Private vehicle fleet model

CA EED Workshop – Munich

7-8 March 2017

Crédit photo : Arnaud Bouissou/MEDDE

French Ministry of the Environment, of Energy and of the Seas

Ludovic FRAGNOL

Context

- Every 3 years : according to the 24th article of the EU directive 2012/27//UE, France is releasing a report on actions about energy efficiency, with 2 main topics :
  - French strategy toward energy efficiency,
  - Measures and policies in the different sectors.
- Report based on the figures of the CO2 emissions reporting to European Parliament (AME, AMS) : CGDD contributing to estimate and forecast transport emissions, until 2035.
- In France : 34 % of CO2 emissions linked to the transport sector. Among them, 94 % is linked to road transport.
- CGDD : modeling private fleet vehicle and its evolution in time.

Key facts

- Historically, in France, only two fuels were proposed for cars : diesel and gasoline.

- CGDD has developed a model to anticipate the trends in motorizations and to assess the impact of public policies on fuel taxes, car prices, etc.

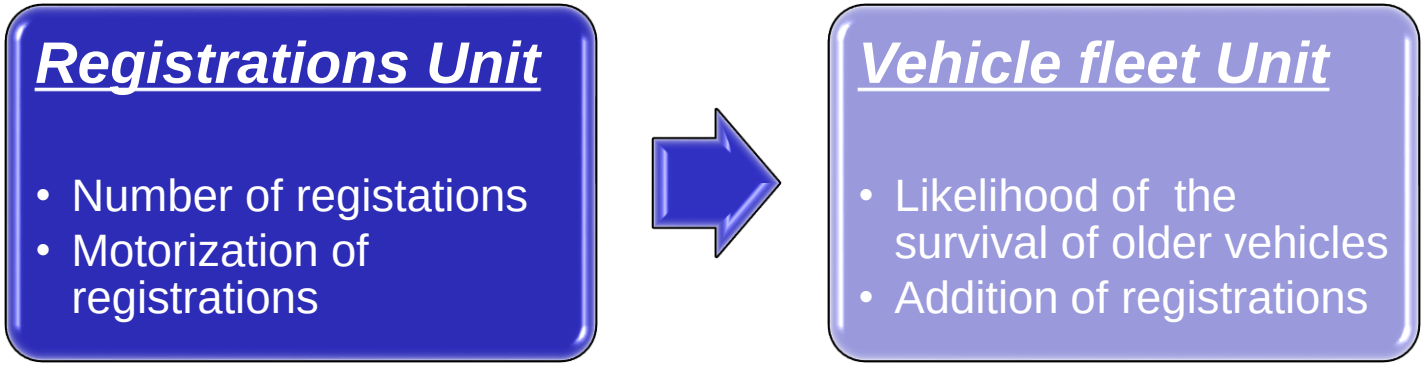
- In France, private vehicle fleet is among the most dieselized in Europe (CCTN 2014) :
  - 62 % of the total fleet (on a total of 32 millions vehicles),
  - 75 % of the total traffic (on a total of 400 billions veh.km).

- Among registrations in France in 2016 (SOeS 2016) :
  - 53 % are diesel cars,
  - 42 % are gasoline cars,
  - 5 % are other motorizations (hybrid, electric, etc.).

- Among company cars, dieselization rate of registrations is around 95 %.

CGDD model (1/3)

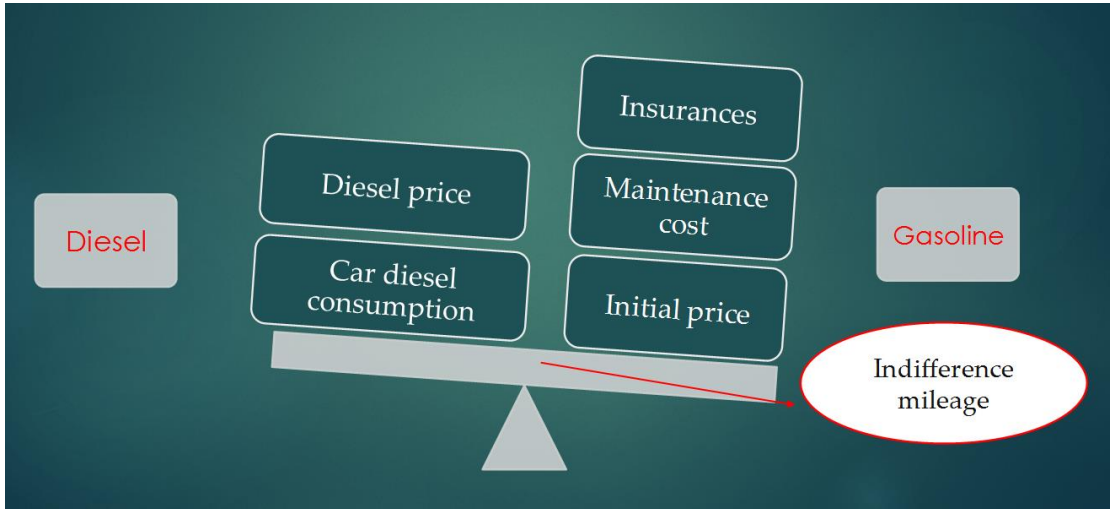
- Model divided into 2 main units :



