POLICY UPDATE

NOVEMBER 2015

# BRAZIL'S INOVAR-AUTO FISCAL INCENTIVE PROGRAM UPDATES

ICCT **POLICY UPDATES** SUMMARIZE REGULATORY AND OTHER DEVELOPMENTS RELATED TO CLEAN TRANSPORTATION WORLDWIDE.

In October 2012, the Brazilian government approved by decree a new program to encourage vehicle technology innovation (MDIC 2012). Inovar-Auto fosters industrial competitiveness by encouraging automakers to produce more efficient, safer, and technologically-advanced vehicles while promoting the national automotive industry. Since its original publication, many updates have been made to the original decree, most notably, the definition of penalties for non-compliance with the energy consumption target, credits for hybrid vehicles, and off-cycle credits.

Inovar-Auto provides fiscal incentives in two ways. First, it increases a tax on industrialized products (IPI) by 30% for all light-duty vehicles (LDVs) and light commercial vehicles. Secondly, it imposes a series of requirements on automakers to qualify for a discount in the IPI up to 30%.[1] In other words, IPI taxes will remain unchanged for those manufacturers that meet the requirements, thus incentivizing investments in national production, R&D, automotive technology, and vehicle efficiency. The program is limited to vehicles manufactured between 2013 and 2017, after which IPI rates return to pre-2013 levels, unless additional modifications to the decree are made.

## IPI DEFINITION

The IPI (Imposto sobre Produtos Industrializados) is a tax on industrialized products manufactured in Brazil or abroad. In the case of products manufactured in Brazil, taxes are imposed on the product sales price, while in the case of imported products, the tax base is the sales price plus import taxes and other required fees (e.g., shipping, insurance). IPI rates for LDVs depend on engine displacement and fuel type, illustrating Brazil's long-term incentive towards smaller engines (Table 1).

**Table 1.** IPI Rates (National Production)

| Engine Displacement (L) | IPI Before 2012 | New IPI |
|---|---|---|
| Up to 1L | 7% | 37% |
| 1-2L Flex/Ethanol | 11% | 41% |
| 1-2L Gasoline | 13% | 43% |
| Above 2L | 25% | 55% |

1 The program assumes that all automakers comply with the requirements unless they are not able to demonstrate compliance. In that case, they need to return the gained credits to the government.

## PROGRAM REQUIREMENTS

Under the original program, automakers had to meet a corporate average vehicle energy consumption target to qualify for up to a 30% discount in the IPI. Under the revised terms, automakers will pay a penalty (but will continue to qualify to up to 30% discount in the IPI) if they do not meet their corporate average vehicle energy consumption target (Figure 1). In addition, automakers will need to conduct a certain number of manufacturing processes in Brazil, and choose at least 2 out of 3 pre-requisites to qualify for the program — (1) investment in research and development (R&D), (2) investment in engineering, industrial technology, and supplier capacitation, and (3) participation in the Vehicle Labeling Scheme (PBEV — Programa Brasileiro de Etiquetagem Veicular). Automakers can qualify for an additional 1-2% discount in the IPI by meeting more stringent corporate average vehicle energy consumption targets.

