



Sustainable transition and the future energy mix in the Norwegian road transport system

DNVA Webinar on Decarbonisation of Transport

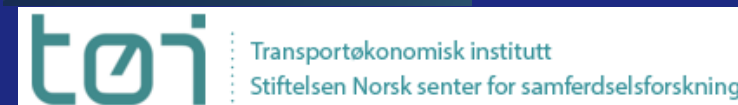
09.09.2020

Kari Aamodt Espegren, Eva Rosenberg,
Janis Danebergs

Principle Scientist, Institute for Energy
Technology

The presentation is based on modelling and analysis done in the ITEM project

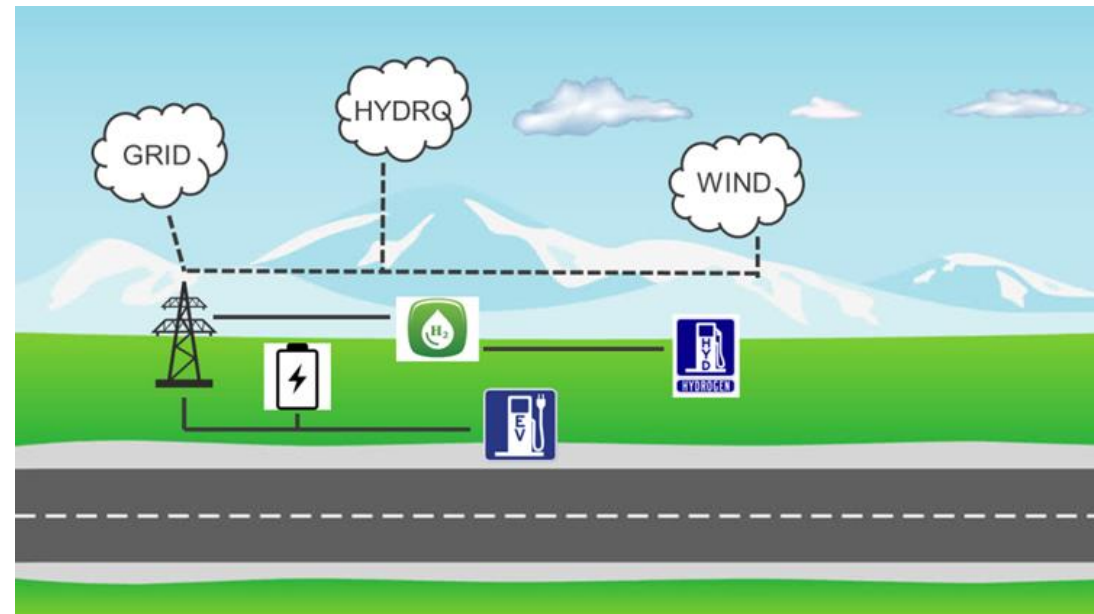
- Improved modelling of zero emission transport infrastructure
 - Policy advise to government
 - Investment support to energy and industry



