



This project is co-financed by the European Union and the Republic of Turkey.

Technical Assistance for Developed Analytical Basis for Formulating Strategies and Actions towards Low Carbon Development



Energy Balance



EMISIA SA presentation

October 2019, Ankara



Automated energy balance (1/3)

- COPERT 5 compares statistical and calculated energy consumption, modifies a number of input data (eg mileage, blend share) and recalculates emissions

Automated energy balance (2/3)

- Assumptions

- Fuel consumption calculated with COPERT functions comes from 100% fossil fuel
- Vehicle **efficiency does not** depend on fuel blend used (i.e. specific energy consumption independent of fuel blend)
- Fossil / Renewable statistical **ratio** per fuel type will also hold for the calculated consumption

Automated energy balance (3/3)

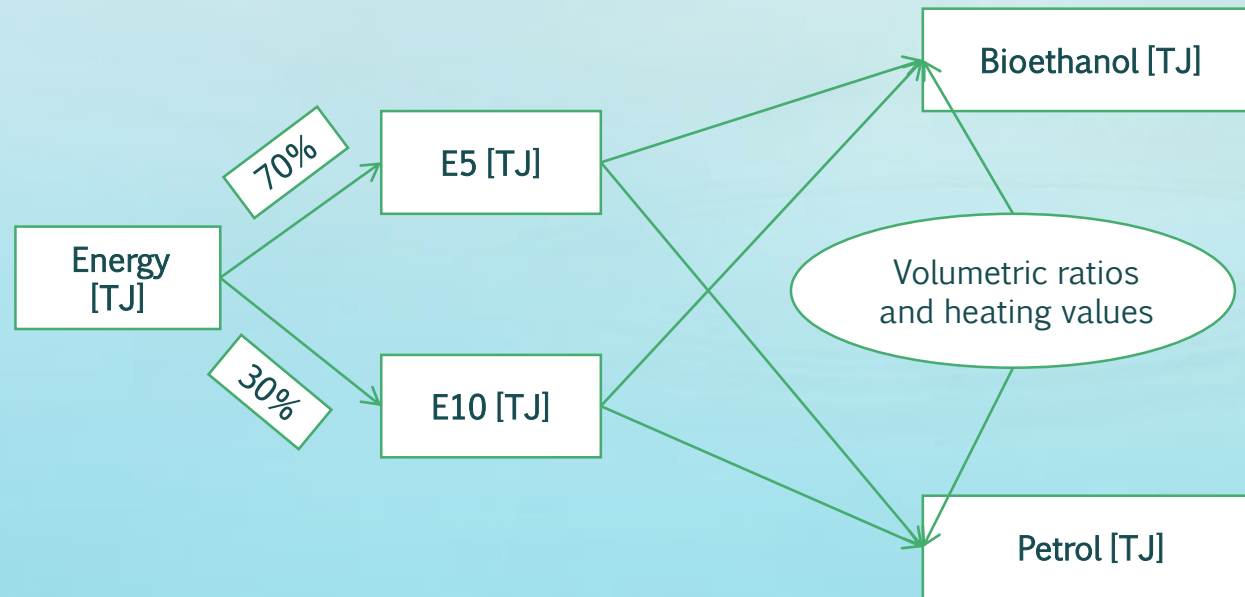
- Adjustments

1. Blends energy share (e.g. 70/30 -> 72/28)
2. Blending ratio (e.g. E5 -> E4.5)
3. Mileage adjusted so that calculated energy per fuel type matches statistical energy per fuel type

- Finally:

- Energy and pollutant emission based on the new mileage (and blends)

Energy allocation: From end to primary fuels



Algorithm for adjustments of bio/fossil

- Ratio of sold (biofuel/fossil) fuel energy has to be respected by calculated consumption

- Algorithm steps:

1. The blend energy share reported by the user first modified

if not enough

2. The blending ratio modified

until solution is found

Last step of energy balance

Once bio/fossil ratio adjusted, mileage is adjusted to match total energy consumption:

$$MCF_i = \frac{Energy_sold_i}{Energy_calculated_i}$$

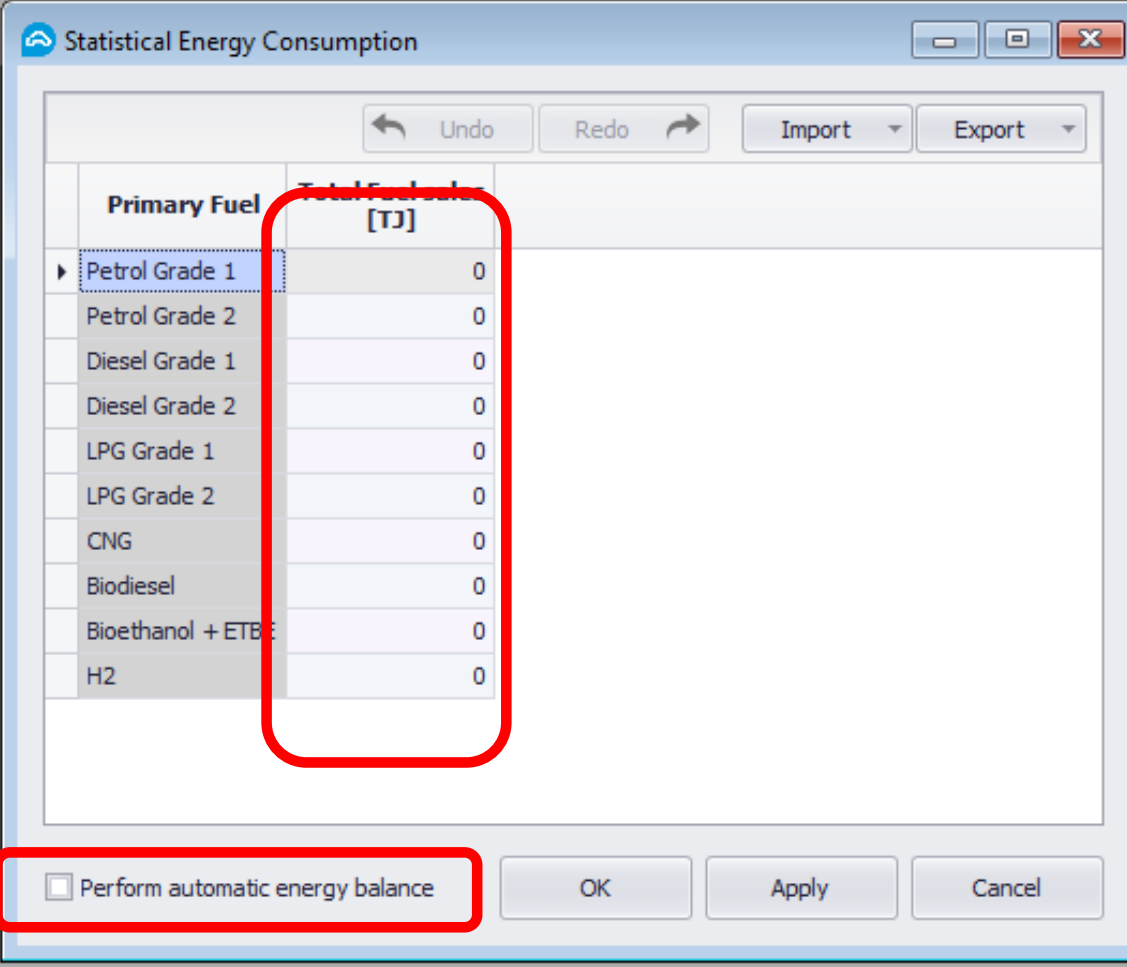
$$NewMileage_j = MCF_i \cdot Mileage_j$$

where

i is either petrol or diesel

j individual vehicle type

Related forms in COPERT 5 (1/4)



Statistical Energy Consumption

Undo Redo Import Export

| Primary Fuel | Total Fuel Use [TJ] |
|-------------------|---------------------|
| Petrol Grade 1 | 0 |
| Petrol Grade 2 | 0 |
| Diesel Grade 1 | 0 |
| Diesel Grade 2 | 0 |
| LPG Grade 1 | 0 |
| LPG Grade 2 | 0 |
| CNG | 0 |
| Biodiesel | 0 |
| Bioethanol + ETBE | 0 |
| H2 | 0 |

Perform automatic energy balance

OK Apply Cancel

Related forms in COPERT 5 (2/4)

Status

File

Country : **Italy**
Run Mode : **Timeseries**
Created : **13 Oct 2016, 20:48**
Saved : **Never**

Year : 2014

Fuel Balance : **YES**
Improved Fuel Quality Year : **1996**
Mileage Degradation : **No Effect**
Lube-Oil CO2 Effect : **NO**
A/C Effect : **NO**
CO2 Effect : **NO**

Fuel Balance Calculated : **YES**
Emissions Calculated : **NO**

Calculate Fuel Balance

Calculate Emissions

Calculate All Years

Cancel

Related forms in COPERT 5 (3/4)

