

# IEA-Advanced Motor Fuels ANNUAL REPORT 2016

An aerial photograph of a city skyline across a river, with a dense green forest in the foreground. A highway with several billboards is visible in the lower part of the image. The entire scene is framed by a blue, curved, metallic-looking border.

Denmark

## Denmark<sup>1</sup>

### **Drivers and Policies**

Energy Strategy 2050 represents a giant step toward realizing the Danish Government's vision of becoming independent of coal, oil, and gas. In 2010, the Danish Commission on Climate Change Policy concluded that transition to a fossil-fuel-independent society is a real possibility. Energy Strategy 2050 builds on this work. The strategy outlines the energy policy instruments to transform Denmark into a green sustainable society with a stable energy supply. The strategy is also fully financed and takes full account of Danish competitiveness. In March 2012, a historic new Energy Agreement was reached in Denmark. The Energy Agreement from 2012 provides the overall framework for the Danish energy policy. According to the agreement, Denmark must reduce total energy consumption by 7% in 2020, compared to energy consumption in 2010. The long-term goal of the agreement is that the country's energy supply become independent of fossil fuels by 2050.

### **Advanced Motor Fuels Statistics**

Energy consumption by the transport sector today amounts to about 30% of total Danish final energy consumption and is almost entirely composed of fossil fuels. The sector includes road transport, rail transport, aviation, and domestic shipping, as well as energy consumption by the military for transport purposes. Road transport today accounts for 75% of energy consumption, followed by aviation (20%), of which most is for international air travel. With regard to road transport, cars account for more than 60% of energy consumption, vans and lorries each account for about 15%, while buses and motorcycles account for the remaining 10%.

Historically, the number of kilometers driven and energy consumption increased steadily until the 2008 economic crisis, which came at the same time as greater focus on energy-efficient cars. Increases in energy efficiency are due to a European Union (EU) Regulation under which car manufacturers must reduce carbon emissions. This led to a greater range of small, energy-efficient cars. In Denmark, the use of energy-efficient cars has been further promoted by changes in the vehicle registration tax introduced in 2007 favoring such vehicles.

Thus far, the green transition of the transport sector has been very limited. A small percentage of rail transport is powered by electricity, and, since 2006, biofuels have been mixed in petrol and diesel for road transport. Otherwise, almost all other energy consumption is from fossil oil products (about 95%).

Total energy consumption by the transport sector is expected to increase by slightly more than 2% up to 2020 compared with the current level (Figure 1). After this, energy consumption will rise slightly in the period 2020 to 2025. The rise will primarily be due to an increase in international air travel of 12% up to 2025, and a small drop in energy consumption for road transport.

Consumption of diesel will continue to increase, with a corresponding drop in petrol consumption, and, from 2020, it is expected that a greater percentage of biofuels will be used. It is currently unclear whether, and to what extent, there will be requirements to increase the level of biofuel blending.

It is unlikely, however, that a mix of up to 10% will be realistic, as has previously been assumed. On the other hand, an increased biofuel blending in petrol has been assumed from 2020, bringing the total biofuel blending in petrol and diesel to about 6.6% (in relation to the energy content).

It is expected that the number of kilometers driven on the roads will increase in the future (Figure 2). More efficient vehicles ensure that total energy consumption is kept more or less constant, despite an increasing number of kilometers driven. Developments are shown for total road transport; however, there will be differences between the different types of transport. Thus, in 2020, 11% more kilometers will be driven than in 2014, and in 2025, 20% more kilometers will be driven than in 2014. Both

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<sup>1</sup> The information given in this report was mainly derived from Danish Energy Agency, 2015, *Danish Energy and Climate Outlook 2015*, December, [https://ens.dk/sites/ens.dk/files/Analyser/danish\\_energy\\_and\\_climate\\_outlook\\_2015.pdf](https://ens.dk/sites/ens.dk/files/Analyser/danish_energy_and_climate_outlook_2015.pdf).