Energy modelling – local level

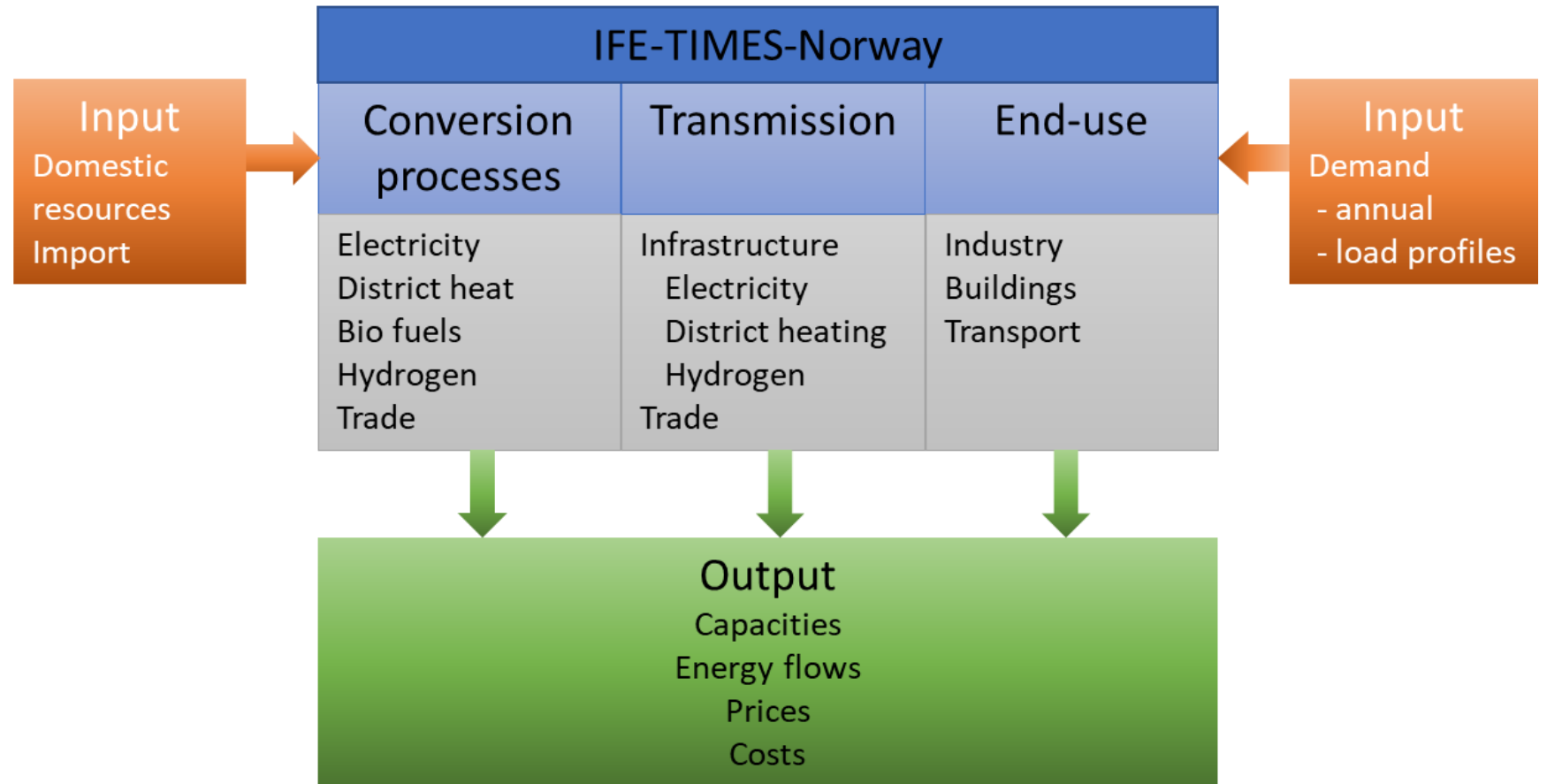
Development of local energy and power system model

- Specific locations in transport corridor between Oslo-Trondheim and Oslo-Bergen
- Detailed modelling of:
 - Hydrogen production and storage
 - Fast charging
 - Local electricity production
 - Battery storage or need for grid reinforcement?



