Technological trends driven by MOVER program

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ABSTRACT

The Green Mobility and Innovation Program (MOVER), approved by the National Congress in June 2024, marks a significant milestone in the transformation of the Brazilian automotive sector. This program sets specific regulations for greenhouse gas (GHG) emissions and implements incentives aimed at marketing more energy-efficient vehicles, including hybrid and electric models. It also introduces goals related to vehicle safety and recyclability.

Another crucial axis of the program is the establishment of R&D incentives for the development of technologies that are not yet developed and/or produced in the country.

This paper aims to clarify the foundations of the MOVER program and identify the main technologies it drives across all its areas of operation: biofuels, electrification, and ADAS will be identified and related to the program's bases. A roadmap of technological trends is presented at the end of the paper.

FOUNDATIONS OF THE MOVER PROGRAM

The MOVER program is based on important pillars for the technological, sustainable, and responsible development of our national industry. We can list five main aspects:

1. Reduction of greenhouse gas (GHG) emissions: Establishes methodologies for quantifying CO2 within well-to-wheel and cradle-to-gate cycles.

2. Energy efficiency: Sets new targets to boost the continuous improvement of national energy efficiency. This metric, defined in previous programs like INOVAR and ROTA, now receives new targets.

3. National technological content: Through significant incentives related to R&D activities and local production, this pillar aims to boost engineering and local industry.

4. Vehicle safety: Another key pillar, MOVER promotes items related to reducing road safety indicators. Items such as ADAS and passive safety are listed as mandatory or eligible for financial incentives.

5. Recyclability: The target related to vehicle recyclability aims to drive the circular economy and align the content of local products with the same 'footprint' as other major global development regions, such as Europe, the United States, and China.

These pillars of the MOVER program are detailed through various decrees, some of which have not yet been published, and which apply the new rules. These decrees relate to mandatory requirements such as energy efficiency, CO2 reduction, and vehicle safety, as well as the application of what we call the 'Green IPI' taxation, and the rollout of various incentives for local development and production. These items will be addressed in the following chapters of the article.

EVOLUTION OF MANDATORY REQUIREMENTS

Decree No. 12.435, dated April 15, 2025, regulates the Green Mobility and Innovation Program (MOVER), establishing mandatory targets for the Brazilian automotive industry with a focus on sustainability, energy efficiency, and vehicle safety.

MAIN MANDATORY TARGETS OF THE MOVER PROGRAM

Energy Efficiency and Emission Reduction:

- An average 12% reduction in energy consumption of light vehicles by October 1, 2027, maintaining this level until 2031, based on 2022 levels.
- A 50% reduction in carbon dioxide (CO_2) emissions in the 'well-to-wheel' cycle by 2030, compared to 2011 levels.

Recyclability:

- From January 1, 2027, vehicles in category M1 (passenger vehicles with up to eight seats) must contain at least 80% reusable or recyclable materials.
- For new projects started in 2027, this percentage increases to 85%.
- As of January 1, 2030, all M1 vehicles produced must meet the 85% recyclability target.

Vehicle Labeling:

- Mandatory implementation of vehicle labeling, providing information on energy efficiency, safety, and component origin.
- Labeling of 100% of models will be coordinated by agencies such as MDIC, Inmetro, and Senatran.

Vehicle Safety:

- Establishment of minimum structural performance standards.
- Mandatory incorporation of driver assistance technologies such as automatic emergency braking systems, stability control, lane departure warning, and driver fatigue monitoring, with full compliance with general safety requirements required by 2027.

The same technical and environmental requirements applicable to local production are also required for imported vehicles.

These measures aim to align the Brazilian automotive sector with global sustainability goals, promoting technological innovation and reducing the environmental impact of vehicles marketed in the country.

INCENTIVES FOR GREEN TECHNOLOGY DEVELOPMENT THROUGH TAXATION

The Green IPI is a federal government initiative, integrated into the Green Mobility and Innovation Program (MOVER), which aims to adjust the Industrialized Products Tax (IPI) rates according to environmental and energy efficiency criteria of vehicles. The proposal is that more sustainable vehicles, such as hybrids, electric vehicles, and ethanol-powered flex vehicles, will have reduced rates, while more polluting models will be taxed at higher rates.

The Green IPI decree will establish differentiated IPI rates based on various criteria, including:

- Energy source used in propulsion: electric, hybrid, and ethanol-powered flex vehicles may have reduced rates.
- Energy efficiency: models with lower fuel consumption will benefit.
- CO_2 emissions: vehicles with lower emissions will have tax advantages.
- Engine power: vehicles with lower engine power may be taxed at lower rates.
- Recyclability: higher levels of recyclable materials in vehicles will be considered positively.
- Vehicle safety technologies: the presence of advanced driver assistance systems (ADAS) will be taken into account.

