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Optiresource – Daimler‘s „Well-to-Wheel“- Optimizer

Comparison of Energy Consumption and Green-House-Gas emissions of different mobility scenarios with Optiresource

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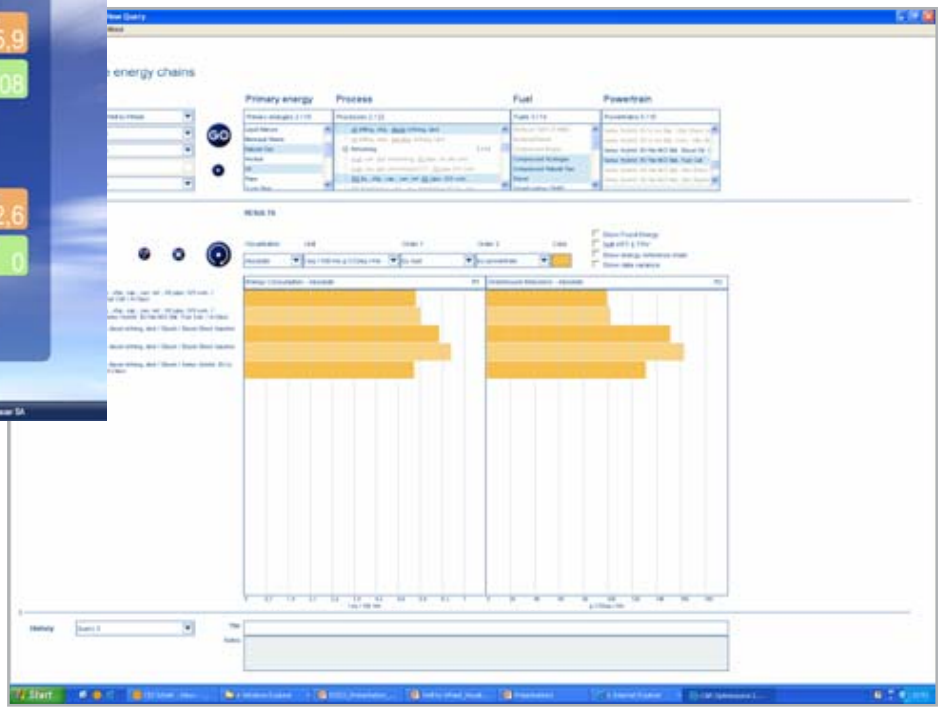
Optiresource is a tool for quick and reliable decisions

Different Optiresource versions for different target groups

Web/Exhibition version

Expert version



The Web version is designed for easy use by non-experts

www.daimler.com/go/optiresource

or

www.optiresource.org

The expert version has a wide variety of funcionalities

The user can

- compare different energy chains in terms of energy consumption, GHG emissions etc.
- detect the chains allowing for the optimization of the consumptions and emissions.
- identify the impact of different energy scenarios.

Different modes

- “Query mode”: the user selects the chains according to certain criteria, the results are visualized (almost 1000 chains available)
- “Scenario Mode”: the user defines scenarios in terms of energy supply and energy demand and then visualizes and compares them