Energy modelling - national level

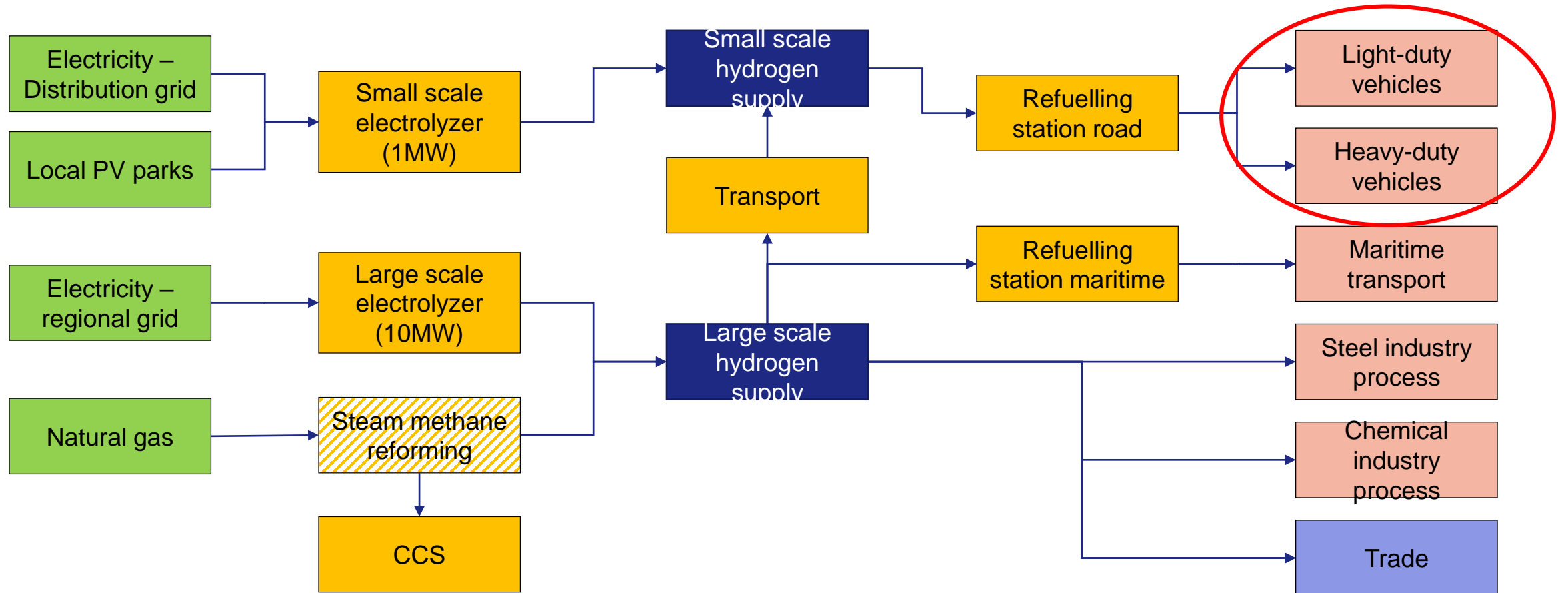
IFE-TIMES-Norway



Model characteristics:

- Five geographic regions
- Start year 2016
- Times slices
 - 4 Seasons
 - 24 hours per day
- Discount rate: 5%

Modelling of hydrogen in IFE-TIMES-Norway



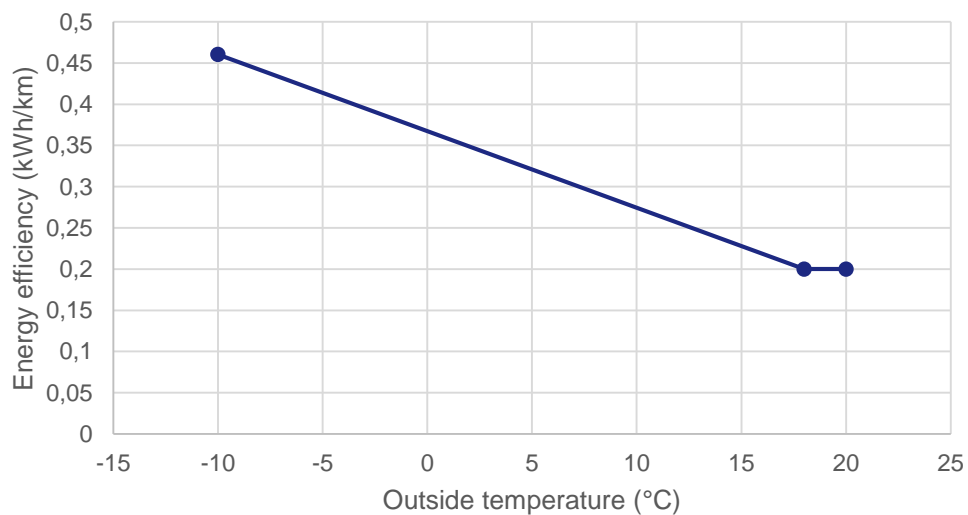
Modelling assumption

- Future transport demand
 - Forecasts made in the National Transport Plan (NTP) 2018-2029
- Technology learning
 - Data from “Klimakur”
 - Updates from recent international research
- Policy
 - Taxes and fees
 - Blending of bio-fuels for ICE and Plug-in hybrids
 - Support schemes – not included in these analysis
- Powertrains applied for the different road transport modes

