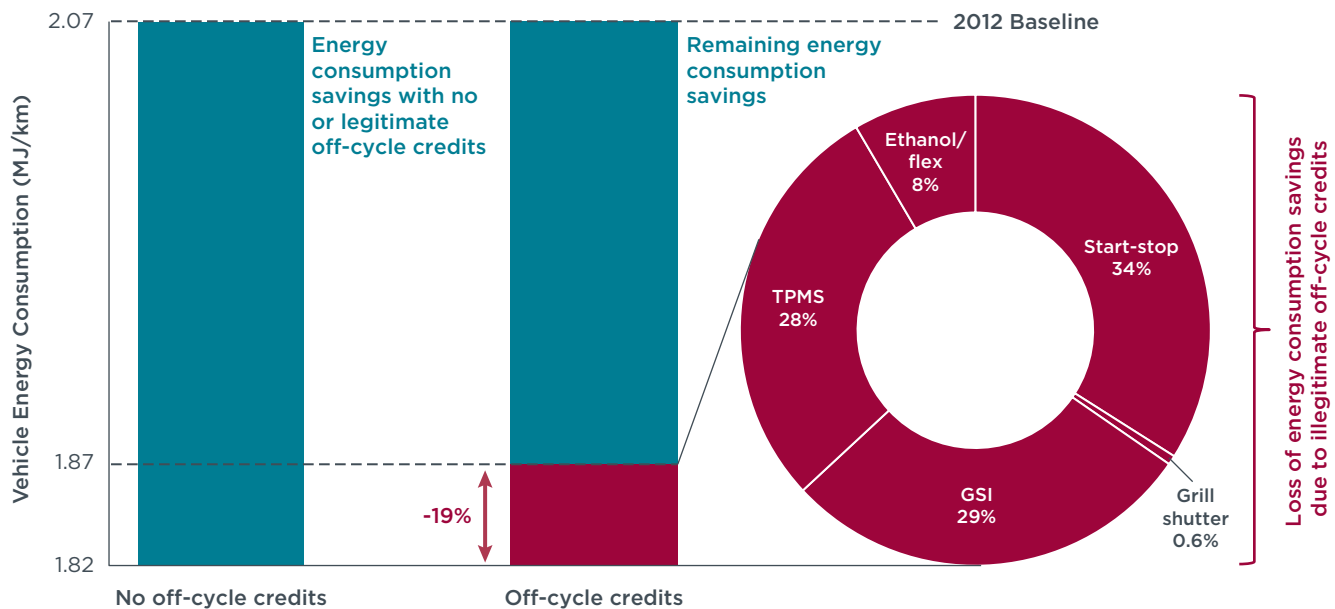


Figure 2. Effects of off-cycle credits on Inovar-Auto stringency

4 Posada, F, Façanha, C (2015). Brazil Passenger Vehicle Market Statistics – International comparative assessment of technology adoption and energy consumption in Brazil’s passenger vehicle fleet.

5 Assuming the off-cycle technologies are introduced in 100% of the new fleet.