



Method of Stating Energy Consumption

Life-cycle analysis for EV energy
consumption results



Method of stating energy consumption

(recommendation 5.2, ECE/TRANS/WP.29/2014/81)

EVE, during 12th Meeting 28./29.10.14
Documentation: EVE-12-10e, EVE-12-13e

- Keep this topic area in the new EVE mandate, but remove it from consideration for future GTR development.
- This topic is decided to be addressed only in Part A (information-sharing only)

Information sharing:

- China believes it is very necessary to find the proper expression method for energy consumption to clarify the fuel saving effect for electric vehicles.
- The study is very challenging due to varied power structure for each nation, however, it is also very meaningful for environment protection.
- China is trying to develop a tentative method for energy consumption with the countries interested in this issue.



➤ To carry out the related research on 5.2, it is advisable to take the following steps:

Step1:

Literatures review: Study on the electric vehicle energy consumption evaluation method executed by main countries.

Step2:

Data collection: Build database and conduct comparative analysis on the energy structure for main countries in the world.

Step3:

Method Development: Discusses the necessity and possibility to standardize the energy consumption method.

Task	start date	end date	status	EVE			EVE		EVE				EVE	
				-13	--	-14	-15	--	-16					
				Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15
Method of stating energy consumption	Feb-15	Nov-15	Preparation	█	█	█	█	█	█	█	█	█	█	█
1 Literature review	Feb-15	Apr-15		█	█	█								
2 Data collection	Apr-15	Sep-15						█	█	█	█	█		
3 Method development	Sep-15	Nov-15											█	█



- **Data on electricity chains**
 - Composition of regional electrical grids (%) (Coal, gas, hydro, nuclear, others)
 - Life cycle energy consumption and GHG emissions situation for fuel production and distribution stages of power generation
 - MJ/MJ fuel obtained
 - g CO_{2,e} /MJ fuel obtained
 - Electricity generation efficiency (% , by type)
 - Electricity transmission loss (%)
- **Data on EV charging and running**
 - Charge efficiency (%)
 - Energy consumption for EV running (%)



Basic parameters of oil-, and coal-based fuel pathways

Oil extraction

Extraction efficiency, 93.0 %

Process fuel mix: electricity (37 %), crude oil (20 %), NG (23 %), coal (10 %), diesel (8 %), residual oil (1 %), and gasoline (1 %)

Oil transportation mode

Sea tanker, 50 % (11,000 km); rail, 45 % (950 km); pipeline, 80 % (500 km); and waterways, 10 % (250 km)

Oil refinery

Process fuel mix: crude oil (50 %), coal (20 %), electricity (12 %), refinery still gas (10 %), residual oil (4 %), diesel (1 %), and gasoline (1 %)

Gasoline production efficiency, 89.1 %; diesel production efficiency, 89.7 %; and LPG production efficiency, 92.0 %

Gasoline and diesel TSD mode

Sea tanker, 25 % (7,000 km); railway, 50 % (900 km); waterways, 15 % (1,200 km); and road (short distance), 10 % (50 km)

LPG TSD mode

Sea tanker, 30 % (7,000 km); railway, 80 % (900 km); pipeline, 0 % (160 km); waterways, 15 % (1,200 km); and road (short distance), 10 % (50 km)

NG extraction and processing

Extraction efficiency, 96.00 %; process fuel mix for NG extraction: electricity (40 %), NG (23 %), residual oil (20 %), diesel (8 %), coal (7 %), and gasoline (2 %); NG processing efficiency, 94.00 %; and process fuel mix for NG processing: residual oil (40 %), NG (28 %), coal (20 %), electricity (10 %), diesel (1 %), and gasoline (1 %)

CNG, LNG, and GTL production

CNG production efficiency, 96.9 %; LNG production efficiency, 90.2 %; and GTL production efficiency, 54.2 %



- **Labelling together**
 - ** kWh /100 km
 - ** Liter (gas equivalent)/ 100 km
- **Considering energy consumption by upstream and operation stages**
 - Upstream (percentile)
 - Operation (percentile)
- **Comparing GHG emissions to conventional gasoline vehicle**
 - Total
 - By stages