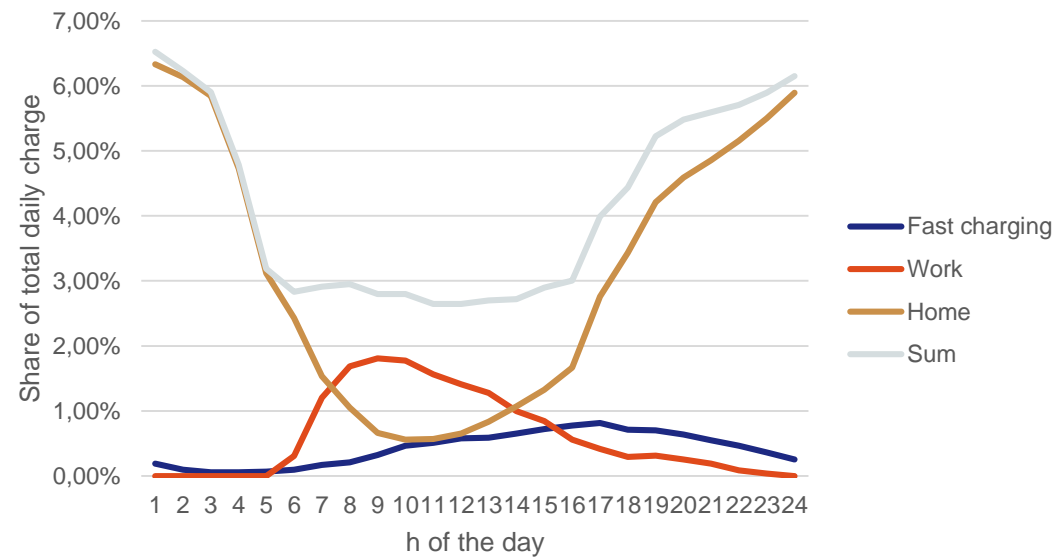
	ICE	Plug-in hybrid	Battery	Fuel cell	Gas powered ICE
Cars	Green	Green	Green	Green	White
Vans	Green	Green	Green	Green	White
Trucks	Green	White	Green	Green	White
Tractor units	Green	White	Green	Green	White
Bus	Green	White	Green	Green	Green

