PROSPECTS FOR THE DEVELOPMENT OF NATURAL GAS VEHICULE (NGV) IN ALGERIA

M' Akretche Said

Abstract- In Algeria, the consumption of the engine fuels does not cease growing. It is induced by the strong economic growth, the social development and the major role of the petroleum products in the satisfaction of the energy needs.

This request is currently satisfied, mainly, by the traditional engine fuels (Gasoline and Diesel) which present major disadvantages for the environment (pollution and emissions of GHE). Moreover, the actions of development of the fuels of substitution are implemented in the framework of environmental protection and sustainable development.

Within this framework, the Natural gas Conveys (NGV) is containing hydrocarbon of substitution where the development prospects in Algeria are promising. The abundance of the gas resource upstream and the development of the public distribution network of natural gas downstream allow the development of the NGV by the means of the intensification of (points of sale) and the intensive conversion distribution network of the vehicles. The company Naftal (National Company of Marketing and Distribution of the Petroleum products) account to specialize in this crenel.

Keywords: NGV, GHE, fuels of substitution, Naftal.

1. History

The NGV business started in Algeria during the 1970’s seventees. The constraints related to technological complexity and the importance of the capital costs at the time slowed down the project with the profit of the GPL/C. In 1998, the project is taken again by group SONELGAZ (Algerian Company of Electricity and Gas) with the launching of an operation controls realization of a first infrastructure of distribution. Within this framework, two (02) compressor plants were carried out between 1999 and 2001 and 10 dedicated buses NGV were acquired, parallel to the conversion of a certain number of light vehicles.

From 2003, the promulgation of several lawful texts concerning the NGV marked the actions of promotion of this product where at the present time a work of analysis and actualization of the regulation is carried out.

Today, Naftal company (National Company of Marketing and Distribution of the Petroleum products) plans to develop NGV filling stations.

2. Characteristics of the NGV

The Natural Gas Vehicule (NGV) is the natural gas produced on the level of the gas fields (made up in major part in methane) compressed, stored and used as alternate fuel in the place of the gasoline.

The availability of natural gas in Algeria entrusts to the NGV a promising future, more especially as it is characterized by a high number octane (about 110) and an appreciable calorific value.

On the ecological level, the NGV is containing hydrocarbon characteristic and adapted. It makes it possible to reduce the pollutants and Gases for Purpose of Greenhouse (GES) in an appreciable proportion compared to the other alternate fuels.

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Table 01: Algerian Specifications of the NGV

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Specification NGV with high calorific value</th>
<th>Specification NGV with bottom calorific value</th>
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<tbody>
<tr>
<td>- GCV (th/m3)</td>
<td>Between 9.3 and 10</td>
<td>Between 8 and 9</td>
</tr>
<tr>
<td>- Index of Wobbe (th/m3)</td>
<td>Between 11.2 and 12.2</td>
<td>Between 10 and 11</td>
</tr>
<tr>
<td>- Not rosy water (80 bars)</td>
<td>Lower than -10°C</td>
<td>Lower than -8°C</td>
</tr>
<tr>
<td>- Not rosy HC (80 bars)</td>
<td>-6°C</td>
<td>-6°C</td>
</tr>
<tr>
<td>- Content of H2S</td>
<td>Traces</td>
<td>Traces</td>
</tr>
<tr>
<td>- CO2 (% molar)</td>
<td>Lower than 3%</td>
<td>Lower than 3%</td>
</tr>
</tbody>
</table>

In addition, the current engines using the NGV are characterized by a great consumption and a weak autonomy compared to the engines of internal combustion traditional.

The technological matter projections of safety and keen progress of reduction of the costs confirm the tendencies of this product and its future place in the mix fuels in Algeria.

Table 2: Advantages and disadvantages of the NGV

<table>
<thead>
<tr>
<th>Advantages of the NGV</th>
<th>Disadvantages of the NGV</th>
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<tbody>
<tr>
<td>- Reduction of the CO2, CO and NOx emissions</td>
<td>- Great consumption</td>
</tr>
<tr>
<td>- Reduction of the noise emitted by the vehicle from -5 to -8 decibels.</td>
<td>- Weak autonomy.</td>
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<tr>
<td>- A very good Octane Number (110).</td>
<td>- Little developed infrastructure.</td>
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<tr>
<td>- Lighter than the air : in the event of escape, its dispersion is done easily.</td>
<td>- Loss of power.</td>
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<tr>
<td>- Freeze only with the lower part of -165°C, which makes it insensitive with the climatic conditions.</td>
<td>- High costs of the investments.</td>
</tr>
<tr>
<td>- Conveyed mainly by underground grids, thus removing the harmful effects related to the road transport of fuels.</td>
<td>- Maintenance requires proven technical skills.</td>
</tr>
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3. Situation of the NGV in Algeria

In Algeria, the consumption of the transport sector in 2008 accounts for 23.4% of the consumption of final energy at the time when the petroleum products account for 37.7% of the aforesaid consumption [1]. This established fact induces strong fuel dependence. That led to measurements which tend to privilege the sources of energy most available, very in substituent products best developed by the gas products. The NGV is containing hydrocarbon of substitution of first rank, its interest is located as well at the environmental level as at the economic level.