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Optiresource Query Mode

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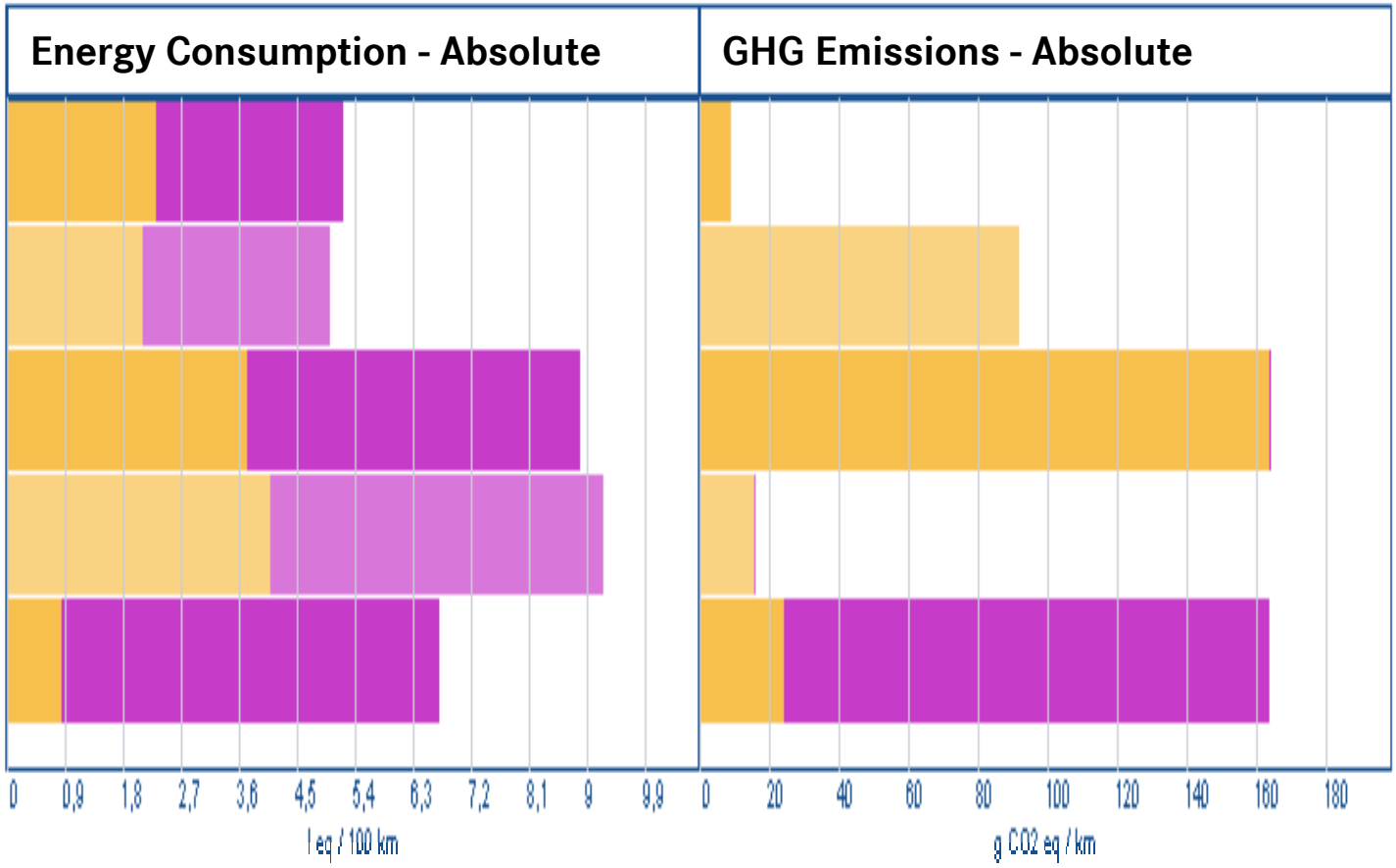
Example for WTW results in the Query Mode

Scenario Title
H2 from wind, pipeline, comp., FCV
H2 from NG, pipeline, CCS, comp., FCV
H2 from NG, pipe CCS, comp., ICE
H2 from wind, pipeline, comp., ICE
Gasoline, ship, refinery, ICE