Modelling assumptions - light duty EV's

EV Energy efficiency dependent on outside temperature



Døgn ladeprofil



Analysis with IFE-TIMES-Norway

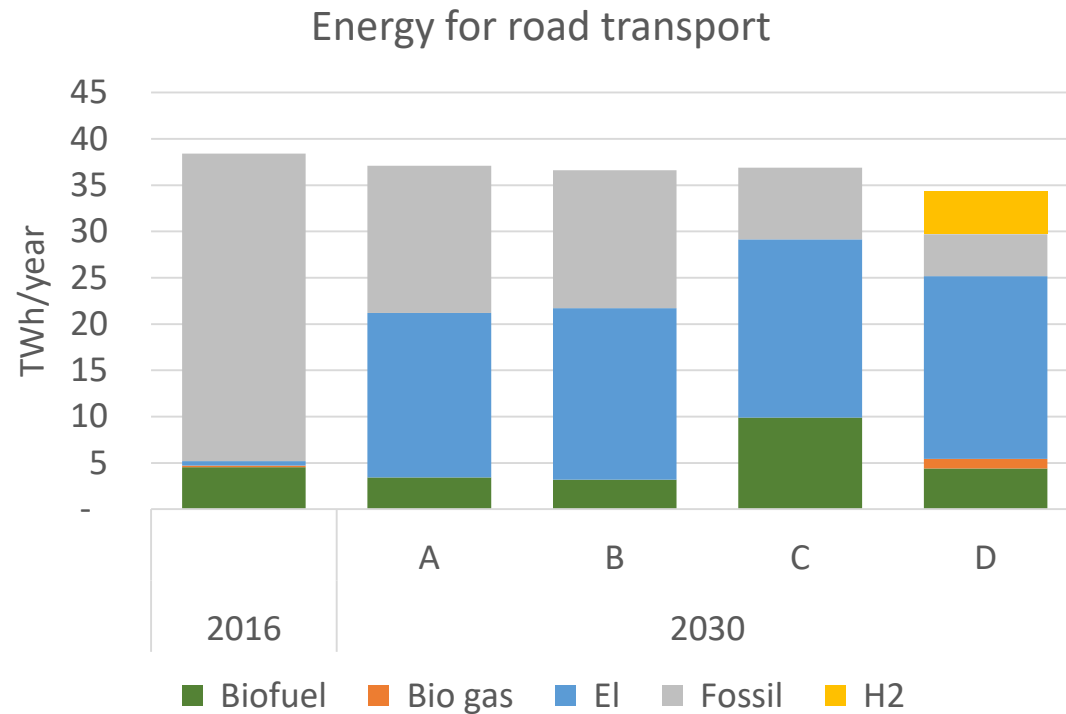
Four scenarios with different assumptions on CO₂-emissions and biofuel

	Without import restriction of biofuel	With import restriction of biofuel
Without CO₂-limitation	A	B
With CO₂-limitation	C	D