Algeria has with its advantage several assets which justified the will to develop the NGV, one can quote:

- The experiment proven in gas industry;
- Importance of the natural gas reserves (3500 billion m3)
- Size of the public distribution network of the natural gas which covers the whole of the northern part of the country and the territory of the principal areas of the country;
- Configuration of the public distribution network of the gas which covers the configuration of the road network perfectly, thus ensuring the provision direct supply of the product on the spot of consumption (installation of the compressor plants).

Taking into account decrease in power of the engines as well as weak autonomy, the NGV is adapted more to the heavy vehicles in the zones with very strong urbanization. Within this framework, the efforts are focused, since the beginning, on the creation of a network of compressor plants in the great agglomerations, while targeting the fleet of public transport.

Since 1998, two stations NGV have been built, 10 NGV buses dedicated and the conversion of a hundred vehicles were done.
Thereafter, several legislative texts were promulgated:

- The executive decree of December 2, 2003 fixing the conditions of exercise of the activities of distribution of Compressed Natural gas (GNC) like automobile fuel and of installations of kits of conversions on the vehicles;
- The decree of fixing January 23, 2005 methods of granting of the authorization of use of Compressed Natural gas Carburizing (GNC) by the motor vehicles ;
- The decree of February 12, 2005 fixing the characteristics and dimensions of the plate announcing the use of Compressed Natural gas Carburizing (GNC) by the motor vehicles;
- The decree at fixing February 22, 2005 specifications of Compressed Natural gas - Fuel cars;
- The decree of April 10, 2005 fixing the rules of adjustment and exploitation of a center of conversion of motor vehicles at Compressed Natural gas Carburizing;
- The decree of April 10, 2005 laying down the methods of establishment and delivery of the compliance certificates for the infrastructures of distribution of Compressed Natural gas Carburizing and them centers of conversion.

In addition, of the studies were started to define a suitable prices system. However, it proves that it is difficult to define a price in the pump which ensures at the same time competitiveness compared to the traditional fuels and which takes account of the too high costs of distribution.

Table 3: Comparative prices of the fuels in Algeria

<table>
<thead>
<tr>
<th></th>
<th>Price with the pump (DA/liter)</th>
<th>Retail Margin (DA/liter)</th>
<th>Price to the 100 km (DA/liter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super gasoline</td>
<td>23</td>
<td>1.5</td>
<td>230</td>
</tr>
<tr>
<td>Gas-oil **</td>
<td>13</td>
<td>1.25</td>
<td>753</td>
</tr>
<tr>
<td>LPG fuel</td>
<td>9</td>
<td>2.50</td>
<td>108</td>
</tr>
<tr>
<td>NGV</td>
<td>4</td>
<td>1.75</td>
<td>104*&lt;br&gt;732**</td>
</tr>
</tbody>
</table>

*small vehicles<br>**Bus

Indeed, although GNV retail margin (1,75 DA/liter) is more important than the gasoline one and of the diesel one, the importance of specific consumption makes the NGV close to the GPL/C for the vehicles light and close to the gas oil for the buses.

It should be noted that the margin of the NGV is far from making competitive the choice of such a mode of combustion. Indeed, the capital cost of a compressor plant (costs of acquisition of the installations and costs of connection) is extremely high. As example, the estimated cost of the connection of the service station SISSANE of Naftal (Algiers) with the NGV is about 500 000 $ US.
Therefore, regarding the investment costs, the NGV is not competitive and that constitutes the principal barrier with its development. In addition to, the GNC has other handicaps:

- High prices of dedicated buses NGV;
- surroundings) and of the kits of conversion;
- Insufficiency of inciting measurements;
- Structure of price non inciting compared to the gas oil;
- Insufficiency of the technical skills;
- Miss the information intended for the potential consumers (taxi, fleets of companies, administrations and public grid systems);

However, the commitment of the authorities in the clean promotion of the fuels, in particular the aspects related to the regulation, allows the development of the NGV in Algeria. Indeed, at the present time, the Agency of Regulation of Hydrocarbons (ARH) analyzes the national regulation relating to the NGV for purposes of actualization. A suitable lawful day before was founded where the objective is to adapt the Algerian regulation to the news give technical related in particular to the sedentary aspects.

In short, this first phase of the launching of the NGV in Algeria aimed at the creation of the conditions which will be used as a basis for the development of the market of the NGV by:

- The Installation of the regulation;
- The Installation of a first pricing system;
- The realization of an infrastructure minimum of distribution
- The conversion of a fleet of light vehicles and the acquisition of some buses dedicated to the GNC on a purely experimental basis.