- For this, several exogenous parameters :
  - Number of registrations I for the year Y, with a total fleet F :
    - $I = F_y - F_{y-1}(Y) + S_{y-1}$ where S_{y-1} is the number of scrapped cars,
    - Total fleet : in 2010, total vehicle fleet of 32,3 M vehicles, estimated to be 35,2 M in 2030. Linear progression of the fleet between the 2 dates, exogenous parameter
  - Percentage of registrations in electric vehicles fixed in advance,
  - Percentage of registrations in hybrid vehicles fixed as a percentage of diesel and gasoline registrations.

CGDD model (2/3)

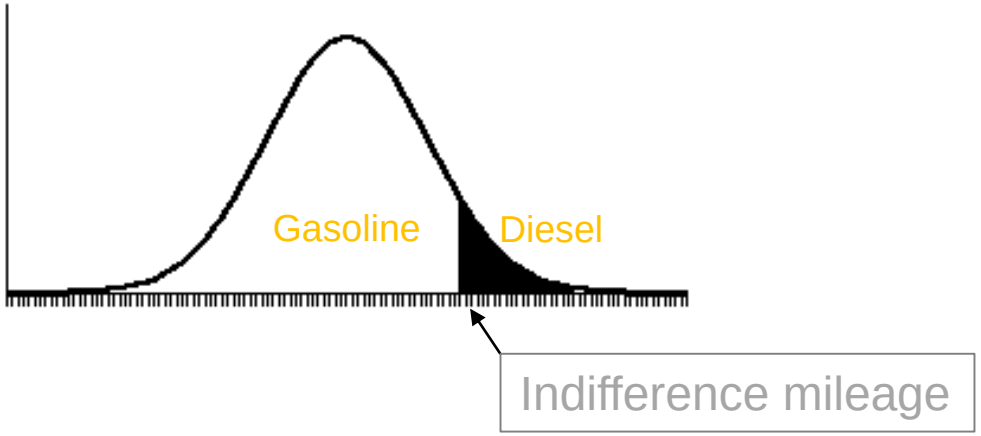
- Registrations divided into 4 ranges : Small, Medium inf., Medium sup., Large. For each range, sub-division according to the owner : private car or company car.
- For each category (range*owner), the different parameters are having different values, there is an estimation of the indifference mileage :



- The higher the mileage is, the more interesting it is to have a diesel car. Over the indifference mileage, all the cars are diesel.

CGDD model (3/3)

- For each category, use of a mileage distribution to know the percentage of diesel and gasoline cars :



- Result :
  - number of cars of each motorization each year,
  - Average kilometer if each type of car, of each motorization.

- Note : possible to model a “manufacturer reaction” according to the rate of diesel registrations.

Intputs

- Data of the fleet in 2010 (TNS Sofres, Argus) :

	% registration		% diesel	
	Private cars	Company cars	Private cars	Company cars
Small	42,0%	11,6%	32,0%	42,3%
Medium Inf.	20,0%	10,2%	74,5%	93,5%
Medium Sup.	7,9%	4,7%	89,4%	96,8%
Large	2,1%	1,5%	91,1%	96,2%

- Mean mileage by category : 9300, 12500, 14000 and 13500 kms (small to large) in 2011. Decreasing mileage by 0,6 % per year.

- Mean mileage for company cars is 31000 for diesel cars vs 8000 for gasoline cars.

- Assumption that companies are keeping their cars only 4 years, then, the cars are sold to private owners.

Intputs

- Estimation of the survival time of an immatriculation (PhD Z. KOLLI, 2012) :
  - around 17 years for a gasoline car,
  - Around 15 years for a diesel car.