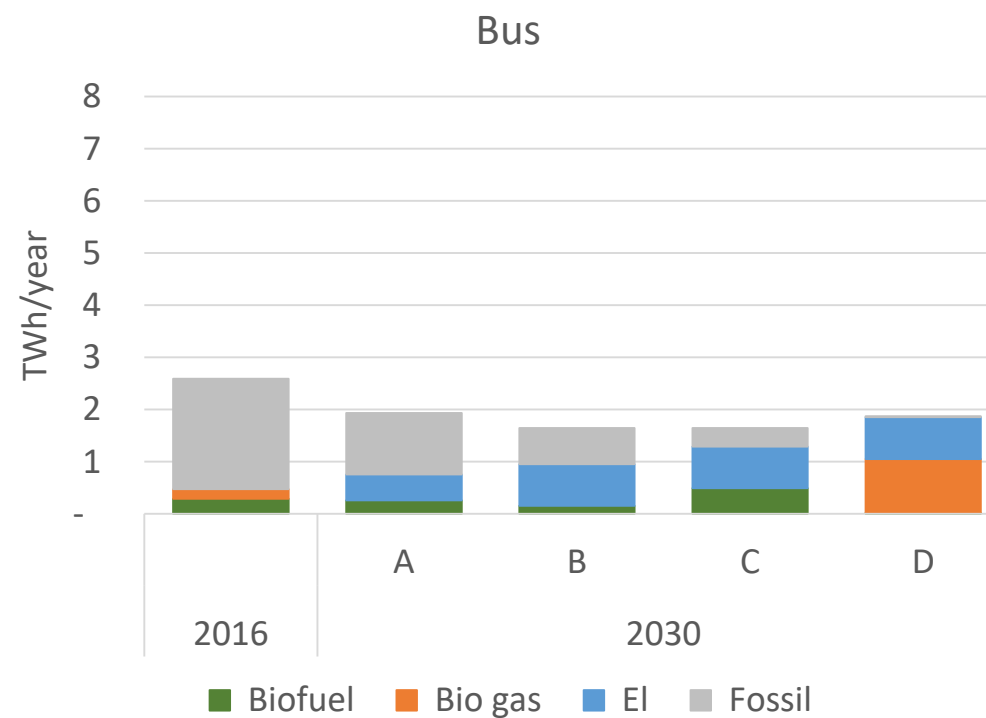
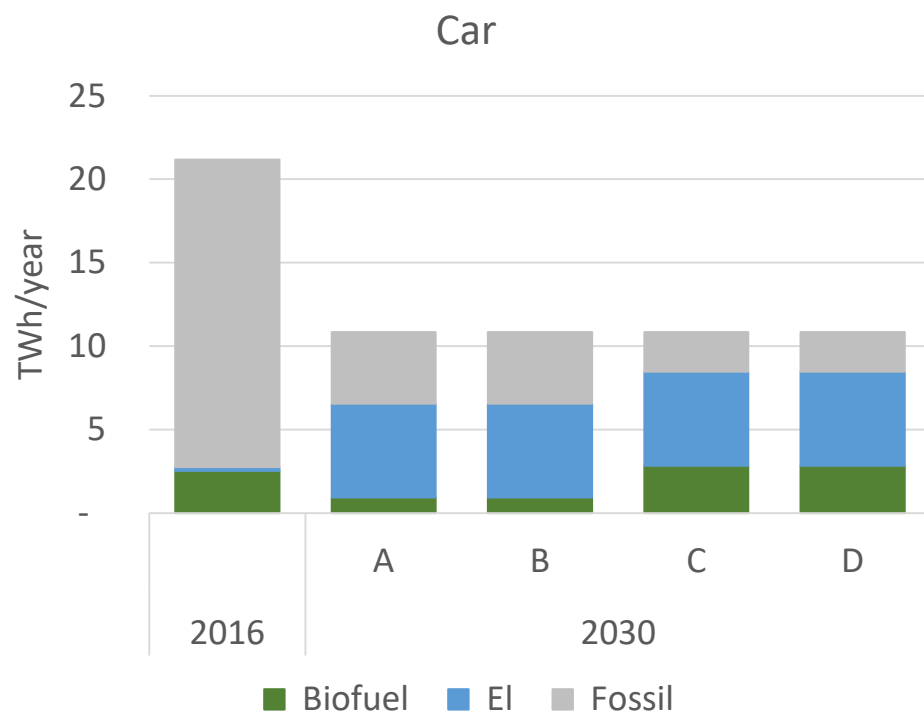
- Import restriction on biofuel:
 - Only Norwegian bio fuel can be used from 2030
 - Imports of bio fuels possible up to 2025
- CO₂-limitations:
 - 90% reduction of CO₂-emission in 2050
 - 40% reduction of CO₂-emission in 2030