The first constraints met concern:

- Capital costs, in particular those related on the compressor plants and conversion;
- The specific consumption of gas and autonomy;
- The knowledge to make technical for maintains;
- The pricing system.

4. Perspectives

Today, the distribution network of the NGV is not developed enough in Algeria due to:

- Lake of marketing and misses it information constitutes a major handicap;
- Economic parameters related on the prices and the costs which weigh heavily on its development.

However, the current and future development of the distribution network of natural gas is a factor favorable to the generalization of the NGV. Precursory signs of promotion of this fuel appeared recently with new commitments of the government.

Within this framework and in parallel to the national program of public distribution of the natural gas which envisages at the horizon a 2020 rate of penetration of natural gas of about 60% (what will result in a consequent development of the public distribution network of natural gas, facilitating at the same time the connection of the compressor plants of the NGV to the network), programs national of development of the NGV is initiated.

The national program of promotion and development of the NGV, by the participation of companies SONATRACH (Production and transport of natural gas), SONELGAZ (Distribution network of natural gas) and NAFTAL (sale of the NGV), envisages by the 2025 mobilization of consequent resources for:
- The acquisition of bus rolling to natural gas;
- The conversion of vehicles;
- The investment in the equipments of distribution.

The national program of promotion and development of the NGV breaks up into two programs, one in the short run, already started, and the other in the medium term.

The short-term program, which is spread out until the end of the year 2011, envisages:

- Building of 40 compressor plants, including 15 in Algiers, which will be connected to the public distribution network of natural gas;
- Conversion of 14,000 vehicles taxis
- Building of 175 buses rolling with natural gas
- Acquisition of 4 grounds of putting up including one for Algiers (parking and maintenance for the fleet of urban transport).

This first program (intended for the public companies of transport, of the taxis and with the fleets of the public administrations) target existing installations of distribution on the level of the traditional service stations which answer the provisions of the inter-ministerial decree of April 10, 2005, fixing the rules of adjustment and exploitation of the infrastructures of distribution of the NGV. It will have to relate to the large cities which present a strong concentration of public institutions with a renewal rate of the important automobile park. Algiers constitutes the first phase for the launching of program NGV on the level of the large cities of the country.

Within this framework, the National Company of Marketing and Distribution of the Petroleum products (Naftal) started at the beginning of the year 2008 its first actions in this field. We can quote:

- Initializing a unit of distribution of NGV at the service station SISSANE in Algiers;
- Initializing an operation of acquisition of vans combustion Gasoline/NGV for the distribution of the lubricants and the maintenance of its network of service stations;
- Initializing three other units of distribution NGV (Algiers, Oran and Annaba);
- Contribution to the actualization of the legislation relating to the NGV, under the aegis of the Agency of Regulation of Hydrocarbons (ARH).

Theoretically, this first program makes it possible to substitute about 96,000 tons of gasoline and fuel oil by 2012 by a volume of 120 NM3 natural gas.

In addition, the medium-term program, which is spread out over the period 2012-2025, consists of:

- The realization of 112 compressor plants which will be connected to the public distribution network of natural gas;
- The acquisition of 500 buses rolling with natural gas.

The total cost of the program is estimated at 28 billion DA, of which 13 billion DA will be supported by the State in the form of subsidies. Contests of Melt National of Control of Energy and of Melt National for the Development of the Actions of Environmental protection are solicited.

In addition to the adaptation of the regulation, several inciting measurements are awaited:

- Revision of the price pattern of the NGV for an improvement of the margin of distribution and reduction of the current price to the pump;
- Reductions tax on the equipment and the activities related to the NGV
- Reduction of the customs duties on equipment NGV;
- Exemptions of the label and the tax of registration of dedicated vehicles NGV or combustion /NGV GASOLINE;
- Advantageous bank loans within the framework of the investments in activity NGV;
Lastly, the experiment of the Company *Naftal* in the promotion of the GPL/C cannot be ignored for the development of the NGV in Algeria.

**Figure 5:** Projects of the filling stations *Naftal* with the NGV ([1] station SISSANE, Algiers, [2] station LOISIRES, Algiers, [3] station EL BAHIA, Oran, [4] station EL BOUNI, Annaba)
5. Conclusion

With a view to environmental protection, the development of Natural Gas Vehicle (NGV) is a major axis of the Algerian energy policy. This is consolidated by the abundance of the gas resources and the development of the distribution network of natural gas.

The relatively important size of the investments on the matter requires suitable mechanisms of financing with the assistance of the State which took this route fully. The program 2007-2025, accompanied by a suitable legislative framework, allows the progressive emergence of the NGV in the mix fuels in Algeria.

6. References