FORESIGHT OF ELECTRIC TRANSPORTS IN FRANCE IN 2020

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Overview

In France, the new green law "Grenelle de l'environnement" has planned to build a lot of infrastructures of public transportation, particularly railways. Besides, some decisions are taken to promote electric vehicles.

If electric transports are always seen as "ecologically friendly", actually, it can be a good mean of transportation for environment (energy consumption and CO2 emissions are only evaluated in this study) but, if the electric mix production is too much carboned", it can be a worst solution in a *well*-to-*wheel analysis* compared to fuel vehicles.

With a low carbon dioxide emission factor for electricity production in average, France is presented as the good place to introduce electric vehicles. But reality is not average, and mass penetration of electric means of transport can be more problematic in long term, especially if considering new electric uses.

This study will demonstrate how the environmental performance can be really different according to the electricity production (considering average and marginal factor of emission : g CO2 / kWh), the charge of battery and the level of consumption for light vehicles.

Methods

Concerning railways (freight transport, long distance trips and urban trips), the development of infrastructures is very important : modal shift in freight transport from 14 to 25% made by train,
construction of 1500 km of infrastructures for urban transport
construction of 2000 km of infrastructures for high speed train.

For the railways, the method selected was to quantify the growth of traffic due to the new infrastructures in 2020. Consequently to this strong level of electricity consumption, the aim was to see if with an electricity with a high emission factor (450 and 900 g CO2 / kWh), corresponding to a marginal consumption, the comparative advantage of railways was still right.

For the light vehicles, with a high emission factor (450 g CO / kWh and 900 g kWh), electric vehicles are not always better in terms of CO2 emissions compared to fuel vehicles in a well-to-wheel analysis (110 g CO2 / km in 2020).

Thus, the availability of "carbon free" electricity has been quantified for night periods and a level of consumption for light vehicles has been defined to reach a better performance whatever the electricity mix (because electric vehicles won't be produced for only one market).

Results

In fact, results are quite different for rail transports (where the electricity mix can change the performance but not the comparative advantage of rail) in comparison with light vehicles (where a too much CO2 intensive electricity and too high electric consumption can make a worst solution compared to best fuel vehicles). It means that a maximum level of consumption for electric vehicle must be set and the economic conditions must change to support "smart grids" and "smart charges" for users of electric vehicles.

Conclusions

Rail transports can be developed without matters for the electricity mix; it is always a good solution in terms of energy consumption and CO2 emissions (considering the current occupation rate).

But for light vehicles, main conditions must be respected: very efficient vehicles (consumption max between : 0.07 and 0.25 kWh / km according to the electricity mix and technology of batteries), new urban vehicles, smart grids and off-peak charges. In a national fleet of more than 30 millions of vehicles, electric vehicles can't be considered as the unique means to reach the objective of reduction of CO2 emissions in transportation.