passenger and freight transport will increase. The increase is due to economic growth combined with expansion of the infrastructure, which will lead to greater mobility for society. At the same time, new cars are expected to be more energy efficient, although not to the same degree as the efficiency improvements seen between 2007 and 2012. If the trend of recent years continues, new sales will meet the standard EU requirement of 95 grams of carbon dioxide per kilometer (95 gCO<sub>2</sub>/km), which will apply from and including 2021. Overall, vehicles on the roads will be more efficient as older vehicles are scrapped and replaced with new, more efficient vehicles. This increased efficiency balances out the increases in the number of kilometers driven, so that total energy consumption will remain more or less stable. This assessment takes into account the changes in vehicle registration tax adopted in the 2016 Finance Act<sup>9</sup>.

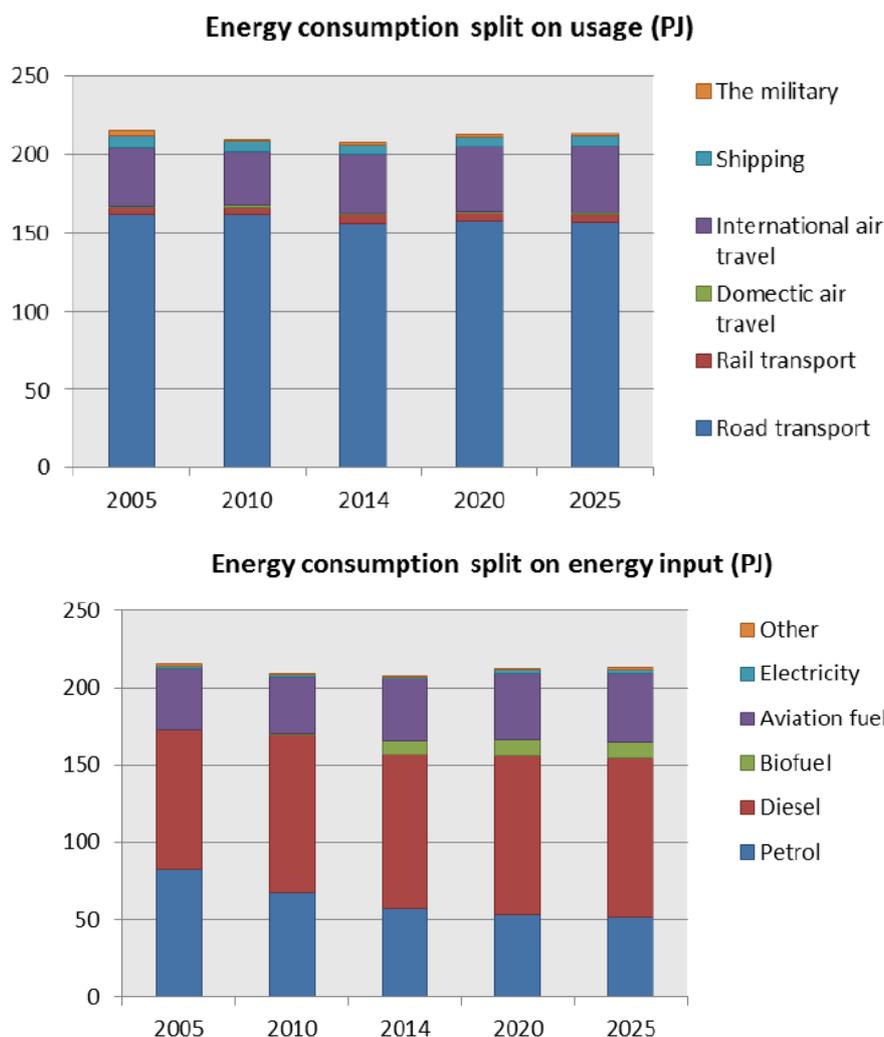


Fig. 1 Expected Development of Energy Consumption in Denmark, 2005–2025

However, there is great uncertainty regarding changes in efficiency and number of kilometers driven. This uncertainty can be attributed to factors such as consumer behavior, including the type of car consumers buy, how often they replace their car, and how much they use it.