Results

Energy used for road transport

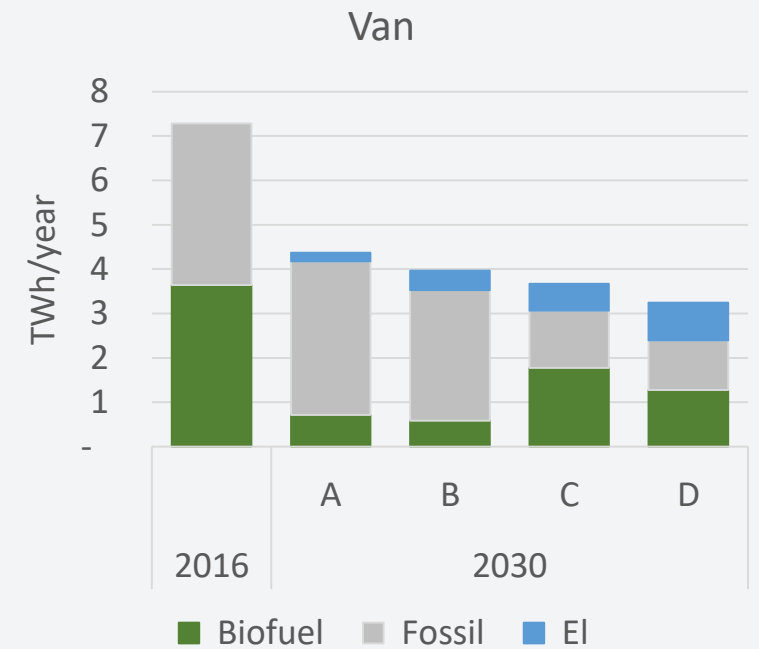
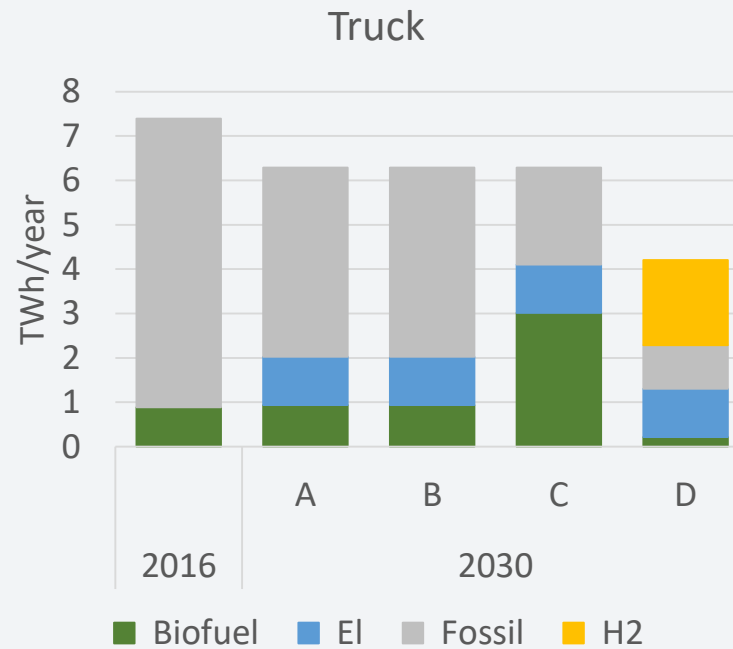
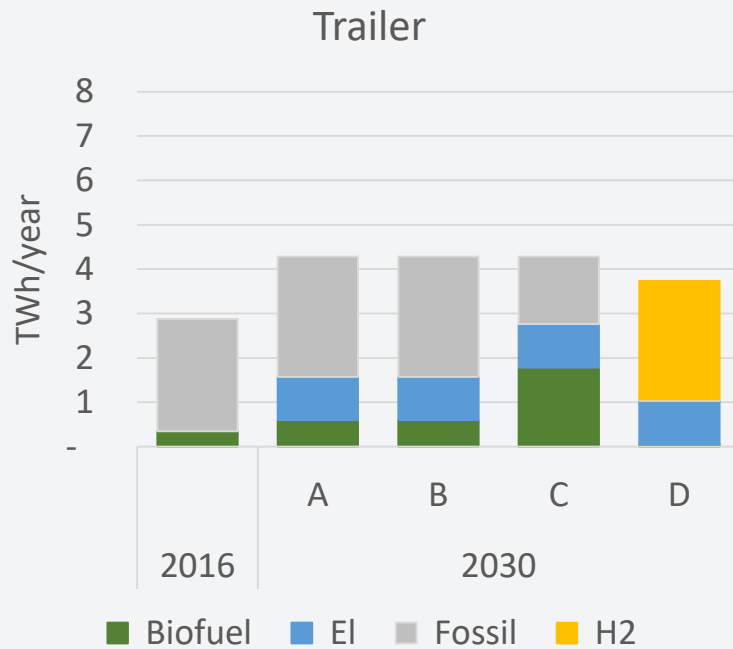


- Do not include electricity for H2-production
- Do not include bioenergy for production of biofuels

10
ResultsEnergy use for passenger road
transport

Results

Energy use for freight road transport



energy system approach when we analyse decarbonisation of the transport sector

Three transport fuels are available:

- Hydrogen
- Bio fuels
- Electricity

Electricity used for hydrogen production:

- Has to be produced from new electricity generation
- Or has to reduce end use of electricity in other sectors

Increased use of bio fuels:

- Increased use of bio fuels in transport, implies reduction of bio energy for heating purposes
- Reduced use of bio for heating – heating is replaced by electricity

