



## RACE TO ELECTRIFICATION – NORWAY IN POLE POSITION

Electrification is one of our best tools to mitigate climate change. By replacing fossil energy used today with electricity produced from renewable sources, we can substantially reduce greenhouse gas emissions.

It is of little doubt that electricity is set to become the dominant energy carrier in the future. After all, electricity is the only energy carrier that can be generated and distributed to the end user in large quantities and over long distances in a split second, with relatively small losses. It is extremely flexible and can be converted into other energy carriers, such as hydrogen, to be stored and used later.

**“IMAGINE AN ELECTRIFIED FUTURE. NOISE AND POLLUTION ARE GONE. THE AIR YOU BREATHE IS CLEAN. HEALTH-RELATED SOCIETAL COSTS ARE REDUCED – FREEING UP RESOURCES FOR OTHER INVESTMENTS THAT ADD VALUE TO PEOPLE’S LIVES.”**

Electrification of transport and industry is a central element in achieving a pathway compatible with the 1.5°C target specified in the Paris Agreement.

What are the economic consequences of continuing with business as usual, or allowing a 2°C temperature increase to occur? According to the Energy Transitions Commission, it will cost the society less than 0.5 per cent of global GDP to decarbonise the hard-to-abate sectors and around 1 per cent of GDP if the lighter-to-abate sectors are included. But research shows that the costs associated with taking no action to combat climate change will be far higher.

**“THERE WILL BE COSTS ASSOCIATED WITH ELECTRIFICATION – BUT THE COST OF NOT TAKING ACTION WILL BE HIGHER.”**

A recent study in *Nature*, an international science journal, concluded that limiting global temperature increases to 1.5°C rather than 2°C can produce cost savings of €18 trillion.

### CAN NORWAY SERVE AS AN INSPIRATION TO THE REST OF THE WORLD?

With electricity representing only 22 per cent of EU energy use, there is substantial potential for electrification in many European countries. These countries can take advantage of the technological breakthroughs and know-how that Norway has gathered in its electrification process, while adapting these measures to their own unique conditions.

Although electricity is the fastest-growing means of using energy, the pace of electrification on the global level is relatively slow.

Sweco’s experts have introduced a new indicator – “E-day” – to measure which countries have come furthest in electrification. The E-day is the theoretical day of the year by which all electricity has been used. All energy used after this day will not be electricity, but other sources (e.g. fossil fuels).

## E-DAY – THE DAY WHEN ALL ELECTRICITY FOR A YEAR HAS BEEN USED



Ill: "E-day" for various European countries, based on end use of energy in 2016. Data source: Eurostat.

For Norway, E-day occurs on July 7th. This translates to a share of electrification of around 52 per cent when comparing fossil fuels and other energy carriers with electricity. In the UK, by contrast, E-day occurs as early as March 12th.

### WHAT DOES FULL ELECTRIFICATION MEAN FOR RESIDENTS AND END CONSUMERS?

The end consumer will see increased product prices in different sectors. Transport sector-related increases can be illustrated as follows:

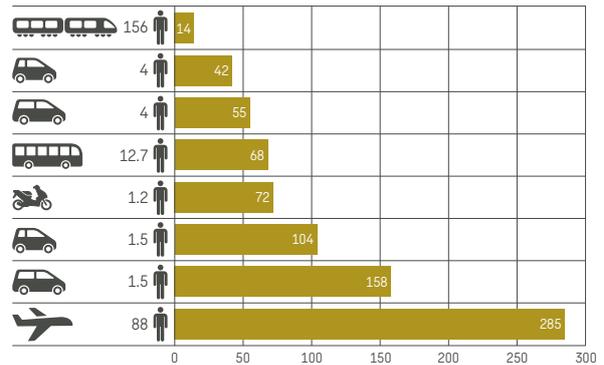
Example of cost to end user:

- Aviation: Ticket prices for zero-carbon international flights will increase 10–20 per cent, resulting in a €35–70 ticket price increase for a 6,500-km economy class flight
- Shipping: <1 per cent increase for a €55 pair of jeans = +€0.3
- Trucking: No cost to end user

Many people are already willing to pay more for products of superior quality and products that have less environmental impact.

In a comparison of various means of transportation, planes are the worst, emitting 20 times more CO<sub>2</sub> per passenger than trains. With hybrid-electric solutions, partially electrified shorter flights could be implemented as early as the 2020s.

## GRAMS OF CO<sub>2</sub> PER PASSENGER KILOMETRE



Ill: Current status of CO<sub>2</sub> emissions per passenger kilometre for various means of transportation. Figures are estimates based on an average number of passengers per vehicle. Data source: European Environment Agency.

### ELECTRIFICATION IN A LARGER CONTEXT

In addition to electrifying energy end use, many countries need to phase out fossil fuels and adapt their energy systems to utilise a larger share of renewable energy sources – to power transports, industries and buildings – in order to reduce their carbon emissions and ecological footprint.

Energy re-use and well-designed energy systems will be of great importance. The electrified future – with huge fleets of electric cars, ferries and aircrafts, along with hydrogen production and an increasingly electrified industry – will put a strain on the grid.

Electrification is not a silver bullet that will solve all problems in achieving a decarbonised society. Electrification is one of several solutions to bridge the gap between the society of today and the society of the future.

The report analyses the measures required to achieve 100 per cent electrification and identifies several possible measures for electrifying the transport, buildings and industry sectors.

Read more in the Urban Insight Report [Race to Electrification – Norway in Pole Position](#).