ORWeb Scenario Version

INTRODUCTION

Optiresource Car is a software package developed by DAIMLER AG to present and to perform comparative analyses of energy conversion chains (see Query Mode) as well as analyses of various scenarios. Since it is a web application, the user only needs a web browser, whatever the platform be (computer, tablet, etc.).

Analyzing the use of cars in the road traffic of tomorrow requires the development of systems and scenarios offering the possibility of assessing the plans and decisions of politicians, vehicle manufacturers as well as users and buyers of vehicles. New energy sources and novel power trains are the focus of such an analysis: these components have to be assessed in terms of climate damage, primary energy supply, and costs.

Optiresource Car provides such an assessment system for scenarios with regard to road traffic and passenger cars. On the basis of energy conversion chains (subsequently called energy chains, see Query Mode), the system allows generating various scenarios for the use of cars in road traffic and comparing them to predefined reference scenarios. Starting from one of these predefined reference scenarios, the software user may than modify the data in order to analyze the impact of changes in the mixture of vehicles on the road, changes in the provision of fuels, or changes in the use of primary energy carriers, including the total savings in greenhouse gas emissions or reductions in the primary energy needed.

A scenario can be started from different starting points: Powertrain, Fuel or Primary Energy. When a scenario is started from the Powertrain or the Fuels, the user may define either the total number of vehicles or the total annual mileage in order to allocate these quantities in the selected energy chains. Optiresource Car provides information about the primary energy required in a certain energy chain and the total amount of greenhouse gas emissions caused by a certain number of vehicles driving a certain amount of km per year. When a scenario is started from the Primary Energy, the user assigns a total amount of primary energy and allocates it to the selected energy chains. Optiresource Car provides information about both the total amount of vehicles and the yearly mileage to be sustained by the selected primary energy allocation and the related GHG emissions.

Thus, Optiresource Car provides information about the primary energy demand and the total amount of greenhouse gas emissions for the selected scenario. In addition, whatever the starting point of the scenario is, the user is also given information about the primary energy (PE) input (in terms of both energy and mass), the land surface used, and the water consumption. For each PE used in the scenario chains, PE input is the sum of the inputs coming from all the chains where that PE is used, no matter whether it is the “main” PE, i.e. the primary energy which is converted into fuel, or the “expended” PE, i.e. the primary energy which is used to supply single conversion process steps. For instance, oil could be the “main” PE of a chain (e.g. a chain where oil is converted into gasoline), whereas in another chain (e.g. a chain where wheat is converted into ethanol), oil is an “expended” energy supplying a single step of the process: the oil input of the scenario is the sum of the inputs coming from all the chains of a scenario. Primary energy, land use and water consumption data represent the sum of the values coming from the various chains where the specific PE is converted into a fuel. For instance, if a scenario comprises 3 chains converting farmed wood into a fuel (e.g. into compressed hydrogen, electricity and ethanol), the land needed for the wood is the sum of the values of the 3 chains. The same applies to the water consumption.

However, Optiresource Car does not yet offer data concerning the availability of energy sources, power trains, and costs.

The data used and displayed are based on the following two sources: (1) a study carried out by Concawe/Eucar/JRC latest release: *Prussi, M., Yugo, M., De Prada, L., Padella, M., Edwards. JEC Well-To-Wheels report v5. EUR 30284 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-20109-0, doi:10.2760/100379, JRC121213*, and (2) supplementary inputs provided by L-B-Systemtechnik (with particular reference to electricity generation on water and PV basis as well as electrolyzer technologies).
DOCUMENTATION-D-BASE .

The results achieved can be presented in a variety of dimensions in the form of Excel sheets.