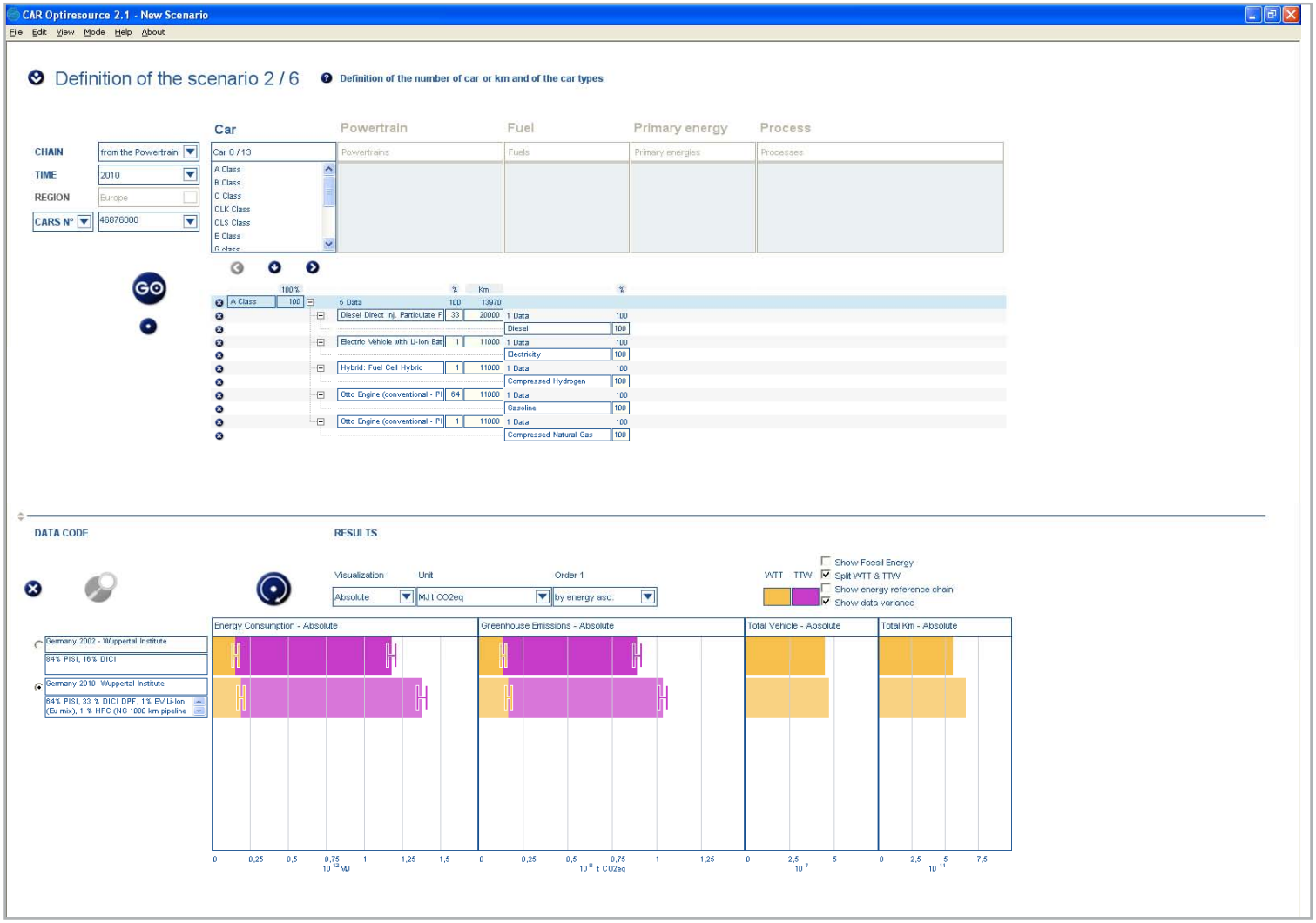


The Optiresource findings for the example query are clearly in favor of renewable hydrogen as a fuel

- By far the lowest GHG emissions and very low energy consumption are achieved by a **Fuel Cell Vehicle** powered by **H2 from wind energy**.
- **Hydrogen from NG** shows even lower energy consumption but clearly higher GHG emissions than **H_2 from wind**. However GHG emissions of this pathway are already lower than those from conventional ICEs.
- An **H2 ICE** powered by hydrogen from NG is the worst of all alternatives shown, both in terms of energy consumption and GHG emissions.