- Fuel consumptions for each catory of registrations (TNS Sofres) and its evolution (ADEME) :

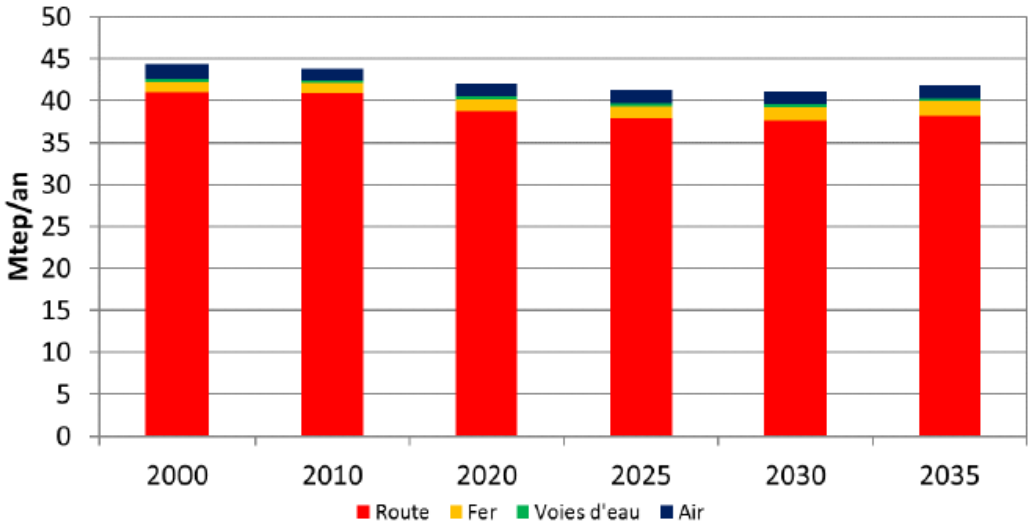
	Evolution from 2011 to 2020	Evolution from 2020 to 2030	Average consumption in 2020 (L/100 km)
Diesel	-2%	0	4,96
Gasoline	-3%	0	5,48

Outputs of the model

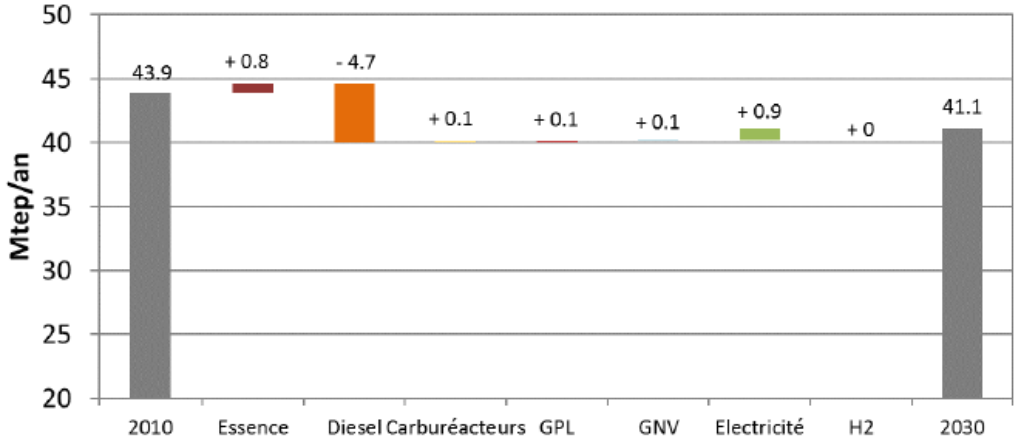
- Registrations from 2011 to 2030.
- Private vehicle fleet from 2011 to 2030 (with motorization, traffic, fuel consumptions, etc.).
- CO2, NOx, PM, VOC emissions (crossed by diesel and gasoline and by Euro norms).
- Impacts of public policies on the vehicle fleet.

Final results for CO2 reporting

- Energy demand by transport mode :



- Evolution of the energy demand by energy type :



Current works and improvements

- Calibration of the model in 2016 with last SOeS data
  - Total fleet,
  - Prices of cars, insurances, maintaining costs, etc.,
  - Average mileage by category,
- Evolution of the percentage between the different ranges
- Increasing knowledges on company cars (current study CGDD-BeMobi)
- Improving the modeling of the car manufacturer reactions according to the diesel rate

Now, time for questions !