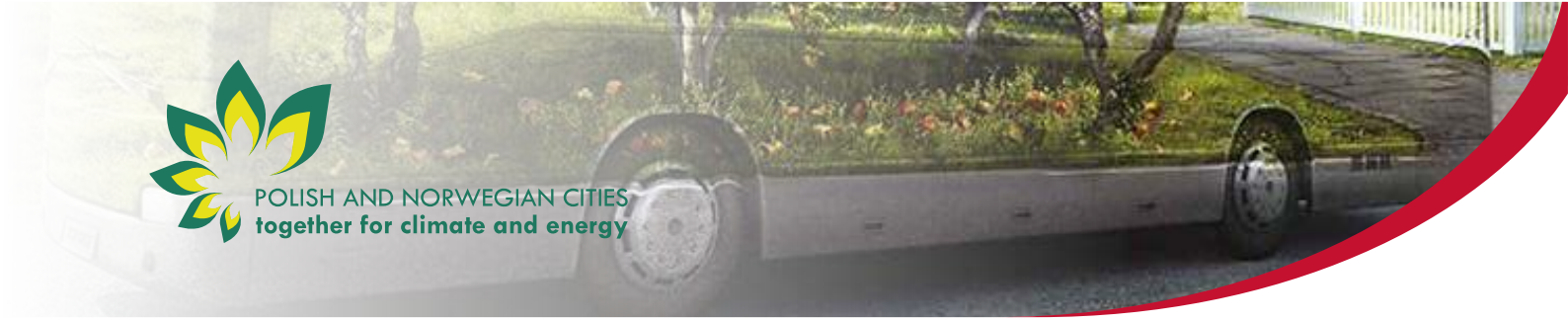


POLISH AND NORWEGIAN CITIES
together for climate and energy

RUTER#: FOSSIL FREE 2020, OSLO AREA
ALL PUBLIC TRANSPORT ON RENEWABLE ENERGY

Sector: Transport

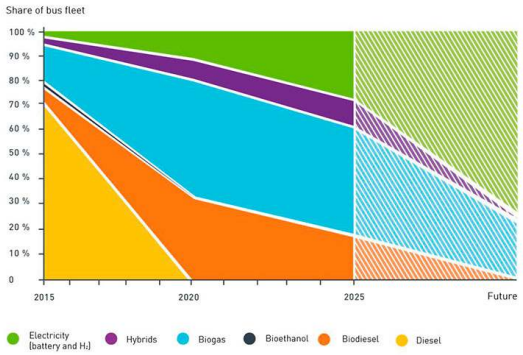
Timeframe: 2015 – 2020

Location: Oslo area, Norway

PROJECT BACKGROUND

Pollution, noise and health issues related to urban traffic is a concern for all large European cities. A growing population creates needs for a large scale, efficient and environmentally friendly public transport system. In Norway, the ambitions for public transport are high, and it is an agreed political goal that all growth in passenger traffic in major cities shall be met by public transport, cycling and walking. Handling traffic growth with environment-friendly mobility solutions is an important contribution to achieve Norway's climate goals and reduce local pollution. Stricter environmental requirements and new technological solutions are driving this process forward.

Ruter is responsible for transport services in Oslo and Akershus counties in Norway, serving 1.2 million people. In June 2015 the board of Ruter adopted an ambitious plan whereby Oslo and Akershus will have only low- and zero-emission buses that run on renewable energy by 2020 and for further developments up to 2025. Ruter's fleet currently comprises some 1,100 buses, 77 % of which run on diesel. In the future most of the buses will be electric and have the necessary driving range to be able to cover long distances. Ruter is also considering introducing electric boats on its services on the Oslo fjord.



The ambition of the public transport sector in Oslo and Akershus is to use only renewable energy in 2020. This calls for wide-ranging changes to the bus fleet and to ferries in the region. Ruter's aim is to introduce the most effective long-term solutions as quickly as possible.

Currently, Ruter's view is that electrical busses and boats are especially promising. They are therefore looking into testing a large number of electric busses and associated infrastructure in regular service during 2016-20, and are now initiating a collaborative phase where they identify partners and concretize ambitions and plans for testing of electric buses.

PROJECT RESULTS

With the introductions of EURO I-VI requirements, significant environmental gains have been achieved, including reductions in local emissions (particulate matter (PM) and nitrogen oxides (NOx)). However, greenhouse gases (GHG, most critical is CO_2) are not part of the EURO emission requirements. To improve local emissions even further and to reduce fuel consumption as well as GHG-emissions, increased usage of new bus and boat technologies is needed.
Electric infrastructure maturity is still low, and further standardization is required. Biodiesel, biogas

fot. Ruter

and bioethanol infrastructure solutions have high technical maturity and are already installed in the Oslo region.

Ruter wishes to contribute to speed up commercialization and adoption of zero-emission solutions for public transport both in Norway and in Europe. This will result in a reduction in environmental impact, less noise and higher energy efficiency in public transport. Ruter's goal is for public transport to continue to be the most environmentally friendly choice, even when in emissions from private cars become low. Becoming fossil fuel free will result in better public transport services in the region, with innovative solutions and reliable, comfortable and quiet vehicles. This will help the capital region to grow into a healthy, green and attractive place to live and work.

MORE INFORMATION

Ruter's web site:
www.ruter.no/en/about-ruter/reports-projects-plans/fossilfree2020/
Read more:
- First battery electric bus test in Oslo and Akershus are under preparation
- Plan ready for transition to running exclusively on renewable energy in 2020
- Fossil Free 2020 and testing of electrical buses
- Renewable energy powertrain options for Ruter, a report for Ruter by Roland Berger Strategy Consultants

	Bus technology maturity level 2015	Commercial ready in 2020	Infrastructure maturity 2020	Fuel/energy availability in 2020	Reduced local emissions vs. Euro V diesel	Reduced WTW CO_2 emissions towards conventional diesel	Energy consumption	TCO Index 2020
Biodiesel	●	✓	●	✓	◕	◕	High	98-102
Bioethanol	◕	✓	●	(✓) 1)	◕	◕	High	103-108
Biogas	●	✓	●	(✓) 1)	◕	◕	High	108-114
HEV	◕	✓	●	✓	◕	◕	Medium	98-104
PHEV	◔	(✓)	◕	✓	◕	◕	Medium/low	114-127 3)
Overnight	◔	(✓)	●	✓	●	● 2)	Low	108-121
Opportunity	◔	(✓)	◕	✓	●	● 2)	Low	110-122
Fuel cell	◔	(✓)	◕	(✓) 1)	●	● 2)	Medium	132-151

● High ○ Low ✓ Available (✓) Partly available

1) Capacity not sufficient for whole fleet 2) Renewable electricity, excluding CO2-impact from battery production which is significant 3) PHEV with opportunity charging

Summary of analysis results by technology towards 2020[3]