Stock & Activity Data

All

Undo Redo Import Export

| Category | Fuel | Segment | Euro Standard | Stock [n] | Mean Activity [km] | Lifetime Cumulative Activity [km] | Fuel Balanced ~ Mean Activity [km] |
|----------------|--------|---------------------|-----------------------|--------------|--------------------|-----------------------------------|------------------------------------|
| Passenger Cars | Petrol | Medium | ECE 15/02 | 0 | 0 | | 0 |
| Passenger Cars | Petrol | Medium | ECE 15/03 | 0 | 0 | | 0 |
| Passenger Cars | Petrol | Medium | ECE 15/04 | 16,201.04 | 3,034.76 | 249,099.0 | 2,973.1 |
| Passenger Cars | Petrol | Medium | Improved Conventional | 0 | 0 | | 0 |
| Passenger Cars | Petrol | Medium | Open Loop | 0 | 0 | | 0 |
| Passenger Cars | Petrol | Medium | Euro 1 | 84,370.58 | 4,525.31 | 225,000.5 | 4,433.36 |
| Passenger Cars | Petrol | Medium | Euro 2 | 613,432.04 | 5,172.43 | 201,407.1 | 5,067.33 |
| Passenger Cars | Petrol | Medium | Euro 3 | 909,521.24 | 5,915.67 | 147,669.5 | 5,795.47 |
| Passenger Cars | Petrol | Medium | Euro 4 | 1,376,650.77 | 6,766.35 | 79,513. | 6,628.86 |
| Passenger Cars | Petrol | Medium | Euro 5 | 478,653.35 | 7,743.51 | 32,025.7 | 7,586.17 |
| Passenger Cars | Petrol | Medium | Euro 6 up to 2016 | 0 | 0 | | 0 |
| Passenger Cars | Petrol | Medium | Euro 6 2017-2019 | 0 | 0 | 10,00 | 0 |
| Passenger Cars | Petrol | Large-SUV-Executive | PRE ECE | 231.76 | 2,271.14 | 42,437.5 | 2,224.99 |
| Passenger Cars | Petrol | Large-SUV-Executive | ECE 15/00-01 | 0 | 0 | | 0 |

OK Apply Cancel

Related forms in COPERT 5 (4/4)

Technology blends share

All

Undo Redo Import Export

| Vehicle | | | | Blend | | Blend Energy Share | | Fuel Balanced ~ Biofuel... | | Fuel Balanced ~ Blend... | |
|---------------------------|--------|---------------|-------------------|-------------|--------------|--------------------|------------------|----------------------------|------------------|--------------------------|------------------|
| Category | Fuel | Segment | Euro Standard | First Blend | Second Blend | First Blend [%] | Second Blend [%] | First Blend [%] | Second Blend [%] | First Blend [%] | Second Blend [%] |
| Light Commercial Vehicles | Petrol | N1-II | Euro 4 | E5 | E10 | 80% | 20% | 4.64% | 0% | 100% | 0% |
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| Light Commercial Vehicles | Petrol | N1-II | Euro 6 up to 2017 | E5 | E10 | 80% | 20% | 4.64% | 0% | 100% | 0% |
| Light Commercial Vehicles | Petrol | N1-II | Euro 6 2018-2020 | E5 | E10 | 80% | 20% | 4.64% | 0% | 100% | 0% |
| Light Commercial Vehicles | Diesel | N1-II | Conventional | B7 | B20 | 80% | 20% | 7% | 20% | 98.18% | 1.82% |
| Light Commercial Vehicles | Diesel | N1-II | Euro 1 | B7 | B20 | 80% | 20% | 7% | 20% | 98.18% | 1.82% |
| Light Commercial Vehicles | Diesel | N1-II | Euro 2 | B7 | B20 | 80% | 20% | 7% | 20% | 98.18% | 1.82% |
| Light Commercial Vehicles | Diesel | N1-II | Euro 3 | B7 | B20 | 80% | 20% | 7% | 20% | 98.18% | 1.82% |
| Light Commercial Vehicles | Diesel | N1-II | Euro 4 | B7 | B20 | 80% | 20% | 7% | 20% | 98.18% | 1.82% |
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| Light Commercial Vehicles | Diesel | N1-II | Euro 6 2018-2020 | B7 | B20 | 80% | 20% | 7% | 20% | 98.18% | 1.82% |
| Heavy Duty Trucks | Petrol | >3,5 t | Conventional | E5 | E10 | 80% | 20% | 4.64% | 0% | 100% | 0% |
| Heavy Duty Trucks | Diesel | Rigid <=7,5 t | Conventional | B7 | B20 | 80% | 20% | 7% | 20% | 98.18% | 1.82% |
| Heavy Duty Trucks | Diesel | Rigid <=7,5 t | Euro 1 | B7 | B20 | 80% | 20% | 7% | 20% | 98.18% | 1.82% |

Set main fuels

OK Apply Cancel



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Thank you for your attention!

<http://www.lowcarbonturkey.org/>

