Road transport and power system scenarios for Northern Europe in 2030

Increasing focus on sustainability affects all parts of the energy system. The future integration of the power and road transport system due to the introduction of electric drive vehicles influences the economically optimal investments and optimal operation of the power system. This work presents analysis of the optimal configuration and operation of the integrated power and road transport system in Northern Europe, i.e. Denmark, Finland, Germany, Norway, and Sweden using the optimization model, Balmorel, with a transport model extension. A number of scenarios have been set up, including sensitivity on CO2 and oil prices, inclusion/exclusion of electric drive vehicles, and change in investment possibilities in flexible power plants. Plug-in hybrid electric vehicles are shown to be competitive in all scenarios except the low oil scenarios. The increased electricity consumption for the electric vehicles is covered by wind power in Denmark and Norway and by coal production in Finland and Germany. The competition between wind power and coal is dependent on fuel price and CO2 price assumptions. Furthermore, introducing the flexibility of electric drive vehicles helps decrease cycling on the remaining power plants. Finally, the electric drive vehicles can replace the use of both heat storage and electric boilers as well as decrease the use of gas turbines.
Original language: English
Keywords: Transport model, Vehicle-to-grid, Electric vehicle, Energy system, Plug-in hybrid
DOIs:
10.1016/j.apenergy.2011.11.074
Source: orbit
Source-ID: 316038
Research output: Research - peer-review; Journal article – Annual report year: 2011