CRITERIA

The criteria used to evaluate the user-defined energy chains are basically given in the following dimensions and abbreviations:

- MJ, GJ, TJ, kWh, MWh, GWh, TWh, Mtoe *
- MJ/100km *
- tCO_2eq *
- gCO_2eq/km *
- km
- t
- km^2
- m^3
- WTW - Well to Wheel
- WTT - Well to Tank
- TTW - Tank to Wheel

* For the trucks the above units are given per 1t of payload

Total amount of primary energy expended for the whole scenario (WTW)

Presentation of energy-related results:

- Specific energy consumption, i.e.

$$\frac{\text{WTW energy of the scenario}}{\text{total amount of annual mileage of the whole scenario}} \times 100$$

- Relative energy consumption (%), i. e.

$$\frac{\text{WTW energy of the scenario under consideration}}{\text{WTW energy of the reference scenario}} \times 100$$

- Reduction potential of energy consumption (%), i. e.

$$\frac{\text{WTW energy of the reference scenario} - \text{WTW energy of the scenario under consideration}}{\text{WTW energy of the reference scenario}} \times 100$$

  Positive results mean advantages for the scenario under consideration compared with the reference scenario.

- Shares of the total amount of primary energy coming from fossil, biomass, renewable (sun, water and wind), and nuclear sources.

Greenhouse gas (GHG) emissions for the whole scenario (WTW)

Negative emission results mean that the CO_2 credits (see below) are higher than the CO_2 emissions due to the combustion of fossil primary energies.

Presentation of emission-related results:

- Specific GHG-emissions, i. e.

$$\frac{\text{WTW emissions}}{\text{total amount of annual mileage of the whole scenario}}$$

- Relative GHG-emissions (%), i. e.

$$\frac{\text{WTW emissions of the scenario under consideration}}{\text{WTW emissions of the reference scenario}} \times 100$$

- Reduction potential of the GHG-emissions (%), i. e.

$$\frac{\text{WTW emissions of the reference scenario} - \text{WTW emissions of the scenario under consideration}}{\text{WTW emissions of the reference scenario}} \times 100$$

  Positive results mean advantages for the scenario under consideration compared with the reference scenario.

- CO_2 credits, i. e. credits due to the complete combustion of biomass-based fuels.

Total amount of vehicles (N) i.e. the total amount of vehicles of the scenario.

Presentation of amount of vehicles-related results:

- Relative amount of vehicles, i. e.

$$\frac{\text{total amount of vehicles of the scenario under consideration}}{\text{total amount of vehicles of the reference scenario}} \times 100$$

Total amouint of km (km) i.e. the total amount of annual mileage of the scenario.

Presentation of amount of km-related results:

- Specific amount of km, i.e.

$$\frac{\textit{total amount of km of the scenario}}{\textit{total amount of vehicles}}$$

- Relative amount of km, i.e.

$$\frac{\textit{total amount of km of the scenario under consideration}}{\textit{total amount of km of the reference scenario}} \times 100$$

Primary energy expended (PEE) given in energy units, i.e. the total amount of expended energy coming from each PE of the scenario.

Primary energy quantity (PEQ) given in mass units (t), i. e. the total amount of energy expended coming from each PE of the scenario divided by its lower heating value (LHV).

This computation is only possible for primary energies that can be weighed in kg.

- LHV for the biomasses is given on a dry matter basis; the moisture content is taken into account in computing the PEQ quantity.
- Typical LHV and moisture content data are to be found on page 9 of the **WTT APPENDIX 1**.

Land use (LU) given in area units (km^2), i.e. the primary energy quantity (PEQ) coming from each PE of the scenario divided by its yield per unit of area (kg/m^2).

The yield values are supplied by LBST.

- LU is also computed for chains based on sun and wind. In this case, LU is defined as a PEE value (MJ) divided by its energetic yield per unit of area (MJ/m^2). Energetic yield data are supplied by LBST.

Water consumption (WU) given in volume units (m^3) for each PE of the scenario (m^3), i.e. the specific water consumption for the process (l/MJ_{fuel}) multiplied by the TTW energy of the chain to which the PE belongs (MJ).

The values of the specific water consumption are supplied by LBST.

- Negative results mean that the quantity of water received during the process as a byproduct is higher than the water consumption.

It is also possible to visualize the same criteria for each chain of the scenario, using the same units. The goal of this visualization is to show the weight of each chain in the whole scenario.

The criteria are visualized as mean values. The values in the d-base are based on both statistics on current production methods and technologies largely not yet fit for series production today. Therefore, some values are affected by a significant uncertainty. The software is able to visualize the uncertainty range of the values (PE and GHG).

For any question or suggestion about the software developement, please contact:

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