

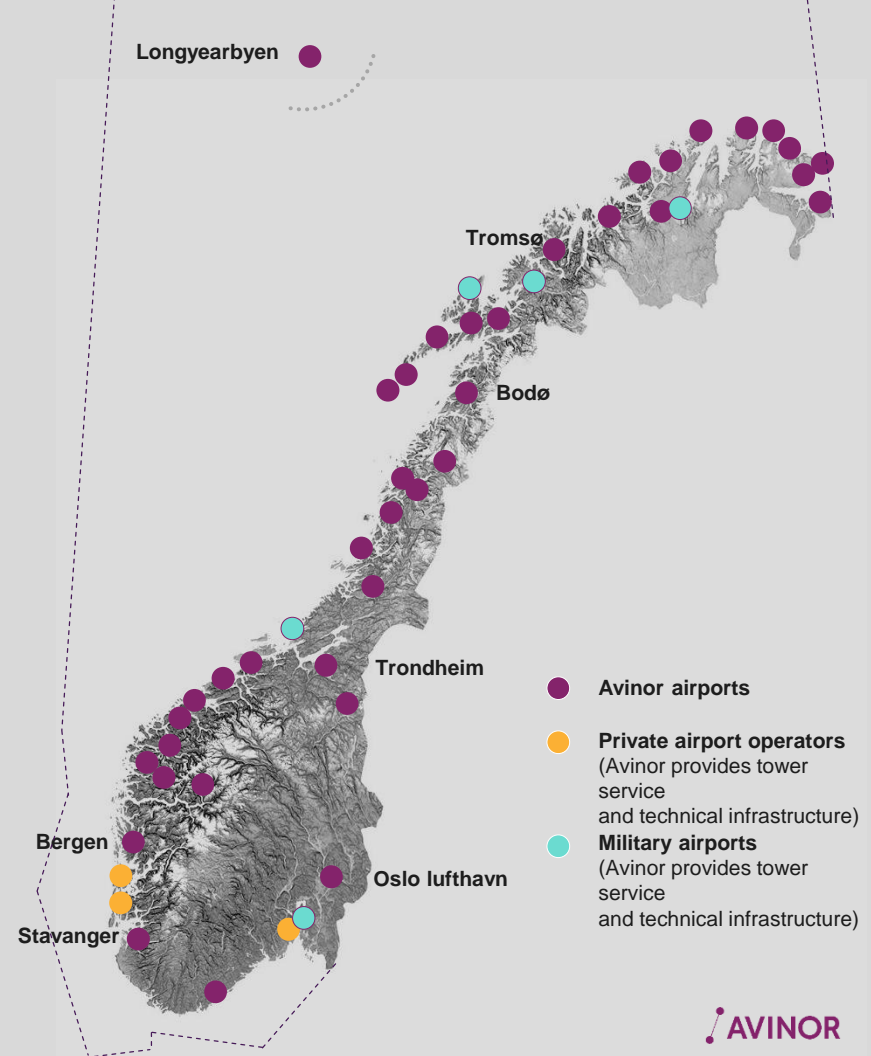
Sustainability Through Improved Environmental Footprint and Adoption of New Technologies



Avinor

State limited company owned by the Ministry of Transport

Responsible for 43 airports, as well as air navigation services for civilian and military aviation, in Norway





Paris-goals must be achieved

- Costly, but necessary
- An industry in fierce international competition
- Technological solutions under development
- Cooperation within the industry and with government(s) crucial

 AVINOR



 NHO
Luftfart


 norwegian

SAS

 widerøe

Norwegian aviation fossil-free by 2050

 AVINOR



Likely that one or more fossil-free technologies will enter the market

- Sustainable aviation fuels
- Battery electric aircraft
- Hybrid solutions
- Hydrogen

Avinor operations fossil-free by 2030



Avinor CO₂ emissions 2020

Vehicles	Svalbard Airport	Business travel
	Runway Deicing	Energy (thermal)
		Firefighting

More energy efficient aircraft



SAF



Sustainable aviation fuels (SAF)

- Jet biofuel and electrofuels
- Compatible with existing infrastructure and aircraft
- ASTM certification required (currently up to 50%)
- Minimum requirements for GHG reduction
- Substantial price difference
- Limited usage (<0,05%)