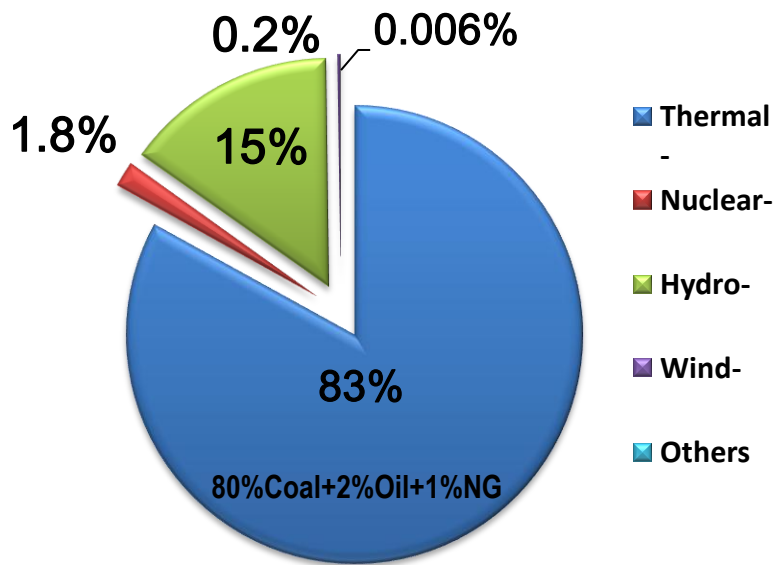


Stating Methods

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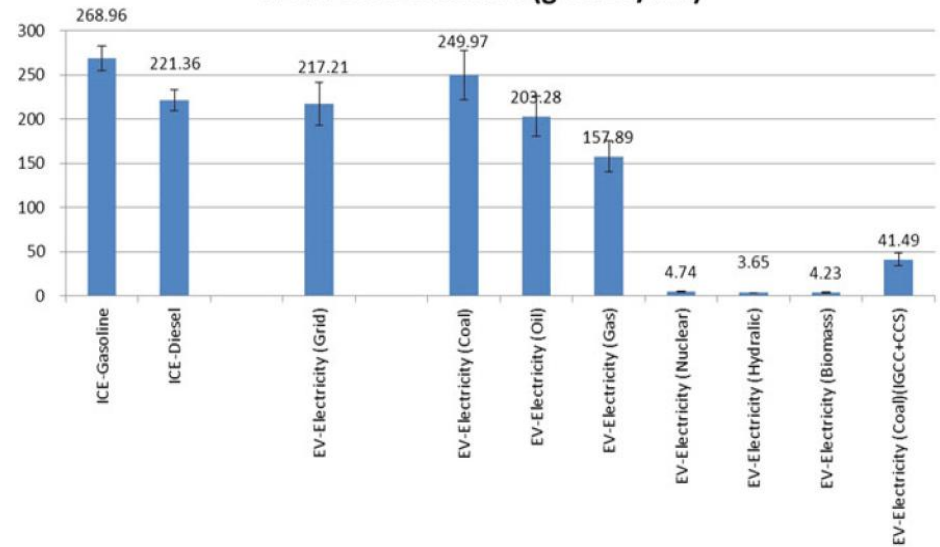
Electricity is not only an important energy input for other vehicle fuel pathways, but also be directly used as vehicle fuel to drive the EV and PHEV. The Grid electricity WTW result is an weight average of various power generation.

Composition of Power Generation in 2010 in China



Sources : Chinese Federation of electric power enterprises , 2011

WTW GHG emission (g CO₂e/km)



Sources : China Automotive Energy Outlook2012

$$\text{Grid GHG} = [249.97 * 0.8 (\text{Coal}) + 3.66 * 0.15 (\text{Hydro}) + \dots] / 0.935 = 222.5 \text{ g CO}_{2,e} / \text{km}$$



Thank you for your attention!