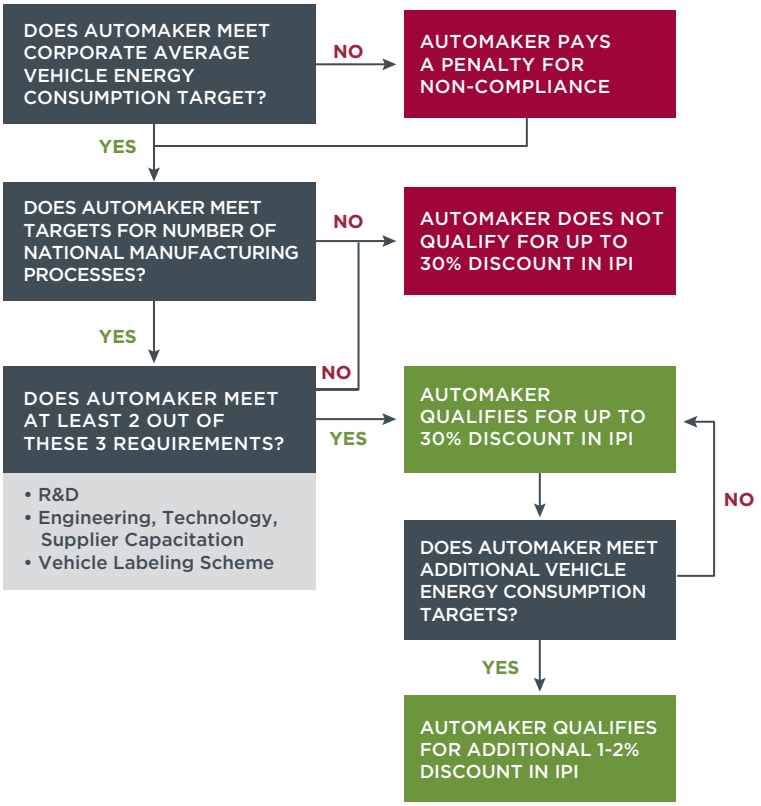


**Figure 1.** Inovar-Auto's program requirements

## VEHICLE ENERGY CONSUMPTION TARGET

Inovar-Auto requires automakers to meet a corporate average vehicle energy consumption target by 2017. The policy establishes corporate average targets for vehicle energy consumption designed to reduce new fleet consumption to 1.82 MJ/km by 2017, equivalent to 137 $gCO_2$/km or 15.8 km/$L_{E22}$. On average, automakers will need to reduce their average consumption for new LDVs by about 12% from 2012 levels by 2017. Corporate average vehicle energy consumption, measured in megajoules/

kilometers (MJ/km) on the combined (urban/highway) CAFE test cycle[2], needs to be calculated by Equation 1. To qualify for an additional IPI reduction of 1% and 2%, automakers need to meet the targets set by Equations 2 and 3. These more aggressive targets would result in average reductions in new vehicle energy consumption of about 16% and 19%, respectively. The most stringent target (based on Equation 3) is equivalent to Europe's 2015 target for new LDVs of 130 $gCO_2$/km, and adapted to Brazil based on differences in driving cycle, vehicle, fuel, and road specifications. The expected improvements from these three target levels are summarized in Table 2.

(1) VE = 1.155 + 0.000593 x M
(2) VE = 1.111 + 0.000570 x M
(3) VE = 1.067 + 0.000547 x M

VE: corporate average vehicle energy consumption (MJ/km)
M: average mass in kilograms (curb weight)[3] for all vehicles commercialized in Brazil, and weighted by vehicle sales in the 12 months preceding the calculation.

**Table 2.** Vehicle energy consumption improvements

| Equation / Target | IPI Reduction | Average New LDV Consumption (MJ/km)[4] | Improvement from 2012 Baseline (%) |
|---|---|---|---|
| – | – | 2.07 (2012) | – |
| 1 | Up to 30% depending on compliance with other pre-requisites (see page 6) | 1.82 | 12.1% |
| 2 | +1% | 1.75 | 15.5% |
| 3 | +2% | 1.68 | 18.8% |

Figure 2 compares the corporate average vehicle energy consumption of the top 10 automakers in 2013 with the three targets. As with most vehicle efficiency/GHG standards worldwide, targets are based on a vehicle attribute (curb weight in the case of Brazil), which means that automakers with higher (sales-weighted) average curb weight have higher (less stringent) targets for energy consumption. The fleet average energy consumption in 2013 was 2.01 MJ/km, a 2.9% improvement over the 2012 baseline. Although, some automakers are doing particularly better than the fleet average, there is still a 9.5% gap between the fleet average vehicle energy consumption in 2013 and the most lenient of the three targets in 2017 (Target 1). A separate study evaluated technology adoption and their impacts on vehicle energy consumption in Brazil (Posada and Façanha 2015).