Increasing demand for SAF

2014: Demo flights



2016: Avinor Oslo airport



2020: Norwegian mandate



2021: Proposed EU mandate



CHC




SAF – opportunities for Norway

- Close cooperation in the Norwegian aviation industry
- Potential feedstock in forestry residues
- High renewable share in the grid
- A number of sustainable fuel production facilities under development world wide
- Norwegian aviation has been a frontrunner

AUGUST 2021

Programme for increased production and uptake of sustainable aviation fuels

Summary



AVINOR

6

NHO LUFTFART

norwegian

SAS

widerøe

Electrification



Introducing Airbus ZEROe

Turboprop



<100

Passengers



Hydrogen
Hybrid Turboprop
Engines (x 2)



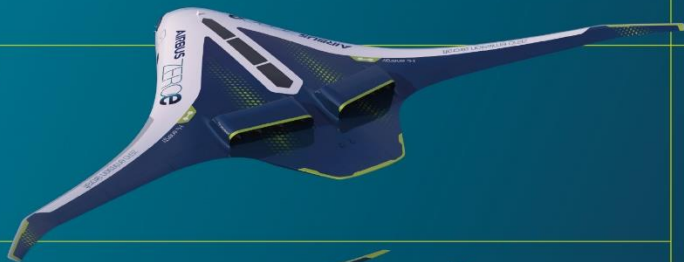
1,000+nm

Range



Liquid Hydrogen
Storage & Distribution
System

Blended-Wing Body



<200

Passengers



Hydrogen
Hybrid Turbofan
Engines (x 2)



2,000+nm

Range



Liquid Hydrogen
Storage & Distribution
System

Turbofan



<200

Passengers



Hydrogen
Hybrid Turbofan
Engines (x 2)



2,000+nm

Range



Liquid Hydrogen
Storage & Distribution
System

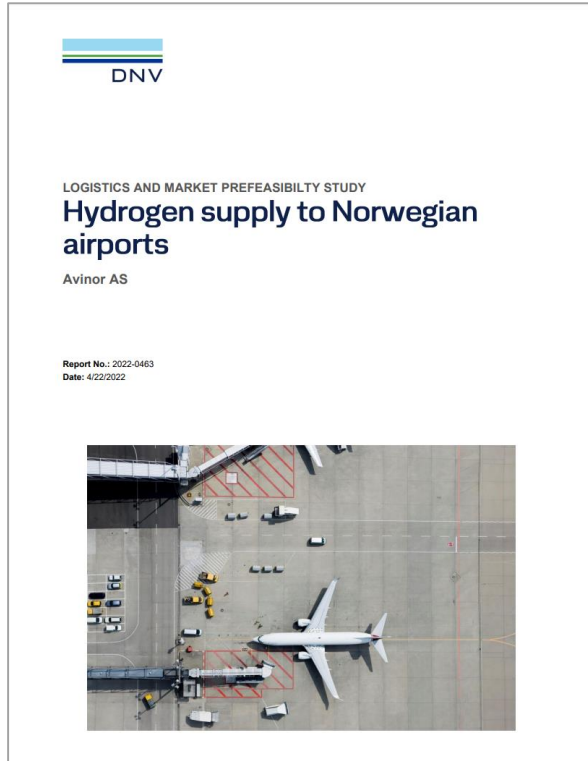
AIRBUS

Norway well positioned

- Short distances in the air
 - Already established market with operators
 - Expect that zero emission aircraft up to 19 seats could enter market before 2030
 - Widerøe indicate testing from 2025 and first regular flights in 2026
 - Hydrogen powered aircraft from 2035? (Airbus)
- ➔ Avinor's main responsibility is to provide adequate infrastructure



Infrastructure



Policy matters

Norwegian aviation has:

- EU ETS
- CO₂-duty on domestic aviation
- Air Passenger Duty (APD)
- SAF Mandate
- ICAO CORSIA

Have been promised:

- Exemption for APD for zero and low emission aircraft

Would like to have:

- Aviation carbon reduction fund
- Close(r) relationship with the government on policies for emission reduction and technology development
- Funding for a Green Aviation Program
- Technology incentives in the PSO routes
- Clarifications on the use of APD and use of environmental incentives in Avinor's aeronautical charges



Concluding remarks

- Norway is totally dependent on aviation
- Carbon emissions must be mitigated
- SAF is a turn key solution and will be crucial
- Very likely that new energy carriers will enter market
- Norway is an ideal innovation arena
- Avinor is committed to develop adequate infrastructure for sustainable aviation
- Cooperation is key!