These criteria aim to encourage the production and commercialization of more sustainable and safer vehicles in Brazil.

With the tax reform scheduled for 2027, the IPI will be replaced by the Selective Tax (IS). The Green IPI model will serve as a basis for IS, maintaining the logic of 'the more you pollute, the more you pay,' ensuring the continuity of sustainability incentives in the automotive sector.

In summary, the Green IPI represents a significant step in promoting more sustainable mobility in Brazil, aligning tax policy with environmental and technological innovation goals.

The MOVER Program (Green Mobility and Innovation) is a Brazilian government initiative aimed at boosting research, development (R&D), and the nationalization of the automotive industry, promoting sustainability and technological innovation in the sector.

R&D INCENTIVES AND INDUSTRY NATIONALIZATION

MOVER offers significant tax incentives for companies investing in R&D in Brazil:

- Financial Credits: Companies can obtain credits of up to 50% of R&D investments and up to 250% for sustainable technologies such as electrification and decarbonization.

- Tax Compensation: Credits can be used to offset federal taxes or be reimbursed in cash, encouraging local innovation.

- National Fund for Industrial and Technological Development (FNDIT): Created to support priority projects in industrial and technological development, the FNDIT receives mandatory investments from qualified companies, especially those importing auto parts without domestic equivalents.

The program also aims to strengthen national production:

- Tax Reduction: Import tax exemption for auto parts without national equivalents, encouraging local production.

- Support for Local Production: Incentives for the installation of engineering and production centers in Brazil, promoting job creation and internal technological development.

- Value Chain Development: Encouraging the integration of local suppliers into the production chain, increasing the competitiveness of the national industry.

Within the R&D and industrial incentive line related to the new FNDIT, the following priority lines have been identified in the programs launched so far:

- Electric and hybrid vehicles.

- Increased energy efficiency using biofuels.

- Vehicle safety.

- Advanced materials.

- Information and communication technologies, products and processes 4.0.

- More competitive Brazilian tooling industry.

- Vehicle connectivity.

TECHNOLOGIES PROMOTED FOR PRODUCTS

When we talk about technologies promoted by the MOVER program, we refer to areas related to decarbonization, increased safety features, and the promotion of technologies not yet produced or developed in Brazil.

For decarbonization, the improvement of thermal engine efficiency, electrification, and biofuels are the major enablers.

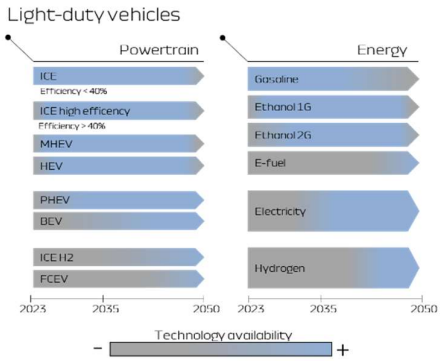

Figure 1. Technological roadmap for light-duty vehicles.

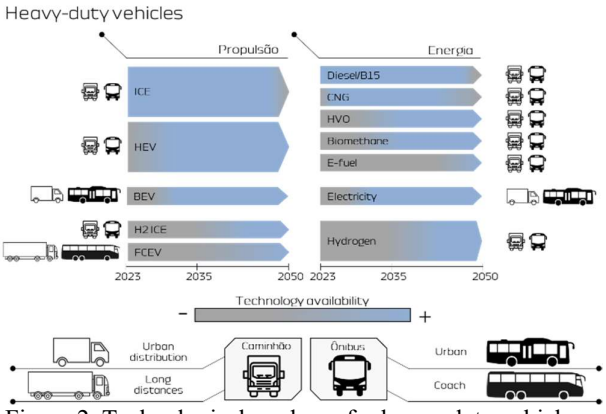

Figure 2. Technological roadmap for heavy-duty vehicles.

For vehicle safety, a wide range of passive and active safety features will be promoted, as shown in the dashboards below:

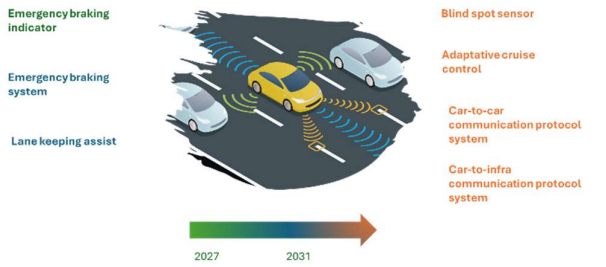

Figure 3. Active safety / Vehicle communication with the external environment.