2 Based on norm ABNT NBR 7024: 2010.

3 Based on norm ABNT NBR ISO 1176: 2006. Curb weight is the total weight of a vehicle with standard equipment, all necessary operating consumables (e.g., motor oil and coolant), a full tank of fuel, but not loaded with passengers or cargo.

4 Values for equations 1 to 3 assume a corporate average curb weight of 1,121 kg.

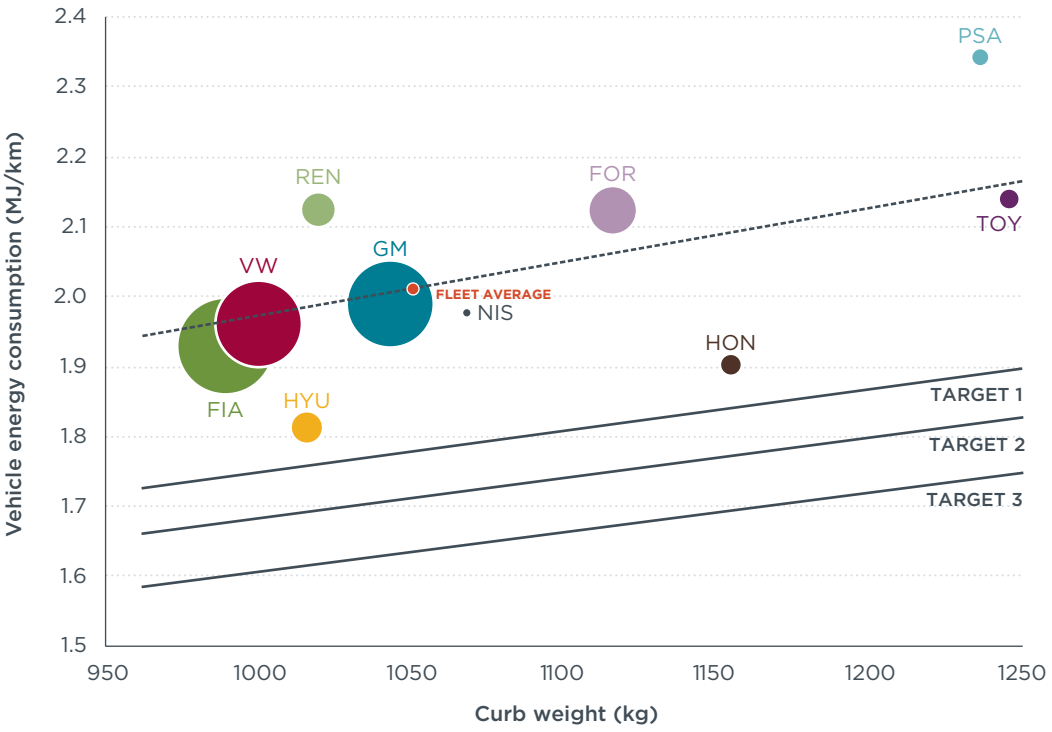


**Figure 2.** Vehicle energy consumption targets

## PENALTIES FOR NON-COMPLIANCE WITH ENERGY CONSUMPTION TARGETS

Under the original program, automakers had to meet a corporate average vehicle energy consumption target to qualify for a discount in the IPI up to 30%. Under the revised terms, automakers will pay a penalty (but will continue to qualify for up to a 30% discount in the IPI) if they do not meet their corporate average vehicle energy consumption target (MDIC 2013). The penalties for non-compliance are summarized in Table 3. These penalties are multiplied by the automaker's total sales since April 2013 or the date the automaker became eligible to receive Inovar-Auto's credits.

**Table 3.** Penalties for non-compliance with energy consumption targets

| Non-compliance Level | Penalty per vehicle sold |
|---|---|
| Up to 0.01 MJ/km above the target | R$ 50 |
| Up to 0.02 MJ/km above the target | R$ 50 + R$ 90 = R$ 140 |
| Up to 0.03 MJ/km above the target | R$ 50 + R$ 90 + R$ 270 = R$ 410 |
| More than 0.03 MJ/km above the target | R$360 for each hundredth above the target. |

## MULTIPLIERS FOR ADVANCED PROPULSION SYSTEMS

Inovar-Auto provides additional incentives for vehicles with advanced propulsion systems — hybrid vehicles, plug-in hybrid vehicles, battery electric vehicles, and fuel cell vehicles — through the application of multiplier factors in the calculation of

corporate average energy consumption (MDIC 2015). Multipliers are limited to those vehicles whose energy consumption is not greater than 1.35 MJ/km (102 $gCO_2$/km or 21.3 $km/L_{E22}$).