Both in terms of energy consumption and GHG emissions, the **Fuel Cell Vehicle** is the best of all alternatives shown

The Scenario Mode to compare different scenarios in terms of energy consumption and GHG emissions



Very good agreement between Optiresource data and real values

	Total energy consumption for passenger cars tank-to-wheel (TTW) (MJ)	Energy consumption per 100 km TTW (MJ/100km)	Total GHG emissions from passenger cars TTW (tons)	GHG emissions per km TTW (g_{CO2eg}/km)
Data for German passenger cars in 2005	1.48×10^{12}	255	110×10^{6}	189
Results from Optiresource® for simplified scenario for Germany 2005	1.22×10^{12}	210	92×10^{6}	158

Optiresource figures are slightly lower that real values because

- 2002 compact class reference vehicle was used while actual car fleet is older with higher fuel consumption and GHG emissions.
- Compact class reference vehicle does not represent the variety within car fleet.
- Real driving patterns differ from NEDC.

Definition of example scenarios

Powertrain	Fuel	Scenarios (Proportion of different drive trains and fuels)								
		Base Scenario	20% HEV	20% Ethanol	20% BTL	20% FCV CH2, Wind	20% FCV CH2, NG	20% FCV LH2, NG	20% ICE LH2, NG	20% BEV Wind
Otto Engine	Gasoline (Crude Oil)	77%	67%	67%	67%	67%	67%	67%	67%	67%
Diesel	Diesel (Crude Oil)	23%	13%	13%	13%	13%	13%	13%	13%	13%
Otto Engine Hybrid	Gasoline (Crude Oil)	-	10%	-	-	-	-	-	-	-
Diesel Hybrid	Diesel (Crude Oil)	-	10%	-	-	-	-	-	-	-
Otto Engine	Ethanol (Wheat)	-	-	20%	-	-	-	-	-	-
Diesel	BTL (Wood)	-	-	-	20%	-	-	-	-	-
Fuel Cell Hybrid	H2 (Wind)	-	-	-	-	20%	-	-	-	-
Fuel Cell Hybrid	CH2 (NG)	-	-	-	-	-	20%	-	-	-
Fuel Cell Hybrid	LH2 (NG)	-	-	-	-	-	-	20%	-	-
Otto engine	LH2 (NG)	-	-	-	-	-	-	-	20%	-
Electric Motor and Li-Ion Battery	Electricity (Wind)	-	-	-	-	-	-	-	-	20%