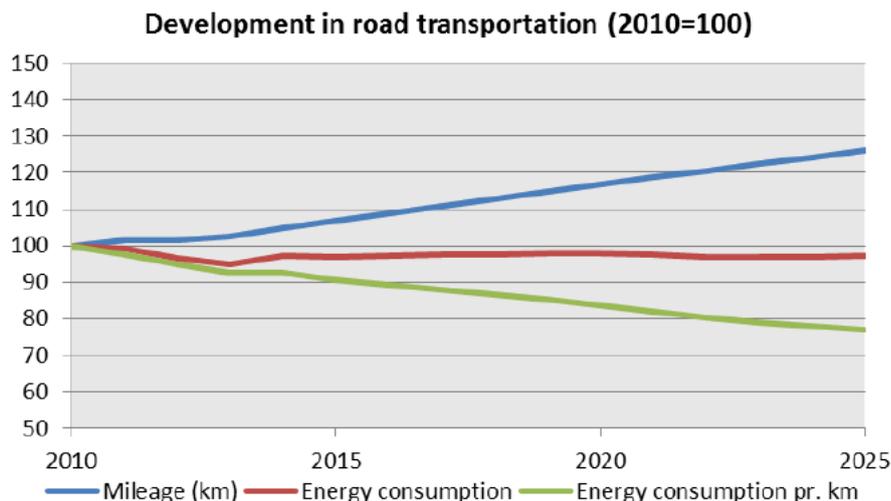


Fig. 2 Expected Development of Transport Work in Denmark, 2010–2025, Relative to Work in 2010

There is no indication that cars, buses, and lorries will move away significantly from petrol and diesel power to electricity, natural gas, and hydrogen before 2025. These alternatives are still expensive compared with conventional fuels, and there is a lack of infrastructure (primarily for gas and hydrogen). No significant technological breakthroughs are expected up to 2025 under current conditions to enable these alternative vehicles to become more widespread; therefore, there will be only limited increases (see Table 1). The alternative vehicles account for less than 0.4% of energy consumption by road transport in 2025.

Table 1 Cars, Buses, and Lorries in Denmark Using Alternative Fuels, 2016–2025<sup>a</sup>

Vehicle Type	Fuel	2016	2020	2025
Cars (number)	Electricity	4,000	6,000	10,000
	Natural gas/biogas	~0	~0	~0
	Hydrogen	~0	200	400
Busses and lorries	Electricity	5	100	300
	Natural gas/biogas	10	300	750

<sup>a</sup> Limited increases in the number of alternative vehicles running on electricity, natural gas, and hydrogen are expected; together, these are also likely to have a very small effect on energy consumption. There are possibly a few cars in Denmark running on gas and hydrogen, but how much these cars are used in practice is unclear, and, therefore, numbers have been rounded to 0 in the projection.

### Research and Demonstration Focus

Research and demonstration in Denmark are focused on electric vehicles and fuel cell vehicles for passenger cars. Several demonstration projects have been initiated. For heavy-duty vehicles, biofuels are the most obvious solution. However, liquid and gaseous electrofuels, which can store a surplus of wind turbine electricity, appear to be gaining attention. Research supporting analysis of common energy and transport fuels production systems also has high priority.

### Outlook

In Denmark, the transportation sector is still almost entirely dependent on oil. The Government has a goal that by 2050 all of the Danish energy supply will be met by renewable energy, including that required by the transportation sector. In February 2012, the Danish Energy Agency finalized a report on alternative fuels for the transportation sector, including socioeconomic aspects, energy efficiency, and environmental impact. The analysis indicates that by 2020 and beyond, electricity, biogas, and natural gas could become especially attractive as alternatives to petrol and diesel in the transportation sector. Electricity is the most energy-efficient alternative because of high efficiency in the engine and an increase in the share of wind-generated electricity supply.

### Additional Information Sources

Further information can be found in Energistyrelsen, [www.ens.dk](http://www.ens.dk).