**Table 4.** Multiplier factors for vehicles with advanced propulsion systems

| Energy Consumption (MJ/km) | Multiplier (2015-2017) | Multiplier (2018-2020) |
|---|---|---|
| Up to 0.66 | 2.75 | 2.50 |
| Between 0.66 and 1.35 | 1.75 | 1.50 |
| Over 1.35 | 1.00 | 1.00 |

## OFF-CYCLE CREDITS

Off-cycle credits, sometimes given to technologies whose real-world energy consumption benefits are not fully reflected in test cycles, were not initially considered in Inovar-Auto. In March 2015, an amendment to Inovar-Auto defined pre-determined credits for four off-cycle technologies, as well as ethanol and flex-fuel engines (MDIC 2015).

Table 5 summarizes the technologies and credits included in the amendment, and the credits recommended by the International Council on Clean Transportation (ICCT). There is a technical basis for off-cycle credits related to start-stop systems and active grill shutters, since their effects on vehicle energy consumption might not always be fully captured in the test cycles. 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 concedes off-cycle credits for these technologies. TPMS is also mandatory for safety purposes in the US and Europe, which violates another eligibility criteria.[5] 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. The ICCT estimates that inappropriate off-cycle credits (i.e., those above the level recommended by ICCT) could weaken Inovar-Auto's target by up to 19% (Façanha 2015).

**Table 5.** 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 reflected in test cycle) |

5 A technology is not eligible for off-cycle credits in the U.S. and Europe if they are required by another law.

# OTHER PROGRAM REQUIREMENTS

## NATIONAL ACTIVITIES

Automakers need to conduct a minimum number of manufacturing and engineering infrastructure activities for at least 80% of light-duty and light commercial vehicles produced in Brazil, according to the scheduled provided in Table 6. The activities considered are the following:

- Stamping
- Welding
- Anticorrosion treatment and painting
- Plastic injection
- Motor manufacturing
- Gearbox and transmission manufacturing
- Steering and suspension systems assembly
- Electrical systems assembly
- Axle and brake systems assembly
- Monoblock manufacturing or chassis assembly
- Assembly, final review and testing
- Own laboratory infrastructure for product development and testing

## R&D INVESTMENT

Automakers need to invest in research & development in Brazil, corresponding to the minimum percentages indicated in Table 6, and applied over the gross revenue of products and services, excluding taxes and contributions over sales.

## INVESTMENT IN ENGINEERING, INDUSTRIAL TECHNOLOGY, AND SUPPLIER CAPACITATION

Automakers need to invest in engineering, industrial technology, and supplier capacitation in Brazil, corresponding to the minimum percentages indicated in Table 6, and applied over the gross revenue of products and services, excluding taxes and contributions over sales.

## VEHICLE LABELING SCHEME

Automakers must comply with Brazil's Vehicle Labeling Scheme (PBEV — Programa Brasileiro de Etiquetagem Veicular), with the minimum percentages of vehicle sales indicated in Table 6.

**Table 6.** Inovar-Auto requirements

| Year | Minimum Number of National Manufacturing Processes[6] | Minimum R&D Investment | Minimum Engineering Investment | Minimum Participation in PBEV |
|---|---|---|---|---|
| 2013 | 6 - 9 | 0.15% | 0.50% | 36% |
| 2014 | 6 - 10 | 0.30% | 0.75% | 49% |
| 2015 | 7 - 10 | 0.50% | 1.00% | 64% |
| 2016 | 7 - 11 | 0.50% | 1.00% | 81% |
| 2017 | 8 - 11 | 0.50% | 1.00% | 100% |