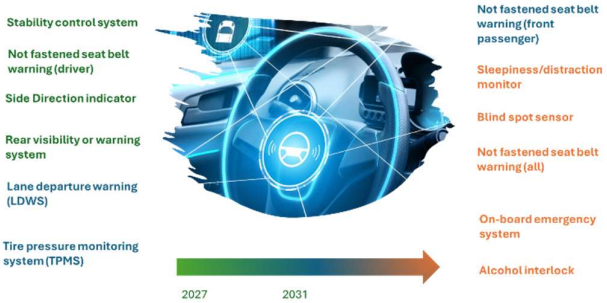

Figure 4. Active safety / Vehicle communication with the driver and passengers.

Figure 5. Passive safety.

For recyclability, there is a roadmap for introducing a target of 85% potentially recyclable materials and 95% recoverable materials.

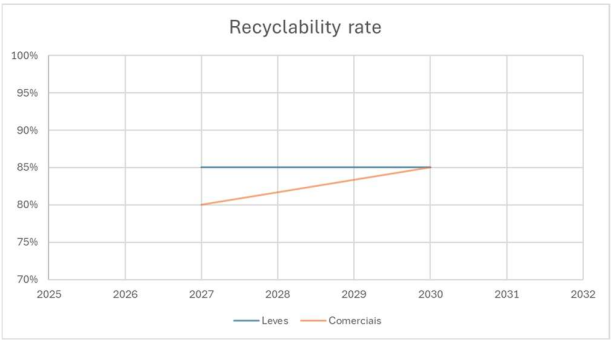

Figure 6. Recyclability rate.

The main areas of work in the context of recyclability are increasing the use of recyclable materials, reducing mixed and composite materials, avoiding permanent adhesives, improving disassembly processes, and reducing materials that are difficult to separate for recycling.

For connectivity, another important priority axis, the dashboard below serves as a direction for what is proposed to be developed and adjusted to the Brazilian context.

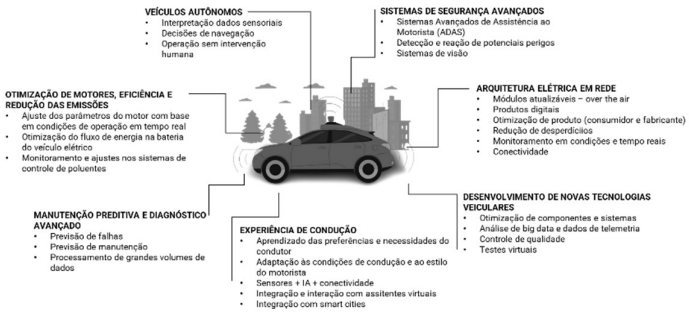

Figure 7. Connectivity roadmap.

CONCLUSION

The Green Mobility and Innovation Program (MOVER), approved by the National Congress in June 2024, marks a significant milestone in transforming the Brazilian automotive sector.

The foundations of this program relate to reducing greenhouse gas emissions from mobility and its industry, increasing energy efficiency, promoting vehicle safety, standardizing and raising recyclability rates, and boosting local development and production.

To implement it, mandatory requirements have been established. These relate to energy efficiency, well-to-wheel CO2 equivalent levels, recyclability, vehicle safety, and labeling.

Also, through what is called green taxation, MOVER tends to associate vehicle taxes with their level of adoption of the program's main pillars.

In parallel, incentive programs have been launched, whether through tax rebates or through the FNDIT fund with BNDES, to encourage local development and industrialization, as well as innovations related to priority lines identified by the government.

Given all the points listed above, it is natural that the MOVER program drives a wave of technologies in the products that will be launched in Brazil in the future.

For decarbonization, energy efficiency, and green taxation, the main focus areas are:

- Improved efficiency of thermal engines
- Higher levels of vehicle electrification
- Promotion of biofuels

In terms of vehicle safety, the introduction of numerous items related to passive and active safety will be a priority.

Regarding recyclability, the major gain is associated with standardization and the adoption of measures to facilitate and accelerate the process.

When we talk about connectivity, we are entering an era where the vehicle is defined by embedded software, databases, and processing capabilities that will take us to a new level in terms of services provided to passengers.

In short, it is evident that the strong and relevant action of the MOVER program accelerates the promotion of technologies and reduces the technological gap between Brazil and the world's major powers. Moreover, it enhances existing assets in our ecosystem, such as biofuels and the highly renewable energy matrix.

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