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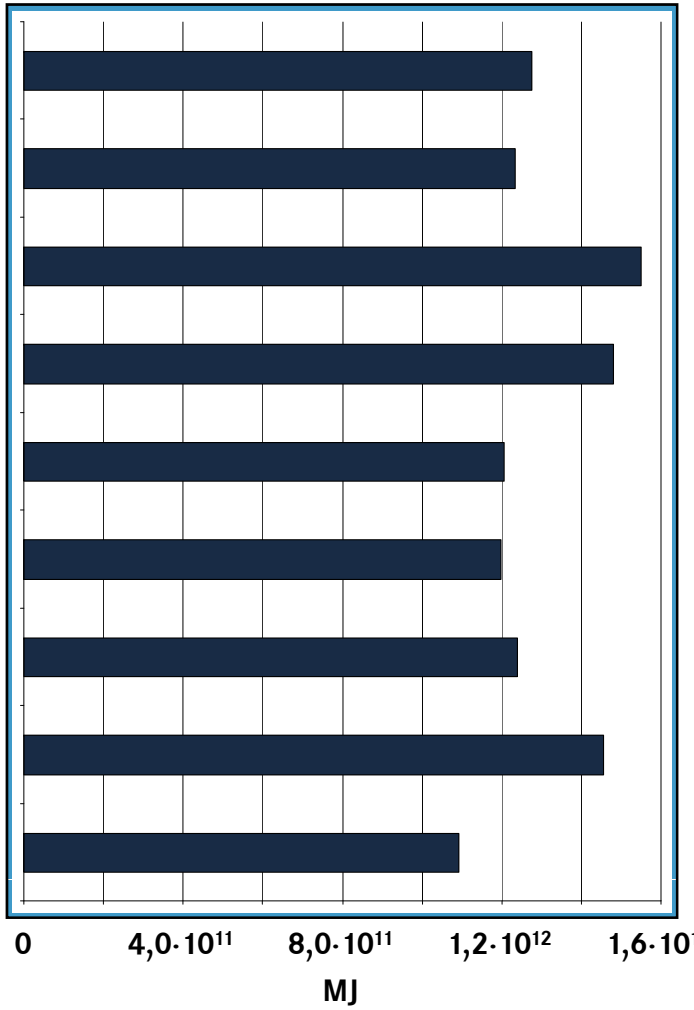
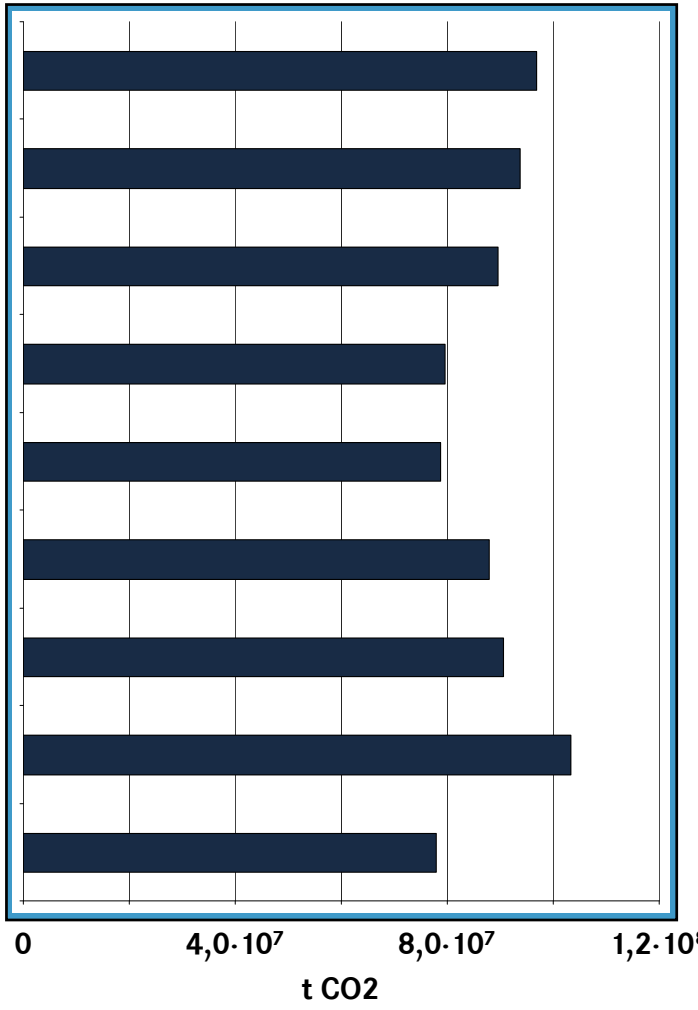
Results of the scenario calculation

Scenario
Base Scenario
20% HEV
20% Ethanol
20% BTL
20% FCV, CH2, Wind
20% FCV, CH2, NG
20% FCV, LH2, NG
20% ICE, LH2, NG
20% BEV, Wind

Total Energy Consumption



Total GHG Emissions



The Optiresource analysis of the example scenarios shows FCV to be the only real alternative for the future

- In terms of GHG emissions every alternative scenario except the H2 ICE is better than the base scenario
- However, only the introduction of **Fuel Cell Vehicles** or **Battery Electric Vehicles** lead to a significant reduction of GHG emissions as well as energy use
- **BEV** show a very similar effect on GHG emissions as **FCV** with even lower energy consumption

Due to still significant difficulties of battery electric vehicles, **Fuel Cell Vehicles** are the only viable mid term alternative for sustainable mobility

Thank you!