6 Depending on vehicle classification.

## POLICY EFFECTS ON VEHICLE ENERGY CONSUMPTION

If automakers meet the minimum corporate average vehicle energy consumption target, Inovar-Auto will reduce the average energy consumption of new LDVs by at least 12% between 2012 and 2017. Automakers can also qualify for an additional 2% discount on IPI taxes by meeting more aggressive targets (up to 19% reduction of average energy consumption of new LDVs over 2012 levels). Figure 3 illustrates the expected effects of Inovar-Auto on Brazil's energy consumption from LDVs, assuming both a moderate case (12% improvement) and an aggressive case (19% improvement).[7] If automakers meet their energy consumption targets, Inovar-Auto could reduce fuel consumption (gasoline and ethanol combined) between 11% and 19% in 2030, equivalent to a reduction of GHG emissions between 15 million and 30 million metric tons of $CO_2$-equivalent ($MtCO_2e$).[8] The cumulative effects of Inovar-Auto through 2030 could result in fuel savings between of 65 billion and 100 billion liters, equivalent to R$ 150-240 billion in savings (USD 42-67 billion) based on 2014 average fuel prices (ANP 2014).

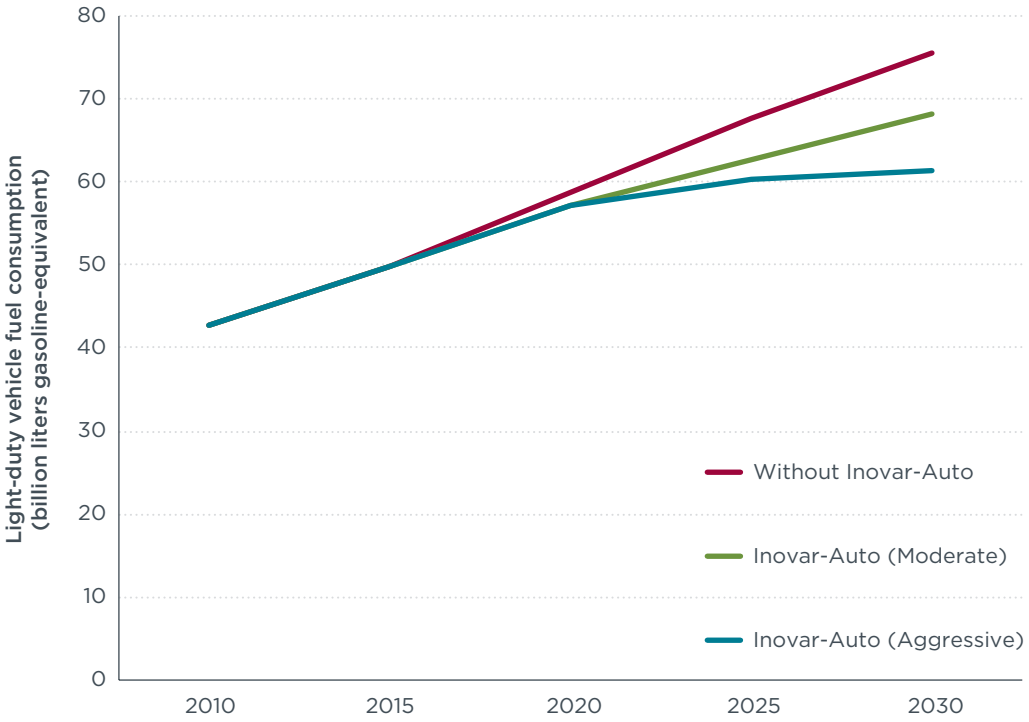


**Figure 3.** Effects of Inovar-Auto on LDV energy consumption in Brazil

7 This analysis does not take into account the potential weaknening of Inovar-Auto's target due to inappropriate off-cycle credits.

8 This analysis considers well-to-wheel $CO_2e$ emissions, including not only fuel combustion, but also fuel refining (including land use and harvest in the case of ethanol) and distribution. Ethanol share of total fuel consumption remains constant at 2010 levels to isolate the effects of vehicle efficiency improvements.

# REFERENCES

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